

Standard Guidelines for Product Review

Type 1 MSEW Geogrids;

Section 02320

July 10, 2009

DEPARTMENT OF
TRANSPORTATION

Construction Section

800 Airport Road SE

Salem, OR 97301-4798

503/986-3059

02320.10 – Type 1 MSEW Geogrids

ODOT maintains a list of products suitable for use as geogrid reinforcement. Geogrid reinforcement shall consist of a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit adequate mechanical interlock with the surrounding backfill. Geogrid reinforcement shall be dimensionally stable and able to retain their geometry under manufacture, transport and installation. Geogrid reinforcements shall consist of polypropylene (PP), high density polyethylene (HDPE), or polyester (PET) with polyvinyl chloride (PVC) coating.

The National Transportation Product Evaluation Program (NTPEP) may be used to have a geogrid reinforcement product approved by ODOT as *Type 1 MSEW Geogrid*. The purpose of the NTPEP evaluation is to perform tests using independent, certified laboratories for qualification of geogrid product lines and the complete assessment of the nominal long-term geogrid reinforcement design strength (T_{al}). NTPEP testing shall meet the requirements of the State of Washington Department of Transportation (WSDOT) *Standard Practice T 925*. Overview of the NTPEP program, contact information, submittal and application forms can be found on the following web page:

<http://www.ntpep.org/index.asp>

Geogrid reinforcement for permanent MSE walls, including short and long-term tensile properties, shall meet all applicable protocols and requirements in WSDOT *Standard Practice T 925 (Standard Practice for Determination of Long-Term Strength for Geosynthetic Reinforcement)*. Copies of *Standard Practice T 925* can be found on the following web page:

<http://www.wsdot.wa.gov/publications/manuals/fulltext/M46-01/Materials.pdf>

Type 1 MSEW Geogrid shall only be used in ODOT preapproved, proprietary MSE retaining wall systems listed in the ODOT *Proprietary Wall Selection Table* and shall meet all applicable requirements of Chapter 15 in the ODOT *Geotechnical Design Manual (GDM)*. The ODOT GDM and *Proprietary Wall Selection Table* are available for viewing and download at the following webpage:

http://www.oregon.gov/ODOT/HWY/GEOENVIRONMENTAL/retaining_structures_manual.shtml

The following requirements apply to geogrid products being evaluated for use as *Type 1 MSEW Geogrid* in permanent MSE walls in accordance with WSDOT *Standard Practice T 925*:

- Submit all geogrid information and data indicated for *Data Requirements for Initial Product Acceptance* in WSDOT Standard Practice T 925. Geogrid properties shall be established in accordance with the referenced test procedures.

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- Geogrid proposed for use as *Type 1 MSEW Geogrid* shall meet all applicable requirements for geogrid reinforcement used in a *Class 1 Geosynthetic Wall* as required by WSDOT Standard Practice T 925.
- Geogrid testing and evaluation (WSDOT Standard Practice T 925) shall be conducted using MSE wall backfill composed of ODOT Base Aggregate (relatively well-graded mixture of gravel-size crushed rock and sand) meeting the requirements in 00596.11(h).
- Unless otherwise indicated, the effective ambient temperature shall be 68°F (20°C) for T 925 initial product qualification and acceptance testing.
- Calculate T_{ai} for the geogrid reinforcement (*Type 1 MSEW Geogrid*) assuming a 75-year design life for MSE walls.
- Assume “nonaggressive environmental conditions” with respect to MSE reinforced backfill particle size and characteristics, chemical properties, MSE wall site temperature, and other criteria in WSDOT Standard Practice T 925.
- Calculate T_{ai} as indicated in *Determination of Long-Term Geosynthetic Strength for Initial Product Acceptance* in WSDOT Standard Practice T 925.
- T_{ult} shall be determined from ASTM D6637, a wide-width tensile strength test.

The following requirements apply to calculation of the strength reduction factor to account for installation damage to the geogrid (RF_{ID}) in WSDOT Test Method No. T 925, Appendix A:

- Place the MSE granular wall backfill in horizontal layers not greater than 8 inches in thickness over the test geogrid in accordance with 00596.41(a).
- Compact the MSE granular wall backfill with a vibratory drum roller in accordance with 00330.21.
- The MSE granular wall backfill shall be compacted to at least 100% of the relatively maximum density per AASHTO T 99 in accordance with 00596.

The following requirements apply to calculation of the strength reduction factor to prevent long-term creep rupture of the geogrid (RF_{CR}) in WSDOT Test Method No. T 925, Appendices B and C:

- Temperature accelerated creep data (ASTM D5262 and D6992) is required for the assumed 75-year geogrid design life.
- Temperature accelerated creep data shall have minimum temperature increments of 50°F (10°C).
- The maximum temperature for temperature accelerated creep testing shall not exceed 158 to 167°F (70 to 75°C).
- RF_{CR} shall be calculated by comparison of the long-term strength to the geogrid wide-width ultimate tensile strength (T_{ult}) per ASTM D6637.

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- Test results shall include average geogrid creep stiffness for 2% strain at 1,000hrs ($J_{2\%}$) and at the specified design life (typically 75 years).

If geogrid product meets the minimum property values and other requirements of Table 1 (*Minimum Requirements for Geosynthetic Products to Allow Use of Default Reduction Factor for Long-Term Degradation*) in WSDOT Standard Practice T 925, a default value of $RF_D=1.3$ may be used in-lieu of testing and evaluation requirements in Appendix D.

Project Acceptance Requirements:

The actual minimum average roll values furnished by the manufacturer shall be based on representative test results from the manufacturing plant which produced the geosynthetic, and shall meet or exceed each of the specified minimum values. All geosynthetics shall be clearly labeled as being part of the same production run certified as meeting all applicable requirements.

The contractor will be required to furnish a Level A or Level B certification (indicated in the Special Provisions for the applicable geosynthetics) or the Geogrid Product Information indicated below, as appropriate.

(1) Level A - Manufacturer's Test Result Certificate - Furnish a test result certificate according to 00165.35 of our Standard Specifications. The certificate shall:

- Include the minimum average roll values for each of the specified properties from the same production run as the delivered material.
- Include test results for factory seams.
- Include production run number, production plant name and location.

If the geosynthetic material is modified, remanufactured, relabeled or sewn, furnish an additional certificate from the supplier making the changes that explain the altered properties, seam strength or relabeling.

(2) Level B - Manufacturer's Quality Compliance Certificate - As a basis of acceptance, the Contractor will need to furnish either a manufacturer's brochure or a quality compliance certificate, according to 00165.35, with geosynthetic properties shown.

If the brochure or certificate lists typical or average roll values instead of minimum average roll values, then increase by 25% the specified minimum values in Table 02320-1 for grab tensile strength, burst strength and puncture strength to determine compliance.

(3) Geogrid Product Information - For geogrid products used in permanent MSE retaining walls, the Contractor shall submit all of the following information to the Engineer for verification purposes:

- Manufacturer's name and current address.
- Full product name and information.
- ODOT QPL Product Category, including the associated standard specification number.
- MSE retaining wall location (reference drawing name, detail and structure number).
- Polymer type(s) for geogrid and coating, if present.
- Primary resin type, class, grade, and category for HDPE (ASTM D 1248) and PP (ASTM D 4101).
- Minimum mass per unit area for product (ASTM D 5261) for each geogrid roll.

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- MARV for ultimate wide width tensile strength (ASTM D 6637) for each geogrid roll.

Manufacturer's Sampling/Testing - The manufacturer's reported property values shall be based on the following sampling and testing requirements:

(1) **Sampling** - Sample all geosynthetics according to ASTM D 4354. The production unit used for sampling shall be a roll or sheet.

(2) **Geotextile Testing** - Perform the specified tests to determine geotextile properties for the intended application(s). The tensile strength requirements shall be tested in both machine and cross-machine directions.

(3) **Geogrid Testing** - Quality Assurance (QA) testing is required for each roll of geogrid reinforcement delivered to the project construction site. The QA test results will be compared to the test results obtained for the initial geogrid reinforcement product evaluation and approval. The mean value of the QA test for each roll shall be greater than or equal to the MARV value associated with the approved geogrid reinforcement product or the entire production run will be rejected according to 00150.25. Perform the following laboratory acceptance tests for QA purposes:

- **Standard Test Method for Determining Properties of Geogrids by the Single or Multi-Rib Tensile Method (ASTM D 6637)** - Provide the mean value of the ultimate wide width tensile strength of a representative specimen from each roll delivered to the construction site.
- **Standard Test Method for Measuring Mass per Unit Area of Geotextiles (ASTM D 5261)** - Provide the mean value of the mass per unit area of a representative specimen tested from each roll delivered to the construction site.

To apply for inclusion on the QPL, submit the following:

- [Preliminary information for Product Evaluation Form](#).
- Copy of NTPEP Test Report or other Independent testing showing compliance with the above requirements.
- Spec data sheet.
- 3 small samples of the geogrid (approximately 2' x 2').
- Detailed installation instructions.

Submit documentation and submittal forms to:

Oregon DOT – New Products Coordinator

800 Airport Road SE

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<http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/QPIndex.shtml>

NTPEP Contact Information: <http://www.ntpep.org/index.asp>

Copies of WSDOT *Standard Practice T 925* can be found on the following web page:

- <http://www.wsdot.wa.gov/publications/manuals/fulltext/M46-01/Materials.pdf>

Link to ODOT Standard Specifications and current Standard Drawings:

- ODOT Standard Specifications for Highway Construction: <http://www.oregon.gov/ODOT/HWY/SPECS/index.shtml>

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- ODOT Standard Drawings: http://www.oregon.gov/ODOT/HWY/ENGSERVICES/standard_drawings_home.shtml