WELD-ON HEEL SHROUD

PRODUCT WELDING PROCEDURE

SHARK™ GROUND ENGAGING TOOLS

CONTENTS

1.0 SCOPE:

This procedure/specification is intended to provide background information and supplementary instructions to subcontractors/welders who are assembling and welding all SANDVIK SS2000 and SS2300 Weld-On Heel Shroud products.

Please note that although this procedure is written and illustrated using a Half Arrow tooth bucket, the basic procedure can and is recommended to be utilized when welding Heel Shrouds to any bucket side wall surface.

2.0 WELDING SAFETY

Refer to PWP0001 for details .

3.0 WELDING PROCESS:

Refer to PWP0001 for details.

4.0 ELECTRICAL PARAMETERS:

Refer to PWP0001 for details.

5.0 WELDING CONSUMABLES:

Refer to PWP0001 for details. Recommended consumables are as in Table 2 of PWP0001.

6.0 WELDING PREPARATION:

Refer to PWP0001 Welding preparation section for details. Inspect the welding area for any cracks before starting the welding.

7.0 PREHEAT / INTERPASS / POST WELD COOLING:

Material	Target Pre-heat Temperature ºC	Max Inter-pass temperature ºC	Post weld Heat Treatment
Sandvik weld-on heel shroud (WHS) G.E.T. products.	160-190	225	Stabilize for 2Hrs & Max Cooling rate 50ºC/hr
Lip plates/ Bucket (ASTM A514 Steels)	As per the manufacturer's recommendation	As per the manufacturer's recommendation	As per the manufacturer's recommendation

Table 1 Preheat, Inter pass temperatures

Refer to Weld Procedure PWP0001 for more preheat, inter pass & post weld cooling details.

8.0 AVOIDING HACC AND STRESS CRACKING:

Refer to PWP0001 for details.

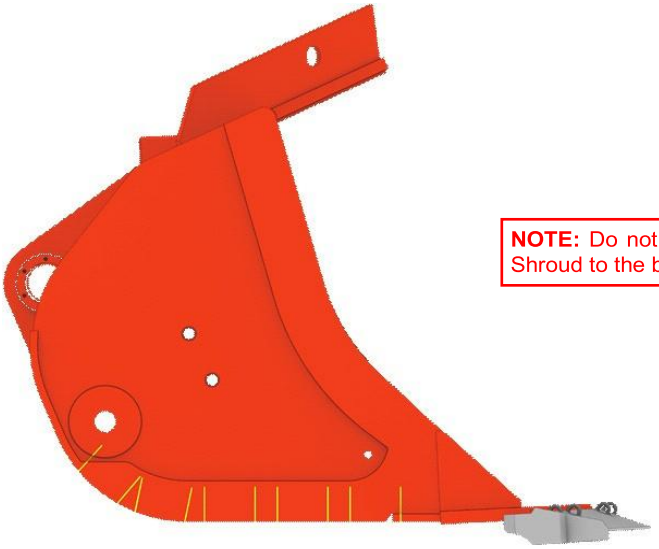
Additional Notes:

- Carbon rich layer must be completely removed if Arc gouging is used for Crack removal or Cutting.
- Use gas shielding to prevent risk of Cracking.
- Remove all traces of slag before laying down the next weld run.
- Welds are cooled at not more than 50°C per hour. This would give enough time to relieve stresses/ less cracking.
- Over welding should be avoided , and proper blending of welds is essential to minimize stress raisers.
- Wind and draft free welding environment is essential to avoid cracking.
- Reduce humidity by heating the work area.
- Welding consumable must be stored in dry environment as per manufacturers recommendations.
- Certified welders & supervisors with experience in meeting the requirement of AWS D1.1 or ISO9606 or AS/NZS 1554.4 steel welding is required.

9.0 WELDING PREPARATION:

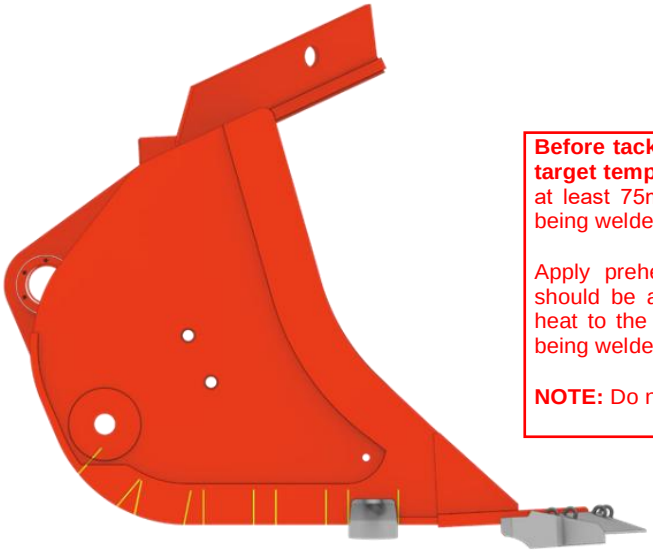
Step 1 : Remove paint/old heel shroud from the bucket. Using a grinder remove any corrosion, paint or other impurities from the areas to be welded, bucket and Shark Heel Shroud.

Step 2 : Mark placement of new heel shrouds.



NOTE: Do not weld the Heel Shroud to the bucket.

Step 3 : Lift Heel Shroud in place and tack weld onto the bucket (ensure safe lifting).

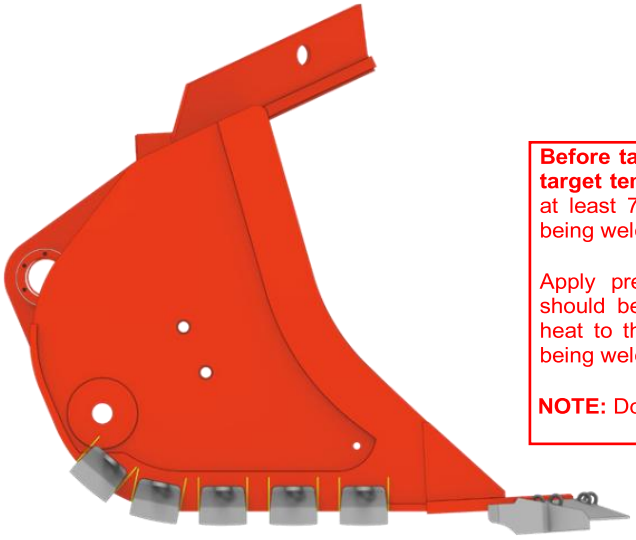


Before tack welding, preheat the bucket and casting to a target temperature (refer to Section #7.0 Table 1) measured at least 75mm (3") either side of the weld joint or the area being welded.

Apply preheat using large diameter heating nozzle. Heat should be applied to the bucket from the underside. Apply heat to the WHS from the opposite side of the area that is being welded.

NOTE: Do not weld the Heel Shroud to the bucket.

Step 4 : Repeat procedure for rest of the Heel Shroud fitment, on both sides of the bucket.



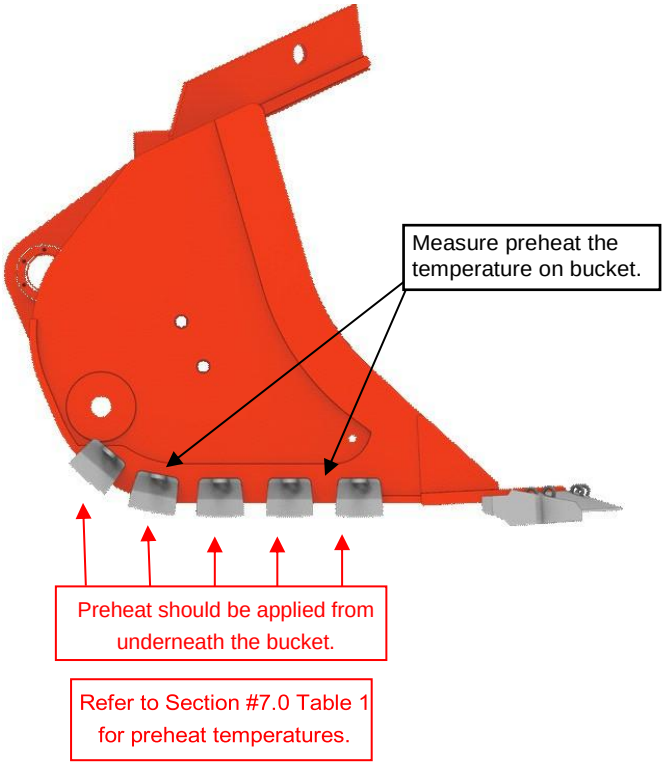
Before tack welding, preheat the bucket and casting to a target temperature (refer to Section #7.0 Table 1) measured at least 75mm (3") either side of the weld joint or the area being welded.

Apply preheat using large diameter heating nozzle. Heat should be applied to the bucket from the underside. Apply heat to the WHS from the opposite side of the area that is being welded.

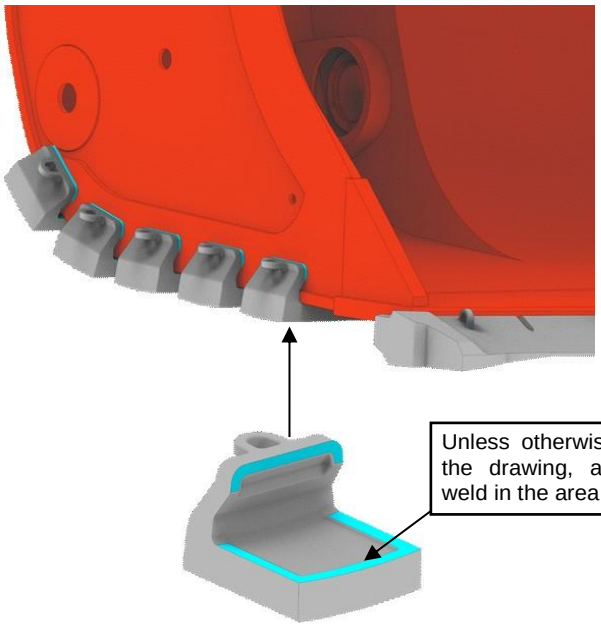
NOTE: Do not weld the Heel Shroud to the bucket.

Step 5 : If temperature is below minimum preheat temperature, reheat the weld area to the target preheat temperature.

Heat should be applied to the Heel Shroud segments from underneath the bucket. This is indicated by the areas in red in the image below. The metal temperature reading should be taken on the top surface of the bucket as indicated.

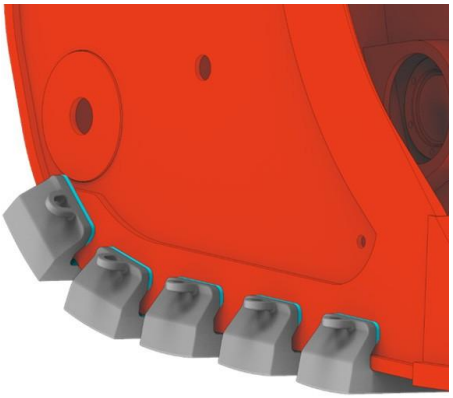


Step 6 : Once the bucket is heated to the required temperature, complete a root run on both sides of the bucket.



NOTE: Ensure the inter pass temperature stays within the target weld temperatures during welding (refer to Section 7.0). If this does occur reheat as per procedure.

Step 7 : Fill out weld prep on both side of the bucket with as many runs as required.



Step 8 : Refer to Section# 7.0 Table 1 of this document & PWP0001 for the post weld cooling requirements.

NOTE: Ensure the inter pass temperature stays within the target weld temperature during welding (refer to Section #7 Table 1). If this does occur reheat as per procedure.

10.0 WELD FINISHING & TESTING (VISUAL & CRACK TESTING):

Refer to PWP0001 for further instructions.

Hydrogen assisted cold cracking appears as delayed cracking and hence it is recommended that crack testing is carried out after 48 to 72 Hrs.

If cracking is found, remove the crack by grinding and re-weld it.

Where Non-Destructive Examination (NDE) methods in addition to visual inspection are applied, the acceptance criteria for welds shall satisfy AS/NZS: 1554 Part 4 – SP criteria of AWS D1.1 cyclically loaded connections.

11.0 REWORK/ REPAIR OF CRACKS:

Cracks on the material may occur due to hydrogen cracking, fatigue, mechanical stresses and environmental causes. Hydrogen cracking occurs most often immediately on weldment at temperatures near normal ambient caused by the diffusion of hydrogen to the highly stressed, hardened part of the weldment and sometime due to no preheating taken before welding process.

It is important to apply localized preheating to the rework component areas prior to commencing rework. Refer section#7.0 and maintain the rework area within the acceptable inter pass temperature range throughout the rework process.

- Excavate cracked material until the whole crack is removed and expose the sound base metal.
- Visually inspect the excavated area for any cracks
- If the crack is still present continue excavating till the crack is completely removed.
- Fill the excavated crater with weld material
- Perform quality inspection following the instructions outlined in Section 10.0.

SANDVIK

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12.0 APPENDIX 1: WELDING CHECKLIST

Date:		*Tick one*	
Item	**Description**	Yes	No
1.0	**Site Prestart Checklist**		
1.1	Are all welding operators trained/certified?		
1.2	Are all welding instructions clear and understood by operators?		
1.3	Are all welding operators familiar with the welding machine?		
1.4	Do the welding operators have the appropriate equipment to complete this job?		
1.5	Has the equipment been inspected by a competent person and confirmed safe for use?		
1.6	Are all welding operators aware of all site-specific safety and emergency protocols?		
2.0	**Welding Prestart Checklist**	Yes	No
2.1	Are all welding operators familiar with the General Welding Procedure for Shark™ Ground Engaging Tools (PWP0001)?		
2.2	Are all welding operators familiar with the Shark™ Weld on Heel shroud Welding Procedure?		
2.3	Have all welding operators read and understood the welding safety requirements of this document? (If the answer is 'No', read Section 2.0 of this document)		
2.4	Are all welding operators familiar with the pre-heat and inter-pass temperature requirements for this product? (If the answer is 'No', read Section 7.0 of this document)		
2.5	Are all welding operators familiar with the welding instructions for this product, including pre and post-welding instructions? (If the answer is 'No', read Section 6.0, 7.0, 8.0 & 9.0 of this document)		
2.6	Are all welding operators using the correct welding consumables for this job? (Refer to section# 5.0 of this document)		
3.0	**Post weld Checklist**	Yes	No
3.1	Are the welds the correct size? (If the answer is 'No', read Section 9.0 of this document)		
3.2	Are the welding operators controlling the rate of cooling? For example, with a thermal or insulating blanket?		
3.3	Has the correct post-welding procedure been followed? (If the answer is 'No', read Section 9.0 of this document)		
3.3	Has the weld inspection procedure been followed? (If the answer is 'No', read Section 10.0 of this document)		
3.4	If rework is required, has the rework procedure been followed? (If the answer is 'No', read Section 11.0 of this document)		

13.0 APPENDIX 2: WELD DETAIL RECORD

Welding Record- SANDVIK Weld-On Heel shrouds (WHS)

1) Pre- Weld Inspection of Castings:

Follow NDT /crack detection test on WHS castings prior to welding to ensure castings are sound and free from any discontinuities.

Findings: ……..

2) Post Weld Inspection:

Follow NDT test on finished weld. Ensure the welds are free from cracks and other defects. Crack testing is preferred after 48-72 Hrs of completing the weld, as hydrogen related cracking can appear later.

Findings ……..

3) Record the Weld:

Record all details of Weld including the date, Name of welder, Welding consumables, Pre-heat, Inter-pass and Post weld temperatures

4) Welding records:

Company Name: …… Date: ……
Machine Number: …… Bucket Number: ……
Machine Operating Hours :……

5) Welding work done:

Describe the welding work completed. **Include photograph that clearly show location and extend of welding**. Include a ruler or tape measure in the photo to show the size of the weld or repair.
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6) Welding Wire or Electrodes:

Manufacturer, type and product number or code ……..
Carbon Arc gouging rods-make and size ……
Preheating method ……..
Pre-heat temperature measuring method ……..

Sandvik recommends welding wires or electrodes that are understrength, high ductility with toughness at least 40J @ -40C

Name of the Welder …… Signature ……..

Inspected by ……Signature ……..

14.0 REVISION HISTORY:

Rev #	Notes	Prepared By	Checked By	Approved By	Date
0	-	J.C	-	-	20/07/2012
1	-	J.C	-	-	30/01/2013
2	Preheat temperature requirement changed to 160-190 °C & Maximum inter pass temperature added as 230°C. Template updated to reflect similar structure as PWP0016.	J.J	-	-	01/06/2023
3	Preheat table added to section 7.0. Duplicate information deleted and for content cross referenced to PWP0001.	R.L	J. J	M.J	23/11/2023
4	Section#7.0, Table 1 updated to include post weld heat treatment. Section#8.0 additional notes added to reduce HACC/stress cracking Section#9.0 steps 2 &3, Typos corrected. Heating side clarified. Added sections 10.0, 11.0, 12.0 & 13.0	J.J	C.S,M.J	M.J	15/07/2024
5	Updated max interpass temperature	R.L	-	M.J	19/12/2024