

				REF.:CE/416/LAB (M)/YADRADRI/PS		
				REV.: 00		
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.				PAGE: 01 of 25		
				CUSTOMER : TSGENCO PROJECT : YADRADRI 5 x 800 MW TPS PURCHASE SPECIFICATION FOR LABORATORY INSTRUMENTS (C&I-MECHANICAL)		
		REVISIONS: 00		APPROVED BY  ASHISH MANJHI		
			PREPARED BY  K.P.	ISSUED 416	DATE 12/08/2019	



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 2 of 25

CONTENTS

SECTION	DESCRIPTION	PAGE NO.
A	GENERAL INSTRUCTIONS TO BIDDERS	03 - 04
B	PRE-QUALIFICATION REQUIREMENTS	05
C	TECHNICAL REQUIRMENTS	06 - 25



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS
Rev. : 00
Page : 3 of 25

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. i) BHEL has Provided Approved makes against each item, to be followed for the BOM items. However If a vendor in his technical bid, offers makes different from *approved makes* and if found technically acceptable by BHEL, such *makes* only will be forwarded to customer for approval , along with credentials (Po copies of Past supplies/ commissioning Reports (MoM)/Satisfactory performance reports) *all the mentioned credentials as requested by BHEL* has to be submitted by vendor
ii) If the customer does not approve the makes submitted for approval or If BHEL finds that the credentials are not submitted/not satisfactory, the item will not be acceptable and supplier has to offer any other suitable make/model from approved makes, with price impact if any applicable for that item only.
 7. Changes in technical specification scope / BOM, if any shall be informed to participating bidders only.
 8. 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.
 9. **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.
 10. 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.
 11. 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.
 12. Name & registered address of The Bidder with Organization chart and contact details shall be submitted.
-



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 4 of 25

-
13. 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.
 14. 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.
 15. 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.
-



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS
Rev. : 00
Page : 5 of 25

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.
 2. Vendor should be in business of supplying Lab instrument equipment for at least last two (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.
-



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 6 of 25

SECTION - C

1.0 GENERAL REQUIREMENT

- 1.01 This section provides the technical information for the design, and setup of an instrument shop / Laboratory, complete with instruments, tools and test equipment required to maintain the instruments and control devices of the plant.
- 1.02 Testing instrument / devices offered shall be proven type and shall incorporate latest design. All instrument supplied under this package shall be in brand-new and unused condition.
- 1.03 The workmanship and design shall be proven and in accordance with the best engineering practice to meet the intended purpose. Bidder shall ensure satisfactory performance of testing instruments / devices even in the worst Environmental condition. All instruments shall be supplied from reputed and proven manufacturer.
- 1.04 Testing instruments /devices shall be furnished with all necessary accessories and original instruction / operating and maintenance manuals.
- 1.05 All instruments offered, shall conform to the relevant International Standards.
- 1.06 The various instruments / devices, small tools, accessories, etc. shall be furnished (in applicable cases) with suitable and durable crates, kits or carry boxes of convenient size; complete with necessary packing etc. for safe storage when not in use..
- 1.07 Measuring / testing instruments, along with associated accessories shall be suitable for intended operation (both indoor and outdoor installations as applicable)
- 1.08 Bidder shall be responsible for proper functioning of supplied items and shall make any necessary additions / modifications, as required for proper maintenance and testing of the installed instruments and controls. Bidder shall also be responsible for erection and commissioning at project site and demonstration of the test equipment.
- 1.09 It is obligatory to Bidder to furnish a complete list of spare parts for these testing / calibrating, instruments /devices. Bidder shall render guarantee for easy availability of all the spare parts required, especially for the components, which are prone to failure.
- 1.10 Bidder shall repair or replace the defective instruments / devices at no extra cost within the guaranteed period of each instrument / device.
- 1.11 Bidder shall submit with the proposal a full list of testing/laboratory instruments / tools offered along with detailed specification of the items. Catalogues, drawings and manuals as required shall be submitted with the proposal to provide necessary information pertaining to the items offered. Proposed offer document shall include but not limited to the following:
- a) BOQ & Data Sheet
 - b) GA of test bench
 - c) Data / information as per bid proposal sheet (Technical particulars)
 - d) Conformance to or deviation from the specification, if any.
- 1.12 Bidder shall furnish following drawings and documents after award of contract:
- a) Final version of all the drawing and document furnished along with bid
 - b) Load and utility list
 - c) Power supply, air and water requirement
 - d) Mounting details including necessary accessories



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 7 of 25

-
- e) Recommendations (if any) for installation/ storage etc.,
 - f) Quality Assurance Plan (QAP)
 - g) Inspection and Test report.
All instruments shall be supplied with calibration report during dispatch. Also one set valid calibration shall be submitted at the time of handing over.
 - h) Spare part list
 - i) Consumable list
 - j) O&M Manual
 - k) Any other scheme, data, drawing, document, etc. required to establish product quality and completeness Supply.
- 1.13 Scope of service of the Bidder shall also include operational and service training of Owner's personnel at site.
- 1.14 Calibration and test certificates, as applicable, shall not be more than one (1) year old.
- 1.15 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.
- 1.16 Electrical power supply requirement of the instruments offered under this specification shall be 240 V AC, 50 Hz, single phase.
- 1.17 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.
- 1.18 Packing shall be as per standard packing of the manufacturer. All the items shall be delivered in a railway container suitable for the qty. as applicable. The container shall be locked. The container shall be suitable for storing the Lab instruments till the time of commissioning. Pl refer section C for details of container.
-



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 8 of 25

2.0 CODES AND STANDARDS:

The design, material, construction features, manufacture, inspection and testing of laboratory instruments shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable standards.

3.00 TECHNICAL SPECIFICATION

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

Following items to be offered:

3.01 DEAD WEIGHT TESTER - (Yadradri Phase – I & II 2 Nos. each)

Dual range dead weight tester shall be furnished to cover 0.1-16 Kg. /Sq.cm. and 2-700 Kg/Sq.cm range. It shall be compact, stable, light in weight and self-contained with anodized metallic base, steel weights, twin area screw pump with ball thrust and axially located hand wheel. Accuracy shall be 0.01% of the actual reading. Dead weight piston and cylinder shall have over pressure stops preventing the piston from coming out. These pistons shall be hardened stainless steel. Oil filter shall be furnished at fill-up point to prevent contamination. The tester shall have 1/2" NPT (F) connection. Adapters of different sizes to receive 1/4"BSP, 1/8"BSP, 3/4"BSP, 1/4" NPT, 1/8" NPT & 3/4" NPT etc. pressure gauge shall be supplied. At least 3 no's of adaptor sets shall be supplied.

The following accessories shall be included:

- a) Angle connector for flush mounted gauges
- b) Spirit level
- c) Bag of seals
- d) Wrenches
- e) Spanners
- f) Pointer remover
- g) Pointer punch
- h) Can of fluid
- i) Dirt trap/ purifier

3.02 LABORATORY TEST PRESSURE GAUGES - (Yadradri Phase – I & II each 3 SETS)

Three Sets of test pressure gauges (accuracy 0.1% including hysteresis) as listed below shall be supplied

IT	RANGE
01.	- 1 to 0 Kg/Sq.cm
02.	0 - 1.0 Kg/Sq.cm
03.	0 - 1.6 Kg/Sq.cm
04.	0 - 2.5 Kg/Sq.cm
05.	0 - 4 Kg/Sq.cm
06.	0 - 6 Kg./Sq.cm
07.	0 - 10 Kg/Sq.cm
08.	0 - 16 Kg/Sq.cm
09.	0 - 25 Kg/Sq.cm
10.	0 - 40 Kg/Sq.cm
11.	0 - 60 Kg/Sq.cm



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 9 of 25

12.	0 - 100 Kg/Sq.cm
13.	0 - 160 Kg/Sq.cm
14.	0 - 250 Kg/Sq.cm
15.	0 - 400 Kg/Sq.cm
16.	0 - 600 Kg/Sq.cm

All test pressure gauges shall have 250 mm anti-parallax white dial with black figures and graduation lines of fineness and legibility used for high precision instruments. The dial shall be mirror-polished stainless steel under the tip of the pointer. Cases shall be fine wrinkle phenol or die cast aluminium, light but strong and rigid. Mounting shall be direct or flush.

The material of the sensing element shall be solid drawn phosphor bronze up to 10 Kg/Sq.cm and above 10 Kg/Sq.cm. stainless steel tube.

The pointer shall be lightweight, stainless steel 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 point-by-point test certificate of the readings shall be provided.

3.03 LABORATORY TYPE MANOMETER- (Yadradri Phase – I & II each 2 Sets)

Enclosed type free-standing U-tube manometers of the following ranges shall be supplied:

ITEM NO.	RANGE
01.	0-250 mm of WC
02.	0-600 mm of WC (300-0-300)
03.	0-1000 mm of WC (500-0-500)
04.	0-2500 mm of WC (1250-0-1250)
05	0-5000 mm of Hg (2500-0-2500)
06	0-8000 mm of Hg (4000-0-4000)

These U type manometers shall be used for measuring low pressures, differential pressures or vacuum. Scales shall be calibrated in centimeters and sub-divided into tenths. These shall be suitable for maximum static pressure of 7 bar with an accuracy of $\pm 1\%$ of FSD. 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-304. Manometer will be mounted on M.S. three leg stand having level adjustment arrangement and attached spirit level. The scale graduations shall be engraved on milky white acrylic in black. Metering tube shall be clear acrylic plastic having uniform reamed bore and thick walls, gland-packed in end blocks. End connections shall be 1/2" NPT (F), with check valves. The scale shall be provided with Vernier arrangement. Liquid drain plug shall be provided. 3 way & 5 way manifold , stand, colored liquid & storing bottle, Vernier, aspirator, cheack valve, liquid pump fill-up funnel and nylon tubes shall be included.



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 10 of 25

3.04 INCLINED TUBE MANOMETER - (Yadradri Phase – I & II each 2 Set)

Portable inclined tube manometers of free standing type of following ranges 0-50 mm, 0-100 mm and 0-200 mm WCL shall be provided.

ITEM NO.	RANGE
01.	0-50 mm of WC
02.	0-100 mm of WC
03.	0-200 mm of WC

These shall be used for measurement of draft, air velocity and air pressure around atmospheric pressure. The scale graduation shall be engraved on milky white acrylic in black and scale shall be calibrated in cm. Indicating tube and oil chambers shall be drilled and reamed in a solid block of clear acrylic plastic material. These manometers shall have levelling screws at the bottom and spirit level bubbles for accurate levelling. Each manometer shall be complete with connecting tubes, mounting box, brass range scale, tube chamber, connecting tube, 1/2" NPT process adapters, manometer liquid and drain plug. Five valve manifold shall be supplied along with each manometer.

3.05 MANOMETER - (Yadradri Phase – I & II each 2 Set)

Each set shall consist of following:

a) Vertical type manometer (Qty. 1 No Each)

Vertical type manometer with range 0-10mbar to 0-765mbar along with differential indicating liquid shall be provided. It shall have scale with black graduation on white background with zero adjustment facility. Accuracy shall be $\pm 0.25\%$ of reading.

b) Test manometer (Qty. 1 No)

Test manometer with range 0-10cm shall be provided. It shall have 0-200mm WC scale with zero adjustment facility. Accessories such as borosilicate glass tube in Al box, three & five way manifold, liquid pump aspirator, check valve, Vernier etc. shall be provided.

3.06 PRESSURE AND VACUUM AIR PUMP - (Yadradri Phase – I & II each 2 Sets.)

Portable type Combined pressure and vacuum pump shall be supplied. This air pump is to produce pressure up to 2 bar for intermittent service, 1 bar for continuous service and to pull a vacuum as high as 700 mm of mercury. The actual free air delivery shall be 40 liter per minute at 1 bar.

This pump shall be complete with pressure gauges (150 mm dial pressure gauge 0-2.5 bar and 150 mm dial vacuum gauge 0-760 mm mercury), lubricator, moisture trap, dust filter, oil mist eliminator, solenoid operated isolation cum air admittance valve, hose nipples and other fittings & accessories.

3.07 PRESSURE COMPARATOR (Yadradri Phase – I & II each 1 SET)

Following items to be offered.

a) PRESSURE GAUGE COMPARATOR: (Qty. 2 No's)

Pressure gauge comparator shall be supplied for testing pressure gauges and vacuum gauges up to 250 bar and 700 mmHg vacuum with an accuracy of $\pm 0.2\%$. This unit shall be complete with test gauges of ranges 0-50 bar, 0-300 bar and 760 to 0 mm Hg. One slide wrench, screw driver, two gauge pointer removers, gauge adaptors set packed in a separate box, one lever handle union, Gauge cock 1/2" NPT (F) and 1/4" NPT (F) connectors for pressure gauges to be tested and other accessories as required. The pressure developed by the test pump shall be continuously adjustable. Filling fluid, funnel to be supplied along with the unit. Comparator shall have the features of LCD digital display for pressure.



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS
Rev. : 00
Page : 11 of 25

The comparator shall be of latest state of the art design and shall have in built battery and battery charger.

b) PRESSURE GAUGE COMPARATOR- PORTABLE TYPE: (Qty. 1 No)

Portable pressure gauge comparator shall be supplied for testing pressure gauges and vacuum gauges within range of 8157 to 19999 mm WC with an accuracy of $\pm 0.1\%$ and 1 mmWC vacuum and pressure resolution. Pressure calibrator and comparator shall be supplied with one hand pump & digital calibrator cum indicator. It will be supplied with 4 1/2 digit LCD display, built in relief valve, zero adjustment facility etc.

The comparator shall be of latest state of the art design and shall have in built battery and battery charger.

c) FIELD PRESSURE COMPARATOR (PORTABLE): (Qty. 4 No's)

01 Features: Single volume pump with integral pressure regulator for fine pressure adjustment

02 Accuracy : $\pm 0.5\%$ of gauge span.

03 Range : 8157 to 19999 mmwc, with 1 mmwc vacuum and pressure

04 Display : 4 1/2 digit calibrator LCD readout

05. Adjustment : Zero adjustment.

06 Pressure calibrator/ pressure comparator shall be supplied with one hand pump, digital Calibrator cum indicator, built in relief valve, four test gauges. Gauge shall be compensated for temperature; operating pressure 300 Kg/Sq.cm maximum.

d) PORTABLE VACUUM TESTER (2 NOS.)

It shall calibrate and test vacuum instrument ranges 760 mm Hg vacuum and comprise of precision test gauge with swivel fitting shut off valve, pistol grip handle, etc. It should be light weight for field use and should have Needle valve for positive shut-off piston grip, handle for quick, easy pump action.

It shall have the following features and specification:

01. Carrying Case: High impact plastic with a die cut foam insert snap open enclosures and handle fitted slots for the tester and two spare gauges.

02. Accuracy : $\pm 0.5\%$ of gauge span

03. Range: 0 to 760 mm Hg

04. Test Connection: 1/2" NPT 60 cm long nose

3.08 TEMPERATURE CONTROLLED BATH - (Yadradri Phase – I & II each 1 NO.)

Electronically controlled Temperature bath of following specification shall be supplied. Range approximately (-20) to (+100) Deg. Centigrade.

a) Insulated box of capacity (water / freezing liquid) around 0.02 Cu.m.

b) Provision of holes with lids on the top for inserting thermocouples / RTD / Temperature gauge. The temperature controller shall have LED / LCD type display for set and measuring parameter. Operating voltage shall be 240V, 50Hz, 1 Ph.

c) Unit shall be complete with Thermo-element, Power supply cords, etc.

3.09 TEMPERATURE CALIBRATOR – (Yadradri Phase – I & II each 3 Nos.)

Electronic type comprising of integral electric heater, thermometer, temperature indicating controller and cooling fan with stability within ± 0.2 Deg. Centigrade. Instrument shall have range of Ambient - 600 Deg. C. The equipment shall be complete with all standard and required accessories and carrying case. Instrument shall have provision for accommodating different bulb size thermometers/temperature elements (Thermocouples/RTD).



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS
Rev. : 00
Page : 12 of 25

3.10 TEMPERATURE CALIBRATOR – TABLE MOUNTED (Yadradri Phase – I & II each 2 NOS.)

Microprocessor based temperature calibrator programmable for different temperature and slope rates suitable for RTD, thermocouple, switches shall be supplied. It shall have self-diagnostic capability along with low battery indication and 4 ½ digit LCD display. It shall have following ranges:

- a. Range of -50 to 123°C along with accuracy of $\pm 0.3^{\circ}\text{C}$, resolution of 0.1°C and stability of $\pm 0.05^{\circ}\text{C}$
- b. Range of 50 to 600°C along with accuracy of $\pm 0.5^{\circ}\text{C}$, resolution of 0.1°C and stability of $\pm 0.05^{\circ}\text{C}$
- c. Range of 200 to 1204°C along with accuracy of $\pm 2^{\circ}\text{C}$, resolution of 1°C and stability of $\pm 0.5^{\circ}\text{C}$

The accessories shall include calibration software, RS-232C interface etc.

3.11 HOT AIR BLOWER – (Yadradri Phase – I & II each 1 NO.)

Portable hot air blower of reputed Make shall be supplied. Blower shall be suitable for 240V A.C., 50 Hz supply.

3.12 BAROMETER – (Yadradri Phase – I & II each 1 SET)

Following to be offered:

a) BAROMETER: (Qty. 1 No)

Precision barometer shall be electronic type (digital display) with a range of 660 to 800 mm Hg with 0.1 mm Hg accuracy complete with battery, battery charger and carrying case. The display shall be barometric pressure, humidity and temperature.

b) ANEROID BAROMETER: (Qty. 1 No)

01 (one) no. of Aneroid Barometer for measuring atmospheric pressure.

- | | |
|----------------------|--|
| 01. Range | : 28.3" to 31.8" Hg |
| 02. Accuracy | : 0.33% full scale |
| 03. Sensitivity | : 0.2% full scale |
| 04. Scale Length | : 16" through 1 pointer revolution |
| 05. Dial Diameter | : 4"/6" |
| 06. Dial calibration | : Standard are mm Hg or inches Hg calibration in other units and two sets of graduations on a single dial. |
| 07. Min. Graduation | : 0.5mm or 0.02" |

3.13 PYROMETER– (Yadradri Phase – I & II each 1 SET)

Following items to be offered.

a) SURFACE PYROMETER: (Qty. 2 No's)

Bidder shall supply pyrometer with spectral response 8 to 14. Instrument shall be supplied with hand held probe and cable (5 meters) assembly. Indication shall be by 5.1/2 digit LED display. Range shall be 0-999 Degree Celsius. Accuracy shall be $\pm 0.8\%$ and repeatability shall be 1°C . Analog output shall be 0-1V or 1 Mv/ $^{\circ}\text{C}$. It shall have RS 232C interface facility.

Instrument shall have internal chargeable battery. Battery charging circuit suitable for 240V AC, 50 Hz shall be integral with the instrument.

b) INFRARED PYROMETER: (Qty. 1 No)

- | | |
|-------------------------|--|
| 01. Type | : Hand held non-contact infrared technique |
| 02. Temperature Range | : 200-1800°C |
| 03. Display Resolution | : 1°C |
| 04. Ambient Temperature | : 0-50°C |
| 05. Power supply | : Battery operated |
| 06. Accessories | : Battery charger kit, Carrying Case |



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 13 of 25

3.14 PNEUMATIC TEST BENCH – (Yadradri Phase – I & II each 2 Nos.)

Self-contained test bench with sets of drawers for testing and repair of electronic/electrical / Pneumatic instruments and combined panel & desk type arrangement with instruments/ hardware's laid aesthetically shall be provided. Front and slant area shall be of 3mm CRCA sheet. Other sides including door shall be of 2mm CRCA sheets. Suitable illumination with door operated switch shall be provided. Color shall be Brilliant White (interior) and Light Grey 631 shade IS 5 (EXTERIOR). However, approval of color shade shall be obtained from Owner during detailed engineering.

Regulated air supply outlet of 0-20 psi and 0-300 psi. Overload protection valve. Complete with control plate with mimic panel incorporating precision pressure regulators, filter reducing unit for the air supply, 150 mm dial pressure gauges having ranges 0-2, 0-4, 0-10 Kg/cm² respectively and accuracy $\pm 0.25\%$ full scale.

Temperature Bath of the test bench shall consist of medium (600°C) and high (1200°C) temperature baths for calibration of thermocouples and RTD, Scanner / thermometer with digital display and with RS232C interface, temperature calibrator etc.

Pneumatic part of test bench shall include, Pressure and Vacuum gauges, differential pressure manometer/calibrator and controller, Multifunction calibrator station, High pressure calibrator, Variac, Motorized vacuum pump, Portable high pressure pump, Dead weight tester, Portable multifunction calibrator, Air filter regulator, Electrically operated Air gun, MCB for each instrument. Vendors to provide unit rates for these items being installed in the test bench. The instrument shall cover pressure from -1kg/cm² to 600 kg/cm².

Computerized calibration system shall consist of server and PC, 21" TFT monitor and A3 laser jet colour printer and shall be located on the test bench.

The variable A.C supply shall have a range of 0-240V and sub-panel shall contain ammeter and Voltmeter. The output shall be protected with circuit breaker. A voltmeter shall be provided in sub-panel to indicate input and output voltages.

D.C. supplies shall be externally settable, floating type, reverse polarity protected, 0-30V, 0.5Amax. A metering sub-panel shall be provided for monitoring voltage, current with necessary plug sockets.

Standard utility outlet sockets (4 nos.) shall be provided. A compressed air blowing arrangements shall be included having a gauge, regulator and flexible hose.

3.15 PORTABLE GAS ANALYZER – (Yadradri Phase – I & II each 1 SET.)

Bidder shall supply one (1) no. manually operated portable flue gas analyser with an accuracy of $\pm 2\%$ for field determination of content of following gases in flue gas:

CO	: 0-1000 PPM
O ₂	: 0-25% by volume
NO	: 0-100 ppm
SO ₂	: 0-1000 ppm
HC	: 0-100% LEL

Power supply shall be 230V AC. It shall have RS232C interface facility. All hardware items such as battery, battery charger, filter, probe, leather case, cable etc. and chemicals required for operation of these analyzers shall be furnished.

3.16 FURNACE - (Yadradri Phase – I & II each 1 No.)

Range Ambient to 1100° C with digital temperature control for normal operation; K type thermocouple temperature sensor, blind temperature control for safety and door limit switch for cut off supply when the door is opened.

3.17 SUPPRESSED RANGE MERCURY IN GLASS THERMOMETER (Yadradri Phase – I & II each 2 SET)

Bidder shall supply suppressed range Mercury in glass thermometers for temperature baths / Calibrator consists of the following gauges:



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 14 of 25

SL NO.	RANGE	QTY.(No's)
01	0 - 52°C	01
02	48 - 102°C	01
03	97 - 152°C	01
04	147 - 202°C	01
05	197 - 252°C	01
06	247 - 302°C	01
07	297 - 360°C	01
08	350 - 402°C	01
09	395 - 605°C	01

3.18 TOOL KIT BOX– (Yadradri Phase – I & II each 12 Nos.)

Each box shall comprise of sets of Allen keys of different sizes both in inch and millimetre, slide wrenches of different sizes, D spanner of different sizes, electric tester, Ring spanner of different sizes, Insulated screw drivers etc. as a minimum

3.19 OIL CONDITION MONITOR– (Yadradri Phase – I & II each 1 NO.)

- | | |
|---------------------|--|
| 01. Type | : Portable Particle Counter |
| 02. Quantity | : One (01) |
| 03. Power supply | : 240V AC mains and Battery operated |
| 04. Indication | : Front panel scrollable data |
| 05. Function Key | : Membrane key |
| 06. Memory | : Adequate for at least 2000 measurements |
| 07. Channels | : At least six |
| 08. Printer | : In built |
| 09. Analysis | : As per international standard |
| 10. Enclosure | : Stainless steel |
| 11. Accessories | : • Battery charger
• Process attachment
• Carrying case |
| 12. Tractability | : Yes |
| 13. Special feature | : Display of environmental data such as humidity, temperature and air velocity |

3.20 PORTABLE ULTRASONIC FLOW METER - (Yadradri Phase – I & II each 2 NOS.)

02 (two) nos. of clamp on type portable Ultrasonic flow measuring instruments for measuring flow through any pipe sizes in between 10 to 2500 mm with an accuracy of $\pm 1\%$ of reading. Sensor shall be weather & dustproof conforming to IP-65. Meter shall be programmable with alphanumeric display (LCD) and membrane type keyboard. Battery, Charger set and Temperature sensor shall also to be provided.

3.21 WET AND DRY BULB HYDROMETER - (Yadradri Phase – I & II each 1 NO.)

01 (one) no. of Wet and Dry Bulb Hydrometer with power supply from three 1.5 V alkaline batteries of reputed make shall be supplied. Measuring range shall be 10 to 95% Relative Humidity and ± 10 to 1100 F with an accuracy of $\pm 0.30F$. Wicks carrying case instruction set shall be supplied with the instruments.

3.22 FLOW METER CALIBRATOR - (Yadradri Phase – I & II each 1 Set)

- | | |
|--------------|--|
| 01. Accuracy | : + 2% |
| 02. Range | : 0 – 1000 mmwcl / 0-6000 mmwcl / 0- 30000 mmwcl |
| 03. Display | : 3 digit LCD |

3.23 AIR SET - (Yadradri Phase – I & II each 1 NO.)

- | | |
|--------------------|---|
| 01. Filter element | : 5 micron sintered bronze filter element |
|--------------------|---|



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 15 of 25

- 02. Max. Primary press : 28 kg/cm²
- 03. Secondary pressure : 0-2.1 kg/cm²
- 04. Connection : 1/4" NPT (F)
- 05. Accessory : O/P Gauge

3.24 WELDING MACHINE - (Yadradri Phase – I & II each 1 NO.)

- 01. Type : Portable
- 02. Welding Process : Arc welding through hand welding electrode (coated wire or rod)
- 03. Power supply : 240V AC, 1 Phase, 50Hz
- 04. Accessories : Electrode cable

3.25 JEWELLERS LATHE - (Yadradri Phase – I & II each 1 NO.)

- 01. Type : Paddle/ Motor operated
- 02. Feature : High precision cutting
- 03. Power supply : 240V AC, 1 Phase, 50Hz

3.26 GRINDING MACHINE - (Yadradri Phase – I & II each 1SET.)

GRINDING MACHINE: (Qty. 1 No.)

- 01. Type : Motor operated adjustable speed
- 02. Feature : Different grade grinding wheel
- 03. Power supply : 240V AC, 1 Phase, 50Hz

GRINDING WHEEL: (5Nos.)

- 01. Type : Abrasive type

3.27 FEELER GAUGE: (Yadradri Phase – I & II Qty. 1 No)

- 01. Type : Sets of feeler of different size

3.28 ANEMOMETER (PORTABLE TYPE): (Yadradri Phase – I & II Qty. 1 No)

- 01. Type : Portable
- 02. Display : LCD backlit display, Simultaneous display of ambient temperature, air flow/ velocity
- 03. Accessories : Battery, Battery charger kit, Carrying Case

3.29 STOP WATCH – (Yadradri Phase – I & II 2 NOS)

Mechanical Type

Stop Watch shall be non- magnetic and with jewelled movement. The stopwatch shall have two hands, a large split second hand making one revolution in 30 seconds and having a dial sub divided into 1/10 seconds, the other hand will record on a small dial graduated to 15 minutes and in 1 minute interval. The case shall be chromium plated, non-rusting, dust and damp proof. The face shall have white dial with steel hand and with bold figures.

3.30 VIBRATION CALIBRATOR (PROXIMITY & SEISMIC PROBE) – (Yadradri Phase – I & II 1NO.)

- 01. No of channel: 2 Analog+1 Auxiliary
- 02. Continuous battery operation: Up to 12 hour
- 03. PC Communication Interface USB
- 04. Display: LCD
- 05. Max input signal range: $\pm 20V$
- 06. Frequency Range: 0-1 KHz
- 07. Protection class: IP-65
- 08. Accessories: Probe, pick up cable, carrying case, battery & battery charger etc.

3.31 CONTAINER FOR STORING (Yadradri Phase – I & II 1 No)

- A. Specification for Container:



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 16 of 25

Type: Standard outdoor type MS container, fully closed with one door at each end,

General Condition:

1. The container shall be in good and usable condition.
2. The container shall be suitable to store imported and sophisticated components in open environment at thermal power plants. It shall be leak proof.
3. Wall thickness (all sides) reinforcement supporting lugs etc., shall be suitable to store and transport the container with permissible load as specified.
4. Doors (both sides) shall have suitable latches to lock the container with pad locks for safety purposes.
5. Interior and external surface shall be completely painted as per the standard practice and it shall be suitable for Sea-Shore atmosphere.
6. Container shall be delivered to BHEL site office stores along with Lab instruments at Thermal Power Station complex by the supplier.

3.32 PRECISION INSTRUMENT RADIAL DRILLING MACHINE - (Yadradri Phase – I & II each 3 NOs.)

- | | |
|------------------|--------------------------------|
| 01. Type | : Motor operated |
| 02. Mounting | : Desk |
| 03. Power supply | : 240V AC, 1 Phase, 50Hz |
| 04. Accessories | : Drill bits of different size |

3.33 PORTABLE DRILLING MACHINE - (Yadradri Phase – I & II each 1 NO.)

- | | |
|-----------------------|--------------------------|
| 01. Drilling capacity | : 6 mm |
| 02. Drilling depth | : 25 mm |
| 03. Power supply | : 240V AC, 1 Phase, 50Hz |
| 04. Mounting | : Cast iron |

3.34 UNIVERSAL DIGITAL THERMOMETER - (Yadradri Phase – I & II each 1 NO.)

- | | |
|---------------------|---|
| 01. Type | : Portable and Digital |
| 02. Range | : (-) 50 to 1200°C |
| 03. Type of element | : RTD (Pt-100) & Thermocouple (Type: K, S, J, T, E, R, B and N) |
| 04. Display | : LCD |
| 05. Power Supply | : Battery operated |

3.35 LOW AND MEDIUM PRESSURE CONTROLLER - (Yadradri Phase – I & II each 1 Set)

- | | |
|--------------|--|
| 01. Range | : 0-2 kg/cm ² (Low), 0-20 kg/cm ² (Medium) |
| 02. Accuracy | : 0.05% or better |

3.36 PORTABLE PNEUMATIC/ HYDRAULIC CALIBRATOR - (Yadradri Phase – I & II each 1 Set)

- | | |
|----------------|---|
| 01. Accuracy | : 0.1% Full Scale |
| 02. Indication | : 4 1/2 digit LCD |
| 03. Pump Range | : (i) (-) 1 to 0 Bar (Pneumatic type)
(ii) 0 to 20 Bar (Hydraulic type)
(iii) 0 to 200 Bar (Hydraulic type) |
| 04. Control | : Volume control with fine adjustment through |

3.37 BENCH VICE & HAND VICE - (Yadradri Phase – I & II each 3 Set)

[A] Bench Vice

- | | |
|-------------|----------------------------|
| 01. Type | : Bench mounted |
| 02. Purpose | : For instrumentation work |

[B] Hand Vice

- | | |
|-------------|----------------------------|
| 01. Type | : Portable |
| 02. Purpose | : For instrumentation work |



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 17 of 25

3.38 VACUUM CLEANER - (Yadradri Phase – I & II each 1 NO.)

- | | |
|------------------|---|
| 01. Type | : Portable |
| 02. Vacuum | : 2000 mm Wcl. |
| 03. Power supply | : 240V AC, 1 Phase, 50Hz |
| 04. Accessories | : All-purpose nozzle, radiator brush, jet air nozzle etc. |

3.39 SCREW GAUGE - (Yadradri Phase – I & II each 1 NO.)

- | | |
|---------------|--------------------|
| 01. Spindle | : Stainless steel |
| 02. Accessory | : Ratchet lock nut |

3.40 PITOT TUBE - (Yadradri Phase – I & II each 2 NOS.)

Pitot tube required to verify primary and secondary air flow measurements.

Differential Pressure for primary air side = 100 mm of Wc.

Differential Pressure for secondary air side = 300 mm of Wc.

Each unit shall include the following:

- a) Differential Pressure Transmitter
- b) Tubing suitable to withstand 200 °F and of 10 meter length.

Material: **Stainless Steel**

3.41 TEST THERMOCOUPLE – (Yadradri Phase – I & II each 2 NOS.)

- | | |
|-----------------|-----------------------------|
| 01. Sensor type | : All type of thermocouple |
| 02. Temperature | : 0-1200°C |
| 03. Accessories | : Cable, carrying case etc. |
-



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 18 of 25

4.0 BILL OF MATERIAL:

Sr. No.	Item Description	Certification	YADRADRI - I	YADRADRI - II
1	Dead Weight Tester	Traceable CC	2 Nos.	2 Nos.
2	Laboratory Test Pressure Gauges	Traceable CC	3 Sets	3 Sets
3	Laboratory Type Manometer	Test Report from OEM	2 Sets	2 Sets
4	Inclined Tube Manometer	Test Report from OEM	2 Sets	2 Sets
5	Manometer	Test Report from OEM	2 Sets	2 Sets
6	Pressure And Vacuum Air Pump	Traceable CC	2 Sets	2 Sets
7	Portable Pressure Comparator	Traceable CC	1 Set	1 Set
8	Temperature Calibration Bath	Test .Report	1 No.	1 No.
9	Temperature Calibrator (Table Top Mounted)	Traceable CC	3 Nos.	3 Nos.
10	Temperature Calibrator- Table Mounted	Traceable CC	2 Nos.	2 Nos.
11	Hot Air Blower	Test .Report	1 No.	1 No.
12	Barometers	C O C	1 Set	1 Set
13	Surface Pyrometer	Traceable CC	1 Set.	1 Set.
14	Pneumatic Test Bench	Traceable CC	2 Nos.	2 Nos.
15	Portable Gas Analyzer	Test Report from OEM	1 Set	1 Set
16	Furnace	Test Report from OEM	1 No.	1 No.
17	Suppressed Range Mercury In Glass Thermometer	Traceable CC	2 Sets	2 Sets
18	Tool Kit Box	COC	12 Nos.	12 Nos.
19	Oil Condition Monitor	Test Report from OEM	1 No	1 No
20	Portable Ultrasonic Flowmeter	COC	2 Nos.	2 Nos.
21	Wet & Dry Bulb Hygrometer	Test .Report	1 No.	1 No.
22	Flowmeter Calibration	COC	1 Set	1 Set
23	Air Sets	Test Report from OEM	1 No.	1 No.
24	Welding Machine	COC	1 No.	1 No.
25	Jewelers Lathe	COC	1 No.	1 No.
26	Grinding Machine	COC	1 Set	1 Set
27	Feeler Gauge	Test Report from OEM	1 Set	1 Set
28	Anemometer (Portable)	Test Report from OEM	1No	1No
29	Stop Watch	Test Report from OEM	1No	1No
30	Vibration Calibrator	Test Report from OEM	1No	1No
31	Container.	CoC	1No	0
32	Precision Instrument Radial Drilling Machine	COC	3 Nos.	3 Nos.



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 19 of 25

33	Portable Drilling Machine	COC	1 No.	1 No.
34	Universal Digital Thermometer	COC	1 No.	1 No.
35	Low and Medium Pressure Controller	Traceable CC	1 Set	1 Set
36	Portable Pneumatic Hydraulic Calibrator	Traceable CC	1 Set	1 Set
37	Bench Vice & Hand Vice	Test Report from OEM	3 Set	3 Set
38	Vacuum Cleaner	COC	1 No.	1 No.
39	Screw Gauge	Test Report from OEM	1 No.	1 No.
40	Pitot Tube	COC	2 Nos.	2 Nos.
41	Test Thermocouple	Traceable CC	2 Nos.	2 Nos.

Legends:

COC: Certificate of Conformity

OEM: Original Equipment Manufacturer



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 20 of 25

	<u>5. SUB-VENDOR / MANUFACTURER LIST:</u>	
Sl. No.	Maintenance and Calibration Equipment (Lab Items) Mechanical Package	Item Wise Makes
1	Dead Weight Tester	DH-Budenberg, (WIKA)
		Dott. Ing. Scandura & FEM S.r.l.(WIKA)
		PRESSUREMENT LTD,/ Fluke
		AMETEK
		Yantrika Instruments Pvt. Ltd.,
2	Laboratory Test Pressure Gauges	DH-Budenberg, (WIKA)
		ASHCROFT INC,
		Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		Yantrika Instruments Pvt. Ltd.
3	Manometers	Fitzer Instruments (I) Pvt. Ltd.,
		Dwyer Instruments INC.,
4	Pressure & Vacuum Air Pump	KNF Neuberger,
		Bharath Vacuum Pumps
5	Pressure Comparator/ Pressure Comparator (Portable Type)/ Field Pressure Comparator (Portable Type)	AMETEK
		FLUKE / PRESSUREMENT LTD
		Beamex
		Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		GE (Druck)
		Yokogawa Electric Corporation
		TRANSCAT
		Yantrika Instruments Pvt. Ltd.
6	Temperature Calibration Bath	Isothermal Technology Ltd
		Dott. Ing. Scandura & FEM S.r.l., / WIKA
		Fluke (Hart Scientific)
		AMETEK
7	Temperature Calibrators / Temperature Calibrator (Table Mounted)	AMETEK
		Druck (GE)
		Dott. Ing. Scandura & FEM S.r.l. / WIKA



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 21 of 25

		Isothermal Technology Ltd
		Hart Scientific / FLUKE
		AOIP
		Eurotron Instruments (UK) Ltd., (EIUK)
8	Hot Air Blower	BOSCH
		SKIL
9	Barometer / Aneroid Barometer	Wallace & Tiernan INC
		DRUCK (GE)
		Control Company (Traceable)
		Extech Instruments Corporation
		WIKA INSTRUMENT
10	Surface Pyrometer / Infrared Pyrometer	LAND INSTRUMENTS
		FLUKE
		Raytek
		Accurate Sensor Technologies (Tempsens)
		WIKA Instruments
		Heitronics GmbH
		TRANSCAT
		Extech Instruments Corporation
		COLE-PARMER
		DRUCK
		TINSLEY
11	Pneumatic Test Bench	Yantrika Instruments Pvt. Ltd.
		Yokogawa India Ltd.
		Fluke
		The Tinsley Group Ltd.
		WIKA INSTRUMENT (Scandura)
12	Portable Vacuum tester	AMETEK
		PRESSUREMENT LTD
		ASHCROFT INC
		Beamex
		Dott. Ing. Scandura & FEM S.r.l. (Wika)
		WIKA INSTRUMENT
		Yokogawa Electric Corporation
		TRANSCAT
13	Portable Gas Analyzer	LAND INSTRUMENTS
		TESTO



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 22 of 25

		AFRISO-EURO-INDEX GMBH
		ENDEE ENGINEERS PVT LTD
		BACHARACH
14	Furnace	Isothermal Technology Ltd
		Fluke (Hart Scientific)
		Eurotron Instruments (UK) Ltd., (EIUK)
15	Suppressed Range Mercury in Glass Thermometer	Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		Swastik
		AMARELL GmbH & Co. KG
16	Tool Kit	Sub vendor approved Makes
17	Oil Condition Monitor	Parker / Kittiwake
		Pamas
18	Portable Ultrasonic Flowmeter	GE Sensing & Inspection Technologies
		Flexim GMBH (Chemtrols)
		Micronics
		Fuji
		Tesco Compuflow
		ENDRESS HAUSER
		EUREKA
		TINSLEY
		FORBES MARSHALL
		TRANSCAT
19	Wet & Dry Bulb Hygrometer	Yaska Control Technologies
		Extech Instruments Corporation
		GE Sensing & Inspection Technologies
		Polltech Instruments Pvt. Ltd.
		TINSLEY
		Transcat
20	Flow meter Calibrator	GE (Druck)
		Yokogawa Electric Corporation
		ASHCROFT INC
		AMETEK
		Dott. Ing. Scandura & FEM S.r.l.(WIKA)
		TRANSCAT
		Dwyer Instruments INC.
		Fluke



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 23 of 25

21	Air Set	ABB
		SHAVO NORGEN (I) PVT. LTD.
		PLACKA INSTRUMENTS INDIA PVT. LTD.
22	Jewelers Lathe	Gee Dee Weiler
		HMT Machine Tools Ltd.,
		Batliboi
		PMT Machines Ltd.
		Godrej
		VENUS
23	Welding Machine	Sherline
		BOC India Limited
24	Grinding Wheel/Grinding Machine	BOSCH
25	Feeler Gauge	RS Components
		Sysco Tech Systems (India) Pvt. Ltd.
		Goodwill
		Small Tools Centre
		Mehta Tools Corporation
		SriVaru Power Tools Co.
		JAIRAMDAS GROUP
26	Radial Drilling Machine	Stanley
		Eifco.
		Ammar Tools
		New Master
		Bhavya Machine Tools
		Micro Engineering Works
27	Portable Drilling Machine	Premier
		BOSCH
28	Universal Digital Thermometer	Yaska Control Technologies
		Extech Instruments Corporation
		TRANSCAT
		GE Sensing & Inspection Technologies
		COLE PARMER
		AOIP
		Eurotron Instruments (UK) Ltd., (EIUK)
		Yudian Automation Technology Co. Ltd.
		WIKA Instruments
		Fluke
		Amprobe



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 24 of 25

29	LOW AND MEDIUM PRESSURE CONTROLLER	ASHCROFT INC
		FLUKE - DH Instruments
		Yokogawa Electric Corporation
		Druck Limited
		Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		Beamex.
		AMETEK
		DH-Budenberg. (WIKA)
		TRANSCAT
30	PORTABLE PNEUMATIC/ HYDRAULIC CALIBRATOR	Beamex
		AMETEK
		FLUKE CORPORATION
		Yokogawa Electric Corporation
		Druck Limited
		Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		ASHCROFT INC
		DH-Budenberg. (WIKA)
31	Bench Vise & Hand Vise	Sysco Tech Systems (India) Pvt. Ltd.
		Small Tools Centre
		RS Components
32	Vacuum Cleaner	EUREKA FORBES
		BOSCH
		LG
33	Anemometer (Portable)	Cole-Parmer
		TESTO, INC
		Extech Instruments Corporation
34	Screw Gauge	R. S. Components & Controls
		Sysco Tech Systems (India) Pvt. Ltd.
		Goodwill Enterprises
		Small Tools Centre
		Mehta Tools Corporation
		SriVaru Power Tools Co.
		JAIRAMDAS GROUP
		Mitutoyo
		Baker
35	Pitot tube	Dwyer Instruments INC.
		Switzer Instrument Ltd.



**PURCHASE SPECIFICATION FOR
LABORATORY AND TEST INSTRUMENTS
(MECHANICAL)**

Doc. : CE/416/LAB (M)/YADRADRI/PS

Rev. : 00

Page : 25 of 25

		Kamrans
		Amprobe
		Veris Instrument
36	Test Thermocouple	WIKA INSTRUMENT
		AMETEK
		Thermo Scientific (HEREAUS)
		Dott. Ing. Scandura & FEM S.r.l. (WIKA)
		Isothermal Technology Ltd, U.K.
		FLUKE CORPORATION
		Druck Limited
		Eurotron Instruments (UK) Ltd., (EIUK)
37	Stop Watch (MECHANICAL)	Sub vendor approved Makes
38	Vibration Calibrator (Proximity & Seismic Probe)	Meggitt India Pvt. Ltd.
		Forbes Marshall Pvt. Ltd. (SINKAWA)



A4 - 15

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 0 of 26

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

COPYRIGHT & CONFIDENTIAL

The information contained in this document is the property of BHEL. It must not be used directly or indirectly in any manner detrimental to the interest of the company.


APPROVED: M. Sivaramaiah

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



ED 049 00 92

Page 1 of 26

1. **PURPOSE:** To describe the materials and procedure for Packing.
2. **SCOPE:** Applicable for packing of control cubicles, loose items, spares of Control Equipment and Transmission System Control products.
3. **MATERIALS**
 - 3.1. **WOOD**
 - 3.1.1 **For Inland contracts:**
 - 3.1.1.1 Plywood of Boiling Water Resistance (BWR) grade and termite, fungus proof as per IS: 303 of 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 with stand the stress caused by cyclic changes in weather conditions. It shall be durable and resistant to heat, sun and moisture. The sheets such procured shall have IS mark IS 303 and BWR grade stamped on it.
 - 3.1.1.2 Silver oak wood of cross section 45x45 mm as support battens for Loose items, spares and single suit, two suit, three suit Cubicles and 70x45 mm for longer sections to be used. These Silver oak wood battens shall be treated with ASCU solution as defined in 4.0. In the case of plywood, treatment with ASCU solution need not be done.

Alternative to silver oak battens, Plywood support battens of suitable cross section and combination of thickness can also be used as per clause 3.1.1.4

APPROVED : M. Sivaramaiah

PREPARED:
PGD/KPN

ISSUED: DATE:
STDS GROUP 30/03/13

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 2 of 26
--	-----------------------	---

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]

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 3 of 26
--	-----------------------	---

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.

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 4 of 26
--	-----------------------	---

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

-----		-----
BHEL-EDN		BANGALORE-560026
SILICA GEL		
INDICATING TYPE		
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.

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 5 of 26
--	-----------------------	---

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

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 6 of 26
--	-------------------------	--

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.

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 7 of 26
--	-----------------------	---

- 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).

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 8 of 26
--	------------------------------	--

- 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.

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 9 of 26
--	-----------------------	---

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

	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 10 of 26
---	-----------------------	--

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.

 A4 - 14	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 11 of 26
--	-------------------------	---

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)

	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 12 of 26
---	-----------------------	--

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.



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 13 of 26

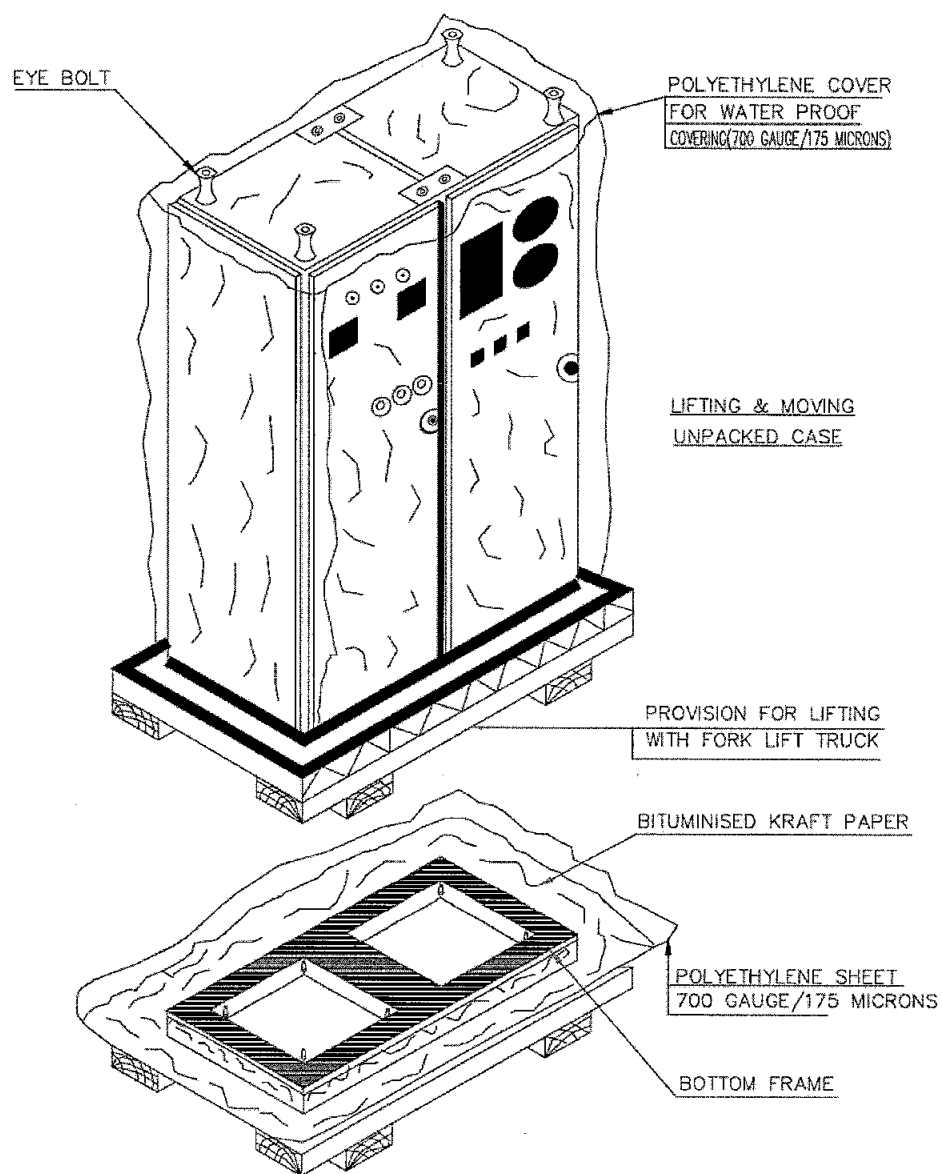


FIGURE-1



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 14 of 26

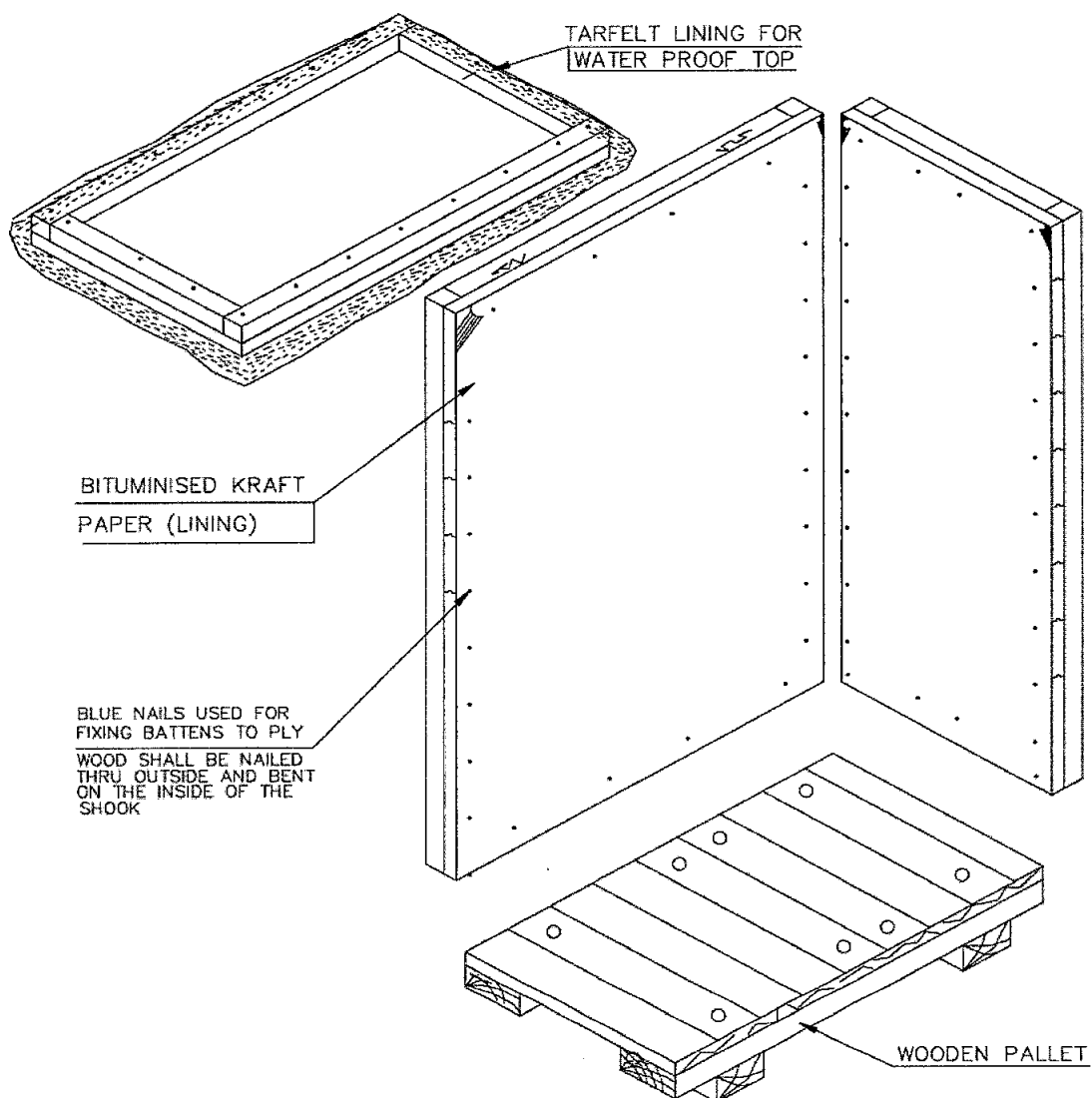


FIGURE-2



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 15 of 26

		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



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 16 of 26

PLYWOOD SHOOKS BOLT TYPE WITH SILVER OAK BATTONS

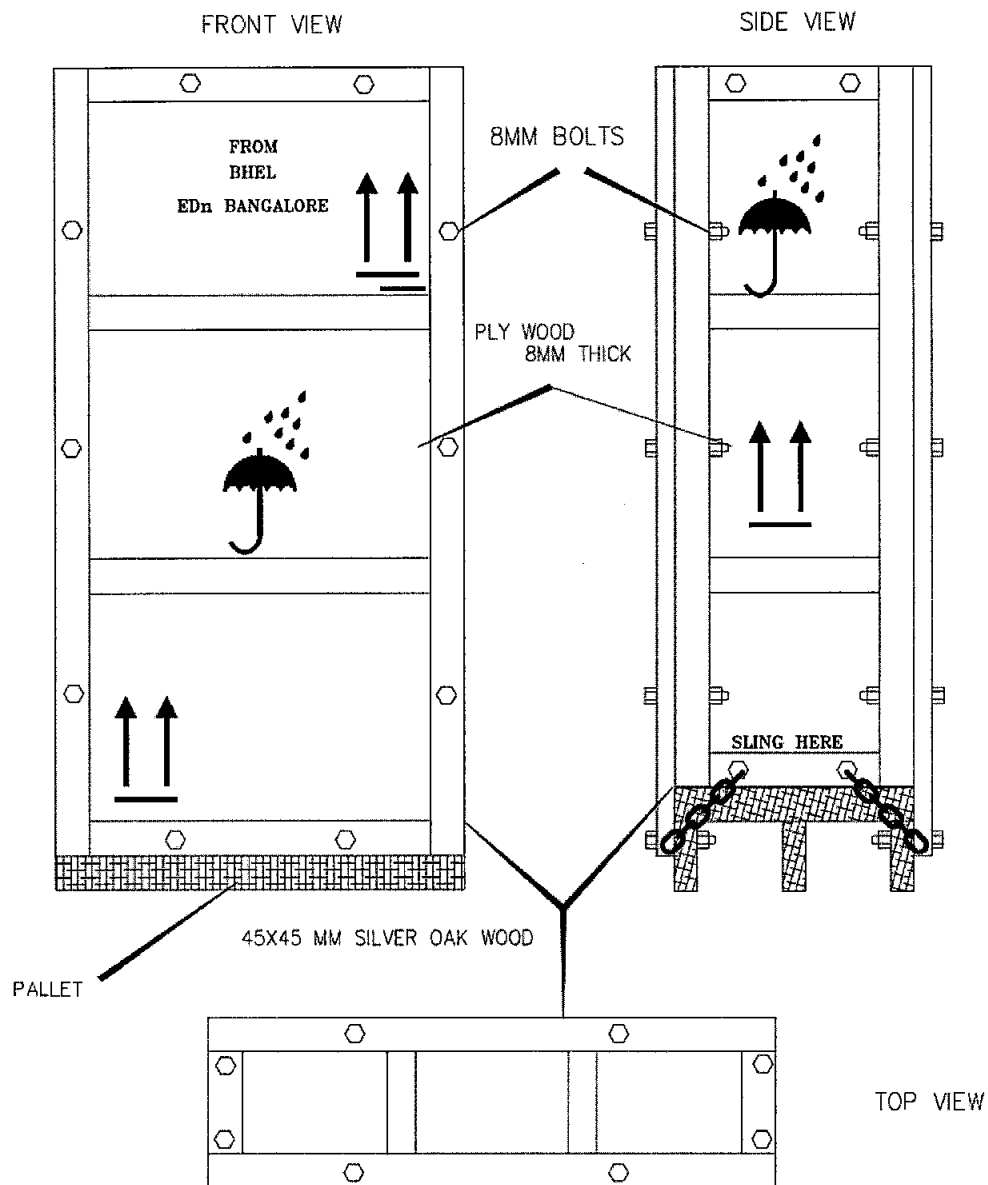


FIG-4



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 17 of 26

LAP JOINTS

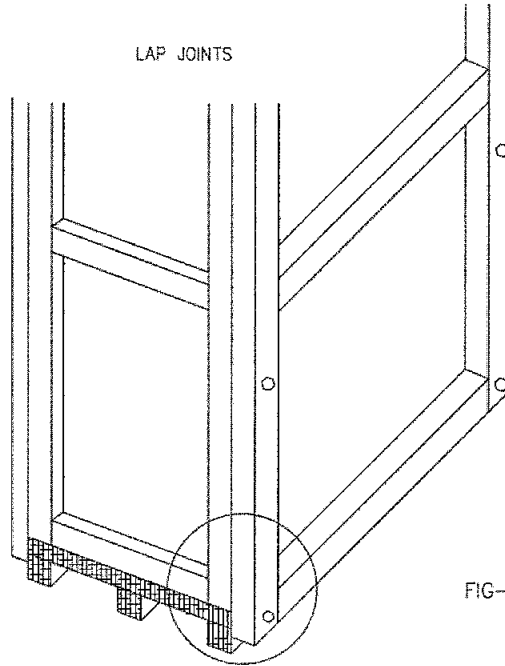
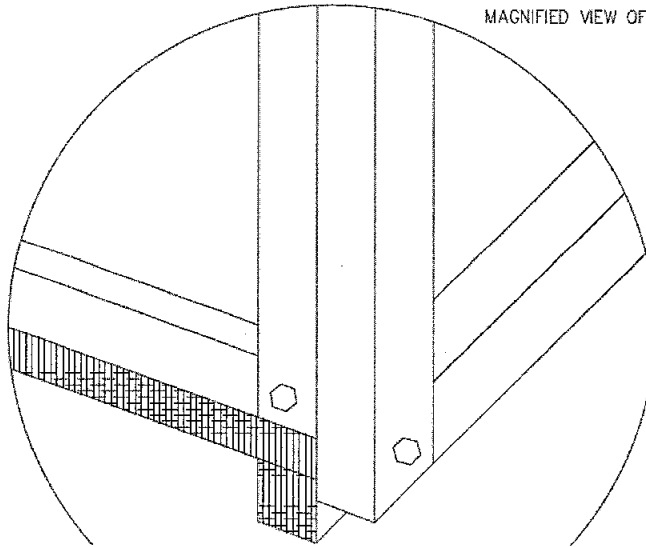


FIG-5

MAGNIFIED VIEW OF THE LAP JOINT





A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 18 of 26

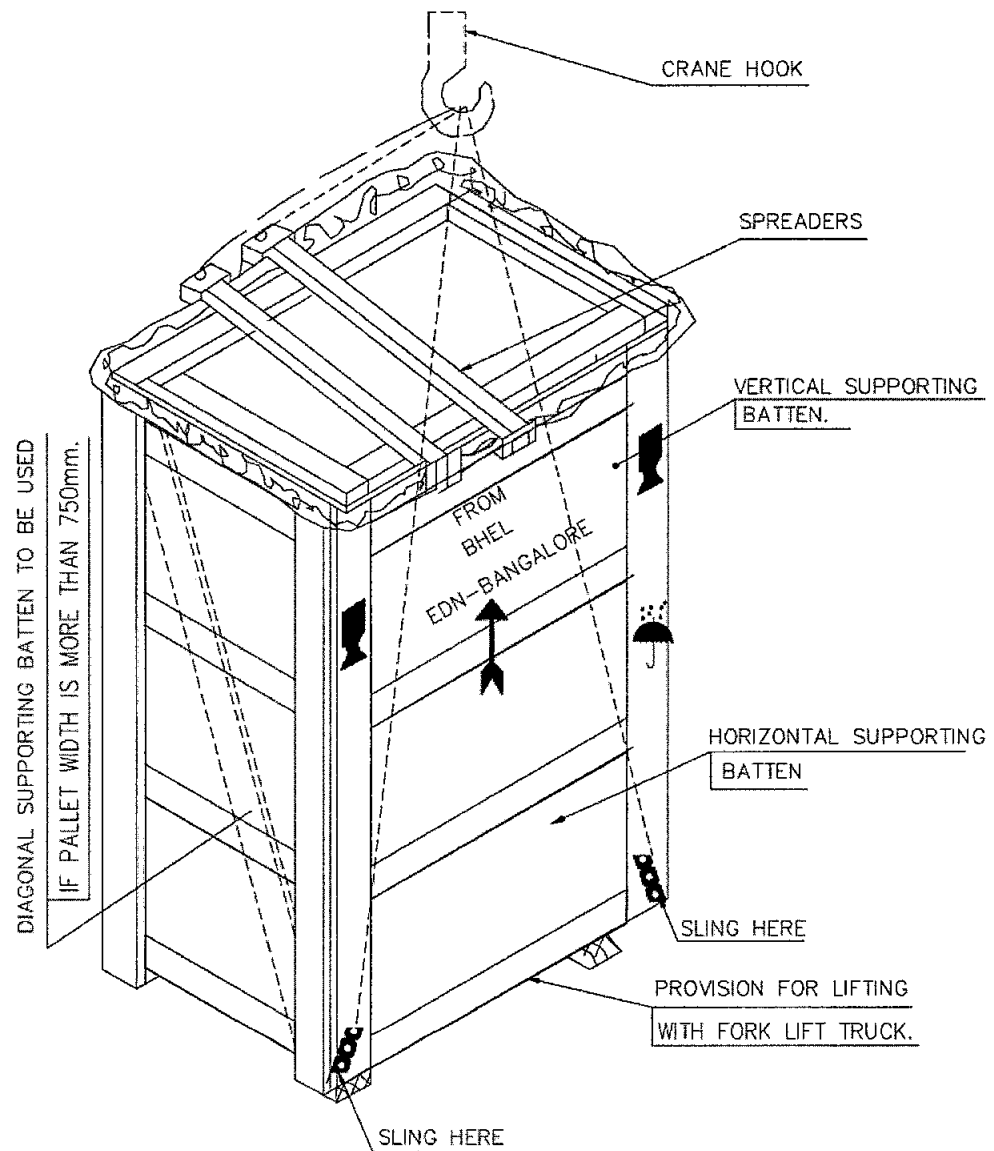


FIG-6 : LIFTING OF PACKED CASE



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 20 of 26

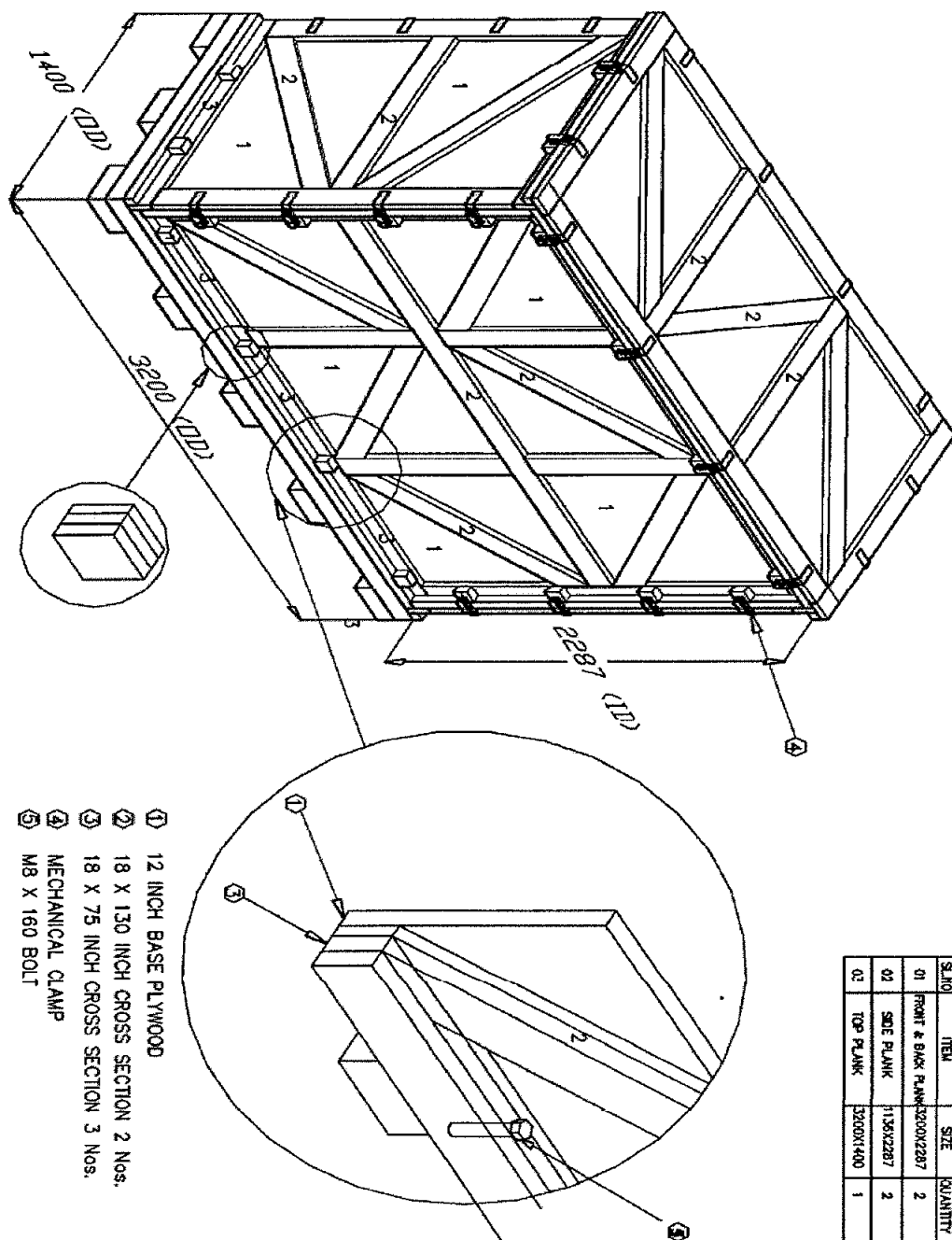


Fig - 8 : CLW Railway Panel Packing with Plywood & Plywood Support Battens



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 21 of 26

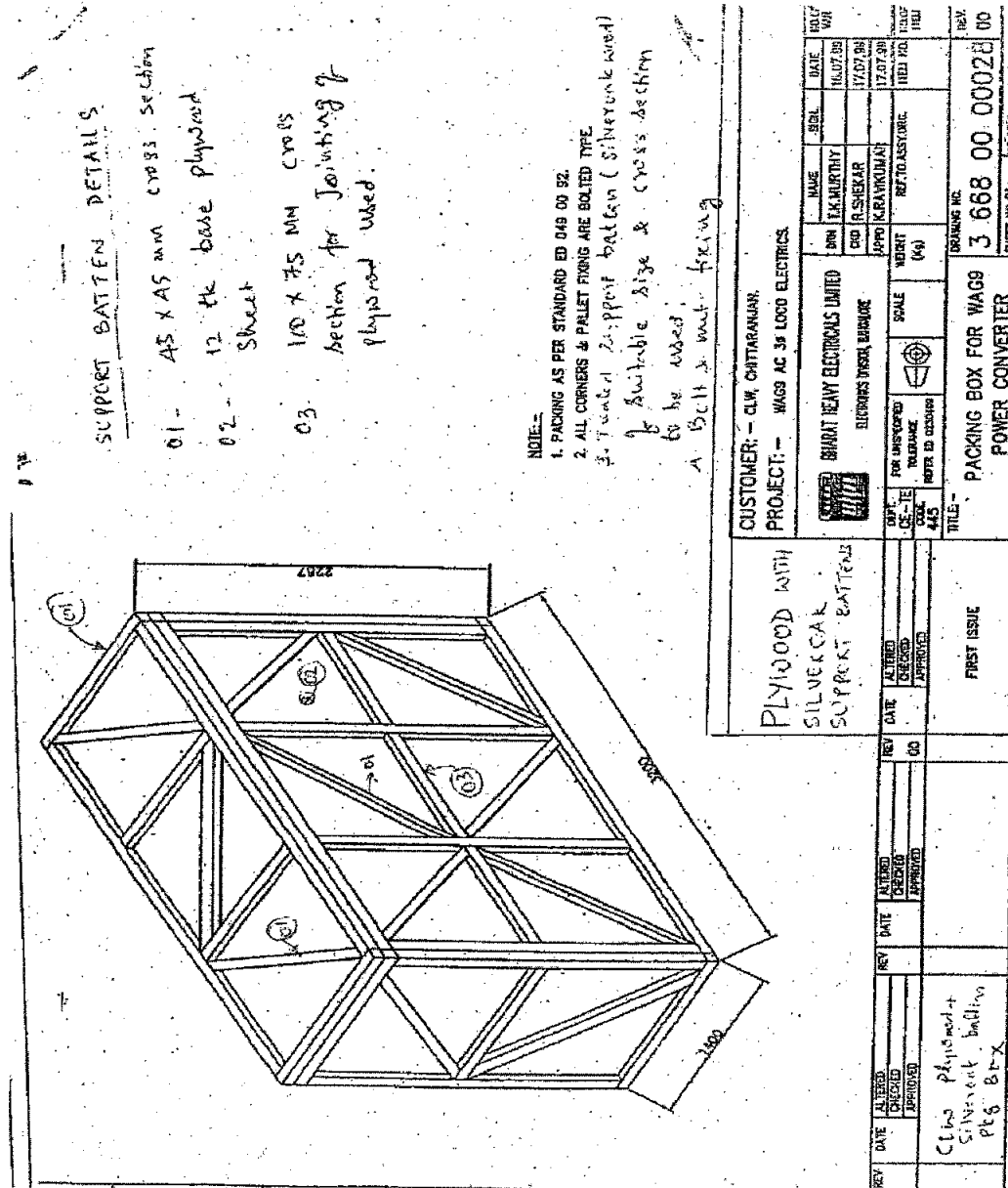


Fig - 9 : CLW Railways Panel Packing with Plywood & Silver Oak Battens



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 22 of 26

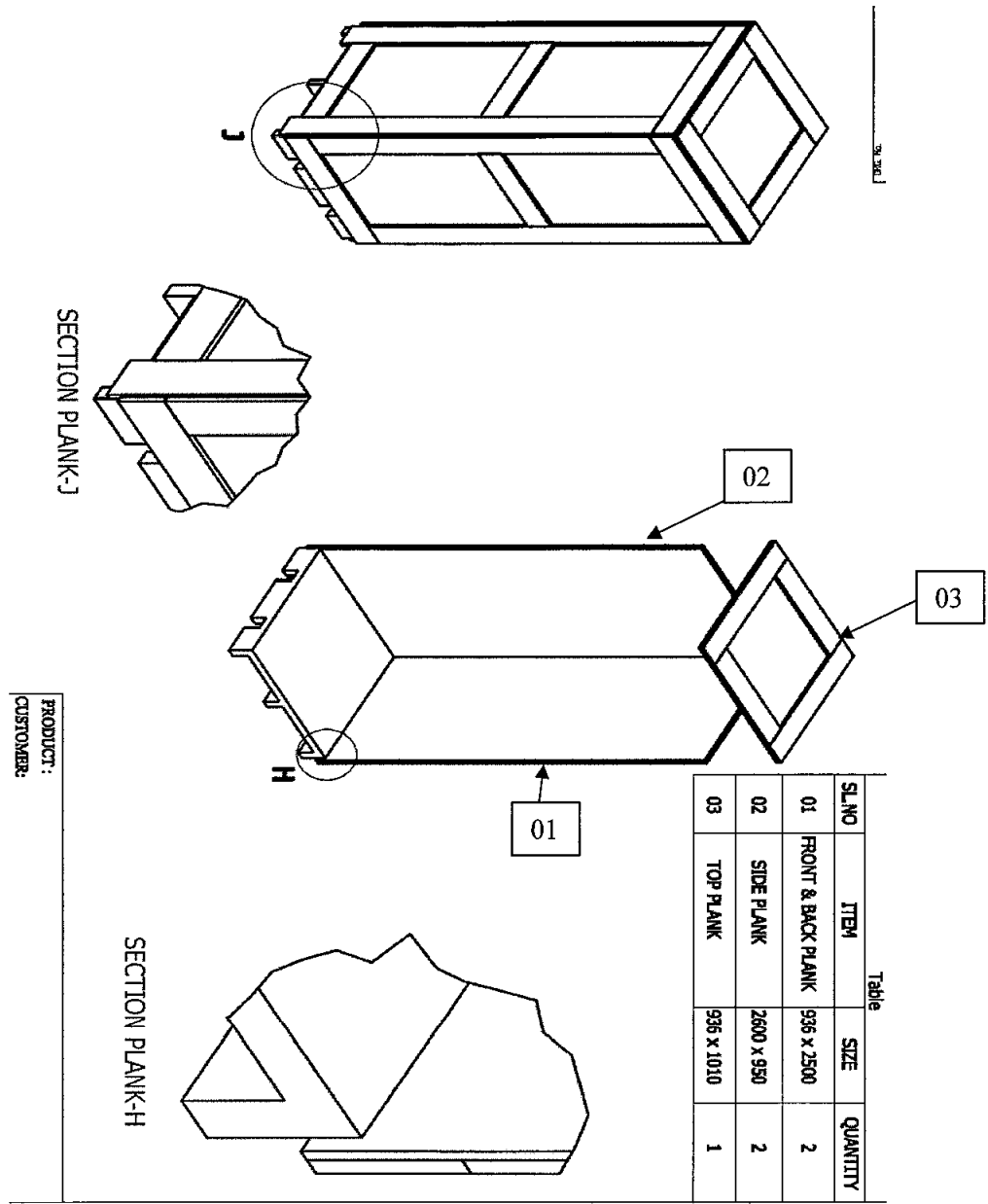


Fig-10 : Plywood Packing for Single Suit Panel.



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 23 of 26

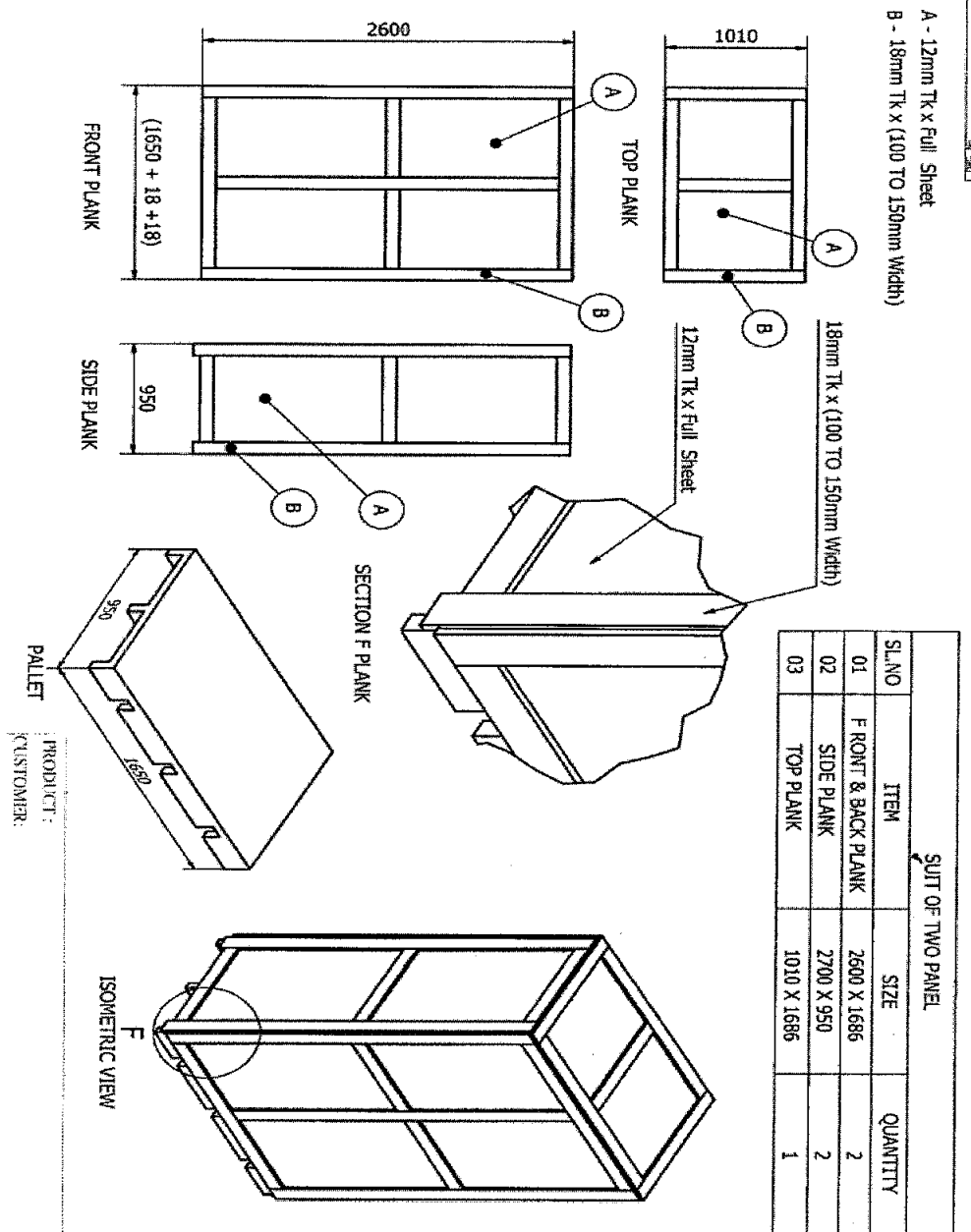


Fig - 11 : Plywood Packing for 2suit panel.



A4 - 14

PLANT STANDARD

ED 049 00 92

REV NO 05

Page 24 of 26

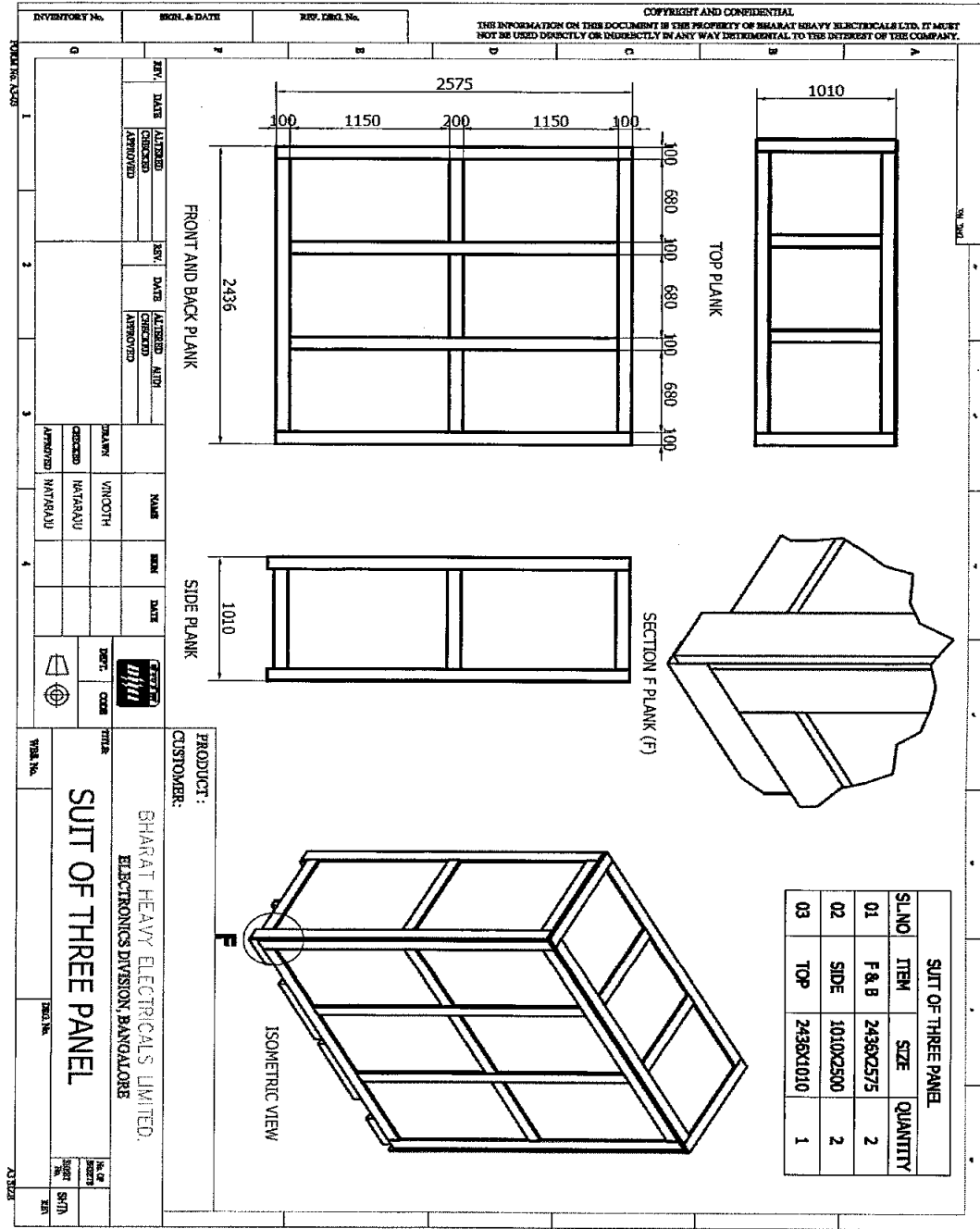


Fig - 12 : Three Suit Panel Packing

 A4 - 14	PLANT STANDARD	ED 049 00 92
		REV NO 05
		Page 25 of 26

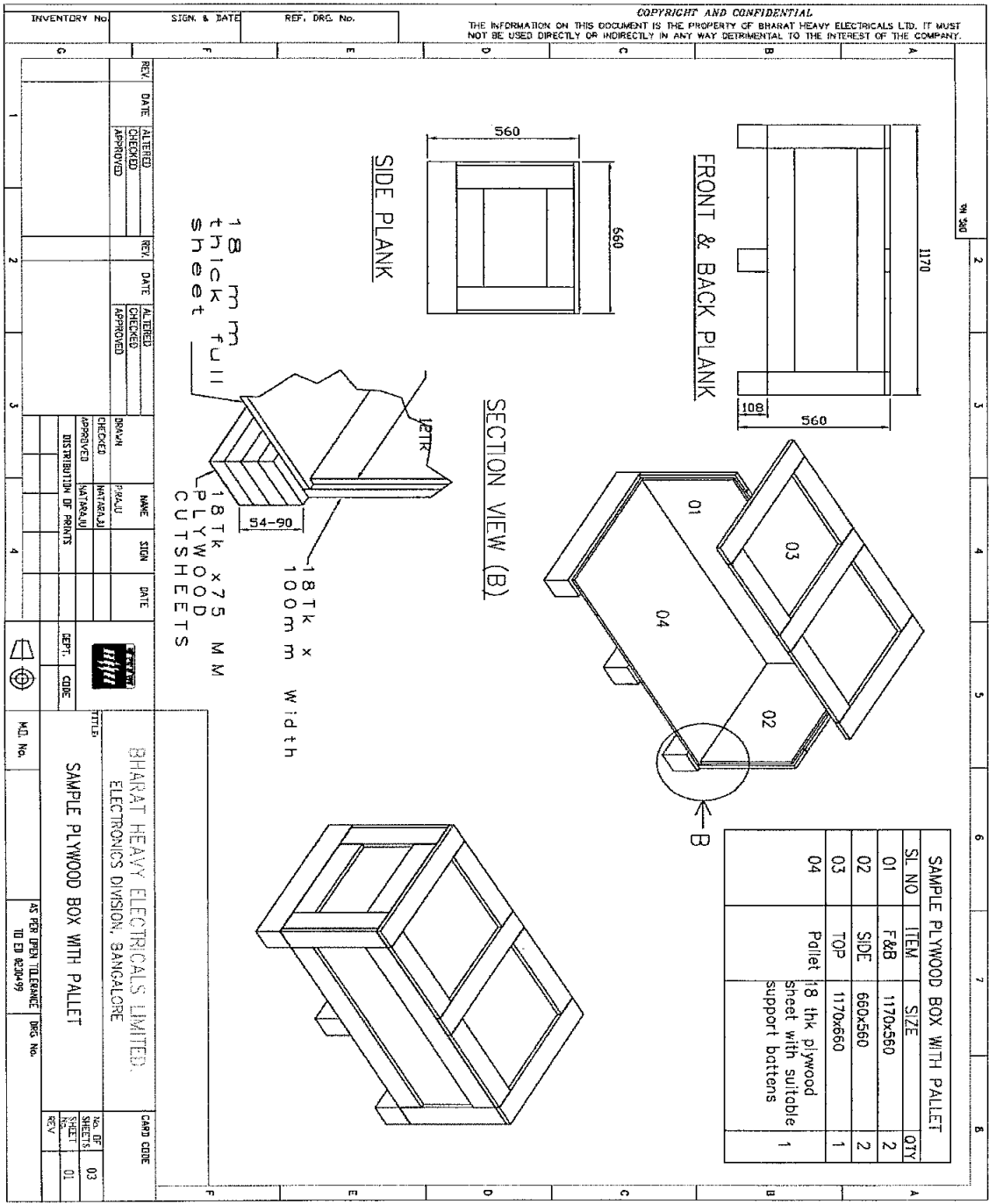


Fig – 13 : Plywood small case with Pallet

	PLANT STANDARD	ED 049 00 92 REV NO 05 Page 26 of 26
---	------------------------------	---

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

Fig: 14

