

# EASTERN COALFIELDS LIMITED



ADDITIONAL COAL HANDLING PLANT (10 MTPA)  
AT  
RAJMAHAL OCP

TECHNICAL SPECIFICATION  
FOR  
SUPPLY, FABRICATION, ERECTION & CLADDING WORK  
OF  
STEEL STRUCTURAL WORKS

PACKAGE No: P-2A  
T.S. No. MEC/11/12/Q7NC/TS/201



**MECON Limited**  
Ranchi – 834 002

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**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

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REVISION STATUS AMENDMENT - RECORD SHEET

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**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



**CONTENTS**

<b>Sl. No</b>	<b>Description</b>	<b>Page. No.</b>
1.	Section 01 - Scope and General Description of Steel Structural Works	01
2.	Section 02 – Supply and Fabrication of Steel Structures	06
3.	Section 03 – Erection of Fabricated Steel Structures	20
4.	Section 04- Painting of Steel Structures	28
5.	Section 05- Supply and Erection of Cladding Works	30
6.	Section 06 to 09 – Measurement, Acceptance, Time Schedule etc.	32
7.	Annexure A: Schedule of Quantities	35
8.	Annexure B: Tender Drawings	38

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



---

**SECTION 01: SCOPE AND GENERAL DESCRIPTION OF STEEL  
STRUCTURAL WORKS**

**1.1. Preamble**

The present Tender document envisages fabrication, erection, side cladding and painting of steel structures for transportation of coal received from the Rajmahal OCP including supply of all materials. Also, all material, consumables, fixtures etc. required for the aforesaid work shall be borne by the contractor without any additional cost.

The handling capacity of the Rajmahal additional CHP has been envisaged of 10.0 Mtpa. The surface miner coal and the coal obtained by drill blasting technique received from the tipping trucks/ dumpers and subsequently reclaimed by the electro-mechanical vibratory feeder and after two stage crushing of coal obtained by drill blasting technique shall be transported through belt conveyor to over ground storage bunker for further reclaim through plough feeders and transported by belt conveyors to loading silo with RLS system for loading into rail wagons.

**Location**

The proposed plant site is located in the Godda District of Jharkhand. The area is easily accessible being connected with the Godda-Pirpaiti PWD road. The nearest railway station is at Pirpaiti on the Sahibganj loop of the Eastern railway, about 30km from the project site.

**1.2. Scope of Work**

The scope of work of the successful tenderer/bidder (contractor) includes, but not limited to, the following.

1. Supply of fabricated steel structures and erection of fabricated structures as per issued Structural fabrication drawings/ design drawings. Also, all cladding work and painting work for all the steel structures complying with the relevant provisions of Technical Specification.
2. Procurement of all materials like raw steel, colour coated steel sheet, FRP sheets, paints, primers etc. at contractor's cost required for above work.
3. Procurement of all materials like bolts, nuts, washers, etc. at contractor's cost required for above work.

# MECON LIMITED

COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP

## TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



4. Procurement of all materials like fixtures, self-tapping screws, washers, wind ties, fasteners etc. required for roof & side cladding etc. at contractor's cost required for above work.
5. Purchase of consumables like electrodes for welding, gases for gas cutting etc. at contractor's cost required for above work.
6. Arrangement/ Purchase/ Hiring of plant & machinery, tools tackles instruments at contractor's cost required for above work for fabrication and erection.
7. Conducting testing of materials and NDT at contractor's cost.
8. Providing transport and handling at contractor's cost.
9. Deploying and making payment of requisite skilled and unskilled manpower by the contractor.
10. Providing all services like approach to site, electricity, water etc. Power supply and water shall be arranged by tenderer of his own (like DG set etc.). In case, electricity & water is provided by purchaser, the same shall be on chargeable basis at prevailing rate as decided by purchaser.
11. Fabrication of structures including steel, their transport and proper storing at site.
12. Erection of all the fabricated steel structures, claddings, gutters, downpipes etc.
13. Erection of side sheeting and roof sheeting including the supply of sheets.
14. Application of primers/ paints at shop after fabrication and at site after erection.
15. Providing all reasonable facilities for inspection by purchaser.
16. Conducting NDT as stipulated by the Owner and making test results available to Owner/ Consultant/ client for evaluation without any extra charges.
17. Compliance with primary acceptance tests / inspection, liquidation of defects, compliance with final acceptance tests / inspection, liquidation of defects.
18. Carrying out field-engineering decisions as desired by the Owner/client.
19. Maintaining adequate safety and security of the raw materials, fabricated structures, and erected structures against theft, accidents etc. till the same are handed over.
20. Any other work deemed incidental for the completion of the overall work but not included in the above detailed scope without any extra charges.

### 1.2 Safety

The successful tenderer/bidder (contractor) shall ensure that the safety requirements are met in respect of men, materials, adjoining structures, equipment etc. and shall be totally responsible in case any mishap occurs due to negligence or otherwise. In this connection the contractor shall strictly adhere to the rules norms and regulations as applicable in the plant. The successful tenderer shall

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



strictly adhere to the safety regulations mentioned therein. The penalties for violation of safety norms as per purchaser stipulations are applicable.

### 1.3. Site Visit

Before submission of tender, the Tenderer shall inspect the site to study the nature and extent of work involved and also to obtain first-hand information regarding site condition. The Tenderer shall consider all such aspects in the quoted rate carefully and no claim whatsoever shall be entertained later on the plea of ignorance of site conditions.

### 1.4 General Description of Structures

Steel structural work shall cover all building structures of crusher house, conveyor galleries, junction houses, bunker building, sampling house, rapid loading system, parking sheds, pump house, DG station, other buildings etc. but not limited to these.

The structural work shall be complete in all respects for proper functioning of all the plants and equipment.

### 1.5 List of Steel Structures.

The structures include, but not limited to, the following:

- Columns, Column bracings.
- Stairs, ladders and crossovers with safety hoops.
- Handrails, Roof Handrails.
- Walkways with chequered plate / grating.
- Working platforms, maintenance platforms, Gable Platforms.
- Storage Bins/ hoppers, Roof Trusses, Roof Girder.
- Girders, Monorail Beams & Supports.
- Purlins, Floor Beams, Sheeting Posts, Side runners, Louvres, Bracings, Sag angles, Sag rods, wind-ties on roof.
- Steel gates, doors.
- Wind girders, Gutters and Down comers.
- Roof & side Cladding with Colour coated metallic sheets/ FRP Sheets.
- Rail & Rail Fixtures.
- Any other structure not listed above, required for completion of the project.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



## 1.6 General provision

### 1.6.1 Types of Construction

The steel structures shall generally be of shop-welded construction.

Site connections shall generally be provided by

- a) Welding with erection bolts after tightening.
- b) Bolting with turned and fitted or high strength friction grip (HSFG) bolts.
- c) Bolting with black bolts/ H.T. bolts.

Elements shall be fabricated in largest possible sizes optimal with transport requirements to minimize site work. Important members shall be assembled under control assembly in manufacturing shop to prevent mismatch at site.

### 1.6.2 Splices in structures

Shop splice: Where shop splices in plates are necessary due to non-availability of plates in required lengths, full penetration defect free sound butt welds shall be made. Shop splice in rolled steel angle, joists and channels shall be developed by fillet welding and cover plates/angles etc.

Site splice: Site splice for members required due to transportation, assembly and erection facilities shall be developed by fillet welds and cover plates or angles with bolts. In case, butt welding in plates is employed for site splice, the same shall be sound, defect free and full penetration. Site welded butt joints shall be 100% ultrasonically tested and without any defects.

### 1.6.3 Storing materials

All materials shall be stored properly on skids, above the ground. It shall be kept clean and properly drained, especially after through primer painting. Structural steel shall be so stored and handled that members are not subjected to excessive stresses and damage. Girders and beams shall be placed upright and stored. Long members such as columns and chords shall be supported on closely spaced skids to prevent damage from deflection. Till handing over, safety of fabricated/ erected items against accidents/ theft is the responsibility and liability of the contractor.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



#### 1.6.4 Workmanship

All workmanship shall be at par with the best practice in modern structural shops. Greatest accuracy shall be observed in the manufacture of every part of the work and all similar parts shall be strictly interchangeable. The erection clearance for cleated ends of members connecting steel to steel should not be greater than 2mm at each end. The erection clearance at ends of beams without web cleats should not be more than 3mm at each end, but where for practical reasons the greater clearance is necessary, suitably designed seatings or connections shall be provided. Holes for bolts shall be drilled to conform to appropriate clause of IS:7215 (1974). No holes shall be made by gas cutting process. Shearing or flame cutting may be used provided that a mechanically controlled cutting torch shall be used for the flame cutting and that the resulting edge shall be reasonably clean and straight. Sheared members shall be free from distortion at sheared edges. Special care shall be taken to remove the burnt edges of high tensile steel when flame cutting method is employed. When gas cutting is adopted, the flame cut edges shall be machined. The Tenderer shall furnish a plan of quality assurance in respect of fabrication and erection which he proposes to follow for the purpose of assuring the quality of material and workmanship at various stages. The Quality Assurance Plan (QAP) shall be mutually discussed and approved by the Purchaser and shall be followed for all structural works.



**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



## SECTION 02: SUPPLY AND FABRICATION OF STEEL STRUCTURES

### 2.0 Scope of Work:

2.1 The scope of work includes, but not limited to, the following:

- a) Supply of fabricated steel structures in accordance with approved fabrication drawing. Procurement of required steel for fabrication/ erection with test certificates/ tests from approved test centres shall be under scope of the contractor.
- b) Supply of all fabricated steel structures from fabrication shop including loading, transportation, unloading and stacking and storing on skids or supports.
- c) Supply of all consumables like bolts nuts, washers, electrodes, paints, shims, packs, etc., including allowance for spares and wastage.
- d) Cold straightening of section and plates, whenever they are bent and kinked.
- e) Fabrication of all steel structural components covered under design drawings and generally described under the scope of the project.
- f) Making arrangements for and conducting tests, such as chemical analysis, physical and mechanical tests on raw materials where specified/as directed by the purchaser at the cost of the tenderer.
- g) Making arrangements for providing all facilities for conducting ultrasonic, X-ray or gamma ray tests of welds; getting the tests conducted by reputed testing laboratories making available test films/graphs, reports and interpretation at the cost of the tenderer.
- h) Control Assembly of steel structure components at shop, wherever required.
- i) Preparation of steel structural surfaces for painting as provided in the specifications/drawings.
- j) Application for one coat of primer at shop, as specified in the design drawing/specifications.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



- k) Loading, transportation of fabricated structures from fabrication workshop to site of erection and unloading of all steel structural components/units/ assemblies.
- l) Cleaning of the site. All the waste material generated during the course of fabrication shall be disposed by the contractor regularly and the area shall be kept neat and clean.

## 2.2 Fabrication General

- 2.2.1 Fabrication of steel structures shall conform to IS: 800 - 2007 and tolerances of fabrication of structures shall be as per IS: 7215-1974 unless otherwise specified.
- 2.2.2 All materials shall be straight and if necessary, before being worked shall be straightened and/ or flattened by pressure unless required being in curvilinear form and shall be free from twists.
- 2.2.3 Edge preparation for welding may be done by machine-controlled flame cutting with edges free of burrs, clean and straight. The butting surfaces at all joints of girders or columns shall be planed so as to butt in close contact throughout the finished joint.
- 2.2.4 Holes for bolts shall be drilled to conform to clause 10 of IS: 7215 -1974. All holes shall be drilled to required size or sub punched 3mm less in diameter and reamed thereafter to the required size. No holes shall be made by gas cutting process.
- 2.2.5 The steelwork shall be temporarily shop assembled as necessary so that accuracy of fit may be checked before despatch. The parts shall be shop assembled with a sufficient number of parallel drifts to bring and keep the parts in place. Since parts drilled or punched, with templates having steel bushes should be similar and so interchangeable, such steel work may be shop erected in part only as agreed by the Purchaser.
- 2.2.6 Each fabricated member whether assembled prior to despatch or not so assembled, shall bear an erection mark, which shall help to identify the member and its position in respect of the whole structure, to facilitate re-erection at site. These erection marks shall be suitably incorporated in the shop detail and erection drawings.
- 2.2.7 All edge preparations for welding will conform to IS:9595.
- 2.2.8 Fabrication shall in general follow the provisions of IS:800, and good engineering practice.
- 2.2.9 Tolerance in fabricated steel work shall be as per IS: 7215.
- 2.2.10 Structural fabrication/ design drawings shall be issued to the successful tenderer after award of contract. Based on the Fabrication drawings contractor shall procure the raw steel, fabricate the steel structures, erect the fabricated steel

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



structures, paint the steel structures including supply of paints, erect the side sheeting and roof sheeting including the supply of sheets

### 2.3 Material of Construction

2.3.1 Tenderer shall procure structural steel material from reputed steel producers and the same shall be approved by the purchaser. The tenderer has to purchase all materials (raw steel, sheeting, paints, consumables) at his own cost including transportation and handling after approval of the purchaser.

All steel and other materials used for steelwork and in association with steelwork will conform to appropriate Indian standards. Only tested materials will be used unless written authority is obtained for the use of untested materials for certain secondary structural members.

- a) All structural steel shall be of tested quality. Mild steel shall conform to IS: 2062-2011 (Grades A/B as applicable).
- b) All high strength steel hollow sections shall conform to IS: 4923 and IS:1161 for square/ rectangular and circular hollow sections.
- c) Permanent colour coated galvalume (Minimum 150 GSM zinc-aluminium coated) 0.5 mm thick steel sheet (high tensile, FY= 550 MPA) shall be troughed (minimum depth of trough= 28 mm & maximum pitch= 200 mm). The minimum paint thicknesses on sheet shall be DFT 20 micron outside and DFT 12 micron inside. Sheets shall be fixed directly to the supporting members with suitable self tapping screws. Sheets shall conform to IS: 14246 -1995. All flashing, trims, closures, wind ties, caps etc. required shall be zinc-aluminium coated and having same specification.
- d) All translucent FRP sheets shall be 2 mm thick, U/V resistant, machine manufactured, ISI stamped and shall conform to IS: 12866 -1989. Profile of these sheets shall be same as profile of steel sheets.
- e) Chequered plates shall conform to IS: 3502-2009.
- f) Skelp plates shall conform to IS: 10748-2004.

The Tenderer shall submit the test certificates conforming to appropriate standards of all steel materials used for fabrication. All structural steel shall be free from rust, scales, lamination, cracks, fissures and other surface defects.

### 2.3.2 Bolts and nuts

All bolts and nuts shall conform to IS: 1363-2002 or IS: 1364-2002 as applicable and unless specified otherwise shall be hexagonal. All nuts shall conform to

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



property class compatible to the property class of the bolt used. The Tenderer shall submit test certificates when called for.

### 2.3.3 Washers

Plain washers shall be made of mild steel conforming to IS: 5369 (1975) unless otherwise specified. One washer shall be supplied with each bolt and in case of special types of bolts more than one washer as needed for the purpose shall be supplied. An additional double coil helical spring washer conforming to IS: 6755 (1980) shall be provided for bolts carrying dynamic or fluctuating loads and those in direct tension. Tapered washers conforming to IS: 5372 (1975) and IS:5374 (1975) shall be used for channels and beams respectively.

### 2.3.4 Electrodes

All welding work shall be carried out with suitable electrodes procured from reputed manufactures. Electrodes for welding shall conform to IS: 814 - 2004.

- i) Covered electrodes for arc welding will conform to IS: 814. Coding of electrodes will be as follows :

ER421 'C' X for mild steel of Grade 'A' and Grade 'B' as per IS : 2062

EB 542 'C' H3X for Mild steel of Grade 'B' as per IS 2062 for dynamically loaded structures (arising out of crane, vibratory screen, equipments etc.) 'C' is the value of the current as recommended by the electrode manufacturer.

All materials will be straight and if necessary, before being worked will be straightened and/or flattened by pressure including decoiling of plates unless required to be of curvilinear form and will be free from twists.

## 2.4 Instructions for Fabrication of steel structures

Fabrication of all structural steelwork will be in accordance with IS:800 unless otherwise specified, and in conformity with various clauses of this Specification.

Wherever practicable and wherever perfect matching of parts is required at site, members will be shop assembled before despatch to minimise site work. Parts not completely assembled in the shop will be secured, to the extent possible, to prevent damage during despatch.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



All pieces will be properly identified and bundled for transportation to work site. Care will be exercised in the delivery, handling and storage of material to ensure that material is not damaged in any manner. Materials will be kept free of dirt, grease and foreign matter and will be protected from corrosion. All materials will be stored properly on skids above the ground which will be kept clean and properly drained. Girders and beams will be placed upright and stored. Long members such as columns and chord members will be supported on skids placed near enough to prevent damage due to deflection.

Bolts will be furnished according to bolt lists showing the location of their use and additional bolts will be supplied to cover wastage.

All fabricated pieces will bear erection mark numbers painted/punched according to appropriate erection and shop drawings at a prominent location on the structure for easy identification.

All workmanship will be in accordance with the best practice in modern structural shops. Greatest accuracy will be achieved in the manufacture of every part of the work and all identical parts will be strictly interchangeable.

Shearing or flame cutting may be used at the Tenderer's option provided that a mechanically controlled cutting torch is used for flame cutting and that the resulting edges are clean and straight.

Unless clean square and true to shape all flame cut edges will be planed/cleaned by chipping or grinding. Where machine flame cutting is permitted for high tensile steel, special care will be taken to leave sufficient margin and all flame hardened material will be removed by machining/edge planing.

Wherever shearing is used for cutting to size, sheared members will be free from distortions at Sheared edge.

The ends of all girder stiffeners will be in contact with the compression flange and will be planed or ground to fit tightly against flange plates unless otherwise stated on the drawings. Care will be taken to ensure full bearing of the stiffeners at the supports by machining the contact surfaces of both bearing stiffeners and bearing plates. The ends will not be drawn or caulked.

Column splices and butt joints of struts and compression members depending on contact for stress transmission will be accurately machined and close butted

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



over the whole section with a clearance not exceeding 0.1 mm locally at any place.

In column cap and bases, the ends of shafts together with the attached gussets, angles, channels, etc., after welding together, should be accurately machined so that the parts connected butt over the entire surfaces of contact. Care should be taken so that these connecting members are fixed with such accuracy that they are not reduced in thickness by machining by more than 1.0 mm. Where sufficient gussets and welds are provided to transmit the entire loading, the column ends need not be machined.

Tenderer shall indicate clearly the machined surfaces in the Fabrication drawing to match the requirement, if any mentioned the in the design drawing.

Holes for permanent black bolts will not be more than 1.5 mm larger than the nominal diameter of the black bolts unless specified otherwise. All holes for turned and fitted bolts will be sub punched or drilled and reamed at site under assembly of connected parts to a tolerance of +0.3 mm unless specified otherwise.

The component parts will be so assembled that they are neither twisted nor otherwise damaged and specified cambers, if any, will be provided. No drifting of hole will be permitted except to draw the parts together. Drifts used will not be larger than the nominal diameter of the bolt. Drifting done during assembling will not distort the metal or enlarge the holes. Sufficient trial assembly will be carried out in the fabrication works to prove the accuracy of workmanship and the number of such trials required will be at inspector's discretion.

Where necessary, washers will be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing. The threaded portion of each bolt will project through the nut by at least one thread.

In all cases where the full bearing area of the bolt is to be developed, the bolt will be provided with a washer of sufficient thickness, under the nut so as to avoid any threaded portion of the bolt being within the thickness of the parts bolted together. Column bases and caps, if applicable, will be in one solid piece, and except when cut from plates with true surfaces, will be accurately machined over the bearing surfaces, and will be in effective contact over the whole area of the machine end of the stanchion.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



Each piece will be distinctly marked before delivery, in accordance with an approved marking diagram and will bear such other marks as well to facilitate erection. For easy identification at site a small distinguishing mark for each building will be painted at each end of every member before despatch from fabrication shop. The fabricated steel work will be despatched in sequence as per agreed programme and for such portion as may be found convenient for erection or as ordered by the Purchaser / Consultant.

The Tenderer will provide suitable packing wherever necessary to guard against damage during handling and transportation to site. All fabricated parts will be adequately braced to prevent damage during transit.

The quality assurance requirements as per ECL/CMPDIL/MECON Specifications shall be met. QAP for the fabrication work shall be submitted by Tenderer for approval.

The tolerances for fabrication of steel structures will generally conform to IS:7215.

Any fabrication work which is considered not to be in keeping with the Technical Specification forming the Contract, or in absence of Technical Specification with recognized good practice, will be rectified /replaced /corrected at the Tenderer's expense as directed by the Purchaser / Consultant. Site fabrication work will also conform to all specifications, stipulations, terms and conditions applicable for shop-welded structures as mentioned above.

## 2.5 Welding Instructions

### 2.5.1 General

The welding and the welded work shall generally conform to IS: 816 -1969 and IS:9595 - 1996 unless otherwise specified. As much work as possible shall be welded in shops and the layout and sequence of operations shall be so arranged as to eliminate distortion and shrinkage stresses. All electrodes shall be kept under dry conditions. Any electrodes damaged by moisture shall not be used. Any electrode which has part of its flux coating broken away or is otherwise damaged, shall be rejected. Any electrode older than six (6) months from the date of manufacture shall not be used. The tenderer shall submit batch certificate for electrode. The edges shall be prepared with an automatically controlled flame cutting torch correctly to the shape, size and dimensions of the groove, prescribed in the design and fabrication drawings. In case of U-groove joint, the edges shall

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



be prepared with an automatic flame cutting torch in two phases following a bevel out with gouging and by machining. The welding surfaces shall be smooth, uniform and free from fins, tears, notches or any other defect which may adversely affect welding and shall be free of loose scale, slag, rust, grease, paint, moisture or any other foreign material. Any weld found defective shall be cut by using either chipping hammer or gouging torch in such a manner that adjacent material is not damaged in any way.

Welded joints shall satisfy the following requirements.

- 1) Strength-quality with parent metal.
- 2) Absence of defects.
- 3) Corrosion resistance of the weld shall not be less than that of parent material in aggressive environment.

Inspection and tests of welded joints:

Inspection of welded joints shall generally be as per IS: 822-1970, unless otherwise specified hereinafter.

Welding will be done by Electrical Arc Process. Automatic welding will be employed for important structures as specified in the drawings. Generally, submerged arc, Automatic & Semi-automatic welding will be employed. Only where it is not practicable, Manual Arc welding may be resorted to. In case of Manual Arc Welding, recommendations of electrode manufacturer are to be strictly followed.

Welding will not be done under such weather conditions which might adversely affect the efficiency of the welding and where necessary, effective protection and other safeguards will be provided.

Only qualified welders suitable for the job will be employed. The Purchaser / consultant at his discretion can order periodic tests in accordance with IS:817 of the welders and / or of the welds produced by them at no extra cost. Welds will be made using requisite jigs and fixtures to avoid distortions or damage to members during / after welding. Welds on exposed work will be finished uniformly smooth to present a neat appearance.

The layouts and sequence of operations will be arranged so as to eliminate distortion and shrinkage stress to the satisfaction of the Inspector. Welding work will be under constant supervision of competent welding supervisor and will be done in a properly organized manner with the approved quality welding sets and



**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



with automatic welding machines. Details of welding procedure shall be agreed upon with the Purchaser / consultant before the fabrication is commenced.

#### 2.5.2 **Welding procedure**

Welding procedure will include the following

- i) Type and size of electrodes.
- ii) Current and arc voltage.(for automatic welding)
- iii) Length of run per electrode, or (for automatic welding) speed of travel.
- iv) Number and arrangement of runs in multi-run welds.
- v) Position of welding.
- vi) Preparation and set-up of parts.
- vii) Welding sequence.
- viii) Pre or, post-heating.
- ix) Any other relevant information.

The welding procedure will be arranged to suit the details of the joints as indicated in the drawings and the positions in which the welding is to be carried out. The welds will meet the requirements of quality specified.

All electrodes for use in the work to which the specification relates will be kept under dry conditions. Electrodes which are damaged by moisture will not be used unless it is certified by the manufacturer that when it is properly dried there will be no detrimental effect. Any electrode which has part of its flux coating broken away or is otherwise damaged will be discarded.

The Tenderer will prepare the edges with an automatically controlled flame cutting torch followed by grinding correctly to the shape, size and dimensions of the groove, prescribed in the design and shop drawings. in case of U-groove joint, the edges will be prepared with an automatic flame cutting torch in two passes following a bevel cut with a gouging pass, or by machining.

The welding surfaces will be smooth, uniform and free from fins, tears, notches or any other defect, which may adversely affect welding. Welding surfaces or the surrounding surfaces within 50 mm of weld will be free from loose scale, slag, rust, grease, paint, moisture or any other foreign material. Pre-bending of plates for three plate welded sections will be done where found necessary.

Manipulators will be used where necessary and will be designed to facilitate welding and to ensure that all welds are easily accessible to the operators.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



Where full strength butt welds are specified run-on and run-off pieces will be used. The welding will be such that the face of weld deposit will at all places be proud of the surfaces of the parent metal by 1 to 1.5 mm. Where a flush surface is required, the surplus weld metal will be ground and dressed off.

After completing each run of weld, all slag will be thoroughly removed, and the surface cleaned before starting the next run of weld. The weld metal, as deposited (including tack welds if to be incorporated) will be free from cracks, slag, inclusions, gross porosity, cavities and other deposition faults. The weld metal will be properly fused with the parent metal without serious undercutting or overlapping at the toes of the weld. The surfaces of the weld will have a uniform and consistent contour and uniform appearance.

All weld runs found defective will be cut by using either chipping hammer, gouging torch, or suitable grinding wheel in such a manner that adjacent material is not injured in any way. Peeling of the welds involving deformation of the weld surface either during deslagging or thereafter will not be allowed.

### 2.5.3 **Control in Welding**

The extent of quality control in respect of welds for structural elements for both statically and dynamically loaded structures will be as follows and will be conducted by the Tenderer at his own cost.

#### a) **Visual Examination -**

The tenderer shall conduct visual examination 100% and measurement of external dimensions of the weld for all joints. Before examining a welded joint, it shall be cleared of slag and other impurities. Welded joints shall be examined from both sides.

The tenderer shall examine the following during the visual examination:

- 1) Check the correctness of shape and size of the welded joints;
- 2) Penetration of weld metal;
- 3) Influx;
- 4) Burns;
- 5) Under cuts;
- 6) Un-welded craters;
- 7) Cracks in welded spots and heat affected zones;
- 8) Porosity in welds and spot welds;
- 9) Compression in welded joints as a result of electrode impact while carrying out contact welding;

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



10) Displacement of welded element;

- b) **Dye Penetration Test (DPT)** - This will be carried out for all important fillet welds and groove welds for both statically and dynamically loaded structures to check the following:
- i) Surface cracks
  - ii) Surface porosities

Dye Penetration Test will be carried out in accordance with American National Standard ASTM E 165.

- c) Ultrasonic- testing: 100% for all Butt joints to detect the following
- i) Cracks
  - ii) Lack of fusion
  - iii) Slag inclusions
  - iv) Gas porosity

Ultrasonic testing will be carried out in accordance with American National Standard ANSI/AWS D1-92 Chapter - 6: Part C. Before ultrasonic test is carried out, any surface irregularity like undercuts, sharp ridges etc. will be rectified. Material surface to be used for scanning by probes must allow free movement of probes. For this purpose, surface will be prepared to make it suitable for carrying out ultrasonic examination.

- d) **Radiographic Testing (X-Ray Examination)**

This test will be limited to 2% of length of welds for welds made by manual or semi- automatic welding and 1% of length of weld if made by automatic welding machines. The location and extent of weld to be tested by this method will be decided by Purchaser to detect the following defects

- i) gas porosity
- ii) slag inclusions
- iii) lack of penetration
- iv) lack of fusion
- v) cracks

Radiographic testing will be conducted in accordance with American National Standard ANSI/AWSD1.1-92. Any surface irregularity like undercuts, craters pits etc. will be removed before conducting radiographic test. The length of weld to be tested will not be more than

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



0.75 x focal distance. The width of the radiographic film will be width of the welded joint plus 20 mm on either side of the weld.

The tenderer shall engage any reputed or Government test agency to carry out the tests. The third party shall carry out tests, give and interpret test results and recommend rectification measures necessary. Tenderer shall carry out the rectification work as recommended by the test agency to ensure defect free welding.

#### 2.5.4 **Acceptable Limits of Defects of Weld**

Limits of Acceptability of welding defects will be as follows:

- a) Visual inspection & Dye Penetration Test : The limits of acceptability of defects detected during visual inspection and Dye Penetration Test will be in accordance with clauses 8.15.1 & clauses 9.25.3 of American National Standard ANSI/AWS DI.1-92 respectively, for statically and dynamically loaded structures.
- b) Ultrasonic Testing - The limits of acceptability of defects detected during ultrasonic testing will be in accordance with clause 8.15.4 & clause 9.25.3 of American National Standard ANSI/AWS DI.1-92 respectively for statically and dynamically loaded structures.
- c) Radiographic testing - The limits of acceptability of defects detected during Radiographic testing will be in accordance with clause 8.15.3 & 9.25.2 of American National Standard ANSI/AWS DI.1-92 respectively, for statically and dynamically loaded structures.

#### 2.5.5 **Rectification of Defects in Welds**

In case of detection of defects in welds, the rectification of the same will be done as follows

- i) All craters in the weld and breaks in the weld run will be thoroughly filled with weld.
- ii) Undercuts, beyond acceptable limits, will be repaired with dressing so as to provide smooth transition of weld to parent metal.
- iii) Welds with cracks and also welds with incomplete penetration, porosity, slag inclusion etc. exceeding permissible limits will be rectified by removing the length of weld at the location of such defects plus 10 mm from both ends

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



of defective weld, and will be re-welded. Defective weld will be removed by chipping hammer gouging torch or grinding wheel. Care will be taken not to damage the adjacent material.

**2.5.6 Inspection & Testing:**

The Purchaser/Inspector shall have free access at all times to those parts of Tenderer's or his Sub-Tenderer's works which are concerned with the fabrication of steel works and shall be afforded all reasonable facilities at all stages of preparation, fabrication and trial assemblies for satisfying himself that the fabrication is being undertaken in accordance with the provisions of relevant specification.

- i) All gauges and templates, tools, apparatus, labour and assistance for checking shall be supplied by the Tenderer free of charge. The Purchaser/Inspector may at his discretion, check the test results obtained at the Tenderer's works, by independent test at the Government Test House or elsewhere, and should the material so tested be found to be unsatisfactory, the cost of such test shall borne by the Tenderer.
- ii) Tenderer shall make all necessary arrangements for stage inspection purchaser/Inspector during the fabrication at shop and incorporate all on-the-spot instructions/ changes conveyed in writing to the Tenderer.
- iii) Material improperly detailed or wrongly fabricated shall be reported to the Purchaser/Inspector the strength or appearance of the structure will not be adversely affected. In the event the Purchaser/Inspector directs otherwise, the items will be rejected and c completely new piece shall be fabricated. The cost of correcting errors shall be to the account of the Tenderer.
- iv) **(1) The Purchaser/ Inspector shall have the Power:**
  - a) To Certify, before any structure is submitted for inspection, that the same is not in accordance with the contract, owing to the adoption of any unsatisfactory method of fabrication.
  - b) To reject any structure as not being in accordance with specification & drawings.
  - c) To insist that no structure or parts of the structure once rejected is resubmitted for inspection/test, except in cases where the Purchaser/ Inspector authorised representative considers the defects as rectifiable.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



- 2) If, on rejection of structure by the Purchaser/Inspector the Tenderer fails to make satisfactory progress within the stipulated period, the Purchaser/Inspector shall be at liberty to cancel the contract and fabricate or authorise the fabrication of the structures at any other place he chooses, at the risk and cost of the Tenderer, without prejudice to any action being taken in addition to terms of General Conditions of Contract.
- 3) The Purchaser/Inspector's decision regarding rejection shall be final and binding on the Tenderer.
- 4) The specifications prescribe various tests at specified intervals for ascertaining the quality of the work done. If the tests prove unsatisfactory, Purchaser/Inspector shall have liberty to order the Tenderer to re-do the work, done in that period and / or to order such alterations and strengthening that may be necessary at the cost of the Tenderer and the Tenderer shall be bound to carry out such orders failing which the rectification/redoing will be done by the Purchaser through other agencies and the cost recovered from the Tenderer.
- 5) Notwithstanding any inspection at the workshop the Purchaser/Inspector shall have the liberty to reject, without being liable for compensation any fabricated members or materials brought to site that do not conform to specifications/drawings.
- 6) All rejected materials shall be removed from the site of fabrication by the Tenderer at his own cost and within the time stipulated by the Purchaser/Inspector.



## SECTION-03: ERECTION OF FABRICATED STEEL STRUCTURES

- 3.1 For erection of steel structures, IS: 800 - 2007 shall be followed and erection shall be carried out ensuring best workman ship, with specified standard limits and tolerances. The tolerances in erection of steel structures shall conform to IS: 12843 - 1989.
- 3.2 The suitability and capacity of all plants and equipment intended to be used for erection shall be to the satisfaction of the employer. The tenderer shall be solely responsible for the safety of such equipment and for any risk involved. The employer shall also be responsible for the safety of men, materials and existing structures/ tracks during erection.
- 3.3 **Scope**  
The scope of work under erection of fabricated steel structures includes in addition to provision of erection and transport equipments, tools and tackles, consumables, materials, labour and supervision, the following:
- a) Storing and stacking at site of erection of all fabricated structural components/ units/assemblies till the time of erection.
  - b) Transportation of structures at site.
  - c) Receiving at site of structures including site handling /movement, unloading, storing and stacking at site of erection of technological structures such as bunkers and the related structures
  - d) All minor rectification / modification such as :
    - i) Removal of bends, kinks, twists, etc. for parts damaged during transportation and handling;
    - ii) Cutting chipping, filing, grinding, etc., if required, for preparation and finishing of site connections;
    - iii) Reaming for use of next higher size bolt for holes which do not register or which are damaged.
    - iv) Welding of connections in place of bolting for which holes are either not drilled at all or wrongly drilled during fabrication.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



- e) Other rectification work such as
  - i) Re-fabrication of parts, damaged beyond repair during transportation and handling or incorrectly fabricated.
  - ii) Fabrication of parts omitted during fabrication by oversight or subsequently found necessary.
  - iii) Plug-welding and re-drilling of holes which do not register and which cannot be reamed for use of next higher size bolt.
  
- g) Assembly at site of steel structural components wherever required including temporary supports and staging.
- h) Making arrangements for and providing all facilities for conducting ultrasonic X-ray or gamma ray tests on welds; getting the tests conducted by reputed testing laboratories, making available test films/ graphs, reports and interpretation.
- i) Rectifying at site, damaged portions of shop primer by cleaning and touch-up paint.
- j) Erection of structures including making connections by bolts/high strength friction grip bolts / welding.
- k) Alignment of all structures true to line, level plumb and dimensions within specified limits of tolerances as per IS :12843 "Tolerance for Erection of Steel Structures".
- l) Application of second coat of primer paint and two coats of finishing paint at site after erection.
- m) Grouting of all column bases after proper alignment of columns and only after obtaining clearance from Owner / Consultant.
- o) Conducting preliminary acceptance and final acceptance tests.
- p) Preparation of sketches/drawings to suit field engineering decisions, availability of material, convenience of fabrication, transportation and erection and changes during fabrication and erection. All such works are subject to approval by the Owner / Consultant.
- q) Cleaning of the site. All the waste material generated during the course of erection shall be disposed by the contractor regularly and the erection site shall be kept neat and clean.



**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



**3.4 STORAGE AND HANDLING**

- 3.4.1 Storage of structures shall be preferably be done in such a manner that erection sequence is not affected.
- 3.4.2 While storing, care shall be taken so that structures do not come in direct contact with the earth surface and accumulated water. Girders, beams, columns shall be placed and stored in such a manner that during rain, no accumulation of water on the structures takes place.
- 3.4.3 Stacking of the structures shall be done in such a way that, erection marks are visible easily and handling does not become difficult. Wherever required, wooden sleepers / grilles may be used.
- 3.4.4 Handling and storage of materials shall be as per IS: 7969-1975, to ensure safety.

**3.5 GENERAL INSTRUCTIONS FOR ERECTION**

- 3.5.1 Erection shall be carried out in accordance with IS: 800 and other relevant standards referred to therein apart from this specification.
- 3.5.2 The Contractor shall be responsible for checking the alignment and levels of foundations, correctness of foundation; centres of anchor bolts etc. well in advance of starting erection work and shall be responsible for any consequence for non-compliance thereof. Discrepancies, if any, shall immediately be brought to the notice of the Purchaser. Any mistake subsequently found in alignment and levels of the structural steelwork due to non-verification of foundation before erection shall be corrected by the Contractor at his own expense.
- 3.5.3 One set of reference axes and one bench mark level will be furnished to the Contractor. These shall be used for setting out of structures. Maintenance of such bench mark level shall be the responsibility of the Contractor.
- 3.5.4 The Contractor at his own expenses shall provide measuring instruments for setting out, levelling and aligning steelwork. He shall provide one exclusive survey team for alignment of structural works.
- 3.5.5 For safe and accurate erection of structural steelwork, staging, temporary support, false-work etc. shall be erected as required.
- 3.5.6 All erection works shall be done with the help of cranes, use of derrick is not envisaged.
- 3.5.7 Erection should start preferably from braced bays

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP



**TECHNICAL SPECIFICATION FOR STRUCTURAL WORK**

---

- 3.5.8** The fabricated materials received at erection site shall be verified with respect of marking on the key plan/marketing plan or shipping list.
- 3.5.9** Any material found damaged or defective shall be stacked separately and the damaged or defective portions shall be painted in distinct colour for identification and the same shall be brought to the notice of the Purchaser.
- 3.5.10** The approved erection drawings and any approved arrangement drawing, specification or instruction accompanying them shall be followed in erecting structures.
- 3.5.11** Erection work shall be taken up after receipt of clearance from the purchaser.
- 3.5.12** For safety requirements during erection, provisions in IS: 7205 - 1974, IS: 7969 - 1975 and other relevant Indian standards shall be followed.
- 3.5.13** Erection shall be carried out with the help of maximum mechanisation possible.
- 3.5.14** Prior to commencement of erection, all the erection equipment, tools, tackles, ropes etc. shall be tested for their load carrying capacity. Such tests may be repeated at intermediate stages also if considered necessary and frequent visual inspection shall be done of all vulnerable areas and components to detect damages or distress in the erection equipment, if any.
- 3.5.15** Temporary bracing, whenever required, shall be provided to sustain forces due to erection loads and equipment etc. Erected parts of the structures shall remain stable during all stages of erection when subjected to the action of wind, dead weight and erection forces etc. Specified sequence of erection of vertical and horizontal structural members shall be followed. Erected members shall be held securely in place by bolts / guy ropes etc to take care of dead load, wind load and erection load during all stages of erection, alignment, welding & painting.
- 3.5.16** All connections shall achieve free expansion and contraction of structures wherever provided.
- 3.5.17** No final bolting or welding of joints shall be done until the structure has been properly aligned. Structures shall be aligned true to plumb and level and shall be checked by using theodolite and a scheme shall be submitted for approval of the purchaser. Final welding / bolting shall be done only after obtaining approval of the alignment scheme from the purchaser.
- 3.5.18** Welding shall be carried out as specified in the Chapter "Welding of Steel Structures" in this specification.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



- 3.5.19** All erection bolts shall be retained in position or the holes shall be plug welded. No un used holes shall be left.
- 3.5.20** For positioning beams, columns and other steel members, the use of steel sledges is not permitted.
- 3.5.21** Instrumental checking of correctness of initial setting out of structures and adjustment of alignment shall be carried out in sequence and at different stages as required, by deploying independent survey team. The final levelling and alignment shall be carried out immediately after completion of each section of a building using survey instruments.
- 3.5.22** All structural members shall be erected with erection marks in the same relative position as shown in the appropriate erection and shop drawings.
- 3.5.23** The contractor shall manufacture, erect and provide false-work, staging temporary support etc. required for safe and accurate erection of structural steel work and shall be fully responsible for the adequacy of the same in strength for transferring temporary and erection loads.
- 3.5.24** The Contractor shall also provide facilities such as adequate temporary access ladders, gangways, tools & tackles, instruments etc. to purchaser for his inspection at any stage during erection.
- 3.5.25** All materials & consumables shall confirm to the material specification .
- 3.5.26** Notwithstanding any assistance rendered to the Contractor by the Purchaser, if at any time during progress of the Work, any error should appear or rise therein, on being required to do so, Contractor at his own cost shall remove and amend the work as directed by the Purchaser.
- 3.5.27** The contractor shall fully abide by the safety procedures and any accident whatsoever concerned to erection shall be full responsibility of the contractor.

**3.6 FIELD CONNECTIONS**

- 3.6.1** The numbers of washers on permanent bolts shall be one for the bolt head side and one or two for the nut side.
- 3.6.2** Where bolting is specified on the drawing, the bolts shall be tightened to the specified limit. The threaded portion of the each bolt shall project through the nut by at least three threads. Tapered washers shall be provided for all heads and nuts to achieve uniform bearing on sloping surface. Minimum two bolts shall be provided at any bolted connection.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP



**TECHNICAL SPECIFICATION FOR STRUCTURAL WORK**

---

- 3.6.3** To prevent loosening of nuts, spring washers or lock-nuts shall be provided as specified in the design/shop drawings.
- 3.6.4** All machine-fitted bolts shall be perfectly tight and the ends shall be checked to prevent nuts from becoming loose. No unfilled holes shall be left in any part of the structures.
- 3.6.5** All field assembly by welding shall be executed in accordance with the requirements for shop fabrication. Where the steel has been delivered painted, the paint shall be removed before field welding for a distance of at least 50 mm on either side of the joints to be welded.
- 3.6.6** The mating surfaces shall be prepared in accordance with the requirements of design in order to achieve required properties to develop adequate friction between the surfaces.
- 3.6.7** The mating surfaces shall be absolutely free from grease, lubricant, dust, rust etc. and shall be thoroughly cleaned before assembly.
- 3.6.8** The nuts shall be tightened up-to the specified torque with the help of torque -wrench or by half- turn method with the help of pneumatic wrench lever.
- 3.6.9** The direction of tightening of the nuts shall be from the middle toward the periphery of assembly.
- 3.6.10** After desired tightening the bolt heads, nuts and edges of the mating surfaces shall be sealed with a coat of paint to obviate entry of moisture.
- 3.7** **ACCEPTANCE STANDARD OF WELDING**  
Acceptance standard of welding shall be as specified in “Welding of Structures” section of this specification.
- 3.8** **BEDDING AND GROUTING**
- 3.8.1** Base plates shall be set to elevations shown on the drawings, supported aligned and levelled using steel wedges and shims or by other approved methods. Plates shall be levelled properly, positioned and the anchor bolts tightened.
- 3.8.2** Pack plates below base plates should cover at least 50% area of the base plate unless noted otherwise and all such material shall be accounted as per special conditions of contract.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



**3.8.3** The gap between the base plate and the foundation shall be pressure grouted by approved method, after thorough cleaning of the gap, duly checked by site Engineer. The concrete mix shall be minimum M30 or as per instruction / drawings and to be supplied by the contractor. Such grouting shall be carried out strictly under the supervision of site Engineer.

**3.8.4** Bedding/grouting shall not be carried out until sufficient number of columns have been properly aligned, levelled and plumbed and sufficient number of girders, beams, trusses and bracings have been put in position & accepted by the purchaser.

**3.9 PAINTING AFTER ERECTION**

The painting shall be as per “Surface preparation and painting of steel structures” section of this specification and instructions stated in the drawings.

**3.10 GUIDELINES FOR SAFE ERECTION PRACTICE:**

**(a) DO'S**

- (1) Carry out erection only after structures are thoroughly inspected and cleared.
- (2) Start erection from braced bay for building structures and fixed/ 4-L trestle for conveyor galleries.
- (3) Ensure proper packing below the columns to have correct levels (to be checked by survey schemes)
- (4) Ensure proper anchoring of column base by tightening of all anchor bolts.
- (5) Ensure that guying is done at 2/3rd height in 3 directions 120 degree apart.
- (6) Ensure that guy ropes are fully tight and anchored . Size of the guy rope should be adequate to take loads
- (7) Provide temporary bracing wherever needed.
- (8) Outstanding of flanges of beams /columns are to be protected against local bending at location of slinging during erection.
- (9) Ensure that cross beam/bracings are erected only after the cleats/gussets are fully welded.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



- (10) Do the welding of cross beams with cleats, only after ensuring all bolts are in position and are tightened fully.

(b) **DON'TS**

- (1) Don't leave the structures without proper guying in all directions till they are braced.
- (2) Don't miss to anchor properly at the base of columns with anchor nuts fully tightened.
- (3) Don't use manila ropes in place of steel ropes for guying.
- (4) Don't support the cross beams with temporary jigs. Ensure all the bolts are provided and tightened.
- (5) Don't use bracings/tie members for fixing lifting tackles/diversion pulleys/cable trays to avoid damages due to erection loads.
- (6) Avoid indiscriminate cutting/notching of erected and loaded structures.
- (7) Don't use column bases for anchoring guy ropes of structures.

**3.11 ACCEPTANCE OF WORK**

Acceptance of erected steel structures shall be either after completion of erection of the whole building or in blocks.



## SECTION-4: PAINTING OF STEEL STRUCTURES

4.1 All steel structural work shall be painted as follows unless otherwise stated in the drawing / Technical Specification.

### 4.2 SURFACE PREPARATION

The internal and external surface of all steel sections shall be cleaned to remove all rust, scale and foreign adhering matter. Surfaces to be painted will be cleaned of dirt and grease, and the heavier layers of rust will be removed by chipping prior to actual surface preparation to a specified grade. The grade of surface preparation shall be strictly in accordance with paint manufacturer's recommendations. All surfaces shall be cleaned of loose substance and foreign materials e.g. dirt, rust, scale, oil, and grease, welding flux etc. so that the prime coat adheres to the original metal surface. Any oil, grease, dust or foreign matter deposited on the surface after preparation shall be removed and care shall be taken so that the surface is not contaminated with acids, alkalis or other corrosive chemicals. The primer coat shall be applied immediately after the surface preparation is completed. Surface preparation shall be either by hand tool cleaning or by power tool cleaning or by solvent cleaning.

Following are the type and standards of surface preparation to be followed based on the requirement of a particular painting system or as specified in the design drawings.

#### MANUAL/ POWER TOOL CLEANING

Manual/Power tool cleaning will be done as per Grade St-2 of Swedish Standard institution SIS 05 5900 or IS: 9954-1981.

**GRADE St2** - Thorough scraping and wire brushing, machine brushing, grinding etc. This grade of preparation will remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or clean brush. After preparation, the surface should have a faint metallic sheen. The appearance will correspond to the prints designated St-2.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



#### 4.3 PAINT SYSTEM

Paints to be applied are as follows.

- i) Surface preparation: St-2 according to IS: 9954-1981.
- ii) Primer paint: - Two coats of zinc chromate (DFT= 35 microns/coat) one coat after fabrication and another after erection.
- iii) Finishing paint :- Two coats of synthetic enamel (DFT=25 microns/coat) conforming to IS:2932-2013 of approved colour/shade after erection.

#### PAINT APPLICATION

Paint shall be applied strictly in accordance with paint manufacturer's recommendations and relevant IS Codes. Prior approval of the Employer shall be taken in respect of all primers and/or paints before their use in the works.

Paint shall not be applied under the following conditions.

- i) When relative humidity is greater than 85% or surface is wet.
- ii) During rain, fog and mist.
- iii) Where amount of moisture on surface or that likely to be caused by subsequent condensation may have harmful effect.



**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



## 5.0 SUPPLY AND ERECTION OF CLADDING WORK

### 5.1 SCOPE OF WORK

5.1.1 The scope of work shall cover:

- a) Procurement and supply sheets as per material specifications with all certificates and reports for all gauges and sizes, flashings and fittings like corner pieces, apron pieces, ridges, along with all sheeting fixtures, self-stitching screws, sealant tapes / adhesives, EPDM washers, fasteners etc.
- b) Procurement and supply of sheeting fixtures, wind ties, self-tapping screws, locking fixtures, sealant materials / tapes, stitch bolts as per recommendation of sheet manufacturer. However in case of Translucent sheets manufacturer's specification for fixing of sheets shall be followed.
- c) All necessary flashings, ridging, capping, gable and corner trimming shall be made from sheets of same material quality.
- d) Loading, transportation, unloading and delivery of sheeting material from place of procurement to erection site.
- e) Provision of all tools, tackles, equipment, labour supervision and services required for the satisfactory completion of the work specified herein and on the drawings.
- f) Erection in position sheets with fixtures for roofing, walling, louvres; erection of all flashings, fittings like ridges, valleys, gutters, corners, apron etc. at all locations all work as per drawings and specifications.
- g) Fixing of self-tapping screws and desired anchor length into purlin / runners.
- h) Cutting and bending of sheets wherever required; drilling of holes all as per specification and drawings.
- i) Suitable Wind Ties (galvanised steel flats) shall be provided after fixing of sheets, at the free edge of sheeting.

### 5.3 FIXING OF SHEETS

- a) All fixing of the roof and side trapezoidal profiled sheeting to purlins shall be by means of self tapping screws of tested quality as per manufacturer's recommendation.
- b) All bolts shall pass through the crown of the corrugations for roof sheets and through trough corrugations for side sheets. Sheets are to be provided EPDM washers of approved quality. Fixing to the purlins shall be provided at every crown / approximately at 200mm c/c. Fixing of side sheets shall be provided at alternate valley approximately at 400mm c/c.
- c) All sheets shall be stitched together by self drilling stitching screws of specified diameter and length as per sheet manufacturer's specification. In

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



- case of double side lap the pitch has to be staggered between alternative crowns. Washers of specified quality shall be placed under the head of the screw which shall always be on the outside the building.
- d) Fixing of trapezoidal profiled translucent FRP sheets shall be as per manufacturer's specification.
  - e) All holes for sheeting and flashings are to be drilled at site with electric drill from the top side of the crown. The method of drilling shall be such that the material fits snugly together at laps to allow washers to have a good seating.
  - f) All the joints / overlaps, unused holes shall be properly sealed by using special sealing tapes/ adhesives as per sheet manufacturer's specification.
  - g) All roofing shall be provided specified side lap and 230 mm end lap for roof slopes 15 ° and below. For roof slopes above 15° end laps may be reduced to 150 mm. However minimum end lap of 150mm shall be ensured.
  - h) All side/gable end sides shall be provided with specified side lap and 100 mm end lap.
  - i) Overhang of sheets on the roof and side cladding shall not exceed 300 mm.
  - j) Erection is to be carried out with the lay of the side laps such that under the prevailing wind, rain is not driven into the lap. The sheets shall be laid so that side laps in any two consecutive rows are staggered.
  - k) Broken or otherwise damaged sheeting shall not be erected.
  - l) Cutting, framing and trimming of all openings required shall be carried out at site.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

---



## SECTION-06: MEASUREMENTS

### 6.1 STRUCTURAL STEEL

Structural steelwork will be measured by the metric tonne and as per IS: 1200 (Part-8)- 1993 and IS:1200 (Part-9)-1973 subject to provisions outlined below:-

- a) The calculation of quantities shall be based on unit-weights for structural sections as given in IS: 808-1989. In the case of mild steel/ SAIL-MA Steel plates, the calculated weights shall be based on 78.5 kg per square meter per centimeter thick plate. The payments will be made on the basis of weights of members given in the approved fabrication drawings. However, any changes on the above weights during fabrication erection, payment shall be based on sketches Approved by the purchaser.
- b) In the event the I.S. does not specify any mode of measurement for a particular item of work, the same shall be measured as per any other relevant international standard or as directed by the Purchaser.
- c) The weight of all plates and sections shall be calculated from the approved drawing using the minimum overall square or rectangular dimensions and theoretical weight, no deduction being made for skew cuts, holes etc. In the case of plates, other than gussets, the actual dimensions shown on approved drawings will apply unless approved otherwise by the purchaser based on cutting diagram of mother plates.
- d) The weight of all welding runs, bolt, stanchion base packing, cuttings to waste and rolling margins, and coatings of paint, will be excluded from the measured weight and shall be deemed to have been allowed for in the rates for structural steelworks quoted by the Contractor. No allowance shall be made for wastage, cut-outs, etc. in the measurement.
- e) Temporary works and all other materials not included in the permanent works shall be excluded from any measurement for payment.

### 6.2 CLADDING SHEETS

- a) Sheeting for roof slopes, louvres of big size and side cladding shall be measured by the square meter of net laid area, as specified and shown on the drawings.
- b) No allowance shall be made for wastage, cut-outs, overlaps etc. in the measurement.
- c) The unit of measurement shall include all fasteners, flashings and fittings such as ridges, corners, aprons and other accessories.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK



- d) No deductions shall be made for openings for area less than a single sheet. Also no extra payment will be made for making opening and installing ventilation chimneys on roof.

### **SECTION-07: COMPLETION DOCUMENTS**

- 1) On completion of work, the Tenderer shall submit to the Purchaser the following documents:-
  - a) The technical documents according to which the work was carried out.
  - b) Modification sketches and records of deviations from issued fabrication drawings.
  - c) Manufacturer's test certificates
  - d) Certificates/documents on control checking
  - e) Test of welds
- 2) Inspection Certificates shall be issued to the Tenderer for the structures found acceptable in all respects by the Purchaser/Inspector.

### **SECTION-08: PRELIMINARY ACCEPTANCE**

After completing the erection of a unit or portion thereof, the Contractor shall give a notice in writing stating that the job is complete in all respects and ready for preliminary acceptance. The job shall be jointly inspected visually by representatives of Contractor and Purchaser. All observed defects and omissions as per drawing and specification shall be noted down and the defects shall be liquidated by the contractor. However Preliminary acceptance certificate will be issued by the end purchaser (ECL).

### **SECTION-09: FINAL ACCEPTANCE**

- 9.1 Before commencement of inspection for final acceptance of the building or unit, the Contractor shall rectify further defects if any and shall make available modification sketches and records of deviations from issued fabrication drawings (i.e. all additions and alterations done during fabrication and erection shall be made available).
- 9.2 The Contractor shall make good all defects deficiencies and omissions noted down during preliminary acceptance and shall inform in advance the Purchaser/ his representative for conducting inspection for final acceptance. Final acceptance certificate will be issued by the Purchaser / his representative only after all defects

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

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/ deficiencies / omissions noted under Preliminary Acceptance have been rectified.

**SECTION-10: TIME SCHEDULE**

- 10.1 The completion period of all the structural work shall be 11 months from the from the effective date of work order.
- 10.2 On placement of the order, fabrication cum erection drawings will be issued progressively from the 1<sup>st</sup> to 9.5<sup>th</sup> month.
- 10.3 On completion of fabrication, request for inspection shall be issued by the contractor and the same will be inspected within 7 days.

**MECON LIMITED**  
**COAL HANDLING PLANT (10 MTPA)**  
**AT RAJMAHAL OCP**  
**TECHNICAL SPECIFICATION FOR STRUCTURAL WORK**



**Annexure- A**

**SCHEDULE OF QUANTITIES**

Sl. No.	Description	Unit	Quantity	Rate	Amount
1	Fabrication of mild steel structures consisting of rolled sections, plates and other elements for steel structures including procurement, testing and supply of raw steel materials, loading, transportation & delivery at site including unloading of all steel structures, and inclusive of supply of bolts, nuts, washers, electrodes, jigs, fixtures and other consumables including all tools, tackles & labour, all tests and application of one coat primer paint at shop, all works as per Technical Specification and drawings.	Tonne	1430		
2	Fabrication of steel structures consisting of mild/ high strength steel hollow sections and plates including procurement, testing and supply of raw steel materials, loading, transportation & delivery at site including unloading of all steel structures, and inclusive of supply of bolts, nuts, washers, electrodes, jigs, fixtures and other consumables including all tools, tackles & labour, all tests and application of one coat primer paint at shop, all works as per Technical Specification and drawings.	Tonne	1750		
3	Erection of all the Fabricated steel structures along with supply of all fasteners, consumables, Guy ropes, Turn buckles, Thimbles etc. all tests including grouting and supply & application of one coat of primer paint and two coats of finishing paints as per technical specifications and drawings.	Tonne	3180		

**MECON LIMITED**  
**COAL HANDLING PLANT (10 MTPA)**  
**AT RAJMAHAL OCP**  
**TECHNICAL SPECIFICATION FOR STRUCTURAL WORK**



4	Supply of colour coated 0.5mm thick galvalume sheets of required length, flashing, corners, ridges, fittings and fixtures as per specifications and drawings including transportation to a designated place(payment as per covered net laid area).	Sq.m	25500		
5	Fixing and erection of colour coated 0.5mm thick galvalume sheets with matching flashing, corners, ridges, fittings and fixtures, transportation to site, cutting and bending of sheets to required shapes and size and erecting them on roof & sides at proper position, all work as per specifications and drawings (payment as per covered net laid area).	Sq.m	25500		
6	Supply of 2mm thk. translucent sheets (FRP sheets) of matching profile and required length, flashing, corners, ridges, fittings and fixtures as per specifications and drawings including transportation to a designated place (payment as per covered net laid area).	Sq.m	2800		
7	Fixing and erection of 2mm thk. translucent sheets (FRP sheets) with matching flashing, corners, ridges, fittings and fixtures, transportation to site, cutting and bending of sheets to required shapes and size and erecting them on roof & sides at proper position, all work as per specifications and drawings (payment as per covered net laid area).	Sq.m	2800		

**NOTES :**

1. The quantities indicated are estimated values and hence are approximate and are subjected to variation. Final payment will be made based on actual quantities as per fabrication drawings certified by the Purchaser.

**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

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2. The cost of all steel, translucent sheets, paints, all testing and test certificates of procured materials, NDT tests, erection bolts, nuts, washers, cost of electrodes, packing plates underneath the columns, trestles, stanchions, putty, gases, cost of straightening the raw materials, cutting of flats from plates and , cost of paints, cost of supply of all types of permanent bolts, nuts, washers , and all other materials , consumables, tools, plants, etc., as required for the completion of the work shall be included in the quoted rates.
3. The cost of sheeting fixtures, fasteners, washers, sealing compounds and all other consumables required for satisfactory completion of work shall be included in the quoted rates.
4. All handling and transport charges of raw materials and fabricated structures including multiple handling as required for completion of work in accordance with time schedule, shall be included in the quoted rates.



**MECON LIMITED**  
COAL HANDLING PLANT (10 MTPA)  
AT RAJMAHAL OCP  
TECHNICAL SPECIFICATION FOR STRUCTURAL WORK

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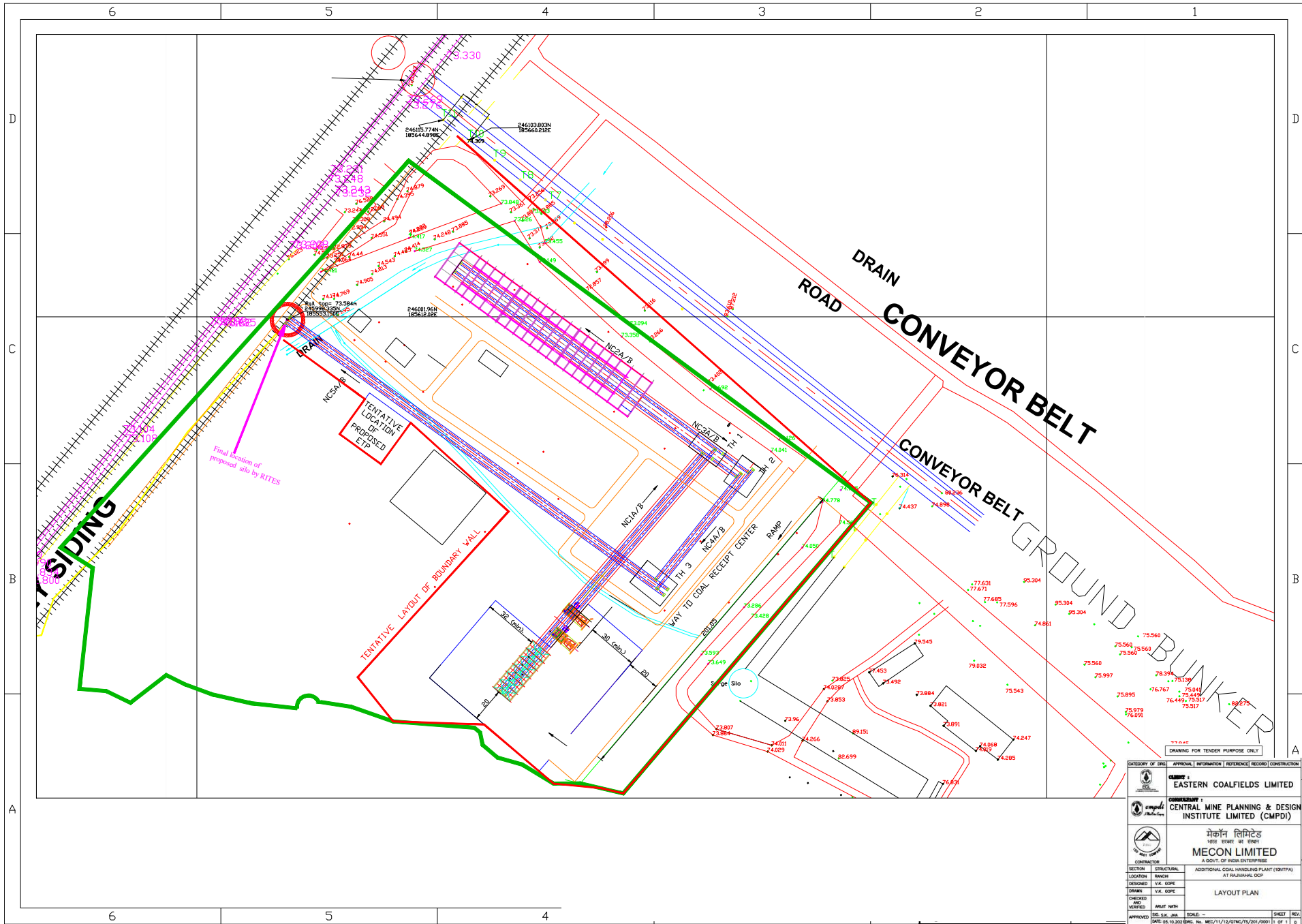


**ANNEXURE-B: TENDER DRAWINGS**

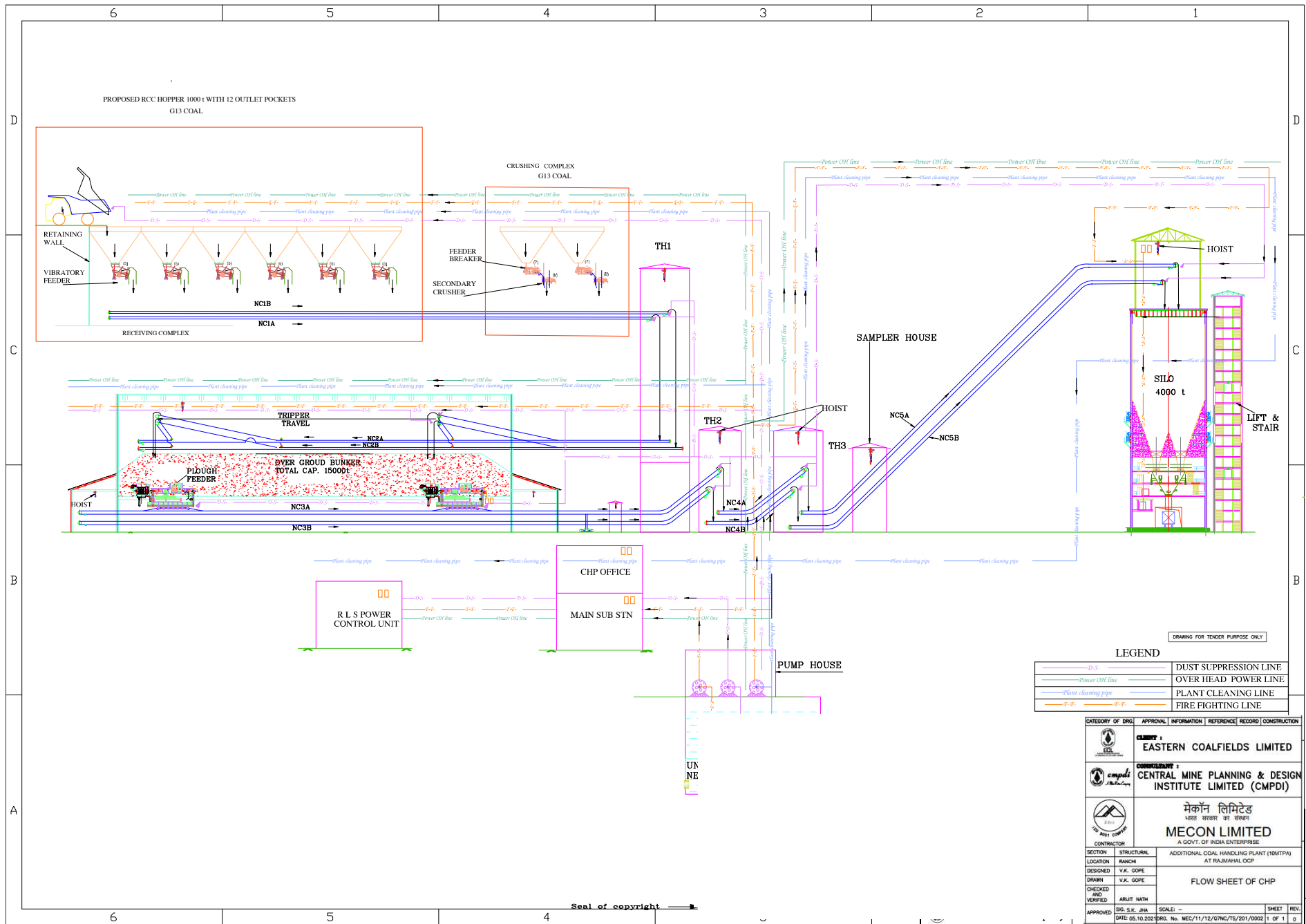
**LIST OF DRAWINGS**

Sl. No.	Description	Drawing No.
1.	MEC/11/12/Q7NC/TS/201/0001	Layout Plan
2.	MEC/11/12/Q7NC/TS/201/0002	Flow Sheet of CHP
3.	MEC/11/12/Q7NC/TS/201/0003	Coal Receiving Complex
4.	MEC/11/12/Q7NC/TS/201/0004	Conveyor Sections
5.	MEC/11/12/Q7NC/TS/201/0005	OG Bunker and Silo

Note: All drawings are indicative and will undergo changes during detailed engineering.



DRAWING FOR TENDER PURPOSE ONLY	
CATEGORY OF DRL	APPROVAL   INFORMATION   REFERENCE   RECORD   CONTRACTOR
	<b>Eastern Coalfields Limited</b>
	<b>CENTRAL MINE PLANNING &amp; DESIGN INSTITUTE LIMITED (CMPDI)</b>
	<b>मेकॉन लिमिटेड MECON LIMITED</b> A GOVT. OF INDIA ENTERPRISE
CONTRACTOR	ADDITIONAL COAL HANDLING PLANT (AHP/AP) AT RAJAMAHAL, OCP
SECTION	STRUCTURE
LOCATION	BRANCH
DESIGNED	V.K. GOPE
DRAWN	V.K. GOPE
CHECKED AND VERIFIED	ARJUN NATH
APPROVED	SCALE -
DATE: 05.10.2023 (REV. No. 002/11/12/076/75/201/0001)	SHEET NO.



DRAWING FOR TENDER PURPOSE ONLY

**LEGEND**

	DUST SUPPRESSION LINE
	OVER HEAD POWER LINE
	PLANT CLEANING LINE
	FIRE FIGHTING LINE

CATEGORY OF DRG. APPROVAL INFORMATION REFERENCE RECORD CONSTRUCTION

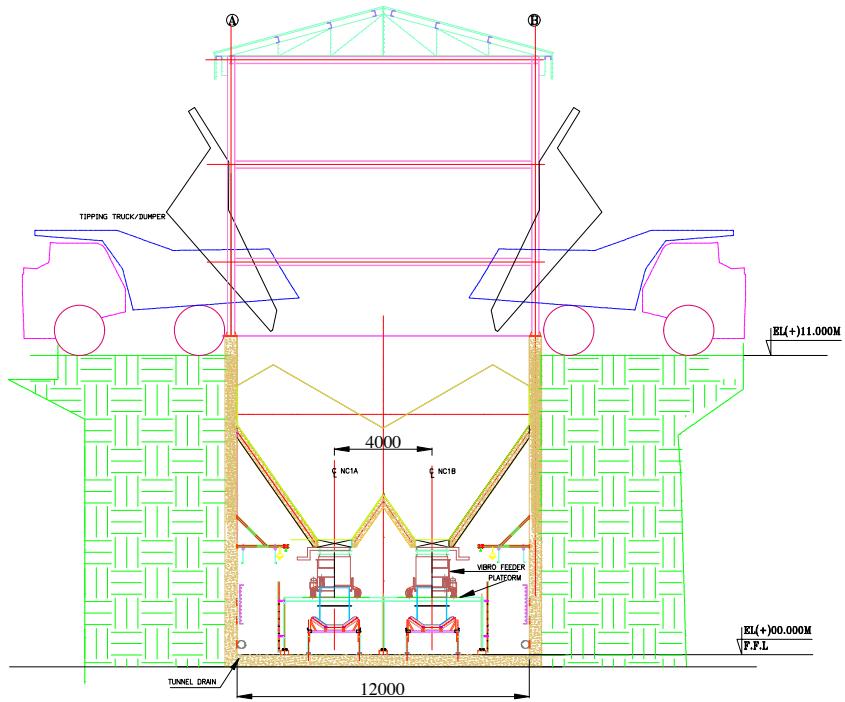
	<b>CLIENT :</b> ECL
	<b>CONSULTANT :</b> CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED (CMPDI)
	<b>मेकॉन लिमिटेड</b> एनईसी एंटरप्राइज <b>MECON LIMITED</b> A GOVT. OF INDIA ENTERPRISE
<b>CONTRACTOR</b>	ADDITIONAL COAL HANDLING PLANT (10MTPA) AT RAJMAHAL OCP
<b>SECTION</b>	STRUCTURAL
<b>LOCATION</b>	RANCHI
<b>DESIGNED</b>	V.K. GOPE
<b>DRAWN</b>	V.K. GOPE
<b>CHECKED AND VERIFIED</b>	ARJIT MATH
<b>APPROVED</b>	SIG. S.K. JHA DATE: 05.10.2022
<b>SCALE</b>	SCALE: -
<b>DRG. No.</b>	MEC/11/12/G7NC/TS/201/0002
<b>SHEET</b>	REV. 1 OF 1

Seal of copyright

DO NOT SCALE, IF ANY DOUBT PLEASE ASK

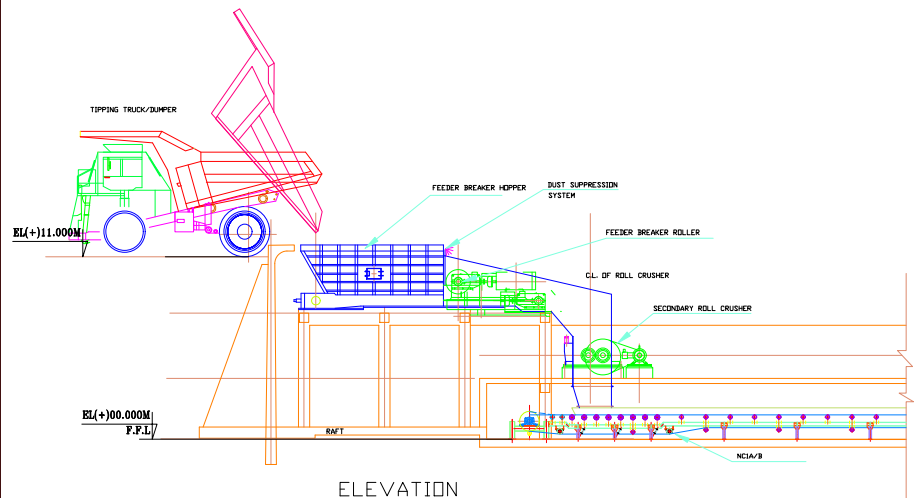
FOR TENDER PURPOSE ONLY

MATCH POINT B-B



SECTION OF TRUCK RECEIPT HOPPERS WITH 12 POCKETS

(INDICATIVE ONLY)



ELEVATION

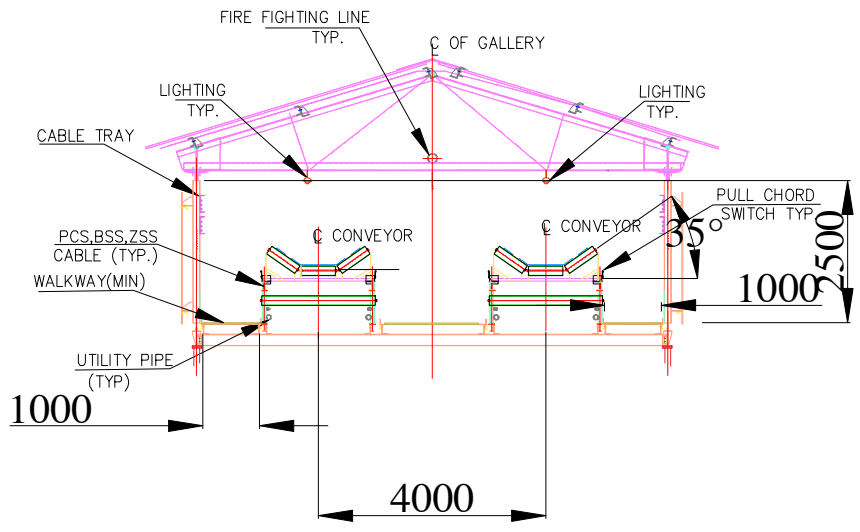
TYPICAL ARRANGEMENT OF TWO STAGE CRUSHING VIA FEEDER BREAKER & SECONDARY ROLL CRUSHER (INDICATIVE ONLY)

- NOTE
1. ALL DIMENSIONS ARE IN MM.
  2. ALL LEVELS ARE IN M.
  3. ALL SECTIONS, DIMENSIONS & LEVELS SHOWN ARE INDICATIVE ONLY & WILL BE DECIDED DURING DETAIL ENGINEERING.
  4. THIS DRAWING IS FOR TENDER PURPOSE DN NET FOR CONSTRUCTION.

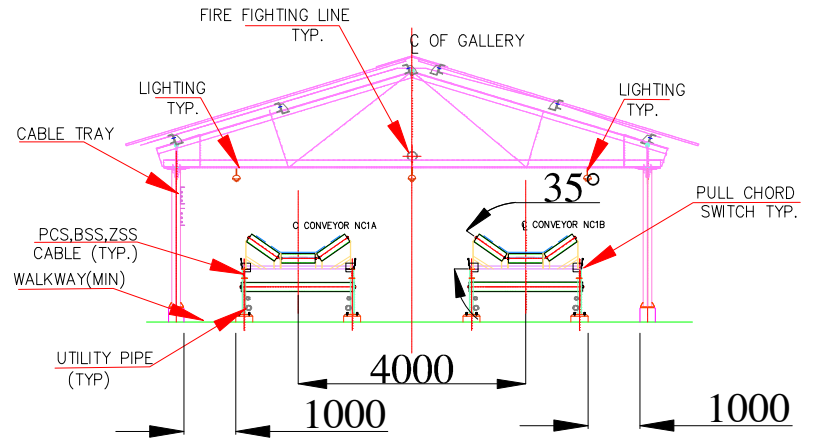
DRAWING FOR TENDER PURPOSE ONLY

CATEGORY OF DPG	APPROVAL	INFORMATION	REFERENCE RECORD	CONSTRUCTION
	CLMNTY : EASTERN COALFIELDS LIMITED			
	CONSULTANT : CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED (CMPDI)			
	मेकॉन लिमिटेड 1000, BISHUP BAGH, DELHI A SOFT COPY INDIAN ENTERPRISE			
CONTRACTOR	MECON LIMITED			
SECTION	STRUCTURAL	ADDITIONAL COAL HANDLING PLANT (DHMPA) AT RAJMAHAL OCP		
LOCATION	RANCH	COAL RECEIVING COMPLEX WITH TRUCK RECEIPT HOPPER AND CRUSHING ARRANGEMENT		
DESIGNED	V.K. GOPE	SCALE: -		
DRAWN	V.K. GOPE	DATE: 08.10.2023		
CHECKED AND VERIFIED	ARJIT NATH	SHEET NO. 1 OF 1		
APPROVED	SIG. S.K. ANA	REV.		

DO NOT SCALE, IF ANY DOUBT PLEASE ASK FOR TENDER PURPOSE ONLY



GALLERY SECTION OF CONVEYORS NC1A/B, NC4A/B & NC5A/B

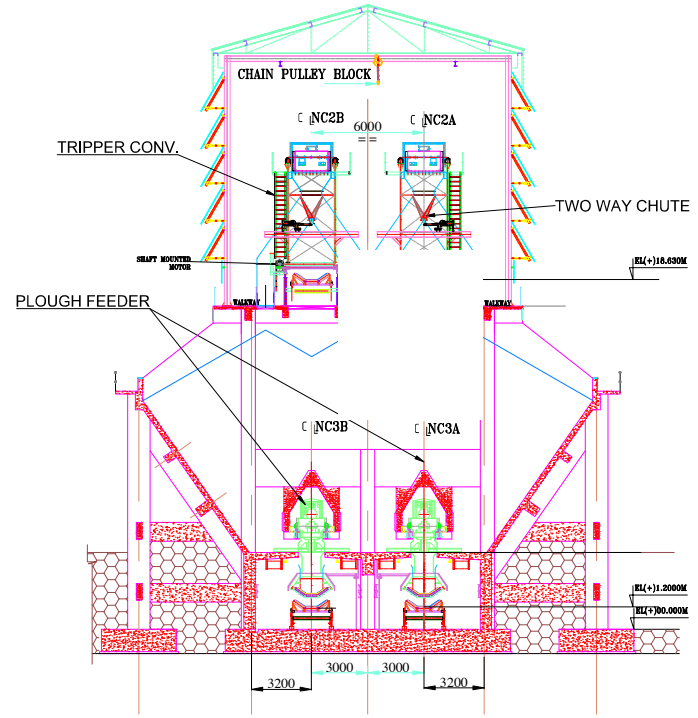
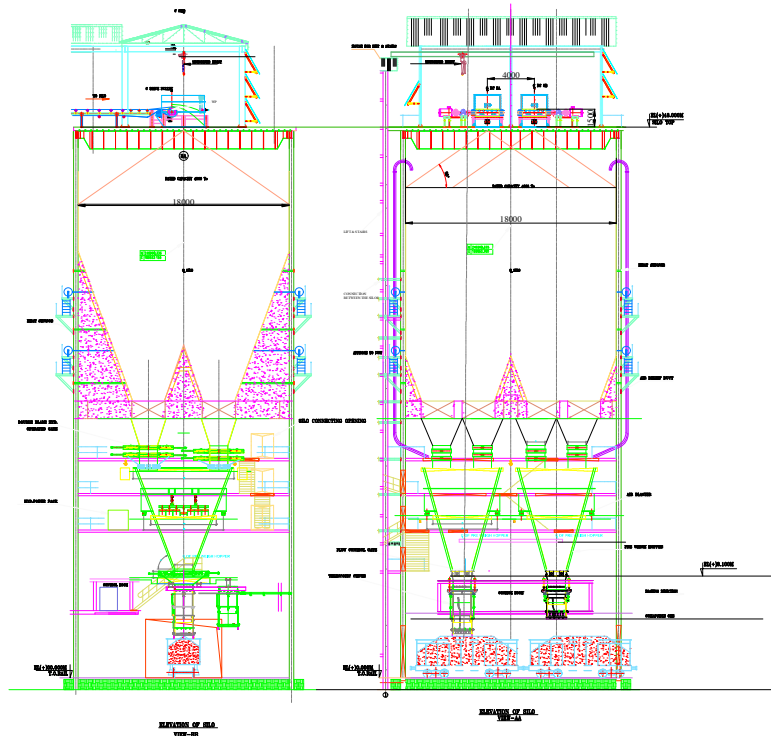


SECTION OF CONVEYORS ON GROUND NC1A/B

DRAWING FOR TENDER PURPOSE ONLY

- NOTE
1. ALL DIMENSIONS ARE IN MM
  2. ALL LEVELS ARE IN M
  3. ALL SECTIONS, DIMENSIONS & LEVELS SHOWN ARE INDICATIVE ONLY & WILL BE CHECKED DURING DETAIL ENGINEERING
  4. THIS DRAWING IS FOR TENDER PURPOSE ONLY NOT FOR CONSTRUCTION.

CATEGORY OF DRG.	APPROVAL	INFORMATION	REFERENCE	RECORD	CONSTRUCTION
	<b>CLUSTER 1</b> <b>EASTERN COALFIELDS LIMITED</b>				
	<b>COMPONENT 1</b> <b>CENTRAL MINE PLANNING &amp; DESIGN INSTITUTE LIMITED (CMPDI)</b>				
	<b>मेकॉन लिमिटेड</b> 1008 रोजर रोड इंदौर <b>MECON LIMITED</b> A GOVT. OF INDIA ENTERPRISE				
CONTRACTOR	ADDITIONAL COAL HANDLING PLANT (10MTPA) AT RAJABAHAL GDP				
SECTION	STRUCTURAL				
LOCATION	BRANCH				
DESIGNED	V.K. GOPE				
DRAWN	V.K. GOPE	CONVEYOR SECTIONS OF NC1A/B, NC4A/B & NC5A/B			
CHECKED AND VERIFIED	ASHTU MATH				
APPROVED	SG. S.K. JHA	SCALE: -			SHEET REV.
DATE: 05.10.2021	DRG. No. MEC/11/12/GM/C/75/201/0004			1	1 of 1



VIEW A-A

NOTE  
 1. ALL DIMENSIONS ARE IN MM.  
 2. ALL LEVELS ARE IN M.  
 3. ALL SECTIONS, DIMENSIONS & LEVELS SHOWN ARE INDICATIVE ONLY & WILL BE DECIDED DURING DETAIL ENGINEERING.  
 4. THIS DRAWING IS FOR TENDER PURPOSE ONLY NOT FOR CONSTRUCTION.

DRAWING FOR TENDER PURPOSE ONLY

CATEGORY OF DMC		APPROVAL	INFORMATION	REFERENCE	RECORD	CONSTRUCTION
 EASTERN COALFIELDS LIMITED						
 CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED (CMPDI)						
 मेकॉन लिमिटेड MECON LIMITED A GOVT. OF INDIA ENTERPRISE						
SECTION	STRUCTURAL	ADDITIONAL COAL HANDLING PLANT (19MTPA)				
LOCATION	WANCH	AT RAJAMAWAL GOP				
DESIGNED	V.K. GOPE					
DRAWN	V.K. GOPE	SECTION OF OVER GROUND BUNKER AND SILO				
CHECKED	ABHJ NATH					
APPROVED	SSD.S.K. JHA	SCALE	-			SHEET REV.
DATE: 08.10.2022		DRG. No.	MEC/11/12/SP/6/75/201/0005			1 OF 1