



TITLE:

**TECHNICAL SPECIFICATION
DEBRIS FILTER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-421-165-N003**

SECTION: **II**

SUB-SECTION: **IIA**

REV. NO. **0** DATE **09.01.18**

SHEET **1** OF **1**

SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

STANDARD TECHNICAL SPECIFICATION FOR DEBRIS FILTER

STANDARD QUALITY PLANS



TITLE :
STANDARD TECHNICAL SPECIFICATION
DEBRIS FILTER
(Backwash Type)

SPECIFICATION NO. PE-TS-999-165-N003

SECTION : II

SUB SECTION : 2A

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1.00.00 GENERAL

This specification covers the Design, Performance and Operational Requirements, Constructional Features, Manufacture, Assembly. Inspection and Testing at the Manufacturer's and/or his Sub-contractor's works and Painting for delivery of Debris Filter (Backwash Type) complete with all accessories as specified hereinafter.

2.00.00 CODES AND STANDARDS

2.01.00 The design, materials manufacture, inspection and testing of the Debris Filter complete with all accessories, shall comply with the requirements of the latest revisions of the following appropriate codes and standards :

2.01.01 IS/ BS/ DIN/ US Standards regarding pressure vessels, pipes, flanges and others as necessary.

2.01.02 IS/ BS/ DIN/ ASTM Standards for materials specification and testing procedures.

2.01.03 IS/ BS/ DIN/ AWWA Standards for valves and their testing.

2.02.00 In case of any conflict between the above codes/ standards and this specification, the later shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding.

3.00.00 DESIGN AND CONSTRUCTION

3.01.00 General Requirements

3.01.01 Unless otherwise necessary manufacturer's standard and proven models of the Debris Filter shall be supplied.

3.01.02 The Debris Filter shall be capable of safe, proper and continuous operation. Vibration, noise, mechanical stresses shall be kept within allowable limits specified by relevant codes / standards, in design due attention shall be given to ease of maintenance, repair and cleaning.

3.01.03 Suitable corrosion allowance shall be provided wherever necessary. Adequate provision for future installation of cathodic protection shall be provided.

3.01.04 The Debris Filter shall be designed to suit installation in on-line or off-line arrangement as specified in Data Sheet-A.

In the on-line arrangement, the inlet and outlet pipes of the debris filter shall be in line with each other on the same axis without any off-set between the centre lines of inlet and outlet pipes.

In the off-line arrangement, the debris filter inlet and outlet pipes shall be at right angle (90°) to each other.



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3.02.00 Performance Requirements

The Debris Filter with all accessories shall be designed and guaranteed to meet the following requirements:-

- 3.02.01 The Debris Filter shall perform satisfactorily under the flow and pressure conditions specified in Data Sheet -A and shall be capable of housing the various forms of debris / sludge i.e., suspended particles / matter, mussels, grass, leaves, wood pieces etc. The performance of the Debris Filter shall be continuous with minimum number of flushing/ backwashing operations.
- 3.02.02 The Debris Filter shall be designed such that the pressure drop across the Debris Filter (i.e., between inlet and outlet connections) under clean conditions and partially (50%) choked conditions shall not be more than those specified in Data Sheet -A.
- 3.02.03 Unless otherwise specified in Data Sheet -A, debris discharge / wash water flow rate during flushing/back washing operation shall be limited to 10% of the total flow rate and flushing / backwashing operation shall be completed within a period of maximum three (3) minutes. The pressure drop across the debris filter during flushing/ backwashing operation shall not be more than the pressure drop under partially (50%) choked condition.
- 3.02.04 The coarse particles and floating matter accumulating at the filter section/screen are flushed out of the system by the system by the debris flushing / backwash unit such that the pressure drop across the filter after flushing / backwashing, shall not be more than 1.1 times the pressure drop under clean conditions.

3.03.00 Operational Requirement

The Debris Filter and other accessories shall be designed for the following flushing/backwashing operation modes:

- 3.03.01 Complete automatic flushing/backwashing operation effected by the following:-
- ◆ differential pressure measuring system at a pre-determined differential pressure across the filter screen.
 - ◆ adjustable timer (0-24 hours)
 - ◆ push button (for manual initiation of sequential flushing / backwashing)
- 3.03.02 Manual operation in the event of failure of control system.

3.04.00 Filter Housing/ Body

- 3.04.01 The Debris Filter housing/body shall be designed and manufactured as per the applicable codes for pressure vessels. It shall house the filter section / screen assembly and shall have flanged inlet, outlet, flushing/ debris discharge openings and pressure measuring tappings etc.



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3.04.02 In design of Debris Filter housing/ body due attention shall be given for easy removal and replacement of filter section / screen assembly.

3.04.03 The Debris Filter shall be provided with inspection hole with bolted cover.

3.04.04 The Debris Filter body / housing shall be provided with vent and drain connections with isolating valves. It shall be possible to drain unfiltered and filtered water.

3.04.05 If specified in Data Sheet-A, filter body/housing shall be epoxy painted.

3.05.00 Filter Section / Screen assembly.

3.05.01 The Debris Filter section/screen shall be designed for the maximum differential pressure across the filter and shall be securely positioned by a supporting cage and shall be securely mounted in the housing or body.

3.05.02 The perforation/mesh size of the Debris Filter section shall not be more than that specified in Data Sheet-A.

3.05.03 The arrangement of the Debris Filter section shall be such that the forced accumulation of debris on the filter screen / section shall be minimum.

3.06.00 Differential Pressure Measuring System

3.06.01 The Debris Filter shall be provided with a measuring system for differential pressure across the filter section/screen, to check debris accumulation and to initiate flushing/ backwashing operation. This shall consist of a differential pressure transmitter for automatic flushing operation, a differential pressure gauge for manual observation with adequate number of tapping with isolating valves and equalising valves.

3.06.02 The contacts for differential pressure transmitter and for differential pressure gauge shall be independent so that in the event of failure of one, the other is available.

3.06.03 The differential pressure measuring system shall be provided with D.P. transmitter & DPG of remote seal arrangement..

3.07.00 Flushing / Backwash Unit. :

3.07.01 The Debris Filter shall be provided with suitable flushing/backwash unit (to be installed at ground floor) and debris discharge/ backwash outlet valve with associated actuator to flush out the accumulated debris/ sludge.

3.07.02 The flushing pump shall be provided with mechanical seals to the extent possible. If gland packing is provided it should be of good quality to prevent leakage of water from pump glands.



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3.07.03 The flushing arrangement shall be either fixed type with flushing valves or a rotating debris extractor.

3.07.04 If any water is to be injected for backwashing the filter section/screen, water shall be taken from down-stream side of the filter section/ screen. Necessary pump, valves and piping for water injection shall be supplied.

3.07.05 View glass to be provided in debris outlet pipe to monitor the flushing of debris.

3.08.00 **Valves**

The flushing valves (if any,) the debris discharge/backwash outlet valve, isolation, vent and drain valves shall conform to appropriate codes / standards.

3.09.00 **Instrumentation and Control System**

3.09.01 Complete instrumentation and control system for automatic flushing/backwashing operation, protection, interlocking, indication/ annunciation of high differential pressure and other malfunctions etc. shall be provided. This shall consist of adequate operational hardware, local control panel and interconnecting control and power cabling between the control panel and the debris filter and its associated electrical devices.

3.09.02 The control panel shall house all necessary instruments, indicating/ annunciation lamps, alarms, differential pressure indicator, timer, function selector switches, relays, protection and interlocking systems, start/stop push buttons, counter to register number of flushing operations etc., and shall be complete with internal wiring. In addition to the above, the control panel shall meet the requirements of the enclosed specification.

3.09.03 All instrumentation shall be of reputed make and shall meet the requirement of the enclosed specification.

3.10.00 **Actuators :**

The actuators for flushing arrangement and debris discharge valve shall be electric motor operated and shall meet the requirements of the enclosed specification. The actuators shall be provided with auxiliary hand-wheel for manual operation in the event of power failure.

3.11.00 **Electric Motors :**

The drive motors for differential pressure measuring system flushing pump and water injected pump (if applicable) shall confirm to the requirements of the enclosed specification.



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3.12.00 Other Accessories.

3.12.01 Counter flanges, complete with gaskets, bolts and nuts etc., shall be supplied for the filter inlet, outlet connections and all other terminal points. Fabrication, dimensions and drilling of the flanges shall conform to the codes/standards specified in Data Sheet-A/ Section -C.

3.12.02 Debris Filter shall be provided with suitable lifting arrangement for handling during erection and maintenance.

4.00.00 SHOP INSPECTION AND TESTS

4.01.00 General:

4.01.01 Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the Debris Filter and other accessories shall conform to the requirements of this specification and of the applicable codes/ standards.

4.01.02 All materials used for manufacture/fabrication of the Debris Filter shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests as per approved quality plan and applicable codes at his cost, for which samples shall be identified by BHEL's representative.

4.01.03 All shop tests shall be conducted in the presence of BHEL's representative and test certificates / reports for the same shall be furnished to BHEL for approval.

4.01.04 Qualification of welding procedures and welders shall be as per ASME B&PV Code, Section-IX / applicable codes.

4.02.00 Filter Housing / Body

4.02.01 Chemical analysis, mechanical tests shall be carried out on housing/body, strainer/ screen, strainer/ screen shaft and other appurtenances as per the applicable material specification standards.

4.02.02 All butt welded joints shall be subjected to radiographic / ultrasonic testing as per applicable codes. However all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.

4.03.00 Rubber Lining (as applicable)

Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.



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4.04.00 Filter Section/Screen assembly

Supporting cage and filter section/screen materials shall be tested for chemical properties. Checks shall be carried out for perforation/mesh size, defects etc.

4.05.00 Flushing / Backwash Unit

4.05.01 Material of various components of the flushing/Backwash Unit shall be tested for chemical and mechanical properties.

4.05.02 Hollow shaft of backwash rotor shall be ultrasonically tested as per ASTM-A 388 for internal flaws. Penetrant test shall be carried out for surface flaws.

4.06.00 Valves

Inspection and testing of valves including leakage test shall be carried out as per the requirements of the applicable standards. Correlating test certificates for materials of the valve components shall be furnished.

4.07.00 Flanges

4.07.01 In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, section VIII, Division-1.

4.07.02 In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-A 388.

4.07.03 If the thickness of the plate used for flanged is 40mm or more the same shall be checked ultrasonically as per ASTM-A435 to demonstrate the absence of lamination and lack of fusion etc.

4.07.04 Chemical and mechanical test certificates shall be furnished for flange materials.

4.07.05 Flanges shall be checked for edge preparation, fit up and satisfactory working with matching parts.

4.08.00 All materials for various nozzles, seals, pipes, gaskets, nuts bolts etc., shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished.

4.09.00 Dimensional Checks

Dimensional checks of various components of the Debris Filter shall be carried out as per the drawings approved by BHEL. Alignment and fit up of movable parts shall be checked.



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4.10.00 Hydrostatic Test

Hydrostatic test shall be conducted on the Debris Filter housing/body at a pressure of 1.5 times the design pressure. The duration of the test shall be minimum 30 minutes.

4.11.00 Leakage Test

Leakage test shall be conducted at the design pressure to demonstrate that the filter assembly is leak tight and no water seepage shall take place at various nozzle and valve connections.

4.12.00 Functional Tests

The Debris Filter assembly complete with valves, actuators and other accessories shall be subjected to functional tests and the following shall be checked:-

4.12.01 Smooth and free operation of all movable parts.

4.12.02 Interlocks and sequential operation.

4.12.03 Satisfactory operation of actuator torque switches, limit switches etc.

4.13.0 Performance Test:

Performance Test shall be conducted to ensure that the Debris Filter meets the specified performance requirements.

5.00.00 TESTING AT SITE

After completion of installation at site, the Debris Filter with complete accessories, will be tested to check that the filter performance meets the requirements of its specification, Rectification of all defects shall have to be done by the supplier at no extra cost to the Owner / Purchaser. However the Owner / Purchaser reserves the right to reject the equipment/ parts not meeting the requirement if the deficiency still persists.

6.00.00 QUALITY ASSURANCE & QUALITY PLAN

6.01.00 The Debris Filter and other accessories to be supplied shall have assured quality and workmanship.

6.02.00 Typical quality plans are enclosed herewith this specification for bidder's guidance. The bidder shall comply with these minimum requirements and shall furnishing own quality plan based on materials and components of the filter being offered.



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7.00.00 NAME PLATE AND TAG NUMBERS

7.01.00 The Debris Filter shall be provided with a permanently attached brass or stainless steel plate indicating the following details:-

- a) Design and maximum flow rates
- b) Design and test pressures
- c) Design temperature
- d) Filter section/screen mesh size
- e) Empty and operating weights
- f) Revolving speed of backwash rotor

7.02.00 Each valve shall be provided with a name plate indicating the following:-

- a) Service
- b) Design and test pressures
- c) Maximum flow and flow direction
- d) Size
- e) Tag Number

Tag numbers will be indicated on the drawing submitted for approval during contract stage.

7.03.00 Each motor / actuator shall be provided with a name plate indicating the following details:

- a) Supply conditions.
- b) KW Rating
- c) Make

8.00.00 DRAWINGS, DATA & INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:

The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.



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DATA SHEET - C
DEBRIS FILTER
(Backwash Type)

1.00.00 **DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:**

After the award of contract, the following drawings, data and information is to be submitted for review / approval of BHEL.

1.01.00 The drawings to be submitted by bidder in event of award of contract shall be as per NIT.

1.01.01 Data Sheet -B.

1.01.02 Final versions of the following drawings to enable BHEL to finalise the layout and to design foundations and structures.

- a) General arrangement / Installation drawings of the Debris Filter with all accessories, indicating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, withdrawal space and scope of supply etc.
- b) Foundation arrangement drawings (wherever applicable) showing load data on supports, size and location of anchor bolts etc.

1.02.00 **Within the stipulated time period as per vendor's drawing/document list, the following shall be submitted:**

1.02.01 Cross-sectional/detailed drawings of filter housing/body, filter screen/section assembly, flushing / backwash unit, differential pressure measuring system, actuators, motors, control panel etc. indicating bill of quantities and materials of construction.

10.02.02 Flow and control logic diagrams for complete filter during normal and flushing operation and system write-up covering all modes of operation.

1.02.03 Final version of performance evaluation procedures at site.

1.02.04 Detailed schedule of valves indicating tag numbers, type, make, size, pressure & temperature ratings, materials etc.

1.02.05 Detailed schedule of power & control cable.

1.02.06 Detailed schedule of piping and fittings indicating sizes, materials, maximum working pressure & temperatures etc.

1.02.07 Control panel layout and list of instruments provided on control panel and internal wiring diagrams.

1.02.08 List of annunciations, protections and interlocks provided.



TITLE :

**DATA SHEET - C
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- 1.02.09 Detailed drawings of flanges.
- 1.02.10 Quality Plan
- 1.02.11 Material test certificates.
- 1.02.12 Shop tests reports and certificates.
- 1.02.13 Write-up and instruction manuals for erection, operation and maintenance.
- 1.02.14 Storage instructions.
- 1.02.15 Vendor to send 3 sets of final documents (O&M Manual, GA drg, P&ID) direct to site under intimation to PEM.

	Manufacturer's Name & Address	STANDARD QUALITY PLAN		BHEL Doc No.: PE-QP-999-165-N003																								
	P.O. No.	INDEX	Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 01 of 10	PROJECT: CUSTOMER: PURCHASER: CONSULTANT:																								
<table><thead><tr><th>SL. NO.</th><th>DESCRIPTION</th><th>PAGE NOS.</th></tr></thead><tbody><tr><td>1</td><td>DEBRIS FILTER</td><td>2-4</td></tr><tr><td>2</td><td>BALL VALVES</td><td>5</td></tr><tr><td>3</td><td>BUTTERFLY VALVES</td><td>6</td></tr><tr><td>4</td><td>PRESSURE GAUGE, DP GAUGE ,DP SWITCH DP TRANSMITTER</td><td>7</td></tr><tr><td>5</td><td>GEAR MOTOR DRIVE , WORM PLANETARY GEAR BOX & ACTUATOR</td><td>8</td></tr><tr><td>6</td><td>CONTROL PANEL</td><td>9</td></tr><tr><td>7</td><td>FASTENERS & ALL COMPONENTS AND EQUIPMENTS</td><td>10</td></tr></tbody></table> Note: Items not included in quality plan to be inspected as per Approved datasheet/drawings.					SL. NO.	DESCRIPTION	PAGE NOS.	1	DEBRIS FILTER	2-4	2	BALL VALVES	5	3	BUTTERFLY VALVES	6	4	PRESSURE GAUGE, DP GAUGE ,DP SWITCH DP TRANSMITTER	7	5	GEAR MOTOR DRIVE , WORM PLANETARY GEAR BOX & ACTUATOR	8	6	CONTROL PANEL	9	7	FASTENERS & ALL COMPONENTS AND EQUIPMENTS	10
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Manufacturer / Sub-Contractor	Contractor	* Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification																										
Signature			Name & Sign. Of approving authority & Seal																									

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003				
					Item : DEBRIS FILTER		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 02 of 10		PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
1	2	3	4	5	6	7	8	9		M	C	O	11
1.0.0	DEBRIS FILTER									**	10		
1.1.0	Raw Material												
[a]	Housing Shell, Nozzle flanges & Main flanges/Counter Flange	Chemical properties	Major	Chemical Analysis	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	All raw material identification as per manufacturer TC/Lab report by BHEL
		Physical properties	Major	Physical test	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface Defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / Inspection Report	--	P	V	V	
		Sub Surface Defects	Major	Ultrasonic Test	100%	ASME A 435/A609	ASME A 435/A609	Inspection report	*	P	V	V	
[b]	Nozzle Pipes	Chemical properties	Major	Chemical Analysis	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Physical properties	Major	Physical test	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / Inspection Report	--	P	V	V	
		Leak tightness	Major	Hydrostatic test	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / Inspection Report	--	P	V	V	
[c]	Screen basket	Chemical properties	Major	Chemical Analysis	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Physical properties	Major	Physical test	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface Defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / Inspection Report	--	P	V	V	
		Sub-surface defects	Major	Ultrasonic test	100%	ASME A 745	ASME A 745	Inspection report	*	P	V	V	
		Corrosion Resistance	Major	IGCI	One/Heat	ASTM A 923	ASTM A 923	Test Report	*	P	V	V	
		LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification											
Manufacturer / Sub-Contractor		Contractor											
Signature										Name & Sign. Of approving authority & Seal			

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
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Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	**	M	C	O	11
1.2.0	Inprocess Quality Control												
1.2.1	Welding procedure specification	Correctness	Critical	Scrutiny	100%	ASME Sec. IX	ASME Sec. IX	QW 482 of ASME Sec.IX	--	P	V	V	Welding procedure already approved by BHEL/ LRQA / NTPC shall be followed.
1.2.2	Welding procedure qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 483 of ASME Sec.IX	--	P	V	V	
1.2.3	Welder performance qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 484 of ASME Sec.IX	--	P	V	V	
1.2.4	Fit-up of butt weld	Alignment and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book	--	P	V	--	RT films will be reviewed by BHEL
1.2.5	Fit-up of shell flange and nozzle assembly to shell	Orientation, alignment and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book	--	P	--	--	
1.2.6	Weld quality for Pressure Parts [a] Root run	Surface defects	Major	Penetrant test / Visual	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Operation Process Sheet		P	--	--	
1.2.7	[a] Completed butt welds	1.Surface defects	Major	Penetrant test	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Inspection report	*	P	V	V	
		2.Sub-surface defects	Critical	Radiography test	10% of total weld length+ 100% T	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 4 / UW 52	Radiographs and inspection report	*	P	V	V	
	[b] Completed fillet welds	Surface defects	Major	Penetrant test	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Inspection report	*	P	V	V	
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Manufacturer / Sub-Contractor		Contractor								Name & Sign. Of approving authority & Seal			
Signature													

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
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1	2	3	4	5	6	7	8	9	**	M	C	O	11
1.2.8	Pickling and Passivation	Protection Layer	Major	Visual	100%	IS : 10117	IS : 10117	Log Book	--	P	—	—	
1.2.9	Fabricated Shell (Prior to sand blasting)	1.Dimensions, Orientation	Major	Measurement by visual	100%	Manufacturing Drawing	Manufacturing Drawing	Inspection report	*	P	V	V	
		2. Hydro test	Critical	Hydrostatic Pr. @ 1.5 times of design pr.(positive) [Duration 30 minutes]	100%	ASME Sec.VIII Div.1	ASME Sec.VIII Div.1	Inspection report	*	P	V	V	
1.2.10	Final tests (completed equipments) - After assembly	1.Dimensions, orientation, workmanship & finish	Major	Measurement by visual	100%	G.A.drawing	G.A.drawing	Inspection report	*	P	V	V	
		2. Leak tightness for assembly	Critical	Leak test @ design pr.(positive) [Duration 30 minutes]	100%	ASME Sec.VIII Div.1	No leakage	Inspection report	*	P	W	V	
		3.Dry function test for Debris filter	Critical	Operational test	100%	Approved PROC	Approved Procedure	Inspection report	*	P	W	V	
1.3.0	Rubber Lining (Shell)												
1.3.1	Rubber Formulation	Tensile, elongation & hardness	Major	Physical test	One per lot	Manufacturer's procedure	BS 6374/Equivalent	Manufacturers certificate	Test *	P	V	V	
		Polymer Identification	Major	Flame test	One per lot	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to burn	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to burn	Inspection report		P	V	V	
		% Change in weight after 24 hours of immersion in sea water at 70°	Major	Immersion test (bleeding test)	One per lot	ASTM D 471	+ / - 1%	Inspection report		P	V	V	
1.3.2	Surface preparation of items to be lined	Free from rust, scale,dust & grease	Major	Visual	100%	SA 2.5	SA 2.5	Manufacturers Inspection report	Internal	P	—	—	
1.3.3	Vulcanising	Temperature, Pressure & Time	Major	Process monitoring	100%	Manufacturer's procedure	Manufacturer Procedure	Process Procedure		P	—	—	
1.3.4	Vulcanised Rubber Lined items	[a] Chip test	Major	Chip test	One per lot	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
		[b] Adhesion, Visual defects, Thickness & Hardness	Major	Measurement, Visual Inspection	100% visual Thickness/ hardness at random	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
		[c] Spark test for Pin Holes at 5 kv/mm	Major	Spark test for Pin Holes	100%	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
		LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification											
Manufacturer / Sub-Contractor		Contractor											
Signature													
										Name & Sign. Of approving authority & Seal			

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
					Item : Ball Valve		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 05 of 10						
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
1	2	3	4	5	6	7	8	9	**	M	C	O	11
2.0.0	Ball valves												
2.1.0	Materials												
2.1.1	Body and Tail end pieces	Chemical,Physical properties	Major	Chemical & Physical analysis	One Sample/Cast heat	Approved drg/ Data sheet	Approved drg/ Data sheet	Manufacturer's T.C.	*	P	V	V	
2.1.2	Ball	Chemical,Physical properties	Major	Chemical & Physical analysis	One Sample/Cast heat	Approved drg/ Data sheet	Approved drg/ Data sheet	Manufacturer's T.C.	*	P	V	V	
2.1.3	Stem	Chemical,Physical properties	Major	Chemical & Physical analysis	One Sample/Cast heat	Approved drg/ Data sheet	Approved drg/ Data sheet	Manufacturer's T.C.	*	P	V	V	
2.2.0	In-process inspection												
2.2.1	Machining of body, end, pieces, ball	Dimension	Major	Measurement	100%	Approved drg/Data sheet	Approved drg/Data sheet	Log book	--	P	V	V	
2.2.2	Ball	a) Surface defects	Critical	Penetrant test	100%	ASME Sec.VIII Div.1	ASME Sec.VIII Div.1 Appendix 8	Inspection report	*	P	V	V	
		b) Hardness	Major	Hardness testing	Random	Approved drg/Data sheet	Approved drg/Data sheet	Inspection report	*	P	V	V	
2.3.0	Assembly	a) Dimensions	Major	Measurement	100%	EN ISO 17292	EN ISO 17292	Manufacturer's T.C.	*	P	V	V	
		b) Opening / Closing	Major	Operation	100%	---	As per approved data sheet	--	--	P	V	V	
2.4.0	Testing												
	[a] Body	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API 598/Appd data sheet	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V	
	[b] Seat test	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API 598/Appd data sheet	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V	
	[c] Seat	Leakage	Critical	Air test	100%	EN 12266-1&2/API 598/Appd data sheet	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V	
				LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature		Contractor Signature									Name & Sign. Of approving authority & Seal		

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
					Item : Butterfly valve		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 06 of 10						
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
1	2	3	4	5	6	7	8	9	**	M	C	O	11
3.0.0	Butterfly valves												
3.1.0	Materials												
	Body and Disc	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.1	Shaft	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.2	Seat	—	Major	—	One Sample/Cast / heat	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.3	Stem	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved sheet	drg/Data	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.2.0	Assembly	a) Dimensions	Major	Measurement	100%	EN ISO 17292/Appd data sheet		EN ISO 17292/Appd data sheet	Manufacturer's T.C.	*	P	V	V
		b) Opening / Closing	Major	Operation	100%	---		As per approved data sheet	--	*	P	—	—
3.3.0	Testing												
	[a] Body	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API598	12266-	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	[b] Seat test	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API598	12266-	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	[c] Seat	Leakage	Critical	Air test	100%	EN 12266-1&2/API598	12266-	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
				LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor		Contractor											
Signature									Name & Sign. Of approving authority & Seal				

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:					
					Item : Pressure Gauge, DP Gauge, DP switch&DP Transmitter		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 07 of 10							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks	
1	2	3	4	5	6	7	8	9		M	C	O	10	11
4.0.0 4.1.0	Pressure Gauge, DP Gauge, DP switch & DP Transmitter In process quality control	Make, Range and Model Calibration Degree of protection	Critical Critical Critical	Visual Calibration test —	100% 100% Type test certificate	Approved Sheet Data Approved Sheet Data Approved Sheet Data	Approved Data Sheet Approved Data Sheet Approved Data Sheet	Manufacturer test certificate Manufacturer test certificate Manufacturer test certificate	*	P	V	V	V	
		LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification												
Manufacturer / Sub-Contractor		Contractor												
Signature							Name & Sign. Of approving authority & Seal							

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003 PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
					Item : Gear Motor Drive Worm Planetary Gear box Actuators		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 08 of 10						
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
1	2	3	4	5	6	7	8	9		M	C	O	11
5.0.0	GEARED MOTOR DRIVE	Running Test	Critical	Functional Test	100%	Approved Data Sheet	Approved Data Sheet	Manufacturer's compliance certificate	*	P	V	V	
		No load	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
		Noise test	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
		Oil leakage test	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
		Visual	Critical	—	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
		Name plate verification	Critical	—	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
6.0.0	Complete Unit of planetary gear	No Leak Test	Critical	Functional test	One Sample/lot	Approved Sheet	Supplier Catalogue	Manufacturer's compliance certificate	*	P	V	V	
		Noise Level	Minor	Functional test	One Sample/lot	Approved Sheet	Approved Data Sheet			P	V	V	
		Visual Name plate Verification	Minor	—	100%	Approved Sheet	Approved Data Sheet			P	V	V	
7.0.0	Actuators	Functional test	Major	Electrical test	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Test certificate	*	P	V	V	
		Make, Range, Model	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	—	P	—	—	
		Assembly check alongwith valves	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	—	P	—	—	
		Functional Check along with settings / Auxillary Contacts	Major	Visual	100%	Supplier catalogue	Supplier catalogue/Appd data sheet	Inspection Report	—	P	—	—	
		LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification											
Manufacturer / Sub-Contractor Signature		Contractor Signature										Name & Sign. Of approving authority & Seal	

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003					
					Item : STARTER PANEL		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 9 of 10		PROJECT: CUSTOMER: PURCHASER: CONSULTANT:					
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record		Agency			Remarks	
										M	C	O		
1	2	3	4	5	6	7	8	9	D*	**	10		11	
8.0.0	Starter panel													
8.1.0	Incoming Material													
8.1.1	Fabricated & Painted Panel	Dimension	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	—	P	--	--	ISI Marked wire	
		Panel G.A.	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	—	P	--	--		
		Paint colour	Major	Visual	100%	Approved Drgs.	Approved Drgs.	Inspection report	—	P	--	--		
		Paint thickness	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	—	P	--	--		
		Paint Shade,		Visual	Sample	Approved Drgs.	Approved Drgs.	Inspection report	—	P	--	--		
		Adhesion	Major						—	P	--	--		
8.1.2	Wire	Size / Colour / Rating / Surface Defects	Major	Visual Dimension /	Sample	IS 694	Specification drawings /	Inspection report	—	P	--	--		
8.1.3	Panel Mounting	Make, Functional, Type & Rating	Major	Visual Electrical /	100%	Approved BOM	Approved BOM	---		P	V	V		
8.2.0	In Process Inspection													
8.2.1	Name Plate, Component Mounting, Etc.	Workmanship, Finish, Correctness	Major	Visual	100%	Approved Drgs.	Approved drawings	Inspection report	—	P	--	--		
8.2.2	Electrical Wiring of Panels	Continuity, Colour of wires, Bunching and Grouping	Major	Visual	100%	Mounting Drawing	Approved drawings	Inspection report	—	P	--	--		
8.2.3	Ferruling of Cables	Start & End	Major	Visual	100%	Manufacturer's drawing	Manufacturer's drawing	Inspection report	—	P	--	--		
8.3.0	Final Inspection													
8.3.1	Workmanship, Finish & Paint shade / Thickness	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	*	P	W	V	For enclosure	
8.3.2	Overall Dimension, G.A of starter panel	Measurement	Major	Visual	100%	G.A Drawing	Approved drgs.	Test Certificate	—	P	W	V		
8.3.3	Component Identification	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	—	P	W	V		
8.3.4	Degree of Protection	Ingres Protection	Critical	Environmental	Verification	G.A Drawing	Approved drgs.	Inspection report		P	V	V		
8.3.5	IR - HV - IR	Electrical	Critical	Electrical	100%	MFG. Procedure	MFG.. Pocedure	Inspection report	—	P	V	V		
8.3.6	Functional & Continuity	Functional	Major	Functional	100%	Appd Drawing	Appd Drawing	Inspection report	*	P	W	V		
			LEGEND * Records indentified with "STAR" shall be essentially included by contractor in QA Documentation. ** M :Manufacturer / Manufacturer's Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification											
Manufacturer / Sub-Contractor			Contractor											
Signature								Reviewed By		Name & Sign. Of approving authority & Seal				

		Manufacturer's Name & Address P.O. No.			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N003				
					Item : Fasteners All Components & Equipments		Vendor Q.P. NO. PACKAGE : DEBRIS FILTER Date : Page 10 of 10		PROJECT: CUSTOMER: PURCHASER: CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
1	2	3	4	5	6	7	8	9	**	M	C	O	11
9.0.0	Fasteners												
9.1.0	Internal Fasteners (Duplex SS)	Chemical & Physical properties	Major	Chemical Mechanical analysis	1 Per heat/HT Batch	Approved sheet	Approved drg/Data sheet	Mfr 's TC / Lab Report	*	P	V	V	
		Visual & workmanship finish	Major	Visual	Sample	Approved sheet	Approved drg/Data sheet	Inspection Report	-	P	V	V	
		Dimensions	Major	Measurement	Sample	Approved sheet	Approved drg/Data sheet	Inspection Report	-	P	V	V	
9.2.0	Main Fasteners	Visual	Major	Visual	Sample	Approved sheet	Approved drg/Data sheet	Inspection report / Mfr TC	*	P	V	V	
		Dimensions	Major	Measurement	Sample	Approved sheet	Approved drg/Data sheet	Inspection report / Mfr TC	*	P	V	V	
		Chemical & Physical properties	--	Chemical Physical test a) Tensile b) Yield c) Elongation d) Proof load	1 sample per heat	Approved sheet	Approved drg/Data sheet	Mfr TC/Lab report	*	P	V	V	
10.0.0	All Components / Equipments	Painting Dry film thickness and	Major	Measurement	Random	Painting schedule	Painting schedule	Inspection report		P	V	V	
		Packing	Major	Measurement	100%	Packing Procedure	Packing Procedure	Inspection report		P	-	-	
				LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : Contractor O : Owner Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature		Contractor Signature								Name & Sign. Of approving authority & Seal			



TITLE:

**TECHNICAL SPECIFICATION
DEBRIS FILTER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-421-165-N003**

SECTION: **II**

SUB-SECTION: **IIB**

REV. NO. **0** DATE **09.01.18**

SHEET **1** OF **1**

SUB-SECTION - IIB

STANDARD TECHNICAL SPECIFICATION (ELECTRICAL)

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ : VENDOR			TITLE QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			NUMBER :			
									SPECIFICATION TITLE			
SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
		SHEET 2 OF 2		SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
NOTES: 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON 2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS		BIDDER/VENDOR				BIDDER'S/VENDORS COMPANY SEAL			
			NAME									
			SIGNATURE									
			DATE									

		QUALITY PLAN SHEET 1 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ :		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
				VENDOR		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVANT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 2 OF 9		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
				VENDOR			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2	
		4.INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2	FOR DIA OF 55 MM & ABOVE
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 3 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ VENDOR :		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
				SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC. 2. OTHER CHARACTERISTICS	MA MA	VISUAL TEST	100% SAMPLE	- MANUF'S SPEC.	NO VISUAL DEFECTS MANUF'S SPEC.	INSPT. REPORT LOG BOOK AND OR SUPPLIER'S TC	3 3	- -	2 2	FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT * MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2.DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA MA MA	VISUAL MEASUREMENT ELECT. & MECH TESTS	100% SAMPLE -DO-	- MANUFR'S DRG. . MANUF'S SPEC./ RELEVANT IS	NO VISUAL DEFECTS (FREE FROM BURS) MANUFR'S DRG. RELEVANT IS	LOG BOOK -DO- SUPPLIER'S TC	3 3 3	- - -	- 2 2	
1.9	CONDUCTORS	1. SURFACE FINISH 2.ELECT. PROP. & MECH. PROP	MA MA	VISUAL ELECT. & MECH.TEST	100% SAMPLES	- RELEVANT IS/ BS OR OTHER STANDARDS	FREE FROM VISUAL DEFECTS RELEVANT IS/ BS OR OTHER STANDARDS	LOG BOOK SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3* 3	- -	2* 2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN SHEET 4 OF 9		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR		QUALITY PLAN			SPECIFICATION :			
		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			TITLE			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

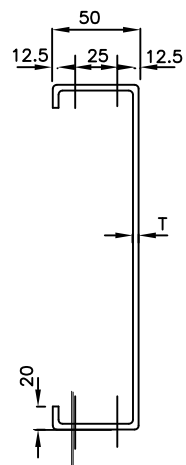
		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
		SHEET 5 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
2.0	IN PROCESS											
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNES	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVANT SPEC./ ASTM-E165	MANUF'S SPEC./ BHEL SPEC./	-DO-	2	-	1	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANUF'S SPEC./BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-	
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
				SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-	
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1	
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-	FOR MV MOTOR
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-	THREE DIPS TO BE GIVEN
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-	
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

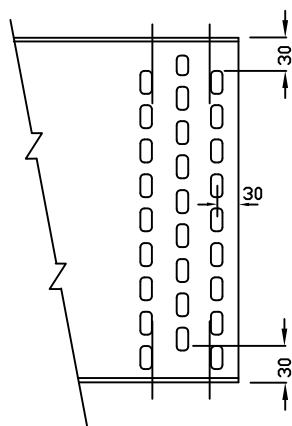
		QUALITY PLAN		CUSTOMER :			PROJECT TITLE		SPECIFICATION : NUMBER :				
				BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE				
		SHEET 7 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6	7	8	9	10	P	W	V	11
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	VERIFICATION FOR MV MOTOR ONLY	
		1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	2	-	-		
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
		2.SOUNDNESS	CR	MALLET TEST & UT	-DO-	-DO-	-DO-	Log Book	2		1		
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2		1		
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	2		1		
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	2		1		
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	-		
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-		
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	1		
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	2	-	-		
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	-		
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2		1		
BHEL			PARTICULARS		BIDDER/VENDOR								
			NAME										
			SIGNATURE										
			DATE										
												BIDDER'S/VENDORS COMPANY SEAL	

		QUALITY PLAN SHEET 8 OF 9		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR		QUALITY PLAN			SPECIFICATION :			
SYSTEM		NUMBER PED-506-00-Q-007, REV-03			TITLE			SECTION			VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	* NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1 ^s	1	* NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	* NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	* NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1 ^s	1	* NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1 ^s	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY * NOTE - 2
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN SHEET 9 OF 9		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
				SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
NOTES: 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED. 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON. 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED. 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE									
												BIDDER'S/VENDORS COMPANY SEAL



-4 HOLES 10mm DIA.

[illegible]

VIEW-DD
(100,50W TRAYS)

TRAY WIDTH W (mm)	100	50
TRAY DEPTH D (mm)	50	50
T (mm)	2	2

PERFORATED TYPE TRAY



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.



TITLE:
**TECHNICAL SPECIFICATION
DEBRIS FILTER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-421-165-N003**

SECTION: **II**

SUB-SECTION: **IIC**

REV. NO. **0** DATE 09.01.18

SHEET **1** OF **1**

SUB-SECTION - IIC

STANDARD TECHNICAL SPECIFICATION (C &I)



Technical specification
for
2X660 MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO. 00

DATE : 05.12.2017

INSTRUMENTS, JB & VALVES SPECIFICATION



Technical specification
for
2X660 MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO.

00

DATE : 05.12.2017

Kindly refer the following specified clause no. for instruments/ equipments in Section-B0 of customer's General Technical Specification:

- | | |
|----------------------------------|--------------|
| 1.1. Control cubicles | - B0.6.19.4 |
| 1.2. Junction boxes | - B0.6.19.5 |
| 1.3. Transmitters | - B0.6.19.8 |
| 1.4. Pressure measurement | - B0.6.19.10 |
| 1.5. Actuators | - B0.6.19.16 |



Technical specification
for
2X660 MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO.

00

DATE : 05.12.2017

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

- 1.1.** Measuring instruments / equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment. The instrumentation vendor shall be subject to BHEL's / customer's approval. Further, all instruments shall be of proven reliability, accuracy, repeatability requiring a minimum of maintenance. All instrumentation equipment and accessories under this specification shall be furnished as per technical specifications, ranges, makes / numbers as approved by BHEL / customer during detailed engineering.
- 1.2.** Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
- 1.3.** All local gauges as well as transmitters, sensors and switches for parameters like pressure, temperature etc. as required for the safe and efficient operation and maintenance under the scope of specification shall be provided. The necessary root valves, impulse piping, drain cock, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting / erection of these local instruments shall be furnished even if not specifically asked for. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg / Cm².
- 1.4.** Instruments envisaged for sea water application shall be provided with wetted parts made of Monel / Hastelloy C.
- 1.5.** All instruments shall be provided with durable epoxy coating for housing and all exposed surfaces of the instruments.



Technical specification
for
2X660 MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO.

00

DATE : 05.12.2017

1. SPECIFICATION FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE

Sl. No.	Features	Essential / Minimum Requirements		
		Pr. Gauge / D.P. Gauge	Temp. Gauge	Level Gauge
1	Sensing Element and Material	Bourdon for high pressure, Diaphragm / Bellow for low pr. of 316 SS	Mercury in steel below 450 Deg.C and inert gas actuated for above 450 Deg.C of SS bulb and capillary	Tempered toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel 304 SS
3	Dial size	150 mm	150 mm	Tubular covering entire range.
4	End connection	½ inch NPT (F)	¾ inch NPT (F)	Process connection as per ASME PTC and drain / vent 15 NB ±2%.
5	Accuracy	±1% of span	±1% of span	±2%
6	Scale	Linear, 270 Deg. Arc graduated in metri units.	Linear, 270 Deg. Arc graduated in Deg. C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Yes	Yes	Test pr. For the assembly shall be 1.5 to the max. design pr. at 38 Deg. C.
9	Housing	Weather and dust proof as per NEMA-4	Weather and dust proof as per NEMA-4	CS/304 SS leak proof
10	Zero / Span adjustment		Provided	Provided
11	Identification	Engraved with service legend or engraved phenolic laminated tag plate	Engraved with service legend or laminated phenolic name plate	Engraved with service legend or laminated phenolic name plate
12	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel / SS as per CS / Alloy process requirement.
13	Material of Bourdon movement	316 SS / 304 SS	316 SS / 304 SS	316 SS / 304 SS



Technical specification
for
2X660 MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO.

00

DATE : 05.12.2017

2. SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, D.P., ELECTRONIC TRANSMITTERS:

Sr. No.	Features	Essential/Minimum Requirements
1.	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible.
2.	Accuracy	$\pm 0.1\%$ of calibrated span (minimum)
3.	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal based on HART protocol
4.	Turn down ratio	10:1 for vacuum/very low pressure applications. 30:1 for other applications.
5.	Stability	$\pm 0.1\%$ of calibrated span for six months for Ranges up to and including 70 Kg/cm ² . $\pm 0.25\%$ of calibrated span for six months for Ranges more than 70 Kg/cm ² (g).
6.	Zero and span drift	+/- 0.015% per deg.C at max span. +/-0.11% per deg.C at min. span.
7.	Load impedance	500 ohm (min.)
8.	Housing	Weather proof as per IP-55 with durable corrosion resistant Coating.
9.	Over Pressure	150% of max. Operating pressure
10.	Connection (Electrical)	Plug and socket type
11.	Process connection	1/2 inch NPT (F)
12.	Span and Zero	Continuous, tamper proof, Remote as well as adjustability Manual from instrument with zero suppression and elevation facility.
13.	Accessories	-Diaphragm seal, pulsation dampeners, siphon etc. as required by service and operating condition. -2 valve manifold for absolute pressure transmitters (3-valve manifold for gauge/ vacuum pressure transmitters) and 5 valve manifold for DP/level/flow transmitters. -For hazardous area, explosions proof enclosure as described in NEC article 500.
14.	Diagnostics	Self Indicating feature
15.	Power supply	24V DC $\pm 10\%$.
16.	Adjustment/calibration/	Centralized PC based system.



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Notes:

In case it becomes necessary to use a DP transmitter for pressure measurement then a 3-valve manifold should be used in place of 2-valve manifold.

LVDT type is not acceptable.

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

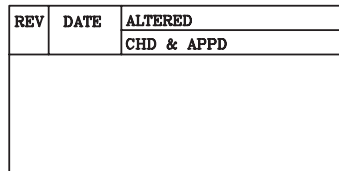
3. LIMIT SWITCH

For offsite plant application, Limit switches shall be gold plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.

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Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL *	* PROJECT	2X660MA BIFPCL, MAITREE BANGLADESH		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	☐ ON / OFF ☐ INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY		
	* OPENING / CLOSING TIME	☐		
	* WORKING PRESSURE	☐		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, DUST TIGHT, WEATHER PROOF, SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, IP:65		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.		
HANDWHEEL	* REQUIRED	☒ YES ☐ NO		
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SEVEN TIMES THE RATED CURRENT as per IEC-60034-30		
	ACTUATOR APPLICABLE WIRING DIAGRAM	☒ ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ☒ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram		
	COLOUR SHADE	☒ BLUE (RAL 9003) ☐		
	PAINT TYPE (## Refer Notes)	☐ ENAMEL ☒ EPOXY ☐		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		Starting current shall not exceed 7 times rated current as per IEC 60034 for IE-3 motors.
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		

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Data Sheet A & B						
DATA SHEET-A (TO BE FILLED BY PURCHASER)					DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC				
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☐ 110 V				
	@ ENCLOSURE CLASS OF MOTOR	☐ IP 67 ☐ FLAME PROOF				
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B				As per IEC-60034
	@ WINDING TEMP PROTECTION	☒ THERMOSTAT (3 Nos., 1 IN EACH PHASE) ☐				
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED				
INTEGRAL STARTER	INTEGRAL STARTER	☒ REQUIRED ☐ NOT REQUIRED				
	TYPE OF SWITCHING DEVICE	☒ CONTACTORS ☐ THYRISTORS				
	TYPE	☒ CONVENTIONAL ☐ SMART (NON-INTRUSIVE)				
	IF SMART					
	a) SERIAL LINK INTERFACE	☐ INTEGRAL ☐ FIELD MOUNTED				
	b) SERIAL LINK PROTOCOL	☐ FOUNDATION FIELD-BUS ☐ PROFI-BUS ☐ DEVICE NET ☐				
	c) SERIAL LINK MEDIA	☐ TWISTED PAIR Cu-CBL ☐ CO-AXIAL Cu-CBL ☐ OFC				
	d) HAND HELD PROGRAMMER	☐ REQUIRED ☐ NOT REQUIRED				
	e) TYPE OF HAND HELD PROGRAMMER	☐ BLUETOOTH ☐ INFRARED ☐				
	f) MASTER STATION	☐ REQUIRED ☐ NOT REQUIRED				
	g) MASTER STN INTRFACE WITH DCS	☐ MODBUS ☐ TCP/IP				
	h) DETAILS OF SPECIAL CABLE	☐ ENCLOSED ☐ NOT REQUIRED				
	STEP DOWN CONT. TRANSFORMER	☒ REQUIRED				
	OPEN / CLOSE PB	☒ REQUIRED ☐ NOT REQUIRED				
	STOP PB	☒ REQUIRED ☐ NOT REQUIRED				
	INDICATING LAMPS	☒ REQUIRED ☐ NOT REQUIRED				
	LOCAL REMOTE S/S	☒ REQUIRED ☐ NOT REQUIRED				
	STATUS CONTACTS FOR MONITORING	☒ REQUIRED ☐ NOT REQUIRED				
INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)					
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	☒ INTERPOSING RELAY ☐ OPTO COUPLER ☐ EITHER				The coils of interposing relays shall be connected to freewheeling diode.
	QUANTITY	☒ 2 Nos. ☐ 3 Nos.				
	DRIVING VOLTAGE	☒ 20.5 – 24V DC ☐ _____ V DC				
	DRIVING CURRENT	☒ 125mA MAX ☐ _____ mA MAX				
	LOAD RESISTANCE	☒ > 192 ohms - <25 k ohms ☐ > _____ ohms - < _____ ohms				
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY				
	OPEN / CLOSE	☒ 1 No. ☐ 2Nos. / ☒ 1 No. ☐ 2Nos				
	CONTACT TYPE	2 NO + 2 NC				
	RATING	5A 240V AC AND 0.5A 220V DC				
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE				
	ACCURACY	+3% OF SET VALUE				
LIMIT SWITCH (Not Applicable)	MFR & MODEL NO.	BIDDER TO SPECIFY				
	OPEN : INT : CLOSE	☒ 1 No ☐ 2 Nos.	2 Nos. (ADJ.)	☒ 1 No. ☐ 2Nos.		

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Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
for Smart Actuator) (\$\$ Refer Notes)	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC		
POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	☒ REQUIRED ☐ NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS		
	SUPPLY	☒ 24V DC ☐		
	OUTPUT	☒ 4-20mA		
	ACCURACY	$\pm 1\%$ FS		
SPACE HEATER	@SPACE HEATER	REQUIRED		
	@ POWER SUPPLY (NON INTEGRAL)	230V AC, 1 PH., 50 Hz		
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY		
	@ RATING			
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED		
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ ☐ IP 68 @ ☐		
	@ EARTHING TERMINAL	REQUIRED		
	PLUG & SOCKET (9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	☒ REQUIRED ☐ NOT REQUIRED ☒ 2 NOS. ☐		
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----		
	@ SPACE HEATER CABLE GLAND	SIZE:-----		
	OTHER CONTROL CABLE GLANDS-1	☐ 1No. for BFV of CW PUMP (Cable size 2Px1.5mm2)		
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE :-----		
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY		_____ Kg.
NOTES: 1. SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. 2. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST INTERNATIONAL STANDARD (INDIAN CODES ARE NOT ACCEPTABLE). 3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. 4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. 5. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. 6. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -6% TO +4% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. 7. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. \$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE. ## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.				
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ = TO BE FILLED BY ES				





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LCP SPECIFICATION & DATASHEET



SPECIFICATION FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS -999- 145 -054A

VOLUME II B

SECTION D

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1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site, supervision, erection, and commissioning at site of Local Panels required for control and monitoring of the Auxiliary Plant & Equipment.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant International standards as mentioned in codes and standard section of this specification.

3.0 TECHNICAL REQUIREMENTS

3.1 Panel Construction

- 3.1.1 The local panels shall house the secondary instruments, annunciation system, Single loop controller, Control switches / push buttons, indicating lamps/LED cluster, relays, timers and other devices required for operation and monitoring of the equipment locally.
- 3.1.2 The panels shall be of free standing type either welded construction on angle iron (minimum section of 50 x 50 x 4 mm) structure or folded construction by sheet metal formation depending upon the equipments to be mounted on it. The panels shall be robustly built and stiffeners as necessary shall be provided.
- 3.1.3 The panel shall be suitably reinforced to ensure adequate support for all instruments mounted thereon. All welds on exposed panel surfaces shall be ground smooth.
- 3.1.4 The salient features of construction shall be:
- Sheet material: Cold rolled sheet steel
Frame thickness: Not less than 3.0mm
Enclosure thickness: Not less than 2.5 mm for load bearing sections (Mounted with instruments)
1.6 mm for doors and Not less than 2.0 mm for others
Panel Height: Not less than 2365 mm (Refer data sheet-A (No. PES-145A-DS1-0)
Gland plate thickness: 3.0mm
Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.
- 3.1.5 The panel shall be provided with rear doors with integral lockable handle. The door when locked shall be held at minimum three places. The door width shall not be more than 550mm. The doors shall be provided with suitable stiffeners to prevent buckling. The handle shall be on the right side of the door. The door shall be removable type with concealed hinges to facilitate maintenance work. Suitable pocket inside the door shall be provided for keeping the drawings / documents. Double door shall be provided with suitable glass windows, as per the requirement.
- 3.1.6 Suitable neoprene gasket shall be provided on all doors and removable covers. Suitable ventilation system along with louvers shall be provided at bottom and top of the doors covered with removable wire mesh.
- 3.1.7 The class of protection shall be in accordance with Cl. No. B0.6.18.4 – “Installation conditions and protection class for electrical operational equipment and control and monitoring equipment” under section IA-Customer's general technical specification – B0. Also refer Cl. No. B0.6.18.15 for Local control points.
- 3.1.8 All steel surfaces shall be cleaned by sand / pellet blasting, treated for pickling, degreasing and phosphating etc. by seven tank method. The panel shall have a high quality finish and appearance. The panel shall be painted with two coats of primer followed by two coats of epoxy / synthetic enamel based final paint of color shade and finish as given in data sheet-A (No. PES-145A-DS1-0). Minimum thickness of the paint shall be 85 microns for external paint and 70 microns for internal paint.



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- 3.1.9 The cable glands of the required size and type as given in data sheet-A (No. PES-145A-DS1-0) shall be supplied along with the Panel.
- 3.1.10 All operable and indicating devices shall be mounted on the front of the panel while aux. Relays / timers MCBs etc. required for realization of control logics shall be mounted on a mounting plate inside the panel. Auxiliary relays and timers etc. shall be grouped according to the control function. No operable or indicating devices shall be mounted below 750 mm and above 1800 mm (w.r.t. finished ground level). The devices shall be located in such a way so as to ensure easy access for operation / maintenance.
- 3.1.11 Single / dual control power supply feeders of voltage class as specified in data sheet-A (No. PES-145A-DS1-0) shall be provided by the purchaser. In case redundant power supply feeders are provided then auto changeover unit shall be mounted on the panel are in the panel supplier's scope. Where DC control power supply is specified an additional 240V, 50 Hz AC supply feeder for powering of space heater and lighting shall be provided by the purchaser. Suitable arrangement shall be provided inside the panel to receive and terminate the power supply feeder(s). For this purpose, MCBs of suitable current rating shall be provided by the vendor. A supervisory relay along with a pilot lamp to indicate control supply 'ON' shall be provided on the panel. Any other power supply required for the operation of the devices mounted in the panel shall be arranged by the vendor.
- 3.1.12 The internal wiring shall be carried out with 1100 volt grade PVC insulated copper multi strand wire / flexible of 1.5mm² size. AC & DC wires shall be kept separate from each other. Separate colored wires to be used for AC and DC circuits. All wires shall be properly numbered and identified with ferrules as per the Control scheme / wiring diagram. Wires shall be routed and run through PVC troughs.
- 3.1.13 Terminal blocks shall be clip on type, 1100 volts grade. Separate terminal blocks shall be used for AC & DC circuits. The terminals shall be suitable for terminating 0.5 mm² to 2.5mm² external cables. The TB points in terminal block shall be cage clamp type / screw type. The terminal for ammeters shall be provided with removable links for shorting CTs. Each terminal strip shall be provided with identification strip. The terminal shall not be mounted below 250 mm height from finished floor. The panel shall have ten (20) percent spare terminal.
- 3.1.14 The interior of each panel shall be suitably illuminated through fluorescent lamps / tube lights with shrouded cover of minimum 15W operable on 240V 50 Hz AC power supply through panel door switch. A 15 Amp. 3-pin Power receptacle shall be provided.
- 3.1.15 Suitable space heaters operable on 240 Volts 50 Hz AC power system shall be provided at the panel bottom. These shall be designed to maintain the panel temperature five (5) deg. C above the ambient temperature during maintenance shutdown. Suitable isolating and control devices comprising of MCB, thermostat etc. shall be provided for the space heater.
- 3.1.16 The panel shall be provided with a copper earth bus of 25 x 6 mm size running throughout the width of the panel. It shall be terminated internally with 10 mm bolts at extreme ends for connection to; main station earth. The panel mounted equipments / devices shall be connected to earth bus through green colored PVC insulated stranded copper conductor of 2.5 mm² size.
- 3.1.17 Local Panel shall be provided with main name plate of 150 mm x 40 mm size having inscription of 20 mm height. The individual devices on the panels shall be as provided with separate name plate with inscription of 3 mm height. The instrument / devices shall be provided with stick on label plates inside the panel. The material of the main and individual labels shall be three (3) ply 3 mm thick Traffolyte Sheet / 2 mm Anodised Aluminium Plate. The inscription shall be with white letters on black background on traffolyte sheet. The labels shall be fixed by self tapping non-rusting screws.
- 3.1.18 Vendor shall furnish electric load and heat load list (in case panel is to be placed in an ac environment) of each panel.



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3.2 Hazardous Area Panel Requirement

3.2.1 The Local Panel located in hazardous area shall be pressurized as per NFPA-496 requirements to render it non-hazardous. Alarms shall be provided for local and remote annunciation when pressurisation falls below 2.5 mm of water column. Protection shall be of type Z of NFPA-496. It shall not be possible to switch ON the power of purged section unless it is purged as per the recommendation of NFPA-496. Vendor must provide a protective device on the panel to protect the panel from over pressurisation.

3.2.2 Vendor shall supply pressurisation kit consisting of valves, restriction orifices, dual filter regulation, pressure gauges, pressure switches, rotameter etc. Pressurisation kit shall be surface mounting on a metal board and located outside the local panel. Pressurisation kit shall further consist of solenoid valve flow switch, timer blow off safety device etc., so as to make purging fully automatic. However final start shall be manual. Panel protection against over pressure to be provided as per NFPA-496.

3.2.3 Pressurised local control panel pressurization kit assembly design shall provide minimum leakage flow through the Local Control Panel. Panel venting shall be as per NFPA-496.

3.2.4 All components in the local panel like indicating instruments, push buttons switches, lamps etc., which are required to be energized without panel pressurization or before completion of purge cycle shall be explosion proof as per NEMA-7 & suitable for area classification.

3.2.5 All push buttons etc. requiring frequent operation during machine running shall have good positive sealing. Weatherproof housing or cover to be provided wherever necessary. Vendor shall provide pressurisation bypass switch outside explosion proof enclosure of pressurized panel with lamp indication. This shall be used only during maintenance. All hinges, screws, other non-painted metallic parts shall be of stainless steel material.

3.2.6 Provision to switch off manually all types of power shall be provided in the panel. In addition, it shall also be possible to switch off power circuits / components which are powered from motor control centre or control room manually in case of pressurization failure. All such cables from MCC and main control room shall be terminated in explosion proof boxes (NEMA-7).

3.3 Control & Monitoring devices

3.3.1 Instruments like Indicators, recorders, single loop controllers etc. as applicable and specified elsewhere for the plant / equipment shall be supplied and mounted on the panel.

3.3.2 Alarm Annunciator System

It shall be solid state discrete facia type having a sequence of ISA-S18.1A or as specified, opaque facia windows of 70 mm x 50 mm size, having two (2) lamps per window, and hooter of 10W, and provision for repeat group alarm at remote. The annunciator shall be provided with ten (10) percent spare windows or minimum two (2) windows along with electronics.

3.3.3 Relays

The relays shall be electromagnetic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable. There shall be ten (10) percent spare contacts.

3.3.4 Timers

The timers shall be electronic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However, minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable.

3.3.5 Control / Selector Switches

Switches shall be Rotary Cam type with minimum of 5 Amps AC & 2 Amp DC continuous current rating. Selector switches shall be stay put type while control switches shall be spring-return-to-neutral type. Contact configuration and rating shall be as per the control function requirement. The switches shall be lockable type wherever specified. Each switch shall be provided with engraved plates indicating the switch position / functions.



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3.3.6 Push Buttons / Indicating Lights

The push buttons shall be momentary action self-resetting type, however stop P.B. for unidirectional drives shall be provided with manual reset facility. Its contact configuration & rating shall be as required for the control function but minimum 2 NO + 2 NC of 5 Amp. AC rating. It shall have round coloured projecting tab and engraved escutcheon plate / inscription plate. Colour coding of push buttons shall be as under:

RED	Motor OFF / Valve CLOSE	YELLOW	Alarm acknowledge	Left Hand Side
GREEN	Motor ON / Valve OPEN	BLACK	Lamp test	Right Hand Side

Indicating lights shall be suitable for direct connections across specified power supplies. It shall be fitted with built in resistance to prevent circuit tripping on shorting of lamp filament. It shall be fitted with LED cluster type lamp replaceable from front.

GREEN	Motor OFF / Valve CLOSED condition	AMBER	Motor tripped	Left Hand Side
RED	Motor ON / Valve OPEN condition	WHITE	Normal / healthy	Right Hand Side

Ammeter shall be 96 x 96 mm size, 90 deg. deflection, 1.5% accuracy, 1 Amp. CT operated or with 4-20mA input and Flush mounting type as called for in the data sheet-A (No. PES-145-54A-DS1-0). Ammeters for motors shall have six (6) times folded scale at upper end to enable motor starting current indication

3.3.8 Miniature Circuit Breaker (MCB)

These shall be instantaneous magnetic trip type for short circuit in addition to current time inverse delayed thermal trip feature for over current protection. The housing of MCB shall be made of non-ignitable, high impact material. It shall have minimum short circuit rating of 9 KA for AC Voltages and 4 KA for DC Voltages.

3.3.9 Makes of various instruments / devices shall be as given below

1.	Alarm Annunciators	:	Procon / IIC
2.	Ammeters	:	AEP / IMP
3.	Control / Selector Switches	:	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	:	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	:	Jyoti / Siemens / L&T / OEN
6.	Timers	:	L&T / Alsthom / Bhartiya Cutler Hammer
7.	MCBs	:	S&S Power Engg. / Indo Asian / MDS
8.	Terminal Blocks	:	Jyoti / Elmex

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

4.2 BHEL's standard Quality Plan for LCP is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.

4.3 The vendor shall conduct the following tests as a minimum requirement:

4.3.1 Routine Tests

1. High Voltage (H.V.)
2. Insulation Resistance (I.R.)
3. Functional

4.3.2 Type Tests

1. Enclosure Class Test



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5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

5.2. Mandatory Spares

The bidder shall offer along with main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3. Recommended Spares

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

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid:

1. Data Sheet no. PES-145A-DS1-0
2. General Arrangement Drawing.
3. Catalogue and technical information for instruments and devices.
4. Quality Plan.

6.2 The vendor shall furnish the following documents in required number as agreed after the award of contract:

1. Data Sheet No. PES-145A-DS2-0
2. GA Drawing indicating layout of instruments, construction details, foundation details, cable gland plate along with cable glands and all details mentioned in this specification.
3. Control Schematic Diagram along with grouping of different terminals for various functions.
4. Catalogue and technical information for instruments and devices with selected options clearly marked.
5. O&M Manuals.
6. "As Built" Drawing.
7. CDs.

7.0 MARKING AND PACKING

7.1 Panel with all instruments / devices mounted on it shall be suitably packed & protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in Transit and storage in open.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms:

- | | | |
|-----------------------------------|---|-------------------------------|
| - Data sheet A&B for Local Panels | : | Data sheet no. PES-145A-DS1-0 |
| - Data sheet C for Local Panels | : | Data sheet no. PES-145A-DS2-0 |



DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS-999-145-054A

VOLUME

SECTION

REV. NO.

DATE: 05.12.2017

SHEET 1 OF 2

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		☒ FOLDED ☐ WELDED
	ENCLOSURE SHEET THICKNESS	FRONT	☒ 2.0 mm
		OTHER	☒ 2.0 mm
		DOOR	☒ 2.0 mm
		HEIGHT	☒ 2365 mm for stand-alone panels
OTHER		☒ Load bearing sheet front shall have 3.0 mm thickness	
TECHNICAL	INPUT POWER SUPPLY (ANY OTHER POWER REQUIREMENT TO BE DERIVED FROM THIS SUPPLY ONLY)		☒ 240 V AC (Supply feeder)/ 415V 3 PHASE 4W ☐ 415V 3 PHASE 3W Kindly refer electrical scope between BHEL & Vendor
	NO. OF FEEDERS		☐ ONE ☐ TWO Kindly refer electrical scope between BHEL & Vendor
	STARTER WITH MCC		☒ REQUIRED (IN VENDOR'S CONTROL PANEL) ☐ NOT REQUIRED
	IPR POSITION		☒ STARTER CUM CONTROL PANEL (IN VENDOR'S SCOPE)
	CONTACT RATING OF RELAY		☒ 5 Amp, 230 V AC ☒ 0.25 Amp, 220V DC
	CONTROL SUPPLY		☐ 110V AC ☐ 220V AC ☐ 220V DC ☐ Other. (As per requirement, to be decided during detailed engg.)
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		Shall be decided during detailed Engg.
	TEMP SCANNER		☐ REQUIRED ☒ NOT REQUIRED
	MIMIC (TYPE OF MIMIC- MATERAIL, THICKNESS TO BE SPECIFIED DURING DETAILED ENGG.)		☐ REQUIRED ☒ NOT REQUIRED
	PAINT TYPE		FOR PAINT TYPE & COLOR: - REFER Cl. No. B0.6.9 – SIGNS & COLOUR CODE GIVEN UNDER CUSTOMER SPECIFICATION B0.
	PANEL COLOUR (EXTERNAL)		
	FINISH (EXTERNAL)		
	PANEL COLOUR (INTERNAL)		
	FINISH (INTERNAL)		
	CLASS OF PROTECTION		REFER Cl. No. B0.6.18.4 of Customer spec B0
	CONTROL HARDWARE		☒ Push buttons along with status indications
	FOUNDATION ARRANGEMENT		☐ FOUNDATION BOLTS ☐ ANCHOR FASTENERES
	WEIGHT OF PANEL (Kg.)		(Vendor to specify)
	PANEL TYPE		☐ PRESSURISED ☒ UNPRESSURISED
	CABLE GLAND		☒ DOUBLE COMPRESSION Kindly refer electrical scope between BHEL & Vendor
	AMMETER (TYPE OF INPUT)		☐ 1 Amp CT ☐ 4-20 mA
	SCOPE OF SUPERVISION FOR ERECTION & COMMISSIONING		☐ APPLICABLE ☒ NA



DATA SHEET FOR LOCAL PANELS

SPECIFICATION NO.: PE-SS-999-145-054A

VOLUME

SECTION

REV. NO.

02

DATE: 05.12.2017

SHEET

2

OF

2

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)

GENERAL	MANUFACTURER			
	CONSTRUCTION		☐ FOLDED	☐ WELDED
	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 MIMC			
	THICKNESS OF MIMIC			
	PANEL COLOUR (INTERNAL)			
	FINISH (INTERNAL)			
	CLASS OF PROTECTION			
	CONTROL HARDWARE			
	FOUNDATION ARRANGEMENT			
	WEIGHT OF PANEL (Kg.)			
	PANEL TYPE			
	CABLE GLAND			
	AMMETER (TYPE OF INPUT)			
	SCOPE OF SUPERVISION			



Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

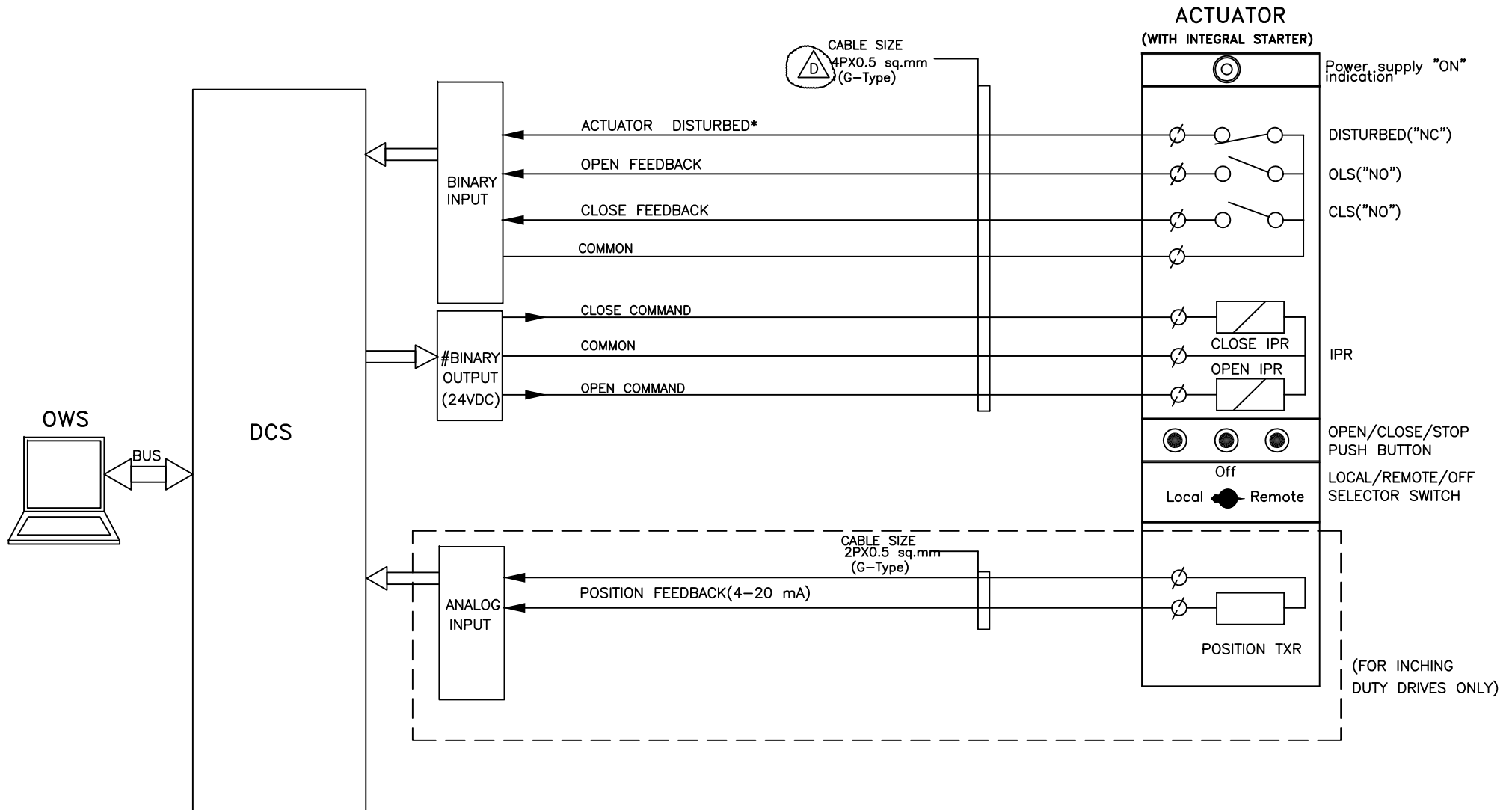
SECTION: D

REV. NO. 00

DATE : 05.12.2017

DRIVE CONTROL PHILOSOPHY

DCS INTERFACE FOR BIDIRECTIONAL DRIVE(WITH INTEGRAL STARTER)



NOTE:

- * DISTURBED= Loss of Power supply (1 Phase/3 Phase)/
Loss of control supply/ Motor thermostat trip/
Thermal over load/
Local/Off/Remote Sel. switch in local or off mode/
Stop PB optd.

#BINARY=
OUTPUT

Redundant output shall be provided



PROJECT: 2X660MW BIFPCL MAITREE

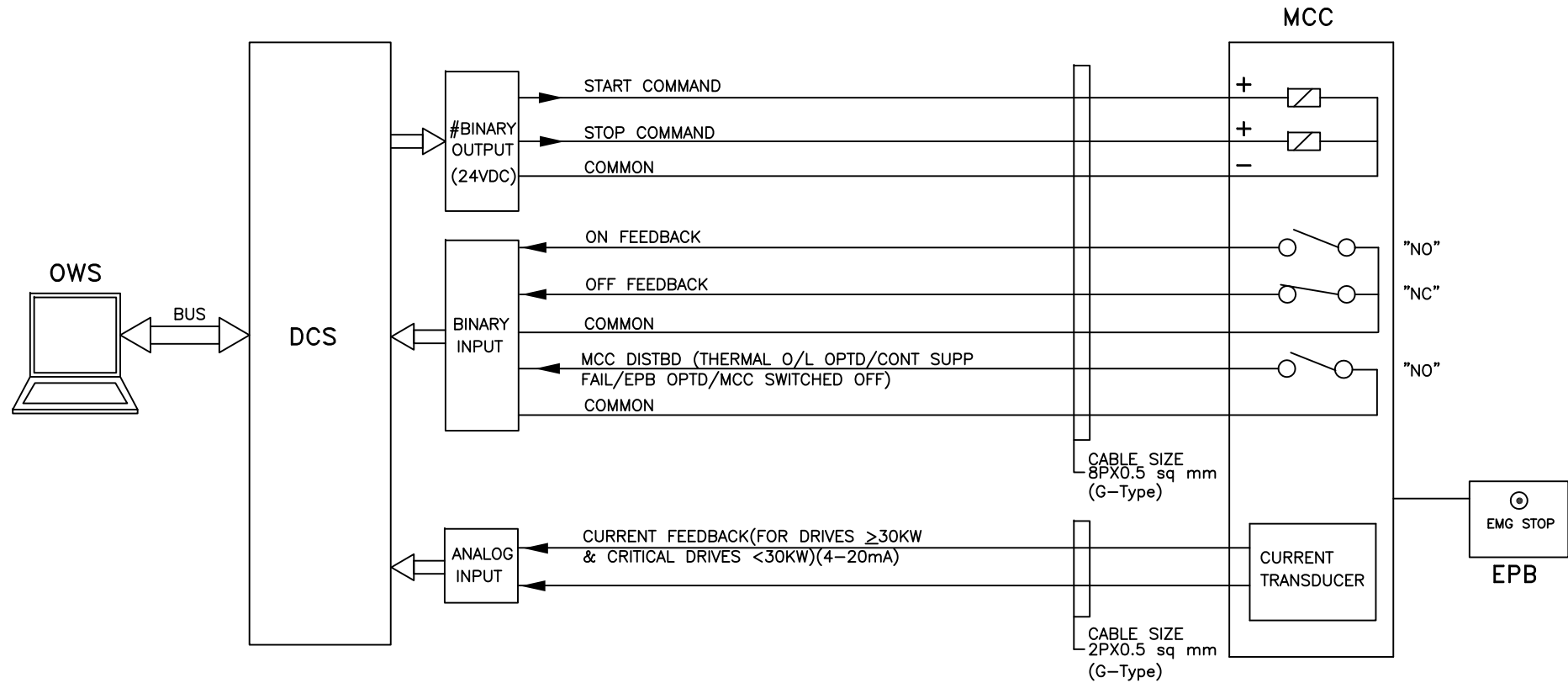
TITLE
DDCMS INTERFACE FOR
BIDIRECTIONAL DRIVE

DRG.NO. Maitree-01-CD-FF-
123002-PEM-D

DATE 10.08.2017

SHT 7 OF 11

DCS INTERFACE FOR UNIDIRECTIONAL LT DRIVE



NOTE:

#BINARY=
OUTPUT

Redundant output shall be provided



PROJECT: 2X660MW BIFPCL MAITREE

TITLE

DDCMIS INTERFACE FOR
UNIDIRECTIONAL LT DRIVE

DRG.NO. Maitree-01-CD-FF-
123002-PEM-D

DATE 10.08.2017

SHT 8 OF 11



Technical specification
for

2X660MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO. 00

DATE : 05.12.2017

APPLICABLE C&I CABLE TYPES



Technical specification
for
2X660MW STPP, MAITREE-BANGLADESH

SECTION D

REV. NO.

00

DATE : 05.12.2017

S. No.	C&I Cable Type
G-TYPE	
1	2P X 0.5 sq.mm
2	4P X 0.5 sq.mm
3	8P X 0.5 sq.mm
4	12P X 0.5 sq.mm
F-TYPE	
1	4P X 0.5 sq.mm
2	8P X 0.5 sq.mm
3	12P X 0.5 sq.mm
4	20P X 0.5 sq.mm
CONTROL CABLE	
1	3C X 2.5 sq.mm



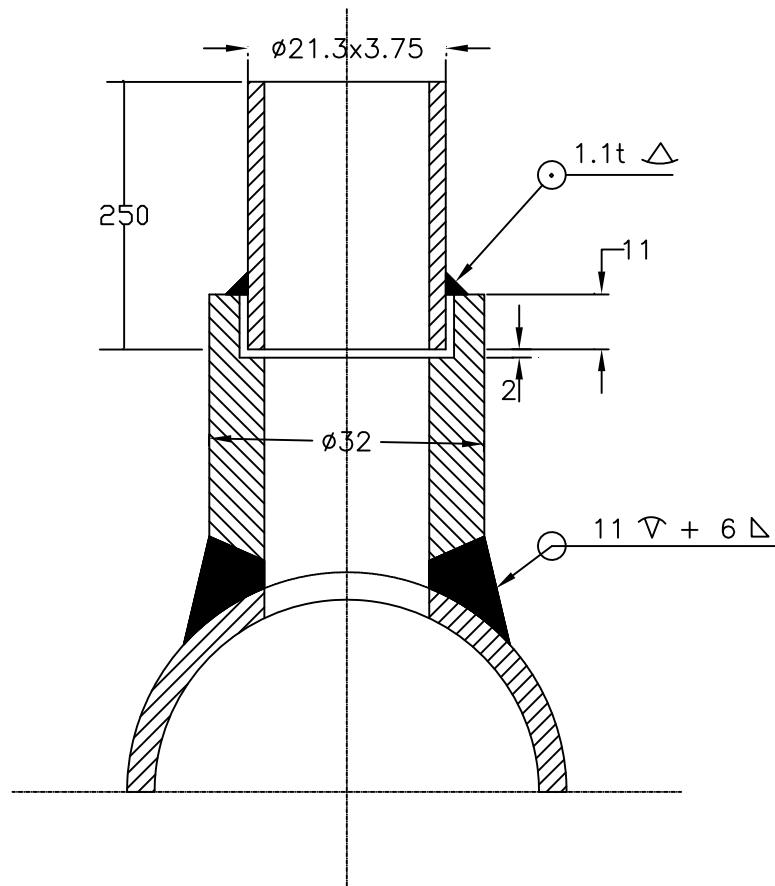
Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

SECTION: D

REV. NO. 00

DATE : 05.12.2017

INSTRUMENT STUB DETAILS



NOTE :

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFORM TO ANSI B16.11.
2. THE LENGTH OF NIPPLE SHOULD BE 250 MM.
3. STUB LENGTH SHALL BE 64mm UPTO 200Nb PIPE, 45mm ABOVE 200Nb PIPE SIZE.
4. STUB AND NIPPLE SHALL HAVE IBR CERTIFICATION, AS APPLICABLE, ACCORDING TO PROCESS DATA



TITLE :
INSTRUMENT STUB DETAILS
FOR PRESSURE MEASUREMENT
 (SYSTEM PRESS UPTO 40Kg/Cm², CLASS 3000#)

DRG. NO.

REV. 00



Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

SECTION: D

REV. NO. 00

DATE : 05.12.2017

INSTRUMENT INSTALLATION DIAGRAM

INSTALLATION NOTES

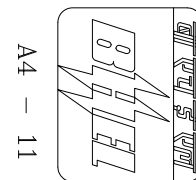
01. HORIZONTAL PIPE RUNS SHALL HAVE A SLOPE OF 50 MM'S IN ONE METER

02. LEGEND/ABBREVIATIONS USED IN THE INSTALLATION SCHEMES.

- A/R : AS REQUIRED
- PT : PRESSURE TRANSMITTER
- DPT : DIFFERENTIAL PRESSURE TRANSMITTER (FT or LT or DPT type).
- DFDC : DOUBLE FERRULE DOUBLE COMPRESSION
- INST : INSTRUMENT

03. DRAIN PIPE INSIDE LIE / LIR SHALL BE OF A106 Gr. C– 2" NB Sch. 80 ALONGWITH WITH SUITABLE ADAPTER / ELBOW ON ONE SIDE & CAP ON OTHER SIDE.

04. DRAIN FROM LIE / LIR SHALL BE CONNECTED TO NEAREST PLANT DRAIN THROUGH OPEN FUNNEL (1/2" SIZE).

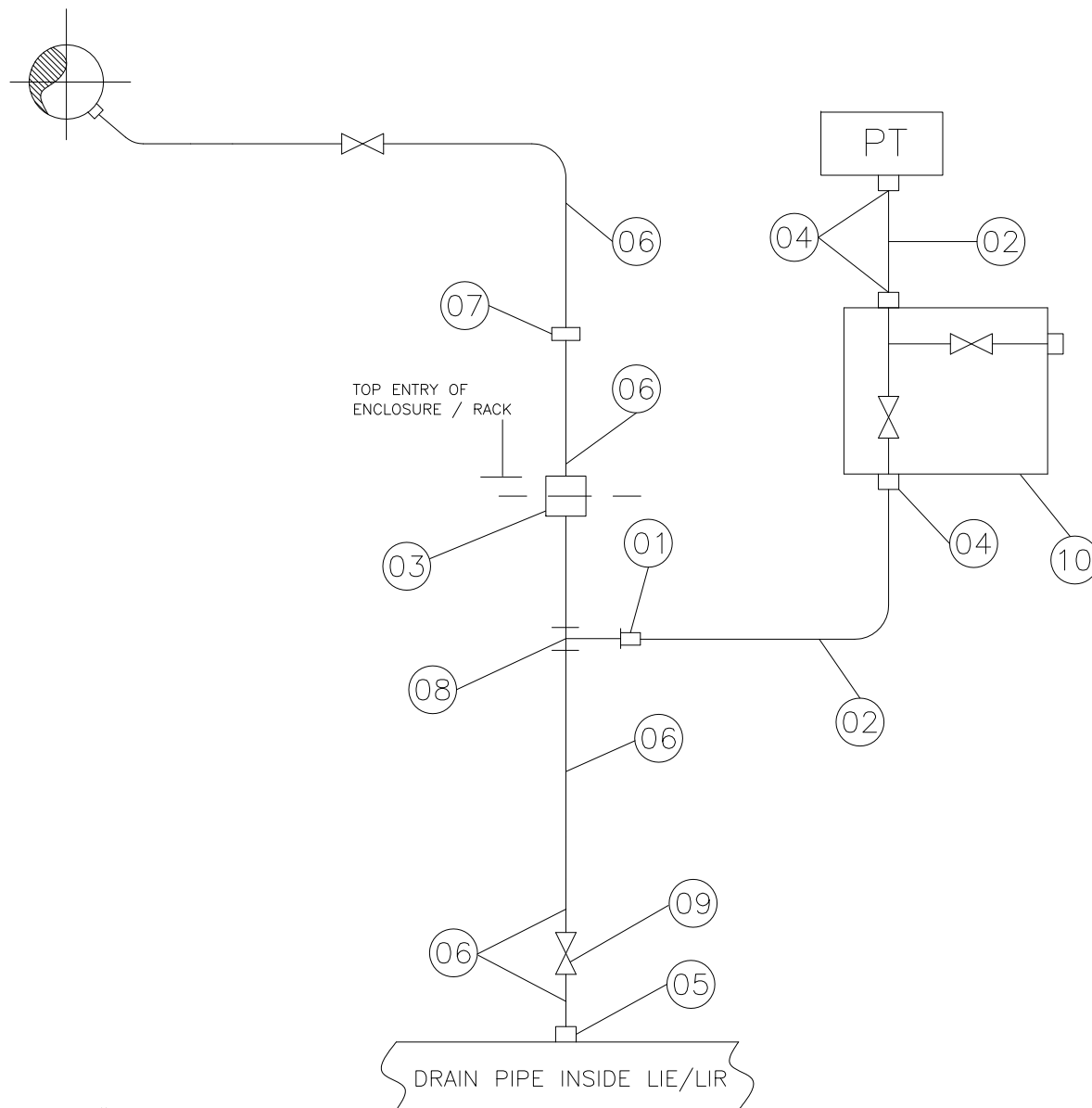
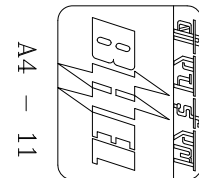


A4 – 11

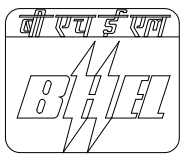
PE-DG-421-145-1555

REV. NO. 00

PAGE : 02

NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 8



A4 - 11

PE-DG-421-145-I555

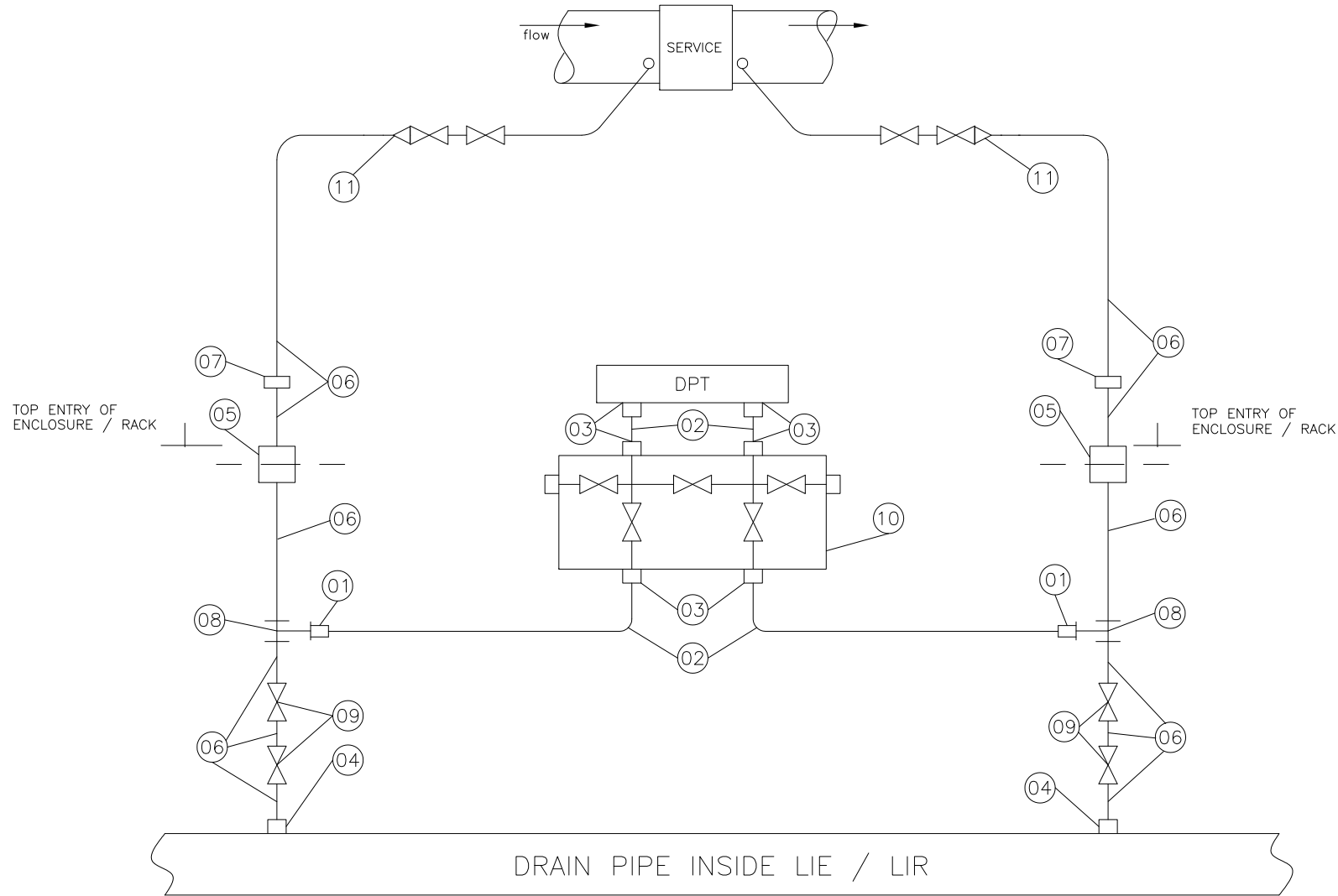
REV. NO. 00

PAGE : 8

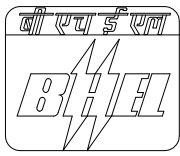
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10	TWO VALVE MANIFOLD WITH VENT PLUG PORT SIZE : 1/2" NPTF / MATL : SS316 PR. TESTING : 3000PSI	01
09	FORGED GLOBE VALVE BODY : ASTM A105 SIZE : 1/2" NB-SW / CL : 800	01
08	FORGED TEE / AS PER ANSI B16.11 MATL. : ASTM A105 SIZE : 1/2" NB-SW / CL : 3000	01
07	FORGED COUPLING / AS PER ANSI B16.11 MATL : ASTM A105 SIZE : 1/2" NB-SW / CL. 3000	A/R
06	IMPULSE PIPE MATL : ASTM A106 Gr. C SIZE : 1/2" NB-SCH 80	A/R
05	HALF COUPLING / 1/2" NB-SW /AS PER ANSI B16.11 MATL : ASTM A105 /CL. 3000	01
04	TUBE FITTING / DFDC MATL. : SS316 SIZE : 1/2" NPTM X TO SUIT 1/2" OD SS TUBE	03
03	BULK HEAD UNION / COUPLING CL : 3000 LBS / 1/2" NB-SW MATL : ASTM A105/AS PER ANSI B16.11	1No.
02	TUBE / MATL. : SS316 ASTM A 213 TP 316 H SIZE : 1/2" OD X 2.1 mm THK.	A/R
01	TEE TUBE UNION / MATL. : SS316 SIZE : OD OF 1/2" NB - PIPE X TO SUIT TO 1/2" OD SS TUBE	01
ITEM NO.	ITEM DESCRIPTION	QTY/INST.

**NOTE:**

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 10



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PE-DG-421-145-I555

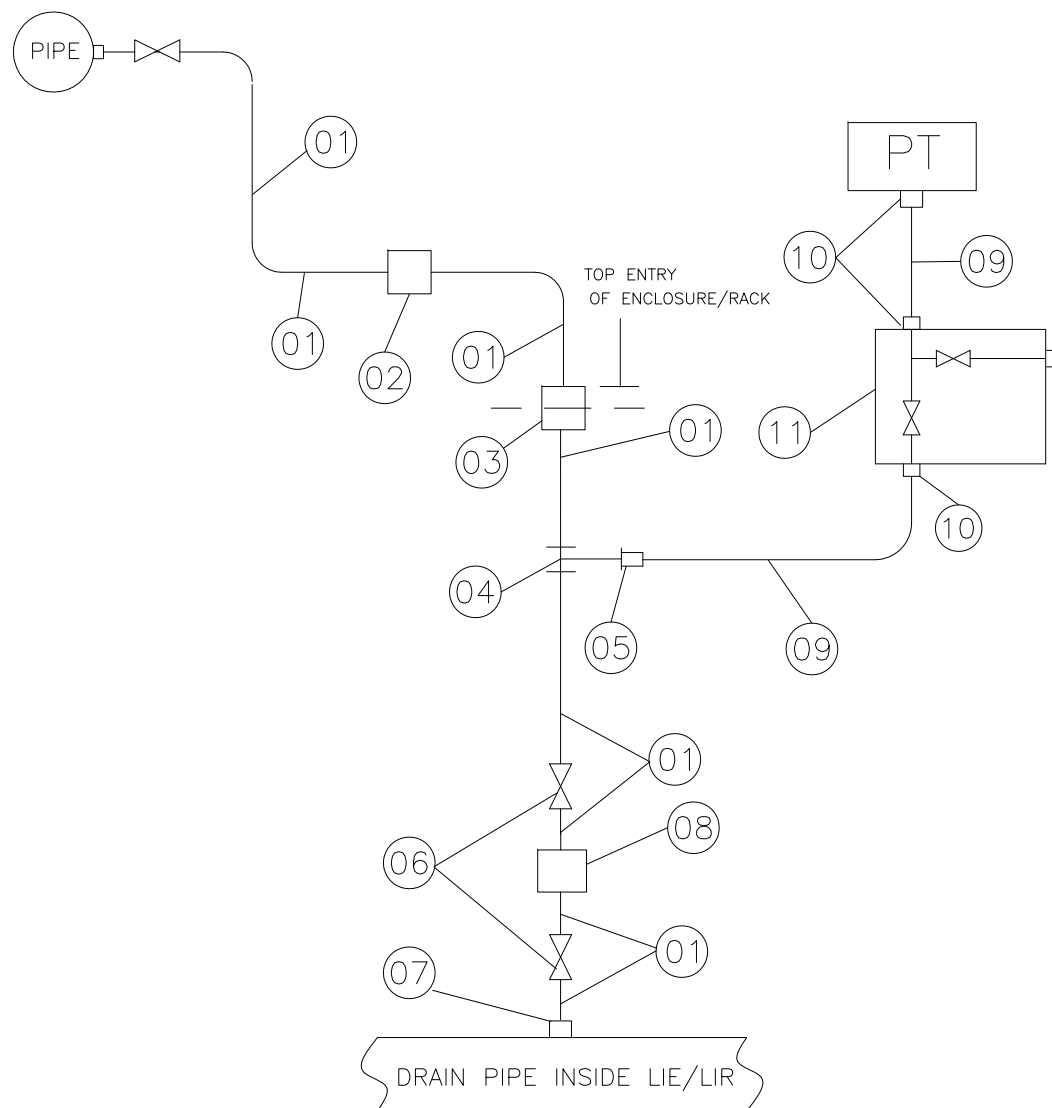
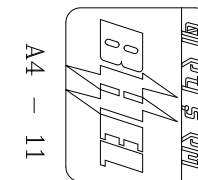
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PAGE : 10

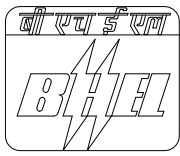
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11	FORGED REDUCER / AS PER ANSI B16.11 MATL.: ASTM A105 SIZE: OD OF 1" NB TO 1/2" NB - SW CL 6000	02
10	FIVE VALVE MANIFOLD WITH VENT PLUG PORT SIZE : 1/2" NPTF / MATL. : SS316 PR. TESTING : 6000PSI	01
09	FORGED GLOBE VALVE BODY MATL. : ASTM A105 SIZE : 1/2" NB-SW / CL. 2500	04
08	FORGED TEE / AS PER ANSI B16.11 MATL. ASTM A105 SIZE : 1/2" NB-SW /CL : 6000	02
07	FORGED COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105 SIZE : 1/2" NB-SW / CL. 6000	A/R
06	IMPULSE PIPE MATL. ASTM A106 Gr.C SIZE : 1/2" NB-SCH 160	A/R
05	BULK HEAD UNION COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105/ 1/2" NB-SW CL : 6000	02
04	HALF COUPLING / AS PER ANSI B16.11 MATL. : ASTM A105 / 1/2" NB-SW /CL.6000	02
03	TUBE FITTING / DFDC MATL. : SS316 SIZE : 1/2" NPTM X TO SUIT 1/2" OD SS TUBE	06
02	TUBE / MATL. : ASTM A 213 TP 316 H SIZE : 1/2" OD X 2.1 THK.	A/R
01	TEE- TUBE UNION MATL. : SS316 / SIZE : OD OF 1/2" NB X TO SUIT 1/2" OD SS TUBE	02
ITEM NO.	ITEM DESCRIPTION	QTY/INST.

NOTE:

1. " TRANSMITTER BELOW SOURCE"
2. FOR BILL OF MATERIAL REFER PAGE 16



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PE-DG-421-145-I555

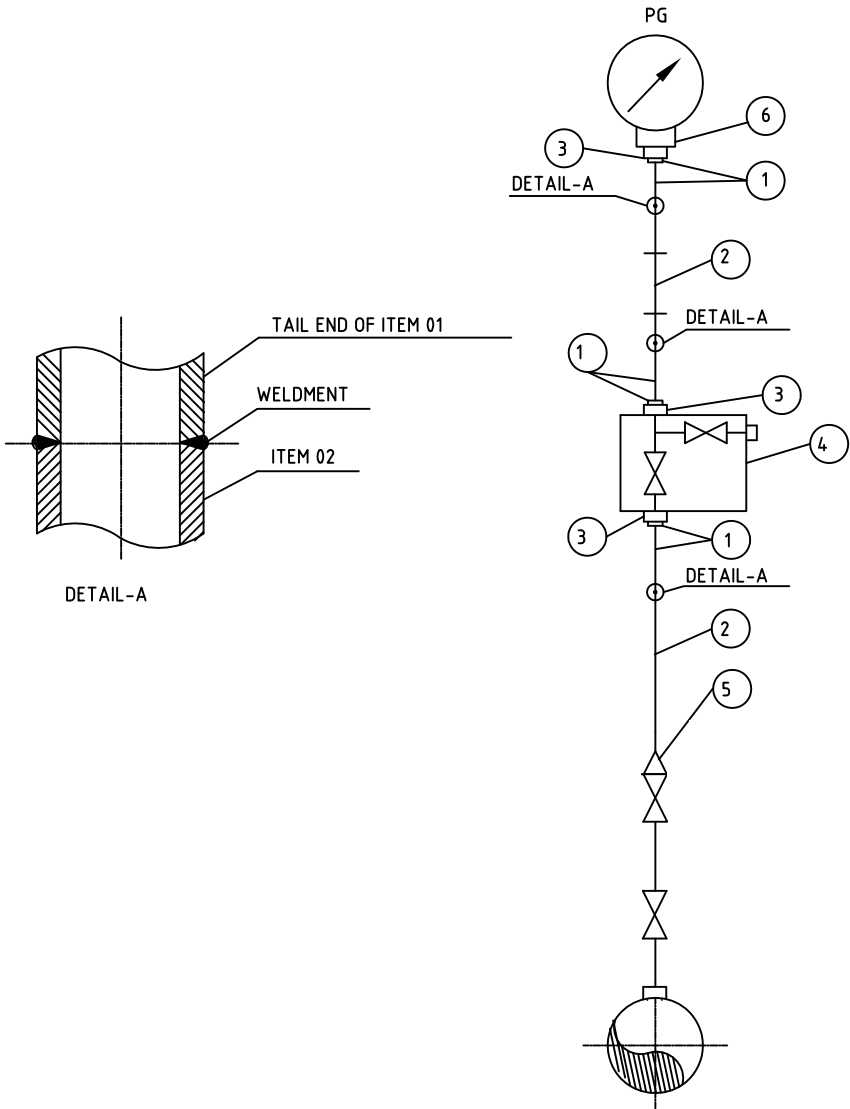
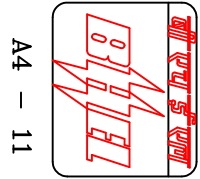
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11	TWO VALVE MANIFOLD + VENT PLUG / PR.TESTING: 3000 PSI MATL. : SS316, PORT SIZE : 1/2" NPTF	01
10	TUBE FITTING/DFDC/, MATL. : SS316 SIZE : 1/2" NPTM x TO SUIT 1/2" OD SS TUBE.	03
09	TUBE MATL. : ASTM A213 TP 316 H SIZE : 1/2" OD x 1.13 mm THK.	A/R
08	DRAIN POT: 2" NB Sch 80 BODY: A106 Gr. C / CONN. 3/4" NB - SW	01
07	HALF COUPLING / 3/4" NB-SW /AS PER ANSI B16.11 MATL : ASTM A105 /CL. 3000	01
06	GLOBE VALVE / CL. 800 SIZE : 3/4" NB-SW BODY: ASTM A105	02
05	TEE TUBE UNION; MATL. : SS316 SIZE : OD OF 3/4" NB PIPE x SUIT TO 1/2" OD - TUBE RATING : 3000	01
04	FORGED EQUAL TEE/AS PER ANSI B16.11/RATING : CL 3000 SIZE : 3/4" NB-SW ; MATL. : ASTM A105	01
03	FORGED BULK HEAD UNION / AS PER ANSI B16.11 RATING : ANSI CL. 3000 SIZE : 3/4" NB - SW/MATL. : ASTM A105	01
02	FORGED COUPLING/AS PER ANSI B16.11 SIZE : 3/4" NB - SW / RATING : ANSI CL 3000 MATL. : ASTM A105	A/R
01	IMPULSE PIPE; SIZE : 3/4" NB - SCH 80 MATL. : ASTM A106 Gr. C	A/R
ITEM NO.	ITEM DESCRIPTION	QTY/INST.



ITEM No.	ITEM DESCRIPTION	QUANTITY/INST. (Nos.)
1	NUT & TAIL FITTING + COPPER WASHERS MATL : ASTM A105 / SIZE: NUT : 3/4" BSPF TAIL : ID= 9 mm / OD= 19 mm	03
2	IMPULSE PIPE SIZE : 1/2" NB - SCH 160 MATL : ASTM A106 Gr.C	A/R
3	ADAPTER MATL:ASTM A105 SIZE : 1/2" NPTM x 3/4" BSPM	03
4	TWO VALVE VALVE MANIFOLD+VENT PLUG RATING : 6000 LBS/ MATL: SS304 PORT CONNECTION : 1/2" NPTF	01
5	FORGED REDUCER/ RATING CL. 6000LBS SIZE: OD of 1" NB x 1/2" NB-SW/AS PER ANSI B16.11 SMATL : ASTM A105	01
6 ##	SNUBBER MATL. ASTM A105 SIZE : 1/2" NPTM X 1/2" NPTF FLOW DIRECTION- 1/2" NPTF TO 1/2" NPTM	01

ONLY FOR SERVICES WITH PULSATING FLOW (DISCHARGE SERVICES)

NOTE :-
1. PRESSURE INDICATOR MOUNTED LOCAL AT SOURCE



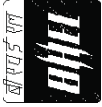
Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

REV. NO.

00

DATE : 05.12.2017

QUALITY PLAN LOCAL CONTROL PANEL



STD QUALITY PLAN NO.: PE-QP-999-145-I056

VOLUME IIB

SECTION D

REV. NO. 01 DATE: 22-02-2008

SHEET 1 OF 7

STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL

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



PEM :: C&I

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

STD QUALITY PLAN NO.:	PE-OP-999-145-I056
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VOLUME	IIB
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SECTION

REV. NO.	01	DATE: 22-02-2008
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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's			Remarks
									P	W	V	
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays Timers Space Heaters Thermostat Indicating meters etc.	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	---	---	+ for relay & contactors only @ for all components except relays & contactors.
		4. Type / Routine Test Certificates	MA	Verification	100%	BHEL Spec. and Relevant standard	BHEL Spec. and Relevant standard	Log Book	3	---	2	
		1. Verification at make and Type	CR	Visual	Sample	BHEL Spec. and BOM	BHEL Spec. and BOM	Log Book	2	---	---	
		2. Verification of Test Certificates	CR	Scrutiny of Type / Routine T.Cs.	100%	Relevant standard	Relevant standard	Log Book	2	---	---	
		3. Operation / Functional check	CR	Electrical	Sample+ 100%@	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	
		4. I.R.	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	
		5. H.V.	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	---	
		6. Calibration	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	Log Book	2	---	1	
		7. Pick up / Drop off Voltage	MA	Electrical	100%	Relevant standard & Catalogue	Relevant standard & Catalogue	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



STD QUALITY PLAN NO.: PE-QP-999-145-I056

VOLUME IIB

SECTION D

REV. NO. 01 DATE: 22-02-2008

SHEET 3 OF 7

STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL

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 2. Surface defects 3. IR / HV on Terminal Blocks	MA MA MA	Visual Visual Electrical	Sample Sample Sample	BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue BHEL Spec. & Mfrs. Catalogue	Log Book Log Book Log Book	2 2 2				
6.0	IN PROCESS Blanking / Bending / Forming	1. Dimensions 2. Surface defects after bending	MI MA	Measurement Visual	100% 100%	Approved Mfr. drgs. Factory Standard	Approved Mfr. drgs. Factory Standard	Log Book Log Book	2 2				
7.0	Nibbling / Punching	1. Cutout Sizes 2. Deburring	MI MA	Measurement Visual	100% 100%	Approved Mfr. drgs. Approved Mfr. drgs.	Approved Mfr. drgs. Approved Mfr. drgs.	Log Book Log Book	2 2				
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions 2. Alignment 3. Welding Quality 4. Surface defects	MA MA MA MA	Measurement Measurement Visual Visual	100% 100% 100% 100%	Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards Approved drg. / Mfr. Standards	Log Book Log Book Log Book Log Book	2 2 2 2		2 2 2 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-I056																							
												VOLUME		IIB																					
												SECTION		D																					
												REV. NO.		01		DATE: 22-02-2008																			
												SHEET		4		OF 7																			
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			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																								
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											



STD QUALITY PLAN NO.: PE-QP-999-145-I056

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SECTION D

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SHEET 5 OF 7

STANDARD QUALITY PLAN
FOR
LOCAL CONTROL PANEL

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 2. Wiring Termination (Crimped Lugs) 3. Ferrule numbers 4. Colour of wiring 5. Size of Conductor	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
			MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
			MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
			MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
			MA	Measurement	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components 2. Fixing	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
			MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Final Inspection	1. Workmanship 2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components 3. Components identification Marking / Name plates	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
			MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
			MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	

LEGEND: *

CR

MA

MI

- Critical characteristics

- Major characteristics

- Minor characteristics

\$

P

W

V

- Agency Performing the Test.

- Agency Witnessing the Test.

- Agency Verifying the Test.

1

2

3

- BHEL

- Vendor

- Sub-vendor

भारतीय वैद्युत निगम BHEL PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL							STD QUALITY PLAN NO.: PE-QP-999-145-I056				
									VOLUME		IIB		
									SECTION		D		
									REV. NO.		DATE: 22-02-2008		
									SHEET		6		OF
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks	
		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 W V		1 - BHEL 2 - Vendor 3 - Sub-vendor		

STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL										STD QUALITY PLAN NO.: PE-QP-999-145-I056						
										VOLUME			IIB			
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										SHEET			7	OF	7	
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks				
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 Calibration	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:										\$			1 - BHEL 2 - Vendor 3 - Sub-vendor		
* CR - Critical characteristics MA - Major characteristics MI - Minor characteristics										P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.					



Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

REV. NO.

00

DATE : 05.12.2017

INSTRUMENTS CHECK LIST



Technical specification
for
2X660 MW MAITREE STPP, BANGLADESH

REV. NO. 00 DATE : 05.12.2017

Important notes for Quality assurance and checks shall be as follows:

- 1) The requirement indicated in the check list is minimal. Vendor has to submit Quality Plans/ Checklists for addressing the minimal requirement indicated in the check list and also those indicated under **clause B0.7** in the specification under **Section-IA**- customer's General Technical Specification – B0, as relevant to instruments. Vendor submitted quality plans shall be subject to customer approval during detail engineering without any commercial and time implication. For instruments for which checklist is not attached, vendor's Quality Plan for such items will also be subject to customer approval during detail engineering without any commercial and delivery implication.
- 2) The inspection agencies indicated in the Checklists in specification may be ignored. These will be aligned in line with approved Inspection categorization plan during detail engineering without any commercial and delivery implication.



STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS			P	W	V	
6	EFFECT OF TEMP VARIATION ON ACCURACY			P	W	V	
7	SPAN / ZERO ADJUSTMENT	ONE / TYPE		P	W	V	
8	EFFECT OF SUPPLY VOLTAGE VARIATION			P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- When material corelation are not available manufacturer's compliance to be provided.
- Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST	P	W	V			
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE	P	W	V		
5	REVIEW OF TC FOR	FOR LOT	V	V	V		
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST	V	V	V		
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW	V	V	V		

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- When material correlation is not available, MFR's compliance to be provided
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS

CHECK LIST FOR ANNUNCIATORS

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE/ MODEL						
	DIMENSIONS OF HARDWARE						
	MODULARITY						
	SEQUENCE						
	FACIA DETAILS						
2	FUNCTIONAL TEST	100%		P	W	V	
3	IMMUNE TO STEP VARIATIONS IN THE POWER SUPPLY	SEE NOTE-1 BELOW		P	W	V	
4	DEGREE OF PROTECTION FOR ENCLOSURE	TYPE TEST		P	W	V	
5	I/R CHECK	SEE NOTE-1 BELOW		P	W	V	
6	RESPONSE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



TITLE:

**TECHNICAL SPECIFICATION
DEBRIS FILTER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-421-165-N003**

SECTION: **III**

SUB-SECTION:

REV. NO. **0** DATE 09.01.18

SHEET **1** OF **1**

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER

	TITLE : COMPLIANCE CERTIFICATE FOR DEBRIS FILTER	SPEC. NO.	SPEC. NO. PE-TS- 421-165- N003
	2X660 MW MAITREE BANGLADESH	DATE:	09.01.18
		SHEET :	1 OF 2

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions with regard to same.
- b) There are no other deviations w.r.t. specification other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer/Customer's Consultant approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself.
- d) Any drawing/ document/ data-sheet/ calculation/ Quality plan/ Instrumentation etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' and to be supplied at the time of commissioning of Debris Filter & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price. Recommended spares for 3 years shall be quoted separately with price indicated separately.
- g) Charges for Installation Checks, Commissioning of equipment, Trial run and Performance Testing at site shall be included by bidder in the base price itself.
- h) The main flanges for DF shall be suitable for the forces and moments as per the specification.
- i) The hydrostatic test pressure shall be 1.5 times the design pressure.
- j) All sub - vendors shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- k) The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer/Customer's Consultant.
- l) The orientation of piping around DF shall be finalised during detailed Engg.
- m) Electrical/ C&I :
 - All selected motor ratings have minimum 15 % margin over maximum continuous demand of the driven equipment including voltage and frequency variations, temperature rise and other factors.
 - Supply of electrical viz. LT power cables, instrumentation and control cables, cable glands, lugs, cable trays etc. shall be as per specification. Their erection shall be done by BHEL

	TITLE : COMPLIANCE CERTIFICATE FOR DEBRIS FILTER	SPEC. NO.	SPEC. NO. PE-TS- 421-165- N003
	2X660 MW MAITREE BANGLADESH	DATE:	09.01.18
		SHEET :	2 OF 2

- The junction boxes for termination of DPT/ DPS/ Actuator LS/ solenoid valves/ Ball oversize monitor/ Ball recirculating monitor are included in bidder's scope. The instrumentation cable and cabling from instruments/ actuators to junction boxes is also included in bidder's scope.
 - Valve actuators and controls shall be provided as specified in Data Sheet-A and Project specific requirements as specified in Section IB & Section IC
 - Alarms/ annunciations/ instruments shall be finalised during detailed engineering in the event of order which shall be subject to BHEL/ Customer/Customer's Consultant approval and shall be without any commercial implications to BHEL.
 - Switch gear panel should have suitable arrangement like bus coupler for providing redundancy to incoming supply feeder.
- n) For design & standards of Debris Filters (Materials specification, pumps, piping, flanges, valves, testing procedures etc) please refer clause no B.0.6.2 of Appendix-1(C)/SECTION-1A (SPECIFIC TECHNICAL REQUIREMENT-MECHANICAL)
- o) Indian Standards and Chinese Standards are NOT acceptable. Wherever international standards have been mentioned same shall not include Indian and Chinese standards.
- p) Wherever 'IS' code is indicated in this specification, equivalent international code is to be used inline with the above.

	TITLE : SCHEDULE OF PERFORMANCE GUARANTEES FOR DEBRIS FILTER (DF)	SPEC. NO. PE-TS- 421-165-N003	
		SECTION : III	
		SUB SECTION : IIIA	
		Sheet 1 of 1 Date- 09.01.18	

S.NO.	DESCRIPTION	UNITS	PROJECT NAME: 2X660 MW MAITREE BANGLADESH
1.	Pressure drop across the Debris Filter (i.e. between inlet & outlet nozzle) under clean condition and Normal flow condition	MWC	

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

[illegible]

CLAUSE NO.	Bidder's Name		
	DE-	LT MOTORS	
	A.	GENERAL	
	1.	Manufacturer & Country of origin. (Shall be as per approved QA make)	
	2.	Equipment driven by motor	
	3.	Motor type	
	4.	Quantity	
	B.	DESIGN AND PERFORMANCE DATA	
	1.	Frame size	
	2.	Type of duty	
	3.	Type of enclosure /Method of cooling/ Degree of	
	4.	Applicable standard to which motor generally	
	5.	Efficiency class as per IS	
	6.	(a)Whether motor is flame proof	Yes/No
		(b)If yes, the gas group to which it conforms as per	
	7.	Type of mounting	
	8.	Direction of rotation as viewed from DE END	
	9.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)	
	10.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
	11.	Maximum continuous load demand of driven	
	12.	Rated Voltage (volts)	
	13.	Permissible variation of :	
		a. Voltage (Volts)	
		b. Frequency (Hz)	
		c. Combined voltage and frequency	
	14.	Rated speed at rated voltage and	
	15.	At rated Voltage and frequency:	
		a. Full load current	

CLAUSE NO.	Bidder's Name	
		b. No load current
	16.	Power Factor at
		a. 100% load
		b. NO load
		c. Starting.
	17.	Efficiency at rated voltage and frequency,
		a.100% load
		b. 75% load
		c. 50% load
	18.	Starting current (amps) at
		a. 100 % voltage
		b. 85% voltage
		c. 80% voltage
	19.	Minimum permissible starting Voltage (Volts)
	20.	Starting time with minimum permissible voltage
		a. Without driven equipment coupled
		b. With driven equipment coupled
	21.	Safe stall time with 100% and 110% of rated
		a. From hot condition
		b. From cold condition
	22.	Torques :
		a. Starting torque at min. permissible voltage(kg-
		b. Pull up torque at rated voltage.
		c. Pull out torque
	d. Min accelerating torque (kg.m) available	
	e.Rated torque (kg.m)	
23.	Stator winding resistance per phase (ohms at 20	
24.	GD2 value of motors	

CLAUSE NO.	Bidder's Name		
	25.	No of permissible successive starts when motor is in hot condition	
	26.	Locked Rotor KVA Input	
	27.	Locked Rotor KVA/KW	
	28.	Vibration limit :Velocity (mm/s)	
	29.	Noise level limit (dBA)	
	C.	CONSTRUCTIONAL FEATURES	
	1.	Stator winding insulation	
		a. Class & Type	
		b. Winding Insulation Process	
		c. Tropicalised (Yes/No)	
		d. Temperature rise over specified maximum ambient temperature of 50 deg C	
		e. Method of temperature measurement	
		f. Stator winding connection	
	2.	Main Terminal Box	
		a. Type	
		b. Location(viewed from NDE side)	
		c. Entry of cables(bottom/side)	
		d. Recommended cable size(To be matched with cable size envisaged by owner)	
		e. Fault level (MVA),Fault level duration(sec)	
		f. Cable glands & lugs details (shall be suitable for	
	3.	Type of DE/NDE Bearing	
	4.	Motor Paint shade	
	5.	Weight of	
		a. Motor stator (KG)	
		b. Motor Rotor (KG)	
		c. Total weight (KG)	

CLAUSE NO.	Bidder's Name	
	D.	List of accessories.
	1.	Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)
	2.	Terminal Box for Space Heater (Yes/No)
	3.	Speed switch (Yes/No)
	4.	Insulation of bearing (Yes/No)
	5.	Noise reducer(Yes/No)
	6.	Grounding pads
		i) No and size on motor body
		ii) Nos on terminal Box
	7.	Vibration pads
		i) Nos and size
		ii) Location
	8.	Any other fitments
	E.	List of curves.
	1.	Torque speed characteristic of the motor
	2.	Thermal withstand characteristic
	3.	Starting. current Vs. Time
	4.	Starting. current Vs speed
	5.	P.F. and Effi. Vs Load
	F.	Additional Data to be filled for each rating of DC Motor
	1.	Rated armature voltage (Volt)
	2.	Rated field excitation (Amp)
	3.	Permissible % variation in voltage
	4.	Minimum Permissible Starting voltage (volt)
	5.	At rated voltage
		i)Full load Armature current.(Amp)

CLAUSE NO.	Bidder's Name	
		ii)Full load Field current (Amp)
		iii)No load Armature current (Amp)
	6.	Full load Field current (Amp)
	7.	No load Aramature current (Amp)
	8.	Minimum permissible field current(Amp) to avoid
		i) Maximum permissible voltage
		ii) Rated voltage
		iii) Minimum Permissible Voltage
	9.	Resistance (indicative Values) in ohm
		i)Armature winding(Arm + IP + Series) at 25
		ii) Field Winding at 25 deg. C
	10..	Inductance (indicative values)
		i) Armature winding
		ii) Field winding
	11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to
		i) 220 V DC
		ii) 250 V DC
		iii) 187 V DC
	12	Value of the external resistance (ohm)required to be connected in series with armature during starting only
	13	Technical data sheet for external resistance box
	14	GA drawing of motor
	15	Starting time calculation
	16	Starter resistance design calculation
	17	Electrical connection diagram of motor

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003		
			SECTION: C SUB-SECTION: IIIC		
			SHEET 1 OF 9		
INSTRUCTION TO BIDDER		1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)			
SL.NO.	ITEM	UNIT	PARTICULARS		
1.0	General :				
1.1	Number of Debris Filter being supplied.	Nos.			
1.2	Type & Model (on-line/off-line)				
1.3	Manufacturer				
1.4	Country of origin				
1.5	Capacity, each	M ³ /hr			
1.6	Size				
	a) Inlet connection	mm			
	b) Outlet connection	mm			
1.7	Liquid to be filtered				
2.0	Design :				
2.1	Design Pressure	Bar (g)			
2.2	Design Temperature	°C			
2.3	Flow rate through the Filter :	M ³ /hr			
	a) Normal				
	b) Maximum allowable				
	c) Minimum				
2.4	Design differential pressure for filter section/ screen	bar (g)			
3.0	Guaranteed Performance				
3.1	Pressure drop across the Filter (i.e., between inlet and outlet connections) at normal flow rate	Bar			
	a) Clean condition				
	b) 50% choked condition				
	c) During flushing operation				
	d) After flushing operation				
3.2	Debris discharge flow during flushing operation.	M ³ /hr			
3.3	Flushing period	Minutes			
Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003		
			SECTION: C SUB-SECTION: IIIC		
			SHEET 2 OF 9		
INSTRUCTION TO BIDDER		1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)			
SL.NO.	ITEM	UNIT	PARTICULARS		
3.4	Minimum pressure differential to cause flushing/ backwashing				
3.5	Maximum size of Particle/ debris which can be safely handled by the filter.				
3.6	Power consumption during flushing	KW			
	a) Flushing Valves(s) b) Debris Discharge Valve c) Debris Extractor d) Water Injector Pump (if any) e) Any other f) Total				
4.0	Operation :				
4.1	Whether automatic flushing/ back-washing operation effected by the following				
	a) Differential pressure		YES/NO		
	b) Adjustable timer		YES/NO		
	c) Push button		YES/ NO		
	d) Any other		YES/NO		
4.2	Whether provision for manual flushing / backwashing operation is made in the event of control system failure.		YES/ NO		
5.0	Filter Housing Body :				
5.1	Code/ Standard				
5.2	Outer diameter	mm			
5.3	Thickness	mm			
5.4	Materials				
	Housing/ Body				
	Internal Hardware				
Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003		
			SECTION: C SUB-SECTION: IIIC		
			SHEET 3 OF 9		
INSTRUCTION TO BIDDER					
1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)					
SL.NO.	ITEM	UNIT	PARTICULARS		
5.5	External hardware				
5.6	Lining materail (if applicable) and thickness				
5.6	Inspection Hole :				
	a) Type				
	b) Size	mm			
5.7	Whether sight glass is provided		YES/ NO		
6.0	Filter Section/ Screen Assembly :				
6.1	Perforation/ mesh size	mm			
6.2	Free filter surface area	m ²			
6.2	Total surface area	M ²			
6.4	Thickness	mm			
6.5	Materails :				
	a) Filter section/ scree				
	b) Supporting cage				
	c) Hardware for fixing the filter section/ screen				
7.0	Flushing/ Backwashing Unit :				
7.1	Type				
7.2	Flushing Valves (if applicable)				
	a) Nos. provided	Nos.			
	b) Type				
	c) Materials				
	• Body				
	• Disc/ Flap				
	• Shaft				
	d) Tag Number				
Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					



Title
DATA SHEET - B
DEBRIS FILTER
(BACKWASH TYPE)

SPECIFICATION NO.
PE-TS-XXX-165-N003

SECTION: **C** SUB-SECTION: **IIIC**

SHEET **4** OF **9**

INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003
2. Items which deviate from Specification shall be marked with an asterisk (*)

SL.NO.	ITEM	UNIT	PARTICULARS
7.3	Debris Extractor (if applicable) a) Type b) Materials		
7.4	Debris discharge/ backwash outlet valves : a) Type b) Size c) Materials ♦ Body ♦ Disc/ Trim ♦ Shaft d) Tag Number	mm	
7.5	Size of Debris discharge/ backwash outlet valves is greater than pipe line size		YES/NO
7.6	Any water injection is required		YES/ NO
7.7	Whether Pump, valves and piping for water injection is included in the offer.		YES/ NO.
7.8	Debris discharge/ backwash outlet pipe a) Material b) O.D. and thickness	mm	
8.0	Differential Pressure Measuring System:		
8.1	Differential Pressure Switch/ Transmitter a) Type b) Make and Model c) Range d) Accuracy e) Material of sensing element		

Name of Bidder/ Vendor

Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003			
			SECTION: C		SUB-SECTION: IIIC	
			SHEET 5 OF 9			
INSTRUCTION TO BIDDER						
1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)						
SL.NO.	ITEM	UNIT	PARTICULARS			
	f) No. of contacts g) Contact rating h) Enclosure i) Type of Mounting	Nos.	YES/ NO			
8.2	Whether differential Pressure gauge is provided for manual observation.					
8.3	Diffrential Pressure Gauge :					
	a) Type b) Make and Model c) Range d) Accuracy e) Material of sensing element f) No. of contacts g) Dial size h) Enclosure i) Mounting	Nos. mm				
8.4	Whether built in flushing arrangement complete with flushing pump, valves, and associated piping, is provided.		YES/ NO			
8.5	Whether remote seal type D.P. Transmitter		YES/ NO			
9.0	Timer for Flushing Operation					
9.1	Timer make					
9.2	Range of duration setting					
10.0	Actuators :					
10.1	Actuators for flushing valves :					
	a) Type and make					
Name of Bidder/ Vendor						
Revision Number		0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative						
Date :						

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003		
			SECTION: C SUB-SECTION: IIIC		
			SHEET 6 OF 9		
INSTRUCTION TO BIDDER		1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)			
SL.NO.	ITEM	UNIT	PARTICULARS		
10.2	b) Nos. provided c) Motor rating Actuators for debris discharge/ backwash outlet valves	KW			
1.03	a) Type and make b) Motor rating Actuator for Debris Extractor	KW			
10.4	Type & make Nos. provided Motor rating				
11.0	Any other				
11.1	Electric Drive Motors				
11.1	Drive motor for water injection pump (if applicable) a) Type and make b) Rating	KW			
11.2	Drive motor for debris extractor a) Type and make b) Rating	KW			
11.3	Drive motor for differential pressure measure, measuring system flushing pump (if applicable). a) Type and make b) Motor rating	KW			
11.4	Any other				
Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003				
			SECTION: C		SUB-SECTION: IIIC		
			SHEET 7 OF 9				
INSTRUCTION TO BIDDER		1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)					
SL.NO.	ITEM	UNIT	PARTICULARS				
12.0	Counter Flanges for inlet & outlet :						
12.1	Nos. provided	Nos.	YES/ NO				
12.2	Type						
12.3	Size						
12.4	Rating						
12.5	Materials						
	a) Flanges b) Bolts and Nuts c) Gaskets						
12.6	Code/ Standard						
12.7	Counter flanges for all other terminal points are provided.		YES/ NO				
13.0	Control Panel						
13.1	Type						
13.2	Model & Manufacturer						
13.3	Operating Voltage/ frequency	V/ Hz					
13.4	Control Voltage/ frequency	V/ Hz					
13.5	Materials of housing and door						
13.6	Protections/ interlocks provided for :						
13.7	Alarms/ Annunciations provided for :						
13.8	Indicators provided for :						
Name of Bidder/ Vendor							
Revision Number	0	1	2	3	4		
Signature of Bidder/ Vendor Authorised Representative							
Date :							

	Title DATA SHEET - B DEBRIS FILTER (BACKWASH TYPE)		SPECIFICATION NO. PE-TS-XXX-165-N003		
			SECTION: C SUB-SECTION: IIIC		
			SHEET 8 OF 9		
INSTRUCTION TO BIDDER 1. This data sheet shall be read in conjunction with Specification No. PE-TS-XXX-165-N003 2. Items which deviate from Specification shall be marked with an asterisk (*)					
SL.NO.	ITEM	UNIT	PARTICULARS		
13.9	Whether counterto register number of flushing operations, is provided.		YES/ NO		
13.10	Whether interconnecting control and power cabling between the control panel and filter is included in the offer.		YES/ NO		
14.0	Whether lifting lugs are provided.		YES/ NO.		
15.0	Whether supports complete with foundation plates, bolts, nuts, etc. are included in the offer (wherever required).		YES/ NO		
16.0	Shop Inspection and Tests				
16.1	Whether all the tests and inspections as detailed in the specification/ quality plan are carried out.		YES/ NO		
16.2	Hydorstatic Test :				
	a) Test Pressure	Bar (g)			
	b) Test duration	Minutes			
17.0	Painting :				
17.1	External Surfaces :				
	a) Surface Preparation				
	b) Primer				
	c) Finish				
17.2	Internal Surfaces :				
	a) Surface Preparation				
	b) Primer				
	c) Finish				
18.0	Weights :				
18.1	Empty Weight	Kg.			
18.2	Operating	kg			
Name of Bidder/ Vendor					
Revision Number	0	1	2	3	4
Signature of Bidder/ Vendor Authorised Representative					
Date :					

