CITY OF FARGO SPECIFICATIONS
GEOTEXTILES AND GEOGRIDS

PART 1
DESCRIPTION OF WORK

The work to be done under this section of the Specifications and the accompanying plans consists of all labor, material, accessories, and equipment necessary to install geotextile fabric or geogrid material as designated in the plans. Generally this item will be used for separation, drainage, and/or reinforcement during the paving operation.

PART 2
MATERIAL

2.1. GEOTEXTILES

2.1.1. GENERAL

Geotextile fabrics shall conform to the Standard Specification for Geotextile Specification for Highway Applications- AASHTO Designation M 288-96 or the latest revision thereof. All property values, with the exception of apparent opening size (AOS) represent minimum average roll values (MARV) in the weakest principle direction. Values for AOS represent maximum roll values.

2.1.2. CERTIFICATION

The Contractor shall provide the Engineer a certificate stating the name of the manufacturer, product name and style, chemical composition of the yarns and any other pertinent information to fully describe the geotextile. The Manufacturer's certificate shall state that the furnished geotextile meets MARV requirements of the Specifications.

2.1.3. GEOTEXTILE PROPERTIES

2.1.3.A. Woven Geotextile Fabric

The geotextile fabric for reinforcement/separation shall be woven, consisting of a continuous chain of polymeric filaments or yarns of polyester, polypropylene, polyethylene, polyamide, or polyvinylidene chloride formed into a stable network that is water permeable. The material shall meet the following requirements:

Grab Tensile Strength (ASTM D-4632)	300 lbs. min.
Elongation (ASTM D-4632)	15% max.
Trapezoidal Tear Strength (ASTM D-4533)	113 lbs. min.
AOS Sieve Size (US Sieve) (ASTM D-4751)	40
Permittivity (ASTM D-4491)	0.02 - 0.05 $sec.^{-1}$
CBR Puncture Strength (ASTM D-6241)	900 lbs. min.

2.1.3.B. Nonwoven Geotextile Fabric

Where specified, the geotextile fabric for separation shall be a nonwoven, AASHTO M 288 Class 2 having the following minimum average roll values (MARV) in the weakest principle direction:
AASHTO M 288 Class 2 requirements:

Weight	D 5261	6 oz/SY			
	ASTM Test Method	Elongation < 50%		Elongation ≥ 50%	
		N	lbs	N	lbs
Grab Strength	D 4632	1100	250	700	160
Sewn Seam Strength	D 4632	990	220	630	140
Tear Strength	D 4533	400	90	250	56
CBR Punct Strength	D 6241	3500	800	1780	400

Additional requirements:

Item	Test Method	Requirement
AOS	ASTM D4751	0.70 mm (max. Avg. roll value)
Permittivity	ASTM D4491	1.5 sec^{-1}
Ultraviolet Stability (Retained Strength)	ASTM 4355	min 50% after 500 hrs exposure

2.1.3.C. Geotextile Drainage Sock

The geotextile sock shall meet or exceed the requirements of ASTM D6707. Sock shall be knit of polymeric materials, exhibit minimum snag or run potential, be factory-applied so as to maintain uniform installed mass, and conform to the outside diameter of the tubing with a snug fit throughout.

2.2. GEOGRIDS

2.2.1. GENERAL

Geogrids are polymer grid structures specifically fabricated for use as soil reinforcement. The Geogrid shall be a unixiallay or biaxially oriented polymer grid structure. All property values represent minimum average roll values (MARV).

2.2.2. CERTIFICATION

The Contractor shall provide the Engineer a certificate stating the name of the manufacturer, product name and style, chemical composition of the material and any other pertinent information to fully describe the geotextile. The Manufacturer's certificate shall state that the furnished geogrid meets MARV requirements of the Specifications.

2.2.3. GEOGRID PROPERTY REQUIREMENTS

A. GEOGRID FOR PAVING GRADE REINFORCEMENT

The Geogrid supplied shall be a polypropylene or polyethylene material with the following requirements:

		Test Method
Aperture size	between 0.75-1.5 inches	ID calipered
Max. Tensile strength	850lb/ft machine direction	GRI GG1
	1300 lb/ft cross-machine direction	GRI GG1
Tensile Modulus@5%	12,000 lb./ft machine direction	GRI GG1
	18,000 lb/ft cross-mchn. direction	GRI GG1
Junction Strength	750 lb./ft min machine direction	GRI GG2
	1200 ln/ft cross-machine direction	GRI GG2
Flexural Rigidity	200,000 mg-cm machine direction	ASTM D1388
Mass per unit area	6.0 oz/sy minimum	

Allowable Products are Tensar BX series, TX series, and BaseGrid 11 or 12.

B. GEOGRID FOR SLOPE REINFORCEMENT

The geogrid supplied shall be a high density reinforcement polyethylene material with the following requirements:

Tensile strength @ 5% strain (min)	3,500 lb/ft
Ultimate Tensile strength (min)	5,700 lb/ft
Junction strength (min)	5,700 lb/ft

PART 3
CONSTRUCTION

3.1. GEOTEXTILES

3.1.1. SEAMING

Seams shall be in accordance with the Construction/Installation Guideline Appendix to the AASHTO M 288-96 Specification.

3.1.2. CONSTRUCTION SEQUENCE

A. The geotextile shall be laid out smooth without wrinkles or folds on the prepared subgrade in the direction of the construction traffic. Adjacent geotextile rolls shall be overlapped a minimum of 2 feet, ends of rolls shall be overlapped 3 feet. On curves, the fabric may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and shall be held in place by staples, pins or aggregate piles. Damaged areas shall be repaired by overlaying the area with sufficient material to overlap on all edges by at least two feet.

B. When placing aggregate base over geotextiles, overstressing the soil shall be avoided by utilizing equipment in spreading and dumping aggregate base that exerts only moderate pressures on the subgrade. The aggregate base material shall be placed by end dumping onto the geotextile from the edge or over previously placed base aggregate. Construction equipment shall not operate directly on the geotextile fabric. A minimum of 4" of aggregate base material must be placed on the geotextile prior to the movement of construction equipment and turning movements must be carefully monitored. All ruts that develop during construction shall be filled with additional aggregate base material and compacted to the specified density at no additional cost to the City. If placement of the backfill causes damage to the geotextile, the damaged area shall be repaired as described in Section 3.1.2.A at no additional cost to the City.

3.2. GEOGRIDS

3.2.1. STORAGE AND HANDLING

Geogrids shall be stored above -20º F and be protected from prolonged periods of direct exposure to sunlight. The Contractor shall prevent excessive mud, wet cement, epoxy or similar material that may affix themselves to the gridwork from coming in contact with the Geogrid.

3.2.2. CONSTRUCTION SEQUENCE

A. Paving Grade Reinforcement

The geogrid shall be laid out smooth without wrinkles or folds on the prepared subgrade in the direction of the construction traffic. Adjacent geogrid rolls shall be overlapped a minimum of 1.0 foot, ends of rolls shall be overlapped 3 feet. On curves, the material may be cut to conform to the curves. The overlap shall be in the direction of construction and shall be held in place by staples, pins or aggregate piles. Damaged areas shall be repaired by overlaying the area with sufficient material to overlap on all edges by at least two feet.

The aggregate base material shall be placed by end dumping onto the geogrid from the edge or over previously placed base aggregate. Construction equipment will not be allowed directly on the geotextile fabric. A minimum of 4” of aggregate must be placed on the geogrid prior to the movement of construction equipment and turning movements must be carefully monitored. Any ruts occurring during construction shall be filled with additional gravel aggregate and compacted to the specified density. If placement of the backfill causes damage to the geogrid, the damaged area shall be repaired as described above.

B. Slope Reinforcement

1. Contractor shall provide an installation plan detailing his intended operation.

2. Fill placement over geogrid

a. Backfill shall be placed in minimum 6-inch lifts compacted to 95% standard proctor density.

b. Backfill shall be placed in a manner that minimizes the development of wrinkles and/or movement in the geogrid.

c. Construction equipment shall not operate directly on geogrid. A minimum of twelve inches of fill shall be placed prior to equipment operating on top of geogrid.

3. Splices

Ends of geogrid rolls shall be spliced by the use of an extruded rod or bar of the same material as the geogrid, supplied by the geogrid supplier. Overlapping ends of geogrid rolls shall not be allowed in lieu of a mechanical connection.

PART 4
GUARANTEE, MEASUREMENT & PAYMENT

4.1. GUARANTEE

The guarantee shall be per the contract.

4.2. MEASUREMENT AND PAYMENT

4.2.1. PAVING GRADE REINFORCEMENT

Payment for the geotextile or geogrid will be made on a square yard basis for the area covered. No allowance will be made for overlaps, repairs, drainage trenches or cutoff trenches. Area covered shall be from 1 foot behind the curb to 1 foot behind the opposite curb. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work.

4.2.2. SLOPE REINFORCEMENT

Payment will be made on a square yard basis for the amount of geogrid installed, for the various types.

4.2.3. OTHER COSTS

All other costs for work necessary to properly complete the work specified herein shall not be bid items; the costs shall be charged to other items unless a bid item is specifically included on the bid sheet.