



BROCK GRAIN & FEED SYSTEMS

4" CORRUGATION NEXT GENERATION BINS/SILOS

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 institutions:

- 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 8-18 gauge sidewall sheets and 2-14 gauge stiffeners use steel that meets ASTM A-653 specifications for Grade 50 structural quality Type 1 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



20 gauge sidewall sheets and 16 gauge stiffeners 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 44 inches (111.7 cm) vertical coverage and 112.5 inches (285.75 cm) horizontal coverage. Corrugation profile has 4.00 inches (101.6 mm) pitch and 7/16 inches (11.1 mm) depth.



SIDEWALLS AND STIFFENERS CONTINUED

Sidewall stiffeners have 88 inches (*223.52 cm*) vertical coverage (*two tiers*). 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) and are used two per body sheet.

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.

ROOFS (Kansas City)

Roofs have a 30° slope, three roof panels per sidewall sheet. Roofs (non-structural) up to 48' (*15 m*) diameter have single continuous roof panels from peak to eave. Roofs (structural) 48' to 72' (*15 m - 22 m*) have two roof panels from peak to eave. Roofs 75' to 105' (*23 m - 32 m*) have three roof panels from peak to eave. Panel ribs are 2-3/16" or 3" depending on roof span. The manhole opening is 24" (*61 cm*) diameter.

Roof material is galvanized steel meeting specifications for ASTM A-653 Grade 33 structural quality Type 1 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

General roof design loads are:

All single span roofs (non-structural) 15' through 48' diameter are designed for a dead load of 2 psf (*0.09 KPa*). Two and three stage roofs (structural) 48' through 105' are designed for a dead load of 7 psf (*0.34 KPa*).

All single span roofs (non-structural) 15' through 48' diameter are designed for a wind or live load of 10 psf (*0.48 KPa*). Two and three stage roofs (structural) 48' through 105' are designed for a wind or live load of 12 psf (*0.58 KPa*). This load is relatively small because of the 30 degree roof slope.



ROOFS (Kansas City) CONTINUED

Allowable peak loads for roofs are:

All single span roofs (non-structural) 15' through 48' diameter will support a 2,000-pound (907 kg) handling equipment load applied at the center collar. Two and three stage roofs (structural) 48' through 105' diameter will support 10,000-pound (4,536 kg) loads at the center collar. (See Roof Assembly Manual for details.)

The structural members under the two and three stage roofs are a "Z" shape section. The 48' through 90' diameter roofs use an eight-inch deep section and the 105' diameter is constructed of a twelve-inch deep section. These "Z" shaped sections are constructed from G-90 galvanized steel. This standard design allows temperature cables to be supported directly from the structure.

An optional 6' diameter flat deck is available for 48' through 105' structural roofs.

DOORS

The standard one-ring sidewall door has a minimum 26" x 41" (660 x 858 mm) clear opening using the patented LATCH-LOCK® system. Optional tier and one half door minimum 26" x 56" (660 x 1,420 mm) opening, and drive-through door 6' x 7' (1,829 x 2,130 mm) or 12' x 12' (3,657 x 3,657 mm) openings.

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.

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.	(0.76 mm)
12 Ga.	0.102 in.	(2.59 mm)	24 Ga.	0.024 in.	(0.61 mm)

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

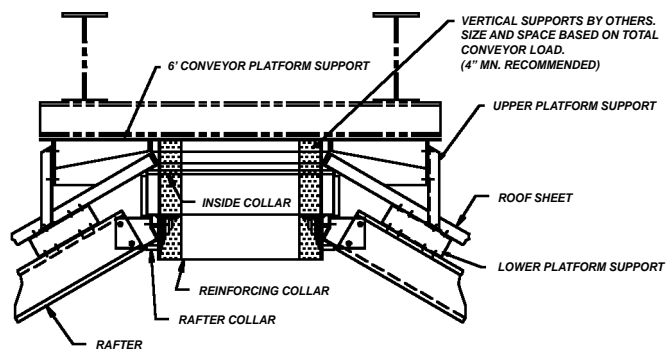


GALVANIZED COATING

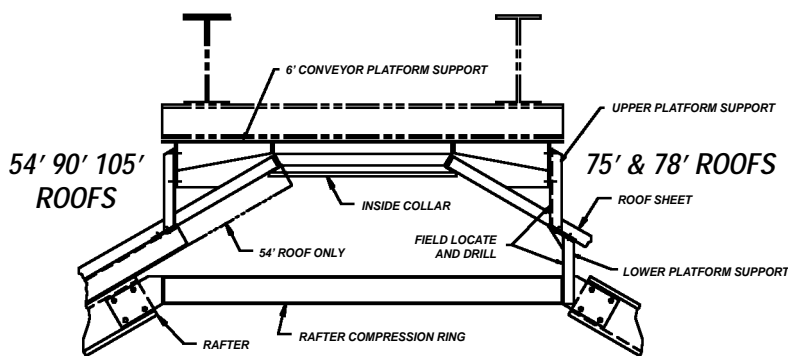
All galvanized steel meets ASTM A-653 "G-90" commercial grade specifications. The zinc coating has a coating of .90 oz/ft² (275 g/m²) both sides.

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

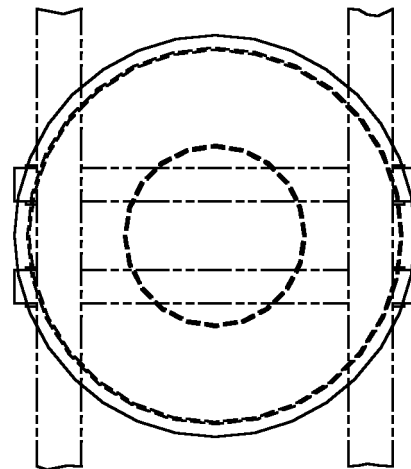
FLAT TOP 48' - 105' (15 m - 32 m) DIAMETER



48', 60' & 72' ROOFS



54' & 75' thru 105' ROOFS

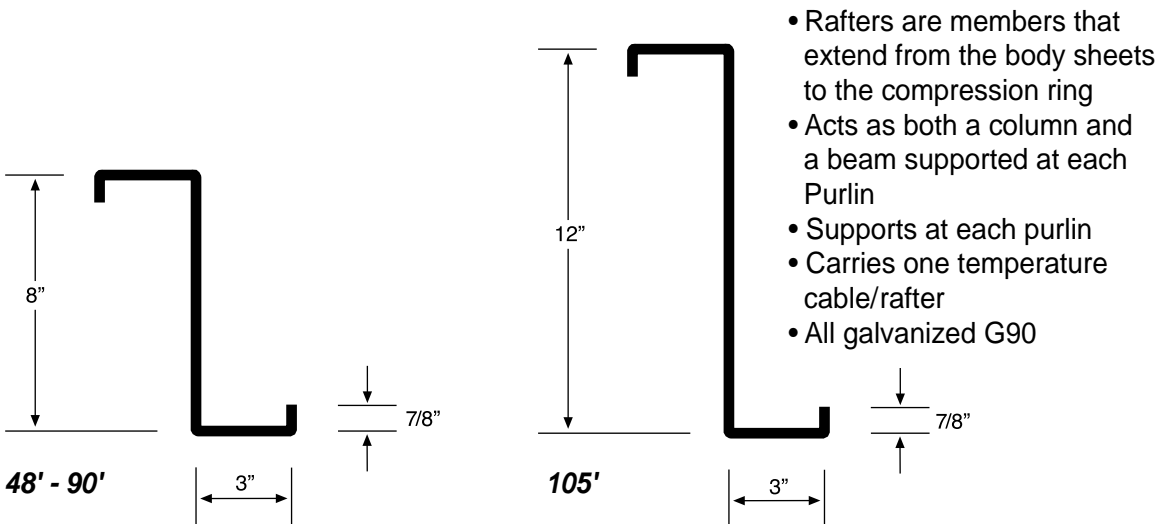


The 6' (2 m) flat-top conveyor support is hot-dipped galvanized and is available as an accessory on the 48' through 105' (15 m - 32 m) diameter structural roof systems. The support is designed to carry and transfer a total vertical load of 10,000 pounds (4,536 kg) to the structural roof system. The connection from the conveyor to the support should be designed by the conveyor manufacturer.



RAFTERS

DIAMETER	48' (15 m)	54' (16 m)	60' (18 m)	72' (22 m)	75' (23 m)	78' (24 m)	90' (27 m)	105' (32 m)
Material Thickness	.106" (2.7 mm)	.106" (2.7 mm)	.106" (2.7 mm)	.106" (2.7 mm)	.106" (2.7 mm)	.106" (2.7 mm)	.106" (2.7 mm)	.130" (3.3 mm)
No. of Rafters	16	18	20	24	25	26	30	35
Material Yield Strength, Ksi	40	40	40	40	40	40	40	50



PURLINS

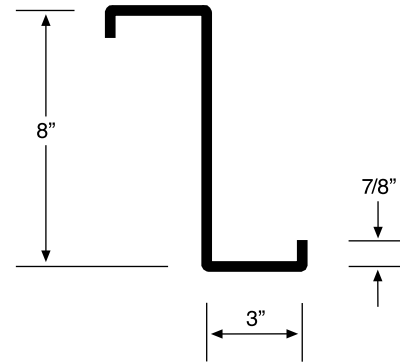
DIAMETER	48' (15 m)	54' (16 m)	60' (18 m)	72' (22 m)	75' (23 m)	78' (24 m)	90' (27 m)	105' (32 m)
Number of Purlin Rings	2	2	2	3	3	4	4	5

- Purlins transfer loads from rafters to axial loads.



PURLINS CONTINUED

DIAMETER	Purlin Material Thickness			
	.070"	.106"	.113"	.127"
54' (16 m)	2	—	—	—
60' (18 m)	2	1	—	—
72' (22 m)	2	1	—	—
75' (23 m)	2	1	—	—
78' (24 m)	—	3	1	—
90' (27 m)	—	3	1	—
105' (32 m)	1	2	—	2



TEMPERATURE CABLES (Kansas City Structural Roofs)

BIN DIAMETER Kansas City Roof	Cable Length from Purlin to Eave of Bin*		
	Center Cable	Interm. Cable	Outside Cable
48'	147"	—	49"
54'	158"	—	57"
60'	189"	—	62"
72'	—	171"	54"
75'	—	179"	56"
78'	240"	179"	42"
90'	282"	207"	53"
105'	273"	164"	52"

*Cable overall lengths can be determined by adding the length noted above to the number of tiers times 44".

EXAMPLE: 4844 Bin (44' eave height bin has 12 tiers.)

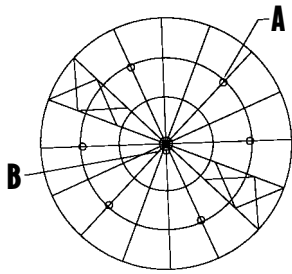
Center cable $147'' + 44'' \times 12 = 675''$ (56' - 3")

Outside cable $49'' + 44'' \times 12 = 577''$ (48' - 1")

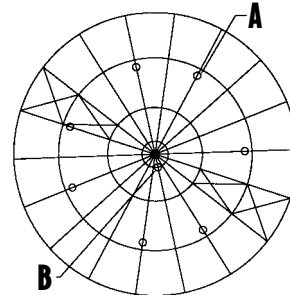
Note: Cable overall lengths must be shortened for sweep unloaders.



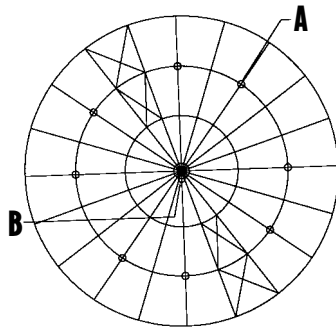
TEMPERATURE CABLES (Kansas City Structural Roofs) CONTINUED



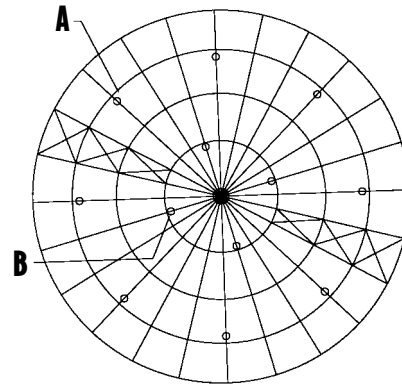
48' ROOF
"A" Radius - 16' (6 cables)
"B" Hang one cable from rafter/
compression ring connection



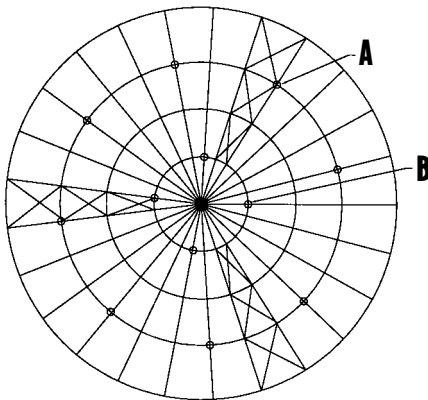
54' ROOF
"A" Radius - 17'-6" (7 cables)
"B" Hang one cable from rafter/
compression ring connection



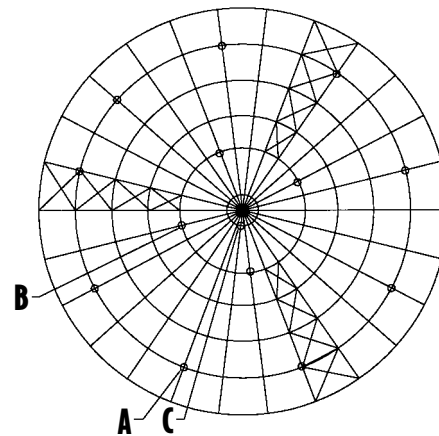
60' ROOF
"A" Radius - 20' (8 cables)
"B" Hang one cable from rafter/
compression ring connection



72' ROOF
"A" Radius - 27' (8 cables)
"B" Radius - 10' (4 cables)



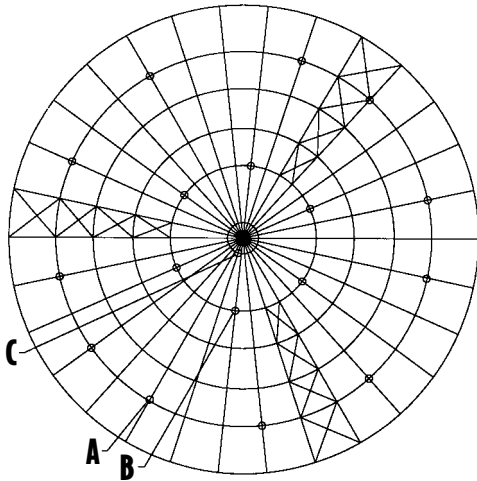
75' ROOF
"A" Radius - 27' (8 cables)
"B" Radius - 9' (4 cables)



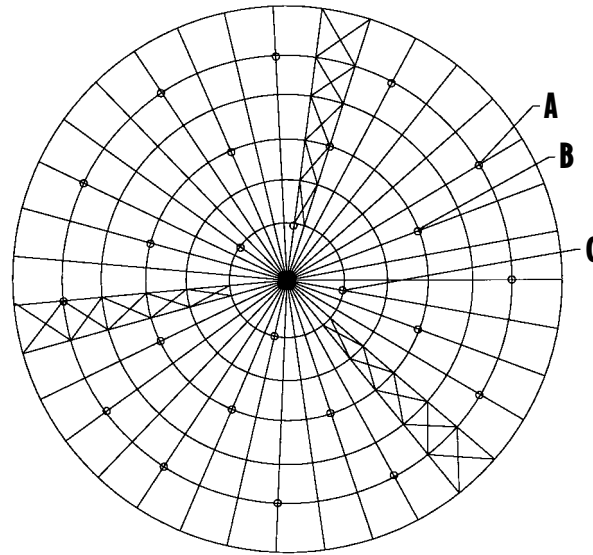
78' ROOF
"A" Radius - 32' (9 cables)
"B" Radius - 12' (4 cables)
"C" Hang one cable from rafter/
compression ring connection



TEMPERATURE CABLES (Kansas City Structural Roofs) CONTINUED



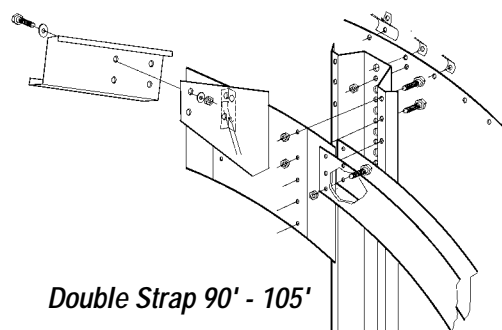
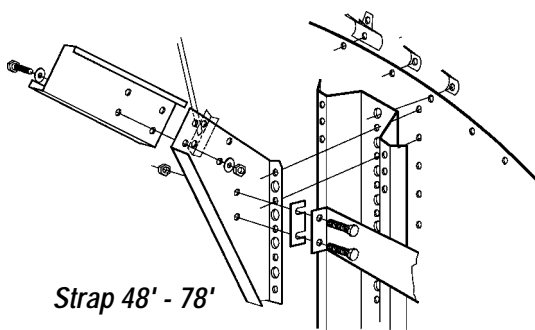
90° ROOF
 "A" Radius - 36' (11 cables)
 "B" Radius - 14' (6 cables)
 "C" Hang one cable from rafter/
 compression ring connection



105° ROOF
 "A" Radius - 43' (12 cables)
 "B" Radius - 27' (8 cables)
 "C" Radius - 11' (4 cables)

TENSION STRAPS

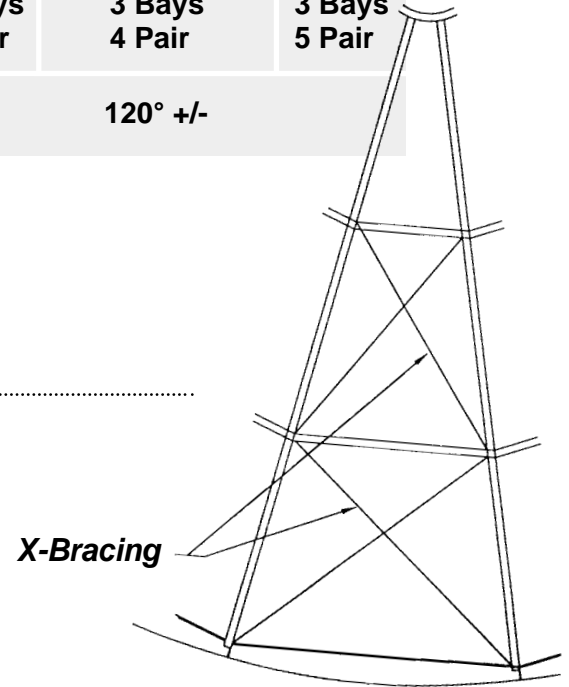
DIAMETER	48' (15 m)	54' (16 m)	60' (18 m)	72' (22 m)	75' (23 m)	78' (24 m)	90' (27 m)	105' (32 m)
Size of Strap	6.00" x .25" (152.4 mm x 6.35 mm)							8.333" x .25" (211.6 mm x 6.35 mm)
No. of Pieces	16	18	20	24	25	26	60	70





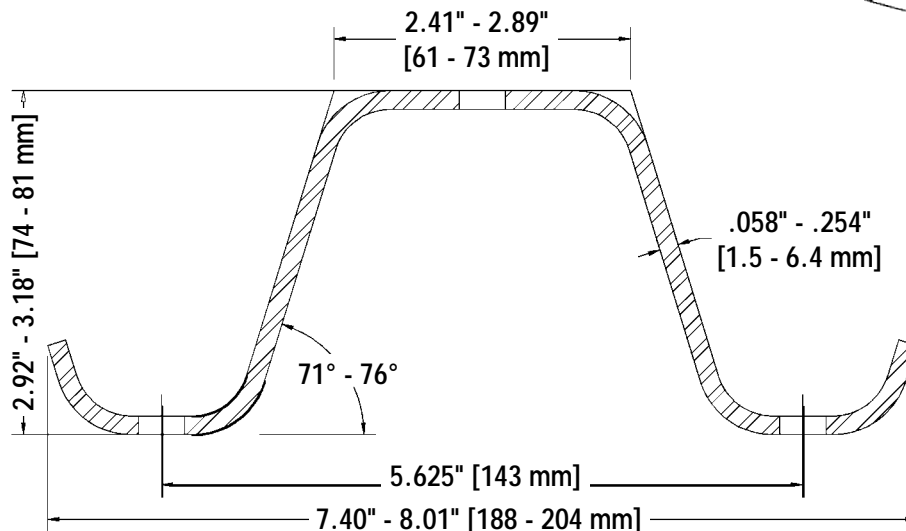
X-BRACING

DIAMETER	48' (15 m)	54' (16 m)	60' (18 m)	72' (22 m)	75' (23 m)	78' (24 m)	90' (27 m)	105' (32 m)	
Tie Rod Diameter	.50" (13 mm)								
Number Required	2 Bays 2 Pair		2 Bays 3 Pair		3 Bays 3 Pair		3 Bays 4 Pair		3 Bays 5 Pair
Location	180° +/-				120° +/-				



STIFFENERS

- 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 4" (10 cm) to body sheet

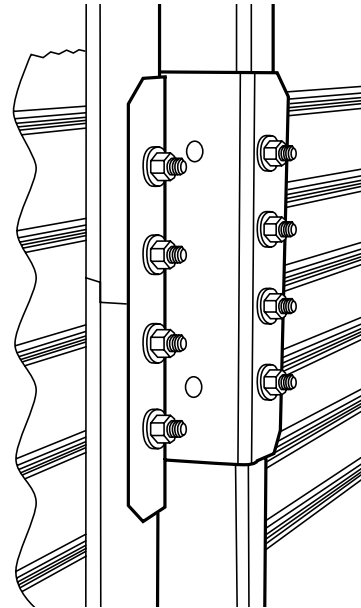


Stiffener Cross Section



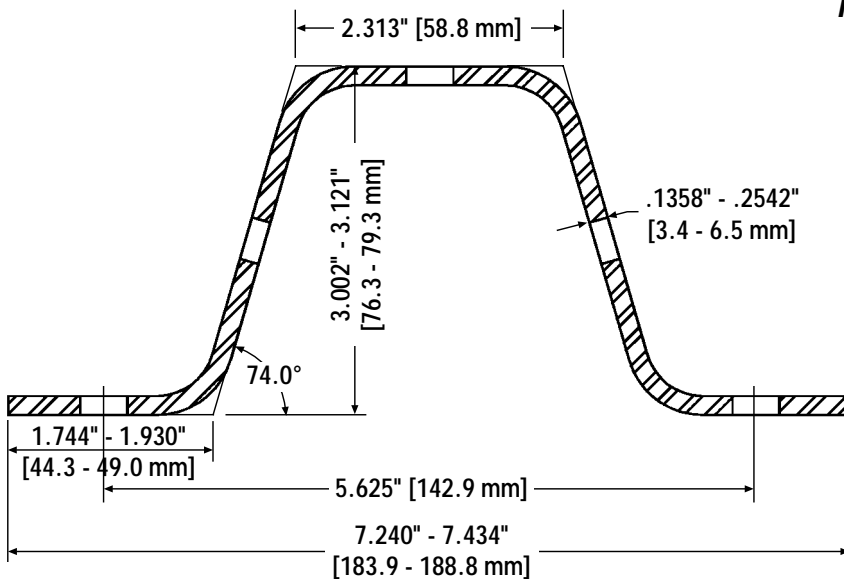
STIFFENER SPLICE

- Splice joint, either 12 gauge or 10 gauge.
- 10 bolt connection

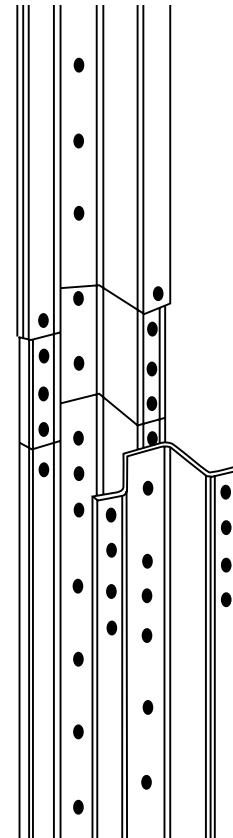


STIFFENER INSERTS

- G-90 galvanize - 10 gauge - 2 gauge
50,000 yield steel - minimum 65,000 tensile
- Bolted every 4" (10 cm) to body sheet and stiffener
- Acts as stiffener splice at joint.



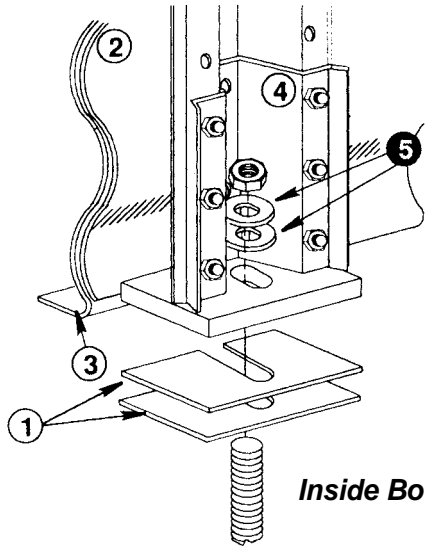
*Stiffener
Insert
Joint*





ANCHORING

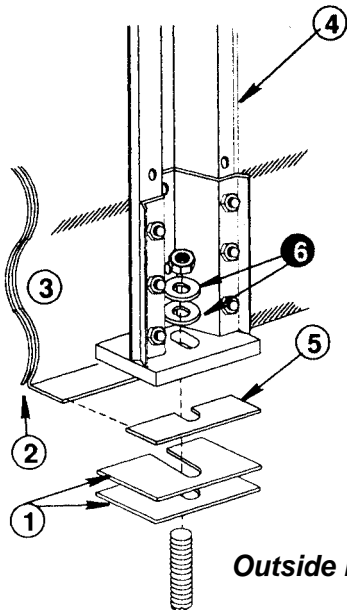
Inside Bottom Stiffeners



Inside Bottom Stiffener

Item	Description
1	Concrete Shim (as needed)
2	Inside Bottom Sheet
3	Outside Bottom (Flange) Sheet
4	Bottom Inside Stiffener Weldment
5	Heavy Washer

Outside Bottom Stiffeners



Outside Bottom Stiffener

Item	Description
1	Concrete Shim (as needed)
2	Inside Bottom Sheet
3	Outside Bottom (Flange) Sheet
4	Bottom Outside Stiffener Weldment
5	Flange Shim
6	Heavy Washer