



# Sports Fencing: Clever Solutions to Interesting Challenges

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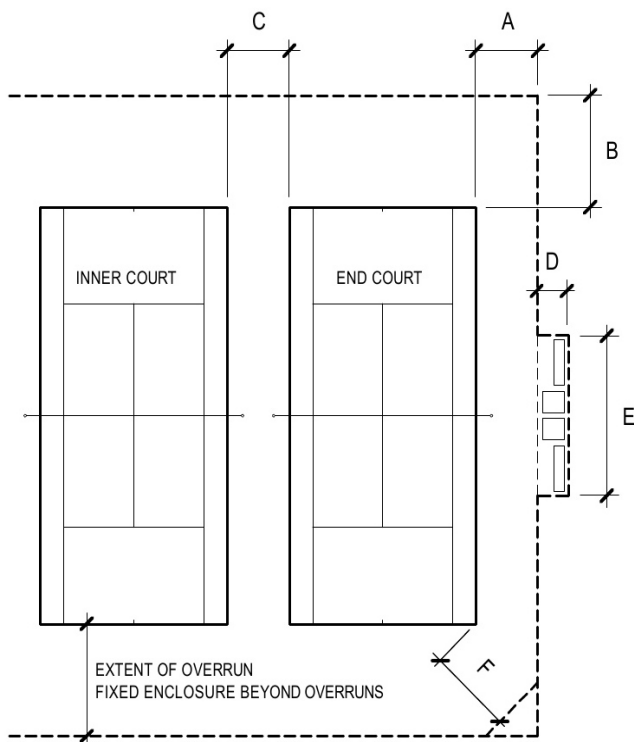
# Beyond the Typical

- 1 Interesting **Fence Layouts**
- 2 Clever Solutions for **Low and High Fences**
- 3 Unusual **Types of Sports Fence**
- 4 Clever **Details**: Gates, Posts, Railings, Fabric, Hardware
- 5 Don't Miss **the Basics**: Safety & Durability

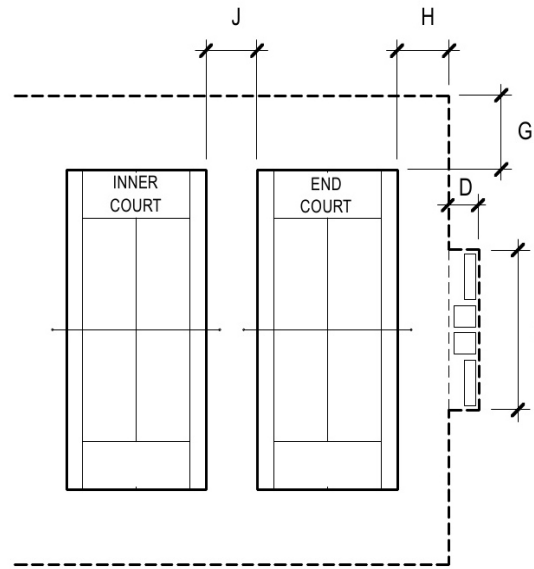
# Fence Layout

At a minimum, the fence should enclose the Playing Area and any recommended Safety Zones. A tennis enclosure may also include an additional area for seating and drinking fountain. For other sports, the fence might also enclose Team Areas, Coaching Boxes, Official's Tables, etc.

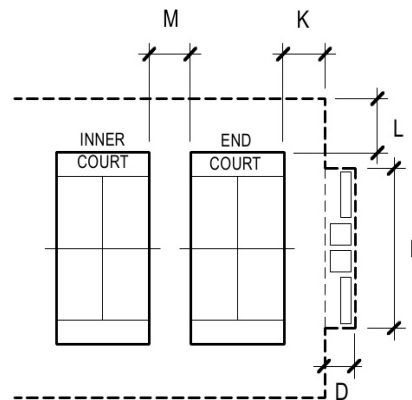
The location of Gates should be both convenient and safe. On tennis courts, gates near the tennis net are preferred.



**78 FT COURT (23.77 M)**  
36 FT.(10.98 M) x 78 FT.(23.78 M)



**60 FT COURT (18.29 M)**  
27 FT.(8.23 M) x 60 FT.(18.29 M)



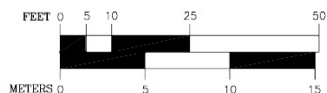
**36 FT COURT (10.98 M)**  
18 FT.(5.49 M) x 36 FT.(10.98 M)

	MINIMUM	PREFERRED	COMPETITION	STADIUM
A =	10 FT.(3.05 M)	12 FT.(3.66 M)	15 FT.(4.57 M)	22 FT.(6.4 M)**
B =	18 FT.(5.49 M)	21 FT.(6.40 M)	27 FT.(8.23 M)	31 FT.(9.4 M)**
C =	10 FT.(3.05 M)	15 FT.(4.57 M)*	18 FT.(5.49 M)	
D =		6 FT.(1.83 M)	10 FT.(3.05 M)	10 FT.(3.05 M)
E =		30 FT.(9.15 M)	30 FT.(9.15 M)	FULL LENGTH
F =	16.25 FT.(4.95 M)	Allowed diagonal reduction on corners of recreational courts.		
G =	14 FT.(4.27 M)			
H =	10 FT.(3.05 M)	A, G, K - UNOBSTRUCTED OVERRUN FROM SIDELINE TO FIXED OBJECTS.		
J =	10 FT.(3.05 M)	B, H, L - UNOBSTRUCTED OVERRUN FROM BASELINE TO FIXED OBJECTS.		
K =	8 FT.(2.44 M)	C, J, M - UNOBSTRUCTED OVERRUN BETWEEN COURTS.		
L =	10 FT.(3.05 M)			
M =	8 FT.(2.44 M)			

\* - 18 FT. FOR COLLEGIATE PLAY OR COURTS WITH DIVIDER NET  
\*\* - REQUIREMENT VARIES WITH TOURNAMENT

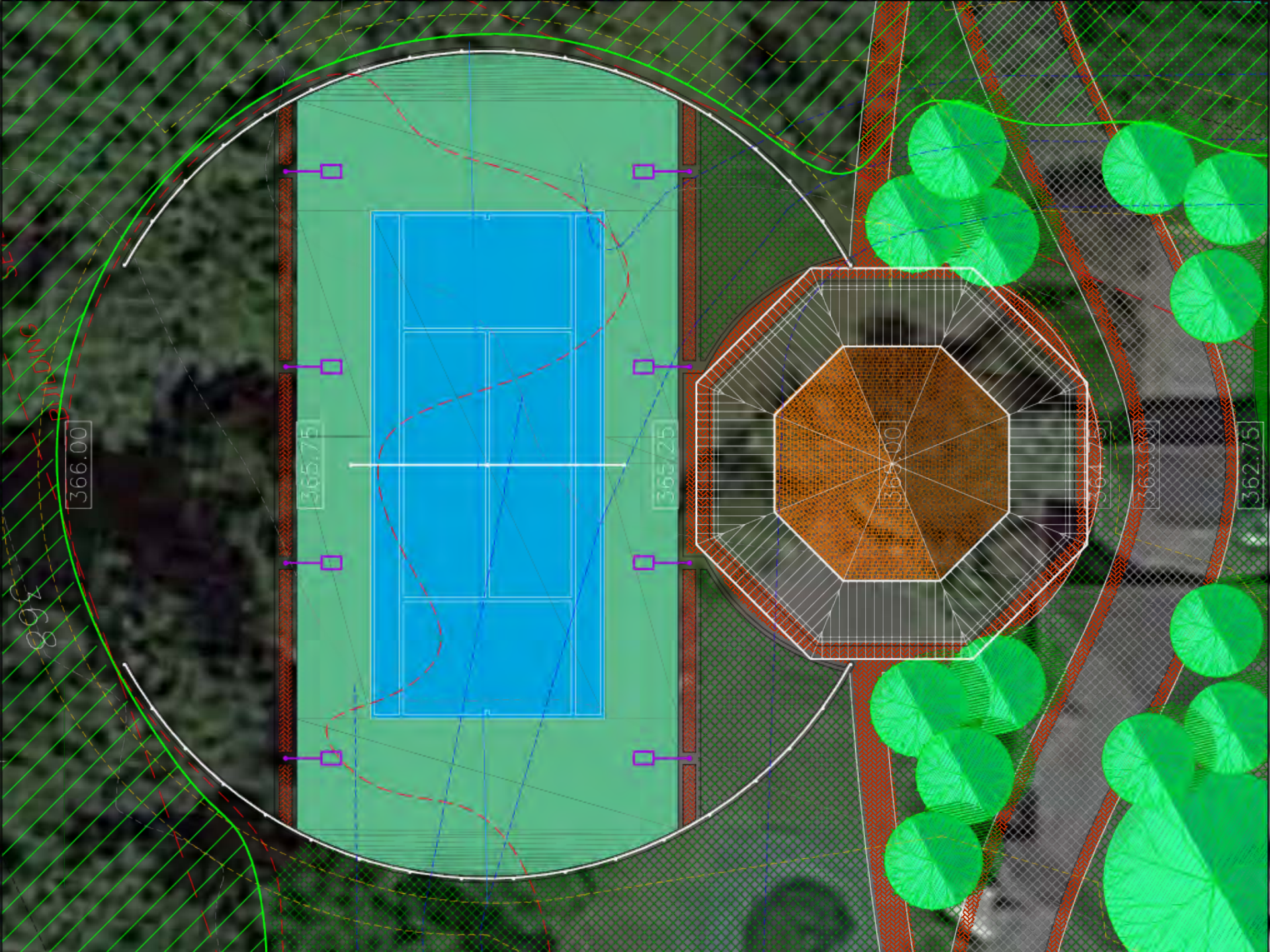
SEE USTA OR ITF FOR ADDITIONAL INFORMATION REGARDING COURT DIMENSIONS

## TENNIS - Playing Areas



RECOMMENDED OVERRUN DIMENSIONS





DRIVING

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365.75

365.75

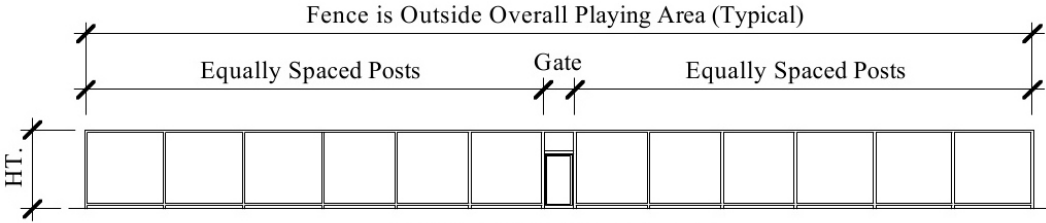
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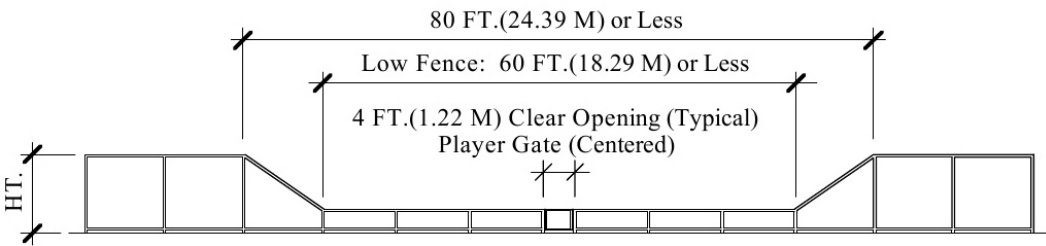
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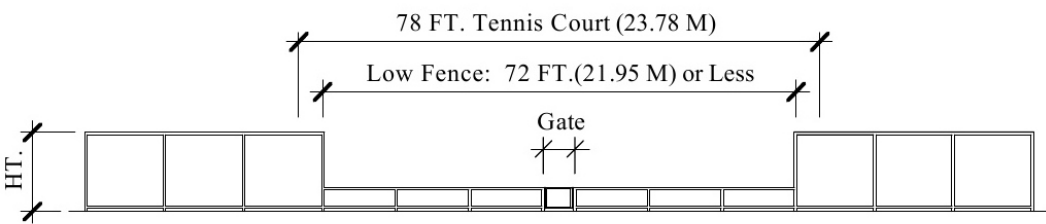
# Fence Heights



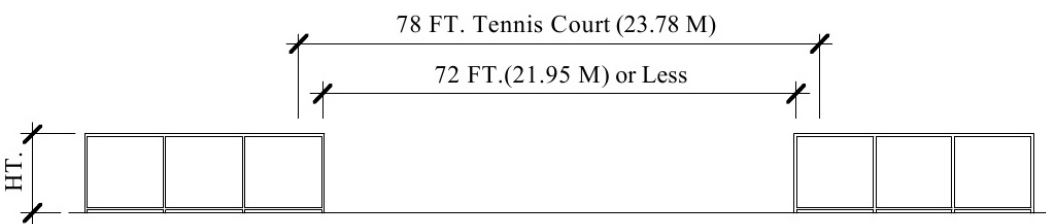
FULL HEIGHT SIDE FENCE



SIDE FENCE WITH TAPERED DROP MIDDLE



SIDE FENCE WITH DROPPED MIDDLE



SIDE FENCE W/ OPEN MIDDLE

HT. - Fence Heights:

**HIGH FENCES**

>10 FT.(3.05 M)	Where Area Outside the Courts is Inaccessible (Rooftops, Etc.)
10 FT.+ (3.05 M)	Hard Courts and Courts Near Property Lines, Roads, Etc.
8 FT.+ (2.44 M)	Soft Courts (Clay, Fast Dry, Infilled Turf) with Accessible Areas Adjacent.
5 FT.+ (1.52 M)	Natural Gras with Extended Areas Behind the Base Lines.

**LOW FENCES**

3.5 FT.+/- (1.07 M)	Spectator Standing Room and Where Guardrails are Required.
3 FT.(0.92 M) to 3.5 FT.(1.07 M)	Between Courts and Along Side Lines.

The fence should respond to both the needs of the players on the court, as well as outside functions such as spectator seating, shade shelter locations, storage areas & site conditions.

In tennis, the backstops are typically 10' high and wrap around the corners. The sideline fences are often guardrail height or even lower to allow for spectator viewing, and sometimes, is left with no fence.

In other sports the backstop might be more than 10' high and extend for long distances.

High backdrop fences, low spectator fences.  
5' backdrop works for grass, not hard courts.

2



10



12

The transition between high and low can be an attractive “signature” piece.

2

# New Dettor Text 10





Rooftops and Site Conditions may require higher fences. Netting is an option.

2

## Type of Fence

The majority of fence around sports fields and courts are Chain Link Fabric with Steel Framework. But there are many other options for both Fabric and Framework.

### For the Fabric:

- Welded Mesh
- Windscreen Material
- Netting
- Wood Lattice

### For the Framework:

- Wood – Partially
- Wood - Completely



There is a variety of wood post and rail options, including: round and rectangular section, caps, etc.

3





15

Lattice fences are elegant but often combined with CLF fabric, welded mesh or netting.

3



16

Welded Mesh with wood frames is an option,  
but requires more maintenance than CLF.

3



17

Netting is extremely light, nearly transparent and requires very little structure.

3



18



Netting can be quickly removed, stretched long distances and is inexpensive.

3



New Dettor Text 9

# New Dettor Text 11





19

Windscreen fences require more structure than netting fences.

3

When done well, a windscreen fence is one of the most attractive solutions.

3

20



Unlike netting, a windscreen fence forms a good translucent or opaque backdrop.

3



21

There are ways to include low fences and incorporate guardrails into windscreen fences.

3



22



New Dettor Text 4



New Dettor Text 2

# New Dettor Text 3



# New Dettor Text 5





New Dettor Text 6



New Dettor Text 8

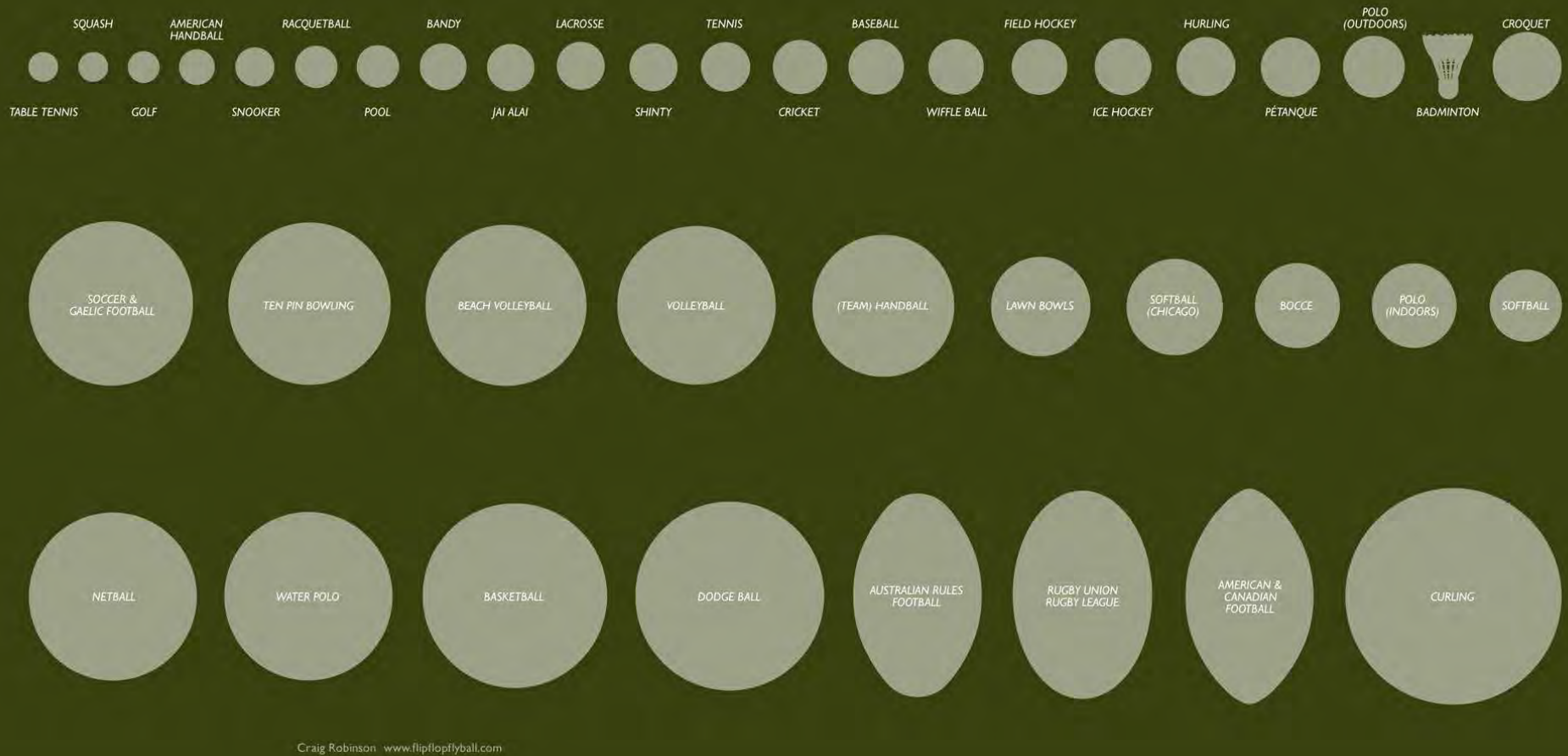
## Components:

Once the overall form of the fence is agreed to, it is critical to determine the components. A fence is as good as the parts it is made from.

- Fabric (& Tension Bars)
- Posts (Foundations, Pipe, Caps)
- Railings (Pipe, Clamps, Ends, Bands, Sleeve, Dowel)
- Fasteners (Clamps, Bands, Hinges, Ties)
- Gates (Frame, Fabric)
- Hardware (Latches, Hinges)



BALL SIZE COMPARISONS  
(INCLUDING A FEW THINGS THAT AREN'T STRICTLY BALLS)

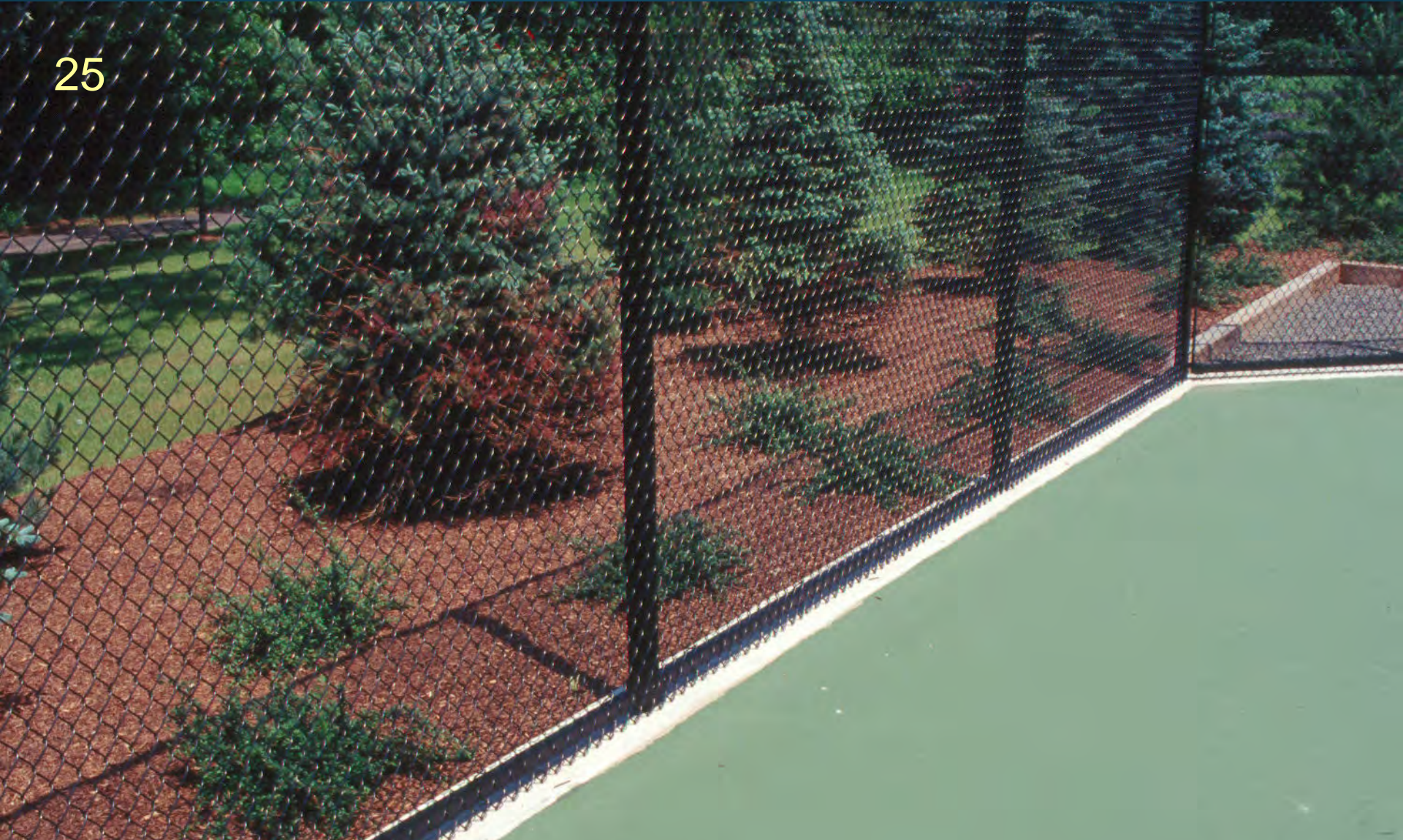


Fence fabric squares are sized to stop ball from escaping the area, among other things.

Fence fabric should be pulled tight and installed  $\frac{3}{4}$ " – 1" above the court surface.

4

25





When fence fabric is improperly installed, it can scrape the surfaces and deform.

4

Fence fabric details are especially important where players touch and at eye level.



Fence posts fail when improperly sized or poorly maintained.

4



A good fence requires a strong fence post and good foundation.

4



# Sleeves allowing easy replacement and expand support options.

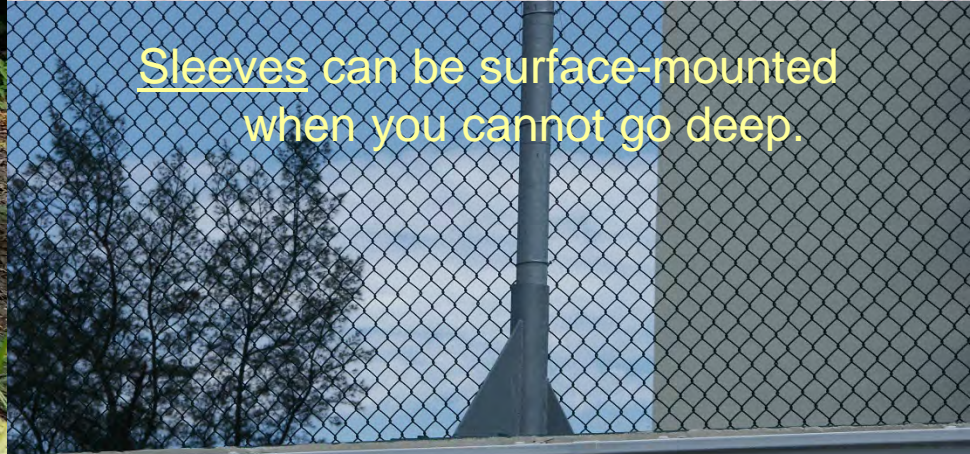
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Sleeves can be wall-mounted.



If sleeves are improperly installed they can do more harm than good.



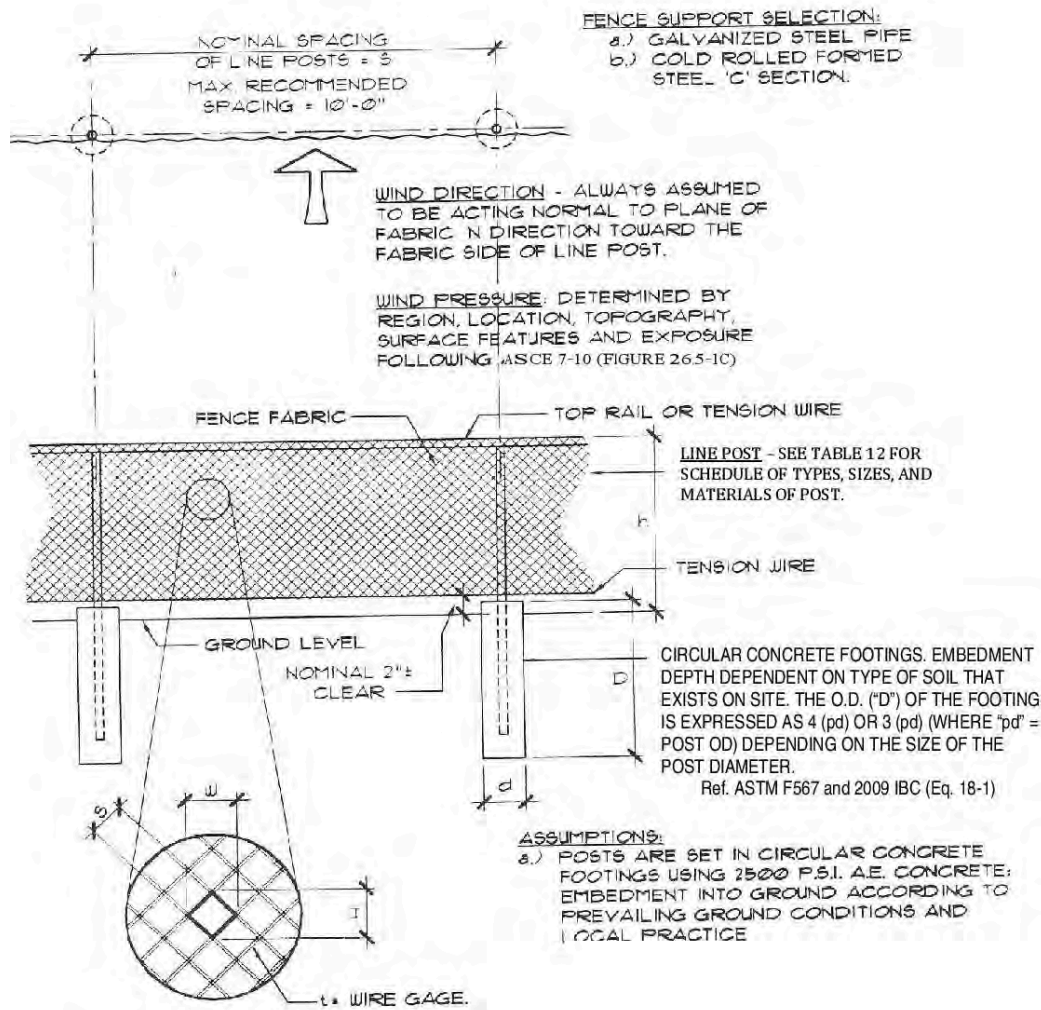
Sleeves can be surface-mounted when you cannot go deep.

MATERIAL SCHEDULE	12' HT.	7'-3" HT.	2'-6" HT.
CORNER, GATE & TERMINAL POSTS	3 1/2" DIA.	3" DIA.	2 1/2" DIA.
LINE POSTS	3" DIA.	2 1/2" DIA.	2 1/2" DIA.
TOP, BOTTOM & MIDDLE RAILS	1 5/8" DIA.	1 5/8" DIA.	1 5/8" DIA.
GATE FRAMES	2" DIA.	2" DIA.	2" DIA.
FENCE FABRIC	AS SPECIFIED		

## NOTES:

1. FENCE FRAME MATERIALS SHALL BE DQ40 POLYOLEPHIN COATED.
2. FENCE COLOR SHALL BE BLACK.
3. FENCE FABRIC TO BE 3/4" ABOVE COURT SURFACE.
4. FENCE FABRIC TO BE UNIFORM 1/2" DIAMOND ABOVE  $\varnothing$  TOP RAIL.
5. ALL FOUNDATION FOR 3" POSTS SHALL BE 12" DIA.
6. ALL FOUNDATION FOR 2 1/2" POSTS SHALL BE 10" DIA.

In 2000, the most common fence post sizes were much weaker than required today.



EFFECTIVE SURFACE AREA IN ONE (1) SQUARE FOOT OF FENCE PANEL THAT RECEIVES POSITIVE EXTERNAL PRESSURE IS DETERMINED BY THE NUMBER OF DIAMONDS FORMED IN THE AREA AND THE DIAMETER OF THE FABRIC WIRES (COATED OR UNCOATED)

**FIGURE #1**  
**LINE POST SPACING GUIDE DETAILS**

(3)

**Fence Posts.** Today, we have the Chain Link Fence Manufacturers Institute Guidelines and ASTM Standards for sizing posts. We take into account:

- Wind Regions,
- Wind Exposure Category,
- Fence Fabric Size,
- Soil Conditions,
- Ice Exposure, and
- Special Conditions.

The same size fence in two distinctly different locations could have fence posts that are dramatically different.

Gates should be wide enough, tall enough, sturdy and designed for their function.

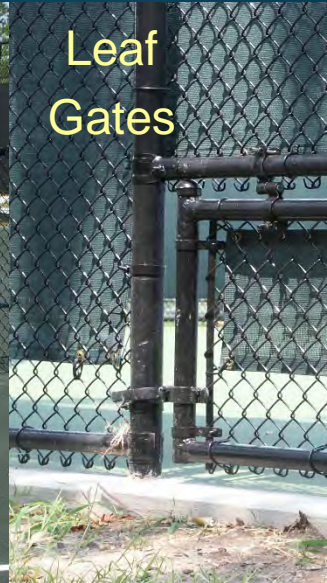
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Player Gates



Maintenance Gates



Leaf Gates



33



Snow Removal Gates

Latches and hinges are a key to a good gate.

4



34

Although a bottom rail is preferred, it will fail if not detailed properly.





We recommend keeping midrails out from 4'-0" to 7'-0" height.

4

Railings. Take care to avoid the finger catcher.

4



Gates and Light Poles should be integrated.

4





New Dettor Text 1

# New Dettor Text 7



## Calcs & Specs:

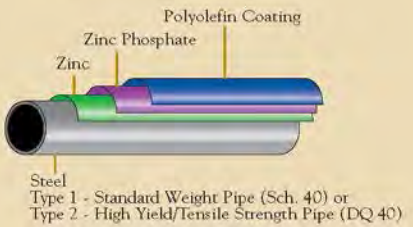
To insure that the fence has the desired appearance, is strong and is durable, the designer needs to specify and test the materials chosen.

Architects and Engineers should issue CSI Format Specifications that address each Fence component, the material it is made of and how the components are assembled.

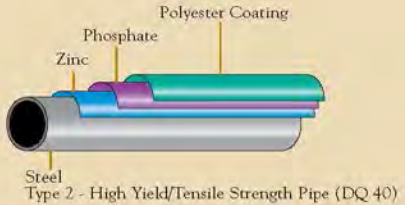
ASTM Standards can help designer's in both specifying the materials and testing them for compliance.

### Coatings

#### Permafused II



#### Spectra



### Colors

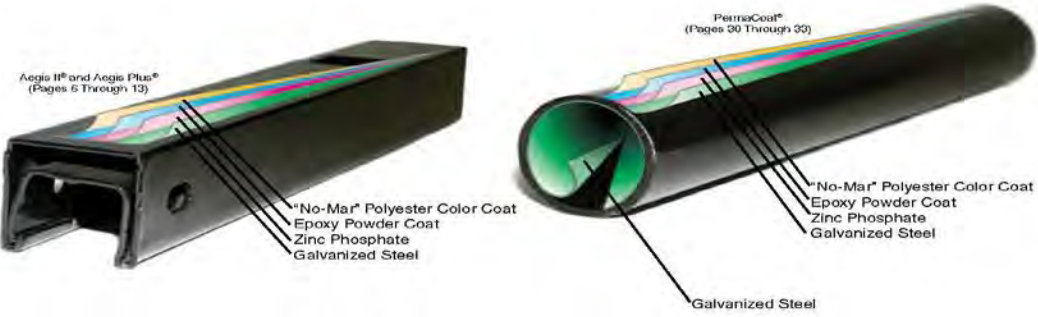
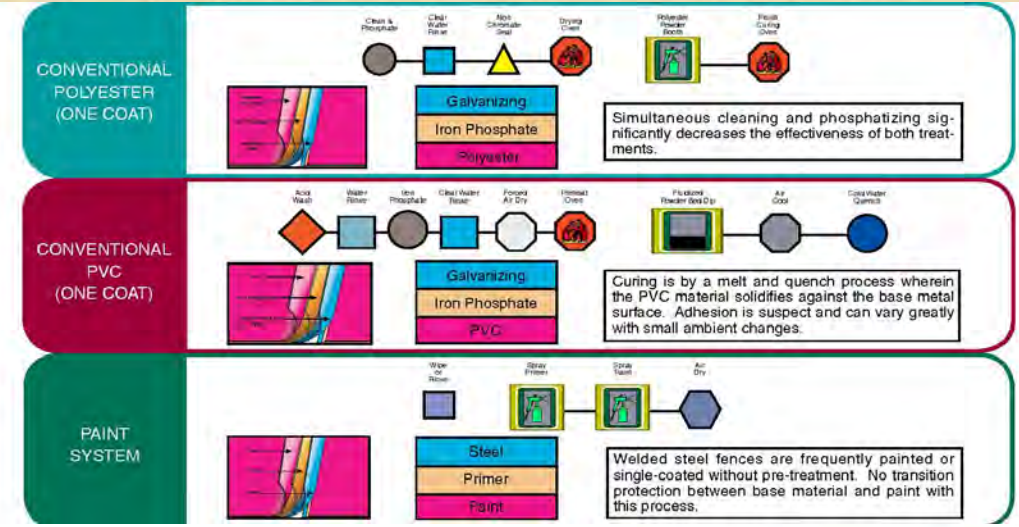
#### Permafused II

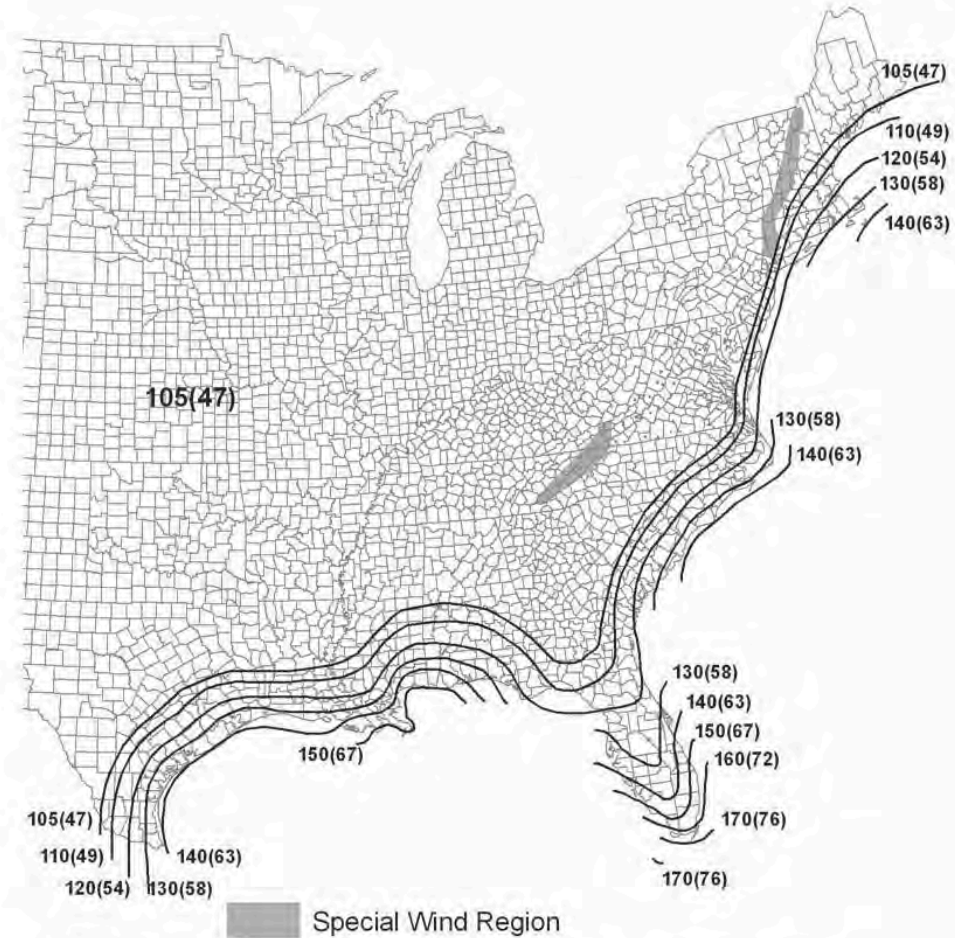
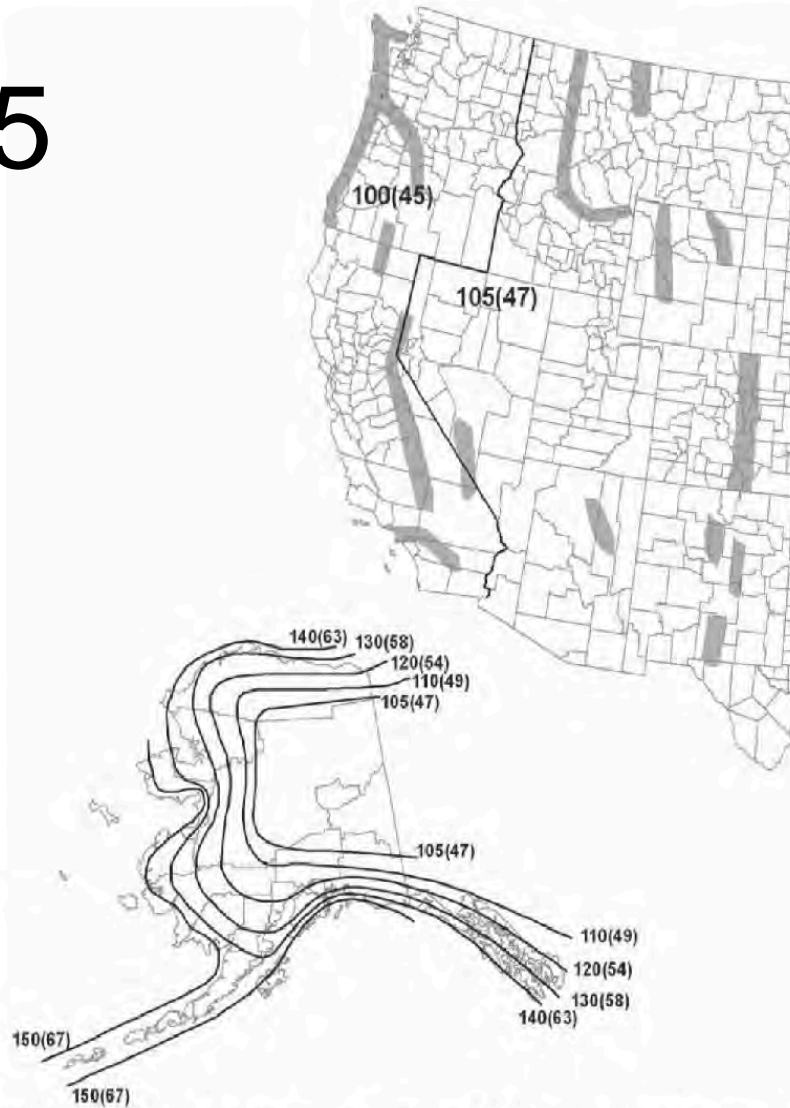


#### Spectra



Note: Due to manufacturing variances and limitations in the production process, colors may vary from this brochure. Contact Master Halco for actual color samples.





Location	Vmph	(m/s)
Guam	180	(80)
Virgin Islands	150	(67)
American Samoa	150	(67)
Hawaii – <b>Special Wind Region Statewide</b>	115	(51)

Figure 26.5-1c (Continued)

Figure 26.5-1C Basic Wind Speeds for Occupancy Category I Buildings and Other Structures.

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 Years).

## Accessories

A fence usually requires accessories to function properly and safely.

- Windscreens may improve the backdrops and reduce the air flow on a playing area.
- Netting may extend the enclose height, divide a playing area or protect spectators.
- Guards that make the top rails safer for players.
- Padding when fences less than optimum distance from the Principal Playing Area.
- Attached Items such as shades and racks.



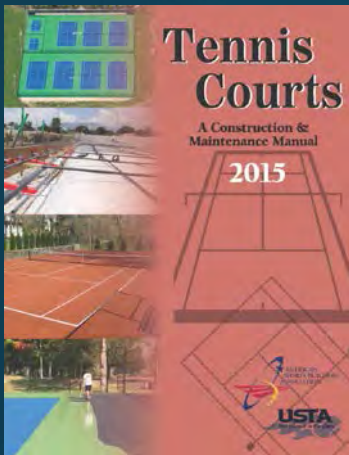
## ASTM STANDARDS FOR SPORT FENCES

<b>A 90M-13</b>	Test Method for	Weight of Coating on Steel with Zinc or Zinc-Alloy
<b>A 123M-17</b>	Specification for	<b>Zinc Coatings on Iron &amp; Steel Products</b>
<b>A 153M-16</b>	Specification for	<b>Zinc Coatings on Iron &amp; Steel Hardware</b>
<b>A 385M-17</b>	Practice for	<b>High-Quality Zinc Coatings</b>
<b>A 392-17</b>	Specification for	<b>Zinc-Coated Steel CLF Fabric</b>
A 428M-14	Test Method for	Weight of Coating on Iron or Steel with Aluminum
A 491-17	Specification for	Aluminum-Coated Steel CLF Fabric
<b>A 569M-98</b>	<b>Specification for</b>	<b>Steel (Withdrawn 2000)</b>
A 817-17	Specification for	Metallic-Coated Steel Wire for CLF Fabric and Marcellled Tension Wire
A 824-17	Specification for	Metallic-Coated Steel Tension Wire for CLF
<b>A 1011M-17</b>	Specification for	<b>Steel</b>
<b>B 6-13</b>	Specification for	<b>Zinc</b>
<b>B 117-16</b>	Practice for	<b>Operating Salt Spray Fog Apparatus</b>
D 412-16	Test Method for	Vulcanized Rubber & Thermoplastic Elastomers
D 792-13	Test Method for	Specific Gravity of Plastics by Displacement
<b>D 1735-14</b>	Practice for	<b>Testing Water Resistance of Coatings</b>
		<b>Using Water Fog Apparatus</b>
D 2240-15	Test Method for	Rubber Property-Hardness
<b>E8-16a</b>	Test Methods for	<b>Tension Testing of Metallic Materials</b>
<b>E 376-11</b>	Practice for	<b>Measuring Coating Thickness by Magnetic- Field or Eddy-Current</b> (Electromagnetic)
		<b>Examination Methods</b>
F 537-14	Specification for	Fences Constructed of Wood
<b>F 552-14</b>	Terminology Relating to	<b>Chain Link Fencing (CLF)</b>
<b>F 567-14a</b>	Practice for	<b>Installation of Chain-Link Fence</b>
<b>F 626-14</b>	Specification for	<b>Fence Fittings</b>
F 654-17	Specification for	Residential CLF Gates

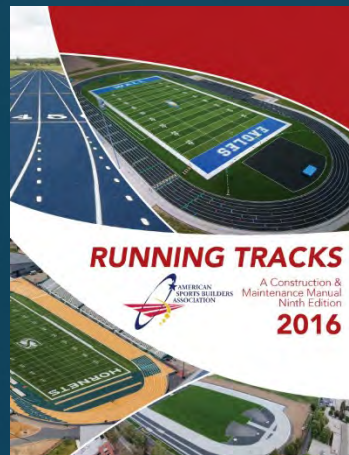
## ASTM STANDARDS FOR SPORT FENCES

<b>F 668-17</b>	Specification for	<b>PVC, Polyolefin &amp; Other Polymer-Coated Steel Chain-Link Fence Fabric</b>
<b>F 900-17</b>	Specification for	<b>Industrial &amp; Commercial Swing Gates</b>
<b>F 934-17</b>	Specification for	<b>Standard Colors for Polymer-Coated Chain-Link Fence Materials</b>
<b>F 969-16</b>	Practice for	<b>Construction of Chain-Link Tennis Court Fence</b>
<b>F 1043-17</b>	Specification for	<b>Strength and Protective Coatings on Steel Industrial Chain-Link Fence Framework</b>
<b>F 1083-16</b>	Specification for	<b>Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures</b>
<b>F 1183-17</b>	Specification for	<b>Aluminum Alloy CLF Fabric</b>
<b>F 1345-15</b>	Specification for	<b>Zinc-5% Aluminum Mischmetal Alloy-Coated Steel Chain Link Fence Fabric</b>
<b>F 1553-17</b>	Guide for	<b>Specifying Chain-Link Fence</b>
<b>F 1664-13</b>	Specification for	<b>PVC &amp; Other Polyester-Coated Steel Tension Wire Used with CLF</b>
<b>F 2631-07</b>	Practice for	<b>Installation of Chain-Link Fence for Outdoor Sports Fields, Sports Courts &amp; Other Recreation Facilities (Withdrawn 2016)</b>
<b>F 2000-10</b>	Guide for	<b>Fences for Baseball and Softball Fields</b>
<b>F 2453-14</b>	Specification for	<b>Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer-Coated) with Variable Mesh Patterns for Meshes of 6 sq.in. or Less</b>
<b>WK60894</b>	Specification for	<b>Safety Performance for Fencing and Containment Systems Surrounding Indoor/Outdoor Playing Fields</b>
<b>WK24076</b>	Guide for	<b>Safety Inspection of Fencing in and Around Athletic, Recreation and Other Outdoor Facilities</b>

# References for this Presentation



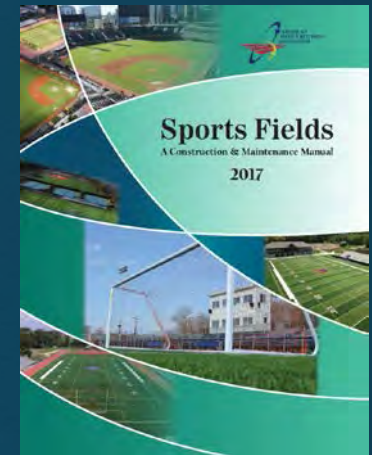
Chapter 12



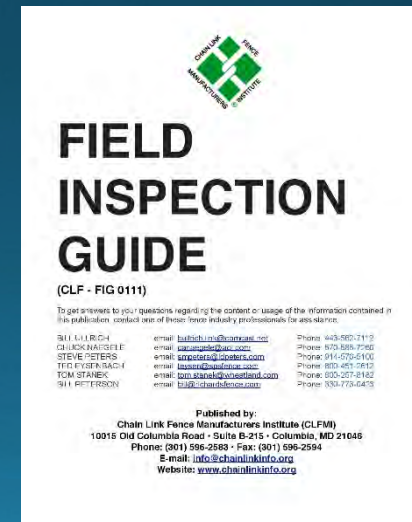
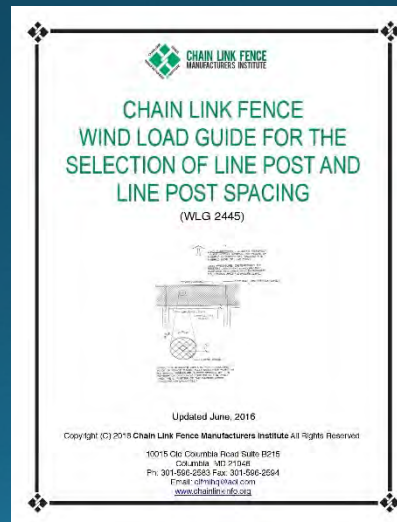
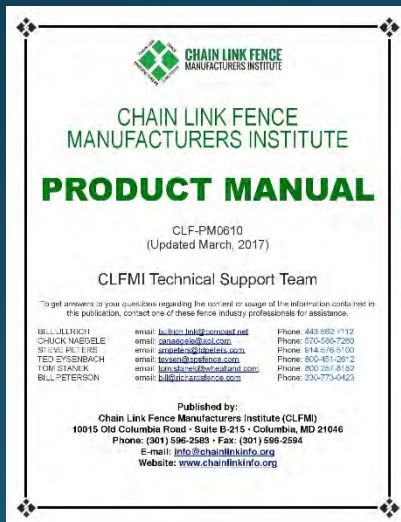
Chapter 5



Chapter 6



Chapter 2





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**Thank You**

Alex Levitsky [GlobalTennisDesign.com](http://GlobalTennisDesign.com)

**QUESTIONS??**

Todd M. Dettor [Fast-Dry.com](http://Fast-Dry.com)







# 1 Basketball, Handball & other courts should have Safety Zones between the court and fence.





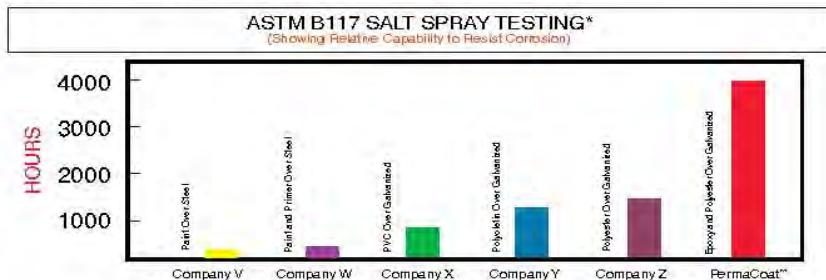
In Platform and Padel Tennis, the fence is in play.  
Therefore, very specific dimensions apply.

# Coating for Outdoors - Corrosion & UV resistance are usually important design criteria to fence finish longevity.

5

## SUPERIOR CORROSION RESISTANCE

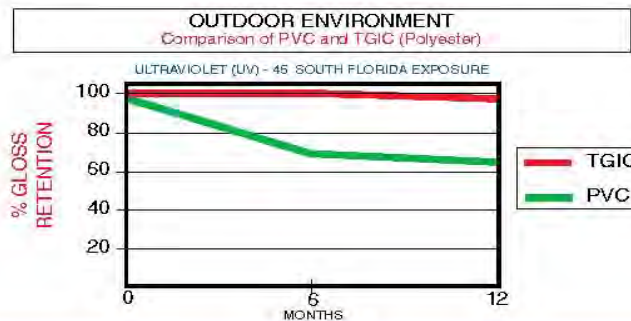
PermaCoat® significantly exceeds paint, polyolefin, PVC, and one coat polyester finishes in its ability to resist corrosion. ASTM B117 test results below show the dramatic difference.



\* Testing to ASTM B-117 with scribe to ASTM D1654 - Failure mode of 1/8-inch undercut or medium #8 blisters.

## SUPERIOR UV RESISTANCE

PermaCoat® is far superior to PVC in resistance to the harmful effects of UV radiation, as shown below using South Florida exposure tests.



### Corrosion Resistance - ASTM B117 Salt Spray Testing

Paint over Steel	150 hours
Primer & Paint over Steel	225 hours
PVC over Galvanized	700 hours
Polyolefin over Galvanized	1300 hours
Polyester over Pre-Galvanized	1500 hours
Epoxy and Polyester over Galvanized	3800 hours
PPA 571	20000 hours?

### UV Resistance - Florida Exposure - % Gross Retention (after 12 months)

PVC	60%
TGIC (Polyester)	98%

# Bending moment is the key and tubes generally perform better than pipes.

# 5

## SUPERIOR STRENGTH

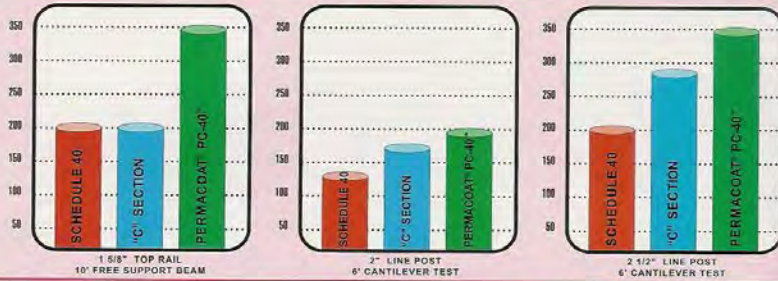
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### PERMACOAT® PC-40™ INDUSTRIAL STRENGTH PIPE PHYSICAL DIMENSIONS & STRENGTH CHARACTERISTICS

FENCE INDUSTRY O.D.	NOMINAL PIPE SIZE I.D.	ACTUAL O.D. (IN.)	WALL THICKNESS (IN.)	WT./FT. (POUNDS)	MIN. YIELD STRENGTH	X	(1) SECTION MODULUS	MAX. BENDING MOMENT LBS./IN.	10' FREE SUPPORTED LBS.	CALCULATED LOAD (LBS.)		
										CANTILEVER		
										4'	6'	
1-5/8"	1-1/4"	1.660	.111	1.84	80,000	x	.091	=	9,005	327	204	135
2"	1-1/2"	1.900	.120	2.28	60,000	x	.2610	=	14,050	468	293	195
2-1/2"	2"	2.375	.130	3.12	50,000	x	.4881	=	24,405	814	505	330
3"	2-1/2"	2.875	.160	4.64	50,000	x	.8778	=	43,890	1,463	914	610
4"	3-1/2"	4.000	.160	6.66	50,000	x	1.7819	=	88,095	2,969	1,856	1,237

(1) Nominal O.D. and minimum wall thickness

### PERMACOAT® PC-40™ VS. SCHEDULE 40 & "C" SECTION BENDING STRENGTH COMPARISON



### PERMACOAT® PC-20™ COMMERCIAL STRENGTH PIPE PHYSICAL DIMENSIONS & STRENGTH CHARACTERISTICS

FENCE INDUSTRY O.D.	NOMINAL PIPE SIZE I.D.	ACTUAL O.D. (IN.)	WALL THICKNESS (IN.)	WT./FT. (POUNDS)	MIN. YIELD STRENGTH	X	(1) SECTION MODULUS	MAX. BENDING MOMENT LBS./IN.	10' FREE SUPPORTED LBS.	CALCULATED LOAD (LBS.)		
										CANTILEVER		
										4'	6'	
1-5/8"	1-1/4"	1.660	.085	1.43	50,000	x	.156	=	7,880	262	164	109
2"	1-1/2"	1.900	.090	1.74	50,000	x	.221	=	11,060	360	230	154
2-1/2"	2"	2.375	.085	2.31	50,000	x	.373	=	18,650	609	389	259
3"	2-1/2"	2.875	.110	3.25	50,000	x	.636	=	31,810	1,039	664	442

(1) Nominal O.D. and minimum wall thickness

Ameristar® is America's premier manufacturer of color chain link fence materials. Making the strongest fence pipe in its state-of-the-art roll-forming mill is one of the reasons for Ameristar's prominence.

## CHAIN LINK FENCE FRAMEWORK SELECTIONS

Revised:03/14/00

Framing Members	Type I Round Pipe	Type II Round Pipe	Square Sections	Formed "C" Sections
<b>Terminal Posts: end, Corner, and Pull (based on fabric height)</b>				
6 ft (1830 mm) or less	Outside Dim. (inches) (mm)	2.375 (60.3)	2.375 (60.3)	2.00 x 2.00 (50 x 50)
	Wall thickness (inches) (mm)	0.154 (3.91)	0.130 (3.30)	0.095 (2.41)
	Weight (lb/ft) (kg/m)	3.65 (5.4)	3.117 (4.64)	2.60 (3.87)
7 ft (2134 mm) to 10 ft (3048 mm)	Outside Dim. (inches) (mm)	2.875 (73.0)	2.875 (73.0)	2.50 x 2.50 (63.5 x 63.5)
	Wall thickness (inches) (mm)	0.203 (5.16)	0.160 (4.06)	0.1875 (4.76)
	Weight (lb/ft) (kg/m)	5.79 (8.6)	4.64 (6.91)	5.10 (7.59)
Over 10 ft (3048 mm)	Outside Dim. (inches) (mm)	4.00 (101.6)	4.00 (101.6)	2.50 x 2.50 (63.5 x 63.5)
	Wall thickness (inches) (mm)	0.226 (5.74)	0.160 (4.06)	0.1875 (4.76)
	Weight (lb/ft) (kg/m)	9.11 (13.6)	6.56 (9.78)	5.10 (7.59)
<b>Line Posts (based on fabric height)</b>				
6ft (1830 mm) or less	Outside Dim. (Inches) (mm)	1.900 (48.3)	1.900 (48.3)	1.875 x 1.625 (47.63 x 41.28)
	Wall thickness (Inches) (mm)	0.145 (3.68)	0.120 (3.05)	0.121 (3.07)
	Weight (lb/ft) (kg/m)	2.72 (3.65)	2.281 (3.30)	2.26 (3.42)
7 ft (2134 mm) to 10 ft (3048 mm)	Outside Dim. (Inches) (mm)	2.375 (60.3)	2.375 (60.3)	1.875 x 1.625 (47.63 x 41.28)
	Wall thickness (Inches) (mm)	0.154 (3.91)	0.130 (3.30)	0.121 (3.07)
	Weight (lb/ft) (kg/m)	3.65 (5.4)	3.117 (4.64)	2.26 (3.42)
over 10 ft (3048 mm)	Outside Dim. (Inches) (mm)	2.875 (73.0)	2.875 (73.0)	2.25 x 1.70 (57.2 x 43.2)
	Wall thickness (Inches) (mm)	0.203 (5.16)	0.160 (4.06)	0.121 (3.07)
	Weight (lb/ft) (kg/m)	5.79 (8.6)	4.65 (6.91)	2.70 (4.02)
Rails and Braces	Outside Dim. (Inches) (mm)	1.660 (42.2)	1.660 (42.2)	
	Wall thickness (Inches) (mm)	0.140 (3.56)	0.111 (2.82)	
	Weight (lb/ft) (kg/m)	2.27 (3.4)	1.83 (2.72)	

Fence Terminology: 1.66" od = 1-5/8" od  
 1.9" od = 2" od  
 2.375" od = 2-1/2" od  
 2.875" od = 3" od

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Note: Fence terminology is od not id as in normal pipe specs.  
 Od - outside diameter / id - inside diameter

# Schedule 40 (pipe) vs. SS20 (tube). Pretty close.

# 5

Fence Post Strength Comparison						
Manufacturer System	Nominal Dimension	Equivalent OD	Wall Thickness	Weight	Max Bend Moment	Load Cantilever-6'
	Inches	Inches	Inches	Lbs./Ft.	lbs.-Inch	Lbs.
<b>Schedule 40</b>	(I.D.)					
Galvanized (pipe)	1 1/4	1.660	0.140	2.27	7,038	98
Merchant's Metal extruded	1 1/2	1.900	0.145	2.72	9,786	136
	2	2.375	0.154	3.65	16,819	234
	2 1/2	2.875	0.203	5.79	31,921	443
	3	3.500	0.216	7.58	51,723	718
Ig40	3 1/2	4.000	0.226	9.12	71,816	997
	4	4.500	0.237	10.80	96,435	1,339
	6	6.625	0.280	18.99	254,873	3,540
	8	8.625	0.322	28.58	504,274	7,004
<b>Schedule 40</b>	1 1/4	1.660	0.140	2.27	7,038	98
Permafused II-Type 1 Polyolefin (pipe)	1 1/2	1.900	0.145	2.72	9,786	136
Master Halco	2	2.375	0.154	3.65	16,819	234
	2 1/2	2.875	0.203	5.79	31,921	443
	3	3.500	0.216	7.58	51,723	718
<b>PC-40</b>	(O.D.)					
PermaCoat (tube)	1 5/8	1.660	0.111	1.84		136
AmeriStar	2	1.900	0.120	2.28		195
	2 1/2	2.375	0.130	3.12		339
	3	2.875	0.160	4.64		610
	4	4.000	0.160	6.56		1,237
<b>DQ-40</b>	1 5/8	1.660	0.111	1.84		
Permafused II-Type 2 Polyolefin (tube)	2					
Master Halco	2 1/2	2.375	0.130	3.12		
	3	2.875	0.160	4.64		
<b>SS40</b>	1 5/8	1.660	0.111	1.84	9,805	136
(tube)	2	1.900	0.120	2.28	14,050	195
Allied Tube	2 1/2	2.375	0.130	3.12	24,405	339
	3	2.875	0.160	4.64	43,890	610
	3 1/2	3.500	0.160	5.71	67,040	931
	4	4.000	0.160	6.56	89,095	1,237
<b>SS20</b>	1 5/8	1.660	0.085	1.431		109
(tube)	2	1.900	0.090	1.741		154
Allied Tube	2 1/2	2.375	0.095	2.315		259
	3	2.875	0.110	3.251		442

Minimum Yield Strength of **PIPES** = 30,000 psi  
 Minimum Yield Strength of **TUBES** = 50,000 psi

## Sizing & Spacing of Line Posts

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### Factors:

- Height of Fence (**S** (part 1))
- Size & Style of Fabric (**Cf1**)
- Material Strength & Shape of Post (**S** (part 2))
- Wind Pressure (**Cf2**) and Icing Effect (**Cf3**)

Formula:  $S' = S * Cf1 * Cf2 * Cf3$

## Diameter & Depth of Footing

### Factors:

- Soils Quality (**S<sub>1</sub>**)
- Applied Force (**P**)
- Footing Diameter (**d**)

Formula:  $D = 0.5 A * \{1 + [1 + (4.36 * c) / A]^{1/2}\}$

# EXAMPLE 1 LINE POST SPACING - HIGH WINDS

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For a site location with a high wind condition and the design selection of an appropriate footing size and depth:

Select a line post size, it's spacing and footing for a 12' high chain link fence that will consist of a #9 gage 1-3/4" mesh fabric. Installation will be in Southern Florida in an open terrain with a wind exposure category "C" and a maximum wind velocity of 150 Mph. Soil condition is assumed to be a medium silty sand. (Actual local soil properties should be established by a qualified geotechnical engineer.)

From Table 6 for 150 Mph wind and under 10' high fence and a trial size line post of Group IA, 4" outside diam. steel pipe "S" = 1.2

"Cf1" for the fabric size and gage = 6.4

"Cf2" for the wind exposure category = 0.67

"Cf3" for icing condition = 1.0

Thus the maximum spacing for the Group IA, 4" Outside Dia. pipe =

$$1.2 \times 6.4 \times 0.67 \times 1.0 = 5.14'$$

This may not be an economical spacing; try another trial size post.

Checking the spacing for a Group IA, 6-5/8" O.D. pipe where

"S" = 4.6 Maximum spacing will be

$$4.6/1.2 \times 5.14' = 19.70' \text{ (use 10.0')}$$

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**TABLE 2**  
 LINE POST SELECTION: WIND SPEED 110 MPH  
 EXPOSURE CATEGORY "B" (N/A = Not Available)

LINE POST SIZE IN	LINE POST MAXIMUM SPACING, S (FEET) FOR USE IN EQUATION: S'=S X Cf1 x Cf2 x Cf3 FENCE HEIGHT (FEET)																		
	3	3.5	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield)																		
1 7/8"	5.3	3.9	2.9	1.8	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	9.2	6.8	5.1	3.2	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	17.5	12.8	9.8	6.2	4.3	3.1	2.3	1.8	1.4	1.1	---	---	---	---	---	---	---	---	---
3 1/2"	28.4	20.9	16.0	10.2	7.0	5.1	3.9	3.0	2.4	2.0	1.6	1.3	1.1	---	---	---	---	---	---
4"	39.6	29.0	22.2	14.2	9.8	7.2	5.5	4.3	3.4	2.8	2.3	1.9	1.6	1.4	1.2	1.0	---	---	---
6 5/8"	---	---	---	50.7	35.2	25.8	19.7	15.6	12.6	10.4	8.7	7.4	6.4	5.5	4.8	4.3	3.8	3.4	3.0
8 5/8"	---	---	---	---	51.1	39.1	30.9	25.0	20.6	17.3	14.8	12.7	11.1	9.7	8.6	7.6	6.8	6.2	---
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	8.8	6.5	4.8	3.0	2.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	15.3	11.3	8.5	5.3	3.7	2.7	1.8	---	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	29.2	21.3	16.3	10.3	7.2	5.2	3.8	3.0	2.3	1.8	---	---	---	---	---	---	---	---	---
3 1/2"	47.3	34.8	26.7	17.0	11.7	8.5	6.5	5.0	4.0	3.3	2.7	2.2	1.8	---	---	---	---	---	---
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6 5/8"	---	---	---	84.5	58.7	43.0	32.8	26.0	21.1	17.3	14.5	12.3	10.7	9.2	8.0	7.2	6.3	5.7	5.0
8 5/8"	---	---	---	---	85.2	65.2	51.5	41.7	34.3	28.8	24.7	21.2	18.5	16.2	14.3	12.7	11.3	10.3	---
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	5.3	3.8	2.8	1.7	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8"	7.6	5.6	4.2	2.6	1.7	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	13.4	9.8	7.4	4.7	3.2	2.2	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	24.2	17.7	13.5	8.6	5.9	4.3	3.2	2.4	1.9	1.5	1.2	---	---	---	---	---	---	---	---
3 1/2"	37.0	27.1	20.7	13.2	9.1	6.6	5.0	3.9	3.1	2.5	2.0	1.7	1.4	1.1	---	---	---	---	---
4"	49.2	36.1	27.6	17.6	12.2	8.9	6.8	5.3	4.2	3.4	2.8	2.4	2.0	1.7	1.4	1.2	1.0	---	---
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	5.7	4.2	3.1	2.0	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8" x 1 5/8" x .121	9.7	7.1	5.4	3.3	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---	---	---	---
2 1/4" x 1 5/8" x .121	11.2	8.2	6.2	3.9	2.6	1.8	1.3	---	---	---	---	---	---	---	---	---	---	---	---
3 1/4" x 2 1/2" x .130	27.6	20.1	15.3	9.5	6.4	4.4	3.1	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---

See Table 12 for post dimensions and material properties.

**TABLE 6**  
 LINE POST SELECTION: WIND SPEED 150 MPH  
 EXPOSURE CATEGORY "B" (N/A = Not Available)

LINE POST SIZE IN	LINE POST MAXIMUM SPACING, S (FEET) FOR USE IN EQUATION: S'=S X Cf1 x Cf2 x Cf3 FENCE HEIGHT (FEET)																		
	3	3.5	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield)																		
1 7/8"	2.8	2.0	1.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	4.8	3.5	2.7	1.7	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	9.1	6.7	5.1	3.3	2.2	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---	---
3 1/2"	14.8	10.9	8.3	5.3	3.7	2.7	2.0	1.6	1.3	1.0	---	---	---	---	---	---	---	---	---
4"	20.6	15.2	11.6	7.4	5.1	3.8	2.9	2.2	1.8	1.5	1.2	1.0	---	---	---	---	---	---	---
6 5/8"	---	---	---	26.4	18.4	13.5	10.3	8.1	6.6	5.4	4.6	3.9	3.3	2.9	2.5	2.2	2.0	1.8	1.6
8 5/8"	---	---	---	---	---	26.7	20.4	16.1	13.0	10.8	9.0	7.7	6.6	5.8	5.1	4.5	4.0	3.6	3.2
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	4.7	3.3	2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	8.0	5.8	4.5	2.8	1.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	15.2	11.2	8.5	5.5	3.7	2.7	2.0	---	---	---	---	---	---	---	---	---	---	---	---
3 1/2"	24.7	18.2	13.8	8.8	6.2	4.5	3.3	2.7	2.2	1.7	---	---	---	---	---	---	---	---	---
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6 5/8"	---	---	---	44.0	30.7	22.5	17.2	13.5	11.0	9.0	7.7	6.5	5.5	4.8	4.2	3.7	3.3	3.0	2.7
8 5/8"	---	---	---	---	---	44.5	34.0	26.8	21.7	18.0	15.0	12.8	11.0	9.7	8.5	7.5	6.7	6.0	5.3
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	2.8	2.0	1.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8"	4.0	2.9	2.2	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	7.0	5.1	3.9	2.4	1.7	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	12.6	9.2	7.1	4.5	3.1	2.2	1.7	1.3	---	---	---	---	---	---	---	---	---	---	---
3 1/2"	19.3	14.2	10.8	6.9	4.8	3.5	2.6	2.0	1.6	1.3	1.1	---	---	---	---	---	---	---	---
4"	25.7	18.8	14.4	9.2	6.4	4.6	3.5	2.8	2.2	1.8	1.5	1.2	1.0	---	---	---	---	---	---
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	3.0	2.2	1.6	1.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8" x 1 5/8" x .121	5.1	3.7	2.8	1.7	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2 1/4" x 1 5/8" x .121	5.8	4.3	3.2	2.0	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3 1/4" x 2 1/2" x .130	14.4	10.5	8.0	5.0	3.3	2.3	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---

See Table 12 for post dimensions and material properties.

**TABLE 9**

**Mesh and Fabric Size Coefficients (Cf<sub>1</sub>)\***

FABRIC WIRE SIZE (O.D.)		3/8"	1/2	5/8"	1"	1 1/4"	1 3/4"	2"	2 1/4"
metric equiv. (mm) =>		9.5	12.7	15.8	25.4	31.8	44.5	50.8	57.1
diam. (in) diam.(mm)									
.#5 (0.207)	5.26				2.92	3.52	4.73	5.33	5.92
#6 (0.192)	4.88				3.30	3.75	5.06	5.71	6.37
#8 (0.162)	4.11				3.58	4.36	5.89	6.67	7.44
#9 (0.148)	3.76	1.77	2.20	2.60	3.87	4.73	6.40	7.26	8.09
10 (0.135)	3.43	1.88	2.36	2.80	4.19	5.13	6.96	7.90	8.82
11 (0.120)	3.0	2.06	2.60	3.10	4.65	5.71	7.77	8.83	9.86
12 (0.113)	2.87	2.16	2.72	3.25	4.91	6.04	8.22	9.35	10.44
* - (Cf <sub>1</sub> ) =1 for solid panel fence									

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**TABLE 10**

**WIND EXPOSURE CATEGORY COEFFICIENTS (Cf<sub>2</sub>)**

EXPOSURE CATEGORY	Kz		WIND COEFFICIENT: ( Kz EXP B ) / ( Kz )	
	0-15 FT	15-20 FT	0-15 FT	15-20 FT
B	0.57	0.62	1.00	1.00
C	0.85	0.9	0.67	0.69
D	1.03	1.08	0.55	0.57

NOTES:

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EXPOSURE B: Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

EXPOSURE C: Open terrain with scattered obstructions having heights generally less than 30 ft. This includes flat open country, grasslands, and all water surfaces in hurricane prone regions.

EXPOSURE D: Flat, unobstructed areas and water surfaces outside hurricane-prone regions. This category includes smooth mud flats, salt flats, and unbroken ice.

**TABLE 11**  
**Ice Exposure Coefficients (Cf<sub>3</sub>)**

Regional Conditions	Cf <sub>3</sub>
Regions likely to experience heavy ice storms	0.45
Regions subject to moderate icing effects	0.85
Regions not subject to the effects of icing	1.00

NOTES

1. Maximum spacing of posts may be limited by top rail design.
2. Recommended maximum spacing of posts not to exceed 10'-0".
3. For solid fence use exposure coefficient (Cf<sub>3</sub>) = 1.0.
4. Ice exposure coefficient is an arbitrary value that may be assigned based on the judgment of the designer, considering the probability of an event occurring where maximum ice accumulation and peak wind velocity occurs at the same time in the locality the fence is installed.

# EXAMPLE 2 LINE POST SPACING - TYPICAL 5

Select a line post spacing for a 10' high Chain Link Fence, constructed of #9 gage wire, having a mesh size pattern of 1-3/4". The installation location is for a park in an urban location in the Eastern U. S., where the wind exposure is considered, ' Exposure C'. Assume the local governing code indicates that the maximum wind speed for this application is 105 mph; localized icing effects are considered to be moderate. One possible line post material selection for this example is Group 1A, Schedule 40 steel pipe.

From Table 1, Wind Speed 105 Mph, for a 3.5" outside dia. (O.D.)  
the listed "S" value for a 10' high fence is 2.5.

From Table 9, the Coefficient "Cf1",  
for a #9 gage, 1-3/4" mesh fabric = 6.4

From Table 10, the Coefficient "Cf2",  
for a Wind Exposure Category C = 0.67

From Table 11, the Coefficient "Cf3",  
for Moderate Icing Effects = 0.85

Thus the recommended maximum spacing for the 4" O.D. Schedule 40, steel pipe post for the 10' high fence with a #9 gage wire and 1-3/4" mesh would be:

$$S' = S \times Cf1 \times Cf2 \times Cf3 = 2.5 \times 6.4 \times 0.67 \times 0.85 = 9.11'$$

**TABLE 1**  
 LINE POST SELECTION: WIND SPEED 105 MPH  
 EXPOSURE CATEGORY "B"

(N/A = Not Available)

LINE POST SIZE IN	LINE POST MAXIMUM SPACING, S (FEET) FOR USE IN EQUATION: $S = S \times Cf1 \times Cf2 \times Cf3$ FENCE HEIGHT (FEET)																			
	3	3.5	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield)																			
1 7/8"	5.5	4.0	3.0	1.9	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	9.6	7.0	5.3	3.4	2.3	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	18.1	13.3	10.2	6.5	4.4	3.2	2.4	1.9	1.5	1.2	---	---	---	---	---	---	---	---	---	
3 1/2"	29.5	21.8	16.6	10.6	7.3	5.3	4.0	3.2	2.5	2.0	1.7	1.4	1.2	---	---	---	---	---	---	
4"	41.0	30.1	23.0	14.7	10.2	7.5	5.7	4.4	2.9	2.4	2.0	1.7	1.5	1.2	1.1	---	---	---	---	
6 5/8"	---	---	---	52.5	36.4	26.8	20.5	16.2	13.1	10.8	9.0	7.7	6.6	5.7	5.0	4.4	3.9	3.5	3.1	
8 5/8"	---	---	---	---	---	53.0	40.5	32.0	25.9	21.4	18.0	15.3	13.2	11.5	10.1	8.9	7.9	7.1	6.4	
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																				
1 7/8"	9.2	6.7	5.0	3.2	2.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	16.0	11.7	8.8	5.7	3.8	2.7	2.0	---	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	30.2	22.2	17.0	10.8	7.3	5.3	4.0	3.2	2.5	2.0	---	---	---	---	---	---	---	---	---	
4"	49.2	36.0	27.7	17.7	12.2	8.8	6.7	5.3	3.3	2.8	2.3	2.0	---	---	---	---	---	---	---	
6 5/8"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
8 5/8"	---	---	---	---	60.7	44.7	34.2	27.0	21.8	18.0	15.0	12.8	11.0	9.5	8.3	7.3	6.5	5.8	5.2	
---	---	---	---	---	---	67.5	53.3	43.2	35.7	30.0	25.5	22.0	19.2	16.8	14.8	13.2	11.8	10.7	---	
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																				
1 5/8"	5.5	3.9	3.0	1.8	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
1 7/8"	7.9	5.8	4.3	2.7	1.7	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	13.9	10.1	7.7	4.9	3.3	2.3	1.7	1.2	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	25.0	18.4	14	8.9	6.1	4.4	3.3	2.5	2.0	1.5	1.2	---	---	---	---	---	---	---	---	
3 1/2"	38.3	28.1	21.5	13.7	9.5	6.9	5.2	4.0	3.2	2.6	2.1	1.7	1.4	1.2	---	---	---	---	---	
---	50.9	37.4	28.6	18.3	12.6	9.2	7.0	5.5	4.1	3.6	2.9	2.4	2.0	1.7	1.5	1.2	1.1	---	---	
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																				
1 7/8" x 1 5/8" x .105	5.9	4.3	3.3	2.0	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
1 7/8" x 1 5/8" x .121	10.0	7.3	5.6	3.5	2.3	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---	---	
2 1/4" x 1 5/8" x .121	11.6	8.5	6.4	4.0	2.7	1.9	1.3	---	---	---	---	---	---	---	---	---	---	---	---	
3 1/4" x 2 1/2" x .130	26.6	20.9	15.8	9.9	6.6	4.6	3.2	2.3	1.6	1.1	---	---	---	---	---	---	---	---	---	

See Table 12 for post dimensions and material properties.

**TABLE 2**  
 LINE POST SELECTION: WIND SPEED 110 MPH  
 EXPOSURE CATEGORY "B"

(N/A = Not Available)

LINE POST SIZE IN	LINE POST MAXIMUM SPACING, S (FEET) FOR USE IN EQUATION: $S = S \times Cf1 \times Cf2 \times Cf3$ FENCE HEIGHT (FEET)																			
	3	3.5	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield)																			
1 7/8"	5.3	3.9	2.9	1.8	1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	9.2	6.8	5.1	3.2	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	17.5	12.8	9.8	6.2	4.3	3.1	2.3	1.8	1.4	1.1	---	---	---	---	---	---	---	---	---	
3 1/2"	28.4	20.9	16.0	10.2	7.0	5.1	3.9	3.0	2.4	2.0	1.6	1.3	1.1	---	---	---	---	---	---	
4"	39.6	29.0	22.2	14.2	9.8	7.2	5.5	4.3	3.4	2.8	2.3	1.9	1.6	1.4	1.2	1.0	---	---	---	
6 5/8"	---	---	---	50.7	35.2	25.8	19.7	15.6	12.6	10.4	8.7	7.4	6.4	5.5	4.8	4.3	3.8	3.4	3.0	
8 5/8"	---	---	---	---	---	51.1	39.1	30.9	25.0	20.6	17.3	14.8	12.7	11.1	9.7	8.6	7.6	6.8	6.2	
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																				
1 7/8"	8.8	6.5	4.8	3.0	2.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	15.3	11.3	8.5	5.3	3.7	2.7	1.8	---	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	29.2	21.3	16.3	10.3	7.2	5.2	3.8	3.0	2.3	1.8	---	---	---	---	---	---	---	---	---	
3 1/2"	47.3	34.8	26.7	17.0	11.7	8.5	6.5	5.0	4.0	3.3	2.7	2.2	1.8	---	---	---	---	---	---	
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
6 5/8"	---	---	---	84.5	58.7	43.0	32.8	26.0	21.1	17.3	14.5	12.3	10.7	9.2	8.0	7.2	6.3	5.7	5.0	
8 5/8"	---	---	---	---	---	85.2	65.2	51.5	41.7	34.3	28.8	24.7	21.2	18.5	16.2	14.3	12.7	11.3	10.3	
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																				
1 5/8"	5.3	3.8	2.8	1.7	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
1 7/8"	7.6	5.6	4.2	2.6	1.7	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	
2 3/8"	13.4	9.8	7.4	4.7	3.2	2.2	1.6	1.2	---	---	---	---	---	---	---	---	---	---	---	
2 7/8"	24.2	17.7	13.5	8.6	5.9	4.3	3.2	2.4	1.9	1.5	1.2	---	---	---	---	---	---	---	---	
3 1/2"	37.0	27.1	20.7	13.2	9.1	6.6	5.0	3.9	3.1	2.5	2.0	1.7	1.4	1.1	---	---	---	---	---	
4"	49.2	36.1	27.6	17.6	12.2	8.9	6.8	5.3	4.2	3.4	2.8	2.4	2.0	1.7	1.4	1.2	1.0	---	---	
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																				
1 7/8" x 1 5/8" x .105	5.7	4.2	3.1	2.0	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
1 7/8" x 1 5/8" x .121	9.7	7.1	5.4	3.3	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---	---	---	---	
2 1/4" x 1 5/8" x .121	11.2	8.2	6.2	3.9	2.6	1.8	1.3	---	---	---	---	---	---	---	---	---	---	---	---	
3 1/4" x 2 1/2" x .130	27.6	20.1	15.3	9.5	6.4	4.4	3.1	2.2	1.6	1.1	---	---	---	---	---	---	---	---	---	

See Table 12 for post dimensions and material properties.

**TABLE 9**

**Mesh and Fabric Size Coefficients (Cf<sub>1</sub>)\***

FABRIC WIRE SIZE (O.D.)		3/8"	1/2	5/8"	1"	1 1/4"	1 3/4"	2"	2 1/4"
metric equiv. (mm) =>		9.5	12.7	15.8	25.4	31.8	44.5	50.8	57.1
diam. (in) diam.(mm)									
.#5 (0.207)	5.26				2.92	3.52	4.73	5.33	5.92
#6 (0.192)	4.88				3.30	3.75	5.06	5.71	6.37
#8 (0.162)	4.11				3.58	4.36	5.89	6.67	7.44
#9 (0.148)	3.76	1.77	2.20	2.60	3.87	4.73	6.40	7.26	8.09
10 (0.135)	3.43	1.88	2.36	2.80	4.19	5.13	6.96	7.90	8.82
11 (0.120)	3.0	2.06	2.60	3.10	4.65	5.71	7.77	8.83	9.86
12 (0.113)	2.87	2.16	2.72	3.25	4.91	6.04	8.22	9.35	10.44
* - (Cf <sub>1</sub> ) =1 for solid panel fence									

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**TABLE 10**

**WIND EXPOSURE CATEGORY COEFFICIENTS (Cf<sub>2</sub>)**

EXPOSURE CATEGORY	Kz		WIND COEFFICIENT: ( Kz EXP B ) / ( Kz )	
	Fence height 0-15 FT	15-20 FT	0-15 FT	15-20 FT
B	0.57	0.62	1.00	1.00
C	0.85	0.9	0.67	0.69
D	1.03	1.08	0.55	0.57

NOTES:

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EXPOSURE B: Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

EXPOSURE C: Open terrain with scattered obstructions having heights generally less than 30 ft. This includes flat open country, grasslands, and all water surfaces in hurricane prone regions.

EXPOSURE D: Flat, unobstructed areas and water surfaces outside hurricane-prone regions. This category includes smooth mud flats, salt flats, and unbroken ice.

**TABLE 11**  
**Ice Exposure Coefficients (Cf<sub>3</sub>)**

Regional Conditions	Cf <sub>3</sub>
Regions likely to experience heavy ice storms	0.45
Regions subject to moderate icing effects	0.85
Regions not subject to the effects of icing	1.00

NOTES

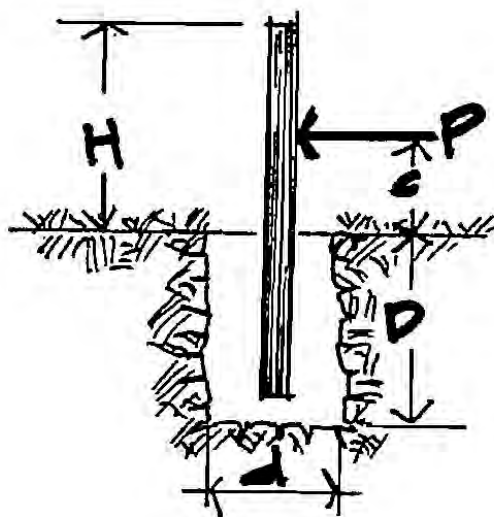
1. Maximum spacing of posts may be limited by top rail design.
2. Recommended maximum spacing of posts not to exceed 10'-0".
3. For solid fence use exposure coefficient (Cf<sub>3</sub>) = 1.0.
4. Ice exposure coefficient is an arbitrary value that may be assigned based on the judgment of the designer, considering the probability of an event occurring where maximum ice accumulation and peak wind velocity occurs at the same time in the locality the fence is installed.

# EXAMPLE 3 FOOTING SIZE & DEPTH

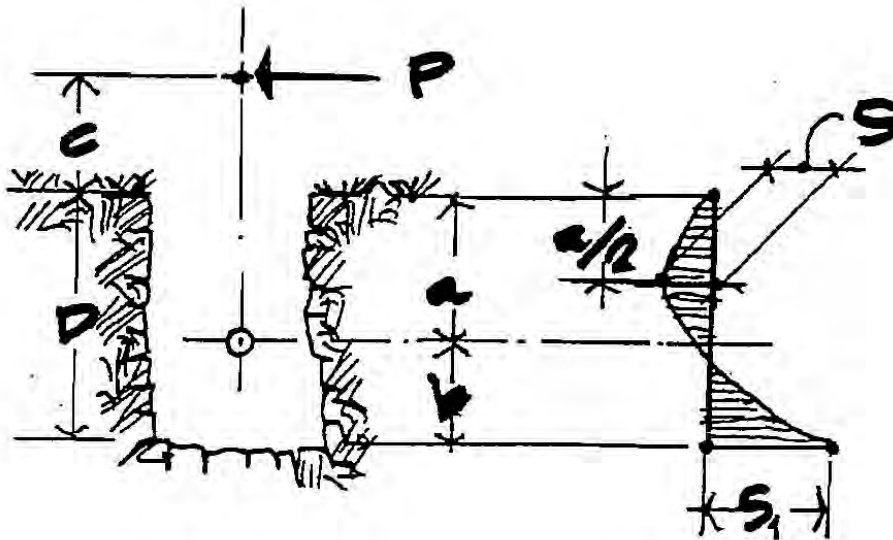
For the 3.5" O.D. line post, the minimum footing size is 4 \* Pipe Dia. for pipes under 4" Dia. and 3 \* Pipe Dia. for pipes over 4" Dia. (per ASTM F-567) or 14"; however, it is recommended that footing size of 15" dia. be used. The minimum depth of footing embedment in the silty sand soil is to be calculated as follows:

- P** = Wind force applied to post
- d** = Diameter of post footing
- c** = Distance where "P" is applied
- S<sub>1</sub>** = Allowable lateral soil-bearing pressure
- D** = Footing depth
- H** = Fence post height (above grade)

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LINE POST



FOOTING

PRESSURE

## Example 3 (continued)

Allowable soil bearing pressure (**S<sub>1</sub>**) for silty sand clay = **150 psf** <sup>\*\*1</sup>

(\*\*1 - As determined from 2009 IBC Table 1806.2 Presumptive Soil Load-Bearing Values.)

Distance of applied force above footing ("**c**") =  $0.5H + 0.05H = 0.55 * 10' = \mathbf{5.50'}$

Applied Force "**P**" =  $(1 / C_{f1}) \times (\text{Net Area of Fence}) \times (\text{Wind Pressure where } C_{f1} \text{ is the Mesh and Fabric Size Coefficient from Table 9 and the Wind Pressure is the Design Wind Pressure from Table 13.})$

$$\mathbf{P} = (0.16 \text{ sf/sf}) * (100 \text{ sf}) * (22.53 \text{ lb/sf}) = \mathbf{360.5 \text{ lbs}}$$

$$\mathbf{d} = 15" = \mathbf{1.25'}$$

$$\mathbf{A} = (2.34 * \mathbf{P}) / (\mathbf{S}_1 * \mathbf{d}) = (2.34 * 360.5) / (150 * 1.25) = \mathbf{4.50}$$

$$\mathbf{D} = 0.5 \mathbf{A} \times \{1 + [1 + (4.36 \times \mathbf{c}) / \mathbf{A}]^{1/2}\} \text{ **2} =$$

(\*\*2 - As determined from 2009 IBC Table Eq. 18-1)

$$= (0.5 \times 4.50) * \{1 + [1 + (4.36 * 5.50') / 4.50]^{1/2}\}$$

$$= \mathbf{7.91'}$$
 (minimum depth of footing by calculation is **95"**.)

Since the minimum footing depth as set by ASTM F-567 is  $24" + [3" * (10' - 4')] \text{ **3} = 24" + 18" = \mathbf{42"}$  is less than the calculation, theoretically, the calculation should be used. REALLY??? Maybe not...

(\*\*3 - Footing depth of 24" plus 3" for every 12" of fence height over 4' high.)

**TABLE 9**

**Mesh and Fabric Size Coefficients (Cf1)\***

**57**

FABRIC WIRE SIZE (O.D.)		3/8"	1/2	5/8"	1"	1 1/4"	1 3/4"	2"	2 1/4"
metric equiv. (mm) =>		9.5	12.7	15.8	25.4	31.8	44.5	50.8	57.1
diam. (in) diam.(mm)									
.#5 (0.207)	5.26				2.92	3.52	4.73	5.33	5.92
#6 (0.192)	4.88				3.30	3.75	5.06	5.71	6.37
#8 (0.162)	4.11				3.58	4.36	5.89	6.67	7.44
#9 (0.148)	3.76	1.77	2.20	2.60	3.87	4.73	6.40	7.26	8.09
10 (0.135)	3.43	1.88	2.36	2.80	4.19	5.13	6.96	7.90	8.82
11 (0.120)	3.0	2.06	2.60	3.10	4.65	5.71	7.77	8.83	9.86
12 (0.113)	2.87	2.16	2.72	3.25	4.91	6.04	8.22	9.35	10.44
* - (Cf1) =1 for solid panel fence									

**5**

**TABLE 13**

**Design Wind Pressure, q (LB / SF)**

EXPOSURE CATEGORY	Height (ft)	Kz	Wind Velocity (MPH)							
			105	110	120	130	140	150	160	170
B	0 - 15	0.57	16.00	16.58	19.74	23.16	26.86	30.84	35.09	39.61
	15 - 20	0.62	16.44	18.04	21.47	25.19	29.22	33.54	38.16	43.08
C	0 - 15	0.85	22.53	24.73	29.43	34.54	40.06	45.99	52.32	59.07
	15 - 20	0.90	23.86	26.18	31.16	36.57	42.42	48.69	55.40	62.54
D	0 - 15	1.03	27.30	29.97	35.66	41.85	48.54	55.72	63.40	71.57
	15 - 20	1.08	28.63	31.42	37.39	43.89	50.90	58.43	66.48	75.05

TABLE 1806.2  
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction <sup>a</sup>	Cohesion (psf) <sup>b</sup>
1. Crystalline bedrock	12,000	1,200	0.70	-
2. Sedimentary and foliated rock	4,000	400	0.35	-
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	-
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	-
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	-	130

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.

a. Coefficient to be multiplied by the dead load.

b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.

## Example 3 (continued)

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Is the soil bearing pressure ( $S_1$ ) for silty sand clay = 150 psf ? Maybe not...

(\*\*1 - As determined from 2009 IBC Table 1806.2 Presumptive Soil Load-Bearing Values.)

**1807.3.2 Design criteria.** The depth to resist lateral loads shall be determined using the design criteria established in Sections 1807.3.2.1 through 1807.3.2.3, or by other methods approved by the building official.

**1807.3.2.1 Nonconstrained.** The following formula shall be used in determining the depth of embedment required to resist lateral loads where no lateral constraint is provided at the ground surface, such as by a rigid floor or rigid ground surface pavement, and where no lateral constraint is provided above the ground surface, such as by a structural diaphragm.

$$d = 0.5A\{1 + [1 + (4.36h/A)]^{1/2}\} \quad \text{(Equation 18-1)}$$

where:

$$A = 2.34P/(S_1b).$$

$b$  = Diameter of round post or footing or diagonal dimension of square post or footing, feet (m).

$d$  = Depth of embedment in earth in feet (m) but not over 12 feet (3658 mm) for purpose of computing lateral pressure.

$h$  = Distance in feet (m) from ground surface to point of application of "P."

$P$  = Applied lateral force in pounds (kN).

$S_1$  = Allowable lateral soil-bearing pressure as set forth in Section 1806.2 based on a depth of one-third the depth of embedment in pounds per square foot (psf) (kPa).

**1806.3 Lateral load resistance.** Where the presumptive values of Table 1806.2 are used to determine resistance to lateral loads, the calculations shall be in accordance with Sections 1806.3.1 through 1806.3.4.

**1806.3.1 Combined resistance.** The total resistance to lateral loads shall be permitted to be determined by combining the values derived from the lateral bearing pressure and the lateral sliding resistance specified in Table 1806.2.

**1806.3.2 Lateral sliding resistance limit.** For clay, sandy clay, silty clay, clayey silt, silt and sandy silt, in no case shall the lateral sliding resistance exceed one-half the dead load.

**1806.3.3 Increase for depth.** The lateral bearing pressures specified in Table 1806.2 shall be permitted to be increased by the tabular value for each additional foot (305 mm) of depth to a maximum of 15 times the tabular value.

**1806.3.4 Increase for poles.** Isolated poles for uses such as flagpoles or signs and poles used to support buildings that are not adversely affected by a 1/2-inch (12.7 mm)

motion at the ground surface due to short-term lateral loads shall be permitted to be designed using lateral bearing pressures equal to two times the tabular values.

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TABLE 1806.2  
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/f below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction <sup>a</sup>	Cohesion (psf) <sup>b</sup>
1. Crystalline bedrock	12,000	1,200	0.70	-
2. Sedimentary and foliated rock	4,000	400	0.35	-
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	-
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	-
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	-	130

- 150 1' Deep Footing
- 300 2' Deep Footing
- 450 3' Deep Footing
- 600 4' Deep Footing
- 750 5' Deep Footing
- 900 6' Deep Footing
- 1050 7' Deep Footing

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.

a. Coefficient to be multiplied by the dead load.

b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.

### Example 3 (continued)

Allowable soil bearing pressure (**S<sub>1</sub>**) for silty sand clay = **525 psf** <sup>\*\*4</sup>

(<sup>\*\*4</sup> - As determined from 2015 IBC Table 1806.2 and Section 1806.3.3.)

Distance of applied force above footing ("**c**") =  $0.5H + 0.05H = 0.55 * 10' = \mathbf{5.50'}$

Applied Force "**P**" =  $(1 / C_{f1}) \times (\text{Net Area of Fence}) \times (\text{Wind Pressure where } C_{f1} \text{ is the Mesh and Fabric Size Coefficient from Table 9 and the Wind Pressure is the Design Wind Pressure from Table 13.})$

$$\mathbf{P} = (0.16 \text{ sf/sf}) * (100 \text{ sf}) * (22.53 \text{ lb/sf}) = \mathbf{360.5 \text{ lbs}}$$

$$\mathbf{d} = 15" = \mathbf{1.25'}$$

$$\mathbf{A} = (2.34 * \mathbf{P}) / (\mathbf{S}_1 * \mathbf{d}) = (2.34 * 360.5) / (525 * 1.25) = \mathbf{1.285}$$

$$\mathbf{D} = 0.5 \mathbf{A} \times \{1 + [1 + (4.36 \times \mathbf{c}) / \mathbf{A}]^{1/2}\} \text{ <sup>**2</sup> =}$$

(<sup>\*\*2</sup> - As determined from 2009 IBC Table Eq. 18-1)

$$= (0.5 \times \mathbf{1.285}) * \{1 + [1 + (4.36 * 5.50') / \mathbf{1.285}]^{1/2}\}$$

$$= \mathbf{3.49'}$$
 (minimum depth of footing by calculation is **42"**.)

Since the minimum footing depth as set by ASTM F-567 is

$$24" + [3" * (10' - 4') \text{ <sup>**3</sup>}] = 24" + 18" = \mathbf{42"}$$

The IBC Equation 18-1 and the ASTM calculations MATCH.

(<sup>\*\*3</sup> - Footing depth of 24" plus 3" for every 12" of fence height over 4' high.)



Coordinate Fence Color with Lights and other Accessories like WINDSCREENS.

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