# NEYVELI LIGNITE CORPORATION LIMITED
# (NLC LTD)

## NEYVELI NEW THERMAL POWER PROJECT
## 2x500 MW LIGNITE FIRED UNITS AT NEYVELI
### (STEAM GENERATOR PACKAGE)

# PROJECT SPECIFIC
# TECHNICAL SPECIFICATION FOR
# CHAIN PULLEY BLOCK

**SPECIFICATION NO.: PE-TS-400-563-A001**

**BHARAT HEAVY ELECTRICALS LTD**
**POWER SECTOR PROJECT ENGINEERIING MANAGEMENT**
**NOIDA**
**INDIA**

**INDEX**

# VOLUME - IIB

# SECTION – A

# SCOPE OF ENQUIRY

## SCOPE OF ENQUIRY

1.1 The specification is intended to cover design, engineering, manufacturing, inspection and testing, painting, supply/ delivery duly packed at FOR site including erection & commissioning spares, maintenance tools & tackles, mandatory spares, all accessories (isolating switch and power cable from isolating switch to DSL rails) including freight in line with drawings/ documents/ test procedures approved by BHEL/ Customer for **CHAIN PULLEY BLOCK.**

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. **Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply of CHAIN PULLEY BLOCK.**

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents.** In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed deviation schedule along with cost of withdrawal; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or customer including their consultant as interpreted by BHEL in the relevant context.

# VOLUME - IIB

# SECTION – B

# PROJECT INFORMATION
# (PROJECT SPECIFIC)

## SECTION - 2

# 2 GENERAL PROJECT INFORMATION

## 2.1 Introduction

The project site at Neyveli has distinct location advantages, being at pit-head distance from the source of lignite supply from Mines, making it convenient for transportation of lignite by belt conveyor. Water source is readily available from the nearby mines lake. Besides, other infrastructure such as access road, railway connection etc, already exist.

## 2.2 Power Plant Site

The power plant site is located at Neyveli, opposite to the now defunct Fertilizer and Briquetting & Carbonization Plant, near TPS-1 Expansion and TPS-II.

## 2.3 Project & Site Information

| | | | |
|---|---|---|---|
| (i). | Owner/Purchaser | : | Neyveli Lignite Corporation Limited (NLC Ltd), Neyveli, Cuddalore District, Tamil Nadu State, India |
| (ii). | Consultant | : | Lahmeyer International (India) Pvt. Ltd (LII), Gurgaon, NCR, India. |
| (iii). | Project Title | : | 2x500 MW Neyveli New Thermal Power Station (NNTPS) |
| (iv). | Location | : | 200 kms south of Chennai and 50 kms south-west of Cuddalore |
| (v). | Latitude | : | 11° 34′ 00″ N to 11° 35′ 00″ N |
| (vi). | Longitude | : | 79° 26′ 00″ E to 79° 27′ 00″ E |
| (vii). | Elevation above MSL | : | +67 m |
| (viii). | Nearest Railway Station | : | Neyveli, |
| (ix). | Nearest Sea Port | : | Chennai, at a distance of 200 km |
| (x). | Nearest Airport | : | Chennai, at a distance of 200 km |
| (xi). | Road Access/Approach to Site | : | Connected by Chennai-Thanjavur NH 45C road and state highway connecting Cuddalore – Virudhachalam via Neyveli. Both NH and state high way roads are well connected to NLC township roads.The approach road is approximately 15 kms from Chennai–Thanjavur NH – 45C road |
| (xii). | **Site Meteorological Data** | | |
| | • Max ambient temperature | : | 42.8° C |

| | | | |
|---|---|---|---|
| | • Min Ambient Temperature | : | 26.9° C |
| | • Wet bulb temp | : | 29° C |
| | • Max. Relative Humidity | : | 92 % in the month of September |
| | • Min. Relative Humidity | : | 23 % in the month of May |
| | • Rainfall | : | About 1265.7 mm annually (average) |
| | • Wind direction | : | South West to North East direction |
| | • Wind Speed | : | 97.2 km/hr (maximum recorded) 4.3 km/hr (average wind speed) |
| | • Seismicity | : | As per IS: 1893 (part 4) (Zone-II) Importance factor: 1.75. |
| (xiii). | Languages spoken in the region | : | English, Tamil |

* * * * *

**VOLUME - IIB**

**SECTION – C**

**SPECIFIC TECHNICAL REQUIREMENT**

## 1.0 SCOPE OF WORK

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's / sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site as required on FOR site basis, demonstration test at vendor's works (as mentioned elsewhere in the specification) of **CHAIN PULLEY BLOCK** as per details in different sections / volumes of this specification for **2X500 MW NNTPS (SG)**

1.2 The equipment to be furnished by the bidder for the chain pulley blocks of different capacity and lift as specified in Annexure-I along with all accessories.

1.3 The chain pulley blocks offered shall have technical parameters as per the Data Sheet A enclosed herewith in section –D of Vol IIB

1.4 Any equipment/accessories not specified herein but required to make the equipment complete and efficient shall also be under bidder's scope of work.

The following shall be in the bidder's scope of work.

a. Chain pulley blocks with/without traveling trolleys as per the Annexure-I.
b. Maintenance Tools and Tackles as given at 4.0
c. Mandatory spares
d. Packaging.
e. O&M manuals, drawings and documents etc.
f. Inspection & testing of Chain Pulley Blocks as per QAP approved by BHEL /Customer during detail engineering. Prime inspection agency shall be BHEL / End Customer. Equipment being supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement at any stage of inspection deemed necessary by Customer/BHEL shall be carried out without any commercial or technical or delivery implication.

## 2.0 TESTING AND INSPECTION

2.1 As per standard quality plan enclosed. Any additional inspection & testing requirement / CHP (customer's hold point) deemed necessary by customer/BHEL during detailed engineering shall also be complied with without any commercial or delivery implication.

2.2 Chain pulley block shall be completely assembled at manufacturer's works and minimum following tests shall be conducted at works

a. Over load test
b. Rated load test
c. Other tests as per IS-3832.

2.3 The scope of inspection shall include but not limited to the following:

i. Material identification / co-relation for important items like hook, load chain, hand chain, wheels, ratchet and pawl etc.
ii. Hardness for pawl and ratchet
iii. Dye penetration test/ UT test for hooks
iv. Operational test including operational effort, velocity ratio etc.
v. Proof load test upto 1.5 times of working load limit.
vi. Dimensional check of hook
vii. Marking

## 3.0 WORKS EXCLUDED

3.1 Supply of monorail for traveling trolley of chain pulley blocks.

## 4.0 MAINTENANCE TOOLS AND TACKLES

A complete unused one set of special purpose maintenance tools & tackles and accessories along with detailed instructions for maintenance and manual operation shall be supplied. Tools shall be of suitable sizes for maintenance of Chain Pulley Block of each type and capacity. Each tool and wrench shall be stamped so as to be identified easy for its use and size. The tools shall be supplied in steel toolbox and with a copy of instruction manual. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement.

| | | |
|---|---|---|
| i. | Adjustable spanner | One (1) |
| ii. | Wrench spanner | One (1) |
| iii. | Oil gun | One (1) |
| iv. | Set of Screw driver . | Min 6 nos. (of different sizes suiting various types and capacities of Chain Pulley Blocks) |
| v. | 2 lb hammer with wooden handle | One (1) |
| vi.. | Grease Gun | One (1) |

Note: All maintenance tools & tackles are to be supplied in a tool box.

Any other item required for maintenance shall also be provided.

## 5.0 Mandatory Spares –

A complete unused and new set of Mandatory Spare parts shall be supplied. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. The minimum requirement of mandatory spare parts is listed in Annexure –II section-C, volume II-B of this specification.

## 6.0 DRAWINGS/DESIGN DOCUMENTS FOR SUBMISSION (during detailed engineering)

A. For Approval

a. G.A. drawing showing clearances, assembly, cross section details, materials of construction, lifts & approaches etc.
b. Quality plan
c. Test certificates & reports on various shop tests.

## 7.0 NO.OF DRAWINGS/DOCUMENTS FOR SUBMISSION (as per attachment in Volume IIB, Section C, Annexure V)

## 8.0 DEVIATIONS

8.1 If the offer submitted has got any deviations from technical specification in the tender document. Bidder shall tabulate the same in the 'Schedule of Deviations" furnishing full particulars of such deviations. Deviations are to be furnished with mention to specific clause numbers notes/ comments e.g. "Refer to forwarding letter" etc. is not acceptable. Cost of withdrawal of deviations to be put against each deviation.

8.2 If there are no deviations from the tender document, bidder shall indicate so.

## 9.0 FUNCTIONAL TESTS

9.1 The chain pulley blocks along with other accessories shall be guaranteed for the rated capacity. The minimum following tests shall be conducted at works – Overload test, rated load test and other tests as per IS-3932. Pull on the hoist and trolley shall not increase during full load operation.

9.2 The bidder shall have full responsibility for the safe and efficient operation of the chain pulley blocks and traveling trolley with associated accessories as a single unit.

9.3 If the shop performance tests indicate the failure of any of the components to achieve the functional performance, the deficiency shall be made good at bidder's cost.

9.4 Performance tests shall be carried out each time after the rectification modification is carried out.

## 10.0 MAKE OF SUB-VENDOR ITEMS (*)

Following makes of bought out items shall be considered:

| | |
|---|---|
| Steel | SAIL/IISCO/TISCO |
| Steel Forgings | Chowdhary/Western India Forgings/ Hindustan Steel Forgings/ Ruby Forgings or as approved by BHEL. |
| Hook | Herman Mohata/Moozumdar & Moozumdar/ Steel . Forgings/ Karachiwala/Smriti/Nasik Forge. |
| Brakes | BHEL approved make |

(*) The sub-vendor list is indicative and will be subject to customer approval during detail engineering of the package without any commercial implication on account of the same.

## 11.0 PAINTING SPECIFICATION

As per attached painting specification in Annexure IV of this volume.

## 12.0 Packing

In general packing shall be wooden box packing.

## SCOPE OF CHAIN PULLEY BLOCKS

## ANNEXURE-1

| A | Chain pulley blocks (CPB) | | | | | |
|---|---|---|---|---|---|---|
| Sl no. | Area description | Type | CAPACITY | LIFT | QTY. | Remark |
| 1 | AHU ROOM FOR ESP CONTROL ROOM-1 | CPB+TT | 1 | 6 | 1 | |
| 2 | AHU ROOM FOR ESP CONTROL ROOM-2 | CPB+TT | 1 | 6 | 1 | |

ANNEXURE II

LIST OF MANDATARY SPARES TO BE SUPPLIED

| | **CHAIN PULLEY BLOCK (for each capacity Hoists)** | |
|---|---|---|
| 1 | **Mechanical** | |
| i) | Grooved pulley | 2 sets |
| ii) | Pinion | 1 set |
| iii) | Bearing | 1 set |
| iv) | Shaft pin | 1 set |

Note:
1. One (1) set is defined as 100% requirement for one chain pulley block for the entire chain pulley block of similar size & capacity.

| | MANUFACTURER'S NAME & ADDRESS : | **MANUFACTURING QUALITY PLAN**<br>**ITEM :** Chain Pulley Block<br>**QP No.:** PE-TS-400-563-A001<br>**REV**.:0, **Date.: JAN 2015, PAGE**: 1 OF 4 | **PROJECT : 2X500 MW NNTPS (SG)**<br>**PACKAGE : CHAIN PULLEY BLOCKS**<br>**VOL IIB, SEC C** |
|---|---|---|---|

| Sr. No. | COMPONENT / OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY M | AGENCY C | AGENCY N | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | | | 11. |
| 1 | **RAW MATERIAL & B/OUT ITEMS:** | | | | | | | | | | | |
| 1.1 | HOOKS | DIMENSIONS, | MA | | One sample | IS: 15560 | IS: 15560 | MTC | ✓ | P | V | V | UT FOR SHANK DIA 50MM AND ABOVE |
| | | CHEMICAL COMPOSITION, MECHANICAL, PHYSICAL PROPERTIES | MA | LAB ANALYSIS | PER LOT | Material specification as per approved drawings | | T.C. | ✓ | P | V | V | |
| | | IDENTIFICATION & COMPLIANCE WITH TC. | MA | VISUAL | 100% | HOOK TC FROM COMPETENT AUTHORITY | | IR | ✓ | P | V | V | |
| | | INTERNAL DEFECTS | MA | UT | 100% | ASTM A-388 (REFER NOTE 1) | | TC | ✓ | P | V | V | |
| | | PROOF LOAD TEST | MA | REVIEW | 100% | IS 15560 | | TC | ✓ | P | V | V | |
| | | NDT AFTER PROOF LOAD | MA | DPT | 100% | ASTM E-165 | NO RELEVANT IDENTIFICATION | TC | ✓ | P | V | V | |
| 1.2 | LOAD CHAIN | - DIMENSIONS | MA | MEASUREMENT | 100 % | IS: 6216 & | IS: 6216 & | IR | ✓ | P | V | V | |
| | | - BREAKING STRENGTH | MA | -TENSILE TEST | 1/LOT | APPD. DRGS. | APPD. DRGS. | MTC | ✓ | P | V | V | |
| | | - PROOF LOAD | MA | -TENSILE TEST | 100% | | | MTC<br>HT | ✓ | P | V | V | |
| | | -HEAT TREATMENT | MA | REVIEW | 100% | | | CHA | ✓ | P | V | V | |
| | | -GRADE | MA | REVIEW | 1/BATCH | | | RT<br>MTC | ✓ | P | V | V | |
| 1.3 | RAW MATL. FOR GEAR/ RATCHET PAWL / RATCHET WHEEL | CHEMICAL COMPOSITION, MECHANICAL PROPERTIES | MA | LAB ANALYSIS | ONE SAMPLE PER LOT | MATERIAL SPECIFICATION AS PER | MATERIAL SPECIFICATION AS PER | MTC | ✓ | P | V | V | TC or inspection report for components |

| | LEGEND: | FOR CUSTOMER USE | |
|---|---|---|---|
| MANUFACTURER / CONTRACTOR<br>SUB-CONTRACTOR | ** M : MANUFACTURER / SUB-CONTRACTOR<br>C : BHEL / NOMINATED INSPECTION AGENCY.<br>N : CUSTOMER<br>INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION | | |
| SIGNATURE | | REVIEWED BY | NAME & SIGN OF APPROVING AUTHORITY & SEAL |

| | MANUFACTURER'S NAME & ADDRESS : | **MANUFACTURING QUALITY PLAN**<br>**ITEM :** Chain Pulley Block<br>**QP No.:** PE-TS-400-563-A001<br>**REV**.:0, **Date.: JAN 2015, PAGE**: 2 OF 4 | **PROJECT : 2X500 MW NNTPS (SG)**<br>**PACKAGE : CHAIN PULLEY BLOCKS**<br>**VOL IIB, SEC C** |
|---|---|---|---|

| Sr. No. | COMPONENT / OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | M | C | N | |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | | | 11. |
| | | | | | | APPROVED DRAWING | APPROVED DRAWING | | | | | shall be given. |
| | | INTERNAL DEFECTS | MA | UT | 10% | ASTM A-388 (REFER NOTE 1) | | IR | ✓ | P | V | V | |
| 1.4. | LOAD CHAIN WHEELS | - CHEMICAL COMPOSITION<br>MECHANICAL PROPERTIES | MA<br>MA | CHEMICAL<br>MECHANICAL PROPERTIES | ONE SAMPLE PER LOT | APPD. DRG. | APPD. DRG. | MTC | ✓ | P | V | V | |
| 1.5 | BEARINGS | MAKE, TYPE, CATALOGUE NO. | MA | VISUAL | RANDOM | APP DRG / MFR"S CATALOGUE | APP DRG / MFR"S CATALOGUE | IR | ✓ | P | V | V | |
| 1.6 | HAND CHAIN WHEEL | CHEMICAL<br>MECHANICAL PROPERTIES | MA | CHEMICAL<br>MECHANICAL PROPERTIES | ONE SAMPLE PER LOT | AS PER DRAWING | AS PER DRAWING | MTC | ✓ | P | V | V | |
| 1.7 | HAND CHAIN | GRADE/ DIMENSION | MA | GRADE<br>DIMENSION | 100 % | AS PER DRAWING | AS PER DRAWING | MTC | ✓ | P | V | V | |
| 1.8 | TROLLEY GEARS, PINION,WHEELS, AXLE | CHEMICAL & MECHANICAL | MA | LAB ANALYSIS, | 100% | APPVD DRGS | APPVD DRGS | IR/TC | ✓ | P | V | V | |
| 2 | **IN PROCESS** | | | | | | | | | | | |
| 2.1 | RATCHET PAWL / RATCHET WHEEL | -HARDNESS | MA | HARDNESS | 100% | IS:3832 / APPD DRG. | IS:3832/ APPD. DRG. | IR | ✓ | P | V | V | |

| | LEGEND: | FOR CUSTOMER USE | |
|---|---|---|---|
| MANUFACTURER / CONTRACTOR<br>SUB-CONTRACTOR | ** M : MANUFACTURER / SUB-CONTRACTOR<br>C : BHEL / NOMINATED INSPECTION AGENCY.<br>N : CUSTOMER<br>INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION | | |
| SIGNATURE | | REVIEWED BY | NAME & SIGN OF APPROVING AUTHORITY & SEAL |

| | MANUFACTURER'S NAME & ADDRESS : | **MANUFACTURING QUALITY PLAN**<br>**ITEM :** Chain Pulley Block<br>**QP No.:** PE-TS-400-563-A001<br>**REV**.:0, **Date.: JAN 2015, PAGE**: 3 OF 4 | **PROJECT : 2X500 MW NNTPS (SG)**<br>**PACKAGE : CHAIN PULLEY BLOCKS**<br>**VOL IIB, SEC C** |
|---|---|---|---|

| Sr. No. | COMPONENT / OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | M | C | N | |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | | | 11. |
| | | -SURFACE CRACK | MA | DPT | 100 % | ASTM E165 | NO DEFECT | IR | ✓ | P | V | V | |
| 2.2 | GEARS AND PINIONS AFTER MACHINING | SURFACE HARDNESS<br>HEAT TREATMENT,<br>SURFACE CRACK,<br>CASE DEPTH | MA | HARDNESS<br><br>HT CHART, DPT FOR SURFACE CRACK | RANDOM<br><br>ASTM E 165 FOR DPT | MFG STANDARD<br><br>NO DEFECT | MFG STANDARD | IR<br><br>IR | ✓<br><br>✓ | P<br><br>P | V<br><br>V | V<br><br>V | |
| 3.0 | **FINAL INSPECTION** | | | | | | | | | | | | |
| 3.1 | COMPLETE ASSEMBLY | OVERALL DIMENSION | MA | MEASUREMENT | 100 % | IS:3832 /APPD DRG | IS:3832 /APPD DRG | IR | ✓ | P | W | V | |
| | | PROOF LOAD TEST | CR | LOAD TEST | 100% | -DO- | No cracks, flaws & other defects | IR | ✓ | P | W | V | |
| | | LIGHT LOAD TEST | MA | LOAD TEST | 100% | IS 3832 | IS 3832 | IR | ✓ | P | W | V | |
| | | HEIGHT OF LIFT | MA | MEASUREME NT | 100% | -DO- | -DO – | IR | ✓ | P | W | V | |
| | | SWIVELING OF HOOK | MA | VISUAL | 100 % | -DO- | -DO- | IR | ✓ | P | W | V | |
| | | EFFORT | MA | PULL ON CHAIN | 100% | -DO- | -DO- | IR | ✓ | P | W | V | |
| 3.2 | PAINTING | -CLEANING | MA | VISUAL | AT RANDOM | APPROVED | APPROVED | IR | | P | -- | -- | |
| | | - SHADE & DFT OF PAINT (Blue / Black) | MI | VISUAL | AT RANDOM | DRAWING/ SPECIFICATION | DRAWING/ SPECIFICATION | IR | | P | W | - | |

| | LEGEND: | FOR CUSTOMER USE | |
|---|---|---|---|
| MANUFACTURER / CONTRACTOR<br><br>SUB-CONTRACTOR | ** M : MANUFACTURER / SUB-CONTRACTOR<br>C : BHEL / NOMINATED INSPECTION AGENCY.<br>N : CUSTOMER<br>INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION | | |
| SIGNATURE | | REVIEWED BY | NAME & SIGN OF APPROVING AUTHORITY & SEAL |

| | MANUFACTURER'S NAME & ADDRESS : | **MANUFACTURING QUALITY PLAN**<br>**ITEM :** Chain Pulley Block<br>**QP No.:** PE-TS-400-563-A001<br>**REV**.:0, **Date.: JAN 2015, PAGE**: 4 OF 4 | **PROJECT : 2X500 MW NNTPS (SG)**<br>**PACKAGE : CHAIN PULLEY BLOCKS**<br>**VOL IIB, SEC C** |
|---|---|---|---|

| Sr. No. | COMPONENT / OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | M | C | N | |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | | | 11. |
| | | | | | | | | | | | | |
| 3.3 | NAME PLATE | VERIFICATION | MA | VISUAL | 100% | | | IR | | P | V | -- | |
| 3.4 | PACKING | -VERIFICATION | MI | VISUAL | 100% | SPECS. | SPECS. | IR | | P | -- | - | |
| 3.5 | REVIEW OF QA DOCUMENTATION | VERIFICATION | MA | VISUAL | 100% | APPD. QP | APPD. QP | | ✓ | V | V | V | |

CR – CRITICAL, MA – MAJOR , MI – MINOR

NOTE 1: BACK WALL ECHO SHALL BE ADJUSTED TO 100% OF FULL SCREEN HEIGHT IN SOUND (DEFECT FREE) AREA. DEFECT ECHO HEIGHT MORE THAN 20% OF SCREEN HEIGHT SHALL BE TREATED AS UNACCEPTABLE. BACK WALL ECHO SHALL NOT BE LESS THAN 80% OF SCREEN HEIGHT IN ANY CASE.

NOTE 2: RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INLCUDED IN QA DOCUMENTATION.

| | LEGEND: | FOR CUSTOMER USE | |
|---|---|---|---|
| MANUFACTURER / CONTRACTOR<br>SUB-CONTRACTOR | ** M : MANUFACTURER / SUB-CONTRACTOR<br>C : BHEL / NOMINATED INSPECTION AGENCY.<br>N : CUSTOMER<br>INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION | | |
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ANNEXURE IV

# PAINTING

TABLE OF CONTENTS

## 11.1 General

1. The term "Painting" referred herein covers rust preventive, preventive and decorative coating along with surface of the following areas.
   a) All Mechanical equipment, Technological structures, chutes, piping, ducts etc.
   b) Various types of static and rotary equipment inclusive of electric motors etc.
   c) Steel tanks and vessels
   d) Pipe work including trestles, supports, hangers, etc.
   e) Metallic duct work such as ventilation ducts, gas ducts including supports, hangers, etc.
2. Surfaces made of aluminium, brass, bronze, stainless steel, cast iron and other corrosion resistant alloys are not required to be painted unless specified except for identification bands or for aesthetic purposes.
3. All machined mating surfaces (e.g. flanges) will be properly cleaned, greased and protected before despatch.
4. The complete paint system for any item includes the following basic activities:
   a) Proper surface preparation
   b) Application of primer coats
   c) Application of intermediate coats
   d) Application of finished coats

All the above coats will be of quality paint products and the scope of work will also include supply of all paint materials as per specification.

## 11.2 Painting for mechanical & electrical equipment, mechanical structures, piping, ducts etc.

1. This section covers the painting requirements for the equipments, structures, piping, duct etc. and any other surface required to be painted for all the equipments in the section-1 of this specification.
2. Codes and Standards

   Painting of equipment will be carried out as per the specifications indicated below and will conform to the relevant IS specification for the material and workmanship.

   The following Indian Standards may be referred to for carrying out the painting job:

**Table 11.1**
**Codes and Standards for Painting**

| S.No | Code | Description |
|---|---|---|
| 1. | IS:5 | Colours for ready mixed paints and enamels |
| 2. | IS 1303 | Glossary of terms relating to paints |

| S.No | Code | Description |
|---|---|---|
| 3. | IS 2379 | Colour code for identification of pipelines |
| 4. | IS 1477 | Code of practice for painting of ferrous metals in buildings (Parts I & II) |
| 5. | IS 2524 | Code of practice for painting of non-ferrous metals in buildings (Part I & II) |
| 6. | IS 2395 | Code of practice for painting of concrete, masonry and plaster surfaces (Part I & II) |
| 7. | IS 2338 | Code of practice for finishing of wood based materials (Parts I & II) |
| 8. | IS 6278 | Code of practice for white washing and colour washing |
| 9. | IS 3140 | Code of practice for painting asbestos cement building products |
| 10. | IS 158 | Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting |
| 11. | IS 2074 | Ready mixed paint, air drying, red oxide, Zinc Chrome, priming |
| 12. | IS 104 | Ready mixed paint, brushing, Zinc Chrome, priming |
| 13. | IS 2932 | Enamel, synthetic, exterior (a) undercoating (b) finishing specification. |

3. **Preparation Of Surfaces**

a) Surface preparation being a pre requisite for any paint application, will be such as to clean the surface thoroughly of any materials which will be conducive to premature failure of the paint substrates and the surface preparation will be as per the painting scheme elaborated subsequently.

b) Solvent cleaning (SP 1)

The surface will 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 will not remove rust, scales, mill scales or weld flux. Therefore, before application of paint, solvent cleaning will be followed by other cleaning procedures as stated below.

c) Hand tool cleaning(SP2)

The surface will be cleaned by vigorous wire brushing done manually to St-2 quality. This method effectively removes loosely adherent materials, but would not affect residues of rust or mill scales that are intact and firmly adherent.

d) Power tool cleaning(SP3)

The surface will be cleaned by electric or pneumatic tools to St-3 quality. The tools will be used carefully to prevent excessive roughing of surface and formation of ridges and burns. This method will remove

loosely adherent materials but would not affect residues of rust or mill scales that are firmly adherent.

e) Blast cleaning (SP4 )

The surface will be cleaned by impingement of abrasive materials, at high velocity created by clean and dry compressed air blast. 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 and excessive surface scales are removed by hand tools or power tool cleaning. The surface will be cleaned to Sa-2 1/2 quality (SP 4) which means that to 95% of surface area is free from all rust, mill scales and visible residues, foreign materials, etc. The blast cleaning is not recommended for sheet metal work.

f) Blast cleaning (SP5): In this process the surface will be cleaned to 35 to 50 Microns.

4. **Primer Paints (P)**

After the surface is prepared in a manner acceptable to Owner/ consultant, two (2) coats of Primer paints will be applied only on dry and clean surfaces. Second coat of red oxide primer will be applied only after first coat has dried up completely. Coating of primer will in general conform to IS:2074-92 and will be applied by brushing to ensure a continuous film without "holidays".

a) Primer paint P1: (Epoxy based)

A two pack air drying epoxy polyamide resin based red oxide –zinc phosphate (primer):

| | |
|---|---|
| Epoxy content ( % wt) | 15 to 18 |
| Air drying time | About 30 minutes ( touch dry) Over night (hard dry) |
| Dry film thickness ( DFT/coat) | 30 microns (min) |
| Temperature resistance | Upto 120°C dry heat |

b) Primer paint P2 ( Epoxy based)

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

| | |
|---|---|
| Epoxy content ( % wt) | 8 to 10 |
| Air drying time | About 10 minutes ( touch dry)<br>2 hours ( hard dry) |
| Dry film thickness ( DFT/coat) | 40 microns ( min) |
| Temperature resistance | Upto 300°C dry heat |

c) Primer paint P3 ( Ethyl zinc silicate, EZS, based)

A two pack heavy duty zinc dust rich silicate primer:

| | |
|---|---|
| Total solids (% wt) | 84 + 2 |

| | |
|---|---|
| Air drying time | 16 hours |
| Density | 3.07 + 0.005 |
| Dry film thickness ( DFT/coat) | 60 microns ( min) |
| Temperature resistance | Upto 450°C dry heat |

d) Primer paint P4 : Double boiled linseed oil as per IS – 77 : specification for linseed oil, boiled for paints

e) Primer paint P5: In organic Zinc silicate with suitable air drying time. 40 microns per coat

f) Primer paint P6 : Red oxide Zinc phosphate as per IS 12744 with DFT 30 microns per coat

g) Primer paint P7 : Red oxide Zinc chrome primer(alkyd based) as per IS 2074 with DFT 40 microns per coat

5. **Intermediate paints (I)**

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

a) Intermediate paint (I1)

A two pack air drying high build epoxy resin based paint with MIO.

| | |
|---|---|
| Air drying time | 6 to 8 hours (touch dry)<br>7 days (full cure) |
| Dry film thickness ( DFT/coat) | 100 microns |
| Temperature resistance | Upto 180 deg.C dry heat |
| Compatible with | Primer P1 and P2 |

Intermediate Paint I2: Synthetic Enamel (long oil alkyd) to IS 2932, 1 coat = 20 Microns per coat.

6. **Finish Paint (F)**

Finish paint coats will be applied over primer coats and intermediate coats after proper cleaning and touch up of primed coats. Synthetic enamel paint comprising of IS: 2932-95 will be used for finish coats.

a) Finish paint (F1)

A two pack air drying epoxy polyamide enamel suitably pigmented.

| | |
|---|---|
| Air drying time | 2 to 3 hours (touch dry) 7 days (full cure) |
| Dry film thickness ( DFT/coat) | 40 microns |
| Temperature resistance | Upto 130°C dry heat |
| Compatible with | Primers<br>Intermediate |
| Color | Generally all shades |

b) Finish paint (F2)

A single pack synthetic rubber based enamel paint.

| | |
|---|---|
| Air drying time | 2 hours (touch dry) |

| | |
|---|---|
| | 24 hours (hand dry) |
| Dry film thickness ( DFT/coat) | 25 microns |
| Temperature resistance | Upto 200°C dry heat |
| Compatible with | No primers |
| Color | Generally all shades |

c) Finish Paint F3

A single pack heat resistant silicon resin based paint with leafing aluminium.

| | |
|---|---|
| Air drying time | 3 to 4 hours (touch dry) 24 hours (hard dry) |
| Dry film thickness ( DFT/coat) | 20 microns (min) |
| Temperature resistance | upto 400°C dry heat |
| Compatible with | no primer paint except P3 |
| Colour | smooth aluminium |

d) Finish Paint F4: Heat resistant Alumina Paint IS 13183 Gr II, DFT 20 microns per coat.

e) Finish Paint F5: Heat resistant Silicone Aluminium Paint with suitable air drying time as per IS 13183 Gr I, 25 microns per coat.

f) Finish Paint F6: Aliphatic acrylic polyurethane paint, DFT = 30 microns per coat.

g) After cleaning the dust on the dried up primer/ intermediate paint, first coat of synthetic enamel will be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint will be applied only after gently removing the gloss of first coat from entire surface and it is dusted off the surfaced. The requirement of workmanship will be as per IS: 1477-71.

h) Equipment No. and the name of the equipment will be painted on the surface of the equipment on visible locations. Service of the Pipe/Line designation with arrow identification for the direction of flow will be painted on all pipes at visible locations at an interval of 20 metres. Wherever pipelines are insulated, the service of the piping and arrow mark will be painted over the clad surface.

i) The color code to be followed during painting of piping will be in line with IS 9404:2002 (Identification of pipelines used in Thermal Power Plants – Color Code).

j) For painting of structure, equipment, tanks & vessels etc. suggested color code is given in Table 11.3.

k) For insulated pipeline the finish paint will be applied at that place where color band is to be painted on the aluminium sheeting. The finished paint (color band) will be of 2m length at that place.

l) Color band for piping will be applied at these following locations-

- At start and end point.
- At every 50m intervals.
- At every T joints and cross connection of piping.
- At every battery limit of pipeline.
- Near valves located at terminal points.

m) Width of band

**Table 11.2**

**Width of band**

| S.No. | Size of pipe including insulated pipe line outside diameter | Width of band |
|---|---|---|
| 1 | 80mm and below | 25 mm |
| 2 | Above 80 mm upto 150 mm | 50 mm |
| 3 | Above 200 mm upto 300 mm | 75 mm |
| 4 | Above 350 mm | 100 mm |

n) Direction of flow will be indicated by black or white arrow in contrast to the base color on the pipeline. Length of the arrow will be minimum 125 mm and width will be minimum 65 mm. These will be put at an interval of 10 m.

7. **Suggested Colour Codes for Painting of Structures, equipments, tanks & vessels etc.**

**Table 11.3**

**Colour of Specific Items**

| S.No. | Item / Service | Colour | IS-5 | Colour Band | IS-5 |
|---|---|---|---|---|---|
| 1. | Structures, platforms, galleries, ladders and handrails | Dark admiralty grey | 632 | - | - |
| 2. | Boiler casing, ESP and ducting | Nut Brown | 413 | - | - |
| 3. | Fans, pumps, motors, compressors, Mills. | Light grey | 631 | - | - |
| a) | Outdoor ,Stand pipes, vent pipes | Aluminium | - | - | - |
| b) | Indoor Tanks | Aluminium | - | - | - |
| 4. | Vessels & all other proprietary equipment (without insulation & cladding) | Light grey | 631 | - | - |
| 5. | Switchgear | Light grey | 631 | - | - |

| S.No. | Item / Service | Colour | IS-5 | Colour Band | IS-5 |
|---|---|---|---|---|---|
| 6. | MCC/PDB, Local control panels, Bus Ducts | Light grey | 631/7078 of IS:1650 | - | - |
| 7. | Transformers | Dark admiralty grey | 632 | - | - |
| 8. | Machinery guards | Signal red | 537 | - | - |
| 9. | Water System | | | | |
| a) | Boiler feed | Sea green | 217 | - | - |
| b) | Condensate | Sea green | 217 | Light brown | 410 |
| c) | D M Water | Sea Green | 217 | Light orange | 557 |
| d) | Soft water | Sea green | 217 | French blue | 166 |
| e) | Bearing cooling water | Sea green | 217 | French blue | 166 |
| f) | Potable & filtered water | Sea green | 217 | French blue | 166 |
| g) | Service & clarified water | Sea green | 217 | French blue | 166 |
| h) | Raw water(if applicable) | Sea green | 217 | White | - |
| i) | Cooling water | Sea green | 217 | French blue | 166 |
| 10. | Compressed Air System | | | | |
| a) | Service air | Sky Blue | 101 | - | - |
| b) | Instrument air | blue | 101 | White | - |
| 11. | Oil system | | | | |
| a) | Fuel oil | Light brown | 410 | French | 166 |
| b) | Light oil | Dark Brown | 412 | Brilliant green | 221 |
| c) | Lubricating oil | Light brown | 410 | Light grey | 631 |
| d) | Control oil | Light brown | 410 | Light orange | 557 |
| e) | Transformer oil | Light brown | 410 | Light orange | 557 |
| 12. | Fire services | Fire red | 536 | - | - |
| a) | Ash slurry pipes | Black | - | - | - |
| b) | Vacuum pipes | Sky blue | 101 | Black | - |
| c) | Fuel pipes (Lignite) | Light brown | 410 | - | - |
| d) | Drainage | Black | - | - | - |
| e) | Stand pipes and all Vent pipes | Aluminum | - | - | - |
| f) | Bottom Ash system | Light Grey | 631 | - | - |

8. **Paint Application**

a) Paint will be applied in accordance with manufacturer's recommendations. The work will generally follow IS 1477 (Part II) for jobs carried out in India and SSPC-PA-I or DIN 55928 or equivalent for jobs carried out outside India. Touch up paint to be applied to cover scratches after erection and assembly of equipment at site.

b) Paint will not be applied when the ambient temperature is 5°C and below. Also paint will not be applied in rain, wind, fog or at relative humidity of 80% and above.

c) Each coat of paint will be continuous, free of pores and of even film thickness without thin spots. The first coat of finish paint at site will be applied preferably within three months of the shop paint.

d) Each coat of paint will be dry sufficiently before application of next coat.

e) Surface which cannot be painted but require protection will be given a coat of rust inhibitive grease according to IS:958-75 or solvent deposited compound according to IS:1153-75 or IS:1674-60.

f) Surfaces which will be inaccessible after assembly will receive minimum coats of specified primer. Surfaces to be in contact with wood, brick or other masonry will be given one shop coat of the specified primer.

g) Parts of steel structure to be embedded in concrete will be given a protective coat of Portland cement slurry immediately after fabrication and thoroughly cleaning the surfaces from grease, rust, mill scales etc. No paint will be applied on this part.

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

i) Rust preventive coating should be given to HSFG bolt and nut threads.

j) Machined surfaces/weld edges are to be applied with a coating of temporary rust preventive oil.

k) All threaded and other surfaces of foundation bolts ands its materials, insulation pins, anchor channels, sleeves will be coated with temporary rust preventive fluid and during execution of civil works; the dried film of coating will be removed using organic solvents.

l) No painting is required for stainless steel components.

m) The temporary rust preventive coating that already been applied on any components, tubes, pipes etc., will be removed by suitable solvents/ heating to 350-400°C for an hour before primer paint application-but, in case, it should be ensured that the minimum surface cleanliness required for primer paint application will be Sp2 ( equivalent to hand tool cleaning).

n) In components, where ver plates/sheets of thickness less than or equal to 5mm, pipes, rods are used, power tool / hand tool cleaning to SP3/SP2 will be followed and the painting will be done as per the painting scheme adopted for components that are coming in the flue gas path.

o) All weld edge preparation for site welding will be applied with one coat of weldable primer.

p) For internal protection of pipes/tubes, VCI pellets will be used at both ends after sponge testing and ends capped. VCI pellets will not be used for SS components and composite assemblies.

q) Wherever inside surfaces of ducts need protection till erection, two coats of red oxide zinc phosphate primer (P1) paint to IS 12744 to a DFT of 60 microns will be applied after power tool cleaning.

9. **Painting scheme**

a) Type of paint products like P1, P2, P3,P4,P5,P6,P7, I1, I 2,F1, F2 and F3,F4,F5,F6 has been specified elsewhere in the specification.

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

10. **Legends**

Sa - 2 .5 – The quality of surface cleaning, i.e 95 % of the surface area is free from all rust, mill scales and visible residues, foreign materials etc.

SP1-Solvent Cleaning

SP2- Hand tool cleaning

SP3 – Power tool cleaning

SP 4: Blast cleaning (Sa 2.5)

SP 5: Blast cleaning (35 to 50 microns surface cleaning)

SP 6 – Phosphating

SP - surface preparation quality

2P1 - Two (2) coats of primer paint type P1

1I1 - One (1) coat of intermediate paint type I1

2F1 - Two (2) coats of finish paint type F1

DFT - Dry film thickness

CRT - Clean and retouch.

The painting scheme to be followed for various mechanical/ electrical equipment / structures is briefly given below for guidance to the Contractor.

## Table 11.4
## Painting Scheme and Total DFT in Microns

| S.No. | Description | Painting scheme | | Total DFT in Microns |
|---|---|---|---|---|
| | | At shop | At site | |
| 1. | Steel structures (for Boiler Proper, Lignite bunkers, Mills, mill maintenance building, Air heaters, aux. boiler, Fans, ESPs, etc) | SP-Sa 2 ½<br>2P1 + 1I1 | 2 F1 | 240 |
| 2. | Separator and separator vessel | a) Surface preparation : Power tool cleaning to St-3 grade<br>b) 2 coats of alkyd red oxide zinc phosphate primer to IS 12744 DFT 30 micron per coat<br>c) 3 coats of long oil alkyd synthetic enamel finish paint ( International Orange) to IS 2932 – DFT 20 microns / coat (min)<br>d) Total DFT 120 microns (min) | - | 120 |
| 3. | Separator internals | SP 1 or SP 3<br>Rust preventive fluid of DFT = 25 µ/coat | | 25 |
| 4. | Following insulated parts viz., Piping,fitting/components, Pipe clamps, vessels/tanks, Equipments and ducts etc | SP 3<br>2P1, Total DFT – 60 microns<br>P1 = pack of air drying alkyd red oxide zinc phosphate primer to IS 12744 – 2 coats, 30 microns per coat. Total DFT 60 microns ( minimum) | - | 60 |
| 5. | Following un insulated parts viz., Piping, fitting/ components, Pipe clamps, vessels/tanks, Equipments and ducts etc | a) Surface preparation : Power tool cleaning to St-3 grade<br>b) 1 coat of alkyd red oxide zinc phosphate primer to IS 12744 DFT 30 micron per coat | 1F2 | 70 |

| S.No. | Description | Painting scheme | | Total DFT in Microns |
|---|---|---|---|---|
| | | At shop | At site | |
| | | c) 2 coats of long oil alkyd synthetic enamel finish paint to IS 2932 – DFT 20 microns / coat (min)<br>d) Total DFT 70 micron (min) | | |
| 6. | Constant load hangers (CLH) & Variable Load hanger(VLH) | SP-Sa 2 ½<br>1P2 + 1 F6 | - | 70 |
| 7. | Hangers mentioned other than (6) above | a)Surface preparation : Power tool cleaning to St-3 grade<br>b) 1 coat of alkyd red oxide zinc phosphate primer to IS 12744 DFT 30 micron per coat<br>c) 2 coats of long oil alkyd synthetic enamel finish paint to IS 2932 – DFT 20 microns / coat (min)<br>d) Total DFT 70 micron (min) | - | 70 |
| 8. | Valves | | | |
| 9. | Cast carbon steel valves Cast alloy steel valves, API valves, QCNRV,<br>SV and SRV,<br>Silencers and soot blower components | SP3<br>2F4 | - | 40 |
| 10. | Forged valves | a)Surface preparation : Solvent cleaning to SSPC-SP1 Grade.<br>b) Phosphating to 16.15 g/sq.m. | | - |
| 11. | Top covers of Soot blower | a)Surface preparation : Power tool cleaning to St-3 grade<br>b) 1 coat of alkyd red oxide zinc phosphate primer to IS 12744 DFT 30 micron per | | 70 |

| S.No. | Description | Painting scheme | | Total DFT in Microns |
|---|---|---|---|---|
| | | At shop | At site | |
| | | coat<br>c) 2 coats of long oil alkyd synthetic enamel finish paint to IS 2932 – DFT 20 microns / coat (min)<br>d) Total DFT 70 micron (min) | | |
| 12. | Floor grills, hand rails and posts, ladders / rungs | Hot dip galvanizing to 610 gms/sq.m | - | - |
| 13. | (a)Components coming in the flue gas path like water walls | a)Power tool cleaning to St- 2 / 3<br>b) One coat of dip – coat paint – Red oxide zinc phosphate primer ( dip / brush) DFT = 30 microns | | 30 |
| | (b)Components coming in the flue gas path,<br>Surfaces in the flue gas path of ESP, Fans and APH | a) Power tool cleaning to St- 2 / 3<br>b) Two coats of dip – coat paint – Red oxide zinc PO4 to IS 12744DFT = 30 microns per coat | | 60 |

**Note! For components not covered above, Contractor's standard practice will be followed with Owner's / Consultant's approval.**

*****

# SECTION – D

# GENERAL TECHNICAL REQUIREMENTS

**GENERAL**

This specification covers the design, manufacture, assembly, painting, inspection and testing at manufacturer's works of hand operated chain pulley block.

**CODES AND STANDARDS**

The design, manufacture, inspection and testing and performance of hand operated chain pulley blocks shall confirm to latest editions of the following standards : -

| | |
|---|---|
| IS: 3832 | Specification for hand operated chain pulley block. |
| IS 807:1976 | Codes of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of cranes and hoists. |
| IS: 3109(Part II) | Calibrated load chain for pulley blocks and other lifting appliances |
| IS: 2429(Part II) | Calibrated hand chain for pulley blocks and other lifting appliances |
| IS: 4460 | Method for rating of machine cut spur and helical gears |
| IS 6216 :1982 | Short Link Chain, Grade T (8), Calibrated for Pulley Blocks and other Lifting Appliances |
| IS:15560: 2005 | Point Hooks with Shank up to 160 Tonne - Specification |

**EQUIPMENT**

Chain Pulley Block – The block shall be so designed that all components shall withstand without failure, an application to the block of a load equal to at least four times the working load limit.

Frame- Frame shall be robust in design and of welded construction .The frame shall be selected in such a way that head room requirement is minimum. Frame shall maintain alignment under all expected conditions of services.

Chain- The load chain shall be electrically welded, accurately calibrated, and pitched arid polished conforming to IS: 6216 Grade 80(T8)/ IS 3109 (Part 2).

i. The load chain shall be electrically welded, accurately calibrated, and pitched arid polished conforming to IS: 6216 Grade 80(T8)/ IS 3109 (Part 2).

ii. The hand chain shall also be electrically welded, calibrated, pitched and polished and shall conform to IS: 2429 (Part II) Grade 30. The length of chain and link dimension shall be as per IS: 3832.

Hook The forged hook shall be properly heat treated and so designed that in loaded condition, it is free to swivel without twisting the load chain. The hook shall conform to IS: 15560

Reduction Gear- The reduction gear shall be either spur or worm/ worm wheel type. The spur gear and worm shall be of high grade carbon steel and heat treated. The worm wheel shall be of bronze. A detachable steel cover shall be provided for total enclosure of the gear train

and ample lubrication to be provided.

Brakes- Brakes shall be of screw friction disc type self-actuating or any other superior type. Brake capacity shall be ample and humid atmosphere shall not affect materials used. The brake shall prevent self-lowering of load and arrest and sustain load in all working positions. The load brake shall also allow smooth lowering of the load without serious overheating which may impair working of block

Bearing- Bearing used shall be as per guidelines laid down in IS: 3832.

Chain Wheels- The load chain wheel shall be made of heavy duty malleable casting and shall be designed to ensure, effective operation of the chain. Load chain wheels shall be mounted on two ball bearings. Hand chain wheel shall be made from malleable casting/pressed sheet steel. The idler wheel shall be so shaped as to avoid the twisting of the chain during operation. The P.C.D of idler wheels shall be such that the bending action of the link is avoided. The hand chain wheel shall be provided with flanges and designed to ensure effective operation with hand chain.

Trolley Monorail trolley frame shall be of heavy section rolled steel, held together by bolts. Wheels shall be of high grade cast iron/steel mounted on ball bearings. Axles and shafts shall be of carbon steel, accurately machined and suitably supported. The trolley shall be suitable for variations in I section beams. The trolley shall be geared travel type.

Other components- All other components of chain pulley block such as anchorage, guide, pawl, stripper etc. shall be designed and provided as per IS: 3832.

The effort required for hoisting and travel shall be as stipulated in IS 3832.

## DATA SHEET-A

| | | | |
|---|---|---|---|
| 1.00.0 | Type | : | Hand operated chain pulley blocks |
| 2.00.00 | Capacity & Lift | : | As per Annexure I in Volume II B, Section C |
| 3.00.00 | Design | : | IS: 3832 |
| 4.00.00 | Duty Class as per IS: 3832 | : | Class -II |
| 5.00.00 | Hoisting Mechanism | | |
| a) | Type | : | Hand operated gear transmission |
| b) | Load Chain | : | |
| i) | Type | : | Link type |
| ii) | Material | : | Alloy steel grade 80 as per IS: 6216 / IS3109 |
| iii) | Conforms to (Std./Code): | | IS: 6216/3109 |
| c) | Hand Chain | : | |
| i) | Type | : | Link type |
| ii) | Material | : | Mild steel (grade 30) as per IS 2429 Part I |
| d) | Load Hook & Hook Block | : | |
| i) | Type of load hook | : | Plain shank- Trapezoidal section |
| ii) | Load hooks conforms to: | | IS: 15560 |
| iii) | Type of hook suspension | : | Swiveling |
| iv) | Type of make of bearing of hook suspension | : | Thrust ball bearing |
| e) | Gears / pinion | : | |
| i) | Type | : | Spur / Helical |
| ii) | Material | : | Alloy steel / carbon steel |
| iii) | Type of bearing used | | : Antifriction ball bearing / Roller |
| f) | Sprockets | | |
| i) | Type of bearings used | : | Antifriction ball bearing / Roller |
| g) | Method of lubrications Used | | |
| i) | Bearings | : | Grease |
| ii) | Gearing & Pinions | : | Grease |
| iii) | Sprockets | : | Grease |

h) Brakes :

i) Type : Screw and friction disc type

6.00.0 Trolley & Bridge Drive

a) Trolley

i) Type : Geared (Manually operated)

ii) Material of frame : Rolled structural steel (IS:2062 Grade A or B)

b) Drive Chain

i) Type : Link type

ii) Material : Steel Gr.30

c) Trolley Wheel

i) Number of pairs of wheel in each trolley/bridge : Two/four

ii) Flange : Single flanged

iii) Wheel material : As per IS 3832

iv) Type of bearings need : Antifriction

d) Gears/ Pinions

i) Type : Spur / helical

ii) Material : Alloy/ Carbon steel

iii) Type of bearings used : Antifriction

e) Method of lubrication for

i) Bearings : Grease

ii) Sprockets : Grease

f) Load chain wheel

i) Material : As per IS 3832

g) Hand chain wheel

i) Material : As per IS 3832

SPECIFIC NOTE:

1. Ball and roller anti frictional bearing only will be used.
2. Swiveling type standard shank hook mounted on grease lubricated anti-friction thrust bearing will be used.
3. Load chain & operating chain will be of calibrated type.
4. Pulley used for the operating mechanism will have suitable guards to prevent the operating chain from coming out.
5. All the open gearing will have suitable cover.
6. Minimum diameter of pulling chains will be 6 mm. All open gearing etc. will be suitably covered.

## Annexure- V

**Master drawing list and submission schedule**

| Sl. No. | BHEL DRG.NO | DRAWING TITLE | REMARKS | SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF P.O |
|---|---|---|---|---|
| 1 | PE-V0-400-563-A200 | Manufacturing Quality Plan | APPROVAL | 2 |
| 2 | PE-V0-400-563-A201 | GA Drawing for Chain Pulley Block with detail BOM with painting details | APPROVAL | 2 |
| 3 | PE-V0-400-563-A202 | O & M Manual | INFORMATION | 4 |
| 4 | PE-V0-400-563-A203 | Mandatory spares list | APPROVAL | |
| 5 | PE-V0-400-563-A204 | Erection procedure | INFORMATION | 4 |
| NOTE | 1. VENDOR SHALL RESUBMIT THE REVISED DRAWINGS WITHIN 7 DAYS OF RECIEPT OF COMMENTS. | | | |
| | 2. INCOMPLETE DRAWINGS/DOCUMENTS SHALL NOT BE TREATED AS SUBMITTED. | | | |
| | 3. MANUFACTURING SHALL BE STARTED ON RECIEPT OF CAT II APPROVED DRAWINGS. | | | |

Note:
1.0 Bidder to note that all the drawings and documents shall also be submitted on CD's (compact disc) in following software.

a) All the drawings shall be prepared in AutoCAD.
b) All the documents shall be prepared MS word / EXCEL.
c) PDF files for all drawings/documents shall also be submitted.

**Document Management System**
**Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.**
**Internet explorer version – Minimum Internet Explorer 7**
**Internet speed – 2 mbps (Minimum preferred)**
**Pop ups from our external DMS IP (124.124.36.198) should not be blocked.**
**Vendor's Internal proxy setting should not block DMS application's link**
**(http://124.124.36.198/wrenchwebaccess/login.aspx)".**

## DRAWING/DOCUMENT DISTRIBUTION LIST

All documents & drawings shall be in English and in metric units

| SI | | LII | NLC (HQ) | NLC-SITE | BHEL SITE | PMG BHEL | PEM/ UNITS/ PSSR | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 1 | Master list of drawings / document (duly indicating schedule of submission) | Soft copy | Soft copy | Soft copy | | Soft copy | Soft copy (S) | |
| 2 | Drawings / document for Approval/Information (First Submission) | Soft copy + 2 prints | Soft copy + 3 prints | Soft copy + 1 print | | Soft copy | Soft copy (S) | |
| 3 | Return with comments/approval | Soft copy (S) | Soft copy | Soft copy | | Soft copy | Soft copy | |
| 4 | Drawings / Documents for approval (second & subsequent submissions till approval) | Soft copy | Soft copy | Soft copy | | Soft copy | Soft copy (S) | |
| 5 | Drawings / documents for distribution (Approved by NLC, in cat. 1 or Received for Information) | Soft copy + 2 print (HQ+ Site) | Soft copy + 3 prints | Soft copy + 3 prints | Soft copy + 5 prints | Soft copy | Soft copy (S) | |
| 6 | Erection Drawings / documents | - | Soft copy + 1 print | Soft copy + 3 prints | Soft copy + 5 prints | Soft copy | Soft copy (S) | |
| 7 | As built Drawings / documents | Soft copy + 1 print | Soft copy + 1 print | Soft copy + 3 prints | Soft copy + 5 prints | Soft copy | Soft copy (S) | |
| 8 | Operation & Maintenance Manual | - | Soft copy + 1 print | Soft copy + 10 prints | Soft copy + 5 prints | Soft copy | Soft copy (S) | |
| 9 | Type Test Certificate | Soft copy | Soft copy + 1 print | Soft copy + 3 prints | Soft copy + 5 prints | Soft copy | Soft copy (S) | |

NOTES:

1. The above schedule of submission does not include Docs/Drgs. of quality assurance/inspection and delivery/dispatches. QAP documents to be submitted as per distribution schedule.
2. Date of submitting soft copy is to be taken as date of submission.
3. S – Source for generation of document.

# VOL -III

## PRE-BID CLARIFICATION SCHEDULE

| S. No. | Section/Clause /Page No. | Statement of the referred clause | Clarification Required |
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The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

**VOLUME III**
**DEVIATION SHEET (COST OF WITHDRAWAL)**

**PROJECT:- 2X500 MW NNTPS (SG)**

**PACKAGE:- Chain Pulley Blocks, SPECIFICATION NO.: PE-TS-400-563-A001**

**TENDER ENQUIRY REFERENCE:-**

**NAME OF VENDOR:-**

| SL NO | VOULME/ SECTION | PAGE NO. | CLAUSE NO. | TECHNICAL SPECIFICATION/ TENDER DOCUMENT | COMPLETE DESCRIPTION OF DEVIATION | COST OF WITHDRAWL OF DEVIATION | REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE | NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE) | REASON FOR QUOTING DEVIATION |
|---|---|---|---|---|---|---|---|---|---|
| **TECHNICAL DEVIATIONS** | | | | | | | | | |
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| **COMMERCIAL DEVIATIONS** | | | | | | | | | |
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**PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE**

| | | | |
|---|---|---|---|
| **NAME** | **DESIGNATIONS** | **SIGN & DATE** | |

## NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

## COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under “exclusion” in section C and those resolved as per ‘Schedule of Deviations’, if applicable, with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the ‘Schedule of Deviations’. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the ‘Schedule of Deviations’.

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer’s decision shall be binding on the bidder whenever the deficiency is pointed out.

f) For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

g) The commissioning spares shall be supplied on ‘As per technical specification’ (if applicable) & prices for same included in the base price itself.

h) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

i) Guarantee for plant /equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.

j) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price and within purview of the contract specification even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities.

k) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL’s/ Customer’s/ Consultant’s office for across the table resolution of issues and to get documents approved in the stipulated time.

l) As built drawings shall be submitted as and when required during the project execution.

m) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

**Annexure VI**

**DOCUMENTS TO BE FURNISHED WITH OFFER FOR TECHNICAL EVALUATION**

1) SCHEDULE OF TECHNICAL DEVIATION ( IF ANY) along with mention of “QUOTED” in front of each deviation in the specified column.

   OR

   ‘NO DEVIATION CERTIFICATE’ – Clearly mentioning that bidder has considered ‘No - Deviation’ from the technical specification provided by BHEL.

2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.
3) Unpriced schedule, duly mentioned ‘Quoted’ against each Sl.no. below each column.

**NOTE:**

i) NO OTHER DOCUMENTS OTHER THAN THOSE LISTED ABOVE ARE REQUIRED TO BE S UBMITTED FOR TECHNICAL EVALUATION. IN CASE ANY OTHER DOCUMENT IS FURNISHED, THE SAME WILL NOT BE TAKEN INTO CONSIDERATION FOR TECHNICAL EVALAUATION.

ii) BIDDER TO CLEARLY MENTION “QUOTED” AGAINST EACH ITEM. IN CASE ANY ITEM IS NOT APPLICABLE THEN “NA” SHOULD BE CLEARLY MENTIONED AGAINST THE SAME.

| Project: 2X500 MW NNTPS (SG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **SUGGESTIVE PRICE FORMAT CHAIN PULLEY BLOCK** | | | | | | | | |
| Sl No. | Description of equipment / item | Total quantity required | Total Price (Ex-works) i.e. (3 x 4) | ED | CST | FREIGHT | INSURANCE | TOTAL ( FOR SITE) (5+6+7+8+9) |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1.0 | Total lumpsum firm price for design, engineering, manufacture, inspection and testing at vendor's'/ sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site as required on FOR site basis, demonstration test at vendor's works including freight, for the following chain pulley blocks along with 1 Set of Maintenance tools & tackles (as per annexure-A), mandatory spares and all other accessories in line with drawings/ documents/ test procedures approved by BHEL/Customer for the total scope given below and technical parameters as per technical specification PE-TS-400- 563-A001 taking into account all clarifications, confirmations and agreements till date. | 2 no.s | | | | | | |
| | **Break-up of 1.0 (1.1 to 1.3)** | | | | | | | |
| 1.1 | 2 no.s 1T cap, 6 M lift chain pulley block with travelling trolley for following areas-<br>a) AHU ROOM FOR ESP CONTROL ROOM-1 (1 no.)<br>b) AHU ROOM FOR ESP CONTROL ROOM-2 (1 no.) | 2 no.s | | | | | | |
| 1.2 | Total lumpsum firm price for one set of Maintenance Tools and Tackles as per Annexure A | 1 set | | | | | | |
| 1.3 | Total lumpsum firm price for one set of mandatory spares as per Annexure B | 1 set | | | | | | |
| | | | | | | | | |
| | Bidder to note that total price indicated above at 1.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed. | | | | | | | |
| | Any item not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection. | | | | | | | |
| | In case, price indicated above does not match with the total of item wise break-up given from 1.1 to 1.3 the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price. | | | | | | | |
| | | | | | | | | |
| | | | | | (Bidder's Signature with Company Seal) | | | |
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**ANNEXURE-A**

**Project: 2X500 MW NNTPS (SG)**

**PACKAGE:- Chain Pulley Blocks, SPECIFICATION NO.: PE-TS-400-563-A001**

**List of Maintenance Tools & Tackles**

| Sl.no | Description | Unit | Unit Ex-works price | Total ex-works price | ED | CST | FREIGHT | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 4 to 8 |
| 1 | Adjustable spanner | 1 Set | | | | | | |
| 2 | Wrench spanner | 1 Set | | | | | | |
| 3 | Oil gun | 1 No. | | | | | | |
| 4 | Set of Screw driver | Min 6 nos. (of different sizes suiting various types and capacities of Chain Pulley Blocks) | | | | | | |
| 5 | 2 lb hammer with wooden handle | 1 No. | | | | | | |
| 6 | Grease Gun | 1 No. | | | | | | |
| 7 | Any other item required for maintenance | As per vendor recommendation | | | | | | |

Note: - The tools shall be supplied in one tool box

Date: _____

Company Seal

Bidder's / bidder's representative signature

## 2X500 MW NNTPS (SG) Annexure B

## PRICE SCHEDULE FOR MANDATORY SPARES FOR 1T CAP CHAIN PULLEY BLOCK WITH

| S. No | DESCRIPTION OF EQUIPMENT / ITEM | Qty | Unit Ex-works price (Rs.) | Total Ex-works price (Rs.) | ED including cess | VAT/CST as applicable (Rs.) | Freight | TOTAL F.O.R. Site Price (Rs.) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | **MECHANICAL** | | | | | | | |
| i) | Grooved pulley | 2 sets | | | | | | |
| ii) | Pinion | 1 set | | | | | | |
| iii) | Bearing | 1 set | | | | | | |
| iv) | Shaft pin | 1 set | | | | | | |
| | Total ( 1 (i) to 1 (iv) ) | | | | | | | |

**Note :**

| | |
|---|---|
| **1** | The lists of spares indicated are for the type equipment generally used in thermal power plants. If the design or type of equipment proposed by the bidder is different, then the bidder shall suit the spares list according to the type of equipment. However, the numers or quantity of spares, indicated shall not be reduced. |
| **2** | All essential spares shall be supplied as per the requirement of the specifications. In case any spare indicated in the specification is not applicable for particular equipment then suitable applicable alternate spare have been offered / shall be supplied without any financial implication. |
| **3** | Any change or variation in equipment or systems during detailed engineering stage which would cause changes / variations in the essential spares quantity, shall be supplied by Vendor without any commercial implications |
| **4** | For quantities indicated in percentage, fractions are to be rounded-off to next higher integer. |
| **5** | Any item which is “not applicable” in the above list and is found to be “applicable” at a later date shall be supplied by theVendor without any extra cost. |
| **6** | If any of the items of spares/tools & tackles ordered is found to be not applicable during detailed engineering stage/execution stage, the contractor will have to supply alternative items of spares/tools & tackles. The alternative items of spares/tools & tackles are to be mutually agreed between the PURCHASER and VENDOR |