TENDER DOCUMENT

NIT No.: DLI/C&E/WI-665/283

FOR

Tender for ‘Design, Engineering, Supply, installation, testing and commissioning of VENTILATION PACKAGE AND ASSOCIATED WORKS’ for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part- B (Package- 061) of Bhilai Steel Plant, (SAIL)“.

VOLUME – 2A

GENERAL SPECIFICATION

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<td>2.</td>
<td>APPENDIX – 6, LIST OF APPROVED SUB-CONTRACTORS / VENDORS</td>
</tr>
</tbody>
</table>
GENERAL SPECIFICATION

GENERAL

The following General Specification shall be read in conjunction with General Technical Specification (GTS) of Bhilai Steel Plant, SAIL. If there are any provisions in these General Specification, which are at variance with the provisions of General Technical Specification (GTS) of Bhilai Steel Plant, SAIL, the provisions in these General Specification shall take precedence.

1.0 PROJECT SYNOPSIS

1.1 Site Conditions

1.1.1 Location

Bhilai Steel Plant (BSP), SAIL is located at Bhilai in Durg District of the state of Chhattisgarh in the central region of India. The site lies between 21.15° North latitude and 81.22° East latitude. The nearest convenient railhead is Durg which is about 12km west Bhilai. Bhilai /Durg stations are on the Howrah-Mumbai rail line of SEC Railway of the Indian railways.

The location of Bhilai is as follows:

From New Delhi, the national capital -- 1359 kms
From Kolkata -- 868 kms
From Chennai -- 1269 kms
From Mumbai -- 1100 kms

The distance from State Capital Raipur to Bhilai Steel Plant is 30km. It is well connected by the rail and road network. The nearest national highways are NH 6 & NH 43 crossing through Raipur.

1.1.2 Meteorological Data

In the absence of meteorological data at Bhilai/Durg, the data of the state capital Raipur, 30kms away, are considered. The meteorological details at Raipur are given below:

**Ambient Temperature**
- Absolute maximum : 47.7° C
- Absolute minimum : 3.9° C
- Highest of mean monthly : 45.2° C

**Ambient Air**
- Ambient air quality : Industrial

**Relative Humidity**
- Maximum : 100%
- Minimum : 7%
Climate : Tropical Humid

Rainfall

Harvest rainfall in 24 hours : 370.3mm
Annual Average : 1288.8mm

Wind

Predominant wind direction : SW to NE (Oct- Feb) and West to East (Mar- Sep)
Mean wind speed : 6.8 kmph
Maximum mind speed : 45 kmph

Altitude

Average altitude of the land is 300 m above MSL. Temperature inside shop premises is generally taken as 5° C above ambient, unless otherwise specified.

1.1.3 Infrastructure Facilities Outside the Plant

Railway

Bhilai Steel Plant is connected to Indian Railways network via Bhilai/Durg Stations of SEC Railway on the Howrah-Mumbai line. The track gauge of SEC Railways as well as of the plant tracks are standard broad gauge i.e 1676 mm.

Road

The plant is well connected to the country by road. National Highways NH6 & NH43 both pass through Raipur.

Sea Port

The nearest sea port is Vishakhapatnam approximately 550 km away from the site by rail.

Air Traffic

The nearest air port connected to the national network is Mana at Raipur, 30kms away.

1.1.4 Infrastructure Facilities Inside the Plant

Railway

The track gauge for the entire plant corresponds to the Indian Railway standard broad gauge i.e 1676mm.
Road

Main road and side of the Plant shall have roadways of 7.0m and 4.0m width respectively and the temporary roads provided during the construction stage shall be designed to cater the needs of movement of heavy construction vehicles.

2.0 GENERAL TECHNICAL REQUIREMENTS (GTR)

2.1 General Rules and Regulations

All plant units with respect to their location, layout, general arrangement and design of equipment, structural design, etc. shall be safe to the personnel and conform to the relevant statutory requirements issued by Chhatisgarh Government and the Government of India but not limited to the following.

- Chhatisgarh State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Pollution control measures shall be provided considering the latest norms and international standards. These should satisfy the stipulations of Central Pollution Control Board and Department of Environment and the Forest, Government of India.

2.1.1 Standard

Preferred Makes of Equipment & Supplies
To restrict/minimize stock/inventory of spares, the Purchaser considering will limit the makes of equipment & supplies to those listed in the “preferred makes of equipment and supplies” unless other-wise expressly so agreed

Unit of Measurement
All dimensions & weights shall be given in metric system.

Language
All drawings, documents etc. shall be in English language.

2.2 Safety

2.2.1 Safety Regulations
The Vendor shall comply with the, relevant Safety Rules and Regulations but not limited to the following:
- Chhatisgarh State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (Unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Strict attention shall be paid to all statutory regulations and safety rules for prevention of accidents.

The safety posters/regulations for prevention of accidents shall be displayed by the Vendor at appropriate places. Notices and warning signs shall be displayed for all sources of dangers.

The Vendor is not permitted to construct any temporary road crossing on the rail tracks for the sake of their convenience at work site.

When the work is carried out at night or in the obscure day light, adequate arrangements for flood lighting in the working area shall be made by the Vendor at his own cost and got approved by the Purchaser.

All handling/transport and the rigging equipment including lifting tools and tackles shall be checked at regular intervals and kept in good and safe working condition.

A register is to be maintained regarding the results of periodical tests/checks and other particulars in respect of each and every such equipment.

The Vendor must take sufficient care in moving his construction plant and equipment from one place to another, so that those do not cause any damage to the property of the Purchaser or obstruct construction activities of other Vendors.

The Vendor shall depute a full time safety engineer who will exclusively look after all the jobs pertaining to safety at site and keep close liaison with Purchaser/Consultant. He will be responsible for maintaining safe working conditions at site, promoting safety consciousness among the workmen and reporting to concerned authorities in case of accident/dangerous occurrences.

Before execution of work in hazardous area like

- Gas contamination
- Working at height
- Storage of inflammable materials
- Danger of electric shocks
- Explosion risks
- Excavation more than 2m deep, etc.
A protocol should be prepared in association with the agencies of the Purchaser / Consultants.

### 2.2.2 Safety while Working with Explosives

Explosives shall not be used on the work site by the Vendor without the written permission of the Purchaser and that too only in the manner and to the extent to which it has been prescribed.

Explosives shall be stored in special premises approved by Purchaser and at the cost of the Vendor who shall be liable for all damages, loss or injury to any person or property and shall be responsible for complying with all statutory obligations in these respects.

### 2.2.3 Safety Appliances

The Vendor shall provide the safety appliances conforming to the relevant Indian standards to all their workmen and supervisors engaged by them as well as by the sub-contractors.

The Vendor shall ensure that all the workmen and supervisors, are using the safety appliances regularly during work at site.

Any form of compensation in lieu of safety appliances shall not be permitted. Any violation in safety provisions of failure to maintain safe working conditions will lead to serious penalty on the Contractor and finally may lead to termination on the Contract.

The workmen of the Vendor deployed for construction and erection in hazardous areas shall be provided with personnel protective safety appliances of special nature suitable for hazardous working conditions.

### 2.2.4 Safety during Construction/Execution

The Vendor shall be responsible for the safety of his workmen and employees. The Vendor shall ensure that safety practices are followed so as to present personal injury to his workmen and also to other persons working/passing by in that area.

The Vendor shall ensure that in case of any accidents, the same are reported without delay to the Purchaser/Statutory Authorities as per Rules. In case of any injury/accident the Vendor shall bear all the expenditure for medical treatment and shall pay the compensation in case of permanent disability or death.

The Vendor shall ensure that all personnel employed do not stray into others areas. Any injury caused due to this shall be the sole responsibility of the Contractor.

The Vendor shall ensure that skilled labours required for specific works have necessary trade certificates and adequate experience of the job. This is likely
to be checked by the Purchaser. The concerned operator, mechanics, electricians, fitters, riggers, etc. must be fully conversant with the hazards associated in operation/maintenance of their relevant equipment.

2.2.5 **Safer Working Platforms**

- Vendor shall use strong and secured planks and boards of the right sizes.
- These planks shall be painted at the edges brightly to warn the workers for any misuse (usually zebra paint).
- Vendor shall make sure that scaffolds are erected by the trained scaffolders.
- Supervisors must inspect scaffolds once every week.

2.2.6 **Falling Objects and Debris**

- No loose materials which can fall down should be kept on the working platforms.
- Overhead shelters should be provided to minimize damage from tailing objects.
- Strong nets to be provided to catch these objects or debris.
- Nets must envelop all sides of the building.

2.2.7 **Personal Safety Equipment**

- Workers must wear approved safety helmets and shoes.
- For those working in high places safety belts shall be provided.
- The safety belts must be attached to strong anchorage points.

2.2.8 **Operating Construction Machine**

- Vendors shall make sure that those operating the construction machinery are well trained for their jobs.
- The keys of such machinery shall be kept with the authorized persons.
- The keys shall be removed after use of the machine.

2.2.9 **Safer Electrical Installations**

- Vendor shall use approved types of electrical sockets and plugs.
- Proper insulators for all electrical wiring shall be provided.
- Wiring should not be allowed to lie on the floor or on the ground.

2.2.10 **Safety in Designing of Equipment**

All machinery and equipment must be equipped with safety devices. The safety provisions shall conform to the recognized standards, safety codes and statues.

All safety measures as required to be adopted as per statutory regulations and the safety rules of the plant shall be strictly followed by the Vendor during the execution of the Contract.
2.3 **Drawing and Documents**

2.3.1 **Drawing**

The drafting standards adopted in preparation of drawing shall be such that good clean and legible print of the drawing can be obtained.

For preparation of original drawing guidelines contained in Indian Standard specification IS: 10164-1985 (preparation of engineering drawing and diagrams) shall be followed

<table>
<thead>
<tr>
<th>Size Code</th>
<th>Working Space (mm)</th>
<th>Cut Size (mm)</th>
<th>Uncut (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>811 X 1144</td>
<td>841 X 1189</td>
<td>880 X 1230</td>
</tr>
<tr>
<td>A1</td>
<td>564 X 796</td>
<td>594 X 841</td>
<td>625 X 880</td>
</tr>
<tr>
<td>A2</td>
<td>390 X 549</td>
<td>420 X 594</td>
<td>450 X 625</td>
</tr>
<tr>
<td>A3</td>
<td>267 X 375</td>
<td>297 X 420</td>
<td>330 X 450</td>
</tr>
<tr>
<td>A4</td>
<td>180 X 252</td>
<td>210 X 297</td>
<td>240 X 330</td>
</tr>
</tbody>
</table>

However, Vendor’s standard drawings are exempted from the above limitations. It is desirable to keep the same size of all drawings for ease of filing, reference and record keeping.

All drawings shall be oriented to match the plant layout drawings and shall have a key plan identifying the plant area to which they apply.

There shall sufficient reference notes and cross-references on the drawings to permit identification of all related drawing and documents, which are required for proper understanding.

When a drawing is revised by the Vendor/ Sub-Contractor, every change made shall be identified on the drawing by placing the revision number in a small triangle so as to be easily recognizable. In addition, a record of revisions along with the co-ordinates showing the location of revisions shall be indicated at the left hand bottom corner of the drawings as per standard practice. In case of revision of drawing, for which different number is allotted, the new drawing shall clearly indicate the number of the drawing which it supersedes.

Approval of drawings from the statutory authorities such as the Indian Boiler Inspectorate, Inspectorate of Explosives, Electrical Inspector, etc. is the responsibility of the Vendor/ Sub-Contractor.

Any additional drawings not specifically mentioned by the EPI/BSP/MECON but are the required for the approval of drawings, shall be submitted by the Vendor/ Sub-Contractor.

The Title block of the drawing shall be enclosed as Annexure I.
2.3.2 Approval of Drawings

Approval of Vendor’s drawings will generally be accorded within four (4) weeks of receipt.

Approval of Vendor’s drawings means that these will be checked for conformity with applicable specifications and general conformity with the engineering requirement for the areas covered in the scope of work. It is understood that approval by the Purchaser’s Consultant does not include checking for drafting and other errors but only reviews of basic concepts and general principles involved.

The Vendor shall be responsible for any discrepancy, errors and omissions in the drawings have been approved by the Purchaser/Consultants or not. The Vendor shall bear all extra cost due to alterations necessitated by reasons of any discrepancies, errors or omissions in the drawings and particulars supplied by the Vendor.

Drawing furnished by the Vendor shall be certified as correct for use and shall bear the signatures of responsible persons of the Vendor.

Approval of Vendor’s drawing shall not relieve the Vendor of his responsibility to comply with the intent of the contract; manufacture/fabrication or procurement prior to approval of drawings shall be at the Vendor’s risk.

The Vendor shall submit drawing to EPI/BSP/MECON for approval by the Purchaser /Consultant as per clause 3.4 to 3.6 of GTR.

If the drawing is “Approved” then one print shall be returned back to the Vendor duly stamped “Approved” by Consultant.

If the drawing is “Not approved” or “Approved as Noted”, then one stamped print with appropriate comments shall be returned back to the Vendor for incorporation of comments and re-submission of revised drawings for approval sets with in 7 days as per clause 3.4 to 3.6 of GTR.

After approval of drawings the Vendor shall submit 12 sets of approved drawings to the EPI. The Vendor shall incorporate the following note on the drawing before “Approved by MECON vide letter no............dt........”

The drawing shall become a contract drawing after approval and there after the Vendor shall not deviate from them in any way whatsoever except with the written permission of the EPI/BSP/MECON.

All reference and information category drawings shall be submitted in 12 sets to EPI. These drawings shall be submitted to Purchaser before forwarding the same to erection Vendor at site for constructive/erection activities.

The information category drawings shall not be approved by the Consultant. However, information category drawings shall be stamped “For Information Only” and one set shall be returned back to the Vendor.
In case any discrepancy is observed on these drawings, same shall be informed to the Vendor by marking the comments on the drawings. The Vendor shall resubmit these drawings after incorporating the comments in 12 sets to the EPI.

After receipt of stamped “For Information Only” the Vendor shall submit 10 sets of drawings to the EPI. The Vendor shall incorporate the following note on the tracing before taking additional prints for submission to the EPI.

Stamped “For Information Only” by MECON vide their letter no........ dtd........

2.3.3 **Submission of Drawings, CD Reproducible and Documents**

The Vendor shall submit the following drawing/documents to EPI and these will be distributed to BSP/MECON as detailed below.

<table>
<thead>
<tr>
<th>Drawings</th>
<th>MECON</th>
<th>BSP</th>
<th>EPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approval category drawings for approval of consultants</td>
<td>6 sets</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
<tr>
<td>2. Fabrication drawing for approval of consultants.</td>
<td>6 sets</td>
<td>--</td>
<td>4 sets</td>
</tr>
<tr>
<td>3. Drawing after approval along with list of Drawings (for distribution)</td>
<td>8 sets</td>
<td>2 sets</td>
<td>4 sets</td>
</tr>
<tr>
<td>4. Information category drawings</td>
<td>8 sets</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
<tr>
<td>5. Information category drawings after stamping “For Information Only” by consultants.</td>
<td>8 sets</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
<tr>
<td>6. Erection drawings</td>
<td>8 sets</td>
<td>2 sets</td>
<td>4 sets</td>
</tr>
<tr>
<td>7. As built drawings</td>
<td>--</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
<tr>
<td>8. Spare parts drawings</td>
<td>--</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
<tr>
<td>9. Wearing parts drawings</td>
<td>--</td>
<td>2 sets</td>
<td>2 sets</td>
</tr>
</tbody>
</table>

**Compact Disc and Reproducibles**

<table>
<thead>
<tr>
<th>Drawings</th>
<th>MECON</th>
<th>BSP</th>
<th>EPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. As built drawing of approval category</td>
<td>--</td>
<td>1 set</td>
<td>1 set</td>
</tr>
<tr>
<td>2. As built drawing of information category</td>
<td>--</td>
<td>1 set</td>
<td>1 set</td>
</tr>
<tr>
<td>3. Spare parts drawings</td>
<td>--</td>
<td>1 set</td>
<td>1 set</td>
</tr>
<tr>
<td>4. Wearing parts drawings</td>
<td>--</td>
<td>1 set</td>
<td>1 set</td>
</tr>
<tr>
<td>5. All manuals</td>
<td>--</td>
<td>1 set</td>
<td>1 set</td>
</tr>
</tbody>
</table>
Documents

1. Erection manual 1 set 6 sets 3 sets
2. Operating and maintenance manuals 1 set 6 set 2 sets
3. Storage and reconservation manuals 1 set 6 set 2 sets
4. Safety manuals 1 set 6 set 3 sets
5. List of consumables 1 set 6 set 3 sets
6. List of lubricants and hydraulic 1 set 6 set 3 sets
7. List of special tools and tackles 1 set 6 set 3 sets
8. Test certificates and inspection certificates in bound volume 1 set 6 set 2 sets

2.3.4 Progress Report

The Vendor shall submit a detailed PERT Network showing completion time which would indicate starting and completion dates of all activities of engineering, purchasing, procurement of materials, manufacturing, inspection, dispatch, erection, testing, and commissioning, etc. under his scope of work.

The Vendor shall submit the progress report in such details as may be required by the Purchaser so as to enable them to monitor the progress of work.

The Vendor shall submit the progress report every month in the proforma mutually discussed and agreed.

2.3.5 Coding Scheme

All drawings/documents/equipment/spare parts/shipments shall have a coded number which shall be finalized with the successful tenderer.

2.3.6 Title Block of Drawing

Separate file is attached as soft copy. Hard copy is enclosed as Annexure - A

3.0 PERFORMANCE GUARANTEE

3.1 General

On completion of erection of the plant units along-with utilities and auxiliaries by respective package bidders as per approved drawings / documents as well as detailed drawings, the successful bidder shall
undertake preliminary Acceptance Test (PAT) i.e. cold test, to prove that the unit has been supplied as per agreement and after erection the unit is fit to be started up and commissioned. The PAT shall be followed by commissioning (hot trials) to demonstrate that the unit is fit for commercial production.

3.1.1 Preliminary Acceptance Test (PAT)

Cold tests shall be performed on the individual sub-assemblies of the unit and shall be designed to conduct the systematic check of the components and of the functional operation thereof.

Cold tests shall comprise idle, no-load tests. Cold tests shall be conducted by the successful bidder under his sole responsibility. The employer will provide skilled operating personnel during the cold test. A detailed programme of cold tests shall be drawn up by the successful bidder and shall be subject to the approval of the employer / consultant. Such programme may be revised and adjusted as may be required by the employer during the test run.

Results of cold tests shall be recorded jointly by the successful bidder and the employer.

On successful completion of preliminary acceptance tests, and liquidation of the defects list, preliminary acceptance certificates shall be issued by the employer.

3.1.2 Successful Commissioning (Hot Trials)

After issue of preliminary acceptance certificates, the successful bidder shall start-up and commission the unit in an integrated manner under his sole responsibility.

During the start-up and commissioning, the successful bidder shall perform the required adaptation, adjustment and hot run the Plant & Equipment to demonstrate its production capacity.

The employer shall, for the purpose of start-up and commissioning, provide operating personnel as may be available with him for normal operation, who shall work under the instructions and guidance of the successful bidder.

Start-up and commissioning of the unit shall be taken up only when material handling system, electrical power system, inter-plant fluid system and auxiliaries serving the unit as well as the preceding / succeeding plant units are under normal operation and / or feed material is available. The successful bidder shall rectify the defects observed during commissioning.

The quantities of starting material and facilities necessary for conducting the commissioning shall be mutually determined by the successful bidder and employer.
Commissioning of the unit shall be deemed to be successfully completed, after ten (10) days of rated material is successfully transported, for the particular circuit.

Results of start-up tests and commissioning shall be recorded jointly by the successful bidder and the employer.

On successful completion of commissioning of the unit and its commencement of commercial production as per above mentioned clause, commissioning certificate shall be issued by the employer within 15 days.

The unit shall be taken over by the employer when:

   a) Commissioning certificate as per clause 08.01.02.008 has been issued by the employer.

   b) The successful bidder has submitted all final documents in compliance with the provisions of this specification.

   c) The successful bidder has supplied all consumables, change parts, special tools and tackles and commissioning spares.

   d) The successful bidder has met, to the satisfaction of the employer, all the observation, if any, contained in the Preliminary Acceptance certificate.

**3.1.3 Performance Guarantee Tests (PG)**

After successful commissioning of the plant & equipment, the bidder shall offer the plant for conducting performance guarantee tests as mutually agreed upon between the employer and bidder.

The bidder shall supervise and carry out the operation under their instruction and guidance during performance guarantee tests and shall take full responsibility of the operation. The employer will make available necessary operating and maintenance personnel as per the agreed manning schedule as well as the raw materials, utilities and services etc, as specified.

The bidder shall submit the scope, general preconditions, test procedures and test evaluation methods which shall be finalised during tender discussion.

The performance tests for all plant equipment shall be carried out to satisfy all operating parameters as per the relevant clauses of the Technical specification for the equipment under consideration.
The performance guarantee test shall be performed for each sub section continuously for 10 days. Continuity of operation however, be limited by availability of raw materials for unloading and stacking and availability of storing capacity on delivering end. Wherever equipment in the sub section is of stand by nature, each such equipment shall operate for at least 10 hours on load in the period.

The performance guarantee test shall also be performed for the complete system for 5 days on round the clock basis.

In case test is disrupted due to reasons attributable to employer, the same shall be repeated two more times attending to the reasons of the employer. If the PG test is disturbed even after this, the PG test shall be on the basis of uninterrupted operation of system for 100 hours of total system, excluding the stoppages due to fault of the bidders. However, there should not be any failure of the equipment supplied by Bidder between starts and finish of this time counting. If the operation stops due to failure of any item supplied by bidder, the operating hours prior to such failure will not be counted.

In case some equipment can not be tested within the period of testing because of failure of equipment or facility provided by others, the same will be accepted on the basis of load test result for the limited period or no – load test result where load test could not be performed at all.

The bidder shall prepare and submit a draft performance test procedure for each equipment and system within 12 months of order. The final performance test procedure will be prepared jointly by the employer / consulting engineers and the bidder based on the draft performance test prepared by the bidder and various requirement indicated in the contract specification and the order.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Description</th>
<th>Acceptable</th>
<th>Acceptable with penalty</th>
<th>Liquidated Damages</th>
<th>Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Wagon Tippler</td>
<td>20 tippling per hour</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than 20 wagons per hour</td>
</tr>
<tr>
<td>2.0</td>
<td>Yard Machines</td>
<td>As per rated capacity</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than rated capacity</td>
</tr>
<tr>
<td></td>
<td>Stacker – 1500tph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reclaimer-1500tph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Conveying capacity</td>
<td>As per rated capacity</td>
<td>-</td>
<td>Not applicable</td>
<td>Less than rated capacity</td>
</tr>
<tr>
<td>4.0</td>
<td>Environment Norms</td>
<td>As specified in TS</td>
<td>-</td>
<td>Not applicable</td>
<td>Not achieving norms</td>
</tr>
</tbody>
</table>

The performance guarantee test shall be performed for each sub section continuously for 10 days. Continuity of operation however, be limited by availability of raw materials for unloading and stacking and availability of storing capacity on delivering end. Wherever equipment in the sub section is of stand by nature, each such equipment shall operate for at least 10 hours on load in the period.
4.0 GENERAL SPECIFICATION ON QUALITY SYSTEM, INSPECTION & TEST OF PLANT & EQUIPMENT AT MANUFACTURER’S PREMISES

4.1 General

Inspection & testing of plant & equipment shall be carried out by BSP/MECON/EPI at the works of successful tenderer during manufacturing and/or on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved drawings, manufacturing drawings applicable national / international standards.

4.2 Quality System Requirements

The successful tenderer must recognise the importance of quality and follow defined quality programme in all stages of manufacturing and quality control activities of the product. Vendor / Contractor must define and implement the tasks and control that will provide needed assurance, in case manufacturing of product is sub-contracted either partly or fully and/ or for the procured from vendors which are duly approved by the project authority.

BSP/MECON/EPI reserve the right to verify the quality programme of tenderer & its vendors/sub- vendors to assure the effectiveness of the programme to meet the intended and specified quality of the product.

4.3 Quality Assurance Plan (QAP)

4.3.1 The successful tenderer shall furnish Quality Assurance Plan (QAP) for respective equipment after completion of detailed engineering and finalisation of billing schedule / equipment identification number for Consultant’s approval at least one month prior to start of manufacturing.

4.3.2 QAP shall be prepared & furnished by Vendor / Contractor for structural & mechanical equipment, electrical equipment and refractory materials etc., QAPs must be submitted in four (4) sets duly signed and stamped by tenderer for BSP/MECON/EPI approval.

4.3.3 The successful tenderer shall indicate procurement source and furnish to BSP/MECON/EPI, during the submission of QAP, copies of P.O., Sub-P.O., T.S., approved GA drawings/ data sheets & detailed manufacturing drawings, as backup reference materials for scrutiny & final approved by BSP/MECON/EPI. The submission & subsequent approval of QAPs shall be ensured to be restricted to one round only.

4.3.4 Inspection and test requirements shall be decided with due consideration of factors like safety, duty cycle, operating conditions, equipment life, environmental conditions, place of installation and statutory regulations, as applicable, for a particular equipment. Any, additional type or special tests or routine tests if found necessary to establish the intended quality after detailed engineering then the same shall have to be incorporated in the QAP without any commercial implication.
4.3.5 Detailed QAP shall be prepared by the successful tenderer in consultation with their Sub-contractors / Manufacturers to avoid any complicacy later.

4.4 Calibration of Measuring Equipment

4.1 All the measuring equipment used for inspection & testing shall be calibrated and appropriate accuracy class of measuring equipment shall be used. Calibration standards used for calibration of measuring equipment shall be traceable to national standards of National Physical Laboratory (NPL), New Delhi with unbroken chains of comparison.

4.2 Valid calibration certificate for all measuring equipment used during inspection and testing at manufacturer’s works, with traceability to national standards of NPL/ NABL accredited laboratories shall be furnished prior to undertaking inspection by BSP/MECON/EPI.

Calibration certificate shall also indicate reference no. of calibration standards calibrated by NPL/NABL accredited laboratories and copies of such calibration certificates of calibration standards shall be included in the complied dossiers of inspection/test results.

4.5 Test Certificates and Documents

4.5.1 For each of the items being manufactured as per approved QAP, following test certificates and documents, as applicable for each of the equipment, in requisite copies including original, duly endorsed by the Manufacturer/successful tenderer with appropriate linkage to project, purchase order and acceptance criteria etc shall be submitted to Consultant/Purchaser.


ii) WPS, PQR & WPQ documents as per applicable code.

iii) Details of stage wise inspection & rectification records for fabricated items, castings, forgings and machined articles.

iv) Control dimension chart with records of alignment, squareness etc.

v) Manufacturer’s material and performance/ relevant test certificates for all bought-out items.

vi) Details of heart-treatment and stress relieving charts as per specification.

vii) Non-Destructive Test reports as per respective code.

viii) Static/dynamic balancing certificate for rotating components/machines.

ix) Hardness test certificate.
x) Pressure/Leakage Test Certificates.

xi) Performance Test Certificates for all characteristics.

xii) Routine / type / calibration / acceptance / special test (Type Tests etc) certificates for electrical items.

xiii) Surface preparation and painting certificates.

xiv) Certificates from competent authority for the items coming under statutory regulations.

4.5.2 Where physical and chemical test certificates of material are not available, the successful tenderer/Sub-contractor shall arrange to have specimens and test samples of the materials, tested in his own laboratory at his cost and submit the copies of test results in requisite numbers to BSP/MECON/EPI for review. Number of test samples against each heat/cast/lot or batch of materials, as applicable shall be as per relevant Indian or International Standards.

4.5.3 Where facilities for testing do not exist in the successful tenderer/Sub-contractor’s laboratories or in case of any dispute, samples and test pieces shall be drawn by the successful tenderer/Sub-contractor in presence of BSP/MECON/EPI and sealed sample shall be sent to any Govt. approved /NABL accredited laboratory for necessary tests at former’s own cost.

4.5.4 The BSP/MECON/EPI shall have the right to be present and witness all tests being carried out by the successful tenderer/Sub-contractor at their own laboratory or approved laboratories. Also, the Inspection Agency shall reserve the right to call for confirmatory test on samples, at his discretion.

4.6 Internal Inspection by Successful Tenderer/Manufacturer

4.6.1 Inspection and tests shall be carried out by Contractor/ Manufacturer in accordance with approved drawing, T.S., P.O., and approved QAP. They shall maintain records of each inspection and test carried out and signed documents shall be submitted to Purchaser/ Consultant for verification.

4.6.2 The successful tenderer shall carry out their internal inspection & obtain clearance from statutory bodies e.g. IBR, CCE, TAC, Weights & Measures, safety, IE rules etc. prior to offering any equipment for BSP/MECON/EPI’s inspection in accordance with approved QAP.

4.6.3 The successful tenderer/ Manufacturers shall identify all the inspected equipment/component/raw materials & shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification/rework, rejected etc.

4.6.4 The successful tenderer shall establish and maintain procedures to ensure that the product that does not confirm to specified requirements is prevented from inadvertent use or installation. The description of non-conformity that has been accepted subsequently by BSP/MECON/EPI by concession and/ or of repairs, shall be recorded.
Repaired and reworked product shall be offered for re-inspection to BSP/MECON/EPI along with records of corrective action taken.

4.7 manufacturing and inspection schedule

All Vendors / contractors shall submit the schedule for manufacturing and inspection indication equipment / components, sub-assembly/assembly.

Date of approval of drawings / data sheets. Address of manufacturer with contact person and scheduled date of inspection. Such reports shall be submitted to respective Consultant Inspecting Offices with a copy to Inspection Co-ordinating Office once in a month. These monthly reports shall state the planning for next three months. Submission of first reports must commence one month prior to commencement of manufacturing activities of the product.

4.8 Method of Undertaking Inspection & Testing by Consultant / Purchaser

4.8.1 Inspection call shall be given only on readiness of the equipment/assembly/sub-assembly & after approval of all relevant drawings and QAP. In case equipment/sub-assembly offered for inspection are found not ready, all the cost of visit of Consultant’s engineer shall have to be borne by the successful tenderer.

If the equipment/assembly/sub-assembly after inspection found not acceptable, require rework and involve Consultant’s re-inspection, all the cost of such re-inspections shall also have to be borne by the successful tenderer.

4.8.2 Inspection call shall be floated to BSP/MECON/EPI, in the approved duly filled in, with ten days clear margin, enclosing all documents like test Certificates, Internal Inspection Reports, P.O., Sub-P.O., T.S., Approved QAP, approved GA drawings/data sheets and manufacturing drawings. Inspection calls without above documents shall be treated as invalid and shall be ignored. The hard copy of such documents must also accompany a CD (comprising computer readable files) containing the identical documents.

4.8.3 The successful tenderer shall offer substantial quantities for economical inspection consistent with the size of order.

4.8.4 On receipt of the Inspection call, pertaining to particular package/equipment/item, QA & Inspection group of MECON, Ranchi (Overall co-ordinating office for Inspection activities) shall organize inspection visit or will issue Inspection assignment to other Consultant’s office (based on nearness to the vendor’s manufacturing works/relevant job expertise). For further inspection pertaining to the same package/equipment/item, successful tenderer may forward the subsequent inspection calls to the respective Consultant’s offices (as identified per initial assignment), with a copy to QA & Inspection Section, Ranchi.

4.9 Obligations of Successful Tenderer
4.9.1 The successful tenderer shall provide all facilities and ensure full and free access of the Inspection Engineer of BSP/MECON/EPI to their own or their Sub-Contractor’s premises at any time, during contract period, to facilitate him to carry out inspection & testing of the product during or after or after manufacture of the same.

4.9.2 The successful tenderer shall delegate a Representative / Co-ordinator to deal with BSP/MECON/EPI on all inspection matters. Representative of successful tenderer shall be present during all inspection at Sub-Contractor’s works.

4.9.3 The successful tenderer shall comply with instructions of BSP/MECON/EPI fully and with promptitude.

4.9.4 The successful tenderer/ Sub-Contractor shall provide all instruments, tools, necessary testing & other inspection facilities to BSP/MECON/EPI free of cost for carrying out inspection.

4.9.5 The cost of testing welds by ultrasonic, radiographic and dye penetration tests etc. in the fabrication workshop shall be borne by the successful tenderer. These tests need to be witnessed by ASNT/ISNT Level-II qualified NDT personals.

4.9.6 The successful tenderer shall ensure that the equipment/ assembly/ component of the plant and equipment required to be inspected, are not dismantled or dispatched before inspection.

4.9.7 The successful tenderer shall not offer equipment for inspection in painted condition unless otherwise agreed in writing by BSP/MECON/EPI.

4.9.8 The successful tenderer shall not offer equipment and materials once rejected by the BSP/MECON/EPI, are not re-used in the manufacture of the plant and equipment. Where parts rejected during inspection have been rectified as per agreed procedures laid down in advance, such parts shall be segregated for separate inspection and approval, before being used in the work.

4.10 Stamping and Issue of Inspection Documents

4.10.1 Inspection Memo:- For rejected items/ items, which do not conform to Technical Specification in one or more quality characteristics requiring rectification / rework, Inspection Memo shall be issued indicating therein the details of observation & remarks. All the non-conformities with respect to specification of the product shall be indicated in the Inspection Memo for further quality control by successful tenderer.

4.10.2 Inspection Certificate:- On satisfactory completion of final inspection & testing. All accepted plant & equipment shall be stamped suitably and Inspection Certificate shall be issued by the Consultant for the accepted items.

4.11 General Clause
4.11.1 Inspection & tests carried out by Consultant/Purchaser shall no absolve the responsibility of the successful tenderer/Manufacturer to provide acceptable product as per the terms of contract nor shall it preclude subsequent rejection.

4.11.2 Purchaser/Consultant reserve the right to inspect any product at any stage of manufacturing beyond pre-identified stages & hold points of approved QAP.

4.12 Format

Performa for inspection of all equipment shall be as per EPI / EPI’s clients requirement.

5.0 PAINTING

5.1 General

5.1.1 This specification covers the materials, tools, facilities and quality requirement for surface preparation and painting of steel structures, equipment, piping, ducts, chutes, wood work etc.

5.1.2 This is only a general guideline of the painting scheme to be followed by the Tenderer. However, in case a specific painting procedure is stipulated in any tendering specification, then this general guideline shall be superseded. Any special case which may arise from time to time shall be dealt with individually on the merit of each case.

5.1.3 The term “painting” referred herein covers rust preventive, fungus/insects preventive and decorative coating along with surface protection of the following area but not limited to the areas indicated below.

i) Structural steel works
ii) Mechanical equipment
iii) Electrical equipment
iv) Instrumentation and control equipment.
v) Pipe work
vi) Oxygen plant, etc.

5.1.4 Surfaces made of asbestos, aluminum, brass, bronze, galvanized steel, stainless steel, cast iron and other corrosion resistant alloys and rubber/synthetic polymer/fiber reinforcement plastic and buried pipe work are not required to be painted unless specified except for aesthetic purposes or for identification bands, wherever relevant.

5.1.5 The complete paint system for any item includes the following basic activities:

i) Proper surface preparation
ii) Application of primer coats
iii) Application of intermediate coats
iv) Application of finished coats
All the above coats shall be of quality paint products and of approved make. The scope of work shall also include supply of all paint materials as per specification described herein.

5.1.6 If the contractor desires to adopt alternative paint system for any specific item for an improvement or equivalent to the system specified here-in or as per recommendations of paint manufacturer, may do so subject to purchaser's approval in advance.

5.2 **Surface Preparation**

5.2.1 Surface preparation required for paint application, shall be such as to clean the surface thoroughly of any material which will be conducive to premature failure of the paint substrates.

5.2.2 All surfaces shall be cleaned of loose substances, and foreign materials, such as dirt, rust, scale, oil, grease, welding flux, etc. in order that the prime coat is rigidly anchored to the virgin metal surface. The surface preparation shall confirm to pictorial representation of surface quality grade of Swedish Standards Institution SIS – 055900 or equivalent standards such as SSPC – VIS – 1.67 or DIN 55928 (Part 4) or BS 4232 or IS 1477 – 1971 (Part I).

5.2.3 The acceptable surface preparation quality/grade are described under each paint system. The procedures include solvent cleaning, hard tool cleaning, power tool cleaning, blast cleaning, wood surface cleaning, flame cleaning and pickling. The will ensure surface quality as required by the specific primer paint. For ready reference surface preparation quality grade to be adopted in respect of SIS 055900 and DIN 55928 (Part 4) is given in Annexure -01.

5.2.3.1 **Solvent Cleaning**

The surface shall be cleaned by wiping, immersion, spraying or vapour contacting of a suitable solvent or washing with an emulsion or alkaline solution to remove oil, grease, dirt, old paint, etc. Solvent cleaning shall not remove rust, scales, mill scales or weld flux. Therefore, before application of paint, solvent cleaning shall be followed by other cleaning procedures as stated in subsequent clauses.

5.2.3.2 **Hand Tool Cleaning**

The surface shall be cleaned manually by vigorous wire brushing as per grade St -2 quality of Swedish Standard Institution SIS 055900 and DIN 55928. This method effectively removes loosely adherent materials, but would not affect residues of rust or mill scales that are intact are firmly adherent. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation the surface shall have a faint metallic shine. The appearance shall correspond to the prints designated St-2.

5.2.3.3 **Power Tool Cleaning**

The surface shall be cleaned by electric or pneumatic tools, such as brushes, sanding machines, disc abrasive grinder, rotary disc scaler etc, to St -3
quality. The tools shall be used carefully to prevent excessive roughening of surface and formation of ridges and burrs. This method will remove loosely adherent materials but would not affect residues of rust or mill scales that are firmly adherent and intact.

5.2.3.4 **Blast Cleaning**

The surface shall be cleaned by impingement of abrasive materials, such as graded sand at high velocity created by clean and dry compressed air blast as per the grade according to Swedish Standard Institution SIS 055900. This method will remove loosely adherent materials as well as adherent scales and mill scales. Prior to application of blast, heavy deposit of oil and grease are removed by solvent cleaning excessive surface scales are removed by hand tools or power tool cleaning. The extent of removal of adherent scales is varied, depending on the application and are defined by the surface quality grades Sa 1, Sa 2, Sa 2.5 and Sa 3 in the order of increasing cleanliness. The blast cleaning is not recommended for sheet metal work.

5.2.3.5 **Flame Cleaning**

The surface is cleaned by rapid heating by means of oxyacetylene flame to loosen the adherent scales, followed immediately by wire brushing. This method will remove loosely adherent materials as well as most of the adherent scales and mill scales. In order to minimize or prevent distortion flame cutting shall not be used on members having thickness of 6 mm and lower.

5.2.3.6 **Pickling**

In this method the surface is cleaned of mill scales, rust or rust scales by chemical reaction or electrolysis or both.

5.3 **Paint Application**

5.3.1 **Paints**

5.3.1.1 Paint shall be applied in accordance with paint manufacturer’s recommendations. The work shall generally follow IS 1477 – 1971 (Part II) for jobs carried out in India and SSPC-PA-1 or DIN 55928 of equivalent for jobs carried out outside India.

5.3.1.2 General compatibility between primer and finishing paints shall be established by the paint manufacturer supplying the paints.

5.3.1.3 In the event of conflict between this general procedure on painting and the paint manufacturer’s specification, the same shall be immediately brought to the notice of the Purchaser. Generally in cases of such conflicts, Manufacturer’s specifications / recommendations shall prevail.
5.3.1.4 Before buying the paint in bulk, it is recommended to obtain sample of paint and establish "Control Area of Painting". On Control Area, surface preparation and painting shall be carried out.

5.3.1.5 If required, samples of paint shall be tested in laboratories to establish quality of paint with respect to:
   (i) Viscosity
   (ii) Adhesion/Bond of paint in steel surfaces.
   (iii) Adhesion/Simulated salt spray test.
   (iv) Chemical analysis (percentage of solids by weight).
   (v) Normal wear resistance as encountered during handling & erection.
   (vi) Resistance against exposure to acid fumes, etc.

5.3.1.6 Whole quantity of paint for a particular system of paint shall be obtained from the same manufacturer.

5.3.1.7 The main Contractor shall be responsible for supply of paints and this responsibility shall not be passed on to the sub-contractor.

5.3.1.8 The painting material as delivered to the Contractor, must be in the manufacturer's original container bearing thereon manufacturer's name, brand and description. Paint/Painting material in containers without labels or with illegible labels shall be rejected, removed from the area and shall not be used.

5.3.1.9 Thinners wherever used shall be those recommended by the paint manufacturers and shall be obtained in containers with manufacturer's name and brand name of thinner legibly printed, failing which the thinner is liable to be rejected and shall not be used.

5.3.1.10 All paint containers shall be clearly labeled to show the paint identification, date of manufacture, batch number, special instruction, shelf life etc. The container shall be opened only at the time of use.

5.3.1.11 All paints shall be stored in accordance with the requirements of laid down procedure by the paint manufacturer.

5.3.1.12 All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments before use and during application to maintain homogeneity.

5.3.1.13 The proposed make, quality and shade of the paint shall have the approval of the client.

5.3.1.14 The colour code of the finishing paint to be followed shall be intimated to the successful Tenderer after finalisation of order. The undercoat shall have different tint to distinguish the same from the finishing coat.

5.3.1.15 The Contractor shall furnish paint manufacturer's test report or technical data sheet pertaining to the paint selected. The data sheet shall indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash
point, method of application, quality of surface preparation required, corrosion resistance properties and colour shades available.

5.3.1.16 For details of paint materials refer Annexure -02.

5.3.2 **General**

5.3.2.1 Each coat of paint shall be continuous, free of pores and of even film thickness without thin spots.

5.3.2.2 Each coat of paint shall be sufficiently dry before application of next coat.

5.3.2.3 Paint shall be applied at manufacturer’s recommended rates. The number of coats shall be such that the minimum dry film thickness specified is achieved. The dry film thickness of painted surfaces shall be checked with ELCOMETER of measuring gauges to ensure application of specified DFT.

5.3.2.4 Zinc rich primer paints which have been exposed several months before finishing coat is applied shall be washed down thoroughly to remove soluble zinc salt deposits.

5.3.2.5 The machine finished surfaces shall be coated with white lead and tallow before shipment or before being put out into the open air.

5.3.2.6 Areas which become inaccessible after assemble shall be painted before assembly (after obtaining painting clearance from the inspecting authority) after requisite surface cleaning as specified.

5.3.2.7 Paint shall not be applied when the ambient temperature is 5 deg C and below or 45 deg C and above. Also paint shall not be applied in rain, wind, fog or at relative humidity of 80% and above unless the manufacturer’s recommendations permit. Applications of paint shall be only be spraying or brushing as per IS 486 – 1983 and IS 487 -1985.

5.3.2.8 Primer paint shall be applied not later than 2 -3 hours after preparation of surface, unless specified otherwise.

5.3.2.9 Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of the required thickness.

5.3.2.10 Surfaces which cannot be painted but require protection shall be given a coat of rust inhibitive grease according to IS 958 – 1975 or solvent deposited compound according to IS 1153 – 1975 or IS 1674 – 1960.

5.3.2.11 Surfaces in contact during shop assembly shall not be painted. Surfaces which will be inaccessible after assembly shall receive minimum two coats of specified primer.

5.3.2.12 Surfaces to be in contact with wood, brick or other masonry shall be given one shop- coat of the specified primer.

5.3.3 **Site/Field Painting**
5.3.3.1 Wherever shop primer painting is scratched, abraded or damaged, the surface shall be thoroughly cleaned using emery paper and power driven wire brush wherever warranted, and touched up with corresponding primer. Touching up paint shall be matched and blended to eliminate conspicuous marks.

5.3.3.2 If more than 50% of the painted surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats shall be applied followed by intermediate and finishing coats as per painting specification.

5.3.3.3 All field welded areas on shop painted items shall be mechanically cleaned (including the weld area proper, adjacent areas contaminated by weld spatter or fumes and areas where existing primer paint is burnt). Subsequently, new primer and finishing coats of paint shall be applied as per painting specification.

5.3.3.4 The first coat of finish paint at site shall be applied preferable within three months of the shop paint.

5.3.4 Structural

5.3.4.1 All fabricated steel structure, fabricated steel pipes, etc. shall have a minimum of two coats of primer paint before dispatch to site.

5.3.4.2 Parts of steel structures embedded in concrete shall be given a protective coat of Portland cement slurry immediately after fabrication and after surfaces of this part is thoroughly cleaned from grease, rust mill scales, etc. No paint shall be applied on this part.

5.3.4.3 All structures shall receive appropriate number of primer and finishing coats in order to achieve overall DFT as per design drawings/ specification.

5.3.5 Hot Surfaces

5.3.5.1 Total DFT for heat resistant paints should no exceed 100 – 120 microns, otherwise flaking occurs (as per paint manufacturer’s recommendations).

5.3.5.2 Heat resistant paints should be applied by brush.

5.3.5.3 Primer coat should not be applied on the surfaces having temperature condition more that 120 deg C.

5.4 Painting Schemes

For a complete painting scheme of any item being printed, all types of paints are to be procured from the same manufacturer as approved by the purchaser.

5.4.1 Legend

SP - Surface preparation quality as per SIS standard
2P1 - Two (2) coats of Primer paint type P1
1I1 - One (1) coats of Intermediate paint type I1
2F1 - Two (2) coats of Finish paint type F1
Type of paint products like P1 to P9, I1 to 14 and F1 to F10 have been specified under Annexure-02.

5.4.2 The painting scheme to be followed for various structure/equipment exposed to different condition is briefly given in Annexure-03 for guidance to the tenderer.

5.4.3 The colour code for different applications are indicated in Annexure-04. Wherever colour codes are not specified, the same is to be mutually agreed between the Purchaser and Contractor.

5.5 **Guarantee**

5.5.1 The Contractor shall guarantee that the physical and chemical properties of the paint materials conform with the specification of paint products.

5.5.2 The Contractor shall submit internal test reports from paint manufacturers regarding the quality of paint whenever asked by the BSP/MECON/EPI.

5.5.3 Guarantee period shall commence from the date of completion of finishing coat of paint. The guarantee period will be indicated depending on the type of surface preparation and system of painting. To fulfill this obligations the Contractor may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.
### Surface Preparation Grade

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Surface Preparation</th>
<th>Swedish Std SIS 055900</th>
<th>DIN Std. Din 55928 (Part 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blast cleaning to white metal</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td></td>
<td>Removal of all visible rusts, mill-scales, paint and foreign matters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Blast cleaning to near white metal</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
</tr>
<tr>
<td></td>
<td>95% of any section of surface area is free from all rusts, mill-scales and visible residues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blast cleaning to commercial quality</td>
<td>Sa 2</td>
<td>Sa 2</td>
</tr>
<tr>
<td></td>
<td>At least 2/3 of any section of the surface area is free from all rusts, mill-scales and visible residues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brush-off blast cleaning:</td>
<td>Sa 1</td>
<td>Sa 1</td>
</tr>
<tr>
<td></td>
<td>Removal of all loose mill-scales, rust and foreign matters etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Power tool cleaning:</td>
<td>St 3</td>
<td>St 3</td>
</tr>
<tr>
<td></td>
<td>Very thorough scrapping and wire brushing to remove loose mill-scale, rust and foreign matters to have pronounced metallic shine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hand tool cleaning:</td>
<td>St 2</td>
<td>St 2</td>
</tr>
<tr>
<td></td>
<td>Removal by hand brushing of loose mill-scale, loose rust and foreign matters.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Annexure - 02

PAINT MATERIALS

01. **PRIMER PAINTS (P)**

Primer paint products shall be applied only on dry and clean surfaces.

01.01 **Primer Paint – P1 (Phenolic – Alkyd Based)**

A single pack air drying phenolic modified alkyd composition with zinc phosphate as a primer paint conforming generally to IS : 2074.

- **Air drying time**
  - About 60 minutes (touch dry)
  - Overnight (hard dry)
- **Dry film thickness (DFT)/ Coat**
  - 40 microns (min)
- **Temperature resistance**
  - Upto 100° C dry heat

01.02 **Primer Paint – P2 (Chlororubber Based)**

A single pack air drying high build chlorinated rubber based zinc phosphate primer.

- **Percent chlororubber**
  - 20 to 22 (% Chlorine above 65% in Chlororubber)
- **Air drying time**
  - About 15 minutes (touch dry)
  - Overnight (hard dry)
- **DFT/ Coat**
  - 50 microns (min)
- **Temperature resistance**
  - Up to 65° C dry heat

01.03 **Primer Paint – P3 (PVC Copolymer Alkyd Based)**

Polyvinyl chloride (PVC) - Alkyd zinc phosphate – redoxide Based primer

- **Ratio**
  - PVC copolymer + alkyd reisn (1.1)
- **Pigments**
  - Zinc phosphate & Fillers
- **Air drying time**
  - 24 hours
- **DFT/Coat**
  - 80 microns
- **Temperature**
  - Upto 80° C dry heat

01.04 **Primer Paint – P4 (Epoxy Based)**
A two pack air drying Epoxy polyamide resin based red oxide – zinc phosphate primer.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy content (% wt.)</td>
<td>15 to 18</td>
</tr>
<tr>
<td>Air drying time</td>
<td>About 30 minutes</td>
</tr>
<tr>
<td></td>
<td>(touch dry)</td>
</tr>
<tr>
<td></td>
<td>overnight (hard dry)</td>
</tr>
<tr>
<td>DFT/Coat</td>
<td>30 microns (min)</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>Upto 120°C dry heat</td>
</tr>
</tbody>
</table>

### 01.05 Primer Paint – P5 (Epoxy Based)

A two pack air drying Epoxy polyamide with zinc dust of at least 92% zinc dust on the dry film.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy content (% wt.)</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Air drying time</td>
<td>Less than 10 minutes</td>
</tr>
<tr>
<td></td>
<td>(touch dry)</td>
</tr>
<tr>
<td></td>
<td>Less than 2 hours</td>
</tr>
<tr>
<td></td>
<td>(hard dry)</td>
</tr>
<tr>
<td>DFT/Coat</td>
<td>40 microns (min)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Upto 300°C dry heat</td>
</tr>
</tbody>
</table>

### 01.06 Primer Paint – P6 (Poly – Vinyl Butyral Resin Based)

A two pack air drying polyvinyl butyral resin based wash primer with rust inhibitive pigments.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air drying time</td>
<td>5 to 7 minutes</td>
</tr>
<tr>
<td></td>
<td>(touch dry)</td>
</tr>
<tr>
<td></td>
<td>2 hours (hard dry)</td>
</tr>
<tr>
<td>DFT/Coat</td>
<td>8 microns</td>
</tr>
<tr>
<td>Temperature</td>
<td>Upto 65°C dry heat</td>
</tr>
</tbody>
</table>

Application for: Galvanised iron, aluminium, light alloys etc. on which the adhesion of conventional paints are poor.

### 01.07 Primer Paint – P7 (Ethyl Zinc Silicate, EZS Based)

A two pack heavy duty zinc dust rich silicate primer which protects the surface with just a single coat.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solids (3 wt)</td>
<td>84 +/- 2</td>
</tr>
<tr>
<td>Density (g / cc)</td>
<td>3.07 +/- 0.05</td>
</tr>
<tr>
<td>Air drying time</td>
<td>To top coat 16 hours</td>
</tr>
<tr>
<td>DFT / Coat</td>
<td>60 microns</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>Upto 450 deg C dry heat</td>
</tr>
</tbody>
</table>
01.08 **Primer Paint – P8 (high Build Coal Tar Epoxy)**

A two pack cold cured H. B. epoxy coal tar coating –no primer is required.

Mixing ratio - Base: Hardener (4:1 by vol.)
Air drying time - 48 hours (hard dry)  
DFT / Coat - 100 microns

01.09 **Wood Varnish – P9**

Treated oil based primer pigmented with suitable pigments:

Air drying time - 16 hours for application of top coat.
Coverage - 10 to 14 sq. m/litre

02. **INTERMEDIATE PAINTS (I)**

These paints shall be applied over primer coats as an intermediate layer to provide weather proof seal of primer coats.

02.01 **Intermediate Paint-II (Phenolic alkyd based)**

A single pack high build phenolic based paint with micaceous iron oxide (M 10).

Air Drying Time - 4 to 6 hours (touch dry)
2 days (hard dry)
DFT / Coat - 75 microns (min)
Temperature resistance - Upto 100 deg C dry heat
Compatible with - Primer P1

02.02 **Intermediate Paint -12 (Chlororubber based)**

A single pack air drying high build chloro based paint with MIO.

Air Drying Time - 15 minutes (touch dry)
- 24 hours (hard dry)
DFT/Coat - 70 microns (min)
Temperature resistance - Upto 65 deg C dry heat
Compatible with - Primer P2, P3 & P4

02.03 **Intermediate Paint -13 (PVC – Alkyd Based)**

PVC Coploymer - Resin 1 : 1
Pigments - Micaceous iron oxide (MIO)
DFT/Coat - 80 microns
Temperature resistance - Upto 80 deg C dry heat
Compatible with - Primer P2 & P3

02.04 **Intermediate Paint -14**
A two pack air drying high build epoxy resin based paint with MIO.

Air drying time       - 6 to 8 hours (touch dry)
- 7 days (full cure)
DFT / Coat           - 100 microns
Temperature          - Up to 180°C dry heat
Compatible with      - Primer P4 & P5

03. **FINISH PAINTS (F)**

Finish paint costs shall be applied over primer coats and intermediate coats after proper cleaning and touch up of primed surface.

03.01 **Finish Paint – F1**

A single pack air drying high gloss phenolic alkyd modified synthetic enamel paint suitably pigmented.

Air drying time       - 3 to 4 hours (touch dry)
- 24 hours (hard dry)
DFT/Coat             - 25 microns (min)
Temperature          - Upto 100°C dry heat
Compatible with      - Primer P1
Colour               - Intermediate I1

03.02 **Finish Paint – F2**

A single pack air drying polyurethane enamel of high gloss and hard finish suitably pigmented.

Air drying time       - 2 to 2 ½ hours (touch dry)
- 6 hours (hard dry)
DFT/Coat             - 30 microns (min)
Temperature resistance - Upto 100°C dry heat
Compatible with      - Primer P1 & P8 and Intermediate I1
Colour               - Generally all shades

03.03 **Finish Paint – F3**

A two pack air drying bituminous aluminum paint.

Air drying time       - 1 to 2 hours (touch dry)
- 21 hours (hard dry)
03.04 **Finish Paint – F4**

A ready mixed oil –alkyd based synthetic enamel paint of high gloss and hard wearing properties.

- Air drying time: 6 to 8 hours
- Coverage: 14 to 16 Sq. m/litre
- Temperature resistance: Upto 60°C dry heat
- Compatible with: P8
- Colour: Generally all shades

03.05 **Finish Paint – F5**

A single pack air drying plasticized chlororubber paint suitably pigmented.

- Air drying time: 30 minutes (touch dry), 24 hours (hard dry)
- DFT/Coat: 35 microns (min)
- Temperature resistance: Primer 65°C dry heat
- Compatible with: Primer P2 & P3, Intermediate I2 & I3
- Colour: Nearly all shades except few.

03.06 **Finish Paint – F6**

A PVC - Copolymer alkyd based enamel.

- Density: 1.17 ± 0.05
- Total solids (1 wt): 55 ± 2
- DFT/Coat: 40 microns
- Compatible with: P2 and P3

03.07 **Finish Paint – F7**
A two pack air drying epoxy polyamide enamel suitably pigmented.

Air drying time
- 2 to 3 hours (touch dry)
- 7 days (full cure)

DFT/Coat
- 40 microns (min)

Temperature resistance
- Up to 130°C dry heat

Compatible with
- Primer P4 & P5,
  Intermediate 14

Colour
- Generally all shades.

03.08 **Finish Paint – F8**

A single pack synthetic rubber based aluminum paint.

Air drying time
- 2 hours (touch dry)
- 24 hours (hard dry)

DFT/Coat
- 25 microns (min)

Temperature resistance
- Upto 200°C dry heat

Compatible with
- No Primer paint except primer P6 is applicable in case of non-ferrous substrate.

Colour
- Smooth aluminium.
**Annexure – 03**

**PAINTING SCHEME**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Painting Scheme</th>
<th>Total DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Steel Structures (Temp. not exceeding 80°C)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Indoor Steel Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Technological steel structures for plant and equipment</td>
<td>SP – Sa 2.5 2P1</td>
<td>CRT 2F1 130</td>
</tr>
<tr>
<td></td>
<td>Outdoor Technological steel structures for plant and equipment</td>
<td>SP – Sa 2.5 2P1</td>
<td>CRT 2F1 205</td>
</tr>
<tr>
<td>1.2</td>
<td>Fabricated steel structures at site for rung ladders, cat-ladders, gates, rolling shutters, etc. (Springs/rubbing surfaces excluded)</td>
<td>SP – St-2 and / Or St-3 2P1</td>
<td>CRT 2F1 130</td>
</tr>
<tr>
<td>1.3</td>
<td>Walkways, stairs, platforms etc. which are of wearing surface</td>
<td>SP – St-2 and / Or St-3 2P1</td>
<td>CRT 2F1 130</td>
</tr>
<tr>
<td>1.4</td>
<td>Steel doors and windows</td>
<td>SP – St-2 and / Or St-3 2P1</td>
<td>CRT 2F2 215</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Painting Scheme</td>
<td>Total DFT</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At Shop At Site</td>
<td></td>
</tr>
<tr>
<td>2.0 MECHANICAL EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Mechanical equipment (Temp. not exceeding 80°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1.1</td>
<td>Static equipment like storage tanks, vessels, bins, bunkers, heat exchangers, coolers, Cyclones, scrubbers, etc.</td>
<td>SP –Sa 2.5 2P2/2P3, CRT 2F5/2F6</td>
<td>170/240</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotary/moving equipment and machineries like crushers, mills, vibratory screens, bin activators, blowers, fan, air/gas compressors, pumps, gear boxes, machine housings etc.</td>
<td>SP –Sa 2.5 2P3/2P4, CRT 2F6/2F7</td>
<td>240/140</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0 Pipe / Duct work (Overground)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Non – insulated (temperature up to 80°C)</td>
<td>SP –St2 and 2P1 or St3 CRT 2F1</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insulated (hot)</td>
<td>SP – St2 and/ or St3 2P1 + 111 CRT 2F1</td>
<td>205</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.0 Oxygen Plant

4.1 Outdoor steel structures

| SP – St2 and / or St3 2P1 + 1I1 | CRT 2F3 | 205 |

4.2 Rotary equipment like air compressors

| Sa 2.5 2P4 | CRT 2F7 | 140 |

5.0 Others

5.1 Standard mobile equipment like chassis of trucks, dumpers, crawler cranes bulldozers, Railway rakes, chasis of slag cars, ladle cars, etc.

| As per manufacturer’s standards |

5.2 Laboratory equipment like ovens, screens, magnetic stirrers, samplers, etc.

| Stove enamelling | CRT | 110 |

5.3 Steel structures partly immersed in water

| SP – Sa 2.5 2P8 | CRT | 200 |

Notes:-

1. Painting scheme of all fabricated steel structures, fabricated pipe work, building structures, conveyor galleries, pipe trestles etc. is indicated in the Technical Specification of steel structures.

2. **Primer Paint**

   Primer coat shall be suitable for intended temperature applications as per manufacturer’s recommendation. The primer selection shall be generally in line with the specification laid down in Annexure -02.

3. **Finish Paint**

   In case of Aluminiums cladding final painting will not be required.

6.0 LIST OF APPROVED MAKES

Approved makes for all the items to be supplied shall be as per BSP / MECON's list, which is enclosed / attached.

Please Refer : 1 Prefered makes ( Chapter – 13 of GTS of BSP)
2 Appendix - 6 of BSP’s Technical Specification.
LIST OF APPROVED SUB-CONTRACTORS / VENDORS

1.0 The following Sub-Contractors / Vendors are approved for carrying out the item of the Facilities indicated against each of them. Where more than one Sub-Contractor / Vendor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice well in advance time prior to appointing any selected Sub-Contractor / Vendor. In accordance with the Sub-Clause 19.1 of GCC, the Contractor is free to submit proposals for Sub-Contractors / Vendor for additional items from time to time. No Sub-Contractors / Vendors shall be placed with any such Sub-Contractors / Vendors for additional items until the Sub-Contractors / Vendors have been approved in writing by the Employer and their name have been added to this list of approved Sub-Contractors / Vendors.

• ELECTRICAL

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item Description</th>
<th>Preferred Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HV EQUIPMENTS</td>
<td>BHEL, TELK, CGL, EMCO, AREVA, ABB, SIEMENS</td>
</tr>
<tr>
<td>2</td>
<td>220 KV &amp; 132 KV Power Transformers up to 160 MVA</td>
<td>CGL, AREVA, Transformers &amp; Rectifiers Ltd, KEC, Intra Vidyut, Kanohar, VoltAmp, Bharat Bijlee, Andrew Yule, BHEL, EMCO, ABB, SIEMENS</td>
</tr>
<tr>
<td>3</td>
<td>33 KV, 11KV, 6.6KV Oil filled / Dry type, distribution / Rectifier Transformers</td>
<td>CGL, EMCO, AREVA, BHEL, ABB</td>
</tr>
<tr>
<td>4</td>
<td>220 KV and 132 KV SF6 Circuit Breakers</td>
<td>ABB, CGL, SIEMENS, AREVA</td>
</tr>
<tr>
<td>5</td>
<td>33 KV, 22 KV, 11 KV, 6.6 KV Vacuum Circuit Breakers</td>
<td>SIEMENS, BHEL, CGL, Schneider, AREVA, ABB, Jyoti (Jyoti -upto 11 KV only)</td>
</tr>
<tr>
<td>6</td>
<td>6.6 KV, 11 KV Vacuum Contactors</td>
<td>BHEL, AREVA, SIEMENS, Andrew Yule, Jyoti, CGL</td>
</tr>
<tr>
<td>7</td>
<td>220 KV and 132 KV Current Transformer (CT)</td>
<td>ABB, TELK, BHEL, CGL, AREVA</td>
</tr>
<tr>
<td>8</td>
<td>33 KV, 22 KV, 11 KV, 6.6 KV Current Transformer (CT)</td>
<td>Pragati, Intrans, Prayog, Intravidyut, Insutech Industries, ABB</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Vendors</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>220 KV and 132 KV Voltage Transformer (PT)</td>
<td>ABB, TELK, BHEL, CGL, AREVA</td>
</tr>
<tr>
<td>10</td>
<td>33 KV, 22 KV, 11 KV, 6.6 KV Voltage Transformer (PT)</td>
<td>ABB, Pragati, Prayog, Intravidyut, Jyoti</td>
</tr>
<tr>
<td>11</td>
<td>220 KV and 132 KV Capacitance Voltage Transformer (CVT)</td>
<td>AREVA, ABB, CGL, BHEL</td>
</tr>
<tr>
<td>12</td>
<td>220 KV and 132 KV Lightning Arrestor (LA)</td>
<td>OBLUM, Elpro, AREVA, CGL</td>
</tr>
<tr>
<td>13</td>
<td>220 KV and 132 KV Isolators</td>
<td>S&amp;S Pondicherry, Elpro, WS-Insulators, ABB, AREVA, CGL</td>
</tr>
<tr>
<td>14</td>
<td>33 KV, 11 KV, 6.6 KV Isolator, Load Break Switch</td>
<td>A-Bond Strands, Drescher &amp; Panicker, ABB, AREVA, CGL</td>
</tr>
<tr>
<td>15</td>
<td>11 KV Air-Break Switch</td>
<td>Pactil &amp; Panchkari, Kayal &amp; Co.</td>
</tr>
<tr>
<td>16</td>
<td>220 KV and 132 KV Condenser Bushings</td>
<td>BHEL, CGL, AREVA, TELK. The Transformer manufacturers may give their own / any other make with QAP.</td>
</tr>
<tr>
<td>17</td>
<td>33 KV, 11 KV and 6.6 KV Capacitors</td>
<td>ABB, Unistar(Universal Cables), BHEL, Meher (Bangalore)</td>
</tr>
<tr>
<td>18</td>
<td>33 KV, 11 KV and 6.6 KV Surge Suppressors</td>
<td>OBLUM, Elpro, WS-Insulators, Toshiba, SIEMENS</td>
</tr>
<tr>
<td>19</td>
<td>33 KV, 22 KV, 11 KV, 6.6KV Cable Jointing Kits (Heat Shrinkable Type)</td>
<td>Raychem, CCI, 3M, M-Seal (M-Seal for 6.6 KV)</td>
</tr>
<tr>
<td>20</td>
<td>Battery Chargers</td>
<td>Chhabi Electricals, Standard, Hi-rect, Sherene Electro Control, Amara Raja</td>
</tr>
<tr>
<td>21</td>
<td>Lead Acid Station Battery</td>
<td>Exide, AMCO, Amara Raja</td>
</tr>
<tr>
<td>22</td>
<td>Electronic Energy Meters (Trivector / KWH)</td>
<td>SEMS, L&amp;T, SATEC, CONZERVE, Dukati, ABB, SIEMENS, AREVA, Schneider</td>
</tr>
<tr>
<td>23</td>
<td>Protection and Auxiliary Relays</td>
<td>ABB, SIEMENS, L&amp;T, AREVA, Schneider</td>
</tr>
<tr>
<td>24</td>
<td>Recorders (Chartless type)</td>
<td>Chino, Yokogawa India Ltd, Okhura, Fuji, Eurotherm (Chessel), Tata Honeywell, Hioki, Fluke, ABB, Pyrotech (Udaipur).</td>
</tr>
<tr>
<td>25</td>
<td>Annunciators</td>
<td>Minilec, SPA, Procon, Yashmun,</td>
</tr>
<tr>
<td>26</td>
<td>Panel /Indicating meters</td>
<td>IMP, AE, MECO, L&amp;T, Motwani, Conzerve</td>
</tr>
<tr>
<td>27</td>
<td>LT Air Circuit Breakers</td>
<td>L&amp;T, SIEMENS, Schneider, ABB, GE Power Control</td>
</tr>
<tr>
<td>28</td>
<td>EHT/HT Insulators</td>
<td></td>
</tr>
<tr>
<td>1. Porcelain insulator</td>
<td>WS-Insulators, Jayashree, BHEL, A-Bond Strand, S&amp;S, AREVA, Oblum</td>
<td></td>
</tr>
<tr>
<td>2. Epoxy insulator</td>
<td>A-Bond Strand, Power Cam Electrical Pvt. Ltd., Baroda Bushings, S &amp; C Electric Co.(America), RISHO KOGYO CO. LTD (Japan)</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>HT HRC Fuses</td>
<td>S&amp;S, GE Power Control, Busmann, SIEMENS, ABB, Drescher Paniker</td>
</tr>
<tr>
<td>30</td>
<td>HV / LV Bus Duct</td>
<td>Best &amp; Crompton, ECC (Kolkata), Star Drive (Chennai), Enpro (Chennai), Advance Power Control (Advance Power Control only for LV Bus Duct)</td>
</tr>
</tbody>
</table>

2. LV Equipments

<p>| 31 | Moulded Case Circuit Breaker (MCCB) | Schneider (CG &amp; MG), L&amp;T, Andrew Yule, ABB, SIEMENS, BCH(BIL), GE POWER CONTROL, MOELLER |
| 32 | Motor Protection Circuit Breakers. (MPCB) | Schneider (TELEMECANIQUE), L&amp;T, ABB, SIEMENS, GE POWER CONTROL, MOELLER, Rockwell Automation |
| 33 | Miniature Circuit Breaker. (MCB) | SIEMENS, L&amp;T, GE POWER, CONTROL, SCHNEIDER (PROTEC / MG), STANDARD, INDOASIAN, HAVELLS, MDS (LEGRAND), ABB |
| 34 | Earth Leakage Circuit Breaker | GE POWER CONTROL, STANDARD, HAVELLS, ABB, SIEMENS, SCHNEIDER |
| 35 | Switch, fuse Unit / Fuse Disconnector (Fuse Switch Unit), Air Break switch | GE POWER CONTROL, L&amp;T, SIEMENS, BASANT PRAN &amp; CO. HAVELLS, STANDARD, INDOASIAN, CONTROL &amp; SWITCH GEAR, ANCHOR |
| 36 | HRC fuse for LT application | GE POWERCONTROL, L&amp;T, SIEMENS, BHARAT LINDER, INDO ASIAN, HAVELLS, STANDARD, BUSSMAN, CONTROL &amp; SWITCH GEAR, ABB |
| 37 | Power Contactor for Crane / Mill Duty Operation | |</p>
<table>
<thead>
<tr>
<th>1. Box Type (AC/DC)</th>
<th>ABB, SIEMENS, SCHNEIDER (TELEMECANIQUE), L&amp;T, MOELLER, GE POWER CONTROL, ROCKWELL AUTOMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Vacuum Contactor</td>
<td>SIEMENS, L&amp;T, MOELLER, ABB, SCHNEIDER (TELEMECANIQUE)</td>
</tr>
<tr>
<td>3. AC/DC Power Contactor-Clapper Type/ Bar Mounted - Mill Duty / Crane Duty</td>
<td>BCH (BIL), BHEL, L&amp;T, SCHNEIDER (TELEMECANIQUE), GE (USA), ABB, Lenoir Elec (France), Microelectrica Scientifica (Italy)</td>
</tr>
<tr>
<td>38 Power contactor for General Purpose &amp; Continuous Duty operation</td>
<td>ABB, SIEMENS, SCHNEIDER, L&amp;T, Rockwell Automation, Andrew Yule, SCHNEIDER (C.G.), BCH (BIL), MOELLER, CONTROL &amp; SWITCHGEAR</td>
</tr>
<tr>
<td>39 Over Load Relays</td>
<td>BCH (BIL), L&amp;T, SEIMENS, SCHNEIDER (TELEMECANIQUE), Andrew Yule, SCHNEIDER (C.G.), Rockwell Automation</td>
</tr>
<tr>
<td>1. Thermal (Bimetallic)</td>
<td>SIEMENS, L&amp;T, ROCKWELL AUTOMATION, MOELLER, BCH, SCHNEIDER-SAMWHA</td>
</tr>
<tr>
<td>2. Electronic Over Load relays</td>
<td>BCH, KILBURN, BHEL, Schneider (Telemecanique)</td>
</tr>
<tr>
<td>40 Aux.Contractors / Control Relays</td>
<td>OEN, L&amp;T, SCHNEIDER, ANDREW YULE, GE POWER CONTROL, BCH (BIL), EASUN REROLLE, JYOTI, Rockwell Automation</td>
</tr>
<tr>
<td>41 Time Delay Relay</td>
<td>BCH (BIL), SCHNEIDER (TELEMECANIQUE), BHEL, ESAUN REROLLE</td>
</tr>
<tr>
<td>1. Electro Pneumatic</td>
<td>SELECTRON, SIEMENS, BCH (BIL), ALSTOM, L&amp;T, ROCKWELL AUTOMATION, IFM, SCHNEIDER (TELEMECANIQUE)</td>
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<tr>
<td>2. Electronic Timer</td>
<td>L&amp;T, GE POWER CONTROL, EAFL, INDO ASIAN, Schneider (MG)</td>
</tr>
<tr>
<td>42 Master Controller</td>
<td>EPCC, INDUSTRIAL SYNDICATE, STROM KRAFT, SCHEIDER, (SQUARE D), SCHNEIDER (TELEMECANIQUE)</td>
</tr>
<tr>
<td>43 Limit Switches</td>
<td>EPCC, SCHNEIDER, INDUSTRIAL SYNDICATE, STROM KRAFT, Jai Balaji</td>
</tr>
<tr>
<td>1. Crane &amp; Heavy duty Application</td>
<td>ESSEN DEINKI, L&amp;T, BCH (BIL), SIEMENS, SCHNEIDER (TELEMECANIQUE), JAI BALIJI</td>
</tr>
<tr>
<td>2. Micro &amp; Other Actuating Type</td>
<td>EPCC, RSI, KINGS, TALSON</td>
</tr>
</tbody>
</table>
### 3. Power Control and Electronics Items

<table>
<thead>
<tr>
<th>46</th>
<th>Thyristor Converters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General Purpose up to 1 KA</td>
<td>BHEL, SIEMENS, SSD Drives, ABB, NELCO, ABIL, Converteam.</td>
</tr>
<tr>
<td>2. Critical application up to 1 KA</td>
<td>BHEL, Siemens, ABB.</td>
</tr>
<tr>
<td>3. 1 KA to 10 KA</td>
<td>BHEL, Siemens, ABB.</td>
</tr>
<tr>
<td>4. Main drives, more than 10 KA</td>
<td>BHEL, Siemens, ABB.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>47</th>
<th>PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockwell Automation, L&amp;T(Quantam), Siemens, ABB, GE Fanuc, BCH, Schneider</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>48</th>
<th>Soft starters (LT motor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB, Rockwell Automation, BHEL, Schneider, N. N. Planner, Siemens, Innovative Technomics</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>49</th>
<th>Soft starters (For HT Motors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. With Energy saving mode</td>
<td>ABB, Rockwell Automation, BHEL, Siemens</td>
</tr>
<tr>
<td>2. Without Energy saving mode</td>
<td>Innovative Technomics, Trial party - SSE, China.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>50</th>
<th>VVVF Drives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General Purpose LT motors</td>
<td>ABB, ABIL, BHEL, Siemens, NELCO (Hitachi), T.B.Wood, Vacon, Schneider, SSD Drives, Jeltron (Toshiba), L&amp;T (Yaskawa), Trial party - Danfoss</td>
</tr>
<tr>
<td>2. Critical application for LT motors</td>
<td>ABB, BHEL, Siemens, L&amp;T (Yaskawa), Schneider, Vacon, Rockwell Automation</td>
</tr>
<tr>
<td>3. For HT Motors MV Drive/ Hi-Lo-Hi Drive</td>
<td>ABB, Rockwell Automation, BHEL, Siemens, Converteam (UK), TMEIC.</td>
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<tr>
<th>51</th>
<th>Thyristor devices</th>
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<tr>
<td>West Code, ABB, BHEL, EUPEC, Hind Rectifier, Rutton Shaw, Semikron rectifier.</td>
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<th>52</th>
<th>Power Diodes</th>
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<td>Rutton-Shaw, Usha Rectifier, Hind Rectifier, Insel, Semikron Rectifier, West code, EUPEC.</td>
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<th>Control Diodes</th>
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<td>ECIL, BEL, Hind Rectifier, INSEL.</td>
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<td>Description</td>
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<td>54</td>
<td>Semiconductor Fuses</td>
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<td>UPS</td>
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<td>56</td>
<td>IGBT</td>
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<td><strong>4. MOTORS</strong></td>
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<tr>
<td>57</td>
<td>LT Squirrel Cage Motors</td>
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<tr>
<td>58</td>
<td>LT Slipring Motors (Crane / Mill Duty)</td>
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<td>59</td>
<td>LT AC Roll Table Motors</td>
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<td>60</td>
<td>LT AC Geared Motors</td>
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<tr>
<td>61</td>
<td>HT AC Motors (Squirrel cage, Slipring &amp; Synchronous Motors)</td>
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<tr>
<td>62</td>
<td>LT Flame Proof Squirrel Cage Motor</td>
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<td>63</td>
<td>Stall Torque Vibrator Motor</td>
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<td>64</td>
<td>Actuator Motors</td>
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<td>65</td>
<td>DC Motors</td>
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<td>5. Electronic Components / Sensors</td>
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<tr>
<td>66</td>
<td>Proximity Switches (Inductive, Capacitive and Magneto)</td>
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<td>67</td>
<td>Encoder</td>
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<tr>
<td>68</td>
<td>Zero Speed Switch</td>
<td>Schneider -SAMWA, IFM, Rockwell Automation, Siemens, Pepperl+Fuchs, Pyrotech</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Sensors / Switches * Light Barriers * Distance * Level</td>
<td>IFM, SICK, ROCKWELL AUTOMATION, PEPPERL + FUCHS, SIEMENS, Schnieder, Dimetix AG</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Switch Mode Power Supply</td>
<td>SIEMENS, IFM, Rockwell Automation, BHEL, Schnieder, Honeywell.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Electronic flow switches for oil / air / water</td>
<td>Everly, NELCO, IFM, Schnieder, SIEMENS, Krone, Endress &amp; Hauser (E&amp;H)</td>
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6. Panels & Panel components (Low Voltage)

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<td>72</td>
<td>Panel Board ( Fire Retardent Board )</td>
<td>LAMTUF PLASTIC, Hyderabad</td>
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<tr>
<td>73</td>
<td>Panel Enclosures</td>
<td>EPCC, BCH, RITTAL, TRANSRECT, ADVANCE POWER CONTROL</td>
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<tr>
<td>74</td>
<td>Terminal blocks</td>
<td>EPCC, ELMEX, PHONIX CONTACT, CONNECT WELL, ESSEN DEINKI, WAGO</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Selector Switches &amp; Control Switches</td>
<td>ABB, GE POWER CONTROL, BCH, EPCC, KAYCEE, SIEMENS, TEKNIK, L&amp;T, RECOM</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Control Transformers</td>
<td>AEI, UNITECH, EPI, Power &amp; Communications, TRANSRECT, ADVANCE POWER CONTROL, EEW</td>
<td></td>
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<tr>
<td>77</td>
<td>Mimic Panels &amp; Annuciation Panels</td>
<td>L&amp;T, ADVANI OERLIKON, GE Power Control, BHEL, BCH, TRANSRECT, MINLEC, Tirupati Electronics, ADVANCE POWER CONTOL</td>
<td></td>
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<tr>
<td>78</td>
<td>M.C.C ( Draw Out Type )</td>
<td>SIEMENS, BCH, L&amp;T, ANDREW YULE, SCHNEIDER ELECTRIC/ CGL, CONTROL &amp; SWITCH GEAR, ABB, ADVANCE POWER CONTROL</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>M.C.C ( Non Draw Out Type )</td>
<td>SIEMENS, BCH, MAHESWARI ELECT., L&amp;T / ECC, ANDREW YULE, SCHNEIDER ELECTRIC / CGL, CONTROL &amp; SWITCH GEAR, ABB, GE POWER CONTROL, TRANSRECT, ADVANCE POWER CONTROL. TRIAL PARTIES -MEDITRON, SWITCHING CKT.</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Power Distribution Boards (PDB) / Roll Table Distribution Boards</td>
<td>ABB, GE POWER CONTROL, ANDREW YULE, BCH, SCHNEIDER ELECTRIC, MAHESWARI ELECT, SIEMENS, L&amp;T, TRANSRECT, HAVELLS, STANDARD, TRICOLITE, ADVANCE POWER CONTROL</td>
<td></td>
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<td>81</td>
<td>Power Control Centre (PCC)</td>
<td>EPCC, BCH, TRANSRECT Industries, ANDREW YULE, Schneider Elect., CONTROL &amp; SWITCHGEAR, L &amp; T, SIEMENS, Maheshwari Elect, GE POWER CONTROL, ABB, NGEF, ADVANCE POWER CONTROL, TRIAL PARTIESMEDITRON, PECON, SWICHING CKT, HANSU CONTROL, MANJUSHREE</td>
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<tr>
<td>82</td>
<td>Local Control Station (LCS) &amp; Control Desk Station</td>
<td>EPCC, BCH, TRANSRECT Industries, ANDREW YULE, Schneider Elect., CONTROL &amp; SWITCHGEAR, L &amp; T, SIEMENS, Maheshwari Elect, GE POWER CONTROL, ABB, NGEF, ADVANCE POWER CONTROL, EEW (EEW FOR INDOOR APPLICATION ONLY), TRIAL PARTIESMEDITRON, PECON, SWICHING CKT, HANSU CONTROL, MANJUSHREE</td>
</tr>
<tr>
<td>83</td>
<td>Main Lighting Distribution Board (MLDB)</td>
<td>SIEMENS, L&amp;T / ECC, TRANSRECT, HAVELLS, STANDARD, SCHNEIDER ELECTRIC, MAHESWARI ELECT., BCH, GE POWER CONTROL, MDS, ADVANCE POWER CONTROL, EEW (EEW for indoor application and up to 200 A only), TRIAL PARTIES -MEDITRON, SWITCHING CKT., S&amp;S</td>
</tr>
<tr>
<td>84</td>
<td>Push buttons</td>
<td>GE POWER CONTROL, BCH, CONTROL &amp; SWITCH GEAR, L&amp;T, SIEMENS, TECHNIK, ESSEN, TELEMECHANIQUE, TRIAL PARTIES - VAISHNO, S&amp;S</td>
</tr>
<tr>
<td>85</td>
<td>Indicating LED LAMP assembly</td>
<td>BINOY, ESSEN DEINKI, SEIEMENS, TECHNIK, BCH, L&amp;T, ALTOS</td>
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<td>86</td>
<td>Open Type Panels</td>
<td>EPCC, TRANSRECT, EEW</td>
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<tr>
<td>87</td>
<td>Current Transformer (LV)</td>
<td>ABB, JAYSHREE, PRAGATI, KAPPA, INTRAVIDUT</td>
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<tr>
<td>88</td>
<td>Control Panel</td>
<td>SONITECH, EPCC, TIRUPATI ELECTRONICS, TRANSRECT, ADVANCE POWER CONTROL, EEW</td>
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7. Telecom Equipments

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<td>C.C.T.V.System</td>
<td>PELCO, SANYO, SHARP, SONY, SAMSUNG</td>
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<tr>
<td></td>
<td>1. CAMERA</td>
<td>PELCO, SANYO, SHARP, SONY, SAMSUNG</td>
</tr>
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<td></td>
<td>2. MONITOR</td>
<td>SHARP, HITACHI, PHILIPS, LG, SAMSUNG, SONY, SANYO</td>
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<td>90</td>
<td>WALKIE-TALKIE SYSTEM</td>
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<tr>
<td><strong>1.</strong> Hand Held Sets 2. Fixed Stations</td>
<td>MOTOROLA, YAESU, VERTEX STANDARD</td>
<td></td>
</tr>
<tr>
<td><strong>91</strong> Distributed Amplifier System</td>
<td>BOSCH, MEGA</td>
<td></td>
</tr>
<tr>
<td><strong>92</strong> Programable Loud Speaking Inter Com System (PROPAM System)</td>
<td>PHI-AUDIOCOM, BOSCH, MEGA</td>
<td></td>
</tr>
<tr>
<td><strong>93</strong> Conferencing System 1. Ampliefiers 2. Chairman Delegate Unit 3. Speakers Note : All units should be of same make(in set).</td>
<td>BOSCH, AHUJA, MEGA, SHURE, Studio Master</td>
<td></td>
</tr>
<tr>
<td><strong>94</strong> Despatcher System (EPABX)/ InterCom / Hot-Lines (Only Exchange)</td>
<td>SIEMENS, ERICSSION, AVAYA GLOBAL CONNECT, ALCATEL Business System, NORTEL, CORAL TELECOM</td>
<td></td>
</tr>
<tr>
<td><strong>95</strong> Batteries (More than 400AH) Lead Acid Batteries / Maintenance Free Batteries</td>
<td>EXIDE, Amara Raja, AMCO</td>
<td></td>
</tr>
<tr>
<td><strong>96</strong> Telephone Instrument</td>
<td>BEETEL, SIEMENS, PANASONIC</td>
<td></td>
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<tr>
<td><strong>97</strong> Yard Communication system</td>
<td>Phi-AUDIO COM, AHUJA, MEGA, BOSCH</td>
<td></td>
</tr>
<tr>
<td><strong>98</strong> Shop Announcement System Public Address System (PAS)</td>
<td>AHUJA, PHILIPS, BOSCH, MEGA, STUDIO MASTER, SHURE</td>
<td></td>
</tr>
<tr>
<td><strong>99</strong> Cable Jointing Kits</td>
<td>RAYCHEM</td>
<td></td>
</tr>
<tr>
<td><strong>100</strong> Optical Fibre Cable</td>
<td>MOLEX, LUCENT, FINOLEX, ERICSON, STERLITE, HFCL, OPTEL</td>
<td></td>
</tr>
</tbody>
</table>

**Cables**

**XLPE Cables HT**

Shriram Cables, Crystal Cables, Fort Gloster, Incab, KEI Industries, Fincab Cable, Phelps Dodge Thiland Ltd., Cable Corporation of India, Central Cables, Nagpur, LAPP Cables, Polycab Cables, RPG Cables, Sky Tone Elect., Uniflex Cables, Universal Cables, Polycab Industries, Delhi, Hindustan Vidyut Products Ltd., Krishna Elect. Industries.

**Rubber Cables ERP/ CSP**

List of approved vendors
IMT Cables, Fort Gloster, Incab, Nangalwala Impex, United Cables, Fincab, Bhagwati Cables, Cable Corporation of India, Delton, Friends Cables, KEI Industries, LAPP Cables, NICCO Cables, Prestige Cables, RPG Cables, Shyam Cables, Uniflex Cables, Universal Cables, Servel Cables, KNG Plastic, Mans – Field Cables (For voltage up to 1100 V).

**PVC Cables (Power & Control – Cu & Al – Armoured & Unarmoured).**

Shriram Cables, Ajanta Elect., Fort Gloster, Incab, Prestige Cables, Fincab Cables, Rollex Electro Pvt. Limited, Sight Sound Electronic, Cable Corporation of India, Delton, Elkay, Finolex Cables, Friends Cables, Govind Cables, Insucon Cables, KEI Cables, LAPP Cables, Mother Cables, NICCO Cables, Polycab Cables, RPG Cables, Reliance Engineers Limited, Shanti Cables, Shyam Cables, Sky Tone Elect., Toshniwal Cables, Uniflex Cables, Universal Cables, Servel Cables, Paramount Cables, GEMs Cab Industries, Delhi, Hindustan Vidyut Products Limited, Laxmi Power Cables, Mumbai, KNG Plastic, Rishabh Industries, Krishna Elect. Industries, Mans Field Cables (for voltage up to 1100 V), Pagoda Cables (For IS 694 and voltage up to 1100 V).

**Welding Cable**

IMT Cable Pvt. Limited; KNG Plastic, Nangalwala Impex.

**Telephone Cables.**


**INSTRUMENTATION ITEM :**

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<th>Item</th>
<th>Preferred make</th>
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<td>FIELD INSTRUMENTS</td>
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<td>1.</td>
<td>Pressure instruments.</td>
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</table>
| 1.1   | Pressure/ differential pressure gauge. | 1. WIKA  
2. Ashcroft  
3. Budenberg  
4. Forbes Marshall |
| 1.2   | A. Pressure/ differential pressure switches (Mech. Type) | 1. Switzer  
2. Solon  
3. Ashcroft  
4. Budenberg  
5. Forbes Marshall |
|       | B. Pressure/ differential pressure switches (Electronic type). | 1. IFM  
2. WIKA  
3. Kobold |
| 1.3   | Pressure/ Differential pressure transmitters. | 1. Emerson (Rosemount)  
2. Honeywell  
3. Yokogawa  
4. Siemens |
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<th>Temperature Instrument/Sensors</th>
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| 2. | Temperature gauges. | 1. WIKA  
2. Ashcroft  
3. Budenberg |
| 2.1 | Thermocouple & RTD/thermo well. | 1. Tempsens  
2. Temptech  
3. Toshniwal Industries  
4. Detriv |
| 2.2 | Temperature Switch | 1. IFM  
2. WIKA  
3. Switzer |
| 2.3 | Temperature Transmitter. | 1. Emerson (Rosemount)  
2. Yokogawa  
3. Honeywell  
4. MTL  
5. Phoenix |
| 2.4 | Infrared radiation pyrometer/portable. | 1. Land  
2. Raytek  
3. Ircon  
4. Impac  
5. Keller HCW |

### 3. FLOW INSTRUMENT/SENSORS

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| 3.1 | Rotameters | 1. Forbes-Marshall  
2. Eureka Instruments  
3. Chemtrols  
4. Rota Instruments  
5. SMC |
| 3.2 | Orifice plate & flanges assembly/venture, flow nozzle. | 1. Engineering Specialties  
3. Instrumentation Limited.  
4. Uni-Control |
| 3.3 | DP type flow/level transmitters. | 1. Emerson (Rosemount)  
2. Honeywell  
3. Yokogawa  
4. Siemens  
5. E & H  
6. ABB |
| 3.4 | Flow Switch | 1. IFM  
2. Kobold  
3. Mobrey |
| 3.5 | Electromagnetic flow meter. | 1. Yokogawa  
2. Emerson (Rosemount)  
4. Endress & Hauser |
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<tr>
<th></th>
<th>Instrument Type</th>
<th>Vendors</th>
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</table>
| 3.6 | Vortex Flow meter.                   | 1. Emerson (Rosemount)  
                                  | 2. Forbes-Marshall  
                                  | 3. Yokogawa  
                                  | 4. Endress & Hauser |
| 3.7 | Mass (coriolis) flow meter.          | 1. Emerson (Rosemount)  
                                  | 2. Forbes-Marshall  
                                  | 3. Yokogawa  
                                  | 4. Endress & Hauser |
| 4.  | LEVEL INSTRUMENTS                     |         |
| 4.1 | Level gauge (magnetic & reflex type) | 1. Chemtrol  
                                  | 2. Mobrey  
                                  | 4. Solatron  
                                  | 5. Hi-Tech (Levelstat) |
| 4.2 | Level switch (conductivity type)     | 1. Vega  
                                  | 2. Endress & Hauser  
                                  | 3. Pepperal & Fuchs |
| 4.3 | Level switch (Capacitance/RF Type)   | 1. Vega  
                                  | 2. Endress & Hauser  
                                  | 3. EIP Bulk  
                                  | 4. Sapcon |
| 4.4 | Level switch (Turning fork/rod type) | 1. Chemtrol (Vega)  
                                  | 2. Endress & Hauser  
                                  | 3. Pepperal & Fuchs |
| 4.5 | Level Switch (Float type)            | 1. Emerson  
                                  | 2. Forbes-Marshall  
                                  | 3. Mobrey  
                                  | 4. V-Automat |
| 4.6 | Level Switch / Transmitter (Displacer type) | 1. Emerson  
                                  | 2. Chemtrons (Eckard)  
                                  | 3. Solartron  
                                  | 4. Masonielan |
| 4.7 | Level Switch/Transmitter (Ultrasonic type) | 1. Sick  
                                  | 2. Endress & Hauser  
                                  | 4. Siemens (Miltronics)  
                                  | 5. Pepperal & Fuchs |
| 4.8 | Level Switch/Transmitter (Radar type) | 1. Sick  
                                  | 2. Endress & Hauser  
                                  | 4. Solatron  
                                  | 5. Pepperal & Fuchs  
                                  | 6. Emerson (Rosemount) |
| 4.9 | Level Switch/Transmitter (Nucleonic type) | 1. Concord International (Dr.Berthold)  
                                  | 2. Emerson (Kay Ray) |

List of approved vendors
### 3. E & H

#### 5. CONTROL VALVES AND ACCESSORIES

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<td>Electrical Actuator</td>
<td>1. Auma&lt;br&gt;2. Limitorque&lt;br&gt;3. Instrumentation Ltd. (Bernard)&lt;br&gt;4. Beck</td>
</tr>
<tr>
<td>5.4</td>
<td>Electro-Hydraulic Actuator</td>
<td>1. Reineke&lt;br&gt;2. Voith</td>
</tr>
<tr>
<td>5.6</td>
<td>I/P Converters</td>
<td>1. Forbes Marshall (Moore products)&lt;br&gt;2. ABB&lt;br&gt;3. Emerson&lt;br&gt;4. Honeywell&lt;br&gt;5. Bells</td>
</tr>
<tr>
<td>5.9</td>
<td>Solenoid Valve</td>
<td>1. Mac&lt;br&gt;2. Herion, Rotex</td>
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| 5.10          | Air Filter Regulator       | 1. Shavo-Norgen  
|              |                           | 2. Marsh-Bellofram  
|              |                           | 3. Placka  
|              |                           | 4. Schradel-Schovill.  |

### 6. CABLES

| 6.1 | Instrumentation Cables | 1. Universal Cables  
|     |                       | 2. Delton  
|     |                       | 3. Lapp Cables  
|     |                       | 4. Asian Cables  
|     |                       | 5. Brooks Cables  
|     |                       | 6. Belden  
|     |                       | 7. MEM  |

| 6.2 | Thermocouple Compensating Cable. | 1. Toshniwal Cables  
|     |                                   | 2. Paramount Cables  
|     |                                   | 3. Udey Pyro Cables  
|     |                                   | 4. Brooks  
|     |                                   | 5. MEM  |

### B. CONTROL ROOM INSTRUMENTATION

| 7.1 | Distributed Control Systems (DCS) | 1. YOKOGAWA  
|     |                                   | 2. Honeywell  
|     |                                   | 3. Emerson  
|     |                                   | 4. Siemens (TELEPERM ME Plus).  
|     |                                   | 5. Toshiba, Japan  |

| 7.2 | Programmable Logic Controllers | 1. ABB  
|     |                                   | 2. GE-FANUC  
|     |                                   | 3. Rockwell Automation  
|     |                                   | 4. Siemens  
|     |                                   | 5. L & T (Quantum)  
|     |                                   | 6. Schneider  |

| 7.3 | Digital Indicator | 1. PEPL  
|     |                    | 2. Yokogawa  
|     |                    | 3. ABB  
|     |                    | 4. Micro Controls  
|     |                    | 5. Masibus  
|     |                    | 6. Lectrotek  
|     |                    | 7. Radix  
|     |                    | 8. Honeywell  |

| 7.4 | Bar Graph Indicator | 1. Masibus Instruments  
|     |                     | 2. ABB  
|     |                     | 3. Bells  
|     |                     | 4. Yokogawa  
|     |                     | 5. Lectrotek  |

| 7.5 | Recorders (Chart less) | 1. Eurotherm  
|     |                       | 2. Yokogawa  |
| 7.6 | Microprocessor Based Controller | 1. Yokogawa  
2. Siemens  
3. Honeywell  
4. Eurotherm  
5. MTL  
6. Forbes Marshall  
7. Toshiba |
| 7.7 | Digital Scanners | 1. Radix  
2. Micro Controls  
3. Masibus Instruments  
4. Lectrotek  
5. PEPL |
| 7.8 | DC Power Supply Unit | 1. Aplab  
2. Phoenix  
3. Schneider  
4. P&F |
| 7.9 | IS Interface/ Zenner Barrier | 1. Pepperl & Fuchs  
2. MTL  
3. Stahl |
| 7.10 | Signal Isolators | 1. Pepperl & Fuchs  
2. MTL  
3. Yokogawa  
4. Forbes Marshall (Protech)  
5. Phoenix |
| 7.11 | Annunciation System | 1. IIC  
2. Minilec  
3. Digicont  
4. MTL  
5. BETA Instruments  
6. Procon |
| 7.12 | Instrument Panels/ Control Desk | 1. Rittal  
2. Pyrotech  
3. Instrumentation Ltd. |
| 7.13 | Manual Loaders | 1. Masibus  
2. PEPL  
3. Lectrotek |
| 7.14 | Totalizer | 1. Masibus  
2. PEPL  
3. Lectrotek  
4. Bivak |

C. ANALYTICAL/ SPECIAL INSTRUMENTS

| 8.1 | Gas Analysis Instruments | 1. ABB (H&B)  
2. Emerson  
3. Siemens  
4. Servomax  
5. Yokogawa |
### 8.2 Gas Detectors
1. Crowcon
2. MSA
3. Dragger
4. BW Technologies
5. Reiken-Keiki, Japan

### 8.3 Calorific Value (CV) Analyzers
1. Reineke
2. Union
3. Yokogawa

### 8.4 Moisture Analyzers (Nucleonic)
1. Concord International (Dr. Berthold)
2. Emerson (Analytical)
3. Sick

### 8.5 Dissolved Oxygen (O2)/PH/Conductivity Transmitter
1. Emerson (Analytical)
2. Forbes Marshall (Polymetron)
3. Yokogawa
4. ABB
5. Honeywell

### 8.6 IR type moisture analyzer.
1. Moistech
2. NDC (EMC)

### 8.7 Flame Detector
1. Honeywell
2. Durag Instruments
3. Yamatake

### 8.8 Vibration sensors & monitors.
- a. For turbines and other high speed critical machines.
  1. Bentley Nevada
  2. Shinkawa (Forbes-Marshall)
- b. For other applications.
  1. SPM
  2. Vibro Meter
  3. Shindawa (Forbes-Marshall)
  4. Rockwell

### 8.9 Opacity/ Dust concentration meter.
1. Codel (Forbes-Marshall)
2. Durag
3. Emerson
4. Land
5. GE Sensing
6. Chemtrol

### 8.10 Dip lance type molten metal temperature measurement system & T/C tips.
1. Ardee Busi. (Electronite)
2. Sidermes.

### 8.11 SPM analyzer.
1. Emerson
2. Yokogawa
3. Durag
4. ABB
5. Honeywell
6. Forbes Marshall (Codel)

### 8.12 SO x NO x analyzer.
1. Emerson
2. Yokogawa
3. ABB

List of approved vendors
### 9. INFORMATION & AUTOMATION SYSTEMS

| 9.1 Computer (Servers) | 1. IBM  
| | 2. HP  
| | 3. SUN  |
| 9.2 Computer (Work Stations/ Laptop) | 1. IBM  
| | 2. COMPAQ  
| | 3. LENOVO  
| | 4. DELL  
| | 5. HP  |
| 9.3 Dot Matrix Printer | 1. EPSON  
| | 2. TVSE  |
| 9.4 Laser / Inkjet Printer/ Scanners. | 1. HP  |
| 9.5 PLC | 1. ABB  
| | 2. GE-FANUC  
| | 3. ROCKWELL AUTOMATION  
| | 4. SIEMENS  
| | 5. L&T (Quantum)  
| | 6. SCHNEIDER  |

### 10. NETWORK EQUIPMENT

| 10.1 Active Switching & Routing | 1. CISCO  |
| 10.2 Active other components. | 1. Alllied Telesys  
| | 2. RAD  
| | 3. Xycel  |
| 10.3 Passive Cabling components. | 1. Lucent  
| | 2. AMP  
| | 3. Systimax  
| | 4. Molex  
| | 5. R & M  |
| 10.4 Passive Racks | 1. APW President  
| | 2. Rittal  
| | 3. Krone  |
| 10.5 Industrial Grade Ethernet Switches. | 1. Hirschmann  
| | 2. Sixnet  |
| 10.6 LCD Projector. | 1. Hitachi  
| | 2. Canon  
| | 3. Panasonic  
| | 4. Soni  
| | 5. Sharp  
| | 6. HP  |
| 10.7 Computer Furniture | 1. Godrej  
| | 2. Methodex  |
## 3. Wipro

<table>
<thead>
<tr>
<th>10.8</th>
<th>UPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. APC</td>
<td></td>
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<tr>
<td>2. Tata Libert (Emerson)</td>
<td></td>
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<tr>
<td>3. Fuji</td>
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</tr>
<tr>
<td>4. GE</td>
<td></td>
</tr>
</tbody>
</table>

### 11. WEIGH BRIDGE SYSTEMS

#### 11.1 Static Rail Weigh Bridge
1. M/s Pivotex OY, Finland
2. M/s Weighload Technologies, UK
3. M/s Procon Engineering Limited, UK
4. M/s Carlschenck AG, Germany
5. M/s Molen, Sweden

#### 11.2 In-motion Rail Weighing Systems.
1. M/s Carl Schenck AG, Germany
2. M/s AMTAB, Sweden
3. M/s Pivotex OY, Finland
4. M/s Weighload Technologies, UK
5. M/s Procon Engineering Limited, UK
6. M/s Eldigi Measurematics Pvt.Ltd., USA

#### 11.3 Road Weigh Bridge
1. M/s Carl Schenck AG, Germany
2. M/s AMTAB, Sweden
3. M/s Pivotex OY, Finland
4. M/s Weighload Technologies, UK
5. M/s Procon Engineering Limited, UK
6. M/s Eldigi Measurematics Pvt.Ltd., USA
7. M/s Sartorius Mechatronics, Bangalore
8. M/s Melter Teledo, UK.

#### 11.4 Hopper Weighing System.
1. M/s Carl Schenck AG, Germany
2. M/s Molen, Sweden
3. M/s Siemens AG, Germany
4. M/s Procon Engineering Limited, UK
5. M/s Eldigi Measurematics Pvt.Ltd., USA
6. M/s Kistler-Morse Automation Ltd., USA
7. M/s Nova

#### 11.5 Belt Weigher & Weigh Feeder
1. M/s Carl Schenck AG, Germany
2. M/s S-E-G Instruments AB, Sweden
3. M/s Dosatec SA, Switzerland
4. M/s Procon Engineering Ltd., UK

#### 11.6 Crane Weighing System.
1. M/s Technical Weighing Services, USA
2. M/s Eldigi Measurematics Pvt.Ltd., USA
3. M/s Elon Engineering Ind. Weighing Systems
|   | Limited, UK. | 4. M/s Carl Schenck AG, Germany  
|   | 5. M/s Tamron OY, Finland  
|   | 6. M/s Procon Engineering Limited, UK  
|   | 7. M/s EHP Waegtecckink GmbH, Germany  
|   | 8. M/s Weighload Technologies, UK  
| 11.7 | Load Cell | 1. M/s HBM, Germany  
|   | 2. M/s Siemens AG, Germany  
|   | 3. M/s Flintab, Germany  
|   | 4. M/s Sartorius Mechetronics, Germany  
|   | 5. M/s Tedia, Germany  
|   | 6. M/s BLH, UK  
|   | 7. M/s Molen, Sweden  
| 11.8 | Weight Transmitter | 1. M/s Sartorius Mechetronics, Bangalore  
|   | 2. M/s Flintak, UK  
|   | 3. M/s Carl Schenck AG, Germany  
|   | 4. M/s Molen, Sweden  
| 12.0 | SENSORS: |  
|   | 12.1 | TEMPERATURE SENSORS  
| 12.1.1 | Pt-Rh element | M/s Arora Matthey Ltd., Kolkata  
|   | M/s Hindustan Platinum  
|   | M/s Parekh Platinum Ltd., Mumbai  
| 12.1.2 | Contact Thermometers | M/S A.N. Instruments  
|   | M/S Detriv Instrumentation & Electronics Pvt. Ltd., Mumbai  
|   | M/S Waaree Instruments, Mumbai  
|   | M/S Toshniwal Industries Pvt. Ltd., Ajmer  
|   | M/S Wika Instruments India Pvt. Ltd., Pune  
| 12.1.3 | Portable / Hand held pyrometers | M/s Tempseins Instruments (i) Pvt. Ltd., Udaipur  
|   | M/S Toshniwal Industries Pvt. Ltd., Ajmer  
|   | M/S Eurotherms Del India Pvt. Ltd., Kolkata  
|   | M/S Waaree Instruments, Mumbai  
|   | M/S Nagman Instruments & Electronics Pvt. Ltd., Chennai  

**ACWE EQUIPMENTS**

|   | AIR WASHHING UNITS | M/s Batliboi, M/s ACCO, M/s ABB FLAKT, M/s F Harley Calcutta, M/s Mesina Bombay, M/s S K Systems Kolkata, M/s Air Technico, Kolkata. M/s Marco Blowers, Kolkata  
|   | WINDOW AIR CONDITIONERS | M/s ACCO, M/s VOLTAS, M/s Blue Star, M/s SIEL AIRCON (USHA), M/s Carrier Aircon. M/s Videocon  

List of approved vendors  

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### 3. Packaged Air Conditioners (With only Open/Semi-Sealed Compressors)
- M/s Voltas, M/s Frick, M/s Batliboi, M/s Mesina, M/s Kirloskar, M/s Blue Star, M/s Sulzer Pune. M/s Lintern

### 4. Chilled Water Unit
- M/s Frick India, M/s Blue Star, M/s Voltas. M/s Airtic, India (for all capacities)
- M/s Mesina (for Capacities up to 3 TR/5TR)

### 5. Air Handling Units (For A/Cs)
- M/s Frick India, M/s Voltas, M/s Batliboi, M/s Airtic India. M/s Blue Star

### 6. Cooling Towers
- M/s Paharpur, M/s Frick India, M/s Mhir, M/s Mesina, M/s Anil Enterprises.

### 7. Central A/Cs
- M/s Voltas, M/s Frick, M/s Batliboi, M/s Airtic India, M/s Blue Star* (* with open compressors)

### 8. Water Coolers
- M/s Shriram (Usha), M/s Voltas, M/s Blue Star, M/s ACCO.

### 9. Refrigerators
- M/s Godrej, M/s Kelvinator, M/s BPL, M/s Videocon, M/s Voltas, M/s Whirlpool

### 10. Refrigerant Compressors

- **a. For Room A/Cs**
  - Shriram AW1500

- **b. For Water Coolers**
  - Shriram AW1000, Shriram SR412.

- **c. For packaged A/Cs**
  - Batliboi, Voltas, Kirlosker Pneumatic. Open type
  - Freeze King, KPC, Frick, ACCEL, Alphalavel.

- **d. For Central A/Cs**
  - Frick, Freeze King, ACCEL, Voltas, Batliboi, KPC.

### 11. Split A/Cs
- M/s Voltas, M/s Amtrex, M/s ACCO, M/s Shriram, M/s Blue Star, M/s Videocon.

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**HYDRAULICS & PNEUMATIC EQUIPMENTS**

List of approved vendors
## A) Hydraulic Equipments and Spares

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Spare/ equipment.</th>
<th>Name of preferred makes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Complete Hydraulic System</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Complete Hydraulic System with servo control.</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s MOOG</td>
</tr>
<tr>
<td>1.2</td>
<td>Complete Hydraulic System with proportional and conventional controls.</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>2.</td>
<td>Hydraulic Pumps</td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Gear Pump</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>b.</td>
<td>Vane Pump</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>c.</td>
<td>Axial Piston Pump</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s PARKER</td>
</tr>
<tr>
<td>d.</td>
<td>Radial Piston Pump</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER, M/s L&amp;T, M/s HAWE</td>
</tr>
<tr>
<td>3.</td>
<td>Hydraulic Motors</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s PARKER, M/s L&amp;T, M/s HAGLUENDS, M/s DANFOSS</td>
</tr>
<tr>
<td>4.</td>
<td>Servo Valves</td>
<td>M/s MOOG, M/S BOSCH REXROTH</td>
</tr>
<tr>
<td>5.</td>
<td>Proportional Valves</td>
<td>M/s MOOG, M/S BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>6.</td>
<td>Hydraulic Control Valves</td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Directional Control valves</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>6.2</td>
<td>Pressure Control Valves</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>6.3</td>
<td>Flow Control Valves</td>
<td>M/s BOSCH REXROTH, M/s EATON VICKERS, M/s YUKEN, M/s PARKER</td>
</tr>
<tr>
<td>7.</td>
<td>Hydraulic Cylinders</td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>a) Critical Application Cylinder – As per drawing.</td>
<td>M/s Wipro, M/s Oscar, M/s USHA Telehoist, M/s Veljan</td>
</tr>
</tbody>
</table>

List of approved vendors

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| 7.2 a) General Application Cylinders – As per drawing. | M/s Wipro, M/s Oscar, M/s Veljan, M/s IPH, M/s Salzgitter, M/s USHA-Telehoist. |
| b) General Application Cylinders – As per catalogue. | M/s BOSCH Rexroth, M/s Eaton Vickers, M/s Parker |

8. Hydraulic Filters

8.1 Filter for systems having servo and proportional control valves | M/s Hydac, M/s Pall, M/s Stauff |
8.2 Filter for systems having conventional control valves. | M/s Hydac, M/s Pall, M/s Stauff, M/s EPE, M/s Parker |


9.1 Seals for critical hydraulic cylinders (**) | M/s Hunger, M/s Parker, M/s Busak-Shamban, M/s Merkel |
9.2 Seals for general purpose hydraulic cylinder | Imported M/s Hunger, M/s Parker, M/s Busak-Shamban, M/s Merkel |
| Indigenous M/s Spareage, M/s Omco, M/s Vako, M/s Softex, M/s Reeco |
| Machined Seals M/s Sealjet, M/s Ankseals |

10. Ball Valves | M/s Stauff, M/s Parker, M/s Hydac |
11. Accumulators | M/s Hydac, M/s EPE, M/s Fawcet - Christie |
12. Hydraulic Pipe Clamps | M/s Hyd-Air, M/s Stauff, M/s Parker, M/s Hydac |

13. Bare Hoses | Sae 100 R1/R2/R9/R10 /R11/R13, EN853 1ST/1SN/2ST/2SN, EN856 4SP/4SH |
| SAE100R1/R2, EN853 1ST /1SN/ 2 ST/2SN | M/s Dunlop- Hiflex, M/s Aeroquip, M/s Manuli, M/s Gates |
| M/s Parker – Markwel, M/s Pix, M/s Superseal |

14. Pipe fittings | M/s Hyd-Air, M/s Parker, M/s Hylo-Hydrotechnic, M/s Stauff |
15. Quick release couplings | M/s Aeroquip, M/s Parker, M/s Stauff, M/s Sterling, M/s Holmbury |
16. Pressure gauges | M/s Wika, M/s Parker – UCC |
17. Minimess hose and couplings | M/s Parker, M/s Stauff, M/s Hydrotechnic |

(**) Critical means the items whose failure may cause more than two hours production loss.

B) Pneumatic Equipments and Spares
<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Air booster pumps/ intensifiers</td>
<td>M/s Maximator, M/s Haskel</td>
</tr>
</tbody>
</table>
| 2. | a) Control valves  
b) Directional control valves  
c) Pressure control valves  
d) Flow control valves  
e) Logic control valves | M/s Parker, M/s Ross, M/s Nucon, M/s Spirax, M/s Martonair, M/s Schrader Bellow, M/s Crouzet  
M/s Telemecanique, M/s Festo |
| 3. | a) Air preparation unit  
b) Filters  
c) Regulators  
d) Lubricators  
e) Combination units  
f) Diffusers  
g) Silencers  
h) Mufflers  
i) Breathers | M/s Airmatic, M/s Parker, M/s Veljan – Hydair, M/s Schrader Bellow, M/s Nucon, M/s Festo, M/s Hydroline |
| 4. | Air driers | M/s Emskay |
| 5. | Pipe and fittings  
Various types of pipes fittings, PVC, PU and nylon turbine. | M/s Mecman. M/s Legris, M/s Parker |

**PUMPS & COOLING TOWERS**

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</table>
| A. | COOLING TOWERS | M/s Shri Ram Tower Tech. Ltd.,  
M/s Enviro Clean System Ltd.,  
M/s GEA Cooling Towers Chennai,  
M/s Engg. Services & Accessories Mumbai,  
M/s Paharpur Cooling Tower Calcutta,  
M/s Bridge & Roof Ltd. Calcutta,  
M/s BSBK Bhilai,  
M/s DBR Cooling Tower Calcutta. |
| B. | PUMPS | M/s Kirloskar,  
M/s Jyoti,  
M/s Mather & Platt,  
M/s KSB,  
M/s Beacon Weir,  
M/s Voltas. |
|   | a) Horizontal Split Casing  
Centrifugal Pumps  
Q = 500 M³ /Hr. and above  
H = upto 80 M WC,  
Direct coupled.  
RPM = 1000/1440/2830  
Construction - CI, Clear water service. | M/s Bharat Pumps, M/s KSB, M/s Bareja,  
M/s Kirloskar, M/s Mather & Platt,  
M/s Sulzer/ Khimeline. |
|   | b) Multi-Stage Centrifugal Pumps for Cold/Hot water service. |   |

List of approved vendors

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<th></th>
<th>Vertical Radial/ Mixed flow/ Axial flow/ Turbine Pumps for clear water service up to 300 M³/hr.</th>
<th>M/s Kirloskar, M/s Mcnally, Bangalore, M/s Kishore, M/s Jyoti, M/s KSB.</th>
</tr>
</thead>
<tbody>
<tr>
<td>c)</td>
<td>Vertical Radial/ Mixed flow axial flow/ Turbine Pumps for Clear water service service more than 300 M³/hr.</td>
<td>M/s Kirloskar, M/s Jyoti, M/s KSB, M/s Voltas.</td>
</tr>
<tr>
<td>d)</td>
<td>Sludge Pumps for pumping sludge from effluent treatment plant.</td>
<td>M/s HIL, M/s Warman Indore, M/s Akay Industries, M/s Beacon.</td>
</tr>
<tr>
<td>e)</td>
<td>Slurry Pumps Vertical &amp; Horizontal</td>
<td>M/s Kirloskar, M/s Mcnally, M/s KSB, M/s Kishore, M/s Beacon Weir.</td>
</tr>
<tr>
<td>f)</td>
<td>Drainage Pumps for pits, Tunnels Q= 100M³/Hr., H= up to 30 M</td>
<td>M/s Kishore, M/s KSB, M/s Kirloskar, M/s Darling, M/s Sam Pumps, M/s Sehra.</td>
</tr>
<tr>
<td>g)</td>
<td>Dosing Pumps/ Metering Pumps</td>
<td>M/s Shape tool, M/s Ion Exchange, M/s Toshniwal, M/s H-Welore.</td>
</tr>
<tr>
<td>h)</td>
<td>Submersible mono-bioc Pumps for special drainage and Lifting Applications.</td>
<td>M/s Kirloskar, M/s Kishore, M/s Darling, M/s Calama, M/s Sehra.</td>
</tr>
</tbody>
</table>

**• VALVES**

<table>
<thead>
<tr>
<th></th>
<th>For all steam services, feed water to boiler, hot condensate &amp; other critical applications for Pressure 20 Kg/CM² (Class 300) and above.</th>
<th>M/s BHEL, M/S L &amp; T, M/s KSB, M/s Fouress Engineering Co., M/s NECO Valves (No subsidiary), M/s Leader Valves Ltd. (Up to Class 300 only) M/s Mehta Nanavati (Up to Class 300 only). M/s Fluide Line Valves Company Pvt., Ltd., Ahmedabad. M/s Chemtaech Industrial Valves. Note: These parties are eligible for categories (B) &amp; (C) also.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>For compressed air, water, nitrogen and other medium pressure application (6 to 18 kg/cm²).</td>
<td>M/s Kirloskar, M/s Valve India, M/s Globe, M/s Sealmet, M/s Levcon, M/s H. Sarkar &amp; Company, M/s VIPJ Industrial Enterprises Pvt. Ltd., M/s Ronex Engineering Company, M/s SPM Engineering, M/s OSWAL Industries, Ahmadabad.</td>
</tr>
</tbody>
</table>

List of approved vendors
<table>
<thead>
<tr>
<th>G.</th>
<th>Sluice/ CI Gate Valves.</th>
</tr>
</thead>
</table>
| A) For all sizes and ratings. | M/s BDK Engg. Industries Ltd., Hubli  
M/s Calsens Private Ltd., Kolkata  
M/s GM Dalui & Sons, Howrah  
M/s H.Sarker & Co., Kolkata  
M/s Hawa Engineers Ltd., Ahmedabad  
M/s Kirloskar Brothers, Nagpur  
M/s Leader Valves Ltd., Jalandhar  
M/s Venus Pump & Engg. Works, Howrah  
M/s Neta Valves Pvt. Ltd., Jalandhar |
| B) For sizes up to NB 100 mm & PN 10 rating. | (*) Vendors appearing under ‘A’ shall be eligible for ‘B’ also. |
| H. | Plug Valve. |
| I. | Cock Valve for Gas applications. |
| J. | Check Valve / Non-return valve. |
| K. | Fabricated Gate Valve. |

List of approved vendors
M/s Spirax Marshall Limited, Nagpur. |
| M. | Valves for Steam Application. |
| A. For all sizes and ratings. | M/s BDK Engg. Industries Limited, Hubli.  
M/s Oswal Industries Ltd., Ahmedabad.  
M/s Larsen & Toubro Limited, Chennai (Audco)  
M/s Fouress Engg. (India) Ltd., Aurangabad.  
M/s KSB Pumps Limited, Kolkata.  
M/s BHEL, Trichurapalli.  
M/s Leader Valves Pvt. Limited, Jalandhar |
| B. For sizes up to 50 mm and Class No. 150 ratings. | M/s Neta Valves Pvt.Ltd., Jalandhar  
M/s Hawa Valves (India) Pvt.Ltd., Mumbai  
(*) Vendors appearing under ‘A’ shall be eligible for ‘B’ also). |
| N. | Knife Edge Gate Valve. |
| O. | Non-Ferrous Valve. |

**MECHANICAL EQUIPMENT :**

| 1. | Gear Box | M/s Elecon, M/s NAW, M/s FMG  
M/s Shanthi, M/s Greaves. |
| 2. | Geared Coupling | M/s NAW, M/s HICLIFF, M/s Concord,  
M/s FMG, M/s Roma Mechanical Works,  
M/s Elecon, M/s David Brown, M/s Greaves. |
| 3. | Fluid Coupling | M/s Voith India, M/s Pembrill, M/s Fluidrive,  
M/s Fluidomat Ltd. |
| 4. | Resilient Coupling | M/s Wellman (Bibby). |
| 5. | Conveyor Idler | M/s Elecon, M/s TRF, M/s Conveyor System,  
M/s IGP Engineering, M/s Indiana,  
M/s Roll Well Conveyor Components,  
M/s Kali Handling Equipment, M/s Radiant.  
M/s Golden Engineering Industries, Bhilai. |
| 7. | Vibrating Screen | M/s IC, M/s Electromag, M/s HIL. |
| 8. | Bearing | M/s SKF, M/s Norma, M/s FAG, M/s GPZ, M/s Koyo, M/s Tata Timken, M/s Nei (NBC). |

**Paint**

| 9.1 | **Category (A) – Critical Application**  
| 9.2 | **Category (B) – Critical Applications for Automobiles’ Body Painting**  
Duco Paint (Black, White, PO Red)  
Duxel Paints (Black, Pale Cream, Bus Green, DA Grey, Signal Red, PO Red, White, Golden, Yellow) | M/s ICI Paints |
| 9.3 | **Category – Non Critical Application**  

**COMPRESSORS**

| 1. | Compressors | M/s ELGI, M/s Ingersoll, M/s Consolidated Pneumatics, M/s Khosla, M/s Kirloskar, M/s Kay International (P) Ltd.*  
(*Only for Twin Lobe) |

**PIPES**

**SEAMLESS PIPES**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
<th>Preferred make</th>
</tr>
</thead>
</table>

List of approved vendors
**Seamless Pipes Manufactures:**

- M/s Maharashtra Seamless, Gurgaon
- M/s BHEL, Trichi
- M/s Heavy Metals & Tubes, Mumbai
- M/s ISMT, Kolkata

**Traders:**

- M/s MJ Patel, Mumbai
- M/s Sunil Kumar Ramesh Kumar, Jamshedpur
- M/s MICCO Metal Industries, Mumbai
- M/s Jayant Metals, Mumbai
- M/s Asian Metals, Mumbai

---

**ERW PIPES**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
<th>Preferred make</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ERW Pipes</td>
<td>Manufactures:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/s Bhilai Auxiliaries, Bhilai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/s Precision Pipes, Kolkata</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/s PS Steel Tubes, Bhilai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/s Feedback Steel Tubes, Gaziabad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/s Surya Roshni Limited, Haryana</td>
</tr>
</tbody>
</table>

**Traders:**

- M/s MJ Patel, Mumbai
- M/s Sunil Kumar Ramesh Kumar, Jamshedpur
- M/s MICCO Metal Industries, Mumbai
- M/s Jayant Metals, Mumbai
- M/s Asian Metals, Mumbai

Note: For ERW pipes dia 219 and above – M/s Rourkela Steel Plant.

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**Turbines & Blowers:**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
<th>Preferred make</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Boiler</td>
<td>M/s BHEL, M/s Thermax Babcock Wilcox, M/s Alsthom</td>
</tr>
<tr>
<td>2.</td>
<td>Turbine</td>
<td>M/s BHEL, M/s Alsthom, M/s Novosky, M/s Siemens, M/s Kaluga</td>
</tr>
<tr>
<td>3.</td>
<td>Blower</td>
<td>M/s BHEL, M/s Novosky, M/s Mann Turbo, M/s Siemens, M/s Alsthom</td>
</tr>
</tbody>
</table>

---

**Portable Maintenance Tools**

List of approved vendors

Page 29 of 29
### A. Electrical equipment.

<table>
<thead>
<tr>
<th>Items</th>
<th>Preferred makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. St.Grinder</td>
<td>M/s Ralli Wolf</td>
</tr>
<tr>
<td>2. Angle Grinders</td>
<td>M/s Bosch Power Tools</td>
</tr>
<tr>
<td>3. Drilling Machines</td>
<td>M/s Kulkarni Power Tools</td>
</tr>
<tr>
<td>4. Bench Grinders 6&quot;</td>
<td>M/s Black &amp; Decker</td>
</tr>
<tr>
<td>5. Sanders/ Polishing</td>
<td></td>
</tr>
<tr>
<td>6. Sander</td>
<td></td>
</tr>
</tbody>
</table>

### B. Lifting / Pulling Equipments.

<table>
<thead>
<tr>
<th>Items</th>
<th>Preferred makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pulling and lifting machines</td>
<td>M/s Tirfor, M/s Max Pul, M/s Indef</td>
</tr>
<tr>
<td>2. Hand Operated chain pulley block.</td>
<td>M/s Indef</td>
</tr>
<tr>
<td>3. Hand operated gear traveling trolleys.</td>
<td>M/s Indef</td>
</tr>
<tr>
<td>4. Hydraulic Jacks</td>
<td>M/s OEW, M/s Orione, M/s Enerpack</td>
</tr>
<tr>
<td>a. Remote Controlled type</td>
<td>M/s OEW, M/s Orione, M/s Enerpack</td>
</tr>
<tr>
<td>(operating pressure + 700 bar)</td>
<td></td>
</tr>
<tr>
<td>(operating pressure + 700 bar)</td>
<td></td>
</tr>
</tbody>
</table>

### C. Pneumatic Tools

<table>
<thead>
<tr>
<th>Items</th>
<th>Preferred makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chipping Hammer</td>
<td>M/s CPT</td>
</tr>
<tr>
<td>3. Angle Grinders</td>
<td></td>
</tr>
<tr>
<td>4. Drilling Machine</td>
<td></td>
</tr>
<tr>
<td>5. Die Grinders</td>
<td></td>
</tr>
<tr>
<td>6. Impact Wrenches</td>
<td></td>
</tr>
</tbody>
</table>

### D. Miscellaneous Tools

List of approved vendors
<table>
<thead>
<tr>
<th>Items</th>
<th>Preferred makes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Die less hyd. Crimping tools (6-500 sq.mm size)</td>
<td>M/s Ismal make</td>
</tr>
<tr>
<td>2. Ring Spanners of asserted sizes.</td>
<td>M/s Taparia, M/s Jhalani</td>
</tr>
<tr>
<td>3. Socket spanners.</td>
<td>M/s Evarest, M/s Mekaster</td>
</tr>
<tr>
<td>M/s Taparia, M/s Mekaster</td>
<td></td>
</tr>
</tbody>
</table>

**Bearings.**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Category</th>
<th>Suppliers</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Category (Supercritical)(*)</td>
<td>SKF, FAG &amp; TIMKEN (Overseas manufacturers only)</td>
<td>Bearings whose country of origin is China are not acceptable.</td>
</tr>
<tr>
<td>2</td>
<td>Category II (Critical)(*)</td>
<td>SKF, FAG, TIMKEN, NSK, SNR, NTN, KOYO (Overseas/Indigenous manufacturers)</td>
<td>Bearings whose country of origin is China are not acceptable.</td>
</tr>
<tr>
<td>3</td>
<td>Category III (General) (*)</td>
<td>SKF, FAG, TIMKEN, NTN, NSK, SNR, KOYO, ZKL, GPZ, MPZ, SPZ, URB, ZWZ, INA, NBC, AEC, ABL, JMC, NRB, ARB (Overseas / Indigenous manufacturers)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Non standard Russian origin (*)</td>
<td>SPZ, MPZ, GPZ, &amp; ZKL, NTN, NSK, KOYO, URB (who have already developed certain Russian bearings)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Uncommon, Non-standard bearings of other origins: (*)</td>
<td>IKO, NACHI, ELGES, ASAHI, FAFNIR, TORRINGTON, UKF, NADELA, RBC, UNIMAC, McGill, HOFFMAN, MRC, NDH, OILITE, MATHWS, HOESCH ROTHE ERDE, ROLLWAY, GAMET, POLLARD, HYATT, EICH, RHP and COOPER</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sleeves</td>
<td>SKF, FAG, TIMKEN, NTN. NSK, SNR, KOYO, for cat-I and Cat.-II. MIDHA &amp; MIDHA, SIBCO</td>
<td>If bearing manufacturers recommend and stand guarantee for their bearings.</td>
</tr>
</tbody>
</table>
(*)

Supercritical:

Bearings whose failure can result in stoppage of either upstream or downstream process or require more than 8 hrs. for restoration of the equipment and the process of the department is stopped during this period or can result in huge consequential losses are classified as supercritical bearings. Based on this, 206 sizes are classified as supercritical bearings.

Critical:

Bearings whose failure can result into a stoppage of the process of the shop for less than 8 hours but more than 2 hours or affects downstream or upstream units to some extent are classified as critical bearings. Based on this, 595 sizes are classified as Critical bearings.

General:

Bearings whose failure can result in stoppage of process for less than 2 hours and sometimes no process stoppage is required immediately and standby or alternative arrangements can be made to maintain process continuity are classified as General purpose bearings. Based on this, 1882 sizes are classified as general purpose bearings.

Non standard Russian origin:

Bearings of supercritical / critical / general nature application supplied alongwith OEMs of Russian, CIS, or former East Block countries, whose substitutes are not available from other manufacturers are grouped under this category. 231 sizes are classified in this category.

Uncommon, Non-standard bearings of other origins:

The varieties of bearings whose consumption pattern is so low that no other manufacturer is ready to develop alternatives are classified as uncommon, non-standard of other origin. 127 sizes are classified in this category.

Sleeves:

Sleeves are to be procured from bearing manufacturers only for their bearings or from sources recommended by bearing manufacturers so that performance of bearing is guaranteed.

Chemicals / Special Material

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Type</th>
<th>Standard/ Specification</th>
<th>Preferred manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Admixtures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Plasticizer</td>
<td>IS 9103</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK</td>
</tr>
</tbody>
</table>

List of approved vendors

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<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>b.</td>
<td>Super Plasticizer</td>
<td>IS 9103</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK</td>
</tr>
<tr>
<td>c.</td>
<td>Water proofing admixtures</td>
<td>IS 2645</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Accelerating admixtures</td>
<td>IS 9103</td>
<td>FOSROC, PIDILITE, CICO, MC</td>
</tr>
<tr>
<td>e.</td>
<td>Shoteretning admixtures</td>
<td></td>
<td>FOSROC, STP, SIKA PIDILITE, CICO, MC</td>
</tr>
</tbody>
</table>

2. Grouts

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Cementitious, freeflow, non-shrink.</td>
<td>ASTM C 1107</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK, ACC</td>
</tr>
</tbody>
</table>
|   | Minimum compressive strength. |   | 1 day : 250 kg/ sq.cm  
28 days : 600 kg/ sq.cm |
| b. | Epoxy based. | ASTM C 881 | FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK, ATUL |
|   | Minimum compressive strength. |   | 7 days : 150 kg/ sq.cm |
|   | Minimum flexural strength |   | 7 days : 250 kg/ sq.cm |

3. Floor hardeners.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Metallic</td>
<td></td>
<td>FOSROC, STP, PIDILITE, CICO, BECK</td>
</tr>
<tr>
<td></td>
<td>Minimum compressive strength.</td>
<td></td>
<td>28 days : 700 kg/ sq.cm.</td>
</tr>
<tr>
<td>b.</td>
<td>Non-metallic</td>
<td></td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK</td>
</tr>
<tr>
<td></td>
<td>Minimum compressive strength.</td>
<td></td>
<td>28 days : 600 kg/ sq.cm</td>
</tr>
</tbody>
</table>

4. Curing and sealing compounds.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Polymer based.</td>
<td>ASTM C 309 Type-2</td>
<td>STP, PIDILITE, CICO, MC</td>
</tr>
<tr>
<td>b.</td>
<td>Wax based</td>
<td>ASTM C 309 Type-1</td>
<td>FOSROC, STP, SIKA, CICO, MC</td>
</tr>
</tbody>
</table>

5. Repair compounds.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Quick setting cementations.</td>
<td></td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC</td>
</tr>
<tr>
<td></td>
<td>Initial set time.</td>
<td></td>
<td>2 minutes – max.</td>
</tr>
<tr>
<td></td>
<td>Minimum compressed strength</td>
<td></td>
<td>28 days : 250 kg/ sq.mm</td>
</tr>
<tr>
<td>b.</td>
<td>SBR Latex</td>
<td></td>
<td>FOSROC, STP, SIKA, PIDILITE, MC</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Solid content</td>
<td>Not less than 42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH value</td>
<td>Not less than 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>More than 1 kg/litre.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Epoxy bond coat</td>
<td>ASTM C 881, Type-2</td>
<td>FOSROC, STP, SIKA, CICO, MC, BECK, PRODORITE</td>
<td></td>
</tr>
<tr>
<td>d. SFMC</td>
<td>FOSROC, STP, SIKA, PIDILITE, BECK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum compressive strength.</td>
<td>1 day: 100 kg/sq.cm, 28 days: 500 kg/sq.cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Screed (*)</td>
<td>FOSROC, STP, SIKA, PIDILITE, MC, BECK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Self leveling (*)</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK, APURVA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Epoxy floor coating (*)</td>
<td>FOSROC, STP, SIKA, PIDILITE, MC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Protective and water proof coatings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Epoxy based.</td>
<td>ASTM C 881, Type-3, Gr.2 Class-B &amp; C</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK, APURVA</td>
<td></td>
</tr>
<tr>
<td>b. Polymer modified cementions.</td>
<td>ASTM C 309</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO, MC, BECK, PRODORITE, APURVA</td>
<td></td>
</tr>
<tr>
<td>8. Joint sealments (Polysulphide) (*)</td>
<td>IS 12118</td>
<td>FOSROC, STP, SIKA, PIDILITE, CICO</td>
<td></td>
</tr>
</tbody>
</table>

(*) Not recommended for Purchase. Can be applied through contracts including supply and application of materials as per requirements and manufacturer’s specifications.

**Fire Fighting Equipment.**


**Polymer Chute Liner.**

1. Polymer Chute Liner. | - | M/s Jyoti Cero Rubber, Jamshedpur. |

List of approved vendors

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