

Precision Steel Car's 100 Ton Greenville Hopper



Precision Steel Car

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PSC Hopper Kit Bill of Materials

Frame	Qty.	Material	Details	Qty.	Material	End Cages	Qty.	Material
Cross Member 1	2	Steel	Walkway	1	Steel	Cage Member 1	1	Alum
Cross Member 2	4	Steel	Walkway Brace 1	1	Steel	Cage Member 2	1	Alum
Cross Member 3	2	Steel	Walkway Brace 2	2	Steel	Cage Member 3	2	Alum
End Sheet	2	Steel	Stirrup Step	4	Steel	Cage Member 4	2	Alum
Frame End	2	Steel	Middle Step	4	Steel	Cage Member 5	2	Alum
Frame Beam	1	Steel	Stirrup Brace 1	2	Steel	Cage Member 6	2	Alum
Bolster Frame	4	Steel	Stirrup Brace 2	2	Steel	Cage Member 7	2	Alum
Bottom Sheet	1	Steel	Grab D 6.094"	2	Alum	Cage Member 8	1	Alum
			Grab D 5.75"	2	Alum	Cage Member 9	1	Alum
Body			Grab D (Bent) 2.5"	2	Alum	Cage Member 10	1	Alum
Rib 1	4	Steel	Grab E (Right) 2.5"	12	Alum	Cage Member 11	1	Alum
Rib 2	4	Steel	Grab E (Left) 2.5"	12	Alum	Cage Member 12	1	Alum
Rib 3	18	Steel	Grab A 2.25"	2	Alum	Cage Member 13	2	Alum
Body Side	2	Steel	Brakewheel Housing Kit	1	Steel	Cage Member 14	2	Alum
Body End "Non-brake"	1	Steel	Modern Brakewheel	1	Steel	Cage Member 15	2	Alum
Body End "Brake"	1	Steel				Angle Bracket	8	Alum
Slope Sheet 1	1	Steel	Discharge Gates			Brace Bracket (Left)	2	Steel
Slope Sheet 2	1	Steel	Discharge Gate "Left"	3	Steel	Brace Bracket (Right)	2	Steel
Bay Center 1	2	Steel	Discharge Gate "Right"	3	Steel			
Bay Center 2	1	Steel	Latch Plate	6	Steel			
Side Braces 1	4	Steel	Latch Cam A	3	Brass			
Side Braces 2	4	Steel	Latch Cam B	3	Brass			
Corner Braces	4	Steel	Latch Arm	6	Steel			
Top Rail Long	2	Alum	#10 Latch Nuts	12	Steel			
Top Rail Short	2	Alum	#10-24x1/4" Button Head	12	SS Steel			
Side Angle	2	Alum	Hinges "End bays"	8	Steel			
Slope Sheet Brace	2	Alum	Hinges "Center bay"	4	Steel			
			Latch Catch	6	Steel			
			Gate Brace	3	Alum	Total Parts	227	

Recommended Assembly Techniques

- Follow Instruction Steps.
- Buy Clecros, they are great temporary fastening devices used in riveting, get them at Aircraft Tool Supply Company. (www.aircraft-tool.com)
- Assemble pieces without riveting or welding, to see how the kit goes together.
- Do not over squeeze/set rivets in the aluminum extrusion, it as soft as the aluminum rivets and will bow and twist.
- Refer to the PSC website for pictures of an assembled car.
- **Tack weld, when applying the final welds the longer pieces will shrink about a 1/32" over the entire length.** Finish welding from one end to the other to avoid warping.
- It is easier to undo a tack weld than a bead.
- Plan your welds, most of the welds can be hidden.
- Skip weld every 4-6 inches, continuous welding will cause extreme warping and twisting.
- Add any extras, such as provisions for safety chains, as early as possible. It's easier to modify a piece before it is welded to the assembly.

Items to be Supplied by Buyer

Tools Needed

- Welder
- Welding Clamps
- Rivet Gun/Rivet Squeezer
- 3/32" Drill Bit
- Cordless Drill (suggested)
- Cleco Pliers/Clamps
- 4-40 Tap
- #43 Drill Bit

Fasteners Needed

- 3/32" Rivets
Lengths 3/16", 1/4", 5/16"
- 4-40 Button Head Cap Screws
3/16" Long (Qty. 6)
- 6-32 Button Head Cap Screws and Nuts
3/16" Long (Qty. 48)

Couplers and Trucks are not included with this kit.

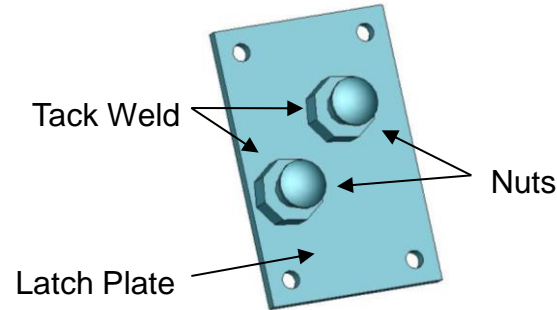
Mounting of the trucks is to be determined by the buyer. This includes making adapter plates for mounting the trucks. The buyer is responsible for creating any additional parts needed to mount trucks or couplers. When creating these parts the buyer must calculate and modify the adapters, trucks, or kit for side bearing heights and coupler heights. Couplers and Trucks should be mounted at Step 7

Precision Steel Car is not responsible for defects resulting from poor assembly or careless handling. Replacement parts may be available to purchase.

Step 1a

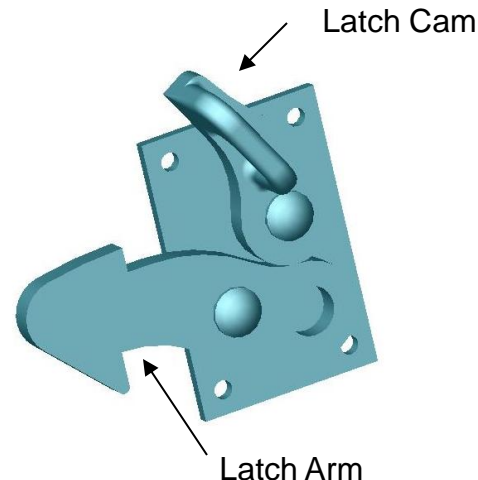
First, assemble the 6 hopper door latches. There are 3 right and 3 left latches. **They are mirror images so assemble 3 and then make the remaining three as mirror images.**

Begin by tack welding two #10-24 nuts onto the Latch Plate oriented as shown. Use the #10 button head screws to position the nuts concentric to the holes during welding. Be careful not to weld the screws in place.

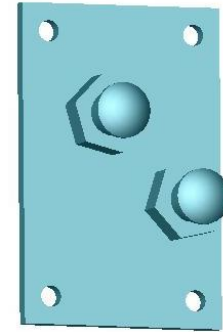


At this point it is a good idea to at least put a coat of primer on the individual parts. Because this is a functional intricate mechanism, it is difficult to paint once assembled and installed on the car.

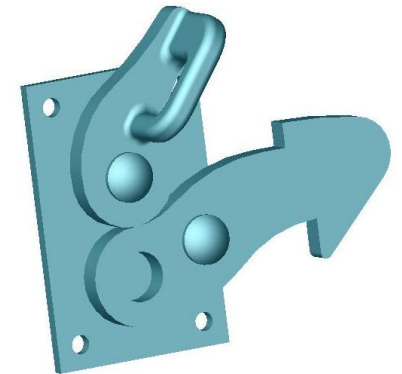
Lastly, assemble the Latch Cam casting and the Latch Arm onto the latch plate using the button head machine screws provided. We recommend using a little Loctite® to prevent the screws from loosening. Leave the screws loose enough so the latch operates freely.



Now assemble the 3 matching latches by flipping over the Latch Plate before tack welding the nuts.

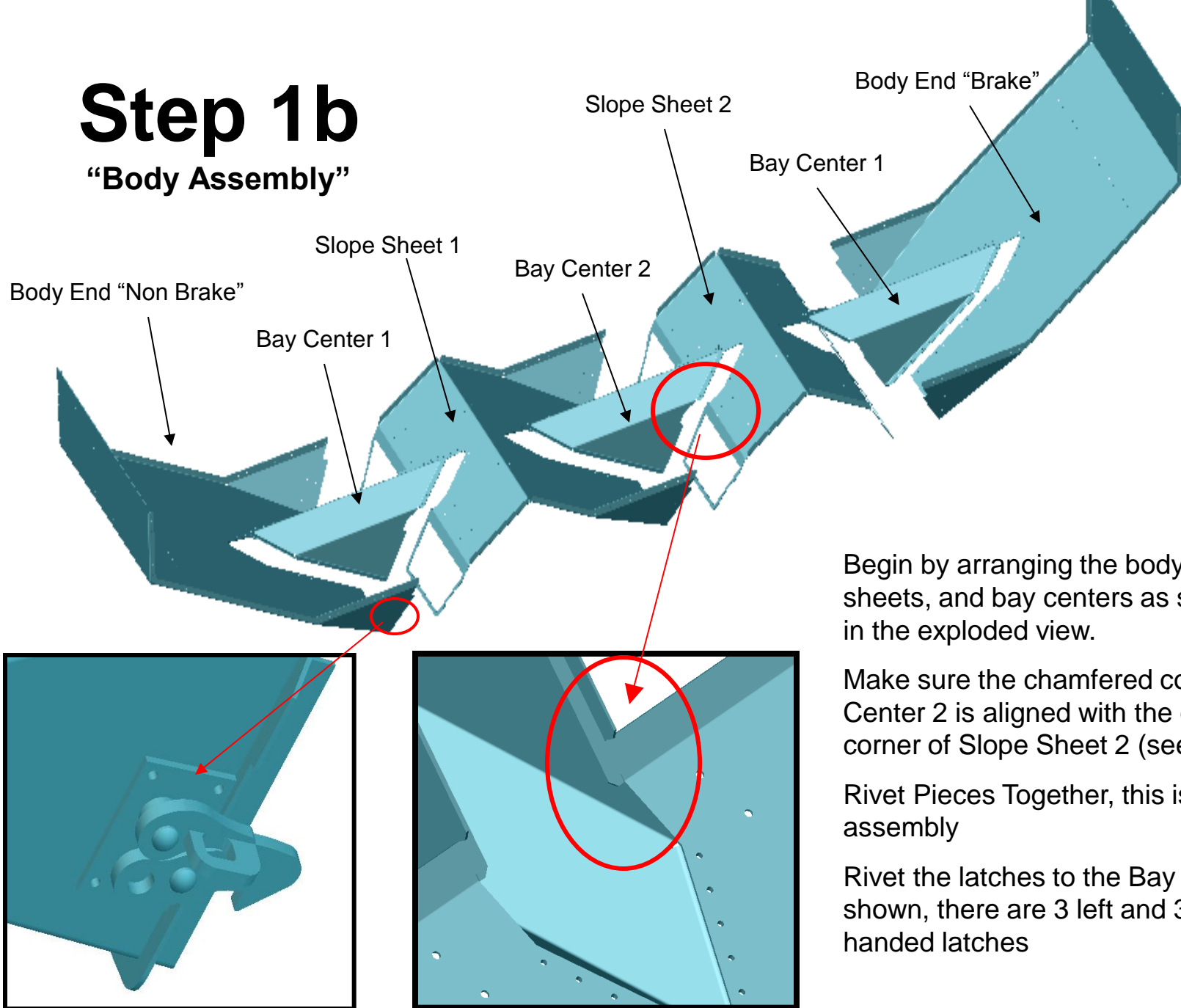


Assemble Latch Cam and Latch Arm as described earlier.



Step 1b

“Body Assembly”



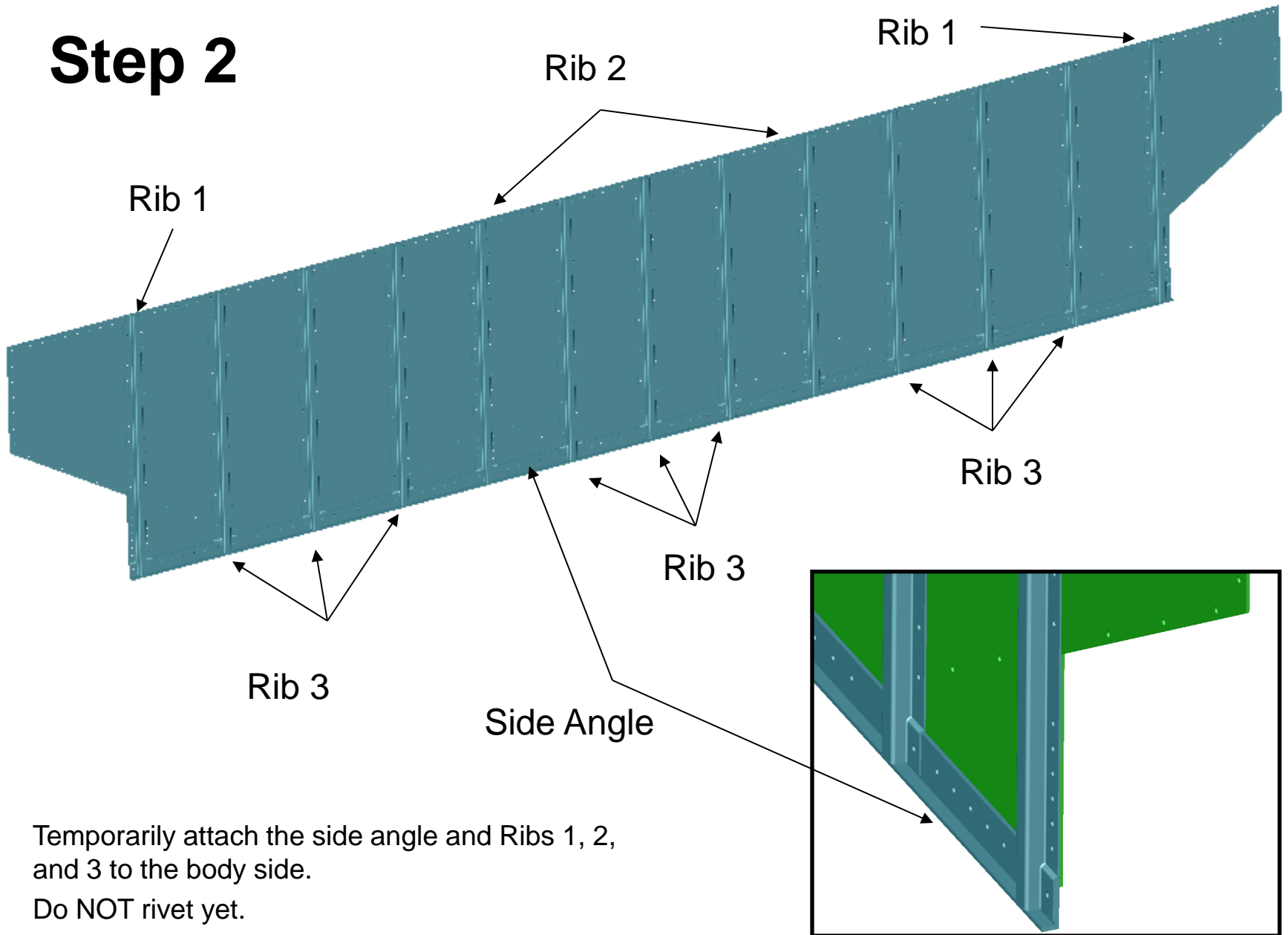
Begin by arranging the body ends, slope sheets, and bay centers as shown above in the exploded view.

Make sure the chamfered corner of Bay Center 2 is aligned with the chamfered corner of Slope Sheet 2 (see detail)

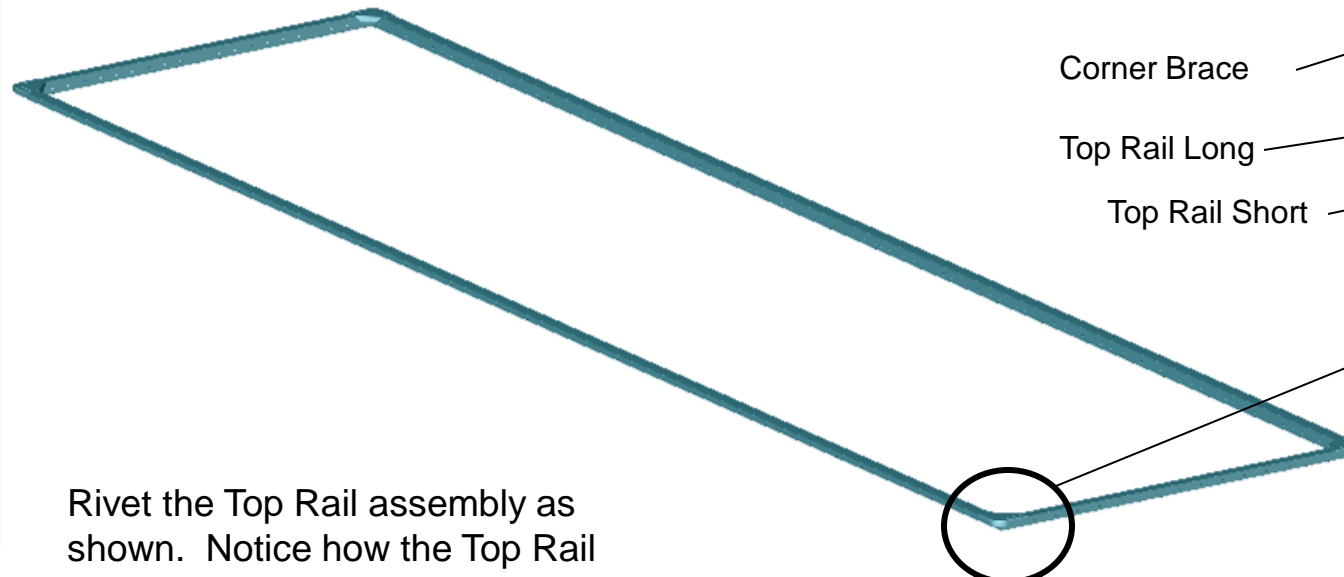
Rivet Pieces Together, this is the bay assembly

Rivet the latches to the Bay assembly as shown, there are 3 left and 3 right handed latches

Step 2



Step 3

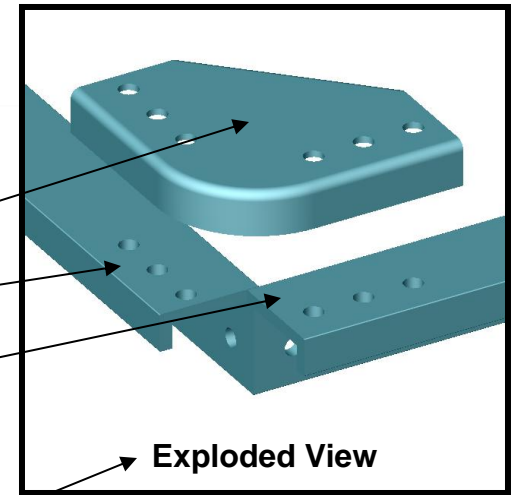


Corner Brace

Top Rail Long

Top Rail Short

Exploded View



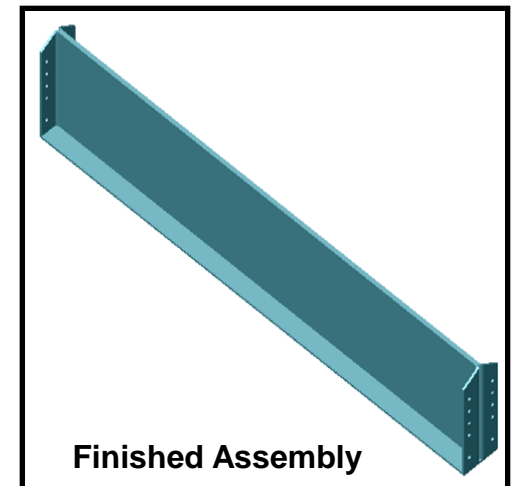
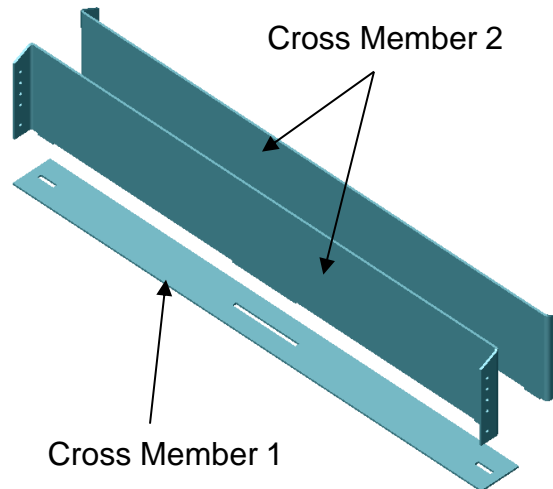
Rivet the Top Rail assembly as shown. Notice how the Top Rail Short overlaps the Top Rail Long in the exploded view.

Locate the tabs of Cross Member 2 and place them inside the slots in Cross Member 1

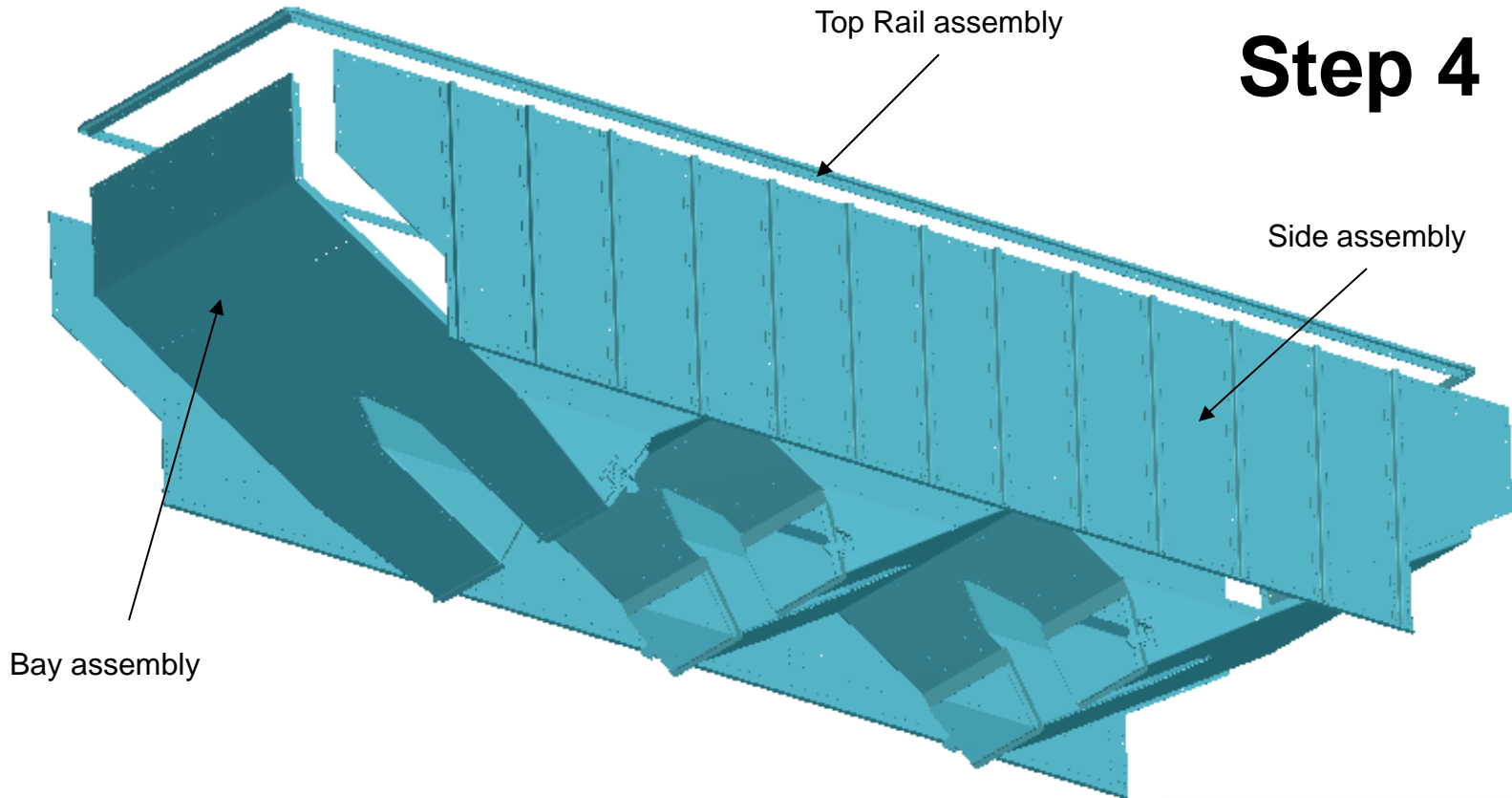
Weld the cross member assemblies, repeat on the second assembly.

Cross Member 2

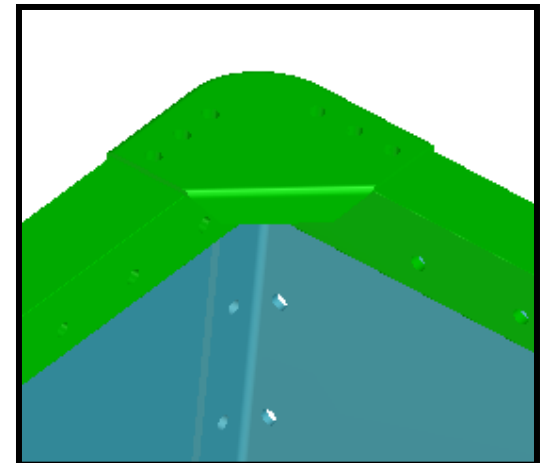
Cross Member 1



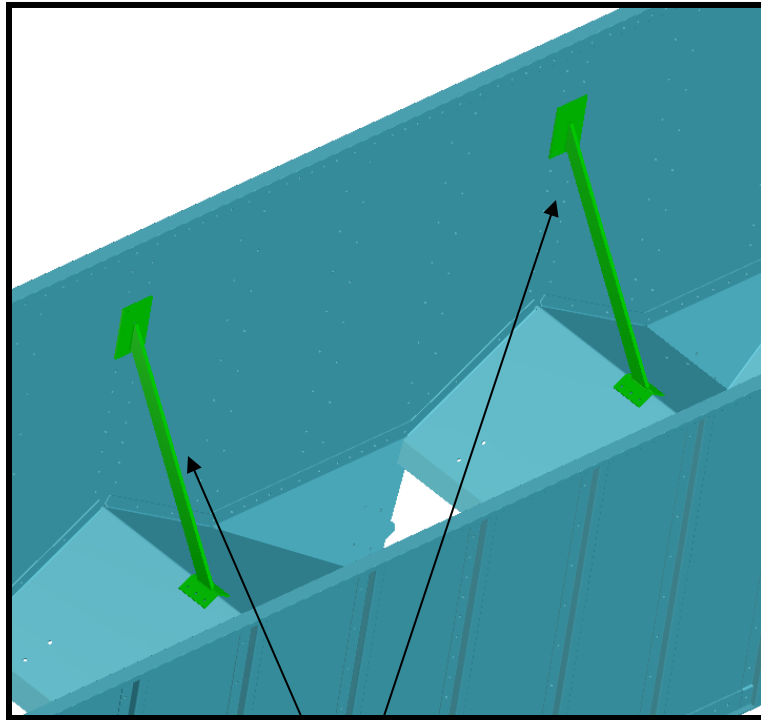
Step 4



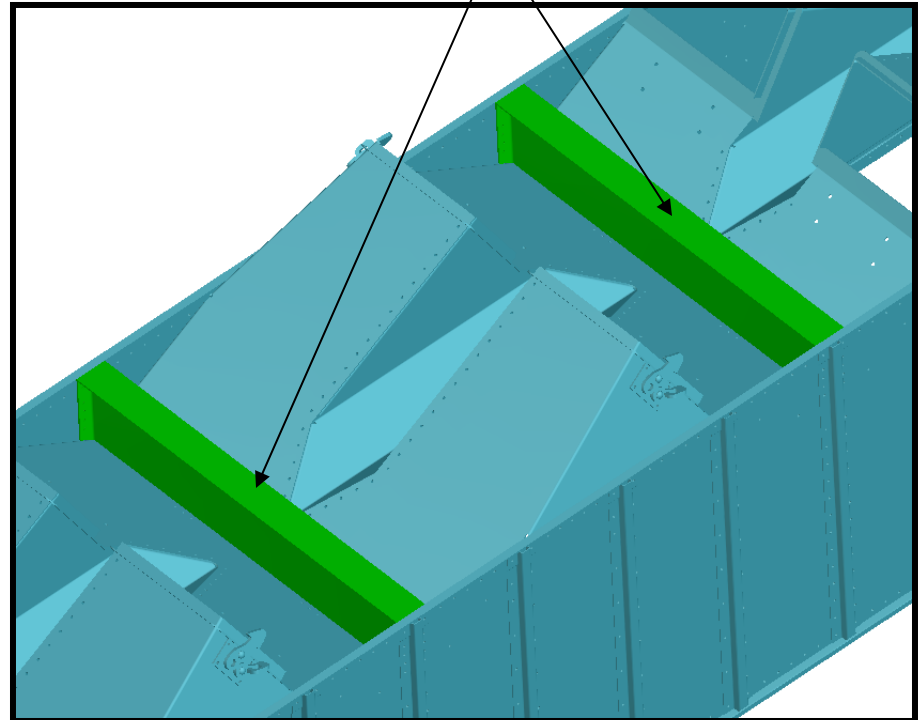
Temporarily attach the Side assemblies to the Bay assembly
Temporarily attach the Top Rail assembly to the Sides and Bay assembly
The long leg on the Top Rail sits on the inside of the Body assembly



Step 5



Side Braces 1 and 2

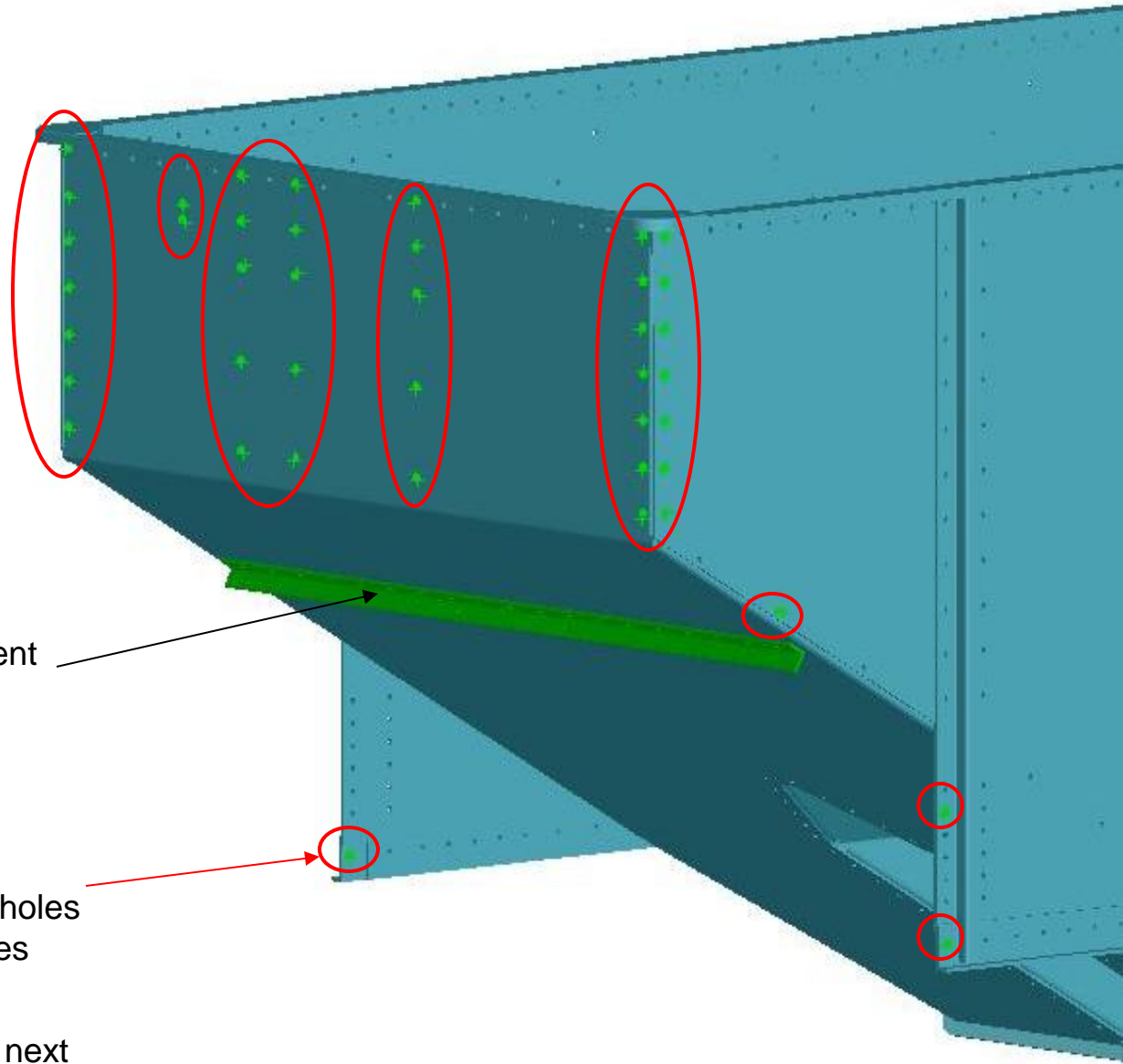


Frame Member Assemblies

Rivet the Side Braces 1 and 2 in place (4 places)

Rivet the Frame Member assemblies in place underneath the Body assembly

Step 6



Rivet the Slope Sheet brace to current Body assembly together as shown.

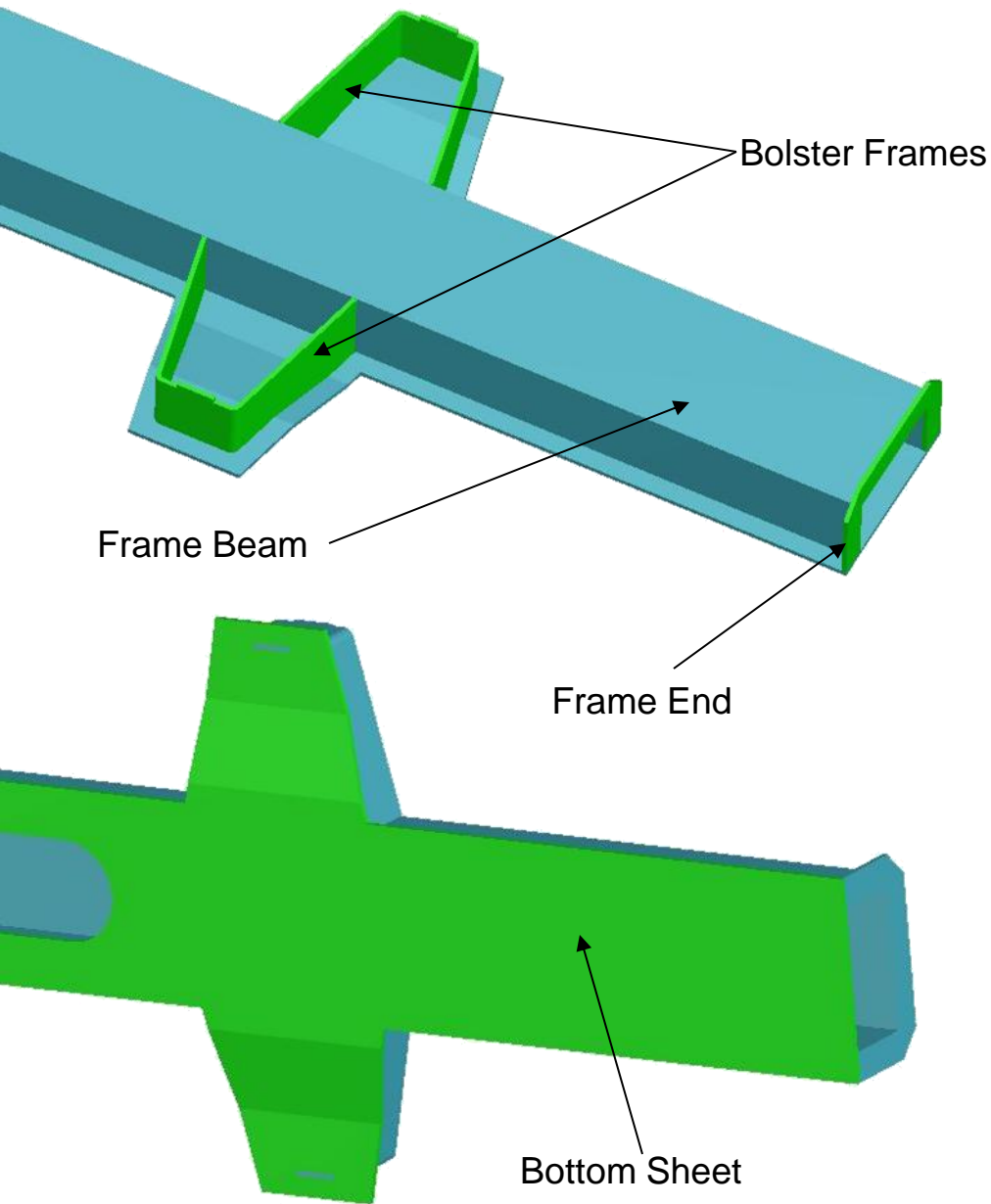
Repeat at the other end of the car.

Permanently rivet the current Body assembly together **EXCEPT** for the holes shown on both ends. (The end cages mount to the holes circled in red.)

This will complete the body section, next will be the frame.

Step 7

"Frame Assembly"



Modify parts or attach your provisions for trucks and couplers at this step!

Begin by inserting the tabs of the bolster frames into the slots of the bottom sheet.

Place the frame beam (channel) on the bottom sheet between the bolster frames, notice the beam is shorter than the bottom sheet.

Place the frame ends on the bottom sheet at each end of the beam.

Skip weld the assembly together. Caution: Too much welding will bow the frame. Make sure the bottom sheet stays straight and even with the beam, otherwise the assembly will not fit between the bays of the body.

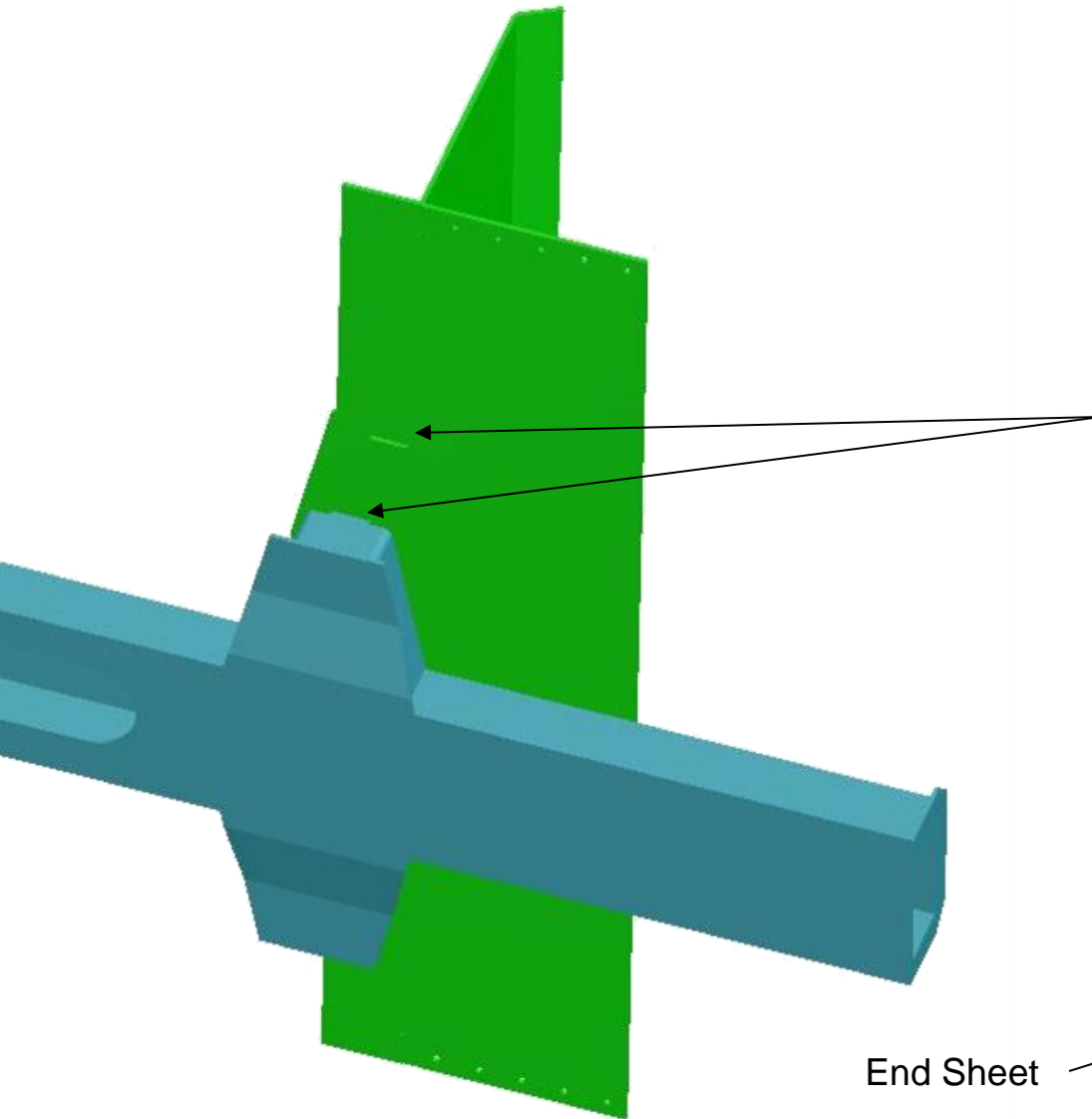
Step 8

Insert the tabs of Cross member 3 into the matching slots of the end sheet, tack together (See Below, notice the direction of the bend in Cross Member 3).

Line up the end sheet assembly slots onto the tabs on the bolster frames of the frame beam.

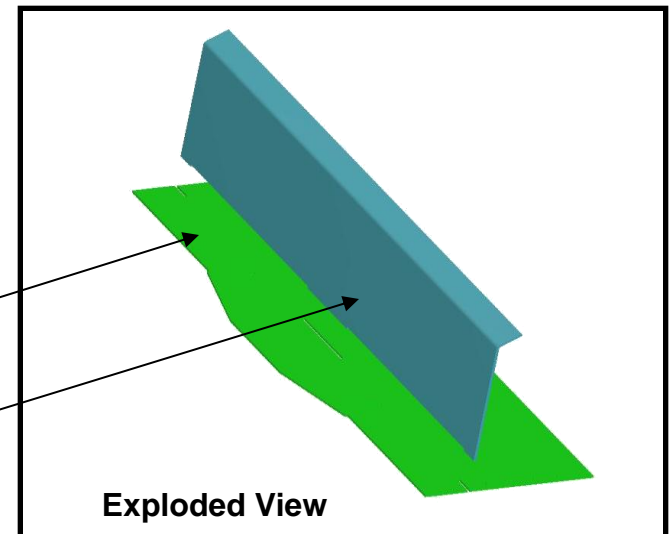
Weld in place.

This completes the frame assembly, next is the end cages



End Sheet

Cross Member 3



Step 9 “End Cage Assembly”

The next step involves the assembly of the end cages and it covers the next 3 pages. Be sure to test assemble these items. The order of assembly will vary with the method of fastening you choose and it is up to you to figure it out. As a sample, our assembly order is listed on the next page, we use a modified rivet squeezer with solid aluminum rivets to build our end cages. Below are a few tips...

...Dry fit all of the pieces with Clecos (temporary fasteners for riveting), figure out your best approach.

...Machine screws are the safest to use, you can disassemble easily if necessary, button head screws look like rivets, the holes can be tapped for 4-40 screws.

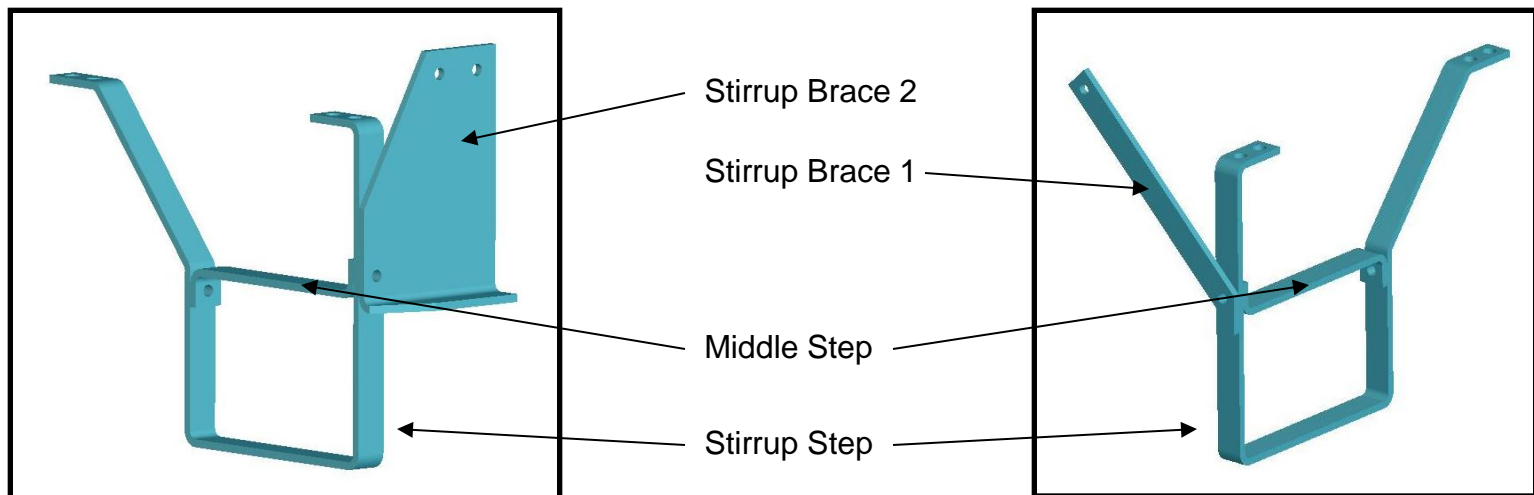
...If using solid rivets with a squeezer, don't squeeze too hard, the aluminum extrusion will distort.

...Do not use an pneumatic rivet tool (air hammer) to set rivets.

...Wait to Rivet the top 7 holes on each side of Cage Members 6 and 5, these fasten the end cages to the body

...Refer to the following 3 pages for information and pictures on building the end cages, CM = Cage Member

...The brake and non-brake end cages are very similar, the grab irons and stirrups steps are in the same locations on each.



Step 9 Continued...

This is an example of the order of assembly we use for riveting our end cages, you must determine the best order of assembly for the fastening method you choose.

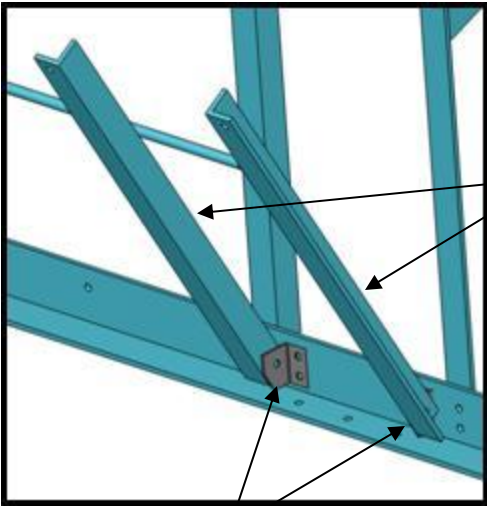
“Brake End” End Cage

Stirrup Brace 1 to Stirrup Step to Middle Step
Stirrup Brace 2 to Stirrup Step to Middle Step
Angle Brackets to CM 11, 13, 14, 15
Walkway Brace 2 to CM 8, 11
Walkway Brace 1 to CM 9
Grab E Right to CM 13
Grab E Left to CM 11
CM 6 to CM 1
CM 11 (w/brackets) to CM 1
CM 8 to CM 1
CM 9 to CM 1
CM 14 (w/bracket) to CM 1
CM 15 (w/bracket) to CM 1
CM 7 to CM 1
CM 5 to CM 1
Stirrup Step to CM 3 to CM 1 (Stirrup brace 1 to CM 1)
CM 13 (w/brackets) to CM 3
Stirrup Step to CM 4 to CM 1 (Stirrup brace 2 to CM 1)
Grab A 2.25” to CM 1
Grab D 5.75” to CM 7, 5
Grab D 6.094” to CM 5
Grab D (Bent) 2.5” to CM 5
Walkway to Walkway Braces 1, 2

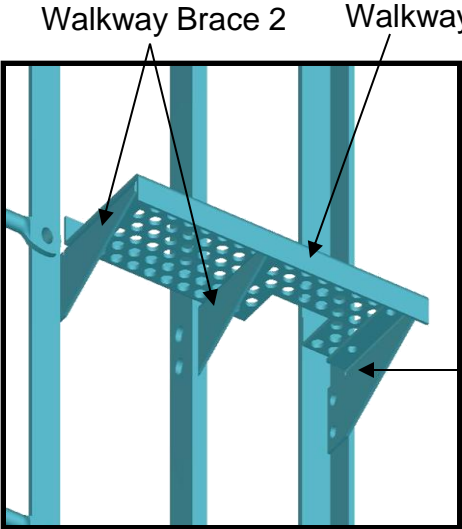
“Non-Brake End” End Cage

Stirrup Brace 1 to Stirrup Step to Middle Step
Stirrup Brace 2 to Stirrup Step to Middle Step
Angle Brackets to CM 12, 13, 14, 15
Grab E Right to CM 13
Grab E Left to CM 11
CM 6 to CM 2
CM 12 (w/brackets) to CM 2
CM 10 to CM 2
CM 14 (w/bracket) to CM 2
CM 15 (w/bracket) to CM 2
CM 7 to CM 2
CM 5 to CM 2
Stirrup Step to CM 3 to CM 1 (Stirrup brace 1 to CM 2)
CM 13 (w/brackets) to CM 3
Stirrup Step to CM 4 to CM 1 (Stirrup brace 2 to CM 2)
Grab A 2.25” to CM 2
Grab D 5.75” to CM 7, 5
Grab D 6.094” to CM 5
Grab D (Bent) 2.5” to CM 5

Step 9 Continued...

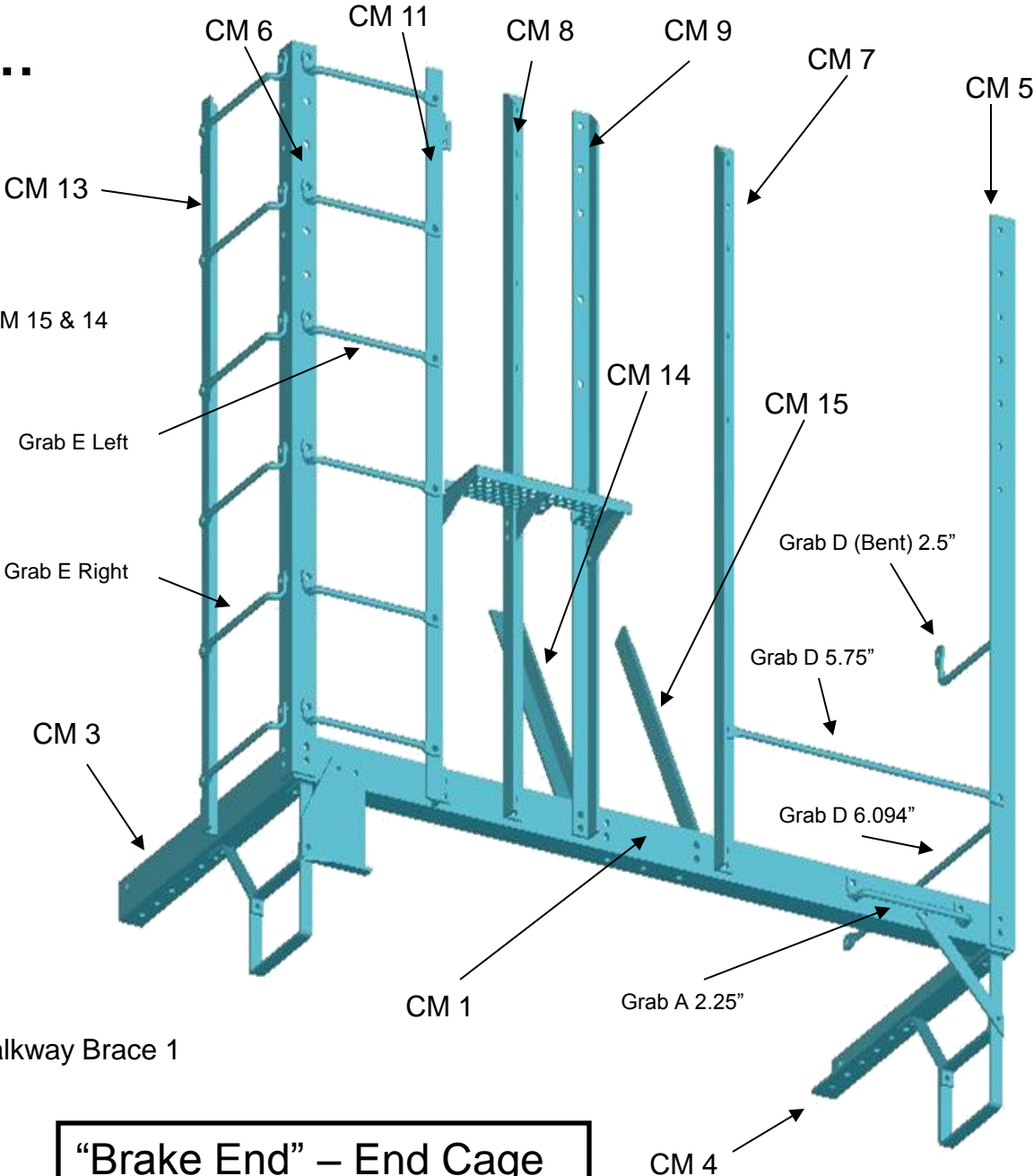


Brace Bracket



Walkway Brace 2 Walkway

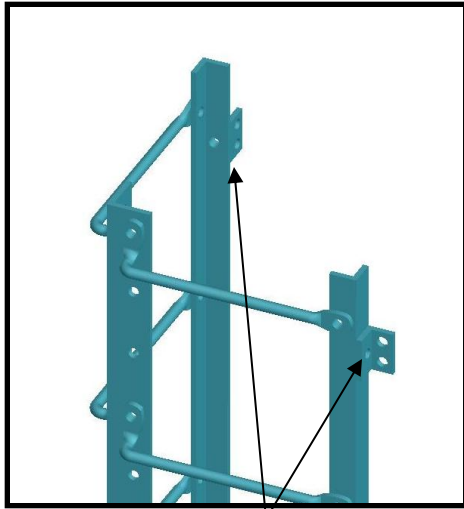
Walkway Brace 1



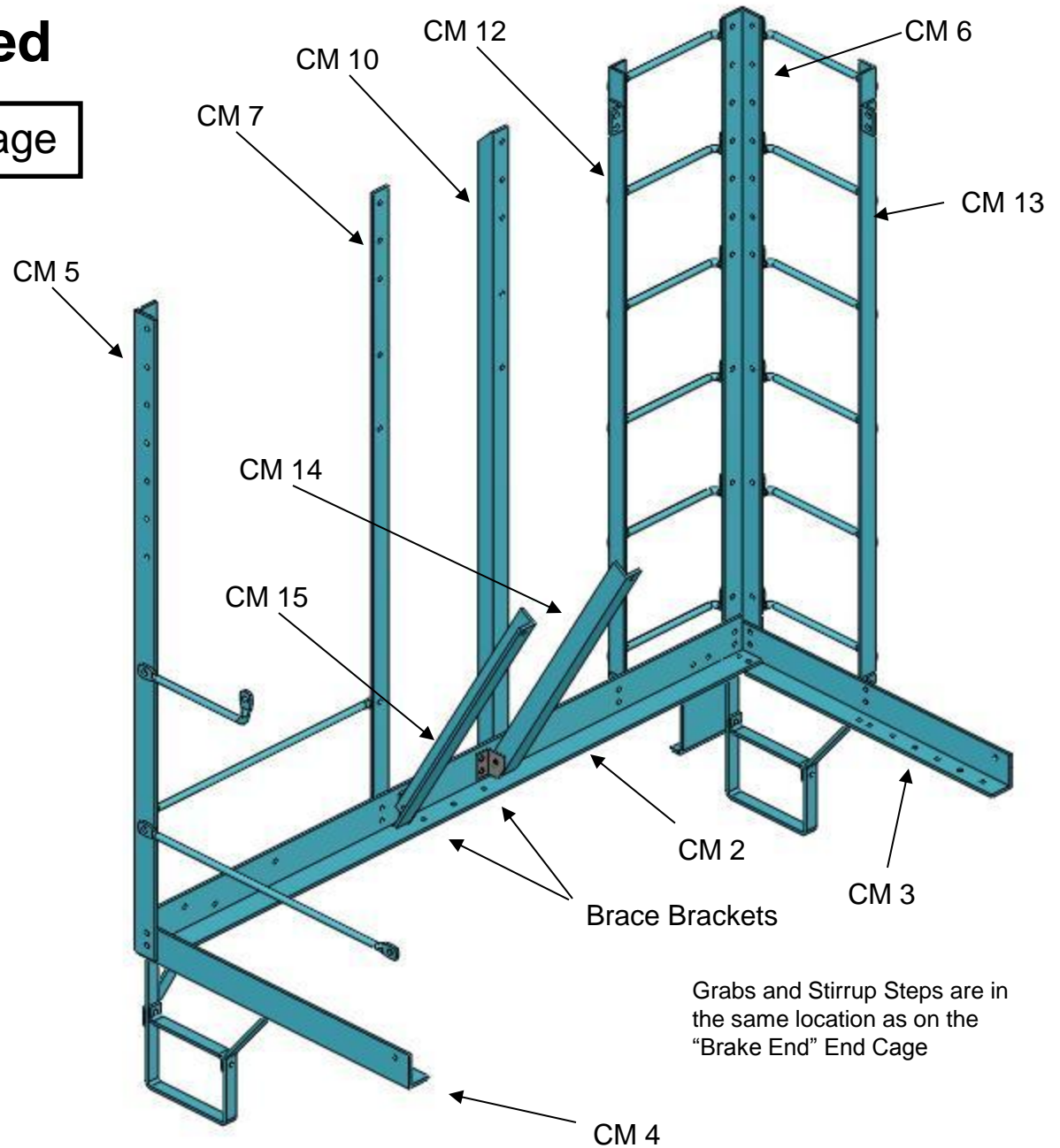
"Brake End" – End Cage

Step 9 Continued

"Non-Brake End" – End Cage

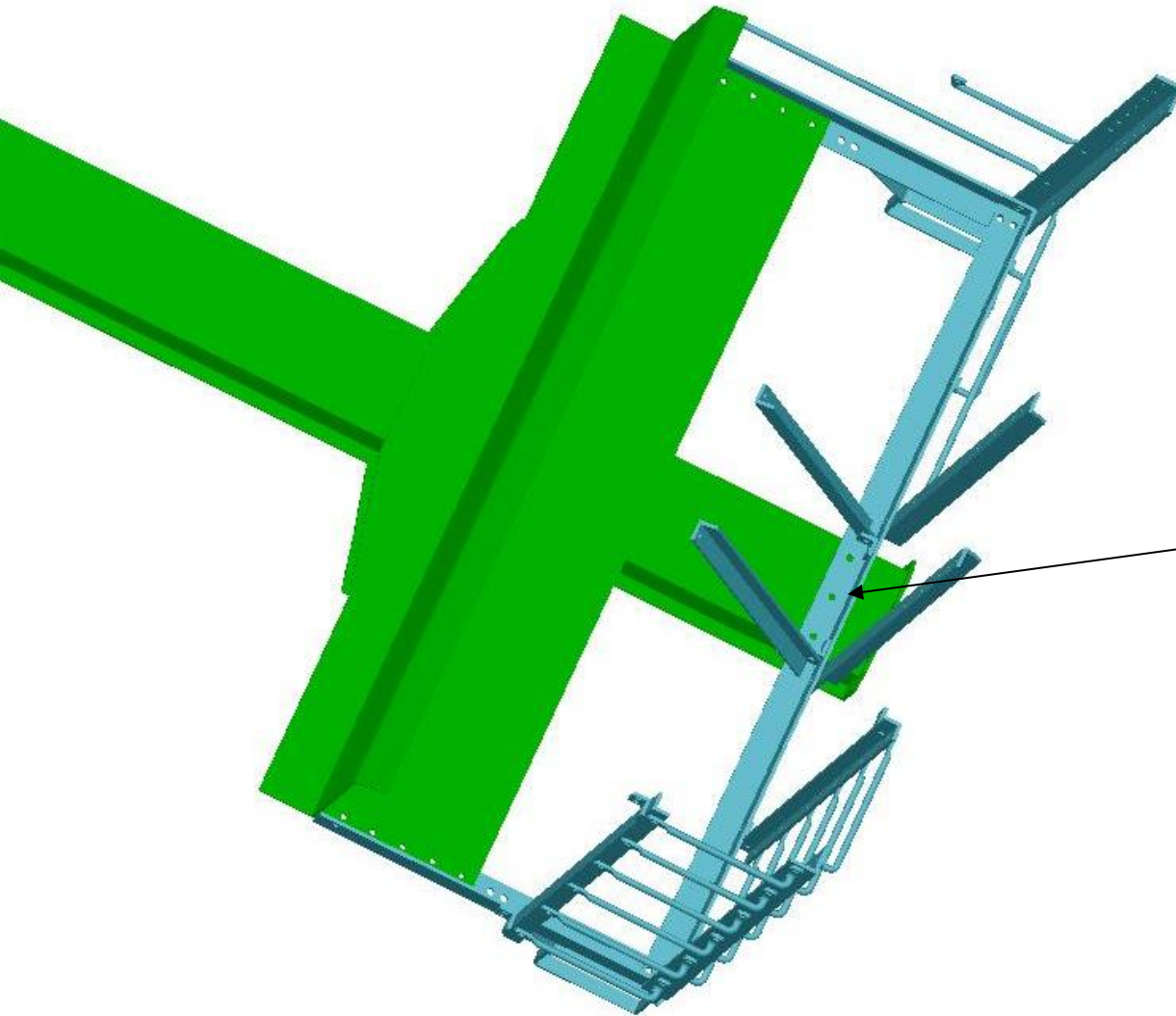


Angle Bracket



Step 10

“Final Assembly”



Temporarily fasten the End Cages into place on the frame assembly as shown

Locate and drill the three holes into the 2" x 1" channel of the frame with a #43 drill bit.

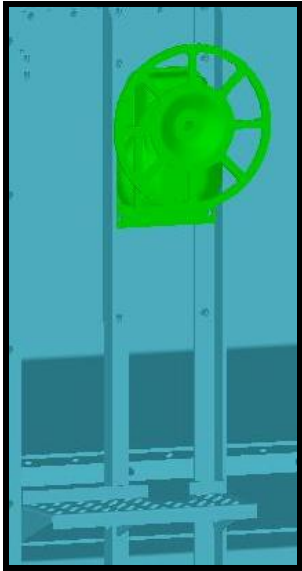
Tap the three holes and fasten with the 4-40 machine screws.

Permanently fasten the end cage to the end sheet

Step 11

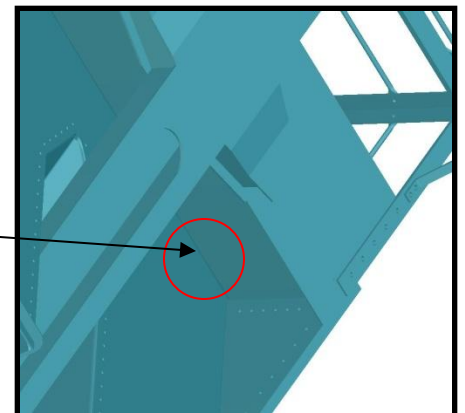
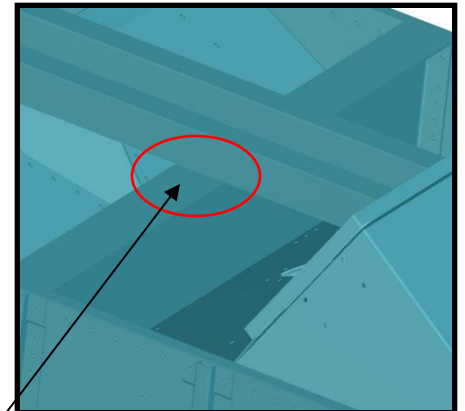
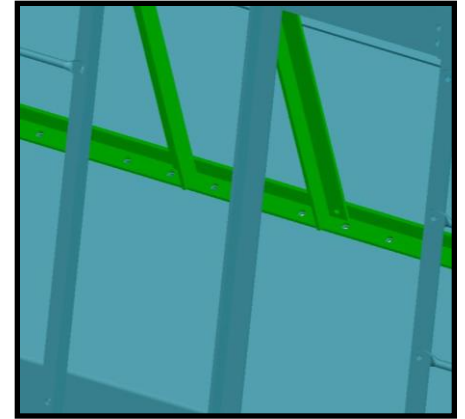
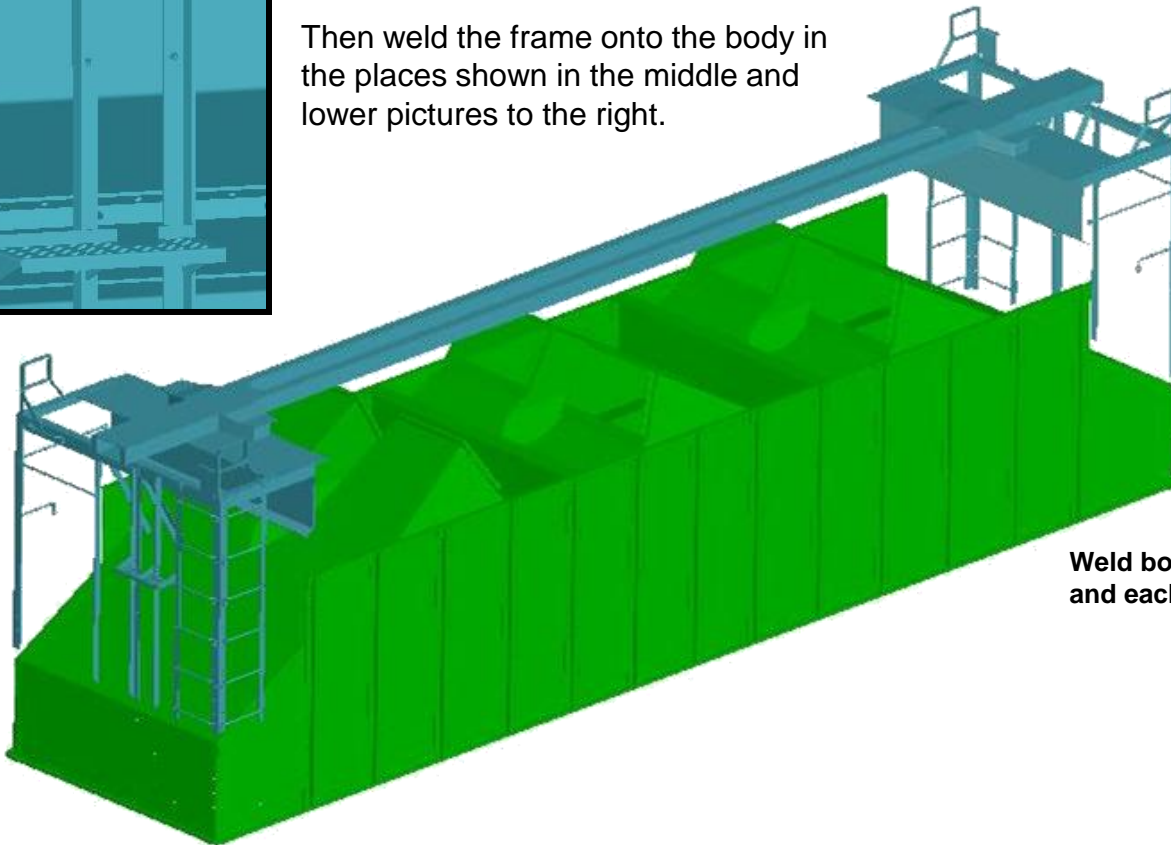
With two people, lower the frame assembly with end cages onto the upside down body.

Be careful to Cage Members 14 and 15 to sit properly on the Slope Sheet Braces as shown in the top right picture.



Fasten all of the vertical pieces of the End Cages to the body first. Be sure to install the brakewheel housing assembly above the brake platform before riveting those cage members. The housing stamping may need some filing to fit properly.

Then weld the frame onto the body in the places shown in the middle and lower pictures to the right.



Weld both sides
and each end

Step 12

Begin by fastening the Latch Catches to the Gate Brace. There are 3 left and a 3 right handed latch catches

Fasten the gate brace to the Discharge Gates (Left and Right) as shown in the picture

Notice that there are two different packs of hinges, Four are labeled as the center bay hinges. The other 8 match up to the end bays.

Using 6-32 Button Head Cap Screws and nuts, attach the hinges to the Discharge Gate assemblies and to the car body. Alternately, the hinges can be plug welded to the body using the holes in the hinges. Be sure to sand off the galvanized coating and provide plenty of ventilation to avoid potentially hazardous fumes.

This completes your Precision Steel Car kit.

Note: Due to an unavoidable change in hinge suppliers, the mounting holes in the main body do not line up correctly. Position the discharge gates over the chutes and either drill new holes or weld the hinges in position. We apologize for the inconvenience.

