QUICK SCREEN USA FENCE POST ASSESSMENT

1. DESIGN STATEMENT

The design presented in this report has been calculated in accordance with the principles of structural mechanics using the following standards:

Wind loads in accordance with ASCE/SEI 7-16;

Member sizing in accordance with Australian Standard AS 1664.1 (Aluminium Structures);

Wind pressures have been determined for Regions B, C and D in accordance with ASCE/SEI 7-16;

The design charts are based upon the requirements for strength only. Deflections in high winds are assumed to be non-critical for a free-standing fence structure;

Footing depths have been determined using widely recognised principles of structural mechanics and structure-soil interaction;

Wind loads and maximum post heights have been determined for basic wind speeds ranging between 60 mph and 170 mph (26 to 76 metres per second).

2. DESIGN CHARTS – MAXIMUM POST HEIGHT

Maximum post heights are provided for 65mm x 65mm x 3.2 mm (2.5-inch x 2.5-inch x 1-eighth inch) and 100 mm x 100 mm x 4.0 mm (4-inch x 4-inch x 1-sixth inch) square hollow section tube posts in Charts 1 to 12. The charts allow for post spacings of 4-feet, 5-feet, 6-feet and 8-feet in Wind Regions B, C and D and for basic wind speeds between 60 and 170 miles per hour.

Post heights apply in in “general areas” of the fence, that is, locations more than two (2) times the fence height from a free end or corner.

Within 0 to 2h (h = the fence height) from a free end of the fence, the maximum post spacing is limited to 45-percent of the “general area” spacing.

Within 0 to 2h (h = the fence height) from a corner, where a return of the fence (or another wall type element of similar or greater height) extends for a distance of at least 2h, the maximum post spacing is limited to 75-percent of the “general area” spacing.

Post heights are stated in feet. Measurements can be converted to millimetres on the basis that 1 foot = 305 mm.

NOTES:

1. The post heights in the charts apply to situations where the horizontal slats are installed without gaps between.

2. For 2.5-inch (65 mm) wide slats with a 0.375-inch clear gap between slats, post heights may be increased by 2.5%.

3. For 2.5-inch (65 mm) slats with a 0.5-inch clear gap between slats, post heights may be increased by 3.5%.

4. For 2.5-inch (65 mm) wide slats with a 1.0-inch clear gap between slats, post heights may be increased by 8.5%.

5. For 6-inch (150 mm) wide slats with a 0.375-inch clear gap between slats, post heights may be increased by 1.5%.

6. For 6-inch (150 mm) wide slats with a 0.5-inch clear gap between slats, post heights may be increased by 2.0%.

7. For 6-inch (150 mm) wide slats with a 1.0-inch clear gap between slats, post heights may be increased by 5.5%.

8. This report does not include an assessment of the maximum span of the slats between posts. Refer to a separate report (by others) for the maximum allowable span of each slat type.

2.1 MAXIMUM POST HEIGHTS FOR SPACING OF 4-FEET – "GENERAL AREAS"

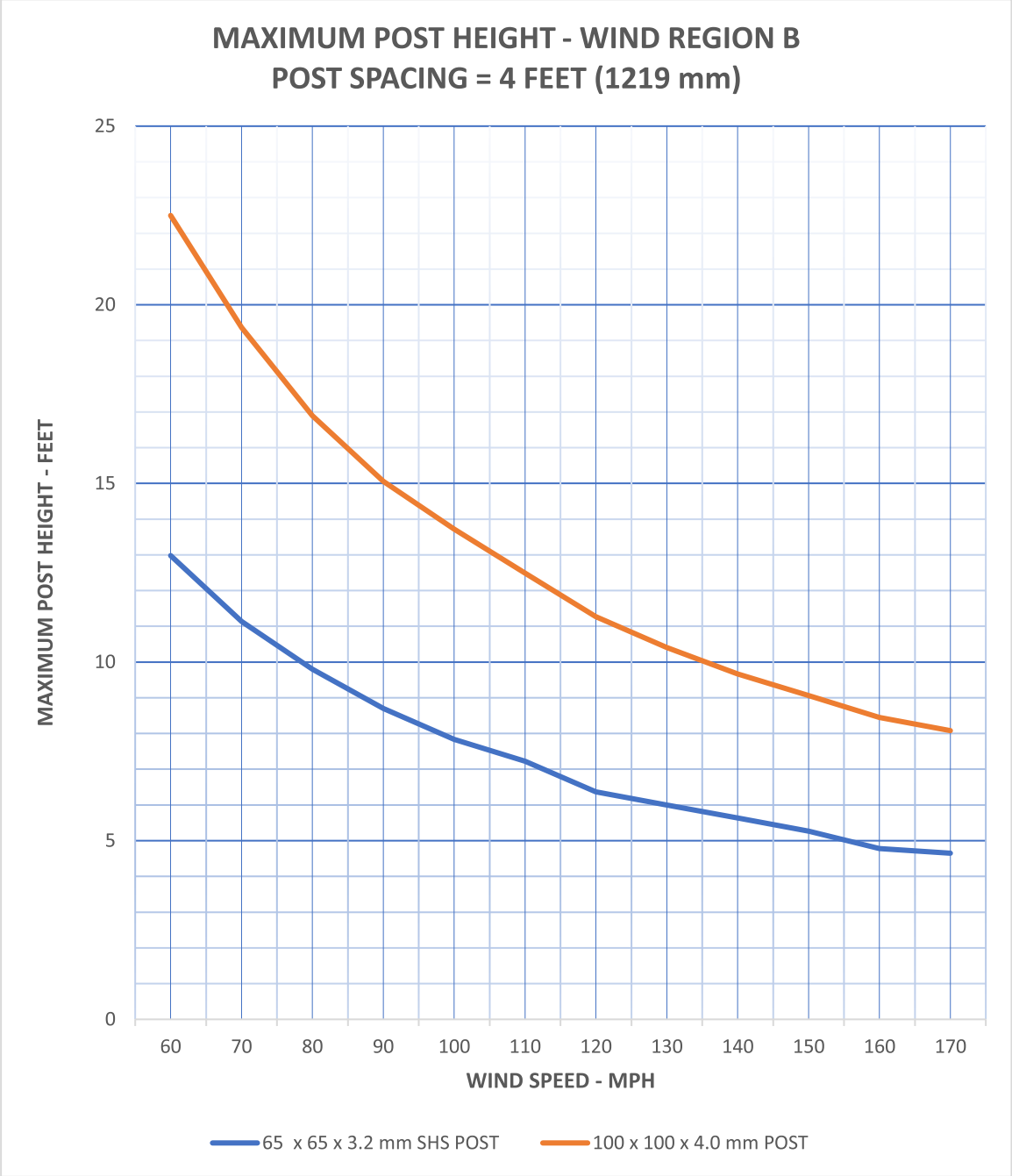

CHART 1 – MAXIMUM POST HEIGHTS – WIND REGION B – POST SPACING = 4 FEET

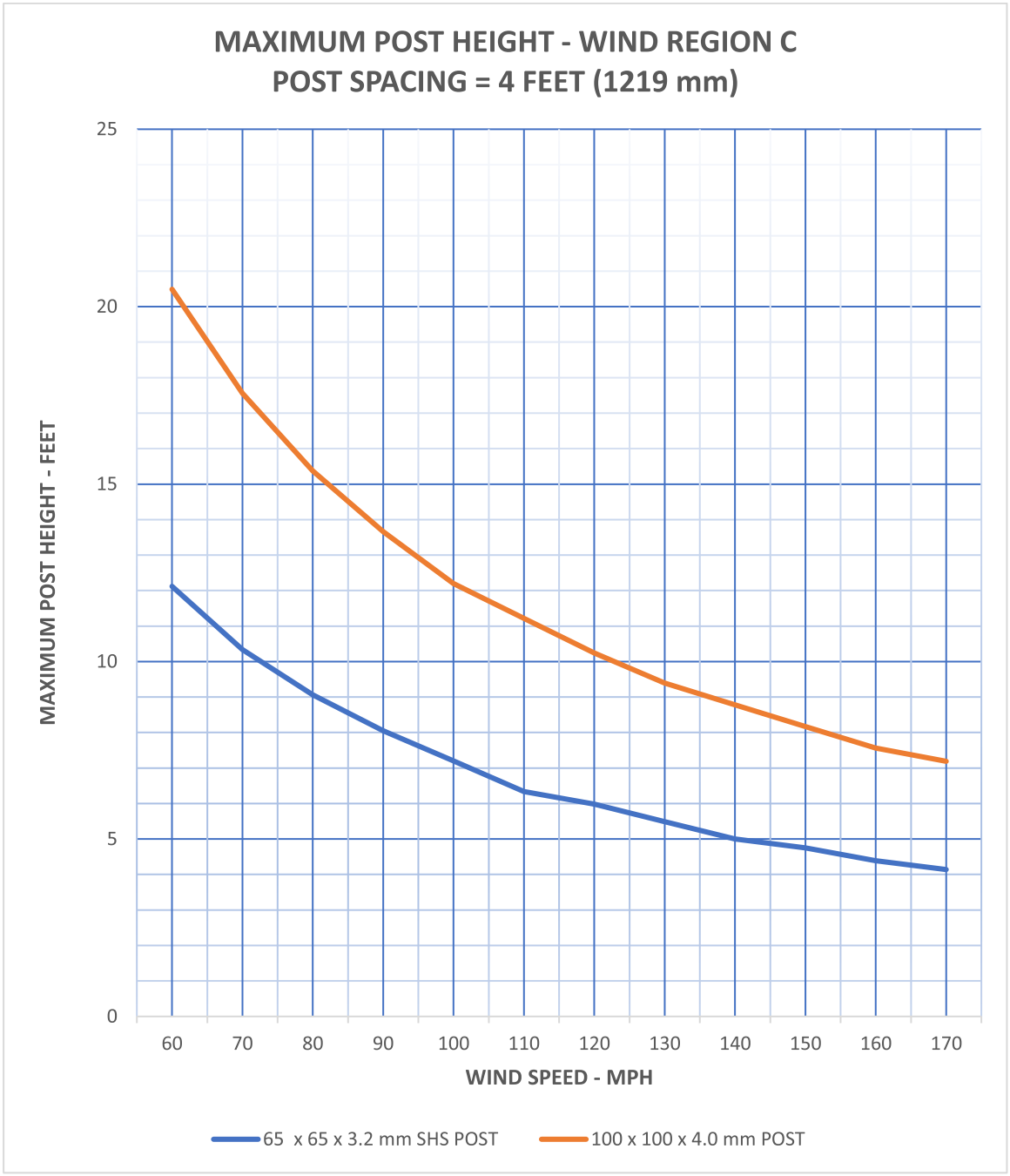

CHART 2 – MAXIMUM POST HEIGHTS – WIND REGION C – POST SPACING = 4 FEET

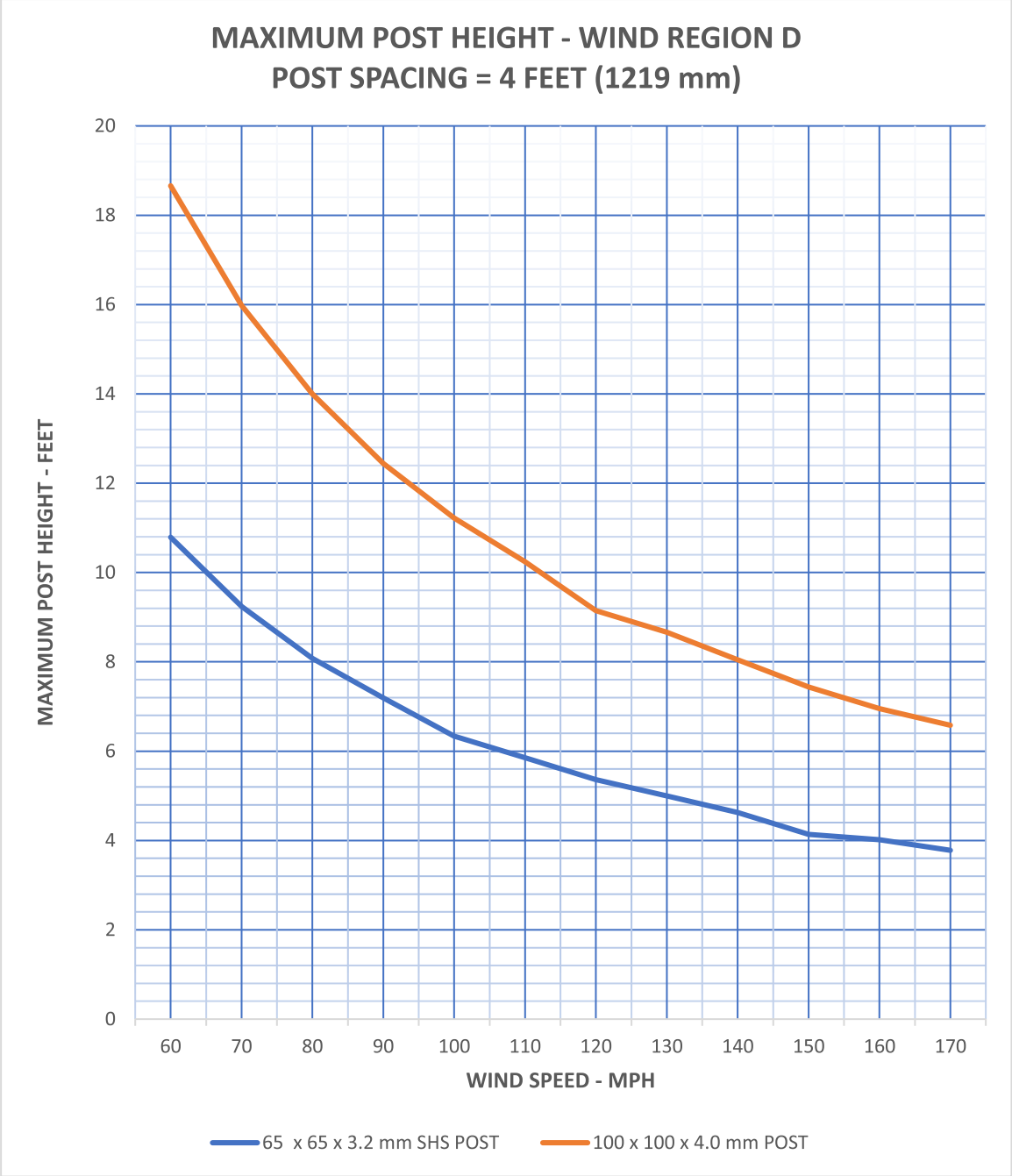

CHART 3 – MAXIMUM POST HEIGHTS – WIND REGION D – POST SPACING = 4 FEET

2.2 MAXIMUM POST HEIGHTS FOR SPACING OF 5-FEET – "GENERAL AREAS".

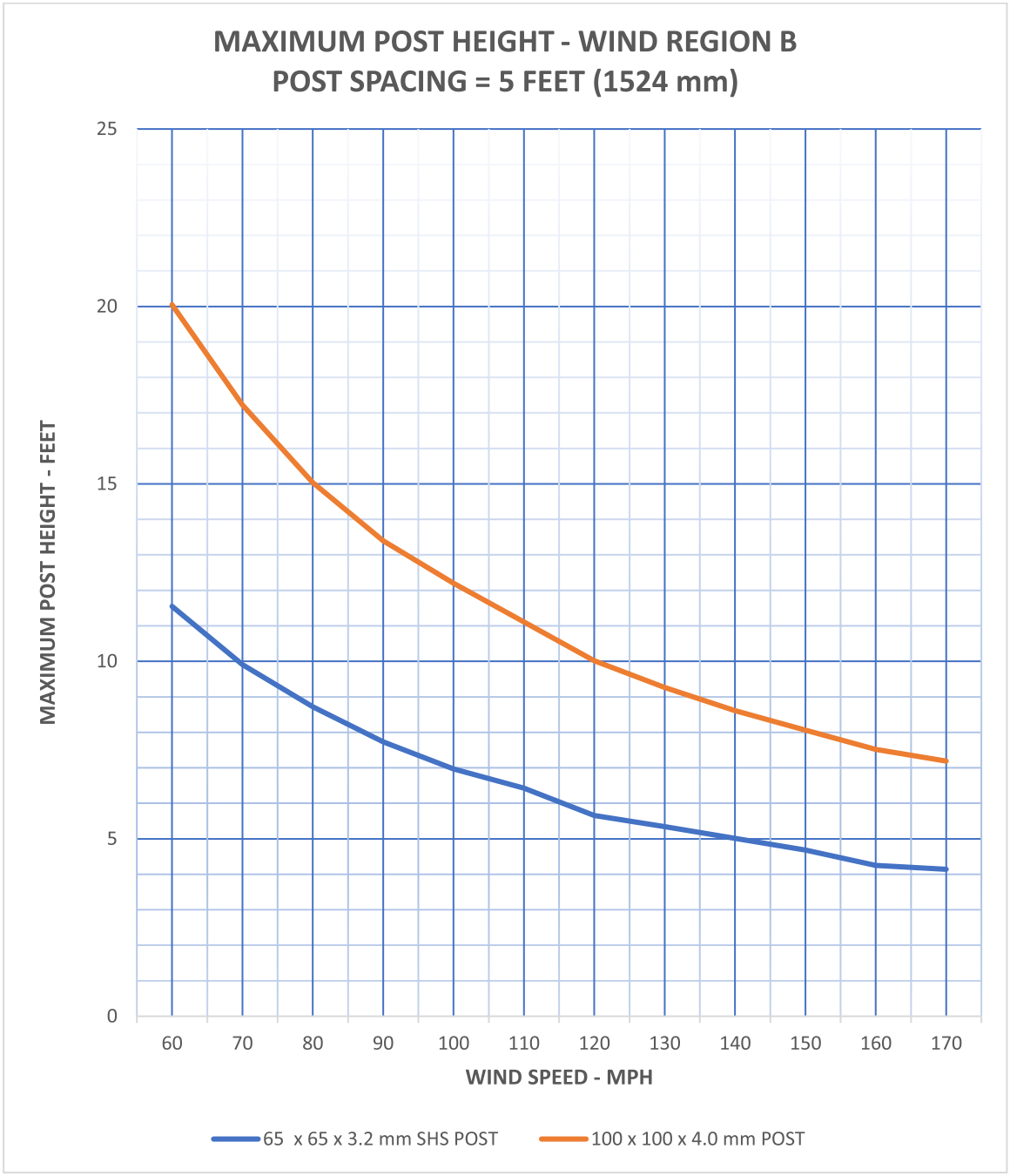

CHART 4 – MAXIMUM POST HEIGHTS – WIND REGION B – POST SPACING = 5 FEET

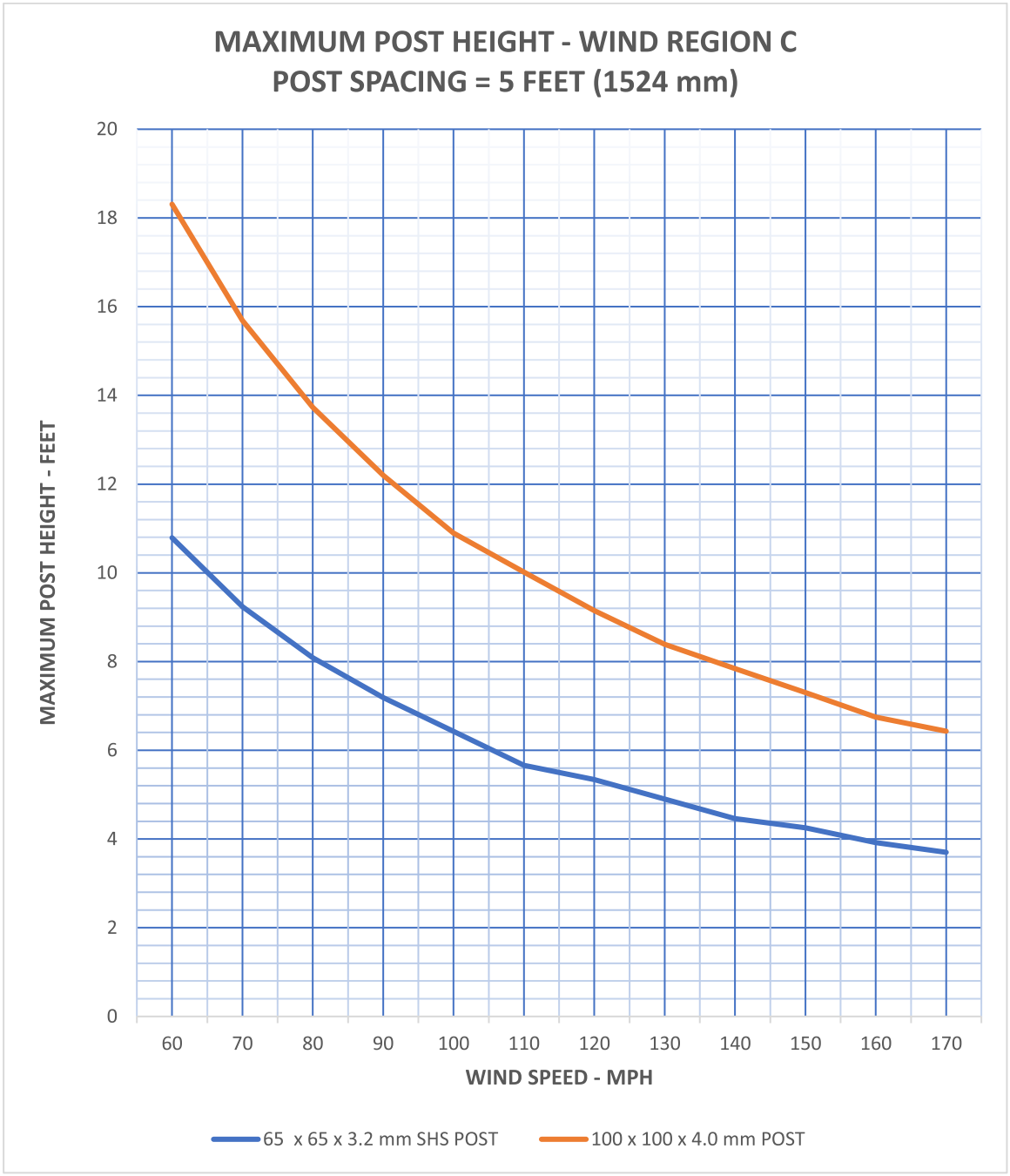

CHART 5 – MAXIMUM POST HEIGHTS – WIND REGION C – POST SPACING = 5 FEET

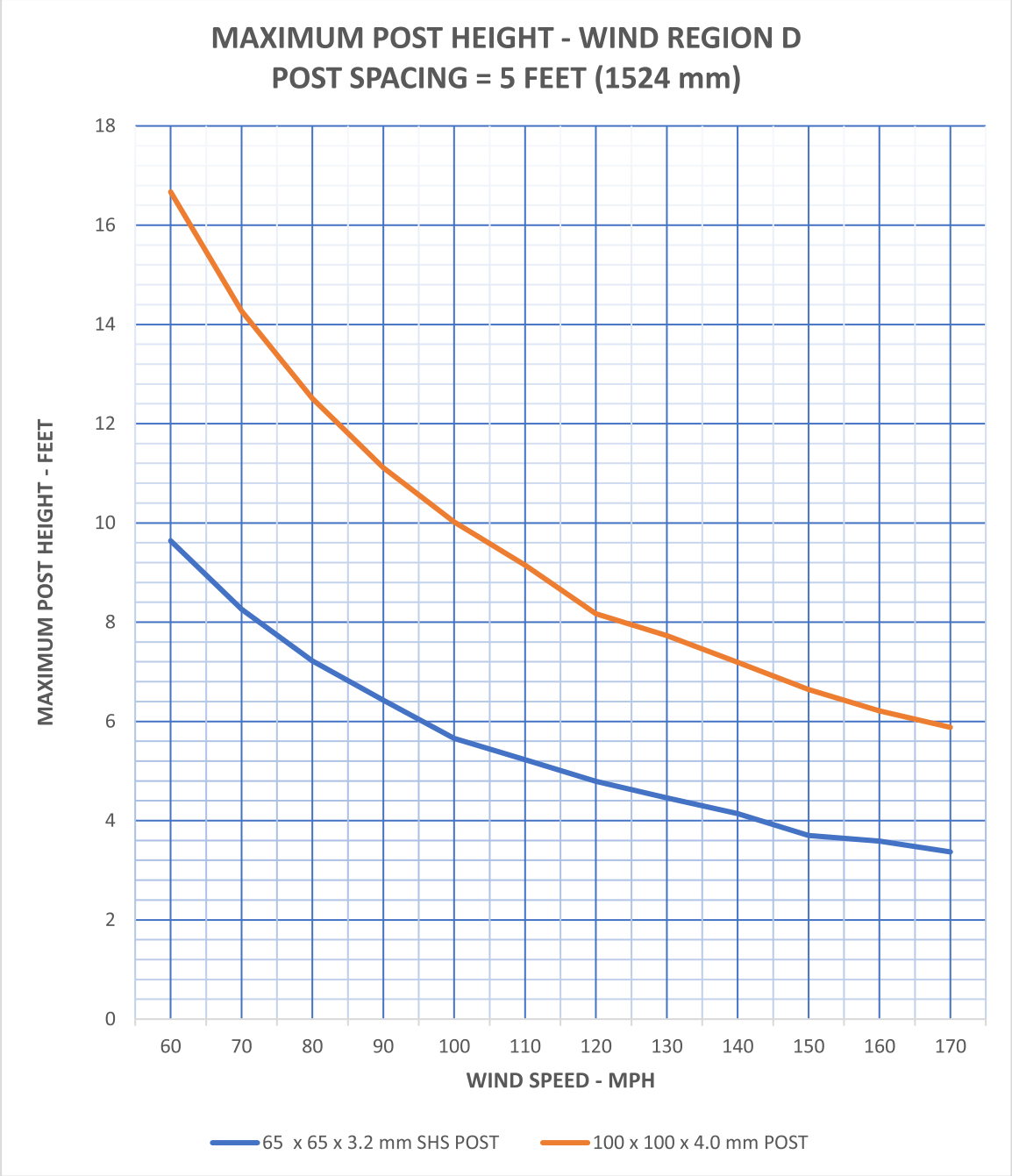

CHART 6 – MAXIMUM POST HEIGHTS – WIND REGION D – POST SPACING = 5 FEET

2.3 MAXIMUM POST HEIGHTS FOR SPACING OF 6-FEET – "GENERAL AREAS".

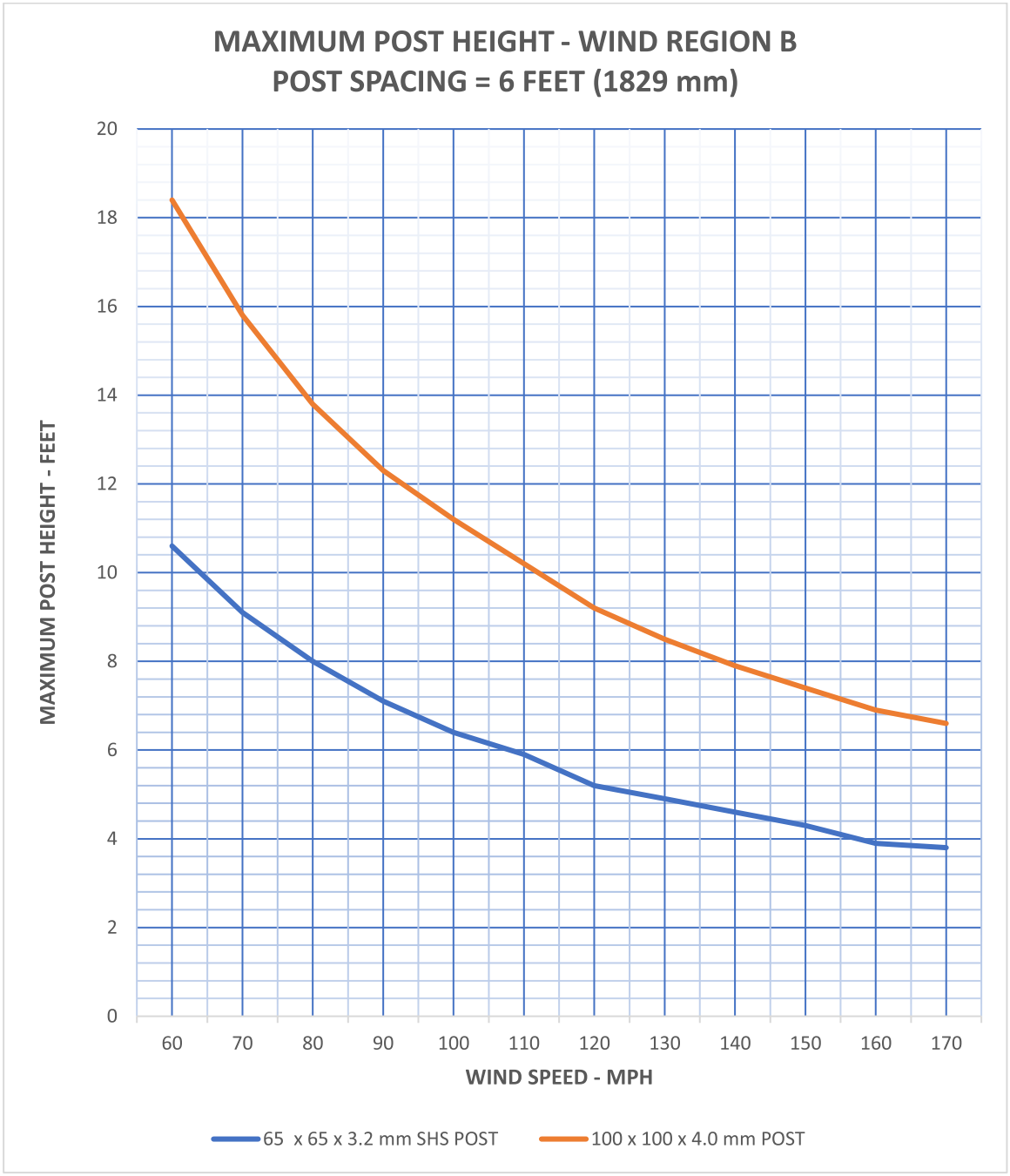

CHART 7 – MAXIMUM POST HEIGHTS – WIND REGION B – POST SPACING = 6 FEET

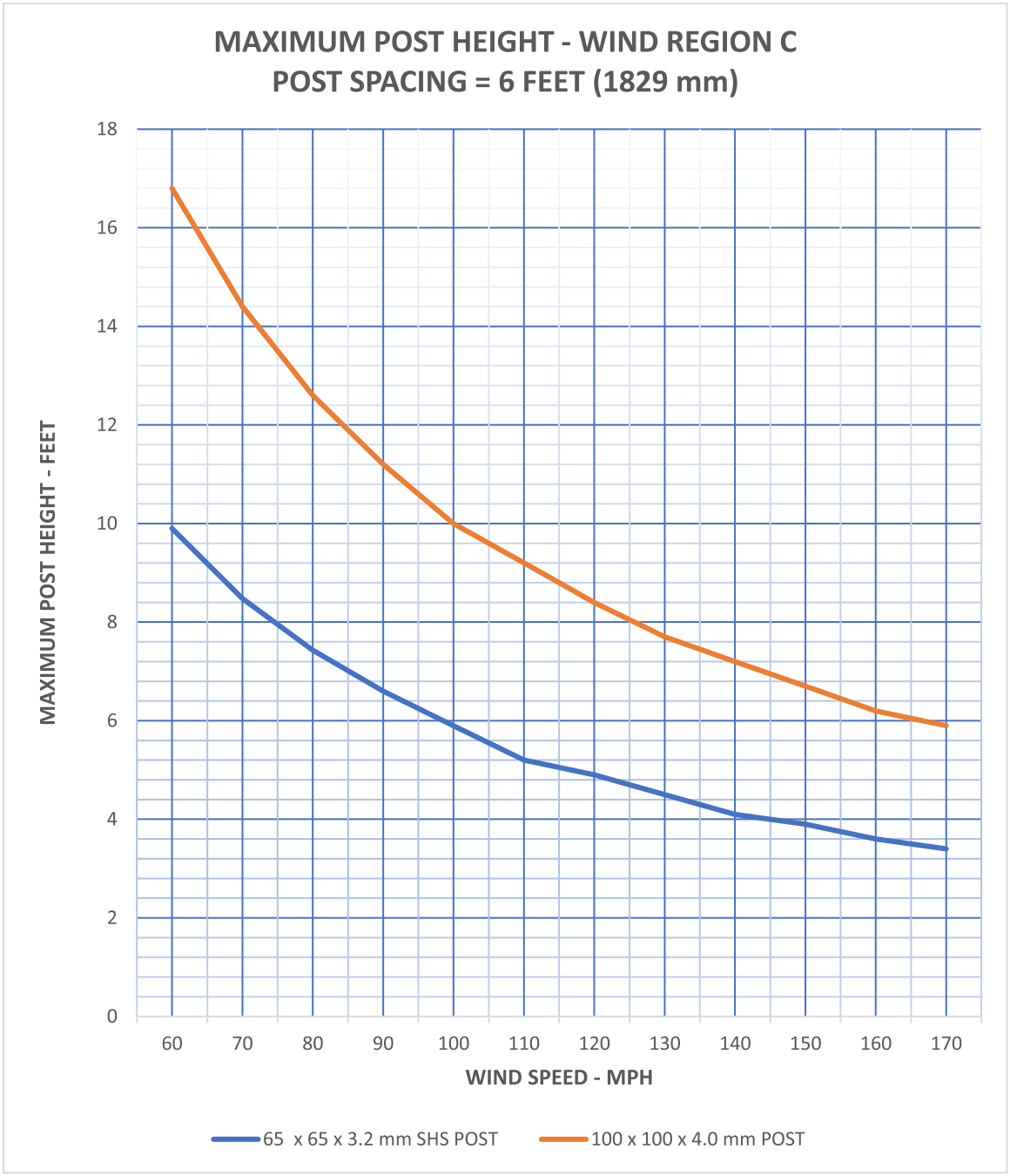

CHART 8 – MAXIMUM POST HEIGHTS – WIND REGION C – POST SPACING = 6 FEET

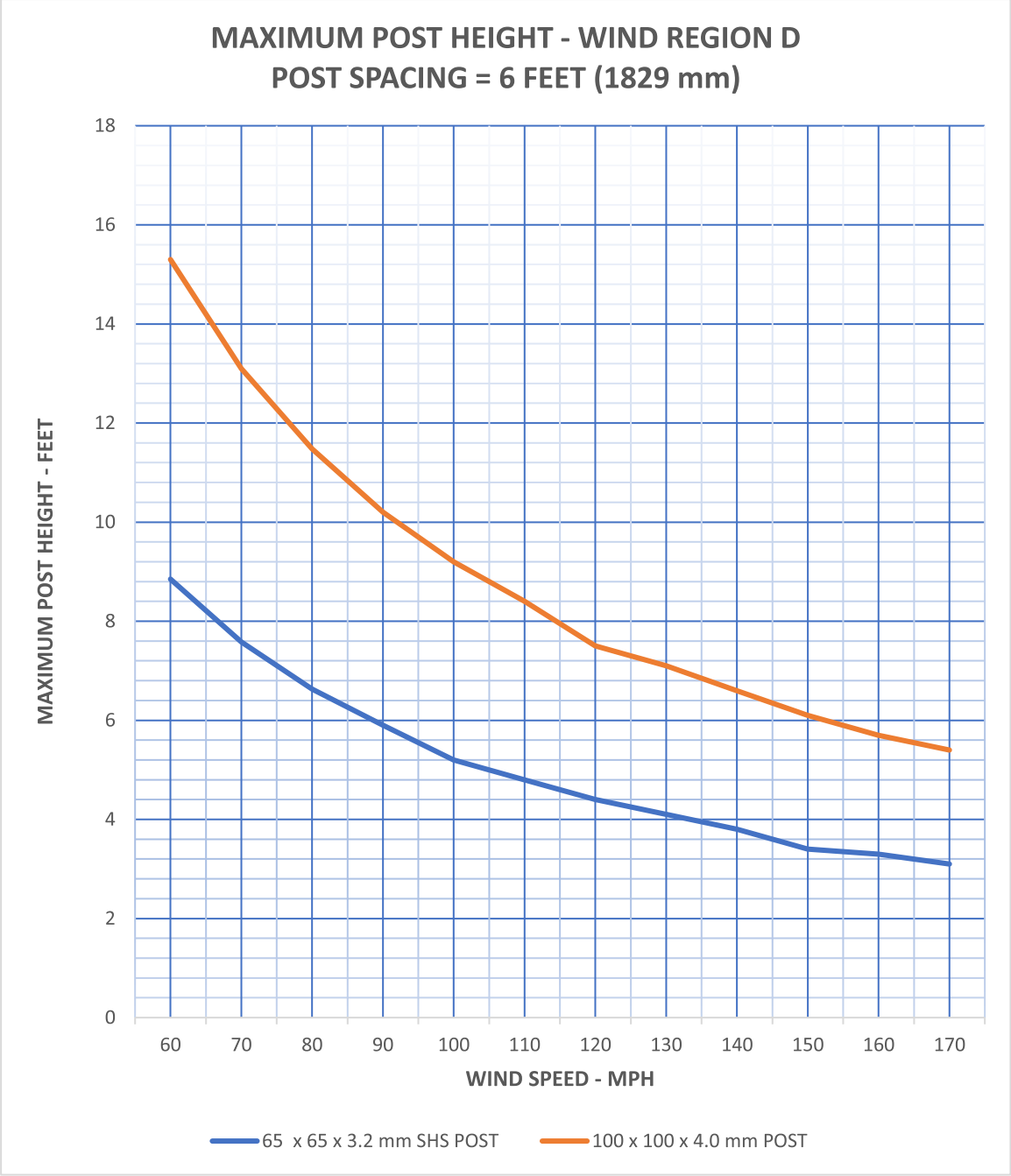

CHART 9 – MAXIMUM POST HEIGHTS – WIND REGION D – POST SPACING = 6 FEET

2.4 MAXIMUM POST HEIGHTS FOR SPACING OF 8-FEET – "GENERAL AREAS".

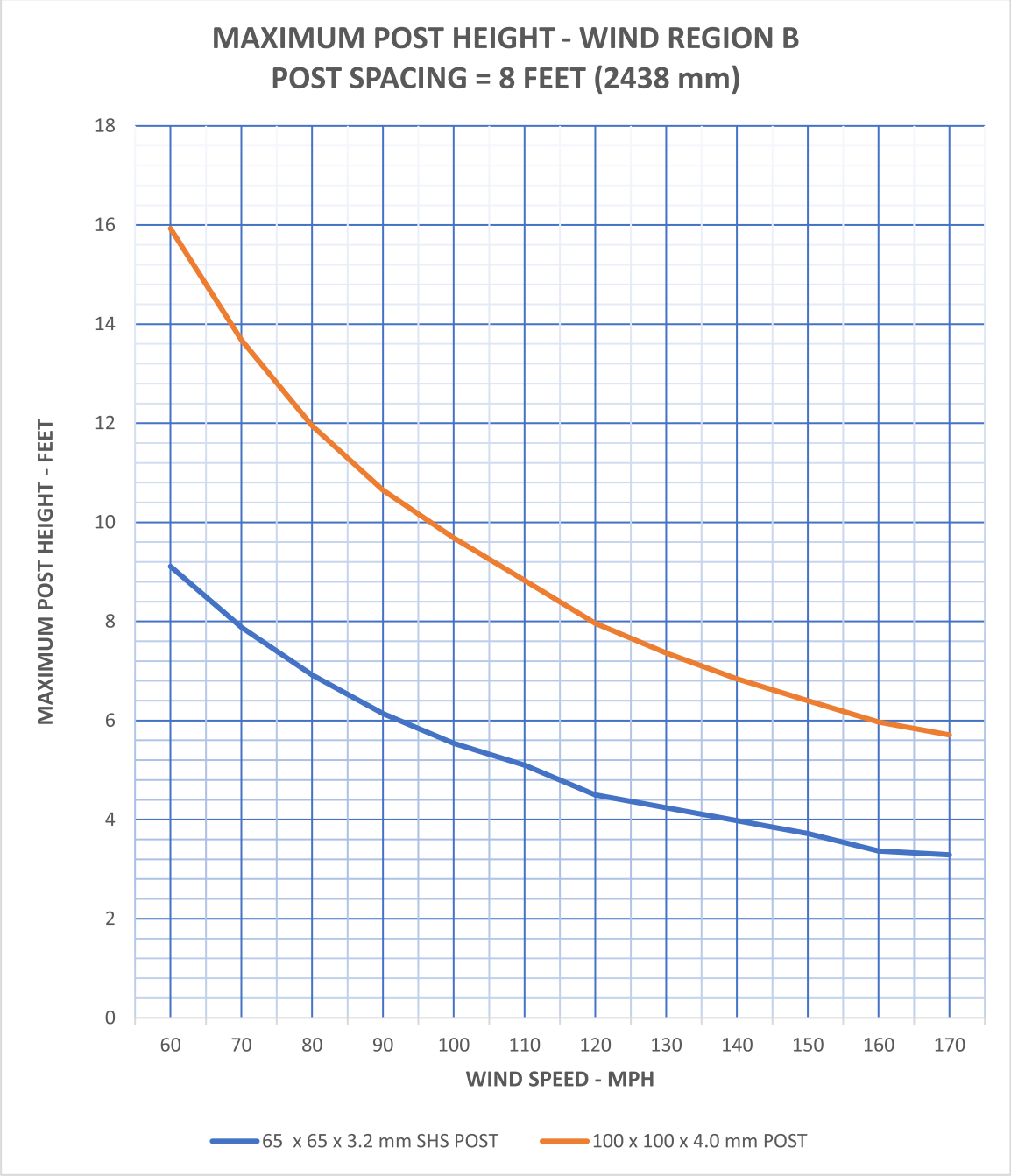

CHART 10 – MAXIMUM POST HEIGHTS – WIND REGION B – POST SPACING = 8 FEET

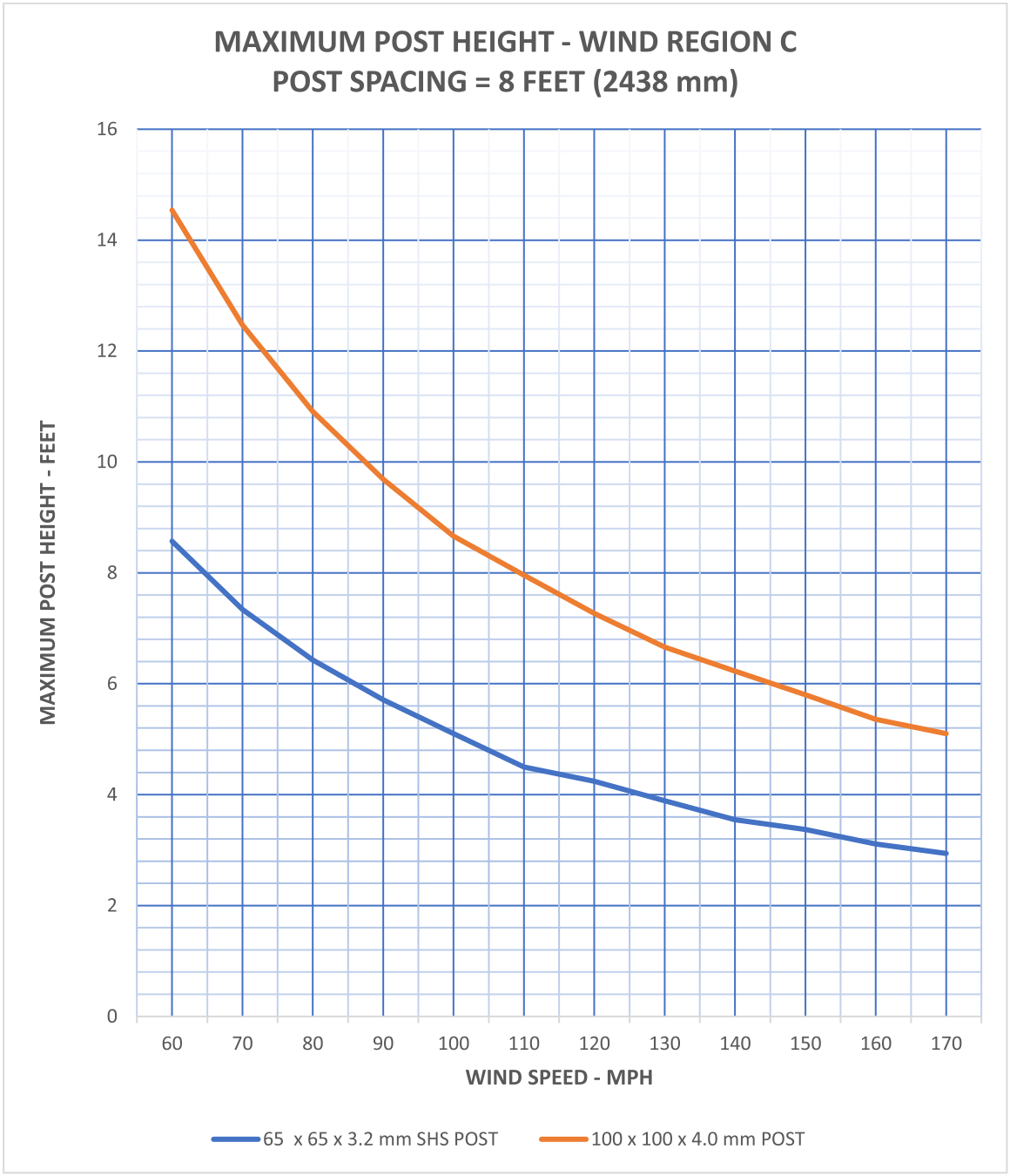

CHART 11 – MAXIMUM POST HEIGHTS – WIND REGION C – POST SPACING = 8 FEET

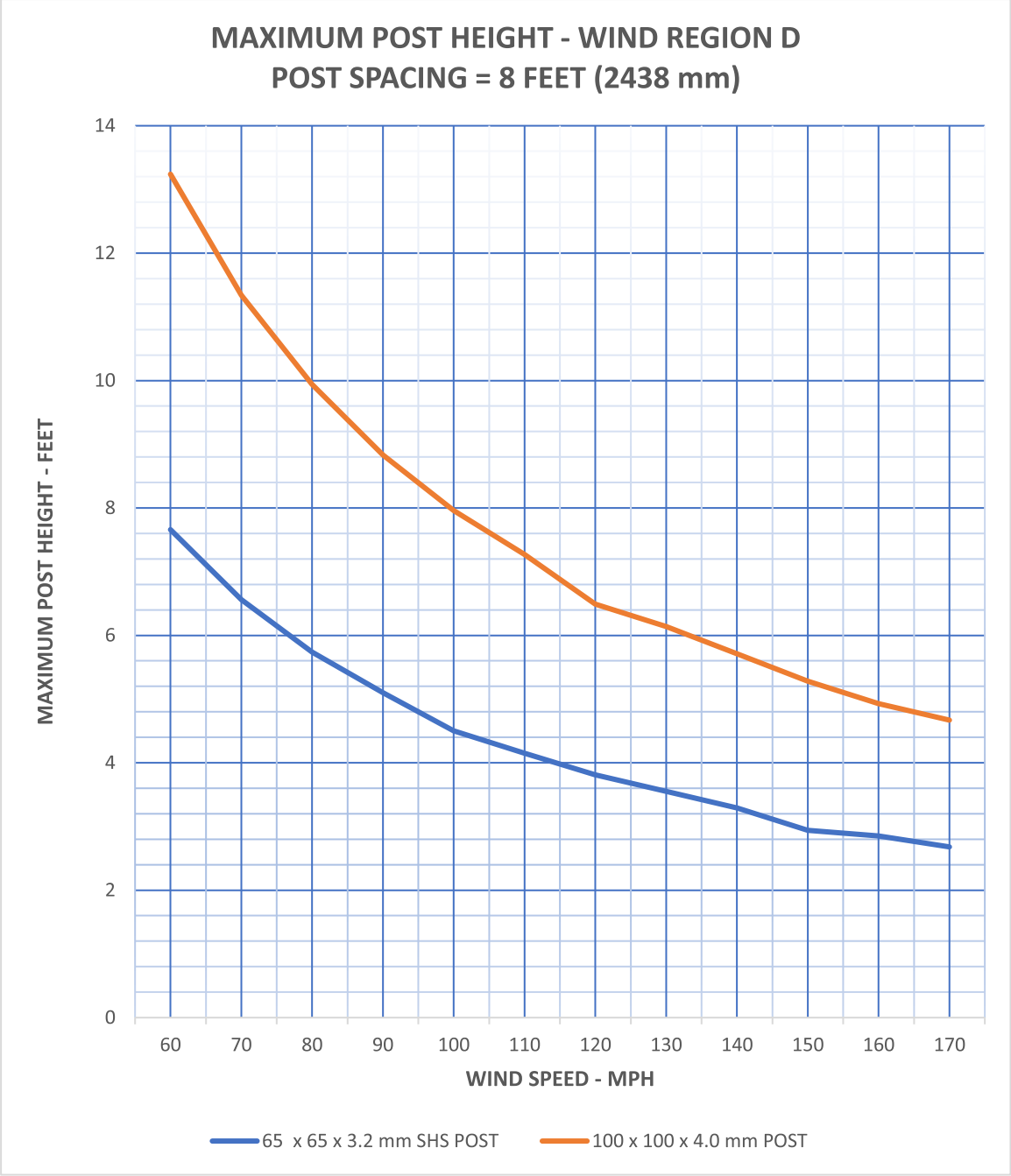

CHART 12 – MAXIMUM POST HEIGHTS – WIND REGION D – POST SPACING = 8 FEET

3. DESIGN TABLE – MINIMUM FOOTING DEPTH

The following table presents the required footing depth for a range of foundation material types.

The footing depths apply when the post height is equal to the maximum height provided in Charts 1 to 12.

Where the actual post height is less than the maximum height specified in the relevant chart, the footing depth may be reduced. The required minimum footing depth is determined by multiplying the depth tabulated below by the Footing Depth Multiplier (Y) determined from Chart 13.

To obtain the Footing Depth Multiplier (Y) first divide the actual post height by the maximum post height, to determine the parameter X. Locate X along the horizontal axis of the chart, then project a vertical line up the curved line in the chart, to the intersection point. Finally, project horizontally from the intersection point to the left to read off the Footing Depth Multiplier, Y.

FOOTING DEPTH – ALL WIND ZONES (For 12-inch (300 mm) diameter post footing)

POST SIZE / SOIL TYPE	**LOOSE SAND** **PHI = 30 DEGREES**	**DENSE SAND** **PHI = 35 DEGREES**	**FIRM CLAY** **C = 3.6 PSI (25 KPA)**	**STIFF CLAY** **C = 5.0 PSI (35 KPA)**	**HARD CLAY** **C = 7.2 PSI (50 KPA)**
65X65X3.2 SHS POST	51 INCHES (1300 MM)	43 INCHES (1100 MM)	36 INCHES (900 MM)	32 INCHES (800 MM)	28 INCHES (700 MM)
100X100X4.0 SHS POST	69 INCHES (1750 MM)	59 INCHES (1500 MM)	48 INCHES (1200 MM)	40 INCHES (1000 MM)	32 INCHES (800 MM)

NOTES:

1. Footing depths (Depth = D as indicated in Figure 1) are stated for a 12-inch (300 mm) diameter concrete pier

2. For sandy soil type, phi = soil friction angle

3. For clay soil type, c = cohesion

4. Required footing diameter, post embedment into the footing and/or required concrete and reinforcement in the concrete piers are indicated in the diagrams. Note: Minimum post embedment may be increased to eliminate the requirement for steel reinforcement in the pier. Refer to Section 5.4.

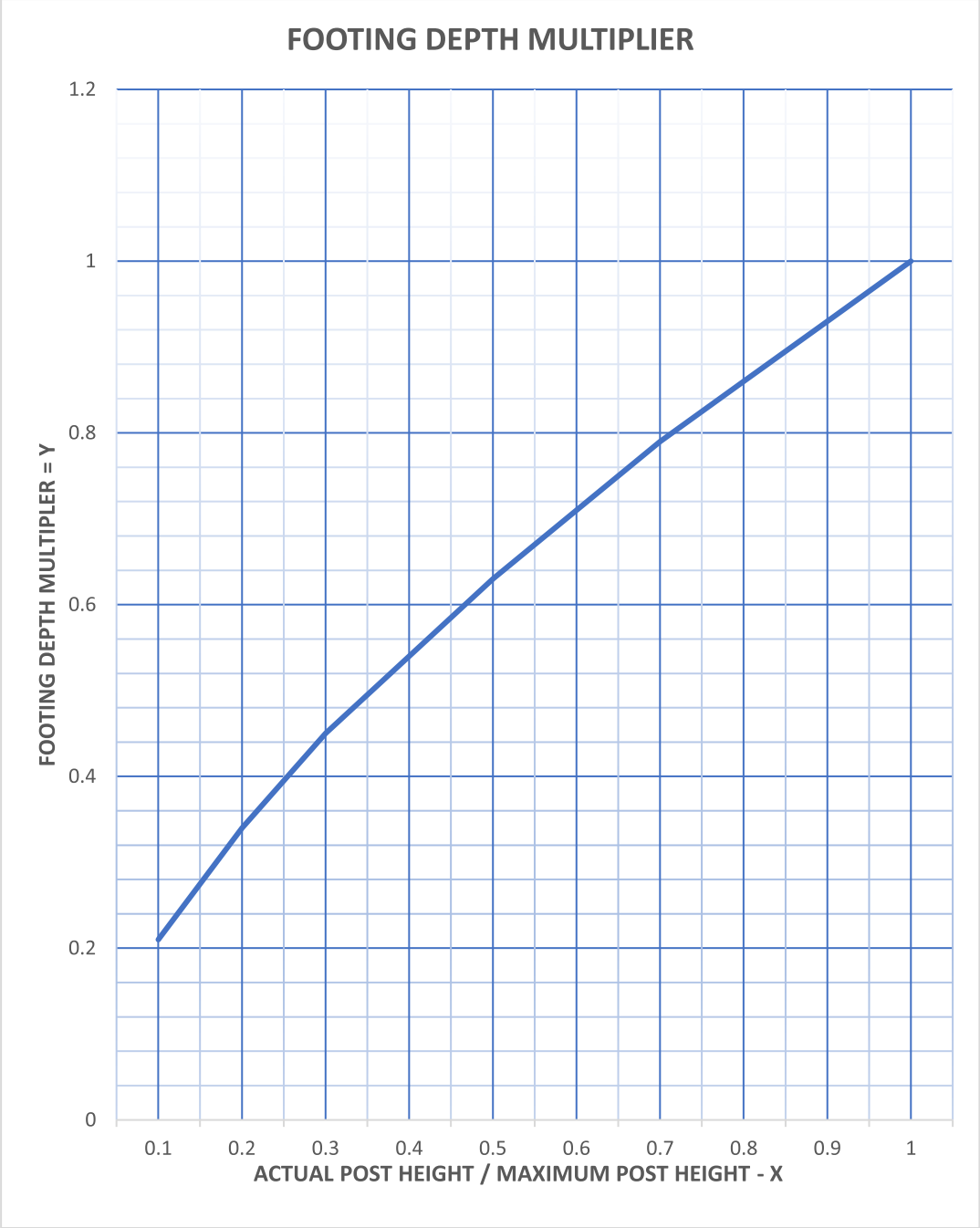

CHART 13 – FOOTING DEPTH MULTIPLIER

4. DESIGN LAYOUT DIAGRAM

Figure 1 provides the layout and definitions for the various parameters listed in the design tables:

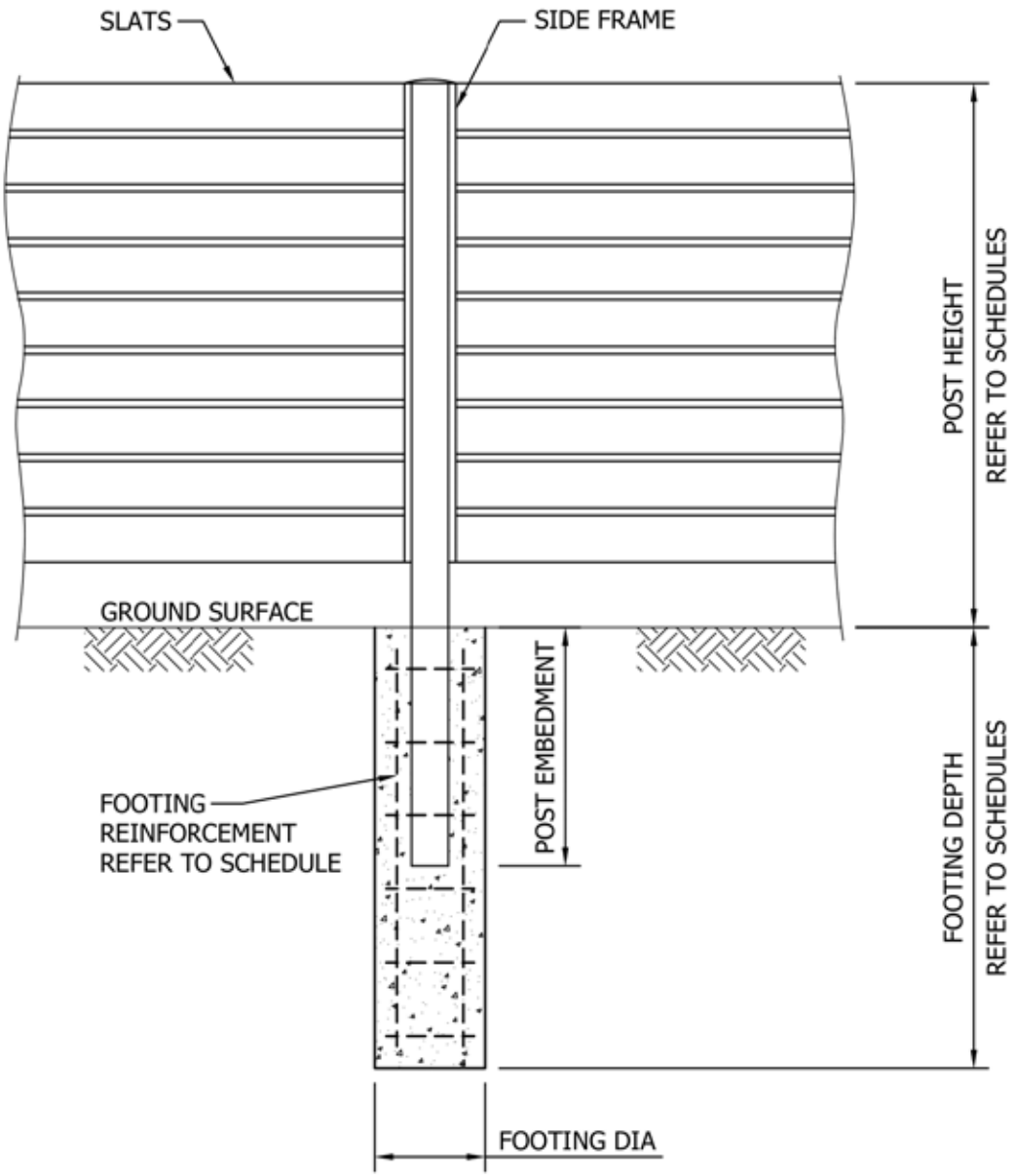

Figure 1 – Assembly Design Criteria

5. TECHNICAL CRITERIA

5.1. ALUMINIUM

Aluminium elements have been designed in accordance with Australian Standard AS1664.1.

Alloy and temper used in this design is 6005-T5.

Minimum ultimate tensile strength = 38,000 psi (262 MPa)

Minimum tensile yield strength = 35,000 psi (241 MPa)

Minimum compressive yield strength = 35,000 psi (241 MPa)

Minimum Youngs Modulus, E = 10,200 ksi (70,000 MPa)

5.2. GROUND CONDITIONS

Loose Sand – Phi (angle of internal friction) = 30 degrees.

Dense Sand – Phi (angle of internal friction) = 35 degrees.

Firm Clay – Cohesion, C = 3.6 psi (25 kPa). Firm clay can be penetrated approximately 0.5 inch with the thumb with considerable effort.

Stiff Clay – Cohesion, C = 5.0 psi (35 kPa). Stiff clay can be readily indented with the thumb but can only be penetrated with great effort.

Hard Clay – Cohesion, C = 7.2 psi (50 kPa). Can be indented with the thumb nail only.

5.3. WIND LOADING

Design fence loading has been determined in accordance with ASCE/SEI 7-16: Minimum Design Loads for Buildings and other Structures.

The Design Charts are applicable for situations where the top of the fence is no greater than 15 feet from the ground and the fence has an aspect ratio (fence length divided by fence height) of 2 or more.

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

Exposure C: Open terrain with scattered obstructions having heights generally less than 30 feet. This category includes flat open country and grasslands.

Exposure D: Flat unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats and unbroken ice.

Topographic multiplier Kzt = 1.0 has been used for the designs in this document.

5.4. CONCRETE AND REINFORCEMENT

Pier footings are to be 1-foot (305 mm) in diameter unless noted otherwise.

2.5-inch (65 mm) square posts are to be embedded at least 20 inches (508 mm) into the concrete pier footing.

4-inch (100 mm) square posts are to be embedded at least 28 inches (711 mm) into the concrete pier footing.

The pier footings are to be constructed with concrete with a characteristic compressive strength of at least 2900 psi (20 MPa).

A higher concrete grade may be required to provide adequate durability, subject to a site-specific evaluation of the ground type.

Piers supporting 2.5-inch (65 mm) square posts are to be reinforced with four (4) No. 3 (10 mm diameter) reinforcing bars inside No. 2 (6 mm) circular ties at 300 mm spacing. NOTE: Reinforcement may be deleted where the post extends into the concrete footing to within 16-inches (400 mm) of the base of the footing.

Piers supporting 4-inch (100 mm) square posts are to be reinforced with four (4) No. 4 (13 mm diameter) reinforcing bars inside No. 2 (6 mm) circular ties at 300 mm spacing. NOTE: Reinforcement may be deleted where the post extends into the concrete footing to within 16-inches (400 mm) of the base of the footing.

Clear cover to the reinforcement (circular ties) to be 2-inches (50 mm).

6. FENCE COMPONENTS

The fence components used in this report are attached as follows:

65x65x3.2 SHS Fence Post
100x100x4.0 SHS Fence Post
65 mm wide slat (refer to report by others for maximum slat spans)
150 mm wide slat (refer to report by others for maximum slat spans)
Side Frame