PUBLIC WORKS DEPARTMENT • SERVICE DES TRAVAUX PUBLICS Engineering Division • Division de l'ingénierie	**Effective Date:** January 28, 2020 **DIVISION 4**
CW 3135 – R2	**SUPPLY AND INSTALLATION OF GEOGRID**

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1. DESCRIPTION

1.1 General

1.1.1 This specification covers the supply and installation of geogrid for use as reinforcement of base or subbase layers for pavement structures.

1.1.2 This specification also covers the supply and installation of geogrid in conjunction with a separation/filtration (nonwoven) geotextile fabric for use in subgrade stabilization applications.

1.2 Definitions

Geogrids:	A synthetic planar structure formed by a regular network of tensile strength elements with apertures of sufficiently large size to allow for interlocking with the surrounding soil to perform the primary function of reinforcement.
Minimum Average Roll Value (MARV):	Property value calculated as typical minus two standard deviations. It shall yield a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
Apertures:	The open spaces formed between the interconnected network of longitudinal and transverse ribs of a geogrid.
Separation:	A geosynthetic function in which a geotextile is used to prevent mixing of two dissimilar materials to maintain their engineering properties such as a subgrade soil and an aggregate cover.
Filtration:	A geosynthetic function in which a geotextile is placed between two dissimilar soils to allow for long-term passage of water into a subsurface drainage system and retain the in-situ soil.
Reinforcement:	A geosynthetic function in which a geotextile acts as a tensile member in the surface structure of a pavement.
Confinement:	A geosynthetic function in which a geosynthetic prevents the lateral movement (rutting) of aggregate.
Stabilization:	The use of a geosynthetic or combination of geosynthetics and geogrid on weak to very weak subgrade conditions (CBR ≤ 3.0%) to provide the coincident functions of separation, filtration, reinforcement, and confinement.
California bearing ratio (CBR)	Standard test method for evaluation the potential strength of sub-grade, sub-base, base course materials in accordance with ASTM Standard D1883.

Class A — Geogrid that can be used for severe survivability conditions. Generally appropriate beneath or within base course and 50 mm and 100 mm sub-base materials to provide lateral confinement to aggregate materials, subgrade restraint, and an improved effective bearing capacity for trafficked structures constructed over good to poor sub-grades.

Class B — Geogrid that can be used for moderate survivability conditions. Generally appropriate for beneath or within base course and 50 mm sub-base materials to provide lateral confinement to aggregate materials, subgrade restraint, and an improved effective bearing capacity for trafficked structures constructed over sub-grades with CBR ≥ 1.5.

1.3 Referenced Standard Construction Specifications

1.3.1. CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
1.3.2. CW 3130 – Supply and Installation of Geotextile Fabrics
1.3.3. Approved Products for Surface Works.

2. MATERIALS

2.1 Approved Products

2.1.1 Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at: https://www.winnipeg.ca/finance/findata/matmgt/std_const_spec/current/Docs/Approved_Products_Surface_Works.pdf

2.2 Material Identification

2.2.1. Geogrid is to be labelled in accordance with ASTM D4873/D4873M, and must clearly show the manufacturer name, product style number and roll number.

2.2.2. Products without proper identification or labelling, mislabelling, or misrepresentation of materials shall be rejected.

2.3 Storage and Handling

2.3.1 Geogrid rolls shall be elevated off the ground and adequately covered to protect them from site construction damage, precipitation, any contamination of dirt, dust any other deleterious materials.

2.3.2 Geogrid rolls shall be protected from extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical properties of the geotextile.

2.3.3 Store and handle the geogrid in accordance with the manufacturer's recommendations.

2.4 Certification

2.4.1 The Contractor shall provide Manufacturer's Mill Certificate and MARV Roll Data to the Contract Administrator prior to installation. The Certification shall state that the geogrid meets MARV requirements of the specification as evaluated under the Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer.

2.4.2 The Contractor shall provide a letter to the Contract Administrator stating the product name, manufacturer, style number, and other pertinent information to fully describe the geogrid.

2.4.3 All testing and data to be in accordance with approved ASTM standards. Data reported in accordance with other standards will not be accepted.

2.5 Geogrid Properties for Reinforcement of Base Course or Sub-base Layers

2.5.1. Geogrid will be extruded polypropylene, bi-axial, single layer with opening configuration either square or rectangular in shape.

2.5.2. The axis with the least strength will be taken as the ultimate strength of the geogrid for any given property.

2.5.3. Class A geogrids shall meet the requirements in Table CW 3135.1.

Table CW 3135.1 – Class A Geogrid Property Requirements

Physical Property	Machine Direction	Cross-Machine Direction	Test Method
Ultimate Tensile Strength	30 kN/m	30 kN/m	ASTM D 6637
Tensile Strength @ 2% Strain	10.5 kN/m	10.5 kN/m	ASTM D 6637
Tensile Strength @ 5% Strain	21.0 kN/m	21.0 kN/m	ASTM D 6637
Junction Strength	24.0 kN/m		ASTM D 7737
Junction Efficiency	90%		ASTM D 7737
Aperture Stability at applied moment of 20kg-cm	7.5 m-N/degree		ASTM D 7864
Aperture Sizes	12.5 – 60 mm		Direct Measure
Flexural Rigidity	1,500,000		ASTM D 7748
U.V. Resistance	70% after 500 hrs		ASTM D4355

2.5.4. Class B geogrids shall meet the requirements in Table CW 3135.2.

Table CW 3135.2 – Class B Geogrid Property Requirements

Physical Property	Machine Direction	Cross-Machine Direction	Test Method
Ultimate Tensile Strength	19.0 kN/m	24.0 kN/m	ASTM D 6637
Tensile Strength @ 2% Strain	6.0 kN/m	9.0 kN/m	ASTM D 6637
Tensile Strength @ 5% Strain	11.8 kN/m	19.6 kN/m	ASTM D 6637
Junction Strength	17.0 kN/m		ASTM D 7737
Junction Efficiency	90%		ASTM D 7737
Aperture Stability at applied moment of 20kg-cm	6.5 m-N/degree		ASTM D 7864
Aperture Sizes	12.5 – 38 mm		Direct Measure
Flexural Rigidity	750,000		ASTM D 7748
U.V. Resistance	70% after 500 hrs		ASTM D4355

2.5.5. All physical property requirements are Minimum Average Roll Values (MARV) determined in accordance with ASTM 4759. Values not labelled as MARV will not be accepted.

2.5.6. Aperture Sizes shall be as follows:

2.5.6.1. Between 12.5 mm and 25 mm for geogrids immediately below or within the base course layer.

2.5.6.2. Between 25 mm and 38 mm for geogrids immediately below or within 50 mm sub-base layers.

2.5.6.3. Between 38 mm and 60 mm for geogrids immediately below or within 100 mm sub-base layers.

2.5.7. If the geogrid has a rectangular aperture size, the smaller dimension shall be used to choose the suitable geogrid.

2.6 Separation/Filtration Geotextile Fabric (non-woven) and Geogrid for Separation, Filtration, and Reinforcement

2.6.1. Separation/filtration geotextile fabric (non-woven) and geogrid must meet the requirements of both CW 3130 Section 2.5.2 and CW 3135.

2.6.2. Geotextile/Geogrid composite products must meet the requirements of both CW 3135 and CW 3130.

3. CONSTRUCTION METHODS

3.1. Geogrid shall not be placed when weather conditions, in the opinion of the Contract Administrator, are not suitable for installation including heavy rainfall, extreme cold or frost conditions, or extreme heat.

3.2. The geogrid shall be laid smooth without wrinkles or folds on the Separation/Filtration geotextile fabric or prepared sub-grade in the direction of construction traffic. The geogrid shall be free from any tension or stress.

3.3. Adjacent geogrid rolls should be overlapped along their sides and ends as a function of subgrade strength as follows:

CBR > 3%:	450 mm overlap
3% ≥ CBR > 1.5%:	750 mm overlap
1.5% ≥ CBR > 0.5%:	900 mm overlap or sewn
CBR ≤ 0.5%:	A multi-filament fibrillated yarn high strength woven geotextile in accordance with CW 3130 shall be used

3.4. Cut geogrid to conform to curves.

3.5. Place piles of base or sub-base material as required to hold geogrid in place. Pins and washers are not permitted.

3.6. Install geogrid to the limits of the roadway sub-grade including intersections and turning lanes or as directed by the Contract Administrator.

3.7. Prior to covering, the geogrid shall be inspected by the Contract Administrator for damage during installation.

3.8. Cover the damaged area with a geogrid patch that extends an amount equal to the required overlap beyond the damaged area.

3.9. Remove and replace geogrid that is improperly installed or damaged as directed by the Contract Administrator.

3.10. Construction vehicles are not permitted directly on the geogrid. Turning of vehicles shall not be permitted on the first lift above the geogrid.

3.11. Avoid sudden stops or sharp turns by construction equipment during placement of sub-base materials.

3.12. Geogrid shall not remain uncovered for longer than 7 days after installation.

3.13. Install geogrid in accordance with this specification and the manufacturer's recommendations.

3.14. Place and compact base course and sub-base materials over the geogrid in accordance with CW3110.

4. MEASUREMENT AND PAYMENT

4.1. Supply and installation of "Geogrid or Geotextile/Geogrid Composite" will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Supply and Install Geogrid or Geotextile/Geogrid Composite". The area to be paid for will be the total number of square metres of "Geogrid or Geotextile/Geogrid Composite", supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

i.) Class A Geogrid
ii.) Class B Geogrid
iii.) Geotextile/Class A Geogrid Composite
iv.) Geotextile/Class B Geogrid Composite

4.2. Only material placed within the designated sub-grade limits will be included in the payment for "Supply and Install Geogrid".

4.3. No measurement or payment will be made for geogrid removed and replaced due to improper installation or damaged materials.

4.4. No measurement or payment will be made for the overlap described in this Specification.