




 <b>BHARAT HEAVY ELECTRICALS LIMITED</b> PIPING CENTRE, MADRAS – 17 QUALITY ASSURANCE & CONTROL DEPT.				<b>STANDARD QUALITY ASSURANCE PLAN FOR CS WELDED PIPES CONFIRMING TO IS 3589 Gr Fe 410</b>					QP NO: SQAP / 18 REV.NO: 01 DATE: 14-06-2006					
REF: 1) TDC No.: TDG:07 Rev. 04 dated 21.06.2006; 2) DRG N o.: 4-80-458-62194 Rev. 00;				3) DRG N o.: 3-80-458-23454 Rev. 00; 4) DRG N o.: 3-80-458-23455 Rev. 00;		5) DRG N o.: 3-80-458-23456 Rev. 00; 6) Painting Scheme with Enq. / PO								
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>1.0</b>	<b>RAWMATERIAL</b>													
1.1	Raw material Inspection	Identification Dimension	Major	Visual, Measurement	100%	Applicable Material Specification as in IS-3589-(latest version)	Inward Receipt Report	--	3	--	2	--		MTC - Mill Test Certificate
1.2		Chemical Composition & Mechanical properties	Major	Verification of MTC	One per Heat		MTC	✓	3	--	2	--		TC - Test Certificate
1.3	Welding Consumables	Chemical Composition & Mechanical properties	Major	Verification of Manufacturer TC	100%	Applicable Specification as per WPS	TC	✓	3	--	2	--		WPS - Welding Procedure Specification
1.4	Paints	Identification	Major	Visual & Verification of TC	100%	Applicable Paint Specification as in Painting Scheme & Manufacturer Data Sheet	Inward Receipt Report & TC	--	3	--	2	--		
<b>2.0</b>	<b>INPROCESS CONTROL</b>													
2.1	Welding Procedure Specification (WPS)	Qualification of Welding Procedure Specification	Major	Verification	Each Procedure	ASME SEC - IX	WPS	✓	3	--	2	--		@ - Welders are to be qualified as per ASME sec IX. PQR - Procedure Qualification record.
2.2	Welder / Machine Performance Qualification. @	Qualification of Welder / Machine Performance.	Major	Verification	Each welder / Machine	ASME SEC - IX	PQR	✓	3	--	2	--		
2.3	<b>Spiral welded pipes:</b>													
2.3.1	Welding M/c Parameters & WPS	IN-PROCESS check of Welding Parameters	Major	Verification	100%	Vendor Work Instruction & WPS for M/c welding	Internal Register / Report	✓	3	--	2	--		
<b>LEGEND:</b> 1 - Coustomer; 2 - BHEL/ BHEL Nominated Agency; 3 - BHEL Vendor; 4 - Subvendor; P - Perform; V - Verification/Review; W - Witness; H - Hold. D - "✓" mark in this column indicates that <b>Document is required</b> .														
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2.4	<b>Longitudinal welded pipes:</b>													
2.4.1	Pre welding operations	Rolling, Post Bending Edge preparation, Root gap alignment, Edge alignment	Major	Visual, Template, Measurement	100%	Manufacturer Work Instruction		Internal Register / Report	--	3	--	--	--	
2.4.2	Butt Joints	Weld Quality	Critical	RT	10%	ASME Sec, VIII Div 1 / UW 51		RT Report	✓	3	--	2	--	
2.5	NDE for Pipes	Weld Quality at both ends of the pipe.	Critical	RT	Each Pipe, Both ends, 100 mm long	ASME Sec, VIII Div 1 / UW 51		RT Report	✓	3	--	2	--	
2.6	<b>Repair Welding:</b>													
2.6.1	Weld Repair	Repair of weld defects	Critical	Visual, Checking Welding Parameters	Identified weld defects	Manufacturer's Weld Repair Procedure		Internal Register / Report	--	3	--	--	--	
2.6.2	NDE for Repair Weld	Weld Quality	Critical	RT	100%	ASME Sec, VIII Div 1 / UW 51		RT Report	✓	3	--	2	--	
2.7	Test Piece Marking	Test piece from welded Pipes for Product Anlysis.	Major	Sampling	As per IS 3589	IS-3589-(latest version)		Internal Register / Report	--	3	2	--	--	Random witness - discretion by BHEL
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3.0	<b>TESTS</b>													
3.1	Hydro test	Soundness of Welded Pipe	Critical	HT	100%	Holding Pressure as per PO / IS 3589 (Higher value shall be used)	No Leakage.	HT Report	✓	3	2	--	--	10% by BHEL at Random. Pr. Holding time: 5seconds
3.2	<b>Product Testing</b>													
3.2.1	Chemical Test for Parent & Weld Metal	Chemical Composition	Major	Chemical Analysis	As per IS 3589 (latest version) and TDG:07 Rev. 04	As per IS 3589 (latest version) and TDG:07 Rev. 04		Test Report	✓	3	--	2	--	
3.2.2	Tensile Test for Parent Metal (Longitudinal or Transverse)	Tensile Strength of Parent Metal	Major	Tensile test					✓	3	2	--	--	
3.2.3	Transverse Tensile Test for Weld	Tensile Strength of Weld	Major	Tensile test					✓	3	2	--	--	
3.2.4	Transverse Guided Bend Test: (Root + Face)	Weld Ductility	Major	Bend test					✓	3	2	--	--	
3.3	Dimension of welded Pipe	Conformance to requirements	Major	Visual & Measurement	100%	As per IS 3589 (latest version) & TDG:07 Rev. 03 & PO, Drawing	Internal Register	--	3	--	--	--	Refer Note 1	
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4.0	<b>PAINTING (Surface Protection) --- Approved Manufacturer's in-house Procedure shall be used.</b>													
4.1	<b><i>If Specified as Coal Tar Epoxy for Internal Surface of the Pipe</i></b>													
4.1.1	Internal Surface Preparation by Blast cleaning	Degree of cleanliness	Major	Visual	100%	SSPC SP 10 / Paint MDS	Near white metal; Refer Note 2	Internal Register / Report	--	3	--	2	--	MDS - Manufacturer Data Sheet
				Surface roughness by Press-O-film.	Min 3 locations per pipe				✓	3	--	2	--	
4.1.2	Application of PRIMER	Coverage and Dry Film Thickness (DFT)	Major	Visual & Measurement	100% & B*	Applicable Painting Scheme & Manufacturer's in-house Procedure		Internal Register	--	3	2	--	--	B* -- Random witness - discretion by BHEL
4.1.3	Application of FINISH COAT	Coverage and Total Dry Film Thickness	Major	Visual & Measurement	100% & B*	Applicable Painting Scheme & Manufacturer's in-house Procedure		Internal Register	--	3	2	--	--	
4.1.4	Holiday testing of Epoxy coating	Coverage and Integrity of Epoxy coating	Major	Holiday Test Refer Note 3	100%	Applicable Painting Scheme & Manufacturer's in-house Procedure		Test Report	✓	3	2	--	--	
4.2	<b><i>If Internal Surface Coat is NOT Specified in the PO</i></b>													
4.2.1	Surface preparation by Power tool cleaning /Rotary wire brush	Degree of cleanliness	Major	Visual	100%	Free from all dirt, oil, grease, rust, scale, weld slag, flux deposit, foreign matters etc.,		Internal Register	--	3	--	2	--	
4.2.2	Application of Resin type translucent Rust Preventive Coating	Coverage	Major	Visual	100%	Applicable TDC / Dry type Rust Preventive Coating shall be used for Pipe NB above 450 mm.		Internal Register	--	3	--	2	--	
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4.3	<b>If Coating for External Surface of Pipe is Specified</b>													
4.3.1	Surface preparation by Power tool cleaning /Rotary wire brush	Degree of cleanliness	Major	Visual	100%	Free from all dirt, oil, grease,rust,scale,weld slag, fluxdeposit,foreign matters etc.,	Internal Register	--	3	--	2	--		DFT -- Measurement by Elcometer type Instrument. ^^ Minimum 6 spots along the length of pipe on 4 regions of the Circumference; in total 24 spots. The spots are to be chosen by BHEL
4.3.2	Application of PRIMER	Coverage and Dry Film Thickness (DFT)	Major	Visual & Measurement	100% & B*	Applicable Painting Scheme & Manufacturer's in-house Procedure	Internal Register	--	3	2	--	--		
4.3.3	Application of OVER COATS (if applicable)	Coverage and Dry Film Thickness (DFT)	Major	Visual & Measurement	100% & B*	Applicable Painting Scheme & Manufacturer's in-house Procedure	Internal Register	--	3	2	--	--		
4.3.4	Application of FINISH COAT	Coverage and Total Dry Film Thickness	Major	Visual & Measurement	100% & B*	Applicable Painting Scheme & Manufacturer's in-house Procedure	Internal Register	--	3	2	--	--		
4.3.5	Adherence of Coating	Peel-off test	Major	Cross cut meathod	Minimum 5 spots / pipe & B*	Manufacturer's approved in-house Procedure	Internal Register	--	3	2	--	--		
4.4	<b>IF External Surface Coat is NOT Specified in the PO</b>													
4.4.1	Surface preparation by Power tool cleaning /Rotary wire brush	Degree of cleanliness	Major	Visual	100%	Free from all dirt, oil, grease,rust,scale,weld slag, fluxdeposit,foreign matters etc.,	Internal Register	--	3	--	2	--		
4.4.2	Application of Resin type translucent Rust Preventive Coating	Coverage	Major	Visual	100%	Applicable TDC / Dry type Rust Preventive Coating shall be used for all sizes of Pipes	Internal Register	--	3	--	2	--		
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5.0	<b>FINAL INSPECTION</b>													
5.1	Final Dimension Bevel Angle	Measurement (including ovality, End Squareness)	Major	Visual & Measurement	100% & 10%	As per IS 3589 (latest version) & Applicable TDC & Drawing & PO	Internal Register / Report	✓	3	2	--	--		10% witness by BHEL.
5.2	Pipe Spider / End cap	Transit damage control & Pipe end protection	Major	Visual	100%	Applicable TDC & Drawing & PO & As per IS 3589 (latest version)	Internal Register	--	3	2	--	--		
5.3	Marking & Identification	Hard Stamping & Stenciling.	Major	Visual & Verification	100%	Each Pipe shall be Marked as per applicable TDC / PO	Internal Register	--	3	2	--	--		Refer Note 4
5.4	Inspection Clearance	Documentation & Certification	Major	Verification	100%	All relevant Documents as per this QAP are required	Inspection Report	✓	3	--	2	2		
<b>Notes:</b>														
1	Tolerance on OD: upto NB 1600 mm +/- 4 mm, Above NB 1600 mm +/- 6mm.; Tolerance on Length unless specified in PO, +/- 100 mm on specified Pipe length.													
	Tolerance on thickness : upto 14mm +1.3mm / - 0.8mm, Above 14mm +1.4mm / -0.8mm.; Tolerance on Squareness of Ends : 3 mm Max.													
	Tolerance on ovality : Difference between major and minor outside diameter shall not exceed 0.5% of Nominal OD													
2	Blast cleaning to near white metal to obtain roughness as per epoxy paint data sheet and measured by Press-O-film and recorded.													
3	As per Paint Manufacturer's Data Sheet. If not specified, Holiday testing by low voltage ( 75 V ) wet sponge Holiday detector.													
4	<b>Hard Stamping: Out Side of pipe at the ends</b> ; Specification, Pipe No., Heat No., Mfr's Identification & (If directly despatched to Project site; Project Name, WO No., DU No., Quantity & Weight).													
	<b>Stenciling: Out Side of pipe at both ends</b> ; Specification, Pipe No., Heat No., Mfr's Identification, Material Code, Size & (If directly despatched to Project site; Project Name, WO No., DU No., Quantity & Weight).													
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