

IOCL PARADIP CAPTIVE POWER PLANT

VOL. - II B & III

TECHNICAL SPECIFICATION FOR DESUPERHEATING STATION ALONGWITH ACCESSORIES

SPECIFICATION NO: PE - TS - 353-142 -N101



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI, INDIA**

IOCL PARADIP CAPTIVE POWER PLANT

VOL. - II B

TECHNICAL SPECIFICATION FOR DESUPERHEATING STATION ALONGWITH ACCESSORIES

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**BHARAT HEAVY ELECTRICALS LIMITED
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TITLE

PREAMBLESPECIFICATION NO **PE-SS-999-100-Q-001**VOLUME **II B**SECTION **PREAMBLE**REV NO. **0** | DATESHEET **1 OF 1****1.0 Volume – II B :**

This volume is sub- divided into following sections :-

Section – A : This section outlines the scope of enquiry


Section – B : This section provides : “ Project Information”.

Section- C : This section indicates tech. Requirements specific to the contract (not covered in Section – D.) and comprises of :

- Specific technical requirements.
- Details to be submitted with the Bid.
- Data sheets –A:
A1- Desuperheater
- List of mandatory Spares as applicable.
- Quality Plan.

Section – D : This section indicates Technical specification of equipments and comprises of:

- Equipment specification for Steam Desuperheater.(PES-148-01) & EIL specification 6-52-0038. In case of any discrepancy, EIL specification 6-52-0038 shall prevail.

<div><div>बीएसईएल</div><div></div></div>	TITLE Desuperheater Specification For IOCL PARADIP CPP	SPECIFICATION NO PE-TS-353-142-N101	
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		SECTION A	
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<div>SCOPE OF ENQUIRY</div>			


	<p>TITLE</p> <p>Desuperheater Specification</p> <p>For</p> <p>IOCL PARADIP CPP</p>	SPECIFICATION NO PE-TS-353-142-N101	
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1.1 This enquiry covers the Design, Manufacture, Assembly, Inspection and Testing at Vendor's and/or his sub-vendors works, painting and delivery to site of Desuperheating Stations, as mentioned in different sections of this specification for the **IOCL Paradip CPP**

1.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the Engineer/Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

1.3 The bidder shall indicate any deviations from this specification in the deviation schedule enclosed at Vol III Part A. In the absence of duly filled deviation schedule, it shall be presumed that the offer conforms exactly to this specification. However, the acceptance of the deviations/options is not binding on the Engineer/Owner.

1.4 The bids shall be in English language and MKS Units.

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<div>PROJECT INFORMATION</div>			

Dated : 18-June-2010

PARADIP REFINERY CPP

PROJECT INFORMATION

1.	Owner	Indian Oil Corporation Limited
2.	Project	PARADIP REFINERY CPP
3.	Owner's consultant	Engineers India Limited
4.	Location	The project Site is located at Paradip in state of ORISSA, India (Approximately 5 kms from the Paradip Port).
5.	Nearest Airport	Bhubaneswar (125 kms)
6.	Nearest Railway Station	Cuttack (94 kms)
7.	Access to site	From Cuttack railway station By bus or taxi
8.	Site data	
A	Altitude	3.91M above Mean Sea Level
B	Ambient Air Temperature	
1.	Design maximum	42.4°C
2.	Design Minimum	11.3°C
3.	Design Wet Bulb	29°C

C	RELATIVE HUMIDITY	
	Mean Daily Humidity	99.7% (Max); 24.7% (Min)
	Average Monthly Humidity	95% (Max); 55% (min)
D	RAINFALL	
1.	Average Annual Rainfall	1572 mm
2.	Design Rainfall (per hour)	125 mm
3.	Maximum Recorded Annual	2251.7 mm
4.	Minimum Recorded Annual	1018.6 mm
E	WIND VELOCITY & PRESSURE [AS PER IS:875]	
1.	Wind Load	In accordance with IS-875 (Part 3) – 1987 (reaffirmed 2003) for a basic wind speed of 65 m/sec.
2.	Average Wind Velocity	Summer: 37 – 45 km/hr Winter: 15 - 26 km/hr Maximum: 259 km/hr (cyclonic)
F	SEISMIC ZONE	Zone-3 as per IS-1893 latest revision
9.0	Power Supply	
	a) In plant generation	11kV \pm 6%, 3ph, 50 \pm 3%Hz
	b) In plant distribution	66kV \pm 6%, 3ph, 50 \pm 3%
	c) Motor rated above 160kW	6.6kV \pm 6%, 3ph, 50 \pm 3%
	d) Motor rated above 18W to 160kW	415V \pm 6%, 3ph, 50 \pm 3%
	e) Motors rated below 18W, Lighting and small power	240V \pm 6%, 1ph, 50 \pm 3%
	f) DC Motors	220V DC \pm 10%, 2 wire ungrounded system
	g) Control supply for relay panel/ 6.6kV	110V DC \pm 10%, 2 wire

	breakers/415V breakers	ungrounded system
	h) UPS for instrumentation & Control system	415V AC $\pm 6\%$, 3 ph, 50Hz $\pm 3\%$
	i) Control supply for 415V Motor contactors/AC Control circuits [to be generated in MCC /panel by vendor]	240V AC $\pm 10\%$, 50Hz $\pm 5\%$
	j) Diesel Generator emergency supply	6.6kV $\pm 6\%$, 3ph, 50 $\pm 3\%$ & 415V $\pm 6\%$, 3ph, 3W, 50Hz $\pm 3\%$
	k) DC emergency lighting.	220V DC $\pm 10\%$, 2 wire ungrounded system
NOTE:	1. All equipment except generator shall be suitable for any combination of voltage and frequency variation. 2. Any other power supply requirement shall be derived by the vendor from the above available power supplies.	
10.0	Design ambient temperature for electrical equipment	45°C
11.0	Fault levels	
	a) 66kV	40 kA rms for 1 sec.
	b) 6.6kV	40 kA rms for 1 sec.
	c) 415V	50 kA rms for 1 sec.



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101


VOLUME **II-B**

SECTION **C**

REV NO. **0** DATE

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SPECIFIC TECHNICAL REQUIREMENTS

	<p>TITLE</p> <p>Desuperheater Specification</p> <p>For</p> <p>IOCL Paradip CPP</p>	SPECIFICATION NO PE-TS-353-142-N101	
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1.0.0 BRIEF SYSTEM DESCRIPTION

- 1.1 Desuperheaters are designed to provide the steam at desired temperature downstream of PRDS stations and at the refinery terminal points during start-up, low loads & normal running of unit & other emergency requirements.
- 1.2 The system comprises of pressure reducing control valves (not in vendor scope), spray control valves (not in vendor scope), desuperheaters as per the tender drawing enclosed at Vol. II B, section C.
- 1.3 The equipments to be offered by the bidder have been clearly indicated in the tender drawing.

2.0.0 EQUIPMENT TO BE PROVIDED BY TENDERER

2.1 For IOCL Paradip CPP

2.1.1 HHP TO HP PRDS DESUPERHEATER COMPRISING OF :

Desuperheater (DSH-1 – 190LBB10 DS501) : One No. for the unit

2.1.2 HP TO MP PRDS DESUPERHEATER COMPRISING OF :

Desuperheater (DSH-2 – 190LBC24 DS501) : One No. for the unit

2.1.3 MP TO LP PRDS DESUPERHEATER COMPRISING OF :

Desuperheater (DSH-3 – 190LBS45 DS501) : One No. for the unit

2.1.4 HP HEADER DESUPERHEATER COMPRISING OF :


Desuperheater (DSH-4 – 190LBB10 DS501) : One No. for the unit

2.1.5 MP HEADER DESUPERHEATER COMPRISING OF :

Desuperheater (DSH-5 – 190LBC31 DS501) : One No. for the unit

2.1.6 LP HEADER DESUPERHEATER COMPRISING OF :

Desuperheater (DSH-6 – 190LBS50 DS501) : One No. for the unit

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2.2.0 Spares, Consumables:

2.2.1 Erection/Commissioning Spares & Consumables

All the Erection/Commissioning Spares & Consumables on as required basis shall be included by the bidder in his scope.

2.2.2 Recommended Spares

The bidder shall submit a list of recommended spares for all the above desuperheaters for three years of normal operation. These will not be taken into account in the bid evaluation. These are to be quoted separately & unit prices to be indicated, to enable placement of a separate order later if required.

3.0.0 SPECIFIC TECHNICAL REQUIREMENTS:

The technical requirement details in this section are applicable for the project and shall override the standard specification no. (PES-148-01) & EIL spec. 6-52-0038 enclosed under Section D in case of any contradiction.

3.1.0 General

Desuperheater shall be designed for the operating conditions as specified in data sheet A.

3.2.0 Noise Level

The equivalent noise level measured at 1.5 M above floor level in elevation and 1 M horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85dBA. Noise abatement method shall be obtained by body and trim design and not by silencer. Use of diffuser is not permitted.

4.0.0 QUALITY PLAN

The quality plan enclosed in this specification is for bidder's guidance only. The bidder shall comply with this and minimum requirements specified in the specification and shall furnish his own quality plan in the event of order for final approval by BHEL /its Customer. BHEL / its customer shall indicate Customer Hold Points (CHP) in the approved quality plan beyond which work shall not proceed without the approval of BHEL / its customer.

5.0.0 MARKING AND PACKING

5.1 Marking

A stainless steel metal name-plate should be permanently fixed on each equipment giving its tag number and technical specifications.



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Desuperheater Specification**For****IOCL Paradip CPP**


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5.2 Packing

All equipment/materials shall be suitably packed and protected for the entire period of despatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea water spray (where applicable) as well as rough handling and delays in transit and storage in open.

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1.0

DETAILS TO BE SUBMITTED ALONGWITH THE BID:

Along with the offer only the following drawings / data are to be furnished :

1.1

Technical deviation schedule .This schedule is placed at Vol.III Part A.

1.2

General Arrangement Drawings, Loading Details, Civil Inputs etc.

1.3

Technical Data Sheets, Model Details etc.

1.4

Calculation Sheets

1.5

Reference Project list

1.6

Any other document mentioned in the specification or deemed necessary.



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101

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SHEET 1 OF 1

DATA SHEETS-A

A1- DESUPERHEATER



TITLE

SIZING DATA SHEETS**DESUPERHEATING STATION**

SPEC. NO. PE-TS-353-142-N101

VOLUME **II-B**SECTION **C**REV NO. **00** DATE

SHEET 2 OF 13

DATA SHEET- A-1**A) SIZING DATA FOR DSH-1 FOR HHP TO HP PRDS APPLICATION**

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	45.5	45.5	45.5	45.5	45.5	45.5	55
1.2	TEMP. (°C)	480	480	480	480	480	480	515
1.3	FLOW (T/HR)	679.6	141.7	483.7	289.8	500	70.0	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	45	45	45	45	45	45	55
2.2	TEMP. (°C)	412	412	412	412	412	412	427
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	50-80	50-80	50-80	50-80	50-80	50-80	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 50 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.



TITLE

SIZING DATA SHEETS

DESUPERHEATING STATION

SPEC. NO. PE-TS-353-142-N101

VOLUME II-B

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DATA SHEET- A-1**B) SIZING DATA FOR DSH-2 FOR HP TO MP PRDS APPLICATION**

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	17.5	17.5	17.5	17.5	17.5	17.5	25
1.2	TEMP. (°C)	375	375	375	375	375	375	427
1.3	FLOW (T/HR)	360.7	129.2	79.9	200	300	35.0	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	17	17	17	17	17	17	25
2.2	TEMP. (°C)	307	307	307	307	307	307	350
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	20-50	20-50	20-50	20-50	20-50	20-50	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 20 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.



TITLE

SIZING DATA SHEETS

DESUPERHEATING STATION

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DATA SHEET- A-1

C) SIZING DATA FOR DSH-3 FOR MP TO LP PRDS APPLICATION

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	6.5	6.5	6.5	6.5	6.5	6.5	10
1.2	TEMP. (°C)	300	300	300	300	300	300	350
1.3	FLOW (T/HR)	10.9	357.0	152.9	50.5	225	290	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	6	6	6	6	6	6	10
2.2	TEMP. (°C)	192	192	192	192	192	192	240
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	10-30	10-30	10-30	10-30	10-30	10-30	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 10 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.



TITLE

SIZING DATA SHEETS

DESUPERHEATING STATION

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DATA SHEET- A-1**D) SIZING DATA FOR DSH-4 FOR HP HEADER**

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	43.5	43.5	43.5	43.5	43.5	43.5	50
1.2	TEMP. (°C)	410	420	427	420	420	420	427
1.3	FLOW (T/HR)	299	299	299	233.4	100	50.0	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	43	43	43	43	43	43	50
2.2	TEMP. (°C)	410	410	410	410	410	410	427
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	50-80	50-80	50-80	50-80	50-80	50-80	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 50 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.



TITLE

SIZING DATA SHEETS

DESUPERHEATING STATION

SPEC. NO. PE-TS-353-142-N101

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DATA SHEET- A-1

E) SIZING DATA FOR DSH-5 FOR MP HEADER

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	16	16	16	16	16	16	25
1.2	TEMP. (°C)	305	325	350	325	325	325	350
1.3	FLOW (T/HR)	142	142	142	188	90	35	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	15.5	15.5	15.5	15.5	15.5	15.5	25
2.2	TEMP. (°C)	305	305	305	305	305	305	350
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	20-50	20-50	20-50	20-50	20-50	20-50	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 20 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.



TITLE

SIZING DATA SHEETS

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DATA SHEET- A-1

F) SIZING DATA FOR DSH-6 FOR LP HEADER

<u>S. NO</u>	<u>PARAMETERS</u>	<u>CASE-I</u>	<u>CASE-II</u>	<u>CASE-III</u>	<u>CASE-IV</u>	<u>CASE-V</u>	<u>CASE-VI</u>	<u>MECH. DESIGN</u>
1.0	INLET PARAMETERS							
1.1	PRESSURE (Kg/Cm ² a)	6	6	6	6	6	6	8
1.2	TEMP. (°C)	190	205	210	220	210	210	240
1.3	FLOW (T/HR)	-41	-41	283	283	200	100	-
2.0	OUTLET PARAMETERS							
2.1	PRESSURE (Kg/Cm ² a)	5.5	5.5	5.5	5.5	5.5	5.5	8
2.2	TEMP. (°C)	190	190	190	190	190	190	240
3.0	FEED WATER SPRAY PARAMETERS							
3.1	PRESSURE (Kg/Cm ² a)	10-30	10-30	10-30	10-30	10-30	10-30	221
3.2	TEMP. (°C)	145.9	145.9	145.9	145.9	145.9	145.9	160
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE :

1. Minimum feed water pressure at the inlet of spray control valve shall be 10 Kg/cm²(a). Spray control system to be designed accordingly.
2. Pressure drop in Desuperheater is to be confirmed by the bidder.
3. Negative (-) sign represents reverse flow from refinery.



TITLE

EQUIPMENT SPECIFICATION

STEAM DESUPERHEATER

SPEC. NO.: PE-TS-353-142-N101

VOLUME II-B


SECTION C

REV NO. 0 DATE

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DESUPERHEATER DATA SHEET A-1**DATA SHEET FOR DESUPERHEATER DSH-1**

S.NO.	DESCRIPTION	UNITS	DSH-1 FOR HHP TO HP PRDS
1.0	TAG NO.		DSH-1 – 190LBB10 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 610X20 (SA335P22)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		BW/ 88.9X20 (SA335P22)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WC9
8.2	PIPE		SA 335 P22
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1

	TITLE EQUIPMENT SPECIFICATION STEAM DESUPERHEATER	SPEC. NO.: PE-TS-353-142-N101	
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DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR DESUPERHEATER DSH-2

S.NO.	DESCRIPTION	UNITS	DSH-2 FOR HP TO MP PRDS
1.0	TAG NO.		DSH-2 – 190LBC24 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 610X20 (SA335P22)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		BW/ 88.9X20 (SA335P22)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WC9
8.2	PIPE		SA 335 P22
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1



TITLE

EQUIPMENT SPECIFICATION

STEAM DESUPERHEATER

SPEC. NO.: PE-TS-353-142-N101

VOLUME **II-B**

SECTION **C**

REV NO. **0** DATE

SHEET 10 OF 13

DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR DESUPERHEATER DSH-3

S.NO.	DESCRIPTION	UNITS	DSH-3 FOR MP TO LP PRDS
1.0	TAG NO.		DSH-3 – 190LBS45 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 863.6X27 (SA106GrC)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		SW/ 88.9X11.13 (SA106GrC)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WCB
8.2	PIPE		SA 106 Gr.C
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1



TITLE

EQUIPMENT SPECIFICATION

STEAM DESUPERHEATER

SPEC. NO.: PE-TS-353-142-N101

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DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR DESUPERHEATER DSH-4

S.NO.	DESCRIPTION	UNITS	DSH-4 FOR HP HEADER
1.0	TAG NO.		DSH-4 – 190LBB10 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 406.4X17.5 (SA335P22)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		SW/ 60.3X12.5 (SA335P22)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WC9
8.2	PIPE		SA 335 P22
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1



TITLE

EQUIPMENT SPECIFICATION

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DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR DESUPERHEATER DSH-5

S.NO.	DESCRIPTION	UNITS	DSH-5 FOR MP HEADER
1.0	TAG NO.		DSH-5 – 190LBC31 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 457.2X12.7 (SA106GrB)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		SW/ 60.3X11.07 (SA106GrC)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WCB
8.2	PIPE		SA 106 Gr.B
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1



TITLE

EQUIPMENT SPECIFICATION

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DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR DESUPERHEATER DSH-6

S.NO.	DESCRIPTION	UNITS	DSH-6 FOR LP HEADER
1.0	TAG NO.		DSH-6 – 190LBS50 DS501
2.0	TYPE		VARIABLE ORIFICE / FIXED ORIFICE
3.0	STEAM PARAMETERS		(INLET OF DESUPERHEATER)
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
3.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
3.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-1
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-1
5.2	PRESSURE	Kg/cm ² (a)	REFER SIZING DATA SHEET A-1
5.3	TEMPERATURE	°C	REFER SIZING DATA SHEET A-1
6.0	END DETAILS		(STEAM INLET / OUTLET)
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 711X20 (SA106GrC)
7.0	END DETAILS		(SPRAY WATER INLET)
7.1	TYPE / MATCHING PIPE		SW/ 60.3X11.07 (SA106GrC)
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A217 WCB
8.2	PIPE		SA 106 Gr.B
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	Kg/cm ² (g)	REFER SIZING DATA SHEET A-1
9.2	DESIGN TEMPERATURE	°C	REFER SIZING DATA SHEET A-1



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101


VOLUME **II-B**

SECTION **C**

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SHEET 1 OF 1

QUALITY PLAN

		STANDARD QUALITY PLAN FOR DESUPERHEATER			CUSTOMER :.			PROJECT: IOCL Paradip CPP		SPECIFICATION NUMBR PE-TS-353-142-N101		
					BIDDER/ : AS PER APPROVED VENDOR LIST			SPECIFICATION TITLE : DESUPERHEATER				
		SHEET 1 of 2			SYSTEM ITEM : STEAM DESUPERHEATER			QUALITY PLAN NUMBR		SECTION VOLUME		
SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11

1.0	Raw Materials											
1.1	Pipes	Mechanical & Chemical Prop.		Mechanical & Chemical	100%	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Leakproofness		Hydraulic test	100%	-do-	-do-	TC	3/2	-	1	
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
1.2	Forging	Physical & Chemical Prop.		Physical & Chemical Prop.	1/heat	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
		Heat Treatment		Scrutiny	100%	-do-	-do-	HT/SR Chart	3/2	-	1	Correlation required
2.0	In Process											
2.1	Forgings	Internal defects		U.T	100%	ASTMA 435	ASTMA 435	IR	3/2	-	1	
2.2	Machining Body Internals	Dimensions		Measurement	100%	Appd.Drg.	Appd.Drg.	IR	3/2	-	1	Correlation required
2.3	Body	Surface Defects		D.P. Check	100%	ASTME165	ASTM-D-12964	TC	3/2	-	1	

PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR	
NAME				
SIGNATURE				
DATE				
				BIDDER'S/ VENDOR'S COMPANY SEALS

		STANDARD QUALITY PLAN FOR DESUPERHEATER		CUSTOMER ::			PROJECT: IOCL Paradip CPP		SPECIFICATION NUMBR PE-TS-353-142-N101			
				BIDDER/ : AS PER APPROVED VENDOR LIST			SPECIFICATION TITLE : DESUPERHEATER					
		SHEET 2 of 2		SYSTEM ITEM : STEAM DESUPERHEATER			QUALITY PLAN NUMBR			SECTION VOLUME		
SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11

2.4	WPS,PQR,WPO	WPS,PQR,WPO		Physical	100%	ASME Sec-IX/IBR	ASME Sec-IX/IBR	Format	3/2	-	1	Records to be shown
3.0	Final Inspection											
3.1	Assembly	Completeness and Marking		Visual	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
		Dimensional		Measurement	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
3.2	Pressure Test	Leak Proofness		Hydraulic Test	100%	-do-	-do-	IR	3/2	1	-	
4.0	Painting	Surface Prepn., Uniformity, Shade & Thickness		Visual, Measurement	100%	-do-	-do-	IR	3/2	-	1	
5.0	Packing	Soundness of Packing, Marking		Visual	100%	Appd Specn./Mfr. Standard	Appd Specn./Mfr. Standard	IR	3/2	-	1	
Note:: IBR –Certificate in Form III C shall be submitted.												

LEGEND	P – PERFORM	W – WITNESS	V – VERIFICATION
	1 – BHEL, CUSTOMER/CONSULTANT	2 – VENDOR	3 – SUB VENDOR

PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR	
NAME				
SIGNATURE				
DATE				
				BIDDER'S/ VENDOR'S COMPANY SEALS

स्प्रे नोजल्स के लिये
निरीक्षण व परीक्षण योजना
INSPECTION AND TEST PLAN
FOR
SPRAY NOZZLES

1	31.01.08	REVISED AND RE-ISSUED	CS	SS	MVKK	VC
0	12.12.02	ISSUED FOR IMPLEMENTATION	NKN		AKB	GRR
Rev. No.	Date	Purpose	Prepared by	Checked by	Convener Standards Committee	Chairman Standards Bureau
					Approved by	

INSPECTION AND TEST PLAN
FOR
SPRAY NOZZLES

STANDARD SPECIFICATION No.

6-81-0113

Rev.1

Page 2 of 5

Inspection Standards Committee

Convenor: Mr. MVK Kumar

Members: Mr. Chandra Kant
Mr. PP Mathur
Mr. SS Lotay
Mr. Surender Singh
Mr. Anoop Goel
Mr. S Kaul (Proj.)

INSPECTION AND TEST PLAN FOR SPRAY NOZZLES

STANDARD SPECIFICATION No.

6-81-0113

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1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Spray Nozzles

2.0 REFERENCE DOCUMENTS:

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

S. NO	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
1	Incoming material (Casting/Forging/Rolled section, etc)	Mechanical and Chemical properties	100% verification with MTC/ check test	Inspection report	-	R	R
2	Material identification (Casting/Forging/Rolled section, etc)	Check test for Chemical properties.	Randomly selected sample	Inspection report	-	P	R
3	Manufacturing/Machining of Spray Nozzle	Visual / Dimensional & Flange finish check for Shape of flute, Orifice opening, Length, etc.	100%	WPS/PQR / Inspection report	-	P	R

**INSPECTION AND TEST PLAN
FOR
SPRAY NOZZLES**

STANDARD SPECIFICATION No.

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S. NO	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	EIL/TPIA
4	Final inspection of Spray Nozzle	-Visual inspection for reinforcement. Under cut, Surface defects. -Dimensional check -End connections (As per spec/Drawings)	100%	Inspection report.	-	P	H (min 10% witness by EIL)
5	Performance test of Spray Nozzle	Flow, Spray angle, Spray pattern (As per spec/Drawings)	10%	Inspection report / Test results	-	P	H
6	Marking for identification	Marking/Identification as per drawing/Spec.	100%	Inspection report	-	P	R
7	Packing & Despatch	Verification of type of packing as per drawing/Spec.	100%	Shipping documents	-	P	R
8	Documentation for Spray Nozzle as per VDR	Verification & compilation of Inspection & test records for submission to Client.	100%	Dossier	-	P	H

**INSPECTION AND TEST PLAN
FOR
SPRAY NOZZLES**

STANDARD SPECIFICATION No.

6-81-0113

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Legends: CCE or CCOE-Chief Controller of Explosives, DT- Destructive Testing, DP or DPT – Dye Penetrant Test, HT- Heat treatment, H- Hold (Do not proceed without approval), IBR-Indian Boiler Regulations, ID – Inside Diameter, ITP-Inspection and Test Plan, M- Monitor, Max. – Maximum, Min. – Minimum, MT or MPT – Magnetic Particle Test, MTC – Manufacturer / Mill Test Certificate, NDT- Non Destructive Testing, OD – Outside Diameter, PMI – Positive Material Identification, P-Perform, PO- Purchase Order, PR-Purchase Requisition, PQR- Procedure Qualification Record, QAP-Quality Assurance Plan, Random -10% (min.1 no.) of each size and type of Bulk item, R-Review, RT- Radiography Testing , RW- Random Witness, TC-Test Certificate, TPI or TPIA - Third Party Inspection Agency, TPM – Test Piece Marking, UT – Ultrasonic Test, VDR- Vendor Data Requirements, WPS- Welding Procedure Specification, WPQ- Welders Performance Qualification, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. Wherever W/R or H/W is indicated, EIL Inspection Engineer shall decide the option to be exercised for the particular stage and supplier.
2. Supplier's in house procedures may be accepted in case TPI / EIL is satisfied with adequacy of procedures to comply with Purchase Order/Specifications Requirements. In case of non availability of suitable procedures, fresh procedures may be qualified under TPI / EIL witness.
3. In case of conflict between purchase specification, contract documents and ITP, more stringent conditions shall be applicable.
- 4 This document describes generally the requirements pertaining to all types of the item. Requirements specific to PO and the item are only applicable.
5. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents



TITLE

Desuperheater Specification
For
IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101


VOLUME **II-B**

SECTION **D**

REV NO. **0** DATE

SHEET 1 OF 1

EQUIPMENT SPECIFICATIONS
FOR
DESUPERHEATER

	TITLE EQUIPMENT SPECIFICATION FOR STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
		SECTION D	
		REV NO. 0	DATE
		SHEET 1	OF 3

1.0.0 GENERAL

This standard specification covers the design, materials, construction features, manufacturing process, assembly, inspection and testing requirements, painting and packing requirements of Steam Desuperheater along with spray nozzle.

2.0.0 CODES AND STANDARDS

2.1.0 The design, manufacture, inspection and testing of the equipment shall comply with the requirements of the latest national and international codes and standards wherever applicable. Wherever the specific code requirements are specified herein,. the same shall be adhered to.

In particular, the equipment shall be designed to comply with latest editions of the following standards

(i) Indian Boiler Regulations (IBR).

(ii) ASME Section - VIII / Div. - 1.

(iii) Material specifications as per ASTM, AISI.


3.0.0 DESIGN AND CONSTRUCTIONAL FEATURES

3.1.0 The desuperheater shall be of direct mixing mechanical spray type. The assembly shall consist of desuperheater pipe with steam inlet and outlet & spray water connection along with spray nozzle. The spray nozzle shall direct the spray in the direction of steam flow for proper mixing and arranged in such position that direct impingement of spray water on desuperheater walls is avoided.

3.2.0 The spray nozzle shall be accurately sized for best results in total range as stipulated in the data sheet.

3.3.0 The desuperheater shall be complete with matching counter flanges including bolts, nuts, gaskets, necessary reducers / expanders to suit purchaser's pipe line and supporting legs / pads & holding down bolts as required.

3.4.0 The material of construction shall be as indicated in Data Sheet – A.

	TITLE EQUIPMENT SPECIFICATION FOR STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
		SECTION D	
		REV NO. 0	DATE
		SHEET 2	OF 3

4.0.0 SHOP INSPECTION AND TEST

4.1.0 The bidder shall submit along with the offer the Quality Plans in the enclosed format together with all reference documents/standards etc. as applicable.

4.2.0 Indicative Quality Plans, specifying minimum checks and tests as considered necessary are enclosed along with this specification for compliance. These however are not intended to exhibit the total comprehensive testing programmes, which are the responsibility of the bidder.

4.3.0 Detailed Quality Plans to be submitted by the bidders should also include all the checks/tests carried out by the suppliers as part of their normal practice. The Quality Plans submitted by the bidders shall be subject to approval of BHEL/their Customer who reserves the right to ask for further checks during finalization of Quality Plans. BHEL/their Customer shall indicate customer hold points in the approved Quality Plans beyond which the work shall not proceed without their approval.

4.4.0 The supplier shall furnish their production program along with scheduled dates of testing at least three months in advance to enable BHEL/their customer to plan for witnessing the tests identified as hold points.

4.5.0 Material identification and co-relation with test certificates for all major components shall be essentially required. In absence of these, the material of each component shall be tested as per relevant specification for Chemical Composition and Mechanical properties i.e. Yield Stress, Ultimate Tensile Stress, Impact test, % Elongation, % Reduction in Area, Hardness etc. In addition, to ensure freedom from surface and sub-surface defects, suitable Non Destructive Testing shall also be carried out.

4.6.0 Following tests shall be done at Manufacturers' works during various stages as minimum requirement :


4.6.1 Visual examination of all components.

4.6.2 Check for weld joints for proper fit up, Dye Penetration Test after root run and final welding. 100% Radiographic test as per ASTM E 165 for all butt welds.

4.6.3 Verification of stress relieving chart if post-weld heat treatment is called for.

4.6.4 Check / test for pressure retaining bolts and nuts as per relevant Codes/Standards.

4.6.5 Dimension check for all components including surface finish.

	TITLE EQUIPMENT SPECIFICATION FOR STEAM DESUPERHEATER	SPECIFICATION NO PES-148-01	
		VOLUME II-B	
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		REV NO. 0	DATE
		SHEET 3	OF 3
4.6.6	Hydraulic Test to two times the rated design pressure for desuperheater body and other pressure retaining parts.		
4.6.7	Check for final completeness, cleaning, surface finish, appearance, identification, surface preparation, painting, marking and packing including spares.		
4.6.8	The equipment comes under the purview of IBR (Indian Boiler Regulations). All tests certificates duly signed by Chief Inspector (IBR) / authorized representative shall be furnished in IBR from III-C.		
4.6.9	The particulars of proposed shop tests and process of test shall be submitted to BHEL/their Customer along with Quality Plan for approval.		
5.0.0	<u>PERFORMANCE REQUIREMENTS</u>		
	Bidder shall guarantee that equipment offered shall meet the rating and performance requirements as stipulated in this specification. In case it is not as per guarantee furnished by the bidder, the deficiency shall be made good by the bidder by rectification / replacement of defective parts within reasonable time at their own cost inclusive of cost of transportation both ways if required. The Purchaser is entitled to reject the equipment in case of repeated failures to meet the guaranteed performance.		
6.0.0	<u>PAINTING</u>		
6.1.0	All foundry sand and loose material shall be removed and surface should be made thoroughly clean for further protection as required.		
6.2.0	A shop coat of paint, removable after installation at site, shall be applied to all steel surfaces and other exposed surfaces requiring corrosion protection during transit and storage at site.		
7.0..0	<u>PRESERVATION, MARKING AND PACKING</u>		
7.1.0	A Stainless Steel metal nameplate should be permanently fixed on each equipment giving its Tag. No. and technical specifications i.e. Service, Size, Pressure Rating etc.		
7.2.0	All equipments / materials shall be packed suitably and protected from impact, abrasion, corrosion, incidental damage due to vermin, Sun-light, high temperature, rain, moisture, humidity, dust, sea water (where applicable) as well as rough handling during entire period of dispatch, storage and erection including delays in transit and storage in open.		
7.3.0	Spares shall be packed separately and marked clearly for identification. These shall be specially packed for long storage without damage.		

डीसुपरहीटरोँ और पीआरडीएस के लिए मानक विनिर्देशन STANDARD SPECIFICATION FOR DESUPERHEATERS & PRDS

(REFER FOR DESUPERHEATERS & ACCESSORIES)

0	05.05.06	Issued as Standard Specification	RG	HCJ	PM	VJN
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Rev.
No

Date

Purpose

Prepared
by

Checked
by

Standards
Committee
Convenor

Standards
Bureau
Chairman

Approved by

Abbreviations:

AARH	Arithmetic Average Root Height
CMRI	Central Mining Research Institute
DS	Desuperheater
ERTL	Electronics Regional Testing Laboratory
FISCO	Field bus Intrinsic Safety Concept
HART	Highway Addressable Remote Transducer
HHC	Hand Held Configurator
NPT	National Pipe Thread
NPS	Nominal Pipe Size
PID	Proportional, Integral and Derivative
PRDS	Pressure Reduction and Desuperheater
PTFE	Poly Tetra Fluoro Ethylene
SS	Stainless Steel
TSO	Tight Shutoff

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2.0	DESIGN AND CONSTRUCTION
3.0	NAME PLATE
4.0	INSPECTION AND TESTING
5.0	SHIPPING
6.0	REJECTION

ANNEXURES:

Annexure-1:	Stud-Bolt and Nut Material Requirement.
Annexure-2:	Gasket Material Requirement

1.0 GENERAL

1.1 Scope

1.1.1 This standard specifications, together with the data sheets, covers the requirements for the design, materials, assembly, painting, nameplate marking, inspection, testing and shipping of desuperheaters and PRDS.

1.1.2 The related standards referred to herein and mentioned below shall be of the latest edition prior to the date of purchaser's enquiry;

ANSI/ASME American National Standards Institute/American Society of Mechanical Engineers.

B 1.20.1 Pipe Threads General Purpose (Inch)

B 16.5 Pipe Flanges and Flanged Fittings NPS½ through NPS24

ANSI FCI-70.2 Control Valve Seat Leakage

ASTM American Society for Testing and Materials

IBR Indian Boiler Regulation

IEC International Electro technical Commission

IEC-60079 Electrical Apparatus for Explosive Gas Atmosphere.

IEC-60529 Degree of Protection Provided by Enclosures (IP code).

IEC 60534-8.3 Industrial process control valves, noise consideration, control valve aerodynamic noise prediction method

IEC 60534-8.4 Industrial process control valves, noise consideration, prediction of noise generated by hydrodynamic flow

IEC-61158 Fieldbus Standard for use in Industrial Control System

IEC-61158-2 Physical layer specification and Service definition for Field bus

IS-13947 Degree of Protection provided by Enclosures for low voltage switchgear and control gear.

IS-13948 Electrical Apparatus for Explosive Gas Atmospheres-Flame proof Enclosures 'd'.

ISA Instrumentation, Systems and Automation Society

S 75.01 Flow equation for sizing control valves.

S 75.02 Control valve capacity test procedure.

S 75.13 Method of evaluating the performance of positioners with analog input signals and pneumatic signals.

S 75.17 Control valve aerodynamic noise prediction.

S 75.25 Control valve Dynamic testing

ITK-x.x Interoperability Test Kit (latest version)

OSHA Occupational Safety and Health Authority

- 1.1.3 In the event of any conflict between this standard specification, data sheets, statutory regulations, related standards, codes etc., the following order of priority shall govern:
- Statutory Regulations
 - Data Sheets
 - Standard Specification
 - Codes and Standards
- 1.1.4 In addition to compliance to purchaser's specifications in totality, vendors' extent of responsibility shall include the following:
- Sizing and selection of desuperheater, pressure reduction and desuperheating station (PRDS) as per purchaser's datasheets.
 - Detailed design of desuperheater and PRDS including mechanical design of its components and internals like stem, plug assembly, atomising nozzle, sleeve, seat assembly, bonnet, packing etc.
 - Purchaser's data sheets indicate the minimum requirements of material of construction for the body, trim (i.e. stem, plug and seat), atomising nozzles, sleeve, packing, gasket etc. Alternate superior material of construction shall also be acceptable provided vendor assumes complete responsibility for all the parts of the desuperheater/PRDS so as to be compatible with the process fluid and its operating conditions.
- 1.2 Bids**
- 1.2.1 Vendor's quotation shall be strictly as per the bidding instructions to the vendor attached with the material requisition.
- 1.2.2 Whenever a detailed technical offer is required, vendor's quotation shall include the following:
- Compliance to the specifications.
 - A detailed specification sheet for each item, which shall provide information regarding type, principle of operation, material of construction, flow co-efficient (C_v) data, % opening, rangeability, leakage class, capacity and end connection etc. The material specification and the units of measurement for various parts in vendor's specification sheets shall be to the same standards as those indicated in purchaser's data sheets.
 - Whenever specified, vendor shall submit a detailed sizing sheet for each desuperheater/PRDS including pressure reduction control valve and coolant control valve, as required. The sizing sheet shall also include the following information for each desuperheater/PRDS;
 - Minimum Velocity Requirements
 - Maximum Turndown
 - Minimum coolant pressure, flow and temperature requirements

- iv) Maximum coolant pressure requirement
 - v) % Opening of desuperheater, temperature control valve and pressure reduction control valve at minimum/maximum condition
 - vii) Expected outlet process temperature with respect to saturation temperature.
 - viii) Full open flow for pressure reducing valve and temperature control valve considering maximum inlet pressure/temperature.
 - d) Proven references for each offered model of desuperheater/PRDS inline with clause 1.2.3 of this specification
 - e) Vendor to indicate minimum upstream and downstream straight pipe length requirements and location of temperature sensor downstream of desuperheater and PRDS.
 - f) A copy of approval from local statutory authority, as applicable, such as Chief Controller of Explosives (CCE), Nagpur or Director General of Mines Safety (DGMS) in India, for the electronic instruments installed in electrically hazardous area along with:
 - i) Test certificate from recognised test house like CMRI/ERTL etc. for flameproof enclosure/intrinsic safety, as specified in the data sheet, as per relevant standard for all Indian manufactured equipments or for items requiring DGMS approval.
 - ii) Certificate of conformity from agencies like LCIE, BASEEFA, PTB, CSA, UL etc. for compliance to ATEX directives or other equivalent standards for all equipments manufactured outside India.
 - g) Deviations on technical requirements will not be entertained in general. In case vendor has any valid technical reason, they must include a list of deviations tag number wise, summing up all the deviations from the purchaser's data sheets and other technical specifications along with the technical reasons for each of these deviations.
 - h) Catalogues giving detailed technical specifications, model decoding details and other related information for each model of desuperheater/PRDS covered in the bid.
- 1.2.3 All items, as offered, shall be field proven and should have been operating satisfactorily individually for a period of minimum 4000 hours on the bid due date in the process conditions similar to those specified in the purchaser's data sheets. Items with proto-type design or items not meeting proveness criteria specified above shall not be offered.
- 1.2.4 All documentation submitted by the vendor including their quotation, catalogues, drawings, installation, operation and maintenance manuals, etc shall be in English language only.
- 1.2.5 Vendor shall also quote for the following:

- a) Two years' operational spares for each desuperheater/PRDS/control valves and its accessories, which shall include plug, nozzle, seat, stem, cage packing, gaskets, actuator diaphragm, positioner, air filter regulator etc. as a minimum.
- b) One extra set of packing along with each desuperheater, PRDS, pressure-reducing valve and temperature control valve, as applicable.
- c) Any special tools needed for maintenance work. In case no special tools are necessary for the offered desuperheater/PRDS or their accessories, vendor must certify the same in their offer.

1.3 Drawings and Data

1.3.1 Detailed drawings, data and catalogues required from the vendor are indicated by the purchaser in vendor data requirement sheets. The required number of reproducible, prints and soft copies should be dispatched to the address mentioned, adhering to the time limits indicated.

1.3.2 Final documentation consisting of design data, installation manual, operational and maintenance manual etc. shall be submitted by the vendor after placement of purchase order. Vendor shall include the following, as a minimum:

- a) Specification sheet for each desuperheater, PRDS, related control valves and their accessories, as applicable.
- b) Certified drawing sheets for each desuperheater, PRDS, related control valves and their accessories, tag number wise, as applicable, which shall provide the following information:
 - i) Overall dimensions in millimetres.
 - ii) Clearance space required for maintenance work in millimetres.
 - iii) Material of construction
 - iv) Weight of complete assembly.
- c) Sizing sheet for each desuperheater/PRDS/control valve and actuator.
- d) Copy of type test certificate, as applicable.
- e) Copy of test certificates for all the tests indicated in clause 4.0 of this specification.
- f) Installation procedure for desuperheater/PRDS/Control valves.
- g) Calibration and maintenance procedure for desuperheater/PRDS/control valves including replacement of parts, as applicable.

2.0 DESIGN AND CONSTRUCTION

2.1 General

2.1.1 Vendor shall offer type of desuperheater/PRDS as per the type specified in the purchaser's data sheet ensuring that the selected desuperheater meets the process requirements specified in the data sheet, particularly the pressure and temperature characteristics of the process fluid at the outlet of the desuperheater. In case, vendor offers desuperheater of a type other than that specified, they must indicate the specific technical reason along with their offer.

- 2.1.2 The coolant injection nozzle of desuperheater/PRDS shall be solely responsible for coolant atomisation and shall ensure uniform atomisation of the coolant fluid without requiring separate atomising fluid. The orientation of the injection nozzles shall be such that the coolant is injected in the process fluid in the direction of process flow resulting in rapid and total evaporation of coolant.
- 2.1.3 Liner
- a) Vendor must review the design of desuperheater/PRDS with respect to the specified process conditions and recommend liner if necessary, to improve the system turndown i.e. to increase the steam velocity at the point of water injection.
 - b) Vendor shall review and provide thermal liner, if necessary, for the protection of steam line, particularly where the difference between the coolant temperature and process fluid temperature exceeds 250°C and/or where pipe thickness exceeds 12 mm.
 - c) The diameter, length, material and design of the liner shall be decided by the vendor. The liner material as selected shall be suitable for the process conditions specified in the purchaser's data sheets.
- 2.1.4 The flow direction of the process fluid shall be clearly marked preferably stamped or cast on the desuperheater/ PRDS/control valve body. In case where direction is stamped on the body, vendor must ensure that stamped portion is unambiguously clear and visible
- 2.1.5 The desuperheater, PRDS, pressure reducing valve and coolant valve body rating shall be equal to or better than the flange rating specified in the data sheet.
- 2.1.6 Material of construction
- a) The material of construction of body and trim of desuperheater, PRDS and control valves shall be as specified in the purchaser's data sheet.
The term trim covers those parts of desuperheater, PRDS and control valve assembly, excluding the body, which are exposed to and are in contact with the line fluid consisting of but not limited to the seat ring, plug, stem, atomising nozzles, coolant sleeve, plug guide, guide bush and cage.
 - b) For the internals where no material of construction is explicitly indicated in the purchaser's data sheet, vendor shall select the material based on their standard design but ensuring suitability of the material for the specified process conditions.
 - c) Whenever purchaser's data sheet specify trim material as hardened SS, vendor may select alternate material as 440C/17-4 PH SS/Nitrided SS/SS stellited/solid stellite provided the selected material is compatible with the specified process conditions.
 - d) Vendor shall ensure that selected material, surface finish, hardness and clearances for the parts, which slide against each other, shall avoid galling effect.
In addition, valve stem surface finish shall be selected considering type of packing used.

2.1.7 End Connection

- a) Unless otherwise specified, the end connections shall be as follows:
- i) Threaded end connection shall be as per ANSI B 1.20.1.
 - ii) Flanged end connection shall be as per ANSI B16.5.
 - iii) Grooves of ring-type joint flanges shall be octagonal as per ANSI B16.20.
 - iv) Flanged face finish shall be as per clauses 6.4.4.1, 6.4.4.2, and 6.4.4.3 of ANSI B 16.5. The face finish as specified in the data sheets shall be as follows: -

125 AARH : 125 to 250 AARH

63 AARH : 32 to 63 AARH

2.1.8 Vendor shall supply two (2) numbers of strainers for installation in coolant line. Unless specified otherwise, these strainers shall be installed in 1:1 (one main and one stand by) configuration by purchaser in coolant line.

2.2 Desuperheaters

2.2.1 Atomising Nozzle Type Desuperheater

2.2.1.1 Atomising nozzle type of desuperheater shall have insertion type of design and shall consist of a coolant injection assembly with nozzle/nozzles inserted perpendicular to the process line. The length of insertion shall be such that the uniform vaporisation of coolant shall take place throughout the cross section of the desuperheater internally avoiding impingement of cooling media on pipe walls.

2.2.1.2 The desuperheater shall be either single nozzle or multinozzle type as per the vendor standard design. However vendor shall ensure that design of the offered type of desuperheater shall avoid problems related to larger coolant droplet size and poor atomisation.

2.2.1.3 In case of multi nozzle desuperheater design, the number of nozzles required in the atomiser shall be decided based on the process requirements specified in purchaser's data sheets.

2.2.1.4 The desuperheater shall have an integral control valve, which shall regulate amount of coolant in to the desuperheater. This valve along with a temperature transmitter and temperature controller shall form part of the temperature control loop, which shall be able to control the temperature within 6 to 8°C of the saturation temperture. Unless otherwise specified, temperature element/transmitter and temperature controller are beyond the vendor's scope of supply.

2.2.1.5 Whenever specified or necessitated by the desuperheater design, a separate temperature control valve shall be used. Special trim like multipath/multistage trim shall be selected when necessary for coolant control valve to avoid effect of cavitation.

2.2.1.6 The inherent characteristics of the integral coolant control valve shall be equal percentage/modified linear unless otherwise specified in purchaser's data sheets.

- 2.2.1.7 Integral coolant control valve shall have leakage class V as per ANSI/FCI 70.2, as a minimum.
- 2.2.1.8 Whenever specified in purchaser data sheet or where fluid flow velocity is constantly low, a separate nozzle shall be provided for atomization of injected coolant. End connection size shall be decided by vendor based on the requirement of atomization fluid.
- 2.2.1.9 End Connection
- a) Unless specified otherwise in purchaser's data sheet, the desuperheater shall be supplied with following end connections;

Body connection	-	3" Flanged
Coolant connection	-	1" Flanged
 - b) The rating and facing of end connection flanges shall be as specified in purchaser's data sheet.
- 2.2.1.10 Material of Construction
- Unless specified otherwise in purchaser's data sheet, the material of construction of desuperheater Trim/Internals shall be as follows:
- | | | |
|-------------------------|---|-------------|
| Seat | - | Stellite |
| Plug | - | Nitrided SS |
| Desuperheater Nozzles | - | Stellite |
| Desuperheater Internals | - | SS316 |
- 2.2.2 Venturi Type Desuperheater
- 2.2.2.1 Venturi type of desuperheater shall be a line-mounted desuperheater wherein coolant is preheated in the circulating chamber around the water diffuser tube and is introduced in many small jets to achieve atomisation. Such a desuperheater shall be capable of installation in horizontal as well as in vertical line.
- 2.2.2.2 This type of desuperheater shall require a separate temperature control valve, which along with temperature controller shall form part of temperature control loop. This desuperheater shall be able to control the outlet temperature within 5°C to 6°C of the saturation temperature of the line fluid. Unless specified otherwise, temperature element/transmitter and temperature controller are beyond the vendor's scope of supply.
- 2.2.2.3 End connection
- a) Venturi type desuperheater shall generally be offered with wafer type of design suitable for mounting in between line flanges. Long stud-bolts and set of gaskets required for the installation of desuperheater shall be supplied by the vendor as per Annexure-1 and Annexure-2. However the line reducers/expanders if required shall not be in vendor scope of supply.
 - b) Unless otherwise specified in purchaser's data sheets, the end connections for the coolant shall be 1" flanged.

2.2.2.4 Material of Construction

Unless otherwise specified in purchaser's data sheet, the material of nozzles shall be stellite. When hardened SS is specified as nozzle material in the purchaser's data sheet the material of construction shall be as per clause 2.1.6 (C) of this specification.

2.2.3 Lifting plug Type Desuperheater

2.2.3.1 Lifting plug type of desuperheater shall be in-line mounted desuperheater, which shall desuperheat the process fluid flowing through it by the coolant, which is injected into the low pressure area created by a lifting plug in the direction of flow over the seat area. The design shall ensure that the injection of the coolant into a low-pressure area and the subsequent turbulence in the process stream shall result in complete atomisation and vaporisation of the coolant by the superheated line fluid, which shall subsequently desuperheat.

2.2.3.2 This desuperheater shall require a separate control valve, which along with temperature controller shall form part of temperature control loop. This desuperheater shall be capable of controlling outlet temperature within 5°C to 6°C of the saturation temperature of the line fluid.

2.2.3.3 Vendor to ensure that the maximum pressure drop across the desuperheater shall be less than allowable pressure drop indicated in data sheets.

2.2.3.4 The desuperheater body shall be flanged and shall be mounted in the line always in vertical position.

2.2.3.5 Unless specified otherwise, the material of construction of plug shall be SS316 while plug seating and seat shall be SS 316 stellited.

2.3 Pressure Reduction And Desuperheating Station (PRDS)

2.3.1 Whenever specified, PRDS shall have pressure reduction along with the desuperheating of process fluid as a complete assembly. Type of PRDS (as per clause 2.3.2 and 2.3.3 of this specification) shall be offered as per purchaser's data sheet.

2.3.2 Combined pressure reduction and desuperheating unit (CPRDS)

2.3.2.1 Combined pressure reduction and desuperheating unit shall reduce pressure and temperature of the process fluid simultaneously in one common unit. The design shall ensure that desuperheating is achieved by injecting coolant in the centre of the line flow i.e. in an area of high velocity, minimum pressure and very high turbulence through a coolant sleeve and atomising injection nozzles thus contributing to very efficient mixing and very high evaporation of the coolant. The pressure reduction shall be achieved by multipath/multistage trim assembly design.

2.3.2.2 Diffuser plates shall be provided at the outlet of PRDS to limit the noise level below the specified limits. The stud-bolts, nuts and gasket material shall be as per Annexure-1 and Annexure-2 enclosed. Design shall ensure that the performance of PRDS is insensitive to the negative effect of coolant evaporation because of presence of diffuser.

- 2.3.2.3 The rangeability of PRDS shall be atleast 50 to 1 even when diffuser plates or silencer is provided to reduce the noise level.
- 2.3.2.4 Unless otherwise specified, the PRDS shall have leakage class IV as per ANSI/FCI 70.2.
- 2.3.2.5 Inherent flow characterisation of PRDS shall be modified linear, in general.
- 2.3.2.6 The unit shall be capable of controlling temperature within 6° C of saturation temperature of process fluid. A separate control valve shall form part of temperature control loop consisting of temperature transmitter and temperature controller. Unless otherwise specified, temperature element/transmitter and temperature controller shall be beyond vendor's scope of supply.
- 2.3.2.7 The pressure control shall be achieved by a downstream pressure sensor/transmitter and pressure controller, which regulates the pressure regulator of PRDS through its integral actuator. Unless specified otherwise, pressure transmitter and pressure controller shall be beyond vendor's scope of supply.
- 2.3.2.8 Material of Construction
- a) The body and trim design and material of construction shall be such that the unit is capable of withstanding excessive stresses produced due to pressure reduction and thermal quenching because of coolant.
 - b) Unless otherwise specified in the purchaser's data sheets, the material of construction for various components of PRDS shall be as follows meeting process requirement specified in the data sheet:

Seat	SS Stellite/ SS Nitrided /Solid Stellite
Plug	SS Stellite/Solid Stellite/SS 440C* (*-SS 440C may be selected for steam service only)
Cage	SS Nitrided/17.4 PHSS
 - c) The plug and seat assembly shall be of sufficient hardness to avoid any wear and tear of these components.
- 2.3.2.9 End Connection
- a) PRDS shall have flanged end connections and shall be installed directly in the line.
 - b) Unless otherwise specified, coolant connection shall be 1" flanged.
- 2.3.3. Separate Pressure Reduction and Desuperheating unit (SPRDS)
- 2.3.3.1 PRDS with separate pressure reduction and desuperheater assembly construction shall be offered when specifically indicated in the purchaser's data sheets. Such a unit shall be supplied as a complete assembly along with line reducers/expanders and interconnecting piping. In case vendor recommends pipe section between pressure reducing valve and desuperheater of material, same or different than that is indicated in purchaser's specifications, the same shall also be supplied by the vendor.
- 2.3.3.2 Complete assembly shall be supplied with flanged end connection including control valve and desuperheater, which shall also have flanged end connections. The type and rating of

flanged ends shall be as specified in purchaser's data sheets. The stud-bolts, nuts and gasket materials shall be as per Annexure-1 and Annexure-2 enclosed.

- 2.3.3.3 In the pressure reducing and desuperheating assembly dedicated pressure reduction control valve shall be located upstream of desuperheater and shall form part of pressure control loop. Unless specified otherwise, pressure transmitter and pressure controller shall be beyond the vendor's scope of supply.
- 2.3.3.4 PRDS assembly shall be sized as per the process conditions specified in the purchaser's data sheet. However the pressure drop indicated in purchaser's data sheet may be readjusted across desuperheater and control valve keeping battery limit/pressure drop unchanged. Desuperheater end connection rating if required to be upgraded because of pressure drop readjustment shall be taken care of by vendor. This change in rating shall be clearly brought out by vendor in their offer.
- 2.3.3.5 The pressure reducing control valve trim design shall be special low noise type. Control valve with external diffuser may be offered along with the special trim when special trim alone is not sufficient to reduce the noise level below the specified limits and the pressure drop across the diffuser does not affect the pressure control loop sensitivity/controllability.
- 2.3.3.6 All other desuperheater requirements shall be similar to the type of desuperheater selected alongside the pressure-reducing valve.

2.4 Sizing criteria

- 2.4.1 The sizing of the desuperheater/PRDS shall be carried out as per the process conditions specified in the purchaser's data sheets.
- 2.4.2 Vendor shall consider the following points while sizing the desuperheater, unless specifically indicated otherwise in purchasers data sheets:
- Coolant flow shall be calculated for the worst conditions specified i.e. high coolant temperature for maximum process flow and low coolant temperature for minimum process flow condition, similarly high inlet coolant pressure for minimum coolant flow and low coolant pressure for maximum coolant flow.
 - Highest and lowest available pressure difference between steam pressure and coolant pressure for minimum flow and maximum flow respectively.
 - Required turndown ratios i.e. coolant turndown ratios i.e. minimum coolant flow to maximum coolant flow (nozzle turndown) and turndown ratio of the fluid to be desuperheated (System turndown).
 - Required coolant flow to fluid to be desuperheated flow.
- 2.4.3 The pressure reducing control valve shall be sized and selected considering operating i.e. minimum, normal and maximum pressure reduction and the process temperature. Readjusted pressure drop as per clause 2.3.3.4 of this specification may also be considered, if applicable, for sizing.

- 2.4.4 The flow coefficient (Cv) of the desuperheater shall be selected such that preferably it operates between 20% to 80% of the lift under minimum and maximum conditions. However, the desuperheater with lift less than 10% and/or higher than 90% shall not be selected even under worst operating conditions.
- 2.4.5 Vendor must ensure that minimum fluid velocity shall not fall below the allowable minimum velocity of the selected desuperheater. If such a condition exists, vendor shall propose a reduction in the pipe diameter or a liner to keep velocity within limits considering allowable pressure drop specified in the purchaser's data sheet.

2.5 Actuator

- 2.5.1 The actuator of the desuperheater and control valves shall be sized for the shutoff differential pressure indicated in the data sheet.
- 2.5.2 The actuator shall be pneumatically operated with its casing made up of pressed steel. The actuator operating range shall be 0.2 to 1.0 kg/cm² preferably.
- 2.5.3 In general, spring opposed diaphragm type of actuators are preferred. Only when this type of actuator becomes extremely unwieldy, piston type can be considered. The actuator casing and diaphragm shall be designed for minimum twice the maximum air supply pressure. Whenever spring less type of actuator is provided, all accessories like pilot valves, booster relays, non-return valve, volume tank etc., shall be provided to achieve desired failure action.
- 2.5.4 Actuator spring shall be manufactured out of corrosion resistant steel and shall be nickel-plated. The spring shall be enclosed in the actuator casing.
- 2.5.5 Each desuperheater actuator and valve actuator shall be provided with stem position indicator with scale calibrated from 0 to 100%.
- 2.5.6 Actuator sizing
- 2.5.6.1 Vendor shall be fully responsible for sizing and selection of the actuator. While sizing the actuator, vendor shall ensure that the actuator is able to develop sufficient thrust to properly seat the desuperheater/PRDS/control valves at the minimum air supply pressure and meet the shut off conditions as specified in the purchaser's data sheet.
- 2.5.6.2 While sizing the actuator, vendor must ensure that sizing factor indicated below are complied. Higher sizing factor may be considered if found necessary by vendor.
- a) For PRDS/desuperheater/control valve with leakage class IV and below, actuator shall be sized considering actuator thrust more than 1.3 times the total force induced by shut off condition specified in the data sheet and the force required to overcome packing friction. Vendor shall utilize the factor as 1.5 in case the desuperheater/PRDS/control valve operates between 80% to 90% or 10% to 20% in any of the specified condition.
 - b) For control valves with leakage class V and above, the actuator shall be sized considering actual thrust more than 1.7 times the total force induced by specified

shut off condition in purchaser's data sheet and force required to overcome packing friction.

2.6 Bonnet and Packing

- 2.6.1 The desuperheater valve bonnet shall be flanged bolted to the body. Bonnet with threaded connections is not permitted. Extended or finned bonnet shall be provided for low temperature or high temperature applications.
- 2.6.2 Generally low friction type of packing is preferred. Wherever external lubrication is required for gland packing lubrication isolation valve shall be provided along with the lubricator. Vendor shall indicate the lubricator stick material and supply the same for one year of continuous operational use.
- 2.6.3 The desuperheater/control valve shall have its gland packing box drilled and tapped to 1/4" NPTF for connecting external lubricator. When external lubricator is not required, the gland packing box either shall not have any lubricating hole or the hole shall be plugged.
- 2.6.4 Asbestos or asbestos bearing material gaskets shall not be used.

2.7 Accessories

2.7.1 Positioners

- 2.7.1.1 Positioners shall be of force-balance type or smart digital type or field bus type as specified in the purchaser's datasheet. They shall be direct acting, with an adjustable gain unless otherwise specified.
- 2.7.1.2 The pneumatic positioner shall be provided with an integral by-pass switch whenever the operating range of the actuator is the same as that of the control signal.
- 2.7.1.3 Every positioner shall have two pressure gauges mounted on it, one each for air supply and for positioner output to actuator. In addition pneumatic positioner shall have third pressure gauge for control signal.
- 2.7.1.4 Pneumatic connections shall be 1/4" NPT (F) and cable entry shall be 1/2" NPTF to ANSI/ASME B1.20.1. If connection for cable entry is different than that specified, suitable adapters shall be provided.
- 2.7.1.5 Positioners shall be side-mounted on the control valve and shall have corrosion resistant linkages and rugged brackets, unless remote mounted positioner is offered when specified in the purchaser's datasheet.
- 2.7.1.6 All positioners shall have metallic casing and cover either of stainless steel or of anodized aluminium.
- 2.7.1.7 Smart type and field bus type positioners
- Digital smart positioners or field bus type of positioners with diagnostic capabilities shall be supplied whenever specified in the purchaser's data sheets. These shall meet the following minimum requirements:

- a) The positioner sensor and sensing mechanism shall be rugged and shall not be affected by the line/valve vibration. The performance of the positioners shall be immune to above vibration.
- b) The positioner's output and input range shall be field adjustable without any hardware modification. The output from the positioners shall be available for both single acting as well as double acting actuator.
- c) Each positioner shall be operable, configurable and accessible through HART compatible hand held configurator/field bus configurator as applicable. Smart positioners shall also have a dedicated operating panel for the above functions
- d) Unless otherwise specified, vendor shall offer smart positioner for all desuperheaters, PRDS and control valves.
- e) The positioner shall be a two-wire device, which shall operate on two-way digital communication mode. All engineering, configuration, diagnostic and maintenance related data shall be provided by the positioner.
- f) When specified, field bus type positioners shall be capable of carrying out control algorithm such as PID etc.
- g) The smart positioner shall provide HART protocol of latest version and shall be capable of implementing commands from HART maintenance system / hand-held HART configurator.
- h) Positioners with field bus shall meet the following requirements:
 - i) All positioners must satisfy the requirements of the field bus registration laboratory with applicable checkmark like foundation field bus, profibus PA, or as specified in the purchaser's data sheets.
 - ii) All positioners shall have two analog input blocks, as a minimum. In addition, when specified the transmitter shall also have PID controller block.
 - iii) All positioners must be interoperable and shall have valid interoperability test clearance like ITK 4.6 for foundation field bus or equivalent for profibus PA, as applicable.
 - iv) The field bus positioners shall support peer-to-peer communication.
 - v) Field bus positioners as offered shall not be polarity sensitive.
 - vi) The field bus positioners in hazardous area shall be certified as per entity concept or shall be FISCO approved as per the requirements specified in the purchaser's specification.
- i) The positioners shall be suitable to operate with commercially available asset management softwares and shall support the following features, as a minimum:

- i) It shall allow multimaster for configuration, calibration, diagnosis and maintenance. The primary could be a host computer and secondary could be a hand held communicator.
 - ii) It shall be capable of implementing universal commands. It shall be possible to communicate all commands of commercially available asset management system to/ from smart positioner.
 - j) The offered positioners shall meet the following performance characteristics: -
 - i) Overall control accuracy shall be better than $\pm 0.5\%$ of span.
 - ii) Repeatability shall be less than $\pm 0.25\%$ of span.
 - iii) Hysteresis shall be less than $\pm 0.5\%$ of span.
 - iv) Vendor shall supply the valve's operating signatures in the form of hard copy and magnetic disc for each control valve supplied with smart positioners. The necessary software for advanced control valve diagnostics like seat ring condition, gland packing condition, actuator leakage etc. shall also be included.
- 2.7.2 Electro-Pneumatic Converter**
- 2.7.2.1** Electro-pneumatic converter shall be of electronic feedback type unless specified otherwise and shall be yoke mounted.
- 2.7.2.2** It shall have an integral terminal housing. Electro pneumatic converter with flying leads shall not be acceptable.
- 2.7.2.3** Unless otherwise mentioned, it shall be intrinsically safe.
- 2.7.2.4** Pneumatic connections shall be 1/4" NPT (F) to ANSI B 2.1. The electrical connections shall be 1/2" NPT (F). If they are different, suitable adapters shall be provided.
- 2.7.2.5** The overall accuracy of the electro-pneumatic converter shall be better than $\pm 0.3\%$.
- 2.7.3 Air Filter Regulator**
- 2.7.3.1** Vendor shall supply air filter regulator with each positioner complete with an integral output gauge.
- 2.7.3.2** Air filter regulator shall be sized considering the air supply pressure and flow required to meet requirements specified in the purchaser's data sheets.
- 2.7.3.3** Filter material shall be sintered bronze. Filter size shall be maximum 5 microns. However, lower filter mesh size shall be considered to suit the electro pneumatic converter vendor's requirement.
- 2.7.4. Line Strainers**
- 2.7.4.1** Vendor shall supply two line strainer per desuperheater/PRDS. The mesh size of the strainer shall be decided by the vendor as per desuperheater nozzle and coolant control valve trim size, as applicable.

2.7.4.2 The material of construction of the strainer shall be as follows;

Mesh Material - SS316

Body Material - Same as Control Valve body material or desuperheater body material specified in the data sheet.

2.7.4.3 The body size of the strainer shall be of the same size as coolant line size. Unless specified otherwise it shall be 1".

2.7.4.4 The end connection of the strainer shall be flanged only with rating as per the coolant end connection specified in the data sheet.

2.7.4.5 The strainers shall include provisions for maintenance of elements and shall be supplied with block and bypass arrangement, when specified.

2.7.5 Hand held configurator for Smart Instruments

Hand Held configurator shall be universal type and shall be able to communicate with all make and models of smart instruments with HART output like transmitters, smart positioners etc., and shall be capable of carrying out all engineering like calibration, configuration and diagnostics. The hand held configurator shall be certified intrinsically safe when used in hazardous area. Carrying case shall be supplied with each configurator.

2.7.6 Battery charger

Hand Held configurator (HHC) for smart positioners shall be supplied with battery charger for battery charging of HHC. Unless otherwise specified, the battery charger shall operate at 220V 50Hz supply.

2.8 Painting

2.8.1 The external surface of the desuperheater/PRDS being supplied shall first be thoroughly cleaned by sand blasting or other suitable means, before painting.

2.8.2 Carbon steel external surfaces other than flange faces shall be given one coat of red oxide zinc chromate primer of single pack. The composition shall be of modified phenolic alkyd pigmented with red oxide and zinc chromate.

2.8.3 The body shall be painted as follows:

Carbon steel: Light grey

Alloy steel: Canary yellow

Stainless steel: Natural

Actuator shall be painted as follows:

Direct action: Green

Reverse action: Red

3.0 NAMEPLATE

3.1 Each desuperheater and PRDS shall have a stainless steel nameplate attached firmly to it at a visible place furnishing the following information:

a) Tag No. as per purchaser's data sheet

b) Body size in inches and ANSI Rating

- c) Designed inlet/outlet conditions of desuperheater
- d) Designed inlet/outlet conditions of coolant
- e) Stem travel in mm
- f) Action on air failure
- g) Spring Range
- h) Air supply pressure
- i) Manufacturer's model no. for desuperheater, actuator and positioner.

4.0 INSPECTION AND TESTING

4.1 Unless otherwise specified, purchaser reserves the right to test and inspect all the items at the vendor works.

4.2 Vendor shall submit the following test certificates and test reports for the purchaser's review:

- a) Material test certificate as per EN10204 Clause 3.1B for desuperheater/PRDS body and as per clause 2.2 for trim i.e. nozzle, stem, seat etc.
- b) Certificate of radiography/X-ray for desuperheater/PRDS castings and welded joints. The radiography shall be carried out as per procedure spelt out in ANSI B 16.34 and acceptance shall be as per ANSI B 16.34 Annexure-B, as applicable.
- c) Pneumatic test certificate for all pneumatic actuators at pressure not less than one and half (1.5) times the actuator working pressure.
- d) Dimensional and workmanship checking.
- e) Hydrostatic test reports for all desuperheaters/PRDS as per clause 4.3 of this specification.
- f) Functional Tests consisting of lift characteristics and Seat leakage test of desuperheater/PRDS and control valve as per clause 4.4 of this specification.
- g) IBR certificate in form III C.
- h) Certificate from statutory body for intrinsically safe/explosion proof for smart positioners and electro-pneumatic converters and type test certificate for weatherproof for these items.

4.3 Hydrostatic Test

Each desuperheater/PRDS/control valve shall be subject to hydrostatic test pressure equal to 1.5 times the maximum working pressure at ambient temperature in accordance with ANSI B 16.34. All items covered under IBR shall be tested as per IBR regulations. There shall not be any visible leakage during this testing.

4.4 Functional Tests

4.4.1 Seat Leakage Test

The procedure and acceptance of seat leakage test shall meet the requirements given in ANSI/FCI 70-2 for the specified seat leakage class.

4.4.2 Lift Characteristics

4.4.2.1 The test shall be carried out at no load condition for the verification of linearity, hysteresis and stem travel.

4.4.2.2 The combined effect of linearity and hysteresis shall be better than the following;

- a) $\pm 1.0\%$ of rated lift with smart positioner or field bus positioner
- b) $\pm 1.5\%$ of rated lift with pneumatic positioner
- c) $\pm 5.0\%$ without positioner.

4.4.3 Tests on smart positioners

4.4.3.1 Following tests shall be carried out on smart and field bus based positioners:

- a) Configuration verification as per purchaser's specifications.
- b) Performance characteristics verification meeting requirements specified in clause 2.7.1.7 (j) of this specifications.
- c) Valve and positioner diagnostics using valve positioner diagnostic software.
- d) Valve failure position in case of positioner failure. Positioner failure shall be simulated considering air failure, signal failure etc.

4.4.4 Control valve dynamic testing and response time verification shall be carried out as per ISA S75.25, whenever specified in the material requisition.

4.5 Witness Inspection

4.5.1 Vendor shall offer all the desuperheaters/PRDS and valves for pre-despatch inspection and the following tests/ checks shall be carried out as a minimum:

- a) Physical dimensional verification and workmanship
- b) Hydrostatic test, functional test and pneumatic test on representative sample of each type of desuperheater/PRDS as per clause 4.3, 4.4 and 4.2 (c) of this specification.
- c) Review of all certificates and test reports as indicated at 4.2 above.

4.5.2 In the event when the witness inspection is not carried out by purchaser, the tests shall anyway be completed by the vendor and documents for the same shall be submitted to purchaser for scrutiny.

5.0 SHIPPING

5.1 The desuperheater/PRDS shall be supplied to site by the vendor in fully assembled and pre-tubed condition. However, in case some components are liable to be damaged during transit, the same shall be dismantled and supplied separately.

5.2 All parts shall be thoroughly cleaned of loose scale, dirt and other foreign material before packing.

5.3 All flange faces shall be suitably protected to avoid damage to the gasket faces and prevent entry of foreign materials

5.4 All tapped openings shall be plugged.

- 5.5 Each item shall be suitably wrapped in polythene sheets, packed in wooden crates, properly tagged and secured before despatch.
- 6.0 REJECTION**
- 6.1 Vendor shall prepare their offer strictly as per clause 1.2 of this specification and shall attach only those documents, which are specifically indicated in the material requisition.
- 6.2 Any offer not conforming to the above requirements shall be summarily rejected.

along with drum pressure gauge at the same location.

4.1.9 Loop Powered Indicators

For applications requiring indication at field but remote from the transmitter, at both local/ local panel as well as at the Control Room, the bidder shall use intrinsically safe loop powered indicators in series with the field transmitter and the Control Room receiver instruments. Type of the loop powered indicators shall be MTL Series 600 or equivalent, for local panel mounting (for the Units which are classified as hazardous). For safe area instrumentation, weatherproof (IP-65) indicator shall be provided. However, wiring shall be same as indicated above.

4.1.10 Pressure Reducing And Desuperheater Station

Desuperheater specification shall be as per standard specification for De-superheater and PRDS document no. 6-52-0038, the requirements specified in A011-6-52-0053 and other specifications as specified elsewhere in this package. Wherever pressure reduction is also required along with Desuperheater, a combined PRDS (Pressure Reducing and Desuperheating Station) shall be preferred. However PRDS design with separate pressure reduction valve shall also be acceptable provided the valve is specially designed for high differential pressure, high temperature and high pressure steam application. In case combined PRDS design is selected Bidder must ensure that PRDS body has been designed considering stresses generated because of steam quenching. This should also be ensured in case of Desuperheater design. Desuperheater design should ensure that the temperature at the outlet shall be maintained with $\pm 5^{\circ}\text{C}$ of the desired outlet temperature, unless otherwise specified by the process licensor.

Separate liquid injection valve and steam valves, if provided, must be installed along with block and bypass valve.

The body and trim material of construction shall be suitable for the service. In general trim including spray nozzles shall be stellited.

The PRDS/ DS in steam application shall be IBR certified including valve in Boiler Feed Water line.

Handwheel or isolation & bypass arrangements shall also be provided.

5.0 INSTRUMENTATION AND CONTROL

Instrumentation and control for CPP includes complete instrumentation and control required for successful operation of this captive power plant.

All monitoring, control, alarm annunciation, interlocking and sequencing shall be carried out from the DCS in the CPP control Room and field operation shall be kept to the minimum. The DCS shall utilize state of the art fieldbus instrumentation for open loops. For Sub-package items, the complete control and monitoring shall be from DCS only as far as possible and field monitoring shall be kept to a minimum. The sub-packages shall have local control panels for start-up as well as monitoring of critical/ necessary parameters. In general, for Local Panels in hazardous area, all items shall be IS for lamps, panel instruments, junction boxes, cable glands, push buttons etc. Pressurisation

information to DCS shall be communicated through serial link/ gateway.

For steam / BFW application, body metallurgy of control valves shall be WCC or better in place of WCB and trim to be stellited. In cases where process pipes are of alloy steel, control valves body & trim material shall be considered accordingly.

4.1.5 Smart Positioner

Smart positioners shall be used for the control valves and desuperheater control valves. The smart positioners shall be provided with necessary hardware/ software for maintenance, diagnostics, programming etc. One license shall be provided for each Make/ Model number of positioner and this shall be configured in the host system by the bidder. While selecting the make and model no. of the smart positioner, Bidder must ensure the provenness of smart positioner in combination with control valves meeting PTR requirements specified in clause 12.1.

The smart positioner shall be a two wire device which shall also operate on two way digital communication in HART protocol format. All engineering, configuration, diagnostic and maintenance related data shall be provided by the positioner.

The smart positioner shall provide HART protocol of latest version and shall have capability to operate with HART maintenance system (HMS) with software like Cornerstone, AMS of Fisher Rosemount or equivalent meeting all the specifications with following features as a minimum:

- i) It shall allow multi-master for configuration, calibration, diagnosis and maintenance. The primary could be host computer like HMS and secondary could be hand held communicator.
- ii) It shall be capable of implementing universal commands. It shall have capability to communicate all commands of HART maintenance system to/ from smart positioner.
- iii) Overall accuracy shall be $\pm 0.5\%$ of span (positioner mode).

Overall accuracy means combined effect of linearity, hysteresis, repeatability etc.

All the requirements of Hand Held Communicator (or Field Communicator) indicated in para 4.1.2 are also applicable for smart positioner.

Two nos. of Hand Held terminals shall be provided for smart positioners of each make in addition to those provided along with smart transmitters. These handheld communicators shall be intrinsically safe if used in hazardous area, certified suitable for use in the field which is classified as hazardous area. Universal type Calibrator is preferred.

In addition to operational and maintenance data provided by the positioner like Actual stem position, instrument input signal, pneumatic pressure to the actuator etc., the positioner shall also provide the cycle counting and store accumulation data to help keep control valve stem leakage in control. The positioner shall also have built-in manual stroke button for stroke open or close the valve for quick verification.

Bidder shall supply the "valve's operating signatures" in the form of hard copy and also CD along with each control valve which are supplied with smart positioner.

Necessary hardware and software for diagnosing parameters like seat ring condition etc shall be provided.

Positioner enclosure shall be metallic only.

3.2 INSTRUMENTATION DESIGN PHILOSOPHY

The type of instruments shall be as per the requirements of process schemes, Engineering Design Basis, Design selection criteria for instruments and the process requirements and various specifications, standards enclosed with this bid specification. Bidder to provide separate initiating devices for interlock and indication/ control even if the same has not been specifically indicated in the P&IDs and other documents. Loops for indication/ control and interlock/shutdown shall be completely independent of each other including the field sensor / transmitter. Separate dedicated transmitters to be used for DCS & PLC application. Same transmitters should not be shared for DCS & PLC

3.2.1 Indian Boiler Regulation (IBR) Requirements

3.2.1.1 Pressure relief valves (boiler drums, desuperheaters and steam lines before pressure reducing station) shall be designed and supplied as per ASME Section I or Indian Boiler Regulation (IBR) latest revision in line with pressure vessel design code. However any item in IBR service shall be certified by IBR.

- a) In case of safety valves in IBR service, the type of valve shall be as per regulation no. 292 with 5% over pressure and 5% blow-down and shall be provided with following certificates:
 - i) IBR Form-III C certificate of manufacture and test of boiler mountings and fittings.
 - ii) IBR form III construction certificate of manufacture and test for item 11.
 - iii) Type test certificate from IBR authority as per appendix-L of IBR for the valve series supplied.
 - iv) Radiography of all castings as applicable.
- b) In case, ASME Section I valves are supplied, it shall be 'V' stamped and should have the certificate from ASME certified laboratory.
- c) The discharge capacity of these safety valves shall be calculated as per IBR regulation no. 293 a, b & c.
- d) Equipment nozzle length and sizes (i.e. diameter) shall meet the corresponding code in ASME Section- I / IBR Requirements.

3.2.1.2 Safety valves in steam service (utility steam network after main pressure reducing station) shall be as per ASME Section VIII as a minimum with 10% over pressure and 7% blow down. These valves shall be provided with IBR form-III C certificate. Bidder may follow IBR regulation if these are under IBR purview over riding above mentioned requirements.

3.2.1.3 All on line instruments such as control valves, Thermowells, flow meters/ orifice flanges and level instruments like level gauges, level transmitters etc. shall be provided with IBR Form-III C certificate.

IOCL PARADIP CAPTIVE POWER PLANT

VOL. - III

TECHNICAL SPECIFICATION FOR DESUPERHEATING STATION ALONGWITH ACCESSORIES

SPECIFICATION NO: PE - TS - 353 -142 -N101



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI, INDIA**

IOCL PARADIP CAPTIVE POWER PLANT

VOL. - III

TECHNICAL SPECIFICATION FOR DESUPERHEATING STATION ALONGWITH ACCESSORIES

SPECIFICATION NO: PE - TS - 353 -142 -N101



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI, INDIA**



TITLE

PREAMBLESPECIFICATION NO **PE-SS-999-100-Q-001**VOLUME **III**SECTION **PREAMBLE**REV NO. **0** | DATESHEET **1 OF 1****1.0 Volume III:**

This Volume is subdivided into following sections:

Part A: This section outlines the “**Details to be submitted with the Bid**” and comprises of:

- Compliance certificate
- Technical Deviation schedule

Part B: This section outlines the “**Schedules ,Drgs/Documents and Data sheets to be filled by the successful Bidder after the award of Contract**” and comprises of :

- Data sheets -B
B1-Desuperheater
Technical schedules
- Price schedules



TITLE

**DESUPERHEATING STATION
FOR
IOCL PARADIP CPP**

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**

SECTION Part -A

REV NO. **0** DATE

SHEET 1 OF 1

DETAILS TO BE SUBMITTED ALONGWITH THE BID

- COMPLIANCE SCHEDULE
- TECHNICAL DEVIATION SCHEDULE



TITLE :

COMPLIANCE CERTIFICATE**DESUPERHEATERS FOR
IOCL PARADIP CPP**

SPEC. PE-TS-353-142-N101

VOLUME III PART A

Date :

Sheet 1 of 1

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
- b) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.

QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.

- c) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/ Customer approval.
- d) There are no other deviation with respect to specification other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied ,taken elsewhere in the offer stand withdrawn unless specifically brought out in the ' Schedule of deviations'.
- e) Noise level etc shall be subject to approval in the event of order .

In the event of order, if any change in the selection of type of desuperheater without major change in the process parameters, is required, the same shall be carried out without any cost to BHEL.

- f) All materials shall be as per respective Data sheet A of the specification or superior to those specified. Also, for the components where material is not specified it shall be suitable for the intended duty .In case different combination of trim material is offered for approval / acceptance, justification with regard to comparison of properties shall be given as a documentary evidence and same shall be subject to Purchaser's approval in the event of order.
- g) All subvendors shall be as per BHEL/Customer approved list .
- h) Prices for recommended spares (if any) for 3 years operation shall be furnished separately & not included in the base price.
- i) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
- j) Any special tools & tackles, if required, shall be in bidder's scope.
- k) All models and sizes of desuperheaters offered have been supplied by the bidder in the past & are successfully operating with the stipulated parameters in two separate stations for at least two years.
- l) Bidder shall be responsible for inspection & testing of applicable desuperheaters by an authorised agency for issue of IBR Form III C certificate. All necessary approvals regarding design , manufacturing & erection for getting such certification shall be arranged by the bidder.

We the undersigned hereby undertake to meet the compliance requirements as listed above on the conditions as elsewhere specified.

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101


VOLUME **III**

SECTION **PART-B**

REV NO. **0** DATE

SHEET 1 OF 1

**DATA SHEET-B
AND
DRAWINGS/DOCUMENTS & SCHEDULES
(TO BE FURNISHED BY THE VENDOR AFTER THE AWARD OF
CONTRACT)**

	TITLE Desuperheater Specification For IOCL Paradip CPP	SPECIFICATION NO PE-TS-353-142-N101	
		VOLUME	III
		SECTION	PART-B
		REV NO.	0 DATE
		SHEET	1 OF 1

DETAILS TO BE SUBMITTED BY THE SUCCESSFUL BIDDER AFTER THE AWARD OF CONTRACT

1.0 LIST OF DRAWINGS/DOCUMENTS:

- DIMENSIONAL DRAWINGS
- INSTALLATION DRAWINGS WITH OVERALL DIMENSIONS OF THE COMPLETED EQUIPMENT AND CLEARANCES FOR OPERATION AND MAINTENANCE
- DATA SHEET –B1 FOR DESUPERHEATER .(2 SHEETS)
- SIZING CALCULATIONS FOR DESUPERHEATER.
- NOISE CALCULATIONS
- QUALITY PLAN OF VENDOR/SUBVENDOR
- LIST OF COMMISSIONING AND MANDATORY SPARES.
- FINAL/APPROVED DRAWINGS IN REQUIRED NO. OF COPIES ALONGWITH 2 NOS. OF CDs.
- OPERATION & MAINTENANCE MANUALS.
O&M MANUALS SHALL ALSO CONTAIN STORAGE AND COMMISSIONING INSTRUCTIONS.

2.0 LIST OF TEST CERTIFICATES: THE FOLLOWING TEST CERTIFICATES SHALL BE MADE AVIALABLE FOR BHEL'S REVIEW/APPROVAL

- i) IBR Certificate : Form III C
- ii) Hydrostatic test :IBR/MSS-SP-61/ANSI B16.34
- iii) Seat Leakage Test :ANSI B 16.104
- iv) Magnetic Particle Test: ANSI B 16.34 Special class
- v) Radiography Test: ANSI B 16.34 Special class
- vi) Accessories Functional Test



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**

SECTION **PART-B**

REV NO. **0** DATE

SHEET **1** OF **1**

DATA SHEETS-B

DATA SHEET – B1 (Desuperheater)

(TO BE FILLED BY SUCCESSFUL VENDOR AFTER THE AWARD OF CONTRACT)



TITLE

DATA SHEET –B1
STEAM DESUPERHEATER
TO BE FILLED BY THE VENDOR AFTER
THE AWARD OF CONTRACT
IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**SECTION **PART-B**REV NO. **0** DATE

SHEET 1 OF 2


S.NO.	DESCRIPTION	UNITS	PARTICULARS
1.0	TYPE OF DESUPERHEATER		
2.0	MODEL NO.		
3.0	NUMBER OFFERED	NOS	
4.0	FLOW CAPACITY (OUTLETOF DESUPERHEATER)	T/HR	
5.0	STEAM PARAMETERS AT INLET		
5.1	PRESSURE	Kg/cm ² (a)	
5.2	TEMPERATURE	0C	
5.3	FLOW	T/HR	
6.0	STEAM PARAMETERS AT OUTLET		
6.1	PRESSURE	Kg/cm ² (a)	
6.2	TEMPERATURE	0C	
7.0	SPRAY WATER PARAMETERS		
7.1	PRESSURE	Kg/cm ² (a)	
7.2	QUANTITY	T/HR	
8.0	DESIGN PARAMETERS OF DESUPERHEATER BODY		
8.1	PRESSURE	Kg/cm ² (G)	
8.2	TEMPERATURE	0C	
9.0	DESIGN PRESSURE OF SPRAY NOZZLE	Kg/cm ² (G)	
10.0	TYPE OF SPRAY NOZZLE		
10.1	FIXED/VARIABLE AREA ORIFICE		
10.2	SINGLE HOLE/MULTI HOLE		
11.0	NUMBER OF SPRAY NOZZLE/ TURNDOWN RATIO		
12.0	SPRAY WATER NOZZLE CHARACHTERISTICS		
13.0	SIZE OF ORIFICE		

Company seal

Name

Signature

Date

	TITLE DATA SHEET –B1 STEAM DESUPERHEATER TO BE FILLED BY THE VENDOR AFTER THE AWARD OF CONTRACT IOCL Paradip CPP		SPECIFICATION NO PE-TS-353-142-N101	
			VOLUME III	
			SECTION PART-B	
			REV NO. 0	DATE
			SHEET 2 OF 2	
	S.NO.	DESCRIPTION	UNITS	PARTICULARS
	14.0	MIN.VELOCITY ACCEPTABLE IN THE DESUPERHEATER PIPE	M/SEC	
	15.0	END CONNECTIONS TYPE AND SIZE		
	15.1	DESUPERHEATER INLET/OUTLET		
	15.2	SPRAY WATER INLET		
	16.0	MATERIAL OF CONSTRUCTION		
	16.1	BODY		
	16.2	SPRAY NOZZLE		
	17.0	OVERALL DIMENSIONS	MM	
	18.0	WEIGHT OF DESUPERHEATER	KG	
	19.0	MOUNTING RECOMMENDATIONS (IF ANY)		
	20.0	DESIGN CODE		
	21.0	HYDRAULIC PRESSURE	Kg/cm ² (G)	
			Company seal	
			Name	
			Signature	
			Date	



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**

SECTION **PART-B**

REV NO. **0** DATE

SHEET **1** OF **1**

SCHEDULES

(TO BE FILLED BY SUCCESSFUL VENDOR AFTER THE AWARD OF CONTRACT)



TITLE

Desuperheater Specification**For****IOCL Paradip CPP**

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**SECTION **PART-B**REV NO. **0** DATE


SHEET 1 OF 1


LIST OF TECHNICAL SCHEDULES


<u>SL.NO.</u>	<u>FORM NO.</u>	<u>FORM DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.	PEM-6020	Checklist-List of Schedules	1
2.	PEM-6024	Schedule of Drawings / Catalogues	1
3.	PEM-6026	Schedule of Equipment, Manufacture, Dispatch & Shipment to Site	1
4.	PEM-6027	Schedule of Weights & Dimensions	1
5.	PEM-6030	Inspection Schedule	1
6.	PEM-6036	Schedule of Deviation	1
7.	PEM-6040	Schedule of Declaration	1
8.	PEM-6042-00	Instructions for filling up Quality Plan	1
9.	PEM-6042	Vendor's Drawings / Document Schedule	1
10.	PE-6046	Inspection Request	1

CHECKLIST — LIST OF SCHEDULES

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings / Catalogues submitted with Bid	✓
2.	PEM-6025@	Schedule of Occurance of Key Events of Delivery,Erection& Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture, Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions	✓
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction / Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings / Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurance of Key Events for Civil / Structural Works	
16.	PEM-6046	Inspection Request	✓
17.	PEM-6051	Schedule of Prices	✓
18.	PEM-6052@	Schedule of Unit Prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles	✓
22.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges.	✓
23.	PEM-6057	Schedule of Daily & Overtime Rates	
24.	PEM-6058	Schedule of Hire-charges for Construction / Site Fabrication Facilities	
For Forms marked with @ certain information to be filled by DEs - before issuing to bidder.			

	TITLE SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID		SPECIFICATION PE-TS-353-142-N101 NUMBER	
			VOLUME III PART - B	
			SHEET OF	
Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.				
DRAWING./ CATALOGUE NUMBER	DESCRIPTION			NUMBER OF SHEETS
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL

	TITLE SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE			SPECIFICATION NUMBER PE-TS-353-142-N101	
				VOLUME III PART - B	
				SHEET OF	
Equipment / Major Bought-out Items	Time for Manufacture/ Procurement from Date of Issue of Letter of Intent (Weeks)	Time for Test, Dismantling Packing & Ready for Despatch (Weeks)	Time required for Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of Intent to Shipment to Site (Weeks)	
We, the undersigned hereby undertake to meet the above time schedule in weeks for manufacture, despatch and shipment of each equipment and procurement of major boughtout items as listed above.					
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE		
				COMPANY SEAL	

	TITLE <div style="text-align: center;">SCHEDULE OF WEIGHTS & DIMENSIONS</div>		SPECIFICATION NUMBER PE-TS-353-142-N101			
			VOLUME III PART - B			
			SHEET OF			
The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.						
Description of Package(s)		Dimensions (in meters)		Weight (in tonnes)		
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE						
NAME	DESIGNATION				SIGNATURE	DATE
COMPANY SEAL						



INSPECTION SCHEDULE

SPECIFICATION NUMBER PE-TS-353-142-N101

P.O.
NUMBER


VOLUME - III PART-A

SHEET OF

S. No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	Scheduled Date of Inspection	Duration of Test / Inspection (in days)

This schedule shall be in line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI / PO.

PARTICULARS OF VENDOR's / AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	COMPANY SEAL

	TITLE				SPECIFICATION NUMBER	
	* SCHEDULE OF DEVIATIONS () From Conditions of Contract (Volume - I) () From General Technical Conditions (Volume - II A) () From Technical Specifications (Volume - II B)				PE-TS-353-142-N101	
					VOLUME III PART - B	
				SHEET OF		
We the undersigned hereby certify that the above mentioned are the only deviations.						
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE						COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE			



TITLE

SPECIFICATION NUMBER **PE-TS-353-142-N101**

VOLUME III PART - B

SHEET OF

*** SCHEDULE OF DECLARATION****DECLARATION**

I,.....certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our formal proposal number Dated..... and there is no deviation to the specification.

I hereby certify that I am duly authorised representative of the Bidder's company whose name appears above my signature.

Bidders Company Name


Authorised representative's
Signature

Name

Bidder's Intent The bidder hereby agrees to fully comply with the requirements and intent of this specifications for the price indicated.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	QUALITY PLAN			CUSTOMER :			PROJECT:		SPECIFICATION NUMBR PE-TS-353-142-N101			
				BIDDER/ : VENDOR			QUALITY PLAN NUMBER		SPECIFICATION TITLE :			
				SYSTEM:			ITEM :		SECTION VOLUME III			
	SHEET OF											
SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11

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PARTICULARS	BHEL	BIDDER / VENDOR	
NAME			
SIGNATURE			
DATE			
			BIDDER'S/ VENDOR'S COMPANY SEALS

INSTRUCTIONS FOR FILLING QUALITY PLAN

(Form No. PEM-6042-0)

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:


- Column 1- Serial Number
- Column 2- Component/Operation- The component and/or operation being checked shall be given here.
- Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
- Column 4- Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel
'MA' stands for major Characteristic - affecting safety of equipment and personnel
'MI' stands for minor characteristic - affecting appearance etc.
- Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
- Column 6- Extent of check, such as, 100, 10, 1 per heat etc.
- Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
- Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
- Column 9- Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
- Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'
The agencies are codified '1' stands for (BHEL)
as 1,2 & 3 '1' * means the operation shall be cleared by BHEL before the start of the next operation.
'2' Stands for Vendor
'3' stands for sub-Vendor of the Vendor and so on.

Example :

- Entry '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC
- Entry '2' in column 'W' means test./inspection to be witnessed by Vendor's QC
- Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
- Column II- Remarks - Any special remarks shall be given here.

NOTES :

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).

	VENDOR's DRAWINGS/DOCUMENTS SCHEDULE (Information in this form is to be furnished only after receipt of LOI/IPO)		SPEC. NO.: PE-TS-328-142-N101	
			VOLUME III	
			SECTION PART-B	
			REV NO. 0	DATE
			SHEET 1 OF 1	
TITLE OF SPECIFICATION				
.S. NO.	Vendor's Drawing/Document No. (VDN)	PEM's Drawing/Document No. (PDN)	First Submission Date	
	TITLE			Final Approval Date
	VDN	PDN		
	TITLE			
	VDN	PDN		
	TITLE			
	VDN	PDN		
	TITLE			
	VDN	PDN		
	TITLE			
	VDN	PDN		
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	VDN	PDN		
	TITLE			
	VDN	PDN		
	TITLE			
	VDN	PDN		
	TITLE			
PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE				
NAME	SIGNATURE	DATE	COMPANY SEAL	

INSPECTION REQUEST

(From Vendor to BHEL Inspection Agency)

1 PROJECT TITLE:**2 NAME OF VENDOR:****3 BHEL'S LOI / PO NO:****DATE :****4 SYSTEM / ITEM DESCRIPTION****5 ITEMS BEING OFFERED FOR INSPECTION WITH SL. NO. AS PER LOI / PO / BILLING SCHEDULE****6 DESCRIPTION AND SL. NO. OF INSPECTION AS PER QUALITY PLAN****7 QUANTITY OFFERED FOR INSPECTION****8 PLACE OF INSPECTION (FULL ADDRESS AND NAME OF SUB-VENDOR, IF ANY)**

PLACE

ADDRESS

.....
.....**9 CONTACT PERSON (FOR SL. NO. 8 ABOVE).**

NAME DESIGNATION

TELEPHONE

FAX TELEGRAM

TELEX

10 THE FOLLOWING DOCUMENTS ARE APPROVED BY BHEL AND AVAILABLE AT PLACE OF INSPECTION

(A) QUALITY PLAN (B) DRAWINGS (C) DATA SHEETS, CHARACTERISTIC CURVES ETC. (D) PLANT STANDARDS

11 REQUIRED DATE OF INSPECTION LIKELY DURATION (No of Working days).....

WEEKLY OFF DAY WORKING HOURS

(At least 15 days prior notice shall be given by the Vendor to Inspection Agency)

We hereby certify that the above items are complete in all respects and have been fully inspected/tested by us and are found to be as per technical specification/approved drawings/data sheets/characteristic curves and are acceptable to our QC department. The detailed inspection and test reports of our QC department are enclosed.

VENDOR'S PARTICULARS

NAME	DESIGNATION	SIGNATURE	PLACE	DATE	COMPANY SEAL



TITLE

Desuperheater Specification

For

IOCL Paradip CPP

SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**

SECTION **PART-B**

REV NO. **0** DATE

SHEET 1 OF 1

VOLUME-III
PART-B
PRICE SCHEDULES



TITLE

Desuperheater Specification**For****IOCL Paradip CPP**


SPECIFICATION NO PE-TS-353-142-N101

VOLUME **III**SECTION **PART-B**REV NO. **0** DATE


SHEET 1 OF 1

LIST OF PRICE SCHEDULES


<u>SL.NO.</u>	<u>FORM NO.</u>	FORM DESCRIPTION	<u>NO. OF SHEETS</u>
1.	PEM-6051	Schedule of Prices for Desuperheating station	1
2.	PEM-6052	Schedule of Unit Prices for Desuperheating station	1
3.	PEM-6053	Schedules of Prices for Commissioning & Mandatory Spares	1
4.	PEM-6054	Schedule of Prices for Recommended Spares	1
5.	PEM-6055	Schedule of Prices for Erection & Maintenance Tools & Tackles	1
6.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges	1


	<p>TITLE</p> <p align="center">SCHEDULE OF PRICES</p> <p align="center">Desuperheaters</p> <p align="center">IOCL Paradip CPP</p>		SPECIFICATION NO PE-TS-353-142-N101	
			VOLUME III	
			SECTION PART-B	
			REV NO. 0	DATE
			SHEET 1 OF 1	


S.No.	Description of Works or Equipment/System	Price (in Lakhs of Rs.)	
1.0	Total price for design, manufacture, assembly, inspection, testing, packing and dispatch to site of SIX (06) no. Desuperheaters with all accessories, including commissioning spares (if any) on as required basis, special tools & tackles as specified and necessary as per technical specification PE-TS-353-142-N101. Mandatory Spares prices to be covered in Sr. No. 2 only		
2.0	Total prices for mandatory spares (Not Applicable)		
3.0	Total of sl. no 1.0 and 2.0		
4.0	Recommended spares, item-wise break up with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of technical specification- price not to be included in clause 1.0 above, Bidder to indicate the break up.		
5.0	Optional price of supervision of erection and commissioning of equipments – prices not to be included in clause 1.0 above.		
Indicate all duties, taxes etc. Stating whether included/excluded in above price.			
<p align="center">Bidder shall furnish this price schedule in his price offer only</p>			
PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	COMPANY SEAL


	<p>TITLE</p> <p>SCHEDULE OF UNIT PRICES</p> <p>Desuperheaters</p> <p>IOCL Paradip CPP</p>		SPECIFICATION NO PE-TS-353-142-N101	
			VOLUME III	
			SECTION PART-B	
			REV NO. 0	DATE
			SHEET 1 OF 1	

S.No.	Item Description	Unit Price (in Lakhs of Rs.)
1.0	Unit price of design, manufacture, inspection, testing, packing and delivery to site of Six (6) no of Desuperheaters ,complete with all accessories as given below :	
1.	Desuperheaters : <ul style="list-style-type: none"> a) Desuperheater (DSH-1 – 190LBB10 DS501) b) Desuperheater (DSH-2 – 190LBC24 DS501) c) Desuperheater (DSH-3 – 190LBS45 DS501) d) Desuperheater (DSH-4 – 190LBB10 DS501) e) Desuperheater (DSH-5 – 190LBC31 DS501) f) Desuperheater (DSH-6 – 190LBS50 DS501) 	
2.0	Unit Price of Mandatory spares (Not Applicable)	
3.0	Others, if any (please specify)	
<p>Note</p> <p>a) Total price of unit prices given above should tally with total price given in Schedule of prices. In case of discrepancy, the lowest of two shall be considered for order. Bidder to note that prices mentioned in the “schedule of prices” and schedule of unit Prices shall be binding for evaluation purpose.</p> <p>b) Unit price quoted by bidder, as above shall be binding for any quantity variation, which is at the discretion of purchaser.</p> <p>c) Prices of commissioning & erection spares and special tools & tackles shall be included in the price of main equipment & shall be supplied with equipment</p>		
<p>Bidder shall furnish unit prices for items as called for in this schedule above and shall furnish this schedule in his price offer only.</p>		
PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE		
NAME	SIGNATURE	DATE
COMPANY SEAL		

		TITLE * SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES				SPECIFICATION PE-TS-353-142-N101 NUMBER			
						VOLUME III			
						SHEET OF			
The bidder shall indicate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section-C / Section - D. If the listed spares are not adequate, then the bidder shall indicate those and additional spares considered necessary by him.									
Type	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Required	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection and Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE									
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL					

		TITLE * SCHEDULE OF PRICES FOR RECOMMENDED SPARES				SPECIFICATION NUMBER PE-TS-353-142-N101			
						VOLUME III			
						SHEET OF			
The bidder shall give below a list of spares recommended for three years (or as otherwise specified in section - C) for trouble free performance of the equipment / system offered.									
S. No.	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity recommended	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE									
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL					

	TITLE SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES		SPECIFICATION NUMBER PE-TS-353-142-N101	
			VOLUME III	
			SHEET OF	
The bidder shall be give below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section - C / Section - D.				
S. No.	Description of Tools & Tackles	Quantity offered	Unit Price (Rs.)	Total Price (Rs.)
NOTE : The hire charges for vendor's equipment called for in this schedule shall include the cost of consumables, operation services, depreciation, wear and tear as well as vendor's over head and profit. (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract.)				
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	

	TITLE		SPECIFICATION PE-TS-353-142-N101	
	SCHEDULE OF BIDDER'S MAN POWER FOR SUPERVISION OF E & C AND THEIR CHARGES		NUMBER	
			VOLUME III	
		SHEET OF		
The bidder shall indicate below, designation-wise, the personnel required for supervision of erection and commissioning and their charges.				
SUPERVISION OF ERECTION				
S. No.	Designation	Normal rate per day of 8 hours		Overtime rate per hour
SUPERVISION OF COMMISSIONING				
Sl. No.	Designation	Normal rate per day of 8 hours		Overtime rate per hour
PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	
				COMPANY SEAL