

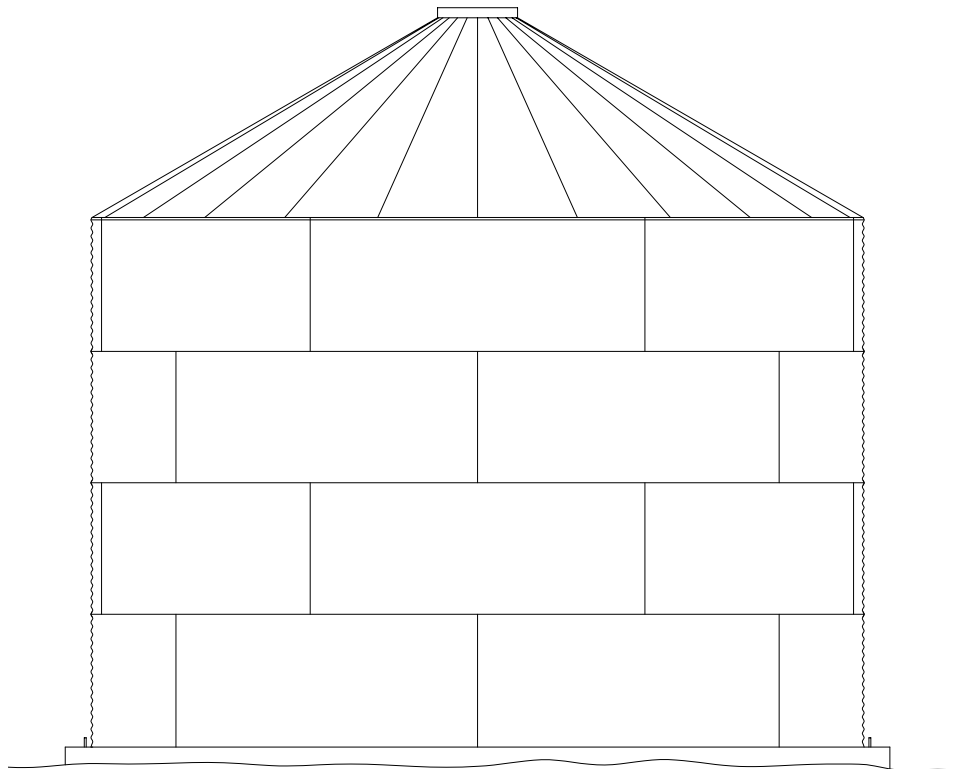
**290350**

R020221

# **SCAFCO<sup>®</sup>**

## **LIQUID STORAGE SYSTEMS**

### **INSTALLATION INSTRUCTIONS**







## WARNING TO CUSTOMERS AND CONTRACTORS

### W A R N I N G !!!

Grain storage silos and liquid storage tanks are structures that are constantly under static and dynamic forces in varying degrees. ScafcO Grain Bins/Silos, Hopper Bottom Tanks and Liquid Storage Tanks are designed and manufactured to withstand these forces when properly installed.

Proper assembly and installation of these storage structures will provide long years of service to our customers. To help ensure this, the Contractors and Customers who plan to install the structure themselves must follow the guidelines listed below:

- The Contractor/Customer should follow the Installation Manuals and Drawings supplied with the product.
- The Installation Manuals and Drawings should be thoroughly studied prior to the start of installation work.
- The Contractor/Customer should contact ScafcO Customer Service to verify or clarify any question they have on the instructions or drawings before starting installation work.
- If any question, doubt or difficulty arises during the process of installation, the Contractor/Customer should contact ScafcO Customer Service to get an answer or instruction to resolve the problem.
- **Non-compliance with the instructions shown in the manuals and/or drawings, or unauthorized modification/s, may result in structural damage/failure, injury or DEATH !**
- **Non-compliance with the instructions shown in the manuals and/or drawings, including unauthorized modification/s, will void the Manufacturer's Warranty.**
- While every effort is made to insure that the drawings and instructions are without errors, they can happen. Therefore, if you have any concerns, doubts or questions regarding the correctness of any instruction or drawing, please contact us immediately for clarification prior to proceeding.





## **TABLE OF CONTENTS**

WARNING TO CUSTOMERS AND CONTRACTORS .....	1
TABLE OF CONTENTS.....	3
SNOW, WIND AND SEISMIC LOADS .....	6
LIQUID STORAGE TANK FLAT FOUNDATION PLAN.....	7
LIQUID STORAGE TANK SPECIFICATIONS .....	8
ROOF ASSEMBLY .....	11
6' & 9' LIQUID STORAGE TANKS .....	11
ERECTION PROCEDURES.....	12
ROOF INSTALLATION DETAILS .....	13
RIB CLIP & EAVE SEAL INSTALLATION .....	14
RIB & CENTER CLIP CONNECTIONS .....	15
12' DIAMETER BINS.....	15
15' DIAMETER BINS.....	15
18' DIAMETER BINS.....	15
21' DIAMETER BINS.....	15
24' DIAMETER BINS.....	16
27' DIAMETER BINS.....	16
30' DIAMETER BINS.....	16
33' DIAMETER BINS.....	16
36' DIAMETER BINS.....	17
39' DIAMETER BINS.....	17
42' DIAMETER BINS.....	17
WEATHERSKIRT & CAP INSTALLATION .....	18
ROOF CAP HINGE INSTALLATION .....	19
ROOF CAP ASSEMBLY .....	20
COMPLETE ROOF CAP ASSEMBLY.....	22
ROOF SUPPORT RING INSTALLATION .....	23
ROOF SUPPORT RING DETAILS .....	24
BOLT SCHEDULE.....	25
ANCHORING AND SEALING INSTALLATION.....	26
ASPHALTIC BASE SEALANT APPLICATION .....	27
ACCESS PANEL INSTALLATION .....	28
EXTERIOR LADDER INSTALLATION .....	29



FOUNDATION, INLETS, OUTLETS & OVERFLOWS .....	30
CONCRETE FOUNDATIONS .....	30
INSTALLING INLETS, OUTLETS & OVERFLOW PIPES .....	31
WATER INLET-OUTLET REQUIREMENTS .....	31
INSTALLING INLETS AND OUTLETS .....	33
TANK PREPARATION.....	34
FLOOR SURFACE.....	34
INTERIOR WALL PAINT .....	35
LINER INSTALLATION PRECAUTIONS.....	35
LINER INSTALLATION .....	35
VINYL & HYPALON LINER PROTECTION.....	36
TANK DISINFECTION.....	37
CHLORINATION METHOD 3.....	37
CARE OF VINYL OR HYPALON LINER.....	38
CLEANING THE VINYL OR HYPALON LINER .....	38
LINER REPAIR – VINYL.....	38
LINER REPAIR – HYPALON .....	38
CONTROLS.....	38
ICE FORMATION.....	39
VENTING .....	39
LINER .....	40
GEO-TEXTILE LINER INSTALLATION .....	41



Congratulations on purchasing a quality Scafco liquid storage tank! The Scafco liquid storage tank is a unique and practical combination of corrugated galvanized steel wall sheets, a conical galvanized steel roof, a vinyl or Hypalon liner capable of retaining water, and a concrete foundation.

Proper design of a complete water storage system can only be insured by a local engineer skilled in the water supply field. Every tank purchaser should retain a local professional engineer and charge him with the responsibility for adequate design of the foundation, inlets, outlets, overflow pipes and controls.

The success of a Scafco liquid storage tank depends upon proper erection and installation of the tank. The following instructions will be helpful to those individuals involved in tank installation.

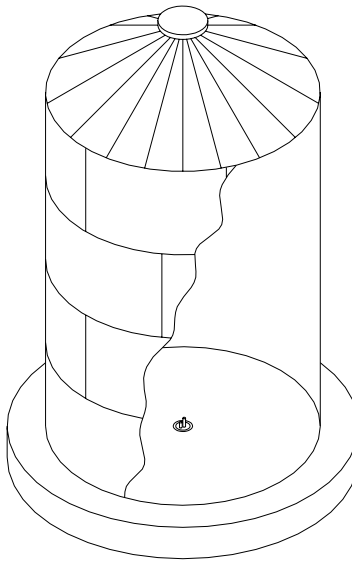
## **SNOW, WIND AND SEISMIC LOADS**

The roof and sidewalls of ScafcO liquid storage tanks shall be designed to resist snow, wind and seismic loads as required by the Uniform Building Code, 1997 Edition, and the local Regulatory Agency issuing building permits for new construction.

Minimum roof design live (snow) load is 16 psf, applied to the horizontal projection. Where required by climatic conditions or the local Regulatory Agency, roof design loads shall be increased to satisfy local requirements.

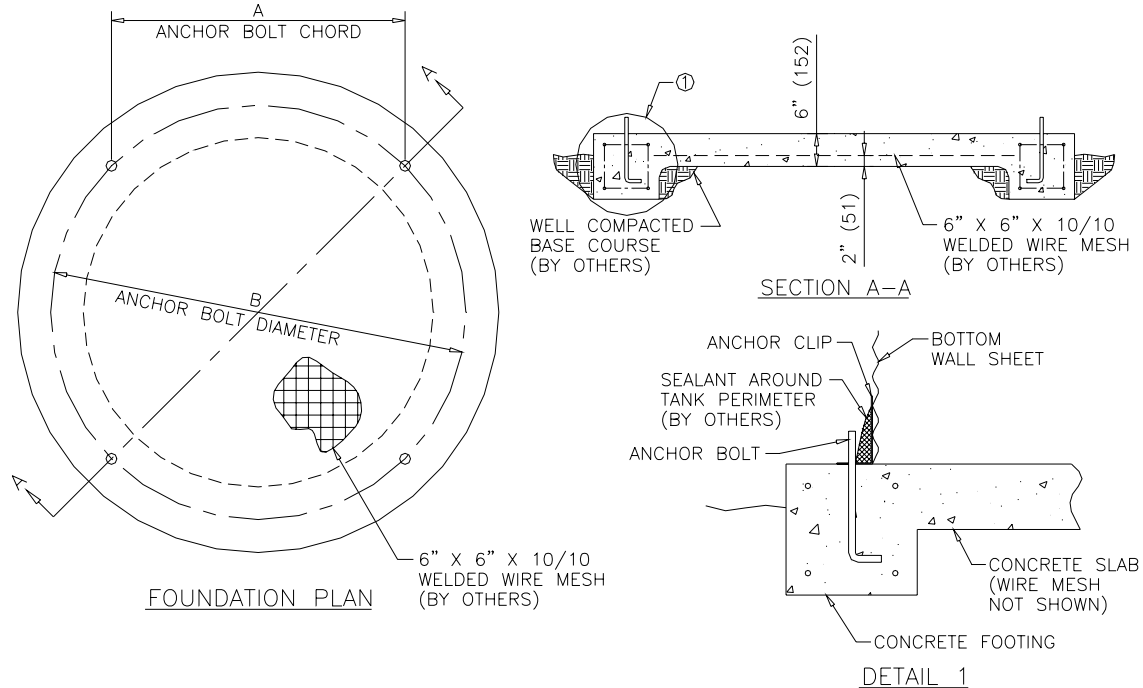
ScafcO liquid storage tanks are designed to resist wind pressures described in the Uniform Building Code, 1997 Edition, Section 1615-1625 Wind Exposure C.

ScafcO liquid storage tanks are designed for Seismic Zone 2B, Uniform Building Code, and AWWA D103-87, Section 12. Upon engineer's design requirements, tank will be designed to resist additional seismic loads or those required by the local Regulatory Agency.





## LIQUID STORAGE TANK FLAT FOUNDATION PLAN



BIN DIA.	QTY. OF ANCHOR BOLTS	A	B	BIN DIA.	QTY. OF ANCHOR BOLTS	A	B
6'	4	4'-5 11/16"	6'-3 15/16"	30'	20	4'-7 3/8"	30'-2 7/16"
9'	6	4'-7 7/8"	9'-3 3/4"	33'	22	4'-8 11/16"	33'-2 1/4"
12'	8	4'-8 7/16"	12'-3 9/16"	36'	24	4'-8 5/8"	36'-2"
15'	10	4'-8 5/8"	15'-3 3/8"	39'	26	4'-8 5/8"	39'-1 13/16"
18'	12	4'-8 3/4"	18'-3 3/16"	42'	28	4'-8 5/8"	42'-1 5/8"
21'	14	4'-8 3/4"	21'-3"	48'	32	4'-8 9/16"	48'-1 1/4"
24'	16	4'-8 3/4"	24'-2 13/16"	60'	40	4'-8 1/2"	60'-1/2"
27'	18	4'-8 11/16"	27'-2 5/8"				

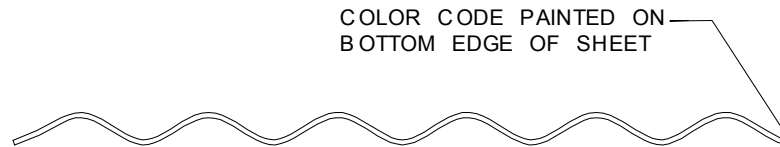
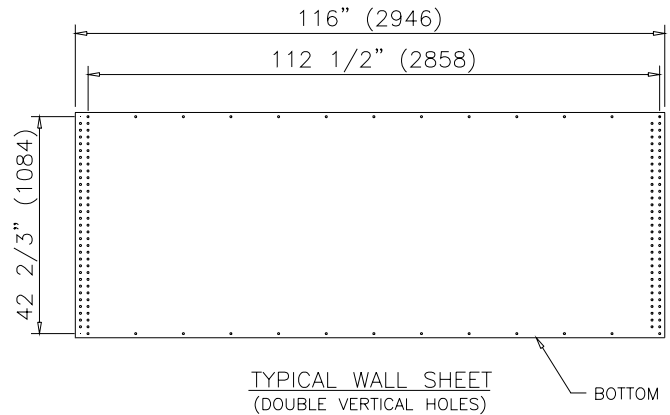
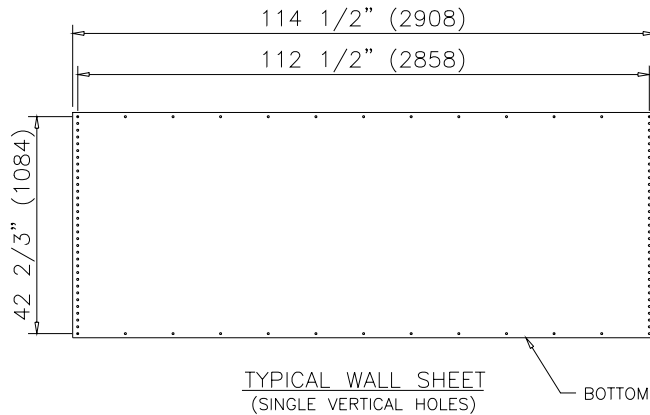
### GENERAL CONCRETE NOTES:

1. Site must be 95% compacted soil back-fill or undisturbed soil. Site must be free from standing water and well drained.
2. Soil around footing must be uniform. (Not fine sand)
3. Foundation design is based on uniform soil bearing capacity of 2000 LB. per square foot. Concrete compressive strength at 28 days shall be 2500 psi.
4. Reinforcing steel-standard deformed bars  $F_y = 40,000$  psi.
5. Add (1) pound to rebar requirements for each end lap. Lap bars 15".
6. These are general concrete foundation requirements, and should be evaluated with respect to each site. Consult with a local engineer if site is questionable.
7. Foundation should be poured smooth for proper weather seal and bin anchorage.

### ADDITIONAL NOTES:

1. Chart above has concrete and reinforcing bar quantities for the foundation illustrated. Top of foundation is 4" above grade.
2. Anchor bolts are 5/8" x 12" A307 with 3" threaded length.

## LIQUID STORAGE TANK SPECIFICATIONS

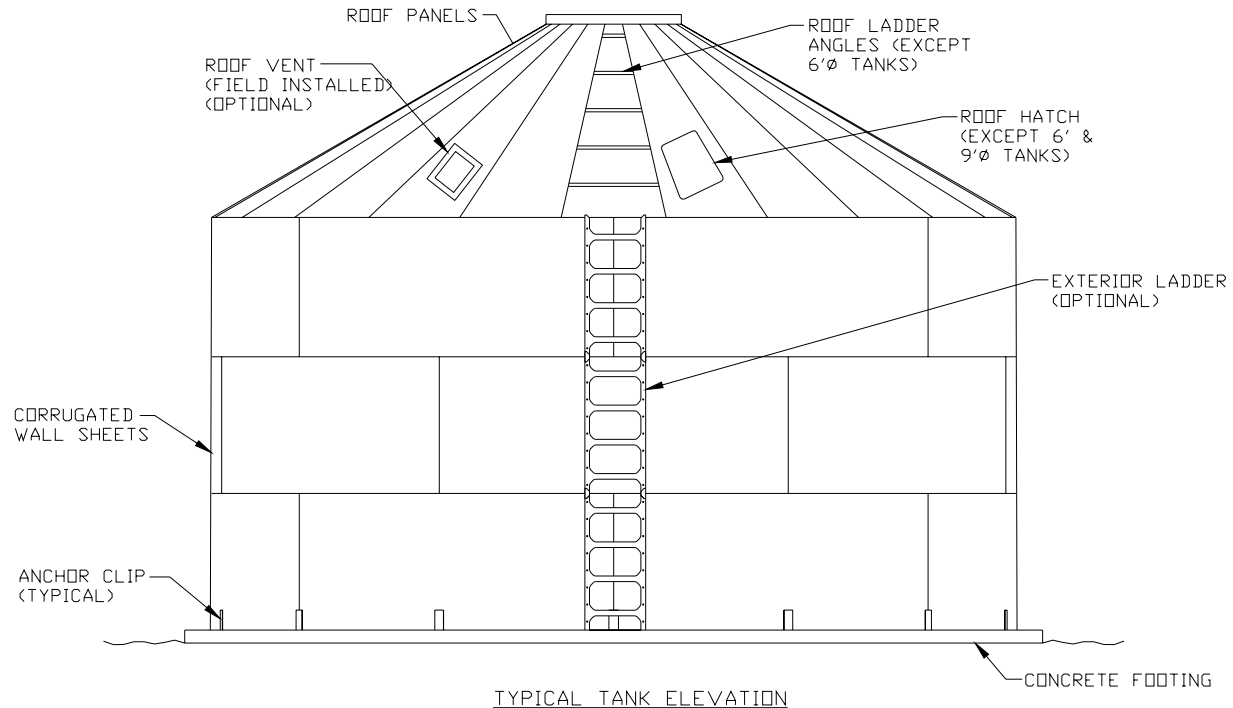


WALL SHEET GAUGE AND COLOR CODE			
GAUGE	COLOR	GAUGE	COLOR
20	BLACK	13	BROWN
18	UNPAINTED	12	ORANGE
17	RED	11	YELLOW
15	YELLOW	10	BLACK
14	GREEN	8	BLUE

## TANK SPECIFICATIONS

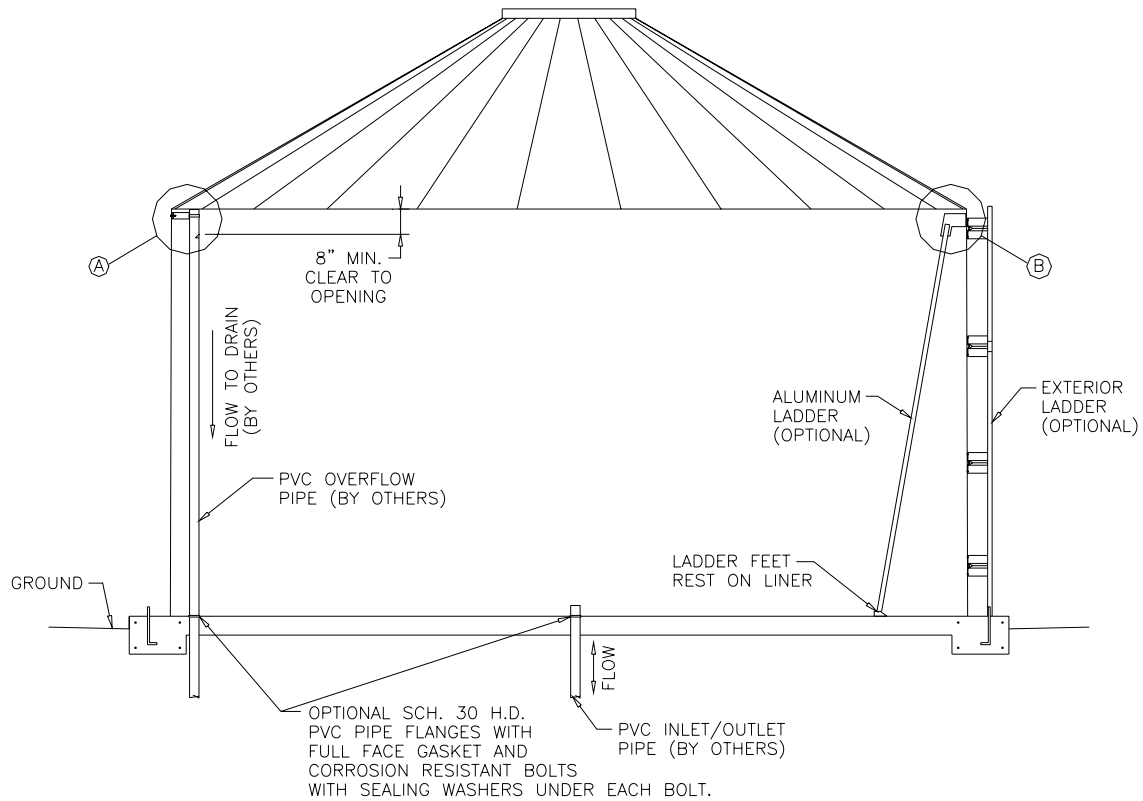
1. All wall sheets to 17 Ga. conform to ASTM A-446, C, Fy = 45,000 P.S.I G-90 galvanized or better. All wall sheets 15 Ga. or thicker conform to ASTM A653 SQ, Grade 57 653 SQ commercial quality.
2. Sheets standard corrugation 2 2/3" x 1 1/2". Sheets have 42 2/3" x 112 1/2" typical coverage.
3. All bolts are grade 8, with neoprene washer. Bolts have mechanical zinc plating .0006" thick. Vertical seams are bolted at 1 1/3" on center. Horizontal seams are bolted at 9 3/8" on center.
4. Tank liner construction of 25 mil vinyl side and bottom, FDA approved for potable water.
5. Finished structure must be disinfected in accordance with AWWA standard D-105. Two or more successive sets of samples, taken at 24 hour intervals, shall indicate microbiologically satisfactory water before facility is placed in operation.

## LIQUID STORAGE TANK SPECIFICATIONS

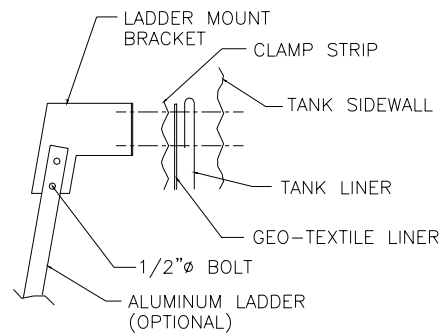


MODEL NO.	DIA.	EAVE HEIGHT	CAPACITY TO EAVE (GAL)	WALL SHEET GAUGES	MODEL NO.	DIA.	EAVE HEIGHT	CAPACITY TO EAVE (GAL)	WALL SHEET GAUGES
601	6'	3' 7"	600	20	3001	30'	3' 7"	16,700	20
602		7' 2"	1,400	20-20	3002		7' 2"	35,300	20-18
603		10' 9"	2,100	20-20-20	3003		10' 9"	54,000	20-18-15
604		14' 3"	2,900	20-20-20-20	3004		14' 3"	72,600	20-18-15-13
901	9'	3' 7"	1,500	20	3301	33'	3' 7"	20,200	18
902		7' 2"	3,100	20-20	3302		7' 2"	42,700	18-17
903		10' 9"	4,800	20-20-20	3303		10' 9"	65,300	18-17-15
904		14' 3"	6,500	20-20-20-20	3304		14' 3"	87,900	18-17-15-13
1201	12'	3' 7"	2,600	20	3601	36'	3' 7"	24,100	18
1202		7' 2"	5,600	20-20	3602		7' 2"	50,900	18-17
1203		10' 9"	8,600	20-20-18	3603		10' 9"	77,800	18-17-14
1204		14' 3"	11,600	20-20-18-18	3604		14' 3"	104,600	18-17-14-12
1501	15'	3' 7"	4,100	20	3901	39'	3' 7"	28,200	18
1502		7' 2"	8,800	20-20	3902		7' 2"	59,700	18-15
1503		10' 9"	13,500	20-20-18	3903		10' 9"	91,300	18-15-13
1504		14' 3"	18,100	20-20-18-18	3904		14' 3"	122,700	17-15-13-11
1801	18'	3' 7"	6,000	20	4201	42'	3' 7"	32,700	18
1802		7' 2"	12,700	20-20	4202		7' 2"	69,200	18-15
1803		10' 9"	19,400	20-20-18	4203		10' 9"	105,800	18-15-13
1804		14' 3"	26,100	20-20-18-17	4204		14' 3"	142,300	17-15-13-11
2101	21'	3' 7"	8,200	20	4801	48'	3' 7"	42,800	17
2102		7' 2"	17,300	20-18	4802		7' 2"	90,500	17-15
2103		10' 9"	26,400	20-18-17	4803		10' 9"	138,300	17-15-13
2104		14' 3"	35,600	20-18-17-15	4804		14' 3"	185,900	17-15-13-11
2401	24'	3' 7"	10,700	20	6001	60'	3' 7"	66,900	14
2402		7' 2"	22,600	20-18	6002		7' 2"	141,500	14-13
2403		10' 9"	34,500	20-18-17	6003		10' 9"	216,000	14-13-11
2404		14' 3"	46,500	20-18-17-14	6004		14' 3"	290,600	14-13-11-8
2701	27'	3' 7"	13,500	20					
2702		7' 2"	28,600	20-18					
2703		10' 9"	43,700	20-18-15					
2704		14' 3"	58,800	20-18-15-14					

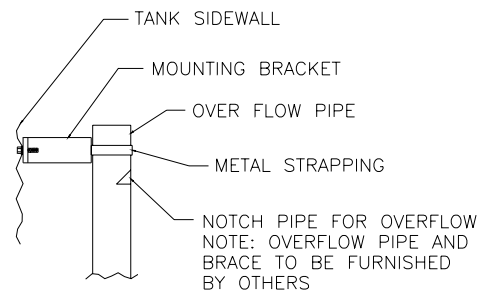
## LIQUID STORAGE TANK SPECIFICATIONS



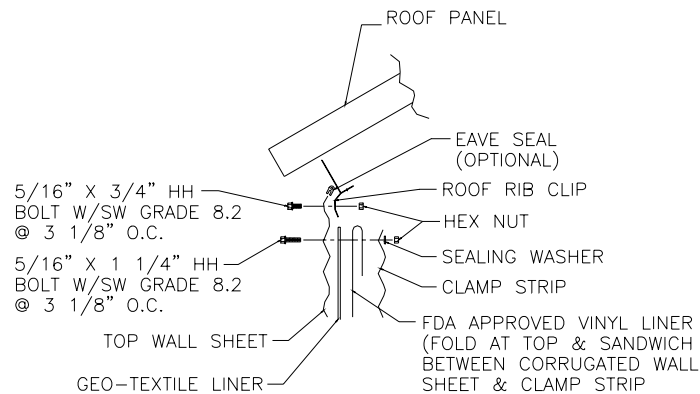
TYPICAL SECTION THROUGH TANK



DETAIL B  
INTERIOR LADDER INSTALLATION

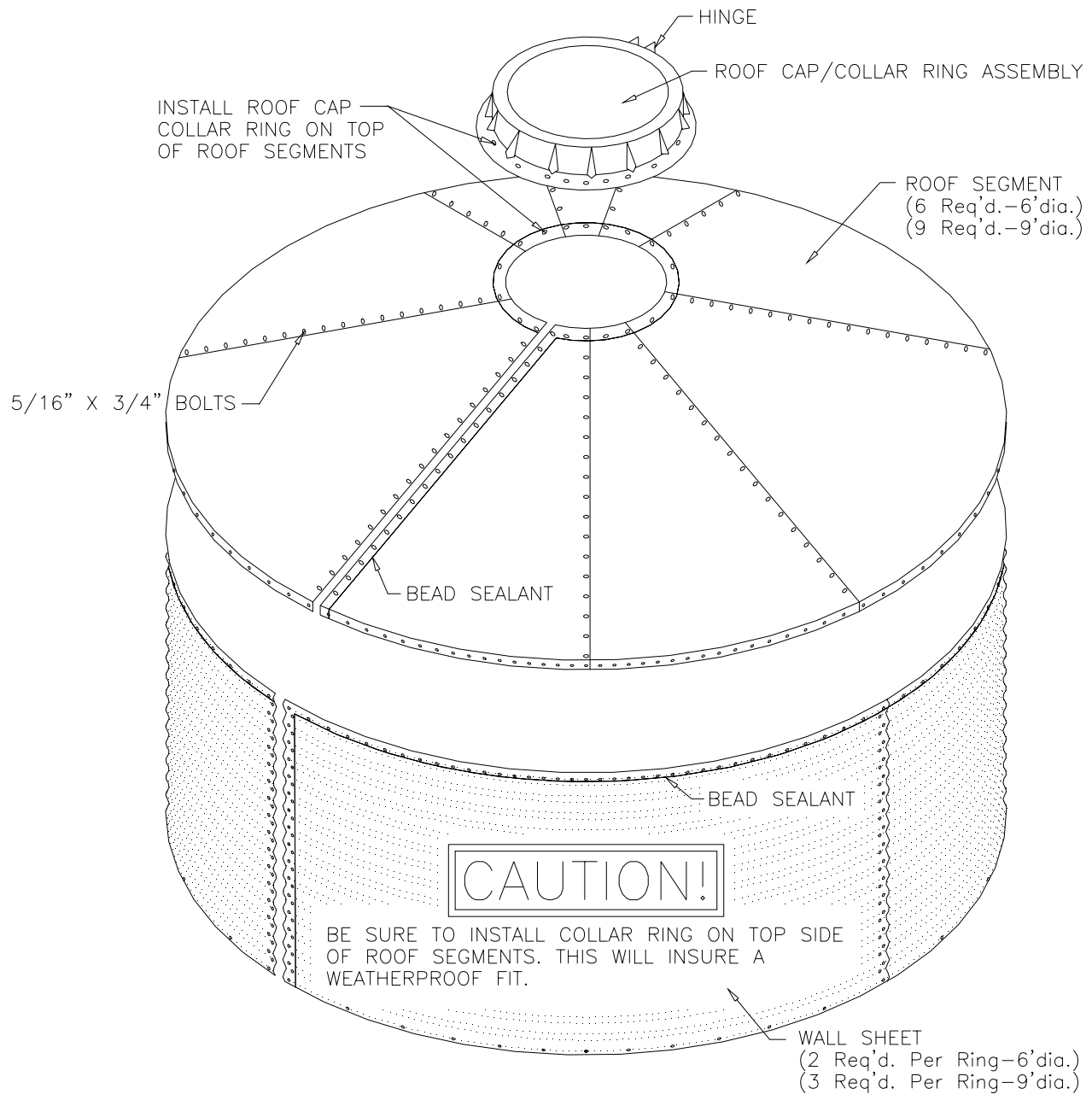


DETAIL A  
OVERFLOW PIPE DETAIL



LINER INSTALLATION

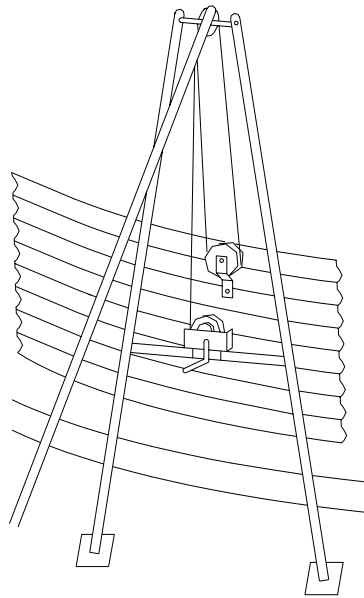
## ROOF ASSEMBLY 6' & 9' LIQUID STORAGE TANKS



### NOTES:

1. Roof segment sheets fit outside wall sheet ring.
2. Top sheets must overlap lower sheets.
3. Use bead sealant on all seams of roof assembly for weatherproofing.
4. For proper fitting roof, leave roof bolted loosely until roof collar ring has been installed, then tighten all roof and collar ring bolts.

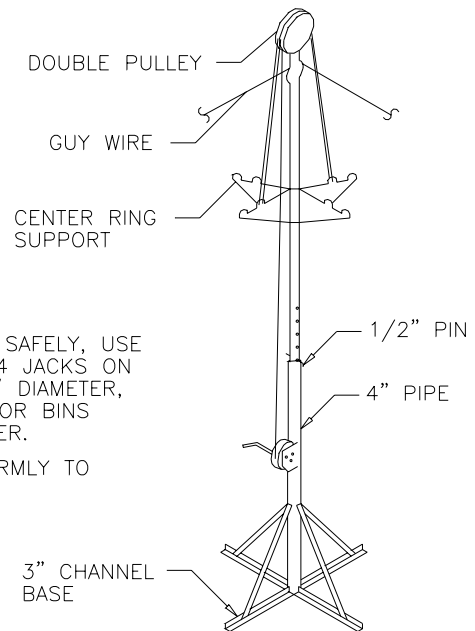
## ERECTION PROCEDURES



A-FRAME JACK WITH WINCH  
5:1 GEAR RATIO WITH 5000 LB. LIFTING CAPACITY,  
5/16" AIRCRAFT CABLE USED WITH WINCH.

### SAFETY NOTES:

1. TO RAISE BINS SAFELY, USE A MINIMUM OF 4 JACKS ON BINS UP TO 24' DIAMETER, USE 6 JACKS FOR BINS 27'-36' DIAMETER.
2. LIFT BIN UNIFORMLY TO AVOID TIPPING.



ROOF JACK CONSTRUCTION

### INSTALLATION NOTES:

\*HAND TIGHTEN ALL BOLTS.

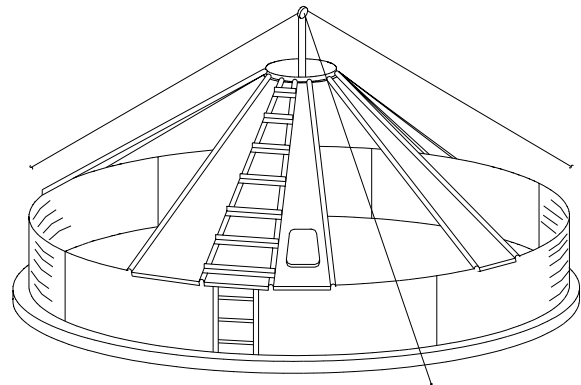
1. Place roof segment ring on center ring support.
2. Assemble top wall sheet ring. Make sure top holes are at 3 1/8" spacing. Holes at bottom of sheet will be at 9 3/8" spacing.
3. Position the roof hatch panel next to the desired sidewall ladder location & fasten to segment ring. Attach the roof center clip to roof panel and put the lower edge of panel on the wall sheet ring.
4. Continue with rest of roof panels by alternating around circumference of bin until all panels are installed. Also attach center clips & rib clips to roof panels and wall sheets as you go. (39' & 42' bins also add roof rib supports).
5. The last roof panel should be next to the roof hatch panel. Attach roof ladder cleats while bolting roof panels together. See next page for bolt size.

CAUTION: As last roof panel is installed, you may incur the following:

Too much space – Raise roof jack. This will close the gap.

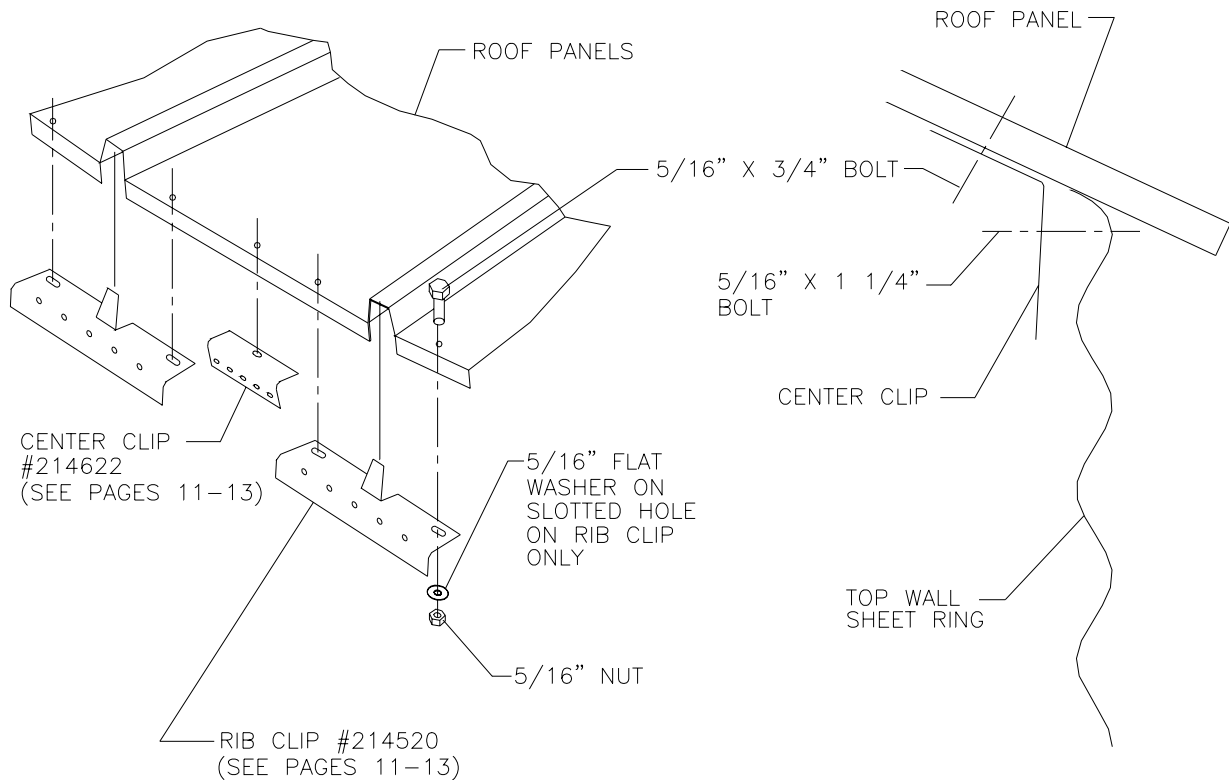
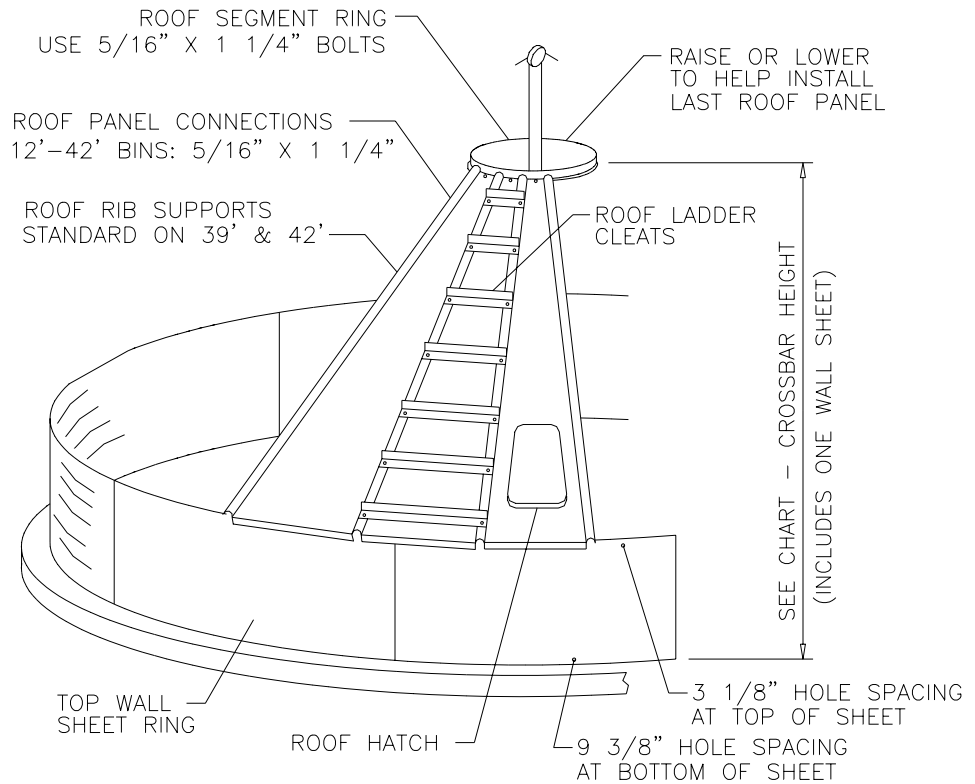
Too little space – Lower the roof jack. This will lessen the slope & increase the space required.

6. Refer to next page for details on center clips, rib clips, and cleats.
7. With everything in place, tighten all roof bolts.

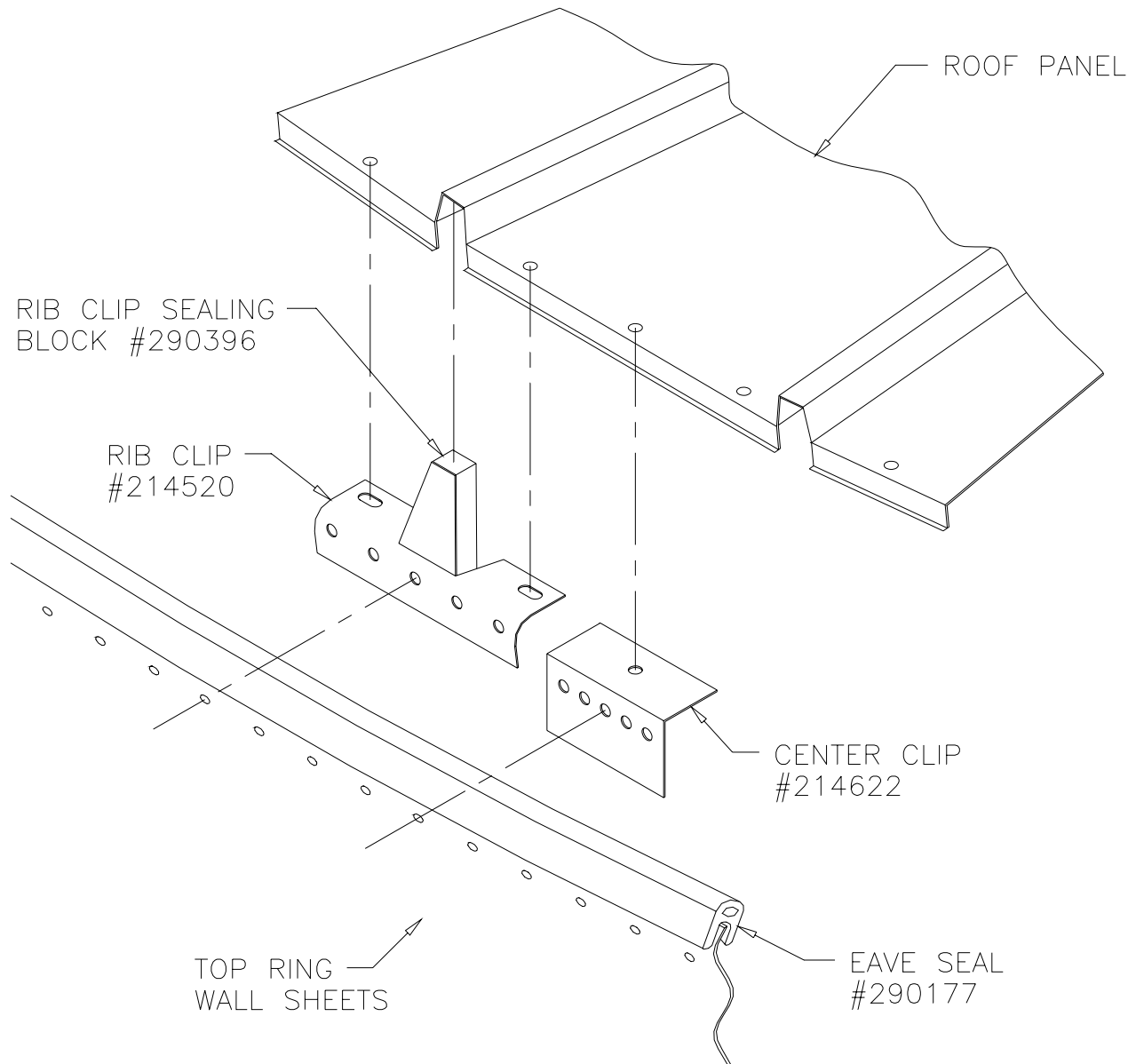


## ROOF INSTALLATION DETAILS

BIN DIA.	CROSS BAR HEIGHT
12'	6'-7"
15'	7'-5"
18'	8'-4"
21'	9'-2"
24'	10'-0"
27'	10'-7"
30'	11'-5"
33'	12'-3"
36'	13'-2"
39'	14'-0"
42'	14'-10"



**RIB CLIP & EAVE SEAL INSTALLATION**  
(OPTIONAL PURCHASE)



**NOTES:**

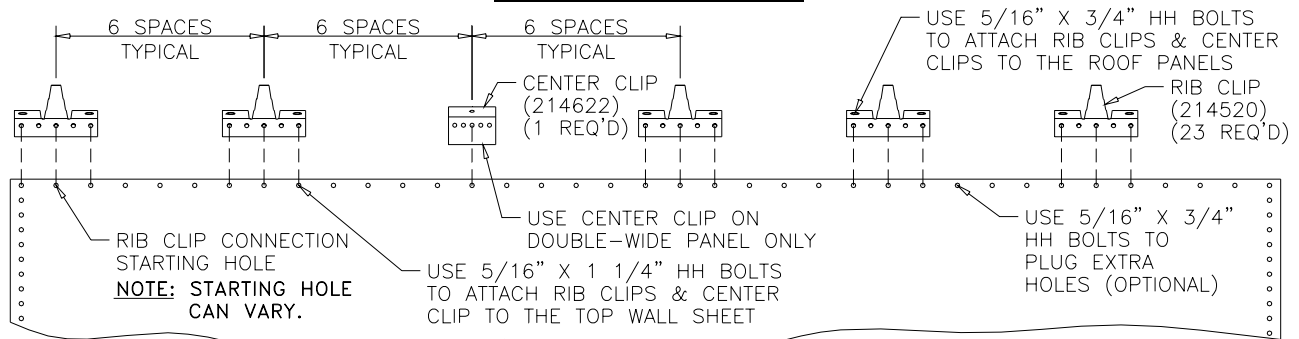
1. Install eave seal around top edge of wall sheets.
2. Glue rib clip sealing block to rib clip (1 per clip).
3. Bolt center clips and rib clips to wall sheets and roof panels as shown.
4. Fill all unused holes w/ 5/16" x 3/4" bolts.

When installed properly, silo will have a weather tight seal.

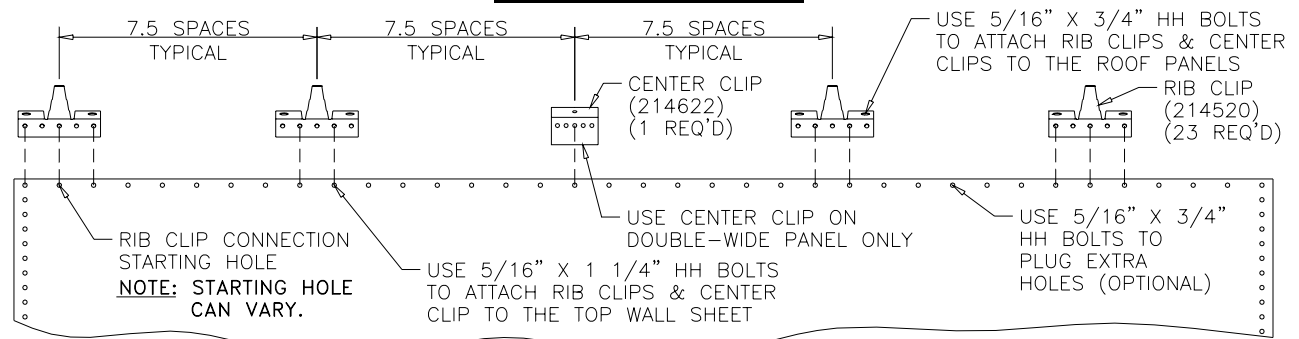


## RIB & CENTER CLIP CONNECTIONS

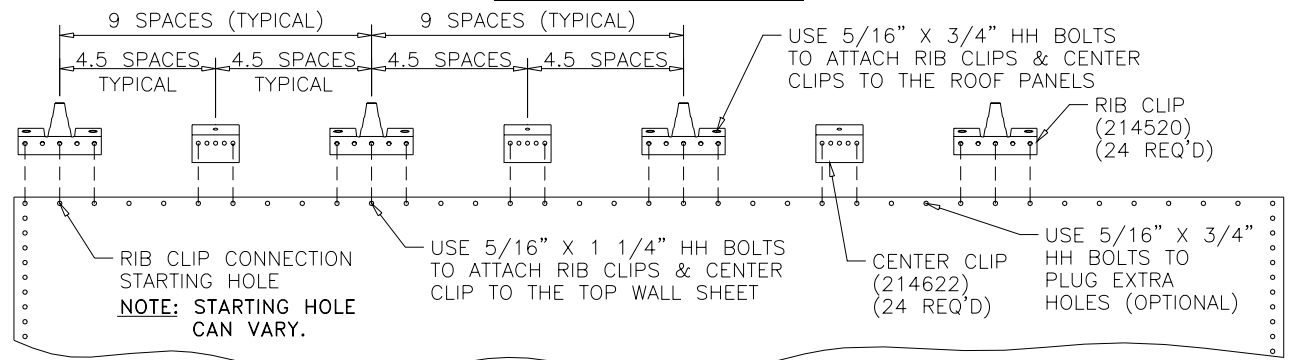
### 12' DIAMETER BINS



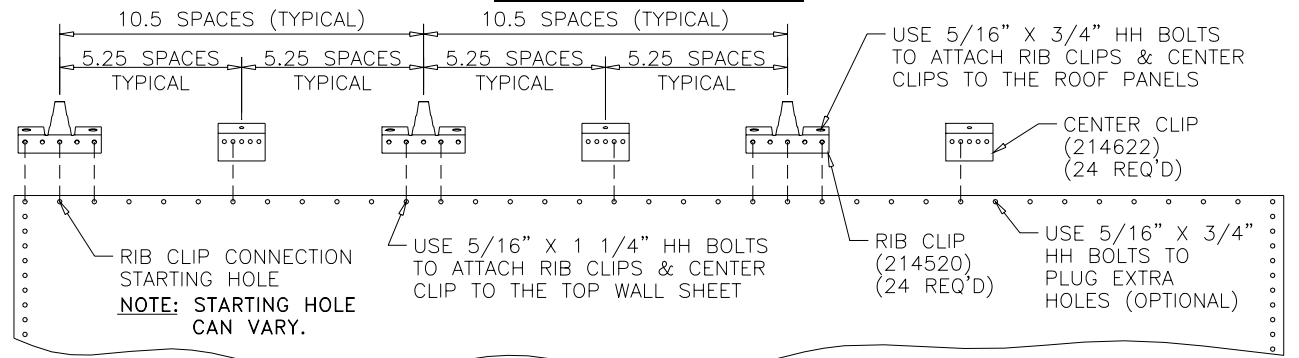
### 15' DIAMETER BINS



### 18' DIAMETER BINS

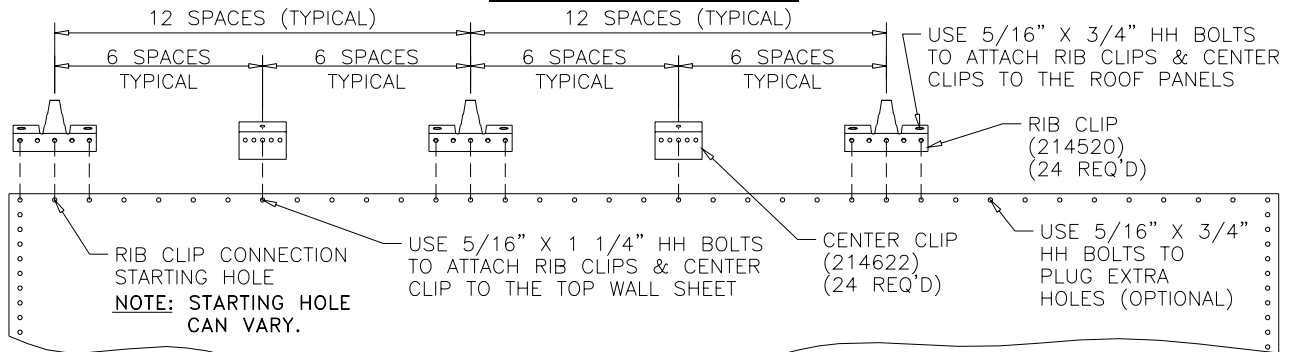


### 21' DIAMETER BINS

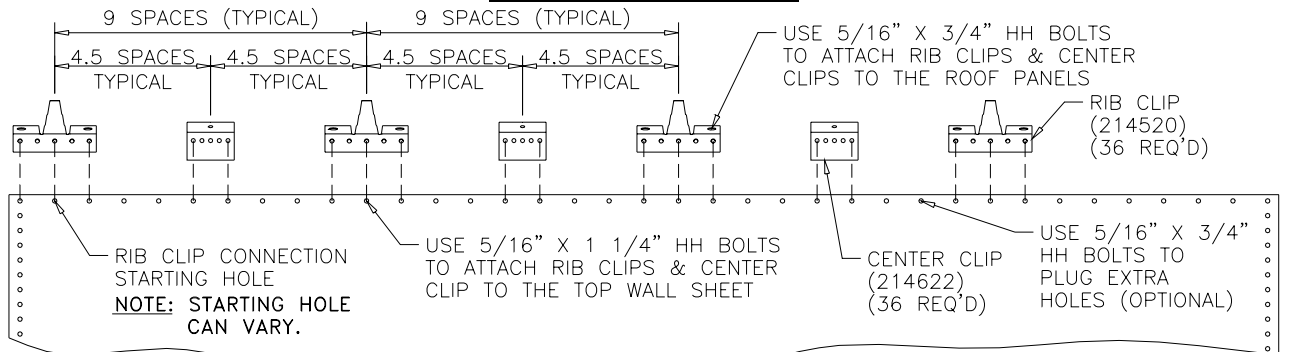


## **RIB & CENTER CLIP CONNECTIONS**

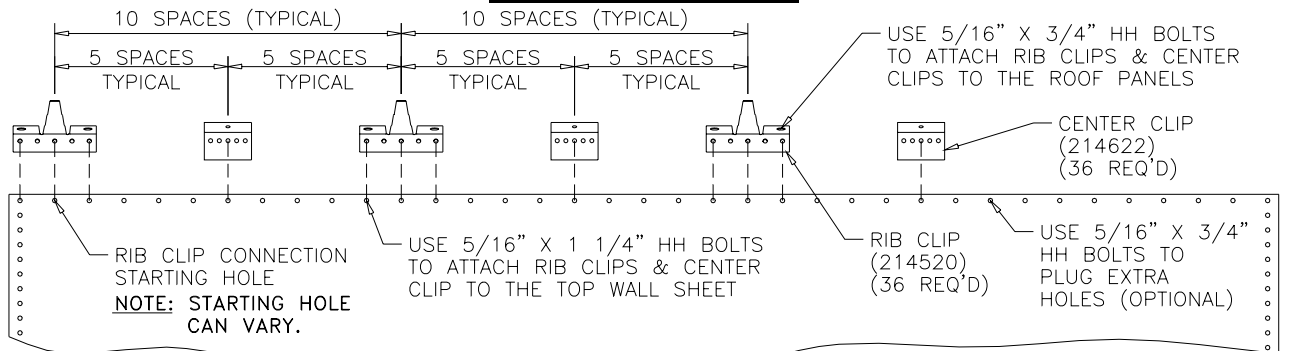
### **24' DIAMETER BINS**



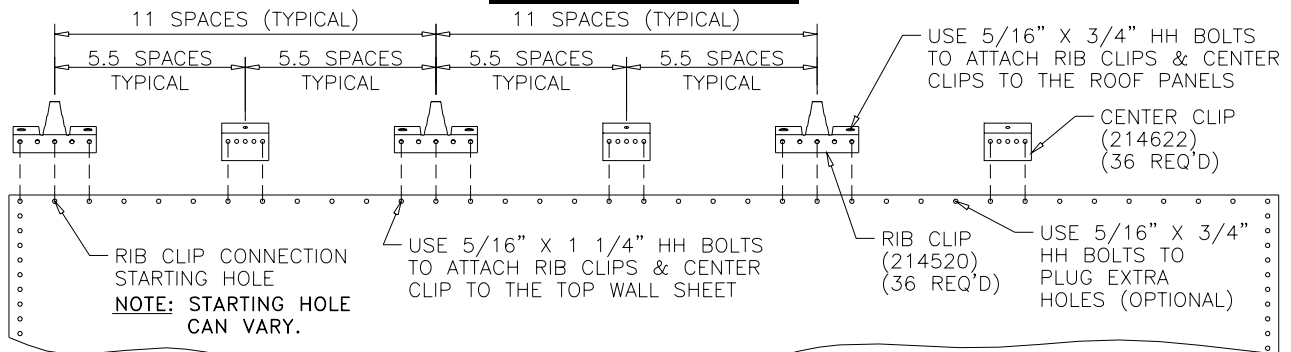
### **27' DIAMETER BINS**



### **30' DIAMETER BINS**

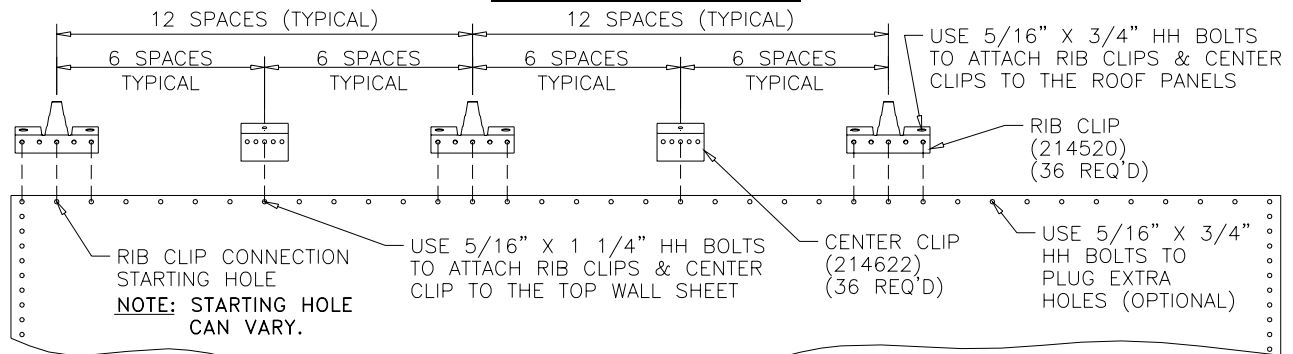


### **33' DIAMETER BINS**

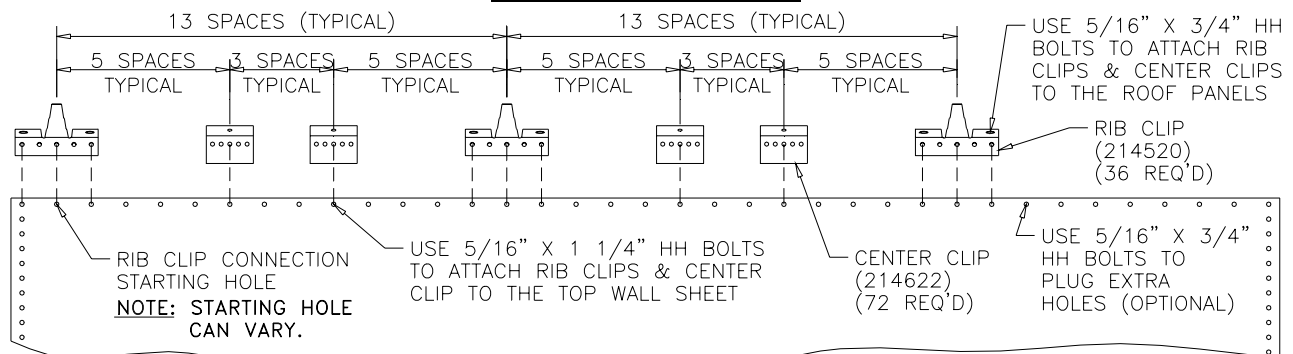


## RIB & CENTER CLIP CONNECTIONS

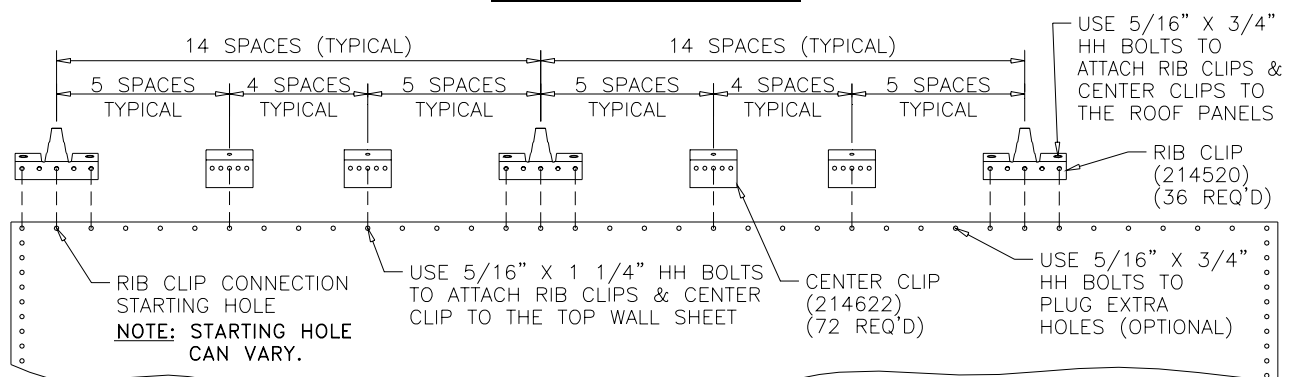
### 36' DIAMETER BINS



### 39' DIAMETER BINS

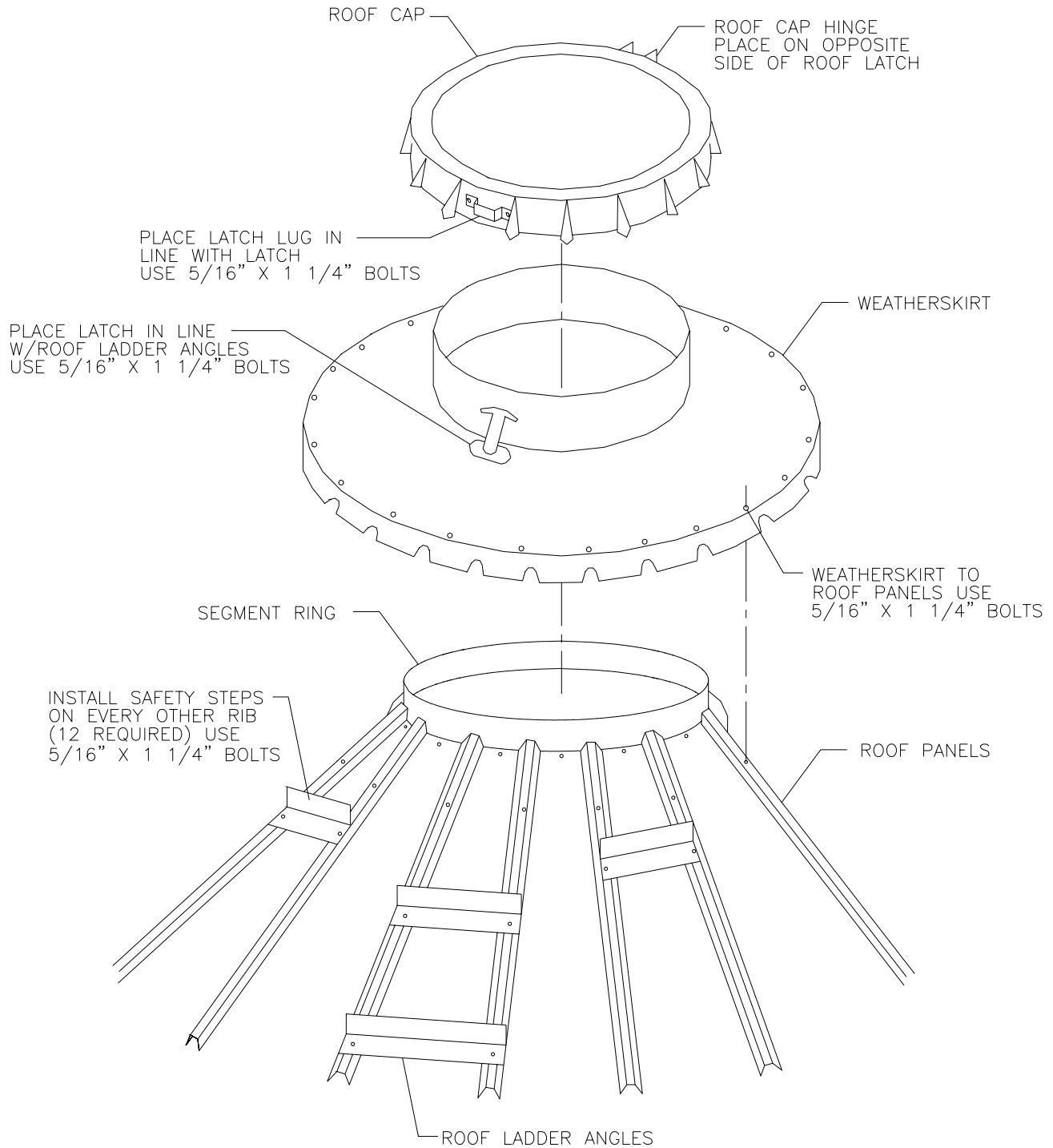


### 42' DIAMETER BINS



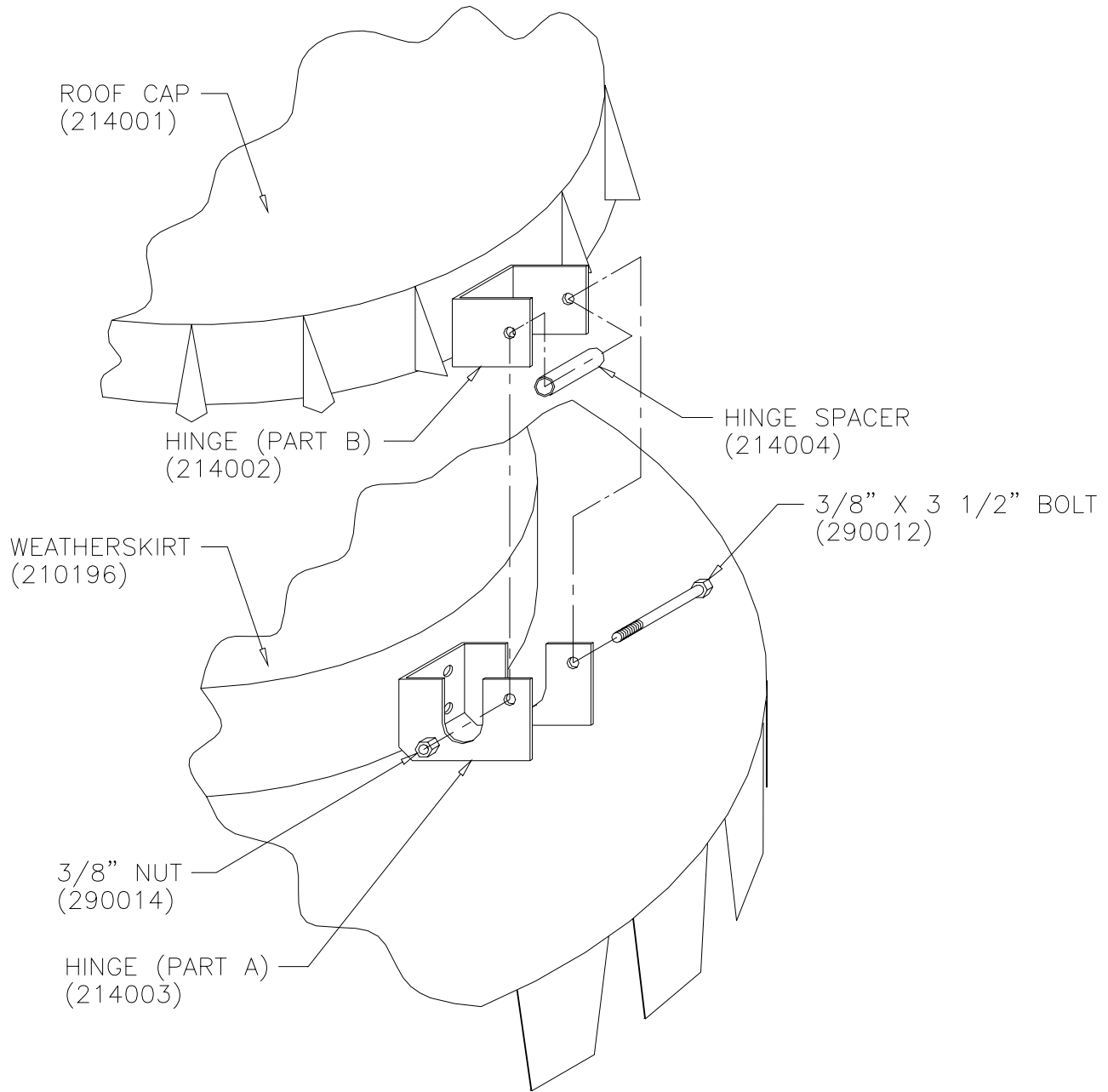
## WEATHERSKIRT & CAP INSTALLATION

12' - 24' DIAMETER BINS



## ROOF CAP HINGE INSTALLATION

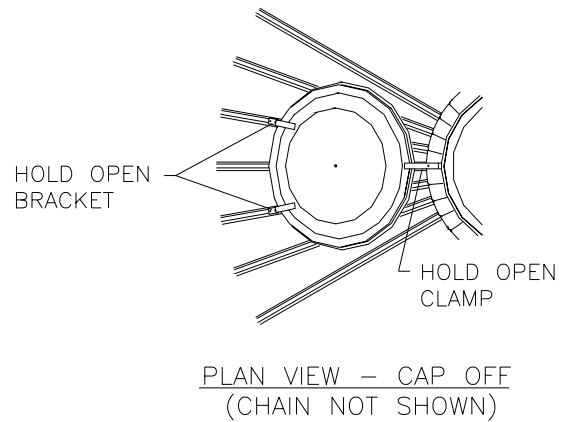
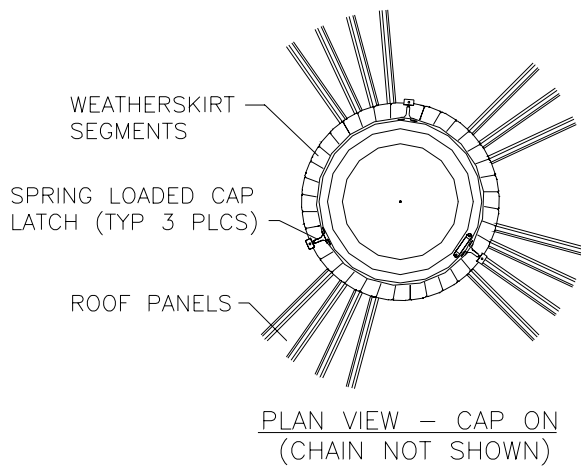
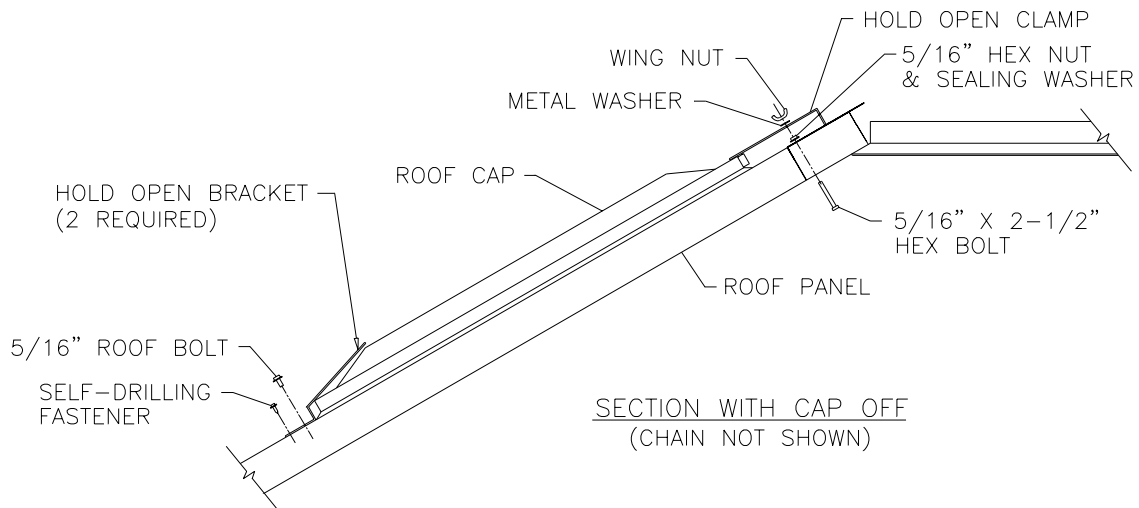
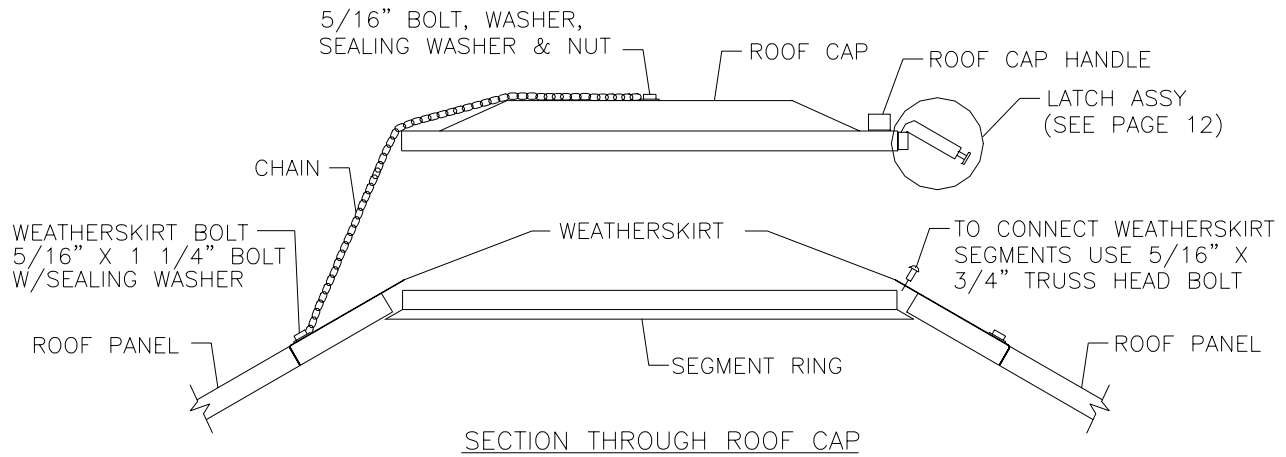
12' – 24' DIAMETER BINS



### **NOTES:**

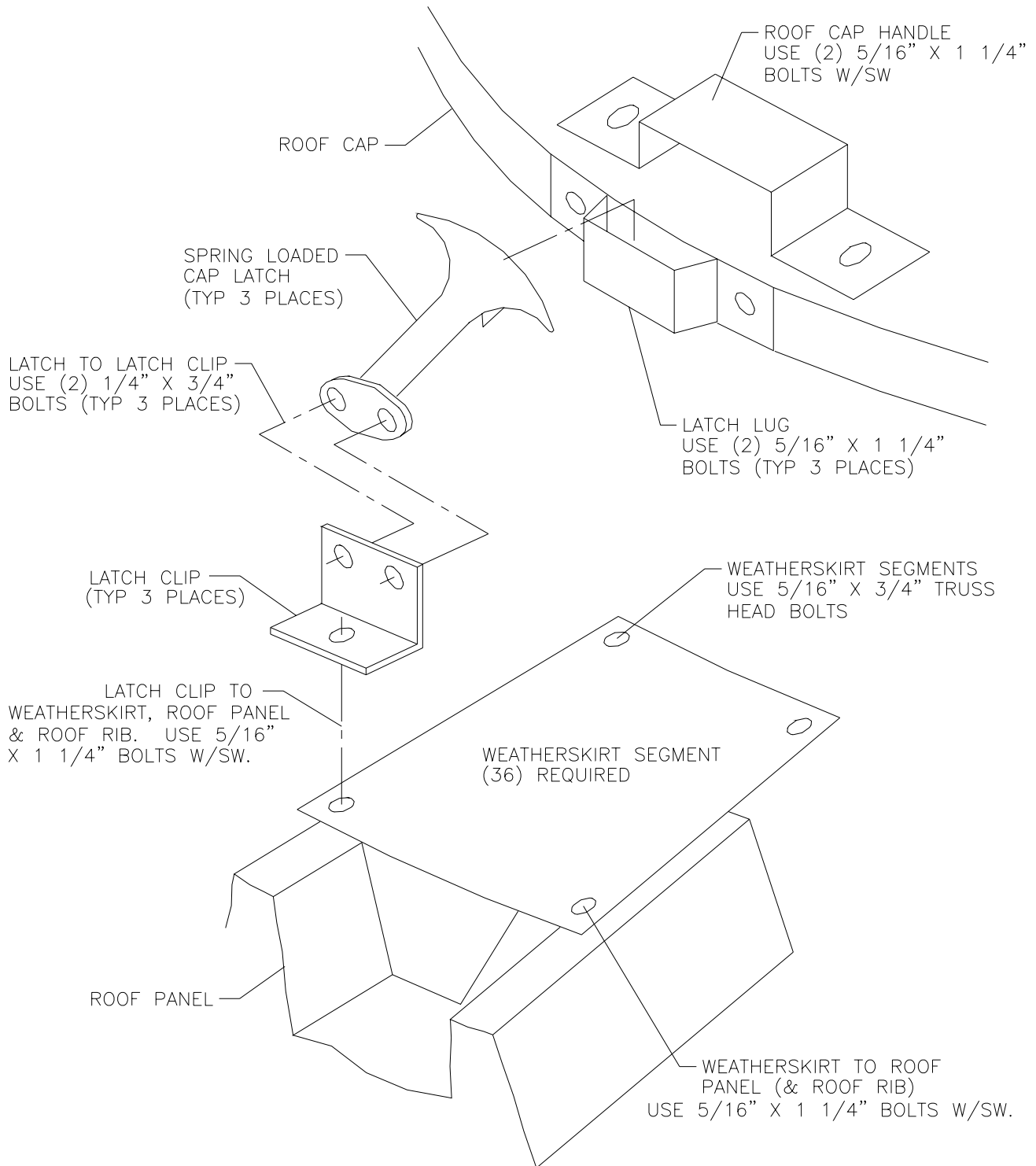
1. Connect hinge (part B) (214002) to roof cap (214001) using (2) 5/16" x 3/4" hh bolt (290001) & 5/16" hex nut (290010).
2. Connect hinge (part A) (214003) to weatherskirt (210196) using (4) 5/16" x 3/4" hh bolt (290001) & 5/16" hex nut (290010).
3. Assemble together using hinge spacer (214004) & 3/8" x 3 1/2" hh bolt (290012) & 3/8" hex nut (290014) as shown.

## ROOF CAP ASSEMBLY 27' – 42' DIAMETER BINS



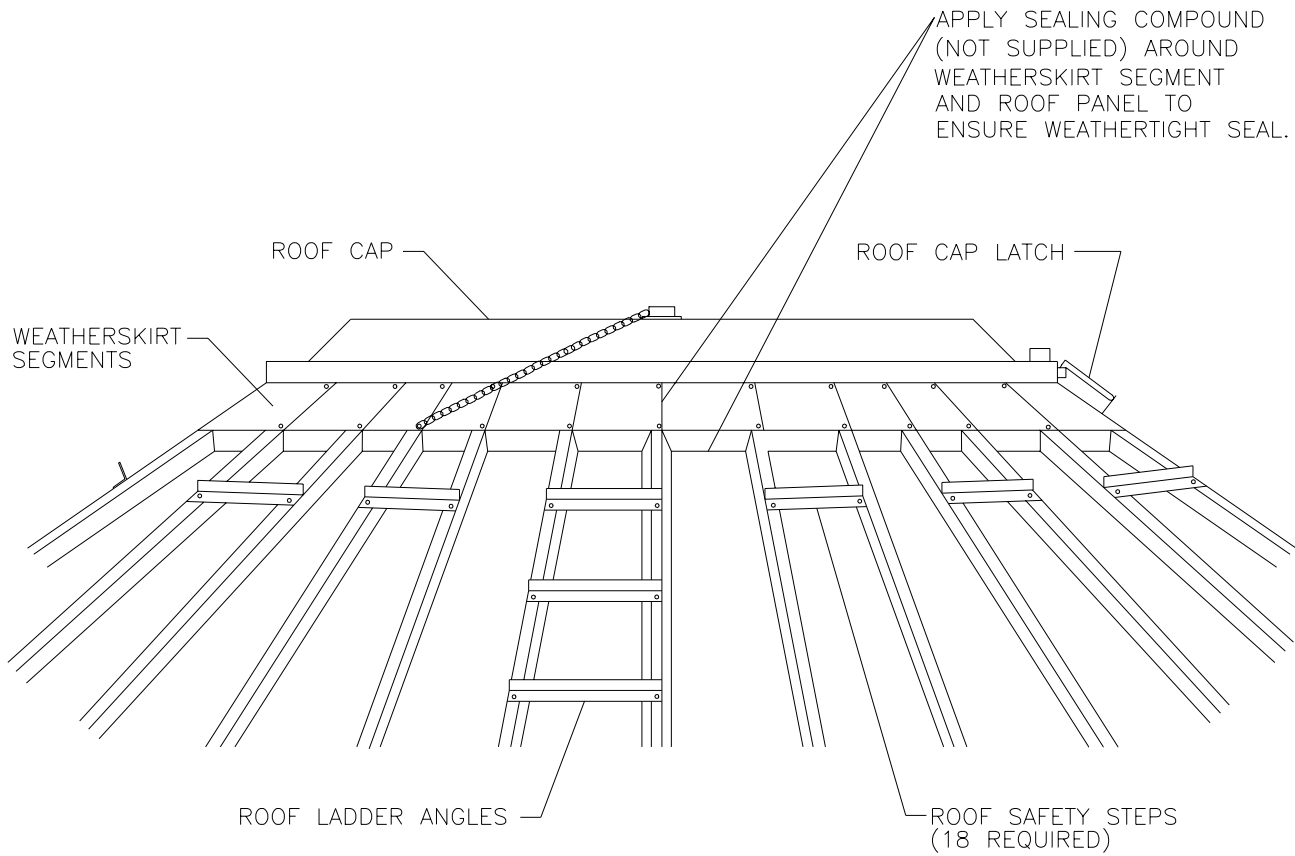
## ROOF CAP ASSEMBLY

27' – 42' DIAMETER BINS



**COMPLETE ROOF CAP ASSEMBLY**

27' – 42' DIAMETER BINS

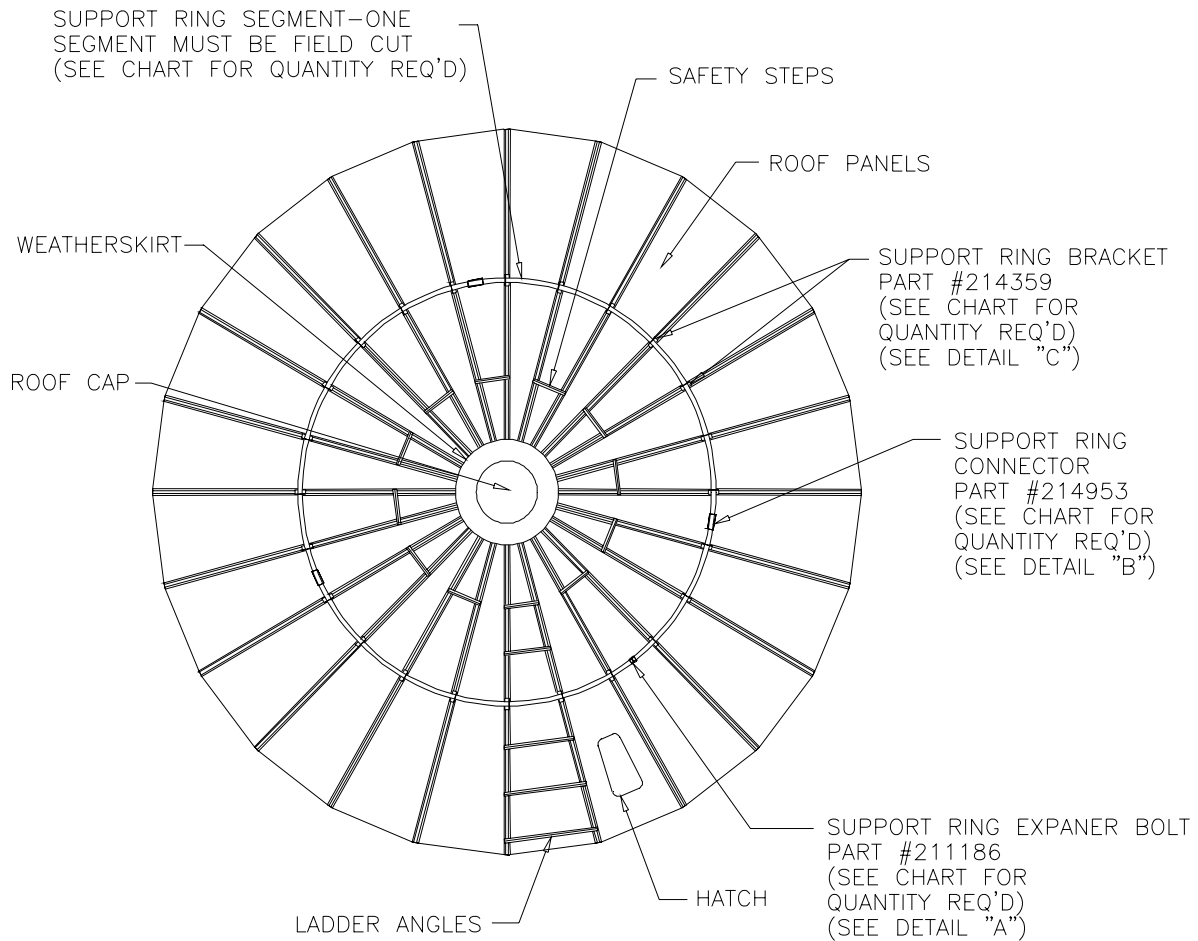




## ROOF SUPPORT RING INSTALLATION

**STANDARD ON 39' & 42' BINS ONLY**

(Optional on other bin diameters)



TOP VIEW

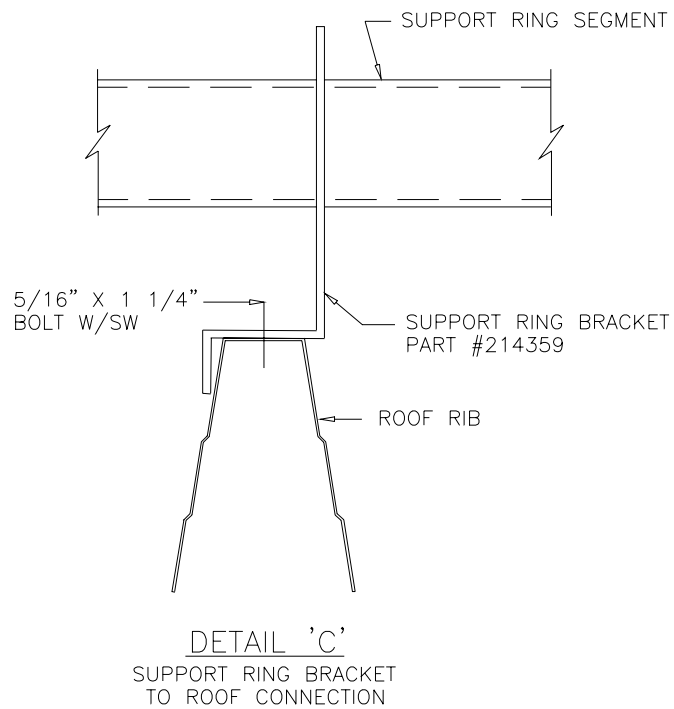
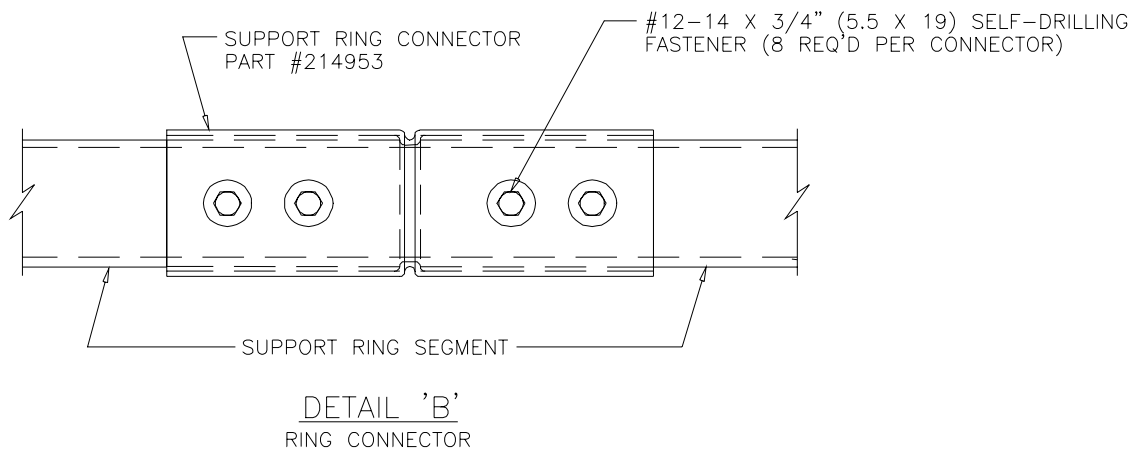
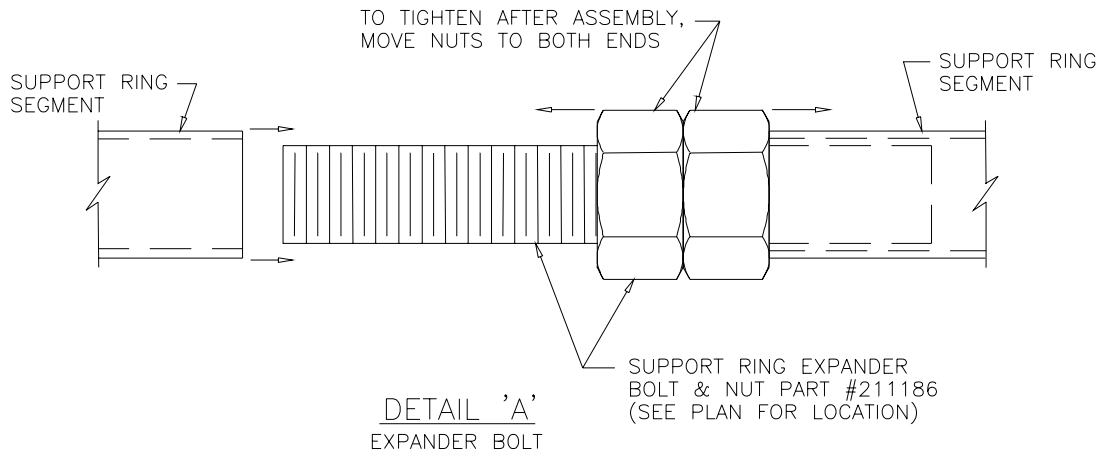
BIN SIZE	NUMBER OF RIB BRACKETS	NUMBER OF SEGMENTS	NUMBER OF EXPANSION BOLTS	*LOCATION OF SUPPORT RING BRACKET	NUMBER OF SUPPORT RING CONNECTORS	ROOF SUPPORT RING ASSEMBLY
42'	36	7	2	7	5	STANDARD
39'	36	6	1	7	5	STANDARD
36'	36	6	1	6	5	OPTIONAL
33'	36	6	1	5	5	OPTIONAL
30'	36	6	1	5	5	OPTIONAL
27'	36	5	1	4	4	OPTIONAL
24'	24	5	1	4	4	OPTIONAL
21'	24	4	1	4	3	OPTIONAL
18'	24	3	1	4	2	OPTIONAL

\*NUMBER OF HOLES FROM BOTTOM OF ROOF SHEET

**NOTE:**

Go to page 20 for detail drawings.

## ROOF SUPPORT RING DETAILS





## BOLT SCHEDULE

### INSTRUCTIONS FOR BOLT PLACEMENT ON WATER TANKS WITH ROOFS

**Anchor Clips:** Insert 3/8" diameter x 1" button head bolt and 3/8" sealing washer from inside with 3/8" hex nut outside.

**Clamp Strip to Top Wall Sheet:** Insert 5/16" diameter x 1 1/4" hex head bolt with sealing washer from outside through liner with 5/16" sealing washer and 5/16" hex nut inside.

**All Vertical Seams and All Other Horizontal Seams:** Insert 5/16" diameter x 3/4" trusshead bolt with vinyl washer from inside with 5/16" hex nut on outside.

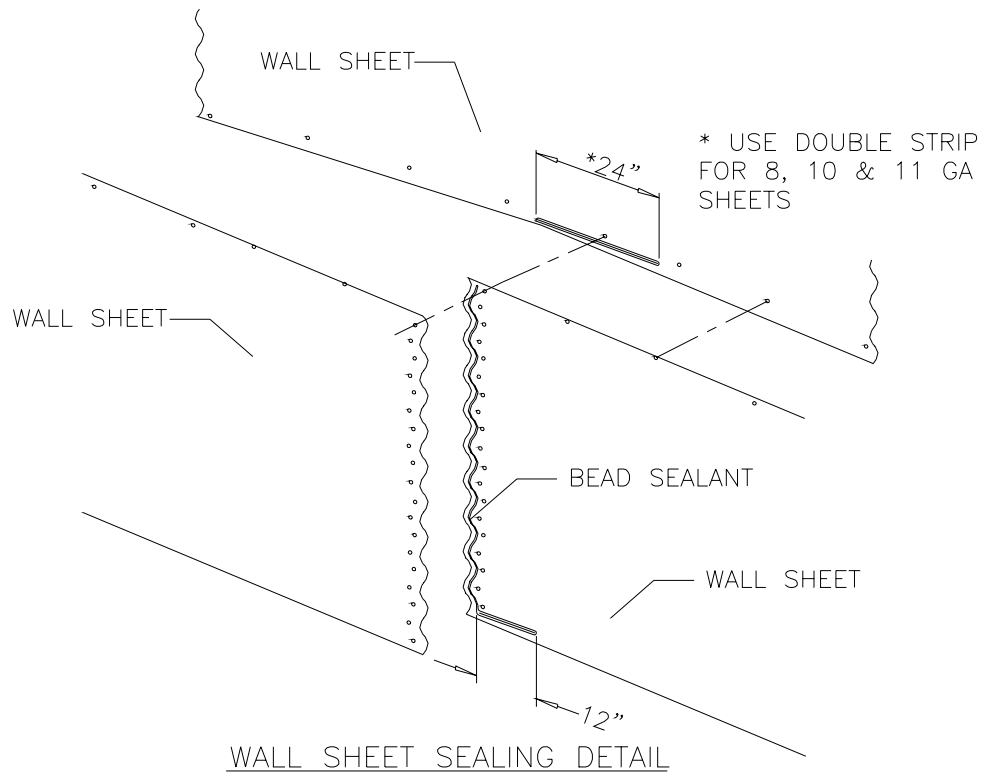
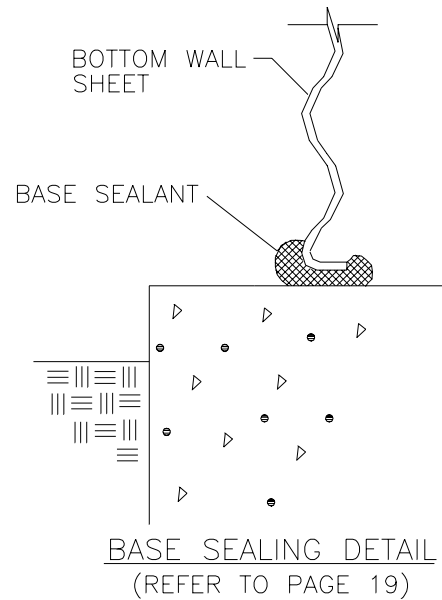
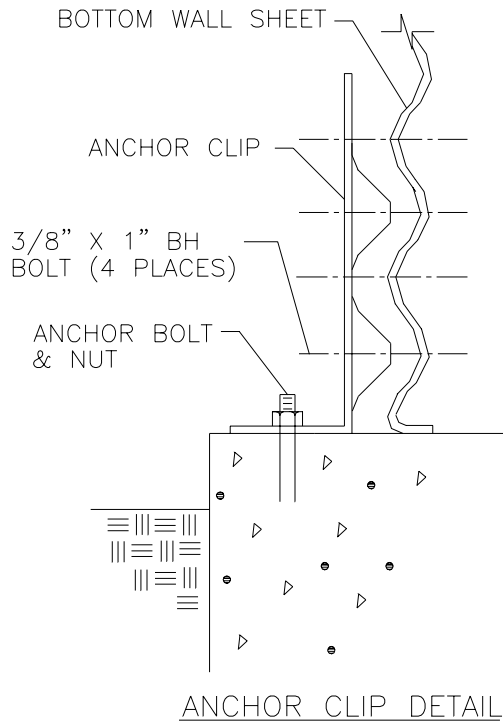
**For Wall Sheets 15 Gauge and Thicker:** Insert 3/8" diameter x 1" button head bolt and 3/8" sealing washer from inside with 3/8" hex nut on outside.

**All Roof Bolts Except Center and Rib Clip Bolts:** Insert 5/16" diameter x 1 1/4" hex head bolt with sealing washer from outside with 5/16" hex nut inside.

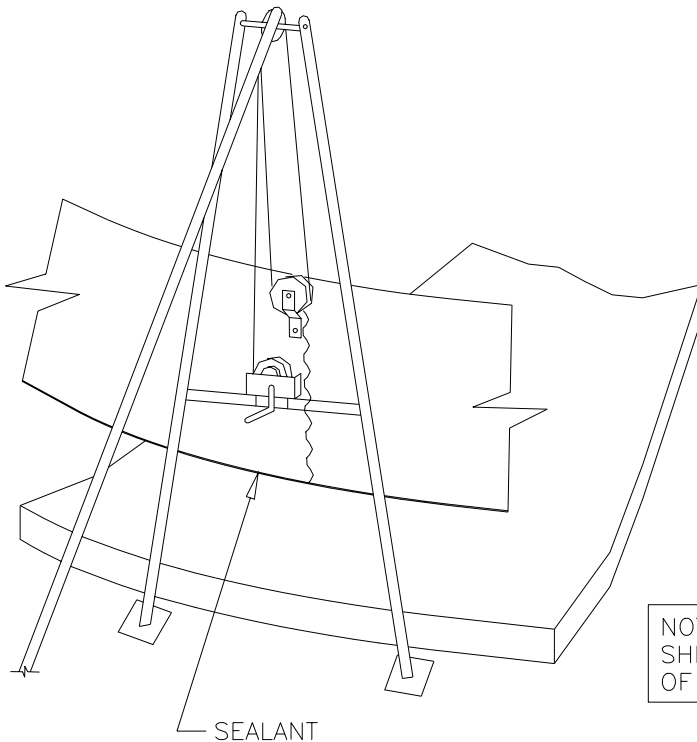
**Center and Rib Clips on Roof Line:** Insert 5/16" diameter x 3/4" hex head bolt with sealing washer from outside with 5/16" hex nut inside.

**Access Panel:** Insert 3/8" diameter x 1 1/4" button head bolt from inside with 3/8" jam nut between panel and wall sheet with 3/8" sealing washer and hex nut on outside.

**ANCHORING AND SEALING INSTALLATION**

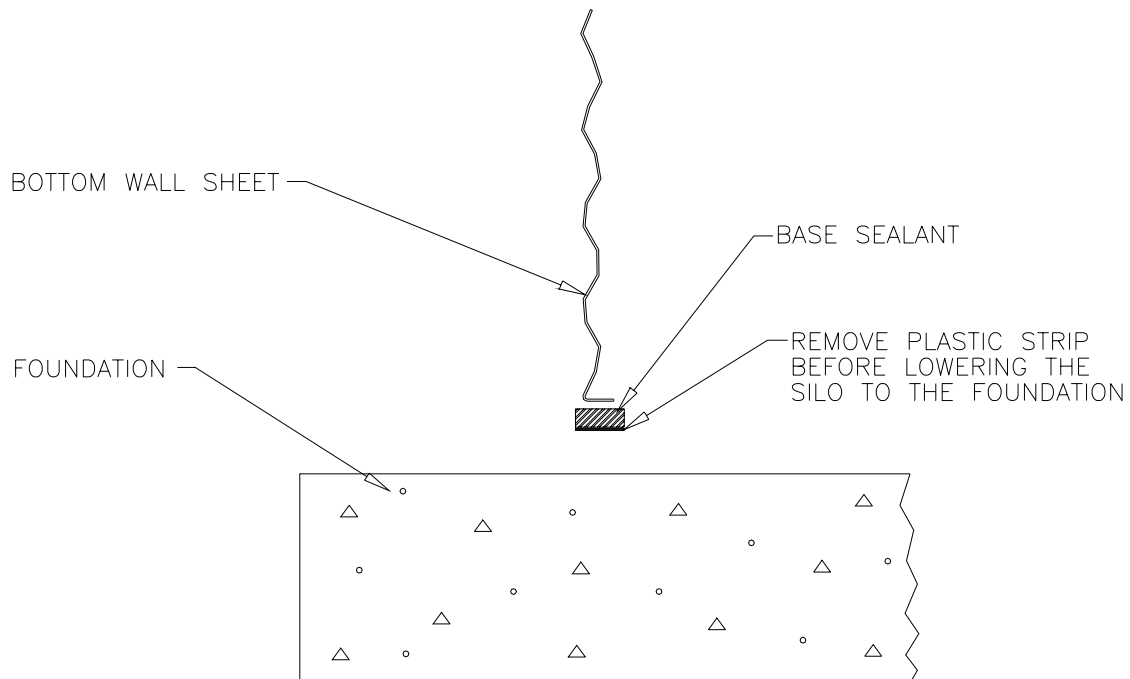


**ASPHALTIC BASE SEALANT APPLICATION**



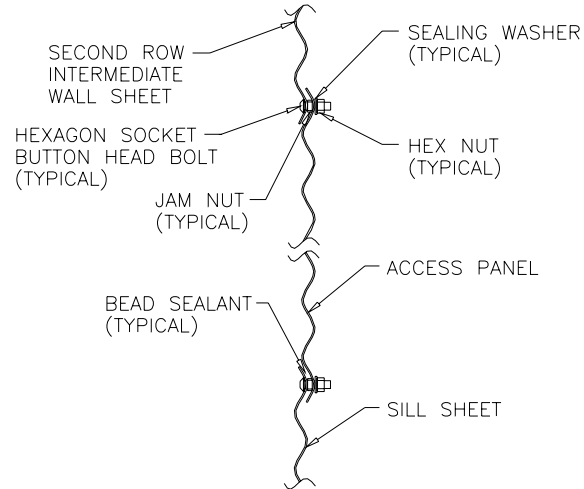
1. APPLY SEALANT ALONG LIP OF BOTTOM RING WHILE SILO IS STILL ON JACKS.
2. REMOVE PLASTIC STRIP OFF SEALANT.
3. LOWER SILO ONTO THE FOUNDATION. WHEN SILO IS LOWERED, SEALANT WILL DISTRIBUTE PROPERLY AND PROVIDE A SEAL BETWEEN THE SILO AND THE FOUNDATION.

NOTE: CONCRETE AND BOTTOM WALL SHEET MUST BE CLEAN AND FREE OF WATER AND SOIL FOR PROPER SEAL.

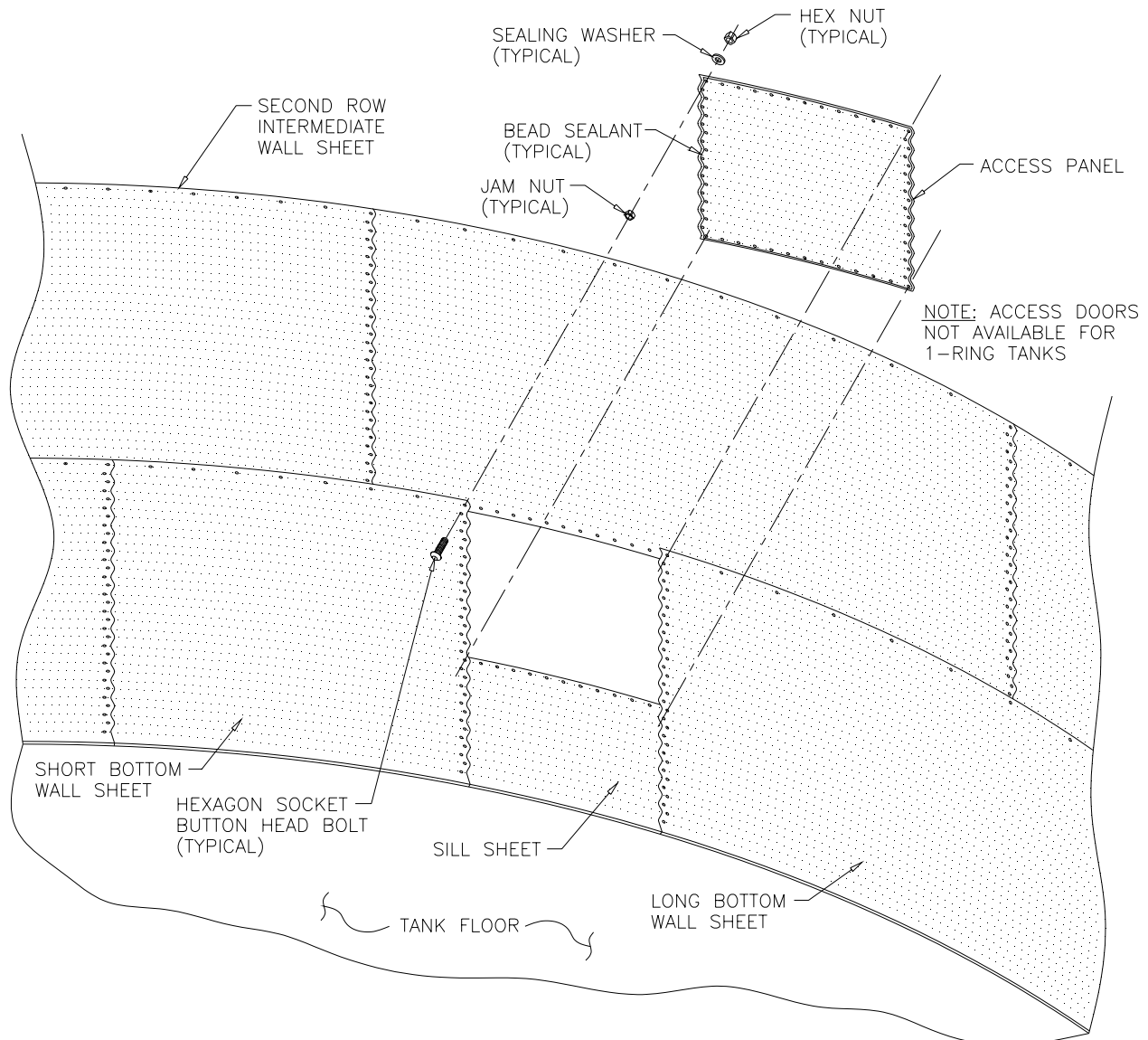


BASE SEALING DETAIL

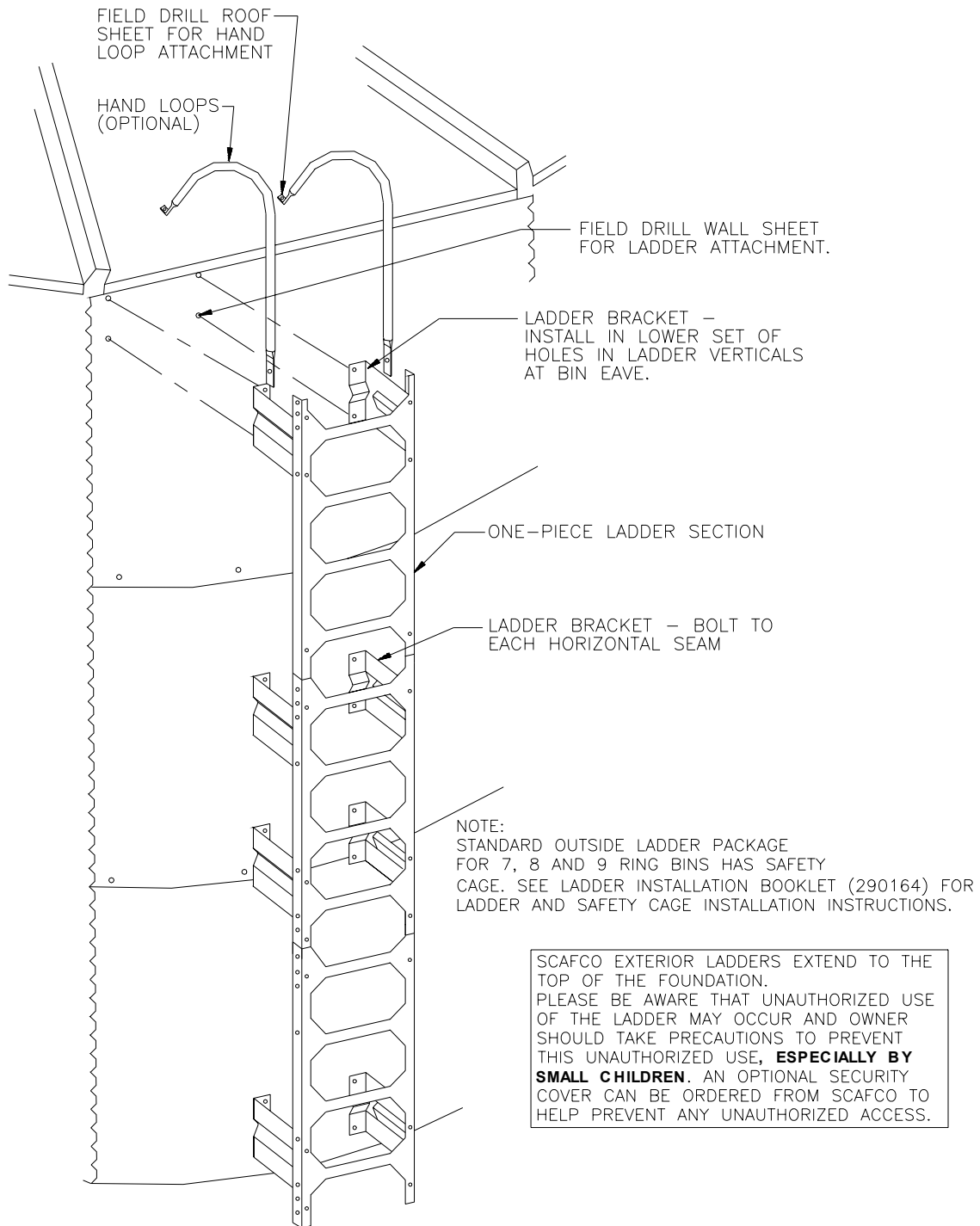
## ACCESS PANEL INSTALLATION



TYPICAL SECTION



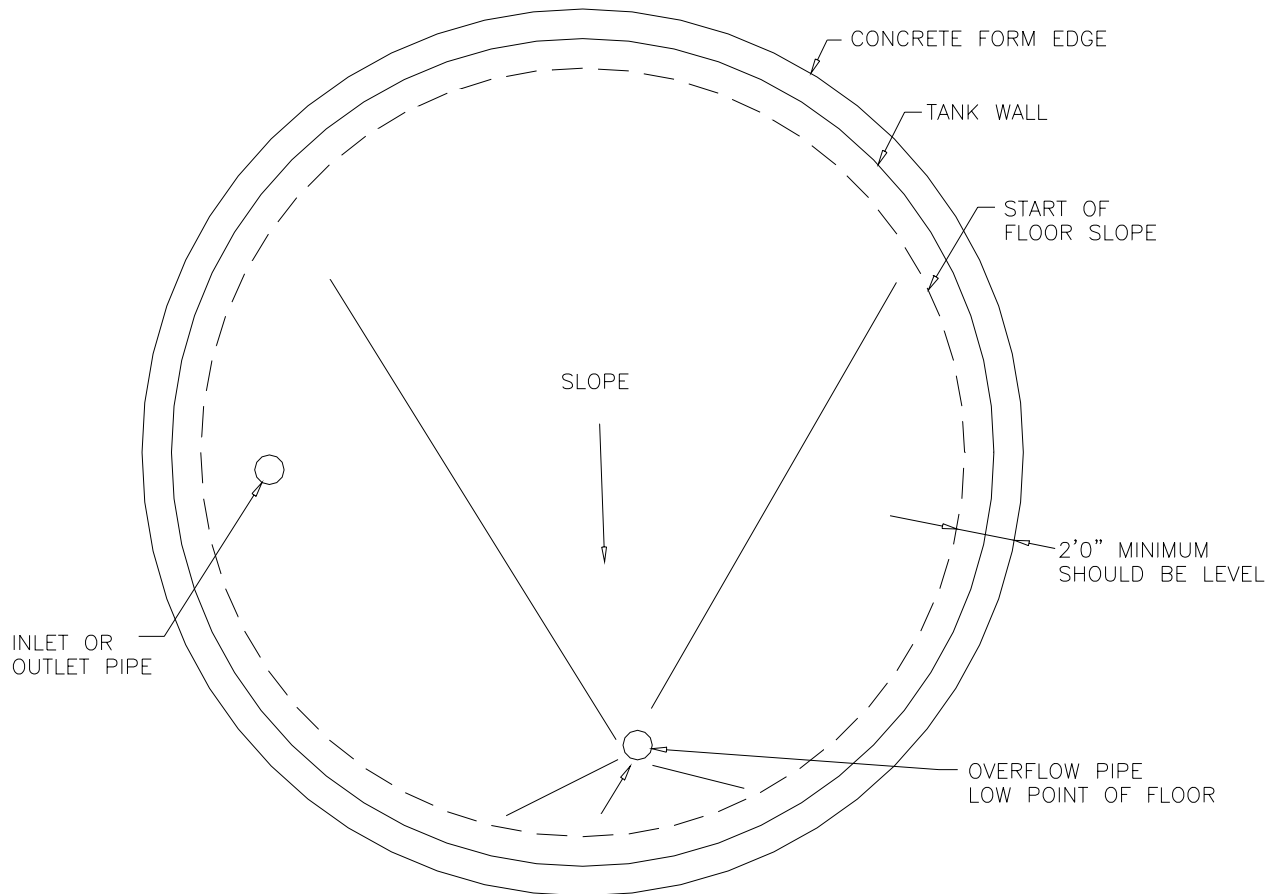
## EXTERIOR LADDER INSTALLATION



**FOUNDATION, INLETS, OUTLETS & OVERFLOWS**

**CONCRETE FOUNDATIONS**

The concrete foundation provides structural support for the liquid storage tank and its contents, transferring the imposed loads to the surrounding soil and underlying strata. In addition, the foundation can accommodate provisions for adequate drainage and sludge removal. See Figures 1 through 5 for recommendations. Foundation design must be done by a local engineer familiar with site conditions.



**Figure 1: Concrete Floor and Foundation Profile.**  
For removal of sludge and silt, a drain trough should terminate at the selected discharge pipe.

**A CONCRETE FOUNDATION IS REQUIRED FOR AN APPROVED SCAFCO LIQUID STORAGE TANK. FOUNDATION DESIGN IS THE RESPONSIBILITY OF A LOCAL ENGINEER RETAINED BY TANK PURCHASER.**

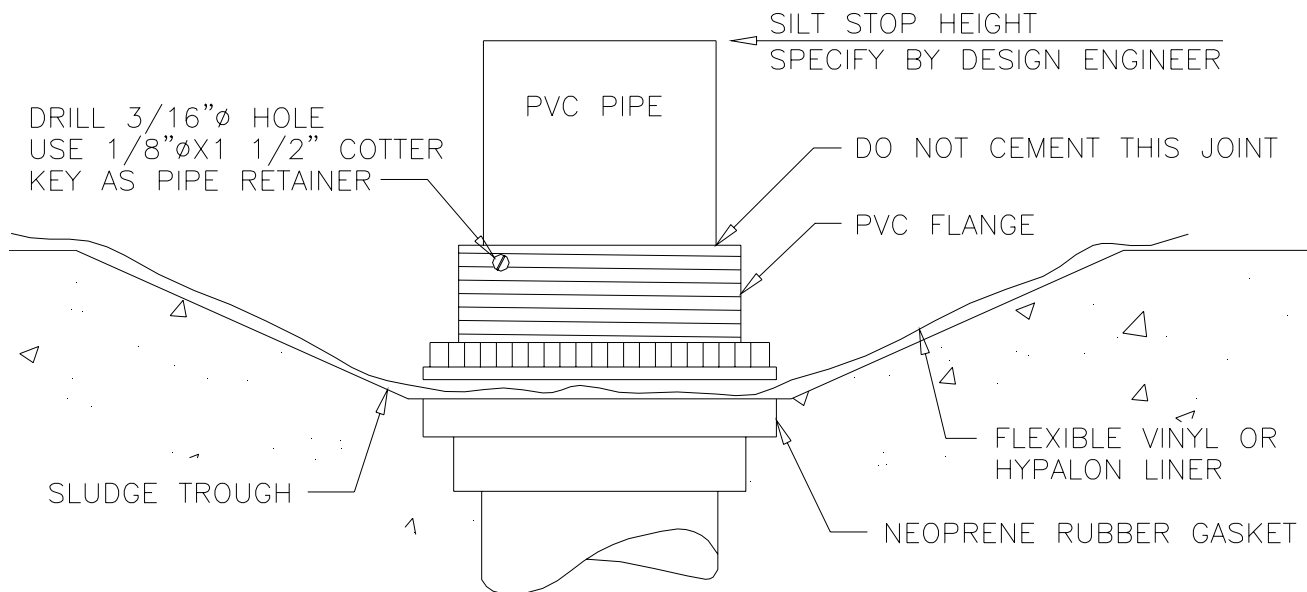


## **INSTALLING INLETS, OUTLETS & OVERFLOW PIPES**

### **WATER INLET-OUTLET REQUIREMENTS**

Every Scafco liquid storage tank has mandatory inlet-outlet and overflow requirements. Each tank must be equipped with a water inlet-outlet pipe and an overflow pipe. Pipe sizes, connections and any controls should be designed by a local engineer retained by the tank purchaser.

Several drawings of recommended piping connections to the Scafco tank liner are shown in succeeding pages.



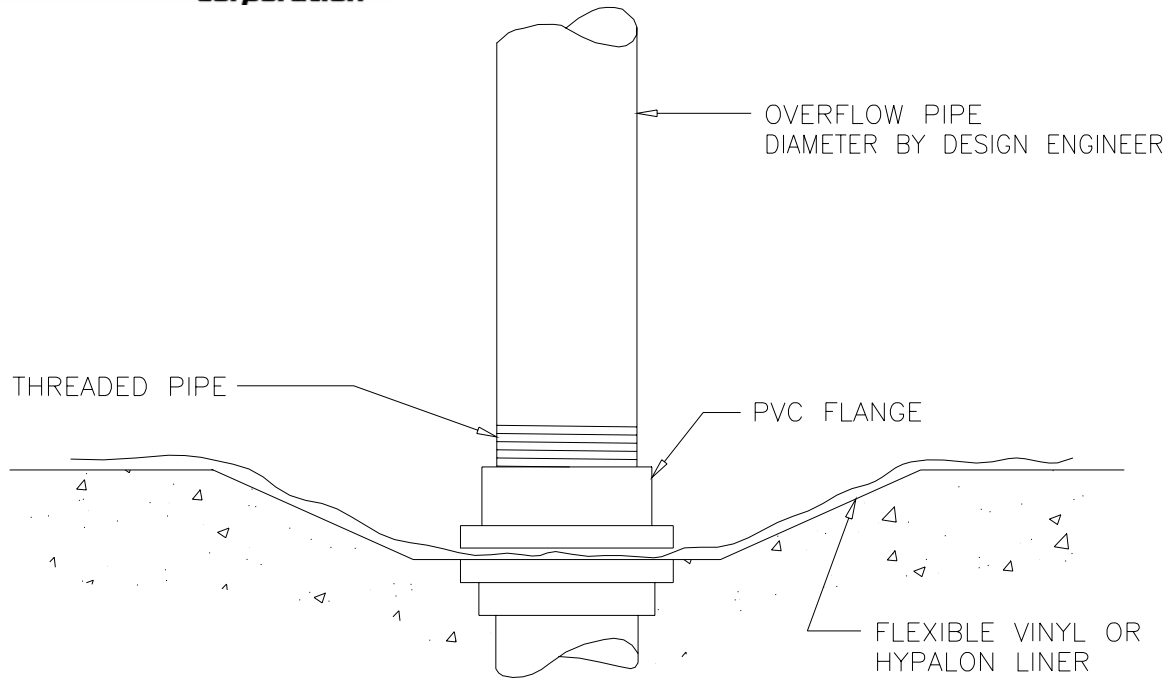
**Figure 2: Discharge Outlet Details.**

Silt and sludge may be removed through the discharge pipe by using a removable silt stop in the outlet flange.

**A DISCHARGE OUTLET AND SILT STOP ARE REQUIRED.**

**DESIGN OF INLET-OUTLET IS RESPONSIBILITY OF PURCHASER'S ENGINEER.**

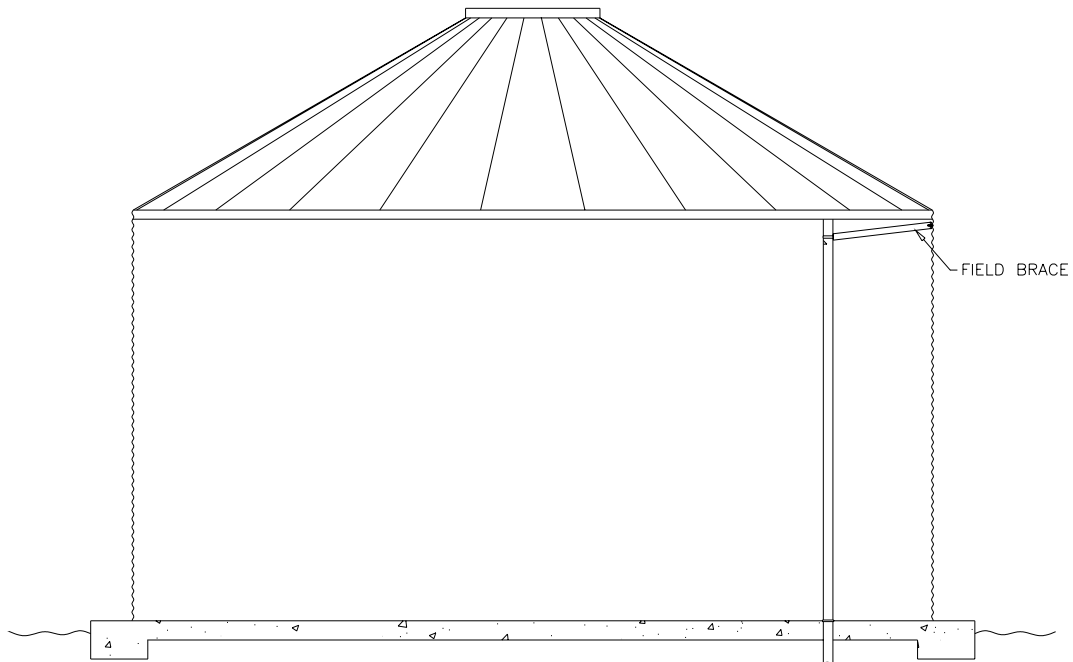
**WARNING: DO NOT LEAVE ANY PORTION OF FLEXIBLE LINER UNSUPPORTED AT FLANGE CONNECTION.**



**AN OVERFLOW PIPE IS REQUIRED.**

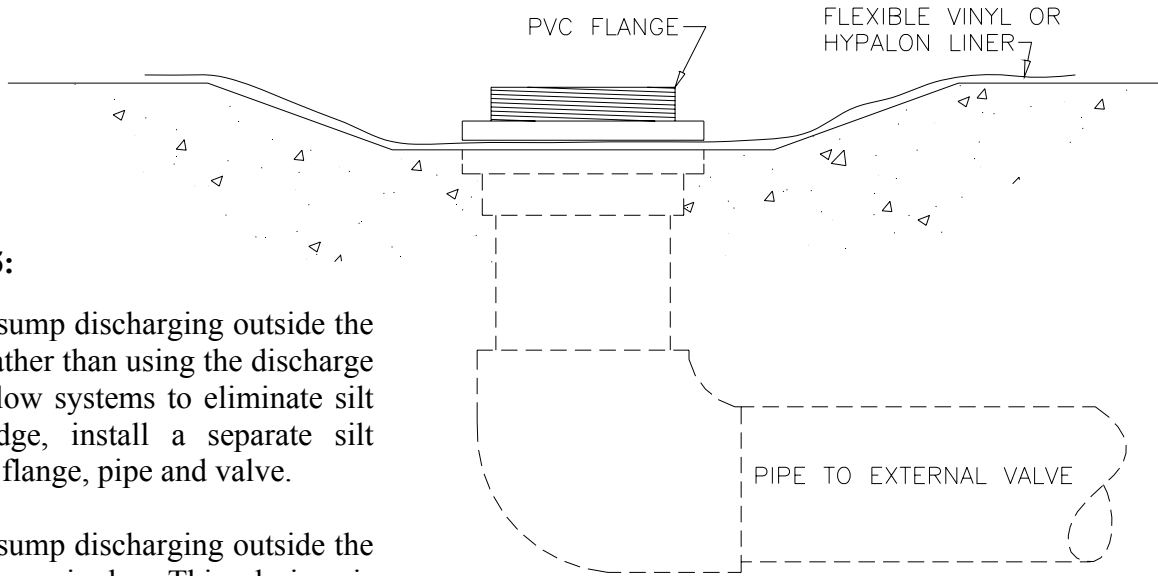
**Figure 3:** Overflow Pipe Details.

By using an overflow pipe with a threaded joint at the floor line, silt and sludge can be removed through the overflow pipe. This eliminates sludge in the discharge system, removing the need to flush the discharge system.



**Figure 4:** Locating Overflow Pipe.

Locate overflow pipe near wall of tank. Top of overflow pipe should be installed 4" below top of tank liner. Brace top of overflow pipe to tank wall at eave. Braces to be furnished by tank or liner installer. Braces must be attached on the tank wall **ABOVE** top of the liner.



**Figure 5:**

A drain sump discharging outside the tank. Rather than using the discharge or overflow systems to eliminate silt and sludge, install a separate silt removal flange, pipe and valve.

A drain sump discharging outside the tank is required. This design is optional if the overflow pipe cannot be used for discharge.

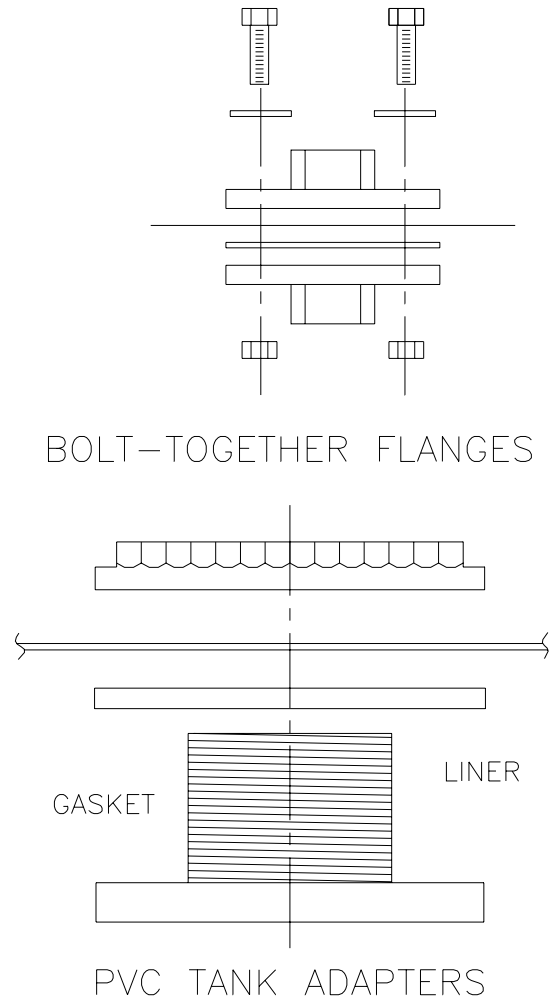
## **INSTALLING INLETS AND OUTLETS**

Inlets and outlets through the liner should be made through the tank bottom. Clamp the liner between two cast iron flanges or Schedule 80 plastic flanges or PVC tank adapters or use a prefabricated boot assembly included and located by the liner manufacturer (optional – call Scafco for pricing). Use a neoprene rubber gasket between top flange and liner.

Seal both sides of liner to flange (and screw threads when applicable) with a waterproof elastomeric sealant. Bolt flanges firmly together with stainless steel bolts, or screw PVC tank adapters together, being careful not to over tighten and damage flanges (tighten bolts alternately).

Cut opening through liner last on bolt-together flanges. Cut opening through liner first on screw type PVC tank adapters (opening should be slightly undersized).

**WARNING: DO NOT LEAVE FLEXIBLE LINER UNSUPPORTED AT FLANGE CONNECTION.**



## **TANK PREPARATION**

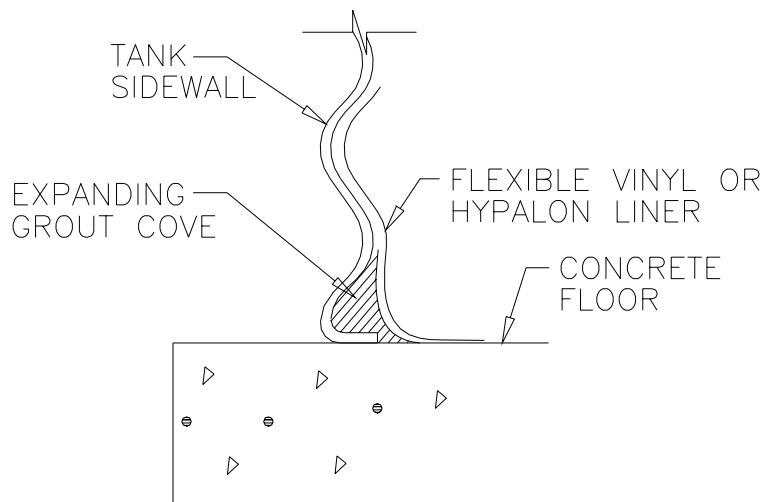
1. Check interior wall for any sharp edges or protrusions that may damage tank. Sand or grind these areas. **SPECIAL REQUIREMENT:** Geotextile fabric should be installed on the wall and floor prior to liner installation (is supplied.)
2. Sweep concrete floor clean of all debris. Check for sharp objects or protrusions. Remove these by grinding.

## **FLOOR SURFACE**

The vinyl liner is in direct contact with the floor finish. The concrete surface must be fine troweled without imperfections, sharp edges, debris or projections that could damage the liner. A beveled edge of expanding grout shall be placed at the intersection of the wall and floor to provide a smooth backing for the liner. **See Figure 6.**

Install geotextile fabric on the concrete floor with adhesive prior to liner installation. This is especially helpful when the concrete finish is not smooth.

Design of the silt stop, sludge discharge, reinforced concrete foundation and liner protection must be determined by the purchaser's Design Engineer or other design professional.



**Figure 6: Tank Perimeter Preparation.**

Provide an expanding grout cove around tank perimeter to reduce corner stress on flexible vinyl liner.

**A COVE AT THE WALL TO FLOOR INTERSECTION IS REQUIRED.**

# **SCAFCO** Corporation

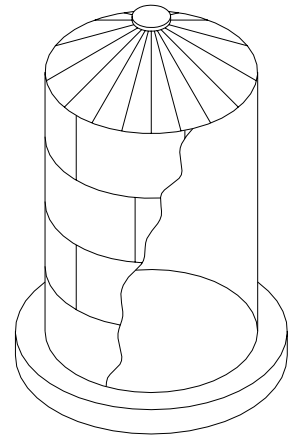
## **INTERIOR WALL PAINT**

It is mandatory that the tank installer coat the interior walls of the ScafcO liquid storage tank prior to the installation of the flexible liner. The following steps and materials are necessary to accomplish satisfactory coating of the interior walls prior to the application of the liner.

1. Apply a 60% phosphoric acid solution, diluted 1 to 3 with warm water, to the interior walls of the tank. This solution should be brushed on and allowed to dry. No rinse is required. Use Dubois Chemical Company "PREPARE" or equivalent product.
2. Apply a moisture cured urethane primer, minimum 2 mil thickness, to the interior tank walls. Primer should be applied on dry surface following etching accomplished in Step 1. Primer may be applied by brush or airless spray. Use Columbia Paint 07-440-PP Single Package Urethane Aluminum Primer or equivalent.

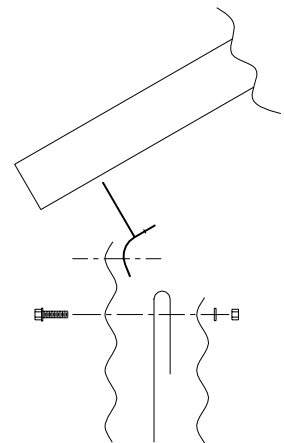
## **LINER INSTALLATION PRECAUTIONS**

1. Do not open liner package with knife.
2. Avoid dropping tools or sharp instruments on liner.
3. **ALL PERSONNEL INVOLVED IN LINER INSTALLATION MUST DO SO IN BARE OR STOCKING FEET.**
4. ScafcO tank liners are manufactured oversize so that there is plenty of slack. It is important, however, to see that no strains develop in the liner. To avoid strains, see that there is no shortage of liner material around the inside bottom perimeter.



## **LINER INSTALLATION**

1. Unfold the liner on the tank floor; stretch it out so the bottom is snug against the inside bottom perimeter. The bottom-to-wall of the liner circle should actually extend partially up the wall of the tank.
2. Raise the liner walls to the eave of the tank. Place the liner between the corrugated clamp strip and the outside walls. Use a sharp center punch to puncture the liner at each bolt hole in the clamp strip. Insert bolts around the upper perimeter of the tank.
3. Tighten all bolts. Make sure there is plenty of slack in walls to Reduce strain when tank is filled.

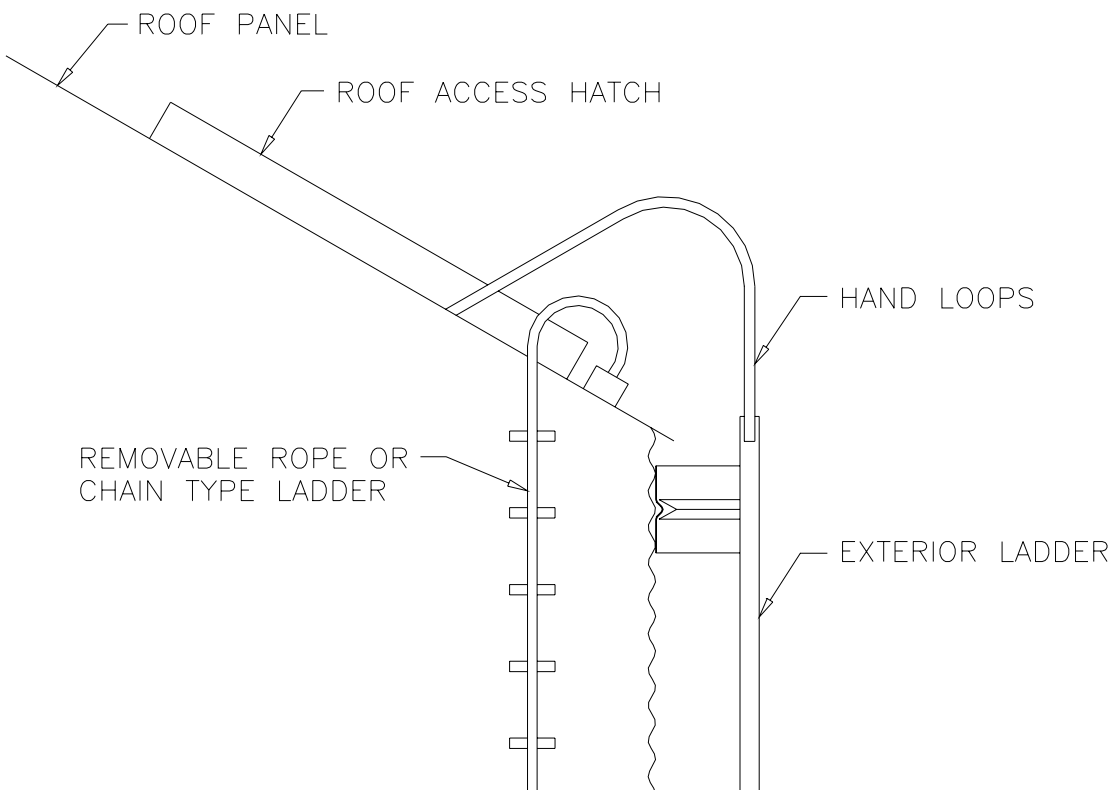


**WARNING: DO NOT ALLOW LINER TO TWIST INSIDE TANK. TWISTING MAY CAUSE PREMATURE LINER FAILURE.**

## VINYL & HYPALON LINER PROTECTION

The vinyl or hypalon liner is durable and will provide many years of service if installed and maintained properly. The liner will **NOT** withstand normal foot traffic during installation and routine cleaning. The following precautions are recommended when working inside a tank or walking on the liner.

1. Do not remove the liner from its carton until it is to be installed. Do not cut carton with a knife. Avoid dropping tools or sharp objects on the liner. Do not drag hypalon excessive distances over floor as the scrim will be exposed and lead to “weeping” type liner leaks.
2. All personnel installing and maintaining liner should do so in bare feet or thin stockings. In no case should personnel enter tank, beneath liner, or inside liner with shoes or boots on. Wearing shoes may introduce foreign matter which could perforate the flexible liner. In addition, personnel working in bare feet can feel foreign matter that may be remaining on the foundation before it can damage the liner.
3. Access to the tank interior through center hatch or additional access manhole may be made with and extension ladder with padded feet. Use of a rope ladder suspended from the hatch opening (**See Figure 7**) is highly recommended. Permanent interior ladders are not practical.



4. Periodic entry between the steel tank and liner, for the purpose of inspection, repair, or readjusting sand overlay, may be made through sidewall wall sheets.
5. A Scafco exterior ladder can be supplied (optional). Ladder extends to the top of the foundation.



## **TANK DISINFECTION**

### **TANK DISINFECTION**

The finished ScafcO liquid storage tank must be disinfected by the purchaser or installer prior to use. Finished structure must be disinfected in accordance with AWWA D105, Method No. 3.

### **CHLORINATION METHOD 3**

Water and chlorine shall be added to the storage facility in amount such that initially the solution will contain 50 mg/L available chlorine and will fill approximately 5% of the total storage volume, and this solution shall be held in the storage facility for a period of not less than 6 hours. The storage facility shall then be filled to the overflow level by flowing potable water into the highly chlorinated water, and shall be half-full for a period of not less than 24 hours. All highly chlorinated water shall then be purged from the drain piping. Then, subject to satisfactory bacteriological testing and acceptable aesthetic quality, the remaining water may be delivered to the distribution system.

**4.3.1. Adding Chlorine.** Chlorine shall be added to the storage facility by the method described in Section 4.1.1, Section 4.1.2, or Section 4.1.3. The actual volume of the 50 mg/L chlorine solution shall be such that after the solution is mixed with filling water and the storage facility is held full for 24 hours, there will be free chlorine residual of not less than 2 mg/L.

## CARE OF VINYL OR HYPALON LINER

### CLEANING THE VINYL OR HYPALON LINER

The surface of the liner is relatively smooth and can be cleaned with a light brushing and pressure spray (water) washdown. The liner can easily accept sweeping, foot traffic and agitation necessary to remove any silt and sludge collected in the tank. Remember, all personnel entering tank must be in bare feet or thin stockings...no shoes or boots.

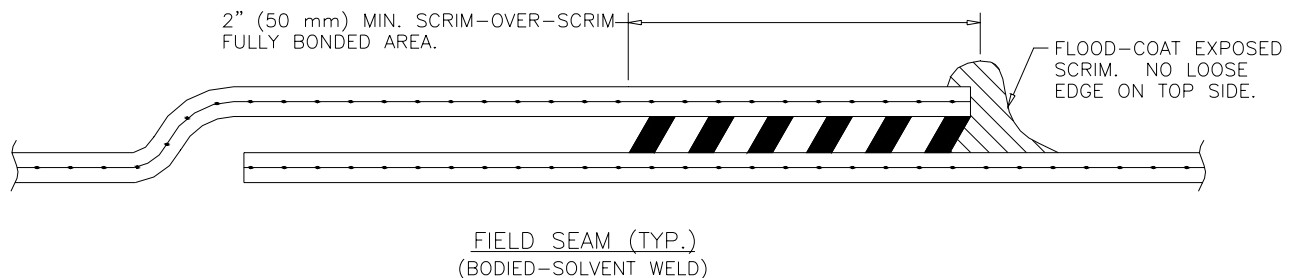
Sanitizing the liner with chlorine wash applied with spray equipment has no negative effects on the vinyl or hypalon liner.

### LINER REPAIR – VINYL

In the event of a cut or damage to the liner, repair can be accomplished by chemically welding a new piece of vinyl over the affected area, using a large second ply over the first patch. This repair may be done to the inside or outside of the liner sheet. Proper repair instructions are provided in the patching kit. All repairs shall be accomplished by personnel in bare feet or stocking feet.

### LINER REPAIR – HYPALON

Cut patch about 6" larger on all sides than the area being patched. Clean area to be patched thoroughly, removing all oil, dirt, sand, etc. Place xylene solvent wash on underside of patch and area to be patched. After solvent wash has dried, place hypalon adhesive on patched area. Place patch on top of adhesive and use roller to insure that the entire patch is bonded to the liner. Flood-coat exposed scrim around cut edge, insuring that no scrim is exposed. Cure the patch with a hot air gun until all adhesive is dry.



### CONTROLS

Water level controls may be installed inside the tank. Control wires for these devices should exit the tank at the eave. Penetrations through the roof panels for control wires are not recommended unless proper sealing methods are used.





## **ICE FORMATION**

Ice may form inside the tank in certain climatic conditions. Large quantities of ice forming around the top water level in a tank provides some potential for damage to the flexible liner.

If ice formation potential is substantial, the tank should be protected by some means of maintaining water movement – air spargers, small recycle pumps, or liquid level fluctuations – during the potential problem period.

When approved by a local engineer, insulation of the tank is a common method to avoid freezing damage.

Tank heating may present viable protection against ice formation. In the event that tank heating is chosen as the method to be used to prevent ice formation, follow the recommendations of the National Fire Protection Association Standard 22, Standard For Water Tanks For Private Fire Protection, Chapter 10.

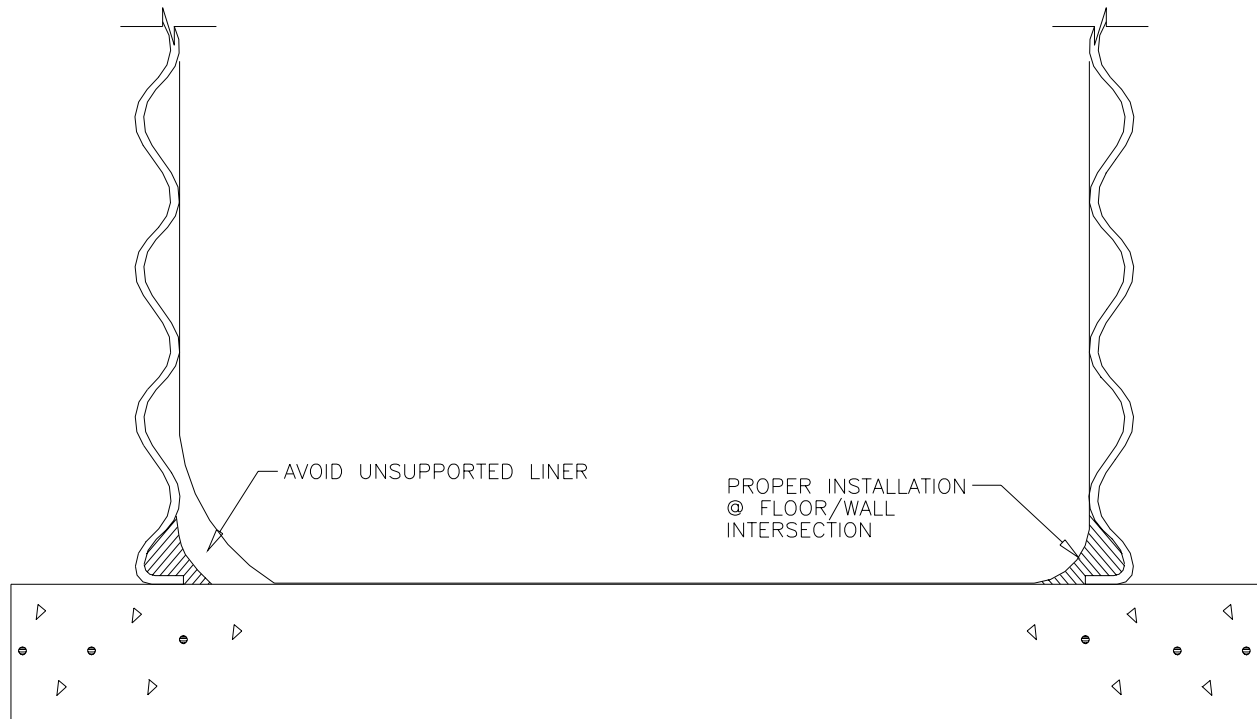
**WARNING: FAILURE TO ADEQUATELY PROTECT AGAINST ICE FORMATION INSIDE THE TANK SHALL VOID THE WARRANTY ON THE FLEXIBLE MEMBRANE LINER.**

## **VENTING**

A suitable roof vent shall be furnished. The vent or vents should be installed in the roof and shall have the capacity to pass air, so that at the maximum possible rate of the water, either entering or leaving the tank, excessive pressure will not be developed. **THE OVERFLOW PIPE SHALL NOT BE CONSIDERED A TANK VENT.**

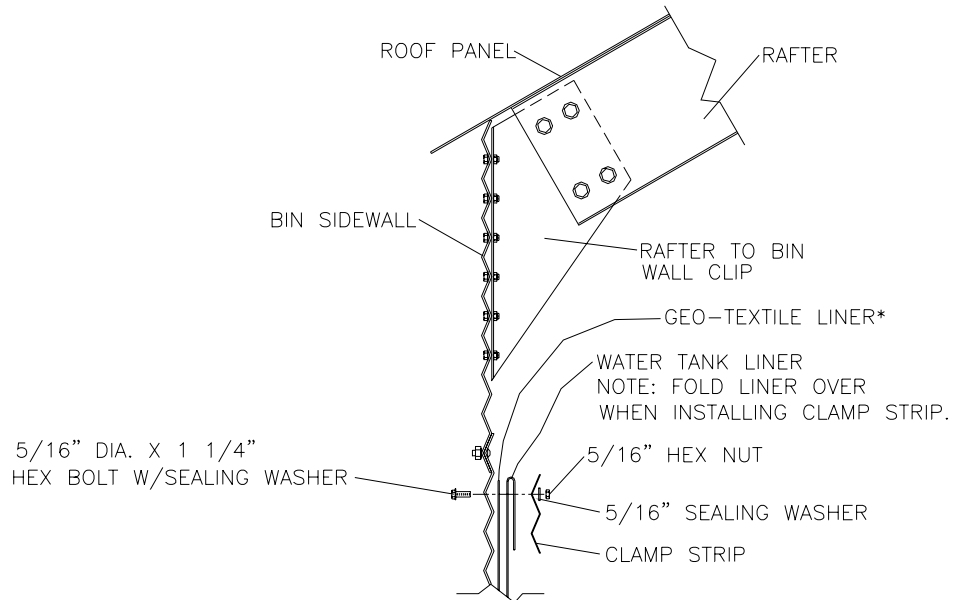
## LINER

Just prior to filling the Scafco liquid storage tank, the liner must be inspected to insure that the liner floor has been pulled up to the wall so that there will be no “bridging” at intersection of wall and floor.



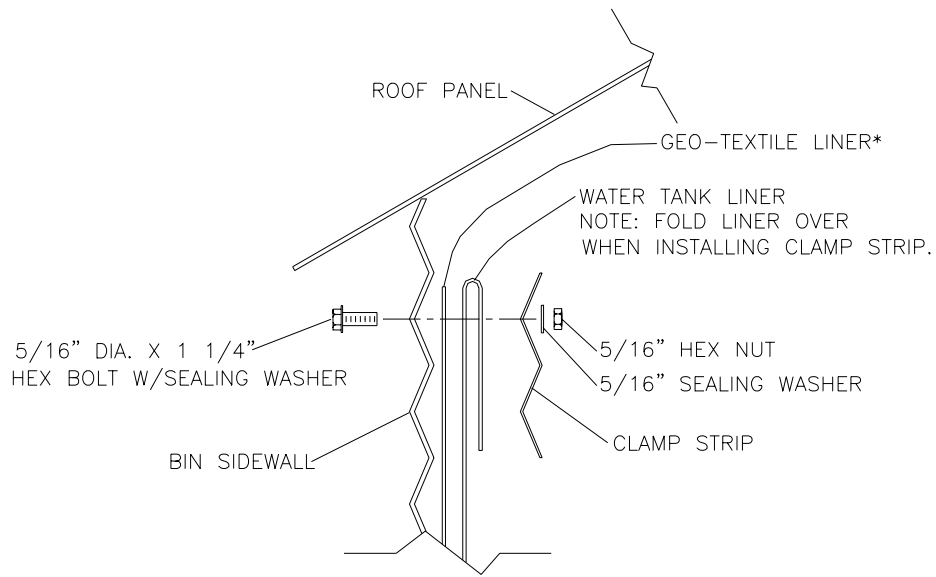
Sloping floor may cause liner to creep away from the wall between the time of installation and filling of the tank.

## GEO-TEXTILE LINER INSTALLATION



### RAFTER CLIP/CLAMP STRIP DETAIL (FOR TANK WITH RAFTERS)

\*ATTACH GEO-TEXTILE LINER TO THE SIDEWALL AND FLOOR.  
USE 1" (25) MAXIMUM OVERLAP. USE RUBBER CEMENT  
OR ADHESIVE COMPOUND. (NOT PROVIDED)



### CLAMP STRIP DETAIL (FOR TANK WITHOUT RAFTERS)

\*ATTACH GEO-TEXTILE LINER TO THE SIDEWALL AND FLOOR.  
USE 1" (25) MAXIMUM OVERLAP. USE RUBBER CEMENT  
OR ADHESIVE COMPOUND. (NOT PROVIDED)



**SCAFCO Grain Systems Company**

6200 E. Main Avenue

PO Box 11215

Spokane, WA 99211-1215, USA