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# SURFACE GET DETAILED WELDING PROCEDURE

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## OUTLINE

This procedure provides a detailed outline of how to attach the weld-on components of Talon's Lockjaw product line to a bucket. For ease of use in a workshop environment shortened "basic procedures" (WP0002 and WP0003) have also been prepared. These procedures outline the critical information for the attachment of Talon Lockjaw weld-on components but may be lacking detail. For full detail please ensure a copy of this procedure is available for personnel who are tasked with welding Talon Lockjaw 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.

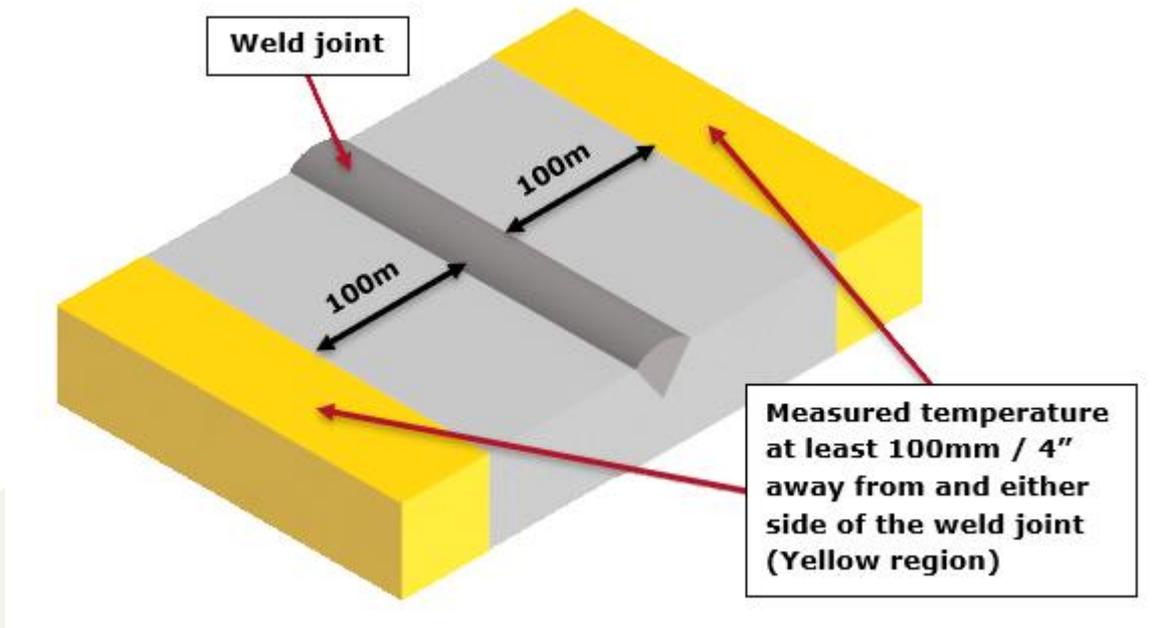
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## WELDING PROCESS AND PREHEAT NOTICE



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.

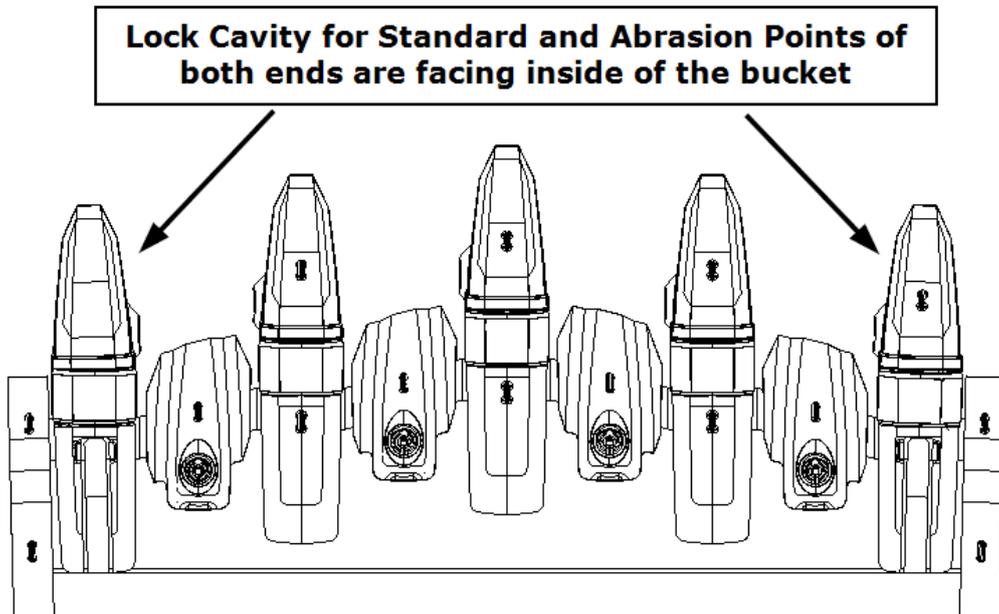


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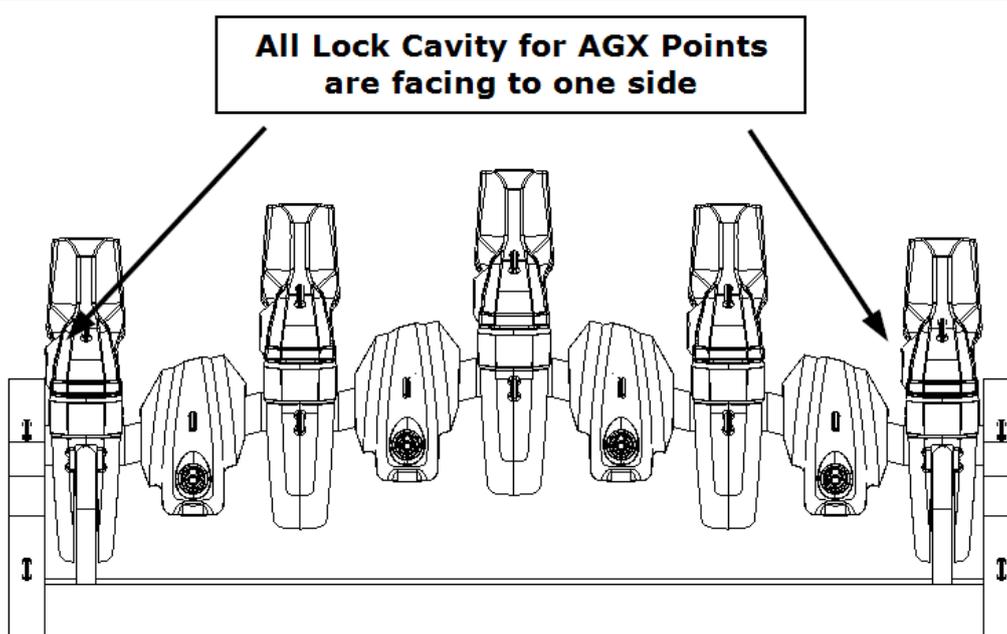
## SECTION 1 – TALON WELDING SETUP

### GET POSITION

During the welding process, please ensure the position of the Cast Corner Adaptor is correct, and the Lock Cavity for Standard and Abrasion Point must be facing inside of the bucket.



On the other hand, please ensure all Lock Cavity for AGX Point must be facing to one side.



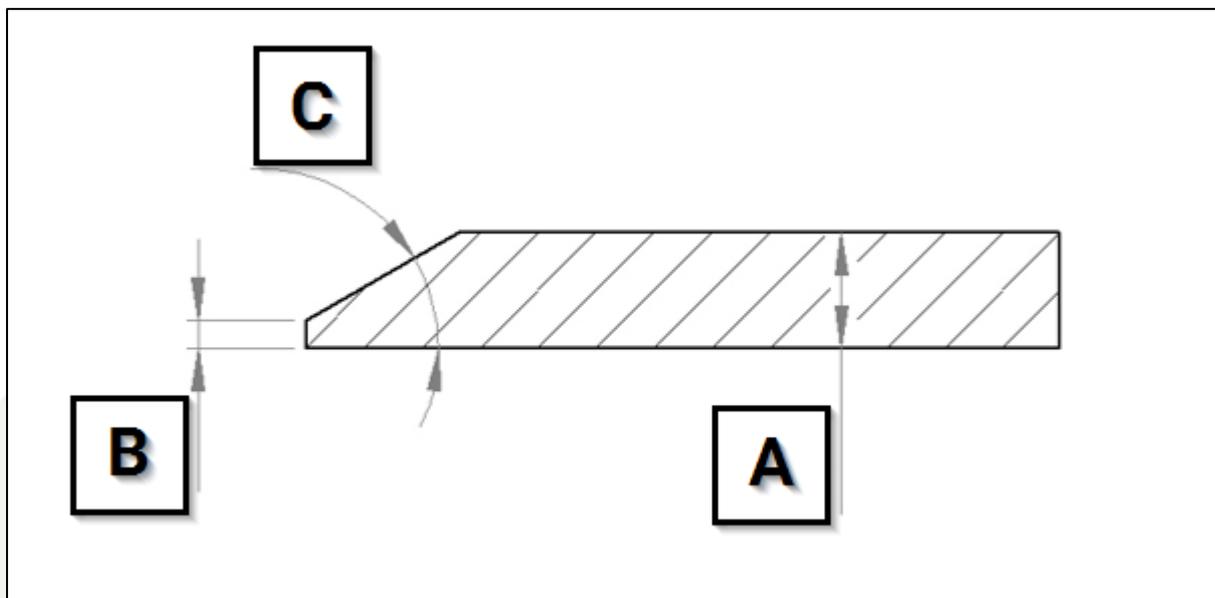
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## WELD PREPARATION

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.

Before fitting Talon Adaptors or Bosses to the lip, ensure the lip profile has been cut correctly. The correct lip profile is shown below.



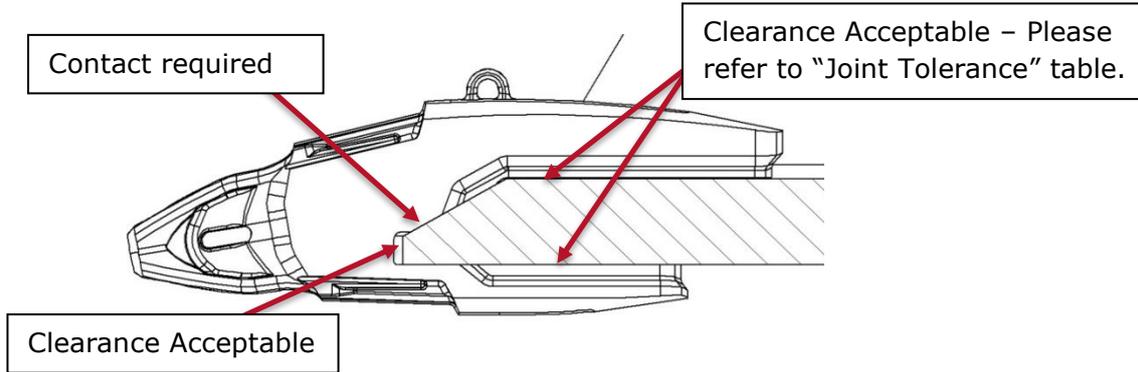
Lip Thickness (mm)	Leading Edge (mm)	Ramp Angle (deg)
A	B	C
70	19	30
90	22	30
100	25	30
120	42	30
140	45	30

### Tolerances

Lip Thickness	Standard Lip Plate Tolerance
Leading Edge	± 2mm
Ramp Angle	+ 0 deg / - 2 deg

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When fitting Talon Adaptors, the castings **must** contact the lip plate as per the following diagram.



Due to plate steel manufacturing methods and casting tolerances, there can be variation in the fitment of Talon adaptor throat opening to the lip. This will often result in a gap being present between the adaptor bottom leg and the lip.

Joint Tolerance	
Separation	Action
2.4mm / 3/32" or Less	No action required
Greater than 2.4mm / 3/32"	Build up the surface of part to be fitted to close gap.

Should the gap between the bottom leg of the Talon adaptor and the lip plate exceed 2.4mm (3/32") the gap needs to be reduced. This is typically done by utilizing spacer plates cut to match the profile of the bottom leg. Use an easily weldable grade of sheet steel of a thickness to fill the gap between the leg and the lip, while still being able to fit in the gap without too much difficulty.

Should the situation occur that the Talon Adaptor throat opening is too narrow to fit the lip. Grind back the landing face on the bottom leg to increase the opening. Ensure care is taken to not excessively grind the surface and create a gap condition between the bottom leg and the lip.

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## 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-

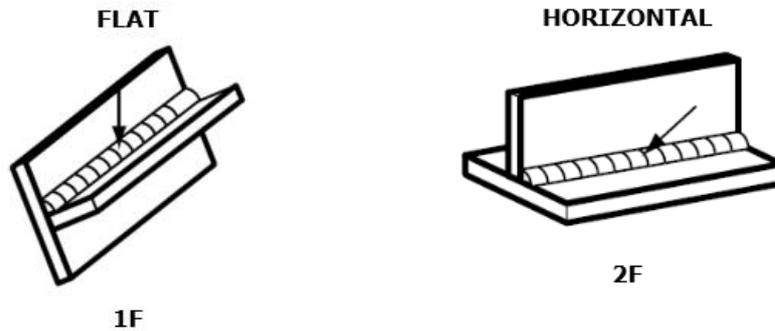
## ELECTRICAL PARAMETERS

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.

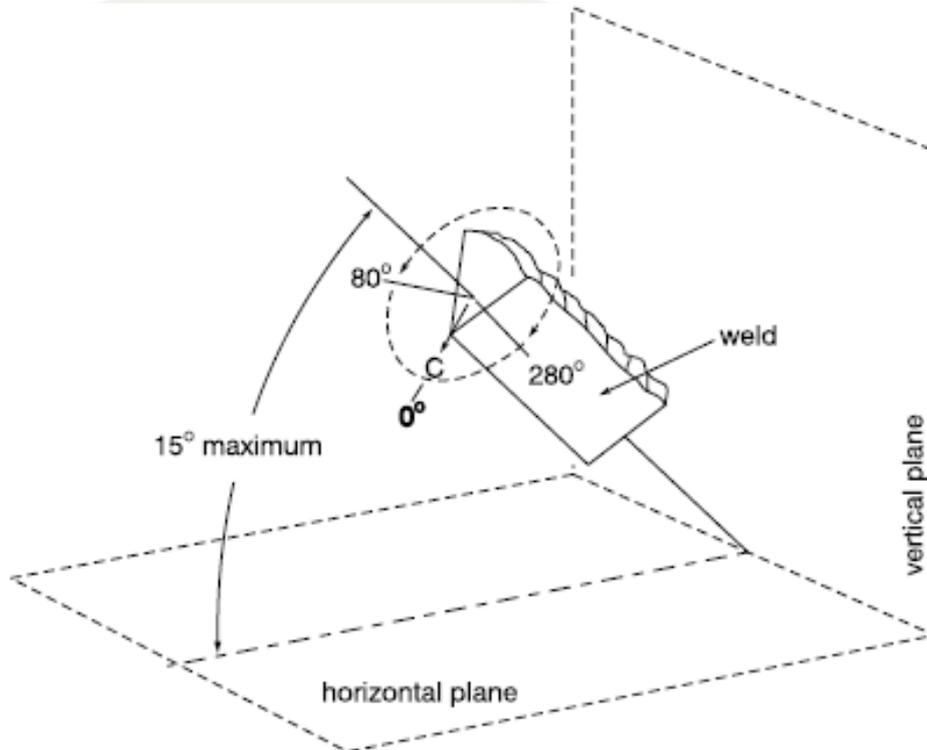
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### WELDING POSITION

Welding of weld-on components of Talon's Lockjaw product line is recommended and shall be completed in the Flat 1F and Horizontal 2F. 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 AWS D1.1, 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.

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## 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 through 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 through 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 through 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.

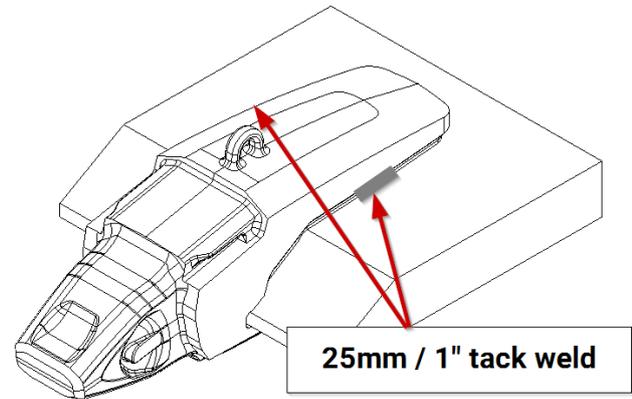
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## SECTION 2 – TALON LOCKJAW ADAPTOR WELDING PROCESS

### WELDING SEQUENCE

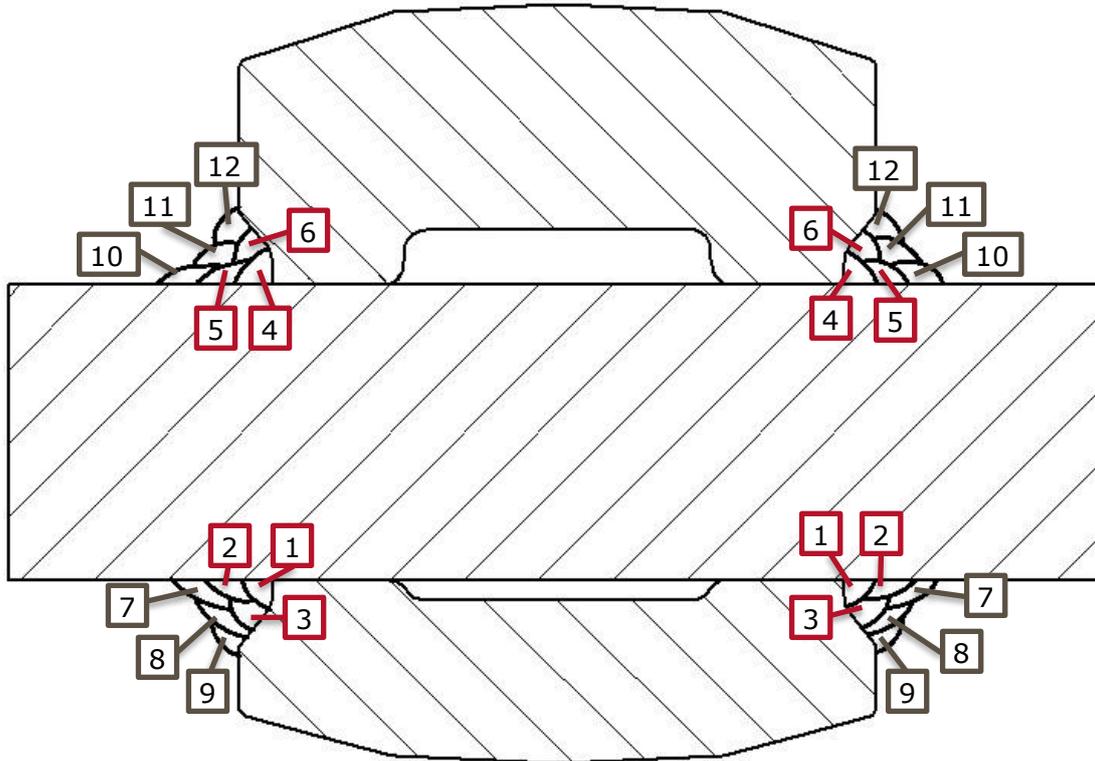
Place Talon Adaptors on the lip plate in the desired locations to suit your bucket size and configuration. Ensure the Talon Adaptor fits the lip plate as specified in the “Weld Preparation” segment of this document, which shows that the top leg and leading edge of the Adaptor must be in contact with the lip.

Preheat the lip plate and Talon GET adaptors as required. Fix the Talon GET adaptors in place with one 25mm / 1” tack weld at the root of the weld prep on either side of the top leg.

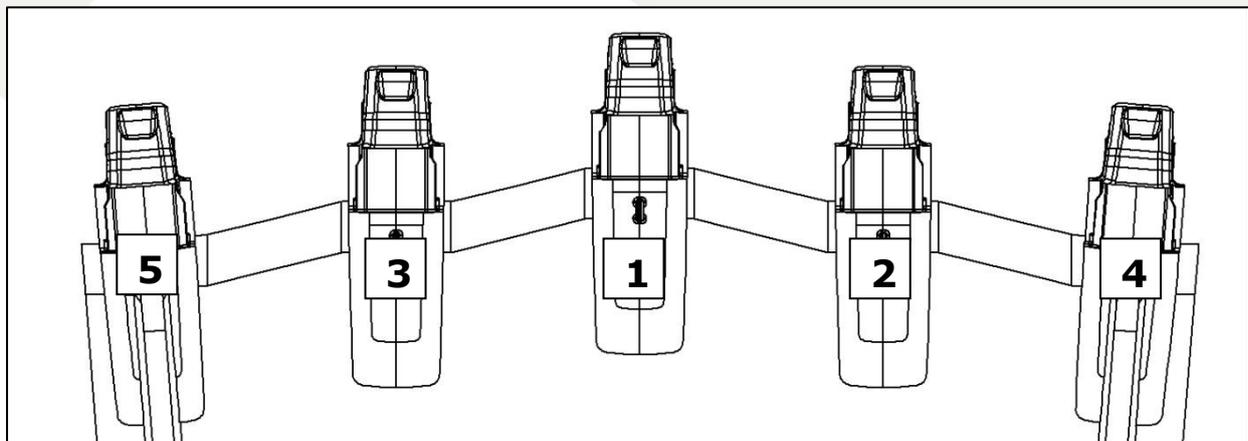


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Welding should be completed using stringer beads in addition to building the weld up to its full size using multiple complete weld runs. Build the weld up in groups of 3 complete weld runs alternated between top and bottom legs and each adaptor on the lip. The purpose of this is to reduce and minimize lip distortion. The following figure shows a cross section demonstrating the recommended bottom leg to top leg transfer sequence:



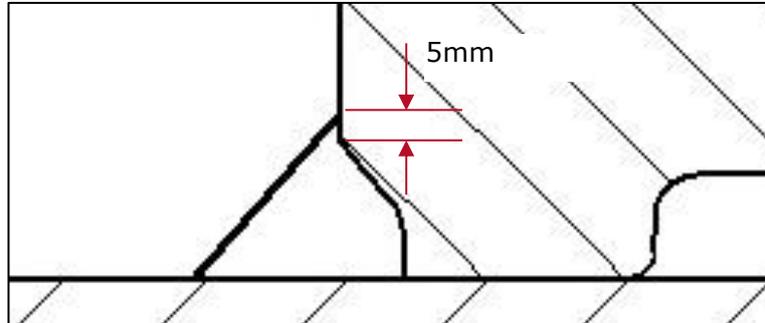
It is recommended not to build up a complete weld on one Talon Adaptor at a time. As per the cross-section image above, the weld should be built up in groups of 3 complete runs. In addition to alternating between bottom and top legs, alternate these groups of runs in the following recommended sequence between Talon Adaptors:



**5 Station Lip Shown**

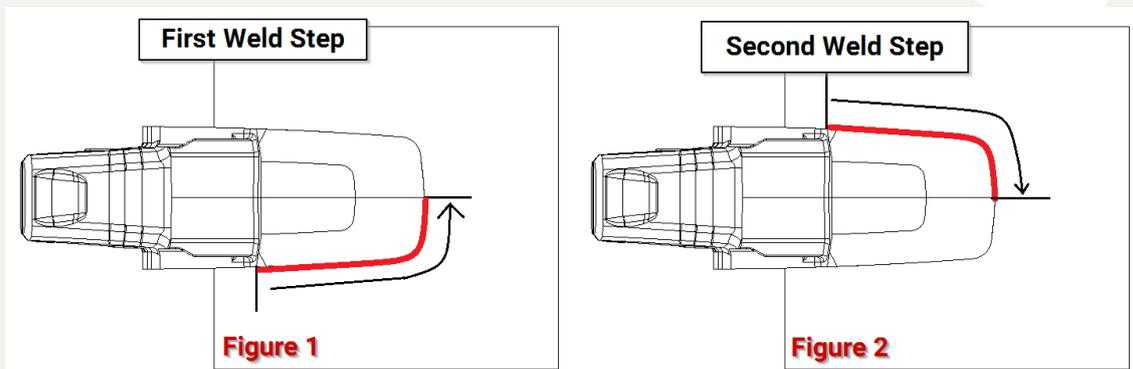
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The final fillet weld size should be such that the weld leg is approximately 5mm above the edge of the cast weld prep in the adaptor. The weld should not undercut the weld prep. The fillet should be equal legged. The weld should form a profile as shown below:



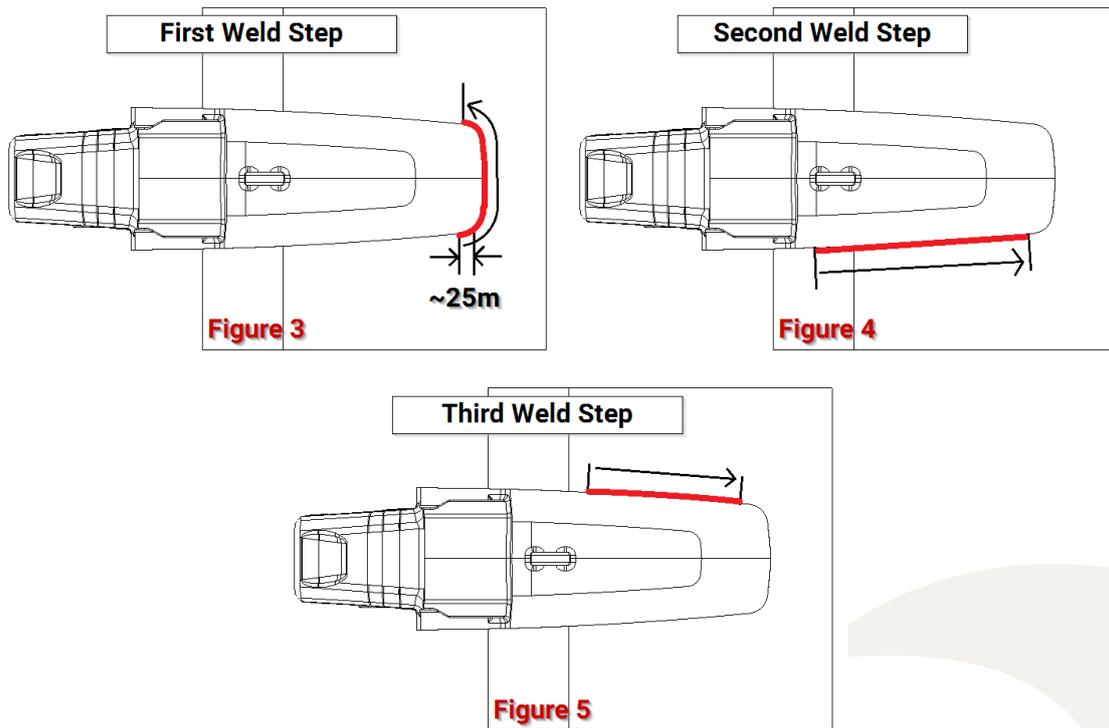
### STANDARD ADAPTOR

Always begin welding Talon Adaptors on the bottom leg. There is less welding required on the bottom leg as it is shorter than the top leg, starting to weld on the bottom side of the lip helps to reduce deformation of the lip plate. Ensure run-on (starter) and run-off tabs are used when welding and the lengths of each run are varied such that the stops are not in the same location. Begin welding in the weld prep cast into the Talon Adaptor near the front of the lip. Keep the weld within the provided weld prep, and do not start the weld any closer to the front of the lip. Complete one full weld around the bottom leg in two runs as shown in Figure 1 and 2. Complete three runs on each side of the bottom leg and turn the lip over. Ensure the length of each run is varied such that the stops are not in the same locations.



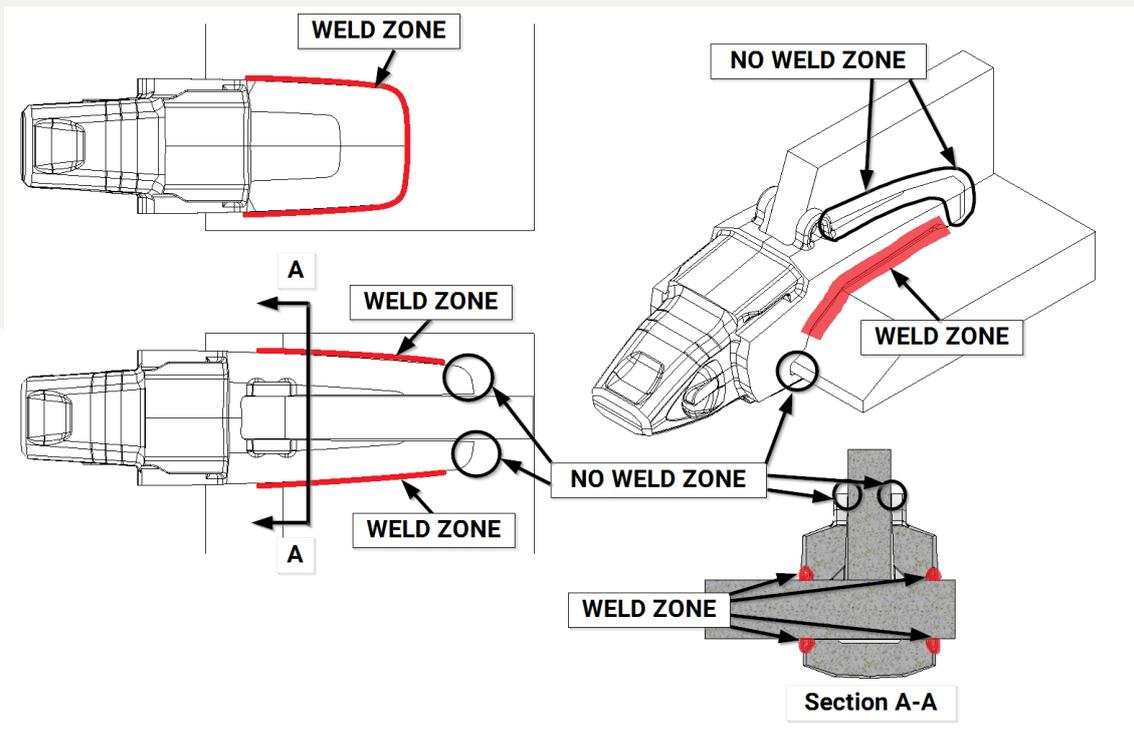
Complete three full runs around the top leg as per the sequence detailed in Figures 3, 4 and 5 below. Again, vary the lengths of each run such that the stops are not in the same location and ensure run-on (starter) and run-off tabs are utilized. Turn lip over and continue welding on the next adaptor following the alternating adaptor and top and bottom sequences detailed on page 10.

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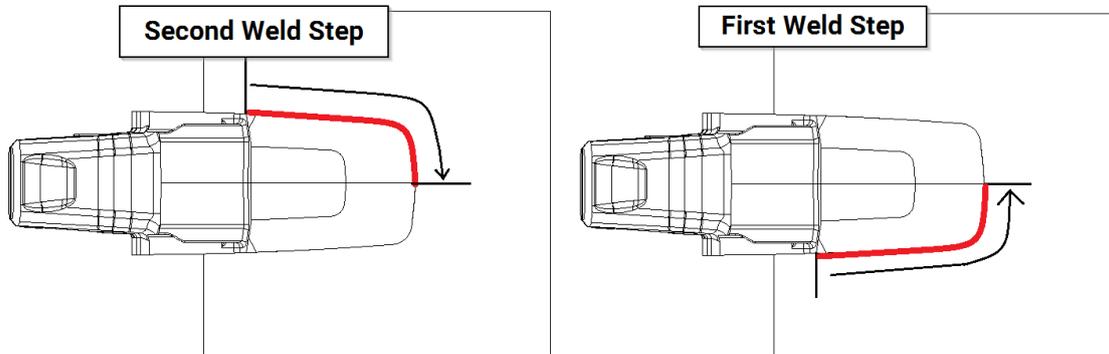
### STRADDLE-LEG ADAPTORS

Position the Talon Straddle Leg Adaptor in the corner of the bucket, such that the split top leg straddles the bucket wall or cheek plate. As for the Standard Adaptor the Straddle Leg Adaptor should contact on the top surface and leading edge of the lip. When welding Talon Straddle Leg Adaptors please refer to the WELD/ NO WELD ZONES detailed in the following figures:

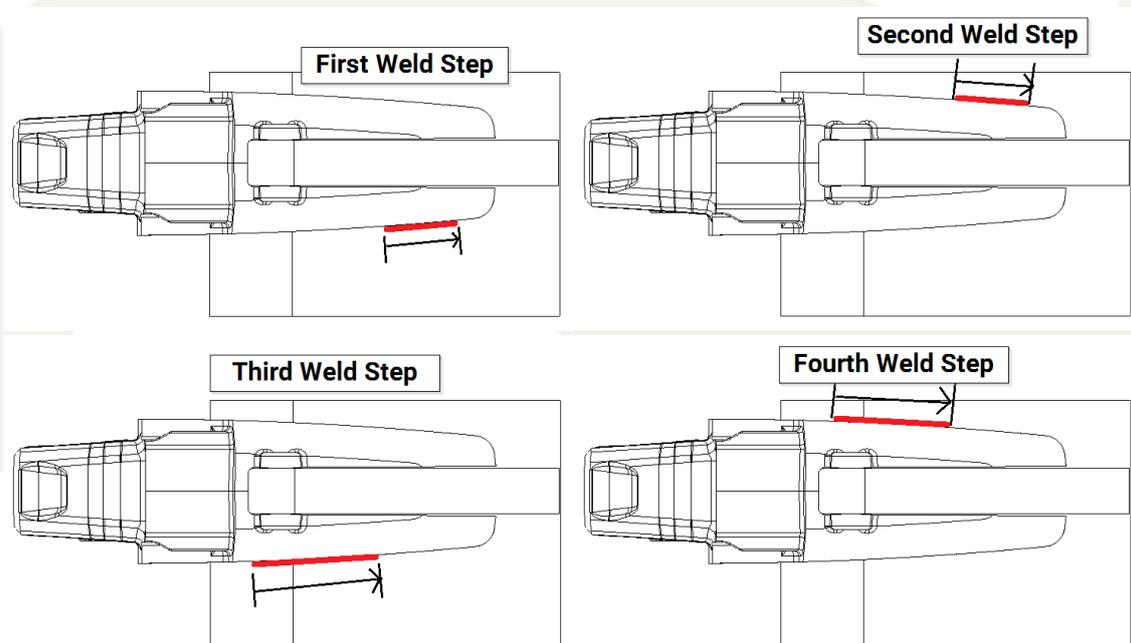


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Preheat and fix the Adaptors in place with one 25mm/1" tack weld at the root of the weld prep on either side of the top leg in the weld zone. Begin welding on the bottom of the Adaptor and complete the first welding sequence as per the Talon Standard Adaptors, as follows:



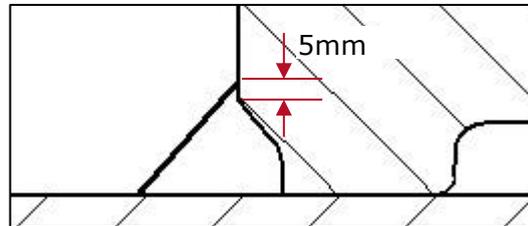
Alternate welding between top and bottom legs every three complete welds as per the welding sequence detailed previously on page 10 for Talon Adaptors. Ensure that the length of each weld run is varied so that the stops are not in the same location and ensure run-on (starter) and run-off tabs are utilized. The welding sequence for the top leg should be completed using four short runs, two on each side of the leg. Ensure the length of the weld is contained within the provided weld preparation groove. The suggested weld sequence is detailed in the figures below:



Continue to alternate welding between the top and bottom of the Talon Straddle Leg Adaptor and alternate between Adaptors as described on page 10 until the full weld size is achieved.

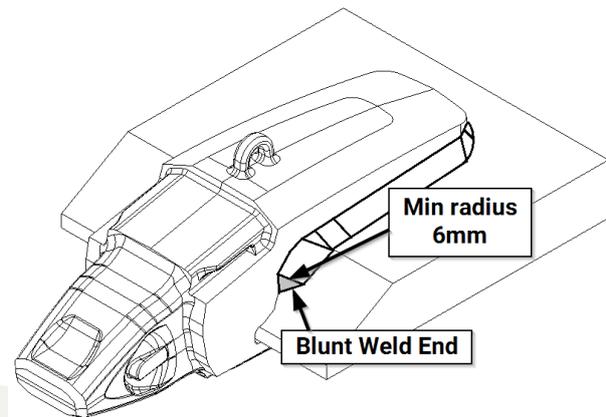
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The final fillet weld size should be such that the weld leg is approximately 5mm above the edge of the cast weld prep in the adaptor. The weld should not undercut the weld prep. The fillet should be equal legged. The weld should form a profile as follows:

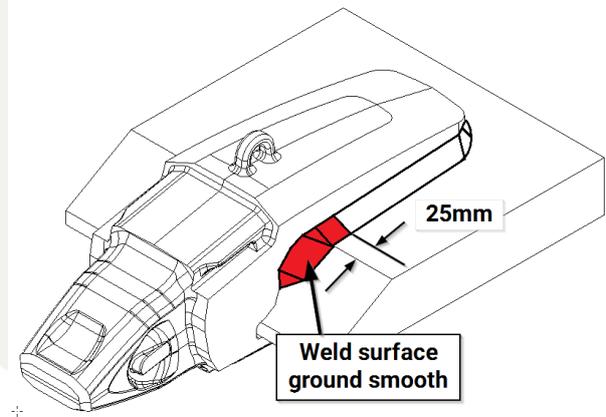


### WELD FINISHING

The end of the fillet weld closest to the bucket leading edge on the top and bottom of the lip shall be ground to a blunt end, typically one half the height of the weld. Round the edge off to the remainder of the weld with a minimum radius of 6mm / ¼". (See figure adjacent)



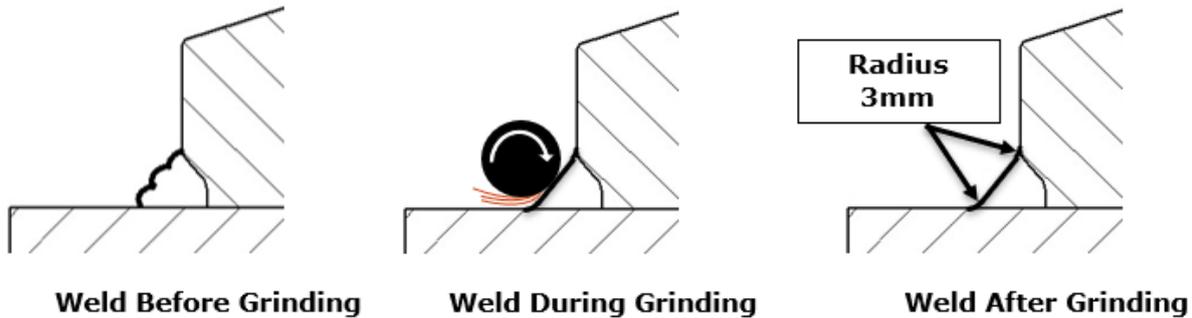
The surface of the fillet welds shall also be ground smooth for a minimum of 25mm / 1" back from the ends of the welds. For welds on the top surface of the lip that transition ramp face of the lip to the top surface of the lip. The surface of the weld shall be ground smooth from the weld end through to a minimum set back of 25mm / 1" back from the ramp face to top surface transition. (See figure adjacent)



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.

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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.

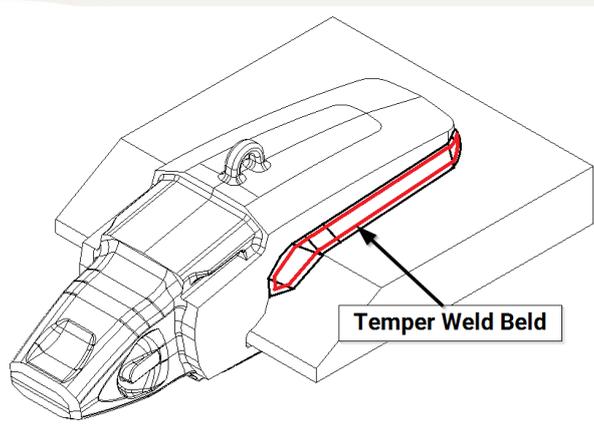


The end of the weld must be tapered and smooth prevent a stress riser at a change in restraint or profile location.

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.

**TEMPER OR ANNEALING WELD BEADS**

Temper or annealing weld beads are additional beads placed on the top and bottom of a completed weld. The purpose of applying a temper or annealing weld bead is to reduce the risk of hydrogen assisted cracking. The heat from these beads reduces the embrittlement of the final weld against the casting or lip and the heat affected zone on the casting or lip.



Tempering beads shall be placed on both top and bottom leg finished welds. Such that the toe of the temper bead is approximately 4mm / 5/32" from the top or bottom toe of the finished adaptor weld. Temper bead may be applied using either GMAW or FCAW, however, the electrode sizes shall be limited to 1.6mm / 1/16" in both cases.

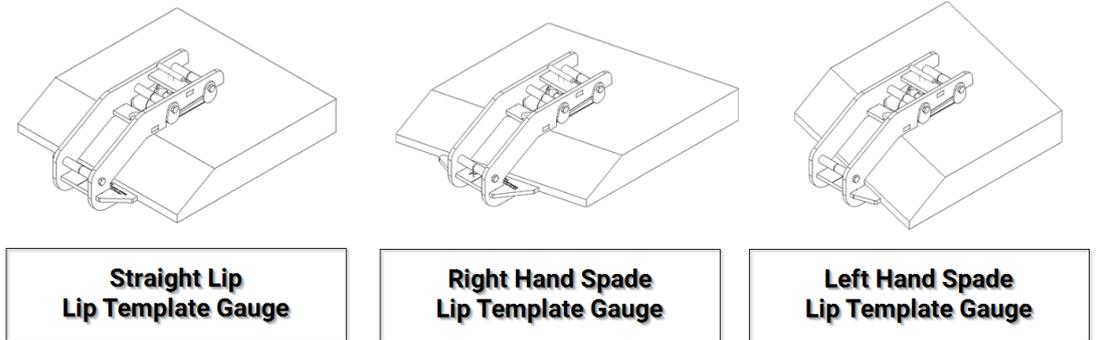
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### SECTION 3 – TALON LOCKJAW BOSS WELDING PROCESS

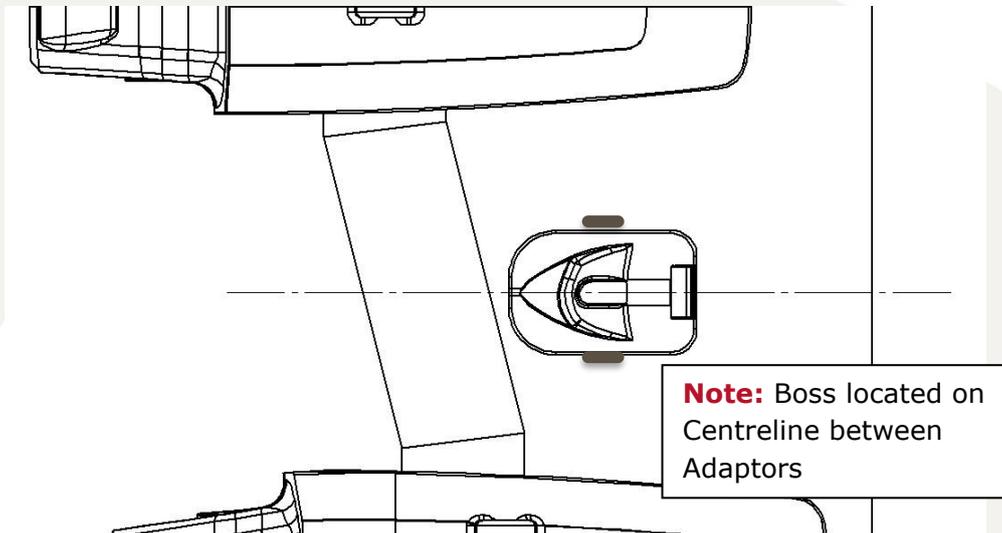
#### WELDING SEQUENCE

Locate each Boss centrally between Talon Adaptors using the Talon Lip Template Gauges. Fix each Talon Boss in place with one 12mm / 1/2" long tack weld at the root of the weld prep on either side of the Boss.

Use Talon lip template gauges to check the lip profile and boss location.

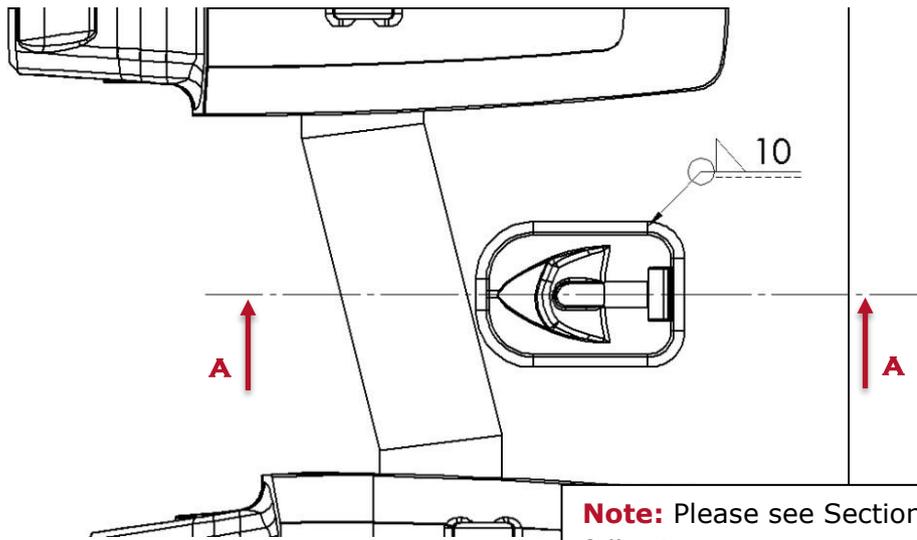


These gauges should locate the Talon Boss on the lip such that the Boss is in line with the direction of bucket operation and front face is set back the correct distance from the leading edge of the lip. When using the Talon Lip Template Gauges ensure the gauge contacts with the leading edge of the lip and the Boss is inserted fully into the locating cradle.

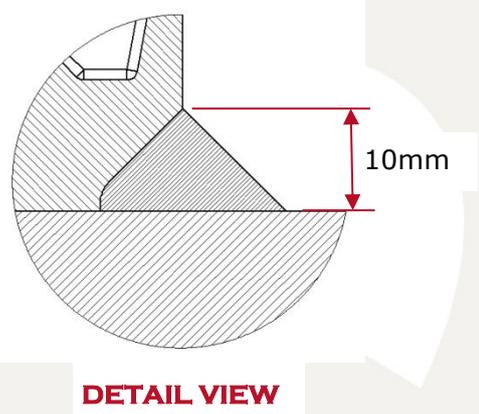
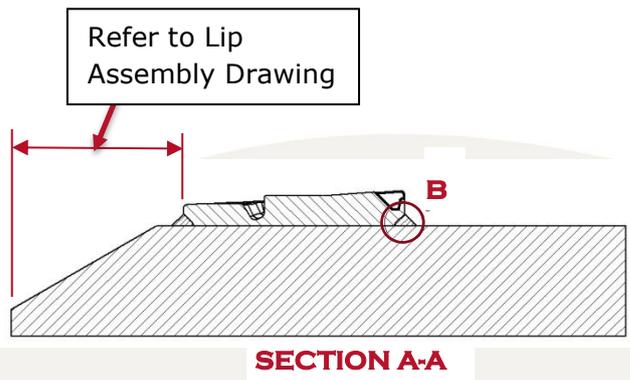


Preheat the lip plate and Talon Bosses as required. Complete an all-round 10mm fillet weld as shown in the figures below. Ensure 2 or more weld passes are used to complete the full-size fillet weld.

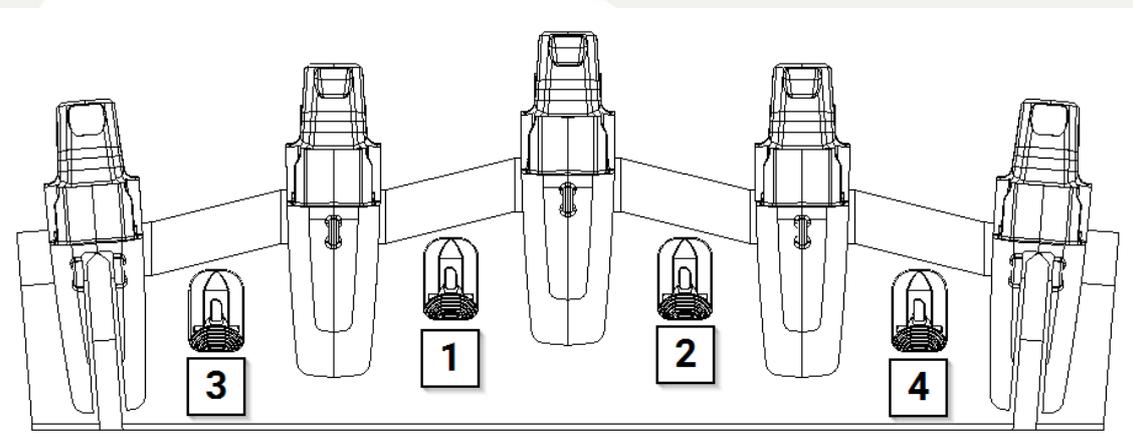
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**Note:** Please see Section A-A on following page.



Begin Welding the Talon Bosses to the lip beginning the bosses located in the centre of the lip and work out to the bosses located near the edges. The follow figure shows the recommended sequence for welding Talon Bosses on a 5-station lip.

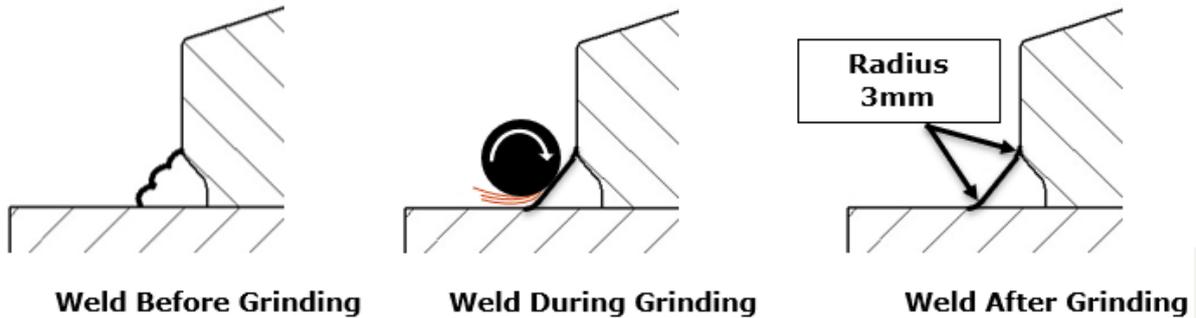


**5 Station Lip Shown**

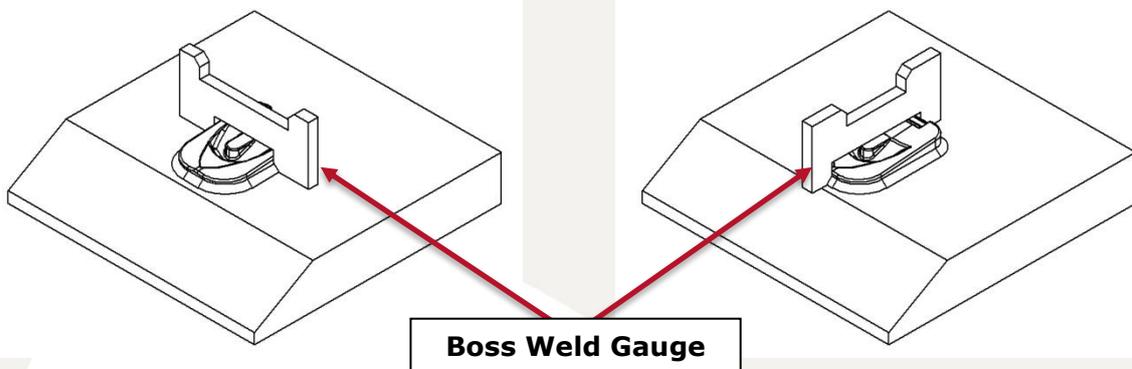
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## WELD FINISHING

The surface of all welds shall be ground smooth, such that the surface of the welds become a smooth surface free of any roughness or ripples associated with fresh welds. The toes of the weld shall transition to the lip and Talon Adaptor smoothly, such that the transition exhibits a minimum of a 3mm / 1/8" radius. Although various methods of grinding may be 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.



Inspect finished weld size using Talon Boss Weld Gauge. This gauge is a simple GO / NO-GO gauge. The gauge should be able to pass easily over the welded Talon Boss while maintaining contact with the lip surface. If the gauges interfere with the weld surface continue to grind the weld until the gauge can pass over the Boss.



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 and gauge inspection as detailed above and re-inspect for cracks.

<b>Document Version Control</b>		
Document Number	Version Number	Release Date
<b>WP0001</b>	<b>4</b>	<b>23/03/2022</b>

### **CHANGE REGISTER**

<b>Rev</b>	<b>Date</b>	<b>Changes from previous version</b>
0	18/04/2012	Original Issue
1	03/02/2014	Template updated; content updated to match new revision parts
2	23/07/2019	Content updated to match new revision parts; address updated to match new office location
3	22/06/2021	Add 70mm Lip Profile to weld prep. section
4	23/03/2022	Update Welding Setup details and indicate correct positioning of Cast Corner adaptors design so that the lock cavity facing inside of the bucket