

Project
Engineering
Management

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)



Ref No. : PE/PG/YEM/E-4413/2014/CORRIGENDUM/01

Date: 18/06/2014

CORRIGENDUM / ADDENDUM - 01

PROJECT: 400 MW MARIB GTPP PHASE-II YEMEN
PACKAGE: VACCUUM TRUCKING SYSTEM
TENDER ENQUIRY NO: PE/PG/YEM/E-4413/2014, Dated 15-May-2014

DUE DATE
23-06-2014
BY 10.00 AM

With reference to above mentioned tender, please note that Amendment 01 to the technical specification PE-TS-372-174-15000-A-A001, Rev00 is attached herewith for your reference.

Further it may be noted that the due date for Bid submission has been extended up to 03-July-2014 before 10:00 AM.

Kindly ensure to submit your offer inline with the total scope on or before due date.

With Regards,
For & on behalf of BHEL


S.E.KANDULNA
SR.ENGINEER/PG-I-2
BHEL PEM, NOIDA.

Please reply to:

Sh. S.E.Kandulna, Sr.Engineer/PG1-2

Sh Deepak Gupta, AGM/ PG-I-2

Power Project Engineering Institute Building

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AMENDMENT TO TECHNICAL SPECIFICATION
PE-TS-372-174-15000A-A001 REV.00 FOR
VACCUM TRUCKING FOR
400 MW, MARIB GTPS, PHASE-II

SPEC NO: PE-TS-392-174-15000A-A001

AMENDMENT: 1

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ADDITIONAL SCOPE

GENERAL DESCRIPTION

Plant sewerage is collected in a septic tank. Overflow from the septic tank is collected in a collection chamber. From the collection chamber overflow is pumped to the aerobic treatment chamber by means of 2x100 % overflow transfer pumps. Extended aeration is done in the aerobic treatment chamber with the help of air supply from blowers. The treated water after aerobic treatment is transferred to the N-Pit (DM Plant) by means of 2X100% treated water transfer pumps.

SCOPE

- 1) Two numbers (2x100%) Septic tank over flow transfer pumps along with motors, accessories, instruments and local control panel.
- 2) Two numbers (2x100%) Treated water transfer pumps with motors, accessories, instruments and local control panel for Aerobic Treatment chamber.
- 3) Two numbers (2x100 %) air blowers with, motors along with accessories & instruments mounted on a skid. The blowers should be housed in an acoustic hood.
- 4) Diffusers for Aerobic treatment chamber
- 5) 600 m of 50 NB HDPE piping.
- 6) 650 nos of piping clamps for 50 NB HDPE Pipe
- 7) Fittings, valves, instruments, accessories etc. as defined in the data sheet.
- 8) The equipment to be packed in crates with sea worthy packing as per Annexure F.
- 9) Painting and color code shall be decided during detailed engineering and shall subject to customer and BHEL approval.

After award of LOI, following drawing/documents shall be submitted by the bidder for BHEL/Customer approval. However, any additional drawing/documents if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial implication.

- 1) Technical data sheet of pumps with motors, accessories, instruments and local control panel
- 2) Technical data sheet of blowers with motors, accessories, instruments and local control panel
- 3) Quality plan of pumps, blowers and motors, instruments and local control panel
- 4) Electrical Load List

DATA SHEET

AIR BLOWER		
1	Number	Two (2x100%)
2	Type	Twin lobe type
3	Pressure gauge	Two (nos) One per blower
a	Type	Bourdon Type
b	Make	a) A.N.Inst Narendrapur b) General Inst Consortium Mumbai / Goa c) Gluck Mumbai



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		d) Goa Thermostatic Goa A With Imported Bourdon Tube For Pressure Gauge e) Manometer Mumbai f) Wika Pune
4	Capacity & Head	30 cum/hr and 5 mwc
5	Operating Speed	1500 rpm
6	Discharge Line	50 NB
7	MOC	
a	Casing	Cast Iron Gr. FG 260 to IS 210
b	Shaft	Carbon Steel to EN 8
c	Base Frame	MS Common for Blower and motor. The same should be MS with epoxy coating.
8	Accessories for each blower	Suction Filter Suction and Discharge Silencer Companion Flange for Blower Spring Load relief valves Belt Guard and Filter hood Non Return Valve
9	Make	a) SWAN PNEUMATIC NOIDA b) EVEREST TRANSMISSION NEW DELHI c) KAY INTERNATIONAL NEW DELHI / SONEPAT d) EVEREST BLOWER BAHADURGARH
10	Spares for Blower	a) Set of Bearing – 1 Set b) Set of Oil Seal – 1 Set c) Suction Filter – 1 Set
11	Noise	85 dBA @ 1 m from blower
12	Inspection and Testing	As per the approved quality Plan
13	Motors	Two (One for each blower)
a	Type	As per motor Data Sheet.
b	Make	a) CGL, Ahmednagar b) Bharat Bijlee Mumbai c) Siemens India d) ABB Faridabad / Bangalore

OVER FLOW TRANSFER PUMP

1	Number	Two (2X100%)
2	Type	Submersible Non Clog Pump
3	Capacity & Head	2 CuM/Hr (each) and Head 10 M
4	Make	a) Darling Pumps Pvt. Ltd Indore b) Aqua Machinery Ahmedabad c) Kishor Pumps Pvt. Ltd. Pune
5	Delivery Size	50 NB
6	Operating Speed	1500 rpm
7	Flange Standard	DIN
8	Pressure Stage	PN 10
9	Minimum installation depth	1 m.
10	MOC	
a	Casing	2% Ni Cast Iron FG 260 IS 210
b	Line Shaft	SS 410
c	Pump shaft	SS 316
d	Impeller	SS-316



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e	Base plate	MS with epoxy coating
11	Pump Accessories	Pump Motor with Cable Auto coupling with bend
12	Motors	Two (One for each pump)
a	Type	As per motor Data Sheet.
b	Make	a) CGL, Ahmednagar b) Bharat Bijlee Mumbai c) Siemens India d) ABB Faridabad / Bangalore
13	Spares	a) Set of Bearing - 1 Set
TREATED WATER TRANSFER PUMPS		
1	Number	Two (2X100%)
2	Type	Submersible Non Clog Pump
3	Capacity & Head	5 CuM/Hr (each) and Head 50 M
4	Make	a) Darling Pumps Pvt. Ltd Indore b) Aqua Machinery Ahmedabad c) Kishor Pumps Pvt. Ltd. Pune
5	Delivery Size	DN 50
6	Operating Speed	1500 rpm
7	Flange Standard	DIN
8	Pressure Stage	PN 10
9	Minimum installation depth	1 m.
10	MOC	
a	Casing	2% Ni Cast Iron FG 260 IS 210
b	Line Shaft	SS-304
c	Pump shaft	SS-304
d	Impeller	SS-316
e	Base plate	MS with epoxy coating.
11	Pump Accessories	Pump Motor with Cable Auto coupling with bend
12	Motors	Two (One for each pump)
a	Type	As per motor Data Sheet.
b	Make	d) CGL, Ahmednagar e) Bharat Bijlee Mumbai f) Siemens India g) ABB Faridabad / Bangalore
13	Spares	a) Set of Bearing - 1 Set
FITTINGS		
1	HPDE Pipe	Size - DN 50, Quantity - 600 m Pressure Rating - PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
2	90 deg elbow	Size - DN 50, Quantity - 50 m Pressure Rating - PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
3	Flange Adaptor	Size - DN 50, Quantity - 50 nos Pressure Rating - PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
4	Backing Flange	Size - DN 50, Quantity - 50 nos



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		Pressure Rating – PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
5	Equal tee	Size – DN 50, Quantity – 50 nos Pressure Rating – PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
6	Reducing Bush	DN 50 X DN 40, Quantity – 20 nos Pressure Rating – PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
7	Coupling	Size – DN 50, Quantity – 50 nos Pressure Rating – PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
8	45 deg Elbows	Size – DN 50, Quantity – 50 nos Pressure Rating – PE 80-PN 10 carbon black quality suitable for both above ground and buried pipe protection.
VALVES		
1	GLOBE VALVES	
a	Quantity	15 nos.
b	TYPE	STRAIGHT, RISING STEM , WITH OUTSIDE SCRES
c	DESIGN STANDARD	IS:778 CLASS 2
d	Make	Leader, Jalandhar H. Sarkar, Howrah Bankim & compony, Howrah
2	NON RETURN VALVE	
a	QTY	10 NOS.
b	TYPE	SWING CHECK (REFLUX TYPE) OR DUAL PLATE TYPE AND FLANGED ENDS
c	Make	Majestic Works, Mumbai BDK, Hubli H. Sarkar, Howrah Leader, jalandhar
INSTRUMENTS		
1	PRESSURE GAUGE WITH ISOLATION VALVES & ACCESORIES	
a	Quantity	4 nos. (one per pump)
b	Type	Bourdon Type
c	Make	a) A.N.Inst Narendrapur b) General Inst Consortium Mumbai / Goa c) Gluck Mumbai d) Goa Thermostatic Goa A With Imported Bourdon Tube For Pressure Gauge e) Manometer Mumbai f) Wika Pune
d	accessories	Pulsation dampener, three way valve
2	LEVEL SWTICH WITH ISOLATION VALVES & ACCESORIES	
a	Quantity	2 nos.
b	Type	Cage float type, contact type-snap acting
c	Make	a) DK INSTRUMENTS b) LEVCON



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		c) TRAC d) SIGMA e) SBEM f) V. AUTOMAT g) PUNE CONTROL
d	accessories	three way valve
3	LOCAL CONTROL PANEL	Refer data sheet A of LCP
	Make	h) PROCON INST CHENNAI i) CONTROL & SWGR CO NOIDA j) INDUSTRIAL CONTROLS & APPS MUMBAI k) PYROTECH UDAIPUR l) ELECMECH AHMEDABAD m) POSITRONICS BARODA

NOTE : Apart from above listed sub vendors, any additional sub vendor proposed by vendor during detailed engineering shall subject to customer and BHEL approval.

ANNEXURE ELCLOSED

1. ANNEXURE A : TECHNICAL SPECIFICATION OF MOTORS AND MOTOR DATA SHEET
2. ANNEXURE B: STANDARD QUALITY PLAN FOR MOTORS
3. ANNEXURE C : DATA SHEET OF LOCAL CONTROL PANEL
4. ANNEXURE D: TECHNICAL SPECIFICATION OF SUBMERSIBLE PUMPS
5. ANNEXURE E: P&ID OF ADDITIONAL SCOPE
6. ANNEXURE F : SEA WORTHY PACKING SPECIFICATION
7. ANNEXURE G: QAUALITY PLAN FOR PUMPS AND BLOWERS

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8.8 ELECTRIC MOTORS

8.8.1 General

This specification covers the design, manufacture, supply, erection, testing and commissioning of Motors for various driven equipment and Actuators.

It is not the intent to specify completely herein all details of the equipment, nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

Should the bidder wish to deviate from this specification in any way, he shall draw specific attention to such deviation by listing the deviations in the deviation schedule without which his offer will be considered in conformity with the specification in all respects.

8.8.2 Scope of work

The scope of work shall include but not limited to the following:

- AC & DC Motors required for various application
- Actuators required for various applications.
- ~~List of recommended spare parts as per Section 10.0, Vol. II.~~
- Commissioning spares.

8.8.3 Technical Requirements

Motors shall conform to IEC and other applicable international standards amended upto date. Equivalent ANSI standards are also acceptable.

8.8.3.1 Motors

Design Features

All AC motors shall be squirrel cage three phase/ single phase induction motors. Lifts/Crane motors may be of slip ring type. DC motor shall generally be of shunt wound type rated for 220 V DC. DC motors shall be sized for operation with fixed resistance starter for maximum reliability. DC motors under GTG package may be rated for 220V DC. All motors shall be rated for continuous duty. Crane motors shall be rated for intermittent duty.

Inching type motors as per the requirement shall be provided.

The motor rating shall be at least 15% (service factor) over the maximum input power requirement of the driven equipment at rated point.

Continuously operating motors shall be of high efficiency type.

Power supply for AC motors shall be as follows:

- Motors less than and equal to : 400 V, 3 Phase, 50 Hz solidly grounded system
250 kW
- Motors larger than 250 kW : 6.6kV, 3 Phase, 50 Hz. resistance grounded system

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Motors shall be capable of delivering the rated output with supply voltage variation of $\pm 10\%$ and frequency variation of $\pm 5\%$ and absolute sum of 10%.

The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, breakdown and full load torques are available for the intended service.

Squirrel cage induction motors shall be designed for direct on line starting. Starting current shall not exceed 600% of full load current with 20% tolerance for ratings upto and including 1000 kW. For motors rated above 1000 kW, starting current shall be limited to 600% of full load current without any tolerance.

The starting current of 220V motors shall be restricted to 200% of full load current whereas for 125V motors, the same shall be restricted to 160%.

The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage. Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals. Motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals. Permissible number of starts per hour for continuous duty motors shall be as follows.

Starts	No. of Starts
No. of hourly startups uniformly distributed, starting from final steady working temperature (Hot)	3
No. of consecutive startups with initial temperature of motor at final steady working temperature (Hot)	2

Motors subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energised shaft rotating at 125% of rated speed in reverse direction.

The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors with 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time. Starting time shall be at the minimum permissible voltage of 80% rated voltage. If the above conditions cannot be met in unavoidable cases, special provisions such as motor shaft speed switch, etc. shall be provided. Hot thermal withstand curve shall have 3 margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.

The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.

The motor shall be designed to withstand any torsional and / or high current stresses which may result during bus transfer, without experiencing any deterioration in the normal life & performance characteristics.

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8.8.3.2 Constructional details

Enclosure

Motors located indoor shall have IP 44 degree of protection and those located outdoor shall have IPW 55 degree of protection for the enclosure. For hazardous areas, approved type of flameproof and increased safety enclosure shall be provided.

The motors shall generally be of self ventilated type totally enclosed fan cooled (TEFC). Alternatively for large motors, closed air Circuit Air Cooled (CACA) System shall be adopted.

Winding and Insulation

The winding for all the motors shall be of super enameled copper wire of suitable gauge or copper strip conductor depending on its rating. All motors shall be class F insulated limiting temperature rise to class B limit.

The windings, fittings and hardware shall be corrosion resistant. The windings shall be tropicalised and shall be impregnated to make them non-hygroscopic and oil resistant.

Main insulation and inter turn insulation of Motors shall be capable of withstanding switching surges as per IEC 34, Part 15.

Motors of rating 37 kW and above shall be provided with space heaters, suitably located for easy removal or replacement. The space heater shall be rated for 230 V, single phase, 50 Hz, and sized to maintain the motor internal temperature above dew point when the motor is idle.

All HT motors shall be provided with six (6) duplex type winding temperature detectors, two (2) per phase and the motor bearing shall be provided with 2 Nos. duplex type temperature detectors on driving end and non driving end. These temperature detectors shall be resistance type, 3 wire, platinum wound, 100 ohms at 0°C. The temperature detectors shall be connected to the DCS system.

Bearings

Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application. Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type are preferred.

Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area.

Provide one pt-100 RTD or chromed – constant type E thermocouple, temperature measurement thermocouples, on bearing or oil reservoir associated with an anti-friction on thrust bearing.

Lubricant shall not deteriorate under all service conditions. The lubricants shall be limited to normally available types.

Bearings shall be insulated as required to prevent shaft current and resultant bearing damage for a motor rating of above 1000 kW.

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In case forced lubrication is adopted, a shaft driven oil pump shall be provided along with an electrical auxiliary pump. Alternatively, two motor driven pumps may be provided, one working and one standby. All necessary auxiliaries and accessories shall be provided to complete the system. A pressure gauge and pressure switch for low oil pressure warning and to start the standby oil pump automatically shall also be provided. A motor driven jacking oil pump may be provided, for heavy shaft loads.

Indicator/Switch

Dial type local indicator with alarm contacts shall be provided for the following:

- HT motor bearing temperature
- Hot and cold air temperatures of the closed air circuit for CACA motors.

Flow switches shall be provided for monitoring oil flow of forced lubrication bearings, if used. Alarm switch contact rating shall be minimum 0.5 A at 220 V D.C. and 5A at 230 V A.C.

Motor Terminal Box

Motor terminal boxes shall be provided with a detachable extension box (cable core splitter box). Terminal box shall be capable of being turned 360° in steps of 90°, unless otherwise approved. The terminal boxes shall be split type with removable cover with access to connections and shall have the same degree of protection as motor. The terminal box shall have sufficient space inside for termination/connection of cables.

Terminals shall be of stud type, substantially constructed and thoroughly insulated from the frame. The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor. The terminal box shall be capable of withstanding maximum system fault current for 0.2 sec for all breaker operated motors and shall be provided with explosion vent. However for contactor operated motors, the terminal box shall be capable of withstanding the fault current for let through time of the fuse preceding it.

For 6600 V motor (if required), the terminal box shall be phase segregated type and neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection. For motors for 1000 kW and above, PS class current transformers shall be provided in the neutral side terminal box on all three connections for differential relay.

All accessory equipment such as space heater temperature detector, etc., shall be wired and terminated in an enclosure, separate from motor (power) terminal box. The degree of protection for accessory terminal box shall be same as that of motor. Terminal box shall be complete with double compression brass glands and stud type terminals and shall be suitably mounted on the side of the motor. If possible, the accessory terminal boxes shall be located on the same side of the motor as the main (power) terminal box.

Earthing Terminals

The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.

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The cable terminal box shall have a separate grounding terminal.

Noise & Vibration

The noise level and vibration limits shall not exceed the limits specified in relevant ANSI / IEEE / IEC standards.

Rating Plate

The motors shall be provided with a rating plate of stainless steel.

In addition to the minimum information required by IEC, the following information shall be shown on motor rating plate:

- Temperature rise in °C under rated condition & method of measurement.
- Degree of protection.
- Bearing identification no. and recommended lubricant.
- Location of insulated bearings.

Lifting

All electric motors shall be provided with lifting lugs.

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Testing requirements of motors

9.7.8.6 Electric Motors

Upon completion, each motor shall be subjected to standard routine tests as per relevant standards. In addition, any special test called for in the driven equipment specification shall be performed.

The following type tests shall be performed on a representative sample of 6600V motor of each type & rating, even if type test certificates of these tests are submitted by the Bidder for Purchaser's approval.

- a) Measurement of stator resistance and rotor resistance on slip ring motors.
- b) No load running of motor and reading of voltage, current, power input and speed.
- c) Locked rotor reading of voltage, current, power input and values of torque of motor.
- d) Full load reading of voltage, current, power input and slip.
- e) Temperature rise test.

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8.8.5 Specified Design Data

SECTION : ELECTRIC MOTORS

8.8.5.1 AC Motors

Rated Voltage

Less than and equal to 250 kW

V 400

Larger than 250 kW

V 6600 V

Rated Frequency

Hz 50

Voltage variation

±10%

Frequency Variation

±5%

Absolute sum of variation

10%

Rated Voltage for DC Motors

V 220 V ±10% to -15% (125
+10% to -15% if GTG
supplier's standard)

Class of Insulation for all Motors

Class 'F' with temperature
Limited to Class 'B'

Starting Current

6 times FLC.

Degree of protection

IP 44/IP W 55

Method of cooling

TEFC/CACA

Fault withstand capability of terminal box

Fault current for 0.2 sec. for
breaker controlled motors

No. of consecutive hot starts with initial temperature of
motor at final steady working temperature

Two

No. of hourly starts uniformly distributed from final
temperature

Three (3)

NOTE:-

The motors shall be of high efficiency type (IE2) as per IEC 60034-30.


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ANNEXURE B

SL. NO.	COMPONENT/OPERATION	QUALITY PLAN CHARACTERISTICS CHECK	CUSTOMER :				PROJECT :				SPECIFICATION :							
			BIDDER/ VENDOR SYSTEM		TITLE		QUALITY PLAN		NUMBER :		TITLE		SPECIFICATION					
			CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	SECTION	AGENCY	SECTION	VOLUME III	REMARKS				
1	2	3	4	5	6	7	8	9	10	11								
1.0	ASSEMBLY	1.WORKMANSHIP 2.DIMENSIONS 3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE 1.SHADE	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-						
2.0	PAINTING		MA	VISUAL	SAMPLE	MANUF'S SPEC/BHEL SPEC./RELEVANT INTERNATIONAL STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK		2	-	-						
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC. 2.OVERALL DIMENSIONS & ORIENTATION	MA	-DO-	100%	RELEVANT IEC/BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT		2	1							NOTE -1 & NOTE-3
			MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IEC	INSPN REPORT		2	1							NOTE -1 & NOTE-3
BHEL			PARTICULARS				BIDDER/VENDOR											
			NAME															
			SIGNATURE															

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	QUALITY PLAN		CUSTOMER : BIDDER/ VENDOR :		PROJECT TITLE QUALITY PLAN		SPECIFICATION NUMBER : SPECIFICATION :					
	SHEET 2 OF 2		NUMBER PED-506-00-Q-006, REV-01 ITEM AC ELECT. MOTORS BELOW 55KW (LV)		SECTION VOLUME III		TITLE :					
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	10	11		
	3.NAMEPLATE DETAILS	MA	VISUAL	100%	RELEVANT IEC & DATA SHEET	RELEVANT IEC & 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 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION. (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.												
2. FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.												
3.												
Legends for Inspection agency												
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		

FORM NO. PEM-6866-0

	<h3>DATA SHEET FOR LOCAL PANELS</h3>	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		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	<input checked="" type="checkbox"/> FOLDED <input type="checkbox"/> WELDED (As per requirement)	
TECHNICAL	INPUT POWER SUPPLY	<input type="checkbox"/> 240V 50 Hz AC <input type="checkbox"/> 220V DC <input type="checkbox"/> 415V 3 PHASE (4 wires)	
	NO. OF FEEDERS	<input type="checkbox"/> ONE <input type="checkbox"/> TWO	
	CONTROL SUPPLY	<input type="checkbox"/> 110V AC <input type="checkbox"/> 220V AC <input type="checkbox"/> 220V DC <input type="checkbox"/> (As per requirement)	
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)	_____ NOS. (AS REQUIRED)	
	PAINT TYPE	<input type="checkbox"/> EPOXY <input type="checkbox"/> SYNTHETIC ENAMEL <input type="checkbox"/> POWER COATED	
	PANEL COLOUR (EXTERNAL)	<input type="checkbox"/> LIGHT GREY (Shade 631 IS-5) <input type="checkbox"/> OPALINE GREEN (Shade 275) <input type="checkbox"/>	
	FINISH	<input type="checkbox"/> SEMI MAT <input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input checked="" type="checkbox"/> SEMI GLOSSY	
	PANEL COLOUR (INTERNAL)	<input checked="" type="checkbox"/> WHITE <input type="checkbox"/> CREAM <input type="checkbox"/> OFF WHITE	
	FINISH	<input type="checkbox"/> SEMI MAT <input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input checked="" type="checkbox"/> SEMI GLOSSY	
	CLASS OF PROTECTION	<input checked="" type="checkbox"/> IP-54 <input type="checkbox"/> _____	
	CONTROL HARDWARE	<input checked="" type="checkbox"/> RELAY BASED <input type="checkbox"/> PLC As per Requirement	
	FOUNDATION ARRANGEMENT	<input checked="" type="checkbox"/> FOUNDATION BOLTS <input type="checkbox"/> ANCHOR FASTENERS	
	WEIGHT OF PANEL (Kg.)		
	PANEL TYPE	<input type="checkbox"/> PRESSURISED <input type="checkbox"/> UNPRESSURISED As per Requirement	
	CABLE GLAND	<input type="checkbox"/> SINGLE COMPRESSION <input checked="" type="checkbox"/> DOUBLE COMPRESSION	

	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL
	NAME			NAME
	SIGNATURE			SIGNATURE
DATE				DATE

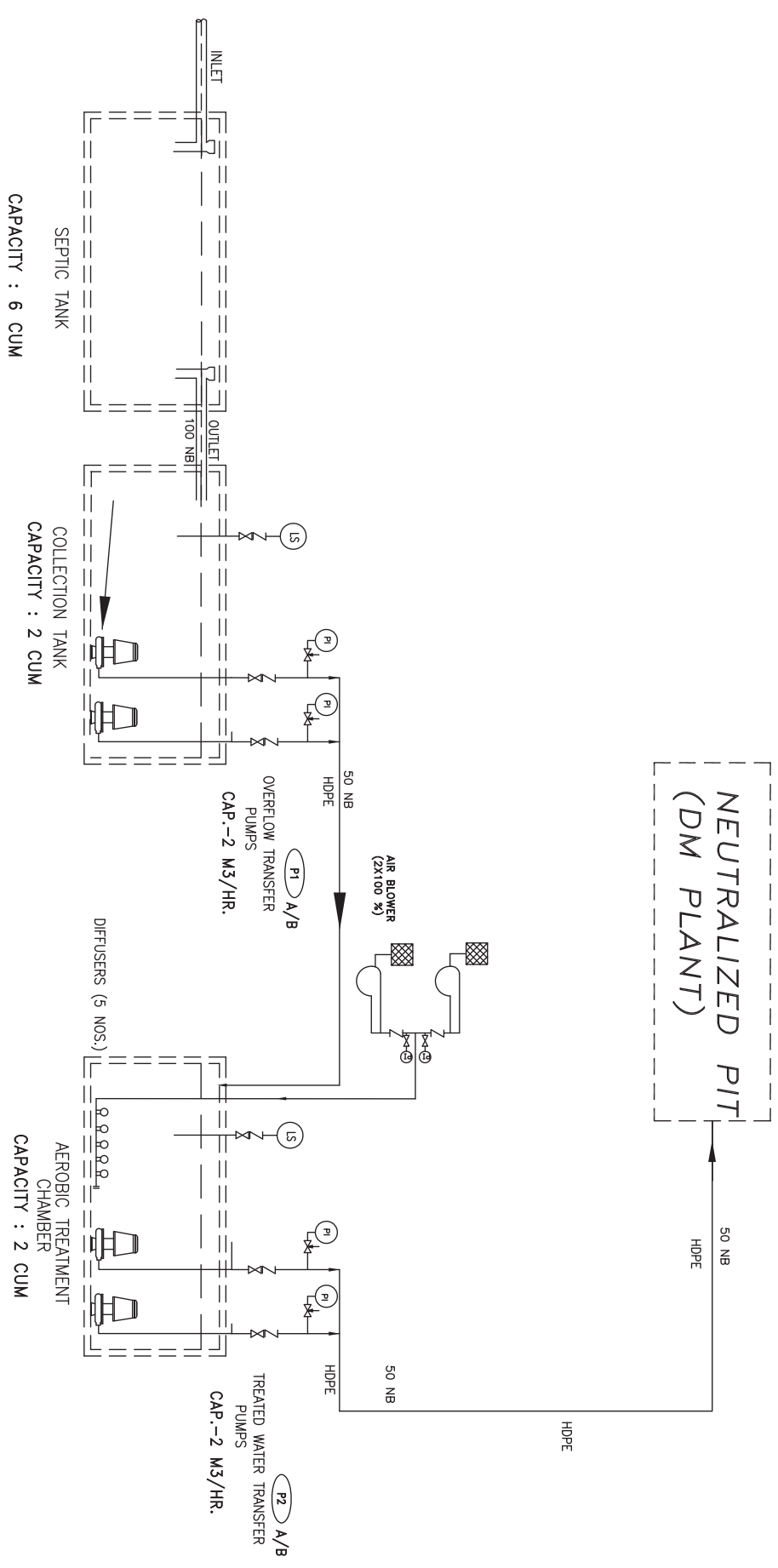
CLAUSE NO.	TECHNICAL REQUIREMENTS
	<p>SUBMERSIBLE PUMPS</p>
1.00.00	<p>SCOPE</p>
1.01.00	<p>This specification covers general requirements in respect of design, material, manufacture, construction, testing & inspection at Vendor's / sub-vendor's delivery to site, of submersible pumps.</p>
2.00.00	<p>CODES AND STANDARD</p>
	<p>The design manufacture and performance of submersible pumps shall be comply with all currently applicable statues, regulation, and safely codes in the locality where the Equipment will be installed. The Equipment shall also conform to the latest applicable Indian standards listed below other Nation Standards are acceptable, if they are established to be equal or superior to the listed standards. Nothing in these specifications shall be construed to relieve the contractor of this responsibility.</p>
2.01.00	<p>List of Applicable Indian Standards</p>
	<p>IS:8034 - Submersible pumps for clear cold fresh water</p>
	<p>IS:5120 - Technical requirement of Rotodynamic Special Purpose pumps.</p>
	<p>In case of any contradiction with aforesaid standards and the stipulations as per technical specification as specified hereinafter the stipulation of the technical specification shall prevail.</p>
3.00.00	<p>DESIGN AND PERFORMANCE REQUIREMENTS</p>
	<p>a) The pump shall be of single stage mono - block type with non-clog design.</p>
	<p>b) Components of Identical pumps shall be interchangeable.</p>
	<p>c) Pumps shall have a continuously rising head characteristic.</p>
4.00.00	<p>MOTOR RATING</p>
	<p>Continuous motor rating (at 50 deg. C ambient) for pumps shall be at least ten percent (10%) above the maximum load demand of the driven equipment in the complete operating range to take care of the system frequency variations.</p>
5.00.00	<p>FEATURES OF CONSTRUCTION</p>
	<p>a) Pumps shall be of Submersible, wet pit type.</p>

AMENDMENT 1 TO TECHNICAL SPECIFICATION PE-TS-392-174-15000A-A001

CLAUSE NO.	TECHNICAL REQUIREMENTS
6.00.00	<ul style="list-style-type: none"> b) Pumps shall be able to pass through solids upto 40 mm and capable of handling waste water which may contain, sludge, plastic solids etc. c) Coupling device shall ensure leak proof joint between the pump and discharge elbow. This shall also enable pump to be removed from the sumps without the necessity of dismantling any nuts, bolts etc. d) Pumps shall be portable type and capable of using in any sump as and when required. Pump shall be provided with required stool, flexible, hoses chain connection etc. for easy installation, removal and maintenance. Adequate length of chain required for lowering the pump into the sump and flexible type discharge pipe shall be provided. e) Impeller Impeller type shall be open/semi-closed type/closed as indicated elsewhere. Enclosed impellers shall be equipped with seal rings on their hubs. In case of open impeller, the pump shall be design to take care of the additional thrust produced.
	<p>MOTOR</p> <ul style="list-style-type: none"> i) Motor shall be coupled directly to the impeller shaft. ii) The motor shall be suitable for operation when submersed in water. The housing shall have required degree of protection. iii) Necessary arrangement to be made to make cable entry absolutely water tight, with cores cast in insulation along with cable gland 'O' ring seat. iv) Built in temperature sensors are to be provided to enable tipping of motor if temperature rises above the design temperature limit. These sensors are to be used directly in the circuiting of control panel. The control circuit should trip the motor if the temperature rises beyond safe limits. v) Moisture sensors are to be embedded in motor chamber to trip the motor in case of moisture entry in motor due to failure of pump mechanical seal. vi) Motor shall be oil filled/oil lubricated or water filled type. Pressure equalizing diaphragm and sand guards with seal shall be provided to prevent the water and sand entering the motor. vii) Power supply to the motor and control connections shall be preferably combined in one cable and shall be flexible copper conductor PVC insulated, armored and overall hard grade PVC sheathed, and suitable for under water service. The cable gland shall be properly sealed to prevent entry of pumped liquid the motor. Length of the cable shall be of suitable for site conditions. The cable shall be terminated on the control panel with necessary facility to terminate with the power receptacle.

AMENDMENT 1 TO TECHNICAL SPECIFICATION PE-TS-392-174-15000A-A001

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.00.00	<p>viii) For pumps which are specified under portable application, Cable shall be suitable for continuous winding/un winding duty on a cable reeling drum and shall be installed on a trolley mounted on wheels. Associated control panel is also to be mounted on the trolley.</p> <p>ix) Water level controller shall be provided which should be with two level controls, high to start and low to stop.</p>
	<p>EQUIPMENT DATA SHEET</p>
	<p>Type of pump : Submersible type fixed inside pits/ sump with guides /lifting chains</p>
	<p>Type of Working Fluid : Drains with particle size upto 40 mm</p>
	<p>Type of impeller : Open</p>
	<p>Type of lubrication : Self / Grease / Oil</p>
	<p>Speed : Preferably 1500 rpm (maximum)</p>
	<p>Material of Construction</p>
	<p>a) Casing : 2% Nickel Cast Iron, IS:210 Grade FG 260;</p>
	<p>b) Impeller : SS-316</p>
<p>c) Shaft : SS- 410</p>	
<p>d) Bolts & nuts : SS-316</p>	
<p>e) Accessories : Suction Strainer, Pump stand, Adaptors for discharge flange, Level measuring devices/ Controllers, Lifting hook & chain handle to agitate debris etc, Discharge hose connected with piping upto the drains etc.</p>	
<p>f) The discharge, suction /column pipes shall be heavy grade Carbon steel externaly lined with epoxy or galvanised.</p>	




ANNEXURE E

- LEGEND**
- NON RETURN VALVE
 - GLOBE VALVE NORMALLY OPEN
 - GLOBE VALVE NORMALLY CLOSED
 - THREE WAY VALVE
 - VENT TO ATMOSPHERE
 - FUNNEL
 - PRESSURE INDICATOR
 - LEVEL SWITCH
 - MOTOR OPERATED (A/C)
 - AIR BLOWER WITH INTAKE FILTER
 - SUBMERSIBLE PUMP

NOT IN BIDDER'S SCOPE

1	NON RETURN VALVE
2	GLOBE VALVE NORMALLY OPEN
3	GLOBE VALVE NORMALLY CLOSED
4	THREE WAY VALVE
5	VENT TO ATMOSPHERE
6	FUNNEL
7	PRESSURE INDICATOR
8	LEVEL SWITCH
9	MOTOR OPERATED (A/C)
10	AIR BLOWER WITH INTAKE FILTER
11	SUBMERSIBLE PUMP

12	11	10	9	8	7	6	5	4	3	2	1
<p>AMENDMENT 1</p> <p>THE KULJIAN CORPORATION ENGINEERS & ARCHITECTS * CONSULTANTS PHILADELPHIA, PA, U.S.A.</p> <p>PROJECT 400MW MARIB GAS TURBINE POWER STATION (PHASE-11)</p> <p>CLIENT PUBLIC ELECTRICITY CORPORATION(PEC) MINISTRY OF ELECTRICITY AND ENERGY SANA, REPUBLIC OF YEMEN</p> <p>PROJECT ENGINEERING MANAGEMENT NEW DELHI</p> <p>STATUS CONTRACT</p> <p>JOB NO. 372</p> <p>REV/ DATE A/D O/D A/P/D</p> <p>SCALE AS SHOWN</p> <p>CUSTOMER DRAWING NO. MARIB-11/2/2008-P-41200</p> <p>DATE MARCH 11, 2008</p> <p>SHEET 1 OF 1</p> <p>REV. 00</p>											

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
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ANNEXURE F

8.5.2 Type of Packing

Depending on the goods to be packed, VENDOR may use one of the following types:

- A triple-corrugated cardboard container made with waterproofed glue and a barrier layer of polyethylene on the outsides to keep out humidity.
- Wooden/cardboard packing cases: the wood being used for the framework and base of the cases, waterproofed triple-corrugated cardboard being used for the sides and top. These cases are of the "Bell" type, and used for material of small or medium dimensions.
- For larger dimensions, plywood cases are acceptable. The timber characteristics, cross-sections and thickness will be systematically determined by the nature of the loads to be packed.

8.5.3 Dimensions

In order to optimize the existing transport facilities (passenger or cargo aircraft), the dimensions of:

- Triple-corrugated containers.
 - Wooden/cardboard packing cases.
 - Plywood cases.
- Are to be adapted to pallets used for air transportation.

9.0 Detailed specification for Wooden Crates/Boxes/Cases and other packing materials

9.1 Technical specification for wood

The wood shall be Fir, Chir, Silver Oak (Gravillea Robusta), chemically treated mango and Pinewood with moisture content not exceeding 50%. The wood shall have flexural and compressive strength, stiffness, shock absorption and nail retention properties. The wood shall be free from common defects such as warp, bone, twist, knot, cracks, splits, end splits, bend, visible sign of infection and any kind of decay caused by insects or fungus, etc. Surface cracks with maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

9.2 Chemical Treatment of Wood:


The wood shall be chemically treated to provide protection against deterioration due to fungi and attack by termites, borers, marine organism and any other kind of infection. It shall be treated only after final processing like cutting, planning, joint grooving, etc.

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:

9.3.1 PACKING OF EQUIPMENTS

Various mechanical, electrical and C&I equipment e.g. Pumps, motors, equipment skids, heat exchangers, control panels, switch gears, transformers, etc. shall be wrapped in weather proof packing and then secured in wooden packing cases. The construction of wooden packing cases/crates shall be as per details given below and also given in figure 1 to 11.

9.3.1.1 Bottom Frame

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The construction of bottom frame shall be as per Fig-2. The No. of slides/runners for bottom frames shall be selected depending upon the weight and overall dimensions of the load to be carried. The equipment shall be secured by fixing their base frame/plate with the help of bolt and nuts etc. to bottom frame of the wooden packing cases/crates. The equipment not provided with base frame/plate like cylindrical vessels, etc to be secured to the bottom frame of the wooden cases with "C" clamps fabricated from steel channels/ angle iron.

9.3.1.2 TOP FRAME

The construction of top frame shall be as per fig-3.

9.3.1.3 END PANELS

The dimension of the end and lateral panels shall be calculated according to overall dimensions of the items to be packed. Diagonal braces shall be used for packing cases having height exceeding 500mm. Details of bracings shall be as per fig 5 to 9.

9.3.1.4 Sling Plate


To facilitate lifting of cases, longitudinal under slide boards shall be fixed. To avoid damage to the box while lifting sling plates shall be provided. Refer fig-11.

9.3.1.5 Angle Iron Cleats

Angle iron cleats shall be used for strengthening the joints as indicated in fig-10


9.3.1.6 Other Requirements

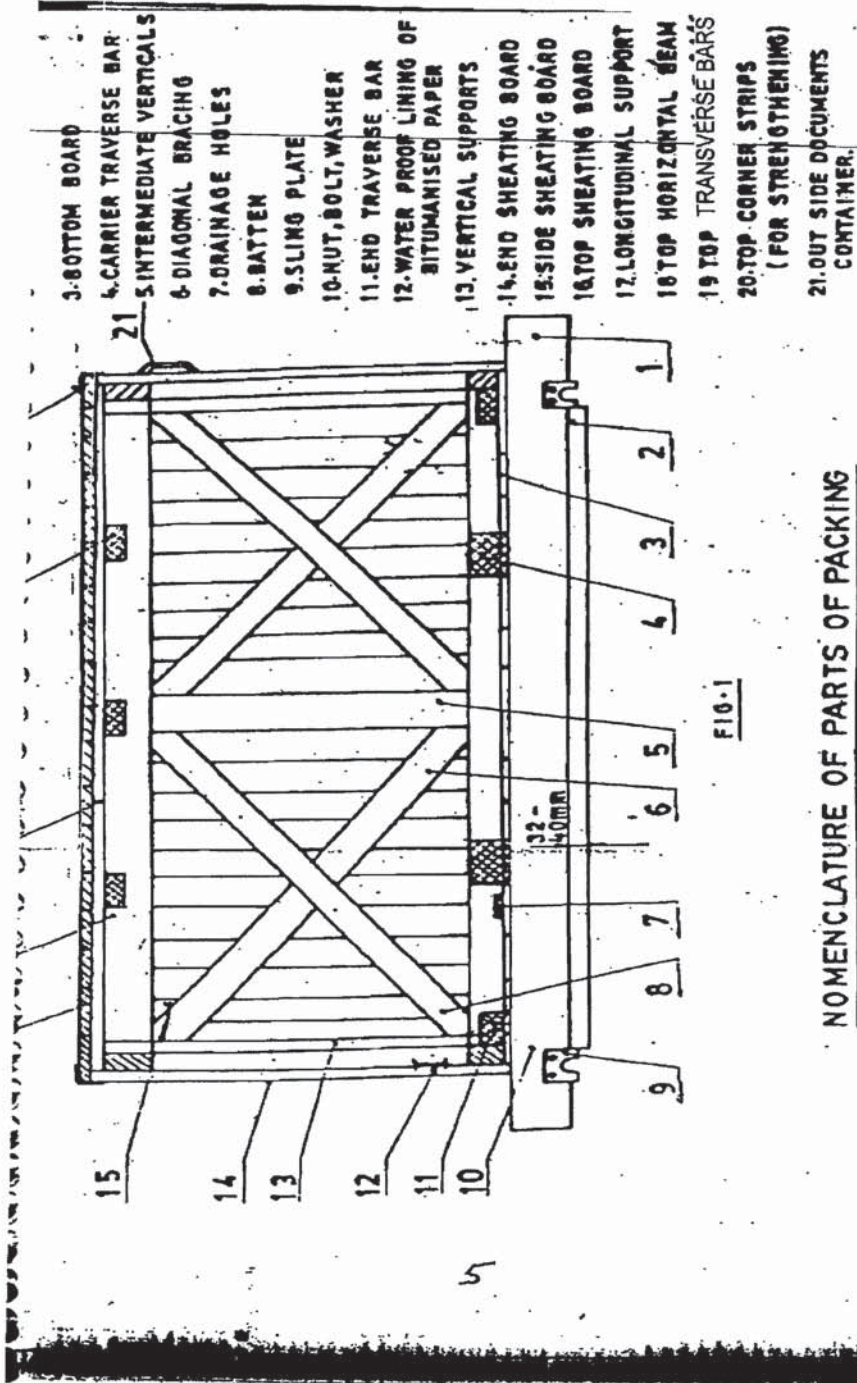
- The thickness of planks for top, bottom, side and end panels shall be at least 25mm. Planks used for this purpose shall be joined with each other by tongue and groove joint. The groove dimension shall be such that tongue fits tightly into groove to make the joint.
- Runners/slides, traverse bars, etc shall be of single length i.e. without any joint. Planks for sheathing, diagonal bracing etc shall also be of single length up to 2400mm, proper jointing is permitted for planks for sheathing and diagonal bracings.
- Each equipment to be individually covered with double polyethylene petticoat. Sheet thickness of polythene sheet shall not be less than 0.175 mm (175 microns). The sealing shall be such so as not to allow moisture inside.
- The inner surface of 4 sides of shooks shall be nailed with bituminized water proof craft paper. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- All the inner sides of the box shall be nailed with bitumen coated HESSIAN POLYTHYLENE KRAFT PAPER. For top frame it shall project on all sides by 100mm and shall be nailed on sides. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- For delicate equipment like control panels and switchgears, lighting panels and lighting transformers, suitable cushioning material like rubberised coir (min. 50 mm thick and 100 mm wide) shall be provided on their bottom support and the gap between the panel and casing

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shall be filled with rubberized coir with distance between consecutive supports less than 500 mm (ref fig15). For other equipment suitable support from sides of the casing shall be provided.

- Switchgear cubicles, control panels and control desks shall be packed and shipped in separate convenient sections. The components e.g. circuit breakers relays and instruments etc. which are removed from panels for shipping purpose and shall be separately packed and shipped as per packing instructions in clause 10.4.
- Packing case for control panels and switchgear panels shall be finally covered with GI sheet of minimum thickness of 0.4mm.
- Packing cases shall be bound at edges by nailing MS clamps/brackets at sufficient intervals. Further heavier boxes shall be strapped with C clamps (ref fig-4) fabricated from steel channels/angles and lighter boxes shall be strapped with hoop iron strips.
- Silica gel is used for this purpose to protect contents over sufficiently long time from corrosion. Silica gel shall be indicating type confirming to IS-304 (1979) packed in cotton bags placed at different positions inside the packing for absorbing moisture and shall not come into directly contact with equipment/material inside the package. The quantity of silica gel shall be adequate for storage period of one year, however it shall not be less than 4 gm. per ltr. Volume of case subject to minimum 400 gm. Per case.

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- 3. BOTTOM BOARD
- 4. CARRIER TRAVERSE BAR
- 5. INTERMEDIATE VERTICALS
- 6. DIAGONAL BRACING
- 7. DRAINAGE HOLES
- 8. BATTEN
- 9. SLING PLATE
- 10. NUT, BOLT, WASHER
- 11. END TRAVERSE BAR
- 12. WATER PROOF LINING OF BITUMANISED PAPER
- 13. VERTICAL SUPPORTS
- 14. END SHEATHING BOARD
- 15. SIDE SHEATHING BOARD
- 16. TOP SHEATHING BOARD
- 17. LONGITUDINAL SUPPORT
- 18. TOP HORIZONTAL BEAM
- 19. TOP TRANSVERSE BARS
- 20. TOP CORNER STRIPS (FOR STRENGTHENING)
- 21. OUT SIDE DOCUMENTS CONTAINER.

NOMENCLATURE OF PARTS OF PACKING


CASES

- 1 SLIDE
- 2 UNDER SLIDE BOARD

FIG-1

FIG-1

026

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	TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	VOLUME II B		
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BOTTOM FRAME ARRANGEMENTS

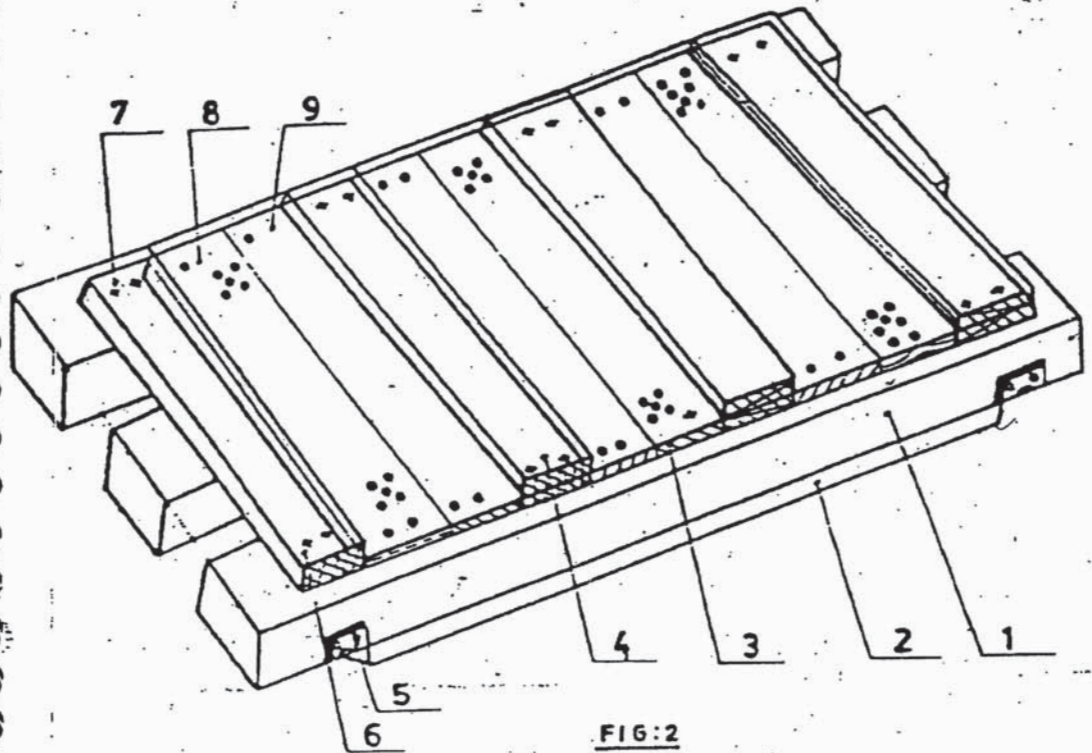



FIG:2

Nos. of slides: Minimum 2 Nos.
 For length more than 1800 mm or
 load more than 1000kg, nos. of
 slides shall be minimum 3 nos.
 For dimensions of slides, refer Table 1
 Cross section of end traverse bar; 100 x 100 mm.
 (minimum)

- 1. SLIDE
- 2. UNDER SLIDE BOARD
- 3. BOTTOM BOARD
- 4. CARRIER TRAVERSE BAR
- 5. SLING PLATE
- 6. TRAVERSE BAR
- 7. BOLT, NUT & WASHER
- 8. DRAINAGE HOLES
- 9. NAILS

	TITLE	SPECIFICATION NO. PE-TS-888-100-A001	
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TOP FRAME ARRANGEMENT

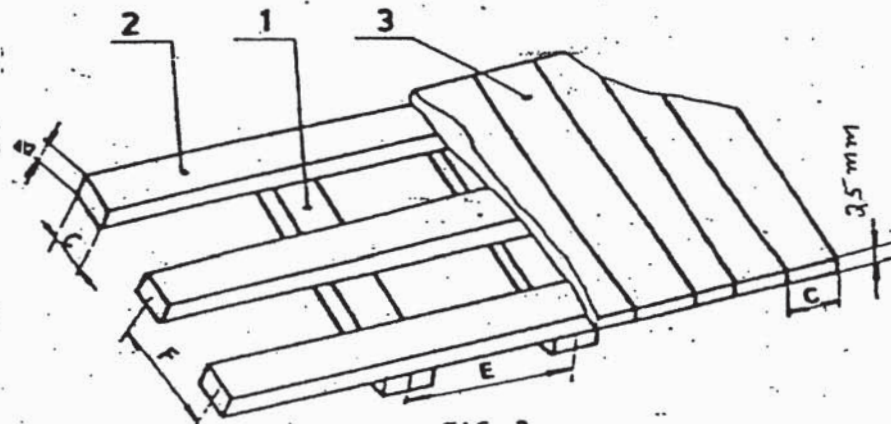
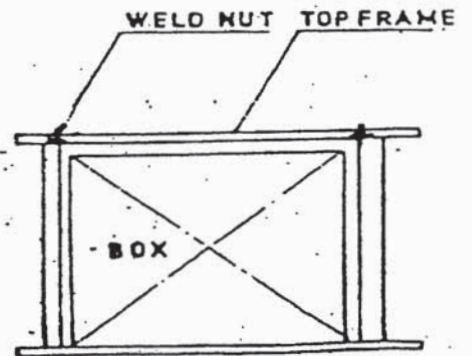
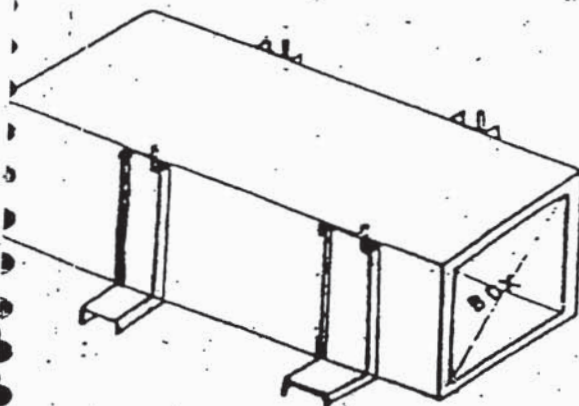



FIG-3

F : 700 to 1000 mm
 E : 500 to 900 mm
 30x100 mm.

- 1 - Traverse Bars
- 2 - Horizontal Soans
- 3 - Top Board

ARRANGEMENT OF C-CLAMPS AROUND CASES



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**ARRANGEMENT OF DIAGONAL BRACING AND
HORIZONTAL SUPPORT**

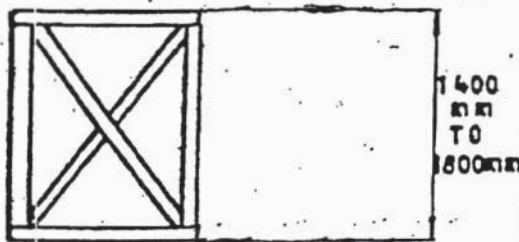


FIG:6

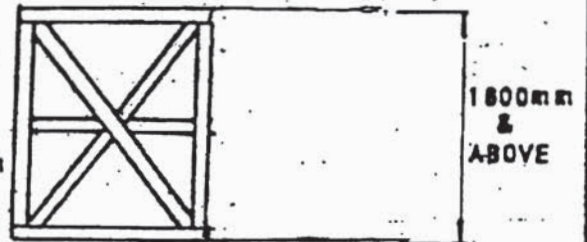


FIG:8

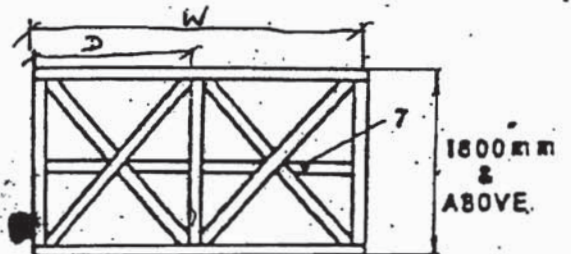


FIG:9

7- Middle Horizontal Support

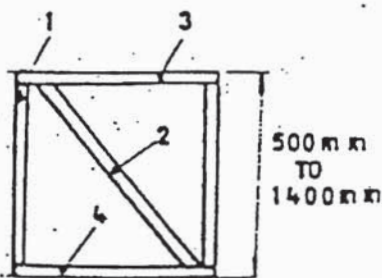


FIG:5

1- Vertical Support

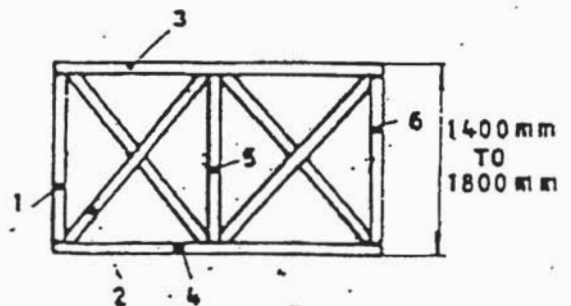

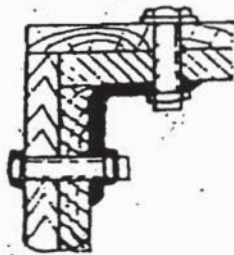
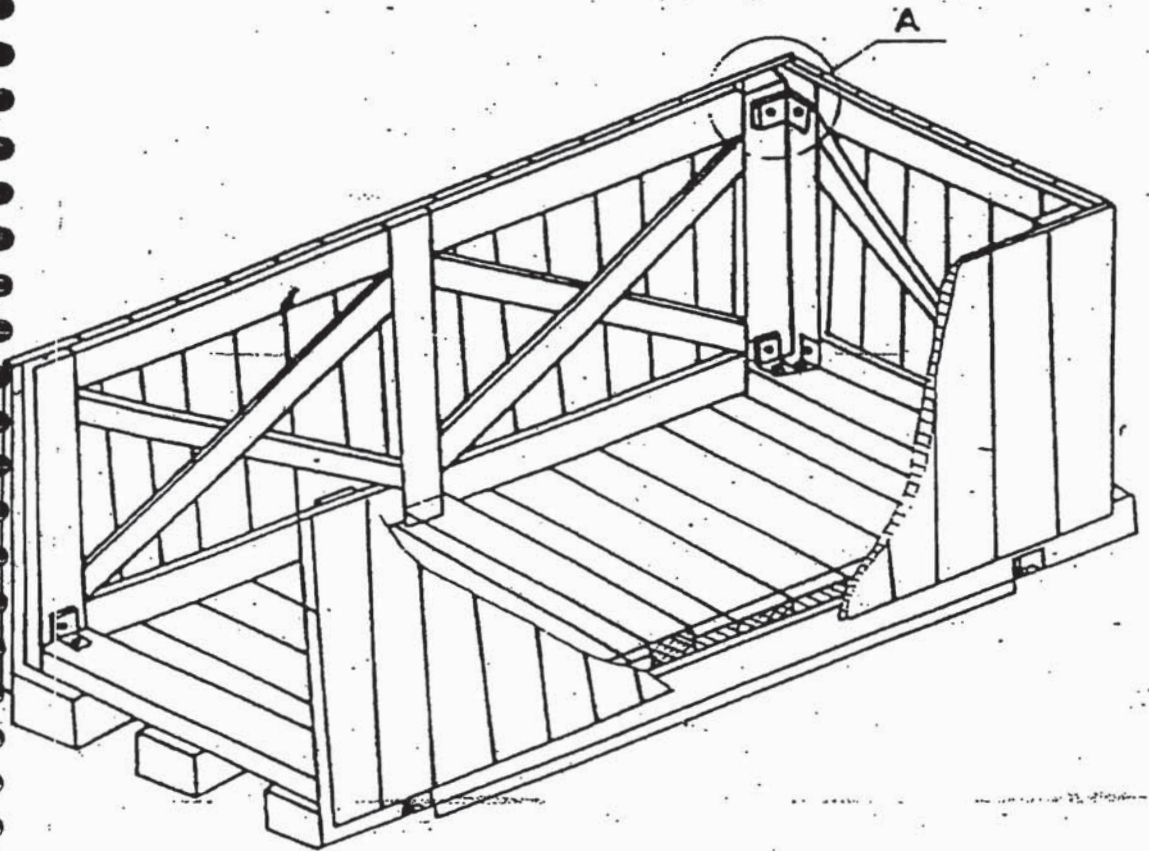


FIG:7

1, 5, 6 - Vertical Support

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ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

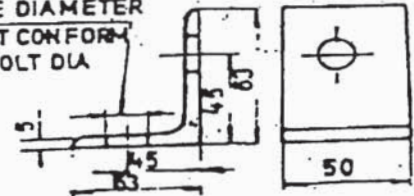

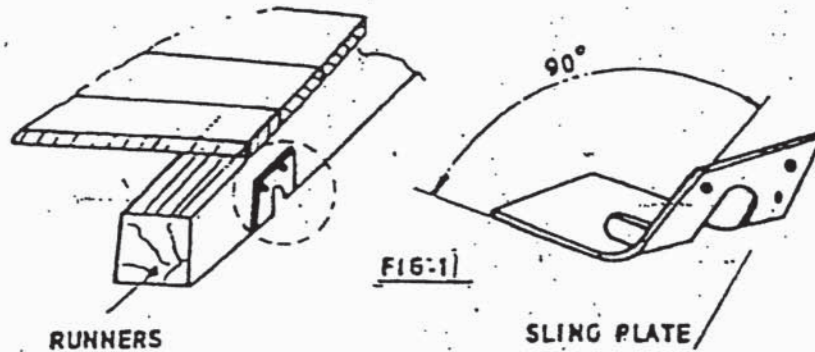


FIG:10

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ARRANGEMENT OF SLING & PLATE ON

CASES



AMENDMENT 1 TO TECHNICAL SPECIFICATION PE-TS-372-174-15000A-A001

QUALITY ASSURANCE																
ANNEXURE G																
Tests/Check Items Components	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Pneumatic Test	Functional/operational Test	Bleeding resistance tests	Adhesion/ Spark Test	Performance Test	Other Test	All Test as per relevant Std/ Appd Data Sheets	Dynamic Balancing	Remarks
Diaphragm Valves	Y ^a				Y		Y ₆	Y ⁶						Y ⁷		
Butterfly Valves (Low Pressure)					Y		Y ₆		Y				Y ⁸			
1. Body (Cast)	Y ^a		Y ^b													
2. Disc (Cast)	Y ^a		Y ^b													
3. Shaft	Y ^a		Y										Y ^c			
High Pressure Ball Valves & Butterfly Valves	Y ^a						Y							Y		
Horizontal Centrifugal Pumps				Y	Y							Y ⁵		Y		
1. Casing	Y ^a		Y ^b				Y									
2. Impeller	Y ^a		Y ^b												Y	
3. Shaft	Y ^a		Y										Y ^c		Y	
Rotary Blowers				Y	Y							Y		Y		
1. Casing	Y ^a		Y ^b				Y									
2. Rotor	Y ^a		Y										Y		Y	

QUALITY ASSURANCE

Notes:

1. Heat Treatment shall be done as per ASME code.
2. Bleeding Resistance tests shall be done by keeping the sample in 33% HCl, 48% NaOH and DM Water for 72 Hrs.
3. Hydro Test shall be conducted, before Rubber lining.
4. As per code requirements.
5. As per HIS, USA.
6. Hydro test of body before Rubber lining. Seat Leakage test for Actuator operated valves shall be done by closing the Valves with Job Actuator.
7. Tests on Rubber parts such as Diaphragms shall be done per batch of Rubber mix, such as Tensile, Hardness, Adhesion, Spark Test, Bleed Resistance test and Flex test. Life Cycle test for Diaphragms for 50000 cycles etc shall also be done.
8. Hydro Test of Body, Seat & Disc Strength shall be carried out in accordance with latest edition of AWWA C-504 Standard. Proof of Design Test in accordance with latest edition of AWWA C-504 Standard shall also be carried out, if not carried out earlier. Seat Leakage test for Actuator operated valves shall be done by closing the Valves with Job Actuator. Seat leakage test shall be carried out in both directions.
 - a) One per Heat/Heat Treatment batch/Lot
 - b) On machined surfaces only.
 - c) UT shall be done for shafts with Dia 50 mm or above.
9. For all other Misc. items, refer Table on LP piping.