CHAIN LINK FENCE MANUFACTURERS INSTITUTE

CHAIN LINK FENCE MANUFACTURERS INSTITUTE

PRODUCT MANUAL

CLF-PM0610
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CLFMI Technical Support Team

To get answers to your questions regarding the content or usage of the information contained in this publication, contact one of these fence industry professionals for assistance.

BILL ULLRICH	email: bullrich.link@comcast.net	Phone: 443-562-7112
CHUCK NAEGELE	email: canaegele@aol.com	Phone: 570-586-7260
STEVE PETERS	email: smpeters@ldpeters.com	Phone: 914-576-5100
TED EYSENBACH	email: teysen@spsfence.com	Phone: 800-451-2612
TOM STANEK	email: tom.stanek@wheatland.com	Phone: 800-257-8182
BILL PETERSON	email: bill@richardsfence.com	Phone: 330-773-0423

Published by:
Chain Link Fence Manufacturers Institute (CLFMI)
10015 Old Columbia Road • Suite B-215 • Columbia, MD 21046
Phone: (301) 596-2583 • Fax: (301) 596-2594
E-mail: info@chainlinkinfo.org
Website: www.chainlinkinfo.org

Chain Link Fence Manufacturers Institute

Product Manual

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CLFMI GUIDE FOR SPECIFYING COMMERCIAL, INDUSTRIAL, AND SECURITY
CHAIN LINK FENCE AND GATES (Contract Section 32 31 13) Addendum
(Note: For a copy of this specification in Word format please contact CLFMI Headquarters)

CHAIN LINK FENCE MANUFACTUTERS INSTITUTE PRODUCT MANUAL

(CLFMI-PM 2445)

The purpose of this manual is to provide chain link fence technical information for general knowledge, system design or the development of a commercial/industrial/security chain link fence specification.

HOW TO USE THE CLFMI PRODUCT MANUAL

a. Familiarize yourself with the content of the CLFMI product manual.
b. The product manual includes drawings of the four standard chain link fence designs plus swing gate, cantilever slide gate and fitting/assembly details.
c. Review the different chain link fabric configurations and gauges to ensure the best selection of the mesh size and wire gauge for the application.
d. Prior to designing a security fence system review the CLFMI "Security Fencing Recommendations SFR2445".
e. Select the type of fabric for the application; galvanized (ASTM A392), aluminum coated (ASTM A491), zinc -5% mischmetal alloy (ASTM F1345) or polymer coated (ASTMF668).
f. Review the framework Dimensions and Strength Characteristics Table # 6 and Guide for Selection of Line Post, Table # 7 to select the post that best suits the application, (ASTM F1043 and ASTM F1083). Make sure to take into consideration wind load particularly if the fence is 8 ft. high or greater using 1 in. mesh or less. Use the CLFMI "Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing WLG2445" for a fence requiring a structural framework design due to wind load.
g. For polymer coated fabric or systems choose an ASTM color from ASTM F934.
h. Thoroughly review and understand the chain link ASTM standards; those reference above as well as; chain link terminology (F552), fittings and tie wire (F626), barbed wire (A121 and F665), barbed tape (F1910 and F1911) tension/coil spring wire (A824 and F1644), swing gates (F900), horizontal slide gates (F1184), automated vehicular gates (F2200), and chain link installation (F567).
i. The CLFMI manual includes a CSI formatted chain link fence specification, "Commercial, Industrial and Security Chain Link Fence and Gates, Section 32 31 13" for use in designing and specifying a chain link fence system.
j. For light industrial/commercial applications select framework from ASTM F1043 Table 4 "Summary of Requirements for Light Industrial/Commercial Fence Framework".
k. All phases of chain link fence installation are covered in detail within the Specification 32 31 13, Part 3.

DESCRIPTION OF TERMS

A short list of descriptive terms: (See ASTM F552, "Standard Terminology Relating to Chain Link Fencing" for a complete list.)

a. Chain link fabric – A fencing material consisting of wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or twisting at the top and bottom of the mesh to form the fabric selvage.
b. Selvage-The top and bottom edge finish on woven chain link formed by joining adjacent pairs of wire pickets. The selvage may be knuckled or twisted.
c. Knuckled selvage* refers to bending the adjacent pairs of wire back into a tight loop.
d. Twisted selvage* refers to twisting the adjacent pairs of wire together in a close helix of 1 ½ machine turns, which is equivalent to three full twists.
e. Mesh size – The minimum clear distance between the wires forming the parallel sides of the mesh.
f. Terminal post – A post to which the chain link fabric is terminated using specific fittings; end post, corner post, gate post and pull post (a terminal post used to accommodate a grade or placed at intervals on long stretches of fence).
g. Line post- Intermediate posts set no greater than 10 feet on center between the terminal posts.
h. See drawing Typical Fence Section for details of various fence fittings; tension bar, truss rod, tension band, brace band, rail end and barb arm.



KNUCKLE SELVAGE*



TWIST SELVAGE*

*Adapted, with permission from the Annual Book of Standards, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19248

TABLE 1 BREAKING STRENGTH OF STEEL WIRE

6 gauge -0.192"	[4.88 mm]	2170 lbf [9650 N]
9 gauge- 0.148"	[3.76 mm]	1290 lbf [5740 N]
11 gauge- 0.120"	[3.05 mm]	850 lbf [3780 N]
11 ½ gauge- 0.113"	[2.87 mm]	750 lbf [3340 N]
12 gauge- 0.105"	[2.67 mm]	650 lbf [2890 N]
14 gauge- 0.080"	[2.03 mm]	380 lbf [1690 N]

TABLE 2 THICKNESS OF COATING FOR ASTM F668 POLYMER COATED FABRIC

Minimum/Maximum	Class 1 & Class 2a	Class 2b
Minimum @ any point	0.015 in. [0.38 mm]	0.006 in. [0.15 mm]
Maximum @ any point	0.025 in. [0.64 mm]	0.010 in. [0.25 mm]

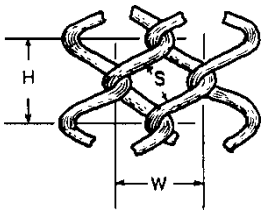
TABLE 3 STANDARD 1" & LARGER MESH SIZES AND GAUGES FOR CHAIN LINK FABRIC

ASTM A392 galvanized, ASTM A491 aluminum coated, ASTM F1345 zinc-5%aluminum-mischmetal alloy, ASTM F668 polymer coated

Size of mesh	Gauge*	Nominal Diameter	Recommended Usage
2 1/8" [54 mm]	11 ½	0.113" [2.87 mm]	Residential
2" [50 mm]	11	0.120" [3.05 mm]	Residential/light commercial
2" [50 mm]	9	0.148" [3.76 mm]	Residential /commercial/ind.
2" [50 mm]	6	0.192" [4.88 mm]	Commercial/ind./security
1 ¾" [44 mm]	11	0.120" [3.05 mm]	Tennis court
1 ¾" [44 mm]	9	0.148" [3.76 mm]	Heavy commercial/industrial
1 ¾" [44 mm]	6	0.192" [4.88 mm]	Security
1 ¼" [32 mm]	11	0.120" [3.05 mm]	Residential/swimming pool
1 ¼" [32 mm]	9	0.148" [3.76 mm]	Heavy industrial /Security
1" [25 mm]	11	0.120" [3.05 mm]	Industrial
1" [25 mm]	9	0.148" [3.76 mm]	Heavy industrial/ Security

*polymer coated core wire gauge is specified fabric wire gauge not the coated finished diameter/gauge

Figure 1. Mesh Dimensions for small security chain link fabric**



Mesh Size S	Height H	Width W
3/8 in. [9 mm]	3/4 in. [19 mm]	3/4 in. [19 mm]
1/2 in. [13 mm]	15/16 in. [24 mm]	15/16 in. [24 mm]
5/8in. [16 mm]	1 1/8 in. [29 mm]	1 1/8 in. [29 mm]

** Figure 1 adapted with permission from the Annual Book of ASTM Standards, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19248

TABLE 4 SMALL MESH SIZES AND WIRE GAUGES FOR METALLIC COATED CHAIN LINK FABRIC

ASTM A392 galvanized, ASTM A491 aluminum coated, ASTM F1345 zinc-5%aluminum-mischmetal alloy

Size of mesh	Gauge	Nominal Diameter	Recommended Usage
5/8” [16 mm]	11 1/2	0.113” [2.87 mm]	Security / anti-climb
5/8” [16 mm]	11	0.120 [3.05 mm]	Security / anti-climb
5/8” [16 mm]	9	0.148 [3.76 mm]	Security /anti-climb
1/2” [12.7 mm]	11 1/2	0.113 [2.87 mm]	Security/anti-climb
1/2” [12.7 mm]	11	0.120 [3.05 mm]	Security/anti-climb
1/2” [12.7 mm]	9	0.148 [3.76 mm]	Security/anti-climb
3/8” [10 mm]	11 1/2	0.113 [2.87 mm]	Security /anti-climb
3/8” [10 mm]	11	0.120 [3.05 mm]	Security /anti-climb

TABLE 5 SMALL MESH SIZES AND WIRE GAUGES FOR POLYMER COATED CHAIN LINK FABRIC ASTM F668

Size of mesh	*Core Wire Gauge	Nominal Diameter	Recommended Usage
5/8” [16 mm]	14	0.080” [2.03 mm]	Industrial/anti-climb
5/8” [16 mm]	12	0.105” [2.67 mm]	Light security/anti-climb
5/8” [16 mm]	11	0.120” [3.05 mm]	Security / anti-climb
5/8” [16 mm]	9	0.148” [3.76 mm]	High Security /anti-climb
1/2” [12.7 mm]	14	0.080” [2.03 mm]	Light security/anti-climb
1/2” [12.7 mm]	12	0.105” [2.67 mm]	Security/anti-climb
1/2” [12.7 mm]	11	0.120” [3.05 mm]	High Security/anti-climb
1/2” [12.7 mm]	9	0.148” [3.76 mm]	Max. Security/anti-climb
3/8” [10 mm]	14	0.080” [2.03 mm]	Security/anti-climb
3/8” [10 mm]	12	0.105” [2.67 mm]	Security/anti-climb
3/8” [10 mm]	11	0.120” [3.05 mm]	High Security /anti-climb

*polymer coated wire gauge is specified by the core wire gauge not the finished coated diameter

TABLE 6 GALVANIZED STEEL POST DIMENSIONS AND STRENGTH CHARACTERISTICS

ASTM F1083 Regular Grade 30,000 psi yield steel schedule 40 pipe - ASTM F1043 Group 1A

Trade Reference	Decimal O.D. Equivalent		Pipe wall Thickness		Weight		Section Modulus		x	Min. Yield Strength		=	Max Bending Moment	Calculated Load (lbs) 10' Free	Cantilever	
O.D.	inches	(mm)	inches	(mm)	lb./ft.	(kg/m)	inches³	(mm³)	x	psi	(MPa)	=	Lb.In.	Supported	4'	6'
1 3/8"	1.315	33.40	0.133	3.38	1.68	2.5	0.1328	3.37	x	30000	205	=	3985	133	83	55
1 5/8"	1.660	42.16	0.140	3.56	2.27	3.38	0.2346	5.96	x	30000	205	=	7038	235	147	98
1 7/8"	1.900	48.26	0.145	3.68	2.72	4.05	0.3262	8.29	x	30000	205	=	9786	326	204	136
2 3/8"	2.375	60.33	0.154	3.91	3.65	5.43	0.5606	14.24	x	30000	205	=	16819	561	350	234
2 7/8"	2.875	73.03	0.203	5.16	5.80	8.62	1.0640	27.03	x	30000	205	=	31921	1064	665	443
3 1/2"	3.500	88.90	0.216	5.49	7.58	11.28	1.7241	43.79	x	30000	205	=	51723	1724	1078	718
4"	4.000	101.60	0.226	5.74	9.12	13.56	2.3939	60.80	x	30000	205	=	71816	2394	1496	997
4 1/2"	4.500	114.30	0.237	6.02	10.80	16.05	3.2145	81.65	x	30000	205	=	96435	3214	2009	1339
5 9/16"	5.563	141.30	0.258	6.55	14.63	21.77	5.4511	138.46	x	30000	205	=	163533	5451	3407	2271
6 5/8"	6.625	168.28	0.280	7.11	18.99	28.23	8.4958	215.79	x	30000	205	=	254873	8496	5310	3540
8 5/8"	8.625	219.08	0.322	8.18	28.58	42.49	16.8091	426.95	x	30000	205	=	504274	16809	10506	7004

ASTM F1083 High Strength Grade 50,000 psi yield steel schedule 40 pipe - ASTM F1043 Group 1A

Trade Reference	Decimal O.D. Equivalent		Pipe wall Thickness		Weight		Section Modulus		x	Min. Yield Strength		=	Max Bending Moment	Calculated Load (lbs) 10' Free	Cantilever	
O.D.	inches	(mm)	inches	(mm)	lb./ft.	(kg/m)	inches³	(mm³)	x	psi	(MPa)	=	Lb.In.	Supported	6'	15'
1 5/8"	1.660	42.16	0.140	3.56	2.27	3.38	0.2346	5.96	x	50000	345	=	11730	392	163	65
1 7/8"	1.900	48.26	0.145	3.68	2.72	4.05	0.3262	8.29	x	50000	345	=	16310	543	227	91
2 3/8"	2.375	60.33	0.154	3.91	3.65	5.43	0.5606	14.24	x	50000	345	=	28030	935	389	156
2 7/8"	2.875	73.03	0.203	5.16	5.80	8.62	1.0640	27.03	x	50000	345	=	53200	1773	739	296
3 1/2"	3.500	88.90	0.216	5.49	7.58	11.28	1.7241	43.79	x	50000	345	=	86205	2873	1197	479
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	x	N/A	N/A	=	N/A	N/A	N/A	N/A
4 1/2"	4.500	114.30	0.237	6.02	10.80	16.05	3.2145	81.65	x	50000	345	=	160725	5357	2232	893
5 9/16"	5.563	141.30	0.258	6.55	14.63	21.77	5.4511	138.46	x	50000	345	=	272555	9085	3785	1514
6 5/8"	6.625	168.28	0.280	7.11	18.99	28.23	8.4958	215.79	x	50000	345	=	424790	14160	5900	2360
8 5/8"	8.625	219.08	0.322	8.18	28.58	42.49	16.8091	426.95	x	50000	345	=	840455	28015	11673	4669

ASTM F1043 Group IC Electric Resistant Welded 50,000 psi yield steel pipe

Trade Reference	Decimal O.D. Equivalent		Pipe wall Thickness		Weight		Section Modulus		x	Min. Yield Strength		=	Max Bending Moment	Calculated Load (lbs) 10' Free	Cantilever	
O.D.	inches	(mm)	inches	(mm)	lb./ft.	(kg/m)	inches³	(mm³)	x	psi	(Mpa)	=	Lb.In.	Supported	4'	6'
1 5/8"	1.660	42.16	0.111	2.82	1.84	2.74	0.1962	4.98	x	50000	345	=	9810	327	204	136
1 7/8"	1.900	48.26	0.120	3.05	2.28	3.39	0.2810	7.14	x	50000	345	=	14050	468	293	195
2 3/8"	2.375	60.33	0.130	3.30	3.12	4.64	0.4881	12.40	x	50000	345	=	24405	814	508	339
2 7/8"	2.875	73.03	0.160	4.06	4.64	6.91	0.8778	22.30	x	50000	345	=	43890	1463	914	610
3 1/2"	3.500	88.90	0.160	4.06	5.71	8.50	1.3408	34.06	x	50000	345	=	67042	2235	1397	931
4"	4.000	101.60	0.160	4.06	6.56	9.76	1.7820	45.26	x	50000	345	=	89098	2970	1856	1237

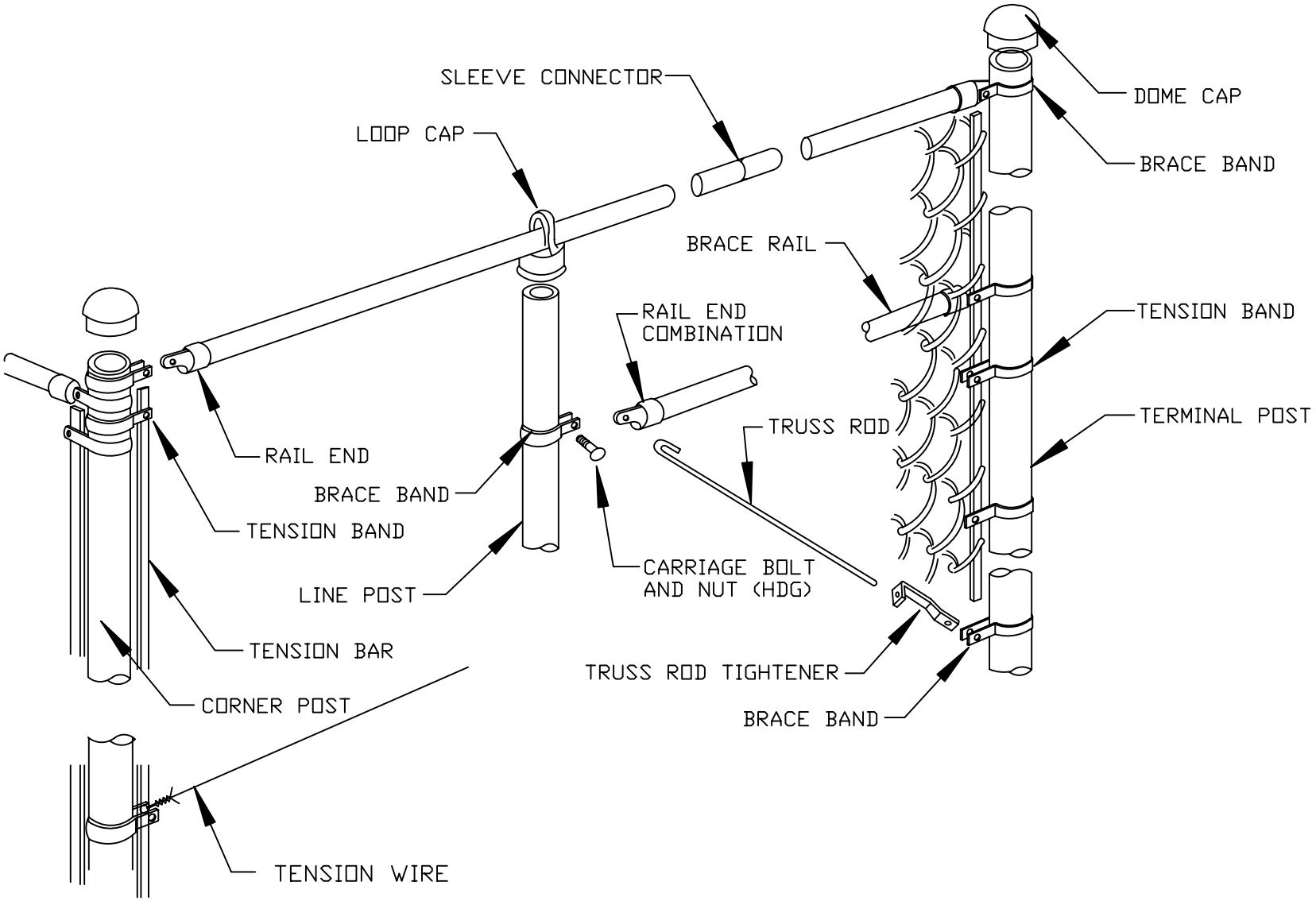
ASTM F1043 Group II Rolled Formed C line post 50,000/60,000 psi yield steel (strength shown is about the major axis)

Dimensions Inches	Dimensions Metric (mm)	Material Thickness Inches	(mm)	Weight lb./ft.	(kg/m)	Section Modulus inches³	(mm³)	Min. Yield Strength psi	(Mpa)	Max. Bending Moment Lb.In.	Cantilever Load 4'	6'
1.875 x 1.625	47.6 x 41.2	0.121	3.10	2.40	3.39	0.395	10.03	50000	345	19750	411	274
2.250 x 1.700	57.2 x 43.2	0.121	3.10	2.78	4.13	0.506	12.85	50000	345	25300	527	351
3.250 x 2.500	82.5 x 63.5	0.130	3.30	4.50	6.70	1.083	27.51	60000	414	64980	1354	903

TABLE 7 GUIDE FOR SELECTION OF ASTM F1043/F1083 LINE POST

Fence Fabric Height	*Group IA ASTM F1083 Sch. 40 Pipe*	*Group IC Elec. Resistance Welded Pipe*	*Group II Rolled Formed C-Section*
	Minimum	*Minimum*	*Minimum*
up to 6' 0"	*1.900"*	*1.900*	*1.875 x 1.625”*
over 6' 0" to 8' 0"	*2.375 "*	*2.375"*	*1.875 x 1.625”*
over 8 ' 0" to 10' 0''	*2.875"*	*2.875 "*	*2.250 x 1.700”*
over 10' 0" to 12' 0"	*3.500"*	*2.875"*	*3.250 x 2.500”*
over 12' 0" to 14' 0"	*3.500"*	*3.500 "*	*N/A*
over 14 0" to 16’ 0"	*4.000"*	*4.000 "*	*N/A*

Minimum post size based on 2” 9 gauge mesh,105 mph wind speed, Category B, no icing.
Consult the CLFMI “Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing (WLG 2445)”
Group IA F1083, schedule 40 pipe reflects Regular Grade 30,000 psi yield steel, High Strength Grade, 50,000 psi yield steel not listed.
Pipe terminal posts are generally one size larger in outside diameter than the line posts.



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TYPICAL FENCE SECTION

TOP RAIL / TRUSSED BRACE RAIL
WITH BOTTOM TENSION WIRE
DETAILS

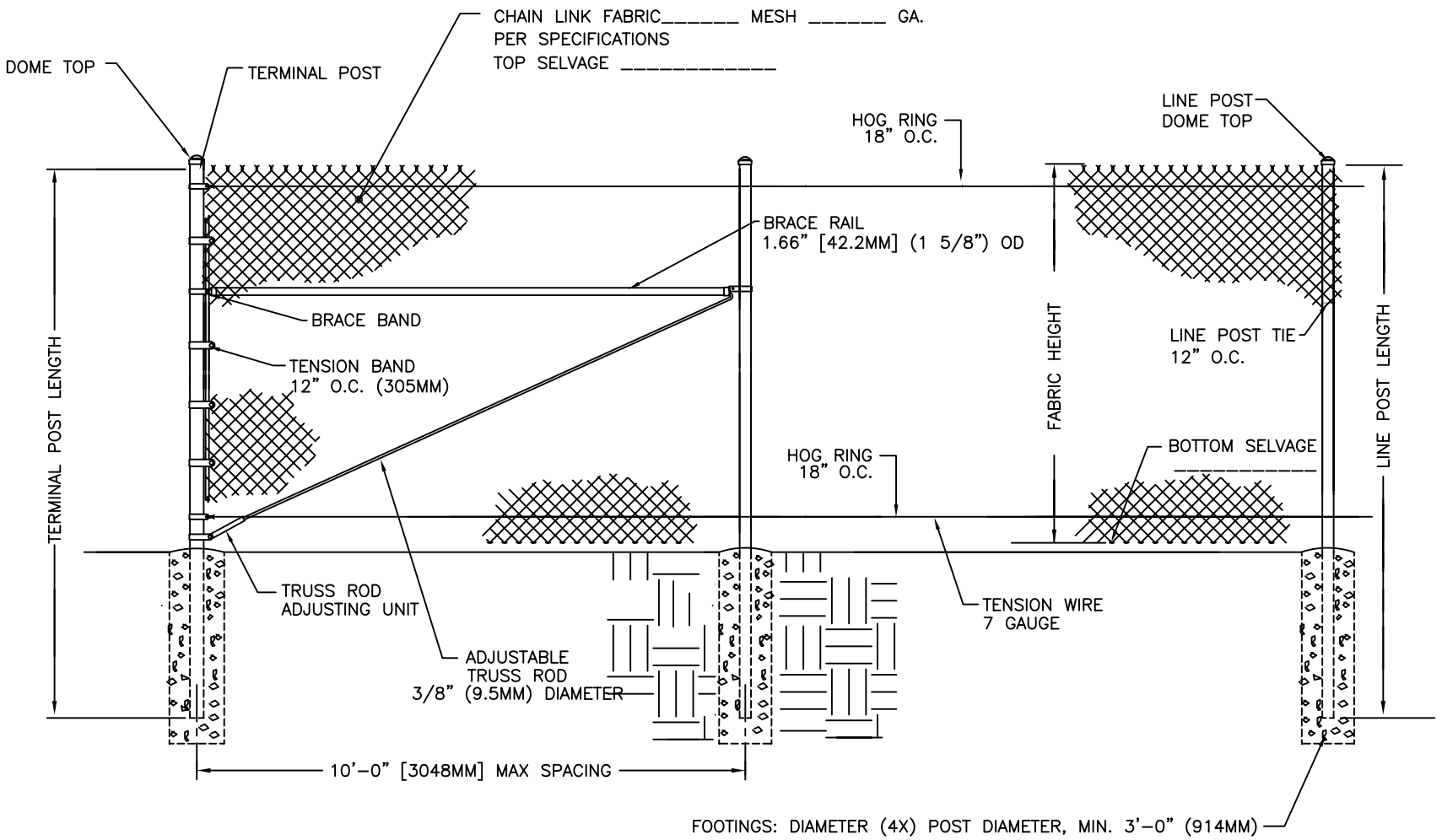
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DATE 02-11-10

CLFMI

DETAILS

SCALE: 1/4"=1'



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TYPICAL FENCE SECTION

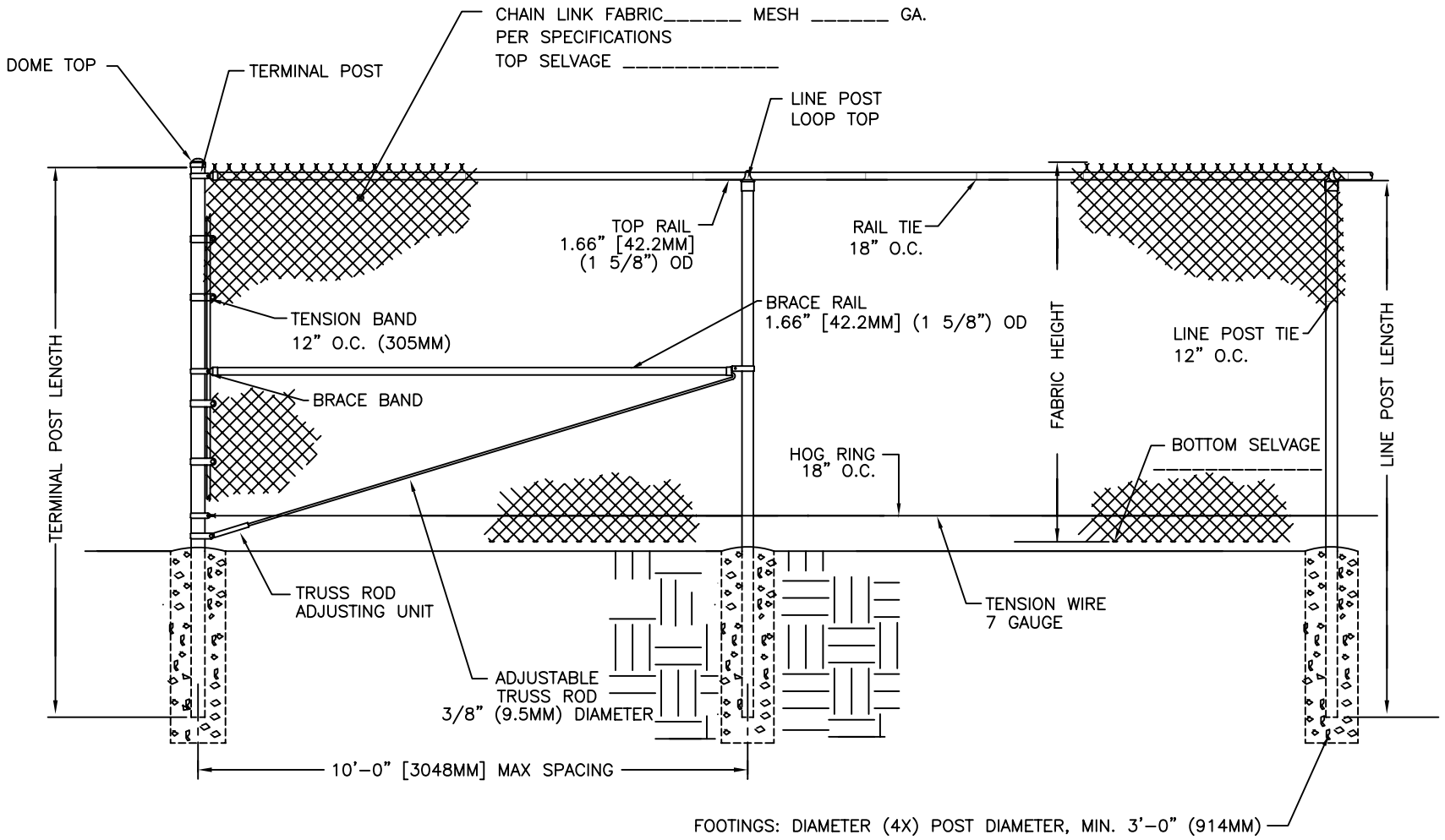
TYPICAL FENCE ELEVATION
TRUSSED BRACE RAIL
W/ TOP & BOTTOM TENSION WIRE

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TYPICAL FENCE SECTION

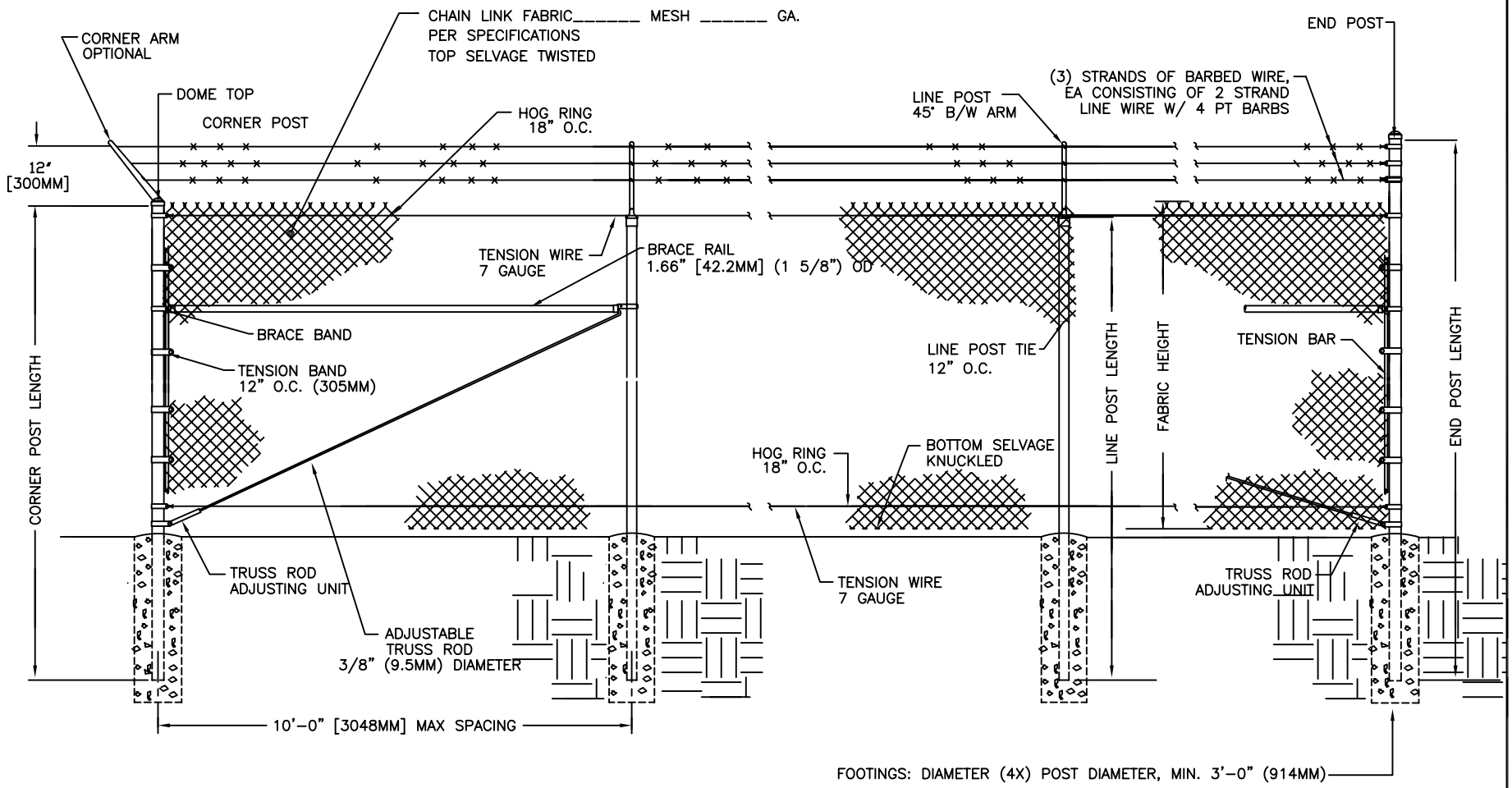
TYPICAL FENCE ELEVATION
TOP RAIL / TRUSSED BRACE RAIL
WITH BOTTOM TENSION WIRE

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SCALE: 1:40



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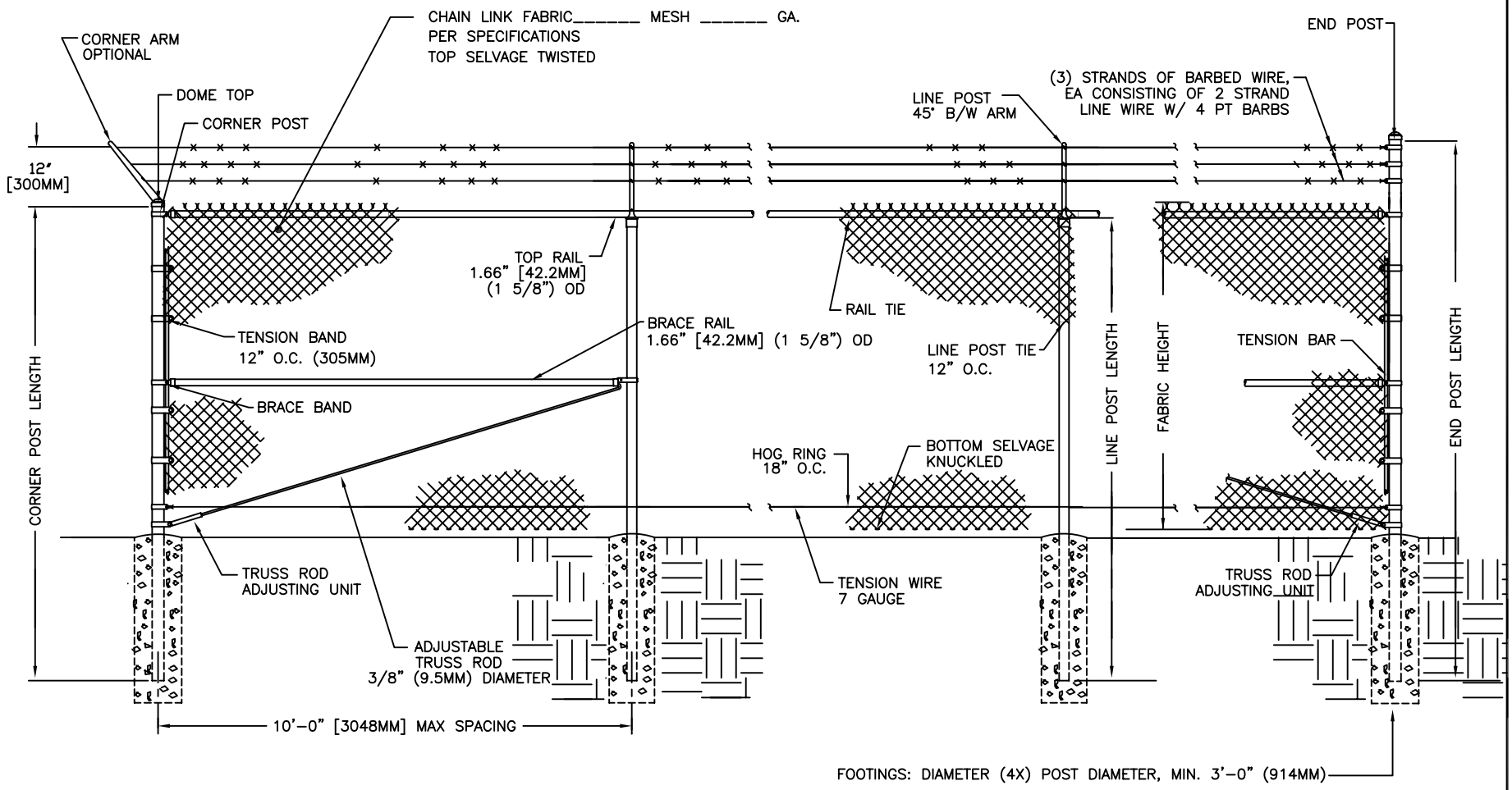
TYPICAL FENCE ELEVATION
TRUSSED BRACE RAIL
3 STRANDS BARBED WIRE
W/ TOP & BOTTOM TENSION WIRE

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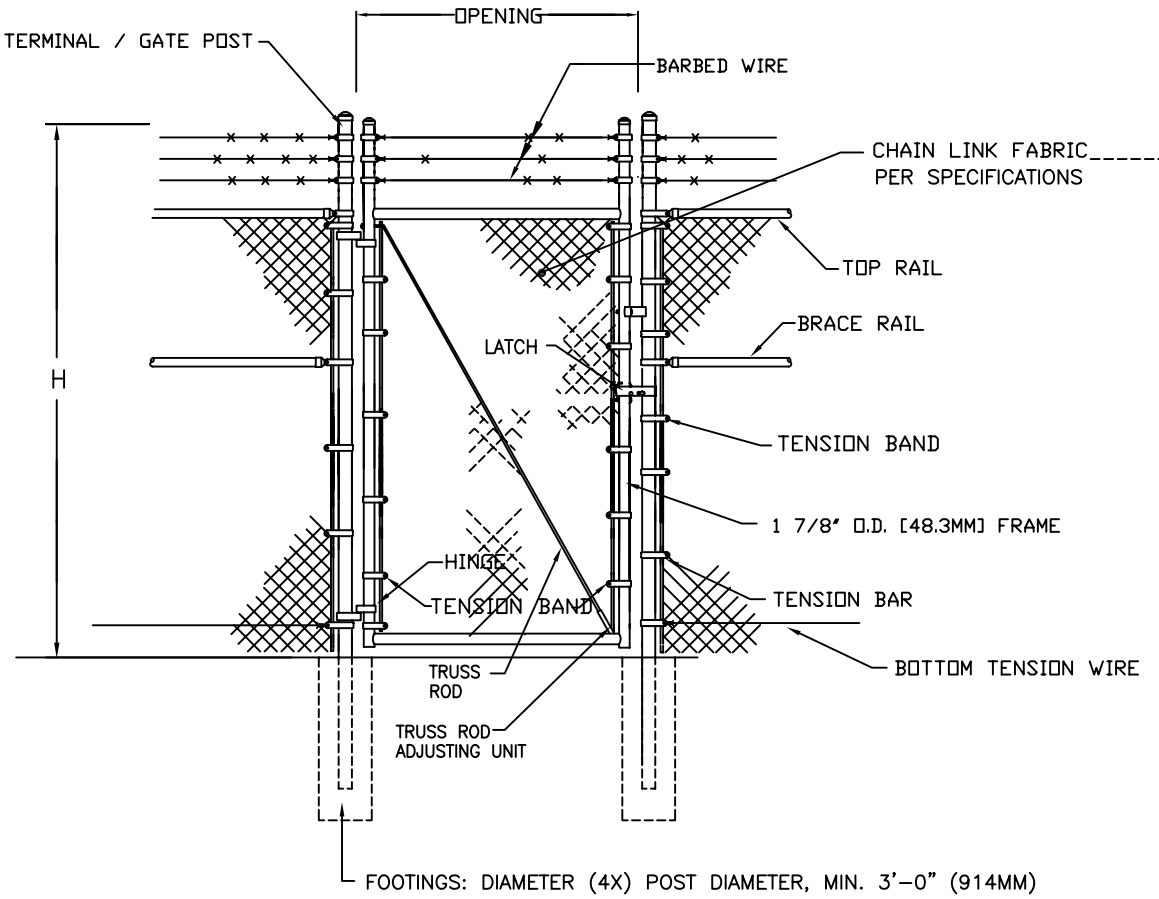
TYPICAL FENCE ELEVATION
TOP RAIL / TRUSSED BRACE RAIL
3 STRANDS BARBED WIRE
WITH BOTTOM TENSION WIRE

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NOTE:

1. VERTICAL AND HORIZONTAL MEMBERS MAXIMUM 8' O.C.

NOM HEIGHT (H)
6'-0" OR 6+1=7'
7'-0" OR 7+1=8'
8'-0" OR 8+1=9'

GATE PLAN

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TYPICAL SINGLE SWING GATE

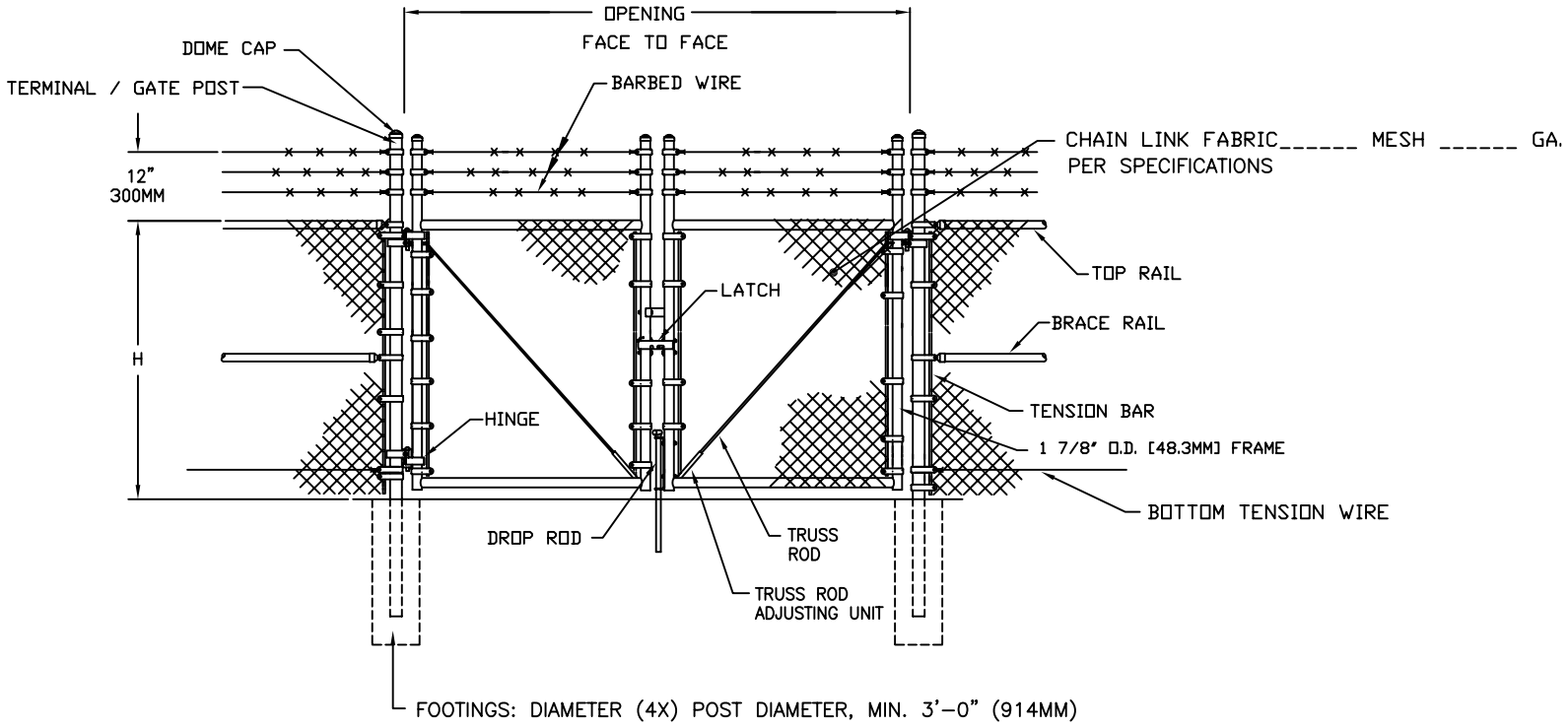
3 STRANDS BARBED WIRE
(OPTIONAL)

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CLGA-1

SCALE: 1:40



NOM HEIGHT (H)
6'-0" OR 6+1=7'
7'-0" OR 7+1=8'
8'-0" OR 8+1=9'

NOTE:

1. VERTICAL AND HORIZONTAL MEMBERS MAXIMUM 8' O.C.

GATE PLAN

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TYPICAL DOUBLE SWING GATE

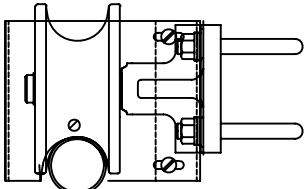
3 STRANDS BARBED WIRE
(OPTIONAL)

BY: ART

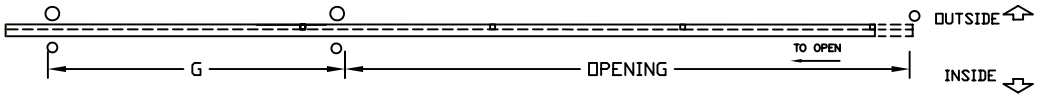
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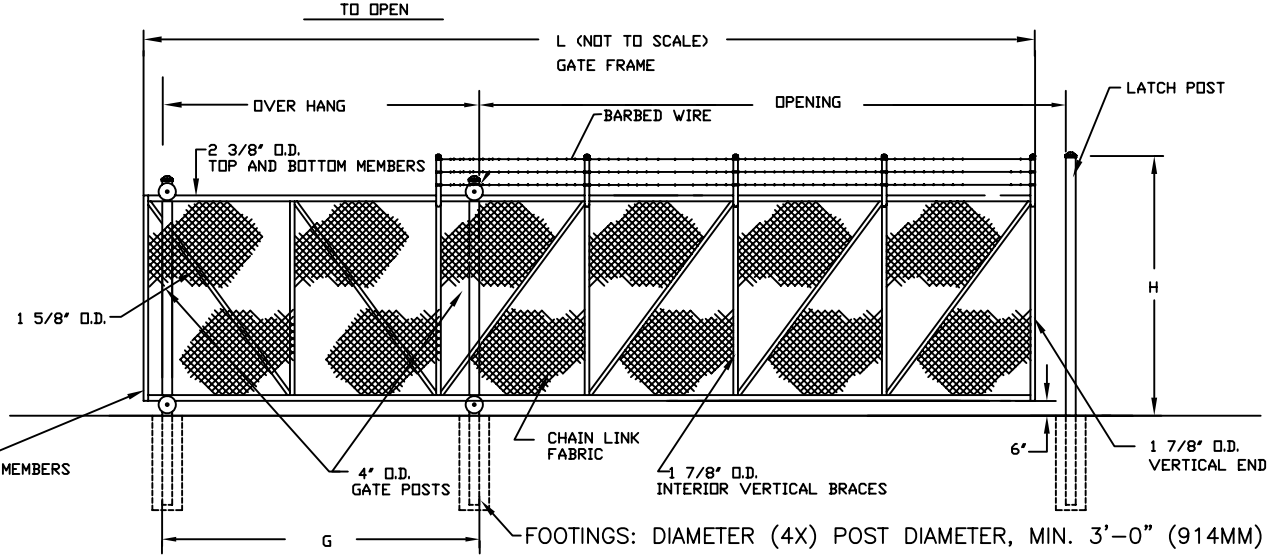
CLFMI
CLGA-2

SCALE: 1:40

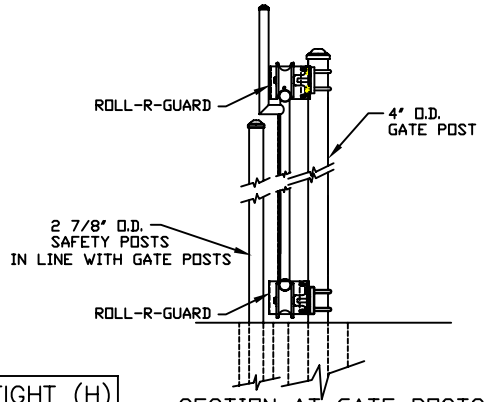


ROLLER ASSY.
WITH ROLL-R-GUARD
(TOP)

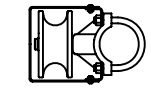




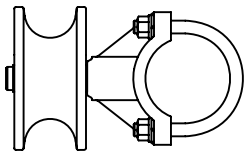
ELEVATION
ROLLER COVERS, GUARD, AND SAFETY POSTS



SECTION AT GATE POSTS
WITH ROLLER COVERS/GUARDS
AND SAFETY POSTS



ROLLER ASSY.
WITH ROLL-R-GUARD
(BOTTOM)



ROLLER ASSY.
(GUARD NOT SHOWN)

NOM HEIGHT (H)
6'-0" OR 6+1=7'
7'-0" OR 7+1=8'
8'-0" OR 8+1=9'

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10018 Old Columbia Rd. Suite B 215
Columbia, MD. 21046

SINGLE CANTILEVERED SLIDING GATE

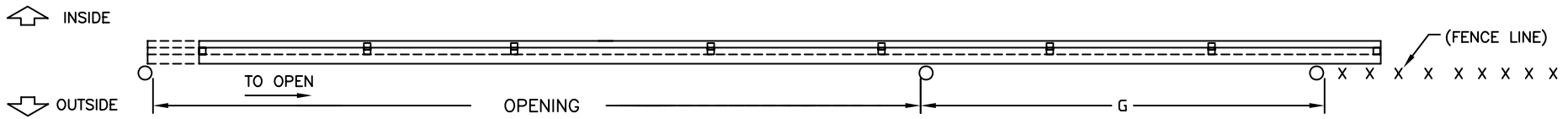
ROUND POSTS W/BARBED WIRE
(6' THRU 22' OPENINGS)

COMPILED BY: ART

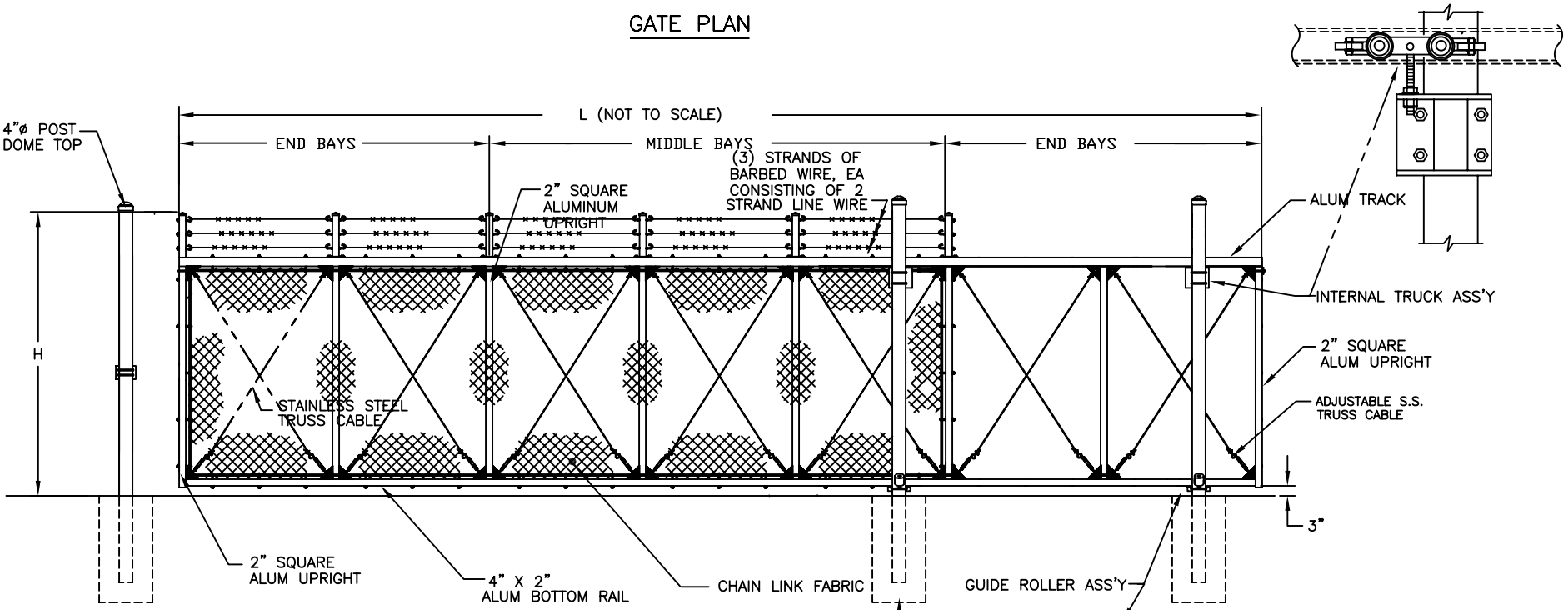
DATE 02-11-10

CLFMI TYPE II CLASS 1
EXTERNAL ROLLERS

SCALE: 1/4"=1'



GATE PLAN





NOM HEIGHT (H)
6'–0" OR 6+1=7'
7'–0" OR 7+1=8'
8'–0" OR 8+1=9'

GATE ELEVATION – 7 BAYS SHOWN

NOTE:

1. MINIMUM BACKFRAME 40% OF OPENING.
2. VERTICAL AND HORIZONTAL MEMBERS MAXIMUM 8' O.C.

Chain Link Fence Manufacturers Institute
10015 Old Columbia Rd. Suite B 215
Columbia, MD. 21046

SINGLE CANTILEVERED SLIDING GATE

ROUND POSTS, W/BARBED WIRE
(10' THRU 30' OPENINGS)

BY: ART
DATE: 02–11–10

CLFMI
ASTM F 1184 TYPE II CLASS 2
INTERNAL ROLLERS

CHAIN LINK FENCE MANUFACTURERS INSTITUTE GUIDE FOR SPECIFYING

COMMERCIAL, INDUSTRIAL AND SECURITY CHAIN LINK FENCE AND GATES (CLFS 2445) [Revised March, 2017]

CONTRACT SECTION 32 31 13

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. DIVISION 01 - GENERAL REQUIREMENTS: Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.

1.2 SUMMARY

A. This Section includes materials applicable for commercial/industrial and security chain link fence and gates. <Refer to CLFMI SFR 2445, "Security Fence Recommendations" , ASTM F2781 "Standard Practice for Testing Forced Entry, Ballistic, and Low Impact Resistance of Security Fence Systems" and CLFMI CLF-TPO211 "Tested and Proven Performance of Security Grade Chain Link Fence Systems" when designing security fence systems>
[delete products not applicable]
   1. Galvanized steel coated chain link fabric
   2. Aluminum coated steel chain link fabric
   3. Polymer coated steel chain link fabric
   4. Zinc 5% Aluminum alloy coated steel chain link fabric
   5. Galvanized steel framework and fittings
   6. Polymer coated galvanized steel framework and fittings
   7. Gates: swing and cantilever slide
   8. Barbed wire
   9. Barbed tape
   10. Installation

B. Related Project Contract Sections: [delete sections not applicable]
   1. 01 33 13 Certificates
   2. 01 33 23 Shop Drawings, product data
   3. 01 43 13 Manufacturers Qualifications
   4. 01 43 23 Installer Qualifications
   5. 01 45 00 Quality Control
   6. 01 65 00 Product Delivery Requirements
   7. 01 66 00 Product Storage and Handling Requirements
   8. 03 30 53 Miscellaneous Cast in Place Concrete
   9. 25 50 00 Integrated automation pertinent to gate operator access control
   10. 26 01 02 Electrical distribution as it relates to gate operators and accessories
   11. 31 22 19 Finish Grading

1.3 REFERENCES

[delete references not applicable]

A. ASTM A121 Specification for Metallic-Coated Carbon Steel Barbed Wire

B. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

C. ASTM A491 Specification for Aluminum-Coated Steel Chain-Link Fabric

D. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

E. ASTM A824 Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link

F. ASTM F552 Standard Terminology Relating to Chain Link Fencing

G. ASTM F567 Standard Practice for Installation of Chain Link Fence

H. ASTM F626 Specification for Fence Fittings

I. ASTM F668 Specification for Polymer Coated Chain Link Fence Fabric

J. ASTM F900 Specification for Industrial and Commercial Swing Gates

K. ASTM F934 Specification for Standard Colors for Polymer-Coated Chain Link

L. ASTM F1043 Specification for Strength and Protective Coatings of Metal Industrial Chain Link Fence Framework

M. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

N. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates

O. ASTM F1345 Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric

P. ASTM F1664 Specification for Poly (Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence

Q. ASTM F1665 Specification for Poly (Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence

R. ASTM F1910 Specification for Long Barbed Tape Obstacles

S. ASTM F1911 Standard Practice for Installation of Barbed Tape

T. ASTM F2200 Specification for Automated Vehicular Gate Construction

U. ASTM F2781 Standard Practice for Testing Forced Entry, Ballistic, and Low Impact Resistance of Security Fence Systems

V. CLFMI SFR 2445Security Fence Recommendations

W. CLFMI CLF TPO211 Tested and Proven Performance of Security Grade Chain Link Fence Systems

X. CLFMI WLG2445 Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing

Y. UL 325 Door, Drapery, Gate, Louver and Window Operators

1.4 SUBMITTALS

A. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence and gates, details of attachments and footings.

B. Certifications: Manufacturers material certifications in compliance with current ASTM specifications.

C. Domestic certifications: Material certifications, Made in U.S.A., Buy American Act or Buy America when required.

D. Specification Changes: May not be made after the date of bid.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company operating in the United States having U.S. manufacturing facility/facilities specializing in manufacturing chain link fence products with at least 5 years experience.

B. Fence contractor: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least 5 years experience.

C. Tolerances: Current published edition of ASTM specifications tolerances apply. ASTM specification tolerances supersede any conflicting tolerance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver products to site per contract requirements.

B. Storage: Store and protect products off the ground when required.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Framework, posts, rails, pipe for gates: [list selected CLFMI manufacturers]

B. Fabric, fittings, gates and accessories: [list selected CLFMI manufacturers]

2.2 CHAIN LINK FABRIC

A. Steel Chain Link Fabric: __in. mesh, __gauge ___high per ASTM____, top selvage__ bottom selvage__ **[**List height or heights] [select ASTM coating specification designation and Class, mesh size and wire gauge (see Table 1), top/bottom selvage and color when applicable] [delete fabric specifications not selected] <Steel chain link mesh sizes and gauges are produced in one-piece widths 3 feet (910 mm) to 12 feet (3660 mm). Custom order fabric is available in heights up to and including 20 ft. (6.1m).>
   1. Zinc-Coated Steel Fabric: ASTM A392 hot dipped galvanized before or after weaving.
      a. Class 1 - 1.2 oz/ft² (366 g/m²)
      b. Class 2 - 2.0 oz/ft² (610 g/m²) **[available 9 and 6 gauge]**
   2. Aluminum–Coated Steel Fabric (Aluminized): ASTM A491
   3. Zinc-5% Aluminum-Mischmetal Alloy Coated Steel Fabric: ASTM F1345
      a. Class 1 – 0.6 oz/ft² (183 g/m²)
      b. Class 2 – 1.0 oz/ft² (305 g/m²)
   4. Polymer Coated Steel Fabric: ASTM F668, the wire gauge specified for polymer-coated wire is that of the metallic coated steel core wire
      a. Class 1 extruded
      b. Class 2a extruded and adhered
      c. Class 2b fused and adhered
      d. Color: **[dark green] [olive green] [brown] [black]** in compliance with ASTM F934
   5. Fabric selvage:
      Standard fabric selvage for 2 in (50 mm) mesh 72 in. (1.8 m) high and over is knuckle finish at one end, twist at the other, K&T.
      Fabric less than 72 in (1.8 m), knuckle finish top and bottom, K&K.

[Specify K&K for added safety for playfield and park applications]
Mesh sizes less than 2 in. (50 mm) have a knuckle selvage for both top and bottom, K&K.

[Table 1: select the chain link fabric mesh size and wire gauge]**

Mesh Size	6 gauge	9 gauge	11 gauge	12 gauge*
Inches (mm)	0.192 in.	0.148 in.	0.120 in.	0.105 in.
	(4.88 mm)	(3.76 mm)	(3.05 mm)	(2.67 mm)
2 (50.8)	A	A	NA	N/C
1 3/4 (44.5)	A	A	Tennis court fabric	N/C
1 1/4 (31.8)	N-M	A	A	N/C
1 (25.4)	N-M	A	A	N/C
5/8 (15.8)	N-M	A	A	A
1/2 (12.7)	N-M	A	A	A
3/8 (9.5)	N-M	N-M	A	A
Wire breakload lbf	2170	1290	850	650
Wire breakload N	9650	5740	3780	2890

"A"= available, "NA"= generally not a commercial/ind./security mesh, "N/M"= not manufactured, "N/C"= not in compliance with ASTM and not applicable
*12 gauge polymer coated core wire only
**See CLFMI Product Manual Tables for complete listing of mesh sizes and gauges

2.3 STEEL FENCE FRAMEWORK

A. Round steel pipe and rail: ASTM F1043 Group IA Heavy Industrial Fence Framework, schedule 40 galvanized pipe per ASTM F1083. Exterior hot dipped zinc coating minimum average 1.8 oz/ft², interior hot dipped zinc coating minimum average 1.8 oz/ft². <specify 2.0 oz/ft² zinc coating when applicable> <Select and specify steel yield strength Grade> Regular Grade or High Strength Grade.
1. Line post: [Refer to Table 2] <Insert outside diameter and weight>
2. End, Corner, Pull post: [Refer to Table 2] <Insert outside diameter and weight>
3. Top, brace, bottom and intermediate rails, 1.660 in. (42.2 mm) OD, 2.27 lb/ft [3.38 kg/m]

B. Round steel pipe and rail: ASTM F1043 Group IC Heavy Industrial Fence Framework. <Select and specify galvanized after forming or galvanized before forming>
Galvanized after forming: Exterior zinc coating minimum average 0.90 oz/ft² and an interior 81% nominal zinc pigmented 0.30 mil coating.
Galvanized before forming: Exterior zinc coating minimum average 0.90 oz/ft² and an interior zinc coating minimum average 0.90 oz/ft².
1. Line post: [Refer to Table 2] <Insert, outside diameter and weight>
2. End, Corner, Pull post: [Refer Table 2] <Insert outside diameter and weight>
3. Top, brace, bottom and intermediate rails, 1.660 in. (42.2 mm) OD, 1.84 lb/ft [2.74 kg/m]

C. Rolled-Formed line posts and rail: ASTM F1043 Group II Heavy Industrial Fence Framework. Zinc coating minimum average 2.0 oz/ft² .
   1. Line post dimensions: [Refer to Table 2] <insert size dimensions and weight>
   2. Top, brace, bottom and intermediate rails: 1.625 x 1.25 in. (41.2 x 31.7 mm), 1.35 lb/ft (2.01kg/m).
   [1.660 in (42.2 mm) OD round pipe rail can be used with the rolled formed post] < select ASTM F1043 Group IA or IC rail >

[When specifying light industrial/commercial fence refer to ASTM F1043 Light Industrial/Commercial Fence Framework; Rolled formed posts Group II-L, and Alternate posts Group IV-L.]

TABLE 2 Line post selection guideline
Minimum post size based on 2" 9 gauge mesh,105 mph wind speed, Category B, no icing.
Consult the CLFMI "Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing (WLG 2445)"
Group IA F1083, schedule 40 pipe reflects Regular Grade 30,000 psi yield steel, High Strength Grade, 50,000 psi yield steel not listed.
Pipe terminal posts are generally one size larger in outside diameter than the line posts.

Fence Fabric	*Group IA ASTM F1083 Sch. 40 Pipe*	*Group IC Elec. Resistance Welded Pipe*	*Group II Rolled Formed C-Section*
	Minimum	*Minimum*	*Minimum*
up to 6' 0"	*1.900"*	*1.900"*	*1.875x1.625"*
over 6' 0" to 8' 0"	*2.375"*	*2.375"*	*1.875x1.625"*
over 8 ' 0" to 10' 0''	*2.875"*	*2.875"*	*2.250x1.700"*
over 10' 0" to 12' 0"	*3.500"*	*2.875"*	*3.250x2.500"*
over 12' 0" to 14' 0"	*3.500"*	*3.500"*	*N/A*
over 14 0" to 16' 0"	*4.000"*	*4.000"*	*N/A*

D. Polymer Coated Framework: Polymer coated framework shall have a **[PVC] [Polyolefin] [Polyester]** coating fused and adhered to the exterior zinc coating of the post or rail. PVC and polyolefin coatings shall have minimum thickness 10-mils (0.254 mm), polyester coating minimum thickness 3 mils (0.0076 mm) per ASTM F1043. Color to match fabric **[dark green] [olive green] [brown] [black]** per ASTM F934.

2.4 TENSION WIRE

A. Metallic Coated Steel Marcelled Tension Wire: 7 gauge (0.177 in.) (4.50 mm) marcelled wire complying with ASTM A824 [Match coating type to that of the chain link fabric] <Insert metallic coating Type and class when applicable>

1. Type I Aluminum–Coated (Aluminized) 0.40 oz/ft² (122 g/m²)
2. Type II Zinc-Coated Class 4 - 1.2 oz/ft² (366 g/m²)
3. Type II Zinc-Coated Class 5 - 2.0 oz/ft² (610 g/m²)
4. Type III Zinc-5% Aluminum-Mischmetal Alloy Coated Steel Fabric Class 1 – 0.6 oz/ft² (183 g/m²) Class 2 - 1.0 oz/ft² (305 g/m²)

B. Polymer Coated Steel Tension Wire: 7 gauge (0.177 in.) (4.50 mm) wire complying with ASTM F1664. Wire gauge specified is the core wire gauge. **[Match coating class and color to that of the chain link fabric] <Insert material coating class and color>**

1. Class 1, extruded
2. Class 2a, extruded and adhered
3. Class 2b, fused and adhered,

2.5 BARBED WIRE

A. Metallic Coated Steel Barbed Wire: Comply with ASTM A121, Design Number 12-4-5-14R, double 12-½ gauge (0.099 in.) (2.51 mm) twisted strand wire, with 4 point 14 gauge (0.080 in.) (2.03 mm) round barbs spaced 5 inches (127 mm) on center. Match coating type to that of the chain link fabric. **<Insert material coating specification including type and class when applicable>**

1. Coating Type A - Aluminum-Coated (Aluminized): Strand wire coating Type A - 0.30 oz/ft² (90 g/m²) with aluminum alloy barbs.
2. Coating Type Z - Zinc-coated: Strand wire coating Type Z, Class 3, 0.80 oz/ft² (254 g/m²), barb coating 0.70 oz/ft² (215g/m²)

B. Polymer Coated Barbed Wire: Comply with ASTM F1665, 0.80 in (2.03 mm) double twisted strand wire; zinc coated four point, 14 gauge (0.080 in.) (2.03 mm) barbs spaced 5 inches (127 mm) on center **[Match strand wire coating class and color to the chain link fabric] [Barbs are not polymer coated] <Insert strand wire Class coating and color>**

1. Class 1, extruded
2. Class 2a, extruded and adhered
3. Class 2b fused and adhered

2.6 BARBED TAPE

Stainless Steel Long Barbed Tape: Comply with ASTM F1910. **[Based on the security level required select the design configuration from the table listed in ASTM F1910] [Insert description, barbed tape material, coil diameter, core wire gauge and material when applicable, barb clusters per loop, coil loops, coil loop spacing, coil length, attachment points]**

2.7 FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.) (2.67 mm), minimum width of 3/4 in. (19 mm) and minimum zinc coating of 1.20 oz/ft² (366 g/m²). **[Bands supplied with 5/16 in. (7.94 mm) or 3/8 in. (9.53 mm) galvanized steel carriage bolts]**

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft² (366 g/m²).

C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. (9.53 mm) diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft² (366 g/m²), assembly capable of withstanding a tension of 2,000 lbs. (970 kg).

D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. (50 mm) less than the fabric height. Minimum zinc coating 1.2 oz. /ft² (366 g/m²). [select bar size]
1. Bars for 2 in. (50 mm) and 1 ¾ in. (44 mm) mesh shall have a minimum cross section of 3/16 in. (4.8 mm) by 3/4 in. (19 mm).
2. Bars for 1 in. (25 mm) mesh shall have a cross section of 1/4 in. (6.4 mm) by 3/8 in. (9.5 mm).
3. Bars for small mesh 3/8 in. (10 mm), 1/2 in. (13 mm) and 5/8 in. (16 mm) shall be attached (sandwiched) to the terminal post using a galvanized steel strap having a minimum cross section of 2 in. (51 mm) by 3/16 in. (4.8 mm) with holes spaced 15 in. (381 mm) on center to accommodate 5/16 in. (7.9 mm) carriage bolts which are to be thru bolted thru the strap the mesh and thru the terminal post.

E. Barbed Wire Arms: In compliance with ASTM F626, pressed steel galvanized after fabrication, minimum zinc coating of 1.20 oz. /ft² (366 g/m²), capable of supporting a vertical 250 lb (113 kg) load. **[Type I – three strand 45 degree (0.785 rad) arm] [Type II – three strand vertical arm] [Type III - V shaped six strand arm]**

F. Polymer Coated Color Fittings: In compliance with ASTM F626. Polymer coating minimum thickness 0.006 in. (0.152 mm) fused and adhered to zinc coated fittings [Match color to fence system]

2.8 TIE WIRE and HOG RINGS

Tie wire and hogs rings per ASTM F626. **[Standard applications: 9 gauge (0.148 in.) (3.76 mm) aluminum alloy ties, 9 gauge (0.148 in.) (3.76 mm) aluminum alloy hog rings] [Applications requiring added security: 9 gauge (0.148 in.) (3.76 mm) galvanized steel preformed power-fastened wire ties, 9 gauge (0.148 in.) (3.76 mm) galvanized steel hog rings. Minimum zinc coating 1.20 oz/ft² (366 g/m²).] [polymer coated; match the coating, class and color to that of the chain link fabric]**

2.9 SWING GATES

A. Swing Gates: [single] [double] ___ opening ___ by ___ ft. high. Galvanized steel welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD (48.3 mm) **<insert pipe specification> [ASTM F1043 Group IA F1083 schedule 40 pipe] [ASTM F1043 Group IC pipe]** Frame members spaced no greater than 8 ft. (2440 mm) apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking gate latch fabricated of 5/16 in. (7.9 mm) thick by 1 ¾" (44.45 mm) pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Match gate fabric to that of the fence system. Gateposts ___OD, ___lb/ft [**ASTM F1043 Group IA ASTM F1083 schedule 40 pipe] [ASTM F1043 Group IC pipe] <Insert outside diameter, specification reference and weight> [Select the gatepost outside diameter from table 2.9 B> [Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework. Moveable parts such as hinges, latches and drop rods may be field coated using a liquid polymer touch up] [electrically operated gates must comply with ASTM F2200 and UL325]**

[Swing gate post size per ASTM F900]

Gate fabric height up to and including 6 ft. (1.2m)	
Gate leaf width	**Post Outside Diameter**
up to 4 ft. (1.2 m)	2.375 in. (60.3 mm)
over 4 ft. to 10 ft. (1.2 to 3.05 m)	2.875 in. (73.0 mm)
over 10 ft. to 18 ft. (3.05 to 5.5 m)	4.000 in. (101.6 mm)
Gate fabric height over 6 ft. to 12 ft. (1.2 to 2.4m)	
Gate leaf width	
up to 6 ft. (1.8 m)	2.875 in. (73.0 mm)
over 6 ft. to 12 ft. (1.8 to 3.7 m)	4.000 in. (101.6 mm)
over 12 ft. to 18 ft. (2.4 to 5.5 m)	6.625 in. (168.3 mm)
over 18 ft. to 24 ft. (5.5 to 7.3 m)	8.625 in. (219.1 mm)

2.10 HORIZONTAL SLIDE GATES

A. Overhead Slide Gates: In compliance with ASTM F1184 Type I.
Gate framing to be of welded construction, minimum 1.900 in. OD (48.3 mm) pipe members. **<Insert pipe specifications> [ASTM F1043 Group IA ASTM F 1083 sch 40 pipe] [ASTM F1043 Group IC pipe]** Framing members to be spaced no more than 8 ft. (2440 mm) apart horizontally and vertically. Welded joints are to be protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking latch, 5/16 in. (7.9 mm) thick by 1 ¾ in. (44.45 mm) pressed steel, galvanized after fabrication. Galvanized steel drop bars to be provided with double gates. Chain link fabric to match the fence system**.** Manufacturer's standard overhead beam/structure, track, rollers and accessories designed to support the load of the gate panel taking into consideration wind load and possible icing. The support beam/structure to be galvanized or receive proper corrosion protection. Gateposts to be ___OD _____lb/ft **<Insert post size & weight per ft>**
Post size for gate openings up to and including 10 ft. (3.05 m) shall be 2.875 in OD (73 mm)
Openings greater than 10 ft. (3.05 m) up to 24 ft. (7.3 m) shall be 4.000 in. OD (101.6 mm)
Openings greater than 24 ft. (7.3 m) up to 40 ft. (12.2 m) shall be double 4.000 in. OD (101.6 mm)
in compliance with <Insert pipe specification> [ASTM F1043 Group IA F 1083 schedule 40 pipe] [ASTM F1043 Group IC pipe].

B. Cantilever Slide Gates: In compliance with ASTM F1184 Type II

1. Class 1-External Roller Design: Horizontal top and bottom steel pipe "track" members to be 2.375 in. OD (60.3 mm), vertical and internal members 1.900 in. O.D. in compliance with **<Inset gate pipe frame specification> [ASTM F1043 Group IA 1083 sch 40 pipe] [ASTM F1043 Group IC pipe.]** Gate frame to be fabricated by welding, vertical and horizontal members located no greater than 8 ft. (2440 mm) apart. The length of back frame support section shall be a minimum of 40% of the opening. Welded joints are to be protected by applying zinc-rich paint in accordance with ASTM Practice A780. Gates designed to open or close by applying an initial pull force no greater 40 lbs. (18.14 kg). Match chain link fabric to that of the fence system. Positive locking latch fabricated galvanized pressed steel. Galvanized steel drop bars provided with double gates. Gateposts, 4.000 in. OD (101.6 mm) ___lb/ft **<Insert post specification & weight per ft.> [ASTM F1043 Group IA ASTM F1083 sch 40 pipe] [ASTM F1043 Group IC pipe].** Provide safety protective guards for the top and bottom external rollers.

2. Class 2-Internal Roller Design**:** **Select material: [aluminum alloy extrusion] [ASTM F 1043 Group IA, ASTM F 1083 schedule 40 pipe] [ASTM F 1043 Group IC pipe]** Gate frame fabricated by welding, vertical and horizontal members located no greater than 8 ft. (2440 mm) apart. The length of back frame support section shall be a minimum of 40% of the opening. Class 2 cantilever slide gates to comply with the performance deflection criteria listed in ASTM F1184. Gates designed to open or close by applying an initial pull force no greater than 40 lbs. (18.14 kg). Internal truck assemblies designed to handle the forces required for gate size opening and height. Match chain link fabric to that of the fence system. Gateposts, 4.000 in. O.D. (106.1 mm) ___lb/ft **<Insert post specification & weight per ft> [ASTM F1043 Group IA ASTM F1083 schedule 40 pipe] [ASTM F1043 Group IC pipe]**.

[Internal roller cantilever designs vary by manufacturer and material]

a. **[Steel Pipe Frame Design: Match the specification of Class 1 cantilever slide gate. Securely bolt an extruded aluminum enclosed track designed to accommodate internal roller assemblies to the top horizontal member]**

b. **[Aluminum Frame Design: Aluminum rectangular members of various shapes and wall thickness per manufacturers design based on gate opening and height. Top horizontal member to be one-piece extruded section having an integral internal track to accommodate truck assemblies.]**

C. [Polymer coated horizontal slide gates and posts shall match the coating type and color as that specified for the fence framework.] <Insert coating requirement and color>

D. [Electrically operated gates and accessories must be manufactured and installed to comply with the safety requirements of ASTM F2200 and UL 325]

2.11 CONCRETE

Concrete for post footings shall have a 28-day compressive strength of 2,500 psi. (17.2 MPa).

PART 3 EXECUTION

3.1 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence **<Insert project requirement> [Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence is included in the earthwork contractor's contract under the provisions of Division 31 - Earthwork.] [Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence is not included in the earthwork contractor's contract and is the responsibility of the fence contractor in accordance with the provisions of Division 31 - Earthwork.]** The contract drawings indicate the extent of the area to be cleared and grubbed.

3.2 FRAMEWORK INSTALLATION

A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 24 in. (609.6 mm) plus an additional 3 in. (76.2 mm) for each 1 ft. (305 mm) increase in the fence height over 4 ft. (1220 mm). Minimum footing diameter four times the largest cross section of the post up to 4.00" (101.6mm) O.D. and three times the largest cross section of post greater than 4.00" (101.6mm). O.D. Gate posts require larger footings; minimum requirements are listed in ASTM F567. **<Insert footing depth and diameter> [Site soil conditions, local frost depth, fence height and wind load may require larger diameter or deeper footings]** Top of post concrete footing to be **[at grade] [6 inches (152 mm) below grade] <Insert footing grade requirement>** crowned to shed water away from the post. Line posts installed at intervals not exceeding 10 ft. (3.05 m) on center.

B. Top rail: When specified, install 21 ft. (6.4 m) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. (152 mm) long. **[if specifying F1043 light industrial/commercial framework swedged rail may be used in lieu of sleeves]** The rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard bands or rail ends and brace bands. **[Fences 12 feet (3.66 m) high or higher require mid rail]**

C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. (1.8 m) and higher and for fences 5 ft. (1.5 m) in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

D. Tension wire: Shall be installed 4 in. (101.6 mm) up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. (101.6 mm) down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to the chain link fabric with a 9 gauge hog rings 18 in. (457.2 mm) on center and to each line post with a tie wire. **[Install the top tension wire through the barb arm loop for fences having barbed wire and no top rail.]**

3.3 CHAIN LINK FABRIC INSTALLATION

Chain Link Fabric: Install fabric to **[outside] [inside]** of the framework. Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. (7.94 mm) carriage bolts spaced no greater than 12 inches (304.8mm) on center. Small mesh fabric less than 1 in. (25 mm), attach to terminal post by sandwiching the mesh between the post and a vertical 2 in. wide (50mm) by 3/16 in. (4.76 mm) steel bar using carriage bolts, thru bolted thru the bar, mesh and post spaced 15 in. (381 mm) on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches (304.8 mm) on center and to rail spaced no greater than18 inches (457.2 mm) on center. Secure fabric to the tension wire with hog rings spaced no greater than 18 inches (457.2 mm) apart. **<Insert method of securing tie wire> [Pre-formed 9 gauge galvanized steel power-fastened tie wire shall be wrapped 360 degrees around the post or rail and fabric picket, twist the two wire ends together three full turns per ASTM F567] [Aluminum alloy wire ties shall be wrapped around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns per ASTM F567.]** Excess wire shall be cut off and bent over to prevent injury. The installed fabric shall have a ground clearance on no more than 2 inches (50 mm).

3.4 BARBED WIRE INSTALLATION

Barbed Wire: Stretched taut between terminal posts and secured in the slots provided on the line post barb arms. Attach each strand of barbed wire to the terminal post using a brace band. **[Indicate type of barb arm, Type I, II or III and direction [inward] [outward] for installation of Type I arm.]**

3.5 GATE INSTALLATION

A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F567. Direction of swing shall be **[inward] [outward.** Gates shall be plumb in the closed position having a bottom clearance of 3 in. (76 mm) grade permitting. Hinge and latch offset opening space from the gate frame to the post shall be no greater than 3 in. (76 mm) in the closed position. Double gate drop bar receivers shall be

set in a concrete footing minimum 6 in. (152 mm) diameter 24 in. (609.6 mm) deep. Gate leaf holdbacks shall be installed for all double gates**. [Electrically operated gates and accessories must be manufactured and installed in compliance with ASTM F2200 and UL 325.]**

B. Horizontal Slide Gates: Installation varies by design and manufacturer, install according to manufacturers instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs. (18.14 kg). Double gate drop bar receivers to be installed in a concrete footing minimum 6 in. (152 mm) diameter, 24 in. (609.6 mm) deep. Roller guards and guide posts must be installed on Type I external roller cantilever slide gate in compliance with ASTM F1184. Ground clearance shall be 3 in. (76 mm), grade permitting. **[Electrically operated gates and accessories must be manufactured and installed in compliance with ASTM F2200 and UL 325]**

3.6 BARBED TAPE INSTALLATION

Barbed Tape: Barbed tape when specified shall be installed in accordance with ASTM F1911, installation of barbed tape.

3.7 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.8 ELECTRICAL GROUNDING

Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00. A licensed electrical contractor shall install grounding.

3.9 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION 32 31 13