SECTION 1052

MECHANICALLY STABILIZED EARTH WALL SYSTEM COMPONENTS

1052.1 Scope. This specification covers material requirements for metallic soil reinforcement, non-metallic soil reinforcement, concrete facing panels for large block wall systems, and concrete blocks for small block wall systems that are supplied as part of mechanically stabilized earth wall systems.

SECTION 1052.10 METALLIC SOIL REINFORCEMENT

1052.10.1 Scope. This specification covers metallic soil reinforcement and the accompanying attachments utilized in mechanically stabilized earth wall systems.

1052.10.2 Reinforcement Strips. Metallic soil reinforcement strips shall be in accordance with the specifications of the manufacturer of the wall system and the contract documents. The minimum grade of steel for strips and connection devices shall be AASHTO M 270, Grade 36 (AASHTO M 270M, Grade 250).

1052.10.3 Reinforcement Mesh. Metallic soil reinforcement mesh shall be in accordance with the specifications of the manufacturer of the wall system and the contract documents. The mesh, connector bars and connection devices, as a minimum, shall be in accordance with AASHTO M 32. Welding shall be in accordance with AASHTO M 55.

1052.10.4 Fasteners. Fasteners shall consist of either AASHTO M 164 hexagon head bolts or AASHTO M 164 hexagonal cap screws with nuts and washers.

1052.10.5 Galvanizing. All soil reinforcement material, except for fasteners, shall be galvanized in accordance with AASHTO M 111. Fasteners, including bolts, nuts and washers, shall be galvanized in accordance with AASHTO M 232.

1052.10.6 Certification. The manufacturer of the wall system shall certify in writing that the soil reinforcement, connections and fasteners meet the minimum requirements directed by the design and this specification. The contractor shall provide this certification and any other supporting documentation to the engineer prior to the material being delivered to the construction site.

SECTION 1052.20 NON-METALLIC SOIL REINFORCEMENT

1052.20.1 Scope. This specification covers non-metallic or geosynthetic soil reinforcement utilized in mechanically stabilized earth wall systems.

1052.20.2 Geogrids. Non-Metallic or geosynthetic soil reinforcement shall be of a polymeric nature and shall consist of a geogrid determined by the wall manufacturer or supplier.

1052.20.2.1 The geogrid shall be dimensionally stable and shall be able to maintain geometry during transport, handling and installation.

1052.20.2.2 The geogrid manufacturer shall maintain a quality control program to ensure that the manufactured material meets the requirements of the index tests shown below. Sampling and conformance testing for the index tests shown in the table shall be done in accordance with ASTM D 4354.

Geogrids	
Property	**Test Procedure**
Specific Gravity (HDPE only)	ASTM D 1505
Wide Width Tensile	ASTM D 4595, GRI GG1
Melt Flow (HDPE and PP only)	ASTM D 1238
Inherent Viscosity (PET only)	ASTM D 4603, GRI GG8
Hydrolysis Resistance (PET only)	GRI GG7
UV Oxidation Resistance	ASTM D 4355
Survivability	ASTM D 5261

1052.20.3 Certification. The manufacturer of geogrid shall certify in writing that the geogrid is in accordance with this specification. The certification shall include the roll numbers and identification, the sampling procedures, the results of the quality control tests along with the tests used, and the Minimum Average Roll Value (MARV) for each roll. This certification and any other supporting documentation shall be provided to the engineer prior to the material being delivered to the construction site.

SECTION 1052.30 LARGE BLOCK WALL SYSTEMS - CONCRETE-FACING PANELS

1052.30.1 Scope. This specification covers the concrete facing panels used as part of large block mechanically stabilized earth wall systems.

1052.30.2 Material.

1052.30.2.1 Concrete. Concrete material, proportioning, air entraining, mixing, slump and transporting of concrete shall be in accordance with Sec 501, except as noted in this section.

1052.30.2.2 Aggregate. Fine and coarse aggregate for the concrete mixture shall be in accordance with Sec 1005, except that the requirements for gradation and percent passing the No. 200 (75 µm) sieve will not apply.

1052.30.3 Design. The concrete shall be Class A-1, air-entrained, with a minimum compressive strength of 4000 psi (28 MPa) at 28 days. No additional admixtures will be permitted unless approved by the engineer.

1052.30.4 Casting. The panels shall be cast in such a manner that the acceptance criteria of this specification are met. Soil reinforcement connection devices shall not be in contact with or attached to the reinforcing steel in the concrete facing panels.

1052.30.5 Testing.

1052.30.5.1 Compression tests shall be performed on a standard 6 x 12-inch (150 x 300 mm) test specimen prepared in accordance with AASHTO T 23. Compressive strength testing shall be conducted in accordance with AASHTO T 22.

1052.30.5.2 During the production of the panels, the manufacturer shall randomly sample the concrete in accordance with AASHTO T 141. A single compressive strength sample, consisting of a minimum of four cylinders, shall be randomly selected for every production

lot. A production lot will be defined as a group of panels that will be represented by a single compressive strength sample, and shall consist of either 40 panels or a single day's production, whichever is less.

1052.30.5.3 For every compressive strength sample, a minimum of two cylinders shall be cured in the same manner as the panels and tested at seven days or less. The average compressive strength of these cylinders, when tested in accordance with AASHTO T 22, shall represent the initial strength of the concrete. In addition, a minimum of two cylinders shall be cured in accordance with AASHTO T 23 and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T 22, shall represent the compressive strength of the production lot.

1052.30.5.4 Air content testing shall be performed in accordance with AASHTO T 152 or AASHTO T 196. Air content samples shall be taken at the beginning of each day's production and at the same time as compressive samples are taken to ensure compliance with this specification.

1052.30.5.5 Slump testing shall be performed in accordance with AASHTO T 119. The slump shall be determined at the beginning of each day's production and at the same time as the compressive strength samples are taken.

1052.30.6 Marking. The date of manufacture, production lot number and piece mark shall be clearly scribed on an unexposed face of each panel.

1052.30.7 Curing. Panels shall be cured in accordance with Sec 1029.6.

1052.30.8 Handling, Storage and Shipping. All panels shall be free of chips, discoloration, cracks, fractures, and any other defects determined to be detrimental to the cosmetic value or to the performance characteristics of the panels. The panels shall not be subjected to excessive bending stresses and the panel connection devices and exposed exterior finish shall be protected from damage.

1052.30.9 Tolerances.

1052.30.9.1 Panel Dimensions. Panel connection devices shall be within one inch (25 mm) of the specified dimension. The panel face and thickness dimensions shall be within 1/8 inch (3 mm) of the specified dimension. All other dimensions or items shall be within 1/4 inch (6 mm) of the specified dimensions.

1052.30.9.2 Panel Squareness. Squareness, as determined by the difference between the two diagonals, shall not exceed 1/2 inch (13 mm).

1052.30.9.3 Panel Surface Finish. Surface defects on smooth formed surfaces measured over a length of 5 feet (1500 mm) shall not exceed 1/8 inch (3 mm). Surface defects on the textured-finish surfaces, measured over a length of 5 feet (1500 mm), shall not exceed 3/8 inch (10 mm).

1052.30.10 Acceptance.

1052.30.10.1 Compressive Strength. Acceptance of the compressive strength of the concrete facing panels will be based on production lots. Acceptance of the compressive strength of a production lot will occur if the compressive strength test result is equal to or greater than 4000 psi (28 MPa) at 28 days. If the compressive strength is less than 4000 psi (28 MPa), the concrete facing panels will be accepted if all of the following criteria are met:

(a) Ninety percent of the compressive strength test results for the overall production exceed 4100 psi (28.6 MPa) at 28 days.

(b) The average of any six consecutive compressive strength test results exceeds 4250 psi (29.3 MPa) at 28 days.

(c) No individual compressive strength test results are below 3600 psi (24.8 MPa) at 28 days.

1052.30.10.2 Other Criteria. Concrete facing panels will not be accepted if any of the following defects are found:

(a) Defects indicating imperfect molding.

(b) Defects indicating honeycombing or open texture concrete.

(c) Cracked or severely chipped panels.

(d) Color variation on front face of panel due to excess form oil or other reasons.

1052.30.10.3 Documentation. The manufacturer of the concrete face panels shall certify that the concrete face panels are in accordance with this specification. This certification, copies of test results for all required tests, and any other supporting documentation shall be provided to the engineer prior to the material being shipped to the construction site.

SECTION 1052.40 SMALL BLOCK WALL SYSTEMS - CONCRETE BLOCKS

1052.40.1 Scope. This specification covers the concrete blocks used as part of small block mechanically stabilized earth wall systems.

1052.40.2 Material.

1052.40.2.1 Concrete.

1052.40.2.1.1 Concrete material, proportioning, air entraining, mixing, slump and transporting of concrete shall be in accordance with Sec 501, except as noted in this section.

1052.40.2.1.2 Air-entraining agents, coloring pigments, integral water repellents, finely ground silica and other constituents shall be previously directed as suitable for use and shall be in accordance with applicable ASTM standards, or evidence shall be provided to prove the product is not detrimental to the durability of the concrete blocks or any material customarily used in masonry construction.

1052.40.2.2 Aggregate. Fine and coarse aggregate for the concrete mixture shall be in accordance with Sec 1005, except that the requirements for gradation and percent passing the No. 200 (75 µm) sieve will not apply.

1052.40.3 Design. The concrete mixture shall be air-entrained and shall have a minimum compressive strength of 4000 psi (28 MPa) at 28 days. The design of the mixture shall be submitted to the engineer and shall be approved before use. No additional admixtures will be permitted unless approved by the engineer.

1052.40.4 Finish Color. Color and finish shall be as shown on the plans and shall be erected with a running bond configuration. If no color or finish is specified on the plans, the contractor shall provide a color and finish to the engineer for approval.

1052.40.5 Testing.

1052.40.5.1 The manufacturer shall perform compressive strength tests for the concrete blocks on a lot basis with the maximum number of blocks per lot being 2000. The lot shall be randomly sampled in accordance with ASTM C 140. Compressive strength test specimens shall be cored, or shall be in accordance with the saw-cut coupon provisions of Section 5.2.4 of ASTM C 140.

1052.40.5.2 The concrete blocks shall be tested for freeze-thaw durability in accordance with ASTM C 1262. Freeze-thaw durability shall be based on tests from five specimens made with the same material, concrete mix design, manufacturing process and curing process. Tests will be required for every project or for every 10,000 concrete blocks that are provided, whichever requires a greater testing frequency. The specimens shall be in accordance with both of the following provisions:

(a) The weight (mass) loss of four out of five specimens at the conclusion of 150 cycles shall not exceed one percent of the initial weight (mass) when tested in water.

(b) The weight (mass) loss of each of four of the five test specimens at the conclusion of 50 cycles shall not exceed 1.5 percent of the initial weight (mass) when tested in a 3 percent saline solution.

1052.40.6 Curing. Concrete blocks shall be cured in accordance with Sec 1029.6.

1052.40.7 Tolerances. Concrete blocks shall be manufactured within the following tolerances:

(a) The length and width of each concrete block shall be within 1/8 inch (3 mm) of the specified dimension.

(b) The height of each concrete block shall be within 1/16 inch (2 mm) of the specified dimension.

(c) When a broken face finish is used, the dimension of the front face shall be within one inch (25 mm) of the theoretical dimension of the concrete block.

1052.40.8 Acceptance.

1052.40.8.1 Compressive strength acceptance of the concrete blocks will be determined on a lot basis. Concrete blocks represented by test coupons that do not reach an average compressive strength of 4000 psi (28 MPa) will be rejected.

1052.40.8.2 At the time of delivery to the work site, the concrete blocks shall be in accordance with the following physical requirements:

(a) Minimum compressive strength shall be 4000 psi (28 MPa) based on an average of three test coupons.

(b) Minimum compressive strength of an individual test coupon shall be 3500 psi (25 MPa).

(c) Maximum water absorption shall be 5 percent.

1052.40.8.3 All concrete blocks shall be sound and free of cracks or other defects that would interfere with the proper placement of the blocks or significantly impair the strength or permanence of the construction. Minor cracks will be defined as cracks that are no wider than 1/64 inch (0.5 mm) and no longer than 25 percent of the block height. Minor cracks incidental to the usual method of manufacture or minor chipping resulting from shipment and delivery will not be grounds for rejection.

1052.40.8.4 Any exposed face of a concrete block shall be free of chips, cracks or other imperfections when viewed from a distance of 30 feet (9.1 m) under diffused lighting. Up to 5 percent of a shipment may contain slight cracks or small chips no larger than one inch (25 mm).

1052.40.8.5 Concrete blocks will be rejected for failure to meet any of the requirements specified above. In addition, any or all of the following defects will be considered sufficient cause for rejection:

(a) Defects indicating imperfect molding.

(b) Defects indicating honeycomb or open texture concrete.

(c) Cracked or severely chipped blocks.

(d) Color variation on front face of blocks due to excess form oil or other reasons.

1052.40.8.6 The manufacturer of the concrete blocks shall certify that the concrete blocks are in accordance with this specification. This certification, copies of test results for all required tests, and any other supporting documentation shall be provided to the engineer prior to the material being shipped to the construction site.