TECHNICAL SPECIFICATION

FOR

FLOW ELEMENT ORIFICE

(ALONG WITH ACCESSORIES)

2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)

VOLUME - IIB

SECTIONS-A, C & D

SPECIFICATION No: PE-TS-491-145-I105

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

TECHNICAL SPECIFICATION
FOR
FLOW ELEMENT- ORIFICE
(ALONGWITH ACCESSORIES)

SECTION – A

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 SCOPE

1.1 This specification covers the Design, manufacture, calibration, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Flow Element Orifice as mentioned in different sections of this specification for **2 X 500 MW NTPC SIPAT, STAGE-II-FGD (LOT-6)** Project.

1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.

1.3 Scope of supply shall be Flow Element Orifice Assembly along with Accessories as indicated in Specification

1.4 Following formats to be signed, stamped with company seal and submitted:

a) Complete offer including calculation sheets, catalogues, etc.
b) Quality Plan
c) Datasheets A & B, duly filled

2.0 GENERAL TECHNICAL INSTRUCTIONS

2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

2.3 BHEL's/Customer's representative shall be given access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him.

2.4 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL.

SECTION-C

- **SPECIFIC TECHNICAL REQUIREMENT**
- **CUSTOMER'S SPECIFICATION**

SPECIFIC TECHNICAL REQUIREMENT

SPECIFIC TECHNICAL REQUIREMENTS

This specification covers the Design, Manufacture, Calibration (at approved labs), Inspection and testing at manufacturer's works, proper packing for transportation and delivery to site of the complete Orifice Plate assembly, Start-up/Commissioning Spares as mentioned in different sections of this specification.

GENERAL INSTRUCTIONS

1.0 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

2.0 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment's shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

3.0 BHEL's / Customer representatives shall be given access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to them.

4.0 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / Customer.

5.0 Quality plan to be duly signed and stamped and to be furnished along with the bid as a token of acceptance. **Any deviation w.r.t Quality Plan shall not be acceptable and bid / offer shall be rejected.**

6.0 In case of any discrepancy in the requirement within the same or different section, as noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre- bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per interpretation of BHEL/customer shall prevail without any commercial implication.

7.0 Scope of supply shall include flow element orifice assembly including flange with nut & bolt, stub, nipples, plug, pair of gasket, spares etc. as indicated in the specification.

8.0 For vertical installation of Orifices (if any), the S-bent impulse pipe shall be supplied by bidder without any commercial implication. The same shall be informed by BHEL during project specific order.

9.0 Inspection will be conducted by BHEL, end customer and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the contract. For all the type tests "Type Test Certificates" shall be furnished. In the absence of the same, such Tests shall be conducted at the Vendor's works in the presence of BHEL, end customer and/or their authorized representatives or in independent Test House/ Laboratory approved by BHEL.

COMPLIANCE CERTIFICATE

We shall comply with the following: -

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / quality plan etc. as enclosed in the tender, shall be fully complied without any deviation.

2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith without any deviation.

3. Sizing Calculations, Data Sheet-C in line with Data sheet-A of specification, dimensional drawings / edge preparation details, etc. shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.

4. Any change in Sizing calculations, QP etc., if desired by BHEL / Customer during approval of the documents after award of contract, without major changes in process parameters as per tender Specification, shall be carried out without any commercial implication and time delay.

5. The offered Flanges, Nipples, Reducers are suitable for the applicable process parameters.

(To be Signed & Stamped by the Bidder)

Signature with date	
Name	
Company seal	

CUSTOMER SPECIFICATION

Power supply 24V DC.

Plug in connector connection.

Insulation : Class “H”

7.00.00 **Limit switches**

Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of Fire alarm Control System subject to a minimum of 60V, 6VA rating. Protection class shall be IP-55.

8.00.00 **SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER**

Type	Coriolis
Material of Wetted Parts	316 SS
Material of Housing	304L SS
Accuracy	± 0.2% of Rate
Repeatability	± 0.1% of Rate
Output	4-20 mA DC, HART Compatible
Power Supply	230 VAC or 24VDC operated
Process Temperature range	0-200 degree Celsius
Others	Drain / purging arrangement shall be provided as per standard practice.

The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer’s approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer’s approval.

9.00.00 **SPECIFICATION FOR FLOW ELEMENTS**

9.01.00 **Orifice Plate**

Features	Essential/Minimum Requirements
Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167
Material	316 SS
Thickness	3 mm for main pipe diameter up to 300 mm and6 mm for main pipe dia above300 mm.
Material of branch pipe	Same as main pipe
Root valve type	Globe
Root valve material	Same as pipe material

	Root valve size	1 / 2 inch or 1 inch (as applicable)
	Impulse pipe of same material up to root valve	Required
	Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.
	Beta Ratio	0.34 to 0.7
	Beta Ratio calculation to be submitted	Yes
	Assembly drg. and flow Vs DP Curves	Yes
	Accessories	Root valves, flanges, Vent/drain hole(As required)

Contractor shall submit certified flow calculation and differential pressure vs. flow curves for each element for Employer's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for Employer's approval.

9.02.00 **Flow Nozzle**

Features	Essential/Minimum Requirements
Type	Long radius, welded type as per ASME PTC-19.5 (Part-III) or BS-1042
Material	316 SS
Thickness	Suitable for intended application.
Material of branch pipe	Same as main pipe
Root valve type	Globe
Root valve material	Same as pipe material
Root valve size	1 inch
Impulse pipe of same material up to root valve	Required
Tapping	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.
Beta Ratio	Around 0.7
Beta Ratio calculation to be submitted	Yes

galvanised pipes shall be done with zinc-rich special electrodes and the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges with zinc-rich electrode will be permitted only when any flange is leak-prone during hydro testing.

e) For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection (with zinc-rich special electrodes) followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint.

18.05.04 **Welded Joints (For steel pipes)**

For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications All welding electrodes and welding rods including special ones, if any shall be furnished by the Bidder.

18.05.05 **Flanged**

a) Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. However for galvanised pipe for 150 NB and above flange-joined pipes may also be adopted as described above

b) Rubber Lined pipes shall be jointed thru flanged connections only

c) Steel pipe flanges shall be generally slip on flat face type. Weld neck flanges shall be used when flange follows immediately after a butt welding or where it is required with respect to service conditions. When weld neck or socket weld flanges are used, their bore must be made the same as that of the pipe being welded to. Socket welded or threaded flanges may be used, with the appropriate piping system for connection of pipe to the flanged equipment.

d) Flange connections on pipes carrying chemicals or chemical solutions are to be fitted with corrosion-resistant, transparent, sleeves to prevent accidents in the event of leakage. For the same reason, pipelines, etc. carrying concentrated chemicals are to be jacketed in transparent plastic material.

Similarly, all areas where concentrated chemicals are handled and mixing pieces are to have transparent shields for protection.

e) All the piping flanges and counter flanges & their drilling shall generally conform to ANSI B 16.5 of relevant pressure & temperature class. Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed. However wherever the interference is involved with the Owner's pipe, the flange/interconnection details shall be designed to match the piping and the details of which will be intimated later.

18.06.00 **Steel Fittings (Bends/ Elbows/ Mitre Bends/Tees/ Reducers etc):**

a) Unless otherwise specified elbows shall be of long radius type

b) For pipe sizes upto 65Nb, long radius forged elbows or seamless pipe bends shall be used. Pipe bends, if used, shall be cold bent to a radius measured to the centre line of pipe of 3 to 5 times the pipe diameter

c) For steel pipes 80 NB and above, seamless long radius forged elbows shall be used. For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. The bend radius shall be 1½ times the nominal pipe diameter. For 90 deg. bends (mitre) 4 pieces (3 cuts) shall be adopted and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534. Mitre bends are not acceptable in case of rubber lined mild steel pipes

d) For pipe fittings such as reducers and tees, the material shall be to ASTM-A-234 Gr. WPB up to 300 NB. However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239. For pipe reducers and tees above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9.

e) For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.

f) For Mitered fittings to be employed in internally coated (Polyurethane / Solvent free Epoxy / glass flake polyester acrylic polymer) special care shall be taken to ensure that no weld burrs, protrusions/ projections or surface irregularities remain before lining material application for internal coating. Such burrs/projections shall be ground smooth to radius of atleast 3mm as specified in the relevant clause for surface preparation for lining.

g) Stainless steel fittings shall conform to either ASTM-A-182 or ASTM-A-403 Class-S, for sizes upto and including 50 mm NB, i.e. the fittings shall be of

SECTION-D

- **EQUIPMENT SPECIFICATION**
- **DATA SHEETS – A & B**
- **QUALITY PLAN**
- **BOQ-MAIN SUPPLY**
- **SPARES**

1.0 SCOPE

This specification covers the Design, Manufacture, Calibration, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Electromagnetic Flow Meter for use in Utility/Captive Power Station/Combined Cycle Station.

2.0 CODES AND STANDARDS

2.1 All the equipment specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 The Electromagnetic Flow Meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. The Design and Materials used for the components shall also comply with the relevant National and International standards.

3.0 TECHNICAL REQUIREMENT

The Electromagnetic Flow Meters and the accessories shall be suitable for continuous operation under an ambient temperature of 0-55°C for Transmitter and (-) 20 to 100°C for Transducer and Relative Humidity of 5-100% unless specified otherwise in volume IIB Section-B or Section-C.

All accessories required for mounting/erection of these instruments shall be furnished as necessary for completeness of the system.

3.1 Accessories: All mounting hardware like clamping fixtures, mechanism to remove the sensors on line, interconnecting screened cables between Transducer & Transmitter, Cable Glands etc. is required to be supplied. Weather canopy for protection from direct sunlight and direct rain shall also be offered as an option. Material of all fittings shall be SS-316.

4.0 GUARANTEE AND PERFORMANCE

The guarantee of flow measuring assembly shall be 18 months from the date of dispatch or 12 months from commissioning whichever is earlier.

5.0 TEST & INSPECTION

5.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipment's offered will meet the specification requirements in full.

5.2 The Quality Plan shall be discussed and finalized with the technically accepted bidders before opening the price bid. The stages where the purchaser would like to be associated for witnessing or verification would be indicated by the purchaser in the Quality Plan before approval.

5.3 Inspection will be conducted by BHEL and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorized representatives or in independent Test House/Laboratory approved by BHEL.

6.0 SPARES AND CONSUMABLES

6.1 Commissioning Spares and consumables

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

6.2 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.3 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

7.0 DRAWINGS & DOCUMENTS

7.1 The offer shall include the following in 4 copies each.

i. Technical data sheet for each flow measuring device assembly in the Pro forma enclosed under Data Sheet-B.
ii. Catalogue/Technical literature.
iii. Assembly drawing with dimensional details.

7.2 4 copy each of the following along with 2 CDs to be furnished after award of contract for owner approval.

i. Technical Data Sheet-C.
ii. Sizing Calculations.
iii. Assembly drawing with dimensions.
iv. Installation drawing.

8.0 FOR INFORMATION

8.1 Storage and Commissioning Instruction
8.2 O&M are to be supplied as specified.

9.0 PACKING & MARKING

9.1 Each item shall be properly packed with adequate protection against friction, stresses, vibration & shock during transportation. Each packing box shall have marking as per Purchase Order.

9.2 Each assembly shall be identified with the following information.
- Tag No.
- Service.
- Line size & thickness.
- Direction of flow.

10.0 APPLICABLE DATA SHEETS

This document shall be read in conjunction with following data sheets.

1. Data Sheet - A & B : Data sheet no. PES-145-27-DS1-0

SECTION-D

DATA SHEETS - A&B

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT Tag No.: SERVICE: QUANTITY:	2X500MW NTPC SIPAT STAGE-II FGD **PCB50CF011** **FGD ACW PUMP DISCHARGE HEADER** ONE (1)	
ELEMENT	MAKE: MODEL TYPE STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	BIDDER TO FURNISH [■] ORIFICE [■] ISO 5167 / [■] BS 1042 [■] SQ EDGE [■] SS316 0.4 TO 0.7 BIDDER TO FURNISH [■] YES [] NO [] YES [■] NO	
END CONNECTION	TYPE FLANGE TYPE FLANGE RATING: MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE NUMBER: SIZE ROOT VALVE MATERIAL: RATING NIPPLE : SIZE/MATL/RATING/QTY	[■] FLANGED [■] BUTT WELD END [■] WELD NECK ANSI – 300 : ASTM A 105 [■] ON FLANGE [■] 3 PAIR // [] 4 PAIR [■] 6 / [] 12 // [] 8 / [] 16 : [■] 15 NB [■] SS316 : [■] ANSI # 800:GLOBE 15NB; SS316; SCH.80; 250mm LONG [■] 6 NOS. / [] 12 NOS // [] 8 NOS. / [] 16 NOS	
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM^2 (A)) TEMPERATURE (DEG. C.) DESIGN PRESS: TEMP MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT MAX FLOW	[]CONDENSATE / [] DMCW / []CW / [■] ACW MAX. NORMAL MINIMUM 100 76 22 36 36 33 10.0 Kg/cm2(g) : 60 °C 0.15 Kg/cm2 Bidder to specify	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH (UPSTREAM: DOWNSTREAM) FLOW DIRECTION*	166.5 X 5.4 [] SA 106 GR B / [] SA 106 GR C / [■] CS AS PER IS 1239 (Heavy Grade) BIDDER TO FURNISH 10 D : 5 D [■] HORIZONTAL / []VERTICAL	
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES 1 No. OF GASKET FOR EACH TAG	[] REQUIRED [■] NOT REQUIRED Bidder to specify [■] REQUIRED	

	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL

- S band shall be provided by the bidder in case flow direction is vertical
- Flow element accuracy is requiring between 20 T/HR and 80 T/HR, recommended range is 0- 100 T/HR

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT Tag No.: SERVICE: QUANTITY:	2X500MW NTPC SIPAT STAGE-II FGD **PCB20CF011** **ECW SUPPLY HEADER TO FGD AUX.'S** ONE (1)	
ELEMENT	MAKE: MODEL TYPE STANDARD DESIGN MATERIAL BETA RATIO BORE DIAMETER VENT HOLE DRAIN HOLE	BIDDER TO FURNISH [■] ORIFICE [■] ISO 5167 / [■] BS 1042 [■] SQ EDGE [■] SS316 0.4 TO 0.7 BIDDER TO FURNISH [■] YES [] NO [] YES [■] NO	
END CONNECTION	TYPE FLANGE TYPE FLANGE RATING: MATERIAL TAPPING LOCATION NUMBER OF TAPPINGS ROOT VALVE NUMBER: SIZE ROOT VALVE MATERIAL: RATING NIPPLE : SIZE/MATL/RATING/QTY	[■] FLANGED [■] BUTT WELD END [■] WELD NECK ANSI – 300 : ASTM A 105 [■] ON FLANGE [■] 3 PAIR // [] 4 PAIR [■] 6 / [] 12 // [] 8 / [] 16 : [■] 15 NB [■] SS316 : [■] ANSI # 800:GLOBE 15NB; SS316; SCH.80; 250mm LONG [■] 6 NOS. / [] 12 NOS // [] 8 NOS. / [] 16 NOS	
PROCESS DATA	FLUID FLOW (T/HR) PRESSURE (KG/CM^2 (A)) TEMPERATURE (DEG. C.) DESIGN PRESS: TEMP MAX. ALLOWABLE PRESS LOSS DIFF. PRESS AT MAX FLOW	[]CONDENSATE / [■] DMCW / []CW / [] ACW MAX. NORMAL MINIMUM 120 90 27 38 38 38 10.0 Kg/cm2(g) : 60 °C 0.15 Kg/cm2 Bidder to specify	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL BORE DIAMETER mm MIN. AVAILABLE STRAIGHT LENGTH (UPSTREAM: DOWNSTREAM) FLOW DIRECTION*	166.5 X 5.4 [] SA 106 GR B / [] SA 106 GR C / [■] CS AS PER IS 1239 (Heavy Grade) BIDDER TO FURNISH 10 D : 5 D [■] HORIZONTAL / []VERTICAL	
OTHER INFORMATION	IBR CERTIFICATION TOTAL WEIGHT OF FLOW ELEMENT AND ACCESSORIES 1 No. OF GASKET FOR EACH TAG	[] REQUIRED [■] NOT REQUIRED Bidder to specify [■] REQUIRED	

	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL

- S band shall be provided by the bidder in case flow direction is vertical
- Flow element accuracy is required between 25 T/HR and 90 T/HR, recommended range is 0- 120 T/HR

SECTION-D

QUALITY PLAN

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO:	DATE:
		CUSTOMER :		QP NO.:PE-QP-999-145-I024, Rev No.:00	DATE:17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: FLOW ORIFICE	SYSTEM: C&I	SECTION:	SHEET 1 OF 2

SNo.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record		Agency			Remarks
1.0	2	3	4	5	6		7	8	9	*	**			10
					M	C/N				D	M	C	N	
1.1	MATERIAL													
	Orifice Plate	Physical, Chemical properties	MA	Physical, Chemical tests	1/Heat	---	Approved Drg / Data Sheet	Approved Drg / data Sheet	Test Certificate	√	P, V	V	-	Refer Note-1, IBR certification(if applicable) to be verified by BHEL
		Dimensions	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P,V	V	-	
1.2	FLANGES													
	a. Forgings	Chemical, Mech Properties, & Heat Treatment	MA	Chemical, Mech Properties, & Heat Treatment	100%	---	ANSI B 16.34	ANSI B 16.34	MTC Cert,HT certificate	√	P, V	V	-	Refer Note-1 & 2
		UT	MA	UT test	100%	---	Material Spec as per ASTM A 388	Material Spec as per ASTM A 388	UT Certificate	√	P, V	V	-	
	b. Machining	Dimensions	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P, V	V	-	
2.0	IN PROCESS													
	Machine	Dimension	MA	Measurement	100%	---	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	V	-	
		Surface finish	MA	Visual	100%	---	---	Mirror Finish	---	√	P, W	V	-	
		Surface flaw on machined surface	MA	Penetrant test	100%	---	ASTM 165 / IS:3658	ASTM 165 / IS:3658	Inspection Reports / Test Certificate	√	P, W	V	-	
3.0	ASSEMBLY and FINAL INSPECTION													
		Overall dimensions	MA	Measurement	100%	100%	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	W	-	
		Marking, Tag no. Direction of flow	MA	Visual	100%	100%	Approved Drg / Data Sheet	Approved Drg / data Sheet	Inspection Reports	√	P, W	W	-	

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	31/8/2020	PRAG JAIN / MAYANK KESHARWANI	Checked by:	31/08/2020	KUNDAN PRASAD			Reviewed by:			
Reviewed by:	31/08/2020	BHARAT SINGH	Reviewed by:	31/8/2020	RITESH KUMAR JAISWAL			Approved by:			

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO:	DATE:
		CUSTOMER :		QP NO.:PE-QP-999-145-I024, Rev No.:00	DATE:17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: FLOW ORIFICE	SYSTEM: C&I	SECTION:	SHEET 2 OF 2

SNo.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record	Agency			Remarks
1	2	3	4	5	6		7	8	9	*	**		10
					M	C/N				D	M	C	N	
		Calibration	MA	Performance test	One per type	---	Approved Data Sheet	Approved Data Sheet	Test Certificate	√	P, W	V	-	Refer Note 4
		Painting	MA	Visual	100%	---	Manufacturer standards	Manufacturer standards	Inspection Reports / Manufacturer records	√	P, W	V	-	
		Root valve BOQ & Access.	MA	Measurement	100%	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	Inspection Reports	√	P, W	W	-	Quantity to be checked physically
4.0	PACKING & DISPATCH	Soundness of Packing against transit damage	MA	Visual	100%	100%	Tech. Spec / Manufacturer standards	Tech. Spec / Manufacturer standards	---	√	P	W	-	Refer Note 10

NOTE:

1. All test reports & dimension reports shall be verified by BHEL wherever verification is by BHEL at the time of Final Inspection.
2. Positive material identification testing (One per type) shall be performed by vendor and the same shall be witnessed by BHEL at the time of final inspection
3. Minimum 2 coats of primer paint to be applied before dispatch (Painting thickness shall be as per Manufacturer's standard)
4. CALIBRATION Test to be carried out at IIT-DELHI / FCRI or NABL approved laboratory.
5. BHEL reserves the right to conduct repeat tests, if required.
6. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed / verified by supplier's TPI.
7. Project specific QP will be prepared based on customer requirement
8. The latest revisions / year of issue of all the standard indicated in the QP shall be referred.
9. Quantum of check by BHEL / BHEL nominated inspection agency shall be indicated during project specific enquiry.
10. Following to be noted for packing:
    a) Material shall be packed suitably in order to avoid damage during transit and also during storage at site.
    b) Photograph of flow element shall be provided, duly packed inside the wooden box just before final packing
    c) Photographs of the packing (with LR No.) shall be provided as per approved packing procedure (if applicable) just before dispatch.
    d) Clearance for dispatch will be given only after receipt of the photos
    e) Sea worthy packing shall be provided, if called for in the Data Sheet. Acceptance norms shall be in line with technical / packing specification.

LEGEND:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,**D**: DOCUMENTATION

** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,

P: PERFORM, **W**: WITNESS, **V**: VERIFICATION, AS APPROPRIATE, **MA**:MAJOR,**MI**:MINOR,**CR**:CRITICAL.

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	31/8/2020	PRAG JAIN / MAYANK KESHARWANI	Checked by:	31/08/2020	KUNDAN PRASAD			Reviewed by:			
Reviewed by:	31/08/2020	BHARAT SINGH	Reviewed by:	31/8/2020	RITESH KUMAR JAISWAL			Approved by:			

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) Page- 2/2

TESTS / ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)
15. Cold junction compensation box	Y	Y	Y	Y					Y			
16. Orifice plate(BS-1042)	Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y
17. Flow nozzle(BS-1042)	Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y
18. Impact head type element	Y	Y	Y					Y				Y
19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y	Y
20. Analysers	Y	Y	Y	Y								
21. Dust emission monitors	Y	Y	Y	Y								
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.												
** If applicable												

R-Routine Test A- Acceptance Test Y – Test applicable

Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.

SUB-SECTION-III-C6

TYPE TEST REQUIREMENTS

1.00.00 **TYPE TEST REQUIREMENTS**

1.01.00 General Requirements

1.01.01 The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the bidder proposes a different standard/code from that indicated at clause no 2.01.00 and at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS' at the end of this chapter and under the item "Special Requirement for Solid State Equipments/Systems".

(a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.

(b) For the rest, submission of type test results and certificate shall be acceptable provided.

i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.

ii. There has been no change in the components from the offered equipment & tested equipment.

iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening.

(c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.

1.01.02 The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.

1.01.03 For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.

1.01.04 The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.

2.00.00 **SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS**

2.01.00 The type test reports which are to be submitted for each of the C&I systems(indicated in clause 2.01.01) shall be as indicated below:

i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems

All solid state systems/ equipments shall be able to withstand the electrical noise

and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI / IEEE C37.90.1.. Hence, all front end cards/ devices which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI / IEEE C37.90.1. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to compliance to ANSI / IEEE C37.90.1, the system shall comply to IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18.

ii) Dry Heat test as per IEC-60068-2-2 or equivalent.

iii) Damp Heat test as per IEC-60068-2-30 or IEC-60068-2-78 or equivalent.

iv) Vibration test as per IEC-60068-2-6 or equivalent.

v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.

vi) Radio frequency immunity test as per IEC 61000-4-6 or equivalent.

vii) Electromagnetic Field immunity as per IEC 61000-4-3 or equivalent.

2.01.01 **C&I Systems-**

Sl. No	Item	Remark	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
1	Control System of DDCMIS		No	Yes
2	PLC, excluding its HMI	Not applicable for integral PLCs and PLCs which are governed by standard practice of OEM	No	Yes
3	VMS System (Applicable for each module of VMS)		No	Yes
4	Main Turbine & BFP Drive Turbine TSI System (Applicable for each module of TSI System)		No	Yes
5	Vibration Analysis System (Applicable for each module of Vibration Analysis System)		No	Yes

6	TG related Special modules like Auto synchronizer, Load transducer module and speed measurement module		No	Yes
7	Master Clock		No	Yes

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

3.00.00 TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS

Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
1	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
2	Instrumentation Cables Twisted & Shielded*				
	-Conductor	Resistance test	VDE-0815	No	Yes
		Diameter test	IS-10810	No	Yes
		Tin Coating test (Persul-phate test)	IS-8130	No	Yes
	-Insulation	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes

		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Cold bend/ cold impact test	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
		Cold bend/ cold impact test	VDE-0472	No	Yes
		Oxygen index test	ASTMD-2863	No	Yes
		Smoke Density Test	ASTMD-2843	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes

-fillers	Oxygen index test	ASTMD-2863	No	Yes
	Acid gas generation test	IEC-60754-1	No	Yes
-AL-MYLAR shield	Continuity test		No	Yes
	Shield thickness		No	Yes
	Overlap test		No	Yes
-Over all cable	Flammability Test	IEEE 383	No	Yes
	Swedish Chimney Test	SEN 4241475	No	Yes
	Noise interference	IEEE Trans-actions	No	Yes
	Dimensional checks	IS 10810	No	Yes
	Cross talk	VDE-0472	No	Yes
	Mutual capacitance	VDE-0472	No	Yes
	HV test	VDE-0815	No	Yes
	Drain wire continuity		No	Yes

* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.

**These tests shall be carried out as per VDE0207 Part 6 & ASTMD-2116 for TEFLON insulated & outer sheathed cables

***Applicable for armoured cables only

3 DC Power Supply System (Applicable for each model and rating)

1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable

	Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).	No	Yes
	Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes
	Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes
	Vibration test	IEC-60068-2-6 or equivalent	No	Yes
	Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes
	Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes
	Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes
	Degree of Protection	IS-13947 or equivalent	No	Yes
4 Battery ##	As per standard (col 4)	IS-10918 (Ni-Cd Batteries)	No	Yes
		IS-1652 (Lead Acid Plante Batteries)	No	

5 UPS (Applicable for each model and rating)

1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable.

2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.

Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or	No	Yes

			(IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).		
		Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes
		Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes
		Vibration test	IEC-60068-2-6 or equivalent	No	Yes
		Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes
		Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes
		Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes
		Degree of protection test	IS-13947	No	Yes
		Fuse Clearing Capability	Approved procedure	No	Yes
		Short Circuit current capability	IEC 60146-2	No	Yes
6	Public Address System				
	IP based PA system components	As per Standard	IEC 60268-16	No	Yes
7	Control Valves	CV test	ISA 75.02& 75.11	No	Yes
8	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes

The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence of owner's representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

SECTION-D

BILL OF QUANTITY

BILL OF QUANTITY

(A) FLOW ELEMENT ASSEMBLIES COMPLETE with Three (3) pairs of tapings, ACCESSORIES, like Gasket, Pressure take-off points, Nipples etc. and commissioning spare of 1 No. of gasket for EACH TAG FOR EACH UNIT (ROOT VALVES shall be under BHEL scope of supply)

S. No.	KKS	SERVICE/ ITEM DESCRIPTION	FLUID	Quantity for Station (in nos.)
1	PCB50CF011	FGD ACW PUMP DISCHARGE HEADER	ACW	1
2	PCB20CF011	ECW SUPPLY HEADER TO FGD AUX.'S	ECW	1

[B] START-UP / COMMISSIONING SPARES FOR FLOW ELEMENT ASSEMBLIES

S. No.	DESCRIPTION	TOTAL QUANTITY
1	PAIR OF GASKETS FOR FLOW ORIFICES	ONE (1) PAIR FOR EACH TAG FOR EACH UNIT

[C] CALIBERATION CHARGES (SEPARATE LIST TO BE ATTACHED)

1332121/2023/PS-PEM-C_I

	PRE-QUALIFICATION REQUIREMENTS	PE-PQ-491-145-I002
		REVISION NO. 00 DATE 06.12.22
		SHEET NO. 1 OF 1

PACKAGE: **FLOW ORIFICE**	PROJECT- 2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)

1.0	
a.	Bidder should be Original equipment manufacturer (OEM) for FLOW ORIFICE.
b.	In case bidder is not OEM, evaluation shall be done as following: 1. If bidder happens to be Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR. 2. If bidder happens to be Authorized channel partner or having a valid collaboration agreement / licensing agreement with some other company or being a Joint Venture Company, then the credentials of collaborator / licensing company / Principal company /JV partner can also be considered for meeting PQR as per scope of the work. The scope matrix shall include their respective roles including design vetting, manufacturing of critical component and warranty/guarantee. If supplier(s) qualifies on the basis of credentials of his principal/JV partner/Collaborator etc., then the principal/JV partner/Collaborator shall be responsible for overall design vetting and warranty/guarantee of the package.
2.0	The Product being offered by the bidder should be in use successfully in power plant or any other industrial application for at least **1 (One)** year. bidder to submit either of following supporting documents for the product: a. Copy of minimum **1 (One)** Performance Certificate from end user / customer certifying that product has been running satisfactorily for **1 (One)** year from date of commissioning to the date of application. The certificate should clearly indicate date of commissioning, date of issue of certificate and name/designation of the certificate issuer. Copy of purchase order & technical parameter to be attached along with the performance certificate. OR b. Copy of repeat orders from minimum **2 (Two)** different purchasers. Order received by bidder from same purchaser with a gap of minimum **2 (Two)** years shall be considered as repeat order. Copy of technical parameters for each order to be attached.
3.0	Bidder to furnish experience list of last 5 years indicating customer name, purchase order reference, item supplied & year of supply to establish the continuity of business.
4.0	Bidder to submit all documents in English. If documents submitted by supplier are in language other than English, a self-attested English Translated document should also be submitted.

Prepared by:	Checked by:	Approved by:
Digitally signed by PRAG JAIN DN: cn=PRAG JAIN, o=BHEL, ou=PS-PEM, email=pragjain@bhel.in, c=IN Date: 2022.12.06 12:36:54 +05'30'	Mayank Kesharwani Digitally signed by Mayank Kesharwani DN: cn=Mayank Kesharwani, o=BHEL, ou=PEM, email=mkkesharwani@bhel.in, c=IN Date: 2022.12.26 11:00:24 +05'30'	Suresh Sharma Digitally signed by Suresh Sharma DN: cn=Suresh Sharma, o=BHEL, ou=PS-PEM, email=sureshsharma@bhel.in, c=IN Date: 2022.12.26 11:33:24 +05'30'
PRAG JAIN	MAYANK KESHARWANI	S.C.SHARMA
MGR-C&I	SR.MGR-C&I	Sr.DGM-C&I

DEFAULT/ BREACH OF CONTRACT, INSOLVENCY AND RISK PURCHASE

In case of delays (beyond the maximum late delivery period as per LD clause) in supplies, or if there be defective supplies or non-fulfilment of any other terms and conditions of the Contract as enumerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the Buyer may be put to incur or sustain by reason of the Seller/Contractor's default or breach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whole or portion thereof without compensation to Seller. On the occurrence of any of the acts/omissions mentioned below, the Buyer may if it so desires, procure upon such terms and in such manner as deemed appropriate, plant/ equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (which shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess costs incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder does not agree to this Risk Purchase clause, BHEL reserves the right to reject the bid/offer of the Bidder.

The order/contract may be cancelled in whole or part thereof and Risk & Cost Clause in line with terms and conditions of PO/Contract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contractor fails to deliver the goods or materials or any installment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;
ii. delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications/execution methodology;
iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.
iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;
v. Termination of Contract on account of any other reason(s) attributable to the Seller.
vi. Assignment, transfer, sub-letting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.
viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
ix. If the Seller/Contractor being a Company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager
x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given in detail in Annexure-V hereto.

ANNEXURE-V

(RISK AND COST CLAUSE)

1. BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

   i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;
   ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;
   iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;
   iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;
   v) Termination of Contract on account of any other reason (s) attributable to Seller.
   vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.
   vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;
   viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;
   ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;
   x) Non-compliance to any contractual condition or any other default attributable to Seller.

1.1 **Risk & Cost Amount against Balance Work:**

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

1.2 *** Balance scope of work (in case of termination of contract):**

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

1.3 **LD against delay in executed work in case of Termination of Contract:**

LD against delay in executed work shall be calculated in line with LD clause no. 16 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below.

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2. <u>Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor</u>

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk & cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.