TECHNICAL SPECIFICATION FOR JACKING OIL PUMP SET (D.C.)

1.0 INTENT OF SPECIFICATION:-

THIS SPECIFICATION IS INTENDED TO COVER DESIGN, MANUFACTURE, ASSEMBLY, TESTING AND SUPPLY OF PUMPING SETS COMPLETE WITH FOUNDATION BASE PLATE, ANCHOR BOLTS, LIFTING LUGS, COUPLING, AND OTHER ACCESSORIES INCLUDING MOTOR WITH STARTING RESISTANCES AND THEIR COMMISSIONING AT POWER STATION TO WHICH BHEL SUPPLIES THE EQUIPMENT.

THE PUMPING SETS ARE INTENDED FOR OPERATION IN CONJUNCTION WITH STEAM TURBINES AND SHOULD BE SUITABLE FOR CONTINUOUS OPERATION AT AN AMBIENT TEMPERATURE OF 50°C + 90% HUMIDITY.

2.0 FUNCTION:-

JACKING OIL PUMP COMES IN OPERATION IN CONJUNCTION WITH THE BARRING OPERATION OF THE TURBINE.

3.0 APPLICABLE CODE/STANDARD:- IS:4722, VDMA 24284.

4.0 OIL SPECIFICATION:-

THE MEDIUM HANDELED IS TURBINE OIL OF VISCOSITY CLASS ISO VG46. THE OIL CAN BE SERVOPRIME 46 OF INDIAN OIL CORPORATION OR TURBOL 46 OF BHARAT PETROLEUM OR SHELL TURBOL 46 OF BHARAT SHELL LTD.

KINEMATIC VISCOSITY AT 65°C/20°c	: 16 cs/100 cs
SPECIFIC GRAVITY AT 65°c	: 0.8488
FLASH POINT	: 200°c (min)
OPERATIONAL TEMPERATURE	: 65°c
POUR POINT	: -6.6°c (max.)

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
C1E	VINOD KR		अनुवादक TRANSLATED BY	-	
TSX	AKCHATURVEDI		निर्माणकर्ता WORKED BY	DHARAMPAL	15/6/06
QAX	SS Chauhan		जांचकर्ता CHECKED BY	ANUJ JAIN	15/6/06
सहगत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	S.C.AGRAWAL	15/6/06
			स्वीकृति APPROVED :	(A.K.JAIN) AGM	21.8.06
REV.NO. 07 (SUPERSEDES) Rev. 08			निर्माण PREPARED :	जारी ISSUED : TSX	दिनांक DATE : 28-01-1999
Dt. 31.08.06		Dt. 26-06-07	STE(TL/TA)		

हस्ताक्षर एवं दिनांक SIGN & DATE
सम्पत्ती सूची संख्या INVENTORY NO. P-5474
सम्पत्ती सूची संख्या को अधिक्रमित करता है SUPERSEDES (INVENTORY NO.
अनुमोदन एवं हस्ताक्षर SIGN & DATE

5.0 PUMP SPECIFICATION:-

5.1 IDENTIFICATION NO. TO BE MENTIONED ON NAME PLATE AS FOLLOWS:-
: MAV 31 AP 001 AND MAV 32 AP 001

5.2 **TYPE** **SCREW TYPE POSITIVE DISPLACEMENT**

DESIGN TEMPERATURE = 100°C , OPERATING TEMPERATURE = 65°C

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Litre/Sec)	NORMAL DISCHARGE PRESSURE (Bar)
VAR. 1	1.26	120
VAR. 2	1.80	140
VAR. 3	1.68	189
VAR. 4	1.25	182
VAR. 5	2.25	182
VAR. 6	1.53	178
VAR. 7	1.33	182
VAR. 8	1.27	182
VAR. 9	1.84	178

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Litre/Sec)	NORMAL DISCHARGE PRESSURE (Bar)
VAR. 10		
VAR. 11		
VAR. 12		
VAR. 13		
VAR. 14		
VAR. 15		
VAR. 16		
VAR. 17		
VAR. 18		

PUMP SHALL BE SUITABLE FOR MOUNTING VERTICALLY ON THE OIL TANK. BASE PLATE OF PUMP SHALL MATCH THE COUNTER FLANGE PROVIDED ON THE TANK AS PER SKETCH ON PAGE 14. SMOOTH FUNCTIONING IS ENSURED BY MAINTAINING OIL LEVELS AS DEPICTED IN THE ARRANGEMENT ON PAGE NO. 13.

5.3 DURING INITIAL START UP IN WINTER, OIL TEMPERATURE MAY GO AS BELOW AS 20°C.

6.0 MOTOR:-

A SUITABLE MOTOR CONFORMING TO THE PUMP REQUIREMENTS SHALL BE SUPPLIED. FOR DETAILS ON MOTOR, PLEASE REFER ANNEXURE-I.

7.0 DESIGN AND CONSTRUCTION OF PUMP:-

ALL MATERIALS USED IN THE CONSTRUCTION OF THE PUMPS SHALL BE SELECTED FROM THE RANGE OF MATERIAL MOST APPROPRIATELY SUITABLE FOR THE PURPOSE AND SERVICE CONDITIONS. THE BIDDER SHALL FURNISH ALONGWITH THE OFFER, MATERIAL SPECIFICATION FOR ALL THE COMPONENTS TO BHEL FOR THEIR REVIEW AND ACCEPTANCE BY BHEL/OWNER. BHEL/OWNER RESERVES THE RIGHT TO ASK FOR CHANGES IN MATERIAL. THE SIZE SHALL BE STANDARDISED SO AS TO ENSURE INTERCHANGEABILITY.

7.1 SPECIAL TOOLS AND TACKLES

ONE SET OF TOOLS REQUIRED FOR ERECTION, OPERATION AND MAINTENANCE OF THE PUMPING SETS SHALL BE SUPPLIED TOGETHER WITH EACH PUMP. LIST OF THESE TOOLS SHALL BE SUBMITTED ALONGWITH THE OFFER.

7.2 THE MATERIALS OF CONSTRUCTION OF THE PUMPS SHALL BE SUCH AS TO RESIST CORROSION AND EROSION AND SHALL GIVE A LONG TROUBLE FREE SERVICE.

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7.3 THE SUPPLIER SHALL ALSO FURNISH THE METHOD AND FREQUENCY OF LUBRICATION OF THE BEARINGS AND QUANTITY AND TYPE OF LUBRICANT REQUIRED FOR NORMAL OPERATION. BUT LUBRICATION OF BEARINGS WITH THE OIL BEING HANDLED IS PREFERED.

7.4 THE DESIGN SHALL BE SUCH AS TO KEEP THE FRICTIONAL LOSS AND WEAR CAUSED BY END THRUST TO THE MINIMUM. IT WILL ALSO ENSURE MINIMUM WEAR AND CAVITATION IN MECHANICAL SEALS AND BEARINGS. LONG AND TROUBLE FREE SERVICE SHALL BE ENSURED. THE ROTORS OF THE PUMP SHOULD BE DESIGNED IN SUCH A WAY SO THAT MINIMUM VIBRATIONS ARE EXPERIENCED. THE SOUND PRESSURE LEVEL OF PUMP MOTOR SET SHOULD NOT BE GREATER THAN 85 dBA TO A REFERENCE OF 0.0002 MICRO BAR WHEN MEASURED AT A DISTANCE OF 1.5 METERS ABOVE FLOOR LEVEL AND ONE METRE HORIZONTALLY FROM THE BASE OF EQUIPMET AND VIBRATIONS ARE IN THE PERMISSIBLE RANGE AS PER VDI 2056.

7.5 SEALS MUST COMPLY WITH THE FOLLOWING PROPERTIES :-

(a) READY ACCESS AND AMENABILITY FOR MAINTENANCE WORK .
(b) NO CONTAMINATION OF THE MEDIUM FROM MATERIAL ABRADED FROM THE SEALS.
(c) NO SEEPAGE OF LUBRICANTS INTO THE FLOW MEDIUM .
(d) MINIMUM LEAKAGE LOSSES WITH THEIR CONTROLLED REMOVAL.

7.6 TO FACILITATE TRANSPORT AND ERECTION, LIFTING HOOKS OR ERECTION EYES SHALL BE FITTED AT SUITABLE POINTS ON THE COMPONENTS. THEIR LOCATIONS MUST BE SHOWN ON THE DIMENSIONAL DRAWING.

7.7 PUMP BEARINGS SHALL BE DESIGNED SO AS TO ASSURE 50,000 hrs CONTINUOUS SERVICE FOR FRICTION BEARINGS & 30,000 hrs FOR BALL & ROLLER BEARINGS.

7.8 THE MECHANICAL DESIGN SHALL ALLOW EASY ACCESS TO VARIOUS PARTS OF CARRYING OUT MAINTENANCE WORK.

7.9 THE DISCHARGE BRANCH OF THE PUMP SHALL BE TAKEN OUT ABOVE THE BASE PLATE BY THE SUPPLIER.

7.10 THE PUMPS SHALL BE PROVIDED WITH DRAINAGE AND VENTING DEVICES.

7.11 ALL SYSTEM PARTS CARRYING OIL SHALL BE OF OIL TIGHT CONSTRUCTION COMPRESSION-TYPE FITTINGS ARE NOT PERMISSIBLE.

7.12 FOR SCREW PUMPS RUNNING AT SUBCRITICAL SPEEDS, IT SHALL BE ENSURED THAT THE CRITICAL SPEED LIES ABOVE THE MAXIMUM SPEED ATTAINABLE DURING OPERATION WITH A MINIMUM MARGIN ON 15% OF RATED SPEED. FOR PUMPS RUNNING AT SUPER CRITICAL SPEEDS, IT SHALL BE ENSURED THAT THERE IS DEFFERENCE OF SUFFICIENT MAGNITUDE (NOT LESS THAN 20%) BETWEEN THE OPERATING SPEED AND THE BORDER IN CRITICAL SPEEDS. ALLOWANCES SHALL BE MADE FOR THE TYPE OF COUPLING BETWEEN THE PUMP AND MOTOR WHILE CALCULATIN THE CRITICAL SPEEDS.

ALLOWANCES SHALL BE MADE FOR THE TYPE OF COUPLING BETWEEN THE PUMP AND MOTOR WHILE CALCULATING THE CRITICAL SPEEDS.

7.13 COUPLING

SUITABLE COUPLING WITH GUARDS SHALL BE PROVIDED FOR COUPLING PUMP WITH MOTOR. IT SHALL BE DESIGNED TO FACILITATE EASY ALIGNMENT. ONE SET OF COUPLING BOLTS SHALL BE SUPPLIED IN SPARE.

7.14 FOUNDATION

THE PUMP SHALL BE MOUNTED ON THE OIL TANK AND HUNG FROM BED PLATE AT THE TANK TOP INTO THE TANK. FOR FURTHER DETAILS PLEASE REFER PAGE NO. 12 AND 13. ALL THE SEATING MACHINED SURFACES OF BED PLATE TO BE MAINTAINED FOR 0.5 mm FLATNESS.

8.0 QUALITY ASSURANCE, INSPECTION AND TESTING

(a) THE MANUFACTURER SHALL CONDUCT ALL TESTS REQUIRED TO ENSURE ALL THE COMPONENTS PART OF THE JACKING OIL PUMP OFFERED, CONFORM TO THE REQUIREMENTS OF THE SPECIFICATION AND IN COMPLIANCE WITH REQUIREMENTS OF APPLICABLE CODES AND STANDARDS.

(b) THE BIDDER SHALL SUBMIT ALONGWITH HIS OFFER QUALITY PLAN.

8.1 THE PARTICULARS OF THE PROPOSED SHOP TESTS AND PROCEDURES FOR THE TESTS SHALL BE SUBMITTED TO BHEL/ITS CUSTOMER FOR APPROVAL ALONGWITH QUALITY PLAN.

8.2 THE MATERIAL SHALL BE DESPATCHED ONLY AFTER INSPECTION AND CLEARENCE OF MATERIAL BY BHEL OR ITS CUSTOMER AND APPROVAL OF TEST CERTIFICATE BY BHEL/ITS CUSTOMER.

8.3 THE MINIMUM TESTS/CHECKS TO BE CARRIED OUT ON THE JACKING OIL PUMP AS ENVISAGED BY BHEL ARE GIVEN BELOW. THIS IS, HOWEVER, NOT INTENDED TO FORM A COMPREHENSIVE TESTING PROGRAMME AS IT IS SUPPLIERS RESPONSIBLITY TO PREPARE THE DETAILED QUALITY PLAN, WHICH SHOULD ALSO INCLUDE TESTS/CHECKS CARRIED OUT BY SUPPLIER AS A PART OF THEIR NORMAL PARACTICE . THIS QUALITY PLAN IS SUBJECT TO THE APPROVAL OF BHEL /ITS CUSTOMER AND BHEL/ITS CUSTOMER RESERVES THE RIGHT TO ASK FOR ANY MORE CHECKS AT THE TIME OF QUALITY PLAN FINALISATION.

8.3.1 TESTING OF MATERIALS

THE MATERIAL OF EACH COMPONENT SHALL BE TESTED AS PER RELEVENT SPECIFICATION FOR ITS CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES, VIZ. YS, UTS, IMPACT, % ELONGATION % RA ETC. AND NDT, UT ON SHAFT, MPI ON SCREWS AND CASING ETC. TO ENSURE FREEDOM FROM SURFACE AND SUB-SURFACE DEFECTS SHALL BE CARRIED OUT.

8.3.2 FOLLOWING TESTS SHALL BE CARRIED OUT DURING VARIOUS STAGES OF MANUFACTURE AT MANUFACTURER WORKS.

(a) CHECK FOR DIMENSIONS OF ALL COMPONENT PARTS INCLUDING SURFACE FINISH, AXIAL AND RADIAL RUN OUT OF SHAFT ETC.

(b) NON-DESTRUCTIVE EXAMINATION :- UT FOR SCREW BLANKS & DPT/MPI ON SCREWS TO BE CARRIED OUT TO ENSURE SURFACE / SUB-SURFACE DEFECTS.

(c) CHECK THE CONDITION OF THE OIL SEALS AND ANY SEEPAGE OF OIL THROUGH SEALS ETC.

(d) HYDRAULIC TESTING OF THE CASING AND OTHER PRESSURE PARTS SHALL BE AS PER VDMA 24284.

(e) CHECK FOR DIRECTION OF ROTATION OF PUMP.

(f) PERFORMANCE TEST WITH CALIBRATED TEST BED MOTOR FOR VERIFICATION OF PUMP CHARACTERISTICS, VIZ. DISCHARGE AT THE GIVEN PRESSURE SCHEDULE OF POWER CONSUMPTION, NOISE AND VIBRATION LEVEL AS PER VDMA 24284.

(g) STRIP DOWN TEST TO CHECK THE CONDITION OF BEARING, MECHANICAL CLEARANCES AND AXIAL PLAY OF SHAFT ETC.

8.3.3 AFTER TESTING THE PUMP, ALL THE SURFACES AND INTERNALS SHALL BE THOROUGHLY CLEANED, DRIED AND CONSERVED. ALL METALLIC SURFACES EXCEPT BRIGHT PARTS EXPOSED TO WEATHER SHALL BE GIVEN A SUITABLE PRIMING COAT AND THEN TWO COATS OF APPROVED PAINTS. ENSURE ASSEMBLY OF ALL THE COMPONENTS OF PUMP AS ONE UNIT AND PACK IN WATER AND DUST PROOF PACKAGE. THE PACKAGES SHOULD BE SUFFICIENTLY STRONG TO SAFEGAURD AGAINST ANY DAMAGE DURING TRANSIT AND IS SAFE FOR TWO YEARS IN A VERY DAMP ATMOSPHERE.

8.3.4 TEST CERTIFICATES INDICATING THE ACTUAL TEST RESULTS OF MATERIAL TESTING, NDT, HYDRAULIC TEST, PERFORMANCE TEST, STRIP DOWN EXAMINATION Etc. SHALL BE FURNISHED.

9.0 PRE-APPROVAL DOCUMENTS AT THE TIME OF OFFER

9.1 ASSEMBLY DRAWING WITH PART LISTS, NOZZLE SIZES AND THEIR COORDINATES, BASE PLATE DETAILS AND CROSS SECTION ARRANGEMENT ALONGWITH STATIC LOADING.

9.2 CALCULATIONS WITH NECESSARY DRAWINGS (TORQUE/SPEED CHARACTERISTICS Etc), POWER REQUIREMENTS, TORQUE SETTING VALUE FOR MOTOR TRIP, PERMISSIBLE TORQUE VALUE FOR KEY AND POWER SHAFT.

9.3 MAXIMUM MAGNETIC AND NON-MAGNETIC PARTICLE SIZE, WHICH CAN PASS THOROUGH PUMP SCREW LY CLEARANCE WITHOUT DAMAGING THE PUMP SHALL BE SPECIFIED IN THE OFFER.

9.4 QUALITY PLAN WITH DETAILS OF QUALITY LEVELS AND MANUFACTURING TOLERANCES. THIS SHOULD GENERALLY CONFORM TO VDMA 24284. GENERALLY ACCELTED PRACTICES, IN PARTICULAR VDMA CODES AND STANDARDS OR EQUIVALENT SHALL BE APPLIED AND TAKEN INTO ACCOUNT FOR DESIGN OF SCREW PUMPS. THE CODES OF STANDARDS APPLIED IN EACH CASE SHALL BE SPCIFIED IN THE OFFER.

9.5 FOR DOCUMENTATION ON MOTOR, PLEASE REFER ANNEXURE-I. EXAMINATION OF THE PRE-APPROVED DOCUMENTS BY BHEL SHALL NOT RELIEVE THE MANUFACTURER AND HIS SUBCONTRACTORS OF THEIR RESPONSIBLITIES.

THE PRE-APPROVED DOCUMENTS SHALL FORM THE BASIS FOR THE ORDER. NO CHANGES SHALL BE MADE WITHOUT APPROVAL FROM BHEL.

10.0 DOCUMENTS TO BE SUPPLIED AFTER THE PLACEMENT OF ORDER:

THESE SHALL BE SUPPLIED EITHER IN FIVE COPIES EACH OR TWO COPIES AND A SET OF REPRODUCCIBLE. SCHEDULE OF DOCUMENTS SHALL BE AS FOLLOWS:

10.1	CONTRACTUAL DRAWINGS	– 8 WEEKS
10.2	OVERHAUL AND SPARE PARTS LISTS	– 8 WEEKS
10.3	EQUIPMENT DESCRIPTION	– 8 WEEKS
10.4	TEST CERTIFICATE OF ALL TESTS AS PER QUALITY PLAN, DRAWINGS DURING VARIOUS STAGES OF MANUFACTURE. ALSO REFER CLAUSE 8.2 AND 8.3.4 ABOVE.	– BEFORE DESPATCH
10.5	LIST OF TOOLS AND TACKLES	– 8 WEEKS
10.6	THE STATIC AND DYNAMIC LOADING DETAILS ON SUPPORT/FOUNDATION SHOULD BE FURNISHED.	– 8 WEEKS
10.7	FOR DOCUMENTATION ON MOTOR, PLEASE REFER ANNEXURE I.	
10.8	O & M MANUALS (10 HARD COPIES+2CD)	– 12 WEEKS

11.0 NAME PLATE IDENTIFICATION MARKINGS SHOULD BE AS FOLLOWS:

11.1 TYPE / DESIGNATION
11.2 MANUFACTURER
11.3 MANUFACTURER'S WORKS NO.
11.4 YEAR OF MANUFACTURING
11.5 PURCHASER'S ORDER NO.
11.6 VOLUMETRIC FLOW (l/m)
11.7 DISCHARGE PRESSURE (Bar/MWC)
11.8 OPERATING TEMPERATURE (°C)
11.9 FLOW MEDIUM.
11.10 SPEED.
11.11 BILINGUAL IN HINDI AND ENGLISH LANGUAGES.

12.0 CLEANING, PAINTING, CONSERVATION & PACKING:

THE SURFACE SHALL BE CLEANED & PREPARED FOR APPLICATION OF THE COATINGS BY BLASTING WITH NON-SILICATIC ABBRASIVE AGENTS. THE PROTECTIVE COATING SHOULD BE OIL RESISTANT TO PREVENT COTAMINATION OF OIL SPECIFIED TO PREVENT THE DETERIORATION OF THE COATING ITSELF. THE SUPPLIER SHALL GIVE EXACT AND PRECISE DETAILS ABOUT THE MEASURES ENVISAGED BY HIM FOR SURFACE PROTECTION, WHICH SHALL BE CHECKD AND APPROVED BY BHEL.

INSTRUCTIONS SHOULD BE ISSUED REGARDING RECONSERVATION, DECONSERVATION ALONGWITH SPECIFICATION OF MATERIAL TO BE USED FOR ABOVE PURPOSE. 100% QUANTITY OF MATERIAL REQUIRED FOR RECONSERVATION AND DECONSERVATION AT SITE DURING STORAGE SHALL BE SUPPLIED ALONGWITH PUMP. ANY SPECIFIC INSTRUCTION TO BE FOLLOWED DURING STORAGE AT SITE TO AVOID ANY SEIZING ETC. SHALL ALSO BE INTIMATED. ALL SUCH INSTRUCTIONS SHALL BE MADE AVAILABLE TO SITE INCHARGE IN A SEPARATE COVER (NOT PACKED WITH PUMP PACKAGE).

THE SUPPLIER SHALL BE RESPONSIBLE FOR ALL LOSS OR DAMAGE DURING TRANSPORTATION, HANDLING AND STORAGE DUE TO IMPROPER PACKING.

13.0 GENERAL

THE SUPPLIER CAN MAKE SUITABLE OFFERS EVEN IF THERE ARE MINOR DEVIATIONS WHICH DO NOT AFFECT THE EFFICIENT FUNCTIONING OF THE EQUIPMENT. HOWEVER, THE DEVIATIONS MUST BE CLEARLY SPELT OUT. SUPPLIER SHALL ALSO FILL IN THE BLANK DATA SHEET AS PER ANNEXURE-II AND SUBMIT THE SAME ALONGWITH THE OFFER. THE OFFER MAY NOT BE CONSIDERED IF ALL THE TECHNICAL PARTICULARS AND INFORMATIONS CALLED FOR IN THE SPECIFICATION ARE NOT SUBMITTED ALONGWITH THE OFFER.

14.0 GUARANTEE

14.1 THE SUPPLIER SHALL GUARANTEE TROUBLE FREE AND SATISFACTORY OPERATION OF THE EQUIPMENT FOR A PERIOD OF 12 MONTHS AFTER THE INSTALLATION AND COMMISSIONING OR FOR A PERIOD OF 18 MONTHS FROM THE DAY THE EQUIPMENT LEAVES THE SUPPLIER'S WORKS WHICHEVER IS EARLIER.

14.2 THE SUPPLIER SHALL GUARANTEE THE CAPACITY, HEAD AND EFFICIENCY OF THE PUMP AS PER THE TESTED CHARACTERISTIC WITH OIL.

14.3 IF DURING ERECTION AT SITE ANY DEFICIENCY IN A PART IS DETECTED. BHEL SITE REPRESENTATIVE SHALL PREPARE THE ASSESSMENT REPORT AND A COPY OF THE SAME SHALL BE FORWARDED TO THE SUPPLIER. THE SUPPLIER SHALL REPLACE/ RECTIFY THE CONCERNED ITEMS FREE OF CHARGE. THE SUPPLIER IF HE SO DESIRE MAY DEPUTE HIS REPRESENTATIVE TO SITE OTHERWISE THE FINDING OF BHEL REPRESENTATIVE SHALL BE FINAL AND BINDING ON THE SUPPLIER OF PUMPING SET.

14.4 THE SUPPLIER SHALL REPAIR/REPLACE THE DEFECTIVE PARTS AT HIS OWN COST DURING THE GUARANTEE PERIOD.

15.0 SPARES

THE SUPPLIER SHALL QUOTE ITEMWISE PRICE OF RECOMMENDED SPARES FOR 3 YEARS AND 5 YEARS OPERATION RESPECTIVELY.

ANNEXURE – I

SPECIFICATION OF D.C. MOTOR FOR JACKING OIL PUMP

1.0 A SUITABLE MOTOR CONFORMING TO THE JACKING OIL PUMP REQUIREMENT SHALL BE SUPPLIED. THE MOTOR SHALL CONFORM TO IS:4722, IS:2253, IS:2254, IS:3202, EQUIVALENT. BS SPECIFICATION. THE MOTOR SHALL MEET ALL INDIAN STATUTORY REQUIREMENTS.

2.0 **APPLICATION**

TO DRIVE OIL PUMP FOR SUPPLYING OIL FOR LIFTING THE SHAFT IN THE BEARINGS.

3.0 **TYPE OF MOTOR:** SEPARATELY EXCITED OR COMPOUND MOTOR WITH 10% COMPOUNDING.

3.1 **KW RATING**

IT SHALL HAVE AT LEAST 15% RESERVE CAPACITY THAN REQUIRED TO DRIVE THE PUMP WHEN IT IS DISCHARGING MAXIMUM QUANTITY.

3.2	KW ACTUALLY REQUIRED BY DRIVE EQUIPMENT UNDER SPECIFIED OPERATING AND START UP CONDITIONS.	: PUMP CAPACITY
3.3	RATED VOLTAGE	: 220 V D.C. : 220 V D.C. FIELD
3.4	PERMISSIBLE VOLTAGE VARIATIONS UNDER NORMAL RUNNING CONDITIONS.	: −15% +10%
3.5	MINIMUM VOLTAGE REQUIRED UNDER STARTING CONDITIONS TO BRING DRIVEN EQUIPMENT UPTO RATED SPEED.	: 80% RATED
3.6	TYPE OF DUTY	: CONTINUOUS
3.7	FULL LOAD SPEED	: IT SHALL BE COMMENSURAT WITH PUMP SPEED AS PER DESIGN.
3.8	FULL LOAD CURRENT	: AS PER DESIGN
3.9	STARTING CURRENT	: 2 TIMES CURRENT AT RATED VOLTS.
3.10	STARTING TORQUE	: 2 TIMES TORQUE AT RATED VOLTS.
3.11	EFFICIENCY AT FULL LOAD	: 85% (minimum)

4.0 **STARTING DATA**

4.1 STARTING: SUITABLE FOR 3 STEP STARTING. STARTING RESISTANCES OF PUNCHED STEEL SHALL BE ENCLOSED IN A SUITABLE HOUSING DESIGNED FOR NATURAL VENTILATION. CABLE ENTRY SHALL BE PROVIDED AT THE BOTOM. ARRANGEMENT SHALL BE PROVIDED TO MOUNT THE HOUSING ON RACKS. G.A. DRAWING OF THE HOUSING, VALUES OF STARTING RESISTANCES AND REQUIRED TIME INTERVAL AT THE STEPS SHALL BE PROVIDED IN THE OFFER. STARTING RESISTANCE HOUSING SHALL HAVE IP21 (MIN.) DEGREE OF PROTECTION.

4.2 PERMISSIBLE STARTING DUTY CYCLE/ NO. OF STARTS. : 3 STARTS SPREAD OVER AN HOUR TWO CONSECUTIVE STARTS.

4.3 STARTING RESISTANCE BOX / PANEL SHALL BE IN VENDOR SCOPE OF SUPPLY.

4.4	OVERLOAD (% OF FULL LOAD) THAT CAN BE CARRIED BY MOTOR IMPAIRING, OVERALL PERFORMANCE AND PERIOD FOR WHICH THIS OVERLOAD IS APPLICABLE.	:	25% FOR 5 MINUTES.
4.5	LOCATION	:	TURBINE HALL–INDOOR
4.6	CLASS OF INSULATION	:	CLASS F, FUNGUS RESISTANT, TROPICALISED AS PER IS:3202, WITH TEMPATURE RISE LIMITED TO THAT OF CLASS B.
4.7	WINDING TEMP. DETECTORS	:	TO BE PROVIDED.
4.8	**MECHANICAL CONSTRUCTION:–**		
4.8.1	SHAFT DISPOSITION/MOUNTING	:	VERTICAL/FLANGE MOUNTED
4.8.2	METHOD OF CONNECTION TO DRIVEN EQUIPMENT.	:	FLANGE FLEXIBLE COUPLING.
4.8.3	DIRECTION OF ROTATION AND CORRESPONDING TERMINAL DESIGNATION.	:	TO SUIT PUMP
4.8.4	ENCLOSURE AND VENTILATION	:	TOTALLY ENCLOSED FAN COOLED IP–55.
4.8.5	BEARING	:	THURST BEARING, MINIMUM STANDARD LIFE NOT LESS THAN 30000 WORKING HOURS.
4.8.6	GROUNDING DEVICE	:	SUITABLE ARRANGEMENT SHALL BE PROVIDED FOR EARTHING THE MOTOR AT TWO SEPARATE AND DISTINCT CONNECTION POINTS. DESIGN OF EARTHING CONDUCTOR SHALL BE AS PER IS:4722.
4.8.7	TERMINAL CONNECTORS	:	2 FOR ARMATURE, 2 FOR FIELD.
4.9	TERMINAL BOX	:	TERMINAL BOX SHALL BE PROVIDED WITH DOUBLE COMPRESSION TYPE BRASS CABLE GLANDS (Nickel Chromium PLAED HEAVY DUTY, CONFIRMING TO BS:6121) AND COPPER CABLE LUGS TO MATCH OWNER'S ALUMINIUM CABLES, THE SIZE OF WITCH SHALL BE INTIMATED LATER. TERMINAL BOX SHALL BE CAPABLE OF BEING ROTATED THROUGH 180° IN STEPS OF 90°. IT SHALL HAVE A DEGREE OF PROTECTION OF IP–55. IT SHALL ALSO BE SUITABLE TO WITHSTAND THE FAULT LEVEL OF 50 KA FOR 0.25 SECONDS.
4.10	SPACE HEATERS	:	TO BE PROVIDED AS PER DESIGN
4.11	VOLTAGE	:	240 VOLTS A.C.

5.0 SPECIAL REQUIREMENTS:

5.1 SEPARATE TERMINAL BOX FOR WINDING (ARMATURE AND FIELD) AND SPACE HEATERS SHALL BE PROVIDED. THE MOTOR WOULD OPERATE IN AN ENVIRONMENT OF OIL FUMES.

5.2 THE MOTOR SHALL BE RE-WOUNDABLE.
5.3 THE MOTOR SHALL HAVE ON LINE GREASING FACILITY.
5.4 THE MOTOR CONSTRUCTION SHALL BE SUITABLE FOR EASY DISASSEMBLY AND REASSEMBLY.
5.5 MOTOR SHALL BE PAINTED WITH PAINT SUITABLE FOR WORKING CONDITION AND ITS COLOUR SHALL BE INTIMATED LATER ON.
5.6 THE MOTOR SHALL BE THOROUGHLY DEGREASED AND SHARP EDGES AND SCALES REMOVED AND TREATED WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL PAINT. FAN SHALL ALSO BE PAINTED TO WITHSTAND CORROSION.

6.00 TESTS AT MANUFACTURER'S WORKS:-

(i) MOTOR AFTER COMPLETE ASSEMBLY SHALL BE SUBJECTED TO BOTH TYPE AND ROUTINE TESTS AS PER IS: 4722. TYPE TEST SHOULD NOT BE MORE THAN 5 YEARS OLD w.r.t. DATE OF ORDERING.
(ii) IN ADDITION THE FOLLOWING TESTS SHALL ALSO BE CARRIED OUT.
(a) DEGREE OF PROTECTION TEST TO CONFORM TO THE SPECIFIED DEGREE OF PROTECTION (TYPE TEST).
(b) 20% OVERSPEED TEST FOR 2 MINUTES (ROUTINE TEST).
(c) MEASUREMENT OF VIBRATION (ROUTINE TEST) AS PER IS: 12075.
(d) MEASUREMENT OF NOISE AS PER IS: 12065. MOTOR NOISE LEVEL SHALL BE LIMITED SO AS TO ACHIEVE PUMP-MOTOR SET NOISE LEVEL AS GIVEN IN CLAUSE 7.4 ON PAGE-3.

7.0 DOCUMENTS TO BE SUPPLIED WITH OFFER:-

THESE SHALL BE SUPPLIED IN TWO COPIES EACH.

7.1 TYPE AND FRAME SIZE.
7.2 STARTING TIME IN SECONDS.
7.3 WITH 100% VOLTAGE AT TERMINALS.
7.4 WITH 85% VOLTAGE AT TERMINALS.
7.5 WITH 80% VOLTAGE AT TERMINALS.
7.6 SAFE STALL TIME AT 100% RATED VOLTAGE UNDER HOT CONDITION.
7.7 MOTOR GD VALUE.
7.8 WEIGHT OF MOTOR / ROTOR
7.9 EXPECTED LIFE OF BEARING.
7.10 TYPE AND SIZE OF CABLE FOR WHICH GLAND IS PROVIDED IN THE THE TERMINAL BOX.
7.11 MOTOR KW RATING CALCULATION . W.R.T PUMP REQUIREMENT.
7.12 VALUE OF STARTING RESISTANCE / RESISTANCES.
7.13 DATA IN RESPECT OF ALL ITEMS MENTIONED AT PARA 1.0 TO 5.0 OF ANNEXURE-I.

8.0 DOCUMENTS TO BE FURNISHED WITHIN FOUR WEEKS OF PLACEMENT OF ORDER.

8.1 SIX HARD COPIES AND ONE SOFT COPY (IN PDF FORMAT) OF MOTOR DATA SHEET AND G.A. DRAWING.
8.2 DRAWING SHOWING TERMINAL DETAIL OF ALL TERMINALS AND LOCATION AND DIMENSION OF TERMINAL BOXES.
8.3 ROTOR WEIGHT AND TOTAL MOTOR WEIGHT.
8.4 CHARACTERISTIC CURVES OF THE MOTOR.
9.0 SIX COPIES OF TESTS CARRIED OUT AS PER CLAUSE NO. 6.0 ON EACH MOTOR SHALL BE FURNISHED TO BHEL FOR SCRUTINY AND APPROVAL. ONLY ON ACCEPTANCE FROM BHEL SIDE, MOTOR CAN BE CONSIDERED SUITABLE FOR DISPATCH.

ANNEXURE–II

DATA TO BE FURNISHED BY BIDDER ALONGWITH OFFER FOR JACKING OIL PUMP

1.0 EQUIPMENT AND SERVICES OFFERED

PLEASE STATE WHETHER THE FOLLOWING EQUIPMENT SERVICE AS SPECIFIED IN THE DATA SHEETS ARE OFFERED OR NOT.

1.1	PUMP AS PER SPECIFICATION	YES/NO
1.2	MOTOR/MAKE	YES/NO
1.3	NECESSARY INSTRUMENTS, TEST CONNECTIONS.	YES/NO
1.4	BASE PLATE AS PER DRAWING.	YES/NO
1.5	COMPANION FLANGES	YES/NO
1.6	SPARE PARTS	YES/NO
1.7	MAINTENANCE AND SPECIAL ERECTION TOOLS.	YES/NO
1.8	COMMISSIONING OF THE SET.	YES/NO
1.9	NO. OF PUMPS OFFERED.	

2.0 DESIGN AND PERFORMANCE.

2.1	DESIGNED CAPACITY OF EACH PUMP.	M^3/hour
2.2	NORMAL DISCHARGE PRESSURE	
2.3	EFFICIENCY	
2.4	RATED SPEED	
2.5	PERFORMANCE GUARANTEED WHEN INSTALLED AS PER GIVEN ARRANGEMENT.	YES/NO
2.6	PUMP b.h.p./Kw AT RATED CAPACITY	
2.7	MAXIMUM ALLOWABLE SUCTION LIFT (FOR MINIMUM NPSH REQUIRED)	
2.8	MAXIMUM DISCHARGE PRESSURE FOR WHICH PUMP IS SUITABLE.	
2.9	PARTY SHALL INFORM THE FILTERATION LEVEL OF THE FLOW MEDIA FOR PROPER FUNCTIONING OF PUMP.	

3.0 MATERIAL OF CONSTRUCTION

3.1	CASING
3.2	DRIVING AND DRIVEN SPINDLE SCREW
3.3	BASE PLATE
3.4	WEARING RINGS
3.5	TYPE OF BEARINGS USED
3.6	TYPE OF COUPLING
3.7	PACKING

4.0 CONNECTIONS

4.1	SUCTION SIZE
4.2	DISCHARGE SIZE

5.0 DRAWINGS

5.1	GENERAL ARRANGEMENT AND SECTIONAL DRAWING ENCLOSED WITH OFFER.	YES/NO

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हस्ताक्षर एवं दिनांक SIGN & DATE 13/7/07
समग्री सूची संख्या को अधिक्रमित करता है SUPERSEDES INVENTORY NO.
दिनांक एवं हस्ताक्षर SIGN & DATE

6.0 **WEIGHT SCHEDULE**

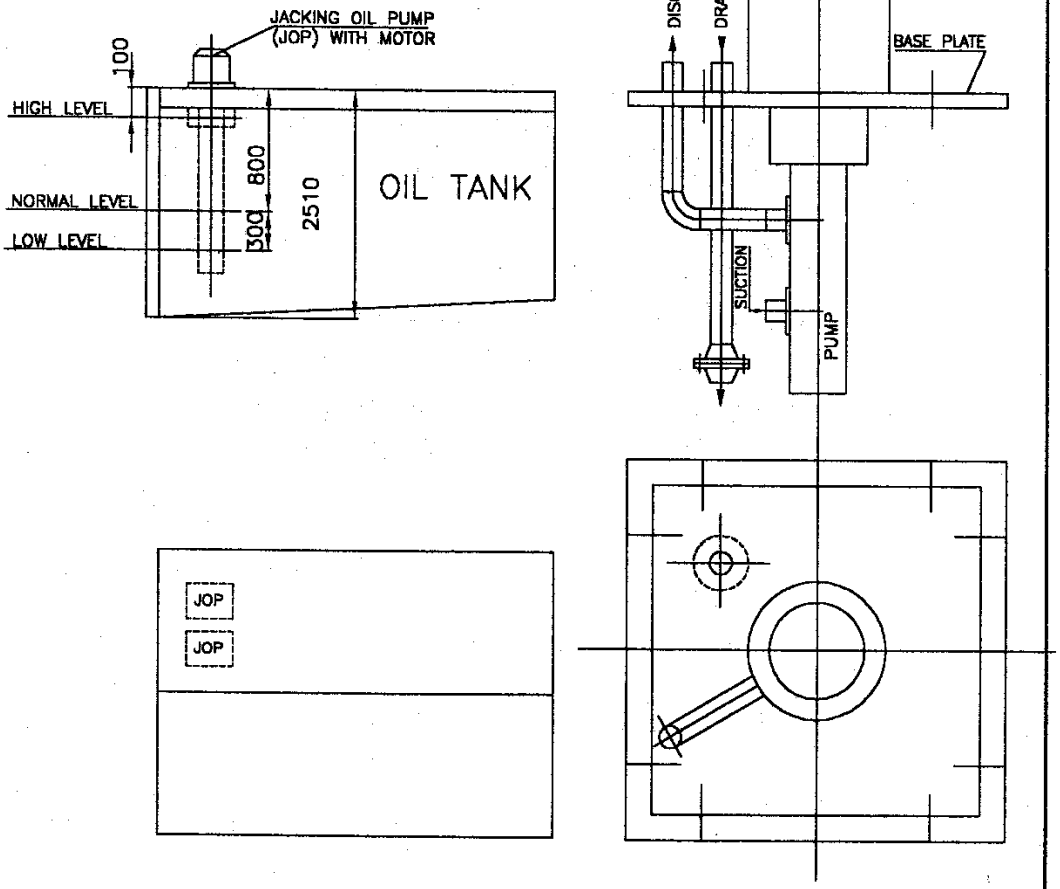
6.1 WEIGHT OF PUMP
6.2 WEIGHT OF MOTOR

7.0 **CHARACTERISTIC CURVES**

7.1 POWER CONSUMPTION / DISCHARGE PRESSURE
7.2 DISCHARGE QUANTITY / DISCHARGE PRESSURE
7.3 DISCHARGE QUANTITY / EFFICIENCY
8.0 ANY DEVIATION TAKEN AGAINST SPECIFICATION. YES/NO
9.0 DEVIATIONS TAKEN AS MENTIONED HERE
10.0 HYDRAULIC TEST PRESSURE

CROSS REFERRED STANDARDS: IS:5 , IS:2253 , IS:2254 , IS:3202 , IS:4722 , IS:12075 , VDMA:24284.

OIL TANK ARRANGEMENT



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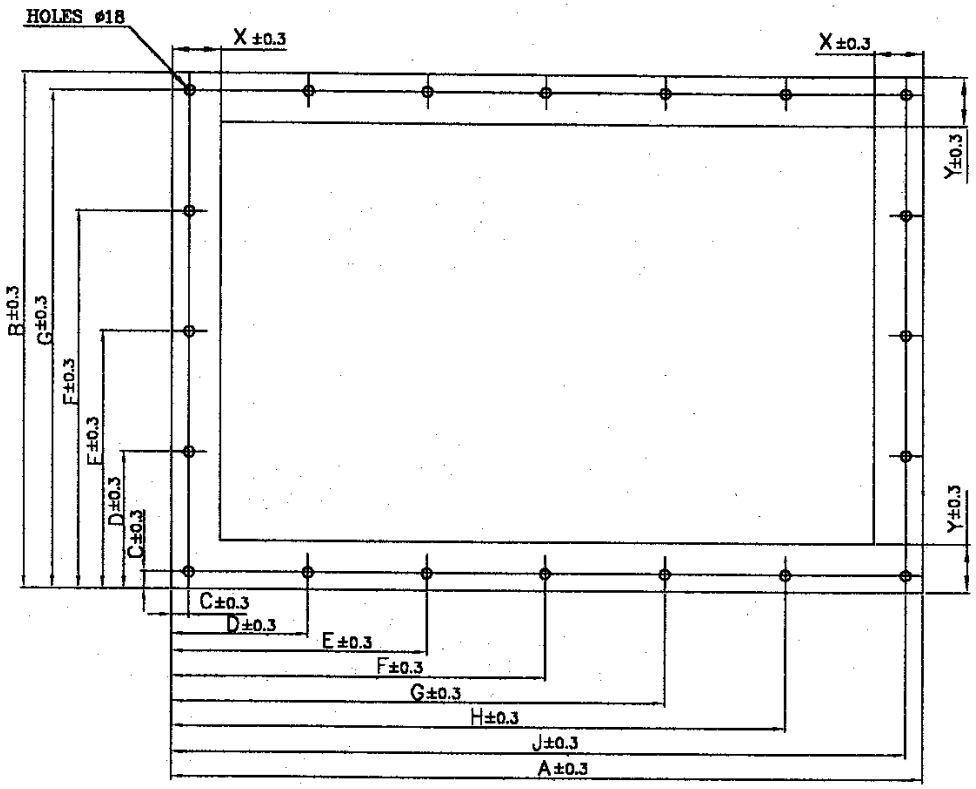
BED PLATE EXISTING ON OIL TANK



BED PLATE TYPE	A ±0.3	B±0.3	C ±0.3	D ±0.3	E±0.3	F ±0.3	G±0.3	H ±0.3	J ±0.3	X±0.3	Y ±0.3	NO. OFF HOLES
AA	700	700	50	250	450	650	–	–	–	80	80	12
BB	700	700	35	245	455	665	–	–	–	60	60	12
CC	1320	900	30	240	450	660	870	1080	1290	85	85	20

TECHNICAL SPECIFICATION FOR JACKING OIL PUMP SET (A.C.)

1.0 INTENT OF SPECIFICATION:-

THIS SPECIFICATION IS INTENDED TO COVER DESIGN, MANUFACTURE, ASSEMBLY, TESTING AND SUPPLY OF PUMPING SETS COMPLETE WITH FOUNDATION BASE PLATE, ANCHOR BOLTS, LIFTING LUGS, COUPLING, AND OTHER ACCESSORIES INCLUDING MOTOR AND THEIR COMMISSIONING AT POWER STATION TO WHICH BHEL SUPPLIES THE EQUIPMENT.

THE PUMPING SETS ARE INTENDED FOR OPERATION IN CONJUNCTION WITH STEAM TURBINES AND SHOULD BE SUITABLE FOR CONTINUOUS OPERATION AT AN AMBIENT TEMPERATURE OF 50°C + 90% HUMIDITY.

2.0 FUNCTION:-

JACKING OIL PUMP COMES IN OPERATION IN CONJUNCTION WITH THE BARRING OPERATION OF THE TURBINE.

3.0 APPLICABLE CODE/STANDARD:- IS:4722, VDMA 24284.

4.0 OIL SPECIFICATION:-

THE MEDIUM HANDELED IS TURBINE OIL OF VISCOSITY CLASS ISO VG46. THE OIL CAN BE SERVOPRIME 46° OF INDIAN OIL CORPORATION OR TURBOL 46 OF BHARAT PETROLEUM OR SHELL TURBOL 46 OF BHARAT SHELL LTD.

KINEMATIC VISCOSITY AT 65°C/20°c	: 16 cs/100 cs
SPECIFIC GRAVITY AT 65°c	: 0.8488
FLASH POINT	: 200°c (min)
OPERATIONAL TEMPERATURE	: 65°c
POUR POINT	: −6.6°c (max.)

5.0 PUMP SPECIFICATION:–

5.1 IDENTIFICATION NO. TO BE MENTIONED ON NAME PLATE AS FOLLOWS:–
: MAV 31 AP 001 AND MAV 32 AP 001

5.2 TYPE SCREW TYPE POSITIVE DISPLACEMENT

DESIGN TEMPERATURE = 100°C , OPERATING TEMPERATURE = 65°C

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Litre/Sec)	NORMAL DISCHARGE PRESSURE (Bar)
VAR. 1	1.26	120
VAR. 2	1.80	140
VAR. 3	1.68	189
VAR. 4	1.25	182
VAR. 5	2.25	182
VAR. 6	1.53	178
VAR. 7	1.33	182
VAR. 8	1.27	182
VAR. 9	1.84	178

VARIANT NUMBER	NORMAL DISCHARGE CAPACITY (Litre/Sec)	NORMAL DISCHARGE PRESSURE (Bar)
VAR. 10		
VAR. 11		
VAR. 12		
VAR. 13		
VAR. 14		
VAR. 15		
VAR. 16		
VAR. 17		
VAR. 18		

PUMP SHALL BE SUITABLE FOR MOUNTING VERTICALLY ON THE OIL TANK. BASE PLATE OF PUMP SHALL MATCH THE COUNTER FLANGE PROVIDED ON THE TANK AS PER SKETCH ON PAGE 13. SMOOTH FUNCTIONING IS ENSURED BY MAINTAINING OIL LEVELS AS DEPICTED IN THE ARRANGEMENT ON PAGE 12.

5.3 DURING INITIAL START UP IN WINTER, OIL TEMPERATURE MAY GO AS BELOW AS 20°C.

6.0 MOTOR:–

A SUITABLE MOTOR CONFORMING TO THE PUMP REQUIREMENTS SHALL BE SUPPLIED. FOR DETAILS ON MOTOR, PLEASE REFER ANNEXURE–I.

7.0 DESIGN AND CONSTRUCTION OF PUMP:–

ALL MATERIALS USED IN THE CONSTRUCTION OF THE PUMPS SHALL BE SELECTED FROM THE RANGE OF MATERIAL MOST APPROPRIATELY SUITABLE FOR THE PURPOSE AND SERVICE CONDITIONS. THE BIDDER SHALL FURNISH ALONGWITH THE OFFER, MATERIAL SPECIFICATION FOR ALL THE COMPONENTS TO BHEL FOR THEIR REVIEW AND ACCEPTANCE BY BHEL/OWNER. BHEL/OWNER RESERVES THE RIGHT TO ASK FOR CHANGES IN MATERIAL. THE SIZE SHALL BE STANDARDISED SO AS TO ENSURE INTERCHANGEABILITY.

7.1 SPECIAL TOOLS AND TACKLES

ONE SET OF TOOLS REQUIRED FOR ERECTION, OPERATION AND MANTENANCE OF THE PUMPING SETS SHALL BE SUPPLIED TOGETHER WITH EACH PUMP. LIST OF THESE TOOLS SHALL BE SUBMITTED ALONGWITH THE OFFER.

7.2 THE MATERIALS OF CONSTRUCTION OF THE PUMPS SHALL BE SUCH AS TO RESIST CORROSION AND EROSION AND SHALL GIVE A LONG TROUBLE FREE SERVICE.

7.3 THE SUPPLIER SHALL ALSO FURNISH THE METHOD AND FREQUENCY OF LUBRICATION OF THE BEARINGS AND QUANTITY AND TYPE OF LUBRICANT REQUIRED FOR NORMAL OPERATION. BUT LUBRICATION OF BEARINGS WITH THE OIL BEING HANDLED IS PREFERED.

7.4 THE DESIGN SHALL BE SUCH AS TO KEEP THE FRICTIONAL LOSS AND WEAR CAUSED BY END THRUST TO THE MINIMUM. IT WILL ALSO ENSURE MINIMUM WEAR AND CAVITATION IN MECHANICAL SEALS AND BEARINGS. LONG AND TROUBLE FREE SERVICE SHALL BE ENSURED. THE ROTORS OF THE PUMP SHOULD BE DESIGNED IN SUCH A WAY SO THAT MINIMUM VIBRATIONS ARE EXPERIENCED. THE SOUND PRESSURE LEVEL OF PUMP MOTOR SET SHOULD NOT BE GREATER THAN 85 dBA TO A REFERENCE OF 0.0002 MICRO BAR WHEN MEASURED AT A DISTANCE OF 1.5 METERS ABOVE FLOOR LEVEL AND ONE METRE HORIZONTALLY FROM THE BASE OF EQUIPMET AND VIBRATIONS ARE IN THE PERMISSIBLE RANGE AS PER VDI 2056.

7.5 SEALS MUST COMPLY WITH THE FOLLOWING PROPERTIES :-

(a) READY ACCESS AND AMENABILITY FOR MAINTENANCE WORK .
(b) NO CONTAMINATION OF THE MEDIUM FROM MATERIAL ABRADED FROM THE SEALS.
(c) NO SEEPAGE OF LUBRICANTS INTO THE FLOW MEDIUM .
(d) MINIMUM LEAKAGE LOSSES WITH THEIR CONTROLLED REMOVAL.

7.6 TO FACILITATE TRANSPORT AND ERECTION, LIFTING HOOKS OR ERECTION EYES SHALL BE FITTED AT SUITABLE POINTS ON THE COMPONENTS. THEIR LOCATIONS MUST BE SHOWN ON THE DIMENSIONAL DRAWING.

7.7 PUMP BEARINGS SHALL BE DESIGNED SO AS TO ASSURE 50,000 hrs CONTINUOUS SERVICE FOR FRICTION BEARINGS & 30,000 hrs FOR BALL & ROLLER BEARINGS.

7.8 THE MECHANICAL DESIGN SHALL ALLOW EASY ACCESS TO VARIOUS PARTS OF CARRYING OUT MAINTENANCE WORK.

7.9 THE DISCHARGE BRANCH OF THE PUMP SHALL BE TAKEN OUT ABOVE THE BASE PLATE BY THE SUPPLIER.

7.10 THE PUMPS SHALL BE PROVIDED WITH DRAINAGE AND VENTING DEVICES.

7.11 ALL SYSTEM PARTS CARRYING OIL SHALL BE OF OIL TIGHT CONSTRUCTION COMPRESSION-TYPE FITTINGS ARE NOT PERMISSIBLE.

7.12 FOR SCREW PUMPS RUNNING AT SUBCRITICAL SPEEDS, IT SHALL BE ENSURED THAT THE CRITICAL SPEED LIES ABOVE THE MAXIMUM SPEED ATTAINABLE DURING OPERATION WITH A MINIMUM MARGIN ON 15% OF RATED SPEED. FOR PUMPS RUNNING AT SUPER CRITICAL SPEEDS, IT SHALL BE ENSURED THAT THERE IS DEFFERENCE OF SUFFICIENT MAGNITUDE (NOT LESS THAN 20%) BETWEEN THE OPERATING SPEED AND THE BORDER IN CRITICAL SPEEDS. ALLOWANCES SHALL BE MADE FOR THE TYPE OF COUPLING BETWEEN THE PUMP AND MOTOR WHILE CALCULATIN THE CRITICAL SPEEDS.

ALLOWANCES SHALL BE MADE FOR THE TYPE OF COUPLING BETWEEN THE PUMP AND MOTOR WHILE CALCULATING THE CRITICAL SPEEDS.

7.13 COUPLING

SUITABLE COUPLING WITH GUARDS SHALL BE PROVIDED FOR COUPLING PUMP WITH MOTOR. IT SHALL BE DESIGNED TO FACILITATE EASY ALIGNMENT. ONE SET OF COUPLING BOLTS SHALL BE SUPPLIED IN SPARE.

7.14 FOUNDATION

THE PUMP SHALL BE MOUNTED ON THE OIL TANK AND HUNG FROM BED PLATE AT THE TANK TOP INTO THE TANK. FOR FURTHER DETAILS PLEASE REFER PAGE NO. 12 AND 13. ALL THE SEATING MACHINED SURFACES OF BED PLATE TO BE MAINTAINED FOR 0.5 mm FLATNESS.

8.0 QUALITY ASSURANCE, INSPECTION AND TESTING

(a) THE MANUFACTURER SHALL CONDUCT ALL TESTS REQUIRED TO ENSURE ALL THE COMPONENTS PART OF THE JACKING OIL PUMP OFFERED, CONFORM TO THE REQUIREMENTS OF THE SPECIFICATION AND IN COMPLIANCE WITH REQUIREMENTS OF APPLICABLE CODES AND STANDARDS.

(b) THE BIDDER SHALL SUBMIT ALONGWITH HIS OFFER QUALITY PLAN.

8.1 THE PARTICULARS OF THE PROPOSED SHOP TESTS AND PROCEDURES FOR THE TESTS SHALL BE SUBMITTED TO BHEL/ITS CUSTOMER FOR APPROVAL ALONGWITH QUALITY PLAN.

8.2 THE MATERIAL SHALL BE DESPATCHED ONLY AFTER INSPECTION AND CLEARENCE OF MATERIAL BY BHEL OR ITS CUSTOMER AND APPROVAL OF TEST CERTIFICATE BY BHEL/ITS CUSTOMER.

8.3 THE MINIMUM TESTS/CHECKS TO BE CARRIED OUT ON THE JACKING OIL PUMP AS ENVISAGED BY BHEL ARE GIVEN BELOW. THIS IS, HOWEVER, NOT INTENDED TO FORM A COMPREHENSIVE TESTING PROGRAMME AS IT IS SUPPLIERS RESPONSIBLITY TO PREPARE THE DETAILED QUALITY PLAN, WHICH SHOULD ALSO INCLUDE TESTS/CHECKS CARRIED OUT BY SUPPLIER AS A PART OF THEIR NORMAL PARACTICE . THIS QUALITY PLAN IS SUBJECT TO THE APPROVAL OF BHEL /ITS CUSTOMER AND BHEL/ITS CUSTOMER RESERVES THE RIGHT TO ASK FOR ANY MORE CHECKS AT THE TIME OF QUALITY PLAN FINALISATION.

8.3.1 TESTING OF MATERIALS

THE MATERIAL OF EACH COMPONENT SHALL BE TESTED AS PER RELEVENT SPECIFICATION FOR ITS CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES, VIZ. YS, UTS, IMPACT, % ELONGATION % RA ETC. AND NDT, UT ON SHAFT, MPI ON SCREWS AND CASING ETC. TO ENSURE FREEDOM FROM SURFACE AND SUB-SURFACE DEFECTS SHALL BE CARRIED OUT.

8.3.2 FOLLOWING TESTS SHALL BE CARRIED OUT DURING VARIOUS STAGES OF MANUFACTURE AT MANUFACTURER WORKS.

(a) CHECK FOR DIMENSIONS OF ALL COMPONENT PARTS INCLUDING SURFACE FINISH, AXIAL AND RADIAL RUN OUT OF SHAFT ETC.

(b) NON-DESTRUCTIVE EXAMINATION :- UT FOR SCREW BLANKS & DPT/MPI ON SCREWS TO BE CARRIED OUT TO ENSURE SURFACE / SUB-SURFACE DEFECTS.

(c) CHECK THE CONDITION OF THE OIL SEALS AND ANY SEEPAGE OF OIL THROUGH SEALS ETC.

(d) HYDRAULIC TESTING OF THE CASING AND OTHER PRESSURE PARTS SHALL BE AS PER VDMA 24284.

(e) CHECK FOR DIRECTION OF ROTATION OF PUMP.

(f) PERFORMANCE TEST WITH CALIBRATED TEST BED MOTOR FOR VERIFICATION OF PUMP CHARACTERISTICS, VIZ. DISCHARGE AT THE GIVEN PRESSURE SCHEDULE OF POWER CONSUMPTION, NOISE AND VIBRATION LEVEL AS PER VDMA 24284.

(g) STRIP DOWN TEST TO CHECK THE CONDITION OF BEARING, MECHANICAL CLEARANCES AND AXIAL PLAY OF SHAFT ETC.

8.3.3 AFTER TESTING THE PUMP, ALL THE SURFACES AND INTERNALS SHALL BE THOROUGHLY CLEANED, DRIED AND CONSERVED. ALL METALLIC SURFACES EXCEPT BRIGHT PARTS EXPOSED TO WEATHER SHALL BE GIVEN A SUITABLE PRIMING COAT AND THEN TWO COATS OF APPROVED PAINTS. ENSURE ASSEMBLY OF ALL THE COMPONENTS OF PUMP AS ONE UNIT AND PACK IN WATER AND DUST PROOF PACKAGE. THE PACKAGES SHOULD BE SUFFICIENTLY STRONG TO SAFEGAURD AGAINST ANY DAMAGE DURING TRANSIT AND IS SAFE FOR TWO YEARS IN A VERY DAMP ATMOSPHERE.

8.3.4 TEST CERTIFICATES INDICATING THE ACTUAL TEST RESULTS OF MATERIAL TESTING, NDT, HYDRAULIC TEST, PERFORMANCE TEST, STRIP DOWN EXAMINATION Etc. SHALL BE FURNISHED.

9.0 PRE–APPROVAL DOCUMENTS AT THE TIME OF OFFER

9.1 ASSEMBLY DRAWING WITH PART LISTS, NOZZLE SIZES AND THEIR COORDINATES, BASE PLATE DETAILS AND CROSS SECTION ARRANGEMENT ALONGWITH STATIC LOADING.

9.2 CALCULATIONS WITH NECESSARY DRAWINGS (TORQUE/SPEED CHARACTERISTICS Etc), POWER REQUIREMENTS, TORQUE SETTING VALUE FOR MOTOR TRIP, PERMISSIBLE TORQUE VALUE FOR KEY AND POWER SHAFT.

9.3 MAXIMUM MAGNETIC AND NON–MAGNETIC PARTICLE SIZE, WHICH CAN PASS THROUGH PUMP SCREW CLEARANCE WITHOUT DAMAGING THE PUMP SHALL BE SPECIFIED IN THE OFFER.

9.4 QUALITY PLAN WITH DETAILS OF QUALITY LEVELS AND MANUFACTURING TOLERANCES. THIS SHOULD GENERALLY CONFIRM TO VDMA 24284. GENERALLY ACCEPTED ENGINEERING PRACTICES, IN PARTICULAR VDMA CODES AND STANDARDS OR EQUIVALENT SHALL BE APPLIED AND TAKEN INTO ACCOUNT FOR DESIGN OF SCREW PUMPS. THE CODES OF STANDARDS APPLIED IN EACH CASE SHALL BE SPECIFIED IN THE OFFER.

9.5 FOR DOCUMENTATION ON MOTOR, PLEASE REFER ANNEXURE–I. EXAMINATION OF THE PRE–APPROVED DOCUMENTS BY BHEL SHALL NOT RELIEVE THE MANUFACTURER AND HIS SUBCONTRACTORS OF THEIR RESPONSIBILITIES.

THE PRE–APPROVED DOCUMENTS SHALL FORM THE BASIS FOR THE ORDER. NO CHANGES SHALL BE MADE WITHOUT APPROVAL FROM BHEL.

10.0 DOCUMENTS TO BE SUPPLIED AFTER THE PLACEMENT OF ORDER:

THESE SHALL BE SUPPLIED EITHER IN FIVE COPIES EACH OR TWO COPIES AND A SET OF REPRODUCIBLE. SCHEDULE OF DOCUMENTS SHALL BE AS FOLLOWS:

10.1	CONTRACTUAL DRAWINGS	– 8 WEEKS
10.2	OVERHAUL AND SPARE PARTS LISTS	– 8 WEEKS
10.3	EQUIPMENT DESCRIPTION	– 8 WEEKS

10.4	TEST CERTIFICATE OF ALL TESTS AS PER QUALITY PLAN, DRAWINGS DURING VARIOUS STAGES OF MANUFACTURE. ALSO REFER CLAUSE 8.2 AND 8.3.4 ABOVE.	– BEFORE DESPATCH
10.5	LIST OF TOOLS AND TACKLES	– 8 WEEKS
10.6	THE STATIC AND DYNAMIC LOADING DETAILS ON SUPPORT/FOUNDATION SHOULD BE FURNISHED.	– 8 WEEKS – 12 WEEKS

10.7 FOR DOCUMENTATION ON MOTOR, PLEASE REFER ANNEXURE I.

10.8 O & M MANUALS (10 HARD COPIES+2CD)

11.0 NAME PLATE IDENTIFICATION MARKINGS SHOULD BE AS FOLLOWS:

11.1 TYPE / DESIGNATION

11.2 MANUFACTURER

11.3 MANUFACTURER'S WORKS NO.

11.4 YEAR OF MANUFACTURING

11.5 PURCHASER'S ORDER NO.

11.6 VOLUMETRIC FLOW (l/m)

11.7 DISCHARGE PRESSURE (Bar/MWC)

11.8 OPERATING TEMPERATURE (°C)

11.9 FLOW MEDIUM.

11.10 SPEED.

11.11 BILINGUAL IN HINDI AND ENGLISH LANGUAGES.

12.0 CLEANING, PAINTING, CONSERVATION & PACKING:

THE SURFACE SHALL BE CLEANED & PREPARED FOR APPLICATION OF THE COATINGS BY BLASTING WITH NON–SILICATIC ABBRASIVE AGENTS. THE PROTECTIVE COATING SHOULD BE OIL RESISTANT TO PREVENT COTAMINATION OF OIL SPECIFIED TO PREVENT THE DETERIORATION OF THE COATING ITSELF. THE SUPPLIER SHALL GIVE EXACT AND PRECISE DETAILS ABOUT THE MEASURES ENVISAGED BY HIM FOR SURFACE PROTECTION, WHICH SHALL BE CHECKD AND APPROVED BY BHEL.

INSTRUCTIONS SHOULD BE ISSUED REGARDING RECONSERVATION, DECONSERVATION ALONGWITH SPECIFICATION OF MATERIAL TO BE USED FOR ABOVE PURPOSE. 100% QUANTITY OF MATERIAL REQUIRED FOR RECONSERVATION AND DECONSERVATION AT SITE DURING STORAGE SHALL BE SUPPLIED ALONGWITH PUMP. ANY SPECIFIC INSTRUCTION TO BE FOLLOWED DURING STORAGE AT SITE TO AVOID ANY SEIZING ETC. SHALL ALSO BE INTIMATED. ALL SUCH INSTRUCTIONS SHALL BE MADE AVAILABLE TO SITE INCHARGE IN A SEPARATE COVER (NOT PACKED WITH PUMP PACKAGE).

THE SUPPLIER SHALL BE RESPONSIBLE FOR ALL LOSS OR DAMAGE DURING TRANSPORTATION, HANDLING AND STORAGE DUE TO IMPROPER PACKING.

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13.0 GENERAL

THE SUPPLIER CAN MAKE SUITABLE OFFERS EVEN IF THERE ARE MINOR DEVIATIONS WHICH DO NOT AFFECT THE EFFICIENT FUNCTIONING OF THE EQUIPMENT. HOWEVER, THE DEVIATIONS MUST BE CLEARLY SPELT OUT. SUPPLIER SHALL ALSO FILL IN THE BLANK DATA SHEET AS PER ANNEXURE–II AND SUBMIT THE SAME ALONGWITH THE OFFER. THE OFFER MAY NOT BE CONSIDERED IF ALL THE TECHNICAL PARTICULARS AND INFORMATIONS CALLED FOR IN THE SPECIFICATION ARE NOT SUBMITTED ALONGWITH THE OFFER.

14.0 GUARANTEE

14.1 THE SUPPLIER SHALL GUARANTEE TROUBLE FREE AND SATISFACTORY OPERATION OF THE EQUIPMENT FOR A PERIOD OF 12 MONTHS AFTER THE INSTALLATION AND COMMISSIONING OR FOR A PERIOD OF 18 MONTHS FROM THE DAY THE EQUIPMENT LEAVES THE SUPPLIER'S WORKS WHICHEVER IS EARLIER.

14.2 THE SUPPLIER SHALL GUARANTEE THE CAPACITY, HEAD AND EFFICIENCY OF THE PUMP AS PER THE TESTED CHARACTERISTIC WITH OIL.

14.3 IF DURING ERECTION AT SITE ANY DEFICIENCY IN A PART IS DETECTED. BHEL SITE REPRESENTATIVE SHALL PREPARE THE ASSESSMENT REPORT AND A COPY OF THE SAME SHALL BE FORWARDED TO THE SUPPLIER. THE SUPPLIER SHALL REPLACE/ RECTIFY THE CONCERNED ITEMS FREE OF CHARGE. THE SUPPLIER IF HE SO DESIRE MAY DEPUTE HIS REPRESENTATIVE TO SITE OTHERWISE THE FINDING OF BHEL REPRESENTATIVE SHALL BE FINAL AND BINDING ON THE SUPPLIER OF PUMPING SET.

14.4 THE SUPPLIER SHALL REPAIR/REPLACE THE DEFECTIVE PARTS AT HIS OWN COST DURING THE GUARANTEE PERIOD.

15.0 SPARES

THE SUPPLIER SHALL QUOTE ITEMWISE PRICE OF RECOMMENDED SPARES FOR 3 YEARS AND 5 YEARS OPERATION RESPECTIVELY.

ANNEXURE – I

SPECIFICATION OF A.C. MOTOR FOR JACKING OIL PUMP

1.0 A SUITABLE MOTOR CONFORMING TO THE JACKING OIL PUMP REQUIREMENT SHALL BE SUPPLIED. THE MOTOR SHALL CONFORM TO IS:325, IS:2253, IS:2254, IS:3202, IS:4029 AND IS:4722 OR EQUIVALENT BS SPECIFICATION. THE MOTOR SHALL MATCH THE REQUIREMENTS OF DRIVEN EQUIPMENT IN ALL RESPECTS. THE MOTOR SHALL ALSO MEET THE FOLLOWING REQUIREMENTS BROADLY. THE MOTOR SHALL MEET ALL INDIAN STATUTORY REQUIREMENTS.

2.0 APPLICATION

TO DRIVE JACKING OIL PUMP FOR SUPPLYING HIGH PRESSURE OIL TO TURBINE BEARINGS.

3.0 TYPE OF MOTOR: SQUIRREL CAGE, INDUCTION MOTOR.

3.1 KW RATING

IT SHALL HAVE AT LEAST 15% RESERVE CAPACITY OVER AND ABOVE REQUIRED POWER TO DRIVE THE PUMP WHEN IT IS DISCHARGING MAX. QUANTITY.

3.2	KW ACTUALLY REQUIRED BY DRIVEN EQUIPMENT UNDER SPECIFIED OPERATION/START UP	:	PUMP CAPACITY
3.3	RATED VOLTAGE	:	415V
	FREQUENCY	:	50HZ
3.4	PERMISSIBLE VOLTAGE & FREQUENCY VARIATION UNDER NORMAL RUNNING CONDITIONS COMBINED VARIATION.	:	±10% VOLT : ±5% FREQUENCY 10% (SUM OF ABSOLUTE VALUES)

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3.5	MINIMUM VOLTAGE REQUIRED UNDER STARTING CONDITIONS TO BRING DRIVEN EQUIPMENT UPTO RATED SPEED.	: 80% RATED
3.6	NO. OF PHASES	: 3 PHASE
3.7	TYPE OF DUTY	: CONTINUOUS
3.8	FULL LOAD SPEED	: IT SHALL BE COMMENSURATE WITH PUMP SPEED AS PER DESIGN.
3.9	FULL LOAD CURRENT	: AS PER DESIGN
3.10	STARTING CURRENT	: NOT TO EXCEED 600% OF RATED (EXCLUSIVE OF IS: TOLERANCES)
3.11	STARTING TORQUE	: 1.3 TIMES (min.) OF RATED TORQUE.
3.12	BREAK DOWN TORQUE	: 2.05 TIMES (min.) OF RATED VALUE.
3.13	EFFICENCY AT FULL LOAD	: 90% (min.)
3.14	POWER FACTOR AT FULL LOAD	: 0.85 (min.)

3.15 MOTOR SHALL BE DESIGNED TO WITHSTAND THE VOLTAGE AND TORQUE STRESSES DEVELOPED DUE TO THE DIFFERENCE BETWEEN THE MOTOR RESIDUAL VOLTAGE AND INCOMING SUPPLY VOLTAGE EQUAL TO 150% OF THE RATED MOTOR VOLTAGE DURING FAST CHANGEOVER OF BUSES.

4.0 STARTING DATA

4.1 STARTING: DOL START AS WELL AS STAR DELTA.

4.2 ACCELERATION TIME WITH FULL LOAD CONNECTED : 3.5±0.5 SECONDS

4.3. LOCKED ROTOR WITHSTAND TIME UNDER HOT CONDITIONS AT RATED VOLTAGE 2.5 SECONDS MORE THAN STARTING TIME.

4.4	PERMISSIBLE STARTING DUTY	: 3 STARTS EQUALLY SPREAD OVER AN HOUR & 2 CONSECUTIVE STARTS FROM HOT CONDITION WITHOUT ANY INJURIOUS HEATING TO WINDINGS.
4.5	OVERLOAD (% OF FULL LOAD) THAT CAN BE CARRIED BY MOTOR WITHOUT IMPAIRING OVERALL PERFORMANCE AND PERIOD FOR WHICH THIS OVERLOAD IS APPLICABLE.	: MOTOR SHALL BE CAPABLE OF RUNNING AT FULL LOAD AT 80% OF RATED VOLTAGE FOR FIVE MINUTES AND 70% OF RATED VOLTAGE FOR 1 SEC.
4.6	LOCATION	: INDOOR
4.7	CLASS OF INSULATION	: CLASS F, FUNGUS RESISTANT, TROPICALISED AS PER IS:3202, WITH TEMP. RISE LIMITED TO THAT OF CLASS B.

4.8 MECHANICAL CONSTRUCTION

4.8.1	SHAFT DISPOSITION MOUNTING	: VERTICAL/FLANGE MOUNTED
4.8.2	METHOD OF CONNECTION TO DRIVEN EQUIPMENT.	: FLANGE FLEXIBLE COUPLING.
4.8.3	DIRECTION OF ROTATION AND CORRESPONDING TERMINAL DESIGNATION.	: TO SUIT PUMP
4.8.4	ENCLOSURE AND VENTILATION	: TOTALLY ENCLOSED FAN COOLED IP–55.
4.8.5	BEARING	: THURST BEARING, MIN. STANDARD LIFE NOT LESS THAN 30,000 WORKING HOURS.

4.8.6	GROUNDING DEVICE	:	SUITABLE ARRANGEMENT SHALL BE PROVIDED FOR EARTHING THE MOTOR AT TWO SEPARATE AND DISTINCT CONNECTION POINTS. DESIGN OF EARTHING CONDUCTOR SHALL BE AS PER IS:4722.
4.8.7	TERMINAL CONNECTORS FOR STATOR LEADS TYPE AND NUMBER.	:	6, NEUTRAL SHALL BE CONNECTED EXTERNALLY IN THE TERMINAL BOX.
4.9	TERMINAL BOX	:	TERMINAL BOX SHALL BE PROVIDED WITH DOUBLE COMPRESSION TYPE BRASS CABLE GLANDS (Nickel Chromium PLAED HEAVY DUTY, CONFIRMING TO BS:6121) AND COPPER CABLE LUGS TO MATCH OWNER'S ALUMINIUM CABLES, THE SIZE OF WITCH SHALL BE INTIMATED LATER. TERMINAL BOX SHALL BE CAPABLE OF BEING ROTATED THROUGH 180° IN STEPS OF 90°. IT SHALL HAVE A DEGREE OF PROTECTION OF IP–55. IT SHALL ALSO BE SUITABLE TO WITHSTAND THE FAULT LEVEL OF 50 KA FOR 0.25 SECONDS.
4.10	WHETHER PHASES SEGREGATED	:	NO.
4.11	SPACE HEATERS	:	TO BE PROVIDED.
4.12	RATED VOLTAGE FOR SPACE HEATERS	:	240 VOLTS

5.0 SPECIAL REQUIREMENTS:

5.01 THE MOTOR SHALL BE REWOUNDABLE.

5.02 THE MOTOR SHALL HAVE ON LINE GREASING FACILITY.

5.03 THE MOTOR CONSTRUCTION SHALL BE SUITABLE FOR EASY DISASSEMBLY AND REASSEMBLY.

5.04 THE MOTOR SHALL BE SUITABLE FOR WORKING IN AN ENVIRONMENT OF OIL FUMES WITHOUT ANY HAZARD.

ENVIRONMENT OF OIL FUMES WITHOUT ANY HAZARD.

5.05 SEPARATE TERMINAL BOX FOR SPACE HEATERS SHALL BE PROVIDED.

5.06 MOTOR SHALL BE PAINTED WITH PAINT SUITABLE FOR WORKING CONDITION AND ITS COLOUR SHALL BE INTIMATED LATER ON.

5.07 THE MOTOR SHALL BE THOROUGHLY DEGREASED AND SHARP EDGES AND SCALES REMOVED AND TREATED WITH ONE COAT OF PRIMER AND TWO COATS OF ENAMEL PAINT. MOTOR FAN ALSO BE PAINTED TO WITHSTAND CORROSION.

6.00 TESTS AT MANUFACTURER'S WORKS:–

(i) MOTOR AFTER COMPLETE ASSEMBLY SHALL BE SUBJECTED TO BOTH TYPE AND ROUTINE TESTS AS PER IS: 4722. TYPE TEST SHOULD NOT BE MORE THAN 5 YEARS OLD w.r.t. DATE OF ORDERING.

(ii) IN ADDITION THE FOLLOWING TESTS SHALL ALSO BE CARRIED OUT:

ADDITIONAL TYPE TESTS:

(a) DEGREE OF PROTECTION TEST TO CONFORM TO THE SPECIFIED DGREE OF PROTECTION. IN CASE THE TEST IS ALREADY CARRIED ON THE SAME FRAME SIZE OF MACHINE, THEN TEST REPORT SHOULD BE FURNISHED.

ADDITIONAL ROUTINE TESTS:

(a) 20% OVERSPEED TEST FOR 2 MINUTES.
(b) MEASUREMENT OF VIBRATION AS PER IS: 12075.
(c) MEASUREMENT OF NOISE AS PER IS: 12065. MOTOR NOISE LEVEL SHALL BE LIMITED SO AS TO ACHIEVE PUMP–MOTOR SET NOISE LEVEL AS GIVEN IN CLAUSE 7.4 ON PAGE–3.

7.0 DOCUMENTS TO BE SUPPLIED WITH OFFER:–

THE OFFER SHOULD BE ACCOMPANIED WITH FOLLOWING DOCUMENTS IN TWO COPIES. THE OFFER WILL NOT BE CONSIDERED IF ALL THESE DOCUMENTS ARE NOT SUPPLIED.

7.1 CHARACTERISTICS AT 80% , 100% AND 110% VOLTAGES:
7.1.1 STARTING CURRENT V/S TIME.
7.1.2 TORQUE V/S SLIP.
7.1.3 THERMAL WITHSTAND CHARACTERISTIC FOR HOT AND COLD CONDITION.
7.2 TYPE AND FRAME SIZE.
7.3 STARTING TIME.
7.3.1 WITH 100% VOLTAGE AT TERMINAL.
7.3.2 WITH 85 % VOLTAGE AT TERMINAL.
7.3.3 WITH 80 % VOLTAGE AT TERMINAL.
7.4 SAFE STALL TIME AT 100 % RATED VOLTAGE UNDER HOT CONDITION.
7.5 POWER (KW) RATING CALCULATION w.r.t. PUMP REQUIREMENT.
7.6 EXPECTED LIFE OF BEARING.
7.7 DATA IN RESPECT OF ALL ITEMS MENTIONED AT PARA 1.0 TO 5.0 OF ANNEXURE I.

8.0 DOCUMENTS TO BE FURNISHED WITHIN FOUR WEEKS OF PLACEMENT OF ORDER (FOR BHEL OR THEIR CUSTOMER'S APPROVAL):–

8.1 SIX HARD COPIES AND ONE SOFT COPY (IN PDF FORMAT) OF MOTOR DATA SHEET AND G.A. DRAWING.
8.2 DRAWING SHOWING TERMINAL DETAIL OF ALL TERMINALS AND LOCATION AND DIMENSION OF TERMINAL BOXES.
8.3 ROTOR WEIGHT AND TOTAL MOTOR WEIGHT.
8.4 CHARACTERISTIC CURVES OF THE MOTOR.

9.0 SIX COPIES OF TESTS CARRIED OUT AS PER CLAUSE NO. 6.0 ON EACH MOTOR SHALL BE FURNISHED TO BHEL FOR SCRUTINY AND APPROVAL. ONLY ON ACCEPTANCE FROM BHEL SIDE, MOTOR CAN BE CONSIDERED SUITABLE FOR DISPATCH.

ANNEXURE–II

DATA TO BE FURNISHED BY BIDDER ALONGWITH OFFER FOR JACKING OIL PUMP

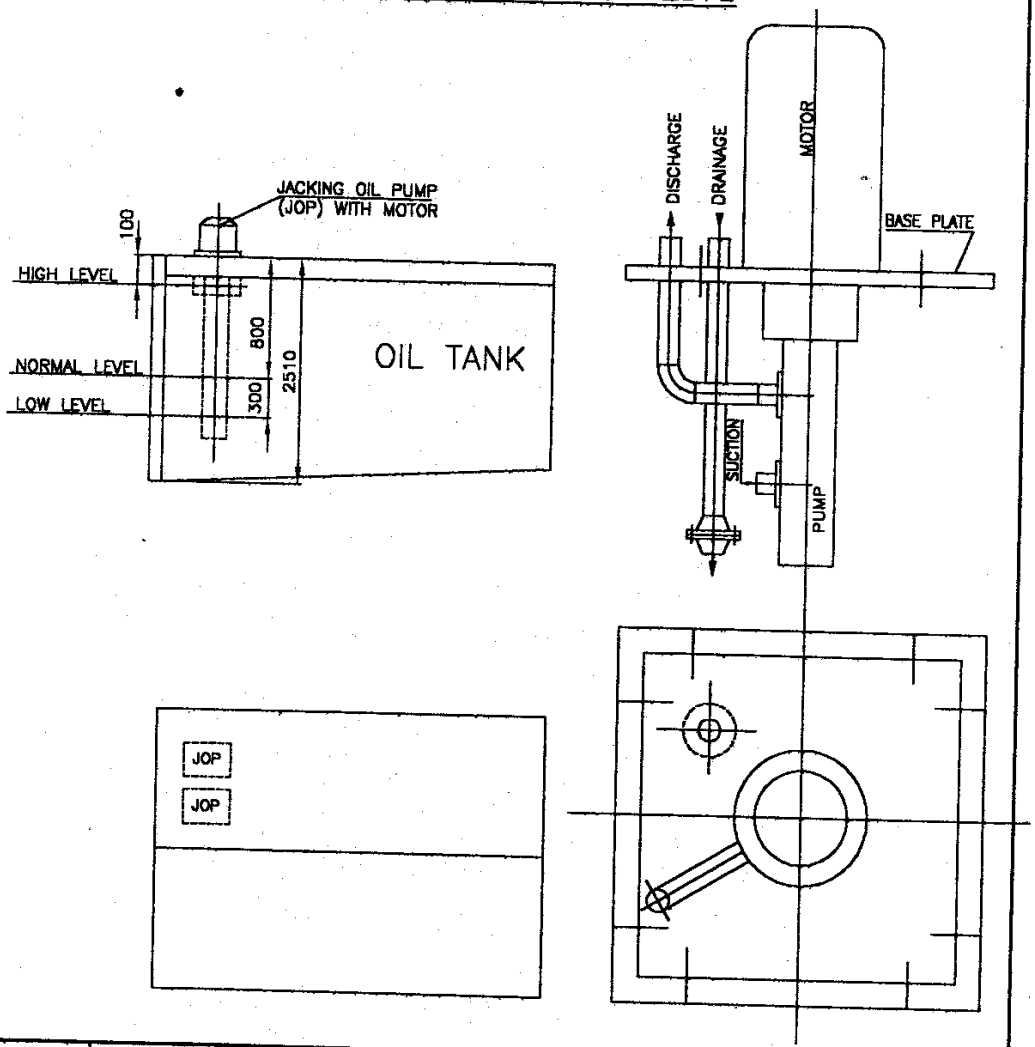
1.0 EQUIPMENT AND SERVICES OFFERED

PLEASE STATE WHETHER THE FOLLOWING EQUIPMENT SERVICE AS SPECIFIED IN THE DATA SHEETS ARE OFFERED OR NOT.

1.1	PUMP AS PER SPECIFICATION	YES/NO
1.2	MOTOR/MAKE	YES/NO
1.3	NECESSARY INSTRUMENTS, TEST CONNECTIONS.	YES/NO
1.4	BASE PLATE AS PER DRAWING.	YES/NO
1.5	COMPANION FLANGES	YES/NO
1.6	SPARE PARTS	YES/NO
1.7	MAINTENANCE AND SPECIAL ERECTION TOOLS.	YES/NO
1.8	COMMISSIONING OF THE SET.	YES/NO
1.9	NO. OF PUMPS OFFERED.	
2.0	DESIGN AND PERFORMANCE.	
2.1	DESIGNED CAPACITY OF EACH PUMP.	M^3/hour
2.2	NORMAL DISCHARGE PRESSURE	
2.3	EFFICIENCY	
2.4	RATED SPEED	
2.5	PERFORMANCE GUARANTEED WHEN INSTALLED AS PER GIVEN ARRANGEMENT.	YES/NO
2.6	PUMP b.h.p./Kw AT RATED CAPACITY	
2.7	MAXIMUM ALLOWABLE SUCTION LIFT (FOR MINIMUM NPSH REQUIRED)	
2.8	MAXIMUM DISCHARGE PRESSURE FOR WHICH PUMP IS SUITABLE.	
2.9	PARTY SHALL INFORM THE FILTERATION LEVEL OF THE FLOW MEDIA FOR PROPER FUNCTIONING OF PUMP.	
3.0	MATERIAL OF CONSTRUCTION	
3.1	CASING	
3.2	DRIVING AND DRIVEN SPINDLE SCREW	
3.3	BASE PLATE	
3.4	WEARING RINGS	
3.5	TYPE OF BEARINGS USED	
3.6	TYPE OF COUPLING	
3.7	PACKING	
4.0	CONNECTIONS	
4.1	SUCTION SIZE	
4.2	DISCHARGE SIZE	
5.0	DRAWINGS	
5.1	GENERAL ARRANGEMENT AND SECTIONAL DRAWING ENCLOSED WITH OFFER.	YES/NO
6.0	WEIGHT SCHEDULE	
6.1	WEIGHT OF PUMP	
6.2	WEIGHT OF MOTOR	
6.3	WEIGHT OF PUMP WITH MOTOR AND BASE FRAME.	
7.0	CHARACTERISTIC CURVES	

7.1	POWER CONSUMPTION / DISCHARGE PRESSURE
7.2	DISCHARGE QUANTITY / DISCHARGE PRESSURE
7.3	DISCHARGE QUANTITY / EFFICIENCY
8.0	ANY DEVIATION TAKEN AGAINST SPECIFICATIONS. YES/NO
9.0	DEVIATIONS TAKEN AS MENTIONED HERE
10.0	HYDRAULIC TEST PRESSURE

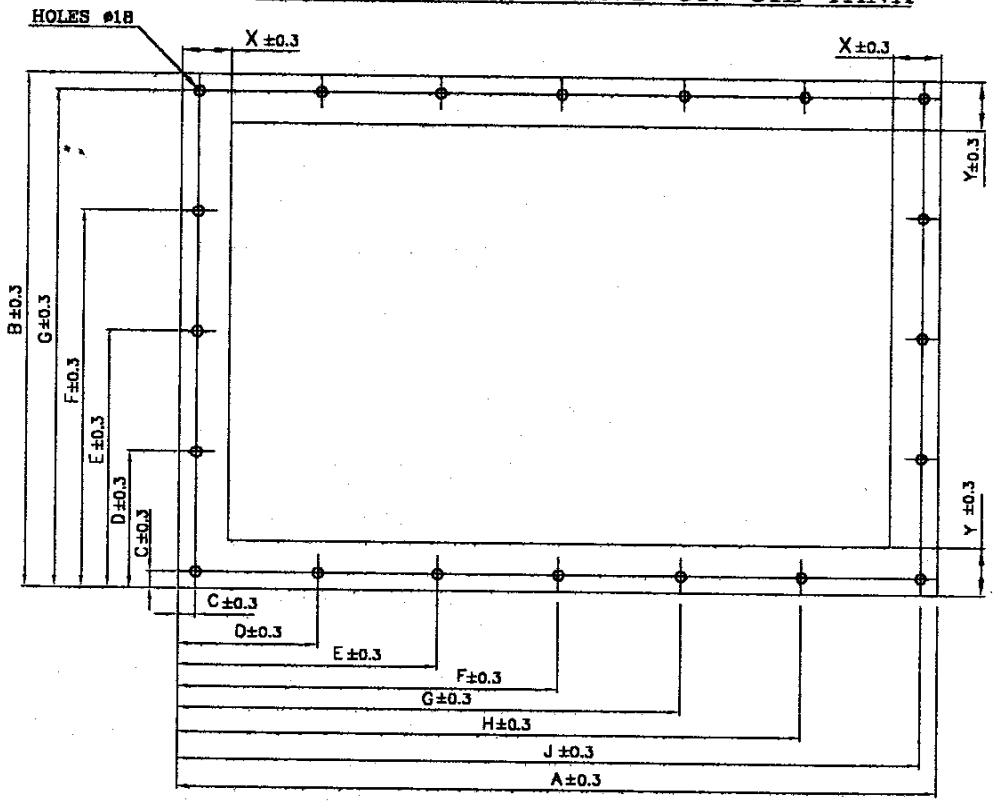
OIL TANK ARRANGEMENT



REV. NO. 08	निर्माणकर्ता WORKED BY	DHARAMPAL	15/6/06
	जांचकर्ता CHECKED BY	ANUJ JAIN	15/6/06

हस्ताक्षर एवं दिनांक SIGN & DATE 19/06
सामग्री सूची संख्या INVENTORY NO. P-5134

BED PLATE EXISTING ON OIL TANK



BED PLATE TYPE	A ±0.3	B±0.3	C ±0.3	D ±0.3	E±0.3	F ±0.3	G±0.3	H ±0.3	J ±0.3	X±0.3	Y ±0.3	NO. OFF HOLES
AA	700	700	50	250	450	650	–	–	–	80	80	12
BB	700	700	35	245	455	665	–	–	–	60	60	12
CC	1320	900	30	240	450	660	870	1080	1290	85	85	20

CROSS REFERRED STANDARDS: IS:325 , IS:2253 , IS:2254 , IS:3202 , IS:4027 , IS:4722 , IS:12065 , IS:12075 , VDMA:24284.

हस्ताक्षर एवं दिनांक SIGN & DATE	21/10/06			
सामग्री सूची संख्या INVENTORY NO.	25134	REV. NO. 08	निर्माणकर्ता WORKED BY	DHARAMPAL	15/6/06
			जांचकर्ता CHECKED BY	ANUJ JAIN	15/6/06

हस्ताक्षर एवं दिनांक SIGN & DATE

समग्री सूची संख्या को अंकित करना है