



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
Engineering Management
NOIDA

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TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	AA	VK	VK	
TITLE AUTOMATIC RELAY TEST KIT SET		SIGN	<i>[Signature]</i>	<i>[Signature]</i>		
		DATE		<i>31/6/13</i>		
		GROUP	TBEM	W.O. No		
CUSTOMER	ONGC Ltd , Hazira					
CONSULTANT	FICHTNER CONSULTING ENGINEERS PVT. LTD					
PROJECT	66kV GIS for 1x51MW CCCPP at Hazira					

TECHNICAL SPECIFICATION

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SECTION - 1

1.1 SCOPE

The scope includes inspection and testing before supply, packing loading and transportation to site of Automatic Relay Test Kit Set. The relay test Kit Set shall be suitable for testing of all types and model of relays of major manufacturer. It shall be supplied with suitable connecting accessories, Laptop PC loaded with software for automatic testing recording and analysis .The scope also includes detailed demonstration of the Relay Kit with its peripherals at site and Site training to Engineers of customer.

The equipment is required for the following project:

Customer : ONGC Ltd.
Project : 66kV GIS at Hazira

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the enquiry.

1.2 BILL OF QUANTITIES

The following items are required for ONGC Hazira Project.

<u>S. No.</u>	<u>ITEM DESCRIPTION</u>	<u>Unit of Measurement</u>	<u>Qty.</u>
1.	Portable dynamic Relay Test Kit with suitable phantom load sets , test plugs , relay tool kits ,connecting cables and accessories.	Nos	1
2.	Laptop PC with suitable software for as per specification for Automatic Testing, Report Generation and Analysis	Set	1
3.	Site demonstration and Training at Site	Lot	1

Note :

- 1) Bidder's offer shall include all items and accessories required to meet the technical specification. No additional price implication will be entertained after placement of order.
- 2) The Vendor shall also provide with main item, brochures and O&M Manual for BHEL review.
- 3) The offered test kit shall be of DOBLE, OMICRON OR EQUIVALENT make.

1.3 Calibration

Unit shall be duly calibrated before supply and the date of calibration shall not be older than 2 months (two months) from the date of supply kit.

1.4 TECHNICAL REQUIREMENTS

The technical requirements are covered in the section that follows -

Technical Specification for Three Phase Relay Test Kit for Cogen plant, ONGC, Hazira

The Fully Automatic Relay Test Kit shall have following features.

1. It shall test all makes and types of poly phase and single phase electro mechanical, solid state and numerical protection relays including IEC-61850 9-2 compatible relays.
2. It should have modular design.
3. Shall be computer based fully automatic and all functions shall be computer controlled in test kit and the standard USB and Ethernet port in note book laptop.
4. Shall be able to perform steady state, dynamic state, transient simulation tests and automated (Computer controlled) testing of all types of relays, and protection equipments using any previously recorded or generated transient signal.
5. Shall be able to provide voltage and current sources along with logic inputs and outputs, timers in a **single compact unit**.
6. Shall have minimum **six** independent controlled current sources and **four** independent controlled voltage sources with multiple ranges.
7. Shall have **independent control of magnitude, phase angle and frequency / harmonics** of all sources for testing and simulate power system condition.
8. Shall have isolated inputs and isolated outputs. Outputs shall be **site configurable** i.e. it can be configured as NO or NC as per requirement. Inputs shall be able to sense contact or voltage. Inputs and outputs shall withstand 250 V AC or DC.
9. The main power supply and kit output shall be **galvanically isolated** from each other.
10. **Must be able to test** high burden electro mechanical earth fault relays, differential relays to modern multifunction numerical micro processor based protection relay **without need of additional instruments**.
11. Shall be fully protected against over load and short circuit.
12. The test equipment shall have built in DC source.
13. Shall be supplied with a certificate of calibration traceable to the National Institute of Standards and Technology or NABL accredited labs.
14. When operated through software all outputs shall be metered and simultaneously displayed including a phase vector graph.

15. The kit shall have IEC 61850-9-2 Sampled Value and GOOSE messaging feature compatibility.
16. Test plans for all relays of different makes shall be furnished with all supplied kits and shall be demonstrated during training period.
17. The guaranteed technical particulars / specifications/ set parameters etc. of the instrument shall remain stable irrespective of the change in temperature.
18. The test program / plan shall allow user, to define the control parameters to control changes to magnitude, phase and frequency of selected source values and allow user to –
 - a) Ramp up / down (at user defined rates) to test the pick up / drop out Values.
 - b) Step up/down the magnitude, phase angle and frequency.
 - c) Quickly find the pickup values.
 - d) Test the characteristic angle for impedance relays / directional relays.
19. It shall be compact and light in weight.
20. The kit shall be supplied with rugged carry case with trolley having adequate mechanical strength and shock absorbers so as it can be transported easily by testing crew.
21. Basic software is to be supplied along with the 3Ph relay test kit.
22. The unit shall have dedicated LAN and USB port for communication and control through window based computer / laptop.

Technical parameters:

(1) Power Supply to the test kit:		
a)	Range	230 V, 1- Phase AC
b)	Frequency	50 Hz, $\pm 5\%$
(2) Voltage Output :		
	i. Range:	
a)	4 Phase A.C. (L-N)	4 x (0 - 150 V (minimum))
b)	3 Phase A.C. (L-N)	3 x (0 - 300 V)
c)	1 Phase A.C. (L-N)	1 x (0 - 300 V) (minimum)
d)	DC	0 – 300 V DC
	ii. Continuous Power	
a)	4 Phase A.C. (L-N)	4 x 50 VA at 150 V (minimum)
b)	3 Phase A.C. (L-N)	3 x 85 VA (minimum)at 300 V
c)	1 Phase A.C. (L-N)	1 x 150 VA at 300 V
d)	DC	100 W at 300 V DC
	iii. Resolution (Setting range step)	10 mV for 300V AC/DC
	iv. Accuracy	< 0.1%
(3) Current Output. :		
	i. Range	
a)	6 Phase A.C. (L-N)	6 x (0 – 30 A)
b)	3 Phase A.C. (L-N)	3 x (0 - 60 A)
c)	1 Phase A.C. (L-N)	1 x (0 – 120 A (minimum))
d)	DC	1 x (0 – 120 A (minimum))
	ii. Continuous Power	
a)	6 Phase A.C	(L-N) :6 x 75 VA at 20 Amps (minimum)
b)	3 Phase A.C	(L-N) : 3 x 150 VA at 40 Amps (minimum)
c)	1 Phase A.C	(L-N) : 1 x 450 VA at 80 Amps (minimum)
d)	DC	450 W minimum at
	iii. Resolution (Setting range step) : 1.5 mA or better	
	iv. Accuracy : 0.2% (in combination or better)	
(4) Phase Angle :		
a)	Range	0 to 359.9° (Lead) 0 to 359.9° (Lag)
b)	Accuracy	< 0.25° at 50 Hz
c)	Resolution	$\pm 0.1^\circ$ or better
(5) Frequency :		

(6) Battery Simulator : 24, 48, 125 , 250 V at 50 W		
(7) Timer		
a)	Range	: 0 – 9999.9 Sec, Auto Ranging
b)	Accuracy	0.001% or better
c)	Resolution	0.50 ms or better
(8) Binary Inputs		
a)	No. of inputs	Minimum 8 Nos.
b)	Input rating	Minimum 250 V DC
(9) Binary Outputs		
a)	No. of outputs	Minimum 4 Nos.
b)	Contact rating	250 V AC/DC, 8A max
(10) Waveform Generation & Storage : From DFR, Relays etc.		
(11) Protection		
a)	All outputs are protected for Overload & Short Circuit.	
(12) Interfaces : Ethernet, USB		
(13) Environment		
a)	Temp Range (Operating)	0 to 50 deg C

(14) Safety:

The product adheres to Electromagnetic Compatibility and Safety Standards as per International Standards / Directives.

The offered Relay test kit shall be capable of testing all types and model of relays of major manufacturer relays including following relays (IEC 61850 compliant) specific to the project-

S.N	Relay Model	Make	Function
1.	7SJ85	SIEMENS	Bay Control Unit
2.	7SA6	SIEMENS	Distance Protection
3.	7SR24	SIEMENS	Transformer Differential and Over-fluxing
4.	7SR23	SIEMENS	Busbar Protection
5.	7SR11	SIEMENS	LBB, 50/51/51G/64
6.	7SR12	SIEMENS	Directional O/C and E/F
7.	7RW80	SIEMENS	df/dt relay

Additionally following requirements shall also be met –

1. The Test Equipment shall be delivered to the Employer in new/fresh condition.
2. Supplier shall provide valid calibration certificate, test certificate and warranty certificate for the quoted test equipment as applicable ,in the event of order.
3. Supplier should have adequate “after sales service facility“ in INDIA.
4. Supplier is required to give an undertaking to “to address issue of warranty/after sales services from the respective manufacturer of the equipment”
5. Bidder shall provide “Authorised Distributor Certificate” from the manufacturer/OEM of the offered test equipment.
6. The testing equipments are generally meant for carrying out testing at site and movement from one place to another is unavoidable .Therefore equipment shall be robust in design so that it gives desired performance even in adverse site condition .Necessary transport packing arrangement shall be provided along with the equipment.
7. The training at site shall cover operation, evaluation/analysis of test results and general troubleshooting about the test equipment.
8. All accessories that are essentially required for the satisfactory operation of the equipment and for meeting the requirements of this specification shall be deemed to be within the scope of the bidder irrespective of whether these are specifically indicated here or not.
9. Following document shall be submitted along with the offer –
 - a) Catalogue and Data sheet .
 - b) List of Past Supplies in India
 - c) Test Certificates
 - d) Deviations if any in the Technical Deviation Sheet.
10. All the equipment shall be inspected prior to dispatch in line with the relevant IS,IEC and Standards etc.

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SECTION – 3
PROJECT DETAILS AND GENERAL SPECIFICATIONS

SL.NO.	DESCRIPTION	
1.	PROJECT INFORMATION	
	a) Customer	ONGC Ltd.
	b) Consultant	FICHTNER Consulting Engineers (India) Pvt. Ltd.
	b) Project	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
1.0	Location	ONGC Limited, Hazira
2.0	Elevation above mean sea level	RL 6.0 above, MSL
3.0	Nearest Railway Station	Surat, 20 KM
4.0	Nearest Airport	Surat, 10 KM
5.0	Nearest Harbour	Magdalla, 20 KM
6.0	Access Road	NH-8 (30 KM)
7.0	Atmospheric pressure at MSL	1.013 bar
8.0	Ambient Temperature	
	a) Max. average dry bulb temperature	45.6 oC
	b) Min. average dry bulb temperature	4.4 oC
	c) Design temperature for electrical equipment / device	50 oC
9.0	Relative Humidity	
	a) Max.	70%
	b) Min.	18%
	c) Average	64%
10.0	Seismic Zone	III (IS 1893)
11.0	Rainfall	
	a) Max. Intensity of rainfall in 24 hrs.	459.2 mm
	b) Period – Monsoon showers	June to September
	c) Average rainfall per annum	1203.5 mm
12.0	Wind data	
	Max. wind speed (as per IS:875) 20-61 kmph for 20 days in a year < 20 kmph for remaining period	62 kmph
	Most predominant wind direction	South -West
13.0	Land	
14.0	Tropicalisation	
	All equipment supplied against specification shall be given tropical and fungicidal treatment in view of the climatic conditions prevailing at site.	
	Tropical protection shall conform to BS: CP-1014-1965 "Protection of Electrical Power Equipment" against climatic conditions.	

Auxiliary Supply

Normal Voltage	Variation in Voltage	Frequency in Hz	Phase/Wire	Neutral Connection
415 Volts	± 10%	50 +3% to -5%	3 phase/ 4	Solidly earthed

			wires	
240 Volts	± 10%	50 +3% to -5%	1 phase/ 2 wires	One point earthed
110 Volts DC	± 10%	DC	1 phase/ 2 wires	Isolated 2 wire system

2. General electrical requirement as per Vol III, Section 3.1 of ONGC specification.(4 pages) (enclosed)

The discharge of pollution in water and air as well as noise levels shall meet with the stipulations of State Pollution Control Board as well as other Acts of the Government under the Ministry of Environment and Forestry. It is a pre-condition that irrespective of what is stated in statutory regulations or any other act or norms, the Specification stipulated environmental qualities standards are the minimum requirements and shall be fulfilled in all aspects.

For control room and offices, noise level shall not exceed 60 dB (A) near to the duct and at other places in the control room/offices noise levels shall not exceed 50 dB (A).

Equipment supplied and all work done including system design and detailed engineering shall also comply with the statutory requirements of the State/Central government and with the Indian Electricity Rules.

Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements.

If not specified otherwise the electrical operational equipment must be designed to meet protection classes stated below.

- HT Switchgear (Indoor) - IP 4X
- LT Switchgear (Indoor) - IP 52
- Control panels (Indoor) - IP 42
- Relay panel - IP 42
- Motors (indoor) - IP 54
- Motors and other equipment located outdoor - IP 55
- Emergency DG (Indoor) - IP 23

Each individual enclosure accommodating electrical equipment which is liable to suffer from internal condensation due to atmospheric or load variations shall be fitted with heating

3. Standards and Codes of Practice

All equipment, systems and works covered under these specifications shall be in accordance with all the applicable statutes, regulations, codes and standard specified as well as all such standards, statutes, regulations and safety codes applicable in the locality where the equipment will be installed. Contractor may familiarize themselves with all such requirements.

Complete design including pressure parts, piping, valves and fittings shall meet or exceed all the latest requirements of the Indian Boiler Regulations (IBR), latest Indian Standards /ASME codes, latest codes and standards as applicable. Any Indian/International standards shall be followed for any imported equipment. For plant layout aspects and area classification requirements OISD standards shall be followed.

The design, construction and testing of all equipment, facilities, components and systems shall be in accordance with relevant standards and codes issued by Bureau of Indian Standards (BIS) and/or reputed international standards and codes as on the date of Award of Contract. A non-exhaustive list of reputed international standards is given below:

- a) American National Standards Institute (ANSI)

- b) American Petroleum Institute (API)
- c) American Society of Mechanical Engineers (ASME)
- d) American Society of Testing and Materials (ASTM)
- e) American Water Works Association (AWWA)
- f) American Welding Society (AWS)
- g) British Standards (BS)
- h) Cooling Technology Institute (CTI)
- i) Deutsches Institut für Normung (DIN), Germany
- j) Gosstandart of Russia (GOST) standards
- k) Heat Exchange Institute (HEI), USA
- l) Hydraulic Institute Standards (HIS), USA
- m) International Electro-technical Commission (IEC)
- n) Institute of Electrical and Electronics Engineers (IEEE)
- o) International Organisation for Standardisation (ISO)
- p) Japanese Industrial Standards (JIS)
- q) National Electric Code (NEC), USA
- r) National Electrical Manufacturers Association (NEMA), USA
- s) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein
- t) National Fire Protection Association (NFPA), USA
- u) Occupational Safety and Health Administration (OSHA)
- v) Tubular Exchanger Manufacturers Association (TEMA), USA
- w) VDE association for Electrical, Electronic and Information Technologies (VDE), Germany
- x) OISD

Other international Standards, equivalent or superior to the above Standards can also be adopted. However, In the event of any conflict between the requirements of the international standards or codes and the requirements of the BIS standards or codes, the latter shall govern unless specified elsewhere in the specifications. Any Indian/International standards shall be followed for imported equipment.

The Plants and Electric Lines (within the plant) shall also be designed to comply with the requirements stipulated in.

- a) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006.
- b) Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007.
- c) Central Electricity Authority (Measures relating to Safety and Electricity Supply), Regulations as and when these are notified by the Authority.
- d) Central Electricity Authority (Safety Requirements for Construction, Operation and

Maintenance of Electrical Plants and Electric Lines) Regulations as and when these are notified by the Authority.

e) Central Electricity Authority (Grid Standards) Regulations as and when these are notified by the Authority.

f) Central Electricity Authority (Construction of Electrical Plants and Electric Lines) Regulations, Notification, 20th August 2010 and to those referred therein

g) Indian Electricity Grid Code issued by Central Electricity Regulatory Commission (CERC) and

h) Applicable State Grid Code issued by appropriate Regulatory Commission.

All material and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of equipment, methods of inspection, constructional peculiarities of equipment and parts and acceptances of partial plants, as far as these are beyond the special requirements of the specifications, shall comply in every respect with the technical codes of the above listed codes and Standards.

It shall be the responsibility of the Contractor to take all approvals required and get the HRSG registered under the IBR. In all other cases where IBR does not govern, IS/ASME, Japanese, American, British, German or other international standards established to be equivalent or superior to IS/ASME shall be acceptable with the approval of the Owner/Owner's representative at the time of detailed engineering.

Where there are no standards or regulations, or the standard is not sufficient to meet the need of design and supply, for such items relating to the power plant, the Contractor shall carry out the design, manufacture, supply and installation on the basis of good engineering practice.

During the period of Contract execution, if any standards change, the Contractor shall be responsible to notify the Owner/Owner's representative and provide the basis for the prospect that it would not cause the lowering of quality, performance and service life of the power plant due to alteration of the standard and the latest standards shall be followed by the Contractor.

Further requirements about applicable standards and codes are specified in the detailed technical specifications.

4. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- two sets of special tools and gauges required for the maintenance of the Plant
- one set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor.

Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

5. INSPECTION, TESTING AND INSPECTION CERTIFICATE

Inspection testing shall be done as per customer specification (clause 8, Vol II, sec 1 , Sheet no. 51 -55) and inspection plan.

6. DOCUMENTATION

Format of Documentation

All engineering documents and drawings shall be of international "A" series sizes, that is, A0, A1, A2, A3 and A4.

One set of CD containing all the drawings in Auto CAD (for final as built drawings) shall also be supplied in addition to hard copies.

Soft copy of all other documents shall be supplied in a CD in PDF or editable format. For review purpose pdf or editable version shall be considered.

Grouped documents shall be provided by size A4, with the inclusion of bigger size drawings which, however, have to be folded as Size A4.

Numbering and Identification of Documents

All the drawings shall be identified through a common way of numbering in accordance with the requirement of contracting. The numbering system of drawings and documents proposed by the Contractor shall be in compliance with the plant identification system and to be agreed with the Owner/Owner's representative. Apart from this, some drawings may also be numbered in the way which the contractor or subcontractors are used to do. But, there shall be a common title Block on all published drawings which include the following contents:

- Owner
- Owner's Engineer
- Project
- Contractor
- System
- Drawing No.
- Sheet No
- Revision No.

The measuring units and dimensions marked on the project engineering drawings shall be of SI system conforming to ISO 1000.

English words shall be used as descriptions on drawings.

In case dimensions are not marked in conformity with the scale of drawings and any dimension on the drawing does not conform to those dimensions and sizes measured through certain scale, the actual marked dimensions shall be applicable.

For revision of drawings, the revised part shall be clearly and definitely shown on the drawing.

For revision of documents which have been grouped together, a brief description shall be a perpendicular line with the margin of the revised copy closely following it.

Provision for Documents

Generally, copies of drawings or documents containing trade secret and drawings with patented nature need not be provided.

However, to know whether the Contractor has performed its obligations, the Owner/Owner's representative has the right to examine those drawings within the Contractor's working scope.

The Contractor shall meet the Owner/Owner's representative's reasonable demands to files and do the following to satisfy the Owner/Owner's representative:

- Contractor will work according to the requirements specified in the contract.
- Contractor's working has been arranged properly and developed according to the plan.
- The quality control system is reliable.
- After receiving all documents necessary for power plant operation and maintenance,

Contractor shall supply equipment and systems.

- Having received all necessary documents for Contractor to perform its legal obligations or other relevant responsibilities.

Distribution of documents

The source, distribution, no. of copies shall be as per the following document distribution schedule. Annexure 4

Title block for the Project:

a) Customer	ONGC
b) Consultant:	FICHTNER Consulting Engineers (India) Pvt. Ltd.

c) Project:	66 KV GIS system for 1 X 51 MW CCCPP for ONGC , Hazira
d) Main Contractor	BHEL

DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings in 2D and 3D format.
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

DOCUMENTATION SCHEDULE AT CONTRACT STAGE

No. of Copies	A: For Approval
5	Copies of GA drawings (2d and 3D) with projects details, dimension, equipment weight, fixing details, tolerances and terminal details etc.
5	Copies of type test reports
5	Copies of shipping list detailing the description & quantities of all items being dispatched separately, with shipping weights, number of cases and dimensions.
5	Copies of manufacturing and field quality plan.
5	Copies of installation, operation & Maintenance manual.
	B : After Approval and For Information/Distribution.
12	Copies of All drawings
12	Bound sets containing all drawings/manuals, type and routine test reports etc. along with sub-vendor's test reports for all bought out assemblies/components/parts including Internal wiring diagrams and exploded diagrams of assemblies/ parts, shall be furnished.
12	Copies of Installation, Operation & Maintenance manual.
	C: On Completion of Entire works
12	Bound sets of Installation, Operation & Maintenance manual and all as built drawings
12	Set of Computer CD-ROMs (with unbreakable CD Covers) containing all as-built drawings in Auto-Cad version 2008 or later with 2D and 3D drawings, Instruction Manual and GTP.

7. CLEANING, PROTECTIVE COATING AND PAINTING

Refer Vol III /Section 2/ Sub Section 2.15 Surface Preparation and Painting.

8. SPARE PARTS

The contractor shall also provide a list of recommended spares for two (2) years of normal operation of the plant over and above the mandatory spares.

List of Mandatory Spares

Refer Vol IV /Section 8/ Annexure 2

NOTE: All mandatory spares as per OEM declared critical items shall be included in the list.

9. Package, storage

All materials and equipment should be packaged according to the typical environmental conditions during storage. In case of severe conditions, these materials and equipment should be packaged carefully by taking a full and appropriate preventive measure to protect from any damage or wear.

The Contractor and his appointed Subcontractor for installation should guarantee jointly that a good supplementary storage will be carried out within the equipment site controlled by them. Three classes for storehouse are described as follows:

Storehouse class A items: Special measures are taken to protect the stored goods and the temperature, humidity are controlled within a specified range.

Storehouse class B items: Goods are stored with temperature uncontrolled.

Storehouse class C items: It is an outdoor storage with a drainage system on the ground.

For storehouses of class A and B they should be fireproof, heat resisting, waterproof and well ventilated. They should not be wet and should be provided with good drainage system and preferably with a brick laying or concrete ground. For storehouses of class C, they should not be wet and should be well drained, preferably with a brick laying or crushed stone ground, should be protected from rainfall, salt corrosion, ash and other adverse conditions with a temporary cover or tent if possible

Component surfaces should not be contacted directly with the ground or ground laying material. There should be a layer of oilcloth or wax or other similar materials between the machine surface and ground surface.

All components shall be inspected for their painting, storing, sealing and any damage or wear should be repaired during acceptance and storage periodically. The inspection interval is determined by the component function, applied protection measure and storehouse class.

Many components are provided with a drying agent or sealed in a coverage (polyethylene or insulating cover) containing drying agent. The drying condition shall be inspected during storage in an interval of every 4 weeks.

10. SPECIAL TOOLS, TACKLES AND EQUIPMENT

One set of special tools and tackles required unit for the operation, maintenance, inspection and repair of the individual main equipment and auxiliary equipment shall be supplied by the Contractors in sufficient quantity to equip the shift personnel, maintenance personnel and workshop craftsman for commissioning, testing, calibration, modification and maintenance of the unit, List of such special tools, tackles and equipment shall be submitted in the EPC bid.

Special tools and tackles excludes conventional ones and those locally available normally (not those requiring a drawing and considered as those made to order).

The special tools and equipment for maintenance and repair shall be delivered by the Contractor in lockable steel boxes and they shall be marked in an approved manner for identification purposes and a corresponding tool chart shall be supplied with the steel boxes.

The following tools and appliances shall be supplied under this Contract for use by the Owner/Owner's representative:

- Two sets of special tools and gauges required for the maintenance of the Plant
- One set of special lifting and handling tackles / appliances required for the maintenance of the Plant.

The tools, tackles and appliances supplied in general, shall not be used for erection purposes by the Contractor and shall be handed over in brand new condition. Damaged tools, tackles, and appliances shall be replaced before handing over.

The exception to this is the special lifting gear which may be used provided that when it is handed over to the Owner/Owner's representative it has not been subjected to more than normal wear and is still fully suitable for its intended use.

Each set of tools, gauges and appliances under category (a) above shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the plant and equipment in question.

If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle supplied under this contract. Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved Authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Owner/Owner's representative.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to handling of equipment located at higher elevations safety valves.

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Owner/Owner's representative at the time of Taking Over of the complete Plant.

Since the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor.

Control and Instrumentation: Software with associated hardware required to access instruments or control systems to be provided.

11. Painting, Insulation, Anti-dewing

Anti-corrosive coatings and painting shall be carried out as a pre-treatment to all equipment and parts. The paint system used should coordinate with the painted objects and surrounding conditions of project.

In multi-layer painting system, different painting layers should be selected to make the painting coordinate. If multi-layer painting system is used, various painting layers should have distinct colours so that the later layer can be distinguished from the former one.

After the equipment or apparatus finished preliminary or full painting, it can be supplied to field. After the installation is finished, ground coat must be painted.

Entire painting procedure should be supplied in order to repair the injures of painting coat after the equipment is delivered to field.

Colour strip indication system should be used for pipes. These strips should be painted on the joint of pipes, entrance, valves of pipe. This pipe without outside protection layer should be marked by some colour in whole length. ***Refer Annexure-3 (Vol-IV, Sec-8) for the colorcoding of piping and fire equipments.***

The principal colour of field equipment should be determined by Owner/Owner's representative and Contractor during execution stage. For Electrical equipment, paint shade shall be as mentioned in the equipment Specification.

Further requirements with regard to painting, insulation, and anti-dewing are specified in the relevant sections in the detailed technical specifications. The specified requirements shall be applied to the whole equipment and facilities of the Contract.

Insulation specification for MPP supplied equipment shall be as mentioned in detailed technical specification.

Language to be used

English shall be used as the general Contract language English translations shall be provided for any code and standards not in English language.

Name plates of equipment and instrument scale shall be marked in English.

Documents for training shall be provided in English.

Danger signs / Exit signs shall be in English, Hindi and Gujarati.

12. CONSUMABLES

12.1.0 Lubricants and greases

All lubricants proposed for the Plant operation shall be suitable for all operating and environmental conditions that will be met on site.

All oils and greases shall where possible be readily available in India.

The number of oils and greases shall be kept to a minimum to the extent feasible. For each type and grade of lubricant recommended the contractor shall list at least three equivalent lubricants manufactured by alternative companies. This will be in line with that suggested by OEM and outcome will be informed to the Owner/Owner's representative.

In case of imported oils, lubricants and other consumables, the contractor shall indicate the indigenous equivalents to enable the Owner/Owner's representative to arrange subsequent fills. Preference should be given to indigenous oils and lubricants during first filling itself. Short shelf life items if any may be supplied in a phased manner keeping in view of their actual use.

The Contractor shall supply the first fill lubricants and greases, and also shall provide at the Completion Certificate sufficient lubricants and greases necessary for the efficient operation and maintenance of the Plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

12.2.0 Chemicals and other consumables

Contract includes the supply (by the Contractor) of all chemicals, reagents, resins, and other consumables required for testing, commissioning and setting to work of each section of the Works.

The Contractor shall provide all chemicals and other consumables required for the efficient operation and maintenance of the plant at full load 24 hours per day for a period as mentioned in the relevant portion of Commercial Specification.

The Contractor shall prepare a list of these consumables giving quantities necessary for each section of the works and the recommended suppliers.

The Contractor shall deliver to site sufficient quantities of consumables in his supply to allow for 6 months running of the Works prior to the issue of the Completion Certificate. The delivery of the

remainder of the consumables shall be programmed to suit the operational requirements and space availability within the various stores.

13. Plant and Equipment Identification

The contractor shall follow identification system for the whole plant equipment, instruments, facilities and systems as per the Annexure-4 Guide for Coding Equipment, Documents & Drawings MPP generated drawings, identification system shall be based on MPP standard.

Labelling

Name plates which are to be firmly fixed on all the equipment, instruments, buildings and structures shall be provided. For equipment of small size, these are to be fixed on the piping or structure adjacent to the equipment. The contents of nameplate are to include the designation and principal parameters of the equipment.

The nameplate within the field shall be made of a high temperature - resistant metallic sheets, with designation permanently engraved on them. Indoor installed equipment (e.g., panels, cabinets, switchgear) shall also be labelled by appropriate name plate.

The form, size, base colour and colour of contents of the name plates and prompting plates will be agreed between the Contractor and the Owner/Owner's representative. It shall be possible for these to be readily seen by the operator. The designation of warning tags shall be different from that of other tags. All buried pipes and cables routes shall be identified with permanent marker.

SECTION - . 5

CHECK LIST FOR TESTING EQUIPMENTS

Check list to be filled for each items quoted

Put a tick mark (√) in 'YES/NO' Column if the specified requirement is met, or put a (X) mark, if the specified requirement is not met and give comments in the "Remarks" column.

S. No.	Parameters	Yes/No	Remarks
1.	Name of instrument		
2.	Name of manufactures & address		
3.	Supply and training at site quoted		
4.	Following Document to be enclosed		
4.1	Authorized Distributor Certificate from Manufacturer/OEM		
4.2	After sales service facility in India will be available		
4.3	Undertaking to address issue of warranty / after sales services from OEM		
4.4	Catalogue and data sheet and test certificates(if any)		
4.5	List of Past supplies in India & abroad		
4.6	List of Deviations if any in Deviation schedule.		
4.7	Furnish technical data		
5	Whether the offered make is approved by end customer (ONGC)		

