

CONSTRUCTION SPECIFICATIONS (ROCK RIPRAP & GEOTEXTILE):

GENERAL

The work shall consist of furnishing and placing loose rock riprap and associated geotextile filter materials at the locations shown on the drawing, as a protective covering at inlets and outlets where the soil is susceptible to erosion.

MATERIALS (RIPRAP)

Unless otherwise stated, either quarry stone (angular crushed bedrock) or durable fieldstone (round) rock riprap may be used.

Stones shall be generally round or cubiform in shape. Slabby or elongated stone pieces having width or thickness less than one-third the length shall not exceed 10 percent of the total. Stone shall be free from dirt, clay, sand, rock fines and other materials prior to incorporation into the work.

The approximate gradation (size) of stones for loose rock riprap shall be as listed for the class of riprap required. The stones shall be reasonably well graded within the percentages shown.

MATERIALS (GEOTEXTILE)

Geotextiles shall meet or exceed the requirements of this specification. Unless otherwise specified, the Contractor shall furnish and install the geotextile to the quantities shown. The Contractor shall provide to the Project Technician manufacturer's certification that the geotextile used has minimum average roll values, which meet or exceed the requirements specified herein.

The geotextile shall be a non-woven fabric of polymeric filaments or yarns such as polypropylene, polyethylene, polyester, or polyamide formed into a stable network such that the filaments/yarns retain dimensional stability relative to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free of any chemical treatment or coating that might significantly reduce porosity or permeability. Fibers shall contain stabilizers and/or inhibitors to enhance resistance to ultraviolet light.

Geotextile shall be uniform in texture, thickness and appearance, and be free of defects, flaws, cuts, punctures or tears that would significantly alter its strength or filtering properties. The geotextile shall conform to the physical requirements specified herein.

Geotextile shall not be left exposed to the sun for a period in excess of 7 days without being covered by the appropriate protective soil or rock layer.

SUBGRADE SURFACE PREPARATION

The surface on which the geotextile and rock riprap are to be placed shall be cut or filled to the lines and grades as shown on the drawings. The surface shall be reasonably smooth, free of holes, depressions, mud, running water, stumps, large rocks, or other debris that would tend to tear or puncture the fabric.

Rock riprap and the geotextile filter materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved.

PLACEMENT (GEOTEXTILE)

Geotextile shall be used beneath all rock riprap. Prior to the placement of the geotextile, the soil surface shall be inspected for quality assurance of design and construction. The geotextile shall be uniformly placed on the approved prepared subgrade surface at the locations and in accordance with the details shown on the drawings and as specified.

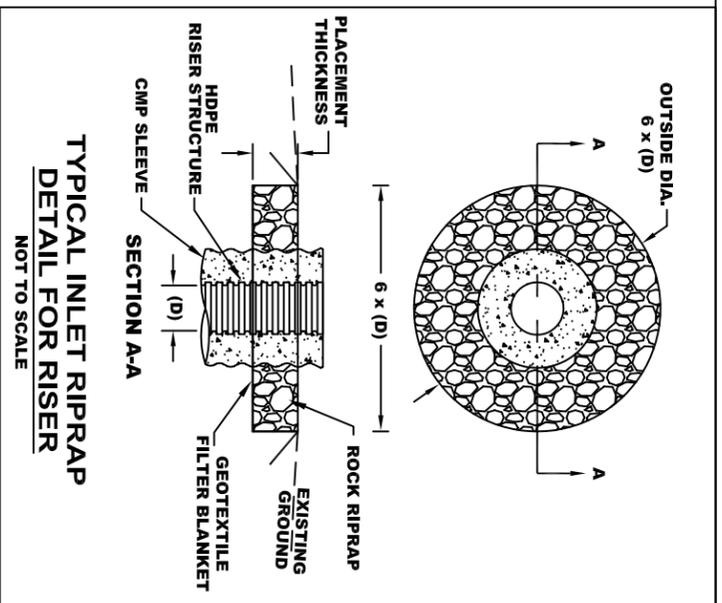
The geotextile may be folded and overlapped to permit proper placement in the designated area. Where multiple fabric widths or lengths are required, the joints shall be overlapped a minimum of 18 inches, except that under water the overlap shall be 36 inches. The joint laps shall be shingled (both in the flow direction and from top of slope to bottom) so as to direct water flow over the joint without undermining. The edges of the fabric area shall be buried sufficiently (minimum depth of 1-foot) to direct water flow over the fabric without undermining.

PLACEMENT (RIPRAP)

The rock riprap shall be placed on the geotextile material in such a manner that the smaller size material remains evenly distributed throughout. The maximum drop height of rock riprap onto the geotextile shall be 1-foot.

Rock riprap shall be carefully placed by hand or machine on the surfaces and to the depths specified. Stones shall be securely bedded with individual stones firmly in contact one to another. Sufficient handwork shall be performed to produce a neat and uniform surface.

The in-place rock riprap shall be well graded. If necessary, individual stones shall be rearranged by hand to produce a well-graded mass. Spaces between the larger rocks shall be filled with smaller rocks. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

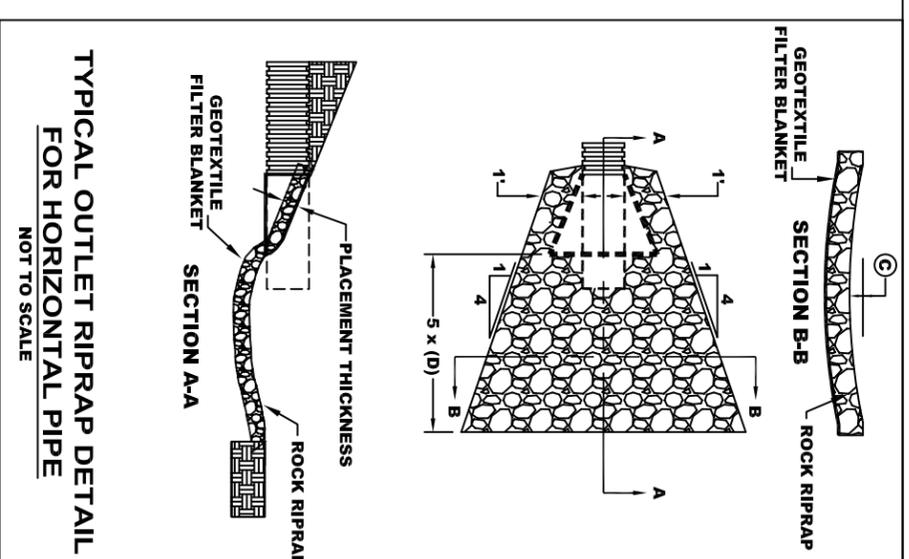
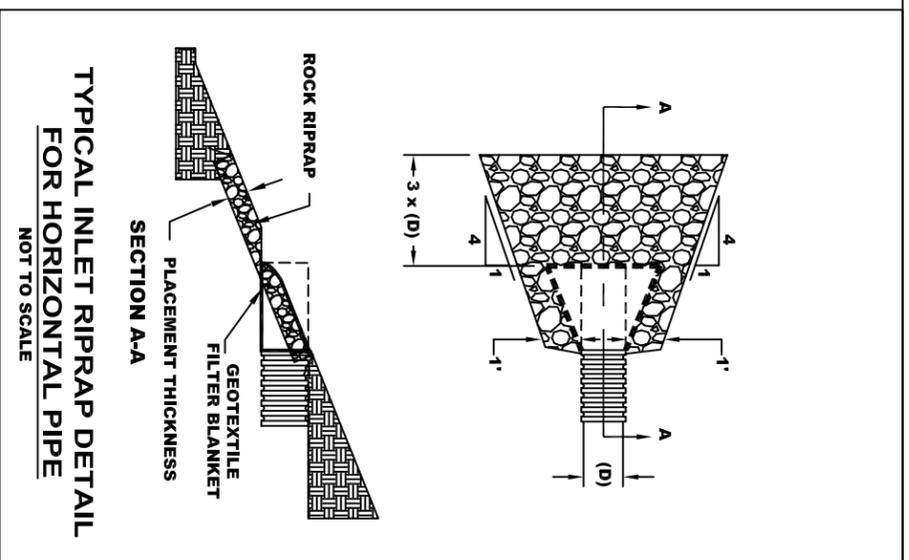


GEOTEXTILE MATERIAL REQUIREMENTS

PROPERTY	TEST METHOD	PHYSICAL REQUIREMENTS
Tensile Strength - lbs (1)	ASTM D 4632 Grab Test Method	180 min. In any principal direction
Bursting Strength - psi (1)	ASTM D 3786	320 min.
Elongation - Percent Failure	ASTM D 4632	100 max.
Puncture - lbs (1)	ASTM D 3787	80 min.
Ultraviolet Light Resistance	ASTM D 4355 150 hours exposure	70% tensile strength retained
Apparent Opening Size (AOS) (2)	ASTM D 4751	30 to 70
Permeivity - sec (1)	ASTM D 4491	0.10 min.

(1) Minimum average roll value (weakest principal direction).
(2) U.S. standard sieve size.

ROCK RIPRAP GRADATION TABLE		
ROCK DIAMETER (INCHES)	APPROX % OF TOTAL SIZE SMALLER THAN GIVEN SIZE	
	CLASS II	CLASS III
15	100	100
12	100	75
9	75	50
6	50	
3		10
2	10	



(D) = PIPE DIAMETER
(USE EQUIV. (D) FOR ARCH PIPE)

ROCK RIPRAP & GEOTEXTILE REQUIREMENT/QUANTITIES TABLE

(D) PIPE DIAMETER (INCHES)	ROCK RIPRAP CLASS	PLACEMENT THICKNESS (INCHES)	GEOTEXTILE (S.Y.)			ROCK RIPRAP (C.Y.)			
			TYPE	RISER	HORZ. PIPE	INLET	HORZ. PIPE	OUTLET	
8"	II	12"	III	7.0	6.5	8.5	0.4	0.4	0.6
10"	II	12"	III	9.0	8.0	10.5	0.6	0.5	.8
12"	II	15"	III	12.25	10.5	14.0	1.2	0.8	1.4
15"	III	18"	IV	17.5	14.0	19.0	2.2	1.3	2.3
18"	III	18"	IV	22.0	17.0	23.5	3.1	1.8	3.1
21"	III	18"	IV	28.0	19.5	28.0	5.7	2.3	4.1
24"	III	18"	IV	32.0	23.0	33.0	5.7	2.8	5.1

Project Name: _____

DATE: _____ LICENSE # _____

PRINT NAME: _____ Title _____

SIGNATURE: _____

Emasment OR Project No. _____ Plan Sheet _____ of _____

DWG# MN-ENG-208

Project Name: _____

REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

APPROVED BY _____ Date _____

RIPRAP & GEOTEXTILE MAT'L DETAILS

BWSR

NRCS

USFWS

Prepared by Minnesota Board of Water & Soil Resources-Rev 06/12/02