



Specification No : RAH - 557

Rev. No : 00

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01.	Item	Steam Coil Air Preheater – Secondary				
02.	Application	Used to Heat the Secondary Air during Boiler Startup & Low Ambient Temperature.				
	Parameters	Units	BMCR	60% BMCR	30% BMCR	30% BMCR - Oil
03.	Air flow per SCAPH	Kg / hr	1025000.	1125000.	315000	510000.
04.	Air Temperature - Entering	°C	6.	6.	6	6.
05.	Air Temperature - Leaving	°C	27.	27.	100	100.
06.	Design Pressure of SCAPH	Kg / Cm² (g)	20.			
07.	Working Pressure of Steam	Kg / Cm² (g)	16.			
08.	Working Temperature of Steam	°C	290.			
09.	SCAPH Connecting Duct Size	mm	8000 x 3460			
10.	Air flow direction	Horizontal				
11.	Heating Element	Finned Tube; Tube OD: 19.05 mm; Tube Thickness: 2.032 mm (14 SWG) mini; Fin width : 38.1 mm (max); Fin Thickness : 0.3759mm (28 SWG) mini.				
12.	Fin Spacing	Vendor to specify, not to exceed 7 FPI.				
13.	Materials					
	a) Tubes	Carbon Steel Seamless tube as per SA 179				
	b) Fins	Carbon steel as per IS : 513 DD				
	c) Headers & Nozzles	Carbon Steel as per IS : 1239 / IS : 3589				
	d) Tube sheet	Carbon Steel as per IS : 2002 Gr 2A / SA 516 Gr 60/70				
	e) Casing	Carbon Steel as per IS : 2062 Gr A				
14.	Connection Size	Steam Inlet - 5 numbers of NB 100. Condensate Outlet - 5 numbers of NB 50.				
15.	Maximum air side pressure drop across SCAPH for an air flow of 1125000 Kg / Hr	50 mmWC				
16.	Dimensions & Mounting details	Shall be as per page 04 of 04.				
17.	Painting					
	a)	All external surfaces that require painting shall be cleaned by Power Tool as per surface preparation standard St3 (SSPC-SP3) before applying paint.				
	b)	2 coats of Heat Resistant Aluminium Paint to IS 13183 paint Gr III, shall be applied to have a dry film thickness of 40 microns (minimum).				
18.	General					
	a)	SCAPH shall be of straight tube construction.				
	b)	Casing thickness shall be 5 mm minimum and tube sheet thickness shall be 20 mm minimum.				
00	10.01.19				FRESH ISSUE	
Rev.No	Date	Prepared	Checked	Approved	Record of Revisions.	

- c) Casing shall be air tight for ± 660 mmWC. Suitable non-Asbestos packing arrangement shall be provided between Casing and Air Inlet & Outlet Nozzles to prevent air leakage.
- d) Tube shall be expanded after the insertion of the Fins.
- e) **Heater is to be designed for maximum heat duty condition. Only latent heat portion of steam shall be considered for heat transfer calculation.**
- f) SCAPH shall be provided with an excess heating area of 10%.
- g) Heating element shall be Hot Dip Galvanized as per IS: 4759.
- h) Steam Inlet & Condensate Outlet connections shall be supplied with mating Flanges & Fasteners to ANSI B16.5 Class 300 lbs.
- i) **Air inlet and outlet duct flanges shall be supplied with mating flanges made of 65x65x6 size angle with inside dimensions of duct opening+10mm as shown in page 03 of 03. Ducts will be inserted inside mating flange angle and welded at site. Required fasteners of size M.16 shall also be supplied. Mating flanges and fasteners shall be shipped integral with each module.**
- j) Suitable Lifting arrangement shall be provided.
- k) Removable stiffeners shall be provided on both sides of the splits, suitably tack welded to the frame, to prevent buckling of finned tubes during transit & handling.
- l) Heating elements shall be accommodated within the Duct Size specified.
- m) Manufacture of SCAPH shall be as per BHEL approved Quality Plan.
- n) Only latest revisions shall be referred for all the standards specified.

19. Vendor shall furnish the following details along with the offer.

- a) **Thermal calculation for heater sizing.**
- b) Pressure Drop Calculations & Pressure Drop Curve, if any.
- c) **Dimensional drawing with Bill of Materials** indicating details of the Fins, Steam Inlet & Outlet Nozzle Connections, Mounting details and Mating Flanges for our approval.
- d) Filled-in Data sheet in the format given in page 03 of 04.
- e) Any other details pertaining to SCAPH.
- f) Supplier should furnish 3 copies of Operation & Maintenance manuals, and Erection procedure of SCAPH, after the award of the contract.

20. Performance Guarantee

Vendor shall guarantee the Pressure Drops & the Air Leaving Temperatures at all the air flows specified.

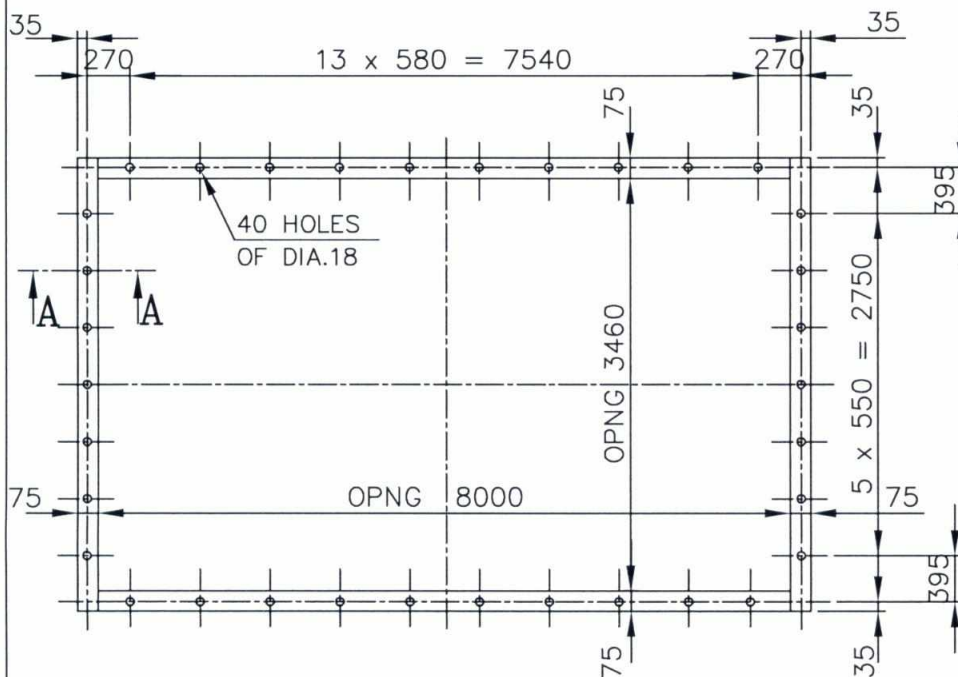
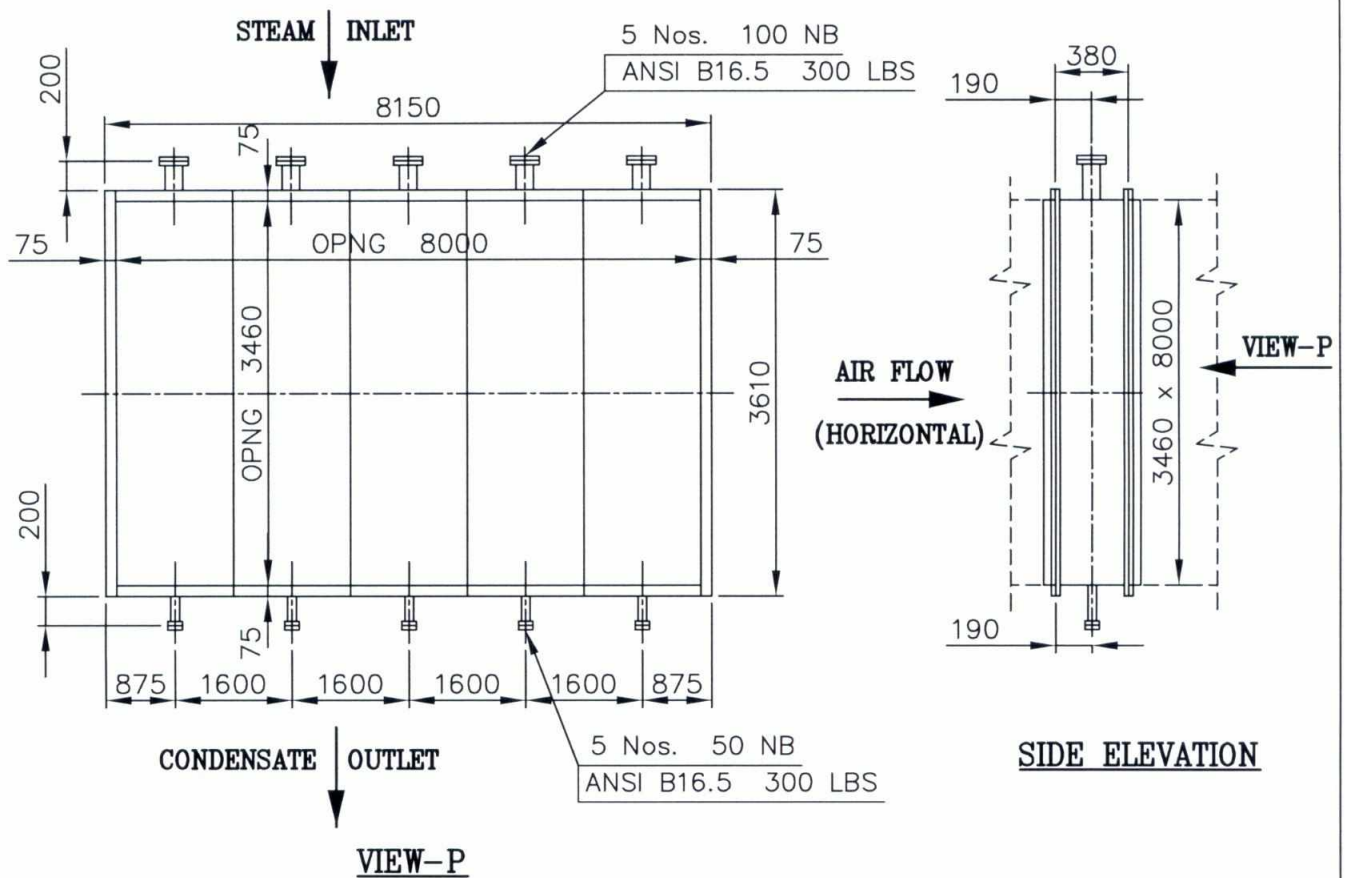
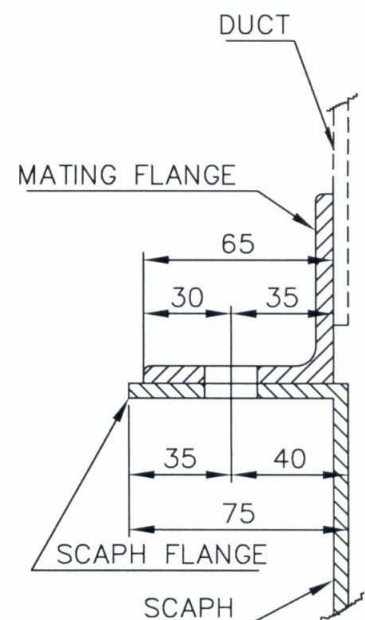
21. Inspection

- a) By BHEL Inspector at Vendor's works as per BHEL approved Quality Plan.
- b) SCAPH is to be hydraulically tested to 1.5 times of the Design Pressure.
- c) Necessary Material, Test & Guarantee Certificates shall be furnished.

Parameter / Requirement in the Spec	Unit	Design Condition / Max heat duty condition	Maximum Flow condition	Other condition 1	Other condition 2
Air Flow per SCAPH - Design	Tons / hr				
Air Inlet Temp - Design	°C				
Air Outlet Temp - Design	°C				
Working Pressure of Steam	Kg/cm ² (a)				
Working Temp of Steam	°C				
Design Temp of SCAPH	°C				
SCAPH Connecting Duct Size	mm x mm				
SCAPH height	mm				
Air Flow Direction	Horizontal / Vertical				
Hydro Test Pressure at Tube side	Kg/cm ² (g)				
Design Pressure for Header & Tubes	Kg/cm ² (g)				
Tube OD	mm				
Fin width	mm				
Tube Thickness	mm				
Tube Spacing	mm				
Row Spacing	mm				
Fin Thickness	mm				
Fin Spacing	FPI				
Tube Material					
Fins Material					
Nozzles Material					
Headers Mateial					
Tube Sheet Material					
Connection Size - Steam Inlet / Outlet	NB				
Steam Consumption	Tons/hr				
Weight of SCAPH	Kg				
Heat Transfer Area reqd	m ²				
Heat transfer Area provided	m ²				
% of Excess area provided	%				
Finned Width	mm				
Finned Depth	mm				
Pressure drop Air side	mmWC				
Overall Heat Transfer Coef. - Fin Side	Kcal/m ² Hr°C				
Confirmation to SCAPH dimensions	Yes / No				
No of Sections	Nos				
No of Tubes per Row / Total	Nos				
No of Rows	Nos				
Remarks					
Prepared	Date		Checked & Approved		

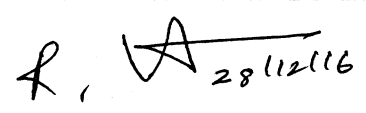
**SCAPH GENERAL ARRANGEMENT**

ALL DIMENSIONS ARE IN MM

**SCAPH FLANGE DRILLING DETAILS****SECTION-AA**

QUALITY DEPARTMENT	
Amendment to Quality Work Instructions (SQP)	
QWI NO: SQP APH 102 REV: 04	DT. 07 03 2014
Amendment no: A1	DT. 28 12 2016
Description: Standard quality Plan for Steam Coil Air pre Heater (SCAPH).	

Details of Amendment		
Sl.no.	Amended As	Basis for Amendment
CL.2(a)	Refer QP Class 2(a) Fin density(no of fin) to be witnessed by BHEL/BHEL AIA.	Revised based on Feedback from QC Proc Email Dt:27.12.2016 .Ref NCR:BOI/67/5 DT:03/05/2016, Disposed DT:27.12.2016

Prepared by	Reviewed and Approved By
 Rakesh kr madhu(Ser/QA)	 R. Arunachalam (SM/QA)

 Ranipet		MANUFACTURER'S NAME & ADDRESS		STANDARD QUALITY PLAN						
		M/S BHEL / BAP / RANIPET TAMIL NADU-632 406		ITEM/SUB SYSTEM:			Doc. No		SQP APH 102	
				Steam Coil Air pre Heater (SCAPH)			Rev. No/Date		04/07.03.2014	
				Page No			01 of 03			
SL NO	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	Agency	REMARKS	
1	2	3	4	5	6	7	8	M	B	10
1.0	Raw Material Tubes, pipes, sheets and plates	Chem. & Mech. Properties	Analysis	One/melt / batch	Respective matl. Spec. as per approved drawing and Note - 1	TC	P	V		
2.0	In Process Control									
Welders & Procedures shall be qualified to ASME SEC.IX. BHEL will review procedures and welders Qualification.										
a)	Fit up of tubes with fins	Fin height, fin density	Measurement	100%	As per approved drawing	HC	P	V		
b)	Galvanization of Fin Tube Assembly (Carbon Steel Fins)	a) Wt of zinc coating b) Thickness of coating c) Uniformity of coating d) Adhesion test.	Visual measurement & lab test	One /batch wise	IS 4759	Test Report	P	V		
	If Aluminium Fins (G type) are envisaged, hot dip galvanizing is not required									
LEGENDS:				Prepared by	APPROVED BY:					
M - Manufacturer, BHEL Shop / Subcontractor, B - BHEL QC/ Authorised Inspection agency P - Performed By, V - Verification Of Reports, W - Witness TC - Test Certificate R- report, HT-Heat treatment				Reviewed by				(SDGM/QA,BE,QC(Proc.))		

 Ranipet	MANUFACTURER'S NAME & ADDRESS		STANDARD QUALITY PLAN				
	M/S BHEL / BAP / RANIPET		ITEM/SUB SYSTEM:		Doc. No		
	TAMIL NADU-632 406		STEAM COIL AIR PREHEATER (SCAPH)		Rev. No/Date		
					Page No		
						SQP APH 102	
						04/07.03.2014	
						02 of 03	

SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	TYPE OF CHECK 4	QUANTUM OF CHECK 5	REFERENCE DOCUMENTS 6	ACCEPTANCE NORMS 7	FORMAT OF RECORDS 8	Agency 9	REMARKS 10
								M B	
2.2	Fit up of galvanised tubes with tube sheet, Tube sheet with header, Header with nozzle, Nozzle with flange	Dimensions & orientation	Measurement	100 %	As per approved drawing		DR	P V	#Tube to tube sheet weld witness. Other welds verification
2.3	Welding	Weld size and finish	Measurement	100%	As per approved drawing		DR	P W	
		Weld quality	DPT	100%	ASME Sec VIII Division 1, UHT 57		NDT Reports	P W#	
3.0	Final Inspection								
3.1	Hydro test	Leak Proof	Hydro test	100%	As per approved drawing /Engineering specification		DR	P W	CHP

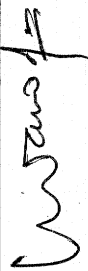
LEGENDS: M – Manufacturer, BHEL Shop / Subcontractor, B – BHEL QC/ Authorized Inspection agency P – Performed By, V – Verification Of Reports, W – Witness T C – Test Certificate R- report, HT-Heat treatment	Prepared by	APPROVED BY:
	Reviewed by	(SDGM/QA,BE,QC(Proc.))

MANUFACTURER'S NAME & ADDRESS		STANDARD QUALITY PLAN							
 Ranipet M/S BHEL / BAP / RANIPET TAMIL NADU-632 406		ITEM/SUB SYSTEM:		Doc. No		SQP APH 102			
		STEAM COIL AIR		Rev. No/Date		04/07.03.2014			
		PREHEATER (SCAPH)		Page No		03 of 03			
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	TYPE OF CHECK 4	QUANTUM OF CHECK 5	REFERENCE DOCUMENTS 6	ACCEPTANCE NORMS 7	FORMAT OF RECORDS 8	Agency 9 M B	REMARKS 10
3.2	Dimensions	Overall dimensions & orientation	Measurement	100%	As per approved drawing		DR	P W	CHP
3.3	Final assembly	Cleaning, painting & preservation	Visual	100%	As mentioned in the Approved drawing /Note -2		DR	P W	CHP

Notes

- Tubes meant for SCAPH are to be procured with following conditions and the same are to be co related in respective tube material certificate
 - Soundness of the each tube to be ensured by conducting Hydro static test instead of Eddy current test. Minimum test pressure shall be 70 bar and hydro static pressure shall be maintained for not less than 5seconds as per ASTM A 714-99(Reapproved 2009).
 - Valid manufacturers marking shall be available in each tube .The list of valid manufactures are 1) KLT Automotive and Tubular Products LTD CHENNAI, 2) TATA steel Limited Kolkata, CHENNAI, 3) Tube investments of India Ltd CHENNAI, 4) BHUSHAN steel Limited CHENNAI ,RAIGAD, 5) CAPARO tubes India DEWAS . Any new vendors are also acceptable subject to the prior approval from BHEL Ranipet..
 - The List of Valid manufacturers for Seamless Steel Tubes are (1) BHEL, Trichy (2) ISMT Limited, Pune, (3) KALPANA STEEL CENTRE, Mumbai (4) MADRAS STEELS & TUBES, Chennai (5) MAHARASTRA SEAMLESS LIMITED, (6) NAVARATNA METAL CORPN, Mumbai (7) PSL Ltd Chennai (8) STEELMET INDUSTRIES, Mumbai.(9) M/s SAINEST TUBES PVT LTD,Gugrat.
- After hydro test, the water in the SCAPH shall be completely drained and dried. All openings of SCAPH shall be closed with suitable end covers.

Record of revision		Original Issue	
Rev 00/DT 19 112001		Painting requirement corrected	
Rev 01/ DT 17 01 07		Note 1 Details added to take care of Tubes procurement .	
Rev 02/DT 27 01 2010		CI 2.0 b modified by including remarks for Aluminium Fins	
Rev 03/DT 04 06 2103		Note 'c' added, CL 2.3 revised.	
Rev 04/DT 07 03 2014		Note 'c' updated, CL 2.3 revised.	

LEGENDS:		Prepared by	Reviewed by	APPROVED BY:
M – Manufacturer, BHEL Shop / Subcontractor,		 	 (SDGM/QA,BE,QC(Proc.))	
B - BHEL QC/ Authorized Inspection agency				
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