Document Version Control		
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WP0017	**2**	**04/04/2022**

Talon Bolt-On Heel Shroud Boss Welding Procedure

Outline

This procedure provides an outline of how to attach the Talon Bolt-On Heel Shroud Boss onto a bucket. Please ensure a copy of this procedure is available for personnel who are tasked with welding Talon products.

Welding Safety

Welding, cutting and any allied process are a significant safety risk. Before undertaking any of these processes ensure that all precautions have been considered or implemented as per welding safety standards AS1674: 2007 or ANSI Z49.1: 2005 or equivalent globally recognized standard.

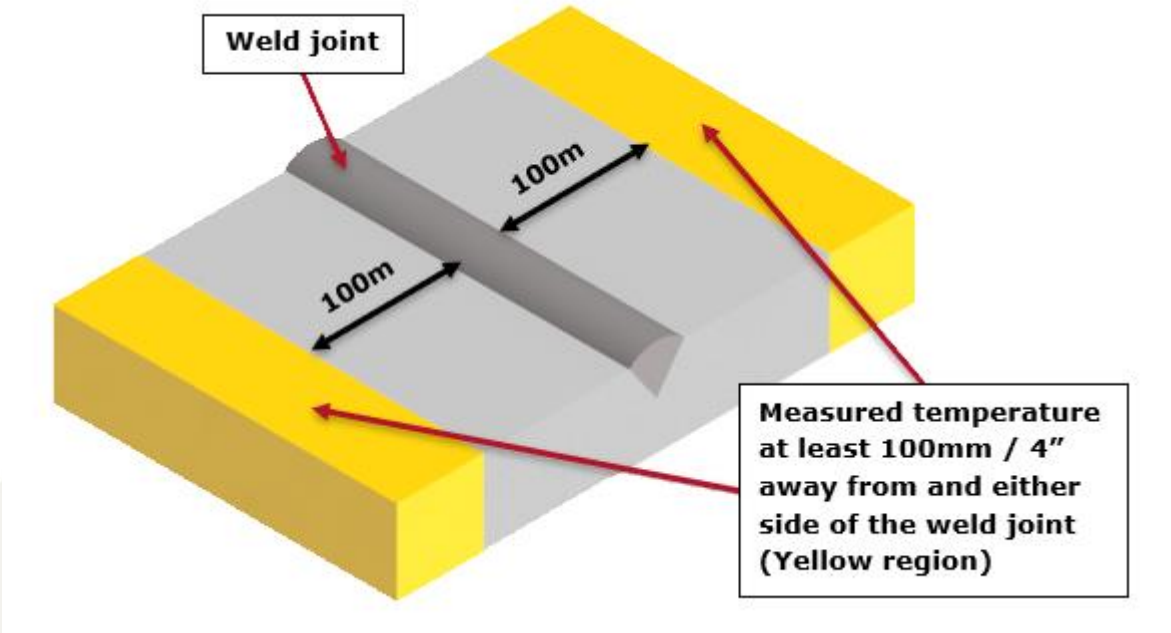
Of particular note please ensure the following is adhered to:

- Wear correct PPE including
  - Full sleeve non-flammable work wear. (No gaps)
  - Non-flammable welding gloves
  - Steel capped work boots
  - Safety glasses
  - Hearing protection
  - Full face welding shield
- Suitable ventilation is available for the person completing the operation.
- Welding is an electrical risk ensure the area where welding is to be conducted is not damp or wet.
- Welding is a fire risk ensure the area where welding is to be conducted is free of any thing flammable and that suitable fire extinguishers are easily available.
- If welding is to be conducted in an area where other people are working, ensure welding flash shields are utilized.
- Good general housekeeping to ensure the work area is safe and free of clutter.
- Ensure appropriate tags for your workplace and work environment are used.

WELDING PROCESS AND PREHEAT NOTICE

Please ensure that you follow the Thermal Treatment (Preheat) procedure stated in this welding procedure. Preheat of the weld area prior to commencing welding will help ensure weld quality, reduce the occurrence of cracking and other problems that can result in costly rework. The weld area must be heated to 150°C, measured at least 100mm / 4" away from and either side of the weld joint and maintained between 150°C and 250°C throughout the welding process.

The warranty may be void on Talon Weld-On components if the specified process is not followed correctly.



Talon Welding Setup

Weld Preparation

The surfaces to be welded must be good and free from scale, grease, paint, water, or any other contaminants. The heat from welding breaks down any hydrocarbons and moisture in the area and releases hydrogen. The hydrogen along with any remaining particulate matter can be absorbed in the weld and result in cracking, porosity, and inclusions.

Preparation of the weld surfaces may be achieved by sand blasting, shot blasting, grinding, sanding, air carbon arc gouging, or a combination of any these processes. Should the air carbon arc gouging process be used, finish the surface by grinding to remove all carbon slag. Following any of these preparation processes ensure any dust or particulate matter is removed from the weld area to prevent porosity and inclusions.

Welding Process

Welding may be completed by any of the following processes:

- Gas Metal Arc Welding (GMAW)
- Flux-cored Arc Welding (FCAW)

A combination of GMAW or FCAW can be utilised.

The following table details **recommended** reference consumables:

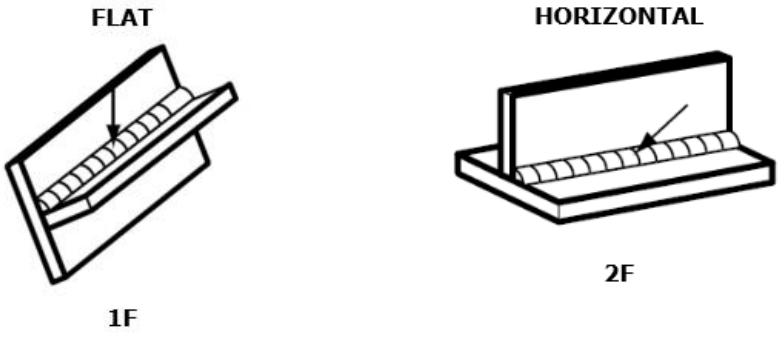
Process	AWS	AS/NZS	ISO	Shielding Gas	Polarity
GMAW	AWS A5.18 ER70S-4	2717.1: ES4-GC/M-W503AH		100% CO2 Ar + 10-15%CO2 Ar + 15-25%CO2	DC+
GMAW	AWS A5.18 ER70S-6	2717.1: ES6-GC/M-W503AH		100% CO2 Ar + 10-15%CO2 Ar + 15-25%CO2	DC+
FCAW-G	AWS A5.20 E71T-1 H8	17632-B: T49 2 T1 1 CAU H10		100% CO2 Ar + 20-25%CO2	DC+
FCAW-G	AWS A5.18 E70C-6M H4	17632-B: T49 4 T15 0 MAU H5		Ar + 20-25%CO2	DC+/-
FCAW-S	AWS A5.20 E70T-7	17632-B: T49 Z T7 0 NA		NR	DC-
FCAW-S	AWS A5.20 E71T-8	17632-B: T49 3 T8-1NA-H15		NR	DC-

Electrical Parameters

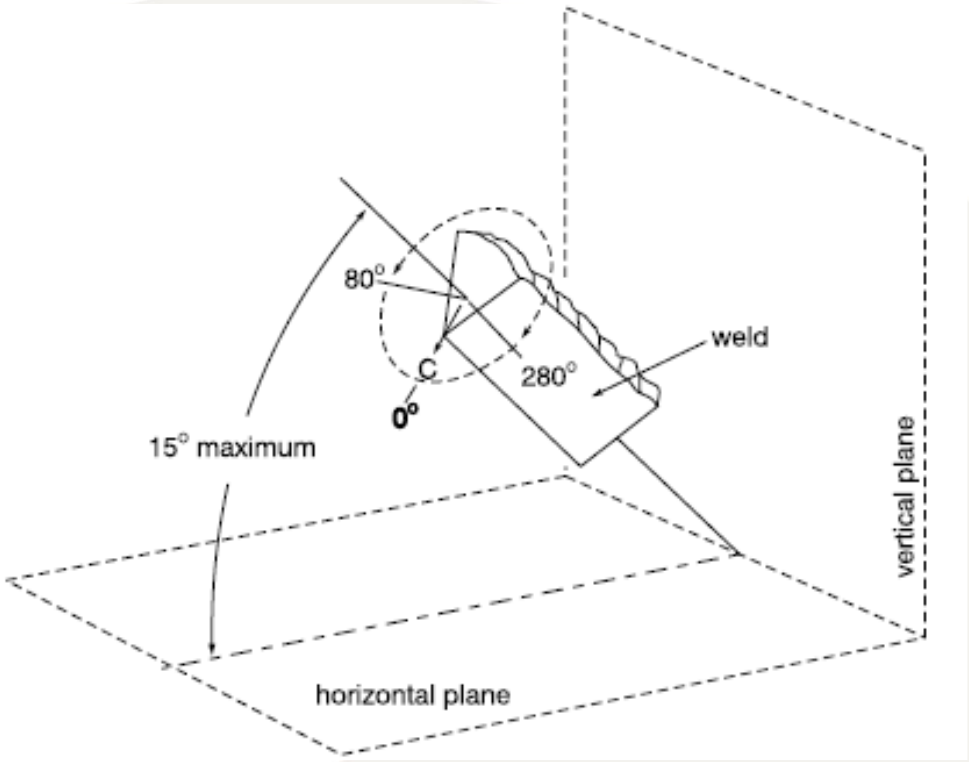
The person completing the weld should refer to the manufacturer's specifications to determine the optimal settings to complete the weld. Actual voltage, welding current and Electrode Stick Out (E.S.O.) used will depend on machine characteristics, plate thickness, run size, shielding gas and operator technique etc.

WELDING POSITION

Welding of Talon Bolt-On Heel Shroud Boss is recommended and shall be completed in the Flat 1F and Horizontal 2F position. The other positions can be welded but the process should be adjusted to suit the applicable weld wire and equipment to ensure good weld strength and integrity.



Deviation from the Flat or Horizontal position is permissible as shown in figure below as typically described in welding standard AWSD1.1, Structural Welding--Steel, Figure 4.2 "Positions of Fillet Welds".



The longitudinal axis of the weld may be inclined no more than 15° with respect to the horizontal plan. The centre of the weld face "C" must lie within the rotational limits of 80° to 280° as shown.

Thermal Treatment

It is important to preheat the work piece prior to commencing welding and ensure the components are maintained within the acceptable interpass temperature range during welding. Preheat is the heating of a work piece prior to being welded, flame cut, or air carbon arc gouged. Heat can be applied though several methods such as propane or butane gas flame burners or torches and magnetic induction.

As welding, flame cutting and air carbon arc gouging use a high temperature heat source to melt the base metal, a high temperature in a small localized area is created along with a large temperature differential to the rest of the work piece. This causes high stresses, hardened areas, deformation, and a very small area for hydrogen gases to be released from the steel. Preheat reduces the temperature differential and so lowers the risk of weld cracking, maximum hardness of the heat affected zone, lessens distortion, and releases hydrogen from the steel prior to welding.

Maintaining the correct interpass temperature is important to hold the reduced temperature differential gained from preheating and to ensure the work piece does not get too hot. Allowing the steel to become too hot will temper the steel and soften it, reducing its hard-wearing properties.

When preheating with burners and torches it is most effective to heat the work piece from below. This allows the heat to soak up though the body of the work piece. Using insulating heat blankets on the topside of the work piece will improve and speed up the process, allowing the dispersion and retention of the heat that has been input.

Temperature should be measured using an infrared thermometer or temperature indicating crayon at least 100mm / 4” away from and either side of the weld joint. Best practice is to measure the temperature on the top side as heat is applied to the bottom side, this will ensure a complete preheat though the thickness of the work piece. Prior to any welding, flame cutting and air carbon arc gouging on Talon components and steel bodies the following preheat and interpass temperatures must be reached and maintained.

Material	Thickness	Min Preheat Temp	Max Interpass Temp
Talon GET Castings	All Weld-on Castings	150°C / 300°F	260°C / 500°F
ASTM A514 Steels	Greater than 63mm / 2-1/2"	120°C / 250°F	260°C / 500°F
400-450 BHN Abrasion Resistant Steel	Greater than 63mm / 2-1/2"	150°C / 300°F	260°C / 500°F

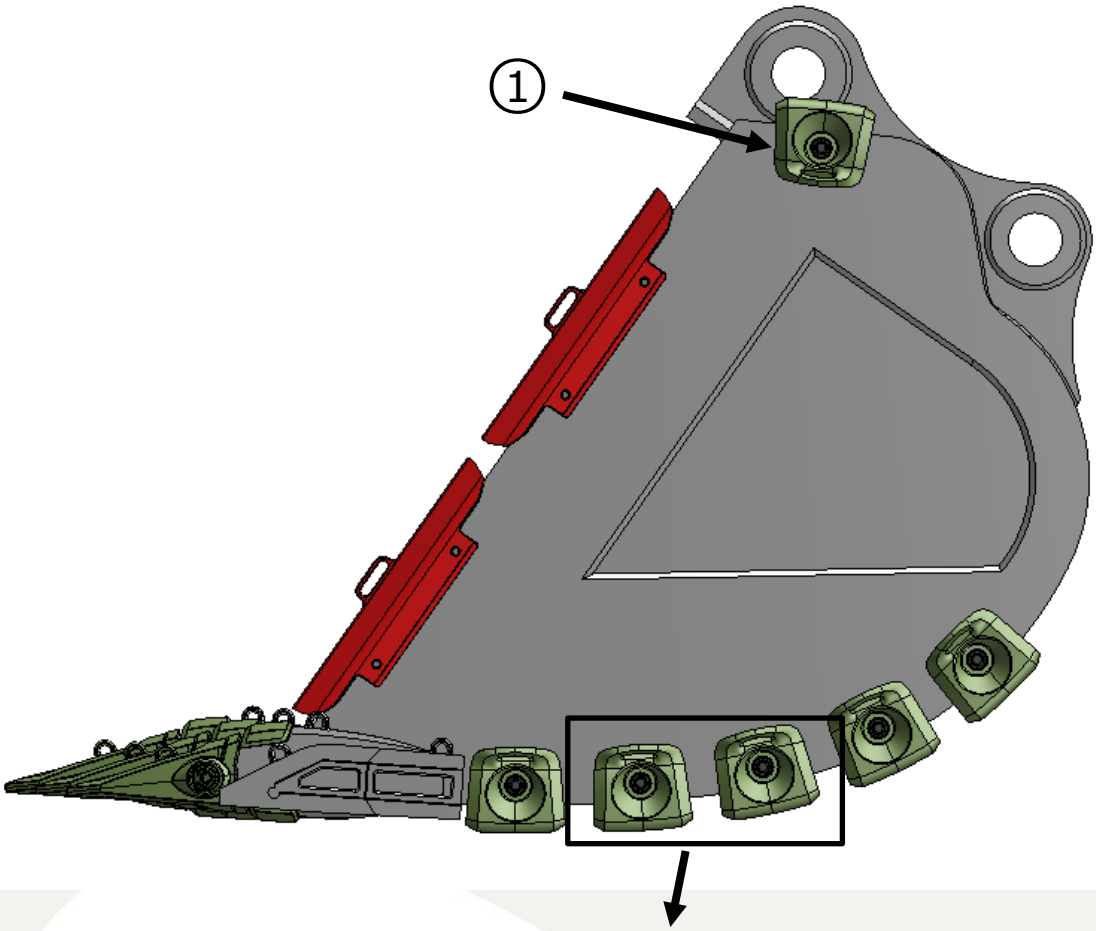
Notes:

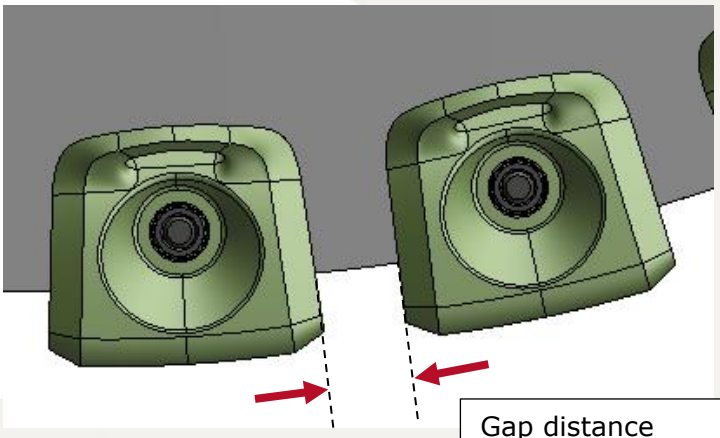
- If the ambient humidity is high and or the temperature is below 4°C / 40°F, the tabulated thermal treatment temperature should be increased by 27°C / 80°F. At no time should any material type or thickness be welded when the temperature of the steel is at or below 4°C / 40°F. This includes tack or spot welds or any allied process. Preheat must be applied as specified.
- All material within 100mm / 4" of the weld zone must be within the specified temperature.
- Cool weld slowly, for a minimum of 8 hours, utilising thermal blankets. Do not allow drafts or cool ambient temperatures to cool the parts or assembly. Cool down rate should not exceed 55°C / 130°F, per hour.
- If the ambient temperature is at or below 4°C / 40°F the part must be covered with a thermal blanket to insure the cool down rate above. Alternatively, the entire part maybe post-heated to 150 - 200°C / 300 - 400°F for four hours and then maybe air cooled.

Welding Procedure

Heel Shroud Arrangement

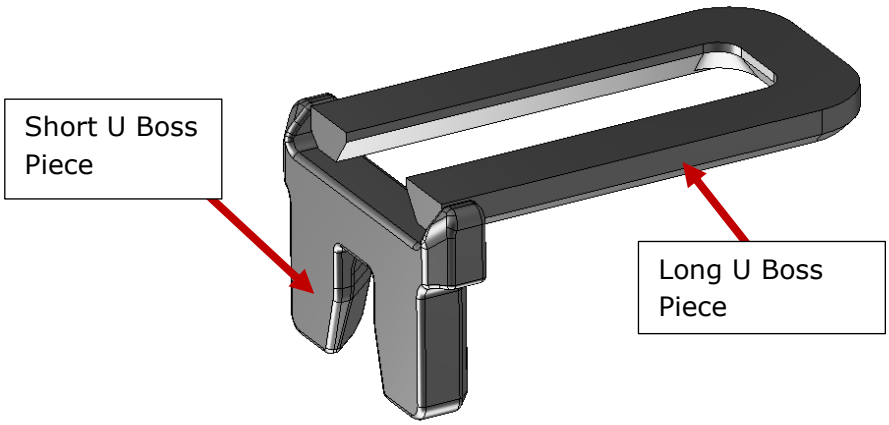
Talon Bolt-On Heel Shrouds can be placed along the bucket heel in the desired locations to suit your bucket size and configuration. Talon Heel Shrouds should be evenly distributed along the bucket heel. It is optional to place a Talon Heel Shroud Boss at the top of the bucket main side wall (indicated as number 1) in the figure below.



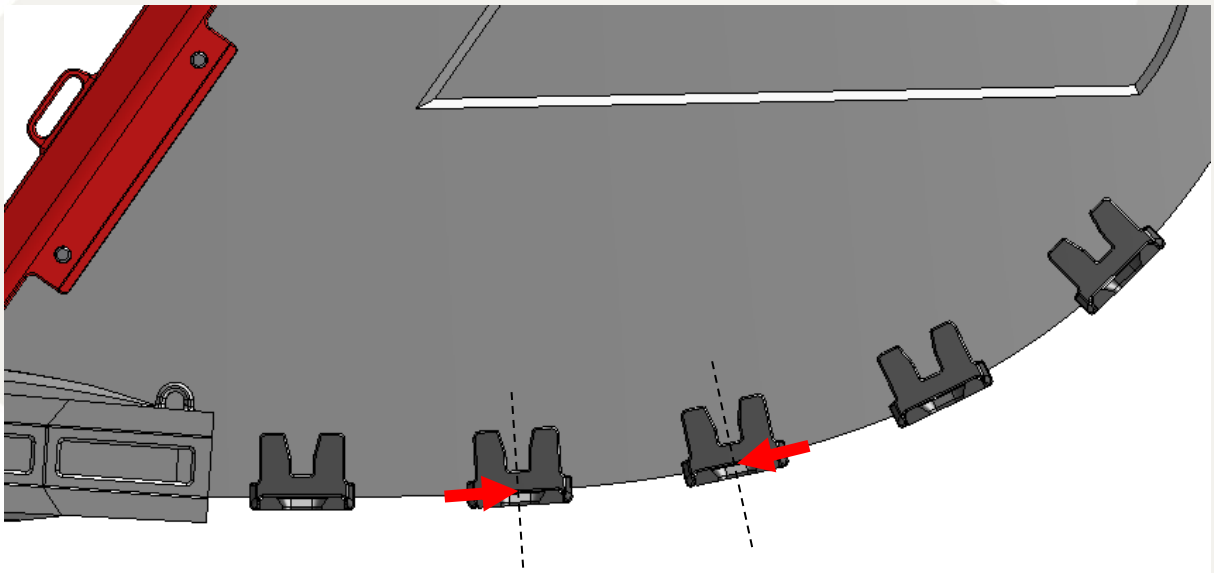


Gap distance
Nominal = 100mm / 4.0”
Min = 80mm / 3.2”
Max = 150mm / 6.0”

Talon Bolt-On Heel Shrouds are Mechanical Heel Shrouds that are attached to the bucket heel using a boss to be welded onto the bucket and tightened in place with a plow bolt and hex nut. To enable proper fitment of the Talon Bolt-On Heel Shroud Boss, ensure that the bucket heel is square at the corner and no parts of the wear plates on the bucket heel protrude out from the sides. The Heel Shroud Boss shown below consists of two separate components which need to accurately interlock at a corner and are to be held in place on the bucket by welding.



The formula for the distance between the bosses to create an equal distribution of heel shrouds along the bucket heel is shown in the figure below.

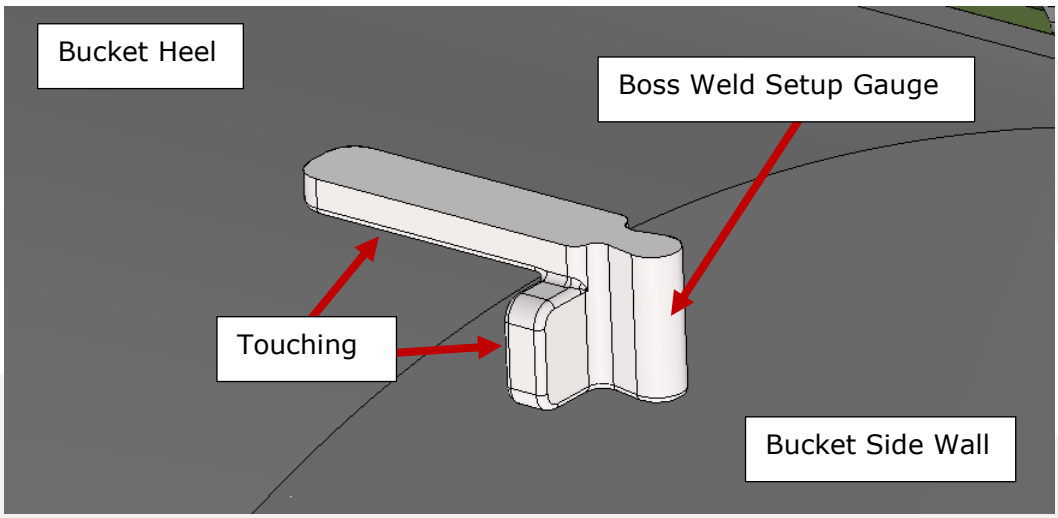


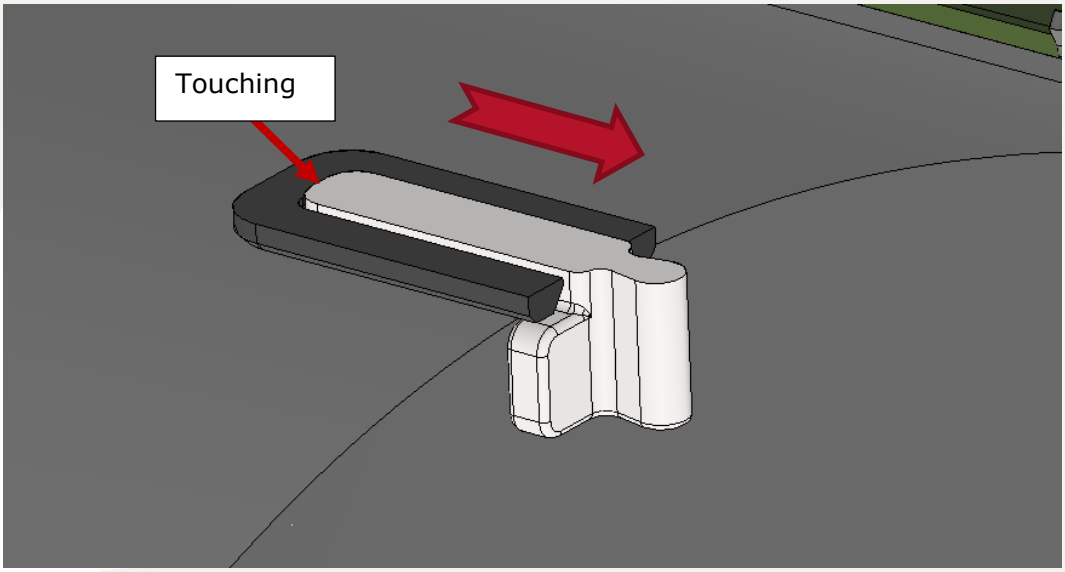
Distance between centre of Heel Shroud Bosses
Nominal = 100mm / 4.0” + (Heel Shroud Width)
Min = 80mm / 3.2” + (Heel Shroud Width)
Max = 150mm / 6.0” + (Heel Shroud Width)

For example, if the Talon Bolt-On Heel Shroud width is 250mm, the nominal distance between the centers of the bosses would be 250 + 100 = 350mm. Make markings on the bucket side wall to enable correct location of the Heel Shroud Boss Weld Setup Gauge. The Boss Weld Setup Gauge will correctly position the Heel Shroud Boss and ensure the two components of the boss is properly aligned relative to the bucket heel and side wall in preparation for welding, of which will be detailed next in the section "Welding Sequence".

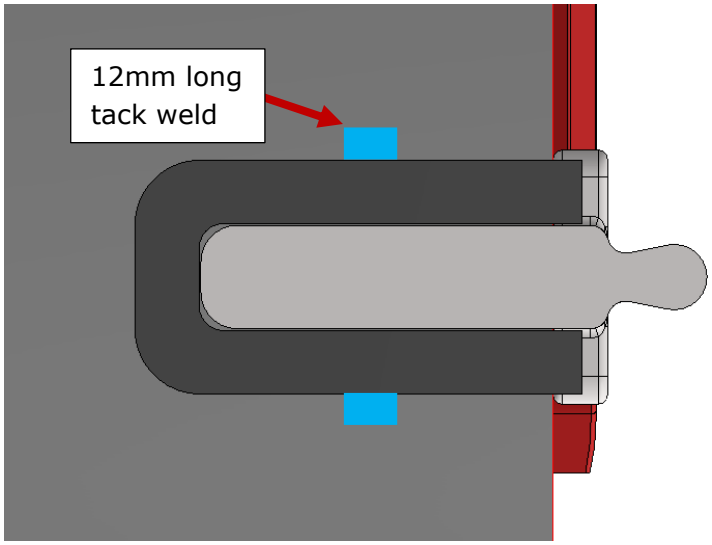
Welding Sequence

Position the bucket or the area to be welded in the right orientation to work properly. By means of markings done in previous section, locate each Long U Boss Component on bucket heel using the Heel Shroud Boss Weld Setup Gauge. Place the gauge on the bucket heel and butt it against the side of the bucket. Displace the Long U Boss piece onto the gauge as indicated in figure below until it makes a stop with the gauge.

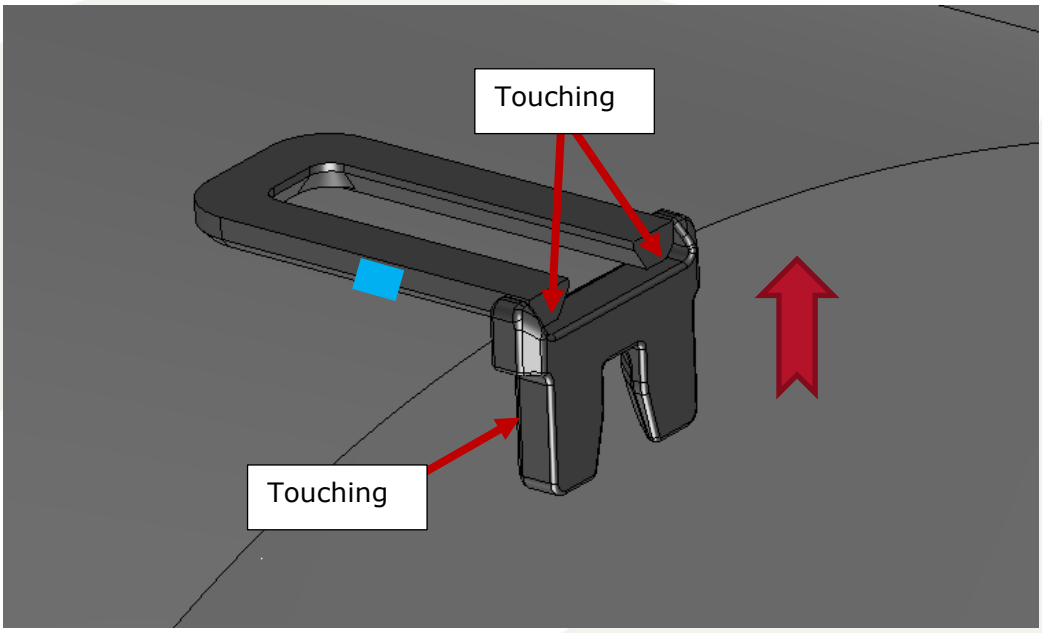




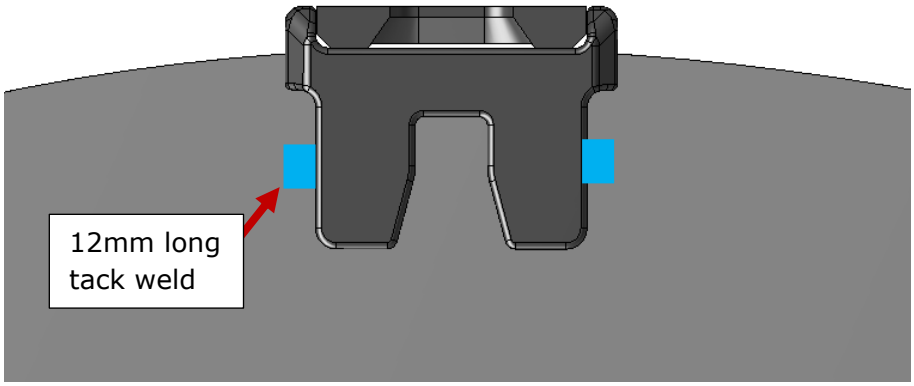
Make a small 1/2 inch or 12mm long tack weld on each side of the Long U Boss piece to secure the first piece onto the bucket.



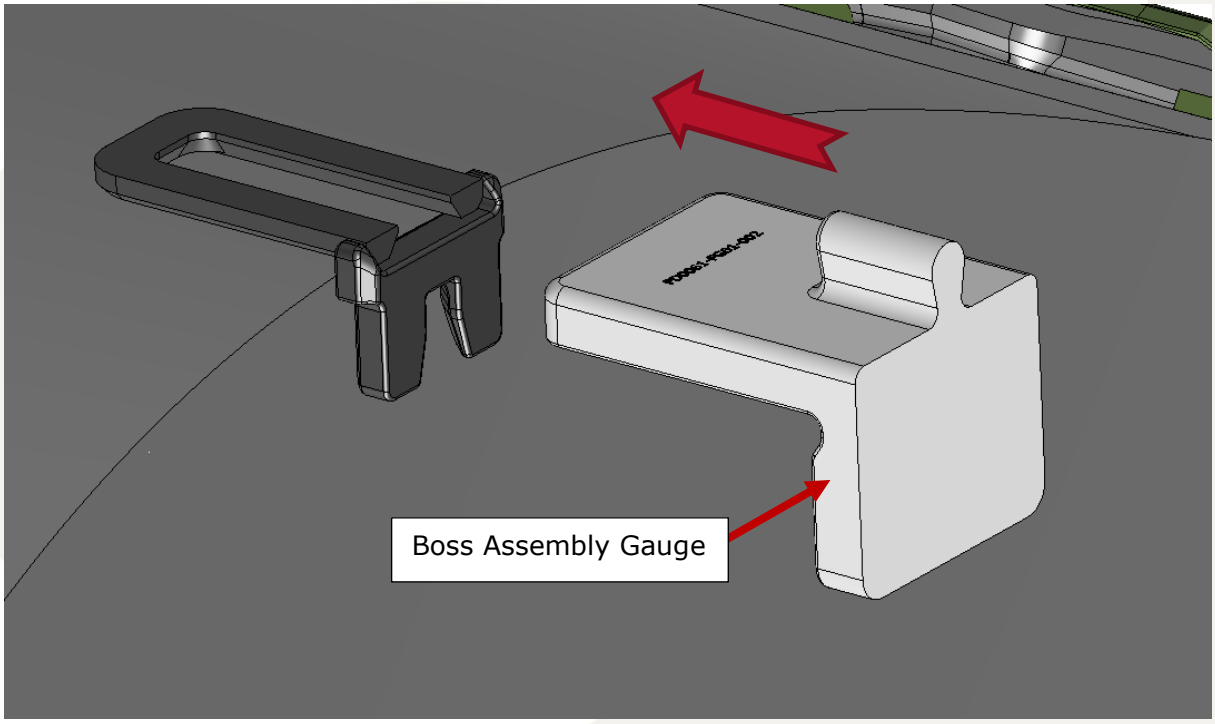
After the first Long U Boss piece has been tack welded, remove the gauge, and displace the second Short U Boss piece until it contacts the first Boss piece. The second Short U Boss piece should also butt against the side of the bucket.



Make a small 1/2 inch or 12mm long tack weld on each side of the Short U Boss piece to secure the second piece onto the bucket. The final placement of the second boss piece should appear the same as the figure below.

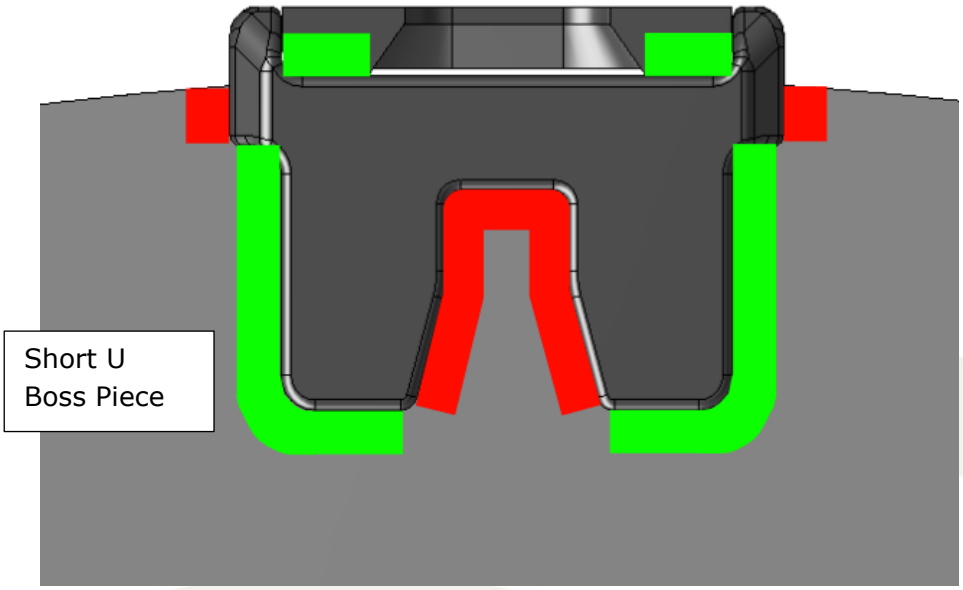


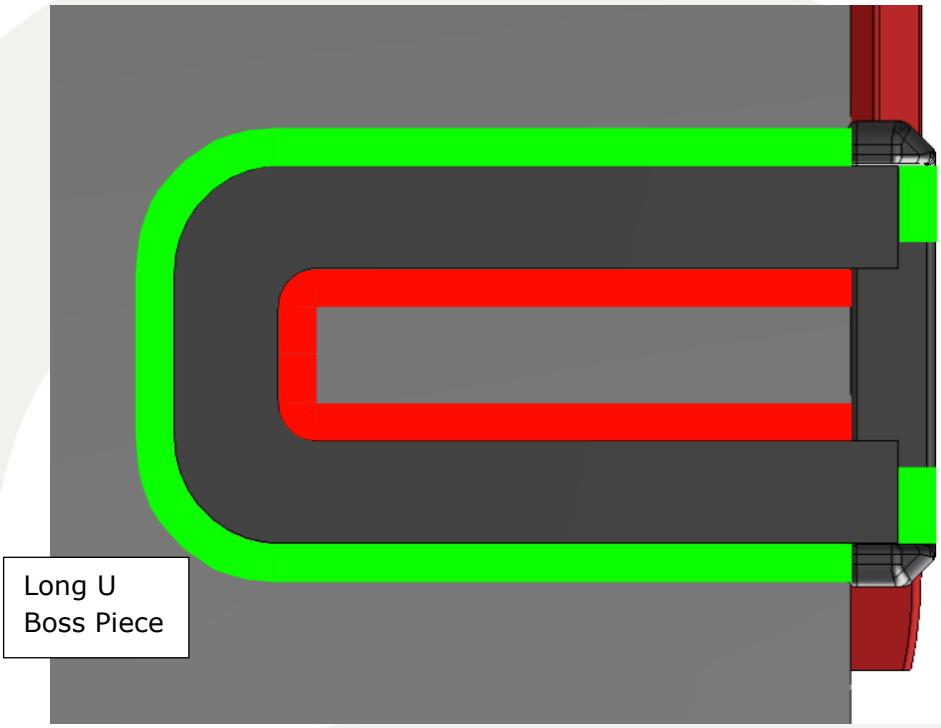
After both boss pieces have been tack welded in place, use the Heel Shroud Boss Assembly Gauge to check that both boss pieces are positioned correctly relative to the bucket as indicated in the figure below. This is done to assure good fitment of the heel shroud with the welded boss assembly.



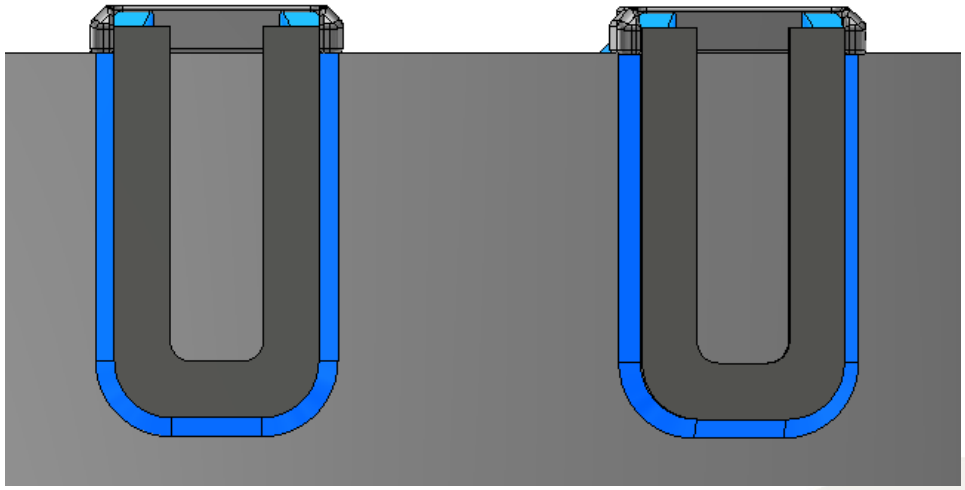
Once the welded boss assembly passes inspection, start welding on areas as specified in the two figures below with a weld size of ½ inches or 12mm. Preheat the area to be welded to 150°C before proceeding with complete weld.

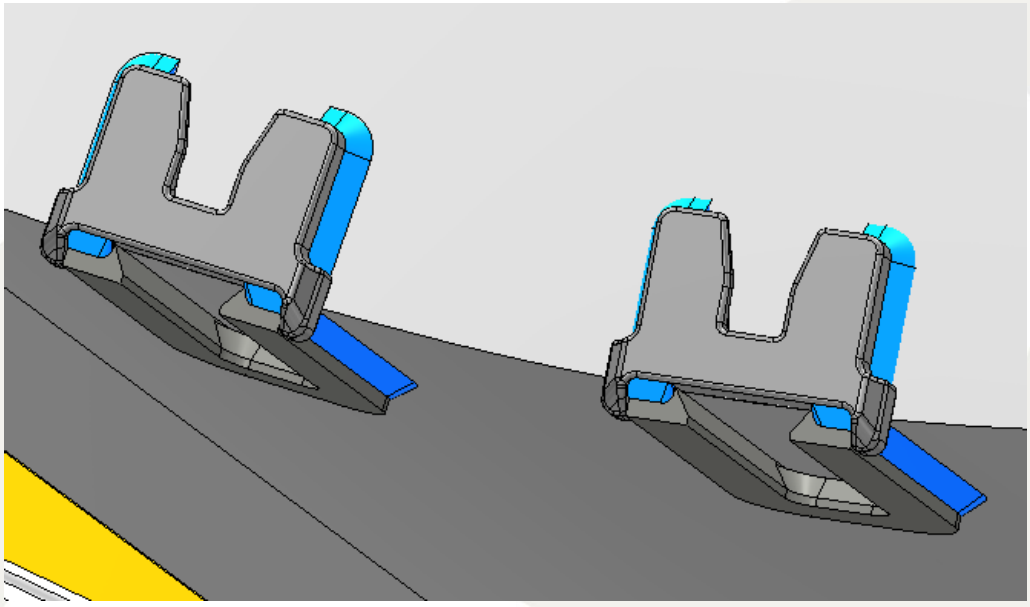
Red Areas: **DO NOT WELD**
Green Areas: Welding Area





The finished welds should look like the figures below.



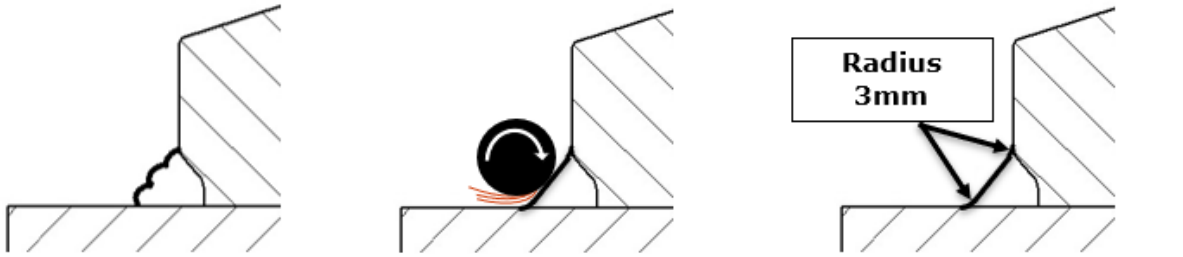


After both boss pieces have been fully welded, inspect again with the Heel Shroud Boss Assembly Gauge.

Weld Finishing

Welds shall be ground such that the surface of the weld becomes a smooth surface free of any roughness or ripples associated with fresh welds. The toes of the weld shall transition smoothly, such that the transition exhibits a minimum of a 3mm / 1/8" radius.

Although various methods of grinding maybe used to remove the bulk of the weld roughness. Grinding shall be finished such that any remaining grinding markings are all perpendicular to the weld.



Weld Before Grinding | Weld During Grinding | Weld After Grinding

The end of the weld must be tapered and smooth prevent a stress riser at a change in restraint or profile location.

It is recommended that all finished welds are inspected for cracks using either MPI or Dye Penetrant Inspection. It is preferable to use the MPI process. Any cracks detected must be completely gouged out and filled with weld. Finish the repair with grinding as detailed above and re-inspect for cracks.

Change Register

Rev	Date	Changes from previous version
0	16/06/2021	Original Issue
1	06/09/2021	Added welds to intersection area of both bosses
2	04/04/2022	Add preheat notice, update Welding Setup details and Weld Finishing