18’– 27’ Stormor Grain Bin

Installation and Storage Instructions

Original Instructions
New in this Manual

The following changes have been made in this revision of the manual:

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<th>Section</th>
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<tbody>
<tr>
<td>New manual</td>
<td>All sections</td>
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1. Introduction

This manual describes how to assemble a 18'– 27' Stormor Grain Bin.

Before assembling, 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

It is the grain bin assembler and installation personnel’s responsibility to read and understand ALL safety instructions, safety decals, and manuals and follow them when assembling, operating, or maintaining the equipment.

- Only experienced personnel who are familiar with this type of assembly and installation should perform this work. Untrained assemblers/installers expose themselves and bystanders to possible serious injury or death.

- Do not modify the grain bin in any way without written permission from the manufacturer. Unauthorized modification may impair the function and/or safety. Any unauthorized modification will void the warranty.

- Follow a health and safety program for your worksite. Contact your local occupational health and safety organization for information.

- Contact your local representative or Stormor if you need assistance or additional information.
2.3. Personal Protective Equipment

The following Personal Protective Equipment (PPE) should be worn when installing 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 as applicable.

2.5. Decal Installation/Replacement

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 grain bin and their messages are shown in the figure(s) that follow. Safe operation and use of the grain bin 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
SAFETY INSTRUCTIONS

- Read operator’s manual and all safety decals before assembling, using, or servicing bin.
- Close/latch all access doors when not in use.
- Do not alter or modify bin structure.
- Replace any damaged components only with factory made components.
- This bin should only be used to store free flowing, granular material, unless specifically designed and marked otherwise.
- When filling, use top filler cap and direct material to center of bin.
- Do not over-fill bin. Material should not be in contact with or place pressure on roof sheets.

WARNING

Never enter the bin when loading or unloading grain.

If you must enter the bin:
1. Shut off and lock out all power.
2. Use a lifeline, safety harness, and have an observer outside before entering the bin.
3. Wear proper breathing equipment or a respirator.
4. Avoid the center of the bin.

Failure to heed these warnings could result in serious injury or death.

ENTRAPMENT HAZARD

Keep clear of all augers. DO NOT ENTER this bin!

If you must enter the bin:
1. Shut off and lock out all power.
2. Use a safety harness and safety line.
3. Station another person outside the bin.
4. Avoid the center of the bin.
5. Wear proper breathing equipment or respirator.

Failure to heed these warnings could result in serious injury or death.
To prevent serious injury or death:

- Do not climb ladder if damaged, wet, icy, greasy, or slippery.
- Maintain good balance by having at least three points of contact at all times.

FALLING HAZARD

When equipped with aeration system, to prevent roof and/or bin damage:

- Use a minimum 1 square foot (0.1m²) opening for each 1000ft³/min (30m³/min) of air.
- Ensure all roof vents are open and unobstructed.
- Discontinue use of aeration fan if roof vents become obstructed with ice.

NOTICE

Part Number: 8110–0066

FALL RERAINT
ANCHOR POINT
MAX WORKING LOAD:
1,000 lb [453 kg]

SEE MANUFACTURER ROOF MANUAL FOR DETAILED INSTRUCTIONS REGARDING ANCHOR POINT LOCATIONS

Part Number: 8110–00136

Part Number: 8110–00066

Part Number: 8110–01090
3. Before You Begin

3.1. Bin Design and Capacity

Standard Stormor Grain Bins are designed for:

1. Non-corrosive free-flowing materials up to 55 lbs/ft³ (880 kg/m³) average compacted bulk density.
2. Maximum horizontal gusted wind speed of 94 mph (151 km/h).

**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**

<table>
<thead>
<tr>
<th>Size</th>
<th>Type of Roof</th>
<th>Load (lbs)</th>
<th>Load (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18' to 24'</td>
<td>non-structural</td>
<td>4000 lbs</td>
<td>1814 kg</td>
</tr>
<tr>
<td>27'</td>
<td>non-structural</td>
<td>5000 lbs</td>
<td>2268 kg</td>
</tr>
</tbody>
</table>

   b. Roof Snow Loads (RSL) – at the above stated standard peak loads, standard RSLs vary with diameter and range from 21 psf (102 kg/m²) to 45 psf (220 kg/m²). *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 x RSL. In Europe GSL = 1.25 x 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

<table>
<thead>
<tr>
<th>Bin Series</th>
<th>Std Peak Load</th>
<th>Standard Roof</th>
<th>Plus Upgrade 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs (kN)</td>
<td>psf</td>
<td>kPa</td>
</tr>
<tr>
<td>18</td>
<td>4000 (17.8)</td>
<td>45</td>
<td>2.15</td>
</tr>
<tr>
<td>21</td>
<td>30</td>
<td>1.44</td>
<td>49</td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td>1.15</td>
<td>39</td>
</tr>
<tr>
<td>27</td>
<td>5000 (22.2)</td>
<td>24</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Table 3. Maximum Roof Snow Load at UPGRADED Peak Load

<table>
<thead>
<tr>
<th>Bin Series</th>
<th>Upgraded Peak Load</th>
<th>Standard Roof</th>
<th>Plus Upgrade 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs (kN)</td>
<td>psf</td>
<td>kPa</td>
</tr>
<tr>
<td>18</td>
<td>8000 (35.6)</td>
<td>29</td>
<td>1.39</td>
</tr>
<tr>
<td>21</td>
<td>24</td>
<td>1.15</td>
<td>40</td>
</tr>
<tr>
<td>24</td>
<td>17</td>
<td>0.81</td>
<td>27</td>
</tr>
<tr>
<td>27</td>
<td>10000 (44.5)</td>
<td>19</td>
<td>0.91</td>
</tr>
</tbody>
</table>

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.
3. For peak load between standard and upgrade limits, a straight line interpolation can be used to determine maximum roof snow load.
4. Higher level upgrade kits include all components from lower level kit; only one upgrade kit needs to be ordered for any given bin.

3.1.2 Roof Snow Load vs. Ground Snow Load

The Roof Design Capacity tables reflect roof snow load (RSL) values. These are design values. Often, comparisons are made to ground snow values (GSL). These are not the same. The conversion from GSL to RSL varies between jurisdictions and is governed by building codes:

- In the United States, for grain bins, GSL = RSL x 2
- In Europe, for grain bins, GSL = RSL x 1.25
- In Canada, for grain bins, the GSL/RSL conversion varies with every location across the country. However, for comparison purposes, the US conversion can be used as an approximation.

Therefore, when comparing against competitive GSL values in the US, double the above values. When comparing against competitive GSL values in Canada, double the above values for a reasonably close approximation.
3.2. Guidelines for Supporting Catwalks and other External Loads on Stormor

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. Stormor 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 Peak Rings

1. The allowable vertical peak load to any Stormor 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 Stormor 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-Stormor peak support structure is used. A non-Stormor 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 Stormor 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 Stormor.

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. Stormor 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

Unless otherwise specifically provided in writing, Stormor 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)
3. Before You Begin

- Bin assembly (Stormor recommends the use of qualified bin installers; contact Stormor 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

The recommendations for assembling and installing Stormor 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/ft³ (880 kg/m³).

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

3.6. Cutting Openings in Stormor Grain Bins

This section provides instructions for cutting openings to accommodate fan transitions, unloading augers and roof vents.

General Rules for Cutting openings

1. Never cut any uprights, roof ribs, or wall sheet bolted vertical seams to create an opening.
2. Openings shall be located so equipment being installed won't interfere with any bin components/accessories.
3. Openings shall be minimized as much as possible for structural integrity of grain bins.
4. Corners in openings shall be cut with minimum radius of 1/8" to reduce stress concentration.
5. Openings shall be sealed all the way around for all weather conditions.
6. Instructions shall be followed closely to avoid damage to bin structure.
7. Except cutting openings described below, any other modification to Stormor bins shall be approved by a professional engineer.

Openings for Roof Vents in Roof Sheets

1. Openings shall be centered between roof ribs and have 2.5" minimum distance between edge of opening and base of a roof rib.
2. Openings can be square, rectangular, or round.
3. Openings shall be the same size as the inlet opening of a vent being installed.
4. Any side of a square/rectangular opening shall have a maximum length of 18" and a circular opening shall have a maximum diameter of 24".
3.7. 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 grain bin installation.

2. Design and build foundations with the necessary strength for the loads they must support, and for local soil conditions. Stormor 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 grain bin 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.

3.8. Product Storage

**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.

4. 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 16.)
- Store curved wall sheets ‘hump-up’. (See Detail A in Figure 2 on page 16.)
- 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 16.)
- Roof sheets must be elevated at least 12" at the small end of the sheets. (See Detail B in Figure 2 on page 16.)
- Temporary storage can be provided by erecting a simple framework supporting a waterproof tarp. (See Detail C in Figure 2 on page 16.)
- 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

1. 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 16.)

2. Any boxed parts that become wet should be dried and stored in a new box that is free of moisture.

3. 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, Stormor does not recommend the use of oil on other parts such as roof sheets and safety ladders.

3.9. 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.

### 3.10. Important Notes

- Stormor 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.
- 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 3.7 – Critical Assembly Requirements on page 15 for mandatory siting and assembly requirements.
- Store only non-corrosive, free-flowing materials up to 55 lbs/ft³ (880 kg/m³) average compacted density in Stormor 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 grain bin.
- 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 (Stormor logo, fall restraint brackets, Grain Gauge, unloading devices, outside ladder etc.).
      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. Trim to fit.
   b. Install the foam closure gasket around the center section of the peak ring. Trim to fit.

Refer to Figure 3 on page 20.
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 20.

   **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>
<thead>
<tr>
<th>Nominal Bin Dia.</th>
<th>Scribe Radius</th>
<th>Top of Peak Ring Height “H” with 1 tier of wall sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ft)</td>
<td>(ft in)</td>
<td>(ft in)</td>
</tr>
<tr>
<td>18</td>
<td>8'10-11/16&quot;</td>
<td>2.710</td>
</tr>
<tr>
<td>21</td>
<td>10'4-9/16&quot;</td>
<td>3.164</td>
</tr>
<tr>
<td>24</td>
<td>11'10-1/2&quot;</td>
<td>3.619</td>
</tr>
<tr>
<td>27</td>
<td>13'4-3/8&quot;</td>
<td>4.074</td>
</tr>
</tbody>
</table>
Assemble the Top Tier of Wall Sheets
1. Assemble a single tier of wall sheets.
2. Refer to the Appendix for information on proper hardware usage.
3. 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.

   Note
   Correcting for roundness becomes much more difficult the longer you wait.
4. When setting jacks, make sure they are also set round and that they are anchored to the concrete.

Install the Top Ring Angle Sections

Important
Read and fully understand the following instructions before attaching the top ring angles to the top of the wall sheets. There are timing considerations for the inspection hatch, outside ladder, inside ladder, and other components.

1. Attach the top ring angle to the inside top of the wall sheets.
   a. Do not align the top ring angle joints with wall sheet joints.
   b. Make sure that the top ring angle joints are at least two or three wall sheet holes away from the Grain Gauge cutout.
   c. If building a stiffened bin, do not install the top angle bolt that lines up with the stiffener holes at this time. It needs to be installed with the stiffeners.
2. There are six pairs of vertically aligned circular and square holes in the top ring angle. (See Figure 4 on page 22)
   a. These are used to attach the center holes at the bottom of the roof sheets to the top ring angle. This locks in the correct centering location of the roof sheets, which is important for locating roof accessories such as the inspection hatch, roof ladder, roof stairs, etc.
   b. Whichever pair of vertically aligned circular or square holes you choose to attach the first roof sheet center hole to, the next pair of vertically aligned circular or square holes over, to the left or right, will be used as a Bird Stop location. (See Figure 4 on page 22)
   c. The next pair of vertically aligned circular or square holes over from the Bird Stop location, will be another roof sheet center hole location.
   d. This pattern will repeat all the way around the bin.

   Note
   To make timing easier of other parts, and accessories on the bin, best practice is to mark all important locations on the top angle using a marker.
3. Because the inspection hatch is in the center of the roof sheet, the inspection hatch will be centered on one set of the vertically aligned circular or square holes.
   a. If this bin is equipped with an inside ladder, center the inspection hatch above the inside ladder.
   b. Do not align the inside ladder with stiffeners.
   c. Do not attach inside ladder brackets at stiffener locations or vertical seams.
4. The slots in the top ring angle align with the other non-center holes in the roof sheet.

   **Note**
   If using bin jacks through the top ring angle, jack bolts will need to be longer. Knowing jack placement before attaching the top ring angles will eliminate the need for replacing bolts.

   **Figure 4. Top Ring Angle Timing Details**

**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 5. 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 the Peak Ring**
1. Determine the correct peak ring height \( H \) for the bin size from Table 4 on page 20.
2. Attach the peak ring assembly to the top of the center post at the correct height for the bin being assembled.

**Figure 6. 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 7 on page 24.)
   - This will stabilize and support the peak ring for the rest of the install.
Figure 7. 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 ribs 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 either the vertically-aligned round or square holes in the top ring angle. This locks in the correct centering location for the roof sheet. The other non-centre holes in the bottom of the roof sheet align with the round slots 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. 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 8 on page 25.)
**Figure 8. 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 8 on page 25.)

5. 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**

Stormor 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 9. Roof Vent Assembly**

6. Install inspection hatch roof panel where required. The inspection hatch can be pre-assembled if desired. (See Section 5.7 – Inspection Hatch Details on page 36.)
7. Install the roof ladder on the roof sheet to the left of the inspection hatch. (See Section 5.3 – Roof Ladder Details on page 30.)

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 28 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 10 on page 26.)

Figure 10. Roof Stiffening Rings Installation

   Offset roof ring joints more than one roof sheet over

   Do not position roof ring joints on a roof sheet that has a ladder rung

   Do not position temperature cable support on a roof sheet that has a roof ring joint

   Do not position more than one roof ring joint on the same roof sheet

   Do not position more than one roof ring joint on the same roof sheet

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.
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. Remove one nut from the ring expander, slide the ring expander retaining clip onto the threaded portion against other nut. Thread removed nut back on. (See Figure 11 on page 27).

h. 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 11 on page 27.)

i. Thread both nuts toward the center.

   The green paint on the threaded portion indicates the center.

j. 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 11. Stiffening Ring Connection**

**Figure 12. Stiffening Ring Connection (side view)**

2. Tighten the roof hardware.

3. 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 12 on page 27.)

4. Slide retaining clip against one nut, bend clip over nut and flat against stiffening ring. Secure the retaining clip to the stiffening ring with a self drilling screw. (See Figure 12 on page 27.)

5. Install u-bolts into stiffening ring brackets, tighten the u-bolts until stiffening ring is pulled tight against the brackets. (See Figure 13 on page 28.)

Figure 13. Stiffening Ring Bracket Assembly

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

<table>
<thead>
<tr>
<th>Table 5. Roof Reinforcing Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component →</td>
</tr>
<tr>
<td>Location &amp; Colour →</td>
</tr>
<tr>
<td>Chord length (in) →</td>
</tr>
<tr>
<td>Qty of Expanders →</td>
</tr>
<tr>
<td>Bin Series</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>21</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>27</td>
</tr>
</tbody>
</table>
| Notes: • Roofs are supplied as standard or with optional upgrades for higher load capacity

<- standard components for all roofs

<- optional components supplied with roofs upgraded to level 1

Install Roof Rib Supports

Rib supports are an upgrade that provide additional load capacity when required. Rib supports vary in length, depending on roof size and are designed to fit under the roof panel ribs. They 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 Rib Support Connection Detail in Figure 14 on page 29.)

**Figure 14. Roof Rib Support Assembly**

(Drawing represents a non-specific example only)

**Install Associated Components**

1. Assemble bin entry anchor system, roof cap, roof cap opener, ladders and associated components (if applicable).
   - See Section 5.3 – Roof Ladder Details on page 30
   - See Section 5.4 – Remote Roof Cap Opener Installation on page 31
   - See Section 5.5 – Bin Entry Anchor System: Non-Structured Roof on page 34
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 roof ladder and a section of the outside ladder early, when the roof section is at ground level.

3. Start at the bottom of the roof with the longest ladder rung supplied and move up the roof using progressively shorter ladder rungs.

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 STL/NEO sealing washer is installed between the ladder rung 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 holes 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 15. Roof Ladder Details
5.4. Remote Roof Cap Opener Installation

5.4.1 Remote Roof Cap Opener System for 18' – 27'
(Standard for 7 — 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. Slide two 5/16" eye-bolts (10) onto the pivot arm (2) and insert the end of the pivot arm through the spring
   bracket and push nut (19).
3. Clip the ends of the springs onto the pivot arm. (Lower the pivot arm down into the roof to make this
easier.)
4. Bolt the rope arm (1) to the cap using a 5/16" x 3/4" bolt.
   a. Bolt the rope arm bracket (7) to the cap with a 3/8" eye-bolt (13) and fasten the bracket to the rope
      arm.
   b. Do not tighten the rod eye-bolt.
5. Pull the pivot arm up and insert a 2x4 across the peak ring and under the pivot arm.
6. 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

18'-27' 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.

7. Fasten the slide rod angle (5) to the roof rib, three holes down from the top.
8. Insert the slide rod (4) through the eye-bolt in the roof cap and the large hole in the peak ring.
9. Fasten the slide rod (4) to the slide rod angle (5) with ½" nuts (15), one on each side of the angle.
10. Adjust the eye-bolt so the cap is supported on the slide rod (4) and tighten all the cap hardware.
11. Install a 3/8" eye bolt (13) and a guide plate (8) approximately on center of the roof sheet eave.
   a. Thread the cable through the eye-bolt. Install a second 3/8" eye-bolt (13) 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

12. Install the winch handle to the winch arm.
13. Fasten the winch bracket to the wall sheet directly below the guide plate about 3 to 4 ft above grade using two screws included in the winch package and two 5/16" washers.
14. Thread the aluminum lug from the winch package through the cable.
15. Thread the cable through the holes of the winch spool.
   a. Pull the cable tight enough to just begin to open the bin cap.
   b. Fasten the cable lock screw into the winch spool hole.
   c. Trim excess cable.
16. Turn the winch handle until the roof cap is in the opened position and not obstructing the peak opening while ensuring the aluminum lug does not get wound into the spool with the cable. Turning the winch handle past this point may weaken the pivot arm springs’ ability to pull the roof cap to closed position.

17. Crimp the aluminum lug about 2” above the spool onto the cable using vice grips.

18. Snap together the two open indicators onto the aluminum lug with the narrow ends facing up.

Figure 19. Winch Detail

5.4.2 Remote Roof Cap Material List

Table 6. Remote Roof Cap Material

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>18’ — 27’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P/N</td>
</tr>
<tr>
<td>1</td>
<td>ROPE ARM</td>
<td>235218</td>
</tr>
<tr>
<td>2</td>
<td>PIVOT ARM</td>
<td>235333</td>
</tr>
<tr>
<td>3</td>
<td>PIVOT ARM BRACKET</td>
<td>235332</td>
</tr>
<tr>
<td>4</td>
<td>SLIDE ROD</td>
<td>212400</td>
</tr>
<tr>
<td>5</td>
<td>SLIDE ROD ANGLE</td>
<td>212402</td>
</tr>
<tr>
<td>6</td>
<td>CABLE</td>
<td>235798</td>
</tr>
<tr>
<td>7</td>
<td>ROPE ARM SUPPORT</td>
<td>235219</td>
</tr>
<tr>
<td>8</td>
<td>ROPE GUIDE PLATE</td>
<td>212404</td>
</tr>
<tr>
<td>9</td>
<td>WINCH ASSEMBLY</td>
<td>235820</td>
</tr>
<tr>
<td>*10</td>
<td>0.313 EYE BOLT</td>
<td>235018</td>
</tr>
<tr>
<td>*11</td>
<td>0.313 X 0.75 HFS c/w WASHER</td>
<td>193801</td>
</tr>
<tr>
<td>*12</td>
<td>0.313 HEX FLLK NUT (250)</td>
<td>235923</td>
</tr>
<tr>
<td>*13</td>
<td>0.375 EYE BOLT</td>
<td>150013</td>
</tr>
<tr>
<td>*14</td>
<td>0.375 HEX NUT (300)</td>
<td>235950</td>
</tr>
<tr>
<td>*15</td>
<td>0.50 HEX NUT</td>
<td>154201</td>
</tr>
<tr>
<td>*16</td>
<td>LEFT HAND SPRING (BLACK IN COLOR)</td>
<td>235012</td>
</tr>
<tr>
<td>*17</td>
<td>RIGHT HAND SPRING (RED IN COLOR)</td>
<td>235013</td>
</tr>
<tr>
<td>*18</td>
<td>1/8” CABLE CLAMP</td>
<td>235804</td>
</tr>
<tr>
<td>*19</td>
<td>PUSH NUT</td>
<td>236847</td>
</tr>
<tr>
<td>*20</td>
<td>0.313 X 2.0 HFS c/w WASHER</td>
<td>234588</td>
</tr>
</tbody>
</table>

*Items 10 to 20 packaged in poly-bag, part number 300120 for 18’ – 27’
5.5. Bin Entry Anchor System: Non-Structured Roof

Important
The fall restraint bracket is rated for a maximum load of 2,000 lbs. The bin owner and user are responsible for correctly installing, using, and operating the Bin Entry Anchor System. The rope, pulley, and harness are not supplied by Stormor.

**WARNING** Failure to install correctly as instructed below may result in serious injury or death.

1. Install fall restraint bracket under peak ring as shown. Make sure to bolt the fall restraint bracket to the roof sheet with the inspection hatch cut out. (See Figure 20 on page 34.)

![Figure 20. Installing the fall restraint bracket](image)

2. Bolt the second fall restraint bracket to the upright splice. Then bolt the upright splice along the top wall sheet horizontal seam with the wind ring clips, sandwiching the load spreader tube and rubber pads as shown. (See Figure 21 on page 35.)

   a. Field drill holes as needed on the wall sheet and top angle for the wind ring clip connections. Washers must be sandwiched between the wind ring clips and the wall sheet for sealing. (See Figure 21 on page 35.)

   b. The load spreader tube and upright splice can be installed off center between the uprights for better reachability from the inspection hatch. Do not install the load spreader tube between a vertical wall sheet seam. (See Figure 21 on page 35.)
3. Place the Fall Restraint Anchor Point Decals (PN 8110-01090) on the bin, see Section 2.5 – Decal Installation/Replacement on page 7 and Section 2.6 – Safety Decal Locations and Details on page 8 for installation instructions and placement.

5.6. Lifting Stormor Bins with Cranes

The table below lists the maximum height and weight limits for each diameter of bin which Stormor approves for lifting by the roof using a crane. These limits assume that the total lifted load is evenly distributed around the peak ring, through the use of a lifting tripod or similar device of adequate strength. Any bin exceeding EITHER the height or weight limit MUST be lifted using jacks or similar method which supports the wall sheets directly.

These limits are critical. Failure during lifting carries the risk of serious injury or death.

Table 7. Lifting Weights for Various Bin Sizes

<table>
<thead>
<tr>
<th>Bin Diameter</th>
<th>Maximum Tier Height</th>
<th>Approximate Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>18’</td>
<td>9</td>
<td>5,200 lbs</td>
</tr>
<tr>
<td>21’</td>
<td></td>
<td>9,000 lbs</td>
</tr>
<tr>
<td>24’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27’</td>
<td></td>
<td>11,000 lbs</td>
</tr>
</tbody>
</table>

Important Safety Notes

- Limits above are based on safe lifting of the bin only. They are not based on design factors for lifting people or objects over people. Adequate safety blocks or supports must be used when working under or near the bin wall.
- Extreme caution must be used when lifting bins more than a few inches, as occurs when mounting bins on hoppers. “Bouncing” of the load and/or wind gusts can add significantly to the loads on the roof and could cause overloading and/or failure.
- Please refer to any additional capacity information, lifting instructions, and safety information provided by the crane manufacturer.
5.7. Inspection Hatch Details

Installation of inspection hatch

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 22. Inspection Hatch Details
5.8. 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 23. Inspection Hatch Reinforcing Plate Detail

5.9. Grain Gauge Installation and Operation

The Grain Gauge™ is a clear polycarbonate unit that shows when the grain level reaches the top of the sidewall. The highly reflective tape is visible at night when a light is directed at it. When you can no longer see this reflective tape - the Grain Gauge™ is full and the grain auger should be shut off. The Grain Gauge™ and reflective strip comes packaged in the parts box.
If the Grain Gauge Cutout IS Present

The cut-out for the Grain Gauge is located in a separate top tier wall sheet.

1. Position the sheet with the cutout for maximum benefit (usually facing the direction of the auger that will be loading the bin).

   The Grain Gage wall sheet can also be rotated to position the Grain Gauge at two possible positions:
   - an upper position for smaller augers and/or larger bins
   - a lower position for larger augers and/or smaller bins

2. Install the reflective strip on the center web of the cut-out as shown.

3. Caulk around the outside of the bolt holes on the Grain Gauge™ flange with the 1/16" x 3/8" tape caulking supplied.

4. Fasten the Grain Gauge™ to the decal sheet using grain bin bolts with the indented upside down “V” at the bottom.

**Note**
Do not position the joint between two adjacent top ring angles directly over the Grain Gauge™ cutout. Insure that the top angle “bridges” the cutout and that the closest joint is at least 2 or 3 holes away.

If the Grain Gauge Cutout IS NOT Present

1. Using the grain gauge, position the grain gauge at a desirable location on the bin. The normal location is such that the top holes in the grain gauge are centered in the second corrugation valley below the top horizontal row of bin bolts at the eave (see Figure 25 on page 39).
The Grain Gauge™ is a clear Polycarbonate unit that shows when the grain level reaches the top of the sidewall. The highly reflective tape is visible at night when a light is directed at it. When you can no longer see this reflective tape - the Grain Gauge™ is full and the grain auger should be shut off. The Grain Gauge™ and reflective strip comes packaged in the parts box.

Position this sheet for maximum benefit (usually facing the direction of the auger that will be loading the bin). The Grain Gauge™ wall sheet can also be rotated to position the Grain Gauge at two possible positions…an upper position for smaller augers and/or larger bins and a lower position for larger augers and/or smaller bins.

Install the reflective strip on the center web of the cut-out as shown. Caulk around the outside of the bolt holes on the Grain Gauge™ flange with the 1/16" x 3/8" tape caulking supplied. Fasten the Grain Gauge™ to the decal sheet using grain bin bolts with the indented upside down “V”.

**5.10. Bin Roundness**

It is imperative that the bin be as round as possible. The following steps describe how to ensure the bin is round.

1. Verify that the foundation meets all the requirements of the installation.
2. Scribe the bin circumference onto the foundation as follows:
   a. Anchor a string to the exact center of the concrete foundation.
   b. Consult the following table to find the scribe radius for the size of the bin being assembled.
   c. Using the required string length, scribe the bin circumference onto the foundation.
      The radius values given in the chart are 3/4–inch 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 inch on the outside of this scribed circle.
3. After the first ring of wall sheets has been assembled, check the position and roundness of the ring:
   a. Verify that the maximum amount that the bin is out of round is no more than 0.75” 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.
Correcting for roundness becomes much more difficult the longer you wait.

4. 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.

5. When setting jacks, make sure they are also set round and that they are anchored to the concrete.

Table 8. Scribe Radius – 18’ to 27’ Bins

<table>
<thead>
<tr>
<th>Nominal Bin Diameter (ft)</th>
<th>Scribe Radius (ft in)</th>
</tr>
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5.11. Farm Series Sheet Part Number Matrix

Table 9. Farm Series Sheet Part Number Matrix

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<th>LENGTH Overall (hole-to-hole)</th>
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**CORRUGATED FLAT WALL SHEETS**

**PUNCHED WALL SHEETS**
5.12. Wall Sheet Caulking Detail

Figure 26. Wall Sheet Caulking Detail (inside view) — Imperial

**IMPORTANT!**

HORIZONTAL STRIPS OF CAULKING ARE USED TO SEAL GAP CAUSED BY OVERLAP OF WALL SHEETS.
LOCATE CAULKING AS SHOWN

5/32" x 7/32" ROLL CAULKING (P/N) 193814
APPLY AS SHOWN USING A CONTINUOUS STRIP

SEE "WHERE USED" CHART...
Figure 27. Wall Sheet Caulking Detail (inside view) — Metric

IMPORTANT!

HORIZONTAL STRIPS OF CAULKING ARE USED TO SEAL GAP CAUSED BY OVERLAP OF WALL SHEETS. LOCATE CAULKING AS SHOWN.

4 mm x 6 mm ROLL CAULKING (P/N) 193814. APPLY AS SHOWN USING A CONTINUOUS STRIP

SEE “WHERE USED” CHART
5.13. Wind Ring Assembly

One or more optional wind rings may be installed to increase the wind resistance of the bin when empty, for high wind areas. Typically, one wind ring is installed at the top of the top tier of wall sheets. Two wind ring brackets (232720) per sheet are attached to the outside of the wall sheet using two 3/8” x 1 ½” bolts (193797).

1. Position the first bracket approximately 28” in from a vertical wall sheet seam and down one corrugation (4”) below the top horizontal wall sheet seam in order to clear the eave.

2. Orientate the bracket with the 0.75” mounting hole up, as shown in Detail 1A in Figure 28.

3. Line up the top slot in the middle of the bracket onto the crest of the corrugation one below the top horizontal wall sheet seam.

4. Line up the bottom slot in the middle of the bracket onto the crest of the corrugation 4” below.

5. Use the bracket as a template to drill the upper slot (13/32” or 7/16” dia) through the wall sheet and attach.

6. Position the second bracket on the wall sheet 56.25” (6 bolt spacings) over from the 1st bracket, as shown in Figure 29 on page 45, field drilling and attaching it in the same manner.

7. Repeat on other wall sheets around the bin.

Figure 28. Mounting the brackets and ring

Adjacent tubes are aligned and secured to each other with wind ring splices (232769). A 3/8” x 3¾” bolt (235949) through the splice keeps it centered on the connection.
Figure 29. Bracket and splice positioning

- Position 1st splice 8” to 10” from upright and build from this end in this direction.
- Wall sheet.
- Wind ring.
- Wind ring bracket (232720).
- Wind ring clip to bracket using top and third holes.
- Make sure all bolt heads are to inside.
- Bolt and nut (3/8” x 1 ½”)
- Field drilled hole.

Figure 30. Wind Ring Placement

- Top horizontal wall sheet seam.
- Wind ring.
- Wind ring bracket.
- Wall sheet vertical seam.

Externally Stiffened Bins

1. Once the wind ring brackets have been secured to the bin walls, position the first wind ring tube and secure it to the bracket using the wind ring clips provided.

The clips use the 2nd and 4th holes on the bracket flanges as shown in Detail 1B in Figure 28. Two clips are required per bracket, one on each flange.

2. Position the wind ring such that a wind ring splice (with bolt inserted) can be slipped onto the end of the tube without interfering with the upright or the wind ring clips.

The splice should be orientated such that the bolt is horizontal.

3. Insert the end of the next wind ring tube into the open end of the wind ring splice.

4. Ensure that the ends of both tubes are tight against the centering bolt.

5. Secure the wind ring tube to the brackets with the wind ring clips.

6. Continue around the bin.
Tip
When placing the first wind ring tube in place, place one end close to an upright with a 8” to 10” overhang, and continue building from that end. This will reduce the need for multiple cuts.

7. Make all wind ring splice connections in the space between brackets. Do not encroach into the area where the wind ring clips are securing the wind ring tube to the brackets.

8. To avoid interference with brackets and the need to make multiple cuts, position an end of the first tube relatively close to a bracket, such that the space between the end of the tube and the next bracket is maximized, and build from that end.

9. Ensure that both ends of the tube are far enough away from the closest brackets to avoid interference with the splice.

When progressing around the bin, this space between the end of the tube and the next brackets may shrink with each additional tube that is installed. On large diameter bins, if this space shrinks to the point where the wind ring splice interferes with the bracket, then the tube will need to be cut. Make the cut such that the space that is created between the end of the tube and the next bracket is similar to the identical space on the first tube that was installed. In this manner, there will not be a shortage of tube.

Tip
When tightening wind ring clips, always tighten in sequence starting at the spliced end of the tube, which has already been secured, and work towards the free, and as yet unspliced, end.

10. The final wind ring tube in a circle will need to be cut to length. Secure one end of the last tube in the previously installed wind ring splice as described above.

11. Hold the tube in place and mark the cut-line relative to the previously installed tube at the other end.

12. Ensure that allowance is made for the 3/8” diameter bolt.

13. Once the tube has been cut, install one end of the tube as described above.

14. On the other end slide the wind ring splice completely onto the free end.

15. Position this end relative to the previously installed tube, and slide the splice onto the second tube until it is centered.

16. Insert the centering bolt.

17. Install all wind ring clips.

18. Tighten all bolts.
5.14. Planning the Location of Ladder Components

**Important**
Timing (assembling components in the correct order and relative position) is very important when assembling ladders, eaves rails, roof stairs or roof ladders, platforms and inside ladders, and other bin components. Consideration must be given to this during the planning stages, before assembly of the bin is initiated.

Consider the following:

**Inside Ladders**
The inside ladder sections bolt to existing holes in the horizontal seams of the wall sheets, which are spaced at a consistent 9 3/8". The inside ladders should also be centered on the roof panel that contains the inspection hatch opening. This roof panel should be centered on the horizontal wall sheet hole that will be the center of the inside ladder sections. Spinning the top ring angles and roof sheets relative to this location on the wall sheets may be required to achieve optimum fit-up.

**Roof Stairs or Roof Ladders**
The external ladder sections bolt to existing holes in the horizontal seams of the wall sheets. The roof stairs, or roof ladders, bolt to the ribs of roof panels, and are positioned to the right or left of the inspection hatch. The hatch should be centered on the inside ladders, if present. It may also be desirable to position the roof stairs, or roof ladders, relative to some external elements such as overhead conveyors, or catwalks.

The roof panel that the roof stairs / roof ladders are bolted to must be centered (as much as possible) to the center of the external ladder and eaves rails. To achieve optimum fit-up, it may be necessary to spin the top ring angles and roof sheets relative to the wall sheets, to align this roof panel relative to the intended location of the external ladder.

**Timing Considerations**
For fully featured bins containing external ladders, eaves rails, platforms, roof stairs or roof ladders, and inside ladders, the following is an example of the timing considerations that should be undertaken prior to the construction of the bin.

1. Select the location of the various ladder components relative to external elements.
2. Select the location of the various ladder components relative to other bin elements such as remote vent opener, etc.
3. Determine if the inspection hatch is located on the right or left side of the external ladder sections.
4. Locate the top ring angles and roof panels relative to this position such that the roof panel containing the inspection hatch is centered, as much as possible, on the hole in the wall sheet that is the center of the inside ladder sections. In general, the center of the inside ladder sections should be 37 ½” (or 4 horizontal wall sheet spaces @ 9 3/8”) to the right or left of the center of the external ladder sections.
5. In the absence of an internal ladder, center the roof panel to which the roof stairs or roof ladders are being bolted to, on the center of the external ladder sections.
Figure 31. Ladder Location

If present, inside ladders should be centered on the inspection hatch. Center the side wall ladder on the roof ladder or roof stairs as much as possible.
5.15. Ladder Installation

(Hopper is not shown in the figures)

Figure 32. Side View of Bin with Ladder

Figure 33. Front View of Bin with Ladder

NOTE:
1. This eaves rail configuration is compatible with cage system.
2. The first step is to install the top ladder clips 4” below the top horizontal wall sheet seam as shown in Detail A1.
3. If extending the ladder to the ground, the ladder block-off plate (P/N 234530) should be installed to prevent unauthorized usage.

WARNING
Falling hazard
Do not climb ladder without an approved fall arresting device in place.
Consult dealer or local Health and Safety Authority for further information.
Note

1. This eaves rail configuration is compatible with a cage system.

2. The first step is to install the top ladder clips 4” below the top horizontal wall sheet seam as shown in Detail A1.

3. If extending the ladder to the ground, the ladder block-off plate (P/N 234530) should be installed to prevent unauthorized usage.

Figure 34. Detail A1

IMPORTANT FIRST STEP: THE TOP LADDER CLIPS MUST BE MOVED DOWN ONE CORRUGATION (4") BELOW THE TOP HORIZONTAL WALL SEAM IN ORDER TO CLEAR THE EAVE. THE WALL SHEET MUST BE DRILLED AT THIS LOCATION. THE 4” IS REQUIRED TO LINE UP WITH THE SUPPORT LOCATIONS ON THE MATING CAGE SYSTEM. USE 3/8” x 1” BIN BOLTS. PUTTING THE SEALING WASHER ON THE INSIDE INSURES A WATERTIGHT SEAL

DETAIL A1
Figure 35. Top View

IMPORTANT FIRST STEP: THE TOP LADDER CLIPS MUST BE MOVED DOWN ONE CORRUGATION (4") BELOW THE TOP HORIZONTAL WALL SEAM IN ORDER TO CLEAR THE EAVE. THE WALL SHEET MUST BE DRILLED AT THIS LOCATION. THE 4" IS REQUIRED TO LINE UP WITH THE SUPPORT LOCATIONS ON THE MATING CAGE SYSTEM.

USE 3/8" x 1" BIN BOLTS. PUTTING THE SEALING WASHER ON THE INSIDE INSURES A WATERTIGHT SEAL.

Figure 36. Detail 1

SUPPORT ARM HAS THE FLEXABILITY TO MOVE EITHER LEFT OR RIGHT TO AVOID HATCH.

FOR 15’ & 18’ BINS THE SUPPORT ARM CAN BE ATTACHED TO THE ROOF RIB TO AVOID INTERFERENCE WITH THE HATCH.

PLACE SUPPORT ARMS ON OUTSIDE OF LADDER SUPPORT ARM CLIPS. DO NOT PLACE BETWEEN BANDS OF CLIP.
Figure 37. Detail 2

Support arm has the flexibility to move either left or right to avoid the inspection hatch. For 18' bins the support arm can be attached to the roof rib to avoid interference with the inspection hatch.

Figure 38. Section A2 and Section A-A

Note the orientation of the pass through rails. Top hole in top ladder clips align with third hole down in top ladder rail. 3/8" x 2½" bolts (pass through rail location).
Figure 39. Details A3 and A4

- **Ladder Clip**
- **Detail A3**: Swaged end of lower ladder section fits into upper ladder section.
- **Detail A4**: Ladder clips connect at horizontal wall sheet seams.
- **TWO BOLTS REQUIRED AT LADDER SECTION CONNECTIONS**
- **3/8” x 1” HEX BOLT & NUT (TYP)**
- **ONLY ONE BOLT IS REQUIRED IF ONLY ONE MATING HOLE IS PRESENT IN THE LADDER RAILS**
- **APPLY WARNING LABEL NEAR BOTTOM OF BIN LADDER AS SHOWN IN SAFETY DECALS LOCATION FIGURE**
5.16. Bin Jack Techniques

Figure 40. External Bin Jack Detail

1. Choose a hoist with a suitable capacity for expected load. Make sure the rated capacity of the hoist is not exceeded.
2. Fabricate custom lifting lugs to suit assembly equipment. Each lug should have a capacity 5 times the expected load.
3. Have jacks evenly spaced around the bin. Use one jack per wall sheet. Each jack should have a capacity 5 times the expected load.
4. Anchor jack securely. Use guy wire if necessary to ensure stability.
5. Use a minimum of 4 – 3/8” x 1¼” bolt (Grade 8) not supplied to fasten lug, if one jack per wall sheet is used

Note
Bin may also be erected using an internal jacking system.

(not available from Westeel)
5.17. Hopper Cone to Bin Installation

New Bin Application
1. Pour the foundation as per instructions provided with your hopper.
   - Ensure the foundation has fully cured before continuing the assembly of your bin.
   - If a Westeel skid base is used, a compacted gravel base can be used instead of a concrete foundation.
   - Follow the soil bearing information and site preparation instructions in Section 3. – Before You Begin on page 11.
2. Assemble the bin as per the instructions in Section 5. – Assembly on page 19.
   - For wall sheet layouts for the 18’ – 27’ bin for hopper, refer to Section 5.18 – Wall Sheet Layouts - Stor Series on page 57.
3. Position hopper cone on foundation and align hopper with bin as shown in Figure 41.
   - Ensure all bottom holes on the bottom wall sheets are clear of bolts.
4. Use of a bin crane to lift your bin is recommended.
   - Ensure the crane and all other lifting devices have adequate capacity to handle the maximum bin weight safely.
   - Lift the bin by placing a round support or 'tripod' inside the bin, directly under the vent collar.
5. Leave the vertical seam bolts loose on the bottom tier only for easy assembly.
6. Align the bin with the cone as shown in Figure 41.
7. Fasten the bin to hopper cone with 3/8” x 1¼” bolts, nuts and washers.
8. Insert one bolt on one side, the next bolt on the opposite side of bin, then the next two bolts at right angles to the first two.
   This will position the bin on the hopper properly.
9. Once the bin is in place, insert all other bolts and tighten the loose bolts.

Important
- Use only lifting devices of adequate rated capacity.
- Make sure the hopper cone is level and all load points contact the foundation.
- Make sure all fasteners are tightened as per torque instructions in Section 7.6 – Recommended Bolt Assembly on page 67.
Figure 41. Hopper Cone to Bin Installation

ROOF VENT OPENER
INSPECTION HATCH
GRAIN GAUGE
SIDEWALL LADDER
ROOF LADDER
## 5.18. Wall Sheet Layouts - Stor Series

### Figure 42. Model 1807STOR to 1809STOR

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### Note
Colors match part number label and indicate wall sheet thickness.
Figure 43. Model 2107STOR to 2109STOR

2107STOR

2108STOR

2109STOR

Note
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Figure 44. Model 2407STOR to 2409STOR

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2409STOR

Note
Colors match part number label and indicate wall sheet thickness.
Figure 45. Model 2707STOR to 2709STOR

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<th>194638 [YELLOW] 1 REQ’D</th>
</tr>
</thead>
<tbody>
<tr>
<td>194951 [ORANGE] 9 REQ’D</td>
<td></td>
</tr>
<tr>
<td>194952 [RED] 9 REQ’D</td>
<td></td>
</tr>
<tr>
<td>194952 [RED] 9 REQ’D</td>
<td></td>
</tr>
<tr>
<td>194953 [PINK] 9 REQ’D</td>
<td></td>
</tr>
<tr>
<td>194954 [LIME] 9 REQ’D</td>
<td></td>
</tr>
<tr>
<td>194955 [GREEN] 9 REQ’D</td>
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2708STOR

<table>
<thead>
<tr>
<th>194950 [YELLOW] 8 REQ’D</th>
<th>194638 [YELLOW] 1 REQ’D</th>
</tr>
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<tr>
<td>194951 [ORANGE] 9 REQ’D</td>
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<tr>
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</tr>
<tr>
<td>194955 [GREEN] 9 REQ’D</td>
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</tr>
</tbody>
</table>

2709STOR

Note
Colors match part number label and indicate wall sheet thickness.
5.19. Nameplate Sign Installation

1. Locate the sign in a high visibility area.

2. Wipe wall sheet to remove oil.

3. Attach the sign to the wall sheet, on the corrugation “peaks”, using supplied self-drilling screws.
   - Use three screws across the top of the sign, and three screws along the bottom of the sign.

   **Important**
   Because the screw heads with the sealing washers will be on the outside of the sign, ensure that the holes created by the screws are sealed with caulking. Caulk between the sign and the wall sheet where the holes are located.

*Figure 46. Nameplate Sign Installation Detail*

**Important**
The sign must be installed to identify the product and validate the warranty.
## 6. Specifications

### 6.1. Stormor Grain Bin Specifications

<table>
<thead>
<tr>
<th>MODEL</th>
<th>NO. OF TIERS</th>
<th>BIN DIAMETER</th>
<th>MAXIMUM CAPACITY</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>bu¹</td>
<td>m³</td>
</tr>
<tr>
<td>1807STOR</td>
<td>7</td>
<td>17’11” (5.46 m)</td>
<td>4340</td>
<td>145</td>
</tr>
<tr>
<td>1808STOR</td>
<td>8</td>
<td></td>
<td>4910</td>
<td>164</td>
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<tr>
<td>1809STOR</td>
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<td></td>
<td>5480</td>
<td>183</td>
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<tr>
<td>2107STOR</td>
<td>7</td>
<td>20’11” (6.37 m)</td>
<td>5980</td>
<td>200</td>
</tr>
<tr>
<td>2108STOR</td>
<td>8</td>
<td></td>
<td>6760</td>
<td>226</td>
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<tr>
<td>2109STOR</td>
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<td></td>
<td>7540</td>
<td>251</td>
</tr>
<tr>
<td>2407STOR</td>
<td>7</td>
<td>23’10” (7.28 m)</td>
<td>7900</td>
<td>264</td>
</tr>
<tr>
<td>2408STOR</td>
<td>8</td>
<td></td>
<td>8920</td>
<td>298</td>
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<tr>
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<td></td>
<td>9940</td>
<td>332</td>
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<td>26’10” (8.19 m)</td>
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<td>2709STOR</td>
<td>9</td>
<td></td>
<td>12700</td>
<td>424</td>
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1. Based on 1.244 cu. ft. per bushel and 6% compaction in cylinder.
2. Based on 770 kg/m³ and 6% compaction in cylinder.

**Note**

STOR does not include hopper capacities or heights.
# Appendix

## 7.1. Stor Parts Box Listing (Common Parts)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Unit Weight (lbs)</th>
<th>18'</th>
<th>21'</th>
<th>24'</th>
<th>27'</th>
</tr>
</thead>
<tbody>
<tr>
<td>212203</td>
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<td>-</td>
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<tr>
<td>212204</td>
<td>PEAK RING 21</td>
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<td>-</td>
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<tr>
<td>212205</td>
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<td>212206</td>
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</table>
### Table 11  Stor Parts Box Listing (Common Parts) (continued)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Unit weight (lbs)</th>
<th>18'</th>
<th>21'</th>
<th>24'</th>
<th>27'</th>
</tr>
</thead>
<tbody>
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<td>235218</td>
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<td>235219</td>
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### 7.2. Stormor Bin Pail and Parts Box Listing (Non-Common Parts)

### Table 12. Stormor Parts Box Listing (Non-Common Parts)

<table>
<thead>
<tr>
<th>Model</th>
<th>235941 BOLT HFS .375 x 1.0 GR8.2 - BAG 325</th>
<th>235943 BOLT HFS .375 x 1.0 GR8.2 - BAG 50</th>
<th>235944 BOLT HFS .375 x 1.25 GR8.2 - BAG 100</th>
<th>235950 HEX NUT .375 - BAG 300</th>
<th>235951 HEX NUT .375 - BAG 100</th>
<th>235956 FLAT WASHER .375 - BAG 200</th>
<th>235957 FLAT WASHER .375 - BAG 75</th>
<th>193814 CAULKING - 40' ROLL</th>
<th>170445 CAULKING - 300 ml TUBE</th>
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<td>9</td>
</tr>
<tr>
<td>2709</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>
7.3. Stormor Ladder Packages c/w Pass Through Rail

Table 13. Stormor Ladder Packages c/w Pass Through Rail

<table>
<thead>
<tr>
<th>LADDER PACKAGES</th>
<th>Ladder Section (44&quot;)</th>
<th>Ladder Clips - WC</th>
<th>Ladder Support Arm</th>
<th>Ladder Passthrough Rail</th>
<th>Hardware Package</th>
<th>Carton 51 x 27 x 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>234500</td>
<td>234501</td>
<td>234504</td>
<td>234505</td>
<td>300101</td>
<td>185011</td>
<td></td>
</tr>
<tr>
<td>300100–7</td>
<td>5</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>300100–8</td>
<td>6</td>
<td>18</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>300100–9</td>
<td>7</td>
<td>20</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

7.4. Stormor Ladder Hardware Package - 300101

Table 14. Stormor Ladder Hardware Package — 300101

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>235943</td>
<td>3/8” x 1” BOLT (Bag of 50)</td>
<td>2</td>
</tr>
<tr>
<td>193797</td>
<td>3/8” x 1¼” HEX BOLT</td>
<td>5</td>
</tr>
<tr>
<td>150517</td>
<td>3/8” x 2½” HEX BOLT</td>
<td>5</td>
</tr>
<tr>
<td>235951</td>
<td>3/8” NUT (Bag of 100)</td>
<td>1</td>
</tr>
<tr>
<td>234517</td>
<td>SUPPORT ARM CLIP</td>
<td>4</td>
</tr>
<tr>
<td>234518</td>
<td>SUPPORT ARM BRACKET</td>
<td>4</td>
</tr>
<tr>
<td>234559</td>
<td>PIPE CAP</td>
<td>2</td>
</tr>
<tr>
<td>234567</td>
<td>WARNING LABEL</td>
<td>1</td>
</tr>
</tbody>
</table>
### 7.5. Hardware Usage

#### Table 15. Roof Hardware

<table>
<thead>
<tr>
<th>Bolt</th>
<th>1/4&quot; x 1&quot; Self Drilling Screw</th>
<th>5/16&quot; x 1&quot; Flanged Hex Bolt (Washer)</th>
<th>5/16&quot; x 1-1/4&quot; Flanged Hex Bolt (Washer)</th>
<th>5/16&quot; Flanged Lock Nut</th>
<th>5/16&quot; STL/NEO Sealing Washer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>235151 (7)</td>
<td>235914 (250)</td>
<td>235916 (80)</td>
<td>235923 (250)</td>
<td>235973 (25)</td>
</tr>
<tr>
<td>Top Ring Angle to Wall Sheet</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Roof Sheet to Peak Ring</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Roof Sheet to Top Ring Angle</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Roof Sheet Rib to Roof Sheet Rib</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Ladder Rung to Roof Sheet Rib</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Stiffening Ring Bracket to Roof Sheet Rib</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Stiffening Ring Expander Clip to Stiffening Ring</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Roof Vent to Roof Sheet Vent Cutout</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Inspection Hatch Lid Assembly to Roof Sheet Hatch Cutout</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Inspection Hatch Latch to Roof Sheet</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Roof Sheet to Peak Ring to Fall Restraint Bracket</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Wind Ring Clip to Wall Sheet to Upright Splice</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Fall Restraint Bracket to Upright Splice</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Bird Stop to Top Ring Angle</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

#### Table 16. Bin Hardware

<table>
<thead>
<tr>
<th>Bolt</th>
<th>3/8&quot; x 1&quot; Flanged Hex Bolt (Washer)</th>
<th>3/8&quot; x 1-1/4&quot; Flanged Hex Bolt (Washer)</th>
<th>3/8&quot; Hex Nut</th>
<th>3/8&quot; Flat Washer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>232850 (700)</td>
<td>232850 (700)</td>
<td>235956 (200)</td>
<td>235957 (75)</td>
</tr>
<tr>
<td></td>
<td>235941 (325)</td>
<td>235941 (325)</td>
<td>235950 (300)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>235943 (50)</td>
<td>235951 (100)</td>
<td>235951 (100)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>193805</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- WALL SHEET to WALL SHEET: ●
- BIN WALL to HOPPER ASSEMBLY: ●
7.6. 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 17. Recommended Impact Gun Torque Values Capacity to Achieve Snug-Tightened Bolts

<table>
<thead>
<tr>
<th>Bolt Diameter</th>
<th>Bolt Grade</th>
<th>Grade Mark</th>
<th>Recommended Torque Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>in-lb</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>5/16&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>215</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>370</td>
</tr>
<tr>
<td>7/16&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>960</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>Grade 8.2</td>
<td></td>
<td>1800</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>Grade 5</td>
<td></td>
<td>3230</td>
</tr>
</tbody>
</table>

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 Stormor.
8. 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:

| Stormor Bins | 1 year |

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.