

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.

10 Reinforcing steel shall meet Article 1070-2. Steel plates shall meet ASTM A36. Anchor rods
11 shall meet ASTM A663 for Grade 65.

12 Anchor cable shall be 3/4" wire rope having a minimum breaking strength of 21.4 tons and
13 galvanized. Use commercial quality galvanized steel cable thimbles. Use commercial quality
14 drop forged galvanized steel cable clips. The fitting and stud for the anchor cable shall be
15 suitable for cold swaging and be galvanized. After being swaged on the cable, the fitting and
16 stud assembly, including swaged joint and cable, shall have a minimum breaking strength
17 of 21.4 tons.

18 Perform welding in accordance with Article 1072-18.

19 Welded components shall be galvanized after welding in accordance with ASTM A123. All
20 other metal parts shall be galvanized in accordance with ASTM A153, except where
21 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
26 Section, the plans and the manufacture's requirements.

27 Furnish cable guiderail manufactured in accordance with AASHTO M 30, Type 1, Class A.

28 For concrete anchors, furnish Class A concrete if cast in place or use concrete meeting
29 Section 1077, if using precast concrete anchors.

30 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
35 delivered to the project and conformance to the annual Brand Registration. Guiderail
36 materials not meeting the above requirements will be rejected, unless written approval is
37 obtained from the State.

38 SECTION 1050
39 FENCE MATERIALS**40 1050-1 GENERAL**

41 All fence material and accessories shall be melted and manufactured in the USA.

Section 1050

1 (A) Chain Link Fence

2 Furnish either galvanized steel fence framework or aluminum alloy fence framework
3 unless otherwise specified. Use the same type of fabric and framework materials
4 throughout the project.

5 Where galvanized steel framework is used, the fence fabric may be either galvanized
6 steel or aluminum coated steel, except where galvanized steel fabric is specified in the
7 contract. The Contractor may furnish any of the following galvanized steel framework
8 systems:

9 System G1

Line Posts:	Steel Pipe
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

10 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

11 System G3

Line Posts:	Roll Formed Steel
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 or Roll Formed Pipe

12 **A.** Top rail to be used instead of tension wire only where called for in the itemized
13 proposal.

14 Where an aluminum alloy framework is used, the fence fabric may be either aluminum
15 alloy or aluminum coated steel. The Contractor may furnish any of the following
16 aluminum alloy framework systems:

17 System A1

Line Posts:	Aluminum Post
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

18 System A2

Line Posts:	Aluminum H Post
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

19 **A.** Top rail to be used instead of tension wire only where called for in the itemized
20 proposal.

1 (B) Wire Gauge

TABLE 1050-1 WIRE DIAMETER	
Size Coated Wire, gauge	Nominal Diameter of Wire, inch
6	0.192
7	0.177
9	0.148
10 1/2	0.128
11	0.120
11 1/2	0.113
12	0.106
12 1/2	0.099
13	0.092
13 1/2	0.086
14	0.080
15 1/2	0.067
16 1/2	0.058

2 Whenever the term gauge is used in this section to refer to a size of wire, it will be
3 construed to mean the United States Steel Wire Gauge, SWG (U.S.), regardless of
4 whether or not the base metal of the wire is steel or a nonferrous metal.

5 **1050-2 TIMBER POSTS AND BRACES**

6 (A) General

7 Use treated southern pine meeting Articles 1082-2 and 1082-3 for all timber posts and
8 braces, except as otherwise specified herein. Posts and braces may be either round or
9 square provided that the same shape is used throughout the project for both the posts and
10 the braces. Post and brace sizes are shown in the plans in inches. The size refers to the
11 diameter for round pieces, or to the edge dimension for square pieces. Square posts and
12 braces shall be fully dressed S4S. An allowable tolerance of 1/2" scant for square pieces
13 will be permitted from the dimensions called for in the plans.

14 Cut round wood posts and braces from sound solid trees, free from short or reverse bends
15 in more than one plane. Do not use log veneer cores for posts and braces unless they
16 contain at least 1" of sapwood for their entire circumference on both ends. The post or
17 brace shall not deviate more than 1" at any point from a straightedge held longitudinally
18 against the piece.

19 All posts shall be free from ring shake, season cracks more than 1/4" wide, splits in the
20 ends and contain no unsound knots. Sound knots will be permitted provided the width of
21 the knot does not exceed 1/3 the diameter of the post where it occurs. Groups of knots or
22 any combination of defects that will impair the strength of the piece will not be permitted.
23 The pieces shall show not less than 3 annual rings per inch and not less than 30% of
24 summer wood.

25 A tolerance of 1" plus and 1/2" minus will be allowed for the diameter of round posts and
26 braces, measured at the small end after peeling. Where they are out of round, this
27 tolerance will apply to the smaller diameter, and the larger diameter shall not exceed the
28 smaller by more than 20%. The maximum rate of increase in diameter at the butt shall be
29 1 1/2" in 10 ft.

30 A minus tolerance of 1% will be allowed in the length of both round and square posts.
31 Cut the ends square.

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1 (B) Optional Steel Posts and Braces

2 Steel posts and braces for woven wire fence instead of timber posts and braces are
3 permitted in areas located in or west of Vance, Franklin, Wake, Lee, Moore and
4 Richmond Counties. Use the same type of fence post and brace throughout the project.
5 The optional steel posts and braces shall meet Subarticle 1050-3(B).

6 1050-3 METAL POSTS AND RAILS

7 (A) Chain Link Fence

8 Posts shall meet AASHTO M 181 except as otherwise provided herein.

9 Steel H posts shall have a minimum yield strength of 45,000 psi and weigh 3.26 lb/ft.
10 Galvanize steel H posts in accordance with ASTM F1043 with a Type A coating.
11 Aluminum H posts shall weigh 1.25 lb/ft.

12 Roll formed steel line posts shall be a 1.625" x 1.875" section weighing 2.40 lb/lf after
13 galvanizing and be formed from 0.121" thick sheet having a minimum yield strength
14 of 45,000 psi. Roll formed steel brace rails and top rails shall be a 1.250" x 1.625"
15 section weighing 1.35 lb/lf after galvanizing and be formed from 0.080" thick sheet steel
16 having a minimum yield strength of 45,000 psi. Galvanize all roll formed members after
17 fabrication in accordance with ASTM F1043 with a Type A coating.

18 Vinyl coated posts shall be pipe posts meeting AASHTO M 181 with a fusion bonded
19 vinyl coating at least 6 mils thick. The vinyl shall meet Section 6 of AASHTO M 181, or
20 if a standard color not listed in AASHTO M 181 is used, the vinyl shall meet the color
21 requirements in ASTM F934, Table 1.

22 Furnish brace rails with suitable metal connections to fasten them securely to the posts.
23 Provide the top rail not less than 6" long with a thickness of at least 0.051" if steel,
24 or 0.062" if 6063-T6 aluminum alloy and in lengths of at least 15 ft. The complete top
25 rail assembly shall form a continuous rail passing through the top fittings of the line posts
26 and be furnished with suitable metal connections to fasten it to the posts at each end.

27 For pipe 1.90" O.D. and under, the outside diameter at any point shall not vary more than
28 1/64" over no more than 1/32" under the standard specified. For pipe 2.375" O.D. and
29 over, the outside diameter shall not vary more than $\pm 1\%$ from the standard specified nor
30 shall the minimum wall thickness at any point be more than 12.5% under the nominal
31 wall thickness specified.

32 A 10% minimum weight tolerance will be allowed for all steel posts and rails.

33 (B) Woven Wire Fence

34 Steel posts used instead of 4" timber posts shall be a standard studded T-section
35 7.5 ft long designed exclusively for use as a fence post and be equipped with a metal
36 anchor plate securely attached to the post. The T-posts shall weigh 1.33 lb/lf exclusive of
37 the weight of the anchor plate, and have a total weight, including anchor plate, of
38 10.65 lb. Nominal dimensions of the T-post shall be 1 3/8" wide and 1 3/8" deep.
39 A tolerance of $\pm 3/16$ " will be permitted from these nominal dimensions. The anchor
40 plate shall be sufficiently sturdy to withstand the strain of driving with no loss of
41 effectiveness, and have a minimum area of 14.0 sq.in.

42 Steel posts used instead of 5" timber posts may be either tubular posts or angle posts.
43 They shall be 8 ft long and be embedded in a concrete anchor at least 3.3 ft deep and
44 10" in diameter. Fit tubular posts with ornamental tops that fit over the top of the post to
45 cap against moisture. Fabricate the tubular posts from 2" diameter pipe meeting
46 AASHTO M 181 for Grades 1 or 2 metallic coated posts and rails. Fabricate angle posts
47 from angle sections measuring 2 1/2" x 2 1/2" x 1/4", $\pm 1/16$ " on the 2 1/2" dimensions
48 and ± 0.015 " on the 1/4" dimension and weighing 4.10 lb/ft.

1 Use steel braces with steel posts and either tubular braces or angle braces to match the
 2 posts. Furnish the braces with suitable metal connections to fasten them securely to the
 3 posts. Fabricate tubular braces from 1 1/4" diameter pipe meeting AASHTO M 181 for
 4 Grades 1 or 2 metallic coated posts and rails. Fabricate angle braces from angle sections
 5 measuring 2" x 2" x 1/4" \pm 3/64" on the 2" dimensions and \pm 0.010" on the
 6 1/4" dimension and weighing 3.19 lb/ft.

7 A 10% minimum weight tolerance will be allowed for all steel posts and braces.

8 For pipe 1.90" O.D. and under, the outside diameter at any point shall not vary more than
 9 1/64" over nor more than 1/32" under the standard specified. For pipe 2.375" O.D. and
 10 over, the outside diameter shall not vary more than \pm 1% from the standard specified nor
 11 shall the minimum wall thickness at any point be more than 12.5% under the nominal
 12 wall thickness specified.

13 Galvanize all steel posts and braces other than tubular members in accordance with
 14 ASTM A123.

15 **1050-4 BARBED WIRE**

16 Barbed wire shall meet ASTM A121 except as otherwise provided in this subarticle.

17 The barbed wire may be either galvanized steel or aluminum coated steel except that where
 18 aluminum chain-link fabric is used, galvanized steel barbed wire shall not be used. Use the
 19 same type of material throughout the project. All barbed wire shall have 4 point barbs spaced
 20 not more than 5" apart. Single strand barbed wire will not be acceptable.

21 Two strand galvanized steel barbed wire shall be fabricated from either 12 1/2 gauge or
 22 15 1/2 gauge strand wire with 4 point galvanized steel 14 gauge barbs. The 12 1/2 gauge shall
 23 be Standard Grade with a Class 3 coating on the wire and a Class 1 coating on the barbs.
 24 The 15 1/2 gauge shall be Chain Link Fence Grade with a Class 3 coating on both the wire
 25 and barbs.

26 Two strand aluminum coated steel barbed wire shall be fabricated from 2 strands of
 27 12 1/2 gauge aluminum coated steel wire with the 4-point barbs being either 14 gauge
 28 aluminum coated steel or aluminum alloy wire.

29 **1050-5 WOVEN WIRE**

30 Woven wire fencing shall conform to ASTM A116 or AASHTO M 279. The fence fabric
 31 shall be 47" high, with 10 horizontal strands. Space the strands 3" apart at the bottom and
 32 8" apart at the top with progressive spacing between. Space vertical strands at 6" intervals.
 33 Any of the following styles and coating classes may be used.

34 (A) Style 1047-6-9, Grade 60 (all horizontal and vertical strands of wire shall be 9 gauge)
 35 with a Class 3 zinc coating.

36 (B) Style 1047-6-11, Grade 60 (top and bottom horizontal strands to be 9 gauge wire, all
 37 other strands to be 11 gauge) with a Class 3 zinc coating.

38 (C) Style 1047-6-12 1/2, Grade 125 (top and bottom horizontal strands of wire to be no
 39 smaller than 10 1/2 gauge with a minimum breaking strength of 1610 lb, all other strands
 40 to be no smaller than 12 1/2 gauge with a minimum breaking strength requirement for
 41 horizontal strands of 960 lb with a Class 3 coating.

42 Brace wire shall be a 9 gauge steel in accordance with ASTM A641, except that the minimum
 43 zinc coating shall be 0.80 oz/sf.

44 **1050-6 CHAIN LINK FABRIC**

45 Chain link fence fabrics shall meet AASHTO M 181. Galvanized steel fabric shall have
 46 a Class D coating. Polyvinyl coated fabric shall be Type IV, Class A or B and the vinyl
 47 coating shall be a standard color meeting AASHTO M 181 or ASTM F934 Table 1.

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1 Glare screen fabric with a 0.5" mesh shall have a Class 1 zinc coating in accordance with
2 ASTM A392. The height of the chain link fence fabrics shall be as shown in the pay item
3 description. Weave the fabric from 11 gauge wire, unless otherwise required by the contract.
4 Glare screen fabric shall be 11 1/2 gauge unless otherwise required by the contract.

5 **1050-7 FENCE FITTINGS, HARDWARE AND ACCESSORIES**

6 All fittings, hardware and accessories shall meet AASHTO M 181, AASHTO M 232,
7 ASTM F626 OR ASTM A641 or ASTM A809 except for the size, type and coating
8 requirement as shown below in Table 1050-2 and elsewhere in this article.

9 Galvanize bolts, nuts, washers and other threaded items in accordance with AASHTO M 232.

10 Where shown in the plans, fit the posts with ornamental tops. The base of tops to be used
11 with pipe posts shall fit over the top of the post to guard against moisture.

12 Tension wire for use with galvanized steel chain link fabric shall meet AASHTO M 181 for
13 zinc coated tension wire. Tension wire for use with aluminum or aluminum coated chain link
14 fabric may be either aluminum coated tension wire meeting AASHTO M 181, or solid
15 aluminum wire with a minimum diameter of 0.192". The aluminum for solid aluminum wire
16 shall meet ASTM B211 for Alloy 5056 or 6061, and have a minimum breaking strength of
17 1,216 lbf and a minimum elongation of 10%. Tension wire for use with guardrail mounted
18 glare screen fabric shall be 6 gauge and for barrier mounted glare screen the wire shall be
19 9 gauge unless otherwise required by the contract.

20 Vinyl coated fittings and accessories shall be galvanized steel or aluminum coated steel
21 meeting this article and have a bonded vinyl coating. The vinyl shall meet Section 6 of
22 AASHTO M 181 and be a standard color meeting AASHTO M 181 or ASTM F934 Table 1.
23 The vinyl coating shall be at least 6 mils thick, except that the coating on tension wire, hog
24 rings and tie wires shall be 6 to 10 mils thick.

25 **1050-8 REPAIR OF GALVANIZING**

26 Repair of galvanizing shall be in accordance with Article 1076-7. Do not use aerosol can
27 products for repairs

TABLE 1050-2 PROPERTIES OF FENCING MATERIALS				
Item	Gauge or Diameter, inch	Coating, oz/sf	Coating, oz/sf, Aluminum	Remarks
Tie wires, steel	9	0.90	0.40	For fastening chain link fabric and tension wire to tubular sections or to roll formed steel line posts.
Tie wires, Aluminum	6	-	-	Alloy 1350-H19 or approved equal.
Clips, steel wire	7	0.90	-	For fastening chain link fabric and tension wire to H- posts.
Clips, steel wire	11	0.85	-	For fastening woven wire fabric to steel posts.
Hog rings, steel	12	0.80	0.40	For fastening chain link fabric to tension wire.
Hog rings, aluminum	9	-	-	Alloy 1350-H19 or approved equal.
Truss rod, steel	5/16	2.00	-	-
Tension (stretcher) bars, steel	3/16 x 3/4	1.50	-	For connection of 1 3/4" or 2" fabric to end, gate and corner posts for fabric heights over 5 ft.
Tension (stretcher) bars, steel	3/16 x 5/8	1.50	-	For connection of 1 3/4" or 2" fabric to end, gate and corner posts for fabric heights up to 5 ft.
Tension (stretcher) bars, steel	1/4 x 3/8	1.50	-	For connection of 1" fabric to end, gate, and corner posts.
Staples, Nails or	9	0.35	-	For fastening woven wire to timber posts. Shall be the size and shape shown in the plans.
Tension wire braces	9	0.90	0.40	For woven wire fence.
Post and line caps	-	1.30	-	For installation on top of posts to guard against moisture.
Rail and brace ends (pressed steel or cast iron)	-	1.30	-	-
Top rail steel sleeves	0.051	1.30	-	For rail connections. shall be fabricated to prevent movement along the rail.
Tension band	14	1.30	-	For fastening tension bar to posts.
Brace band	12	1.30	-	For fastening rail to posts.
Barbed wire extension arms (pressed steel or cast iron)	14	1.30	-	Shall be fitted with clips or slots for attaching the barbed wire to the arms.
Hinges, latches	-	2.00	-	-

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SECTION 1052 SALT AND LIME STABILIZERS

1052-1 SODIUM CHLORIDE

Sodium chloride shall meet AASHTO M 143.

1052-2 CALCIUM CHLORIDE

Calcium chloride shall be Class S or L meeting AASHTO M 144.