Pay Items (Continued)

Item No.	Pay Item	Pay Unit
7113XX2	Steel Pipe Index Piling (*(dia.)*" Diameter)	Linear Foot
7119100	Treated Timber Piling	Linear Foot
7119101	Pile Load Test - Treated Timber Piling	Each

SECTION 712

DRILLED SHAFTS AND DRILLED PILE FOUNDATIONS

712.01 Description. This work shall consist of furnishing all labor, materials, equipment, and services necessary for construction of portland cement concrete foundations consisting of fully cast-in-place shaft foundations and pile foundations within drilled excavations. The size and locations are shown on the plans. Work shall be in strict accordance with the plans and the special provisions. Work shall comply with the applicable requirements of Sections **701**, **702**, and **703** of these specifications.

For the purposes of this specification:

Drilled Shafts are cast-in-place shafts with reinforcing steel, and

Drilled Pile Foundations consist of a drilled excavation of the proper size, with a pile section concreted or grouted in place. Reinforcing steel may or may not be required in a Drilled Pile Foundation.

712.02 Site Information. Data on subsurface conditions are not intended as representations or warranties of continuity of

such conditions. It is expressly understood that the Department or the Engineer will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data is made available for convenience of the Contractor and not guaranteed to represent conditions that may be encountered.

Available soil borings are plotted on the plans, and a copy of the boring logs is included in the proposal for the project.

The Contractor, at no additional cost to the Department, may make additional test borings and other exploratory operations.

712.03 Materials. Cast-in-place concrete shall be Class 4000DS as specified in Section **701**. Adjustments to the mix design may be requested by the Contractor when characteristics of materials, job condition, weather, test results, or other circumstances warrant. Adjustments will be made at no additional cost to the Department, and are subject to the Engineer's acceptance.

Reinforcing steel shall conform to the requirements of AASHTO M 31 (ASTM M 615), Grade 60.

Any piling used in a Drilled Pile Foundation shall conform to the applicable requirements of Section **711**.

712.04 Qualifications of Contractor. The installation of drilled shaft foundations shall be performed by personnel who specialize in drilled shaft construction. The Contractor's supervisory personnel in charge of daily operations or the Subcontractor's personnel in charge of daily operations shall have a minimum of three (3) years of work experience in the installation of drilled shaft foundations. A supervisor with at least this minimum requirement shall be on the site during the entire construction process of all drilled shafts (i.e. drilling, coring, placing of reinforcement, concreting, etc.) to troubleshoot any problems that may arise during the construction process.

After award of contract, but before the start of drilled shaft construction, the Contractor shall submit for the Engineer's approval the work experience records of the personnel, or those of the Subcontractor, it proposes to use for the installation of drilled shafts. The Engineer shall be the sole judge of the Contractor's and/or the Subcontractor's qualifications and experience to accomplish the drilled shaft work.

Failure to comply with these requirements shall result in the suspension of all work related to the drilled shafts. Work shall not begin on the drilled shafts until the Contractor provides personnel or a Subcontractor with the required qualifications and experience. The Department shall not be liable for any damages or costs of any type related in any way to the suspension of this work, nor will the project completion date be postponed for delays in furnishing the qualifications.

Minimum experience requirements may be waived for drilled pile foundations provided the Contractor or Subcontractor who installs the drilled pile foundations is knowledgeable in this type of construction.

712.05 Installation Plan. The Contractor shall submit an *Installation Plan* for the review and acceptance by the Engineer. This plan shall be submitted a minimum of thirty (30) days before the date the Contractor proposes to begin drilled shaft or drilled pile construction. The plan shall address and include, but not be limited to, the information listed below:

1. List and size of proposed equipment such as cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, tremies, concrete pumps, casings, etc.

2. Details of sequence of construction operations and sequence of shaft or pile construction in bents or in shaft or pile groups.

3. Details of the method of determining the elevation of the top and bottom of any construction casing.

4. Details of excavation methods.

5. Details of proposed methods to clean the excavation after initial drilling.

6. When slurry is required, details of methods to mix, circulate, desand, and dispose of slurry.

7. Details of the steel reinforcing cage, such as method of placement, spacers, concrete feet, supports, method of centering the cage in the shaft or pile, handling, lateral stability, prevention of buckling, etc.

8. Details of concrete placement, such as proposed procedures for concrete tremie or pumping, initial placement, lifts during placement, and overfilling of the concrete. Indicate the intervals at which the top of concrete will be measured for plotting the Theoretical vs. Actual Concrete Volume graph.

9. Required submittals such as shop drawing and concrete design mixes.

10. Means of disposing of excavated materials.

11. The type and frequency of tests that the Contractor intends to perform, including but not limited to, chemical and specific gravity tests for slurry. The Contractor will also supply the name(s) of personnel that are qualified to perform these tests.

12. How the Contractor intends to check the dimensions, depth of the shaft or pile. Indicate the method for determining horizontal and vertical alignment, vertical position of the top of shaft or pile and potential movement of the reinforcing cage.

13. Construction and/or temporary casing details and dimensions, elevations, including splice details, painting, and/or casing removal details if applicable.

14. Details of the Contractor's method of protecting the integrity of the structure(s) during installation of the shafts or piles.

15. Other information required by the plans or requested by the Engineer.

The Engineer will evaluate the *Installation Plan* for conformance to the plans and special provisions. The Engineer will notify the Contractor within twenty-one (21) days of receipt of the plan if there is any additional information required and/or changes necessary for acceptance of the plan. If any part of the plan is unacceptable, the entire plan will be rejected, and the Contractor shall submit a revised *Installation Plan* for re-evaluation. The Engineer will notify the Contractor within seven (7) days after receipt of the revised plan of its acceptance or rejection. Acceptance given by the Engineer shall be subject to satisfactory performance in the field. Any claim by the Contractor for delay based on the Engineer's failure to comply with the above notification time provisions shall be limited to an extension of contract time as the only possible compensation.

The Contractor shall not commence with the installation of drilled shafts or drilled pile foundations until the Contractor's Installation Plan has been accepted by the Engineer.

Acceptance of the Contractor's Installation Plan shall in no way relieve the Contractor of its responsibility to provide sound and adequate foundations that conform to the plans and special provisions. Changes in methods or equipment will not be allowed after acceptance of the plan without the written consent of the Engineer.

For each drilled shaft or drilled pile foundation, the Contractor shall provide a Certified Drilled Shaft Report, or Certi-

fied Drilled Pile Foundation Report. The report shall record the actual elevation at bottom and top of the construction casing and shaft or pile, elevation of sound rock, final centerline location at top, variation of shaft or pile from plumb, result of tests performed, levelness of bottom, seepage of water, static water level (if any), any unusual conditions, excavation starting date, soil description at top and bottom of each stratum encountered, excavation completion date, inspection findings, testing results, and placement of concrete (including any delays placing concrete and location of construction joints in shafts).

The Certified Report shall indicate the theoretical versus actual concrete volume. The Contractor shall provide the elevation of the top of concrete after placement of each truckload of concrete or at intervals as specified by the Engineer. It is the Contractor's responsibility to provide a qualified and competent person to make the necessary measurements.

The Certified Report shall be submitted before beginning construction on other shafts or piles. The requirement may be waived should the Contractor complete more than one shaft or pile in one day, and in that case, the report shall be submitted prior to beginning construction the next working day.

If the Engineer determines that soil conditions warrant, the shafts or piles may be required to be extended below the estimated bottom elevations shown on the plans. Any additional compensation will be at the contract unit price for respective items as described in Subsection **712.19**.

712.06 General Methods and Equipment. The Contractor shall perform the excavations required for the shafts and drilled pile foundations through whatever materials encountered, to the dimensions and elevations shown in the plans or otherwise required by the special provisions. The Contractor's methods and equipment shall be suitable for the intended purpose and the materials encountered.

712.07 Dry Construction Method. The dry construction method shall be used only at sites where the groundwater level and soil conditions are suitable to permit construction of the shaft or drilled pile foundation in a relatively dry excavation, and where the sides and bottom of the excavation may be visually inspected by the Engineer before placing the concrete. The dry method consists of drilling the excavation, removing accumulated water and loose material from the excavation, setting the reinforcing cage, and concreting the shaft or pile in a relatively dry excavation. The Contractor may elect to use a temporary casing with the dry method.

The dry construction method shall only be allowed by the Engineer when the excavation demonstrates the following:

1. Less than 6 inches of water accumulates above the base over a one-hour period when no pumping is permitted.

2. The sides and bottom of the excavation remain stable without detrimental caving, sloughing, or swelling. If immediately following the completion of the excavation, the stability of the hole is questionable, the Engineer may order up to a four-hour observation period prior to setting rebar cage and placing concrete.

3. Loose material and water can be satisfactorily removed before inspection and before concrete placement.

If the Engineer deems that the excavation meets all the criteria for the dry construction method, the setting of the rebar cage and concreting shall begin immediately after completion of the excavation, cleaning, inspection, and acceptance of the hole.

The Contractor shall use the wet construction method or the casing construction method for excavations that do not meet the above requirements for the dry construction method.

712.08 Wet Construction Method. The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the drilled shaft or drilled pile foundation concrete. This method consists of using water, mineral slurry, or a casing to maintain stability of the excavation perimeter while advancing the excavation to its final depth, placing the reinforcing cage, and concreting the shaft or pile foundation.

712.09 Casing Method of Construction. Where drilled shafts or drilled pile foundations are located in wet subsurface conditions or in open water areas, exterior casings shall be extended from above the water elevation to protect the shaft or pile concrete from water action during placement and curing of the concrete. The exterior casing shall be installed in a manner that will produce a positive seal at the bottom of the casing so that no piping of water or other materials occurs into or from the excavation. In open water areas, exterior casings may be removed or left in place. Removal shall be in accordance with Subsection **712.17F**. Limits of casings left in place shall conform to the requirements for construction casing in Subsection **712.11C**.

712.10 Excavation.

A. General. The plans indicate the expected length of shaft or drilled pile, the elevation of the top of the shaft or drilled pile foundation, and the estimated elevation of the bottom of drilled shaft or drilled pile foundation. The Engineer reserves the right to alter the elevations and dimensions of the drilled shaft or drilled pile foundations based on the top of rock and/or the results of the Shaft Load Test if performed. Where drilled shaft or drilled pile foundation lengths and dimensions are altered, adjustment in price will be made by applying original contract

unit prices to the change in quantity with no additional expense per unit or extension of contract time.

Unless authorized by the Engineer, the drilling process for each individual excavation shall be a continuous operation. In rare cases and with written approval by the Engineer, the drilling for an individual excavation may be discontinued provided the walls can remain stable and drilling will be resumed within 12 hours. See Subsection **712.17A** for additional requirements.

Waste material removed from excavations, concrete spillage, and other debris shall be hauled off and disposed of offsite at location(s) provided and obtained by the Contractor. Any fees or permits required for disposal of waste material shall be the Contractor's responsibility. Copies of all agreements and/or licenses for the disposal site(s) shall be submitted for Engineer's record. The disposal shall be in strict accordance with local, state and federal environmental, and pollution laws and ordinances.

The Contractor may be allowed to dispose of the waste material on the project site if the Engineer determines that the waste material can be incorporated into the project.

The Contractor shall not permit workers to enter the excavation for any reason unless both a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied. The proper OSHA safety equipment and procedures shall be supplied by the Contractor and used by the workers entering the confined space excavation.

B. Obstructions. Surface and subsurface obstructions at drilled shaft or drilled pile foundation locations shall be removed by the Contractor. The Contractor shall notify the Engineer of any obstruction deeper than ten feet below the elevation of the original ground. Such obstructions may include man-made materials such as old con-

crete foundations and natural materials such as boulders. Special procedures and/or tools shall be employed by the Contractor after the excavation cannot be advanced using conventional augers fitted with soil or rock teeth, drilling buckets, and/or under-reaming tools. Such special procedures/tools may include, but not be limited to, chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casing, and increasing the excavation diameter. Blasting will not be permitted unless specifically approved in writing by the Engineer. All costs for removing obstructions shall be included in the unit price bid for excavation for drilled shafts or drilled pile foundations.

Drilling tools that are lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including, but not limited to, costs associated with excavation degradation due to removal operations or the time the excavation remains open.

C. Drilled Shafts with Wet and Dry Excavation. All excavation for drilled shafts shall be considered Wet and Dry Excavation unless a bid item is included for Rock Excavation. If rock is encountered, and there is a Rock Excavation bid item, Wet and Dry Excavation shall be measured from the top of shaft to the top of rock elevation for each individual shaft. Top of rock elevation shall be determined as indicated in Subsection **712.10E**.

D. Soil Excavation for Drilled Pile Foundations. All excavation for drilled pile foundations shall be considered Soil Excavation unless a bid item is included for Rock Excavation. If rock is encountered, and there is a Rock Excavation bid item, Soil Excavation shall be measured from the actual top of ground to the top of rock elevation for each individual pile. Top of rock elevation shall be determined as indicated in Subsection **712.10E** below.

E. Classification of Rock for Pay Purposes. Rock shall be defined as any material that cannot be drilled with earth or rock augers and/or under-reaming tools, and requires the use of core barrels, rotary percussion drills, and/or blasting. For pay purposes, all earth seams, rock fragments, and voids included in the rock excavation area will be considered rock for the full volume of the excavation from the initial contact with rock.

All drilling equipment used to determine the top of rock shall be appropriate for the purpose and depths and shall be well maintained in good working condition. The Engineer shall be the sole judge of whether the drilling equipment is appropriate and in good working condition.

712.11 Casings.

A. General Requirements. Steel casings shall be smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of shaft or pile foundation.

Pre-drilling with slurry and/or over-reaming to beyond the outside of the casing may be required to install casing. Nevertheless, an oversized casing or excavation will not be allowed unless accepted in writing by the Engineer. Even when the use of an oversized casing or excavation is allowed, it will be at no extra cost and the extra concrete used to fill the oversized casing or excavation will not be considered for payment. Further, if the Contractor elects to remove a casing and substitute a longer or larger diameter casing through caving soils, the excavation shall be either stabilized with slurry or backfilled before the old casing is removed. Other methods, as accepted by the Engineer, may be used to control the stability of the excavation and protect the integrity of the foundation soils. Such removal and stabilization operations will be at the Contractor's expense.

B. Temporary Casings. Unless a bid item for Construction Casing is included in the pay quantities, all subsurface casing shall be considered Temporary Casing. All casings shall be withdrawn from excavations before the completion of the placement of concrete unless the casing is to be used as a forming system. At the Contractor's option, casing used as a forming system may be left in place in accordance with Subsection **712.11C**.

Before the casing is withdrawn, the level of fresh concrete in the casing shall be a minimum of five feet above the hydrostatic water level. As the casing is withdrawn, care shall be exercised to maintain an adequate level of concrete within the casing so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the concrete.

Temporary casings that become bound or fouled during concreting and cannot be practically removed shall constitute a defect in the foundation. The Contractor shall be responsible to improve the defective work to the satisfaction of the Engineer. Such improvement may consist of, but is not limited to, removing the concrete and extending the shaft or pile deeper to compensate for loss of frictional capacity in the cased zone, providing straddle shafts or piles to compensate for capacity loss, or providing a replacement shaft or pile. All corrective measures including removal or re-design of structural members shall be done by the Contractor to the satisfaction of the Engineer without compensation or extension of contract time. In addition, no compensation will be paid for any abandoned casing remaining in place.

When the shaft or pile extends above ground or through a body of water, the exposed portion above ground or through a body of water may be formed with a removable or temporary casing. If the casing is removed, it shall be removed in accordance with the requirements of Subsection **712.17F**

C. Construction Casing. Construction casing is casing that is specified in the plans to facilitate construction through water or other material that is not normally conducive to the use of temporary casing. Portions of this casing may be left in place or removed at the Contractor's option. Construction casing will not be paid for unless it is specified in the plans, or approved in writing by the Engineer.

Construction casing shall be of the size specified in the plans or by the Engineer. The Contractor shall be responsible for determining the wall thickness of the casing. Unless otherwise directed by the Engineer, the casing shall be new steel casing conforming to AASHTO M 183, (ASTM A 36). Additional stiffening may be required to withstand handling and driving stresses and the pressure of concrete and of the surrounding earth and/or fluid pressures. The casing wall thickness shall be increased as necessary to allow for installation within the subsurface conditions anticipated on the project. The casing shall be smooth and watertight.

The Contractor shall determine the elevation of the top and bottom of the construction casing in accordance with the method accepted in the Contractor's Installation Plan.

If the Contractor elects to leave the construction casing in place, the casing shall be removed to an elevation 3 feet below water level or 2 feet below ground level. Care shall be taken not to damage the concrete portion of the drilled shaft. Instead of removing it, the Contractor may elect to paint the casing in conformance with the requirements of Subsection **712.11E** and **710.09B.3**.

Casing shall be installed in one continuous unit. Each unit may be fabricated from one or more sections, and each section shall be as long as feasible and spliced as described below. The use of the "telescoping" casing method is not permitted.

Inside wall surfaces of construction casings shall be thoroughly cleaned of any organics and other materials detrimental to soundness of the shaft or pile concrete and reinforcing steel.

D. Welded Splices. If splices in casings are necessary, they shall be made as follows:

1. Splices in construction casing will not be allowed unless authorized in writing by the Engineer.

2. The surface of only one section of casing shall be beveled on the outside edge of the wall at an angle of approximately 45° with the horizontal. A surface of 1/8 inch may be left unbeveled. Guide bars may be temporarily attached to the casing wall in order to properly align the sections before welding.

3. The beveled section shall then be butted to the unbeveled section and temporarily clamped thereto. The beveled edge shall be separated about 1/8 inch from the edge of the other section and the axes of the two sections shall be made to coincide by adjusting the clamps.

4. The entire periphery of the joint shall then be butt welded with a shielded-arc low hydrogen electrode of proper size and with sufficient generating amperage to fuse the root of the weld. The weld shall be made with sufficient passes to completely fill the joint, removing the slag of each pass before beginning the next pass. The weld specified here is the butt weld designated as B-U4b in the latest edition of the ANSI/AASHTO/AWS D1.5 *Bridge Welding Code*.

Care shall be taken to remove all coatings from the metal at the welds before welding is begun, and after all welding is complete, the slag shall be removed.

Splices in temporary casing will be considered incidental and no additional compensation will be allowed for this work.

The welding of steel casing, including bracing, caps, splices, etc., shall conform to the requirements of the latest edition of the ANSI/AASHTO/AWS D1.5 *Bridge Welding Code*.

E. Painting Casing Left in Place.

1. General. Unless specified otherwise in the plans or special provisions, and at no additional expense to the Department, the Contractor may elect to paint the construction casing instead of removing. Unless specified otherwise, the casing shall be painted a minimum of 5 feet below low water level or 2 feet below ground level. If, after installing the casing, the painted portion does not meet the specified limits, the casing shall be removed to an elevation 3 feet below water level, or 2 feet below ground level. It is the Contractor's sole responsibility to determine the amount of construction casing to be painted.

2. Field Painting. Field painting of casing left in place shall be in accordance with the requirements of Subsection **710.09B.3** and **710.11B**.

3. Basis of Payment. All costs of equipment, materials, and labor necessary to clean and paint the casing in accordance with these requirements shall be included in the contract unit price for Construction Casing.

712.12 Slurry. Mineral slurries shall be employed when slurry is used in the drilling process unless other drilling fluids

are accepted in writing by the Engineer. The slurry shall have a mineral grain size that will remain in suspension and possess sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the excavation. In case of a sudden significant loss of slurry to the excavation, the construction of the foundation shall be stopped until either a method to stop the slurry loss or an alternate construction procedure has been accepted by the Engineer.

The mineral slurry shall be premixed thoroughly with clean fresh water and an adequate time (as prescribed by the mineral manufacturer) has been allotted for hydration before introduction into the excavation. Slurry tanks of adequate capacity will be required for slurry circulation, storage, and treatment. Excavated slurry pits will not be allowed without the written permission of the Engineer. Desanding equipment shall be provided by the Contractor as necessary to control slurry sand content to less than 4% by volume at any point in the excavation. Desanding will not be required for setting temporary casing, sign post, or lighting mast foundations unless specified on the plans or in the special provisions. The Contractor shall take all steps necessary to prevent the slurry from "setting up" in the shaft. Such methods may include, but are not limited to, agitation, circulation, and/or adjusting the properties of the slurry. Disposal of all slurry shall be done offsite in suitable areas by the Contractor.

Control tests using suitable apparatus shall be carried out on the mineral slurry by the Contractor to determine density, viscosity, and pH. An acceptable range of values for those physical properties is shown in the following table:

MINERAL SLURRY
(Sodium Bentonite or Attapulgite in Fresh Water)
Acceptable Range of Values

Property (Units)	Range of Values At Time of Slurry Introduction	Range of Values In Excavation at Time of Concreting	Test Method
Density (pcf)	64.3** - 69.1**	64.3** - 75.0**	Density Balance
Viscosity (seconds/quart)	28 – 45	28 – 45	Marsh Cone
pH	8 – 11	8 – 11	pH paper pH meter

**Increase by 2 pcf in saltwater

Notes:

a. Tests should be performed when the slurry temperature is above 40°F.

b. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the bore hole as determined by the American Petroleum Institute Sand Content Test.

Tests to determine density, viscosity, and pH value shall be done during the shaft excavation to establish a consistent working pattern. A minimum of four sets of tests shall be made during the first 8 hours of slurry use. Slurry sampling and testing shall be observed by the Engineer. When the results show consistent behavior, the testing frequency may be decreased to one set every 4 hours of slurry use.

The Contractor shall insure that heavily contaminated slurry suspension, which could impair the free flow of concrete, has not accumulated in the bottom of the shaft. Before placing concrete in any shaft excavation, the Contractor shall take slurry samples using a slurry sampling tool. Slurry samples shall be extracted from the base of the shaft at intervals not exceeding 10 feet up the shaft, until two consecutive

samples produce acceptable values for density, viscosity, pH, and sand content. No concrete shall be cast before the Engineer's acceptance of the slurry.

When any slurry samples are found to be unacceptable, the Contractor shall take whatever action is necessary to bring the mineral slurry within specification requirements. Concrete shall not be poured until re-sampling and testing yield acceptable values.

Reports of all the tests required above shall be signed by an authorized representative of the Contractor and furnished to the Engineer on completion of each drilled shaft.

During construction, the level of mineral slurry in the shaft excavation shall be maintained at a level not less than 4 feet above the highest expected piezometric pressure head along the depth of the shaft. If at any time, in the opinion of the Engineer, the slurry construction method fails to produce the desired results, the Contractor shall discontinue this method and propose an alternate method for acceptance by the Engineer.

712.13 Excavation and Drilling Equipment. The excavation and drilling equipment shall have adequate capacity including power, torque and down thrust to excavate a hole of both the maximum diameter and to a depth 10 feet beyond the depth shown on the plans.

The excavation and over-reaming tools shall be of adequate design, size, and strength to perform the work shown in the plans or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drill buckets, and/or under-reaming tools, the Contractor shall provide special drilling equipment including, but not limited to, rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary

to construct the excavation to the size and depth required.

Written concurrence of the Engineer is required before excavation by blasting can be performed.

712.14 Inspection of Excavations.

A. Dimensions and Alignment. The Contractor shall provide equipment for checking the dimensions and alignment of each excavation. The dimensions and alignment of the drilled shaft or drilled pile foundation excavation shall be determined by the Contractor under the observation and direction of the Department inspectors. Generally the alignment and dimensions shall be checked during and after excavation by the following methods as necessary:

1. Insertion into the shaft excavation of a rigid rod or pipe assembly with several 90° offsets equal to the shaft diameter for alignment and dimension checks.

2. Other methods provided by the Contractor and accepted by the Engineer.

Any rod or pipe assembly, or other device used to check dimensions and alignment shall be provided by the Contractor and must be able to be inserted into the excavation to the full depth of the foundation.

B. Depth. The depth of the excavation during drilling shall be referenced to appropriate marks on the Kelly bar or other suitable methods. Final excavation depths shall be measured after final cleaning with a suitable weighted tape or other accepted methods.

C. Excavation Inspection. The Engineer will inspect each excavation for acceptance before placement of the reinforcing cage and concrete. The Contractor shall provide necessary equipment for inspecting the excavation. The inspection equipment shall be compatible with the Contractor's construction methods. The Contractor shall

be responsible for providing all necessary safety precautions, equipment, and procedures required for confined space entry and fall protection by current OSHA standards for these inspections and shall perform any corrective work found necessary as a result of the inspections. Necessary time shall be allowed for performance of these inspections.

D. Excavation Cleanliness Requirements. The Contractor's cleaning operation will be adjusted so that a minimum of 50% of the base of each excavation will have less than 1/2 inch of sediment at the time of placement of the concrete. The maximum depth of sedimentary deposits or any other debris any place on the base of the excavation shall not exceed 1 1/2 inches. Excavation cleanliness will be determined by the Engineer using visual inspection for dry excavations and other methods deemed appropriate by the Engineer for wet excavations. In addition, for dry excavations, the maximum depth of water shall not exceed 3 inches immediately before concrete placement.

E. Construction Tolerances.

1. Drilled Shafts. The following construction tolerances shall apply to drilled shafts unless otherwise stated on the plans or in the special provisions:

a. The drilled shaft shall be within 3 inches of plan position in the horizontal plane at the plan elevation for the top of the shaft.

b. The top elevation of the shaft shall have a tolerance of from plus 1 inch to minus 3 inches from the plan elevation.

c. The vertical alignment of a vertical shaft excavation shall not vary from the plan alignment by more than 1/4 inch per foot of depth. The alignment of a battered shaft excavation shall

not vary by more than 1/2 inch per foot of depth from the prescribed batter.

d. After all the concrete has been placed, the top of the reinforcing cage shall be no more than 6 inches above and no more than 3 inches below the plan position, unless otherwise ordered by the Engineer.

e. All casing diameters shown on the plans refer to OD (outside diameter) dimensions. The dimensions of casings are subject to American Pipe Institute tolerances applicable to regular steel pipe. When allowed, the Contractor may elect to provide a casing larger in diameter than shown on the plans. However, the Contractor will take steps to insure that the reinforcing cage does not move when temporary casing is extracted. It may be necessary to increase the size of the spacers.

f. Excavation equipment and methods shall be designed so that the completed shaft excavation will have a planar bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of ±3/8 inch per foot of diameter.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. Materials and work necessary, including engineering analysis and re-design to complete corrections for out of tolerance drilled shaft excavations shall be furnished without cost to the Department or an extension of contract time.

2. Drilled Pile Foundations. Construction tolerances

will be the same as tolerances mandated for the applicable piling as shown in Section **711** of these specifications.

F. Foundation Integrity Testing. If a bid item for Foundation Integrity Testing (Setup) is included in the project, then the Engineer may utilize a non-destructive test to verify the integrity of selected shafts. This test will be performed by a Department Consultant on each drilled shaft selected by the Engineer. The performance of the test will be at no cost to the Contractor. If however, the Engineer has reason to believe the integrity of a drilled shaft has been compromised by the Contractor's methods or materials, the Engineer may call for a Foundation Integrity Test. If the drilled shaft is found to be faulty due to the Contractor's methods or materials, the entire cost of the setup and testing will be the responsibility of the Contractor. If the results of the test prove the foundation to be sound, the Contractor will be paid for the test setup, and the testing will be the responsibility of the Department.

The test will be conducted after the concrete has been allowed to cure at least 72 hours and the concrete reaches a compressive strength of at least 2500 psi as determined from concrete cylinder tests.

The Contractor shall notify the Engineer at the completion of each shaft that is to be tested so that the Engineer will have a minimum of 72 hours to schedule the test.

It is anticipated that all shafts for each bent or pier will be tested at the same time. Therefore, construction on the bent or pier above the shafts cannot begin until all shafts in the bent or pier have been completed, the tests performed, and the data evaluated.

The Contractor shall assist the Engineer in performing the test by providing access to the top of the shaft. The Contractor shall construct a work platform if necessary to provide access. The Contractor shall also assist the En-

gineer by grinding and smoothing portions of the top of the shaft as directed by the Engineer. This work will be included as part of the bid item Foundation Integrity Test (Setup.)

If the Foundation Integrity Test indicates that the shaft is defective, the Contractor shall be responsible to improve the defective shafts to the satisfaction of the Engineer. Such improvement may consist of, but is not limited to, correcting defective portions of the shaft, installing straddle shafts to compensate for capacity loss, or providing a replacement shaft. All corrective measures including re-design of bent or pier caps caused by defective shafts shall be done by the Contractor to the satisfaction of the Engineer without either compensation or extension of contract time.

G. Shaft Load Test. Material, equipment, and procedures for a Shaft Load Test will be specified in the special provisions for the project. Measurement and Payment will also be included in the special provision.

712.15 Construction of Drilled Shaft Using Cofferdams. The Contractor may elect to use cofferdams for the construction of drilled shafts in open water or other areas where such a method of construction would be to his advantage. Obtaining of any required permits shall be the Contractor's responsibility.

If the Contractor elects to use cofferdams, the Contractor shall comply with the requirements of Subsection **204.05** and **702.10** for design, installation, and inspection of cofferdams.

712.16 Reinforcing Cage Fabrication and Placement.

A. Cage Fabrication and Placement. The Contractor shall not begin any drilling before the cage of reinforcing steel, consisting of longitudinal bars, ties, spirals, any necessary cage stiffener bars, and spacers is completely assembled and ready to be placed in the excavation. The

reinforcing cage shall be placed immediately after the excavation is inspected and accepted. The maximum time between completion of excavation and concrete placement shall not exceed 12 hours unless otherwise approved in writing by the Engineer. The Contractor shall provide the necessary temporary or permanent stiffening against distortion during assembly, lifting, and placement of reinforcing cage.

B. Splicing Cage. If the bottom of the constructed shaft or pile elevation is lower than the bottom of shaft or pile elevation shown on the plans, all longitudinal bars shall be extended the additional length. Spirals shall be continued for the extra depth and the stiffener bars shall be extended to the final depth. These bars shall be spliced by mechanical couplers, or unspliced bars of the proper length may be used. Welding of reinforcing steel will not be permitted unless called for on the plans or in the special provisions.

C. Support, Alignment, and Tolerance. The reinforcing steel in the shaft shall be tied and supported so that the location of the reinforcing steel will remain within allowable tolerances. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals (near the bottom, the top, and at intervals not exceeding 10 feet vertically) to insure concentric spacing for the entire cage length. The number of spacers required at each level will be one spacer for each foot of excavation diameter, with a minimum of four spacers at each level. Spacers shall be constructed of approved material equal in quality and durability to the concrete specified for the shaft. The spacers shall be of adequate dimension to insure a minimum 5 inch annular space between the outside of the reinforcing cage and the side of the excavation. Acceptable concrete feet (bottom supports) shall be provided to insure that the bottom of the cage is maintained

the proper distance above the base of the excavation. If

an oversize casing or excavation is used, spacer sizes shall be adjusted to insure concentric spacing.

The elevation of the top of the reinforcing cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional shafts shall be constructed until the Contractor has modified the reinforcing cage support in a manner satisfactory to the Engineer.

712.17 Concrete Placement.

A. In Drilled Shafts. Concrete shall be placed as soon as possible after placing the reinforcing steel cage. Concrete placement shall be continuous from the bottom to the top elevation of the shaft. Concrete placement shall continue until good quality concrete is evident at the top of shaft. Concrete shall normally be placed either by a tremie or concrete pump. Free fall placement of concrete from the end of the tremie or pump line shall not be permitted. Free fall from the top may be allowed in a dry hole with conditions outlined in Subsection **712.17E** below.

The elapsed time from the beginning of concrete placement to the completion of the placement shall not exceed two hours. All admixtures, when accepted for use, shall be adjusted for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the two-hour limit. Before concrete placement, the Contractor shall provide test results of both a trial mix and a slump loss test conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets the two-hour workable plastic state requirement. The Contractor may request a longer placement time provided he supplies a concrete mix that will maintain a slump of 4 inches or greater over the longer placement time as demonstrated by trial mix and slump loss tests. The trial mix and slump loss tests shall be conducted using concrete and ambient temperatures ap-

propriate for site conditions.

B. In Drilled Pile Foundation. Concrete shall be placed as soon as possible after placing the steel H-pile and reinforcing steel cage. The Contractor may opt to place concrete before placement of steel H-pile provided that a suitable set retarding agent is used to ensure ability to place steel H-pile to the required tip elevation before hardening of concrete. Unless approved in writing by the Engineer, concrete placement shall be continuous from the bottom to the top elevation of the pile foundation. Concrete placement shall continue until the excavation is full and good quality concrete is evident at the top of the pile foundation. Concrete shall normally be placed either by a tremie or concrete pump. The free fall placement from the end of the tremie or pump line shall not be permitted. Free fall from the top may be allowed in a dry construction excavation with conditions outlined in Subsection **712.17E**.

The elapsed time from the beginning of concrete placement in the excavation to the completion of the placement shall not exceed 2 hours. All admixtures, when accepted for use shall be adjusted for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the 2 hour limit. The Contractor may request a longer placement time provided he supplies a concrete mix that will maintain a slump of 4 inches or greater over the longer placement time as demonstrated by trial mix and slump loss tests. The trial mix and slump loss tests shall be conducted using concrete and ambient temperatures appropriate for site conditions.

The Contractor may opt to place the drilled pile foundation concrete by tremie, free-fall, or pump method as specified below before placing the steel H-pile in the excavation provided that a suitable set retarding agent is used to insure that the steel H-pile can be placed as specified. Further, a vibratory hammer may be required

when using this method. The Department reserves the right to disallow this method of construction should it be determined unworkable or defects in the completed drilled pile foundations are observed.

C. Tremies. Tremies may be used for concrete placement in either wet or dry construction excavations. Tremies used to place concrete shall consist of a rigid pipe or tube of sufficient length, weight, and diameter to discharge concrete at the bottom of the excavation. The tremie shall not contain aluminum parts that will have contact with the concrete. The tremie inside diameter shall be at least 6 times the maximum size of aggregate used in the concrete mix, but shall not be less than 10 inches. The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and allow unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends that may restrict concrete placement.

The tremie used for wet excavation concrete placement shall be watertight. Underwater placement shall not begin until the tremie reaches the bottom of the excavation. Discharge of concrete may begin at one tremie diameter above the bottom of the excavation only if a valve, bottom plate, or a plug is used. The plug shall be removed from the excavation or be of a material accepted by the Engineer that will not cause a defect in the shaft or pile if not removed. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall be immersed at least 10 feet in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The concrete in the tremie shall be maintained at a positive pressure differential at all times to prevent water or slurry intrusion into the concrete column.

If at any time during the concrete placement, the tremie

line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the shaft shall be considered defective. In such a case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall repairs directed by the Engineer, and re-pour the shaft. All costs of replacement of defective shafts shall be the responsibility of the Contractor.

D. Pumped Concrete. Concrete pumps and lines may be used for concrete placement in either wet or dry excavations. All pump lines shall be a minimum of 5 inches in diameter and shall be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the bottom of the excavation.

For wet excavations, a plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or be of a material accepted by the Engineer that will not cause a defect in the shaft if not removed.

The discharge orifice shall remain at least 10 feet below the surface of the fluid concrete for wet excavation concrete placement. When lifting the pump line during concreting, the Contractor shall temporarily reduce the line pressure until the orifice has been repositioned at a higher level in the excavation. If at any time during the concrete placement, the pump line orifice is removed from the fluid concrete and discharges concrete above the rising concrete level, the shaft shall be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall repairs directed by the Engineer, and re-pour the shaft. All costs of replacement of defective shafts shall be the responsibility of the Contractor.

E. Free-Fall of Concrete. With the written acceptance of

the Engineer, the free-fall of concrete may be allowed only under the following conditions:

1. The excavation is a dry construction method excavation as defined under Subsection **712.07**.

2. The inspector can see the top of the rising concrete during pouring and can determine if the concrete is striking the reinforcing cage.

3. The concrete is placed in a chute with a rigid pipe to direct the concrete straight down.

4. The concrete fall is less than 75 feet.

5. The maximum size of aggregate is 3/4 inch; the slump is in the 7 inch to 9 inch range; and there are no strength problems.

6. The Contractor has a tremie or pump on site and is prepared to use it if it becomes necessary.

7. It is expressly understood by the Contractor that permission to use the free-fall method is conditional and that the Department reserves the right to require a tremie or pump on any shaft if, for any reason, the Engineer determines that the free-fall method is not producing satisfactory results.

F. Forms. When the top of shaft or pile elevation is above ground, the portion of the structure above ground shall be formed to the dimensions shown on the plans with removable forms or another accepted method.

Casing used as form and later removed to expose the concrete shall be removed in a manner that will not damage the underlying concrete. The casing may be removed in accordance with the following requirements:

1. The concrete has attained a compressive

strength of 3000 psi as determined from test cylinder breaks.

2. After removal of the casing, the concrete shall continued to be cured for the full curing period in accordance with specifications.

3. The concrete is not exposed to moving water or tidal water for at least seven (7) days after removal of the casing.

712.18 Method of Measurement.

A. Drilled Shafts with Wet and Dry Excavation. The quantity to be measured for payment shall be the length in linear feet of the reinforced concrete drilled shaft of the diameter shown in the plans, completed and accepted.

If a bid item for Drilled Shaft with Rock Excavation is not included in the pay quantities, then the length for Drilled Shafts with Wet and Dry Excavation shall be the difference between the top of shaft elevation as shown on the plans and the final bottom of shaft elevation as authorized by the Engineer or the actual bottom of shaft elevation, whichever produces the lesser length. No measurement will be made for over drilling beyond the elevation authorized by the Engineer. Measurement will be made to the nearest one-tenth of a linear foot.

If a bid item for Drilled Shaft with Rock Excavation is included in the pay quantities, then the length for Drilled Shafts with Wet and Dry Excavation shall be the difference between the top of shaft elevation as shown in the plans and the top of rock elevation determined in accordance with Subsection **712.10E**.

B. Drilled Shafts with Rock Excavation. If a bid item for Drilled Shaft with Rock Excavation is included in the pay quantities, then the length in linear feet for Drilled Shafts with Rock Excavation shall be the difference be-

tween elevation of the top of rock determined in accordance with Subsection **712.10E** and elevation of the final bottom of shaft as authorized by the Engineer or the actual bottom of shaft elevation, whichever produces the lesser length. No measurement will be made for over drilling beyond the elevation authorized by the Engineer. Measurement will be made to the nearest one-tenth of a linear foot.

If a bid item for Drilled Shaft with Rock Excavation is not included in the pay quantities, then all costs shall be included in the price bid for Drilled Shafts with Wet and Dry Excavation.

C. Soil Excavation for Drilled Pile Foundation. The quantity to be measured for payment shall be the length in linear feet of the concrete portion of the drilled pile foundation of the diameter shown in the plans, completed and accepted.

If a bid item for Rock Excavation for Drilled Pile Foundation is not included in the pay quantities, then the length for Soil Excavation for Drilled Pile shall be the difference between the elevation of the top of ground, as determined by field measurement, and the elevation of the final bottom of the drilled pile foundation as authorized by the Engineer or the actual elevation of the bottom of the concrete pile, whichever produces the lesser length. No measurement will be made for over drilling beyond the elevation authorized by the Engineer. Measurement will be made to the nearest one-tenth of a linear foot.

If a bid item for Rock Excavation for Drilled Pile Foundation is included in the pay quantities, the length for Soil Excavation for Drilled Pile Foundation shall be determined as the difference between elevation of the top ground as determined by field measurement and the authorized elevation of the top of rock determined in accordance with Subsection **712.10E**.

D. Rock Excavation for Drilled Pile Foundation. If a bid item for Rock Excavation for Drilled Pile Foundation is included in the pay quantities, then the length in linear feet for Rock Excavation for Drilled Pile Foundation shall be the difference between the top of rock excavation determined in accordance with Subsection **712.10E** and the final bottom of concrete pile elevation as authorized by the Engineer or the actual bottom of drilled pile elevation, whichever produces the lesser length. No measurement will be made for over drilling beyond the elevation authorized by the Engineer. Measurement will be made to the nearest one-tenth of a linear foot

If a bid item for Rock Excavation for Drilled Pile Foundation is not included in the pay quantities, then all costs shall be included in the price bid for Soil Excavation for Drilled Pile Foundation.

E. Reinforcing Steel. The quantity of reinforcing steel measured for payment shall be the theoretical number of pounds of reinforcing steel required to construct the drilled shafts or drilled pile foundations to the dimensions and elevations as shown on the plans unless revised by the authority of the Engineer.

F. Concrete for Drilled Shafts. All costs for concrete in drilled shafts shall be included in the contract unit price for Drilled Shafts and will not be measured for payment.

G. Concrete for Drilled Pile Foundations. The quantity of drilled pile foundation concrete measured for payment shall be the theoretical number of cubic yards of concrete required to construct the drilled pile foundations to the dimensions and elevations as shown on the plans or revised by the authority of the Engineer.

H. Construction Casing. The quantity to be measured

for payment shall be the length in linear feet of the Construction Casing of the diameter shown on the plans, completed and accepted.

Unless directed otherwise by the Engineer, measurement for payment shall include from the authorized top of the construction casing to final authorized bottom of casing elevation. Portions of construction casing removed will not be deducted from the pay quantities. Portions of construction casing removed shall become the property of the Contractor and shall be disposed of by the Contractor away from the site.

With written authorization of the Engineer, the Contractor may elect to use a construction system using a temporary form down to the final cut-off elevation of the construction casing. This may be done to eliminate the need for removal of construction casing below water level. If this type of system is used, the measurement for pay quantity shall be from the top of construction casing estimated on the plans to the authorized bottom of casing elevation. If this type of system is to be used, it shall be shown on the Installation Plan.

An allowance of 5 feet of construction casing will be added to the total measurement for each approved splice eligible for payment. There will not be an allowance for any splice made for the convenience of the Contractor.

Measurements shall not include casing which are not in accordance with these specifications or for those that are not as directed and accepted by the Engineer.

I. Steel H-Piling. Steel H-piling for drilled pile foundations shall be measured in accordance with Section **711**.

J. Foundation Integrity Test Setups. The number of Foundation Integrity Test Setups shown in the plans is estimated for bid purposes only. The actual number of Foundation Integrity Test Setups measured for payment

shall be equal to the number of each drilled shaft tested with the Foundation Integrity Test to verify the integrity of drilled shafts and result in no known defects attributable to the Contractor.

712.19 Basis of Payment.

A. Drilled Shafts with Wet and Dry Excavation. The quantity of reinforced concrete drilled shaft measured as specified in Subsection **712.18A** will be paid at the contract unit price for Drilled Shafts with Wet and Dry Excavation, which price and payment shall be full compensation for labor, material and equipment and shall include the excavation including disposal of excavated materials, installation and removal of temporary casings, removal of obstructions, cleaning excavation, pumping out water, furnishing and placing concrete, painting casings left in place, and other incidentals necessary to satisfactorily complete the work as specified.

B. Drilled Shafts with Rock Excavation. The quantity of reinforced concrete drilled shaft measured as specified in Subsection **712.18B** will be paid at the contract unit price for Drilled Shafts with Rock Excavation, which price and payment shall be full compensation for labor, material and equipment and shall include the excavation including disposal of excavated materials, installation and removal of temporary casings, removal of obstructions, cleaning excavation, pumping out water, furnishing and placing concrete, painting casings left in place, and other incidentals necessary to satisfactorily complete the work as specified.

C. Drilled Pile Foundations. The quantity of reinforced or non-reinforced concrete drilled pile foundations measured as specified in Subsection **712.18C** will be paid at the contract unit price for Soil Excavation for Drilled Pile Foundations, which price and payment shall be full compensation for labor, material and equipment and shall include the excavation including disposal of excavated ma-

terials, installation and removal of temporary casings, removal of obstructions, cleaning excavation, pumping out water, painting casings left in place, and other incidentals necessary to satisfactorily complete the work as specified.

D. Rock Excavation for Drilled Pile Foundations. The quantity of reinforced or non-reinforced concrete drilled pile foundations measured as specified in Subsection **712.18D** will be paid at the contract unit price for Rock Excavation for Drilled Pile Foundations, which price and payment shall be full compensation for labor, material and equipment and shall include the excavation including disposal of excavated materials, installation and removal of temporary casings, removal of obstructions, cleaning excavation, pumping out water, painting casings left in place, and other incidentals necessary to satisfactorily complete the work as specified.

E. Reinforcing Steel. Reinforcing steel will be paid for in accordance with Subsection **703.12**, which price and payment shall be full compensation for furnishing, tying, assembling, stiffening, and placing reinforcing steel cages. It shall also include furnishing and attaching spacers on cages and other incidentals necessary to satisfactorily complete the work as specified.

F. Concrete for Drilled Pile Foundations. Concrete for drilled pile foundations shall be paid for at the contract unit price for Drilled Foundation Concrete, which price and payment shall be full compensation for all costs of mix designs, trial batches, testing, concrete, forms, placing concrete, labor, materials and other incidentals necessary to satisfactorily complete the work as specified.

G. Construction Casing. The quantity of construction casing measured in accordance with Subsection **712.18H** will be paid for at the contract unit price for each size of Construction Casing indicated on the plans, which price and payment shall be full compensation for furnishing all materials, including stiffening materials, equipment, tools,

labor, and other items necessary for installing, removing, and/or painting, if necessary, and disposing of specified portions, splicing, and welding as required. It shall also include any temporary bracing necessary to hold the casing in alignment and the removal of any obstructions to satisfactorily complete the work as specified.

H. Steel H-Piling. Steel H-piling for drilled pile foundations shall be paid for in accordance with Section **711**.

I. Foundation Integrity Test Setups. The number of Foundation Integrity Test setups will be paid for at the contract unit price for Foundation Integrity Test Setup, which price and payment shall be full compensation for mobilization, equipment, labor, materials and incidental work required to assist the Engineer in the preparation, performance, and monitoring in accordance with these specifications.

Payment for each item will include all direct and indirect costs and expenses necessary to complete the work.

Payment will be made under:

Item No.	**Pay Item**	**Pay Unit**
7120001	Foundation Integrity Test Setup	Each
712002X	Soil Excavation for Drilled Pile Foundations - (*diameter*)" Diameter	Linear Foot
712006X	Rock Excavation for Drilled Pile Foundations - (*diameter*)" Diameter	Linear Foot
7120XX1	Drilled Shafts with Wet & Dry Excavation - (*diameter*)"Diameter	Linear Foot

Pay Items (Continued)

Item No.	Pay Item	Pay Unit
7120XX2	Drilled Shafts with Rock Excavation - (*diameter*)" Diameter	Linear Foot
7120XX5	Construction Casing - (*diameter*)" Diameter	Linear Foot
7120500	Drilled Pile Foundation Concrete	Cubic Yard

SECTION 713

MECHANICALLY STABILIZED EARTH RETAINING WALL (SEGMENTAL BLOCK)

713.01 Description. This work shall consist of furnishing and constructing a Mechanically Stabilized Earth Retaining Wall (MSERW) using segmental block concrete facing units conforming to the lines, grades, and dimensions shown on the plans. It includes erecting the segmental concrete facing units; storing, cutting, and placing the structural geosynthetic reinforcement; excavating existing material, placing and compacting wall fill material and backfill material, providing a concrete leveling pad, and installing a drainage system behind the wall.

713.02 Definitions.

1. Structural Geosynthetic Reinforcement (SGR) is a structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and functions primarily as horizontal reinforcement.

2. Segmental Concrete Facing Unit is a precast concrete shape, machine made from portland cement, water, and mineral aggregates and is manufactured specifically for mortarless reinforced earth retaining wall construction.