

1X660 MW UPRVUNL PANKI TPS EXTENSION

VOLUME: II B & III

**TECHNICAL SPECIFICATIONS
FOR
SIDE STREAM FILTRATION PLANT**

SPECIFICATION NO.: PE-TS-426-156-A101



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



TITLE:
TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660 MW UPRVUNL PANKI TPS EXTENSION.

SPEC NO: PE-TS-426-156-A101

VOLUME: II-B

SECTION: A

REV NO: 00

DATE:

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VOLUME-IIB & III

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SECTION – A SCOPE OF ENQUIRY



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1. SCOPE OF INQUIRY/ INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, fabrication, assembly, inspection and testing at vendor's & sub-vendor's works, painting, mandatory spares along with spares for erection and commissioning, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, trial run, on FOR site basis, preparation & submission of "As Built" drawings, PG test at site and handing over of **Side Stream Filtration Plant** as per the details in different sections / volumes of this specification for **1X660 MW UPRVUNL PANKI TPS EXTENSION**.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of **Side Stream Filtration Plant**.
- 1.3 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 purchaser 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.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.8 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.9 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer including their consultant as interpreted by BHEL in the relevant context. Bidder to refer GCC/SCC for more clarity.
- 1.10 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.11 BHEL's/Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 1.12 Pre-bid meeting shall be held before bid submission. Bidder to ask all their queries in pre-bid meeting.



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SPEC NO: PE-TS-426-156-A101

VOLUME: II-B

SECTION: B

REV NO: 00

DATE:

SECTION – B PROJECT INFORMATION

1.0 PROJECT INFORMATION

1.1	Owner	:	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED, LUCKNOW	
1.2	Project Title	:	Panki Thermal Power Station (1x660MW)	
1.3	Owner's Engineer	:	DEVELOPMENT CONSULTANTS PVT. LTD and NTPC	
1.4	Project Site Location	:	Place	Panki
		:	District	Kanpur
		:	State	Uttar Pradesh
		:	Country	India
1.5	Latitude & Longitude of project site	:	North	N26°28'20"
		:	East	E 80°14'32"
1.6	Nearest Railway Station	:	Panki	5 km
1.7	Nearest Town	:	Kanpur	16km
1.8	Nearest Highway	:	National Highway - 25	
1.9	Nearest Airport	:	Kanpur	25 km
		:	Lucknow	80 Km
1.10	Nearest Commercial Airport	:	Delhi	140 km
1.11	Nearest Water Body	:	Lower Ganga Canal, adjacent to site	
1.12	Land	:	Land is in possession of UPRVUNL.	
1.13	Station Graded Level Elevation from Mean sea level (MSL)	:	Plant FGL → RL(+) 126.0M → EI(-) 0.500M Plant FFL → RL(+) 126.5M → EI(+/-) 0.000M	
1.14	Water	:		
1.14.1	Nearest Water Source	:	Lower Ganga Canal system running adjacent for project site	
1.14.2	Water Requirement for station	:	~ 1927 m ³ /hr considering closed cooling cycle with NDCT. Additional 700m ³ /hr for ash slurry preparation during emergency ash disposal to ash dyke.	
1.14.3	Raw Water Analysis from Upper Ganga Canal	:	Refer Appendix - I	
1.15	Site Ambient Condition	:		
1.15.1	Monthly mean (DBT)	:	Maximum	44.4 °C
		:	Minimum	3.8 °C
1.15.2	Extreme Recorded (DBT)	:	Maximum	47.3 °C
		:	Minimum	-0.9 °C
1.15.3	Monthly mean (WBT)	:	Maximum	27.3 °C
		:	Minimum	9.2 °C
1.15.4	Relative Humidity	:	Maximum	84 %
		:	Minimum	28 %
1.15.5	Average relative humidity	:	Annual Average	65 %
1.15.6	Rainfall	:	Annual average	832.6 mm

			Heaviest fall recorded in 24 hrs	247.4 mm
1.15.7	Basic Wind Speed	:	47.00 m/s	As per IS: 875 part – III
			For wind resistance design of structure & equipment refer relevant civil section	
1.15.8	Climatic condition	:	For detailed information refer attached Climatological data as published by IMD for Kanpur station.	
1.16	Seismic data	:	Zone – III	As per IS: 1893
			For earthquake resistance design of structure & equipment refer relevant civil section	
1.17	Fuel Data			
1.17.1	Coal Source	:	Coal requirement for this stage of the project is estimated as 2.99 million tones/annum considering 660 MW capacity, GCV of blended coal 4030 kcal/kg, Heat Rate as 2317 kcal/kwh and 90% PLF as per CERC operative norms effective from 1/4/2009.	
1.17.2	Coal Transportation	:	Thru BOXN wagons of Indian Railways System	
1.17.3	Coal Analysis	:	Refer Appendix – II	
1.17.4	Support Fuel (HFO / LDO) transportation	:	Support fuel will be transported by road tankers or by Railway system. Start-up / support fuel for the proposed project will be LDO/HFO.	
1.17.5	Support Fuel (HFO / LDO) analysis	:	Refer Appendix - II	

Appendix – I: Raw Water Analysis (Source - Lower Ganga Canal)

S. No.	Description	Unit	Parameter
1	Physical characteristics		
	pH at 25°C	-	8.00
	Turbidity	Silica Scale	500
	Total Suspended solids	ppm	250
	Total Dissolved solids	ppm	241
	Colour	Hazen	< 5
2	Cations		
	Calcium Hardness	ppm as CaCO ₃	80
	Magnesium Hardness	ppm as CaCO ₃	40
	Sodium + Potassium	ppm as CaCO ₃	36
	Iron	ppm as CaCO ₃	1.5
	Total Cations	ppm as CaCO ₃	157.5
3	Anions		
	Bicarbonate	ppm as CaCO ₃	100
	Carbonate	ppm as CaCO ₃	0.95

S. No.	Description	Unit	Parameter
	Hydroxyl	ppm as CaCO ₃	0.05
	Chlorides	ppm as CaCO ₃	20
	Sulphate	ppm as CaCO ₃	36
	Nitrate	ppm as CaCO ₃	0.5
	Total Anions	ppm as CaCO ₃	157.5
4	Carbon Di-oxide as CO ₂	ppm	1.97
5	Dissolved Silica	ppm as SiO ₂	10.0
6	Colloidal Silica	ppm as SiO ₂	0.5
7	Organic Matter	ppm as O ₂	4.0

Appendix – II : Coal Quality Parameter

Sl.N o.	Particulars	Unit	Performance / Design Fuel	Worst Fuel	Best Fuel
1.0.	Proximate Analysis (As Received Basis)	By Weight			
1.1.	Moisture	%	10.5	12	12
1.2.	Ash	%	35	43	32
1.3.	Volatile Matter	%	26	19	27
1.4.	Fixed Carbon	%	28.5	26	29
1.5.	Total	%	100	100	100
1.6.	Gross Calorific Value	kcal/kg	3700	3200	4200
2.0.	Ultimate Analysis (As Received Basis)				
2.1.	Moisture	%	10.5	12	12
2.2.	Ash	%	35	43	32
2.3.	Carbon	%	42	33.5	44
2.4.	Hydrogen	%	2.0	2.4	2.77
2.5.	Nitrogen	%	1.6	1.3	1.5
2.6.	Sulfur	%	0.46	0.45	0.5
2.7.	Oxygen	%	8.44	7.35	7.23
2.8.	Total	%	100	100	100
3.0.	Hard Groove Index		53	50	55
4.0.	Ash Fusion Range				
a)	Initial Deformation Temperature	°C	1200	1154	1165
b)	Hemispherical Temperature	°C	1350	1300	1350

Sl.N o.	Particulars	Unit	Performance / Design Fuel	Worst Fuel	Best Fuel
c)	Fusion Temperature	°C	>1400	>1400	>1400

Source: Saharpur Jamarpani Coal Mine, Jharkhand

Imported Coal

Sl. No.	Item	Unit	Design Coal
1.	Gross heating Value	Kcal/kg	5500

Source: Indonesia / South African coal

Appendix – III : Light Diesel Oil (LDO) **As per IS: 1460-2000**

S.No.	Property	Unit	Value
1.0	Ash content (max)	% by mass	0.02
2.0	Carbon residue (Rams Bottom) max	% by mass	0.2
3.0	Cetane number (Min)	-	-
4.0	Pour Point (max)		
	a) Winter	°C	12
	b) Summer		21
5.0	Flash Point (min)		
	a) Abel	°C	--
	b) Pensky0Martens		68
6.0	Kinematic Viscosity at 38 deg	Cst	2.5 to 15.7
7.0	Sediments (max)	% by mass	0.1
8.0	Sulphur Content (max)	% by mass	1.8
9.0	Water Content (max)	% by volume	---
10.0	Gross Calorific Value (GCV), approx	kCal/kg	10,000
11.0	Density at 15°C	Kg/m ³	850 to 870

Appendix – IV : Heavy Fuel Oil (HFO) **As per IS: 1593-1982**

S.No.	Property	Unit	Value
1.0	Viscosity at 50 °C	Cst	370
2.0	Density at 15°C (approx)	Kg/m ³	890 to 950
3.0	Flash Point (min)	°C	66
4.0	Pour Point (max)	°C	20
5.0	Water Content (max)	% by volume	1
6.0	Sediments (max)	% by weight	0.25
7.0	Sulphur Content (max)	% by weight	4.5
8.0	Ash content (max)	% by weight	0.1
9.0	Gross Calorific Value (GCV), approx	kCal/kg	10,000

2.0 Access to Site

The nearest town Kanpur is about 16 km from site. It is easily accessible by Railway/Road.

Dedicated railway link is available for the transportation of coal and fuel oil for the power plant. No problem is envisaged in accessibility and transportation of heavy equipment to site by road or rail.

3.0 Plant Rating, Capacity, Availability, PLF

Plant continuous rating will be 660 MW at generator terminals based on the following site conditions.

- Ambient air temperature
- Condenser cooling water inlet temperature of 33°C and 10°C temperature rise across the condenser.
- Generator power factor of 0.85 (zero point eight-five).
- Fuel specification as given elsewhere.
- Design temperature for electrical equipment is 50°C.

The VWO capacity of the steam turbine 660 MW will be 105% or 693 MW and the Boiler maximum Continuous Rating (MCR) will be established to match the steam requirement at VWO conditions. The capacity of the unit is selected so as to deliver the rated output even after ageing that will occur between overhauls, as a result of deposition of salts in turbine blades, wear and tear etc.

4.0 Power Evacuation

The power generated from the proposed project will be evacuated over the 400 KV through a 400 KV open switchyard. Further to Switchyard distribution will be by UPTRANSCO. Interconnection of proposed 400 KV Switchyard with existing 220 kV switchyard shall be done as specified elsewhere in specification.

जलवायवी सारणी CLIMATOLOGICAL TABLE

स्टेशन : कानपुर (ए)
STATION : Kanpur (A)

अक्षांश देशांतर
LAT 26°26' N LONG 80°22' E

समुद्री तल मध्य से ऊँचाई
HEIGHT ABOVE M. S. L. 126 METRES

1951 से 1976 तक के प्रेक्षणों पर आधारित
BASED ON OBSERVATIONS FROM 1951 TO 1976

वायु तापमान															वर्षा											
		मध्य						चरम				आर्द्रता		मेघ की भवा												
		सूक्ष्म बल्ब	नम बल्ब	दैनिक अधिकतम	दैनिक न्यूनतम	मह. में उच्चतम	मह. में निम्नतम	दिनांक और उच्चतम	दिनांक और निम्नतम	सापेक्ष आर्द्रता	बाष्प दाब	सम्प्रत मेघ	निम्न मेघ	मसिक योग	वर्षा के दिनों की संख्या	वर्षासहित सबसे कम महीने का योग	वर्षासहित एकलवर्ष में सबसे अधिक महीने का योग	24 घंटों की सबसे घटी वर्षा	दिनांक और वर्ष	मध्य फवन गति						
मं.सं.		AIR TEMPERATURE															RAINFALL									
		MEAN						EXTREMES				HUMIDITY		CLOUD AMOUNT												
		DRY BULB	WET BULB	DAILY MAX	DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	HIGHEST	DATE AND YEAR	LOWEST	DATE AND YEAR	RELATIVE HUMIDITY	VAPOUR PRESSURE	ALL CLOUDS	LOW CLOUDS	MONTHLY TOTAL	NO. OF RAINY DAYS	TOTAL IN WETTEST MONTH WITH YEAR	TOTAL IN DRIEST MONTH WITH YEAR	HEAVIEST FALL IN 24 HOURS	DATE AND YEAR	MEAN WIND SPEED				
MONTH	STATION LEVEL PRESSURE	ह्य. बू. प. hPa	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	प्रतिशत %	एच.पी.ए. hPa	अक्षांश के अनुसार Olds of day	मि.मि. mm	मि.मि. mm	मि.मि. mm	मि.मि. mm	मि.मि. mm	मि.मि. mm	कि.मी. प्र. घ. Kmph					
जनवरी	1002.8	11.3	9.5	22.7	8.5	27.1	4.4	31.1	21	1.7	14	79	10.5	1.8	0.6	21.1	1.5	74.7	0.0	48.5	04	8.0				
JAN	1000.2	20.1	14.2					1939			1967	50	11.5	1.8	0.5			1948		1893						
फरवरी	1000.2	15.0	11.7	26.4	11.3	31.9	6.7	35.6	28	0.6	02	66	11.1	1.4	0.4	12.5	1.0	97.5	0.0	59.2	20	9.9				
FEB	997.4	24.6	16.0					1930			1905	38	11.3	1.6	0.3			1928		1942						
मार्च	997.4	21.5	15.6	32.5	16.6	38.2	11.1	42.8	27	7.2	07	52	13.0	1.6	0.3	6.2	0.7	77.2	0.0	61.7	30	11.3				
MAR	993.9	30.9	19.0					1941			1945	29	12.3	1.8	0.4			1944		1944						
अप्रैल	993.6	28.5	18.8	38.3	22.0	42.5	16.7	45.6	30	11.1	03	37	14.1	1.3	0.3	4.5	0.5	94.2	0.0	25.9	09	12.2				
APR	989.8	36.6	21.4					1938			1905	23	12.9	1.7	0.4			1909		1928						
मई	988.9	32.4	21.8	41.4	26.5	45.0	21.7	47.2	30	17.8	03	37	17.3	1.1	0.4	9.8	0.8	47.2	0.0	40.0	12	12.7				
MAY	985.2	39.7	23.3					1941			1909	22	14.9	1.2	0.4			1969		1969						
जून	985.1	32.4	24.8	40.1	28.7	44.8	23.8	47.3	09	20.6	03	54	24.9	3.5	1.2	65.4	3.3	378.7	6.0	133.3	10	13.4				
JUN	981.5	37.7	25.7					1966			1922	39	22.9	3.5	1.3			1916		1916						
जुलाई	984.8	29.0	26.2	34.3	26.7	39.8	23.8	45.0	10	21.7	28	80	31.8	5.9	3.2	229.8	12.0	704.1	36.6	181.0	25	11.2				
JUL	982.1	31.9	26.8					1903			1948	68	31.2	6.1	3.1			1924		1970						
अगस्त	986.5	27.9	26.1	32.2	25.9	35.6	23.7	40.6	01	21.7	25	87	32.5	6.2	4.0	289.5	13.3	664.2	40.0	235.2	31	9.6				
AUG	984.3	30.0	26.8					1903			1948	77	32.5	5.9	3.6			1921		1965						
सितम्बर	990.5	27.8	25.2	33.0	24.9	35.8	22.2	40.0	02	16.1	27	81	29.9	4.0	2.3	124.4	6.5	527.6	5.2	242.8	16	9.2				
SEP	987.3	30.5	25.7					1932			1896	68	29.5	4.1	2.2			1915		1966						
अक्टूबर	996.7	25.0	21.0	32.7	20.2	35.6	15.4	40.6	03	11.1	30	69	21.5	1.4	0.8	60.7	2.1	335.3	0.0	136.1	05	6.4				
OCT	993.6	29.5	22.5					1896			1895	54	21.2	1.6	0.8			1955		1894						
नवम्बर	1001.4	18.3	14.5	29.0	13.2	32.7	8.8	36.1	04	5.0	19	65	13.6	0.8	0.3	1.0	0.2	92.2	0.0	59.2	19	5.3				
NOV	998.4	25.1	17.8					1940			1948	46	14.6	0.9	0.2			1894		1911						
दिसम्बर	1003.1	12.6	10.3	24.2	8.9	28.1	4.8	31.3	15	-0.9	27	76	10.8	1.3	0.3	7.7	0.7	82.6	0.0	40.6	25	6.0				
DEC	1000.4	20.8	14.8					1959			1961	50	11.8	1.4	0.2			1967		1950						
वार्षिक योग	994.3	23.5	18.8	32.2	19.5	45.6	3.7	47.3		-0.9		65	19.3	2.5	1.2	832.6	42.6	1567.2	420.6	242.8		9.6				
ANNUAL TOTAL OR MEAN	991.2	29.8	21.2									47	18.9	2.6	1.1			1955	1918			22				
वर्षों की सं.	23	23	23	24	24	24	24	90		90		23	23	23	13	25	25	85	85	85						
NUMBER OF YEARS	23	23	23									23	23	23	13											

जलवायवी सारणी CLIMATOLOGICAL TABLE

स्टेशन :कानपुर (ए)
STATION : Kanpur (A)

मौसम परिपटना										पवन										मेघ										दृश्यता																									
के साथ दिनों की संख्या										पवन की गति के साथ दिनों की संख्या (कि. मी. प्र. घं.)										पवन की दिशा के दिनों की संख्या का प्रतिशत										मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्टमारा										निम्न स्तरीय मेघ मात्रा सहित दिनों की संख्या - अष्टमारा										दृश्यता सहित दिनों की संख्या					
माह	वर्षा 0.3 मि.मि. या अधिक	ओले	गर्जन	कुहप	भूत मरी आंधी	चंड कत	62 या अधिक	20-61	1-19	0	उ	उपू	पू	दपू	द	दप	प	उप	रशंत	0	ले-2	3-5	6-7	8	0	ले-2	3-5	6-7	8	कुहप 8	1 कि.मी. तक	1-4 कि.मी.	4-10 कि.मी.	10-20 कि.मी.	20 कि.मी. से अधिक																				
WEATHER PHENOMENA										WIND										CLOUD										VISIBILITY																									
No. OF DAYS WITH										No. OF DAYS WITH WIND SPEED (Kms. p. h.)										PERCENTAGE No. OF DAYS WIND FROM										No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) O K T A S										No. OF DAYS WITH LOW CLOUD AMOUNT O K T A S										No. OF DAYS WITH VISIBILITY					
MONTH	PPT 0.3mm or more	HAIL	THUN DER	FOG	DUST STORM	SQU ALL	62 or more	20-61	1-19	0	N	NE	E	SE	S	SW	W	NW	LM	0	T-2	3-5	6-7	8	0	T-2	3-5	6-7	8	FOG 8	UP TO 1 Km	1-4 Kms	4-10 Kms	10-20 Kms	OVER 20 Kms																				
जनवरी JAN	2.4	0.1	0.4	3.2	0.1	0.0	0	0	22	9	6	5	13	3	2	9	29	8	25	18	4	3	3	3	25	2	2	0	1	1	1.5	11.1	14.4	3.8	0.2																				
फरवरी FEB	2.0	0.0	0.7	1.0	0.1	0.0	0	0	22	6	6	5	12	3	2	11	36	7	18	19	3	3	2	1	24	1	2	1	0	0	0.9	6.3	16.0	4.8	0.0																				
मार्च MAR	1.4	0.0	1.1	0.1	0.4	0.3	0	0	27	4	6	5	10	4	1	14	36	10	11	19	4	4	3	1	28	1	1	1	0	0	0.0	6.2	19.6	5.2	0.0																				
अप्रैल APR	1.0	0.0	0.9	0.0	0.6	0.0	0	1	26	3	5	5	13	6	6	10	35	13	7	19	4	4	2	1	26	2	2	0	0	0	0.1	4.1	18.8	7.0	0.0																				
मई MAY	1.4	0.0	1.8	0.1	1.9	0.0	0	1	28	2	7	6	20	7	5	7	31	12	5	21	3	5	1	1	27	2	2	0	0	0	0.1	6.1	17.6	7.2	0.0																				
जून JUN	5.2	0.0	2.8	0.0	1.6	0.0	0	2	26	2	5	8	27	9	4	7	28	9	3	11	3	5	7	4	17	4	6	2	1	0	0.1	5.1	19.1	5.7	0.0																				
जुलाई JUL	15.1	0.0	2.1	0.0	0.0	0.0	0	1	29	1	4	6	33	9	9	14	18	3	4	1	2	7	10	11	8	4	11	5	3	0	0.1	2.4	21.8	6.7	0.0																				
अगस्त AUG	17.1	0.0	1.8	0.0	0.0	0.0	0	0	28	3	4	7	32	12	6	11	20	2	6	0	2	6	10	13	4	5	12	6	4	0	0.3	2.7	19.3	8.7	0.0																				
सितम्बर SEP	9.3	0.0	2.2	0.1	0.0	0.0	0	1	27	2	5	8	26	7	5	8	27	5	9	6	4	7	8	5	11	6	7	4	2	0	0.1	2.2	18.1	9.6	0.0																				
अक्टूबर OCT	2.8	0.0	1.1	0.2	0.1	0.0	0	0	24	7	6	6	16	4	4	10	28	5	21	20	4	2	2	3	25	2	2	1	1	0	0.1	3.7	19.4	7.8	0.0																				
नवम्बर NOV	0.3	0.0	0.1	0.1	0.1	0.0	0	0	19	11	6	4	7	2	2	7	27	7	38	23	3	2	1	1	28	1	1	0	0	0	0.3	9.8	14.6	5.3	0.0																				
दिसम्बर DEC	1.0	0.0	0.1	2.4	0.0	0.0	0	0	18	13	6	5	8	1	1	6	29	7	37	23	3	2	2	1	28	1	1	0	0	1	2.3	11.2	13.9	3.6	0.0																				
वार्षिक योग या मास्य ANNUAL TOTAL OR MEAN	59.0	0.1	15.1	7.2	4.9	0.3	0	6	296	63	6	6	18	6	4	10	29	7	14	180	39	50	51	45	251	31	49	20	12	2	5.9	70.9	212.6	75.4	0.2																				
वार्षिक सं। NUMBER OF YEARS	20										17										22										18										18														
											17										22										18										18														

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SECTION – C
(SPECIFIC TECHNICAL REQUIREMENTS)

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1.0 SCOPE OF SUPPLY:

The scope of supply under this specification shall be as follows:

1.1 SIDE STREAM FILTRATION PLANT (SSF):

- 1.1.1 12 Numbers (10 working +2 s/under backwash) side stream filters (SSF) as per the datasheet and P&ID.
- 1.1.2 The SSF shall be complete with inlet, outlet connections, and bed support system, Inlet water distribution, siphon breaker, back wash facility etc.
- 1.1.3 Internals, fittings and appurtenances of SSF as per system requirement.
- 1.1.4 All necessary drains, vents and valves, sampling point etc. as specified and as required.
- 1.1.5 All interconnection piping & valves, fittings, instruments (as minimum) as shown in the P & ID and as mentioned in Data Sheet-A.
- 1.1.6 Hangers and supports as per the requirement.
- 1.1.7 Filtration media for all SSF.
- 1.1.8 Start-up & Commissioning spares.
- 1.1.9 Mandatory spares.
- 1.1.10 Counter flanges, blank flanges, isolation valves at all the terminal points as required as per system requirements.
- 1.1.11 All special tools necessary for proper maintenance or adjustment of the equipment packed in permanent box.
- 1.1.12 All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with Side Stream Filtration Plant.
- 1.1.13 Permanent ladder (not rungs) for approaching the top of tanks, valves for All steel inserts with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipments being supplied under this specification for opening/maintenance purpose.
- 1.1.14 All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles.
- 1.1.15 Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.
- 1.1.16 Finish paint for touch-up painting of equipment after erection at site in sealed containers.
- 1.1.17 Set of special tools and tackles if required for maintenance and erection of equipment supplied.
- 1.1.18 All necessary flanges and counter flanges to interconnect the piping.

2.0 SCOPE OF SERVICE:

The bidder's scope also includes the following services at site:

- 2.1 Erection and commissioning, unloading, storage and handling at site.
- 2.2 Arrangement of all instruments and lab facilities to carry out trial run, commissioning and PG test.
- 2.3 In site transportation.
- 2.4 Monitoring gadgets, instruments and equipments required for maintenance (till PG test and plant handed over).
- 2.5 All personal required during commissioning and PG test.
- 2.6 Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
- 2.7 Trial run for requisite period.
- 2.8 Performance testing.
- 2.9 Painting as per enclosed painting schedule. However, any variation in the painting schedule as finally approved by customer shall be taken care by the bidder without any commercial and delivery implication. Colour coding scheme shall be intimated to vendor during detailed engineering.
- 2.10 SSF shall be either site fabricated or shop fabricated.
- 2.11 Customer training with study material.

3.0 TERMINAL POINTS:

- 3.1 SSF plant inlet header: Single piping connection near SSF area (Twenty (20) meter from SSF boundary). Working pressure of inlet water of SSF is 3.5-4 Kg/Cm² (g). Design pressure of SSF will be 7.5 kg/cm² (g) minimum.
- 3.2 SSF outlet header: Up to the cooling tower forebay (Refer P&ID for SSF, P&ID for CW & ACW flow and Layout). Minimum length of pipe will be 200 meters.
- 3.3 Back Wash water outlet: Backwash water outlet piping till backwash sump (backwash sump is not in bidder's scope).

Note: Bidder to note that the pipe length indicated in the specification may vary by +/-10 % for which no extra claim shall be applicable.

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4.0 MAJOR EXCLUSIONS

- 4.1 All civil work including foundation of equipment. However, complete grouting for equipment, fixing and any concreting inside vessels shall be in the scope of bidder.
- 4.2 Pedestals for pipe supports, however, auxiliary structure, supports components for piping is in bidder's scope.

5.0 BIDDER TO FURNISH FOLLOWING DOCUMENT/INFORMATION ALONG WITH THE BID.

- 5.1 Deviation if any in enclosed deviation schedule with mention of specification clause with page no. for which clarification/deviation is being asked.
- 5.2 Deviation schedule duly fill for deviation, if any.
- 5.3 Price Schedule duly filled.
- 5.4 List of Spares (Commissioning spares).

Any other technical document enclosed with the offer will not be considered by BHEL and the same will be considered as null and void.

6.0 QP AND SUB VENDOR APPROVAL

- a) QP requirements part of section-C shall be as per the enclosed QP subject to BHEL/Customer approval. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any delivery and price implication to BHEL.
- b) Approved sub vendor list is enclosed elsewhere of this specification. However all the sub vendors including any additional sub-vendor shall be subject to BHEL and Customer approval without any delivery and price implication to BHEL.

7.0 DESIGN/CONSTRUCTION

In addition to the requirements of Section-C & D the following shall also be complied under scope of this specification:

- The P&ID is enclosed herein in this section for bidders compliance.
- The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to customer approval during detailed engineering without any delivery and price implication to BHEL.

8.0 DRAWINGS AND DATA TO BE FURNISHED AFTER AWARD OF CONTRACT

After award of LOI, following minimum drawing/documents shall be submitted by the bidder for BHEL/Customer approval. However any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The number of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV. The submission of soft copy or hard copy of the document whichever is later will be considered as final date of submission of the document. The bidder has to submit the revised document along with the compliance sheet indicating enumerate reply to all BHEL comments. Without compliance sheet the submission of the documents will not be considered and the delay on this account will be solely on bidder's side only.

- Detailed piping and instrument diagram for process and utility, showing all equipments, machinery, piping and instruments. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it.
- Equipment layout.
- Datasheets.
- Quality plans.
- Foundation Design drawings indicating foundation design, load data, anchor bolt location, pocket details etc.
- General arrangement drawings for all the equipments showing dimensions and detail of materials.
- All the data and drawings necessary for civil design and construction.
- Sizing calculations for all equipments and thickness calculations for all major vessels and tanks.
- Pipe, Valves and Instrument schedule.
- General arrangement drawings and detailed piping layout drawings showing valves, supports, hangers etc.
- Operating procedures for start up, normal running, shutdown and abnormal operating conditions.
- Instructions for maintenance, assembly and erection of equipments.
- Instructions for proper balancing, alignment, adjustment, checking, and calibration as may necessary.
- Other necessary drawings, data etc.

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- Bar chart and schedules for drawing submission, manufacturing, erection and commissioning.
- Any other drawing required to make the system complete & as required for erection, commissioning & inspection purpose.
- Operation and maintenance manual.
- PG test procedure.
- Sub-vendor list.
- As built drawings

However any other documents as required by BHEL during detailed engineering stage has to be submitted by the bidder without and commercial and delivery implication to BHEL.

NOTE-1 Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification.

NOTE-2 Bidder shall perform the guarantee parameters as per the specification requirement to the satisfaction of Owner. The exact modalities of verifying guarantee for the parameters indicated in the specification shall be finally as agreed with the Owner during detailed engineering & mutually agreed.

NOTE-3 The Bidder shall arrange all the monitoring gadgets / instruments / equipment required for performing guarantee parameters (returnable after PG test). Site facility as available or as extended by Owner shall only be provided.

NOTE-4 All major drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful vendor shall comply with the comment of the customer/BHEL without price & delivery implication.

NOTE-5 All equipments shall be dimensioned to provide as undisturbed space, free of pipes or similar obstacles of at least 1000 mm between installed equipment and surrounding enclosures or walkway to ensure proper access for maintenance and operation.

NOTE-6 All sub-vendors shall be subject to BHEL/Customer approval during detailed engineering without price & delivery implication to BHEL.

NOTE-7 Bidder to note that the pressure overloaded at the inlet terminal point of the SSF system is 3.5 to 7.5 Kg/Cm2(g). Bidder to take care this to design the system.

NOTE-8 Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's Internal proxy setting should not block DMS application's link

(<http://124.124.36.198/wrenchwebaccess/login.aspx>)

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DESIGN CLARIFIED WATER ANALYSIS (MAKE UP WATER) [TABLE-1]

S. No.	Description	Unit	Parameter
1	Physical characteristics		
	pH at 25°C	-	7.59
	Turbidity	NTU	<15
	Conductivity	µs /cm	590
	Total Dissolved solids	ppm	285
	Total Suspended Solids	ppm	<15
2	Cations		
	Calcium Hardness	ppm as CaCO ₃	113.86
	Magnesium Hardness	ppm as CaCO ₃	40
	Sodium + Potassium	ppm as CaCO ₃	37.2
	Iron	ppm as CaCO ₃	0.3
	Total Cations	ppm as CaCO ₃	191.36
3	Anions		
	Bicarbonate	ppm as CaCO ₃	97
	Carbonate	ppm as CaCO ₃	0.34
	Hydroxyl	ppm as CaCO ₃	0.02
	Chlorides	ppm as CaCO ₃	27.1
	Sulphate	ppm as CaCO ₃	66.4
	Nitrate	ppm as CaCO ₃	0.5
	Total Anions	ppm as CaCO ₃	191.36
4	Carbon Di-oxide as CO ₂	ppm	5.54
5	Dissolved Silica	ppm as SiO ₂	10.0
6	Colloidal Silica	ppm as SiO ₂	0.5

NOTE:

A. THE CYCLE OF CONCENTRATION (COC) SHALL BE CONSIDERED AS 5.

[TABLE-2]

GUARANTEE	Total Suspended Solids in effluent water shall be less than 2 ppm with respect to influent total Suspended Solids of around 25 ppm. For suspended solids higher than 25 ppm at inlet, the Suspended Solids in filtered water shall be within 10% of the inlet value.
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LIST OF SUB VENDORS (TABLE-3)

Sl.No.	Item	PROPOSED SUB SUPPLIER	PLACE
1	MS PIPE/PLATE	AJANTA	GHAZIABAD
		JINDAL	BAHADURGARH
		SURYA ROSHNI	GHAZIABAD
		TISCO	JAMSHEDPUR
		SAIL	ROURKELA
		WELL SPUNGUJRAT	BAHRUCH
2	FITTINGS/FLANGES	RELIANCE FORGE	MUMBAI
		EBY	MUMBAI
		SIDDARTH & GAUTAM	FARIDABAD
3	ROTAMETER	CHEMTROLS SAMIL (INDIA) PVT LTD.	MUMBAI
		M/S INSTRUMENTATION ENGINEERS PRIVATE LIMITED	HYDRABAD
4	PRESSURE GAUGE/DPG	AUXIROL	UK
		SWITZER (FOR DP GAUGES)	CHENNAI
		BUDENBURG	UK
		A N INSTRUMENTS	KOLKATA
5		BELLS CONTROL	KOLKATA
		MANOMETER INDIA	MUMBAI
		GENERAL INST	MUMBAI/GOA
6	PAINT	BERGER PAINTS	MUMBAI
		ASIAN PAINTS	
		SHALIMAR	
		J&N	
7	GATE VALVES		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA
		AV VALVES	AGRA
		HAWA VALVES	MUMBAI
		STEEL STRON VALVES	MUMBAI
		AKSONS MECH. ENTERPRISES	MUMBAI
		BABCOCK BORSIG ESPANA, S.A.	SPAIN
		CRESCENT VALVES MFG.CO.PVT.LTD.	MUMBAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		NITON INDUSTRIES	MUMBAI
		NECO SCHUBERT & SALZER LTD.	NAGPUR
		OSWAL INDUSTRIES LTD.	AHMEDABAD
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		VENUS PUMP & ENGG. WORKS	KOLKATA
		VALTECH INDUSTRIES ,MUMBAI	MUMBAI
8	GLOBE VALVE		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA
		AV VALVES	AGRA

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		HAWA VALVES	MUMBAI
		STEEL STRON VALVES	MUMBAI
		AKSONS MECH. ENTERPRISES	MUMBAI
		BABCOCK BORSIG ESPANA, S.A.	SPAIN
		CRESCENT VALVES MFG.CO.PVT.LTD.	MUMBAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		NITON INDUSTRIES	MUMBAI
		NECO SCHUBERT & SALZER LTD.	NAGPUR
		OSWAL INDUSTRIES LTD.	AHMEDABAD
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		VENUS PUMP & ENGG. WORKS	KOLKATA
		VALTECH INDUSTRIES ,MUMBAI	MUMBAI
9	BALL VALVE		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA
		AV VALVES	AGRA
		HAWA VALVES	MUMBAI
		FLOW CHEM	AHMEDABAD
		STEEL STRON VALVES	MUMBAI
		AKAY VALVES LTD.	MUMBAI
		AQUA VALVES PVT.LTD.	KARNATAKA
		CRESCENT VALVES	MUMBAI
		FISHER SANMAR LIMITED	CHENNAI
		HABONIM VAAS AUTOMATION PVT LTD.,CHENNAI	CHENNAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICROFINISH VALVES PVT LTD.	HUBLI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		PEC VALVES	MUMBAI
10	DIAPHRAGM VALVE		
		PROCON ENGINEERES	MUMBAI
		HAWA VALVES	MUMBAI
		BDK VALVES	HUBLI
		FOURESS	BANALORE
		INERVALVE	GUJRAT
11	BUTTER FLY VALVE		
		BDK VALVES	HUBLI
		TYCO VALVES	HALOL
		INTERVALVES	PUNE
		FOURESS	BANGALORE
		LEADER	JALANDHAR
12	3 WAY VALVE		
		HI TECH	AHMEDABAD
		ADVANCE VALVES PVT.LTD	NOIDA
		BDK	HUBLI
		FOURESS ENGG.INDIA LTD.	MUMBAI
		FLUIDLINEVALVES COMPANY PRIVATE	MUMBAI

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		LTD.,	
		INSTRUMENTATION LTD.	PALAKAD
		KIRLOSKAR BROTHERS LTD.	PUNE
		VENUS PUMP & ENGG. WORKS	KOLKATA
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		STAFFORD CONTROLS LIMITED	PUNE

Notes:-

- All the finally selected sub vendors shall be subject to customer approval during detailed engineering without any delivery/ commercial implications to BHEL/ CUSTOMER.
- This vendor list applicable for Mechanical, electrical and C&I items.

DRAWING/DOCUMENT DISTRIBUTION SCHEDULE (TABLE-4)

ANNEXURE-VI
DOCUMENTS DISTRIBUTION SCHEDULE

TABLE-4

S.No.	Description of Document	DESEIN				UPRVUNL			
		HO		SITE		HO		SITE	
		HC	CC	HC	CC	HC	CC	HC	CC
1.	Drawings, Data Sheets, Calculation, all equipment / Instrument Schedule, BOM etc. a) For Approval b) Resubmission c) For Information	6 *	1	-	-	2	1	-	-
2.	Final Approved Documents	2	1 + 1 CD	1	1	1	1 + 2 CD	4	1 + 1 CD
3.	Drawings / Documents 'As Built'	2	1 + 1 CD	1	1	2	1 + 2 CD	4	1 + 1 CD
4.	Type Test Reports (Initial)	4 *	1 + 1 CD	-	-	2	1 + 2 CD	-	-
5.	Type Test Report (Final)	2	1 + 1 CD	1	1	2	1 + 2 CD	4	1 + 1 CD
6.	Piping / Equipment Analysis (Transient) etc., Model Study Report (Draft) including Input / Output date etc.	4 *	1	-	-	2	1 + 1 CD	-	-
7.	Piping / equipment Analysis (Transient) etc. Model Study Report (Final Approval) including Input / Output date	2	1 + 1 CD	-	-	2	1 + 2 CD	2	1 + 1 CD
8.	Erection Manual (Draft)	3 *	1CD	-	-	1	1CD	-	-



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



S.No.	Description of Document	DESEIN				UPRVUNL			
		HO		SITE		HO		SITE	
		HC	CC	HC	CC	HC	CC	HC	CC
9.	Erection Manual 'Final'	1	1CD	1	-	1	1CD	2	1CD
10.	O&M Manual 'Draft'	3*	1CD	+	-	1	1CD	-	-
11.	O&M Manual 'Final'	1	1CD	1	-	1	1CD	2	2CD
12.	Commissioning Procedure 'Draft'	3*	1CD	-	-	1	1CD	-	-
13.	Commissioning Procedure 'Final'	1	1CC	1	-	1	1CD	2	1CD
14.	PG Test Procedure "Draft"	3*	1	-	-	1	1	-	-
15.	PG Test Procedure 'Final'	1	1 + 1 CD	1	-	2	1 + 1 CD	2	1 + 1 CD
16.	Progress Report	3	1CD	1	-	2	1CD	1	1CD
17.	PG Test Report for Approval	4*	1	-	-	2	1 + 1 CD	-	-
18.	Approved PG Test Report	1	1 + 1 CD	1	-	2	1 + 1 CD	4	1 CD
19.	Project Completion Report	1	1 + 1 CD	1	-	1	1CD	1	1CD
20.	Vendor Details in respect of proposed vendors including Contractor's evaluation Report	1	1CD	-	-	1	1CD	-	-
21.	Monthly Vendor / QP Approval Status	1	1	-	-	2	1	1	1
22.	Manufacturing QPs, Field QPs for review / comments	6*	1	-	-	2	1CD	-	-
23.	Manufacturing QPs, Field QP, Final	1	1CD	1	-	2	1CD	2	1CD
24.	QA documents Package for equipment / field activities etc.	1	1CD	1	-	1	1CD	1	1CD

- * - Consultant will return one (1) commented document to Vendor and CE (UPRVUNL), Lucknow
- HC - Hard Copy
- CC - Soft Copy thru e-mail
- CD - CD ROM
- HO - Head Office of Consultant / UPRVUNL

Note:

- Quantity of prints may change during detailed engineering stage based on BHEL / Customer requirement. However, the same will be adhered by the bidder without any delivery/commercial implication to BHEL.
- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copies whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Bidder has to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.
- Bidder to also furnish the auto cad copy / MS-word (as applicable) of the following documents after award of contract. However any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL / customer will also be submitted by the bidder without any delivery/commercial implication to BHEL.
 - P&IDs.
 - Equipment lay out.
 - Equipment Cable tray layout.
 - Civil scope drawings.
 - Piping lay out drawing.



	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

LIST OF MANDATORY SPARES TABLE-5

S.no.	Mandatory Spares	Total Quantity
1.0	All internal fitting including laterals, strainers & nuts and bolts strainers & nuts and bolts.	One sets as require for one filter for each type and size.
2.0	Gate Valve	
2.1	Spindle	One no. of each size
2.2	Wedge	One no. of each size
2.3	Seal rings & packing	One no. of each size
3.0	Butterfly Valve	
3.1	Spindle	One no. of each size
3.2	Seat	One no. of each size
3.3	Disc	One no. of each size
3.4	Seal rings & packing	One no. of each size
4.0	Local Gauges like temperature gauges, pressure gauges, differential Pressure gauges, flow gauges, flow meters, rotameters/sight flow indicators with local display etc.	10% of total number of instruments/ transducers offered for each model and type, rating or a minimum of one number for each model, rating and type , whichever is more.

Note: Only applicable items shall be considered. Applicable items are those which are installed in the system.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

PAINTING SPECIFICATION

CHAPTER 7: PAINTING**1.0 SCOPE**

This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted. The painting system should ensure optimal protection of the installation with minimum need for maintenance, environmental friendly & easy to apply.

2.0 CODES AND STANDARDS

Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS contract for the material and workmanship.

The following Indian Standards may be referred to for carrying out the painting job:

IS: 5	:	Colours for ready mixed paints and enamels
IS: 101	:	All Parts and Sections for paint testing
IS: 1303	:	Glossary of terms relating to paints
IS: 2379	:	Colour code for identification of pipelines
IS: 1477	:	Code of practice for painting of ferrous metals in buildings (Parts I & II)
IS: 2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS: 6278	:	Code of practice for white washing and colour Washing
IS: 13183	:	Aluminium Paint, heat Resistant specification
IS: 158	:	Ready mixed paint, brushing, bituminous, black, Lead free, acid, alkali, water and heat resisting
IS: 2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS: 104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel, synthetic, exterior (a) undercoating (b) finishing.
IS: 2629	:	Recommended Practice for Hot Dip Galvanising
BS EN ISO 14713	:	Code of practice for protection of iron & steel structure against corrosion
ISO 8501-1	:	Preparation of steel substrates before application of paint & related Products. Part-1: Rust grades & preparation grades of uncoated steel substrates & steel substrates after overall removal of previous coatings
ISO 8502-3	:	Assessment of dust on steel surface prepared for painting (Pressure sensitive tape method)
ISO 12944 (Part 1 to 7)	:	Corrosion protection of steel structures by Protective paint systems
SSPC	:	US Specifications of Steel Structures Painting Council, SSPC Volumes I and II
SSPC-SP-08	:	Surface preparation by Pickling
NORSOK M-501	:	Surface preparation & Protective coating
ISO 20340	:	Pre-Qualification test
ASTM	:	American Standard Test Method for paints and coatings
AWWA	:	American Water Works Association

SIS: 55900 : Swedish standard for blasting

In the event of conflict between the Codes and Standards referred to in the specification and the requirement of this specification, the latter shall govern. Statutory and Local regulations shall be strictly followed in selection and application of paint.

3.0 GENERAL

- 3.1 This specification covers the surface preparation, method of application and material to be used for all coating of equipment, steel structures and piping. Steel material subjected to surface preparation on shop/site shall have minimum requirements in accordance with Rust Grade B (SSPC/SSPM Volume-2).
- 3.2 Coating materials according to SSPC, EN ISO, ASTM, BIS or DIN standards, shall be used. The paint shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work. The materials shall be matched with each other so that they are compatible. Coatings deviating this specification shall be subject to approval. Standards of surface preparation and painting shall give a time to first maintenance of 10 years.
- 3.3 The paint to be applied shall be approved by Customer / Engineer.
- 3.4 All paints & paint material used shall be procured from approved manufacturers. Paint shall be supplied in manufacturers original containers with the description of content, specification No., colour, ref no, date of manufacture, shelf life expiry date & pot life.
- 3.5 The paint manufacturers shall provide coating system data sheet for each coating system to be used containing the following information:
1. Surface preparations
 2. Film thickness (min and max)
 3. Min and max recoating intervals at relevant temperatures
 4. Mixing ratio, thinner details and coating repair systems
- 3.6 The sample for testing the paint being used may be taken by the customer at any time.
- 3.7 In general Shop fabricated equipment will be delivered to the site coated with a shop applied system or the manufacturer's standard finish in accordance with the requirements of this specification.
- 3.8 For equipment that has received shop prime coat, touch-up prime coat and additional coats shall be applied in accordance with the coating schedule. It is responsibility of the vendor to ensure compatibility between shop and field applied paint systems.
- 3.9 Necessary precautions shall be provided to all equipment, structures to protect other surfaces from abrasive blasting, coating over spray and spatter. Damage to other surfaces or equipment shall be repaired by the vendor.
- 3.10 The Contractor shall submit the following for review and approval by the Customer:

1. Manufacturer's recommended paint scheme for the project
2. Latest published product & instructions for application data,
3. Procedures for surface preparation and application.
4. Pre qualification for equipments and blasting materials, product, procedure and personnel qualifications for the paint and painting systems.
5. Painting repair procedures

Painting records shall contain:

- Equipment/components/location painted
- Date of painting
- Paint details such as specification No, colour, date of manufacture, shelf life, expiry date
- Application equipments
- Ambient conditions at the time of painting
- Surface temperature
- Drying time between coating, DFT and number of coatings
- Appropriate work plan for painting.

- 3.11 The supply of all necessary equipments, weather protection, and scaffolding for painting to ensure work is carried out in accordance with the specification and agreed programme.
- 3.12 Maintenance of the paint work until completion of the contract, this shall include repair of any damaged areas caused by third party.
- 3.13 Disposal of painting waste resulting from painting, shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work and coating materials.
- 3.14 It is a mandatory requirement that all operatives working to this procedure take full cognizance and implement necessary safety precautions.

4.0 PREPARATION OF SURFACES

- 4.1 All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust, weld spatters, sharp edges and any other foreign matter. Removal of grease and oil contamination shall be in accordance with SSPC-SP1 prior to cleaning process described below.
- 4.2 Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out, hand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the Engineer.
- 4.3 The blast cleaned surface shall be checked for signs of salt contamination as per ISO 8502-6 & 9. The maximum allowable level of contamination shall be 20 mg/m². Surfaces that do not meet these criteria shall be reprocessed.

Mechanical Cleaning:

Manual/power tool cleaning shall be done as per grade St-2 or St-3, of ISO 8504-3. This method to be used for repair painting or on already painted

surface and in case of usage on new construction painting prior approval may be obtained from purchaser/engineer.

	Condition of surface	ISO 8504-3	SIS 055900	SSPC
Hand tool cleaning	Rusted	C St2	C St2	SP2
	Rusted and pitted	D St2	D St2	SP2
Power tool cleaning	Rusted	C St3	C St3	SP3
	Rusted and pitted	D St3	D St3	SP3

- i) Grade St-2: Thorough scraping and wire brushing, machine brushing, grinding etc. This grade of preparation shall remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation, the surface should have a faint metallic sheen. The appearance shall correspond to the prints designated St-2.
- ii) Grade St-3: very thorough scraping and wire brushing, machine brushing, grinding etc. After preparing the surface, it should have a pronounced metallic sheen and correspond to the prints designated St-3.

Blast cleaning:

Compressors: Compressed air supply for blast cleaning shall be free of water and oil. Air compressors shall not be allowed to deliver air at 110deg C. The blasting activity shall be performed at ambient temperatures above 5°C and relative humidity less than 85%. Steel temperature shall be 3°C above dew point. Necessary safety precautions for equipment and operator shall be adhered to.

Abrasives: Abrasives used for blast cleaning carbon steel and alloy steel shall be as per ISO 8504-2 and SSPC painting manual. Suggested abrasives may be chilled iron grit or shot steel and malleable iron grit and shots non metallic abrasive (aluminium oxide, copper slag, garnet etc.).

Removal of mill scale and rust using abrasives such as grit or shot under high pressure. The grade of blasting performed in line with the approved painting scheme.

Surfaces to be coated shall be free of all grease, oil, loose rust, and loose mill scale. Rust, mill scale, weld spatter, flux, shall be removed by the methods indicated in the Coating Schedule. Oil and grease shall be removed by solvent cleaning method as outlined in SSPC - SP – 1 prior to blasting.

The quality and grain size of abrasives and the parameter of their use are to be chosen to obtain the surface profile depth and cleanliness. Abrasives shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertaining to the work.

Profile measurements for abrasive blast cleaned surface shall be made with a Profile comparator and permanent record shall be maintained with Testex Press-O-Film.

Surfaces prepared for coating shall be coated the same day and before any visible rusting occurs (the time elapsed between blast cleaning and

commencement of painting shall under no circumstances exceed 4 hours, but in any case must commence before signs of degradation occur).

After blasting cleaning, depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer of minimum dry film thickness 25 mm may be used.

The grades of surface finish:

	ISO 8501-1	SIS 055900	SSPC	NACE
White metal	Sa3	Sa3	SP5	1
Near White metal	Sa 2½	Sa 2½	SP10	2
Commercial blast	Sa2	Sa2	SP6	3
Brush off blast	Sa1	Sa1	SP7	4

Paint Application

General:

Paints and other coating materials shall be applied in accordance with the paint manufacturer's instructions. The surface preparation and painting system shall be as described in ANNEXURE with the following exceptions:

- Nameplates, code stampings and push buttons
- Concrete brickwork, tile, and glass unless specified by the Purchaser / Engineer
- Non-ferrous materials
- Austenitic stainless steel
- Plastic and / or plastic coated materials
- Insulated surface of equipment and pipes except colour coating wherever required
- Any surface specified by the Purchaser / Engineer not to be painted.

Paint Application Requirements

The paint shall be applied in accordance with the paint manufacturer's product data sheet, which shall include the mix ratio, the method of application, and the use of thinners and over coating times.

Paint application shall be by brush, roller or spray gun. Local regulations regarding spray and roller coating shall be observed. A smooth uniform film shall be applied to the surfaces to be coated.

Painting shall be performed when the temperature of the surface is greater than 3°C above the dew point of the surrounding air and relative humidity of the air is less than 85% unless local conditions dictate otherwise and the Customer is in agreement. Guidance on the estimation of the probability of condensation can be found in ISO 8502-4. The measurement of these conditions is the responsibility of the Vendor.

In addition, paints shall not be applied under the following conditions:

- When the surface temperature is greater than 60 °C (unless a higher temperature is agreed by the paint manufacturer)
- When the air temperature is less than approximately 5°C, (depending on local conditions)

- When there is the likelihood of an unfavourable change in weather conditions within two hours after painting
- When there is a deposition of moisture in the form of rain, condensation, frost, etc., on the surface.
- When the available light is less than 500 lux.

Paints shall not be applied within 50 mm of edges which will later have to be welded. Such weld areas shall be taped/one coat of weldable primer for distance of 50 mm either side of the weld line.

When zinc rich primers are used, care shall be taken to mask to avoid any possibility of over spraying onto duplex, austenitic stainless steels; nickel alloys or 9% nickel steel components.

Two pack coatings like Air drying epoxy, Polyurethane coatings etc shall be mixed in the ratio recommended by manufacturer to ensure proper and complete curing of the coatings. The base and hardener are to be separately mixed first to obtain a homogenous mixture. The hardener is to be added to the base slowly, with continuous mixing / agitation and not the reverse. Power agitation is preferred over hand mixing.

Any addition of thinner to achieve the application viscosity should be made only after the components are thoroughly mixed. Excess thinner is not recommended, as increase in volume, leads to lower DFT, sagging, longer curing time, etc.

Coating containing heavy or metallic pigments that have a tendency to settle shall be kept in suspension by continuous use of a mechanical agitator whilst being applied, to ensure uniformity over the surface area (e.g., zinc MIO's pigmented materials).

Transport and erection of painted structures shall be carried out only after the drying time specified by the paint manufacturer has elapsed. Handling & packing of painted material shall be appropriate to avoid damage to painting, such as the use of non-metallic slings, etc for handling and by minimising handling after painting. All steel equipment shall be provided with priming or coating system to protect the steel surface during transport, storage, installation and construction.

Spray Application

Airless or pneumatic spray applications are preferred methods of application. Spraying shall be carried out keeping the spray gun at the minimum suitable distance from the work piece and consistently at 90° to the surface being painted.

Approval of Purchaser / Engineer shall be obtained during spray painting which may cause interference to other works. If spray painting is to be carried out, the following shall be taken into account:

The correct spray tips, air pressures, etc, as recommended by the equipment supplier, shall be used.

Conventional air spray equipment is used, the correct combination of air volume, air pressure and fluid flow to give good atomisation to be ensured to

get a defect free painted surface. The major disadvantage of conventional air spray is that high build coatings can generally not be applied by this method as most paints have to be thinned to a suitable viscosity for satisfactory atomisation, and so lose their high build properties. Vendor shall follow manufacture's instruction.

Air spray (pressure pot) is recommended in cases where large quantities of paint are to be applied as paint in the tank can be prevented from settling, reduces application time and also enables the gun to be turned to any angle to coat objects effectively without spilling paint.

Airless spray is recommended as high build coatings can be applied without thinning, very rapid application is possible, giving an economic advantage, compared to conventional spray, overspray and bounce-back are reduced, leading to reduced losses of material and less dust and fume hazards.

Each coat shall be applied uniformly and completely over the entire surface. All runs and sags shall be brushed out immediately or the paint shall be removed and the surface re-sprayed.

Very complex structures should be painted by brush instead of spray gun to avoid overspray, dry spray and unacceptable paint losses.

Brush application

Brush application may be used under the following circumstances:

- When areas cannot be properly coated by spraying for reasons such as material or environmental considerations
- For the initial coat of paint to corners, edges, crevices, holes, welds or irregular surface prior to spray application
- For "touch up" or repairs to localized damaged paint or areas of incorrectly applied paint
- Where the paint manufacturer considers the coating material suitable for brush application.

Brushes shall be of a style and quality that will permit the proper application of paint.

Brush applications should be done in two passes that are perpendicular to each other 'wet on wet' so that a smooth coat, as near uniform in thickness as possible, is obtained thereby avoiding running and droplets. There should be no deep or detrimental brush marks. Paint shall be worked into all crevices and corners. Runs and sags shall be brushed out.

During the application of each coat, all areas such as corners, edges, welds, small brackets, bolts, nuts and interstices shall receive additional paint to ensure that these areas have at least the minimum specified dry film thickness and to ensure continuity of coating.

Roller application

Roller application shall only be used on relatively large surface areas and only if spraying is not an option. Roller application shall only be used if the first or priming coat of paint has been applied by brush. Roller application shall be in accordance with the paint Manufacturer's instructions.

Coating materials

The selected coating materials shall be suitable for the intended use and shall be selected after an evaluation of all relevant aspects such as

- Corrosion protective properties
- Requirements to health, safety and environment
- Properties related to application conditions, equipment and personnel
- Experience with the coating materials and coating system.

All coating materials and solvents shall be protected from ignition sources and shall remain within storage temperatures and storage conditions recommended by the coating manufacturer. All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions. Performance standard as listed below shall be established by paint manufacturer the records shall be submitted for review.

- Adhesion test (pull off test)
- Flexibility test
- Salt spray test (min 1000 Hrs)
- Water absorption test
- UV resistance test (external coating)
- Cathodic disbonding test (internal coating)
- Abrasion test (internal coating)
- Impact resistance test
- Sea water immersion test (structures in tidal, splash zone and conveying sea water)

Each product shall have a batch number showing year and month of manufacture and giving full traceability of production. Shelf life shall be included in the technical data sheet. All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions.

The composition of the paint shall be at the discretion of the manufacturer, provided that the finished product meets the requirements of, State or Local regulatory bodies for the products. All vehicle components for use in the manufacture of paints and enamels shall meet the ASTM/ ISO Specification except as otherwise stated coating systems shall be selected as per corrosivity category listed in the table below. Coating systems are tabulated in ANNEXURE and shall be pre-qualified in accordance with specification. Coating systems/ alternative coating systems may be re-subjected to pre-qualification, at the discretion of OWNER/ ENGINEER. The specified coating systems, the number of coats and the coating film thicknesses given in Annexure are minimum requirements Top coat colors should be in accordance with Annexure.

Gratings and step threads

- i) Surface preparation

Gratings and step threads shall be cleaned by acid pickling as per SSPC-SP-08.

- ii) Hot dip galvanising

The hot dip galvanising shall be done as per IS 2629 .The average mass of coating shall be 610 gms/m².

iii) Post galvanising treatment

Immediately after galvanising, post treatment such as chromating shall be applied to retard white rust attack.

iv) Touch up mechanical damages

The repair of damages coatings shall be done as per the recommended practice ASTM A 780.

CORROSIVITY OF ENVIRONMENTS

Corrosivity category		Mass loss per unit surface (per year of exposure)	
		Mass loss g/mm ²	Thickness loss μ m
C2	Low	>10 to 100	>1.30 to 25
C3	Medium	200-400 g/m ²	(25-50 μ m)
C4	High	400-650 g/m ²	(50-80 μ m)
C5	Very High Industrial & marine	650-1500g/m ²	(80-200 μ m)

Tests required for evaluation of acceptance of coating materials:

TABLE -1**PERFORMANCE TEST OF PAINT**

SL. No.	Test	ASTM TEST METHOD
1.0	Abrasion Resistance: (topcoat only)	ASTM D4060
2.0	Adhesion:	ASTM D4541
3.0	Dry Heat Resistance:	ASTM D2485
4.0	Flexibility: (topcoat only)	ASTM D522, 180° bend
5.0	Pencil Hardness: (topcoat only)	ASTM D3363
6.0	Salt Fog Resistance:	ASTM B117, 1000 hours
7.0	Weather Resistance:	ASTMG23 Type D
8.0	Test	ASTM Test Method
9.0	Density	D 1475
10.0	Dipping properties	D 823
11.0	Drying time	D 1640
12.0	Flexibility	D 1737/D 522
13.0	Hardness	D 3363
14.0	Adhesion (pull off test)	D 4541
15.0	Abrasion resistance	D 968/D 4060
16.0	DFT/Coat	As per SSPC Guidelines
17.0	Storage Stability	D 1849
18.0	Resistance to	
	i) Humidity for 2000 hrs.	D 2247
	ii) Salt Spray for 2000 hrs.	B 117
	iii) Accelerated Weathering	D 822

INSPECTION:

Inspection will be performed by an inspector authorised by Purchaser / Engineer. Paint materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specification and shall be accompanied by manufacturer's test certificates.

The painting work shall be subjected to inspection by purchaser / engineer at all times. The vendor shall offer following stage of inspection:

- Surface preparation
- Primer application
- Subsequent coats
- Paint qualification test

Vendor shall provide the expert technical services of the paint manufactures as and when required by purchaser / engineer to ensure both the surface preparation and applications are carried out as per their recommendations. This service shall be provided without any obligation to purchaser.

The following coating inspection & test shall be carried out:

1. Ambient and steel temperature, relative humidity and dew point min twice in a shift.
2. Surface finish & profile check each component or once per 10 m² after surface preparation.
3. Salt contamination test - Free from salt contamination.
4. Dry Film Thickness as per ISO 2808 No.6.
5. Holiday Test as per ASTM D 5162/ NACE RP 0188.
6. Adhesion Test as per ISO 2409 for cross-cut test, or a pull-off test as per ISO 4624/ ASTM D 4541.

6.0 SUGGESTED COLOUR CODES FOR PAINTING:

Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS-5
1.0	Structures, platforms, ladders and handrails	Dark Admiralty Grey	632		
2.0	Boiler casing, ESP and ducting	Nut Brown	413		
3.0	Fans, pumps, motors,	Light Grey	631		
4.0	Tanks (without insulation and cladding)				
4.1	Outdoor	Aluminium			
4.2	Indoor	Light grey	631		
5.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631		
6.0	Switchgear	Light grey	631		
7.0	Control & relay panels	Light grey	631 78 of IS1650		
8.0	Turbine	Golden	356		



Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS-5
		Yellow			
9.0	Generator & exciter	Light grey	631		
10.0	Transformers	Aluminium			
11.0	Machinery guards	Signal red	537		
12.0	Crane				
12.1	Crane structure	Golden Yellow	356		
12.2	Trolley and hook	Crimson	540		
13.0	Piping (without insulation and cladding)				
13.1	Water System				
13.1.1	Boiler feed	Sea green	217		
13.1.2	Condensate	Sea green	217	Light brown	410
13.1.3	Bearing cooling water	Sea green	217	French blue	166

Notes:

1. This colour code basically refers to IS: 2379 for piping with necessary modifications.
2. Where band colour is specified, same shall be provided at 30 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

PAINTING SCHEME FOR C2 AND C3 ENVIRONMENT

S. No	Description	Surface Preparation	Primer			Intermediate paint			Finish coat			Total DFT
			Paint	No. of coats	DFT	Paint	No. of coats	DFT	Paint	No. of coats	DFT	Min.
1.	Boiler structure, un-insulated ducts, suspensions, hangers temperature <120°C	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	120 μ	Poly urethane	2		260μ
2.	Indoor structure	Sa 2 ½	HB Zn Phosphate	2	80 μ	HB MIO epoxy	1	120 μ	--	--	--	260μ
3.	Insulated parts exposed to temp >120°C	Sa 2 ½	In organic Zn silicate	2	60 μ							60μ
4.	Work shop	Sa 2 ½	HB Zn Phosphate	2	80 μ	HB MIO epoxy	1	120 μ	--	--	--	260μ
5.	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	80 μ	HB MIO epoxy	2	200 μ	Aliphatic poly urethane	2	80 μ	360μ
6.	Coal Handling Plant	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	120 μ	poly urethane	2	60 μ	260μ
7.	Fuel pipings	Sa 2	Ehthy Zn silicate	1	40 μ				HR aluminium paint	2	40 μ	80μ
8.	Un insulated silencer, steel stacks >120°C	Sa 2 ½	Ehthy Zn Silicate	1	40 μ				HR silicone aluminium paint	2	40 μ	80μ
9.	Above ground piping	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	120 μ	Poly urethane	2	60 μ	260μ
10.	Burried piping (External)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre									4.0m m
11.	Burried piping (Internal)	Sa 2 ½	Solid rigid poly urethane 500 μ									500μ
12.	Storage tanks (external)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	120 μ	Poly urethane	2	60 μ	260μ
13.	Storage tanks (internal)	Sa 2 ½	3 coats of amine adducts									400μ



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



14.	DM water piping (internal)	Sa 2 ½	Hard rubber lining min 4 mm thickness									4. mm
15.	DM water tank (internal)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	150 μ	HB coal tar epoxy	1	150 μ	380μ
16.	Fuel oil tanks (internal)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	150 μ	HB coal tar epoxy	1	150 μ	380μ
17.	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2	75 μ							75μ
18.	For insulated piping <125°C	Sa 2 ½	Polyamide cured epoxy coating	2	250 μ							250μ
19.	Electrical parts, control panels, valves, pumps & motors (indoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	80 μ	160μ
20.	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	100 μ	180μ
21.	Switch yard, floor grills walk ways	Sa 2 ½	Hot dip galvanising 80μ									80μ

* Note: Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance

PAINTING SCHEME FOR C4 AND C5 ENVIRONMENT

S. No	Description	Surface Preparation	Primer			Intermediate paint			Finish coat			Total DFT
			Paint	No. of coats	DFT	Paint	No. of coats	DFT	Paint	No. of coats	DFT	Min.
1.	Boiler structure, un-insulated ducts, suspensions, hangers temperature <120°C	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	2	200 µ	Epoxy PU HB	2	80 µ	360µ
2.	Indoor structure	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
3.	Insulated parts exposed to temp >120°C	Sa 2 ½	In organic Zn silicate	2	60 µ							60µ
4.	Work shop	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
5.	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	80 µ	HB MIO epoxy	2	200 µ	Epoxy PU HB	2	80 µ	360µ
6.	Coal Handling Plant	Sa 2 ½	HB Zn Phospate	2	80 µ	HB MIO epoxy	2	200 µ	Poly urethane	2	60 µ	340µ
7.	Coal Fuel pipings	Sa 2	Ehthy Zn silicate	1	40 µ				HR aluminium paint	2	40 µ	80µ
8.	Un insulated silencer, steel stacks >120°C	Sa 2 ½	Ehthy Zn Silicate	1	40 µ				HR silicone aluminium paint	2	40 µ	80µ
9.	Above ground piping	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120 µ	Poly urethane	2	60 µ	260µ
10.	Burried piping (external)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel									4.0 mm
11.	Burried piping (internal)	Sa 2 ½	Solid rigid poly urethane 500 µ									500µ
12.	Storage tanks (external)	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	2	200 µ	Poly urethane	2	60 µ	340µ
13.	Storage tanks (internal)	Sa 2 ½	3 coats of amine adducts									400µ
14.	DM water piping (internal)	Sa 2 ½	Hard rubber lining min 4 mm thickness									4.0



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



												mm
15.	DM water tank (internal)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	150 μ	HB coal tar epoxy	1	150 μ	380μ
16.	Fuel oil tanks (internal)	Sa 2 ½	In organic Zn silicate	2	80 μ	HB MIO epoxy	1	150 μ	HB coal tar epoxy	1	150 μ	380μ
17.	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2	75 μ							75μ
18.	For insulated piping <125°C	Sa 2 ½	Polyamide cured epoxy coating	2	250 μ							250μ
19.	Electrical parts, control panels, valves, pumps & motors (indoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	80 μ	160μ
20.	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 μ				Chlorinated rubber	2	100 μ	180μ
21.	Switch yard, floor grills walk ways	Sa 2 ½	Hot dip galvanising coating Wt. 610 gms/M ² (coating thickness of 80μ)									80μ

*** Note:** Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION

After award of LOI, following minimum drawing/documents shall be submitted by the bidder for BHEL and Customer approval. However any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

For the Drawings/Documents Submission Procedure, please refer **Sec-C1**. The submission of soft copy or hard copy of the drawing/document whichever is later will be considered as final date of submission of the drawing/document. The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Bidder to note that the drawings to be submitted by bidder in the event of award of contract shall be as per the below given drawing/document list. Bidder to note that any additional drawings/documents requirement during detailed engineering shall be provided by bidder without any technical, commercial and delivery implications to BHEL. Bidder confirmed that every revised submission incorporating comments – within 7 days.

Bidder further confirmed that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

(a) List and schedule of drawings/documents to be submitted after award of contract:-

SL NO.	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE	SCHEDULE OF SUBMISSION IN WEEKS
1.	PE-V0-426-156-A101	P&I DIAFRAM FOR SIDE STREAM FILTERS	4
2.	PE-V0-426-156-A102	QAP of SSF	8
3.	PE-V0-426-156-A103	PG test procedure for SSF	10
4.	PE-V0-426-156-A104	DATA SHEET FOR INSTRUMENTS for SSF	6
5.	PE-V0-426-156-A105	Civil Assignment drawing for SSF	10
6.	PE-V0-426-156-A106	GA drawing of Side stream filters.	8
7.	PE-V0-426-156-A107	PIPING LAYOUT DRAWING:- SSF (Both inside SSF Area and Yard Piping)	6
8.	PE-V0-426-156-A108	DESIGN CALCULATION & PLATE THICKNESS CALCULATION for SSF	4
9.	PE-V0-426-156-A109	O&M MANUAL FOR SSF	14
10	PE-V0-426-156-A110	Equipment Layout for Side Stream Filtration	4

(b) Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's internal proxy setting should not block DMS application's link
 - (<http://124.124.36.198/wrenchwebaccess/login.aspx>)
- DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.

- For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>

NOTES:

1. A= APPROVAL. I = INFORMATION.
2. ANY ADDITIONAL DRAWINGS-DOCUMENTS REQUIRED DURING DETAILED ENGINEERING STAGE SHALL BE PROVIDED BY BIDDER WITHOUT ANY COMMERCIAL, TECHNICAL AND DELIVERY IMPLICATION TO BHEL AND CUSTOMER.
3. BIDDER TO SUBMIT REUSABLE DATABASE FORMATS IN BHEL/NTPC APPROVED FORMATS LIKE MS EXCEL, MS WORD OF DOCUMENTS LIKE INSTRUMENT SCHEDULE, I/O LIST, DRIVE LIST, FIELD JB TERMINATIONS, CABLE SCHEDULE & INTERCONNECTION, ETC. SOFT COPY OF FORMATS SHALL BE PROVIDED TO SUCCESSFUL BIDDERS.
4. DOCUMENTS PERTAINING TO PROVENNESS TO BE SUBMITTED BY THE BIDDER.
5. DWG. / DOCUMENT SHALL BE UPLOADED BY THE SUCCESSFUL BIDDER ON WRENCH /DMS. PROCEDURE FOR THE SAME WILL BE INFORMED AFTER AWARD OF CONTRACT.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

QUALITY PLAN

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	1X660 MW UPRVUNL PANKI TPS EXTN.				
		SPEC NO:	PE-TS-426-156-A101					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-426-156-A101					Rev:	0				
		Page No	1 of 3					Date:	10/04/2008				
SL NO.	COMPONENETS/ OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOC	ACCEPTANCE NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
A	Proprietary items												
1.0	a) Filtering sand b) Anthracite	Compliance	Major	Doc. Review.	100%	Prop. Doc of Mfr.	Prop. Doc of Mfr.	Mfr's compliance Certificate		P/V	V	*	
2.0	Strainer	a) Dimension	Major	Measurement	100%	Approved drawing/document	Prop. Doc of Mfr.	Mfr's compliance Certificate		P/W	W	*	
		b) Material of composition	Major	Document review	100%	As per relevant standard	As per relevant standard	Mfr's compliance Certificate		P/V	V	*	
B	Miscellaneous items												
1.0	Structural steel	a) Dimension check	Major	Measurement	100%	Approved drawing/documents.	Approved drawing/documents.	Mfr's compliance Certificate		P/V	-	-	
		b) Material of composition	Major	Document review	100%	As per relevant standard	As per relevant standard	Mfr's compliance Certificate		P/V	-	-	
C	Raw material												
1.0	Palates for shell, top& bottom plate, Nozzle Flanges & Nozzle pipes	a) Physical & chemical prop.	Major	Document review	1/Heat	Appd Doc/Drg.	Appd Doc/Drg.	Mill TC/Lab TC.	√	P/V	V	V	
		b) Dimension	Major	Measurement	At random	Appd Doc/Drg.	Appd Doc/Drg.	Log Book.		P	W	V	
			Legend: * RECORD SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.				FOR CUSTOMER USE						
			M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT										
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	2X500 MW, MEJIA PH-II				
		SPEC NO:	PE-TS-270-156B-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-270-156B-A001					Rev:	0				
		Page No	2 of 3					Date:	10/04/2008				
SL NO.	COMPONENETS/ OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOC	ACCEPTANCE NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
2.0	In Process												
2.1	Welding procedure	Welder's ability to perform	Major	Document review	100%	ASME Sec IX.	ASME Sec IX.	QW 482, 483 & 484.		P/V	V	V	
2.2	Checks of dished end (wherever applicable)	Dimension and profile	Major	Measurement	100%	Approved drawing/documents.	Approved drawing/documents.	IR		P/W	V	V	
2.3	DP test on edges, SF and Knuckle.	Surface defects on edges, SF and Knuckle.	Major	Visual & DP Test.	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P/W	V	V	
2.4	All "L" seam & "C" seam set up for dish to shell and shell to shell	Edge preparation, 'V' angle, Root gap, Matching, etc.	Major	Measurement	100%	Appd. Dgr.	Appd. Dgr	IR		P	-	-	
2.5	Back chip & DP test of joints Flanges & Nozzle pipes	Detection of internal defects	Major	DP Test	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P	V	V	
		b) Dimension	Major	Measurement	At random	Appd Doc/Drg.	Appd Doc/Drg.	Log Book.		P	V	V	
CONTRACTOR		FOR BHEL	Legend: * RECORD IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE	NAME & SIGN OF APPROVING AUTHORITY					
			REVIEWED BY										

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	2X500 MW, MEJIA PH-II				
		SPEC NO:	PE-TS-270-156B-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-270-156B-A001					Rev:	0				
		Page No	3 of 3					Date:	10/04/2008				
SL NO.	COMPONENETS/ OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOC	ACCEPTANCE NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
3.0	Final inspection												
3.1	Complete tank	Dimension & orientation of Nozzles	Major	Measurement	100%	Appd.Drg/Doc.	Appd.Drg/Doc.	IR.	√	P/W	W	V	
3.2	Complete tank	Workmanship	Major	Visual	100%	Appd.Drg/Doc.	Free from visual defects	IR		P/W	W	V	
3.3	R.F. Pad test	Pneumatic test	Major	Pneu. Test at 1.5 Kg/Cm2.	100%	-	No leakage	IR	√	P/W	V	V	
3.4	Complete tank	Hydro test/water fill up test	Critical	Water fill up test	100%	Appd. Dgr.	No leakage	IR	√	P/W	W	V	Duration of holding time=8 hrs.
3.5	Painting	Surface finish/DFT adhesion, uniformity & shade	Major	Visual/Measurement	100%	Appd.Drg/Doc.	Appd.Drg/Doc.	IR	√	P/W	-	-	
			Legend: * RECORD IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

DATA SHEET-A

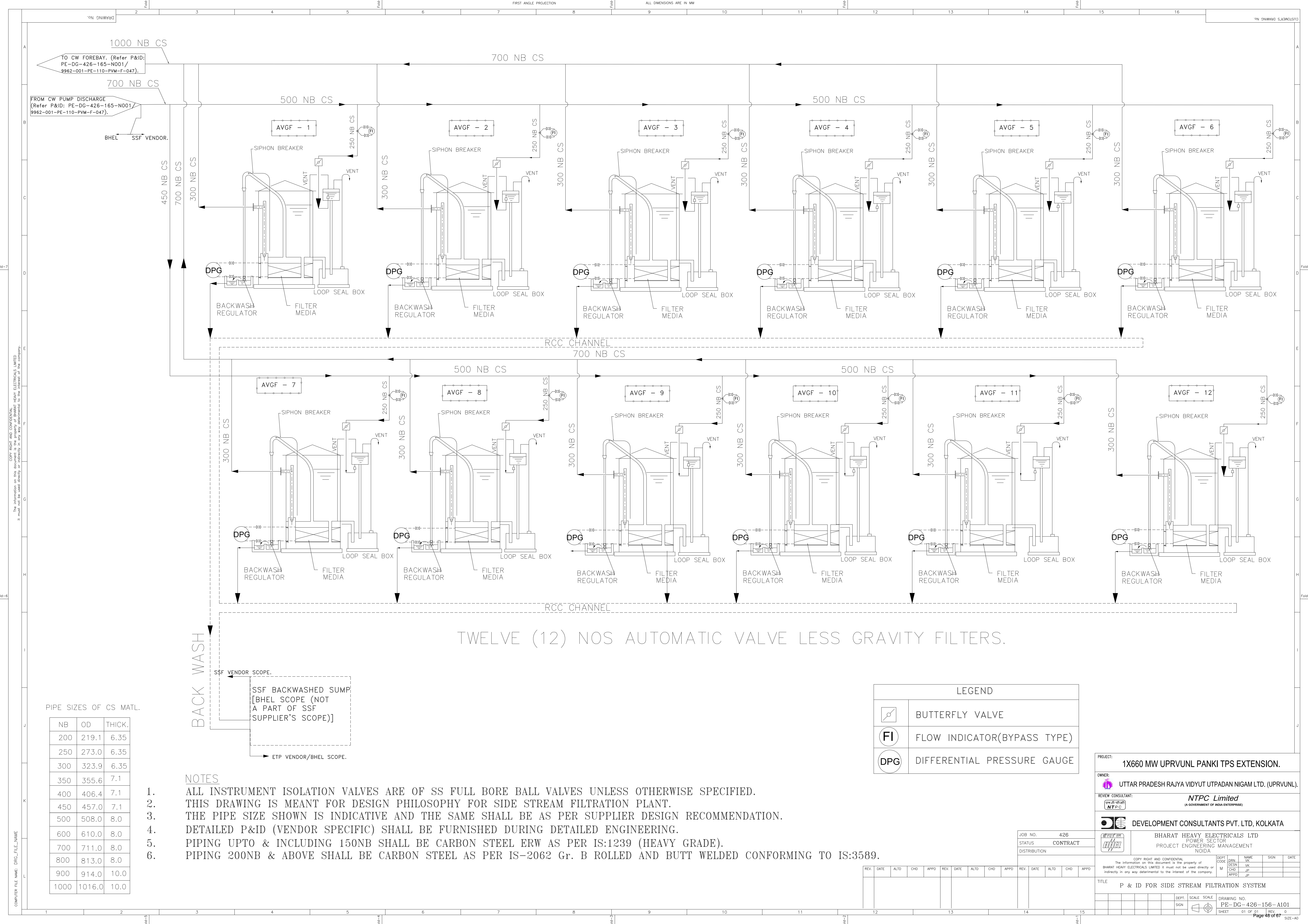
SL NO.	PARTICULARS	DESCRIPTIONS
1.0	SIDE STREAM FILTERS (AUTO VALVE LESS GRAVITY FILTER)	
1.1	Number	12 Nos (10W+2S/Backwash)
1.2	Type	Auto Valve less gravity filter
1.3	Thickness	
1.3.1	Base plate thickness	8 mm
1.3.2	Shell plate thickness	6 mm
1.3.3	Top cover plate thickness or roof	6 mm
1.4	Design Normal Service Flow Rate, in m ³ /hr	Not less than 250
1.5	Design code	IS: 803/ Manufacturer standard.
1.6	Maximum Design Inlet Total Suspended Solid (TSS)	25 PPM
1.7	Design TSS in Treated Water	Total Suspended Solids in effluent water shall be less than 2 ppm with respect to influent total Suspended Solids of around 25 ppm. For suspended solids higher than 25 ppm at inlet, the Suspended Solids in filtered water shall be within 10% of the inlet value.
1.8	Design Temperature, °C	60°C
1.9	Filter media	
1.9.1	Type	Bed of Graded Sand and Anthracite supported over Graded Gravel/ Manufacturers standard.
	Characteristics of Anthracite	
1.9.1.1	Bulk Density	900 kg/m ³ / Manufacturer's standard.
1.9.1.2	Uniformity Coefficient	1.7/ Manufacturers standard.
1.9.1.3	Ash (minimum)	Less than 30 %/ Manufacturer's standard.
1.9.2	Characteristics of Sand	
1.9.2.1	Bulk Density	1400-1600 kg/m ³ / Manufacturer's standard.
1.9.2.2	Acid Solubility	Not to exceed 5% [10% HCL & 24 hrs].
1.9.2.3	Effective size, mm	Around 0.45/ Manufacturer's standard.
1.9.2.4	Uniformity Coefficient	1.6-1.65/ Manufacturer's standard.
1.9.2.5	Silica (minimum)	90 %/ Manufacturer's standard.
1.9.3	Bed type	Single/twin bed type
1.9.4	Bed depth	Shall be as per system requirement/ Manufacturer's standard.
1.9.5	Freed board	50% min
1.10	Design surface flow rate	10 m ³ /hr/m ²
1.11	Material of construction	
	a) Shell	Carbon steel as per IS 2062 or ASTM A 515 Gr. 70
	b) Dish	Carbon steel as per IS 2002 Gr. 2A or ASTM 515 Gr.70.
	c) Bottom Plate	Carbon steel as per IS 2062 or ASTM A 515 Gr.60/70 or better.
	d) Bottom collector plate	Carbon steel as per IS 2062 or ASTM A 515 Gr.60/70 or better.
	e) Strainers	PVC
1.12	Diff. Pressure gauge across the filter bed in each filter.	Provided
1.13	Flow meter/Bypass Rota meter at inlet and outlet of each filter.	Provided.
1.14	Piping	Carbon Steel (IS 1239, Heavy Grade or IS 3589)
1.15	Valves	Carbon Steel
1.16	Manhole	Two (2) nos. (minimum) each of Davit Type and minimum 500 mm diameter.
1.17	Hand hole	One (1) no. of 150 mm diameter for removal of media inside.
1.18	Manual backwashing facility	Shall be provided.
2.0	VALVES	
i.	Gate (All gate valves shall have flanged end connections, it shall be outside screw rising stem type with hand wheel). [Design Std-API 602 and Testing Std-API 598 for <50 NB size and Design Std-API 600 and Testing Std-API 598 for >=50 NB size].	Rating: PN 10 (min). Body/Bonnet – Cast Iron. Stem – stainless steel AISI 410/ 13% chrome steel. Disc – Cast iron. Seat & seat rings – 13% Chromium steel. Hand wheel- Cast iron.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
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		SECTION: C	
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ii.	Ball valve	Type :Full bore, Rating: PN 10 (min), Body: cast Iron/carbon steel Ball: stainless steel, Seat ring: PTFE, Stem: Stainless steel Seat: Nitrile rubber, PTFE
iii	Globe valve [Design Std-BS 5352 and Testing Std-BS 6755 for <50 NB size and Design BS 1873 and Testing Std-BS 6755 for >=50 NB size].	Type: Double flanged. Rating: PN 10 (min). Body: Cast iron:IS 210 Gr FG260 Stem: stainless steel.
iv	Butter fly valve	Butterfly valves shall be of Lugged wafer type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.) Body: cast Iron IS:210 Gr. FG 260 Disc: SS 316. Shaft:ASTM.A296 Gr. CF8M Seat rings: Nitrilerubber, EPDM,Hypalon All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min).

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

P&ID



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PIPE SIZES OF CS MATL.

NB	OD	THICK.
200	219.1	6.35
250	273.0	6.35
300	323.9	6.35
350	355.6	7.1
400	406.4	7.1
450	457.0	7.1
500	508.0	8.0
600	610.0	8.0
700	711.0	8.0
800	813.0	8.0
900	914.0	10.0
1000	1016.0	10.0

NOTES

- ALL INSTRUMENT ISOLATION VALVES ARE OF SS FULL BORE BALL VALVES UNLESS OTHERWISE SPECIFIED.
- THIS DRAWING IS MEANT FOR DESIGN PHILOSOPHY FOR SIDE STREAM FILTRATION PLANT.
- THE PIPE SIZE SHOWN IS INDICATIVE AND THE SAME SHALL BE AS PER SUPPLIER DESIGN RECOMMENDATION.
- DETAILED P&ID (VENDOR SPECIFIC) SHALL BE FURNISHED DURING DETAILED ENGINEERING.
- PIPING UPTO & INCLUDING 150NB SHALL BE CARBON STEEL ERW AS PER IS:1239 (HEAVY GRADE).
- PIPING 200NB & ABOVE SHALL BE CARBON STEEL AS PER IS-2062 Gr. B ROLLED AND BUTT WELDED CONFORMING TO IS:3589.

LEGEND	
	BUTTERFLY VALVE
	FLOW INDICATOR(BYPASS TYPE)
	DIFFERENTIAL PRESSURE GAUGE

JOB NO.	426
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

PROJECT:
1X660 MW UPRVUNL PANKI TPS EXTENSION.

OWNER:
 UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD. (UPRVUNL).

REVIEW CONSULTANT:
 NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

DEVELOPMENT CONSULTANTS PVT. LTD, KOLKATA

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
Noida

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DEPT CODE	DESIGN	NAME	SIGN	DATE
M	YK	YK		
CHD	JP	JP		
APPD	JP			

TITLE
P & ID FOR SIDE STREAM FILTRATION SYSTEM

DEPT.	SCALE	SCALE	DRAWING NO.
SIGN			PE-DG-426-156-A101
SHEET	01 OF 01	REV.	0

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	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

KEY PLAN

KEY PLAN

5 SPACE FOR SERVICE BUILDING

PASSAGE

COND. TRANSFER PUMP HOUSE

16
246.0E
430.5S

236.5E
439.5S

63

FIRE WATER BOOSTER PUMP HOUSE
242.5E
455.5S

290.0E
449.4S

289.0E
495.0S

473.0S

53

E 265.0
S 552.0

AHP CLARIFIER

238.59E
593.19S

Boundary

Road

18

19

17

NDCT

CW TREATMENT PLANT

CW CHLORINATION PLANT

SIDE STREAM FILTRATION UNIT

GEN. STATOR

GEN. STATOR

SPACE FOR PARKING

CT VENDOR

BHEL

6.0E

415.75S

413.0S

451.5S

214.8E

21.0E
540.0S

21.0E
555.0S

21.0E
582.0S

148.0E
539.0S

81.0E
465.0S

53.770M (E)
522.500M (S)

EL. (-) 1.935

R270290 SILL LEVEL

R527250 OF PERIPHERAL DRAIN

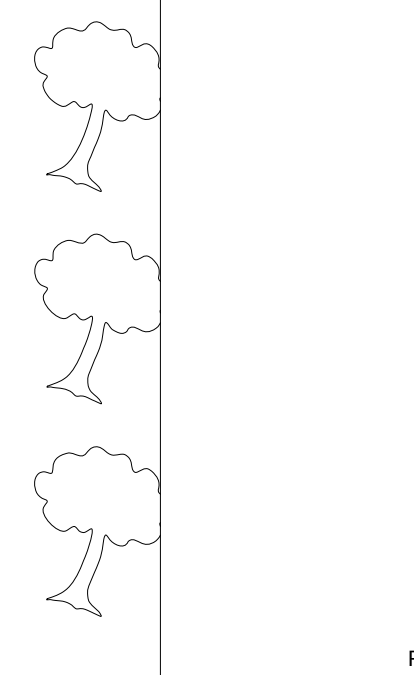
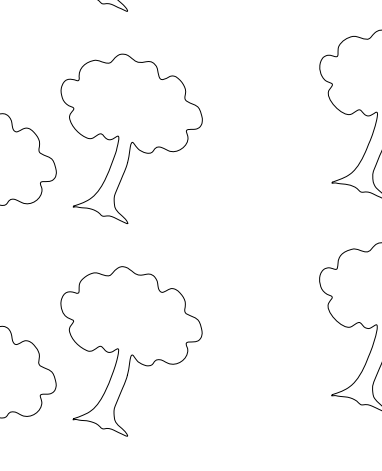
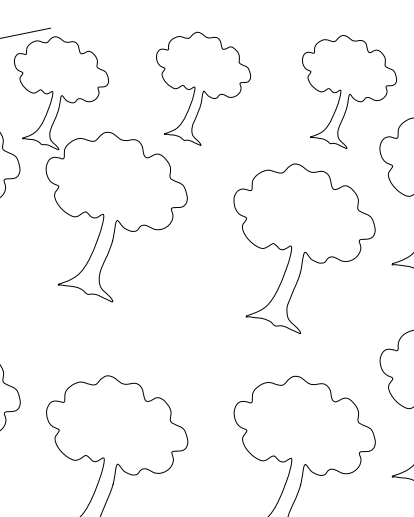
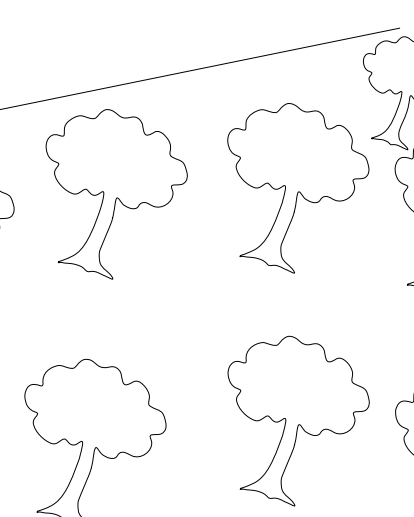
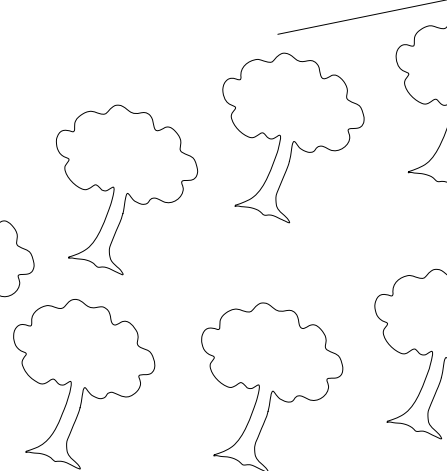
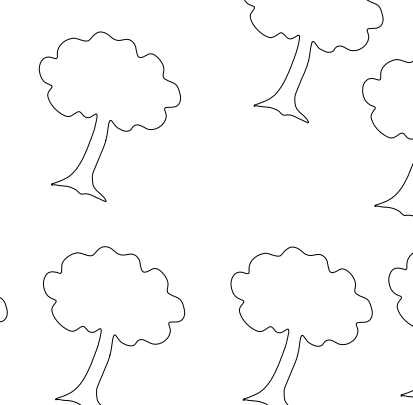
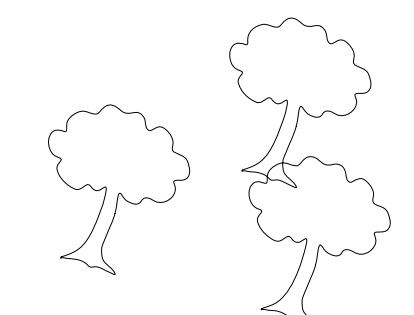
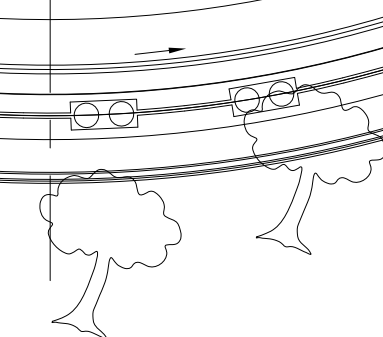
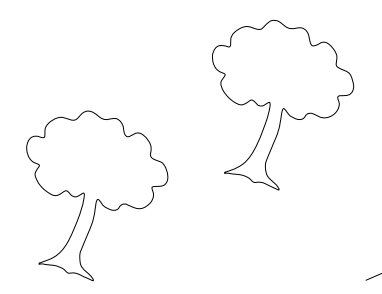
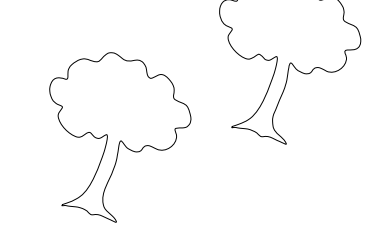
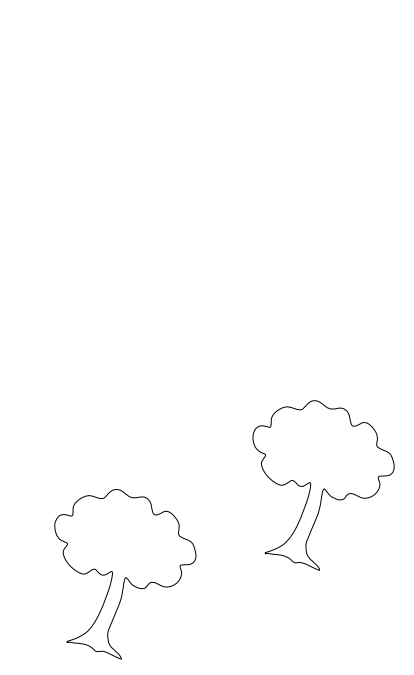
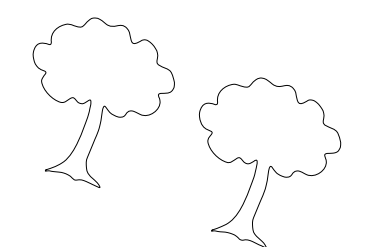
MS DRAIN PIPE

SLUDGE PIT

OVER FLOW PIPE (TYP)

BASIN WALL (TYP.)

QW (0.01575)
RESERVE



	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: D	
		REV NO: 00	DATE:

SECTION-D
(GENERAL TECHNICAL REQUIREMENT)

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: D	
		REV NO: 00	DATE:

1.0 DESIGN PHILOSOPHY:

To reduce the Suspended Solids in the cooling water, at least 2.5 % of the total Circulating Water shall be passed through Automatic Valve less Gravity Filter Units. The filter Units will take the supply of circulating water from discharge header of CW Pumps and after filtration the filtered water will be returned to the CW Fore-bay.

2.0 CAPACITY SELECTION:

CW Flow	=	83300 m ³ /hr
ACW flow	=	3713 m ³ /hr
Total CW and ACW flow	=	(83300+3713)=87013 m ³ /hr
2.5% of total CW and ACW flow	=	2175.32 m ³ /hr
Flow selected with margin	=	2270 m ³ /hr
Capacity of each AVGF	=	250 m ³ /hr
AVGF @250 m ³ /hr	=	9.08 nos
AVGF selected	=	12 Nos (10W+2S/Backwash) each of 250 m ³ /hr is in bidder's scope

3.0 PLANT OPERATIONS AND CONTROL

The Auto Valve-less Gravity Filter operates automatically on the siphon principle. Water enters the Filter Chamber and then flows down through the filter media. The filtered water is collected in Collection Chamber and then travels up through a pipe to service outlet. As dirt is collected over the filter bed in course of service run, the head loss across the filter bed increases and the water level raises in both inlet and backwash pipes. When the water starts to flow over and into the downward section of the backwash pipe, a siphon action occurs. Once the siphon has been established between the filter and the backwash regulator sump, the pressure immediately above the filter bed is lower when the pressure in backwash storage compartment. This causes water from the backwash compartment to flow down through the filter bed, into the collection chamber.

In course of backwash, water is drawn from backwash storage compartment down through the pipe and up through the strainers. Backwash continues until the backwash water level reaches below the terminal of the siphon breaker. The air gets admitted into the backwash pipe and terminates the siphon action as well as backwash.

A differential pressure gauge shall be provided in each filter for monitoring pressure loss locally. Normally 12 out of 14 filters will be in service. The backwash waste from Side Stream Filtration System shall be routed to Waste Water Treatment System.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
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		SECTION: D	
		REV NO: 00	DATE:

FIELD INSTRUMENT DATA SHEET



Technical specification
for
1X660 MW TPS PANKI EXTN.

REV. NO.

00

DATE : 04.04.2019

INSTRUMENTS, JB & VALVES SPECIFICATIONS

CHAPTER-2: FIELD AND MEASURING INSTRUMENTS

2.00.00 MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

- 2.00.01 Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section/chapter 1, Vol. V, Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Owner's approval.
- 2.00.02 Every panel-mounted instrument requiring power supply shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
- 2.00.03 All transmitters, sensors, and switches, Gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Bidder shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Owner during detailed engineering.
- 2.00.04 The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.
- 2.00.05 For corrosive applications, all instruments applications, they shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if proven ness experience of the proposed material for such applications is established by bidder).
- All instruments shall be provided with durable epoxy coating for housings and all exposed surfaces of the instruments.
- 2.00.06 All field instruments shall be weatherproof, drip tight, dust tight and splash proof suitable for use under outdoor ambient conditions prevalent in the subject plant. All field-mounted instruments shall be mounted in suitable locations where maximum accessibility for maintenance is achieved. The enclosures of all electronic instruments shall conform to IP-65 unless otherwise specified (Explosion proof for NEC article 500, class 1/2, Division 1 area & Flame proof area) and an anti corrosive paint shall be applied to the field mounted enclosures / instruments.



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



In general, double cable entry shall be provided, wherever available, unused cable entry shall be provided with blind metal plug. All the field instruments shall also be provided with SS tag nameplate. Counter and mating flange (SS316 material), fastener, gaskets, Nuts, bolts etc. shall also be included wherever required with the field instruments.

- 2.00.07 In general, front draw out type instruments with plug-in facility at the rear for connecting cables for power supply and signal shall be provided unless otherwise specified like for Explosion proof area, Flame proof area and high vibration prone area. Separate plugs & socket connection shall be provided for connecting power supply cables and signal cables.

The plug & sockets shall be polarized to prevent wrong connections and have facility for secure coupling in plug-in position to prevent loose connections.

Signal and Electrical connection shall be screwed connection with double compression type Nickel-plated brass/SS316 cable glands (Material as decided by owner) for Explosion proof area, Flame proof area and high vibration prone area.

- 2.00.08 The quantity of secondary instruments etc. to be provided by Bidder shall be adequate to meet the requirements of Technical Specifications. Any other additional quantity of secondary instruments envisaged by Bidder as per system and process requirements shall also be supplied without any cost implication.

~~2.01.00 SPECIFICATION FOR ELECTRONIC TRANSMITTERS~~

~~2.01.01 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF. PRESSURE AND DP BASED FLOW, LEVEL MEASUREMENTS~~

Sl. No.	Features	Essential/Minimum Requirements
1	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible
2	Accuracy	± 0.1% of calibrated span (minimum) (upto turn down ratio of 10:1).
3	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol)
4	Turn down ratio	10:1 for vacuum/very low pressure applications. 5:1 for very high pressure application. 30:1 for other applications.
5	Stability	± 0.1% of calibrated span for six months for Ranges up to and including 70Kg/cm². ± 0.25% of calibrated span for six months for Ranges more than 70Kg/cm².
6	Zero and span drift	+/- 0.015% per deg.C at max span.



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Notes

~~For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for pressure measurement.~~

~~LVDT type is not acceptable.~~

~~Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.~~

2.02.00 Specification for Pressure Gauge, D.P Gauge, Temperature Gauge and Level Gauge

s. no.	Features	Essential minimum requirements		
		Pr. Gauge/DP Gauge/Draught gauges	Temperature gauge	Level Gauge
1	Sensing Element and Material	Bourdon for high pressure, Diaphragm/ Bellow for Low pr. Of SS 316	Mercury in Steel/Bimetallic type for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body Material	Die Cast Aluminum with stoved enamel black finish /SS316	Die Cast Aluminum with stoved enamel black finish /SS316	Forged carbon steel/SS 304
3	Dial Size	150 mm with toughened shatter proof glass	150 mm with toughened shatter proof glass	Tubular covering entire range
4	End Connection	½ inch NPT (M)	¾" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	+/- 1% span	+/- 1% span	+/- 2%
6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
7	Range Selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale



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8	Over range test	Test pr. For the assembly shall be 1.5 to the max. Design pr. At 38°C		
9	Housing	Weather and dust proof as per IP-65	Weather and dust proof as per IP-65	CS/304 SS leak proof.
10	Zero/span Adjustment	Provided	Provided	-
11	Identification	Engraved with service legend or laminated phenolic name plate		
12	Accessories	Blow out Disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS316 Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of steel/SS as per CS/ alloy process requirement.
13	Material of Bourdon/ movement	SS 316	SS 316	

Notes – *Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with inert liquid suitable for the application.

~~2.03.00 GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER~~

Guided wave radar type level transmitters shall be provided for level measurements of the vessel under vacuum or low pressure applications as specified in Part A.	
Type	Guided wave Radar
Principle	TDR (Time domain reflectrometry)
Probe Type & Material	Coaxial, SS316/316L. If required, probe shall be suitable for overfill prevention.
Connection type and material	Flanged and SS316/316L.
Signal o/p	4-20mA with HART signal suitable for overfill prevention.
Display	Integral
Power supply	24 VDC



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2.12.03 ROTAMETERS

1	Type	Variable Area Metal Tube
2	Fluid media	Water/oil
3	Tube body	SS316
4	Material of float	316 SS
5	Indicator	Linear scale
6	Accessories	Flange, orifice in case of bypass Rota meter (for line size above 100 mm)
7	Housing protection class	IP-65
8	Accuracy	$\pm 2\%$ of measured value

2.12.04 POSITIVE DISPLACEMENT TYPE FLOW TRANSMITTERS

~~The meter shall be a volumetric meter type consisting of two meshing oval wheels driven by the fluid. Each revolution of the oval wheels shall displace a precisely known volume of the fluid from inlet to outlet. The housing/measuring chamber and oval wheels shall be of 316 SS. Air eliminators shall also be provided to ensure maximum accuracy.~~

~~The measurement accuracy of the transmitter shall be better than $\pm 0.2\%$.~~

~~The transmitter shall provide suitable 4-20mA dc output signal for control and indication/recording. Converters if necessary shall be provided to generate the 4-20mA signal.~~

~~A local indicator of fuel oil flow shall also be provided. The instrument shall be calibrated in Tons/hr.~~

~~Suitable strainer shall be provided before the transmitter for the protection of oval wheel meters against foreign matter contained in the fuel oil.~~

~~The exact model no. and type of material being used, etc., shall be subject to Owner's approval during detailed engineering without any price repercussion to Owner.~~

2.12.05 DUAL PATH TRANSIT TIME CLAMP-ON ULTRASONIC FLOW METER

~~The flow meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. They shall comply with relevant international standards and shall be subject to owner's approval.~~

~~All accessories required for mounting/erection of this instrument shall be furnished, erected and installed as necessary for completeness of the system though not specifically asked for. Also the equipment shall include necessary cables, flexible conduits, junction boxes required for the purpose.~~

~~Flow meters shall be provided with suitable environment protection devices/structures such that they shall be suitable for continuous operation in the~~



1 x 660 MW - Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660 MW UPRVUNL PANKI TPS EXTENSION.	SPEC NO: PE-TS-426-156-A101	
		VOLUME: II-B	
		SECTION: D	
		REV NO: 00	DATE:

P&ID FOR CW/ACW SYSTEM



TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660 MW UPRVUNL PANKI TPS EXTENSION.

BHEL DOCUMENTS NO.: PE-TS-426-156-A101

VOLUME **III**

REV. NO. 00

LIST OF SCHEDULES



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660 MW UPRVUNL PANKI TPS EXTENSION.**

SPEC NO: PE-TS-426-156-A101

VOLUME: III

SECTION:

REV NO: 00

DATE:

SCHEDULE OF PRE-BID CLARIFICATION

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

Page 63 of 67

DEVIATION SHEET (COST OF WITHDRAWAL)**PROJECT:-1X660 MW UPRVUNL PANKI TPS EXTENSION.****PACKAGE:- SIDE STREAM FILTRATION PLANT****TENDER ENQUIRY REFERENCE:-****NAME OF BIDDER:-**

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

NOTES:

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660 MW UPRVUNL PANKI TPS EXTENSION.**

SPEC NO: PE-TS-426-156-A101

VOLUME: III

SECTION:

REV NO: 00

DATE:

COMPLIANCE CUM CONFIRMATION SCHEDULE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing 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.
The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder
- c.) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.
- d.) There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'
- e.) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
- f.) 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).
- g.) All sub vendors shall be subject to BHEL/CUSTOMER approval
- h.) Any special tools & tackles, if required, shall be in bidder's scope.
- i.) Demonstration parameters shall stand valid till the satisfactory completion of demonstration test and its acceptance by BHEL/Customer.



TITLE: TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660 MW UPRVUNL PANKI TPS EXTENSION.

BHEL DOCUMENTS NO.: PE-TS-426-156-A101

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REV. NO. 00

SUGGESTIVE PRICE FORMAT FOR SIDE STREAM FILTRATION PLANT FOR 1X660 MW UPRVUNL PANKI TPS EXTN.

Sl. No.	DESCRIPTION OF EQUIPMENT / ITEM	UNIT	TOTAL PRICE FOR "FOR" SITE
(1)	(2)	(3)	(4)
1.0	Total lump sum firm price on FOR site basis for design, engineering, manufacture, inspection, testing at manufacturer's works, supply/delivery duly packed at site including freight, unloading, storage and handling at site, erection and commissioning, trial run at site, PG test, plant handing over to customer etc. inclusive of all prevailing taxes, duties and other levies of Side Stream Filtration Plant complete with all accessories, start up and commissioning spares as required, mandatory spares for the total scope defined as per BHEL Technical specification - PE-TS-426-156-A101 as required for safe and trouble free smooth operation.	SET	
2.0	BREAK-UP OF PRICES GIVEN IN 1.0 ABOVE		
2.1	Total lump sum price on Design, engineering, manufacture, assembly, tests at manufacturer's works, forwarding, transportation, delivery of entire Side Stream Filtration Plant to the site including Start up and commissioning spares as required, as defined subsequently complete with all accessories, auxiliaries as specified in Technical Specification No. PE-TS-426-156-A101 as required for safe and trouble free smooth operation.	LOT	
2.2	Total lump sum price for supply/delivery of mandatory spares as specified in Technical Specification No. PE-TS-426-156-A101.	LOT	
2.3	Total lump sum price on unloading, handling, storage, and in plant transportation at site, erection, commissioning trial run the entire Side Stream Filtration Plant, as defined subsequently complete with all accessories, auxiliaries as specified in Technical Specification No. PE-TS-426-156-A101 as required for safe and trouble free smooth operation.	LOT	
2.4	Total lump sum price on performance guarantee test, and handing over to Purchaser the entire Side Stream Filtration Plant, as defined subsequently the Side Stream Filtration Plant and ancillaries as specified in Technical Specification No. PE-TS-426-156-A101 as required for safe and trouble free smooth operation.	LOT	

Note:

- 1.) PG to consider and suitably incorporate taxes, duties and other commercial aspects.
- 2.) Bidder to quote the Prices in 'figures' along with corresponding 'words'.



TITLE
*** SCHEDULE OF DECLARATIONS**

BHEL DOCUMENTS NO.: PE-TS-426-156-A101

VOL III

SHEET..... OF.....

*** Bidder shall include this schedule both in technical and Price offers**

DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification (except indicated in the deviation sheet (cost of withdrawal).

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

Biders Company Name

Authorised representative's
Signature

Name

Bider's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	