

# ENG Fencing Installation Guide



*Building the World to Last®*

HIGH PERFORMANCE COMPOSITE SOLUTIONS



# ENC Fencing Installation Guide

## SUGGESTED TOOL LIST

- 48" Spirit Level**
- Laser level**
- 25 ft tape measure**
- 4 ft straight edge**
- Chalk line**
- Equipment for drilling post holes and mixer for concrete**
- 7.5" diameter circular saw with masonry, carbide grit, or diamond grit blade.**
- Drill motor with 5/16", 7/16" and 3/4" diameter masonry or diamond grit drill bits**
- SAE Sockets and ratchets or power tools for installing bolts**
- Surveying and measuring equipment for laying out fence posts**
- 2" x 4" wood shoring and C-clamps for securing posts during foundation cure**
- Come along and wire cutting tools for installing barbed wire (if specified)**

**NOTE:** Cuts and drilled holes must be sealed to maintain corrosion protection.



## INSTALLATION INSTRUCTIONS:



1. Immediately upon receiving the shipment, inspect all materials and check against the packing list for missing items or for damaged materials. Contact Fibergrate at (800) 527-4043 to report any issues with the shipment.
2. Read and review all drawings to fully understand the scope of the project, the installation details, and the basic layout. Contact Fibergrate at the number above if there are questions or issues with installing the fence per the drawings.
3. Lay out post locations using survey equipment to achieve the most accurate possible layout. Dimensions on the drawings are to the centerline of the line posts and to their outside face. Dimensions are to the outside face of the corner posts.
4. Excavate for the foundations to the depth and diameter required. Post embedment in the concrete foundation can be located on the installation drawings. Typical post embedment into the foundation is 1'-11 7/8". A 3'-6" post embedment is required for the 6" x 6" x 3/8" sq. tube posts at the two leaf vehicular gates and the posts adjacent to them used for bracing.
5. Standard line posts (4", 6", or 8" wide flange beams) and corner posts (6" x 6" x 3/8" angle) are supplied in a length of 9'-11 7/8". Allow for 8' of post to extend above ground for the installation of the fencing panels. Posts for standard vehicular gates are supplied at a length of 11'-6". Post embedment and therefore length may vary based on project requirements.
6. Install line posts, corner posts, and gate posts at the locations indicated on the drawings. Be careful to install any specially fabricated corner posts or gate posts at the correct locations and orientation. Set posts by temporarily bracing them in the excavated holes and filling the holes with concrete. Brace posts so that they are plumb in both directions and ensure that the post to post spacing is accurate to within a  $\pm 1/4$  inch tolerance. Wood bracing should be clamped to the FRP posts with C-clamps – do not use temporary screws or nails into FRP members. Allow concrete to adequately cure prior to continuing with the installation process.
7. Before the concrete cures, install any horizontal and diagonal bracing at the gate posts using the stainless steel hardware indicated in the erection details. Tighten all bolts finger tight during the assembly process, then go back and fully tighten them after all braces are installed. Tighten bolts to a 'snug tight' condition – after the members are in contact, tighten the bolts as tightly as you can with a wrench by hand. Double check plumb and location of posts prior to allowing the concrete to fully cure.
8. Temporarily clamp the fencing panels in place and back drill 7/16" diameter holes in the center of the fence panel cells as indicated in the elevations and details for installation of the square fence panel clips. Use single clips at the corner posts and the interior of fence panels where indicated. Use two fence panel clips at abutments falling on the center of line posts. Install fence panel clips with the 3/8" diameter galvanized carriage bolts, nuts, and washers supplied. F-clips are used to secure the horizontal panel abutments between line posts as indicated in the drawings. Install all fence panel clips finger tight and full tighten only after all fence panels are installed to allow for small adjustments.
9. For fence panels that require cutting, refer to the 'Guide to Fabrication' on page 4 for specific cutting and sealing procedures.

# ENC Fencing Installation Guide

10. For fences on sloped ground, install the fence panels with the panels oriented horizontally and with the combined 8' height on the down slope end of the panel. Trim the bottom edge of the lower most fence panel to conform to the bottom edge of the slope. The top of the uppermost panel will be horizontal and uncut. Installing the panels this way will result in a 'stair-step' upper edge of the fence panels.

11. Personnel gates are pre-assembled. Install by temporarily clamping in place with the top of the gate aligned with the top of the gate post and leaving a 2" gap at the bottom. The face mounted hinges attach to the outer face of the gate posts and the door swings outward – reference the detail on the drawings. Back drill the posts using a 5/16" diameter drill bit using the hinge holes as a template. Install the hinges using the 1/4" diameter countersunk head stainless steel bolts provided.



12. Vehicular gates are not pre-assembled. Assemble the vehicular gate leaves following the drawings provided. Assemble the angle frame and X-braces with all bolts finger tight and ensure squareness by measuring the diagonal out to out dimension of the frame and adjusting until the two diagonal measurements are equal. When the diagonal measurements are equal, torque all bolts to a snug tight condition. Install the gate fence panels following the procedure given under (8) above. Install the top and bottom strap hinges in the locations using the 3/8" diameter carriage bolts provided. Leave the middle strap hinge off until after the gates are hung.

13. Install the top and bottom hook bolts in the 6" x 6" x 3/8" square tube posts with the hooks pointing upward. Install the hooks with a washer and nut on both the inside and outside of the square tube and with the centerline of the pivot 3" from the face of the square tube. Do not install the center hook bolt until after the gate leaves are hung.

14. Lubricate the pivot portion of the hook bolts using axle grease or white lithium grease (not provided) and hang the gate leaves. Adjust the hook bolts as required until a uniform gap of 1" exists between the two gate leaves. Torque down the nuts on the hook bolts to lock secure them in place.

15. Thread one nut and washer onto the middle hook bolt, threading it so that the washer is 3" from the centerline of the pivot. Lubricate the pivot portion of the middle hook bolt as above and slip the middle strap hinge over it. Install this assembly into the square tube post and the gate with the hook of the bolt pointed downward. This will prevent the gate leaves from being lifted off of the hook bolts as a mode of forced entry. Install the strap hinge bolts and the washer/nut on the hook bolt and adjust so that there is no binding as the gate is opened and closed.

16. Steps 16-20 are for fence installations with barbed wire. At line posts, install two 15" Universal Barb Arms as follows. Drill a 7/16" diameter hole at the centerline of the post web located 15/16" down from the cut end of the post. Interleaf the ends of the barb arms and slide them over the web of the post and secure using a 3/8" x 1-1/2" long carriage bolt as shown in the detail. The barb arms are at 45 degrees from the horizontal, one facing inward and one facing outward.

17. At pedestrian gates and the inside and outside edges of vehicular gates, barbed wire is connected to the vertical gate angles which are extended 12" above the top of the gate. The barbed wire connection consists of three 1/4" diameter x 1" long zinc plated eye bolts, installed in 5/16" diameter holes drilled at equal spacings into the leg of the angle which faces the outside of the fence.

18. Barb arms at the midpoint of vehicular gate leaves are installed using two 4" x 4" x 1/2" x 4" long angle clips bolted into the top angle of the gate using two 3/8" x 2" hex head bolts for each angle. The barb arm connected to one angle faces inward at 45 degrees from horizontal and the other barb arm faces outward. Barb arms are secured to the angles using a single 3/8" x 2-1/4" carriage bolt which passes through both.

19. For barbed wire installations, the 6" x 6" x 3/8" corner posts are supplied long enough to be 12" above the top of the fence panels. The barbed wire is connected to six 1/4" diameter x 1" long zinc plated eye bolts are installed in 5/16" diameter holes drilled at equal spacings into the two legs of the post, three eye bolts on each side.

20. The barbed wire is threaded and tensioned using the same procedure as steel fencing.

## SHIPPING PRACTICES

1. Grating to be shipped as full panels (4'x12') for field cutting and notching (by others).
2. All posts are shipped in stock 20' lengths to be field cut to length and drilled (by others)
3. Field attach grating (by others).
4. Gates - field drill the posts for field assembly (by others). Gates are to be shipped unassembled. Gates will require field assembly (by others).
5. Post bracing to be shipped in 20' stock lengths to be field cut to length and drilled (by others).
6. Approximately 10% additional grating panels, post material, barbed wire, bayonets, hardware, and grating clips to be shipped.



# ENC Fencing Installation Guide

## GUIDE TO FABRICATION

### Fabrication Tips

A major advantage of using Fibergate Composite Structures' fiberglass products is the ease of fabrication — sawing, grinding, drilling and machining is similar to working with wood, metals and plastics. If possible, perform fabrication “on-site” to increase accuracy. Be sure to allow for saw kerf (usually 3/16”) when performing take-offs and layouts. For a nice looking installation, cut panels, so bars of adjoining panels are aligned and leave a solid bar on all sides.

### Recommended Safety Practices

Prior to cutting Fibergate products, take the following steps:

1. Carefully read the Safety Data Sheet (SDS), formerly MSDS. If you do not have an SDS, contact Fibergate prior to fabricating. Individuals with respiratory ailments should not fabricate FRP products. (SDS can be downloaded at [fibergate.com](http://fibergate.com))
2. Observe common safety precautions when using cutting tools. Always wear gloves when handling Fibergate products. Wear approved safety glasses or goggles to protect your eyes and a respirator (mask) to reduce inhalation of dust. We recommend the use of a NIOSH/MSHA approved mask for dust with a permissible exposure limit (PEL) of not less than 0.1 mg/M<sup>3</sup>.
3. Dust from cutting FRP products can cause skin irritation. Wear clothing to reduce dust from coming into contact with skin. If cutting products causes difficulty in breathing or excessive skin irritation, stop immediately and consult a physician.
4. Observe common safety precautions when using the epoxy coating or sealing kit. Read and follow instructions provided with the coating or enclosed in the kit prior to using. Always wear personal protective equipment when working with FRP products or using a protective coating or sealing kit. Do not allow resin or catalyst to come in contact with skin.

### Tools Required

1. Power saw with a masonry or diamond blade for cement board products (Figure 1); use a circular saw for straight cuts, a jig saw for circular cuts. For large fabrication jobs, use a diamond grit blade.
2. Sawhorses or platform for supporting products while cutting (Figure 2).
3. Tape measure, straight-edge and chalk-line or felt-tip pen for marking cuts.
4. Use Aervoe Epoxy 403 Clear coating (Figure 3) to seal edges after cutting\*. Alternate products to use for sealing Corvex & Vi-Corr gratings are: Devcon 2-Ton Epoxy or 5 Minute Epoxy. For Corvex resins only: Rustoleum Lacquer 1906 Clear, Helmsman Spar Urethane, Krylon-Crystal Clear protective coating.

\*Fibergate's previous seal kit (Figure 4) is still available with minimum order quantity requirements.

### Procedures

1. Support panel securely so it will not flex or shift during cutting.
2. Mark cuts clearly and carefully. Avoid splitting 1/4" and 5/16" bars. Molded construction allows “stubs” to support weight.
3. Cut from the smooth side (bottom) of a grit-top panel.
4. Use even, steady pressure when cutting. Excessive pressure may cause heat and/or ragged edges. Replace dull blades to prevent heat buildup.
5. Use an epoxy sealer to coat all cut or sanded surfaces. This is recommended to prevent corrosive chemicals from reaching exposed glass fibers. Carefully read and follow the instructions provided on the epoxy coating or those included with the sealing kit.

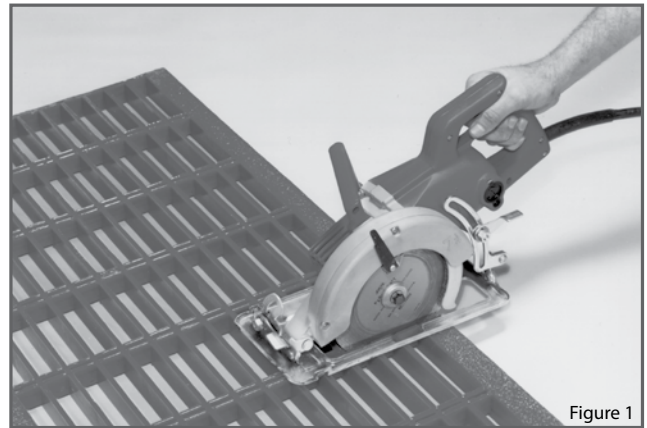


Figure 1



Figure 2



Figure 3



Figure 4

# ENC Fencing Installation Guide

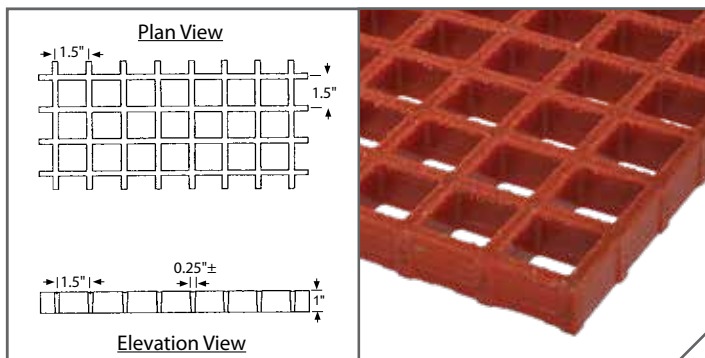
Fibergrate Composite Structures Inc. manufactures fiberglass reinforced plastic (FRP) products that combine corrosion resistance, strength, durability, safety, and low maintenance to provide a longer lasting solution for industrial and commercial applications. Fibergrate's variety of products lines are often used in conjunction with one another to create a complete FRP solution that will meet customer and industry requirements. Fibergrate® molded grating and Dynaform® structural shapes are used to construct screening and non conductive security fencing systems. These systems are designed to provide protection and security around electrical equipment, machinery, and other areas that require a non-magnetic, thermally and electrically non conductive system.

## PANEL DATA

Product*	Depth	Mesh	Panel Sizes	Color	Resin
Fibergrate® Molded Grating	1"	1-1/2" x 1-1/2"	3' x 10'; 4' x 8'; 4' x 12'	Dark Gray	Corvex®
Micro-Mesh® Molded Grating	1"	3/4" x 3/4"	4' x 12'	Dark Gray	Corvex®

### 1" Deep x 1-1/2" Square Mesh

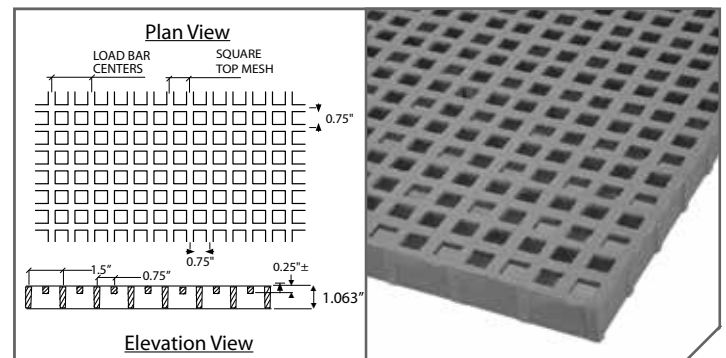
# of Bars/ Ft of Width	Load Bar Width	Open Area	Load Bar Centers	Approximate Weight
8	1/4"	70%	1-1/2"	2.5 psf



**Section Properties per Ft of Width:** A = 1.71 IN<sup>2</sup> I = 0.14 IN<sup>4</sup> S = 0.29 IN<sup>3</sup>

### 1" Deep x 3/4" Micro-Mesh®

# of Bars/ Ft of Width	Load Bar Width	Open Area	Load Bar Centers	Approximate Weight
8	1/4"	44.4%	1-1/2"	2.9 psf



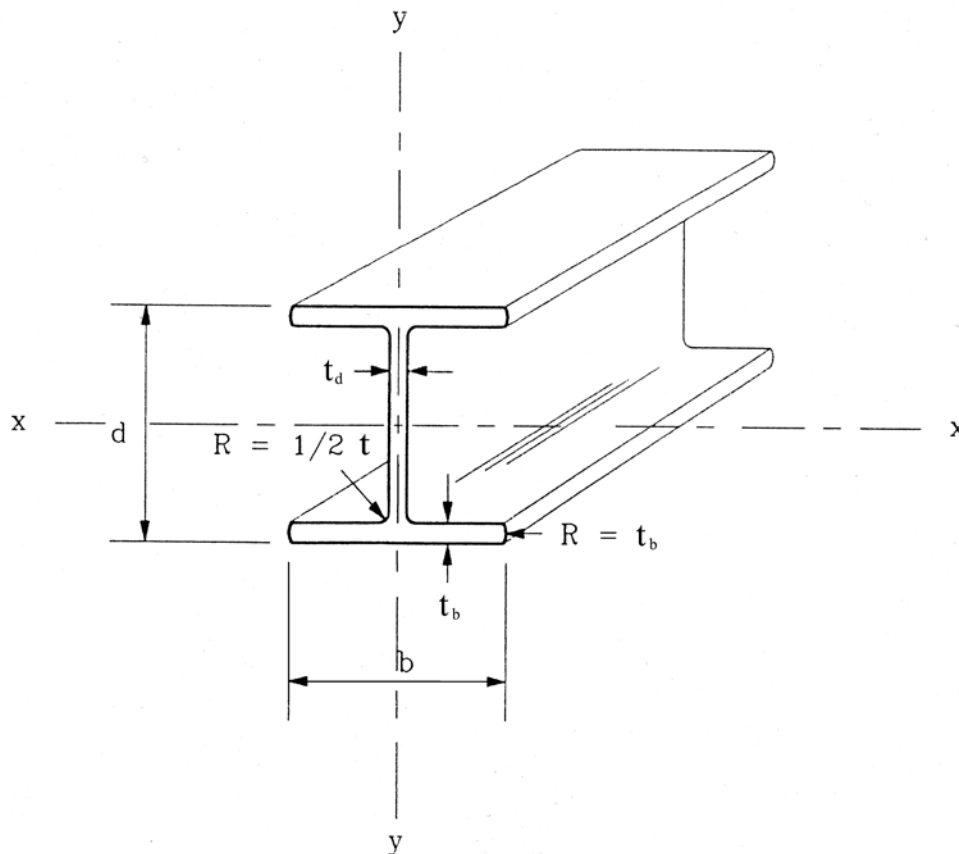
**Section Properties per Ft of Width:** A = 2.34 IN<sup>2</sup> I = 0.23 IN<sup>4</sup> S = 0.37 IN<sup>3</sup>

# ENC Fencing Installation Guide

## POST DATA

### Wide Flange Shapes

SECTION DIMENSIONS					SECTION PROPERTIES					
					X - X			Y - Y		
d	b	t	A	Wt.	I	S	r	I	S	r
in.	in.	in.	in. <sup>2</sup>	lb./ft.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.
6	6	.25	4.39	3.40	28.28	9.43	2.54	9.01	3.00	1.43
6	6	.375	6.48	4.90	40.17	13.39	2.49	13.52	4.51	1.44
8	8	.375	8.73	6.49	99.19	24.80	3.37	32.03	8.01	1.92
8	8	.5	11.51	8.70	126.96	31.74	3.32	42.74	10.69	1.93

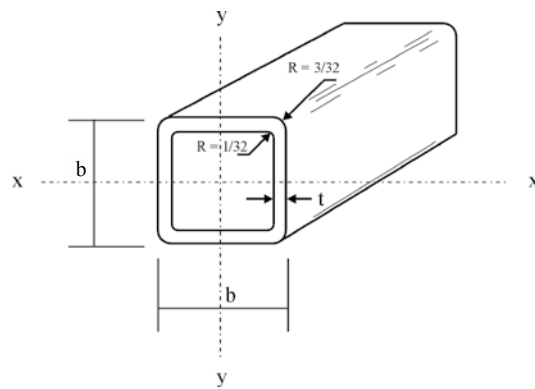


# ENC Fencing Installation Guide

## POST DATA - CONTINUED

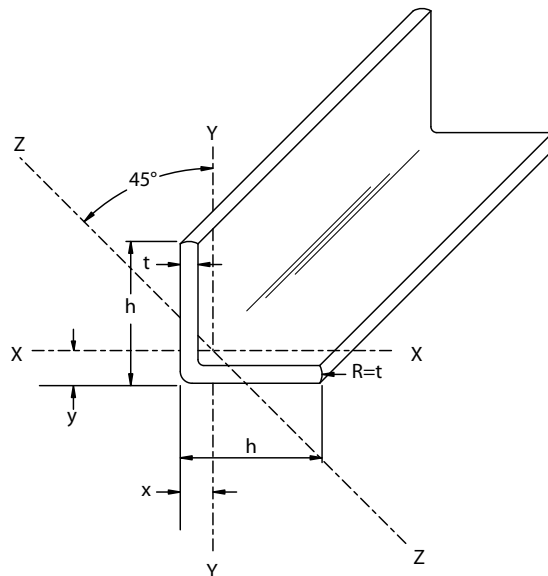
### Square Tubes

SECTION DIMENSIONS					SECTION PROPERTIES		
b	t	A	Wt.		I	S	r
in.	in.	in. <sup>2</sup>	lb./ft.		in. <sup>4</sup>	in. <sup>3</sup>	in.
4	.25	3.74	2.83		8.82	4.41	1.53
6	.375	8.236	6.57		42.991	14.33	2.284



### Equal Leg Angle

SECTION DIMENSIONS				SECTION PROPERTIES					
DEPTH	WALL			X - X / Y - Y				Z - Z	
h	t	A	Wt.	I	S	r	x or y	I	r
in.	in.	in. <sup>2</sup>	lb./ft.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in.
6	3/8	4.34	3.03	15.23	3.49	1.87	1.64	6.07	1.18

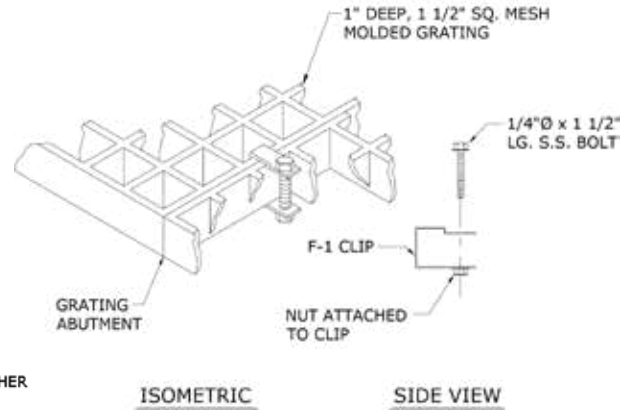
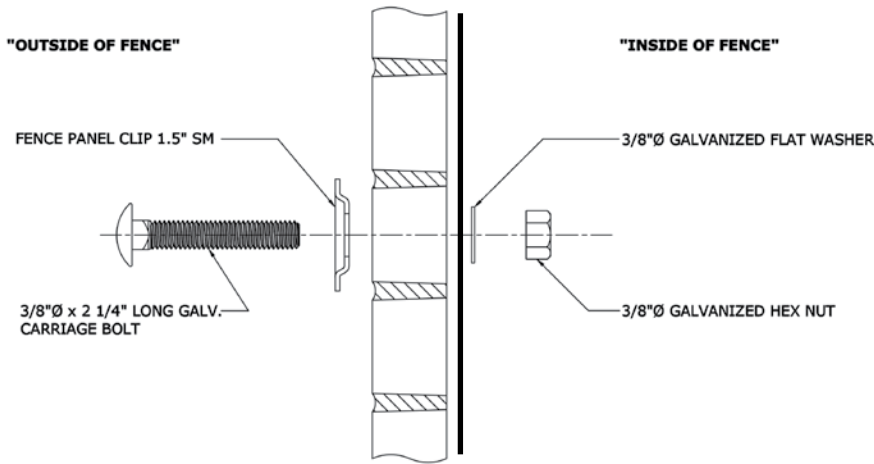


# ENC Fencing Installation Guide

## F-1 PANEL ABUTMENT CLIP

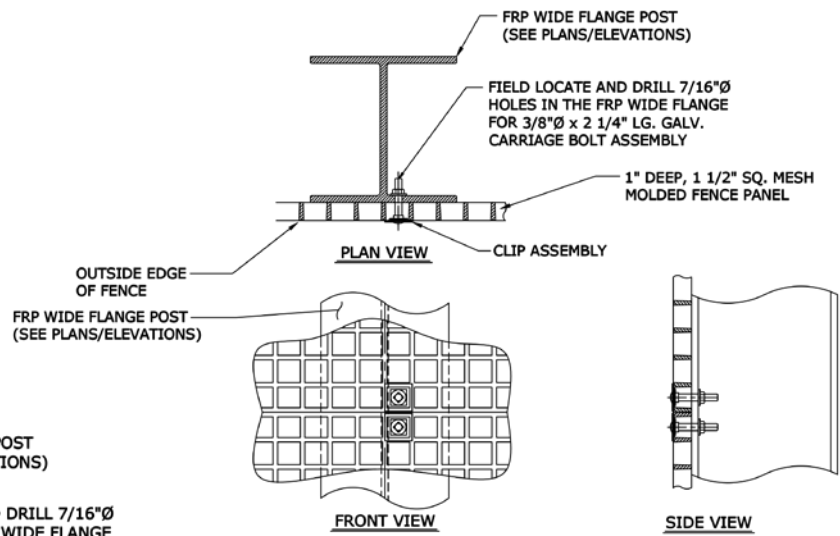
Shown with 1" Deep, 1-1/2 Square Mesh molded Fence Panel

## EXPLODED VIEW -CLIP ASSEMBLY PN 710860.1



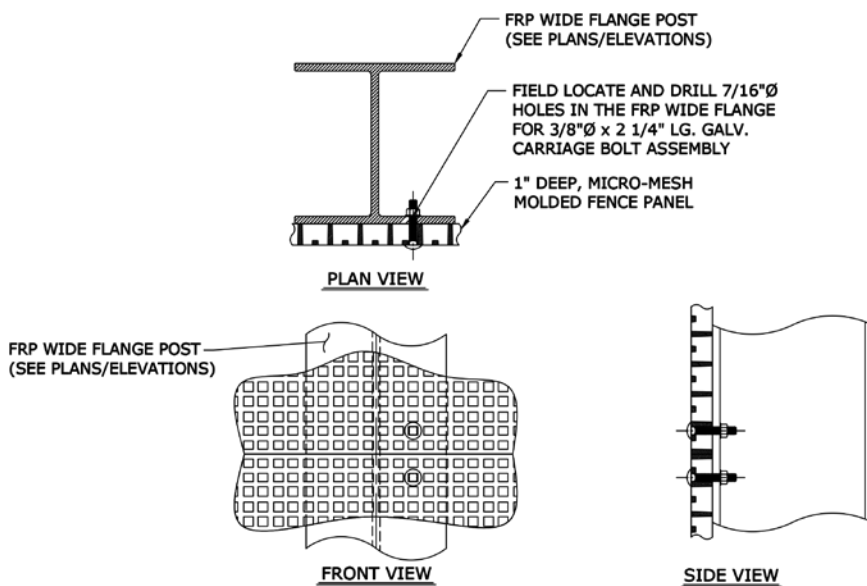
## E CONNECTION WITH LINE POST

with 1" Deep, 1-1/2" Square Mesh Molded Fence Panel



## MIDDLE CONNECTION WITH LINE POST

Shown with 1" Deep, Micro-Mesh Molded Fence Panel

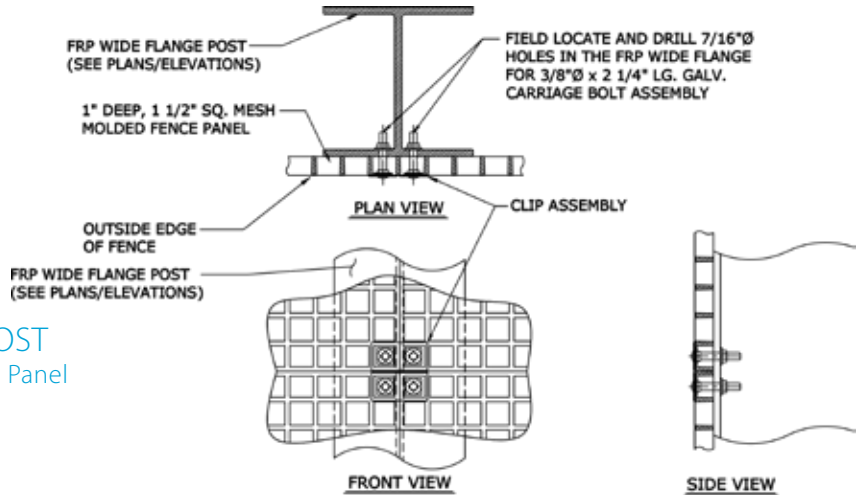




# ENC Fencing Installation Guide

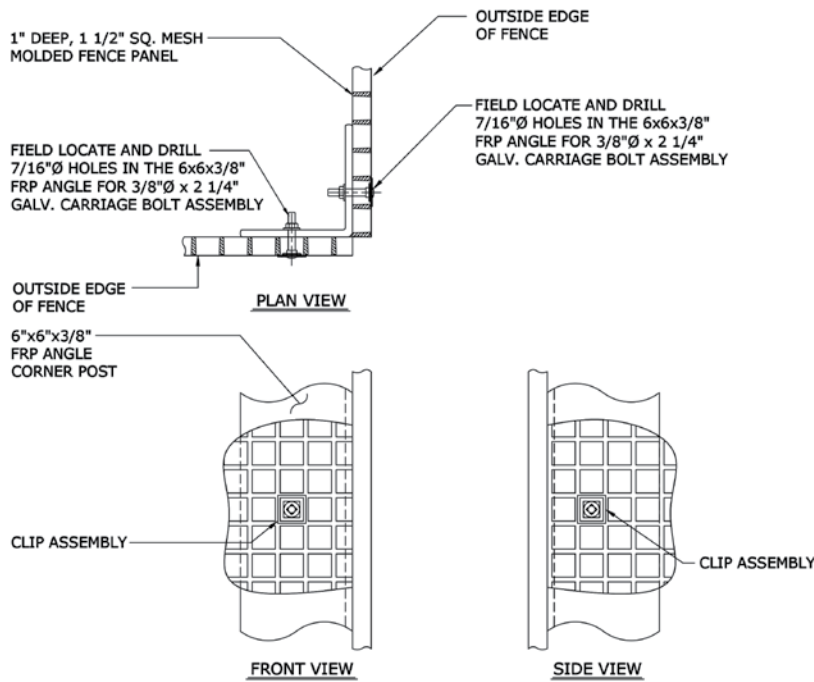
## SPLICE CONNECTION WITH LINE POST

Shown with 1" Deep, 1-1/2" Square Mesh Molded Fence Panel



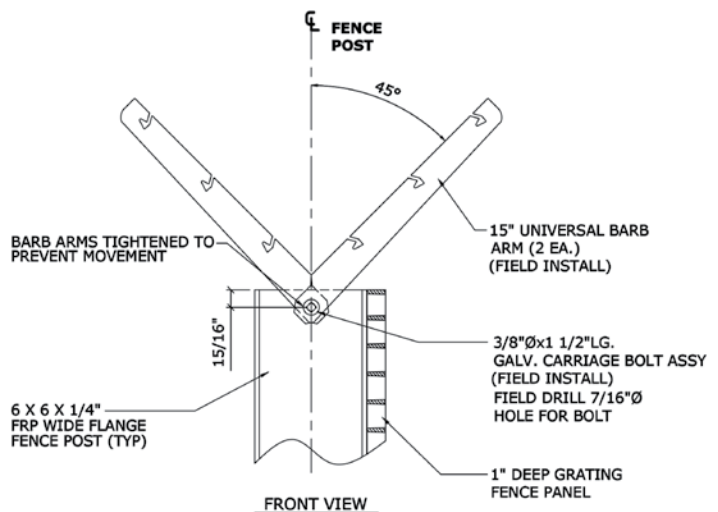
## CORNER CONNECTION WITH A6 CORNER POST

Shown with 1" Deep, 1-1/2" Square Mesh Molded Fence Panel



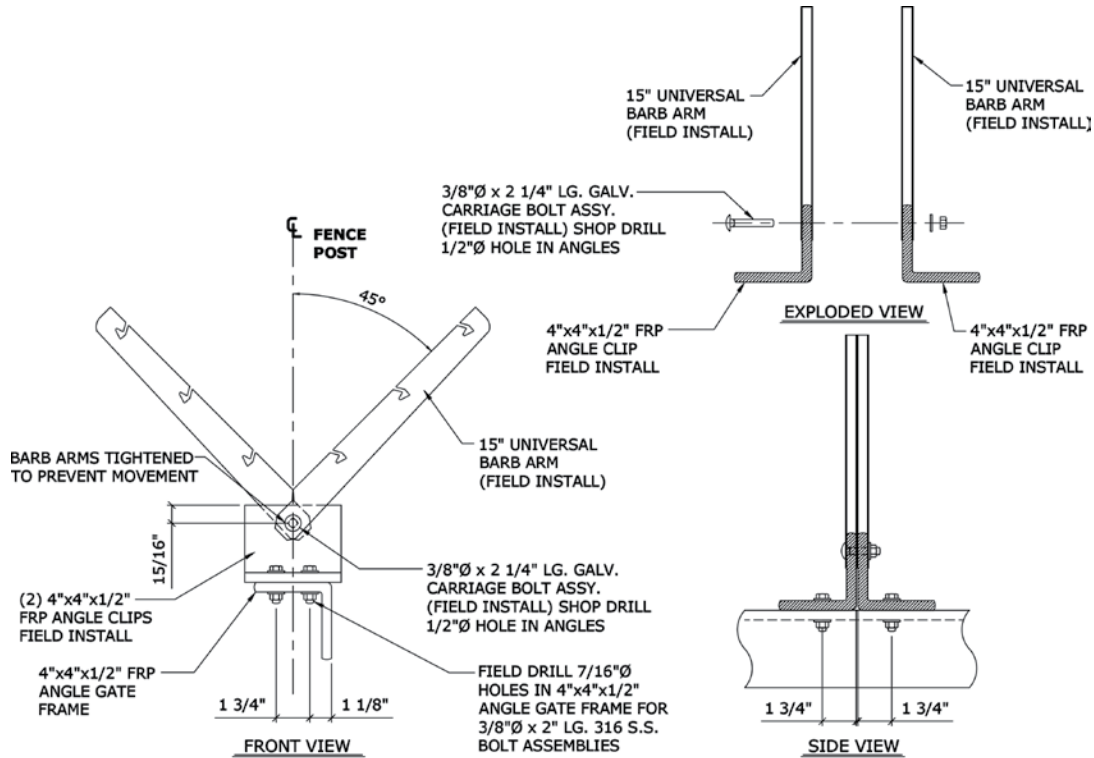
## DETAIL - 15" UNIVERSAL BARB ARM TO W6 FENCE POST

Shown with: 6 x 6 x 1/4" FRP Wide Flange



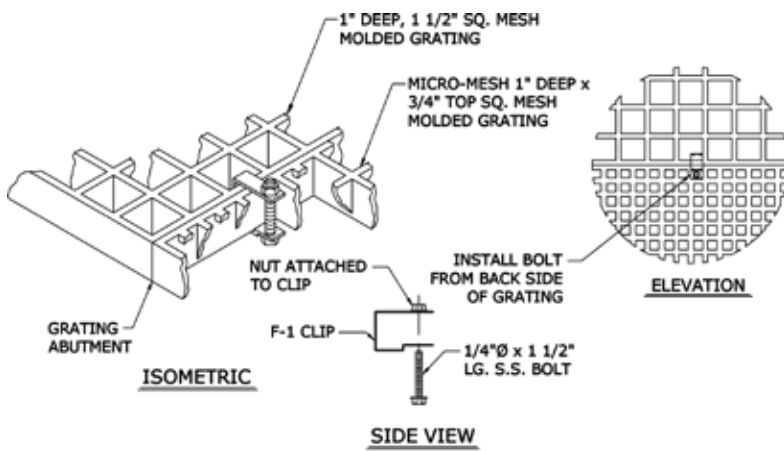
# ENC Fencing Installation Guide

## DETAIL - 15" UNIVERSAL BARB ARM CONNECTION AT TOP OF GATE

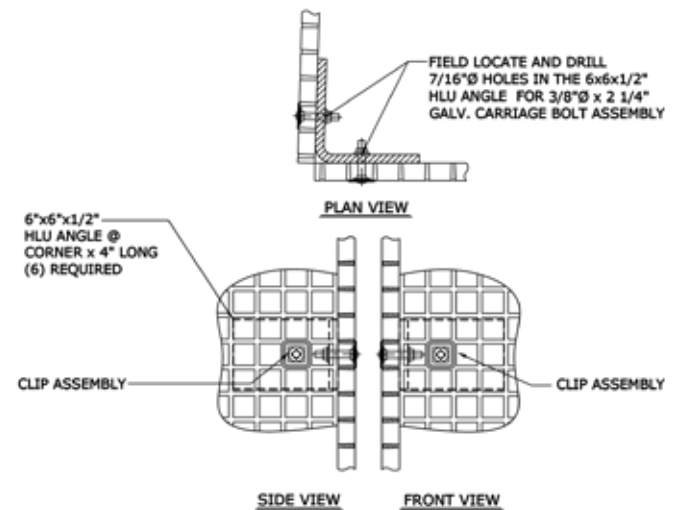


## F-1 PANEL ABUTMENT CLIP

Shown with 1" Deep, 1-1/2" Square Mesh Molded Fence Panel & 1" Deep Micro-Mesh Panel

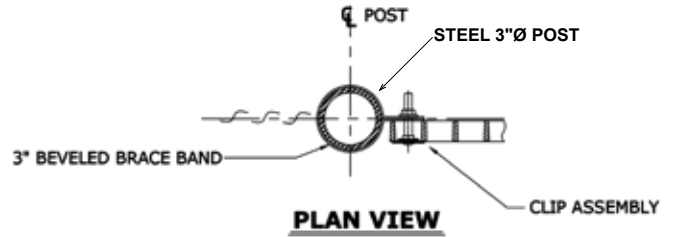


## CORNER CONNECTION WITH 6" X 6" X 1/2" NON-90° ANGLE CLIPS

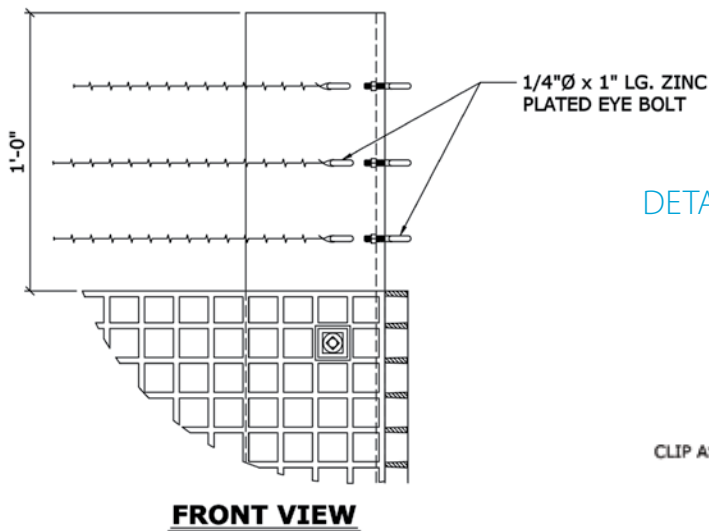
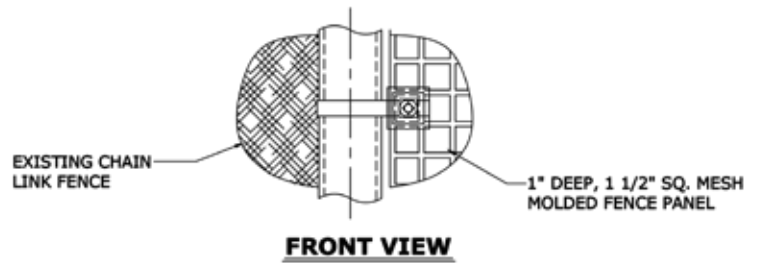
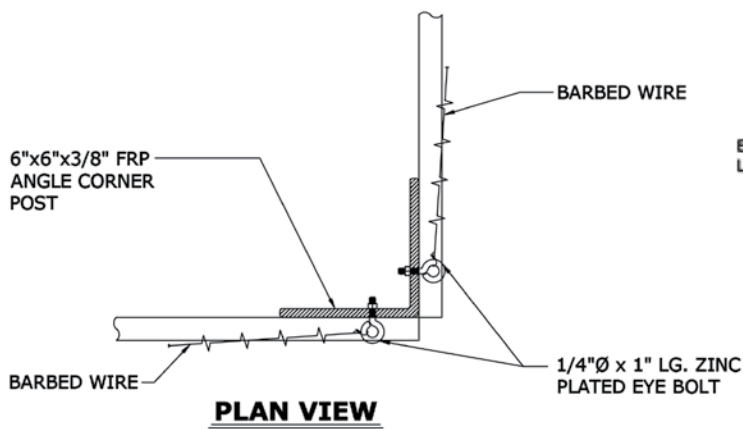


# ENC Fencing Installation Guide

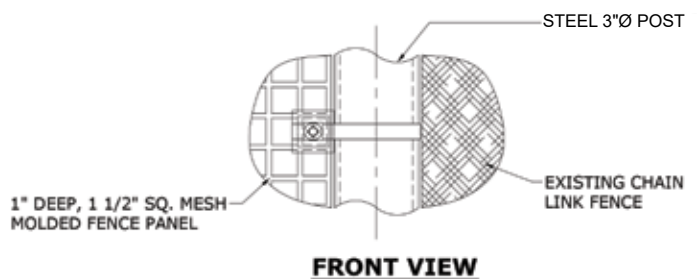
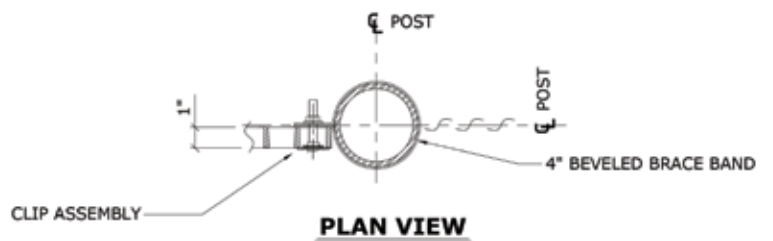
## DETAIL - CONNECTION TO STEEL 3"Ø POST



## DETAIL - BARBED WIRE AT 6" ANGLE CORNER COLUMN



## DETAIL - CONNECTION TO STEEL 4"Ø POST



# ENC Fencing Installation Guide

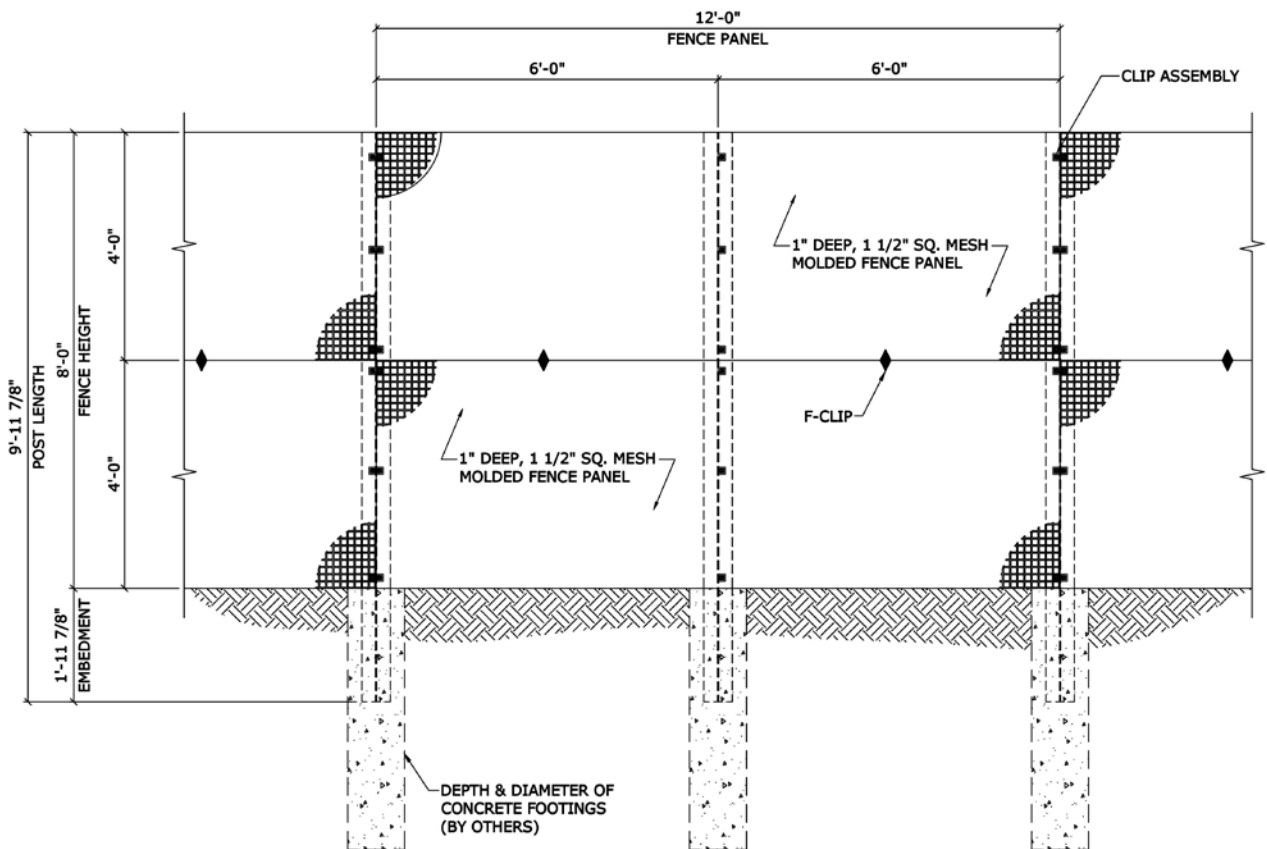
## STANDARD CONSTRUCTION ELEVATIONS

FENCE HEIGHT	FRP POST SELECTION						
	WIND SPEED (MPH)						
	90	100	110	120	130	140	150
8 FT	W6	W6	W6	W6A	W6A	W8	W8
10 FT	W6A	W8	W8	W8	W8	W8A	W8A

Design based on ASCE7-16 using Exposure C, and Category III  
 Maximum post spacing: 6 ft  
 Maximum post deflection: H/60

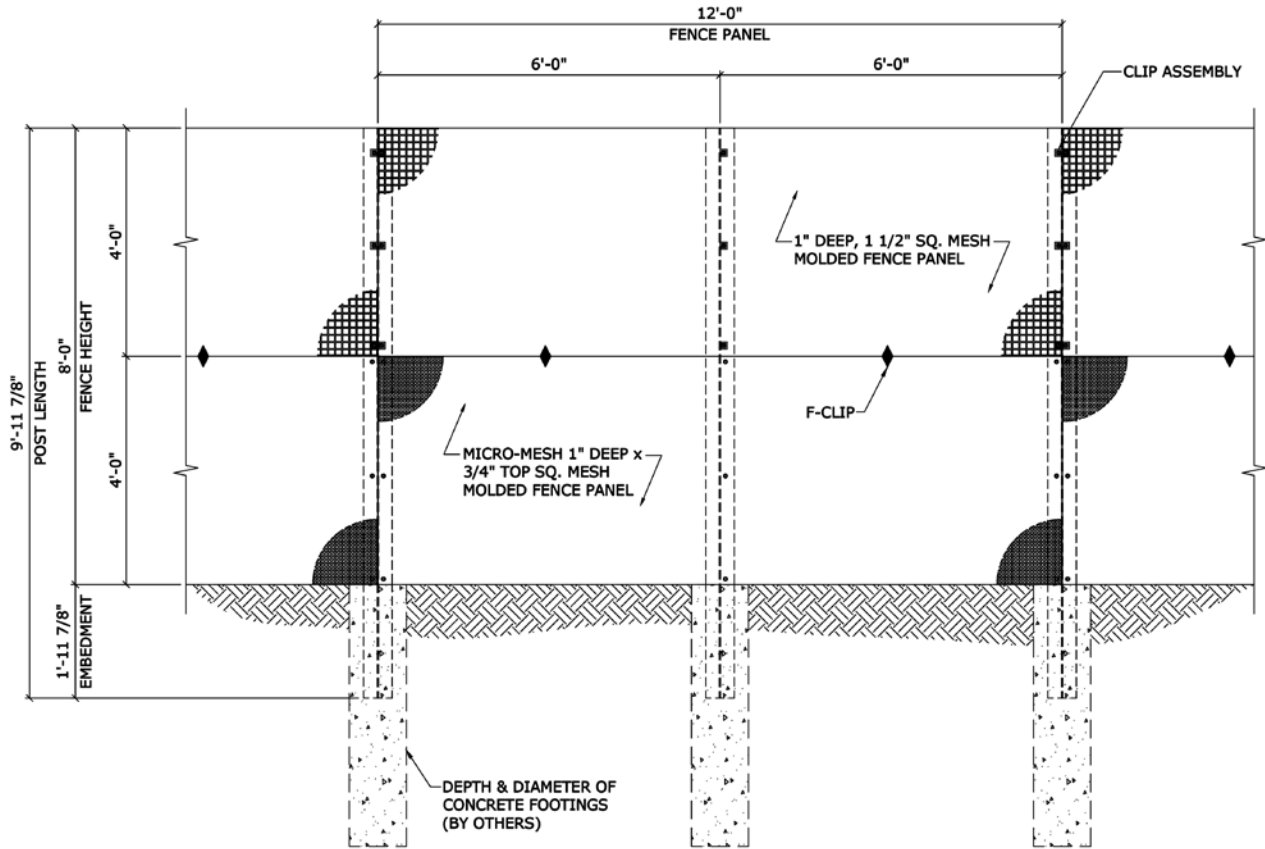
- W6 = WF6x6x1/4"
- W6A = WF6x6x3/8"
- W8 = WF8x8x3/8"
- W8A = WF8x8x1/2"

### FENCE ELEVATION, 8' HEIGHT, 2' EMBED, 1" DEEP 1.5" SQUARE MESH BOTH PANELS

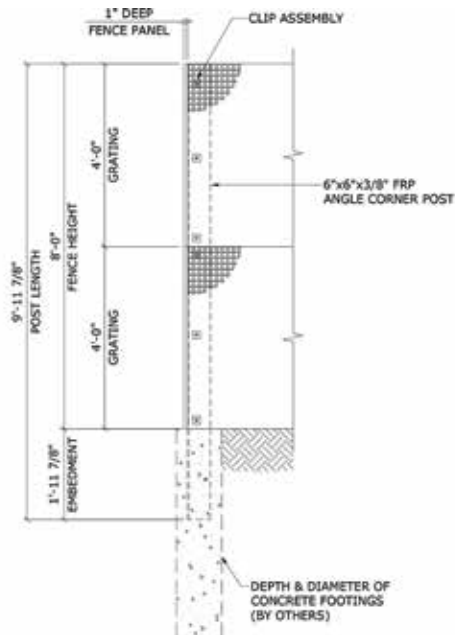


# ENC Fencing Installation Guide

FENCE ELEVATION, 8' HEIGHT, 2' EMBED, 1" DEEP 1.5" SQUARE MESH UPPER PANEL/  
1" MICRO-MESH LOWER



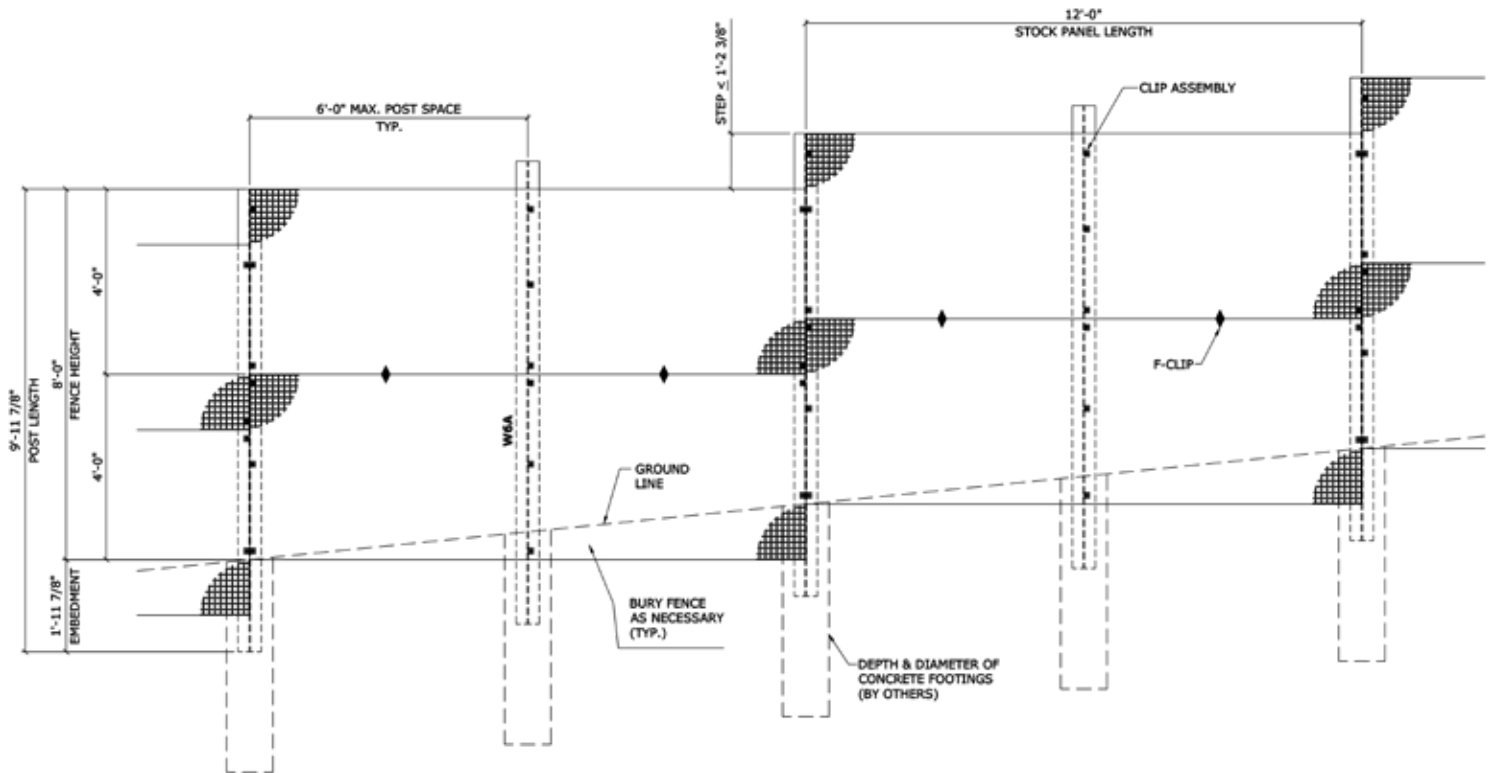
ELEVATION VIEW - 90 DEGREE CORNER WITH 6" X 6" X 3/8" FRP ANGLE POST





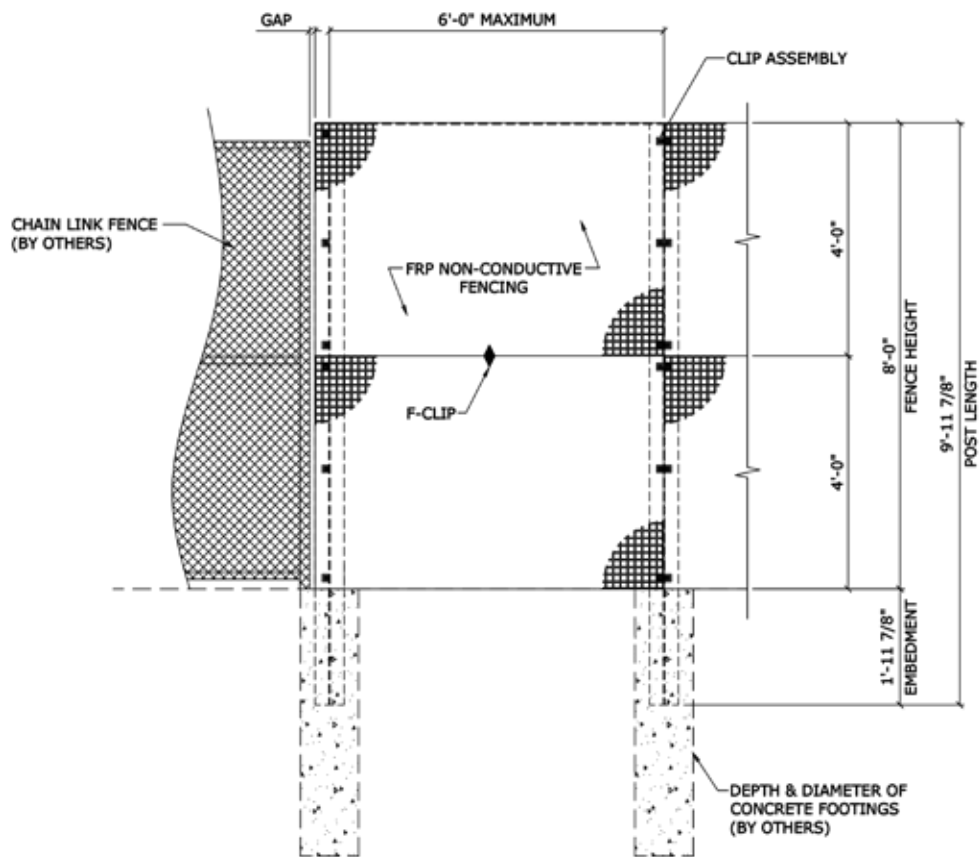
# ENC Fencing Installation Guide

## EXAMPLE FENCE ELEVATION SHOWING METHODS TO 'STAIR STEP' PANELS ON SLOPED INSTALLATIONS

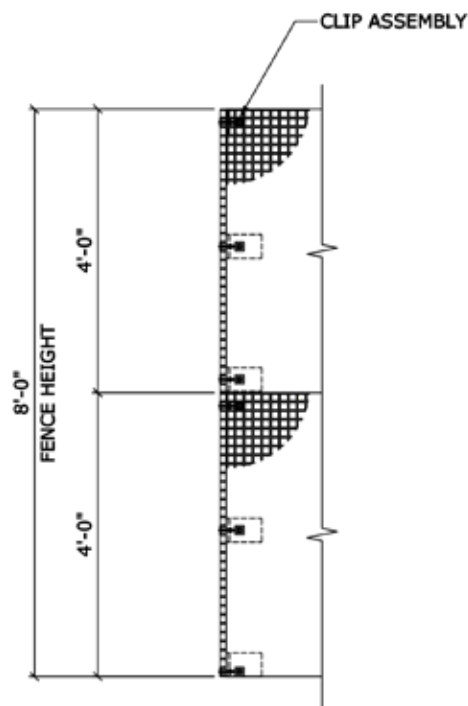


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## ELEVATION VIEW - NON-CONDUCTIVE FENCE TO CHAIN LENGTH FENCE WITH GAP

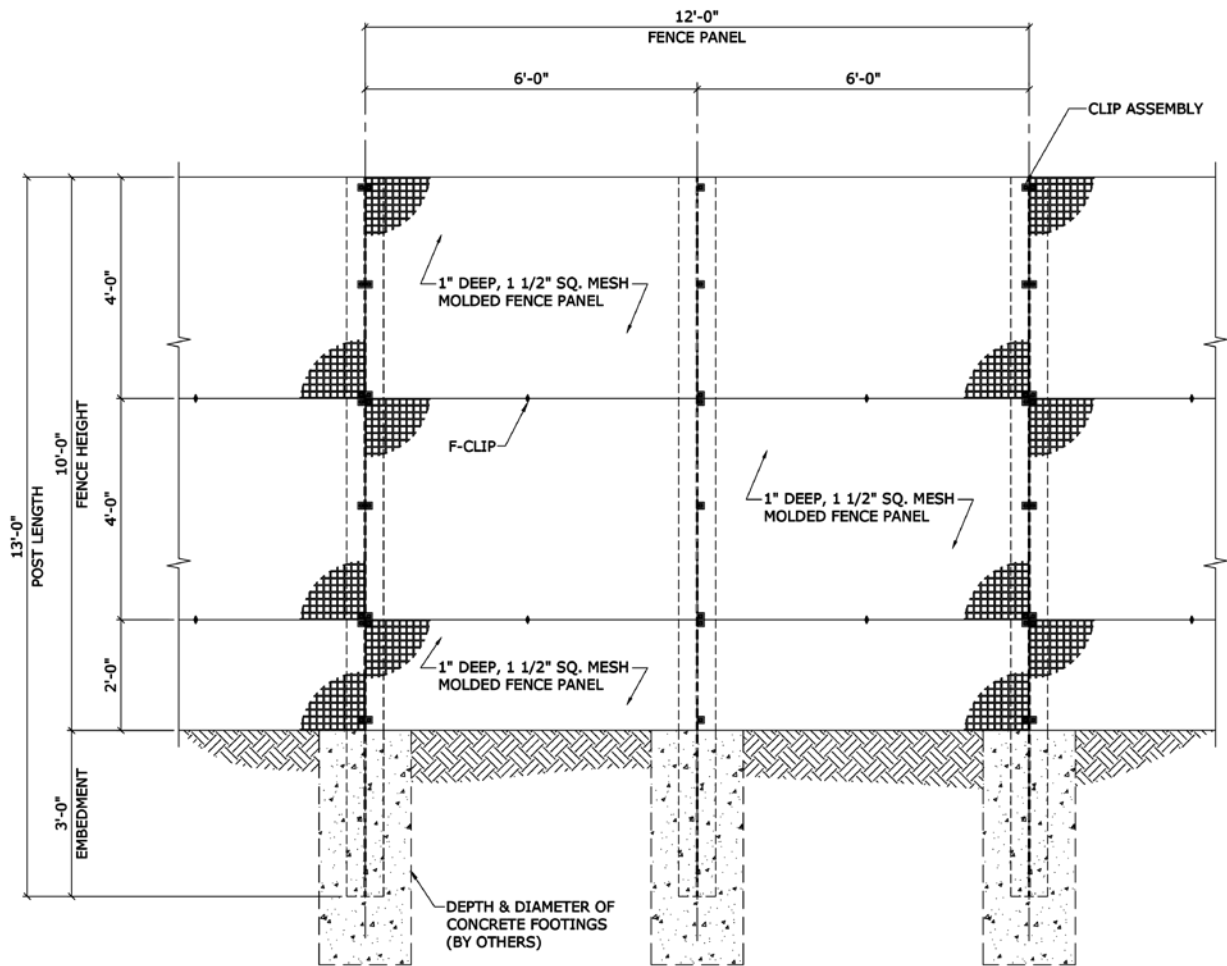


## ELEVATION VIEW - NON 90 DEGREE CORNER WITH 6" X 6" X 1/2" HLU ANGLE CLIPS



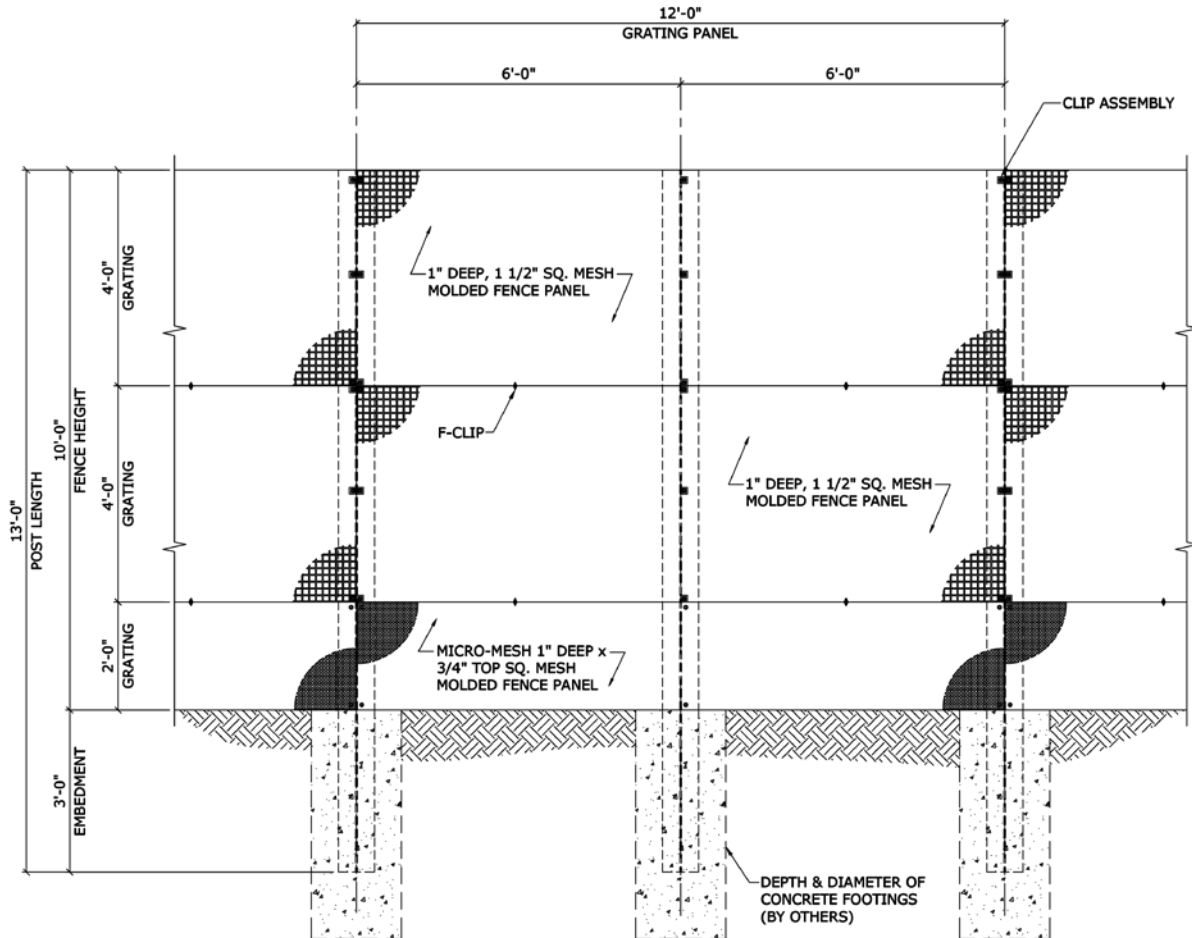
# ENC Fencing Installation Guide

FENCE ELEVATION, 10' HEIGHT, 3' EMBED, 1" DEEP 1.5" SQUARE MESH ALL PANELS

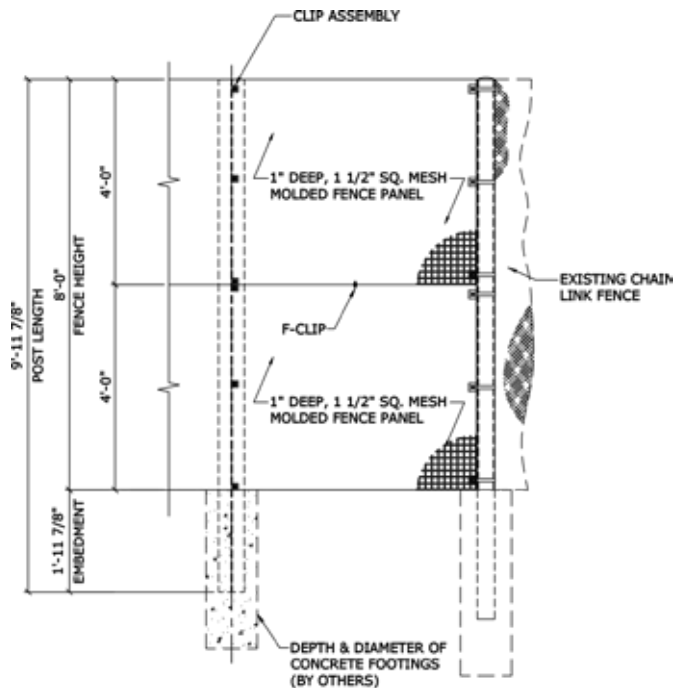


# ENC Fencing Installation Guide

FENCE ELEVATION, 10' HEIGHT, 3' EMBED 1" DEEP 1.5" SQUARE MESH UPPER PANELS/  
1" MICRO-MESH LOWER

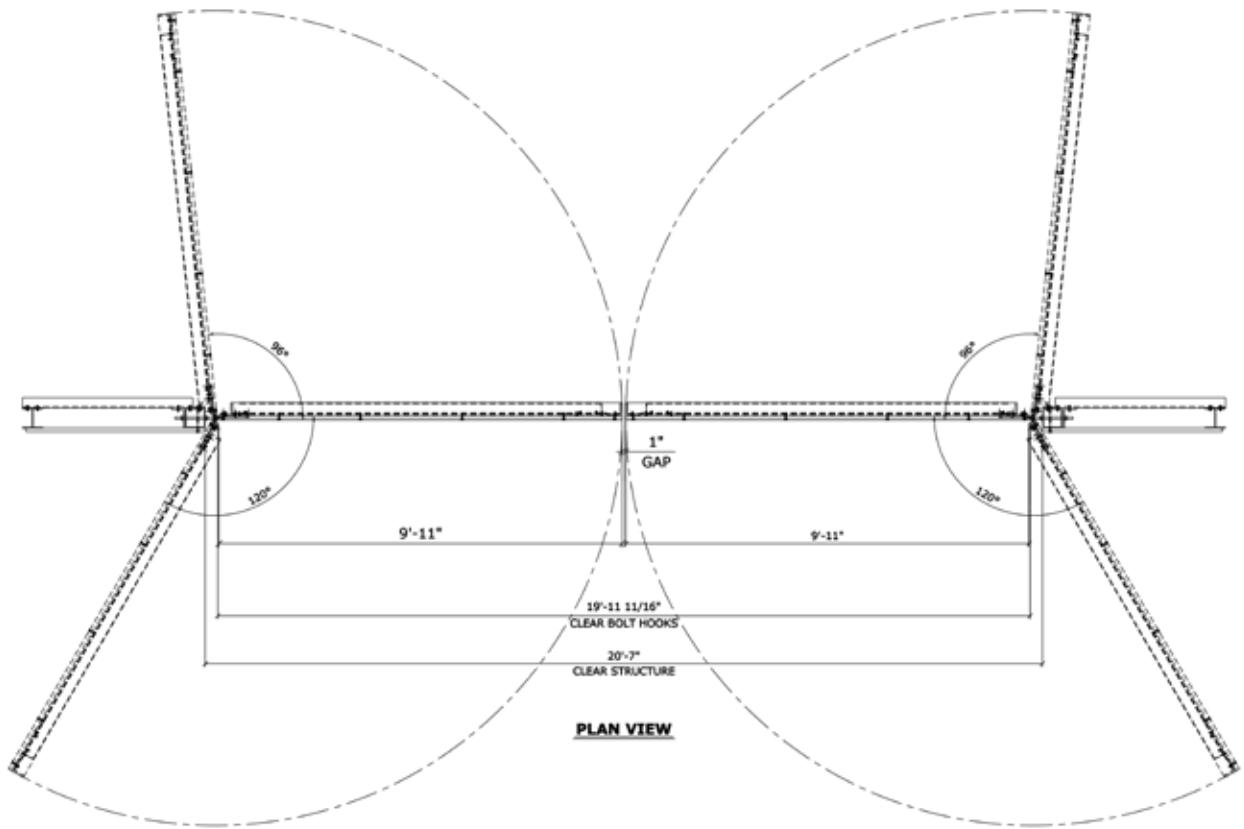


ELEVATION VIEW - NON-CONDUCTIVE FENCE TO CHAIN LENGTH FENCE CONNECTION



# ENC Fencing Installation Guide

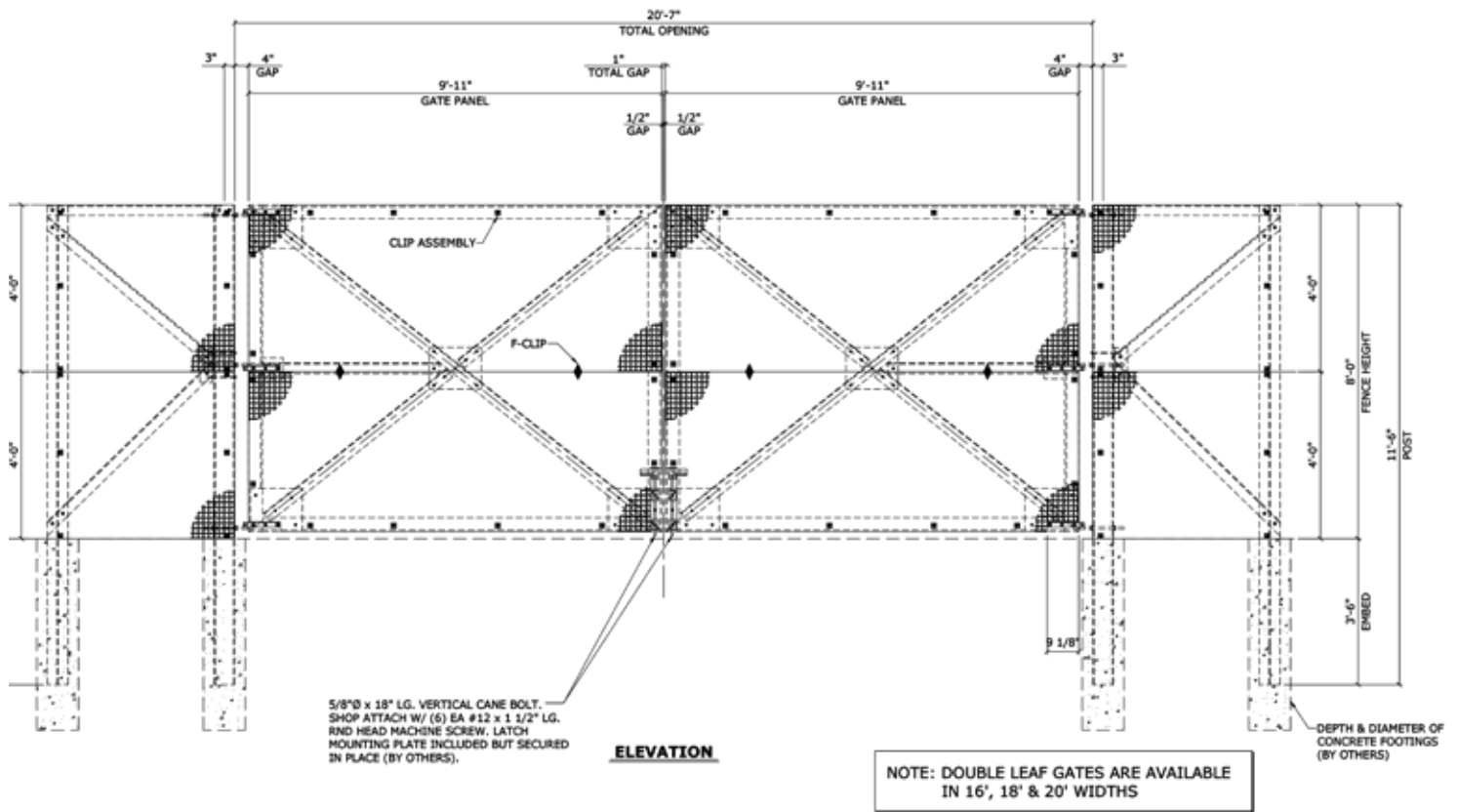
## PLAN VIEW - 20' DOUBLE LEAF FRP GATE



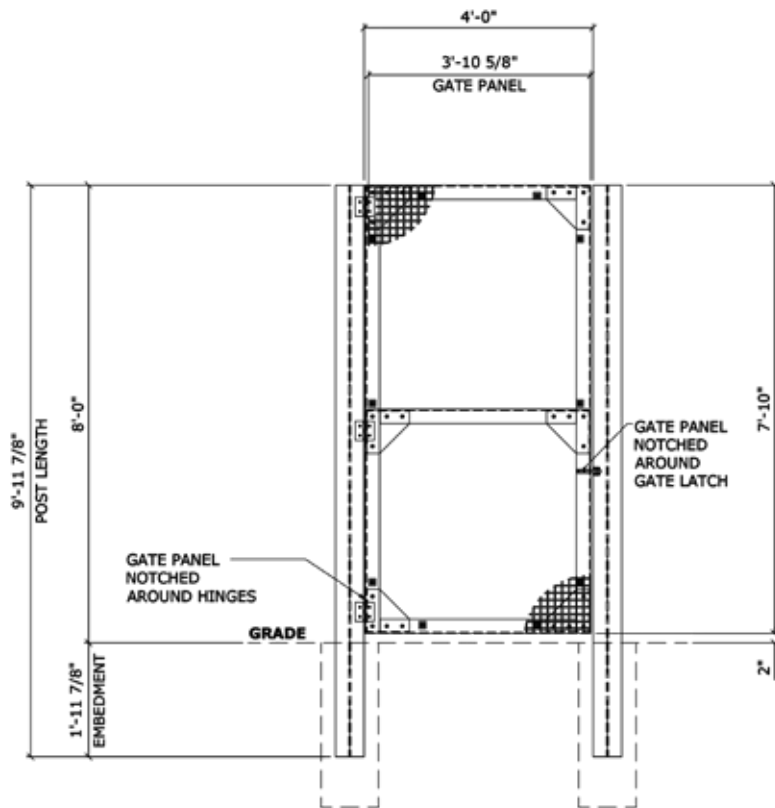


# ENC Fencing Installation Guide

## ELEVATION VIEW - 20' DOUBLE LEAF FRP GATE

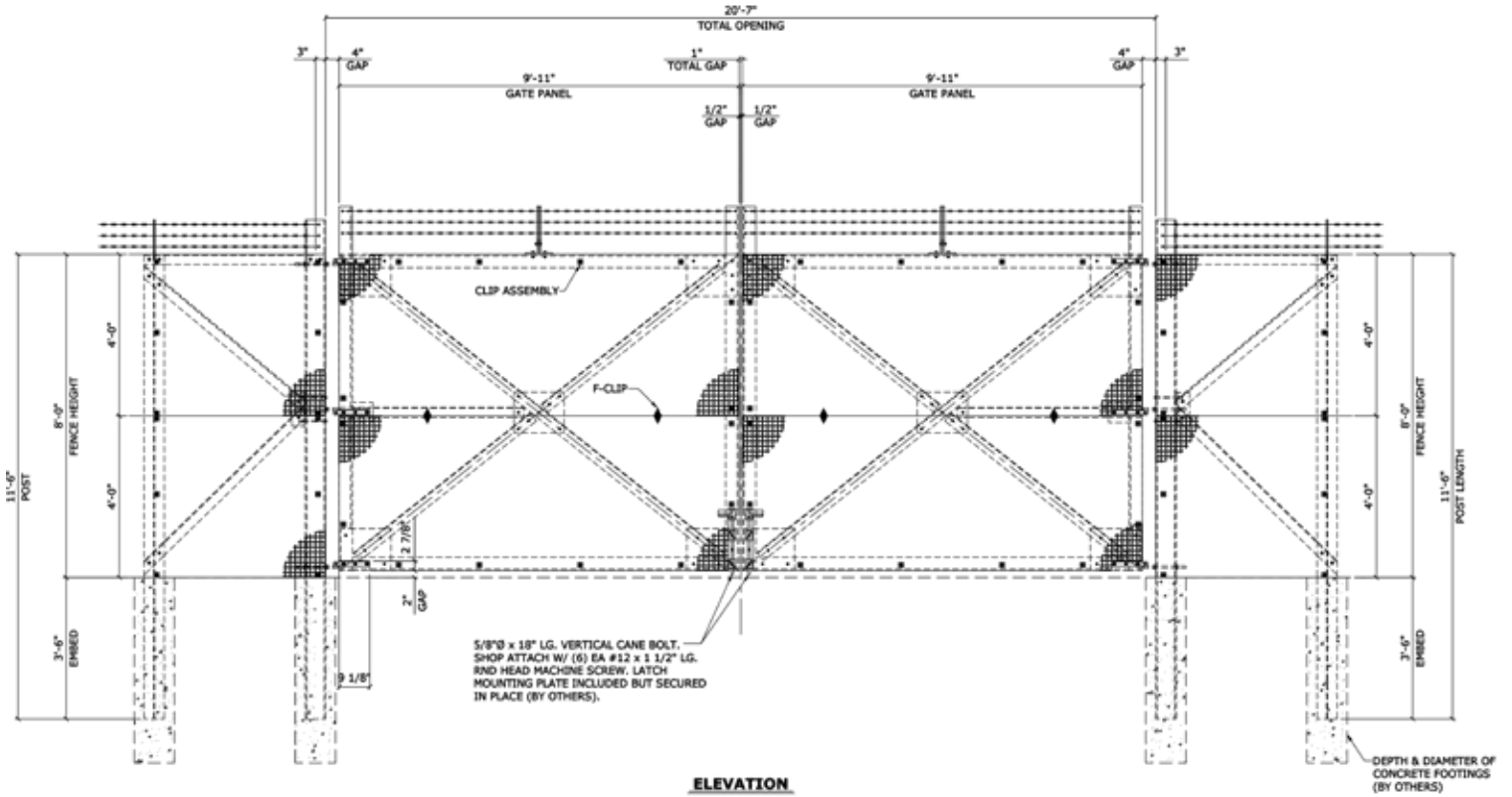


## ELEVATION VIEW - 4' PEDESTRIAN GATE



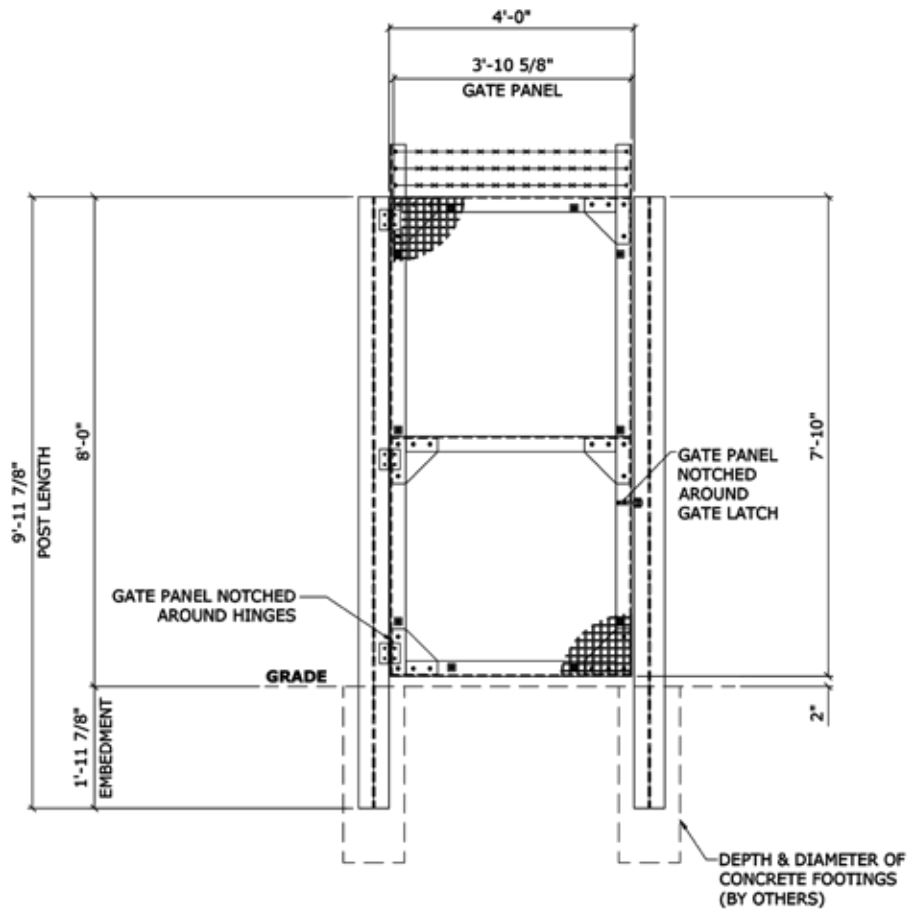
# ENC Fencing Installation Guide

## DETAIL - 20' DOUBLE LEAF FRP GATE W/ BARBED WIRE



# ENC Fencing Installation Guide

## ELEVATION VIEW - 4' PEDESTRIAN GATE WITH BARBED WIRE



# ENC Fencing Installation Guide

## ENGINEERING SPECIFICATION - FIBERGRATE® FRP FENCE SYSTEM

SECTION 32 31 32

### PART 1 GENERAL

#### 1.1 SCOPE OF WORK

This section to include the supply and installation of a fiberglass reinforced plastic (FRP) Fence System as shown on the Contract Drawings.

#### 1.2 REFERENCES

- A. The latest revision of the publications listed below form a part of this specification to the extent referenced herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:

ASTM D-149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

ASTM D-638 Tensile Properties of Plastics

ASTM D-696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics

ASTM D-790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D-2344 Short Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM D-2583 Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

ASTM F-711 – Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools (Ref for Test Apparatus Only)

#### 1.3 SUBMITTALS

- A. Submit shop drawings of the FRP Fence System clearly showing material sizes, types, styles, part or catalog numbers, and details. Shop drawings should include installation instructions for the system.
- B. Submit the manufacturer's published literature, certificates of compliance, and other information to support compliance with project requirements.
- C. If requested, submit sample pieces of each item specified herein for acceptance by the owner.

#### 1.4 QUALITY ASSURANCE

- A. All items to be provided under this Section shall be furnished manufacturers having a minimum of ten (10) years experience in the design and manufacture fiberglass reinforced plastic systems.
- B. Manufacturer shall offer a 3-year limited warranty on all FRP products against defects in materials and workmanship.
- C. To insure system integrity and compatibility, all fencing materials, including fence panels, posts, and gates shall come from a single source.
- D. Manufacturer shall be certified to the ISO 9001 standard.
- E. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (DNV, ABS, USCG, and AARR).
- F. Manufacturer shall provide proof, via independent testing less than six months old, which materials proposed as a

# ENC Fencing Installation Guide

## ENGINEERING SPECIFICATION - FIBERGRATE® FRP FENCE SYSTEM - *cont.*

solution, do not contain heavy metals in amounts greater than that allowed by current EPA requirements.

### 1.5 PRODUCT DELIVERY AND STORAGE

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer.
- B. Storage of Products: All materials shall be carefully handled to prevent damage. Materials shall be stored in such a manner to provide adequate drainage, ventilation and other weather-related damage.

## PART 2 PRODUCTS

### 2.1 MANUFACTURER

- A. FRP Fence System shall be Fibergrate® as manufactured by

**Fibergrate Composite Structures Inc.**

5151 Belt Line Road, Suite 1212

Dallas, Texas 75254-7028 USA

(800) 527 4043 (972) 250 1530 Fax

Website: fibergrate.com

E-mail: info@fibergrate.com

### 2.2 MOLDED FRP FENCE PANELS

- A. Fence panels shall be of a one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Panels shall have a square mesh pattern providing bidirectional strength. Panels shall be reinforced with continuous roving of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8" below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces.
- B. Percentage of glass shall not exceed 35% by weight to achieve maximum impact resistance.
- C. After molding, no dry glass fibers shall be visible on any surface. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.
- D. Grating bar intersections are to be filleted to a minimum radius of 1/16" to eliminate local stress concentrations and the possibility of resin cracking at these locations.
- E. Resin system: The resin system used in the manufacture of the fence panels shall be Corvex®. Color to be dark gray.
- F. Fence panels to be 1" deep, 1-1/2" x 1-1/2" square mesh or 1" deep, 3/4" x 3/4" Micro-Mesh®, with the load bars oriented parallel to the edges of the panels.
- G. All cut edges shall be sanded smooth and sealed according to the manufacturer's recommendations.
- H. 1" deep, 1-1/2" x 1-1/2" square mesh fence panels to be installed using 3/8" dia. ASTM A307 galvanized carriage bolts with 1.5" square x 0.060" thick 316 SS fitted washers. 1" deep, 3/4" x 3/4" Micro-Mesh® fence panels are to be installed with 3/8" dia. ASTM A307 galvanized carriage bolts fitted directly through the openings in the grating mesh. In all instances, the round head of the carriage bolt is to be fitted to the outside of the fence to prevent unauthorized disassembly.

### 2.3 PULTRUDED FRP LINE AND CORNER POSTS

- A. Line and corner posts are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.



# ENC Fencing Installation Guide

## ENGINEERING SPECIFICATION - FIBERGRATE® FRP FENCE SYSTEM - *cont.*

- B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.
- C. Post resin shall be DYNIFORM® ISO-FR, fire retardant isophthalic polyester with a tested flame spread rating of 25 or less per ASTM E 84 Tunnel Test. Line post color to be dark gray.
- D. All finished surfaces of FRP items and fabrications shall be smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.
- E. Line posts shall be 4" x 4" x 1/4" or 6" x 6" x 1/4" wide flange sections as specified on the project drawings.
- F. Corner Posts shall be 6" x 6" x 3/8" angles or as specified on the project drawings.
- G. Posts are to have the minimum longitudinal mechanical and physical properties as listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5 x 10 <sup>6</sup> (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8 x 10 <sup>6</sup> (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8 x 10 <sup>6</sup> (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5 x 10 <sup>5</sup> (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	4.4 x 10 <sup>-6</sup> (8.0 x 10 <sup>-6</sup> )	in/in/°F (cm/cm/°C)
Dielectric Strength (Lengthwise)	D-149	35	kV/inch
Dielectric Strength (Perpendicular to Face)	D-149	200	volts/mil
Flame Spread	E-84	25 or less	N/A

### 2.3 ELECTRICAL PERFORMANCE OF FRP MATERIALS

- A. 2-inch-wide x 72-inch-long strips of the line post and molded fence panels are to be tested using a the 'hot stick' test rack as described in ASTM D-711 with the electrodes set at 12 inches on center.
- B. In the dry condition, each sample must be capable of resisting a 95 kV potential with a current leakage of 2 milliamps or less.
- C. Testing as described above must be conducted on samples of materials of the same configuration and composition as those to be used in the fence. Testing is to be conducted at a N. A. I. L. (National Association of Independent Laboratories) lab accredited for testing high voltage personnel protective equipment.

### 2.4 PERSONNEL GATES

- A. Personnel gates are to be factory fabricated and assembled using the FRP fence panels listed above, 3" x 3" x 1/4" FRP angles, and 1/4" thick FRP plate gussets. Maximum personnel gate width is 4'-0".
- B. Personnel gate is to be mounted to the line post with three each 4" x 4" stainless steel surface mount hinges.
- C. Personnel gate is to be equipped with a stainless steel, lockable gate latch.

# ENC Fencing Installation Guide

## ENGINEERING SPECIFICATION - FIBERGRATE® FRP FENCE SYSTEM - *cont.*

### 2.5 VEHICULAR GATES

- A. Vehicular gates are to be factory fabricated and assembled using FRP fence panels and FRP structural shapes to conform to the design requirements of the project. Maximum two leaf gate width is 20'-0" supplied in two leaves of 10'-0" each.
- B. Both the active and inactive leaf is to be equipped with a 5/8" padlockable vertical cane bolt for fixing the gate in the closed position.
- C. The gate leaves are to be equipped with adjustable hinges to allow for adjustment of the gap between the leaves to eliminate the effects of soil settlement.
- D. Accommodation for locking the gate leaves together is to be provided as specified by the owner.

## PART 3 EXECUTION

### 3.1 INSPECTION

- A. The owner's representative shall field verify all site dimensions and conditions and verify that they match the shop drawings of the FRP fence.
- B. Shop inspection is authorized as required by the Owner and shall be at Owner's expense. If a shop inspection is required, the fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that an inspection may be conducted.

### 3.2 INSTALLATION

- A. The contractor shall install the FRP Fence system in accordance with manufacturer's installation drawings that have been released for construction.
- B. Erect the FRP Line Posts with the embedment as indicated on the installation drawings. Posts are to be installed plumb and at the spacing indicated on the drawings. For posts embedded in concrete, insure that concrete has come to sufficient cure before installing the fence panels.
- C. Erect the FRP Fence Panels following the installation drawings, field cutting the full-sized panels are required to fit the installation. Connect the FRP Fence Panels to the FRP Line Posts using the connection hardware provided following the details in the installation drawings.
- D. Erect the Personnel and Vehicular Gates as detailed on the installation drawings. Adjust hinges, latches, and cane bolts as required to achieve a free swinging, securely latching installation.

# ENC Fencing Installation Guide

## PROJECT PHOTOS





# ENC Fencing Installation Guide

## PROJECT PHOTOS



# Fibergrate Products & Services

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## Fibergrate® Molded Grating

Fibergrate® molded gratings are designed to provide the ultimate in reliable performance, even in the most demanding conditions. Fibergrate offers the widest selection in the market with multiple resins and more than twenty grating configurations available in many panel sizes and surfaces.



## Safe-T-Span® Pultruded Industrial & Pedestrian Gratings

Combining corrosion resistance, long-life and low maintenance, Safe-T-Span® provides unidirectional strength for industrial and pedestrian pultruded grating applications.



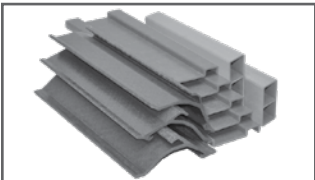
## Dynaform® Structural Shapes

Fibergrate offers a wide range of standard Dynaform® pultruded structural profiles for industrial and commercial use, including I-beams, wide flange beams, round and square tubes, bars, rods, channels, leg angles and plate.



## Dynarail® & DynaRound™ Guardrail, Handrail & Ladders

Easily assembled from durable components or engineered and prefabricated to your specifications, Dynarail® square tube and DynaRound™ round tube railing systems and Dynarail® safety ladder systems meet or exceed OSHA and strict building code requirements for safety and design.



## Custom Composite Solutions

Combining Fibergrate's design, manufacturing and fabrication services allows Fibergrate to offer custom composite solutions to meet our client's specific requirements. Either through unique pultruded profiles or custom open molding, Fibergrate can help bring your vision to reality.



## Design & Fabrication Services

Combining engineering expertise with an understanding of fiberglass applications, Fibergrate provides turnkey design and fabrication of fiberglass structures, including platforms, catwalks, stairways, railings and equipment support structures.



## Worldwide Sales & Distribution Network

Whether a customer requires a platform in a mine in South Africa to grating on an oil rig in the North Sea, or walkways in a Wisconsin cheese plant to railings at a water treatment facility in Brazil; Fibergrate has sales and service locations throughout the world to meet the needs and exceed the expectations of any customer.

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