Mounting Instruction Polar Bear North South System

Introduction

Polar Bear® FR is designed to maximize array construction speed and minimize construction risk. Polar Bear's patent pending, innovative, streamlined construction features:

- Just three major components plus two nut and bolt sizes
- Several labor saving factory-installed features
- A modular, adaptable design with a single-module tilt-up feature

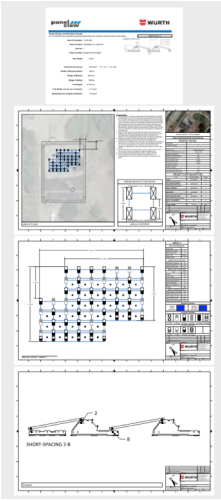
The Polar Bear system has been extensively tested, undergoing individual component finite element analysis, computational fluid dynamics modeling, static load modeling, and wind tunnel testing. All testing has been independently conducted by third parties and provided to PanelClaw, Inc. ("PanelClaw").

Additionally, every Polar Bear® FR Support requires a roof protection pad underneath each support to protect the roof membrane. Suitable roof protection pad material may be purchased from PanelClaw. Please consult with PanelClaw Customer Technical Support for a list of suitable roof protection pad materials.

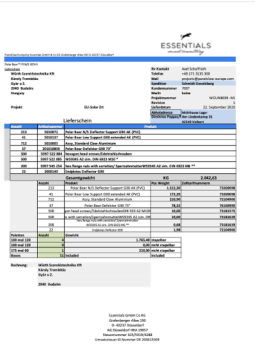
List of parts

This is list for a ballasted Polar Bear® FR installation not requiring mechanical attachment. Please refer to the Roof Connector Installation Manual, available at panelclaw.com, for instructions on mechanical attachment of the system.

First check the documents received:



Ballast Layout with construction plan, parts needed and Ballastplan

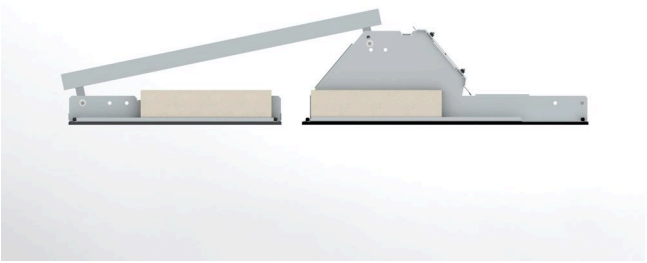


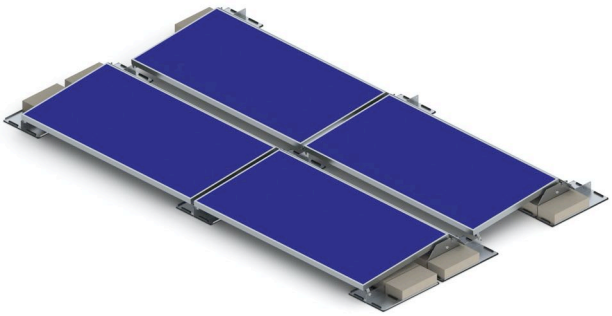
Delivery note check all parts if delivery is complete

Polar Bear 2 North South - Aerodynamic Flatroof (**FR**) System

1. Supports

	Polar Bear N/S Deflector Support	**Polar Bear Low Support Extended**
Length	87,63 cm	65,10 cm
Hight	28,41 cm	8,9 cm
WIdth	40,8 cm	40,8 cm
Weight	6,8 KG	4,4 KG
Protection Pad	Regupol Resist AK (PVC)	Regupol Resist AK (PVC)
Mounting Options	Standard 5/6 short 6/4	Standard A/D short D/B
Distances	Standard 16 cm short 10 cm	Standard 16 cm short 8 cm
Material	G90 galvanized steel	G90 galvanized steel
Ballast Options	36 Ballast Stones Standard 3,5 KG	12 Ballast Stones Standard 3,5 KG
Packing Unit	60 pcs per pallet 100 x 120 x 100	128 pcs per pallet 100 x 120 x100



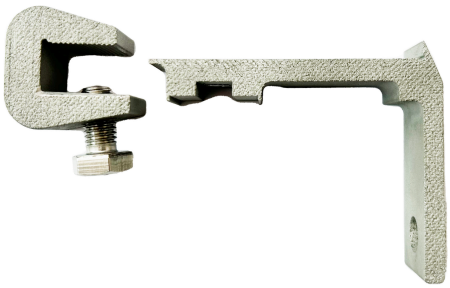


Polar Bear 2 NS Deflector Support contains two parts:

PolarBear 2 N/S West side

PolarBear 2 N/S East side

2. Other System Parts



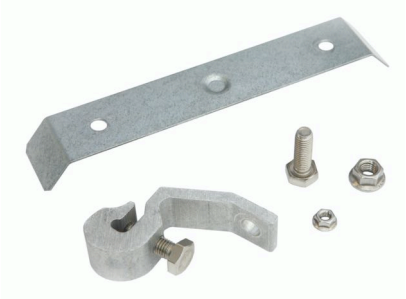
Claw 4 pro Modul

	Polar Bear N/S Deflector
Standard length	
69“	1.753 cm / 5,6 KG
73“	1.854 cm /5,9 KG
Material	G 90 galvanized steel
Packing unit	150 pcs per pallet 60 x 175 x 60

Deflector End Plate (depends on layout)

Regupol Resisst AK (PVC)
pre installed

M10 A2 Nuts and Bolts for Module connection to supports
M6 A2 Nuts for Deflector mounting



Installation

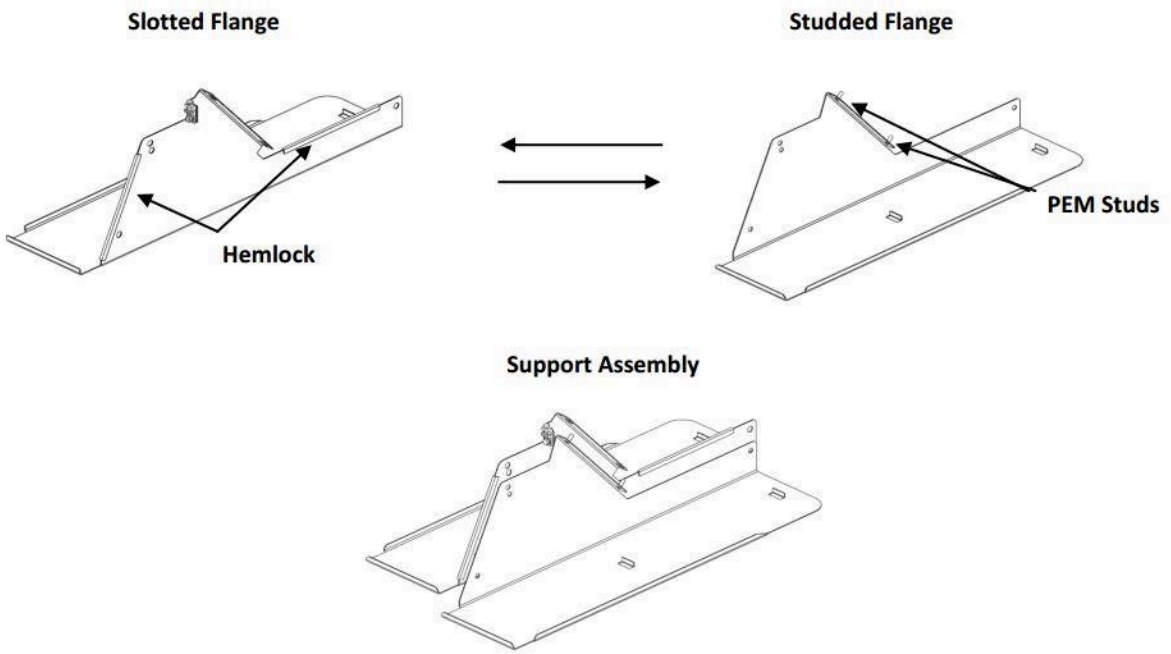
Polar Bear® FR can be installed in 6 easy steps.

Step 1. Mark Array Perimeter and Assemble Supports

Mark the array perimeter using a chalk line or similar method. See site's ballast layout drawing provided by PanelClaw for array dimensions.

Once the array perimeter is marked, assemble the studded flange and slotted flange units to form the Support. No tools are required for Support assembly. The slotted flange unit will fit over the flange of the studded unit. Hemlocks on the back and front of the slotted unit will slip over the studded unit as seen in Fig. 1 below.

Fig. 1 Support Assembly

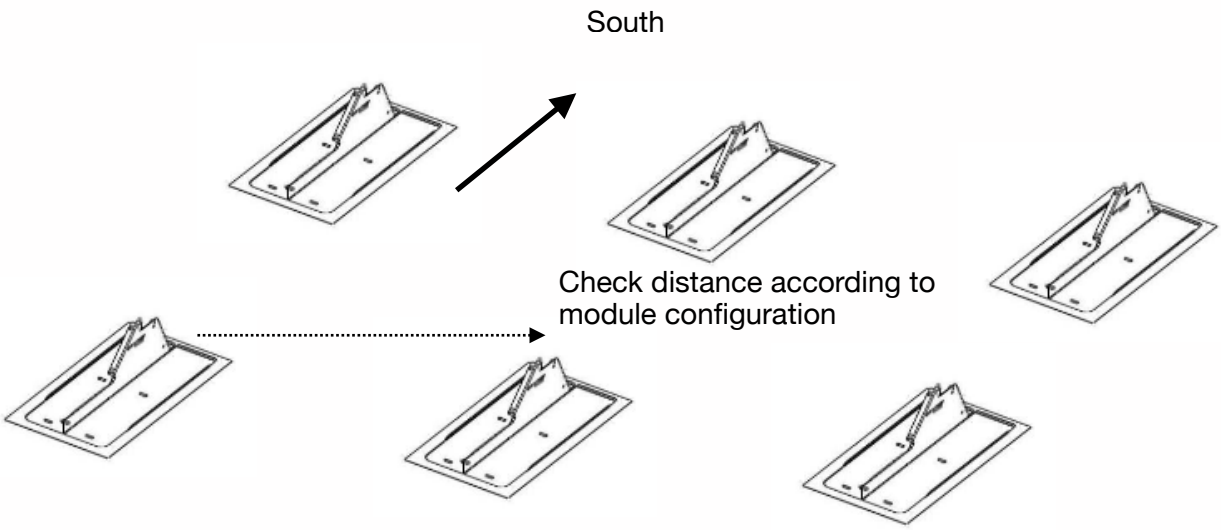


Step 2. Lay Out Supports

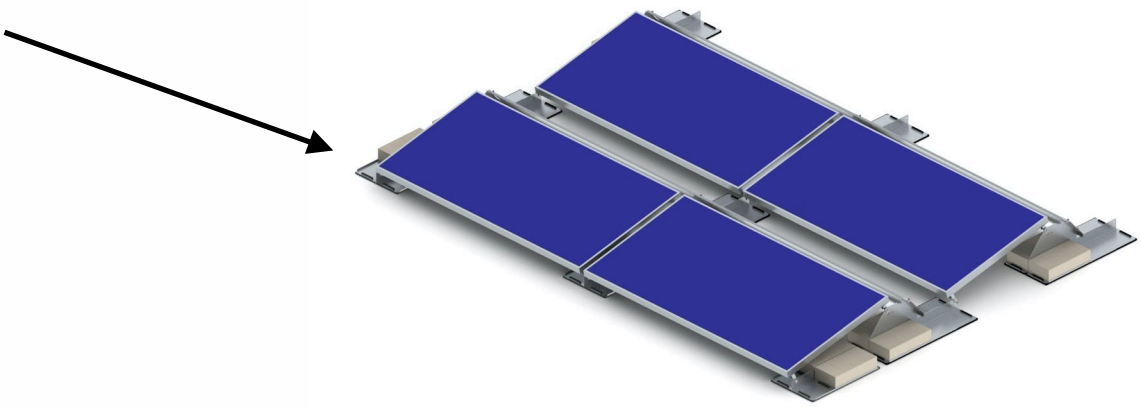
Deploy the Supports along the marked array perimeter and add the specified number of Ballast Blocks to each Support*.

The first support should be placed in the striating corner at it's exact designated position, layout the pother supports according to the ballasted layout.

Note: PanelClaw recommends starting the array in a corner with low complexity and moving outwards in a direction that best suits the individual array you are building (e.g. rows and columns with the least number of interruptions/breaks). This process can be continued to layout the remainder of the array.



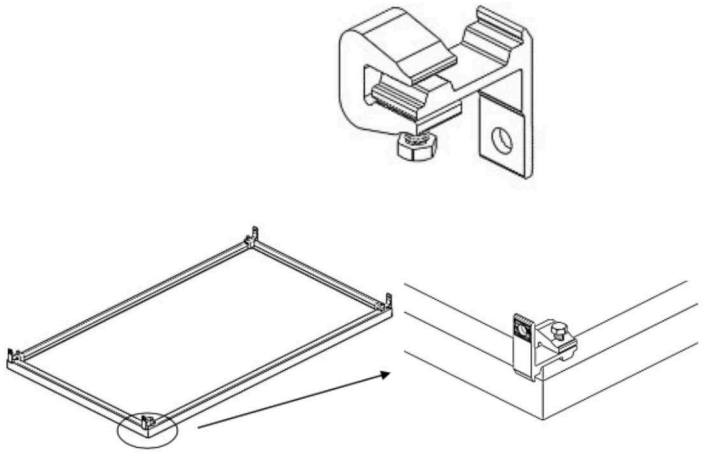
Low supports are being placed only at the south end of any array and are designed to be placed underneath the module in order to finish the arrays on the southern end.



Step 3. Attach Claws to Module

PanelClaw offers two Claw options to accommodate different frame types, Standard and Multi-piece. The following directions are for the Standard Claw.

Place a PV module face down on protected work surface and place a Claw over the module frame flange on the **long** side of the module; slide to the corner and tighten the M10 hex head cap screw between 18 and 20 ft-lb (24.4-27.1 N-m). Ensure that the Claw is seated up against the flanges of both the long and short sides of the module as shown in Fig. 4 below. Each module must be fitted with four (4) Claws. The module is now ready to be attached to the Supports.



Step 4. Mount Modules to Supports

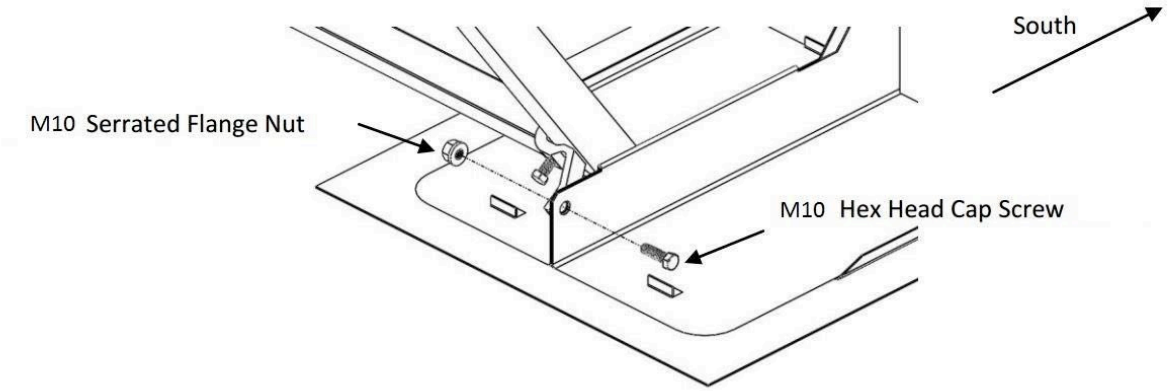
Begin attaching modules to Supports moving from West to East (or East to West) starting at the Southwestern (or Southeastern) most corner of the array and moving North as each row is completed.

For the steps below, assume the Southwestern most corner is the starting point.

1.

Attach the module to the inside of the low end of the first two North facing Supports, by inserting a M10 x30 hex head cap screw through the hole in the Claw and the Support. Ensure that the hex head cap screws are inserted into the Support mounting holes so the threaded end of each hex head cap screw faces the next Support to be installed (to the East). A M10 serrated flange nut should then be finger tightened on the Western-most Support only to initially secure the module (Fig. 5).

Fig. 5 Attach Module to North Support



2.

Tilt the module back and attach the Claws to the high end of the North Support by inserting a M10 x30 hex head cap screw through the hole in the Claw and the Support. Ensure
that the hex head cap screws are inserted into the Support mounting holes so the threaded end of each hex head cap screw faces the next Support to be installed (to the East) (Fig 6).

a. Note the high end of each Support is equipped with two Claw mounting holes that can be used to alleviate module misalignment in wavy roof situations. The top mounting hole should always be used as the default mounting hole (Fig 7).

Fig. 6 Tilt Module to Attach to North Support

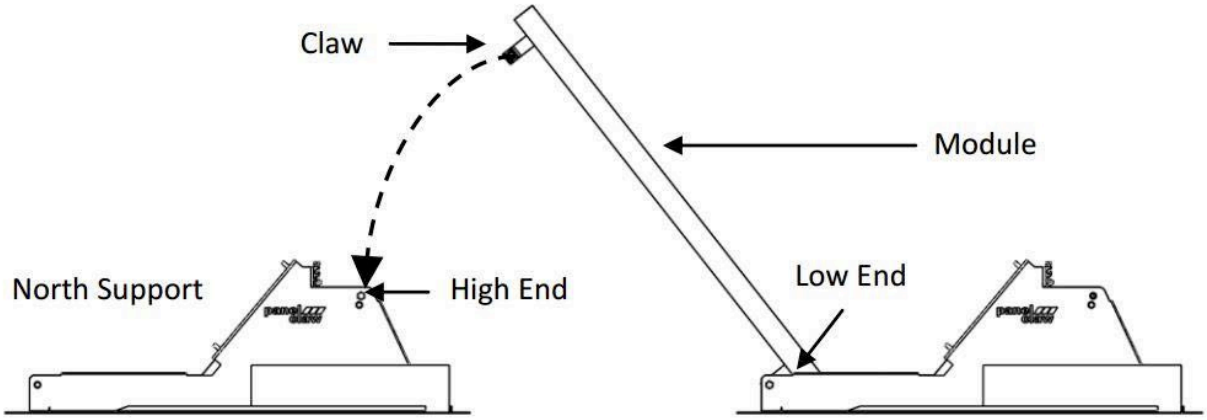
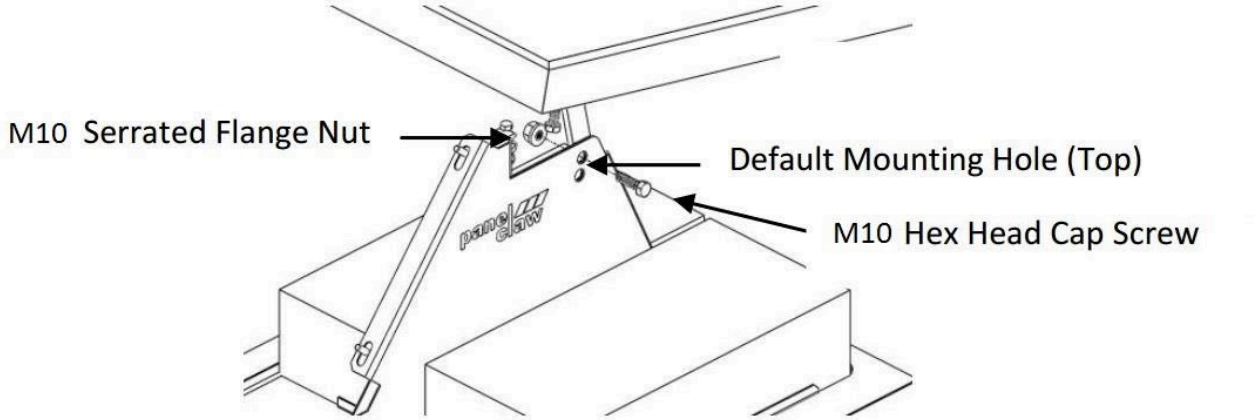


Fig. 7 Default Mounting Hole



3. Secure Western-most Claws to Supports using the M10 serrated flange nuts. The recommended minimum torque is 30 ft-lb (40.7 N-m).

4. Continue building the array from West to East (or East to West) by bringing the next module into place.

    - The hex head cap screws on the Northwest and Southwest sides of the array are already in place from the prior module mounting.

    - Add hex head cap screws to the Northeast and Southeast sides.

    - Secure the Western-most Claws only to Supports using the M10 serrated flange
      nuts.

    - Connect the module to module wiring.

Repeat this process until all modules are mounted.

Step 5.Ballst

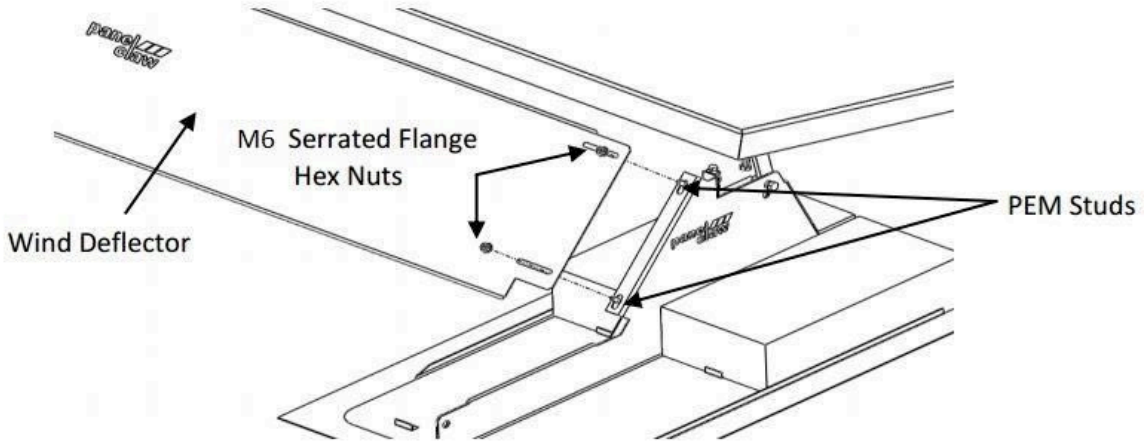
Place ballast on each Support based on Ballast layout drawing. Each Support will accommodate up to 24 Solid Cap Concrete 3,5kg blocks as ballast (not provided). Blocks of various weights may be used in advance consultation with PanelClaw's engineering department.

Step 6. Install Wind Deflectors

Wind Deflectors mount to the Supports via the Support's pre-installed PEM studs using two M6 serrated flange nuts per Support (Fig 9). Tighten each serrated flange nut to a minimum of 8 ft-lb Deflectors should be installed on the Southern-most row of Supports (these Supports will only have modules attached at the low end of the Support). At the end of each work day a deflector must be attached to any Supports to which a module has been mounted with the exception of the Southern-most row of Supports as noted above.

Note: The Wind Deflector is installed with the PanelClaw logo facing toward you and right side up. At the end from a deflected row the last deflector has to be fixed with an endplate under the serrated M6 nuts.

Fig. 9 Wind Deflector Installation



General Installation Safety with PanelClaw Products:

Safety is an essential part of every photovoltaic (PV) installation and every construction site. It is imperative to plan ahead for any safety concerns and hazards to promote safe work practices during installation. This section does not claim to address or support all safety concerns that may arise during the installation of PanelClaw racking systems or any other aspect of the work being performed. Before beginning work, installers should refer to all local and federal safety, health, and regulatory requirements to assure compliance. Refer to OSHA Part 1926 and its related Subparts for federal construction related regulations and standards.

The subsections below outline some of the obvious / major hazards that could exist during the installation of PanelClaw product, and are divided to bring a level of clarity to such hazards. Some sections to not apply to all PanelClaw product lines and such exclusions are noted within each section.

Electrical Hazards: PanelClaw products are purely mechanical and do not contain any electrically live parts. When a photovoltaic module is exposed to sunlight it is electrically live and cannot be turned off. As soon as modules are installed using a PanelClaw system, an electrical shock hazard is present. All personnel on site should coordinate to ensure that such electrical hazards are clearly communicated. It is advised, at a minimum, that all personnel utilize caution and proper Personal Protective Equipment as outlined in that section. Only electrically qualified personnel should perform PV module installation. Refer to OSHA Part 1926 Subpart K – Electrical and NFPA 70E for additional information.

Trip Hazards: All PanelClaw arrays have elevated components that are installed above grade or above a roof surface. Such hazards should be identified and caution should be taken to avoid tripping over such components. Make sure to pick up and not drag your feet when working on site, and always pay attention to your path of movement to note any obstructions that could create a trip hazard.

Lifting Hazards: The PanelClaw installation process involves lifting of heavy items that could lead to personal injury and damage to property. All personnel should be trained in the proper procedures for manually lifting. Evaluate an objects size and weight prior to lifting.

Follow these general guidelines for lifting:

1. Assess the lift and know the object weight

2. Bend at the knees and get a good grip.

3. Keep back straight and lift straight up with legs without twisting. It is important to lift with
   the legs and not the back.

4. If an object is too large or heavy, ask for help and do not attempt to lift by yourself. In the case that an object requires mechanical assistance (e.g. crane, forklift, etc.) to complete the lifting operations, all machine operators of such devices should be licensed and trained

Material Handling: All PanelClaw parts and components are made of aluminum and steel alloys and utilize stainless steel assembly hardware. These materials are considered non-toxic and require no special handling procedures. Metal components may have sharp edges, so be sure to handle with care and utilize proper personal protection equipment, especially gloves, during handling. Refer to OSHA Part 1926 Subpart H – Materials Handling, Storage, Use, and Disposal for additional information.

Personal Protective Equipment (PPE): All personnel should utilize and implement proper PPE . The following items are suggested as a minimum to avoid injury based on the installation procedure outlined in this manual:

1. Appropriate work clothing
2. Electrically insulated hard hat
3. Protective eyewear
4. EH rated safety boots
5. Gloves
6. High-visibility safety vest
7. Hearing protection

If any PPE appears to be defective, stop the use of such equipment immediately, and ensure it is replaced before work continues.

Hand and Power Tools: Access to all hand and power tools will be regulated and controlled at all times on site to prevent improper use and related injuries. When not in use, all equipment should be stored in a secured location. Only personnel who have been properly trained in the safe operation of any potentially dangerous tool should be allowed access. All required tools to perform the installation of PanelClaw racking are outlined in the installation procedure. All tools should be inspected daily and before use by the operator. If any tool appears to be defective, stop the use of such equipment immediately, and ensure they are replaced before work continues.