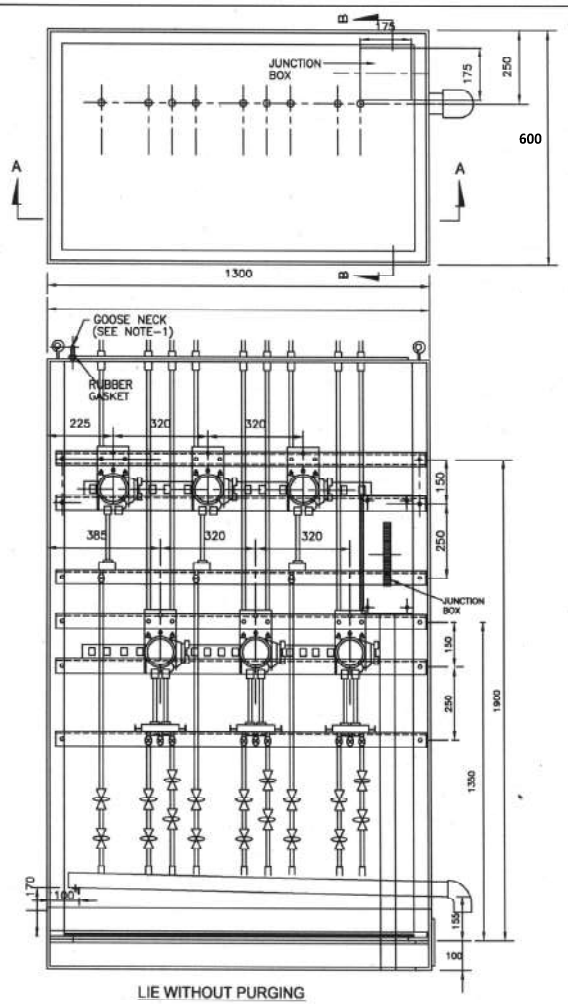
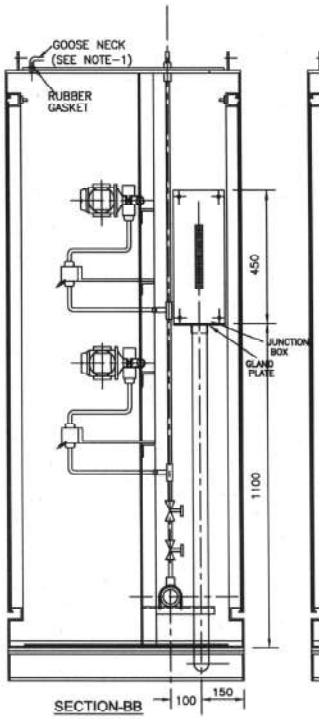
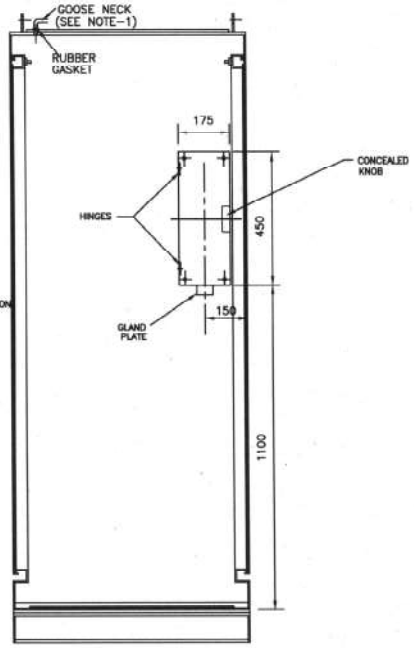


LIE WITHOUT PURGING



SECTION-BB



SIDE ELEVATION

NOTES:-

1. TO BE PROVIDED FOR LIEs USED IN STEAM & WATER APPLICATION.
2. MATERIAL OF JBs FOR LIEs SHALL BE SAME AS THAT OF LIE.

FOR TENDER PURPOSE ONLY

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE						T.G.				21.08.12

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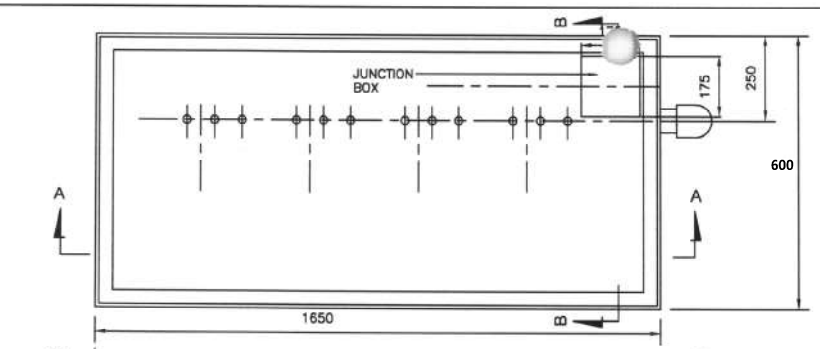
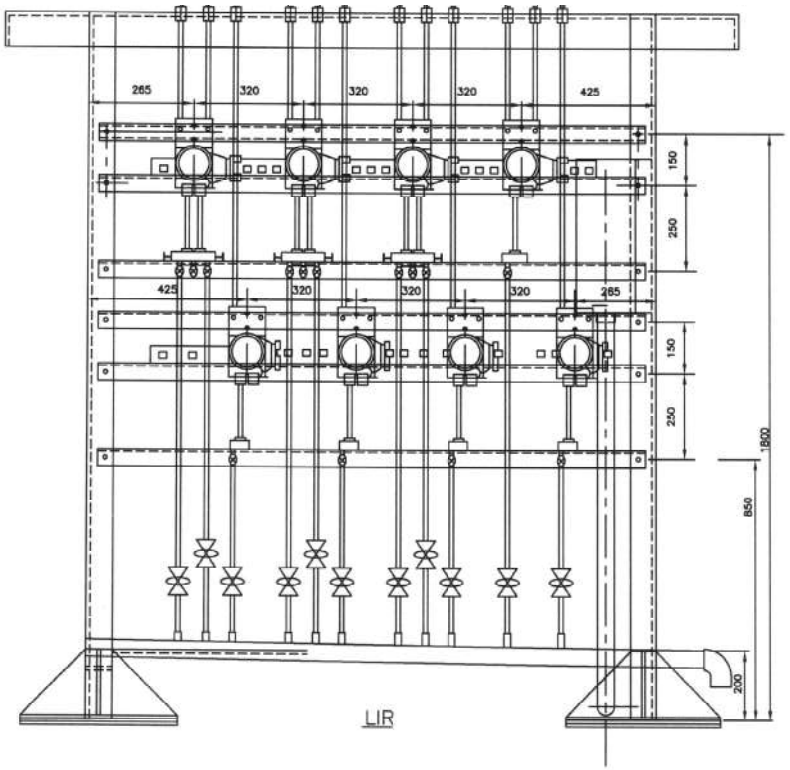
N T P C LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

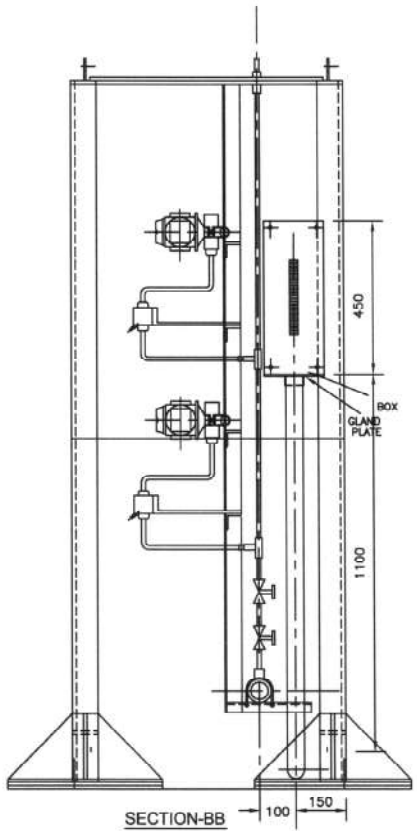
TITLE: TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

SIZE	SCALE	DRG. NO.	REV. NO.
A2	N.T.S.	0000-999-POI-A-064 SHEET 01 OF 03	B





LIR



SECTION-BB

SECTION-AA
LIR WITHOUT PURGING

NOTE:-

1. MATERIAL OF JBs FOR LIRs SHALL BE SAME AS THAT OF LIR.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
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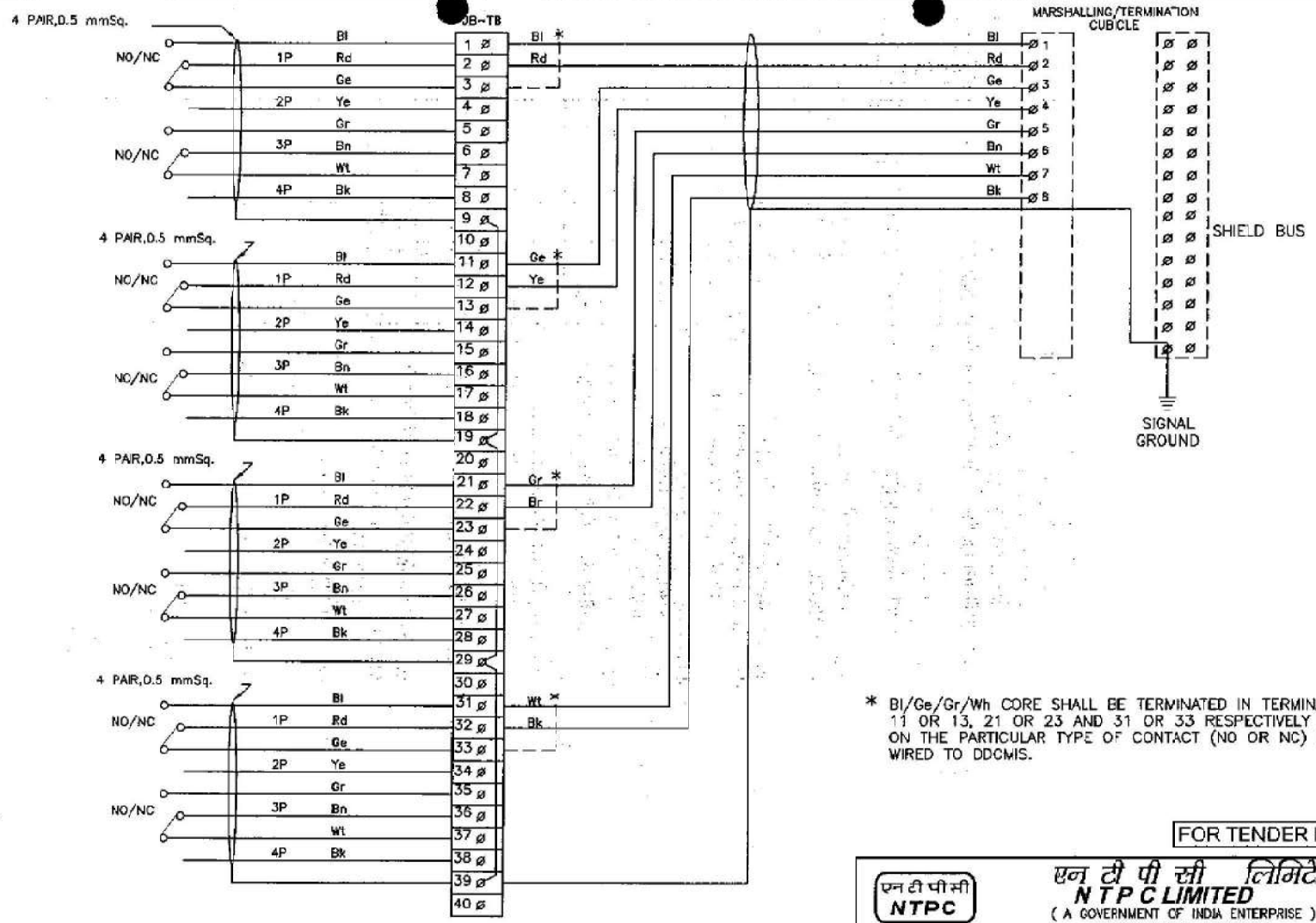
ENGINEERING DIVISION

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE			T.G.							21.08.12

CLEARED BY

PROJECT	TITLE	SIZE	SCALE	DRG. NO.	REV. NO.
TYPICAL THERMAL POWER PROJECT	TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK	A3	N.T.S.	0000-999-POI-A-064 SH- 03 OF 03	A



* Bl/Ge/Gr/Wh CORE SHALL BE TERMINATED IN TERMINAL 1 OR 3, 11 OR 13, 21 OR 23 AND 31 OR 33 RESPECTIVELY DEPENDING ON THE PARTICULAR TYPE OF CONTACT (NO OR NC) IS TO BE WIRED TO DDCMIS.

FOR TENDER PURPOSE ONLY

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NTPC LIMITED
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ENGINEERING DIVISION

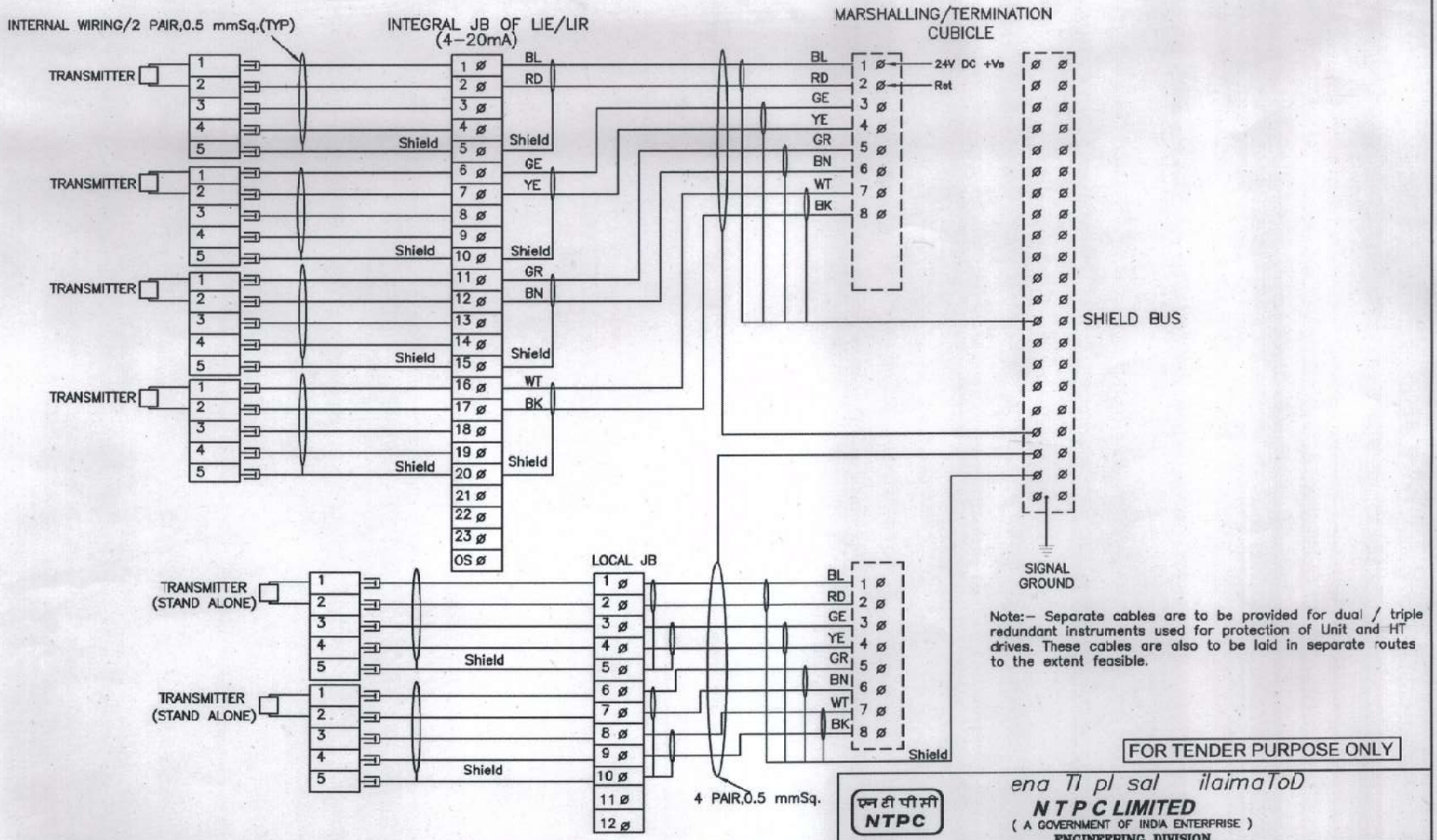
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS
SWITCH TERMINATION DETAILS
NO/NC

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										29.04.06

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065 SH 02 OF 14	A



Note:– Separate cables are to be provided for dual / triple redundant instruments used for protection of Unit and HT drives. These cables are also to be laid in separate routes to the extent feasible.

FOR TENDER PURPOSE ONLY

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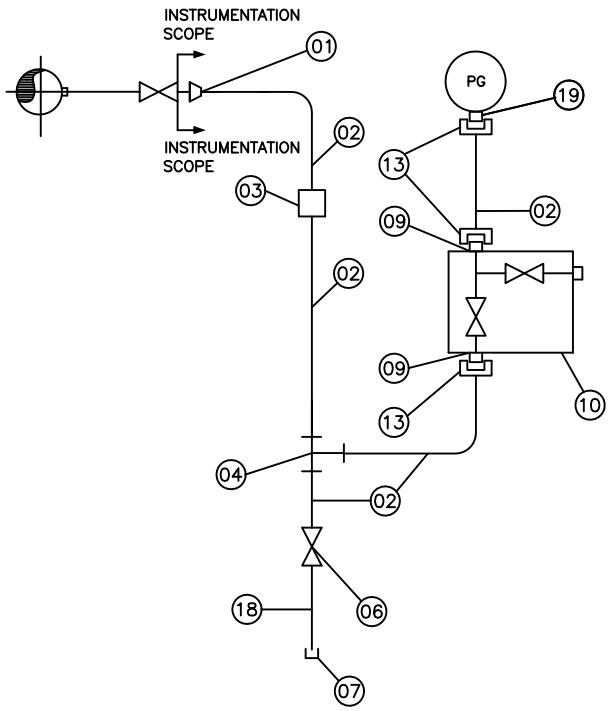
ENGINEERING DIVISION

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
C	NOTE REGARDING CABLE IS ADDED.										10.12.13
B	INTERNAL WIRING FOR LIE/LIR MOUNTED SHOWN WIRING OF STAND ALONE TXTR SHOWN										10.12.06
A	FIRST ISSUE										12.1.05
					CLEARED BY						

PROJECT: TYPICAL THERMAL POWER PROJECT

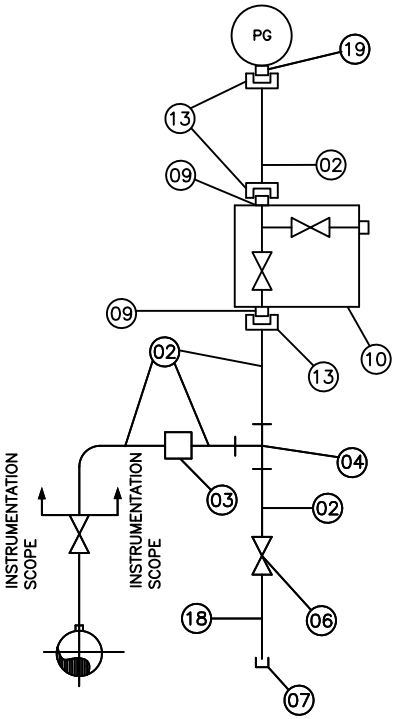
TITLE: INTERFACING OF FIELD INSTRUMENTS 4-20mA

SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065 SH 04 OF 14	C

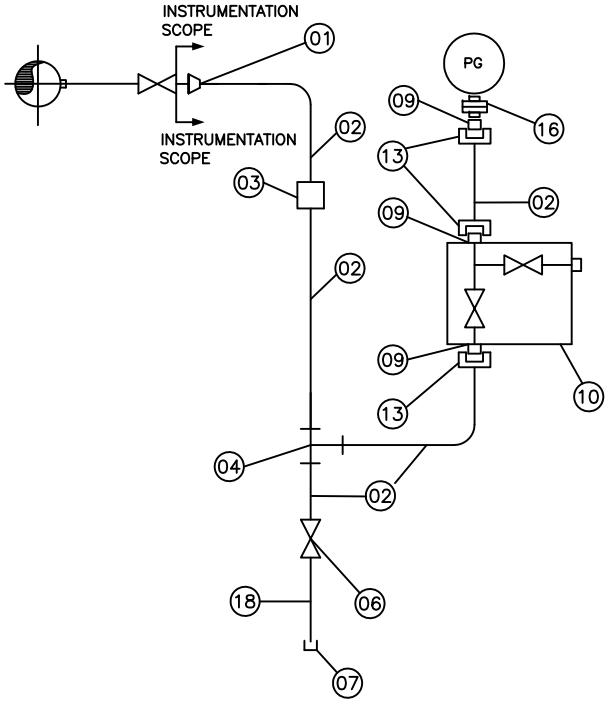


WATER SERVICE

	TITLE :- INSTRUMENT INSTALLATION DIAGRAM PRESSURE GAUGES	DRG. NO.	PE-DG-999-145-IXXX	
		REV. NO.	00	DATE 05.11.13
		SHT	3 OF 9	



AIR SERVICE

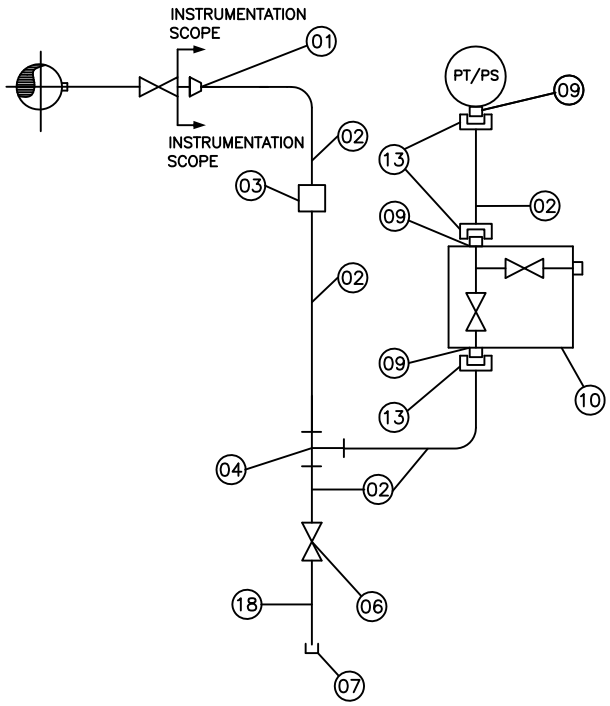


WITH CHEMICAL SEAL

(FOR VISCOUS NON–CORROSIVE FLUID ONLY)

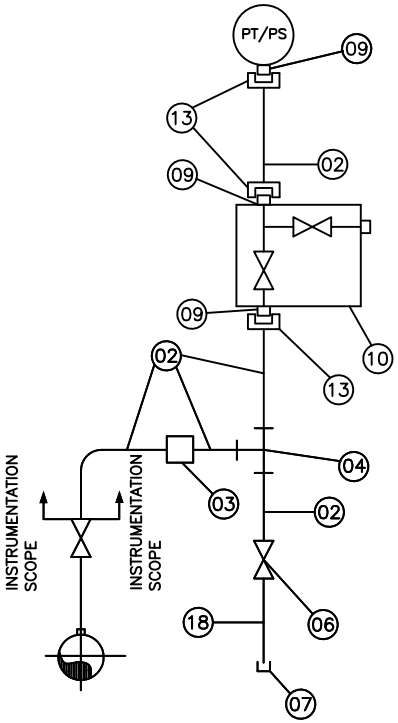
ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY				
				WATER	STEAM	PULSATING	AIR	CHEMICAL
01	REDUCER (IF APPLICABLE)	SAME AS MAIN PIPE	1" X 1/2"SW	01	01	01	00	01
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R	A/R	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R	A/R	A/R	A/R
04	FORGED TEE	SAME AS MAIN PIPE	1/2" SW	01	01	01	01	01
06	FORGED GLOBE VALVE	SAME AS MAIN PIPE	1/2" SW	01	01	01	01	01
07	CAP	SAME AS MAIN PIPE	1/2" NPTF	01	01	01	01	01
09	ADAPTER – M TO M	SS316	M20X1.5M X 1/2" NPTM	02	02	02	02	03
10	TWO VALVE 3 WAY MANIFOLD WITH VENT PLUG	SS316	1/2" NPTF	01	01	01	01	01
11	SYPHON	SS316	1/2" SW	00	01	00	00	00
12	SNUBBER	SS316	M20X1.5M X M20X1.5F	00	00	01	00	00
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	03	03	03	03	03
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00	00	00	01
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	01	01	01	01	01
19	ADAPTER – M TO F	SS316	M20X1.5M X 1/2" NPTF	01	01	01	01	00

BHEL	TITLE :– INSTRUMENT INSTALLATION DIAGRAM PRESSURE GAUGES	DRG. NO.	PE–DG–999–145–IXXX
		REV. NO.	00 DATE 05.11.13
		SHT	4 OF 9

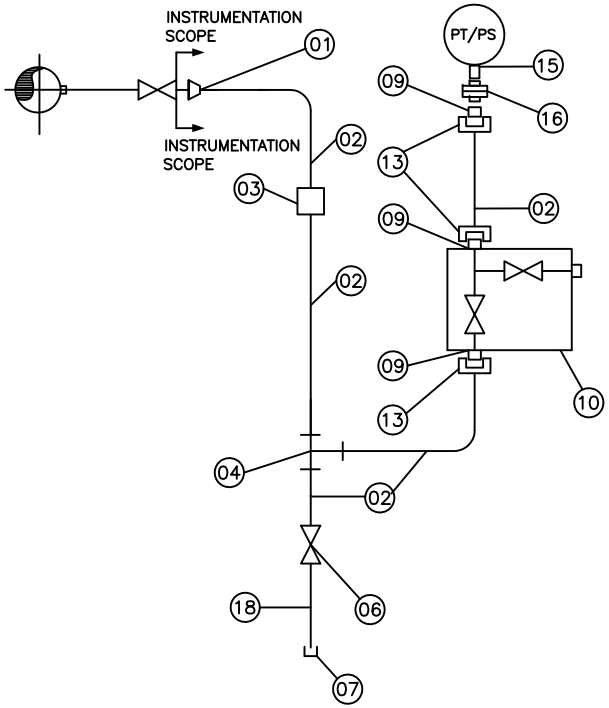


WATER SERVICE

BHEL	TITLE :- INSTRUMENT INSTALLATION DIAGRAM PRESSURE SWITCHES/TRANSMITTERS	DRG. NO.	PE-DG-999-145-IXXX	
		REV. NO.	00	DATE 05.11.13
		SHT	5 OF 9	



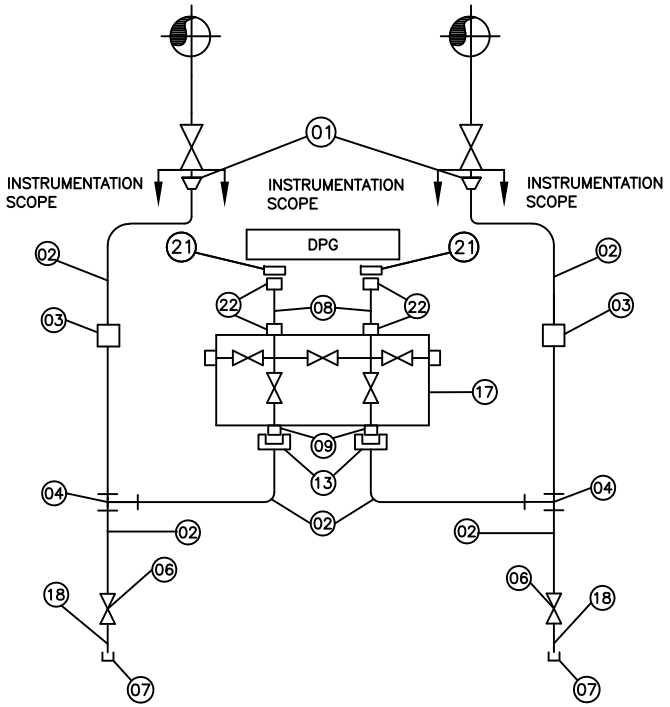
AIR SERVICE



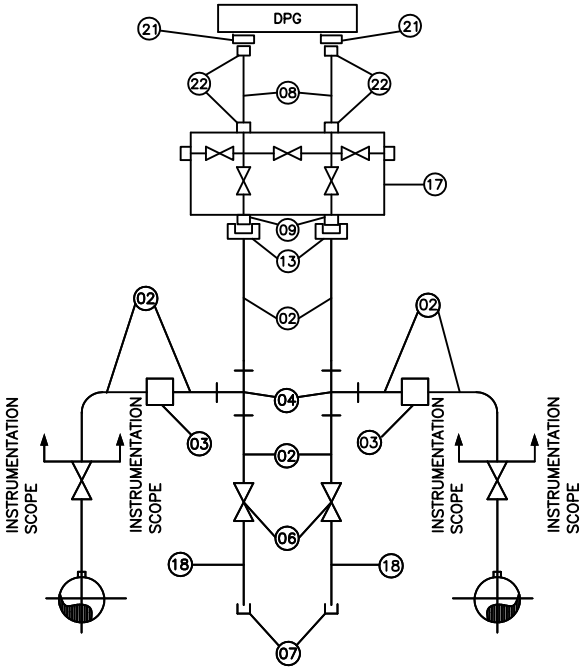
WITH CHEMICAL SEAL
(FOR VISCOUS NON–CORROSIVE FLUID ONLY)

ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY				
				WATER	STEAM	PULSATING	AIR	CHEMICAL
01	REDUCER (IF APPLICABLE)	SAME AS MAIN PIPE	1" X 1/2"SW	01	01	01	00	01
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R	A/R	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R	A/R	A/R	A/R
04	FORGED TEE	SAME AS MAIN PIPE	1/2" SW	01	01	01	01	01
06	FORGED GLOBE VALVE	SAME AS MAIN PIPE	1/2" SW	01	01	01	01	01
07	CAP	SAME AS MAIN PIPE	1/2" NPTF	01	01	01	01	01
09	ADAPTOR – M TO M	SS316	M20X1.5M X 1/2" NPTM	03	03	03	03	03
10	TWO VALVE 3 WAY MANIFOLD WITH VENT PLUG	SS316	1/2" NPTF	01	01	01	01	01
11	SYPHON	CS	1/2" SW	00	01	00	00	00
12	SNUBBER	SS316	M20X1.5M X M20X1.5F	00	00	01	00	00
15	CONNECTOR – M TO M	SS316	1/2" NPTM X 1/2" NPTM	00	00	00	00	01
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00	00	00	01
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	03	03	03	03	03
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	01	01	01	01	01

भेल BHEL	TITLE :– INSTRUMENT INSTALLATION DIAGRAM PRESSURE SWITCHES/TRANSMITTERS	DRG. NO.	PE–DG–999–145–IXXX
		REV. NO.	00 DATE 05.11.13
		SHT	6 OF 9



WATER SERVICE



AIR SERVICE

ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY	
				WATER	AIR
01	REDUCER (IF APPLICABLE)	SS316	1" X 1/2"SW	02	00
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R
04	FORGED TEE	SAME AS MAIN PIPE	1/2" SW	02	02
06	FORGED GLOBE VALVE	SAME AS MAIN PIPE	1/2" SW	02	02
07	CAP	SAME AS MAIN PIPE	1/2" NPTF	02	02
08	SEAMLESS TUBE	SS316	1/2" OD	A/R	A/R
09	ADAPTOR – M TO M	SS316	M20X1.5M X 1/2" NPTM	02	02
17	FIVE VALVE MANIFOLD WITH DRAIN PLUG	SS316	1/2" NPTF	01	01
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	02	02
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	02	02
22	TUBE FITTING DFDC	SS316	1/2" NPTM X 1/2"OD TUBE	04	04
21	CONNECTOR – F TO F	SS316	1/2" NPTF X 1/2" NPTF	02	02

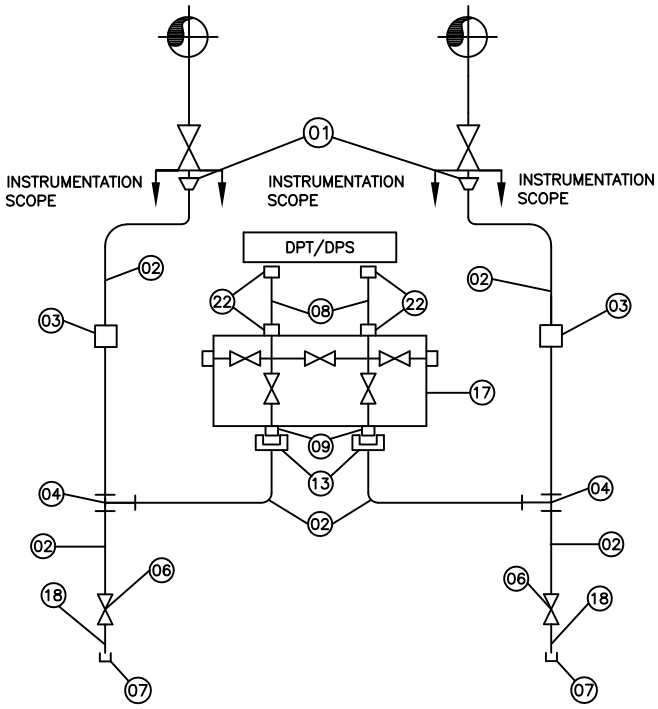
BHEL

TITLE :-

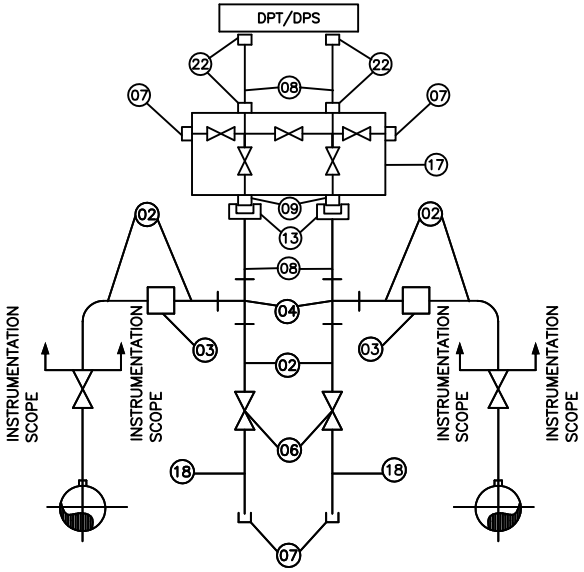
INSTRUMENT INSTALLATION DIAGRAM

DIFFERENTIAL PRESSURE GAUGES

DRG. NO.	PE-DG-999-145-IXXX		
REV. NO.	00	DATE	05.11.13
SHT	7 OF 9		



WATER SERVICE

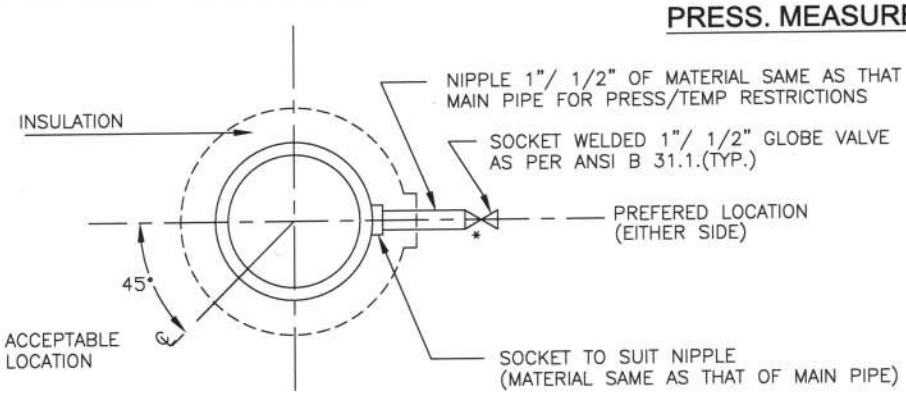


AIR SERVICE

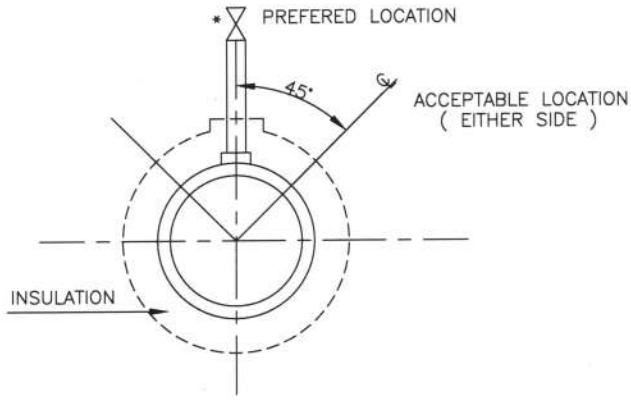
ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY	
				WATER	AIR
01	REDUCER (IF APPLICABLE)	SS316	1" X 1/2"SW	02	00
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R
04	FORGED TEE	SS316	1/2" SW	02	02
06	FORGED GLOBE VALVE	SS316	1/2" SW	02	02
07	CAP	CS	1/2" NPTF	02	02
08	SEAMLESS TUBE	SS316	1/2" OD	A/R	A/R
09	ADAPTER – M TO M	SS316	M20X1.5M X 1/2" NPTM	02	02
17	FIVE VALVE MANIFOLD WITH DRAIN PLUG	SS316	1/2" NPTF	01	01
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00
15	CONNECTOR – M TO M	SS316	1/2" NPTM X 1/2" NPTM	00	00
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	02	02
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	02	02
21	CONNECTOR – F TO F	SS316	1/2" NPTF X 1/2" NPTF	00	00
22	TUBE FITTING DFDC	SS316	1/2" NPTM X 1/2"OD TUBE	04	04

BHEL	TITLE :- INSTRUMENT INSTALLATION DIAGRAM DIFFERENTIAL PRESSURE SWITCHES/TRANSMITTERS	DRG. NO.	PE-DG-999-145-IXXX	
		REV. NO.	00	DATE 05.11.13
		SHT	8 OF 9	

PRESS. MEASUREMENT

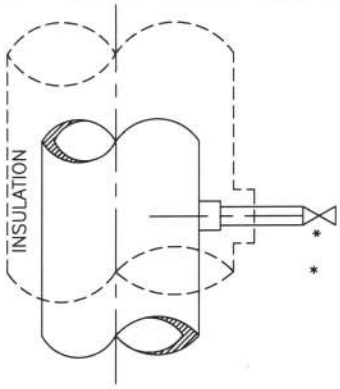


ELEVATION
LIQUID SERVICE



ELEVATION
STEAM SERVICE

PRESSURE CONNECTION ON HORIZONTAL PIPE



* USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm2.

ELEVATION
LIQUID OR STEAM SERVICE

PRESSURE CONNECTIONS ON VERTICAL PIPES

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE		
A	FIRST ISSUE							T.G.			21.08.15		
					CLEARED BY								

PROJECT	TYPICALTHERMAL POWER PROJECT			
TITLE	INSTRUMENT SOURCE CONNECTION DETAILS			
SIZE A4	SCALE N.T.S.	DRG. NO. 0000-999-POI-A-035 Sh-1 Of 14	REV. NO. A	

NTPC LIMITED
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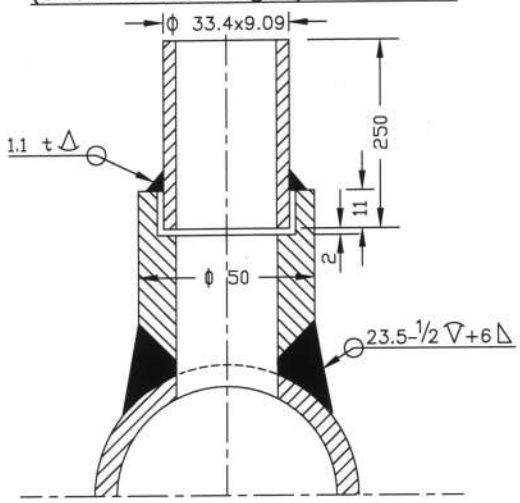
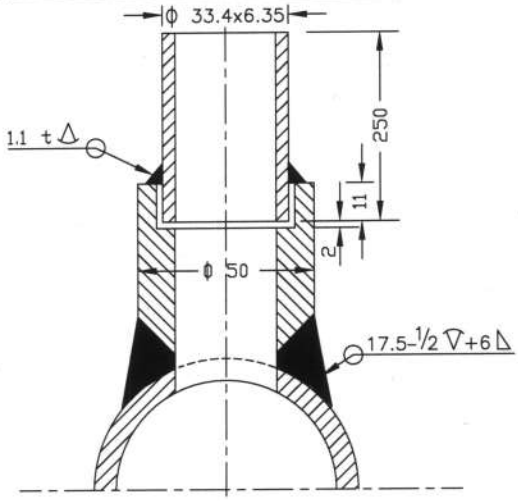
ENGINEERING DIVISION

PRESSURE MEASUREMENT

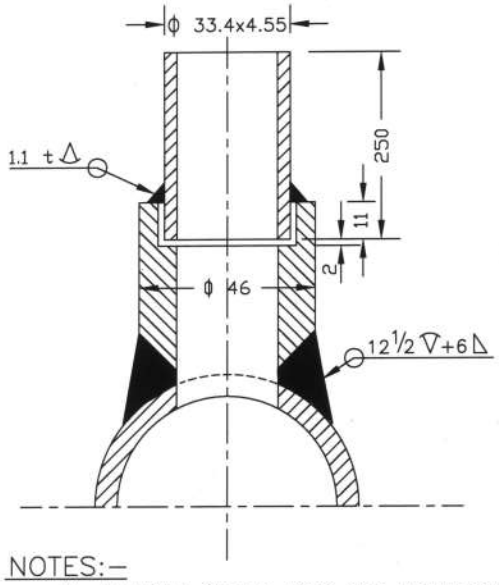
(SYSTEM PR.>40Kg/Sq Cm CL 9000)



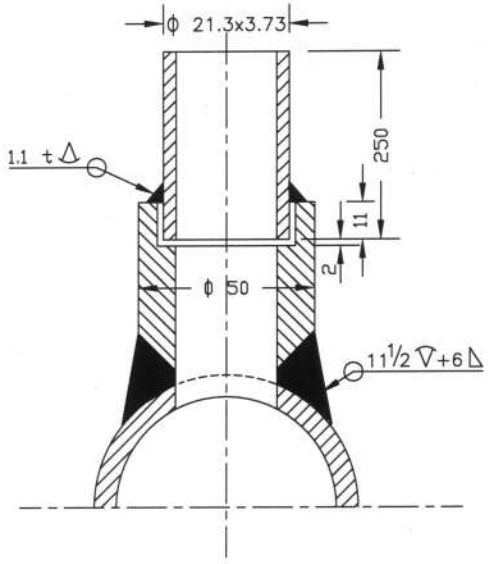
(SYSTEM PR.>40Kg/Sq Cm CL 6000)



(SYSTEM PR. <40Kg/Sq cm Nb 25 CL 3000)



(SYSTEM PR. <40Kg/Sq cm Nb 15 CL 3000)



NOTES:–

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFIRM TO ANSI B 16.11.
2. THE LENGTH OF THE NIPPLE SHOULD BE 250mm.
3. THE OTHER END OF THE NIPPLE SHALL BE SOCKET WELDED WITH 1" GLOBE VALVE OF MATERIAL AS PER ANSI B 16.1.
4. TWO ISOLATED VALVES ARE TO BE USED FOR PRESSURE = >40 Kg/Cm2.
5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES.
6. ORIENTATION OF TAP WILL BE VARY WITH TYPE OF PROCESS FLUID AND NATURE OF RUN OF THE PIPE.
7. ACTIVITIES TO BE COMPLETED AT THE SHOP, WELD THE COUPLING (OR BOSS) ON THE PIPE AND DRILL PRESSURE CONNECTION HOLE (SAME AS I D OF NIPPLE) IN THE PIPE IN ALLIGNMENT WITH HOLE IN THE COUPLING.
8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE
A	FIRST ISSUE							T.G.			21.06.18

CLEARED BY

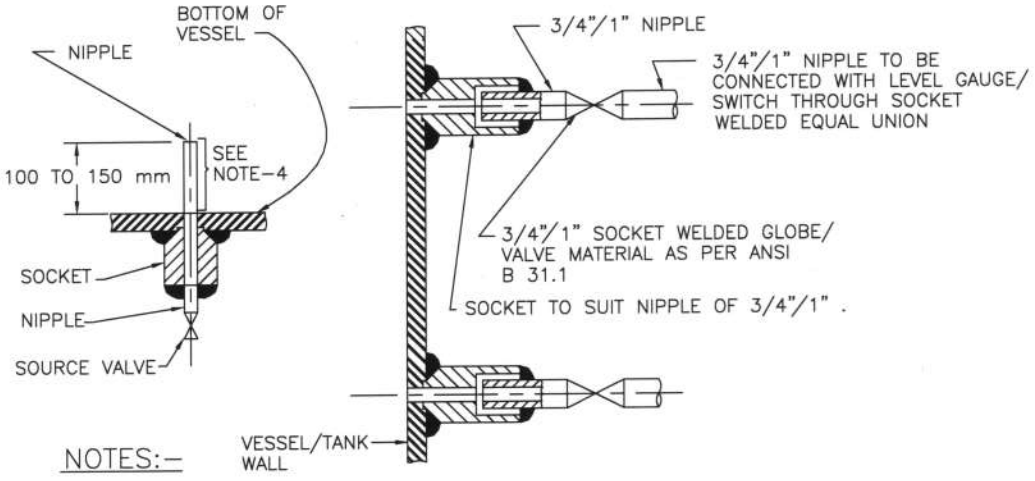
NTPC — **NTPC LIMITED** (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

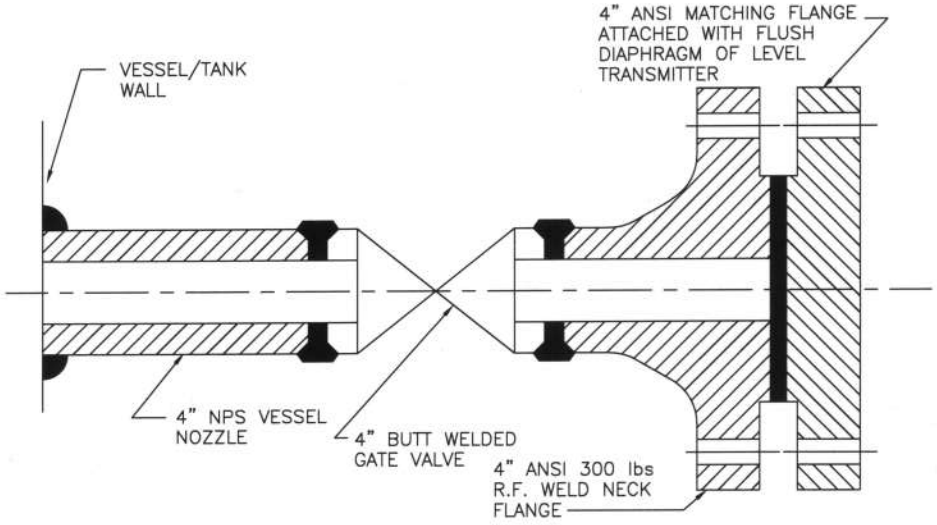
SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh–2 Of 14	A

LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR LEVEL GAUGE AND EXTERNAL CAGE TYPE FLOAT OR DISPLACER OPERATED LEVEL SWITCH.
2. FOR GAUGES 3/4" NIPPLE ALONG WITH 3/4" SW SOURCE VALVE AND FOR SWITCHES 1" NIPPLE ALONG WITH 1" SW SOURCE VALVE SHALL BE PROVIDED AS PROCESS CONNECTION.
3. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
4. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE PROVIDED FOR TANK LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER.
2. WELDING OF MATCHING FLANGE TO GATE VALVE SHALL BE DONE BY BIDDER.

FOR TENDER PURPOSE ONLY

								T.G.					
A	FIRST ISSUE												01.06.15
REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE		
					CLEARED BY								

एन टी पी सी NTPC **NTPC LIMITED** (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-13 Of 14	A

1

INSTRUCTION MANUALS

The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in specification . The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following.

A) ERECTION MANUALS

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of a particular equipment/system. The erection manual should contain the following as a minimum.

a) Erection strategy.

b) Sequence of erection.

c) Erection instructions.

d) Critical checks and permissible deviation/tolerances.

e) List of tools, tackles, heavy equipments like cranes, dozers, etc.

f) Bill of Materials

g) Procedure for erection and General Safety procedures to followed during erection/installation.

h) Procedure for initial checking after erection.

i) Procedure for testing and acceptance norms.

j) Procedure / Check list for pre-commissioning activities.

k) Procedure / Check list for commissioning of the system.

l) Safety precautions to be followed in electrical supply distribution during erection.

B) OPERATION & MAINTENANCE MANUALS

a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.

b) The arrangement and contents of O & M manuals shall be as follows:

1) Chapter 1 - Plant Description: To contain the following sections specific to the equipment/system supplied

(a) Description of operating principle of equipment / system with schematic drawing / layouts.

(b) Functional description of associated accessories / controls. Control interlock protection write up.

(c) Integrated operation of the equipment alongwith the intended system. (This to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers).

(d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries.

(e) Design data against which the plant performance will be compared.

(f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets.

(g) Identification system adopted for the various components, (it will be of a simple process linked tagging system).

(h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume).

2) Chapter 2.0 - Plant Operation: To contain the following sections specific to the equipment supplied

(a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc.

(b) Limiting values of all protection settings.

(c) Various settings of annunciation/interlocks provided.

(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode.

(e) Do's and Don'ts related to operation of the equipment.

(f) Safety precautions to be taken during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions.

(g) Parameters to be monitored with normal value and limiting values.

(h) Equipment isolating procedures.

(i) Trouble shooting with causes and remedial measures.

(j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing.

(k) Routine Operational Checks, Recommended Logs and Records

(l) Change over schedule if more than one auxiliary for the same purpose is given.

(m) Preservation procedure on long shut down.

(n) System/plant commissioning procedure.

3) Chapter 3.0 - Plant Maintenance- To contain the following sections specific to the equipment supplied.

(a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population.

(b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment.

(c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc.

(d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.

(e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out.

(f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done.

(g) Long term maintenance schedules

(h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling.

(i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement.

(j) Tolerance for fitment of various components.

(k) Details of sub vendors with their part no. in case of bought out items.

(l) List of spare parts with their Part No, total population, life expediency & their interchangeability with already supplied spares to NTPC.

(m) List of mandatory and recommended spare list along with manufacturing drawings, material specification & quality plan for fast moving consumable spares.

(n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares.

(o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied.

2 After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in specification. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer.

If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Employer for records and number of copies shall be as mentioned in Annexure-VI.

3 **PLANT HANDBOOK AND PROJECT COMPLETION REPORT**

3.1 **PLANT HANDBOOK**

The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including

i) Design and performance data.

ii) Process & Instrumentation diagrams.

iii) Single line diagrams.

iv) Sequence & Protection Interlock Schemes.

v) Alarm and trip values.

vi) Performance Curves.

vii) General layout plan and layout of main plant building and auxiliary buildings

viii) Important Do's & Don't's

The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.

3.2 **PROJECT COMPLETION REPORT**

The Contractor shall submit a Project Completion Report at the time of handing over the plant.

4 **DRAWINGS**

a) i) All the plant layouts shall be made in computerized 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.

ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per **Annexure-VI** of Part-C. The soft copies shall be uploaded by the vendors in C-folders, a Web-based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC.

Similarly, the vendor can download the drawings/documents, approved/ commented by NTPC, through above site.

The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.

iii) Final copies of the approved drawings along with requisite number of hard copies shall be submitted as per specification.

iv) Contractor shall prepare the model of all the facilities located within plant boundary covering facilities in Main Plant Block area and Balance of plant (BOP) area in an integrated & intelligent 3D software solution. Main Plant Block area shall include Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area, FGD area and any other facility located in main plant block. BOP area shall include all facilities pertaining to AHP, CHP, LHP, GHP, DM PT plant, pipe & cable racks and any other facility located within plant boundary.

All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.), General Arrangement drawings and RCC layout of major buildings and structural arrangement

drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D review model to enable NTPC to review and approve these drawings.

Contractor shall prepare and provide 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc.), which is extracted from intelligent 3D model and shall make a presentation of the same every 3 months from LOA to enable NTPC to review the progress of engineering or as & when required by employer.

The complete 3D data (editable model) which shall be utilised for all future detailed engineering related to maintenance, operation, R&M, efficiency improvement of the project etc. Complete 3D model along with as built GADs, layout, isometrics, reports extracted and 3D models for all disciplines , with any other document generated from 3D model and naming conventions with as-built updates along with complete reference databases, component catalogues for all the size range shall be handed over to owner. Apart from the 3D Model, all drawings like GADs, Isometrics etc. extracted from the model shall also be submitted by the Contractor in Electronic form. 3D model along with complete Project databases shall be submitted at each model review stage and as final as-built. The contractor shall also submit all the configuration files, customization files, templates and all referenced databases.

All input files of software used for design of Equipments / Piping like CAESAR2 files, input files for Pressure vessel design, datasheets etc., shall be handed over to NTPC as per NTPC specifications for handover of Engineering Information.

Further, two Licenses of the used 3D Modelling Software (One for Engineering View and One for Site View) shall be provided along with compatible Hardware for possible review and study of the Model Files being submitted by the Bidder Time to time.

All software provided shall necessarily include cost for perpetual license(s) for use on all the machines and an Annual maintenance contract (AMC) which shall include software upgrades as & when released by the software agency for a period of three years after warranty/guarantee period .

Handover Plan: There shall be continuous handover of documents and data at various stages of the project including rules and trigger points for handover of data to NTPC shall be at 30%, 60% and 90 % of 3D

model stage.

Database backup shall be taken every month and handed over to NTPC.

b) All documents/text information shall be in latest version of MS Office/MS Excel/PDF format as applicable.

c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.

d) Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

e) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.

Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION" prior to submission **in line with suggestive MDL.**

Further, space shall be identified on each drawing for Approval stamp and electronic signature.

f) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or

approval by the Employer/ Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.

g) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.

h) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.

i) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority/ representative of Employer based on requirements of such piping indicated in approved/ finalised Flow Scheme/ Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.

Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.

j) As Built Drawings

After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to “as built” conditions and submit no. of copies

k) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout

completely and collect all necessary data/ drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

l) The Contractor shall submit adequate prints of drawing / data / document as per Annexure-VI. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule.

m) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.

SECTION-C1
TECHNICAL SPECIFICATION
(OPERATION AND MAINTENANCE SERVICES FOR VENTILATION SYSTEM)

1.0 OPERATION AND MAINTENANCE SERVICES

The bidder scope also covers the Operation and Maintenance (O&M) services for Preventive and Breakdown maintenance from the date of successful commissioning till handing over to end customer. However, actual date of start of O&M services shall be communicated to successful bidder by BHEL site personnel.

Bidder to note that the spares and consumables required for maintenance of the equipment during this O&M period shall be in bidder's scope of supply. Bidder shall use only genuine parts as mentioned in O&M Manual. Any damage or malfunction caused by the use of unauthentic parts or unqualified personnel shall be responsibility of bidder and as a consequence of above bidder is required to replenish the unauthorised part and abridge the qualified person without any commercial implication to BHEL.

O&M Services scope also covers all regular maintenance by trained service engineers and supply of genuine parts and lubricants as per the original equipment manufacturer's recommendations.

For the purpose of Operation of Ventilation System, One-day shall be considered as 24 hours i.e. 3 shifts of 8 hours each. The Ventilation System (along with related accessories) shall be operated on Round-the-clock basis on all the days of the year including Sundays and Public Holidays

O & M Personnel should be acquainted with local language. Governmental / Statutory approval w.r.t. O&M service as applicable shall be in bidder's scope.

Total duration of the Operation and Maintenance services has been envisaged for **Twelve (12)** months for individual Ventilation System / buildings identified in price format/specification. The duration of operation & maintenance services can be increased or decreased as per requirement and payment in such case shall be made on pro-rata basis.

The operation and maintenance services can be continuous or intermittent as per site requirement for individual Ventilation System / buildings identified in price format/specification.

Bidder has to compulsorily maintain log book for the O & M staff engaged for O&M jobs and submit to Engineer-in charge for certification for realization of the bills. After certification of the bill by Engineer in charge of BHEL, bidder shall claim the amount after completion of minimum 30 days.

Depending on start of O&M services, there is a possibility that some period of O&M services and Warranty period may overlap. However, it is clarified that any maintenance required or any spare of Ventilation System required to be replaced during Warranty period (as part of warranty clause requirement) shall not be made part of O&M Services. Bidder may take care of this fact while working out the prices of O&M services

Wherever Ventilation system has been written in O&M Service Specification, the same shall be deemed as complete Ventilation System.

The vendor shall deploy following minimum manpower for Operation of Ventialtion System.

i. Two qualified and experienced operator per shift on "Round the Clock" basis throughout the year for all days of the year including Sundays & Public Holidays. There must be minimum 30 minutes overlapping between two shift operators to get familiarize with the status of Ventilation System.

ii. One Helper per shift on " Round the Clock" basis throughout the year for all the days of the year including Sundays and Public Holidays. The helper shall assist the Ventilation System Operator in day to day operation of Ventilation System and accessories and shall assist him for keeping Ventilation System equipment's in neat and tidy condition.

1.1 Responsibility of System Operator

i. Ventilation System operator shall be responsible for proper sequential operation of Ventilation System in a predefined sequence and stopping the same (when necessary) as per the procedural practice. In case of any abnormality (like non availability of power supply at incomer of Ventilation System), he shall immediately report the matter to BHEL site Engineer for further action. Similarly, any malfunctioning in the system shall be immediately reported by him to BHEL site Engineer for suitable corrective action irrespective of time of occurrence of malfunctioning / abnormality in the system. A log book of all such outrages shall be maintained by Ventilation system operator, which shall be shared with BHEL site engineer on periodic basis.

ii. Ventilation System operator shall take hourly readings of all the parameters of Ventilation System / Equipment's including reading on main electrical panel of Ventilation System.

1.2 Responsibility of Helper.

i. The Ventilation System helper shall assist Ventilation System operator for day to day smooth operation of Ventilation System, like Checking of water levels of Air Washer/UAF Tank, cleaning of Tanks, cleaning of strainers, cleaning of Air Washer / UAF filters and other filters etc. as and when required. He shall be responsible for keeping all the equipment's of Ventilation System as applicable in clean and tidy condition. He shall also carry out general cleaning of all Ventilation equipment including Electrical Panels (Part of Ventilation System), etc. on regular basis.

ii. The helper shall work under the control of Ventilation System operator and shall always ensure that unusable junk materials are not allowed to be kept in Ventilation Systemequipment.

iii. Under such eventuality, he will report the matter to Plant Operator, who in turn will take suitable action including reporting the matter to BHEL site Engineer.

1.2.1 All the log book registers shall be arranged by vendor. Log book register duly paged and bounded will be maintained in good condition by vendor.

1.2.2 All the necessary tools & tackles and other materials, required for operation of Ventilation System shall be kept by vendor under the control of Ventilation System operator. These tools & tackles shall be separate from tools & tackles (as per price format) which shall be handed over to customer in new condition. Required testing instruments like Multi Meter (for Electrical portion of Ventilation System), Sling pshycrometer, Line Tester, Tool Kit, Torch, Pressure testing kit etc. should also be always available with Plant Operator.

1.2.3 In case of any operator / helper being on leave, vendor shall immediately take advance action and provide substitution so that minimum manpower as indicated above is not reduced on any day. In case a particular shift duty Operator or helper does not turn up due to any reasons, the earlier duty person shall continue to make sure that System never remains unattended.

2.0 Maintenance of Ventilation System

i. Maintenance work under scope of the vendor shall broadly include but in no way limited to the following:

a) Preventive maintenance of the plant.

b) Servicing of the plants and associated equipment's at regular interval

c) Attending to complaints.

d) Replacement of worn out or defective components

e) Replacing of consumables as and when required.

No consumable or any other items of system shall be arranged by Customer and no extra payment shall be made by customer in this regard.

ii. Vendor shall be responsible at all time, during the entire period of contract for satisfactory performance of Ventilation system (including accessories) with zero down time. During emergency or breakdown, vendor's Engineer along with related technicians shall be available immediately even though it may be beyond normal working hours or on public holidays till the Ventilation System is restored back into normal satisfactory condition. Response time for attending breakdown complaints shall not exceed 2 hours.

iii. Defective / worn out components shall be replaced only by genuine and original parts. OEM or its authorized dealer's invoice shall be submitted as proof of using genuine parts. All common spares required for Ventilation system shall normally be kept available in the plant by the vendor. However, for critical spares, the same shall be made available in not more than 72 hours from the time of break-down requiring such spare.

iv. Preventive Maintenance, servicing of Ventilation System equipment's and accessories etc. shall be done by vendor in a planned manner in consultation with concerned customer's engineer. Preventive maintenance and service should be done as per the recommendations / guidelines of various OEMs

v. Major servicing & over handling of equipment's like fans, pumps, piping / ducting works, valves etc. shall be done by vendor once in a year.

vi. In case any repair/services of particular equipment of system is to be carried out by vendor through OEM (or their authorized dealer), all the arrangements including tools, O&M spares etc. shall be the total responsibility of vendor.

vii. Vendor shall arrange and maintain separate logbook register for services / maintenance of Ventilation System. Record of work done for services/maintenance repairs etc. shall be recorded by vendor's engineer in this register. This register shall always be with updated records & shall be produced to customer's engineer on weekly basis or as & when required by him.

viii. Vendor shall arrange and maintain sufficient stock of spares and consumable at site. Similarly, all necessary tools & instruments required for the purpose of servicing / maintenance / routine testing etc. shall also be arranged by vendor and should be available at site at all times.

ix. Repairs / servicing works shall normally be done by vendor at site up to maximum possible extent. However, in case any equipment or accessories is essentially required to be taken by vendor out of the plant premises for repairing / servicing, all necessary arrangements including to and fro transportation shall be the responsibility of vendor. Vendor shall also inform concerned customer's engineer for doing procedural formalities (like issue of gate pass etc.), prior to taking out the materials out of Plant premises.

x. In case bidder fails to supply the spares required for maintenance of the equipment, same shall be provided by BHEL at Bidders risk and cost.

xi. Vendor shall be fully responsible for safety of his personal at all times. Vendor shall also be responsible for taking all safety precautions at all the times, especially during servicing / preventive maintenance and repairs of Ventilation System equipment's etc.

xii. All the safety controls, inter locking etc. shall be positively checked at least once a month and same shall be recorded by vendor engineer

xiii. Technicians & helpers engaged by the vendor shall wear uniform with nameplate for easy identification, while being within plant premises

xiv. Vendor's engineer shall be focal point for customer. He shall report to customer engineer on daily basis, for taking necessary instructions and to update the status of Ventilation system

xv. If any damage to the equipment and its accessories has happened due to improper maintenance by bidder shall be recovered from the bidder.

xvi. Bidder is to arrange all the safety gears like helmets, air plugs, safety shoes etc. during the maintenance for the O&M Staff.

xvii. Bidder shall have to maintain storage shed along with site office during O & M contract also

xviii. Fabrication and erection of platform/extra support for Ventilation areas if felt necessary during operation and maintenance of the system has to be done by the bidder.

Notes:

1. The bidder shall take approval from Engineer-in charge of BHEL by submitting organization Chart of O&M staff for this site clearly indicating man power deployment with their educational background & experience with supporting documents.

2. The bidder shall be solely and wholly responsible for safety and security of workers engaged in the job and the BHEL property. In case of any accident the contractor shall pay proper compensation to the workers as per workmen's compensation act and repair/replace BHEL property at their own cost & arrangement. The bidder shall also make adequate provision of insurance for their workers at their own cost to cover them against the risk of accident.

3. The bidder and their workers engaged in the job shall follow all safety rules at the time of execution of work. It shall be responsibility of the bidder to supply all safety equipment as necessary to its O&M staff.

4. Beyond general shift if any trouble/breakdown occurs in the plant, Maintenance team must reach the plant without any delay along with Engineer/Site In-charge.

5. No Person from the list of manpower shall leave the plant site without prior permission from the Engineer in charge of BHEL.

6. However, in operation part, if any person is absent, substitute must be given immediately otherwise proportionate deduction will be made

7. The replacement / substitute personnel for maintenance, manpower shall have the same educational qualification and experience.
8. If any additional manpower is required during O&M whatsoever under the scope of contract the same shall be made available by bidder in time within the cost. To cater the need of time bound maintenance jobs, the bidder shall depute additional manpower without any cost implication to BHEL
9. During execution of work if any personnel is found not suitable for the job or his presence inside powerhouse premises is felt undesirable, the personnel has to be replaced within 15 days.
10. BHEL will not be responsible for payment towards idle labour charges

Statutory Compliance by the bidder:

All Statutory compliances related to Labour, Health & Safety, Quality & Environment protection and insurance shall be as GCC applicable for the tender.

Sub : Sub-Qualifying Requirements for the Ventilation System

In line with the Sub-Qualifying Requirements stipulated in clause no. 4.6 of Sub-Section-IA, Part-A, Section-VI of Technical Specification of Bidding Documents, we/our Sub-vendor have designed, supplied, erected and commissioned atleast One (1) number ventilation system including air washer units having individual fan capacity of 80,000 Cum/hr. or more the system are in successful operation for atteast One (1) year.

Sl.No.	Item	Plant 1
1.	Name of the Project and its address	.....
2.	Name of the Client with address, name of Contact person(s) with tel.no. & fax no.	.....
3.	Order No. and date	
4.	Purchase order enclosed	Yes*/No*
5.	Date of commisisoning	.....
6.	Individual fan capacity of air washer unit in ventilation system, cu.m/hr.	.....
7.	The scope for the ventilation system contract included	
	(a) Design	Yes*/No*
	(b) Supply	Yes*/No*
	(c) Erection	Yes*/No*
	(d) Commissioning	Yes*/No*
8.	No. of years of successful.	.....
9.	The installation where the ventilation system has been provided can be treated as Industrial/commercial installation	Yes*/No*

Sl.No.	Item Description	Plant No.1
10.	Documentary evidence in support of above is enclosed	Yes*/No*
11.	Clients certificate regarding successful operation of ventilation system enclosed	Yes*/No*

*** Strike off whichever is not applicable.**

Date :

(Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note : Continuation sheets of like size and format may be used as per Sub-vendor's requirement and shall be annexed to this Attachment-3K.

Signature of authorized signatory.....

ANNEXURE 10

RE / wall mounted fans/ wall mounted louver/ wall mounted damper shall be selected so as to have motor rating (for fans) and wall / slab opening as under. Feeder suitable for following ratings only shall be provided by BHEL.

1.	Roof extractor units with 15 mmwc static pressure.		
	Capacity	Motor rating	Roof / Slab opening
a.	50,000 CMH	5.5 KW	1320mm
b.	40,000 CMH	5.5 KW	1320mm
c.	20,000 CMH	2.2 KW	1140mm
2	Axial flow supply fans with 30 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	10,000 CMH	2.2 KW	800mmx800mm
b.	7,500 CMH	1.5 KW	700mmx700mm
c.	6,000 CMH	1.1 KW	600mmx600mm
d.	4,000 CMH	0.75 KW	500mmx500mm
3	Axial flow supply fans with 20 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	10,000 CMH	1.5 KW	800mmx800mm
b.	7,500 CMH	1.1 KW	700mmx700mm
c.	6,000 CMH	1.1 KW	600mmx600mm
d.	4,000 CMH	0.75 KW	600mmx600mm
4	Axial flow exhaust fans (Bifurcated type) with 15 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	15,000 CMH	2.2 KW	900mmx900mm

b.	10,000 CMH	1.5 KW	800mmx800mm
c.	7,500 CMH	1.1 KW	700mmx700mm
d.	2,000 CMH	0.55 KW	500mmx500mm
5	Axial flow exhaust fans with 10 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	15,000 CMH	1.1 KW	900mmx900mm
b.	10,000 CMH	0.75 KW	800mmx800mm
c.	7,500 CMH	0.55 KW	700mmx700mm
d.	6,000 CMH	0.55 KW	600mmx600mm
e.	2,000 CMH	0.37 KW	500mmx500mm
6	Exhaust fan (propeller type) with 5 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	1200 CMH	100 W	380 mm circular
7.	Louver	NA	900 mm x 1300 mm (h)
8.	Damper	NA	700 mm x 550 mm (h)

	GENERAL REQUIREMENT (ANNXURE 11)
1	Bidder shall submit Quality Plan on compliance route in the event of order Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
2	In case, the bidder is sourcing the item/any component from outside India, the third party inspection shall be arranged by bidder at their cost and shall be deemed to be considered by the bidder in their offer.
3	Nameplates shall be manufactured from stainless steel or aluminium with a matte or satin finish, and engraved with black lettering of a minimum 6 mm height or as per equipment standard whichever is higher
4	All sub - vendors shall be subject to BHEL/ Customer approval in the event of order.
5	Mandatory Spares : Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the mandatory spare list
6	Foundations for equipment's i.e. Air washer and UAF is excluded from vendor's scope. Grouting of foundation / foundation bolts etc. including special type of grouting like GPX2 etc. are in the scope of vendor
7	Slab cutout / Wall Openings for ducts, pipes, fans, cables are excluded from vendor's scope. Sealing of duct opening, pipe opening, fan opening in wall and floor is in scope of vendor
8	Fixing frame works for diffusers and grilles in the scope of Vendor.
9	Drain piping within room up to the drain point to be provided by the Vendor.
10	Instruments required for performance testing of various equipment / system of the package shall be arranged by Vendor at site. Instrument for testing shall be calibrated by Air-conditioning plant supplier before taking up testing.
11	Instruments to be used for PG test shall be additionally supplied over and above the instruments shown in tender P&IDs. PG test Instruments being supplied, installed and commissioned for each unit,shall be retained by employer after completion of PG tes
	TRAINING TO CUSTOMER PERSONEL
1	The scope of service under training of Employer's engineers shall include a training module covering the areas of Operation & Maintenance
2	Training module shall enable these personnel to individually take the responsibility of operating and maintaining the system in a manner acceptable to the Employer
3	Training on Erection methodologies of system and Equipment's associated with the Package, including a visit to power plant construction site.
4	The exact details, extent and schedule for training shall be as finalized during detailed engineering and shall be subject to Employer's approval
5	The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering entire scope for the package
6	This shall cover all disciplines viz, Mechanical, Electrical, C&I , QA etc. and shall include all the related areas like Design familiarization, training on product design features and product design software of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing erection, welding etc.
7	In all the above cases, the lodging and boarding of the Employer's personnel shall be at the cost of Bidder
8	The Bidder shall make all necessary arrangements towards the same
9	For training purposes, one (1) man month implies 30 working days (excluding all intervening holidays) per person.
10	Location of classroom training for engineering shall be at Design/Engineering office. Classroom training for erection/O&M shall be at location of Manufacturers' works.
	E-LEARNING PACKAGE REQUIREMENT
1	e-learning package shall be provided for the system. e-learning package shall be installed on the Learning Management Server (LMS) of Power Management Institute (PMI), NTPC located at Noida. The Engineer- In-Charge (EIC) for the e-learning modules shall be from PMI.
2	The objective of the e-Learning package consisting of courses for erection, commissioning, operation and maintenance of equipment / system as specified and to facilitate the employees to have first hand information / requirement with respect to above activities for the supplied equipment / system
3	The bidder shall submit e-learning courses each for erection, commissioning, operation and maintenance of each of the equipment / system supplied
3.1	The erection course(s) should include instructions on pre-checks, prerequisites, erection strategy, erection procedure

3.2	The commissioning course(s) should include instructions on pre-commissioning, commissioning initial operation
3.3	The operation course(s) should include instructions on the permissive, interlocks, physical check-ups, start-up, shutdown and protections
3.4	The maintenance course(s) should include instructions on predictive, preventive, breakdown and overhauling
4	Depth of coverage of above courses shall be as specified for “Instruction Manuals” in above clauses. A literature on caution / safety while handling equipment / system for the above modules shall follow the description of the said equipment /system
5	The e-Learning packages on equipment / system shall be installed by the vendor and shall be successfully test run in the presence of EIC or representative before acceptance by NTPC. The vendor will also give the master copy in form of Flash Drive/CD/DVD. The respective module for erection & commissioning shall be delivered and successfully test run at least three months before the scheduled start of the corresponding activity at site
6	**e-Learning course broad requirements:**
6.1	The courses shall be web based and mobile based Application type. It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.
6.2	The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/Mobile, Tablet and any other display devices.
6.3	Course content text shall be in English language and be associated with a voiceover in English language with Indian accent
6.4	Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.
6.5	Each course shall have every physical and functional detail of the equipment / system supplied.
6.6	Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.
6.7	There shall be option for self-assessment test after every course. In case the user doesn’t opt for self-assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/quiz.
6.8	If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.
6.9	Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.
6.10	The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course
6.11	The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.
6.12	The system shall provide the user with the ability to select the information with a Cursor
6.13	The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop-up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function
6.14	Every course shall contain the 3D design/drawing/exploded view/360 deg. Turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio
6.15	The users shall be able to control audio sound level associated with the courses.
6.16	Drawings / text in the courses shall be scalable (Zoom In/ Out).
6.17	The user shall have the capability to record a bookmark to mark displayed information for later recall, whenever he accesses the same course next time.
7	e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system.
8	e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system.

PERFORMANCE GUARANTEES TO BE DEMOSTRATED

PERFORMANCE GUARANTEES TO BE DEMOSTRATED AT SITE	
S.N.	**DESCRIPTION OF TESTS TO BE PERFORMED**
1	Saturation efficiency of Air washer and UAF
2	Parallel operation, Vibration level of centrifugal fans & pumps of Ventilation system.

PERFORMANCE GUARANTEES TO BE DEMOSTRATED AT SHOP	
S.N.	**DESCRIPTION OF TESTS TO BE PERFORMED**
1	Capacity and discharge pressure of pumps of air washer units and UAF units at its rated duty point of Ventilation system.
2	Capacity and static pressure of centrifugal fans, roof exhausters at its rated duty point of Ventilation system.

PG TEST PROCEDURE FOR VENTILATION SYSTEM PACKAGE
PROJECT : ------ SUPER THEMAL POWER PROJECT (-- X -- MW)

OBJECTIVES OF THE TESTS:

I.	To Verify the guarantee parameters.
II.	To check healthy working of all the equipment forming the total Ventilation system.
	Following parameters shall be measured during Guarantee Test.
III..	D.B., W.B. temp. and saturation efficiency of Evaporative Cooling
IV..	System and D.B and W.B temperature of UAF System during summer
V.	Capacity of Centrifugal Fans
VI.	Power Consumption of fans & pumps at rated capacity using watt meters. Current and voltage rating of motors shall also be recorded.
VII.	Vibration & Noise Level of pumps and fans
VIII.	Bearing Temp. of Motors, fans & pumps.
IX.	Fan speed.
X.	Pressure drop across air washer and UAF units.
XI.	To check satisfactory operation of all electrical interlocks for each individual equipment and for the complete system.
XII.	Performance test for Centrifugal & Axial flow (i.e. R. Exhauster, Propeller type Tube Axial fan etc.) Fans

1. EQUIPMENT PERFORMANCE

The plant should continuously run for two hours for stabilization of the system before commencement of taking measurement of different parameters.

Following are the parameters to be recorded during equipment performance test:

I. Current and Voltage or Power drawn by motors.

II. Bearing temperature of motors, fans and pumps to be measured

III. Pressure developed by pumps shall be measured

IV. The Air flow quantity shall be calculated by measuring velocity with help of anemometer /velometer in front of suction filters in a direction perpendicular to filter planes and at 1'' distance from the filter. Air Washer Room shall be closed while taking reading on Anemometer/Velometer. Velocity shall be measured at 5-7 transverse points across the filters to compute average velocity for flow calculations.

Test Capacity (M^3/sec) = Inlet Suction Area(M^2) x Average Velocity (M/sec)

V. Dry bulb temperature, Wet bulb temperature of entering air before the air washer and leaving air just after the eliminators.

VI. Vibration and noise level of centrifugal fans and associated motors to be measured. The limit will be as per QAP/Relevant standard.

VII. Fan speed by Tachometer .

2. CONDUCTANCE OF TEST

i) Responsibility for conducting the test rests lies with Contractor.

ii) Guarantee Test shall be conducted at site by representatives of Vendor and NTPC as per the procedure hereunder. Contractor shall be given permission to inspect the system in advance and make it ready for the test.

3. TEST INSTRUMENTS

All instruments required for the test shall be arranged by Vendor free of cost.
Calibration of test instruments shall be responsibility of Vendor.

I. Calibration of instruments (to be used in the test) shall be carried out at an Govt./NABL approved test laboratory and calibration certificate of the instruments should be valid during the period of the test.

II. Calibration certificate (in original) of all instruments shall be submitted to NTPC Site for approval.

III. All the calibrated instruments shall be sealed after calibration at test lab and intactness of the seal shall be checked by NTPC before start of the test.

IV. Bearing Temperature is to be measured using thermometers of $\pm$ 1 deg. C accuracy having least count of 0.5 deg. C.

V. Online pressure gauges shall be used for recording the parameters of pumps.

VI. Calibrated gauges of accuracy $\pm$ 0.5% shall be used on water circuit for temperature & pressure measurements.

VII. Air flow shall be measured using calibrated velometer / Anemometer.

VIII. Dry bulb & Wet bulb temp shall be measured using sling psychrometer. The thermometers of psychrometer, shall be $\pm$ 0.5 deg. C accuracy with least count of 0.5 deg. C.

IX. Wattmeter of $\pm$ 1.0% accuracy class shall be used for power consumption measurement.

X. Vibration & Noise level of motors, fans & pumps shall be measured by calibrated instruments.

XI. Tachometer for R.P.M. measurement shall be of $\pm$ 1.0% accuracy.

XII. Manometer for pressure drop across filters.

XIII. Voltage and current shall be measured using tong tester/Clamp meter of +/- 1% accuracy class.

4. PRE-REQUISITES TO THE GUARANTEE TEST

I. All the installation / commissioning protocols in respect of alarm/ annunciation/ control system, pipeline flushing, vibration & noise level measurement data of motors, fans & pumps during

commissioning shall be made available during Guarantee Test by the contractor.

II. All NTPC approved data sheets for the plant/system for which Guarantee Test is to be carried out shall be made available during the test.

III. Uninterrupted power supply within specified parameters for the duration of the test shall be ensured by NTPC.

IV. Proper lubrication and oil level of all equipment to be ensured.

V. Cleanliness of Plant/System shall be ensured by NTPC.

VI. Protection relays of switchgears and all motor feeders shall be checked.

VII. Readiness of all protections, interlocks and safety switches to be ensured. Joint protocol in this respect shall be signed.

VIII. Availability of suitable fire protection system/ fire fighting equipment to be ensured by NTPC during Guarantee Test.

IX. Deputation of team to site to associate with the test to be ensured by the Contractor.

X. Arrangement of all calibrated test instrument as per Cl. No. 2.02.00 to be ensured by the Contractor.

XI. The plant/ system shall be jointly inspected by NTPC and the contractor and a joint protocol shall be signed that the plant is fit for conducting guarantee Test.

1 Successful completion of trial operation.

5.TEST METHODOLOGY

I. **SATURATION EFFICIENCY OF AIR WASHER UNIT**

Before commencement of Guarantee Test of Air Washer System, the plant shall run for at least 2-3 hours for stabilization of system and all required adjustments shall be done by vendor till all guaranteed parameters are achieved.

Also before start of test working of various mechanical/electrical parts to be checked visually and satisfactory operation of all electrical interlocks and controls to be checked.

SATURATION EFFICIENCY shall be computed using following formula:-

$$\text{Saturation Efficiency} = \frac{Te - T1}{Te - te} > \text{-------}$$ (As per Technical Specification)

Where,

Te = Dry Bulb temperature Entering Air Washer Unit.

T1 = Dry Bulb Temperature leaving Air Washer Unit.

te =Wet Bulb Temperature entering Air Washer Unit

Dry Bulb & Wet Bulb Temperature at Inlet & Outlet of Air Washer shall be measured by Sling Phychrometer. Sling Phychrometer reading will be taken through moving air and continued till thermometer reading becomes steady. The thermometer forming part of Sling Phychrometer shall be of $\pm$ 0.5% accuracy with least count of 0.5 deg. C.

II. In case of UAF units, Dry Bulb & Wet Bulb temperature at inlet and outlet of UAF unit shall be measured by sling phychrometer.

III. **VIBRATION & NOISE LEVEL**

Vibration of Centrifugal Fans and Pumps and Associated Motors shall be measured. Acceptance criterion for Vibrations and noise level shall be as per technical specification.

IV. **BEARING TEMPERATURE**
Motor, Fan & Pump Bearing Temperature, wherever possible, shall be measured by Surface Contact.

V. General Functional Test (Run Test) of all equipment shall be done at site.

PROJECT: ---- THERMAL POWER STATION (---x ---MW) PACKAGE :

VENTILATION SYSTEM

P.G TEST LOG SHEET FOR AIR WASHER/UAF SYSTEM

Location/System :						
1	Velocity across Filter (M/Sec.)	A	B	C	D	E
		Average velocity (M/Sec.) =				
2	Area of Filter (M2)					
3	Pump (RPM)	Fan:			Pump :	
4	Current (Amp)	Fan Motor			Pump Motor	
		R			R	
		Y			Y	
		B			B	
5	Voltage (V)	Fan:			Pump :	
6	Bearing temp. Deg. C	Fan:			Pump :	
7	Dry bulb temp (Te)					
8	Wet bulb temp (te)					
9	Dry bulb temp (TI)					
10	Pump Discharge Pressure (Kg/cm2)					
11	Pressure drop across the Air washer (mm W.C)					
12	Noise (dBA)					
13	Vibration	V	H		A	

STANDARD MANUFACTURING QUALITY PLAN

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN	PROJECT :
		ITEM : AIR WASHER QP. NO. : REV. : 0 SYSTEM : DATE : PAGE 1 OF 3	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	-10			(11)
1.0	**MATERIAL**											
1.1	Air washer tank & casing Material : MS	Visual, Chemical & Physical	Major	Visual / Physical & Chemical	Sample / Heat	Mfg's drawing / Appd Data sheet/IS 1079/ IS 2062	Mfg's drawing / Appd Data sheet/IS 1079 Gr.O/ IS 2062 Gr.A	TC/Inspection report	3	-	2,1	Material testing is carried out pediodically at random by c. doctor at autorised test lab.
1.2	Elimanator & Air Distribution Sheet Mat. - G.I.	Visual, dimension (Including thickness)	Major	TC Varification	One / Lot	Appd data sheet / Drg./ IS 277	Appd data sheet / Drg./ IS 277Grade. 275 gms./sq.m	Inspection Report	3	-	2,1	
		Bend Test & Zn coating grade	Major	TC review	One / Heat	- do -	- do -	- do -	3	-	2,1	
1.3	Pipes for header, branch for spray set, external piping for air washer .	Mech. Dimension, hydro test	Major	TC Varification	100%	IS:3589/1239	IS:3589/1239 Heavy Grade	Test Certificate	3	-	2,1	
1.4	Nozzle	Dimension, Visual & Material	Major	Visual	At random	Mfg's drawing	Mfg's drawing	Inspection Report & TC	3	-	2,1	

Q.P. NO.CQS/SQP/01		SIGNATURE	DATE				DATE					
REV. NO. 0		NAME										
		PARTY		CUSTOMER/CONSULTANT		BHEL		VENDOR				
LEGEND.	CR: CRITICAL CHARECTERISTIC				P : PERFORMING		1:BHEL					
	MA: MAJOR CHARECTERISTIC				W: WITNESSING		2: VENDOR					
	MI : MINOR CHARECTERISTIC.				V: VERIFYING		3: SUB VENDOR					

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN	PROJECT :
		ITEM : AIR WASHER QP. NO. : REV. : 0 SYSTEM : DATE : PAGE 1 OF 3	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	-10			(11)
2.0	**IN PROCESS INSPECTION**											
2.1	Fabrication of Casing & Tank, marking, cutting, forming & pipe fabrication,eliminator,distribution plate	Visual, dimensional	Major	Visual & Measurement	100%	CDC Mfg's drawing	CDC Mfg's drawing	Inspection report	3	-	-	CDC approved WPS to be used
2.2	Welding	DPT of weld	Major	NDT	20%	ASTME 165	No relevant indication	Inspection Report	3	-	2,1	
3.0	**FINAL INSPECTION**											
3.1	Water fill test of TANK	Leakage test	Major	Fill test for 4 hrs.	100%	Appd. Drawing	No leakage	Inspection Report	3	2,1	-	CHP
3.2	Assembly of tank & casing Trial assly.Procedure Of A/W UNIT	Visual, final dimension	Major	Visual & Measurement	1 of each type & size	Appd. Drawing/trial assly. Procedure.	Appd. Drawing	Inspection Report	3	2,1	-	CHP-All air washers are of field erected type. One no. of air washer will be offered to BHEL/BVQI in assembled condition in shop.
3.3	Spray galvanising / painting	Visual, dft/galvanising thk	Major	Visual & Measurement	100%	Appd. Drawing	Appd. Drawing	Inspection Report	3	2,1	-	
3.4	Review of QA document					Appd Q Plan	Appd Q Plan		-	-	2,1	CHP

Q.P. NO.CQS/SQP/01	SIGNATURE	DATE			DATE	
REV. NO. 0	NAME					
	PARTY		CUSTOMER/CONSULTANT	BHEL	VENDOR	

LEGEND.	CR: CRITICAL CHARECTERISTIC				P : PERFORMING		1:BHEL					
	MA: MAJOR CHARECTERISTIC				W: WITNESSING		2: VENDOR					
	MI : MINOR CHARECTERISTIC.				V: VERIFYING		3: SUB VENDOR					

	MANUFACTURE'S NAME & ADDRES	STANDARD QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : CENTRIFUGAL PUMP	PACKAGE :
		REV. : 0	
		SYSTEM : DATE :	CONTRACT NO. :
		PAGE 1 OF 3	MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**MATERIAL.CONTROLS**											
1.1	CASING(UPPER&LOWER/VOLUTE)/BOWLS DIFFUSER,STAGE BODIES,DISCHARGE HEAD (IF CAST) ETC.	Physical & Chemical Props.	Critical	Physical & Chemical Analysis.	ONE/HEAT /BATCH	Apprd. Data Sht/ Apprd G.A. Drg.	Apprd. Data Sht/ Apprd G.A. Drg.	LAB. REPORT	3, 2			
1.2	IMPELLERS	Physical & Chemical Props.	Critical	Physical & Chemical Analysis.	ONE/HEAT /BATCH	Apprd. Data Sht/ Apprd G.A. Drg.	Apprd. Data Sht/ Apprd G.A. Drg.	LAB. REPORT	3, 2	2, 1		
1.3	STUFFING BOX,SUCTION HOUSING,SUCTION BELL,WEARING RINGS,NECK RINGS,SHAFT	Physical & Chemical Props.	MA	Physical & Chemical Analysis.	ONE/HEAT /BATCH	Apprd. Data Sht/ Apprd G.A. Drg.	Apprd. Data Sht/ Apprd G.A. Drg.	LAB. REPORT	3, 2		2,1	
	STRESS RELIEVING/HEAT TREATMENT OF CASTING, AS ABOVE(IF APPLICABLE)	HEAT CYCLE	MA	VARIFICATION OF SR/HT CHARTS	ALL BATCHES	Apprd. Data sht / Apprd G.A. Drg.	Apprd. Data sht / Apprd G.A. Drg.	SR/HT CHARTS	3, 2		2,1	
1.4												
1.5	BARS/FORGINGS FOR SHAFTS,LINE SHAFTS	1.Physical & Chemical Props. 2.DIMENSIONS 3.SUB-SURFACE DEFECTS FROM 50 MM AND ABOVE DIA SHAFTS	Critical	1.Physical & Chemical Analysis. 2.Measurement 3. ULTRASONIC TEST	1/CAST OR 1/BAR 100%	MFR DRAWING ASTMA:388,BACK WALL ECHOE 100%	MFR DRAWING DEFECT ECHOE MAX.20% OF B.W.E.LOSS OF BACK WALL ECHOE 20% MAX.	MILL T.C. OR LAB. REPORT INSPN. REPORT	3, 2		2,1	
1.3	Shaft (Above 50 mm dia)	Ultrasonic Testing	Critical	Non Destructive Testing	1005	ASTM-E-114	OEM Procedure	NDT Certificate	3		2,1	

	Q.P No :		DESIGNATION		DATE		DATE			DATE
	REV. No / DATE		NAME							
	PAGE No	1 OF 3	PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR		

	MANUFACTURE'S NAME & ADDRES	MANUFACTURING QUALITY PLAN	PROJECT :
		ITEM : CENTRIFUGAL PUMP QP. NO. : REV. : 0	PACKAGE :
		SYSTEM : DATE : PAGE 2 OF 3	CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.0	**INPROCESS INSPECTION**											
2.1	Various Components Mentioned in 1.0	Dimensional Inspection	Major	Dimensional Check	100% for Critical & 10% for others	Approvd. Drawing	Approvd. Drawing		3			
2.2	Impeller	Cleaning & de burning	Major	Visual	100%	Approvd. Drawing	Approvd. Drawing	Assm report	3			
2.3	Rotating Unit	Balancing	Major	Balancing	100%	ISO 1940 Gr.6.3 at reduced speed	ISO 1940 Gr.6.3 at reduced speed	Balancing Certificate	3		2,1	
2.4	Impeller	D.P. Testing	Critical	D.P. Test on Machined surface and Accessible	100%	ASTM-E-165	OEM Procedure	NDT Certificate	3		2,1	
2.5	Shaft & Shaft sleeve	D.P. Testing	Critical	D.P. test	100%	ASTM-E-165	OEM Procedure	NDT Certificate	3		2,1	
3.0	**ASSEMBLY & TESTING**											
3.1	Hydro Test	Leak Tightness	Major	Visual	100%	Appd. Data sheet	No leak for test duration of 30 min.	Hydrostatic Pressure Test Certificate	3	2, 1		Refer Note 4
	Dimension	Overall dimension	Major	Measurement	100%	Appd drawing	Appd drawing	IR	3	2, 1		

	Q.P No :		DESIGNATION		DATE		DATE			DATE
	REV. No / DATE		NAME							
	PAGE No	2 OF 3	PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR		

	MANUFACTURE'S NAME & ADDRES	MANUFACTURING QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : CENTRIFUGAL PUMP	PACKAGE :
		REV. : 0	
		SYSTEM : DATE :	CONTRACT NO. :
		PAGE 3 OF 3	MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.2	Performance test with calibrated shop motor / Job Motor	Q Vs H,Q Vs n, Q Vs P, Vibration, noise level and	Critical	Performance test	100%	Appd. Data sheet & HIS	Appd. Data sheet & HIS	Test Report	3	2, 1		CHP refer note 5
3.3	Strip test	Check for wear and rubbing	Major	Visual	100%	No undue wear & rubbing	No undue wear & rubbing	I.R.	3	2, 1		CHP refer note 6
4.0	**FINAL INSPECTION**											
4.1	Pump	Record checking and crediting / review of QA documentation	Major	Record Checking / Verification	100%	All assembly record & test certificates as per appd. QAP	Appd. QAP	Crediting Slip	3		2,1	
		Painting, Packing & Despatch	Major	Visual	100%	Relevant Spec.	OEM Procedure.	Crditing slip	3			

NOTES :

A) Chemical composition of grey cast iron, Ni = as applicable, S = 0.1% Max, P = 0.15% Max., As cast heat mark shall be provided on CI castings.

B) In case of co-relation TC's are not available then quantum of check will be each bar.

1. **This QAP is also applicable for spares if ordered.**
2. **No weld repairs permissible on CI castings.**
3. **Materials shall be as per approved C.S. Drawings.**
4. **Test Pressure shall be 1.5 times the Shut off Head or twice the Duty Point Head whichever is higher.**
5. **Vibration level shall be recorded during shop test but shall not form acceptance criteria, However values as per HIS are quaranteed at site only.**
6. **Strip Test : - Only in case of abnormal performance, pump shall be dismantled followed by re-assembly & testing. Otherwise it is limited to bearing inspection only by removing bearing cover. Bearing shall not be removed from shaft.**

Q.P No :		DESIGNATION		DATE		DATE		DATE
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LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : CENTRIFUGAL FAN	PACKAGE :
		REV. :	
			CONTRACT NO. :
		DATE :	
			CUSTOMER :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**MATERIAL**											
1.1	Casing, Impeller Pedestal & Hub - M.S sheets & plates	Visual, Chemicals & Physical	Major	Visual Measurement Physical & Chemical test	Sample / heat	Appr. drg./ Appr. Data sheet	Appr. drg./ Appr. Data sheet	Arrival note & test certificate	3		2,1	Material testing is carried out periodically at random by OEM authorised testing lab & test report is kept. Sample are drawn & tested from each lot. Report will be submitted to BHEL / Customer for verification
1.2	SHAFT (EN-8)	Visual, Chemicals & Physical	Critical	- do -	100%	- do -	- do -	- do -	3		2,1	
		UT if DIA > 50mm (in proof machined condition)	Critical	NDT	100%	ASTMA 388	When back wall echo set to 100% of FSH in sound area of material, defects echo shall not exceed 20% of FSH and or back wall echo shall not fall to less than 80% of FSH. Max. no of acceptable defects indication as scanned above shall be 5 in 1 mtr length of	IR	3		2,1	
1.3	BEARING	Visual	-----do-----	Check for make & no	100%	Mfg. Drg.	Mfg. Drg.	Arrival note	3			
1.4	PULLEYS - C.I.	Visual & dimension	Major	Visual & Measurement	100%	ABB P.O.	Manufacturer catalogue / drg	Arrival note	3			

	Q.P No :			DESIGNATION		DATE		DATE				DATE
	REV. No / DATE			NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : CENTRIFUGAL FAN	PACKAGE :
		REV. :	CONTRACT NO. :
		SUB-SYSTEM : DATE :	CUSTOMER :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.5	V-BELT	Visual	Minor	Visual & check for make	10%	------do-----	Dimension as per P.O.	Arrival note	3			
1.6	Base frame-MS channel & Angle	Visual	Minor	Visual & measurement	100%	Mfg. Drg	Mfg. Drg	Inspection report	3			
1.7	Outlet damper	Visual & dimensional	Major	-----do-----	100%	-----do-----	-----do-----	-----do-----	3			
2.0	**IN PROGRESS INSPECTION**											
2.1	Casing /impeller fabrication	DPT of welding	Major	NDT	20%	ASTME 165	No relevant indication	-----do-----	3		2,1	
2.2	Shaft machining	DPT	----do-----	----do-----	100%	-----do-----	-----do-----	-----do-----	3		2,1	
2.3	Impeller balancing (Static & Dynamic)	Balancing level	Critical	Balancing	100%	VDI-2060 / ISO 1940 Gr. 6.3	VDI-2060 / ISO 1940 Gr. 6.3	Balancing register	3	2,1		20% of each type and size to be witnesed by BHEL
3.0	**ASSEMBLY**											
3.1	Overall dimension	Visual & measurement	Major	Measurement	100%	Approved drg	Approved drg	Inspection report	3	2,1	2,1	At random by BHEL / CUSTOMER
3.2	Final painting	Visual & dimensional	Major	Visual	100%	Approved drg	Approved drg	-----do-----	3			

	Q.P No :			DESIGNATION		DATE		DATE		DATE
	REV. No / DATE			NAME						
	PAGE No	2 OF 4		PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR	

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		QP. NO. : ITEM : CENTRIFUGAL FAN REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : CUSTOMER : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
4.0	**FINAL ACCEPTANCE**											
4.1	Motors					**REFER QP FOR MOTORS**						
4.2	Run test of fan for 4 hours or till stabilisation or temp. rise which ever is earlier	Visual & measurement	Critical	Measurement a) Speed b) Vibration c) Temperature rise d) Power input to motor e)Noise	100%	IS-4894 & VDI-2056 / ISO-10816-1	Approved data sheet. Vibration-acceptable zone as per VDI-2056 / ISO-10816-1 Temp. rise; 40 deg C. Maximum above ambient	Runtest report	3	2,1		One of each type & size to be run tested and witnesed by BHEL / customer. Noise at shop for reference only
4.3	Performance test of Fan	Measurement	Critical	Measurement a) Flow b) Pressure c) Speed d) Power consumption	One of each type & size	AMCA-210 / IS-4894/ appvd data sheet	Performance IS-4894	PT report	3	2,1		P.T. will be conducted for D.I.D.W fan as per AMCA-210 providing test duct piece at fan outlet. P.T. for S.I.S.W fan will be conducted providing test duct piece at fan inlet as per IS-4894. However In both the cases testing will be conducted with available test motor rating, may be at increased RPM depending on availability of drive set.

	Q.P No :			DESIGNATION		DATE		DATE				DATE
	REV. No / DATE			NAME								
	PAGE No	3 OF 4		PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : CENTRIFUGAL FAN	PACKAGE :
		REV. :	
			CUSTOMER :
		SUB-SYSTEM : DATE :	MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
				e) Efficiency								
				f) Noise			Noise - 85dBA at 1.0mtr					Results thus obtained will be interpoleteed / extrapolatted
				g) Vibration			Vibration acceptance zone as per VDI-2056 / ISO-10816-1					to check the fan performance at rated RPM. Based on the above guaranteed power
				h) Temp. rise			Temp rise -40 deg C max above ambient					Tolerance will be as per IS-4894 noise & vibration value at shop is for reference only.
4.4	Painting	Visual / Dft	Major	Visual & Measurement	100%	Appvd. Drg.	Appvd. Drg.	Insp. Report	3	2	1	
5	Review of Q.A documentation					Appvd. Q.P.	Appvd. Q.P.				2,1	CHP

	Q.P No :			DESIGNATION		DATE		DATE				DATE
	REV. No / DATE			NAME								
	PAGE No	4 OF 4		PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN			PROJECT :
				QP. NO. :	
		ITEM : AXIAL FAN			PACKAGE :
				REV. :	
					CONTRACT NO. :
		SYSTEM :		DATE :	
					MAIN CONTRACTOR :
					SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)			(11)
1.0	RAW MATERIAL AND BOUGHT OUT CONTROL											
1.1	IMPELLER & HUB	1. PHYSICAL, CHEM. PROPERTIES	MA	PHY., CHEM. TEST	1/HEAT	APPD. DATA SHEET	APPD. DATA SHEET	FOUNDRY REPORT	3	-	2,1	
		2. - DO -	MA	- DO -	ONE/LOT	- DO -	- DO -	LAB. REPORT	3	-	2,1	
1.2	CASING	DIMENSIONS	MA	MEASUREMENT	100%	- DO -	- DO -	- DO -	3	-	2,1	
2.0	IN PROCESS CONTROL											
2.1	IMPELLER, HUB & CASING AFTER MACHINING/ FABRICATION	WORKMANSHIP AND FINISH DIMENSIONS	MA	VISUAL, MEAS.	100%	MFG. DRAWING	MFG. DRAWING	INSPN. REPORT/ LOG BOOK	3/2	-	2,1	
2.2	IMPELLER & HUB	STATIC, DYNAMIC, RESIDUAL BALANCE	CR	STATIC, DYNAMIC BALANCING	100%	IS0:1940	ISO:1940 G.6.3	INSPN. REPORT	3/2	-	2,1	
2.3	MOTOR	ROUTINE TESTS, TYPE TESTS, DRG. OF PROTECTION	MA	ELECTRICAL TESTS	100%	APPD. DATA SHEET	APPD. DATA SHEET	IIR/LOG BOOK	3/2	-	2,1	REFER NOTE-1
3.0	ASSY. CONTROL, FINAL INSPECTION & TESTS											
3.1	COMPLETE FAN ASSY. WITH UNIT MOTOR	COMPLETENESS, CORRECTNESS, CLEANLINESS, FREE RUN BY HAND, CLEARANCES	MA	VISUAL, MEAS.	100%	MFG. DRG./ APPD. DRG.	MFG. DRG./ APPD. DRG.	INSPN. REPORT	3/2	-	2,1	
3.2	COMPLETE FAN ASSY. WITH UNIT MOTOR	TYPE TESTS	CR	PERFORMANCE TEST	ONE/TYPE/ SIZE	APPD. DATA SHEET	APPD. DATA SHEET,	TYPE TEST REPORT	3/2	2,1	-	
		SIGNATURE	DATE				DATE					DATE
		NAME										
		PARTY		CUSTOMER/CONSULTANT		BHEL		VENDOR				

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN		PROJECT :
		ITEM : AXIAL FAN	QP. NO. :	PACKAGE :
			REV. :	CONTRACT NO. :
		SYSTEM :	DATE :	MAIN CONTRACTOR :
				SUB CONTRACTOR :

S.NO.	COMPONENT/OPERATI	CHARACTERISTICS	CATE-	TYPE/METHOD	EXTENT	REFERENCE	ACCEPTANCE	FORMAT OF	AGENCY			REMARKS
									P	W	V	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)			(11)
3.3	COMPLETE FAN ASSY. WITH UNIT MOTOR	ACCEPTANCE TESTS	MA	ACCEPTANCE TEST	100%	APPD. DATA SHEET	APPD. DATA SHEET,	TEST REPORT	3/2	-	2,1	
3.4	COMPLETE FAN ASSY. WITH MOTOR	AIR DELIVERY	CR	AIR DELIVERY TEST	APPD. DATA SHEET	APPD. DATA SHEET	APPD. DATA SHEET,	- DO -	3/2	-	2,1	
3.5	COMPLETE FAN ASSY. WITH MOTOR	ROUTINE TESTS	MA	ROUTINE TESTS	100%	- DO -	- DO -	- DO -	3/2	-	2,1	
3.6	COMPLETE FAN ASSY. WITH MOTOR	DIMENSIONS, WORKMANSHIP, FINISH, COMPLETENESS	MI	MEAS., VISUAL	100%	APPD. DATA SHEET, MFRS. DRG.	APPD. DATA SHEET, MFRS. DRG.	INSPN. REPORT	3/2	-	2,1	
3.7	PAINTING & PACKING	SURFACE, PREPN. FILM THICKNESS, FINISH & SHADE, SOUNDNESS, WEATHER PROOFNESS OF PACKING	MI	VISUAL EXAM.	100%	TECHNICAL SPEC./ MFG. DRG.	TECHNICAL SPEC./ MFG. DRG.	- DO -	3/2	-	2,1	

	SIGNATURE	DATE			DATE		DATE
	NAME						
	PARTY		CUSTOMER/CONSULTANT	BHEL		VENDOR	

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		ITEM : PIPES, FITTINGS, PIPE WORK QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	**MATERIAL CONTROL**											
1.1	Pipes (Mill made)	Physical, chemical properties, dimensions surface finish, heat treatment (If applicable), leak tightness	Major	Physical, chemical, tests, measurement, visual exam., ver. Of HT chart, Hydro test	Technical specification IS : 4711	Appd. Data sheet/tech. Specification	Appd. Data sheet/tech. Specification	Mfg. TC/Lab report	3		2,1	
1.2	Fittings	Physical, chemical properties, dimensions surface finish, heat treatment (If applicable)	Major	-----do-----	1/heat, 100%	-----do-----	-----do-----	-----do-----	3		2,1	
1.3	Plate for flanges, fabricated piping & forgings for flanges	Physical, chemical properties, dimensions surface finish, heat treatment	Major	-----do-----	1/cast	-----do-----	-----do-----	-----do-----	3		2,1	
2.0	**IN-PROCESS CONTROL**											
2.1	Pipes, fittings, flanges-machining, bending	Dimensions including thinning, ovality, finish, wrinkles etc	Major	Measurement, visual exam	100%	Manufacturing drawing	Manufacturing drawing	I.I.R	3		2,1	
2.2	Welding procedure specification	Correctness	Major	Exam	100%	IS : 7307/ASTME IX	IS : 7307/ASTME IX	Format of IS : 7307 ASME	3		2,1	

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN					PROJECT :			
		ITEM : PIPES, FITTINGS, PIPE WORK				QP. NO. :	PACKAGE :			
						REV. :	CONTRACT NO. :			
		SUB-SYSTEM :				DATE :	MAIN CONTRACTOR :			
							SUB CONTRACTOR :			

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.3	Procedure qualification & welder's qualification	Weld soundness	Major	Physical tests	ASME IX/IS : 7310 / IS : 7307	IS : 7310 / ASME IX	IS : 7310 / ASME IX	Format of IS : 7310 ASME	3	2	1	
2.4	Weld Fit - UPS	Dimensions, alignment orientation	Major	Measurement visual	100%	W.P.S, Approved drawings	W.P.S approved drawings	I.R	3,2	2	1	
2.5	Welds A) Butt welds with joint efficiency											
	i) Root run	Weld defects	Major	Penetrant test	100%	IS : 3658/ASME 165	ASME VIII DIV/ANSIB 31.1	Inspection report	3,2	2	1	
	ii) Final run	Weld defects	Major	Penetrant test	100%	-----do-----	-----do-----	-----do-----	3,2		2,1	
				RT	100% for JT. Eff 1.0 & 10% for 0.9	ANSI B 31.1	ANSIB 31.1	-----do-----	3,2		2,1	
	B) Butt welds with joint efficiency less thatn 0.9	-----do-----	Major	Penetrant test	100% for 100NB & above, 10% for other	IS : 3658/ASTME 165	-----do-----	-----do-----	3,2		2,1	
		-----do-----	Major	RT	10% for THK>/20mm & Spot for other							
3.0	Complete pipe work & pipes	Workmanship & finish dimensions, orientation, leak tightness	Critical	Measurement, visual hydro test at 1.5 x design pressure	100%	Appd. Drawing	Appd. Drawing No leakage	I.R BHEL Format	3	2,1		

				DESIGNATION		DATE		DATE		DATE
				NAME						
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR	

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		ITEM : G.I SHEET QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1		3	4	5	6	7	8	9	10			11
1.0	**MATERIAL**											
1.1	G.I Sheet	A) Chemical	Major	Chemical	One per Heat	**IS-277 Gr-275**	**IS-277 Gr-275**	Mfg TC	3		2/1	
		B) Bend	Major	Physical	One per Heat	**IS-277 Gr-275**	**IS-277 Gr-275**	Mfg TC	3		2/1	Co-related Mfg's T.C will be submittted for verification
		C) Sheet Thickness	Major	Dimension	One per Sheet	**IS-277 Gr-275**	**IS-277 Gr-275**	Mfg TC	3		2/1	
		D) Zinc Coating	Major	Grade	One per Sheet	**IS-277 Gr-275**	**IS-277 Gr-275**	Mfg TC	3		2/1	
2.0	**FINAL ACCEPTANCE**											
2.1	Jacketted Sheet/Coil	Identification	Major	Visual verification	100%	Mfg standard	Mfg standard	Inspection report	3	2	1	* Witness by vendor & Verification of TC by BHEL

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		ITEM : FILTER QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1		3	4	5	6	7	8	9	10			11
1	**MATERIALS**											
1.1	Filter Frame	Thickness of sheet	Major	Measure	Random	App. Drg/Data Sheet	App. Drg/Data Sheet	Inspection Report	3		2,1	
1.2	Spacer	Thickness of sheet	Major	Measure	Random	App. Drg/Data Sheet	App. Drg/Data Sheet	Inspection Report	3		2,1	
1.3	Filter Media	Gram / Sq.M	Major	Weight	Random	-----do-----	-----do-----	-----do-----	3		2,1	
1.4	Wirenet	Mesh Count	Minor	Measure	Random	-----do-----	-----do-----	-----do-----	3		2,1	
2.0	**IN PROCESS INSPECTION**											
2.1	Filter Frame	Dimensional	Major	Visual	Randomk	Appd. Data Sheet/ Drg	Appd. Data Sheet/ Drg	Inspection Report	3		2,1	
2.2	Media Stitching	Dimensional	Major	Visual	Randomk	-----do-----	Tech. Spec.	-----do-----	3		2,1	
3.0	**FINAL INSPECTION**											
3.1	Assembly	Dimensional	Major	Measure	Randomk	-----do-----	-----do-----	-----do-----	3	2,1		CHP at Random 5% (min 2 per visit for each size)
3.2	End Seal	Tightness	Major	Physical	100%	-----do-----	-----do-----	-----do-----	3	2,1		
3.3	Aesthetics	Visual	Major	Visual	100%	-----do-----	-----do-----	-----do-----	3	2,1		
4.0	**PERFORMANCE**											
4.1	Initial and final pressure drop	Pressure drop Vs flow	Critical	Test	1 / Lot *	(As per BS : 6540 Part-I / Ashare 52-latest)	Appd. Data Sheet/ Drg	Inspection Report	3	2,1		CHP
4.2	Av. Synth. Dust weight arrestance	Efficiency	Critical	Test	1 / Lot *	-----do-----	-----do-----	-----do-----	3	2,1		CHP
4.3	Review of TC / IR as per approved QAP										2,1	CHP

*** LOT SIZE SHALL BE MAX 500 NOS OR PARTS OFFERED PER VISIT FOR EACH SIZE OF FILTER**

NOTE : FOR AVERAGE SYN. DUST WEIGHT ARRESTANCE, HEPA FILTER WITH EFF. 98.97% DOWN TO 0.3 MICRON SHALL BE USED

				DESIGNATION		DATE		DATE		DATE
				NAME						
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR	

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION

3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : 'Y' - TYPE STRAINER	PACKAGE :
		REV. :	CONTRACT NO. :
		SYSTEM : DATE :	MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	**MATERIAL CONTROL**											
1.1	Body, cap	Physical, Chemical Properties	Major	Physical, chimical analysis	1/heat/batch	Appd. Data sheet / technical specification	Appd. Data sheet / technical specification	Lab report	3,2		2,1	
1.2	Mesh	Chemical properties, mesh size	Major	Chemical analysis, measurement	1/sheet, 100%	-----do-----	-----do-----	-----do-----	3,2		2,1	
2.0	**IN-PROCESS CONTROL**											
2.1	All components	Workmanship, finish, dimensions	Major	Visual, examination, measurement	100%	Mfg. Drawing	Mfg. Drawing	I.I. Report	3,2		2	
3.0	**ASSEMBLY CONTROL**											
3.1	Complete strainer	Overall dimensions, leak tightness, workmanship & finish	Critical	Measurement, hydro test at 1.5 times design pressure, visual examination	100%	Approved drawing	Approved drawing	Inspection report	3,2	2	1	

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	STANDARD QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : NON RETURN VALVE	PACKAGE :
		REV. :	
		SYSTEM : DATE : 27.12.2004	CONTRACT NO. :
			MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	**MATERIAL**											
1.1	Body, cover, disc, hinge	1.Physical, chemical properties	Major	Physical, chemical, tests	1/Heat	Appd. Drawing/technical specification	Appd. Drawing/technical specification	TC	3,2	2	1	
2.0	**TESTING**											
2.1	Body	1.Leak tightness	Critical	Hydraulic test	100	Appd. Drawing/technical specification	No leakage	TC/IBR certificate (If required)	3,2	2	1	
2.2	Seat	Leal tightness	Critical	Hydraulic test : 1) At specified pressure 2.)At ATM Pressure	100%	-----do-----	-----do-----	-----do-----	3,2	2	1	
3.0	End connection details	1.Dimensions	Major	Measurement	100%	Appd. Drawing/relevant standard	Appd. Drawing/relevant standard	Inspection report	3,2		2,1	
		2.Surface defects for BW end	Critical	Pentrant test	100%	ASTME-165	ASTME-165	TC	3,2	2	1	
4.0	Final Inspection	1.Cleanliness & completeness	Major	Visual	100%	Appd. Drawing/technical spec.	Appd. Drawing/technical spec.	Inspection report	3,2	2	1	

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		ITEM : BUTTERFLY VALVES QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.	**RAW MATERIAL INSPECTION BOUGHT OUT ITEMS**											
1.1	Body / Disc	a) Dimensions	Major	Measurement	100%	Appd. Data Sheet / Relevant Std.	Appd. Data Sheet / Relevant Std.	GRN	3		2,1	
		b) Mechanical Properties	Major	Lab Analysis	1 per Heat	Appd. Data Sheet / Relevant Std.	Appd. Data Sheet / Relevant Std.	MTC	3		2,1	
1.2	Shaft	c) Chemical Properties	Major	Lab Analysis	1 Per Lot	Appd. Drg / Data Sheet	Appd. Drg / Data Sheet	TC	3		2,1	
1.3	Operating Hand Lever	a) Dimensions	Major	Measurement	10%	Drawing	Drawing	IR	3		2,1	
		b) Surface Quality	Major	Visual	100%	Drawing	Drawing	IR	3		2,1	

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		ITEM : BUTTERFLY VALVES QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.	**IN PROCESS INSPECTION**											
2.1	Machining of Body / Disc / Shaft	a) Dimensions	Major	Measurement	100%	Mfg. Drg	Mfg. Drg	Insp. Report	3		2,1	
		b) Finish	Major	Visual	100%	Mfg. Drg	Mfg. Drg	Insp. Report	3		2,1	
3.	**FINAL INSPECTION**											
3.1	Assembled Valves	a) Dimensions	Major	Measurement	100%	Appd. Drg/Data Sheet	Appd. Drg/Data Sheet	Insp. Report	3	2,1*		*At random
		b) Seat Hydro Test	Major	Leakage Test	100%	-----DO-----	-----DO-----	Insp. Report	3	2,1*		* 10% will bw offered for witteness
		c) Operation Gear Lever	Major	Manual	100%	90° Opening	Smooth Operation	Insp. Report	3	2,1		
4.	**PAINTING & PACKING**											
		Surface Preparation, packing marking	Minor	Visual	100%	A.I.S.I.L Plant Standard	A.I.S.I.L Plant Standard	Insp. Report / Check List	3		2,1	

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		ITEM : C I GLOBE VALVE QP. NO. : REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1		3	4	5	6	7	8	9	10			11
1.1	Body, cover, door, hinge bracket	Tensile & Hardness	Major	Physical analysis	One / Heat	Appd. Drawing / Data Sheet	Relevant material STD. As per Col-7	T/C of testing laboratory	3		2,1	
1.2	Hinge Pin	Tensile & Chemical	Major	Mechanical, chemical, analysis	One / size	Appd. Drawing / Data Sheet	Relevant material STD. As per Col-7		3		2,1	
1.3	Seat rings	Chemical	Major	Chemical analysis	One / Heat	Appd. Drawing / Data Sheet	Relevant material STD. As per Col-7		3		2,1	
1.4	Assembly of valves	Overall diaminsion	Major	Measurement	100%	Approved Drg	Design.STD,Apd drg	Inspection	3	2,1*		*At random
		Flange drilling	Major	Measurement	100%	Approved Drg	Col-7	Inspection	3	2,1*		
		Visual examination	Major	Visual	100%	Approved Drg	Re;evamt desig.std	Inspection	3	2,1*		
1.5	Operation	Open / Close	Major	Smooth movement full travel	100%	Relevant design standard	Col-7	Inspection	3	2,1*		
1.6	Testing	Body Leakage	Major	Hydrostatic	100%	Approved drawing	Col-7	Inspection report	3	2,1*		CHP
		Seat leakage	Major	Hydrostatic	100%	Approved drawing	Col-7	Inspection report	3	2,1*		CHP

				DESIGNATION		DATE		DATE				DATE
				NAME								
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR			

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
		QP. NO. :	
		ITEM : INSULATION MATERIALS (THERMAL & ACCOUSTIC) REV. : 0	PACKAGE :
		SUB-SYSTEM : DATE :	CONTRACT NO. :
			MAIN CONTRACTOR :
			SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1	**MATERIAL**											
	Resinbonded & Glasswood	Bulk density	Major	Physical	Sample as per IS 8183	Approved Data Sheet / IS	Approved Data Sheet / IS	Inspection Report	3	2,1		Review of Certificate for k-value test done at Laboratory on sample from insulation material manufactured within 12 months period
		Compression	Major	-----do-----	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Shot content	-----do-----	-----do-----	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Moisture apsorption & Moisture content	-----do-----	-----do-----	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Sulphur content	-----do-----	Chemical	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Dimensional & Visual	-----do-----	Physical	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Incombustibility	-----do-----	Physical	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Recovedry after compression	-----do-----	Physical	-----do-----	-----do-----	------do-----	----do-----	3	2,1		
		Thermal conductivity	Critical	Physical	Once in 12 months per density & type	IS 3346	Appd. Data sheet	Lab Report	3		2,1	
		Final Inspection for making & packing	Major	Visual	100%	IS : 8183	IS : 8183	----do-----			2,1	
	Review of QA documentation						As per Appvd QP				2,1	

				DESIGNATION		DATE		DATE		DATE
				NAME						
	PAGE No	1 OF 1		PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR	

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	PROJECT :
BHEL		QP. NO. : ITEM : FIRE DAMPER REV. : SUB-SYSTEM : DATE :	PACKAGE : CONTRACT NO. : MAIN CONTRACTOR : SUB CONTRACTOR :

SL No.	COMPONENT & OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
I.	**RAW MATERIALS**											
1	Damper - Casing	Bend Test &	Major	Lab Test	Sample	IS 277-1992	IS 2771992	Testing Lab				
2	Damper - Louver	Chemical Analysis			From Lot	ZN coating-120	ZN coating-120	Report	3		2,1	
3	Damper - Shaft	Chemical & Mechanical	Major	Lab Test	-----DO-----	IS 9550-1980	IS 9550-1980	-----DO-----				
4	Bearings	Visual & Operation	Major	Visual	100%	Mfg Standard	Mfg Standard	Internal Inspection Report	3		2,1	
5	Electric Solenoid	Operation characteristic	Major	Functional	100%	Appd. Drg/Data Sheet	Appd. Drg/Data Sheet	Mfg Test Certificate	3		2,1	
6	Limit Switch	Visual & Operation	Major	Visual	100%	Mfg Standard	Mfg Standard	Internal Inspection Report	3		2,1	
II	**FINISHED DAMPER**											
1	Visual Inspection	Surface Defects	Minor	Visual	100%	Mfg Standard	Mfg Standard	Internal Inspection Report	3		2,1	
		Tag Details	Minor	Visual	100%	Appd. Drg	Appd. Drg	Internal Inspection Report	3		2,1	
2	Dimensional Check	Measurement	Major	Dimentional	100%	Appd. Drg	Appd. Drg	Dimm. Report	3	2,1	2,1	
3	Damper operation with actuator	Functional/performance	Major	Functional	100%	Appd. Drg	Appd. Drg/Smooth & proper operation	Internal Inspection Report	3	2,1	2,1	
4	Limit Switch operation	Functional	Major	Functional	100%	-----do-----	-----do-----	Internal Inspection Report	3	2,1	2,1	
5	Review of QA documents					Appd. QAP	Appd. QAP				2,1	
6	Painting	Visual	Minor	Finish	100%	Appd. Drg	Appd. Drg	Internal Inspection Report	3		2,1	
	Note : Test Report of Inspection Reporte test as per UL-555 for similar type of fInspection Reporte damper shall be furnished at the time of inspection											

				DESIGNATION		DATE		DATE		DATE
				NAME						
	PAGE No			PARTY	CUSTOMER/ CONSULTANT		BHEL		VENDOR	

LEGEND : P- PERFORMANCE, W - WITNESS, V- VERIFICATION
3 - OEM/VENDOR, 2- BHEL, 1 - CUSTOMER

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 50 KW (415V)	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	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	D	**			
					M	C/ N					M	C	N	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1 & NOTE-2

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 50 KW (415V)	SYSTEM:	SECTION: II	SHEET 2 of 2

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:
1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR**, CR:** CRITICAL
D: DOCUMENTATION

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

CLAUSE No. CHAPTER NAME

MOTOR

TESTS/CHECKS / TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-1/ IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y										
Shaft	Y	Y	Y	Y	Y	Y			Y										
Magnetic Material	Y	Y	Y	Y			Y			Y		Y							
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes, for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	Y	Y	Y	Y				Y		Y								
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y											
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y											
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y										
Wound stator	Y	Y					Y	Y											
Wound Exciter	Y	Y					Y	Y											
Rotor complete	Y	Y					Y						Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y												

Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																
Complete Motor	Y	Y	Y												Y	Y	Y	Y1	Y

Note:

1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization:

Note for LT Motor:

i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets."

ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP: Acceptance of Motor rating above 50 KW & less than 75 KW is based on NTPC rev
report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequency variation, hot s
KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets."

iii) Motor rating 75 KW & above: Inspection CAT-I: As per NTPC approved MQP.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard
3. Makes of major bought out items for HT motors will be subject to NTPC approval.
4. Y1 = for HT Motor / Machines only.
5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE2/IE3 shall be checked/verified in addition to Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission, the motor shall be subjected to efficiency test.

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

MEASURING INSTRUMENTS

Item Components / Sub System Assembly	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (As applicable)(R)	Hydro Test(R)	Material Test certificate (R)
Pressure Gauge (IS-3624)	Y	Y	Y	Y	Y				
Pressure /Differential Pressure Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
Electronic Transmitter(IEC-60770)	Y	Y	Y	Y	Y	Y			
Transducer (IS-14570)	Y	Y	Y	Y	Y	Y			

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

PROCESS CONNECTION AND PIPING

Tests / Items	Visual & Dimensions ®	GA, BOM, Layout of component & construction feature, Paint Shade/thickness ®	Flattening,flaring,hydrotest,hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessability of TBs/Devices Illumination,grounding ®	Tubing ®		Chemical/physical	Proof pressure	Tests as per
Local Instrument enclosure	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			
Local instruments racks	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			
Junction Box	Y	Y*		Y		Y	Y							
Impulse pipes and tubes	Y		Y			Y						Y		
Socket weld fittings ANSI B-16.11	Y					Y						Y		Y
Compression fittings	Y					Y					Y	Y	Y	
Instrument valves & Valve manifolds	Y					Y					Y	Y		
*-applicable for painted junction boxes.														

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

ELECTRICAL ACTUATOR

Test/Attributes Characteristics / ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Local/ Remote (Open-Stop-Close)	
ELECTRICAL ACTUATOR with Integral Starter , Non- Intrusive Electrical Actuator (EN15714-2)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

® - Routine Test A - Acceptance Test Y - Test applicable

Note:

1) SIL 2 certificate

LOCAL CONTROL PANEL

Tests / Items	Pre Power on Check (#) (R)	Post Power on Check (%) (R)	Internal cabling / Wiring checking(R)	Door Alignment, waviness, and Locking (R)	Louvers, Fans, wire mesh, Lifting arrangement (R)	HV / IR on wired panels (R)	Paint Shade, Thickness and Illumination (R)	Hardware/Make as per BOM (R)	Dimensions, GA, layout (R)
Local Control Panel	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									

Note:

2) Pre power on check: - Wire dressing, looseness, Availability of Fuses and MCB, Modules are inserted properly, Earthing connection, Input Voltage checking.

3) Manufacturer also needs to include their practices and procedure in MQP along with relevant supporting documents.

SUB VENDOR LIST

SI. NO.	ITEM / EQUIPMENT	SUB SUPPLIER	REMARKS
1	AIR WASHER & UAF*	HYDERABAD POLUTION CONTROL	
		SK SYSTEM	
		ADVANCE VENTILATION	
		DRAFT AIR	
		BLUE STAR	
		VOLTAS	
		STERLING WILSON	
		ROOTS COOLING SYSTEM	
		C DOCTOR	
		TAP	
		PACK PLAST	
		INDUSTRIALPROJECTS AND PRODUCTS	
		*Designed by HYDERABAD POLUTION CONTROL / SK SYSTEM/ ADVANCE VENTILATION / DRAFT AIR/ BLUE STAR/ VOLTAS/ STERLING WILSON/ ROOTS COOLING SYSTEM/ C DOCTOR/ TAP/ PACK PLAST/ INDUSTRIALPROJECTS AND PRODUCTS and fabricated by their approved fabricator.	
2	CENTRIFUGAL FAN	FLAKT	
		KRUGGER	
		DRAFTAIR	
		HYDERABAD POLUTION CONTROL	
		ADVANCE VENTILATION	
		PATELAIR	
		NICOTRA	
		SKSYSTEM	
		MARATHON	
		CBDOCTOR	
		SARLA	
3	AXIAL FLOW FANS/RE UNITS	HYDERABADPOLLUTION	
		SKSYSTEM	
		ADVANCEVENTILATION	
		KRUGER	
		NICOTRA	
		MARATHON	
		FLAKT	
		CBDOCTOR	
		PATELAIR	
		SITAL	

4	CENTRIFUGAL WATER PUMP	BEST&CROMPTON	
		JYOTI	
		SAMTURBO	
		KBL	
		KSB	
		M&P	
		VOLTAS	
		BEACON-WEIR	
		WORTHINGTON	
		FLOWMORE	
		SULZER	
		BHARATPUMPS & COMPRESSORSLTD	
		FLOW SERVE INDIA CONTROL PVT LTD	
		V-FLOWPUMPS & SYSTEMS CO	
5	INDUCTION MOTORS (LT)	ABB	FARIDABAD (UPTO 55 KW), BANGALORE & SWEDEN (UPTO 55 KW)
		CGL	AHMEDNAGAR, RQP, FOR FLAME PROOF MOTOR
		MARATHON	KOLKATA, RQP (UPTO 690V & 600 KW) FOR FLAME PROOF ALSO
		KEC	BANGALORE/ HUBLI* *UPTO 90KW, RQP, FOR FLAME PROOF ALSO
		BHARAT BIJLEE	MUMBAI, RQP, FOR FLAME PROOF ALSO
		NGEF	BANGALORE, UPTO 15 KW
		JYOTI	VADODARA
		LHP	SOLAPUR
		TIPM	JAPAN, UPTO 15 KW (NON FLAME PROOF)
		HYOSUNG	SOUTH KOREA
		WEG	BRAZIL
		HYUNDAI	SOUTH KOREA
		TMEIC	JAPAN (NAGASAKHI)
		HAVELL	NEEMRANA (UPTO 90 KW)
		KAWAMATA	JAPAN (UPTO 75 KW)
		TIPS	JAPAN (UPTO 45 KW)

6	AIR FILTER	PUROLATOR	
		FMI	
		ANFILCO	
		TENACITY	
		JOHNFOWLER	
		SPECTRUM	
		AIRTECH	
		PUROMATIC	
7	INSULTATION MATERIAL	BEARDSHELL	
		K-FLEX	
		PARAMONT	
		ARMAFLEX	
		SUPREME	
		LLOYDS	
		UPTWIGA	
		AEROCELL	
8	BALANCING VALVE	ADVANCE	
9	BUTTERFLY VALVE	AUDCO	
		FOURESS	
		INTERVALVE	
		BDK	
		WEIRBDK	
		TYCO	
		CRANE PROCESS	
		KEYSTONE	
10	NON RETURN VALVE	LEADER	
		H.SARKAR	
		FLUIDLINE	
		HI-TECH	
		CRESENT	
		AVVALVES	
		BANKIM&COMPANY	
		SHIVADURGA	
11	GATE/GLOBE VALVES	CRESENT	
		BDK	
		AUDCO	
		FOURESS	
		KIRLOSKAR	
		SANT	
		BOMBAY METAL & ALLOYS	
		BANKIM	
		LEADER	
		HSARKAR	
		AVVALVES	
		VENUSPUMPSANDENGG	
		SAMSON CONTROLSPVT.LTD	

		INSTRUMENTATION LTD.	
		Koso India Private Limited,	
12	MOTORIZED BUTTERFLY VALVE	ANERGY	
		ADVANCE	
		BELIMO	
		JOHNSON	
		HONEYWELL	
		SIEMENS	
13	Y / POT STRAINER	MULTITEX	
		GREAVESCOTTON	
		JAYPEE	
		SANT	
		OTOKLIN	
		GRANDPRIX	
		GUJARATOTOLIFT	
		DSENGG	
		SAROJINI ENTERPRISE	
		BHATIAENGINEERING	
		FILTERATION ENGINEERS INDIA PVT LTD	
		SUNGOV ENGINEERING	
14	PIPING - ERW	SURYAROSHNI	
		TISCO	
		DADUPIPES	
		INDUSTUBE	
		WELSPUN	
		TATA	
		BST	
		JINDAL	
		SAIL	
15	PIPING - CS SEAMLESS (ASTM A 106)	ISMT	
		MAHARASHTRA SEAMLESS	
16	GI SHEETS FOR DUCTING	TISCO	
		INDIAN IRON&STEEL CO LTD.	
		RASHITRYA ISPAT NIGAMLTD.	
		ESSAR	
		ISPATINDUSTRIES	
		JSWSTEEL	
		LLOYDSSTEEL	
		BHUSHAN	
		TATA	
		SAIL	
		JINDAL	

17	FIRE DAMPER	TSC	
		CARRYAIRE	
		RAVISTAR(SYSTEMAIR)	
18	GRILL/DIFFUSER/VOLUME CONTROL DAMPER	AIRFLOW	
		TSC	
		AIRMASTER	
		CARYAIRE	
		RAVISTAR(SYSTEMAIR)	
19	STRIP HEATER	ESCORTS	
		RACOLD	
		DASPASS	
		ALCO	
		HEATCO	
		HOTSET	
20	PAN HUMIDIFIER	RAPIDCOOL	
		HOTSET	
		ALCO	
21	RELIEF / PURGE VALVE	BRASSO MATIC	
22	THERMOSTATS	HONEYWELL	
		RANCO	
		PENN	
		DANFOSS	
		INDFOSS	
		JHONSON CONTROL	
		RANUTROL	
23	HUMID STAT	JHONSON CONTROL	
		HONEYWELL	
		PENN	
24	ANTI FREEZE THERMOSTAT	RANCO	
		HONEYWELL	
		PENN	
		DANFOSS	
		INDFOSS	
25	PRESSURE GAUGE	GENERAL INST CONSORTIUM	
		BELL	
		H.GURUINSTP.LTD.	
		WAAREE INSTRUMENTS	
		H.GURUIND	
		FORBESMARSHALL	
		MANOMETER	
		A.N.INST	
		GAUGESBOURDON	
		GLUCK	
		WIKA	
		ASHCROFT	
		BAUMERTECHNOLOGIES	

		PRECISION MASS PRODUCTSPVT.LTD.	
		BOSE PANDAINSTT.PVT.LTD	
26	TEMPERATURE GAUGE	H.GURUIND	
		H.GURUINST	
		FORBES MARSHALL	
		DETRIVEINST&ELECTRONICS	
		PYROELECTRIC	
		TOSHNIWAL BROSS	
		WAREE INSTRUMENTS	
		A.N.INST	
		GOA INSTRUMENTS	
		WIKA	
		ASHCROFT	
		HGURU(SI)	
		BAUMERTECHNOLOGIES	
		GOA THERMOSTATIC	
		GAUGE BOURDON	
		BUDENBERG GAUGE	
		PRECISION MASSPRODUCTS	
27	LEVEL GAUGE	GENERAL INSTRUMENTS	
		CHEMTROLS	
		SBEM,PUNE	
		AUTOMAT MUMBAI	
		SIGMA	
		TOSHNIWAL	
		TECHNOMATIC	
		TELACO	
		LEVCON	
		DK INSTRUMENTS	
		PUNE TECHTROL	
		FLOWSTAR	
		BLISSANAND	
28	PRESSURE SWITCH / DP	BELLS	
		DANFOSS	
		DK INSTRUMENTS	
		DRESSER	

		SORINC	
		VASU	
		SWITZER	
		INDFOSS	
		TRAFAG	
		GIC	
		ASHCROFT	
		KASTURBA UDYOG	
		BARKSDALE	
		PRECISION MASSPRODUCTS	
		MITTAL REFRIGERATION	
29	TEMPERATURE SWITCH	INDFOSS	
		SEIMENS	
		DANFOSS	
		DK INSTRUMENTS	
		SORINC	
		VASU	
		DRESSER	
		TOSHNIWAL	
		SWITZER	
30	FLOW SWITCH	SWITZER	
		LEVCON	
		DK INSTRUMENT	
		SBEM	
		V.AUTOMATE	
		SIEMENS	
31	LEVEL SWITCH	SBEM	
		BLISSANAND	
		HITECH	
		RAMANINST	
		SIGMA	
		SORINC	
		WAREEINST	
		LEVCON	
		DK INSTURMENT	
		VATUOMATE	
		CHEMTROLS	
		SIMENS	
		FLOWSTAR	
		TRAC	
		FLOWTECH	
		NIVO CONTROLS	
		PUNE TECHTROL	
		SAPCON	
		BAUMER TECHNOLOGIES	
		GIC	

		SBEM	
32	TRANSMITTERS	TAYLOR	
		ABB	
		BRISTOL BABCOCK	
		BIRLA KENTTAYLOR	
		BLISSANAND	
		SBEM	
		SMARTINST	
		VAUTOMATION&INST	
		FISHER-ROSEMOUNT	
		SIEMENS	
		TATA HONEYWELL	
		PUNE TECHTROL	
		NIVO CONTROLS	
		PANAM ENGINEERS	
		EMERSON	
		MOORE INDUSTRIES	
		TOSHINIWAL INDUSTRIES	
		YOKOGAWA	
		E&H	
		ABB	
33	SIGHT FLOW INDICATORS	SIGMA	
		LEVCON	
		VAUTOMAT	
		TELLACE	
		EUREKA	
		TATA HONEYWELL	
		BLISSANAND	
		SCIENTIFIC DEVICES	
		BK EQUIPMENTS	
		INSTRUMENTATION ENGINEERS	
34	FLOW ELEMENT	BRISTOLBABCOCK	
		BALIGA	
		LIGHTING EQUIP	
		ENGINEERING SPECIALITIES	
		IL	
		MINCO	
		MICROPRECISION	
		STARMECH	
35	TEMPERATURE ELEMENT	GENERAL INST CONSORTIUM	
		PYROELECTRIC	

		WAAREE INSTRUMENTS	
		DETRIVEINST&ELECTRONICS	
		TOSHNIWAL	
		GOA INSTRUMENTS	
		GAUGE BOURDON	
		TECHNO INSTRUMENTS	
		TEMPSENS INSTRUMENTS	
		THERMAL INSTRUMENTS	
		TMTECHNOMATIC	
		BAUMER TECHNOLOGIES	
36	FLOW METER	EUREKA	
		INSTRUMENTATION ENGINEERS PVT LTD	
		PLACKA	
		TRAC	
		FLOWSTAR	
		SCIENTIFICDEVICE	
37	RH SENSOR/TEMP SENSOR	HONEYWELL	
		JOHNSON	
		SIEMENS	
		GENERAL INSTRUMENTS	
38	OWS / PC	HP	
		COMPAQ	
		DELL	
		HCL	
		IBM	
		LENOVO	
39	PRINTER	HP	
		CANON	
		EPSON	
		XEROX	
		IBM	
		LEXMARK	
40	UPS	HITACHI-HIREL	
		APC	
		DELTA	
		EMERSON	
		DBPOWER	
		APLAB	
41	FIBRE OPTIC CABLE	BIRLAERICSON	
		FINOLEX	
		AKSHFIBRE	
42	ANNUNCIATOR FOR PANEL	ICC	
		PECON	
		PROCON	
43	LT ADAPTER BOX FOR AL	CONTROL DEVICE	

	TO CU CABLE CONVERTOR	SYSTEM POWER CONTROL	
		JACKSON	
		UNILEC	
		ELECTRICALLIED PRODUCT	
44	METERING PUMP	SHAPOTOOLS	
		VKPUMPS	
46	WATER SOFTENING PLANT	THERMAX	
		IONEXCHANGE	
		DOSIION	
47	PRESSURE TRANSMITTER	ABB	
		ENDRESS+HAUSER(INDIA)	
		MOORE	
		SIEMENS	
		SMART INSTRUMENT BRAZIL	
		SBEM	
		TOSHNIWAL	
		V.AUTOMAT	
		EMERSON	
		YOKOGAWA	
		HONEYWELL	
		FUJI	
48	BATTERY CHARGER	AMARARAJA	
		CHHABI ELECTRICAL	
		DUBASENGG.	
		HBL POWERSYSTEM	
		STATCON	
		CALDYNE	
49	BATTERY (NI -Cd)	HBLPOWER	
		AMCOSAFT	
		SAFT	
50	CONTROL PANEL	INDUSTRIAL CONTROL&APPLIANCE	
		PYROTECH	
		POSITRONICS	
		CONTROL&SWITCHGEAR	
		SIEMENS	
		L&T	
		GEPOWER	
		RITTAL	
		HOFFMAN	
51	TEMPERATURE TRANSMITTER	ABB	
		ENDRESS+HAUSER(INDIA)	
		MOORE	
		SIEMENS	
		SMART INSTRUMENT BRAZIL	
		SBEM	
		TOSHNIWAL	

		V.AUTOMAT	
		EMERSON	
		YOKOGAWA	
		HONEYWELL	
52	ROTAMETER	CHEMTROLSSAMIL	
		EUREKAIND	
		IL	
		TRANSDUCERS AND CONTROL	
53	ALARM ANNUNCIATORS	PROCON IIC	
54	DIGITAL METERS (A/V/PF/HZ)	SCHNEIDER ELECTRIC SECURE AE SOCOMEC NEPTUNE HAGER	
55	CONTROL / SELECTOR SWITCHES	L&T HAVELLS HPL HAGER C&S SOCOMAC ABB	
56	PUSH BUTTONS / INDICATING LAMPS	SIEMENS SCHNEIDER ELECTRIC TEKNIC ALSTHOM	
57	AUXILIARY RELAYS	JYOTI SIEMENS L&T OEN	
58	CONTACTOR/RELAY /TIMER	SCHNEIDER ELECTRIC L&T BCH SIEMENS LEGRAND ABB C&S HAGER	
59	MCB, ISOLATOR, INDUSTRIAL PLUG SOCKET	SCHNEIDER ELECTRIC LEGRAND HAGER L&T C&S ABB SIEMENS	

60	TERMINAL BLOCKS AND CONNECTORS	ELMAX WAGO HENSEL CONNECTWELL	
61	POTENTIAL TRANSFORMERS / CURRENT TRANSFORMER (FOR 415 VAC TO 230VAC)	AUTOMATIC ELECTRIC MATRIX PRECISE L&T KAPPA PROCOM	
62	CABLE GLANDS	ALLIED TRADERS & EXPORTERS	NOIDA
		ARUP ENGG & FOUNDARY WORKS	KOLKATA
		BALIGA LIGHTING EQPT.PVT.LTD.	CHENNAI
		COMMET BRASS PRODUCTS	MUMBAI
		DOWELLS	MUMBAI
		ELECTROMAC INDUSTRIES	MUMBAI
		INCAB	KOLKATA
63	CABLE LUGS	DOWELLS	MUMBAI
		UNIVERSAL MACHINES LTD.	KOLKATA
64	GI CONDUITS	BIS APPROVED MAKE	
65	GI CONDUIT (EPOXY PAINTED) FLEXIBLE	BIS APPROVED MAKE	
66	FLEXIBLE CONDUIT (PVC COATED)	REPUTED MAKE	

NOTES:

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL. BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.

2. THE INSPECTION CATEGORY WILL BE INTIMATED AFTER AWARD OF CONTRACT BY BHEL/CUSTOMER. HOWEVER THE SAME WILL BE ADHERED BY THE BIDDER WITHOUT ANY COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/ CUSTOMER.

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3	FAN- AXIAL TYPE > = 5KW	I			CB DOCTOR VENTILLATOR PVT LTD	AHMEDABAD	A		up to 50000 CMH	WTP,CT.AC&VENTILATION,CHP,LHP&GHP,AHP
					HOWDEN SOLYVENT FLAKT INDIA PVT LTD,	CHENNAI	A		up to 125000 CMH	
					C DOCTOR &CO PVT LTD	KOLKATA	A		up to 50000 CMH	
					KRUGER VENTILATION INDUSTRIES (I) PVT LTD	SHAHPUR, THANE	A		Up to 6000 CMH	
					NADI AIRTECHNICS PVT LTD	CHENNAI	A		Up to 15000 CMH	

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					ADVANCE VENTILATION PVT LTD	KUNDALI. SONEPAT	A		up to 40000 CMH	
					SK SYSTEMS PVT LTD	KUNDALI PHASE-II, SONEPAT, HARYANA	A		up to 50000 CMH	
					ALMONAROD (P) LIMITED	CHENNAI	A		Up to 14000 CMH	

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7	PUMPS- HORIZONTAL & VERTICAL CENTRIFUGAL -UP TO 300KW	(UP TO 60 KW CAT-II , ABOVE 60 KW CAT-I)			KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			WTP,CW, CPU,FDPS,CHP, LHP &GHP,AC & VENTILATION,MUW, AHP
					WILO MATHER & PLATT	PUNE	A			
					WILO MATHER & PLATT	KOLHAPUR	A			
					SAM TURBO	COIMBATORE	A		FLOW UP TO 1500 CUM/HR AND POWER RATING UP TO 425 KW	
					FLOWMORE LTD	GHAZIABAD	A			
					BEST AND CROMPTON	CHENNAI	A			
					JYOTI LTD	VADODARA	A			
					WPIL	GHAZIABAD	A			
					KISHORE PUMPS	PUNE	A		UPTO 500M3/HR ONLY RUBBERLINED PUMPS ALSO	
					GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	A		HORIZONTAL UP TO 30 KW ONLY AND VERTICAL UP TO 45 KW ONLY (FOR	
					SINTECH PRECISION	GHAZIABAD	A		HORIZONTAL UP TO 400 KW MOTOR RATING AND VERTICAL UP TO 30 KW MOTOR RATING	
					KSB	PUNE	A			
					KSB	NASHIK	A			
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		HOIZONTAL CENTRIFUGAL PUMP UP TO 75 KW ONLY	
					SU MOTOR	MUMBAI	A		HORIZONATL UPTO 500M3/HR ONLY RUBBERLINED PUMPS AND VERTICAL CENTRIFUGAL PUMPS UP TO 100CMH ONLY	
					BHARAT PUMPS AND COMPRESSORS	NAINI	A		FLOW UP TO 2200 M3/HR AND HEAD UP TO 60 MWC	

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9.C	VALVE-BUTTERFLY > 600MM OR CLASS>150 (VALVE-BUTTERFLY UP TO 600MM & CLASS 150::CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			INTERVALVE POONAWALA LTD	PUNE	A		SGI / CI / D2 1400MM PN10, SGI / CI 1000MM PN16,CS/SS 500MM PN16, SS 400MM CLASS#300, MS FABRICATED UPTO 2800NB	WTP, CW,CT,CPU,FDPS,CAS, AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					TRILLIUM FLOW	HUBLI	A		CI/ DI BUTTERFLY VALVE UP TO 1000MM AND PN16 AND UP TO 1800MM AND PN10,CCS UP TO 1050MM CLASS 150 AND UP TO 1800MM AND PN16 SS - UP TO 400NB PN-16 ,FABRICATED 800MM CLASS#150.	
					PENTAIR VALVES	HALOL	A		FOR SS UP TO 500 NB PN-10, CI- UP TO 900NB PN-10, UP TO 500NB PN-16, 450MM CLASS#300., MS FABRICATED UPTO 2800NB, PN6.	
					FOURES ENGINEERING	BANGALORE	A		CAST SGI/CI/ MS FABRICATED- UP TO 1200 PN-10, UP TO 350 PN-16 ,2400 MM	
					KIRLOSKAR BROTHERS LTD	KONDHAPURI	A		CAST SGI/CI/CS 1400 MM PN16 , SS 300 MM PN16 , 1800MM CLASS 150, MS FABRICATED 900 NB PN40,MS FABRICATED 2800NB, PN6.	
					R & D MULTIPLE	VALSAD	A		CAST SGI/CI/MS FABRICATED- UP TO 1800 MM PN-10/CLASS # 75, ,1100MM PN25,1400MM CLASS#150 ,MS FABRICATED	
					ADVANCE VALVES PVT LTD	GREATER NOIDA	A		METAL SEATED, TRIPLE ECCENTRIC, SS BFV OF SIZE UPTO 100NB, AND PRESSURE RATING UPTO CLASS #300.	
					BRAY CONTROLS INDIA PVT. LTD	KANCHIPURAM	A		UPTO 450 MM AND CLASS#600	
					INSTRUMENTATION LTD.	PALAKKAD	A		UPTO 2200NB CLASS # 75	
					HAWA ENGINEERS	AHMEDABAD	A		CI/ CS & FABRICATED UPTO 1200MM, CLASS #150, SS UPTO 250MM, CLASS#150	
					CRANE PROCESS FLOW	SATARA	A		UP TO 900MM PN10	
					L & T VALVES LIMITED	COIMBATORE	A		UP TO 900MM CLASS 150	
					DEMBLA VALVES	THANE	A		UP TO 2200MM CLASS#75	

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9.D	VALVE-CONVENTIONAL GATE / GLOBE / CHECK > 600NB OR CLASS > 300	II			LEADER VALVES	JALANDHAR	A		CS GATE 600MM CLASS#600, SS GLOBE 600MM CLASS#600, CS CHECK 600MM AND CLASS#600	WTP, CW,CT,CPU,FDPS,CAS, AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					HAWA ENGINEERS	AHMEDABAD	A		FCS / FSS 50 NB CLASS 800.	
					FOURES ENGINEERINGS	THANE	A		400NB CLASS 600 AND 50NB CLASS 800.	
					BHEL IVP	GOINDWAL	A		GATE UP TO 300 NB CLASS 600. GLOBE 250 NB CLASS 400, CHECK 150NB CLASS 600.	
					HITECH ENGG PVT LTD	AHEMDABAD	A		50 NB CLASS 800.	
					KSB PUMPS LTD	COIMBATORE	A		300NB CLASS 2500.	
					NITON VALVES INDIA PVT LTD	NAVI MUMBAI / AURANGABAD	A		CS GATE 900 NB CLASS 600, CHECK 300 NB CLASS 600.	
					L&T VALVES LIMITED	COIMBATORE	A		650 MM CLASS 600, 50 NB CLASS 800.	
					TRILLIUM FLOW	HUBLI	A		CONVENTIONAL CCS GATE / GLOBE / CHECK VALVES UP TO 600MM AND CLASS # 1500, CSS GATE/ GLOBE/ CHECK VALVES UP TO 200MM AND CLASS # 600, FCS GATE / GLOBE / CHECK VALVES UP TO 50MM AND CLASS # 2500.	
9.E	VALVE- DIAPHGRAGM TYPE				SPANE PROCESS FLOW	SATARA	A		UP TO 300NB PN10	WTP,CPU

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					KMP	GREATER NOIDA	A			
					VIJAY FIRE	UMBERGAON	A			
26	CENTRIFUGAL FAN (≥ 5KW) MOTOR FROM NTPC ACCEPTED SOURCE	I			MARATHON ELECTRIC MOTOR(I) LTD	KOLKATA	A		UP TO 50000 CMH	AC& VENTILATION, CHP, LHP&GHP,,AHP
					HOWDEN SOLYVENT FLAKT INDIA PVT LTD,	CHENNAI	A		UP TO 200000 CMH	
					ALMONAROD (P) LIMITED	CHENNAI	A		UP TO 60000 CMH	
					PATEL AIRFLOW	VATWA, AHMEDABAD	A		UP TO 250000 CMH	
					CB DOCTOR VENTILATOR PVT LTD	AHMEDABAD	A		UP TO 150000 CMH	
					WOLTER VENTILATORS INDIA (P) LTD	BHIWADI,	A		UP TO 200000 CMH	
					C DOCTOR &CO PVT LTD	KOLKATA	A		UP TO 250000 CMH	
					SUVIDHA AIR ENGINEERS	AHMEDABAD	A		UP TO 190000 CMH	
					SUBURBAN INDUSTRIAL WORKS PVT. LTD	KOLKATA	A		UP TO 100000 CMH	
					KRUGER VENTILATION INDUSTRIES (I) PVT LTD	THANE	A		UP TO 90000 CMH	
					SOLYVENT FLAKT	KOLKATA	A		UP TO 200000 CMH	
					ADVANCE VENTILATION PVT LTD	SONEPAT	A		UP TO 250000 CMH	
					SK SYSTEMS PVT LTD	SONEPAT	A		UP TO 250000 CMH	

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34	SCREW CHILLER	II			KIRLOSKAR CHILLER	PUNE	A		REGENERATIVE DRYERS BHK TYPE 1000 UP TO 350TR	AC& VENTILATION
					DAIKIN	NEEMRANA	A		UP TO 185 TR	
					BLUE STAR (COMPRESSOR FROM HANBEL-TAIWAN)	WADA	A		SCREW CHILLER UP TO 282TR	

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3	WATER MONITOR	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					
4	PIPES-MS- (BLACK/ GI) AS PER IS:1239 & IS:3589 UPTO 1000 NB	II			(BIS MARKED, MANUFACTURERS WITH VALID BIS LICENSE)					WTP,CW,CT,CPU,FDPS,AC&VENTILATION,CHP,LHP&GHP,AHP

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Lara-II (2X800MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :07.06.2022 SUB SECTION: C&I

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
13	Electronics Transmitter (Pressure , DP and DP based Flow/Level)										
13-A	Electronics Transmitter (Pressure , DP and DP based Flow/Level)										
		III				ABB Ltd	Bengaluru	A			2600T & critical item from ABB Italy/ Their approved source;
		III				Emerson Process Management Ltd	Pawane	A			
		III				Siemens Ltd	Thane	A			Model:-SITRANS P
		III				Honeywell Automation India Ltd	Pune	A			
		III				Baldota Control and Equipment Pvt Ltd	Navi Mumbai	A			PT & DPT of LD 301 Series (SMAR)
		III				Yokogawa India Limited	Bengaluru	A			EJA-E 110,430,530 SERIES & all raw material and BOI under knocked down condotion (sensor assembly as a single unit) shall be sourced from M/S Yokogawa Japan
		III				M/s Endress + Hauser India Automation Instrument Pvt Ltd	Aurangabad	A			
		III				Emerson (Rosemount)	USA	A			
		III				Yokogawa	Japan	A			
		III				ABB	Germany / Italy	A			2600T & critical item from ABB Italy/ Their approved source;
		III				Siemens	France	A			Sitrans P DSIII Series
		III				Fuji Electric	France	A			FCX -AIII SERIES
		III				Fuji	Japan	A			
13-B	Electronics Transmitter -Field Bus Based (Pressure , DP and DP based Flow/Level)										
		I				ABB India Ltd	Bengaluru	A			One no of Transmitter will be sent at DDCMIS supplier for function testing of field bus communication with DDCMIS during FAT

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A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्त, , यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए ।										
DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए।										
QP / INSPECTION CATEGORY:										
CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह										
CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया										
CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.										
UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.										
FORMAT NO./ प्रारूप सं: QS-01-QAI-P-1B/F1-R0										

PAINTING REQUIREMENT

Package	Condition	Surface Preparation	Primer Coat	No. of Coats	Final Coats	Intermediate Coat (in Microns)	No. of Coats	DFT (in Microns)	Final Coat	No. of Coats	DFT (in Microns)	Total DFT
HVAC SYSTEM	MECHANICAL EQUIPMENT (OUTDOOR INSTALLATIONS)	Surface preparation: Shot blast cleaning/ wire brushing.	Red oxide primer	1	30-35 µm per coat.				Synthetic enamel paint	3	25 µm per coat	105-110 µm
HVAC SYSTEM	MECHANICAL EQUIPMENT (INDOOR INSTALLATIONS)	Surface preparation: Shot blast cleaning/ wire brushing.	Red oxide primer	1	30-35 µm per coat.				Synthetic enamel paint	2	25 µm per coat	80-85 µm
HVAC SYSTEM	PARTS COMING IN CONTACT WITH ACID FUMES (IN BATTERY ROOMS)/ EQUIPMENT IN COASTAL AREA	Surface preparation: Shot blast cleaning/ wire brushing.	Epoxy resin based zinc phosphate	1	30-35 µm per coat.	Epoxy resin based paint pigmented with Titanium dioxide	1	25 µm per coat.	Epoxy paint with glossy finish	1	25 µm per coat.	80-85 µm
HVAC SYSTEM	For Indoor components such as motors, electrical parts etc	Epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat.										
	Notes	The surfaces of stainless steel, Galvanized steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting										
		For centrifugal fans/axial/Roof extractor fans - Casing shall have hot dip/ spray galvanization (minimum 60 micron DFT).										
		Touch up painting shall be as per standard industrial practice.										

PACKING REQUIREMENT

	COMMON GUIDELINES FOR PACKING
1	**GENERAL:**
1.1	The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.
1.2	All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.
1.3	The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement.
1.4	Each package shall be accompanied by a packing note quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

2.	**TYPES OF PACKING:**
	The following 5 types of packing have been standardized for packing of General Components/ Assemblies.
a	**OP'** - Open Type.
b	**PP'** - Partially Packed.
c	**CP'** – Crate/Box Packing - Components/Equipment requiring physical protection.
d	'**CQ**' - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
e	**'CR'** - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

3.	**DESCRIPTION OF TYPES OF PACKING:**
	The various types of packing, as standardized above, are described below.

3.1	**'OP' - Open Type**
	In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.

3.2	**PP' - Partially Packed**
3.2.1	Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene
3.2.2	Film. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film.

3.3	**'CP' - Crate Packing**
	Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.

3.4	**'CQ' - Case Packing -** Machined Components/Assemblies/Equipment
3.4.1	Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.
3.4.2	For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.

3.5	**CR' - Case Packing** - Electrical & Electronic Components/Assemblies

	Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel.

4	**PREPARATION OF PACKING CASES**
4.1	**DIMENSIONS:**
a)	Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units/manufacturers.
b)	Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.
c)	Minimum number of planks shall be used for a shook.
d)	Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.
e)	Width of binding planks shall be minimum 100mm.
f)	Distance between any 2 binding planks shall be less than 750mm.
g)	diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
h)	Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
i)	Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

4.2	**HOOP IRON STRIPS**
	These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

4.3	**BRACKETS**
	These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of “L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

4.4	**MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM**
	100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

4.5	**RUBBERISED COIR:**
	The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

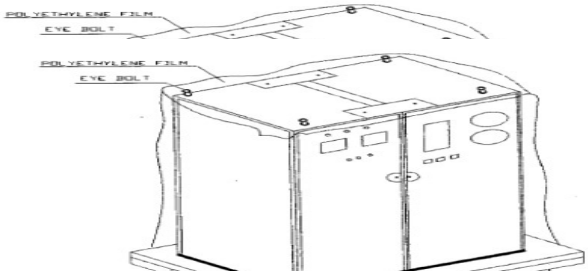
5	**MULTI LAYER CROSS LAMINATED POLY FILM WHILE PACKING OF CUBICLES/CASING**
5.1	The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 4.4) using blue nails wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.
5.2	The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film. This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.
5.3	The cubicles shall be covered with Multi-layer cross laminated poly film.

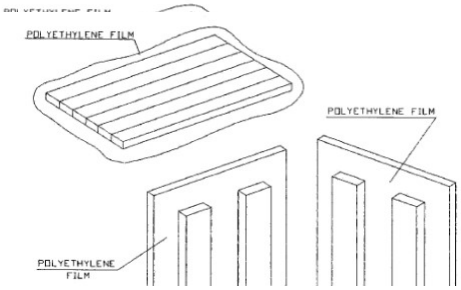
6	**PACKING OF LOOSE ITEMS/SPARES**
6.1	Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 5.4) using blue nails.
6.2	Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
6.3	Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
6.4	Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
6.5	Silica gel held in cotton bags shall be kept at proper places in the box.
6.6	Packing slip kept in polyethylene bag shall be placed in the box.
6.7	Two numbers of hoop iron strips shall be strapped tightly on the case using clips.

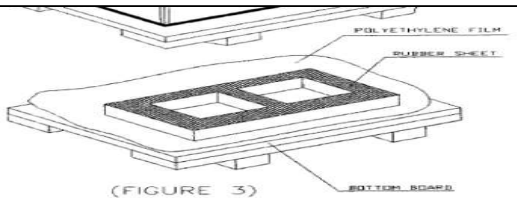
6.8	Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
6.9	Loose items to be kept inside the cubicle/casing

	- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

7	**TYPICAL PATTERN OF WOODEN BOX**







(FIGURE 3)

Figure 2

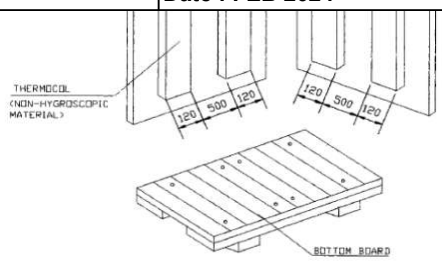


Figure 1

8	**SEALED PACKING:**
	Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and

9	**MARKINGS/STENCILINGS**
9.1	**"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".**
9.2	Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.
9.3	In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel.
9.4	Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.
9.5	Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.
9.6	In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

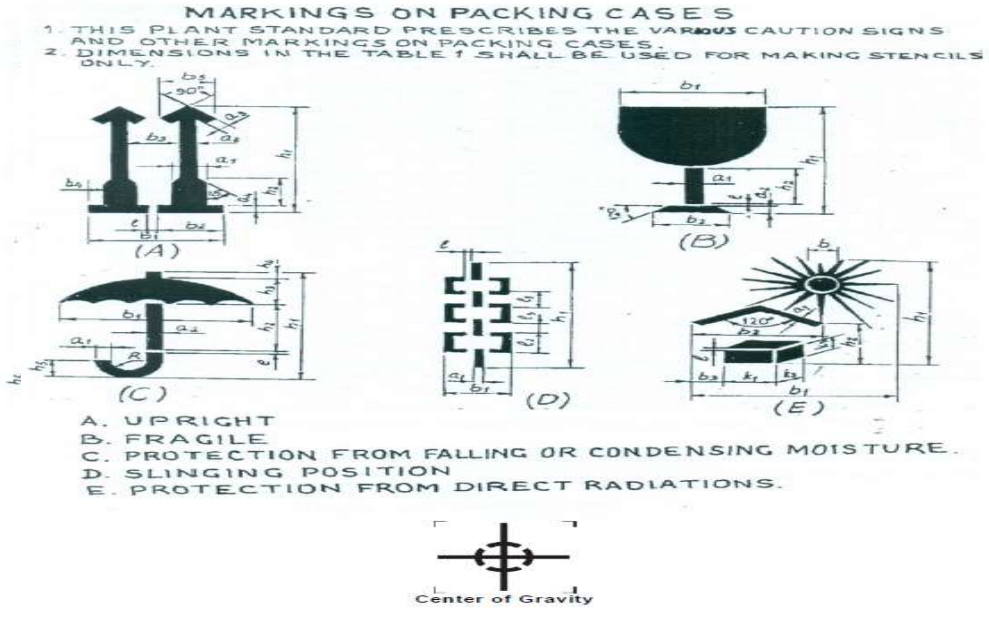


Figure 3
Figure 3

	BHEL – <unit> - <location> - <pin>				
CONSIGNEE					
MATERIAL					
CUSTOMER REF.		MO. NO.			
DESPATCH ADVICE NOTE NO		CASE NO			
DIMENSIONS(MM) L x B x H			NET WT –KGS	GROSS WT –KGS	
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT				

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

10 STANDARD METHOD OF PACKING

Table 1 - Standard Method of Packing

S. No.	DESCRIPTION	CASE	CRATE	BUNDLE	BARE	DRUM
1	AIR WASHER AND UAF	O				
2	PUMPS	O				
3	DUCTING			O		
4	AHU	O				
5	SUPPORTING STRUCTURALS				O	
6	FANS	O				
7	GASKETS	O	O			
8	FLANGES	O	O			
9	MOTORS, TRANSMFORMERS, VVVFD, LIMIT SWITCHES, , RELAYS, FUSES, LIGHTING FIXTURES, PENDANT, ISOLATING SWITCH, RRC, TRANSMITTERS AND OTHER ELECTRICAL ACCESORIES	O				
10	CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL,		O			
11	OPERATIONAL SPARES , MAINTENANCE TOOLS AND TACKLES	O				
12	ALL OTHER LOOSE ITEMS	O				

Note
Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

DOCUMENTATION REQUIREMENT

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY ALL THE BIDDERS ALONG WITH THE BID

Sl. No.	DOCUMENT TITLE
1	PQR CREDENTIALS
2	COMPLIANCE SHEET
3	"NO DEVIATION" CERTIFICATE DULY STAMPED AND SIGNED.

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

S.N.	BHEL drawing No.	Title	Type of document	Schedule date of submission from date of LOI. (in weeks)
1	PE-V0-508-554-A603	STANDARD DRAWING FOR DUCT FABRICATION & SUPPORTING ARRANGEMENT AND ERECTION & APPLICATION DETAIL OF INSULATION	Secondary	7
2	PE-V0-508-554-A605	TG HALL VENTILATION DUCT LAYOUT FROM A-ROW SIDE AIR WASHER	Primary	15
3	PE-V0-508-554-A606	TG HALL VENTILATION DUCT LAYOUT FROM B-C BAY AIR WASHER	Primary	15
4	PE-V0-508-554-A607	EQUIPMENT LAYOUT OF AIR WASHER UNIT ALONGWITH FOUNDATION DETAIL ALONG A-ROW	Primary	14
5	PE-V0-508-554-A608	EQUIPMENT LAYOUT OF AIR WASHER UNIT ALONGWITH FOUNDATION DETAIL ALONG BC-BAY AND BOILER MCC ROOM	Primary	14
6	PE-V0-508-554-A609	EQUIPMENT LAYOUT OF UAF UNIT ALONGWITH FOUNDATION DETAIL FOR ESP & FGD BUILDING	Primary	14
7	PE-V0-508-554-A610	VENTILATION DUCT LAYOUT OF UAF UNIT FOR ESP & FGD CONTROL BUILDINGS	Primary	12
8	PE-V0-508-554-A101	SIZING CALCULATIONS FOR VENTILATION FANS FOR ALL BUILDING	Primary	12
9	PE-V0-508-554-A707	WRITE UP & CONTROL PHILOSOPHY FOR VENTILATION SYSTEM	Primary	10
10	PE-V0-508-554-A903	OPERATION & MAINTENANCE MANUAL	Secondary	18
11	PE-V0-508-554-A601	DESIGN PHILOSOPHY, HEAT LOAD CALCULATION AND SCHEME OF AIR DISTRIBUTION FOR EVAPORATIVE COOLING SYSTEM FOR ESP CONTROL ROOM & FGD CONTROL ROOM	Primary	12
12	PE-V0-508-554-A212	TECHNICAL DATA SHEET & GA DRAWING FOR AXIAL FAN & ROOF EXTRACTOR ALONGWITH FIXING DETAILS	Primary	15
13	PE-V0-508-554-A210	TECHNICAL DATA SHEET & GA DRAWING OF MODULAR AIR WASHER & UAF INCLUDING FAN & PUMP DETAILS	Primary	14
14	PE-V0-508-554-A213	TECHNICAL DATA SHEET FOR Y TYPE STRAINER	Secondary	13
15	PE-V0-508-554-A214	TECHNICAL DATA SHEET & G/A/DRWG/ FOR CAST IRON VALVES(GATE VALVE,CHECK VALVE, GLOBE VALVE)	Secondary	16
16	PE-V0-508-554-A216	TECHNICAL DATA SHEET FOR THERMAL & ACCOUSTIC INSULATION FOR DUCTING	Secondary	10
17	PE-V0-508-554-A217	TECHNICAL DATA SHEET & G/A/ DRAWING OF PRE-FILTER,FINE FILTER&WATER REPELLANT FILTER (AIR WASHER & UAF)	Secondary	12
18	PE-V0-508-554-A218	TECHNICAL DATA SHEET OF G/I SHEET	Secondary	12
19	PE-V0-508-554-A219	TECHNICAL DATA SHEET OF PIPES	Secondary	12
20	PE-V0-508-554-A220	DATA SHEET & GA OF FIRE DAMPER WITH ACTUATOR DETAILS	Secondary	12
21	PE-V0-508-554-A002	MQP Axial/RE fan	Secondary	12
22	PE-V0-508-554-A003	MQP Butterfly Valves	Secondary	12
23	PE-V0-508-554-A004	MQP Centrifugal fan	Secondary	12
24	PE-V0-508-554-A006	MQP Horizonatal Centrifugal Pumps	Secondary	13
25	PE-V0-508-554-A007	MQP MS ERW Pipe (Black/GI)	Secondary	13
26	PE-V0-508-554-A206	TECHNICAL DATA SHEET, GA DRAWING AND PERFORMANCE CURVES OF MOTOR FOR CENTRIFUGAL FAN & PUMPS	Secondary	15
27	PE-V0-508-554-A207	TECHNICAL DATA SHEET, GA DRAWING & PERFORMANCE CURVES OF MOTOR FOR AXIAL FLOW & ROOF EXTRACTOR FANS	Secondary	15
28	PE-V0-508-554-A701	ELECTRICAL FEEDER LIST.	Secondary	18
29	PE-V0-508-554-A702	VENTILATION CABLE SCHEDULE	Secondary	18
30	PE-V0-508-554-A901	P.G. TEST PROCEDURE.	Secondary	12

Notes:-

1	Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified.
2	All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.: -
3	All drawings and documents shall indicate the list of all reference drawings including general arrangement.
4	All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
5	Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
6	All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
7	Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C… etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0,1, 2, 3 ….etc.
8	Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication
9	All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.
10	All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.
11	Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
12	Bidder to follow the following the drawing submission schedule:
13	1st submission of drawings from date of LOI as per the submission schedule.
14	Every revised submission incorporating comments – within 7 days.
15	Bidder to submit revised drawings complete in all respects 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
16	BHEL /Customer Comment/Approval on subsequent revision shall be provided within 18 days of vendor's submission.
17	Primary documents shall be treated as basic Engineering documents for contractual purpose.

The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document

S. no.	Description of Drgs./Docs.		No. of Prints	No. of Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents			
	First submission and submission with major changes			
	Layout (A0&A1 sizes)	3		-
	Other Drawings/Documents (A0 & A1 sizes)	3		-
	P&ID (All sizes)	3		-
	Final drawings/documents (Directly to site)	4		3
	"As Built" Drawing/Documents (Directly to site)	4		3
	Analysis report of Equipment/ piping/structures componenets/system employing software packages as detailed in the specification	3		3
2	Erection Manual (Directly to site)	4		3
3	Operation & Maintenance manual Final Submission (Directly to site)	4		3
4	plant hand Book (Final submission)	2		2
	Commissioning and Performance Test Procedure manual First Submission	1		-
5	Commissioning and Performance Test Procedure manual Final submission - (Directly to site)	4		3
6	Performance and Functional Guarantee Test Report First Submission	2		-
7	Performance and Functional Guarantee Test Report Approved Copies (Direct to Site)	4		3
8	Project Completion Report (Directly to site)	4		3

GPC

S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWERCONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL (IN KW)	DUTY FACTOR	TOTAL KW
		WORKING	STANDBY			
1	2	3A	3B	4	5	6=3Ax4x5
1.0	**VENTILATION SYSTEM FOR POWER HOUSE BLDG.**					
a.	Centrifugal Fan of cap. 1,00,000 CMH at 60 mmwc static pr. for Air Washers.	20	0		1	
b.	Centrifugal Fan of cap. 50,000 CMH at 60 mmwc static pr. for Air Washers.	2	0		1	
2.0	**VENTILATION SYSTEM FOR BLDG. AND FGD BLDG.**					
a.	Centrifugal Fan of cap. 75,000 CMH at 50 mmwc static pr. for UAF	4	0		1	
					TOTAL(kW)	

Note: Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as 612 KW. So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation @ USD 4642 per KW of additional power over EPC.

Bidder's guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty @ USD 4642 per KW shall be levied on vendor.

COMPLIANCE CERTIFICATE

S. NO.	The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.
1	The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under “exclusion and those resolved as per ‘Schedule of Deviations’, with regard to same.
2	There are no other deviations w.r.t. specifications other than those furnished in the ‘Schedule of Deviations’. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the ‘Schedule of
3	Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & 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. This is within the contracted price without any extra implications to BHEL after award of the contract.
4	All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.
5	The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer’s decision shall be binding on the bidder whenever the deficiency is pointed out. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
6	The commissioning spares shall be supplied on ‘As Required Basis’ & prices for same included in the base price itself.
7	All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
8	Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions
9	In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant’s comments. No extra claims shall be put on this account

10	Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
11	As built drawings shall be submitted as and when required during the project
12	The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder
13	Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
14	Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
15	In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

Signature of authorised Representative

Name and Designation :

Name & Address of the Bidder

Date