



**TENDER FOR LAYING OF M S PIPELINE RANGES OF DIA 6" ALONG WITH
FABRICATION AND INSTALLATION OF PONTOON AND FLOATING DOCK
FOR PROVIDING WATER SUPPLY TO CONSTRUCTION SITE**

FOR

2000 TPD COAL TO AMMONIUM NITRATE PROJECT

OF BCGCL

AT LAKHANPUR, JHARSUGUDA (ODISHA)

TENDER NO. PC298/PNCN-TS-601

PART-II (TECHNICAL)

ISSUED BY:



PROJECTS & DEVELOPMENT INDIA LTD. NOIDA

(A GOVT. OF INDIA UNDERTAKING)

PDIL BHAWAN, A-14, SECTOR-01

NOIDA-201301

DISTT. GAUTAM BUDH NAGAR

UTTER PRADESH, INDIA

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SCOPE OF WORK

&

TECHNICAL SPECIFICATION

OF

**LAYING OF M S PIPELINE RANGES OF DIA 6" ALONG WITH
FABRICATION AND INSTALLATION OF PONTOON AND
FLOATING DOCK FOR PROVIDING WATER SUPPLY TO
CONSTRUCTION WATER SYSTEM OF COAL TO AMMONIUM
NITRATE (2000TPD) PLANT OF BCGCL, AT LAKHANPUR,
JHARSUGUDA, ODISHA**

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	SCOPE OF WORK & TECHNICAL SPECIFICATION FOR LAYING OF PIPELINE ALONG WITH FABRICATION AND INSTALLATION OF PONTOON AND FLOATING DOCK FOR PROVIDING WATER SUPPLY TO CONSTRUCTION WATER SYSTEM AT BCGCL, LAKHANPUR, ODISHA	PC298/PNCN-TS-601		0	
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1.0 SCOPE OF WORK:

The scope of work covers all activities required for handling, transportation, laying, jointing, testing and commissioning of Mild Steel (M.S.) pipelines, including associated pump, pontoon system, power supply, Supply of Porta Cabin and Manpower in line as per SOR, drawings, technical specifications and directions of Engineer-in-Charge.

Following works to be executed by Contractor:-

1. Loading, Unloading & Transportation: Loading of M.S. pipes from store/yard, transportation to site, unloading and stacking at designated locations including all labour, tools/tackles within the mine Area.
2. Handling & Shifting: Shifting of M.S pipe within site limit along pipeline route or manually within a lead of 100mtrs where the site is not motorable/in slope terrain / different benches in mine etc. wherever required as per direction of Engineer-in-charge
3. Pipe Laying & Alignment: Lowering of pipes, alignment & laying as per drawing including maintaining line & level tolerances.
4. Joining & Assembly: Jointing of pipes including fit-up, welding, alignment, tightening of joints, and installation of nuts, bolts and washers as per SOR.
5. Testing & Inspection: Hydrostatic testing of pipeline, inspection of joints, rectification of defects & making the leak proof system.
6. Drum Pontoon System: Design (if required), fabrication, supply, installation and commissioning of drum pontoon system for supporting pipeline across water bodies/low-lying areas. Scope includes supply of drums, fabrication of frame, mounting of pipeline, anchoring arrangement, ensuring buoyancy and stability, anti-corrosion protection and testing.
7. Supply of M.S Nut and Bolt, Providing and fixing of 1.6 MPa Swing Check Type Reflux (Non-Return) Valves for of Nominal size (in mm) 150, Providing and fixing of sluice valve of 150 mm nominal dia Supply of MS Flange, 150 mm, (6 "), supply of steel required structure etc. & painting as per SOR.
8. Operation, Maintenance & Security: The contractor shall be responsible for operation, routine maintenance and security of pump, pontoon system, pipeline and associated power line for the specified contract period.

Scope includes:

- Operation of pump and pipeline system as per requirement.
- Routine inspection & preventive maintenance.

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- Repair/replacement of minor components to ensure uninterrupted operation.
- Deployment of adequate manpower for round-the-clock monitoring.
- Security of all installations including pump, pontoon, pipeline and power line against theft, damage or vandalism.
- Coordination with local authorities if required.
- Maintaining logbooks for operation and maintenance activities.

9. Pre-commissioning and commissioning activities

Note: Pipe shall be free issued by client in random length of 6 meter.

The scope of work shall include, but not limited to, the following:-

- 1.1 Unloading/Loading & transportation of piping material from yard/Contractor yard or directly from trailer / truck will be the responsibility of the contractor. Suitable heavy lift machinery/equipments should be available with the contractor for lifting and erection purpose.
- 1.2 The lifting and transportation of materials shall be done by the Contractor to their site stores/yard, storage and protecting them as per relevant specification and instruction of Owner/Consultant's representative.
- 1.3 After opening the packing boxes Contractor shall record the items available in individual case. Contractor shall return to Owner's store immediately, the items which are not required by them.
- 1.4 **Before start of any erection activities the following shall be checked by Contractor:**
 - a. Thorough initial surveying of the SITE shall be done with regard to the proper laying/ routing of the pipe lines/items & instruments. It is responsibility of contractor to generate the fabrication & erection front depending on availability of drawings, material and site condition to co-up the progress of the work. Any delays due to this reason are solely attributable to the contractor.
 - b. Checking of foundations/structures including anchor bolts for their correct dimension, levels, co-ordinates etc., with reference to bench marks, well before the actual erection is planned.
 - c. Structural steel fabrication and erection as per requirement of site. Detailed structural drawing preparation shall be included in the rates of fabrication Refer Schedule of Rates.
 - d. Carrying out Dye-penetrant examination, Radiography and other Non-destructive tests etc. where ever required as per Instruction of Engineering In charge/Owner.

1.5 FABRICATION & ERECTION OF PIPELINE

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- 1.5.1 a) All piping shall be assorted and marked for identification to avoid mix up of different materials, as per colour code provided by Owner/PMC.
- b) Prefabrication of piping as per convenient spools from pipes supplied in random commercial lengths. Contractor shall mark spools on in consultation with Owner/PMC.
- c) Fabrication of piping all consumable materials & steel for pipe support are to be supplied by the Contractor.
- d) Cleaning, edge preparation, welding, Non-Destructive Tests wherever required as per specifications/standards and codes including supply of manpower machinery, consumables, and necessary arrangements for execution of all works
- e) Laying & leveling of pipeline maintaining slope.
- f) Hydro test to be carried with fresh water only. Any temporary piping, temporary spool pieces, required drain and vent for hydro test and temporary supports required for carrying out hydro testing shall be supplied and erected by the Contractor within his quoted rates, nothing extra is payable on this account. Contractor is required to carry out the test, required hydrostatic drain and vent, tightening of bolts, and replacement of gaskets shall also be done without any extra cost to Owner. Equipment flanges shall be considered as part of piping system for this purpose. Making suitable arrangement for fixing of target plates shall be part of the scope of Contractor
- g) After hydro testing, pipe lines of sizes 2" and above shall be cleaned by air blowing, for efficient and proper cleaning of line as per instruction of Owner/PMC. If compressor is required for these activities, the same shall be arranged by the Contractor without any extra cost to the Owner/PMC. required for carrying out hydro-testing/blowing shall be Contractor's sole responsibility without any extra cost to Owner. Nothing extra shall be payable on this account.
- h) All structural steels required for fabrication of above supports shall consist of angles, channels, beams, plates, flats etc. including bolts, nuts and washers to be in the Contractor's scope of supply. Supply and fabrication of supports as per drawings, sketches, specifications, standards and instructions of Owner/PMC. All materials required for supports shall be in the Contractor.

2.0 OBLIGATIONS AND RESPONSIBILITIES OF CONTRACTOR

The Contractor's obligations and responsibilities shall include but not limited to the following:

- 2.1 Construction power & water shall be arranged and supplied by the Contractor.
- 2.2 All permanent gaskets, fasteners, such as bolts/nuts/washers etc. for all size of piping and nuts, bolts, washers etc. required for **structural** works, shall be arranged and supplied by Contractor.

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- 2.3 **Paved floor** and covered shed area shall be made available for piping pre-fabrication and *work shop* without any extra cost to Owner. The pre-fabrication of piping shall not be allowed on loose earth. The Contractor must strictly adhere and built the same during the mobilization stage.
- 2.4 To deploy skilled, semiskilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.
- 2.5 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner/PMC.
- 2.6 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner and Contractor shall be required to keep updating the same (as per the instructions of Owner/PMC) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner shall in no way be held responsible for such changes because such changes are deemed quite a common feature in any project of this size.
- "To achieve the targeted progress, as required by Owner/PMC, the number of construction equipments, tools tackles and manpower shall be augmented by contractor without any additional cost to Owner/PMC. These numbers shall be based on the actual output achieved in the previous fortnight".
- 2.7 To check for quantity compliance between bill of materials and drawings for piping, structures etc. and intimate Owner sufficiently well in advance regarding discrepancies if any.
- 2.8 Compressed air generation to arrange & provide at site.
- 2.9 To arrange and supply all equipments/machineries, lifting, handling and shifting devices, tools and tackles which are required for the execution of jobs in sufficient quantities, as per the best engineering practices and within the targeted completion Schedule. It must be clearly under stood that Owner/PMC shall not be responsible for arranging or supplying any tools and tackles. Contractor shall also arrange motorised hydro-testing pump in sufficient nos. for hydro testing of pipes.

LIST OF MAJOR TOOLS AND TACKLES REQUIRED ARE AS LISTED BELOW:

- Cranes of suitable capacity
- Hydra of suitable capacity.
- Suitable Trailer with Prime Mover
- 10Te capacity truck
- Motor generator welding sets in sufficient numbers

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- f) TIG welding sets complete with all accessories
 - g) DG welding machines
 - h) Rectifier welding sets
 - i) Gas cutting set
 - j) Drilling and grinding machines
 - k) Air Compressor
 - l) Portable D.G. Set
 - m) Theodolites/Dumpy level /Master level/Sprit level
 - n) Pipe beveling machine
 - o) Pipe bending machines
 - p) Sufficient pipe fabrication stand for piping spool fabrication
 - q) Manual Torque Wrench preferably ratcheting type
 - r) Wooden sleepers and scaffolding (metallic only) materials.
 - s) D-shackles, slings, lifting and spreader beams and any other special tools and tackles and facilities required to complete all jobs as per NIT to the engineering practices.
 - t) Central and portable electric ovens for electrode's baking & heating.
- 2.10 To arrange and supply all consumables required for executing the job covered under the scope of Contractor such as but not limited to the following in adequate quantity of required quality and in time to meet the completion schedule :-
- Electrodes, filler wires, industrial gases such as oxygen, acetylene, argon, water soluble paper, fuel oils, cotton waste, markine cloth, toil stones; emery papers; grinding wheel; cutting wheel; Teflon sealing tapes etc.
- 2.11 To provide proper storage and security arrangements for Contractor's tools, tackles, equipments, materials etc. as well as materials issued by Owner to Contractor. Owner shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.
- 2.12 Completion of all repairs arising out of defective work done by Contractor. Owner may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation
- 2.13 To maintain all the records for manpower, materials and execution of job as required by law as well as Owner/PMC.
- 2.14 To get his work approved from statutory agencies, If required.

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- 2.15 To make arrangements for services such as transport, medical lighting, canteen etc. for working round the clock.
- 2.16 In addition to safety regulations listed elsewhere in the NIT, Owner/PMC may issue certain safety directive which shall have to be followed meticulously without any reservation.

For executing Hot Job the party should possess the following:

- a. Suitable provision for Water Curtain
 - b. DCP Cylinder.
 - c. Asbestos Clothes
 - d. Plant Air Connectivity system to the booths
- 2.17 Reconciliation of materials issued to Contractor as directed by Owner/PMC.
- 2.18 Hand over of the completed works to Owner as per procedure laid down by Owner/PMC.
- 2.19 To submit documentation forming part of request for issue of completion certificate.
- 2.20 Clear the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office / fabrication shop etc.
- 2.21 For working within booths the contractor should have suitable metallic planks / gratings etc which will serve as the working platform for the executing team. **Use of Bamboo or any wooden structure is strictly prohibited.**

Note: - Contractor has to erect Welding Booths covered on all sides with CGI Sheets so that there is no splash over of welding / grinding sparks outside the booths at the contractor's risk and cost. Only new CGI Sheets will be allowed to be used.

3.0 TECHNICAL CONDITIONS OF CONTRACT

3.1 WELDER'S QUALIFICATION

Welders proposed to be deployed at SITE shall be tested for welding procedure qualification and welder performance qualification in the presence of Owner/PMC or his representative or any statutory authority whenever required strictly as per standards, codes and specifications.

3.2 ELECTRODES AND FILLER WIRES

Electrodes and filler wires to be used at site in this job shall be procured from the approved vendors only. Electrodes and filter wires shall be **D&H, Advani Orlikon or ESAB, Mailam and Bohler group make only**

Selection of electrodes and filler wires shall be as per standards, codes and specifications. Tests required, if any, to satisfy the technical suitability of these electrodes/filler wires shall be arranged by Contractor at his own cost. All electrodes and filler wires shall be supplied by

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Contractor within their quoted rates. All welding of materials shall be as per Engineering/Technical Standard and shall be of radiographic quality. Electrodes shall be baked as per manufacturer's catalogue at suitable temperature for the requisite time before these are to be used. The ovens (mother as well as field) are to be arranged by the Contractor.

3.3 ROOT RUN USING TIG

All piping's root run for Carbon Steel weld joints shall be done using TIG welding. Welding of socket joints for all CS and C.S. piping > 600 # rating shall be done by TIG welding only. Further to this if butt weld joints are required to be done by **TIG welding**; only **Argon gas** shall be used both for shielding and purging wherever required.

3.4 HYDROTESTING

Hydraulic testing including repair, rectification and retesting of the complete piping system, by making suitable loops in consultation with Owner/PMC representative, shall be done by the Contractor. All the necessary materials and arrangements required (such as but not limited to blanks, temporary supports, temporary spools in place on on-line instruments, pressure gauges, pumps suitable for required hydro test pressure, including connected piping and accessories for pumps temporary fasteners etc.) shall be in the scope of Contractor. The pressure gauges shall be used after due calibration and certification by the PMC representative (a valid calibration test certificate shall be made available at all time of test by the Contractor).

3.4 MEASUREMENTS: As per SOR units

3.5 INDIAN & INTERNATIONAL CODES (FOR REFERENCE)

- ANSI: B 31.3
- ASME SECTION VIII & IX (Latest revision)
- IS-800 CODE OF PRACTICE FOR STRUCTURAL STEEL IN GENERAL BUILDING CONSTRUCTION (Latest revision)
- IS-554 - DIMENSIONS FOR PIPE THREADS FOR PRESSURE JOINTS

4.0 STATUTORY APPROVALS

The Contractor shall be fully responsible for obtaining Statutory Approvals for drawings and documents needed for carrying out erection and Hydro testing of equipment & pipeline coming under different local authority.

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5.0 FABRICATION OF 84 DRUM PONTOONS & DECK INSTALLATION AS PER DRAWING:

A drum pontoon consists of floatation units (PVC barrel), Supporting frame (steel) with Mooring & anchoring system & Buoyancy is governed by Archimedes' Principle.

DRUMS:

Type: PVC drums (200 L)

Condition: Leak-proof

Typical buoyancy: 180–200 kg per drum

FRAME: Steel channels / angles

Fasteners: bolts, nuts, washers, clamps or straps for drum fixing etc

PRE-INSTALLATION CHECKS: Verify Drum integrity (no leakage), Frame alignment and dimensions ensure All materials are available on site & Mark layout at installation location

ASSEMBLY PROCEDURE (ON LAND):

Frame Fabrication: Fabricate rectangular grid frame as per attached drawing, provide cross members at drum spacing Clean drums, seal all openings tightly

FIXING OF DRUMS: Position drums under frame fix using clamps & ensure firm holding (no movement) even spacing.

DECK INSTALLATION: Fix decking on top of frame, Provide anti-slip surface & secure with screws/bolts

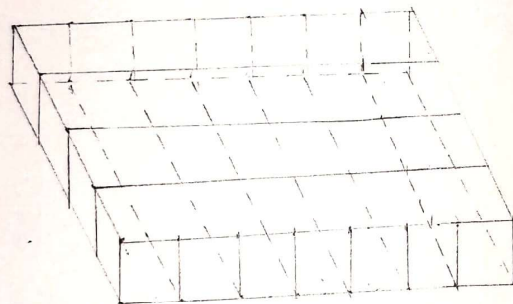
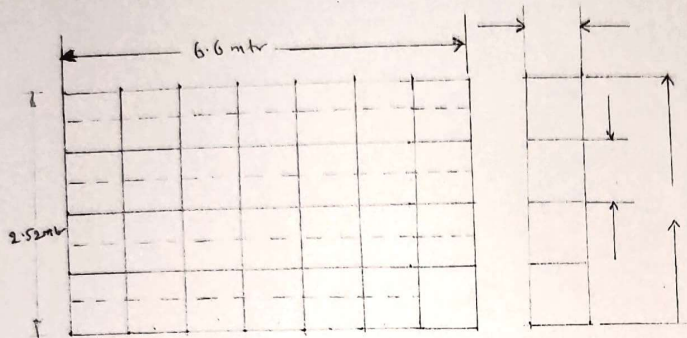
TESTING & CHECKS:

Load test: Apply expected load gradually, check stability & Drum fixing tightness

SAFETY PRECAUTIONS: Use life jackets during installation, avoid overloading & Ensure anti-slip deck & no sharp edges.

Note: Before start of job bidder shall submit final drawing & installation procedure of pontoons & deck.

Schematic Diagram of 28 Nos. of Drum pattern [28 nos. of 28 drum pattern will form a 28 drum pattern]



Paul
01/02/20

Geany
01/02/20



Free hand drawing

SOME IMAGES OF OUR WORK DONE



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TECHNICAL SPECIFICATION FOR STRUCTURAL WORKS

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4.	PAINTING

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1.0 GENERAL

- 1.1 Specifications of materials and workmanship shall be as described in the Central Public Works Department Specifications Vol. I & II (latest) include latest amendments, unless otherwise specified. These CPWD Specifications shall be deemed to form part of this contract. The **CONTRACTOR** shall procure and maintain copies of the latest CPWD Specifications at site for reference.
- 1.2 These technical Specifications shall be supplementary to the specifications contained in the CPWD specifications, wherever at variance, these Particular Specifications shall take precedence over the provisions in the CPWD Specifications.

2.0 REFERENCE CODES & STANDARDS

- 2.1 Wherever reference of IS Specifications/ or IS Codes of Practice are made in the Specifications/ Schedule of Rates or Preambles, reference shall be to the latest edition of IS (Bureau of Indian Standards).

IS - 432	Mild Steel & Medium tensile steel bars.
IS - 800	Code of Practice for General Construction in Steel
IS - 1079	Hot rolled carbon steel sheets & strips
IS - 1161	Steel tubes for structural purposes.
IS - 1285	Wrought aluminium & aluminium alloy extruded round tube and hollow sections
IS - 1361	Steel windows for Industrial Buildings.
IS - 1363	Hexagon head bolts, screws & nuts of product grade C : Part - I Hexagon head bolts (size range M5 to M64)
IS - 1367	Technical supply conditions for threaded steel fasteners
IS - 1566	Hard - Drawn steel wire fabric for concrete reinforcement.
IS - 1786	High strength deformed steel bars & wires for concrete reinforcement.
IS - 2062	Steel for general structural purposes.

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IS - 4923 Hollow Steel sections for structural use.

IS - 6477 Dimensions for wrought aluminium & aluminium alloys, extruded hollow sections.

IS - 7318 Fusion welding of steel.

3.0 **STRUCTURAL STEEL WORK**

This specification covers the technical requirements for the preparation of shop drawings, supply, fabrication, protective coating, painting and erection of all structural steel rolled sections, built up sections, plates and miscellaneous steel required for the completion of the work.

Steel

All structural steel used in construction within the purview of this contract shall, comply with one of the following Bureau of Indian Standard Specifications, whichever, is appropriate or as specified.

IS – 2062 Hot rolled sections and plates

IS – 1079 Cold formed light gauge sections

IS – 1161 Tubular sections

IS – 4923 Hollow sections (rectangular or square)

Fabrication

Fabrication of steel structure shall be carried out in conformity with the best modern practices and with due regard to speed with economy in fabrication and erection and shall conform to IS-800. All members shall be so fabricated as to assemble the members accurately on site and erect them in correct positions. Before dispatch to site the components shall be assembled at shop and any defect found rectified. All members shall be free from kink, twist, buckle, bend, open joints etc. and shall be rectified before erecting in position. Failure in this respect will subject the defective members to rejection.

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Fabrication Drawings:

Development of Fabrication drawings shall be in contractor's scope. Connections, splices and other details shall be suitably designed based on good Engineering practice.

Electrodes:

Electrodes used for welding shall comply with IS-814 or IS - 815.

3.1 MS Black/High Strength Bolts and Nuts

M.S.Black or high strength bolts, nuts and washers etc. shall be as per IS-800, IS-1363 and IS-1367. Manufacturer's test certificate shall be made available to the **Engineer-in-Charge**. For bolted joints, shanks and threaded bolts are to be used to ensure that threaded length do not encroach within the thickness of connected members of dimension beyond the following limit:-

1. 1.5 mm for connected members of thickness below 12 mm and
2. 2.5 mm for connected member of thickness 12 mm and above and that adequate shearing and bearing values required as per design are achieved.

Every portion work shall have its erection mark or numbers stencilled on the member for guidance in erection and bear all necessary marks of erections as directed by the Owner / Consultant.

- 3.2 No part of the work is to be oiled, painted (except contact surfaces) packed, bundled, crated or dispatched until it has been finally inspected and approved by the Owner / Consultant or his authorized representative. The whole steel work before being dispatched from the Contractor's shop shall be dry and after being thoroughly cleaned from dust, mills scale, rust etc., and shall be given two coats of primer and one coat of final paint as per painting specification attached in this enquiry. Unless otherwise specified, all surfaces inaccessible after welding shall be given two coats of primer and two coats of paints as per painting specification attached in this enquiry.

- 3.3 The Owner / Consultant or his authorized representative shall have free access at all reasonable time to all places where the work is being carried out, and shall be provided by

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the Contractor at his own expenses all necessary facilities for inspection during fabrication and erection. The Owner / Consultant or his authorized representative shall be at liberty to reject the work in whole or in part if the workmanship or materials do not conform to the terms of the specifications mentioned herein. The Contractor shall remove, replace or alter any part of the work as ordered by the Owner / Consultant or his authorized representative.

4.0 PAINTING

1) BITUMINOUS PAINT

This is generally of heavy grade bituminous corrosion resisting paint. 2 coats of the paint shall be given, and drying time between the 2 coats shall not be less than 5 hours. Also, its drying time after second coat shall not be more than 8 hours. Its finish shall be smooth, glossy and elastic.

The primer shall confirm to the following requirements:

- Viscosity by standard tar viscometer, 4mm orifice at 25°C: 4 to 24
- Penetration at 25°C, 100g, 5sec in 1/100 cm : 20 to 50
- Water content percent (max) : 0.2

APPLICATION

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1.	Bituminous Paint (Primer)	Concrete surface
2.	10mm Bitumastic Laying in two layers each shall not be more than 5mm thick	Over Bituminous Paint

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1.0 GENERAL

1.1 Scope

This specification covers the technical requirements for shop and site application of paint and protective coatings and includes; the surface preparation, priming, application, testing and quality assurance for protective coatings of mechanical equipment, structural steelwork, plate work, tankage, guards, pipe work, handrails and associated metal surfaces, which will be exposed to atmospheric for the Project.

1.2 Definitions

- C.S - Carbon steel and low chrome (1-¹/₄ Cr through 9 Cr) alloys
- S.S - Stainless steel, such as 304,316, 321, 347,
- Non-ferrous - copper, aluminium and their alloys.
- High Alloy - Monel, Inconel, Incoloy, Alloy 20, Hastelloy, etc.
- DFT - Dry Film thickness, the thickness of the dried or cured paint or coating film.

1.3 Safety Regulations

Protective coatings and their application shall comply with all national, state, and local codes and regulations on surface preparation, coating application, storage, handling, safety, and environmental recommendations.

Sand or other materials producing silica dust shall NOT be used for any open-air blasting operations.

1.4 Material Safety Data Sheets

The latest issue of the coating manufacturer's product datasheet, application instructions, and Material safety data Sheets shall be available prior to starting the work and shall be complied with during all preparation and painting / coating operations.

1.5 Materials

All paints and paint materials shall be obtained from the company's approved manufacturer's list. All materials shall be supplied in the manufacturer's containers, durably and legibly marked as follows.

- Specification number
- Colour reference number
- Method of application
- Batch number
- Date of Manufacture
- Shelf life expiry date
- Manufacturer's name or recognised trade mark.

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2.0 CODE AND STANDARDS:

Without prejudice to the provision of Clause 1.1 above and the detailed specifications of the contract, the following codes & standards shall be followed. Wherever reference to any code is made, it shall correspond to the latest edition of the code.

2.1 Indian Standards:

IS-5: 1994	Colors for ready mixed paints and enamels.
IS-2379: 1990	Color codes for identification of pipe lines.
IS-2629: 1985	Recommended practice for hot-dip galvanizing on iron and steel.
IS-2633: 1986	Methods for testing uniformity of coating of zinc-coated articles.
IS-8629: 1977	Code of practice for protection of iron and steel structures from atmospheric corrosion.
IS:110	Specification for Ready Mixed Paint, Brushing, Grey Filler, for Enamels, for Over Primers
IS:101	Methods of test for ready mixed paints & enamels.

2.2 Other Standards:

2.2.1 Swedish Standard: SIS-05 5900-1967 / ISO-8501-1-1988
(Surface preparations standards for Painting Steel Surface).
This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer-in-charge.

2.2.1 DIN: 53151 Standards for Adhesion test.

2.3 The paint manufacturer's, instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

- Instructions for storage to avoid exposure as well as extremes of temperature.
- Surface preparation prior to painting.
- Mixing and thinning.
- Application of paints and the recommended limit on time intervals between coats.

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3.0 SURFACE PREPARATION

3.1 Metal Surface Preparation

3.1.1 Safety

All work in adjacent areas, which may negatively affect the quality of blast cleaning, and/or impose safety hazards, must be completed or stopped before the blasting operation starts.

3.1.2 Pre-cleaning

Prior to surface preparation all weld spatter shall be removed from the surface, all sharp edges ground down and all surfaces cleaned free of contaminants including chalked paint, dust, grease, oil, chemicals and salt. All shop primed surfaces shall be water washed by means of suitable solvent, by steam cleaning, with an alkaline cleaning agent if necessary or by high-pressure water, to remove contaminants prior to top-coating

3.1.3 Surface Decontamination

Surface decontamination shall be performed prior to paint application when uncoated surface is exposed to a corrosive environment or existing paint work is to be repaired.

Existing coatings shall be removed by abrasive blast cleaning, and then high pressure potable water shall be used to clean steel surfaces.

Prior to application of coatings, the surface shall be chemically checked for the presence of contaminants. A surface contamination analysis test kit shall be used to measure the levels of chlorides, iron salts and pH in accordance with the kit manufacturer's recommendations.

Swabs taken from the steel surface, using cotton wool test swabs soaked in distilled water shall not be less than one swab for every 25m² of surface area to be painted. Maximum allowable contaminant levels and pH range is as follows:

Sodium chloride, less than 50 microgram / cm²;

Soluble iron salts, less than 7 microgram / cm²; and

If the results of the contamination test fall outside the acceptable limits, then the wash water process shall be repeated over the entire surface to be painted, until the contaminant test is within the specified levels.

3.1.4 Abrasive Blasting

All C.S. materials shall be abrasive blast cleaned in accordance with Codes (Ref. Clause 2.0). To reduce the possibility of contaminating S.S., blasting is not usually specified. However, for coatings which require a blast-cleaned surface for proper adhesion, S.S. may be blast cleaned using clean aluminium oxide or garnet abrasives (Free from any chloride or Iron / Steel contamination). When hand or power tool cleaning is required on S.S., only S.S. wire-brushes (including 410 S.S.) which have not been previously used on C.S. surfaces may be used.

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The surface profile of steel surfaces after blasting shall be of preparation grade Sa 2-1/2 of Swedish Standards SIS-05-5900 (Latest Revision) or better according to ISO 8501-1 and shall be measured using the replica tape method or the comparator method.

The roughness (profile) of blast-cleaned surfaces shall be Medium (G) according to ISO 8503-2: 1988 (appendix 1) unless otherwise specified. Medium defines a surface profile with a maximum peak-to-valley height of 60-100 microns, and G indicates that the surface profile is obtained by grit blasting. For the evaluation of surface roughness Comparator G shall be used.

Abrasive blast cleaning shall NOT be performed when the ambient or the substrate temperatures are less than 3° C above the dew point temperature. The relative humidity should preferably be below 50% during cold weather and shall never be higher than 60% in any case.

Abrasive blast cleaning shall be performed with a clean, sharp grade of abrasive. Grain size shall be suitable for producing the specified roughness. Abrasives shall be free from oil, grease, moisture and salts, and shall contain no more than 50ppm chloride. The use of silica sand, copper slag and other potentially silica containing materials shall not be allowed.

The blasting compressor shall be capable of maintaining a minimum air pressure of 7 kPa at the nozzle to obtain the acceptable surface cleanliness and profile.

The blast cleaning air compressor shall be equipped with adequately sized and properly maintained oil and water separators. The air supply shall be checked to ensure no oil and water contamination at the beginning of each work shift.

Blast cleaning abrasive shall be stored in a clean, dry environment at all times. Recycling of used abrasive is prohibited.

After blast cleaning, the surfaces shall be cleaned by washing with clean water (Pressure 7kg/Cm² using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matter.

Assessment of the blast cleaned surfaces shall be carried out in accordance with reference code.

Blast cleaned surfaces which show evidence of rust bloom or that have been left uncoated overnight shall be re-cleaned to the specified degree of cleanliness prior to coating.

All grit and dust shall be removed after blasting and before coating application. Removal shall be by a combination of blowing clean with compressed air, followed by a thorough vacuum cleaning with an industrial grade, heavy duty vacuum cleaner.

All cleaned surfaces shall have protection from atmospheric corrosion as per IS8629:1977

3.1.5 Alternate Methods of Surface Preparation

When open air blasting is not permitted on site, or when space limitations or surface configurations preclude blasting, the alternate cleaning methods listed below may be used with prior approval. Alternate cleaning methods shall consider the degree of surface cleanliness and roughness profile required by the specified coating system.

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- Vacuum or suction head abrasive blast-cleaning,
- Wet jet abrasive blast-cleaning,
- Compressed-air wet abrasive blast cleaning,
- Pressurized liquid blast-cleaning,
- Power tool cleaning,
- Hand or power tool cleaning,

Hand and/or power tool cleaning shall only be used for spot repair where abrasive blasting is not permitted or is impractical, and on items which could be damaged by abrasive blasting. Power tool cleaning shall not be carried out with tools which polish the surface, e.g. power wire brushes.

The surfaces of equipments and prefabricated piping etc. which are received at site Primerised or with finish paints, depending upon their conditions, shall be touched up and painted at site. For these surfaces sand blasting is not envisaged and these surfaces shall be prepared using power brushes, buffing or scraping, so as to achieve a surface finish to St-3 as per SIS-05-5900 . After wash-up the area to be touched up shall be jointly marked, measured and recorded for payment purposes. The type of system & nos. of coat (primer and/or finish paint) to be applied after touch up, which shall be decided by OWNER/CONSULTANT in writing before taking up the job.

When paint is to be applied on damaged painted surfaces of equipments all loose and flaking paint work should be removed to a firm feathered edge. Rusted spots should be cleaned by one of the methods specified in the clauses 4.4.1 & 4.4.2 above. In case the previous paint work is not compatible to the specified one the entire coating must be removed.

It shall be ensured that sand blasted surface/machine cleaned surface is not contaminated with oil and grease. Water shall also not be allowed to come in contact with sand blasted surface.

4.0 APPLICATION

4.1 General

The final specification of paint systems to be used to suit the exposure conditions of equipment and steelwork, shall be as specified on the scope of work, equipment data sheets or the drawings.

All coatings shall be in accordance with Indian / International Standards, the coating manufacturer's product data sheets and application instructions and the requirements contained in this specification.

4.1.1 General Requirements for Shop Application

All work areas which facilitates shop paint application shall be surface prepared for painting and have the paint system applied before installation.

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Equipments assembled at site shall only receive primer coat in the shop and finish coatings will be applied at site.

In all cases, where surfaces will be inaccessible after shop assembly, they shall be prepared and have the paint system applied before assembly is carried out. Drying times between successive coats shall be at least those recommended by the manufacturer.

All known field weld areas shall be given the specified abrasive blast surface preparation but left uncoated for a distance of 50mm from the weld line. Such areas shall be given the appropriate touch-up treatment after installation.

The manufacturer's directions for preparation and application of coatings shall be followed to ensure that the durability of the coating system is not impaired.

The Contractor shall submit the full details of the proposed surface preparation and paint systems prior to the commencement of any surface preparation.

4.1.2 General Requirements for Site Application

Paint shall be stored only in accordance with the manufacturer's instructions.

All materials used for the specific system being applied shall be products supplied by one manufacturer and details of such product shall be submitted for approval before commencement of work.

The contents of cans shall be thoroughly stirred before being poured into paint pots and shall be thinned only in the specified proportions in accordance with the manufacturer's instructions.

Finish coats may be applied by spraying except where any over spray is likely to affect finished surfaces or where spraying constitutes a health hazard to workmen in the other areas. Brush and roller application will require multiple coats to achieve the specified dry film thickness.

Brush application may be used only with the approval of the company.

Roller application shall only be used on relatively large surface areas (i.e. > 50m²) and only if spraying is not an option.

The Contractor shall complete the application of any one type of paint or each coat thereof, before beginning the next coat on that section.

In cases nominated as critical, the application of each coat shall be approved before application of the next coat can proceed, in accordance with 'hold' points nominated in the Inspection and Test Plans (ITPs)

All fittings within any given area are to be painted with the same system as the area unless otherwise specified.

Where 2 coat of finish paint are indicated they shall be applied in two different shades to ensure that two coat are applied.

Paint shall not be applied in rain, snow, fog or mist or when the relative humidity is such as to cause condensation on metal surface.

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The CONTRACTOR must ensure the availability of a specialist from the paint manufacturer, at SITE during pendency of CONTRACT within his quoted rates to ensure the quality of painting & procedure. Addition of drying agents, pigments or other substances is not allowed unless specifically prescribed or approved by paint manufacturer's specialist.

Name plates/tags attached to the equipments/machineries shall not be painted or removed during painting job. Failing to comply with above, the CONTRACTOR may be required to replace name plates/tags at his cost.

4.1.3 Qualifications and Materials

All surface preparation, coatings application and inspection, shall be carried out by personnel experienced in that particular field. Contractors shall submit the names of subcontractors to be employed for the specific work together with the brand names of coating materials for approval prior to commencement of application.

4.1.4 Handling and Transport

All pipe work, steelwork and equipment that have been finish coated shall be handled with care to preserve the coating in the best practical condition.

Painted materials shall not be handled until the coating has completely cured and dried hard Supports in contact with coated steel during transport and storage shall be covered with a soft material to prevent damage to the coating. Appropriate materials shall be used during transportation between coated steelwork and holding down chains to prevent damage to the coating.

4.2 Application of Coatings

4.2.1 General

The application method and type of equipment to be used shall be suitable for the paint specified and the surface being painted.

Paints and thinners shall be brought to the point of usage in unopened original containers bearing the manufacturer's brand name and colour designation and ready-mixed unless otherwise specified. Two-pack systems shall be mixed at the site of application to the paint manufacturer's recommendations. The mixed amount prepared shall be no more than the amount that can be applied during the stated pot life.

Paint shall be applied so that an even film of uniform thickness, tint and consistency covers the entire surface and is free of pin holes, runs, sags or excessive brush marks. Film finish shall be equal to that of first class brushwork.

Unless it is practical to do so colour shades for primer, intermediate coat and finish coat must be different to identify each coat without any ambiguity

Paint ingredients shall be kept properly mixed during paint application.

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Equipment shall be kept clean to ensure dirt, dried paint and other foreign materials are not deposited in the paint film. Any cleaning solvents left in the equipment shall be completely removed before painting.

To ensure the required film thickness is achieved on angles, welds, sharp external edges, nuts and bolts, a coat shall be applied to such items/locations immediately prior to the application of each coating to the whole area.

Care shall be taken to ensure paint application into all joints and crevices.

The contact surfaces between steelwork to be fastened by means of friction grip bolting shall be abrasive blast cleaned and prime coated only, prior to erection.

4.2.2 Atmospheric conditions

Surface preparation and coating shall not be carried out in inclement weather and shall be carried out such that the surface being coated is free of moisture, wind-borne or blast cleaning dust.

Coatings shall not be applied if:

- The relative humidity exceeds 85%.
- The ambient temperature is less than 5⁰C (depending on local condition)
- The metal temperature is less than 3⁰C above the dew point.
- There is likely hood of an unfavourable change in weather conditions within two hours after painting.

As a general rule, sufficient ventilation, dehumidification and heating capacity to cope with local climatic conditions must be secured before any coating – related work is started.

In any case, humidity, ambient and surface temperature conditions at the time of paint application, and curing and drying time before application of the next coat, shall be in accordance with the paint manufacturer's recommendations. These conditions shall be recorded in the Inspection Test Record (ITR) by the Contractor and be available for review.

4.2.3 Conventional or Airless Spray

Spray equipment shall be equipped with accurate pressure regulators and gauges. Spray gun nozzles and needles shall be those recommended by the paint manufacturer.

Air from the spray gun shall be clean and dry with no traces of oil or moisture.

Coatings shall be wet on contacting the painted surface. Areas of dry spray shall be removed and the correct system re-applied.

4.2.4 Brush Application

The method of "laying-off" shall be suited to the paint specified and shall ensure minimum brush marking.

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4.2.5 Roller Application

A uniform method of application shall be adopted when painting large areas. The rolling direction shall minimise paint joint build up. Edges and areas subject to possible roller damage shall be brush-painted prior to rolling.

4.2.6 Thickness of Coatings

The maximum thickness DFT in any one application shall not exceed that specified in Technical specifications/ recommended by the paint manufacturer.

Wet film thickness gauges shall be used to make frequent checks on the applied wet film. The Contractor shall maintain at the site of painting operations, a dry film thickness tester of an approved type with a valid current calibration.

Coating thickness checks in accordance with reference code shall be performed, and the Contractor shall undertake remedial action if the measured thickness is less than specified.

Build up of each material to required thickness shall be made prior to the application of the subsequent coat; final film build shall be the minimum specified.

4.2.7 Multiple Coat Applications (Except Wet-On-Wet)

Before successive paint coats are applied, intermediate coats shall be inspected for surface contamination. The presence of any grease or oil, shall be removed by a suitable solvent, and any salt and dirt adhering to the surface shall be removed by scrubbing with a solution of non-toxic detergent (except those prescribed by the manufacturer as "wet-on-wet"). Removal of contaminants shall only be performed after an intermediate coat has had sufficient time to cure.

The surface shall then be pressure hosed or dusted down by brush to disturb and remove deposits not apparent on visual inspection.

Coatings shall be applied only under the following conditions:

- The surface has been cleaned and is dry;
- The manufacturer's stated minimum time for re-coat has elapsed;
- The manufacturer's stated maximum time for re-coat has not elapsed. If the maximum time has elapsed then pre-treatment shall be in accordance with the paint manufacturer's recommendations; and

Damaged areas in preceding coat have been made good in accordance with this Specification.

When multiple coat of finish paint are indicated, they shall be applied in different shades to ensure that multiple coats have been applied.

4.2.8 Protective Coatings for Fasteners

Black and galvanised erection bolts/nuts and galvanised holding down bolts/nuts shall be prepared and painted in accordance with Section 4.4 of this Specification.

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Black high tensile bolts/nuts shall be painted after erection to the same paint system specification as the surrounding structural steel.

4.3 Hot Dip Galvanising

All galvanising shall be carried out by the hot dipping process and conform to the requirements of IS-2629:1985 and uniformity of coating shall conform to IS 2633:1986.

All welding slag shall be removed by chipping, wire brushing, flame cleaning or abrasive blast cleaning where necessary prior to galvanising

For temporary identification, either water-soluble marking paints or detachable metal labels shall be used. For permanent identification, figures/labels shall be heavily punched or embossed by the fabricator.

For galvanised items after pickling, the work shall be inspected and any defects that render the work unsuitable for galvanising shall be repaired. After such repairs, the work shall again be cleaned by pickling.

The coating mass of zinc shall be as specified on equipment data sheets and the Drawings. Galvanised coatings shall be tested by the methods described in referred code.

After galvanising all material shall be cooled to air temperature in such a manner that no embrittlement occurs.

Galvanised coatings shall be smooth, uniform, adherent and free from stains, surface imperfections and inclusions.

All gratings and fixtures including nuts, bolts and washers that are required to be galvanised, shall be hot dipped galvanised and all nut threads shall be re-tapped after galvanising and a lubricant applied on Cold working of galvanised steelwork shall be avoided.

4.4 Damaged or Inaccessible Surfaces

4.4.1 Damaged Paint Surface

Repair of damaged painted surfaces, as well as painting of galvanised and black bolts, and galvanised holding down bolts after erection shall comply with this Clause. The treatment shall be:

- Pre-clean the damaged or unpainted areas in accordance with Section 4.2.1 of this Specification;
- Disc or hand sand to clean bright metal;
- Inorganic zinc primers subject to mechanical damage or weld etc shall be power tool cleaned
- Feather backs by sandpapering or whip blasting the original coatings surrounding the damaged area over a 50mm distance. A rough surface shall be obtained on epoxy coatings;

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- Clean surface to remove all dust;
- Conduct surface contaminant test in accordance with Section 4.2.2 of this document; and

Build up a new paint system over the affected area with paints equal to those originally used and having the same dry film thickness for each coat. As an exception, damaged inorganic zinc primers shall be repaired with epoxy organic zinc rich paint and shall be applied within four hours of blast cleaning.

The new coatings shall overlap the original coating over the 50mm prepared distance and shall be colour matched to the specified colour of the original coating.

4.4.2 Damaged Galvanised Surfaces

Damaged areas caused by oxy-cutting, welding or physical impact shall be treated as follows:

- Prepare the surface by removing any weld slag followed by vigorous power wire brushing of the coating surrounding the damaged area over a 50mm distance;
- Clean surface to remove all dust; and
- Apply two coats of organic zinc-rich primer to a minimum DFT of 100 microns.

The area to be reinstated shall be colour matched to the surrounding finish colour with 40 microns of aluminium paint to the manufacturer's **written instructions**.

4.4.3 Inaccessible Surfaces

Surfaces that will be inaccessible after erection of other elements of the structure, shall be fully painted prior to the installation of the obstructing item.

4.5 Surfaces Not To Be Coated

The following surfaces shall not be blasted or coated unless specifically directed:

Machined surfaces, bearings, seals, grease fittings, adjusting screws and name plates, and identification tags.

- Valve stems;
 - Raised faces on pipe and equipment flanges;
 - Electrical cabling;
 - Instrumentation, gauges and sight glasses;
 - Titanium, stainless steel and non-metallic surfaces; and
- Field weld margins, 50mm either side of weld, on tankage and piping, prior welding.

The rear face of piping flanges shall be shop prime coated only. Flange holes for fasteners shall be fully coated.

4.6 Wash-Up

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All surface of equipments/prefabricated piping etc. Primerised / painted at Vendor shop and received at site if required shall be washed up as follow:

- a) Washing with clean water (Pressure 7 Kg/cm²) using suitable nozzles. During washing, broomcorn brushes shall be used to remove foreign matter.
- b) Solvent washing, if required, to remove traces of wash up as per above procedure of all surfaces of equipment, piping, structure etc. completely painted at contractor's shop shall be included in the quoted rates of oil, grease etc. Wash up as per above procedure of all surfaces of equipment, piping, structure etc. completely painted at contractor's shop shall be included in the quoted rates.

4.7 Touch-Up Painting

Prior to the application of any coat, all damage to the previous coat(s) shall be touched-up. Damage to finished work shall be thoroughly cleaned and re-coated.

Surface preparation shall be done as per clause no. 3.0.....

Items supplied with the manufacturer's standard coating system shall be touched-up with the same generic coating system or recoated.

4.8 Paint Storage

The following must be ensured:

- a) All paints and painting material shall be stored only in such rooms assigned for the purpose. All necessary precaution shall be taken to prevent fire. The Storage building shall preferably be separate from adjacent buildings. A sign-board bearing the Words "PAINT STORAGE- NO NAKED LIGHT" shall be clearly displayed outside. The building shall be properly ventilated and shall be adequately protected with fire fighting equipment.
- b) Storage shall be far away from heated surface open flames, sparks & well protected from sun rays.
- c) Ambient temperature at which paints are stored shall be intimated to paint manufacturer & their advice sought regarding precautions to be taken if any, regarding flammability, explosiveness & toxicity.
- d) Maximum allowed storage time for various paint materials shall be clearly indicated on individual containers. Materials which have passed expiry date shall not be used.
- e) Paints in non-original containers and/or in containers without seals, shall not be used.

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5.0 COATING SYSTEM SELECTION

Coating Systems for Structures Piping and Equipment

The following Table 1 shall be used as a general guide for the selection of a paint system suitable for a particular plant area application. Paint systems specified on equipment data sheets and the Drawings shall take precedence over the general paint system area applications listed in Table 1.

TABLE - 1

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
01	Structural Steel work with operating temp. Up to 90°C (Steel structures, Piping support, uninsulated CS piping, flanges, valves, stairways, walkways etc. except grating).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 F1 : One coat of two packs. Polyamide Cured Epoxy. F5 : One coat of two pack aliphatic acrylic polyurethane	P2 : 60 microns F1 : 120 – 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High durability	Total dry film thickness of paint system: 320 microns as per C5 – High durability
02	Uninsulated CS piping, flanges, valves with operating temp. From Above 90°C to 200°C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900 (Latest)	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	P1 : 75 microns F3 : 2 x 25 microns for each coat Total - 125 microns.	Total dry film thickness of paint system: 125 microns.	
03	Uninsulated CS piping, flanges, valves with operating temp. Over 200°C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1 : 75 microns F4 : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
04	Insulated CS piping flanges, valves with operating temp up to 90°C	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F8 : One coat of high temperature epoxy phenolic	F8 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
05	Insulated CS piping, flanges, valves with operating temp. From 90° C to 200° C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system:250 microns	
06	Insulated CS piping, flanges, valves with operating temp. Over 200° C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F9 : Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	F9 : 2 x 150 microns	Total dry film thickness of paint system: 300 microns.	
07	Uninsulated CS equipment with operating temp. Up to 90° C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 F1 : One coat of two packs. Polyamide Cured Epoxy. F5 : One coat of two pack aliphatic acrylic polyurethane	P2 : 60 microns F1 : 120 – 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
08	Uninsulated CS equipment with operating temp. From 91° C to 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	P1 : 75 microns F3 : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
09	Uninsulated CS equipment with operating temp. Over 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1 : 75 microns F4 : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
10	Insulated CS equipment with operating temp. Up to 90° C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system:250 microns	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
11	Insulated CS equipment with operating temp. From 91° C to 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns	
12	Insulated CS equipment with operating temp. Over 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F9 : Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	F9 : 2 x 150 microns	Total dry film thickness of paint system: 300 microns.	
13	Surface of structural steel for furnaces, external surface of furnaces, external surface of flue duct, metal stacks and similar with operating temp. Up to 200°C. (With exclusion of stair ways, walk ways etc.).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	P1 : 75 microns F3 : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
14	For external surfaces of flue ducts, metal stacks, and similar with operating temp. Above 200°C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1 : 75 microns F4 : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
15	For surfaces of air cooler heads not galvanized with operating temperature up to 90° C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 F1 : One coat of two packs. Polyamide Cured Epoxy. F5 : One coat of two pack aliphatic acrylic polyurethane	P2 : 60 microns F1 : 120 – 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
		NOTE: All surfaces shall be galvanized at manufacturer's shop with exception of the end header of air cooled heat exchangers that shall be treated as described above at Manufacturer's shop. In case the same surfaces shall not be treated at shop, they shall be treated at site according to environmental and operating conditions.				

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
16	For surfaces of air cooler heads not galvanized with operating temperature up to 91 ^o C TO 200 ^o C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	P1 : 75 microns F3 : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
		NOTE: All surfaces shall be galvanized at manufacturer's shop with exception of the end header of air cooled heat exchangers that shall be treated as described above at Manufacturer's shop. In case the same surfaces shall not be treated at shop, they shall be treated at site according to environmental and operating conditions.				
18	STORAGE TANKS					
a)	Acid / Alkali CS Storage Tank (External Surface including all stair ways)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 F1 : One coat of two packs. Polyamide Cured Epoxy. F5 : One coat of two pack aliphatic acrylic polyurethane	P2 : 60 microns F1 : 120 – 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
b)	CS Storage Tanks, Excluding indicated in Sl. No. (a)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F1 : One coat of two pack Polyamide Cured Epoxy. F5 : Two-pack aliphatic Isocyanate cured acrylic finish paint	P1 : 60 microns F1 : 120 - 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
19	Cold Insulated Carbon Steel and low alloy Steel (1- ¹ / ₄ Cr through 9 Cr) Piping and Equipment. (Upto 60 Deg. C)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F7 : Two coats of Tar Free Epoxy paint suitably pigmented	F7 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	
20	Cold Insulated high alloy Steel piping and Equipment (Upto 200 Deg. C)	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900 (Latest).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system:250 microns	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
21	DELETED					
22	Surface (CS) with Equipment with temp. Indicating paint from 220°C to 240°C treated at Manufacturer's shop	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F6 : Temperature indicating paint	P1 : 75 microns F6 : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
23	PACKAGE:					
a)	Surface(CS) with operating temperature upto 90°C treated at Manufacturer's shop	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 F1 : One coat of two packs. Polyamide Cured Epoxy. F5 : One coat of two pack aliphatic acrylic polyurethane	P2 : 60 microns F1 : 120 – 200 microns F5 : 60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
b)	Surfaces (CS) with operating temperature upto 91°C TO 200°C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	P1 : 75 microns F3 : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
c)	Surface (CS) with operating temp. Over 200°C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1 : 75 microns F4 : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
d)	Package in Carbon Steel and low Alloy Steel (1-¼ Cr through 9 Cr) with cold insulated surface treated at manufacturer's shop (Upto 60 Deg. C)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F7 : Two coats of Tar Free Epoxy paint suitably pigmented	F7 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	
e)	Package in Cold Insulated high alloy Steel. (Upto 200 Deg. C)	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
		(Latest).			
f)	DELETED				
24	For internal surface of shell, roof of CS tanks, with operating temp. Upto 110°C	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F2 : Two coats of two pack amine adduct cured Phenolic (Novolac) epoxy (immersion grade)	F2 : 2 x 150 microns for each coat	Total dry film thickness of paint system: 300 microns.
25	For underside (soil side) of the tank bottom (CS) below only of the fixed tanks, bottom & shell shall be treated as follows:	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	F7 : Two coats of Tar Free Epoxy paint suitably pigmented OR F8 : Two coats of high temperature epoxy phenolic (novolac)	F7 : 2 x 200 microns OR F8 : 2 x 150 microns	Total dry film thickness of paint system: 400 microns. OR Total dry film thickness of paint system: 300 microns.
26	CS Equipment and associated piping subject to cyclic, intermittent or regeneration operating condition (e.g. Molecular Sieve Driers) subjected to very severe corrosion with wide operating temperature range.	Blast cleaning to near white metal grade 3, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal Finish Coat: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal.	Primer: 125 microns Finish: 125 microns	Total dry film thickness of paint system 250 microns.

NOTES:

Primers

ZINC ETHYL SILICATE PRIMER – P1

The zinc ethyl silicate consists of two packs. One pack contains the ethyl silicate binder with suitable solvents. The other pack contains zinc dust (NOT Paste). Zinc dust shall be ASTM D 520 Type II. They have to be mixed in suitable proportions before application as recommended by manufacturer.

Volume solids	:	Min.64% ±2
DFT Range	:	50 – 75 microns
Theoretical Spreading Rate	:	12.8 – 8.53 sqm/litre
Colour	:	Grey
Application	:	Spray (airless/air)
Drying time (dry to handle)	:	< 45 mins. @ 30 Deg. C and 65% RH
Curing	:	<16 hrs @ 30 Deg. C and 65% RH
% of total metallic zinc in dry film (As per the ASTM D520 – Spherical	:	(SSPC SP 20 Level 1) >85% by wt.

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size)		
Specific Gravity	:	2.5 Kg/Litre min.
Storage life	:	6 months under sealed conditions

Zinc silicate Material curing shall be checked using ASTM D 4752, minimum Acceptable value is 4.

ZINC RICH EPOXY PRIMER – P2

The zinc rich epoxy consists of two packs. One pack contains the epoxy binder with suitable solvents. The other pack contains zinc dust as per ASTM D520 Type II. They have to be mixed in suitable proportions before application as recommended by manufacturer.

Volume solids	:	65% min. ±2
DFT	:	50 – 100 microns
Theoretical Spreading Rate	:	13 – 6.5 sqm/litre
Colour	:	Grey
Application	:	Airless spray/air spray/brush
Drying time (dry to handle)	:	<10 min. @ 30 Deg C
Hared Dry	:	< 1.5 hrs @ 30 Deg C
% of total metallic zinc in dry film (As per the ASTM D520 – Spherical size)	:	(SSPC SP 20 Level 2) 81% by wt. min.
Specific Gravity	:	2.3 Kg/Litre min.
Storage life	:	12 months under sealed conditions

Finish Paints

HIGH BUILD EPOXY FINISH – F1

This finish paint is fast drying, high build, Two-pack polyamide cured epoxy resin

Volume solids	:	85% min. ±2
DFT Range	:	100 – 200 microns
Theoretical Spreading Rate	:	7.6 – 3.8 sqm/litre
Colour	:	As per Manufacturer List
Binder	:	Polyamide cured epoxy resin, Lead & Chrome Free
Application	:	Brush or spray
Drying time	:	< 2 hrs @ 30 Deg C
Over coating time	:	< 2 hrs @ 30 Deg C
Storage life	:	24 months under sealed conditions

HIGH BUILD EPOXY FINISH (Immersion Grade) – F2

This finish paint is high build, Two-pack phenolic (novolac) epoxy

Volume solids	:	68% min. ±2
DFT Range	:	100 – 150 microns
Theoretical Spreading Rate	:	6.8 – 4.5 sqm/litre
Colour	:	As per Manufacturer List
Binder	:	Amine adduct cured epoxy resin

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Application	:	Brush or spray
Drying time	:	< 1.5 hrs @ 30 Deg C
Over coating time	:	< 6.5 hrs @ 30 Deg C
Storage life	:	24 months under sealed conditions

HEAT RESISTANT ALUMINIUM FINISH PAINT : F3

It is a single pack system based on oleo resinous general purpose aluminium paint with good heat resistance upto 250 Deg. C. and light reflection.

Volume solids	:	25% min. ± 2
DFT Range	:	25 microns
Theoretical Spreading Rate	:	10 sqm/litre
Main pigment	:	Aluminium (ASTM 962), Lead & Chrome Free
Colour	:	Metallic Aluminium
Pigment Volume Concentration	:	15 – 20%
Application	:	Brush or spray
Drying time	:	Surface dry <1hr. @ 30 Deg. C
		Hard dry < 3 hrs. @ 30 Deg. C
Storage life	:	24 months under sealed conditions

HEAT RESISTANT SILICON ALUMINIUM FINISH PAINT : F4

It is a single pack system based on ambient curing silicone aluminium pigmented polysiloxane paint with maximum heat resistance of upto 600 Deg. C.

Volume solids	:	25% min. ± 2
DFT Range	:	25 microns
Theoretical Spreading Rate	:	10 sqm/litre
Main pigment	:	Aluminium (ASTM 962), Lead & Chrome Free
Colour	:	Metallic Aluminium
Pigment Volume Concentration	:	15 – 20%
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. at 30 Deg. C
		Hard dry < 3 hrs. at 30 Deg. C
Storage life	:	12 months under sealed conditions

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TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT – F5

It Consists of Acrylic Resin in Part A. Part B consists of an aliphatic poly-isocyanate with appropriate solvents and additives.

Volume solids	:	51% min. ± 2
DFT range	:	50 – 100 microns
Theoretical Spreading Rate	:	10.2 – 5.1 sqm/litre
Main pigment	:	Suitable pigments to get the desired colour, Lead & Chrome Free
Colour	:	Metallic Aluminium
Binder	:	Shall not contain any binder other than acrylic resin; should not contain any alkyd / acrylate alkyds / esters.
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. @ 30 Deg. C Hard dry < 8 hrs. @ 30 Deg. C
ISO 11507/ASTM G 154, QUV A - Accelerated weathering	:	Gloss retention: approx. 80 % and colour change approx. DE 1.2 after 3000 hours exposure
Storage life	:	24 months under sealed conditions

TEMPERATURE INDICATING PAINT : F6

It is a single pack temperature indicating system based on silicone binder. Pigments change colour by heating. The colour change of the coating is permanent. At approximately 200°C, the colour changes from green to blue, above 310°C, the colour changes from blue to greyish white. Maximum service temperature is 400°C.

Volume solids	:	40% min.
DFT	:	25 microns
Theoretical Spreading Rate	:	16 sqm/litre
Main pigment	:	As per shade requirement, Lead & Chrome free
Colour	:	As per manufacturer
Binder	:	Based in silicone Resins
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. @ 30 Deg. C Hard dry < 4 hrs. @ 30 Deg. C

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Storage life	:	12 months under sealed conditions
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TAR FREE EPOXY – F7 (Coal Tar is Banned Globally being Carcenogenic)

A high build two component abrasion resistant, pure epoxy with anti-corrosive properties meant for excellent performance.

Volume solids	:	Minimum 72%
DFT Range	:	150 – 200
Theoretical Spreading Rate	:	4.8 – 3.6 sqm/litre
Application	:	By brush or airless spray
Drying time	:	Touch Dry within 4 hrs. @ 30 Deg C
		Hard dry < 9 hours @ 30 Deg. C
Storage life	:	12 months under sealed conditions

EPOXY PHENOLIC (NOVOLAC) – F8

Two Pack epoxy-phenolic (novolac) cured with amine adduct used as an External coating for the protection of insulated (CUI) equipment.

Volume solids	:	68% min.
DFT Range	:	100 – 150 microns
Theoretical Spreading Rate	:	6.8 – 4.5 sqm/litre
Binder	:	Epoxy phenolic (novolac)
Dry Temp. Service	:	Min. -196 to max. 205 Deg. C.
Application	:	Airless Spray / Brush Touch up
Drying Time	:	Surface dry < 1.5hr. @ 30 Deg. C
		Hard dry < 6 hours @ 30 Deg. C
Storage life	:	12 months under sealed conditions

INORGANIC CO-POLYMER COATING – F9

MIO pigmented single component inorganic copolymer coating which cures to form an inert polymer matrix able to resist temperatures up to 650°C/1202°F and thermal shock/cycling in dry or dry/wet service.

Volume solids	:	74% min.
DFT Range	:	150 microns
Theoretical Spreading Rate	:	5 sqm/litre
Binder	:	Inorganic copolymer coating
Dry Temp. Service	:	Min. -196 to max. 650 Deg. C.
Application	:	Airless Spray / Brush Touch up
Drying Time	:	Surface dry < 0.5hr. @ 30 Deg. C
		Hard dry < 1.5 hours @ 30 Deg. C
Storage life	:	12 months under sealed conditions

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6.0 MACHINERY, ELECTRICAL AND INSTRUMENT EQUIPMENT:

6.1 Machinery

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std. However, suitable for operating condition and the environmental condition where the machinery will operate. Where necessary machinery shall be restored at site by Contractor with suitable finish.

6.2 Electrical and Instrument Equipment

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std., however suitable for operating condition and the environmental condition where the electrical and instrument equipment will operate. Where necessary Electrical and Instrument Equipment shall be restored at site by Contractor with suitable finish.

7.0 COLOURS:

These shall be as required by specification and in particular for:

Description	Colour	RAL	Correspond. Asian Paint colors to be defined – See Note-2
- Piping with temperature less than 90°C	GREY	7035	
- Piping, hot surface, flue gas ducts and stacks with temperature above 90°C	SMOOTH	ALUMINIUM	"
- Cooling Water Piping	SEA GREEN		"
- Fire fighting Piping	Red	3002	"
- Structures	GREY	7010	"
- Stair cases – ladders	BLACK	9005	"
- Walkways	GREY	7010	"
- Handrails assemblies	YELLOW	1004	"
- Equipment	GREY	7035	"
- Hot equipment	SMOOTH	ALUMINIUM	"
- Fire fighting equipment	RED	3002	"
- Valves in general	GREY	7035	"
- Hot valves	SMOOTH	ALUMINIUM	"
- Safety and Fire fighting valves	RED	3002	"
- Valves handwheels	BLACK	9005	
- Electric Rotary Machines	SKY BLUE	5012	
- Electric Static Machines	GREY	7035	
- Machinery (compressors & pumps)	GREY	7035	"

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Description	Colour	RAL	Correspond. Asian Paint colors to be defined – See Note-2
with operating temperature less than 90°C			
- Machinery (compressors & pumps) with operating temperature above 90°C	SMOOTH	ALUMINIUM	“
FURNACES			
- Casing and connected steel works	SMOOTH	ALUMINIUM	“
- Steel work not connected to casing	SMOOTH	ALUMINIUM	“
AIR COOLER			
- High Temperature Surfaces (Temp. > 90°C)	SMOOTH	ALUMINIUM	
- Low Temperature surface (Temp. ≤ 90°C)	GREY	7035	“
- Flare ≤ 90°C	GREY	7035	“
- Flare ≥ 90°C)	SMOOTH	ALUMINIUM	“
TANKS			
- Shell of fixed roof	WHITE	9010	“
- Roof of fixed roof tank	WHITE	9010	
-			

NOTE-1: The colours shall be according to IS2379:1990/International STD. RAL or BS, proposed by Contractor or Manufacturer/Owner

8.0 PARTICULAR DESCRIPTION

The abrasive Grit Blasting shall be used for surface preparation. **Sand blasting is prohibited due to environmental regulations.**

Primerized surface shall be faultless and shall not have mud-cracking, dripping over thickness and dry sprays.

Blast cleaning and painting shall not be carried out on wet surfaces.

Blast cleaning shall not be done when surfaces temperatures are less than 3°C above dew point, or temperature is below 5°C.

No acid washes or other cleaning solutions or solvents shall be used on metal surfaces after they have been blasted.

The surface preparation of all steel surfaces to be coated shall be free of all mill scale, rust corrosion product, oxides, paint, oil or other foreign matter

Only dry abrasive blasting procedures will be allowed. The compressed air supply used for blasting shall be free of detrimental amounts of water and oil. Adequate separator and traps shall be provided and these shall be kept emptied of water and oil. Any blast cleaning set up without functioning moisture separators shall be removed from blast cleaning areas.

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All welded areas and appurtenances shall be given special attention for removal of welding flux in crevices. Welding splatter, slivers, laminations and underlying mill scale exposed during sand blasting shall be removed or repaired.

The blast-cleaned or power brushing surfaces shall be coated with primer within four hours of surface preparation.

No primer or intermediate or finishing coating shall be applied without prior notification to the Company.

The application of the products shall be carried out in strict compliance with the paint manufacturer's recommendation.

The Contractor shall provide suitable protection for all adjacent plants or equipment from airborne during spraying and sand blasting.

9.0 INSPECTION AND TESTING

The inspection and testing requirements outlined in this section shall be performed for shop and site applied coating systems.

Preference shall be given to manufacturers and applicators that are quality certified to ISO 9001: 2000.

Documentation of coating material manufacturers and applicators shall include daily inspection reports, equipment reports, and shall clearly identify and trace materials supply and testing performed on coated items and areas.

Inspection and Test Plans (ITPs), and quality control procedures used for application of coating systems shall form part of the Method Statement and shall be submitted for approval by the Principal prior to commencement of work.

The applicator shall appoint a certified inspector of coatings for inspection and testing of coating systems.

Tests of coated areas and items shall form part of the ITPs.

- Surface Preparation in accordance to Swedish Standard SIS-05-5900 (Latest).
- Blast cleaning profile shall be checked using a suitable profile meter – Acceptable profile shall be 40 - 60 microns.
- Check of time of top coating and drying in accordance with the direction of the paint manufacturer.
- Check of dry film thickness by suitable non-destructive Instrument such as "MIKROTEST", "DIAMETER" or equivalent.
- Before any coating work is performed on the site, the contractor shall ensure that any works applied by others is acceptable.

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Any defect that are discovered, are to be notified in writing to the owner before proceeding with the contract work. To ensure the good execution of painting work following test shall be performed:

- Surface Preparation
- Surface contaminant tests
- Surface profile tests
- Coating thickness tests
- Tests for cure of coatings
- Adhesion tests
- Continuity testing
- Iron contamination
- Chloride contamination
- Dust Contamination

All Inspection and Test Records (ITRs) shall be submitted with the Manufacturer's Data Report (MDR) at the conclusion of the job.

Defective coated areas shall be suitably marked for rectification work to be performed in compliance with this specification.

Access shall be granted for inspection of all paint work, and witnessing of test work. This shall not however relieve the Contractor of their own QA/QC responsibilities.

10.0 ADHESION TEST RESULTS

For all type of primer the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D3359. The acceptable Rate Adhesion Test Results shall be for sandblasted and primerized surfaces shall be minimum 3A (or Higher)

For primer plus finishing coat(s) the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D 3359. The acceptable Rate Adhesion Test Results shall be for blast cleaned and painted surfaces shall be minimum 3A (or higher).

After test, the surface must be repaired according to the system applied.

11.0 SUBMISSION OF DATA

Contractor shall submit in phase of bid the original technical data sheet and system for all material supplied by him to apply for the permanent works and test report for the paint in compliance to IS101. This material shall be subject to Owner's approval. The test certificates of zinc silicate shall provide the specific gravity of mixed paint.

12.0 LETTER AND NUMBER INSCRIPTION

Inscriptions letters, as herebelow indicated, shall be made on equipments, piping, storage tanks, machinery etc.

12.1 Geometric forms and dimensions

Letters and numbers dimensions shall be orientatively fixed according to following:

(A – Dimension of side of unitary elements of grid)

a) Storage Tanks A – 60 mm

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- b) Equipments and piping with O.D. above 600 mm A– 40 mm and
- c) Equipments and pipings with O.D. from 300 to 600 mm and for machinery of great dimensions A – 20 mm
- d) Equipments and pipings with O.D. less than 300 mm and for machinery with small dimensions A – 10 mm

12.2 Inscription's Colours

Inscriptions shall be Black ENI 901 (RAL 9005) on light base

Inscriptions shall be White ENI 101 (RAL 9010) on dark base

12.3 Spaces and Interspaces

Spaces between words and assemblage of numbers shall have dimensions equal to 2A

Interspaces between letters or numbers shall have dimensions equal to A.

13.0 **Colour Band for piping ;-**

As a rule minimum width of colour band shall confirm to the following Table:-

Nominal pipe Size	Width L (mm)
3" & below	25
4" NB-6" NB	50
8" NB-12"NB	75
14" OD & above	100

14.0 **LIST OF MANUFACTURERS :**

1. M/s Berger Paints
2. M/s Jensions & Nickolson
3. M/s Asian Paints
4. M/s Grauer & Weil (India) Limited
5. M/s Shalimar paints
6. M/s Garware Paints
7. M/s Goodlass Nerolac Paints Ltd
8. M/s. HEMPEL Paints
9. M/s International Paints (Akzo Nobel Brand)
10. M/s Jotun Paints
11. M/s Carboline (India) Pvt. Ltd.
12. M/s Mohan Paints

15.0 The contractor shall obtain prior approval from Engineer-In-Charge for the brands of paint material proposed to be used. The contractor shall submit the following details of paint material either at the time of bidding or soon after award of work for approval of paints.

- a. Technical data sheet

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- b. Material safety data sheet
- c. Finger printing of paint products as per ISO 20340

16.0 Owner reserves the right to take random samples and get it tested through reputed labs. In case the supplied paint material do not meet the specified performance requirements then suitable action shall be taken against the paint supplier. The decision of Engineer-In Charge shall be final and binding on the Contractor in such cases.

17.0 WARRANTY:

Contractor along with Paint Manufacturer jointly shall develop the paint schemes following the system specification.

They shall jointly provide a performance guarantee for a period 5 years as stipulated below,

After 1 years – Corrosion in 3% of total painted area accepted

After 2 years – Corrosion in 6% of total painted area accepted

After 3 years – Corrosion in 9% of total painted area accepted

After 4 years – Corrosion in 12% of total painted area accepted

After 5 years – Corrosion in 15% of total painted area accepted

where spontaneous visible corrosion has broken down the paint film to a degree exceeding “Ri 3” (as defined in ISO 4628/3-2003).

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TECHNICAL SPECIFICATION
OF
OPERATION & MAINTENANCE
OF
CONSTRUCTION WATER SYSTEM
OF
COAL TO AMMONIUM NITRATE (2000 TPD) PROJECT
OF BCGCL
AT LAKHANPUR, JHARSUGUDA (ODISHA)

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1.0 GENERAL

- 1.1 This section covers the requirements for Operation & Maintenance (O&M) of the complete Construction Water System including pump, Pontoon, Pipeline and Power line **systems** and all associated facilities installed under this contract.
- 1.2 The O&M period shall be **02 (Two) years** from the date of handing over of the system and may be extended by **01 (One) year** on the same terms and conditions at the discretion of the Owner.
- 1.3 The Contractor shall ensure efficient, safe, reliable and uninterrupted operation of the system throughout the O&M period.

2.0 SCOPE OF WORK

- 2.1 The scope of O&M shall include, but not be limited to:
 - a) **Operation of pump, Pontoon, Pipeline and associated systems**
 - b) Operation and maintenance of electrical systems including LT panels, cables, starters, etc.
 - c) Preventive, routine and breakdown maintenance of all equipment
 - d) Monitoring of system performance and optimization
 - e) Maintaining records and reporting
 - f) Ensuring continuous availability of construction water
- 2.2 The Contractor shall carry out all activities required to maintain the system in healthy operating condition as per relevant IS Codes and specifications.

3.0 OPERATION REQUIREMENTS

- 3.1 The Contractor shall operate the pumping systems as per site requirements.
- 3.2 The Contractor shall ensure:
 - a) Proper starting and stopping of pumps and electrical systems
 - b) Maintaining required discharge, pressure and availability
 - c) Monitoring of voltage, current, power factor and energy consumption
 - d) Continuous operation through adequate manpower deployment
- 3.3 The Contractor shall follow permit-to-work system and all operational instructions issued by the Engineer-in-Charge.

4.0 MAINTENANCE REQUIREMENTS

4.1 Preventive Maintenance

- 4.1.1 The Contractor shall prepare and implement a preventive maintenance schedule covering all mechanical, electrical and civil components.
- 4.1.2 Preventive maintenance shall include inspection, lubrication, tightening, testing and cleaning.

4.2 Breakdown Maintenance

- 4.2.1 All breakdowns shall be attended immediately on priority basis.

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4.2.2 The system shall be restored in minimum possible time.

4.2.3 Coordination with OEMs and Owner shall be ensured.

4.3 Routine Maintenance

4.3.1 Daily inspection shall include:

- a) Checking leakage, vibration and abnormal noise
- b) Monitoring operating parameters
- c) Cleaning of equipment and surroundings

5.0 MANPOWER DEPLOYMENT

5.1 The Contractor shall deploy qualified manpower for O&M and Security manpower.

5.2 The Contractor shall ensure the manpower for O&M :

- a) Operation in one shift
- b) the aforementioned shift should not remains unmanned
- c) immediate replacement of absent personnel

5.3 The Contractor shall ensure the manpower deployment of Security Manpower:

- a) Operation in two shift
- b) the aforementioned shift should not remains unmanned
- c) immediate replacement of absent personnel

5.4 All personnel shall be provided with necessary PPE and shall comply with safety requirements.

6.0 RECORDS AND REPORTING

6.1 The Contractor shall maintain the following records:

- a) Operation log books (hourly/daily readings)
- b) Maintenance registers (preventive and breakdown)
- c) Energy consumption records
- d) Water discharge and performance records
- e) Fault and shutdown reports

6.2 All formats shall be approved by the Engineer-in-Charge.

7.0 WATER ACCOUNTING & CHARGEABLE SUPPLY

7.1 Construction water supplied through this system shall be **on chargeable basis**.

7.2 The Contractor shall:

- a) Maintain daily records of water supplied to various contractors/agencies
- b) Record quantity of water (in KL or m³) based on flow measurement / pump discharge
- c) Maintain contractor-wise consumption register
- d) Submit certified records to Engineer-in-Charge for billing purposes

7.3 Measurement methodology and formats shall be approved by the Engineer-in-Charge.

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8.0 PAYMENT TERMS (AS PER SOR)

Payment for O&M shall be made as per Schedule of Rates (SOR).

10.0 TOOLS & TACKLES

10.1 The Contractor shall provide all tools and tackles required for O&M.

10.2 Tools shall include electrical testing instruments, mechanical tools and safety equipment.

10.3 All tools shall be maintained in good working condition.

11.0 SAFETY REQUIREMENTS

11.1 The Contractor shall comply with all safety rules and statutory regulations.

11.2 The Contractor shall:

- Provide PPE to personnel
- Follow permit-to-work system
- Ensure safe operation of equipment
- Report all incidents immediately

12.0 HOUSEKEEPING

12.1 The Contractor shall maintain clean and safe working conditions at all locations.

12.2 Waste, scrap and debris shall be removed regularly.

12.3 Poor housekeeping may lead to stoppage of work.

13.0 HANDING OVER AFTER O&M

13.1 The Contractor shall hand over the system in good working condition after completion of O&M period.

13.2 All records, documents and maintenance history shall be submitted.

14.0 TERMINATION

14.1 The contract may be terminated by the Owner for poor performance, non-compliance or safety violations.

14.2 Termination shall be as per NIT conditions.

15.0 SYSTEM AVAILABILITY & LIQUIDATED DAMAGES (LD)

15.1 Minimum Availability Requirement

15.1.1 The Contractor shall ensure that the Construction Water System is operated and maintained in such a manner that a **minimum system availability of 90% (Ninety Percent)** is achieved on a monthly basis.

15.2 Definition & Calculation of System Availability

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15.2.1 System availability shall be calculated on a monthly basis as per the following formula:
System Availability (%) = [(Total Hours in Month – Downtime Hours)/(Total Hours in Month)]*100

15.2.2 For the purpose of calculation:

- Total Hours in Month = Number of days in the month × 24 hours
- Downtime Hours = Total duration during which the system is not operational and incapable of delivering the required water discharge due to reasons attributable to the Contractor.

15.3 Classification of Downtime

15.3.1 The following shall be considered as **Downtime (Contractor's responsibility)**:

- Failure of pumps, motors, pontoons, pipeline or associated mechanical systems
- Electrical system failures including panels, cables, starters, etc.
- Delay in attending breakdowns
- Non-availability of manpower
- Improper operation or inadequate maintenance

15.3.2 The following shall **NOT be considered as Downtime (excluded)**:

- Grid power failure or upstream supply interruptions
- Shutdowns instructed by the Owner/Engineer-in-Charge
- Force majeure conditions such as natural calamities
- Non-requirement of water by the Owner

All such exclusions shall be **certified by the Engineer-in-Charge**.

15.4 Measurement & Record

15.4.1 The Contractor shall maintain **daily and hourly downtime records** indicating cause, duration, and corrective action taken.

15.4.2 All records shall be jointly verified and certified by the Engineer-in-Charge.

15.4.3 Monthly system availability shall be computed based on these certified records.

15.5 Liquidated Damages (LD)

15.5.1 In case the system availability falls below **90% in any month**, Liquidated Damages (LD) shall be imposed.

15.5.2 The LD shall be **proportionate to the shortfall in availability**, calculated as:

Shortfall (%) = 90% – Achieved Availability (%)

15.5.3 The LD amount shall be recovered from the Contractor's running bills of O&M as per provisions of the Contract.

15.6 General

15.6.1 The calculation of system availability, classification of downtime, and applicability of LD shall be determined by the Engineer-in-Charge, whose decision shall be **final and binding** on the Contractor.

15.6.2 Failure to achieve minimum system availability of **90% for three (03) consecutive months** shall

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be treated as **unsatisfactory performance**.

15.6.3 In such cases, the Owner reserves the right to take appropriate action including termination of contract as per relevant clauses of NIT.

15.6.4 No additional payment shall be made for achieving availability beyond the specified level unless otherwise specified in the Contract.

15.6.5 The detailed methodology for downtime recording and availability calculation shall form part of the approved O&M reporting formats.

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1.0 INTRODUCTION

- 1.1 The purpose of the present document is to outline the minimum safety requirements applicable to personnel, equipment and facilities during erection, pre-commissioning and commissioning activities of OWNER / CONSULTANT Construction Sites. Constructing safe structure and providing safe working environment to the personnel is a vital factor in successful construction business. Safety and health are as much as part of effective project planning and control as the cost, schedules, procurement and quality. Indeed they are all closely interrelated. Productivity, safety and quality can move forward in close proximity.

1.2 OBJECTIVES

OWNER/CONSULTANT Site Management has following main objectives regarding safety at site.

- No Accident
- To make the environment safe
- No harm to people
- Safety is everyone's responsibility
- To make the job safe

2.0 GENERAL

- These rules do not exempt the Contractor from statutory Health, Safety and Environmental duties but are intended to assist in attaining a high standard of compliance with those duties, in order to provide a safe and healthy working environment.
- OWNER/CONSULTANT will assist Contractors in any practical way to facilitate safe working, and requires full co-operation in observing these rules.
- The rules for Health and Safety specified herein are in no way intended to relieve the Contractor from any obligation or liability under the Contract, nor is it intended to relieve the Contractor of any of his legal obligations for the avoidance of accidents.
- In all matters arising in the performance of the Contract, the Contractor shall conform with all Statutory Regulations and By-Laws made with statutory authority by Government Departments or by Local or other Authorities that shall be applicable to the Works.
- The Contractor, in the performance of the Contract, shall not endanger the safety or unlawfully interfere with the convenience of the public in any manner.
- The Contractor's representative on Site shall communicate details of these rules for Health, Safety and Environment to all Contractors' employees and to all Subcontractors and Subcontractors' employees employed on the Site.

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2.7 The requirements of the Client/Owner's existing Site Rules/Regulations form part of the Contract and in the case of conflict between the OWNER/CONSULTANT'S rules, the highest standard shall be applied.

2.8 At the tender stage OWNER/CONSULTANT will require to see a copy of the Contractor's policy, organization and arrangements for the Health and Safety at Work. The Contractor shall submitted complete documents Health and Safety Questionnaire. Contractor shall deploy safety officer of adequate experience at each work site or during each shift including Sunday/holiday with approval of EIC/Owner.

3.0 SITE HEALTH, SAFETY AND ENVIRONMENT INDUCTION

3.1 All personnel shall receive OWNER/CONSULTANT and Contractors' site Health, Safety and Environment induction before they commence work on site. The induction shall comprise information on the various hazards which they may come into contact with, instructions on the site emergency procedures, warning and alarm systems, and permit to work system, first aid locations, welfare facilities, access routes and project specific rules.

3.2 It is the responsibility of the Contractor to familiarize all new personnel to the Project on the actual location of muster points, fire alarm points, first aid stations and the like.

4.0 DEMARCATION

4.1 Construction personnel are restricted to the construction areas shown on the Contract Drawings. Any personnel found on/in or interfering with the existing works/plant, without permission, will be dismissed from site. Any work outside of these areas may only be carried out with the written agreement of OWNER/CONSULTANT.

Before any work is started on the site, the Contractor's representative shall report to OWNER/CONSULTANT, who will confirm to the Contractor's representative, the limits of the working area(s) and shall be informed of any special requirements appertaining thereto.

5.0 ACCESS TO THE CLIENT'S FACILITIES/BUILDINGS

5.1 The Client's Facilities, including the canteen/cafeteria and toilets shall not be used by Construction Personnel.

5.2 Construction Personnel shall not enter any of the Owner's building unless escorted by a member of the OWNER/CONSULTANT'S staff (or working with prior agreement to Owner's Permit to Work System).

6.0 BEHAVIOR ON SITE

6.1 All Contractors' personnel shall treat everyone with respect and will refrain from any sexually suggestive or abusive comments or behavior.

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7.0 SMOKING, EATING AND DRINKING

7.1 Smoking, eating and drinking is allowed in designated areas.

8.0 DRUGS AND ALCOHOL

8.1 The possession or use of illicit drugs and alcohol at site is not permitted. Anyone who is found, or suspected to be, under the influence of either will be removed from site (subject to the Contractors' disciplinary procedure).

8.2 Anyone taking prescriptive drugs shall advise their employer, in particular those drugs that may impair their performance. Their employer may make arrangements to assign them to more suitable work, but shall ensure that the OWNER/CONSULTANT Construction manager is informed without delay.

9.0 PERMIT TO WORK SYSTEM

9.1 All construction works will be carried out under a permit to work system. It is designed to protect personnel and plant and consists of an organized and predefined safety procedure. It forms a clear record of all foreseeable hazards which have been considered in advance of construction operations.

9.2 The identities of the permit "Issuing Authority" will be OWNER and the "Permit Acceptor" will be the Contractor.

9.3 The following types of permits will be issued:

- Clearance Certificate - all other permits are invalid without this Certificate, (this certificate can be used for general work).
- Hot Job Work Permit.
- Electrical Work Permit.
- Confined Spaces Work Permit.
- Excavations Work Permit.
- Working at Height work Permit.
- Radiography Work Permit.
- Cold Job Work Permit.
- Road Closure Work Permit.

9.4 Written requests for permits must be submitted to Owner at least twenty-four hours in advance and the permits will be issued daily. Permits shall be given to Safety Officers of the contractor, by representatives authorized by Owner in approved formats.

10.0 ACCESS, SITE PASSES AND SECURITY

10.1 Passes

All personnel and vehicles shall enter and leave the site via the entrance authorized for construction personnel and traffic. Contractors' employees shall not enter any part of the site other than for the purpose of carrying out the Works.

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All personnel shall be issued with a site pass. The site pass must be carried (or displayed on the pass holder's lapel) at all times. Details of all personnel requiring site passes shall be submitted to OWNER/CONSULTANT at least seven working days in advance of the

planned start-on-site date. Site passes shall be submitted for inspection on entering or leaving the site, or when requested for inspection by OWNER/CONSULTANT or Security.

Loss of site passes must be reported immediately to Owner/Consultant. Lack of a site pass may mean delay at the site entrance. Owner/Consultant shall not accept any responsibility for lost time or costs incurred.

On completion of their assignment, or termination or their employment, all personnel will return their site pass to Owner or Owner representative/ Owner authorized personal.

10.2 Security

The security of Contractor's plant, tools, equipment, materials (including free issue materials properly handed-over by Owner/Consultant) are the responsibility of the Contractor. It is the Contractor's responsibility to satisfy themselves that the security arrangements in existence on the site are adequate. The Contractor shall provide any other security measure that he deems necessary for the control and security of Contractor owned equipment and plant, including for free-issue plant and materials, both within the site establishment area and the working areas on the site.

Owner accepts no liability for any loss, damage or deterioration to the Contractor's plant tools equipment and materials.

Owner reserves the right to search at random all personnel, any Contractor's employee, or employees of its servants, agents, Contractors or any vehicle entering or leaving the site. Any package or container being taken into or out of the site may be opened and inspected by security staff or any other persons authorized by Owner/Consultant to make such a search or inspection.

It is the Contractor's obligation and responsibility to ensure that OWNER / CONSULTANT right to search and inspect persons and property, extends to and is brought to the attention of all his personnel.

Personnel shall give all possible assistance and make available any facilities required to assist OWNER/CONSULTANT and the Police in pursuance of the prosecution of any person(s) responsible for alleged malicious damage or loss to the Works or existing installations.

Owner shall not accept any responsibility for the loss or damage of personal effects. The security and safekeeping of personal effects is the responsibility of each individual.

- 10.3 Construction personnel will not be admitted to the Construction Areas unless they have undergone Owner/ Consultant's induction, and received a security pass.

No Induction, No Pass, No Access to the Site

- 10.4 OWNER/CONSULTANT reserves the right to deny access to the Construction Site/Areas and/or the Construction Car parks to any person, or vehicle.

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- 10.5 Individuals may be excluded from and refused future entry to the Site and/or Construction Areas for any breach of Safety or Security Rules, or exceeding the speed limit (20 mph on roads leading to the site off the public highway and 5 mph in the construction area).
- 10.6 No plant/skips waste or materials may leave the Construction Area without the clearance of OWNER/CONSULTANT.
- 10.7 The taking of photographs on the site is prohibited.
- 10.8 Vehicles with children under the age of 16 years or animals onboard will not be allowed access.
- 10.9 Visitors will only be allowed by appointment (two days' notice to OWNER/CONSULTANT is required). Visitors shall be accompanied by a member of the Contractor's team (who has received Health, Safety and Environment Induction) at all times. The visitor will have to obtain a visitor's pass, and be collected from and returned to the main gate.
- 10.10 Each Contractor will keep a daily register of who is on site. The register will record name, pass number, time-in and time-out (records on time-clocks will not be permitted). This information shall be used to check personnel (role call) in the event of an emergency

11.0 PARKING, DELIVERIES AND VEHICLE PASSES

- 11.1 Contractors' personnel shall not be allowed to park any vehicle on the main car park or site. All contractors shall park in the Contractors' Temporary Car Park.
- 11.2 The Contractor shall arrange transport between the parking area(s), the main site gate and the Contractor's establishment and working areas if judged to be necessary.
- 11.3 Vehicles used solely for transporting of tools and equipment may be allowed access to the working area(s) for unloading/loading only.
- 11.4 Owners of vehicles parked illegally will have their car pass taken off them and told to remove the vehicle from site. They may have their site pass withdrawn and be refused further access to the Construction Site.
- 11.5 The Construction Areas will be restricted to construction plant and delivery vehicles.
- 11.6 The speed limit on site is 10 mph on the approach roads leading to the site off the public highway and 5 mph on the construction areas

12.0 SITE OPENING AND CLOSING TIMES

- 12.1 The site will be open from 8.00am to 6.00pm Monday to Saturday. Work outside the agreed normal working hours will be by agreement with Owner (subject to two working days' notice). All applications for out of hour working will identify the scope of work, supervision arrangements and a list of personnel.

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13.0 SITE SUPERVISION

13.1 The Contractor must ensure that an employee of suitable seniority and authority, with responsibility for Health and Safety, is always present on site during the course of the works, to supervise and direct the Works and to receive and implement instructions from OWNER/CONSULTANT. Seven days before commencing works on site, the Contractor must notify OWNER/CONSULTANT of the name of that employee.

13.2 All supervisory staff shall be made aware of their responsibilities for safety.

14.0 TRAINING, COMPETENCE OF EMPLOYEES AND NOTIFICATION OF HAZARDS

14.1 Each Contractor must ensure that all his supervision and employees have had adequate safety training and are experienced to carry out their work safely, prior to starting on site. Training should be continuous throughout a project and should include regular toolbox discussions, (on site briefings at the start of each working day/shift).

To this end, the Contractor must also ensure that specific hazards likely to be experienced on the Site, whether notified to them or discovered by them, are notified to their workforce together with any precautions to be taken and local rules to be observed. Similarly, such hazards should be notified to their Subcontractors and, where discovered by them, to OWNER/CONSULTANT.

14.2 Where particularly severe or unusual hazards may arise on site, OWNER/CONSULTANT reserves the right at no additional cost to request Contractors' employees to attend special safety training and instruction sessions, whether carried out on site or externally. OWNER/CONSULTANT also requires Contractors' employees to undergo specified induction safety training. These aspects should be checked prior to submission of Tenders or execution of the works.

15.0 METHOD STATEMENTS

15.1 Contractors shall submit Safety Method Statements and JSA for all work activities, for example:

- Piling Operations.
- Excavation works.
- Lifting operations, as specified.
- Steel erection.
- Hot work operations.
- Radiography/NDT.
- Entry into confined spaces.
- Pressure testing.
- Working at height.
- Shot fired tools.
- Installation of pre-cast concrete planks.
- Pre-cast concrete structure.
- The erection of safety nets and fall arrest equipment.

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Safety method statements must also be submitted for activities which have been identified as being of significant risk during the risk assessment process and activities selected by OWNER/CONSULTANT.

15.2 All Safety method statements must be submitted to OWNER/CONSULTANT at least seven days before planned commencement of the works.

15.3 The Safety method statement shall detail:

- The job to be undertaken.
- The individual activities required to complete the job.
- The individual trades/disciplines involved in each activity.
- Plant, equipment and tools be used in each activity.
- Any substances/chemicals to be used and where, and during which activity they will be used (together with a COSHH assessment).
- The Name(s) of the Supervisor(s) for each activity.
- The Name of the person in overall charge of the job.
- A detailed description of how the work will be done including control measures and procedures to complete each activity and the overall job safety.
- All hot work.

15.4 Compliance with the contents of the safety method statement shall be monitored on a daily basis and addressed during Contractors' safety management meetings.

15.5 The Contractor must ensure that employees executing the works are fully briefed and are made aware of the details within the approved Safety Method Statements, prior to starting the task, this includes highlighting hazards associated, associated risk assessments and reduction measures.

16.0 RISK ASSESSMENTS

16.1 Contractors will be required to produce risk assessments for all works under their control. The risk assessment shall be submitted as part of the Safety Method Statement to OWNER/CONSULTANT at least seven days before the job commences, and include the following information:

- Identification of all hazards applicable to significant risk activities.
- Details of measures in place to control the risk.
- Justification that the existing control measures are adequate or if not, a detailed action plan on how the risk(s) shall be controlled.

16.2 The use of Generic Risk Assessments is only acceptable if they follow the logical progression of the method statement and that specific operation, otherwise, task specific risk assessments will be required.

16.3 All risk assessments must be communicated to the workforce who will be responsible for undertaking the work.

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17.0 COMPLIANCE WITH STATUTORY REGULATIONS

- 17.1 Contractors shall carry out their work in accordance with statutory legislation. It is the duty of the Contractor to have knowledge of all relevant legislation and take account of it in the planning and execution of the work on OWNER/CONSULTANT' Sites.

18.0 INFORMATION TO BE PROVIDED AND POSTED

- 18.1 Contractors shall have in place, and issue to OWNER/CONSULTANT the following documents or information prior to commencement of their work, (where detailed within these rules):

- 18.1.1 Safety, Health and Environmental Policy.
- 18.1.2 Employer's Liability Insurance Certificate.
- 18.1.3 A detailed Health, Safety and Environment Plan, compliant with the project plan developed by the Planning Supervisor and/or Principal Contractor.
- 18.1.4 Work Method Statement Lifting Studies.
- 18.1.5 COSHH Procedures and Assessments.
- 18.1.6 Noise Procedures and Assessments.
- 18.1.7 Name of the individual appointed as the Site Safety Supervisor/Advisor.
- 18.1.8 Test certificates and examination for lifting gear, plant and appliances to be used on site. (Duplicates to be provided for OWNER/CONSULTANT's records.)
- 18.1.9 Drawings and calculations relating to false work, designed scaffolds, ground works and supporting temporary works.
- 18.1.10 Details of young persons to be employed on site.
- 18.1.11 Information relating to hazards associated with plant, operation and materials used in the works.
- 18.1.12 Proof of training for all personnel engaged in the works.
- 18.1.13 Daily Labour Returns.
- 18.1.14 Monthly Return of Accident Statistics to submitted OWNER/CONSULTANT format (Nil returns required).
- 18.1.15 Personal Injury Report to submitted to OWNER/CONSULTANT format (all injuries, however minor, to be reported). OWNER/CONSULTANT may request a detailed investigation into an accident. OWNER/CONSULTANT' decision on which incidents require detailed investigation is final.
- 18.1.16 Dangerous Occurrences, Incidents, Damage to Equipment and/or Property report to be submitted to OWNER/CONSULTANT format.
- 18.1.17 All entries/records of accidents entered into the Contractor's Accident Book shall also be copied into OWNER/CONSULTANT' Accident Book by the Contractor.
- 18.1.18 Copies of all Statutory Registers to be submitted weekly to OWNER/CONSULTANT.
- 18.1.19 Copies of the Contractor's Safety Officer/Advisor's reports of their findings on site visits/inspections.

18.2 Accidents, Incidents, Dangerous Occurrences and Notifiable Diseases

18.2.1 Accidents/Incidents/ Dangerous Occurrences/Near Misses

All accidents/incidents/dangerous occurrences/near misses must be notified to OWNER/CONSULTANT immediately, and a report prepared.

For reportable incidents, a copy the report to the Authority must be submitted to OWNER/CONSULTANT on completion but no later than two calendar days after the accident.

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18.2.2 OWNER/CONSULTANT reserves the right to decide which accident, incidents or minor injuries shall be Investigated, and to what extent/format/contents of any investigation.

Note: All such notification or reports to OWNER/CONSULTANT do not release the Contractor of his statutory duties to report such matters to the Authorities by the quickest possible means (viz, telephone, fax and e-mail) immediately following the incident/accident.

19.0 PERSONAL PROTECTIVE EQUIPMENT/CLOTHING

19.1 All personnel on OWNER/CONSULTANT' site must wear as a minimum safety helmet, hi-vis vest, safety glasses and protective footwear. Additional personal protective equipment may be required dependent on the tasks being undertaken or as dictated by the risk assessment.

19.2 Contractors shall provide all necessary personal protective clothing and equipment for their employees and renew as necessary. Records of the issue of such equipment must be maintained for inspection by OWNER/CONSULTANT.

19.3 The Contractor shall:

- Provide personal protective equipment which is comfortable and fit for purpose.
- Maintain and clean personal protective equipment.
- Replace free of charge defective, broken or lost personal protective equipment.
- Provide storage for personal protective equipment when not being used.
- Ensure that personal protective equipment is properly used.
- Give training, information and instruction on its use to employees.
- Ensure that all personnel wear suitable clothing at all times (**no shorts, no sports shirts and no colours that may invite aggression - HSE "Keep Your Tops On" is enforced**).
- OWNER/CONSULTANT reserves the right to direct the contractor to change/replace personal protective equipment if they determine that it is unsuitable or inadequate for its proposed use.

20.0 SUBSTANCES (Control of Substances Hazardous to Health – COSHH)

20.1 Substances hazardous to health must be identified prior to taking them onto site and, if they cannot be substituted or eliminated, assessments stating how the substances will be controlled and what precautions will be introduced must be carried out and recorded in writing by a competent person. This assessment must be communicated to, and understood by, the members of the workforce who are likely to come into contact with the substance(s). A copy of all assessments should be submitted to OWNER/CONSULTANT.

20.2 Hazardous substances may only be brought to site with OWNER/CONSULTANT' permission. They shall be kept to a minimum and must be stored in secure, appropriate containers with the contents clearly labelled. The containers must be stored in a secure area, preferably quarantined from the main stores areas, with suitable warning notices and signage posted.

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20.3 Hazardous materials must not be allowed to discharge into natural watercourses or drainage systems.

20.4 All hazardous material waste must be kept separate from normal waste and be disposed of in a specialist disposal facility.

21.0 NOISE

21.1 When any operation of a Contractor is likely to expose any employee on site to an average noise level of 85 dB(A) and above, an assessment shall be carried out, by the Contractor, and records maintained for OWNER/CONSULTANT' inspection. In such circumstances, the Contractor must keep stocks of adequate ear defenders or other suitable hearing protection.

21.2 In addition to the foregoing, noise must be kept to a minimum at all times and must not exceed acceptable and/or locally specified rules and conditions relating to noise imposed by the Contract. Due regard must always be given to noise levels, and their effects on the local community and persons not involved in the operations. Permissible times for noisy work operations, and other restrictions, may be imposed by the Local Authority. Contractors receiving Notices or Prohibition Notices under the related legislation must notify OWNER/CONSULTANT of such Notices.

22.0 FIRST AID

22.1 All Contractors shall provide or ensure that they are provided with, such equipment and facilities as are adequate and appropriate in the circumstances for enabling first-aid to be rendered to any of their employees if they are injured or become ill at work.

22.2 No work shall commence on site until Contractors have trained first aid personnel on site. Contractor at all times during execution, shall station at site an emergency vehicle without any extra cost or claim.

23.0 TOOL BOX TALKS

23.1 Tool Box Talks will be implemented by all Contractors. The agenda for these talks will be agreed with OWNER/CONSULTANT prior to the commencing of work.

24.0 HEALTH, SAFETY AND ENVIRONMENT INSPECTIONS/HEALTH, SAFETY AND ENVIRONMENT ADVISORS

24.1 The OWNER/CONSULTANT' Health, Safety and Environment Engineer/Advisor will visit the sites and carry out Site Safety Inspections. Contractors must co-operate in these inspections. Whenever Contractors' own Health, Safety and Environment Advisors visit site they must report their arrival and departure to the OWNER/CONSULTANT' Senior Representative, and provide a report of their findings and any necessary corrective action to be undertaken.

24.2 Contractors on the project must provide a full-time site based Health, Safety and Environment Advisor, when the intensity of the work requires or at the request of the OWNER/CONSULTANT.

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24.3 Contractors who do not have full-time site based Health, Safety and Environment Advisors, shall ensure that their Health, Safety and Environment Advisor visits site once per week as a minimum.

24.4 **Appointment of Health, Safety and Environment Supervision**

The Contractor shall appoint safety supervision. The name of each appointee, together with evidence of his or her competence to carry out the requirements of the role, shall be submitted to OWNER/CONSULTANT for their approval.

25.0 **HEALTH, SAFETY AND ENVIRONMENT MEETINGS**

25.1 Health, Safety and Environment will form part of the agenda at all Site Progress Meetings. The Contractor's Safety Advisor may be asked to attend these progress meetings.

25.2 Once per month OWNER/CONSULTANT' Resident Construction Manager shall convene a Health Safety and Environment Meeting of all Contractors. Attendees at the meeting shall be all Contractors' Safety Advisors and Site Managers.

26.0 **HEALTH, SAFETY AND ENVIRONMENT COMMITTEES AND SAFETY REPRESENTATIVES**

26.1 OWNER/CONSULTANT encourages the workforce to nominate Safety Representatives as a way of improving communication on Health, Safety and Environment issues. Wherever Contractors' Safety Representatives have been appointed, OWNER/CONSULTANT must be informed of their appointment in writing.

27.0 **HOUSEKEEPING**

27.1 Contractors are expected to carry out their work in a clean, safe and orderly manner.

27.2 Dust shall be kept to acceptable levels for the work being carried out. Waste materials and rubbish shall be cleared up as the work progresses and not left to introduce a safety hazard for other personnel engaged on the works.

27.3 Construction waste should never obstruct emergency exit routes, Firefighting equipment, emergency alarm call points or other emergency facilities.

27.4 From time to time as judged necessary, at the expiration of the contract, or when instructed to do so by OWNER/CONSULTANT, the Contractor shall undertake to clean and tidy his areas of occupation and work to the satisfaction of OWNER/CONSULTANT. Should the Contractor fail to do this, OWNER/CONSULTANT reserves the right to remove all offending materials and debris and to deduct the cost of this operation from the Contract Price. OWNER/CONSULTANT accepts no responsibility for any materials and/or tools which may be removed during this operation.

27.5 The Contractor must ensure that the following requirements are strictly enforced:

- Ample provision of refuse bins for all rubbish including organic waste such as food scraps, etc.
- Daily clearance of all such bins to the area designated for this discharge.

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- No discharge of deleterious matter such as oils or other industrial waste.

27.6 All site offices, toilets, eating facilities, changing rooms, drying areas, stores, etc, which are the responsibility of the Contractor, shall be cleaned daily as a minimum by the Contractor. These facilities shall be checked for vermin on a two weekly rota.

28.0 FIRE PREVENTION

28.1 Before welding, flame or arc cutting of metals, or other processes involving heat or naked lights are permitted, a fire risk assessment shall be carried out by the contractor and arrangements agreed with OWNER/CONSULTANT who will issue a Permit to Work.

28.2 Contractors shall familiarize both themselves and their employees with the fire safety arrangements, fire alarms, means of escape and emergency evacuation procedures.

28.3 Before leaving the premises and site, contractors shall ensure that naked lights and other ignition sources have been extinguished and electrical apparatus, where practicable, switched off and/or disconnected.

28.4 Contractors shall store Highly Flammable Liquids and Liquefied Petroleum Gases in a manner approved by OWNER/CONSULTANT.

28.5 OWNER/CONSULTANT' fire protection equipment shall only be used in an Emergency. Fire extinguishers/fire blankets for use when carrying out hot work shall be provided by the Contractor.

29.0 REMOVAL OF WASTE FROM CONSTRUCTION SITES

29.1 The removal of waste shall only be undertaken by Licensed Waste Carriers.

29.2 Where there is any doubt of the composition of excavation spoil, it must be analyzed before it is removed from site.

29.3 Evidence of compliance shall be submitted to OWNER/CONSULTANT prior to the removal of any waste from site.

29.4 Controlled waste is any kind of household, industrial or commercial waste. This includes, for example:

- Scrap metal.
- Building, construction, demolition and excavation waste, including waste from any repair or renovation.
- Clinical waste.
- Anything which is unwanted because it is surplus, broken, worn out, contaminated or spoiled in some other way.

Controlled waste disposal must be managed via a chain of transfer notes, maintained by the contractor and readily retrievable for OWNER/CONSULTANT' inspection.

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30.0 EXCAVATIONS AND OPENINGS

- 30.1 No excavation work shall be commenced by the Contractor unless a valid excavation permit has been issued. The Contractor shall have on site at all times while excavation work is being carried out, detection equipment which meets the latest technology.
- 30.2 Prior to the start of any excavation, OWNER/CONSULTANT shall be consulted and the presence of overhead and buried service records shall be checked. Where “live” services are present, hand excavation must be carried out until the location of the service has been identified, recorded and made safe.
- 30.3 The Contractor must erect suitable solid edge protection (i.e., double handrails) around excavations or openings. During the hours of darkness any excavations, openings or obstructions near or on roadways and walkways must be indicated by a sufficient number of warning lamps.
- 30.4 The sides of all excavations should be properly shored, battered or stepped to prevent collapse. No excavation work shall commence unless there are adequate resources present to ensure the stability of the excavation. Excavations shall be inspected prior to, or re-commencement of the work to ensure the excavation is still in a safe condition.
- 30.5 All excavations shall have a proper ladder access point provided.
- 30.6 Spoil from excavations must be piled at least 1m from the edge of the hole.
- 30.7 Vehicular traffic shall be restricted from the edges of excavations, to prevent possible collapse.

31.0 ELECTRICITY

- 31.1 All Contractors must provide their own electrical power supplies or as per Technical ITB.
- 31.2 Contractors must not interfere with, or work on any of, the Client’s electrical installations or equipment without written consent.
- 31.3 Where Contractors have to work in the vicinity of electrical equipment they must carry out a risk assessment prior to commencement of any works.

ALL EQUIPMENT MUST BE TREATED AS “LIVE” UNLESS ISOLATED/LOCKED OFF AND TAGGED.

- 31.4 Repair or installation of any electrical equipment must only be carried out by a competent qualified electrician.
- 31.5 The electrical supply to powered hand tools must not exceed permissible volts, centre tapped giving appropriate volts to earth. Where this is not possible, due to the type of tool being used, the approval of OWNER/CONSULTANT must be sought in writing.

Electrical lighting for use in confined spaces must not exceed 24 volts (and be explosion proof where applicable). Powered hand tools used in confined spaces should, where possible, be air operated.

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- 31.6 Contractors requiring to install temporary electrical supply equipment shall submit a temporary electrical supply procedure to OWNER/CONSULTANT for approval. The procedure shall, where necessary, cover installation of 380/440 volt system, installation of 110 volt system, lighting system, welding equipment installation, inspection testing operation and maintenance of temporary electrical systems.

31.6.1 Distribution Boards - Semi-permanent or Long Term

These should be accommodated in weatherproofed locations and be so arranged, if possible, that they will not need to be moved during the Contract. They should be proofed against interference or unauthorized operation and they should be large enough to accommodate all the necessary apparatus required. Each circuit should be clearly labeled and a circuit diagram should be located at each board.

31.6.2 Distribution Boards – Temporary

These are usually small portable panels or boards containing two or three socket outlets. They must be of robust construction, preferably all-insulated and should be supplied by heavy duty flexible cables, these cables shall not be spliced. Socket outlets, plug connectors and cable couplers should comply with High Standards or equivalent industry standard.

31.6.3 Distribution Cables

These cables run from the main distribution boards to the local distribution boards throughout the site.

The cables will normally be multi-strand multi-core armored PVC cables but, in certain cases, may take the form of Mineral Insulated Copper Clad (MICC) cables. The latter type should be sheathed with PVC.

The installation must be so arranged as to prevent the need for long trailing cables. Socket outlets should be located as near the working point as possible.

Power and lighting circuits should be kept separate.

A full record should be made of all parts of the installation and should be kept up to date when alterations or extensions are made.

31.6.4 Underground Cables

Cables may be provided by the Contractor and laid underground or overhead to connect the supply or metering point to the semi-permanent site distribution boards.

The cables must be suitable for the duty and loading expected, e.g., armored PVC cables.

The cables should be buried at a safe depth or taken from a height so as not to obstruct the movement of persons and vehicles and their routes clearly marked both on the site and on the site plans.

The cables should be properly terminated and be provided with efficient circuit protection.

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Cable routes should be so arranged that the minimum of obstruction is caused. The cables should be treated with care and given the same supervision and protection as other cables.

31.7 No temporary electrical supply shall be installed or modified without the agreement and approval of OWNER/CONSULTANT.

31.8 Any tool, plant or equipment exceeding 110 volts (55v to earth) shall be connected to an earth leakage circuit breaker (ELCB).

32.0 WORK IN CONFINED SPACES

32.1 All work in confined spaces must be covered by a safety method statement.

Safety method statements for work in confined spaces should include arrangements for the following as a minimum:

- Issue of a permit to work
- Work scope and method.
- Nominated Supervisor.
- Tally man.
- Rescue procedures and equipment.
- Training.
- Tools and equipment to be used, including low voltage or pneumatic.
- Lighting requirements, including standby/emergency.
- Explosion proof fittings.
- Low voltage or pneumatic tools.
- Ventilation.
- Access.
- Bonding to prevent both electrical shock and static discharge.
- Work cycles, to reduce risk of heat exhaustion.
- Fire safety and extinguisher requirements.

32.2 Contractors shall not enter or commence work in any excavation, tank, vessel, pipe or chamber or other enclosed space, until a valid permit to work has been issued. Where Contractor's operations result in a dangerous atmosphere arising during the monitoring of the work activity, the permit to work issuing authority must be informed and all personnel removed from the area.

No new activity shall be introduced into a confined space without the permission and signed approval of the permit to work issuing authority.

Whilst work is ongoing within a confined space, the Contractor will be required to provide a trained standby/tally man.

32.4 All personnel who have to enter confined spaces must have undertaken the training appropriate to this task.

33.0 MOBILE CRANES

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- 33.1 All cranes (including piling rigs, fork lift trucks, mobile elevated work platforms, hand lorries and similar equipment), whether owned by the Contractor or hired, must carry relevant test certificates and thorough examination reports, together with the manufacturer's handbook. Copies of this documentation must be submitted to Owner/Consultant prior to commencing work.
- 33.2 Only persons who are certificated as competent and authorized shall be allowed to operate cranes. The Contractor must be able to prove the competence of their employees to operate such equipment prior to its use.
- 33.3 Crane operators or other competent persons must carry out daily inspections and enter these in the crane register. Failure to maintain the register properly may lead to suspension of operations. This obligation is the responsibility of the crane hirer when he is supplying the crane and the operator. In addition, the Contractor will implement a regular inspection and maintenance programme to ensure that all components of the lifting device are in good condition.
- 33.4 Travel routes for cranes and crane standing must be agreed with OWNER/CONSULTANT in order to avoid such things as overhead lines and other structures, underground services, excavations, made up ground, etc. Load spreader pads of sufficient size and thickness area, and of suitable material, e.g., metal plates, timber, etc, are to be placed under each outrigger foot, before all crane lifting operations are allowed to commence.
- 33.5 Crane duty charts (Load Radius Tables) must be displayed on or be available in the crane for easy reference. In addition, crane manufacturers' rigging/de-rigging instructions must be available on site. During rigging/de-rigging of jibs/booms, provision must be made to support sections/either side of rigging points, from below, utilizing tightly packed blocks.
- 33.6 All cranes shall be fitted with:
- A reverse warning audible alarm.
 - Load radius indicator.
 - Automatic safe load indication.
 - Crane hooks with safety catches.
- All of which must be serviceable.
- 33.7 All lifting equipment accompanying the crane shall comply with the requirements of lifting regulations.
- 33.8 The assembly, rigging and de-rigging of any crane components, including fly jibs, shall only be done under the supervision of a competent lifting supervisor. An approved risk assessment, together with the manufacturers' rigging/de-rigging instructions must be in place covering rigging activities for the equipment.
- 33.9 Every Contractor involved in lifting operations with a crane (including a piling rig) or mobile crane shall appoint, in writing, a lifting supervisor to oversee all lifting operations.
- 33.10 No crane shall travel with a suspended load.
- 33.11 Outriggers, when installed, must always be used.

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34.0 LIFTING OPERATIONS

- 34.1 A Lifting Study and Safety Method Statement must be prepared for all heavy lifts exceeding 10 tons, or of a complex nature, e.g., tandem lifts or as specified by the Construction Manager (or the Rigging and Lifting Supervisor) and submitted to OWNER/CONSULTANT for review.
- 34.2 Every lifting operation must be properly planned by a nominated, competent person.
- 34.3 Every lifting operation shall be appropriately supervised.
- 34.4 All slinging and rigging of loads must be carried out by competent personnel.
- 34.5 Clear communications between the crane operator and the person responsible for controlling the lift must be established.

All statutory Inspection Reports/Certification/Documentation and proof of the driver's training shall be photocopied and handed to OWNER/CONSULTANT prior to the setting up of the crane. Certification for lifting equipment to be used in the lift shall be identified and cross checked with the item of plant

35.0 STEEL ERECTION

- 35.1 The weight of each component in excess of 500 kg shall be clearly marked upon it.
- 35.2 Erectors must be fully informed of the correct erection sequence, by their supervisor, prior to each stage of work commencing.
- 35.3 Vertical access provision should, whenever possible, be fixed to the steel before it is lifted into position. Where this is not possible permanent access, ie, stairways or permanent metal ladders, shall be installed as early as possible.
- 35.4 Where horizontal access along structural members is required, as much work as possible must be completed before the steel is lifted into position. This includes:

Fixing of handrails or posts for securing steel wire ropes to be used in conjunction with safety harnesses or inertia reels.

The fixing of scaffold tubes (needles) to the lower flange of an I-beam to allow a working platform to be erected.

Where scaffold tubes (needles) are used they shall not support a working platform wider than three boards, or one lightweight staging without being "picked up".

Where no ladder access, permanent stairway, etc, leads onto working platforms, as described above, employees must use man riding baskets or mobile elevated work platforms as far as reasonably practicable to access working areas.

36.0 SCAFFOLDING

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- 36.1 All scaffolding must be of good quality, be erected in compliance Good Practices for Access and Working Scaffolds, and special scaffold structures in steel. In addition to the main guard rail, an additional guardrail is required such that the gap between the toe-board and main guardrail does not exceed 470mm and all boards must be secured, without causing a tripping hazard.
- 36.2 All scaffolding shall be erected, modified and inspected by qualified competent scaffolders.
- 36.3 Where materials are to be positioned on scaffolding the Contractor's supervision must ensure that the scaffolding is not overloaded.
- 36.4 Before use, scaffolding shall be inspected by an authorized Scaffold Inspector who shall complete a "scaffold tag" and secure it in a prominent position at the base of all ladder access points. The scaffolding tag will clearly show the following information as a minimum:
- Location.
 - Reference number.
 - Requested by.
 - Access Scaffold Classification.
 - Maximum distributed load/working lift.
 - Maximum number of working lifts to be used simultaneously.
 - Date erected.
 - Erected by.
 - Inspected by.
- 36.5 Scaffolds shall be inspected at weekly intervals or after storms by the authorised Scaffold Inspector who shall sign and date the "Scaffold Tag" after each inspection. Scaffolding not considered safe shall have the Scaffold Tag withdrawn and a prominent "DO NOT USE" sign displayed.
- 36.6 A scaffold register shall be maintained by the authorized Scaffold Inspector. This shall contain:
- Date of first and subsequent weekly inspections.
 - Individual identifications of all scaffolds which shall be cross-referenced to the Scaffold Tag identity number.
 - Clear name and signature of the authorized Scaffold Inspector against each separate scaffold inspected.
- 36.7 No scaffold may be erected which impedes normal access or can be accidentally struck by moving plant without prior consultation with OWNER/CONSULTANT to ensure that a safe system of work is in place.
- 36.8 Contractors are not permitted to erect or carry scaffolding near live overhead electrical cables, or equipment because of the danger of tubes making accidental contact with electrically charged apparatus.

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- 36.9 If there is any doubt about the security of any anchorage, suspension points or ties for a scaffold, e.g., strength of existing buildings/structures, or those under construction, OWNER/CONSULTANT must be consulted before proceeding with erection.
- 36.10 All scaffolds must be provided with suitable access. Where ladders are used for this purpose they must be of adequate length and properly secured by lashing or fixing to prevent displacement.
- 36.11 Action shall be taken to warn personnel against using partly erected or dismantled scaffolds. A prominent "DO NOT USE" sign shall be clearly displayed.
- 36.12 OWNER/CONSULTANT shall approve the sitting of the scaffold material racks/compounds.
- 36.13 Mobile tower scaffolds shall not be constructed with a height greater than 3 times the minimum base width and shall only be used on level ground. Towers shall only be erected by trained personnel.
- 36.14 In addition to weekly inspections, wooden scaffold boards shall be subject to a monthly inspection to ensure wood has not rotted or been subject to insect damage
- 36.15 The Contractor shall ensure that the system of work employed for the erection and dismantling of scaffolding shall not expose the Scaffolders to any risk.
- 36.16 All scaffolding must be erected and dismantled to the requirements laid down in the current regulations and guidance notes and to the requirements of OWNER/CONSULTANT.

37.0 LADDERS/STEPS

- 37.1 Ladders must be in good condition and free from defects, i.e., broken rungs, split stiles.
- 37.2 Ladders must not be painted.
- 37.3 Ladders must:
- Be securely fastened at the top.
 - Be properly positioned at the base.
 - Extend at least 1m (5 rungs) above the working platform.
 - Be at an angle of 300mm out for every 1.2m vertical drop.
- 37.4 **All steps used on the project Site.**
- 37.5 Only one person must be allowed on a set of steps at any one time.
- 37.6 Persons must work with a set of steps of the appropriate height for the task.
- 37.7 The top rung of the steps must be kept at waist height, no work to be carried out above this height on steps.
- 37.8 Ladders are to be used as a means of access not as a working platform except for light, minor or one off activities. Then the person must wear a harness and tie-off to a suitable anchorage whilst carrying out the minor task.

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38.0 FALL PROTECTION

- 38.1 Depending on the task and the risks, harnesses and appropriate anchorages/running lines will be used for activities carried out above a height of 2 meters.
- 38.2 Fall protection equipment shall be subject to regular inspection by a competent person, and a register maintained for OWNER/CONSULTANT' inspection.
- 38.3 During the execution of work at height, where it is not practicable to work from within a standard working platform with double handrail and toe boards (for example erection of structural steelwork, installation of roof components, etc), safety netting capable of catching a falling person must be installed as far as reasonably practicable.
- 38.4 The provision of safety netting does not relieve individuals from utilizing fall protection devices during the execution of the works.
- 38.5 The safety nets should be manufactured to Indian Standard and erected in accordance with good practices by a competent person.
- 38.6 The safety nets must bear a label stating the normal size of the net; the date of manufacture, the deflection at the centre of the net during the prescribed test and the maximum distance below the working height for which the net is designed to be used.
- 38.7 Test certificates must be provided for all safety nets, which will state the breaking strength of the net and provide details of the drop test carried out.
- 38.8 All safety nets must be periodically tested at intervals not exceeding three months – and records of these tests must be retained.
- 38.9 A formal inspection of safety nets must be carried out weekly to check for damage, loose ties, changes in anchorage points, etc. Records of these inspections must also be retained.

39.0 MOBILE ELEVATED WORK PLATFORMS

- 39.1 The term Mobile Elevated Work Platform (MEWP) covers the following types of equipment:
- Scissor lifts.
 - Telescopic booms or jibs.
 - Articulating and telescopic booms.
- 39.2 Anyone who is to operate a MEWP must be competent and have received formal training accredited by manufacturer.
- 39.3 Prior to any MEWP being used on site, a formal risk assessment must be carried out to identify any potential hazards which may exist as a consequence.
- 39.4 Whilst working within the platform of a MEWP, all personnel must wear a safety harness which is attached to a secure anchorage point within the platform.

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- 39.5 Before commencing work from a MEWP, the surrounding area should be cordoned-off to prevent personnel straying into a potentially hazardous area.
- 39.6 The Safe Working Load specified on the MEWP must not be exceeded.
- 39.7 If the MEWP has been manufactured with outriggers or stabilizers, they must always be deployed.
- 39.8 Prior to commencing work, ground conditions must be checked to ensure that the ground bearing capacity will not be exceeded by the loading from the MEWP. Where required, spreader plates shall be used to distribute the loading.
- 39.9 The MEWP shall only be permitted to travel with the platform occupied and/or the boom extended if it is within the machine's specified operational capabilities.
- 39.10 MEWP shall not be used as a jack, prop or support.
- 39.11 MEWP shall not be used as a crane or lifting device.
- 39.12 MEWP shall not be used primarily for the transport of goods or materials.
- 39.13 MEWP shall not be used in wind speed exceeding 30 mph (12.5 m/s).
- 39.14 All MEWPs must be subjected to a regular maintenance and inspection regime, which as a minimum will require weekly inspections by a competent person and a thorough examination every six months.

40.0 CONTRACTORS' TOOLS AND EQUIPMENT

- 40.1 All Contractors' tools and equipment must be fit for purpose. Tools should be CE marked.
- 40.2 Guards and electrical trip switches must work effectively and must not be removed or by-passed.
- 40.3 All tools shall be of good quality and maintained in a safe working condition. Home made tools are not permitted.
- 40.4 The Contractor shall provide suitable storage with suitable racks and bins for storing tools and equipment.
- 40.5 All temporary construction leads, lighting and portable electric tools shall be of appropriate volts.
- 40.6 The Contractor shall nominate or employ the services of a competent qualified person to inspect and tag electrical power hand tools, transformers, distribution boards, extension cables, etc, on an at least a three monthly basis (PAT testing). The tag shall display name, signature of the individual inspecting the tool and date of inspection.
- 40.7 The Contractor shall keep, on site, a register of all electrical power hand tools in use. The register shall detail:

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- Individual identity number of the tool.
- Name, signature and company of the qualified electrician carrying out the inspection.
- Date of inspection.
- Maintenance and Inspection schedule.
- Remarks on condition of tool and whether repaired or withdrawn from use.

40.8 No electrical powered hand tool shall be used unless it is tagged with a current "INSPECTION" tag.

40.9 All electrical leads must be connected to the power source through standard industrial waterproofed plugs and sockets, which shall be in good condition.

41.0 MECHANICAL PLANT AND EQUIPMENT

41.1 Mechanical plant and equipment is defined as:

- Earthmoving plant.
- Road making plant and equipment.
- Concrete batching plant and mixers.
- Forklift trucks.
- Miscellaneous plant, including generators and compressors.
- Mobile elevating work platforms (e.g., star- lift, cherry picker, etc).

41.2 All items of mechanical plant transported to the project shall be in a safe and sound condition and shall be properly maintained. Emissions shall be to acceptable limits and no smoke shall be discharged.

41.3 A programme of regular, preventative maintenance shall be established by the Contractor, as per the manufacturer's handbook, to ensure that all plant equipment is systematically inspected, maintained and repaired as necessary.

41.4 The preventative maintenance programme and the Contractor's employee responsible for taking the action shall be clearly detailed, identified and given to OWNER/CONSULTANT.

41.5 A safe system of work must exist during all maintenance and repair operations to ensure that no part of the machinery is set in motion while work is being carried out.

41.6 Plant maintenance must not be carried out within the main construction site.

41.7 Where refueling is required, facilities provided shall be adequately covered by fire extinguishers, earthing, warning signs, bonding and proper fuel dispensers. Refueling areas shall be curbed to avoid spills.

41.8 Waste oil removed from vehicles after servicing shall be sent to the appropriate off-site waste disposal facility and this is the responsibility of the Contractor.

41.9 The OWNER/CONSULTANT'S tools, plant and equipment may not be used by Contractors without their express permission.

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42.0 COMPETENCY/PLANT EQUIPMENT

42.1 All drivers and operators of mobile plant (mechanically propelled vehicles) shall be in possession of the appropriate license for the class of vehicle.

42.2 It is the responsibility of the contractor to ensure that all drivers, operators and banks men of mobile plant (mechanically propelled vehicles) are certificated as competent.

42.3 General

42.3.1 Every dangerous part of machinery shall be securely guarded.

42.3.2 Any guards removed for maintenance or repair purposes must be replaced before the machine is set in motion.

42.3.3 No mobile plant (mechanically propelled vehicles) shall carry passengers unless a proper fixed seat is provided, except when the equipment is specifically designed for standing personnel.

42.3.4 Mobile plant (mechanically propelled vehicles) must be parked on firm level ground when unattended, the engine stopped, brakes on and any load or attachment lowered to the ground and the keys left in the ignition.

42.3.5 No mechanical plant or equipment shall be sited on or operated on any area of the project without express the permission of OWNER/CONSULTANT.

42.3.6 All items of mobile plant (mechanically propelled vehicles) shall be fitted with a reverse warning audible alarm.

42.3.7 All drivers/operators of mobile plant (mechanically propelled vehicles) shall strictly obey the instructions of the site security, traffic regulations and speed limits. A banks man shall be in attendance during all reversing procedures.

42.4 Inspection

All mobile equipment (mechanically propelled vehicles) shall be inspected by a competent person appointed by the Contractor prior to use on site. Equipment considered to be unsafe, by OWNER/CONSULTANT, shall not be allowed access to the site.

42.5 Flame Arrestors

42.6 All mobile plant for use in Petro Chemical Live Plant Areas, or during the Start-up and Commissioning Phase of the project, must be fitted with Exhaust Flame Arrestors and Chalmers Valves where there is a risk of flammable gas releases.

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43.0 MACHINERY GUARDING

- 43.1 Unauthorized personnel must not operate, interfere or tamper with plant or equipment.
- 43.2 Persons authorized to use machines must first check that guards are in position and that any other safety devices, e.g., emergency stops, are in working order.
- 43.3 All plant or equipment brought onto the site must be properly guarded to prevent injury and be CE marked.

NO GUARD OR FENCE MAY BE REMOVED FROM MACHINERY.

44.0 WELDING

- 44.1 Welding sets shall be in good condition, properly maintained and earthed.
- 44.2 Isolation switches on welding sets shall be readily accessible.
- 44.3 Terminals and live components shall be adequately protected.
- 44.4 Cables shall be frequently inspected to ensure the insulation is intact.
- 44.5 Damaged cables or electrical holders shall be properly repaired or replaced.
- 44.6 The welding return cable shall be secured onto the work piece. If this is not practical it shall be as near as possible.
- 44.7 Proper cable connectors shall be used when connecting runs of cables.
- 44.8 Welders shall wear:
 - Face and eye protection with correct grade of filter.
 - Welder's gauntlets.
 - Long sleeved flame retardant overalls.

Welders shall wear safety helmets at all times, except whilst welding, when it is agreed as impractical and written permission is granted by OWNER/CONSULTANT, subject to mitigation of hazard, i.e., no work overhead, or shielded from falling objects.

- 44.9 Welding areas should whenever possible be screened off using flame retardant blanket or other suitable material. All combustible materials must be cleared from the vicinity of all welding operations.
- 44.10 Asbestos material shall not be used on the project.
- 44.11 Electric Arc Welding equipment and accessories shall conform to Latest Engineering Standards.
- 44.12 Fire extinguishers must be provided and kept adjacent to any welding or cutting activity.

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45.0 ABRASIVE WHEELS

- 45.1 Contractors must ensure that any of their employees authorized to change Abrasive Wheels have attended an approved course of training and have been appointed in writing.
- 45.2 Details of each employee trained must be entered in the training register kept on site. Contractors must produce certificates and registers on request.
- 45.3 Machines used to drive Abrasive Wheels must be in good condition and properly guarded.
- 45.4 Pedestal or bench mounted grinders must have an emergency stop button and be fitted with a properly adjusted tool rest and guard.
- 45.5 All hand held grinders shall have a "Dead Man" switch and appropriate guards fitted.
- 45.6 The use of hand held angle grinders over 115mm shall only be permitted for specific tasks, subject to Owner's / Consultant's approval.

46.0 USE OF GAS AND OXYGEN EQUIPMENT

- 46.1 Compressed gas cylinders shall:
 - Be in good condition and not suffering from corrosion.
 - Be properly colour coded (reference should be made to National Standards).
 - Be individually identified.

Hoses shall be properly colour coded to the internationally recognized standard for the gas being used, in good condition and fitted with hose connectors attached by permanent clips.

Check valves and flashback arrestors must be used on both hoses at all times.
- 46.2 Users shall check the equipment for perished, damaged hoses, regulators, and pressure gauges, etc. Defects must be reported to their supervisors and faulty equipment must be replaced.
- 46.3 When on site, cylinders must be in trolleys or secured in an upright position at all times. A bottle key shall be kept with cylinders in use.
- 46.4 Stored oxygen and fuel gas cylinders shall be kept separate with minimum separation distance of 5m. Cylinders must never be stored or used in a horizontal position cylinders must be secured in an upright position. Empty cylinders must also be separated from full cylinders. Cylinders shall be stored in lockable open mesh bottle cages.
- 46.5 All gas cylinders must be handled with care and they must not be misused or abused. They must be properly shut off when not in use and safety caps must be fitted when being moved.
- 46.6 Great care must be taken to ensure that gas equipment, including hoses, are not allowed to cause obstruction of roadways, walkways, manholes, ladders or other means of access where they can cause hazards or be damaged. Hoses not in use should be coiled up and put in a safe place. Hoses should whenever possible be supported off the ground.

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46.7 Where any operation involves the use of gas and oxygen equipment in enclosed or semi-enclosed spaces, Contractors' supervision must carry out frequent checks to ensure these procedures are complied with.

46.8 During meal breaks and at stopping times, hoses and equipment must be removed from confined spaces or excavations. Oxygen or gas cylinders must not be taken into confined spaces for use or storage.

46.9 No modification to tanks or drums which have contained flammable liquid shall be undertaken at the site.

47.0 ABRASIVE AIR BLAST CLEANIN

47.1 Blast cleaning shall be carried out in an enclosed designated area.

Provision shall be made to prevent the spread of grit and dust out of the blast area and to collect and dispose of the spoil to an approved location.

47.2 The blast cleaning area shall be indicated by prominent warning signs.

47.3 Only approved abrasives having no free silica shall be used.

47.4 Personnel involved in the actual blasting of material shall be protected by a positive pressure, blast hood, meeting approved standards and providing both respiratory and eye protection, with breathing air supplied via a suitable filter.

47.5 The nozzle shall be fitted with a properly functioning dead man's handle, and anti-static abrasive blast hoses. It is required that all equipment be grounded and checked for ground potential

47.6 A standby man shall stay by the blast pot.

48.0 COMPRESSED AIR

48.1 All air receivers and compressors shall be in good condition and properly maintained.

48.2 Air receivers shall be individually identified and marked with their safe working pressure.

48.3 Air receivers shall be accompanied by a valid test certificate which shall be kept on site by the Contractor and shown to OWNER/CONSULTANT before bringing the vessel onto site.

48.4 All air receivers must be fitted with a properly set pressure relief valve.

48.5 Air receivers shall be examined and the pressure relief valve tested by an independent examiner at yearly intervals.

48.6 There shall be a register of all air receivers containing:

- Individual identification numbers.
- Dates of independent inspections.
- Name and signature of independent examiner.
- Rates safe working pressure.

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- Pressure at which pressure relief valve lifted shall be kept on site by the Contractor along with all current certification.

48.7 The requirements inclusive also apply to compressor mounted air receivers.

48.8 All compressed air fittings shall be wired and/or restrained to prevent them from whipping should the coupling separate.

48.9 Only hose clamps designed for compressed air service shall be used. Worm drive (Jubilee) clips are not acceptable.

COMPRESSED AIR MUST NEVER BE USED FOR CLEANING CLOTHES.

48.10 Nozzles used for air blowing must be fitted with a “Dead Man” valve.

49.0 MOBILE PHONES AND PAGERS

49.1 Radios, personal CD and tape players are not allowed in the construction areas.

49.2 Mobile phones and pagers are prohibited in the designated construction areas by any hands-on personnel. External to the designated construction areas, providing it does not detract the user from any safety requirements and the user is stationary, then mobile phones and pagers may be used. **Other uses of this equipment will be at the discretion of OWNER/CONSULTANT.**

50.0 RADIOGRAPHY/NDT

50.1 Contractors who carry out radiography/NDT on the site must comply with safe systems of work. In particular, they **MUST** ensure that:

- Radiography areas are clearly marked using barrier tapes, notices and flashing lights.
- Audible warning (horns) must be sounded before a source is exposed.
- Only Classified Workers are engaged in radiography work.
- All other personnel are clear of the area before radiography takes place.
- Radiography work is supervised by a Qualified Radiological Protection Supervisor. Such supervisors must be nominated in writing and notified to OWNER/CONSULTANT.
- Any incident which may have resulted in over-exposure of any personnel is brought to the attention of OWNER/CONSULTANT for investigation.
- They have a written emergency procedure to be followed in the event of loss of an isotope or damage or malfunction of associated equipment. This procedure must be submitted to OWNER/CONSULTANT for approval before commencement.
- A certified meter is available on site.
- Radiography is carried out at the times agreed with OWNER/CONSULTANT normally this will only be during silent hours. OWNER/CONSULTANT requires twenty-four hours notice of such planned work.

50.2 Contractors who are not involved in radiography work must ensure that their employees observe warning notices, alarms and barriers in use where such work is being carried out.

50.3 Contractors must ensure that statutory notification is made to the authorities of radiography works.

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50.4 Disposal of spent radioactive sources shall be agreed with OWNER/CONSULTANT.

51.0 WORKING OVER WATER/DIVING OPERATIONS

51.1 The Contractor shall provide a buoyancy aid to any employee working over (or near) water where there is a likelihood of falling in.

The Contractor shall also supply a sufficient number of life buoys to be permanently located at the point(s) of danger. The life buoys shall be attached to a throwing line.

Where rescue of a person falling into the water may be difficult, OWNER/CONSULTANT may require the Contractor to supply a standby boat, crewed by a competent boatman trained in rescue and resuscitation techniques.

51.2 Diving operations may only be carried out using approved specialist diving contractors, employing certified commercial divers, and upon acceptance by OWNER/CONSULTANT of their Health, Safety and Environment plan and method statements (Diving Rules).

52.0 ASBESTOS

52.1 Only certified Contractors are allowed to handle asbestos.

53.0 IMPROVEMENT AND PROHIBITION NOTICES

53.1 In the event of an Improvement or Prohibition Notice being served by an Inspector, the OWNER/CONSULTANT Senior Representative must be notified immediately and the Contractor shall comply with the terms of such Notice immediately.

54.0 CARTRIDGE OPERATED FIXING TOOLS

The use of Cartridge Operated tools shall only be permitted with the express permission of OWNER/CONSULTANT, subject to an approved method statement and risk assessment, and use only by competent, trained operators).

55.0 SITE ESTABLISHMENT AND AMENITIES

55.1 Details of temporary services to be provided by Contractor or as Per Technical portion of ITB.

56.0 ACCOMMODATION

56.1 An area will be allocated for temporary site establishment facilities/services.

56.2 When required by the Contract, the Contractor shall provide and maintain (including de-watering when necessary) a suitable level and hardcore surface in the area allocated for temporary buildings such as offices, stores, workshops, mess huts and a stores compound.

56.3 When required by the Contract, the Contractor shall provide all site offices, stores facilities, workshops and mess huts for the accommodation of staff/site personnel. Proposals for the

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Contractor's temporary buildings shall be submitted to OWNER/CONSULTANT for approval with their tender.

56.4 **Storage in Permanent Buildings**

No Plant, Contractor's Equipment or Construction Aids shall be stored in any permanent building without first obtaining the written permission of OWNER/CONSULTANT. Such permission will not relieve the Contractor of the obligation to protect the building from damage whilst used as a store. If permission to use the building is refused by OWNER/CONSULTANT, the Contractor shall provide alternative storage facilities at no additional cost to OWNER/CONSULTANT.

56.5 **Sanitary Facilities**

All toilets and washing facilities shall be provided by the Contractor.
The supply and installation of necessary water sewage/drainage pipe work, pits, etc, for the facilities and the regular emptying and servicing are the responsibility of the Contractor.

56.6 **Canteen**

The Contractor must provide mess-huts for his employees and arrange any canteen facilities required for his employees and those of any others employed by him in connection with the Work.

57.0 **TEMPORARY SERVICES**

57.1 **Telephone, Facsimile, etc**

Arrangements for the provision of telephones, computer modems and/or facsimile facilities shall be made directly with providers of such facilities by the Contractor.

57.2 **Electricity**

If under the contract the Contractor is responsible for providing electricity for the site establishment amenities and working area(s), the Contractor shall ascertain the type, location and available spare capacity of the electrical point(s) of supply and provide cable, connections, isolating switches and earth leakage protection of approved specification.

If the Contractor's requirements for temporary electrical supplies exceed those agreed and render the available service inadequate, the Contractor shall provide the additional requirements at no extra cost to OWNER/CONSULTANT.

Electrical installations including all cables, temporary connections, wandering leads and all electrical facilities and/or equipment required for the execution of the Works shall be properly installed and maintained by the Contractor.

Temporary electrical installations must comply with all appropriate statutory requirements, the latest edition of the Institution of Electrical Engineers Regulations, COP for Distribution of Electricity on Construction and Building Sites and Electrical Safety on Construction Sites.

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Electrical equipment and installation shall at all times be subject to inspection and approval by OWNER/CONSULTANT but this shall not relieve the Installer/User of their responsibilities for the safety of the system.

Electrical equipment or cables forming part of the permanent installation shall not be used by the Contractor for temporary services.

Temporary buildings shall have an external isolating switch.

The Contractor shall supply, install and maintain any temporary workface lighting.

57.3 **Water**

Supply of potable water for drinking and raw water for washing/toilet facilities, mixing concrete, hydrostatic testing and other construction purposes shall be in Contractor's scope. The Contractor shall ascertain the location of the supply point and shall provide and install any temporary pipe work necessary for the provision, use and disposal of such water.

58.0 **DISCHARGES INTO THE INTERNAL AND EXTERNAL DRAINAGE SYSTEMS, LAND AND CONSTRUCTION AREAS**

58.1 All proposed controlled discharges into the site drainage systems shall be agreed with OWNER/CONSULTANT.

58.2 Any water discharged on existing roads, hard shoulders or drainage systems shall first pass through a filtering interceptor (which must be regularly cleaned) to prevent the discharge of sludge or solids.

58.3 Any damage to the Works caused by prolonged or excessive pumping and any damage or nuisance arising out of pumping operations shall be the liability of the Contractor.

58.4 Subsequent to filling with water and testing of any part of the Works for hydraulic testing, the Contractor shall be responsible for safe disposal of the water, and shall ensure that the rate of discharge is controlled and kept within the capabilities of any drainage system utilized.

58.5 The Contractor shall provide all requisite equipment and materials to ensure that all drains, rivers, streams or waterways are safeguarded against pollution.

59.0 **MAINTENANCE OF ROADS AND DRAINS**

59.1 Existing roads, road gullies and drains shall be inspected by OWNER/CONSULTANT and the Contractor prior to work commencing. A record of this inspection shall be compiled and on the completion of the Works, a further inspection will be carried out and any necessary repairs to road surfaces or cleaning of drains shall be to the Contractor's cost.

59.2 The Contractor shall provide temporary protection to any existing roads to prevent all possibility of damage whatsoever arising from the Works.

59.3 The Contractor shall at all times in the execution of the work maintain all public and site roads in a clean condition to the satisfaction of OWNER/CONSULTANT.

59.4 The Contractor shall immediately remove all mud, earth and debris from road surfaces.

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- 59.5 Track-laying cranes and similar vehicles must not travel on finished roads without written authority from OWNER/CONSULTANT and then only with the use of timber mats or approved precautions to prevent damage to the roads. Timber mats or other approved precautions shall be supplied by the Contractor.

60.0 MATERIALS – STORAGE AND CONTROL

- 60.1 The Contractor must give a minimum of twenty-four hours notice of the intention to uplift and transport materials/equipment supplied free-issue from OWNER/CONSULTANT/Client' storage facilities to the point of erection or Contractor's storage facility.

- 60.2 Free-issue materials/equipment furnished by OWNER/CONSULTANT shall be accepted by the Contractor and become the responsibility of the Contractor until acceptance of the Works. Any damage caused to free-issue materials after acceptance shall be repaired or replaced by the Contractor to OWNER/CONSULTANT' satisfaction.

60.3 Storage of Petrol, Fuels, Lubricants etc

All fuel and construction materials which may contaminate the site drains, land or watercourses shall be stored in bounded areas. Refueling of plant shall be via bounded bowers. All construction plant in static locations shall have drip trays which shall be cleared daily.

60.4 Environmental Impacts

The Contractor shall, prior to commencement of the work, present to OWNER/CONSULTANT for their approval a register of environmental impacts that necessarily arise from their works.

Each identified environmental impact shall be accompanied by an individual Risk Assessment, clearly showing the reduction measures put in place to ensure mitigation of residual risk.

61.0 PENALTY

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of noncompliances and also for repeated failure in implementation of any of the HSE provisions, Consultant/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty shall be limited to 0.5 % (Zero decimal five percent) of the contract value.

The amount of penalty applicable for the Contractor on different types of HSE violations is as below.

- For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Full body harness, Face shield, Boiler suit, etc.) **Rs 500/- per day/ Item / Person.**
- Working without Work Permit/Clearance **Rs 20000/- per occasion.**

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3. Execution of work without deployment of requisite field engineer / supervisor at work spot **Rs. 5000/- per violation per day.**
4. Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire/cables on the roads, electrical jobs by incompetent person, etc.) **Rs 10000/- per item per day.**
5. Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required, like handrails, life-lines, Safety Nets etc. **Rs. 10000/- per case per day.**
6. Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, and not keeping cylinders vertical during storage/handling, not using safety cap of cylinder). **Rs 500/- per item per day.**
7. Use of domestic LPG for cutting purpose / not using flash back arresters on both the hoses/tubes on both ends. **Rs. 3000/- per occasion.**
8. No fencing/barricading of excavated areas /trenches. **Rs. 3000/- per occasion.**
9. Not providing shoring/strutting/proper slope and not keeping the excavated earth at least 1.5M away from excavated area. **Rs. 5,000/- per occasion.**
10. Non display of scaffold tags, caution boards, list of hospitals, emergency services available at work locations. **Rs. 1000/- per occasion per day**
11. Traffic rules violations like over speeding of vehicles, rash driving, talking on mobile phones during vehicle driving, wrong parking, not using seat belts, vehicles not fitted with reverse horn / warning alarms / flicker lamps during foggy weather. **Rs. 2000/- per occasion per day**
12. Absence of Contractor's RCM/SIC or his nominated representative (prior approval must be taken for each meeting for nomination) from site HSE meetings whenever called by Consultant/Owner & failure to nominate his immediate deputy (in the site organ gram) for such HSE meetings. **Rs 10000/- per meeting.**
13. Failure to maintain HSE records by Contractor Safety personnel, in line with approved HSE Plan/Procedures/Contract specifications. **Rs 10000/- per month.**
14. Failure to conduct daily site safety inspection (by Contractor's safety engineers/safety officers), internal HSE meeting, internal HSE Awareness/Motivation Program, Site HSE Training and HSE audit at predefined frequencies (as approved in HSE Plan). **Rs. 10000/- per occasion.**
15. Failure to submit the monthly HSE report by 5th of subsequent month to Project's Engineer-in-Charge /Owner **Rs. 10000/- per occasion and Rs. 1000/- per day of further delay.**
16. Poor House Keeping **Rs. 5000/- per occasion per subject**
17. Failure to report & follow up accident (including Near Miss) reporting system within specific timeframe. **Rs. 20000/- per occasion**

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18. Degradation of environment (not confining toxic spills, spilling oil/lubricants onto ground).Rs10000/- per occasion
19. Not medically examining the workers before allowing them to work at height / to work in confined space / to work in shot-blasting / to work for painting / to work in bitumen or asphalt works, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices,etc. Rs 5000/- per occasion per worker.
20. Violation of any other safety condition as per job HSE plan / work permit and HSE conditions of contract (e.g. using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box at site, not using hood with respiratory devices by blaster for shot/grit blasting, etc.) Rs. 5000/- per occasion.
21. Failure to carry-out Safety audit in time (internal & external), close-out of identified shortfalls of Observations of Safety Aspects(OSA),etc. Rs. 20,000/- per occasion.
22. Carrying out sand blasting instead of grit/shot blasting Rs. 50,000/- per day.
23. Failure to deploy adequately qualified and competent Safety Officer Rs. 10000/- per day per Officer.
24. Utilization of hydra/ back-hoe loader for material shifting or any other unauthorized /unsafe lifting works Rs 25,000/- per occasion.
25. Any violation not covered above to be decided by Consultant/Owner.
26. Any physical injury - maximum of Rs.2,00,000 per injury
27. Fatal accident - Rs. 25,00,000 per fatality

62.0 FOLLOWING SHALL BE APPLICABLE FOR MANDATORY MEDICAL EXAMINATION OF CONTRACTOR WORKERS BEFORE DEPLOYMENT AT WORK SITE:

Medical examination will be in the scope of the contractors.

Medical examination to be conducted by a doctor with minimum MBBS qualification, having registration number for practicing.

Certificate issued should have endorsement on the photo & clearly mention general health/fitness of the candidate to carryout work inside plant, including eye sight, Vertigo, BP,Heart, convulsion problem etc.

Certificate of fitness is to be issued on letter head of doctor and to be produced with application for photo Gate pass to the E-I-C for the job.

Validity of medical certificate will be for one year from the date of issuance.

Gate pass issued by CISF will bear "Medically Fit" stamp based on the E-I-C's recommendation.

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Accordingly, this shall be treated as part of the tender.

MEDICAL CERTIFICATE

**Affix latest PHOTO
impression of the
workmen half
covering the
photo.**

Form for Medical Check Up for the Workman engaged by the Contractor

Certified that I, _____ have examined Shri _____ Age _____
who has signed / thumb impression above on the photo in my presence. The details of his examination as required are given in the enclosed medical examination report. I certify that all clinical and pathological tests were done in my hospital/dispensary under my instructions. General and physical examinations of Shri _____ do not reveal any abnormality. He does not suffer from any acute / chronic disease or any contagious or infectious disease. He is medically fit to work inside plant. He is free from Vertigo, Epilepsy or Fits, general giddiness and height related disease. His B.P.Pulse, Eyesight etc. are normal.

In my opinion, Shri _____ is physically and mentally fit for undertaking physical labour inside the plant.

Sign _____
Date: _____

Signature and Rubber stamp of medical practitioner with name

Note: This certificate is to be given on the letterhead of the registered medical practitioner who is possessing MBBS qualification as recognized by the Indian medical council. Below the signature, the rubber stamp of the medical practitioner should be affixed. The letterhead normally should contain the following:

- 1) Name of the Medical practitioner:
- 2) Qualifications:
- 3) Registration Number:
- 4) Designation:
- 5) Address:

63.0 ADDITIONAL SAFETY REQUIREMENT

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A. Strict implementation of IS marked safety helmets & IS/CE marked safety shoes for contract personnel

All the contractors working inside the plant shall ensure that their supervisors/labourers compulsorily wear IS marked safety helmets & IS/CE marked safety shoes while entering plant premises. No contract personnel shall be allowed inside battery area without wearing IS marked safety helmets & IS/CE marked safety shoes. All EIC's/site engineers and F&S department shall sensitize and spread awareness among the contract personnel.

Name of Tenderer:

Signature & Seal of Tenderer:

SCHEDULE OF RATES (SOR)

SOR for "Laying of M S Pipeline ranges of dia 6" along with fabrication and installation of pontoon and floating dock for providing water supply to construction water system of M/s BCGCL

SL.NO.	DESCRIPTION IN BRIEF	UNIT	QTY	UNIT RATE WEIGHT (UPTO 10 DECIMAL POINT)	DERIVED QUOTED UNIT RATE in INR (TOTAL QUOTED PRICE *UNIT RATE WEIGHT)	DERIVED TOTAL QUOTED AMOUNTin INR (QUANTITY*DERIVED QUOTED UNIT RATE)
1.00	Loading and Unloading of MS pipe into 10Te capacity truck for all lead within the mine Area					
1.01	6" dia. M.S pipe	Mtr	3500	0.0000031777		
2.00	Shifting of M.S pipe manually within a lead of 100mtrs. where the site is not motorable/in slope terrain / different benches in mine etc. wherever required as per direction of Engineer-in-charge.					
2.01	6" dia. M.S pipe	Mtr	3500	0.0000114401		
3.00	Laying of M.S. Pipe including sligning surface leveing & supporting wherever required and jointing of pipe all complete as per direction of Engineer-in-charge.					
3.01	6" dia. M.S pipe	Mtr	3500	0.0000134663		
4.00	Rubber insertions for 150 mm dia. Pipe joints.	Each	655	0.0000302792		
5.00	M.S Nut and Bolt for 6" dia. M.S pipe 16mm dia,65mm long,Full thread,Hexagonal shape	Joint	655	0.0000783475		
6.00	Welding of Flanges (Welding by gas or electric plant including transportation of plant at site etc complete	CM	59167.02	0.0000007882		
7.00	Making of 6" Dia. Bend & Tee as per requirement	Nos	50	0.0004390045		
8.00	Making of 6" dia. Short pieces/Taper Pieces.	Nos	22	0.0007795329		
9.00	Providing and fixing of sluice valve of 150 mm nominal dia	Nos	4	0.0016340291		
10.00	Supply of MS Flange,150 mm, (6 ")	Nos	1310	0.0000404836		
11.00	Providing and fixing of 1.6 MPa Swing Check Type Reflux (Non-Return) Valves for of Nominal size (in mm) 150	Nos	4	0.0016340291		
12.00	Operation and Maintenance of pumps in one shift(1 semi skilled and 1 unskilled)	Shift	730.00	0.0002986098		
13.00	Security of pump,Pontoon,Pipeline and Powerline (semi skilled Manpower)	Shift	1,460.00	0.0001609423		
14.00	Fabrication of 84 Drum pontoon as per drawing with 3446.4 kg structural steel work, Supply of 200ltr-84 nos PVC drum, Fitting and erection of drum including cleaning, pressure testing, tightening and finally pulling it inside the Tee along with painting with black anti corrosive bitumastic paint of approved brand and manufacture to give an even shade two or more coats on new work	No	1	0.0905434982		
15.00	HDPE Floating Dock 15 meter x 3 meter as per TPS attached.	No	1	0.0901550444		
16.00	Supply of Manpower exclusively for BCGCL office at Lakhanpur (2 unskilled Manpower) As per direction of BCGCL	ManMonth	48.00	0.0001376675		
17.00	<u>PROCUREMENT, SUPPLY & INSTALLATION OF PORTACABIN FOR BCGCL LAKHANPUR SITE</u> Supply and Erection of Porta Cabin at site including Transportation / Freight charges, Construction of Foundation at site, Erecting the structure on the foundation, Provision for Cable, Switches and Junction box connection: Complete with Internal wiring, LED lights, AC Point, Switch Sockets, Exhaust Fans, MCBs etc. complete in all respect as per defined scope of work in Technical specification Configuration of Cabin : One Room including toilet only Capacity: 5 persons Cabin Inside Length ± 15 mm: 6100 mm (min.) Cabin Inside Width ± 15 mm: 3050 mm (min.) Total Height (mm) ± 15mm: 2590 mm (min.) Time period for completion :- Entire work including supply, erection, etc has to be completed within 30 days from date of order and same to be handed over to the client.	Each	1	0.0384477439		

NOTE:- 1. The manpower to be deployed for job execution must possess VTC , IME/ PME

2.The job has to be executed within 30 days

3. The contractor must possess relevant experience in execution of such jobs

4. Contractor must provide safety gadgets including helmets, shoes , fluorescent jackets , safety gloves , slings and ropes for safe execution of jobs.

5. Power supply arrangements/ Dg for welding works has to be arranged by contractor at its own cost.

6. Contractor has to deploy supervisor for monitoring job execution and will bear total responsibility for ensuring safety of manpower