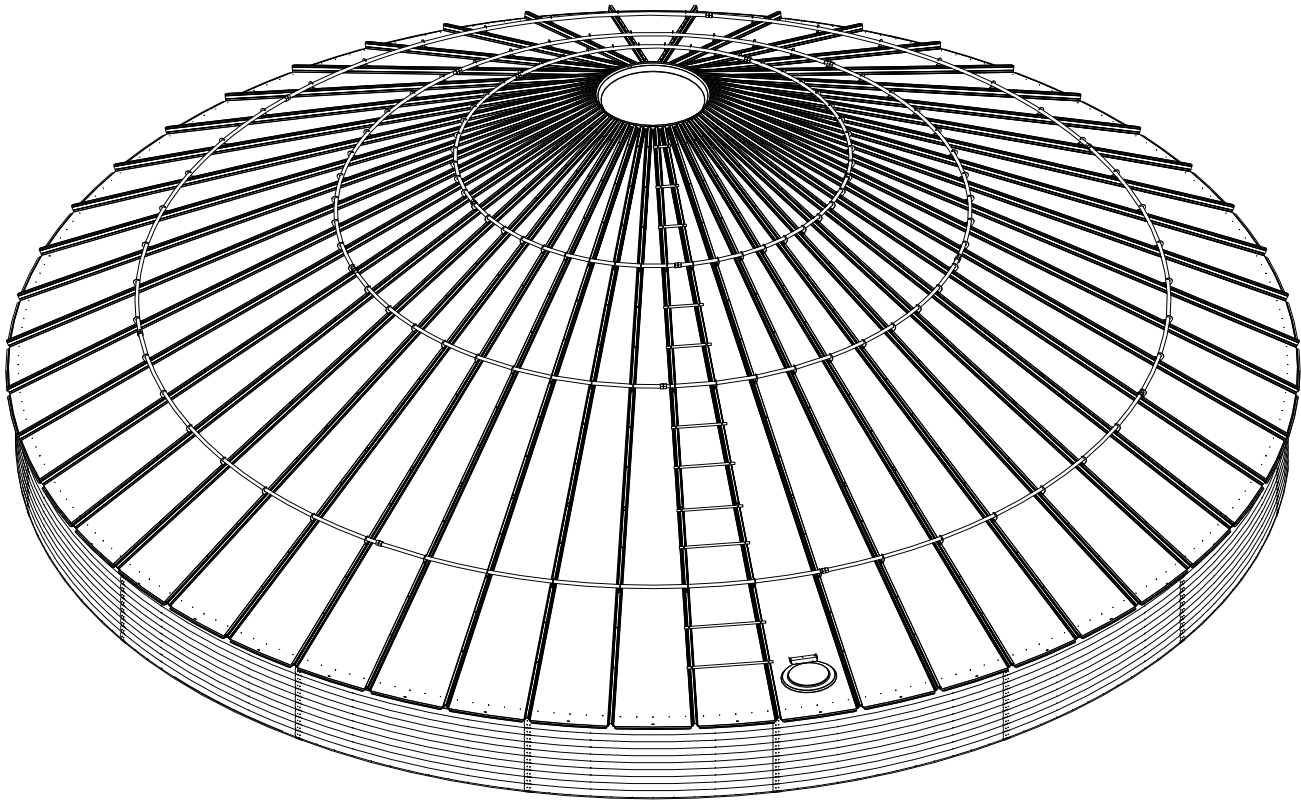




# Non-Structured Centurion Roof

## Installation and Storage Instructions



Read this manual before using product. Failure to follow instructions and safety precautions can result in serious injury, death, or property damage. Keep manual for future reference.

Part Number: 212454 R6

Revised: January 2017





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# 1. Introduction

This manual describes how to assemble a Westeel Non-Structured Centurion Roof.

Before assembling the non-structured roof, please read this manual. Familiarize yourself with the process and the necessary precautions for efficient and safe assembly.

Everyone present at the assembly site is required to be familiar with all safety precautions.

Keep this manual available for frequent reference and review it with new personnel. Call your local distributor or dealer if you need assistance or additional information.







# 2. Safety

## 2.1. Safety Alert Symbol and Signal Words



This safety alert symbol indicates important safety messages in this manual. When you see this symbol, be alert to the possibility of injury or death, carefully read the message that follows, and inform others.

**Signal Words:** Note the use of the signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTICE** with the safety messages. The appropriate signal word for each message has been selected using the definitions below as a guideline.

-  **DANGER** Indicates an imminently hazardous situation that, if not avoided, will result in serious injury or death.
-  **WARNING** Indicates a hazardous situation that, if not avoided, could result in serious injury or death.
-  **CAUTION** Indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.
-  **NOTICE** Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

## 2.2. General Safety

The safety information in the safety section of this manual applies to all safety practices. Specific safety information (such as Operation Safety), can be found in the appropriate section.

**YOU** are responsible for the **SAFE** use and maintenance of your non-structured roof. **YOU** must ensure that you and anyone else who is going to work around the non-structured roof understands all procedures and related **SAFETY** information contained in this manual.

Remember, **YOU** are the key to safety. Good safety practices not only protect you, but also the people around you. Make these practices a working part of your safety program. All accidents can be avoided.

- It is the non-structured roof owner, operator, and maintenance personnel's responsibility to read and understand **ALL** safety instructions, safety decals, and manuals and follow them when assembling, operating, or maintaining the equipment.
- Owners must give instructions and review the information initially and annually with all personnel before allowing them to operate the non-structured roof. Untrained users/operators expose themselves and bystanders to possible serious injury or death.
- The non-structured roof is not intended to be used by children.
- Use the non-structured roof for its intended purposes only.
- Do not modify the non-structured roof in any way without written permission from the manufacturer. Unauthorized modification may impair the function and/or safety, and could affect the life of the non-structured roof. Any unauthorized modification of the non-structured roof will void the warranty.



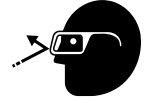
## 2.3. Personal Protective Equipment

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The following Personal Protective Equipment (PPE) should be worn at all times when assembling the equipment.

### Safety Glasses

- Wear safety glasses at all times to protect eyes from debris.



### Coveralls

- Wear coveralls to protect skin.



### Hard Hat

- Wear a hard hat to help protect your head.



### Steel-Toe Boots

- Wear steel-toe boots to protect feet from falling debris.



### Work Gloves

- Wear work gloves to protect your hands from sharp and rough edges.



## 2.4. Safety Decals

---

- Keep safety decals clean and legible at all times.
- Replace safety decals that are missing or have become illegible. See decal location figures that follow.
- Replaced parts must display the same decal(s) as the original part.
- Replacement safety decals are available **free of charge** from your distributor, dealer, or factory.

## 2.5. Decal Installation/Replacement

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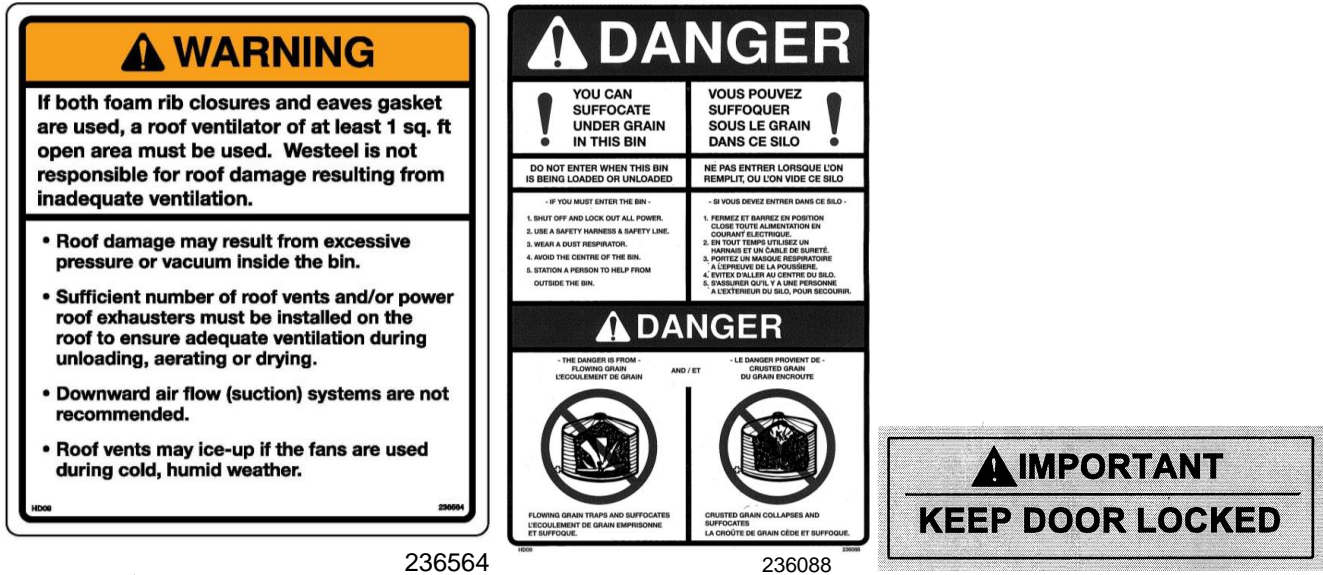
1. Decal area must be clean and dry, with a temperature above 50°F (10°C).
2. Decide on the exact position before you remove the backing paper.
3. Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.
4. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.

5. Small air pockets can be pierced with a pin and smoothed out using the sign backing paper.

## 2.6. Safety Decal Locations and Details

Replicas of the safety decals that are attached to the non-structured roof and their messages are shown in the figure(s) that follow. Safe operation and use of the non-structured roof requires that you familiarize yourself with the various safety decals and the areas or particular functions that the decals apply to, as well as the safety precautions that must be taken to avoid serious injury, death, or damage.

Figure 1. Safety Decals



# 3. Before You Begin

## 3.1. Bin Design and Capacity

---

Standard Westeel Grain Bins are designed for:

1. Non-corrosive free-flowing materials up to 55 lbs/ft<sup>3</sup> (880 kg/m<sup>3</sup>) average compacted bulk density.
2. Maximum horizontal gusted wind speed of 94 mph (151 km/h)
3. Zero seismic activity

**Note**

Seismic resistance in grain bins varies with height and diameter. Many standard designs have significant seismic capabilities. Designs can be reviewed and/or modified to reflect local seismic requirements.

4. Roof loading capabilities vary with diameter, peak load and snow load.
  - a. Peak Loads – standard peak loads follow. **Upgrades are available.**

**Table 1. Peak Loads for Various Roofs**

Size	Type of Roof	Load (lbs)	Load (kg)
15' to 24'	non-structural	4000 lbs	1814 kg
27' to 48'	non-structural	5000 lbs	2268 kg
51' & 54'	non-structural	8000 lbs	3629 kg
48' to 108'	structural	20,000 lbs	9072 kg

- b. Roof Snow Loads (RSL) – at the above stated standard peak loads, standard RSLs vary with diameter and range from 16 psf (78 kg/m<sup>2</sup>) to 49 psf (239 kg/m<sup>2</sup>). **Upgrades are available.**

**Note**

The correlation between ground snow load (GSL) and roof snow load (RSL) for grain bin designs vary with jurisdictions. In the US  $GSL = 2 \times RSL$ . In Europe  $GSL = 1.25 \times RSL$ . In Canada the correlation between GSL and RSL varies and is site specific.

- c. For maximum roof snow load capacities for various sizes and types of roofs, refer to the Roof Design Capacities sections that follow.



### 3.1.1 Roof Design Capacities for Non-Structural Roofs

**Table 2. Maximum Roof Snow Load at STANDARD Peak Load**

Bin Series	Std Peak Load	Standard Roof		Plus Upgrade 1		Plus Upgrade 2		Plus Upgrade 3		
	lbs (kN)	psf	kPa	psf	kPa	psf	kPa	psf	kPa	
15	4000 (17.8)	49	2.35	n/a		n/a		n/a		
18		49	2.35							
21		33	1.58	50	2.39					
24		23	1.10	36	1.72					
27		26	1.24	42	2.01					
30	5000 (22.2)	22	1.05	34	1.63	43	2.06	47   2.25		
33		16	0.77	26	1.24	36	1.72			
36		26	1.24	33	1.58	42	2.01	n/a		
39		24	1.15	29	1.39	39	1.87			
42		21	1.01	27	1.29	37	1.77			
45		18	0.86	26	1.24	35	1.68			
48		23	1.10	28	1.34	36	1.72			
51		8000 (35.6)	22	1.05	31	1.48	n/a			
54			19	0.91	30	1.44				

**Table 3. Maximum Roof Snow Load at UPGRADED Peak Load**

Bin Series	Upgraded Peak Load	Standard Roof		Plus Upgrade 1		Plus Upgrade 2		Plus Upgrade 3		
	lbs (kN)	psf	kPa	psf	kPa	psf	kPa	psf	kPa	
15	8000 (35.6)	31	1.48	n/a		n/a		n/a		
18		31	1.48							
21		26	1.24	41	1.96					
24		19	0.91	29	1.39					
27		20	0.96	30	1.44					
30	10000 (44.5)	17	0.81	25	1.20	36	1.72	40   1.92		
33		12	0.57	20	0.96	26	1.24			
36		20	0.96	25	1.20	34	1.63	n/a		
39		18	0.86	23	1.10	32	1.52			
42		16	0.77	21	1.01	30	1.44			
45		14	0.67	19	0.91	27	1.29			
48*		18	0.86	23	1.10	28	1.34			
51*		12000 (53.4)	16	0.77	23	1.10	n/a			
54*			14	0.67	22	1.05				

**Note**

1. Standard roofs are adequate for many applications but additional capacity is available when optional upgrade packages are used.
2. Upgrade packages include roof stiffening rings and/or rib supports. For 21' and 24' roofs, the upgrade uses heavier gauge roof sheets.
3. For peak load between the standard and upgraded, a straight line interpolation can be used to determine maximum roof snow load.
4. \*Structural 48', 51' and 54' roof with rafters is available to support peak ring loads greater than loads on [Table 3](#).



## 3.2. Guidelines for Supporting Catwalks and other External Loads on Westeel

---

Frequently catwalk and related equipment loads are supported on grain bins. Such connections are commonly made into the grain bin stiffeners and across the peak. A grain bin is a thin shell structure primarily designed to withstand the internal uniformly distributed loads inherent with the stored bulk material inside of the bin. Special considerations must be given to the manner in which external loads are supported. Westeel has developed products which are compatible with these requirements and considerations. If a third party solution is provided, the provider assumes full responsibility of the structure, its load distribution, and the manner in which it is connected to the grain bin. The following guidelines must form part of the third party design considerations.

### Connection to Stiffeners

1. The available catwalk support stiffeners in Westeel stiffened bins are for 10,000 lb incremental catwalk loads and 20,000 lb incremental catwalk loads per upgraded stiffener. The actual loads subjected to a single stiffener by the mating catwalk support shall not exceed these maximum capacities.
2. Westeel recommends that the vertical load transfer between the catwalk supports and the stiffener occur over a minimum distance of 66" for 10,000 lb loads and 120" for 20,000 lb loads. Adequate connection strength must be provided.
3. The catwalk support stiffener in Westeel bins are designed to provide vertical load support only. Any lateral loads subjected to the grain bin must be negligible.
4. There is a restriction of 2 upgraded catwalk support stiffeners per bin location. Therefore, the maximum supported load at the grain bin eave is 20,000 lbs (for two 10,000 lb upgrades) and 40,000 lbs (for two 20,000 lb upgrades). This can be repeated on the opposing side of the bin at a second location. Deviation from this must be approved by Westeel Engineering.

### Connection to Peak Rings

1. The allowable vertical peak load to any Westeel bin roof is restricted to its published rated capacity. The load must be centered and evenly distributed into the peak ring. Any off-centre load and/or improper load distribution may cause roof failure.
2. A Westeel structural roof requires the peak support loads to be transferred directly into the compression ring/roof rafter system. This is accomplished with peak load support brackets that are included with the structural roof. They must be installed as shown in the structural roof manual, connecting the peak support structure to the compression ring. They are required even if a non-Westeel peak support structure is used. A non-Westeel peak support structure needs to be designed to be able to connect with the brackets. The required bolt pattern is shown in the structured roof manual.
3. A Westeel non-structural roof that is supporting a catwalk requires six clips to be installed in order to attach the flat cap to the peak ring. These clips are available from Westeel.

## 3.3. Foundation Design and Loads

---

The foundations for the stiffened bin models are based on 4000 lbs. per sq. ft. (192 kPa) soil bearing capacity. All foundation designs use 3000 lbs. per sq. in. (21 MPa) ultimate compressive strength (after 28 days) for concrete and 43,500 lbs. per sq. in. (300 MPa) re-bar. The foundation designs included in this manual are suggestions only, and will vary according to local soil conditions. Westeel will not assume any liability for results arising from their use.

**Important**

Foundation should be uniform and level. Level should not vary by more than ¼" over a span of four feet under the bottom ring angle. Any variance from level must be shimmed under upright base assembly. If being utilized to support a full floor aeration system, this levelness requirement should extend across the complete floor area.

### 3.4. Site and Assembly

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Unless otherwise specifically provided in writing, Westeel does not take responsibility for any defects or damages to any property, or injury to any persons, arising from or related to any site or assembly considerations, including but not limited to:

- Bin location and bin siting
- Soil conditions and corresponding foundation requirements (note that the examples provided in manuals are for specifically stated soil conditions)
- Bin assembly (Westeel recommends the use of qualified bin installers; contact Westeel for information on installers in your area)
- Field modifications or equipment additions that affect the bin structure
- Interconnections with neighboring structures
- Compliance with all applicable safety standards, including but not limited to fall restraint systems (ladders or other systems). Local safety authorities should be contacted as standards vary between jurisdictions.

### 3.5. Methods of Installation

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The recommendations for assembling and installing Westeel grain bins must be closely followed to achieve the full strength of the bin and to achieve adequate weather sealing. The product warranty is void if:

1. Wall sheets and/or uprights not specified for a given tier are used.
2. Foundations are found to be inadequate or out-of-level.
3. Anchor bolts (cast-in-place, drill-in, chemical type or other) are found to be inadequate.
4. Off-center loading or unloading is used. (This does not apply to the use of approved side unloading systems.)
5. Materials stored are not free-flowing or have a compacted bulk density greater than 55 lbs/ft<sup>3</sup> (880 kg/m<sup>3</sup>).

If using bin jacks during assembly, always lift on an upright. Choose a hoist with a adequate capacity for the expected empty bin deadload. Make sure the rated capacity of the hoist is not exceeded.

### 3.6. Critical Assembly Requirements

---

To ensure a successful, safe and reliable outcome you must comply with the following assembly techniques and practices:

1. Comply with all local code and jurisdictional requirements applicable to your non-structured roof installation.
2. Design and build foundations with the necessary strength for the loads they must support, and for local soil conditions. Westeel foundation guidelines are based on specific stated conditions and may not be applicable to local conditions.



3. Your foundation must provide uniform and level support to the structure being supported. Surface imperfections causing gapping must be remedied. This may involve, but not be limited to a) grouting under the bottom ring of a non-stiffened bin or tank, and b) shimming under the uprights of a stiffened bin or tank, or under the legs of a hopper.
4. Make sure that the proper hardware is utilized for all bolted connections. If a shortage occurs, do not substitute. Take the necessary steps to obtain the proper hardware. Make sure nuts are tightened to the required torque values as specified in the appropriate assembly manual.
5. Comply with all assembly instructions provided in the appropriate assembly manual to make sure your whole non-structured roof is constructed safely. **Important: Do not deviate from the wall sheet and upright layouts provided.**
6. Before anchoring your structure to its foundation, make sure the structure is round. The maximum variation from perfect roundness is 3/4" on the radius. Locate anchor bolts toward the outside of the anchor bolt holes (away from the circle) to permit the incremental expansion that can occur with the initial filling.
7. When installing roof stiffening rings, if it is necessary to shorten the stiffening ring tubes, shorten them as little as possible. Initially the nuts on the expanders should be centered and as close together as possible. When tightening, share the amount of take-up between expanders such that the nuts remain centered, and the amount of engagement between all expanders on the same ring is equalized.
8. If extending an existing bin or tank, ensure that the foundation is adequate for the increased loads it must support.
9. If installing an existing bin on a hopper, make sure the bin is designed for a hopper application, and that the foundation is capable of withstanding the substantial point loads that the hopper legs apply. If uprights are present, make sure that they are supported.
10. Make sure that an integral end-to-end connection exists between all mating uprights. Successive uprights must not overlap.
11. Vertical tolerances between uprights and wall sheets are tight. This can be affected by "jacking" techniques, which can allow the tolerance to grow or shrink depending on the technique used. The gapping between successive uprights must be monitored to ensure that upright holes align with wall sheet holes.
12. If catwalks are being installed on the structure, upright catwalk upgrades are likely required. The upgraded stiffeners must be installed in the correct locations to support the intended catwalk loads. Also, the structure must be properly oriented to ensure the eventual correct alignment between the catwalks and the supporting uprights. Finally, the connectors that tie into the uprights and support the catwalks are best installed during assembly of the structure. See the catwalk assembly manual for additional details.

## 3.7. Product Storage

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### Rust on Galvanized Parts

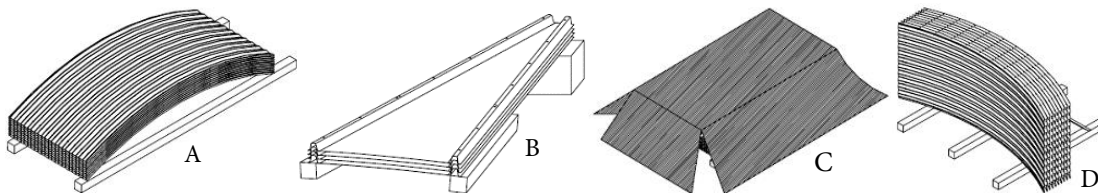
1. White rust forms when moisture is allowed to collect on galvanized surfaces that have yet to develop the durable zinc oxide layer. This zinc oxide layer naturally occurs as the surface interacts with carbon dioxide, and is characterized over time by the dull grey appearance that weathered galvanized surfaces get.
2. Parts that are not well ventilated or well drained can collect water between surfaces and develop white rust.
3. White rust is not a structural concern if its development is stopped in the early stages. A light film or powdery residue can occur after a period of heavy rainfall or a short time of improper storage. If white rust has started to develop, separate parts and wipe off any moisture. Next, using a clean cloth, apply a thin layer of petroleum jelly or food-grade oil to the entire part.

- If moisture is left on parts, this white rust can become more aggressive and turn into red rust. Red rust can cause degradation in the material and become a structural concern. Any parts that have red rust should be replaced immediately.

### Storage Guidelines

- Keep all bundles dry before assembly of the bin.
- Start assembly as soon as possible.
- Do not lay bundles on the bare ground. Raise all bundles 6" to 8" off the ground on wood blocks or timbers. (See Detail A in [Figure 2 on page 13.](#))
- Store curved wall sheets 'hump-up'. (See Detail A in [Figure 2 on page 13.](#))
- All other bundles material should be placed so that they are well sloped to promote good drainage. (See Detail B in [Figure 2 on page 13.](#))
- Roof sheets must be elevated at least 12" at the small end of the sheets. (See Detail B in [Figure 2 on page 13.](#))
- Temporary storage can be provided by erecting a simple framework supporting a waterproof tarp. (See Detail C in [Figure 2 on page 13.](#))
- All bin boxes, ladder boxes and hardware boxes should be stored inside. These are not waterproof, and will deteriorate in normal weather conditions, allowing moisture to contact the parts inside.

**Figure 2. Product Storage**



### If Parts Become Wet

- If parts become submerged or wet, the bundles should be opened as soon as possible, sheets or material separated and dried. Keep separated until assembly.  
Brace parts properly so as to avoid damage or injury from material falling when in storage. (See Detail D in [Figure 2 on page 13.](#))
- Any boxed parts that become wet should be dried and stored in a new box that is free of moisture.
- In addition to wiping down wall sheets, a food-grade oil can also be applied with a clean, lint-free cloth. This will assist in preventing any further moisture from contacting the galvanizing on the steel. Due to safety concerns with installation and use, Westeel does not recommend the use of oil on other parts such as roof sheets and safety ladders.

## 3.8. Grain Bin Use

- Do not off-center unload a grain bin. It is imperative to unload from the center of the bin first, until as much grain as possible has been removed, and only then proceed to unload from the next closest unload gate to the center. Continue utilizing the unload gates in succession from the center towards the outside. Gate control mechanisms should be clearly marked and interconnected to prevent an external gate from being opened first.

- The only exception to center unloading is when a properly designed and installed side draw system is utilized. However, as bins tend to go out of round when employing side draws, the bin must be completely emptied before refilling.
- When unloading a bin with a mobile auger through a properly designed auger chute, the entry end of the auger should be pushed into the center of the bin before the auger is engaged. Slower rates of flow are preferable and should not exceed the capacity of an 8" auger.
- Ensure that the inner door panels of grain bin doors are completely closed and latched before filling the grain bin.
- Never enter a loaded grain bin for any reason. Grain can be a killer.

### 3.9. Important Notes

---

- Westeel does not provide a foundation design for this product, and is not liable for any damages or injuries related to inadequately designed or constructed foundations. Customers must contract professional services for all foundation design and construction work. For information on foundation design requirements, refer to [Section 3.3. – Foundation Design and Loads on page 10](#).
- In order to maintain your wall sheets in good condition separate sheets and allow air circulation between them. Store sheets in a dry place. Do not store sheets with sheet ends pointing upwards.
- To keep an even pressure on walls, the bin must always be unloaded from the centre.
- Contact local power officials for minimum power line clearance.
- See [Section 3.6. – Critical Assembly Requirements on page 11](#) for mandatory siting and assembly requirements.
- Store only non-corrosive, free-flowing materials up to 55 lbs/ft<sup>3</sup> (800 kg/m<sup>3</sup>) average compacted density in Westeel bins.
- Tighten all bolts to the recommended torque settings.
- Do not locate grain bins close to high buildings, which might cause snow to fall onto or build up on the roof of the grain bin. Consider future expansion and allow space for loading and unloading of the bin. Your dealer and local government agricultural consultants can help you plan your storage system for maximum efficiency.



# 4. Preparation

## 4.1. Check Shipment

---

Unload the parts at the assembly site and compare the packing slip to the shipment. Ensure that all items have arrived and that none are damaged.

Report damaged parts or shortages immediately to the delivering carrier, followed by a confirming letter requesting inspection by the carrier, if required. Order any replacement parts immediately to ensure that assembly will not be held up by missing parts. All parts will be charged for and credit will be issued by party at fault. No credit will be issued if freight bills are signed as received in good condition.

## 4.2. List of Tools and Equipment

---

Use quality tools and equipment. Use them safely, and correctly, for their intended use. Tools for this application should include:

### Tools

- Electric or pneumatic (air) impact tools
- Power drill and drill bits
- Sockets (multiple 9/16" and 1/2" sockets recommended)
- Large-pocket carpenter pouch
- 8" (20 cm) metal punches (for aligning bolt holes)
- Step and extension ladders, construction grade
- 6-point wrenches (Imperial, box end)
- Metal-cutting saw suitable for cutting roof rings and wind rings
- Scaffolding
- Centre-post bin stand
- Crane and/or bin jacks

### Minimum Recommended Safety Equipment

- A properly-stocked first-aid kit
- Eye, foot, head, and hand protection (safety glasses, steel-toed boots, hard hat, work gloves)
- Cable, chain, or rope to tie-off bin or jacks in case of wind
- Body harness and lifeline (for use where falling hazard exists)
- Ground fault interrupt protected electrical hook-ups

## 4.3. Order Optional Equipment

---

Optional equipment such as unloading augers, aeration equipment, anchor bolts, foundation sealant, external ladders, safety cage and platforms, etc., should all be on site and checked before assembly starts. Plan your installation in advance. For details, see assembly instruction supplied with optional equipment.



# 5. Assembly



Before continuing, ensure you have completely read and understood this manual's Safety section, in addition to the safety information in the section(s) below.

## 5.1. Assembly Safety

---

### WARNING

- Do not take chances with safety. The components can be large, heavy, and hard to handle. Always use the proper tools, rated lifting equipment, and lifting points for the job.
- Carry out assembly in a large open area with a level surface.
- Always have two or more people assembling the non-structured roof.
- Make sure you have sufficient lighting for the work area.
- Tighten all fasteners according to their specifications. Do not replace or substitute bolts, nuts, or other hardware that is of lesser quality than the hardware supplied by the manufacturer.
- Stay away from overhead power lines and other obstructions during assembly. Contact with power lines can cause electrocution.
- Do not work in high winds.

## 5.2. Typical Non-Structural Roof Installation

---

The following is a step-by-step procedure for assembling a non-structural roof system.

### Preparation

1. Inspect the concrete foundation to insure that the foundation meets all the requirements of the installation.
2. Plan the assembly:
  - a. Determine the desired bin orientation.
  - b. Determine the locations of bin features and accessories (Westeel logo, Grain Gauge, unloading devices, outside ladder, spiral stairs).

These considerations affect the location of the inspection hatch roof panel and the placement of the roof ladder or roof stairs.

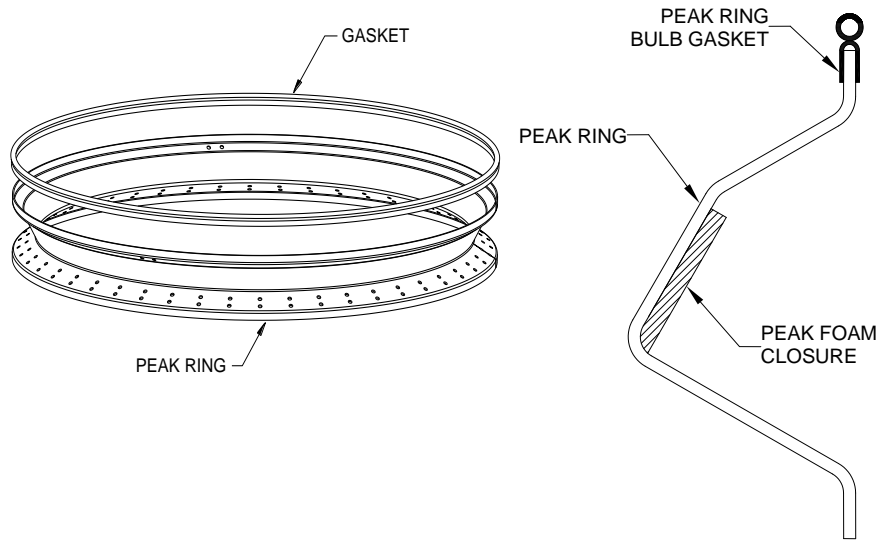
3. Prepare the peak ring:
  - a. Install the supplied bulb gasket around the top of the peak ring.
  - b. Install the foam closure gasket around the center section of the peak ring.

Refer to [Figure 3 on page 17](#).





**Figure 3. Gasket and Foam Closure Assembly to Peak Ring**



4. Install the center post making sure the post is vertical, braced and anchored properly for safe installation.
5. Lay out the bin circumference (for the bottom tier of wall sheets) on the foundation:
  - a. Anchor a string to the exact center of the concrete foundation.
  - b. Determine the required string length using [Table 4 on page 17](#).

**Note**

The radius 'values given in the chart are 3/4" smaller than the wall sheet radius at the bottom. This ensures that the scribed circle can be seen during assembly. A perfectly placed ring of sheets should be 3/4" on the outside of this scribed circle.

- c. Scribe the bin circumference onto the foundation.

**Important**

**Follow these steps carefully. It is imperative that the bin be as round as possible.**

**Table 4. Scribe Radius and Peak Ring Height (1 and 2 tier)**

Nominal Bin Dia.	Scribe Radius		Top of Peak Ring Height "H" with 1 tier of wall sheets		Top of Peak Ring Height "H" with 2 tiers of wall sheets	
	(ft in)	(m)	(ft in)	(m)	(ft in)	(m)
15	7' 4 -3/4"	2.255	7' 9-3/8"	2.372	11' 5-3/8"	3.489
18	8' 10-11/16"	2.710	8' 7-3/4"	2.635	12' 3-3/4"	3.753
21	10' 4-9/16"	3.164	9' 6-1/16"	2.897	13' 2-1/16"	4.015
24	11' 10-1/2"	3.619	10' 4-7/16"	3.160	14' 0-7/16"	4.279
27	13' 4-3/8"	4.074	11' 2-3/4"	3.423	14' 10-3/4"	4.540
30	14' 10-5/16"	4.529	11' 7-5/8"	3.546	15' 3-5/8"	4.664
33	16' 4-3/16"	4.984	12' 5-15/16"	3.808	16' 1-15/16"	4.910
36	17' 10-1/8"	5.438	13' 4-1/4"	4.071	17' 0-1/4"	5.188
39	19' 4"	5.893	14' 2-5/8"	4.334	17' 10-5/8"	5.452
42	20' 9-15/16"	6.348	15' 0-15/16"	4.596	18' 8-15/16"	5.714



**Table 4 Scribe Radius and Peak Ring Height (1 and 2 tier) (continued)**

Nominal Bin Dia.	Scribe Radius		Top of Peak Ring Height "H" with 1 tier of wall sheets		Top of Peak Ring Height "H" with 2 tiers of wall sheets	
45	22' 3-13/16"	6.803	15' 11-5/16"	4.859	19' 7-5/16"	5.977
48	23' 9-3/4"	7.258	16' 9-5/8"	5.121	20' 5-5/8"	6.239
51	25' 3-5/8"	7.712	17' 5-5/8"	5.325	21' 1-5/8"	6.442
54	26' 9-9/16"	8.167	18' 4"	5.588	22' 0"	6.706

**Assemble the Bottom Tier of Wall Sheets**

1. Assemble a single tier of wall sheets if single-tier uprights are included in the bin package.
2. Assemble two tiers if two-tier uprights are included in the bin package.
3. Refer to the Appendix for information on proper hardware usage.
4. After the first ring of wall sheets has been assembled, check the position and roundness of the ring:
  - a. Verify that the bin is round, with **no more than 0.75" variation** on the radius, when measured from the center of the bin.
  - b. Verify that the wall sheets form a smooth circle with no flat spots or cauliflower shaped curves.
  - c. Before anchoring the bin to the foundation, re-check to ensure that the bin is round and within tolerance.

**Note**

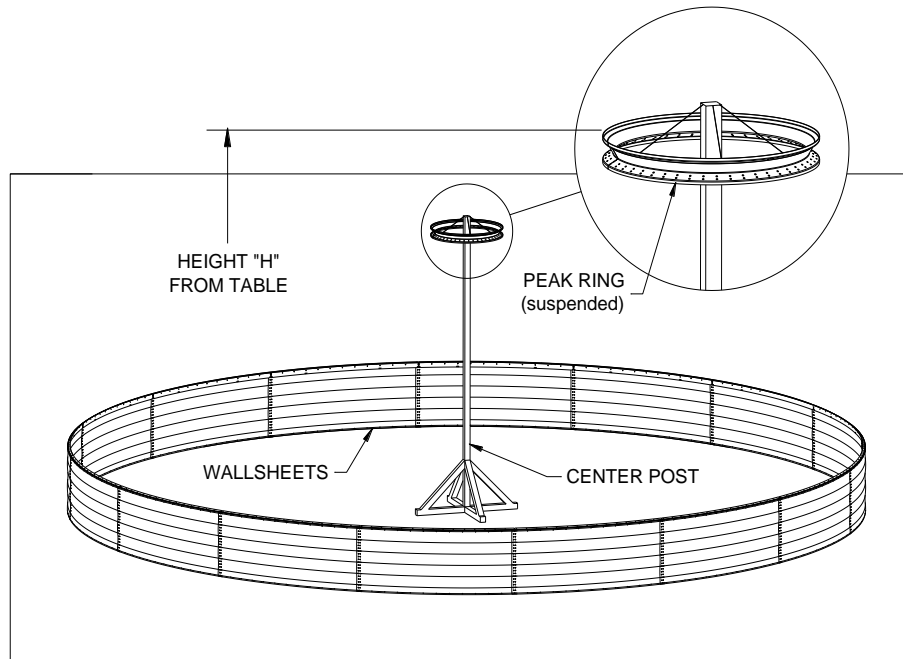
Correcting for roundness becomes much more difficult the longer you wait.

5. Locate anchor bolts towards the outside of the anchor bolt slots (away from bin) to permit the incremental expansion that can occur with the initial filling of the bin.
6. When setting jacks, make sure they are also set round and that they are anchored to the concrete.
7. Attach the top ring angle to the inside top of the wall sheets.
  - Do not align the top ring angle joints with wall sheet joints.
  - Make sure that top ring angle joints are is at least two or three wall sheet holes away from the Grain Gauge cutout.

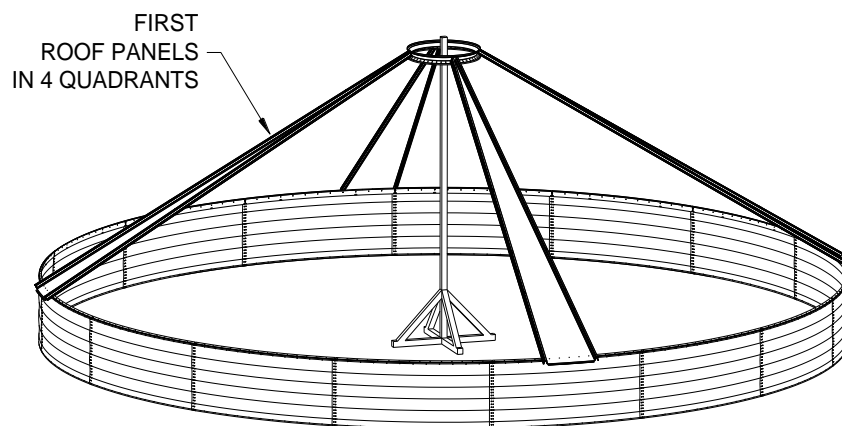
**Install the Peak Ring**

1. Determine the correct peak ring height (H) for the bin size from [Table 4 on page 17](#).
2. Attach the peak ring assembly to the top of the center post at the correct height for the bin being assembled.



**Figure 4. Peak Ring Installation****Install the Roof Sheets**

1. Attach roof sheets with the narrow end to the peak ring and the wide end to the top ring angle.
2. Initially, attach four roof panels at the quarter points of the bin. (See [Figure 5 on page 19.](#))  
This will stabilize and support the peak ring for the rest of the install.

**Figure 5. Roof Panel Installation**

**Tip**

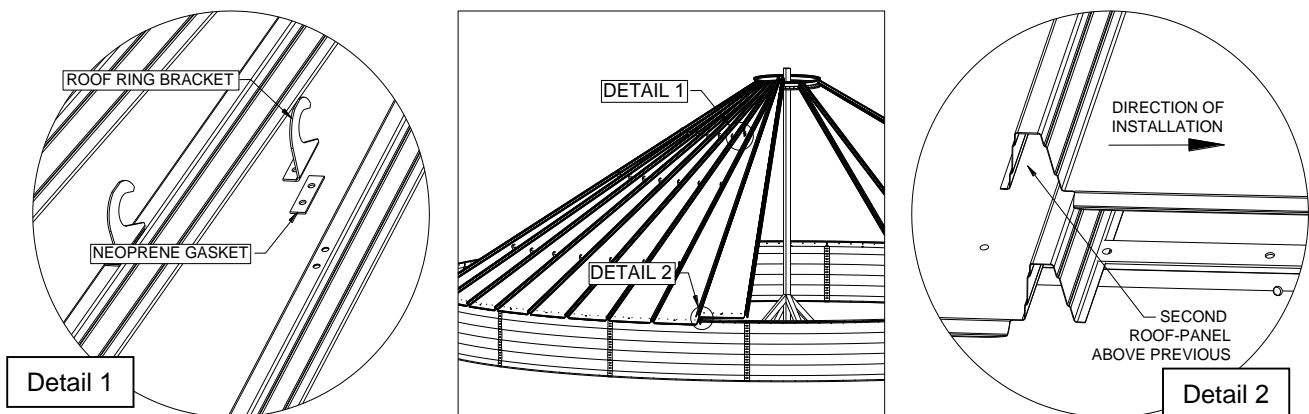
The narrow end of the roof panels gets pushed into the foam closure. Once this occurs there is little room for adjustment at the top end as the roof panel is embedded in the foam. Sometimes the roof panels get “flattened” slightly from bundling, shipping and handling. It is relatively easy to push the rigs together slightly but this should occur before the panel is seated in the foam. Monitor the alignment of mating roof panels with the underlying holes in the peak ring and make adjustments, if necessary, before anchoring the roof panel into the foam.

**Important**

Be careful when attaching the bottom of the roof panels to the top ring angle. The center round holes at the bottom of the roof panels must align with round holes in the top ring angle. This locks in the correct centering location for the roof sheet. The other holes in the bottom of the roof sheet align with the round holes in the top ring angle.

3. Make sure that the gap between the roof panel and the peak-ring is sealed by the foam closure.
4. Make sure the center hole in the roof panels aligns with round holes in the top ring angle.
5. Install the remaining roof panels, working in a counter clockwise direction:
  - a. Attach the center roof panel hole first.
  - b. Use two bolts at each roof panel to peak ring connection.
  - c. Fill in every bolt hole in roof panel ribs with rubber washered bolts to the outside and nuts on the underside.
  - d. Make sure the left roof rib overlaps the right rib of the preceding panel. (See Detail 2 in [Figure 6 on page 20.](#))

**Figure 6. Roof Rib Orientation & Roof Ring Bracket Assembly**

**Important**

As assembly proceeds, additional support is advised to keep the peak ring level. Alternatively sequentially add roof panels in the different quadrants such that the weight of the panels on the peak ring remains uniformly distributed. Leave all roof bolts loose until the roof is completely assembled, especially those at the peak ring and top ring angle locations.

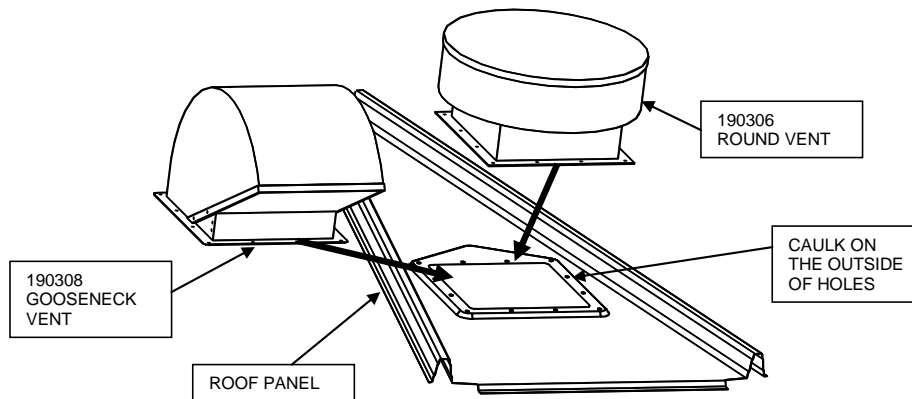
- e. If the number and diameter of optional roof stiffening rings is known, install the roof ring brackets (with a neoprene gasket under each) in the double rib hole locations as you add roof panels. (See [Detail 1 Figure 6 on page 20.](#))
6. Install vent roof panels where required, as the roof is being assembled.

Distribute vent roof panels evenly around the roof. Ensure that they do not interfere with other roof elements such as roof stairs or rungs, temperature cables, etc.

**Note**

Westeel supplied roof vents come in two styles: Gooseneck and Round. Both have pre-formed bolt holes for mounting to the roof panel. The vent roof panels have a raised mount section, mounting holes and a pre-cut ventilation opening. No on-site cutting is required. A recommended practice is to assemble the vents to the roof panels at ground level before installing. Place a strip of caulking all the way around the weather side of the connection, position the vent, and bolt into place.

**Figure 7. Roof Vent Assembly**



7. Install inspection hatch roof panel where required.

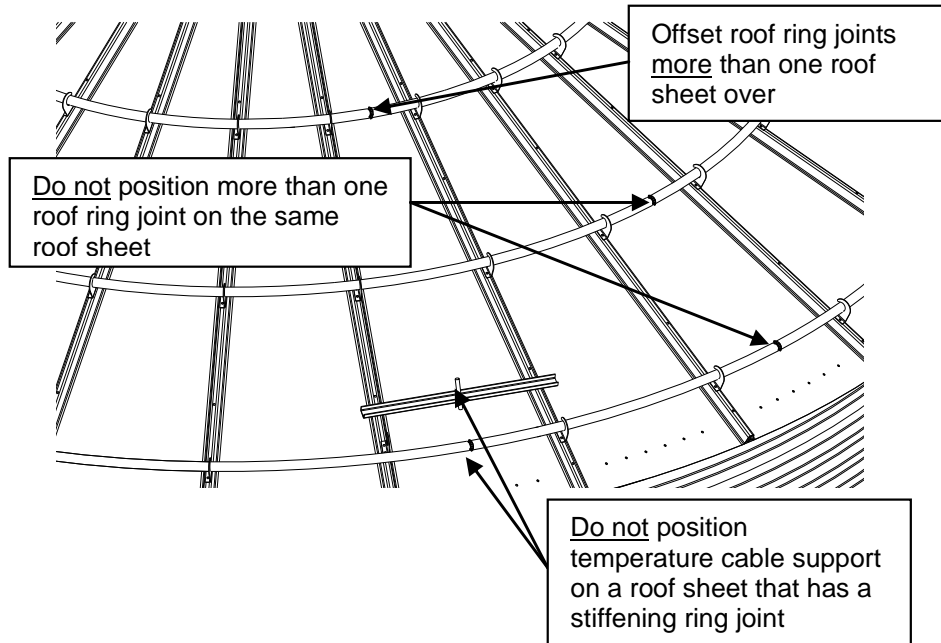
The inspection hatch can be pre-assembled if desired. (See [Section 5.4. – Inspection Hatch Details \(15’ – 54’\)](#) on page 28.)

8. Install the roof ladder on the roof sheet to the left of the inspection hatch. (See [Section 5.3. – Roof Ladder Details](#) on page 27.)

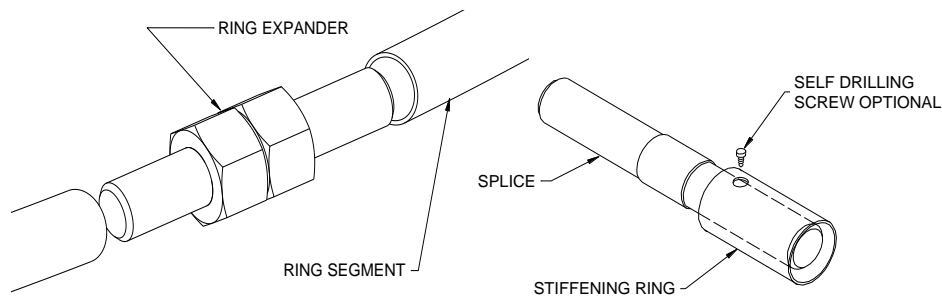
Enough roof ladder rungs are supplied to bridge across every pair of holes on a single roof panel. Where roof stiffening ring brackets are placed, the ladder rung can be skipped. The roof ring will serve as a rung in this location. Roof ladder rungs are installed with the higher vertical flange facing the peak ring.

### Install Roof Stiffening Rings

1. Add roof stiffening rings (if required):
  - a. See [Table 5](#) on page 23 for standard roof stiffening ring locations.
  - b. On roofs with multiple stiffening rings, stagger the ring joints to avoid having more than one joint on same roof sheet. (See [Figure 8](#) on page 22.)

**Figure 8. Roof Stiffening Rings Installation**

- c. Join roof stiffening rings together by inserting a ring splice into the facing ends and pushing everything together tightly.
- d. Secure the splice to the roof ring with a self-drilling screw.

**Figure 9. Stiffening Ring Connection**

- e. Field cut the last stiffening ring segment so there is a 2½" gap between the mating tubes.
- f. To make the final connection, insert a ring expander between the final ring sections.
- g. With nuts close to one end, insert the long end of the ring expander into one tube and, by flexing both tubes, make the connection to the mating tube.

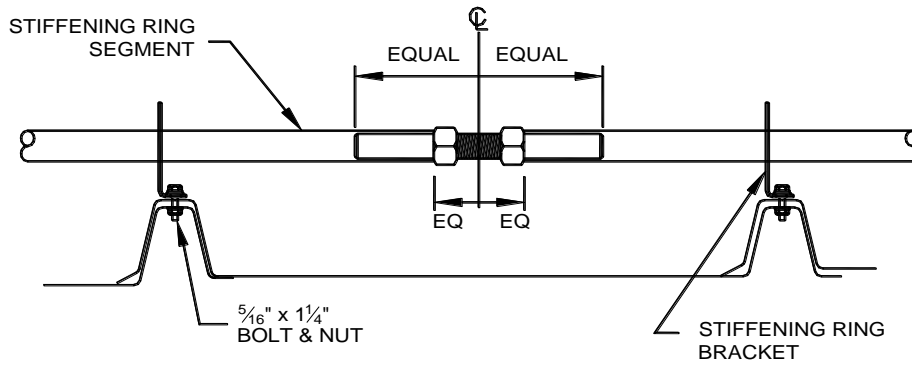
(See [Figure 9 on page 22.](#))

- h. Thread both nuts toward the center.  
The green paint on the threaded portion indicates the center.
- i. Slide stiffening ring tubes into the brackets.

**Note**

Before expanding, or tightening the roof, all nuts on the ring expanders should be tight together and centered.

**Figure 10. Stiffening Ring Connection (side view)**



2. Install the remaining stiffening ring clips.
3. Tighten the roof hardware.
4. Expand the nuts on the stiffening ring expanders until the slack has been taken up and the roof is snug.
  - a. Do not overtighten and crown the roof.
  - b. Nuts must be centered on the threaded rod.
  - c. Use the painted marking as a guide.
  - d. On rings with multiple expanders, the distance between the nuts on all of them should be equal. (See [Figure 10 on page 23.](#))

**Table 5. Roof Reinforcing Matrix**

Component →	Roof Stiffening Ring Tubes				Rib Supports
Location & Colour →	1st - Yellow	2nd - Black	3rd - Red	4th - Green	Under ribs
Chord length (in) →	103.8	167.4	197.6	200.4	Varies
Qty of Expanders →	2	2	3	4	n/a
Bin Series	Component Part Numbers (and Quantity)				
15	n/a	n/a	n/a	n/a	n/a
18					
21					
24					
27	195100 (5)	195101 (5)	n/a	n/a	212755 (30)
30	195100 (5)				
33	195100 (5)				
36	195100 (5)				
39	195100 (5)	195101 (5)	195102 (6)	n/a	212758 (39)
42	195100 (5)	195101 (5)	195102 (6)		212759 (42)
45	195100 (5)	195101 (5)	195102 (6)		212760 (45)
48	195100 (5)	195101 (5)	195102 (6)		195103 (7)
51	n/a	195101 (5)	195102 (6)	195103 (7)	212762 (51)



**Table 5 Roof Reinforcing Matrix (continued)**

Component →	Roof Stiffening Ring Tubes			Rib Supports
54		195101 (5)	195102 (6)	195103 (7) 212763 (54)
Notes:	<ul style="list-style-type: none"> <li>• Roofs are supplied as standard or with optional upgrades for higher load capacity</li> </ul>			
	<- standard components for all roofs			
	<- optional components supplied with all roof upgrade levels 1, 2 & 3			
	<- optional components supplied with roofs upgraded to level 2 & 3			
	<- optional components supplied with roofs upgraded to level 3 (33' only)			
	<ul style="list-style-type: none"> <li>• For 21' &amp; 24' only, the upgraded roof uses a heavier gauge roof sheet bundle</li> </ul>			
	<ul style="list-style-type: none"> <li>• Structural roofs with rafter system is available for 48' bins and larger. These raftered roofs do not require stiffening rings or rib supports</li> </ul>			

5. Once all the roof panels have been installed, make sure all nuts have been tightened.

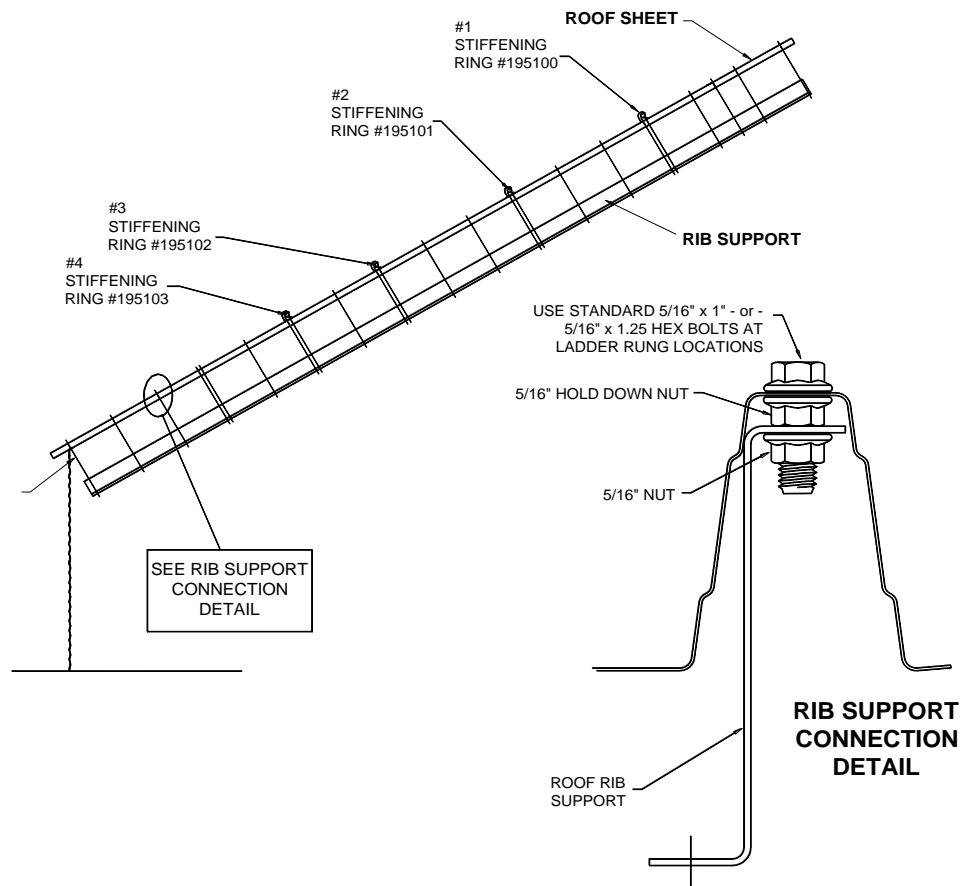
**Install Roof Rib Supports**

Rib supports are an upgrade that provides additional load capacity when required. Rib supports vary in length, depending on roof size and are designed to fit under the roof panel ribs and run along the length of the rib from the eave (at the bottom) to near the peak ring (at the top).

1. Install one rib support at each roof rib location:
  - a. Fit the rib support onto the shanks of the existing bolts used to join mating roof ribs.
  - b. Add a second nut to secure the rib supports to the ribs. (See





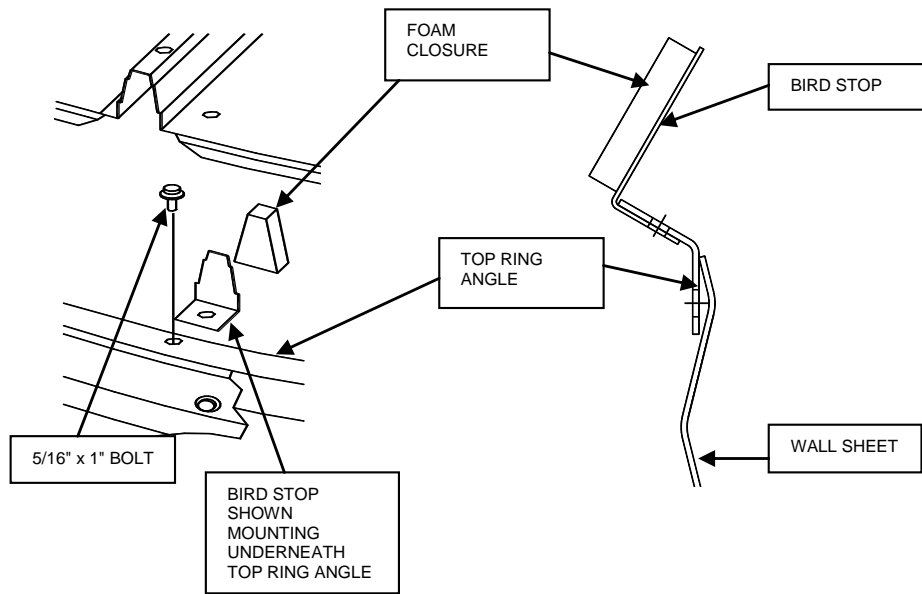
**Figure 11. Roof Rib Support Assembly**

(Drawing represents a non-specific example only)

### Install Bird Stops

Bird stops consist of a metal bird stop bracket, an adhesive backed foam closure and a nut and bolt.

1. Install bird stops at the bottom end of all roof panel ribs:
  - a. Best practice is to install bird stops before attaching the roof panels. (Easier access to bolts and aids with timing)
  - b. Install bird stops at locations that are five holes to the left or right of the roof panel center mounting holes in the top ring angle.
  - c. Best practice is to mount the bird stop under the top ring angle.

**Figure 12. Bird Stop Installation****Tip**

Mounting the bird stop under the top ring angle prevents it from turning when tightening the nut. Other methods of installing are acceptable.

**Install Associated Components**

1. Assemble roof cap, roof cap opener, ladders and associated components (if applicable).
  - See [Section 5.6. – Remote Roof Cap Opener Installation on page 30](#)
  - See [Section 5.3. – Roof Ladder Details on page 27](#)

## 5.3. Roof Ladder Details

1. Locate the roof panel containing the roof ladder components to the left or right of the inspection hatch, and in line with the outside ladder.
2. Recommended (for convenience): Attach the ladder and a section of the outside ladder early, when the roof section is at ground level.
3. Start at the bottom with the longest ladder rung supplied and move up the roof using progressively shorter ladder sections.
4. Bolt ladder rungs to the roof panel ribs using the pre-drilled holes in the ribs.
5. Use 5/16" x 1 1/4" hex bolts and hex nuts (bolts above and nuts underneath).

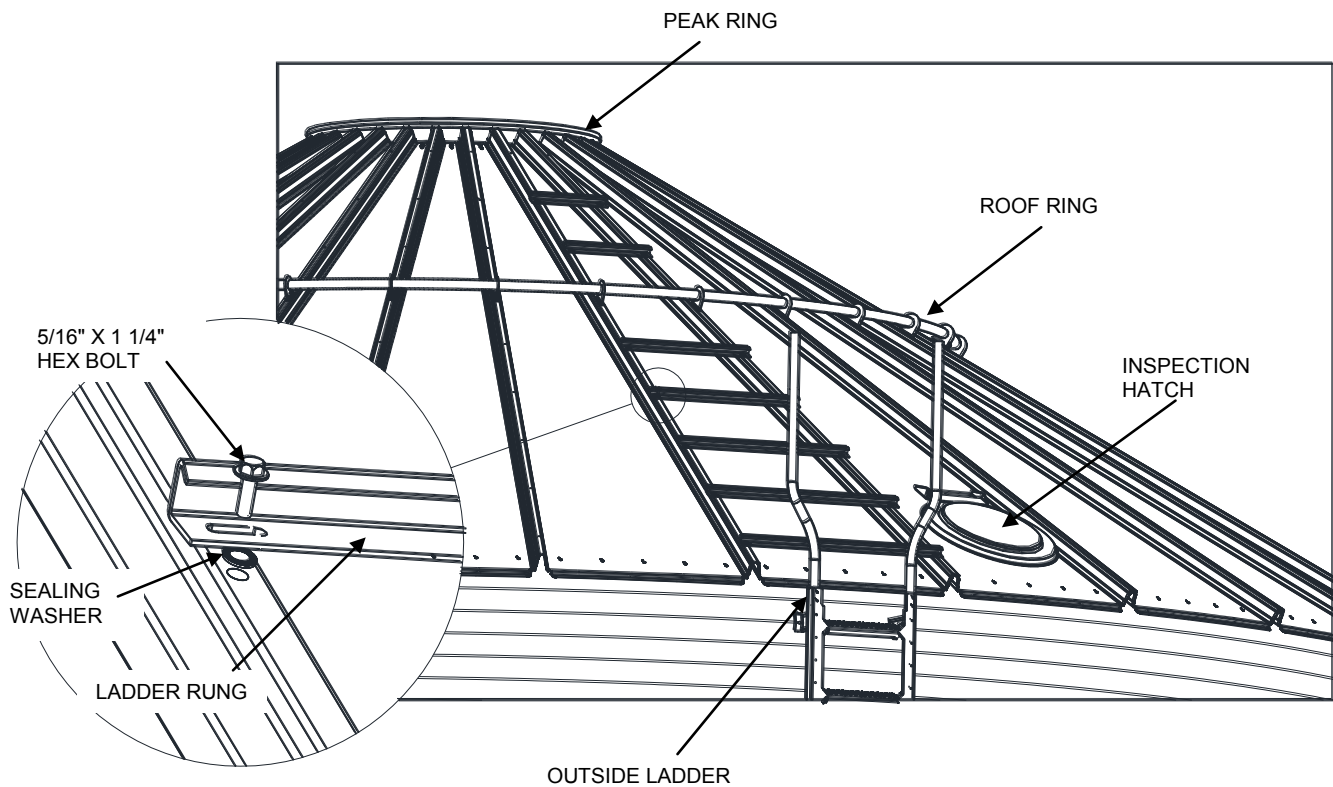
### Note

Make sure that a sealing washer is installed between the last part and the roof sheet.

### Note

The ladder rung is oriented with the vertical portion facing up towards the peak ring. When a ladder rung is located at a double hole pattern designed for a roof-ring element, bolt through the upper holes and fill the other hole with a 1" hex bolt. No ladder rung is used at a roof-ring location. The ring itself will serve as a step. This ladder rung can be discarded or saved for another job.

**Figure 13. Roof Ladder Details**

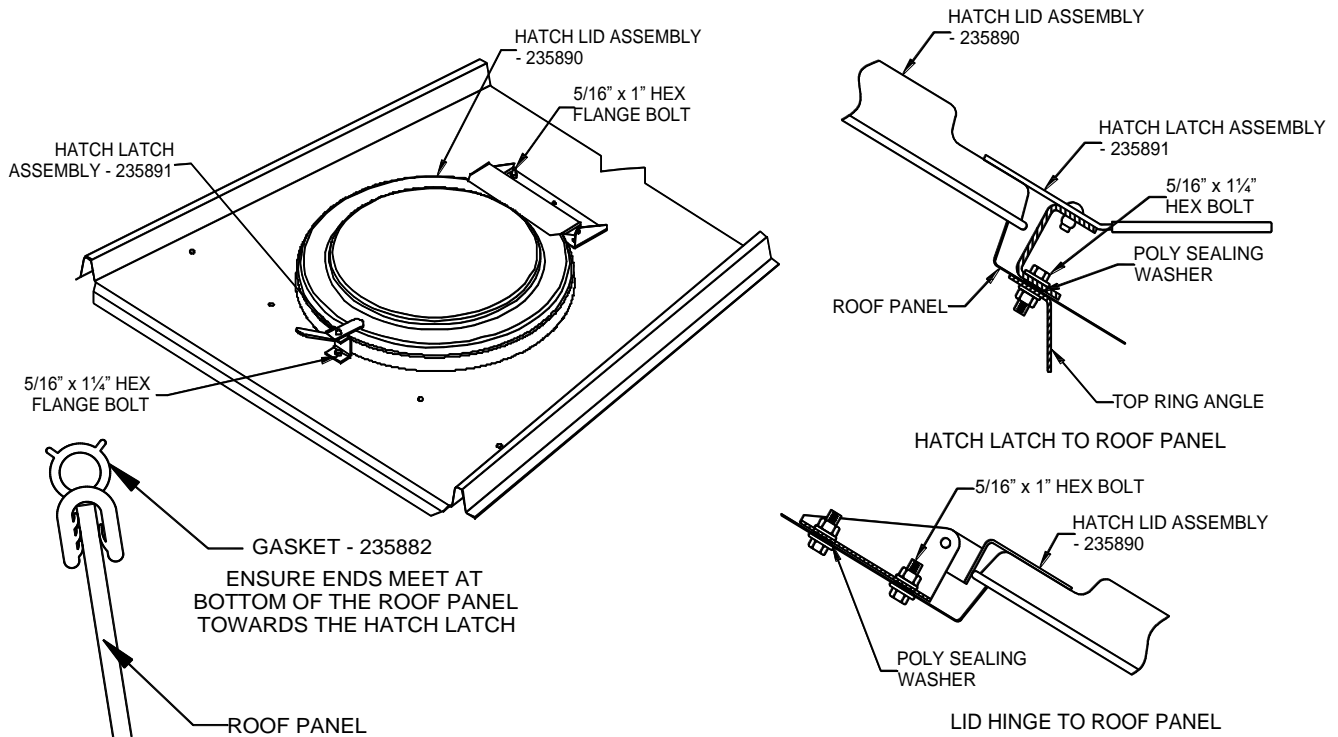


## 5.4. Inspection Hatch Details (15' — 54')

Installation of inspection hatch (15' to 54')

1. Place the inspection hatch gasket (235882) around the lip of the inspection hatch opening. Trim the gasket to fit if necessary.
2. Bolt on the hatch lid assembly (235890) with 5/16" x 1" bolts provided for the roof. For best sealing results, the bolt heads should be on the underside of the roof panel, with the sealing washers pressed against the roof panel.
3. Bolt on the latch assembly (235891) as shown below. The latch is positioned on the center hole of the roof panel and bolts through the top ring angle as shown.

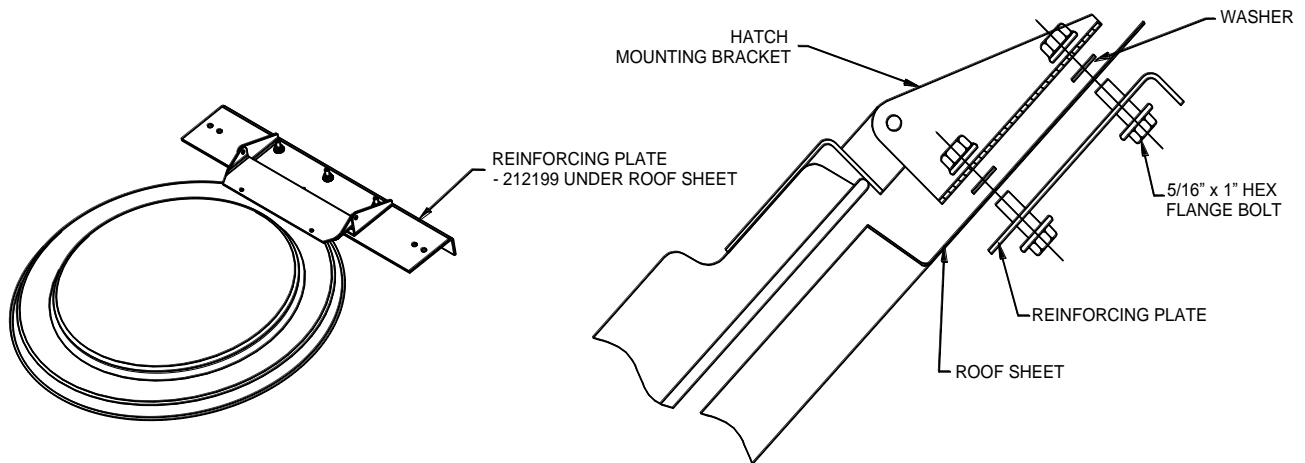
**Figure 14. Inspection Hatch Details**



## 5.5. Inspection Hatch Reinforcing Plate

1. For high wind applications, place the inspection hatch reinforcing plate under the roof sheet and secure with 5/16" x 1" hex flange bolts and nuts.
2. The flange on the plate must be located away from the hatch opening to minimize the possibility of interference or injury with inspector.
3. The four outermost mounting holes are used for extra stiffening when the roof sheet width permits. Field drill the roof sheet as needed.

**Figure 15. Inspection Hatch Reinforcing Plate Detail**

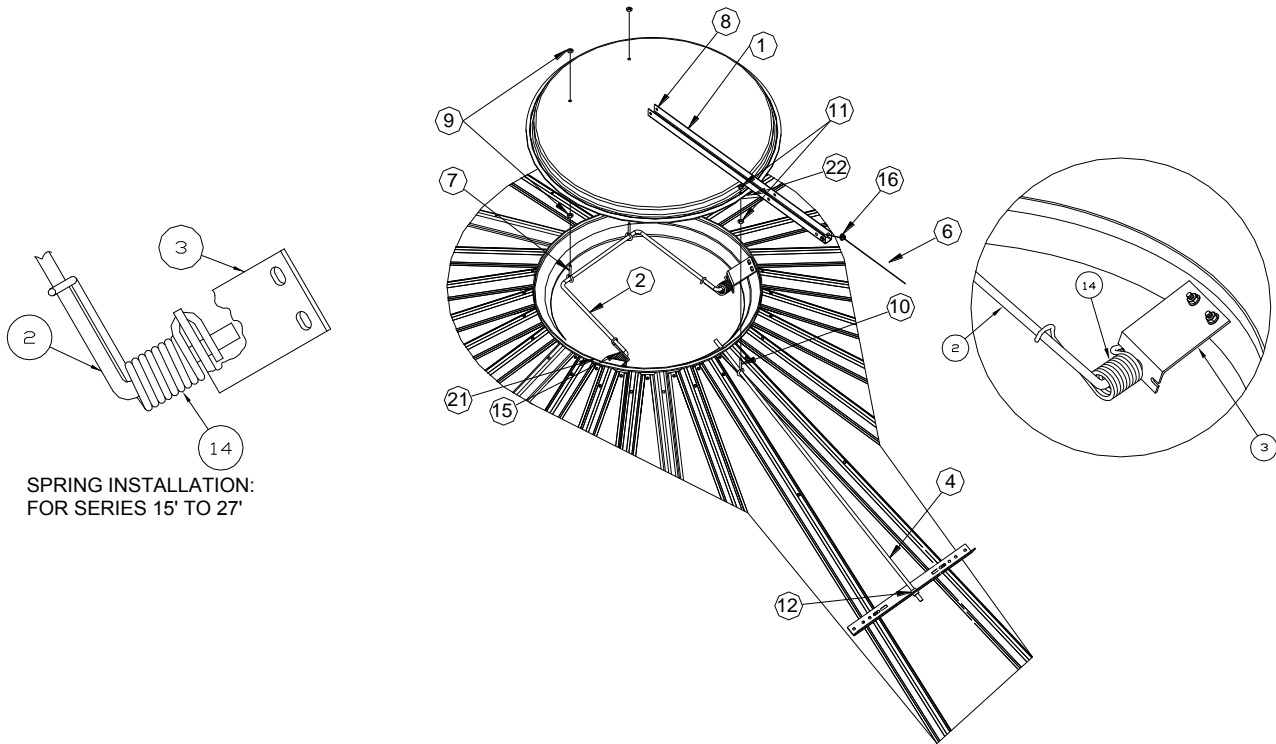


## 5.6. Remote Roof Cap Opener Installation

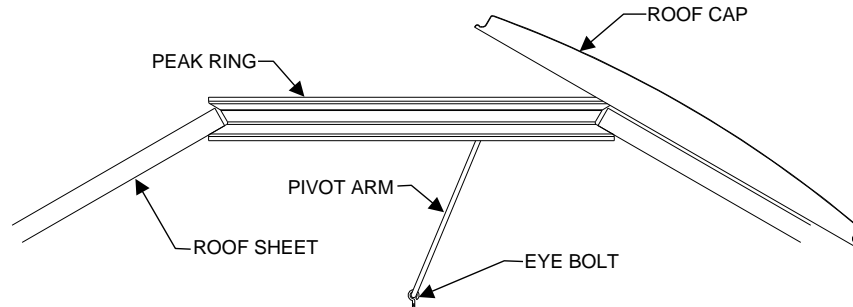
### 5.6.1 Remote Roof Cap Opener System for 15' – 27'

(Standard for 5 – 9 tier bins)

**Figure 16. Roof Cap, Pivot Arms and Bracket Detail**

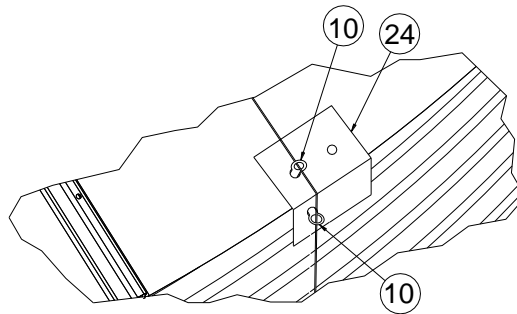


1. Bolt the pivot arm brackets (3) to the peak ring. (The brackets are interchangeable, right to left.)
2. Install the peak ring gasket (21) to the peak ring and trim to fit.
3. Slide two 5/16" eye-bolts (7) onto the pivot arm (2) and insert the end of the pivot arm through the spring and bracket
4. Clip the ends of the springs onto the pivot arm. (Lower the pivot arm down into the roof to make this easier.)
5. Bolt the rope arm (1) to the cap using a 5/16" x 3/4" bolt.
  - a. Bolt the rope arm bracket (22) to the cap with a 3/8" eye-bolt (10) and fasten the bracket to the rope arm.
  - b. Do not tighten the rod eye-bolt.
6. Pull the pivot arm up and insert a 2x4 across the peak ring and under the pivot arm.
7. Attach a nut to each pivot arm eye-bolt.
  - a. Make sure the nuts are threaded down to the end of the thread.
  - b. Place a cap over the eye-bolts and tighten the nuts on top.

**Figure 17. Roof Cap Assembly Detail****15'-48' REMOTE CAP OPENER PIVOT ARM INSTALLATION**

Once the eyebolts and the LH/RH springs are on the pivot arm, the best way to hook the 'legs' of the pivot arm into the bracket is to let the arm hang towards the ground to keep the springs 'loose' as the illustration shows. Caution must be used when bringing the pivot arm up when attaching it to the roof cap due to the force on the springs.

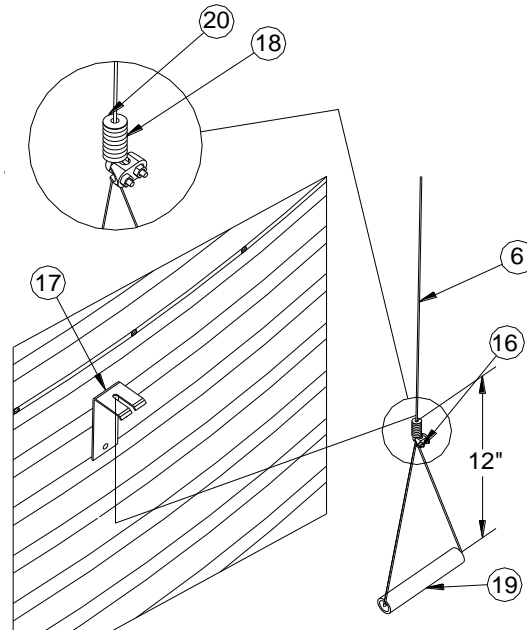
8. Fasten the slide rod angle (5) to the roof rib, three holes down from the top.
9. Insert the slide rod (4) through the eye-bolt in the roof cap and the large hole in the peak ring.
10. Fasten the slide rod (4) to the slide rod angle (5) with ½" nuts (12), one on each side of the angle.
11. Adjust the eye-bolt so the cap is supported on the slide rod (4) and tighten all the cap hardware.
12. Install a 3/8" eye bolt (10) and a guide plate (24) approximately on center of the roof sheet eave.
  - a. Thread the cable through the eye-bolt. Install a second 3/8" eye-bolt (10) on the down angle of the guide plate in line with the first eye-bolt.
  - b. Thread the cable through the second eye-bolt to fully align the cable over the guide plate down the bin.

**Figure 18. Guide Plate Detail**

13. Install the cleat hook (17) directly below the eave eye-bolt, approximately 7 to 8 ft above grade.
  - a. If the cleat position falls near a horizontal or vertical seam bolt, use this bolt to mount the cleat hook.
  - b. If not, drill a hole to suit.
  - c. Install a rubber washer behind the cleat to maintain a weather seal.
14. Thread the cable through the ¼" flange nut (20), the spring (18), and the PVC handle (19), in that order.
  - a. Pull the cable tight enough to just begin to open the bin cap.
  - b. Mark the spot on the cable that is even with the cleat hook when the cable is slightly in tension.
  - c. Loop the cable large enough to allow the handle to hang horizontally 12" down from the mark.
  - d. Push the nut and spring above the mark.

- e. Clamp the cable at the mark and trim.
- f. Insert a nut into the spring and position the spring on the top of the clamp.
- g. Position a second clamp approximately the diameter of the roof cap up the cable (36"), tightening it firmly enough to hold the cap in the open position.
- h. Adjust as required so that the cap is fully open in the open position.

**Figure 19. Cable and Handle Detail**

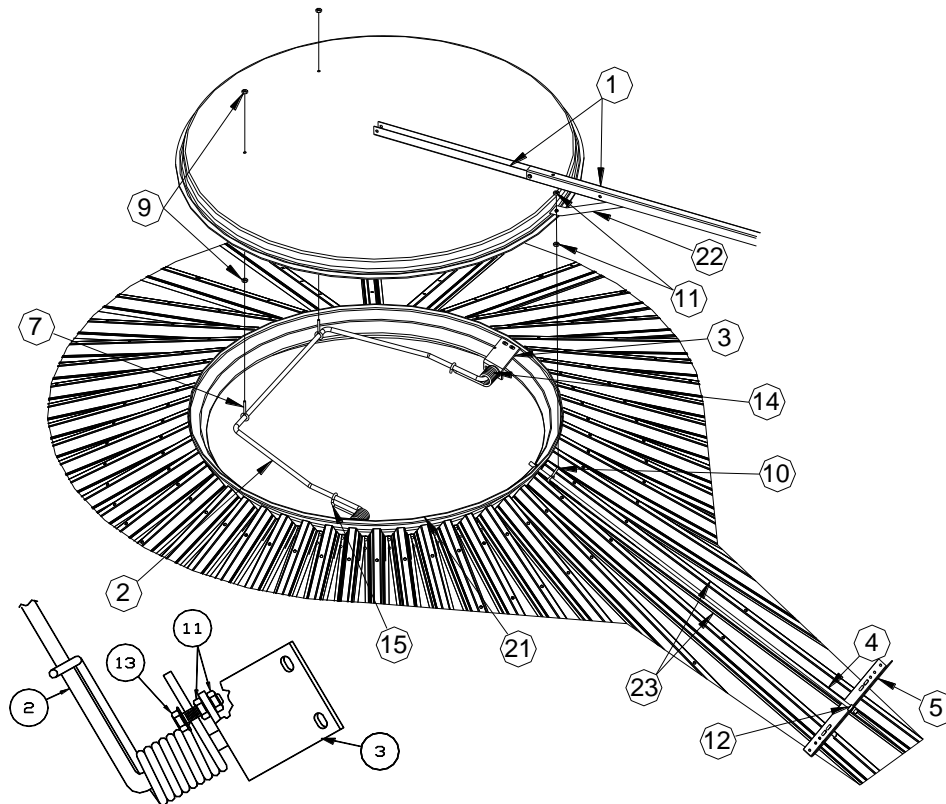




## 5.6.2 Remote Roof Cap Opener System for 30' — 48'

(Standard for 5 — 9 tier bins)

**Figure 20. Roof Cap, Pivot Arms and Bracket Detail**

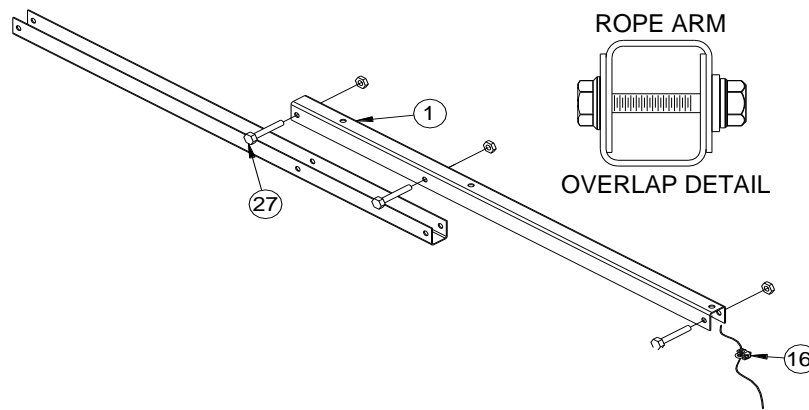


**NOTE: Double nut required on retainer bolt.**

1. Bolt the pivot arm brackets (3) to the peak ring. (The brackets are interchangeable, right to left.)
2. Install the peak ring gasket (21) to the peak ring and trim to fit.
3. Fasten a 3/8" x 1½" (13) bolt to the hole in the pivot arm bracket and hook the straight leg of the spring under the bolt. Double-nut the bolt as shown.
4. Slide two 5/16" eye-bolts (7) onto the pivot arm (2) and insert the end of the pivot arm through the spring and bracket
5. Slide the remaining spring (15) onto the pivot arm.
  - a. Fasten the remaining 3/8" x 1½" bolt to the other arm bracket.
  - b. Hook the other spring leg under the bolt.
6. Clip the ends of the springs onto the pivot arm. (Lower the pivot arm down into the roof to make this easier.)
7. Bolt the rope arm (1) to the cap using a 5/16" x 3/4" bolt.
  - a. Bolt the rope arm bracket (22) to the cap with a 3/8" eye-bolt (10) and fasten the bracket to the rope arm.
  - b. Do not tighten the rod eye-bolt.
  - c. Overlap the second rope arm using the 5/16" x 2" bolt (27).

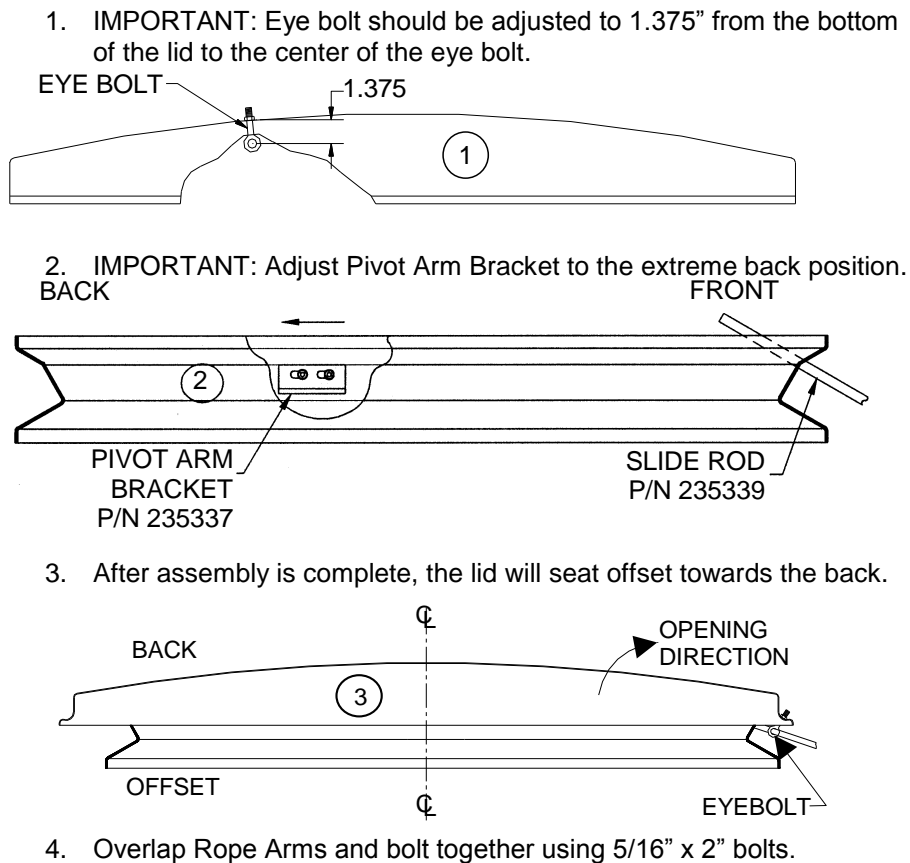
- d. Install a 5/16" x 2" bolt and nut to the end of the rope arms and fasten the cable (6) to bolt with a cable clamp (16).

**Figure 21. Rope Arm Detail**



- 8. Pull the pivot arm up and insert a 2x4 across the peak ring and under the pivot arm.
- 9. Attach a nut to each pivot arm eye-bolt.
  - a. Make sure the nuts are threaded down to the end of the thread.
  - b. Place a cap over the eye-bolts and tighten the nuts on top.

**Figure 22. Roof Cap Assembly Detail**



10. Remove the 2x4 and test the closing of the cap.

The roof cap should be offset toward the back (see [Section 5.3. – Roof Ladder Details on page 27](#)).

11. Adjust the pivot arm brackets (3), if necessary.

12. Fasten the slide rod angle (5) to the roof rib, four holes down from the top.

13. Insert the slide rod (4) through the eye-bolt in the roof cap and the large hole in the peak ring.

14. Fasten the slide rod (4) to the slide rod angle (5) with ½” nuts (12), one on each side of the angle.

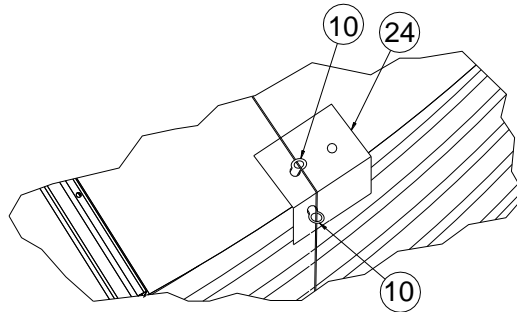
15. Adjust the eye-bolt so the cap is supported on the slide rod (4) and tighten all the cap hardware.

16. Fasten the guide rail (23) to the nearest roof sheet ribs on both sides of the slide rod (4).

17. Install a 3/8” eye bolt (10) and a guide plate (24) approximately on center of the roof sheet eave.

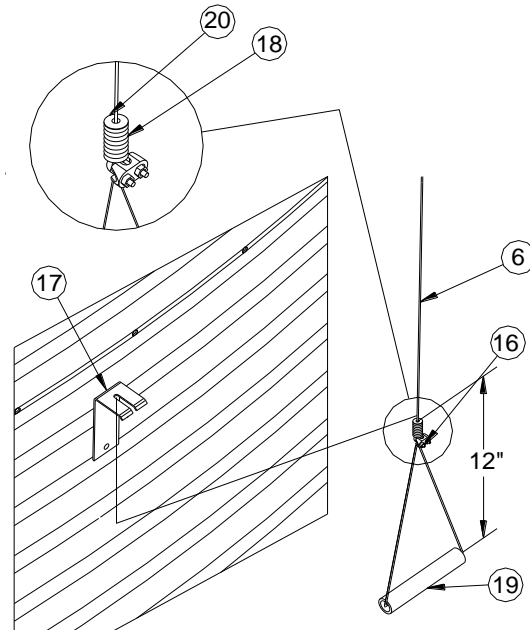
- a. Thread the cable through the eye-bolt. Install a second 3/8” eye-bolt (10) on the down angle of the guide plate in line with the first eye-bolt.
- b. Thread the cable through the second eye-bolt to fully align the cable over the guide plate down the bin.

**Figure 23. Guide Plate Detail**



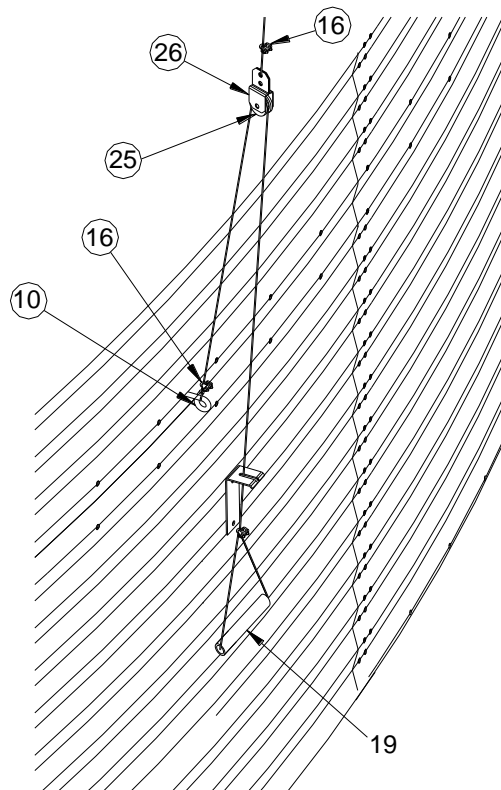
18. Thread the cable through the ¼” flange nut (20), the spring (18), and the PVC handle (19), in that order.

- a. Pull the cable tight enough to just begin to open the bin cap.
- b. Mark the spot on the cable that is even with the cleat hook when the cable is slightly in tension.
- c. Loop the cable large enough to allow the handle to hang horizontally 12” down from the mark.
- d. Push the nut and spring above the mark.
- e. Clamp the cable at the mark and trim.
- f. Insert a nut into the spring and position the spring on the top of the clamp.
- g. Position a second clamp at approximately 36” (the diameter of the roof cap) up the cable, tightening it firmly enough to hold the cap in the open position.
- h. Adjust as required so that the cap is fully open in the open position.

**Figure 24. Cable and Handle Detail**

19. Fasten the pulley (25) and pulley bracket (26) to the cable end approximately 10 ft. off grade.
  - a. Cut the remaining cable and thread it through the pulley brackets.
  - b. Fasten one end to the eye bolt (10) on the wall sheet and thread the other end of the cable through the ¼" flange nut (20), spring (18) and PVC handle (19).
  - c. Loop the handle and fasten it to the cable so that the handle hangs about 7 to 8 ft. above grade at a reachable height.
  - d. Trim the cable, leaving 6" extra above the clamp for final adjustment.
  - e. Pull the handle down so that the cap is in the fully open position.
  - f. Mark the handle clamp location on the wall sheet.
  - g. Drill and install the cleat hook at this position.
  - h. Install a rubber washer behind the cleat to maintain a weather seal.
  - i. Test to see if the cap is fully open when the cleat traps the handle, adjusting the height of the handle to fit.
  - j. When the proper handle height is firmly clamped, trim excess cable.
  - k. If desired, a rope can be tied to the handle and an eyebolt installed on the bin to tie off the handle when the lid is closed.

Figure 25. Cable Pulley Detail



### 5.6.3 Remote Roof Cap Material List

**Table 6. Remote Roof Cap Material**

Item	Description	15' – 27'		30' – 48'		51' – 54'	
		P/N	QTY	P/N	QTY	P/N	QTY
1	ROPE ARM	235218	1	235218	2	235218	2
2	PIVOT ARM	235333	1	235338	1	235338	1
3	PIVOT ARM BRACKET	235332	2	235337	2	235344	2
4	SLIDE ROD	212400	1	212401	1	212401	1
5	SLIDE ROD ANGLE	212402	1	212402	1	212405	1
6	CABLE	235798	1	235799	1	235799	1
*7	0.313 EYE BOLT	235018	2	235018	2	235018	2
*8	0.313 X 0.75 HFS c/w WASHER	193801	9	193801	10	193801	12
*9	0.313 HEX FLLK NUT (250)	235923	0.072	235923	0.092	235923	0.1
*10	0.375 EYE BOLT	150013	5	150013	5	150013	5
*11	0.375 HEX NUT (300)	235950	0.023	235950	0.04	235950	0.04
*12	0.50 HEX NUT	154201	2	154201	2	154201	2
*13	0.375 x 1.5 HFW (100)	-	-	235946	0.02	235946	0.02
*14	LEFT HAND SPRING (BLACK IN COLOR)	235012	1	235342	1	235342	1
*15	RIGHT HAND SPRING (RED IN COLOR)	235013	1	235341	1	235341	1
*16	1/8" CABLE CLAMP	235804	4	235804	5	235804	5
*17	CLEAT HOOK	235805	1	235805	1	235805	1
*18	COMPRESSION SPRING	235806	1	235806	1	235806	1
*19	ROPE HANDLE	235807	1	235807	1	235807	1
*20	1/4" DIA FLANGE NUT	154156	1	154156	1	154156	1
21	BULB GASKET	195149	1	195150	1	195150	1
22	ROPE ARM SUPPORT	235219	1	235220	1	235220	1
23	GUIDE RAIL	-	-	212403	2	212403	2
24	ROPE GUIDE PLATE	212404	1	212404	1	212404	1
*25	ROPE PULLEY	-	-	235224	1	235224	1
*26	ROPE PULLEY BRACKETS	-	-	235223	2	235223	2
*27	0.313 x 2.0 HFS c/w WASHER	234588	1	234588	4	234588	4

- Items 7 to 20 packaged in poly-bag, part number 235009 for 15' – 27'
- **Items 7 to 20, 25 to 27 packaged in poly-bag, part number 235335 for 30' – 48'**
- Items 1 to 17 packaged in poly bag, part number 235336 - 51' to 54'

### 5.6.4 Flat Roof Cap Assembly

Figure 26. Flat Roof Cap Assembly Detail

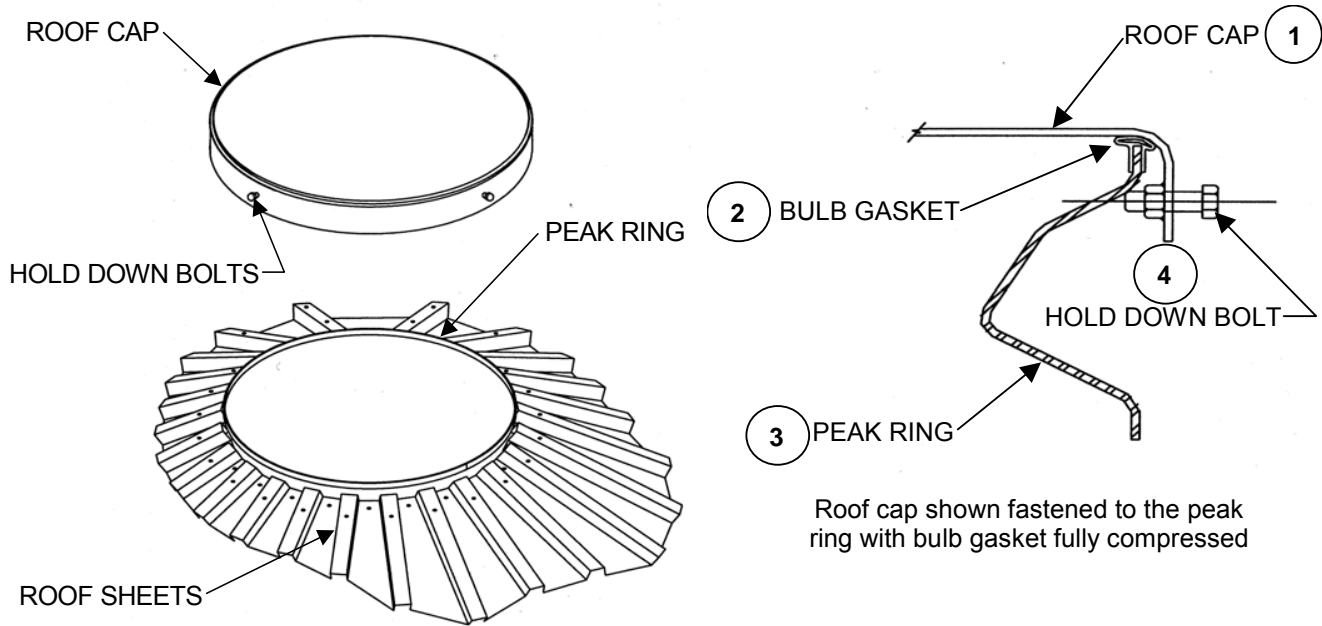


Table 7. Flat Roof Cap Part Numbers

Item	Description	Part No.	Used On
1	34" HEAVY DUTY FLAT CAP (for use with 33" peak ring)	195090	15' to 27' Bin
	53.5" HEAVY DUTY FLAT CAP (for use with 52" peak ring)	195087	30' to 48' Bin
	61.5" HEAVY DUTY FLAT CAP (for use with 60" peak ring)	195091	51' & 54' Bin
2	PEAK RING BULB GASKET 105" LONG	195149	15' to 27' Bin
	PEAK RING BULB GASKET 168" LONG	195150	30' to 48' Bin
	PEAK RING BULB GASKET 105" LONG	2x 195149	51' & 54' Bin
3	3/8" x 1 1/2" HEX FLANGE BOLT (supplied with the lid)	193797	All

1. Fasten the bulb gasket onto the top rim of the peak ring.
2. Trim to fit.
3. Place the roof cap on the peak ring with two of the hold down bolts, making sure they are clear of the roof ladder.
4. Locate bolts between the roof ribs.
5. Tighten the hold-down bolt opposite the roof ladder until approximately 3/8" of the bolt is protruding past the welded nut.
6. Tighten the two bolts near the roof ladder until the roof cap pulls down firmly and cannot be moved.
7. Tighten all other roof cap bolts similarly.
8. Ensure that the roof cap is fully secured around the peak ring.
9. For a non-structural roof that is supporting a catwalk, install six flat cap clips (213437) as shown in the Westeel catwalk manual 213440. These clips are provided in the Westeel catwalk peak support modules.







# 6. Appendix

## 6.1. Roof Parts Box Listing

Figure 27. Roof Parts Box Part Identification

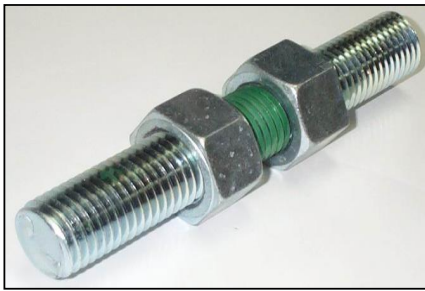
DESCRIPTION and PART NUMBER		15'	18'	21'	24'	27'	30'	33'	36'	39'	42'	45'	48'	51'	54'
		235760	235761	235762	235763	235764	235765	235766	235767	900170	235768	235778	235769	235777	235797
PEAK RING	VARIES	212201	212203	212204	212205	212206	212207	212208	212209	212210	212211	212212	212213	212214	212215
PEAK RING BULB GASKET 105"	195149	1	1	1	1	1								2	2
PEAK RING BULB GASKET 168"	195150						1	1	1	1	1	1	1		
PEAK RING FOAM 96"	212228	1	1	1	1	1								2	2
PEAK RING FOAM 160"	212229						1	1	1	1	1	1	1		
INSPECTION HATCH LID	235890	1	1	1	1	1	1	1	1	1	1	1	1	1	1
INSPECTION HATCH LATCH	235891	1	1	1	1	1	1	1	1	1	1	1	1	1	1
INSPECTION HATCH BULB GASKET 76"	235882	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BIRD STOP ANGLE	212230	15	18	21	24	27	30	33	36	39	42	45	48	51	54
FOAM for BIRD STOPS (set of 12)	212231	2	2	2	2	3	3	3	3	4	4	4	4	5	5
STIFFENING RING SPLICE 1.375"	195074								3	3	3	3	6	9	9
STIFFENING RING EXPANDER 1.375	195085								2	2	2	2	5	9	9
STIFFENING RING BRACKET	195062								36	39	42	45	96	153	162
STIFFENING RING GASKET – BAG 50	195080								1	1	1	1	2	4	4
LADDER RUNG 14.5 (6" CTR)	193062												1	1	1
LADDER RUNG 14.5 (8" CTR)	193063				1	1			1	1	1	1	1	1	1
LADDER RUNG 14.5 (10" CTR)	193064			1			1	1			1	1		1	1
LADDER RUNG 14.5 (12" CTR)	193065		1			1			1	1	1	1	1	1	1
LADDER RUNG 16.5 (14" CTR)	193066	1			1		1	1		1		1	1		1
LADDER RUNG 18.5 (16" CTR)	193067			1		1		1	1	1	1		1	1	1
LADDER RUNG 20.5 (18" CTR)	193068		1		1		1		1		1	1			1
LADDER RUNG 22.5 (20" CTR)	193069			1		1		1		1			1	1	1
LADDER RUNG 24.5 (22" CTR)	193070	1			1		1		1			1	1	1	
LADDER RUNG 26.5 (24" CTR)	193071		1			1		1			1	1			1
LADDER RUNG 28.5 (26" CTR)	193072			1			1	1		1	1	1		1	
LADDER RUNG 30.5 (28" CTR)	193073	1			1	1			1	1	1		1		1
LADDER RUNG 32.5 (30" CTR)	193074		1				1	1	1			1	1	1	1
LADDER RUNG 34.5 (32" CTR)	193075			1	1	1				1	1	1	1	1	1
LADDER RUNG 36.5 (34" CTR)	193076						1	1	1	1	1	1	1	1	1
LADDER RUNG 38.5 (36" CTR)	193077	1	1	1	1	1	1	1	1	1	1				
LADDER RUNG 40.5 (38" CTR)	193078											1	1	1	1
GRAIN GAUGE	194120														1
REFLECTIVE STRIP	194125														1
DOOR TIE BACK ASSEMBLY	236801	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SEALING CLIP for BOTTOM ANGLE	235372	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SELFDRIILL SCREW .25 x 1.0 – BAG 7	235151								1	1	1	1	1	2	2
BOLT HFS .313" x 1.00" GR8.2 – BAG 250	235914	1	1	1	1	2	2	2	3	3	4	5	5	6	6
BOLT HFS .313" x 1.00" GR8.2 – BAG 50	235915			2	4		1	4	1	4	1		2	1	3
BOLT HFS .313" x 1.25" GR8.2 – BAG 80	235916	1	1	1	1	1	2	2	1			3	1	3	2
BOLT HFS .313" x 1.25" GR8.2 – BAG 50	235917		1	1	1	1			2	4	4		3		2
HEX FLANGE NUT .313" – BAG 250	235923	1	1	1	2	2	3	3	4	4	5	5	6	7	7
HEX FLANGE NUT .313" – BAG 50	235925	1	2	4	1	3		2		3		4	2	1	4
WASHER POLY .313" – BAG 25	235929	1	1	1	1	1	1	1	1	1	1	1	1	1	2
FLAT WASHER .375 – BAG 75	235957	2					1	1	1	2		2		2	1
FLAT WASHER .375 – BAG 200	235956		1	1	1	1	1	1	1	1	2	1	2	1	2
MANUAL – ROOF NON STRUCTURAL	212454														1

Shaded items are not included in the parts box, rather they are shipped individually



## 6.2. Roof Parts Box Part Identification

Figure 28. Roof Parts Box Part Identification



195085 – Expander (1.375" Dia.)



195074 – Stiffening Ring Splice (1.375" Dia.)



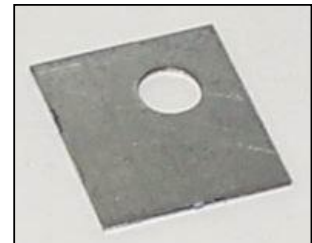
195062 – Stiffening Ring Bracket  
195080 – Stiffening Ring Gasket  
(Bag of 50)



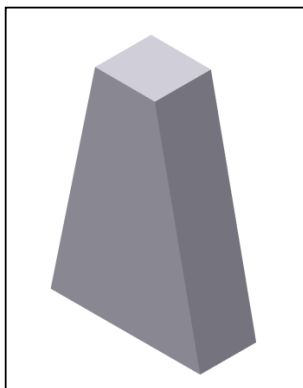
212228 – Foam Closure for Peak Ring  
(15' - 27')  
212229 -- Foam Closure for Peak Ring  
(30' - 48')



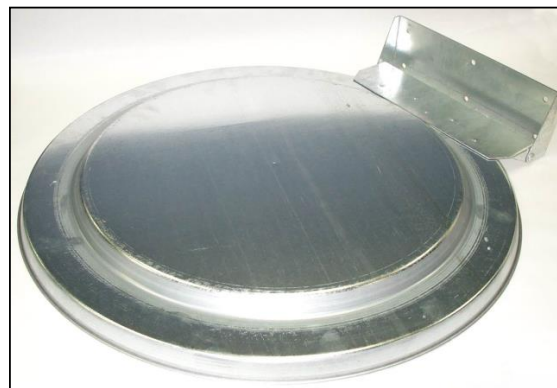
235891 – Inspection Hatch Latch  
Assembly



235372 – Sealing Clip for  
Bottom Ring Angle

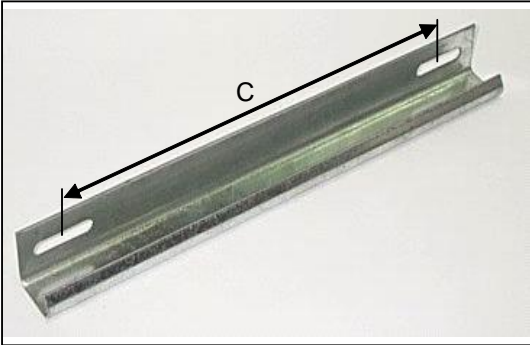


212231 – Foam Roof  
Rib Closure



235890 – Hatch Lid Assembly

**Figure 28 Roof Parts Box Part Identification (continued)**

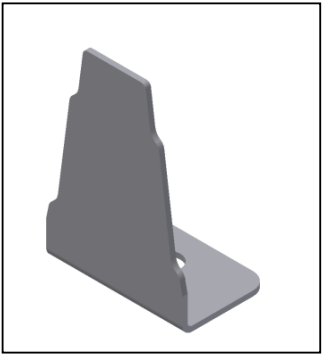


P/N	C
193061	4
193062	6
193063	8
193064	10
193065	12
193066	14
193067	16
193068	18
193069	20
193070	22

P/N	C
193071	24
193072	26
193073	28
193074	30
193075	32
193076	34
193077	36
193078	38

"C" Dimension Is In Inches

193060-79 – Roof Ladder Rung



212230 - Bird Stop



235882 – Inspection Hatch Bulb Gasket



195149 – Peak Ring Bulb Gasket (105")  
 195150 – Peak Ring Bulb Gasket (168")



## 6.3. Recommended Bolt Assembly

When tightening bolts, tighten the nut on the bolt until a “snug-tightened condition” has been achieved. A “snug-tightened condition” is defined in *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (Research Council on Structural Connections: June 2004), which states:








*“The snug-tightened condition is the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench to bring the connected plies into **firm contact.**”*

A properly tightened bolt will compress the sealing washer noticeably. All assembly crew members must be made aware of this requirement, and must know how to achieve a snug-tightened condition using common bin-building tools.

It is important that the bolts in the vertical wall sheet seams are tightened enough to squeeze the caulking and bring the wall sheet surfaces into firm contact with each other. This is especially important to monitor when installing bolts in temperatures approaching -10°C (14°F).

The following table shows the minimum impact gun torque capacity necessary to achieve a snug-tightened condition for bolts used in the assembly process.

**Table 8. Recommended Impact Gun Torque Values Capacity to Achieve Snug-Tightened Bolts**

Bolt Diameter	Bolt Grade	Grade Mark	Recommended Torque Capacity		
			in-lb	ft-lb	N-m
1/4"	Grade 8.2		75	6	8
5/16"	Grade 8.2		215	18	24
3/8"	Grade 8.2		370	31	42
7/16"	Grade 8.2		600	50	68
1/2"	Grade 8.2		960	80	108
5/8"	Grade 8.2		1800	150	203
3/4"	Grade 5		3230	269	365

For proper sealing, do not overtighten the wall seam connections. Sealing is not critical on upright splice connections; these connections should be tightened securely to prevent loosening.

Hold the bolt head securely when tightening the nut to prevent damage to the sealing washer.

### Important

#### **ALWAYS TIGHTEN THE NUT, NOT THE BOLT!**

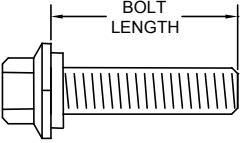
Avoid bin assembly at temperatures below -10°C (14°F) if possible. Erection in low temperatures does not ensure strong, well sealed connections. Do not substitute bolts in place of those supplied by Westeel.

## 6.4. Hardware Usage

### Important

Use 5/16" x 1¼" bolts provided in the bin parts boxes for the top ring angle to wall sheet connection.  
 Use 3/8" hardware at all other wall sheet connections as shown below. There may be a shortage of 3/8" bolts if used at the top ring angle connection.

**Table 9. Roof Hardware**

	5/16" x 1"	5/16" x 1¼"	5/16"	5/16"
	bolt (washer)	bolt (washer)	flange lock nut	poly washer
	193802	193803	193732	193806
Roof sheet rib to roof sheet rib	•		•	
Roof sheet to top ring angle	•		•	
Roof sheet to peak ring	•		•	
Stiffening ring bracket to roof sheet	•		•	
Stiffening ring bracket to ladder support to roof rib		•	•	
Ladder rung to ladder support to roof rib		•	•	
Ladder rung to roof rib		•	•	
<b>Top wall sheet to top ring angle</b>		•	•	
Bird stop to top ring angle	• (27'-48')		•	
Between ladder rung & ladder support or roof rib				•
Inspection hatch lid assembly to roof panel	•		•	
Inspection hatch latch to roof panel		•	•	



# 7. Limited Warranty: Westeel Grain Bin Products

Westeel – Ag Growth International ("Westeel") warrants products that it has manufactured and/or that are branded with its name (the "goods") subject to the following terms and limitations, (the "warranty"):

## Duration of Warranty

This warranty will run from the date of purchase from the dealer or distributor, authorized by Westeel. The duration of the warranty is limited as follows:

Galvanized Bins	5 years
EasyFlow2	24 months
Westeel Fans	36 months
Floors	12 months
Catwalk	12 months
Bulk Feed Tanks	24 months
<b>SeedStor-K Cones</b>	
Paint	12 months
Structural	30 months
<b>Elite Cones</b>	
Paint	30 months
Structural	10 years
<b>WESTEEL cones</b>	
Paint	No Warranty
Structural	12 months
<b>Smooth Wall Bins</b>	
Paint	60 months
Structural	10 years
<b>Commercial Smooth Wall Bins</b>	
Paint	12 months
Structural	10 years

## Limitation of Remedies Replacement

Within the warranty period, Westeel will replace the goods and/or original manufactured components thereof which are found, to Westeel's satisfaction, to be defective. Westeel is not responsible for direct, indirect, special, consequential, or any other damages of any kind, including personal injury to any individual, howsoever caused, including caused by transportation of the goods for repair or replacement.



### Procedure for Obtaining Service

In the event of a warranty claim, the purchaser must complete any and all information required by Westeel in order to properly assess or investigate the claim. Westeel will not be responsible for the removal of any of the goods found to be defective, or transportation charges to and from Westeel's authorized dealer or distributor, or for installation of any replacement goods and/or parts furnished under the warranty.

### Limitations as to Scope of Warranty

The warranty does not extend to defects or damage caused, in whole or in part, by:

1. use of a kind and/or to a degree not reasonably expected to be made of the goods;
2. improper storage of the goods both prior to and after purchase;
3. damage caused by, or in the course of, installation or assembly;
4. any use of the goods which is not an intended use as specified in Westeel's published product literature, or otherwise specified by Westeel in writing;
5. any equipment attached to or used in conjunction with the goods;
6. any field modifications or substitutions to original bin components;
7. inadequate ventilation or any other circumstance not in keeping with proper maintenance and/or use of the goods;
8. Acts of God, accident, neglect or abuse of the goods by the purchaser and/or any other individual or entity; or
9. Any use or installation inconsistent with Westeel's Standard Disclaimers.

### Limitations as to Manufacturer

The warranty does not cover products sold by Westeel that are not manufactured by Westeel. In those circumstances, the purchaser is referred to the manufacturer of those products.

### Limitation of Implied Warranties and Other Remedies

To the extent allowed by law, neither Westeel nor its dealers, nor any company affiliated with Westeel makes any warranties, representations, or promises as to the quality, performance, or freedom from defect of any Product covered by this Warranty.

**WESTEEL HEREBY DISCLAIMS, TO THE EXTENT APPLICABLE, ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. A PURCHASER'S ONLY REMEDIES IN CONNECTION WITH THIS WARRANTY ARE THOSE SET FORTH IN THIS WARRANTY. IN NO EVENT WILL WESTEEL, ITS DEALERS, OR ANY COMPANY AFFILIATED WITH WESTEEL BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES.**

Some jurisdictions do not allow waivers of certain warranties, so the above waivers may not apply to you. In that event, any implied warranties are limited in duration to ninety (90) days from delivery of the products. You may also have other rights which vary from jurisdiction to jurisdiction.

### Exclusive Warranty

This warranty is the only warranty provided by Westeel and all other warranties and/or commitments, whether express or implied and no matter by whom made, statutory or otherwise, are subsumed and replaced by it and are of no legal effect. If any provision of the warranty is held by a court of



competent jurisdiction to be void or unenforceable, in whole or in part, such provision shall be deemed severable and will not affect or impair the legal validity of any other provision of the warranty.







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