Annexure-B

Technical Pre-Qualification Requirement (PQR) for

Manual Hoist

1. The vendor shall be an established **Manual Hoist** supplier and having adequate Engineering, Manufacturing, testing and servicing facilities and shall furnish technical backup documents in proof for above requirements.

2. The vendor shall have experience of having supplied **Manual Hoist** as per the technical specification for power plants or application of similar severity. Supply reference list with details of PO, PO date, customer name shall be submitted.

3. The **Manual Hoist** offered shall be from the existing regular supply range of the vendor. Vendor shall provide the product catalogue.

4. Proven track record is required. Minimum One end user certificate for the satisfactory operational performance of their product supplied meeting requirements specified in enquiry specification or greater.

   (or)

   successfully executed two POs for same item meeting requirements specified in enquiry specification or greater.

   Vendor to submit the corresponding datasheets / drawings / technical documents of supplied **hoist** as per POs / end user certificate.

5. In case of ordering, the Vendor shall have the responsibility for the following and same to be confirmed point wise.
   a. Vendor should have the component replacement responsibility in case of defect / failure.
   b. Experts from Vendor's side shall associate in commissioning activities at site, if required.
   c. Vendor should ensure the product performance during erection & commissioning and ensure performance guarantee.

6. Backup document checklist to meet PQR to the fullest satisfaction of BHEL:

S. No	Document description	Check list
1	Documents to meet clause(1)	☐
2	Supply reference document (General reference list) to meet clause (2)	☐
3	Product Catalogues to meet clause (3)	☐
4	Min. one end user certificate (or) Two POs to meet clause (4)	☐
5	Confirmation to clause meet clause (5)	☐

MEMORANDUM OF UNDERSTANDING

M/s BHEL
Trichy – 620014

And

For supplying

Manually Operated Handling Equipment
(Item Code : 99 HEM)

MOU NO. : MOU/TPBHEL_HOIST – REV.00

Memorandum of Understanding (MOU) between BHEL / FB and M/s. xxxxxxxxxxxxxx , for supplying Manually operated Handling Equipment (Trolley with Hoists, Ratchet Lever hoist, Under hung Cranes and Interlock mechanisms).

1.0 GENERAL:

1.1 This MOU is signed for supplying the Manually operated Hoists as per the agreed standardized specification so that these details need not be discussed again and again for future supplies.

1.2 The various aspects covered in this MOU are as follows.

1.2.1 The general points are covered in Section – 1.0 – General.

1.2.2 The specification requirements are covered in Section – 2.0 – Specifications.

1.2.3 The documents to be submitted along with the offer / after placement of Order / along with the hoists are covered in Section 3.0.

1.2.4 The Inspection / Testing and Packing requirements are covered in Section – 4.0

1.2.5 The project specific details / data and if any customer specific requirements shall be covered in Section 5.0 – Project related Information. **DEVIATION ON PROJECT RELATED INFORMATION WILL LEAD TO REJECTION OF OFFER.**

1.2.6 **If any differences are found between the details given in Section 5.0 and other sections, Section 5.0 shall be considered as final and the vendors shall meet this requirement for that particular project.**

1.3 Sections 1.0, 2.0, 3.0 and 4.0 are standard and Section 5.0 alone will be furnished along with enquiry to the vendors for their acceptance.

1.4 **It is agreed that no deviations will be taken by the vendors while submitting their offers against future enquiries**.

1.5 Since the specifications are standardized and an understanding has been reached, the future enquiries will be floated on "SINGLE BID SYSTEM" only. Hence, if any offer is found with deviations, the same will be totally rejected and will not be considered for further evaluation.

1.6 The validity of this MOU is for TWO years from the date of signing. After the expiry of the period, the same can be extended further with or without any modifications. However, in case any changes are required, the MOU may be amended before the expiry of the validity.

1.7 Pre commissioning spares (if applicable) with price break up as per the list (vide Section 5.0) shall be supplied along with the hoists.

1.8 Two years recommended Spares list(vide Section 5.0) with price break up shall be enclosed.

1.9 If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the hoists.

1.10 Trouble-free operation of the equipment shall be guaranteed for a period of 18 months from the date of commissioning OR 24 months from the date of dispatch whichever is earlier.

1.11 Vendor has to provide Bank Guarantee for 10% order value (as per BHEL format) valid for a period mentioned in point No.1.10.

1.12 Dispatch clearance will be issued along with PGMA with DU Nos. for the ordered items to vendor after the receipt of acceptable Inspection Report . Vendor agreed to mark the PGMA with DU Nos. in the casing of the packing and in the Packing Slip.

1.13 Materials shall be dispatched on "Door Delivery with or without Consignee Copy attached basis to avoid demurrage at transporter's godown.

1.14 Since the vendors works alone is approved by BHEL, it is agreed the vendor will manufacture this item in their own works only and will not off-load the jobs to any other suppliers without the written approval by BHEL.

1.15 All components of the hoists should be packed in such a way that it should not get damaged during transport.

1.16 BHEL and the Vendor shall have an involvement which will commence at bid stage and follow through the completion and acceptance, thus ensuring total conformity to Purchaser's requirements.

2.0 Technical Requirements:

2.1 This purchase specification specifies the requirements for design, manufacture, inspection and testing at supplier's works and supply of manually (Hand) operated Trolley With Hoist (TWH), Ratchet lever, Under Hung Crane (UHC) and male & female interlock mechanism. For scope of supply, refer to Annexure II.

2.2 The trolley with hoist, under hung crane and interlock mechanism will be operating in normal ambient temperature range of 0 - 50℃. The atmosphere will be with excessive dust, heat, moisture and corrosive fumes.

*2.3 The equipment shall be designed for operation suitable for **OUTDOOR DUTY** without any roofing above the equipment. The trolley with hoist / under hung crane shall be operated on monorail / runway beams of rolled or fabricated beam.*

2.4 Technical parameters for equipment design are furnished in Annexure I. For scope of supply and special requirements refer to Annexure II. Annexure III comprises data

sheets which are to be duly filled in by the vendor and shall be submitted along with the offer.

This is a general specification dealing with technical requirements of various handling equipment as mentioned above. Contract requirements and special requirements (if any) for a particular project are specified in Section-V of this specification.

2.5 Codes & Standards:

2.5.0 The equipment shall comply with the latest revisions of the following standards.

2.5.1 *IS 3832 Specification for hand operated chain pulley block.*

2.5.2 *IS 6216 Specification for short link chain grade T (8) calibrated for pulley blocks and other lifting appliances.*

2.5.3 *IS 15560 Specification for point hook with shank up to 160 tonnes.*

2.5.4 *IS 807 Design, manufacture, erection and testing (Structural portion) of cranes and hoists.*

2.5.5 *IS 3681 General plan for spur gear and helical gears.*

2.5.6 *IS 2062 Weldable structural steel.*

2.5.7 *IS 2429(Part 1) Round steel short link chain (Electric butt welded), Grade L (3)*

2.5.8 *IS 1024 – Code of practice for use of welding in bridges and structures subject to dynamic loading.*

2.5.9 *IS 2004 - Carbon steel forgings for general engineering purposes*

2.5.10 *IS 4368 – Alloy steel billets, blooms, and slabs for forging for general engineering purposes.*

2.6 Technical requirements

2.6.1 *Design and manufacture of under hung crane and chain pulley block with trolley and male and female interlock mechanism shall be of consistent capacity, lift, headroom, span, overhang and any other parameters as specified in the annexure-I.*

2.6.2 *While designing the under hung crane, chain pulley block with trolley and male & female interlock mechanism, care shall be taken for the following features:*

- *Minimum effort to lift and move the under hung crane & chain pulley block with rated safe working load.*
- *Self-braking systems for holding the load and stop the crane in any position.*
- *Compact design and even loading of bearings.*
- *Ease of installation and maintenance.*
- *Interlock mechanism shall be capable of taking the axial load due to the movement of equipment with rated safe working load.*

2.6.3 *All materials used for construction of different components shall individually conform to standards mentioned in clause 2.5*

2.7.0 ***Hand operated chain pulley block, ratchet lever & under hung crane.***

2.7.1 ***Frame:*** *The Frame, crane girder and end carriage shall be designed for proper strength built from steel plates with bolted/welded construction (recommended material: IS 2062).*

2.7.2 ***Gear & Pinions****: Hand operated under hung crane and chain pulley block with trolley shall be supplied with helical / spur / worm gear. The gear shall be designed for surface durability and proper strength such as to afford efficient operation through out the period guaranteed by the manufacturers. In case of enclosed gearing, means shall be provided for ample lubrication. Such lubrication points are to be indicated along with specification of lubricant, market trade names, quantity of lubricant requirement and frequency of lubrication. Material of construction shall be conforming to relevant Indian standard or equivalent and casehardened. Hardness for CT & LT shall be minimum 250 BHN for pinions and 200 BHN for gears. Hardness for hoisting shall be in the range of 285 to 300BHN for pinions & minimum 250BHN for gears. However vendor shall maintain and ensure that gear hardness is always less than pinion hardness by at least 35BHN. Helical / spur gears only shall be used for hoists, CT & LT. All gears & pinions shall be examined by LPI / MPI for surface cracks after case hardening.*

2.7.3 ***Gear Housing****: Gear housing assembly consists of a fabricated housing in which gears are assembled (worm-worm wheel in case of worm wheel type and spur gear in case of spur gear type)*

2.7.4 ***Load Brakes****: Hand operated under hung crane and chain pulley block with trolley shall be provided with an automatic mechanical load brake, Ratchet & pawl type, which will prevent self lowering of the 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 efficient working of the block.*

The pawl and ratchet shall be made of steel and hardened and tempered to provide satisfactory degree of wear resistance. Hardness shall be minimum 375BHN for Pawl & minimum 300BHN for Ratchet. However vendor shall maintain and ensure that ratchet hardness is always less than pawl hardness by at least 50BHN. Material shall be of 45C8 - IS2004 & IS 4368 or equivalent. Supplier shall indicate material specification and provide material test certificates for compliance.

2.7.5 ***Bearing****: Only antifriction bearings of reputed make shall be used. Supplier shall specify the make of the bearings used in the offer (make shall be of TATA, SKF, NBC, FAG, PRECISION).*

2.7.6 ***Hooks:*** *Hooks shall meet the dimensional, material, testing & inspection requirement of IS 15560. The hook shall be provided with standard depress type safety latch and swivel thrust bearings with hardened race. Lugs for fixing safety latch shall be either forged along with the hook or clamp type latch with lugs shall be provided. Welding of lug is not permitted. Locking arrangement shall be provided to avoid unscrewing of the hook in service. Material of hook shall be conforming to IS 2004 – 35C8 or equivalent (Tensile strength shall be in the range of 50 to 62 Kg/Sq.mm) and made by controlled grain forging and normalised. All the hooks shall be tested for twice the safe working load. After the proof load all hooks shall be examined by LPI / MPI & UT (UT required for hooks >5.0T capacity) for cracks. The hook shall not distort or fracture. Ball & roller bearings shall not be used in these hooks. The bottom hook block shall be provided with thrust bearing to enable its free swivelling in the loaded condition without twisting the load chain.*

2.7.6.1 *Suspension fittings other than hook shall be of sufficient strength to afford a static factor of safety of not less than 4(four).*

2.7.7 ***Load Chain:*** *The link chain shall be of minimum GRADE 80 conforming to IS: 6216. The chain shall be pitched and polished. The chain shall be coated with rust preventive oil. All chains shall be tested for 2 times of SWL and other testing shall be as per IS 6216.*

2.7.8 ***Hand Chain:*** *The hand chain shall be of GRADE L (3) and conform to IS: 2429 (Part1). The chains shall be pitched and polished. The chain link dimensions shall be 6.0 mm. conforming to IS 2429 (Part1). The length of chain shall be such that the lowest point of loop will be 0.4 meter above the operating level. The chain shall be coated with rust preventive oil.*

2.7.9 ***Load Chain Wheel:***
Wheel for load chain shall be made of material suitable for use with load chain employed and be of adequate strength and shall be designed to ensure effective operation.

2.7.9.1 ***Hand Chain Wheel:***

Wheel for hand chain shall be of malleable cast iron / plate with suitable thickness to ensure effective operation and shall be provided with flange.

2.7.9.2 *The chain guide shall be so designed that the chain will neither come out of the wheel during use nor get caught between guide & the wheel.*

2.7.10 ***Idler wheels:*** *The chain pulley blocks shall be provided with idler wheels so shaped as to avoid twisting of the chain when passing around.*

2.7.11 ***Wheels:*** *Wheels for under hung crane and trolley wheels for chain pulley block shall be spur geared type, cast / forged, 4 wheeled, driven by hand chain.*

2.7.11.1 Trolley / under hung crane wheels shall be designed to suit the monorail / runway beam size and profile decided by purchaser (which will be furnished during drawing approval stage).

2.7.11.2 Shall be made out of forged or low carbon steel/cast steel with heat treated to minimum 200BHN hardness. Cast iron grade 20 with hardness of 200 BHN is also acceptable. The drive gears if any integral with the wheel shall be of the same material and hardness. Wheels for under hung crane and trolley wheels for hoists shall be spur geared type, cast / forged 4 wheeled.

2.7.12 ***Trolley:***

The trolley for chain pulley block shall be of spur geared type, fabricated construction, 4 wheeled, driven by hand chain and shall have provision for mounting the chain pulley block.

2.7.13 ***End Carriage:***

Shall be of 4 wheeled spur geared type and fabricated construction. Suitable wheelbase shall be provided. End carriages shall be designed to suit the runway beam size. (Which will be furnished by purchaser during drawing approval.) End carriages shall be connected with crane girder by welding or by fasteners (For ease of transportation, if welding required, the same shall be done at site by purchaser).

2.7.14 Ratchet Lever:

The ratchet lever consists of toothed wheel, pawl, catch etc., The pawls shall be of strength to arrest the full load from lowering due to gravity. The relative width and positioning of the ratchet wheel and the pawl shall be such as shall ensure full engagement irrespective of wear of the friction faces. The pawl and the ratchet shall be made of steel, hardened and tempered or given an equivalent treatment to provide satisfactory degree of wear resistance together with toughness. The hardness of the pawl tip shall no be not less than 40HRC and that of ratchet not less than 30HRC. The pawl shall engage with the ratchet wheel either by means of a spring other than a tension spring or by some other equally effective means.

The pawl shall be so positioned that it engages the ratchet wheel under gravity should it operating mechanism fails. Adequate arrangements shall be made to ensure that the pawl does not seize on the pawl pin.

2.7.15 ***Crane Girder:***

Crane girder shall be of rolled section. Fabricated beam and welded beam shall not be used for this purpose unless otherwise specified by the purchaser for special cases. For such cases, refer annexure - II to this specification for details. Camber /

deflection shall be within span/1000. Allowable bend (straightness) shall be 1mm/metre and maximum bend shall not exceed 6mm of total span.

2.7.16 *Suitable anti tilt/topple or roller arrangement shall be provided between runway beam and crane girder to avoid toppling of crane while the hoist is at overhang side.*

2.8.0 ***Male & Female interlock mechanism***

2.8.1 *Male & female interlock mechanism shall be designed to transfer the trolley with hoist with rated safe working load from master crane to slave crane or master crane to fixed monorails and vice versa. The interlock mechanism shall be capable of withstanding the forces even when one of the cranes is being operated by mistake. The cross travel stoppers should give way to the hoist when interlock mechanism is coupled.*

2.8.2 *Dimensional tolerance for the male & female component of the interlock mechanism shall be very close which will ensure proper locking (without play) and smooth transfer of trolley from one crane to the other.*

2.8.3 *Hand wheel with chain of suitable length shall be provided to operate the male & female mechanism manually from the operating floor.*

2.8.4 *Male and female interlock mechanism shall be designed suitably to take the axial load and safe working load.*

2.8.5 *Grease nipples shall be provided at all lubrication points & shall be easily accessible. Frequency of lubrication shall be minimum.*

2.8.6 *Fasteners shall be made of precision grade high tensile steel (Grade 8.8 class) and galvanised. Load bearing fasteners shall be suitably designed & machined. Vendor shall furnish material / tensile strength for special fasteners in the arrangement drawing.*

2.9 ***Welding**: All welding shall conform to IS 1024 and welders shall be qualified to AWS D1.1 / ASME -Section IX.*

2.10 ***Name Plates**:*

2.10.1. *Nameplates shall be provided with non-corrosive material*

2.10.2. *Nameplates shall have details of the equipment, model no., type, capacity, lift, span, and motor & brake details.*

2.10.3 *All lubrication points shall be provided with nameplates.*

3.0 DOCUMENTS BY VENDOR

3.1 Along with the offer:

3.1.1 Data sheets for Trolley With Hoist & Under Hung Crane (Annexure III)

3.1.2 Technical specification for equipment

3.1.3 Quality plan & typical arrangement drawing

3.1.4 Deviation: No deviation will be entertained on the MOU specification.

3.1.5 Exclusion: Any exclusion from scope of supply shall be clearly spelt out in the offer itself. Exclusion of major / critical items shall make the offer liable for rejection.

3.2 After placement of order:

3.2.1 Quality Plan is to be submitted by vendor for Purchaser and End user's approval.

3.2.2 Dimensional drawings for approval.

3.2.3 Data sheet for hoists and cranes for Purchaser's / End user's approval.

3.3 During supply:

3.3.1 Performance test certificates for TWH, UHC, Safety devices and Chain.

3.3.2 Physical, Chemical, hardness and NDE test certificates shall be provided wherever applicable for trolley / crane wheels, load chain, hand chain, pulleys, hook, gears, pinions, shafts and other materials.

3.3.3 Other certificates either for sub-vendor's manufacturing or bought-out items shall also be furnished if applicable.

3.4 Drawings & O & M Manuals:

3.4.1 The drawings furnished with the offer shall clearly indicate the items (bill of materials) that go to make the trolley with hoist and / or under hung crane. The drawings shall clearly indicate the weight particulars of such items / sub assembly that will be despatched as loose items in the packing cases.

The bill of material shown in the drawing shall match with that of the despatchable unit as indicated in the packing slip. The drawing shall be prepared in AUTOCAD and vendor shall forward both hard copies (3 numbers each) and floppy (Copied with drawing files) to the purchaser.

3.4.2 Performance and load test certificate shall be submitted along with the supply.

3.4.3 Catalogues and other details of the product shall be submitted along with the offer.

*3.5 **O & M Manuals***

3.5.1 Number of copies required is 3sets of hard copies and 3 nos.soft copies in CDs..

*3.5.2 Manuals should be in printed form only (**Xerox** copies are not acceptable).*

3.5.3 The size of manuals should be in correct A4 size with drawings not bigger than A3 size. Large size drawings (greater than A3 size) should be reduced to A3 size and inserted (Drawings shall be of laser prints or printed. Blue prints are totally not acceptable).

3.5.4 Spiral or comb bound copies should be totally avoided.

3.5.5 If manuals are supplied in folders, the folder should have 3-hole punching.

3.5.6 O & M manuals, should be submitted to BHEL / Tiruchirappalli prior to despatch of the equipment.

*3.5.7 **Manual, generally should contain the following:***

3.5.7.1 Data sheet

3.5.7.2 Brief description

3.5.7.3 Operation

3.5.7.4 Maintenance (including lubrication, where necessary) and service, recommended spares for 2/3 years trouble free service.

3.5.7.5 Trouble shooting

3.5.7.6 Assembly drawings with part list, dimensional drawings and other applicable drawings.

3.5.8 Manuals should pertain only to the types or model of the equipment supplied for a particular order.

3.5.9 It is preferred if the O & M manuals are prepared in electronic media and copied on a floppy and submitted along with hard copies.

*3.6 **Guarantee Required**:*
18 months from the date of commissioning or 24 months from the date of supply.

*3.7 **Packing & Identification***

3.7.1 All packaging shall be done in such a manner as to reduce the volume. The equipment shall be dismantled into major components suitable for shipment and shall be properly packed to provide adequate protection during shipment. All assemblies shall be properly match marked for site erection.

3.7.2 Attachments, spare parts of the equipment and small items are to be packed separately in small cases. Each item shall be tagged with identification of the main equipment number, item denomination, and reference number of the respective assembly.

3.7.3 Detailed packing list in water- proof envelope shall be inserted in the package together with equipment.

3.7.4 Each equipment shall have a name- plate giving the salient equipment data, make, year of manufacture, equipment number followed by the firm, manufacturers name plate. Each hoist will have a name- plate fixed on both faces in such a manner that the safe working load can be clearly seen from the operating floor.

3.8 Spare Parts

3.8.1 Mandatory spares: The offer shall include list of recommended spare parts with itemised price, for 2/3 years operation of the equipment Proper coding and referencing of spare parts shall be done so that later identification with appropriate equipment will be easier.

3.8.2 Commissioning spares: The offer shall include the required commissioning spares as part of the main package. The cost of such spares included may be separately indicated in the offer.

4.0 INSPECTION, TESTING & PACKING:

4.1 Purchaser's (BHEL) and end user's (BHEL's customer) representative shall have the access to the works of vendor at all reasonable times for the purpose of witnessing the purchased equipment being tested.

*4.2 Vendor shall provide a **Quality Plan** along with the offer for review and approval by Purchaser or end user.*

4.3 Each chain pulley block with trolley shall be subjected to 1.5 times the safe working load for a lift of minimum one metre, which shall ensure that every part of the block mechanism and each tooth of the gears come under load. The trolley with load shall be tested for smooth operation for cross travel without any problems.

4.4 All visual examination after operational proof tests for deformation, cracks etc, shall be checked by Purchaser or it's appointed representative for all 100% cases.

4.5 Type test (static loading) shall be conducted at 200% safe working load. Static tensile loading shall be done once in a year or if there is a design change which ever is earlier. Records shall be maintained by the supplier for this and a copy of the same shall be furnished.

4.6 *All under hung crane shall be tested for 125% of safe working load. All visual examination after operational proof test for deformation, cracks etc, shall be checked by Purchaser or their appointed representative for all 100% cases.*

4.7 *Each under hung crane shall be subjected to 1.25 times the safe working load at the middle of the crane girder. The trolley and chain pulley block with load shall be tested for smooth operation for cross travel on the crane girder without any problems. Wheel matching of the crane with runway beam shall be checked with 125% safe working load. Allowable deflection is span / 1000 at SWL.*

4.8 *Certificate of test and examination shall be issued for the chain pulley blocks with trolley and under hung crane individually giving the following information.*

4.8.1 *Safe Working Load*

4.8.2 *Range of Lift*

4.8.3 *Load chain & hand chain size and grade*

4.8.4 *Span of the crane*

4.8.5 *Over hang on either side*

4.8.6 *Proof load applied.*

4.9 *Hooks:*

4.9.1 *Raw material test certificate shall be submitted from manufacturer.*

4.9.2 *Proof load at 200% of safe working load on each hook irrespective of capacities.*

4.9.3. *Chemical composition and destruction test shall be carried out on one sample per batch.*

4.4.4 *After proof load test, hook shall be examined for cracks, deformation, flaws and other defects with LPI / MPI. Hooks above 5T capacity shall be examined with UT. Acceptance norms for LPI / MPI: No linear indications or crack are acceptable while carrying-out LPI / MPI. For UT, it shall be as per ASME - Sec. VIII - Division 2. - AM 203.2.*

4.10 *Load Chain:*

4.10.1 *Breaking Test:*

First few links of the lot (Refer IS 5616) shall be tested for minimum breaking load (400% SWL) after manufacture, heat treatment and calibration.

The sample shall first be subjected to proof loading and then shall be tested to destruction and breaking load.

4.10.2 *Rolling Over Wheel Test:*

Full length of chain after proof loading shall be passed over actual load chain wheel.

4.11 All structural welds, gears, castings/forging shall be examined by MPI / LPI for cracks, surface defects. Acceptance norms for LPI / MPI: No linear indications or crack are acceptable while carrying-out LPI / MPI. All butt welds shall be tested radiography and acceptance norms shall be as per AWS D1.1/ ASME -Section IX.

4.12 Performance test for Under Hung Cranes, Chain pulley blocks & Ratchet lever

4.12.1 Under hung crane shall be checked for smooth running of chain pulley block with trolley on crane girder and crane movement shall be checked with 125% safe working load on runway beam at site by purchaser / end user under vendor's supervision and if found defective, the same shall be replaced at free of cost by vendor.

4.12.2 Chain Pulley block with trolley and under hung crane shall be checked for brake system to arrest the movement and sustain the load at any working positions.

4.12.3 Chain pulley block with trolley shall be checked for smooth running on monorail with load above 2meters from ground.

4.12.4 Wheels shall be checked for matching with monorail / runway beam.

4.12.5 Ratchet lever shall be checked for its smooth operation to the rated capacity

4.12.6 Equipment shall be provided with nameplates consisting of:

a) Description

b) Serial No.

c) Manufacturer

d) Type

e) Capacity & size.

f) Year of manufacture.

4.13 Protection & Painting

4.13.1 Surface Preparation:

The surfaces to be coated shall be free from contamination, weld slag and spatter shall be removed. Surface defects shall be removed by suitable methods.

Sharp edges shall be smoothened by grinding. Prior to surface preparation oil, grease, drilling / cutting emulsions and preservative agents shall be carefully removed by suitable solvents. The surface shall be carefully dried with clean cloths to prevent the dissolved impurities from spreading over the entire surface. The surface shall be cleaned by wire brush and shot blasting if required. Proper adhesion of paint to the surface shall be ensured.

*4.14 **Painting***

*4.14.1 **Primer**: 2 coats of red oxide with 40 microns DF Thick minimum.*

*4.14.2 **Finish Coat**: 2 Coats of enamel paint with each 40 microns DF Thick minimum.*

4.14.3 Finish paint colour shall be of Black for HOOK and Golden yellow for CHAIN PULLEY BLOCKS, Ratchet lever and UNDER HUNG CRANES.

4.14.4 Non-ferrous material, austenitic stainless steels, plastic or plastic coated materials, insulated surface of equipment and pre painted items need no painting.

4.14.5 All the rotary parts inside shall be thoroughly greased.

4.14.6 All the machined parts shall be covered with water- proof packing material and packed in wooden boxes to avoid any damage during transit.

4.14.7 Machined and bearing surfaces shall be protected with varnish or thick coat of grease.

*4.14.8 **For special painting if any, refer Section-5 to this specification.***

5.0 PROJECT RELATED INFORMATIONS

Project Name : Bhusawal 660MW Project (1727)

Enquiry No. / P.O.No. :

Sl.No.	Description	Specification	Vendor Confirmation Yes / No
5.1	Hoist Parameter	N/A	
5.2	Painting schedule & Special requirements	As per approved Painting Schedule attached	
5.3	Spares		
5.3.1	Commissioning Spares	Vendor to specify	
5.3.2	2 Years recommended spares	Vendor to specify	
5.4	Data Sheet		
5.5	Data Sheet	(Annexure-III) Vendor to fill & submit	
5.6	G.A. Drawings (for hoists, cranes, CPB, Ratchet lever hoist, etc.)	Vendor to submit	

Note: 1. Deviation in the above requirements shall reject the offer.
2. If required, please add more sheets.

Annexure-III to Specification MOU/TPBHEL/M_HOIST - Rev. 00

Project : Bhusawal 1x660MW
(Cust.no. 1727)
Enquiry no:

The following data sheet is to be filled by the vendor and submitted along with the offer. This data sheet shall form part of ordering specification and shall be approved by Engineering On acceptance of the offer.

Technical Data sheet for Hand operated Handling equipment

1.0	**Under hung crane**					
1.1	Capacity - in tons					
1.2	Span - in m.					
1.3	Overhang on either side - in mm.					
1.4	Runway beam size (User / Purchaser) Wiil be furnished during vendor drawing approval.					
1.5	Operating floor - in m.					
1.6	**Wheels**					
1.6.1	Wheel shape whether match with runway beams	Yes / No				
1.6.2	Wheel material					
1.6.3	Wheel diameter - in mm.					
1.6.4	Wheel base - in mm.					
1.7	**Wheel bearing**					
1.7.1	Type					
1.7.2	Size					
1.7.3	Make					
1.8	**Shaft**					
1.8.1	Material					
1.8.2	Hardness					
1.9	**Gears / Pinions**					
1.9.1	Material					
1.9.2	Hardness					
1.10	**Crane girder**					
1.10.1	Type	Signle / Double / Box				
1.10.2	Size					
1.10.3	Material					
1.11	**End stopper**					
1.11.1	Provided	Yes / No				
1.11.2	Type					
1.12	**Weight of the crane - in Kgs.**					
1.13	**Overall dimensions of crane**					

Vendor Name :
Signature :
Date :

Project : Bhusawal 1x660MW
(Cust.no. 1727)
Enquiry no:

1.14	Clearance between Runway beam bottom & Crane girder top - in mm.					
2.0	**Chain Pulley Block/ Manual Hoist**					
2.1	Capacity - in tons					
2.2	Lift - in m.					
2.3	Headroom - in mm.					
2.4	Operating floor - in m.					
2.5	Approximate weight - in Kgs.					
2.6	Overall dimensions of Trolley with hoist					
2.7	No. of Falls					
2.7	**Trolley wheels**					
2.7.1	Wheel diameter - in mm.					
2.7.2	Material					
2.7.3	Hardness					
2.7.4	Quantity					
2.8	**Load chain**					
2.8.1	Link diameter					
2.8.2	Material					
2.8.3	Ultimate tensile strength in kg/sq.mm.					
2.9	Hand chain					
2.9.1	Size					
2.9.2	Material					
2.10	**Ratchet**					
2.10.1	Material					
2.10.2	Hardness					
2.11	**Pawl**					
2.11.1	Material					
2.11.2	Hardness					
2.12	**Gears & Pinions for Hoisting**					
2.12.1	Material					
2.12.2	Hardness					
2.13	**Gears & Pinions for Cross travel**					
2.13.1	Material					
2.13.2	Hardness					
2.14	**Hook**					
2.14.1	Material					
2.14.2	Hardness					
2.14.3	Tensile strength in kg/sq.mm.					
2.14.4	Safety latch provided in the hook(Yes / No)					

Vendor Name :
Signature :
Date :

ANNEXURE -D

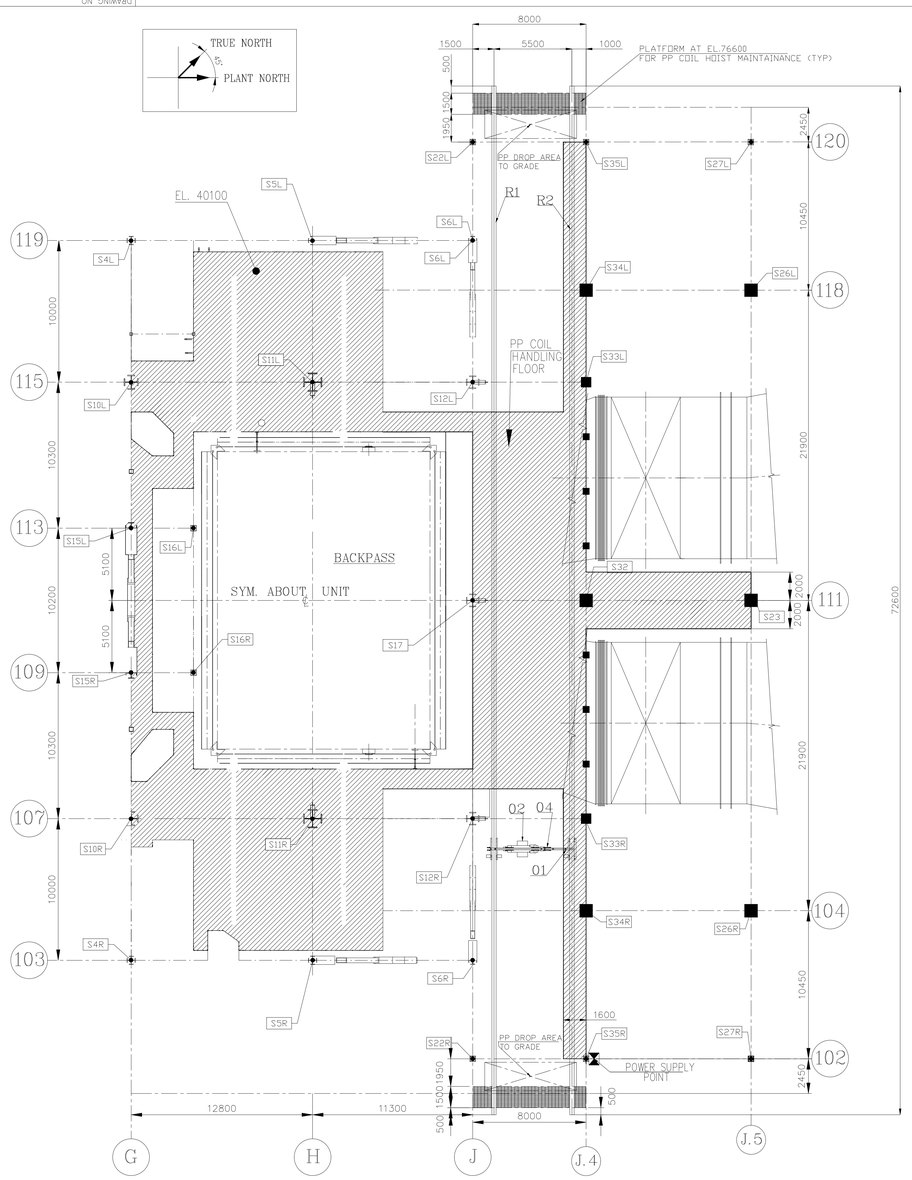
BHUSAWAL TPS 1x660MW - Mandatory spare list for Manual handling equipments

Sl.no	EQUIPMENT/PACKAGE NAME	QUANTITY	Manual Trolley with CPB	Chain pulley block	Manual hand chain hoist	Manual Chain pulley block
	Application & BHEL drawing		Pressure part handling 0-99-502-40382		BCW pump motor handling- 0-99-300-40384	As per BHEL material code L172719909901001
	BHEL drawing Item number		04 & 08	06	02	
	Capacity and Lift		12T/40m,15m	3T/15M	10T/6M	2T/10M
4.11.12	Chain pulley block					
(a)	Load chain wheel	One (1) number				
(b)	Load chain stripping fork	Five (5) numbers				
(c)	Hand chain wheel	Two (2) numbers				
(d)	Ratchet pawl	One (1) numbers				
(e)	Locking ratchet wheel	Two (2) numbers				
(f)	Guide roller	Two (2) numbers				
(g)	Brake disc	Two (2) numbers				

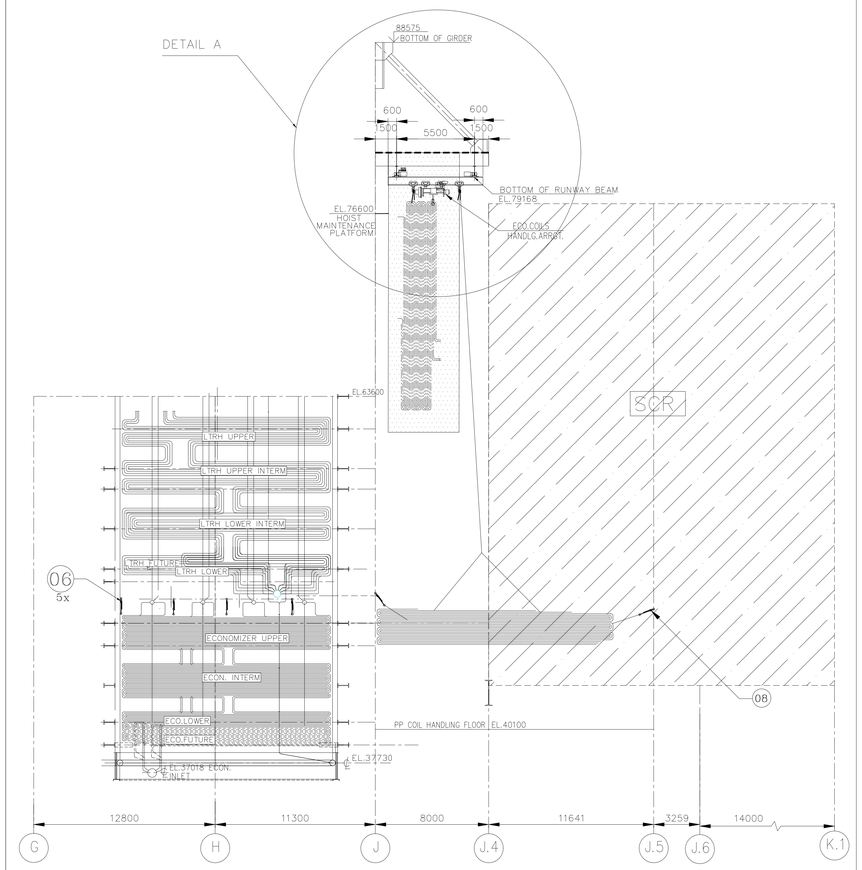
NOTES:

A) * 1 SET MEANS ONE COMPLETE REPLACEMENT FOR ONE UNIT

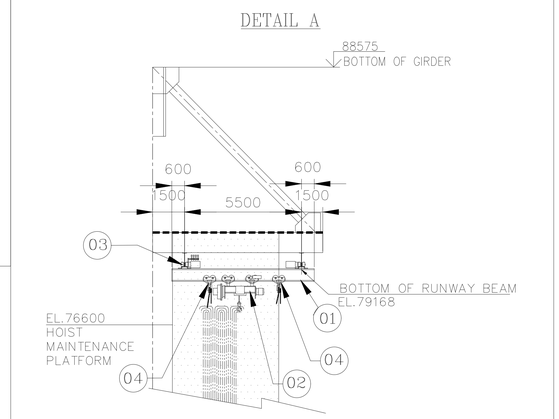
B) MANDATORY SPARES QUANTITY SHALL BE ARRIVED ON PACKAGE BASIS. THE QUANTITY SHALL BE FOR EACH TYPE RATING WITH IN THE OFFERED HOISTS PACKAGE.



FLOOR PLAN VIEW
EL.–40100
SCALE 1:150



ELEVATION VIEW
SCALE 1:160



SCALE 1:100

HOIST VENDOR ITEMS

ITEM NO.	DESCRIPTION	QTY.	REMARKS
01	UNDERHUNG CRANE–ELEC., CAP. 12T, SPAN 5500mm	1	
02	TROLLEY WITH HOIST–ELEC., CAP. 12T, LIFT 78.0M	1	
03	DSL FOR UNDERHUNG CRANE–TRAVEL LENGTH 72.600M	1	
04	MANUAL TROLLEY WITH CHAIN PULLEY BLOCK–CAP. 12T, LIFT 40.0M	2	
05	RATCHET LEVER TYPE AUX. HOIST–CAP.10T, LIFT 35.0M	1	NOT SHOWN
06	CHAIN PULLEY BLOCK (LUG MOUNTED TYPE WITH LATCHING ARRANGEMENT FOR BOTH HOOKS)–CAP. 3T, LIFT 15.0M	5	
07	WIRE ROPE DIA 28; L35 M	5	NOT SHOWN
08	CPB–CAP.12T, LIFT 15M	1	NOT SHOWN

Max.weight of pair of coils to be handled

ECONOMISER	9000 KG.

NOTES:

1. NO INTERCONNECTING STEEL OR VERTICAL BRACING BETWEEN COLUMN ROWS J & J.4 FROM PLATFORM EL. 40100 TO EL. 79168 FOR MOVEMENT OF HOIST AND P.P. COILS TO DROP AREA.
2. ONE (1) ELECTRICALLY OPERATED UNDERHUNG HOIST SHALL BE PROVIDED FOR LOWERING/RAISING P.P. COILS TO/FROM GRADE.
3. TWO (2) TROLLEY TYPE MANUALLY OPERATED #04 CHAIN HOISTS SHALL BE PROVIDED TO POSITION P.P. COILS ONTO PLATFORM EL. 40100 AND AID IN TILTING VERTICALLY FOR LOWERING TO GRADE.
4. FOUR (4) MANUALLY OPERATED CHAIN PULLEY BLOCKS SHALL BE PROVIDED FOR HANDLING P.P. COILS INSIDE BACKPASS ALONG WITH ONE (1) MANUALLY OPERATED CHAIN PULLEY BLOCK LOCATED OUTSIDE OF BACKPASS AT COLUMN ROW J. SUSPENDED EITHER ABOVE LTRH OR ECONOMIZER BANKS.
5. MAXIMUM OF SIX (6) PAIRS OF P.P. COILS MAY BE LOADED ON PLATFORM EL. 40100 AT A TIME.
6. SUITABLE LUGS AND PIPES SHALL BE SUPPLIED FOR POSITIONING THE MANUALLY OPERATED CHAIN PULLEY BLOCK AT COLUMN ROW J.
7. THE REQUIRED NUMBER OF LUGS ARE TO BE PROVIDED FOR SUSPENDING WIRE ROPES INSIDE THE BACKPASS FOR SUPPORTING THE MANUALLY OPERATED CHAIN PULLEY BLOCKS. THEY SHALL EITHER ATTACH TO THE BACKPASS SIDE WALLS OR PASS THROUGH AND ATTACH TO INTERCONNECTING BEAMS.
8. TWO (2) RUNWAY BEAM (R1 & R2) SHALL BE SUPPLIED FOR UNDERHUNG CRANE–LENGTH 70.60M.
9. PIPE CLAMPS OF DIFFERENT CONFIGURATIONS FOR ECONOMISER COILS SHALL BE DESIGNED AND SUPPLIED.
10. THREE (3) SETS OF CLAMPS ARE REQUIRED PER BUNDLE WITH A TOTAL OF 21 SUPPLIED.
11. RUNWAYS BEAMS SHALL BE INSTALLED AND SHALL MAINTAIN LEVEL WITH EACH OTHER AND WITHOUT SLOPE THROUGHOUT.
12. VERTICALITY OF RUNWAYS SHALL BE WITHIN ±2MM. SHIMS SHALL BE USED TO ENSURE SUCH.
13. REFER TO O&M MANUALS FOR DETAILED INSTRUCTIONS ON DISMANTLING/ASSEMBLY OF P.P. COILS.
14. QUANTITY FURNISHED IN THE DRAWING IS FOR ONE BOILER ONLY.
15. AT ANY INSTANCE,3 NUMBERS OF CHAIN PULLEY BLOCKS (ITEM NO 06) ARE TO BE USED IN TENDEM FOR DRAWING OUT COILS.
16. ITEM#08 SHALL BE USED TO HANDLE THE COILS IN THE SPACE FOR HANDLING ECO. COILS AND SHALL BE SUITABLY SUSPENDED AT SITE.

REFERENCE DRAWINGS:

1. GENERAL ARRANGEMENT–SIDE ELEVATION "EE"–DRG. No. 0–00–022–77413
2. FLOOR PLAN AT EL. 41000,43300&43600 (MBL–3)–DRG. No. 0–00–021–77397
3. FLOOR PLAN AT EL. 77200, 76500, DRG. No. 0–00–021–77409

NOTES TO SUPPORTING STRUCTURES/PE/FB:

1. NO INTERCONNECTING STEEL MEMBER OR VERTICAL BRACING BETWEEN 40.100M AND 79.168M IN THE REGION OF ECO COIL HANDLING SPACE.
2. RUNWAY BEAMS (R1&R2) LENGTH EACH 72.60M.

NOTES TO PRESSURE PARTS/PE/FB:

1. PIPE CLAMPS OF DIFFERENT CONFIGURATIONS FOR ECO COILS SHALL BE DESIGNED AND SUPPLIED.
2. 3 SETS OF LUGS ARE REQUIRED PER BUNDLE.
3. REQUIRED NO.OF LUGS FOR ROPE TYING ARRANGEMENT SHALL BE DESIGNED AND SUPPLIED.
4. BEAMS FOR TYING UP THE ROPE BETWEEN COLUMNS AS PER PROCEDURE ARE TO BE PROVIDED.
5. FOR POSITIONING THE PULLEY BLOCK AT OUTSIDE THE SECOND PASS, SUITABLE LUGS AND PIPES SHALL BE DESIGNED AND SUPPLIED.

NOTES TO BHEL–PEM & C&I (FB):

A. POWER SUPPLY POINTS ARE TO BE PROVIDED AT 1.0M ABOVE OPERATING FLOOR AT EL. 40100 AT COLUMN S35R.
B. POWER SUPPLY REQUIRED RATING 415V AC; 3 PHASE; 50Hz. & 24 KVA

NOTES TO VENDOR:

A. VENDOR TO PROVIDE INTEGRATED PLATFORM FOR ITEM#02.
B. VENDOR TO DESIGN HOIST WITH MAXIMUM POWER REQUIREMENT OF 24 KVA.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / DI	UNIT WEIGHT / QUANTITY	GS	ZONE
	08	CPB–CAP.12T, LIFT 15M							170.000 / 1		
	07	WIRE ROPE DIA 28MM, L=35M							170.000 / 5		
	06	CHAIN PULLEY BLOCK CAP.3T; LIFT 15M							100.000 / 5		
	05	RATCHET LEVER WITH HOIST CAP.12T; LIFT 35M							900.000 / 1		
	04	MANUAL TROLLEY WITH CPB CAP.12T; LIFT 40M							700.000 / 2		
	03	DSL–CABLE TROLLEY TYPE TRAVEL LENGTH 72.60M							900.000 / 1		
	02	ELEC.TROLLEY WITH HOIST CAP.12T; LIFT 78.0M							4000.000 / 1		
	01	UNDERHUNG CRANE CAP.12T; SPAN 5.5M (OVERHANG 600MM ON BOTH SIDES)							3000.000 / 1		

CUSTOMER NO. 1727

DEVELOPMENT CONSULTANT PVT. LTD.

Reviewed only for general conformance with contract drawings and specifications; Contractor to be responsible for any error and for fulfilment of details requirements of contract documents.

CODE:– 4 DATE:– 19.01.2021

DISTRIBUTED BY:– SAURABH DAS

1	Approved	√4	For information only
2	Approved Subject to compliance to comments. Proceed with manufacturing/construction. Revised document required to be submitted after incorporating the comments.	V	Null and Void (Not applicable)
3	Not Approved. Resubmission required		

SEE COVERING LETTER

LETTER REF.NO.:– 18V06–M50–LOT–BHEL–0823

REV	DATE	ALTERED :
01		CHD & APPD :
ZONE		

CUSTOMER: MAHAGENCO (MAHARASTRA) CO.LIMITED BHUSAWAL, INDIA

PROJECT: MSPGCL BHUSAWAL (1 X 660MW) unit # 6
BHUSAWAL,JALGAON, MAHARASHTRA

BHARAT HEAVY ELECTRICALS LTD
BOILER PLANT, TIRUCHIRAPALLI –620014

	NAME	SIGN	DATE
DRAWN	SAURABH KUMAR	Sd...	01.12.2020
CHECKED	PREETAM KUMAR S	Sd...	01.12.2020
APPROVED	SHANKAR NAIK V	Sd...	01.12.2020

DEPT CODE: FS 129

ALL DIMENSIONS IN MILLIMETRE

TITLE: PRESSURE PARTS HANDLING ARRANGEMENT

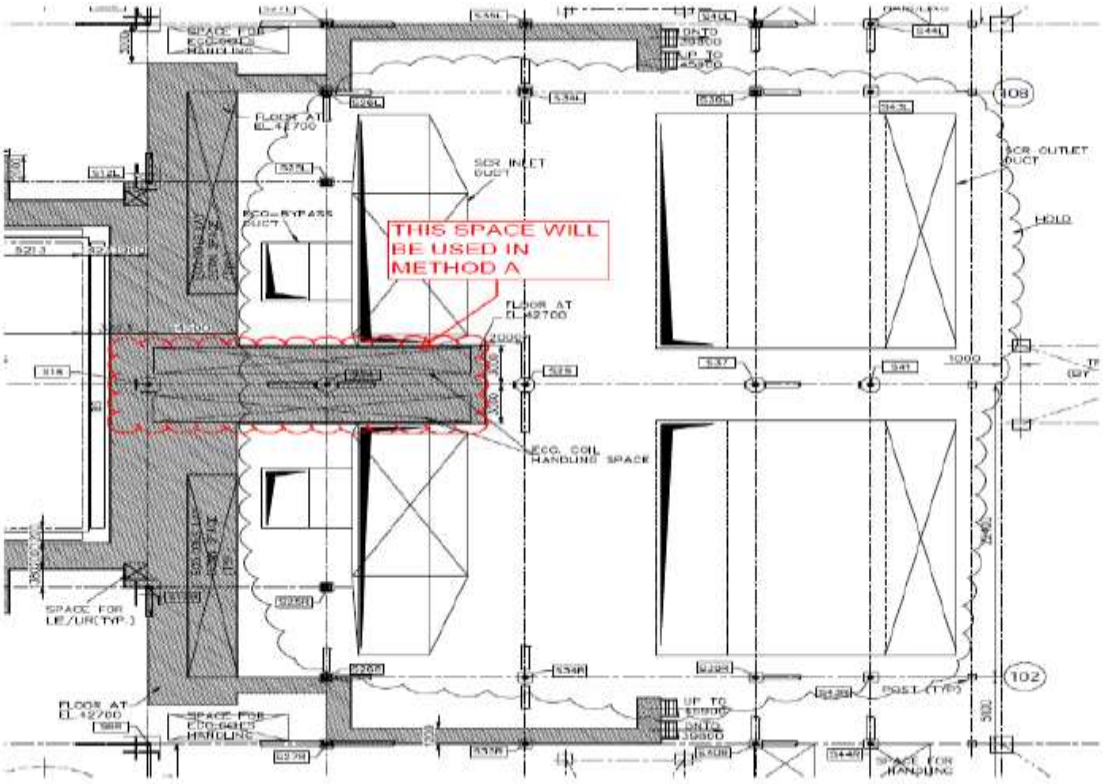
PROJECTION | SCALE: 1:150 | DRG No.: 0–99–502–40382 | REV.: 00

SIZE–A0

ELECTRONIC FILE NAME:

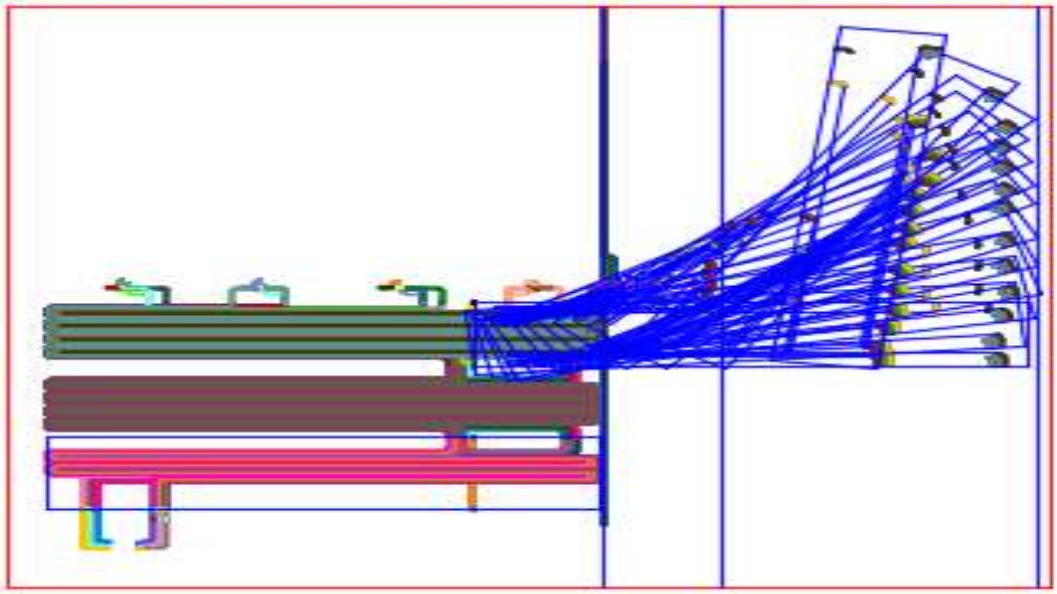
HANDLING PROCEDURE FOR ECONOMIZER COILS IN OTSC BOILERS

1. Clear the area of any obstruction behind the back pass rear wall for removal / transfer / replacement of coils.
2. Steam cooled rear wall tubes may be cut to have an access opening as shown in the sketch A-09. Required number of openings across the rear wall may be made one by one after re welding the previous opening so that the transfer of the rear wall load to the ceiling is not affected. For cutting elevations at Back pass rear wall panel refer Table 1.
3. The buckstays and floor beams, bracings etc., which are obstructing the above openings are to be removed to have a clear access and re welded / re fixed. Steel at the elevations of any Main Brace Level (MBL) is not to be disturbed.
4. Four numbers of pulley blocks (P1 to P4) are to be suspended inside the second pass. For suspending these pulley blocks wire ropes of Diameter 25 mm (approximately) may be run along the width of second pass (i.e., Side wall to Side Wall). Suggestive elevation for pulley blocks shall be minimum 425 mm below lower most LTRH coil element elevation.
5. The wire ropes for suspending the pulley blocks may be positioned by any one of the following methods: -
   a. **METHOD 1:** Make the opening in the back pass sidewall fins and pass the rope outside to reach the interconnecting members. If warranted Brackets may be welded on the columns at both left and right sides to have interconnecting member on to which the wire ropes are tied. The elevation of the interconnecting member may be 100 mm (Approximately) above the elevation of wire rope.
   b. **METHOD 2:** The lugs as per sketch A-08 enclosed may be welded on the inner side of the fins of back pass sidewall panels. On these lugs the wire ropes can be tied.
6. One more pulley block (P5) may be suspended outside the second pass along the interconnecting member running at appropriate elevation between the columns located immediately after the back pass rear wall. Suitable lugs as per Sketch A-08 & Sketch A-10 & may be welded at a desirable span to run a pipe so that the pulley block may be adjusted for its location along the second pass. The pulley elevation must be chosen such that the chain connecting this pulley and coil must always take the load of the coil.
7. Due to the presence of SCR system there are two approaches for the removal of coils
   a. **Method A:** The coils are to be removed from the axis of boiler. After removing the coils at the axis, with the handling system provided, the coils adjacent to the coils at the axis shall be moved to the vacant space created due to the removal of coils at the axis of boiler and removed. The same shall be continued for the entire set of coils.



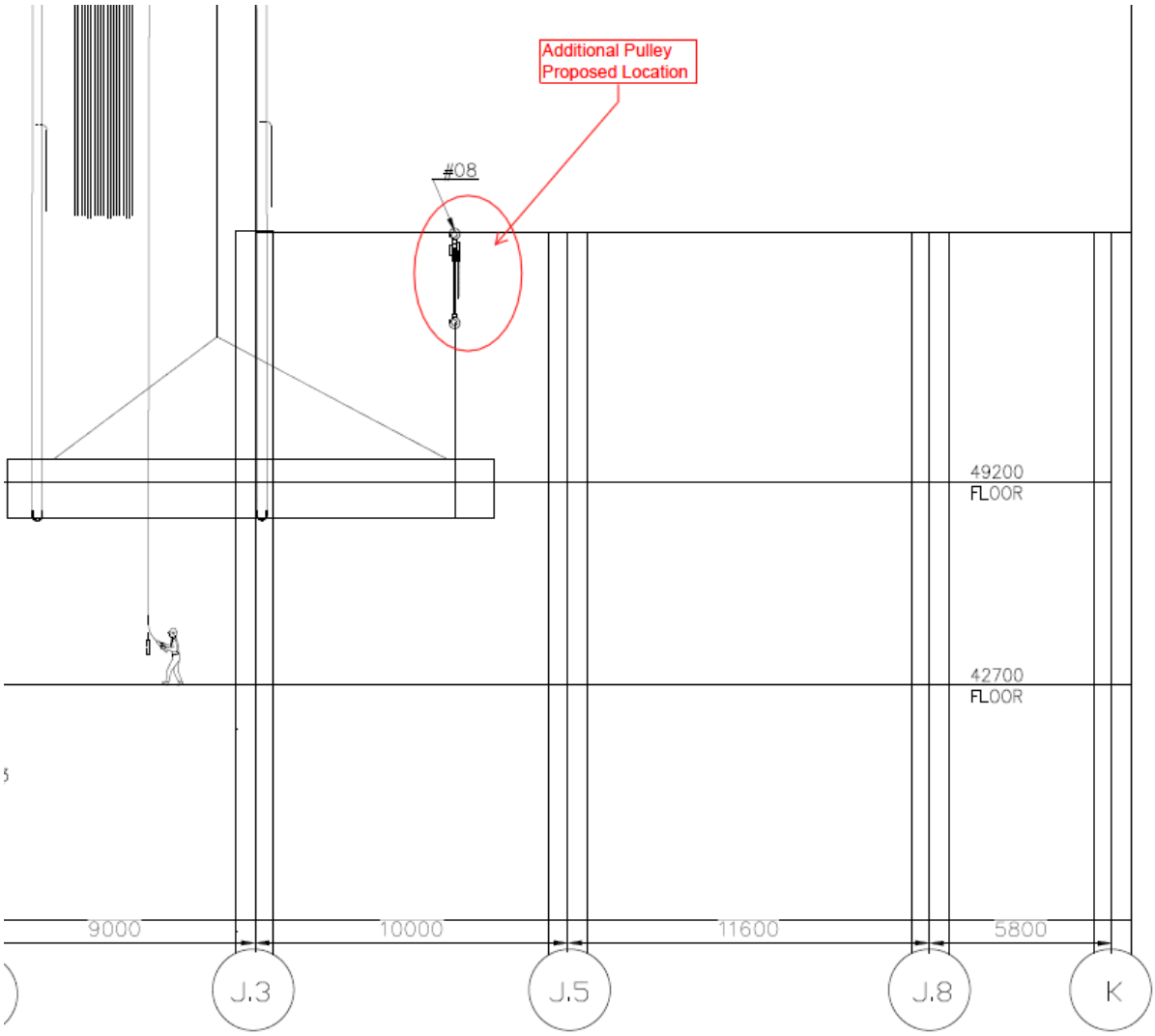
Method A

b. **Method B:** The coils shall be removed utilizing the space between the back pass rear wall and the SCR by simultaneous lifting of coil to vertical position while pulling the coil out from back pass as the handling space is less.



Method B

Additional pulley blocks as required shall be suspended as shown along the interconnecting member running at appropriate elevation between the SCR's.



Additional Pulley Proposed location.

8. When any assembly in top bank is removed the assembly below in the bottom bank is to be supported by inserting rods or plates between assembly elements in 4 or 5 elevations adjacent to the hanger tubes. Thus the load of the bottom assembly is transferred to the adjacent assemblies. Refer Sketch A-10.
9. By positioning the chain pulley blocks attached on the wire ropes, the coils / assemblies / module which are to be removed are tied. Refer sketch A-01, Sketch A- 02 & Sketch A- 03.
10. Detach the module that are to be removed by cutting both coil ends and hanger ends. The suggestive cutting elevations are same as the Erection Weld Locations indicated in the PPA drawings. These elevations can be shifted up or down if there is any difficulty at site. But the maximum coil height to be handled should not increase beyond the maximum distance between the Erection Welds. Refer sketch A-02 & Sketch A-03
11. The released module may be pulled towards rear after lifting to match with the wall opening already

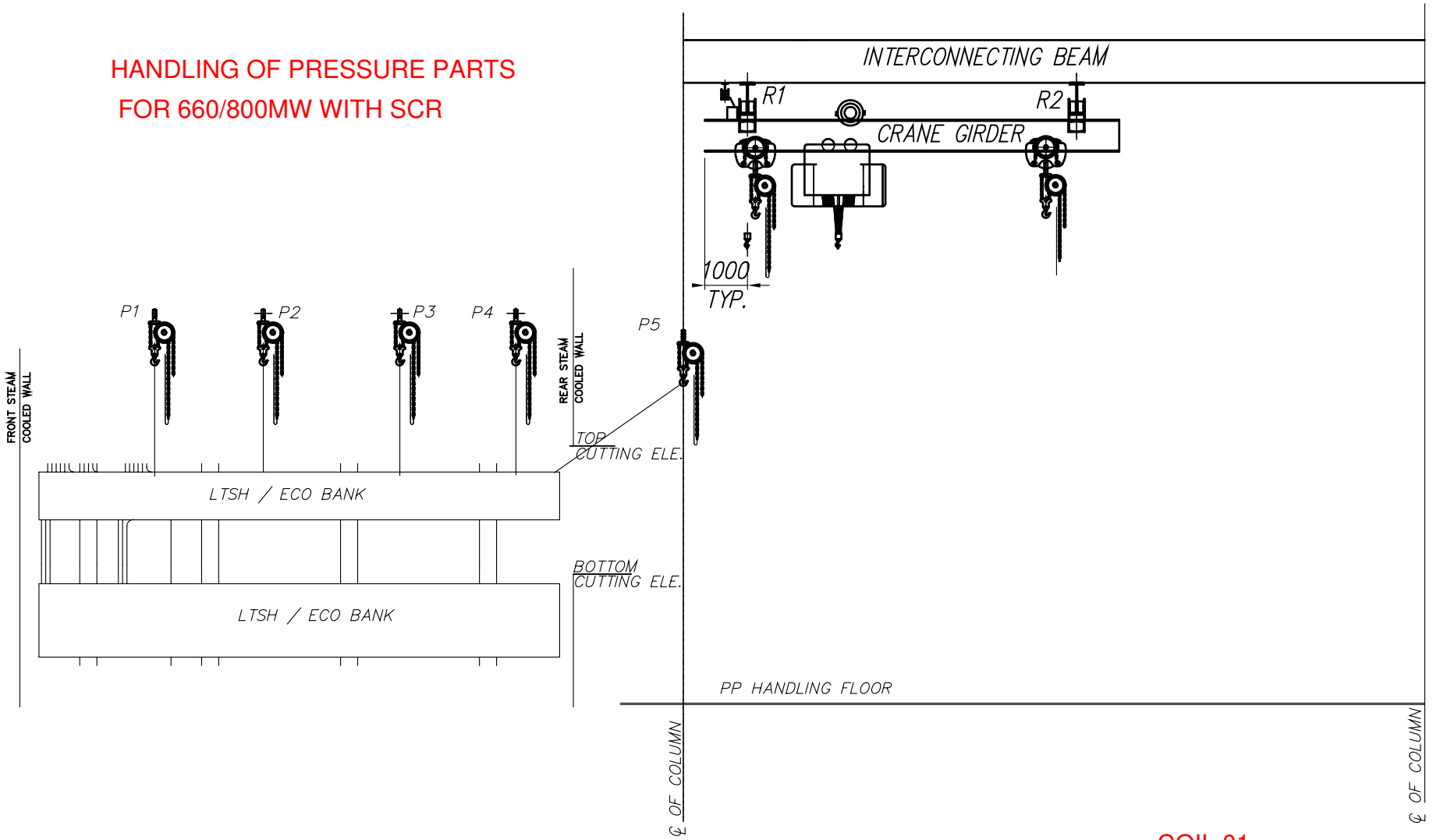
been cut. The lifting of coils may not be required for upper bank coils. Refer Sketch A-04 & Sketch A-5.

12. In case of middle or lower bank coils the corresponding upper bank module has to be removed and the lower module has to be lifted to occupy the upper bank position.
13. The released module has to be retied such that there is an offset between pulley center and the point at which coils are tied. This initiates further movement of module towards rear. Refer Sketch A-04 & Sketch A-5.
14. Repeating this procedure by retying the ropes one by one the module can be moved towards rear.
15. Once the rear end of the module comes out of rear wall to the extent possible enough to tie it with electrical / manual hoist available outside. The module may be tied and removed always to the floor as indicated in the corresponding handling drawing released under 99-502 PGMA. Refer Sketches A-06 & Sketch A-7.
16. If the handling area space is less than the back pass depth, while removing the coils outside the back pass it has to be lifted to vertical position in stages. Refer Sketch “COIL8” to “COIL10”.
17. If the post or any such structural members is obstructing the module of any bank behind back pass rear wall the module cannot be directly removed. Adjacent two modules are to be removed one by one then the exact module may be shifted towards either of the sidewalls to clear the structural members and can be removed.
18. The same procedure can be reversed for replacement of coils.
19. Maximum length of the coil is 250 mm less than the back pass depth.
20. Maximum width of coil is 250 mm
21. Maximum weight of coil is approximately 9 MT

Table 1 Suggestive Cutting Elevations of BP rear wall

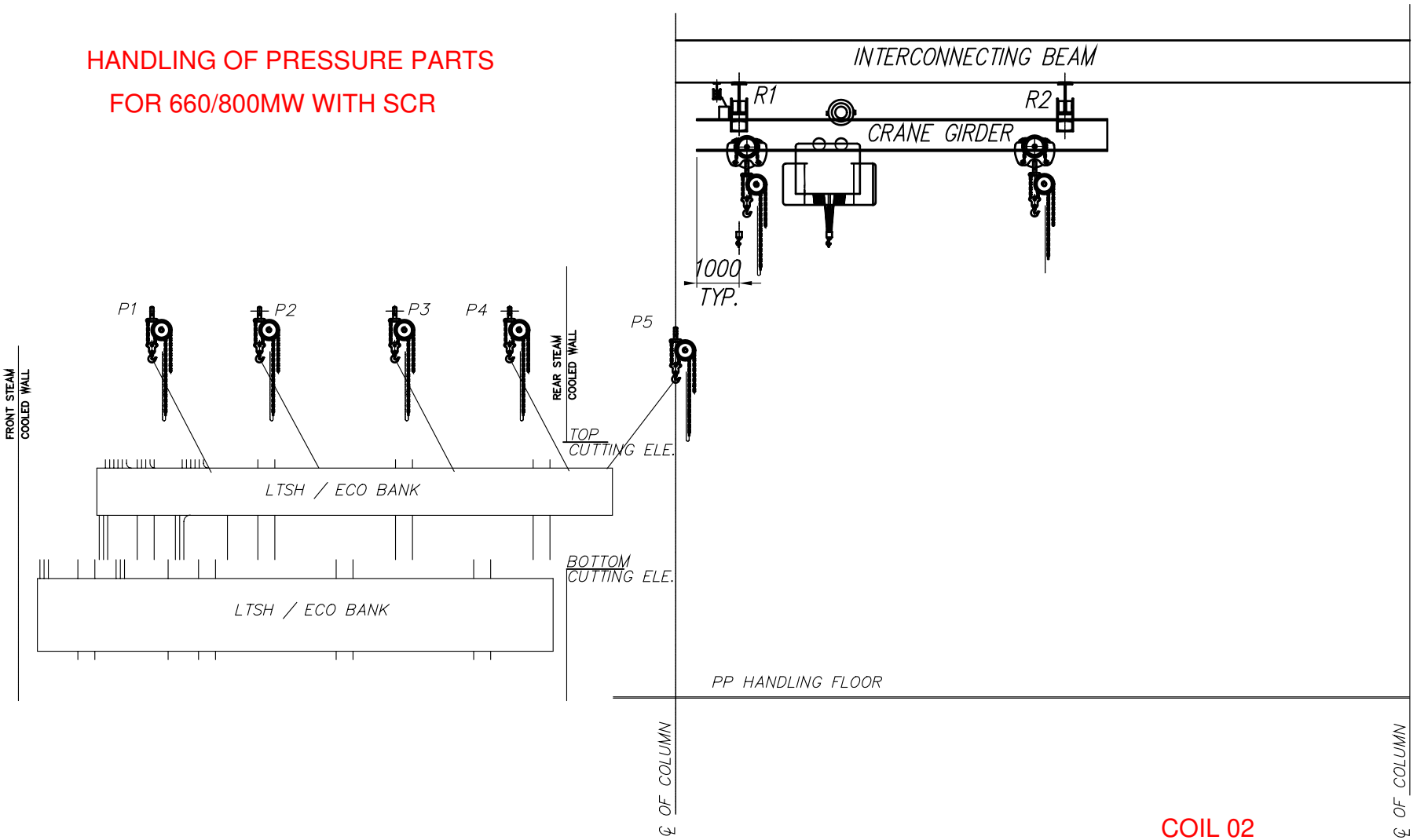
Economiser Coils	Top cutting elevation	260 mm below lower most LTRH coil element elevation adjacent to rear wall.
	Bottom cutting elevation	(1000 mm more than the maximum Height of Eco. Coil to be handled) below top cutting elevation or 350 mm above the topmost coil element directly below the coil to be handled whichever is at lower elevation.

HANDLING OF PRESSURE PARTS
FOR 660/800MW WITH SCR



COIL 01
SKETCH A- 01

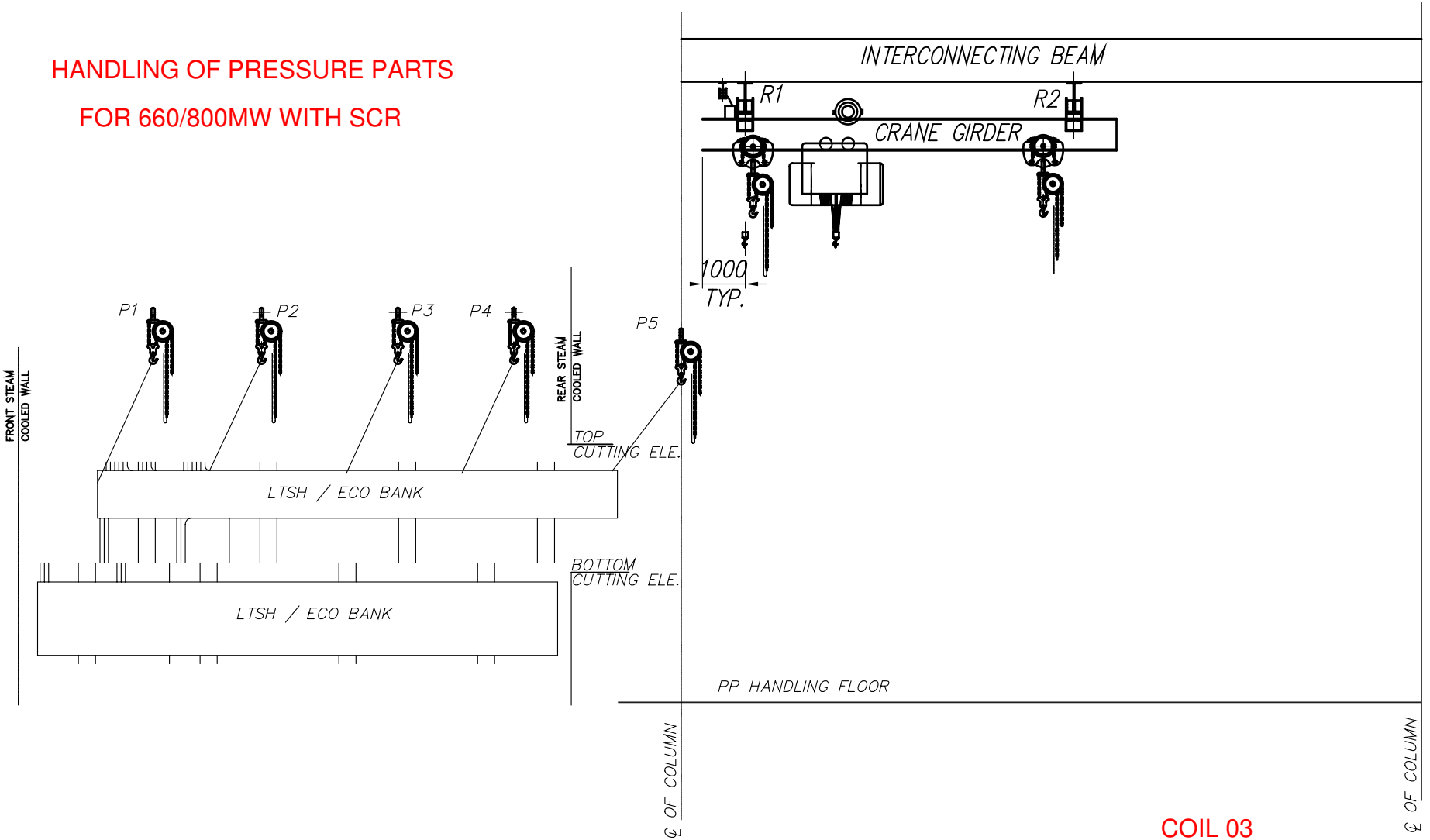
HANDLING OF PRESSURE PARTS
FOR 660/800MW WITH SCR



COIL 02
SKETCH A- 02

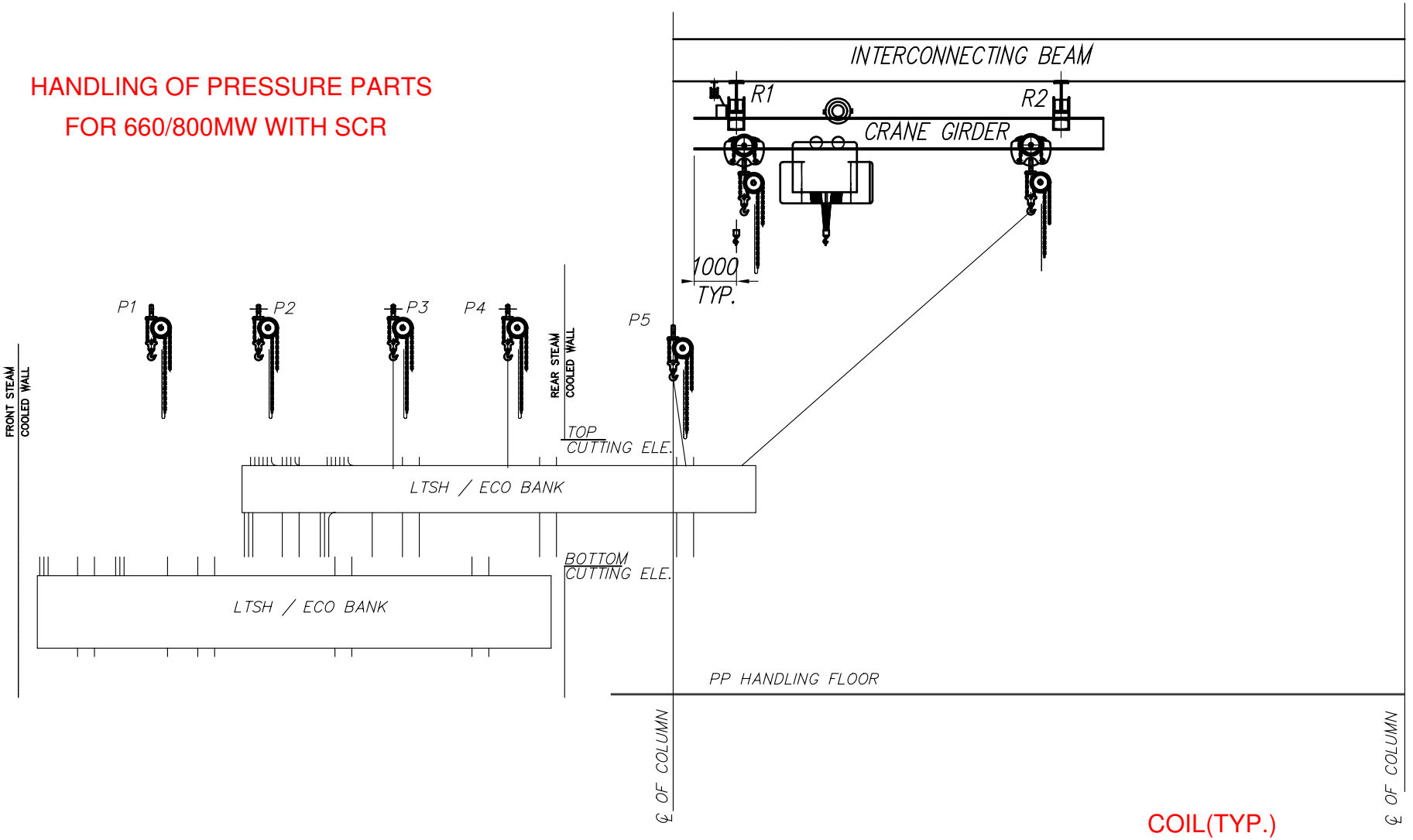
HANDLING OF PRESSURE PARTS

FOR 660/800MW WITH SCR



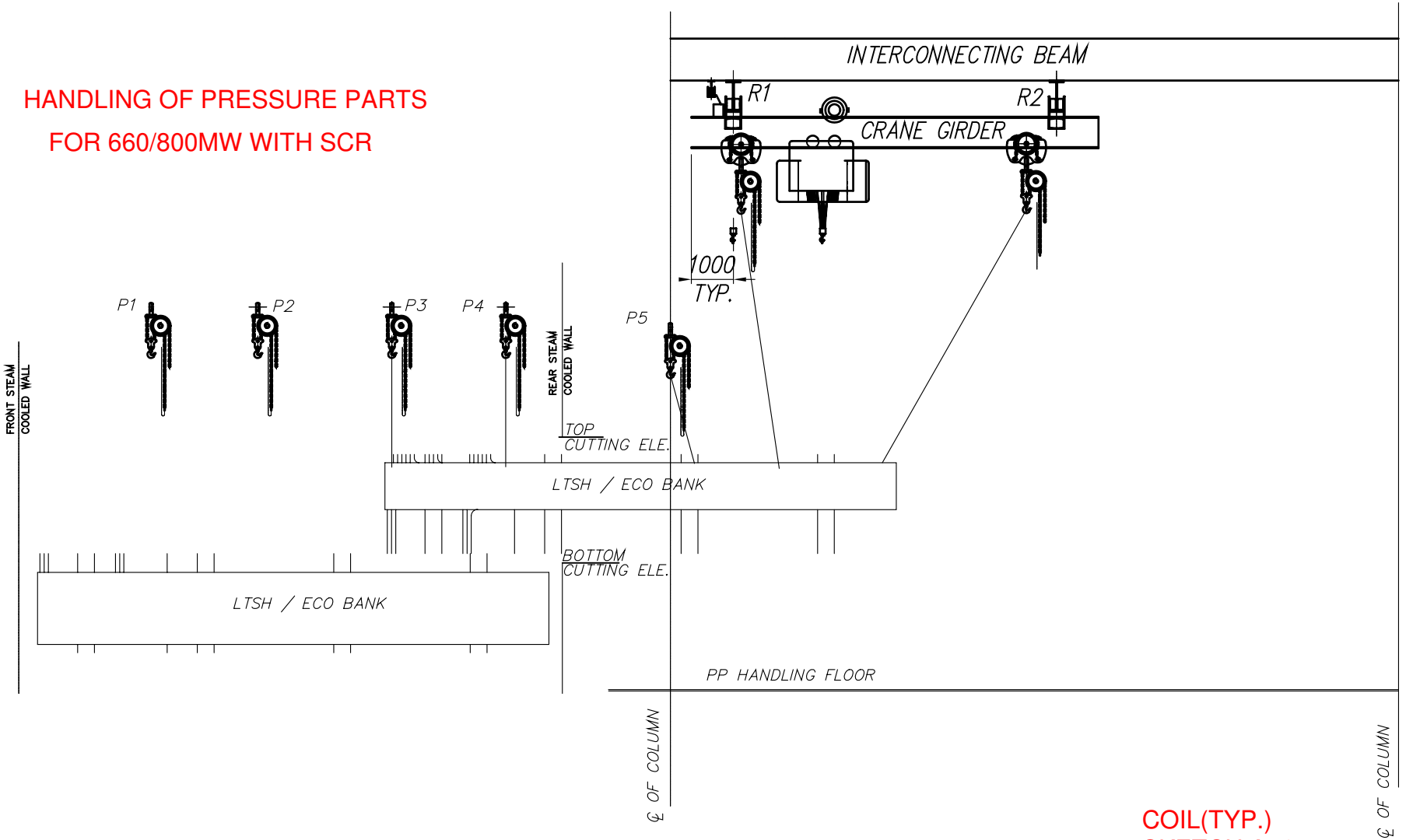
COIL 03
SKETCH A- 03

HANDLING OF PRESSURE PARTS FOR 660/800MW WITH SCR



COIL(TYP.)
SKETCH A- 04

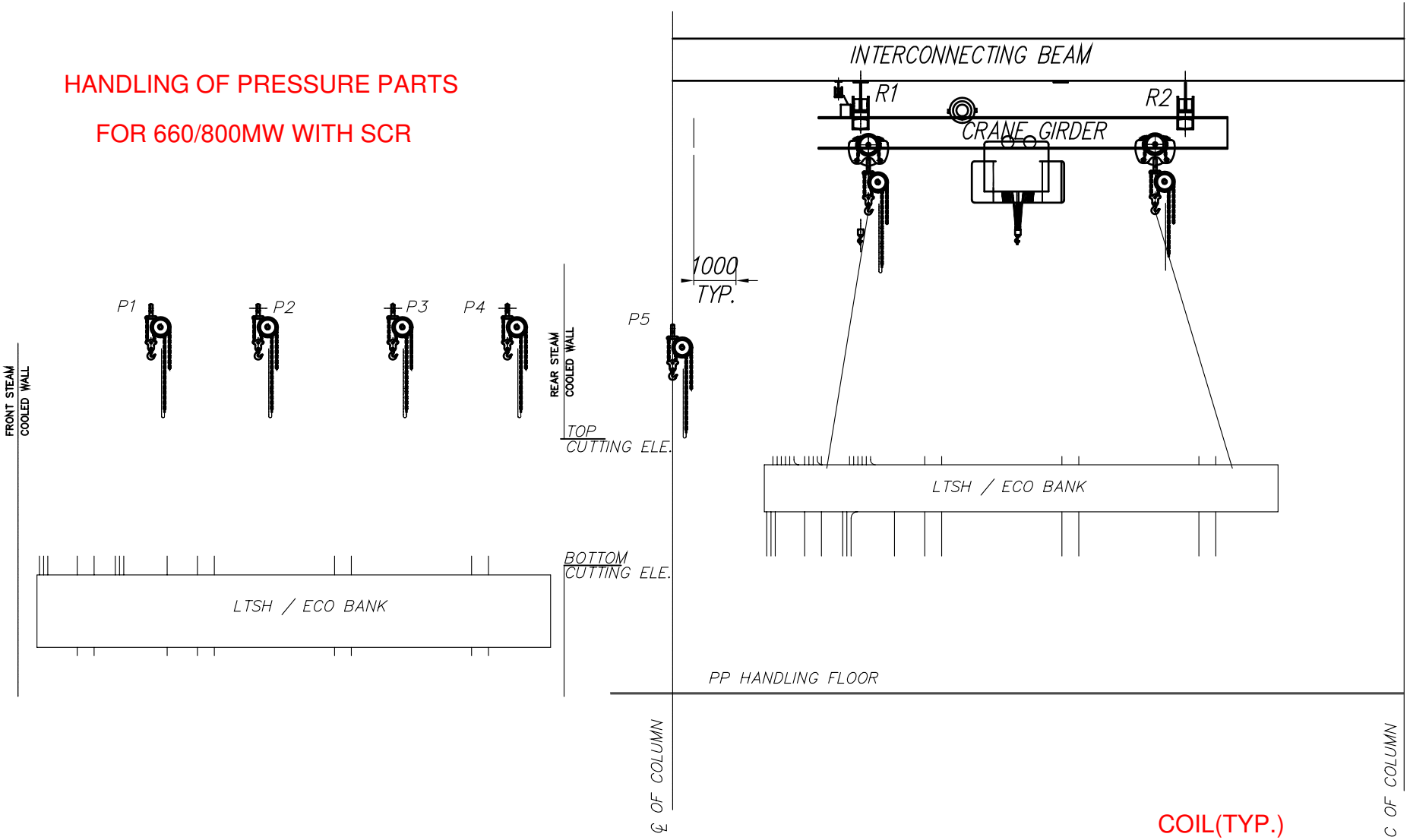
HANDLING OF PRESSURE PARTS
FOR 660/800MW WITH SCR



COIL(TYP.)
SKETCH A- 05

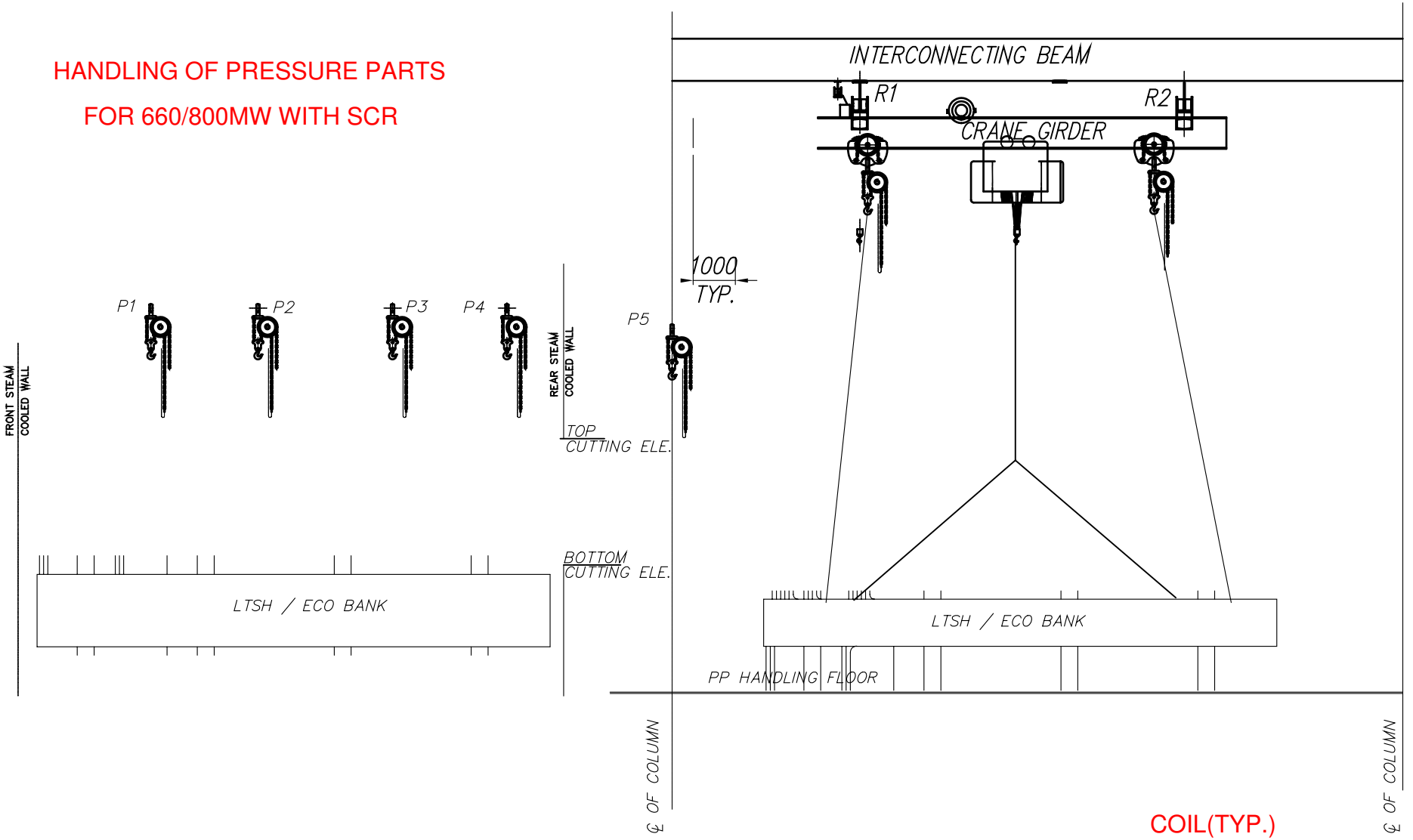
HANDLING OF PRESSURE PARTS

FOR 660/800MW WITH SCR



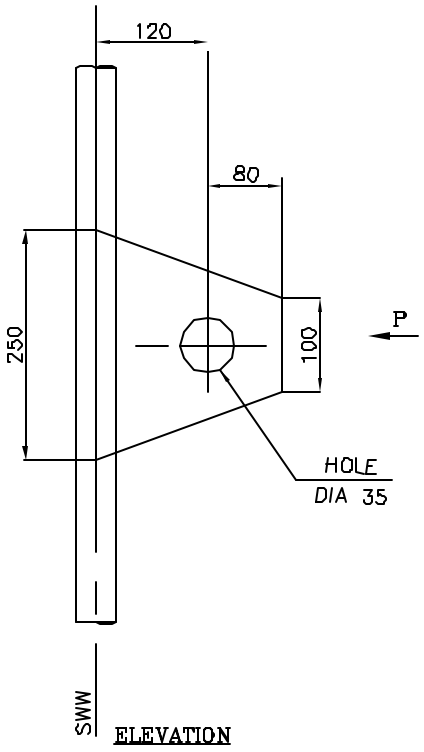
COIL(TYP.)
SKETCH A- 06

HANDLING OF PRESSURE PARTS
FOR 660/800MW WITH SCR

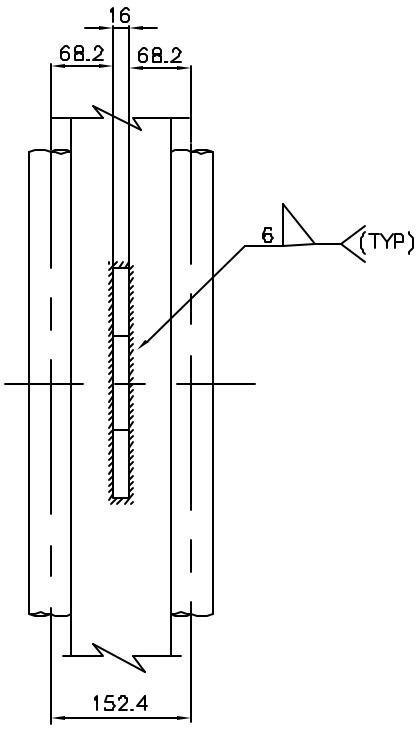


COIL(TYP.)
SKETCH A- 07

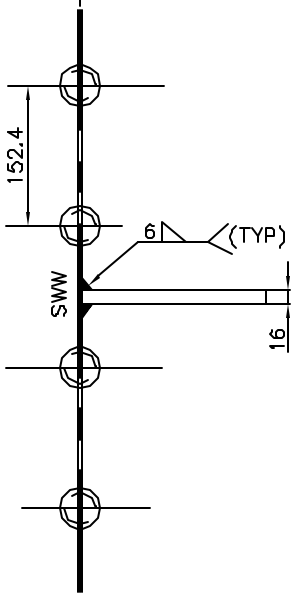
HANDLING OF PRESSURE PARTS
FOR 660/800 MW WITH SCR



ELEVATION



VIEW-P



PLAN

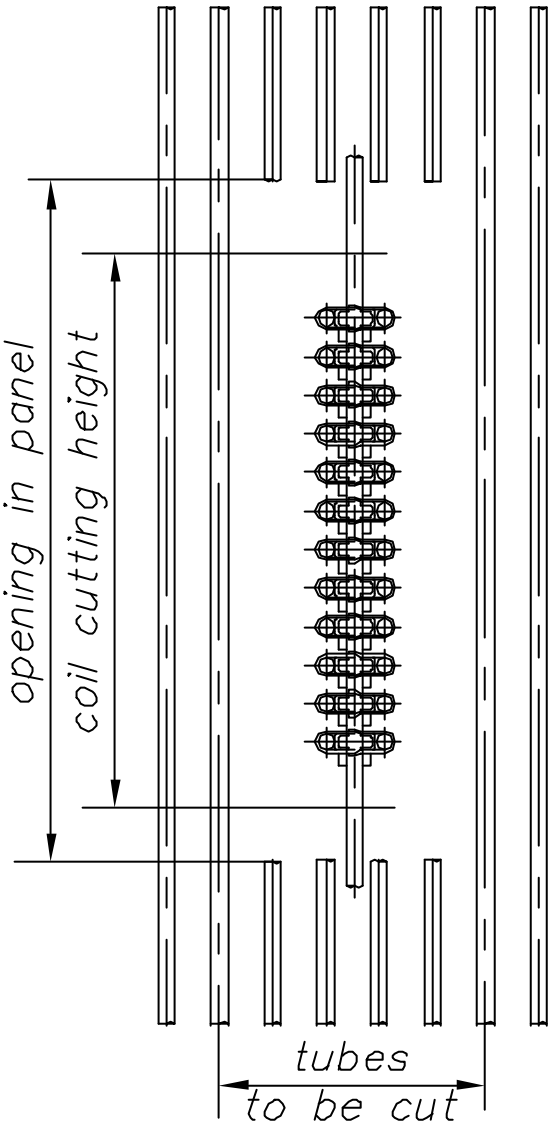
LUG DETAILS FOR WIRE ROPE TIEING
(WELDABLE ON SIDE WALL FINS)
MATERIAL IS2062 Gr.A

GEN. 01

SKETCH A-08

PPA

HANDLING OF PRESSURE PARTS FOR 660/800 MW WITH SCR



OPENING IN REAR WALL

Depending on the bank to be removed the opening is to be made in back pass rear wall.

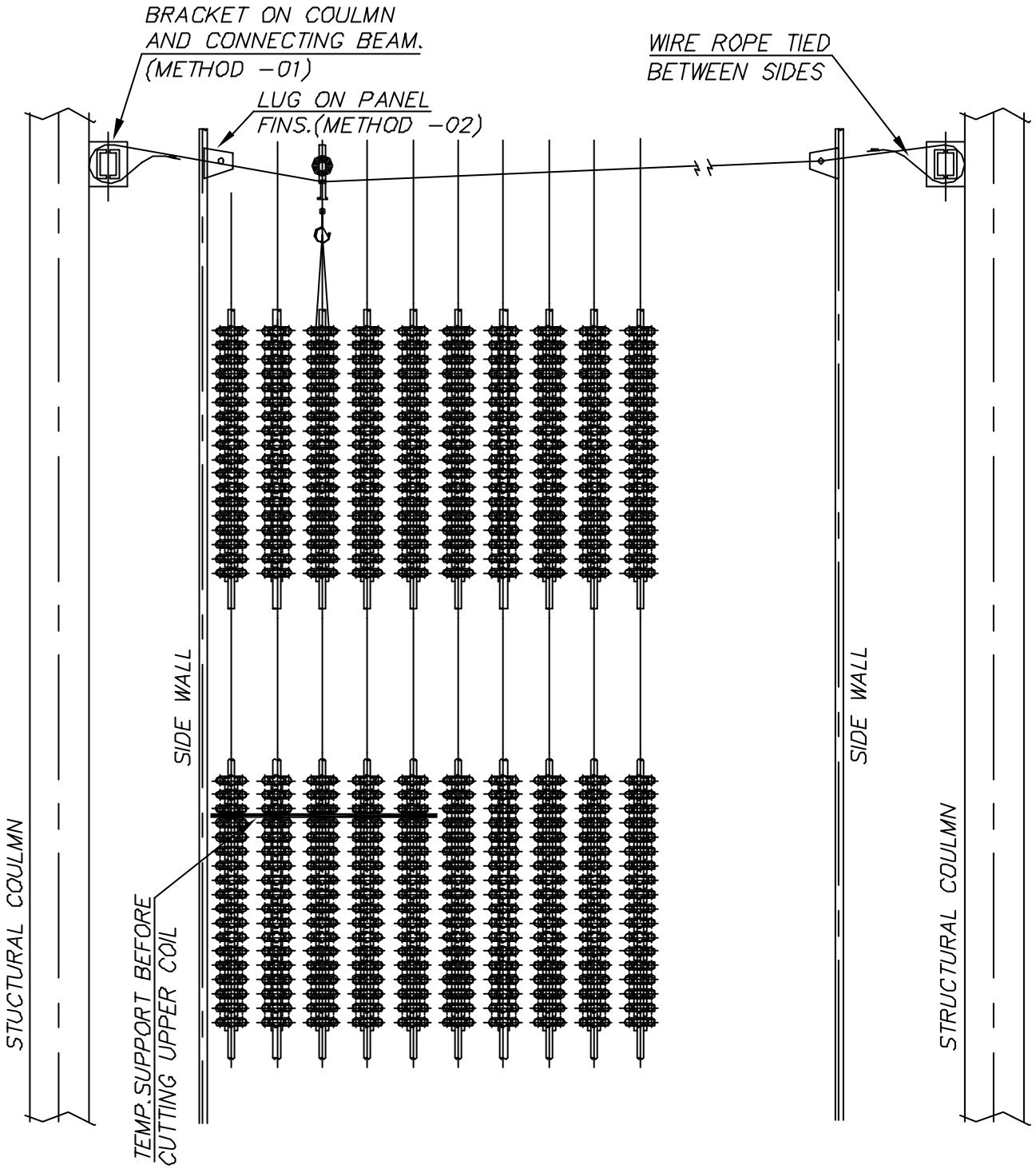
The opening height,cut and weld location are to be adjusted considering other restraints such as buckstays etc, so that rewelding of the tubes are accessable.

GEN. 02

SKETCH A-09

PPA

HANDLING OF PRESSURE PARTS
FOR 660/800 MW WITH SCR



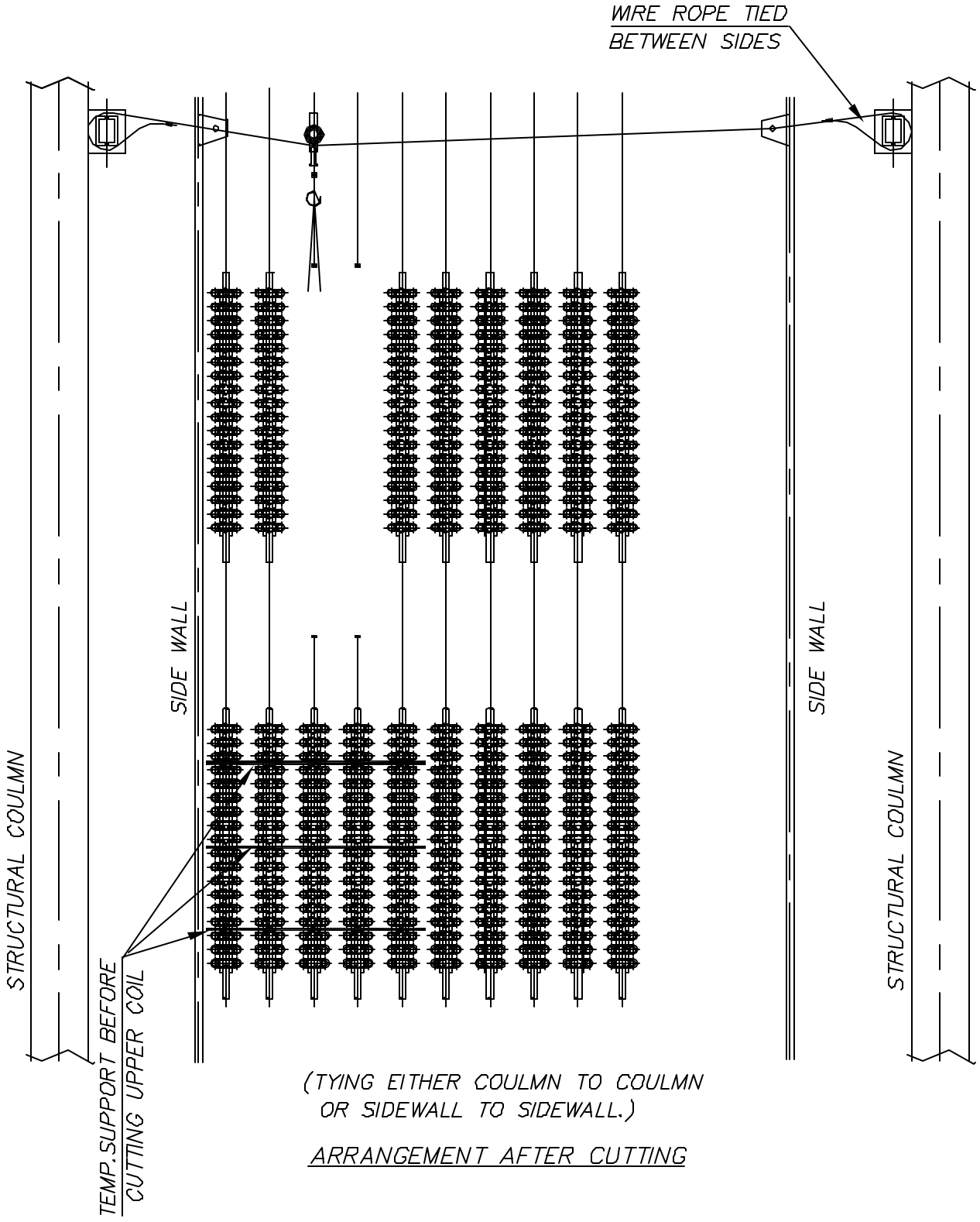
ARRANGEMENT BEFORE CUTTING

GEN. 03

SKETCH A-10

PPA

HANDLING OF PRESSURE PARTS
FOR 660/800 MW WITH SCR



(TYING EITHER COULMN TO COULMN
OR SIDEWALL TO SIDEWALL.)

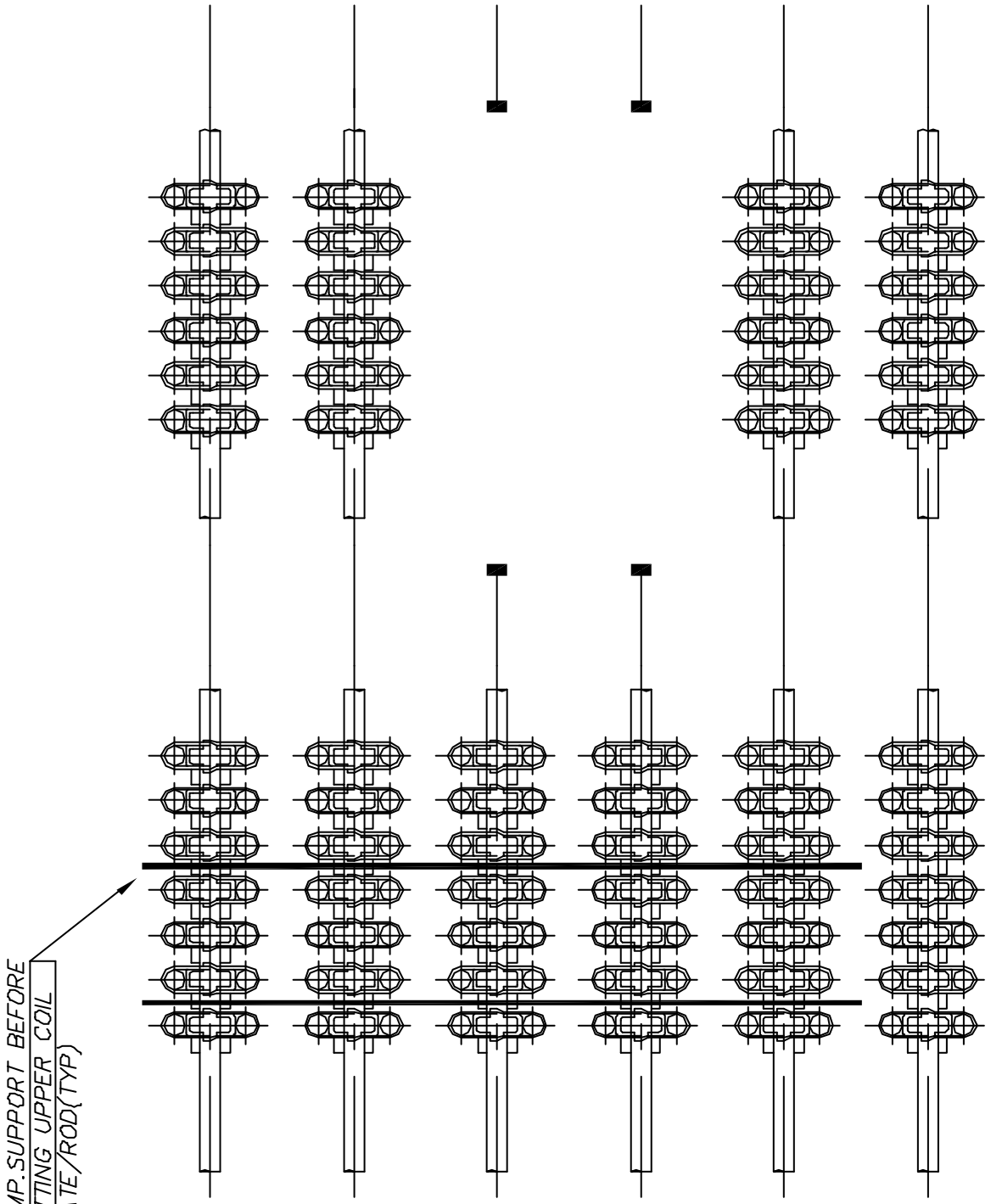
ARRANGEMENT AFTER CUTTING

GEN. 04

SKETCH A-11

PPA

HANDLING OF PRESSURE PARTS
FOR 660/800 MW WITH SCR



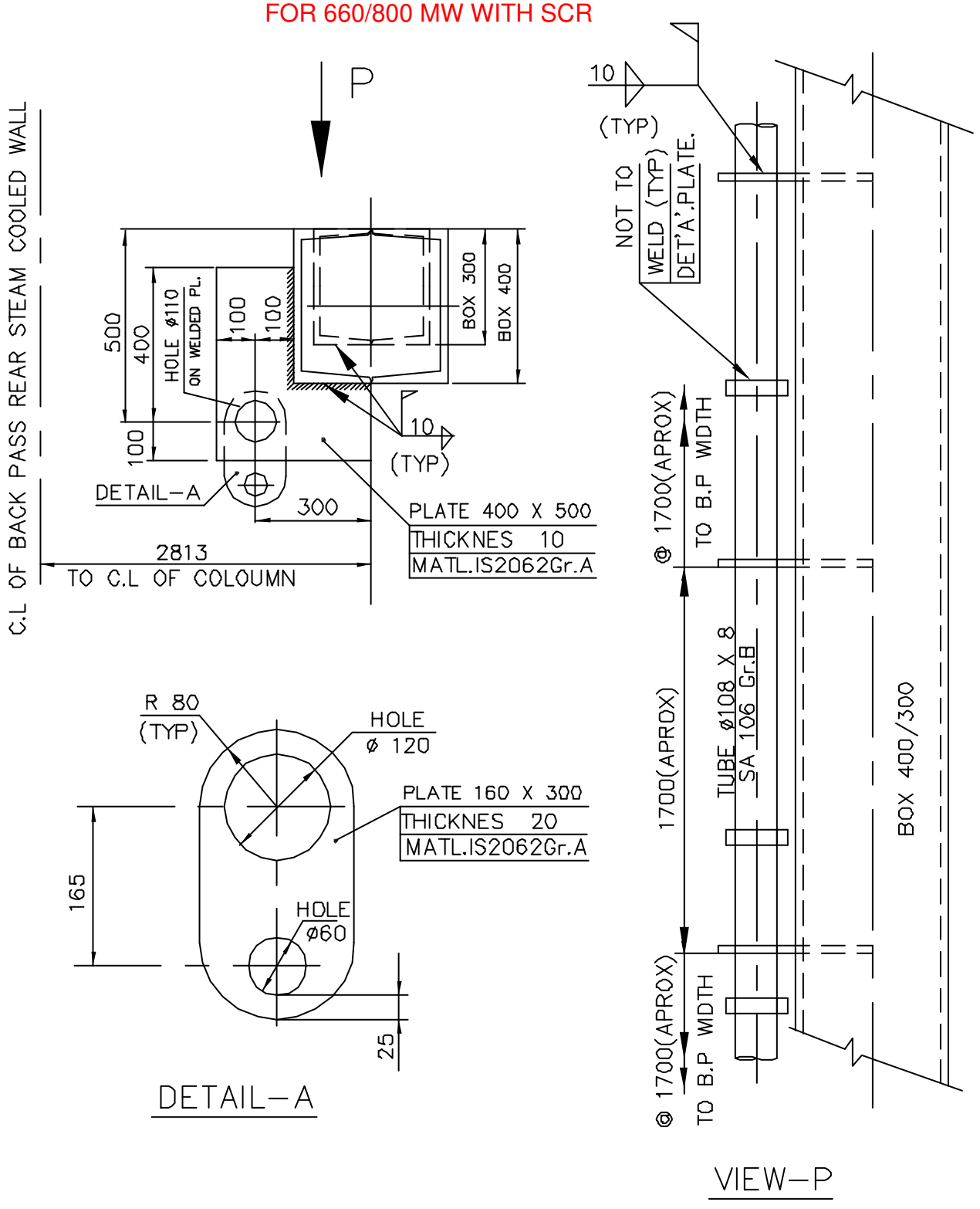
ARRANGEMENT AFTER CUTTING

GEN. 05

SKETCH A-12

PPA

HANDLING OF PRESSURE PARTS
FOR 660/800 MW WITH SCR



LUG ARRANGEMENT

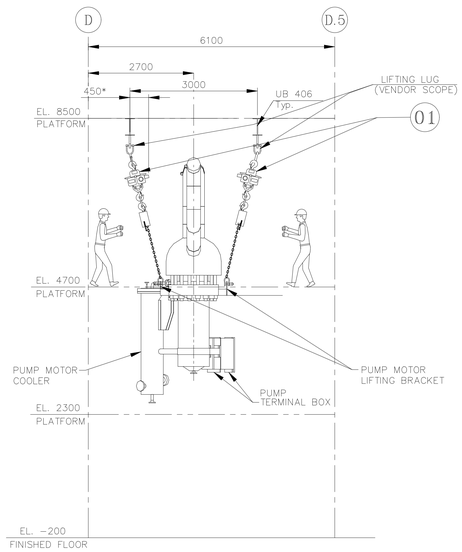
GEN. 06

SKETCH A-13

PPA

DRAWING NO: 0-99-300-40384

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299

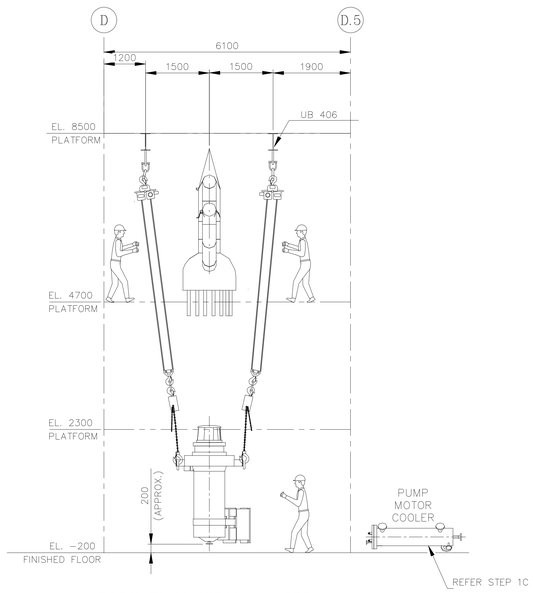


ELEVATION VIEW – STEP #1

(1A). DISCONNECT POWER SUPPLY AND STARTER BEFORE COMMENCING ANY WORK ON MOTOR.

(1B). DISCONNECT ALL THERMOCOUPLE AND DIAL THERMOMETER TO MOTOR.

(1C). REMOVE PUMP MOTOR COOLER AND ALL PIPING ASSOCIATED WITH IT TO PREVENT DAMAGE TO IT AND TO MAKE CLEARANCE FOR REMOVAL OF MOTOR.



ELEVATION VIEW – STEP #2

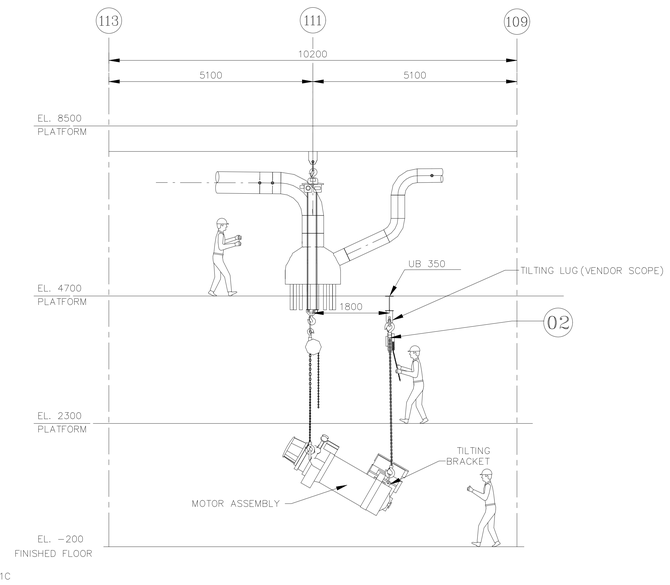
(2A). ATTACH 2 (TWO) SCREW PIN ANCHOR SHACKLES TO THE LIFTING BRACKETS ON THE MOTOR BODY TO ALLOW ATTACHMENT OF THE HOIST HOOKS.

(2B). ATTACH 2 (TWO) HAND CHAIN HOISTS TO THE LIFTING LUGS AND SHACKLES ON LIFTING BRACKETS ON MOTOR BODY.

(2C). MAKE HOIST AND CHAIN SLING TAUT, SO THAT THERE IS NO SLACK IN THEM. THEN REMOVE NUTS FROM PUMP CASE AND MOTOR BODY BOLTS.

(2D). BEGIN TO LOWER THE PUMP MOTOR BODY BY THE CHAIN HOISTS SIMULTANEOUSLY AND VERY SLOWLY AS TO AVOID DAMAGING THE BOLT THREADS AND THE PUMP IMPELLER.

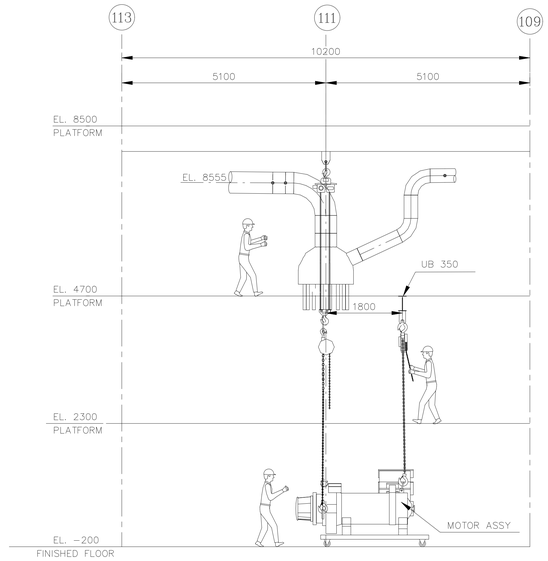
(2E). AFTER THE PUMP IMPELLER HAS CLEARED THE PUMP CASE VOLUTE, CONTINUE TO LOWER THE MOTOR BODY STRAIGHT DOWN TO GRADE, STOPPING ~200MM ABOVE GRADE AS TO AVOID DAMAGING MOTOR TERMINAL BOXES.



ELEVATION VIEW – STEP #3

(3A). ATTACH 2 (TWO) SCREW PIN ANCHOR SHACKLES TO TILTING BRACKET TO ALLOW ATTACHMENT OF THE HOIST HOOK.

(3B). CONTINUE TO LOWER THE MOTOR ASSEMBLY DOWN VERY SLOWLY. WHILE SIMULTANEOUSLY LIFTING THE LOWER PORTION, BY MEANS OF THE TILTING BRACKET TO A HORIZONTAL POSITION.



ELEVATION VIEW – STEP #4

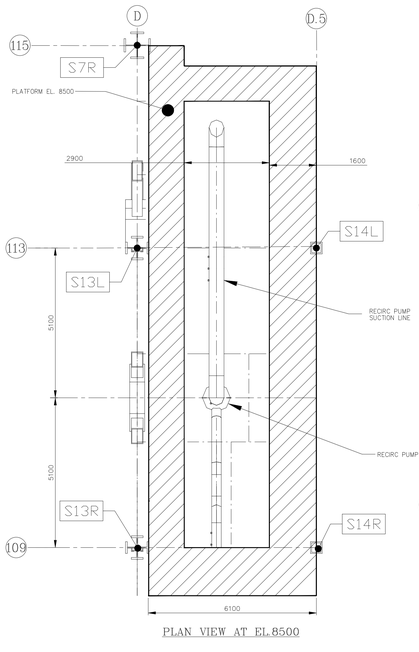
(4A). IN A HORIZONTAL POSITION, LOWER THE MOTOR ASSEMBLY ONTO APPROVED DOLLIES AND SAFELY SECURE PUMP MOTOR BODY TO MAKE READY FOR LATERAL TRANSPORT.

COMPONENT WEIGHTS	
ITEM	WEIGHT (Kg.)
DISMANTLED MOTOR	8000
PUMP + MOTOR	12000
MOTOR COOLER	1000

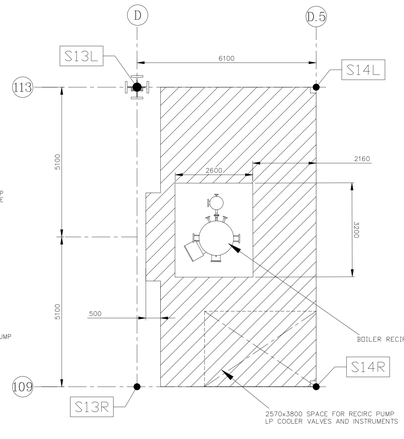
NOTES: –

1. REFERENCE DRAWINGS
   - A. 0-00-022-77413 -- GA OF BOILER SIDE ELEVATION
   - B. 0-00-021-77386 -- FLOOR PLAN AT EL. 0.000 & -200
   - C. 0-00-021-77387 -- FLOOR PLAN AT EL. 2300 & 4700
   - D. 0-00-021-77388 -- FLOOR PLAN AT EL. 8500
   - E. 0-00-022-77415 -- GA OF BOILER FRONT ELEVATION
2. ALL WORK DONE ON PUMP MOTOR SHOULD BE PERFORMED BY QUALIFIED PERSONNEL WHO HAVE READ AND UNDERSTOOD ALL INFORMATION AS PER MANUFACTURER'S REQUIREMENTS IN THE INSTALLATION, MAINTENANCE AND TECHNICAL DATA MANUAL.
3. POWER SUPPLY REQUIRED:
   POWER SUPPLY POINT 1M ABOVE OPERATING FLOOR AT COLUMN D5 SHALL BE PROVIDED BY BHEL/PEM. (SUPPLY RATING: 415VAC, 50HZ.)
4. NOTES TO VENDOR
   - A. SUPPLIER'S SCOPE STARTS FROM BHEL'S POWER SUPPLY POINT.
   - B. VENDOR ITEMS :-
     - I. POWER SUPPLY CABLE FROM SUPPLY POINT TO THE EQUIPMENT.
     - II. SWITCH FUSE UNITS AND ALL ELECTRICAL ITEMS FROM POWER SUPPLY POINT
     - III. ELECTRICALLY OPERATED LUG MOUNTED HOIST WITH CHAIN PULLEY BLOCK CAPACITY : 10.0TONS; LIFT : 6.000M.

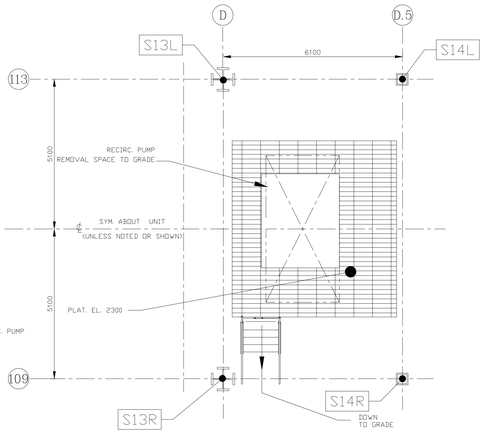
     (LUG MOUNTED ELECTRIC HOIST CAPACITY : 10.0TONS; LIFT : 10.000M. 2 Nos. per Pump & CHAIN PULLEY BLOCK CAPACITY : 10.0TONS LIFT: 1.00M :2 Nos. per Pump.)
     BOTH THE LUG MOUNTED HOISTS ARE TO BE INTERCONNECTED BY A SINGLE CONTROL PANEL FOR TANDEM OPERATION
5. MAXIMUM LOAD TO BE HANDLED : 8.0 TONS (WITH TWO HOISTS)
6. PROVIDE CLEAR SPACE FOR LOWERING CIRCULATING PUMP MOTOR UPTO THE GROUND LEVEL AS PER THE SPACE EAR-MARKED WITHOUT ANY INTERFERENCE AND ENCROACHMENTS..
7. ALL ELEVATION ARE WITH RESPECT TO EL.(0.00)m FINISHED FLOOR LEVEL OF TG BUILDING AS EL.0.00M, WHICH CORRESPONDS TO RL 209.0M. FINISHED FLOOR LEVEL OF BOILER AND ESP AREAS ARE AT (-0.200)m, BELOW FINISHED FLOOR LEVEL OF TG BUILDING.



PLAN VIEW AT EL.8500



PLAN VIEW AT EL.4700



PLAN VIEW AT EL.2300

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	GS	ZONE
	02	MANUAL HAND CHAIN HOIST CAPACITY 10T, LIFT 6.0M				SUB-DELY		L	200.000 / 1		
	01	TWH – ELEC.; CAP:10T LIFT : 10.0M W/CPB.				SUB-DELY		L	1700.000 / 2		
					VAR NO	MATERIAL SPECN		DI	QUANTITY		

DEVELOPMENT CONSULTANT PVT. LTD.

Reviewed only for general conformance with contract drawings and specifications; Contractor to be responsible for any error and for fulfilment of details requirements of contract documents.

CODE:- 4 DATE:- 11.06.2021

DISTRIBUTED BY:- SAURABH DAS

1	Approved	4	For information only
2	Approved Subject to compliance to comments, Proceed with manufacturing/construction. Revised document required to be submitted after incorporating the comments.	V	Null and Void (Not applicable)
3	Not Approved. Resubmission required		

SEE COVERING LETTER

LETTER REF.NO.:- 18V06-M47-LOT-BHEL-0850

CUSTOMER NO. 1727

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: MAHARASHTRA STATE POWER GENERATION CO.LTD. 1X660 MW BHUSAWAL TPS UNIT-6

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
355-055

	NAME	SIGNATURE	DATE
DRN	PREETAM KUMAR		21.11.2020
CHD	PREETAM KUMAR		21.11.2020
APPD	SHANKAR NAIK		21.11.2020

DEPT FS | CODE 129 | ALL DIMENSIONS ARE IN MM | PROJECTION | SCALE: AS NOTED | WEIGHT (Kg): - | REF TO ASSY / OLD DWG: -

TITLE: BOILER WATER RECIRCULTING PUMP MOTOR HANDLING ARRANGEMENT

DRAWING NO : 0-99-300-40384 | REV 00

PAINTING PROCEDURE

Surface Preparation and Surface Profile: SSPC-SP3/ Power Tool Cleaning

Primer Coat

Paint: Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744; DFT= 30µm per coat.

No of coats: 1 coat

Finish Coat

Paint: Synthetic Enamel paint (Long Oil Alkyd) to IS 2932: DFT= 20µm

per coat= 20µm per coat

No of Coats: 2 Coat

Final Shade: Smoke Grey Shade No: 692 of IS5

Prepared By **Quality Assurance**	VENKANNA RUPANI	R. Venkanna 18/05/2019

Reviewed by	Signature
Quality Assurance G. PANNEER SELVAM	18/05/19
Engineering G. SARAVANA KUMAR	18.05.2019
Materials Management / BOI PRATEEK KUMAR JAIN	Prateek 18/05/2019
Quality Control R. DHARMAR	18/05/19

Rev No	Date	Approved by	Signature
00	18/05/2019	AGM / QA & BE	18/5/19

Record of Revisions

Rev No	Details of Revision	Remarks
00	Fresh Issue	

MANUFACTURER'S NAME & ADDRESS: BHEL: TIRUCHIRAPPALLI APPROVED SUPPLIERS	STANDARD QUALITY PLAN PRODUCT: MANUAL HANDLING SYSTEM SUB-SYSTEM :Steam Generator and Auxiliaries	QWI NO: SQP:SD:34 REV NO: 00 DATE: 18/05/2019 PAGE: 2 OF 3

SL. NO	COMPONENT & OPERATIONS	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	M	C/N	7	8	9	D*	** 10			11
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**													
1.1	Plates/Rolled Sections for Frames, Crane Girder, End Carriage	Chemical & Mechanical Properties	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet, BHEL Specification & Relevant Applicable Standard	Lab Report	√		P	V	-	IS 2062
1.2	Gear/Pinion	Chemical & Mechanical Properties	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet, BHEL Specification & Relevant Applicable Standard	Lab Report	√		P	V	-	IS 2004 Cl 4 or 5 (45C8 / 55C8)
1.3	Pawl/Ratchet	Chemical & Mechanical Properties	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet & BHEL Specification	Lab Report	√		P	V	-	IS 2004 Cl 4 (45C8)
1.4	Load Chain	Calibration, Proof Load, Brake Load, Rolling over test	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet, BHEL Specification & Relevant Applicable Standard	Mfg/TC	√		P	V	-	BIS IS/ISO: 3077; BIS IS/ISO: 1834
1.5	Hand Chain	Calibration	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet & BHEL Specification	IR	√		P	V	-	Roll on Hand wheel.
1.6	Hooks as per IS-15560	Chemical & Mechanical Properties	B	Review of Documents	1 Sample per Lot		BHEL Approved Drawings / Data Sheet & BHEL Specification	Mfg/TC	√		P	V	-	IS: 2004 Cl 3A
1.7	Interlock Mechanism, if applicable	Dimensions & Locking Mechanism	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet & BHEL Specification	Mfg/TC	√		P	V	-	
1.8	Trolley Wheel, if applicable	Chemical & Mechanical Properties	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet, BHEL Specification & Relevant Applicable Standard	Lab Report	√		P	V	-	
1.9	Bearings & Fasteners	Type & Make	B	Review of Documents	100%	100%	BHEL Approved Drawings / Data Sheet & BHEL Specification	IR/COC	√		P	V	-	
2.0	**INPROCESS CONTROL**													
2.1	Welding Qualifications (if welding is involved)	Procedure	Major	Documents Review	100%	100%	AWS D1.1 / ASME Sec IX	PQR & WPS	√		P	V	V	
		Personnel	Major	Documents Review	100%	100%	AWS D1.1 / ASME Sec IX	WPQ	√		P	V	V	
2.2	Gear Cutting	Gear teeth dimensions & Hardness	B	Measure	100%	10%	As per BHEL Approved Drawing & BHEL Specification	IR	√		P	V	-	
2.3	Machining	Dimension	B	Measure	10%	10%	As per BHEL Approved Drawing & BHEL Specification	IR/COC	√		P	V	-	
2.4	Assembly	Visual and Dimensional	B	Visual	10%	10%		IR/COC	√		P	V	-	

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY THE SUPPLIER IN QA DOCUMENTATION;
**** M:** MANUFACTURER, **C:** BHEL QC/BHEL AIA, **N**: CUSTOMER; **P:** PERFORM. **W**: WITNESS, V: VERIFICATION; **CLASS**: A - CRITICAL; B - MAJOR; C – MINOR;
MTC- Manufacturer's Test Certificate; IR- Inspection/Test Report; COC: Certificate of Compliance; (R): Routine test; (T)/(Ts): Type test.

MANUFACTURER'S NAME & ADDRESS: BHEL: TIRUCHIRAPPALLI APPROVED SUPPLIERS	STANDARD QUALITY PLAN PRODUCT: MANUAL HANDLING SYSTEM SUB-SYSTEM :Steam Generator and Auxiliaries	QWI NO: SQP:SD:34 REV NO: 00 DATE: 18/05/2019 PAGE: 3 OF 3

SL. NO	COMPONENT & OPERATIONS	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	M	C/N	7	8	9	D*	** 10			11
2.5	Butt welds	Soundness	B	RT	100%	100%	AWS D1.1 / ASME Sec IX		IR	√	P	V	-	
2.6	All structural & fillet welds and gears	LPI/MPI	B	NDE	100%	100%	ASTM E165/ E709	No relevant indication & Cracks	IR	√	P	V	-	
2.7	Hooks, IS-15560	a) Dimensions & Proof Load Test	B	Measurement & Testing	As per Standard		IS- 15560	BHEL Specification	Mfg/TC	√	P	V	-	
		b) LPI/MPI*	B	NDE	100%	100%	ASTM E165/ E709	No relevant indication & Cracks	IR	√	P	V	-	*After proof load test.
		c) UT* on Hooks > 5T	B	NDE	100%	100%	ASTM A388	ASME Sec VIII Div 2 Cl 3.3.4	IR	√	P	V	-	
3.0	**FINAL ASSEMBLY & TESTING**													
3.1	Final Inspection	Load Test	B	Testing & Measurement	100%	One per each type & capacity	IS: 3832; BHEL Approved Data Sheet & BHEL Specification		Mfg/TC	√	P	W	-	
		Functioning of Brake system & smooth running	B	Testing & Visual	100%		IS: 3832; BHEL Approved Data Sheet & BHEL Specification		Mfg/TC	√	P	W	-	
		Capacity/Lift	B	Testing & Measurement	100%		IS: 3832; BHEL Approved Data Sheet & BHEL Specification		Mfg/TC	√	P	W	-	
4.0	**PAINTING & PACKING**													
4.1	Surface Cleaning & Protection	Surface condition & Painting – Shade, DFT	B	Visual	100%	10%	As per PO & BHEL Specification		IR	√	P	V	-	
4.2	Identification & Packing	Name Plate & Details of Model No, Type, Capacity, Lift, Span, Motor & Brake, etc.; Stability	B	Verification	100%	10%	As per PO & BHEL Specification		IR	√	P	V	-	
4.3	Spares, if applicable	List of Spares & Applicable reports	B	Verification	100%	10%	As per PO & BHEL Specification		IR	√	P	V	-	

Notes: 1. Customer stages specified above, under column "N", shall be followed. Additional Customer witness/verification stages, if required, shall be as specified in BHEL PO.
2. The latest editions/ revisions of the above mentioned /referred standards / procedures /specifications shall be used.

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY THE SUPPLIER IN QA DOCUMENTATION;
**** M:** MANUFACTURER, **C:** BHEL QC/BHEL AIA, **N**: CUSTOMER; **P:** PERFORM. **W**: WITNESS, V: VERIFICATION; **CLASS**: A - CRITICAL; B - MAJOR; C – MINOR;
MTC- Manufacturer's Test Certificate; IR- Inspection/Test Report; COC: Certificate of Compliance; (R): Routine test; (T)/(Ts): Type test.

BANK GUARANTEE FOR PERFORMANCE SECURITY

(Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s))

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

IFSC AND MICR CODE

Dear Sirs,

1. In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____[1] through its Unit at……..(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) (VENDOR CODE) with its registered office at_____[2] hereinafter referred to as the ' Vendor / Contractor / Supplier ', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……..[3] valued at Rs……[4] (Rupees ----------)/FC……(in words……..) for ……[5] (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to ……% (…. Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

2. we, ……, (hereinafter referred to as the Bank), having registered/Head office at …….. and inter alia a branch at …… being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs ---------- [6] (Rupees ----------) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

3. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

4. We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

5. The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

6. We the …….bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

7. We……..BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

8. The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier's liabilities.

9. This Guarantee shall remain in force upto and including…….. [7] and shall be extended from time to time for such period as may be desired by Employer.

10. This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

11. Unless a demand or claim under this guarantee is made on us in writing on or before the …….[8]we shall be discharged from all liabilities under this guarantee thereafter.

12. Any claim or dispute arising under the terms of this document shall only be enforced or settled in the Courts at Tiruchirappalli.

13. We……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [6]

b) This Guarantee shall be valid up to …….[7]

c) Unless the Bank is served a written claim or demand on or before (minimum 3 to 6 months from the expiry date [8] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

14. We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated…….
Place of Issue……..

BANK EMAIL ID:

BANK PHONE NO:

AUTHORISED SIGNATORIES CELL PHONE NO:

BANK FAX NO:

[1] *NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited*

[2] *NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.*

[3] *DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE*

[4] *CONTRACT VALUE*

[5] *PROJECT/SUPPLY DETAILS*
[6] *BG AMOUNT IN FIGURES AND WORDS*

[7] *VALIDITY DATE*

[8] *DATE OF EXPIRY OF CLAIM PERIOD*

List of Consortium Banks	
Sl. No.	**Name of the bank**
1.	State Bank of India
2.	Canara Bank
3.	Axis Bank
4.	Bank of Baroda
5.	Central bank
6.	Citi Bank N.A.
7.	Deutsche Bank
8.	Exim Bank
9.	Federal Bank Limited
10.	HDFC Bank Limited
11.	Hongkong and Shanghai Banking Corporation Limited
12.	Indian Bank
13.	ICICI Bank Limited
14.	IDBI Bank Limited
15.	IndusInd Bank Limited
16.	Indian Overseas Bank
17.	Kotak Mahindra Bank Limited
18.	Punjab National Bank
19.	RBL Bank Ltd.
20.	Standard Chartered Bank
21.	Union Bank of India
22.	Yes Bank Limited