



**BHARAT HEAVY ELECTRICALS LIMITED**  
 PIPING CENTRE CHENNAI – 17  
 QUALITY DEPARTMENT.

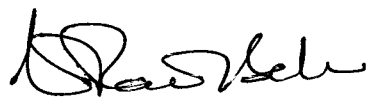

QA 03

**STANDARD QUALITY PLAN FOR  
 PIPE CLAMPS**

QP NO : QPG : 45  
 REV. NO : 00  
 DATE : 04.10.2008  
 Page 1 of 3

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS
									M	B	
1	2	3	4	5	6	7	8	9	10	11	

<b>1.0 MATERIAL</b>											
1.1	Plates. SA 515 Gr 60,70. SA 387 Gr 11,22.	Chemical & Mechanical properties Soundness (UT)	Major	Review of Mill TC	100%	Material spec. as per Drg. & QCP 14	Mill TC		P	V	
			Major	Review of Mill TC	100%	ASTM A578 Level I	Mill TC		P	V	
1.2	Bars.	Chemical & Mechanical properties Soundness (UT)#	Major	Review of Mill TC	100%	Material spec. as per Drg. & QCP 14	Mill TC		P	V	
			Major	Review of Mill TC	100%	SA 388 and 3.3.4 of ASME Sec. VIII Div . 2	Mill TC		P	V	
<b>2.0 INPROCESS CONTROL</b>											
2.1	Process Qualification										# UT only for dia. / thick ness above 50 mm.
2.2	Welding/Welders qualification.	Procedure & Personnel qualification	Major	Review of Document	100%	ASME SEC- IX	*WPS / PQR		P	V	
3.0	Pipe Clamps – Plate Marking, Cutting & Preparation	Dimensions	Major	Measurement	100%	Drawing.	-		P	--	*Review of WPS /PQR, if the welder is already qualified by BHEL / Lloyds / SGS / BV / TUV / IRS. Otherwise the procedure & welder are to be qualified

 Prepared by G.PANNEER SELVAM SM / QA.	<b>LEGEND:</b> M : BHEL/BHEL Approved Vendor B : BHEL/BHEL Authorized Inspection Agency WPS – Welding procedure Specification PQR – Procedure Qualification Report P: Perform V: Verification W: Witness IR – Inspection Report	 Reviewed and Approved by P.ELANGO VAN SDGM / QA
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3.1	Forming (Cold/Hot)	Time/Temp	Major	Doc. Review	100%	BHEL approved vendor forming procedure.		Log book	P	V	
3.2	a) Heat treatment -Forming b) Heat treatment -Welding	Time/Temp Time/Temp	Major} Major}	Visual, Review of HT chart.	100% 100%	Note 1, & 2 Note 3		Chart Chart	P P	V V	
3.3	Machining, Drilling	Dimensions	Major	Measurement	100%	Drawing		Register	P	V	
3.4	NDE on a) bend portion.	Surface Quality	Major	LPI/MPI \$	100%	ASME SEC V/ASME B 31.1 CL : 136.4.4 / 136.4.3		Report	P	W*	\$ Only on the bend area
	b) Fillet Welds (RIBS)	Soundness	Major	LPI/MPI	100%	ASME SEC V/ASME B 31.1 CL : 136.4.4 / 136.4.3		Report	P	W*	W*Random
	c) Hardness	Surface hardness	Major	Visual	10%@	Max 197 BHN		Report	P	W*	@-10% per Heat treatment batch.
3.5	PMI for Alloy Steel	Material Identification	critical	Spectrography / X-ray fluorescence	100%	Material Specification		Report	P	W*	
<b>4.0</b>	<b>Final inspection.</b>										PMI – Positive Material Identification
4.1	Pipe clamp Assembly	Dimensions	Major	Measurement	100%	Drawing and Note 5 & 9		Register	P	W	
5.0	Painting and identification	Appearance ,DFT, Identification.	Major	Visual	100%	Note 6 & 7.		IR	P	W*	
<b>6.0</b>	<b>Documentation</b>	QP compliance	Major	Compilation of Records.	100%	Mill TC,NDE Reports, HT Charts and inspection report.			P	V	

**LEGEND:**

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 SM / QA.

Reviewed and Approved by P.ELANGO VAN  
 SDGM / QA



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**NOTE :-**

**1.0 Cold Forming**

1.1 Post forming Heat treatment is not required for following:  
 a) Material thickness upto 12.7 mm and inside radius (r2) 12.7 mm or more.  
 b) For materials thickness above 12.7 mm with inside radius (r2) is more than 2.5 times material thickness.

1.2 In other cases, carbon steel shall be heat treated at 600 – 620 Deg.C and alloy steel at 680 – 720 Deg.C with 2.5 mts/mm thickness holding (not less than one hour) followed by furnace cooling. Heating and cooling rate as per Note 4.0.

**2.0 Hot Forming :** Hot formed Pipe clamps shall be heat treated as below :-

2.1 Carbon steel (SA 515 Gr 60/70) :- Normalised at 870 – 900 Deg. C (Holding time 2.5 mts/mm minimum 1 Hr). Heating and cooling rate as per Note 4.0.

2.2 Alloy steel (SA 387 Gr 11/22) :- Normalised at 920 – 950 Deg. C and tempered at 680 – 720 Deg. (Holding time 2.5 mts/mm minimum 1 Hr). Heating and cooling rate as per Note 4.0.

3.0 For clamps having welding : if fillet thickness is >13mm for Alloy steel, and >19mm for carbon steel, stress relieving is applicable as indicated in Note 1.2. However PWHT may be combined with heat treatment cycle for forming.

4.0 Heating rate above 400 deg C shall be 220 deg C / hr for thickness up to 25 mm , 110 deg C / hr for thickness between 26 and 50 mm, 75 deg C / hr for thickness between 51 and 75 mm and 55 deg C / hr for thickness above 75 mm. Cooling rate up to 400 deg C shall 110 deg C for all thickness.

5.0 The following tolerances shall apply when not specified in the P.O./drawings.



Radius of curvature	- 1 , + 1mm .
Distance between hole center	- 0 , + 2 mm .
Overall length	- 0 , + 2 mm.
Hole variation (Axis / Slot)	- 0 , + 1 mm.

6.0 All pipe clamps shall be Hard punched and paint stenciled with Melt no., Matl Spec, Matl. Code and Manufacturer's seal, if clamps are sent to BHEL stores. Otherwise Work order- DU details, DU qty, Melt no, Matl. Spec. and Manufacturer's seal to be hard punched.

7.0 All pipe clamps shall be painted as below **when not specified in the P.O./Project Painting Scheme /Drawings:-**  
 Carbon steel clamps:-Primer:-One coat of Redoxide zinc phosphate primer IS12744 – to 30 microns DFT  
 Finish:-Two coats of Synthetic enamel paint (long oil alkyd)to IS 2932.Smoke grey shade No 692 of IS 5- to 20 micron per coat.  
 Total DFT : Primer 30+Finish 40= 70 microns.  
 Alloy steel clamps:-Painting scheme as per Carbon Steel clamps , however the **Shade shall be white.**

8.0 All other components like LOAD PIN,STUD,NUT,RIBS,SPACER RING,STUD WASHER,LOAD PIN WASHER used in clamp assy shall be as per applicable BPS/IS/ as indicated in Drawing.

9.0 All clamps shall be supplied in assembled condition along with fasteners etc., as shown in the drawing.

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