

02830 CHAIN LINK FENCES AND GATES

Specifier: This section does not include fabric screens attached to some chain link fences at locations such as tennis courts. Any kind of permanent screen added to a chain link fence should be analyzed by a structural engineer so that breakaway in 70 mph winds can be ensured (and increased post sizes specified as needed).

However, plastic slats, as sometimes inserted in chain link fabric to screen mechanical equipment, can be specified here.

Only protective bollards that are within 10 ft of a chain link fence are specified here. Other bollards around the site are specified in 05500.

Do not design chain link fences with barbed wire except when needed in agriculture education facilities.

Their use otherwise is prohibited by FBC / SREF.

For those rare instances in which a horizontal rolling gate is needed, a skeleton article has been included to help the Specifier get started in specifying the type that is wanted.

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Coordinate chain link fence & gate work with work before and after. See especially:
 - 1. Bollards on worksite that are more than 10 ft from fence.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM): Specifications for
 - 1. A121 - Metallic-Coated Carbon Steel Barbed Wire.
 - 2. A123A - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. A392 - Zinc-Coated Steel Chain Link Fence Fabric.
 - 4. A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 5. A817 - Metal-Coated Steel Wire for Chain Link Fence Fabric & Tension Wire.
 - 6. A824 - Metal-Coated Steel Marcellled Tension Wire for Chain Link Fence.
 - 7. C94 - Ready-Mix Concrete.
 - 8. F567 - Standard Practice for Installation of Chain Link Fence.
 - 9. F626 - Fence Fittings.
 - 10. F1043 - Strength & Protective Coatings on Steel Chain Link Fence Framework.
 - 11. F1083 - Pipe, Steel, Hot Dip Zinc-Coated, Welded, for Fence Structures.
 - 12. F1184 - Industrial and Commercial Horizontal Slide Gates.
- B. American Society of Mechanical Engineers (ASME) / American National Standards Institute (ANSI) joint standard:
 - 1. B36.10 Welded and Seamless Wrought Steel Pipe.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Chain link fence and components, including producer's installation instructions.

2. Schedule of treatment, primer and enamel for painting bollards as selected from the MDCPS Paints approved list.
3. Draft of Special Warranty from chain link fence & gates producer to Board.

B. Shop Drawings:

1. Layout and details of corner, end post, gate, gate post, and baffle construction, including types and sizes of members, fabric, fastenings and fittings.
2. Show gate leaf sizes and bracing, gate swings, which items of hardware are welded to gate leaves in shop, and the location of keepers and stops at end of swing.
3. Show closer spacing of posts where narrower bays are needed to keep sloping bottom rails close to sloping grades.
4. Identify any bays where tension wire has been approved by A/E.
5. Show the location of items of bollard-protected equipment that are within 10 ft of the new chain link fence; then show site-specific bollard quantities and locations. When approved, this establishes the initial quantity of bollards to be provided.

SPECIFIER: Delete the following item unless specifically required by a project specific M-DCPS Educational Program.

C. Samples:

1. Colored powder-coated chain link fabric, in colors selected by A/E.

1.4 SECURITY

A. Maintain the worksite in secure condition as follows:

1. At the beginning of each workday, remove temporary fence, barricades, and other security items from that portion of the worksite perimeter where the new permanent chain link fence work will be done that day.
2. Before the end of each workday, protect the entire facility using temporary chain link fence or plastic mesh barricades that surround safety hazards and create a continuous worksite fence perimeter at least 6 ft high.
3. When a continuous temporary perimeter fence cannot be provided during installation of new fence, provide the services of a licensed security guard to the extent directed by the Board until the security of a full perimeter fence is restored.

1.5 SPECIAL WARRANTIES

A. Chain Link Fence Assembly – Material Only:

1. Scope of Special Warranty: Replace defective galvanized steel items within the chain link fence and gates assembly, such as posts, rails, braces, fittings, fabric, fasteners, hardware, and accessories.
 - a. “Defective”: Galvanized steel items in the assembly that develop red rust over more than 5% of its surface during warranty period.
 - b. The chain link fence manufacturer shall be named as the entity issuing the limited warranty in the interest of Miami-Dade County Public Schools.

- c. In satisfying the warranty the manufacturer shall provide material replacing rusted components, without paying for delivery, tax, or the labor of removing/replacing.
2. Special Warranty period / duration: From date of Substantial Completion of the Work until 12 years after that date.

SPECIFIER: Delete the following warranty unless this finish has actually been specified.

B. Chain Link Fence Fabric and Posts with Color Powder-coat Finish.

1. Scope of Special Warranty: Replace chain link fence and gate fabric and posts with defective color powdercoat.
 - a. "Defective": Any galvanized steel fabric and posts that develop red rust over more than 5% of their surface during warranty period.
 - b. The assembly's manufacturer shall be named as the entity issuing the limited warranty in the interest of the Board.
 - c. In satisfying the warranty the manufacturer shall provide material replacing rusted components, without paying for delivery, tax, or the labor of removing/replacing.
2. Special Warranty period / duration: From date of Substantial Completion of the Work until 12 years after that date.

PART 2 PRODUCTS

2.1 CHAIN LINK FENCE AND GATES

A. Description:

1. Fence and baffles: Steel chain link fabric on galvanized steel pipe posts, with other steel pipe framing, such as rails and bracing, with wires and fastenings and steel or iron fittings, all items galvanized.
2. Gates: Steel chain link fabric on welded steel pipe frames and bracing, with fastenings and steel hardware, all items galvanized.
3. Bollards associated with fence work: Concrete filled galvanized pipe, painted, with concrete foundations. Other bollards are specified in 05500.
4. Chain link fence and gate work also includes, only when and to the extent shown in the Construction Documents, such items as colored chain link fence fabric, colored slats, barbed wire, and horizontal slide gates.

2.2 TEMPORARY FENCING

- A. Posts and Bracing:** At least NPS 1-1/2 line and NPS 2-1/2 end / corner / pull / gate posts, non-corroding, driven in compacted soil sufficient to hold fence in place against fabric-stretching and wind forces, with rails and bracing.

1. Provide the posts and their bracing in quantity and spacing as needed to secure the site against unauthorized entry during construction.
 2. Where soil does not keep posts vertical under forced entry, rain softening, or wind loads on fence, set posts in concrete footings.
- B. Fabric: Non-corroding fabric with knuckled edges: 6 ft x 2 in. mesh x 11 ga (0.120 in. diameter) wire or heavier. Tie fabric to posts, bracing and rails so that fabric is within 2 in. of ground, using galvanized steel ties.
- C. Gates: Provide 6 ft. high, lockable, non-sagging gates in quantity and width as needed to give access to the site by authorized users.

2.3 CHAIN LINK FABRIC

- A. Description: Hot dip galvanized after weaving (GAW) steel chain link fabric.
1. Do not use: Aluminum, aluminum alloy wire, or aluminum coating.
 2. Average zinc weight on wire: Not less than 2.0 oz / ft², galvanized after weaving.
 3. Wire size: 9 ga, 0.148 in. diameter
 4. Breaking strength of 9 ga wire: Not less than 1290 lb; ASTM A817.
 5. Mesh: 2 in.
 6. Edges: Knuckle fabric at top and bottom of fence.

SPECIFIER: Delete the following unless use of colored fabric is specifically requested by M-DCPS.

7. Provide colored fabric only as required by Construction Documents.
- B. Standard:
1. Wire strength: ASTM A817, Table 2.
 2. Wire coating: ASTM A123, Table 2, Coating Grade 85.
 3. Fabric: ASTM A392, Class 2 zinc coating. Do not use Class 1 (1.2 oz / ft²).
- C. Producer.
1. Master Halco.
 2. Merchants Metals.
 3. Stateside Steel and Wire.
 4. Equal product in quality and performance approved by A/E and Board.

2.4 FENCE POSTS, CAPS, AND FOOTING DIMENSIONS

- A. Description: Zinc galvanized round steel pipe and post caps.
1. Steel pipe: ASTM F1043, Group IC, $f_y = 50,000$ lb/in².
 2. Do not use: Channel-formed steel, square steel pipe, or aluminum posts.
 3. Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.
 - a. Do not use: SS40 zinc coating.
 - 4.
 5. Post loop caps: Provide on line posts and where needed to let top rail pass.
 6. Post dome caps: Provide on corner, end, pull, and gate posts.

7. Pipe size convention: Nominal pipe size (NPS); ASME/ANSI B36.10.

B. Standards:

1. Post galvanizing: ASTM A123, Table 2, Coating Grade 85.
2. Post dimensions: ASTM F1083, Table 1, Standard Weight, Schedule 40.
3. Fence post sizes: ASTM F1043, from Table 3 or larger as specified.
4. Gate post sizes: ASTM F567, from Table 2 or larger as specified.

C. Line Post Size Schedule:

<u>Height above grade</u>	<u>10 & 12 ft</u>	<u>6 & 8 ft</u>	<u>4 ft</u>
NPS (Nominal Pipe Size)	2-1/2	2	1-1/2
Pipe OD (outside diameter), in.	2.875	2.375	1.900
Pipe wall thickness, in.	0.203	0.154	0.145
Post spacing, ft oc	10	10	10
Minimum footing depth, in.	36	30	24
Minimum footing diameter, in.	12	10	8

D. Corner, End, and Pull Post Schedule:

<u>Height above grade</u>	<u>10 & 12 ft</u>	<u>6 & 8 ft</u>	<u>4 ft</u>
NPS	4	3-1/2	2
Pipe OD, in.	4.500	4.000	2.375
Pipe wall thickness, in.	0.237	0.226	0.154
Minimum footing depth, in.	36	36	30
Minimum footing diameter, in.	18	16	10

E. Gate Post Schedule for Gates over 6 ft High:

<u>Gate leaf width</u>	<u>8-1 to 10 ft</u>	<u>4-1 to 8 ft</u>	<u>up to 4 ft</u>
NPS	4	3-1/2	3
Pipe OD, in.	4.500	4.000	3.500
Pipe wall thickness, in.	0.237	0.228	0.216
Minimum footing depth, in.	36	36	30
Minimum footing diameter, in.	18	16	14

F. Gate Post Schedule for Gates up to 6 ft High:

<u>Gate leaf width</u>	<u>8-1 to 10 ft</u>	<u>4-1 to 8 ft</u>	<u>up to 4 ft</u>
NPS	3	2-1/2	2
Pipe OD, in.	3.500	2.875	2.375
Pipe wall thickness, in.	0.216	0.203	0.154
Minimum footing depth, in.	36	36	30
Minimum footing diameter, in.	14	12	10

G. Producer.

1. Allied Fence / Tyco.
2. Master Halco.
3. Merchants Metals.
4. Sonco Worldwide.

5. Equal product in quality and performance approved by A/E and Board.

2.5 BRACES AND RAILS

A. Description: Zinc galvanized steel pipe.

1. Accessories, such as truss rods, turnbuckles, rail sleeves, bolts, washers, and nuts: Hot dip galvanized steel.
2. Size: NPS 1-1/4 in., OD 1.660 in., 0.140 in. wall thickness.
3. Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.

B. Standards:

1. Pipe galvanizing: ASTM A123, Table 2, Coating Grade 85.
2. Pipe dimensions: ASTM F1083, Table 1, Standard Weight, Schedule 40.

C. Producer:

1. Allied Fence / Tyco.
2. Master Halco.
3. Merchants Metals.
4. Sonco Worldwide.
5. Equal product in quality and performance approved by A/E and Board.

2.6 FASTENINGS AND ACCESSORIES

A. Description: Zinc galvanized steel (or malleable iron) fastenings and accessories with rounded edges, galvanized after fabrication. Do not use aluminum.

1. Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.

B. Rail and Brace Ends, Line Caps, Rail Sleeves, Tension and Brace Bands: Sized to fit posts and rails; ASTM F626.

C. Stretcher Bars, Tension Bars: At least 3/16 x 3/4 in. galvanized steel, 2 in. shorter than full height of fabric, 1 bar at gate or end posts; 2 bars corner or pull posts.

D. Fastenings: Hot dip galvanized steel; ASTM F626. (For spacing, see PART 3)

1. Tie Wire: 9 ga, for attaching fabric to posts.
2. Clips: 9 ga.
3. Bands: 12 ga, at end, corner, pull, and gate posts
4. Hog rings: 12 ga hot dip galvanized steel (use only where approved by Board).
5. Brace rods: Galvanized steel, with welded-on turnbuckles for adjustment.

E. Tension Wire: Marcellled 7 ga (0.177 in.) galvanized steel wire; ASTM A824, Type II.

1. Zinc coating: 2.00 oz/ft² ASTM A817, Type II, Class 5.
2. Breaking strength of 7 ga wire: Not less than 1880 lb; ASTM A817.

F. Zinc Repair Compound, for use at missing or damaged zinc galvanizing. High adhesion, zinc-rich, UV-resistant compound, such as ZRC.

G. Concrete: $f'_c = 2500$, 5 in. maximum slump; ASTM C94.

2.7 GATE FABRICATION AND HARDWARE

A. Framing Assembly: Galvanized steel pipe, together with fabric, bracing, hinges and latches, shop assembled and welded.

1. Gate heights: Match adjacent fence height, unless shown otherwise.
2. Gate framing and fixed bracing: At least NPS 2, galvanized, as specified above.
3. Brace gates against sagging using brace rods and adjustable turnbuckles in place of fixed bracing if more practical than fixed braces.
4. For gate leaves over 73 in. high, add one hinge to the number specified.
5. Coat welds and bare spots with specified zinc repair compound.

B. Gate Hardware: Steel or malleable iron, zinc coated with at least 1.8 oz / ft² hot dip galvanizing, for all items. Typical examples follow:

1. Hinges: Heavy duty, industrial grade, offset type, of ball and socket design, allowing gates to swing back parallel to the fence line, such as:
 - a. 1746 / 1747 / 1748, by Semmerling Fence & Supply.
 - b. 422405 / 422406 / 422407, by Southeastern Wire.
 - c. Equal product in quality and performance approved by A/E and Board.
2. Latches, all heights: Easily lockable with padlock(s).
 - a. Padlocks, with chains, will be provided by the Board.
3. Latches for single leaf gates: Single gate latch assembly, with keeper.
4. Latches for twin leaf gates: Heavy duty gate stops with steel pipe sleeves anchored in concrete so as to engage plunger of latch at the center of each opening. Latch and plunger shall not be removable without special tools.

SPECIFIER: Where keepers present a tripping hazard, M-DCPS representative may allow a chained snap hook as the keeper.

5. Keepers: To automatically engage the gate leaf and hold it in the open position until manually released. Where A/E or Board determines that a keeper's location presents a tripping hazard, provide a chained snap hook instead.
6. Stops: Set in a concrete base, located so as not to present a tripping hazard.
7. Rods with turnbuckles: Cut rods to length that gives maximum future adjustability and weld turnbuckles to rods and rods to gate frame.
8. Items for handicapped accessibility: Heavy-duty lever-type gate hardware or weatherproof push bar in place of latches.

C. Gate Hinge Schedule.

<u>Gate leaf width</u>	<u>8-1 to 10 ft</u>	<u>4-1 to 8 ft</u>	<u>4 ft or less</u>
Number of hinges, leaves over 6 ft high	4	4	3
Number of hinges, leaves up to 6 ft high	3	3	2

2.8 BOLLARDS

- A. Description: Galvanized steel pipe filled with concrete; tops domed 2 in. above pipe.
1. Pipe size: NPS 6.
 2. Pipe: Galvanized steel: ASTM F1083, Table 1, Schedule 40.
 3. Zinc coat: At least 1.8 oz / ft² hot dip galvanized; ASTM A123.
 4. Paint for bollards: Zinc neutralizer, galvanized metal primer, and exterior acrylic latex enamel (Safety Yellow) as listed in MDCPS Paints (list is available from MDCPS Materials Control).

SPECIFIER: Delete the following article for all facilities except where specifically required by M-DCPS Educational Program.

2.9 COLORED FABRIC AND SLATS

- A. Colored Chain Link Fabric: UV-resistant color olefin powdercoat over an intermediate zinc phosphate coat on zinc galvanized steel pipe, in pipe sizes as specified above for post, rails and bracing. Color: As selected by A/E.
1. Do not use vinyl-coated fence fabric.
 2. Product / Producer: Permafused II, by Master Halco, or equal product in quality, appearance and performance as approved by A/E and Board.
- B. Colored Plastic Slats: UV-resistant color HDPE olefin plastic, in color as selected by A/E.
1. Product / Producer. Colored Fence Slats, by Filona, or equal product in quality, appearance and performance approved by A/E and Board.

SPECIFIER: Delete the following article for all facilities except where required by the Educational Specifications for some schools with agricultural programs. Do NOT use barbed wire in any other situation, no matter how much security is desired. Where extension arms are needed, select either inside-the fence or outside-the-fence location.

2.10 BARBED WIRE

- A. Barbed Wire Extension Arms: Steel, holding 3 strands of barbed wire at a 45° angle from 4 to 12 in. above and [inside] [outside] of the fence's top rail, hot dip galvanized after fabrication. Provide specially shaped arms at corners.
- B. Barbed Wire: Double strand 12.5 ga (0.099 in. diameter) twisted steel wire with 14 ga (0.080 in.), 4-point barbs woven in 5 in. oc, all hot dip zinc galvanized after weaving.
1. Do not use: Aluminum, aluminum alloy wire, or aluminum coating.
 2. Standard: ASTM A121, Type Z, Standard Grade, Design No. 12-4-5-14R.

2.11 HORIZONTAL ROLLING CHAIN LINK GATES

- A. Description: Galvanized steel pipe framed gate, shop assembled and welded, with shop attached chain link fabric, guides, hardware and aids to operation.
1. Gate height and gate fabric: Match adjacent fence.
 2. Size of frames and bracing: At least NPS 2, OD 2.375 in., 0.145 in. wall thickness; ASTM F1083, Table 1, Standard Weight, Schedule 40.
 3. Zinc coating on all components: At least 1.8 oz / ft² hot dip galvanized after forming; ASTM A123.
 4. Coat welds with specified zinc repair compound.
 5. Provide "V" groove wheel, and V-track full length of opening.
 6. Provide top and bottom rollers to permit smooth gate operation.
 7. Provide two pipe bollards with proper footing, symmetrically placed 6 feet apart and 2 feet from the interior face of the sliding gate when in the fully-opened position. Bollards shall extend 5 feet above finished grade and be located so as to prevent the sliding gate panel from falling flat to the ground should it get derailed from its guide tracks.

SPECIFIER: In some rare cases a mechanized gate may be required by Educational Specifications. Complete and add to the following as needed. Otherwise, delete what follows. Mechanized gates are most often either card, push-button, or radio controlled, which you must coordinate with designing a properly sized electric power outlet near the gate's operating equipment. If qualified sources are known, add a Product / Producer paragraph as C. below. Also coordinate with signage and the security system for the facility. Add Special Warranty provisions to PART 1 in format similar to other warranties. Write appropriate mechanized gate installation language in PART 3 of this section.

8. Mechanized operation:
9. Speed of operation: At least 40 ft/minute.
10. [Card controls and cards] [Radio controls and radio activators] [Push-button controls]:

B. Standard: ASTM F1184.

PART 3 EXECUTION

3.1 PREPARATION

- A. Underground Clearances: Before starting chain link fence and gate work, obtain underground locations, depths and clearances of underground utilities, pipes, cables and structures from utility companies and the Construction Documents. Probe before drilling for footings in questionable locations.
- B. Remove Existing Fences: Remove existing chain link fences not shown to remain. Also remove other types of fence shown in Construction Documents to be replaced by chain link.
1. Perform unearthing, disassembling, collecting, and disposing of all existing fence posts, fabric, hardware, footers, keepers, stops, and debris accumulated along the fence line.
 2. Fill holes and surface irregularities created by fence removal to reduce trip hazard.

3.2 TEMPORARY FENCING

- A. Temporary Fencing: Provide NPS 2 or larger driven posts and 6 ft. high with 11 ga or heavier fabric tied with 11 ga steel ties. Provide gates as specified for permanent construction, adjustable against sagging but without mid-rails.
 - 1. Coordinate so as to maintain security requirements specified in PART 1.
- B. Removal of Temporary Fencing. Remove temporary fencing when A/E and Board state that levels of other security are sufficient to do so. Remove fencing and post foundations. Fill, tamp and level post foundation holes to ensure no trip hazard.
 - 1. Remove trash, vegetation (except grass that matches adjacent new sod) and ground level irregularities within 1 ft of x entire length of the former temporary fence line.

3.3 INSTALLATION

- A. Overall Chain Link Fence and Gate Assembly:
 - 1. Follow ASTM F567 and chain link fence producer's published instructions except as more stringently specified herein.
 - 2. Install components of the assembly plumb and level, except as needed to closely follow vertical contours of the site.
 - 3. Rails: Provide a top rail and a bottom rail at all intervals between posts (and a mid-rail where specified).
 - 4. Adjust post spacing to accommodate bottom rails. Where the ground level slopes, decrease the normal 10 ft spacing between posts to as little as 3 ft in order to be able to install bottom rails that will hug the contour of the paving or soil.
 - a. Definition of "hug": Keep average bottom-of-fence dimension within 1 in. of grade as measured in any 1 ft of run but never more than 2 in.
 - 5. Tension wire: Do not replace a bottom rail with a tension wire unless severe grade changes make this more practical. Obtain written approval of A/E and Board before installing any tension wire.
 - a. Where a tension wire is approved, tie fabric to wire not more than 16 in. oc.
 - 6. Alignment: Align new fencing with existing fencing. Where obstructions are encountered, obtain instructions from A/E and Board. Keep the top of fabric line straight and level, except as needed to conform the fence to slopes and to make the bottom of fabric hug the surface of paving or soil – never more than 2 in. above it.
- B. Footing Excavation: Excavate to the exact size specified, in compacted soil, so that concrete will socket in firm soil or rock.
 - 1. Post footing diameters: Not less than 4 x the OD of the post.
 - 2. Form sides of holes if they are unstable.
 - 3. Excavate for each footing so that the top of the footing concrete is the specified distance below grade, and so that the bottom of each post, at its correct elevation, has 6 in. of concrete beneath it.

4. Do not lose excess excavated soil on site. Remove excess soil from site unless Board designates a fill location on site – to which deliver the excess excavation.
- C. Footings: Set posts in concrete, then fully rod or vibrate after posts have been raised to required level. No post bottom shall rest within 6 in. of soil beneath.
1. Place and temporarily support posts that have been cut to required height + required underground length. Set in concrete so that post tops are at the level needed to support chain link fabric with no more than a 2 in. bottom gap between the fabric and the underlying soil, grass or paving.
 2. Slope tops of footings at least 1 in. to shed water, whether above or below grade.
 3. Installing posts in soil or rock. Place concrete so that footing tops are 2 in. below grade. Place and tamp soil over cured footing tops so that bare soil or sod will be level with adjacent soil or sod.
 4. Posts in bituminous paving. Place concrete so that footing tops are 2 in. below grade. Backfill with well-tamped asphaltic concrete to match existing paving.
 5. Posts in areas to be concrete paved: Install footings and posts before paving.
 6. Install footings for all posts except those temporary fence posts that can be driven
- D. Fence Post Installation: Install initially so that posts are plumb, and tops are above the finished fence height. Then cut post tops to a line parallel to the ground profile, along the entire fence line.
1. Install post caps when the footings have set up and the posts have been cut, to prevent the accumulation of moisture in each post.
- E. Braces and Rails:
1. Braces: Install horizontal bracing at every end, corner, gate, and pull post.
 2. Top and Bottom Rails: Provide at all fence height. Install to run continuously between line, corner, gate, pull, and end posts at permanent fencing fences.
 3. Grade changes: Where there are large changes in ground level, space line posts closer than 10 ft to allow bottom rail to conform to grade.
 - a. A tension wire, in place of the bottom rail, may be used at large changes of ground level if approved by A/E and Board.
 4. Center rails: Provide at fences 8 ft and higher.
 - a. Install to run continuously between line, corner, gate, pull, and end posts.
 - b. Install mid-rail at the fence's half height level.
- F. Bracing Installation: Brace end, corner and pull posts sufficiently to stretch fabric and to provide stability against wind and forced entry forces.
1. Install bracing in both directions from each corner, end and pull post, inclined no more than 50° from ground, with concrete footings at bracing ends to resist pulling thrust.
 2. In addition, provide pull-post bracing, at a post sized for pulling forces, every 200 ft in straight fence runs.
 3. Attach brace halfway up end, corner and pull posts.
 4. Fasten horizontal bracing members with truss rods from end, corner and pull posts to the adjacent line post.

G. Fabric and Fastener Installation:

1. Fabric: Place fabric on outside of posts in the longest practicable rolls.
 - a. Join rolls by weaving a single picket into the ends of the rolls.
 - b. Stretch fabric to remove slack before fastening and to provide a smooth, uniform appearance.
 - c. Set edge of fabric 0 to 2 in. above ground level.
2. Stretcher bars: Provide 1 tension bar for each gate or end post and 2 bars for each corner or pull post. Attach stretcher bars (2 in. shorter than fabric height) with tension bands and no protruding ends: Space no more than 15 in. oc.
3. Wire ties: Attach fabric, with at least 2 full twists in wire, to:
 - a. Line posts, top to bottom: Space no more than 15 in. oc;
 - b. Braces and horizontal rails: Space no more than 15 in. oc;
4. Bands: Attach fabric to top, center and bottom of the following posts:
 - a. End, corner, pull, and gate: Space no more than 15 in. oc.
5. Hog rings: For attaching bars or fabric and only where approved by A/E and Board.
 - a. Bars: Space no more than 15 in. oc.
 - b. Fabric: Space no more than 15 in. oc.
6. If these maximum permissible spacings cannot be maintained, obtain instructions from A/E and Board before continuing installation.

H. Eliminate Sharp Edges and Ends:

1. Knuckle fabric and tie wire terminal ends. Turn ends away from the traffic side of fence. Assemble drip points, bolts, truss rods, posts, and hardware so that their sharp edges are directed away from the traffic side of the fence and so that they do not project more than 1/2 in. on the non-traffic side.
2. At non-agricultural educational plants, barbed or purposely sharpened edges are not allowed from the highest grade level up to the 7 ft level along any fence.
3. File down and apply galvanizing compound, or remove and replace, components that are erected with sharp or pointed surfaces or edges.

I. Double Baffles Protecting Twin Access Ports in Fence:

1. Construct each 24 ft long double baffle, consisting of 2 end posts, bracing, 2 line posts, and fabric. Provide top and bottom rail.
2. Center the baffles on each pair of 4 ft access ports in the fence.
3. To construct the twin access ports in the fence.
 - a. Lay out end posts in the fence line to form 2 ports, each 4 ft wide, with 8 ft of fence separating the ports (16 ft from extreme port jamb to extreme port jamb).
4. Set the 24 ft double baffle to form an exactly 2 ft clear opening between baffle inside and the fence outside to allow lateral bicycle-walking passage between the two.

5. Baffle construction: Match the post, bracing, and fabric qualities specified for fence.
- J. Single Baffles Protecting Single Access Ports in Fence:
1. 12 ft long single baffle: Construct using 2 end posts, bracing, 1 line post, and fabric. Provide top and bottom rail.
 2. Center each single baffle on a single 4 ft access port in the fence.
 3. To construct the single access port in the fence, lay out end posts in the fence line to form a 4 ft wide port.
 4. Set the 12 ft single baffle to form an exactly 2 ft clear opening between baffle inside and the fence outside to allow lateral bicycle-walking passage between the two.
 5. Baffle construction: Match the post, bracing, and fabric qualities specified for fence.
- K. Gate Installation:
1. Gates in the vicinity to a building shall open in the direction of building egress.
 2. No gate shall reduce or restrict a building egress dimension in its open position.
 3. Make gates level and plumb in their closed position.
 4. Make gates so they can be secured in both their open and closed positions.
 5. Install gates complete with welded-on hinges, latches, keepers, and stops. Weld on hasps for locking with a lock provided by MDCPS Central Lock Dept.
 6. Do not swing a gate outward onto a public sidewalk; instead, notify A/E and Board that for safety the gate must either swing inward or a sliding gate considered.
- L. Bollard Quantities and Locations: (See shop drawing submittal requirement.)
1. Quantity of bollards and scope of their location: Provide bollards to protect each of the following items in site that are up to 10 ft inside or outside of a run of new chain link fence and within 6 ft of vehicular traffic or parking.
 2. Items on to be protected by bollards as part of chain link fence and gate work:
 - a. On each side of each new chain link fence gate post: 2 bollards.
 - b. Protecting each new or existing fire hydrant, pressure reduction valve, transformer, electrified sign, guy wire, trash bin or trash storage area, or other equipment: 4 bollards arranged to minimize possible damage from vehicles,
 - 1) The 4 required bollards will be reduced to 2 in particular locations if A/E and Board determine that protection from 2 bollards is adequate.
 - 2) After the Board directs reducing the number of bollards at any location from 4 to 2, move construction of the 2 "extra" bollards and their footings to another location on the worksite as directed by Board.
 - c. Bollards are not required at single-post signs, light poles or utility poles unless shown on Drawings or directed by Board as location of "extra" bollards.
 3. Precise location: Locate as directed and approved by A/E and Board if precise location is not already shown on the Drawings or approved shop drawings.
 - a. Review bollard locations with A/E and Board before start of fence installation.
- M. Bollard Footing and Bollard Installation:

1. Bollard footings: 18 in. OD x 36 in. deep concrete placed around each bollard.
2. Bollards: Construct 3 to 6 ft: from each item being protected.
3. For the immediate safety of gate posts and items of mechanical-electrical-utility equipment on site, paint bollards by neutralizing galvanized surfaces, then painting them with 1 coat of galvanized metal primer + 2 coats of acrylic latex enamel.
 - a. Color of topcoat: Safety Yellow.
 - b. Other preparation and painting requirements are specified in 09900.
4. Additional bollards for location on the worksite more than 10 ft. from chain link fence are specified in 05500.

3.4 CLEANING AND ADJUSTING

- A. At completion of each day's work, remove all fencing debris, cuttings and removed fencing not claimed by the Board from the worksite, roads, walks, and adjoining properties.
- B. Adjust gates and hardware for friction-free, noise-free alignment between gates and posts. Lubricate, and demonstrate to be in smooth, quiet working order.

END OF SECTION