1 2	SECTION 1044 SUBSURFACE DRAINAGE MATERIALS	
3	1044-1 SUBDRAIN FINE AGGREGATE	
4	Subdrain fine aggregate shall meet Class III select material, Type 1 or Type 3.	
5	1044-2 SUBDRAIN COARSE AGGREGATE	
6	Subdrain coarse aggregate shall meet Class V select material.	
7	1044-3 PIPE AND FITTINGS	
8	Pipe and fittings may be, at the option of the Contractor, either concrete, corrugated steel, bituminized fiber or corrugated plastic.	
10	1044-4 CONCRETE PIPE AND FITTINGS	
11 12	Non-perforated concrete pipe and pipe fittings shall meet AASHTO M 86 for standard strength nonreinforced concrete pipe.	
13 14	Perforated concrete pipe shall meet AASHTO M 175 for standard strength perforated nonreinforced concrete underdrainage pipe.	
15	Joint materials shall meet Section 1028.	
16	1044-5 CORRUGATED STEEL PIPE AND FITTINGS	
17	Non-perforated corrugated steel pipe and pipe fittings shall meet Subarticle 1032-3(A).	
18	Perforated corrugated steel pipe shall meet AASHTO M 36.	
19 20	Fabricate the corrugated steel pipe from steel sheets having a minimum thickness of 0.052 inch.	
21	1044-6 PVC PIPE	
22	PVC pipe shall meet ASTM D1785.	
23	1044-7 CORRUGATED PLASTIC PIPE AND FITTINGS	
24 25	Corrugated plastic pipe and fittings shall meet AASHTO M 294 for heavy duty tubing, except that the maximum stretch resistance shall be 10%.	
26	1044-8 OUTLET PIPE	
27 28	Outlets constructed of PVC Schedule 40 pipe shall meet ASTM D2665. HDPE pipe shall meet AASHTO M 294, Type S.	
29	SECTION 1046	
30	GUARDRAIL MATERIALS	
31	1046-1 GENERAL	
32 33 34 35 36	Use guardrail materials from sources meeting requirements of the Department's Branc Registration Program for guardrail. A list of these sources is available from the Materials and Test Unit's Central Laboratory. The Department will remove a manufacturer of guardrai materials from this program if the monitoring efforts indicated that non-specification materia is being provided or test procedures are not being followed.	
37 38 39	The following types of guardrail materials and all associated accessories may be accepted under this program: rail elements, posts and offset blocks, terminal sections, anchor units, transition sections and hardware.	
40	1046-2 RAIL ELEMENTS	
41	The rail element and terminal sections shall meet AASHTO M 180 for Class A, Type 2.	

Section 1046

1046-3 POSTS AND OFFSET BLOCKS

2 (A) General

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- 3 (1) The Contractor may furnish any one of the following types of steel guardrail posts.
 4 Only one type of post will be permitted at any one continuous installation.
- Use structural steel posts throughout the project, unless otherwise directed or detailed in the plans.
 - (a) Steel W6 x 8.5 or W6 x 9.0 posts
 - (b) Steel 4.5 inches x 6.0 inches C-shape posts
 - (2) The Contractor may at his option furnish either of the following types of treated timber posts if specifically directed or detailed in the plans. Only one type of post will be permitted at any one continuous installation.
 - (a) Timber 6 inch x 8 inch posts
 - (b) Timber 8 inch x 8 inch posts

(B) Structural Steel Posts

Fabricate steel posts for guardrail of the size and weight shown in the plans from structural steel complying with Section 1072. Metal from which C-shape posts are fabricated shall meet ASTM A1011 for any grade of steel except that mechanical requirements that shall meet ASTM A36. Punch or drill the holes for connecting bolts. Burning will not be permitted. After fabrication the posts shall be galvanized in accordance with Section 1076.

(C) Treated Timber Posts

- Timber guardrail posts shall be of treated southern pine meeting Articles 1082-2 and 1082-3.
- Bore bolt holes to a driving fit for the bolts. A minus tolerance of 1% will be allowed in the length of the post. Perform all framing and boring before the posts receive preservative treatment.

27 **(D) Offset Blocks**

- Provide 8 inch deep recycled plastic or composite offset blocks approved for use with the guardrail shown in the *Roadway Standard Drawings* or plans. Only one type of offset block will be permitted at any one continuous installation. Before beginning the installation of recycled offset block, submit the FHWA acceptance letter for each type of block to the Engineer for approval.
- Treated timber offset blocks with steel beam guardrail will not be allowed unless required by Specifications, directed by the Engineer or detailed in the plans. Steel offset blocks with steel beam guardrail will not be allowed.
- Recycled plastic or composite offset blocks shall be made from no less than 50% recycled plastic or composite and shall meet the requirements in Table 1046-1.

TABLE 1046-1 WIRE DIAMETER			
Property	Requirement		
Minimum Specific Gravity	0.950		
Min. Compressive Strength in Lateral Direction	1,600 psi		
Maximum Water Absorption	10% by weight		
Maximum Termite and Ant Infestation	10%		
Testing	Pass NCHRP Report 350, Test Level 3 by Crash Testing		
Approval	Approved for use by the FHWA		

1 **1046-4 HARDWARE**

- 2 Provide all hardware as indicated in the plans that is galvanized in accordance with
- 3 ASTM A153.

4 1046-5 ANCHORS AND ANCHOR ASSEMBLIES

- 5 Each shipment of guardrail terminal end sections, anchors and anchor assemblies shall be
- 6 shipped from the manufacture with a current parts list and installation guide. Units not having
- 7 the above documents will be rejected.
- 8 Articles 1046-1, 1046-2 and 1046-3 are applicable to rail elements, terminal sections, posts,
- 9 offset blocks and hardware.
- Reinforcing steel shall meet Article 1070-2. Steel plates shall meet ASTM A36. Anchor rods
- shall meet ASTM A663 for Grade 65.
- Anchor cable shall be 3/4 inch wire rope having a minimum breaking strength of 21.4 tons
- and galvanized. Use commercial quality galvanized steel cable thimbles. Use commercial
- 14 quality drop forged galvanized steel cable clips. The fitting and stud for the anchor cable
- shall be suitable for cold swaging and be galvanized. After being swaged on the cable, the
- 16 fitting and stud assembly, including swaged joint and cable, shall have a minimum breaking
- strength of 21.4 tons.
- 18 Perform welding in accordance with Article 1072-18.
- Welded components shall be galvanized after welding in accordance with ASTM A123. All
- other metal parts shall be galvanized in accordance with ASTM A153, except where
- otherwise specified in Articles 1046-1, 1046-2 and 1046-3.

22 1046-6 REPAIR OF GALVANIZING

23 Perform repair of galvanizing in accordance with Article 1076-7.

24 1046-7 CABLE GUIDERAIL

- 25 Posts, hardware and miscellaneous components shall meet the applicable requirements of this
- Section, the plans and the manufacture's requirements.
- 27 Furnish cable guiderail manufactured in accordance with AASHTO M 30, Type 1, Class A.
- For concrete anchors, furnish Class A concrete if cast in place or use concrete meeting
- 29 Section 1077, if using precast concrete anchors.
- Cable guiderail is not covered under the Brand Certification Program for guardrail materials.
- 31 Sample cable guiderail according to the *Minimum Sampling Guide*.

32 1046-8 ACCEPTANCE

- 33 Acceptance of guiderail materials and its accessories will be based on, but not limited to,
- 34 visual inspections, classification requirements and check samples taken from material
- delivered to the project and conformance to the annual Brand Registration. Guiderail NCDOT 2018 Standard Specifications

Section 1050

FENCE MATERIALS

1050-1 GENERAL 5

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6 All fencing material and accessories shall meet Section 106.

(A) Chain Link Fence

8 Furnish either galvanized steel fence framework or aluminum alloy fence framework 9 unless otherwise specified. Use the same type of fabric and framework materials 10 throughout the project.

11 Where galvanized steel framework is used, the fence fabric may be either galvanized 12 steel or aluminum coated steel, except where galvanized steel fabric is specified in the contract. The Contractor may furnish any of the following galvanized steel framework 13 14 systems:

15 System G1

Steel Pipe Line Posts: Steel Pipe Terminal Posts (End, Corner, or Brace Posts): Gate Posts, Double Gate: Steel Pipe Gate Posts, Single Gate: Steel Pipe Brace Rail and Top Rail A Steel Pipe

16 System G2

Line Posts: Steel H Post Terminal Posts (End, Corner, or Brace Posts): Steel Pipe Gate Posts, Double Gate: Steel Pipe Gate Posts, Single Gate: Steel Pipe Brace Rail and Top Rail A Steel Pipe

17 System G3

Roll Formed Steel Line Posts:

Terminal Posts (End, Corner, or Brace Posts): Steel Pipe Steel Pipe Gate Posts, Double Gate: Gate Posts, Single Gate: Steel Pipe

Brace Rail and Top Rail A: Steel Pipe or Roll Formed Pipe

- A. Top rail to be used instead of tension wire only where called for in the itemized proposal.
- 20 Where an aluminum alloy framework is used, the fence fabric may be either aluminum 21 alloy or aluminum coated steel. The Contractor may furnish any of the following 22 aluminum alloy framework systems:

23 System A1

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Aluminum Post Line Posts: Terminal Posts (End, Corner, or Brace Posts): Aluminum Pipe Gate Posts, Double Gate: Aluminum Pipe Gate Posts, Single Gate: Aluminum Pipe Brace Rail and Top Rail^A: Aluminum Pipe