

STANDARD DETAIL SPECIFICATIONS
FOR
SANITARY AND STORM SEWER AND WATERMAIN SYSTEMS
EXCAVATION, INSTALLATION AND NON-PAVEMENT RESTORATION PROCEDURES *

CITY OF EDEN PRAIRIE, MINNESOTA

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* See Standard Detail Specifications for street construction, walkways and pavement restoration.

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1. **STAKING AND PROJECT REPRESENTATION**

The City of Eden Prairie Engineering Division (or consultant) shall provide staking and project representation for work under this Contract. The Contractor shall give 48-hour notice when survey stakes are needed.

2. **PRE-CONSTRUCTION CONFERENCE**

Prior to the start of any work, there will be a pre-construction conference arranged by the Engineer. Representatives of the City, the Contractor, project foreman and utility companies will be notified to be present at this meeting.

At this meeting, the Contractor shall submit in writing to the Engineer for approval, a schedule of procedure which shall essentially indicate the number of crews to be employed, locations of work for each crew, contract time schedule and sequence of moves.

3. **TEMPORARY EROSION CONTROL**

This work shall consist of furnishing material and equipment for the construction and maintenance of temporary erosion control for the prevention of erosion and siltation during construction operations. This work shall be performed in accordance with the provisions of MnDOT 1803.5, Detail Drawing R-19, and to the satisfaction of the Engineer and shall also comply with all federal, state and local laws and regulations.

All temporary erosion and pollution control measures which, in the opinion of the Engineer, are necessitated by the Contractor's carelessness, negligence or failure to properly coordinate the installation of permanent erosion controls shall be performed as ordered by the Engineer as incidental work for which no direct compensation will be made.

Other temporary erosion control work ordered by the Engineer or performed by the Contractor with the Engineer's approval will be paid for at the Contract unit price for similar work, or as Extra Work in the absence of comparable items of work.

Performance of temporary erosion control work will not relieve the Contractor of his responsibility toward any damage claims which may arise because of erosion or siltation.

Measurement will be made by length in linear feet of the erosion control installed complete in place. Payment will be made at the Contract price per lineal foot, which price shall be compensation in full for all cost incidental thereto, including but not limited to; snow fence, filter fabric, stakes, hay bales, etc.

All erosion control items, (hay or straw bales, stakes, snow fence, filter fabric, etc.) shall be removed upon completion of this Contract with no compensation thereof.

4. CONSTRUCTION IDENTIFICATION SIGNS

The Contractor shall furnish, install and maintain signs at entrance points to the public streets and avenues where construction is underway and until work is accepted by the City.

These signs (2) will remain the property of the Contractor and are to be removed by him upon said acceptance.

Signs may be on 4" x 4" posts, about 3' x 5' and should read as follows:

**CITY OF EDEN PRAIRIE
Department of Public Works
Improvement Contract (Number)
Utility Construction**

**TRAVEL WITH CAUTION
(Contractor's Name)
(Address)
(Local Phone Number)**

These signs shall be placed on City right-of-way in a manner to be easily noticed by traffic entering or detouring the construction zone. These signs do not replace the Contractor's obligation to protect the public by other appropriate signs, flares, warning devices and flagmen as necessary or required by law. The cost of these signs will be incidental to the project.

5. CLEARING AND GRUBBING

All clearing and grubbing shall be in accordance with MnDOT Specification 2101. All trees clearly marked by the Engineer for removal shall be cleared, grubbed, and disposed of by the Contractor. The Contractor shall dispose of elm wood timber as per City ordinances.

6. SOIL BORINGS

If available, soil boring logs are bound in the back of this Specification. The City of Eden Prairie makes no warrants, either expressed or implied, that the information contained in the boring logs will be the conditions encountered during construction. The logs are for the Contractor's information and are not considered part of the Contract.

7. COLD WEATHER OPERATION

No pipe shall be laid in open cut trench in temperatures below 15 degrees Fahrenheit without approval of the Engineer.

8. DISPOSAL SITES

The Contractor will be required to dispose of all bituminous, concrete and other undesirable debris to an approved landfill located outside the project limits, with no direct compensation made therefore.

9. ALIGNMENT AND GRADE

The Engineer will furnish all the necessary line and gradestakes, bench marks, or other necessary control. It is the responsibility of the Contractor to protect these stakes, and any replacement stakes shall be at the expense of the Contractor. The Contractor will carry line and grade into the trench by using the batter board method. Not less than three (3) boards shall be set at any time, and as each new board is set, it shall be visually checked with the preceding boards. In case of an apparent error disclosed by this visual check, the setting of the boards should be checked and, if the variation still exists, the Engineer shall be notified immediately so that the offset stakes may be checked. The Contractor shall give the Engineer 48 hours notice for normal staking.

A laser beam instrument may be used in lieu of batter boards. However, grade and placement stakes will be provided at 100-foot intervals and the Contractor shall check the grade and alignment with reference to the stakes so provided.

10. EXISTING OVERHEAD AND UNDERGROUND UTILITIES

The location of overhead and underground utilities will 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. The Contractor shall determine the location of all power lines, ducts, culverts, conduits, pipes, or structures which will be affected by his excavation, and shall take steps necessary to support, protect, remove or relocate said structures by any means suitable to the owners of the structures involved, and the Engineer. In those instances where their relocation or reconstruction is impractical, a deviation from line and grade will be ordered by the Engineer. To prevent any delay concerning the Contractor's schedule and the established completion date, the Contractor shall program this work with the utility company involved.

Where culverts are damaged during construction, they shall be replaced with new pipe at the Contractor's expense unless specific pay items are included in the Proposal Form for such replacements. Replacement with damaged material will not be permitted.

All costs of investigation and any necessary protection, support, removal, relocation, or replacement of said structures shall be included in the Contract bid price of laying pipe.

The Contractor shall verify all utility locations by calling Gopher State One-Call (Phone 454-0002) at least 48 hours (excluding weekends, holidays and emergencies) prior to the start of any proposed excavating operations.

11. SHEETING AND BRACING

The Contractor, to prevent the disturbing or settlement of adjacent road surfaces, foundations, structures, or railroad tracks or other improvements, shall furnish and place all sheeting and bracing necessary for good working conditions acceptable to the Engineer and to prevent damage and delay to the work. The Contractor shall be responsible for the strength and sufficiency of all sheeting and bracing.

Bracing shall be so arranged as to provide ample working space and so as not to interfere with the work and so as not to place any strain on the structures being constructed until such structures are of ample strength to withstand such strain. All sheeting and bracing, unless otherwise specified or ordered to be left in place by the Engineer, shall be installed and removed from the work at no additional compensation.

Any damage to work under this Contract or to adjacent structures or property caused by settlement, water or earth pressures, slides, caves, or other causes due to failure or lack of sheeting and bracing or improper

bracing through negligence or fault of the Contractor in any manner shall be repaired by the Contractor without delay at his expense.

12. JACKING OPERATIONS

All crossings of the roadbeds of State and County trunk highways and all railroad crossings shall be completed by jacking the pipe into place, unless otherwise specified. The auger shall not lead the casing pipe by more than one (1) inch.

Casings shall be made of steel conforming to the details on the Plans and/or Specifications. After the jacking operations have been completed, the annular space between the casing and carrier pipe shall be filled with sand or pea rock and the ends sealed with cement mortar. Cathodic protection shall be used on all casings.

All voids caused by jacking or boring shall be filled at the Contractor's expense by pressure grouting. The grout material shall consist of a cement-sand slurry of at least two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.

If tunneling or jacking of watermain building services is required, the method used shall be approved by the Engineer.

13. CLASSIFICATION OF EXCAVATED MATERIALS

No classification of excavated materials will be made except for the top three (3) feet of street subgrade material. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the Contract work, regardless of the type, character, composition or condition thereof.

14. PILING

If the Engineer shall order piling to be placed, the Contractor shall furnish, drive and place all said piles and test piles as required and directed by the Engineer. Piles shall be driven vertically in exact position at locations given by Engineer. Piles which may become shifted must be removed and good piles driven in their places, or additional piles put in as directed by the Engineer, without additional expense to the City.

All timber piling shall be in conformance with the latest revision of Minnesota Department of Transportation and shall be pressure treated in conformance with the latest revision of Minnesota Department of Transportation.

15. TRENCHING

The Contractor may use any means consistent with efficient, accepted methods to excavate to the proper depth and width necessary for the construction of the conduit according to the Plans and Specifications. The maximum width of the excavation at the top of the pipe shall be the outside diameter of the pipe plus 36 inches. If the Contractor chooses to excavate to widths greater than the above, he must get approval of the Engineer and supply pipe with adequate strength to support the increased pipe loading.

Prior to excavating on easements crossing open or cultivated fields, existing topsoil in the area to be disturbed by construction shall be windrowed to the side opposite the proposed trench spoil bank and replaced after the trench backfill is completed.

The trench shall be dug in advance of the pipe installation, only so far as the Engineer may permit.

Trenches shall be refilled or barricaded at the end of each days work. The sides of the trench shall be sloped and/or braced and the trench drained so that workmen can work safely and efficiently. All discharge water shall be drained to natural drainage channels or to storm sewers or Contractor provided drainage channels if directed by the Engineer.

During the course of utility placement, the Contractor will be required to take suitable precautions to insure that all trenches and excavated trench materials are maintained in a dry and stable condition.

If, in the opinion of the Engineer, the Contractor performing the work is not satisfactorily maintaining dry and stable conditions, the utility placement or trench backfilling work will be terminated until these conditions are met.

Any and all ground water encountered during trench excavation, utility placement and trench backfilling shall be removed completely for the duration of utility placement and trench backfilling. Removal of all trench ground water shall be accomplished as the Contractor deems appropriate, but at no time shall the Contractor permit the backfill material to absorb moisture due to careless workmanship during trench water removal. Specifically, when native soil materials are to be used for trench backfill, the removal of trench water with the excavation machine along with native soil materials, thereby creating a saturated or highly elevated soil moisture content is prohibited.

Removal of trench ground water and replacement of any backfill material containing moisture caused by careless workmanship which is deemed unsuitable by the Engineer shall be the Contractor's responsibility and no direct compensation will be made. Replacement material must be approved by the Engineer prior to its use.

16. INSTALLING PIPE AND APPURTENANCES

Pipe and other materials shall be unloaded and distributed on the job in a manner approved by the Engineer. In no case shall materials be thrown or dumped from the truck. All materials shall be examined by the Engineer and approved. The Contractor shall furnish the necessary assistance in such examination of materials.

All pipe materials shall be carefully lowered into trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to materials and protective coatings and lining. Under no circumstances shall pipe materials be dumped into the trench. Damaged coatings and linings shall be repaired or the pipe replaced prior to installation.

The Contractor shall provide, without additional compensation, suitable temporary channels for any water that may flow along or across the site of the work. The excavated material shall be placed on one side of the trench except when permitted by the Engineer to use both sides. All material shall be so placed as not to obstruct any drain or gutter, or to unnecessarily obstruct any passageway.

17. PIPE BEDDING

As shown on the attached Detail Drawings for pipe bedding, all pipe shall be laid upon sound, granular soil (min. 6") cut true and even so that the barrel of the pipe will have a bearing for its full length. Bell holes shall be dug at the ends of each length of pipe to permit proper jointing.

If the Contractor encounters unstable soil not suitable for bedding of pipe, or for trench backfill, he shall notify the Engineer. All unstable material shall be removed and replaced with stabilization material as may be ordered by the Engineer. There will be no extra compensation for such additional excavation but payment for stabilization material will be made based upon the appropriate unit bid price.

The material for base stabilization as described above shall be sand-gravel material or binder stone, as described in these Specifications. The type of material to be used will be specified by the Engineer.

18. SAND-GRAVEL MATERIAL

This material shall be used for pipe bedding and/or trench backfill wherever peat, clay or other unsuitable bearing material is encountered as determined by the Engineer. It shall be clean, granular material with no rocks larger than 1" (where used as pipe bedding) and not more than 10% passing the No. 200 sieve. The material shall be composed such that proper compaction under the "Specified Density Method" (MnDOT 2105.3F1) is achieved.

The material shall be placed to a depth as determined by the Engineer, with a minimum depth of 6" below the bottom of the pipe and extending at least one (1) foot beyond the sides of the pipe and one (1) foot above the pipe. Payment shall be for cubic yards placed, based upon vehicular measure.

The unit price bid for sand-gravel material shall include the cost of all excavation and compacting required to place the material and also the cost to dispose of any undesirable material as replaced, unless specified otherwise in the Special Conditions.

Maximum quantities allowed for payment for stabilization rock will be based on the actual depth ordered by the Engineer and the width of a standard trench box required for the size of pipe being installed. The standard box width shall be outside diameter of the pipe plus two (2) feet or in accordance with O.S.H.A. regulations. Any rock used for the convenience of the Contractor or used due to the Contractor's decision to do extra excavation in lieu of using a box, shall be the responsibility of the Contractor, with no direct compensation therefore.

19. BINDER STONE

Binder stone shall consist of durable crushed stone or graded aggregate. All materials shall pass a 1-1/2 inch sieve and shall be retained on a 3/4 inch sieve. This material shall be used for pipe bedding and/or roadway restoration as directed by the Engineer. Payment shall be for cubic yards placed based upon vehicular measure. The unit price bid for binder stone shall include the cost of all excavation and compacting required to place the material and also the cost to dispose of any undesirable material as replaced, unless specified otherwise in the Special Conditions.

20. PUMPING AND BAILING TRENCH WATER

The Contractor shall, at his own expense, pump or otherwise remove any water which may exist in the trenches and shall form all dams or other works necessary for keeping the excavation clear of water during progress of the work. In case of running sand or other bad ground, the work shall proceed day and night if the Engineer so directs. (The Contractor will not be paid for crushed rock or other material which is used for maintaining a dry trench.)

If any private water supply shall become interrupted, either temporarily or permanently, solely as a result of the Contractor's approved de-watering procedure, the Contractor may be held responsible for claims thereof.

No pipe or fittings shall be laid in water or when the trench conditions are unsuitable for such work, except with written permission of the Engineer.

The Contractor shall, at his own expense, control all erosion at the outfall and downstream of the dewatering pipe. The Contractor shall also be responsible for applying for and obtaining any dewatering permit that

may be required from any agency, such as the DNR, with no direct compensation therefore.

21. BACKFILLING PROCEDURES

All trench areas shall be backfilled to the original ground surface or to such other grade as may be shown on the Plans and/or specified in the Special Conditions. The backfill shall be placed as soon as practical after the pipe installation.

Granular material, free from rocks, boulders or frozen material, shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench to a minimum height of twelve (12) inches above the top of the pipe. The material shall be shovel-placed and hand-tamped to fill completely all spaces under and adjacent to the pipe. If the pipe size is larger than 12", the granular backfill from the bottom of the trench to 12" above the top of the pipe shall be placed by either hand or mechanical methods in two (2) lifts. The first lift, from the trench bottom to the pipe springline and the second lift shall be compacted with a minimum of two (2) passes with an approved type of mechanical tamping compactor.

If suitable granular material for this portion of the backfill is not available from the trench excavation as determined by the Engineer, the Contractor shall provide and place an approved sand-gravel or binder stone material as described in these Specifications.

Succeeding layers of backfill from twelve (12) inches above the pipe to the surface may contain coarse materials, but shall be free from large pieces of rock, frozen materials, concrete, blacktop, wood, roots, stumps, sod, rubbish and other similar articles whose presence in the backfill, in the opinion of the Engineer, would cause excessive settlement of the trench or damage to the pipe.

If, in the opinion of the Engineer, the native trench material is unsuitable for any portion of the trench backfill, it shall be considered surplus material and disposal shall be as previously described. The Contractor, during the excavation operations, shall make a reasonable attempt to segregate all undesirable materials encountered from suitable materials. Any additional suitable material needed for backfilling shall be furnished and installed by the Contractor. It shall be sand-gravel material as described in these Specifications and payment will be made according to cubic yards placed, based upon vehicular measure.

22. COMPACTION REQUIREMENTS

Where density tests are taken to evaluate the compaction, the fill or trench backfill shall be compacted by mechanical means until it meets the requirements of MnDOT Specification 2105.3F1 "Specified Density Method". The fill and trench backfill shall be compacted to a minimum of 100% of standard proctor density (ASTM D698) in the upper three (3) feet of the embankment and a minimum of 95% of standard proctor density below the upper three (3) feet. With the exception of the upper three (3) feet, if the existing moisture content of the backfill material is greater than 3% above the optimum moisture content, the soil shall be compacted to a minimum density of three (3) pounds per cubic foot less than the standard proctor curve at that moisture content. However, at no time shall the density be less than 90% of the standard proctor density.

Trench backfill compaction around all utility structures shall be accomplished as follows:

Within five (5) feet of all utility structures, backfill compaction by mechanical roller vibrators will not be allowed, but shall be accomplished by using whatever mechanical means the Contractor deems appropriate, and shall be compacted in layers with material not to exceed one (1) foot in depth.

23. DUST CONTROL

If blowing dust becomes a nuisance, as determined by the Engineer, the Contractor shall apply water from a tank truck to all trench areas. The rate of application shall be as directed by the Engineer. Water application for dust control shall continue as needed until the final road surface and all seeding and sodding is completed and acceptable. The cost of all water and equipment used for dust control shall be considered incidental and there will be no additional compensation.

24. TOPSOIL - SOD- SEED

A minimum of four (4) inches topsoil and either seed or cultured sod shall be placed where grassed areas have been disturbed by construction, as directed by the Engineer. Payment for sod and four (4) inches topsoil will be based on the unit price bid per square yard of sod placed. Sod shall be placed and maintained in accordance with MnDOT 2575 specifications. Sod types shall be determined by the Engineer and follow the requirements of MnDOT 3878.

All areas adjacent to proposed street construction (ex. boulevards and island areas) requiring seed shall be seeded with (salt resistant) MnDOT Seed Mixture No. 40A spread at a rate applicable to MnDOT 2575.

In other seeded areas, the standard seed mix shall be MnDOT Mixture No. 50A spread at a rate applicable to MnDOT 2575. In areas where there is high erosion potential, wood fiber blanket meeting the requirements of MnDOT 3885 shall also be used.

Mulch shall be MnDOT (2575) Type 1 spread at a rate of two (2) tons per acre and disc anchored.

Payment for seeding will be based on the unit price bid per acre seeded and mulched.

25. MISCELLANEOUS RESTORATION

The Contractor shall restore to a condition equal to or better than existing, as determined by the Engineer, all other structures not specifically mentioned above which are disturbed because of this construction, including fences, irrigation systems, clothes posts, mailboxes, yard lights, entrance markers, etc. There will be no additional compensation for this miscellaneous restoration unless specified otherwise in the Special Conditions.

26. INSULATION BOARD

Where called for on the Plans, the Contractor shall install polystyrene insulation board meeting the requirements of MnDOT 3760. Minimum thickness is two (2) inches and minimum width is four (4) feet, placed one (1) foot from top of pipe.

The insulation board shall be formed by the expansion of polystyrene base resin in an extrusion process and shall be homogeneous, and essentially multicellular. The surface of the boards shall be extruded, with skins. The material shall conform to the following requirements:

Compressive strength, at yield or 5% deflection	35 psi minimum
Flammability	self-extinguishing
Water absorption after 24 hours immersion, by volume	0.25% maximum
Thermal Conductivity, at mean temperature of 75 deg. F	0.23 maximum

27. SETTLEMENT

The Contractor shall be responsible for all settlement of backfill, fills and embankment which may occur within two (2) years after final acceptance of the completed work.

The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement with 30 days after notice from the Engineer or Owner.

28. MODULAR BLOCK RETAINING WALL

This work shall consist of constructing modular block retaining walls in the locations and to the dimensions indicated in the Plans, or as directed by the Engineer. The Contractor shall submit shop drawings and the manufacturer's suggested installation procedure showing materials and construction methods to the Engineer for approval prior to beginning any retaining wall work. Construction limits, as shown on the plans, shall be strictly observed. It shall be the Contractor's responsibility to verify that the proposed wall system, including geogrid placement, remains within the construction limits. Timber or boulder retaining walls shall not be permitted in the right-of-way without the express written permission of the City Engineer.

The design of the wall system must be designed and certified by a registered structural engineer. A building permit shall be required for any retaining wall over four feet (4') in height.

The modular block retaining wall units shall be tan in color with a "Sculptured Rockface" pattern.

Granular base shall meet requirements of MnDOT 3149.2B (Select Granular). The material for filling voids in and between all units, as well as the granular backfill, shall meet the manufacturer's specifications. In the event the manufacturer does not specify a backfill material, either MnDOT 3149.2H (Course Filter Aggregate) or MnDOT 3149.2G (Aggregate Bedding) may be used by the Contractor at his option.

In the event backfill material containing more than 10 percent passing the No. 4 sieve is used, whether specified by the manufacturer or not, a geotextile filter fabric meeting the requirements of MnDOT 3733, Type I placed along the back of the wall units to eliminate material shifting through the joints will be required.

Modular block retaining walls shall be constructed as shown in the details and as required by the manufacturer's specifications and in accordance with the following:

Excavation and Backfill

The Contractor shall excavate to the lines and grades shown on the construction drawings or as required by the manufacturer's specifications for constructing the wall. Excavation and backfill required for retaining wall construction shall be paid for as common excavation (PV) and is included in the proposal form. Over excavation and additional compacted backfill shall not be paid for unless directed by the Engineer. The Contractor shall be careful not to disturb embankment materials and foliage beyond lines shown or as directed by the Engineer. All tree roots encountered during excavation larger than 1-1/2 inch shall be cut vertically with a pruning saw, leaving as much of the root intact as possible.

Landscape ground cover shall be removed and stockpiled at the top of the slope and maintained. Upon completion of the retaining wall, the ground cover shall be spread uniformly over the disturbed area to restore it to its original appearance.

Foundation Soil Preparation

The foundation soil shall be excavated as required by the manufacturer's specifications or as directed by the Engineer.

Foundation soil shall be examined to assure that the actual foundation soil strength meets or exceeds assumed design strength for the retaining wall system to be constructed. Soils not meeting required strength shall be removed and replaced with acceptable material at the direction of the Engineer.

Over-excavated areas shall be filled with compacted backfill material.

Foundation

Footing materials shall be installed upon undisturbed in situ soils.

Foundation preparation and backfill zone shall be constructed as shown in the Plans or as required by the manufacturer's specifications.

The material shall be compacted so as to provide a level hard surface on which to place the first course of units. Compaction shall be by mechanical plate compactors to 95 percent of standard proctor density.

The footing shall be prepared to insure complete contact of retaining wall unit with base. Gaps shall not be allowed.

Footing materials shall be to the depths and widths shown in the Plans or in accordance with the manufacturer's specifications. The Contractor may, at his option and cost, use a reduced depth of sand and gravel with a concrete topping, as per manufacturer's specifications. The concrete shall be unreinforced and a maximum of one (1) inch thick.

Unit Installation

The units shall be installed according to the manufacturer's specifications and as directed by the Engineer.

Backfill shall be placed as per the manufacturer's specifications and compacted as each course is completed. A minimum of 12 inches of aggregate bedding shall be placed behind the block units unless otherwise specified by the manufacturer. Geotextile filter fabric, if required by the manufacturer, shall be placed between the block and the backfill prior to backfilling.

Top cap blocks shall be adhered to the previous course with an approved construction adhesive or epoxy cement.

Construction, inspection and testing of wall units shall conform to MnDOT Technical Memo No. 03-07-MRR-03 for walls four - ten feet in height. And No. 03-16-MRR-06 for walls greater than ten feet in height.

Geogrid Reinforcement

Geogrid reinforcement shall be furnished and installed in accordance with the manufacturer's specifications and recommendations for the retaining wall system used and as directed by the Engineer. All costs associated with furnishing and installing the geogrid reinforcement, including excavation and backfill, shall be considered incidental to the Contract.

Drainage Systems

Drainage systems for the retaining wall shall be furnished and installed according to manufacturer's specifications and shall be considered incidental to the Contract. It shall be the Contractor's responsibility to ensure that any drainage system installed behind any wall is properly discharged into the proposed storm sewer system. All costs associated with wall drainage and discharge shall be incidental to the modular block retaining wall.

Payment shall be made at the Contract unit price per square foot of wall units (both above and below ground), and shall be compensation in full for all materials (pins and miscellaneous hardware, coarse filter aggregate, geogrid reinforcement, drainage systems, etc.) required to construct the walls complete in place.