

- clearly brought out by the Contractor in his offer, alongwith all relevant details/basis.
- 3.03.00 Any other requirement for proper LVS mounting & functioning & viewing shall also be specifically brought out by the Contractor in his offer, along with all relevant details.
- 4.00.00 **LOCAL INSTRUMENT RACK (LIR) & LOCAL INSTRUMENT ENCLOSURE (LIE)**
- 4.01.00 GENERAL
- 4.01.01 Devices (Transmitters/ Switches) located in the field shall be suitably grouped together to the extent possible and installed in the LIE (Closed Rack) and LIR (Open Rack) in Boiler/TG Building and Off-site plant areas.
- 4.01.02 Racks and enclosure shall be factory prefabricated & painted and shall complete with internal piping, tubing, manifold, isolation valves, blowdown valves, integral junction box, illumination etc.
- 4.01.03 No more than six instruments shall be grouped in a single rack / enclosure.
- 4.01.04 Racks shall be installed above the tapping points for air, flue gas and coal air mixture application whereas for applications such as for water and steam, racks to be installed below the source point.
- 4.01.05 Attention shall be paid in the layout to avoid air traps in liquid piping and water accumulation in air /gas piping.
- 4.01.06 Racks used for furnace, flue gas and air application shall be provided with intermittent & continuous air purging
- 4.01.07 Welding of impulse lines shall comply with the provisions of the latest applicable ANSI Code for Pressure Piping.
- 4.01.08 Earth stud shall be furnished at rack for safety grounding.
- 4.02.00 LOCAL INSTRUMENT ENCLOSURE (LIE)
- 4.02.01 Enclosure shall be free standing type. Racks shall be adequately reinforced to ensure true surfaces and to provide support. Major load - bearing posts shall be suitably supported by gusset plates or moment members.
- 4.02.02 Enclosure outer shall be constructed from at least 3 mm thick steel plate and epoxy painted to shade gray. Base frame shall be made of ISMC 100 and black colour finish.
- 4.02.03 2" NB galvanized pipes shall be laid horizontally and supported at two end channels to mount transmitters at accessible height. Center posts or any

- member, which would reduce access, shall be avoided.
- 4.02.04 Double leaf interlocking front opening doors with three point locking shall be provided and shall be arranged for maximum possible access to the interior. Key shall be of identical for all enclosures.
- 4.02.05 Doors shall have concealed quick removal type pinned stainless steel hinges and locking handles. Gaskets shall be used between all mating sections to achieve dust and weather proof enclosure rated for IP-65 including the internal junction box. All enclosures shall have access doors on front side.
- 4.02.06 Removable type bulkhead plates of thickness not less than 6 mm shall be mounted at the racks with suitable high temperature gasket. Impulse lines within the enclosures shall be properly clamped.
- 4.02.07 All internal wirings between the instruments and junction box shall run through flexible conduits. No exposed wirings within transmitter racks both open and closed type, is admissible.
- 4.02.08 Racks shall have a common blowdown drain header, which will connect individual instrument blowdown line after suitable pressure breaking through regulating globe type blowdown valves. Covered funnels shall be used for saturated liquid and steam service, whereas, open funnels may be used for cold liquid services. Header (2" NB ASTM A 106, Sch-80 Gr. C) shall be suitably sloped and shall have one end flanged and extending beyond the rack for connection to plant drain header..
- 4.02.09 Each rack shall be provided with one receptacle, light fixtures with wire guard and one lighting switch each at instrument & Junction box compartments with wire guard. Lighting switches may be door actuated & mounted inside the panel. Outlet box, switch box and device covers shall be of galvanized stamped steel. 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.
- 4.02.10 Power supplies for miscellaneous devices shall be provided with MCB located within the enclosures. MCB shall be mounted in fuse blocks. Nameplates shall be furnished above the MCB blocks, identifying the devices being served.
- 4.02.11 Vibration dampeners shall be installed for supporting each enclosure. The loading at each corner of the enclosure shall be determined by actual test weighting when construction is complete to determine the correct length of each dampener for proper loading of the dampener in accordance with manufacturer's recommendations
- 4.03.00 LOCAL INSTRUMENT RACK (LIR)
- 4.03.01 Rack shall be free standing type constructed from 6 mm thick steel channel frame provided with a canopy to protect the instrument from dripping water or

falling objects and shall be epoxy painted. Canopy shall be of CRCA steel sheet of at least 3 mm thickness.

4.03.02 Rack Major load-bearing posts shall be suitably supported by gusset plates or moment members. Suitable fenders grill shall be welded to the end-posts of the rack to outline a boundary beyond which no mounted equipment shall project to protect instrument from accidental contact during personnel movement. Center posts or any member, which would reduce access, shall be avoided.

4.03.03 2" NB galvanized pipes laid horizontally and supported at two end channels shall be employed at working accessible height for mounting of instruments.

4.03.04 All internal wirings between the instruments and junction box shall run through flexible conduits. No exposed wirings are admissible.

4.03.05 Racks shall have a common blowdown drain header, which will connect individual instrument blowdown line after suitable pressure breaking through regulating globe type blowdown valves. Covered funnels shall be used for saturated liquid and steam service, whereas, open funnels may be used for cold liquid services. Header (2" NB ASTM A 106, Sch-80 Gr. C) shall be suitably sloped and shall have one end flanged and extending beyond the rack for connection to plant drain header..

Each rack shall be provided with one receptacle, one light fixture with wire guard and one lighting switch. Outlet box, switch box and device covers shall be galvanized stamped steel. Light fixtures shall be installed on the canopy of the rack

4.03.06 Power supplies for miscellaneous devices shall be provided with MCB located within the enclosures. MCB shall be mounted in fuse blocks. Nameplates shall be furnished above the MCB blocks, identifying the devices being served.

4.04.00 JUNCTION BOX

- | | | |
|----------------------|---|--|
| 1. Type of Enclosure | : | Dust tight & weatherproof conforming to IP 65 |
| 2. Material | : | 3 mm sheet steel / fiberglass reinforced polyester(UV stabilized) |
| 3. Type of Cover | : | Solid unhinged with retention chain / Screwed at all four corners |
| 4. Paint | : | i) Exterior : Opaline green shade 275 of IS: 5
ii) Interior - Brilliant Glossy White. |

- Surface / Two (2) inch Pipe stanchion
5. Mounting : (At a dry compartment at one side of the enclosure / rack with front opening type door)
6. Cable Entry : 3 mm (min) Bottom / side Gland plate
7. Gasket : Neoprene
8. Grounding : Brass earth lug with green screw head
External-2 nos , Internal-1no. (M6)
9. Number of Drain Holes : Two at bottom capped
10. Identification : Label for JB and Tags for cable
11. Accessories : Rail mounted cage clamp type screwless terminals (suitable for conductor size up to 2.5sq.mm of suitable voltage grade) with markers and 20% spare terminals
- b) Cable gland (Brass) & raceways
- c) Ferrules & lugs (Brass)
- d) Aluminum back panel
- e) Canopy at top
- f) Mounting brackets
- g) bolts and nuts made of brass etc.

FORM NO. PEM-5666-0



DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS-999-145-054A	
VOLUME	
SECTION	
REV. NO. 02	DATE: 16.09.2013
SHEET 1	OF 3

TAG No. Qty.....

Data Sheet No.: PES-145A-DS1-0

Data Sheet A & B

DATA SHEET-A FOR LOCAL PANEL
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY
BIDDER)

GENERAL	MANUFACTURER			
	CONSTRUCTION		<input checked="" type="checkbox"/> FOLDED <input type="checkbox"/> WELDED	
	ENCLOSURE SHEET THICKNESS (As per Section 8.13, Volume V of contract specification)	FRONT	<input type="checkbox"/> 2.0 mm	
		OTHER	<input type="checkbox"/> 2.0 mm	
		DOOR	<input type="checkbox"/> 1.6 mm	
HEIGHT		<input type="checkbox"/> 2365 mm for stand alone panels. <input type="checkbox"/> Other		
	OTHER	<input type="checkbox"/> Load bearing sheet front shall have 3mm thickness		
TECHNICAL	INPUT POWER SUPPLY * (As per Electrical specification) (ANY OTHER POWER REQUIREMENT TO BE DERIVED FROM THIS SUPPLY ONLY)		<input type="checkbox"/> 240V 50 Hz AC <input type="checkbox"/> 220V DC <input checked="" type="checkbox"/> 415V 3 PHASE 3W <input type="checkbox"/> 400V 3 PHASE 4W	
	NO. OF FEEDERS (As per Electrical specification)		<input type="checkbox"/> ONE <input type="checkbox"/> TWO	
	STARTER WITH MCC		<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	
	IPR POSITION		<input checked="" type="checkbox"/> MCC <input type="checkbox"/> RELAY PANEL	
	CONTACT RATING OF RELAY		<input checked="" type="checkbox"/> 5 Amp, 230 V AC <input checked="" type="checkbox"/> 0.25 Amp, 220V DC	
	CONTROL SUPPLY		<input type="checkbox"/> 110V AC <input type="checkbox"/> 220V AC <input type="checkbox"/> 220V DC <input type="checkbox"/> Other. (As per requirement)	
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		_____ NOS. (AS REQUIRED)	
	TEMP SCANNER (IF REQUIRED -NO. OF CHANNELS TO BE SPECIFIED UNDER SEC-C)		<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	
	PAINT TYPE (As per Annex-1, Section 7.6, Volume IV of contract specification)		<input type="checkbox"/> EPOXY ENAMEL <input type="checkbox"/> EPOXY POWDER COATED	
	MIMIC (TYPE OF MIMIC- MATERAIL, THICKNESS TO BE SPECIFIED DURING DETAILED ENGG.)		<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	PANEL COLOUR (EXTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		<input type="checkbox"/> LIGHT GREY <input type="checkbox"/> OPALINE GREEN	
	FINISH (EXTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		<input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input type="checkbox"/> SEMI GLOSSY	
	PANEL COLOUR (INTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		<input type="checkbox"/> WHITE <input type="checkbox"/> CREAM <input type="checkbox"/> OFF WHITE	
	FINISH (INTERNAL) (As per Annex-1, Section 7.6, Volume IV of contract specification)		<input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input type="checkbox"/> SEMI GLOSSY	
	CLASS OF PROTECTION		<input checked="" type="checkbox"/> IP-55 (FOR INDOOR SERVICE) <input checked="" type="checkbox"/> IP-67 (FOR OUTDOOR SERVICE) <input type="checkbox"/> ANY OTHER	
	CONTROL HARDWARE		<input checked="" type="checkbox"/> RELAY BASED	
FOUNDATION ARRANGEMENT		<input type="checkbox"/> FOUNDATION BOLTS <input type="checkbox"/> ANCHOR FASTENERS		
WEIGHT OF PANEL (Kg.)	(Vendor to specify)		

FORM NO. PEM-5666-0



DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS-999-145-054A	
VOLUME	
SECTION	
REV. NO. 02	DATE: 16.09.2013
SHEET 2	OF 3

TAG No. Qty..... Data Sheet No.: **PES-145A-DS1-0**

Data Sheet A & B

DATA SHEET-A FOR LOCAL PANEL
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY
BIDDER)

	PANEL TYPE	<input type="checkbox"/> PRESSURISED <input type="checkbox"/> UNPRESSURISED As per Requirement		
	CABLE GLAND	<input checked="" type="checkbox"/> DOUBLE COMPRESSION		
	AMMETER (TYPE OF INPUT) *	<input type="checkbox"/> 1 Amp CT <input type="checkbox"/> 4-20 mA		
	SCOPE OF SUPERVISION FOR ERECTION & COMMISSIONING	<input type="checkbox"/> APPLICABLE <input checked="" type="checkbox"/> NA		
	* TO BE CO-ORDINATED WITH PEM ELECTRICAL			
NAME DESIGNATION SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME: SIGNATURE: DATE:
	AANCHAL CHOUDHARY	SACHIN SRIVASTAVA	MA MANSOORI	
	SR.ENGR	DY.MNGR	D. GM	
	16.09.2013	16.09.2013	16.09.2013	

FORM NO. PEM-6666-0


	DATA SHEET FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS-999-145-054A	
		VOLUME	
		SECTION	
		REV. NO. 02	DATE: 16.09.2013
		SHEET 3	OF 3

TAG No. Qty.....	Data Sheet No.: PES-145A-DS1-0
Data Sheet C	

DATA SHEET-C FOR LOCAL PANEL (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)
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GENERAL	MANUFACTURER		
	CONSTRUCTION		<input type="checkbox"/> FOLDED <input type="checkbox"/> WELDED (As per requirement EDN)
	ENCLOSURE SHEET THICKNESS	FRONT	
		OTHER	
		DOOR	
		HEIGHT	
OTHER			
TECHNICAL	INPUT POWER SUPPLY		
	NO. OF FEEDERS		
	CONTACT RATING OF RELAY		
	TEMP SCANNER		
	CONTROL SUPPLY		
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		
	PAINT TYPE		
	PANEL COLOUR (EXTERNAL)		
	FINISH (EXTERNAL)		
	TYPE OF MIMIC MATERIAL OF MIMIC THICKNESS OF MIMIC		
	PANEL COLOUR (INTERNAL)		
	FINISH (INTERNAL)		
	CLASS OF PROTECTION		
	CONTROL HARDWARE		
	FOUNDATION ARRANGEMENT		
	WEIGHT OF PANEL (Kg.)		

FORM NO. PEM-6666-0

	DATA SHEET FOR LOCAL PANELS			SPECIFICATION NO.: PE-SS-999-145-054A	
				VOLUME	
				SECTION	
				REV. NO. 02	DATE: 16.09.2013
TAG No. Qty.....		Data Sheet No.: PES-145A-DS1-0			
Data Sheet C					
DATA SHEET-C FOR LOCAL PANEL (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)					
	PANEL TYPE				
	CABLE GLAND				
	AMMETER (TYPE OF INPUT)				
	SCOPE OF SUPERVISION				
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME: SIGNATURE: DATE:	
	AANCHAL CHOUDHARY	SACHIN SRIVASTYAVA	MA MANSOORI		
	16.09.2013	16.09.2013	16.09.2013		



Technical specification for
CONTROL & INSTRUMENTATION

1X800 MW KOTHAGUDEM

SPEC NO.: **PE-TS-410-145-I**

VOLUME

SECTION

REV. NO. 00

DATE : 10.03.2015

SHEET OF

LCP Quality Plan



**STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL**

STD QUALITY PLAN NO.: PE-QP-999-145-1056	
VOLUME	IIB
SECTION	D
REV. NO.	01
DATE:	22-02-2008
SHEET	1 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	Relevant standard	Relevant standard	Test Certificate	3	---	2	
		2. Bend Test	CR	Mech. test	Sample	Relevant standard	Relevant standard	Log Book	2	---	---	
		3. Surface finish	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		4. Waviness	MA	Visual	100%	Factory Standard	No Waviness	Log Book	2	---	---	
		5. Thickness	MA	Measurement	100%	BHEL Spec.	BHEL Spec.	Log Book	2	---	---	
		6. Mill marking	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	1	
2.0	Flats / Angles / Channels	1. Dimensions	MA	Measurement	Sample	Relevant standard	Relevant standard	Log Book	2	---	---	
		2. Surface Defects	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		3. Straightness	MA	Measurement	100%	Factory Std.	Factory Std.	Log Book	2	---	---	
		4. Mill marking	MA	Visual	100%	Relevant standard	Relevant standard	Log Book	2	---	1	
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	
		2. IR and HV	MA	Electrical	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

[§] P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor



STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

STD QUALITY PLAN NO.: PE-QP-999-145-1056	
VOLUME	IIB
SECTION	D
REV. NO.	01
DATE:	22-02-2008
SHEET	2 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
		3. Conductor a) Resistance b) Size c) Sheet colour	MA MA MA	Electrical Measurement Visual	100% 100% 100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	2	---	---	
		4. Type / Routine Test Certificates	MA	Verification	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	3	---	2	
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays Timers Space Heaters Thermostat Indicating meters etc.	1. Verification at make and Type 2. Verification of Test Certificates 3. Operation / Functional check 4. I.R. 5. H.V. 6. Calibration 7. Pick up / Drop off Voltage	CR CR CR MA MA MA MA	Visual Scrutiny of Type / Routine T.Cs. Electrical Electrical Electrical Electrical	Sample 100% Sample+ 100% 100% 100% 100%	BHEL Spec. and BOM Relevant standard Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue	BHEL Spec. and BOM Relevant standard Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue Relevant standard & Catalogue	Log Book Log Book Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2 2 2	---	---	+ for relay & contactors only @ for all components except relays & contactors. 1

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FOR
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
		2. Surface defects	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
		3. IR / HV on Terminal Blocks	MA	Electrical	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
6.0	IN PROCESS Blanking / Bending / Forming	1. Dimensions	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---	
		2. Surface defects after bending	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	---	
7.0	Nibbling / Punching	1. Cutout Sizes	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---	
		2. Deburring	MA	Visual	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---	
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
		2. Alignment	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
		3. Welding Quality	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	
		4. Surface defects	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
9.0	Pre-treatment and Painting	1. Pretreatment Process	MA	Visual	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		2. Process parameters like bath temp. concentration etc.	MA	Measurement	Periodic	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		3. Dipping / Removal Time	MA	Measurement	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		4. Surface quality after every dip	MA	Visual	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		5. Primer after phosphating	MA	Visual, Thickness	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		6. Putty Application & Rubbing after primer	MA	Visual	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		7. Paint first coat	MA	Visual, Thickness	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		8. Putty Application and Rubbing after first coat of paint	MA	Visual	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	Factory Standard & Relevant standard	Factory Standard & Relevant standard	Log Book	2	---	1	

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STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

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SHEET	5 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		3. Ferrule numbers	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		4. Colour of wiring	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
		5. Size of Conductor	MA	Measurement	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
		2. Fixing	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Final Inspection	1. Workmanship	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	} At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		3. Components identification Marking / Name plates	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	

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**STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL**

STD QUALITY PLAN NO.: PE-QP-999-145-1056		
VOLUME	IIB	
SECTION	D	
REV. NO.	01	DATE: 22-02-2008
SHEET	6	OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
		5. Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		6. Door functioning	MA	Functional	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		7. Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		8. Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		9. Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	
		10. Wiring Layout	MA	Visual	100%	BHEL approved drg.	BHEL approved drg.	Inspection Report	2	1	1	
		11. Wire Termination	MA	Pulling manually	Sample	----	Firm termination	Inspection Report	2	1	1	
		12. Continuity	MA	Electrical	100%	----	Continuity OK	Inspection Report	2	1	1	

LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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**STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL**

STD QUALITY PLAN NO.: PE-QP-999-145-1056	
VOLUME	IIB
SECTION	D
REV. NO.	01
DATE:	22-02-2008
SHEET	7 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	BHEL approved spec., drg relevant IEC-60947, IEC-60079	BHEL approved spec., drg relevant IEC-60947, IEC-60079	Type Test Certificate	3	---	1	
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	BHEL approved spec., drg., BOM & relevant standard	BHEL approved spec., drg., BOM & relevant standard	Test Report	2	1	1	
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
		2. Instrument Calibratio	CR	Electrical	10%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
		3. Temperature rise	CR	Electrical	100%	BHEL approved spec/drg. & relevant standard	BHEL approved spec/drg & relevant standard	Inspection Report	2	1	1	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

[§] P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor



Technical specification for
CONTROL & INSTRUMENTATION

1X800 MW KOTHAGUDEM

SPEC NO.: **PE-TS-410-145-I**

VOLUME

SECTION

REV. NO. 00

DATE : 10.03.2015

SHEET OF

CABLE BOQ

CABLE SIZES FOR 1X800 MW KOTHAGUDEM TPS	
Sl no.	Cable Type
	G-TYPE
1	2P X 0.5 sqmm
2	4P X 0.5 sq mm
3	8P X 0.5 sqmm
4	12P X 0.5 sqmm
5	2P X 1.5 sqmm
	F-TYPE
1	4P X 0.5 sqmm
2	8P X 0.5 sqmm
3	12P X 0.5 sqmm
4	20P X 0.5 sqmm
	CONTROL CABLE
1	3C X 2.5 sqmm
2	5C x 2.5 sq mm
3	12C x 2.5 sqmm

ERECTION HARDWARES

1.00.00 GENERAL TECHNICAL REQUIREMENTS

This section provides the general technical guidelines for the erection materials for instruments. All erection materials shall be of good quality and conform to the operating environment of the corresponding instrument.

However, any item required for erection of Bidder supplied system but not categorically indicated in this section, shall be supplied by the Bidder and all these items shall conform to International / National standards / codes.

1.01.00 Electrical Accessories

Electrical conduit and associated materials shall conform to the requirements of the articles which follow :

- a) Rigid Steel Conduit
 - i) Conduits up to and including 25 mm shall be of 16 SWG and conduits above 25 mm shall be of 14 SWG. Minimum size of conduits shall be 19 mm.
 - ii) Each piece of conduit shall be straight, free from blister and other defects and covered with capped bushing at both ends.
 - iii) All rigid conduit couplings and elbows shall be hot dip galvanized rigid mild steel in accordance with IS:9537 Part-I (1980) and Part-II(1981).. The conduit interior and exterior surfaces shall have a continuous zinc coating with an over coat of transparent enamel lacker or zinc chromate. Conduits shall be furnished in standard length of 3 meters, threaded at both ends.
 - iv) All rigid conduit fittings shall conform to requirements of IS:2667,1976. Galvanised steel fittings shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fitting shall be compatible with the flexible conduit supplied.
- b) Flexible Conduit
 - i) Flexible conduit shall be of three layer construction of very high quality of lead coated steel. Outside and inside layer shall be reinforced with heat resistant material.
 - ii) Lead coating outside and inside of the conduit steel surface shall provide a non-corrosive characteristic particularly in acidic atmosphere. Besides flexibility, this shall be strong enough to stay at the desired profile without support and shall be durable and strong so as to offer sufficient mechanical protection. It shall also be fully liquid dust and air tight and shall withstand a continuous hydraulic pressure up to 2 Kg/Sq. cm and temperature up to 200 °C.
- c) Special Fittings
 - i) Conduit sealing and fittings shall be provided as required and shall be consistent with the area and equipment with which they are installed.
 - ii) Double locknuts shall be provided on all conduit terminations not provided with threaded lugs and couplings. Locknuts shall be designed to securely bond the conduit to the enclosure when tightened. Locknuts shall not loosen due to vibration.

- 1.02.00 Electrical Junction Box:
Please refer to Section VII , Subsection – D of this volume of the Specification.
- 1.03.00 Cable Gland
1. Type : Double compression
 2. Entry Thread : NPT / ET
 3. Material : Brass
 4. Finish : Cadmium Plated.
 5. Protection : IP 54 or better
 6. Accessories : Neoprene gasket, locknuts, reducers etc
- 1.04.00 Cable Tray
1. Material : Mild steel, slotted
 2. Thickness : not less than 2.0 mm
 3. Finish : Hot dip galvanized
 4. Perforation : As per MFR standard
 5. Cover : Suitable for tray
- 1.05.00 Process Hook Up Accessories & specification
Material and rating of the hook up items shall suit the piping and fluid condition. Hook up materials shall be IBR certified for applicable cases. Bidder shall furnish hook up drawings and the drawings for open racks & closed racks for owner's approval.
- 1.05.01 Seamless Stainless Steel Pipe
1. Reference : ASTM A-312 TP 316
 2. Material Grade : TP 316
 3. Type : Seamless /Plain end
 4. Size : As applicable (e.g.½" NB etc)
 5. Schedule : 40
 6. Standard Length : 5 meter
- 1.05.02 Stainless Steel Pipe Fittings

1. Reference : ASTM A-182 F 316 / ANSI B16.11
2. Type : Forged
3. Rating : 3000 lbs / 6000 lbs / 9000 lbs
4. Size : To suit related SS pipe.
5. End connection : Generally socket weld
6. Type of Fittings : Reducing coupling, male-female reducer, straight coupling, equal tee, three piece union, elbow, cap etc.

1.05.03 Seamless Stainless Steel Tube

1. Reference : ASTM A-213 , ASTM A-249 or ASTM A-269
2. Material Grade : TP 316
3. Size : As applicable (e.g. ½" OD X 0.083" wall thickness / ¼" OD X 0.049" wall thickness etc.)
4. Type : Cold drawn annealed, pickled, passivated, de-scaled, hydraulically cleaned seamless tube.
5. Properties : The tube shall be free from scratches and suitable for bending and capable of being flared by hardened and tapered steel pin. The expanded tube shall show no crack or rupture. Hardness shall be RB 80.
6. Test Pressure : 400 Kg/Sq. cm (minimum)
7. Tolerance : ± 0.13 mm for outside diameter
: ± 15 % for wall thickness
8. Standard Length : 5 meter
9. Test : Flare, Hardness, Ball and Bubble Test

1.05.04 Stainless Steel Tube Fittings

1. Reference : ASTM-A-182
2. Type : Double ferrule double compression
3. Material : 316 Stainless steel forged
4. Ferrule : 316 Stainless Steel

- | | | | |
|---------|----|--------------------|--|
| | 5. | Type of Fittings | : Male / female connector, elbow, cross /equal tee, straight connector, bulkhead union, ferrule etc. as required to suit installation. |
| | 6. | Size | : To suit SS tubing and NPT end connection |
| 1.05.05 | | C.S. Pipe | |
| | 1. | Reference | : ASTM-A 106 Gr. C |
| | 2. | Material | : Cold drawn seamless black C.S. |
| | 3. | Type | : Seamless / Plain ends |
| | 4. | Size | : As applicable (e.g. ½” NB etc) |
| | 5. | Schedule | : 80, 160, XXS as required |
| | 6. | Standard Length | : 5 meter |
| 1.05.06 | | C.S. Pipe Fittings | |
| | 1. | Reference | : ASTM-A 105 / ANSI B16.11 |
| | 2. | Type | : Forged |
| | 3. | Rating | : 3000 lbs / 6000 lbs / 9000 lbs |
| | 4. | Size | : Suitable to related C.S.Pipe |
| | 5. | End connection | : Generally socket weld |
| | 6. | Type of Fittings | : Reducing coupling, male-female reducer, straight coupling, equal tee, three piece union, elbow, cap etc. |
| 1.05.07 | | A.S. Pipe | |
| | 1. | Reference | : ASTM-A 335 P22 AS PER ANSI B 36.10 |
| | 2. | Material | : Cold drawn seamless A.S. |
| | 3. | Type | : Seamless / Plain ends |
| | 4. | Size | : As applicable (e.g. ½” NB etc) |
| | 5. | Schedule | : XXS |
| | 6. | Standard Length | : 5 meter |
| 1.05.08 | | A.S. Pipe Fittings | |

- | | | | |
|---------|----|--------------------------|--|
| | 1. | Reference | : ASTM-A 182 F22 AS PER ANSI B 16.11 |
| | 2. | Type | : Forged |
| | 3. | Rating | : 9000 lbs |
| | 4. | Size | : Suitable to related A.S.Pipe |
| | 5. | End connection | : Generally socket weld |
| | 6. | Type of Fittings | : Reducing coupling, male-female reducer, straight coupling, equal tee, three piece union, elbow, cap etc. |
| 1.05.09 | | G.I.Pipe | |
| | 1. | Reference | : IS-1239, Part-I |
| | 2. | Type | : Medium grade, threaded at both ends protected with end caps |
| | 3. | Material | : Continuous ERW galvanized MS pipe |
| | 4. | General | : Pipe shall be galvanized both inside and outside |
| | 5. | Size | : As applicable (e.g 1/2"/3/4"/1" etc.) |
| 1.05.10 | | G.I.Pipe Fittings | |
| | 1. | Reference | : IS-1239, Part-II for material, dimension, thread etc. |
| | 2. | Style | : Threaded |
| | 3. | Type of Fittings | : Equal tee, three piece union, unequal tee, straight socket, 90 Deg. elbow, reducing socket cap. etc. to suit installation. |
| | 4. | Size | : Suitable to related G.I.Pipe |
| 1.05.11 | | Carbon Steel Globe Valve | |
| | 1. | Reference | : ASTM A-105 |
| | 2. | Type | : Globe |
| | 3. | Construction | : Forged Body Cadmium Plated |
| | 4. | End Connection | : As applicable (eg. 1/2" Socket Weld etc.) |
| | 5. | Rating | : Cl. 800 / CL. 2500 |

- | | | |
|-----|-----------------|---|
| 6. | Material | : Body - Carbon steel
: Stem - Hardened Steel
: Plug - AISI 316 SS
: Seat- Stainless steel stellited |
| 7. | Packing | : Teflon / Grafoil as required |
| 8. | Yoke | : ASTM A105 |
| 9. | Hand wheel | : Carbon steel |
| 10. | Design standard | : As per ANSI B 16.34 |

1.05.12 Stainless Steel Globe Valve

- | | | |
|-----|-----------------|--|
| 1. | Reference | : ASTM A-182 F316 |
| 2. | Type | : Globe |
| 3. | Construction | : Forged Body |
| 4. | End Connection | : As applicable (eg. ½” Socket Weld etc.) |
| 5. | Proof Pressure | : 400 Kg/Cm2 |
| 6. | Material | : Body - Stainless steel
: Stem - Hardened Steel
: Plug - AISI 316 SS
: Seat- Stainless steel stellited |
| 7. | Packing | : Teflon as required |
| 8. | Yoke | : ASTM A182 F316 |
| 9. | Handwheel | : Carbon steel |
| 10. | Design standard | : As per ANSI B 16.34 |

1.05.13 Alloy Steel Globe Valve

- | | | |
|----|--------------|------------------|
| 1. | Reference | : ASTM A-182 F22 |
| 2. | Type | : Globe |
| 3. | Construction | : Forged Body |

- | | | |
|-----|-----------------|--|
| 4. | End Connection | : As applicable (eg. ½” Socket Weld etc.) |
| 5. | Rating | : CL. 2500 |
| 6. | Material | : Body - Alloy steel
: Stem - Hardened Steel
: Plug - AISI 316 SS
: Seat- Stainless steel stellited |
| 7. | Packing | : Grafoil as required |
| 8. | Yoke | : ASTM A182 F22 |
| 9. | Handwheel | : Carbon steel |
| 10. | Design standard | : As per ANSI B 16.34 |

1.05.14 Structural Steel

Steel supports for JB's, trays; tubes and related equipments shall not be limited to the following:

- | | |
|----|---------------------------------------|
| a) | MS Angle |
| b) | MS Channel |
| c) | I-Beam |
| d) | Hexagonal head Bolt & Nut with washer |
| e) | Foundation Bolt & Nut |
| f) | Expansion Bolt |
| g) | Steel Plates / Flats |
| h) | CRCA sheet |
| i) | 50 NB Pipe |
| j) | Pipe clamps, U Bolts & Nuts |
| k) | Checker plate |

1.05.15 Condensate Pot

- | | | |
|----|----------------|--|
| 1. | Reference | : ASTM A182 F22 /ASTM A105 |
| 2. | Material | : Alloy steel / carbon steel as per application |
| 3. | Construction | : Drilled from barstock |
| 4. | End connection | : As applicable (e.g 3 nos. ½” socket weld end etc.) |

	5. Accessories	: Vent valves
1.05.16	Instrument Valve Manifold	
	1. Type	: Two valve manifold : Five valve manifold
	2. Mounting	: Remote 2" Pipe Mounting / Transmitter Rack mounting
	3. Construction	: Single block (bar stock)
	4. Material	: Forged body and bonnet AISI 316 stainless steel
	5. Ports	: Mfg std. (e.g 1/2 " NPT (F) etc.)
	6. Rating	: 420 Kg/Sq. cm at ambient
	7. Operating Temperature	: (-)30 to (+)170 Deg C
	8. Packing	: PTFE Wafer
	9. Seat & Stem	: AISI 316 SS
	10. Plug	: AISI 316 SS free to turn on stem / 17-4 PH
	11. Handle Bar	: AISI 316 SS
	12. Connection	: Straight
	13. Accessories	: Plugs for all ports, Mounting Bracket , bolts , nuts

1.06.00 Pneumatic Hook Up Accessories

1.07.00 Air Header

Technical Particulars	For Panel	For Field
Material of Construction	: Stainless steel	: Stainless steel
Inlet Connection	: 2" NPT (M)	: 1" NPT (M)
Header Take-off Material	: Stainless steel	: Stainless steel
Take off connection	: 1 / 2" NPT (M)	: 1/ 2" NPT (M)
Take-off Valves Material	: stainless steel	: stainless steel

Tube Take-off	: Tube adapter on valve	: Tube adapter on valve
Drain	: SS drain valve at lowest point	: SS drain valves at lowest point



Technical specification for
CONTROL & INSTRUMENTATION

1X800 MW KOTHAGUDEM

SPEC NO.: **PE-TS-410-145-I**

VOLUME

SECTION

REV. NO.

00


DATE : 10.03.2015

SHEET

OF

KKS PHILOSOPHY

FORM No. PEM - 6100 -0

	DOCUMENT TITLE
	KKS NUMBERING PHILOSOPHY
1X800MW KOTHAGUDEM	

KKS NUMBERING PHILOSOPHY

For identifying (tagging) an instrument / equipment in Power plant KKS numbering scheme is used. The purpose is to assign a unique number to every equipment in the power plant. For C&I equipment unique number are to be provided up to the signal level so that a unique number Input / Output exist in DCS for every signal.

Normally KKS number is a 10 digit alpha-numeric code and is typically split into the following:


X	X	X	AAY			YBBB		
---	---	---	-----	--	--	------	--	--

First three digits indicate the Sub-System. The Code for the major system are given as per **Annexure-1**.

Fourth and Fifth digits are the **Numerical Keys at System Code Level** and used to distinguish between main systems having same Alpha Codes.

Sixth and Seventh digits are the **Equipment / Apparatus / Measuring Circuit Code**. The code of various Equipment / Apparatus / Measuring Circuit is shown in **Annexure-2**

Eight, Nine and tenth digits are the **Numerical Keys at Equipment / Apparatus / Measuring Circuit Code** and used to distinguish between various instruments in the same sub-group. Numerical keys at System / Equipment / Apparatus / Measuring Circuit is shown in **Annexure-3**.

	DOCUMENT TITLE
	KKS NUMBERING PHILOSOPHY
1X800 MW KOTHAGUDEM	

ANNEXURE-1

List of System / Sub-System Codes used in Power Plant:

- 1) Compressed air system : QEA, QEC
- 2) Ventilation System : SAA TO SAZ
- 3) Fire Detection & Protection System + Fire Water pumps : SGM, SGN, SGO, SGP
- 4) Sewage Treatment : SJA TO SJZ
- 5) Pre-treatment Plant : GBI, GBM, GBV
- 6) RO DM Plant : GCI, GCM, GBV


ANNEXURE-2

Standard Equipment Codes:

AA	Valves including drives, also hand operated
AB	Seclusions, Lock, Gates, Doors
AC	Heat Exchanger
AE	Turning, Driving, Lifting equipment
AF	Continuous conveyors, Feeders
AG	Generator Units
AH	Heating and Cooling Units
AK	Pressing and Packaging equipment
AM	Mixer, Stirrer
AN	Blower, Air Pumps / Fans, Compressor Units
AP	Pump Units
AT	Purification, Drying, Filter
AV	Combustion Equipment e.g. grates

Standard Apparatus Codes:

BB	Vessels and Tank
BF	Foundation
BG	Boiler Heating Surfaces
BN	Injector, Ejector
BP	Flow and throughput limitation equipment (Orifice)
BQ	Holder, Carrying Equipment, Support
BR	Piping, Ducts, Chutes, Compensator
BS	Sound Absorber
BU	Insulations, Sheatings

	DOCUMENT TITLE
	KKS NUMBERING PHILOSOPHY

1X800 MW KOTHAGUDEM

Standard Measuring Circuits Codes:

CD	Density
CE	Electrical Quantities
CF	Flow, throughput
CG	Distance, Length, Position
CK	Time
CL	Level
CM	Humidity
CQ	Analysis (SWAS)
CS	Speed, Velocity, Frequency
CT	Temperature
CY	Vibration, Expansion

ANNEXURE-3**Numerical Keys****A) Numerical Keys at System Code Level**


- i) Use 10, 20, 30, To distinguish between main systems having same Alpha Codes. Examples:
 - a) Main Steam (Left) and Main Steam (Right)
 - b) BFP – A/B/C
 - c) ID Fan – A/B, FD Fan A/B, AH – A/B
- ii) For branch off from main system path having code say 10, keep the same alpha code and use 11, 12, 13 etc. Similarly for other branch off from main system path having code say 20, keep the same alpha code and use 21, 22, 23 etc and shall carry on further in the same way.
- iii) If the branch off from main system / sub system path is used for some other system, where different alpha codes can be applied, then in that case the said branch line will be designated by the alpha codes of the system to which it is providing the input.

B) Numerical keys at Equipment Code level:

There are three numerical keys available for each type of equipment code. Following has been agreed upon considering present practice, better flexibility and ease in sorting.

- i) Valves and Dampers --- *Equipment Code – AA*

N1N2 N3

DOCUMENT TITLE	
	KKS NUMBERING PHILOSOPHY
1X800 MW KOTHAGUDEM	
Motorised (<i>on/off duty</i>)	- 0 01 to 50
Motorised (<i>inching duty</i>)	- 0 51 to 99
Pneumatic (Control)	- 1 01 to 50
Motorised (<i>thyrestor Control</i>)	- 1 51 to 99
Sol. Operated (Open / Close duty (Valves, NRVs, Gate)	- 2 01 to 99
Hydraulic	- 3 01 to 99
NRV (Without actuation)	- 4 01 to 99
Manual	- 5 01 to 99
Manual	- 6 01 to 99
Relief & Safety Valves	- 7 01 to 99
Reserve	- 8 01 to 99
Reserve	- 9 01 to 99
 ii) Field Instruments	
Field Transmitters & Analog Signals	- 0 01 to 99
Field Switches & Binary Signals	- 1 00 to 99
PG Test Point	- 4 00 to 99
Gauges	- 5 00 to 99
Automatic Turbine Tester (ATT)-HWR	- 2 00 to 99
(Reserved for protection Signals used by Hardwar)	
 Example of Numerical Key Usage:	
<p>In line with the philosophy adopted for Valves / Dampers /instruments etc. pumps and fans in the main systems (having different system code) can be numbered as AP/N100 and as AP/N101, 102, Where system code is same.</p>	



TITLE:

TECHNICAL SPECIFICATION FOR
CONDENSATE POLISHING UNIT
1X800 MW TSGENCO KOTHAGUEDEM TPS
STAGE -VII, PALONCHA

SPEC NO: PE-TS-410-155A-A001

VOLUME: II-B

SECTION: D1

REV NO: 01

DATE:

SECTION – D1
GENERAL TECHNICAL REQUIREMENT- MECHANICAL



TITLE:

TECHNICAL SPECIFICATION FOR
CONDENSATE POLISHING UNIT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA

SPEC NO: PE-TS-410-155A-A001

VOLUME: II-B

SECTION: D1

REV NO: 01

DATE:

1.00.00 GENERAL

- 1.01.00 The proposed Condensate Polishing Plant (CPP) shall treat the condensate of the respective Turbine-Generator (TG) Unit of the power station. The system shall be as per tender drawing titled P&ID of Condensate polishing Plant.
- 1.02.00 The proposed schematic arrangement of the Condensate Polishing Plant has been shown in the relevant Tender Drawing (P&ID). Arrangement of piping and valves shown in them are for guidance only. The Contractor shall propose the complete system including regeneration facilities as per their standard design and as elaborated in this specifications meeting the basic functional requirements.
- 1.03.00 The Condensate polishing Plant shall consists of one set of Condensate polishing Units (CPU) for TG unit inside TG Building and a regeneration system. CPU shall consist of three (3) service vessels of 50% capacity for TG Unit.
- 1.04.00 The regeneration system shall be external for the TG unit. For regeneration, resin from the exhausted exchanger vessel will be transferred hydraulically to this facility. The exhausted resin charge will be cleaned, separated, regenerated, mixed and rinsed before being stored for the next use.
- 1.05.00 The common influent and effluent headers of each CPU, will be connected to an automatic bypass line (s) to be provided by Contractor. On high pressure signal across the service vessel, the automatic control valve(s) in the bypass line(s) shall open, bypassing the service vessel(s).
- 1.06.00 Make-up water to the turbine cycle will be added to the condenser hotwell as required. The analysis of the cycle makeup water (DM Water) is exhibited in the section B of tender specification.
- 1.07.00 In the event of a tube failure in the condenser, circulating water will enter the condensate system and will contaminate it. Typical composition of the circulating water is exhibited elsewhere in the technical specification and the condensate polishing plant shall be designed for such tube leakage condition as mentioned.
- 1.08.00 The condensate polisher service vessel will be located near corresponding units. All the components of the CPP plant shall be located indoor and regeneration system equipments shall be kept under shed and neutralizing pit shall be located outdoor.
- 1.09.00 All the instruments associated with condensate polishing plant shall be provided with proper enclosures by Bidder. All vessels, pumps & blowers and their drives and other electrical and C&I equipments/accessories of regeneration system shall be suitable for outdoor duty and enclosures class of all the equipments shall be suitably selected by the bidder.

2.00.00 SYSTEM REQUIREMENT

- 2.01.00 The regeneration process offered by the bidder, shall be of proven design and shall essentially be the same process by virtue of which the bidder is qualified and shall give resin-separation compatible with the desired effluent quality. Documentary evidence shall be submitted by the bidder to the Customer/BHEL to establish this requirement during detailed engineering stage if required.
- 2.02.00 The bidder shall include inert resin in the system if they feel that it helps in better resin separation.
- 2.03.00 In case, after separation of resins, there are undesired contaminant resins, the bidder shall provide a system either to eliminate this cross contamination of resins or to nullify the detrimental effect of entrapped resins to the effluent quality.
- 2.04.00 **Exchange Resins**
- i. The bidder shall include with the plant adequate resins for all the condensate polisher service vessels & mixed resin storage vessel. In addition separate charge of resin shall also be included for using the resins during commissioning stage of unit. Therefore, total number of charges supplied by bidder shall include total resin charges for TG units and mixed resin storage vessel plus one spare charge for commissioning along with one charge for resin make up hopper.



TITLE:

**TECHNICAL SPECIFICATION FOR
CONDENSATE POLISHING UNIT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA**

SPEC NO: PE-TS-410-155A-A001

VOLUME: II-B

SECTION: D1

REV NO: 01

DATE:

- ii. First fill of resins for all Condensate Polisher Mixed Beds, Mixed Resin Storage Vessel and Makeup Resin Hopper for all the units complete with make-up resin for first three years of operation (Quantity of make-up resins shall be calculated on the basis of 3% and 5% attrition loss per annum for cation and anion resin respectively).
- iii. Cation-anion resin ratio shall be 2.0 parts Cation to 1.0 part anion by volume. In case the process require any non ionic resin the same shall represent at least 10% of the bed volume, but not less than 15 cm of the bed depth in the resin separation / cation regeneration tank of the external regeneration facility.
- iv. After Separation anion resin in the cation resin shall be less than 0.1 % and cation resin in the anion resin shall be less than 0.1%.
- v. Dearation factor of 10% for all resins shall be considered while calculating the quantity of resin to be supplied.
- vi. The resins shall be in the form of spherical beads. Base of the ion-exchange resins shall be a copolymer of styrene and divinyl benzene forming a macro porous or macrorecticular structure. Other details are as follows:

Cation : Strong acid, with sulfonic acid functional group.

Anion : Strong base, with quaternary ammonium (type I) functional group.

Inert : Non ionic, compatible with the above resin types.

Cation resins shall be supplied in hydrogen form and Anion resins shall be supplied in hydroxide form.

vii. **Physical Properties:**

- i. Particle size: The resins shall be in the form of spherical beads. All resins, when wet screened with U.S. standard sieves, shall pass through a No.14 sieve no more than 2 percent shall be retained on a no. 16 sieve, and more than 2 percent shall pass through a no. 40 sieve. The particle sizes and densities shall be carefully controlled to facilitate clear separation between the resins during regeneration process.
- ii. Bead Strength: The average force required to fracture individual beads of cation resins in hydrogen form, anion resins in hydroxide form, and the inert resins, shall exceed 350 grams. Not more than 5 percent of the beads tested in each batch shall get fractured by forces less than 200 grams.

viii. **Chemical Properties:**

- i. Total wet volume ion-exchange capacities in equivalents/liter shall not be less than the following:

Cation in hydrogen form : 1.7

Anion in hydroxide form : 0.8

- ii. The resins shall contain a minimum of metallic and organic impurities consistent with good processing. The processing procedure will include rinsing the resins with demineralized water before packing, so that further rinsing will not be required before use. Foreign objects in the resins shall constitute a basis for its rejection.
- iii. Cation-Anion resin ratio shall be 2.0 parts cation to 1.0 part anion by volume. In case the bidder's process require any non-ionic resin the same shall represent at least 10 percent of the bed volume, but not less than 15 cm of the bed depth in the resin separation tank of the external regeneration facility.
- iv. Manufacturer: It is not the intent to pre-select any specific brand name for this application. Resins will be accepted by the BHEL/Customer strictly on their merits. The resins shall be of reputed manufacturer with adequate past record of successful service for not less than 3 years in similar application.



TITLE:

**TECHNICAL SPECIFICATION FOR
CONDENSATE POLISHING UNIT
1X800 MW TSGENCO KOTHAGUEDEM TPS
STAGE –VII, PALONCHA**

SPEC NO: PE-TS-410-155A-A001

VOLUME: II-B

SECTION: D1

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v. Bidder shall submit all necessary data and information in this regard along with his proposal. Some of these possible resin terms are as follows:

1. Duolite C -26 TR & A - 161 TR Rohm and Hass 252 C & TRA-900C.
2. Dowex MSC-1, MSA-1 C grades.
3. Inert resin – Duolite sec, Rohm & Hass 359 or Dow-buffer beads.

Above listing is by no means exhaustive, and shall not be construed to be a recommendation for their selection for this plant. Bidder shall fully satisfy himself as to the suitability of the resin system selected by him before offering it in his proposal.

ix. The resin shall be suitable for the condensate temperature that may be achieved in all operating regimes of TG cycle. However, the anion resin shall be suitable for a minimum temperature of 60 deg.C.

2.05.00 Condensate Polishing Units

2.05.01 Operating pressure for service vessels shall be normal operating pressure of condensate extraction pump. Service vessel design pressure shall be equal to shut off pressure of condensate extractions pump plus 5% margin and as per Datasheet-A.

2.05.02 Design temperature of the service vessel shall take care of all operating regimes including HP-LP bypass operation. Maximum temp. expected during all loads at CEP discharge is 60 Deg C.

2.06.00 Emergency bypass system :

- 1) Each condensate polisher service unit shall be provided with an automatic bypass system for the condensate polisher on the condensate inlet and outlet headers of the unit with a set of control valve with its isolation valves on the upstream and downstream sides of the control valve.
- 2) In the event of pressure differential 0.35 Mpa between the condensate inlet and outlet headers, the control valve will open automatically to bypass requisite quantity of condensate to prevent this pressure differential from exceeding a preset limit when two vessels, one vessel or no vessel is in operation.
- 3) When condensate temperature exceeds 53 Deg C the bypass valve shall be 100% opened automatically and the inlet / outlet of the condensate polisher mixed bed shall be closed to protect elements and resins inside the polisher.
- 4) Bidder to provide 1x100% control valve to achieve proper control under all operating conditions as per Customer/BHEL's approval of Engineering Documents.
- 5) The isolation valves shall be provided with geared operators for manual operation. The entire system shall be designed for an internal pressure of at least the design pressure of service vessels and for a maximum condensate flow of not less than total design flow of all the working service vessels.
- 6) The control system shall be so designed that the control valve is able to bypass 50% of rated flow when any of the service vessel is out of service and 100% of flow when all the service vessels are out of service.
- 7) Complete instrumentation and controls for this system, including the differential pressure transmitters, panel mounted indicating type controller with provision for remote manual operation, actuator for the control valve with position indicator shall be furnished by the bidder as part of this package. All tubing, wiring, air sets, and other fittings, required to complete the system, shall also be installed by bidder.



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2.07.00 External Regeneration Facility (Regeneration Plant)

2.07.01 The pressure vessels in the common external regeneration facility shall be provided with adequate freeboards over the top of the settled resins, to minimize resin loss during their use. Minimum freeboards to be are as follows:

- i. Condensate polisher/Mixed bed polisher-100%
- ii. Mixed resin Storage vessel (if applicable) - 100%
- iii. Resin separation vessel- 100%
- iv. Cation regeneration vessel- 100%
- v. Anion regeneration vessel- 100%
- vi. Resin make up hopper – 80%
- vii. Activated carbon filter : 75%

However, if a vessel is used for more than one service, then the vessel design shall be based on the service which gives maximum freeboard.

2.07.02 Design pressure of the condensate Polisher Service Vessels is indicated elsewhere. For all other Pressure vessels the design pressure shall be at least 8 kg/sq. cm (g).

2.07.03 All equipment for dosing of acid and alkali solutions shall be rated to provide a maximum dosing rate at least 20% in excess of that required from process calculation.

3.00.00 TECHNICAL REQUIREMENT OF EQUIPMENTS

3.01.00 Hot water tank (for alkali)

For heating of alkali diluent water, 2x50% electrical heating coil in a tank of mild steel rubber lined construction shall be provided. The capacity of tank shall be minimum 20% higher than the maximum water demand. This tank shall be provided with burn out protection, pressure relief valve, level switches, temperature indicator etc. The heater shall be controlled by the temperature switches provided on the tank. The heaters shall be sized for heating the water from a temperature of 15 Deg.C to 50 Deg.C at the outlet. The water shall be heated to the required temperature within 5 hours.

3.02.00 Activated Carbon Filter (for alkali):

Rated flow of the filter shall not be less than the design capacity of the alkali transfer-cum recirculation pump, and the maximum velocity through the filter for this flow shall not exceed 12 meters/hour. Depth of the filter material shall not be less than 1.2 meter.

The filtering medium shall be granulated activated carbon, meeting following minimum requirements. Total

Surface area	:	Not less than 850 sq.m/gm.
Bulk density	:	Not less than 400 kg/cu.m.
Iodine number	:	850 minimum
Uniformity coefficient	:	1.9 or less
Abrasion number	:	70 minimum
Ash	:	8% maximum



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Mean particle diameter shall be about 1.5-1.7 mm with following size distribution:

On 20 mesh	:	Less than 3%
Through 40 mesh	:	Less than 10%
Through 50 mesh	:	Less than 1%

The filter shall be provided with all necessary valves and connections for manual backwashing and rinsing with demineralized water. Rate set valves shall be provided with adjustable limit stops for setting backwash and rinse rates.

3.03.00 Resin Injection Hopper

The bidder shall provide a hopper type tank for resin make-up, using water slurry, to the condensate polishing systems. This make-up system will constitute a portion of the condensate polishing external regeneration system. The resin hopper shall have a conical bottom and a flat top. The top shall have a piano type hinged port, having a lifting handle, of sufficient size for easy resin loading. The resin shall discharge through a bottom connection to a water ejector for transport. Water shall be added to the hopper to assist in the resin transfer. The ejector discharge shall be to the resin separation-cation regeneration vessel. Demineralized water shall be used throughout for the resin transfer. Piping of the resin make-up system shall be the responsibility of the Bidder as a part of the external resin regeneration system.

a) Capacity

The resin make-up hopper tank shall be sized to handle up to 150 liters of as received new resin per single injection.

b) Material

The resin make-up hopper tank shall be fabricated of mild carbon steel having a minimum thickness of 6 mm and lined.

3.04.00 Piping

3.04.01 Bidder shall design, supply and erect the piping between the service units and the common external regeneration facility, for transferring the exhausted and regenerated resins as required.

3.04.02 All piping shall be laid above ground and generally laid in pipe trestles including crossing of road/pipe/cable trenches if any. Piping of between chemical tanks area and regeneration area etc. may be laid on pedestals if layout permits.

3.04.03 Complete supporting system for the pipeline shall be designed, fabricated and supplied by the Bidder. Inside the building, the overhead portion of the pipeline may be supported from the building structures. In outdoors, the pipeline may run on steel posts. Crossing of the roads shall be on a pipe bridge with a clear height of at least 6.1 meters over the road surface. All the steel structures of the pipe bridge and the supporting posts along with all necessary hanger, clamps, connecting steel, fixing bolts, nuts, etc. shall be supplied and erected by the bidder.

3.04.04 Routing of this pipe line shall be developed by the bidder and shall be finalized in coordination with the BHEL/Customer, based on the space available and the final layout.

3.04.05 The resin transfer pipeline arrangement shall avoid any sharp bends which cause segregation of the mixed resins, and pockets where the resins can get trapped. Suitable observation ports shall be provided in all critical areas to enable the operator to monitor completeness of the resin transfer operations. All necessary arrangements for venting and draining of the pipeline shall be provided.

3.04.06 The resin transfer pipeline shall be sized for a flow velocity of between 2.3 and 3.0 meters/sec.

3.04.07 The condensate pipeline shall be sized for a flow velocity between 3 and 5 m/sec.