PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 FABRIC

A. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one piece fabric widths for fencing up to 12 feet high. Wire size includes zinc or aluminum coating.

1. Size: 2 inch mesh, 9 gage (0.148 inch diameter) wire or thicker.

2. Polyvinyl Chloride (PVC) Finish (Preferred Finish): Comply with ASTM F 668, with core wire diameter (gage) measured prior to application of PVC coating with not less than 0.40 oz. zinc per sq. ft. of uncoated surface on 6 gage wire and not less than 0.30 oz. zinc per sq. ft. of uncoated surface on 9 and 11 gage wire. Color selected by the Owner from manufacturer's standard colors available.

   a. Finish to be Class 2b thermally fused and bonded.

3. Galvanized Steel Finish (only acceptable when out of public view, or for agricultural use): ASTM A 392, Class 2, with not less than 2.0 oz. zinc per sq. ft. of uncoated wire surface on wire coated before weaving or not less than 2.0 oz. zinc per sq. ft. of uncoated wire surface on wire of fabric coated after weaving as determined from the average of two or more samples and not less than 1.8 oz. zinc per sq. ft. of uncoated wire surface for any individual sample.

B. Top edge of fabric shall be twisted and barbed on 6 foot or greater height fencing and shall be knuckled salvage on 4 foot fencing.

C. Bottom edge of all fencing shall be twisted and barbed.

2.2 FRAMING

A. Steel Framework, General: Posts, rails, braces, and gate frames.

1. Type I Pipe: Hot dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.

2. Type II Pipe: Manufactured from steel conforming to ASTM A 569 or A 446, grade D, cold formed, electric welded with minimum yield strength of 50,000 psi and triple coated with minimum 0.9 oz. zinc per sq. ft. after welding, a chromate conversion coating and a clear polymer overcoat. Corrosion protection on inside surfaces shall protect the metal from corrosion when subjected to the salt spray test of ASTM B 117 for 300 hours with the end point of 5 percent Red Rust.
3. **C Section:** Rolled form steel shapes conforming to ASTM F 669, group II produced from steel conforming to A 446, grade D, or ASTM A 570, grade 45, cold formed, hot dip galvanized with minimum 2.0 oz. zinc per sq. ft. of surface area conforming to ASTM A 123 or ASTM A 525; or 5 percent aluminum mischmetal coated with minimum 1.0 oz. coating per sq. ft. of surface area each side conforming to ASTM A 875.

4. **H Section:** Hot rolled steel H shape with minimum yield strength of 45,000 psi conforming to ASTM F 669, group III and hot dip galvanized with minimum 2.0 oz. zinc per sq. ft. of surface area conforming to ASTM A 123.

5. **Round Tubing:** Fabricated from steel conforming to ASTM A 500, grade B and hot dip galvanized with minimum 2.0 oz. zinc per sq. ft. of surface area conforming to ASTM A 123.

6. **Polyvinyl Chloride (PVC) Finish:** Provide framework, fittings, and accessories with manufacturer's standard polyvinyl chloride (PVC) plastic resin finish Class 2b thermally bonded and adhered to a cured primer applied over zinc coated steel, not less than 10 mils (0.010 inch) thick. Color to match chain link fabric.

**B.** End, corner, and pull posts for following fabric heights:

1. Up to 6 feet: 2.375 inch OD Type I or II steel pipe, 2 inch dia. galvanized steel tubing weighing 2.60 lb. per lin. ft., or 3.5 inch by 3.5 inch roll formed sections weighing 4.85 lb. per lin. ft.

2. Over 6 feet: 2.875 inch OD Type I or II steel pipe, 2.50 inch dia. steel tubing weighing 5.10 lbs. per lin. ft., or 3.5 inch by 3.5 inch roll formed sections weighing 4.85 lbs. per lin. ft.

**C.** Line or intermediate posts for following fabric heights:

1. Up to 6 feet: 1.90 inch OD Type I or II steel pipe, 1.875 inch by 1.625 inch C section weighing 2.28 lb. per lin. ft., or 2.25 inch x 1.70 inch galvanized steel H section weighing 3.26 lb. per lin. ft.

2. Over 6 feet: 2.375 inch OD Type I or II steel pipe, 2.25 inch by 1.70 inch C section weighing 2.70 lbs. per lin. ft., or 2.25 inch by 1.70 inch galvanized steel H section weighing 3.26 lb. per lin. ft.

**D.** Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

1. Up to 6 feet: 2.875 inch OD Type I or II steel pipe, 2.50 inch dia. galvanized steel tubing weighing 5.10 lbs. per lin. ft., or 3.5 inch x 3.5 inch roll formed sections weighing 4.85 lbs. per lin. ft.

2. Over 6 feet to 13 feet: 4.00 inch OD Type I or II steel pipe.

3. Over 13 feet to 18 feet: 6.625 inch OD Type I steel pipe.

4. Over 18 feet: 8.625 inch OD Type I steel pipe.

**E.** Top Rail: Manufacturer's longest lengths, with expansion type couplings, approximately 6 inches long, for each joint. Provide means for attaching top rail securely to each gate corner, pull, and end post.
1. Galvanized Steel: 1.25 inch NPS (1.66 inch OD) Type I or II steel pipe or 1.625 inch by 1.25 inch roll formed C sections weighing 1.35 lb. per ft.

2.3 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Mill finished aluminum or galvanized iron or steel, to suit manufacturer's standards.

1. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights per Table I.

B. Tension Wire: 0.177 inch diameter metallic coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.

1. Type II Zinc Coated in following class:
   a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.

C. Tie Wires: 12 gage (0.106 inch diameter) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating of surface area in accordance with ASTM A 641, Class 3 or 9 gage (0.106 inch diameter) aluminum wire alloy 1100 H14 or equal, to match fabric core material.

D. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 3/8 inch diameter rod and adjustable tightener. Provide manufacturer's standard galvanized steel or cast iron or cast aluminum cap for each end.

E. Bottom and Center Rail: Same material as top rail. Provide manufacturer's standard galvanized steel or cast iron or cast aluminum cap for each end.

F. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.

G. Tension or Stretcher Bars: Hot dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross section of 3/16 inch by 3/4 inch and minimum 1.2 oz. zinc coating per sq. ft. of surface area. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

H. Tension and Brace Bands: Minimum 3/4 inch wide hot dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.

1. Tension Bands: Minimum 14 gage (0.074 inch) thick.

2. Tension and Brace Bands: Minimum 12 gage (0.105 inch) thick.

I. Barbed Wire Supporting Arms: Manufacturer's standard barbed wire supporting arms conforming to ASTM F 626, metal and finish to match fence framework, with provision for anchorage to posts and attaching three rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap and must be capable of withstanding 250 lb. downward pull at outermost end. Provide following type:

1. Single vertical arm for three strands barbed wire, one for each post.

2. Single 45 degree arm for three strands barbed wire, one for each post.
3. Vee type with two arms at 45 degrees to vertical, one for each post.

4. Inverted Vee type with two cross braced arms at 45 degrees to vertical, one set for each post.

J. Steel Barbed Wire: Two strand, 12 1/2 gage steel wire with 14 gage, 4 point barbs spaced not more than 5 inches on center; metallic coated finish to match fabric.


K. Barbed Tape: Continuous helical coils of barbed stainless steel tape, fabricated from ANSI 430 stainless steel hardened to Rockwell (30N) 40 45, 0.025 inch thick by 1 inch wide prior to fabrication with 4 needle sharp barbs not less than 1.25 inch long in clusters on 4 inch centers and permanently cold clenched to a minimum of 230 degrees around a 0.098 inch diameter core wire of high tensile zinc coated steel conforming to ASTM A 764 or stainless steel conforming to ASTM A 478. Clip adjacent loops together with 0.065 inch thick by 0.375 inch wide stainless clips capable of withstanding a minimum 150 lb pull load to limit extension of coil, resulting in a concertina effect when deployed. Provide coil diameter, type, and configuration as indicated; if not otherwise indicated, provide 24 inch diameter, single concertina type coil.

L. Concrete: Provide concrete consisting of Portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 2500 psi. Use at least 4 sacks of cement per cu. yd., 1 inch maximum size aggregate, maximum 3 inch slump, and 2 to 4 percent entrained air.

2.4 GATES

A. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8 feet apart unless otherwise indicated.

   1. Provide same fabric as for fence unless otherwise indicated. Install fabric with tension bars and bands at vertical edges and at top and bottom edges.

   2. Install diagonal cross bracing consisting of 3/8 inch diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

   3. Where barbed wire is indicated above gates, extend end members of gate frames 12 inches above top member and prepare to receive 3 strands of wire. Provide necessary clips for securing wire to extensions.

B. Swing Gates: Comply with ASTM F 900.

   1. Steel:

      a. Up to 6 feet High and 8 feet Wide: Fabricate perimeter frames of minimum 1.660 inch OD Type I or II steel pipe or 1.50 inch dia. galvanized steel tubing weighing 1.90 lb per square feet.

      b. Over 6 feet High and 8 Feet Wide: Fabricate perimeter frames of minimum 1.90 inch OD Type I or II steel pipe or 2.00 inch dia. galvanized steel tubing weighing 2.60 lb per square feet.

      c. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
1) Hinges: Size and material to suit gate size, non lift off type, offset to permit 180 deg gate opening. Provide 1 1/2 pair of hinges for each leaf over 6 foot nominal height.

2) Latch: Forked type or plunger bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

3) Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

4) Gate Stops: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

C. Sliding Gates: Comply with ASTM F 1184.

1. Type I, Overhead Slide: Provide manufacturer’s standard heavy duty inverted channel track, ball bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.

2. Type II, Cantilever: Provide manufacturer’s standard top rail incorporating track for top roller and guide posts to keep gate on rollers. External rollers shall have accessible grease fittings, and internal rollers shall have sealed lubricant ball bearings. Brace frame to prevent sagging and apply fabric to entire gate. Provide lockable positive latch and other hardware and accessories as required.

PART 3 - EXECUTION

END OF SECTION 32 31 13

This section of the U of I Facilities Standards establishes minimum requirements only. It should not be used as a complete specification.