



BROCK GRAIN & FEED SYSTEMS

2.67" CORRUGATION COMMERCIAL BINS/SILOS & MILFORD ROOF GENERAL DESIGN SPECIFICATIONS

Brock commercial stiffened bins/silos are designed for storage of free flowing grain products weighing up to 48 lb/ft³ (769 kg/m³) or 51.8 lb/ft³ (830 kg/m³) with compaction.

Standard Brock bins/silos are designed for 90 mph (145 km/hr) wind velocity. This is equivalent to an unfactored pressure of 20.7 psf (1.0 KPa). Bins/silos are designed according to UBC requirements for Seismic zones 0 and 1.

General design criteria conforms to applicable portions of the following codes and specifications:

- ACI** - American Concrete Institute
- AISC** - American Institute of Steel Construction
- AISI** - American Iron and Steel Institute
- ASAE** - American Society of Agricultural Engineers
- ASCE** - American Society of Civil Engineers
- IBC** - International Building Code
- SAE** - Society of Automotive Engineers
- UBC** - Uniform Building Code

NOTE: A certified drawing of the general silo design, sealed by a licensed professional engineer for the states of Indiana, Ohio, Michigan and Missouri will be provided upon request at no charge (with the order). Certified drawings for other states are available at a charge that will be credited with an order. Bins/silos required to meet special design criteria may be quoted when requested.

SIDEWALLS AND STIFFENERS

All sidewall sheets and 2 – 14 gauge stiffeners use steel that meets ASTM A-653 specifications for Grade 50 structural quality Type I steel having the following properties:

- Yield strength** = 50,000 psi (345 MPa) minimum
- Tensile strength** = 65,000 psi (448 MPa) minimum
- Elongation in 2 in.** (50.8 mm) = 12% minimum

Stiffeners 16 gauge use steel that meets ASTM A-653 specifications for Grade 40 steel having the following properties:

- Yield strength** = 40,000 psi (276 MPa) minimum
- Tensile strength** = 55,000 psi (379 MPa) minimum
- Elongation in 2 in.** (50.8 mm) = 16% minimum



All sidewall sheets have 32 inches (81.28 cm) vertical coverage and 112.5 inches (285.75 cm) horizontal coverage. Corrugation profile has 2.667 inches (67.73 mm) pitch and 0.505 inches (12.8 mm) depth.



SIDEWALLS AND STIFFENERS (CONTINUED)

Sidewall Stiffeners have 64 inches (162.56 cm) vertical coverage (*two rings*). The Stiffeners are of an open hat-shaped cross section with stiffener flanges. All Stiffeners butt together one on top of the other and are fastened together with Splice Brackets. Stiffeners are designed to be used either inside or outside at the customer's option (to be specified at time of order).

BIN DIAMETER	2 STIFFENERS/SHEET	3 STIFFENERS/SHEET
15'	8 - 26 rings	—
18' - 36'	8 - 26 rings	27 - 32 rings
42'	8 - 27 rings	28 - 32 rings
48'	8 - 28 rings	29 - 32 rings
54' - 60'	8 - 27 rings	28 - 32 rings
72'	8 - 26 rings	27 - 32 rings
75' - 78'	8 - 25 rings	26 - 32 rings
90'	8 - 24 rings	25 - 32 rings
105'	8 - 23 rings	24 - 32 rings

BOLTS

All Body Sheet and Roof Panel and Stiffener bolts used in Brock commercial bins/silos are Grade 8.2 silo seal bolts with JS500 coating. Anchor bolts are Grade 5. Optional Grade 8.2 silo seal bolts can be supplied with a patented, encapsulated polypropylene head.

ROOFS (Milford)

Roofs have a 30° slope, four Roof Panels per sidewall sheet. Roofs up to 60' (18 m) diameter have single continuous Roof Panels from peak to eave. Roofs 72' to 90' (22 m - 27 m) diameter have two Roof Panels from peak to eave. The 105' has three Roof Panels from peak to eave. Panel ribs are 3" (76 mm) high stepped for additional strength. The Manhole opening is a large obround shape for maximum ease of entry.

Roof material is galvanized steel meeting specifications for ASTM A-653 Grade 33 structural quality Type I steel having the following properties:

- Yield strength** = 33,000 psi (228 MPa) minimum
- Tensile strength** = 45,000 psi (310 MPa) minimum
- Elongation in 2 in.** (50.8 mm) = 16% minimum



ROOFS (Milford) CONTINUED

General roof design loads are:

Design wind velocity is 90 mph (145 km/hr)

Design wind load is 20.7 lb/ft² (1.0 KPa)

Design roof load for dead load plus snow load of 20 lb/ft² (98 kg/m²)

NOTE: Some roof sizes exceed these design loads. Also, special roof designs for other reasonable loading may be quoted as an option.

Allowable peak loads for commercial roofs are:

15' - 36' (5 m - 11 m) diameter - 2,500 lb. (1,134 kg)

42' - 48' (13 m - 15 m) diameter - 4,000 lb. (1,814 kg)

54' (16 m) diameter - 6,000 lb. (2,722 kg)

60' - 90' (18 m - 27 m) diameter - 10,000 lb. (4,536 kg)

105' (32 m) diameter - 20,000 lb. (9,072 kg)

The under structure of 60'-90' (18 m - 27 m) roofs is back-to-back C-channels made from G-60 galvanized steel. 105' under structure is a painted W16 x 26 I beam. This standard design allows temperature cables to be supported directly from the structure.

54' has a 6' 5" (1.96 m) diameter flat deck at the roof peak. 60' and 72' (18 m and 22 m) bins/silos have a 7' 5" (2.26 m) diameter flat deck at the roof peak. 78', 90' and 105' (24 m, 27 m, and 32 m) bins/silos have a 12' 3 1/8" (3.74 m) diameter 10° sloped deck at the roof peak. Each comes with a 42" (1067 mm) high, circular guardrail.

DOOR

The standard one-ring sidewall door has a minimum 26" x 23 3/4" (660 x 603 mm) clear opening using the patented LATCH-LOCK™ system. Optional two ring door minimum 26" x 56" (660 x 1420 mm), Drive-Through Door 7' x 7' (2130 x 2130 mm) or 12' x 12' (3,657 x 3,657 mm) opening.

LADDERS, CAGES, ROOF STAIRS, PLATFORMS

All are made of galvanized steel and are designed to meet or exceed applicable standards such as ASAE S412-1 and OSHA. Ladder side Rails are formed from 16 gauge material. Ladder Rungs are from 18 gauge material.



LADDERS, CAGES, ROOF STAIRS, PLATFORMS CONTINUED

BROCK DESIGN STEEL GAUGE THICKNESS

2 Ga.	0.254 in.	(6.46 mm)	13 Ga.	0.088 in.	(2.25 mm)
5 Ga.	0.205 in.	(5.21 mm)	14 Ga.	0.072 in.	(1.82 mm)
8 Ga.	0.165 in.	(4.20 mm)	16 Ga.	0.058 in.	(1.47 mm)
9 Ga.	0.149 in.	(3.80 mm)	18 Ga.	0.046 in.	(1.18 mm)
10 Ga.	0.136 in.	(3.45 mm)	20 Ga.	0.035 in.	(0.88 mm)
11 Ga.	0.118 in.	(2.99 mm)	22 Ga.	0.030 in.	(0.762 mm)
12 Ga.	0.102 in.	(2.59 mm)	24 Ga.	0.024 in.	(0.610 mm)

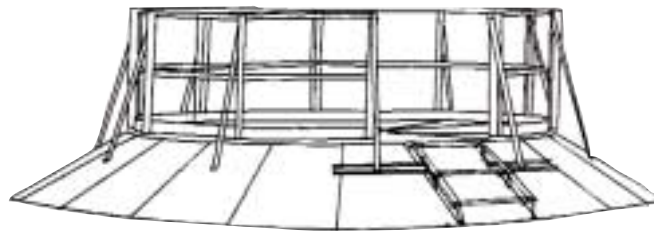
NOTE: More details and specific information can be provided upon request.

GALVANIZED COATING

All galvanized steel meets ASTM A-653 "G-90" commercial grade specifications. The zinc coating has a coating of .90 oz/ft² (275 g/m²) both sides.

All Brock design/specifications are subject to changes without notification.

FLAT TOP 54' - 105' (16 m - 32 m) DIAMETER



DIAMETER	15' to 36' (4.5 - 10.9 m)	42' & 48' (12.7 & 14.6 m)	54' (16.4 m)	60' & 72' (18.2 m & 21.8 m)	78' & 90' (23.6 m & 27.3 m)	105' (31.8 m)
Peak slope	0"	0°	0°	0°	10°	10°
Fillhole diameter	39" (991 mm)	39" (991 mm)	17" (432 mm)	17" (432 mm)	22 1/2" (572 mm)	22 1/2" (572 mm)
Diameter of peak platform	8' 6" * (2.6 m)	8' 6" * (2.6 m)	6' 5" (1.96 m)	7' 5" (2.26 m)	12' 3" (3.74 m)	12' 3" (3.74 m)
Guardrail height	42" (1.1 m) *	42" (1.1 m) *	42" (1.1 m)	42" (1.1 m)	42" (1.1 m)	42" (1.1 m)
Peak load	2,500 lb. max (1,134 kg)	4,000 lb. max. (1,814 kg)	6,000 lb. max. (2,722 kg)	10,000 lb. max. (4,536 kg)	10,000 lb. max. (4,536 kg)	20,000 lb. max. (9,072 kg)

Standard Items - All G-90 Galvanized Material

*Optional



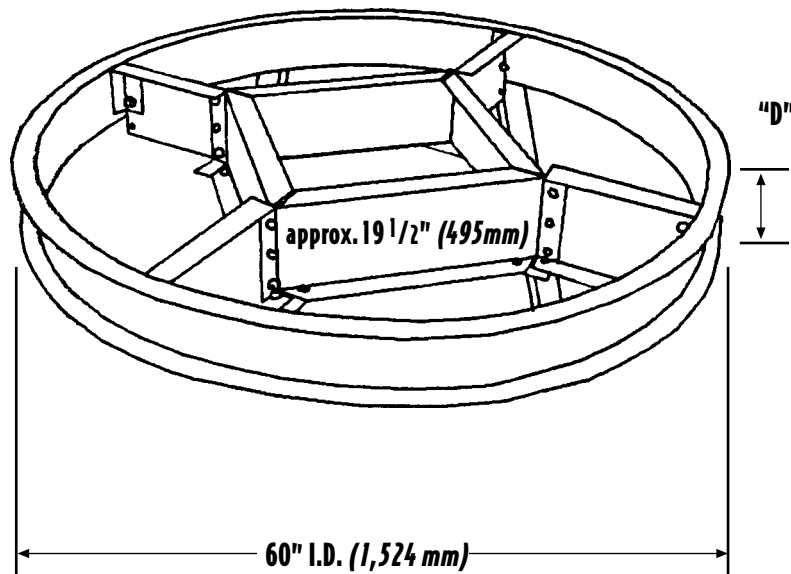
BENEFITS OVER CONE TOP

- Easier working surface for attaching conveyors and down spouts.
- Allows vents or fans to be installed in the peak. Helps eliminate heat buildup in the peak.

COMPRESSION RING (Painted)

DIAMETER	54' (16 m)	60' – 72' (18 m) – (22 m)	78' – 90' (24 m) – (27 m)	105' (32 m)
Shape				
Diameter	60" I.D. (1.5 m)	60" I.D. (1.5 m)	124.5" I.D. (3 m)	
Location	web	web	four points on compression ring	
	6,000 lbs. (2,722 kg)	10,000 lbs. (4,536 kg)	10,000 lbs. (4,536 kg)	20,000 lbs. (9,072 kg)
"D" (depth)	6" (150 mm)	6" (150 mm)	10" (250 mm)	

54' – 72' Compression Ring Web Assembly

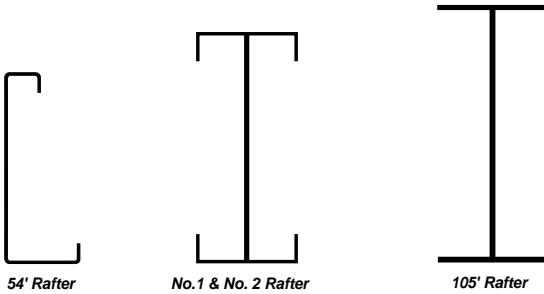


EXAMPLE



RAFTERS

DIAMETER	54' (16 m)	60' (18 m)	72' (22 m)	78' (24 m)	90' (27 m)	105' (32 m)
Material thickness	0.072"	0.058"	0.072"	0.072"	0.072"	0.295"
No. of rafters	18	20	24	26	30	35

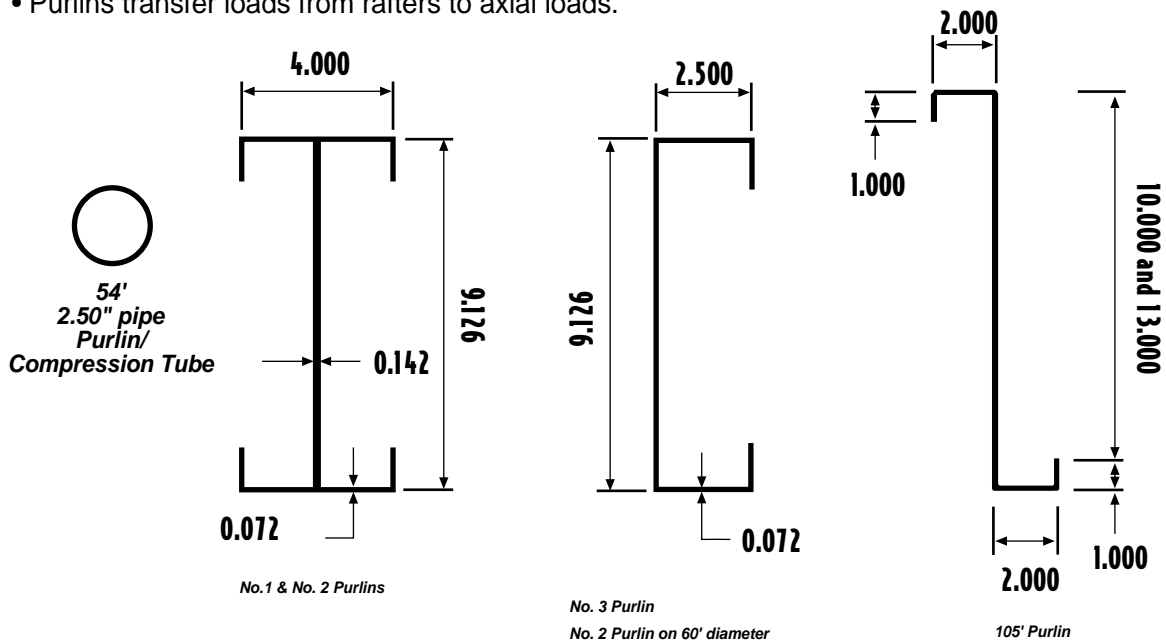


- Rafters are members that extend from the body sheets to the compression ring.
- Acts as both a beam and a column
- Supports at each purlin
- Carries one temperature cable/rafter
- Assembled at Brock
- All galvanized except 105' Rafters

PURLINS

DIAMETER	54' (16 m)	60' (18 m)	72' (22 m)	78' (24 m)	90' (27 m)	105' (32 m)
No. of Purlins	1	2	2	2	3	5

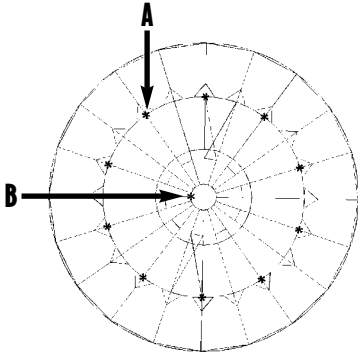
- Purlins transfer loads from rafters to axial loads.



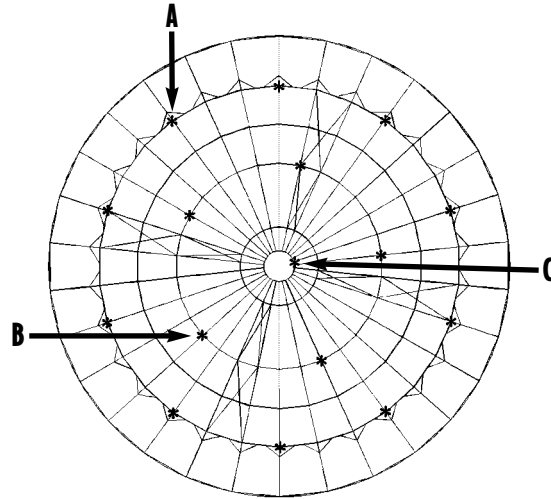


TEMPERATURE CABLE LAYOUTS

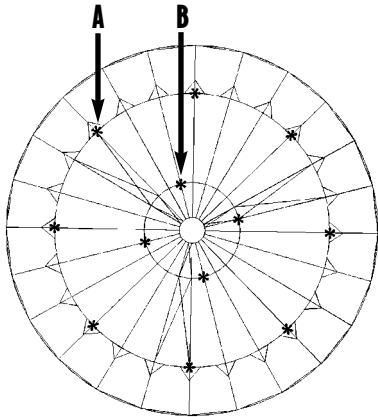
Note: 54' requires one additional rafter per temperature cable



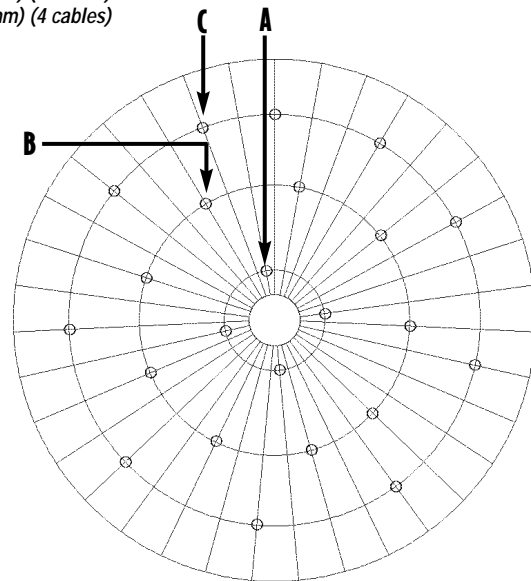
60' (18,288 mm) diameter
 "A" Radius - 19' (5,660 mm) (10 cables)
 "B" Hang one cable from compression ring



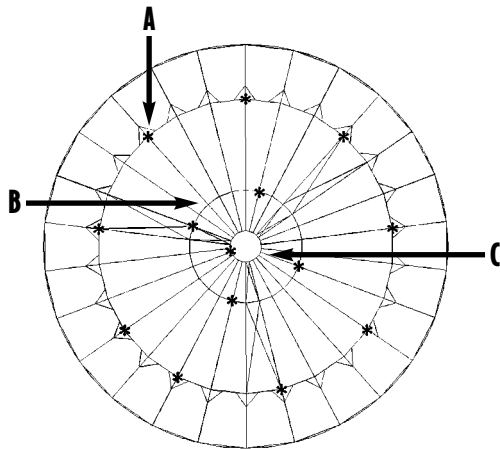
90' (27,432 mm) diameter
 "A" Radius - 34' (10,220 mm) (10 cables)
 "B" Radius - 21' (6,520 mm) (5 cables)
 "C" Hang one cable from compression ring



72' (21,946 mm) diameter
 "A" Radius - 25' (7,480 mm) (8 cables)
 "B" Radius - 12' (3,660 mm) (4 cables)



105' (32,004 mm) diameter
 "A" Radius - 10' (3,048 mm) (4 cables)
 "B" Radius - 27' (8,230 mm) (9 cables)
 "C" Radius - 41' (12,497 mm) (10 cables)



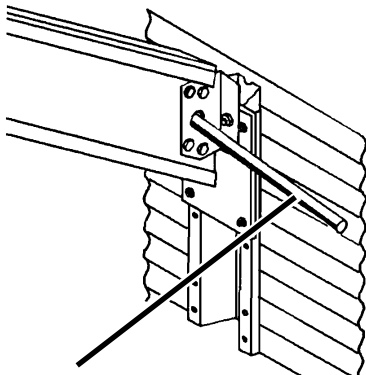
78' (23,774 mm) diameter
 "A" Radius - 28' (8,400 mm) (9 cables)
 "B" Radius - 15' (4,710 mm) (4 cables)
 "C" hang one cable from compression ring



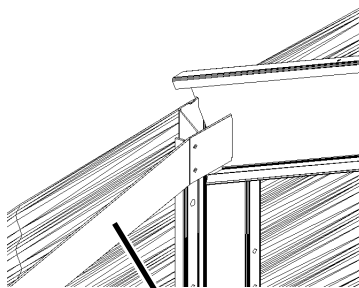
TENSION RODS/STRAPS

	Strap	Rod					Strap
DIAMETER	54' (16 m)	60' (18 m)	72' (22 m)	78' (24 m)	90' (27 m)	105' (32 m)	
Size of rod or strap	3.625" x .102" (92.1 mm x 2.59 mm)	1.125" Ø (28 mm)	1.375" Ø (35 mm)	1.375" Ø (35 mm)	1.375" Ø (35 mm)	8.333 x .25" (211.6 mm x 6.35 mm)	
No. of pieces	16	20	24	26	30	35 prs.	

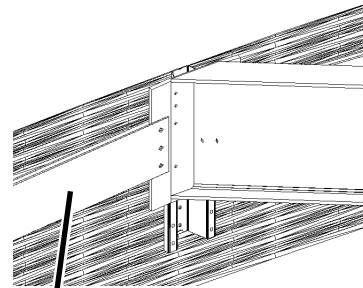
- Threaded rod with turnbuckle allows for easy assembly of roof panels.



Tension Rod 60' - 90'



54' Strap

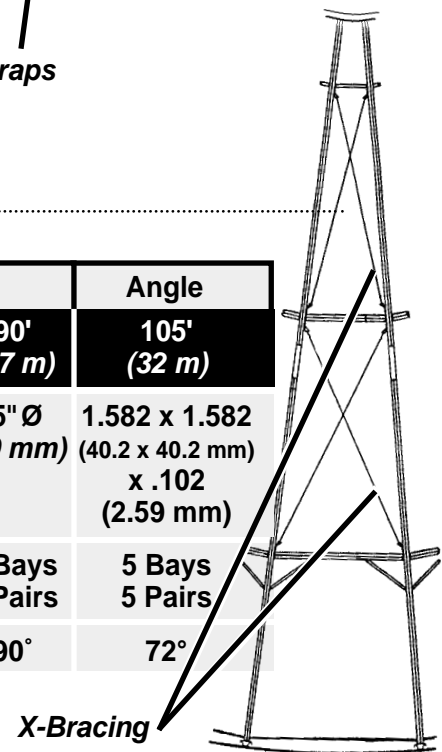


105' Straps

X-BRACING

	Angle	Rod					Angle
DIAMETER	54' (16 m)	60' (18 m)	72' (22 m)	78' (24 m)	90' (27 m)	105' (32 m)	
Size	1.582 x 1.582 (40.2 x 40.2 mm)	.5" Ø (10 mm)	.5" Ø (10 mm)	.5" Ø (10 mm)	.5" Ø (10 mm)	1.582 x 1.582 (40.2 x 40.2 mm)	
Thickness	x .102 (2.59 mm)					x .102 (2.59 mm)	
No. required	3 Bays 2 Pairs	2 Bays 1 Pair	3 Bays 2 Pairs	3 Bays 2 Pairs	4 Bays 2 Pairs	5 Bays 5 Pairs	
Location	120°	180°	120°	120°	90°	72°	

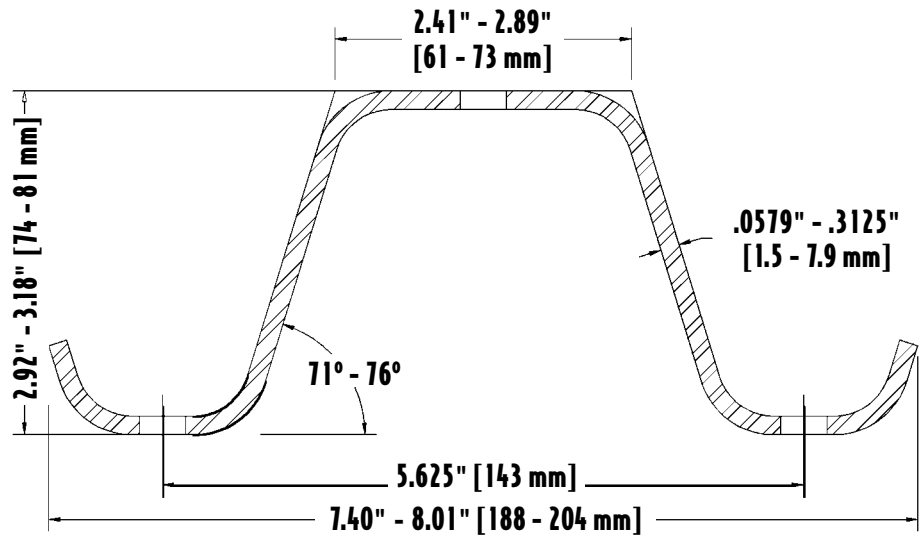
- Cross bracing keeps roof square during construction.
- Roof panel also helps keep square after construction.



X-Bracing



STIFFENERS

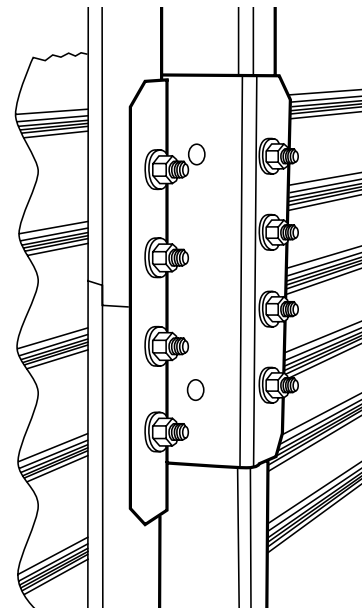


Stiffener Cross Section

- Available for either inside or outside
- G-90 galvanize - 16 gauge
40,000 yield steel - minimum 55,000 tensile
- G-90 galvanize - 14 gauge - 2 gauge
50,000 yield steel - minimum 65,000 tensile
- Bolted every 8" (20 cm) to body sheet

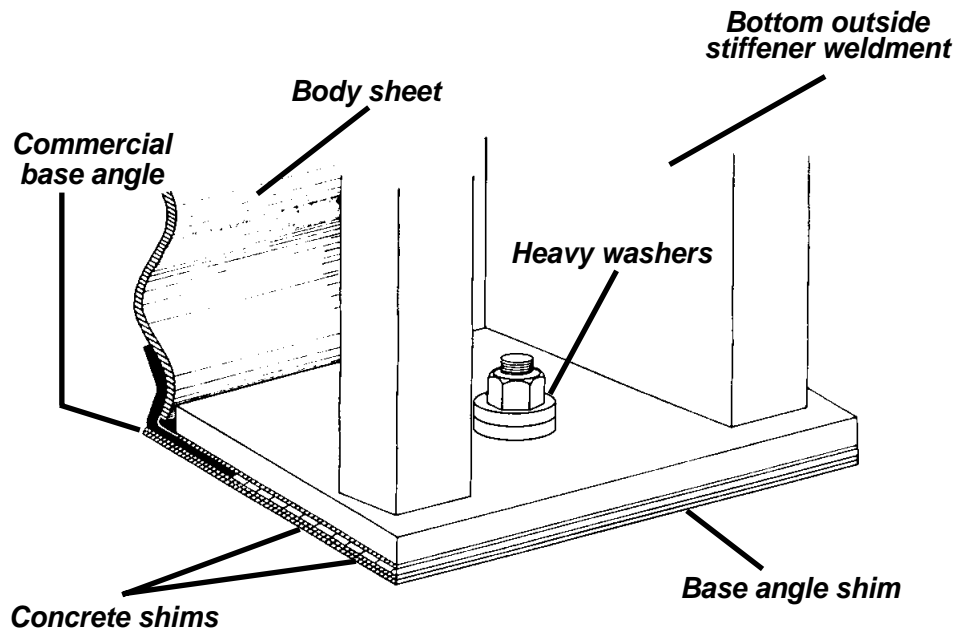
STIFFENER JOINT

- Splice joint, either 12 gauge, 10 gauge or 8 gauge

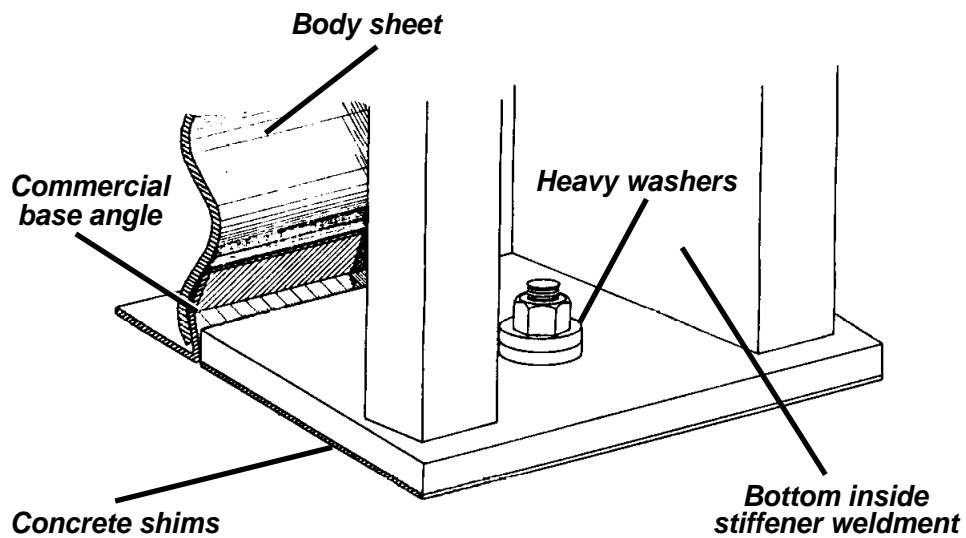




BASE ANGLE RING AND ANCHORING



Outside Bottom Stiffener



Inside Bottom Stiffener