SECTION 32 32 23

SPECIFICATIONS FOR **MEGAWALL MSE** RETAINING WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing materials and labor required for the design and construction of the **MegaWall MSE** retaining wall system.

1.2 **RELATED SECTIONS**

A. 01 00 00 General Requirements
B. 02 00 00 Existing Conditions
C. 03 00 00 Concrete
D. 31 00 00 Earthwork
E. 33 46 00 Subdrainage

1.3 REFERENCES

Where applicable, the latest editions of the following standards shall form a part of this specification to the extent referenced. The publications are referenced to in the text of this guide specification by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

	Standard Specifications for Highway Bridges
	LRFD Bridge Design Specifications
AASHTO M288	Standard Specification for Geotextiles

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

Design Manual for Segmental Retaining Walls

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 304R	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 318	Building Code Requirements for Structural Concrete
ACI 517.2R	Accelerated Curing of Concrete at Atmospheric Pressure

AMERICAN NATIONAL STANDARDS INSTITUTE (ASTM)

ASTM C 31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 33	Specification for Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C 70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C 117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C 136	Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 150	Specifications for Portland Cement
ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 494	Standard Specification for Chemical Admixtures for Concrete
ASTM C 566	Test Method for Total Evaporable Moisture content of Aggregate by Drying
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 805	Test Method for Rebound Number of Hardened Concrete
ASTM C 1018	Test method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)
ASTM C 1064	Standard Test Method for Temperature of Freshly Mixed Concrete
ASTM C 1116	Standard Specification for Fiber-Reinforced Concrete
ASTM C 1231	Standard Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders
ASTM C 1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 1293	Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction
ASTM C 1399	Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete
ASTM C 1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM C 1611	Standard Test Method for Slump Flow of Self-Consolidating Concrete
ASTM D422	Gradation of Soils
ASTM D 424	Atterberg Limit of Soils
ASTM D 698	Laboratory Compaction Characteristics of Soil –

	Standard Effort
ASTM D 1248	Specifications for Corrugated Plastic Pipe
ASTM D 3034	Specifications for Polyvinyl Chloride Pipe (PVC)
ASTM D 4318	Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4439	Standard Terminology for Geosynthetics
ASTM D 4873	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D 6637	Determining Tensile Properties of Geogrids by the Single or Multi-Rib Test Method
ASTM D 6638	Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units
ASTM D 7737	Standard Test Method for Individual Geogrid Junction Strength

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

NPCA QC Manual	Quality Control Manual for Precast Concrete Plants

1.4 GENERAL REQUIREMENTS

MegaWall MSE is a mechanically stabilized earth system meant to retain soil on one side. The block, soil reinforcement and Wedge Connector act as a total system; any material substitution of any of these systems MUST be pre-approved by the design engineer in writing a minimum of 14 days prior to the bid.

1.5 SUBMITTALS

The following items shall be submitted unless specified otherwise herein.

A. Preconstruction Submittals

1. Upon request by the customer, submit quality control procedures established by the precast, wedge and soil reinforcement manufacturer's Quality Control Manual.

B. Drawings

1. The drawings for **MegaWall MSE** shall be furnished by the wall manufacturer for approval. These drawings shall show the design loads and standards which have been met. Installation and construction information shall be included on shop drawings upon request. It is the responsibility of the project's engineer-of-record to verify that the design assumptions are suitable for the proposed application.

2. In addition to the requirements in B.1, the submittal drawings shall show locations and dimensions to all penetrations and special embed items. Product dimensions and thicknesses shall be shown, and the drawing shall be to a common architectural scale with the **MegaWall MSE** system manufacturer's information in the title block.

C. Precast Concrete Unit Data

1. Anchorage, Lifting Inserts and Devices
    i. For anchors, lifting inserts and other devices, the precast concrete producer shall provide product data sheets and proper installation instructions upon request.
2. Accessory Items
    i. For items including, but not limited to sealants, gaskets, pipe entry connectors, and other items installed before or after delivery, the precast concrete producer shall include proper installation instructions and relevant product data upon request.

D. Design Data

1. The **MegaWall MSE** system provider shall supply submittals showing design loading and material specifications for supplied products. At a minimum, the following shall be shown on the submittals:
    i. Live load used in design
    ii. Vertical and lateral earth loads used in design
    iii. Required soil properties (Slope, Tiered Geometry, Bearing Pressure)
    iv. Soil reinforcement reduction factors

E. Test Reports

1. Upon request, the **MegaWall MSE** system provider shall supply copies of material certifications and/or laboratory test reports
2. Upon request, the **MegaWall MSE** precast concrete producer shall submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the project conditions. Such tests may include compressive strength, plastic air content, temperature of freshly mixed concrete, and slump of freshly mixed concrete. Special tests for precast concrete items shall be clearly detailed in the specifications
3. Upon request, the **MegaWall MSE** precast concrete producer shall supply copies of in-plant QA/QC inspection reports.
4. Upon request the **MegaWall MSE** soil reinforcement producer shall supply copies of in-plant QA/QC inspection reports.

1.6 DESIGN

A. MegaWall MSE System Design

1. The **MegaWall MSE** system provider shall employ a professional engineer capable of MSE design registered in the state where **MegaWall MSE** systemis to be installed.

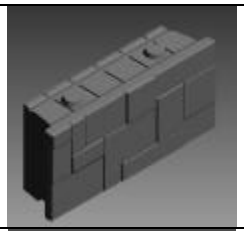
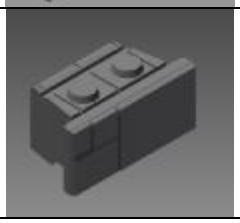
2. The design engineer shall call out one of the MSE design methodologies listed below:
    i. AASHTO Standard Specification for Highway Bridges LRFD Bridge Design Specifications
    ii. NCMA Design for Segmental Retaining Walls

B. Precast Concrete Unit Design

1. Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer.

2. Design standard precast concrete units to withstand design load conditions in accordance with the applicable industry design standards. Design must also consider stresses induced during handling, shipping, and installation in order to avoid product cracking or other handling damage. Design loads for precast concrete units shall be indicated on the shop drawings, and designed by a licensed professional engineer.

3. Standard block dimensions and weights shall be as shown below and on the construction details. Specialty blocks, such as corner pieces, may be used when warranted and will be detailed on the construction details.

Full Block Dimensions W 66 in x H 30 in x D 16 in (*) Weight 2100 lb (**) Coverage 13.75 SF 1" set back (1:30 batter)	
Quarter Block Dimensions W 33 in x H 15 in x D 16.5 in (*) Weight 550 lb (**) Coverage 3.44 SF 0.5" set back (1:30 batter)	

C. Concrete Mix Design

1. Concrete type
    i. Concrete shall be self-consolidating concrete which produces minimal bugholes and does not segregate.
    ii. Concrete shall consist of fiber reinforcement per ASTM C1116 at 1 pound per cubic yard.
2. Concrete Proportions
    i. Selection of proportions for concrete shall be based on current self-consolidating concrete mix design techniques. At a minimum, ACI 211.1 shall be used.
    ii. Upon request the precast concrete producer shall submit a mix design for each strength and type of concrete that will be used. Submitted mix designs shall include the quantity, type, brand and applicable data sheets for all design constituents as well as documentation indicating conformance with applicable reference specifications.
3. Durability and Performance Requirements

i. Concrete Compressive Strength

1. Precast concrete units shall have a 28-day compressive strength of 6000 psi for SCC.

ii. Water-Cementitious Ratio

1. Concrete that will be exposed to freezing and thawing shall contain air and shall have a water-cementitious ratio of 0.45 or less. Concrete which will not be exposed to freezing but which is required to be leak resistant, shall have a water-cementitious ratio of 0.48 or less. For corrosion protection, reinforced concrete exposed to deicer salts, brackish water or seawater shall have a water-cementitious ratio of 0.40 or less.

iii. Air Content

1. The air content of concrete that will be exposed to freezing conditions shall be within the limits given below

Nominal Maximum Aggregate size (in)	Air Content %	
	Severe Exposure	Moderate Exposure
3/8	6.0 to 9.0	4.5 to 7.5
1/2	5.5 to 8.5	4.0 to 7.0
3/4	4.5 to 7.5	3.5 to 6.5
1	4.5 to 7.5	3.0 to 6.0
1-1/2	4.5 to 7.0	3.0 to 6.0
* For specified compressive strengths greater than 5000 psi, air content may be reduced 1% point		

D. Soil Reinforcing Design

1. Soil reinforcing shall be designed by a competent soils engineer registered in the state the project is in.
2. The project engineer will select which soil reinforcing method from the list below is to be used for this project:

☐ Geogrid – HDPE Uniaxial Geogrid soil reinforcing shall be designed based on the soil parameters found in the soils report this project.

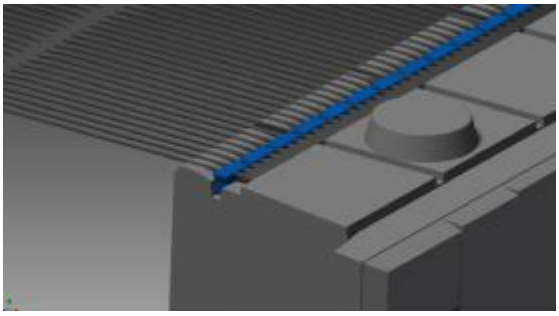
1. Geogrid shall be attached to retaining wall block via the Wedge Connector.
2. Approved Products: Tensar uniaxial geogrid
3. Specific types and amounts shall be detailed in construction details.

☐ Welded Wire Mesh – WWM soil reinforcing shall be designed based on the soil parameters found in the soils report for this project.

1. 10” x 10” apertures
2. Specific types and amounts shall be detailed in construction details.

E. Wedge Connector

1. Geogrid shall be mechanically connected to the precast block using the Wedge Connector as shown in detail below.



2. Wedge connector shall be manufactured from material which can withstand the shear forces applied by the geogrid such as Acrylonitrile Butadiene Styrene (ABS) with the following properties:

Properties	Test Condition	Test Method	Unit	Typical Value
Physical				
Specific Gravity		ASTM D792	-	1,04
Molding Shrinkage (Flow), 3,2mm		ASTM D955	%	0,4~0,7
Melt Flow Rate	220℃/10kg	ASTM D1238	g/10min	23
Mechanical				
Tensile Strength, 3.2mm		ASTM D638		
@ Yield	50mm/min		kg/cm^2	520
Tensile Elongation, 3.2mm		ASTM D638		
@ Yield	50mm/min		%	>5
@ Break	50mm/min		%	30
Tensile Modulus, 3.2mm	1mm/min	ASTM D638	kg/cm^2	22,600
Flexural Strength, 3.2mm	15mm/min	ASTM D790	kg/cm^2	800
Flexural Modulus, 3.2mm	15mm/min	ASTM D790	kg/cm^2	28,000
IZOD Impact Strength, 6.4mm		ASTM D256		
(Notched)	23℃		kg·cm/cm	20
	-30℃		kg·cm/cm	8
IZOD Impact Strength, 3.2mm		ASTM D256		
(Notched)	23℃		kg·cm/cm	23
	-30℃		kg·cm/cm	8
Rockwell Hardness	R-Scale	ASTM D785	-	110
Thermal				
Heat Deflection Temperature, 6.4mm		ASTM D648		
(Unannealed)	18.6kg		℃	86
	4.6kg		℃	90
Vicat Softening Temperature		ASTM D1525		
	5kg, 50℃/h		℃	94
Flammability		UL94		HB
Relative Temperature Index		UL 746B		
Electrical			℃	60
Mechanical with Impact			℃	60
Mechanical without Impact			℃	60

Note) Typical values are only for material selection purpose, and variation within normal tolerances are for various colors.
Values given should not be interpreted as specification and not be used for part or tool design.
All properties, except melt flow rate are measured on injection molded specimens and after 48 hours storage at 23℃, 50% relative humidity.

1.7 QUALITY ASSURANCE

The precast concrete producer shall demonstrate adherence to the standards set forth in the plant Quality Control Manual. The precast concrete producer shall meet the requirements written in subparagraph 1.7.A.

A. Qualifications, Quality Control and Inspection

1. The **MegaWall MSE** system precast concrete, wedge and soil reinforcement producer shall maintain a permanent quality control department at the block producing facility.
2. The **MegaWall MSE** system precast concrete producer shall have a quality control program which is audited for compliance annually by persons outside that plant's employee structure.
3. Upon request, the **MegaWall MSE** system precast concrete, wedge and soil reinforcement producer shall supply a copy of their quality control manual.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handling

MegaWall MSE system materials shall be handled and transported in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Lifting shall be accomplished with methods or devices intended for this purpose as indicated on the shop drawings. Upon request, the **MegaWall MSE** system provider shall provide documentation on acceptable handling methods for the product.

B. Storage

MegaWall MSE system materials shall be stored in a manner that will minimize potential damage. Acceptable staging areas will keep **MegaWall MSE** system materials out of standing water and soft soils.

C. Delivery

MegaWall MSE system materials shall be delivered to the site in accordance with the delivery schedule. Upon delivery to the jobsite, all **MegaWall MSE** system materials shall be inspected by the customer's agent for quality and final acceptance.

D. Final Acceptance

Upon final acceptance, the customer's agent acknowledges and understands the appropriate methods for handling the accepted precast concrete unit(s). Upon acceptance by the customer or customer's agent, the precast concrete manufacturer is not responsible for replacing damaged product resulting from improper handling practices on the job site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. MegaWall MSE Block:

Oldcastle Precast Inc., which has over 75 locations Nationwide; Toll Free Tel: 866-9-OLDCASTLE (866-965-3227); Email: sales@oldcastleprecast.com; Web: www.OldcastlePrecast.com

B. Wedge Connector

Oldcastle Precast Inc., which has over 75 locations Nationwide; Toll Free Tel: 866-9-OLDCASTLE (866-965-3227); Email: sales@oldcastleprecast.com; Web: www.OldcastlePrecast.com

C. Geogrid Soil Reinforcement (if used)

Tensar International Corporation

D. Welded Wire Mesh Soil Reinforcement (if used)

Hilfiker Retaining Walls

E. Substitutions

Substitutions must be pre-approved by the design engineer in writing a minimum of 14 days prior to the bid.

2.2 MATERIALS

Except as otherwise specified, material shall conform to the following section.

A. Materials

Cement	Standard Specification for Admixtures to Inhibit ASTM C 150 (Type I, II, III, or V) ASTM C 595 (for Blended Cements)
Fly Ash and Pozzolans	ASTM C 618
Ground Granulated Blast-Furnace Slag	ASTM C 989
Water	ASTM C 1602 (the use of reclaimed/recycled water shall be permitted)
Aggregates	ASTM C 33 (and aggregate specifications)
Air Entraining Admixtures	ASTM C 260
Accelerating, Retarding, Water Reducing Admixtures	ASTM C 494
Drainage Geotextile	Nonwoven geotextile manufactured for subsurface drainage applications: Apparent opening size: No 70 – 100 sieve, maximum ASTM D 4751, 110 lb grab tensile strength ASTM D 4632, Minimum Weight 4 oz/sq. yd.
Fiber Reinforced Concrete	ASTM C1116
Geogrid Reinforcement	ASTM D6637
Drainage Pipe	If required by engineer in construction drawings, pipe shall be either PVC or HDPE and follow the appropriate specification listed below. Drainage pipe shall be the diameter as shown on the plans. A geotextile covering shall be used if shown on the construction details. • PVC: ASTM D 3034, perforated or slotted • Corrugated HDPE: ASTM D 1248,

perforated or slotted

PART 3 EXECUTION

Due to the unique nature MSE walls the **MegaWall MSE** system supplier shall provide technical instructions and guidance in pre-construction activities. Any instructions from the **MegaWall MSE** system supplier shall be closely followed by the Contractor, unless otherwise directed by the Owner or Owner's Representative. The Contractor shall submit a copy of any written instructions from the **MegaWall MSE** system supplier to the Owner or Owner's Representative.

3.1 SURVEY

- The installation area shall be surveyed using the work print and a checklist to identify the work to be done and to determine that the plans are correct
- All underground facilities and structures such as gas, water, sewer, power, telephone cable, and so forth shall be located and identified. Location markings shall be placed by the affected utilities before construction
- The survey shall identify and obstacles such as overhead wires, building structures that will interfere with crane operations, work progress, or create a safety hazard.
- The survey shall give consideration to the soil structure so that proper shoring, sloping, or both may be planned in advance of the excavation work

3.2 SAFETY REQUIREMENTS

- Safety requirements for construction shall be in accordance with all federal, state, and local regulations.

3.3 PREPARATION

If subgrade preparation is the responsibility of the installer, notify Owner or Owner's Representative of unsatisfactory preparation. Do not begin work until unsatisfactory conditions have been rectified.

- Permits required to do work in accordance with the detail plans shall be secured before starting the job. All permits or a record of the permits shall be retained on the job for immediate reference
- All utilities and owners of surface and subsurface facilities and structures in the area shall be given advance notification of proposed excavation. Every effort shall be made to avoid damage to the facilities of others. If any damage occurs, the owner of the damaged facility shall be notified immediately.
- Planning shall include the coordination of all responsible parties to ensure that arrangements for removal of excess and damaged material have been made.
- Should it appear that a structure location will interfere with traffic, review the situation with the engineer and notify appropriate authorities.
- Provide for access to call boxes, fire hydrants, etc

3.4 EXCAVATION

- Excavation shall conform to the limits shown on the plans and shall be in accordance with applicable sections of the submittal drawings and plans.

- Excavate the subgrade vertically to the plan elevation and horizontally to the extent of the geogrid lengths.

- Excavate trench for leveling pad to the dimensions indicated on the approved shop drawings.

- Remove soils not meeting required strength and replace with approved materials by the Owner's Geotechnical Engineer.

- Protect excavated materials to be used for backfilling the reinforcement zone from the weather.

- Inspect excavations after every rainstorm or other hazard-increasing occurrence, and increase the protection against slides and cave-ins, if necessary

- In dewatering excavations, make certain that the discharge is carried to a suitable runoff point. Also verify that the design accounts for the level of groundwater encountered.

3.5 **FOUNDATION PREPARATION**:

- Owner's Geotechnical Engineer will inspect the subgrade soil for the reinforced zone and leveling pad to ensure proper bearing strength in accordance with the Field Quality Control provisions specified.

- Over-excavated areas of the subgrade and leveling pad trench shall be constructed fashion as shown in the submittal drawings and plans

3.6 LEVELING PAD:

- Material: Use one of the following:
  - Concrete: dimensions and compressive strength shown on construction details.
  - Well graded aggregate: dimensions and aggregate type shown on construction details.

- Surface of leveling pad shall be smooth and horizontal both side-to-side and front-to-back to ensure the first course of units and subsequent courses are level.

- Vertical steps in the leveling pad shall be equal to the height of the MegaWall MSE Standard or MegaWall MSE Quarter units or multiples of that height to provide uniform support to overlying units.

PART 4 CONSTRUCTION

Construct modular concrete retaining walls in accordance with the approved shop drawings and Manufacturer Installation Manual.

4.1 **INSTALLATION OF FIRST COURSE**:

- Always use both pin lifters to lift and move **MegaWall MSE** precast units.

- Use a 1 ½" Crosby Shackle, or equivalent, to lift and move **MegaWall MSE** precast units. It is best practice to also use a spreader bar to minimize shackle movement during lifting.

- Place first course of **MegaWall MSE** precast units on the leveling pad.
- Verify the first course of units is level from side-to-side and from front-to-back.
- Butt each new piece up to the one which was just set.
- Use a string line to align a straight wall; use flexible pipes to establish a smooth convex or concave curved wall.
- Sweep tops of modular concrete facing units clean of all debris before installing the next course of units or placing geogrid materials.
- Pull a string line after each course has been set to ensure maintenance of the wall's geometry.

4.2 INSTALLATION OF REMAINING COURSES:

- **MegaWall MSE** precast units shall be set in running bond fashion as shown in the submittal drawings and plans.
- Place each **MegaWall MSE** precast unit on the previous course in a running bond fashion. The channel on the bottom of the **MegaWall MSE** precast unit will index one nub from each **MegaWall MSE** precast unit in the previous course.

4.3 GRANULAR FILL:

- Cover vertical joints between each block with filter fabric prior to backfill.
- Place drainage fill as shown in the construction details and plans.
- Place drainage fill behind the wall before placing the reinforced backfill and geogrid materials as shown in the submittal drawings and plans.
- Separate drainage from the reinforced fill as shown in the submittal drawings and plans.

4.4 REINFORCED BACKFILL:

- Place the reinforced backfill material as shown in the submittal drawings and plans.
- Use only hand-operated compaction equipment within 3 feet of the rear edges of the MegaWall MSE units. Use a minimum of 3 passes to compact this zone.
- At a distance greater than 3 feet from the back of the wall, a vibratory roller may be used, provided that the frequency and amplitude combined with bulk weight of the roller has performed satisfactorily at a trial section of the same type of wall. A smooth wheel or rubber tire roller is considered adequate
- Smooth and level the backfill as indicated so that the geogrid lays flat.
- Any wall materials which become damaged or disturbed during backfill placement shall be either removed and replaced, or corrected as directed by the Engineer, at the Contractor's expense.

4.5 GEOGRID CONNECTION

- It is best to precut all soil reinforcing grid to lengths as shown in the submittal drawings and plans. Separate different length and/or strength requirements by color coding.

- Unroll geogrid and cut to length indicated, minus distance between front face of the unit and the front of the connector. Cut geogrid ribs immediately in front of the transverse bar.

- Place the geogrid on the **MegaWall MSE** precast unit. Insert the connector teeth through the apertures of the geogrid into the slot at the rear of the **MegaWall MSE** precast unit. Pull the grid snug against the teeth. Force the connector into the slot with a mallet.

- Each standard block will use 3 wedge connector pieces.

4.6 GEOGRID INSTALLATION

- Stake or pin the geogrid near the end to maintain alignment and tension during filling.

- Place a minimum of 3 inches of fill between overlapping layers of geogrid where overlapping occurs behind curves and corners of a wall.

- Rubber tired vehicles may travel on the geogrid at low speeds, less than 5 miles per hour. Turning of vehicles should be avoided to prevent dislocation or damage to the geogrid and the connected wall facing units.

- Tracked vehicles shall not be operated directly on the geogrid. A minimum of 8 inches of fill cover over the geogrid is required for operation of tracked construction vehicles in the reinforced zone.

4.7 TOE FILL:

- Area in front of leveling pad and lower course, as shown on plans, shall be filled and compacted before the wall is two courses tall.

- Toe fill shall be placed according to construction details.

4.8 TOLERANCES

- Variation from overall wall batter measured between top and bottom of the wall: Plus or minus 1/8 inch per foot, maximum.

- Horizontal and vertical alignment: 3/4 inch per 10 feet excluding variations due to facing unit shape.

PART 5 FIELD QUALITY CONTROL

- Testing and Inspection will be provided by the Owners Testing Agency as specified in Section 003132 Testing and Inspection Services. Notify the Owner or Owner's representative 72 hours in advance of testing.

- Perform laboratory material tests in accordance with ASTM D 698.

- Perform in place compaction tests in accordance with the following:
  - Density Tests: ASTM D 1556, ASTM D 2167, or ASTM D 6938 as appropriate for material tested.
  - Moisture Tests: ASTM D 4643, ASTM D4959 or ASTM D 6938.

- Frequency of Tests:
  - Leveling Pad Trench: A minimum of one test per 100 feet of trench.
  - Subgrade Soil: A minimum of one test per 50 feet length of wall.
  - Reinforced Backfill: Provide one test for every 50 cubic yards of fill placed.

PART 6 PROTECTION

- Protect installed products until completion of project.
- Repair or replace damaged products before Substantial Completion.

PART 7 MEASUREMENT

- The area of **MegaWall MSE** system to be used for payment shall be the area bound by the facial top of the top course to the top of the leveling pad, and the beginning and end wall limits as shown on the contract plans.
- The quantity, determined as provided above, shall be paid for at the contract unit price per square foot for the **MegaWall MSE System**.

PART 8 PAYMENT

- Payment for the retaining wall shall include all labor, equipment and materials necessary to complete the wall in its entirety including the excavation, temporary sheeting and shoring, foundation preparation, except undercut and replacement, the concrete leveling pad, the **MegaWall MSE** System, structural backfill material and any barrier as shown on the plans.

END OF SECTION