

SECTION 02 80 00
SEGMENTAL RETAINING WALLS AND REINFORCED SLOPES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work shall consist of furnishing all materials, labor, equipment and supervision for construction of a segmental retaining wall or reinforced slope (SRW/RS) system in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the drawings or as established by the Owner or the Owner's engineer.

1.2 REFERENCED SECTIONS

- A. Section 02300 - Earthwork
B. Section 02821 - Site Chain Link Fences and Gates

1.3 REFERENCE STANDARDS

- A. Engineering Design:
1. NCMA Design Manual for Segmental Retaining Walls, 2nd Edition.
 2. NCMA SRW-1 - Determination of Connection Strength between Geosynthetics and Segmental Concrete Units.
 3. NCMA SRW-2 - Determination of Shear Strength between Segmental Concrete Units.
 4. FHWA/SA-96-71 - Mechanically Stabilized Earth Wall and Reinforced Soil Slopes Design and Construction Guidelines.
- B. Segmental Retaining Wall Units:
1. ASTM C140 - Testing Methods of Sampling and Testing Concrete Masonry Units.
 2. ASTM C1372 - Specification for Segmental Retaining Wall Units.
- C. Geosynthetics:
1. ASTM D4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 2. ASTM D5262 - Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics.
 3. GRI GG-1 - Single Rib Geogrid Tensile Strength.
 4. GRI GG-5 - Geogrid Pullout.
 5. GRI GG-7 - Carboxyl End Group Content of Polyester Yarns.
 6. GRI GG-8 - Average Molecular Weight of Polyester Yarns.
 7. GRI GT-6 - Geotextile Pullout
 8. ASTM D4354 - Practice for Sampling of Geosynthetics for Testing.

9. ASTM D4759 - Practice for Determining Specification Conformance of Geosynthetics.
 10. ASTM D4873 - Guide for Identification, Storage and Handling of Geotextiles.
 11. ASTM D5321 - Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
 12. ASTM D5818 - practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage.
 13. AASHTO M288-00 - Geotextile Specification for Highway Applications.
- D. Soils:
1. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 2. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 3. ASTM D422 - Test Method for Particle Size Analysis of Soils.
 4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and plasticity Index of Soils.
 5. ASTM D4972 - Standard Test Method for pH of Soils.
 6. ASTM D2487 - Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 7. ASTM D3080 - Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.
 8. ASTM D4767 - Test Method for Consolidated Undrained Triaxial Compression Test on Cohesive Soils.
- E. Drainage Pipe:
1. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 2. ASTM D1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion.
- F. Where specifications and reference documents conflict, the Owner or the Owner's Engineer shall make the final determination of applicable document.

1.4 CONSTRUCTION CONTRACTOR QUALIFICATIONS

- A. For walls or slopes which have a maximum height less than 15 feet, the retaining wall slope Contractor and supplier of the SRW RS system shall

demonstrate successful construction of at least 100,000 ft of the proposed system (facing and reinforcement elements).

- B. For walls which have a maximum height greater than 15 feet, the retaining wall slope Contractor and supplier of the SRW RS system shall demonstrate successful construction of at least 200,000 ft of the proposed system and 5 projects comparable in height and site conditions to the project under construction.
- C. Documentation shall include the project name, location and date of construction, type of SRW RS system and geosynthetic reinforcement, total face area and maximum height, soil conditions, Owner name and telephone number and critical design aspects.

1.5 SUBMITTALS

- A. Material Submittals: The Contractor shall provide with his bid, a sample of the proposed block, geogrid, connecting pins/strips, etc. The Contractor shall submit manufacturer's certifications, together with the design submittal, stating that the SRW RS units, the geosynthetic reinforcement, and the drainage aggregate meet the requirements of part 2 of this section and the approved design calculations/drawings. The Contractor shall submit laboratory test results from the SRW unit manufacturer that demonstrate the SRW units comply with ASTM C1372. Test shall have been performed within 120 days prior to delivery of the SRW units to the project site and shall be sealed by a professional engineer.
- B. Design Submittal: If a complete design of the SRW RS is included as part of the Contract Documents, the Contractor shall base his bid on that SRW RS design. If a complete design is not included, a design submittal will be required by the Contractor. For this submittal, the Contractor shall submit 3 sets of detailed design calculations, construction drawings and shop drawings for review and approval at least 30 days prior to ordering of SRW RS materials. A detailed explanation of the design properties for the geosynthetic reinforcements shall be included in the design. All calculations and drawings shall be prepared and sealed by a professional engineer, licensed in the state in which the project is located. The professional engineer shall have a minimum of 5 years of experience in designing SRW RS systems of similar type and size to that which is being proposed. Preliminary calculations, which includes all factors of safety, shall be completed and submitted with

the bid to verify that the design meets all of the design requirements included herein. This submission shall be in addition to the above Material and Design submission. At a minimum, the design submittal shall include:

1. Drawings:

- a. A front elevation view which depicts the location, elevation and type of geosynthetic reinforcement; elevation of top and bottom of wall; finished grade at bottom and top of wall; utilities located in the reinforced soil zone; and horizontal penetrations of the wall face (e.g. storm water pipes).
- b. The scale of the front elevation view shall be no less than 1 inch 5 feet vertical and 1 inch 10 feet horizontal.
- c. Wall station data with corresponding elevation for exposed grade at top and bottom of wall (i.e. profile data).
- d. Drawings shall be plotted on sheets with dimensions no less than 36 inches x 24 inches.
- e. Representative cross sections of the SRW RS.
- f. Details of the SRW RS unit-geosynthetic connection.
- g. Details of drainage system design and installation.
- h. Details of fence or traffic barricade systems.
- i. Details of vertical and horizontal penetrations in the reinforced zone that included manholes, pipes, light poles, etc. Show installation details for geosynthetic reinforcement at these locations. If reinforcement must be attached to a penetration structure, show connection detail.

2. Specifications:

- a. The Designer's Project Specifications, which shall be in accordance with or more stringent than this specification, shall be an integral part of the drawings and shall address the following as a minimum:
 - 1) Materials: Specifications for all construction materials and/or pre-approved materials.
 - 2) Construction Procedures: Foundation preparation, sequence of work, backfill placement, geosynthetic installation and quality assurance requirements.
 - 3) Drainage Materials.

- 4) Design Parameters: Factors of safety, geosynthetic properties and soil properties, peak connection strength data.
 - 5) Special Provisions.
- b. Written calculations and computer output. Calculations will specifically address each of the following:
- 1) Classification of soil in accordance with Unified Soil Classification System, moist unit weight and shear strength parameters for soil in reinforced, retained and foundation zones.
 - 2) Internal and External Stability.
 - 3) Global Stability.
 - 4) Description of applicable groundwater, rapid drawdown and hydrostatic loading conditions and assumptions.
 - 5) Design Factors of Safety and Parameters as listed in Article 3.08.
 - 6) Geosynthetic reinforcement ultimate strength, long-term design strength (LTDS), allowable design strength (Ta), reduction factors, coefficient of interaction © and coefficient of direct sliding (Cps).
 - 7) Summary of geosynthetic reinforcement schedule including station, design geometry, reinforcement length and reinforcement type.
 - 8) Connection capacity of reinforcement to anchors at vertical penetrations.

1.6 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall inspect the materials upon delivery to assure that proper type, grade and color material has been received.
- B. The Contractor shall store and handle all materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes.
- C. The Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the SRW RS.

PART 2 - PRODUCTS

2.1 CONCRETE SEGMENTAL RETAINING WALL UNITS

- A. Concrete segmental units shall conform to the requirements of ASTM C1372 with a minimum 28 day compressive strength of 3000 psi and a maximum

absorption of 8%. For areas subject to detrimental freeze-thaw cycles as determined by the Owner or the Owner's Engineer, the concrete shall have a minimum compressive strength of 4000 psi and adequate freeze-thaw protection as required in ASTM C1372.

- B. All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit, impair the strength or permanence of the construction, or create an unsatisfactorily appearance as determined by the Owner. Any cracks or chips observed during construction shall fall within the guidelines outlined in ASTM C1372 or the units shall be removed from the project site.
- C. SRW RS unit dimensions shall not differ more than 1:8 inch except height, which shall not differ more than 1:16 inch from manufacturer's dimensions and other units shipped to the jobsite as measured in accordance with ASTM C140.
- D. Cap adhesive shall meet the requirements of the SRW RS unit manufacturer.
- E. The minimum wall batter shall be 4 degrees unless otherwise approved by the Owner.
- F. Pre-approved SRW RS systems include the following and the Owner reserves the right to accept or reject any pre-approved system:
 - 1. Mesa and Sierra Slope by Tensar Earth Technologies, Inc.
5775 Glenridge Drive
Atlanta, Georgia 30328
(404) 250-1290 (Joe Emberson)
(800) 292-4459
(404) 250-9185 (Fax)
www.tensarcorp.com/index2.htm
 - 2. Anchor Wall Systems
6101 Baker Road, Suite 201
Minnetonka, MN 55345
(952) 979-8454 (Don Armstrong)
(800) 473-4452
(952) 979-8454 (Fax)
www.anchorwall.com
 - 3. Keystone Retaining Wall Systems
4444 W78th Street
Minneapolis, MN 55345
(919) 783-5422 (Scott Vollmer)
(919) 783-5402 (Fax)
www.keystonewalls.com
 - 4. Versa-Lok Retaining Wall Systems
6348 Highway 36, Suite 1
Oakdale, MN 55128
(651) 770-3166 (Chad Johnson)
(800) 770-4525

(651) 770-4089 (fax)
www.versa-lok.com/frmset.htm

5. Rockwood Retaining Walls, Inc.
325 Alliance Place NE
Rochester, MN 55906
(507) 529-2871 (Greg Ernst)
(888) 288-4045
(507) 529-2879 (Fax)

G. Alternate SRW RS Systems may be quoted in addition to the base bid quote from one of the pre-approved SRW RS systems. The Owner reserves the right to accept or reject any alternate bid.

2.2 GEOSYNTHETIC REINFORCEMENTS

- A. Geosynthetic reinforcement shall meet minimum long-term strength (LTDS) and durability in accordance with Section 3.5 of the NCMA Design Manual for Segmental Retaining Walls (2nd Edition), which shall also include minimum partial safety factors.
- B. Acceptable geosynthetic manufactures are Tensar, Mirati, Stratagrid, Synteen or approved equal by the Owner and the Owner's Engineer.

2.3 DRAINAGE PIPE

- A. The drainage collection pipe shall be a perforated or slotted HDPE or PVC pipe. Perforations or slots shall be sized to prevent migration of drainage fill into the pipe.
- B. Drainage pipe shall be manufactured in accordance with ASTM D3034 and/or ASTM D1248.

2.4 DRAINAGE FILL

- A. Drainage fill shall be freely draining aggregate meeting the requirements of AASHTO Size No. 57 or 67 Aggregate.
- B. Drainage fill shall extend a minimum of 12 inches from the back of the wall.

2.5 REINFORCED FILL

- A. Maximum particle size within the reinforced zone shall be 3 inches. Compacted fill for the reinforced zone shall be a non-plastic to low plastic fill based on the wall height, percent finer than the Size No. 200 sieve and Plasticity Index (PI) as defined by:

<u>Wall Height (H)</u>	<u>% Fines</u>	<u>PI</u>
H <10	<65	<20
10 H <20	<50	<10
H <20	<35	<10

Materials outside of these criteria (i.e. on-site soils) require approval of the Owner and the Owner's Engineer.

- B. The pH of the backfill material shall be between 3 and 9 when tested in accordance with ASTM D4972.
- C. Where fill consists of rocky material (maximum 3 inch particle size), within the reinforced zone, such material shall be well distributed throughout the fill. Fill containing topsoil, brush, sod, peat, roots or other organic perishable or deleterious matter including, but not limited to, snow, ice or frozen soils, shall be considered unsuitable material for use in the reinforced zone and shall be removed.

2.6 GEOTEXTILE

- A. Geotextiles used for separation, stabilization and drainage applications shall be in accordance with AASHTO M288-00.

PART 3 - WALL DESIGN CRITERIA

3.1 GENERAL

- A. If a SRW RS design is provided and the Contractor elects to construct the wall as shown on the Contract Documents, no design submittal will be required; otherwise, a complete design shall be prepared by the Contractor's professional engineer.

3.2 DESIGN METHODOLOGY AND ANALYSIS

- A. Retaining walls shall be designed in accordance with the recommendations of the NCMA Design Manual for Segmental Retaining Walls (Current Edition).
- B. The design shall consider the internal stability of the reinforced soil mass and shall be in accordance with acceptable engineering practice and these specifications.
- C. External stability, including sliding, overturning and bearing, as well as global slope stability shall be evaluated in accordance with acceptable engineering practice and these specifications.

3.3 DESIGN HEIGHT

- A. The structures design height, H, shall be measured from the bottom of the lowest course of block to the top of the wall where the ground surface intercepts the wall facing. See construction drawings to determine how wall heights are depicted.

3.4 SOIL REINFORCEMENT EMBEDMENT LENGTH

- A. The minimum soil reinforcement length shall be as required to achieve a minimum width of structure, B, measured from the front face of the wall

to the end of the soil reinforcements, greater than or equal to 65% of the design height, H.

B. Provide for 100% coverage of Geosynthetic Reinforcement.

3.5 INCLINATION OF FAILURE SURFACE

A. At a minimum, a Coulomb failure surface passing through the base of the wall behind the facing units up to the ground surface at or above the top of wall shall be evaluated in design of walls. Other failure surfaces shall be considered in coordination with the wall/soil conditions and configuration.

3.6 SOIL STRENGTH PARAMETERS

A. Wall design engineer shall obtain recommendations from the Owner's geotechnical engineer for soil design parameters for soils available on-site. Wall design engineer of record shall be responsible for selecting and specifying reinforced fill material. Reinforced fill material shall have a minimum angle of internal friction of 28 degrees. The Contractor shall be responsible for providing soil samples and completing laboratory testing, as indicated by the owner's geotechnical engineer, necessary to determine soil design parameters for imported fill and Contractor is also responsible for ensuring and documenting that Owner's geotechnical engineer has approved the fill to be utilized in the reinforced zone.

3.7 SURCHARGE LOADING

A. A minimum uniform surcharge load of 250 psi shall be used in design to model traffic, parking or loading where applicable.

B. Other surcharge loads shall be incorporated into the design as such as buildings, construction equipment, etc. as determined to be necessary by the design engineer, Owner or Owner's Engineer.

3.8 MINIMUM FACTORS OF SAFETY

A. The wall designed shall determine the appropriate factors of safety for the specific SRW RS location and soil conditions and shall provide for the following minimum factors of safety defined by the Owner:

- | | |
|--------------------------------------------------|-------------------------------------------|
| 1. Base Sliding | 1.5 |
| 2. Internal Sliding | 1.5 |
| 3. Overturning of the reinforced mass | 2.0 |
| 4. Eccentricity | shall fall within middle 1:3 of structure |
| 5. Bearing Capacity | 2.0 |
| 6. Geosynthetic Reinforcement Tensile Overstress | 1.0 |

7. Geosynthetic Reinforcement Pullout	1.5
8. Inter-SRW RS Shear Capacity	1.5
9. Peak Geosynthetic SRW RS Connection Strength	1.5
10. Global (Deep-Seated) Failure	1.5
11. Compound Failure	1.5

3.9 ALLOWABLE REINFORCEMENT TENSION

- A. The allowable reinforcement tension, T , at the end of the service life shall consider the time-temperature creep characteristics of the reinforcement, environmental degradation, construction-induced damage and an overall factor of safety.

3.10 CONNECTION STRENGTH

- A. The allowable connection strength of the reinforcements to the facing units, T , shall be computed in accordance with the NCM Design Manual for Segmental Retaining Walls (Current Edition) and shall be based on actual test data in accordance with NCMA SRW RSSRW RS RSU-1.
- B. Minimum Factor of Safety against connection failure. $FS = 1.5$.

3.11 VERTICAL SPACING

- A. The maximum vertical spacing of geosynthetic reinforcement between vertically adjacent layers shall be 24 inches.
- B. The top layer of reinforcing shall be no more than 20 inches below finished grade or 2 units, whichever is less.

3.12 MINIMUM WALL EMBEDMENT

- A. The minimum wall embedment below finish grade shall be the greater of 0.5 feet or the following:
1. Level Slope in front $H/20$
 2. Level Slope (abutments) $H/10$
 3. 3H:1V Slope in front $H/10$
 4. 2H:1V Slope in front $H/7$, where H is the exposed height of the wall

3.13 SEISMIC LOADING

- A. Seismic loading shall be considered where required by local building codes.

3.14 SAFETY FENCE

- A. A minimum 6 foot high fence, shall be installed along the top of the SRW RS, for all wall over 3 feet 6 inches in height. The fence shall meet Section 02821, Site Chain Link Fences and Gates, the requirements of any regulatory authorities having jurisdiction, or architectural requirements, unless otherwise indicated on the drawings.

PART 4 - EXECUTION

4.1 VERIFICATION OF EXISTING SITE CONDITIONS

- A. The Contractor shall verify on-site grades and conditions prior to construction. The Owner, the Owner's Engineer and the Wall Design Engineer shall immediately be notified if on-site conditions differ from the wall design calculations or drawings.

4.2 EXCAVATION

- A. The Contractor shall excavate to the lines and grades required for construction of the wall as shown on the design drawings. The Contractor shall take precautions to minimize over-excavation. Excavation support, if required, shall be the responsibility of the Contractor.
- B. Any over excavation shall be replaced with compacted structural fill as indicated in Article 2.05(A) of this section and Section 023000, Earthwork.
- C. Embankment excavations shall be bench cut.
- D. Excavations necessary to install the SRW RS shall be performed in accordance with the most current OSHA excavation regulations.

4.3 FOUNDATION PREPARATION

- A. Prior to construction of the SRW RS, the Contractor shall clear and grub the reinforced fill zone area removing topsoil, brush, sod, or other organic or deleterious materials.
- B. Following excavation for the reinforced soil zone foundation, the Owner's Geotechnical Engineer shall evaluate subgrades. Subgrades should be capable of supporting an allowable soil bearing pressure per the design. Any soft or unsuitable areas shall be excavated and replaced or stabilized as recommended by the Owner's Geotechnical Engineer prior to placement of fill soils.
- C. Leveling pad shall be constructed of a 6 inch minimum layer of dense graded aggregate and shall be level both horizontally and front-to-back to ensure the first course of units are level. A ½ inch layer of well graded sand may be used for final leveling of the base leveling pad. At the Contractor's option, a 6 inch minimum layer off non-reinforced concrete will be permitted.

4.4 SRW RS AND GEOSYNTHETIC REINFORCEMENT PLACEMENT

- A. All materials shall be installed at the proper elevation and orientation as shown on the wall design drawings and as directed by the Wall Design

Engineer. The concrete SRW RS units and geosynthetic reinforcement shall be installed in accordance with the manufacturer's recommendations.

- B. Overlap of adjacent strips of the geosynthetic, in the design strength direction, shall not be permitted except in corners where unavoidable. The design strength direction is that length of geosynthetic reinforcement perpendicular to the wall face and shall consist of one continuous piece of material. Adjacent sections of geosynthetic shall be placed in a manner to assure that the horizontal coverage is 100%.
- C. Geosynthetic reinforcement shall be installed under tension. A nominal tension shall be applied to the reinforcement and maintained by staples, stakes, hand tensioning unit and reinforcement has been covered by at least 6 inches of soil fill.
- D. The construction tolerances of the SRW RS shall be within all of the following:
 - 1. Maximum allowable horizontal or vertical deviation from drawings grade or location shall be 1 inch.
 - 2. All straight sections and flat surfaces shall be checked with a 10 foot straight edge. Curves shall be smooth and linear with no abrupt changes.
 - 3. The finished wall batter shall be no more than the SRW unit design batter minus 3 degrees.
- E. Broken, shipped, stained or otherwise damaged units shall not be placed in the wall.
- F. SRW RS units shall be core filled with drainage fill in accordance with the manufacturer's recommendations. A minimum of 12 inches of drainage fill shall be required behind the back of the wall.

4.5 PENETRATIONS OF SRW RS

- A. Where fences or guide rails are required, post shall be installed according to the SRW RS manufacturer's recommendations and as shown on the wall design drawings. If no recommendations are provided, the posts shall be driven following construction or forms for posts set during construction. Drilled excavation into the reinforced zone shall not be permitted unless approved by the geosynthetic manufacturer, Owner and Owner's Engineer.
- B. Construction of utilities or structures that lie within the reinforced zone shall be coordinated with wall construction. Excavation into the

reinforced zone following wall construction shall not be permitted. Any damage caused following completion of the wall shall be brought to the attention of the owner and Owner's Engineer and shall be immediately corrected.

4.6 FILL PLACEMENT

- A. Compacted fill for the reinforced zone and over excavated areas shall be placed in minimum horizontal layers of 6 inches and maximum horizontal layers of 8 inches in compacted thickness.
- B. Only hand operated compaction equipment shall be allowed within 3 feet from the back of the units.
- C. Fill shall be placed, spread and compacted in such a manner that eliminates the development of wrinkles or movement of the geosynthetic reinforcement and the SRW RS facing units.
- D. Each lift of fill shall be compacted to the maximum dry density of at least 95% as determined in accordance with ASTM D698, Standard Proctor or 92% as determined in accordance with ASTM D1557, Modified Proctor. The top 18 inches of subgrade for areas of the wall which lie under pavement shall be compacted to the maximum dry density of at least 100% as determined in accordance with ASTM D698, Standard Proctor, or 95% as determined in accordance with ASTM D1557, Modified Proctor. A minimum of one test per lift per 1,000 sf of backfill shall be required and the Owner's Geotechnical Engineer, based on soil type, shall dictate the compaction method.
- E. Tracked Construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles should be kept to a minimum to prevent displacing the fill and damaging or moving the geosynthetic reinforcement.
- F. Rubber-tired equipment may pass over the geosynthetic reinforcement, if permitted by the manufacturer, at slow speeds (less than 10 mph). Sudden braking and sharp turning shall be avoided.
- G. At the end of each day's operation, the Contractor shall slope the fill away from the wall facing to direct runoff away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

4.7 DRAINAGE

- A. Drainage fill shall be placed in horizontal layers not exceeding 8 inches in compacted thickness and compacted with a minimum of two passes of a vibratory plate tamper. This includes drainage fill used to fill any voids in the SRW RS facing units when required by the manufacturer.
- B. Drainage collection and outlet pipes shall be installed at the elevations shown on the drawings and to maintain gravity flow of water outside of the reinforced soil zone.
- C. Drainage pipes shall have a minimum diameter of 4 inches.

4.8 CAP BLOCK PLACEMENT

- A. The cap block and/or top SRW RS unit shall be bonded to the SRW RS units below using cap adhesive in accordance with the manufacturer's recommendations.

4.9 COMPLETION

- A. A minimum of 12 inches of low permeability fill shall be placed over the drainage fill and below topsoil or other surface treatment. This low permeability cap shall be graded to prevent ponding of water behind the wall or flow over the top of the wall.
- B. The Contractor shall confirm that as-built wall geometrics conform to the approximate geometries shown on the wall design drawings. Any deviations shall be brought to the attention of the owner's Engineer.

4.10 QUALITY CONTROL

- A. The Owner and/or Owner's Engineer will review all submittals for materials, design and qualifications.
- B. The owner shall appoint, at this cost, a geotechnical engineering and material testing firm to perform inspection and testing, which would include:
 - 1. Foundation: Evaluation of subgrades for fill and SRW RS unit placement.
 - 2. Fill Placement: Compaction testing of backfill.
 - 3. SRW RS unit and geosynthetic reinforcement placement. Inspect for acceptability and compliance with Contract Documents and wall design drawings.
 - 4. Drainage Store and Pipes: Evaluation of material for suitability and placement.

- C. The above field inspection and testing will not relieve the Contractor of his responsibility to meet the more stringent of the design drawings, manufacturer's requirements and the project specifications.
- D. For walls in excess of 15 feet in height or 10,000 sf of vertical facing or as requested by the owner and the Owner's Engineer, the SRW RS system supplier shall provide a qualified and experienced representative on site weekly to assist the Contractor regarding proper wall installation. This representative shall be provided at no additional cost to the Owner. Weekly field inspection reports shall be provided to the Owner.
- E. The Contractor shall provide a notarized written certification to the owner stating the SRW RS installation has been constructed in accordance with the drawings and the more stringent of the manufacturer's requirements and the project specifications.

4.11 PRE-CONSTRUCTION MEETING

- A. The Wall Contractor, with coordination through the General Contractor, shall be responsible for holding an on-site pre-construction meeting which shall include the General Contractor, Grading Contractor, The Owner, the Wall Design Engineer, the Project Geotechnical Engineer, and the SRW RS system supplier.
- B. The Wall Contractor shall be responsible for coordinating with the Grading Contractor on preparatory work to be performed prior to commencement of wall construction.
- C. Construction phasing of proposed site utilities, which may fall within the reinforced backfill zone or at the base of the wall shall be reviewed.

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