

**CITY OF FARGO SPECIFICATIONS  
EXCAVATION, TRENCHING, AND BACKFILLING  
FOR UNDERGROUND WORK**

**PART 1  
DESCRIPTION OF WORK**

The terms “Excavation” and “Trenching”, either individually or collectively, as used in these Specifications and other contract documents shall refer to and shall mean all material excavated or otherwise removed, in the performance of the specified work and all subsequent handling, backfilling, and/or disposing of such material. Excavation and trenching shall include site clearing and preparation where required, subgrade preparation, boring, tunneling, bell holes, all sheeting, shoring, and dewatering of trenches and excavations, protection of adjacent property, backfilling, pipe encasement, specified backfill compaction and consolidation, surfacing, final grading and dressing of the sites to the grades and elevations shown on the drawings or specified to be done, and other work necessary or required.

**PART 2**  
**MATERIAL**

2.1. CLASSIFICATION OF EXCAVATED MATERIAL

No classification of excavated material will be made. Excavation and trenching work shall include all the removal and subsequent handling of all material encountered in the excavation limits.

2.2. SURFACE RESTORATION

Unless stated specifically to the contrary in the Special Instructions, the Contractor shall replace all surface material and shall restore paving, curbing, sidewalks, gutters, fences, sod, topsoil, and other items disturbed, to a condition equal to that before the work began; furnishing all labor, material, and equipment necessary to do this work. Traveled streets shall be kept open and maintained by the Contractor after the backfilling and before surfacing or final inspection. The cost of all such work shall be absorbed in the contract unit price for size of pipe being installed unless otherwise specified in the special instructions.

2.3. BARRICADES AND LIGHTS

When streets or public thoroughfares are impacted by construction activity, the public shall be protected by placement of adequate warning devices. All open trenches and other excavations shall be provided with suitable barrier signs and lights, to the extent that adequate protection is provided to the public against accident by reason of such open construction. Obstructions such as equipment and material piles shall be provided with similar warning signs and lights.

All barricades and warning devices shall be in accordance with Section 4100 of these Specifications.

2.4. PAVING REMOVAL AND REPLACEMENT

Whenever paving or sidewalk is encountered on the line of the pipe, it shall be cut through at such places and in such a manner as the Engineer may direct. Removals shall be in accordance with Section 1050 of these Specifications.

The Contractor shall maintain all paving cuts until paving is done. Temporary patching may be done with concrete, asphalt, stabilized gravel or any other method approved by the Engineer, except for temporary patches left over the winter, which shall be concrete. Permanent patches shall be subject to the warranty period specified in the contract.

A. ASPHALT PAVING

Asphalt paving that is removed shall be replaced in kind in accordance with Section 2400 of these Specifications.

B. CONCRETE PAVEMENT REPLACEMENT

Concrete pavement and concrete base pavement that is removed shall be replaced in kind in accordance with Section 2100 of these Specifications.

C. SIDEWALK REPLACEMENT

Concrete sidewalks removed on the line of the pipe shall be replaced in kind with new sidewalk. Sidewalk replacement shall be done in accordance with Section 2300 of these Specifications.

2.5. TRENCH FOUNDATION MATERIAL

Material used for stabilizing trench bottoms shall be 100% crushed rock and shall be sized 1-1/4" minus or as specified on the plans or bid sheet.

**PART 3**  
**CONSTRUCTION**

3.1. LOCATION AND PROTECTION OF EXISTING UTILITIES

The location of the public or private utilities may be shown on the plans, as reported by the various utility companies and the City, but this does not relieve the Contractor of the responsibility of determining the accuracy or completeness of said locations. North Dakota law requires the Contractor to contact ND One-Call at 800-795-0555 prior to any underground interference. The Contractor shall protect all trees, shrubs, manholes, water shut-off, survey monuments, or any other existing utilities from damage. Any utilities that are damaged during the course of the work shall be repaired or replaced to the satisfaction of the Engineer at the Contractor's expense.

3.2. CONTRACTOR TO MAINTAIN TRAFFIC AND DRAINAGE

A. *TRAFFIC*

The Contractor shall conduct the work in such a manner as to interfere as little as possible with the use of the street for public travel, whether vehicular or pedestrian. When it is necessary to cross or interfere with roads, driveways, and walks, whether public or private, the Contractor shall at his own expense provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of travel, and shall give reasonable notice to owners of private drives before interfering with them; provided however, that such maintenance of traffic will not be required at any point where the Contractor has obtained permission from the owner and tenant of the private property, or from the authority having jurisdiction over public property involved to obstruct traffic at any designated point thereon and for the duration of whatever period of time as may be agreed on.

B. *DRAINAGE*

The trenches shall be smoothed to conform to the elevations and contours of the existing ground and all sod removed or damaged shall be replaced at the Contractor's expense. The backfilling of the trench shall be done in such manner as to prevent water from accumulating in unfilled or partially filled trenches. All ditches or other watercourses crossed by the line of the trench shall be restored to their original condition immediately

after backfilling in order that surface drainage will be obstructed no longer than necessary.

### 3.3. CLEARING, GRUBBING, AND TREE REMOVAL

Sites that are to be occupied by permanent construction or which are to be excavated and graded shall be cleared and grubbed of all stumps, trees, logs, brush and other vegetation and debris as may be required for the proper conduct and execution of the work.

Clearing, grubbing, and tree removal shall be in accordance with Section 1050 of these Specifications.

### 3.4. TOPSOIL

#### *3.4.1. STRIPPING AND STOCKPILING*

The Contractor shall remove and stockpile all topsoil in areas of excavation as delineated in the field by the Engineer in accordance with Section 1050 of these Specifications.

#### *3.4.2. TOPSOIL SPREADING AND IMPORT*

All topsoil shall meet the requirements specified in Section 2000 of these Specifications.

### 3.5. DISPOSAL OF EXCESS MATERIAL

All excess excavated material shall become the property of the Contractor and shall be disposed of away from the work site at such locations and in such a manner as the Engineer may direct. The Contractor shall furnish a dump person at no expense to the City. Broken concrete, asphalt, and other similar materials shall be separated from the earth fill and hauled to the City of Fargo landfill.

Stockpiling: On projects where the City retains ownership of the excess material at a site designated on the plans or special instructions, the Contractor shall stockpile the material. The costs to haul and shape the material to a drainable, mowable stockpile shall be included in the cost of other bid items.

### 3.6. EXCAVATION FOR STRUCTURES

Except where special construction on unstable soil is authorized, all structures shall be founded on and be in direct contact with undisturbed original subsoil; all unauthorized excavation below the specified structure subgrade shall be replaced by and at the expense of the Contractor, with concrete monolithic with that of the structure, slab or foundation above.

All excavations shall be kept dry to the extent that no pipe or reinforcing steel is installed in water and that no water will be allowed to rise over the reinforcing steel prior to the concrete being placed. No water shall be allowed to come in contact with any concrete within 12 hours after placing. Such lowering of the water level shall be maintained from subgrade preparation until after the concrete has been placed and hardened. In the case of trenches, the dewatering shall be done by means of well points or other acceptable means until the pipe has been laid and backfill has been completed to a stage where danger from flotation is eliminated.

The Contractor is responsible for the condition of any sewer, drain or other conduit which may be for drainage purposes and all such pipes or conduits shall be clean and free of all sediment before acceptance thereof by the Engineer.

Concrete forms shall be required above extended footings and excavations shall provide adequate clearance for their installation and removal. In no case shall excavation faces be undercut to provide for extended footings. Not less than 6 inches clearance shall be provided between excavation faces and brick or block masonry exterior wall surfaces that are to be plastered.

Subgrade soil for all concrete structures shall be firm, dense, and thoroughly consolidated and compacted; shall be free of mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen. Where necessary, a layer of concrete of sufficient strength and thickness to withstand subsequent construction activity shall be installed below the specified subgrade elevation and the structure concrete placed thereon. Coarse gravel or crushed stone may be used for subsoil reinforcement if satisfactory results can be obtained thereby. Such material shall be applied in thin layers, each layer being entirely embedded in the subsoil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone and the finished elevation of any subsoil reinforced in this manner shall not be above the specified subgrade.

### 3.7. STRUCTURE BACKFILL

Backfilling around and outside of structures shall be adequately compacted, to the extent necessary to prevent future settlement, by tamping or by other means approved by the Engineer. Settlement by inundation with water will be permitted only where no damage could result to the structure from hydrostatic pressure or uplift. All backfill shall be earth only, with no vegetation or debris being placed in the backfill.

Mechanically compacted backfill shall not be deposited or compacted in water and shall consist of loose, damp earth having a moisture content such that maximum density of the compacted soil will be obtained. Moisture content shall be uniform throughout and where added, it shall be made in sufficient time in advance to ensure uniform distribution throughout the backfill.

### 3.8. TRENCH EXCAVATION

No more than 300 feet of trench shall be open at any one time in advance of the complete construction of the pipe installation. Ordinary excavation shall be open-cut from surface, however when depth of trench and soil conditions permit, tunneling may be required beneath crosswalks, driveways, curbs and gutters, pavement and other surface structures; for such tunneling no additional compensation will be allowed over the price for open-cut excavation.

All material excavated shall be deposited alongside the trench in a manner that will cause the least inconvenience to the public and be consistent with the rapid and economical handling of the work. Sidewalks, streets, driveways, and alleys shall be kept open to traffic and all trees shall be protected from injury.

#### *3.8.1. ROUGH EXCAVATION*

Rough excavation shall be deep enough to provide at least three (3) inches of pipe embedment material as specified. Trenches shall be of sufficient width to provide ample space for workmen to install the pipe and in no case shall the trench be less than 24 inches.

### 3.8.2. *HAND EXCAVATION*

Hand excavating tools and methods shall be used in locations where the use of mechanical equipment would cause damage to trees, buildings, culverts, utilities, or other structures above or below ground.

### 3.8.3. *TUNNEL EXCAVATION*

Tunnel sections shall provide adequate clearance for the proper installation of the pipe. All bracing, shoring, or sheeting necessary for the construction of the tunnel and the proper protection of the workmen therein shall be furnished and installed by the Contractor and, where and as required by the Engineer, shall be left in place. All tunnel backfill shall be of proper moisture content and condition to readily compact, and shall be thoroughly tamped and rammed into the annular space around the pipe.

### 3.8.4. *ALIGNMENT, GRADE, AND MINIMUM COVER*

The alignment, grade and elevation shall be fixed and determined by means of offset stakes located by the Engineer. The minimum cover over water lines and the minimum separation from sewer lines shall be in accordance with Section 1300 of these Specifications. Care should be taken to maintain depth of cover under ditches, vertical curves, gutters and on service lines. Cover over sewers and sewage force mains shall be as shown on the plans and as staked by the Engineer.

### 3.8.5. *REPLACEMENT OF UNSUITABLE PIPE FOUNDATION MATERIAL*

When, in the sole opinion of the Engineer, the trench bottom is not suitable to provide a uniform base for the pipe, the trench shall be undercut to sufficient depth to build an acceptable base.

### 3.8.6. *ARTIFICIAL TRENCH FOUNDATIONS*

Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such artificial material(s) as the Engineer may order installed. All timber, concrete foundations, wooden invert, pipes, posts, stringers, and/or saddles made necessary by quicksand or other treacherous soil, shall be installed as directed by the Engineer.



### 3.8.7. DEWATERING OF TRENCHES

Pipe trenches shall be kept free from water during excavation, grading, pipe laying and embedment in an acceptable manner. When the trench bottom is unstable due to ground water, and in all cases where the static ground water level is above the bottom of the trench or bell hole excavation, such ground water shall be lowered by means of well points and pumps or by other means acceptable to the Engineer, to the extent necessary to keep the trench free from water and the trench bottom stable at all times the work is in progress. The disposal of the wastewater from trench dewatering operations shall be piped/routed to existing drainage ditches, channels or drains, subject to the approval of the Engineer. Surface water shall be diverted to prevent it from entering trenches to the greatest extent possible without damage to adjacent property from dikes, ditches, or impounded water. The ND Storm Water Permit shall govern dewatering methods.

### 3.8.8. FINISH GRADING OF TRENCH BOTTOM

Trench bottoms shall conform to the grade and elevation to which the pipe is to be laid and the gravel bedding shall be accurately compacted, graded, and shaped to provide uniform bearing and support for each pipe along its length between bell holes before the pipe is laid in the trench.

In the event that after placing the pipe in the trench it is found that the prepared trench bottom is not at the proper elevation, the pipe shall be removed and the grade corrected. In no case shall the pipe be raised from and dropped in the trench bottom for the purpose of lowering a subgrade that is too high.

#### A. BELL HOLES

Bell holes in the trench bottom shall be dug after the trench has been graded. Each bell hole shall be dug immediately prior to placing the pipe in the trench. Regardless of the type of joint, all bell holes shall be of sufficient depth and size that the joints can be properly made with no part of the pipe bell in contact with the trench bottom.

#### A.1. SANITARY AND STORM SEWERS

Bell holes shall not be longer than 1/4 of the pipe laying length nor exceed 18 inches.

#### A.2. WATER LINES

Bell holes shall be large enough to properly make the joint, and no part of the pipe bell is in contact with the pipe bottom.

#### B. EXCAVATION FOR CONCRETE ENCASEMENT OR EMBEDMENT OF THE PIPE

Where concrete encasement or embedment is required, trench subgrade elevation will be determined by the thickness of the required concrete section. The horizontal dimension shall be at least the minimum trench width permitted for the pipe being laid and shall extend the full width of the trench as excavated and shall be poured against vertical trench walls. In the case of a sheeted trench, the concrete shall be poured against sheeting that has been left in the trench.

#### 3.8.9. MAXIMUM TRENCH WIDTHS

Trenches shall be excavated to a width that will provide adequate working space to install and embed the pipe. However, in order to protect the pipe from loading in excess of design conditions, the width of the lower portion of the trench to a point 6 inches above the pipe shall not exceed 24" plus the outside diameter of the bell.

#### 3.8.10. UNAUTHORIZED TRENCH WIDTHS

Where, for any reason, the width of the lower portion of the trench exceeds the maximum permitted, pipe of adequate design, special pipe embedment, rock encasement, or arch concrete encasement as required by loading conditions and as determined by the Engineer shall be furnished and installed by the Contractor at his sole expense. The determination of necessary pipe, special embedment or arch concrete encasement shall be based on pipe strength equal to the minimum three-edge bearing ultimate strength stipulated in the governing pipe specification for the size and type of pipe involved. Trench loading will be based on saturated backfill weighing 120 pounds per cubic foot with suitable allowances for trench or other live loads where required.

*3.8.11. TRENCH BRACING AND SHEETING*

Sheeting, bracing, or pulling a trench box or shield shall be used and maintained where necessary to comply with City, County, State and Federal regulations to protect personnel & property on the job. The cost of such sheeting, unless a special price is called for in the contract, shall be included in the bid price per foot of pipe. In order to meet trench width provisions, it is not possible for the trench box or shield to be on grade at the bottom of the pipe. The box shall be made to rest on a ledge cut along each side of the top of the pipe, and a narrower and deeper trench shall be cut inside the box to accommodate the bedding material, pipe, and backfill material up to the top of the pipe. This installation is necessary to maintain the strength of the flexible pipe and pipe envelope and to prevent excessive deflection when the box is moved forward and the pipe trench is backfilled.

In the event it is necessary to extend sheeting or bracing to the bottom of the trench, all materials used therein, except cross braces that interfere with the pipe installation, shall be left in place. Where sheeting is left in place, it shall not be braced against the pipe, but shall be supported by stakes driven into the trench bottom on each side of the pipe and with tops of the stakes supported by cross braces above the top of the pipe or by other means, approved by the Engineer, which will not result in the application of concentrated loads or horizontal thrust on the pipe. These cross braces may be removed after the specified pipe encasement has been completed beyond the point of cross brace removal.

*3.8.12. SHEETING LEFT IN TRENCH*

The Contractor may make written request to the Engineer for permission to leave timber in a trench and receive payment for the same. Such request must state location, the amount of timber, and the reason for leaving it in the trench. When such request is made and granted, payment shall be made only for the timber left in the trench at current prices in the City of Fargo. No timber shall be left in the trench without written order of the Engineer.

### *3.8.13. DISPOSAL OF EXCESS EXCAVATED MATERIAL*

All excess material removed from trenches shall be disposed of at such location and in such manner as the Engineer may direct. Any material loaded, hauled, and dumped within a two (2) mile radius of the project shall be done by and at the expense of the Contractor. The Contractor shall level the dumpsite to the satisfaction of the Engineer.

### *3.9. HAUNCHING, ENCASEMENT, AND TRENCH BACKFILL*

The bedding material shall be placed so that after the pipe is laid, the bedding will extend up the sides of the pipe a distance of 1/2 the pipe diameter, where the material shall then be shovel-sliced and tamped with mechanical tamping equipment to provide uniform bearing along the entire length of pipe.

Generally, most of the trenches backfilled in the City of Fargo will be backfilled with the excavated material, however in certain cases, special types of backfill will be used. No trench backfill containing rock or detritus from rock excavation shall be placed in the upper 12 inches of the trench nor shall any rock, stone, concrete or boulder larger than 8 inches be placed within 6 inches of any portion of installed pipe. Large stones or concrete pieces may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

#### *3.9.1. TYPES OF BACKFILL AND ENCASEMENT MATERIAL*

##### A. COMPACTED EARTH BACKFILL

Compacted earth backfill shall be free from sticks, large roots, or other organic material coarser than grass roots, stones, hard lumps, and clods and shall have a moisture content such that optimum compaction is obtained when PROPERLY TAMPED OR ROLLED.

##### B. UNCOMPACTED OR WATER SETTLED EARTH

All earth backfill not required to be tamped or rolled, including all earth backfill settled with water, shall be free of brush, roots more than 2 inches in diameter, or other organic material that would interfere with proper settlement and consolidation.

C. GRAVEL OR SAND BACKFILL

Gravel for backfill shall meet the requirements for ND Class 3 with the Number 200 sieve requirement modified to be 3-15% passing. When the aggregate does not meet the gradation specified for all required samples, a reduction in the contract unit price will be made for such material in accordance with the acceptance requirements for Aggregate Base outlined in the current version of the NDDOT Standard Specifications for Road and Bridge Construction.

D. PIPE ENCASEMENT

All gravel for pipe encasement shall meet the requirements specified above.

E. CONCRETE ENCASEMENT

All concrete for encasement shall be 3000 psi Portland Cement Concrete.

*3.9.2. PIPE ENCASEMENT METHODS*

A. GRAVEL ENCASEMENT AND HAUNCHING

The pipe shall be bedded and encased in gravel encasement as specified. After the pipe has been graded, aligned and joined, sufficient gravel encasement material shall be deposited and compacted under and around each pipe in 6" lifts with mechanical tamping equipment to firmly support and hold the pipe in position during subsequent pipe laying activity. Gravel encasement material shall be deposited in such a manner that it is scattered along the pipe and not dropped in a compact mass.

All pipe and bells shall be covered with a minimum of 3 inches of gravel above the pipe. The gravel shall not be "humped" over the pipe but shall be level from one side of the trench to the other.

For concrete storm sewers, gravel encasement shall only be required to 1/2 way up on the pipe. PVC and PP storm sewer shall be covered with a minimum of 3" of gravel above the pipe.

**B. CONCRETE ENCASUREMENT**

The pipe shall be encased in concrete when called out on the plans or as determined by the Engineer. Materials shall be as specified and constructed as directed by the Engineer.

Loose material shall be removed from the trench and the concrete placed with continuous contact with undisturbed soil on the sides and bottom of the trench. A base course of concrete shall be screeded to a level that ensures the pipe to be at the specified grade. Each length of pipe shall be held in rigid alignment and braced to prevent flotation. The pipe joints shall be carefully sealed to prevent entrance of concrete mortar and water into the joints. The cementing or sealing of the joints shall be done at least one hour before the encasement is poured.

**3.9.3. BACKFILLING ABOVE PIPE ENCASEMENTS**

Normal backfill above pipe encasement shall be done with excavated earth backfill and compacted. Compacted gravel backfill above encasement for the entire depth of the trench will be required beneath pavements, driveways, parking areas, curbs, gutters, walks or other surface construction; road and highway shoulders; and all tunnel backfill, except where a clay capped trench is required (see standard details).

The locations of compaction tests will be determined by the Engineer in the field. The Contractor shall assist with, and make all necessary accommodations for compaction and material testing at no additional compensation.

**3.9.4. COMPACTION METHODS****A. STANDARD COMPACTION OF BACKFILL**

The backfill shall be compacted to 90% of Standard Proctor Density for areas outside the street right-of-way and 95% of Standard Proctor Density for all trenches located in street right-of-ways unless otherwise noted on the plans or special instructions. Moisture content shall be between optimum and +6% of optimum for earth backfill and between 65% of optimum and optimum for gravel backfill. Where excessive ground moisture is encountered, the Engineer

may relax the earth backfill moisture requirements, in which case the Contractor shall provide compactive effort satisfactory to the Engineer to achieve compaction as close to zero-air voids as possible.

Before any compaction is begun, two (2) feet of backfill shall be placed over the encasement to prevent damage to the installed pipe. Backfill shall be compacted in successive 12-inch layers. If pneumatic hand tampers are used, the backfill shall be installed in 6-inch layers. Pneumatic tampers are to be used only in areas that are not accessible to heavier duty or motorized compaction equipment. The Contractor shall take special care to uniformly compact all portions of the trench, particularly the valve boxes and manholes, as he is responsible for damage caused by future settlement due to improper compaction.

#### B. WATER SETTLEMENT OF BACKFILL

Earth, gravel and sand backfill may be compacted by the water settlement or “flushing” method where permitted by the special instructions or by the Engineer and where water and fire hydrants are available. Water shall be applied in a manner that will use a minimum of water yet provide effective settlement of the backfill. In no case shall the trench be allowed to overflow or water to be wasted. Generally, the water shall be introduced into the bottom of the trench as quickly as possible by forcing the hose vertically downward in the trench and regulating the flow to promote consolidation.

#### 3.10. FINAL INSPECTION

After the Contractor has completed the installation of the public facility and any clean-up items, he shall make a written request to the Engineer for a final inspection. Upon receipt of this request, the Engineer will set a date and time for the final inspection. The final inspection request form can be found on the City’s website.

**PART 4**  
**GUARANTEE, MEASUREMENT & PAYMENT**

4.1. GUARANTEE

The guarantee shall be per the contract, and shall include trench settlement. When settlement occurs during the guarantee period, the Contractor shall fill the settled area with imported topsoil and reseed, or repair settled curb, pavement, etc. as applicable, at no additional cost to the City.

4.2. MEASUREMENT AND PAYMENT

*4.2.1. EXCAVATION AND BACKFILL FOR STRUCTURES*

All costs for excavating and backfilling of structures shall be included in the cost of the structure unless indicated as a separate bid item on the bid sheet. Where gravel is indicated as a separate bid item on the bid sheet, it will be measured and paid for on a cubic yard basis.

*4.2.2. TRENCHING*

The cost of trenching and subsequent handling of the material regardless of character or condition shall be included in the contract unit price for the pipe per linear foot in place.

*4.2.3. TRENCH FOUNDATION MATERIAL*

The contract unit price for “Trench Found” for the size of pipe being installed shall include all costs for removal of unsuitable material and replacement with material meeting the specifications for Foundation Material.

Where no bid item exists, the Contractor will be paid the actual cost of the delivered foundation material plus 15%, with no allowance for excavation nor the installation of the material.



#### 4.2.4. ARTIFICIAL TRENCH FOUNDATIONS

Where not otherwise provided for in the special instructions or on the bid sheet, compensation for extra excavation and artificial trench foundations shall be made in accordance with Section 9000 of these Specifications.

#### 4.2.5. BACKFILL

Backfilling of trenches will be paid as follows:

- A. STANDARD COMPACTION OF BACKFILL: All costs for standard compaction of backfill shall be included in the contract unit price for the size of pipe being installed.
- B. GRAVEL BACKFILL: All costs for installing and compacting gravel backfill shall be included in the “w/Gravel Backfill” contract unit price for the size of pipe being installed. The contract unit price shall include the cost of loading, hauling, and dumping of the excavated material.

In the event no “w/Gravel Backfill” bid item is provided on the bid sheet for the size of pipe being installed with gravel backfill, gravel backfill will be paid for by the cubic yard as an extra to the contract. The Contractor will be paid the actual cost of the gravel backfill material plus 15% with no allowance for the installation. The cubic yards of gravel will be calculated by multiplying the length of the trench by the height as measured from the top of the pipe encasement to the bottom of the existing pavement (or top of gravel if not under hard surfacing). This product will then be multiplied times the average width; however the width shall not exceed the outside diameter of the pipe bell plus 24 inches at the bottom of the trench and 48 inches plus the outside diameter of the pipe at the top.

- C. WATER SETTLED BACKFILL: All costs for this type of backfilling shall be included in the contract unit price for the size of pipe being installed.

#### 4.2.6. GRAVEL ENCASEMENT

All costs of furnishing and placing the gravel encasement shall be included in the contract unit price for the size of pipe being installed.

#### 4.2.7. CONCRETE ENCASEMENT OF PIPE

If concrete encasement is shown on the plans and not included as a separate item on the bid sheet, its cost shall be included in the contract unit price for the size of pipe being installed. In cases where unforeseen conditions warrant the use of concrete encasement and such has not been included on the plans or bid sheet, it will be paid for in accordance with Section 9000 of these Specifications.

#### 4.2.8. PAVEMENT AND SIDEWALK REMOVAL AND REPLACEMENT

If pavement or sidewalk removal is shown on the plans and not included as a separate item on the bid sheet, its cost shall be included in the contract unit price for the size of pipe being installed. In cases where a separate bid item exists for pavement or sidewalk removal and replacement, the maximum width of concrete or asphalt pavement that will be paid for is 48 inches plus the outside diameter of the pipe bell. Any removal in excess of these limits will be at the expense of the Contractor unless the Engineer designates additional removal.

#### 4.2.9. TREE REMOVAL

Tree removal shall be in accordance with Section 1050 of these Specifications.

#### 4.2.10. CLEARING AND GRUBBING

Clearing and Grubbing shall be in accordance with Section 1050 of these Specifications.

4.2.11. *TOPSOIL*

Topsoil will be paid as follows:

A. TOPSOIL STRIPPING:

Topsoil stripping shall be in accordance with Section 1050 of these Specifications.

B. TOPSOIL SPREADING:

Topsoil spreading shall be in accordance with Section 2000 of these Specifications.

C. TOPSOIL IMPORT:

Topsoil import shall be in accordance with Section 2000 of these Specifications.