1.0 Purpose

The purpose of this procedure is to provide a standardized method for the installation of scraper bars in tees without welding in the crotch area of tees.

2.0 General Requirements

2.1 All bars shall be installed by TFA certified welders qualified per the requirements of ASME Section IX.

2.2 Magnetic Particle examination shall be performed by qualified inspectors per TFA NDT procedure 1.01 E709.

2.3 Verify the accuracy and calibration status of ALL gauges that are about to be utilized for inspection.

2.4 An approved WPS must be utilized for the correct material, welding process, and electrode combination.

2.4.1 Refer to controlled document #23weldmatrix for approved WPS/PQR/WPQ applications.

3.0 Material

3.1 Bars are to be from hot rolled mild carbon steel with a minimum yield of 35,000 psi., A-36 or A516 grade 70 plate or equivalent.

3.2 Filler metal to be used must be AWS ER70S6, E7018 or equivalent for WPB.

3.3 Filler metal to be used must be AWS ER80S-D2 or equivalent for WPHY Grade.

4.0 Dimensions

4.1 The thickness and number of scraper bars to be installed in tees up to 36" OD is shown in the TFA Scraper TEE-Bar Installation Guide (See Exhibit #1 attached).

5.0 Procedure

5.1 Bars shall be cut to fit on the inside diameter of the outlet in line with the run, per Exhibit#2.

5.2 Bars shall be equally spaced in the outlet lengthwise to run parallel with the run and centered with the bar width perpendicular to the outlet face of the tee.

5.3 One bar shall be on the centerline when odd numbers of bars are required.

5.4 Bars shall be spaced to straddle the centerline when even numbers of bars are required.

5.5 Preheat the weld joint per the applicable WPS.

5.6 The fillet weld shall be full penetration running on both sides of the scraper bar(s) along the length of the outlet straight tangent.

5.6.1 Minimum fillet weld length to be no less than 1 inch per side.

5.6.2 A cover pass wrapping the bevel root face side and / or run side of the scraper bar(s) is preferred – refer to barring detail.

5.6.2.1 The cover pass shall not extend into the flow line of the run and shall satisfy the clearance tolerance of exhibit #2.

5.6.3 TFA Barring Procedure 33.01 shall be utilized in the event a 1 inch fillet weld length cannot be achieved.

5.7 Post weld heat shall be applied to the completed joint per the applicable WPS.

5.8 All barred tees must be stress relieved OR normalized per procedure 11.01 after all welding is complete.

5.8.1 At the discretion of the Quality Assurance, all barred tees that require thermal treatment post welding in order to achieve enhanced mechanical properties may circumvent the requirements of 5.8 and move directly to final thermal treatment .

6.0 Supplemental Requirements

6.1 A visual inspection shall be performed on the scraper bar fillet welds before and after the final thermal treatment.

6.1.1 Discontinuities identified by visual inspection shall be validated by MT inspection.

6.2 A first piece inspection shall be performed after fabrication is complete and prior to final thermal treatment.

6.2.1 Inspection shall be conducted by an AWS certified weld inspector (CWI).

6.3 Magnetic particle inspection shall be performed on the scraper bar fillet welds after the final thermal treatment.

6.3.1 Lack of penetration, incomplete fusion, cracks, arc burn or excessive undercut and/or overlap shall be repaired and re-inspected.

6.3.1.1 Arc burn shall be removed by grinding. Complete removal shall be verified by use of an etchant capable of exposing the affected area, i.e. Muriatic or Nitric Acid.

Note: Refer to the applicable SDS and follow the required safety precautions for utilizing such etchant.

6.3.2 Porosity, slag inclusions and other rounded indications greater than 1/8" (individually or collectively) in any 2" length of weld shall be repaired.

6.4 Welds shall be free of slag and scale prior to magnetic particle examination.

6.5 Welds that require repair after final heat treat shall be reworked with the applicable thermal treatment and then scheduled for final magnetic particle inspection.

6.5.1 Repairs that require welding shall be re-processed like the original weld.

1) Pre and post weld heat treatment.

2) Full Stress Relieve or Normalize.

3) MT inspection.

3) Final thermal treatment.

4) Visual / MT inspection

6.6 The heat lot number of the scraper bar material used shall be recorded on the work order.

6.7 The welding personnel and the welder used for installing the scraper bars shall be recorded on the work order.

Exhibit #1: INSTALLATION GUIDE

RUN \ BRANCH	2 - 4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
2 - 4	1/4"/ 3/8"																
6	3/8"	3/8"															
8	3/8"	3/8"	3/8"														
10	3/8"	3/8"	3/8"	3/8"													
12	3/8"	3/8"	3/8"	3/8"	3/8"												
14	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"											
16	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"										
18	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"									
20	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"								
22	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"							
24	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"						
26	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"					
28	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"				
30	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"			
32	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"		
34	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	
36	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"
	1 BAR				2 BARS			3 BARS			4 BARS				5 BARS		

Note: Scraper bars will be made from steel plate having a minimum yield of 35,000 psi.

Exhibit #2: INSTALLATION DETAIL