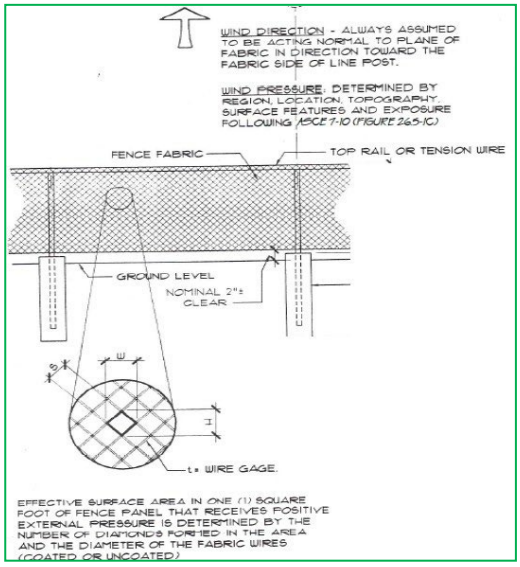
CHAIN LINK FENCE MANUFACTURERS INSTITUTE

CHAIN LINK FENCE WIND LOAD GUIDE FOR THE SELECTION OF LINE POST AND LINE POST SPACING

(WLG 2445)



Updated January 2023

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DISCLAIMER

The Wind Load Guide for the Selection of Line Post Spacing values for Woven Wire Chain Link Fencing is published by the Chain Link Fence· Manufacturers Institute as a general information service in the selection of spacing for fencing line posts for chain link fence systems. However, because exposure, workmanship, soils, drainage, emplacement problems, wind and other weather conditions may vary, even at various locations in a single site, a qualified professional engineer should assess each application. Accordingly, no representation or warranty is made, and none should be implied, respecting the suitability or adequacy of the information in this Guide for any particular application, nor is this Guide intended to establish industry "standards" respecting the selection of spacing for fencing line posts, or for any purpose.

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INTRODUCTION

The Chain Link Fence Manufacturers Institute (CLFMI) would like to acknowledge Pagnotta Engineering, Inc. for the technical analysis of this Guide, as well as members of the CLFMI Technical Committee, for their complete and thorough editing effort on the original version. In addition, further acknowledgement is extended to the American Society of Civil Engineers (ASCE) for agreeing to the use of its copyrighted materials. CLFMI also wishes to extend special recognition to **Charles Naegele**, former Chair of the CLFMI Technical Committee, for his leadership in the production of the original Guide and its subsequent updated editions .

This Guide is intended to provide background information in the forms of charts and tables to assist fence designers and installers in the appropriate selection of fencing line posts for chain link fencing. However, because conditions vary from site to site, the information in the Guide should not be relied upon without the evaluation of a qualified professional engineer.

PLEASE READ THE DISCLAIMER.

The Guide includes twelve tables for the spacing values of line posts exposed to wind speeds of 105 MPH up to and including 210 MPH. These tables are based on the applicable ASCE 7-22 wind load standards. The spacing values listed in the twelve tables must be adjusted using appropriate and selected coefficients to account for the size of the fabric gauge and mesh size, wind exposure and the probability for the development of icing conditions at that location. Moreover, the tables do not take into account wind speeds exceeding 210 MPH, which may occur in category 5 hurricanes, tornadoes, at high elevations, or as the result of explosions. Note: The wind speeds listed in the ASCE 7-22 are Ultimate or Load and Resistance Factor Design (LRFD) Strength Level. Per Section 2.4 of the ASCE 7-22, Load Combination 5a, a factor of 0.6 is used to convert the resulting wind forces to the Allowable Stress Design (ASD) Strength Level.

Seven of the most commonly used fabric wire gage sizes and seven of the most commonly used mesh sizes (shown in **Table 13**), when used in any combination and acted upon by several sets of wind pressures (not wind speed or velocity), allow the user to select specific line posts. Line post selection is based on local wind conditions, economics, aesthetics and functionality of other design criteria established for a specific application. Note: this guide is designed for chain link fence systems only and is not intended for use with other types of fence designs.

The guide considers the following assumptions as being applicable in the design analysis based on the wind loading criteria outlined in **ASCE 7-22, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures", Chapter 26, Wind Loads: General Requirements** and **Chapter 29, Wind Loads on Building Appurtenances and Other Structures—MWFRS**.

- Wind is acting in a direction normal to the plane of the fencing fabric and applied on the fabric side of the line post.
- Tension wire or rail at the base and top of the fence accommodates the normal tensile loading being applied to take up vertical sag of the fence.
- A Factor of Safety of 1.5 is applied to the allowable stress of the materials used in Tables 1 through 12 and 16.
- A constant Force Coefficient, C_f, of 1.458 is used in Tables 1 through 12. The average of the C_f values for the aspect ratios of the maximum

allowed spacing (10 feet) divided by the minimum fence height (3 feet) and maximum fence height (20 feet) from Figure 29.3-1 is 1.458. The C_f value may vary by +23.4% (C_f = 1.8 maximum) to -10.8% (C_f = 1.3 minimum).

Additionally, the line posts are considered to be embedded in the ground surface in accordance with the minimum size and depth established according to the **2009 International Building Code** and **ASTM F567, "Standard Practice for Installation of Chain Link Fence"**. All posts are considered to be embedded in concrete, minimum 2,500 psi, air-entrained, of a depth consistent with local soil types and conditions.

FACTORS WHICH INFLUENCE THE SIZE AND SPACING OF LINE POSTS*

- **HEIGHT OF FENCE** The height of the fence influences the amount of wind force that must be resisted by the post and the required anchorage to the ground. The fence height times the line post spacing sets the total force acting on a solid panel of the fence which is transferred to the line posts and then into the footing.

- **STYLE AND SIZE OF FABRIC** The style and size of fabric determines the net surface area of the solid fence panel exposed to the wind pressure, which in turn must possess adequate tensile strength to transfer the developed loading to the supporting members of the fence assembly; i.e., line posts, top rail and base tension wire.

- **MATERIAL STRENGTH AND SHAPE OF POST** Material strength and shape of post determines the size of posts and their spacing, which will provide the required resistance to the maximum wind forces and remain serviceable subsequent to the maximum wind event.

- **UPDATED FOOTING ANALYSIS AS RELATED TO SOIL TYPE AND BEARING LOADS** The type of soil that will be encountered at the site of the fence installation will influence the post size and spacing by way of the passive soil pressures that can reasonably be expected to resist the tendency for the line posts to overturn and also to remain in an essentially plumb position after the wind event. For footing design criteria, it is advisable to contact a geotechnical professional for the appropriate soils information at the particular site. The minimum depth of footings in accordance with **ASTM F567** is 24" plus an additional 3" for each one (1) foot of fence height over 4 feet. The **2009 International Building Code, (Eq. 18-1)** is utilized to determine the required footing embedment depth, up to a maximum embedment depth of 12'-0" below finish grade

VARIABLES AND DEFINITIONS for the FORMULA FOR DETERMING FOOTING DEPTH

P = Resultant concentrated wind force applied to post

c = Distance above top of footing at which "P" is applied to post

D = Post footing embedment depth below finish grade

d = Diameter of post footing

S1 = Allowable lateral soil-bearing pressure

H = Fence post height above top of footing

$$D = 0.5A * \{ 1 + [1 + (4.36 * c) / A)]^{1/2} \}$$
$$A = 2.34P/S1*d$$

SEE THE CALCULATION EXAMPLE 3 ON PAGES (10 & 11) FOR AN ILLUSTRATION OF THIS ANALYSIS

The table listed below (which is also found on page 44 of this Guide) shows the Presumptive Soil Load Bearing Values for calculations to determine footing sizes using this updated approach, which includes lateral and vertical factors.

TABLE 1806.2
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (pst)	LATERAL BEARING PRESSURE (*psf/f* below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)b
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.

- **ACTUAL LATERAL SOIL BEARING PRESSURE (LSBP) DETERMINATION SHOULD BE DETERMINED AT THE FENCE SITE BY APPROPRIATE MEANS. HOWEVER, WHEN USING TABULAR LSBP VALUES IN PLACE OF ACTUAL SITE DATA, IT IS IMPORTANT TO KNOW THAT THEY ARE GENERALLY ADJUSTED UPWARD DEPENDING ON THE DEPTH OF EMBEDMENT WHEN CALCULATING A FOOTING DEPTH. HOWEVER, THIS LSBP INCREASE IN VALUE SHOULD ONLY BE APPLIED UNDER THE SUPERVISION OF A PROFESSIONAL THAT IS KNOWLEDGEABLE AND FAMILIAR WITH THE CONDITIONS SPECIFIC TO THE SITE AND APPLICATION.**

• **WIND PRESSURE** Wind pressure is the dominant factor that influences the post size and spacing, as it is the only force that can reasonably be predicted and will be acting on the posts under normal conditions. Reference Table 17 for values of various wind speeds and pressures. Wind pressure in itself is influenced by other factors; i.e., geographical region, exposure, topography and ground surface features in the local area. Note: Wind pressures in Table 17 must be multiplied by 0.6 to convert them to ASD levels.

***Reference Figure I, "LINE POST SPACING GUIDE DETAILS"**

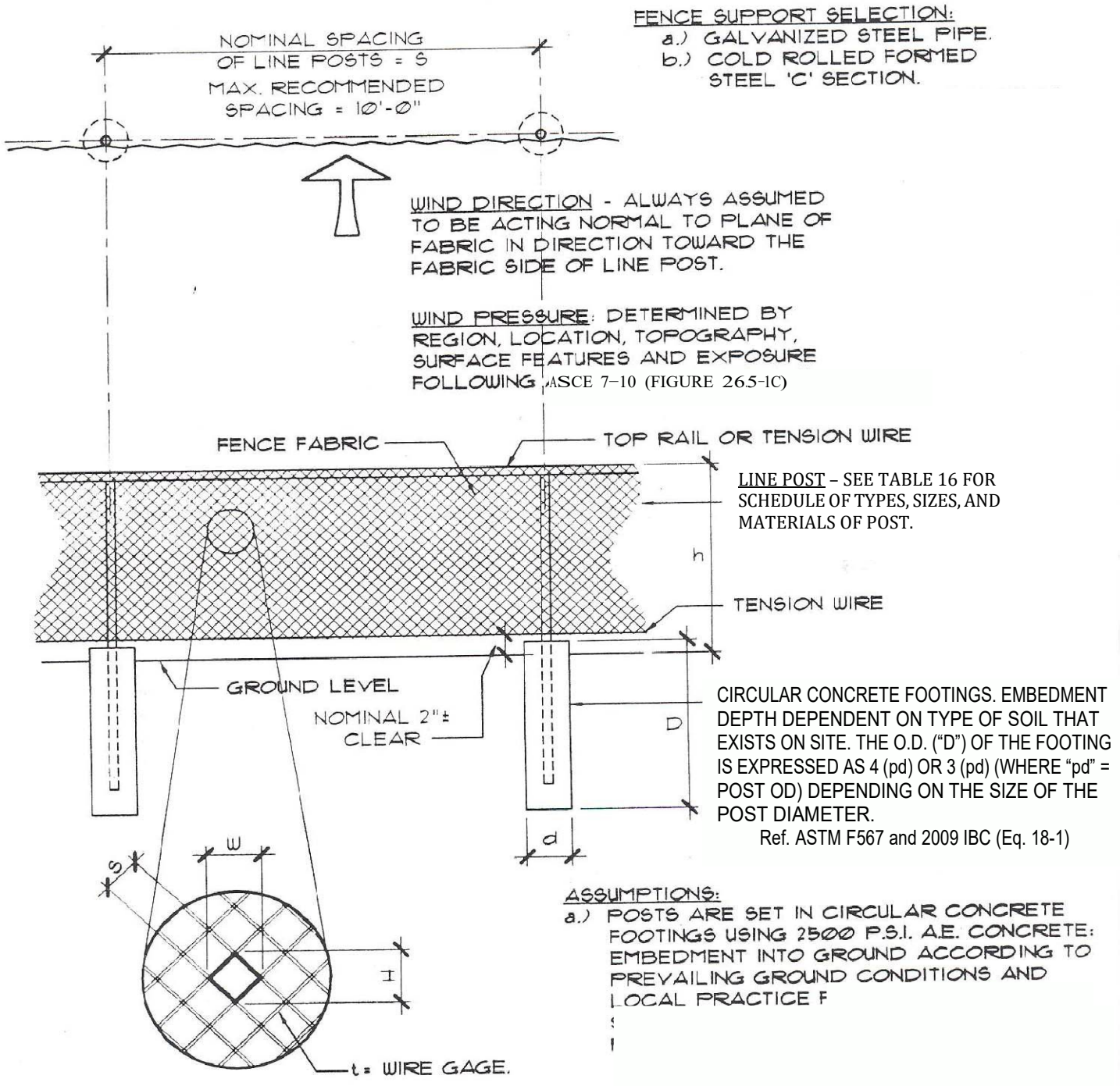


FIGURE #1

LINE POST SPACING GUIDE DETAILS

METHODOLOGY

The methodology used to develop the tabular values of the maximum Line Post Spacing, "S", is based on wind loading criteria outlined in **ASCE 7-22, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures", Chapter 26, Wind Loads: General Requirements** and **Chapter 29, Wind Loads on Building Appurtenances and Other Structures—MWFRS.** Relevant excerpts from the ASCE 7-22 are included in the Appendix. “S” is the unmodified maximum Line Post Spacing based on materials, sizes and shapes most commonly employed in the chain link fencing industry for various fence heights and wind speeds.

The application of the fence loading criteria considers all factors that influence the wind force applied to the primary force-resisting component of the fence, the line posts, which transfer the loading to the ground. Tables 1-12 assume the fence panel is solid. Cf_1, the Mesh and Fabric Size Coefficient, is applied after the fact to account for various percentages of free area of the fence panel.

To establish the magnitude of the wind force that acts on the line post, the net surface area of the fence panel must be calculated; i.e., the solid panel area, "h x S", less the void spaces. The net surface area of the wire fabric is what the wind force impinges on and is directed on to the post. Since the panel of the fence is essentially a perforated plane, it is necessary to quantify the solid surface to void area. The area of wire surface was determined by establishing the number of diamonds in a square foot of fabric and totaling the length of wire. This value, used in combination with the computed wind velocity pressure, is applied as a force to the fence post. The fence is essentially a flagpole design; i.e., a vertical cantilever, fixed at its base to the footing and ground.

Now, with the wind velocity pressure calculated for each of the twelve Wind Speeds of 105 MPH through 210 MPH, acting under normal conditions for a Wind Exposure Category "**B**", these pressures are then applied to the face area of the solid fence panel. With the height "**H**" of the fence known, the only variable that needs to be established to set the total gross area "$\mathbf{A_g}$" of the panel is the line post spacing "S". The values of "**S**" were generated based on the loading applied to the post as a vertical cantilever, in a similar fashion as the "classic" flagpole design.

Tables 1 through **12** are set up for fence heights that range from 3 feet up to and including 20 feet and twenty-six combinations of line post sizes and types, in a solid panel configuration. The **"S"** values were computed on the basis of their physical, material properties and formulas listed in **Table 16** with a limiting value based on the factored maximum allowable stress.

To account for the variations in the fabric wire sizes and sizes of mesh, **Table 13** lists the Coefficient "$\mathbf{Cf_1}$", which is based on a ratio of net area to gross area of a solid panel for each of the commonly used styles employed in the industry. The reciprocal of the Cf_1 values in **Table 13** is the net resisting area of the fence, or the closed area factor.

The line post spacing **Tables 1 through 12** are for Wind Exposure Category "**B**. **Table 14** lists conversion factors for Wind Exposure Categories "**C**" and "**D**" for fence heights of 0-15 feet and 15-20 feet. The Coefficient "**Cf_2**" is the ratio of the Wind Exposure Coefficient "**Kz**" for Exposure "**B**" divided by the Wind Exposure Coefficient "**Kz**" for Wind Exposure Categories "**C**" and "**D**" as listed in **ASCE 7-22, Table 26.10-1**. The Coefficient "**Cf_2**" is used to convert "S" values from **Tables 1 through 12** to Wind Exposure Categories "**C**" or "**D**".

Table 15 lists the Ice Effect Probability Coefficient, "**Cf_3**", for various regional conditions. Engineering judgement shall be used to conservatively apply a **Cf_3** factor. The user shall take into account the probability that a severe icing condition may develop concurrent with the maximum wind speed.

Figure 26.5-1A from **ASCE 7-22** shows wind speed categories in the range of 105 MPH to 170 MPH, but also includes special wind speed regions and a 180 MPH wind speed for use in Guam for Risk Category I buildings and other structures. **Figure 26.5-1C** from **ASCE 7-22** shows wind speed categories in the range of 105 MPH to 200 MPH, but also includes special wind speed regions and a 210 MPH wind speed for use in Guam for Risk Category III buildings and other structures. This guide provides values of wind speeds that cover the entire range of velocities that may be encountered in the continental United States, Hawaii and Guam. For any installations determined to have intermediate wind speeds, it is acceptable to interpolate linearly.

The user of this guide is advised that they may want to consider use of the full allowable yield stress of the material being employed which has a built-in Factor of Safety equivalent to 1.5; ie., 0.66 Fy, **Reference Table 16**. The user may also want to consider using a higher maximum allowable stress, as wind loadings may not be a sustained condition.

HOW TO USE THE GUIDE

For the fence fabric configuration and size of line post being considered, go to the appropriate table (Table 1 through 12) that closely agrees with the maximum anticipated wind speed designated by the local codes for that geographical area where the fence installation is planned. From that table, find the value of "**S**" for the line post size and desired height. This value of "**S**" must then be multiplied by correction coefficients that account for the type, size and mesh of the wire fabric, "**Cf1**" from **Table 13**; Wind exposure category coefficient, "**Cf2**" from **Table 14**; Icing effects probability coefficient, "**Cf3**" from **Table 15**.

The recommended post spacing **S' = S X Cf1 x Cf2 x Cf3**

EXAMPLE I:

Select a line post spacing for a 10' high Chain Link fence constructed of #9-gage wire and 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 "Exposure C". Assume the local governing code indicates that the maximum wind speed for this application is 105 MPH and localized icing effects are moderate. One possible line post material for this example is Group 1A, Regular Grade Schedule 40 steel pipe.

From **Table 1, Wind Speed 105 MPH**, for a **4.0"** outside diameter pipe, the listed "**S**" value for a 10' high fence is **7.8 feet.**
From **Table 13**, the Coefficient "**Cf1**", for a #9 gage, 1-3/4" mesh fabric = **6.4**
From T**able 14**, the Coefficient "**Cf2**", for a Wind Exposure Category C = **0.67**
From **Table 15**, the Coefficient "**Cf3**", for Moderate Icing Effects = **0.85**

Thus, the recommended maximum spacing for the 4" outside diameter Schedule 40 steel pipe post for the 10' high fence with a #9-gage wire and 1-3/4" mesh is:

S' = S X Cf1 x Cf2 x Cf3 = 7.8 x 6.4 x 0.67 x 0.85 = 28.43'

The maximum recommended spacing is **10'-0" c/c**.

EXAMPLE2

If the Wind Velocity is not one of the velocities used in the twelve tables of line post spacing values in the guide:

Select a line post size and spacing for a 16' high chain link fence installation for a #9-gage, 1/2" mesh pattern. Assume the fence is located in an open terrain where the Wind Exposure Category is "C" and the code listed maximum wind speed is 115 MPH. Icing effects are moderate.

From **Table 13**, the coefficient "**Cf_1**" for mesh size and gage = **2.20**

From **Table 14**, the coefficient "**Cf_2**" for wind exposure "**C**" = **0.69**

From **Table 15**, the coefficient "**Cf_3**" for moderate icing effect = **0.85**

From **Table 2**, for a 110 MPH wind and a 16' high fence, select a trial line post size spacing factor **"S" = 2.6'** for a Group IA, regular grade, 4" OD steel pipe.

For this arrangement, the maximum spacing would be the result of 2.6' x 2.20 x 0.69 x 0.85 = 3.35'; This may not be an economical or practical spacing.

Therefore try the spacing for a Group IA, 6-5/8" OD steel pipe where **"S" = 9.10'** whose maximum recommended spacing would be 9.10'/2.6' x 3.35' = 11.74'.

Since the wind speed is **115 MPH**, the recommended spacing would be 110^2/115^2 x 11.74' = **10.74' or 10'- 0" on centers**, which would be more consistent with the usual standard maximum spacing followed in the industry.

EXAMPLE 3:

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, its 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 silty sand (Actual soil properties should be established by a qualified geotechnical engineer familiar with local soil conditions).

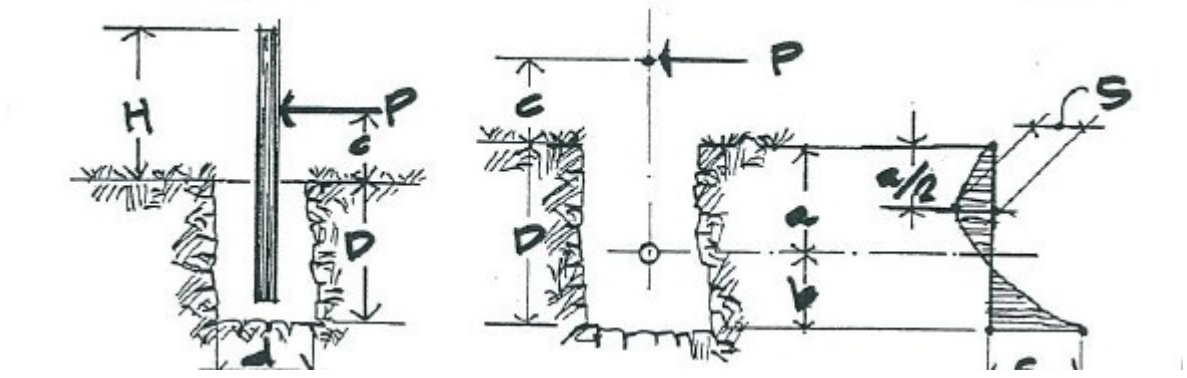
From **Table 6** for 150 MPH wind and under 12' high fence and a trial size line post of Group IA, Regular Grade, 3-1/2" outside diameter steel pipe "**S**" = **1.9'**

"Cf_1" for the fabric size and gage **= 6.4**
"**Cf_2**" for the wind exposure category= **0.67**
"**Cf_3**" for icing condition = **1.0**

Thus the maximum spacing for the Group IA, 3-1/2" outside diameter pipe = 1.9' x 6.4 x 0.67 x 1.0 = 8.14'. This may not be an economical spacing; try another trial size post.

Checking the spacing for a Group IA, 4" outside diameter pipe where "S" = 2.7', maximum spacing will be 2.7'/1.9' x 8.14' = 11.6' use 10'-0".

For the 4" outside diameter line post, the minimum footing size is 3 x Pipe outside diameter per ASTM F567 or 12"; however, it is recommended that footing size of 30" diameter be used. The minimum depth of footing embedment in the silty sand soil is to be calculated as follows:



LINEPOST FOOTING PRESSURE

Allowable lateral soil bearing pressure (S_1) for silty sand = 150 psf*, as determined from the *2009 International Building Code* Table 1806.2

Presumptive Soil Load-Bearing Values. See Appendix, pg. 44.

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EXAMPLE 3 (Continued):

Distance of applied force above footing "c" = 0.5H + 0.05H =0.55 x 12' = 6.60'

Applied Force "P" = (1/Cf1) x Net Area of Fence x Wind Pressure where Cf1 is the Mesh and Fabric Size Coefficient from Table 13 and the Wind Pressure is the Design Wind Pressure from Table 17.

P = (1/6.4 sf/sf) (10' x 12' sf) (48.96 lb/sf x 0.6)
= 550.8 lbs

Diameter of footing d = 30" = 2.50'

Solving for "D" D $= 0.5A * \{ 1 + [1 + (4.36 * c) / A)]^{1/2} \}$ *(20 9 IBC Eq. 18-1)*

where A $= 2.34P/S_1*b = 2.34 * (550.8 \text{ lbs}) / 150 \text{ psf} * 2.5'$
= 3.437'

D $= (0.5)(3.437') * \{ 1 + [1 + (4.36 * 6.60' / 3.437')]^{1/2}$
}
= 6.98'

AS ILLUSTRATED ABOVE THE CALCULATION FOR "D" PRODUCED A RESULT OF 6.98' USING A VALUE OF 150 PSF FROM THE TABLE ON PAGE 44 AS THE ALLOWABLE LATERAL SOIL BEARING PRESSURE (LSBP). HOWEVER, AS INDICATED IN THE TEXT FOLLOWING THIS TABLE AN UPWARD ADJUSTMENT OF THIS SOIL PROPERTY SHOULD ONLY BE DONE UNDER THE SUPERVISION OF A KNOWLEDGEABLE PROFESSIONAL. IT ALSO BECOMES CLEAR THAT WITHOUT INCREASING THE LSBP DUE TO EMBEDMENT DEPTH THE RESULTING "D" CALCULATION (6.98') WILL BE OVERLY CONSERVATIVE, WHICH IS EVIDENT IN THIS EXAMPLE. FOR THIS SITUATION, A MORE REASONABLE DEPTH FOR THE FOOTING CAN BE DETERMINED WITH ASTM F567, WHICH REQUIRES A DEPTH OF 24", PLUS AN ADDITIONAL 3" FOR EACH ONE (1) FOOT OF FENCE HEIGHT OVER 4 FEET:

ACCORDINGLY,

D= 24" + [(3" X (12' – 4')] = 24" + 24" = 48"

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 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"	12.0	8.8	6.8	4.3	3.0	2.2	1.7	1.3	1.1	---	---	---	---	---	---	---	---	---	---
2 3/8"	20.4	15.0	11.5	7.3	5.1	3.7	2.9	2.3	1.8	1.5	1.3	1.1	---	---	---	---	---	---	---
2 7/8"	38.6	28.4	21.7	13.9	9.7	7.1	5.4	4.3	3.5	2.9	2.4	2.1	1.8	1.5	1.2	1.1	---	---	---
3 1/2"	62.7	46.1	35.3	22.6	15.7	11.5	8.8	7.0	5.6	4.7	3.9	3.3	2.9	2.5	2.0	1.8	1.6	1.4	1.3
4"	87.1	64.0	49.0	31.4	21.8	16.0	12.2	9.7	7.8	6.5	5.4	4.6	4.0	3.5	2.8	2.5	2.2	2.0	1.8
6 5/8"	----	----	----	111.5	77.4	56.9	43.6	34.4	27.9	23.0	19.4	16.5	14.2	12.4	10.0	8.9	7.9	7.1	6.4
8 5/8"	----	----	----	----	----	112.5	86.2	68.1	55.1	45.6	38.3	32.6	28.1	24.5	19.8	17.5	15.6	14.0	12.7
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	20.0	14.7	11.3	7.2	5.0	3.7	2.8	2.2	1.8	1.5	1.3	1.1	---	---	---	---	---	---	---
2 3/8"	34.0	25.0	19.1	12.2	8.5	6.2	4.8	3.8	3.1	2.5	2.1	1.8	1.6	1.4	1.1	---	---	---	---
2 7/8"	64.4	47.3	36.2	23.2	16.1	11.8	9.1	7.2	5.8	4.8	4.0	3.4	3.0	2.6	2.1	1.8	1.6	1.5	1.3
3 1/2"	104.5	76.8	58.8	37.6	26.1	19.2	14.7	11.6	9.4	7.8	6.5	5.6	4.8	4.2	3.4	3.0	2.7	2.4	2.2
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"	----	----	----	----	129.1	94.8	72.6	57.4	46.5	38.4	32.3	27.5	23.7	20.7	16.7	14.8	13.2	11.8	10.7
8 5/8"	----	----	----	----	----	----	143.6	113.5	91.9	75.9	63.8	54.4	46.9	40.8	33.0	29.2	26.1	23.4	21.1
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	12.1	8.9	6.8	4.4	3.0	2.2	1.7	1.3	1.1	---	---	---	---	---	---	---	---	---	---
1 7/8"	17.0	12.5	9.6	6.1	4.3	3.1	2.4	1.9	1.5	1.3	1.1	---	---	---	---	---	---	---	---
2 3/8"	29.8	21.9	16.7	10.7	7.4	5.5	4.2	3.3	2.7	2.2	1.9	1.6	1.4	1.2	---	---	---	---	---
2 7/8"	53.5	39.3	30.1	19.2	13.4	9.8	7.5	5.9	4.8	4.0	3.3	2.8	2.5	2.1	1.7	1.5	1.4	1.2	1.1
3 1/2"	81.4	59.8	45.8	29.3	20.3	14.9	11.4	9.0	7.3	6.1	5.1	4.3	3.7	3.3	2.6	2.3	2.1	1.9	1.7
4"	108.1	79.4	60.8	38.9	27.0	19.9	15.2	12.0	9.7	8.0	6.8	5.8	5.0	4.3	3.5	3.1	2.8	2.5	2.2
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	14.0	10.3	7.9	5.0	3.5	2.6	2.0	1.6	1.3	1.0	---	---	---	---	---	---	---	---	---
1 7/8" x 1 5/8" x .121	23.7	17.4	13.3	8.5	5.9	4.4	3.3	2.6	2.1	1.8	1.5	1.3	1.1	---	---	---	---	---	---
2 1/4" x 1 5/8" x .121	27.3	20.1	15.4	9.8	6.8	5.0	3.8	3.0	2.5	2.0	1.7	1.5	1.3	1.1	---	---	---	---	---
3 1/4" x 2 1/2" x .130	67.4	49.5	37.9	24.3	16.9	12.4	9.5	7.5	6.1	5.0	4.2	3.6	3.1	2.7	2.2	1.9	1.7	1.5	1.4

See Table 16 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 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"	11.0	8.1	6.2	3.9	2.7	2.0	1.5	1.2	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	18.6	13.7	10.5	6.7	4.6	3.4	2.6	2.1	1.7	1.4	1.2	---	----	----	----	----	----	----	----
2 7/8"	35.2	25.9	19.8	12.7	8.8	6.5	4.9	3.9	3.2	2.6	2.2	1.9	1.6	1.4	1.1	1.0	----	----	----
3 1/2"	57.1	42.0	32.1	20.6	14.3	10.5	8.0	6.3	5.1	4.2	3.6	3.0	2.6	2.3	1.8	1.6	1.5	1.3	1.2
4"	79.4	58.3	44.6	28.6	19.8	14.6	11.2	8.8	7.1	5.9	5.0	4.2	3.6	3.2	2.6	2.3	2.0	1.8	1.6
6 5/8"	----	----	----	101.6	70.6	51.8	39.7	31.4	25.4	21.0	17.6	15.0	13.0	11.3	9.1	8.1	7.2	6.5	5.8
8 5/8"	----	----	----	----	----	102.5	78.5	62.0	50.2	41.5	34.9	29.7	25.6	22.3	18.0	16.0	14.3	12.8	11.5
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																				
1 7/8"	18.3	13.4	10.3	6.6	4.6	3.4	2.6	2.0	1.6	1.4	1.1	---	----	----	----	----	----	----	----
2 3/8"	31.0	22.8	17.4	11.2	7.7	5.7	4.4	3.4	2.8	2.3	1.9	1.7	1.4	1.2	1.0	----	----	----	----
2 7/8"	58.7	43.1	33.0	21.1	14.7	10.8	8.2	6.5	5.3	4.4	3.7	3.1	2.7	2.3	1.9	1.7	1.5	1.3	1.2
3 1/2"	95.2	69.9	53.5	34.3	23.8	17.5	13.4	10.6	8.6	7.1	5.9	5.1	4.4	3.8	3.1	2.7	2.4	2.2	2.0
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"	----	----	----	N/A	117.6	86.4	66.2	52.3	42.3	35.0	29.4	25.1	21.6	18.8	15.2	13.5	12.0	10.8	9.7
8 5/8"	----	----	----	----	----	----	130.8	103.4	83.7	69.2	58.1	49.5	42.7	37.2	30.1	26.6	23.8	21.3	19.2
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																				
1 5/8"	11.1	8.1	6.2	4.0	2.8	2.0	1.6	1.2	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	15.5	11.4	8.7	5.6	3.9	2.8	2.2	1.7	1.4	1.2	---	----	----	----	----	----	----	----	----
2 3/8"	27.1	19.9	15.3	9.8	6.8	5.0	3.8	3.0	2.4	2.0	1.7	1.4	1.2	1.1	----	----	----	----	----
2 7/8"	48.7	35.8	27.4	17.5	12.2	8.9	6.8	5.4	4.4	3.6	3.0	2.6	2.2	1.9	1.6	1.4	1.2	1.1	1.0
3 1/2"	74.2	54.5	41.7	26.7	18.5	13.6	10.4	8.2	6.7	5.5	4.6	3.9	3.4	3.0	2.4	2.1	1.9	1.7	1.5
4"	98.5	72.4	55.4	35.5	24.6	18.1	13.9	10.9	8.9	7.3	6.2	5.2	4.5	3.9	3.2	2.8	2.5	2.3	2.0
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																				
1 7/8" x 1 5/8" x .105	12.7	9.4	7.2	4.6	3.2	2.3	1.8	1.4	1.1	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	21.6	15.9	12.1	7.8	5.4	4.0	3.0	2.4	1.9	1.6	1.3	1.1	---	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	24.9	18.3	14.0	9.0	6.2	4.6	3.5	2.8	2.2	1.9	1.6	1.3	1.1	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	61.4	45.1	34.6	22.1	15.4	11.3	8.6	6.8	5.5	4.6	3.8	3.3	2.8	2.5	2.0	1.8	1.6	1.4	1.3

See Table 16 for post dimensions and material properties.

TABLE 3

LINE POST SELECTION: WIND SPEED 120 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"	9.2	6.8	5.2	3.3	2.3	1.7	1.3	1.0	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	15.6	11.5	8.8	5.6	3.9	2.9	2.2	1.7	1.4	1.2	---	---	---	---	---	---	---	---	---
2 7/8"	29.6	21.7	16.6	10.6	7.4	5.4	4.2	3.3	2.7	2.2	1.8	1.6	1.4	1.2	---	---	---	---	---
3 1/2"	48.0	35.3	27.0	17.3	12.0	8.8	6.7	5.3	4.3	3.6	3.0	2.6	2.2	1.9	1.6	1.4	1.2	1.1	---
4"	66.7	49.0	37.5	24.0	16.7	12.2	9.4	7.4	6.0	5.0	4.2	3.6	3.1	2.7	2.2	1.9	1.7	1.5	1.4
6 5/8"	----	----	----	85.4	59.3	43.6	33.4	26.4	21.3	17.6	14.8	12.6	10.9	9.5	7.7	6.8	6.1	5.4	4.9
8 5/8"	----	----	----	----	----	86.2	66.0	52.1	42.2	34.9	29.3	25.0	21.5	18.8	15.2	13.4	12.0	10.8	9.7
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	15.3	11.3	8.6	5.5	3.8	2.8	2.2	1.7	1.4	1.1	---	---	---	---	---	---	---	---	---
2 3/8"	26.0	19.1	14.6	9.4	6.5	4.8	3.7	2.9	2.3	1.9	1.6	1.4	1.2	1.0	---	---	---	---	---
2 7/8"	49.3	36.2	27.7	17.7	12.3	9.1	6.9	5.5	4.4	3.7	3.1	2.6	2.3	2.0	1.6	1.4	1.3	1.1	1.0
3 1/2"	80.0	58.8	45.0	28.8	20.0	14.7	11.2	8.9	7.2	5.9	5.0	4.3	3.7	3.2	2.6	2.3	2.0	1.8	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"	---	---	---	---	98.8	72.6	55.6	43.9	35.6	29.4	24.7	21.1	18.2	15.8	12.8	11.3	10.1	9.1	8.2
8 5/8"	---	---	---	---	---	---	109.9	86.9	70.4	58.1	48.9	41.6	35.9	31.3	25.3	22.4	20.0	17.9	16.2
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	9.3	6.8	5.2	3.3	2.3	1.7	1.3	1.0	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	13.0	9.6	7.3	4.7	3.3	2.4	1.8	1.4	1.2	---	---	----	----	----	----	----	----	----	----
2 3/8"	22.8	16.7	12.8	8.2	5.7	4.2	3.2	2.5	2.1	1.7	1.4	1.2	1.0	---	----	----	----	----	----
2 7/8"	40.9	30.1	23.0	14.7	10.2	7.5	5.8	4.5	3.7	3.0	2.6	2.2	1.9	1.6	1.3	1.2	1.0	---	---
3 1/2"	62.3	45.8	35.1	22.4	15.6	11.4	8.8	6.9	5.6	4.6	3.9	3.3	2.9	2.5	2.0	1.8	1.6	1.4	1.3
4"	82.8	60.8	46.6	29.8	20.7	15.2	11.6	9.2	7.5	6.2	5.2	4.4	3.8	3.3	2.7	2.4	2.1	1.9	1.7
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	10.7	7.9	6.0	3.9	2.7	2.0	1.5	1.2	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	18.1	13.3	10.2	6.5	4.5	3.3	2.6	2.0	1.6	1.3	1.1	---	---	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	20.9	15.4	11.8	7.5	5.2	3.8	2.9	2.3	1.9	1.6	1.3	1.1	---	---	----	----	----	----	----
3 1/4" x 2 1/2" x .130	51.6	37.9	29.0	18.6	12.9	9.5	7.3	5.7	4.6	3.8	3.2	2.7	2.4	2.1	1.7	1.5	1.3	1.2	1.1

See Table 16 for post dimensions and material properties.

TABLE 4

LINE POST SELECTION: WIND SPEED 130 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"	7.8	5.8	4.4	2.8	2.0	1.4	1.1	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	13.3	9.8	7.5	4.8	3.3	2.4	1.9	1.5	1.2	---	---	---	----	----	----	----	----	----	----
2 7/8"	25.2	18.5	14.2	9.1	6.3	4.6	3.5	2.8	2.3	1.9	1.6	1.3	1.2	1.0	---	---	----	----	----
3 1/2"	40.9	30.0	23.0	14.7	10.2	7.5	5.8	4.5	3.7	3.0	2.6	2.2	1.9	1.6	1.3	1.2	1.0	---	---
4"	56.8	41.7	32.0	20.5	14.2	10.4	8.0	6.3	5.1	4.2	3.6	3.0	2.6	2.3	1.8	1.6	1.5	1.3	1.2
6 5/8"	----	----	----	72.8	50.5	37.1	28.4	22.5	18.2	15.0	12.6	10.8	9.3	8.1	6.5	5.8	5.2	4.6	4.2
8 5/8"	----	----	----	----	----	73.4	56.2	44.4	36.0	29.7	25.0	21.3	18.4	16.0	12.9	11.4	10.2	9.2	8.3
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	13.1	9.6	7.4	4.7	3.3	2.4	1.8	1.5	1.2	---	---	---	----	----	----	----	----	----	----
2 3/8"	22.2	16.3	12.5	8.0	5.5	4.1	3.1	2.5	2.0	1.7	1.4	1.2	1.0	---	---	----	----	----	----
2 7/8"	42.0	30.9	23.6	15.1	10.5	7.7	5.9	4.7	3.8	3.1	2.6	2.2	1.9	1.7	1.4	1.2	1.1	---	---
3 1/2"	68.2	50.1	38.3	24.5	17.0	12.5	9.6	7.6	6.1	5.1	4.3	3.6	3.1	2.7	2.2	2.0	1.7	1.6	1.4
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"	----	----	----	----	84.2	61.9	47.4	37.4	30.3	25.1	21.1	17.9	15.5	13.5	10.9	9.6	8.6	7.7	7.0
8 5/8"	----	----	----	----	----	----	93.7	74.0	59.9	49.5	41.6	35.5	30.6	26.6	21.5	19.1	17.0	15.3	13.8
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	7.9	5.8	4.5	2.9	2.0	1.5	1.1	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	11.1	8.2	6.2	4.0	2.8	2.0	1.6	1.2	---	---	---	----	----	----	----	----	----	----	----
2 3/8"	19.4	14.3	10.9	7.0	4.9	3.6	2.7	2.2	1.7	1.4	1.2	1.0	---	---	----	----	----	----	----
2 7/8"	34.9	25.6	19.6	12.6	8.7	6.4	4.9	3.9	3.1	2.6	2.2	1.9	1.6	1.4	1.1	---	---	---	---
3 1/2"	53.1	39.0	29.9	19.1	13.3	9.8	7.5	5.9	4.8	3.9	3.3	2.8	2.4	2.1	1.7	1.5	1.4	1.2	1.1
4"	70.5	51.8	39.7	25.4	17.6	13.0	9.9	7.8	6.3	5.2	4.4	3.8	3.2	2.8	2.3	2.0	1.8	1.6	1.5
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	9.1	6.7	5.1	3.3	2.3	1.7	1.3	1.0	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	15.5	11.4	8.7	5.6	3.9	2.8	2.2	1.7	1.4	1.1	---	---	---	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	17.8	13.1	10.0	6.4	4.5	3.3	2.5	2.0	1.6	1.3	1.1	---	---	---	----	----	----	----	----
3 1/4" x 2 1/2" x .130	44.0	32.3	24.7	15.8	11.0	8.1	6.2	4.9	4.0	3.3	2.7	2.3	2.0	1.8	1.4	1.3	1.1	1.0	---

See Table 16 for post dimensions and material properties.

TABLE 5

LINE POST SELECTION: WIND SPEED 140 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"	6.8	5.0	3.8	2.4	1.7	1.2	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	11.5	8.4	6.5	4.1	2.9	2.1	1.6	1.3	1.0	---	---	---	----	----	----	----	----	----	----
2 7/8"	21.7	16.0	12.2	7.8	5.4	4.0	3.1	2.4	2.0	1.6	1.4	1.2	---	---	---	---	----	----	----
3 1/2"	35.3	25.9	19.8	12.7	8.8	6.5	5.0	3.9	3.2	2.6	2.2	1.9	1.6	1.4	1.1	1.0	---	---	---
4"	49.0	36.0	27.6	17.6	12.2	9.0	6.9	5.4	4.4	3.6	3.1	2.6	2.2	2.0	1.6	1.4	1.3	1.1	1.0
6 5/8"	----	----	----	62.7	43.6	32.0	24.5	19.4	15.7	13.0	10.9	9.3	8.0	7.0	5.6	5.0	4.4	4.0	3.6
8 5/8"	----	----	----	----	----	63.3	48.5	38.3	31.0	25.6	21.5	18.4	15.8	13.8	11.1	9.9	8.8	7.9	7.1
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	11.3	8.3	6.3	4.1	2.8	2.1	1.6	1.3	1.0	---	---	---	----	----	----	----	----	----	----
2 3/8"	19.1	14.1	10.8	6.9	4.8	3.5	2.7	2.1	1.7	1.4	1.2	1.0	---	---	---	----	----	----	----
2 7/8"	36.2	26.6	20.4	13.0	9.1	6.7	5.1	4.0	3.3	2.7	2.3	1.9	1.7	1.4	1.2	1.0	---	---	---
3 1/2"	58.8	43.2	33.1	21.2	14.7	10.8	8.3	6.5	5.3	4.4	3.7	3.1	2.7	2.4	1.9	1.7	1.5	1.3	1.2
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"	----	----	----	----	72.6	53.3	40.8	32.3	26.1	21.6	18.2	15.5	13.3	11.6	9.4	8.3	7.4	6.7	6.0
8 5/8"	----	----	----	----	----	----	80.8	63.8	51.7	42.7	35.9	30.6	26.4	23.0	18.6	16.4	14.7	13.2	11.9
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	6.8	5.0	3.8	2.5	1.7	1.3	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	9.6	7.0	5.4	3.4	2.4	1.8	1.3	1.1	---	---	---	----	----	----	----	----	----	----	----
2 3/8"	16.7	12.3	9.4	6.0	4.2	3.1	2.4	1.9	1.5	1.2	1.0	---	---	---	----	----	----	----	----
2 7/8"	30.1	22.1	16.9	10.8	7.5	5.5	4.2	3.3	2.7	2.2	1.9	1.6	1.4	1.2	---	---	---	---	----
3 1/2"	45.8	33.6	25.8	16.5	11.4	8.4	6.4	5.1	4.1	3.4	2.9	2.4	2.1	1.8	1.5	1.3	1.2	1.0	---
4"	60.8	44.7	34.2	21.9	15.2	11.2	8.6	6.8	5.5	4.5	3.8	3.2	2.8	2.4	2.0	1.7	1.6	1.4	1.3
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	7.9	5.8	4.4	2.8	2.0	1.4	1.1	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	13.3	9.8	7.5	4.8	3.3	2.4	1.9	1.5	1.2	---	---	---	---	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	15.4	11.3	8.6	5.5	3.8	2.8	2.2	1.7	1.4	1.1	---	---	---	---	----	----	----	----	----
3 1/4" x 2 1/2" x .130	37.9	27.9	21.3	13.7	9.5	7.0	5.3	4.2	3.4	2.8	2.4	2.0	1.7	1.5	1.2	1.1	---	---	---

See Table 16 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"	5.9	4.3	3.3	2.1	1.5	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	10.0	7.3	5.6	3.6	2.5	1.8	1.4	1.1	---	---	---	---	---	---	---	---	---	---	---
2 7/8"	18.9	13.9	10.6	6.8	4.7	3.5	2.7	2.1	1.7	1.4	1.2	1.0	---	---	---	---	---	---	---
3 1/2"	30.7	22.6	17.3	11.1	7.7	5.6	4.3	3.4	2.8	2.3	1.9	1.6	1.4	1.2	---	---	---	---	---
4"	42.7	31.4	24.0	15.4	10.7	7.8	6.0	4.7	3.8	3.2	2.7	2.3	2.0	1.7	1.4	1.2	1.1	---	---
6 5/8"	---	---	---	54.6	37.9	27.9	21.3	16.9	13.7	11.3	9.5	8.1	7.0	6.1	4.9	4.3	3.9	3.5	3.1
8 5/8"	---	---	---	---	---	55.1	42.2	33.4	27.0	22.3	18.8	16.0	13.8	12.0	9.7	8.6	7.7	6.9	6.2
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	9.8	7.2	5.5	3.5	2.5	1.8	1.4	1.1	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	16.7	12.2	9.4	6.0	4.2	3.1	2.3	1.9	1.5	1.2	1.0	---	---	---	---	---	---	---	---
2 7/8"	31.5	23.2	17.7	11.4	7.9	5.8	4.4	3.5	2.8	2.3	2.0	1.7	1.4	1.3	1.0	---	---	---	---
3 1/2"	51.2	37.6	28.8	18.4	12.8	9.4	7.2	5.7	4.6	3.8	3.2	2.7	2.4	2.0	1.7	1.5	1.3	1.2	1.1
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"	----	----	----	----	63.2	46.5	35.6	28.1	22.8	18.8	15.8	13.5	11.6	10.1	8.2	7.2	6.5	5.8	5.2
8 5/8"	----	----	----	----	---	---	70.4	55.6	45.0	37.2	31.3	26.6	23.0	20.0	16.2	14.3	12.8	11.5	10.3
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	6.0	4.4	3.3	2.1	1.5	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8"	8.3	6.1	4.7	3.0	2.1	1.5	1.2	---	---	---	---	---	---	---	---	---	---	---	---
2 3/8"	14.6	10.7	8.2	5.3	3.6	2.7	2.1	1.6	1.3	1.1	---	---	---	---	---	---	---	---	---
2 7/8"	26.2	19.2	14.7	9.4	6.5	4.8	3.7	2.9	2.4	1.9	1.6	1.4	1.2	1.0	---	---	---	---	---
3 1/2"	39.9	29.3	22.4	14.4	10.0	7.3	5.6	4.4	3.6	3.0	2.5	2.1	1.8	1.6	1.3	1.1	1.0	---	---
4"	53.0	38.9	29.8	19.1	13.2	9.7	7.5	5.9	4.8	3.9	3.3	2.8	2.4	2.1	1.7	1.5	1.4	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	6.8	5.0	3.9	2.5	1.7	1.3	---	---	---	---	---	---	---	---	---	---	---	---	---
1 7/8" x 1 5/8" x .121	11.6	8.5	6.5	4.2	2.9	2.1	1.6	1.3	1.0	---	---	---	---	---	---	---	---	---	---
2 1/4" x 1 5/8" x .121	13.4	9.8	7.5	4.8	3.3	2.5	1.9	1.5	1.2	---	---	---	---	---	---	---	---	---	---
3 1/4" x 2 1/2" x .130	33.0	24.3	18.6	11.9	8.3	6.1	4.6	3.7	3.0	2.5	2.1	1.8	1.5	1.3	1.1	---	---	---	---

See Table 16 for post dimensions and material properties.

TABLE 7

LINE POST SELECTION: WIND SPEED 160 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"	5.2	3.8	2.9	1.9	1.3	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	8.8	6.5	4.9	3.2	2.2	1.6	1.2	---	---	---	---	---	----	----	----	----	----	----	----
2 7/8"	16.6	12.2	9.4	6.0	4.2	3.1	2.3	1.8	1.5	1.2	1.0	---	---	---	---	---	----	----	----
3 1/2"	27.0	19.8	15.2	9.7	6.7	5.0	3.8	3.0	2.4	2.0	1.7	1.4	1.2	1.1	---	---	---	---	---
4"	37.5	27.6	21.1	13.5	9.4	6.9	5.3	4.2	3.4	2.8	2.3	2.0	1.7	1.5	1.2	1.1	---	---	---
6 5/8"	----	----	----	48.0	33.4	24.5	18.8	14.8	12.0	9.9	8.3	7.1	6.1	5.3	4.3	3.8	3.4	3.1	2.8
8 5/8"	----	----	----	----	----	48.5	37.1	29.3	23.7	19.6	16.5	14.1	12.1	10.6	8.5	7.6	6.7	6.0	5.5
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	8.6	6.3	4.9	3.1	2.2	1.6	1.2	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	14.6	10.8	8.2	5.3	3.7	2.7	2.1	1.6	1.3	1.1	---	---	---	---	---	----	----	----	----
2 7/8"	27.7	20.4	15.6	10.0	6.9	5.1	3.9	3.1	2.5	2.1	1.7	1.5	1.3	1.1	---	---	---	---	---
3 1/2"	45.0	33.1	25.3	16.2	11.2	8.3	6.3	5.0	4.0	3.3	2.8	2.4	2.1	1.8	1.5	1.3	1.1	1.0	---
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"	----	----	----	----	55.6	40.8	31.3	24.7	20.0	16.5	13.9	11.8	10.2	8.9	7.2	6.4	5.7	5.1	4.6
8 5/8"	----	----	----	----	----	----	61.8	48.9	39.6	32.7	27.5	23.4	20.2	17.6	14.2	12.6	11.2	10.1	9.1
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	5.2	3.8	2.9	1.9	1.3	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	7.3	5.4	4.1	2.6	1.8	1.3	1.0	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	12.8	9.4	7.2	4.6	3.2	2.4	1.8	1.4	1.2	---	---	---	---	---	----	----	----	----	----
2 7/8"	23.0	16.9	12.9	8.3	5.8	4.2	3.2	2.6	2.1	1.7	1.4	1.2	1.1	---	---	---	---	---	---
3 1/2"	35.1	25.8	19.7	12.6	8.8	6.4	4.9	3.9	3.2	2.6	2.2	1.9	1.6	1.4	1.1	1.0	---	---	---
4"	46.6	34.2	26.2	16.8	11.6	8.6	6.5	5.2	4.2	3.5	2.9	2.5	2.1	1.9	1.5	1.3	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	6.0	4.4	3.4	2.2	1.5	1.1	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	10.2	7.5	5.7	3.7	2.6	1.9	1.4	1.1	---	---	----	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	11.8	8.6	6.6	4.2	2.9	2.2	1.7	1.3	1.1	---	---	---	---	---	----	----	----	----	----
3 1/4" x 2 1/2" x .130	29.0	21.3	16.3	10.5	7.3	5.3	4.1	3.2	2.6	2.2	1.8	1.5	1.3	1.2	---	---	---	---	---

See Table 16 for post dimensions and material properties

TABLE 8

LINE POST SELECTION: WIND SPEED 170 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"	4.6	3.4	2.6	1.7	1.1	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	7.8	5.7	4.4	2.8	1.9	1.4	1.1	---	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	14.7	10.8	8.3	5.3	3.7	2.7	2.1	1.6	1.3	1.1	---	---	---	---	---	----	----	----	----
3 1/2"	23.9	17.6	13.5	8.6	6.0	4.4	3.4	2.7	2.2	1.8	1.5	1.3	1.1	---	---	---	---	---	---
4"	33.2	24.4	18.7	12.0	8.3	6.1	4.7	3.7	3.0	2.5	2.1	1.8	1.5	1.3	1.1	---	---	---	---
6 5/8"	----	----	----	42.5	29.5	21.7	16.6	13.1	10.6	8.8	7.4	6.3	5.4	4.7	3.8	3.4	3.0	2.7	2.4
8 5/8"	----	----	----	----	----	42.9	32.9	26.0	21.0	17.4	14.6	12.4	10.7	9.3	7.6	6.7	6.0	5.4	4.8
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	7.6	5.6	4.3	2.8	1.9	1.4	1.1	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	13.0	9.5	7.3	4.7	3.2	2.4	1.8	1.4	1.2	---	---	---	----	----	----	----	----	----	----
2 7/8"	24.6	18.0	13.8	8.8	6.1	4.5	3.5	2.7	2.2	1.8	1.5	1.3	1.1	---	---	---	---	---	---
3 1/2"	39.9	29.3	22.4	14.3	10.0	7.3	5.6	4.4	3.6	3.0	2.5	2.1	1.8	1.6	1.3	1.1	1.0	---	---
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"	----	----	----	----	49.2	36.2	27.7	21.9	17.7	14.7	12.3	10.5	9.0	7.9	6.4	5.6	5.0	4.5	4.1
8 5/8"	----	----	----	----	----	----	54.8	43.3	35.1	29.0	24.3	20.7	17.9	15.6	12.6	11.2	9.9	8.9	8.1
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	4.6	3.4	2.6	1.7	1.2	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	6.5	4.8	3.6	2.3	1.6	1.2	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	11.4	8.3	6.4	4.1	2.8	2.1	1.6	1.3	1.0	----	----	----	----	----	----	----	----	----	----
2 7/8"	20.4	15.0	11.5	7.3	5.1	3.7	2.9	2.3	1.8	1.5	1.3	1.1	---	---	---	---	---	---	---
3 1/2"	31.1	22.8	17.5	11.2	7.8	5.7	4.4	3.5	2.8	2.3	1.9	1.7	1.4	1.2	1.0	---	---	---	---
4"	41.2	30.3	23.2	14.8	10.3	7.6	5.8	4.6	3.7	3.1	2.6	2.2	1.9	1.6	1.3	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	5.3	3.9	3.0	1.9	1.3	---	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	9.0	6.6	5.1	3.3	2.3	1.7	1.3	1.0	---	---	----	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	10.4	7.7	5.9	3.8	2.6	1.9	1.5	1.2	---	---	----	----	----	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	25.7	18.9	14.5	9.3	6.4	4.7	3.6	2.9	2.3	1.9	1.6	1.4	1.2	1.0	---	---	---	---	---

See Table 16 for post dimensions and material properties.

TABLE 9

LINE POST SELECTION: WIND SPEED 180 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"	4.1	3.0	2.3	1.5	1.0	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	6.9	5.1	3.9	2.5	1.7	1.3	---	---	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	13.1	9.7	7.4	4.7	3.3	2.4	1.8	1.5	1.2	----	----	----	----	----	----	----	----	----	----
3 1/2"	21.3	15.7	12.0	7.7	5.3	3.9	3.0	2.4	1.9	1.6	1.3	1.1	---	---	---	---	---	---	---
4"	29.6	21.8	16.7	10.7	7.4	5.4	4.2	3.3	2.7	2.2	1.9	1.6	1.4	1.2	---	---	---	---	---
6 5/8"	----	----	----	37.9	26.4	19.4	14.8	11.7	9.5	7.8	6.6	5.6	4.8	4.2	3.4	3.0	2.7	2.4	2.2
8 5/8"	----	----	----	----	----	38.3	29.3	23.2	18.8	15.5	13.0	11.1	9.6	8.3	6.7	6.0	5.3	4.8	4.3
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	6.8	5.0	3.8	2.5	1.7	1.3	---	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	11.6	8.5	6.5	4.2	2.9	2.1	1.6	1.3	1.0	---	---	---	----	----	----	----	----	----	----
2 7/8"	21.9	16.1	12.3	7.9	5.5	4.0	3.1	2.4	2.0	1.6	1.4	1.2	1.0	---	---	---	---	---	---
3 1/2"	35.6	26.1	20.0	12.8	8.9	6.5	5.0	4.0	3.2	2.6	2.2	1.9	1.6	1.4	1.1	1.0	---	---	---
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"	----	----	----	----	43.9	32.3	24.7	19.5	15.8	13.1	11.0	9.4	8.1	7.0	5.7	5.0	4.5	4.0	3.6
8 5/8"	----	----	----	----	----	----	48.9	38.6	31.3	25.8	21.7	18.5	16.0	13.9	11.2	9.9	8.9	8.0	7.2
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	4.1	3.0	2.3	1.5	1.0	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	5.8	4.3	3.3	2.1	1.4	1.1	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	10.1	7.4	5.7	3.6	2.5	1.9	1.4	1.1	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	18.2	13.4	10.2	6.5	4.5	3.3	2.6	2.0	1.6	1.4	1.1	---	---	---	---	---	---	---	---
3 1/2"	27.7	20.3	15.6	10.0	6.9	5.1	3.9	3.1	2.5	2.1	1.7	1.5	1.3	1.1	---	---	---	---	---
4"	36.8	27.0	20.7	13.2	9.2	6.8	5.2	4.1	3.3	2.7	2.3	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	4.8	3.5	2.7	1.7	1.2	---	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	8.1	5.9	4.5	2.9	2.0	1.5	1.1	---	---	---	----	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	9.3	6.8	5.2	3.3	2.3	1.7	1.3	1.0	---	---	----	----	----	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	22.9	16.9	12.9	8.3	5.7	4.2	3.2	2.5	2.1	1.7	1.4	1.2	1.1	---	---	---	---	---	---

See Table 16 for post dimensions and material properties.

TABLE 10

LINE POST SELECTION: WIND SPEED 190 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"	3.7	2.7	2.1	1.3	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	6.2	4.6	3.5	2.2	1.6	1.1	---	---	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	11.8	8.7	6.6	4.2	2.9	2.2	1.7	1.3	1.1	----	----	----	----	----	----	----	----	----	----
3 1/2"	19.1	14.1	10.8	6.9	4.8	3.5	2.7	2.1	1.7	1.4	1.2	1.0	---	---	---	---	---	---	---
4"	26.6	19.5	15.0	9.6	6.7	4.9	3.7	3.0	2.4	2.0	1.7	1.4	1.2	1.1	---	---	---	---	---
6 5/8"	----	----	----	34.1	23.7	17.4	13.3	10.5	8.5	7.0	5.9	5.0	4.3	3.8	3.1	2.7	2.4	2.2	2.0
8 5/8"	----	----	----	----	----	34.4	26.3	20.8	16.8	13.9	11.7	10.0	8.6	7.5	6.0	5.4	4.8	4.3	3.9
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	6.1	4.5	3.4	2.2	1.5	1.1	---	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	10.4	7.6	5.8	3.7	2.6	1.9	1.5	1.2	---	---	---	---	----	----	----	----	----	----	----
2 7/8"	19.7	14.4	11.1	7.1	4.9	3.6	2.8	2.2	1.8	1.5	1.2	1.0	---	---	---	---	---	---	---
3 1/2"	31.9	23.4	17.9	11.5	8.0	5.9	4.5	3.5	2.9	2.4	2.0	1.7	1.5	1.3	1.0	---	---	---	---
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"	----	----	----	----	39.4	29.0	22.2	17.5	14.2	11.7	9.9	8.4	7.2	6.3	5.1	4.5	4.0	3.6	3.3
8 5/8"	----	----	----	----	----	----	43.9	34.6	28.1	23.2	19.5	16.6	14.3	12.5	10.1	8.9	8.0	7.1	6.5
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	3.7	2.7	2.1	1.3	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	5.2	3.8	2.9	1.9	1.3	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	9.1	6.7	5.1	3.3	2.3	1.7	1.3	1.0	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	16.3	12.0	9.2	5.9	4.1	3.0	2.3	1.8	1.5	1.2	1.0	---	---	---	---	---	----	----	----
3 1/2"	24.9	18.3	14.0	8.9	6.2	4.6	3.5	2.8	2.2	1.8	1.6	1.3	1.1	---	---	---	----	----	----
4"	33.0	24.3	18.6	11.9	8.3	6.1	4.6	3.7	3.0	2.5	2.1	1.8	1.5	1.3	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	4.3	3.1	2.4	1.5	1.1	---	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	7.2	5.3	4.1	2.6	1.8	1.3	1.0	---	---	---	---	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	8.3	6.1	4.7	3.0	2.1	1.5	1.2	---	---	---	---	----	----	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	20.6	15.1	11.6	7.4	5.1	3.8	2.9	2.3	1.9	1.5	1.3	1.1	----	----	----	----	----	----	----

See Table 16 for post dimensions and material properties.

TABLE 11

LINE POST SELECTION: WIND SPEED 200 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"	3.3	2.4	1.9	1.2	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	5.6	4.1	3.2	2.0	1.4	1.0	---	---	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	10.6	7.8	6.0	3.8	2.7	2.0	1.5	1.2	---	----	----	----	----	----	----	----	----	----	----
3 1/2"	17.3	12.7	9.7	6.2	4.3	3.2	2.4	1.9	1.6	1.3	1.1	---	---	---	---	---	---	---	---
4"	24.0	17.6	13.5	8.6	6.0	4.4	3.4	2.7	2.2	1.8	1.5	1.3	1.1	---	---	---	---	---	---
6 5/8"	----	----	----	30.7	21.3	15.7	12.0	9.5	7.7	6.4	5.3	4.5	3.9	3.4	2.8	2.4	2.2	2.0	1.8
8 5/8"	----	----	----	----	----	31.0	23.7	18.8	15.2	12.6	10.6	9.0	7.8	6.8	5.5	4.8	4.3	3.9	3.5
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	5.5	4.1	3.1	2.0	1.4	1.0	---	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	9.4	6.9	5.3	3.4	2.3	1.7	1.3	1.0	---	---	---	---	---	----	----	----	----	---	----
2 7/8"	17.7	13.0	10.0	6.4	4.4	3.3	2.5	2.0	1.6	1.3	1.1	---	---	----	----	---	----	----	----
3 1/2"	28.8	21.2	16.2	10.4	7.2	5.3	4.0	3.2	2.6	2.1	1.8	1.5	1.3	1.2	---	----	----	----	----
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"	----	----	----	----	35.6	26.1	20.0	15.8	12.8	10.6	8.9	7.6	6.5	5.7	4.6	4.1	3.6	3.3	2.9
8 5/8"	----	----	----	----	----	----	39.6	31.3	25.3	20.9	17.6	15.0	12.9	11.3	9.1	8.1	7.2	6.5	5.8
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	3.3	2.5	1.9	1.2	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	4.7	3.4	2.6	1.7	1.2	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	8.2	6.0	4.6	3.0	2.1	1.5	1.2	---	---	---	---	---	----	----	----	----	----	----	----
2 7/8"	14.7	10.8	8.3	5.3	3.7	2.7	2.1	1.6	1.3	1.1	---	---	----	----	----	----	----	----	----
3 1/2"	22.4	16.5	12.6	8.1	5.6	4.1	3.2	2.5	2.0	1.7	1.4	1.2	1.0	---	----	----	----	----	----
4"	29.8	21.9	16.8	10.7	7.5	5.5	4.2	3.3	2.7	2.2	1.9	1.6	1.4	1.2	----	----	----	----	----
GROUP II: (ASTM F1043) High Strength Cold Rolled Formed C-Shape (50,000 psi yield)																			
1 7/8" x 1 5/8" x .105	3.9	2.8	2.2	1.4	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	6.5	4.8	3.7	2.4	1.6	1.2	---	---	---	---	----	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	7.5	5.5	4.2	2.7	1.9	1.4	1.1	---	---	---	----	----	----	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	18.6	13.7	10.5	6.7	4.6	3.4	2.6	2.1	1.7	1.4	1.2	---	---	----	----	----	----	----	----

See Table 16 for post dimensions and material properties.

TABLE 12

LINE POST SELECTION: WIND SPEED 210 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"	3.0	2.2	1.7	1.1	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	5.1	3.7	2.9	1.8	1.3	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 7/8"	9.7	7.1	5.4	3.5	2.4	1.8	1.4	1.1	---	----	----	----	----	----	----	----	----	----	----
3 1/2"	15.7	11.5	8.8	5.6	3.9	2.9	2.2	1.7	1.4	1.2	---	---	---	---	---	---	---	---	---
4"	21.8	16.0	12.2	7.8	5.4	4.0	3.1	2.4	2.0	1.6	1.4	1.2	---	---	---	---	---	---	---
6 5/8"	----	----	----	27.9	19.4	14.2	10.9	8.6	7.0	5.8	4.8	4.1	3.6	3.1	2.5	2.2	2.0	1.8	1.6
8 5/8"	----	----	----	----	----	28.1	21.5	17.0	13.8	11.4	9.6	8.2	7.0	6.1	5.0	4.4	3.9	3.5	3.2
GROUP IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield strength)																			
1 7/8"	5.0	3.7	2.8	1.8	1.3	---	---	---	---	---	---	---	----	----	----	----	----	----	----
2 3/8"	8.5	6.2	4.8	3.1	2.1	1.6	1.2	---	---	---	---	---	----	----	----	----	----	----	----
2 7/8"	16.1	11.8	9.1	5.8	4.0	3.0	2.3	1.8	1.4	1.2	1.0	---	---	---	---	---	---	---	---
3 1/2"	26.1	19.2	14.7	9.4	6.5	4.8	3.7	2.9	2.4	1.9	1.6	1.4	1.2	1.0	---	---	---	---	---
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"	----	----	----	----	32.3	23.7	18.2	14.3	11.6	9.6	8.1	6.9	5.9	5.2	4.2	3.7	3.3	3.0	2.7
8 5/8"	----	----	----	----	----	----	35.9	28.4	23.0	19.0	16.0	13.6	11.7	10.2	8.3	7.3	6.5	5.9	5.3
GROUP IC: (ASTM F1043) Steel Pipe (50,000 psi yield)																			
1 5/8"	3.0	2.2	1.7	1.1	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----
1 7/8"	4.3	3.1	2.4	1.5	1.1	---	---	---	---	----	----	----	----	----	----	----	----	----	----
2 3/8"	7.4	5.5	4.2	2.7	1.9	1.4	1.0	---	---	---	---	---	---	---	----	----	----	----	----
2 7/8"	13.4	9.8	7.5	4.8	3.3	2.5	1.9	1.5	1.2	---	---	---	---	---	----	----	----	----	----
3 1/2"	20.3	14.9	11.4	7.3	5.1	3.7	2.9	2.3	1.8	1.5	1.3	1.1	---	---	----	----	----	----	----
4"	27.0	19.9	15.2	9.7	6.8	5.0	3.8	3.0	2.4	2.0	1.7	1.4	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	3.5	2.6	2.0	1.3	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----
1 7/8" x 1 5/8" x .121	5.9	4.4	3.3	2.1	1.5	1.1	---	---	---	---	----	----	----	----	----	----	----	----	----
2 1/4" x 1 5/8" x .121	6.8	5.0	3.8	2.5	1.7	1.3	---	---	---	---	----	----	----	----	----	----	----	----	----
3 1/4" x 2 1/2" x .130	16.9	12.4	9.5	6.1	4.2	3.1	2.4	1.9	1.5	1.3	1.1	----	----	----	----	----	----	----	----

See Table 16 for post dimensions and material properties.

TABLE 13									
Mesh and Fabric Size Coefficients (Cf_1)*									
FABRIC WIRE SIZE (O.D.)		3/8”	1/2	5/8"	1”	1 ¼”	1 ¾”	2”	2 ¼”
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_1) =1 for solid panel fence**									

TABLE 14

WIND EXPOSURE CATEGORY COEFFICIENTS (Cf_2)

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:

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 15
Ice Exposure Coefficients (Cf_3)

Regional Conditions	Cf_3
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 (Cf3) = 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.

TABLE 16

Line Post Material Properties Table (N/A = Not Available)

Line Post Material Properties Table							
Trade Size	O.D.	I.D.	S_x	I_x	F_y	Mallow	Em
O.D.	in.	in.	$in.^3$	$in.^4$	kip/in^2	kip-ft.	kip/in^2
Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield)							
1 7/8"	1.900	1.610	0.33	0.31	30	0.54	29000
2 3/8"	2.375	2.067	0.56	0.67	30	0.93	29000
2 7/8"	2.875	2.469	1.06	1.53	30	1.76	29000
3 1/2"	3.500	3.068	1.72	3.02	30	2.84	29000
4"	4.000	3.548	2.39	4.79	30	3.95	29000
6 5/8"	6.625	6.065	8.50	28.14	30	14.02	29000
8 5/8"	8.625	7.981	16.81	72.49	30	27.74	29000
Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 High Strength Grade (50,000 psi yield)							
1 7/8"	1.900	1.610	0.33	0.31	50	0.90	29000
2 3/8"	2.375	2.067	0.56	0.67	50	1.54	29000
2 7/8"	2.875	2.469	1.06	1.53	50	2.93	29000
3 1/2"	3.500	3.068	1.72	3.02	50	4.74	29000
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6 5/8"	6.625	6.065	8.50	28.14	50	23.38	29000
8 5/8"	8.625	7.981	16.81	72.49	50	46.23	29000
Group IC: (ASTM F1043) High Carbon Steel Pipe (50,000 psi yield)							
1 5/8"	1.660	1.438	0.20	0.16	50	0.54	29000
1 7/8"	1.900	1.660	0.28	0.27	50	0.77	29000
2 3/8"	2.375	2.115	0.49	0.58	50	1.34	29000
2 7/8"	2.875	2.555	0.88	1.26	50	2.41	29000
3 1/2"	3.500	3.180	1.34	2.35	50	3.69	29000
4"	4.000	3.680	1.78	3.56	50	4.90	29000
Group II: (ASTM F1043) Cold Rolled Formed C-Shape (50,000 psi yield)							
1 7/8" x 1 5/8" x 0.105"			0.23	0.33	50	0.63	29000
1 7/8" x 1 5/8" x 0.121"			0.39	0.36	50	1.07	29000
2 1/4" x 1 5/8" x 0.121"			0.45	0.52	50	1.24	29000
3 1/4" x 2 1/2" x 0.130"			1.11	1.88	50	3.05	29000

Sx..... Section Modulus Ix..... Moment of Inertia Fx..... Minimum Yield

Mallow..... Allowable Moment Capacity Post (Fy)(Sx)0.66/12 in.ft

Em..... Modulus of Elasticity of Material

TABLE 17														
Design Wind Pressure, q (LB / SF)														
EXPOSURE CATEGORY	Height (ft.)	K_z	Wind Velocity (MPH)											
			105	110	120	130	140	150	160	170	180	190	200	210
B	0 - 15	0.57	16.09	17.66	21.01	24.66	28.60	32.83	37.36	42.17	47.28	52.68	58.37	64.35
	15 - 20	0.62	17.50	19.21	22.86	26.82	31.11	35.71	40.63	45.87	51.43	57.30	63.49	70.00
C	0 - 15	0.85	23.99	26.33	31.33	36.77	42.65	48.96	55.71	62.89	70.50	78.55	87.04	95.96
	15 - 20	0.9	25.40	27.88	33.18	38.94	45.16	51.84	58.98	66.59	74.65	83.17	92.16	101.61
D	0 - 15	1.03	29.07	31.91	37.97	44.56	51.68	59.33	67.50	76.20	85.43	95.19	105.47	116.28
	15 - 20	1.08	30.48	33.45	39.81	46.73	54.19	62.21	70.78	79.90	89.58	99.81	110.59	121.93

NOTES:
$q = (0.00256)(K_z)(K_{zt})(K_e)(V^2)$ (eq. 26.10-1)

K_z = EXPOSURE COEFFICIENT (GIVEN ABOVE)
K_{zt} = 1.0 (TOPOGRAPHIC FACTOR, PRESUMED = 1 FOR NO TOPOGRAPHIC EFFECTS)
K_e = 1.0 (GROUND ELEVATION FACTOR, IT IS PERMITTED TO TAKE Ke = 1 FOR ALL ELEVATIONS)
V = VELOCITY (GIVEN ABOVE)

REF: ASCE 7-22, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures"

Note: The wind speeds listed in the ASCE 7-22 are Ultimate or Load and Resistance Factor Design (LRFD) Strength Level. Per Section 2.4 of the ASCE 7-22, Load Combination 5a, a factor of 0.6 converts the resulting wind forces to the Allowable Stress Design (ASD) Strength Level. The values in the table above are ***not*** converted to ASD level pressures.

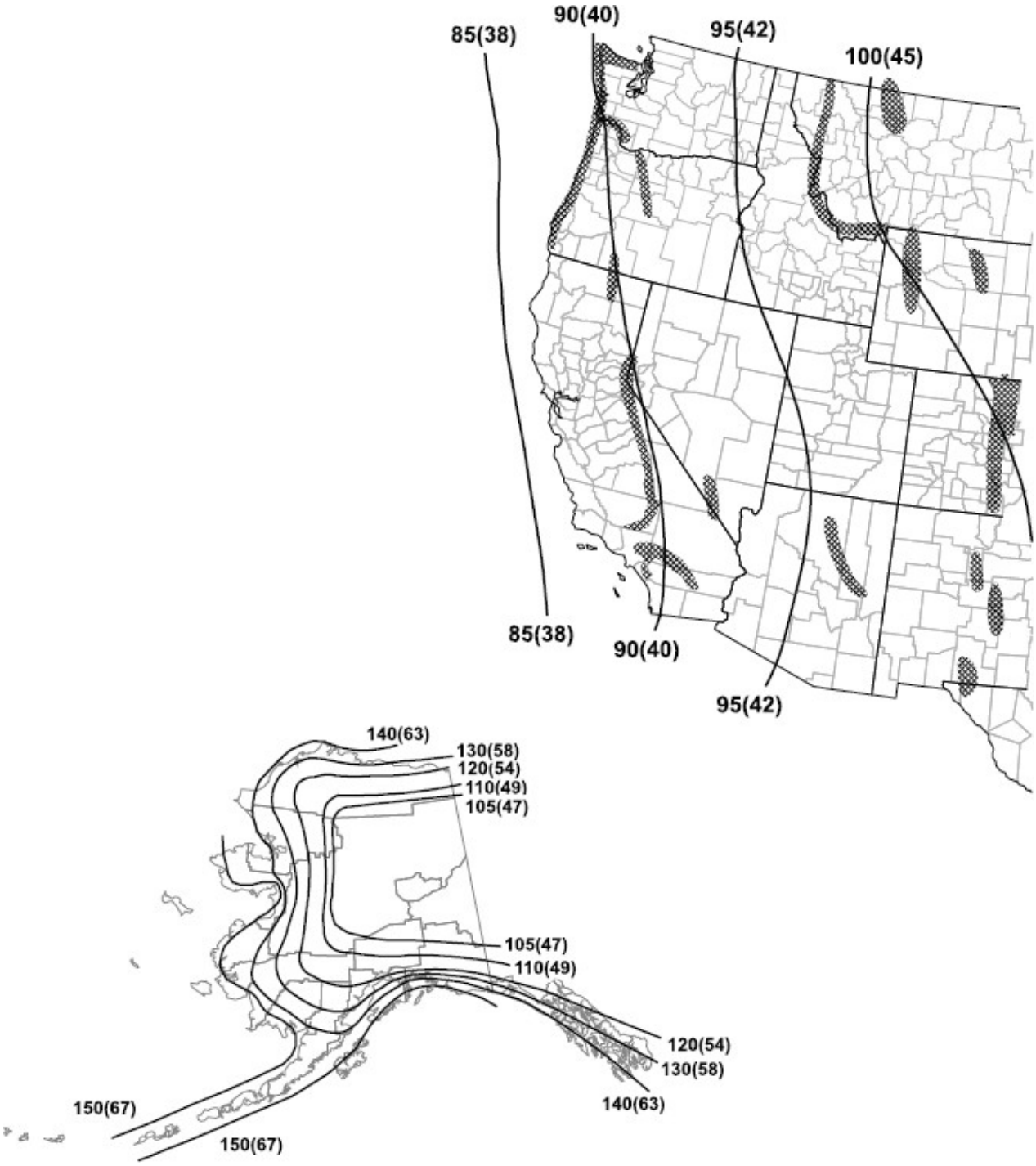
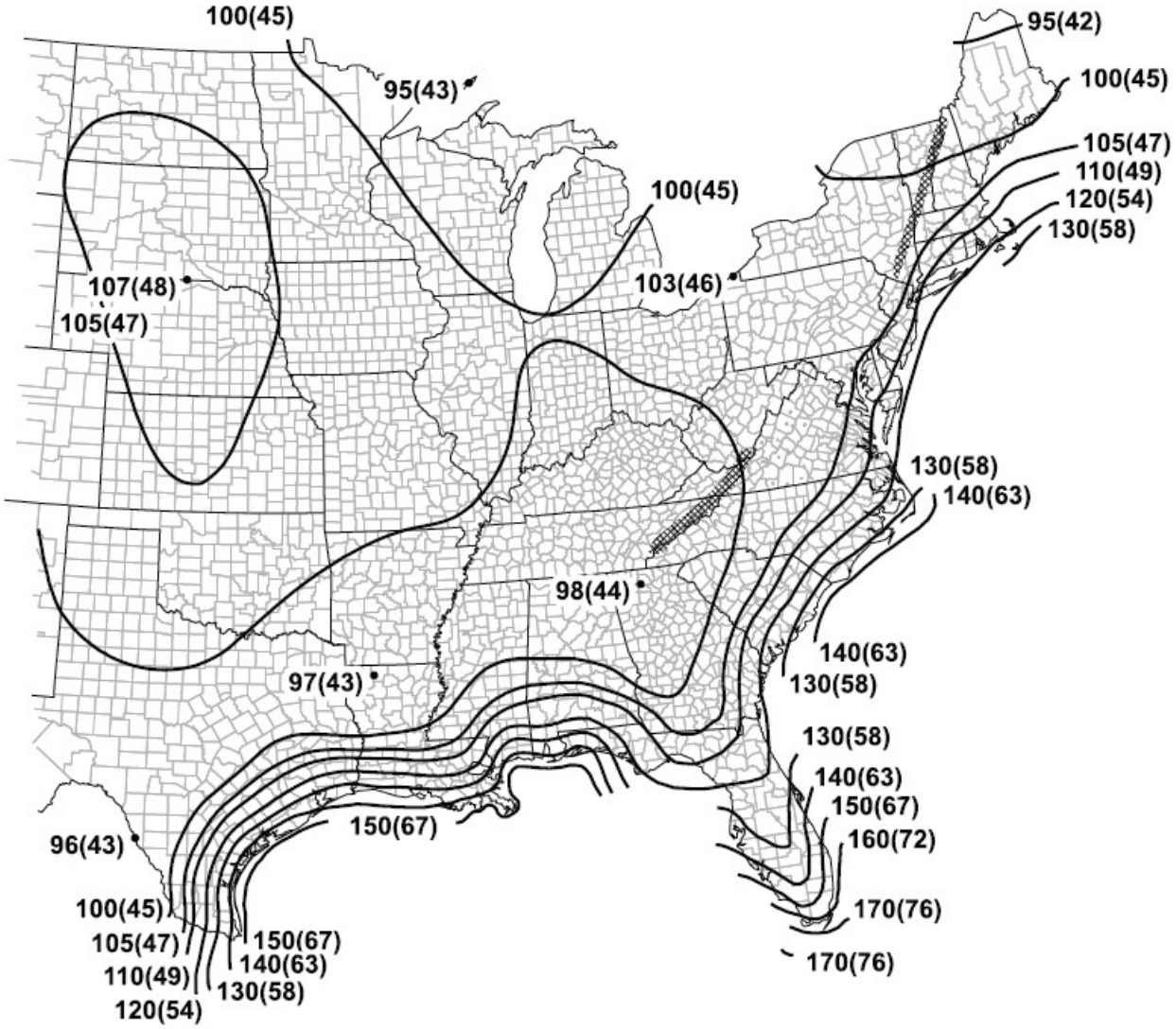


Figure 26.5-1A Basic wind speeds for Risk Category I buildings and other structures.

Notes:

1. Values are 3 s gust wind speeds in mi/h (m/s) at 33 ft. (10 m) above ground for Exposure Category C.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
4. Location-specific basic wind speeds shall be permitted to be determined using the ASCE Wind Design Geodatabase.



Location	V (mi/h)	V (m/s)
American Samoa	150	(67)
Guam & Northern Mariana Islands	180	(80)
Hawaii	ASCE Wind Design Geodatabase	
Puerto Rico	ASCE Wind Design Geodatabase	
U.S. Virgin Islands	ASCE Wind Design Geodatabase	

Figure 26.5-1A (Continued). Basic wind speeds for Risk Category I buildings and other structures.

Notes:

5. Wind speeds for Hawaii, US Virgin Islands, and Puerto Rico shall be determined from the ASCE Wind Design Geodatabase.
6. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions. Site-specific values for selected special wind regions shall be permitted to be determined using the ASCE Wind Design Geodatabase.
7. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 years).
8. The ASCE Wind Design Geodatabase can be accessed at the ASCE 7 Hazard Tool (https://asce7hazardtool.online) or approved equivalent.

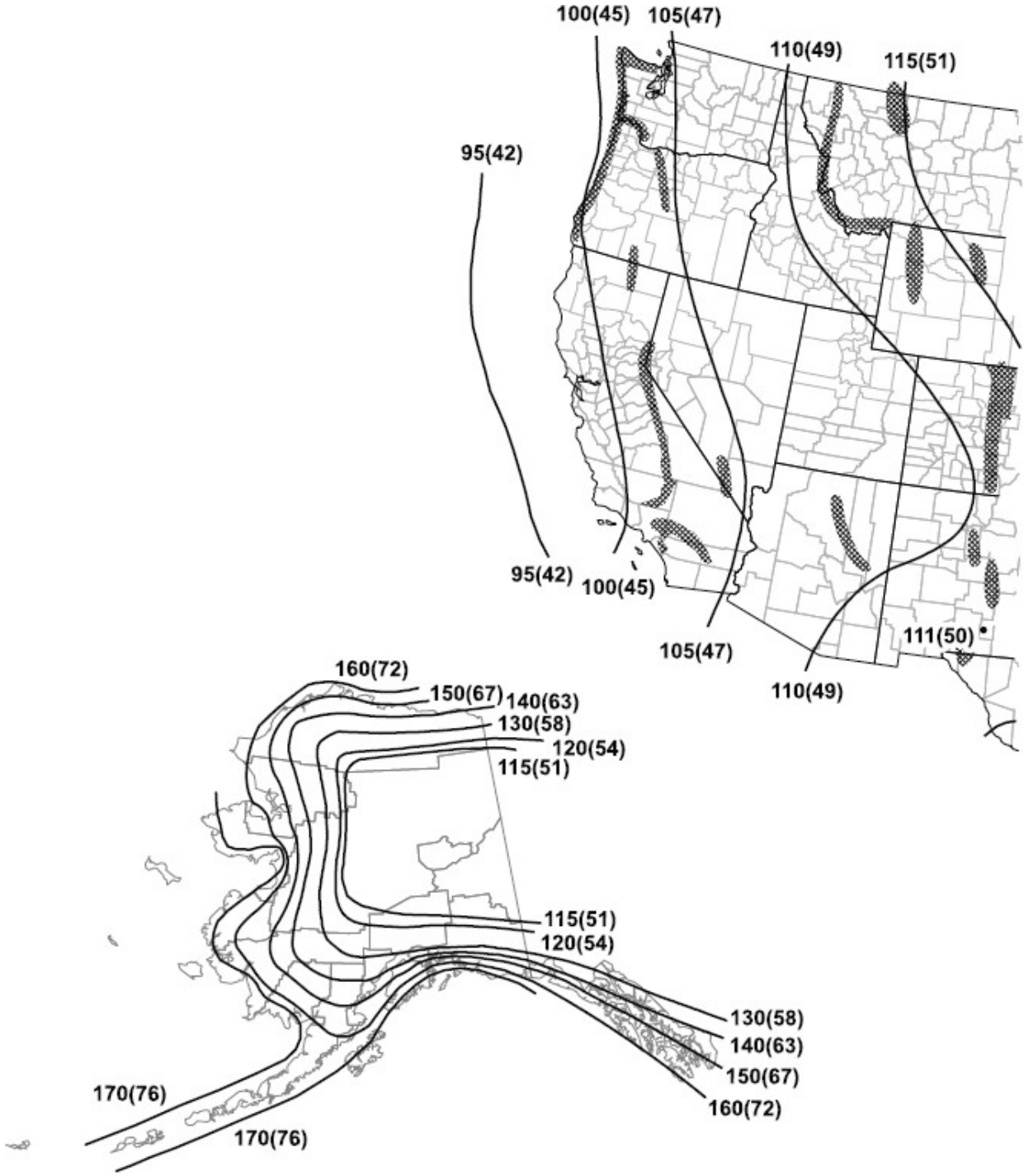
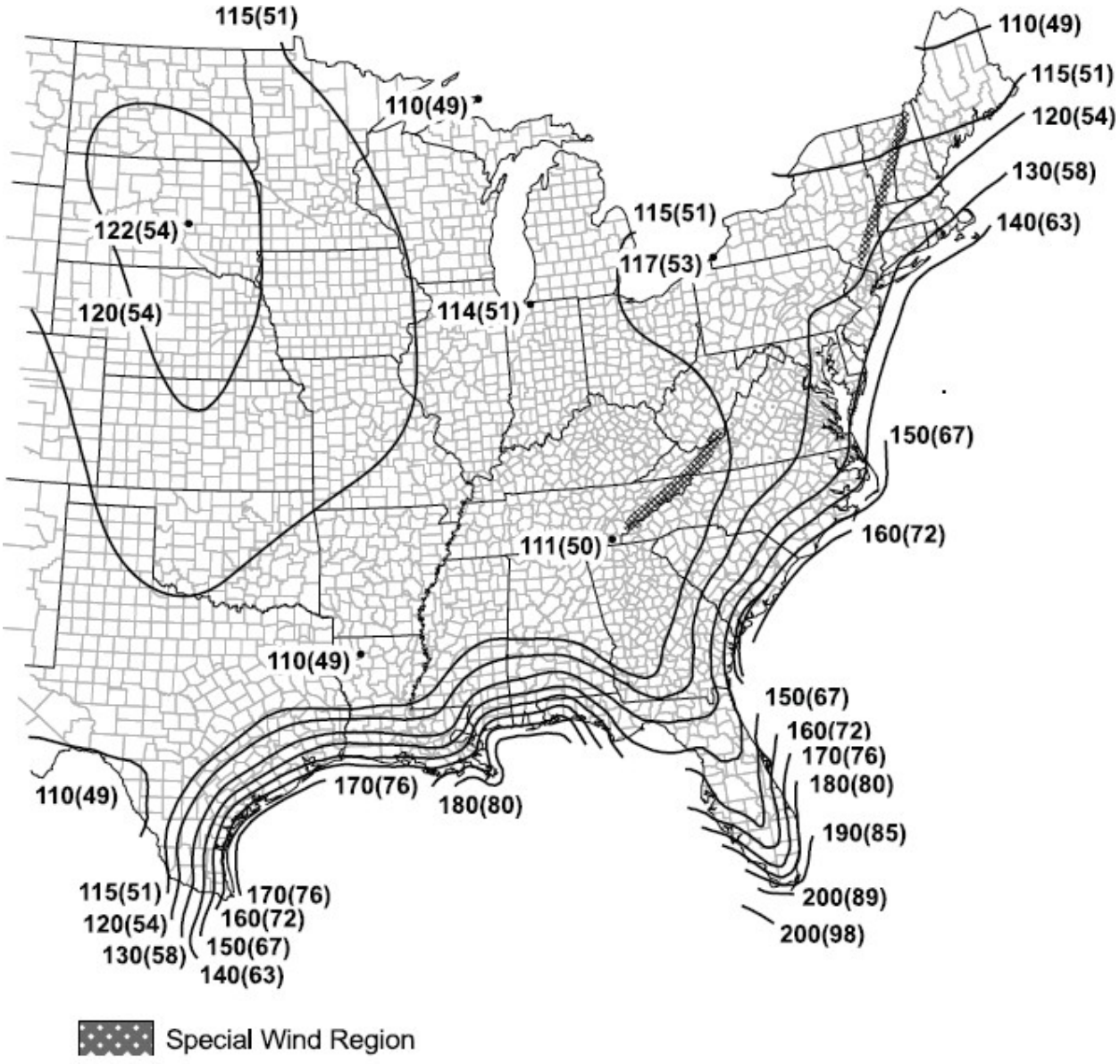


Figure 26.5-1C Basic wind speeds for Risk Category III buildings and other structures.

Notes:

1. Values are 3 s gust wind speeds in mi/h (m/s) at 33 ft. (10 m) above ground for Exposure Category C.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
4. Location-specific basic wind speeds shall be permitted to be determined using the ASCE Wind Design Geodatabase.



Location	V (mi/h)	V (m/s)
American Samoa	170	(76)
Guam & Northern Mariana Islands	210	(94)
Hawaii	ASCE Wind Design Geodatabase	
Puerto Rico	ASCE Wind Design Geodatabase	
U.S. Virgin Islands	ASCE Wind Design Geodatabase	

Figure 26.5-1C (Continued). Basic wind speeds for Risk Category III buildings and other structures.

Notes:

5. Wind speeds for Hawaii, US Virgin Islands, and Puerto Rico shall be determined from the ASCE Wind Design Geodatabase.
6. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions. Site-specific values for selected special wind regions shall be permitted to be determined using the ASCE Wind Design Geodatabase.
7. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 years).
8. The ASCE Wind Design Geodatabase can be accessed at the ASCE 7 Hazard Tool (https://asce7hazardtool.online) or approved equivalent.

APPENDIX

METRIC CONVERSION FACTORS

LENGTH:

lFt = 0.304 8 m

lin = 25.4 mm

AREA:

1 ft^2 = 0.0929 m^2

1 in^2 = 645.16 mm^2

VELOCITY, SPEED:

1 Mph = 1.6093 km/h

MASS:

1lb = 0.4536 kg

MASS PER UNIT AREA:

1 lb/sq ft = 4.88224 kg/sq m

FORCE:

1 kip (1,000 lbf) = 4.44822 kN

1 lbf (pound-force) = 4.44822 N

FORCE PER UNIT LENGTH:

1 lb/ft = 14.5939 *Nim*

1 lb/in = 175.1268 N

PRESSURE, STRESS. MODULUS OF ELASTICITY <FORCE/UNIT AREA>:

1 lb/sq in = 6.8947 kPa

1 lb/sq ft = 47.8803 Pa

Table 26.11-1. Terrain Exposure Constants.

Customary Units										
Exposure	α	z_g (ft)	$\hat{\alpha}$	$\hat{b}$	$\overline{\alpha}$	$\overline{b}$	c	l (ft)	$\overline{\varepsilon}$	z_{min} (ft)*
B	7.5	3,280	1/7.5	0.84	1/4.5	0.47	0.30	320	1/3.0	30
C	9.8	2,460	1/9.8	1.00	1/6.4	0.66	0.20	500	1/5.0	15
D	11.5	1,935	1/11.5	1.09	1/8.0	0.78	0.15	650	1/8.0	7
SI Units										
Exposure	α	z_g (m)	$\hat{\alpha}$	$\hat{b}$	$\overline{\alpha}$	$\overline{b}$	c	l (m)	$\overline{\varepsilon}$	z_{min} (m)*
B	7.5	1,000	1/7.5	0.84	1/4.5	0.47	0.30	97.54	1/3.0	9.14
C	9.8	750	1/9.8	1.00	1/6.4	0.66	0.20	152.40	1/5.0	4.57
D	11.5	590	1/11.5	1.09	1/8.0	0.78	0.15	198.12	1/8.0	2.13

* z_{min} = Minimum height used to ensure that the equivalent height $\overline{z}$ is the greater of $0.6h$ or z_{min}. For buildings or other structures with $h \leq z_{min}$, $\overline{z}$ shall be taken as z_{min}.

26.7.3 Exposure Categories

Exposure B: For buildings or other structures with a mean roof height less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500 ft (457 m). For buildings or other structures with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600 ft (792 m) or 20 times the height of the building or structure, whichever is greater.
Exposure C: Exposure C shall apply for all cases where Exposures B or D do not apply.
Exposure D: For buildings or other structures with a mean roof height less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500 ft (457 m). For buildings or other structures with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600 ft (792 m) or 20 times the height of the building or structure, whichever is greater.
For a site located in the transition zone between exposure categories, the category resulting in the largest wind forces shall be used.

EXCEPTION: An intermediate exposure between the preceding categories is permitted in a transition zone provided that it is determined by a rational analysis method defined in the recognized literature.

26.10.2 Velocity Pressure

Velocity pressure, q_z, evaluated at height z above ground shall be calculated by the following equation:

$$q_z = 0.00256K_zK_{zt}K_eV^2 \text{ (lb/ft}^2\text{); V in mi/h (26.10-1)}$$

$$q_z = 0.613K_zK_{zt}K_eV^2 \text{ (N/m}^2\text{); V in m/s (26.10-1.SI)}$$

where:

K_z = Velocity pressure exposure coefficient defined in Section 26.10.1
K_{zt} = Topographic factor defined in Section 26.8.2
K_e = Ground elevation factor defined in Section 26.9
V = Basic wind speed from Section 26.5.; and
q_z = Velocity pressure calculated using Eq. 26.10-1 at height z.

The numerical coefficient 0.00256 (0.613 in SI) shall be used except where sufficient climatic data are available to justify the selection of a different value of this factor for a design application.

29.3. DESIGN WIND LOADS: SOLID FREESTANDING WALLS AND SOLID SIGNS

29.3.1 Solid Freestanding Walls and Solid Freestanding Signs

The design wind force for solid freestanding walls and solid freestanding signs shall be determined by the following formula:

$$F = q_hK_dGC_fA_s \text{ (lb); (29.3-1)}$$

$$F = q_hK_dGC_fA_s \text{ (N); V in m/s (29.3-1.SI)}$$

where:

q_h = Velocity pressure evaluated at height h (defined in Figure 29.3-1) as determined in accordance with Section 26.6
K_d = Wind directionality factor, see Section 26.6
G = Gust-effect factor from Section 26.11
C_f = Net force coefficient from Figure 29.3-1; and
A_g = Gross area of the solid freestanding wall or freestanding solid sign, ft^2 (m^2).

Note: A constant Force Coefficient, C_f, of 1.458 is used. The average of the C_f values for the aspect ratios of the maximum allowed spacing (10 feet) divided by the minimum fence height (3 feet) and maximum fence height (20 feet) from Figure 29.3-1 is 1.458. The C_f value may vary by +23.4% (C_f = 1.8 maximum) to -10.8% (C_f = 1.3 minimum).

26.11 GUST EFFECTS
26.11.1 Gust-Effect Factor The gust-effect factor for a rigid building or other structure is permitted to be taken as 0.85.

EXAMPLE CALCULATION FOR "S", LINE POST MAXIMUM SPACING, FOR TABLES 1 through 12
Calculate the maximum spacing, S (feet), for a 3' high, 1-7/8" line post size, Group IA: (ASTM F1043) Schedule 40 Steel Pipe, ASTM F1083 Regular Grade (30,000 psi yield) at 105 MPH (Exposure Category "B"):

From Table 16, $S_x = 0.33in^3$ (Section Modulus) and F_y = 30,000psi (yield strength of ASTM F1083 Regular Grade)
$M_{allow} = (S_x)$ x (F_y) x 1/SF = $(0.33\ in^3)*((1ft)^3/(12in)^3)$ x $(30{,}000psi)*((12in)^2/(1ft)^2)$ x (1/1.5) = 550 lb-ft
$K_z = 0.57$
$K_{zt} = 1.0$
$K_e = 1.0$
$K_d = 0.85$
G = 0.85
$C_f = 1.458$
A_g = h x w = 3' x w (ft^2)
$q_z = 0.00256K_zK_{zt}K_eV^2$
$F = [q_hK_dGC_fA_s]$ x 0.6 ← convert F to ASD level wind load

Maximum Allowable Bending Moment = (Force, F) x (Moment Arm, M_A)
→$M_{allow} = ([q_hK_dGC_fA_s]$ x 0.6) x (1/2h)
→$M_{allow} = ([(0.00256K_zK_{zt}K_eV^2)K_dGC_fA_s]$ x 0.6) x (1/2h)
→550lb-ft = $([(0.00256(0.57)(1.0)(1.0)(105MPH)^2)(0.85)(0.85)(1.458)(3'$ x w)] x 0.6) x (1/2(3'))
→w (or "S") = 12.02 feet

Wind Directionality Factor, K_d

Table 26.6-1

Structure Type	Directionality Factor K_d
Buildings	
Main wind force resisting system	0.85
Components and cladding	0.85
Arched roofs	0.85
Circular domes	1.0*
Chimneys, tanks, and similar structures	
Square	0.90
Hexagonal	0.95
Octagonal	1.0*
Round	1.0*
Solid freestanding walls, roof top equipment, and solid freestanding and attached signs	0.85
Open signs and single-plane open frames	0.85
Trussed towers	
Triangular, square, or rectangular	0.85
All other cross sections	0.95

*Directionality factor $K_d = 0.95$ shall be permitted for round or octagonal structures with nonaxisymmetric structural systems.

Velocity Pressure Exposure Coefficients, K_h and K_z

Figure 26.10-1

Height above Ground Level, *z* or *h*		Exposure		
ft	m	B	C	D
0–15	0–4.6	0.57 (0.70)*	0.85	1.03
20	6.1	0.62 (0.70)*	0.90	1.08
25	7.6	0.66 (0.70)*	0.94	1.12
30	9.1	0.70	0.98	1.16
40	12.2	0.74	1.04	1.22
50	15.2	0.79	1.09	1.27
60	18.3	0.83	1.13	1.31
70	21.3	0.86	1.17	1.34
80	24.4	0.90	1.21	1.38
90	27.4	0.92	1.24	1.40
100	30.5	0.95	1.26	1.43
120	36.6	1.00	1.31	1.48
140	42.7	1.04	1.34	1.52
160	48.8	1.08	1.39	1.55
180	54.9	1.11	1.41	1.58
200	61.0	1.14	1.44	1.61
250	76.2	1.21	1.51	1.68
300	91.4	1.27	1.57	1.73
350	106.7	1.33	1.62	1.78
400	121.9	1.38	1.66	1.82
450	137.2	1.42	1.70	1.86
500	152.4	1.46	1.74	1.89

* Use 0.70 in Chapter 28, Exposure B, when $z < 30$ ft (9.1 m).

Notes:

1. Velocity pressure exposure coefficient K_z may be determined from the following formula:

For $z < 15$ ft	$K_z = 2.41\,(15/z_g)^{2/\alpha}$
For $z < 4.6$ m	$K_z = 2.41\,(4.6/z_g)^{2/\alpha}$
For 15 ft (4.6 m) $\le z \le z_g$	$K_z = 2.41\,(z/z_g)^{2/\alpha}$
For $z_g < z \le$ 3,280 ft (1,000 m)	$K_z = 2.41$

2. α and z_g are tabulated in Table 26.11-1.
3. Linear interpolation for intermediate values of height z is acceptable.
4. Exposure categories are defined in Section 26.7.

Ground Elevation Factor, K_e

Table 26.9-1

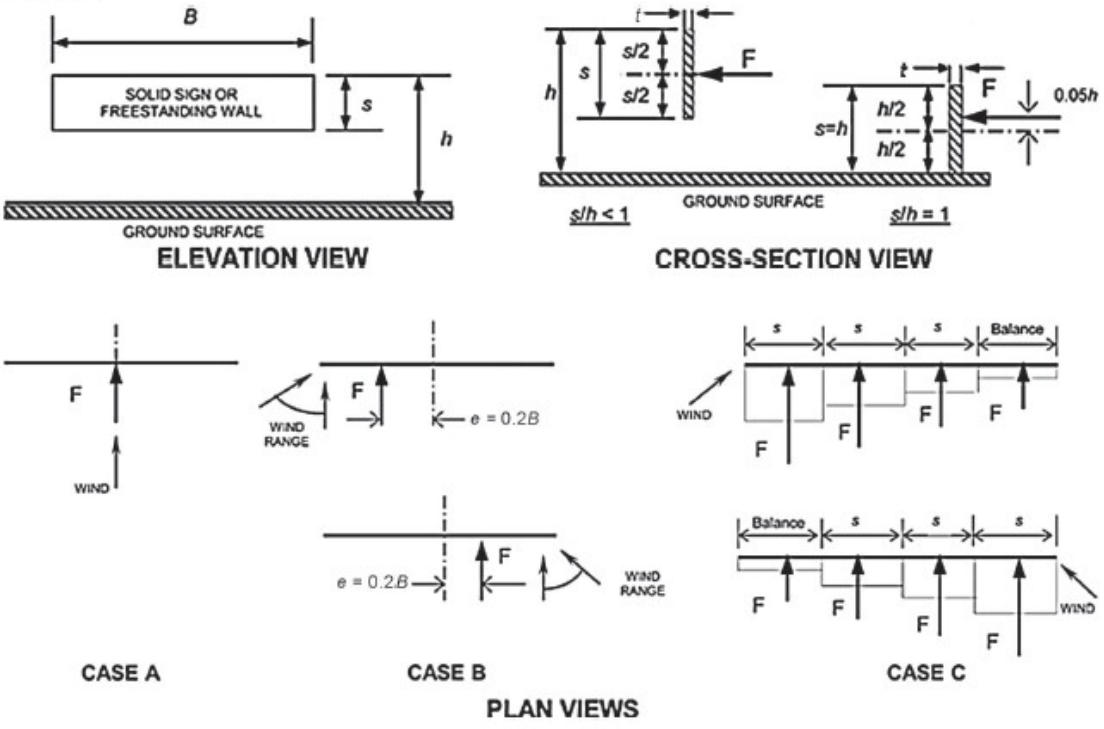
Ground Elevation above Sea Level		Ground Elevation Factor, K_e
ft	m	
<0	<0	See note 2
0	0	1.00
1,000	305	0.96
2,000	610	0.93
3,000	914	0.90
4,000	1,219	0.86
5,000	1,524	0.83
6,000	1,829	0.80
>6,000	>1,829	See note 2

Notes:

1. Conservative approximation $K_e = 1.00$ is permitted in all cases.
2. Factor K_e shall be determined from Table 26.9-1 using interpolation or from the following formula for all elevations: $K_e = e^{-0.0000362 z_e}$ (z_e= ground elevation above sea level, ft); or $K_e = e^{-0.000119 z_e}$ (z_e= ground elevation above sea level, m).
3. K_e is permitted to be taken as 1.00 in all cases.

Design Wind Loads		All Heights
Figure 29.3-1	Force Coefficients, C_f	**Solid Freestanding Walls & Solid Freestanding Signs**
Other Structures		

Diagrams



Notation

B = Horizontal dimension of wall or sign, ft (m)
e = Eccentricity of force, ft (m)
F = Design wind force for other structures, lb (N)
h = Height of the wall or sign, ft (m)
L_r = Horizontal dimension of return corner, ft (m)
$R_{min} = t/\min$ (B and s)
$R_{max} = t/\max$ (B and s)
s = Vertical dimension of the wall or sign, ft (m)
t = Thickness of the wall or sign, ft (m)
ε = Ratio of solid area to gross area

Force Coefficients, C_f, for Case A and Case B

Clearance Ratio, s/h	Aspect Ratio, B/s											
	≤ 0.05	0.1	0.2	0.5	1	2	4	5	10	20	30	≥45
1	1.80	1.70	1.65	1.55	1.45	1.40	1.35	1.35	1.30	1.30	1.30	1.30
0.9	1.85	1.75	1.70	1.60	1.55	1.50	1.45	1.45	1.40	1.40	1.40	1.40
0.7	1.90	1.85	1.75	1.70	1.65	1.60	1.60	1.55	1.55	1.55	1.55	1.55
0.5	1.95	1.85	1.80	1.75	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.75
0.3	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85
0.2	1.95	1.90	1.85	1.80	1.80	1.80	1.80	1.80	1.85	1.90	1.90	1.95
≤ 0.16	1.95	1.90	1.85	1.85	1.80	1.80	1.85	1.85	1.85	1.90	1.90	1.95

Note: A constant Force Coefficient, C_f, of 1.458 is used. The average of the C_f values for the aspect ratios of the maximum allowed spacing (10 feet) divided by the minimum fence height (3 feet) and maximum fence height (20 feet) is 1.458. The C_f value may vary by +23.4% (C_f = 1.8 maximum) to -10.8% (C_f = 1.3 minimum).

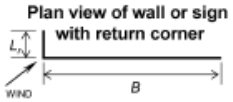
Design Wind Loads		All Heights
Figure 29.3-1 (*Continued*)	Force Coefficients, C_f	**Solid Freestanding Walls & Solid Freestanding Signs**
Other Structures		

Force Coefficients, C_f, for Case C

Region (horizontal distance from windward edge)	Aspect Ratio, B/s										
	2	3	4	5	6	7	8	9	10	13	≥45
0 to s	2.25	2.60	2.90	3.10*	3.30*	3.40*	3.55*	3.65*	3.75*	4.00*	4.30*
s to $2s$	1.50	1.70	1.90	2.00	2.15	2.25	2.30	2.35	2.45	2.60	2.55
$2s$ to $3s$		1.15	1.30	1.45	1.55	1.65	1.70	1.75	1.85	2.00	1.95
$3s$ to $10s$			1.10	1.05	1.05	1.05	1.05	1.00	0.95		
$3s$ to $4s$										1.50	1.85
$4s$ to $5s$										1.35	1.85
$5s$ to $10s$										0.90	1.10
$>10s$										0.55	0.55

*Values shall be multiplied by the following reduction factor when a return corner is present:

L_r/S	*Reduction Factor*
0.3	0.90
1.0	0.75
≥2	0.60



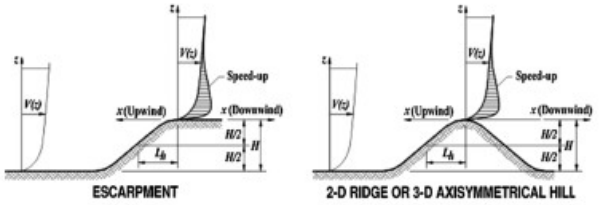
Notes

1. Force coefficients for solid walls or signs with openings less than 30% of gross area shall be permitted to be multiplied by the reduction factor $(1-(1-\varepsilon)^{1.5})$.
2. To allow for both normal and oblique wind directions, the following cases shall be considered:
   For $s/h < 1$:
   Case A: Resultant force acts normal to the face of the wall or sign through the geometric center.
   Case B: Resultant force acts normal to the face of the wall or sign at a distance from the geometric center toward the windward edge equal to 0.2 times the average width of the wall or sign.
   For double-faced signs with all sides enclosed and $R_{max} \le 0.4$, it is permitted to use force eccentricity, $e = (0.2 - 0.25R_{max})B$. For double-faced signs with all sides enclosed and $R_{min} \le 0.75$, it is permitted to multiply tabulated C_f values in Cases A and B by the reduction factor, $(1 - 0.133R_{min})$.
   For $B/s \ge 2$, Case B need not be considered, while Case C must be considered;
   Case C: Resultant forces act normal to the face of the wall or sign through the geometric centers of each region.
   For $s/h = 1$:
   The same cases as above except that the vertical locations of the resultant forces occur at a distance above the geometric center equal to 0.05 times the average height of the wall or sign.
3. For Case C where $s/h > 0.8$, for efficients shall be multiplied by the reduction factor $(1.8 - s/h)$. It is permitted to apply this reduction with those specified in Note 2.
4. Linear interpolation is permitted for values of s/h, B/s, and L_r/s other than shown.

Topographic Factor, K_{zt}

Figure 26.8-1

Diagrams



ESCARPMENT

2-D RIDGE OR 3-D AXISYMMETRICAL HILL

Topographic Multipliers[a,b,c,d]

H/L_h	K_1 Multiplier			x/L_h	K_2 Multiplier		z/L_h	K_3 Multiplier		
	2D Ridge	2D Escarpment	3D Axisymmetrical Hill		2D Escarpment	All Other Cases		2D Ridge	2D Escarpment	3D Axisymmetrical Hill
0.20	0.29	0.17	0.21	0.00	1.00	1.00	0.00	1.00	1.00	1.00
0.25	0.36	0.21	0.26	0.50	0.88	0.67	0.10	0.74	0.78	0.67
0.30	0.43	0.26	0.32	1.00	0.75	0.33	0.20	0.55	0.61	0.45
0.35	0.51	0.30	0.37	1.50	0.63	0.00	0.30	0.41	0.47	0.30
0.40	0.58	0.34	0.42	2.00	0.50	0.00	0.40	0.30	0.37	0.20
0.45	0.65	0.38	0.47	2.50	0.38	0.00	0.50	0.22	0.29	0.14
0.50	0.72	0.43	0.53	3.00	0.25	0.00	0.60	0.17	0.22	0.09
				3.50	0.13	0.00	0.70	0.12	0.17	0.06
				4.00	0.00	0.00	0.80	0.09	0.14	0.04
							0.90	0.07	0.11	0.03
							1.00	0.05	0.08	0.02
							0.50	0.01	0.02	0.00
							2.00	0.00	0.00	0.00

[a] For values of H/L_h, x/L_h, and z/L_h other than those shown, linear interpolation is permitted.

[b] For $H/L_h > 0.5$, assume that $H/L_h = 0.5$ for evaluating K_1 and substitute $2H$ for L_h for evaluating K_2 and K_3.

[c] Multipliers are based on the assumption that wind approaches the hill or escarpment along th direction of maximum slope.e

[d] Multipliers shall be used for any exposure.

Notation

H = Height of hill or escarpment relative to the upwind terrain, ft (m);

K_1 = Factor to account for shape of topographic feature and maximum speed-up effect;

K_2 = Factor to account for reduction in speed-up with distance upwind or downwind of crest;

K_3 = Factor to account for reduction in speed-up with height above local terrain;

L_h = Distance upwind of crest to where the difference in ground elevation is half the height of hill or escarpment, ft (m);

x = Distance (upwind or downwind) from the crest to the site of the building or other structure, ft (m);

z = Height above ground surface at the site of the building or other structure, ft (m);

μ = Horizontal attenuation factor;

γ = Height attenuation factor.

Equations

$K_{zt} = (1+K_1K_2K_3)^2$

K_1 = Determined from table above

$K_2 = (1-|x|/\mu L_h)$

$$K_3 = e^{-\gamma z/L_h}$$

Parameters for Speed-Up over Hills and Escarpments

Hill Shape	$K_1/(H/L_h)$ Exposure B	C	D	γ	μ Upwind of Crest	Downwind of Crest
2D ridges (or valleys with negative H in $K_1/(H/L_h)$)	1.30	1.45	1.55	3	1.5	1.5
2D escarpments	0.75	0.85	0.95	2.5	1.5	4
3D axisymmetrical hill	0.95	1.05	1.15	4	1.5	1.5

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.

SECTION 1807
FOUNDATION WALLS, RETAINING WALLS AND EMBEDDED POSTS AND POLES

1807.1 Foundation walls. Foundation walls shall be designed and constructed in accordance with Sections 1807.1.1 through 1807.1.6. Foundation walls shall be supported by foundations designed in accordance with Section 1808.

1807.1.1 Design lateral soil loads. Foundation walls shall be designed for the lateral soil loads set forth in Section 1610.

1807.1.2 Unbalanced backfill height. Unbalanced backfill height is the difference in height between the exterior finish ground level and the lower of the top of the concrete footing that supports the foundation wall or the interior finish ground level. Where an interior concrete slab on grade is provided and is in contact with the interior surface of the foundation wall, the unbalanced backfill height shall be permitted to be measured from the exterior finish ground level to the top of the interior concrete slab.

1807.1.3 Rubble stone foundation walls. Foundation walls of rough or random rubble stone shall not be less than 16 inches (406 mm) thick. Rubble stone shall not be used for foundation walls of structures assigned to *Seismic Design Category C,* D, E or F.

1807.1.4 Permanent wood foundation systems. Permanent wood foundation systems shall be designed and installed in accordance with AF &PA PWF. Lumber and ply- wood shall be treated in accordance with AWPA Ul (Commodity Specification A, Use Category 4B and Section 5.2) and shall be identified in accordance with Section 2303.1.8.1.

1807.1.5 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be designed in accordance with Chapter 19 or 21, as applicable.

Exception: Concrete and masonry foundation walls shall be permitted to be designed and constructed in accordance with Section 1807.1.6.

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[a]	Cohesion (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.7	---
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.

REFERENCES

ASCE Publication ASCE 7-22, "Minimum Load Design Criteria for Buildings and Other Structures," Sections 26 and 29, Wind Loads.

American Society of Testing Materials Standard, ASTM FI043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

American Society of Testing Materials Standard, ASTM F567, Standard Practice for Installation of Chain Link Fence.

American Society of Testing Materials Standard, ASTM FI083, Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded for Fence Structures

American Institute of Steel Construction, "Manual of Steel Construction-Allowable Stress Design"