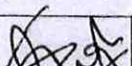
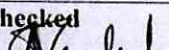


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		Rev. 00
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PURCHASE SPECIFICATION FOR H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

1. SCOPE OF SUPPLY

High pressure, heavy duty, motor driven stationary, air cooled multi stage reciprocating type air compressor, suitable for indoor use, should be of industrial type & designed to run 24x7 or continuous duty and complete with following fittings / instruments / equipment for water depression system / synchronous condenser operation.

- 1.1 Air intake filter.
- 1.2 Air cooled inter coolers (if applicable).
- 1.3 Air cooled after cooler (outlet air temperature must be confirmed in the offer, it should not exceed 10°C-20°C above ambient temperature).
- 1.4 Safety valves between each stage, non-return valves and isolating valves, if any.
- 1.5 Liquid filled pressure gauge of reputed make or OEM'S standard make.
- 1.6 Automatic moisture trap / condensate trap with timer.
- 1.7 Low oil level visual indicator / switch for lubricating oil.
- 1.8 A thermometer gauge & temperature transducer (of reputed make or OEM'S standard make) before the after-cooler for measuring / monitoring the temperature of outlet air and to stop the compressor if temperature of discharged air exceeds a predetermined temperature.
- 1.9 Water/oil separator in delivery line. The water / oil separator shall be equipped with an automatic solenoid operated drain valve to achieve automatic draining during standstill.
- 1.10 Suitable unloader valve/solenoid valve for release of trapped air.
- 1.11 Compressor motor unit with base plate, V-belt drive and belt guard or direct coupled with flexible coupling and high tensile steel fasteners.
- 1.12 Anti-vibration pads / mountings.
- 1.13 Any lubricant / coolant which are required for operation / commissioning & not filled in/supplied with the compressor during transportation have to be supplied in separate cans along with the compressor.
- 1.14 PLC based logic controller (to be supplied only if called in Annexure-I) with necessary status & alarm signal contacts (potential free) for remote use by purchaser. Fixing arrangement (of M/s Hilti make only) with floor/wall shall also be supplied.
- 1.15 Weather proof canopy with space heater (for sites where sub-zero temperature is there) or sound proof canopy (if called in **Annexure-I**)
- 1.16 **Spares:** As per **Annexure-II** or as specified in the enquiry.
- 1.17 Oil heater with thermostat (if called in **Annexure-I**)

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<u>PURCHASE SPECIFICATION FOR</u> <u>H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM</u>		

2. **DESCRIPTION**

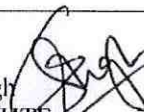
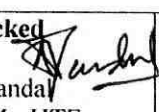
2.1 **Compressor:**

The HP Air compressor shall be installed in a Hydro Electric Project having design parameters as per **Annexure-I**. Vendor has to offer suitable model of compressor of required FAD, considering site conditions and altitude as mentioned in **Annexure-I**. **Calculations for the same to be submitted along with the offer.**

2.2 **Electric Motor:**

The requirements of the electric motor are as follows:-

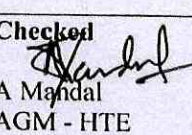
- Motor construction shall be normally to **IS-325/IS12615**.
- Each compressor shall be provided with an electric motor of adequate capacity for the duty capacity. Motor rating shall be **at least 10% in excess** of max. BHP required in the entire range of operation. It should be suitable for continuous duty. **Motor insulation needs to be class F with temperature rise up to class B.**
- Motor shall be designed and manufactured strictly in line with applicable latest edition of Indian Standard (IS). It shall be designed for 415 volts ($\pm 10\%$), 3-phase, 50 Hz ($+5\%$ & -5%) AC supply. Combined variation in voltage & frequency should be within $\pm 10\%$ absolute sum. Motor shall be able to sustain transient over-voltage of 130% of nominal voltage. The motor shall also be capable of stable operation for a period of not less than 5 minutes with a voltage 25 percent below nominal voltage at nominal frequency without injurious overheating. The starting current at full voltage shall not exceed **six** times the full load current in case of DOL and **three** times in case of star delta starter. The motor shall be provided with protective devices against over loading. The speed drop between no load and full load shall not exceed 10% of no load speed.
- Motor shall be TEFC, squirrel cage induction type. The motor insulation (Class F but temperature rise shall be limited to class B insulation at continuous running at 10% overload) shall be resistant to moisture, oil or oil vapor and the motors in general shall be so designed as to suit the tropical climate. Varnished cambric or glass insulation class F shall be used for connection from the windings to the terminals but temperature rise shall be limited to Class B insulation at continuous running at full rated load. Degree of protection shall be **IP-55** or better. Motor shall be suitable for operation in damp location.

Rev. No.	Date of Rev.	Remarks	Approved		
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		Rev. 00
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PURCHASE SPECIFICATION FOR H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

- v) Starting torque of the motor shall be suitable for the compressor application. The pull out torque shall be at least 160% of the rated torque and for intermittently loaded motors 200% of the rated torque.
- vi) Motor shall be provided with terminal box. The terminal box shall be weather proof, closed conduit box type and firmly fixed to the motor frame. The terminal studs shall be so sized as to be adequate for the current duty required and shall be identified. The terminal box shall have approved cable adaptor plates, sealing chambers, cable glands for cable/ conduit entries. The terminal box and terminals shall be provided as per the type of starting of motors i.e. DOL up to 15 kw and above 15 kw it shall be Star-delta unless otherwise specified in **Annexure-I**.
- vii) The arrangement of the terminal box shall be such so as to facilitate installation of cables and allow interchanging of any two phases leads without disturbing the sealing compound, if this is used at cable terminations.
- viii) The motor terminals shall be of the stud type totally enclosed. Terminals, terminal box and cable glands of terminal boxes of motors should be suitable for cable size selected by vendor. For interconnection of motors and starter / control panel the cables and associated auxiliaries shall be supplied by vendor along with compressor, duly wired. The incoming power supply TB in the compressors starter cum controller panel shall be suitable for LT power cables and accordingly suitable cable glands shall be provided in the Starter cum Controller Panel. The sizes and type of cables shall be as follows:-

Sr. No.	KW rating	Mode of starting	Line current	Phase current	Motors & starters outgoing terminal & glands suitable for cable size	Cable type	Starter incomer terminal & glands suitable for cable size	Cable type
1.	7.5	DOL	15.5	NA	4C X 6 sq mm	Cu	4C X 6 sq mm	Cu
2.	11	DOL	22	NA	4C X 6 sq mm	Cu	4C X 6 sq mm	Cu
3.	15	DOL	29	NA	3-1/2C X 25 sq mm	Al	3-1/2C X 25 sq mm	Al
4.	18.5	Star-Delta	34	19.7	4C X 6 sq mm	Cu	3-1/2C X 25 sq mm	Al
5.	22	Star-Delta	40	23.2	4C X 6 sq mm	Cu	3-1/2C X 35 sq mm	Al
6.	30	Star-Delta	53	30.6	3-1/2C X 25 sq mm	Al	3-1/2C X 50 sq mm	Al
7.	37	Star-Delta	65	37.5	3-1/2C X 25 sq mm	Al	3-1/2C X 70 sq mm	Al
8.	45	Star-Delta	78	45	3-1/2C X 35 sq mm	Al	3-1/2C X 95 sq mm	Al
9.	55	Star-Delta	96	55.4	3-1/2C X 50 sq mm	Al	3-1/2C X 120 sq mm	Al
10.	75	Star-Delta	131	75.6	3-1/2C X 95 sq mm	Al	3-1/2C X 150 sq mm	Al
11.	90	Star-Delta	156	90.1	3-1/2C X 120 sq mm	Al	3-1/2C X 185 sq mm	Al
12.	110	Star-Delta	189	109	3-1/2C X 150 sq mm	Al	3-1/2C X 240 sq mm	Al

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		Rev. 00
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PURCHASE SPECIFICATION FOR H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

- ix) The vendor shall have to provide starter panel along with PLC based logic controller for each compressor if specified in Annexure-I. The starter cum controller panel shall have features for accepting start/stop command from remote. The type of remote command (continuous or pulse command (time duration)) shall be clearly specified by vendor in their offer and technical write up shall be supplied with the compressors.

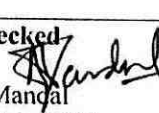
Main & standby compressors shall be operated in synchronism for catering the air pressure requirement. Upon failure of main compressors the standby compressors shall get automatically switched on and fulfill the air pressure requirement. There shall be provision for changing the duty cycle (i.e. any one compressor can be made main or standby) for ensuring the readiness of compressors at any moment of time. This feature can be achieved either through controller or separate hardware provided in the control circuitry.

Features required to be incorporated in the control panel

- Earthing strip to be of tinned copper. Size to be 25 x 6 sq mm.
- Heat dissipation arrangement (ventilation louvers).
- Provision and indication of digital voltmeter, ammeter, hour meter, Phase fail, counter for number of starts etc.
- Lamp test wiring.

The following status & alarm signal contacts (potential free) for each compressor from starter cum control panel (supplied by vendor) shall be provided for remote use by purchaser.

- ON status contact of compressor
- OFF status contact of compressor
- Local & remote operation selection position contacts
- Main & Standby selection position contacts of compressors
- Incoming supply MCCB ON & OFF status contacts
- Compressor motor thermal overload operated contact
- Compressor mechanical faults (comp. temp. high, oil level low etc.) contacts (if any)
- Air pressure low (as available from pressure transmitter) contact
- Air receiver normal (as available from pressure transmitter) contact
- Air pressure high (as available from pressure transmitter) contact
- Valves interlock contacts if any
- Any other contact used in the logic

Rev. No.	Date of Rev.	Remarks	Approved		
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<u>PURCHASE SPECIFICATION FOR</u> H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

When the starter and control panels are not in vendor's scope as per the Annexure-I, following documents for designing of control panels shall be furnished by the vendor.

- Wiring and terminal diagrams along with catalogues for all types of devices.
 - Control philosophy / logics for the compressors.
 - P & I diagram for the complete compressor assembly.
 - Interlocking scheme (if any) required for operation of valves / instruments etc.
 - List of fault alarms generated from the compressors.
 - Wiring and terminal diagram of junction box.
- x) Each motor shall be provided with lifting hooks /eye bolts for handling purpose.
- xi) Motors shall be equipped with lubricators permitting greasing while the motor is running and preventing over lubrication. Additionally, the bearings shall be fitted with grease nipples permitting the use of a universal grease gun.
- xii) Under all operating conditions, the noise level of motor shall not exceed 95 dB (A) if measured from 1 metre distance.
- xiii) In order to prevent undue & harmful vibration, the motor shall be statically and dynamically balanced, vibration displacement or velocity shall be measured in accordance with relevant standards prevailing in the industry. The results for all motor shall be within the "R" (reduced) limits.
- xiv) Each motor shall be tested at manufacturer's works to confirm compliance with the requirements. The vendor shall furnish test certificates for routine tests (for each motor) & type test (for the batch) as per relevant standards prevailing in the industry. Motor shall be of standard frames manufactured by any one of the following reputed makes:
- M/S Kirloskar Electric Co. Ltd.,
M/S Asea Brown Boveri,
M/S Crompton greaves,
M/S Siemens,
M/S Jyoti,
M/S GE,
M/S Bharat Bijlee,
M/S NGEF/GEC Kolkata /Areva,
Motor of compressor manufacturer.

Rev. No.	Date of Rev.	Remarks	Approved		
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		Rev. 00
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<u>PURCHASE SPECIFICATION FOR</u> <u>H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM</u>		

3. DOCUMENTATION

The following documents shall be submitted by the vendor.

3.1 Along with the offer:

Vendor's offer without any of the following documents shall not be entertained & get automatically rejected.

- OGA drawing of compressor motor set showing overall dimensions, mounting details, Bill of Material giving part reference number, weight of compressor motor assembly, type of cable connection for the motor.
- Technical particulars of the compressor as per **Annexure-III**
- Technical particulars of the motor as per **Annexure-IV**
- QA plan in line with BHEL QA plan attached with the enquiry
- P&I diagram along with control schematics & logics and OGA with BOM of starter panel.
- Calculations for selecting the motor rating and FAD for site elevation and temperature
- List of deviations (if any)

If the vendor is unable to fulfill any requirements mentioned in the purchase specification then a list of deviations is to be prepared by the vendor & and the same should be submitted along with the offer. Otherwise it will be understood that the vendor is meeting all the requirements specified in the specifications and deviations will not be allowed after placement of order and at the time of delivery.

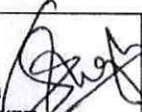
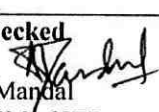
- Filled in check list

3.2 After placement of order:

- QA plan for approval by BHEL/BHEL's customer.
- Detailed GA drg. of compressor-motor with overall dimensions and complete BOM for approval by BHEL/BHEL's customer.
- List of instruments & their technical specification, size, make and model no. etc.
- P&I diagram along with control schematics & logics and OGA with BOM of starter panel for approval by BHEL/BHEL's customer.
- Motor characteristics curves.
- List of spare parts with their part no. etc. for approval.
- Philosophy of control panel including auto drain operation.

IMPORTANT NOTE:

Manufacturing / procurement of components shall commence only after approval of calculations, drawing and QA plan. During evaluation of drawing & calculations submitted by the vendor for approval; modification/ additions which are required for

Rev. No.	Date of Rev.	Remarks	Approved		
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		Rev. 00
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PURCHASE SPECIFICATION FOR H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

satisfactory functioning of the HP compressor and which are required in line with this specification, shall be carried out by the vendor without any price repercussion.

3.3 At the time of supply of equipment

- 3 hard copies of all the drawings & documents along with soft copies.
- 3 copies of test certificates / test reports / inspection records and performance test certificates/ guarantee certificates / calibration certificates of instruments and other equipment as applicable
- 5 sets of O&M manuals along with catalogues, drawings and spare parts list
- In addition to above, all drawings, O&M manual and other documents shall also be furnished in soft copy. The drawing shall be prepared in Auto-Cad latest version
- Shipping / packing lists of the equipment being supplied, shall be furnished as follows
 - To Purchaser (BHEL) - 3 Copies
 - To Customer as per consignee address given in PO - 2 Copies
 - Inside each case / package - 1 Copy of the list of items contained in that case.

Note: The shipping lists should contain following information for each case / package

- List of items contained in the case giving drawing / catalogue no., item no. of BOM, description of item and quantity.
- Case number, dimensions of case, and gross weight of case, net weight of items.

4. GUARANTEE PERIOD

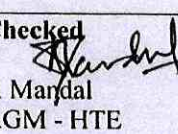
All the equipment must be guaranteed for trouble free operation, good workmanship for a period of 18 months from the date of commissioning of the equipment or 24 months from the date of dispatch whichever is earlier. Vendor shall undertake to replace any material / components free of cost at site if found defective in operation during guarantee period.

5. COMPLETENESS OF EQUIPMENT

Vendor to give compliance certificate stating that the equipment has been manufactured as per the purchase specification in all respects.

6. INSPECTION & TESTING

Final inspection and testing shall be carried out as per approved QA plan & drawing in the presence of BHEL/Third party inspection agency/BHEL's customer at vendor's works before dispatch.

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<u>PURCHASE SPECIFICATION FOR</u> <u>H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM</u>		

Combined performance tests on compressor-motor sets shall be carried out as per relevant standard at vendor's works. Minimum 30 days' notice will be required for Inspection and witness of performance testing.

Note:- Compressor and motor unit shall be tested as a whole; individual testing of compressor and motor is not acceptable. Testing of compressors shall be carried out with respective job motor only. Testing with test rig motor is not allowed.

Final Inspection and Testing shall include the following:-

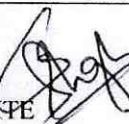
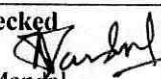
Verification of certificates for calibration of test rig instruments viz. thermometer, pressure gauge etc.

All compressor motor units will be tested for continuous running.

Reliability of workmanship, leak tightness, pressure, temperature, oil consumption for lubrication etc. shall be checked / verified and recorded during running.

Witnessing of routine tests of all compressor/motor sets in accordance with the prevailing international standard in the industry, to ensure the performance of each compressor motor set in terms of the following:

- 1) Capacity output achieved
- 2) Power consumption
- 3) Speed (RPM) of Motor / Compressor
- 4) FAD test by venturi method or tank filling method as per prevailing standards in the industry.
- 5) Delivery pressure
- 6) Temperature at intake and outlet
- 7) Leak tightness at all joints, fittings
- 8) Time for filling up air receiver
- 9) Noise level (*should not exceed 95 dB to a distance of 1 meter from the unit*) in feel free condition as per relevant IS.
- 10) Pressure transducer / Pilot valve functioning
- 11) After cooler safety valve set pressure.
- 12) Operation of inlet and outlet valves, non-return valve on pressure side.
- 13) Air intake filter function (Suction must be noiseless).
- 14) Temperature of motor – Witness temperature rise of motor body during and after routine test of the compressor.
- 15) Record of testing time: Should not be less than 30 minutes to carry out the above routine tests at Sl. No. 1 to 14.
- 16) Interchangeability of all motors with each compressor to be checked.
- 17) Physical verification of all major components shown on supplier's drawing and order & dimensional check of assembly.

Rev. No.	Date of Rev.	Remarks	Approved		
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		Rev. 00
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<u>PURCHASE SPECIFICATION FOR</u> <u>H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM</u>		

Notes:

- The presence of BHEL's representative during testing of motors at manufacturer's works is not required. Motor manufacturer's works' test certificates in accordance with IS 325 will suffice the requirement. Requirements for motor characteristics must be clearly confirmed by the vendor at the time of submission of offer.
- Testing of compressor with test rig motor is **not allowed**. During testing the each compressor must be assembled with the individual / respective contract motor and tested. However the interchangeability of the motors with any compressor to be ascertained as per Sl. No. 16 mentioned above.
- Acceptance or waiver of inspection shall, in no way, relieve the supplier of the responsibility to supply the equipment in conformity with the specification.

7. PAINTING & PROTECTION (See Sl. No. 13 of Annexure-I)

Before dispatch, the compressor and motor are to be painted as per vendor's standard practice (**Shade- Sky blue to RAL 5015**) unless otherwise specified in **Annexure-I**. These are to be protected for long storage.

All items should be dispatched in suitable wooden cases to prevent damage / pilferage during transit.

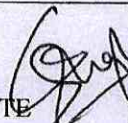
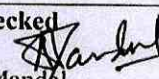
After proving all instruments /fittings with compressor and air receivers the former shall be packed separately in thermocol boxes covered with polyethylene sheet with silica gel and placed in a carton or case with adequate cushioning material to avoid damage / pilferage in transit.

8. ANNEXURES

See attached Annexures- I, II, III, IV, Sample QA plan

9. CHARGES FOR SUPERVISION OF COMMISSIONING

If called in the enquiry (**Annexure-I**), lump sum charges for supervision of commissioning are to be furnished in the offer.

Rev. No.	Date of Rev.	Remarks	Approved		
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			Prepared	Checked	Date of issue
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		Rev. 00
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PURCHASE SPECIFICATION FOR H.P AIR COMPRESSORS OF WATER DEPRESSION SYSTEM		

CHECK LIST

(To be filled in by the vendor and submitted along with the offer)

Sl. No.	Description	Vendor's comments
1	Scope of supply shall be in line with Clause-1 of spec.	Yes / No
2	FAD of compressor at site conditions as per Annexure-I	Yes / No
3	Calculations of FAD as per clause no.2.1 attached with the offer	Yes / No
4	Calculations for selecting the motor rating attached with the offer	Yes / No
5	OGA drg. of compressor motor set showing overall dimensions, mounting details, BOM giving part reference number, weight of compressor motor assembly, type of cable connection for the motor enclosed	Yes / No
6	Filled in Annexure-III attached with the offer	Yes / No
7	Filled in Annexure-IV attached with the offer	Yes / No
8	P&I diagram with control schematics and logics attached with the offer	Yes / No
9	Control panel (if applicable as per Annexure-I) shall be supplied with all the features specified in the spec.	Yes / No
10	Control panel when not in scope (as per Annexure-I), documents for designing of control panels as per point 2.2 (ix) will be submitted after placement of order	Yes / No
11	Weather canopy (as per Annexure-I) shall be provided	Yes / No
12	Oil heater with thermostat shall be provided	Yes / No
13	Inspection & testing shall be done as per clause – 6	Yes / No
14	TCs shall be submitted as per approved QAP	Yes / No
15	O&M manual and shipping lists shall be submitted	Yes / No
16	All documents shall be submitted as per Clause 3.2 and 3.3	Yes / No
17	QAP attached with the offer	Yes / No
18	Testing of compressor with contract's motor shall be done	Yes / No
19	Manufacturing shall start after the drgs. & QAP are approved	Yes / No
20	Spares shall be supplied as per Annexure-II	Yes / No
21	Painting shall be done as per	Clause 7/Annexure-1
22	Sound proof canopy (as per Annexure-I) shall be provided	Yes / No
23	All fixing bolts for foundation shall be of M/s Hilti make.	Yes / No
24	Deviations (if any) listed in a separate sheet	Yes / No

BHEL's enquiry no. & date -
Name of project -

Signature and stamp of vendor

Rev. No.	Date of Rev.	Remarks	Approved		
			J.S.Hanspal, AGM (HOD) - HTE		
			Prepared Gurpreet Singh Dy. Manager/HTE	Checked A Mandal AGM - HTE	Date of issue 08.07.2016
Saved in server as no. 42009900265					



REF. PRODUCT STD.: HT 00265

Hydro Turbine Engineering Division

INPUT DATA SHEET - ANNEXURE- I REV.00

- | | | |
|---|---|--|
| 1. Type | : | Air cooled Reciprocating type air compressor |
| 2. Type of drive | : | As per clause 1.11 |
| 3. Residual oil content at outlet | : | Less than 5 mg/cubic metre. |
| 4. Suction air filter grade | : | Less than 10 micron |
| 5. Operation | : | 24x7 or continuous |
| 6. Elevation (from MSL) where Compressor is to be installed | : | EL 279.5 meter approx. (Palamuru-II)
EL 384.5 meter approx. (Palamuru-III) |
| 7. Ambient conditions of site | : | |
| Temperature | : | Minimum = 20 °C, Maximum = 48 °C |
| Relative humidity | : | Minimum = 30 %, Maximum = 98 % |
| 8. Minimum F.A.D. (Free air delivery) | : | Total 28 m³ / min for each complete set with minimum FAD of 4 m³ / min of each individual compressor. |

Each set of compressor shall consist of multiple individual compressor units selected as per following conditions -

- Total Free Air delivery for complete set should not be less than 28 m³ / min.
- F.A.D of each individual compressor should not be less than 4 m³ / min.
- No. of compressors in complete set should not be less than 5 Nos.
- Individual compressor should not again consist of multiple compressor connected in series on a single skid.
- The offered models of all individual compressors must be identical.
- The offered set of compressors for item-1 & 2 must be identical.

- | | | |
|--|---|--|
| 9. Discharge pressure of Compressor | : | 60 kg/sq.cm at site conditions of each compressor |
| 10. Oil Heater with thermostat | : | NO |
| 11. Seismic factors | : | Site location is in Seismic Zone-II (0.1g Horizontal) |
| 12. Special painting requirement | : | N.A. |
| 13. Weather proof canopy required | : | NO |
| 14. Sound proof canopy required | : | NO |
| 15. Commissioning in vendor's scope
<u>Considering 10 days for each project</u> | : | YES (Vendor to quote lump sum price for supervision of commissioning of all the compressors of one set i.e. each project) |
| 16. STARTER/CONTROL PANEL REQUIRED | : | NO |
| 17. Length of cable from each compressor Motor to starter panel | : | 20 meter |

Name of the projects: Palamuru RangaReddy-II & III
Purchase Indent No. : 240203374

Sign and seal of BHEL's designer

Date: 06.10.2020
Sr. Manager (Design)
H.T.E. Division
BHEL, BHOPAL



REF. PRODUCT STD.: HT 00265

Hydro Turbine Engineering Division

Pg 1 of 2

ANNEXURE – II REV.00

LIST OF SPARES

One set of spares (for each project) comprising of the following items. Total number of such sets to be as per the enquiry.

Sl. No.	Description	Quantity
1	Set of seals, gaskets, O rings and pins.	2 sets *
2	Set of filter elements / cartridges	2 sets *

- Note - * Set indicates quantity required for 1 compressor.
- Vendor to furnish the breakup of all spares quoted and should quote item wise.

Name of the projects: Palamuru RangaReddy-II & III

Purchase Indent No. : 240203374


Sign and seal of BHEL's designer
वारी. प्रबंधक (अभियंता) / Design Engineer (Design)
Date: 06.10.2020
T.E. Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL



ANNEXURE-III
TECHNICAL PARAMETERS OF COMPRESSOR
(To be filled in by the vendor and submitted along with the offer)

1.	Make of compressor	-	.....	
2.	Model No.	-	.....	
3.	Type of compressor	-	.....	
4.	No. of stages of compressor	-	.....	
	Drive	-	.....	
5.	Standard to which compressor conforms	-	.....	
6.	FAD of compressor at vendor's works	-	.....	m ³ /min
7.	FAD of compressor at site condition given at Sl. No. 6 & 7 of Annexure-I	-	.....	m ³ /min
8.	Max. discharge pr. at site conditions	-	.....	kg/cm ²
9.	Speed of motor	-	.....	rpm
10.	Drive motor efficiency	-	.....	
	At full load	-	.....	
	At no load	-	.....	
11.	Type of oil used	-	.....	
12.	Oil filling capacity	-	.....	litre
13.	Canopy dimensions (L x B x H)	-	.....	mm
14.	Net weight	-	.....	kg
15.	Diameter of air inlet pipe	-	.....	mm
16.	Diameter of compressed air outlet pipe	-	.....	mm
17.	Maximum allowable inlet air temperature	-	.....	deg C
18.	Minimum ambient temperature	-	.....	deg C
19.	Shaft power input at operation pressure at site condition	-	.....	kw
20.	Shaft power input at maximum operation pressure at site condition	-	.....	kw
21.	Mean sound pressure level at 1 m distance	-	.....	dB
22.	Space heater provided	-	Yes / No	
23.	Rating of space heater	-	.....	
24.	Oil heater provided	-	Yes / No	
25.	Rating of oil heater	-	.....	
26.	Paint system and coating	-	.....	
27.	Residual oil content at outlet	-	.....	
28.	Suction air filter grade	-	.....	

BHEL's enquiry no. & date

Signature and stamp of vendor

Name of project:



ANNEXURE-IV
TECHNICAL PARAMETERS OF ELECTRIC MOTOR
(To be filled in by the vendor and submitted along with the offer)

- | | | | |
|-----|---|---|-------|
| 1. | Manufacturer | - | ..... |
| 2. | Frame size | - | ..... |
| 3. | Type of electric motor & no. of phases | - | ..... |
| 4. | Applicable standard | - | ..... |
| 5. | KW rating at rated output at 50 deg C | - | ..... |
| | Frequency | - | ..... |
| | Slip | - | ..... |
| | No. of poles | - | ..... |
| 6. | Duty type | - | ..... |
| 7. | Type of mounting | - | ..... |
| 8. | Insulation class | - | ..... |
| 9. | Temperature rise over 50 deg C | - | ..... |
| 10. | Type of enclosure and ventilation | - | ..... |
| 11. | Degree of protection | - | ..... |
| 12. | Rated voltage & frequency variation | - | ..... |
| 13. | Combined voltage & frequency variation | - | ..... |
| 14. | Minimum voltage for starting | - | ..... |
| 15. | No load current | - | ..... |
| 16. | Rated current | - | ..... |
| 17. | Starting current XFLA (sub to tolerance) | - | ..... |
| 18. | Rated speed | - | ..... |
| 19. | Efficiency at rated voltage & frequency | - | ..... |
| | At full load | - | ..... |
| | At 3/4 load | - | ..... |
| | At 1/2 load | - | ..... |
| 20. | Power factor | - | ..... |
| | At rated output | - | ..... |
| | At starting | - | ..... |
| 21. | Rated torque (kg-m) | - | ..... |
| 22. | Starting torque at permissible voltage (% FLT) | - | ..... |
| 23. | Pull out torque at rated voltage (% FLT) | - | ..... |
| 24. | Pull out torque (% FLT) | - | ..... |
| 25. | Min. accelerating torque at min. permissible starting voltage at all speeds | - | ..... |
| 26. | Ratio of locked rotor KVA & rated KV | - | ..... |
| 27. | Stator winding | - | ..... |
| | a) Connection (Star or Delta) | - | ..... |
| | b) Resistance per phase at 20 deg C | - | ..... |
| 28. | Direction of rotation & terminal designation | - | ..... |

BHEL's enquiry no. & date

Signature and stamp of vendor

Name of project:



REF. PRODUCT STD.: HT 00265

Hydro Turbine Engineering Division

ANNEXURE-IV

29.	Weight of motor (kg)	-	.....
30.	Bearing (with catalogue no.)		
	a) Driving end	-	.....
	b) Non driving end	-	.....
31.	Recommended lubricant	-	.....
32.	GD2 of motor in kg-sq m	-	.....
33.	Terminal connection		
	a) For stator leads type and No.	-	.....
	b) For purchaser's incoming cable type and number	-	.....
34.	Fault level withstand capacity	-	.....
35.	Space heater		
	a) Quantity	-	.....
	b) Rated voltage & rated wattage	-	.....
36.	Suitable for DOL starting	-	.....
37.	Star delta starter required	-	.....
38.	Paint shade	-	.....
39.	Noise level at 1 metre from equipment (dB)	-	.....
40.	Shaft orientation	-	.....
41.	Test certificates and inspection report	-	.....

Note: 3 copies of works test certificates and type test report are required. The type test report should give complete information regarding actual performance of the motor along with load characteristics, speed-torque and speed current curves.

BHEL's enquiry no. & date

Signature and stamp of vendor

Name of project:



BHARAT HEAVY ELECTRICALS LIMITED BHOPAL
SAMPLE QUALITY PLAN

QAP FOR- H.P. COMPRESSOR

MAIN ASSEMBLY: HP COMPRESSED AIR
SYSTEM

QP NO. : QA/HT/950

REV : 00

DATE : 08/07/2016

PROJECT :

P.O. NUMBER:

SUPPLIER NAME:

SR. NO.	COMPONENTS AND OPERATORS & CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			Remarks
				3	2/1			P	W	V	
1.0	Electric motor										
1.1	Motor electric (As per approved drg/spec.)	Visual	Major	100	100	As per drawing / Tech. Spec.	TC	3		1,2	
1.2	Type test	Test	Major	100	100%	As per Standard IS 32S	TC	3		1,2	
1.3	Routine test	Test	Major	100	100%	As per drawing / Tech. Spec.	TC	3		1,2	
2.0	Air-cooled after cooler										
2.1	Air-cooled after cooler	Test	Major	100	100%	As per drawing / Tech. Spec.	TC	3		1,2	
3.0	Control Panel (if applicable)										
3.1	Control Panel IR & HV Test	Electrical	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	1,2	CHP
4.0	Compressor Assembly & functional test										
4.1	Bare compressor unit (Make, Type,capacity)	Visual	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	-	1,2	-
4.2	Assembly Dimensions Width, length & foundation plan	Measurement	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP
4.3	Capacity (FAD)	Measurement	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP
4.4	Speed	Measurement	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP
4.5	Specific power consumption of full load	Measurement	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP

1: BHEL APPOINTED TPIA/BHEL/BHEL'S CUSTOMER
2: MAIN VENDOR/MAIN VENDOR'S SUB-VENDOR
3: MAIN VENDOR

P : PERFORM
W : WITNESS
V : VERIFICATION/REVIEW OF RECORDS

TC: TEST CERTIFICATES
JIR: JOINT INSPECTION REPORT
CHP: CUSTOMER HOLD POINT

BHEL (Signature & Seal)



VENDOR (Signature & Seal)

8



BHARAT HEAVY ELECTRICALS LIMITED BHOPAL
SAMPLE QUALITY PLAN

QAP FOR- H.P. COMPRESSOR

**MAIN ASSEMBLY: HP COMPRESSED AIR
SYSTEM**

QP NO. : QA/HT/950

REV : 00

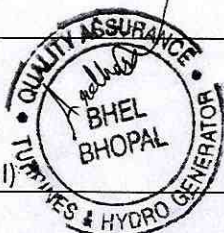
DATE : 08/07/2016

PROJECT :

P.O. NUMBER:

SUPPLIER NAME:

SR. NO.	COMPONENTS AND OPERATORS & CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			Remarks
				3	2/1			P	W	V	
4.6	Noise level	Measurement	Major	100	100%	As per drawing / Tech. Spec	JIR	3	1,2	-	CHP
4.7	Verification of bill of material	Visual	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP
4.8	Cutout / Cutin Pressure in Bar	Visual	Major	100	100%	As per drawing / Tech. Spec.	JIR	3	1,2	-	CHP
5.0	Calibration certificates of instruments										
5.1	Temperature & pressure gauge and moisture separator make type calibration & rating	Visual	Major	100	100%	As per drawing / Tech. Spec.	TC	3	-	1,2	
5.2	Air & oil filter make, type rating & mesh size	Visual Measurement	Major	100	100%	As per drawing / Tech. Spec.	TC	3	-	1,2	
5.3	Switches make, type, rating and calibration	Visual	Major	100	100%	As per drawing / Tech. Spec.	TC	3	-	1,2	
6.0	Painting & preservations										
6.1	Dry film thickness	Measurement	Major	100	100%	As per drawing / Tech. Spec.	TC	3	-	1,2	
6.2	Adhesion test	Visual	Major	100	100%	As per drawing / Tech. Spec.	TC	3	-	1,2	

1: BHEL APPOINTED TPIA/BHEL/BHEL'S CUSTOMER 2 :MAIN VENDOR/MAIN VENDOR'S SUB-VENDOR 3: MAIN VENDOR	P : PERFORM W : WITNESS V : VERIFICATION/REVIEW OF RECORDS	TC: TEST CERTIFICATES JIR: JOINT INSPECTION REPORT CHP: CUSTOMER HOLD POINT
BHEL (Signature & Seal) 	VENDOR (Signature & Seal)	

(1)