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COPY RIGHT AND CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.		PROJECT : 2 x 660 MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH CUSTOMER : BIFPCL CONSULTANT: FICHTNER GmbH & Co KG, Stuttgart, GERMANY PURCHASE SPECIFICATION FOR LABORATORY INSTRUMENTS (C&I-MECHANICAL)					
		REVISIONS: 00	APPROVED BY  ASHISH MANJHI				
			PREPARED BY  K.P.	ISSUED 416	DATE 02/07/2019		



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SECTION- A

GENERAL INSTRUCTIONS TO BIDDERS:

Introduction: Bidders are required to offer Laboratory Instruments (C&I Package) in Power Plant applications as per BHEL Technical Specification (refer Section C).

1. All required documents against this Tender/Specification shall be submitted in English only.
2. In order to accept the Technical offers / proposals from Bidders for the project mentioned in this Specification (refer Sections C), certain Pre-qualification criteria are required to be met by Bidder.
3. Pre-qualification requirements are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details required for BHEL's acceptance.
4. In case Bidder does not submit Complete PQR Documents or the Documents submitted by vendor does not meet the PQR Criteria mentioned, offer of such bidders will be summarily rejected and will not be considered for Further evaluation in the tender.
5. Technical Bids of those bidders who meet the PQR Criteria shall be opened for Review and further consideration by BHEL.
6. Changes in technical specification scope / BOM, if any shall be informed to participating bidders only.
7. If a vendor does not quote for all the listed items, then his complete offer will be technically rejected. Please note that essence of this tender is packaging and hence all items within this project are to be offered so as to have one packaged vendor for this project.
8. **Evaluation methodology:** BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Bidders those who are meeting technical requirement will be taken up End User / Customer for approval. Only bidders who are approved by End user / Customer, commercial bids of those bidders will be considered for further evaluation by BHEL. Bidders to fill FICHTNER sub supplier form along with attachments and submit along with RFQ.
9. Bidders are required to submit offers as detailed below:
AA). Documents pertaining to Pre-Qualification requirement (Section B of this Specification) shall be in a separate cover / soft-folder with reference no. "Section B" marked on it.

BB). Technical offers/proposals for the Project, whose requirements are mentioned in Sections C will be submitted in a separate cover / soft-folder with Project name & reference marked on it.
10. Vendors, without permanent vendor code in BHEL EDN are required to fill up online supplier registration format available in website <http://supplier.bhel.in/> at the time of submission of bids.
11. Name & registered address of The Bidder with Organization chart and contact details shall be submitted.
12. Bidder shall be responsible for complete package supply, installation / commissioning and satisfactory demonstration to customer. Wherever OEM representative to be deputed for commissioning bidder shall coordinate at his own cost and complete the work. Qualified technical persons shall only be deputed by the bidder for commissioning of the items in the package.
13. Whenever required during evaluation of PQR and Technical offers/bids, vendor is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the vendor documents by End users / Customers, vendor shall accompany BHEL representative for discussions.



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- 14.** Bidders shall confirm to submit unit price of each instrument for each project as quoted; which shall be used for addition / deletion of items, valid for the tenure of purchase order from the date of bid opening, for the commercially successful offer.



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SECTION- B

Pre-Qualification Requirements (PQR) of Bidders for Laboratory Instruments:

1. Vendor should have supplied Lab instruments equipment to process plant/ refinery/ power Plant / nuclear plant / testing Lab etc.
2. Vendor should be in business of supplying Lab instrument equipment for at least last five (5) years from the date bid opening.
3. Minimum One no. purchase order for supplying 5 different items of Lab instrument equipment shall be submitted which should not be more than 5 years old from date of bid opening for establishing continuity in business.
4. The Bidder based outside India, who are making offer for this tender shall have authorised representatives in India for support related to documentation, commissioning & any other co-ordination work. Please provide supporting details.
5. Bidder has to submit letter of undertaking stating that they will take care of service Requirements till guarantee / warranty period / commissioning & Demonstration and handing over whichever is later for all items.
6. Bidder should have a clean track Record, i.e., the Bidder should not be under Hold or blacklist by any of the BHEL units/any Govt. of India PSU / Govt. of India as on bid submission date. To this effect a declaration should be given by the bidder.
7. **Important note:** - In case Bidder does not submit details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily rejected and Bidder's Technical offers/proposals will not be evaluated. Please read carefully the General instructions in **Section-A** of this specification.



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SECTION- C

I. GENERAL TECHNICAL REQUIREMENT

1. Testing instrument/devices offered shall be proven type and shall incorporate latest design.

The workmanship and design shall be in accordance with the best engineering practice and shall be such, as have proved to be suitable for the intended purpose and shall offer satisfactory performance even in the worst environmental conditions.

Testing instruments/devices shall be furnished with all necessary accessories whether specifically indicated herein or not.

2. i) All instruments offered, shall conform to the relevant IS or international standards.
Accuracy of the calibration instruments should be traceable to National or international standards indicating date of calibration and due date of calibration. Calibration and trace ability certificate shall be provided with the Lab instruments.
ii) The various instruments/devices, small tools, accessories etc., shall be furnished with suitable and durable boxes of convenient size, complete with necessary packing etc., in order to have safe storage when not in use.
3. Measuring/testing instruments, along with allied accessories shall be suitable for continuous operation (both indoor and outdoor installations as applicable).
4. The Bidder shall supply testing instruments/ devices, specified hereinafter, for meeting the requirement of the power plant. The Bidder shall be responsible for proper functioning of supplied items. The Bidder shall also be responsible for erection and commissioning the test equipment where applicable.
5. It is obligatory to the Bidder to furnish a complete list of spare parts for these testing/calibrating, instruments /devices. The Bidder shall render guarantee for easy availability of all the spare parts required, especially for the components, which are prone to failure.
6. The Bidder shall repair the defective instruments/devices free of cost within the guaranteed period or replace the same if required.
7. Scope of service of the Bidder shall also include operational and service training of Owner's personnel at site.
8. Calibration and test certificates, as applicable, shall not be more than one (1) year old.
9. All electronic portable instruments shall be powered from rechargeable battery system. Battery charger suitable for the instrument shall also be supplied which can be in-built or standalone type.
10. Electrical power supply requirement of the instruments offered under this specification shall be 240 V AC, 50 Hz, single phase.
11. All the microprocessor based maintenance and calibration instruments shall have provision for data logging facility for keeping calibration/maintenance record with proper communication facility to down load these data on the Lab PC.
12. Packing shall be as per guidelines provided at BHEL specification ref. ED 049 00 92, rev. 05 attached herewith.

13. Calibration Standards

The calibration standards shall be traceable to the National Bureau of Standards of the United States of America, comparable Indian Standards, or to applicable standards existing in the country where the equipment is manufactured and tested. The Bidder shall elaborate in the proposal the standards followed for the equipment manufacturing and testing.



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II. TECHNICAL SPECIFICATION:

A. MECH-LAB-ITEMS (MECH-LAB-ITEMS, Qty. 1Set)

The following items to be offered.

1. Instrument mechanic's and electronics tool kit (Qty. 10 Sets):

Instrument mechanic's and electronics tool kit, Bach in accordance with DIN or equivalent standard complete.

- 8" pipe wrench, 6" Nose plier, Set of 'D' spanners, Set of 'Ring' spanners, Set of Allen key mm (1.5-10mm) and inches (1/16" -3/8"), 12" Hacksaw with frame, Round file, 9" combination pliers, Needle house pliers, Wire stripper, Screw drivers (2", 4½", 6"), magnetic screw driver set, Crimper, Nut driver, Hammer, Socket spanner set (inch and mm), Cutting plier, Watchmaker screw driver set, Adjustable spanner set (6" to 12"), Needle file set, Cable stripper, Tweezers, Digital multi-meter etc.

2. Sets Heavy fitter's tools and equipment (Qty. 10 Sets):

Sets Heavy fitter's tools and equipment , complete – Typical - Steel rule, Gauges, Set square, Bevel protractor, Hacksaw, File, Chisel, Drill, Reamer, Tap and Die, Hammer, Mallet, Pliers, Punch, Scraper, Sprit level, Clamp Tool Makers, Screw Driver, Caliper etc.

3. Drill Bits/tools (Qty. 6 Sets):

Set drilling tools, in accordance with DIN or equivalent, complete – Drill bit (up to 13mm), Claw Hammer, Combination plier, Adjustable Wrench, Screwdriver set, Hole punch, Tap set etc.

4. Mobile Work Bench tools. (Qty. 4 Sets):

Sets of mobile work bench tools to be stored in the work bench, complete – Typical metal files, drills, double ended spanners, ring spanners, quick acting tube cutters, carpenters saw 500 mm long, metal saw, hole punches, chisels, oil cans finger pump operated, electrician's pliers, electrician's screwdrivers, electrician's hammers, ignition contact file, metric steel tape rule, electrician's knife, electrician's shears etc.

5. Multi-Purpose all-steel Cupboard (Qty. 10 Nos.):

Multi-purpose all-steel cupboard size approx. 1500 x 600 x 2000 mm. With two-flap doors, made from solid plate, with five adjustable shelves, doors with lift-action lock.

6. Steel tools cabinets, small size (two types) (Qty. 1Set):

i) Steel tools cabinets (Qty. 4 Nos.)

Steel tool cabinets 500 x 500 x 1000 mm high, including 125 mm leg height, with upper steel drawer and two removable trays, door latch for padlock, including lock.

ii) Steel tool cabinets with double doors (Qty. 8 Nos.)

Steel tool cabinets with double doors, 1000 x 500 x 1000 mm high including 125 mm leg height, with center partition, each side separately lockable with two steel drawers and two removable trays, door latches for padlocks, including padlocks.

7. Fire-proof steel cupboard (Qty. 1 No.):

Fire-proof steel cupboard Approx. Size: 1200 x 500 x 800mm. With center partition, each side separately lockable with two steel drawers and two removable trays, door latches for padlocks, including padlocks.



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8. Pneumatic workbenches (Qty. 8 Sets)

Pneumatic workbench with a vertical top section for the installation of the devices as listed below shall be provided. The dimensions of the workbenches shall be 2000x1000x800 mm and shall be suitable for a logical distribution of devices on the vertical section and for the loose distribution of test instruments and tested devices on the horizontal surface. The instrument board console shall be composed of sheet steel with a minimum thickness of 2.5 mm and shall be totally closed. Connections to the installed instruments shall be fixed at the front of the instrument board for prompt access. Earthing arrangement for the Workbench and for measurements shall be provided. The following equipment shall be integrated into the vertical section of each of the workbenches:

Air Filter Regulator: (Qty. 2 Sets)

Instrument air filter and regulator for flush-mounting with pressure adjusting knobs, precision pressure gauge, diameter 160 mm, range 0 - 1.6 bar, accuracy 0.3%, and front air connections

Precision regulating valves: (Qty. 2 Nos.):

Precision regulating valves with fine adjustment for control air supply with front air connections

Vacuum Module (Qty. 2 Nos.):

Vacuum Module 6 inch gauge 0-760 mmHg with regulated output

Three-way valves (Qty. 2 Sets):

Three-way valves for control air with front air connections

Pressure Gauges (Qty. 1 Set):

Flush-mounted precision pressure gauges, diameter 160 mm, accuracy $\pm 0.3\%$, ranges 0 - 1.6 bar, 0 - 2.6 bar, 1 - 60.0 bar, 1 - 250.0 bar with front air connections

Flexible pneumatic and hydraulic pipes (Qty. 2 Nos.):

Flexible pneumatic and hydraulic pipes/hoses with appropriate end connections for necessary interconnecting of items

Power supply sockets (220 AC and 110 AC) (Qty. 4 Nos.).

9. Soldering iron (Qty.: 8 Nos.):

Soldering iron sets with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench. 40W.

10. Stationary solder remover (Qty.: 8 Nos.):

Stationary solder remover with vacuum pump, pipes, tips, etc. for each workbench.

11. Standard rotatable vice (Qty.: 8 Nos.):

Standard rotatable vice, mounted on each of the regular workbenches.



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12. Storage metal cabinets (Qty.: 8 nos):

Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. approx dimensions (W x D x H) 0.8 x 1.8 x 0.6 m.

13. Heavy duty chairs (Qty.: 8 nos):

Heavy duty chairs for the workbenches. Shall have revolving and tilting mechanism.

14. Light sources (Qty.: 8 nos):

Light sources/ lamps adapted to the workbenches.

15. Pressure Calibrator (Qty. 12 Nos.):

It shall be microprocessor based and used for calibration of electronic and pneumatic instruments. Measuring Range -0.8 to 600 bar. Accuracy: 0.025% FS. Shall be supplied with hand pumps for generating pressure and vacuum.

16. Temperature Baths / Calibrators (Qty. 12 Set):

Temperature Baths / Calibrators with cooling coil with control for medium and high temperature testing. Portable Dry Block type temperature calibrator with microprocessor based controller heater to be supplied for field calibration of temperature instrumentation viz. T/C, RTD. Medium Temperature Bath: Range 50°C to 600°C. Stability 0.1°C. High Temperature Bath: Range up to 1200°C. Stability 0.5°C. Shall be supplied with one Insert for 4 thermocouple and one Undrilled Insert. Shall have interface with PC along with interface software.

17. Temperature Indicating Meter (Qty. 12 Nos.):

Direct temperature indicating meter suitable for direct measurement of different types of thermocouples and resistance thermometers with additional hand-held thermos probes for temperature measurements from -20 to + 600°C. Digital thermometer with reference RTD probe.

18. Depth Gauge (Qty. 8 Nos.):

Depth gauge: Range – 250mm, Resolution 0.05mm.

19. Feeler Gauge (Qty. 8 Nos.):

Feeler gauge: 0.05 – 1mm, Blade length 100mm, Stainless Steel.

20. Dial Indicators (Qty.: 6 Sets):

Dial Indicators: Measuring Range max: 10mm, Resolution: 0.01mm.

21. Hand Held IR Thermometers (Qty. 12 Nos.):

Hand Held IR Thermometers: Temperature Range: (0 to 1000°C), Accuracy: 2%.

22. Humidity & Moisture Meter (Qty. 8 Nos.):

Humidity & Moisture Meter: Range 0 to 100RH, Accuracy 2%RH.



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23. Hazardous & Toxic Gas leak detector (Qty. 6 Nos.):

Hazardous & Toxic Gas leak detector. Gas to be detected %LEL, O₂, H₂S, CO.

24. Field Meters (LEL) (Qty. 6 Nos.):

Field Meters (LEL), Leak & Emission Detectors for detection of Hazardous gases. Shall have LED bar display and audible tone for detection of gas leakage.

25. Laser Distance Meter (Qty. 6 Nos.):

Laser Distance Meter: Range 40m, Accuracy 2mm.

26. Ultrasonic Distance Estimators (Qty. 6 Nos.):

Ultrasonic Distance Estimators, Range 12m.

27. Ultrasonic Hand held flow meters (Qty. 6 Nos.):

Ultrasonic Hand held flow meters- Clamp on type portable Ultrasonic flow measuring instruments for measuring flow through any pipe sizes in between 10 to 3000 mm with an Accuracy of +/- 1% of reading. Meter shall be programmable with alphanumeric display (LCD) and membrane type keyboard. Battery, Charger set and Temperature Sensor shall also to be provided. Portable Handheld enclosure and carrying case.

28. Ultrasonic handheld level meters (Qty. 6 Nos.):

Ultrasonic handheld level meters – Range 10m.

29. Portable ultrasonic flow meter (transit time type). (Qty. 4 Nos.)

Portable ultrasonic flow meter (transit time type). Clamp on type portable Ultrasonic flow measuring instruments for measuring flow through any pipe sizes in between 10 to 3000 mm with an Accuracy of +/- 1% of reading. Meter shall be programmable with alphanumeric display (LCD) and membrane type keyboard. Battery, Charger set and Temperature Sensor shall also to be provided. Portable Handheld enclosure and carrying case.

30. Precision Pressure Gauges (Qty.: 8 Sets):

Precision pressure gauges, accuracy 0.6%, in portable boxes, pressure ranges in bar -1 - 0, -1 - 10, 0 - 1, 0 - 1.6, - 4, 0 - 10, 0 - 16, 0 - 25, 0 - 40, 0 - 60, 0 - 100, 0 - 160. All test pressure gauges shall have 250 mm anti-parallel white dial with black figures and graduation lines of fineness and legibility used for high precision instruments. The dial shall be mirror-polished Aluminum under the tip of the pointer. Cases shall be SS / die cast Al.

The pointer shall be lightweight, balanced design with tip turned 90 degree for easy reading to smallest sub-division.

Connection size of all gauges shall be 1/2" NPT (M).

For all test gauges test certificate of the readings shall be provided.

31. Manometers (Qty.: 6 Sets):

Manometers suitable for very low and low pressure measurements, Single Limb type - Range 1500mmWC, U tube type Range -1000 to 1000mmWC. Cases shall be of aluminum on three sides with clear acrylic front cover.

Scales shall have provision for zero adjustment. All wetted parts and fittings shall be SS.



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Manometer will be mounted on M.S. three leg stand having level adjustment arrangement and attached spirit level.

Metering tube shall be clear acrylic plastic / Borosilicate glass having uniform reamed bore and thick walls, gland-packed in end blocks. End connections shall be ½" NPT (F).

32. Portable pressure source for low pressure and vacuum (Qty.: 2 Sets):

Portable pressure source for low pressure and vacuum (pneumatic measuring box). Range -1 to 2 bar. Hand pump type with Fine adjustment and release valve.

33. Calibration pressure pump (Qty.: 8 Sets):

Calibration pressure pump 0-2 bar, 0-10 bar, 0-20 bar, 0-40 bar. Hand pump type with Fine adjustment and release valve.

34. Deadweight Testers (Qty. 8 Set.):

Deadweight testers: Range -1 to 50 bar and 20 to 600bar. Accuracy of 0.025% of reading. Dead weight piston shall be made of hardened steel. Weight set shall be provided. Accessories like Angle connector, spirit level, pointer remover shall be provided. Dead weight piston and cylinder shall have over pressure stops preventing the piston from coming out. These pistons shall be hardened stainless steel. The tester shall have 1/2" NPT (F) connection. Adapters of different sizes to receive 1/4" NPT, 1/8" NPT & 3/4" NPT pressure gauge shall be supplied. Software shall be provided to correct for effects of environmental factors such as gravity and temperature to determine the pressure generated by dead weight testers.

35. Opacity / extinction combustion testing kit (Qty.: 4 Sets):

Opacity / extinction combustion testing kit, comprising CO2 indicator 20 %, smoke test pump, digital thermometer, CO2 indicator 10 %, CO detector, inclined manometer etc.

36. Portable gas detector with test gas bottle (Qty.: 6 Sets):

Portable gas detector with test gas bottle – For detection of CO, NO, H2S, SO2.

37. Anemometer (Qty.: 4 Sets):

Anemometer: With LCD backlit display, Simultaneous display of ambient temperature, air flow/ velocity Range- .5 to 25 m/s. Accuracy 3%.

38. Portable sound level (dBA) meter (Qty. 4 Nos.):

Portable sound level (dBA) meter, Sound Range: 40 to 130 dB, Basic Accuracy: ±2 dB.

39. Barometer (Qty.: 4 Sets):

Barometer: Range 930 to 1070mbar, Analog type.

40. Vernier Caliper (Qty. 4 Nos.):

Vernier Caliper 250 mm range.

41. Sets of standard instrument technician Tools (Qty. 100 Set):

Sets of standard instrument technician tools, appropriate cases/bags comprising screw drivers, spanners, pliers, voltage testers, cable isolating tools and other electrician and instrument fitter tools. Following to be provided: Standard Digital Multi-Meter, Cushion Grip Screw Drivers, Utility Knife, 6" Long Nose Pliers, 8"



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Linesman Plier, Mini Hacksaw, 10" Adjustable Wrench, 9" Wire Stripper, Hex Key, Spinner Handle, 1/4" Dr. Drive Adaptor, 1/4" Dr. Drive 6 point Socket, Screwdriver set, Soldering iron, Solder, De-soldering Pump, Digital Spark Tester, Tweezers, Measuring Tape, Plastic Box.

42. Thermochrome-chalks (Qty 6 Sets):

Thermo-chrome-chalks for measuring of temperature of metallic surface, range 65 – 670°C, consisting of 18 chalks for different temperatures.

43. Lighting/ reflecting mirror tool (Qty. 4 Sets):

Lighting/ reflecting mirror tool. Hand tool type. Mirror dimension approx. 1.5 x 2.5 inch.

44. Column drilling machine (Qty. 2 Sets):

Drilling capacity up to 13 mm, with 6 speeds from 200 to 2000RPM, V-belt drive, electrical equipment, with standard accessories.

45. Portable drilling machine (Qty 10 Sets):

Portable drilling machine, up to 10 mm drill diameter, with 3 sets of drill bits.

46. Mini drilling machine set (Qty 5 Sets):

Mini drilling machine set with set of bits for precision works.

47. Sets of standard technician tools (Qty 140 Sets):

Sets of standard technician tools in appropriate cases/bags comprising spanners, pliers, voltage testers, cable isolating tools and other electrician and instrument fitter tools like: cutters, trim tools, hexagonal key sets, hacksaw, nut spanners, isolated screw driver sets, socket set boxes, different purpose hammers, tap wrenches, HSS steel twist drill bits, centre drills, tapered reamers, precision hand drill, engraver, G-clamps, sheet-metal hole-cutters, micrometers, spring calipers, vernier calipers, different types of nose pliers, self-gripped wrenches, feeler gauges, rulers, logic checkers and others.

48. Vacuum cleaners (Qty. 6 Sets):

Vacuum cleaners, industrial type.

49. Standard pedestal grinder and tool grinder (Qty. 5 Sets):

Grinding machine, with cast iron frame, tool tray, grinding wheel size 200 x 32 x 51 mm approximately spark protection on both sides, lighting attachment with bulb, complete with electrical equipment and motor, motor protection switch and standard accessories.

50. Steel plate rack with shelves (Qty 5 Sets):

Steel plate rack with shelves, approx. 3000 x 600 x 2000. Shall be provided for storing the instruments.

51. Multi-purpose all-steel cupboards (Qty. 15 Sets):

Multi-purpose all-steel cupboards, 1000 x 600 x 2000 mm. With two-flap doors, made from solid plate, with five adjustable shelves, doors with lift-action lock.



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52. Die Tap Sets (Qty. 25 Set):

Die Tap Sets Including tap wrench, diestock and screwdriver in a wooden box. Set of 9 piece die set, taps. 1 piece tap wrench, 1 piece die handle.

9 pc dies set: 3 x 0.5, 4 x 0.7, 5 x 0.8, 6 x 1.0, 7 x 1.0, 8 x 1.25, 10 x 1.5, 12 x 1.75, 1/8-27.

9 pc taps: 3 x 0.5, 4 x 0.7, 5 x 0.8, 6 x 1.0, 7 x 1.0, 8 x 1.25, 10 x 1.5, 12 x 1.75, 1/8-27.

53. Engineering bench vice (Qty. 5 Nos.):

Engineering bench vice. Jaw opening 100mm.

54. Vice, cross type (Qty. 5 Nos.):

Vice, cross type. Jaw opening 70mm.

55. Vice, hand type (Qty. 5 Nos.):

Vice, hand type. Jaw opening 200mm.

56. Crimp tool kit (Qty 10 Set):

Crimp tool kit – For ferrule crimping of different wire size.

57. Spanner / socket set (Qty 15 Set):

Spanner / socket set. Spanner size from 6mm to 32mm. Socket – 10 to 34mm.

58. General purpose hexagonal keys (big size) (Qty 10 Set):

General purpose hexagonal keys (big size). Both in inches and metric.

Inch Size: 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32, 1/4, 5/16, 3/8.

Metric Size: 1.5mm, 2mm, 2.5mm, 3mm, 4mm, 5mm, 6mm, 8mm, 10mm.

59. Industrial thread repair kit (Qty 10 Set):

Industrial thread repair kit with ratchet application tool in polypropylene case.

60. Pipe bending machine Hydraulic operated (Qty 5 Set):

Pipe bending machine Hydraulic operated, size 3/8 - 2 inches.

61. Pipe bending machine manually operated (Qty. 5 Sets):

Pipe bending machine manually operated size ¼ inch & 5/16 inch.

62. Tube cutter (Qty. 25 Nos.):

Tube cutter (3-30 mm) size.

63. Rigid heavy duty pipe cutter (Qty. 5 Nos.):

Rigid heavy duty pipe cutter (1/8 - 2 inch).

64. Plastic pipe cutter (Qty. 20 Nos.):

Plastic pipe cutter 42 mm.



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65. Hacksaw frames (Qty. 10 Nos.):

Hacksaw frames 450 mm long.

66. Pipe wrench (Qty. 10 Nos.):

Pipe wrench (adjustable) 8 inch.

67. Pipe wrench (Qty. 10 Nos.):

Pipe wrench (adjustable) 14 inch.

68. O Ring kit (Qty. 100 Set):

Material Buna N / Viton. 30 sizes.

69. Long nose pliers (Qty. 20 Nos.):

Long nose pliers 200 mm.

70. Magnetic measuring tape (Qty. 25 Nos.):

Magnetic measuring tape 10 meters, 33 feet, 32 mm wide blade.

71. Tubing cutter Make RIDGID or equivalent (Qty. 25 Nos.):

Tubing cutter Make RIDGID or equivalent, Model 150-HD, 3 mm 28 mm (1/8 ~ 1-1/8 inch).

72. Pipe threader (Qty. 10 Nos.):

Pipe threader Model 12-R, RIDGID or equivalent, 1/8 ~ 2 inch (3 ~ 50 mm).

73. Lever bender (Qty. 10 Nos.):

Lever bender Model 316/310 M, RIDGID or equivalent 16 mm, 5/8 inch.

74. Tube bender RIDGID or equivalent (Qty. 10 Nos.):

Tube bender RIDGID or equivalent, 404, Part # 36122.

75. Lever bender RIDGID or equivalent (Qty. 10 Nos.):

Lever bender RIDGID or equivalent, Model #312, 3/4 inch.

76. Tube bender RIDGID or equivalent (Qty. 10 Nos.):

Tube bender RIDGID or equivalent, 3/8 inch, Model 406.

77. Aluminum pipe wrench (Qty. 5 Nos.):

Aluminum pipe wrench With Beryllium copper jaws Length 18 inch.

78. Aluminum pipe wrench (Qty. 5 Nos.):

Aluminum pipe wrench With Beryllium copper jaws.



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79. Portable pipe vises (Qty. 4 Nos.):

Portable pipe vises with trip pod stand, Size 12 * 14 inch with 45 and 90 degree.

80. Heavy duty yoke pipe (Qty. 4 Nos.):

Heavy duty yoke pipe with reversible yoke self locking hinge mechanism and double faced Reversible lower jaws. Size: 1/8-6".

81. Safety goggles (Qty. 100 Nos.):

Industrial Safety goggles.

82. Acetate face shield (Qty. 25 Nos.):

Acetate face shield with ratchet gear Clear 8 inch * 16 inch * 0.04 inch thickness.

83. Ear muff (Qty. 140 Nos.):

Industrial Ear Muff.

84. Flaring and swaging tool kit (Qty. 10 Nos.):

Flaring and swaging tool kit for copper brass and aluminum tubing.
Flaring tool Sizes (in): 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 5/8.
Swaging Tool capacity 6mm.

85. Standard duty 37 degree flaring tool kit (Qty. 10 Nos.):

Standard duty 37 degree flaring tool kit with slip on yoke, 3/16 ~ ¾ inch tube outer diameter, 7 Sizes. Sizes (in): 3/16, 1/4, 5/16, 3/8, 1/2, 5/8, 3/4".

86. Screw extractor and drill set (Qty. 10 Set):

Extractor for screw sizes -3, 6, 8, 11, 14 mm and matching drill bits.

87. Straight flute screw extractor (Qty. 10 Nos.):

Straight flute screw extractor With 5 sizes of extractors for screw size 3/16, 5/8, ¼ and 3/8 inch Pipe sizes and 5 matching cobalt drills.

88. Safety belts (Qty. 10 Nos.):

Industrial Safety Belts.

89. Heavy duty pipe wrench (Qty. 10 Nos.):

Heavy duty pipe wrench 18 inch.

90. Genuine ridge heavy duty pipe wrench (Qty. 2 Nos.):

Genuine ridge heavy duty pipe wrench, 36 inch.

91. Genuine ridge heavy duty pipe wrench (Qty. 5 Nos.):

Genuine ridge heavy duty pipe wrench, straight 24 inch.



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92. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-1/8 inch.

93. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-1/4 inch. 32 mm, length 11 inch.

94. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-5/16 inch. Length 11 inch.

95. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-1/2 inch. 38 mm.

96. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-5/8 inch. 41 mm.

97. 12 point metric striking face box wrench Offset 45 degree (Qty. 10 Nos.):

12 point metric striking face box wrench Offset 45 degree, size 1-11/16 inch. 43 mm.

98. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 1-3/4 inch. 44 mm.

99. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 2 inch. 51 mm.

100. 12 point metric striking face box wrench Offset type (Qty. 10 Nos.):

12 point metric striking face box wrench Offset type, size 3 inch. Length 16-1/2 inch.

101. Heavy duty alloy steel anchor shackle (Qty. Each 15 Nos each):

Heavy duty alloy steel anchor shackle with end nut, shackle size 1 inch, 0.5, 0.75, 1, 2, 3, 4 tones.

102. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 27 mm, length 180 mm.

103. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 30 mm, length 190 mm.

104. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 32 mm, length 190 mm.

105. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 36 mm, length 205 mm.



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106. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 41 mm, length 230 mm.

107. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 46 mm, length 240 mm.

108. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 55 mm, length 270 mm.

109. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 60 mm, length 280 mm.

110. 12 point metric striking face box Wrench (Qty. 5 Nos.):

12 point metric striking face box Wrench size 50 mm, length 295 mm.

111. Black smith sledge (Qty. 3 Nos.):

Black smith sledge, 1500 g with plastic handle.

112. Bench grinder (Qty. 4 Nos.):

Surface grinding machine wet grinding, grinding wheel diameter width 250/25 mm.

113. Spark less tool box (Qty. 2 Sets):

Tool box dimension approx. 400x300x200mm.

114. Chain block (Qty. Each 4 Nos.):

Chain block 0.5 ton, 1 ton, 1.5 ton, 2 ton, 3 ton.

115. Hole saw kit (Qty. 10 Set):

Hole Saw sizes: 19mm to 64mm.

116. Chisels and punches set (Qty. 50 Nos.):

Chisels and punches set. Different size.

Chisel size: 3/8", 1/2" and 5/8".

Punch Sizes: 1/16", 1/8", 5/32", 1/4", 5/16", 3/32".

117. Standard rotatable vice (Qty. 6 Nos.):

Standard rotatable vice. Jaw width 150mm, Jaw opening – 150mm.

118. Storage metal cabinets for electronic equipment (Qty. 6 Nos.):

Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. approx. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m.

119. Heavy duty chairs (Qty. 6 Nos.):

Heavy duty chairs for workbenches. Shall have revolving and tilting mechanism.



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120. Hot air guns (Qty. 6 Nos.):

Electrically operated. Approx. 1000W.

121. Vernier caliper (Qty. Each 4 Nos.):

Vernier caliper, different ranges and sizes. Sizes: 150mm, 200mm, 300mm.

122. Standard technician tools (Qty. 10 Sets):

Consisting of a standard digital multi-meter, Philips screwdrivers, Slotted Screwdrivers, Diagonal Pliers, Mini hacksaw, Linesman, Pliers, Utility Knife, Adjustable Wrench, Wire Stripper, Hex Key set, Spinner Handle, Drive Adapter, Drive 6 Point Sockets, Precision Screwdriver Set, Soldering iron, Solder, De-soldering Pump, Digital Tester and Tweezers.

123. Lighting/ reflecting mirror tool (Qty. 6 Sets):

Lighting/ reflecting mirror tool. Hand tool type. Mirror dimension approx. 1.5 x 2.5 inch.

124. Column drilling machine (Qty. 2 Sets):

Drilling capacity up to 13 mm, with 6 speeds from 200 to 2000 r.p.m, V-belt drive, electrical equipment, with standard accessories.

125. Battery operated portable hammer drilling machine (Qty 6 Sets):

Battery operated portable hammer drilling machine up to 10 mm drill diameter, with 3 sets of drill bits.

126. Battery operated power screw driver/drill machine (Qty 6 Sets):

Battery operated power screw driver/drill machine up to 10 mm drill diameter, with 3 sets of drill bits.

127. Mini drilling machine set (Qty 2 Sets):

Mini drilling machine set with set of bits for precision works. Up to 10mm drill capacity.

128. Vacuum cleaners (Qty. 2 Sets):

Industrial type.

129. Standard pedestal grinder and tool grinder (Qty. 3 Sets):

Grinding machine, with cast iron frame, tool tray, grinding wheel size 200mm approx, spark protection on both sides, lighting attachment with bulb, complete with electrical equipment and moto, motor protection switch and standard accessories.

130. Steel plate rack (Qty 5 Sets):

Steel plate rack with shelves approx. 3000 x 600 x 2000 mm.

131. Multi-purpose all-steel cupboards (Qty 15 Sets):

Multi-purpose all-steel cupboards 1000 x 600 x 2000 mm.

132. Magnifier (Qty 6 Set):

Magnifier (hand held and table mount).



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133. Digital micrometer (Qty 5 Set):

Digital micrometer- Range max: 25mm, Resolution: 0.001 mm, Accuracy: $\pm 2\mu\text{m}$.

134. Anemometer With LCD backlit display (Qty. 2 Set):

Anemometer with LCD backlit display, Simultaneous display of ambient temperature, air flow/
Velocity Range- .5 to 25 m/s. Accuracy 3%.

Note:

- 1.0 Makes against certain items have been provide in section (V). Vendors can offer different makes against these items, however same will be acceptable based on credentials submitted for the offered makes.
- 2.0 For balance items vendors to offer from reputed makes.



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IV) Bill of Material:

SL NO	DESCRIPTION OF ITEMS	Qty.	UOM
1	Instrument mechanic's and electronics tool kit	10	Set
2	Sets Heavy fitter's tools and equipment	10	Set
3	Drill Bits / tools	6	Set
4	Mobile Work Bench tools	4	Set
5	Multi-purpose all-steel cupboard	10	Nos.
6	Steel tools cabinets , small size (two types)	1	Set
7	Fire-proof steel cupboard	1	No.
8	Pneumatic workbenches	8	Set
9	Soldering iron sets with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench	8	Nos.
10	Stationary solder remover with vacuum pump, pipes, tips, etc. for each workbench	8	Nos.
11	Standard rotatable vice, mounted on each of the regular workbenches	8	Nos.
12	Storage metal cabinets	8	Nos.
13	Heavy duty chairs	8	Nos.
14	Light sources / lamps adapted to the workbenches	8	Nos.
15	Pressure Calibrator	12	Nos.
16	Temperature Baths / Calibrators	12	Set
17	Direct temperature indicating meter	12	Nos.
18	Depth gauge	8	Nos.
19	Feeler gauge	8	Nos.
20	Dial Indicators	6	Set
21	Hand Held IR Thermometers	12	Nos.
22	Humidity & Moisture Meter	8	Nos.
23	Hazardous & Toxic Gas leak detector	6	Nos.
24	Field Meters (LEL), Leak & Emission	6	Nos.
25	Laser Distance Meter	6	Nos.
26	Ultrasonic Distance Estimators	6	Nos.
27	Ultrasonic Hand held flow meters	6	Nos.
28	Ultrasonic handheld level meters.	6	Nos.
29	Portable ultrasonic flow meter (transit time type)	4	Nos.
30	Precision pressure gauges.	8	Sets
31	Manometers suitable for very low and low pressure measurements.	6	Set
32	Portable pressure source for low pressure and vacuum (pneumatic measuring box).	2	Set
33	Calibration pressure pump 0-2 bar, 0-10 bar, 0-20 bar, 0-40 bar.	8	Set



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34	Deadweight testers: Range -1 to 50 bar and 20 to 600bar.	8	Set.
35	Opacity / extinction combustion testing kit.	4	Set
36	Portable gas detector with test gas bottle	6	Set
37	Anemometer	4	Set
38	Portable sound level (dBA) meter	4	Nos.
39	Barometer	4	Set
40	Vernier caliper	4	Nos.
41	Sets of standard instrument technician tools in appropriate cases/bags.	100	Set
42	Thermochrome-chalks.	6	Set
43	Lighting/ reflecting mirror tool. Hand tool type.	4	Set
44	Column drilling machine	2	Set
45	Portable drilling machine	10	Set
46	Mini drilling machine set	5	Set
47	Sets of standard technician tools in appropriate cases/bags.	140	Set
48	Vacuum cleaners	6	Set
49	Standard pedestal grinder and tool grinder	5	Set
50	Steel plate rack with shelves	5	Set
51	Multi-purpose all-steel cupboards	15	Set
52	Die Tap Sets	25	Set
53	Engineering bench vice.	5	Nos.
54	Vice, cross type	5	Nos.
55	Vice, hand type.	5	Nos.
56	Crimp tool kit	10	Set
57	Spanner / socket set.	15	Set
58	General purpose hexagonal keys (big size).	10	Set
59	Industrial thread repair kit	10	Set
60	Pipe bending machine Hydraulic operated.	5	Set
61	Pipe bending machine Manually operated size ¼ inch & 5/16 inch	5	Set
62	Tube cutter	25	Nos.
63	Rigid heavy duty pipe cutter	5	Nos.
64	Plastic pipe cutter	20	Nos.
65	Hacksaw frames	10	Nos.
66	Pipe wrench (adjustable) 8 inch	10	Nos.
67	Pipe wrench (adjustable) 14 inch	10	Nos.
68	O Ring kit	100	Set
69	Long nose pliers 200 mm	20	Nos.
70	Magnetic measuring tape	25	Nos.
71	Tubing cutter	25	Nos.
72	Pipe threader.	10	Nos.
73	Lever bender	10	Nos.



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74	Tube bender RIDGID or equivalent , 404	10	Nos.
75	Lever bender RIDGID or equivalent, Model #312, ¾ inch	10	Nos.
76	Tube bender RIDGID or equivalent, 3/8 inch, Model 406	10	Nos.
77	Aluminum pipe wrench With Beryllium copper jaws Length 18 inch	5	Nos.
78	Aluminum pipe wrench With Beryllium copper jaws	5	Nos.
79	Portable pipe vises	4	Nos.
80	Heavy duty yoke pipe	4	Nos.
81	Safety goggles	100	Nos.
82	Acetate face shield	25	Nos.
83	Ear muff	140	Nos.
84	Flaring and swaging tool kit for copper brass and aluminum tubing	10	Nos.
85	Standard duty 37 degree flaring tool kit	10	Nos.
86	Screw extractor and drill set	10	Set
87	Straight flute screw extractor	10	Nos.
88	Safety belts	10	Nos.
89	Heavy duty pipe wrench 18 inch	10	Nos.
90	Genuine ridge heavy duty pipe wrench, 36 inch	2	Nos.
91	Genuine ridge heavy duty pipe wrench, straight 24 inch	5	Nos.
92	12 point metric striking face box wrench Offset type, size 1-1/8 inch	10	Nos.
93	12 point metric striking face box wrench Offset type, size 1-1/4 inch. 32 mm, length 11 inch	10	Nos.
94	12 point metric striking face box wrench Offset type, size 1-5/16 inch. Length 11 inch	10	Nos.
95	12 point metric striking face box wrench Offset type, size 1-1/2 inch. 38 mm	10	Nos.
96	12 point metric striking face box wrench Offset type, size 1-5/8 inch. 41 mm	10	Nos.
97	12 point metric striking face box wrench Offset 45 degree, size 1-11/16 inch. 43 mm	10	Nos.
98	12 point metric striking face box wrench Offset type, size 1-3/4 inch. 44 mm	10	Nos.
99	12 point metric striking face box wrench Offset type, size 2 inch. 51 mm	10	Nos.
100	12 point metric striking face box wrench Offset type, size 3 inch. Length 16-1/2 inch	10	Nos.
101	Heavy duty alloy steel anchor shackle With end nut, shackle size 1 inch, 0.5, 0.75, 1, 2, 3, 4 tones	15	Nos. each
102	12 point metric striking face box Wrench size 27 mm, length 180 mm	5	Nos.
103	12 point metric striking face box Wrench size 30 mm, length 190 mm	5	Nos.



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104	12 point metric striking face box Wrench size 32 mm, length 190 mm	5	Nos.
105	12 point metric striking face box Wrench size 36 mm, length 205 mm	5	Nos.
106	12 point metric striking face box Wrench size 41 mm, length 230 mm	5	Nos.
107	12 point metric striking face box Wrench size 46 mm, length 240 mm	5	Nos.
108	12 point metric striking face box Wrench size 55 mm, length 270 mm	5	Nos.
109	12 point metric striking face box Wrench size 60 mm, length 280 mm	5	Nos.
110	12 point metric striking face box Wrench size 50 mm, length 295 mm	5	Nos.
111	Black smith sledge	3	Nos.
112	Bench grinder	4	Nos.
113	Spark less tool box	2	Sets
114	Chain block 0.5 ton, 1 ton, 1.5 ton, 2 ton, 3 ton	4	Nos. each
115	Hole saw kit	10	Set
116	Chisels and punches set.	50	Nos.
117	Standard rotatable vice	6	Nos.
118	Storage metal cabinets	6	Nos.
119	Heavy duty chairs for the workbenches	6	Nos.
120	Hot air guns	6	Nos.
121	Vernier caliper, different ranges and sizes	4	Nos. each
122	Standard technician tools	10	Set
123	Lighting/ reflecting mirror tool	6	Set
124	Column drilling machine	2	Set
125	Battery operated portable hammer drilling machine	6	Set
126	Battery operated power screw driver/drill machine	6	Set
127	Mini drilling machine set	2	Set
128	Vacuum cleaners, industrial type	2	Set
129	Standard pedestal grinder and tool grinder	3	Set
130	Steel plate rack with shelves	5	Set
131	Multi-purpose all-steel cupboards	15	Set
132	Magnifier (hand held and table mount)	6	Set
133	Digital micrometer	5	Set
134	Anemometer	2	Set



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V) SUB-VENDOR / MANUFACTURER LIST:

Sl Nos.	Item	Makes
1	8) Pneumatic workbenches	Tinsley, Isothermal, Yantrika, Fluke, GE, Nagman, R&D Instruments, Toshniwal, Yokogawa
2	15) Pressure Calibrator	Tinsley, Eurotron, Yokogawa, BEAMEX, Time Electronics, FLUKE, DRUCK, ASHCROFT INC, WIKA , AMETEK, AOIP, Nagman, Haven Automation, Yokogawa, R&D Instruments
3	16) Temperature Baths / Calibrators	Jofra, Isothermal, Fluke, Eurotron, Nagman, Wika, Druck, Haven Automation, R&D Instruments
4	17) Temperature Indicating Meter	Yaska Control, Extech, GE, AOIP, Eurotron, Wika, Fluke
5	21) Hand Held IR Thermometers	Extech, Fluke, MIKRON, Impac, MINOLTA, TESTO, LAND, WIKA, Eurotron, Druck, Tinsley
6	22) Humidity & Moisture Meter	Yaska Control, Extech, GE, Amprobe, Transcat
7	23) Hazardous & Toxic Gas leak detector	Endee, Land, Bacharach, H&B, Eurotron TESTO, Honeywell, Extech, RS-Pro
8	24) Field Meters (LEL) Leak & Emission Detectors for detection of Hazardous gases.	Endee, Land, Bacharach, H&B, Eurotron TESTO, Honeywell, Extech, RS-Pro
9	27) Ultrasonic Hand held flow meters	Fuji, E&H, Dynasonic, Micronics, GE, Flexim, Tesco
10	29) Portable ultrasonic flow meter (transit time type).	Fuji, E&H, Dynasonic, Micronics, GE, Flexim, Tesco
11	30) Precision Pressure Gauges	Ametek, Budenberg, Tinsley, Wika, Ashcroft, Yantrika, Gauges Bourdon, Heise, Afriso-Euro
12	31) Manometers	Dwyer, Meriam, Tinsley, Fitzer, KAMRANS, SHARP
13	32) Portable pressure source for low pressure and vacuum	GE, Fluke, Yantrika, Nagman, Toshniwal, Time electronic, R&D
14	33) Calibration pressure pump	GE, Fluke, Yantrika, Nagman, Toshniwal, Time electronic, R&D
15	34) Deadweight Testers	Tinsley, Scandura, Budenberg, AMETEK, WIKA, Fluke, Yantrika, Nagman, Ashcroft



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16	35) Opacity / extinction combustion testing kit	Endee, Land, Bacharach, H&B, Eurotron TESTO, Honeywell, Extech, RS-Pro
17	36) Portable gas detector with test gas bottle	Endee, Land, Bacharach, H&B, Eurotron TESTO, Honeywell, Extech, RS-Pro
18	37), 134) Anemometer	Extech, Testo, Cole-Parmer
19	39) Barometer	Cole Parmer, Wika, Meriam, Novalynix, Druck, Control Compay, Extech, Fitzer, Revue Thommen



SUB-VENDOR QUESTIONNAIRE
(Information marked with asterisk (*) is mandatory)
(APPLICABLE FOR SERVICE/ WORK CONTRACTS)

FICHTNER

Name of the proposed SERVICES/ WORKS *

1. **Name of Proposed Sub-Vendor *:** _____

Website *: _____

2. **Address of Regd. Office *:**

Details of contact person *:

Name_____

Mobile no._____

Desig._____

E-mail:

• **Country of Head Office ***

• **Field of activities ***

3. **Address of Works***

Details of contact person:

Name_____

Mobile no._____

Desig._____

E-mail:

4. **Branch / Liaison office in Dhaka***

Details of contact person:

Name_____

Mobile no._____

Desig._____

E-mail:



SUB-VENDOR QUESTIONNAIRE

FICHTNER

5. Annual Turnover * & Profit in past three years *:

#	Annual Turnover in Mn USD	Profit After tax in Mn USD
2015-2016		
2014-2015		
2013-2014		

6. Present & Peak Manpower Handled Status*:

Division Status	Permanent Manpower			Peak Manpower		Remarks
	Graduate		Diploma	Number	Project	
	Technical	Non-Technical				

- a) Enclose organization chart of the proposed works (Y / N)
- b) Enclose Organization chart of QA / QC Deptt. (Y / N)
- c) Enclose List of Qualified Welders with process etc. (Y / N)
- d) Enclose List of Qualified NDT personnel with area (Y / N)

7. Approval/ Certificates by National/ International standards/ accredited agency applicable for the proposed services/ works

8. Furnish Experience list of the proposed services/ works *

9. Enclose End User's operational feedback certificate for the proposed services/ works *.

10. Enclose list of equipment & machinery specific to the proposed services/ works*.

This should include name of equipment, capacity, year of manufacturing & nos. etc.:

11. Enclose list of Site Infrastructure & Services Available *

11. Quality management*

11.1 General

11.1.1 Work Instruction for different processes available. (Y / N)
if yes, furnish list.

11.1.2 Records generated during inspection maintained & available for review? (Y / N)

11.1.3 Statistical quality control techniques used? (Y/N)
If yes please furnish details.

11.1.4 ISO certificate for the works available? (Y/ N)
If yes, enclose copy of the certificate.

11.1.5 Quality & HSE Manual for the works available (Y / N)
If yes, enclose copy of the manual.

11.2 Corrective action

11.2.1 Specifically confirm whether System for identifying & disposition of Non
Conformity in the process / product is available (Y / N)

11.2.2 Specifically confirm whether System for Customer complains & their satisfactory
disposal is available. (Y / N)

11.3 Documentation Control

11.3.1 Procedure available for documentation control (Y / N)

11.4 Control of Inspection, measuring & testing equipment.

11.4.1 Procedure for calibration of testing & measuring instrument available. (Y / N)

12. Certification of sub-vendor *

I CERTIFY THAT THE INFORMATION SUPPLIED HEREIN (INCLUDING ALL PAGES ATTACHED) IS CORRECT.

SEAL

Name

M/S.

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

13. Certification by Main Supplier *:

ABOVE INFORMATION HAVE BEEN VERIFIED AND FOUND IN ORDER TO COMPLY WITH TECHNICAL SPECIFICATION AS PER EPC-CONTRACT.

SEAL

Name

M/S.

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

NOTE:

1. COLUMN SHALL NOT BE LEFT UNFILLED. IN CASE OF NOT APPLICABLE / NOT AVAILABLE, THE SAME SHALL BE INDICTED IN THE PROVIDED SPACE.
2. IN CASE PROVIDED SPACE IS NOT ADEQUATE, INFORMATION SHALL BE PROVIDED AS AN ATTACHMENT.
3. PRODUCT CATALOGUE FOR THE PROPOSED EQUIPMENT / ITEM / PROCESS, IF AVAILABLE, SHALL BE ENCLOSED



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PLANT STANDARD

ED 049 00 92

REV NO 05

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REVISION HISTORY SHEET

REV NO.	DATE	NATURE OF CHANGE	REASONS	CHANGED BY	APPROVED BY
00	11/05/1995		-	VS, SHG	NJ
01	05/06/1995	ANNEXURE ADDED	ACCEPTANCE CRITERIA INCLUDED FEED BACK FROM QUALITY	SHG	NJ
02	06/03/1997	CL.6.4.1 ALTERED	FEEDBACK FROM SHIPPING	SHG	NS
03	20/12/1999	IS YEAR OF ISSUE REMOVED	-	CCR	NS
04	15/12/2009	INCLUSION OF MR GRADE PLYWOOD SHEET FOR PACKING (Commercial Grade)	FEEDBACK FROM SHIPPING & GENERAL REVIEW	PGD / KPN	MSR
05	21/03/2013	Inclusion of recommendations pertaining to spares in page-12&26	Recommendations from Corporate systems & IT	HRN	MS

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APPROVED: M. Sivaramaiah

PREPARED: PGD/KPN ISSUED: STDS GROUP DATE: 30/03/13



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ISSUED: DATE:
STDS GROUP 30/03/13

DATE :

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3.1.1.3

Plywood for general purposes i.e. moisture resistance or MR grade (Commercial ply wood) and termite, fungus proof as per IS: 303 of 9 mm / 12 mm thick for control cubicles, single and multi cubicles, loose items and spares cases. The plywood shall be bonded with high quality Phenol Formaldehyde Synthetic Resin and specially treated with preservatives to repel termites and wood destroying organisms. The plywood shall withstand the stress caused by cyclic changes in weather conditions. It shall be durable and resistant to heat, sun and moisture. The sheets so procured shall have IS mark IS 303 and MR grade stamped on it. 9 mm thick plywood can be used with additional plywood support/ reinforcement suitable battens both for small cases and also for panels. Support batten as indicated at 3.1.1.4 shall be used.

Sample drawings of panels & loose boxes are attached for ready reference.

[Fig : 10 to 13]

3.1.1.4 Support Battens:

Ply wood sheet of cross section 18 mm x (100 mm) for support batten for loose items, spares, and plywood sheet of cross section 18 mm thk x 100 to 150 mm width as support batten for standard panels up to 2450 x 1350 x 2500 mm panels. Support batten of plywood cross section 12 thk x 75 to 100 mm can also be used for small cases apart from 18 mm x 100 mm cross section. These plywood support battens can also be used in place of silver oak support battens as referred in clause 3.1.1.2. Additional support battens/ cross battens of suitable sizes are to be provided on need basis.

Sample drawings of panel's i.e. single suit, two suite and three suit cubicles are attached for ready reference [Fig: 10 to 13].

Special support battens for Rlys and similar panels:

Plywood of cross section 18 mm x 75mm x 3 no's at both bottom end and top end of front and back shock's , and also at top portion of both corner shock's for fixing with bolt and nut/ clamps, and 18 mm x 150 mm x 2 nos cross section as support batten/ slanting reinforcement batten on all sides. On need basis 18mm x 125 mm x 2 to 3 no's of plywood cross section can also be used additionally depending upon the size and weight of the panel.

Plywood shock's can be fixed with both Bolts and mechanical latching clamps or combination of both as the case may be.

Sample drawings of panels are attached for ready reference.

[Fig : 8 & 9]

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3.1.2 For Export Contracts

- 3.1.2.1 Plywood of Marine grade as per IS: 710 of 9 / 12 mm Thick for control cubicles of single / two / three suite for loose items and spare cases. For suit of four and longer cubicle sections, 19mm thick is to be used.

It shall be highly resistant to attacks from fungi, termites and wood destroying organisms including marine borers. The plywood shall withstand the stress caused by cyclic changes in weather conditions. It shall be durable and resistant to heat, sun and moisture. The sheet shall have IS: 710 and marine grade marking.

3.1.2.2 Same as clause 3.1.1.2.

- 3.1.3 BHEL EDN will be carrying out test on ISI marked ply Wood whenever required.

- 3.2 Fasteners: M8 x 130 mm and M8 x 150 long zinc plated Bolts and M8 zinc plated nuts for fixing, and spring Washers or suitable size can also be used.

- 3.3 Nails: Nails of dia 3.15 mm and about 40 mm for nailing of plywood and silver oak batten. Suitable smaller size is to be used for other nailing.

- 3.4 Polyethylene sheet: The polyethylene sheets are used to make covers for the jobs individually. The material shall have a minimum thickness of 0.175 mm (175 microns).

The polyethylene sheet shall be clear and transparent manufactured out of virgin material. Reprocessed material shall not be used.

- 3.5 Bituminised water proof kraft paper - used for lining the inside of shookees of cubicles.

- 3.6 Bitumen coated Hessian polyethylene kraft paper used for lining the inside of top cover for cubicles and all inner and top sides for small boxes.

- 3.7 Rubberised Coirs- used for cushioning and to fill the gap inside packing boxes. The coir shall be about 100 mm wide and 25mm thick.

- 3.8 Foam rubber/U Foam - This is used for covering the delicate items. This material is normally provided by BHEL.

- 3.9 Thermocole (Expanded polystyrene) sheets - This is used for covering delicate items. This material is normally provided by BHEL.

- 3.10 Silica gel - shall be of indication type to conform to IS: 3401: shall be blue in colour while usage.

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- 3.11 Cotton bag - These are used for holding silica gel. The bags shall have the following matter indicated on them:

BHEL-EDN	SILICA GEL INDICATING TYPE	BANGALORE-560026
BLUE	: ACTIVE	
ROSE	: REDUCED ACTIVITY	
WHITE	: NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL	

- 3.12 Cotton / Plastic tape-This is used for tying small items and also to prevent vibrations of moving parts within the cubicles.
- 3.13 Polyethylene bags - These are to be used for keeping the packing slips. The bag shall be of size 70 mm X 100 mm (minimum).
- 3.14 Hessian cloth, twine thread, paint will have to be used in packing certain items.
- 3.15 Marking plate - This shall be of anodized aluminium sheet. Details and specifications are given in Fig-3.
- 3.16 Marking ink - Ink used shall be normally black in colour. The ink shall be indelible, non fading and non washable in water.
- 3.17 Packing Slip Holder - This shall be of galvanised iron tinned sheet / aluminium sheet.
- 3.18 Mechanical Latching clamps : For CLW Railway panels and similar Panels self locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. Sample drawing attached [refer Fig.7]. For reusable boxes, these clamps provides easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.
- 3.19 Flex/Vinyl digital print media for labeling:
Labels made out of Flex/Vinyl/ other digital media shall be used for export contracts & some prestigious domestic contracts on need basis apart from existing present marking/ labeling system.
- 3.20 Aluminium foil for packing:
On need basis, suitable size & thickness of aluminium foil shall be used for packing of electronic panels and loose items for both indigenous & export contracts.
- 3.21 Pallets :
All cubicles are mounted on the pallets by BHEL. For loose items, HMI items & small cabinets for which no pallets are available, suitable size pallets have to be arranged by the contractor.

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4.0 Chemical treatment for silver oak preservation

- 4.1 The silver oak battens are to be treated with ASCU solution. For plywood wood treatment is not required.
- 4.2 The chemical used shall be ready mix ASCU paste. This consists of Arsenic, copper sulphate, sodium dichromate. This paste shall be mixed at the rate of 1 kg of paste per 10 liters of water. Alternate to this CCA can also be used as indicated at para 4.4
- 4.3 The chemical treatment shall be done at the premises of the contractor. A cement concrete tank of capacity to hold a minimum of 2000 liters of solution shall be constructed. The solution shall be prepared in the presence of BHEL- EDN's representative by contractor. The wooden battens shall be soaked in the solution for a minimum of 12 hours.

The solution shall be replenished after treating a maximum of 12 cubic meters of wood for 2000 liters of solution. A log book shall be maintained by the contractor to give the details of date of preparation of solution, quantity of solution prepared, quantity of chemicals used, quantity of wood treated and the details of replenishment.

Samples of solutions [only paste before mixing] shall be tested at the laboratories designated by BHEL. The testing fees to be paid to the laboratories will have to be borne by the contractor. The solution [paste] shall be tested as and when required.

4.4 Specifications for water soluble type wood preservatives: Copper - Chromium - Arsenic [CCA]:

Copper - Chromium - Arsenic preservative formulation shall be as per IS : 10013 Part - II - 1981 shall consist of following active ingredients in nominal proportions by weight as shown below:

Arsenic Pentoxide	$As_2O_5 \cdot 2H_2O$	12.5
Copper Sulphate	$CuSO_4 \cdot 5H_2O$	37.5
Sodium Dichromate	$Na_2Cr_2O_7 \cdot 5H_2O$	50.0
Or		
Potassium Dichromate	$K_2Cr_2O_7$	

- 5.0 Jointing of plywood- to the extent possible, single plywood sheet shall be used in case of equipment of large size, jointing is allowed as bellow.
- 5.1 The joining shall be as close to the center of equipment as possible, but not less than 500 mm from one edge.
- 5.2 While joining (2 or more plywood sheets), care shall be taken to fix the sheets in the direction of the grain structure.
- 5.3a For joining Plywood and Silver oak wooden batten:
While joining, 2 sheets shall be kept close to each other and treated

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silver oak batten of 100 mm width and 45 mm thick to be used and nailed to both plywood sheets alternately (2 numbers) in zig-zag manner.

5.3b For Joining plywood with plywood sheets :

While joining, 2 sheets shall be kept close to each other and plywood sheet batten of minimum 100 to 200 mm width and 18 mm thick to be used depending upon the size of the box/ case and nailed to both plywood sheets alternately (2 numbers) in zig-zag manner. Suitable size nails to be used.

5.4 Jointing of silver oak batten : Only single length silver oak batten shall be used. In case of height or width of equipment is more than 2400 mm, jointing of batten is acceptable. The jointing of batten shall be such that two batten are kept together and one more batten of width & length of about 200 mm to be nailed on both the planks as in Clause 5.3 above.

5.5 The above jointing is to be done close to center of equipment.

6.0 Packing procedure

6.1 Packing of cubicles for inland contracts.

6.1.1 Packing to be done using materials given in clause 3.0.

6.1.2 The cubicles are fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets.

6.1.3 Loose parts : All loose parts in the cubicles, shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

6.1.4 Additional loose items which may be kept inside the cubicle.

- a. The components which are removed from cubicle for loose shipping, such as meters shall be kept inside the cubicle individually kept in wooden box and tied firmly to the bottom of cubicle.
- b. Other items which are given loose in addition to cubicle, shall be packed in separate boxes (like cables).
- c. For transformer cubicles loose items shall be packed in separate boxes and these boxes may be tied firmly in bottom of cubicles.
- d. Items which are bigger in size such as impulse tubes may be kept at the top of cubicles firmly bunched and tied.

6.1.5 Wooden batten : This batten shall be silver oak wood .In case of Cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/ battens of proper size shall be provided to give strength to the package.

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- 6.1.6 Silica gel: Silica gel (as in 3.10) packed in cotton bag (as in 3.11) shall be kept at different place inside the cubicle as per BHEL-EDN directions. Each suit of cubicle shall provided with 1 kg of silica gel (for a suit of 4 cubicles, 4 kg of silica gel shall be used).
- 6.1.7 Polyethylene sheet covering: Cubicles shall be covered with polyethylene petticoat (sheet as in 3.4). This shall be tailor made to fit the cubicle. The sealing shall be such as not to allow any moisture to enter the cubicle. This sheet is to be folded to the bottom pallet with wooden planks on 2 larger sides.
- 6.1.8 After completion of this, the arrangement is as shown in Fig.1.
- 6.1.9 Rubberised coir: (as in 3.7) to be nailed from inner side of plywood after pasting kraft paper for full length with a pitch less than 500mm with a min. of 2 rows of cover is to be used.
- 6.1.10 Bituminised water proof kraft paper: (as in 3.5) to be pasted with glue on 4 inner sides of plywood. Whenever 2 pieces of kraft paper are used, the joint shall have an over lap of min 20 mm.
- 6.1.11 Bitumen coated Hessian polyethylene kraft paper (as in 3.6) to be nailed using nails (as in 3.3) on top cover inner surface. This sheet shall project outside on 4 sides by atleast 100 mm and shall be folded and nailed on to the sides. Joining of 2 sheets shall have an overlap of min 20 mm.
- 6.1.12 After completion of above steps, the arrangement shall be as given in Fig.2.
- 6.1.13 Marking Plate : One no (as in 3.15) shall be nailed to the front side of case, item as shown in Fig.3.
- 6.1.14 Case Marking : After complete packing, marking of various details and symbols as given by EDN shall be done using indelible ink (as in 3.16)
- 6.1.15 Packing Slip : Packing slip kept in polyethylene bag (as in 3.18) shall be placed inside the box at appropriate place before closing the top. in addition one more packing slip covered in polyethylene cover and packing slip holder (as in 3.17) shall be nailed to front or rear of shook.
- 6.1.16 At the end of this stage, the arrangement is as shown in Fig.4. Front and rear shook fixing arrangement to the bottom of the pallet is as shown in Fig.5
- 6.1.17 The lifting arrangement of the packed case is shown in Fig.6
- 6.2 Packing of cubicles for export contracts Procedure is same as that given in 6.1 except for the following changes:
- Two Polyethylene petticoat (as in 6.1.7) instead of one
 - Fumigation may have to be done if required (BHEL Scope).

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- 6.3 Packing of empty Cubicles Procedure is same as that given in 6.1 except For following changes
- Bituminised kraft paper, bitumen coated Hessian polyethylene paper, silica gel need not be used.
- 6.4 Packing of loose items/spares for inland contracts
- 6.4.1 All the materials and procedure are same as in 6.1 except that :
- No joining of plywood and silver oak batten
 - Inner sides of all 6 sides shall be nailed with bitumen coated Hessian polyethylene kraft paper (as in 3.6) using nails.
 - Kraft paper (as in 3.5) is not required
 - Silica gel quantity is 100 gm approx per box.
 - Rubberised coir is to be nailed to inner surfaces of bottom 4 sides of box.
 - Bottom plywood sheet / pallet shall be of 18 mm thick for all practical purposes and 12 mm thick for smaller boxes on need basis. Suitable bottom beams made out of plywood/ any other wood of suitable cross section 75x36 mm, 75x54 mm, 75x75 mm, 100x100 mm.
 - Support battens of cross section 12x75 mm, 12x100mm, 18x75 mm, 18x100 mm can be used depending upon the size of the boxes. Plywood support battens can be used in the place of silver oak battens.
 - Clause 6.1.10 is not applicable. Individual items to sealed with polyethylene sheet(as in 3.4) and one full cover of polyethylene sheet covering of all items is to be made.
- 6.4.2 In few cases gabled roof (single or double gable) may have to be made, details of which will be given by EDN.
- 6.4.3 Internal Packing: Items that go into the box shall be packed using polyethylene sheet/ U foam/ thermocol sheets/air bubbled sheets/ paper cartoons and cotton tape. Any space left between the job and the sides and the top of the box shall be filled with rubberised coir/air bubbled sheet /thermocole to get proper cushioning effect. Certain items like transformers, reactors, breakers, etc shall be bolted to the bottom of the box using bolts, nuts and washers.
- 6.5 Packing of Loose items/ Spares for Export Contracts: Procedure is same as that given in 6.4 except for following changes:
- Two polyethylene covers to be provided,
 - Fumigation may have to be done, if required, for which payment will be made by EDN.
- 6.6 Any other changes/ new methods/ alternative packing systems can be undertaken with prior information and approval from the dept. For other parameters and further details concerned agency may please be contacted.

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7.0 ACCEPTANCE CRITERIA OF PLYWOOD :

**PLYWOOD FOR GENERAL PURPOSE
GRADE FOR PACKING - AS PER IS:303**

1. Plywood sheets shall have IS:303 & BWR / MR grade stamped on each sheet.
2. Packing/contractor should give a certificate to this effect.
3. Contractor shall identify each sheet with their name/firm in suitable place.
4. Visual checks to be done by packing contractor and EDN-QC CE shipping.
5. For other parameters, testing will be done at authorised laboratories/institutions by EDN on sample basis.

7.1 FOR BWR GRADE : TABLE-1 QUALITY REQUIREMENTS OF PLYWOOD

Sl NO	Defect Category	Maximum Number of Defect Permitted on any one surface of panel (as applicable to Type A Surface of IS:303)
1.	Blister	Nil
2.	Check	Individual check not more than 50mm in length and the total length not more than 300mm/m ²
3.	Discoloration	Nil
4.	Dote	5cm/m ²
5.	Insect hole	Scattered up to 12 holes/m ²
6.	Joints	One joint for every multiple of 200mm provided no individual piece is less than 100mm in width
7.	Knots(dead)	2 up to 12mm dia/m ²
8.	Pin knots(dead)	2/m ²
9.	Pin knots(live)	No restriction
10.	Knots(tight)	6 up to 25mm dia/m ²
11.	Patches	4 patches/m sq provided they are all tight patches & do not mar the appearance

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12. Splits. 2 splits each not more than 1mm wide and length not more than 100mm provided they are filled with suitable filler

13. Swirl Unlimited provided they do not mar the

7.2 FOR MR GRADE : TABLE -2 QUALITY REQUIREMENTS OF PLYWOOD

Sl NO	Defect Category	Maximum Number of Defect Permitted on any one surface of panel (as applicable to Type A Surface of IS:303)
1.	Blister	Nil
2.	Check	Individual check not more than 100mm in length and the total length not more than 1000mm/m ²
3.	Discoloration	5 %
4.	Dote	15cm/m ²
5.	Insect hole	Scattered up to 24 holes/m ²
6.	Joints	: No restrictions
7.	Knots (dead)	4 up to 20mm dia/m ²
8.	Pin knots (dead)	: 6/m ²
9.	Pin knots (live)	No restriction
10.	Knots (tight)	: No Restrictions
11.	Patches	Any number provided they are all tight patches & do not mar the appearance
12.	Splits	3 splits each not more than 4 mm wide and length not more than 150 mm provided they are filled with suitable filler
13.	Swirl	NO restrictions

7.3 Thickness of Plywood sheets:

The plywood boards shall be of uniform thickness within specified tolerance limit specified. The faces of plywood boards shall be reasonably smooth.

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7.4 PERMISSIBLE DEFECTS:

Gaps in cores and cross-bands may be permitted except for 3 ply plywood, provided the width of the gap does not exceed 1mm in case of and 2 mm in case of plywood of more than 5 ply and provided such gaps, if more than one, shall be spaces not less than 80mm away from each other and are staggered not less than 50mm away as between ply, the next ply having the same grain direction.

7.5 WORKMANSHIP AND FINISH:

The plywood boards shall be of uniform thickness.

The faces of plywood boards shall be reasonably smooth and face veneers shall be reasonably uniform thickness.

7.6 TESTS:

For testing any other mechanical property of general purpose plywood, Subject to agreement between the purchaser and the supplier, reference shall be made to the provisions of IS 1734 Part 1 and 20)

8.0 Details of Drawings / Figures attached:

- Fig- 1 : Packing of panel - Preparation
- Fig- 2 : Shookes preparation
- Fig- 3 : Marking Plate
- Fig- 4 : Packed panel with plywood and silveroak battens
- Fig- 5 : Detailed joining of pkg shookes with battens
- Fig- 6 : Lifting of packed case
- Fig- 7 : Mechanical Latching clamps
- Fig 8 & 9 : CLW Railway panel packing
- Fig 10 to 13: Packing of panels and spares packing cases.
- Fig 14 : All Units supplying Initial and O & M spares
(Recommendations from Corporate Systems & IT)

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Additional points to be taken care for :

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

(Recommendations from Corporate Systems & IT)

Sl	Activity
1	All Initial and O&M spares preferably supplied in one lot to site and progressive inventory till all spares are accumulated could be kept at units.
2	Spares (Initial and O&M) should be supplied in separate Boxes / Containers and not mixed in main supply boxes.
3	i) Initial spares Box / Container to be labeled as "INITIAL SPARES " in RED. Ref fig: 14 (Page-26). ii) O & M spares Box /Container to be labeled as" O&M SPARES " in GREEN. Ref fig: 14 (Page-26).
4	iii) Initial Spares Box to have red Color strip as per diagram. Ref fig: 14 (Page-26). iv) Majority of spares (initial and O&M) are for indoor storage at site. v) O&M spares box to have green Color strip as per diagram. Ref fig: 14 (Page-26).
5	vi) Spares (Initial and O&M) Packing list kept inside the boxes and affixed securely outside the box to contain vii) Custom name viii) Project / Power station Name ix) Customer PO No and date x) Sl no of customer PO. xi) Quantity total & dispatched. xii) Unit work order number xiii) All above to be developed from Unit IT System
6	xiv) All spares (Initial and O&M) items to have tags (wono, item customer order no, customer item.description)
7	xv) Supply of spares by Vendor should also be instructed for following point 2,3,4,5,6 mentioned above.

Action By : Sites on arrival of spares (Initial and O&M)Receipt .

	Activity
1	Material utilized if any from Initial and O&M spares , should have prior written approval of concerned MUs. Such MUs shall also confirm replacement dates which should be entered in the system for creation of repository.



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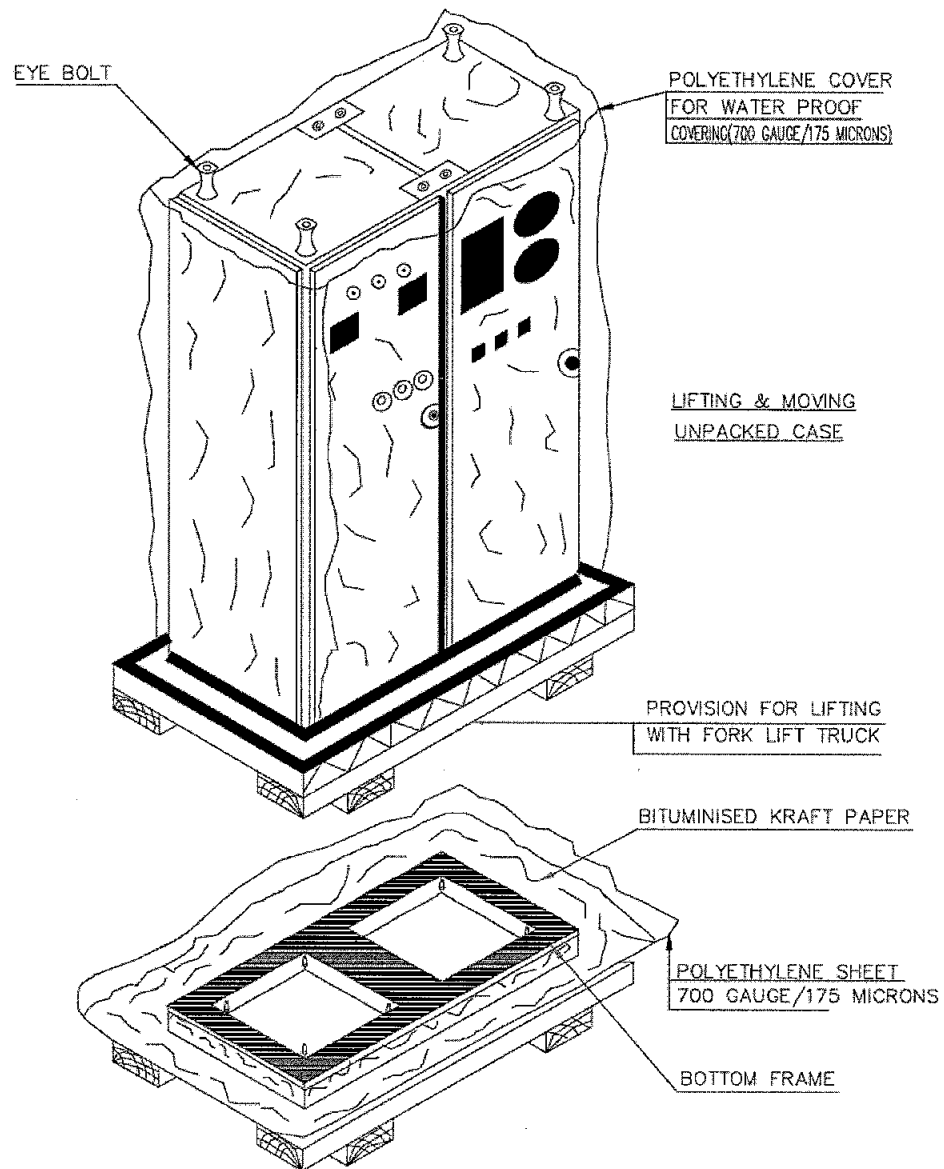


FIGURE-1



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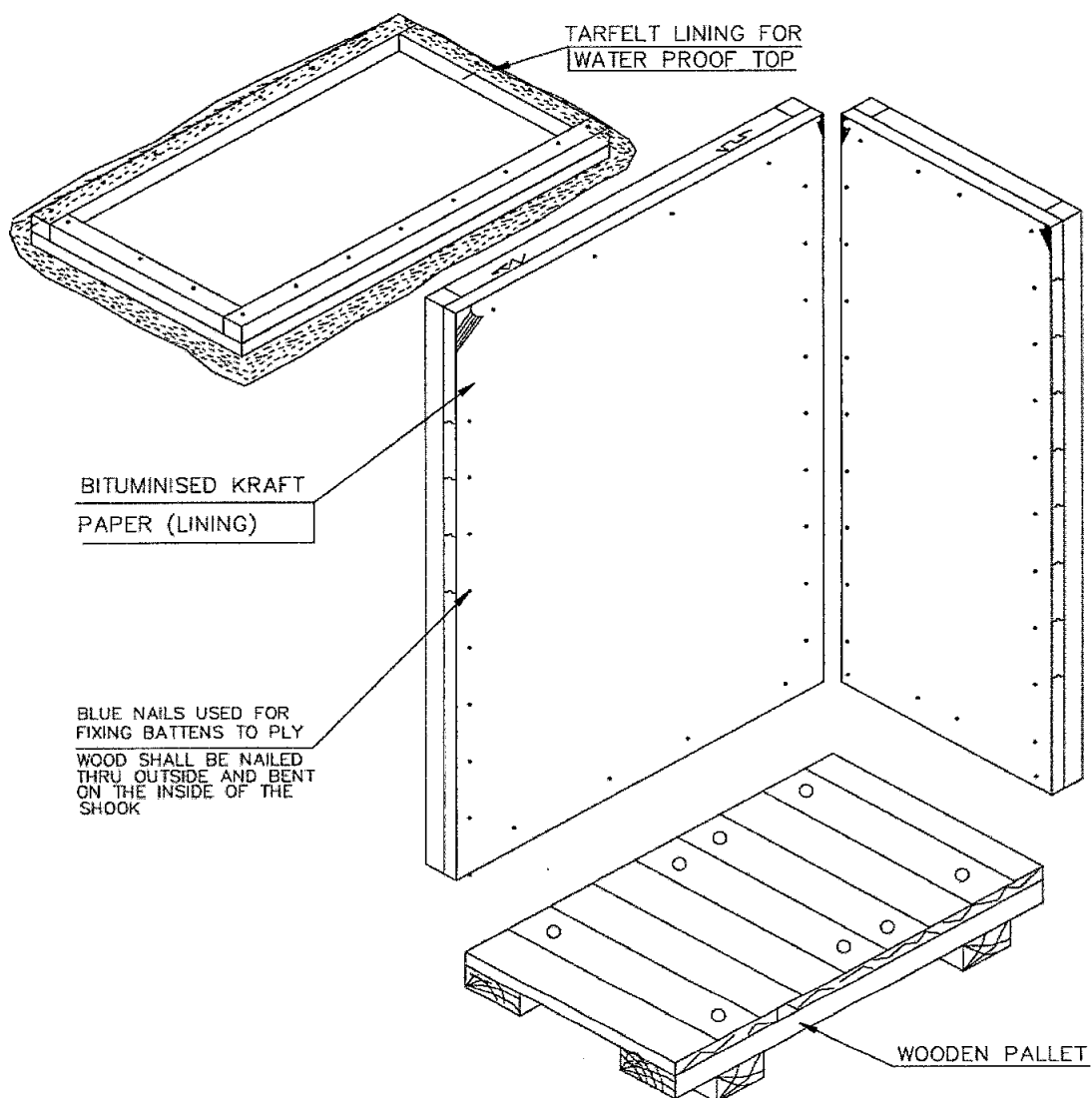


FIGURE-2



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		BHEL-EDN-BANGALORE-26					
CONSIGNEE							
MATERIAL							
CUSTOMER REF.				MO. NO.			
DESPATCH ADVICE NOTE NO.				CASE NO.			
DIMENSIONS(MM) LXBXH				NET WT -KGS		GROSS WT -KGS	
SPECIAL INSTRUCTIONS		HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT					

225

170

FIG-3 : MARKING PLATE



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PLYWOOD SHOOKS BOLT TYPE WITH SILVER OAK BATTONS

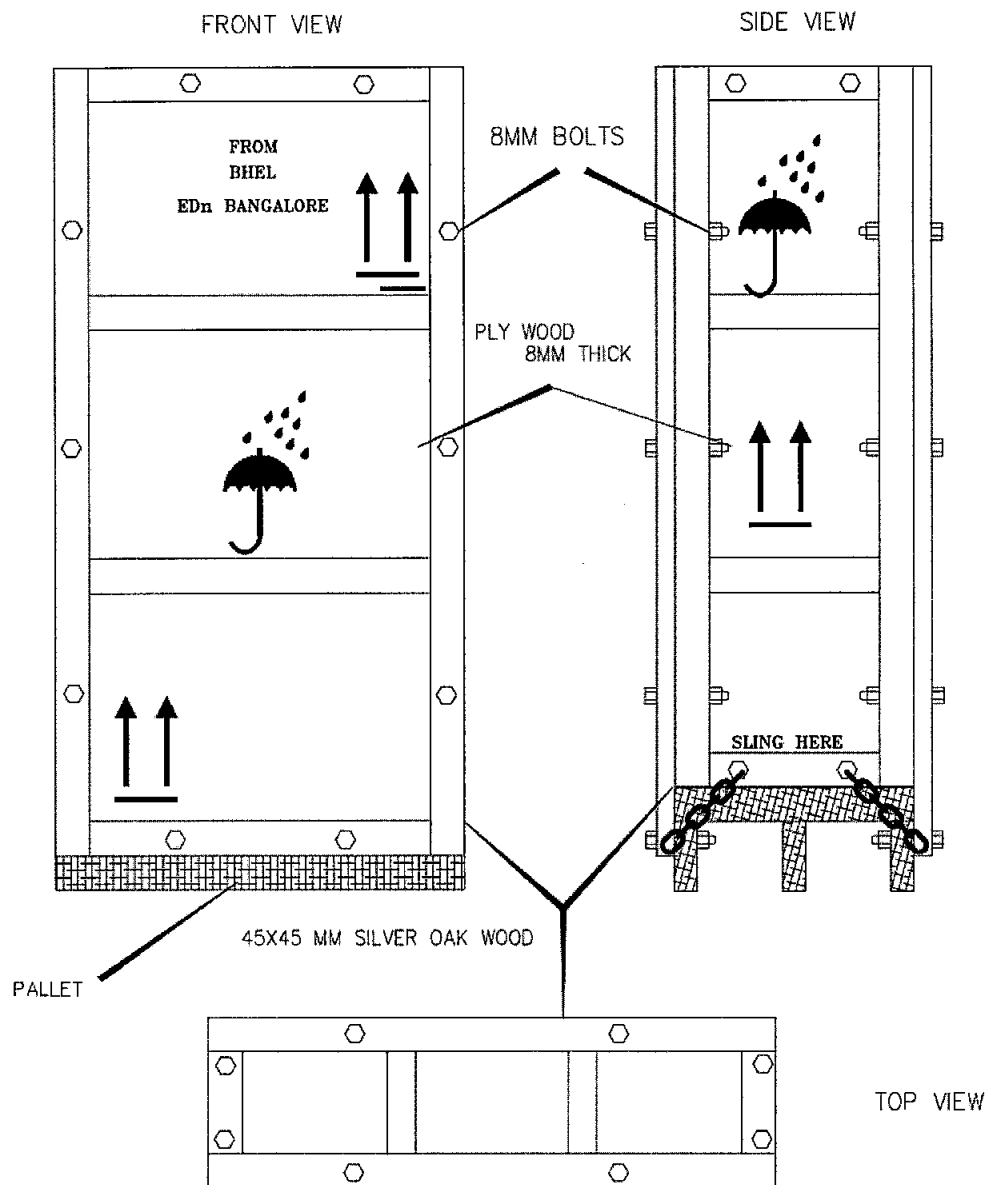


FIG-4



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LAP JOINTS

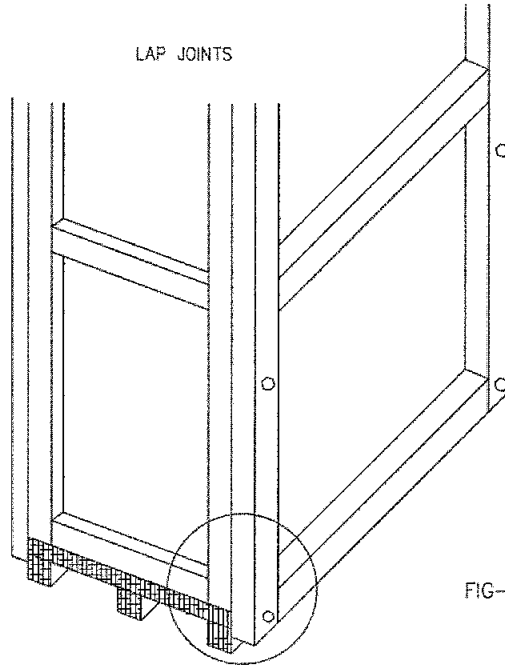
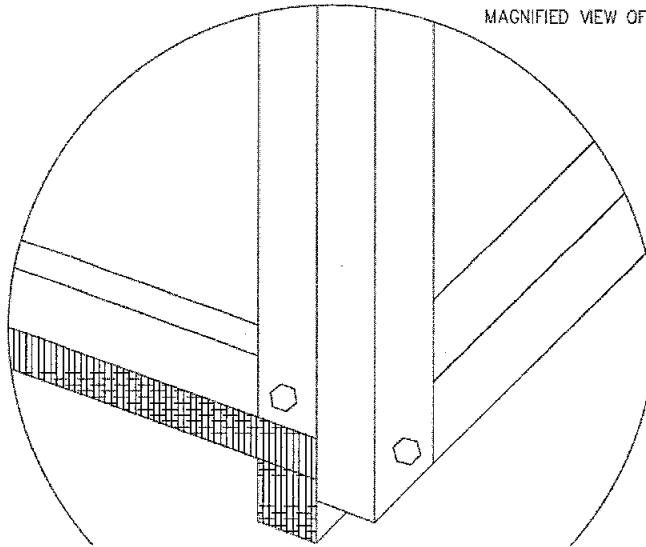


FIG-5

MAGNIFIED VIEW OF THE LAP JOINT





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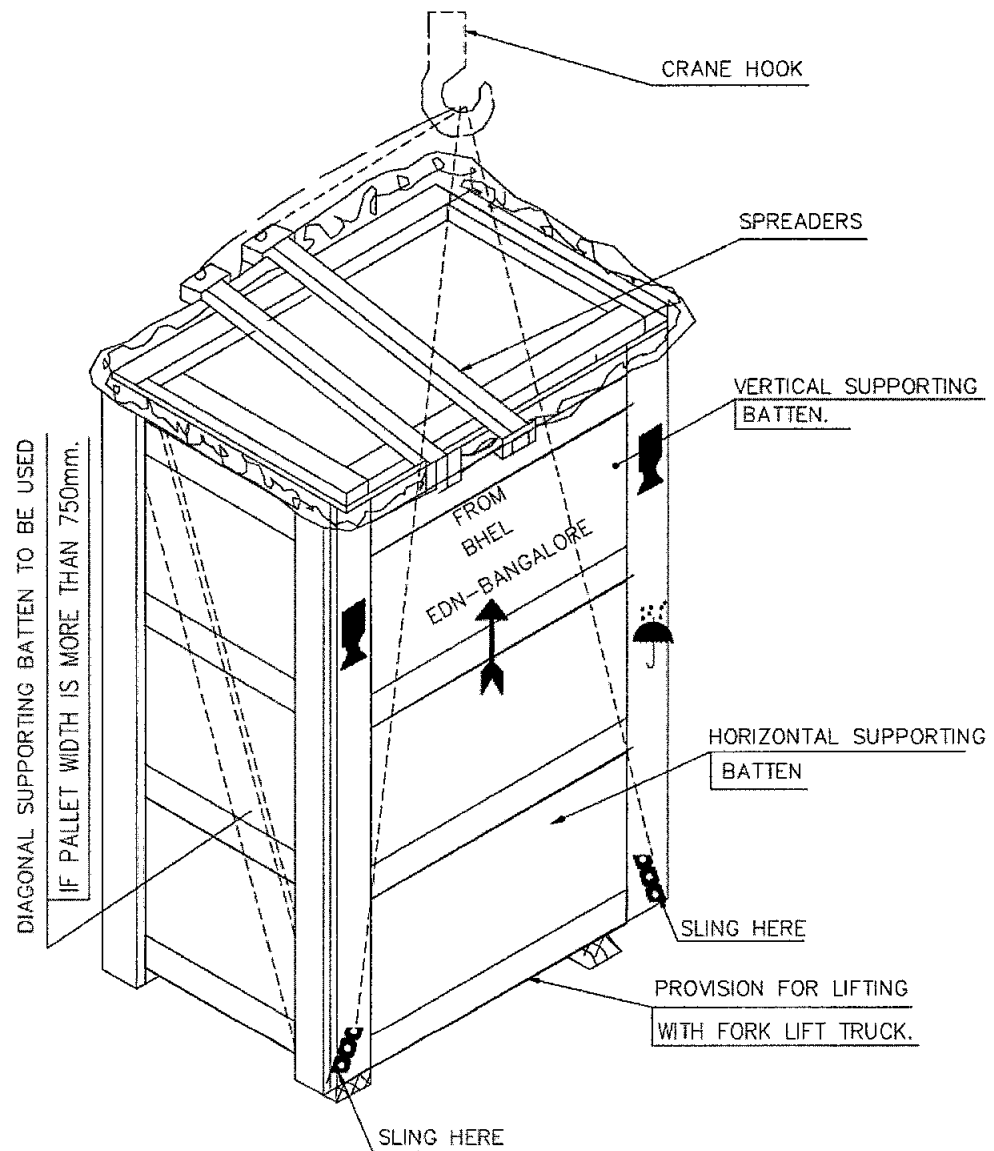


FIG-6 : LIFTING OF PACKED CASE



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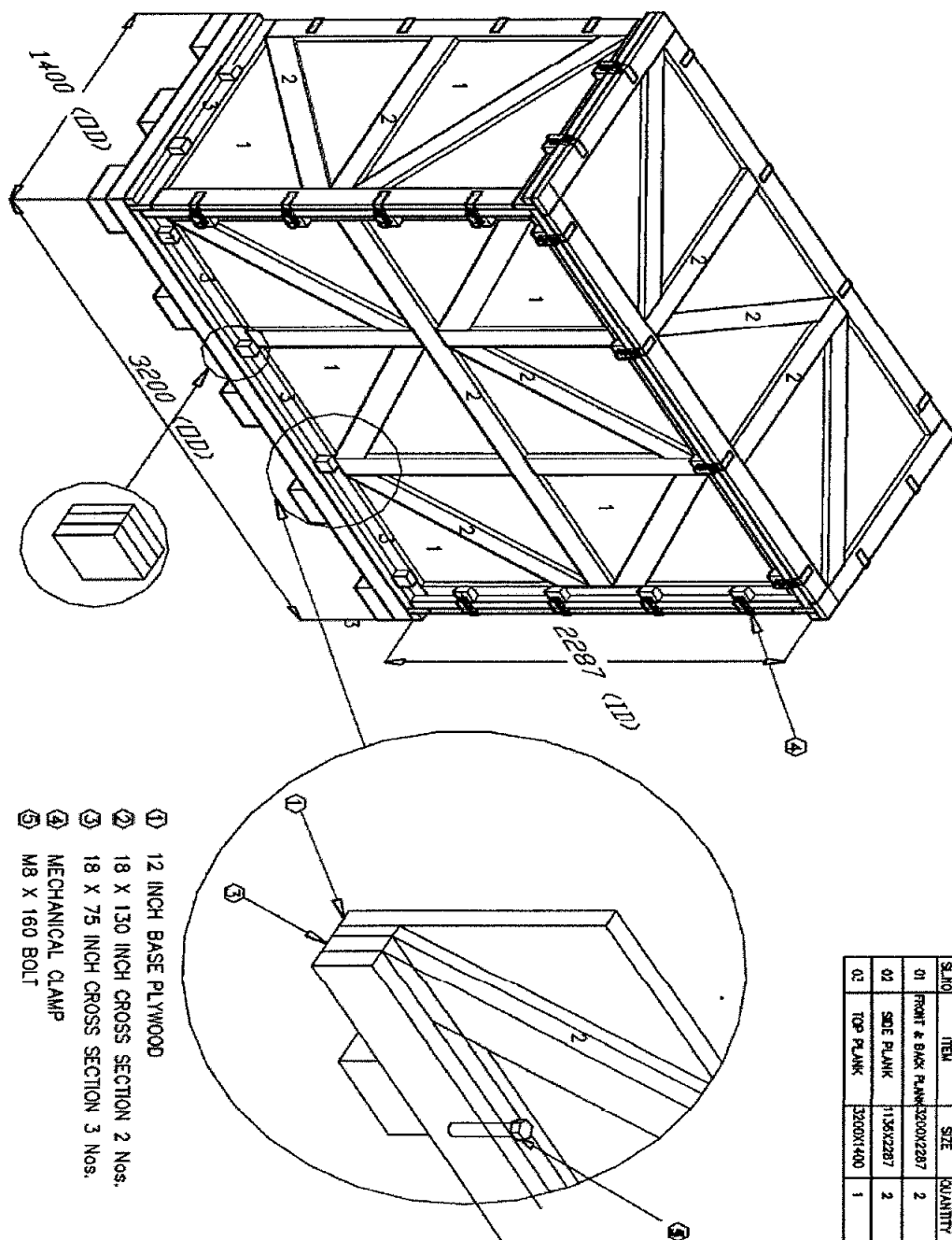


Fig - 8 : CLW Railway Panel Packing with Plywood & Plywood Support Battens

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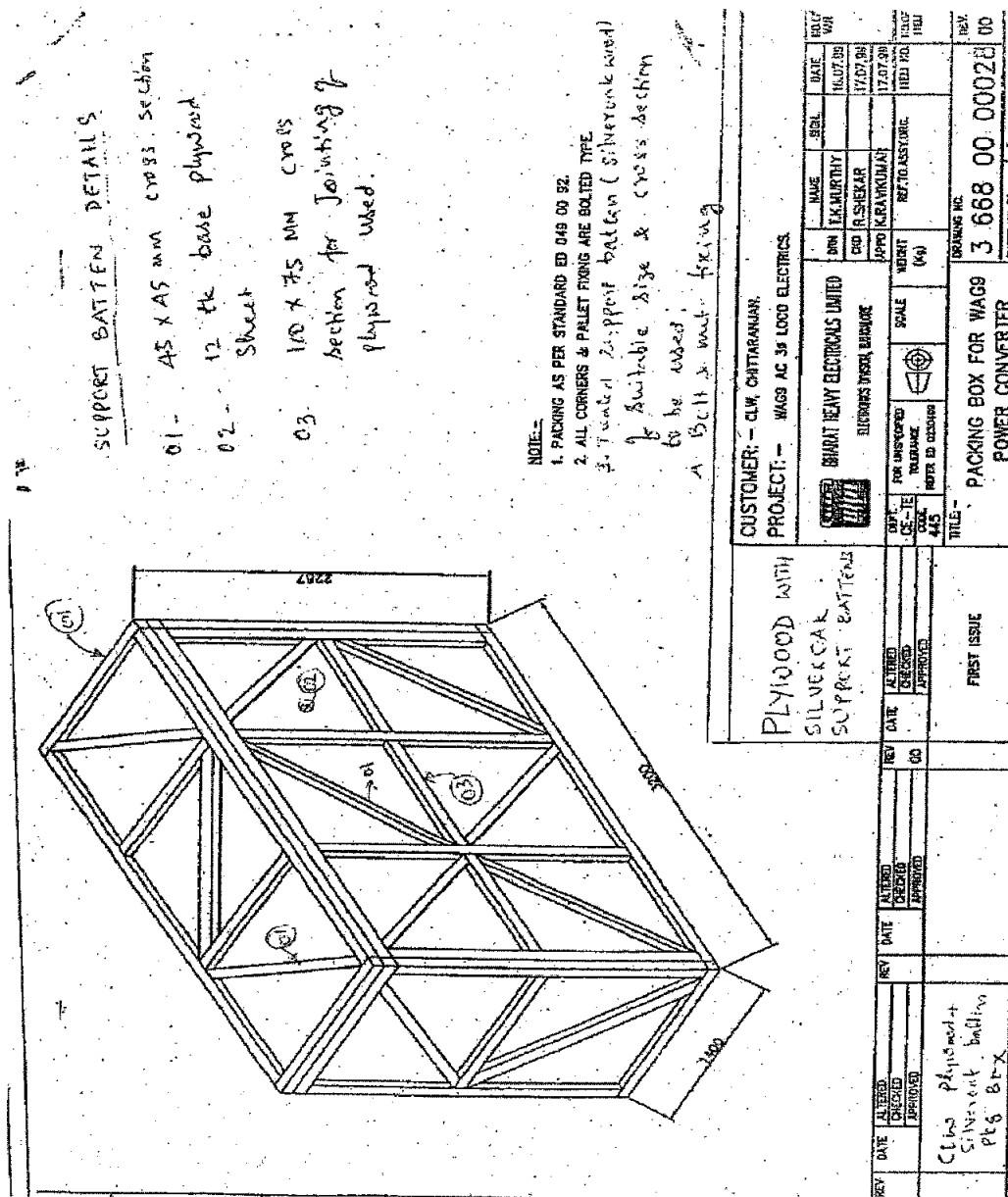


Fig – 9 : CLW Railways Panel Packing with Plywood & Silver Oak Battens



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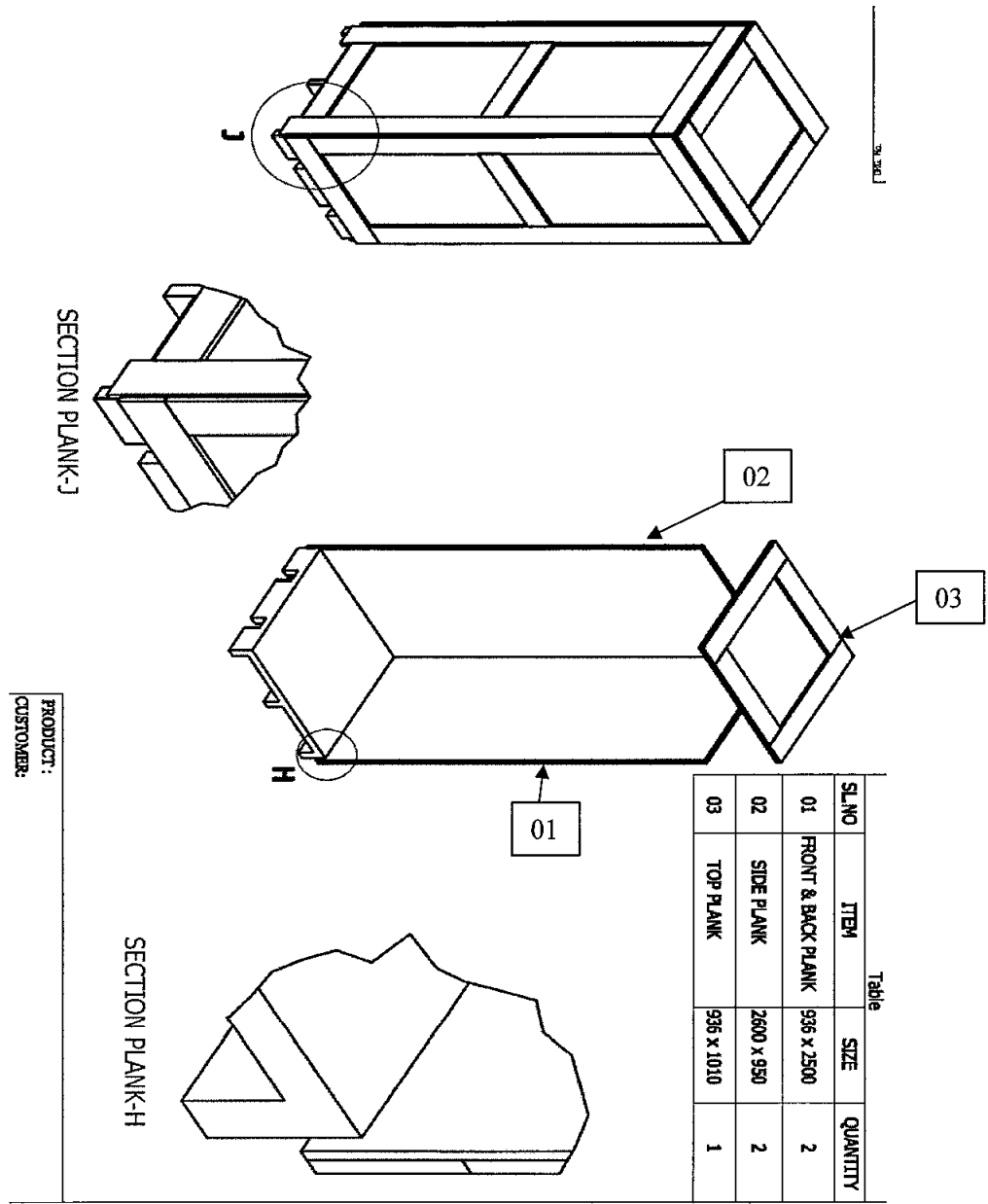


Fig-10 : Plywood Packing for Single Suit Panel.



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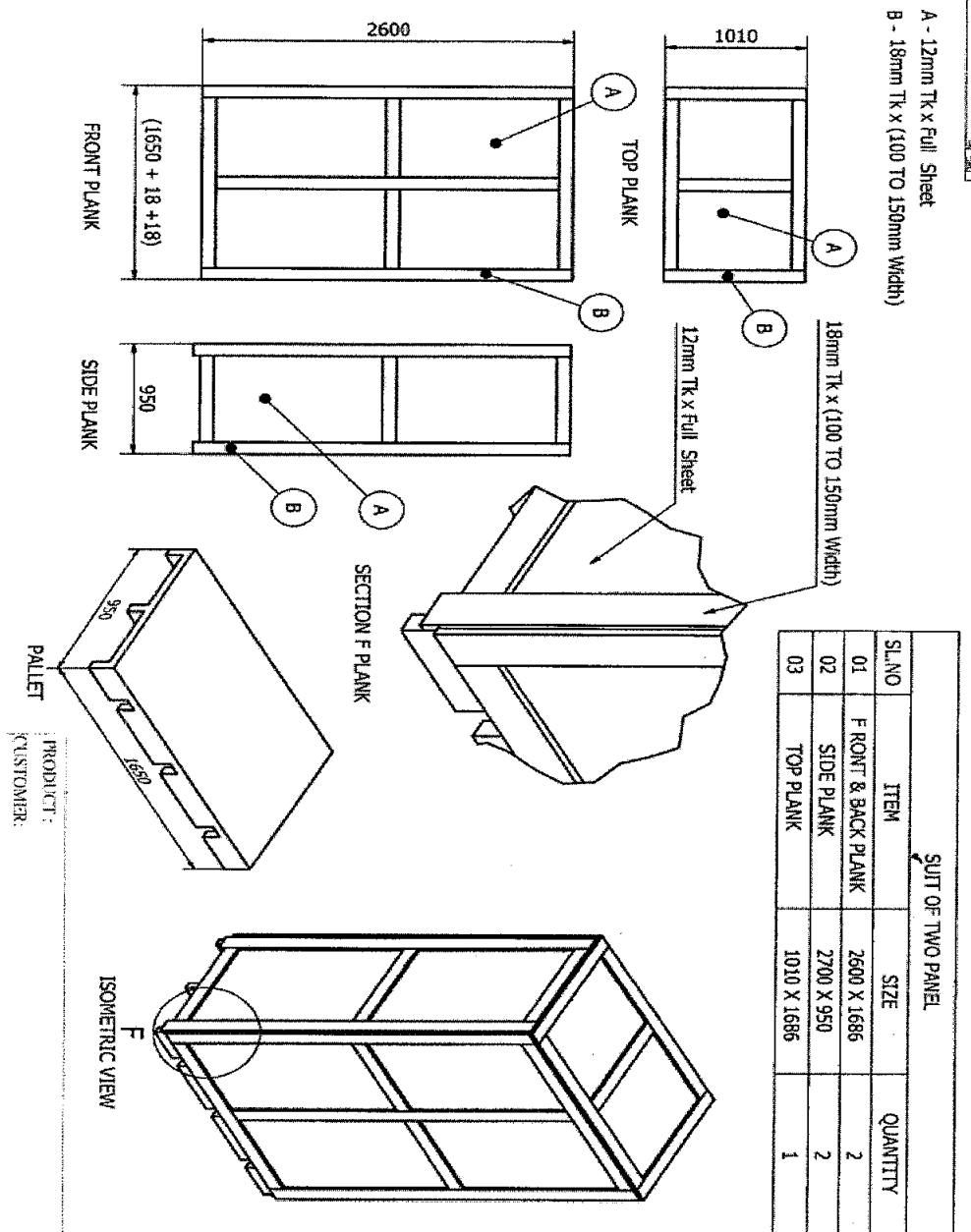


Fig - 11 : Plywood Packing for 2suit panel.

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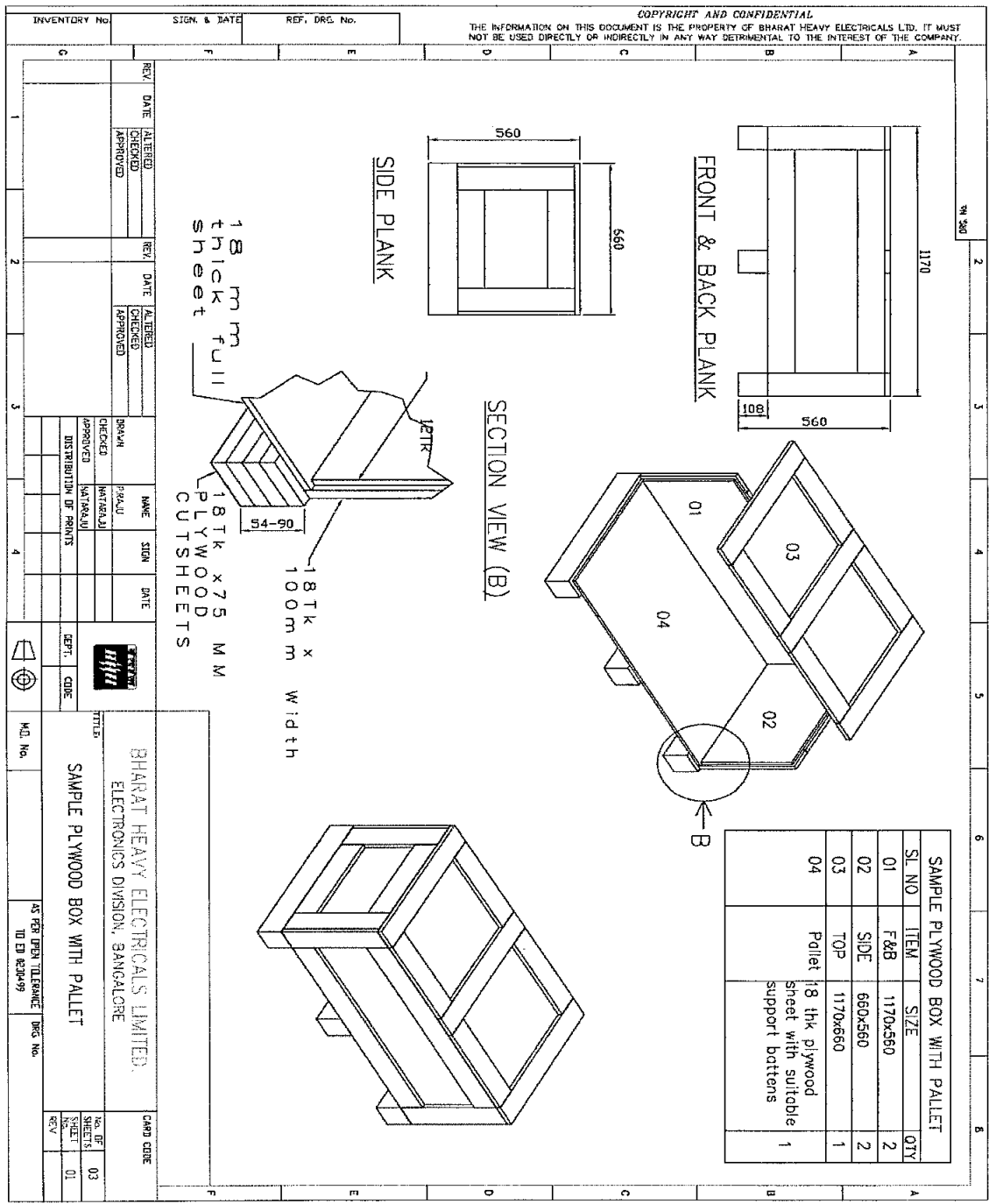


Fig – 13 : Plywood small case with Pallet

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Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

Fig: 14

