Ref. No.: BHEL/EDN/MM/PR/EOI/001-Methedology

Subject: Methodology to evaluate the interested vendors.

1. The aim of this EOI is to increase our vendor base for each of the items listed in the attachment Annexure-1

2. Please read attached Pre-Qualification Criteria (PQC) , Instructions to Bidder (ITB), General Commercial Condition (GCC), Special Commercial Condition (SCC) and Specifications for the items given in the attachment Annexure-1,

3. Vendors fulfilling PQC and Specification of all / or any items, are requested to submit bid as per specification.

4. Bids shall have :
   A. Pre-qualification criteria bid
   B. Techno-commercial bid

   Please write ref as "BHEL/EDN/CE-MM-PR/EOI/001 dated 14/01/2016" on envelope and both can be in one envelope.

   On receipt of above bids, same will be evaluated by BHEL and then decide regarding acceptance or rejection of bids.

5. A list of such eligible bidder shall be enrolled in our PMD as per guidelines of SEARP, and the eligible venders shall be allotted permanent vendor code against eligible supply category of items and shall be updated in PMD.

6. RFQ / Tender / mailing will be sent to enrolled vendors as per BHEL policies , procedures and guidelines.

DGM (CE-MM-PR)

List of items considered for Expression Of Interest (EOI)

SL NO.	ITEM	ENGG GRP	APPROX QUANTITY REQ PER YEAR	APPROX TOTAL VALUE PER YEAR In LAKHS	Name of contact person for clarification	Contact Number
1	CO ANALYSER	BPE MECH	10 NO	45	PREETHAM	9591925273
2	OXYGEN ANALYSER - HIGH TEMPERATURE	BPE MECH	20 NO	50	ASHISH MANJHI	9449869641
3	MASTER / SLAVE CLOCK SYSTEM	BPE ELEC	12NO	96	AMIT KUMAR SHARMA	9448819225
4	FLEXIBLE CONDUITS	BPE ELEC	75 KM	400	ARULJOTHI G D	9739353950
5	BATTERY (NICKEL CADMIUM) CHARGER (SMPS BASED)	BPE ELEC	6 SETS	700	AMIT KUMAR SHARMA	9448819225
6	UPS	BPE ELEC	12 SETS	480	SATHISH KUMAR S	9449869753
7	ELECTRONIC TRANSMITTERS	BPE ELEC	6,000 NO	1200	SANDEEP S	7829914950
8	ULTRASONIC TYPE LEVEL TRANSMITTERS	BPE ELEC	60 NO	51	SANDEEP S	7829914950
9	GUIDED WAVE RADAR TYPE LEVEL TRANSMITTERS	BPE ELEC	132 NO	132	SANDEEP S	7829914950
10	COAL BUNKER LEVEL MONITORING SYSTEM (STRAIN-GAUGE)	BPE MECH	12 NO	300	PREETHAM	9591925273
11	COAL BUNKER LEVEL MONITORING SYSTEM (ULTRASONIC)	BPE MECH	5 NO	75	PREETHAM	9591925273
12	TEMPERATURE TRANSMITTERS (DIN-RAIL MOUNTED)	BPE ELEC	10,000	600	SANDEEP S	7829914950
13	TEMPERATURE TRANSMITTERS (DUAL INPUT)	BPE ELEC	2,000	210	SANDEEP S	7829914950
14	CJC JUNCTION BOX WITH POWER DISTRIBUTION BOARD	BPE ELEC	90 NO	12	ARULJOTHI G D	9739353950
15	CHARGER (THYRISTOR BASED)	BPE ELEC	1 NO	50	AMIT KUMAR SHARMA	9448819225
16	FURNANCE CAMERA	BPE ELEC		50(ONLY FOR R&M PROJECTS)	AMIT KUMAR SHARMA	9448819225
17	RIGID CONDUITS	BPE ELEC	50KM	150	ARULJOTHI G D	9739353950

List of items considered for Expression Of Interest (EOI)

SL NO.	ITEM	ENGG GRP	APPROX QUANTITY REQ PER YEAR	APPROX TOTAL VALUE PER YEAR In LAKHS	Name of contact person for clarification	Contact Number
18	FLUE GAS ANALYSER (SOX/NOX/CO)-INSITU TYPE	BPE MECH	15 NO	300	PREETHAM	9591925273
19	E/P CONVERTER	BPE MECH	100 NO	15	ASHISH MANJHI	9449869641
20	CONDUCTIVITY TYPE LEVEL SWITCHES	BPE MECH	40 NO	60	PREETHAM	9591925273
21	FLAME PROOF JUNCTION BOXES	BPE ELEC	364 NO	50	ARULJOTHI G D	9739353950
22	HAND HELD HART COMMUNICATOR	BPE MECH	8 NO	245	SANDEEP S	7829914950
23	AIR FILTER REGULATOR	BPE MECH	200 NO	2	ASHISH MANJHI	9449869641
24	LIE LIR	BPE MECH	1,000 NO	1000	ASHISH MANJHI	9449869641

Ref :	CE/416/ANALYZER/CO-CRSS
Rev. :	00
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PURCHASE SPECIFICATION FOR CO ANALYZER – CROSS DUCT TYPE

REVISIONS :	APPROVED BY PUNIT P SINGH		
	PREPARED BY PV	ISSUED 416	DATE 11/04/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer CO Analyzers to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for CO Analyzer:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of CO Analyzer in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of analyzer.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. For analyzer, Bidder should be authorized and he should have capacity to commission the analyzers in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
7. Bidder shall have optimum inventory of critical components like analyzer sensors/ electronic modules.
8. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
9. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Analyzer/ Sensors/ Systems/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out for last three year & minimum two systems. Also, submit reports of successful erection & commissioning Protocols & Minutes of the meetings for handing over of CO analyzer system for these projects.
5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
6. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of analyzer. Submit these details.
7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION- C2

SUPPLY REQUIREMENTS OF CO ANALYZER FOR EACH PROJECT:

Vendor shall quote unit prices for each of the items indicated below. Without the unit rates the offer shall be treated as incomplete and shall be rejected.

SCOPE:

1. CO ANALYZER:

   CO Analyzer (Cross Duct Type) as per Specification as per SECTION-D for each project as per requirement.

2. Following separate documents to be furnished in the event of order:

   2.1 Drawings, Data Sheets, Technical Literature – 7 sets.
   2.2 Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.
   2.3 O & M Manuals - 4 Sets (2 Sets to BHEL-EDN & 2 Sets to Site with Consignment).

3. Erection and Commissioning for offered system

   - Supervision of Erection, Total Commissioning and Handing over of the offered system to Owner / End user

4. Specific Requirement: Vendors to quote / confirm the following project specific requirements:

   a. Location of CO Analyzer will be at ID Fan Inlet or as the case may be.

   b. Vendors to confirm project specific technical requirement as per SECTION-D Any deviation w.r.t this spec to be clearly indicated in the offer.

5. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.
6. Unit rates quoted will considered for mandatory spare if applicable.
7. A total of 6 systems are to be supplied for the projects in the year 2015-2016.

TECHNICAL REQUIREMENT FOR CO ANALYSER CUM MONITOR

The following are the technical requirements for Insitu CO analyzer to be used for measurement of CO in flue gas in coal fired power plants. The location shall be in the chimney or the duct leading chimney or at ID Fan inlet. The offered instrument shall meet relevant international standards for emission monitoring systems.

1.0 General requirements.

1.1. Output signals Analog	: 4-20 mA DC isolated
1.2. Output signal Binary	: 2NO+2NC for High alarm
1.3. Zero and span adjustment	: Available
1.4. Ambient temperature	: 60 Deg. Centigrade
1.5. Indication	: Digital
1.6. Enclosure	: Weather and dust proof (IP 55) Die cast Aluminum / SS
1.7. Digital Signal Transmission	:RS 232 Link and to suit Connection Protocol to DDCMIS
1.8. Calibration	:Auto and Manual (from Remote)
1.9. Error Diagnostic	: To be Provided
1.10. Others	: If analyzer provides superimposed HART signal on 4-20 mA DC output it shall also be connected to PC based station.

2.0 Technical requirements for CO analyzer

2.1 Type of instrument	: Micro-Processor Based **Insitu** type
2.2 Principle of measurement	: IR absorption
2.3 Measurement rang	: 0-999 ppm selectable at any value in between.
2.4 Accuracy	: ± 2 % of F.S.
2.5 Linearity	: ± 1 % of F.S.
2.6 Response time	: 5 Sec. Or less
2.7 Drift	: ± 1 % / 10°C.
2.8 Operating range	: 0-300°C.
2.9 Filter	: Sintered Bronze 5 micron
2.10 Accessories	: Purging system, with all required accessories & Automatic Shutters for windows to be provided.
2.11 Compensation for Temperature	: To be provided. Suitable temperature sensor with necessary accessories like flange, counter flange, fasteners etc. shall be provided

2.12 All interconnecting cabling including cables up to JB to be provided. Cable length is approximately 15 meters.

2.13 Power supply (nominal)	: 240 V AC Single phase, 50 Hz.
2.14 Process flange	: As per suitable for 4" 150 #. Bidder to provide all mounting accessories stub, such mating

flange on probe suiting the above Gaskets and Fasteners.

2.15 Path Length : Path length is approximately 5 to 6 Meters. Exact patch length shall be informed during detailed engineering.

3.0 Remote Calibration

The analyzer shall have facility for Remote manual calibration. Vendor shall offer all required hardware and software for remote calibration along with necessary details. Typical location of this facility is in main equipment room of Unit Control room. If vendor proposes to use a PC based remote calibration system, a PC OEM manufacturer like HCL, HP or IBM shall be offered. Assembled PCs are not acceptable. Remote calibration system shall be certified by manufacturer of analyzer for suitability of components and engineering.

4.0 Special tests

The offered system above shall confirm to the special test requirements if required.

5.0 Bidder shall furnish with the offer Clause-wise compliance / deviation list. This is one of the important document to be submitted for evaluating the offer.

6.0 Documents to be furnished, with the offer:-

6.1 Datasheets / Schematic and Probe assembly Drawings - 02 set

6.2 Technical Literature / Catalogs - 02 set

7.0 Documents to be furnished project wise, for Approval , in the event of order :-

7.1 Datasheets / Schematic and Probe assembly Drawings - 11 sets. Also a soft copy of all drawings shall also be furnished.

7.2 Technical Literature / Catalogs - 04 sets

8.0 Typical list of each set of Mandatory Spares for offered System

8.1 One (1) Set of measuring circuit, printed board etc.

8.2 Two (2) Sets of Gaskets/ 'O' Rings.

8.3 One (1) No. of infrared source unit.

8.4 One (1) No. of detector unit

8.5 One (1) No. of Purge Air Flow Meter unit.

8.6 Any other items required / recommended items for two years continuous operation of the offered system

Unit Rates for each item in spares to be provided for addition and deletion of items.

9.0 Quality documents to be submitted for approval:

Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

10.0 O& M Manuals – 4 sets (2 Sets to BHEL-EDN Bangalore & 2 Sets to site with Consignment).

11.0 Erection and Commissioning requirement for offered System

Supervision of Erection, Total Commissioning and Handing over of the offered CO Analyzer system to Owner / End user.

		A4-10	REF. : CE / 416 / OH / EOI
			REV. NO. : 00
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SPECIFICATION
FOR
HIGH TEMPERATURE OXYGEN ANALYSER

REVISION : 00

APPROVED

ASHISH M

PREPARED	ISSUED	DATE
R.K.L	416	16/04/2015

CONTENTS

		A4-10	**SECTION – A**	**REF. : CE / 416 / OH / GI** **REV. NO. : 00** **PAGE : 01 0F 02**

GENERAL INSTRUCTIONS TO BIDDERS

REVISION : 00	**APPROVED** **ASHISH M**		
	PREPARED **RKL**	**ISSUED** **416**	**DATE** **16/04/2015**

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

1.0 All required documents against this expression of intrest shall be submiited in english only.

2.0 Introduction: Bidders are required to offer Non heated type Oxygen Analyser for coal fired Thermal Power Plant application.

3.0 In order to accept the Bidders for Oxygen Analyser as per Specification (refer Sections C), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's will not be Evaluated.

6.0 Evaluation methodology : BHEL shall open Bidder's PQR documents only as per Section B of this specification for review & acceptance. Only after acceptance of PQR documents, the Bidders will be further evaluated for registration as a vendor with BHEL. However bidders to note that their acceptance for a particular project will be based on approval of bidders name by End user for that project.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/OH/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/OH/PQR / Cl BB of Section B" marked on it.

cc. Clause wise confirmation on specification as per section C.

8.0 Whenever required during evaluation of PQR, vendor is required to be present at BHEL Electronic Division, Mysore Road, Bangalore, for discussions.

9.0 Deviations (if any) shall be discussed with only those vendors who quote for this tender.

	A4-10	**SECTION – B**	**REF. : CE / 416 / OH / PQR** **REV. NO. : 00** **PAGE : 01 0F 03**

PRE-QUALIFICATIONS REQUIREMENTS

REVISION : 00	**APPROVED** **ASHISH M**	
	PREPARED **RKL**	**ISSUED** **416**
		DATE **16/04/2015**

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for High Temperature (Non heated type) Oxygen Analyser, as a part of Offer:

1.0 The bidder should have executed / completed work of Design, manufacture, supply supervision of erection & commissioning of Oxygen Analyser for at least 2 units in a coal fired power plant in the last three years as on the date of bid opening.

2.0 Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Engineering Documentation, Erection, Commissioning & any other co-ordination work.

3.0 Submit reference List of Projects for which Oxygen Analyser has been supplied in last Three year.

4.0 Submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com.

5.0 For vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.

6.0 OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Unpriced Purchase Order copies of Oxygen Analyser executed in past three years.
2.0 Documents, drawings and catalogue of Oxygen Analyser supplied to power plant.
3.0 Details of Manufacturing, testing & inspection facility.
4.0 Bidder shall have facility for Engineering activities, preparation of Documents Etc. Submit these details with.
5.0 In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
6.0 Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

7.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

<u>Important note:</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the General instructions in Section A of this specifications.

TECHNICAL SPECIFICATION FOR HIGH TEMPERATURE OXYGEN ANALYSER

REVISION : 00

APPROVED

ASHISH M

PREPARED	ISSUED	DATE
RKL	416	16/04/2015

Technical Specification
The offered Oxygen Analyser shall meet the following specification requirements:

1.1 Type of instrument	: Non- heated in-situ dry type.
1.2 Principle of measurement	: Partial pressure using Zirconium Oxide cell.
1.3 Probe Length	: 900 mm
1.4 Measurement Range	: 0.01% to 10% oxygen.
1.5 Operation range	: 600-1600°C.
1.6 Filter	: Cell shall be protected using ceramic boot.
1.7 Accuracy	: ±1% of F.S or 0.5 % O2 whichever is more.
1.8 Linearity	: ±1% of F.S.
1.9 Repeatability	: ≤ 0.5% of Span.
1.10 Response time	: 5 sec. or less (T90).
1.11 Stability	: 1% deviation throughout life of sensor.
1.12 Compensation for Temp.	: With R/B type Thermocouple.
1.13 Output signals Analog	: 4-20mA DC galvanically isolated.
1.14 Binary Output	: 2 NO + 2NC for high alarm.
1.15 Ambient temp.	: 50°C
1.16 Indication	: Digital Alphanumeric Display. Display of reading in engineering units shall be provided.
1.17 Enclosure type / material	: Weather & dust proof (IP 55) Die cast Aluminum / SS.

1.18 Type of electronics : Microprocessor based with Self diagnostics.

1.19 Verification : Auto & Manual (from remote).

1.20 Error Diagnostic : To be provided.

1.21 Zero and Span Adjustment : To be provided with range selection facility.

1.22 Digital Signal Transmission : HART / RS 485 Port Modbus Protocol / Ethernet TCP / IP protocol for communication with plant control system.

1.23 Others : All interconnection SS tubing and cabling between probe and analyser / Reference air & verification unit to be provided. Probe protector. Flanges for mounting probe. Verification gas cylinder shall be provided.

2. Supervision of Erection, Total Commissioning and Handing over of the offered system to Owner / End user shall be in bidder's scope.

3. Two analysers are required per unit. Total analyser requirement for a year will be about 10 nos.

PQR AND TECHNICAL REQUIREMENTS

FOR

GPS BASED MASTER & SLAVE CLOCK SYSTEM

REVISION:00

APPROVED

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT K SHARMA	416	10-Apr-15

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 In order to accept the Technical offers/ proposals from Bidders for three projects mentioned in this Specification (ref. Sections C, D & E), certain Pre-qualification criteria are required to be met by Bidder.

3.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

4.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

5.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

6.0 Bidders are required to submit offers as detailed below:

Documents pertaining to Pre- Qualification requirement shall be in a separate cover clearly mentioning on cover "PQR".

Technical offers/proposals for requirements mentioned in subsequent Sections C shall be submitted in another cover mentioning "Technical Offer" on it.

7.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders as a part of offer:

1.0 Submit Reference List of Projects where in offered MASTER CLOCK SYSTEM is supplied & commissioned along with details of performance and Year of Commissioning.

2.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years (if applicable).

3.0 Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com".

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Technical literature/Manuals, Catalogs etc.

2.0 Un priced Purchase Order copies

3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.

4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.

5.0 Details of Manufacturing, testing & inspection facility.

6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered system, Stocking of Spares, etc. submit these details.

7.0 Bidders shall submit Type test reports and routine / Acceptance test reports as per section G.

8.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered system. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Important note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated.

Please read carefully the General instructions in Section A of this specification.

SECTION-C

TECHNICAL REQUIREMENTS

1. Typical BOM of Master & Slave clock system

Sl No.	Description
1.0	GPS redundant antenna for outdoor use along with lightning arrestor
2.0	Fully wired Master Clock Panel of size 800 mm(W) x 800 mm(D) x 2415 mm(H) of Pyrotech / Rittal / Instrumentation Ltd, Kota / MPP Technologies / Khoday Controls / Chemin Control & Instrumentation / MODAYIL make
2.1	GPS Receiver unit (redundant)
2.2	Redundant Master clock
2.3	2 x 100% hot redundant Comparators
2.4	Redundant power supply units/Converters operating on 230V A.C UPS Power supply
2.5	Diode O-ring unit for D.C distribution –Inside panel
2.6	Interface for Time synchronization with other microprocessor based equipments
2.7	Interface to slave clocks
3.0	**Interfaces / outputs / other items required for the system**
3.1	IRIG B output
3.2	NTP/SNTP output
3.3	Pulse output (PPH)
3.4	Pulse output (PPM)
3.5	Pulse output (PPS)
3.6	BCD(1sec)
3.7	RS232C
3.8	DCF77 with date
4.0	IRIG-B multiplexer with amplifier (1 input / 4 output)
5.0	Signal Booster for slave clocks
6.0	Junction boxes
7.0	Slave Clocks
8.0	Interconnecting Cables as given below **(ARMOURED & FRLS TYPE):-**
8.01	GPS antenna to Receiver unit (un-armoured with flexible metal conduit)
8.02	Cable from master clock Panel to various IRIG-B interfacing equipment
8.03	Cable from master clock panel to various pulse interfacing equipment
8.04	Cable for NTP/SNTP Output
8.03	Cable from master clock to slave clock for signal
8.04	Cable for power supply to slave clocks
9.0	Erection supervision and commissioning of complete system

2. **Erection Supervision, Commissioning and Handing over of services.**

This activity will require 2-3 visits to site and shall include following for the project:

a) Demonstrating healthiness of Master & slave clocks with signal acquisition from both antenna.
b) Demonstrating healthiness of various time synchronization interfaces to microprocessor based equipment.

Demonstrating healthiness of slave clocks display.

3.0 GENERAL TECHNICAL PARTICULARS

1. All the requisite cables shall be provided with prefabricated male/female connectors at both ends including interfacing equipment & slave clocks power supply. The connectors related to slave clocks signals termination shall all be in supplier's scope.
2. **IRIG-B** Interfaces are required including spares for interfacing with DCS system or any other microprocessor based time synchronization equipment. IRIG B interface shall be 1 KHz amplitude modulated type.
3. **PPS** output and **PPM** pulse outputs as potential free contacts are also to be provided as a standard as applicable per clock system taking care of site + any spares requirements.
4. Junction box shall be of Steel.
5. The output from various signal conditioner cards shall be independent and isolated.
6. The NTP ports shall have independent IP address in each output.

4.0 Type Test Requirements

The vendor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the vendor proposes a different standard/code from that indicated below, the same is acceptable provided the equivalence of the proposed standard is established by the vendor. Submission of type test results and certificate shall be acceptable provided.

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

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

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

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

The minimum type test reports which are to be submitted for each electronic module shall be as indicated below:

i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems: All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, and data links shall be provided with protections that meet the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.

ii) Dry Heat test as per IEC-68-2-2 or equivalent.

iii) Damp Heat test as per IEC-68-2-3 or equivalent.

iv) Vibration test as per IEC-68-2-6 or equivalent.

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

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

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

(Test listed at item no. v, vi, vii, above are applicable for electronic cards only)

5.1 Along **with the Technical offer**: For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected.

01. Single line diagram
02. GA drawings
03. Circuit diagrams
04. Fault co-ordination details
05. Technical write-up
06. Technical literature / Catalog of each component
07. Data sheet of complete system/subsystem
08. Wiring diagram/interconnecting arrangement details
09. Complete Bill of Material with make & Model
10. Mandatory spares list and commissioning spares list.
11. Clause-wise deviation list

MASTER SLAVE CLOCK SYSTEM

The Supplier shall provide a master and slave clock system to provide uniform timing throughout the various plant facilities and time synchronization between various systems for a Project.

A Global Positioning Satellite (GPS) based date insensitive Master Clock system shall synchronize the entire system for uniform time stamping of all parameters. The system shall be complete with redundant antennas, receivers, master clocks, comparators. Master Clock system shall receive the synchronizing pulses from the Global Positioning Satellite (GPS) system, process it and then transmit and synchronize this time with other system clocks for recording of any event, logs and reports, which may take place in any portion of the network distributed throughout the plant. A provision shall be Available in the master clock system for synchronization with other GPS/Radio signal as primary and Switchyard Disturbance recorder as secondary.

The clock system shall include a master clock and slave display units. The master clock shall employ highly stable crystal oscillator to ensure accurate time indication. The stability shall be better than 0.1 sec per day. Facility for manual setting of time i.e. hours/minutes/seconds shall be provided in the master clock.

PANEL DETAILS

Paint (epoxy based, power coated)
IP Protection Class : IP32 as per IS-13947
Permissible Ambient Temp : 0-50DegC for operation and -25 to 80DegC during storage
Relative Humidity : 65% (average) and 90% (max one day)
Nomenclature labels shall be provide on both ends of the panels
Louvers with mesh shall be provided for ventilation
Panel shall be provided with removable 3 piece gland plate of 3mm thick CRCA sheet at bottom
Panel shall be made of 2mm thick CRCA sheet.
Top canopy shall be provided to cater to second digit of the IP protection class.
(The panel shade is tentative shall be confirmed during detailed engineering)
Paint thickness 55 micron & above for Powder coating otherwise 100-150 microns thickness for normal painting.

SLAVE CLOCK SPECIFICATIONS

The master clock shall drive the slave display units. It shall be ensured that loss of any slave display unit does not affect the display of any other unit.

The slave clock display shall have following minimum features :-

No. of Digits	:	6 (2-hours, 2-Minutes, 2-Seconds)
Display element	:	7 segment Red LEDs.
Digit Size	:	100 mm (minimum)
Viewing Distance	:	20 meters
Glass Cover	:	Non – Glare type.
Mounting	:	Wall / Panel mounting
Protection	:	Shall conform to protection class IP55 for all units.
Operating Temperature	:	0 – 50°C
Relative Humidity	:	95 % maximum

Note: In between the digits for hours/minutes and minutes/seconds, flashing LED'S should be provided to segregate hours, minutes, seconds digits

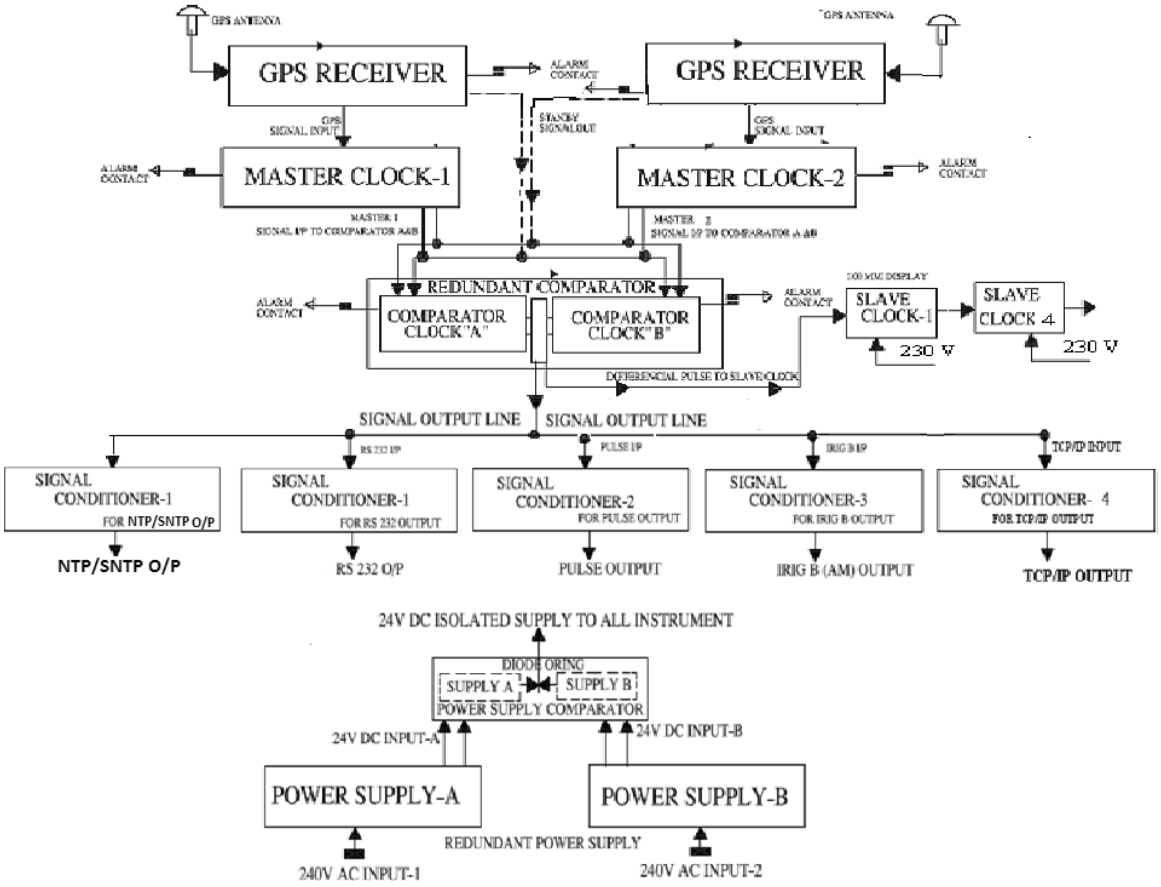


Fig 1: TYPICAL CONFIGURATION DIAGRAM

RG -58 FRLS Armoured Co- axial Cable

(FOR MASTER CLOCK PANEL TO VARIOUS IRIG B / PULSE INTERFACES)

S.No	Description	Units	Requirement
01	Conductor material	-	Annealed tin copper
	Conductor resistance	?/km	35.4
	No / Dia of strand	MM	19 / 0.19
02	**DIELECTRIC**		
	Material	-	P.E
	Tensile strength	M /MM²	10
	Elongation	%	300
	Dia over electric	-	2.95
03	**SHIELDING**		
	Material	-	Annealed tin copper
	Coverage	%	90
04	**ARMOURING**		
	No of wire	No	15
	Dia of each wire	MM	0.90
	Material	-	G.I.M.S wire
05	**INNER SHEATH**		
	Thickness	MM	1.0
	Material	-	PVC Compound
07	**OUTHER SHEATH**		
	Thickness	MM	0.60
	Tensile strength	N / MM²	12.5
	Elongation	%	150
	shrinkage	%	4
	Hot Deformation	%	50
	Heat shock test	-	No sign of Crack
	Dia over outer sheath	MM	5.0
08	**ELECTRICAL PROPERTIES**		
	1.Insulation Resistance @ Room Temp	M?□/ km	5000(min)
	2.Impedance	?□s	50 ±2
	3. Capacitance Resistivity @ 27□C @ 70□C	?□Cm ?□cm	 1 x 10^{13} 1 x 10^{10}
09	**FLAMMABILITY TEST** 1.Length 2.Time	 mm (min) Seconds (Max)	 50 60

Note: The cables shall be supplied from BHEL approved vendor or any other vendor as per manufacturer's standard befitting customer/consultant requirement as executed/offered for earlier project of similar type

CABLE FOR NTP/SNTP OUTPUT : Cat – 5 armoured cable

S.No	Description	Units	Requirement
1	Conductor material	-	24 AWG solid annealed copper
2	Jacket	-	Thermoplastic
3	Operating range	-	-40 C to +85C
4	Bend Radius	-	25.4 mm (1 in.)
5	Breaking strength	-	400 N (90 lbf)
6	Impedance	ohms	100 ohms ±15%
7	Capacitance	pF/Km	0.2
8	Propagation Delay	-	5.7 ns/m at 100 MHz

Note: The cables shall be supplied from BHEL approved vendor or any other vendor as per manufacturer's standard befitting customer/consultant requirement as executed/offered for earlier project of similar type

5) ANTENNAE CABLE

S.No	Description	Units	Requirement
1	Conductor material	-	Copper –Clad Aluminum
2	Dielectric	-	Closed cell low density foam PE
3	Inner Shield	-	Aluminum/Polyester
4	Outer Shield	-	Aluminum Braid
5	Jacket	-	Black UV and sunlight resistant
6	Operating range	-	-40 C to +85C
7	Over all DIA	-	10.29 mm (0.405 in.)
8	Bend Radius	-	25.4 mm (1 in.)
9	Weight	LBS/1000ft (lb/km)	50.4(165)
10	Velocity of propagation	-	85
11	Impedance	ohms	50
12	Capacitance	pF/ft(pF/m)	23.9(78.0)
13	Center Conductor DC resistance	ohms/1000 ft	1.4(4.6)
14	Shield DC resistance	ohms/1000ft	6.1(20.0)
15	Test Frequency	GHZ	.03 to 5.8

Note: The cables shall be supplied from BHEL approved vendor or any other vendor as per manufacturer's standard befitting customer/consultant requirement as executed/offered for earlier project of similar type

PQR AND TECHNICAL REQUIREMENTS FOR ZINC COATED FLEXIBLE CONDUIT

APPROVED

MDS

PREPARED	ISSUED	DATE
AJ	416	08.06.2015

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 **Introduction:** Bidders are required to offer ZCFC as per BHEL Technical Specifications

3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

6.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. "CE/416/ZCFC/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. "CE/416/ZCFC/PQR/CI BB of section B" marked on it.

cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

9.0 Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders for ZCFC as a part of offer:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of ZCFC in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
5. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
6. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered item/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning of ZCFC for these projects.

5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

6. Bidder shall have facility in India for Engineering activities, preparation of Documents. Submit these details.

7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION-C

TECHNICAL REQUIREMENTS

The technical requirements of ZCFC as mentioned below:

1. Flexible conduits shall be made with bright, cold rolled, annealed and electro-galvanized mild steel strip coated internally with epoxy.

2. Couplers shall be provided at one end of conduits.

3. The construction of the conduit shall be of triple layer as Galvanized steel (outer layer)/Craft Paper (intermediate layer)/Galvanized Steel (internally quoted with epoxy) (inner layer).

4. The zinc coating thickness on steel strips shall be minimum 150 gram/sq.meter.

5. The width of the steel strips used shall be such that suits the diameter requirements. The strips shall be of uniform width & thickness throughout. The strips shall be free from scales/rust before galvanizing and shall have smooth finish after galvanizing.

6. Conduit shall be wound tightly, overlapping each other to form a continuous flexible conduit. The diameter should be uniform throughout the length.

7. The internal & external surface of the conduit shall be free from burrs & sharp edges.

8. Appropriate marking & packing shall be provided by the vendor.

PQR AND TECHNICAL REQUIREMENTS

FOR

24V DC CHARGER AND BATTERY

REVISION:00

APPROVED

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT K SHARMA	416	9-Apr-15

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 In order to accept the Technical offers/ proposals from Bidders for three projects mentioned in this Specification (ref. Sections C, D & E), certain Pre-qualification criteria are required to be met by Bidder.

3.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

4.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

5.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

6.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (CI AA of section B of this Specification) shall be in a separate cover with reference no. "CE/416/BATTERY/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (CI BB of Section B of this Specification) shall be in a separate cover clearly mentioning on cover "PQR".

cc. Technical offers/proposals for requirements mentioned in subsequent Sections C, D & E shall be submitted in another cover mentioning "Technical Offer" on it.

7.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

8.0 Bidder may either participate for supplying Charger only, Battery only or Both (refer BOM of charger and battery)

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders as a part of offer:

1.0 Submit Reference List of Projects where in offered Battery /charger is supplied & commissioned along with details of performance and Year of Commissioning of the Batteries specified in Section C, D, E & F.

2.0 Bidder should have manufactured and supplied atleast two (2) numbers of minimum 24V DC 500Amps charger / Battery for 500Amps charger Industrial / Telecommunication installations, which should be in successful operation for atleast one year as on date of bid opening.

3.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years.

4.0 Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com".

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Technical literature/Manuals, Catalogs & Charging/Discharging Characteristics of offered Battery Sets.

2.0 Un priced Purchase Order copies

3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.

4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.

5.0 Details of Manufacturing, testing & inspection facility.

6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered Batteries, Stocking of Spares, etc. submit these details.

7.0 Bidders shall submit Type test reports and routine / Acceptance test reports as per section G.

8.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered Batteries. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Important note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated.

Please read carefully the General instructions in Section A of this specification.

SECTION-C

TECHNICAL REQUIREMENTS

24V DC Charger system shall consist of following

Sl no	Item	Qty
1	2X100% capacity (microprocessor controlled, intelligent, modular rectifier banks & controller (incoming for charger shall be through MCCB of suitable rating)	2 sets
2	100 % 24V DC system battery (Ni-Cad type) with accessories for **one hour duty cycle** at 100% load (refer feeder list for details of battery calculation)	2 sets
3	DCDB with bus-coupler arrangement (DCDB and Charger Panel to be joined together with Busbar arrangement as the panels will be placed together)	2 sets
4	Battery Health Management System **common for both sets** of battery of a package including hardware/software for connectivity to DCS **(for Type A charger system only)**	1 set
5	Battery Isolation comprising of MCCB housed in charger panel or in a separate box	1 set
6	Serial link with MODBUS protocol with 100 mtrs. cable for connecting to DCS. (Single connection is also acceptable provided it carries data to DCS of both Chargers.)	2 sets
7	Erection, supervision, commissioning & handing over of (a) Chargers/DCDB and BHMS and (b) of complete system after batteries have been commissioned by it's vendor	1 set
8	Erection, supervision, commissioning & handing over of complete Battery system inclusive of necessary support to Charger vendor for commissioning the complete system	1 set
9	Any software/hardware ,if applicable, to be provided to complete the system	1 set

Notes:

1. Sl.no. 2 , 8 and 9 are in scope of supply for Battery vendor.
2. Sl no 1, 3, 4, 5, 6, 7 & 9 are in scope of supply for Charger vendors.
3. Please refer BOM in annexure for detailed requirements.
4. If individual BHMS is required for each charger as per manufacturer's standard then the same is also acceptable.

2.1 Considering the fact that Charger and battery may be procured seperately, the total overall responsibility of system integration at site for satisfactory operation lies with charger manufacturer only. Site acceptance tests for complete system need to be successfully performed and support of Battery vendor for this, as necessary, shall be extended.

2.2 The system shall be provided with MCCB/MCB at 415 V, 3 phase,3 wire inputs to chargers and shall have suitable ratings chargers so as to generate the necessary output voltages suitable for Rectifier modules functionin$_g$

2.3 Each DCDB shall have, apart from the bus-bars for 24 V DC (+) and (-) buses , 2 tinned copper bus-bars with one catering to panel body earth and other for cable shield wiring coming from each DCS panel. The DCS Earthing scheme shall be furnished by BHEL during detailed Engg. shall be referred for details. The Shield bus-bar and the (-) 24 V DC busbar shall have suitable terminals, as per the earthing scheme, to extend cables to the Electronic earth pit. The Charger panel body Earth shall be extended, at site, to floor Earth mat / nearest riser. (External Earthing Cabling not in Charger vendor scope). The power supply distribution box shall include necessary change over circuitry, switch fuse units, MCB, terminal blocks etc as suitable.

3.0 DOCUMENTS TO BE FURNISHED:

Along with the Technical offer: For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected.

01. Single line diagram
02. GA drawings
03. Circuit diagrams **and single line diagram**
04. Fault cordination details
05. Charger rating calculation and cable sizing calculations.
06. Battery sizing calculation (as per IEEE or Equivalent Standard)
07. Battery curves
08. Technical write-up **including redundancy features**
09. Technical literature / Catalog of each component
10. Data sheet of complete system/subsystem
11. Wiring diagram/interconnecting arrangement details
12. Complete Bill of Material with make & Model as per format attached with specification
13. Mandatory spares list and Commissioning spares list
14. Clause-wise compliance AND deviation list w.r.t specification. In case there is no deviation, a NL deviation certificate to be provided with offer. In no deviation list or NIL deviation sheet is found in offer, it will be assumed that there is NO deviation and no explanation on non compliance may be acceptable.

Incomplete offers (without all above) will be technically rejected without any notice.

24V DC power supply system

This specification covers the requirement of a Microprocessor based, Intelligent ,Modular 24V DC Power Supply System comprising of microprocessor controlled, Intelligent, Modular rectifier banks, battery banks and DC distribution boards. The vendor shall be responsible for engineering and furnishing complete and operation system fully meeting the intent and requirement of this specification. All the equipment and sub-system offered shall be from reputed experienced manufacturers. All system, cabinet, enclosure and distribution boards shall be manufactured, assembled, wired and fully tested as a complete assembly as per requirements of this specification.

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The 24 V DC equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. The requirements of 24 V DC System are specified herein on system basis. The bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification and BHEL/Consultant/Customer approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not.

All non interrupting components of 24 V DC system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.

24 V DC provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open . Further it will be the sole responsibility of the 24 V DC supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc. The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the 24 V DC upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case

Following general requirements shall be met for ensuring proper branch and circuit protection.

I. The feeder fuse ampere rating and feeder conductor capacity must be at least 100% of the non continuous load plus 125% of the continuous load as calculated per Article 220 (220-10G) of NEC code - 1984. The feeder conductor must be protected by a fuse not greater than the conductor capacity.

II. For circuit with transformers requirements for conductor protection articles 240 and 310 of NEC must be observed. If secondary fuse protection is not provided then the primary fuses must not be sized larger than 125% of the transformer primary full-load amperes.

If secondary fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary provided the primary feeder fuses are not larger than 250% of the transformer rated primary current.

General technical requirements to be complied

1 The charger equipment should have circuits to prevent malfunctioning of control panels & ensure protection of the same, in case of variations in the AC mains, which, among others include sudden voltage spikes in the input 3- phase AC supply, irregular waveform and phase imbalances. In such cases, the charger should respond in shortest possible time to trip itself and switch panel load to battery equipment. The response time of charger equipment for such responses shall be provided by the vendor for BHEL consideration.

2 The earthing scheme for the charger equipment and DCDB, including description of the ground terminals will be provided by the vendor.

3 The cable termination points in the DCDB should be sufficiently distanced to ensure flexibility to have a minor change (increase) in the cable size if site conditions require the same.

2.00 DC POWER SUPPLY SYSTEM (24V)

2.1. Microprocessor based, Intelligent, Modular Power Supply

2.1.1 Microprocessor based, Intelligent, Modular Power Supply shall be sized **for continuous duty** to meet connected 100% load requirements and keep the connected battery full charged in Float. A provision of design margin shall be kept over and above load requirement. Either of the banks of rectifier modules shall be able to re-charge the fully discharged battery within 8 hours. It shall also be possible to discharge batteries periodically manually. Each rectifier bank shall be provided with N+1 rectifier modules of all ratings and maximum number of rectifier modules shall not be more than 25nos. The exact sizing of the rectifier in one bank shall be subject to end customer's approval during detailed engineering. Provision shall be available to add minimum 2 new modules in each rectifier cabinet for future use. It shall be ensured that all rectifier modules in one rectifier bank shall be of same rating and not more than 3 rating of rectifier module shall be used in various rectifier banks. Provision for manual boost charging with isolation of loads shall also be provided. While selecting the components and finalizing the cooling arrangements, vendor to note that these rectifier modules are require to operate at 30-40% of the rated load for most of the time. While sizing, the temperature derating factor, as applicable, is to be considered for arriving at the rating of the modules if the modules are rated to operate at less than 50Deg C ambient. For the rectifier bank, matching controller along with applicable software shall be provided to meet the system requirement under all modes of operation.

2.1.2 The rectifier module shall be microprocessor controlled, IGBT/Power MOSFET based, high frequency with active load sharing, designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage and DC load fluctuates, effective current limiting features, front access design, programmable temperature compensation feature for battery charging and filters on both input and output to minimize harmonics. The rectifier module output regulation shall be ±1% or better from no load to full load with an input power supply variation of ±10% in voltage and ±5% in frequency. In addition to indication/display on rectifier panel, alarms like O/P voltage high and low, battery isolated, multiple rectifier module fail, AC input supply out of specified range, communication fault, Battery fuse blown, Surge protection failure, controller faulty, system overload, battery feeding the load etc, along with relevant analog measurements shall also be provided by employing RS485 port MODBUS protocol / Ethernet TCP/IP protocol for use in DDCMIS. Further, isolated 4-20 mA signals shall be provided for important parameters like rectifier module voltage, rectifier bank current, battery voltage, battery current, DCDB voltage, DCDB current etc. The list of alarm output &4-20 mA signals shall be as approved by end customer during detailed engineering.

2.1.3 "Float/Boost" charge functions shall be provided with alarm/indications.

2.1.4 Each rectifier bank shall be rated for 100% load requirement and keep the connected battery full charged and one spare rectifier module.

2.1.5 The rectifier module circuitry shall be of fail-safe design and failure of any component should not result in any rectifier bank output voltage to increase beyond acceptable limits of the C & I system being fed from it.

2.1.6 The rectifier module shall be current limited for circuit protection and protection of battery from overcharge. The current limit shall be continuously programmable.

2.1.7 The rectifier module shall have slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.

2.1.8 The rectifier module shall be fed from 415V AC, 50 HZ; 3 phase, 3 wire system. The bidder shall provide all required power cables & other accessories etc., from 415 V AC power supply system to his Electrical power supply system.

2.1.9 The full load efficiency at nominal input and output shall be 90%. The ripple content shall be limited to ±0.5 % of Charger output voltage.

2.1.10 The rectifier module design shall ensure that there is no component failure due to fluctuations of input supply or loss of supply and restoration. This feature shall be demonstrated during factory testing and various loads.

2.1.11 Bidder shall furnish the equipment complete in all respects along with rectifier module rating & voltage drop calculations, supporting curves/data etc.

2.1.12 The controller shall be intelligent, microprocessor controlled for monitoring & control of rectifier modules with features viz. Auto/manual battery discharge test, battery reserve time prediction, energy management, remote control, float/boost mode control etc.

2.1.13 All software as required for smooth operation and monitoring of rectifier modules in conjunction with controller & BHMS shall be provided.

3.0 BATTERIES

3.1.0 The batteries shall be heavy duty Nickel-cadmium type and shall be sized for one hour of full load operation during non-availability of AC supply/chargers. The Ni-CD batteries shall conform to IS: 10918. **Sizing calculations shall be as per IEEE-1115 standard which also mentions Float-charging correction factor. For sizing calculation, an aging factor of 0.8 and a temperature correction factor as per manufacturer's standard at 4 deg. C electrolyte temperature (based on temperature characteristics curve to be submitted by the vendor at a temperature of 4 deg. C), capacity factor shall be taken into consideration (if applicable) and ambient temperature shall be considered as the electrolyte temperature.** The sizing of the battery shall be as approved by employer during detailed engineering. **The system shall also be suitably designed to overcome any over voltage that may arise during low-load operation of the rectifier modules.**

3.1.1 Bidder shall furnish battery sizing calculations, supporting curves/data etc. with the proposal to demonstrate to BHEL/Consultant/Customer that the proposed battery capacity meets the above specification requirements at maximum temperature as well as minimum ambient temperature condition of 4°C.

3.1.2 Cells shall be Ni-Cd, sealed type assembled in heat resistance, shock absorbent, explosion-proof, hard rubber type containers with cover fused or cemented in place to form a permanent leak-proof seal. Each cover shall be fitted with vent plugs.

3.1.3 The plate structure shall be provided with adequate separators, suspensions and supports so that all plates are permanently aligned and protected from breakage.

3.1.4 Sufficient sediment space shall be provided below the plates to eliminate the necessity of sediment removal during normal battery life.

3.1.5 Each cell container shall be clearly marked for low and high electrolyte level limits on all four sides.

3.1.6 Vent plug shall be of such a design to allow escape of gases but not of acid spray and shall be explosion proof.

3.1.7 All cell terminals shall have adequate current carrying capacity and shall be Nickel plated copper terminal or approved equal material.

3.1.8 Cell terminals posts shall be suitable for bolted connection and shall be equipped with complete connector bolts and nuts. Cell posts shall be sealed against creepage of electrolyte either by burned ring seals or by lead alloy seal nuts or equivalent.

3.1.9 Each cell shall be assigned an identification number. Identification numbers shall be clearly marked on the front of the rack structure so that individual cells are easily identifiable. In addition, the polarity markers shall be furnished for the end cells.

3.1.10 Battery racks: Two tier battery racks of mild steel construction in accordance with applicable codes and standard shall be provided. ASIC specification shall apply in the absence of another design specification.

3.1.11 Suitable termination with isolation/DCDB shall be provided at battery set output for proper isolation of battery set at battery end. This Battery isolating switch shall be wall-mounting type in IP55 enclosure.

4.0 Battery Health Monitoring system (BHMS)

BHMS shall include microprocessor based hardware and software to monitor the condition of each battery cell of 24 V DC battery banks on-line. With BHMS it shall be possible to measure & analyze the minimum and maximum voltage values of each battery-cell so that any damage to battery shall be prevented by pro-active maintenance. **BHMS shall communicate with the DCS system** & provide alarms as finalized by NTPC/BHEL during detailed engineering. BHMS shall be offered if all the features/functions listed herein are not a part of Controller. BHMS should be able to communicate with active charger all the time.

5.0 DCDB

Redundant DCDB feeder (one from each DCDB) shall supply each of the connected loads. Each DCDB shall have high capacity common isolating switch, fuses, voltmeter, ammeter, on the incoming feeder and a set of individual MCBs on the outgoing feeders as per the feeder list provided in this specification.

6.0 AUXILIARY EQUIPMENT

All required auxiliary equipment / materials as finalized during detailed engineering shall be furnished with each charger / battery bank and shall include as a minimum various meters such as **AC / DC voltage / current, power factor etc., circuit breakers, selector switches, push buttons, indicating lights/ Lamps, ground detector system.**
Each charger shall have the necessary control switches, push buttons and indicating lamps on the front panel door for its independent start up and shut down. It should be possible to isolate each charger on the input as well as the output side by means of DC and AC MCCBs.

7.0 RELIABILITY & AVAILABILITY:-

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete C&I system is assured for 99.7%. Further the Bidder shall ensure that all equipment/Part of its system shall have normal life expectancy exceeding the expected life of the plant i.e. thirty years.

7.1 In order to ensure the target reliability the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & derating of electronic components and parts and carry out necessary tests, etc.

7.2 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

7.3 All components like diodes, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and de-rated such that failure rate is reduced to absolute minimum

8.0 CABINETS/ENCLOSURES

The construction details for Power supply system cabinets/Enclosure/Racks shall conform to the following requirements:

8.1 Equipment enclosures shall match and line up in assemblies of freestanding floor mounted cabinets designed for indoor service. The cabinets shall be of **IP-22** class. Mounting plate 3mm, Gland plate = 3mm

8.2 The charger panels shall be **ventilated switchboard** type fabricated from not less than 1.6mm thick sheet steel. Panels shall be furnished with concealed hinges. Front and rear doors shall be designed to permit easy access to all components for maintenance or replacement. The enclosures shall be reinforced with formed steel members as required to form a rigid self-supporting structure. Doors shall have three point latches.

8.3 Adequate ventilating louvers and enclosure top panels shall be included. All vent openings shall be covered with corrosion resistant fine screen coverings.

8.4 The temperature rise inside all the cabinets/enclosures shall not exceed 10 deg.C above ambient temperature. Vendor shall furnish calculation to establish this during tender stage.

8.5 Each assembly may be shipped in sections for ease of handling and field assembly. Terminal blocks shall be furnished as required adjacent to each shipping split to facilitate field assembly. Cable bundles cut to the required length and furnished with terminal lugs tagged for identification shall be provided for the wiring between shipping sections.

9.0 Cooling System

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements:

(a) Reserve cooling equipment shall be furnished for each switch board assembly. Reserve fan capacity shall be equal to 100 % of cooling fan requirements for full load operation with only one bank of rectifier in service at the specified maximum ambient temperature.

(b) Completely independent duplicable wiring and control system shall be provided for the normal cooling fan system the reserve cooling fan system.

(c) Each cooling fan shall normally run continuously and shall be powered from the output of the inverter whose enclosure if serves. Each cooling fan supply circuit shall be separately fused.

(d) Each cooling fan shall be equipped with an airflow switch having an alarm contact that closes upon failure of air flow.

9.0 Packaging details of the charger panel, DCDB panels and spares:

a) The panels shall be covered from top by a petticoat polythene sheet of minimum 175micron thickness and the sheet shall be fixed at the bottom to wooden pallet. (Refer Figure-1)

b) The base frame of all panels shall be bolted to a wooden pallet. The pallet shall be used for transporting of the panels using fork lift trucks. Bituminised kraft paper and polyethylene sheets of min 175 microns shall be fixed between base frame and wooden pallet and should be nailed to plywood packing side walls. (Refer Figure-1)

c) The panels should be packed using plywood of boiling water resistance (BWR) grade and termite/fungus proof as per IS:303 of 12mm thickness. The plywood shall be bonded with high quality phenol Formaldehyde synthetic resin and especially treated with preservatives to repel termites and wood destroying organisms. Plywood shall have IS:303 and BWR grade stamped on it. (Refer Figure-2)

d) Bituminised water proof kraft paper shall be used for lining of inside of the plywood packings. Bitumen coated hessian polyethylene kraft paper shall be used for lining the inside of top covers. (Refer Figure-2)

e) Support battens shall be of 18mmx100mm cross section plywood (Refer Figure-3)

f) Rubberised coir or thermocol should be used for cushioning and filling of gaps between packing and panel. The coir / theromocol shall be about 100mm wide and 25mm thick.

g) Joining of Plywoods: To the extent possible single piece of plywood shall be used. For bigger size panels.
   1. The joints of the plywood shall be as close as center of the panel.
   2. While joining two sheets, they should be kept close to each other and plywood sheet batten of minimum 100x200mm of 18mm thick plywood to be nailed in zig zag manner.

h) Components which are removed from panel for loose shipping may be kept inside the cubicle in wooden boxes and tied firmly to bottom of the panel.

i) Marking label of GI Sheet shall be nailed on front of the panel.

NOTE: The technical requirements enumerated above are broad guidelines & vendor shall furnish a complete and fully operational system suiting to the requirements of this section, and for the said purpose, if any extra accessories or sub-systems are required, the same shall be provided by the vendor.

BILL OF MATERIAL- BATTERY

REVISION:00

CHECKED & APPROVED

GURURAJ M

PREPARED

Amit Kr Sharma

ISSUED: 416

DATE:9-Apr-15

BOM FOR BATTERY for a 24V DC power supply system	
	qty
QUANTITY OF BATTERY BANKS	2
Discharge Resistor Bank (IP22)	1
BATTERY STAND (MS STAND)	2
CU BUS BAR TERMINATION PLATE PER BANK	2
ACCESSORIES SET FOR BATTERY (REFER LIST-I BELOW)	2
COMMISSIONING ACCESSORIES (REFER LIST-II)	2
ANY OTHER ACCESSORIES,ITEM (requried to complete the system	2
ROUTINE AND ACCEPTANCE TEST	2
ERECTION SUPERVISION AND COMMISSIONING	2

LIST- I BATTERY ACCESSORIES LIST	
Vent plug Hydrometer	2
Hydrometer syringes suitable for vent holes in different cells	2
Vent plug thermometer for measuring electrolyte Temp.	2
Specific gravity correction chart	2
Wall mount holder (teak wood) for hydrometer & thermometer	2
Cell testing voltmeter (3-0-3V)	**3**
Alkali mixing jar	2
Rubber aprons	**5**
Pair of rubber gloves	5
Set of spanners	5
No smoking notice for each battery room	2
Goggles (industrial)	2
Instruction card	5
Min. & Max. temperature indicator **(nos / per battery room)**	1
Cell lifting facilities **(nos / per battery room)**	1
LIST-II COMMISSSIONING ACCESSRIES: Items supplied loose from	
Inter row connectors (with 10 % spare) – As required **(Sets / bank)**	1
Inter-cell connectors (with 10 % spare)- As required **(Sets / bank)**	1
Electrolyte in non-returnable cans (as per std) with 10 % spare – **(Sets / bank)**	1
Copper termination plates (with adequate support arrangement.) for each of +ve/-ve poles to cater to 3 Runs of 1Cx630sqmm cable for Main Charger Batteries and 3 Runs of 1Cx120 sqmm cable for Offsite charger batteries **(Sets / bank)**	1

BILL OF MATERIAL- CHARGER

REVISION:00

CHECKED & APPROVED

GURURAJ M

PREPARED

Amit Kr Sharma

ISSUED: 416

DATE:9-Apr-15

BOM FOR CHARGER SYSTEM for a 24V DC POWER SUPPLY SYSTEM

	charger
CHARGER CONFIGURATION	2X100% rectifier
TOTAL NO OF CHARGER SETS	2
TOTAL QTY OF DCDB	2
BHMS with CONNECTIVITY TO DCS with cable	1
ANY OTHER ACCESSORIES AS REQUIRED BY VENDOR	1
ROUTINE TEST AND ACCEPTANCE TESTS	4
LAPTOP for programming and trouble shooting	1
ERECTION SUPERVISION AND COMMISSIONING	4

TYPE TEST & ROUTINE /SITE ACCEPTANCE TEST REQUIREMENTS FOR CHARGER & BATTERY

REVISION:00

CHECKED & APPROVED

RAJASEKAR K

PREPARED

Amit Kr Sharma

ISSUED 416

DATE
9 / 4 /15

1. Routine/Acceptance Tests:

1.1 The complete charger and battery system, including all instruments and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per IS, NEMA, IEEE, IEC-146 standards wherever applicable. All shop tests shall be performed prior to shipment and BHEL/ Customer shall be notified 15 days before the scheduled dates to give an opportunity to witness the test. Tests on other equipment's viz, step down transformer, voltage stabilizer, cables etc. Shall be conducted in accordance with relevant IS or any other approved standard.

1.2 The following tests shall be conducted as a minimum requirement as per IEC-146 Standard.

i) Frequency regulation test.
ii) Voltage regulation test.
iii) Current limiting test.
iv) Transfer time test.
v) Short circuit test.
vi) Efficiency test.
vii) Transient response test.
viii) Meter accuracy test.
ix) Harmonic content measuring test.
x) Temp. Rise Test.
xi) Restart Test.
xii) Voltage Rise & Voltage Dip Test.
xiii) Load Test.
xiv) Audible Noise Test.
xv) Synchronisation Test.
xvi) Radio Frequency Interference.
xvii) Holdff Interval.
xviii) Checklist of Auxiliary Devices.
xix) Insulation Test.

1.3 Routine Test:

i)Burn in Test & Elevated Temperature Test

Temperature rise test shall be considered as Routine test to be done on all chargers at 100% load for 120 hours(at ambient) till temperature stabilizes.

ii) Tests in accordance with IEC -146 Clause 491, IEC-146-2 Clause 5.2.2 and IEC -146-4 Clause 7.3.1

2. Functional test

On completion of installation and commissioning of the equipment the following tests/checks shall be carried out with the max. available load, which does not exceed the rated continuous load. These tests/checks shall include but not limited to the tests as indicated below.

1. Light Load Test

This test is carried out to verify that the Power supply system is correctly connected and all functions operate properly. The load applied is limited to some percent of rated value. The following points should be checked:

(a)Output voltage, frequency and the correct operation of meters;
(b)Operation of all control switches and other means to put units into operation.
(c)Functioning of protective and warning devices.
(d)Operation of remote signaling and remote control devices.

2. A. C_ Input Failure Test

The test is performed with a fully charged battery and is carried out by tripping input circuit breakers or may be simulated by switching off all Power supply system rectifiers and bypass feeder as at the same time. Output voltage variations are to be checked for specified limits with an oscilloscope or equivalent. Frequency variation is defined as the steady state frequency of the Power supply system with and without AC input. The rate of change of frequency is measured by the time it takes to reach steady-state values.

4. A. C Input Return Test

AC input return test is performed by closing AC input circuit breakers, or is simulated by energizing rectifiers and bypass feeders. Proper operation of rectifier starting and voltage and frequency variations are to be observed.

Note: This test is normally performed with a fully or partially charged battery.

5. Full load test

Load tests are performed by connecting the actual load to the Power supply system output. Large Power supply system in parallel connection may be load tested by testing the individual Power supply system units separately. Load tests are necessary for testing output voltage and frequency, rated stored energy, recharge time, ventilation, temperature rise and determination of efficiency. Load tests are performed to prove, transient voltage deviations specified under step load conditions.

6. Efficiency

Efficiency should be determined by measurement of the active power at input and output.

7. Actual Load Test

Conditions under actual load may differ from those with dummy load. Steady-state generation of current & voltage harmonics & transients a load switching conditions should be observed.

8. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & Power supply system units shall be measured with actual load under conditions of parallel operation.

9. Rated Stored Energy Time (Battery Test)

This test is a load test to prove the actual possible time of battery operation.

If rated load is not available in the case of large Power supply system, it is possible to, apply a partial load to check the actual battery discharge characteristics and compare these with characteristics specified by the battery manufacturer Discharge time with rated load- shall then be calculated. The test shall be performed with a fully charged battery and also may be done under other battery conditions to be specified, if so agreed. Active power output of the Power supply system and the battery voltage shall be recorded during the test.

Since new batteries often do not provide full capacity during a starting up period, the discharge test may be repeated after a reasonable recharge time if the original test has failed.

10. Rated Restored Energy Time

Restored energy depends on the charging capacity of the rectifiers and the battery characteristics. If a certain recharging rate is specified, it shall be provided by repeating the discharge test after the specified charging period.

11. Battery Ripple Current

If battery ripple currents are specified, then the ripple current which depends on Power supply system operation shall be checked under normal operating conditions. Rough measuring methods are sufficient.

12. On site ventilation test

The test is performed with the actual load. Temperature conditions of all Modular DC power supply rectifiers and Power Supply System cubicles are to be observed.

13.Overload capability test

Overload capability test is a load test. Specified values of short time overload or starting up sequences of actual load are to be applied for the time interval specified. Specified values of voltage and current are to be recorded.

14. Restart

Automatic or other restart means are to be tested after a completed shut-down as specified.

15. Output overvoltage

Output overvoltage protection to be checked.

16. Periodic output voltage modulation

When this test is specified, it may be checked by voltage recording at different loads and operating conditions.

17. Earth-fault test

If the DC Power Supply output is isolated from earth, then an earth fault can be applied to any output terminals. DC Power Supply output transients (if any) shall be measured.

3 Site-tests:

The vendor shall also carry out the site-tests. In case any other site tests are required to be conducted as a standard practice of the vendor or deemed necessary by BHEL/Customer, the same shall also be carried out.

3 TYPE TEST REQUIREMENTS

The contractor shall furnish type test reports of all type tests as per relevant codes and standards as well as other specific test indicated in this specification. If the vendor proposes a different standard/code from that indicated below, the same is acceptable provided the equivalence of proposed standard is established by the vendor.

Type test report and certificates for earlier conducted test are acceptable provided:

1. The same has been carried out by vendor on exactly same model and rating of equipment
2. There has been no change in the components from the offered equipment and tested equipment.
3. The test has been carried out as per latest standard along with amendments.

TYPE TESTS FOR BATTERY CHARGER: Type test report for following test are to provided **along with technical offer on earlier conducted type test on similar charger conducted within last 5 years**. Type test report for offered rectifier module and controller module irrespective of rectifier bank rating shall be acceptable.

i) SWC (Surge withstand capability test as defined is ANSI 37.90.1/IEE-472. Complete detail of the features incorporated in the electronic system to meet this requirement, the relevant test carried out, test certificates etc shall be submitted along with offer. As an alternate to above, suitable class of EN61000-4-12 which is equivalent to ANSI 37.90.1/IEE-472may also be adopted for SWC test.
ii) Dry Hest test as per IEC-68-2-2 or equivalent
iii) Damp Hest test as per IEC-68-2-3 or equivalent
iv) Vibration test test as per IEC-68-2-6 or equivalent
v) Electrostatic discharge test as per EN61000-4-2 or equivalent
vi) Radio Frequency Immunity test as per EN61000-4-6 or equivalent
vii) Electromagnetic field immunity test as per EN61000-4-3 or equivalent
viii) Degree of protection as per IS13947 or equivalent

TYPE TEST FOR BATTERY: Type test report to be submitted as per IS 10918 conducted at independent laboratory.

ITEM : UPS SYSTEM

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 **Introduction:** Bidders are required to offer Three Phase Input, Single Phase Output UPS Systems as per BHEL Technical Specifications

3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

6.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. "CE/416/UPS/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. "CE/416/UPS/PQR/CI BB of section B" marked on it.

cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

9.0 Please note that Batteries for these UPS Systems will be procured by BHEL Separately. Hence, Batteries shall not be considered in Bidder's offer.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders for UPS System (Three Phase Input, Single Phase Output), as a part of offer:

1.0 Submit Reference List of Projects where in offered UPS System is supplied & commissioned along with details of performance and Year of Commissioning of the UPS System specified in BHEL Technical Specifications.

2.0 Bidder should have manufactured and supplied atleast two (2) numbers of minimum 150 kVA, 3 Phase Input, 1 Phase Output UPS Systems in at-least two (1) different industrial installations, which should be in successful operation for atleast one(1) year as on date of bid opening. This satisfactory performance certificate shall be from End-User only.

3.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years.

4.0 Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com".

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Technical literature/Manuals, Catalogs & Charging/Discharging Characteristics of offered UPS Systems.

2.0 Un-priced Purchase Order copies

3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.

4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.

5.0 Details of Manufacturing, testing & inspection facility.

6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered UPS Systems, Stocking of Spares, etc. submit these details.

7.0 Bidders shall submit following Type test reports for offered UPS Systems as per IEC 62040-3: latest /equivalent standard.

8.0 Routine & Acceptance Tests shall be conducted as per IEC 62040-3: latest /equivalent standard considering sample of cells pertaining to a lot.

9.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered UPS Systems. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Importantly note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specification.

SPECIFICATION

FOR

UNINTERRUPTIBLE POWER SUPPLY SYSTEM(UPS)

REVISION:00

APPROVED

K. Rajasekars.

K RAJASEKAR

PREPARED	ISSUED	DATE
SATHISH	416	06/06/2015

CONTENTS

SCOPE OF SUPPLY

REVISION:00

APPROVED

K. Rajasekar.

K RAJASEKAR

PREPARED	ISSUED	DATE
SATHISH	416	06/06/2015

SCOPE OF SUPPLY

Following UPS shall be as per Technical Requirement Ref: CE/416/UPS/TR and detailed Scope of Supply.

A.

2x150 kVA, Single-phase 0.8 p.f lagging 230V AC, 50Hz parallel redundant UPS guaranteed at 50 deg. C as per manufacturer catalog. If any manufacturer doesn't have UPS guaranteed at 50 deg C, the vendor shall offer as per their manufacturing standards at 40/45 deg C.

B. Each UPS system comprises ⟶

01. 100% Capacity Static Inverters	2 Nos.
02. 100% Capacity Static Switches	2 Sets
03. Manual Bypass Switch.	1 Set
04. Input Isolation Transformers	2 Nos.
05. 100% Capacity float cum boost chargers	2 Nos.
06. UPS Battery (Ni-Cd Battery with accessories for 1 hr. duty cycle at 100 % load)	1 Set **
07. Battery Health Monitoring System	1 Set
08. Step down transformer 415V, 3 Ph. to 230V, 1 Ph.	1 No.
09. Servo Controlled Voltage Stabilizer.	1 No.
10. AC power Distribution boards	2 Nos.
11. Battery isolation box(housed in UPS panel)	1 Set*
12. Accessories of UPS system, in line with specification including suitable interconnection cables.	1 Set

Note: The interconnection cables shall be from Battery to UPS, between UPS, between UPS to ACDB (to be offered on per meter basis). The cable quantity from Battery to UPS shall be 100 metres per run and from UPS to ACDB shall be 25 metres per run.

MODBUS cable of 100 meters per run is to be provided per charger / inverter combination for DCS connection. Therefore since each UPS system has redundant charger/inverter, this cable shall be 200 mtrs under each UPS system.

** *Battery being procured by BHEL separately.*

C. Erection supervision, complete commissioning & handing over

2.0 GENERAL TERMS & CONDITIONS

2.1 Since the projects, are bunched together based on commonality of some aspects such as specifications, vendors, customers, etc., will be technically evaluated as a package, the participating vendors should quote for all the items.

2.2 Similarly, the vendor must clearly quote for unit price as well as lot price for all the selected UPS & UPS battery models including accessories, commissioning spares and cables (for UPS System only) for indisputable calculations of lot prices in case of revised quantities later.

2.3 The type tests are as listed as part of the specification & if the type tests are not specifically conducted, then same are to be offered with unit rates in offer. However, in either case, the type tests reports are to be submitted for BHEL/ Customer approval in case of order.

3.0 GENERAL TECHNICAL REQUIREMENTS

3.1 The output voltage, current and frequency transducers (4-20mA DC) are to be provided (total 6 numbers) per UPS system as a standard for remote monitoring. Apart from this, transducers related to input voltage and current at charger limbs and SCVS are to be provided (total 6 Nos. per UPS). All these transducers are remote monitoring wired to UPS. All above analog signals are apart from Binary potential free contacts provided as meaningful information to DCS.

3.2 Only the site-proven & type tested (in the last 4 years), electronic modules (in case of UPS System) & cell plates (in case of UPS Battery) will be acceptable unless otherwise decided by the purchaser in special circumstances.

3.3 For UPS, the type test shall be as per IEC-146, Degree of Protection test as per IS-2147 and the same are not to be specifically conducted for the projects if conducted on similar type/rating or similar type/ higher rating UPS.

3.4 Routine & Acceptance tests shall be done as per relevant standards. Temperature rise test is also to be done 100% for 10-12 hours duration each time (till temperature stabilizes).

3.5 Considering the fact, separate quotations are being sent for UPS vendors and UPS battery vendors separately. Battery will be sized corresponding to the UPS manufacturer and accordingly UPS & Battery orders will be placed. Battery order will be placed after determining the UPS vendor and UPS rating. However, both UPS and battery vendors have to offer lumpsum unit rates for erection supervision & commissioning of UPS, erection supervision & commissioning of Battery with overall integration of complete system being responsibility of UPS vendor.

3.6 Protection class of all UPS, Voltage Stabilizer shall be IP32 and ACDB panels shall be IP54 as per IS2147.

3.7 Material Thickness = All sides are 2mm CRCA, Mounting plate 3mm, Gland plate = 3mm. The above details are for reference and if as per manufacture's standard, lower sizes are supplied without affecting performance, same are also technically acceptable. Also please note that panel construction shall be with base/bottom frame of approximate height as 100mm (3mm thick) and anti-vibration pad as 15mm thick-all details as per manufacturer standard.

3.8 Each ACDB shall be provided with Electrolytic grade copper tinned bus bars as 4 numbers each of suitable capacity. One busbar caters to ACDB body earthing (broughtout by suitable screws), two busbars for Phase and Neutral, One busbar catering to cable shields in ACDB-1 and other busbar for 24V DC zero potential bus bar in ACDB-II. All these busbars will be separately connected to Earth pit/ risers. (Earthing arrangement alongwith cables are not in vendor scope).

4.1. DOCUMENTS TO BE FURNISHED

4.1.0. Following documents shall be furnished to BHEL as a minimum, apart from any other documents required to be submitted as called for elsewhere or as deemed necessary.

4.1.1. **Along with the Technical offer**: For technical evaluation, vendor must send one (01) set of the following documents in hard copy, without which your offer is liable to be rejected.

01. Single line diagram
02. GA drawings
03. Circuit diagrams
04. Fault co-ordination details
05. Charger/Inverter rating calculation
06. Battery sizing calculation (as per IEEE or Equivalent Standard)
07. Battery curves
08. Technical write-up
09. Technical literature / Catalog of each component
10. Data sheet of complete system/subsystem
11. Wiring diagram/interconnecting arrangement details
12. Complete Bill of Material with make & Model
13. Mandatory & Commissioning spares list.
13. Clause-wise deviation list

NOTE: - Later no explanation on noncompliance or deviation, stated or observed, may be acceptable. Incomplete offers (without documents / not relevant documents as mentioned above) will be technically rejected without any notice.

4.1.2 **After placement of Purchase Order within 1 week**: For BHEL/CUSTOMER approval, vendor must send One (1) set of the following documents in hard copy & soft copy.

a) All documents Sl. No 01 ~ 13 as above.
b) Interfacing diagram & cable type details used or suggested.
c) Quality Plan format enclosed as part of the specification.

4.1.3. **After Type Test but before Inspection :** For BHEL/CUSTOMER approval, vendor must send eight (8) Sets of the following documents in hard copy.

01. Type test reports/Certificates as per specification/approved QP

4.1.4. **After Inspection but 1 week before dispatch:** For BHEL/CUSTOMER approval, vendor must send two (2) sets of the following documents one in hard copy & one in soft copy.

01. Preliminary Instruction /O&M Manual

4.1.5. **Along with the materials being dispatched:** Vendor must send five (5) sets of the following "**As Built & Approved"** status documents four (4) in hard copies & one (1) in soft copy.

(a) Instruction/O&M Manual
(b) Bill of Material
(c) Data Sheets
(d) Technical literatures/Catalogs
(e) Drawings GA/layout/wiring/interconnection/schematic, etc.)

4.1.6. **After despatch of material within 1 week :** Vendor must send two (2) set of the following **"As Built & Approved"** status documents one (1) in hard copy & one (1) in soft copy directly to the project site.

(a) Instruction/O&M Manual

NOTE: One (01) set soft copy of Final document shall also be provided to BHEL. The soft copy shall be in CD-ROM media and shall be compatible with Windows-95/98/NT/2000 with drawing/documents in AutoCad-14/MS-Word/MS-Excel/Acrobat formats. Soft copy to be supplied for datasheet/document/ drawings at approval stage also.

TECHNICAL REQUIREMENTS

REVISION:00

APPROVED

K. Rajasekars.

K RAJASEKAR

PREPARED	ISSUED	DATE
SATHISH	416	06/06/2015

Uninterruptible Power Supply (UPS) system including UPS Battery

1.0 GENERAL REQUIREMENTS

This specification covers the requirement of an Uninterruptible Power Supply (UPS) System comprising of static inverters, static switch, manual bypass switch, chargers, battery banks and DC & AC distribution boards.

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The UPS equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. The requirements of UPS System are specified herein on system basis. The bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification and BHEL/CUSTOMER approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not.

All non interrupting components of UPS system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.

UPS provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open . Further it will be the sole responsibility of the UPS supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc.

The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case.

Following general requirements shall be met for ensuring proper branch and circuit protection.

I. The feeder fuse ampere rating and feeder conductor capacity must be at least 100% of the non continuous load plus 125% of the continuous load as calculated per Article 220 (220-10G) of NEC code - 1984. The feeder conductor must be protected by a fuse not greater than the conductor capacity.

II. For circuit with transformers requirements for conductor protection articles 240 and 310 of NEC must be observed. If secondary fuse protection is not provided then the primary fuses must not be sized larger than 125% of the transformer primary full-load amperes.

If secondary fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary provided the primary feeder fuses are not larger than 250% of the transformer rated primary current.

The UPS system shall have 2x100% parallel redundant chargers and inverters. 1x100% battery bank, bypass line transformers and voltage stabilizer, static switch, manual bypass switch, AC/DC distribution boards, other necessary protective devices and accessories and shall meet the following requirements as a minimum.

1.1 The KVA rating of UPS arrived at shall be guaranteed at 50°c ambient. If UPS KVA rating is applicable at a lower ambient temperature than specified 50°C the bidder shall consider a derating factor of at least 1.5% / °C for arriving at the specified UPS capacity at applicable ambient temperature. The UPS shall have an over load capacity of 125% rated capacity for 10 minutes and 150% rating capacity for 10 seconds. The inverter shall have sufficient I^2t capability to clear fault in the maximum rated branch circuit limited to 12 percent of finally selected UPS capacity. The sizing of UPS shall be based on the power factor of loads being led subject to maximum of 0.8.

In case the calculated UPS rating above is not same as one of the standard KVA ratings of the UPS manufacturer (indicated in printed catalogue), the next higher standard KVA rating of the manufacturer shall be selected and provided. Bidder may specifically note that UPS of manufacturer's non-standard rating shall not be acceptable.

2.0 Each of the redundant chargers & batteries shall meet the specification requirements are as follows :

2.1 Float cum boost chargers

2.1.1 Each of the two sets of 2X100% redundant chargers shall be sized to meet the 100 % load requirements of the control system plus recharge the fully discharged battery within 8 Hours.

The chargers shall be self regulating, solid state silicon controlled, full - wave rectifier type designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage and DC load fluctuates, effective current limiting features and filters on both input and output to minimize harmonics. The charger output regulation shall be ±1% from no load to full load with an input power supply variation of ±10 % in voltage and ±5 % in frequency. In addition to alarms on charger panel, potential free contacts for alarms like charger O/P voltage high etc. shall also be provided for use in DDCMIS. Further isolated 4-20mA signals shall be provided for important parameters like charger voltage etc.

2.1.2 The Bidder shall furnish the charger rating calculations to the BHEL/NTPC/ to satisfy that this requirement is met. The charger shall be furnished as per rating approved by the BHEL/NTPC/ during engineering stage without any price repercussions whatsoever. Typical calculation for sizing the capacity of the chargers to be followed by the Bidder is enclosed as part of the specification and the Bidder must adhere to the same strictly while sizing the capacity of the chargers to be offered by him.

2.1.3 The chargers shall be served from a 415V, 50 Hz, 3 phase 3 wire system. The chargers shall maintain the output voltage within ± 1.0 % from no load to full load with an input power supply deviation in voltage level of ±10% and input power supply deviation in frequency of ±5% and with both deviations present in any combination.

2.1.4 In addition to supply DC power for inverters, the chargers shall be designed to charge a fully discharged battery without causing interrupting operation of AC or DC circuit breakers for the entire range of intended operating regimes. Suitable solid state electronic circuits shall be provided to ensure that the charging current is voltage regulated and current limited. After the battery is recharged the charger shall maintain the battery at full charge until the next emergency operation when the UPS battery is again required to provide DC power.

2.1.5 Float and equalizing controls shall have an adjustment range of 5% continuous (without steps).

2.1.6 The charger shall be current limited at 125% of full load to reduce output stage for charger circuit protection and for protection of battery from overcharge. The current limit shall be continuously adjustable from 80% to 125%.

2.1.7 Suitable devices/hardware shall be provided to alarm charger output voltage higher than adjustable present limit. Further, charger shall be tripped automatically on charger output voltage high-high (adjustable). This aspect shall be further discussed during detailed engineering.

2.1.8 All necessary equipment and devices shall be provided to protect the charger from short circuits, transient voltage surges and load and supply fluctuations including sudden loss of input or load.

2.1.9 The charger shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.

2.1.10 The minimum full load efficiency at nominal input and float output shall be 90%. The output regulation, ripple content and power factor shall meet the requirements of UPS system as well as the inverter furnished by the Bidder as specified above.

2.2.0 BATTERY CHARGER AUXILIARY EQUIPMENT

In addition to the battery charger specified herein, auxiliary equipment shall be furnished with each charger as follows :

2.2.1 Equipment and materials furnished, mounted and wired on the front panel of the charger enclosures:-

ITEM	QUANTITY
a) AC voltmeter, indicating at input with required scale range and 2%accuracy	1 No.
b) DC voltmeter, indicating output with required scale range and 2%accuracy	1 No.
c) DC Ammeter, indicating output Amperes with required scale range and 2% accuracy	1 No.
d) Charger ON-OFF push buttons	2 Nos.
e) Potentiometers, one "Float voltage adjust" and" one Equalizing voltage adjust " both with manual adjustment knobs. The settings of these knobs shall be independent of each other.	2 Nos.
f) Selector switch of selecting " float charge " or "Equalizing charge "	1 No.
g) Charging rate setter	1 No.
h) Selector switch & lights for ground fault detector	1 Set
i) Equalizing charge timer(0-72 hrs.) with manual reset	1 No.

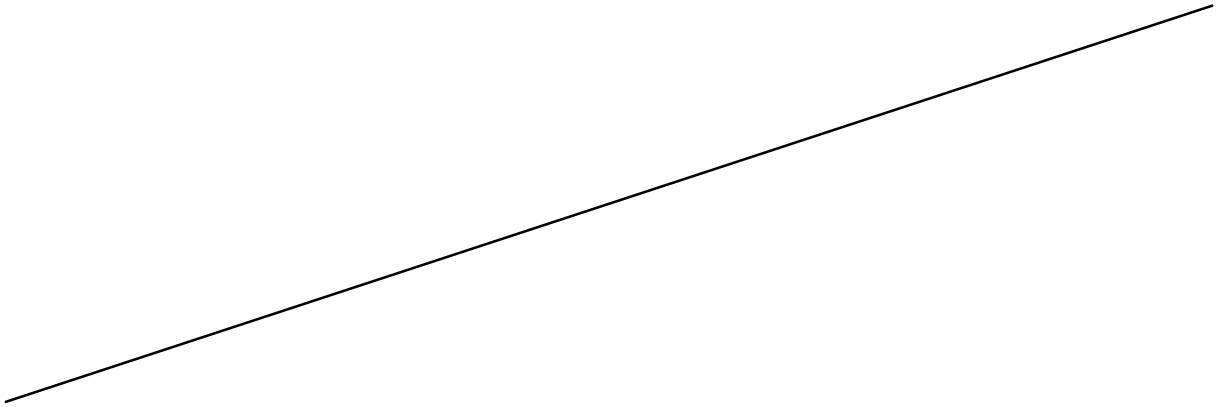
3.0 Indicating light listed below with proper actuating devices, circuitry and legend shall be furnished on the front of UPS panels. One set of electrically independent potential free contacts shall be wired to the "Integrated Distributed Digital Control Monitoring and Information System". The following indications shall be furnished as minimum :-

a) Failure of input AC supply to the charger.
b) Charger failure.
c) Charger fuse blown.
d) System on battery operation.
e) Battery equalize timer “ON ".
f) Low battery voltage.
g) Low DC bus voltage.
h) DC ground fault.
i) Charger output voltage high and high-high.
j) Redundant fan failure and temperature high (as provided).

4.0 The UPS system shall be capable of operating without DC battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch etc. shall be guaranteed without the battery in circuit.

4.1 The UPS system design shall ensure that in case of failure of line input power supply to one of the chargers, the other charger whose mains input power supply is healthy, shall feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge the DC battery at all load conditions. The bidder should note that this situation should not in any way lead to the discharge of the DC Battery.

4.2 Both the inverters/chargers shall not be housed in single cubicle. One inverter one charger can be housed in one common cubicle i.e. there will be two such cubicles per UPS system if the same is standard and proven practice of the bidder.



5.0 STATIC INVERTER

i. The static inverter shall be solid state type using proven pulse width modulation (PWM) / Quasi square wave /step wave technique. Ferro resonant type inverters are not acceptable. The static inverter equipment shall include all necessary circuitry and devices to confirm to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization, etc. The steady state voltage regulation shall be ± 2 % and transient voltage regulation (on application / Removal of 100 % load) shall be ± 20% Time to recover from transient to normal voltage shall not be more than 50 msec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination shall be better than 0.5% (automatically controlled). The total harmonic content shall be 5% maximum and content of any single harmonic shall be 3% maximum. The inverter efficiency shall be atleast 85 % on full load and 80 % on 50% load. The synchronization limit for maintenance of synchronization between the inverter and stand by AC source shall be 47.5-51.5 Hz, field adjustable in steps of 0.5 Hz. Each inverter shall have an overload capacity of 125% rated capacity for 10% minutes and 150% rated capacity for 10 seconds.

ii OVER LOAD, SHORT CIRCUIT AND LOAD LOSS

The inverter shall be provided with suitable HRC fuses at the input and output which will permit proper coordination with other protective devices and at the same time protect the inverter against damage due to internal faults. However, if the bidder's system design does not use fuses then the fuse free circuit breaker may also be permitted provided it meets the specification requirements. All necessary equipment shall be provided to protect the inverter against overload, short circuit & 100 % loss of load. The inverter shall be self protecting against damage if energized with full load connected.

iii Inverter equipment shall include all solid state circuitry and devices including stable oscillator etc to enable inverters to operate satisfactorily in parallel sharing mode each inverter taking 50 % load during normal operation.

In case of failure of either inverter, 100% load shall automatically be transferred to healthy inverter without any break and degradation in the quality of UPS output and disconnecting the faulty inverter automatically.

iv The inverter failure shall be alarmed and the healthy inverter shall get synchronizing signal from the standby AC source and remain synchronized within the set limits. The limits for the synchronization between healthy inverter and standby AC source shall be field adjustable.

v On failure of both inverters, the loads shall be transferred to standby AC power without a break if within synchronization limits. Provision of asynchronous transfer with a break in case of inverter being out of synchronization limits shall also be there with standby source.

6.0 Static Switch and Manual bypass switch: The static switch shall be provided to perform the function of transferring UPS loads automatically without any break from

(i) faulty inverter to healthy inverter in case of failure of one of the inverter and

(ii) from faulty inverter to stand by AC source in case of failure of both inverter.

Manual bypass switch shall be employed for isolating the UPS during maintenance

Continuous and overload capacity of the switches shall be equal to 100% of the continuous and overload rating of each inverter. Peak capacity shall be 1000% of continuous rating for 5 cycles.

7.0 STEP DOWN TRANSFORMER & VOLTAGE STABILIZER

7.1 The transformer shall be of low impedance type and the rating shall be such that extremely fast fault clearance is achieved even in the largest rated branch circuit. The overload capacity of the transformer / stabilizer shall not be less than 300% for 200 ms. The voltage stabilizer shall employ state of art control circuitry and shall maintain the specified output voltage for 0-100% load with maximum input voltage variations as indicated above. The efficiency of the stabilizer shall be 95% or better. The stabilizer shall be servo-controlled voltage stabilizer.

7.2 AUXILIARY EQUIPMENT

All required auxiliary equipment / materials as finalized during detailed engineering shall be furnished with each charger / inverter / battery bank and shall include as a minimum various meters (AC / DC voltage / current, KVA, power factor, frequency meters etc., circuit breakers, selector switches, push buttons, indicating lights/ Lamps ground detector system) battery accessories like (inter cell connectors, inter step connectors battery racks etc) further, isolated 4 -20mA signals for important parameters and potential free contacts for important alarms shall be provided for use in DDCMIS.

7.3 Each inverter shall have the necessary control switches, push buttons and indicating lamps on the front panel door for its independent start up and shut down. It should be possible to isolate each inverter on the input as well as the output side by means of DC and AC MCCBs.

7.4 Indicating lights listed below with proper actuating devices, circuitry and legend shall be furnished on front of UPS panels. For these abnormal conditions which could be of a momentary nature, the indicating lights shall remain energized and the Contact remain closed until cleared by a reset push button furnished on the panel. The indicating lights shall be of make subject to BHEL/NTPC/ approval. The following indications shall be provided as a minimum.

a) DC voltage to the inverter : Low
b) DC voltage to the inverter : High
c) DC input loss to the inverter : High
d) Inverter A output voltage : High
e) Inverter B output voltage : High
Avoid unnecessary alarm due to low voltage on load in rush etc).
f) Inverter A output voltage low. - With a time delay.
g) Inverter B output voltage low. - With a time delay.
h) Inverter A failure.
i) Inverter B failure.
j) Inverter fuse failure.
k) Redundant fan failure and temperature high (if provided)
l) Standby AC source failure
m) Inverter A/Inverter B not synchronized with stand-by AC source in case of failure of inverter B/inverter A respectively.

n) Automatic transfer to stand by AC source & Inverter A/Inverter B feeding 100% UPS load.
o) Stand by source feeding 100% UPS loads.
p) Inverter A overload Trip.
q) Inverter B overload Trip.

7.5 In addition to the above lamps one potential free change over contact shall be made available (wired up to the terminal block) for each of the above conditions to be connected to other systems.

7.6 The following meters shall be provided as minimum, mounted on front of inverter panels for each inverter :-

i) DC input voltmeter.
ii) DC input Ammeter.
iii) AC output voltmeter.
iv) AC output Ammeter.
v) Frequency meter.
vi) Output KVA meter.
vii) Power factor meter.

7.7 The above listed instruments shall be of ± 1% accuracy class. Inverter ON/OFF switch & Alarm reset Push Button shall also be provided for each inverter.

7.8 Bidder shall furnish the power supply distribution scheme, single line diagram, all calculation such as charger/inverter rating calculations, battery sizing calculation etc. during offer stage itself and during detailed engineering stage for owner's review and approval.

7.9 ACDB

7.9.1 AC distribution panel of CRCA sheet steel construction shall be supplied for 2 wire AC single phase distribution with a solid neutral bar.

7.9.2 The phase and neutral bars shall be of copper.

7.9.3 Rating of the main lugs shall be equal to the rated continuous full load current of each inverter.

7.9.4 The panel boards shall be rated for 600V AC. All outgoing switches shall be load breaker, air break type provided with quick make breaker manual operating mechanism.

7.9.5 Each UPS load shall be fed from redundant feeder from AC distribution board “A” and other AC distribution board “B " ie all the UPS loads shall be fed from both the distribution boards A & B. Each AC distribution panel board shall have all the required HRC slow acting fuses, switches and other devices. The exact nos and rating etc. of HRC slow acting fuses, switches shall be as finalized during detailed engineering without any price repercussions. BHEL/NTPC/ decision shall be final in case there is any disagreement in Bidder's opinion and BHEL/NTPC/ view.

8.0 Factory Tests:

8.1 The complete UPS system, including all instruments and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per IS, NEMA, IEEE, IEC-146 standards wherever applicable.

8.2 The following Type tests shall be conducted as a minimum requirement as per IEC-146 Standard.

i) Frequency regulation test.
ii) Voltage regulation test.
iii) Current limiting test.
iv) Transfer time test.
v) Short circuit test.
vi) Efficiency test.
vii) Transient response test.
viii) Meter accuracy test.
ix) Harmonic content measuring test.
x) Temp. Rise Test.
xi) Restart Test.
xii) Voltage Rise & Voltage Dip Test.
xiii) Load Test.
xiv) Audible Noise Test.
xv) Synchronization Test.
xvi) Radio Frequency Interference.
xvi) Simulation of Parallel Redundant UPS fault.
xvii) Hold-off Interval.
xix) Checklist of Auxiliary Devices.
xx) Insulation Test.
Also refer scope of supply.

8.3 Routine Test:

i.) Temperature rise test

ii) Tests in accordance with IEC -146 Clause 491, IEC-146-2 Clause 5.2.2 and IEC -146-4 Clause 7.3.1

8.5 SITE TESTS

The Contractor shall also carry out the site tests on equipments/systems as specified below. However, these shall not be limited to this specification only and in case any other site test is required to be conducted as a standard practice of BHEL or deemed necessary by the Employer and mutually agreed between BHEL and NTPC/, the same shall also be carried out.

Uninterruptible Power Supply System

Functional Test

On completion of installation and commissioning of the equipment the following tests/checks shall be carried out with the maximum available load, which does no1 exceed the rated continuous load. These tests/checks shall include but not limited to the tests as indicated below. The details of the tests are as indicated below:

1. Light Load Test

This test is carried out to verify that the UPS is correctly connected and all functions operate properly. The load applied is limited to some percent of rated value. The following points should be checked:

(a)Output voltage, frequency and the correct operation of meters;
(b)Operation of all control switches and other means to put units into operation.
(c)Functioning of protective and warning devices.
(d)Operation of remote signaling and remote control devices.

2. Checking of Auxiliary Devices

The functioning of auxiliary devices, such as lighting, cooling, pumps, fans annunciation, etc., should be checked, if convenient, in conjunction with the preliminary light load test.

3. Synchronization Test

If possible, frequency variation limits should be tested by use of a variable frequency generator, otherwise, by simulation of control circuit conditions. If applicable the rate of change of frequency during synchronization shall be measured.

4. A. C_ Input Failure Test

The test is performed with a fully charged battery and is carried out by tripping input circuit breakers or may be simulated by switching off all UPS rectifiers and bypass feeder as at the same time. Output voltage variations are to be checked for specified limits with an oscilloscope or equivalent. Frequency variation is defined as the steady state frequency of the UPS with and without AC input. The rate of change of frequency is measured by the time it takes to reach steady-state values.

5. A. C Input Return Test

AC input return test is performed by closing AC input circuit breakers, or is simulated by energizing rectifiers and bypass feeders.

Proper operation of rectifier starting and voltage and frequency variations are to be observed.

Note: This test is normally performed with a fully of partially charged battery.

6. Simulation of Parallel Redundant UPS Fault

This test is applicable for UPS with parallel redundant connections. Faults of rectifier or inverter units may be carried out by simulation. Output transients are to be observed.

7. Transfer Test

This test is applicable for UPS with bypass, particularly in the case of an electronic bypass switch. Transients shall be measured during load transfer to bypass caused by a simulated fault and load retransfer after clearing of the fault.

8. Full load test

Load tests are performed by connecting the actual load to the UPS output. Large UPS in parallel connection may be load tested by testing the individual UPS units separately. Load tests are necessary for testing output voltage and frequency, rated stored energy, recharge time, ventilation, temperature rise and determination of efficiency. Load tests are performed to prove, transient voltage deviations specified under step load conditions.

9. Efficiency

Efficiency should be determined by the measurement of the active power at input and output.

10. Actual Load Test

Conditions under actual load may differ from those with a dummy load Steady-state generation of current and voltage harmonics and transients a load switching conditions should be observed.

11. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & UPE units shall be measured with actual load under conditions of parallel operation.

12. Rated Stored Energy Time (Battery Test)

This test is a load test to prove the actual possible time of battery operation.
If rated load is not available in the case of large UPS, it is possible to, apply a partial load to check the actual battery discharge characteristics and compare these with characteristics specified by the battery manufacturer Discharge time with rated load- shall then be calculated. The test shall be performed with a fully charged battery and also may be done under other battery conditions to be specified, if so agreed. Active power output of the UPS and the battery voltage shall be recorded during the test.
Since new batteries often do not provide full capacity during a starting up period, the discharge test may be repeated after a reasonable recharge time if the original test has failed.

13. Rated Restored Energy Time

Restored energy depends on the charging capacity of the rectifiers and the battery characteristics. If a certain recharging rate is specified, it shall be provided by repeating the discharge test after the specified charging period.

14. Battery Ripple Current

If battery ripple currents are specified, then the ripple current which depends on UPS operation shall be checked under normal operating conditions. Rough measuring methods are sufficient.

14. On Site Ventilation Test

The test is performed with the actual load. Temperatures conditions of all UPS cubicles are to be observed.

15. Overload Capability Test

Overload capability test is a load test. Specified values of short time overload or starting up sequences of actual load are to be applied for the time interval specified. Specifed values of voltage and current are to be recorded.

16. Short Circuit Current Capability

If short-circuit current capability is specified, it may be tested by applicable of a short circuit to UPS output if necessary, via suitable fuse, short circuit is to be recorded.

17. Short Circuit Fuse Test

Fuse tripping capability of a UPS shall be tested, by short-circuiting the UPS output via a fuse of specified type.

The test shall be repeated to ensure against fuse non-uniformity and switching time during the cycle. The test is carried out at an appropriate UPS load, under normal operation, if not otherwise specified by Owner.

18. Restart

Automatic or other restart means are to be tested after a completed shut-down of UPS as specified.

19. Output over voltage

Output over voltage protection is to be checked.

20. Periodic Output Voltage Modulation

When this test is specified, it may be checked by voltage recording at different loads and operating conditions.

21. Harmonic Conditions

Harmonic components of output voltage shall be checked with the actual load. Methods of specification and checking shall be subject to Owner's approval.

22. Earth Fault Test

If the UPS output is isolated from earth, then an earth fault can be applied to any output terminal. UPS output transients (if any) shall be measured.

If the battery is isolated from earth, then an earth fault can be applied to any output terminals. UPS output transient (if any) shall be measured.

9.0 RELIABILITY & AVAILABILITY:-

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete C&I system is assured for 99.7%.

Further the Bidder shall ensure that all equipment/Part of its system shall have normal life expectancy exceeding the expected life of the plant i.e. thirty years.

9.1 In order to ensure the target reliability the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & de-rating of electronic components and parts and carry out necessary tests, etc.

9.2 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

10.0 THERMAL DESIGN OF UPS SYSTEM PANELS

The UPS panels shall be preferably designed for natural cooling and shall be fabricated from not less than 3mm thick sheet steel. When the inverter is in operation the temperature rise in the panel shall not be more than 15 Deg. C above ambient for all operating conditions. All components like transistors, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and derated such that failure rate is reduced to absolute minimum.

10.1 Cooling System

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements:

(a) Reserve cooling equipment shall be furnished for each switch board assembly. Reserve fan capacity shall be equal to 100 percent of cooling fan requirements for full load operation at the specified maximum ambient temperature failure of air flow.

(b) Completely independent duplicate wiring and control system shall be provided for the normal cooling fan system the reserve cooling fan system.

(c) Each cooling fan shall normally run continuously and shall be powered from the output of the inverter whose enclosure if serves. Each cooling fan supply circuit shall be separately fused.

(d) Each cooling fan shall be equipped with an air low switch having an alarm contact that closes upon failure of air flow.

*****

TYPE TEST

REVISION:00

APPROVED

K. Rajasekars.

K RAJASEKAR

PREPARED	ISSUED	DATE
SATHISH	416	06/06/2015

TYPE TEST REQUIREMENTS

1.00.00 **TYPE TEST REQUIREMENTS**

1.01.00 General Requirements

1.01.01 The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.

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

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

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

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

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

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

1.01.02 As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.

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

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

1.01.05 The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project.

The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.

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

2.01.00 The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below:

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

All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.

ii) Dry Heat test as per IEC-68-2-2 or equivalent.

iii) Damp Heat test as per IEC-68-2-3 or equivalent.

iv) Vibration test as per IEC-68-2-6 or equivalent.

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

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

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

Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.

TECHNICAL REQUIREMENTS					
S. NO.	*ITEM*	*TYPE TEST REQUIREMENT*	*STANDARD*	*TEST TO BE SPECIFICALLY CONDUCTED*	*NTPC'S APPROVAL REQD. ON TEST CERTIFICATE*
1	**Battery**	**As per Standard**	**IS-10918**	**NO**	**YES**
2	**UPS(Applicable for each model and rating)**	**Degree of Protection Test**	**IS-2147**	**NO**	**YES**
		Power Efficiency	**IEC 146-2, IEC 146**	**NO**	**YES**
		Load test	**Approved Procedure**	**YES**	**YES**
		Audible Noise Test	**IEC 146- 2**	**NO**	**YES**
		Fuse Cleaning Capability	**Approved Procedure**	**YES**	**YES**
		Relative harmonic content	**Approved Procedure**	**NO**	**YES**
		Radio interference	**IEC 146 - 4**	**NO**	**YES**
		Synchronous transfer test	**IEC 146 - 4**	**NO**	**YES**
		Temperature rise test without redundant fans	**Approved Procedure**	**NO**	**YES**
		Input voltage variation test	**Approved Procedure**	**NO**	**YES**
		Over load Test	**Approved Procedure**	**NO**	**YES**
		Insulation test	**IEC 146**	**NO**	**YES**
		Restart Test	**IEC 146 - 2**	**NO**	**YES**
		Short circuit current capability	**IEC 146 - 2**	**NO**	**YES**
		Output voltage & frequency Tolerance	**IEC 146 - 2**	**NO**	**YES**
		Voltage/current Division	**IEC 146 - 2**	**NO**	**YES**
		Relative Harmonic Content	**IEC 146 - 2**	**NO**	**YES**

QUALITY ASSURANCE

POWER SUPPLY SYSTEM																	
TESTS / ITEMS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)	General arrangement/BOM/make of components /Mimic®	Efficiency ,regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range(A)	Premilinary light load test(R)	Load transfer retransfer test (R) *	AC input faliure and return test (R)	Parralel operation and current divison(R)	Relative harmonic content(R)	Restart with PRI A.C and battery (separately)(R)	System transfer and retransfer (R)*	Asynchronous transfer(R)	Ripple content(R)	Load limiter operation (R)	IR/HV(R)	Tests as per standard &specification (R)&(A)
UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y				Y	
LEAD ACID BATTERY(TUBLAR)-IS-1651																	Y
LEAD ACID BATTERY (PLANTE)-IS-1652																	Y
NICKEL CADMIUM BATTERY(IS-10918/IEC-623)																	Y

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

* Transfer time and Over shoot /under shoot during load & system transfer shall be recorded .

Note: **1) Detailed procedure of Burn-in and Elevated Temperature test shall be as per Quality Assurance Programme in General Technical Conditions**

2) 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.

PQR AND TECHNICAL REQUIREMENTS FOR ELECTRONIC TRANSMITTERS

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
 Sandeep	416	08/06/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer ELECTRONICS TRANSMITTERs for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete/not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/ELECTRONICS TRANSMITTER/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/ELECTRONICS TRANSMITTER/PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C & D will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for ELECTRONICS TRANSMITTER, as a part of Offer:

1.0 Bidder shall be the OEM of the ELECTRONICS TRANSMITTER or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of Electronics Transmitters and Year of Commissioning of the equipment specified in Section C&D

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C &D of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Electronic Transmitters shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Electronics Transmitters. If there are multiple place of manufacturing ie. Pressure/DP Transmitters is at one factory & capillary remote seal type in different factory then both factory/manufacturing place to be registered mandatorily. Also is same situation is there in different countries then all countries manufacturing place to be registered & details to be furnished in separate SRF for complete requirement of Transmitters. Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

5.0 The offered model / series of transmitters should have successfully passed type tests as per the IEC 60770 is mandatory. List is attached as Annexure-I. These tests are applicable for 2(two) no Pressure transmitters of ranges 0-100 Kg/Cm2, 100-350 Kg/Cm2. Similarly for tests are applicable for 2(two) no Diff. Pressure transmitters of ranges 0- 250 mmWc & 5-20 Kg/Cm2

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Transmitters model series. Model list to be furnished as per Annexure II.
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Type test reports for each model & series(If multiple series is offered) as per annexure-I
4.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
5.0 Details of Manufacturing, testing & inspection facility.
6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
7.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Transmitters. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : SCOPE OF SUPPLY

Sl No	Type	Span	Static presure	Qty. nos(Approx. for 800MW unit)	Model Nos
1	DPT	40 MMWC TO 100 MMWC	up to 3300mmWC	50	
2	DPT	30 MMWC TO 39 MMWC	up to 3300mmWC		
3	DPT	100 MMWC TO 600 MMWC	up to 105 kg/cm2		
4	DPT	600 MMWC TO 8000 MMWC	up to 105 kg/cm2	100	
5	DPT	8000 MMWC TO 5KG/CM2	up to 105 kg/cm2		
6	DPT	5kg/cm2 to 9kg/cm2	up to 105 kg/cm2		
7	DPT	9kg/cm2 to 140 kg/cm2	up to 105 kg/cm2		
8	DPT	600 MMWC TO 8000 MMWC	up to 210 kg/cm2	30	
9	DPT	8000 MMWC TO 5KG/CM2	up to 210 kg/cm2		
10	DPT	5kg/cm2 to 10kg/cm2	up to 210 kg/cm2		
11	DPT	10kg/cm2 to 70kg/cm2	up to 210 kg/cm2		
12	DPT	600 MMWC TO 8000 MMWC	beyond 210 kg/cm2	40	
13	DPT	8000 MMWC TO 5KG/CM2	beyond 210 kg/cm2		
14	DPT	5kg/cm2 to 70kg/cm2	beyond 210 kg/cm2		
15	DPT	5kg/cm2 to 70kg/cm2	beyond 320 kg/cm2		
16	PT	40 MMWC TO 100 MMWC	up to 3300mmWC	100	
17	PT	30 MMWC TO 39 MMWC	up to 3300mmWC		
18	PT	100 MMWC TO 600 MMWC	up to 105 kg/cm2		
19	PT	600 MMWC TO 8000 MMWC	up to 105 kg/cm2		
20	PT	8000 MMWC TO 2KG/CM2	up to 105 kg/cm2		
21	PT	2KG/CM2 TO 20 KG/CM2	up to 20 kg/cm2		
22	PT	20KG/CM2 TO 140 KG/CM2	up to 140 kg/cm2		
23	PT	140KG/CM2 TO 249 KG/CM2	up to 320 kg/cm2	35	
24	PT	250KG/CM2 TO 400 KG/CM2	up to 500 kg/cm2		
25	DPT Remote Seal	1000 MMWC TO 8000 MMWC	up to 77 kg/cm2	10	
26	DPT Remote Seal	0.7KG/CM2 TO 5KG/CM2	up to 77 kg/cm2		
27	PT Remote Seal	1KG/CM2 TO 3KG/CM2	up to 77 kg/cm2	10	
28	PT Remote Seal	3.1KG/CM2 TO 14KG/CM2	up to 77 kg/cm2		
29	PT Remote Seal	14KG/CM2 TO 140KG/CM2	up to 77 kg/cm2		
				375	

SECTION-D : TECHNICAL REQUIREMENTS

REQUIREMENTS FOR ELECTRONIC TRANSMITTERS

1.0 Electronic Transmitters for Pressure, Differential Pressure, Flow and Level measurement shall be furnished complete with all accessories to meet the requirements given below.

2.0 Pressure Transmitters and Differential Pressure Transmitters (for all Air & Flue Gas Applications) shall be used for measurement of Pressure as indicated in the BOM schedule of Scope of Supply. Differential Pressure Transmitters shall be used for measurement of Differential Pressure, Flow rates and Levels as indicated in the BOM schedule of Scope of Supply.

3.0 Electronic transmitters shall meet or exceed the following requirements

3.1	Type of Transmitter	: Microprocessor based, 2 wire Smart type, HART Protocol compatible, with LCD indicator.
3.2	Accuracy	: ±0.1% of calibrated span (minimum)
3.3	Range	: About 1.5 times calibration span.
3.4	Output signal range	: 4-20 mA DC (Analog) and superimposed Digital signal on HART protocol.
3.5	Turn-down ratio	: (i) 10:1 for vacuum/very low pressure applications (ii) 5:1 for very high pressure applications (iii)30:1 for other applications
3.6	Stability	: ±0.2 % of Calibrated span for 6 months for range up to and including 70 Kg/cm^2, And ± 0.25 %of Calibrated Span for six months for range more than 70 Kg/cm^2 (g).
3.7	Zero and Span drift	: ±0.015 % per deg. C at maximum span and ±0.11% per deg. C at minimum span.
3.8	Load Impedance	: 500 Ohms minimum.
3.9	Body/Element rating	: 1.5 times the maximum span / Full static pressure on one side with other side venting for DPT
3.10	Electrical Connection	: ½" NPT double compression Ni-plated brass cable gland.
3.11	Housing	: Weather proof with durable corrosion resistant coating. Protection Class shall be IP65.
3.12	Overpressure	: 150% of maximum operating pressure.
3.13	Process Connection	: ½" NPT (F).
3.14	Span and zero adjustment	: Continuous, tamper proof, remote as well as manual adjustability from instrument with zero suppression and elevation facility is required.
3.15	Diagnostics	: Self indicating feature.
3.16	Power Supply	: 24 V dc ± 10%.
3.17	Adjustment/calibration/maintenance	: Through centralized PC based System being procured by BHEL separately. Additionally transmitter should be operable through universal hand held HART communicator being procured by BHEL separately.
3.18	Drain and Vent plug	: Drain and Vent plug(SS316) shall be provided With transmitter

3.19 In case of failure & return of power supply to the transmitters, no false signals endangering the system shall be issued.

3.20 Accessories : Remote diaphragm seal with SS capillary tubes, having necessary protective coating of **eight(08)meters length** for fuel oil applications suitable to service and operating conditions. Necessary flanges & fasteners both for process end as well as transmitter end shall be provided suitable to service & operating conditions. Flange shall be 3" ANSI 300 RF minimum. The flange at the transmitter end shall be stainless steel. Matching blind counter flanges with nuts, bolts, gaskets etc are to be provided. This counter flanges shall be of carbon steel. Each transmitter shall have blind plugs, Mounting bracket, U clamp (for 2″ NB pipe) and fasteners etc shall be suitable for mounting in LIE/LIR vertical impulse pipe mounting from Up/down ward.

Notes:

1. The offered model DDL (Device Driver list) shall be registered in HART foundation, which is mandatory for device operable by universal HART communicator & HMS system.
2. LVDT type transmitter is not technically acceptable.
3. Transmitter for Draft ranges pressure measurement shall be provided as DP transmitter model.
4. Transmitter for Fuel oil services shall be remote diaphragm seal type.

****

Annexure – I

Type test Requirements

TYPE TEST REQUIREMENT OF ELECTRONICS TRANSMITTER AS PER IEC 60770

Sr. No.	Test name	Reference standards	Test Type
1	Inaccuracy and measured error (with graphs in 03 cal. Ranges)	IEC 61298 -2	Performance test
2	Non-Linearity	IEC 61298 -2	Performance test
3	Hysterisis	IEC 61298 -2	Performance test
4	Non-repeatability	IEC 61298 -2	Performance test
5	Dead Band	IEC 61298 -2	Performance test
6	Start up drift	IEC 61298 -2	Functional test
7	Long term drift	IEC 61298 -2	Functional test
8	Ambient temperature	IEC 61298 -3	Temp. related Test
9	Vibration (sinusodial)	IEC 61298 -3	Enviromental Tests
10	Shock	IEC 61298 -3	Functional test
11	Mounting Position Effect	IEC 61298 -3	Functional test
12	Overrange	IEC 61298 -3	Functional test
13	Short term Supply Voltage interruptions	IEC 61298 -3	Functional test
14	Reverse supply voltage protection	IEC 61298 -3	Functional test
15	Common mode interference	IEC 61298 -3	Functional test
16	Normal mode interference (series Mode)	IEC 61298 -3	Functional test
17	Earthing	IEC 61298 -3	Functional test
18	Electrical fast transients (Bursts)	IEC 61298 -3/ IEC 61000-4-4	EMI Test
19	Surge Voltage immunity	IEC 61298 -3	EMI Test
20	Conducted sine wave RF disturbances	IEC 61298 -3	EMI Test
21	Power frequncy magnetic filed	IEC 61298 -3	EMI Test
22	Damped Oscillatory Magnetic Field	IEC 61298 -3	EMI Test
23	Radiated radio frequncy electromagnetic field	IEC 61298 -3	EMI Test
24	Open and short circuit of Output	IEC 61298 -3	EMI Test
25	Input resistance of a transmitter with electrical inputs	IEC 61298 -2	Functional test
26	Insulation Resistance	IEC 61298 -2	Functional test
27	Dielectrics strength	IEC 61298 -2	Functional test
28	Power consumption	IEC 61298 -2	Functional test
29	Output ripple	IEC 61298 -2	Functional test
30	Output load	IEC 61298 -3	Functional test
31	Source Impedance	IEC 61298 -3	Functional test
32	Supply voltage depressions	IEC 61298 -3	Functional test
33	Dry Heat Test		Enviromental Tests
34	Damp Heat Test	IEC 61298 -3, IEC 60068 -2-1,IEC 60068 -2-2,	Enviromental Tests
35	ESD Immunity test		EMI Test
36	Frequency response		n/a
37	Air consumption		n/a
38	Ingrass Protection (IP)		IP Test
39	Electrical output Load at Full span		Functional test
40	Supply voltage variation		Functional test
41	Life cycle test		Functional test
43	static pressure test		

Annexure-II

INDEX SHEET FOR MODEL OFFER FOR OUR REQUIREMENT

Sl No	Type	Span	Static presure	Model Nos	ACCURACY	Remarks
1	DPT	40 MMWC TO 100 MMWC	up to 3300mmWC			
2	DPT	30 MMWC TO 39 MMWC	up to 3300mmWC			
3	DPT	100 MMWC TO 600 MMWC	up to 105 kg/cm2			
4	DPT	600 MMWC TO 8000 MMWC	up to 105 kg/cm2			
5	DPT	8000 MMWC TO 5KG/CM2	up to 105 kg/cm2			
6	DPT	5kg/cm2 to 9kg/cm2	up to 105 kg/cm2			
7	DPT	9kg/cm2 to 140 kg/cm2	up to 105 kg/cm2			
8	DPT	600 MMWC TO 8000 MMWC	up to 210 kg/cm2			
9	DPT	8000 MMWC TO 5KG/CM2	up to 210 kg/cm2			
10	DPT	5kg/cm2 to 10kg/cm2	up to 210 kg/cm2			
11	DPT	10kg/cm2 to 70kg/cm2	up to 210 kg/cm2			
12	DPT	600 MMWC TO 8000 MMWC	beyond 210 kg/cm2			
13	DPT	8000 MMWC TO 5KG/CM2	beyond 210 kg/cm2			
14	DPT	5kg/cm2 to 70kg/cm2	beyond 210 kg/cm2			
15	DPT	5kg/cm2 to 70kg/cm2	beyond 320 kg/cm2			
16	PT	40 MMWC TO 100 MMWC	up to 3300mmWC			
17	PT	30 MMWC TO 39 MMWC	up to 3300mmWC			
18	PT	100 MMWC TO 600 MMWC	up to 105 kg/cm2			
19	PT	600 MMWC TO 8000 MMWC	up to 105 kg/cm2			
20	PT	8000 MMWC TO 2KG/CM2	up to 105 kg/cm2			
21	PT	2KG/CM2 TO 20 KG/CM2	up to 20 kg/cm2			
22	PT	20KG/CM2 TO 140 KG/CM2	up to 140 kg/cm2			
23	PT	140KG/CM2 TO 249 KG/CM2	up to 320 kg/cm2			
24	PT	250KG/CM2 TO 400 KG/CM2	up to 500 kg/cm2			
25	DPT Remote Seal	1000 MMWC TO 8000 MMWC	up to 77 kg/cm2			
26	DPT Remote Seal	0.7KG/CM2 TO 5KG/CM2	up to 77 kg/cm2			
27	PT Remote Seal	1KG/CM2 TO 3KG/CM2	up to 77 kg/cm2			
28	PT Remote Seal	3.1KG/CM2 TO 14KG/CM2	up to 77 kg/cm2			
29	PT Remote Seal	14KG/CM2 TO 140KG/CM2	up to 77 kg/cm2			

Note 1 In case of Remote seal the above model is for 3"/ANSI 300# Flange in carbon Steel,if required in SS then the option code shall be provided for Capillary length is 8 meters

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PQR AND TECHNICAL REQUIREMENTS FOR ULTRASONIC TYPE LEVEL TRANSMITTERS

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
 Sandeep	416	08/06/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer ULTRASONIC LEVEL TRANSMITTERs for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete/not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/ ULTRASONIC LEVEL TRANSMITTER /PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/ ULTRASONIC LEVEL TRANSMITTER /PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C & D will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for ULTRASONIC LEVEL TRANSMITTER, as a part of Offer:

1.0 Bidder shall be the OEM of the ULTRASONIC LEVEL TRANSMITTER or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of ULTRASONIC LEVEL TRANSMITTER and Year of Commissioning of the equipment specified in Section C&D

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C &D of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Ultrasonic level Transmitters shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Ultrasonic type level Transmitters. If there are multiple place /countries of manufacturing ie. Ultrasonic type level Transmitters like sensors at one factory , other parts at different factory and final assembly at some other factory, in that case all manufacturing place/countries to be registered & details to be furnished in separate SRF for complete requirement of Transmitters. Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Transmitters model series to be furnished.
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
4.0 Details of Manufacturing, testing & inspection facility.
5.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
6.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Transmitters. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : SCOPE OF SUPPLY

Sl No	Type	Span	Design parameters	Qty. nos(Approx. for 800MW unit)	Model Nos
1		0-5 mtr		6	
2		5-15 mtr		4	
3		Above 15 mtrs		2	

SECTION-D : TECHNICAL REQUIREMENTS

REQUIREMENTS FOR ULTRASONIC TRANSMITTER:-

01.01 Ultrasonic Transmitter for Level measurement shall be furnished complete with all accessories to meet the requirements given below.

01.02 Ultrasonic transmitters shall meet or exceed the following requirements;

Sl. No	Features	Essential/Minimum requirements
1	Type of Transmitter:	HART protocol compatible Ultrasonic transmitter, 2 Wired.
2	Output signal:	Galvanically Isolated 2 Wired, 4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol).
3	Sensor Accuracy:	**+/- 0.5% of calibrated span.**
4	Power supply:	24V DC.
5	Temperature compensation:	To be provided within transducer
6	Configuration:	Sensor unit and Electronic units are to be separate. It shall be possible to mount the Electronic unit at a remote accessible location from the transducer. All cables and weather proof fittings to interconnect transducer to electronic unit shall be provided by Bidder.
7	Adjustment/calibration/maintenance:	Continuous, tamper proof, manual adjustability as well as Through centralized PC based System being procured by BHEL separately. Additionally transmitter should be operable through universal hand held HART communicator being procured by BHEL separately. It shall be possible to calibrate the Instrument without any level in the tank/sump etc.

8 Housing: Weather proof as per IP-55 with durable corrosion resistant coating with **Aluminum material**.

9	Sensor Material:	Corrosion resistant material to suit individual application requirement
10	Sensor Seal:	EPDM or equivalent.
11	Sensor repeatability	: 3mm or better
12	Process Connection:	3" 150# Flanged, SS316
13	False signal tolerance:	Transmitter shall be capable of ignoring false echoes from Internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping.
14	Range:	Range of transmitter shall be capable of the Complete level span of tank taking care blocking distance (as per manufacturer's standard), frequency attenuation due to surface, obstructions, vapors etc.
15	Display:	Minimum 4 character display (alphanumeric back lit LCD/LED) with integral keypad access protected by user code, These transmitters shall be provided with remote indication system. Indication system of these transmitters shall be placed 10 meters away from the sensors.
16	Diagnostics:	Loss of echo alarm.
17	Load Impedance:	500 ohms minimum.
18	Electrical Connection:	Plug in socket / ½" NPT Double compression Ni-plated brass cable gland
19	Accessories:	1) All weather canopy for protection from direct sunlight and direct rain. 2) All mounting hard ware and accessories required for erection and commissioning mounting fittings material shall be SS 316.

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PQR AND TECHNICAL REQUIREMENTS FOR GUIDED WAVE RADAR TYPE LEVEL TRANSMITTERS

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
Sandeep	416	08/06/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer GUIDED WAVE RADAR Type Level Transmitters for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete / not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/GUIDED WAVE RADAR TRANSMITTER/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/GUIDED WAVE RADAR TRANSMITTER/PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C & D will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for GUIDED WAVE RADAR LEVEL TRANSMITTER, as a part of Offer:

1.0 Bidder shall be the OEM of the GUIDED WAVE RADAR LEVEL TRANSMITTER or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of Guided Wave Radar type level Transmitters and Year of Commissioning of the equipment specified in Section C&D

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Guided Wave Radar type level Transmitters shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Guided Wave Radar type level Transmitters. If there are multiple place /countries of manufacturing ie. Guided Wave Radar type level Transmitters like sensors at one factory , other parts at different factory and final assembly at some other factory, in that case all manufacturing place/countries to be registered & details to be furnished in separate SRF for complete requirement of Transmitters. Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Transmitters model series to be furnished .
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
4.0 Details of Manufacturing, testing & inspection facility.
5.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
6.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Transmitters. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : SCOPE OF SUPPLY

Sl No	Type	Span	Design parameters	Qty. nos (Approx. for 800MW unit)	Model Nos
1		0-4000 mm	Up to 150°C	8	
2		0-4000 mm	Above 150°C to 250°C	4	
3		0-4000 mm	Above 250°C	4	

SECTION-D : TECHNICAL REQUIREMENTS

1.0 GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER

1.1	Type	: Guided wave Radar (Microprocessor based)-coaxial type.
1.2	Wave guide	: SS Rod – probe shall be suitable for **over fill prevention.**
1.3	Principle of operation	: TDR (Time Domain Reflectometry)

These instruments will be used for level measurement of level, having medium as Water/steam/oil at not very high pressure conditions. The temperature requirements as listed in BOM are to be met taking care of safety factors with contingency.

a) Guided wave radar transmitter shall be used for LPH and Hot well level measurements as per BOM attached.
b) The Radar type level instrument shall be microprocessor based and shall use digital signal processing techniques for conditioning.
c) Level instruments mounted in fixed roof type and floating roof shall be considered by supplier.
d) Wetted part materials of the sensor shall be chemically compatible with the process media to avoid corrosion.
e) Since medium is pure water /steam in hot well, hence wetted parts shall be of stainless steel.

1.4	Power supply	: 24V DC
1.5	Output Signal	: 4-20 mA DC (linear) along with superimposed digital signal on HART protocol signal suitable for over fill prevention as a standard feature.
1.6	Accuracy (combined)	: 5mm
1.7	Enclosure class	: Weather proof with durable corrosion resistant coating. Protection Class shall be IP-55.
1.8	Local Indicator	: LCD Local indication shall be provided
1.9	Name plate	: Suitable tag no name plate shall be engraved.
1.10	Body/ Cage-By Pass	: Carbon steel or suitable material according to application.
1.11	Drain and Vent plug	: Drain and Vent plug shall be provided With Body/ Cage-By Pass.
1.12	Process connection	: 3" ANSI companion flange or threaded with screw on flange with nuts, bolts and gaskets (suitable for 2" upper side and lower side connections)
1.13	Electrical connection	: Plug and socket type/ 1/2″ NPT Double compression Ni-plated brass cable gland.

1.14 Accessories: The transmitters should be complete along with its chamber and flanges. The flanges (3"ANSI) should be provided at the process end as weld neck raised face type along with counter flanges, gaskets, nuts, &bolts etc. for connecting to the stand pipe. Similarly when the complete sensor/electronics are mounted on top of the chamber, same should also be weld neck SS flanges taking care of complete mounting accessories. Flange rating shall be 300#.

2.0 Design of Transmitters shall be in compliance with the Electromagnetic compatibility requirement as per IEC 61326-1 "Electromagnetic compatibility for industrial process measurement and control equipment".

3.0 The offered model DDL (Device Driver list) shall be registered in HART foundation, which is mandatory for device operable by universal HART communicator & HMS system.

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PURCHASE SPECIFICATION
FOR
COAL BUNKER LEVEL MONITORING SYSTEM – STRAIN GAUGE TYPE

REVISIONS :

APPROVED BY

PUNIT P SINGH

PREPARED BY	ISSUED	DATE
PV	416	11/04/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer Coal Bunker level System – Strain Gauge type to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for Coal Bunker level System – Strain Gauge type:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Coal Bunker level System – Strain Gauge type in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
7. Bidder shall have optimum inventory of critical components like sensors/ electronic modules.
8. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
9. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Sensors/ System/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning Protocols & Minutes of the meetings for handing over of Coal Bunker level System – Strain Gauge type system for these projects.
5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
6. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of the system. Submit these details.
7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION – C

SCOPE OF SUPPLY FOR EACH PROJECT:

Following items are required to be supplied as per SECTION –D:

1. Coal Bunker Level monitoring system with Sensors, Electronics, Panels - Total for each unit & all required accessories for all bunkers/ unit.

2. Documents to be furnished in the events of order, before dispatch of items:-
   i. Test certificates/ reports and calibration reports, for approval.
   ii. O & M manuals –4 sets (2 sets to BHEL-EDN & 2 sets with consignment to site).
   iii. Data sheets / GA drawings and Instrument schedule to be provided in a soft copy (CD) compatible with windows 98 format (Autocad-14, MS Word, Excel). Also, a soft copy of O & M manual to be provided.
   iv. Erection drawings/ wiring chart.
   v. Detailed BOM including all items supplied for approval. A representative of vendor shall visit site with approved BOM for validation of supplies made.

3. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.

4. Erection/ mounting of sensors, commissioning and handing over to the customer at site.

5. Vendor to include one site visit of min. 7 man-days during Performance Availability Test.

6. Unit rates quoted will considered for mandatory spare if applicable.

7. A total of 9 systems to be supplied for the projects in the year 2015-2016.

SECTION – D

1. TECHNICAL REQUIREMENTS FOR COAL BUNKER LEVEL SYSTEM

1.1. The Coal Bunker Indicating System shall consist of all necessary semiconductor strain gauge sensors, electronic unit comprising of signal conditioner, amplifier, isolated output signal (4-20mA DC) transmitter, limit value monitors and power supply, Bar graph type LED indicator for continuous level indications and all mounting accessories required for complete installation of the system. Separate set of sensors and separate electronic unit and display shall be provided for each Bunker.

1.2. Bidder may note that as per support systems/ structure envisaged for coal Bunkers, there may be interactions among the adjacent Bunkers. The exact details of the support systems/ structure shall be obtained from section DRAWINGS. The Bidder shall provide required no. of sensors and make the mounting arrangement in such a way that the system meets the specified accuracy in spite of interactions among the adjacent Bunkers. Bidder shall furnish full justification as to how the same is achieved.

1.3. The electronic units shall be housed in a cubicle. The bar graph type LED indicator shall be supplied along with mounting panel by the Bidder for mounting the same in Tripper Floor. Cables for the signal transmission between strain gauge sensors and electronic unit and between electronic units and bar graph type LED indicator shall be in BHEL's scope. However, Bidder shall indicate the type of above cables in the offer.

1.4. Bidder shall provide signal booster, if necessary for the signal to be transmitted to bargraph indicator to be mounted on control room panel.

1.5. Electronic unit and Level Indicators: Each electronic unit shall include signal conditioners, amplifiers, limit value monitors, power supply for all the strain gauge sensors of the respective coal bunker, controls for Zero and span adjustments, high and low set adjustments, transmitter for 4-20mA DC galvanically isolated output signals. The electronic unit shall provide three nos. of galvanically isolated 4-20mA DC signals, one for DDCMIS, one for the local indicators at tripper floor and one for coal handling plant DDCMIS through station wide LAN. Cutout details for these indicators shall be furnished with the offer. The overall accuracy of the system, including the accuracies of all devices i.e. sensor, control unit, transmitter and indicator shall be **10% or better**.

1.6. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.

1.7. Strain Gauge Sensors:

The Bunker level sensors shall be of semiconductor strain gauge type with Nickel plated Carbon Steel base suitable for bolting on the structural member, strain on the sensor represents weight/level of each bunker. The elongation/compression of the sensor base is sensed by two semiconductor elements forming a half bridge circuit. The sensor shall be encapsulated hermetically with 3 wire flexible lead for external connections. The sensor base material shall be matched with that of its mount. The strain gauge sensor shall be rugged, immune to temperature variations, vibrations, & shock, and easy to install and shall meet the following performance specifications as a minimum:

i.	Non-linearity	: 0.1 %
ii.	Repeatability & Hysteresis	: 0.05 %
iii.	Compensated temperature range	: 0-55°C
iv.	Number of strain gauge sensors	: Vendor to decide meeting accuracy requirements

2. **DOCUMENTS**

The Bidder shall submit the following documents along with the offer.

a) Complete BOM for Coal Bunker Level Indicating System including strain gauge sensors, electronic units housed in cubicle, Bar graph type LED indicators and all necessary accessories with relevant catalogs.

b) Complete technical literature for strain gauge sensors, electronic unit's etc.

c) Typical GA Drawing for the cubicle housing electronic units.

d) Mounting details for strain gauge sensors & Indicators.

e) List of mandatory spares as per scope of supply.

f) Technical evaluation checklist duly filled.

g) Clause-wise compliance/deviation list.

SECTION-E

"TECHNICAL EVALUATION CHECKLIST FOR
COAL BUNKER LEVEL INDICATING SYSTEM
(To be filled by the vendor and submitted along with the offer)

Project :

Enquiry No. :

Vendor :

Specification No. :

Tick (✓) 'YES' OR 'NO' AS APPLICABLE. IF ANY DEVIATION IS TAKEN, IT SHOULD BE CLEARLY INDICATED IN A SEPARATE "LIST OF DEVIATIONS" TO BE ATTACHED TO THE OFFER

"If no deviations are listed, it shall be assumed that there are no deviations. Vendor's offer not accompanied with this filled in technical evaluation checklist shall be rejected."

	YES	NO
1. Is the coal bunker level indicating system offered with the following?		
a. Strain gauge sensors		
b. electronic units housed in cubicle		
c. Bar graph type LED indicator		
d. All mounting accessories required for complete installation of system.		
2. Are separate set of sensors and separate electronic unit & display provided for each of the bunkers indicated in the Instrument Schedule?		
3. Are the number and location of sensors adequate to meet accuracy requirement?		
4. Is signal booster required/ offered for signal transmission to control room where bar graph type indicators are located?		

5.	Does each electronic unit include the following?	
	a. Signal conditioners	
	b. Amplifiers	
	c. Limit value monitors	
	d. Power supply for all strain gauge sensors of the respective coal bunker.	
	e. Controls for zero & span adjustments	
	f. High & Low set point adjustments	
	g. Transmitter for 4-20mA DC isolated output signals.	
6.	Does the electronic unit provide three numbers of galvanically isolated 4-20mA DC signals?	
7.	Is the overall accuracy of the system (including accuracies of all the devices i.e. sensors, control unit, transmitter and indicator) better than or equal to 10%?	

PURCHASE SPECIFICATION
FOR
COAL BUNKER LEVEL MONITORING SYSTEM – ULTRASONIC/ RADAR TYPE

REVISIONS :

APPROVED BY

PUNIT P SINGH

PREPARED BY	ISSUED	DATE
PV	416	11/04/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer Coal Bunker level System – Ultrasonic type to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for Coal Bunker level System – Ultrasonic type:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Coal Bunker level System – Ultrasonic type in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
7. Bidder shall have optimum inventory of critical components like sensors/ electronic modules.
8. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
9. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Sensors/ System/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test / Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning Protocols & Minutes of the meetings for handing over of Coal Bunker level System – Ultrasonic type system for these projects.
5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
6. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of the system. Submit these details.
7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION - C

SCOPE OF SUPPLY FOR EACH PROJECT:

1. Following items are required to be supplied as per enclosed section-D

   Coal Bunker Level monitoring system with Sensors, Electronics -Total for 1 unit & all required accessories for all bunkers/ unit

   Vendors to quote unit rates for all major components such as:-

   - Ultrasonic sensor
   - Aiming device
   - Transmitter unit
   - Bar graph indicator
   - Enclosure/Panel for mounting

2. Documents to be furnished in the events of order, before dispatch of items:-
   (i) Test certificates/ reports and calibration reports, for approval.
   (ii) O & M manuals –4 sets (2 sets to BHEL-EDN & 2 sets with consignment to site).
   (iii) Data sheets / GA drawings and Instrument schedule to be provided in a soft copy (CD/ floppy) compatible with windows 98 format (Autocad-14, MS Word, Excel). Also, a soft copy of O & M manual to be provided.
   (iv) Erection drawings/ wiring chart.
   (v) Detailed BOM including all items supplied for approval. A representative of vendor shall visit site with approved BOM for validation of supplies made.
3. Erection/ mounting of sensors, commissioning and handing over to the customer at site.
4. Vendor to include one site visit of min. 3 man-days during Performance Availability Test.
5. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.
6. Unit rates quoted will considered for mandatory spare if applicable.
7. A total of 4 systems are to be supplied for the projects in the year 2015-2016.

SECTION-D

TECHNICAL REQUIREMENT

1.	Type of Transmitter	: Non-contact Microprocessor based 2 wire type.
2.	Output Signal	: Galvanically isolated two nos. of 4-20mA DC
3.	Sensor Accuracy	: +/-0.5% of calibrated span
4.	Sensor Repeatability	: 10 mm or better
5.	Temperature Compensation	: To be provided within transducer.
6.	Configuration	: Sensor & Electronic unit shall be separate.
7.	Housing	: IP55 with durable corrosion resistant Epoxy coating.
8.	Zero & Span adjustment	: Continuous, Tamper proof, Remote as well as manual adjustability. Provision to calibrate the instrument without any level in the bunker.
9.	Sensor Material	: Corrosion resistant to suit the individual application.
10.	False Signal Tolerance	: Facility to be provided. Shall have adjustable damping circuitry
11.	Display	: Min. 4 character display with integral key pad, access protection features.
12.	Diagnostics	: Loss of Echo alarm.

VENDORS WHO DO NOT HAVE ULTRASONIC TYPE CBLMS CAN OFFER RADAR TYPE CBLMS MEETING THE TECHNICAL REQUIREMENTS.

13. The transmitter shall have the capability to use statistical filtering techniques, wherever required, to compensate to suppress false signal due to heavy dust or fill-stream interference.

14. The transducer shall have suitable build-up compensation (i.e. repetitive, pulsating displacement at its face shall be used to remove the build-up of material).

15. The level measuring system shall consist of following (Minimum) in vendor's scope:

15.1. Ultrasonic Sensor / Transducer: Min. 02 no. per Bunker.

15.2. Aiming accessories for measuring solid level: One set per Sensor / Transducer.

15.3. Ultrasonic Level Transmitter unit with local display & key pad and all required interconnecting cables between Transducer located at bunker top and Control/Display Unit located on nearest platform will be in vendor's scope. This unit shall be with IP 55 protection class. Averaging of sensor inputs from a bunker is to be done to indicate correct bunker level.

15.4. Indicator: Digital bar graph LED indicator for level display shall be offered for each bunker. Power supply for indicators shall be AC 230V. Approved Makes are – Gossen – Germany, ABB –Germany/Bangalore, Masibus – Gandhinagar, Yokogawa – Japan/Bangalore, Chino - Japan/Navi Mumbai, Pyrotech – Udaipur, Samson – Hamburg, M-System – Osaka.

15.5. All the indicator shall be mounted in a wall mounted enclosure.

15.6. Necessary fixing / mounting plates / flanges along with other fixing / mounting hardware for Sensor / Transducer and Controller / Transmitter.

15.7. Sheet Metal Panel / Enclosure shall be offered for housing the Indicators / Transmitters. Enclosure shall have protection class of IP55. Enclosure shall be constructed on structural members of adequate strength and rigidity to ensure proper support to the mounted instruments and equipment. Exterior steel surfaces of Panel shall be rust free and scale free and all other residue during fabrication operation such as Oil, grease and salts etc. shall be removed by one or more solvent cleaning methods. Epoxy primer surface shall be applied to all exterior and interior surfaces. Epoxy paint shall be applied to all surfaces and the paint thickness shall be 100 to150 microns.

Vendors to indicate approximate dimension of above Enclosure / Panel in the offer.

The Terminal Blocks inside Enclosure / Panel shall be of "Cage Clamp" type with 20% spare Terminals.

Panel / Enclosure shall be complete w.r.t internal interconnection signal & power wiring, MCB's, Lighting, Earthling strip etc.

QUANTITY:

a. 01 nos. for mounting all of Transmitters.
b. 01 nos. for mounting all of bar graph indicators in CHP Control room.

16. All interconnecting cables supplied by vendor shall be immune to environment, RFI and magnetic interference normally prevalent in the plant area. The length of cable along with sensor shall be 10 meters. Additional 300 meters of sensor cable (armoured type) for the unit shall also be provided between Sensor / Transducer and Controller / Transmitter.

Required Field JB's to be provided by vendor for connecting sensor cable to Transmitter. Unit rates for sensor cable to be furnished for quantity revision if required as per site condition.

17. Bidder shall furnish with the offer Clause-wise compliance / deviation list. This is a must for evaluating the offer.

18. Documents to be furnished, with the offer:-

    18.1. Datasheets / Drawings of offered items / system- 02 set
    18.2. Technical Literature / Catalogs - 02 set

19. Documents to be furnished, for Approval , in the event of order :-

    19.1. GA drawing of Enclosure for mounting Transmitter showing overall dimension & layout of items housed inside.
    19.2. Datasheets, Component Drawings and BOM of offered items.
    19.3. Electrical Schemes with Termination details for Power & Signal Wiring.
    19.4. Technical Literature
    19.5. Manufacturers QA Plan.

Note: All above documents shall be submitted in 8 sets. Also a Soft copy in "pdf" format of all the above documents shall be furnished.

20. Quality Documents to be submitted for approval, in the event of order:

    Test Certificates and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the Transducer as per the attached scope of supply.

21. O& M Manuals to be furnished– 4 sets (2 Sets to BHEL-EDN, Bangalore & 2 Sets to site with Consignment).

22. Erection and Commissioning Training requirement for offered System
    22.1. Supervision of Erection of Transducer on Top of each Bunker.
    22.2. Supervision of Erection of balance items
    22.3. Total Commissioning and handing over of the offered systems offered to Owner / End user.
    22.4. Three days of Training to Site Engineer/s at Site

PQR AND TECHNICAL REQUIREMENTS FOR SINGLE INPUT DIN RAIL MOUNTED TEMPERATURE TRANSMITTERS

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
Sandeep	416	08/06/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer TEMPERATURE TRANSMITTERs(SINGLE INPUT DIN RAIL MOUNTED) for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete/not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/TEMPERATURE TRANSMITTERS(SINGLE INPUT DIN RAIL MOUNTED)/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/TEMPERATURE TRANSMITTERS(SINGLE INPUT DIN RAIL MOUNTED)/PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C & D will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for TEMP. TRANSMITTER(SINGLE INPUT DIN RAIL MOUNTED), as a part of Offer:

1.0 Bidder shall be the OEM of the TEMP. TRANSMITTER(SINGLE INPUT DIN RAIL MOUNTED) or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of TEMP. TRANSMITTER(SINGLE INPUT DIN RAIL MOUNTED) and Year of Commissioning of the equipment specified in Section C&D

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C &D of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Temperature Transmitters (Single input din rail mounted) shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Temperature Transmitters (Single input din rail mounted). If there are multiple place /countries of manufacturing ie. Temperature Transmitters (Single input din rail mounted) like manufacturing of parts at one factory and final assembly at some other factory, in that case all manufacturing place/countries to be registered & details to be furnished in separate SRF for complete requirement of Transmitters. Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Transmitters model series to be furnished.
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
4.0 Details of Manufacturing, testing & inspection facility.
5.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
6.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Transmitters. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : SCOPE OF SUPPLY

Sl No	Type	Span	Input Type	Qty. nos (Approx. for 800MW unit)	Model Nos
1		0-600°C	K-type T/C	150	
2		0-1000°C	R-type T/C	20	
3		0-250°C	PT-100 RTD	150	
4		0-150°C	Cu-53 RTD	30	

SECTION-D : TECHNICAL REQUIREMENTS

REQUIREMENTS FOR TEMPERATURE TRANSMITTERS

1.0 Temperature transmitter shall be of SMART type and shall be used for receiver instrument or control loop requiring signal conversion. They shall have either resistance or thermocouple type measuring system.

2.0 Following types of 2-wire temperature transmitter (directly powdered from 4-20 mA input cards of DDCMlS) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the BHEL. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself.

2.1 Single Input DIN-rail mounted Temperature Transmitter

These shall be suitable for mounting on DIN-rails in JBs. This temperature transmitter shall be the ones which are especially designed for **DIN-rail mounting with IP 20 protection classes**. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category.

2.2 Common requirements for each of the above type of temperature transmitters

2.2.1 The transmitter output shall be compatible with major instrumentation selected. Adjustable spans and suppressed ranges shall be provided where required by process consideration. Thermocouple burn-out or RTD wire-break protection for "failsafe" condition shall be provided.

2.2.2 Transmitters shall have easily accessible span and zero adjustment facilities and shall meet the following minimum requirements:-

Output : 2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal.

Input : Same transmitter shall be capable to handle Pt-100 RTD , Thermocouples –K, R & other types (**input type to be selectable at site through HART terminal at site from TC to RTD & vice versa**)

Isolation : should be optically isolated from power circuit (Min. 500V AC)

Output load : min 600 ohms at 24VDC.

Operating ambient Temperature : 0 to 85 deg C (Without indicator)
0 to 70 deg C (With indicator)

Power supply : Uv=24VDC (admissible tolerance 13Vdc <= Uv <= 45Vdc) or compatible with input module of Control System.

Composite Accuracy : **For single input DIN rail mounted-type:**
RTD =<0.4% of 0-250 deg C span
T/C-K type =<0.4% of 0-600 deg C span
T/C-R type =<0.4% of 0-1000 deg C span
CJC accuracy (for T/C) shall be =< 1deg C

(Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of Temperature Elements specified. All such accuracy/ temp effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures.)

Stability : ±0.1% of reading or 0.1°C, whichever is greater, for 06 months for RTDs.

EMC Compatibility : as per EN 61326

3.0 Transmitters shall be provided with following features

- Sensor drifts alarm for sensor failure prediction also for zero shifts.
- RFI / EMI Effect: Conforming to EEC standards.
- Accepts any of the sensor type (RTD, TC, mV or ohms)
- Ambient temperature compensation (Cold junction compensation shall be provided in-built with the equipment).
- In case of failure (open or burn-out) of RTD/thermocouple, temp. Transmitter shall provide low temperature output.

4.0 The product and make shall be selected so that with one make of transmitter all applications with respect to measuring rages temperature sensor (resistance thermometer / thermocouple) and connection type (2/3/4) wire connection of resistance thermometers) shall be covered. In a nutshell, the transmitter shall be universal type.

5.0 The offered model DDL (Device Driver list) shall be registered in HART foundation, which is mandatory for device operable by universal HART communicator & HMS system. These HMS & HART communicator are being procured by BHEL separately. If this technicality is not met, the offer will be technically rejected.

6.0 All transmitters cases shall be dust-tight and rugged weather-proof and explosion - proof cases shall be used in outer and hazardous areas respectively. Degree of protection shall be $\geq$ IP55. IP65 is required for outside installation or installation in spray-water affected areas.

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PQR AND TECHNICAL REQUIREMENTS FOR DUAL INPUT TEMPERATURE TRANSMITTERS

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
Sandeep	416	08/06/2015

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SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer TEMPERATURE TRANSMITTERs(DUAL INPUT) for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete/not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/TEMPERATURE TRANSMITTERS(DUAL INPUT)/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/TEMPERATURE TRANSMITTERS(DUAL INPUT)/PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C & D will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for TEMP. TRANSMITTER(DUAL INPUT), as a part of Offer:

1.0 Bidder shall be the OEM of the TEMP. TRANSMITTER (DUAL INPUT) or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of TEMP. TRANSMITTER (DUAL INPUT) and Year of Commissioning of the equipment specified in Section C&D

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C &D of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Temperature Transmitters(Dual input) shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Temperature Transmitters (Dual input). If there are multiple place /countries of manufacturing ie. Temperature Transmitters(Dual input) like manufacturing of parts at one factory and final assembly at some other factory, in that case all manufacturing place/countries to be registered & details to be furnished in separate SRF for complete requirement of Transmitters. Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Transmitters model series to be furnished .
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
4.0 Details of Manufacturing, testing & inspection facility.
5.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
6.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Transmitters. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : SCOPE OF SUPPLY

Sl No	Type	Span	Input Type	Qty. nos (Approx. for 800MW unit)	Model Nos
1		0-600°C	K-type T/C	150	
2		0-1000°C	R-type T/C	20	
3		0-250°C	PT-100 RTD	150	
4		0-150°C	Cu-53 RTD	30	

SECTION-D : TECHNICAL REQUIREMENTS

REQUIREMENTS FOR TEMPERATURE TRANSMITTERS

1.0 Temperature transmitter shall be of SMART type and shall be used for receiver instrument or control loop requiring signal conversion. They shall have either resistance or thermocouple type measuring system.

2.0 Following types of 2-wire temperature transmitter (directly powdered from 4-20 mA input cards of DDCMlS) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the BHEL. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself.

2.1 Dual-input Temperature Transmitter with Indicator:

These shall be suitable for mounting on pipes/ support. These shall be provided for temperature measurement which are used for tripping/ protection of auxiliaries e.g. for bearing temperature on which trip is envisaged. These transmitters shall also be used for temperature measurement used for close loop controls, in which case, both elements of the duplex thermocouple/RTD shall be used in a single transmitter. Indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum.

2.2 Common requirements for each of the above type of temperature transmitters

2.2.1 The transmitter output shall be compatible with major instrumentation selected. Adjustable spans and suppressed ranges shall be provided where required by process consideration. Thermocouple burn-out or RTD wire-break protection for "failsafe" condition shall be provided.

2.2.2 Transmitters shall have easily accessible span and zero adjustment facilities and shall meet the following minimum requirements:-

Output : 2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal.

Input : Same transmitter shall be capable to handle Pt-100 RTD , Thermocouples –K, R & other types (**input type to be selectable at site through HART terminal at site from TC to RTD & vice versa**)

Isolation : should be optically isolated from power circuit (Min. 500V AC)

Output load : min 600 ohms at 24VDC.

Operating ambient Temperature : 0 to 85 deg C (Without indicator)
0 to 70 deg C (With indicator)

Power supply : Uv=24VDC (admissible tolerance 13Vdc <= Uv <= 45Vdc) or compatible with input module of Control System.

Electrical connection :Plug in socket / ½" NPT Double compression Ni-plated brass cable gland

Composite Accuracy : **For dual input-type:**
RTD =<0.4% of 0-250 deg C span
T/C-K type =<0.4% of 0-600 deg C span
T/C-R type =<0.4% of 0-1000 deg C span
CJC accuracy (for T/C) shall be =< 1deg C

(**Composite Accuracy** is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of Temperature Elements specified. All such accuracy/ temp effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures.)

Stability : ±0.1% of reading or 0.1°C, whichever is greater, for 06 months for RTDs.

EMC Compatibility : as per EN 61326

3.0 Transmitters shall be provided with following features

- Sensor drifts alarm for sensor failure prediction also for zero shifts.
- Differential & average temperature measurement if required.
- Automatic switch – over to back –up sensor on primary sensor failure.
- Accepts any combination of two sensor types (RTDs, TCs, mV or ohms)
- Ambient temperature compensation (Cold junction compensation shall be provided in-built with the equipment).
- Fault detection for electronics & sensors with fail-safe alarming.
- In case of failure (open or burn-out) of RTD/thermocouple, temp. Transmitter shall provide low temperature output.

4.0 The product and make shall be selected so that with one make of transmitter all applications with respect to measuring rages temperature sensor (resistance thermometer / thermocouple) and connection type (2/3/4) wire connection of resistance thermometers) shall be covered. In a nutshell, the transmitter shall be universal type.

5.0 The offered model DDL (Device Driver list) shall be registered in HART foundation, which is mandatory for device operable by universal HART communicator & HMS system. These HMS & HART communicator are being procured by BHEL separately. If this technicality is not met, the offer will be technically rejected.

6.0 All transmitters cases shall be dust-tight and rugged weather-proof and explosion - proof cases shall be used in outer and hazardous areas respectively. Degree of protection shall be $\geq$ IP55. IP65 is required for outside installation or installation in spray-water affected areas.

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PQR AND TECHNICAL REQUIREMENTS FOR CJCB AND PDB FOR CJCB

APPROVED

TM

PREPARED	ISSUED	DATE
AJ	416	08.06.2015

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 **Introduction:** Bidders are required to offer CJCB & PDB for CJCB as per BHEL Technical Specifications

3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

6.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. "CE/416/CJCB-PDB/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. "CE/416/CJCB-PDB/PQR/CI BB of section B" marked on it.

cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

9.0 Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders for Explosion Flame Proof Junction Boxes as a part of offer:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Cold Junction Compensation boxes and Power Distribution Boxes for Cold Junction Compensation boxes in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
5. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
6. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered CJCB & PDB/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.

4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning for CJCB and PDB for these projects.

5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

6. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of the system. Submit these details.

7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION-C

TECHNICAL REQUIREMENTS

COLD JUNCTION COMPENSATION BOXES (CJCB)

Field mounted cold junction compensation Boxes shall be provided to maintain a constant reference junction temperature of 60 deg.C for T/C signals. Compensation shall be provided for both elements of dual T/C. Remote monitoring of CJCB inside temperature in BHEL supplied DCS will be provided for each CJCB.

Cold junction compensation boxes shall be as per following specification Requirements:

1. Mounting : Field mounted
2. Enclosure : IP-65 as a minimum
3. Cable entry : From bottom through cable glands forming part of CJC Box.
4. Power supply : 240 V AC ± 10% (with conversion from 240V AC to 24VDC supply internally, if required)
5. In-built indication : In built power supply indication lamp.
6. Reference junction temp: 60 deg. C
7. Automatic Temp. Control: To be provided. Control
8. Input signals : Type K, Type R
9. Terminal Blocks : As per actual requirements (Cage clamp type make phoenix/wago
10. Reference junction temp. : + 0.5 deg C max. (for K-type)
11. Effect of temperature : + 0.1% per 10 deg C
12. No.of Channels : a) K-type -12 channels (i.e. for 6 nos. of duplex T/Cs)
    b) K-type -24 channels (i.e. for 12 nos. of duplex T/Cs)
    c) R-type – 12 channels (i.e. for 6 nos. of duplex T/Cs)

CONSTRUCTION :

The thermostat unit together with metal block and thermocouples shall be mounted on mounting plate. All the connections are to be terminated on cage clamp type 2.5 mm^2 terminal blocks. Then whole assembly is mounted in a junction box. JB's shall be made up of 4mm thick reinforced glass fiber polyester. Paint thickness 100-150 micron. Paint color will be informed later.

THERMOSTAT UNIT

1. Electronic unit for maintaining temperature of metal block at 60 deg.C .

2. Thermocouple elements as per standards with tolerance spot welded of 0.5mm dia and terminal resistance of 2.52 ohms fixed in a metal block, as per specification

3. Necessary insulation for the metal block and electronic circuit.

4. Terminal block cable channels to be mounted on mounting frame with electronic unit and completely wired.

5. One number 4 wire RTD for 0 to 100 deg.C to be provided and wired to terminals.
   Accuracy of regulation : + 0.2 deg.
   Time for heating up : < 30 minutes.
   Power consumption : < 12 VA

6. Routine test, HV, IR & functional test certificates to be submitted along with supplies.

7. Functional check: The functional test shall include.

   i) Measurement of resistance of RTD at specified cold junction temperature.
   ii) Measurement of EMF of all thermocouples at specified cold junction temperature.

Supplier shall write down a procedure for ensuring other functional requirements as per specification and furnish to BHEL for approval.

8. Burn in Test: The assembled and tested modules are subjected to a burn in test as follows,

   Duration : 96 hours

   Temperature : 70 deg. C + 2 deg.C

   Status of EUT : Powered 'ON'

   Sample size : 100%

NOTE : All PT 100's used in the circuit will be of class A type and have a tolerance of +0.06 ohm or + 0.15 deg.C at 0 deg.C. And + 0.13 ohm or + 0.35 deg.C at 100 deg.C.

POWER DISTRIBUTION BOXES (PDB)

The power distribution box (PDB) shall be provided to supply power to field mounted cold junction compensation Boxes of K-type & R-type CJC boxes (All K-12, K-24, R-12 types).

Power distribution box enclosures shall comprise of a case and cover/door constructed from fiber glass reinforced polyester of thickness not less than 4 mm. The construction shall ensure adequate strength and rigidity. Power distribution boxes shall be confirmed to IP 55 class as per IS: 2147.

Each power distribution box shall cater to one incomer double pole MCB and output feeders shall also be provided with double pole MCB. The incoming feeder is UPS-ACDB feeder and outputs will correspondingly be distributed to cluster of 08 CJCBs nearby at site.

Power distribution boxes shall be as per following specification Requirements:

1. No. of Channels (O/P) of PDB : 08 No's
2. Power Supply Input : 240V AC ±20%
3. Output : 240V AC ±20% (Same as Input)
4. Operating Temperature : 0° C to 55° C
5. PDB : FRP with IP55 Protection
6. Terminal Block: Cage Clamp Type 280-101 WAGO make and 20% spare terminal to be provided in each PDB. Suitable cable channel shall be provided on both sides & below all TB channel for all PDB's. Gap between TB's & from TB end to all walls shall be adequate. Cage clamp terminals shall be suitable for 6 sq.mm cable. Please note that in case cage clamp terminals are not available in 6 sq.mm size, normal screw type terminals for 6 sq.mm cables can be used. Each power distribution box should be fully wired type to corresponding breakers. The dimensions of each PDB shall be as per supplier's standard taking care of erection & maintenance at site. Any other items/details required to complete the box construction, erection shall be provided.
7. Cable Glands: Double Compression Nickel Plated Brass. Make: Electromac/Braco/Comet
   - ¾" : 08 No's
   - 1" : 2 No's

   The above glands shall suit 2Core x 6 sq.mm cable.
8. All the power distribution boxes shall be suitable for mounting on walls, columns, structures etc. The brackets, nuts, bolts, screws. Glands and lugs, etc; required for erection shall be included in supplier's scope of supply
9. Paint thickness 100-150 micron. Paint color will be informed later.
10. TESTING:
    - Dimensional test
    - High voltage & Insulation Resistance test. & IP 55.

PQR AND TECHNICAL REQUIREMENTS

FOR

24V DC THYRISTOR BASED CHARGER

REVISION:00

APPROVED

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT K SHARMA	416	4-June-15

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 In order to accept the Technical offers/ proposals from Bidders for three projects mentioned in this Specification (ref. Sections C), certain Pre-qualification criteria are required to be met by Bidder.

3.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

4.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

5.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

6.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Clause AA of sec-B of this Specification) shall be in a separate cover with reference no. "CE/416/furnace camera/PQR/Clause AA of sec-B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Clause BB of Sec-B of this Specification) shall be in a separate cover clearly mentioning on cover "PQR".

cc. Technical offers/proposals for requirements mentioned in subsequent Sections C shall be submitted in another cover mentioning "Technical Offer" on it.

7.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders as a part of offer:

1.0 Submit Reference List of Projects where in offered furnace camera system is supplied & commissioned along with details of performance and Year of Commissioning.

2.0 Bidder to refer technical specification for provenness criterias

3.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years.

4.0 Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com".

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Technical literature/Manuals, Catalogs of offered system.

2.0 Un priced Purchase Order copies

3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.

4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.

5.0 Details of Manufacturing, testing & inspection facility.

6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered Batteries, Stocking of Spares, etc. submit these details.

7.0 Bidders shall submit Type test reports and routine / Acceptance test reports as per section C.

8.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered system. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Important note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated.

Please read carefully the General instructions in Section A of this specification.

SECTION C: TECHNICAL REQUIREMENT

REVISION:00

CHECKED & APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT KUMAR SHARMA	416	04.06.2015

24V DC power supply system

Each set of 24V DC charger system shall comprise of :

1.) 100% Capacity boost charger 1 no.
2.) 100% Capacity float charger 1 no.
3.) DCDB ** 1 no.
(DCDB and Charger Panel connection with Busbar as the panels will be placed together.)
4.) Battery Isolation Box (Comprising of MCCB) housed in IP55 CRCA 1 no.
Wall mounted housing for mounting in charger room.
5.) Serial link with MODBUS protocol with 100 mts. cable for connecting to DCS 1 set
6.) Erection, supervision, commissioning & handing over of complete system 1 set

1.0 GENERAL TECHNICAL REQUIREMENTS

This specification covers the requirement of 24 DC Power Supply System comprising of chargers, DC distribution boards, Batteries, Auxiliary equipment.

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, and IEC. NEC & IS. The 24V DC equipment and the complete system shall have surge withstand capability (SWC) to meet the requirements of ANSI C37. 90a, IEEE Standard 472. The requirements of 24 V DC System are specified herein on system basis. The bidder shall be responsible for engineering and furnishing a complete and operational system fully meeting the intent and requirements of this specification and BHEL/Consultant/Customer approved drawings. All equipment and accessories required for completeness of this system shall be furnished by the Bidder within the quoted price whether these are specifically mentioned herein or not.

All non interrupting components of 24 V DC system shall be capable of withstanding all available short circuit currents without damage. Additionally, all circuits interrupting components shall be capable of withstanding and interrupting all encountered short circuit currents without damage.

24 V DC provided with fuse free circuit breaker shall be preferred. However In case, it is the standard practice of manufacturer to use fast current limiting fuses at inverter output etc. to protect its power semiconductors devices, the same shall be acceptable. However, in AC distribution board either fuse-free circuit breakers shall be employed same shall be of HRC type only. In any case selective fuse(fuse free circuit breaker) coordination shall be provided by Bidder to ensure that only the fuse (fuse free circuit breaker) nearest to the fault will open and isolate the faulted circuit. Other branches of the distribution system will be unaffected and the fault will not cause more than one fuse to open . Further it will be the sole responsibility of the 24 V DC supplier to Engineer/design this system keeping in view the basic guideline as indicated elsewhere in specification like selectivity ratios etc.

The selection and selective coordination of all the protecting devices including fuse free circuit breakers / fuses shall conform to the requirements of National Electric Code (NEC) 1984 and other applicable standards. The selectivity ratios of the fuses (fuse free breakers) shall be such that there is a sufficient margin between the total electric energy of the downstream fuse and the total melting energy of the 24 V DC upstream fuse. The selective ratio shall be as finalized during detailed engineering stage but the same shall be not less than 2:1 in any case.

Following general requirements shall be met for ensuring proper branch and circuit protection.

I. The feeder fuse ampere rating and feeder conductor capacity must be at least 100% of the non continuous load plus 125% of the continuous load as calculated per Article 220 (220-10G) of NEC code - 1984. The feeder conductor must be protected by a fuse not greater than the conductor capacity.

II. For circuit with transformers requirements for conductor protection articles 240 and 310 of NEC must be observed. If secondary fuse protection is not provided then the primary fuses must not be sized larger than 125% of the transformer primary full-load amperes.

If secondary fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary provided the primary feeder fuses are not larger than 250% of the transformer rated primary current.

2. Technical specification of charger

2.1.1 Each of the boost chargers shall be sized to recharge the fully discharged battery within 8 Hours. Float charger shall be able to supply 100 % D.C load requirements of the control system plus float charging battery.

2.1.2 The chargers shall be natural air-cooled, self regulating, solid state type with full wave, fully controlled, bridge configurations designed for single and parallel operation with battery and shall have automatic voltage regulators for a close voltage stability even when AC supply voltage and DC load fluctuates, effective current limiting features, smoothing filters on both input and output to minimize harmonics and soft-start feature. The charger output regulation shall be ±1% from no load to full load with an input power supply variation of ±10 % in voltage and ±5 % in frequency & with both deviations present in any combination. In addition to indications on charger panel, potential free contacts for alarms like charger O/P voltage high, Battery isolated, charger failed etc., shall also be provided for use in DDCMIS. Further isolated 4-20mA signals shall be provided for important parameters like charger voltage etc. The list of Alarm output and 4-20 mA signals shall be as approved by customer during detailed engineering.

2.1.3 The Bidder shall furnish the charger rating calculations to the BHEL/CUSTOMER to satisfy that this requirement is met.

2.1.4 Boost charger shall operate in constant current mode building up the voltage across the battery to 2.7V/cell(for Lead acid plante battery) & 2.3V/cell(for SMF-VRLA lead acid battery).

2.1.5 The charger circuitry shall be of fail-safe design and failure of any component should not result in any charger output voltage to increase beyond acceptable limits of the C&I system being fed from it.

2.1.6 The charger shall have a slow walk-in circuit which shall prevent application of full load DC current in less than 10 seconds after AC power is energized.

2.1.7 The chargers shall be fed from a 415V AC, 50 Hz, 3 phase 3 wire system. The bidder shall provide all required power cables from 415V AC power supply system to his power supply system.

2.1.8 Charger design shall ensure that there is no component failure due to fluctuations of input supply or loss of supply and restoration. The charger shall be self-protecting against all AC and DC transients and steady state abnormal currents and voltages. This feature shall be demonstrated during factory testing at various loads.

2.1.9 The ripple content shall be limited to less than 250V p-p without battery connected, 100 mV p-p with battery connected. The ripple content in charger D.C output shall be limited to ± 1%.

2.1.10 The minimum full load efficiency at nominal input & float output shall be 80% at 0.8 power factor.

2.1.11 All necessary equipment and devices shall be provided to protect the charger from short circuits, transient voltage surges, load and supply fluctuations including sudden loss of input or load.

2.1.12 Bidder shall furnish the equipment complete in all aspects along with charger rating and voltage drop calculations, supporting curves/data etc.

2.1.13 The voltage at load terminals shall never exceed the limits of +10% and -15% of the nominal system voltage. Voltage control shall be stepless, smooth and continuous.

2.1.14 The continuous operation at specified ratings, temperature rise of the various components of battery charger shall be limited to the permissible values stipulated in the relevant standards.

2.1.15 Charger AC input and DC output shall be electrically isolated from each other and also from panel ground.

2.1.16 Isolation shall be provided between power and control circuits.

2.1.17 Each battery charger shall be provided with one (1) no. voltage transducer and one(1) no. current transducer for monitoring the D.C output. These transducers shall have twin channel output of 4-20mA and will be used for analog inputs to DCS. The following 4-20mA minimum transducer signals to be provided apart from potential-free alarm contacts for DCS: (a) Float Charger Voltage (b) Boost charger Voltage(c) Battery Voltage (d)Float Charger Current(e) Boost Charger Current.

2.1.18 The charger shall be current limited at 125% of full load to reduce output stage for charger circuit protection & for protection of battery from overcharge. The current limit shall be continuously adjustable from 80% to 125%.

2.2.0 System Concept

The Battery Charging equipment shall comprise of Charger-I & Charger-II. Charger-I & II comprises of Float charger & Boost charger. Float charger is (Constant Voltage mode) shall be capable to supply trickle-charging current to battery as well as supply the load. Boost charger shall be capable to boost charge the battery (constant current mode). Generally Boost charger is to be kept in off condition. During an emergency when AC power fails, the battery shall supply the load and discharge to certain extent depending upon duration of emergency. When AC power is restored, the battery needs to be boost charged for which Boost charger shall be operated in its constant current mode. Normally, float charger shall float the batteries at 2.2V per cell within a stabilization of ±1% of the floating voltage. The float charger shall supply the trickle charging current required for the batteries and shall also feed the DC continuous load as required. During this time, the float charger and the battery shall be across the DC load terminals. When there is a power failure, the battery shall readily meet the various DC loads. When the power resumes, the battery has to be recharged for which the Boost charger shall be operated in CC mode so that the required constant current for re-charging the batteries can be set. The higher current required during the initial operation of recharging shall be able to be set and after the gassing occurs, the required lower current also shall be able to be set. Whatever is the current set, it shall remain constant within ±2%. During boost charging the contactor shall remain open & higher voltage during boost charging shall not appear across the load. If there is one more power failure during boost charging, the 80% battery shall supply the load through tap diode for the moment contactor takes time to close & then whole battery shall supply the load.

Note: Normally boost charger of Charger-I & II shall charge battery-I & II respectively. In case of emergency the Battery-II shall be charged with Boost charger of Charger-I & vice versa.

2.3.0 Construction

2.3.1 The charger shall comprise a continuous line up of free-standing, floor mounted sheet steel panels, with all access from the front.

2.3.2 The panel shall conform to the degree of protection IP 32. Minimum thickness of sheet metal used shall be 2 mm.

2.3.3 Access doors shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh. Door over 600mm width shall be of double-leaf design.

2.3.4 All equipment within the panels shall be arranged in modular units and laid out with sufficient space for easy maintenance.

2.3.5 Switches, meters, relays etc. shall be flush mounted on the front of the panels. Name plates of approved size and type shall be provided for all circuits and devices.

2.4.0 Charger equipment

In addition to the battery charger specified herein, auxiliary equipment shall be furnished with each charger as follows:

2.4.1 All power diodes and control rectifiers shall be silicon type. Rectifier transformers shall be dry type, double wound, with copper conductor and class-B insulation. The maximum temperature rise of the class-B insulation shall be limited to that of class-A insulation.

2.4.2 Blocking diodes shall be fully rated and redundant so that failure of a single diode shall not incapacitate the system in any way.

2.4.3 Isolation switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON and OFF position.

2.4.4 Change over switch shall be 3 position, 4 pole, load break type with 2 NO + 2 NC auxiliary contacts.

2.4.5 Contactor shall be air-break type with thermal overload relays having inbuilt single phase preventor.

2.4.6 Fuses shall be HRC type and arranged for easy replacement. Semiconducting device fuses shall be fast-acting.

2.4.7 Indicating lights shall be LED type. Both lamp and lens shall be replaceable from front.

2.4.8 Meters (like AC voltmeter, DC voltmeter, DC Ammeter) shall be 96 X 96 mm switch board type, antiglare glass, $\pm$ 2% accuracy with zero adjuster on the front.

2.5.0 Alarms / Indications

2.5.1 One alarm facia (min. 12 points) shall be provided on each charger panel, complete with proper actuating devices, circuitry and legends. Alarms should be compatible to Main DCS.

2.5.2 The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button is pressed.

2.5.3 Each time a window lights up, a master relay will get energized to provide group alarm signals for owner's remote panel.

2.5.4 Alarm points shall include the following indications as minimum:

a) A.C supply failure
b) Charger Failure
c) Charger fuse blown
d) System on battery operation.
e) Battery equalize timer "ON"
f) Low battery voltage.
g) Low DC Bus Voltage
h) DC ground fault
i) Charger output voltage high
j) Redundant fan failure & temperature high(as provided)
k) Charger on boost mode.
l) Charger on float mode
m) Battery isolated

2.5.5 All the alarms shall have electrically separate spare set of contacts wired up to the terminal block for owner's use.

2.5.6 Alarm contacts shall be rated 0.5A at 220V D.C and 5 A at 240V A.C.

2.5.7 The indications to be provided on each float charger and float-cum-boost charger panel shall include but shall not be limited to :

a) A.C Mains on (R,Y,B)
b) Charger on Float
c) Charger/Battery on boost
d) Charger D.C output healthy
e) Control supply ON

2.6.0 Controls

The following manual controls shall be provided as a minimum on the front of the panel:-

a) Selection of float, boost charge.
b) Voltage setters for setting the output of float/boost charge. Setting shall be independent of each other so that setting of one voltage shall not require resetting other.
c) Current limit setter.
d) Alarm window reset button.
e) Charging rate setter.

2.7.0 Lamp/Space heaters/receptacles

2.7.1 The charger shall be provided with :-

a) Internal illumination lamp with door switch.

b) Space heater with thermostat control.

c) 3 pin 5A receptacle with plug.

2.7.2 Lamp, heater and receptacle circuits shall have individual switch-fuse units.

2.8.0 Wiring/Cabling

2.8.1 The panels shall be completely wired-up. All wiring shall be routed through wiring troughs. Wires shall be ferruled at both ends for identification.

2.8.2 Panels shall have removable gland/plates at the bottom for cable entry. All incoming/outgoing cables shall be terminated in suitable terminals blocks.

2.8.3 Control terminal blocks shall be box-clamp type ELMEX 10 Sqmm or approved equal. 20% spare terminals shall be furnished.

2.9.0 Grounding

2.9.1 The charger panels shall have fully rated ground bus with two ground terminals, one at each end.

2.9.2 Each terminal shall comprise two-bolt drilling with M10 G.I bolts and nuts to receive owner's ground connection of 50X6 mm G.I flat.

2.10.0 Tropical protection

2.10.1 All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

2.10.2 Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

2.11.0 Painting

2.11.1 The panels shall be chemically cleaned, phosphate and sprayed with two coats of high quality primer and stoved after each coat.

2.12.0 Name Plate

2.12.1 Name plates shall be provided for each panel and for each equipment/device mounted on it.

2.12.2 The material shall be anodized aluminum/lamicoid, 3 mm thick, with white letters on black background

2.12.3 Name plates shall be held by self-tapping screws. The size of nameplates shall be approximately 20mm X 75mm for equipment and 40mm X 150mm for panels.

2.12.4 Name plates for panels shall be provided both on the front, rear and also inside the panels.

2.12.5 Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices both inside & outside of panel.

2.12.6 Instruments and devices mounted on the face of the panels shall also be identified on the rear with the instrument/device number. The number may be painted on or adjacent to the instrument or device case.

2.12.7 Caution notice on suitable metal plate shall be affixed at the back of each panel.

2.13.0 Grounding cubicle for 24V DC system

2.13.1 The grounding cubicle shall be indoor, air insulated sheet steel construction, floor mounting, dust and weather proof with degree of protection IP-54, with door on front and back side of the cubicle.

2.13.2 The grounding cable shall be provided with two (2) number copper buses of 1500A rating one for 24V bus earthing and another for screen(shield) earthing. The grounding cubicle shall be provided with terminals suitable for termination of 3 X 1C X 630 Sqmm (AL) cable on each terminal

2.14.0 Copper Busbar

Copper bus bar of electrolyte grade shall be provided between 24V battery and its charger and from battery charger to its 24V DC DBs. The bus bar shall be properly sleeved. The connection hard wires, supporting arrangement for the bus bar shall be in the vendor scope. Seal off bushing arrangement shall be provided whether it passes through the wall.

3.0 RELIABILITY & AVAILABILITY

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete C&I system is assured for 99.7%. Further the Bidder shall ensure that all equipment/Part of its system shall have normal life expectancy exceeding the expected life of the plant i.e. thirty years.

3.1 In order to ensure the target reliability the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & derating of electronic components and parts and carry out necessary tests, etc.

3.2 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Bidder shall be required to ensure supply of spare parts for life time of the plant. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

3.3 All components like diodes, SCRs, ICs, capacitors, resistors etc. Shall be properly chosen and derated such that failure rate is reduced to absolute minimum.

4.0 CABINETS/ENCLOSURES

The construction details for Power supply system cabinets/Enclosure/Racks shall confirm to the following requirements:

4.1 Equipment enclosures shall match and line up in assemblies of freestanding floor mounted cabinets designed for indoor service.

4.2 The charger panels shall be preferably designed for natural cooling and shall be fabricated from not less than 2mm thick sheet steel. Panels shall be furnished with concealed hinges. Front and rear doors shall be designed to permit easy access to all components for maintenance or replacement. The enclosures shall be reinforced with formed steel members as required to form a rigid self-supporting structure. Doors shall have three point latches.

4.3 Adequate ventilating louvers and enclosure top panels shall be included. All vent openings shall be covered with corrosion resistant fine screen coverings.

4.4 The temperature rise inside all the cabinets/enclosures shall not exceed 10 deg.C above ambient temperature. Vendor shall furnish calculation to establish this during tender stage.

4.5 Protection class of all chargers, DCDB panels shall be IP32 as per IS13947 with Type test reports of earlier conducted tests to be furnished for BHEL perusal along with offer.
4.6 Material Thickness = All sides are 2mm CRCA, Mounting plate 3mm, Gland plate = 3mm.

5.0 Cooling System

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements:

(a) Reserve cooling equipment shall be furnished for each switch board assembly. Reserve fan capacity shall be equal to 100 % of cooling fan requirements for full load operation with only one bank of rectifier/inverter in service at the specified maximum ambient temperature.

(b) Completely independent duplicable wiring and control system shall be provided for the normal cooling fan system the reserve cooling fan system.

(c) Each cooling fan shall normally run continuously and shall be powered from the output of the inverter whose enclosure if serves. Each cooling fan supply circuit shall be separately fused.

(d) Each cooling fan shall be equipped with an airflow switch having an alarm contact that closes upon failure of air flow.

TYPE TEST REQUIREMENTS					
S. NO.	*ITEM*	*TYPE TEST REQUIREMENT*	*STANDARD*	*TEST TO BE SPECIFICALLY CONDUCTED*	*BHEL/CUSTOMER APPROVAL REQD. ON TEST CERTIFICATE*
1	DC Power supply system (Applicable for each model and rating)	Degree of Protection Test	IS-2147 , IS-13947	YES	YES
		Short circuit current capability	Approved Procedure	YES	YES
		Voltage proof test	UL 950, IEC950	YES	YES
		Burn in test	Approved Procedure	YES	YES
		Effieciency	Approved Procedure	YES	YES
		Audible Noise Test	IEC 146- 2	YES	YES
		Fuse Cleaning Capability	Approved Procedure	YES	YES
		Total harmonic content	Approved Procedure	YES	YES
		Over Load Test	Approved Procedure	YES	YES
		Restart Test	Approved Procedure	YES	YES
		Output voltage tolerance	Approved Procedure	YES	YES
		Parallel operation	Approved Procedure	YES	YES
		Insulation Test	Approved Procedure	YES	YES
		Load tests	Approved Procedure	YES	YES
		Preliminary light load test(without battery supply)	Approved Procedure	YES	YES
		Load sharing	Approved Procedure	YES	YES
		Dielectric test	Approved Procedure	YES	YES
		Ripple content measurement	Approved Procedure	YES	YES
		Heat run test in current limiting value	Approved Procedure	YES	YES
		Functional operation	Approved Procedure	YES	YES
		Radio Frequency interference	IEC-CISPR22, IEC-61000-4-12(9b), IEC-61000-4-3, IEC-61000-4-5, IEC-61000-4-6	NO	YES
		ESD immunity test	IEC-61000-4-2-9(1)	NO	YES
		Electrical fast transient/ Burst immunity test	IEC-61000-4-4	NO	YES
		Surge protection	IEC 61312, IEC 61024, VDE 100-534	NO	YES

6.0 Routine/Acceptance Tests:

6.1 The complete charger and battery system, including all instruments and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per IS, NEMA, IEEE, IEC-146 standards wherever applicable. All shop tests shall be performed prior to shipment and BHEL/ Customer shall be notified 15 days before the scheduled dates to give an opportunity to witness the test.

Tests on other equipment's viz, step down transformer, voltage stabilizer, cables etc. Shall be conducted in accordance with relevant IS or any other approved standard.

6.2 The following tests shall be conducted as a minimum requirement as per IEC-146 Standard.

i) Frequency regulation test.
ii) Voltage regulation test.
iii) Current limiting test.
iv) Transfer time test.
v) Short circuit test.
vi) Efficiency test.
vii) Transient response test.
viii) Meter accuracy test.
ix) Harmonic content measuring test.
x) Temp. Rise Test.
xi) Restart Test.
xii) Voltage Rise & Voltage Dip Test.
xiii) Load Test.
xiv) Audible Noise Test.
xv) Synchronisation Test.
xvi) Radio Frequency Interference.
xvii) Hold-off Interval.
xviii) Checklist of Auxiliary Devices.
xix) Insulation Test.
Also refer scope of supply.

6.3 Routine Test:

i)Burn in Test & Elevated Temperature Test

Temperature rise test shall be considered as Routine test to be done on all chargers at 100% load for 10-12 hours(at ambient) till temperature stabilizes.

ii) Tests in accordance with IEC-146 Clause 491, IEC-146-2 Clause 5.2.2 and IEC-146-4 Clause 7.3.1

7.0 Site-tests

The vendor shall also carry out the site-tests on equipments/systems as specified below. However, these shall not be limited to this specification only and in case any other site test is required to be conducted as a standard practice of the vendor or deemed necessary by BHEL/Customer, the same shall also be carried out.

Functional test

On completion of installation and commissioning of the equipment the following tests/checks shall be carried out with the max. available load, which does not exceed the rated continuous load. These tests/checks shall include but not limited to the tests as indicated below.

1. Light Load Test
This test is carried out to verify that the Power supply system is correctly connected and all functions operate properly. The load applied is limited to some percent of rated value. The following points should be checked:
(a)Output voltage, frequency and the correct operation of meters;
(b)Operation of all control switches and other means to put units into operation.
(c)Functioning of protective and warning devices.
(d)Operation of remote signaling and remote control devices.

2. Checking of Auxiliary devices
The functioning of auxiliary devices, such as lighting, cooling, pumps, fans, annunciation etc. should be checked, if convenient, in conjunction with the preliminary light load test.

3. Synchronization test
If possible, frequency variation limits should be tested by use of a variable frequency generator, otherwise, by simulation of control circuit conditions. If applicable the rate of change of frequency during synchronization shall be measured.

4. A. C_ Input Failure Test
The test is performed with a fully charged battery and is carried out by tripping input circuit breakers or may be simulated by switching off all Power supply system rectifiers and bypass feeder as at the same time. Output voltage variations are to be checked for specified limits with an oscilloscope or equivalent. Frequency variation is defined as the steady state frequency of the Power supply system with and without AC input. The rate of change of frequency is measured by the time it takes to reach steady-state values.

5. A. C Input Return Test

AC input return test is performed by closing AC input circuit breakers, or is simulated by energizing rectifiers and bypass feeders. Proper operation of rectifier starting and voltage and frequency variations are to be observed.

Note: This test is normally performed with a fully or partially charged battery.

6. Full load test

Load tests are performed by connecting the actual load to the Power supply system output. Large Power supply system in parallel connection may be load tested by testing the individual Power supply system units separately. Load tests are necessary for testing output voltage and frequency, rated stored energy, recharge time, ventilation, temperature rise and determination of efficiency. Load tests are performed to prove, transient voltage deviations specified under step load conditions.

7. Efficiency

Efficiency should be determined by the measurement of the active power at input and output.

8. Actual Load Test

Conditions under actual load may differ from those with a dummy load Steady-state generation of current and voltage harmonics and transients a load switching conditions should be observed.

9. Current Division in Parallel -

Load sharing between the Modular DC power supply rectifier banks & Power supply system units shall be measured with actual load under conditions of parallel operation.

10. Rated Restored Energy Time

Restored energy depends on the charging capacity of the rectifiers and the battery characteristics. If a certain recharging rate is specified, it shall be provided by repeating the discharge test after the specified charging period.

12. Battery Ripple Current

If battery ripple currents are specified, then the ripple current which depends on Power supply system operations hall be checked under normal operating conditions. Rough measuring methods are sufficient.

13. On site ventilation test

The test is performed with the actual load. Temperature conditions of all Modular DC power supply rectifiers and Power Supply System cubicles are to be observed.

14.Overload capability test

Overload capability test is a load test. Specified values of short time overload or starting up sequences of actual load are to be applied for the time interval specified. Specified values of voltage and current are to be recorded.

15. Restart
Automatic or other restart means are to be tested after a completed shut-down as specified.

16. Output overvoltage
Output overvoltage protection to be checked.

17. Periodic output voltage modulation
When this test is specified, it may be checked by voltage recording at different loads and operating conditions.

18. Earth-fault test
If the DC Power Supply output is isolated from earth, then an earth fault can be applied to any output terminals. DC Power Supply output transients (if any) shall be measured.
If the battery is isolated from earth, then an earth fault can be applied to any output terminals. DC power supply output transient (if any) shall be measured.

8.0 DOCUMENTS TO BE FURNISHED:

8.1 **Along with the Technical offer**: For technical evaluation, vendor must send one (01) set of the

01. Single line diagram, GA drawings, Circuit diagrams, Fault co-ordination details
02. Charger rating calculation and cable sizing calculations.
03. Technical write-up, Catalog of each component
04. Data sheet of complete system/subsystem
05. Wiring diagram/interconnecting arrangement details
06 Complete Bill of Material with make & Model
07. Mandatory spares list and Commissioning spares list
08. Clause-wise compliance/deviation list, clearly indicating compliance/deviation to all the clauses mentioned in this specification

QUALITY ASSURANCE & QUALITY PLAN FORMAT

REVISION: 00

APPROVED

GURURAJ M

PREPARED	ISSUED	DATE
AMIT KR SHARMA	416	8 / 6 /15

POWER SUPPLY SYSTEM

ITEMS/COMPONENTS SUB-ASSEMBLY / ATTRIBUTRES/ CHARACTERISTICS	Make, Model, Type, Rating & Finish	Chemical & Mechanical Tests	Sheet Steel Pretreatment & Painting process checks	Conform to relevant Standard	Dimensional check and Paint shade, thickness, adhesion & Finish checks	Complete physical examination for constructional features of Battery Charger as per NTPC specification	Temperature Rise Test	Dynamic Response Test	Ripple Content Test, Load Limiter & Annunciator & AVR Operation Test	Operational & Functional Checks	HV & IR Test	Burn-In Test at 50°C for 48 hrs	Degree of Protection Test as per NTPC Spec.
BATTARY CHARGER													
Rectifier Transformer (IS:2026)	Y			Y			Y				Y		
Electronic Components including Potentiometer (Vernier Type)	Y			Y									
PCB & Electronic Cards	Y			Y									
19" standard racks for electronic cards	Y					Y							
Control & Selector Switches (IS : 6875)	Y			Y						Y			
Indicating Meters (IS : 1248)	Y			Y						Y			
Indicating Lamps (IS: 13947)	Y			Y						Y			
Air Break Switches / Fuses (IS : 13947 / 13703)	Y			Y						Y			
Control Terminal Blocks (IS :13947)	Y			Y									
Control Transformer (IS : 12021)	Y			Y						Y			
Push Buttons (IS : 4794)	Y			Y						Y			
MCB (IS : 8828)	Y			Y						Y			
PVC insulated Copper control wires (IS : 694)	Y			Y									
Sheet Steel (IS : 513)	Y	Y	Y	Y									
Synthetic Rubber Gaskets	Y	Y		Y									
Annunciator	Y									Y		Y	
Battery Charger	Y				Y	Y	Y	Y	Y		Y	Y	Y

Notes:
1. Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions.
2. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the Practice and procedure along with relevant supporting documents.
3. Makes of all major Bought Out items will be subject to NTPC approval.

POWER SUPPLY SYSTEM

ITEMS \ TESTS	Visual/dimension/rating/ Paint Adhesion/ Thickness (R)	General arrangement/BOM/make of components /Mimic ®	Efficiency, regulation(R)	Input voltage variation (A)	Out put voltage and frequency adj.range (A)	Prermilinary light load test (R)	Load transfer retransfer test (R) *	AC input failure and return test (R)	Parallel operation and current divison (R)	Relative harmonic content (R)	Restart with PRI A.C and battery (separately) (R)	System transfer and retransfer (R)*	Asynchronous transfer (R)	Ripple content (R)	Load limiter operation (R)	IR/HV(R)	Tests as per standard &specification (R)&(A)
UPS/CONVERTER (IEC-146 PT-4)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VOLTAGE STABILISER	Y	Y	Y	Y	Y					Y		Y				Y	
LEAD ACID BATTERY (TUBLAR)-IS-1651																	Y
LEAD ACID BATTERY (PLANTE)-IS-1652																	Y
NICKEL CADMIUM BATTERY (IS-10918/IEC-623)																	Y

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

* Transfer time and Over shoot /undef shoot during load & system transfer shall be recorded.

Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions

2) 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.

PQR AND TECHNICAL REQUIREMENTS

FOR

FURNACE FLAME CAMERA SYSTEM

REVISION:00

APPROVED

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT K SHARMA	416	4-June-15

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 In order to accept the Technical offers/ proposals from Bidders for three projects mentioned in this Specification (ref. Sections C), certain Pre-qualification criteria are required to be met by Bidder.

3.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

4.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

5.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

6.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Clause AA of sec-B of this Specification) shall be in a separate cover with reference no. "CE/416/furnace camera/PQR/Clause AA of sec-B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Clause BB of Sec-B of this Specification) shall be in a separate cover clearly mentioning on cover "PQR".

cc. Technical offers/proposals for requirements mentioned in subsequent Sections C shall be submitted in another cover mentioning "Technical Offer" on it.

7.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders as a part of offer:

1.0 Submit Reference List of Projects where in offered furnace camera system is supplied & commissioned along with details of performance and Year of Commissioning.

2.0 Bidder to refer technical specification for provenness criterias

3.0 Submit List of Projects for which Erection & Commissioning has been carried out by subsidiary / Authorized Indian representative for last two years.

4.0 Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com".

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Technical literature/Manuals, Catalogs of offered system.

2.0 Un priced Purchase Order copies

3.0 Reports of successful erection & commissioning Protocols & Minutes of the meetings.

4.0 Name & registered address of the Indian branch office or Indian representative for support of Erection & Commissioning and after sales service with Organization chart.

5.0 Details of Manufacturing, testing & inspection facility.

6.0 Bidder shall have facility in India for Engineering activities, preparation of Documents, servicing of offered system, Stocking of Spares, etc. submit these details.

7.0 Bidders shall submit Type test reports and routine / Acceptance test reports as per section C.

8.0 If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, Supply, Erection, Commissioning and Servicing of the offered system. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Important note: - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated.

Please read carefully the General instructions in Section A of this specification.

SECTION C: TECHNICAL REQUIREMENT

REVISION:00

CHECKED & APPROVED

K. Rajasekar.

RAJASEKAR K

PREPARED	ISSUED	DATE
AMIT KUMAR SHARMA	416	04.06.2015

I. SPECIFICATION FOR FURNACE AND FLAME VIEWING SYSTEM

Furnace and Flame viewing system with all equipment and accessories shall be supplied for the purpose of monitoring flame from all the burners of the fossil fired boiler with balanced draft, tilting tangential and corner firing arrangement. The cameras are expected to withstand the temperature (not less than 1600deg C) in the furnace of boiler (with suitable air cooling arrangements provided if camera itself cannot withstand to this temperature). The cameras and system shall be suitable for all the fuels fired like light diesel oil, heavy fuel oil and sub-bituminous coal with high ash content. Cameras shall be suitable for viewing of furnace flame at a straight line of view. Number of cameras as indicated in the enquiry shall be supplied with viewing angle sufficient to view the furnace flame and all the burners fully.

The system should meet the following requirements as a minimum

a. The system shall be supplied complete with all accessories, cooling systems, piping & fittings, auxiliaries, interconnecting cables and pneumatic air distribution tubing's required for the system from the power/air terminal points indicated elsewhere in this specification. Camera shall be equipped with a pneumatic advance & retract system.
b. Camera shall have Zoom and Iris control facility. Instead of manual Iris control camera with in-built Electronic shutter may also be offered. Zooming and adjustment of IRIS shall be available from monitor.
c. Fully wired Panel/Camera Control box with IP:55 degree of protection shall be provided in the field near camera for mounting all the controls /electronics/accessories necessary for controlling camera operation as well as to take care of interlocks such as :
   - Automatic withdrawal of camera in case of pneumatic air supply failure, temperature exceeding the design set point at camera tip, camera control electronics failure and power supply failure.
   - Camera Local/Remote operation selection along with advance/ retract provisions and indications shall be provided.
d. However, loose components which are designed for IP: 55 or better degree of protection can be neatly mounted in an open top covered rack near the camera instead of panel.
e. There is one Control Equipment Room (CER) and Common Control Room (CCR equipments/ panels in Control Room
   i. The panel in the Control Equipment Room (CER) shall be of IP-32 protection class with following supplied and mounted inside: Monitor, Multiplexer, Camera advance/retract pushbuttons, Advance/Retract/Fault indications, Camera Remote/Local selected indication, Video amplifier, if any, etc. Lock and key shall be provided for the panel. Provisions shall be available for operating all equipments from the panel front and viewing monitor screen in the panel front. Provisions shall be available for taking out signals for LVS display and on operator workstation. Dimension of the panel shall be 800 mm(D) X 800mm(W) X 2415mm(H)
   ii. The Common Control Room (CR) shall contain a wall mounted box of IP- 32 protection class with following supplied and mounted inside: Iris controller, zoom controller, Video amplifier (If applicable), Camera local/ remote selected indication, multiplexer etc. which are required for sending multiplexed & loop through 1V p-p composite video signal for display on LVS. Lock and key shall be provided for the wall mounted box. In case it is mutually agreed with customer at later stages that it is not possible to accommodate any wall mounted box in CCR, the components shall be suitably mounted in CER and Vendor to take care of supervision of all the wiring modification within the panel in CER at site and also provide commissioning assistance. Additional man-days, if any, required will be part of commissioning assistance envisaged as per clause X of this specification.

f. System shall be capable of transmitting images of multiplexed output from all the cameras to customer's large video screen (LVS) system located in CCR, wherein it should be possible to display the same. LVS will be suitable for receiving video signal type PAL in S-VHS. Necessary video cable to LVS along with connectors (DVI/BNC/VGA) as required by customer shall be taken care of by vendor at site. The distance between CER and Control Room/CCR for the said video cable will be around 100mtrs.

II. OTHER SPECIFIC REQUIREMENTS OF THE SYSTEM

a. The cameras shall be of colour CCD, suitable and proven for the respective duty.
b. The viewing angle of the camera shall be commensurate with the furnace size, the camera location and the positioning of the burners as indicated in the enquiry drawings.
c. The cameras shall be suitable for direct online continuous viewing of the coal and oil flame and condition of the furnace internals including slagging of the water walls and any other deterioration in the furnace condition in the monitor located in the central control room.
d. It is vendor's responsibility that the offered system is suitable to provide clear picture of the furnace.
e. The system shall confirm to PAL and number of TV lines shall be adequate for clear image of the furnace.
f. The camera and total system shall be suitable for firing arrangement (corner/front/wall) and the ash content of worst coal.
g. Air cooled lens focusing range shall be selected to have clear view of the closest and farthest point in furnace as per given furnace sizes indicated.
h. Any cooler unit required for lowering the temperature of cooling air shall be included in vendor's scope. Vendor shall take into account the pressure, temperature and quality of instrument air available for the purpose of cooling and purging.
i. Each camera unit shall have the following features :
   - Automatic light compensation : Suitable for furnace flame viewing.
   - Resolution : 450 or more lines at centre.
   - Power supply : 230V/110V AC, 50 Hz, 1 Phase
j. Camera housing shall have following features.
   - The camera used shall be housed in stainless steel housing with air-cooled jacket.
   - Suitable ventilation, purging and cooling facilities shall be provided to suit application requirements.
   - Gasket sealing : All edges (Neoprene/Silicone)
k. Video Monitor offered shall have following features
   The monitor shall be 19" high resolution colour monitor or 20" TFT monitor and have following minimum features:

Resolution :	450 lines or better
Geometric distortion	: Less than 2%
Power supply	: 230V, 50 Hz AC, 1 Phase.
Primary controls	: Contrast, brightness
Scanning standard	: PAL standard.
High-frequency radiation noise	: Minimum
Operating temperature	: Up to 40ºC

l. Weather Proof local control box for mounting of electronics shall be provided.

m. System will be installed by BHEL, as per the drawings furnished by vendor using the materials supplied by the vendor. On completion of installation, it is the responsibility of vendor to fully commission the system and prove the performance. It will be vendor's responsibility to interface the system with the customers DDCMIS / LVS system. Also, it is the vendor's responsibility to get the protocol signed from customer and BHEL site for successful operation and handing over of the system.

n. Any accessories required for erection and commissioning of the system shall be included in the offer itself even though the same is not called for in the enquiry.

o. All necessary remote/ local programming tools, if required, shall be included in the main offer itself.

p. Any other accessory to make the system completely operational shall be included in the main offer itself.

III. CLIMATIC CONDITIONS:

- Altitude above Mean Sea Level – less than 1000 meters
- Ambient Temperature - 50°C
- Relative Humidity - 100%
- Atmosphere - Tropical, Dusty, Corrosive and highly polluted.
- Equipment shall be suitable for use in tropical climate with high humidity, heavy rainfall and climate conducive to fungus growth and corrosion.
- All equipments / components rating specified are for site conditions. Vendor shall apply suitable de-rating factor for the given site conditions to the rating of the equipments / components offered

IV. QUALIFYING REQUIREMENT:

a. The system shall have proven background in similar applications in fossil-fired power plants of similar or higher capacities. Vendor shall submit a list of references of plants (for power boilers with capacity as per enquiry or above) where similar systems are in operation for more than one year. Vendor shall ensure accurate, reliable and trouble-free operation in conditions and environments that are normally found in fossil-fired power stations. T**he offered flame camera shall have record of trouble free performance of minimum one year in coal fired boiler of size 500MW or above with firing angle similar for the projects**.

V. PANEL specifications:

a. The panel should be of IP-32 class as per IS:13947

b. Paint (EPOXY based, powder coated):
   Doors, Canopy and Plain end covers: OFF WHITE TO RAL:9002
   Semi Glossy Both interior and exterior
   Folded End Covers: BLUE TO SHADE RAL:5012 (Exterior)
   OFF WHITE TO RAL:9002 Semi Glossy (Interior)

c. Nomenclature Plates are to be provided on both sides.

d. Louvers with mesh are to be provided at bottom of doors for ventilation

e. Copper Flat size of 25Sqmm shall be provided at bottom for cubicle earthing.

f. Panels to be provided with removable 3 piece (front and rear opening) Gland plate of 3mm thick CRCA sheet at bottom.

g. Panels to be made up of 2mm thick CRCA sheet.

h. Top canopy to cater for second digit of IP protection class

i. Door switches to be provided

VI. PROTECTION REQUIREMENTS OF THE SYSTEM

a. The Camera assembly & housing shall have air cooling arrangement with all accessories.
b. The camera for furnace flame monitoring shall be mounted on a retract mechanism having automatic retraction facility with fail -safe feature. The auto matic retraction unit shall be pneum atic o perated. BHEL/Customer will provide instrument air for the camera and lens tube.
c. Retract mechanism mounts shall have following features.
   - Retract mechanism shall be provided with suitable mounts to fix the camera housing, the lens tube and the wall box.
   - Mounts shall be sturdy and lightweight, capable of being supported from boiler.
d. Protection shall be given against cooling medium failure.
e. Automatic shutter/gate mechanism at the camera port to be supplied by vendor, so that port will be closed once camera is withdrawn from the furnace.
f. To protect the ca mera unit fro m the fur nace heat, continuous air purging shall be maintained into the camera housing.
g. In case of fai lure of purging air the ca mera assembly shall retract automaticall y to avoid any damage or deterioration due to overheating. Also, shutte r/gate located in the furn ace opening shall close to prevent radiant heating.
h. Necessary limit switche s shall be supplied along with the ca mera sy stem by the vendor to detect camera advanced/retracted positions. Vendor shall build necessary interlocks for protection of camera with the same.
i. Necessary int erlocks to be built in to the camera system such that once camera gets retract ed due t o fault, onl y af ter the cause of the fault is corr ected and acknowledged b y o perator camera can b e inserted again.
j. For acknowledging and re setting the fault, necessary pushbuttons to be m ade available in CCR and CER panels.
k. An air tank shall be provided near the camera which can store sufficient instrument air for advancing and retractin g the ca mera minimum th ree ti mes int o and out of the furnace. The capacity of the air tank shall be 10 liters minimum for advance / retract operations.
l. In case ca mera retracts due to fault suc h as loss of air for prolonged duration necessary protections shall be built into the system so that camera do not drift into the furnace due to gravity.

VII. CABLES

a. The Scope of Cables to be provided by the Vendor is as follows.
   - All Video cables required for the system.
   - Any other cable required to form a complete functional system.
   - Length between Camera and Control Equipment Room
   - Length between Camera and Central Control Room
   - Length between CR and CER- 100mtrs
b. Control cables, if applicable, shall be HRPVC Ty pe-C insulated, PVC type ST2 inner-sheathed, armoured, FRLS PVC type ST2 outer-sheathed. Cables offered shall confirm to standards IS-1554, IS-3961, IS-58 31, IS-81 30, IS-10418, IS -10810, IEC -332, IEC-7 54 -I, IEEE -383, ASTM -D-2843, ASTM-D-2863, SEN-4241475.
c. Video signal transm ission cable shall be of high temperature co-axial type having t he following characteristics:

Temperature range	: Up to 80° C.
Nominal impedance	: 75 Ohm.
Nominal capacitance	: Less than 20 pF/ft.

d. Requirement of video am plifiers, if any, shall be included by vendor based on the length as indicated above.
e. Sizes of signal cables used shall be minim um of 1.5 sq.mm copper. Power cable size shall be minimum of 2.5 sq.mm copper. All armoured cables are required.

VIII. ADDITIONAL FACILITIES :

a. Multiplexing units (vendor to specify the type offered) to display one / multiple CCTV inputs in the monitor and LVS simultaneously.

IX. FACILITIES PROVIDED BY BHEL/CUSTOMER AT SITE :

a. Power Supply

- Only one number 230V/110VAC, 50 Hz. single phase supply will be made available for each flame viewing camera at Vendor's Field camera control box. Any other voltage required for the operation has to be derived by the vendor from the above supply. Isolation/ protection requirements for the same also shall be in vendor scope.
- One feeder 230V/110VAC, 50 Hz. single phase will be given in CER room and CCR room. Electrical power requirements for other accessories shall be derived by the vendor from this supply.

b. Air Supply

- Instrument air at 4.0 to 5.0 kg / sq.cm (g) will be made available for camera housing cooling and lens tube cooling at one point for each camera, terminated with a valve of connection size Nb40 (F) within three metres from the camera. It shall be in vendor's responsibility to derive any other requirement for air supply from this available source. Vendor to provide all required accessories to receive this air and supply to the various components that requires air supply.
- As boiler is not a fixed structure, tubes connecting camera with the air source shall consist of flexible, SS braided hoses with quick disconnect facility along with PVC coated copper /SS tubes /GI pipes and shall be supplied by the vendor along with the camera system.
- Quality of instrument air provided may not be meeting the necessary standards all times and hence, it is vendor's responsibility to include suitable air filter arrangements for getting good quality instrument air for their CCTV system.

X. MAKE OF COMPONENTS OFFERED:

a. Makes of all major brought out components shall be subjected to BHEL/Customer approval.

XI. Vendor to include the following in the offer:

- Erection materials and supporting structures required for the CCTV system shall be estimated and supplied considering the furnace expansion as below. Necessary supporting required for camera system shall be from boiler only and not platforms considering the boiler movements.

  Furnace expansion in horizontal direction - 39mm sideways
  Furnace expansion in vertical direction - 150mm downward

  (These values will be finalized during detailed engineering)

DOCUMENTS TO BE FURNISHED BY THE VENDOR : (Along with the offer)

- **Complete Bill of material.**
- **Catalogue on the various equipments.**
- **Block diagram showing inter-connection among various equipments (from field to control room) showing the components and cabling in-between.**
- **Signed copy of the specification indicating confirmation to project specific requirements.**
- **Dimension of the panels and loose components in control room.**
- **List of references of plants where similar systems are in operation**

Section-4

I. INSPECTION AND TEST REQUIREMENTS

Test requirements

- The vendor shall submit the Vendor Quality Plan (VQP)
- The VQP shall indicate all quality checks performed right from raw material, bought out items, manufacturing, assembly, final assembly, inspection and testing stage and shall list down all routine & type test as per relevant National / International standards. This shall also indicate pre-treatment, painting and details on electronic items.
- ELECTRONICS: Test methods adopted for electronic module based on International practice have to be indicated in the VQP. Environmental test for electronics like burn-in-test, temperature rise test have to be included in the VQP. The electronic components shall be suitable for operating under stringent environmental condition – expected when the boiler is operating.
- ELECTRONIC MODULES: The electronic components shall be industrial grade or better and shall be suitable for operating at 85°C.
- FOR THE CABINETS WITH MODULES: Tests like elevated temperature variable voltage test have to be done as detailed below.
- BURN-IN AND ELEVATED TEMPERATURE TEST: All solid state electronic systems / equipments shall be tested as a complete system / equipment with all devices connected for a minimum of 24 hours continuously under energised conditions prior to shipment from manufacturing works, as per the following cycle.
- The fully equipped cabinet/equipment is kept energized with nominal voltage for 24 hours continuously. Out of the 24 hrs., the cabinet is kept in temperature controlled oven for the first 10 hrs. at 50 deg C + /- 2 deg C. This 10 hrs. period is divided into 5 cycles of 2 hrs. duration each. In each cycle, the voltage is varied between 100% for 1 hr, 110% for ½ hour, and 90% for ½ hr. For the balance 14 hours, the cabinet/equipment will be at ambient temperature prevalent at that time with nominal voltage. Functional test will be performed after this test. During the test, temperature rise inside cubicle should not exceed 10 deg. C over ambient. If any customer deviates from the above requirement for burn-in test, this special requirement will be indicated in the "Project Specific requirement".
- All instruments / devices which are not otherwise covered in the checklist shall be tested as per relevant standards to conform to specification requirements.
- Reference documents column: This shall include purchase order, approved specification, drawings, data sheets and National / International / Plant standards.
- VQP shall include packing requirements.
- Vendor shall indicate the sub-vendor list for major bought out items as Annexure to QP.
- In case of Control Cables, vendor to submit separate VQP and type test report (conducted within five years from the date of enquiry) of Control Cable for NTPC/BHEL review and approval.

TYPE TEST REQUIREMENTS

a. The Contractor shall furnish the type test reports of all type tests conducted within five years from the date of enquiry as per relevant standards and codes as well as other specific tests indicated in this specification under "Special Requirement for CCTV System". For the balance equipment/ instrument, type tests may be conducted, if required, as per manufactures standard or by relevant standard.

b. Submission of type test results and certificate shall be acceptable provided.

i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment within 5 years from the date of enquiry.

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

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

c. In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/sub-vendor within the quoted price.

DETAILS FOR TYPE TESTS TO BE CONDUCTED

a. The minimum type test reports, which are to be submitted shall be as indicated below:

i. Surge Withstand Capability (SWC) for Solid State Equipments/ Systems. All solid state sy stems/ equipments shall be able to withstand the el ectrical noise and surges as encountered in actual service conditions and inh erent in a power plant. Al l the solid state sy stems/ e quipments sh all be provided with all required protections t hat needs the surge withstand capabilit y as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards wh ich receive external signals like Analog i nput & output m odules, Binary in put & outp ut modules etc. includin g po wer supply , data highway, and data links shall be provide d with protections that meet the surge withstand capability as defi ned in ANSI 37.90. 1/ IEEE-472. Com plete details of the features incorporated in electronics sy stems to meet this req uirement, the relevant test s carri ed out, the test certificates etc. shall be sub mitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-5/EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.

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

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

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

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

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

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

b. Test listed at item no. v, vi, vii, above are applicable for electronic cards only.

PQR AND TECHNICAL REQUIREMENTS FOR GI CONDUITS

APPROVED

MDS

PREPARED	ISSUED	DATE
AJ	416	08.06.2015

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 **Introduction:** Bidders are required to offer GI Conduits as per BHEL Technical Specifications

3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

6.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. "CE/416/GI CONDUIT/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. "CE/416/GI CONDUIT/PQR/CI BB of section B" marked on it.

cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

9.0 Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders for GI Conduits as a part of offer:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of GI conduits in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
5. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
6. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered item/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning of GI conduits for these projects.

5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

6. Bidder shall have facility in India for Engineering activities, preparation of Documents. Submit these details.

7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION-C

TECHNICAL REQUIREMENTS

The technical requirements of GI conduits as mentioned below:

1. All rigid conduits, couplings and elbows shall be hot dipped galvanized rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981).

2. The conduit interior and exterior surfaces shall have continues zinc coating with an overcoat of transparent enamel lacker or zinc chromate.

3. All rigid conduit fittings (Tee joint, Union, GI clamps as applicable) shall conform to the requirements of IS: 14768 (Part 2):2003.

4. Each piece of conduits shall be straight, free from blister and other defects; internal surface shall be of smooth finish and covered with capped bushings at both ends.

Technical requirement of GI rigid conduit:

1. Duty : Heavy duty type
2. Applicable standard : IS-9537 Part I & II
3. Material : Mild steel
4. Sheet thickness (minimum): As per 9537 Part – II.
5. Surface treatment : Hot dip galvanised inside & outside as per IS-2629
6. Min. Weight of zinc coating (gm/sq.m) : As per IS 4759.
7. Min. Thickness of zinc coating (microns) : As per relevant IS std.
8. Standard length approximate: 3 meters.

PURCHASE SPECIFICATION
FOR
INSITU PROBE TYPE GAS ANALYSER

REVISIONS :

APPROVED BY

PUNIT P SINGH

PREPARED BY	ISSUED	DATE
PV	416	13/01/2016

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer Gas Analysers to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. **Pre-Qualification Requirements (PQR) of Bidders for Gas Analyzer**:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Gas Analyzer in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of analyzer.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. For analyzer, Bidder should be authorized and he should have capacity to commission the analyzers in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
7. Bidder shall have optimum inventory of critical components like analyzer sensors/ electronic modules.
8. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
9. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Analyzer, Sensors.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be supported by type test certificates.
3. Unpriced Purchase Order copies is to be submitted.
4. Reports of successful erection & commissioning Protocols & Minutes of the meetings for handing over of Gas analyzer system to be submitted.
5. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out for last three year & minimum two systems.
6. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
7. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of analyzer. Submit these details.
8. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION- C1

SUPPLY REQUIREMENTS OF KORADI SOx/NOx ANALYZER:

Vendor shall quote unit prices for each of the items indicated below. Without this the offer shall be treated as incomplete and shall be rejected.

PROJECT REQUIREMENT:

NAME of Owner / End user: MAHAGENCO
Project: KORADI R&M 1x210 MW Unit-6.

SCOPE:

1. **SOx/NOx ANALYZER:**
   SOx/NOx Analyzer as per Specification CE/416/ANALYZER/GAS/PS SECTION C1. Total quantity is 2 Nos. Applicable details are as below:

DESCRIPTION	RANGE (ppm)	OPERATING TEMP(^{0}C)	MAX TEMP (^{0}C)	OPERATING Process (ppm)
SOx	0-2000	137	150	890
NOx	0-1000	137	150	430

MANDATORY SPARES FOR KORADI SOX/NOX ANALYZER:

SL NO	ITEM DESCRIPTION	QUANTITY
1	ELECTRONIC CARD ASSEMBLIES OF EACH TYPE	10% OR 1 NOS WHICHEVER IS MORE
2	SET OF GASKETS/ "O" RINGS	2 SETS
3	TEMPERATURE SENSOR & HEATER ASSEMBLY	20% OR 2 NOS WHICHEVER IS MORE
4	COMPLETE PROBE WITH SHEILD ASSEMBLY	2 NOS
5	AIR FLOW METER	1 NOS
6	CONSUMABLES LIKE FILTER ELEMENTS, LIGHT SOURCES ETC.	1 EACH
7	CALIBRATION GASES OF ALL TYPES AND RANGES	ONE YEAR SUPPLY
8	COMPLETE ANALYZER ASSEMBLY WITHOUT ACCESSORIES	ONE OF EACH TYPE

2. PC based Data-logger to be supplied common for SOx/NOx & CO analyzer for Koradi Project.

3. Following separate documents to be furnished in the event of order:

   2.1 Drawings, Data Sheets, Technical Literature – 7 sets.

   2.2 Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

   2.3 O & M Manuals - 4 Sets (2 Sets to BHEL-EDN & 2 Sets to Site with Consignment).

4. Erection and Commissioning for offered system

   - Supervision of Erection, Total Commissioning and Handing over of the offered system to Owner / End user

5. Specific Requirement: Vendors to quote / confirm the following project specific requirements:

   a. ***Location of SOx/NOx Analyzer is at ID A&B Outlet Duct.***

   b. Vendors to confirm project specific technical requirement as per CE/416/ANALYZER/GAS/PS SECTION C1. Any deviation w.r.t this spec to be clearly indicated in the offer.

6. Packing: BHEL Packing standards attached as Annexure- 1 shall be followed, No deviations will be allowed.

SECTION- C2

SUPPLY REQUIREMENTS OF KORADI CO ANALYZER:

Vendor shall quote unit prices for each of the items indicated below. Without this the offer shall be treated as incomplete and shall be rejected.

PROJECT REQUIREMENT:

NAME of Owner / End user: MAHAGENCO
Project: KORADI R&M 1x210 MW Unit-6.

SCOPE:

1. **CO ANALYZER:**

CO Analyzer as per Specification CE/416/ANALYZER/GAS/PS SECTION- C2. Total quantity is 02 Nos. Applicable details are as below:

DESCRIPTION	RANGE (ppm)	OPERATING TEMP (^{0}C)	MAX TEMP (^{0}C)
CO	0--500	330	350

MANDATORY SPARES OF CO ANALYZER:

SL NO	ITEM DESCRIPTION	QUANTITY
1	ELECTRONIC CARD ASSEMBLIES OF EACH TYPE	10% OR 1 NOS WHICHEVER IS MORE
2	SET OF GASKETS/ "O" RINGS	2 SETS
3	TEMPERATURE SENSOR & HEATER ASSEMBLY	20% OR 2 NOS WHICHEVER IS MORE
4	COMPLETE PROBE WITH SHEILD ASSEMBLY	2 NOS
5	AIR FLOW METER	1 NOS
6	CONSUMABLES LIKE FILTER ELEMENTS, LIGHT SOURCES ETC.	1 EACH
7	CALIBRATION GASES OF ALL TYPES AND RANGES	ONE YEAR SUPPLY
8	COMPLETE ANALYZER ASSEMBLY WITHOUT ACCESSORIES	ONE OF EACH TYPE

2. Following separate documents to be furnished in the event of order:

2.1 Drawings, Data Sheets, Technical Literature – 7 sets.

2.2 Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

2.3 O & M Manuals - 4 Sets (2 Sets to BHEL-EDN & 2 Sets to Site with Consignment).

3. Erection and Commissioning for offered system

   - Supervision of Erection, Total Commissioning and Handing over of the offered system to Owner / End user

4. Specific Requirement: Vendors to quote / confirm the following project specific requirements:

   a. ***Location of CO Analyzer is at APH INLET A&B Duct.***

   b. Vendors to confirm project specific technical requirement as per CE/416/ANALYZER/GAS/PS SECTION C2. Any deviation w.r.t this spec to be clearly indicated in the offer.

5. Packing: BHEL Packing standards attached as Annexure- 1 shall be followed, No deviations will be allowed.

SECTION- C3

SUPPLY REQUIREMENTS OF RAYALSEEMA FLUE GAS ANALYZER AND FLUE GAS FLOW MONITOR:

Vendor shall quote unit prices for each of the items indicated below. Without this the offer shall be treated as incomplete and shall be rejected.

PROJECT REQUIREMENT:

NAME of Owner / End user: APGENCO

Project: RAYALSEEMA- IV 1x600 MW Unit.

SCOPE:

1. **FLUE GAS ANALYZER**:

   a. COMBINED FLUE GAS ANALYZER – 01 Nos
   Combined Flue gas Analyzer as per Specification CE/416/ANALYZER/GAS/P SECTION C3. Quantity as per instrument schedule below. Total quantity is 1 number. Applicable process details are as below:

KKS NO.	KKS DESCRIPTION	RANGE (ppm)	OPERATING TEMP (^{0}C)	DESIGN TEMP (^{0}C)	OPERATING Process (ppm)
HNA80CQ102	SOX AT CHIMNEY	0-1000	136	150	600
HNA80CQ103	NOX AT CHIMNEY	0-1000	136	150	435
HNA80CQ101	CO AT CHIMNEY	0-500	136	150	100

   b. **FLUE GAS FLOW MONITOR – 01 NOS**.

2. Following separate documents to be furnished in the event of order:

   2.1 Drawings, Data Sheets, Technical Literature – 7 sets.

   2.2 Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

   2.3 O & M Manuals - 4 Sets (2 Sets to BHEL-EDN & 2 Sets to Site with Consignment).

3. Erection and Commissioning for offered system

   - Supervision of Erection, Total Commissioning and Handing over of the offered system to Owner / End user

4. Specific Requirement: Vendors to quote / confirm the following project specific requirements:

   a. ***Location of Analyzer is above 104.5m platform in the chimney with OD 17.823m and Thickness 706mm @ 104.5m elevation***

   b. Vendors to confirm project specific technical requirement as per CE/416/ANALYZER/GAS/PS SECTIONC3. Any deviation w.r.t this spec to be clearly indicated in the offer.

5. Packing: BHEL Packing standards attached as Annexure- 1 shall be followed, No deviations will be allowed.

SECTION- D1

TECHNICAL REQUIREMENT FOR KORADI SOx/NOx ANALYSER CUM MONITOR

1.0 General Specifications:-

1. Type : Insitu Probe type analyzer
2. Principle of measurement : IR/UV
3. Flue gas Temperature : 150 ^{O}C
4. Ambient temperature : 60 ^{O}C
5. Mounting : On duct
6. Measurement range : 0-2000 ppm fully selectable
7. Units of measurement : PPM,
8. Power Supply : 240V, 50 Hz, 1 Phase
9. Measurement of averaging : 10 sec to 60minutes (selectable)
10. Accuracy : ±2% of measured value
11. Linearity : 1 % of full scale
12. Repeatability : 1% of full scale
13. Response time : 5 seconds or better for 90% of full scale
14. Zero & Span drift: 1 % span per week.
15. Calibration: Zero and Span calibration in manual and automatic mode. Automatic calibration interval shall be fully selectable.
16. Analog output: Galvanically Isolated 4-20 mA linear for each Channel i.e. SOx, NOx & moisture.
17. Alarm output: 2 SPDT potential free contacts rated at 5 A 230 VAC/0.5 V A 220 VDC. Alarm set points programmable through keyboard.
18. Input normalization : Required–online [With pressure and temperature sensor] and also provision for key pad entry of inputs
19. Probe material : Stainless Steel 316L, 1.8m Probe
20. Protection to Probe: Coating/ Shield
21. Enclosure: Corrosion resistant epoxy coated aluminum housing rated to IP-65 for Transceiver and control unit.
22. Purge fail alarm shall be offered.

2.0 Common Accessories:

a) All tubing & fittings required for calibration and purging system using Instrument Air– Separate price to be provided.
b) Combined Calibration gas cylinders for SO2, NOx filled in 10 Ltrs. of WC aluminium cylinder with necessary SS regulator, SS gauges, SS tubings and SS fittings etc. as required shall be supplied. N_2 Zero gas carbon steel cylinders shall be supplied along with necessary regulator, gauges, fitting & tubing.
c) Mounting flanges (mating & counter flanges with fasteners), stub pipes and gaskets shall be supplied.
d) Interconnecting cabling / piping and tubing shall be offered to meet the system requirement.
e) Supervision of Erection, Total commissioning & handing over of complete analyzer to end user.
f) PC with data-logger shall be offered. The PC shall be a standard industrial PC from HP/Dell/Lenovo but not an assembled one. It should be equipped with all the required softwares for data collection.
g) Minimum Requirement for PC: 4GB RAM, 500GB Hard disk, 19" TFT Monitor.

3.0 Documents to be furnished, with the offer:-

3.1 Datasheets / Schematic and Probe assembly Drawings - 02 set
3.2 Technical Literature / Catalogs - 02 set

4.0 Documents to be furnished for Approval , in the event of order :-

4.1 Datasheets / Schematic and Probe assembly Drawings - 04 sets. Also a soft copy of all drawings shall also be furnished.
4.2 Technical Literature / Catalogs - 04 sets

5.0 Quality documents to be submitted for approval.

Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

6.0 O& M Manuals – 4 sets (2 Sets to BHEL-EDN Bangalore & 2 Sets to site with Consignment).

SECTION- D2

TECHNICAL REQUIREMENT FOR KORADI CO ANALYSER CUM MONITOR

1.0 General Specifications:-

1. Type : Insitu Probe type analyzer
2. Principle of measurement : IR/UV
3. **Flue gas Temperature : 350 ^{O}C**
4. Ambient temperature : 60 ^{O}C
5. Mounting : On duct
6. Measurement range : 0-500 ppm fully selectable
7. Units of measurement : PPM,
8. Power Supply : 240V, 50 Hz, 1 Phase
9. Measurement of averaging : 10 sec to 60minutes (selectable)
10. Accuracy : ±2% of measured value
11. Linearity : 1 % of full scale
12. Repeatability : 1% of span
13. Response time : 5 seconds or better for 90% of full scale
14. Zero & Span drift: 1 % span per week.
15. Calibration: Zero and Span calibration in manual and automatic mode. Automatic calibration interval shall be fully selectable.
16. Analog output: Galvanically Isolated 4-20 mA linear for each Channel**.**
17. Alarm output: 2 SPDT potential free contacts rated at 5 A 230 VAC/0.5 V A 220 VDC. Alarm set points programmable through keyboard.
18. Input normalization : Required–online [With pressure and temperature sensor] and also provision for key pad entry of inputs
19. Probe material : Stainless Steel 316L, 1.8m Probe
20. Protection to Probe: Coating/ Shield.
21. Enclosure: Corrosion resistant epoxy coated aluminum housing rated to IP-65 for Probe and control unit.
22. Purge fail alarm shall be offered.

2.0 Common Accessories:

a) All tubing & fittings required for calibration and purging system using Instrument Air– Separate price to be provided.
b) Calibration gas cylinders for CO filled in 10 Ltrs. of WC aluminium cylinder with necessary SS regulator, SS gauges, SS tubing's and SS fittings etc. as required shall be supplied. N_2 Zero gas carbon steel cylinders shall be supplied along with necessary regulator, gauges, fitting & tubing.
c) Mounting flanges (mating & counter flanges with fasteners), stub pipes and gaskets shall be supplied.
d) Interconnecting cabling / piping and tubing shall be offered to meet the system requirement.
e) Supervision of Erection, Total commissioning & handing over of complete analyzer to end user.

3.0 Documents to be furnished, with the offer:-

3.1 Datasheets / Schematic and Probe assembly Drawings - 02 set
3.2 Technical Literature / Catalogs - 02 set

4.0 Documents to be furnished for Approval , in the event of order :-

4.1 Datasheets / Schematic and Probe assembly Drawings - 04 sets. Also a soft copy of all drawings shall also be furnished.
4.2 Technical Literature / Catalogs - 04 sets

5.0 Quality documents to be submitted for approval.

Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

6.0 O& M Manuals – 4 sets (2 Sets to BHEL-EDN Bangalore & 2 Sets to site with Consignment).

SECTION- D3

TECHNICAL REQUIREMENT FOR RAYALSEEMA FLUE GAS ANALYSER CUM MONITOR

1.0 General Specifications:-

1. Type : Insitu Probe type combined analyzer
2. Principle of measurement : IR/UV
3. Flue gas Temperature : 150 ^{O}C
4. Ambient temperature : 60 ^{O}C
5. Mounting : On chimney
6. Measurement range : 0-1000 ppm fully selectable
7. Units of measurement : PPM, mg / m^3 and mg / Nm^3
8. Power Supply : 240V, 50 Hz, 1 Phase
9. Measurement of averaging : 10 sec to 60minutes (selectable)
10. Accuracy : ±2% of measured value
11. Linearity : 1 % of full scale
12. Repeatability : 1% of full scale
13. Response time : 5 seconds or better for 90% of full scale
14. Zero & Span drift: 1 % span per week.
15. Calibration: Zero and Span calibration in manual and automatic mode. Automatic calibration interval shall be fully selectable.
16. Analog output: Isolated 4-20 mA linear for each Channel **i.e.** SOx, NOx, CO, CO2 & moisture.
17. Alarm output: 2 SPDT potential free contacts rated at 5 A 230 VAC/0.5 V A 220 VDC. Alarm set points programmable through keyboard.
18. Input normalization : Required–online [With pressure and temperature sensor] and also provision for key pad entry of inputs
19. Probe material: Stainless Steel 316L, 2.3m Probe.
20. Protection to Probe: Coating/ Shield.
21. Enclosure: Corrosion resistant epoxy coated aluminum housing rated to IP-65 for Transceiver and control unit.
22. Purge fail alarm shall be offered.

2.0 Common Accessories:

a) All tubing & fittings required for calibration and purging system using Instrument Air– Separate price to be provided.
b) Combined Calibration gas cylinders for SO2, NOx CO2 and CO filled in 10 Ltrs. of WC aluminium cylinder with necessary SS regulator, SS gauges, SS tubings and SS fittings etc. as required shall be supplied. N_2 Zero gas carbon steel cylinders shall be supplied along with necessary regulator, gauges, fitting & tubing. All the calibration cylinders gases required for one year continuous operation shall be provided. The calibration gas container shall not contaminate the calibration gas.
c) Mounting flanges (mating & counter flanges with fasteners), stub pipes and gaskets shall be supplied.
d) Interconnecting cabling / piping and tubing shall be offered to meet the system requirement.
e) Supervision of Erection, Total commissioning & handing over of complete analyzer to end user.

TECHNICAL REQUIREMENT FOR RAYALSEEMA FLUE GAS FLOW MONITOR

1.0 General Specifications:

1. Type : Non-Contact Type
2. Measurement : Flue Gas Measurement
3. Principle of measurement: As per Manufacturer's Standards.
4. Flue gas Temperature : 150 ^{O}C
5. Ambient temperature : 60 ^{O}C
6. Mounting : On chimney
7. Measurement range : As required
8. Units of measurement : velocity - m/s, flow – m^3/s
9. Power Supply : 240V, 50 Hz, 1 Phase
10. Local Display: Backlit LCD/LED.
11. Measurement of averaging : 10 sec to 60minutes (selectable)
12. Accuracy : ±2% of measured value
13. Linearity :- 2 % of full scale
14. Response time : 5 seconds or better for 90% of full scale
15. Zero & Span drift: 2 % per month.
16. Calibration: Zero and Span adjustment.

17. Analog output: **:** 4-20mA DC to DDCMIS for each Channel
18. Probe material : Stainless Steel 316L
19. Enclosure : Corrosion resistant epoxy coated aluminum housing & enclosure rated to IP-65
20. Accessories :
    a. Blower unit, tubes &fittings for calibration and purging, purge fail alarm is to be offered.
    b. Mounting Flanges (mating & counter flanges with fasteners), Gaskets etc.
21. Application: On Chimney.

2.0 Documents to be furnished, with the offer:-

2.1 Datasheets / Schematic and Probe assembly Drawings - 02 set
2.2 Technical Literature / Catalogs - 02 set

3.0 Documents to be furnished for Approval , in the event of order :-

3.1 Datasheets / Schematic and Probe assembly Drawings - 04 sets. Also a soft copy of all drawings shall also be furnished.
3.2 Technical Literature / Catalogs - 04 sets

4.0 Quality documents to be submitted for approval.

Test Certificates/ Reports and Calibration Reports, for approval, before dispatch of items. The calibration reports shall correspond to range of the analyzer as per the instrument schedule.

5.0 O& M Manuals – 4 sets (2 Sets to BHEL-EDN Bangalore & 2 Sets to site with Consignment).

SECTION- E1

PRICING SHEET- KORADI SOx/NOx ANALYZER:

SL NO	DESCRIPTION	TOTAL QTY	UNIT	UNIT PRICE (RS.)	TOTAL PRICE (RS.)
1	SOX/NOX ANALYZER WITH BELOW RANGE: RANGE SOX: 0-2000 PPM RANGE NOX: 0-1000 PPM	2	NOS.		
2	COMPLETE PROBE ASSEMBLY	2	NOS.		
3	ACCESSORIES FOR THE SYSTEM LIKE TUBING, CABLES, MOUNTING FLANGES (MATING & COUNTER FLANGES WITH FASTENERS), & STUBS	2	SETS		
4	CALIBRATION CYLINDERS OF ALL TYPES WITH REGULATORS	2	SETS		
5	SUPERVISION OF ERECTION AND COMMISSIONING CHARGES - FOR ALL THE SYSTEMS QUOTED ABOVE. IT INCLUDES SUPERVISION OF ERECTION, TOTAL COMMISSIONING AND HANDING OVER THE OFFERED SYSTEM.	2	LOTS		
6	CALIBRATION TCS	1	SETS		
7	PC WITH DATALOGGER COMMON FOR SOx/NOx & CO ANALYZER.	1	NO		
8	UNIT RATES FOR ADDITION / DELETION OF INTERCONNECTING CABLES LENGTH	PER	METER		

Note1: If during the Engineering stage, the PC & data-logger needs to be deleted the unit prices given above will be used for deletion from the Purchase Order.

Note2: - Unit rates quoted will be used for additional requirements raised during commissioning of the system.

SECTION- E2

PRICING SHEET- KORADI CO ANALYZER:

SL NO	DESCRIPTION	TOTAL QTY	UNIT	UNIT PRICE (RS.)	TOTAL PRICE (RS.)
1	CO ANALYZER WITH BELOW RANGE: RANGE CO: 0-500 PPM	2	NOS.		
2	COMPLETE PROBE ASSEMBLY	2	NOS.		
3	ACCESSORIES FOR THE SYSTEM LIKE TUBING, CABLES, MOUNTING FLANGES (MATING & COUNTER FLANGES WITH FASTENERS) & STUBS	2	SETS		
4	CALIBRATION CYLINDERS OF ALL TYPES WITH REGULATORS	2	SETS		
5	SUPERVISION OF ERECTION AND COMMISSIONING CHARGES - FOR ALL THE SYSTEMS QUOTED ABOVE. IT INCLUDES SUPERVISION OF ERECTION, TOTAL COMMISSIONING AND HANDING OVER THE OFFERED SYSTEM.	2	LOTS		
6	CALIBRATION TCS	1	SETS		
7	UNIT RATES FOR ADDITION / DELETION OF INTERCONNECTING CABLES LENGTH	PER	METER		

Note: - Unit rates quoted will be used for additional requirements raised during commissioning of the system.

SECTION-E3

MANDATORY SPARES LIST:

1. KORADI SOX/ NOX ANALYZER

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT PRICE (INR)	TOTAL PRICE (INR)
1	ELECTRONIC CARD ASSEMBLIES OF EACH TYPE	10% OR 1 NOS WHICHEVER IS MORE		
2	SET OF GASKETS/ "O" RINGS	2 SETS		
3	TEMPERATURE SENSOR & HEATER ASSEMBLY	20% OR 2 NOS WHICHEVER IS MORE		
4	COMPLETE PROBE WITH SHEILD ASSEMBLY	2 NOS		
5	AIR FLOW METER	1 NOS		
6	CONSUMABLES LIKE FILTER ELEMENTS, LIGHT SOURCES ETC.	1 EACH		
7	CALIBRATION GASES OF ALL TYPES AND RANGES	ONE YEAR SUPPLY		
8	COMPLETE ANALYZER ASSEMBLY WITHOUT ACCESSORIES	ONE OF EACH TYPE	UNIT PRICES QUOTED FOR ANALYZER IN THE MAIN SCOPE OF SUPPLY WILL BE CONSIDERED	

2. KORADI CO ANALYZER.

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT PRICE (INR)	TOTAL PRICE (INR)
1	ELECTRONIC CARD ASSEMBLIES OF EACH TYPE	10% OR 1 NOS WHICHEVER IS MORE		
2	SET OF GASKETS/ "O" RINGS	2 SETS		
3	TEMPERATURE SENSOR & HEATER ASSEMBLY	20% OR 2 NOS WHICHEVER IS MORE		
4	COMPLETE PROBE WITH SHEILD ASSEMBLY	2 NOS		
5	AIR FLOW METER	1 NOS		
6	CONSUMABLES LIKE FILTER ELEMENTS, LIGHT SOURCES ETC.	1 EACH		
7	CALIBRATION GASES OF ALL TYPES AND RANGES	ONE YEAR SUPPLY		
8	COMPLETE ANALYZER ASSEMBLY WITHOUT ACCESSORIES	ONE OF EACH TYPE	UNIT PRICES QUOTED FOR ANALYZER IN THE MAIN SCOPE OF SUPPLY WILL BE CONSIDERED	

SECTION- E4

PRICING SHEET- RAYALSEEMA FLUE GAS ANALYZER WITH FLOW METER:

SL NO	DESCRIPTION	TOTAL QTY	UNIT	UNIT PRICE (RS.)	TOTAL PRICE (RS.)
1	SOx/NOx/CO ANALYZER WITH BELOW RANGE: RANGE SOx: 0-1000 PPM RANGE NOx: 0-1000 PPM RANGE CO: 0-500 PPM	1	NOS.		
2	COMPLETE PROBE ASSEMBLY	1	NOS.		
4	FLUE GAS FLOW METER FOR CHIMNEY WITH ACCESSORIES FOR THE SYSTEM LIKE TUBING, CABLES, PURGE UNIT, MOUNTING FLANGES (MATING & COUNTER FLANGES WITH FASTENERS) & STUBS, Etc.	1	SETS		
5	ACCESSORIES FOR ANALYZER LIKE TUBING, CABLES, MOUNTING FLANGES (MATING & COUNTER FLANGES WITH FASTENERS), STUBS Etc.	1	SETS		
6	CALIBRATION CYLINDERS OF ALL TYPES WITH REGULATORS FOR FLUE GAS ANALYZER	1	SETS		
7	SUPERVISION OF ERECTION AND COMMISSIONING CHARGES - FOR ALL THE SYSTEMS QUOTED ABOVE. IT INCLUDES SUPERVISION OF ERECTION, TOTAL COMMISSIONING AND HANDING OVER THE OFFERED SYSTEM.	2	LOTS		
8	CALIBRATION TCS	1	SETS		
9	UNIT RATES FOR ADDITION / DELETION OF INTERCONNECTING CABLES LENGTH	PER	METER		

Note: - Unit rates quoted will be used for additional requirements raised during commissioning of the system.

PURCHASE SPECIFICATION
FOR
E/P CONVERTERS – FAIL FREEZE TYPE
(STAY PUT TYPE)

REVISIONS :

APPROVED BY

PUNIT P SINGH

PREPARED BY	ISSUED	DATE
PK	416	01/07/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer E/P CONVERTERS-FAIL FREEZE TYPE to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for E/P CONVERTERS – FAIL FREEZE TYPE:

1. The bidder should have executed/ completed work of Design, supply, in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models are acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. Bidder shall have optimum inventory of critical components like sensors/ electronic modules.
7. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Sensors/ System/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
5. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of the system. Submit these details.
6. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION – C

SCOPE OF SUPPLY FOR EACH PROJECT:

Following items are required to be supplied as per SECTION –D:

1. E/P Converter – Fail Freeze Type Total for each unit & all required accessories for mounting/unit.

2. Documents to be furnished in the events of order, before dispatch of items:-
   i. Test certificates/ reports and calibration reports, for approval.
   ii. O & M manuals –4 sets (2 sets to BHEL-EDN & 2 sets with consignment to site).
   iii. Data sheets / GA drawings and Instrument schedule to be provided in a soft copy (CD) compatible with windows 98 format (Autocad-14, MS Word, Excel). Also, a soft copy of O & M manual to be provided.

3. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.

4. Unit rates quoted will considered for mandatory spare if applicable.

SECTION D
TECHNICAL REQUIREMENTS FOR ELECTRIC TO PNEUMATIC (E/P) CONVERTORS

A. E/P Converters and associated accessories shall be furnished in accordance with the specifications given below :-

SL. NO	TECHNICAL PARAMETER	SPECIFICATION
1	AIR SUPPLY	1.5 Kg/cm sq
2	MAX. SUPPLY PRESSURE	7 Kg/cm sq
3	INPUT SIGNAL	4-20 mA DC
4	OUTPUT SIGNAL	0.2 to 1.0 Kg/cm sq
5	LINEARITY	0.5% of span or better
6	HYSTERESIS	0.1% of span or Better
7	REPEATABILITY	+/-0.1% Span typical
8	ACCURACY	+/-0.25% Span typical
9	AMBIENT TEMP. EFFECT	Less than 0.02% of span per deg c between -20 to +60 deg c.
10	SUPPLY PRESSURE EFFECT	Less than 1%
11	MOUNTING	Close to actuator (but Not on the actuator)
12	RESPONSE TIME	5 seconds for 0 to 90% Output pressure
13	SPAN & ZERO ADJUSTMENT	Screw
14	OUTPUT CAPACITY	To suit the actuator
15	PROTECTION CLASS	IP 65
16	PNEUMATIC CONNECTIONS	1/4”NPTF
17	ALLOWABLE DRIFT RATE	+/-2% of set point/hour maximum.
18	ELECTRICAL CONNECTION	One end - Plug in socket connector(matching plug & socket shall be offered), Other end - Screwed
19	FAIL FREEZE FACILITY REQUIRED	

B. On the loss of control signal, the last set point pressure shall be maintained so that the associated control valve remains in stay put position without using any solenoid valve.

C. Vendors should indicate compliance to this sheet & Quality Check List REF: CE/416/GEN/EP, dated 18/09/2012 enclosed and submit the same with offer. In case of any deviation, vendor should clearly indicate the same.

QUALITY CHECK LIST FOR ELECTRIC TO PNUEMATIC CONVERTER

REF : CE/416/GEN/EP REVISION : 00 DATE : 18/09/2012

CONTRACTOR: M/S B H E L – EDN

SL. NO.	TESTS/CHECKS	QUANTOM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS.	AGENCY**				REMARKS
				M	C	N	D *	
1	CHECK FOR MODEL TAG, DIMENSIONS	See note-1 below	Approved specs./data sheets	P	W	V	√	IN CASE OF IMPORTED ITEMS BHEL SHALL REVIEW TC & NOT INSPECT MANUFACTURER TO CARRYOUT ROUTINE TEST ON 100%
2	DIMENSIONS			P	W	V	√	
3	ACCURACY TEST AND HYSTERESIS			P	W	V	√	
4	EFFECT OF AIR PR. VARIATION			P	W	V	√	
5	LEAKAGE TEST	Type test		P	W	V	√	
				P	V	V	√	
6	DEGREE OF PROTECTION TEST			V	V	V	√	
7	VISUAL CHECKS FOR MOUNTING ACCESS			V	V	V	√	

LEGEND:
* RECORDS, IDENTIFIED WITH ' √ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB CONTRACTOR,
C: CONTRACTOR/NOMINATED INSP. AGENCY.
N: CUSTOMER "P" PERFORM "W" WITNESS "V" VERIFICATION

NOTE: 1) QUANTUM OF CHECK SHALL BE AS BELOW:
100 % - BY MANUFACTURER.
10% - BY M/S BHEL.
NIL – CUSTOMER.
2) MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.

A4 - 10		REF. : CE/416/CTLS/PS REV. NO. : 00 PAGE : 01 OF 02

RATE CONTRACT SPECIFICATION
FOR
CONDUCTIVITY TYPE LEVEL SWITCH

REVISIONS :	APPROVED (PPS)		
	PREPARED PV	ISSUED 416	DATE 11-07-2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer Conductivity Type –Level Switch to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for Conductivity Type-Level Switch:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Conductivity Type Level Switch in power station of 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered item is supplied & commissioned, along with details of item.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models is acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. Bidder should be authorized and he should have capacity to commission in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
7. Bidder shall have optimum inventory of critical components like sensors/ electronic modules.
8. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
9. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Sensors/ items.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out for last three year & minimum two systems. Also, submit reports of successful erection & commissioning Protocols & Minutes of the meetings for handing over of Conductivity Type Level Switch for these projects.
5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
6. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of analyzer. Submit these details.
7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

A4 - 11		REF. : CE/416/CTLS/SOS REV. NO. : 00 PAGE : 01 OF 02

SCOPE OF SUPPLY

REVISIONS :	APPROVED (PPS)		
	PREPARED PV	ISSUED 416	DATE 11-07-2015

SCOPE OF SUPPLY FOR RATE CONTARCT

01. Conductivity type level switches shall be supplied as per enclosed technical requirement and the quantity of the switches shall be offered as per annexure enclosed with this specification.Further , detailed bill of material shall be quoted as mentioned below.

	Total Qty per tag	Total Qty/unit
1.1 Conductivity Probes/Sensors	02 Nos	04 Nos
1.2 Stand pipes/columns with 2 Vent & 2 Drain Valves- C-C distance between process connection shall be 350 mm- -Complete Assembly shall be IBR certified	1 No	02 Nos
1.3 Electronic units & interconnecting cables	1 Lot	02 Lots

Note:

a. Total 2 no. tags per unit.

b. Item 1.1 above shall be duly assembled / mounted on to 1.2 as per schedule enclosed with this specification by the bidder.

c. Refer Installation drawing Ref. CE/416/CTLS/TR for reference.

02.0 Mandatory spares: (Optional offer to be given, Shall not be part of evaluation of offer)

0.1 Electroes/probes: 100% of total probes

0.2 Electronic modules/cards/PCB's used in detector units/logic units etc. 10% of the total modules /cards/PCB's used or 2 Nos. which ever is moe.

0.3 Relays:20% of total quantity used.

However , unit prices shall be valid till the respective project document approval.

03.0 Documents to b furnished in the vent of order:

i) Test Certificate/reports as per chcklist.

ii) O & M manuals in 3 sets.

iii) One CD-ROMcontaining the O&M manual in window 2003 format shall be supplied.

4.0 Supervision of Erection,Totalcommissioning & Handing ove of the system to the custom is in Bidder's Scope.

A4 - 10		REF. : CE/416/CTLS/TR REV. NO. : 00 PAGE : 01 OF 04

TECHNICAL REQUIREMENT

REVISIONS :	APPROVED (PPS)		
	PREPARED PV	ISSUED 416	DATE 11-07-2015

TECHNICAL REQUIREMENT

1.0 Each of the switching system shall be furnished complete with at least 2 Nos. of conductivity probes as indicated in installation drawing. Column (stand pipe) for mounting the conductivity probes, drain valves,isolated valves elctronic units, twisted and shielded pair interconnecting cables between the electrodes probes and electronic units & between electronic unit and junction box. All the stand pipes/valves/coupling indicated in installation drawing section of the specs., shall be furnished with IBR certification. Electrical connection to be suitable for gland 3/4 " The system shall be proven and approved by Factory Mutual,USA/ IBR, or equivalent.

i) The pressure vessel shall be constructed in such a way that density level error between drum and pressure vessel shall not be more than 25 mm. All vent, drain and isolation valves shall meet 1.5 times the max.design conditions.

ii) Electrode assembly shall have blow out and leakage proof seating arrangement Field proven ceramic / zirconia's probe insulation suitable for design pressure and temperature of 75 kg/cm2 and 365 deg c respectively.

iii) The system design shall be such that it shall ensure that failure of one probe circuit shall not affect another probe circuit and failure of any electrode will not hamper the system function and operation. Further the entire system shall be of proven fail-safe design.

iv) The system shall have fault diagnostic features such as process fault, system hardware fault, probe failure,circuit board failure,shorted wire etc. Further the system shall be able to distinguish between a cable fault and an electrode fault.

3.0 Conductivity probes and the columns (stand pipe) for mounting these probes shall be designed for the press and temp conditions as indicated above.

4.0 The electronic unit shall be separate and dedicated for each of the switching system . The electronic unit shall be mounted at site on the 'local instrument rack' and necessary hardware shall also be offered. Bidder to furnish mounting details of the electronic unit with the offer.

5.0 Each of the switching system shall be fed with redundant +240 volts (+/- 10%), Ac power supply. Feeders to be terminated at the Bidder electronic unit by the BHEL. The redundant

power packs/modules provided by the bidder shall be diode auctioned to feed the system and probes. Failure of one of the redundant power packs/modules, transformer shall not affect the system, performance in any way including the availability of level sensibility by all the probes. Further power supply shall be monitored and potential free contact shall be provided as alarm for any of the power packs/modules failures.

6.0 The electrodes shall be designed in such a manner that they sense the rising water level and that they do not givefaulty indication due to the falling condensate on the electrodes. Further the system design shall ensure that failure of one probe circuit does not affect another probe circuit. Also each system shall incorporate proper validation circuits that eliminate spurious or unwanted alarm/trip actions due to a single channel fault.

7.0 For each of levels sensed by each of the switch systems,the bidder shall provide 2 Nos. potential free changeover contact rated for 5 amps at 240 volts AC and 0.25 amps at 220 volts DC potential fre changeover. All these contacts shall be DPDT type.

8.0 Switching elements shall be snap acting shock and vibrationproof. All switches shall have electrically independent DPDTchangeover contacts to enable non-coincidence monitoring.

9.0 High or low set points shall be adjustable over the full-scale range. All switches shall have 0.5% repeatability unless specified otherwise.

10.0 All switch devices shall be provided with 3/4'' NPT conduit connection/compression type cable gland. The process connection shall be as indicated in the respective specification clauses above.

11.0 Electonic unit shall be funished in IP-65 weather proof housing. Type test certificates shall be provided for approval of owner.

12.0 Hydro static test of stand pipes shall be carried out at 1.5 times the design pressure.

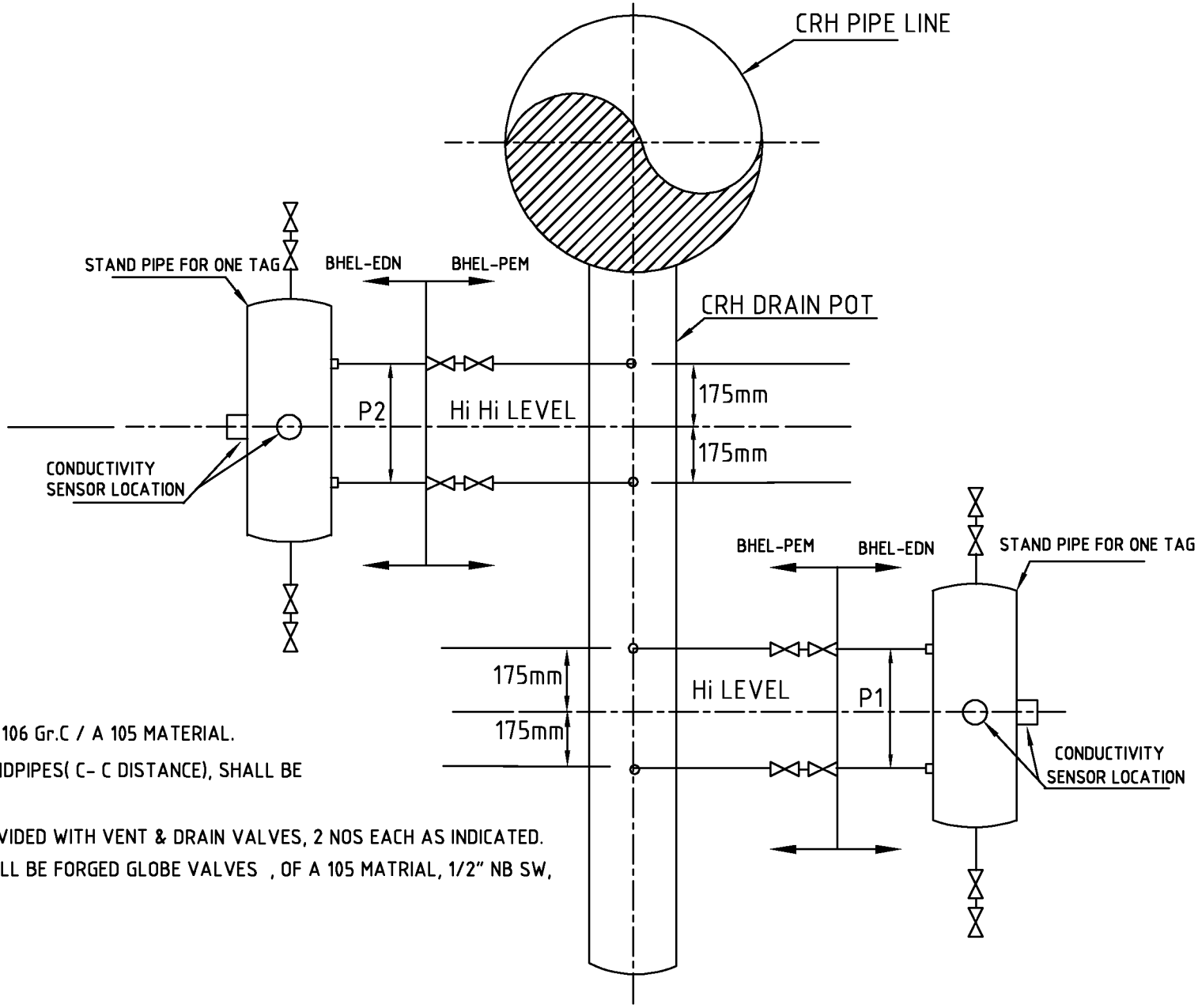
13.0 Indicator shall be one Red LED for steam / one Green LED for Water / One Amber LED for fault

14.0Bidder to note that enclosure material shall be suitable for mounting in open Environment.

15.0 Bidder shall provide accessories like electrode inserts & covers

16.0 Bidder shall furnish clause wise compliance/deviation list with the offer.

CRH DRAIN POT LEVEL MEASUREMENT (Hi & HiHi LEVELS)



NOTES :

1.0 STAND PIPE SHALL BE OF A 106 Gr.C / A 105 MATERIAL.

2.0 DIMENSION P1 & P2 ON STANDPIPES(C- C DISTANCE), SHALL BE 350 mms.

3.0 STANDPIPES SHALL BE PROVIDED WITH VENT & DRAIN VALVES, 2 NOS EACH AS INDICATED. VENT & DRAIN VALVES SHALL BE FORGED GLOBE VALVES , OF A 105 MATRIAL, 1/2" NB SW, 1500 CLASS, .

CHECK LIST FOR LEVEL SWITCH. / PAGE 1 OF 1

NUMBER : CE/416/STD/LS/CL REVISION : 00 DATE : 11-07-2015

PROJECT : STANDARD

CONTRACTOR : M/S B H E L - EDN

SL NO.	TESTS/CHECKS	QUANTUM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS.	AGENCY**				REMARKS
				M	C	N	D*	
1.	CHECK FOR DIMENS-IONS,MODEL,TAG	SEE NOTE-1 PAGE 2 OF 2	APPROVED SPECS. / APPROVED DATA SHEETS	P	V	V	♦	
2.	PROCESS CONNEC--TION			P	V	V	♦	
3.	ON OFF DIFFERENT-IAL			P	W	V	♦	
4.	REPEATABILITY			P	W	V	♦	
5.	INSULATION RESIST-. ANCE.			P	W	V	♦	
6.	HIGH VOLTAGE			P	W	V	♦	
7.	PR.TEST ON CHAM-BER			P	W	V	♦	
8.	CHECK FOR MAT. T.C FOR CHAMBER AND FLOAT	FOR LOT		V	V	V	♦	
9.	VERIFICATION OF CONTACT CONFIGRN. & RATING OF MICRO SWITCH	FOR LOT		V	V	V	♦	IN CASE OF IMPORTED ITEMS BHEL SHALL REVIEW TCs
10.	CHECK FOR TEMP SUITABILITY FOR MICRO SWITCH AND LEAD WIRE.			V	V	V	♦	

LEGEND:

* RECORDS,IDENTIFIED WITH ' ♦ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION

** M:MANUFACTURER/SUB CONTRACTOR,C:CONTRACTOR/NOMINATED INSP.AGENCY.
N: CUSTOMER "P" PERFORM "W" WITNESS "V" VERIFICATION

QUANTUM OF CHECK SHALL BE AS BELOW :

100 % - BY MANUFACTURER.
5 % - BY M/S BHEL.
NIL - BY M/S. CUSTOMER

PQR AND TECHNICAL REQUIREMENTS FOR EXPLOSION FLAME PROOF JUNCTION BOX

APPROVED

TM

PREPARED	ISSUED	DATE
AJ	416	08.06.2015

CONTENTS

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 **Introduction:** Bidders are required to offer Explosion Flame Proof Junction boxes as per BHEL Technical Specifications

3.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

6.0 **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer as per Cl 2.0 of above for evaluation. In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of technical offers shall be submitted to End-users/Customers for their acceptance/approval. Commercial bids of only accepted /approved Bidders by End-users/Customers shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl. AA of section B) shall be in a separate cover with reference no. "CE/416/EFP JB/PQR/CI AA of section B" marked on it.

bb. Documents pertaining to Pre- Qualification requirement (Cl. BB of Section B) shall be in a separate cover with reference no. "CE/416/EFP JB/PQR/CI BB of section B" marked on it.

cc. Technical offers/proposals for requirements mentioned in BHEL Technical Specifications shall be submitted with Project Name & reference marked on it.

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions.

9.0 Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION-B

PRE-QUALIFICATION REQUIREMENTS

AA. Pre-Qualification Requirements (PQR) of Bidders for Explosion Flame Proof Junction Boxes as a part of offer:

1. The bidder should have executed/ completed work of "Design, supply, supervision of erection & commissioning of Explosion Flame Proof Junction Boxes in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection, Commissioning & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. Bidder should be authorized and he should have capacity to commission the system in India. The bidder should have the team of experienced service engineers on pay role located at various parts of INDIA. (With documentary evidence).
5. BHEL shall issue call for service / commissioning with 15 days' notice. Bidder shall agree to visit BHEL project sites within above notice period.
6. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered item/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.

4. Submit List of Projects (rating of = or >200 MW Power Plants) for which Erection & Commissioning has been carried out in the past three years & minimum two systems. Also, submit reports of successful erection & commissioning of Explosion Flame proof junction boxes for these projects.

5. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

6. Bidder shall have facility in India for Engineering activities, preparation of Documents. Submit these details.

7. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply, Erection, Commissioning and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION-C

TECHNICAL REQUIREMENTS

EXPLOSION FLAME PROOF JUNCTION BOXES (JB)

01. The Junction box enclosures shall comprise of a case and cover/door constructed from Die-Cast Aluminium (Type LM 6) of thickness not less than 5 mm. The construction shall ensure adequate strength and rigidity. Junction boxes shall confirm to IP 65 class as per IS: 2147.

02. The junction boxes shall be provided with canopies to avoid ingress of water.

03. Door of the Junction boxes shall be bolted/Hinged type. And also note that all the nuts & bolts in front cover shall be un-detachable type i.e. the same shall be remain attached with the front covers in case the covers are open if its bolted type . Junction box shall have neoprene/synthetic gasket lining of 5 mm thick to confirm IP 65 protection class.

04. All the junction boxes shall be suitable for mounting on walls, columns, structures etc. Also suitable accessories like mounting brackets, nuts (SS), bolts (SS), metal tag (SS), screws, clamps, fixtures, lock & Key, fire proof compound for sealing, washers, blind plug etc shall be included in suppliers scope of supply. Double compression Nickel plated brass cable glands shall be supplied & fixed at the bottom side of Junction Boxes. Make of Cable glands shall be Electromac/Comet/Braco.

05. All JB metallic parts should be connected to earth bus bar with 2.5mm2 copper green wires. A M10 earthing stud (3nos totally, 2 outside & 1 inside) shall be provided in each junction boxes.

06. Terminal blocks shall be properly arranged inside the junction boxes to facilitate easy termination (cage clamp type) of the cables suitable for 0.5mm2 to 2.5mm2. (Make Phoenix/Wago/Elmex).20 % Spare terminals shall be provided & fixed on each of the junction boxes distributed over terminal blocks uniformly.

07. All the TBs used shall be 6.6 polymide to withstand corrosion and the metallic portion shall be coated against rust/corrosion.

08. Adequate space shall be provided between TB's & between TB to wall of the junction box. The exact size and dimensions of junction boxes shall be as decided during detailed during detailed engineering stage keeping in view the no of terminals required etc. The same shall be subject to approval during detailed engineering stage.

09. Paint shade of junction boxes shall be informed later.

REMARKS:

Subsequent to order, bidder to furnish filled in BOM schematics / GA drgs/IP 65 test report etc.

TESTING:

1. Dimensional Test
2. Insulation resistance test at 500V DC between all terminals shorted and body - > 200Mohms. High Voltage test at 2.5KV AC for one minute between all terminals shorted and body.

Cable Gland details:

Sl.no.	Description	¾"	1"	1-11/4"
1	12 WAY FRP JB	4	2	-
2	24 WAY FRP JB	7	3	-
3	36 WAY FRP JB	9	4	-
4	48 WAY FRP JB	10	4	1
5	64 WAY FRP JB	14	5	2
6	72 WAY FRP JB	14	5	2
7	96 WAY FRP JB	16	6	2
8	128 WAY FRP JB	16	6	2

PQR AND TECHNICAL REQUIREMENTS FOR HAND HELD HART COMMUNICATOR

REVISION : 00

APPROVED
&
VERIFIED

SAILENDRA KUMAR KISAN

PREPARED	ISSUED	DATE
 Sandeep	416	08/06/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS :

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICIFICATION SHALL BE SUBMIITED IN ENGLISH ONLY.

2.0 Introduction : Bidders are required to offer HAND HELD HART COMMUNICATORs for a Thermal Power Plant of 800 MW rating and above.

3.0 In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Section C), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance separately.

5.0 In case Bidder does not include / incomplete/not meeting of Pre-qualification requirements (PQR) is furnished, total offer will be summarily Rejected and Bidder's Technical offers will not be Evaluated & liable for technical rejection automatically.

6.0 Technical Evaluation methodology :

Step 1:-
BHEL shall initially open Bidder's PQR documents only as per Section B of this specification for review & acceptance.

Step 2:-
Only after acceptance of PQR documents, BHEL shall open Bidder's Technical offers as per Cl 2.0 of above for evaluation.

Step 3:-
In the event of acceptance of Bidder's technical offers, the names of such Bidders along with details provided by them for PQR and details of Technical offers, shall be submitted to End users / Customers for their acceptance/approval. Commercial bids of only accepted/approved Bidders by End users / Customers, shall be considered by BHEL for further processing.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/ HAND HELD HART COMMUNICATOR /PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/ HAND HELD HART COMMUNICATOR /PQR / Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Section C will be submitted in a separate cover with Project name & bidders Reference marked on it as "Technical offer".

8.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor representative shall accompany BHEL representative for discussions.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for HAND HELD HART COMMUNICATOR, as a part of Offer:

1.0 Bidder shall be the OEM of the HAND HELD HART COMMUNICATORs or authorized manufacturer/dealer of OEM in India.

2.0 Submit Reference List of Projects wherein offered system is supplied & commissioned, along with details of HAND HELD HART COMMUNICATOR and Year of Commissioning of the equipment specified in Section C

2.0 Bidders shall note that qualifying criteria for this project is minimum of one year satisfactory operation in one or more coal based thermal power plants having unit rating of 200 MW or above for the main plant Packages (supplied only for off-site plant packages are not acceptable) as on 08-06-2015, for similar measurements indicated in Section C &D of this specification, for verification.

3.0 Vendors who are not registered in BHEL EDN for Hand Held Hart Communicators shall submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com. SRF along with credentials to be furnished separately by the Bidder. If any authorised representatives in India is the bidder then SRF is also applicable for OEM for the manufacturing place. Filling of SRF is now available in above mentioned website. It is to be noted that manufacturing place is only to be registered in the PMD(Product material Directory) for Hand Held Hart Communicators. If there are multiple place /countries of manufacturing then all manufacturing place/countries to be registered & details to be furnished in separate SRF for complete requirement of Hand Held Hart Communicators .Further if any model series to be offered are different manufacturing place than normally offered model series same also to be furnished in a separate SRF.

4.0 Vendors who are making offer for this tender shall have authorised representatives in India for support related to Documentation, Erection , Commissioning, servicing & any other co-ordination work required.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer :

1.0 Technical literature / Manuals of offered Hand Held Hart Communicators model series to be furnished.
2.0 Reports on successful erection & commissioning like Protocols / Minutes of the meetings with end user for current jobs for commissioning activity. End user certificates from customer with detailed plant address , designation of the customer & contact etc. for the completed jobs.
3.0 Name & registered address of the Indian branch office or Indian representative for after sales service & support with Organization chart.
4.0 Details of Manufacturing, testing & inspection facility.
5.0 Bidder shall have facility in India for Engineering activities, preparation of Documents etc. to be submitted.
6.0 **If Bidder is not a Original Equipment Manufacturer (OEM), then Bidder to include Authorisation letter from OEM for Design, Engineering, Assembly, Testing, supply , and Servicing of the offered Hand Held Hart Communicators. This Authorisation letter provided by OEM to Bidder shall indicate the Type**

and Duration of the agreement. Such authorized agents shall be legally registered in India for carrying out above activities. They have to mention clearly in the bidding as Non-OEM & OEM name to be indicated by providing above information.

<u>Important note :</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specifications.

SECTION-C : TECHNICAL REQUIREMENTS

1.0 Universal type Handheld HART Communicator for calibration of HART compatible Electronic Transmitters for measurement of pressure, flow, Diff. pressure and other HART compatible devices like Level transmitters, control valves & Analysers etc.

2.0 Universal type Handheld HART Communicator shall meet or exceed the following requirements

2.1 Memory: 16MB (minimum) to suit all HART foundation registered DDL {(configuration of smart instruments for range (Primary Value-PV), Damping & diagnosis features of the instrument & process parameters for all third party devices- manufactured options etc.} **No generic functional mode is acceptable.** New device software up gradation / down loading option (**3years min.** from the date of guaranty/warranty expiry condition of the project)shall be offered.

2.2 Operation shall be possible with NiMH batteries or 240VAC ± 10%, 50Hz supply through power adapter & universal plug.

2.3 Facility for data transfer through PC along with interface accessories like cable, software if applicable shall be offered etc.

2.4 **HHC shall be loaded with DD files** for the makes as min. for all HART devices/ Field Instruments for Electronics Transmitters, GWR LT, Radar type LT, Ultrasonic Type LT, Temp. Transmitters, Valve positioners, Disp. type level Transmitters, Analysers etc. as min.(Makes :-Fisher/Emerson & associated group, Yokogawa, Fuji, Endress+Hauser, Moore, M-systems, ABB , Vega, Siemens, Honeywell, Magnetrol, Dresser, Foxboro, Eckardt, Autrol, Smar, etc.).Same will be verified during inspection,if required.

3.0 Following accessories (Standard & Optional) shall be supplied, as minimum along with each communicator:

3.1 Soft carrying case with adjustable shoulder strip & lead compartment inclusive of protective boot.

3.2 HART leads – 1set

3.3 250 ohm load resister – 1No.

3.4 NiMH (or better) rechargeable batteries shall be indicated with capacity & continuous operation time with fully charged battery – 1 set.

3.5 Battery charger set – 1No.

3.6 Power adapter – 1No.

3.7 Universal plug kit for power adapter – 1No.

3.8 Standard banana jacks for HART

3.9 Any other accessories to complete the equipment.

4.0 Obsolete /discontinued models are not technically acceptable. Preferably the latest model to be offered.

PURCHASE SPECIFICATION
FOR
AIR FILTER REGULATORS

REVISIONS :

APPROVED BY

PUNIT P SINGH

PREPARED BY	ISSUED	DATE
PK	416	01/07/2015

CONTENTS

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

All required documents against this Tender/Specification shall be submitted in English only.

Introduction: Bidders are required to offer AIR FILTER REGULATOR to be used in Power Plant applications.

In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C & D), certain Pre-qualification criteria are required to be met by Bidder.

Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidder's Technical offers will not be evaluated.

Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Commercial bids of only accepted/approved Bidders by End users/Customers, shall be considered by BHEL for further processing.

Bidders are required to submit offers as detailed below:

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "Cl BB of Section B" marked on it.

cc. Technical offers/proposals for the Project, whose requirements are mentioned in Sections C &D will be submitted in a separate cover with Project name & Reference marked on it.

Note 1:-Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End users/Customers, Vendor shall accompany BHEL representative for discussions.

Note 2:- Deviations (if any) shall be discussed with only those vendors who quote for this tender.

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for AIR FILTER REGULATORS:

1. The bidder should have executed/ completed work of Design, supply, in 200 MW or above capacity for at least 2 units within preceding three (3) years as on the date of bid opening.
2. Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation & any other co-ordination work.
3. Submit Reference List of Projects wherein offered system is supplied & commissioned.
4. For Vendors offering upgraded / latest models, PQR of equivalent previous models are acceptable. OEM shall certify that offered model is upgraded version of previous existing model.
5. OEM shall furnish an undertaking that in case of change in Indian representative / agent, OEM shall continue to support supplies w.r.t to field service and supply of spare parts.
6. Bidder shall have optimum inventory of critical components like sensors/ electronic modules.
7. BHEL shall submit vendor credentials to customer and await customer's decision for one month from the date of PQ bid opening. If approval is not received within above period, BHEL shall treat the offer as "NOT Meeting PQ" criteria and offer shall be rejected.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1. Technical literature / Manuals of offered Sensors/ System/ Accessories.
2. In the event of technical specification not indicated in Technical literature, confirmation from OEM is acceptable. Such confirmations shall be suitably supported by certificates like Type test/ Routine test certificates.
3. Submit Unpriced Purchase Order copies for executed projects in the past three years.
4. Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.
5. Bidder shall have facility in India for Engineering activities, preparation of Documents, trouble shooting and calibration of the system. Submit these details.
6. If Bidder is not Original Equipment Manufacturer (OEM), then Bidder to include Authorization letter from OEM for Design, Engineering, Manufacture, Testing, supply and Servicing of the offered System. This Authorization letter provided by OEM to Bidder shall indicate the Type and Duration of Validity of the agreement.

Important note: In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the GENERAL INSTRUCTIONS in Section A of this specifications.

SECTION – C

SCOPE OF SUPPLY FOR EACH PROJECT:

Following items are required to be supplied as per SECTION –D:

1. Air Filter Regulators Total for each unit & all required accessories for mounting/unit.

2. Documents to be furnished in the events of order, before dispatch of items:-
   i. Test certificates/ reports and calibration reports, for approval.
   ii. O & M manuals –4 sets (2 sets to BHEL-EDN & 2 sets with consignment to site).
   iii. Data sheets / GA drawings and Instrument schedule to be provided in a soft copy (CD) compatible with windows 98 format (Autocad-14, MS Word, Excel). Also, a soft copy of O & M manual to be provided.

3. The unit rate for each item is to be indicated in the offer. The unit rates will be used for addition or deletion of items at a later stage if required.

4. Unit rates quoted will considered for mandatory spare if applicable.

SECTION D
TECHNICAL REQUIREMENTS FOR AIR FILTER REGULATOR

A. Air Filter Regulators and associated accessories shall be furnished in accordance with the specifications given below:-

SL. NO	TECHNICAL PARAMETER	SPECIFICATION
1	Type of Construction	Filter cum Pressure Regulator
2	Body Material	Die Cast Aluminium with epoxy coating.
3	Spring Material	SS
4	Trim Material	SS
5	Packing Material	Neoprene
6	Diaphragm	Manufacturers Standard
7	Filter Size & Material	5 Microns, Sintered Bronze
8	Normal Air Supply	2.5 Kg/cm2 to 8 Kg/cm2.
9	Output Range	0-2 Kg/cm2 (Adjustable) & Flow upto 10 SCFM
10	Maximum Pressure Input	10 Kg/cm2
11	Accuracy	+/- 0.1%
12	Weather proof	IP 65
13	Connection	¼" NPT (F)
14	Built-in housing Blowdown Valves shall be provided	
15	AFR shall have Automatic drain feature.	
16	Accessories: a) SS Pressure Gauge with 2" diameter. b) All required mounting Accessories for 2" NB pipe mounting (Clamp, bolt & Nut etc.) in SS material. c) SS Tag plate	

B. Vendor shall comply with Quality checklist indicated below.

QUALITY CHECK LIST FOR AIR FILTER REGULATORS

REF : CE/416/GEN/AFR REVISION : 00 DATE : 01/06/2015

CONTRACTOR: M/S B H E L – EDN

SL. NO.	TESTS/CHECKS	QUANTOM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS.	AGENCY**				REMARKS
				M	C	N	D *	
1	CHECK FOR MODEL TAG, DIMENSIONS	See note-1 below	Approved specs./data sheets	P	W	V	√	IN CASE OF IMPORTED ITEMS BHEL SHALL REVIEW TC & NOT INSPECT MANUFACTURER TO CARRYOUT ROUTINE TEST ON 100%
2	AIR LEAK TEST AT MAX. RATED PRESSURE			P	W	V	√	
3.1	EFFECT INLET PR VARIATION ON OUTPUT PR.			P	W	V	√	
3.2	EFFECT OF AIR SUPPLY FAILURE	Type test		P	W	V	√	
4	FILTER ELEMENT SIZE/TYPE			P	V	V	√	
5	TYPE TEST CERTIFICATE FOR CAPACITY			V	V	V	√	

LEGEND:
* RECORDS, IDENTIFIED WITH ' √ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB CONTRACTOR,
C: CONTRACTOR/NOMINATED INSP. AGENCY.
N: CUSTOMER "P" PERFORM "W" WITNESS "V" VERIFICATION

NOTE: 1) QUANTUM OF CHECK SHALL BE AS BELOW:
100 % - BY MANUFACTURER.
10% - BY M/S BHEL.
NIL – CUSTOMER.
2) MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.

SPECIFICATION
FOR
LOCAL INSTRUMENT ENCLOSURE (LIE) AND LOCAL INSTRUMENTS RACKS (LIR)

REVISION : 00

APPROVED

ASHISH M

PREPARED	ISSUED	DATE
R.K.L	416	16/04/2015

CONTENTS

		A4-10	**SECTION – A**	**REF. : CE / 416 / LIE-LIR / GI** **REV. NO. : 00** **PAGE : 01 0F 02**

GENERAL INSTRUCTIONS TO BIDDERS

REVISION : 00	**APPROVED** **ASHISH M**		
	PREPARED **RKL**	**ISSUED** **416**	**DATE** **16/04/2015**

SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

1.0 All required documents against this expression of interest shall be Submitted in English only.

2.0 Introduction: Bidders are required to offer Local Instrument Enclosure (LIE) & Local Instrument Racks (LIR) populated with components as per Technical Specification (refer Section C).

3.0 In order to accept the Bidders for LIE-LIR as per Specification (refer Sections C), certain Pre-qualification criteria are required to be met by Bidder.

4.0 Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.

5.0 In case Bidder does not include the details or meet the requirements of Pre-qualification requirements, their offer will be summarily rejected and Bidders will not be Evaluated.

6.0 Evaluation methodology : BHEL shall initially open Bidder's PQR documents as per Section B of this specification for review & acceptance. Only after acceptance of PQR documents, the Bidder will be further evaluated for registration as a vendor with BHEL. However bidders to note that their acceptance for a particular project will be based on approval of bidders name by End user for that project.

7.0 Bidders are required to submit offers as detailed below :

aa. Documents pertaining to Pre-Qualification requirement (Cl AA of Section B of this Specification) shall be in a Separate cover with reference no. "CE/416/LIE-LIR/PQR / Cl AA of Section B" marked on it.

bb. Documents pertaining to Pre-Qualification requirement (Cl BB of Section B of this Specification) shall be in a Separate cover with reference no "CE/416/LIE-LIR/PQR / Cl BB of Section B" marked on it.

8.0 Whenever required during evaluation of PQR, vendor is required to be present at BHEL Electronic Division, Mysore Road, Bangalore, for discussions.

	A4-10	**SECTION – B**	**REF. : CE / 416 / LIE-LIR / PQR** **REV. NO. : 00** **PAGE : 01 0F 03**

PRE-QUALIFICATIONS REQUIREMENTS

REVISION : 00	**APPROVED** **ASHISH M**	
	PREPARED **RKL**	**ISSUED** **416**
		DATE **16/04/2015**

SECTION- B

AA. Pre-Qualification Requirements (PQR) of Bidders for Local Instrument Enclosures and Racks (LIE-LIR:

1.0 Submit Reference List of Projects wherein offered LIE & LIR has been supplied

2.0 The bidder should have executed / completed work of "Design, supply, complete LIE LIR package for at least 2 units in coal fired power plant. For the purpose of evaluation, system shall be not less than 150 Pressure transmitters / Pressure switches.

3.0 Original Equipment Manufacturers based outside India, who are making offer for this tender shall have authorized representatives in India for support related to Documentation, Erection & any other co-ordination work.

3.0 Submit List of Projects for which LIE & LIR has been supplied in last three year.

4.0 Submit duly-filled Source Request Form (SRF), which shall be downloaded by Bidder from our website "www.bhel.com.

5.0 Bidders shall have experienced welders for welding of materials specified in the Technical specification (refer Section C). Welder's certificate shall be provided for verification.

6.0 Bidders shall have a designated drawing office with AUTOCAD, submission of Engineering drawings in pdf format, availability of standards such as ASTM / ASME/IS/BSI standards for Seamless pipe, material, Instrument valves, socket weld fittings.

7.0 Bidders shall have designated machine shop including sheet metal fabrication required for fabrication of LIE-LIR, Painting facility for both epoxy based tank process painting and powder coating facility.

8.0 Bidder shall have facility for performing 100 % hydro test on all individual lines.

9.0 Vendor shall have requisite working personal, machine shop, painting facility, space for physical inspection, loading facility etc for offering about 100 LIE and 100 LIRs at the same time for inspection.

10.0 BHEL shall visit vendor's work for verification of facilities offered and BHEL decision on suitability of manufacturing facility is final and binding.

BB. Along with the documents related to PQR above, following details shall also be included in the Offer:

1.0 Unpriced Purchase Order copies of LIEs-LIRs.
2.0 Documents and drawings of LIEs-LIRs supplied to power plant.
3.0 Details of Manufacturing, testing & inspection facility.
4.0 Bidder shall have facility for Engineering activities, preparation of Documents Etc. Submit these details with.
5.0 Name & registered address of the Indian branch office or Indian representative for support of E&C and after sales service with Organization chart.

<u>Important note:</u> In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the General instructions in Section A of this specifications.

TECHNICAL SPECIFICATION FOR LOCAL INSTRUMENT ENCLOSURES AND RACKS

REVISION : 00

APPROVED

ASHISH M

PREPARED	ISSUED	DATE
RKL	416	16/04/2015

CONTENTS

TECHNICAL REQUIREMENT
FOR
LOCAL INSTRUMENT ENCLOSURE / RACKS
(LIE / LIR)

REVISIONS :

APPROVED BY

AM

PREPARED BY	ISSUED	DATE
RKL	416	16/04/15

TECHNICAL REQUIREMENTS FOR TRANSMITTER ENCLOSURES AND TRANSMITTER RACKS:

I. TRANSMITTER ENCLOSURES:

1. The Transmitter enclosures (Closed type) are provided for mounting Transmitters etc. and located in Boiler area. This shall be constructed of 3 mm thick steel sheet material.

2. These shall be reinforced as required to ensure true surfaces and to provide adequate Support for instruments and other equipment mounted therein. Double interlocking doors shall be provided and shall be arranged for maximum possible access to the module interior. Center posts or any member which would reduce access shall not be provided.

3. The doors shall be the three-point locking type constructed of not less than 3 mm steel sheet. Doors shall have concealed quick removal type pinned hinges and locking handles. Enclosure door locks shall accept the same / common key all over the plant. Gaskets shall be used between all mating sections to achieve dust proof enclosure rating for the modules and waterproof and dust tight rating on the Terminal / Junction boxes. All enclosures shall have access doors on Front and Rear sides.

4. Internal wirings between the Transmitters and Terminal / Junction box shall run through flexible dust tight conduits.

5. Anti Vibration Pads of minimum 15 mm thickness shall be provided for supporting each enclosure.

6. Construction of same shall be typically as per enclosed drawing 1) CE/416/LIE-LIR/OGA1 2)CE/416/LIE-LIR/OGA2

7. Service Power and Lighting

Each enclosure shall be provided with one receptacle, one light fixture with wire guard and one lighting switch and suitable MCBs. Lighting switches may be doors actuated, mounted door. Light switches and receptacles shall be installed inside the enclosure on the wall near the latch side of the enclosure door. Light fixtures shall be installed on the ceilings of the enclosures. Power supplies for miscellaneous devices shall be provided with fuses located within the Enclosure JB. Fuses shall be mounted in fuse blocks. Fuse ratings will be given on electrical schematic diagrams. Power supply shall be 240 V AC.

8. Equipment Installation

a. Enclosures shall be provided to mount field instrument, equipment and accessories. Vendor shall prepare enclosures and piping drawings indicating the layout for each enclosure. Special attention shall be given in the piping layout to avoid air traps in liquid filled piping, or water pockets in piping intended to be dry.

b. Drawings shall indicate the arrangement of all Piping, Valves and Fittings within the enclosures.

9. **Impulse Piping /Tubing**

a. Transmitter enclosures shall be complete with impulse tubing piping, valves from enclosure bulkhead connection to all instruments and necessary drain / blow down connections. The type, sizes, material and pressure class of pipes/tubes, fittings, valves etc. shall be suitable for the intended applications as per the Schemes / Tagging list of Instrument, provided by BHEL.

b. Bulkhead connection shall be used when instrument piping/ tubing enters the enclosure through Bulkhead plate. Typically through Bulk heads, Impulse pipe entry shall be through Top side of the Enclosure for Steam and Liquid services and for Air / flue gas services, impulse pipe entry shall be from Bottom side.

c. All Instrument Blow down lines, except those measuring vacuum shall be connected to a two-inch header, which is extended through one end of the enclosure and turned downward at other end.

d. Instrument piping and tubing shall be hydrostatically tested at one and one-half times the maximum system pressure for that instrument except for low pressure and vacuum measurement the test pressure will be 8 Kg / Cm2.

10. For Purging :

a. Pneumatic tubing shall be installed for all pneumatic devices, such as Air filter Regulator, Purge rotameters, Isolation valves, distribution air-header etc. Pneumatic tubing shall be installed in a neat workmanlike manner in protected locations with suitable supports. All Pipes / Tubes, which enter or leave the enclosure, shall be terminated on bulkhead fittings in the bulkhead plate. Pneumatic tubing material shall be ½" OD SS316 tubing Flareless SS- Tube fittings shall be used for tubing connections.

b. Instrument tubing schematic, connection and interconnections diagrams shall be furnished.

11. Wiring Within Enclosures and Grounding

Vendor shall furnish general arrangement and wiring diagrams for each transmitter Enclosures for approval.

12. **Enclosure Electrical Junction Box**

a. IP 65 junction box for the termination of all internal wiring shall be provided for each transmitter enclosure.

b. Junction boxes for enclosures shall be fabricated externally on one end of each enclosure assembly to accept field wiring through the top or bottom of the junction box. The Junction box shall be 150 millimeters minimum depth. A hinged door shall give access to the interior of the junction box. Junction boxes shall be provided with fluorescent lighting. Same key shall be used to lock both Junction box & enclosure.

II. OPEN TYPE TRANSMITTER RACKS:

1. Transmitter racks is provided for mounting transmitters and other accessories, in buildings and closed areas like the power house building / turbine hall.

2. Racks shall be constructed on structural members of adequate strength and rigidity to ensure proper support to the mounted instruments and equipment. Racks shall be of welded construction. Each rack shall be provided with a canopy to protect the instrument from dripping water or falling objects.

3. All Valves & Manifolds shall be securely mounted and the structural design shall be such that no item shall interfere with maintenance and removal of instrument, equipment and their accessories.

4. Construction of same shall be typically as per enclosed drawing 1) CE/415/LIELIR/OGA1 (2)CE/416/LIELIR/OGA2

5. Service Power and Lighting

a. Each rack shall be provided with one receptacle, one light fixture with wire guard and one lighting switch. Light fixtures shall be installed on the canopy of the rack.

b. Power supplies for miscellaneous devices shall be provided with fuses located within the rack JB. Fuses shall be mounted in fuse blocks. Fuse ratings will be given on electrical schematic diagrams. Power supply shall be 240 V AC.

6. Equipment Installation

Vendor shall prepare rack fabrication and piping drawings indicating the layout of each Rack. Transmitter/Instruments shall be installed using custom fabricated supports which are attached to the vertical members provided for this purpose. Drawings shall indicate the arrangement of all equipment, piping, valves and fittings within the rack and shall be subject to approval.

7. Impulse Piping / Tubing

a. Transmitter racks shall be complete with impulse tubing piping, valves from enclosure bulkhead connection to all instruments and necessary drain / blow down connections. The type, sizes, material and pressure class of pipes/tubes, fittings, valves etc. shall be suitable for the intended applications as per the Schemes / Tagging list of Instrument, provided by BHEL.

b. Bulkhead connection shall be used when instrument piping/ tubing enters the enclosure through Bulkhead plate. Typically through Bulk heads, Impulse pipe entry shall be through top side of the Enclosure for Steam and Liquid services.

c. All Instrument Blow down lines, except those measuring vacuum shall be connected to a two-inch header, which is extended through one end of the enclosure and turned downward for directing the blow down into drain.

d. Instrument piping and tubing shall be hydrostatically tested at one and one-half times the maximum system pressure for that instrument except for low pressure and vacuum measurement the test pressure will be 8 Kg / Cm2.

8. Wiring of the Racks

a. A fully enclosed IP 65 type junction box shall be provided in each rack for housing the terminal blocks, power supply fuses and other electrical accessories, as required.

b. All electrical connections between instrument and the Terminals in Junction box shall be made. In addition all utility wiring for lighting and service power shall be installed.

c. Vendor shall furnish general arrangement and wiring diagrams for each transmitter rack for approval.

d. Junction boxes for the racks shall be mounted on one end of each assembly to accept field wiring through the top or bottom of the junction box.A removable bolted door shall give access to the interior of the junction box. All junction boxes shall accept same key. JB shall be of CRCA material with 3mm thick and IP65 protection class. Door shall be of self locking type with common key. Door gasket shall be of synthetic rubber.

III. General Requirement applicable to Transmitter Enclosures & Racks :

1. Surface preparation And Painting

a. All sheet metal / exterior steel surfaces shall rust free and scale free and all other residue during fabrication operation such as Oil, grease and salts etc. shall be removed by one or more solvent cleaning methods. Epoxy primer surface shall be applied to all exterior and interior surfaces. Epoxy paint shall be applied to all surfaces and the paint thickness shall be 100 to150 microns. The finish colours for exterior and interior surfaces shall conform to the shades mentioned in scope of supply.

1. Grounding

a. Enclosures and Racks shall be provided with a continuous tinned copper ground bus of minimum 25 mm X 6 mm cross section, extended along the entire length. The ground bus shall have two (2) bolts drilling with GI bolts and nuts at each end.

2. Name plate / Label.

a. Service details and Tag no. shall be engraved on a nameplate or label for each of the Transmitter. These Nameplates or Labels shall be of white non-hygroscopic material with engraved black lettering. This shall be fixed on to the Impulse Pipe closer to the Transimitter inside the Enclosure / Rack.

3. Wiring Details

a. Interconnecting wiring shall be provided between all electrical devices mounted in the panels and between the devices and terminal blocks if the devices are to be connected to equipment outside the panels by cabling. All interior wiring shall be installed neatly

and carefully and shall be terminated at suitable terminal blocks in the Junction box. Sufficient clearance shall be provided for all control and instrumentation leads.

b. Each wire shall be identified at both ends with wire designations as per approved wiring diagram. Interlocking type ferrules shall be used for identification.

c. All wire termination shall be made with insulated sleeve and cage clamp type terminals.

d. All signal wiring shall be done with 2 pair, 0.5 sq. mm annealed tinned copper, pair twisted overall & shielded (Individual & overall), voltage grade 660 V , FRLS PVC sheathed cable and 4 pair, 0.5 sq. mm for PS/DPS. For power supply application, 1100V cable shall be used.

e. Wires shall be dressed and run in trays or troughs with clamp-on type covers. Wiring may be neatly bunched in-groups by non-metallic cleats or bands. Shield wires shall be terminated on separate terminal blocks.

f. Internal wiring shall follow distinct color coding to segregate different voltage levels viz. 24V DC & 230V AC

g. Junction Box of enclosures will be provided with removable, gasketted cable gland for cable entrance.

4. Fuse Blocks

a. Fuse blocks shall be modular type with bakelite frame and reinforced retaining clips.

5. Terminal Blocks

a. Terminal blocks shall be DIN rail mounted and shall have Cage clamp type connection which shall be maintained for all panels uniformly.

b. The rated cross section of the terminal blocks shall be suitable for connecting 0.5-mm^2/2.5 mm^2. Conductor of suitable voltage grade as specified.

c. Terminal blocks shall be mounted vertically with adequate spacing between rows for routing the cable troughs and to allow adequate free workspace for termination and removal of wires.

d. Terminal blocks shall be provided with white marking strips/self adhesive marker cards.

e. At least 25 percent spare unused terminals shall be provided on each terminal blocks for circuit modifications and for termination of all conductors in a multi conductor control cables.

f. Terminal blocks for termination of electrical power supply shall be type WAGO / PHOENIX make of suitable size with marking strips.

g. The last terminal in a rail-mounted assembly shall be closed with an end plate and end bracket.

IV. Documents to be Submitted by Vendor for Approval :

1. OGA for Transmitter Enclosure and Racks.
2. Layout of Components in each of Transmitter Enclosure and Rack.
3. Electrical diagrams for each Transmitter Enclosure and Rack.
4. Component datasheets
5. Quality plan including Welding Procedure specification and Welder Procedure qualification Record.
6. The quality plan shall include Visual inspection, GA BOM/Layout features verification, Dimensions, Paint shade, thickness measurement, Alignment of sections, component ratings, Wiring, IR, HV, review of TC for instruments / Devices, Accessibility of TBs / Devices, Illumination, Tubing and Degree of protection (Review of type test certificate)

V. Specific requirements

1. Sub components shall be as per vendors approved by End user .BHEL Approved vendors for sub components is indicated in ref: CE/416/LIE-LIR/VL.
2. Bidders to submit type test for IP class for verification.
3. Typical quantity requirement is indicated in table A.

Table A

S.No	Drawing Reference no	Description	Quantity/Unit	Tentative Quantity per annum	Unit Of Measurement
1	CE/416/LIE-LIR/OGA1	LIE TYPE A	13	123	No
2	CE/416/LIE-LIR/OGA1	LIE TYPE B	18	166	No
3	CE/416/LIE-LIR/OGA1	LIE TYPE C	18	186	No
4	CE/416/LIE-LIR/OGA2	LIE TYPE D	9	44	No
5	CE/416/LIE-LIR/OGA2	LIE TYPE E	9	57	No
6	CE/416/LIE-LIR/OGA2	LIE TYPE F	2	12	No
7	CE/416/LIE-LIR/OGA1	LIR TYPE A	21	171	No
8	CE/416/LIE-LIR/OGA1	LIR TYPE B	12	144	No
9	CE/416/LIE-LIR/OGA1	LIR TYPE C	7	69	No
10	CE/416/LIE-LIR/OGA2	LIR TYPE D	11	54	No
11	CE/416/LIE-LIR/OGA2	LIR TYPE E	28	66	No
12	CE/416/LIE-LIR/OGA2	LIR TYPE F	4	173	No
13	CE/416/EOI/HUP page no 2 of 49	HOOK UP SCHEME PT/PS 1/2" P91 9000CL	15	30	No
14	CE/416/EOI/HUP page no 4 of 49	HOOK UP SCHEME DPT/DPS 1/2" P91 9000CL	9	2	No
15	CE/416/EOI/HUP page no 6 of 49	HOOK UP SCHEME PT / PS 1/2” P91 6000CL	14	98	No
16	CE/416/EOI/HUP page no 8 of 49	HOOK UP SCHEME DPT / DPS 1/2” P91 6000CL	8	56	No
17	CE/416/EOI/HUP page no 10 of 49	HOOK UP PT/PS 9000 STEAM AND WATER	8	66	No
18	CE/416/EOI/HUP page no 12 of 49	HOOK UP SCHME DPT/FT/LT 9000 STEAM AND WATER	3	26	No
19	CE/416/EOI/HUP page no 14 of 49	HUP SCHEME PT/PS-1/2” P22 6K SCH 160	8	108	No
20	CE/416/EOI/HUP page no 16 of 49	HUP SCHEME DPT / DPS-1/2” P22 6K SCH 160	6	182	No
21	CE/416/EOI/HUP page no 18 of 49	HUP SCHEME PT /PS-1/2” P22 SCH 80	6	42	No
22	CE/416/EOI/HUP page no 20 of 49	HUP SCHEME DPT / DPS-1/2” P22 SCH 80	11	113	No
23	CE/416/EOI/HUP page no 22 of 49	HUP SCHEME PT /PS-1/2” A106 9K SCH- XXS	3	21	No

S.No	Drawing Reference no	Description	Quantity/Unit	Tentative Quantity per annum	Unit Of Measure ment
24	CE/416/EOI/HUP page no 24 of 49	HUP SCHEME DPT / DPS-1/2" A106 9K SCH- XXS	3	21	No
25	CE/416/EOI/HUP page no 26 of 49	HOOK UP PT / PS STEAM AND WATER A 106 6K	12	222	No
26	CE/416/EOI/HUP page no 28 of 49	HOOK UP DPT /FT/LT STEAM AND WATER A106 6K	18	267	No
27	CE/416/EOI/HUP page no 30 of 49	HOOK UP SCHEME PT / PS 3000 WATER	78	1152	No
28	CE/416/EOI/HUP page no 32 of 49	HOOK UP SCHEME DPT / DPS 3000 WATER	68	1021	No
29	CE/416/EOI/HUP page no 34 of 49	HOOK UP PT/PS 3000 DM WATER SS316 PIPES	21	203	No
30	CE/416/EOI/HUP page no 36 of 49	HOOK UP SCHEME DPT / FT 3000 CLASS SS316	25	195	No
31	CE/416/EOI/HUP page no 38 of 49	HOOK UP SCHEME PT / PS CLEAN AIR TOP ENTRY 3/4"	4	48	No
32	CE/416/EOI/HUP page no 40 of 49	HOOK UP SCHEME PT / PS CLEAN AIR SERVICE	40	437	No
33	CE/416/EOI/HUP page no 42 of 49	HOOK UP SCHEME DPT/ FT/DPS FLUE GAS	45	576	No
34	CE/416/EOI/HUP page no 44 of 49	HOOK UP SCHEME PT/PS FLUE GAS - F22	3	15	No
35	CE/416/EOI/HUP page no 46 of 49	HOOK UP SCHEME DPT/FT/LT FLUE GAS -F22	3	16	No
36	CE/416/EOI/HUP page no 48 of 49	HOOK UP FOR AIR PURGING	30	391	No
37	CE/416/EOI/HUP page no 48 of 49	HOOK UP FOR CONTINUOUS PURGING	127	1603	No
38	CE/416/EOI/HUP page no 48 of 49	HOOK UP SCHEME FOR INTREMITTENT PURGING	31	398	No

Note:

1)Typical qunatity per per boiler and per annum indicated and applicability of each in a project will be as per detail engineering

2)Bidders to be refer that schemes under S.L.No from 13 to 38 has to be assembled in side LIE/LIR under S.No 1 to S.No 12 as per grouping provided during detailed engineering

OGA DRAWINGS
FOR
LOCAL INSTRUMENT ENCLOSURE / RACKS
(LIE / LIR)

Enclosed OGA Drawing Ref: 1) CE/416/LIE-LIR/OGA1 2)CE/416/LIE-LIR/OGA2

REVISIONS :

APPROVED BY

AM

PREPARED BY	ISSUED	DATE
RKL	416	16/04/15

FIRST ANGLE PROJECTION

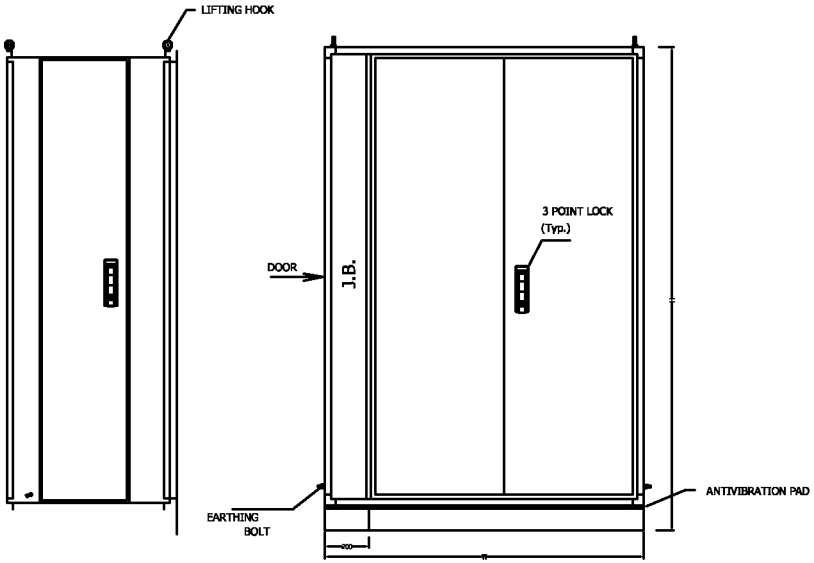
(ALL DIMENSIONS ARE IN mm)

DRG. No. CE/416/LIE/LIR/OGA1

REF. DRG. No.

SIGN. & DATE

INVENTORY No.



LH SIDE VIEW

FRONT VIEW

NOTES:-

1. ALL SHEETs ARE 3.0mm CRCA SHEET
2. ALL DOORS WILL BE FLUSH / CONCEALED TYPE
3. BASE FRAME SHALL BE MADE OF ISMC 100
4. BULK HEAD PLATE FOR TOP & BOTTOM SHALL BE PROVIDED
5. CABLE GLAND PLATE OF THICKNESS 3.0 mm. CRCA SHEET SHALL BE PROVIDED TOP AND BOTTOM OF J.B
6. ENCLOSURE SHALL BE OF IP-65 PROTECTION CLASS
7. TERMINAL SHALL BE PROVIDED IN SIDE THE J.B. AS PER TRANSMITTER GROUPING
8. DOORS SHALL BE THREE POINT LOCKING FOR FRONT AND REAR DOOR AND SIDE DOOR LEAF
9. THE WIDTH OF JB IS EQUAL TO DEPTH OF ENCLOSURE
10. GASKET SHALL BE PROVIDED BETWEEN BULK HEAD PLATE & ENCLOSURE
11. EARTH BUS BAR 25x6mm TINNED COPPER SHALL BE USED
12. 2 Nos. CFL 11W,230V AC WITH FIXTURE SHALL BE PROVIDED
13. DRAIN PIPE SLOPE WILL BE I : 25 APPROX.
14. POWER SOCKET SHALL BE PROVIDED IN J.B. OF ENCLOSURE

LIE TYPE	H	W	D
A	2200	1450	800
B	2200	1100	800
C	2200	700	700

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED

	NAME	SIGN	DATE
DRAWN	HKS		15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

PROD / PROJ :

CUSTOMER:

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA-FOR-LIE

No. OF SHEETS: 03

SHEET No.: 01

WBS. No.:

DRG. No. CE/416/LIE/LIR/OGA1

REV 00

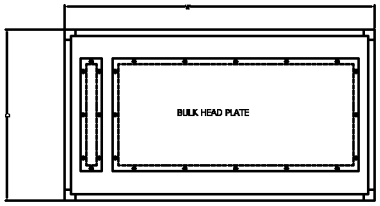
FORM No. A3-03

A3 SIZE

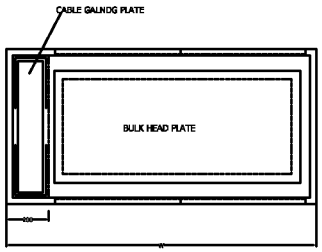
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

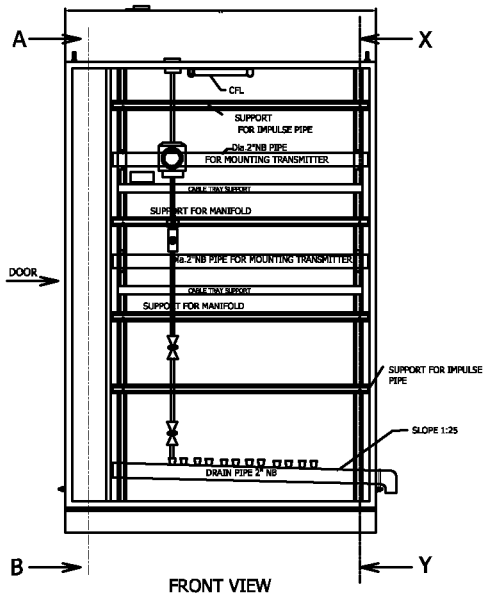
DWG. No. CE/416/LIE/LIR/OGA1



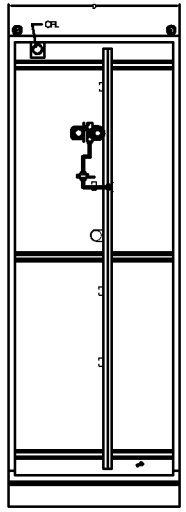
TOP VIEW



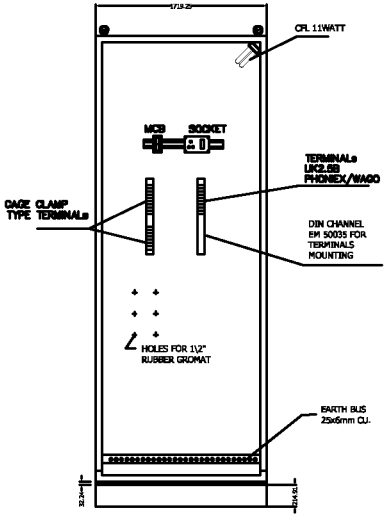
BOTTOM VIEW



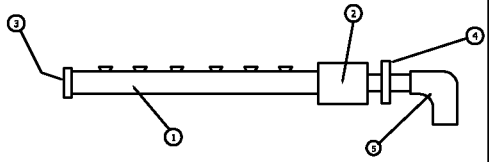
FRONT VIEW



SIDE VIEW FROM X-Y



SIDE VIEW FROM A-B



DRAIN PIPE

ITEM	DESCRIPTION	QTY.
1	2" NB ASTM A-106' SCH80/GR-C	A/R
2	2" NBSW X 1" NPT(F) COUPLING CS ASTM A105	1No.
3	2" S.W.CAP,CS ASTM A105	1No.
4	1" NPT (M) X1" BSP(M) HEX. COUPLING, CS ASTM105	1No.
5	1" BSP (F) ELBOW, CS ASTM A105	1No.

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

PROD / PROJ :

CUSTOMER:

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED

	NAME	SIGN	DATE
DRAWN	HKS		15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA–FOR–LIE

No. OF SHEETS 03

SHEET No. 02

WBS. No.

DRG. No. CE/416/LIE/LIR/OGA1

REV 00

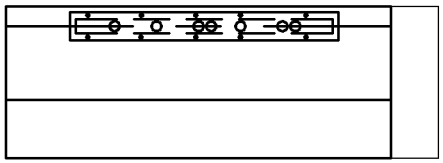
FORM No. A3–03

A3 SIZE

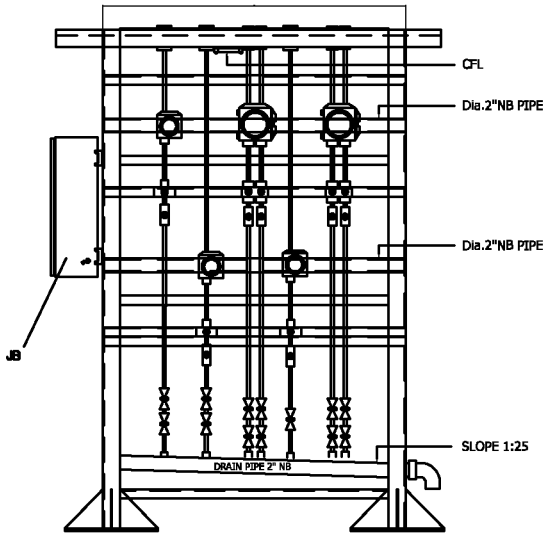
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

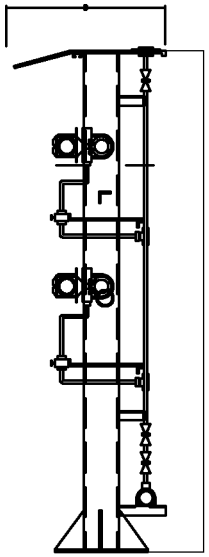
DWG. No. CE/416/LIE/LIR/OGA1



TOP VIEW



FRONT VIEW



SIDE VIEW

NOTES:

1. JB TO BE LOCATED INSIDE THE LIR. JB DOOR SHALL OPEN FORM OUTSIDE.
2. LIR'e ARE WITH 4 LEGS.
3. MIN JB DIMENSION 600 MM X 200 MM X 200 MM.
4. SUPPORTING LEG SHALL BE MADE OF 6 MM THK ANGLE.
5. BULK HEAD PLATE SHALL BE PROVIDED AT THE TOP
6. GASKET SHALL BE PROVIDED BETWEEN BULK HEAD PLATE & RACK
7. EARTH BUS BAR 25x6mm COPPER SHALL BE USED
8. 2 No CFL 11W,230V AC WITH FIXTURE SHALL BE PROVIDED
9. POWER SOCKET SHALL BE PROVIDED IN J.B. OF RACK
10. CANAPY ASSEMBLY WITH 3 MM THICK CRCA SHEET
11. TERMINALS SHALL BE PROVIDED IN SIDE THE JB AS PER GROUPING PROVIDED

LIR TYPE	H	W	D
A	2200	1400	650
B	2200	1100	650
C	1500	800	650

REF. DRG. No. FLREF

SIGN. & DATE

INVENTORY No.

REV.	DATE	ALTERED – / CHECKED – / APPROVED –	REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–		–	–	

	NAME	SIGN	DATE
DRAWN	HKS		15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

PROD / PROJ : –

CUSTOMER: –

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA–FOR–LIR

No. OF SHEETS 03

SHEET No. 03

WBS. No. –

DRG. No. CE/416/LIE/LIR/OGA1

REV 00

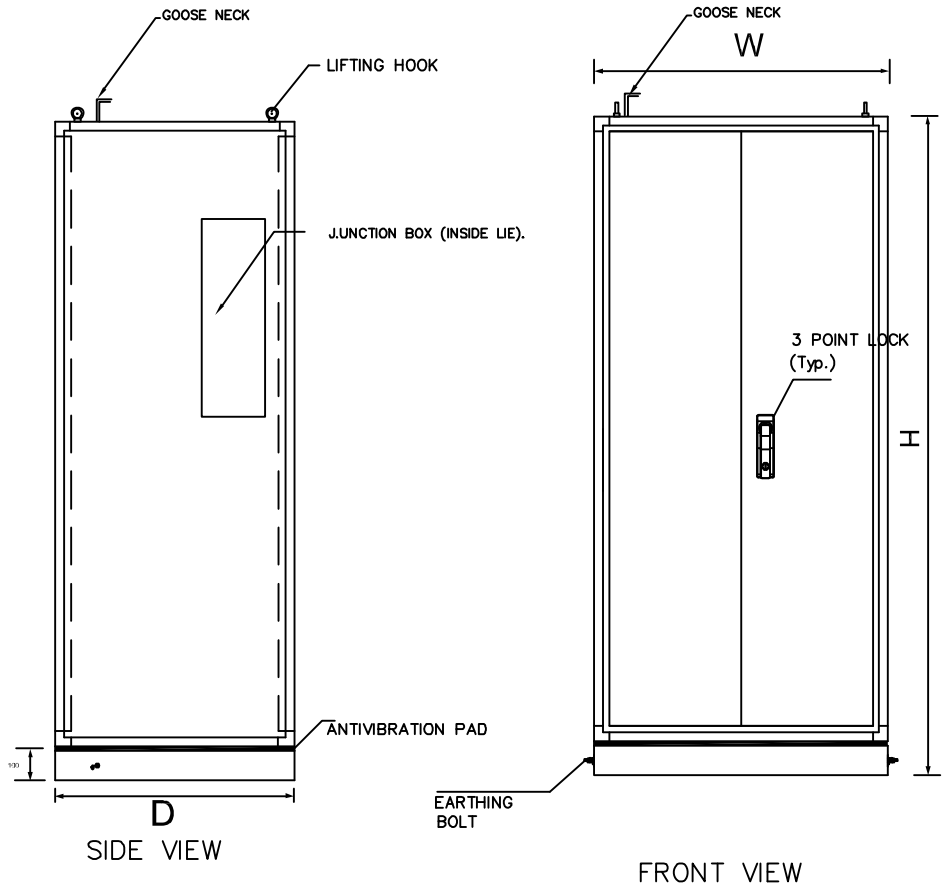
FORM No. A3–03

A3 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. No. CE/416/LIE/LIR/OGA2



NOTES:-

1. ALL SHEETs ARE 3.0mm CRCA SHEET
2. ALL DOORS WILL BE FLUSH / CONCEALED TYPE
3. BULK HEAD PLATE FOR TOP & BOTTOM SHALL BE PROVIDED
4. CABLE GLAND PLATE OF THICKNESS 3.0 mm. CRCA SHEET SHALL BE PROVIDED AT BOTTOM OF J.B
5. ENCLOSURE SHALL BE OF IP-55 PROTECTION CLASS
6. TERMINAL SHALL BE PROVIDED IN SIDE THE J.B. AS PER TRANSMITTER GROUPING
7. DOORS SHALL BE THREE POINT LOCKING FOR FRONT AND REAR DOOR
8. GASKET SHALL BE PROVIDED BETWEEN BULK HEAD PLATE & ENCLOSURE
9. EARTH BUS BAR 25x6mm COPPER SHALL BE USED
10. MIN JB DIMENSION 800 MM X 200 MM X 200 MM.
11. BASE FRAME SHALL BE MADE OF ISMC 100
12. 1 No CFL 11W,230V AC WITH FIXTURE SHALL BE PROVIDED
13. DRAIN PIPE SLOPE WILL BE I : 25 APPROX.
14. POWER SOCKET SHALL BE PROVIDED IN J.B. OF ENCLOSURE

LIE TYPE	H	W	D
D	2200	1400	800
E	2200	1000	800
F	2200	700	800

REF. DRG. No. FLREF

SIGN. & DATE

INVENTORY No.

REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–	

REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–	

	NAME	SIGN	DATE
DRAWN	HKS	-sd-	15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

PROD / PROJ : –

CUSTOMER: –

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA-FOR-LIE

No. OF SHEETS 03

SHEET No. 01

WBS. No. –

DRG. No. CE/416/LIE/LIR/OGA2

REV 00

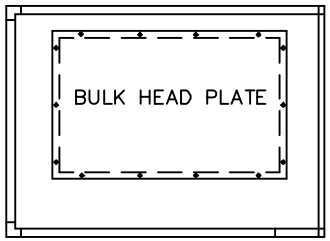
FORM No. A3-03

A3 SIZE

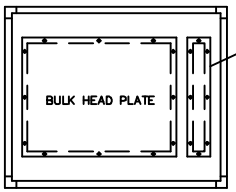
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

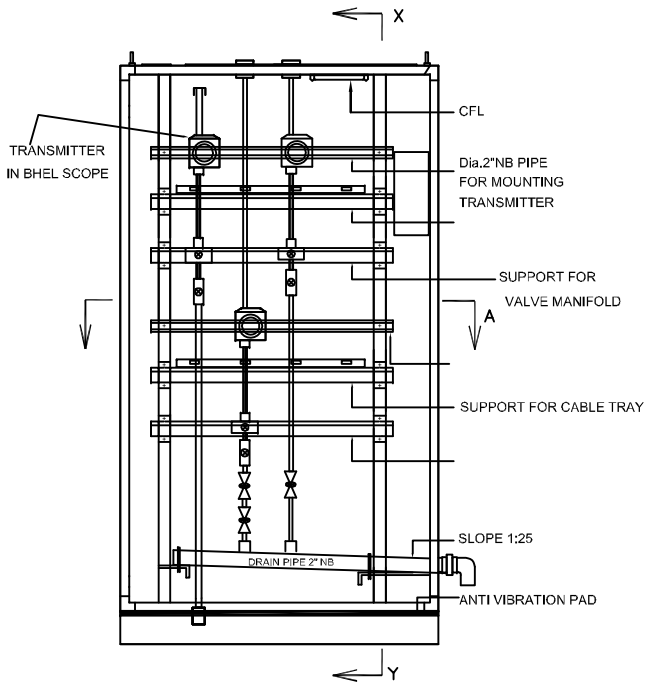
DRG. NO. CE/416/LIE/LIR/OGA2



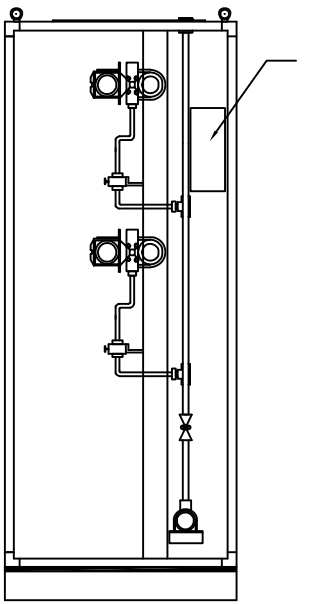
TOP VIEW



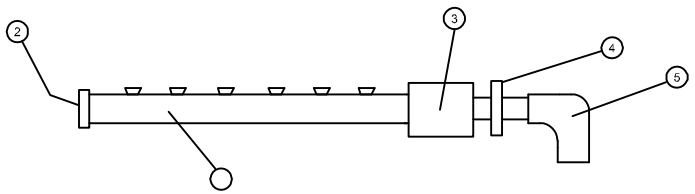
BOTTOM VIEW



FRONT VIEW



SIDE VIEW FROM X–Y



DRAIN PIPE

ITEM	DESCRIPTION	QTY.
1	2" NB ASTM A-106' SCH80/GR-C	A/R
2	2" S.W.CAP,CS ASTM A105	1No.
3	2" NBSW X 1" NPT(F) COUPLING CS ASTM A105	1No.
4	1" NPT (M) X1" BSP(M) HEX. COUPLING, CS ASTM105	1No.
5	1" BSP (F) ELBOW, CS ASTM A105	1No.

PROD / PROJ : –

CUSTOMER: –

REF. DRG. No. FLREF

SIGN. & DATE

INVENTORY No.

REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–	

REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–	

	NAME	SIGN	DATE
DRAWN	HKS	-sd-	15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA–FOR–LIE

No. OF SHEETS 03

SHEET No. 02

WBS. No. –

DRG. No. CE/416/LIE/LIR/OGA2

REV 00

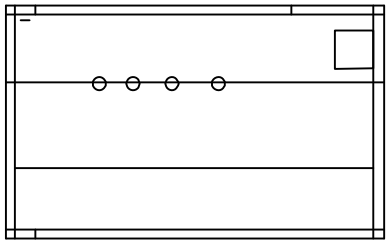
FORM No. A3–03

A3 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

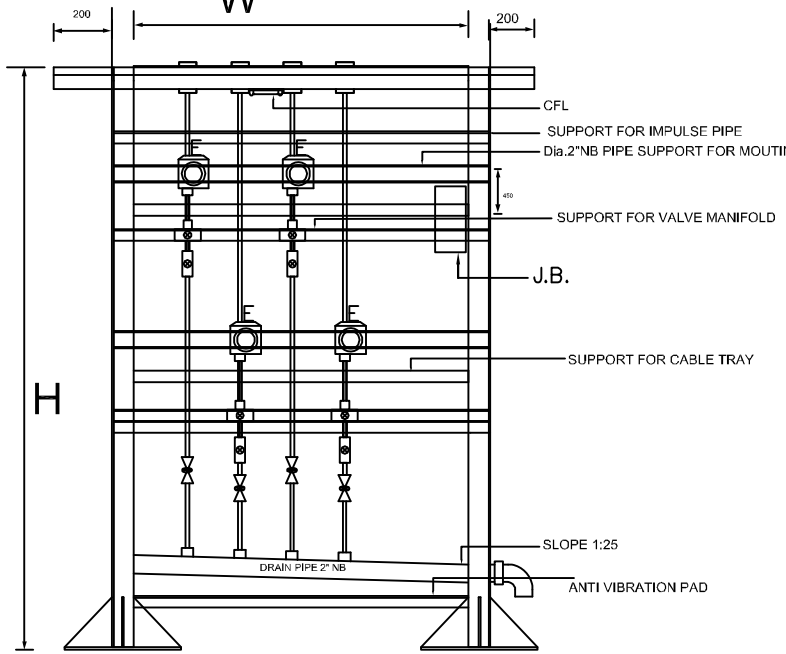
DRG. No. CE/416/LIE/LIR/OGA2



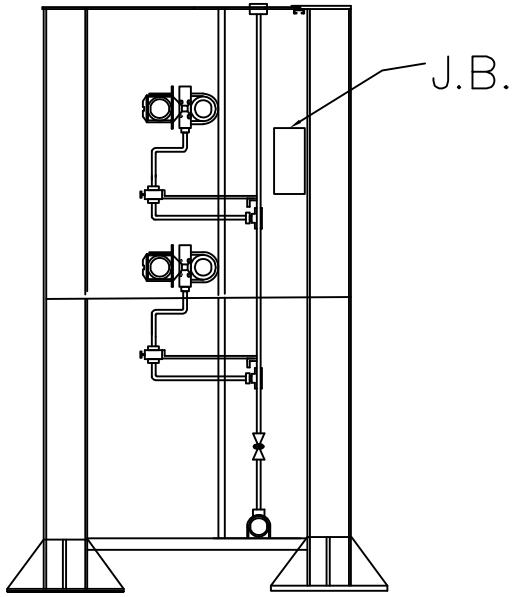
TOP VIEW

NOTES:

1. JB TO BE LOCATED INSIDE THE LIR. JB DOOR SHALL OPEN FORM OUTSIDE.
2. LIR's ARE WITH 4 LEGS.
3. MIN JB DIMENSION 800 MM X 200 MM X 200 MM.
4. SUPPORTING LEG SHALL BE MADE OF 6 MM THK ANGLE.
5. BULK HEAD PLATE SHALL BE PROVIDED AT THE TOP
6. TERMINAL SHALL BE PROVIDED IN SIDE THE J.B. AS PER TRANSMITTER GROUPING
7. GASKET SHALL BE PROVIDED BETWEEN BULK HEAD PLATE & RACK
8. EARTH BUS BAR 25x6mm COPPER SHALL BE USED
9. 1 No CFL 11W,230V AC WITH FIXTURE SHALL BE PROVIDED
10. POWER SOCKET SHALL BE PROVIDED IN J.B. OF RACK
11. CANPAY ASSEMBLY WITH 3MM THICK CRCA SHEET



FRONT VIEW



SIDE VIEW

LIR TYPE	H	W	D
D	2200	1650	650
E	2200	1300	650
F	1500	800	650

REF. DRG. No. FLREF

SIGN. & DATE

INVENTORY No.

REV.	DATE	ALTERED – / CHECKED – / APPROVED –	REV.	DATE	ALTERED – / CHECKED – / APPROVED –
–	–		–	–	

	NAME	SIGN	DATE
DRAWN	HKS	-sd-	15.04.2015
CHECKED	RKL		15.04.2015
APPROVED	AM		15.04.2015

DEPT. BPE | CODE 416

PROD / PROJ : –

CUSTOMER: –

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: OGA–FOR–LIR

No. OF SHEETS: 03

SHEET No.: 03

REV: 00

WBS. No. –

DRG. No. CE/416/LIE/LIR/OGA2

FORM No. A3–03

A3 SIZE

HOOK UP SCHEMES

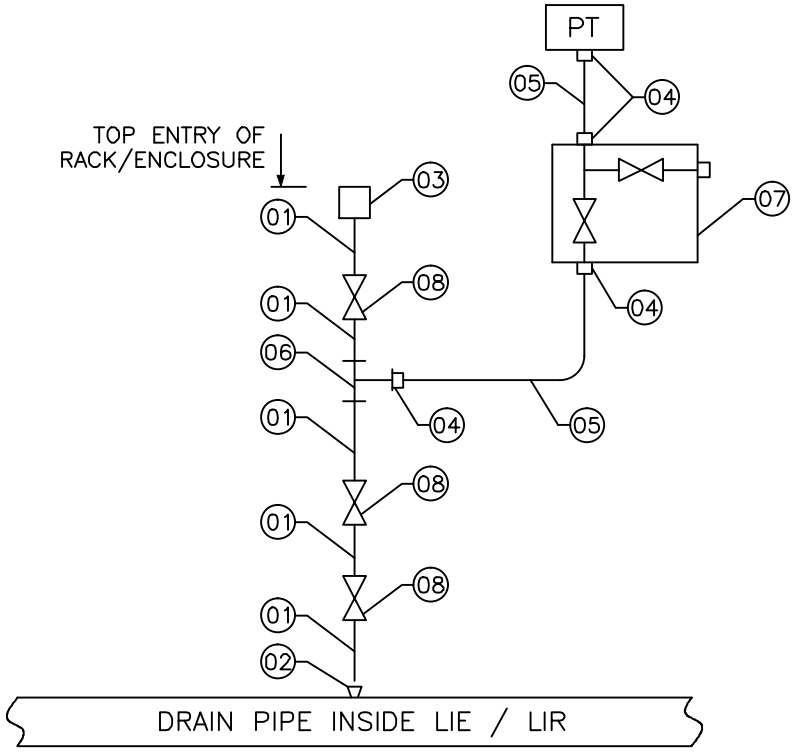
REVISIONS :

APPROVED BY

AM

PREPARED BY	ISSUED	DATE
RKL	416	16/04/15

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

A4 – 11

CE/416/EOI/HUP

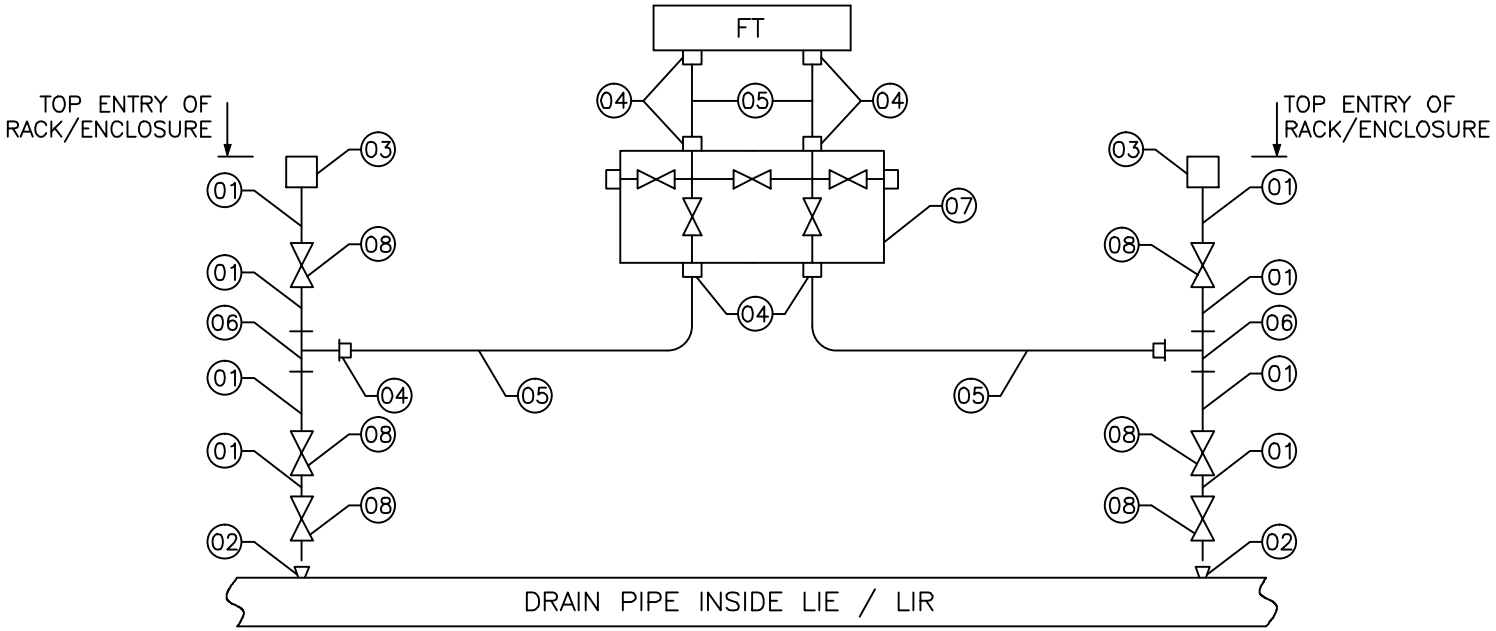
REV. NO. 00

PAGE NO.: 02 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P91 SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 1/2" NB–SW / CL : 9000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 9000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F91 SIZE: 1/2" NB–SW / CL 3000 SPL	03

REVISION NO | DATE

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

A4 – 11

CE/416/EOI/HUP

REV. NO. 00

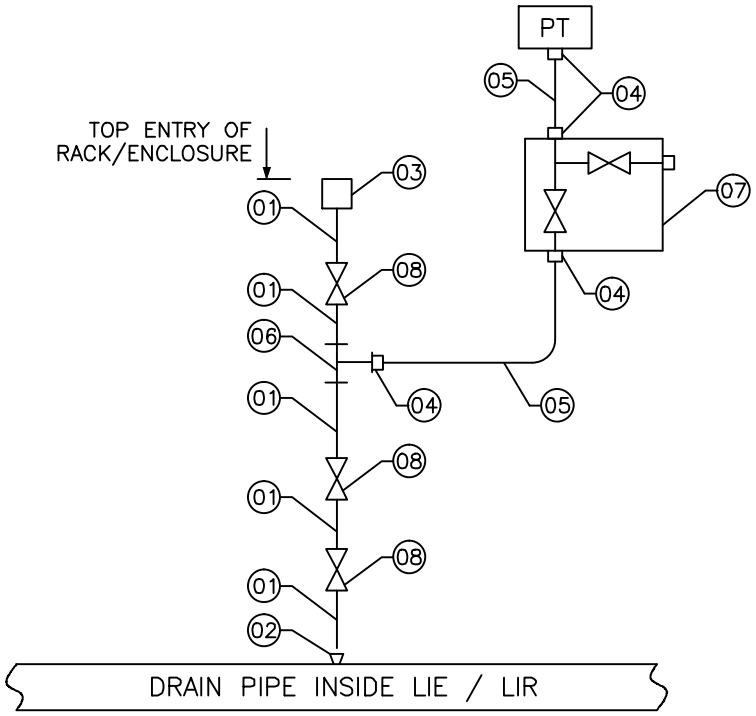
PAGE NO.: 04 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P91 SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 1/2" NB–SW / CL : 9000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 9000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F91 SIZE: 1/2" NB–SW / CL 3000 SPL	06

REVISION NO | DATE

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		

A4 – 11



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

CE/416/EOI/HUP

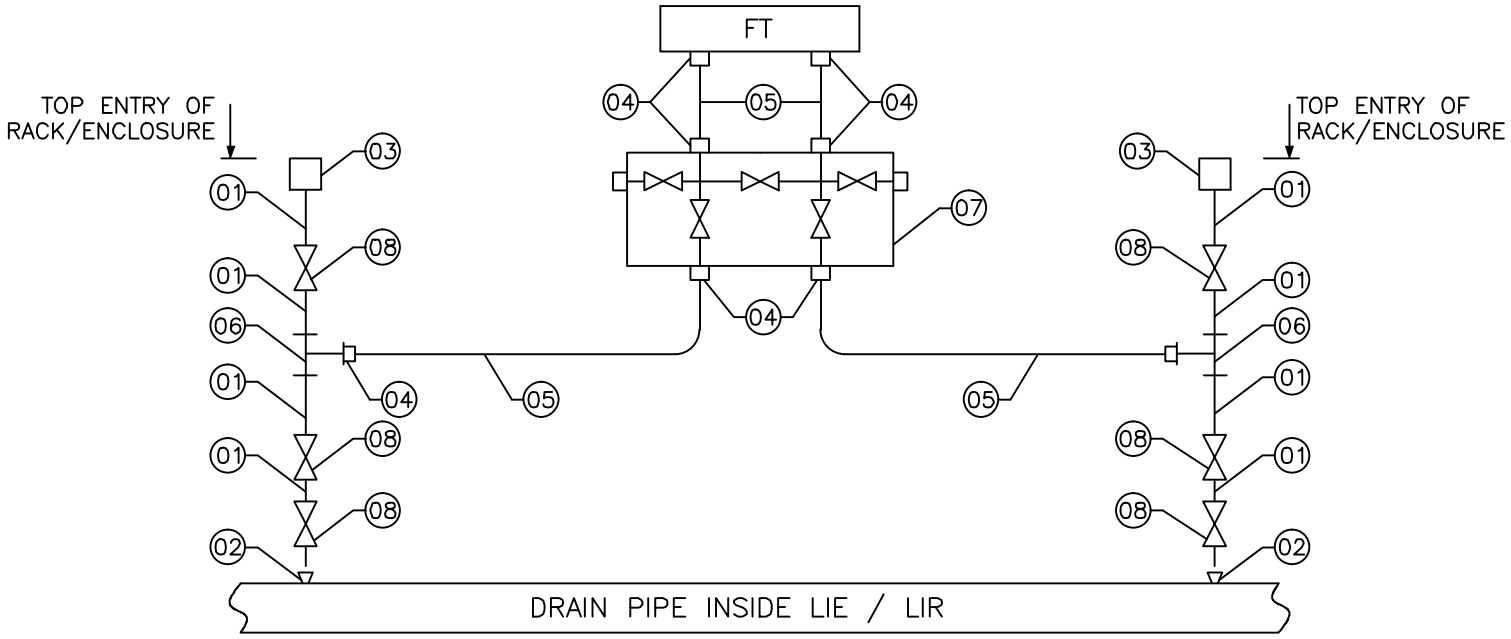
REV. NO. 00

PAGE NO.: 06 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P91 SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 1/2" NB–SW / CL : 6000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 6000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F91 SIZE: 1/2" NB–SW / CL 3000 SPL	03

REVISION NO | DATE

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

A4 – 11

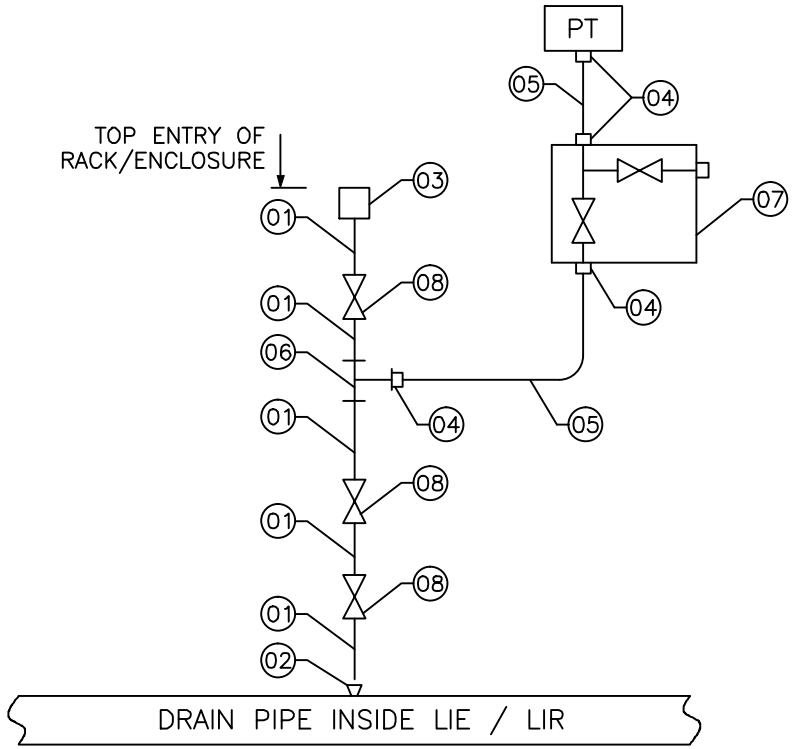
CE/416/EOI/HUP

REV. NO. 00

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P91 SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 1/2" NB–SW / CL : 6000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F91 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 6000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F91 SIZE: 1/2" NB–SW / CL 3000 SPL	06

REVISION NO | DATE

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		



01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

A4 – 11

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 10 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 1/2" NB–SW/ CL : 9000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 9000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL 3000 SPL	03

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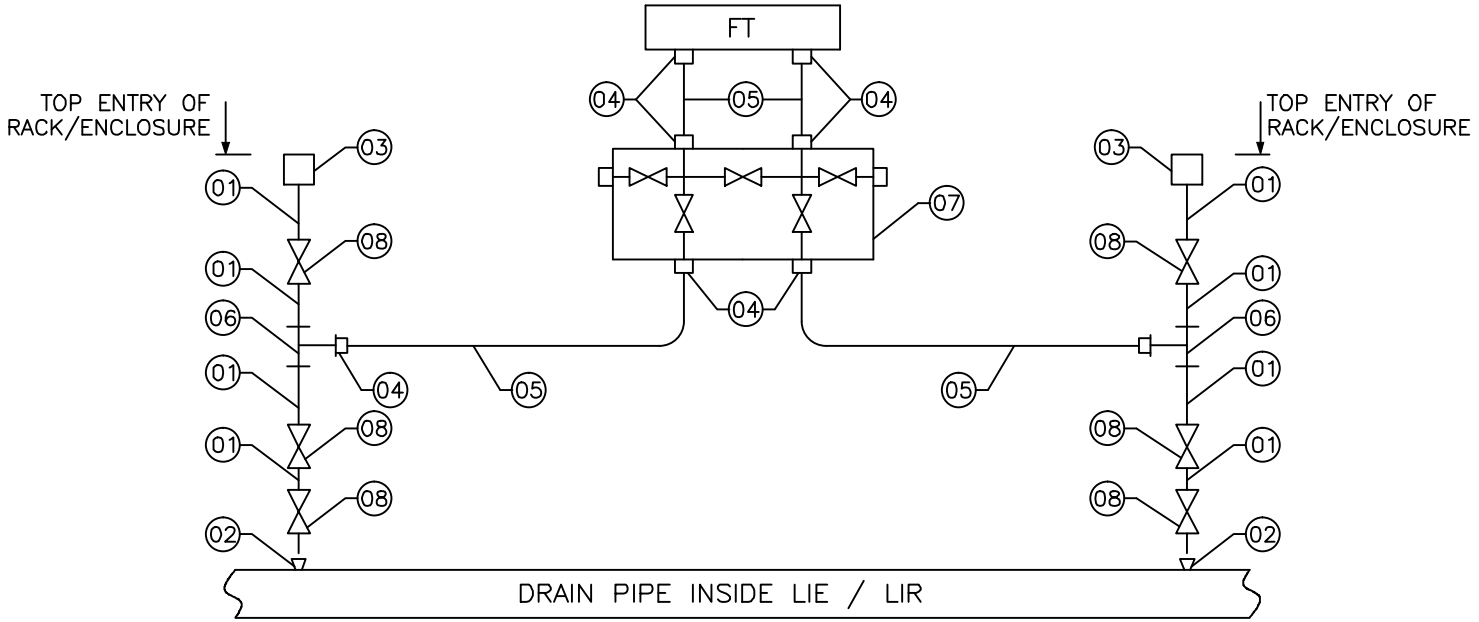

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

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ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 1/2" NB–SW / CL : 9000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 9000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL 3000 SPL	06

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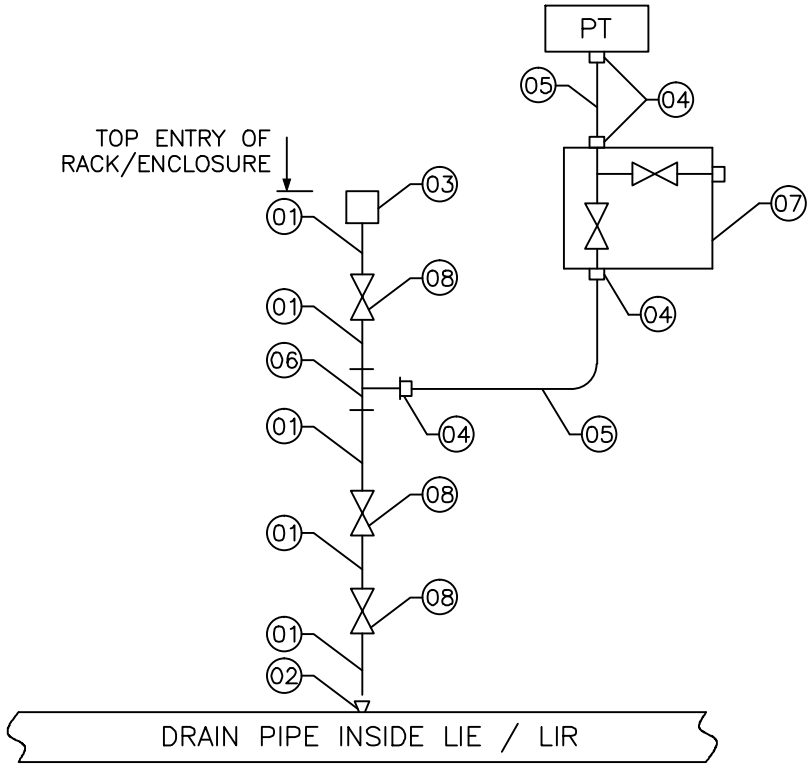

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 14 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 1/2" NB–SW / CL : 6000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 6000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL 3000 SPL	03

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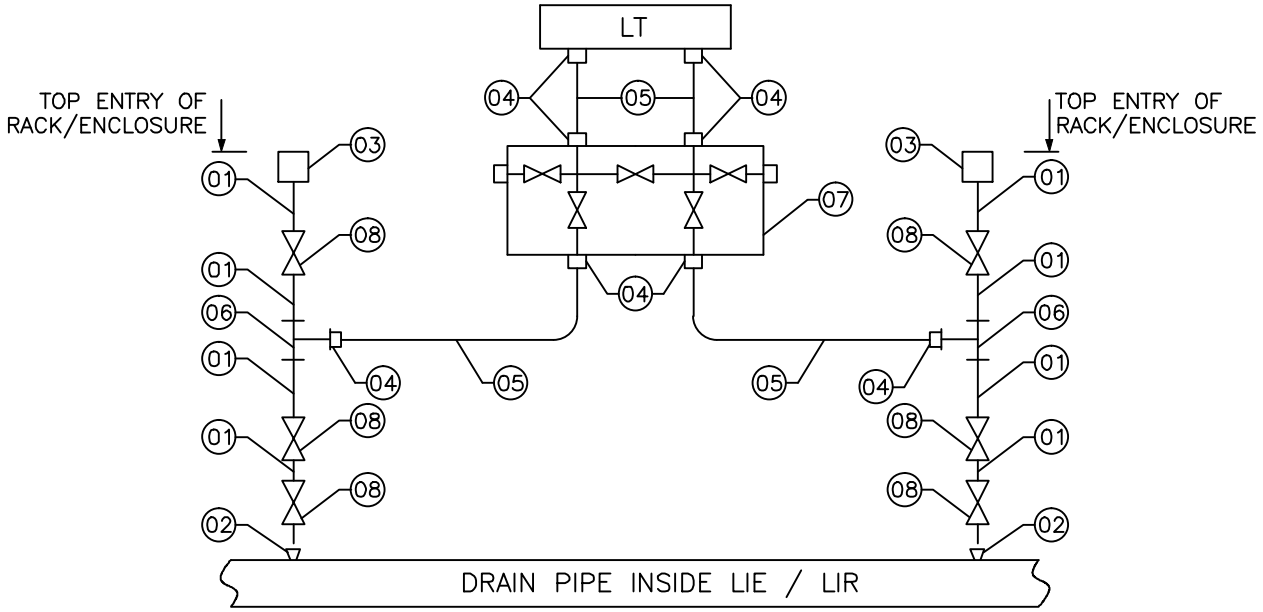

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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REV. NO. 00

PAGE NO.: 16 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL : 6000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 BODY: ASTM A182 F22 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 6000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL 3000 SPL	06

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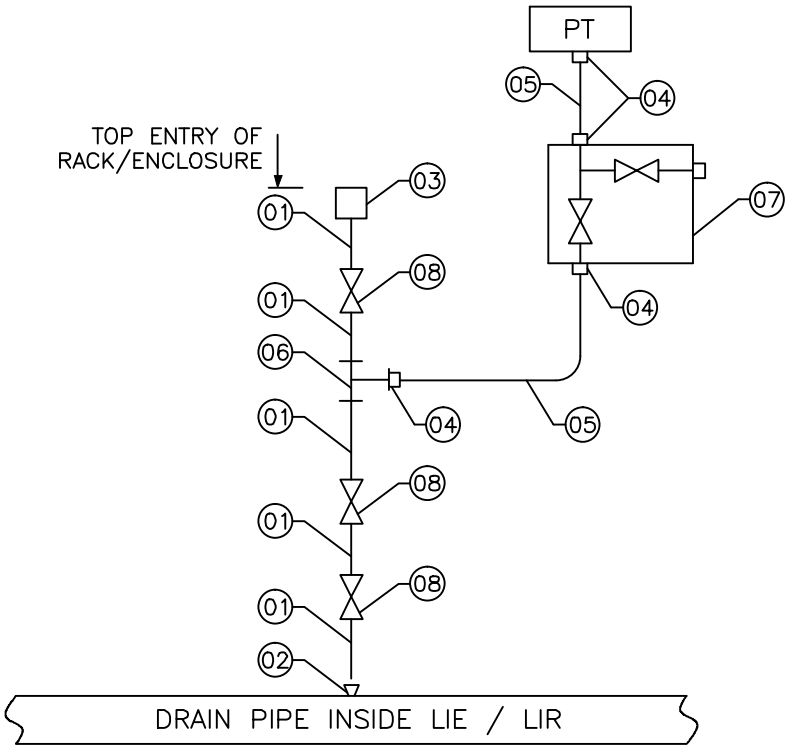

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

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ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH 80	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 1/2" NB–SW / CL : 3000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 3000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F22 SIZE: 1/2" NB–SW / CL 1500	03

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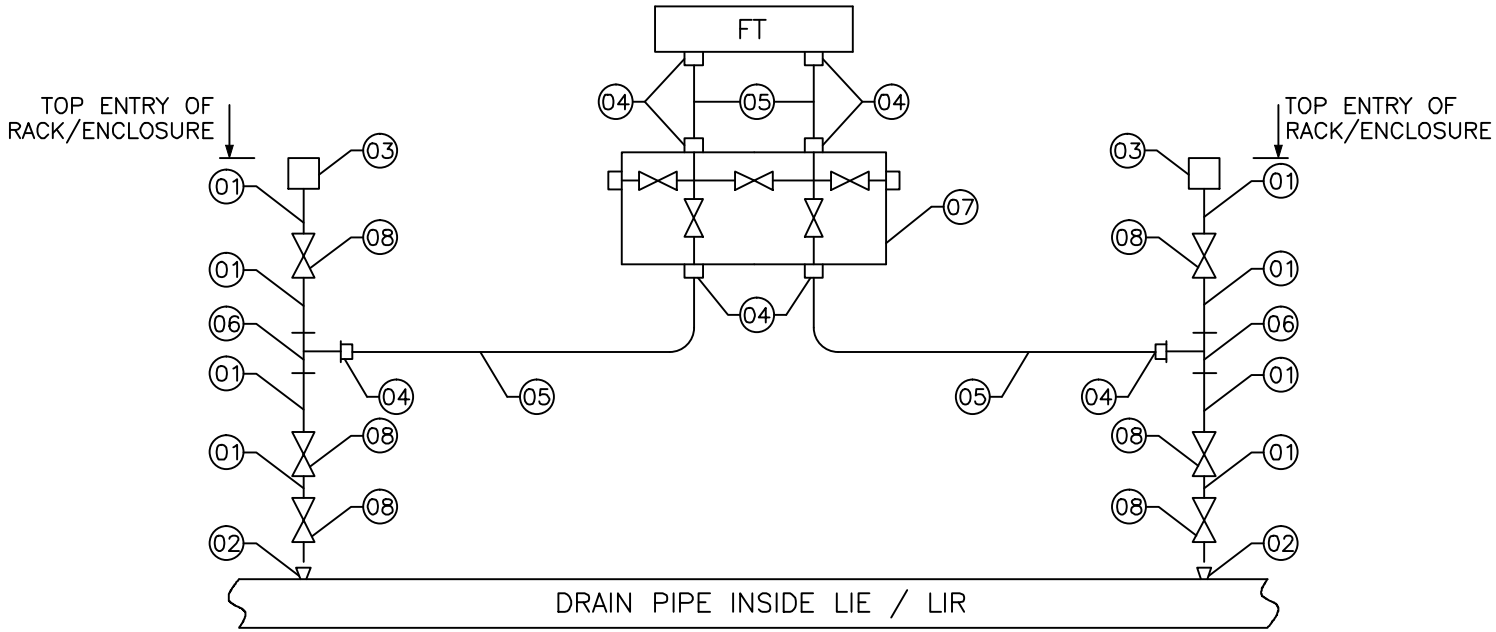

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 1/2" NB–SCH 80	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 1/2" NB–SW / CL : 3000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 3000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 1500	06

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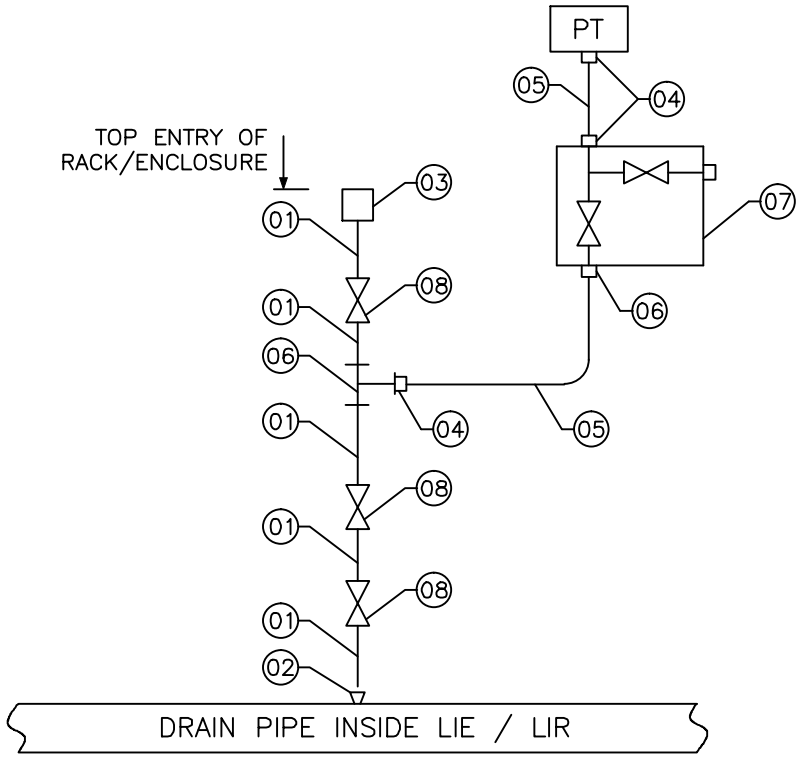

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 22 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 1/2" NB–SW / CL : 9000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 9000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 3000	03

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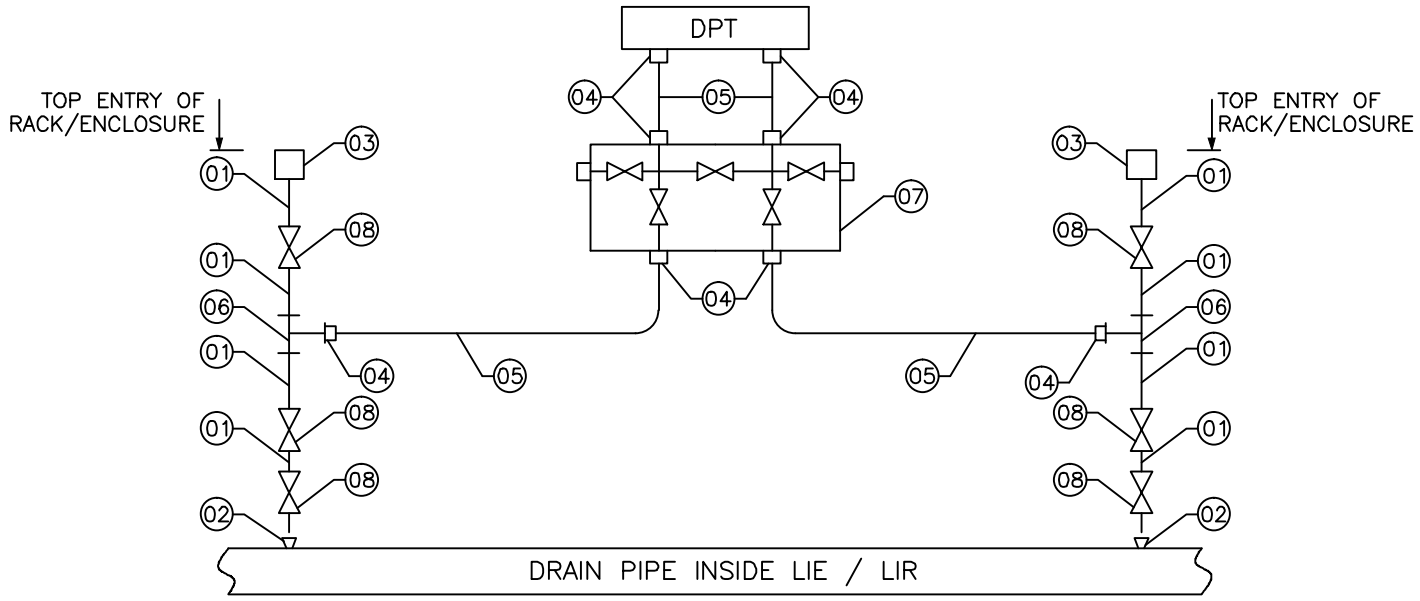

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

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ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A 106 Gr C SIZE: 1/2" NB–SCH XXS	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 1/2" NB–SW/ CL : 9000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB–SW X 1/2" NPTF / CL 9000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 9000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 3000	06

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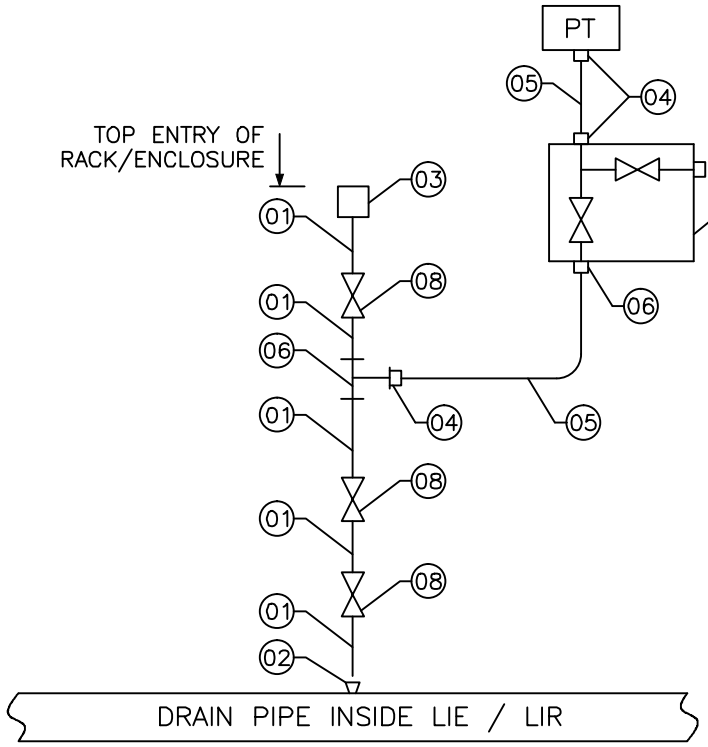

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 26 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 1/2" NB–SW / CL : 6000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 6000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 2500 SPL	03

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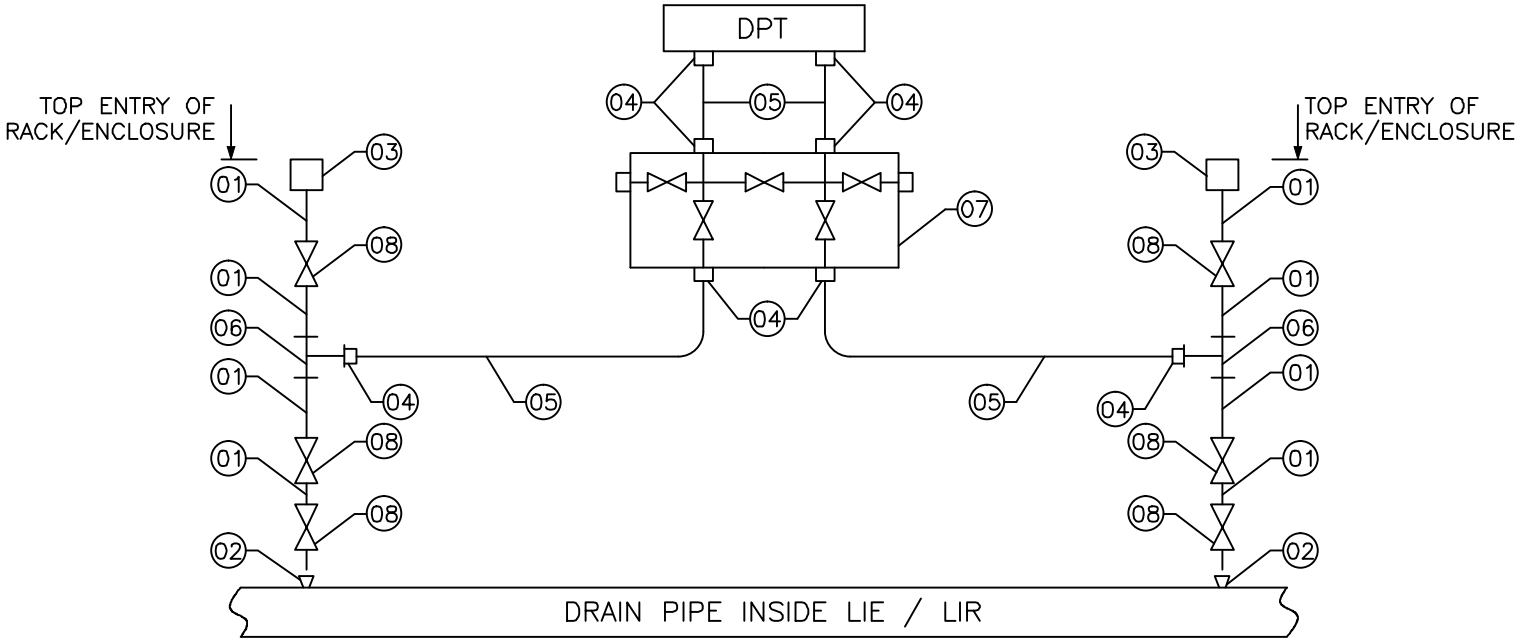

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 28 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A 106 Gr C SIZE: 1/2" NB–SCH 160	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 1/2" NB–SW / CL : 6000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB–SW X 1/2" NPTF / CL 6000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 6000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 2500 SPL	06

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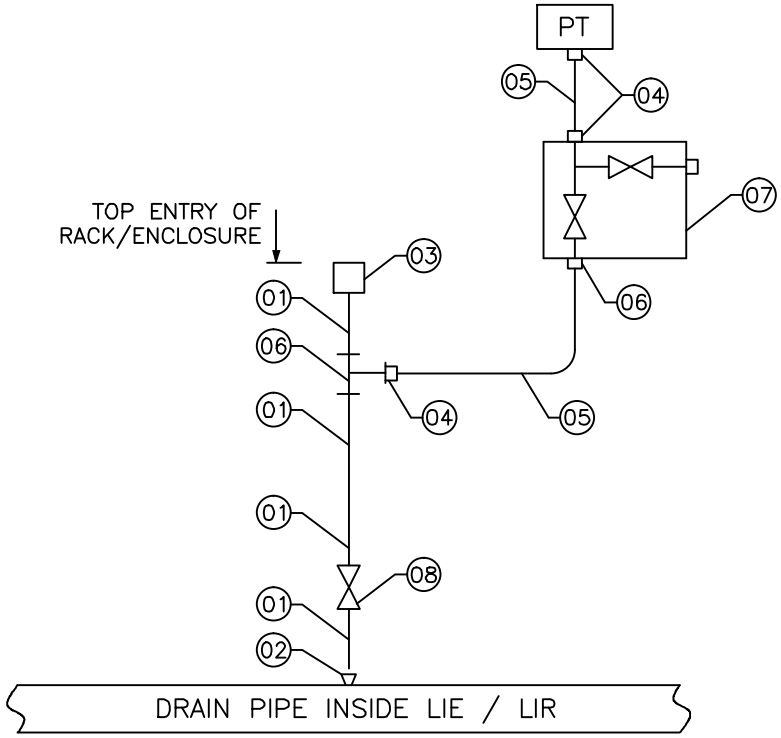

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 30 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 1/2" NB–SCH 80	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 1/2" NB–SW / CL : 3000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 1/2" NB –SW X 1/2" NPTF / CL 3000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 1/2" NB–SW / CL 800	01

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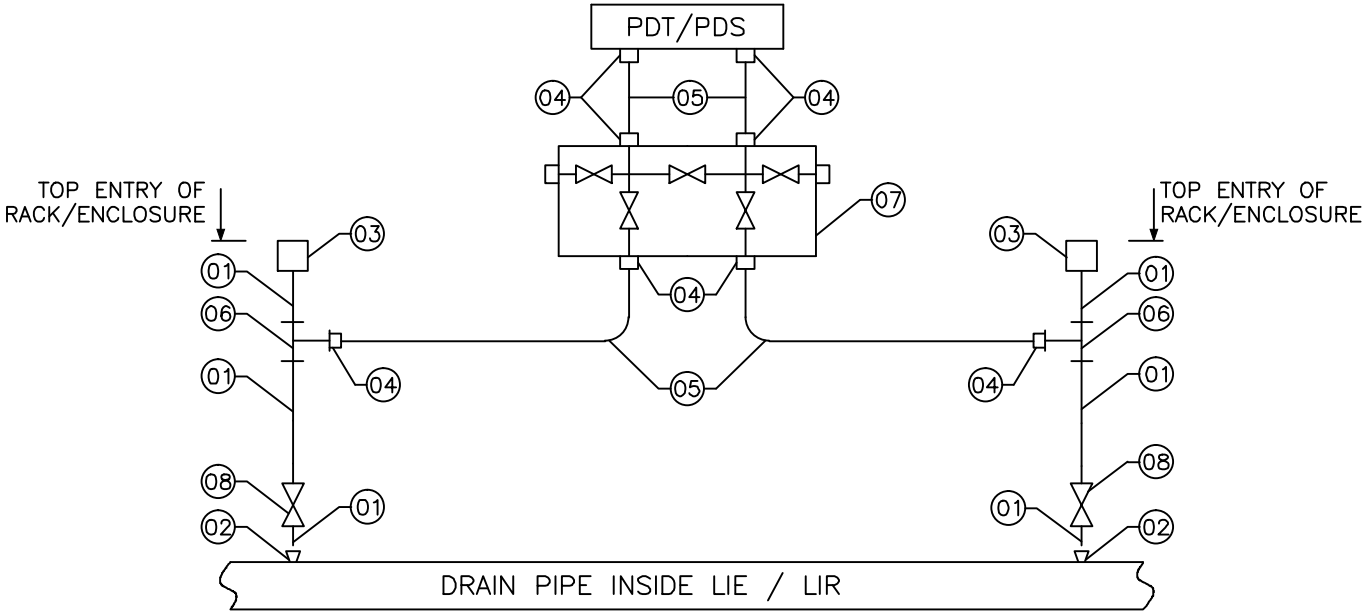
A4 – 11



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 32 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A 106 Gr C SIZE: 1/2" NB–SCH 80	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULK HEAD UNION / COUPLING /AS PER ANSI B16.11 MATL.: ASTM A 105 SIZE: 1/2" NB–SW / CL : 3000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A 105 SIZE: 2 x 1/2" NB – SW X 1/2" NPTF / CL : 3000 LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG MATL.: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A 105 SIZE: 1/2" NB–SW / CL : 800	02

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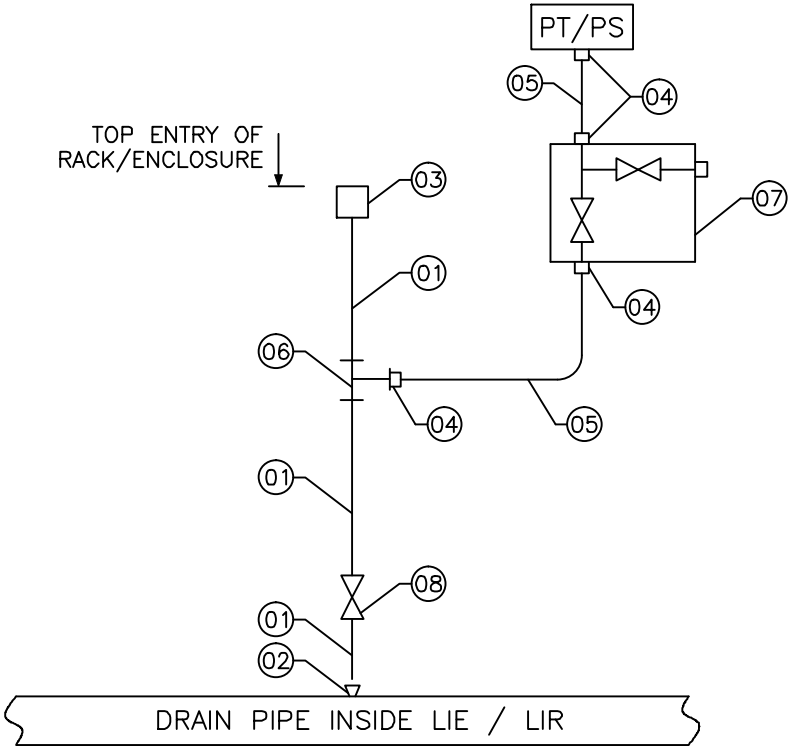

NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

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CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 34 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM 312 TP316 SIZE: 1/2" NB–SCH 40	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	01
03	BULK HEAD UNION / COUPLING /AS PER ANSI B16.11 MATL.: ASTM A182 F316 SIZE: 1/2" NB–SW / CL : 3000 LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE / AS PER ANSI B16.11 MATL.: ASTM A182 F316 SIZE: 2 x 1/2" NB – SW X 1/2" NPTF / CL : 3000 LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG MATL.: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A182 F316 SIZE: 1/2" NB–SW / CL : 800	01

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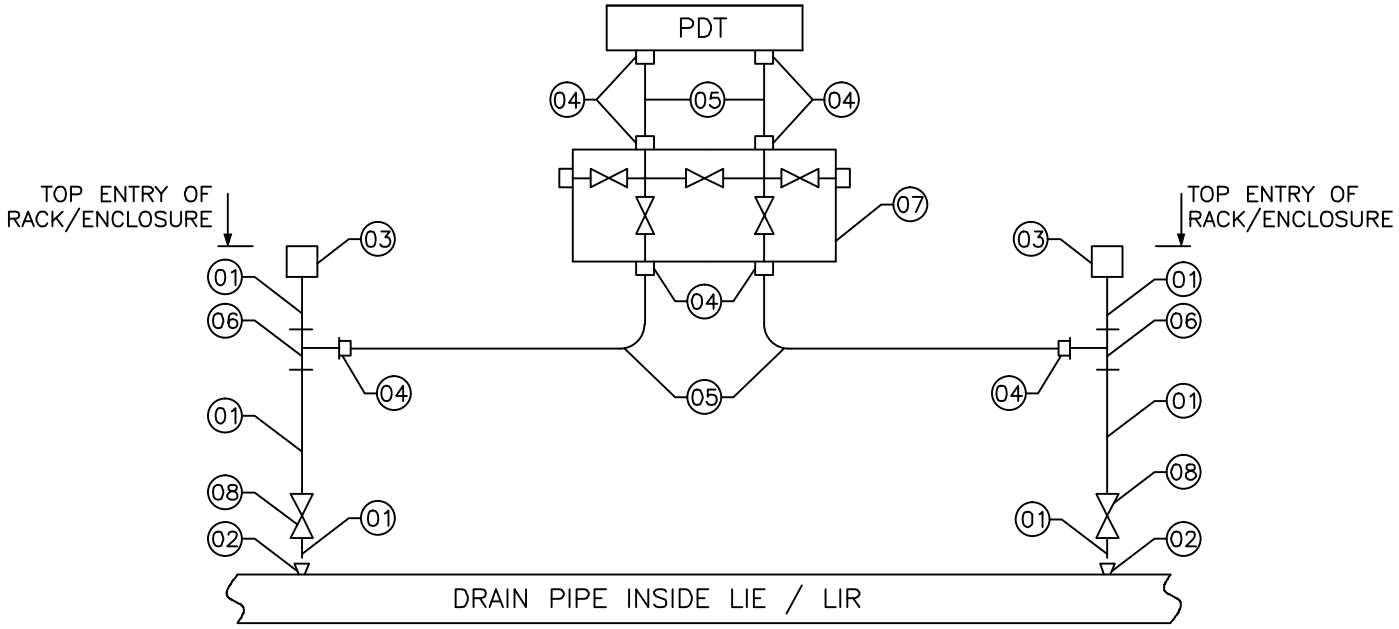
A4 – 11



NOTES:

01. "TRANSMITTER BELOW SOURCE"
02. DRAIN PIPE / 2" NB SCH 80 – A106 Gr. C

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 36 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A 312 TP316 SIZE: 1/2" NB–SCH 40	A/R
02	FUNNEL / ASTM 105 / 2" x 1/2"	02
03	BULK HEAD UNION / COUPLING /AS PER ANSI B16.11 MATL.: ASTM A 182 F 316 SIZE: 1/2" NB–SW / CL : 3000 LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 2.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A 182 F 316 SIZE: 2 x 1/2" NB – SW X 1/2" NPTF / CL : 3000 LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG MATL.: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 3000PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A 182 F 316 SIZE: 1/2" NB–SW / CL : 800	02

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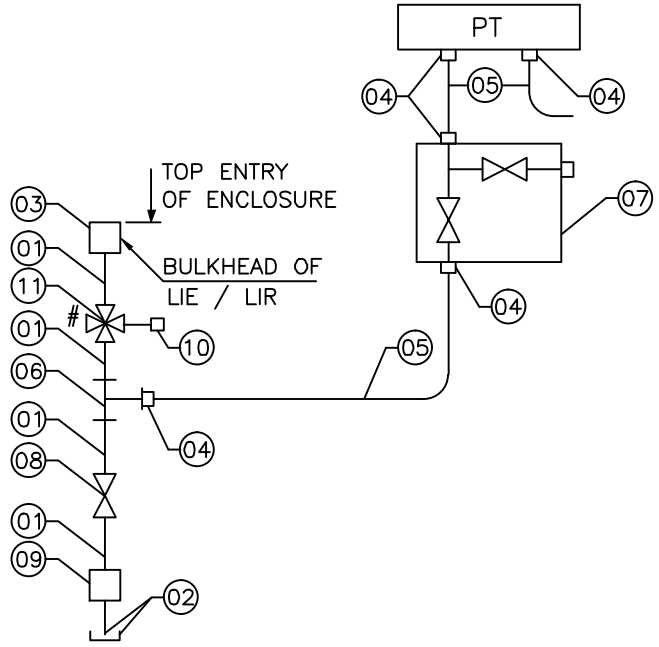

NOTES:

01. "TRANSMITTER ABOVE SOURCE"

02. # FOR INTERMITTANT PURGIING REFER PAGE NO 48 OF 49

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CE/416/EOI/HUP

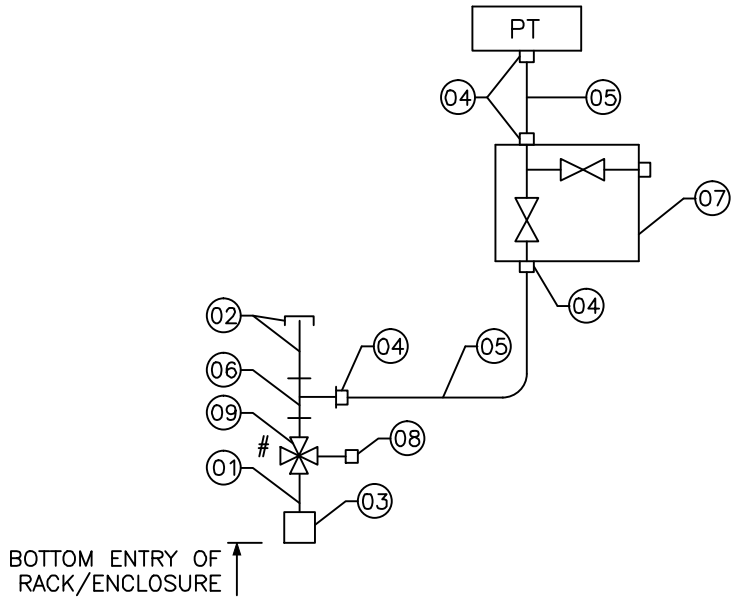
REV. NO. 00

PAGE NO.: 38 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 3/4" NB–SCH 80	A/R
02	NIPPLE / CAP MATL.: ASTM A106 Gr.C / ASTM A 105 SIZE: 3/4" NB–SCH 80 ONE / 3/4" NPTF	01
03	BULK HEAD UNION/COUPLING/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 3/4" NB–SW / CL 3000LBS	01
04	MALE CONNECTOR / TUBE FITTING/DFDC MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	05
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 1.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 3/4" NB –SW X 1/2" NPTF / CL 3000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 1500PSI	01
08	FORGED GLOBE VALVE BODY: ASTM A105 SIZE: 3/4" NB–SW / CL 800	01
09	DRAIN POT: 2" NB SCH 80 BODY: A106 Gr B SIZE: CONN. 3/4" NB – SW	01
10	QUICK DISCONNECTING FITTING MATL.: SS 304 SIZE.:1/2" NPTM	01
11	FOUR WAY VALVE MATL.: ASTM A105 / RATING CLASS 800 SIZE: (2 x 3/4" NB–SW) x (2 x 1/2" NPTF)	01

REVISION NO | DATE

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		



NOTES:

01. "TRANSMITTER ABOVE SOURCE"

02. # FOR INTERMITTANT PURGIING REFER PAGE NO 48 OF 49

A4 - 11

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 40 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 3/4" NB–SCH 80	A/R
02	NIPPLE / CAP MATL.: ASTM A106 Gr.C / ASTM A 105 SIZE: 3/4" NB–SCH 80 ONE / 3/4" NPTF	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 3/4" NB–SW / CL 3000LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 1.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 3/4" NB –SW X 1/2" NPTF / CL 3000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 1500PSI	01
08	QUICK DISCONNECTING FITTING MATL.: SS 304 SIZE.:1/2" NPTM	01
09	FOUR WAY VALVE MATL.: ASTM A105 / RATING CLASS 800 SIZE: (2 x 3/4" NB–SW) x (2 x 1/2" NPTF)	01

REVISION NO | DATE

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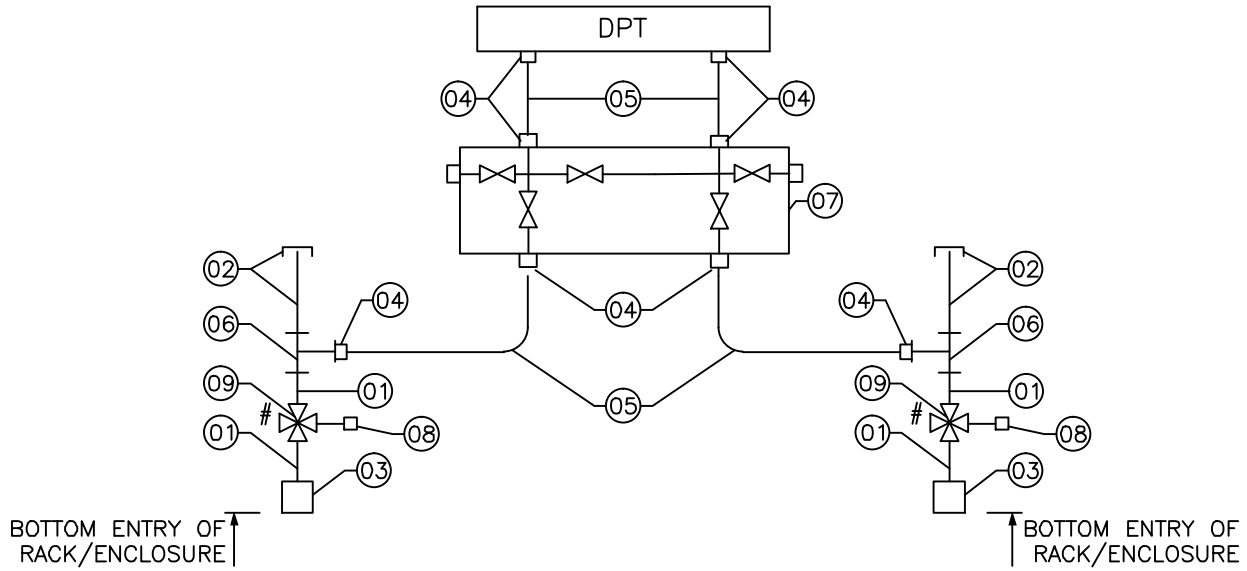

NOTES:

01. "TRANSMITTER ABOVE SOURCE"

02. # FOR INTERMITTANT PURGIING REFER PAGE NO 48 OF 49

A4 - 11

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 42 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A106 Gr.C SIZE: 3/4" NB–SCH 80	A/R
02	NIPPLE / CAP MATL.: ASTM A106 Gr.C / ASTM A 105 SIZE: 3/4" NB–SCH 80 ONE / 3/4" NPTF	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 3/4" NB–SW / CL 3000LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 1.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 3/4" NB –SW X 1/2" NPTF / CL 3000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 1500PSI	01
08	QUICK DISCONNECTING FITTING MATL.: SS 304 SIZE.:1/2" NPTM	02
09	FOUR WAY VALVE MATL.: ASTM A105 / RATING CLASS 800 SIZE: (2 x 3/4" NB–SW) x (2 x 1/2" NPTF)	02

REVISION NO | DATE

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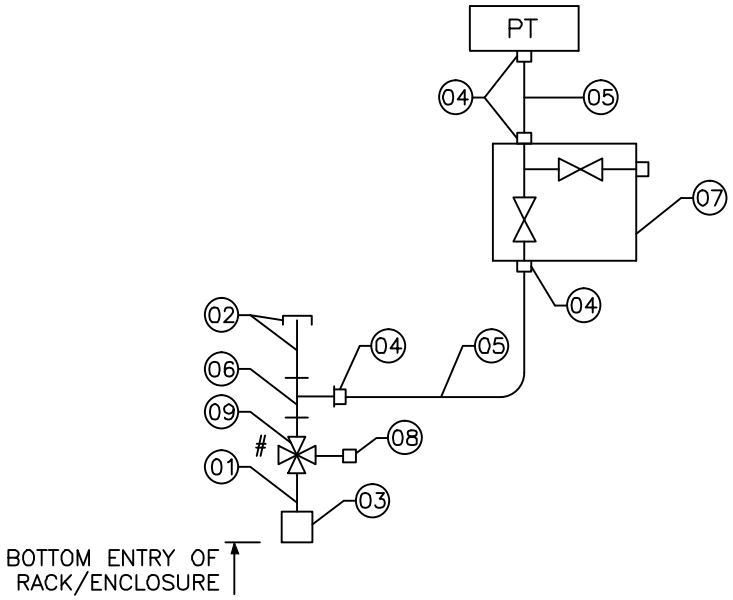

NOTES:

01. "TRANSMITTER ABOVE SOURCE"

02. # FOR INTERMITTANT PURGIING REFER PAGE NO 48 OF 49

A4 - 11

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 44 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 3/4" NB–SCH 80	A/R
02	NIPPLE / CAP MATL.: ASTM A335 P22 / ASTM A 182 F22 SIZE: 3/4" NB–SCH 80 ONE / 3/4" NPTF	01
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 3/4" NB–SW / CL 3000LBS	01
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	04
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 1.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 2 x 3/4" NB –SW X 1/2" NPTF / CL 3000LBS	01
07	TWO VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 1500PSI	01
08	QUICK DISCONNECTING FITTING MATL.: SS 304 SIZE.:1/2" NPTM	01
09	FOUR WAY VALVE MATL.: ASTM A182 F22 / RATING CLASS 800 SIZE: (2 x 3/4" NB–SW) x (2 x 1/2" NPTF)	01

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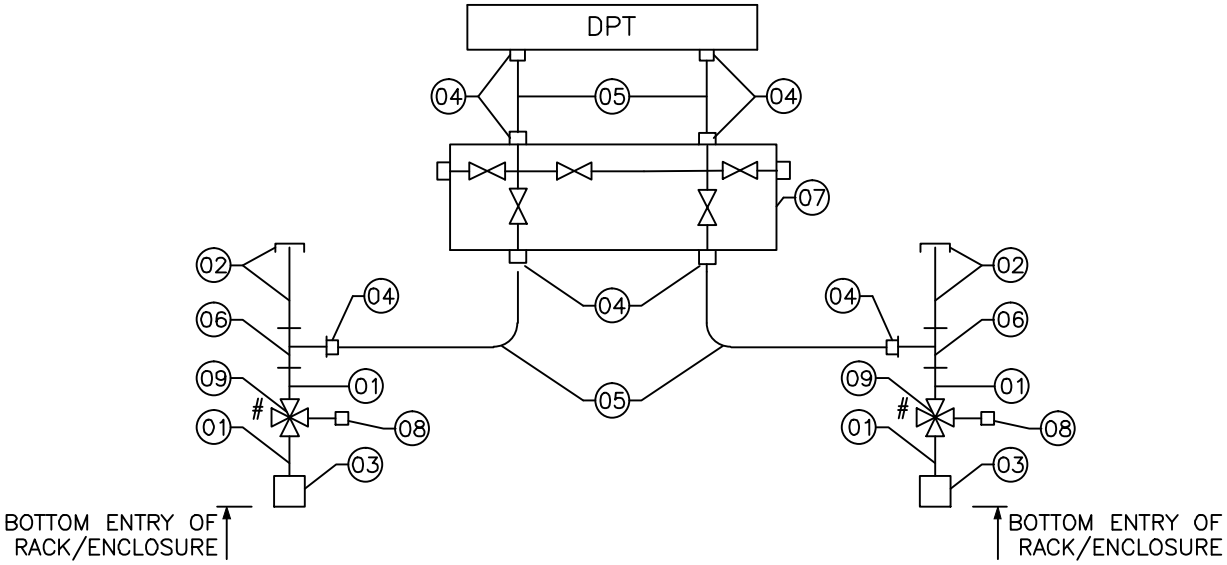
A4 - 11



NOTES:

01. "TRANSMITTER ABOVE SOURCE"

02. # FOR INTERMITTANT PURGIING REFER PAGE NO 48 OF 49

CE/416/EOI/HUP

REV. NO. 00

PAGE NO.: 46 OF 49

ITEM NO.	ITEM DESCRIPTION	QTY / INST. (Nos.)
01	SEAMLESS PIPE MATL.: ASTM A335 P22 SIZE: 3/4" NB–SCH 80	A/R
02	NIPPLE / CAP MATL.: ASTM A1335 P22 / ASTM A 182 F22 SIZE: 3/4" NB–SCH 80 ONE / 3/4" NPTF	02
03	BULKHEAD COUPLING / AS PER ANSI B16.11 MATL.: ASTM A182 F22 SIZE: 3/4" NB–SW / CL 3000LBS	02
04	MALE CONNECTOR MATL.: SS316 SIZE: 1/2" NPTM x TO SUIT 1/2" OD SS TUBE	08
05	SEAMLESS TUBE MATL.: A213 TP 316 SIZE: 1/2" OD x 1.1mm THK.	A/R
06	FORGED UNEQUAL TEE/AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: 2 x 3/4" NB –SW X 1/2" NPTF / CL 3000LBS	02
07	FIVE VALVE MANIFOLD WITH DRAIN PLUG BODY: SS316 PORT SIZE: 1/2" NPTF / PR. TESTING : 1500PSI	01
13	QUICK DISCONNECTING FITTING MATL.: SS 304 SIZE.:1/2" NPTM	02
14	FOUR WAY VALVE MATL.: ASTM A182 F22 / RATING CLASS 800 SIZE: (2 x 3/4" NB–SW) x (4 x 1/2" NPTF)	02

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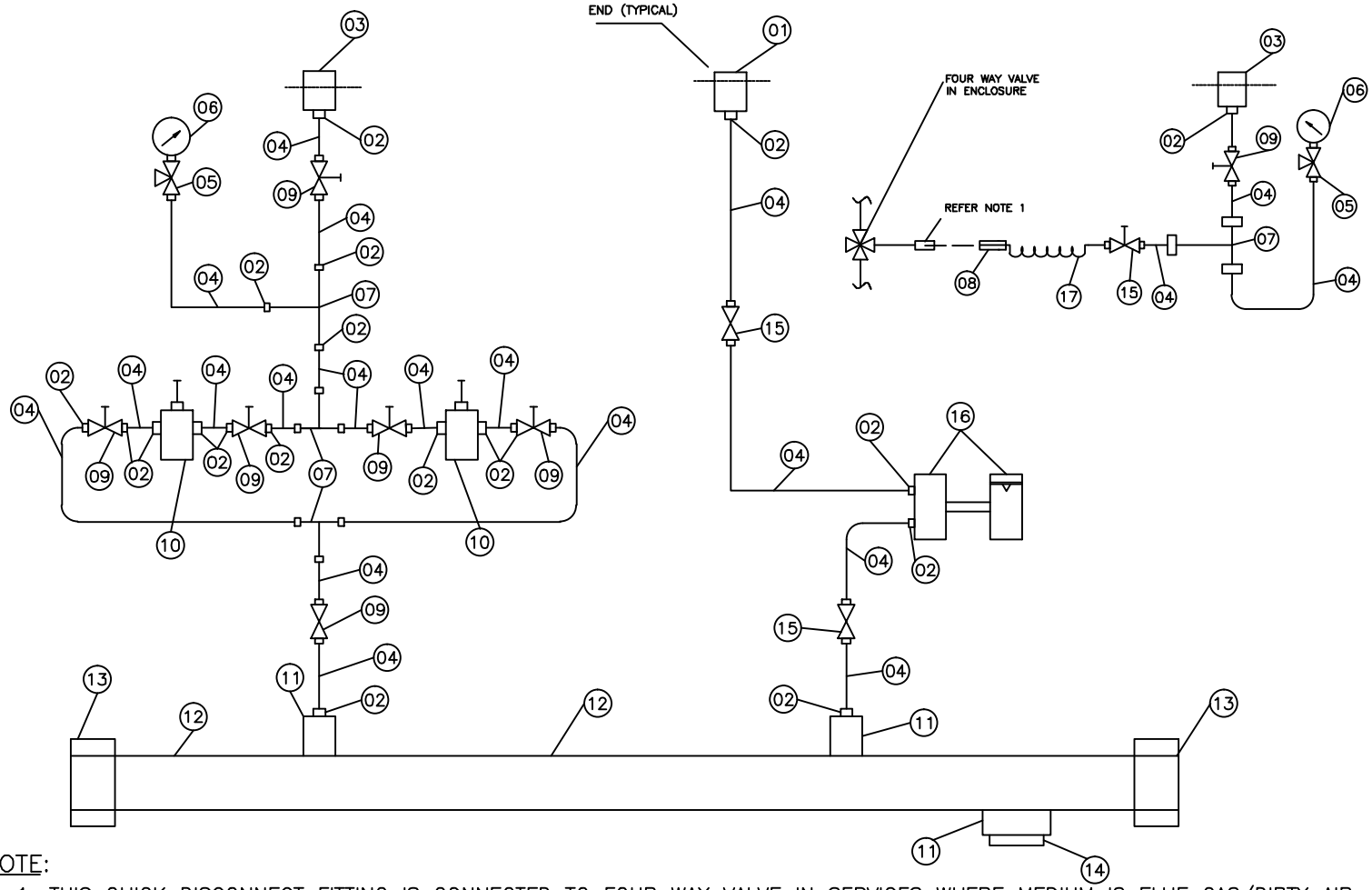
REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		

TYPICAL PURGE AIR SCHEME



NOTE:

1. THIS QUICK DISCONNECT FITTING IS CONNECTED TO FOUR WAY VALVE IN SERVICES WHERE MEDIUM IS FLUE GAS/DIRTY AIR
2. FOR BILL OF MATERIAL REFER PAGE 49 OF 49.
3. THE PURGE AIR SCHEME IS COMING INSIDE LOCAL INST. ENCLOSURE (LIE) IN BHEL–EDN'S SCOPE OF SUPPLY

A4 – 11

CE/416/EOI/HUP

REV.NO. : 00

PAGE : 48 OF 49

REVISION NO	DATE	COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest to the Company.		

A4 – 11

ITEM NO.	ITEM DESCRIPTION	QUANTITY
10	AIR FILTER REGULATOR PROCESS CONN : 1/2" NPTF	02
09	ISOLATING VALVE/GATE TYPE PROCESS CONN : 1/2" OD SS TUBE MTL : ASTM A182 F316	04
08	QUICK DISCONNECTING FITTING–SS304/MALE SIZE : END CONN. TO SUIT 1/2" OD SS–TUBE	02
07	EQUAL TEE FITTING / MATL : SS316 END CONN. – TO SUIT 1/2" OD SS TUBE	01
06	PRESSURE GUAGE / DIAL SIZE : 4" RANGE : 0–10 KG/Sq. CM BOTTOM CONN: 1/2" NPTM	02
05	THREE WAY GUAGE COCK/MTL : SS316 SIZE : 1/2" NPTF x TO SUIT 1/2" OD SS TUBE	02
04	TUBE MATL. ASTM A213 TP 316L SIZE : 1/2" OD – 1.13 mm THK.	A/R
03	BULK HEAD UNION / MATL : SS316 SIZE : 1/2" NPT (F) x 1/2" NPTF	A/R
02	TUBE CONNECTOR SIZE : 1/2" NPTM x TO SUIT 1/2" OD SS TUBE MATL. ASTM Gr. SS316	03
01	BULK HEAD UNION / MATL SS304 SIZE : 2 x 1/2" NPT (F)	01

ITEM NO.	ITEM DESCRIPTION	QUANTITY
17	NYLON FLEXIBLE HOSE BRAIDED WITH SS WIRE SIZE = 1/2" DIA.	1 MTR
16	PURGE ROTAMETER PROCESS CONN : 1/2" NPTF	01
15	NEEDLE VALVE/MATL : SS316 SIZE : END CONN. TO SUIT 1/2" OD SS TUBE	02
14	PLUG SIZE : 1/2" NPTM MAT : SS316	01
13	SS END CAP SIZE : 1" BSPF / MATL : SS316	02
12	AIR HEADER SIZE : 1" NB–SCH 40 / MATL: SS316	01
11	SS COUPLET SIZE : 1/2" NPTF MATL : SS316	01

CE/416/EOI/HUP

REV. NO. : 00

PAGE : 49 OF 49

COMPONENT VENDOR LIST

REVISIONS :

APPROVED BY

AM

PREPARED BY	ISSUED	DATE
RKL	416	16/04/15

COPONENT VENDOR LIST

Bidders to note that following sub components vendors shall be as per approved vendors by end user for particular project.

Sl No	Item Description	Approved Vendors
1	Socket Weld Fittings	PRECISION ENGG INDUSTRIES GOREGAON(W), MUMBAI
		V.K.INDUSTRIES BANGALORE
		VIKAS INDUSTRIAL PRODUCTS NOIDA
		EXCEL HYDRO-PNEUMATICS PVT LTD MUMBAI
		METPRESS ENGINEERING WORKS KOLKATA
		BALDOTA VALVE AND MUMBAI
		PMT ENGINEERS,AHMEDABAD
		FLOWTECH. KOLKATA.
		PANAM ENGINEERS LTD. SAHAR ROAD,ANDHERI(EAST),MUMBAI
		AURA INC. PHASE - 2, NEW DELHI
		HP VALVES & FITTINGS (INDIA) PVT. L MOGAPPAIR WEST, CHENNAI
		PRIME ENGINEERS
		ARYA CRAFTS & ENGINEERING PVT. LTD.
2	Compression Fitting	PRECISION ENGG INDUSTRIES GOREGAON(W), MUMBAI
		EXCEL HYDRO-PNEUMATICS PVT LTD MUMBAI
		METPRESS ENGINEERING WORKS KOLKATA
		ASTEC VALVE & FITTINGS PVT. LTD. ANDHERI (EAST), MUMBAI
		FLUID CONTROLS PVT. LTD. ,PUNE
		PANAM ENGINEERS LTD. SAHAR ROAD,ANDHERI(EAST),MUMBAI
		AURA INC. PHASE - 2, NEW DELHI
		HP VALVES & FITTINGS (INDIA) PVT. L MOGAPPAIR WEST, CHENNAI
		PMT ENGINEERS,AHMEDABAD
		PRIME ENGINEERS
		ARYA CRAFTS & ENGINEERING PVT. LTD.
		SWAGELOCK
		PARKER HANNIFIN INDIA PVT. LTD.

COMPONENT VENDOR LIST

Sl No	Item Description	Approved Vendors
3	Instrument Valves	BHARAT HEAVY ELECTRICALS LIMITED TIRUCHIRAPALLI
		PRECISION ENGG INDUSTRIES GOREGAON(W), MUMBAI
		EXCEL HYDRO-PNEUMATICS PVT LTD MUMBAI
		METPRESS ENGINEERING WORKS KOLKATA
		BALDOTA VALVE AND MUMBAI
		PMT ENGINEERS,AHMEDABAD
		AURA INC. PHASE - 2, NEW DELHI
		HP VALVES & FITTINGS (INDIA) PVT. L MOGAPPAIR WEST, CHENNAI
		FLUID CONTROLS PVT LTD, PUNE
		INSTRUMENTATION LIMITED PALGHAT
		FLOW TECH,KOLKATA
4	Valve Manifolds	PRECISION ENGG INDUSTRIES GOREGAON(W), MUMBAI
		EXCEL HYDRO-PNEUMATICS PVT LTD MUMBAI
		METPRESS ENGINEERING WORKS KOLKATA
		BALDOTA VALVE AND MUMBAI
		ASTEC VALVE & FITTINGS PVT. LTD. ANDHERI (EAST), MUMBAI
		FLOWTECH. KOLKATA.
		PMT ENGINEERS,AHMEDABAD
		AURA INC. PHASE - 2, NEW DELHI
		HP VALVES & FITTINGS (INDIA) PVT. L MOGAPPAIR WEST, CHENNAI
		MICRO PRECISION PRODUCTS PVT LTD FARIDABAD
		FLUID CONTROLS LIMITED ,PUNE
		PRIME ENGINEERS
		ARYA CRAFTS & ENGINEERING PVT. LTD.
5	Air Filter Regulator	M/S SHAVO NORGEN, INDIA
		JRU INSTRUMENTS (Formerly PLACKA),CHENNAI

COMPONENT VENDOR LIST

Sl No	Item Description	Approved Vendors
6	Impulse Pipes / Seamless Tube	BHARAT HEAVY ELECTRICALS LTD, TRICHY
		HEAVY MEATAL TUBES, AHMADABAD
		INDIAN SEAMLESS METAL TUBES LTD, INDIA (only for Carbon steel and Alloy steel pipes)
		JINDAL SAW PIPES LTD, INDIA(only for Carbon steel and Alloy steel pipes)
		MANNESMANN AG, GERMANY
		RATNAMANI METALS & TUBES LTD, AHMADABAD (Only for Stainless Steel pipes)
		MAHARASTRA SEAMLESS PVT LTD ,HARYANA(Only for Carbon Steel pipes)
		SHUBHLAXMI METALS AND TUBES PVT LTD,MUMBAI (Only for Stainless Steel pipes)
		MAXIM TUBES COMPANY PVT LTD ,AHMEDABAD (Only for Stainless Steel pipes)
		SURAJ STAINLESS STEEL PVT LTD,AHMEDABAD (Only for Stainless Steel pipes)
		SUMITOMO CORPORATION, JAPAN
		TPS TECHNITUBE ROHREN WERKE GMBH, GERMANY
		MAHALAXMI SEAMLESS LTD ,GURGOAN (only for Carbon steel and Alloy steel pipes)
7	Instrumentation Cable	PARAMOUNT COMMUNICATION LTD ,NEW DELHI
		CARDS CABLE INDUTRY LTD
		DELTON CALBE LTD, NEW DELHI.
		KEI INDUSTRIES LTD,BANGALORE
		POLY CAB WIRES PVT LTD
		INCAB,PUNE
		ELKAY TELE LINKS,FARIDABAD
		THERMO CABLES LTD,BANGALORE
		GOYOLENE FIBER PVT LTD
		ADVANCE CABLE TECHNOLOGIES LTD
		TC COMMUNICATION PVT LTD
		MANSFIELD COMPANY LTD
		GUPTA POWER INFRA STRUCTURE PVT LTD
		RJ INDUSTRIAL CORPOARATION LTD
		RR KABEL
		APAR INDUSTRIES
		SUYOG ELECTRICAL LTD
		GEMS CAB INDUSTRIES PVT LTD
		NICCO CABLES ,KOLKATA
		LAPP INDIA PVT LTD
		ASSOCIATED CABLES PVT LTD
		INDUSTRIAL CABLES LTD, PUNJAB.
		KEC INSTERNATIONAL LTD
		RJR INDUSTRIES
		RADIENT CABLES,HYDERABAD
		GOVIND CABLE INDUSTRIES
		SPECIAL CABLES

MANUFACTURING QUALITY PLAN

REVISIONS :

APPROVED BY

AM

PREPARED BY	ISSUED	DATE
RKL	416	16/04/15

	MANUFACTURER'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		
		ITEM : LOCAL INSTRUMENT ENCLOSURE & LOCAL INSTRUMENT RACK	QP Ref NO.: CE/416/LIE-LIR/QP REV. : 00 DT. :16.04.2015 PAGE : 02 OF 06	

S. NO.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
									D*	M	C	E	
1	2	3	4	5	6	7	8	9		**10			11
(A)	***MATERIAL***												
1	CRCA SHEET	A) MATERIAL	MAJOR	CHEMICAL COMPOSITION	SAMPLE	IS-513 APP.DRG	IS-513	M.T.C./Q.A.REP.		V	V	V	
		B) THICKNESS	MAJOR	MEASUREMENT	100%	APP.DRG	APP.DRG	M.T.C./Q.A.REP.		P	V	V	
		C) HARDNESS	MAJOR	STRENGTH	SAMPLE	IS-513	IS-513	M.T.C./Q.A.REP.		V	V	V	
		D) SURFACE FINISH	MAJOR	VISUAL	100%	IS-513	IS-513	M.T.C./Q.A.REP.		P	V	V	
2	MS C- CHANNELS / MS ANGLE	A) DIMENSION	MAJOR	VISUAL	100%	APP.DRG/ F.S.	APP.DRG/ F.S.	M.T.C./Q.A.REP.		P	V	V	
		B) SURFACE DEFECTS	MAJOR	VISUAL	100%	APP.DRG/ F.S.	APP.DRG/ F.S.	M.T.C./Q.A.REP.		V	V	V	
		C) STRAIGHTNESS	MAJOR	MESUERMENT	100%	APP.DRG/ F.S.	APP.DRG/ F.S.	M.T.C./Q.A.REP.		V	V	V	
3	GASKET	A) DIMENSION	MAJOR	MEASUREMENT	SAMPLE	APP.DRG/ F.S.	APP.DRG/ F.S.	M.T.C./Q.A.REP.		P	V	V	
		B) HARDNESS/SHORE HARDNESS	MAJOR	MEASUREMENT	SAMPLE	APP.DRG/ F.S.	APP.DRG/ F.S.	M.T.C.		V	V	V	
4	TERMINALS	A) TYPE, SIZE & MAKE	MAJOR	VISUAL	100%	APP.DRG	APP.DRG	M.T.C./Q.A.REP.		P	V	V	

		LEGEND :	FOR END USER :
		* RECORDS, INDENTIFIED WITH `TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.	DOC. NO.
		** M : MANUFACTURER/ SUBCONTRACTOR	
MANUFACTURER /SUBCONTRACTOR	CONTRACTOR	C: CONTRACTOR/ NOMINATED INSPECTION AGENCY E : END USER	
		INDICATE `P' PERFORM, `W' WITNESS AND `V' VERIFICATION	
SIGNATURE		AS APPROPRIATE "CHP" END USER SHALL IDENTIFIED IN COLUMN `E'	REVIEWED BY
			NAME & SIGN OFAPPROVING AUTHORITY WITH SEAL

	MANUFACTURER'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN												
		ITEM : LOCAL INSTRUMENT ENCLOSURE & LOCAL INSTRUMENT RACK				QP Ref NO.: CE/416/LIE-LIR/QP REV. : 00 DT. : 16.04.2015 PAGE : 03 OF 06								
S. NO.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	RECORD		M	C	E	REMARKS	
1	2	3	4	5	6	7	8	9	D*	**10			11	
5	PVC WIRE/ CABLE	A) TYPE, SIZE, MAKE	MAJOR	MEASUREMENT	SAMPLE	IS 694/APPD. APP.DRG	IS 694/APPD. APP.DRG	M.T.C./Q.A.REP.		P	V	V		
6	PAINT	A) SHADE	MAJOR	VISUAL	SAMPLE	APP. DRG	APP. DRG	M.T.C./Q.A.REP.		P	V	V		
		B) FINISH	MAJOR	VISUAL	SAMPLE	APP. DRG	APP. DRG	M.T.C./Q.A.REP.		P	V	V		
7	FLEXIBLE CONDUIT / M.S. CABLE TRAY	A) TYPE, SIZE & MAKE	MAJOR	VISUAL	SAMPLE	APP.DRG	APP.DRG	M.T.C./Q.A.REP.		P	V	V		
(B)	***COMPONENTS ****												* TYPE / MODEL /RANGE OF COMPONENTS AS PER BOM OF LIE/ LIR .	
1	VALVES, MANIFOLDS	MECHANICAL	MAJOR	A)CHEM. TEST	SAMPLE	SUPPLIER CAT./ APP.DRG	SUPPLIER CAT./ APP.DRG	M.T.C./Q.A.REP.		V	V	V		
				B)FUNCTIONAL	100%	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V		
				C) DIMENSION	100%/SAM.	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V		
				D)HYDROSTA-TIC	10%	-DO-	-DO-	M.T.C./Q.A.REP.		V	V	V		
2	FITTINGS	MECHANICAL	MAJOR	A)CHEM. TEST	SAMPLE	-DO-	-DO-	M.T.C./Q.A.REP.		V	V	V		
				B) DIMENSION	100%/SAM.	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V		
				C)HYDROSTA-TIC	10%	-DO-	-DO-	M.T.C./Q.A.REP.		V	V	V		
3.a	PIPES	MECHANICAL	MAJOR	A)CHEM. & PHY. TEST	SAMPLE	-DO-	-DO-	M.T.C./Q.A.REP. M.T.C./Q.A.REP.		V	V	V		
				B) DIMENSION	100%/ SAM.	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V		

		LEGEND :	FOR END USER :
		* RECORDS, INDENTIFIED WITH `TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.	DOC. NO.
		** M : MANUFACTURER/ SUBCONTRACTOR	
MANUFACTURER /SUBCONTRACTOR	CONTRACTOR	C: CONTRACTOR/ NOMINATED INSPECTION AGENCY E : END USER	
		INDICATE `P' PERFORM, `W' WITNESS AND `V' VERIFICATION	
SIGNATURE		AS APPROPRIATE "CHP" END USER SHALL IDENTIFIED IN COLUMN `E'	REVIEWED BY
			NAME & SIGN OFAPPROVING AUTHORITY WITH SEAL

	MANUFACTURER'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		
		ITEM : LOCAL INSTRUMENT ENCLOSURE & LOCAL INSTRUMENT RACK	**QP Ref NO.: CE/416/LIE-LIR/QP** **REV. : 00** **DT. : 16.04.2015** **PAGE : 04 OF 06**	

S. NO.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	RECORD		M	C	E	REMARKS
1	2	3	4	5	6	7	8	9	D*		**10		11
3.b	TUBES	MECHANICAL	MAJOR	A)CHEM. & PHY. TEST	SAMPLE	SUPPLIER CAT./ APP.DRG	SUPPLIER CAT./ APP.DRG	M.T.C./Q.A.REP.		V	V	V	
				B) DIMENSION	100%	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V	
				C) HYDROSTA-TIC	10%	-DO-	-DO-	M.T.C./Q.A.REP.		P	V	V	
(C)	**INPROCESS**												
1	FABRICATED/CUBICLE AND COMPONENTS	A) DIMENSION	CRITICAL	MEASUREMENT	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	
		B) LIFTING FACILITY	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	
		C) CABLE ENTRY	CRITICAL	VISUAL	100%	APP.DRG	APP. APP.DRG	Q.A. REPORT		P	V	V	
		D) STRAIGHTNESS / WAVINESS	CRITICAL	VISUAL	100%					P	V	V	
		E) GASKET ARGMNT.	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	
		F) DEBURRING	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	
		G) WELDING	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	
		H) REMOVAL OF WELDING SLAGS	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	

		LEGEND :	FOR END USER :
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MANUFACTURER /SUBCONTRACTOR	CONTRACTOR	C: CONTRACTOR/ NOMINATED INSPECTION AGENCY E : END USER	
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DOC. NO.

NAME & SIGN OFAPPROVING AUTHORITY WITH SEAL

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		ITEM : LOCAL INSTRUMENT ENCLOSURE & LOCAL INSTRUMENT RACK	QP Ref NO.: CE/416/LIE-LIR/QP REV. : 00 DT. : 16.04.2015 PAGE : 05 OF 06

S. NO.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY M	AGENCY C	AGENCY E	REMARKS
1	2	3	4	5	6	7	8	9	D*	**10			11
2	PRETREATMENT	A) DEGREASING	CRITICAL	VISUAL	100%	IS- 6005/F.S.	IS- 6005/F.S.	Q.A. REPORT		P	V	V	
	(7 TANK PROCESS)	B) DERUSTING	CRITICAL	VISUAL	100%	IS- 6005/F.S.	IS- 6005/F.S.	Q.A. REPORT		P	V	V	
		C) PHOSPHATISING	CRITICAL	MEASUREMENT	100%	IS- 6005/F.S.	IS- 6005/F.S.	Q.A. REPORT		P	V	V	
		D) PASSIVATION	CRITICAL	VISUAL	100%	IS- 6005/F.S.	IS- 6005/F.S.	Q.A. REPORT		P	V	V	
3	SURFACE PREPARA-	A) PRIMER(2 COATS)	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
	-TION & PAINTING	B) SURFACER	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		C) FINAL PAINTING	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		D) THICKNESS	CRITICAL	MEASUREMENT	SAMPLE	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
4	ELECTRICAL & MECH.	A) CHECK ARRANGE / LAYOUT OF COMP. & MOUNTING	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		B) WIRE CLAMPING & FERULING	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		C) INTERCONNECTION B/W COMPONENT	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		D)LUG SIZE&CRIMPING	CRITICAL	VISUAL	100%	APPD. APP.DRG	F.S./APP.DRG	Q.A.REPORT		P	V	V	
		E) COMPONENT IDENTIFICATION	CRITICAL	VISUAL	100%	APPD. APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		F) WIRE SIZE	MAJOR	VISUAL	SAMPLE	IS-694 / APP.DRG	IS-694 / APP.DRG	M.T.C./QA REP.		P	V	V	
		G) NAME PLATES	CRITICAL	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	
		H) PIPING	MAJOR	VISUAL	100%	APP.DRG	APP.DRG	Q.A.REPORT		P	V	V	

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MANUFACTURER /SUBCONTRACTOR	CONTRACTOR	C: CONTRACTOR/ NOMINATED INSPECTION AGENCY E : END USER	
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	MANUFACTURER'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN	
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S. NO.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY M	AGENCY C	AGENCY E	REMARKS
1	2	3	4	5	6	7	8	9	D*	**10			11
D)	***FINAL INSPECTION***												
1	A) VERIFICATION OF COMPONENTS /RATING/ ARRANGEMENTS/ LOCATION FOR EASY ACCESSABILITY AND MAINTENANCE .		CRITICAL	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	B) COMPLETENESS OF WIRING ,TUBING/ PIPING		CRITICAL	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	C) TERMINAL ARRANGEMENTS,SPARE TER--MINALS , EARTH BUS TIN PLATED COPPER)		CRITICAL	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	D) PAINT SHADE,THICKNESS & ADHESION		CRITICAL	MEASUREMENT	SAMPLE	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	E) DOOR ALIGNMENT		MAJOR	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	F) GENERAL APPEARENCE (STRAIGHTNESS, FREE FROM SCRATCHES, BENDS, DENTS AND SHEET THICKNESS)		MAJOR	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
	G) HYDROSTATIC TEST FOR ASSEMBLY. (1.5 TIMES RATED PRESSURE) (PNEUMATIC TEST FOR PURGING LINES (NO LEAKAGED WITH SOAP SOLUTION)		CRITICAL	MECHANICAL	100%	APP.DRG	APP.DRG/ NO LEAK/ PRESSURE DROP	Q.A. REPORT		P	W	W	PERFORMED BY VENDOR 100 % BHEL WITNESS ON 10%
2	OVERALL FINISH		MAJOR	VISUAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
3	CONTINUITY TEST		MAJOR	FUNCTIONAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
4	IR TEST		MAJOR	MEASUREMENT	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
5	HV TEST		MAJOR	MEASUREMENT	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
6	FUNCTIONAL TEST		MAJOR	FUNCTIONAL	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	W	W	
7	IP TEST TYPE TEST		MAJOR	VERIFICATION	100%/SAM.	APP.DRG	APP.DRG	Q.A. REPORT		P	V	V	

M. T.C. = MANUFACTURER'S / MATERIAL TEST CERTIFICATE
F.S. = FACTORY STANDARD
Q.A.REP.= QUALITY ASSURANCE REPORT
APP. APP.DRG = APPROVED DRAWING
SAM. = SAMPLE

NOTE :-CUSTOMER / INSPECTION AGENCY / END USER MAY DO INSPECTION ON SAMPLE BASIS

LEGEND :
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MANUFACTURER /SUBCONTRACTOR	CONTRACTOR	REVIEWED BY	NAME & SIGN OFAPPROVING AUTHORITY WITH SEAL
SIGNATURE			

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 001- Rev 00

INSTRUCTIONS TO BIDDERS (Common for all RFQs)

Bidder is requested to read the instructions carefully and submit their quotation covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 00), General Conditions of Contract (document reference: CE: PR: 002 - Rev 00) and Special Conditions of Contract, if any, of the enquiry.
2. Any deviations from or additions to the "General Conditions of Contract" or "Special Conditions of Contract" require BHEL's express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily the following documents:
   a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
   b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
   c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages / damages / replacement / repair of imported scope till system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
   d. Refer **Annexure X** on "Guidelines for Indian Agents".
8. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport / Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment. Warehousing charges due to

incomplete or missing documentation will be recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**

9. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: **www.bhel.com**
10. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices / misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike / lockout for a long period.

B. <u>GUIDELINES FOR PREPARATION OF OFFER:</u>

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
   - **SINGLE PART BID**: Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
   - **TWO PART BID**: Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed **"Techno-commercial offer)** and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed **"Price Bid"**. Both these envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.
   - **THREE PART BID**: Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.

   If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.
2. Supplier shall ensure to super scribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Pease ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only. Xerox copy will not be accepted.
4. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.
5. Deviation to this specification / item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
6. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and / or any other relevant documents called in purchase specification as part of Technical Bid.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all

applicable taxes and duties, packing & forwarding charges (if applicable), freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.

8. In addition, bidder shall also quote for erection & commissioning charges (E&C charges), documentation charges, service charges, testing Charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totaling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure II** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. <u>GUIDELINES FOR OFFER SUBMISSION:</u>

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE." Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer. **(This clause will not be applicable for e-tenders)**
2. E-Mail / Internet / EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC of the tender. (Refer to SCC document of tender)
3. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two officers whose names are mentioned in the RFQ. (Refer to SCC document of tender)
4. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor will be solely responsible:
   a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
   b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
   c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box or if the tender document is handed over to the wrong person BHEL will not be responsible for any such delays.
   d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time.
   e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is

needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.
Service provider: M-junction
Website address: https://bheleps.buyjunction.in/
Helpline no.: 033-66106426/6217/6013/6046/6176 (9:30 am to 5:30 pm)
9163348283/9163348284/9163348285/9163348286/8584008116 (5:30 pm to 8:30 pm)

Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OFFERS RECEIVED:

1. Any discount / revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes / revisions are requested by BHEL.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).
4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from vendors, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.
5. BHEL EDN reserves the right to adopt Reverse Auction or standard Price Bid Opening procedure for price evaluation, at its discretion. This will be decided after completion of technical evaluation of tender. **(Refer Annexure III for Guidelines for Reverse Auction)**.
6. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
7. After receipt of Purchase Order, supplier should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and / or any other relevant documents as per Specification / Purchase Order, as and when required by BHEL / Customer.
8. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order.
9. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL").
"Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and duties, freight charges, insurance, service tax for services, any other cost indicated by vendor for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on Mega Projects, Physical Imports or such 100% exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (wherever applicable and as indicated in SCC document of tender)

10. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

    Single part bids: Date of tender opening
    Two/three part bids: Date of Part-I bid opening
    Reverse Auction: Date of Part-I bid opening

    In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

    If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.

11. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format **(Refer Annexure IV)** for receiving all payments through NEFT. (Applicable for Indian vendors only)
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors. All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to suppliers account only. Such recovery will be made out of any of the available bills. **(Refer Annexure V)**.
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act. (Applicable for Indian vendors only).
   Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
4. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

(a) SUPPLY WITH E&C:

1) 85% of basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of submission of documents against supplementary invoice with proof of completion of E&C along with E & C charges (if any)

(b) SUPPLY WITH SUPERVISION OF E&C:

1) 90% basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
2) 10% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any)

(c) SUPPLY ONLY:

1) 100% of PO value with taxes, duties and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.

Purchase orders for import procurement:

(d) SUPPLY WITH E&C:

1) 85% of the basic value (excluding E&C charges) will be paid in 45 days, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of E&C along with E & C charges against supplementary invoice with proof of completion of E&C (if any).

(e) SUPPLY WITH SUPERVISION OF E&C:

1) 90% of the value of the order will be paid on the 45th day, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
2) 10% of basic value (retention money) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any).

(f) SUPPLY ONLY:

1) 100% of PO value will be paid against usance draft of 45 days from the date of dispatch or 15 days from the date of submission of complete set of documents whichever is later.

LOADING FACTORS FOR PAYMENT TERMS:

1) For offers received with requests for negotiation of documents through bank loading will be 15% of basic value (all bank charges to be borne by the seller).
   (This loading factor is applicable only for purchase orders for indigenous supply).

2) In all cases where credit period is 30 days but not in line with the above mentioned standard payment terms offered loading applicable will be 5% of basic value.
   (This loading factor is applicable only for purchase orders for indigenous supply).

3) For offers received with Letter of Credit payment term in place of sight draft payment term, loading applicable will be 5% of basic value. Additional loading of 5% will be applicable for payment terms as Letter of Credit with usance of less than 45 days.
   (This loading factor is applicable only for purchase orders for imported supply).

4) For offers received with Sight Draft payment terms with usance of less than 45 days, loading of 5% will be applicable.
   (This loading factor is applicable only for purchase orders for imported supply).

5) All payment terms with credit period of less than 30 days for indigenous supply and any other variation of payment terms are liable for rejection.

6) Standard payment terms indicated in para F (a), (b), (c), (d), (e) and (f) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and E&C charges (wherever applicable).

Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 15% or 10% (as applicable) of both purchase order values put together.

Note 2: ***If the E&C could not be completed till the end of the Warranty period due to reasons not attributable to the supplier, BHEL may consider releasing the retention money to the supplier against Bank Guarantee for equivalent value valid for an initial period of one year.***

G. Bank guarantee (BG) / Performance bank guarantee (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of 36 months + claim period of 6 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
    a. PBG shall be from any of the BHEL consortium of bankers **(refer Annexure VI)**.
    b. PBGs from nationalized banks are also acceptable.
    c. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order. PBG should be in the format indicated. **(Refer annexures VII & VIII respectively)**. No deviation to these formats will be allowed.
    d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).
    e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.
    f. Non acceptance for submission of PBG will attract loading as indicated below
        i. Loading will be equal to the percentage of value for which BG / PBG is not provided. (Ex: if PBG / BG is given for 3 % of the basic value against 10% specified, loading applicable will be 7% (10 – 3 = 7 %). This value will be added to the quoted price while evaluating the lowest offer.

H. PROVISONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

a. Valid NSIC certificate or
b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).
c. EM II certificate with CA certificate **(in the prescribed format given in Annexure IX)** applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.
d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

e. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 20% of the requirement against this tender provided
    1. The MSE vendor matches the L1 price
    2. L1 price is from a non MSE vendor
    3. L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
    4. 20% of the 20% (i.e. 4% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.

5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 4% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.
6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.

I. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL:

   BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.

2. Commitment by Bidder(s)/ Contractor(s):

   a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
   b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
   c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
   d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

   If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

PURCHASE EXECUTIVE

ANNEXURE - I
LIST OF INTERNATIONAL GATEWAY AIRPORTS

For airbased consignment, terms of delivery will be on FCA basis from following listed airports only. This list is valid from 01.03.2013 to 28.02.2015.Vendors are requested to verify this list for use after 28.02.2015.

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
DO6	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE – II

DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE-III
GUIDELINES FOR REVERSE AUCTION PROCEDURE

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

ANNEXURE - IV

Electronic Funds Transfer (EFT) OR

Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.
TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:
Company Name :
Permanent Account Number(PAN):
Address

City: PINCODE STATE

Contact Person(s)
Telephone No:
Fax No:
e-mail id:

1 Bank Name:
2 Bank Address:
3 Bank Telephone No:
4 Bank Account No:
5 Account Type: Savings/Cash Credit
6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank
7 Bank IFSC Code(applicable for NEFT)
8 Bank IFSC code(applicable for RTGS) (Indian Financial System Code)

A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.

B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transfering Bank responsible.

C This authority remains in full force until BHEL, EDN,Bangalore receives written notification requesting a change or cancellation.

D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:
Designation: Telephone No. with STD Code

Company Seal

Bank Certificate

We certify that_____has an Account No_____ with us and we confirm that the bank details given above are correct as per our records.

Date: (……..)
Place: Signature

Please return completed form **along with a blank cancelled cheque or photocopy** thereof to:
Bharath Heavy Electricals Ltd,
Attn:
Electronics Division, Mysore Road,
BANGALORE - 560 026
In case of any Querry, please call concerned purchase executive.

ANNEXURE - V
PRESENT PROCEDURE FOR SALE IN TRANSIT (HIGH SEA SALES)

In case of High Sea Sales, vendor should submit following documents:

1. **ORIGINAL HIGH SEA SALES AGREEMENT**
   - Sale agreement (on Rs. 200/- non-judicial stamp paper & notarised with 2 witnesses with identity) has to be signed between BHEL and the Party importing material. The date of the sale documents should be in between the date of House Air Way Bill / Bill of Lading and before landing of the goods in Indian origin.
   - The date of the stamp paper should be prior to the Air Way Bill / Bill of Lading date.
   - Following shall be included in the High Sea Sales Agreement:
     "THE BUYER ALSO UNDERTAKE DISCHARGES, THE OBLIGATION AND FULFILLMENT OF CONDITIONS, IF ANY, ATTACHED TO THE IMPORTATION, ASSESSMENT AND CLEARANCE OF THE GOODS IN TERMS CUSTOMS TARIFF ACT 1975, THE CUSTOMS ACT 1962 & RULES & REGULATIONS MADE THERE UNDER AND OTHER RELEVANT ACTS, ORDERS, NOTIFICATIONS**".**

2. **ORIGINAL INVOICES: INDIGENOUS RUPEE INVOICE & FOREIGN CURRENCY INVOICE**
   - Prices should be C.I.F., designated airport/seaport basis.
   - I.E.C., C.S.T., K.S.T. Nos. to be mentioned.
   - Description of item (Nomenclature), Unit & Quantity in both the Foreign Currency & the Indigenous Invoice in Rupee shall be exactly as per Purchase Order Description of item, Quantity and Unit. The Indigenous Invoice value shall be exactly as per Purchase Order value.
   - Seller should give Foreign Currency Invoice from the original consignor. The Foreign Currency Invoice value should be at least 2% (two per cent) less than the Indigenous Rupee Invoice value in equivalent foreign currency.

4. **ORIGINAL HOUSE AIR WAY BILL/ BILL OF LADING**
   - The sale agents should duly endorse House Air Way Bill (HAWB) for air shipments or original Bill of Lading (O.B.L.) for sea shipments and Foreign Currency Invoice in favour of BHEL-EDN.

5. **ORIGINAL CARGO ARRIVAL NOTICE FROM FORWARDER**.

6. **ORIGINAL DELIVERY ORDER ISSUED IN NAME OF BHEL-EDN.**

7. **ORIGINAL PACKING LIST.**

8. **A LETTER TO THE COMMISSIONER OF CUSTOMS FOR EFFECTING ABOVE SALE.**

9. **A LETTER TO THE DEPUTY ASSESSOR (OCTROI) FOR EFFECTING ABOVE SALE IN FAVOUR OF BHEL**.

REMARKS: In case vendor needs any clarifications on the above, the same may be sought in writing.

Annexure-VI
BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		**Nationalised Banks**
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		**Public Sector Banks**
3	Bank of Baroda	20	IDBI
4	Canara Bank		**Foreign Banks**
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce	25	The Royal Bank of Scotland N.V.
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		**Private Banks**
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE-VII
PROFORMA OF PERFORMANCE BANK GUARANTEE
(For Bank Guarantees issued in Indian Rupees by Banks in India)

Note:

- To be executed in Rs. 100/- Non-Judicial stamp paper.
- To be submitted by issuing bank to Purchase Dept. directly. Please give BHEL address to banker.
- Do not enclose with Bank document.
- Modifications and additions/deletions to this BG format are not permitted.

PERFORMANCE GUARANTEE (PROFORMA OF BANK GUARANTEE)

Ref no: (BG No.) _____

THIS DEED OF GUARANTEE made and executed on the _____ day of _____ (month & year), by the _____ (Bank), registered under the Companies Act 1956/Nationalised Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the State Bank of India Act / Subsidiary Banks Act, having its registered / head office at _____ represented herein by its Branch Manager / authorised representatives Sri._____ & Sri._____ (Hereinafter called 'guarantor' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort, New Delhi-110 049 and its Electronics Division at Mysore Road, Bangalore - 26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No_____ Dtd_____.

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order / contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____ being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except, against a Bank Guarantee for the said sum of Rs._____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees_____ being (10%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below :

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants with company is as follows:

1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs_____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier

2) The Guarantor hereby undertakes to pay the amounts and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by any terms contained in the said order/contract. Any such demand made on the guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the contractor/supplier admits or denies.

3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all supplies to be made /works to be performed / services to be rendered under the said order /contract /agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract agreement have been fully and

properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below, the guarantor shall be discharged from all the liability under this guarantee thereafter.

4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forebear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part, by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.

5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.

6) Notwithstanding anything herein above obtained, the liability of the guarantor under these presents is restricted to Rs._____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through it authorised representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)
For & On behalf of _____Bank
Signature of authorized person with seal & designation

WITNESS:

1.

2.

ANNEXURE-VIII

PROFORMA OF PERFORMANCE BANK GUARANTEE

(For Bank Guarantees issued in Foreign Currency by Banks located outside India)

BANK NAME AND ADDRESS

Electronics Division
Bharat Heavy Electrical Limited (BHEL),
Mysore Road, PB.No.2606
Bangalore- 560 026

Dear Sir,

Sub : CONTRACT PERFORMANCE GUARANTEE Ref no. …….. Dtd…….

WHEREAS you have entered into a contract reference No &PO NO._ Date_with M/s _having its registered office at _for the supply of _as detailed in your purchase order No. _which is hereinafter referred to as "the said contract" and WHEREAS M/s _has undertaken to produce a Bank Guarantee for 10% (Ten Percent) of the contract price amounting to _ () to secure its obligations to Electronics Division, BHEL having its registered office at New Delhi for the performance of the contract including the warranty of the equipment supplied, we _ Bank, _hereby expressly, irrevocably and unreservedly undertake and guarantee as principal obligors on behalf of M/s_that in the event Bharat Heavy Electricals Ltd. (B.H.E.L) declares to us in writing that M/s_ has not fulfilled any obligors according to the contractual obligation of the said contract, to pay you on demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division, Mysore Road, P.B.No. 2606, Bangalore - 560 026., India an amount of _ (in words) subject to as may be determined below :

1. Notwithstanding any right M/s. _may have directly against or any disputes raised by M/s. _, your written demand shall be conclusive evidence to us that repayment is due under the terms of the said contract and shall be binding on us.

2. We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. with or without our consent and knowledge or by any alteration in the obligations of M/s. by any forbearance whether as to payment, time, performance or otherwise.

3 This guarantee shall remain valid until the end of six months after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.

4 We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below :

5. This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. .

6. This guarantee shall be governed by and constructed in accordance with the laws of India.

7. At any time Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being (in words)

For and On behalf of Bank
By its Authorised Signatory

Annexure - IX
Certificate by Chartered Accountant on Letter Head

This is to certify that M/s ....(Hereinafter referred to as `Company') having its registered office at ..... is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part-II ..... dtd ..... Category: ..... (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on date**..... as per MSMED Act 2006 is as follows:**

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:

2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
   Rs. .....Lacs.

The above investment of Rs. ..... Lacs in within permissible limit of Rs..... Lacs for.....Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

Date:

(Signature)

Name -
Membership Number -
Seal of Chartered Accountant

Guidelines for Indian Agents

ANNEXURE - X

- **Definition of Indian Agent**: An Indian Agent of foreign prinicipal is an individual, a partnership, an association of persons, a private or pubile company, that carries our specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

In case of yes, vendor to note the following and reply accordingly:

i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.

ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.

iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.

iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.

v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.

vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.

vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure –'A' shall apply in all such cases.

viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

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Vendor's Signature with Seal

Annexure-A

Guidelines for Indian Agents of Foreign Suppliers

1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BHEL shall apply for registration in the registration form in line with SEARP.

1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.

1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.

2.0 Disclosure of particulars of agents/ representatives in India, if any.

2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:

2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.

2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.

2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.

2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:

2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.

2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.

2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, reserved for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.

2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.

2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

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Disclaimer Certificate For Deemed Export Benefits

I, (Name & Designation) …..on behalf of M/s. ….. (Name and address of the supplier) hereby certify that we have supplied the following goods to M/s….. (Name and address of the recipient):

S.No.	Inv. No. & date	Description of goods	Unit	Qty.	Value

1. We are the manufacturer exporters/suppliers and are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the input/components used in aforesaid supplies. We have also not availed and will not avail rebate on the inputs/components used in aforesaid supplies.

OR

We are the suppliers and our supporting manufacturer(s) is/are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the inputs/components used in aforesaid supplies.

2. We also certify that we have not been issued any Advance Authorization/Duty Free Import Authorization in respect of the aforesaid supplied goods and have not availed any benefit thereon.

3. We further state that we have not drawn nor will draw any benefit for deemed export and we have no objection if M/s…… (Name and address of the recipient) draws the deemed export benefits on the supplies mentioned above. (Required to be given in case benefits are claimed by recipient of goods).

OR

We have not given disclaimer certificate to M/s…… (Name and address of the recipient) and will not give disclaimer certificate, in future, in respect of these supplies for claiming deemed export benefits (Required to be given in case benefits are claimed by DTA suppliers).

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 00

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' hereinafter referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects / customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent / acceptance / award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection / Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Interpretation:

In the contract, except where the context requires otherwise:

a) words indicating one gender include all genders;
b) words indicating the singular also include the plural and words indicating the plural also include the singular;
c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. Price Basis: All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.

2. Validity: The offer will be valid for a period of 120 days from the date of technical bid opening date. Validity beyond 120 days, if required, will be specified in the SCC (special conditions of contract).

3. Ordering and confirmation of Order: Vendor shall send the order acceptance on their company letter head within two weeks from the date of Purchase Order or such other period as specified / agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
   The purchase order will be deemed to have been accepted if no communication to the contrary is received within two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.

4. Documentation: After receipt of Purchase Order, vendor should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
   At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.

5. Penalty:
   For delay in documentation: In the event of delay in submission of complete set of documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond three weeks (or as agreed/indicated in the Purchase Order) from the date of Purchase Order, penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

   For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

   Penalty for delayed documentation/delayed delivery, if applicable, shall be deducted at the time of first payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted.

6. Contract variations (Increase or decrease in the scope of supply): BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be applied to such additional work. Vendor shall not

perform additional work before BHEL has issued written instructions / amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.

7. Reverse Auction: BHEL reserves the right to follow REVERSE AUCTION PROCEDURE (ONLINE BIDDING ON NETWORK) before finalising the Purchase order on technically competent bidders, as per the guidelines given in Annexure III. In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) already submitted and available with BHEL shall be opened as per BHEL's standard practice.

8. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates / COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification / acceptance for issue of dispatch clearance.
   All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.

9. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.

10. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors.
    Any delay in submission of complete / correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete / incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.

11. Packaging and dispatch: The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
    The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw / solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitory / Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
    Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (L x B x H) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated.
    Separate packing & identification of items should be as follows.
    1. Main Scope - All items must be tagged with part no. & item description.
    2. Commissioning spares - All items must be tagged with part no. & item description.
    3. Mandatory spares - All items must be tagged with part no. & item description.

12. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.

13. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.

14. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.

15. Cancellation / Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
    BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so, on account of any decline, diminution, curtailment or stoppage of the business.

16. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services NOT supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
    In case of items demanding services at site like erection and commissioning, vendor should send his servicemen /representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase / service including additional handling charges due to the change.

17. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will have to be reimbursed by the Supplier.
    Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, Supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed.

18. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.

19. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.

20. Product Information, Drawings and Documents: Drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
    Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
    All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.

21. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods / related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

22. Force Majeure: Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.
    A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

    Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

23. Guarantee / Warranty: Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. Unless otherwise specified, guarantee / warranty period shall be 30 months after the date of delivery of goods or 24 months from the date of commissioning of goods whichever is earlier. The guarantee / warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

24. Limitation of Liability: Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.
    The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

25. Liability during guarantee / warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.
    In case, defects attributable to vendor are detected during first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.

26. Liability after guarantee / warranty period: At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / warranty period of the respective plant and equipment including spares or first time commissioning whichever is later but not later than 3 (three) years from the date of shipment.

27. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.

28. Settlement of Disputes: Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).

29. Arbitration Clause: In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
    Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
    The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.

30. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in BANGALORE alone shall have jurisdiction to consider over any matters touching upon this contract.

31. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.
That the headings used in this agreement are for convenience of reference only.
That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

32. Fraud Prevention Policy: The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to your notice.

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 003- Rev 00

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00). These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No: ……. **RFQ Date:**……
Due Date: …… **Project:** ……
Item Description: ……

Purchase Executives: In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand, the offers are to be handed over to either of the following Purchase Officers: …….

E-mail IDs: In case offers are sent through E-mail, please send the offers to both of the following email IDs……

E-tendering: Applicable / **Not Applicable**

Type of Bid: Two part Bid system

Reverse Auction: Not Applicable / **W** be intimated during commercial clarifications to technically acceptable vendors.
In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) shall be opened as per BHEL's standard practice.

Splitting of tendered quantity to MSE vendors: The tendered quantity will /will not be split to MSE vendors subject to submission of relevant documents by vendors. **Refer clause H of Instructions to Bidders for conditions applicable and for information on documents to be submitted.**

Destination: Items are to be directly dlspatched to BHEL's Site Office or Stores/Customer's Stores located at/near ……. Road Permit, if applicable, will be issued by BHEL along with DIspatch Clearance.

Project Benefits:

Indigenous scope of supply:

a) Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Excise Duty. Necessary documents for availing Excise Duty exemption by suppliers will be furnished by BHEL
b) Physical Export project: Eligible for complete exemption of Excise Dut y &ales Tax. Necessary documents for availing such benefits will be furnished by BHELto suppliers.

- **Imported scope of supply:**
  a) Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Customs Duty.
  b) Physical Export project: Eligible for complete exemption of Customs Duty.

Terms of Delivery:
Indicate station of despatch:
Indicate place of manufacturing (wherever applicable): _

- **Indigenous scope of supply:** Ex-works (including Packing &Forwarding charges but excluding Taxes &Duties): _
- **Imported scope of supply:** F.C.A. (for air consignments) /F.O.B. (for sea consignments)
  (Including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc): _____ .

S NO.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	DEVIATION IF ANY

01	**Validity**	The offer will be valid for a period of 120 days from the date of technical bid opening.	**AGREE**	
02	**Excise Duty & Cess**	If applicable, indicate current rate of Excise Duty and maximum rate of Excise Duty (against proof of Excise Invoice). However, for calculation purpose and arriving at "Total Cost to BHEL" maximum rate of Excise Duty will be considered. In case Excise Duty remains firm throughout the contract, the same shall be specifically indicated. Otherwise, maximum Excise Duty will be considered for arriving at lowest bidder. However, reimbursement of Excise Duty shall be at actuals against proof of Excise Invoice only. (Within contractual delivery). Physical export contract eligible for complete exemption of Excise duty against submission of necessary documents by BHEL like ARE -1/CT-1 form.	**APPLICABLE / NOT APPLICABLE** Present rate of Excise Duty with CESS .....% Maximum rate of Excise Duty with CESS .....%	
03	**Central Sales Tax (CST)**	If applicable, indicate current rate of sales tax against form "C". For issue of original form "C", vendor has to furnish "E1/E2" form. To enable vendor give E1/E2 form, photocopy of C form will be issued by BHEL Please confirm submission of "E1/E2 Sale form". For physical export project, Sales Tax is exempted against necessary documents furnished by BHEL	**APPLICABLE / NOT APPLICABLE** Present Sales Tax rate against form "C" ..... % **CONFIRMED**	
04	**Value Added Tax (VAT)**	If applicable, indicate current rate of VAT . When VAT is applicable, BHEL ROD's/ Nodal Agency's Name, TIN No. and address to be indicated in invoice. (Note that two original invoice and one tax invoice should be submitted to BHEL).	**APPLICABLE / NOT APPLICABLE** VAT rate at present ..... % **NOTED**	
05	**Octroi**	If applicable, indicate current rate of octroi.	**AGREE** Present Octroi rate .....%	
06	**Freight Charges (for indigenous scope of supply)**	Freight charges shall be to vendor's account. Quote lumpsum reasonable Freight charges separately in priced offer, plus service tax if any. Vendor's offer will be evaluated on "Total cost basis" including freight charges. Vendor shall book the consignment through their approved Road carriers on "Freight pre -paid" and door delivery consignee copy attached basis. Freight charges to be claimed from BHEL along with POD (Proof of Delivery) on original LR .	**AGREED** and quoted as lumpsum amount in price bid. Service Tax <u>%</u> (extra /inclusive in freight charges)	
07	**Service Tax on E&C and Training Charges**	If applicable, indicate current rate of Service Tax <u>%</u> Service Tax Regn. No. _ Confirmation that Service Tax register is maintained.	**APPLICABLE / NOT APPLICABLE** **CONFIRMED**	
08	**Parting of license for imported raw materials**	In case of Mega project, Ultra -Mega project and Physical Export project where Custom Duty and Excise Duty are NIL and vendor is importing any raw materials / components	**AGREE**	

		for the enquired item, same are eligible for zero Customs duty. As per EXIM policy, BHEL will part the import licence with the vendors to obtain import licence by themselves and custom clear the raw materials/ components by availing zero customs duty. Hence, please furnish list of raw materials / components to be imported by you with Quantity and CIF value (for which BHEL has to share import licence). The benefit due to the above shall be passed on to BHEL and confirmed in the quotation. If there are no imported raw materials/components, same shall be confirmed in the offer.	CIF value …… **Yes, benefit passed-on to BHEL in the priced quotation.** **We confirm that there are no imported components.**	
09	**Delivery Period**	Within **…** weeks from the date of issue of approved documents or manufacturing clearance by BHEL, whichever is later.	**AGREE** …… weeks	
10	**Guarantee/ Warranty**	**…** months from the date of delivery of goods or **…** months from the date of commissioning of goods, whichever is earlier.	**AGREE**	
11	**Inspection agency**	Materials will be inspected by : • BHEL • Customer/Consultant/BHEL nominated Third Party Inspection Agency (TPIA)	**AGREE**	
12	**Terms of Payment at the time of material supply**	Refer Clause "F" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: **Indigenous Scope:** a)Supply with E& b)Supply with Supervision of E& c) Supply only **Imported Scope:** d)Supply with E& e)Supply with Supervision of E& f) Supply only Note: Kindly indicate if High Sea Sales will be operated. If yes, confirm submission of relevant documents as per Annexure V	**AGREE** **YES / NO** **CONFIRMED**	
13	**Performance Bank Guarantee (PBG)**	PBG will be applicable for a period of **…** months +claim period of **….** months for a value equal to 10% of the basic value of the purchase order. Refer Clause "**G**" of Instructions to Bidders.	**AGREE**	
14	**Terms of Payment not related to material supply**	**For Training:** 100% will be paid in 45 days from the date of completion of Training or 15 days from the date of submission of complete set of documentation, whichever is later.Separate invoice shall be submitted for Training charges along with documentary evidence. **For Engineering & Documentation Charges:** 100% will be paid in 45 days from the date of approval of final documents or 15 days from the date of submission of invoice, whichever is later. Separate invoice to be submitted for Engineering & documentation charges.	**AGREE**	
15	**Mode of despatch**	**Indigenous Scope:** By Road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Despatch Instructions), only on receipt of Despatch Clearance from BHEL **Imported Scope:** By Air/Sea through BHEL approved Consolidator/Freight Forwarder, only on receipt of Despatch Clearance from BHEL	**AGREE**	

16	**Despatch Documents**	Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to BHEL directly. Depending upon the project/customer demands, despatch documents may include one or more documents from the following: Commercial Invoice, Excise Invoice (if ED is applicable), Lorry Receipt (LR), Packing List, Air Way Bill (AWB), Country of origin certificate, Warranty Certificate, Insurance Intimation letter, NIL Short Shipment Certificate, Original Performance Bank Guarantee (directly from issuing bank to BHEL), POD (Proof of Delivery) on original LR, Disclaimer Certificate (as per BHEL format attached as Annexure XI) along with ER-1 form & attested excise invoice (as per project demands like Nuclear Power plant) etc. **The precise list of despatch documents needed for a particular project will be specified in the Purchase Order.** One set of Invoice, Packing List and L/R or AWB shall be e-mailed/faxed immediately to BHEL-EDN after despatch.	**AGREE**	
17	**O & M Manuals**	As built Drawings, O&M Manuals and other approved documents shall be furnished in required no. of sets as per Specification/Purchase Order. Note: Supply of above documents (O&M) in required no. of sets along with material shall be indicated in packing list. If not mentioned BHEL may insist for submission in required sets once again.	**AGREE**	
18	**Quantity Tolerance**	If applicable, indicate Quantity tolerance for each of the line item. For Impulse/seamless/ GI pipes one random length applicable for each variety of pipes.	**CONFIRMED**	Quantity Tolerance ..... % per Variety
19	**Evaluation criteria for tendered item**	Itemwise evaluation of tendered item. Splitting of tendered quantity to MSE vendors (if any) is applicable. OR Items will not be split on item wise lowest offer. All the items in the tender will be evaluated and procured as a SINGLE package i.e. ordering will be done on Single L1 vendor.	**AGREE**	
20	**Integrity Commitment**	Integrity commitment will be applicable in the tender process and execution of contracts as mentioned in clause "I" of Instructions to Bidders.	**AGREE**	

With this, it is inferred that vendor has understood and accepts all terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00).

VENDOR'S SIGNATURE WITH SEAL

NOTE: The above filled-in and signed-sealed document (in original) shall be furnished as part of Part-I Bid without fail. If no deviations are brought, it will be treated as if all terms and conditions of this enquiry are accepted by vendor without any deviation.