

TENDER NO – PSER:SCT:VRM:C-1907:18		
VOLUME-IF-CML-REV-00	ANNEXURE-1 TO TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 1 OF 1

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# SCOPE OF SUPPLY AND WORK

## CAPTIVE POWER PLANT (CPP) PACKAGE

### TENDER NO. B016-606-02-43-PG-T-7810

PROJECT : VISAKH REFINERY MODERNISATION PROJECT

UNIT : 606

OWNER : HPCL VISAKHAPATNAM

PMC : EIL

JOB NO. : B016

A	19.05.2017	ISSUED FOR TENDER	SM	MLSP	SCM
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

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- **PART A: ARCHITECTURE**
- **PART B: STRUCTURAL**
- **PART C: U/G CIVIL**

## **PART- A (ARCHITECTURAL)**

### **1.1 Detailed Scope of Work**

#### **1.1.1 General**

Contractor shall develop the FEED to Approved for Construction (AFC) status, taking due account of the detailed requirements of the drawings, design basis, specifications and standards for architectural works for the scope of work covered under this Contract. CONTRACTOR shall not proceed with construction till those documents which are specifically listed at "Review" category are reviewed by OWNER /PMC.

The scope of architectural works under this contract shall include design, detailed engineering, procurement, supply and construction of all relevant works as per specifications enclosed with the bid document. The scope of work as defined herein shall be read in Conjunction with Job Specifications for Architectural works and Architectural Standards.

Scope of work by the Contractor shall consist of Architectural design & detail engineering including preparation of Architectural drawings, construction including construction supervision & supply of all materials, labour, tools & tackles etc., obtaining approvals from Statutory Authorities, supply of deliverables like drawings, documents, preparation of As-built drawings etc. and co-ordination with EIL & the Owner etc. all complete for the following buildings:

#### **1) Substation - 94**

The building shall be four storied RCC frame structure with masonry wall, RCC roof. The building shall comprise of two Cable Cellars – on ground and second floor , two air – conditioned Switchgear rooms – on first and third floor (size 66m X 15m aprox.) with battery room and distribution transformers, power capacitors as required for the package. The building shall have loading/unloading areas (with monorails), Staircases, lifts (goods cum passenger lift) and other services like toilet and drinking water facility etc., as per functional requirement. Contractor shall design and construct the building conforming to all bid requirements and standard/ codal requirements as governing.

#### **2) Substation – 93 GIS Building**

The building shall be three storied RCC frame structure with masonry wall, RCC roof. The building shall comprise of Cable Cellar on ground floor, air – conditioned GIS Hall on first floor (size 66m X 12m approx.), air conditioned control room (size 40m X 12m approx.) and relay panel room (size 26m X 12m approx.) on third floor, with battery room and distribution transformers, power capacitors as required for the package. The building shall have loading/unloading areas (with monorails), Staircases, lifts and other services like toilet and drinking water facility etc., as per functional requirement. Contractor shall design and construct the building conforming to all bid requirements and standard/ codal requirements as governing.

### 3) GTG & STG Shed

All sheds shall be Steel structure with precoated galvalume steel sheet roofing and side cladding. The provision of EOT within the shed to be considered. Suitable detail engineering layout as per functional requirement of these buildings shall be prepared and submitted by the contractor.

### 4) SWAS Room

The building shall be RCC frame structure with masonry wall, RCC roof and shall comprise of SWAS/ Analyser Room and other areas, loading/unloading area etc as per functional requirement. Contractor shall design and construct the building conforming to all bid requirements and standard/ codal requirements as governing.

### 5) DG Shed

The building shall be RCC frame structure with masonry wall, sloping steel roof with precoated galvalume steel sheeting and shall comprise of DG Shed, Electrical Panel Room (with RCC roof) and other areas, loading/unloading area etc as per functional requirement of the building. The acoustical treatment for the sound being generated also needs to be taken care by the contractor. Contractor shall design and construct the building conforming to all bid requirements and standard/ codal requirements as governing.

### 6) Any other Building / Shed as required for functional operation of the CPP Package

All buildings shall be RCC frame structure with masonry wall and RCC roof.

All sheds shall be Steel structure, precoated galvalume steel sheet roofing and side cladding.

#### 1.1.2 Detail Engineering

Detail Engineering shall be based on "Architectural design basis" and approved preliminary drawings. The Contractor shall prepare construction drawings and submit the same to Owner/PMC for review/ approval. The requirement of deliverables by the Contractor for detail engineering is indicated elsewhere.

#### 1.1.3 Construction

The Contractor in strict conformity with Owner/PMC reviewed/approved construction drawings, using materials as per Specifications, Standards & List of Approved Manufacturers as attached in the Tender Documents shall carry out construction including construction supervision. Construction shall include supply of all materials, labours, plants, tools & tackles by the Contractor unless specifically mentioned elsewhere in the Tender Document.

#### 1.1.4 Statutory Approvals

The Contractor shall obtain all necessary approvals from statutory authorities such as Factory Inspector, Tariff Advisory Committee (TAC), Local Municipal or Development Authorities as applicable for the design and construction. The Contractor shall also prepare all drawings,

documents as required for obtaining such approvals and perform necessary submissions to the authority concerned. Any changes/ modifications etc. in design/construction required for obtaining such approvals shall also be done by the Contractor without any time & cost implication to the Owner or PMC.

## **1.2 Scope of Supply**

### **1.2.1 Owner's Scope of Supply**

NIL

### **1.2.2 Contractor's Scope of Supply**

All architectural materials (consumables/ non-consumables) required for satisfactory completion of the job shall be supplied by the contractor.

## **1.3 Deliverables by the Contractor**

### **1.3.1 Drawings / Documents Required after Award of contract**

The Contractor shall submit a detailed schedule of submission of deliverables as indicated herewith for review by Owner/PMC as per agreed schedule. Such a schedule shall be made in line with the overall time schedule indicated elsewhere in the Tender Documents. Submission of all deliverables shall be as per the said schedule as reviewed by Owner/PMC.

All deliverables shall be prepared using Computer software and shall be complete in all respects including correct titles indicating Owner, Consultant, Contractor, Project name, PMC Job No., Dates, Issues, Revisions and signatures of Performer, Checker & Approver of the Contractor.

Incomplete, unsigned & unchecked Documents/ Drawings shall not be accepted and shall be returned.

All revisions shall be clearly pointed out clouded for easy identification/ review.

All deliverables shall be submitted in requisite number of prints as per methodology mentioned elsewhere in the Tender Documents.

Deliverables by the Contractor shall be as listed herewith.

## **1. Drawing/Document Schedule**

The schedule shall include all Drawings/ Documents with Title, Number, Dates of issues (scheduled & actual) & present review status etc. The schedule shall be updated and submitted at regular intervals as mentioned elsewhere.

## **2. Drawings**

- A. Preliminary Architectural Drawings of the buildings in accordance with bid indicating Plans, Sections & Elevations & Architectural treatment. Such preliminary drawings shall be prepared after finalisation of sizes & layout of the

required spaces/ areas/ rooms and review of the same by the originating department of PMC.

- B. Construction drawings of all the Buildings shall be prepared incorporating comments etc. on the preliminary Drawings.

Construction Drawings shall contain the followings.

1. Plan of all levels, Terrace Plan, Key Plan.
2. Sections as required for complete understanding of the Design & Construction.
3. Elevations of all sides.
4. Door/Window details.
5. False ceiling details & layouts.
6. Schedule of Architectural Finishes.
7. Architectural details as required.
8. Any other Dwg as required for complete understanding of the Design & Construction.

Drawings shall be prepared using AutoCAD software of latest (at the time of floating the Tender) version. Drawings shall be prepared in 1:100 or 1:50 scale. For Construction details, Door Window Details the scale shall be 1:20 to 25. For key plans larger but legible scale may be used.

The Contractor shall prepare & submit specifications of materials etc., which are not covered or attached in the Tender Documents for review by Owner/PMC.

### **3. Documents/ Drawings for Statutory Approval**

The Contractor shall prepare & submit Documents/Drawings for Statutory Approval in accordance with the statutory requirement for Information/Record of Owner/PMC.

### **4. As Built Drawings**

The Contractor shall prepare & submit As-built drawings both in requisite no. of hard prints as well as in form of computer files for Information/Record of Owner/PMC.

### **5. List of Sub- vendors/ authorised applicators for specialised items**

The Contractor shall submit list of all Sub- vendors/ authorised applicators to be engaged for execution of various specialised items (like Aluminium Doors and Windows, Waterproofing and Underdeck Insulation, False ceiling, False Flooring etc.) for approval.

The above requirements are a minimum. Contractor shall also refer section of Drawings/ Documents Review for Owner's / PMC Review for drawing and document deliverables.

## **1.3.2 Review of the Contractor's Drawings/Documents**

Drawings/ Documents submitted by the Contractor shall be reviewed by Owner/PMC within agreed upon time schedule.

It shall be Owner/ PMC's right to review any/ all or none of the Drawings/ Documents submitted by the Contractor.

Review by Owner/ PMC shall not relieve the Contractor of his responsibility for correct Design, Engineering and Construction. The sole responsibility of the correctness of Design, Engineering & Construction shall lie with the Contractor irrespective of the fact that the Drawings/Documents submitted are reviewed or not reviewed by Owner/PMC. The Contractor shall correct all faulty design & construction detected at any stage of work without any cost & time implication to PMC or the Owner.

Following Parameters of Design & Drawings shall not be reviewed.

- A. Adequacy of provisions (in terms of spaces, services & utilities) and space/ area/ Room sizes for Plant Buildings or Plant Areas in other Buildings. The Contractor shall ensure correctness of such provisions vis-à-vis Owner/ PMC reviewed/ approved G.A. drawings & submit Architectural dwgs only after approval/ review of such provisions by concerned deptt. of PMC.
- B. Correctness of Drawings in terms of dimensions, matching of Plan, Elevation, Section, etc. These parameters may be reviewed at random only.
- C. Location, Co-ordinates, Orientation & Road/Ground/Pavement levels. The Contractor shall ensure correctness of these vis-à-vis EIL reviewed/approved G.A. drawings.

#### **1.4 LIST OF ATTACHEMENTS**

- Job Specifications – B016-606-81-41-SP-7810



## **PART B: STRUCTURAL**

### **1.0 SCOPE OF SUPPLY/WORK**

The scope of Civil and Structural works under this contract shall include design, detailing, supply and construction of all relevant civil and structural steel works required for successful completion of works for **CAPTIVE POWER PLANT** of VRMP as per specifications enclosed with the Bid document.

Major Civil and Structural works involved shall include but not limited to the following:

- a. All Design, Detailing, Supply and Construction of foundations and superstructure for all types of structures and equipments for **CPP** package broadly including piperack, GTG, HRSG & STGSheds, deaerator structure, Buildings, RCC blind floor at Air Cooler supporting levels with decking sheet, Columns, vessels, exchangers, tanks, turbines, stack, pumps, skids, filters, heaters, fans, silencers including battery limit platforms, pipe supports, cable racks, Instrument supports, trenches and Circular platforms, Ladders around equipments, miscellaneous platforms, hand railings, crossovers, UG pits, etc. for CAPTIVE POWER PLANT (unit battery limits shall be as per functional discipline i.e. piping/ mechanical/ electrical/ instrumentation scope) are in the scope of this package.
- b. Cutting of pile & building of pile heads for all structures.
- c. Design and construction of all foundations in line with foundation recommendations attached elsewhere in the bid package.
- d. Preparation of bar bending schedule for all RCC works before construction is taken up.
- e. Preparation of fabrication drawings for all structural steel works.
- f. Painting to structural steel including primer shall be as per EIL specification no. B016-000-79-41-PLS-01.Environmental classification shall be considered as Industrial Marine.
- g. Fire Proofing of equipment supports and steel structures with vermiculite cementitious coating, wherever required as per engineering design basis document no. B015-999-81-41-EDB-1001, shall be done as per EIL specifications including for equipments/ structures designed by others.
- h. Providing hot dip galvanized electro-forged grating and galvanized & painted handrails on platforms/ stairs.
- i. Providing one side machined sliding plates, embedded in the grout over sliding support, under horizontal equipment.
- j. Designing and constructing any barricading arrangement required in or around unit/ worksite due to safety reasons at any stage prior to the commissioning of the Plant, and dismantling & removal of the same by the contractor from site of work after completion of the project.

- k. Obtaining statutory approval from local authorities such as Municipal Corporation, Development Authorities, Inspector of Factories and any other concerned authorities before starting the works at site.
- l. Furnishing activity wise work programme and taking necessary approvals from the related department in the plant before carrying out any activity in existing structure. Any statutory approval, if required, shall also be taken.
- m. 3-D modeling of all structures in PDS/ PDMS, including piles and foundation (whether designed by contractor or Owner/ Owner's representative)
- n. Documentation of "AS BUILT" drawings/ details for all works in native file format (AutoCAD etc.) (whether designed by contractor or Owner/ Owner's representative)
- o. Any other civil and structural works required/ directed by Owner/ Owner's representative/ Resident Construction Manager for the satisfactory and successful completion of the Project.

## **2.0 SPECIFIC REQUIREMENTS:**

Apart from the conditions mentioned in the Engineering and Seismic design basis B015-999-16-48-EDB-1001& B016-000-16-54-DB-0001-Rev.0, 6-68-0021 & 6-68-0022; the following shall be strictly adhered to:

- a. Package contractor to ensure isolation of structures/ equipment with difference of temperature for free expansion while providing interconnecting platform and for connection to stair structures.
- b. Material of construction shall be as per Engineering Design Basis.
- c. Contractor shall have to follow the layout provided in the package.
- d. Foundation layout drawing for various structures / facilities covered under this package shall be prepared duly considering the presence of existing Piling/stone columns within the area.
- e. Package contractor shall provide foundation loading plan (including level, location, bolt diameter & bolt projection) within 6 weeks after award of contract. (for all the structures being designed by Contractor)
- f. Package contractor shall ensure lateral stability by providing box/ built-up sections for columns wherever it is not feasible to provide vertical bracing in either direction.
- g. All designs, detailing & construction shall strictly conform to enclosed standards, specifications & drawings.
- h. Sequence of construction is to be shown on the AFC drawings by indicating construction joints wherever required.
- i. Package contractor shall depute his concerned Civil-Structural design engineer to Owner/ PMC's review office as and when required for review of his documents. During such reviews involving computer aided analysis/ design/ drafting of structures, the package contractor shall make his own arrangement of Personal Computer (PC) in the form of Lap-top in the premises of Owner/ PMC's representative's review office. This is required to expeditiously resolve all

the comments including those involving the use of PC by Package contractor in his submission. The Package contractor shall ensure that these PC's are fully operational along with necessary software already loaded including the input/ output/ drawing files of the structures being reviewed. The Package contractor shall revise and re-submit the analysis/ design and drawings as required during review.

- j. **Verification of foundation loading data for all equipment/ structures/ stacks etc., which form part of the comprehensive packages supplied by the respective vendors, shall be entirely the responsibility of Package contractor. Package contractor shall ensure that wind/ seismic loadings are strictly in line with the basic wind pressures/ seismic loads enclosed with this package.**
- k. The Pile Capacities/ Net Safe Bearing Capacity of Soil considered for the design of foundation shall be mentioned in drawings for all structures and equipment.
- l. For cutting & bending of rebar mechanized equipment/ cutting-bending machine shall be used. Usage of "Ready-to-use Rebar" as per bar bending schedule shall be preferred, as per approval of the Engineer-in-Charge, without any cost implication. "Ready-to-use Rebar" shall be from reputed manufacturer only.

### 3.0 SCOPE OF SUPPLY OF MATERIALS

All materials (consumable / non-consumable) required for execution of Civil - Structural works under this contract shall be in the scope of contractor.

### 4.0 EXCLUSIONS

NIL

## **PART-C (U/G CIVIL)**

### **1.0 SCOPE OF WORK**

#### **1.0 INTRODUCTION**

The scope of work of this package tender involves design, detail engineering, preparation of drawings, obtaining approval from PMC/ Owner and licensor, construction, fabrication, erection, installation, tie-up with main system as per scope limit, testing, painting, commissioning, trial runs, supply of all materials, items, equipment, transportation, labour, consumables, tools and tackles etc. required for completion of job as per specifications, standards, codes, data sheets, drawings & good engineering/ national/ international standards/ practice accepted by client and direction of Engineer-in-charge in all respect of all the U/G Civil works including taking approval from Statutory Bodies (like PESO,DGCA etc.)/Local Bodies and preparation of drawings/documents for approval from Statutory Bodies/Local Bodies for the **CPP and Associate facilities, Sub Station, DG Shed, STG, GTG, Storage Tankage etc. for VISAKH REFINERY MODERNISATION PROJECT** of M/s HPCL VISHAKHAPATANAM Refinery.

The scope of work shall be read in conjunction with complete bid document. Scope of work for CPP Package shall be read in conjunction with Scope drawing no. B016-606-81-41-04561-A

The brief scope of work mainly involves as described below, but not limited to the following.

1. Preparation of basic/ detailed engineering drawings for construction and getting approval of the same from PMC/ Owner/ Licensor.
2. Clearing and stripping of the area, removing vegetation, grass, shrubs, roots etc. within the package battery limit and site grading of the area to achieved proposed FGL.
3. RCC pavement within entire CPP Unit area
4. Distribution network of Drinking water system for Safety shower & eye wash unit or any other places required within the contractor scope limit, from tapping point connected with the main drinking water network as per scope limit drawing enclosed with this bid package.
5. Drinking water pressure at scope limit shall be considered around 2.0 kg/cm<sup>2</sup>g. Any boosting pump required to enhance the drinking water pressure is in Package contractor's scope.
6. Approach roads, hard stand and crane movement area required for fabrication and Installation of equipment's etc.
7. U/G piping system for following
  - OWS- Oily Water Sewer
  - CRWS- Contaminated Rain Water Sewer
  - SWS- Sanitary Water Sewer
  - WDK- Drinking water System.
  - Building Drainage and plumbing system in the buildings
  - Cooling Water Supply & Return (WCS/ WCR)- (Above Ground)

- Hooking up of all underground services.
- 8. All underground carbon steel piping shall be provided with corrosion protection as per Job specification no.B016-000-79-41-PLS-01 Corrosion protection shall extend beyond U/G portion up to a length of 500 mm.
- 9. Safety shower and eye wash at caustic & chemical handling areas.
- 10. Storm water drains within scope limit & connecting the same up to main storm drains along road.
- 11. RCC trenches for electrical cables in paved area.
- 12. Construction of road/RCC Pavement around the unit as required.
- 13. All construction approaches, culverts, fencing as required.
- 14. Strengthening of existing roads for crane movement if required.
- 15. Acid/ Alkali resistant lining in and around acid/ caustic and chemical storage and handling areas as applicable.
- 16. Hard stand required for erection of heavy equipment's.
- 17. Preparation of basic/ detailed engineering drawings for construction, and getting approval of the same from Consultant / Owner.
- 18. Any temporary work/ activities required to complete the work
- 19. Any change in specifications/ design must be got approved from Owner/ Consultant.
- 20. Approval from statutory and local authorities (like PESO, DGCA, Agency appointed by insurance agency/client for fire protection system etc.) /Local Bodies including preparation of all drawings/documents required for approval from Statutory Bodies/Local Bodies.
- 21. The plot for construction area/ fabrication yard/ field office/ construction stores has to be developed by the Package contractor of its own and the space for the same shall also be arranged by Package contractor. All the infrastructure facilities which includes approaches, drainage system, pavements etc. shall be developed & provided by the contractor of its own cost.
- 22. RCC pavement, RCC kerb wall, Storm water drainage from uncontaminated areas of units. Entire area within scope of work limit shall be provided with RCC pavement.
- 23. All approach roads from existing main roads up to process units, sub-stations as per detailed engineering requirement for maintenance and operation.
- 24. Maintenance and erection approach roads/ by strengthening of RCC pavement within unit.
- 25. Micro grading & disposal of surplus and unserviceable material beyond Refinery complex's compound wall. Contractor to assess the lead by physically visiting the Plant site. Additional

Earth if required shall be arranged by the Package Contractor from outside the Refinery Complex.

26. The sub-grade for roads & pavements and soil improvement/ preparation below foundation level of drains, culverts, pipe way bridges, manholes, etc. shall be carried out as per Geo-Technical recommendation.
27. Electrical and Instrumentation Road Crossings (ERC/IRC) under roads.
28. Crossings (Culverts, bridges, sleeves as applicable) of Underground services below approach roads for all services in the corridor including drains, FW lines, Cooling water lines, drinking water lines, waste sewers.
29. 3-D modelling of complete Underground (U/G) Piping system, other U/G facilities (drains, culverts, crossings, roads, ERC, IRC, trenches), pavement, safety shower and eye wash and complete U/G and A/G Fire Protection System including hydrant system, monitors, FW piping water spray and sprinkler system. For detail methodology of 3-D modelling refer relevant section of tender document.
30. Modification in existing storm water drain and connecting the same with the main storm water drain along road within the scope limit.
31. Dewatering works wherever required for all civil works and underground piping works.
32. Cutting of existing roads for underground services and repairing them good.
33. Foot path, walkways, cross overs to facilities like hydrants, monitors, process & utilities, valve operating areas etc.
34. Contractor shall provide construction/ safety barricading for working inside existing refinery areas. It is contractor's responsibility to ensure the smooth functioning of existing facilities while working in existing areas.
35. Any damaged during course of construction shall be repaired and brought to the original shape by package contractor.
36. Any change in specifications/ design must be got approved from Owner/ Consultant.
37. For borrowed earth or disposal outside refinery, location for borrow area/ disposal of surplus earth, debris shall be identified by the bidder. Bidder shall obtain relevant statutory approval from all statutory authorities (like municipal etc.) including payment of charges/ royalty/ octroi for the same. Bidder shall keep client indemnified of any liability and/ or complaint from local authorities/ municipal bodies.

## **2.0 APPROVALS**

Approval of the facilities within contract scope limit from PESO (Petroleum Explosives Safety Organization (CCOE), India), Agency appointed by Owner/ Insurance Company for approval of Fire protection system, & DGCA (Director-General of Civil Aviation) and any other statutory and local body shall be obtained by the Package contractor. Package Contractor to comply with the requirement of these authorities irrespective if it is mentioned or not in the bid package & shall form part of contractor's scope of work including preparation of required drawings/ documents. Contractor shall comply with the requirement of local bodies including



preparation of required drawings/ documents. Any modification suggested/commented by statutory authorities/ local bodies shall be complied by Package contractor without any time and cost implication.

Any drawings, documents required for obtaining statutory approvals before starting of the job and during start-up is in the scope of the contractor.

Package contractor shall arrange for the inspection of the works by the concerned authorities and will undertake necessary coordination and liaison required and shall not be entitled to any extension of time for any delay in obtaining such approvals. Any deficiency (ies) as pointed out by any such authority shall be rectified by contractor at no extra cost to the OWNER. The inspection and acceptance of the works by such authorities shall, however, not absolve the contractor from any of its responsibilities under this Contract.

Deficiency (ies) pointed out if any, by Internal and External audit team of OISD, Owner/PMC the same shall be rectified by contractor at no extra cost and time implication to the OWNER. No extension of time shall be granted for meeting the requirement and/or obtaining approval of statutory authorities.



### **3.0 SCOPE OF SUPPLY**

#### **3.1 OWNER'S SCOPE OF SUPPLY**

Nil

#### **3.2 CONTRACTOR'S SCOPE OF SUPPLY**



- a. All items consumables/non consumables required to complete the job.
- b. All tools and tackles, plant machinery etc. to complete the job.

	<b>SPECIAL CONDITIONS OF CONTRACT (SCC)</b>	<div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-between; font-size: small;"> <span>Rev <b>00</b></span> <span>Page <b>14</b> of <b>21</b></span> </div>
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**LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS**

<b><u>Sr. No</u></b>	<b><u>Code No.</u></b>	<b><u>Title</u></b>
01.		IS : 818 Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations - First Revision.
02.		IS : 875 Code of practice for Structural safety of buildings: Masonry walls
03.		IS : 933 Specification for Portable Chemical Fire Extinguisher, Foam Type - Second Revision.
04.		IS : 1179 Specification for Equipment for Eye and Face Protection during Welding - First Revision.
05.		IS : 1904 Code of practice for Structural safety of buildings: Shallow foundations
06.		IS : 1905 Code of practice for Structural safety of buildings: Masonry walls
07.		IS : 2171 Specification for Portable Fire Extinguishers, Dry Powder Type -Second Revision.
08.	IS : 2361	Specification for Building Grips - First Revision.
09.	IS : 2750	Specification for Steel Scaffoldings.
10.	IS : 2925	Specification for Industrial Safety Helmets - First Revision.
11.	IS : 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations - First Revision.
12.	IS : 3521	Industrial safety belts and harnesses
13.	IS : 3696 - Part I	Safety Code for Scaffolds and Ladders : Part I - Scaffolds.
14.	IS : 3696 - Part II	Safety Code for Scaffolds and Ladders : Part II - Ladders.
15.	IS : 3764	Safety Code for Excavation Work.
16.	IS : 4014 -Part I & II	Code of practice for Steel tubular scaffolding
17.	IS : 4081	Safety Code for Blasting and Related Drilling Operations.
18.	IS : 4082	Recommendations on staking and storage of construction materials at site
19.	IS : 4130	Safety Code for Demolition of Buildings - First Revision.
20.	IS : 4138	Safety Code Working in Compressed Air-First Revision
21.	IS : 4756	Safety code for Tunneling works
22.	IS : 4912	Safety requirements for Floor and Wall Openings, Railings and toe Boards -First Revision.
23.	IS : 5121	Safety Code for Piling and other Deep Foundations.
24.	IS : 5916	Safety Code for Construction involving use of Hot Bituminous Materials.



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25. IS : 5983 Specification for Eye Protectors - First Revision.
26. IS : 6922 Structures subject to underground blasts, criteria for safety and design of
27. IS : 7155 Code of recommended practices for conveyor safety
28. IS : 7205 Safety Code for Erection on Structural Steel Works.
29. IS : 7069 Safety Code for Handling and Storage of Building Materials.
30. IS : 7293 Safety Code for Working with Construction Machinery.
31. IS : 7323 Guidelines for operation of Reservoirs
32. IS : 7969 Safety code for handling and storage of building material
33. IS : 8758 Recommendation for Fire Precautionary Measures in construction of  
Temporary Structures and Pandals.
34. IS : 8989 Safety Code for Erection of Concrete Framed Structures.
35. IS : 9706 Code of Practices for construction of Arial ropeways for transportation of  
material
36. IS : 9759 Guidelines for de-watering during construction
37. IS : 9944 Recommendations on safe working load for natural and manmade fibre  
roap slings
38. IS : 10291 Safety code for dress divers in civil engineering works
39. IS :10386 - Part I Safety Code for Construction, Operation and Maintenance for  
River Valley Projects.
40. IS :10386 - Part II Safety Code for Construction, Operation and Maintenance of  
River Valley Projects.
41. IS : 11057 Code of practice for Industrial safety nets
42. IS : 13415 Code of Practice on safety for Protective barriers in and around building
43. IS : 13416 Recommendations for preventive measures against hazards at working  
places

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# **SAFETY INTEGRITY LEVEL STUDY GUIDELINES FOR VISAKH REFINERY, HPCL**

**PROJECT : VISAKH REFINERY MODERNIZATION PROJECT**  
**OWNER : HPCL VISAKHAPATNAM**  
**PMC : ENGINEERS INDIA LTD.**  
**JOB NO. : B016**

0	02.02.2017	Issued for BID document	GGR	AP/DK	RBB
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## **1. INTRODUCTION**

M/s Hindustan Petroleum Corporation Limited (IOCL) intends to carry out Safety Integrity Level (SIL) study for its facilities coming under Visakh Refinery Modernization Project at Visakh Refinery.

The purpose of this specification is to provide the mandatory technical requirements to be fulfilled during detailed engineering of the project.

## **2. OBJECTIVE OF SAFETY INTEGRITY LEVELS (SIL) CLASSIFICATION STUDY**

Safety Integrity levels (SIL) are measures of safety of a given process, or in other words it is a statistical representation of the integrity of the Safety Instrumented System (SIS) when a process demand occurs. Specifically, to what extent can the end user expect the process in question to perform safely and in the case of a failure, fail in a safe manner.

## **3. FACILITIES UNDER SCOPE OF WORK**

The scope will include facilities coming under Visakh Refinery Modernization Project for HPCL Visakh Refinery. Details of facilities are described elsewhere in the bid document.

## **4. SCOPE OF WORK**

Contractor will provide a third party SIL certified Chairman (Certified from internationally recognized agencies such as TUV, Exida etc.) and Scribe to undertake the SIL study. The SIL workshop will be carried out by a team comprising of representatives from all relevant project disciplines. The scope of the study includes all the identified Safety Instrumented Functions (SIFs) on the P&IDs and C&E drawings. The CONTRACTOR shall prepare procedure for SIL classification study for UNITS / FACILITIES which shall comply with latest edition of IEC 61511 / 61808 requirements and shall submit to OWNER/PMC for approval at least 4 weeks prior to commencement of SIL study. Contractor shall submit chairman CV for OWNER/PMC approval prior to SIL workshop.

## **5. METHODOLOGY**

The most commonly used techniques for assigning target SIL's in the process industries are:

- Consequence analysis
- Modified HAZOP
- Risk Matrix
- Risk Graph
- Quantitative Assessment

## CONSEQUENCE ANALYSIS

This methodology is the simplest but the most conservative. It evaluates the target SIL's on the basis of the potential consequences of critical hazardous events. The likelihood of the event is not considered. The following is an example to illustrate how consequence is correlated with SIL.

SIL	Consequence
4	Potential for fatalities offsite
3	Potential for multiple fatalities onsite
2	Potential for single fatality onsite or serious injuries
1	Potential for minor injuries

## MODIFIED HAZOP

Modified HAZOP is an extension of the existing HAZOP procedure. The target SIL is assigned by a team based on the review of the potential risk identified in the HAZOP. It requires a good understanding of process risk and the acceptable risk tolerance of the company. As the assignment is very subjective, there needs to be some consistency between the personnel on the SIL assignment team and the Process Hazard Analysis (PHA) team.

## RISK MATRIX

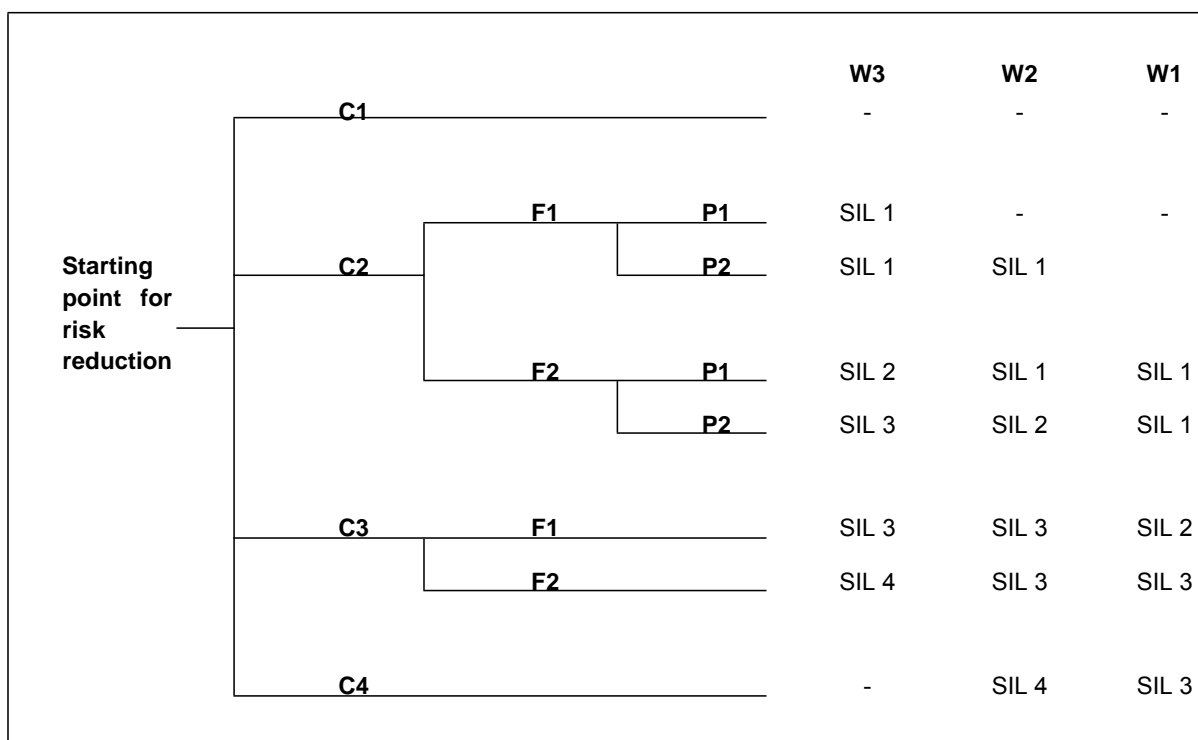
This is one of the most commonly used techniques in the process industries to establish target SIL. It uses a risk matrix, which correlates risk severity and risk likelihood for the SIL. The method allows the consideration of both likelihood and severity of a potential hazardous event during the assignment of SIL. By correlating SIL values with corporate developed risk

matrix, there is more consistency compared to the use of the Modified HAZOP methodology. Using this method requires the evaluation of the existing layers of protection and their effects on the risks of the potential hazardous events. The following is an illustration of a two dimensional risk matrix that correlates to various SIL values.

EVENT SEVERITY	High			
	Medium	SIL 3	SIL 3	SIL 3
	Low	SIL 2	SIL 2	SIL 3
		Low	Medium	High
EVENT LIKELIHOOD				

## RISK GRAPH

IEC 61808 provides an alternate to Risk Matrix, called Risk Graph. This method focuses on the evaluation of risk from the point of view of a person being exposed to the incident impact zone. It is consequence driven and four parameters are used to characterize a potential hazardous event, Consequence (C), Frequency (F), Possibility of escape (P) and Likelihood of event (W). The following is an example of Risk Graph.



The Consequence levels are as follows:

C1 = Minor injury

C2 = Serious permanent injury to one or more persons, death to one person

C3 = Death of several people

C4 = Very many people killed

In assessing the consequence severity, the following are considered:

- Potential for injury or fatality
- Possibility of the exposed person recovering and returning to normal activities
- The effects of injury – acute or chronic

The exposure frequency (F) has two levels:

- F1= Rare to more often exposure in hazardous areas
- F2= Frequent to permanent exposure

Personnel exposure is evaluated in terms of the personnel presence and activity in the unit. Typically, the following are considered:

- Location of the process unit
- Fraction of time plant personnel spend in the vicinity.

The possibility of escape (P) has two levels:

- P1= Possible under certain conditions
- P2= Almost impossible

The likelihood of occurrence (W) is quantified as follows:

- W1= 0.03 pa or above (below 0.3 pa) - a slight probability
- W2= 0.3 pa or above (below 3 pa) - a medium probability
- W3= 3 pa or above - a high probability

## QUANTITATIVE ASSESSMENT

The methods outlined above are qualitative approaches. The quantitative approach to SIL assignment is the most rigorous technique but the most demanding one. It requires a thorough understanding of the potential causes of the incident and determination of the process demand or incident likelihood quantitatively using quantitative risk assessment techniques, such as fault tree analysis or event tree analysis. The quantitative technique is often used when there is very limited historical information about the process, so that the qualitative determination of likelihood is extremely difficult.

The table provided below serves as a guide to assess that failure probability for the developed SIS model meets the required failure measure.

SIL	Probability of failure on demand
4	$\geq 10^{-5}$ to $< 10^{-4}$
3	$\geq 10^{-4}$ to $< 10^{-3}$
2	$\geq 10^{-3}$ to $< 10^{-2}$
1	$\geq 10^{-2}$ to $< 10^{-1}$

The SIL Classification study shall be carried out based on OWNER/PMC approved risk tolerance criteria.

## 6. SOFTWARE USED FOR THE STUDY

Reputed software, recognized internationally should be utilized for recording the SIL workshop. The scribe should have a laptop loaded with appropriate template for the SIL workshop.

## 7. DOCUMENTS REQUIRED FOR STUDY

It is expected that the following information/ facilities are available for the study:

- P&IDs
- Safety Instrumented System design philosophy
- Cause and Effects Matrices (ESD)



- Failure Rates of typical instrumentation
- Workshop facilities
- Workshop participants (design and operations)

## **8. STUDY SESSIONS**

The study sessions shall be scheduled for 8 hours a day, 5 days per week. Upon completion of each daily session, the Chairman and the Scribe will typically continue work for additional one to two hours on administrative matters such as editing up the day's worksheets and preparing for the following day's session.

## **9. VENUE & FACILITIES**

SIL classification study is to be carried out by EPCC contractor at a place acceptable to OWNER/ PMC. The workshop room should be

- Large enough for potential attendees
- Space for arranging P&IDs on the walls.
- PC projection and screen
- Located away from noisy activity

## **10. SIL STUDY TEAM**

The team shall include:

- Chairman
- Scribe
- Process Engineer(s)
- Instrument and Control Engineer(s)
- Safety Engineer
- Senior Operations Personnel

The team may be assisted by other specialists to provide satisfactory answers to some specific points. Virtually all project team members shall be considered to be "on-call" to participate in specific areas of the study.

## **11. REPORTING**

During the SIL study, the consequences of safety instrumented functions failure on demand will be recorded in a clear and unambiguous manner. A classification of all

causes and consequences will be conducted; all study findings will be recorded in the SIL worksheets. A report comprising of findings of the workshop including background, methodology, team composition etc. shall be submitted by contractor.

## **12. PRESENTATION**

The Draft SIL Classification study report shall be submitted within 2 weeks of conclusion of SIL workshop for OWNER/PMC Review and Final report shall be submitted within 2 weeks from the date of receipt of OWNER/PMC Comments. Six copies of Final SIL study report shall be submitted by EPCC contractor to OWNER/ PMC along with electronic copy of report on CD. The electronic files should be compatible with either MS Word or PDF Format.

## **13. SIL VERIFICATION**

After defining target level for all SIF, SIL verification need to be carried out by contractor and report needs to be submitted to OWNER/PMC for review and approval.

**APPENDIX-B**

**HEALTH, SAFETY AND  
ENVIRONMENT (HSE) MANAGEMENT  
DURING CONSTRUCTION**

## **GENERAL REQUIREMENTS**

- 1.0 Specification for Health, Safety and Environment (HSE) Management (Spec. No. B016-6-82-0001), is required to be followed by CONTRACTOR during Construction Phase at site.
- 2.0 CONTRACTOR shall have a documented HSE policy to cover commitment of the organization to ensure Health, Safety and Environment aspects in the line of operation.
- 3.0 It is the responsibility of the CONTRACTOR to ensure that safe construction procedures are complied with. CONTRACTOR will also ensure that adequate First Aid medical facilities with trained personnel/ nurse (male) to administer First Aid with shed/ Bunker are available are available on round o Clock basis for emergency purpose and that safety practices as per the approved safety procedure are followed by his sub-contractors also.

CONTRACTOR to ensure safety measures at the minimum like:

- a) The use of safety gadgets, viz. safety goggles, helmets, safety shoes, full body harness, provision of safety net for construction at higher elevations and provision of toe boards in scaffolding platforms, etc.
- b) All hot works must be performed by ensuring compliance to the requirements as specified by the Owner from time to time.
- c) Barricading of crane movement areas / Radiography areas
- d) Proper earthing of equipments.
- e) Proper shoring / strutting of Excavated Areas, as applicable.
- f) Cylinders of inflammable gases to be stacked upright.
- g) Storing of cylinders like Oxygen/argon/acetylene etc. requires PESO approval. Agency has to obtain necessary approvals from PESO and their guidelines to be followed.

To assist in the development of an effective safety program, a safety checklist for various jobs shall be developed by the CONTRACTOR and the same shall be adhered to by the Contractor's Site-In-charge.

The responsibilities of the CONTRACTOR will include but not limited to:

- Coordination and supervision of the details of the job safety programme.
- Initiation of accident reporting, investigation and follow-up actions.
- Preparation of periodic accident summaries.
- Periodic Accident Analysis Reports
- Tallying safety inspection of the job and submission of summary inspection report to OWNER/PMC.
- Obtaining work permits from the OWNER, wherever applicable.
- Check the fitness of cranes and other hoisting equipments on periodic basis/before all major lifts and submit to Owner/PMC valid/latest test certificates of tackles used for lifting.
- Submission of any other report required by Owner/ PMC.
- Conduct HSE Audit at predefined frequencies and assist OWNER/CONSULTANT/TPI during conductance of their HSE Audits.
- Ensure closure of NCs observed during the above audits.

All contract workman to be provided with color coded Boiler/ Safety Suits with contractor name and logo.

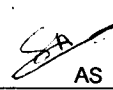
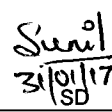


- 4.0 Guidelines on Safety Practices during Construction and Contractor Safety prepared by Oil Industry Safety Directorate (OISD) Nos. OISD-GDN-192 & OISD-GDN-207 shall be followed by the contractor at site. Safety Recommended Practices for Electrical System (OISD-RP-147) shall be followed by the contractor at site. These are supplementary requirements in addition to specification for Health, Safety and Environment (HSE) Management (Spec. No. B016-6-82-0001) to be followed by the CONTRACTOR at site.

Mock drills and Reporting system (Near miss, Accident and fire) to be followed as per the safety Manual.

- 5.0 Any Observation on Safety aspects ,Owner/PMC shall raise observation in attached OSA format, which has to be acknowledged & compliance to be done by the contractor within the agreed time period.

निर्माण स्थल पर  
स्वास्थ्य, सुरक्षा एवं पर्यावरण  
प्रबंधन हेतु मानक विनिर्देशन

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY & ENVIRONMENTAL  
(HSE) MANAGEMENT AT  
CONSTRUCTION SITES**

7	31/01/2017	REVISED & UPDATED	 AS	 SD	 TKS	 RN
6	26/02/2014	REVISED & UPDATED	SM	DJ	RKD	SC
5	19/12/2012	REVISED & UPDATED	SM	SM	RKD	DM
4	13/02/2008	REVISED & UPDATED	AS	RK	SCB	VC
3	17/07/2007	REVISED & UPDATED	AS	MPJ	VNP	VC
2	11/08/2005	REVISED & UPDATED	MPJ	MPJ	VNP	VJN
Rev	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman Approved by

**Abbreviations:**

AERB	:	Atomic Energy Regulatory Board
ANSI	:	American National Standards Institute
BARC	:	Bhabha Atomic Research Centre
BS	:	British Standard
EIL	:	Engineers India Limited
BPCL	:	Bharat Petroleum Corporation Limited
ELCB	:	Earth Leakage Circuit Breaker
EPC	:	Engineering, Procurement and Construction
EPCC	:	Engineering, Procurement, Construction and Commissioning
ESI	:	Employee State Insurance
GCC	:	General Conditions of Contract
GM	:	General Manager
GTAW	:	Gas Tungsten Arc Welding
HOD	:	Head of Department
HSE	:	Health, Safety & Environment
HIRAC	:	Hazard, Identification Risk Assessment & Control
OISD	:	Oil Industry Safety Directorate
HV	:	High Voltage
IS	:	Indian Standard
IE	:	Indian Electricity
LOTO	:	Lock Out & Tag Out
LPG	:	Liquefied Petroleum Gas
LSTK	:	Lump Sum Turn Key
MV	:	Medium Voltage
PPE	:	Personal Protective Equipment
RCM	:	Resident Construction Manager or Site-in-Charge, as applicable
SCC	:	Special Conditions of Contract
SLI	:	Safe Load Indicator
TBT	:	Tool Box Talks

**Construction Standards Committee****Convenor :** Sh. T K Sen, ED(Construction)

**Members :** Sh. Amitava Pal, CGM (C)  
 Sh. S N Bhatnagar, GM (C)  
 Sh. M K Garg, GM (C)  
 Sh. A K Mishra, GM(C)  
 Sh. Janak Kishore, DGM (P)  
 Sh. Rajeev Jain, DGM (C&P)  
 Sh. Udayan Chakravarthy, AGM (Piping)  
 Sh. Ravindra Kumar, AGM (C)  
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XVIII	Environmental Aspect Impact Register	HSE-18 Rev 0	
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## 1.0 SCOPE

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied by Contractors/ Vendors including their sub-contractors/ sub-vendors during construction.

This specification is not intended to replace the necessary professional judgment needed to design & implement an effective HSE system for construction activities and the contractor is expected to fulfill HSE requirements in this specification as a minimum. It is expected that contractor shall implement best HSE practices beyond whatever are mentioned in this specification.

Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act(s)/ legislations, General Conditions of Contract (GCC), Special Conditions of Contract (SCC) and Job (Technical) Specifications. Where different documents stipulate different requirements, the most stringent shall apply.

## 2.0 REFERENCES

The document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers Act,
- Indian Factories Act
- Job (Technical) specifications
- Relevant International/ National Codes (refer Appendix-A for standards/codes on HSE)
- Relevant State & National Statutory requirements.
- Operating Manuals Recommendation of Manufacturer of various construction Machineries
- Occupation Health and Safety Management System (OHSAS 18001:2007) and Environmental Management System (ISO 14001:2004).

## 3.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENTAL (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS

### 3.1 Management Responsibility

#### 3.1.1 HSE Policy & Objectives

The Contractor should have a documented and duly approved HSE policy & objectives to demonstrate commitment of their organization to ensure health, safety and environmental aspects in their line of operations.

HSE Policy of the contractor shall be made available to Owner / EIL at the place of execution of specific contract works, as a valid document.

#### 3.1.2 Management System

The HSE management system of the Contractor shall cover the HSE requirements & commitments to fulfill them, including but not limited to what have been specified under clauses 1.0 and 2.0 above. The Contractor shall obtain the approval of its site specific HSE Plan from EIL / Owner prior to commencement of any site works. Corporate as well as Site management of the Contractor shall ensure compliance of their HSE Plan at work sites in its entirety in true spirit.

**3.1.3 Indemnification**

Contractor shall indemnify & hold harmless, Owner/EIL & their representatives, free from any and all liabilities arising out of non-fulfillment of HSE requirements or its consequences.

**3.1.4 Deployment & qualifications of Safety personnel**

The Contractor shall designate/deploy various categories of HSE personnel at site as indicated below in sufficient number. In no case, deployment of safety Supervisor / Safety Steward shall substitute deployment of Safety Officer / Safety Engineer what is indicated in relevant statute of BOCW Act i.e. deployment of safety officer/Safety Engineer is compulsory at project site. The Safety supervisors, Safety stewards/Observer etc. Would facilitate the HSE tasks at grass root level for construction sites and shall assist Safety Officer /Engineers.

Contractor shall appoint safety personnel as given below for every work shift (As per table point):

Safety Observer/ Steward: Contractor shall depute one Safety Observer/Steward for every 100 workers and additionally thereon.

Safety Supervisor: In addition to above, contractor shall depute one Safety Supervisor for every 250 workers and additionally thereon.

Safety Engineer: In addition to above, one safety engineer/ officer for every 1000 workers and additionally thereon.

No. of Workers deployed	Requirement of Safety Personnel for every shift		
	Safety Observer/ Steward	Safety Supervisor	Safety Engineer/ Officer
1- 50	One	One	One
51-100			
101-150	Two		
151-200			
201-250	Three		
251-300			
301-350	Four	Two	
351-400			
401-450	Five		
451-500			
Up to 1000	Ten		
Up to 2000	Twenty	Eight	Two

In case any of the safety personnel leave the contractor the same shall be intimated to the owner/ Consultant/ EIL. The contractor shall recruit new personnel and fill up the vacancy.

**a) Safety Steward/Observer**

As a minimum, he shall possess class XII pass certificate and trained in fire-fighting as well as in safety/occupational health related subjects, with minimum two year of practical experience in construction work environment and should have adequate knowledge of the local language spoken by majority of the workers at the construction site.

## b) Safety Supervisor

As a minimum, he shall possess a recognized graduation Degree in Science (with Physics & Chemistry) or a diploma in Engg. or Tech. with minimum Two years of practical experience in construction work environment and should possess requisite skills to deal with construction safety & fire related day-to-day issues.

## c) Safety Officer / Safety Engineer

Safety officer/Engineer Should Possess following Qualification & Experience:

- (i) Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, **or** possessing recognized diploma in any branch of Engg. or Tech with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than five years.
- (ii) Recognized degree or diploma in Industrial safety
- (iii) Preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

Alternately

- (i) Person possessing Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (from any Indian institutes recognized by AICTE or State Council of Tech. Education of any Indian State) with practical experience of working in a building, plant or other construction works (as Safety Officer, in line with Indian Factories Act, 1958) for a period of not less than five years, may be considered as Safety Officer.

## d) HSE In-Charge

In case there is more than one Safety Officer at any project construction site, one of them, who is senior most by experience (in HSE discipline), may be designated as HSE In-Charge. Duties & responsibilities of such person shall be commensurate with that of relevant statute and primarily to coordinate with top management of Client and contractors.

In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act, 1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above clarifications, the same shall be followed.

Contractors shall ensure physical availability of safety personnel at the place of specific work location, where Hot Work Permit is required/granted. No work shall be started at any of the project sites until above safety personnel & concerned Site Engineer of Contractor are physically deployed at site. The Contractor shall submit a HSE Organogram clearly indicating the lines of responsibility and reporting system and elaborate the responsibilities of safety personnel in their HSE Plan.

The Contractor shall verify & authenticate credentials of such safety personnel and furnish Bio-Data/Resume/Curriculum Vitae of the safety personnel as above for EIL/Owner's approval, at least 1 month before the mobilization. The Contractor, whenever required, shall arrange submission of original testimonials/certificates of their Safety personnel, to EIL/Owner (for verification/scrutiny, etc.)

Imposition / Realization of penalty shall not absolve the Contractor from his/ her responsibility of deploying competent safety officer at site.

Adequate planning and deployment of safety personnel shall be ensured by the Contractor so that field activities do not get affected because of non-deployment of competent & qualified safety people in appropriate numbers.

### 3.1.5 Implementation, Inspection/ Monitoring

- The Contractor shall be fully responsible for planning, reporting, implementing and monitoring all HSE requirements and compliance of all laws & statutory requirements.
- The Contractor shall also ensure that the HSE requirements are clearly understood & implemented conscientiously by their site personnel at all levels at site.
- The Contractor shall ensure physical presence of their field engineers / supervisors, during the continuation of their contract works / site activities including all material transportation activities. Physical absence of experienced field engineers / supervisors of Contractor at critical work spot during the course of work, may invite severe penalization as per the discretion of EIC, including halting / stoppage of work.
- Contractor shall furnish their annual Inspection Plan, with regard to project issues /subjects, frequency and performers to EIL/Owner.
- The Contractor shall regularly review inspection report internally and implement all practical steps / actions for improving the status continuously.
- The Contractor shall ensure important safety checks right from beginning of works at every work site locations and to this effect format No: HSE-10 “Daily Safety Check List” shall be prepared by field engineer & duly checked by safety personnel for conformance.
- The Contractor shall carry out inspection to identify various unsafe conditions of work sites/machinery/equipment’s as well as unsafe acts on the part of workmen/supervisor/engineer while carrying out different project related works.
- Adequate records for all inspections shall be maintained by the Contractor and the same shall be furnished to EIL/Owner, whenever sought.
- The Contractor shall not carry-out work by engaging single worker anywhere without any supervisor anytime during day or night.
- To demonstrate involvement/commitment of site management of Contractor, at least one Safety Walk through in a month shall be carried out by Contractor’s head of site (along with his area manager/field engineers) and a report shall be furnished to EIL/Owner as per format No: HSE-1” Safety walk through report” followed by compliance for unsatisfactory remarks.
- As a general practice lifting tools/ tackles, machinery, accessories etc. shall be inspected, tested and examined by competent people (approved by concerned State authorities) before being used at site and also at periodical interval (e.g. during replacement, extension, modification, elongation/ reduction of machine/parts, etc.) as per relevant statutes. Hydra, cranes, lifting machinery, mobile equipment’s / machinery / vehicles, etc. shall be inspected regularly by only competent / experienced personnel at site and requisite records for such inspections shall be maintained by every contractor. Contractor shall also maintain records of maintenance of all other site machinery (e.g. generators, rectifiers, compressors, cutters, etc.) & portable tools/equipment’s being used at project related works (e.g. drills, abrasive wheels, punches, chisels, spanners, etc.).The Contractor shall not make use of arbitrarily fabricated ‘derricks’ at project site for lifting / lowering of construction materials.
- Site facilities /temporary. installations, e.g. batching plant, cement godown, DG-room, temporary electrical panels/distribution boards, shot-blasting booth, fabrication yards, etc. and site welfare facilities, like labour colonies, canteen/pantry, rest-shelters, motor cycle/bicycle-shed, site washing facilities, First-aid centers, urinals/toilets, etc. should be periodically inspected by Contractor (preferably utilizing HR/Admn. personnel to inspect site welfare facilities) and records to be maintained.



**3.1.6 Behaviour Based Safety**

- The contractor shall develop a system to implement Behaviour-Based Safety (BBS) through which work groups can identify, measure and change the behaviours of employees and workers towards construction safety aspects.
- The BBS process shall include the following:
  - Identify the behaviours critical to obtaining required safety performance.
  - Communicate the behaviours and how they are performed correctly to all
  - Observe the work force and record safe/at risk behaviours. Intervene with workers to give positive reinforcement when safe behaviours are observed. Provide coaching/correction when at risk behaviours are observed
  - Collect and record observation data
  - Summarize and analyze observation data
  - Communicate observation data and analysis results to all employees
  - Provide recognition or celebrate when safe behaviour improvements occur
  - Change behaviours to be observed or change activators or change consequences as appropriate.
  - Communicate any changes to workforce
- Contractor through its own HSE committee shall implement the above process.
- The necessary procedures and Monthly reporting formats shall be developed by the contractor for approval by EIL/ Owner.
- The HSE committee of contractor shall observe individual's behavior for safe practices adapted for utilization/ execution of work for following as a minimum:-
  - PPE
  - Tools & equipment
  - Hazard Identification & control
  - House keeping
  - Confined space entry
  - Hot works
  - Excavation
  - Loading & unloading
  - Work At height
  - Stacking & storage
  - Ergonomics
  - Procedures

**3.1.7 Awareness and Motivation**

- The Contractor shall promote and develop awareness on Health, Safety and Environmental protection among all personnel working for the Contractor.
- Regular awareness programs and fabrication shop/work site meetings atleast on monthly basis shall be arranged on HSE activities to cover hazards/risks involved in various operations during construction.
- Contractor to motivate & encourage the workmen & supervisory staff by issuing/ awarding them with tokens/ gifts/ mementos/ monetary incentives/ certificates etc.
- Contractor shall assess & recognize the behavioral change of its site engineers / supervisors periodically and constantly motivate / encourage them to implement HSE practices at project works.

**3.1.8 Fire prevention & First-Aid**

- The Contractor shall arrange suitable First-aid measures such as First Aid Box (Refer Appendix-B for details), stand-by Emergency Vehicle. Additionally separate ambulance with trained personnel/nurse (male) to administer First Aid shall be provided by the Contractor beyond deployment of 400 workmen during day/night working hours.

- The Contractor shall arrange installation of fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate portable fire extinguishers (Refer Appendix-C for details) to the satisfaction of EIL/Owner.
- The Contractor shall deploy trained supervisory personnel / field engineers to cater to any emergency situation.
- The Contractor shall arrange EMERGENCY MOCK DRILL like fire, bomb threat, gas leakage, earth quake, etc. at each site at least once in three months, involving site workmen and site supervisory personnel & engineers. The Contractor shall maintain adequate record of such fire drills at project site

### 3.1.9 Documentation

The Contractor shall evolve a comprehensive, planned and documented system covering the following as a minimum for implementation and monitoring of the HSE requirements and the same shall be submitted for approval by owner/EIL.

- HSE Organogram
- Site specific HSE Plan
- Safety Procedures, forms and Checklist. Indicative list of HSE procedures is attached as Appendix :H
- Inspections and Test Plan
- Risk Assessment & HIRAC for critical works.
- HIRAC Register as per Format no: HSE-19 to identify, assess, analyze & mitigate the construction hazards& incorporate relevant control measures before actually executing site works.
- Environmental Aspect Impact Register as per Format no: HSE-18 (identify, assess, analyze & mitigate the environmental impact & incorporate relevant control measures).
- Legal Register to identify and comply to all applicable HSE related legal requirements.

The monitoring for implementation shall be done by regular inspections and compliance of the observations thereof. The Contractor shall get similar HSE requirements implemented at his sub-contractor(s) work site/office. However, compliance of HSE requirements shall be the responsibility of the Contractor. Any review/approval by EIL/Owner shall not absolve contractor of his responsibility/liability in relation to fulfilling all HSE requirements.

### 3.1.10 Audit

The Contractor shall submit an Audit Plan to EIL/Owner indicating the type of audits and covering following as minimum:

- Internal HSE audits regularly at least on quarterly basis by engaging internal qualified auditors (viz safety officers/ Construction personnel having 5 years experience in construction safety and Lead Auditor Course : OSHA 18001certification).
- External HSE audits regularly at least on every six months by engaging qualified external auditors (viz safety officers/ Construction personnel having 10years experience in construction safety and Lead Auditor Course: OHSAS 18001certification).

All HSE shortfalls/ non-conformances on HSE matters brought out during review/audit, shall be resolved forthwith (generally within a week) by Contractor& compliance report shall be submitted to EIL/ Owner.

In addition to above audits by contractor, the contractor's work shall be subjected to HSE audit by EIL/ Owner at any point of time during the pendency of contract. The Contractor shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to OWNER/ EIL till all the findings of the Audit Report are fully complied.

Failure to carry-out HSE Audits& its compliance (internal & external) by Contractor, shall invite penalization.

**3.1.11 Meetings**

- The Contractor shall ensure participation of his top most executive at site (viz. Resident Construction Manager / Resident Engineer/ Project Manager / Site-in-Charge) in Safety Committee/HSE Committee meetings arranged by EIL/ Owner usually on monthly basis or as and when called for. In case Contractor's top most executive at site is not in a position to attend such meeting, he shall inform EIL/ Owner in writing before the commencement of such meeting indicating reasons of his absence and nominate his representative – failure to do so may invite very stringent penalization against the specific Contractor, as deemed fit in Contract. The obligation of compliance of any observations during the meeting shall be always time bound. The Contractor shall always assist EIL/Owner to achieve the targets set by them on HSE management during the project implementation.
- In addition, the Contractor shall also arrange internal HSE meetings chaired by his top most executive at site on weekly basis and maintain records. Such internal HSE meetings shall essentially be attended by field engineers / supervisors (& not by safety personnel only) of the Contractor and its associates. Records of such internal HSE meetings shall be maintained by the Contractor for review by EIL/ Owner or for any HSE Audits.
- Agenda of internal HSE meeting should broadly cover: -
  - a) Confirmation of record notes /minutes of previous meeting
  - b) Discussion on outstanding subjects of previous points / subjects, if any
  - c) Incidents / Accidents (of all types) at project site, if any
  - d) Current topics related to site activities / subjects of discussion
  - e) House keeping
  - f) Behavioral Safety
  - g) Information / views / deliberations of members / site, sub-contractors
  - h) Report from Owner / Client
  - i) Status of Safety awareness, Induction programs & Training programs

The time frame for such HSE meeting shall be religiously maintained by one and all.

**3.1.12 Intoxicating drinks & drugs and Smoking**

- The Contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force.
- The Contractor shall not allow any workman to commence any work at any locations of project activity who is/are influenced / effected with the intake of alcohol, drugs or any other intoxicating items being consumed prior to start of work or working day.
- Awareness about local laws on this issue shall form part of the Induction Training and compulsory work-site discipline.
- The Contractor shall ensure that all personnel working for him comply with “No-Smoking” requirements of the Owner as notified from time to time. Cigarettes, lighters, auto ignition tools or appliances as well as intoxicating drugs, dry tobacco powder, etc. shall not be allowed inside the project / plant complex.
- Smoking shall be permitted only inside smoking booths exclusively designated & authorized by the Owner/EIL.

**3.1.13 Penalty**

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliances and also for repeated failure in implementation of any of the HSE provisions,



EIL/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty to be levied against defaulted Contractor shall be up to a cumulative limit of

2.0% (Two percent) of the contract value for Item Rate or Composite contracts with an overall ceiling of 1, 00, 00, 000 (Rupees One crore)

0.5% (Zero decimal five percent) of the contract value for LSTK, OBE, EPC, EPCC or Package contracts with an overall ceiling of 10, 00.00.000 (Rupees ten crores)

This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stop-work-instruction and imposition of penalty shall rest with EIL/Owner. The same shall be binding on the Contractor. Imposition of penalty does not make the Contractor eligible to continue the work in unsafe manner.

The amount of penalty applicable for the Contractor on different types of HSE violations is specified below:

Sl. No.	Violation of HSE norms	Penalty Amount
1.	For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Face shield, Boiler suit, etc.)	Rs.500/- per day/ Item / Person.
2.	Working without Work Permit/Clearance	Rs.20,000/- per occasion
3.	Execution of work without deployment of requisite field engineer / supervisor at work spot	Rs.5,000/- 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.10,000/- 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 hand-rails, life-lines, Safety Nets etc.	Rs.10,000/- 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.3,000/- per occasion.
8.	No fencing/barricading of excavated areas / trenches.	Rs.3,000/- 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.1,000/- 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.2,000/- per occasion per day

Sl. No.	Violation of HSE norms	Penalty Amount
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 EIL/Owner & failure to nominate his immediate deputy (in the site-organogram) for such HSE meetings.	Rs.10,000/- per meeting.
13.	Failure to maintain HSE records by Contractor Safety personnel, in line with approved HSE Plan/Procedures/Contract specifications.	Rs.10,000/- 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.10,000/- per occasion.
15.	Failure to submit the monthly HSE report by 5 <sup>th</sup> of subsequent month to Project's Engineer-in-Charge/ Owner	Rs.10,000/- per occasion and Rs. 1,000/- per day of further delay.
16.	Poor House Keeping	Rs.5,000/- per occasion per subject
17.	Failure to report & follow up accident (including Near Miss) reporting system within specific time-frame.	Rs.20,000/- per occasion
18.	Degradation of environment (not confining toxic spills, spilling oil/ lubricants onto ground)	Rs.10,000/- 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.5,000/- 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 providing dead man handle switch for blasting, whiplash arrestor for the compressor line, not using hood with respiratory devices by blaster for shot/grit blasting, etc.)	Rs.5,000/- per occasion
21.	Penalty for non-deployment of ambulance in case of man-power more than 400 or not providing dedicated emergency vehicle in case of man-power less than 400.	Rs.3,000/- per day
22.	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
23.	Carrying out sand blasting instead of grit/shot blasting.	Rs.50,000/- per day

Sl. No.	Violation of HSE norms	Penalty Amount
24.	Failure to deploy adequately qualified and competent Safety Officer	Rs.10,000/- per day per Officer
25.	Utilization of hydra/back-hoe loader for material shifting or any other unauthorized /unsafe lifting works	Rs.25,000/- per occasion
26.	Any Fatal Accident	Rs.10,00,000/- per fatality
26.	Any violation not covered above	To be decided by EIL/Owner.

- The Contractor shall make his field engineers/supervisors fully aware of the fact that they keep track with the site workmen for their behavior and compliance of various HSE requirements. Safety lapses / defects of project construction site shall be attributable to the concerned job supervisor / engineer of the Contractor, (who remains directly responsible for safely executing field works). For repeated HSE violations, concerned job supervisor / engineer shall be reprimanded or appropriate action, as deemed fit, shall be initiated (with an information to EIL & Owner) by the concerned Contractor.

Contractor shall initiate verbal warning shall be given to the worker/employee during his first HSE violation. A written warning shall be issued on second violation and specific training shall be arranged / provided by the Contractor to enhance HSE awareness/skill including feedback on the mistakes/ flaws. Any further violation of HSE stipulations by the erring individuals shall call for his forthright debar from the specific construction site. A record of warnings for each worker/employee shall be maintained by the Contractor, like by punching their cards / Gate passes or by displaying their names at the Project entry gate. Warnings, penalizations, appreciations etc. shall be discussed in HSE Committee meetings by site Head of the Contractor.

### 3.1.14 Accident/ Incident investigation

All accidents/incidents shall be informed to EIL/Owner at least telephonically by Contractor immediately and in writing within 24 hours on Format No. HSE-2 as applicable, by Contractor. Thereafter, a Supplementary Accident/Incident investigation Report on Format No. HSE-3 shall be submitted to EIL/Owner within 72 hours. Near Miss incident(s), Dangerous accidents/incident shall also be reported on Format No. HSE-4 within 24 hours. The accident/incident shall be investigated by a team of Contractor's senior Site personnel (involving Site-in-Charge or at least by his deputy) for establishing root-cause and recommending corrective & preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to EIL/Owner. Owner/EIL shall have the liberty to independently investigate such occurrences and the Contractor shall extend all necessary help and cooperation in this regard. EIL/Owner shall have the right to share the content of this report with the outside world.

### 3.2 House Keeping

The Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure inter-alia; the followings:

- All surplus earth and debris are removed/ disposed-off from the working areas to designated location(s).
- Unused/ surplus cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identify location(s).
- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

- d) Roads shall be kept clear and materials like pipes, steel, sand, boulders, concrete, chips and bricks etc. shall not be allowed on the roads to obstruct free movement of men & machineries.
- e) Fabricated steel structural, pipes & piping materials shall be stacked properly for erection.
- f) Water logging on roads shall not be allowed.
- g) No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.
- h) Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.
- i) Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant area/ or these materials shall be transported with top surface wet.
- j) The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.
- k) At least two exits for any unit area shall be assured at all times – same arrangement is preferable for digging pits / trench excavation / elevated work platforms/ confined spaces etc.
- l) Welding cables and the power cable must be segregated and properly stored and used. The same shall be laid away from the area of movement and shall be free from obstruction.
- m) Schedule for upkeep/ cleaning of site to be firmed up and implemented on regular basis.

The Contractor shall carry-out regular checks (minimum one per fortnight) as per format No: HSE-11 for maintaining high standard of housekeeping and maintain records for the same. The Contractor shall provide supervisor for housekeeping exclusively for management of day-to-day housekeeping activities.

### **3.3 HSE Measures**

#### **3.3.1 Construction Hazards**

The Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures. Contractor shall carry out HIRAC specifically for high risk jobs/critical jobs like

- a) Working at height (+2.0 Mts height) for cold (incl. colour washing, painting, insulation etc.) & hot works.
- b) Work in confined space,
- c) Deep excavations & trench cutting (depth > 2.0 mts.)
- d) Operation & Maintenance of Batching Plant.
- e) Shuttering / concreting (in single or multiple pour) for columns, parapets & roofs.
- f) Erection & maintenance of Tower Crane.
- g) Erection of structural steel members / roof-trusses / pipes at height more than 2.0 Mts. with or without crane.
- h) Erection of pipes (full length or fabricated) at height more than 2.0 Mts. height with Crane of 100T capacity.
- i) All lifts using 100T Crane plus mechanical pulling.
- j) All lifts using two cranes in unison (Tandem Lifting).
- k) Any lift exceeding 80% capacity of the lifting equipments (hydra, crane etc.).
- l) Laying of pipes (isolated or fabricated) in deep narrow trenches – manually or mechanically.
- m) Maintenance of crane / extension or reduction of crane-boom on roads or in yards.
- n) Erection of any item at >2.0 Mts. height using 100T crane or of higher capacity
- o) Hydrostatic test of pipes, vessels & columns and water-flushing.
- p) Radiography jobs (in-plant & open field)
- q) Work in Live Electrical installations / circuits

- r) Handling of explosives & Blasting operations
- s) Demolishing/ dismantling activities
- t) Welding/ gas cutting jobs at height (+2.0 Mts.)
- u) Lifting/placing roof-girders at height (+2.0 Mts.)
- v) Lifting & laying of metallic / non-metallic sheet over roof/structures.
- w) Lifting of pipes, gratings, equipments/ vessels at heights (+2.0 Mts) with & without using cranes
- x) Calibration of equipment, instruments and functional tests at yards / work-sites.
- y) Operability test of Pump, Motors (after coupling) & Compressors.
- z) Cold or Hot works inside Confined Space.
- aa) Transportation & shifting of ODC consignments into project areas.
- bb) Working in “charged/Live” elect. Panels
- cc) Stress Relieving works (Electrically or by Gas-burners).
- dd) Pneumatic Tests
- ee) Card board blasting
- ff) Chemical cleaning

And take feedback from EIL/Owner. The necessary HSE measures devised shall be put in to place, prior to start of an activity & also shall be maintained during the course of works, by the Contractor. Copies of such HIRAC shall be kept available at work sites by the Contractor to enable all concerned carrying out checks / verification.

A list of typical construction hazards along with their effects & preventive measures is given in **Appendix-E**.

### 3.3.2 Accessibility

- The Contractor shall provide safe means of access (in sufficient numbers) & efficient exit to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen and EIL/Owner.
- The Contractor shall implement use of all measures including use of “life line”, “fall-arresters”, “retractable fall arresters”, “safety nets” etc. during the course of using all safe accesses & exits, so that in no case any individual remains at risk of slip & fall during their travel.
- The access to operating plant / project complex shall be strictly regulated. Any person or vehicle entering such complex shall undergo identification check, as per the procedures in force / requirement of EIL/Owner.
- Accessibility to ‘confined space’ shall be governed by specific system / regulation, as established at project site.

### 3.3.3 Personal Protective Equipment (PPEs)

- The Contractor workmen shall be permitted entry inside the project premises only with proper PPEs.
- The Contractor shall ensure that all their staff, workers and visitors including their sub-contractor(s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head & sweat band with ¾” cotton chin strap (made of industrial HDPE), safety shoes with steel toe cap and antiskid sole, full body harness (CE marked and conforming to EN361), protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications/ CE or other applicable international standards. The Contractor shall implement a regular regime of inspecting physical conditions of the PPEs being issued / used by the workmen of their own & also its sub-agencies and the damaged / unserviceable PPEs shall be replaced forthwith.



- Owner/EIL may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner/EIL and shall choose any colour other than white (for Owner) or blue (for EIL) All HSE personnel shall preferably wear dark green band on their helmet so that workmen can approach them for guidance during emergencies. HSE personnel shall preferably wear such dresses with fluorescent stripes, which are noticeable during night, when light falls on them.
- Florescent jackets with respective company logo to be worn by the contractor workmen with different color coding for categories like supervisor and workmen
- For shot blasting, the usage of protective face shield and helmets, gauntlet and protective clothing is mandatory. Such protective clothing should conform relevant IS Specification.
- For off-shore jobs/contracts, contractor shall provide PPEs (new) of all types to EIL & Owner's personnel, at his (contractor's) cost. All personnel shall wear life jacket at all time.
- An indicative list of HSE standards/codes is given under **Appendix-A**.
- Contractor shall ensure procurement & usage of following safety equipment's/ accessories (conforming to applicable IS mark / CE standard) by their staff, workmen & visitors including their subcontractors all through the span of project construction / pre-commissioning/ Commissioning:-
  - a. PPEs (Helmet with company name/logo, Spectacle, Ear-muff, Face shield, Hand gloves, Safety Shoes, Gum boot)
  - b. Barricading tape / warning signs
  - c. Rechargeable Safety torch (flame-proof)
  - d. Safety nets (with tie-chords)
  - e. Fall arresters
  - f. Portable ladders (varying lengths)
  - g. Life-lines (steel wire-rope, dia not less than 8.0 mm)
  - h. Full body harness (double lanyard)
  - i. Lanyard
  - j. Karabiner
  - k. Retractable fall arresters (various length)
  - l. Portable fire extinguishers (DCP type) – 5 kg capacity
  - m. Portable Multi Gas detector
  - n. Sound level meter
  - o. Digital Lux meter
  - p. Fire hoses & flow nozzles
  - q. Fire blankets / Fire retardant cloth (with eyelets)

### 3.3.4 Working at height

- The Contractor shall issue permit for working (PFW) at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence of personal protective equipment's. Contractor's Safety Officer shall verify compliance status of the items of permit document after implementation of action is completed by Contractor's execution / field engineers at work site. HIRAC for specific works at height duly commented by EIL/Owner, shall be kept attached with particular Permit for Work (PFW) at site for ready reference & follow-up.
- Such PFW shall be initially issued for one single shift or expected duration of normal work and extended further for balance duration, if required. EIL/Owner can devise block-permit

system at any specific area, in consultation with project specific HSE Committee to specify the time-period of validity of such PFW or its renewal. This permit shall be applicable in areas where specific clearance from Owner's Operation Deptt./ Safety Deptt. is not required. EIL / Owner's field Engineers/ Safety Officers/ Area Coordinators may verify and counter sign this permit (as an evidence of verification) during the execution of the job.

- All personnel shall be medically examined & certified by registered doctor, confirming their 'medical fitness for working at height. The fitness examination shall be done once in six months.
- In case work is undertaken without taking sufficient precautions as given in the permit, EIL/ Owner Engineers may exercise their authority to cancel such permit and stop the work till satisfactory compliance/rectification is arranged made. Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the used permits for verification during audits etc.
- The Contractor shall arrange (at his cost) and ensure use of Fall Arrester Systems by his workers. Fall arresters are to be used while climbing/descending tall structures or vessels / columns etc. These arresters should lock automatically against the anchorage line, restricting free fall of the user. The device is to be provided with a double security opening system to ensure safe attachment or release of the user at any point of rope. In order to avoid shock, the system should be capable of keeping the person in vertical position in case of a fall.
- The Contractor shall ensure that Full body harnesses conforming EN361 and having authorized CE marking is used by all personnel while working at height. The lanyards and life lines should have enough tensile strength to take the load of the worker in case of a fall. One end of the lanyard shall be firmly tied with the harnesses and the other end with life line. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.
- The Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.
- The Contractor shall ensure that a proper Safety Net System is used wherever the hazard of fall from height is present. The safety net, preferably a knotted one with mesh ropes conforming to IS 5175/ ISO 1140 shall have a border rope & tie cord of minimum 12mm dia. The Safety Net shall be located not more than 6.0 meters below the working surface extending on either side upto sufficient margin to arrest fall of persons working at different heights.
- In case of accidental fall of person on such Safety Net, the bottom most portion of Safety Net should not touch any structure, object or ground.
- Grade separators shall be provided in Pipe-rack/Tech-structures to arrest falling objects like welding spatters, welding rods, nuts, bolts, tools etc. and to facilitate U/G and A/G works simultaneously.
- Beam Clamps may be used for construction of localized temporary working platforms, sheds for welding booths etc. at height in all types of steel structure due to faster installation and requirement of less scaffolding materials.
- Hanging Platform, manufactured by Standard HSE equipment vendors must be encouraged for painting of Buildings etc.
- All the tools used at height (like spanner, screw driver etc.) shall be provided with securing arrangement like back-pack/waist pouch to prevent accidental slippage from worker hand.
- The Contractor shall install temporary lightening arrester in tall structures during construction to save human life and to avoid damage to equipments & machineries

- The Contractor shall ensure positive isolation while working at different levels like in the pipe rack areas. The working platforms with toe boards & hand rails shall be sufficiently strong & shall have sufficient space to hold the workmen and tools & tackles including the equipment's required for executing the job. Such working platforms shall have mid-rails, to enable people work safely in sitting posture.

### 3.3.5 Scaffoldings& Barricading

- Suitable steel scaffoldings only shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that can be safely done using ladders or certified (by 3<sup>rd</sup> party competent person) man-basket. When a ladder is used, an extra workman shall always be engaged for holding the ladder.
- The Contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Main Contractor shall always furnish duly approved construction-design details of scaffold & SWL (from competent designers) free of charge, before they are being installed / constructed at site. Owner/EIL reserves the right to ask the Contractor to submit certification and or design calculations from his Head office/ Design/ Engineering expert regarding load carrying capacity of the scaffoldings.
- All scaffolds shall be inspected by a competent Scaffolding Inspector of the Contractor. He shall paste a GREEN tag (duly signed by competent Scaffolding Inspector) on each scaffold found safe and a RED tag (duly signed by competent Scaffolding Inspector) on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and Scaffolds with RED ones shall immediately be made inaccessible. Work being found continuing on scaffolds with RED tag shall be considered unauthorized work by Contractor and may invite penalization from EIL/Owner. For every 120-125 m<sup>2</sup> /m<sup>3</sup> area / volume or its parts there of minimum one TAG shall be provided.
- The Contractor shall ensure positive barricading (indicative as well as protective) of the excavated, radiography, heavy lift, high pressure hydrostatic & pneumatic testing and other such areas. Sufficient warning signs shall be displayed along the barricading areas.
- Scaffolding shall be constructed using foot seals or base plates only.

### 3.3.6 Electrical installations

- All electrical installations/ connections shall be carried out as per the provisions of latest revision of following codes/standards, in addition to the requirements of Statutory Authorities and IE/applicable international rules& regulations:
  - OISD STD 173 : Fire prevention & protection system for electrical installations
  - SP 30 (BIS) : National Electric Code
- All electrical installations shall be approved by the concerned statutory authorities.
- All temporary electrical installations/ facilities shall be regularly checked by the licensed/ competent electricians of the Contractor and appropriate records shall be maintained in format no: HSE-12" Inspection of temporary electrical booth/ installation at project construction site". Such inspection records are to be made available to EIL/Owner, whenever asked for.

#### 3.3.6.1 The Contractor shall meet the following requirements:

- a. Shall make Single Line Diagram (SLD) for providing connection to each equipment's & machinery and the same (duly approved by EIL/Owner) shall be pasted on the front face of DBs (distribution boards) or JBs (Junction boxes) at every site. (A typical Switch Board Sketch is attached as Appendix -G).



- b. Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical/ applicable international regulations.
- c. Shall deploy qualified & licensed electricians for proper & safe installation and for regular inspection of construction power distribution system/points including their earthing. A copy of the license shall be submitted to EIL / Owner for records. Availability of at least one competent (ITI qualified) / licensed electrician (by State Elec. authorities) shall be ensured at site round the clock to attend to the normal/emergency jobs.
- d. All switchboards / welding machines shall be kept in well-ventilated & covered shed/ with rain shed protection. The shed shall be elevated from the existing ground level to avoid water logging inside the shed. Installation of electrical switch board must be done taking care of the prevention of shock and safety of machine.
- e. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.
- f. Fire extinguishers and insulating mats shall be provided in all power distribution centers.
- g. Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.
- h. Proper housekeeping shall be done around the electrical installations.
- i. All temporary installations shall be tested before energizing, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.
- j. All welders shall use hand gloves irrespective of holder voltage.
- k. Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.
- l. Operation of earth leakage device shall be checked regularly by temporarily connecting series test lamp (2 bulbs of equal rating connected in series) between phase and earth. ELCB tester /test meter shall be used for testing ELCBs
- m. Regular inspection of all installations at least once in a month. (Ref. **Format HSE-12**).

3.3.6.2 The following features shall also be ensured for all electrical installations during construction phase by the contractor:

- Each installation shall have a main switch with a protective device, installed in an enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.
- The outgoing feeders shall be double or triple pole switches with fuses / MCBs. Loads in a three phase circuit shall be balanced as far as possible and load on neutral should not exceed 20% of load in the phase.
- The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type.

Use of rewirable fuses shall be strictly prohibited. The earth leakage device shall have an operating current not exceeding 30 mA.

- All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.
- All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.
- Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm<sup>2</sup> copper shall be used for all single phase hand tools.
- Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.
- All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multi-strand wires / cables.
- Cables shall be free from any insulation damage.
- Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25 M of buried trench route. When laid above ground, cables shall be properly cleated or supported on rigid poles of atleast 2.1 M high. Minimum head clearance of 6 meters shall be provided at road crossings.
- Underground road crossings for cables shall be avoided to the extent feasible. In any case no underground power cable shall be allowed to cross the roads without pipe sleeve.
- All cable joints shall be done with proper jointing kit. No taped/temporary joints shall be used.
- An independent earthing facility should preferably be established within the temporary installation premises. All appliances and equipment shall be adequately earthed. In case of armoured cables, the armour shall be bonded to the earthing system.
- All cables and wire rope used for earth connections shall be terminated through tinned copper lugs.
- In case of local earthing, earth electrodes shall be buried near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earth connection shall have insulation of green colour.
- Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.
- ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

### 3.3.7 Welding/ Grinding/ Gas cutting

- Contractor shall ensure that flash back arrestors conforming to BS:6158 or equivalent are installed on all gas cylinders as well as at the torch end of the gas hose, while in use.

- All cylinders shall be mounted on trolleys and provided with a closing key. Empty & filled-up gas cylinders shall be stored separately with TAG, protecting them from direct sun or rain. Minimum 2 nos. of Portable DCP type fire extinguishers (10 kg) shall be maintained at the gas cylinder stores. Stacking & storing of compressed gas cylinders shall be arranged away from DG set, hot works, Elect. Panels / Elec. boards, etc.
- The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrestor/ Non Return Valve device.
- The hoses for acetylene and oxygen cylinders must be of different colours. Their connections to cylinders and burners shall be made with a safety collar.
- At end of work, the cylinders in use shall be closed and hoses depressurized.
- Cutting of metals using gases, other than oxygen & acetylene, shall require written concurrence from Owner.
- Grinding activity shall not be carried out in confined spaces without a valid work permit.
- All grinding/cutting machines shall be guarded and fitted with Dead-Man switch and this shall not be bypassed any time.
- All welding/grinding machines shall have effective earthing at least at distinctly isolated two points.
- In order to help maintain good housekeeping, and to reduce fire hazard, live electrode bits shall be contained safely and shall not be thrown directly on the ground.
- The hoses of Acetylene and Oxygen shall be kept free from entanglement & away from common pathways / walkways and preferably be hanged overhead in such a manner which can avoid contact with cranes, hydra or other mobile construction machinery.
- Hot spatters shall be contained / restricted appropriately (by making use of effective fire-retardant cloth/fabric) and their flying-off as well as chance of contact with near-by flammable materials shall be stopped.
- The Contractor shall arrange adequate systems & practices for accumulation / collection of metal & other scraps and remnant electrodes and their safe disposal at regular interval so as to maintain the fabrication and other areas satisfactorily clean & tidy.
- All gas cylinders must have a cylinder cap on at all times when not in use.

### 3.3.8 Ergonomics and tools & tackles

- The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health.
- All lifting tools, tackles, equipment, trailers, trucks/dumpers, accessories including cranes shall be tested periodically by statutory/competent authority for their condition and load carrying capacity. Valid test & fitness certificates from the applicable authority shall be submitted to Owner/EIL for their review/acceptance before the lifting tools, tackles, equipment, trailers, trucks/dumpers, accessories and cranes are used.
- Load testing of Cranes must be made mandatory after each modification/alteration of crane configuration/change in boom length.
- The contractor shall not be allowed to use defective equipment or tools not adhering to safety norms.
- Contractor shall arrange non-sparking tools for project construction works in operating plant areas / hydrocarbon prone areas.
- Wherever required the Contractor shall make use of Elevated Work Platforms (EWP) or Aerial Work Platforms (mobile or stationary) to avoid ergonomical risks and workmen shall be debarred to board such elevated platform during the course of their shifting/ transportation.
- Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in use) to minimize overloading risk. SLI shall have capability to continuously monitor and display the load on the hook, and automatically compare it with the rated crane capacity at the operating condition of the crane. The system shall also provide visual and audible warnings at set capacity levels to alert the operator in case of violations.

- The contractor shall be responsible for safe operations of different equipment's mobilized and used by him at the workplace like transport vehicles, engines, cranes, mobile ladders, scaffoldings, work tools, etc.
- The Contractor shall arrange periodical training for the operators of hydra, crane, excavator, mobile machinery, etc. at site by utilizing services from renowned manufacturers

### 3.3.9 Occupational Health

- The contractor shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.
- For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.
- To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.
- Appropriate respiratory protective devices (hood with respiratory devices) shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.
- Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipment's.
- For jobs like drilling/demolishing/dismantling where noise pollution exceeds the specified limit of 85decibels, ear muffs shall be provided to the workers.
- To avoid work related upper limb disorders (WRULD) and backaches, Display Screen Equipment's' workplace stations shall be carefully designed & used with proper sitting postures. Power driven hand-held tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good blood circulation in hands.
- The Contractor shall arrange health check-up (by registered medical practitioner) for all the workers at the time of induction. Health check may have to be repeated if the nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. EIL/Owner reserves the right to ask the contractor to submit medical test reports. Regular health check-ups are mandatory for the workers assigned with Welding, Radiography, Blasting, Painting, Heavy Lift and Height (>2m) jobs. All the health check-ups shall be conducted by registered Medical practitioner and records are to be maintained by the Contractor.
- The Contractor shall arrange Medical Camps at regular intervals at work sites and labor colonies to assess health condition of workers.
- The Contractor shall ensure vaccination of all the workers including their families, during the course of entire project span.

### 3.3.10 Hazardous substances

- Hazardous, inflammable and/or toxic materials such as solvent coating, thinners, anti-termite solutions, water proofing materials shall be stored in appropriate containers preferably with lids having spillage catchment trays and shall be stored in a good ventilated area. These containers shall be labeled with the name of the materials highlighting the hazards associated with its use and necessary precautions to be taken. Respective MSDS

(Material Safety Data Sheet) shall be made available at site & may be referred whenever problem arises.

- Where contact or exposure of hazardous materials are likely to exceed the specified limit or otherwise have harmful effects, appropriate personal protective equipment's such as gloves, goggles/face-shields, aprons, chemical resistant clothing, respirator, etc. shall be used.
- The work place shall be checked prior to start of activities to identify the location, type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured and the matter shall be reported immediately to EIL/ Owner.

### 3.3.11 Slips, trips & falls

The contractor shall establish a regular cleaning and basic housekeeping programme that covers all aspects of the workplace to help minimize the risk of slips, trips & falls. The contractor shall take positive measures like keeping the work area tidy, storing waste in suitable containers & harmful items separately, keeping passages, stairways, entrances & exits especially emergency ones clear, cleaning up spillages immediately and replacing damaged carpet/ floor tiles, mats & rugs at once to avoid slips, trips & falls.

- Grating removal permit system should be implemented during construction phase. So that after permanent gratings are installed on platforms and tech structure floors; removal of any gratings for whatever purpose (including for lifting piping material etc.) is required to be sanctioned by signed permit by HSE officers of both contractor and Engineer-in-charge. The spot where gratings are removed shall be hard-barricaded during course of work. The removed gratings shall be re-installed immediately after completion of work or at the time of cessation of work every day whichever is earlier and the permit shall be closed on daily basis. A register shall be maintained for recording all the grating removal permits and their closure shall be monitored on daily basis.

### 3.3.12 Radiation exposure

- All personnel exposed to physical agents such as ionizing & non-ionizing radiation, including ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.
- For Open Field Radiography works, requirements of Bhabha Atomic Research Centre (BARC)/ Atomic Energy Regulatory Board (AERB) shall be followed.
- The Contractor shall implement an effective system of control (as described in the AERB regulations) at site for handling radiography-sources & for avoiding its misuse & theft.
- The contractor shall generate the Format No: HSE-8 "Permit for radiation work" before start of work.
- In case the radiography work has to be carried out at day time, suitable methodology to be used so that other works, people are not affected.

### 3.3.13 Explosives/Blasting operations

- Blasting operations shall be carried out as per latest Explosive Rules (Indian/ International) with prior permission. The Contractor shall obtain license from Chief Controller of Explosives (CCoE) for collection, transportation, storage of explosives as well as for carrying out blasting operations.



- The Contractor shall prepare exclusive method statement (in cognizance with statutory requirements) for diffusing unfired explosives, if any, at project site before carrying out actual task. Nowhere blasting shall be carried out by the Contractor or its agency without the involvement of competent supervisor and licensed blaster / shot blaster.

### 3.3.14 Demolition/ Dismantling

- The contractor shall adhere to safe demolishing/ dismantling practices at all stages of work to guard against unsafe working practices.
- The contractor shall disconnect service lines (power, gas supply, water, etc.)/ make alternate arrangements prior to start of work and restore them, if required as directed by EIL/ Owner at no extra cost.
- Before carrying out any demolition/dismantling work, the contractor shall take prior approval of EIL/Owner and generate the Format No.HSE-9. For revamp jobs in operating plants where location of underground utilities is not known with certainty, the contractor shall depute an experienced engineer for supervision and shall make adequate arrangements for fire-fighting & First-Aid during the execution of these activities.
- The Contractor shall arrange approved HIRAC / Method Statement for the specific demolition / dismantling task and corresponding action plan commensurate with hazards / risks associated therein. In no case any activity related to demolition / dismantling shall be carried out by the Contractor without engaging own supervision / field engineer.

### 3.3.15 Road Safety

- The Contractor shall ensure adequately planned road transport safety management system.
- The vehicles shall be fitted with reverse warning alarms & flashing lights / fog-lights and usage of seat belts shall be ensured.
- The Contractor shall also ensure a separate pedestrian route for safety of the workers and comply with all traffic rules & regulations, including maintaining speed limit of 20 KMPH or indicated by owner for all types of vehicles / mobile machinery. The maximum allowable speed shall be adhered to.
- In case of an alert or emergency, the Contractor must arrange clearance of all the routes, roads, access. The Contractor shall deploy sufficient number of traffic controllers at project site routes / roads/ accesses, to alert reversing movement of vehicles & machinery as well as pedestrians.
- Dumpers, Tippers, etc. shall not be allowed to carry workers within the plant area and also to & from the labour colony to & from project sites.
- Hydras shall only be allowed for handling the materials at fabrication/ storage yards and in no case shall be allowed to transport the materials over project / plant roads.
- The Contractor shall not deploy any such mobile machinery / equipment, which do not have competent operator and / or experienced banks-man/ signal-man. Such machinery/ equipment shall have effective limit-switches, reverse-alarm, front & rear-end lights etc. and shall be maintained in good working order.
- The Contractor shall not carry-out maintenance of vehicles / mobile machinery occupying space on project / plant roads and shall always arrange close supervision for such works.
- For pipeline jobs, the contractor shall submit a comprehensive plan covering transportation, loading / unloading of pipes, movement of side booms, movement of vehicles on the ROW, etc.
- Contractor shall arrange/ install visible road signs, diversion boards, caution boards, etc. on project roads for safe movement of men and machinery.

**3.3.16 Welfare measures**

Contractor shall, at the minimum, ensure the following facilities at work sites:

- A crèche at site where 10 or more female workers are having children below the age of 6 years.
- Adequately ventilated / illuminated rooms at labour camps & its hygienic up-keeping.
- Reasonable canteen facilities at site and in labour camps at appropriate location depending upon site conditions. Contractor shall make use of “industrial” variety of LPG cylinder & satisfactory illumination at the canteens. Necessary arrangement for efficient disposal of wastes from canteens & urinals /toilets shall also be made and regular review shall be made to maintain the ambience satisfactorily hygienic & shall also comply with all applicable statutory requirements.
- Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers).
- Provision for suitable mobile toilets to be made available by Contractor for remote/scattered job locations.
- Urinals, Toilets, drinking water, washing facilities, adequate lighting at site and labour camps, commensurate with applicable Laws/ Legislation.

**3.3.17 Environment Protection**

Contractor shall ensure proper storage and utilization methodology of materials that are detrimental to the environment. Where required, Contractor shall ensure that only the environment friendly materials are selected and emphasize on recycling of waste materials, such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

Contractor to submit Environmental Aspect Impact Register detailing the list of activities in his scope, the respective environmental impact and the actions taken to minimize the impact. Environmental Aspect Impact Register to be prepared as per Format HSE-18 and to be updated and maintained till job completion.

The contractor shall strive to conserve energy and water wherever feasible.

The contractor shall ensure dust free environment at workplace by sprinkling water on the ground at frequent intervals. The air quality parameters for dust, poisonous gases, toxic releases, harmful radiations, etc. shall be checked by the contractor on daily basis and whenever need arises.

The contractor shall not be allowed to discharge chemicals, oil, silt, sewage, sullage and other waste materials directly into the controlled waters like surface drains, streams, rivers, ponds. A discharge plan suggesting the methods of treating the waste before discharging shall be submitted to EIL/Owner for approval.

For pipeline jobs, top soil shall be stacked separately while making ROW through fields. This fertile soil shall be placed back on top after backfilling.

For offshore construction barges, arrangements shall be made for safe disposal of human, food & other wastes and applicable laws in this regard shall be followed.

**3.3.18 Rules & Regulations**

All persons deployed at site shall be knowledgeable of and comply with the environmental laws, rules & regulations relating to the hazardous materials, substances and wastes. Contractor shall not dump, release or otherwise discharge or disposes off any such materials without the express

authorization of EIL/Owner. An indicative list of Statutory Acts & Rules relating to HSE is given under Appendix-D.

### 3.3.19 Weather Protection

Contractor shall take appropriate measures to protect workers from severe storms, rain, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging/ planning the construction activities to suit the weather conditions. Effective arrangement (without creating inconvenience to project facilities & permanent installations) for protecting workmen from hailstorm, drizzle in the form of temporary shelter shall be made at site.

### 3.3.20 Communication

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them.

All health & safety information shall be communicated in a simple & clear language easily understood by the local workforce.

For information to all, typical subjects that should be communicated are: -

Inside the company (Top to down)

- a. Quality Policy
- b. HSE Policy contents
- c. Environment Policy
- d. HSE Objectives
- e. Safety Cardinal Rules
- f. HSE Target – reached or missed
- g. Praises & Warnings to personnel for HSE Management
- h. Safety Walk Through Reports and safety defects / shortfalls (by management)
- i. HSE Audit results
- j. Revised Statutory Health & Safety provisions, if any
- k. H & S publicity
- l. Suggestions

Inside the Company (Bottom to up)

- a. Complaints
- b. Compliances on safety defects / shortfalls
- c. Suggestions
- d. Proposals for changes & improvements
- e. HSE Reports (including near-miss reports)

### 3.3.21 Confined Space Entry

The contractor shall generate a work permit (Format No. HSE -7) before entering a confined space. People, who are permitted to enter into confined space, must be medically examined & certified by registered doctor, confirming their 'medical fitness for working in confined space'. All necessary precautions mentioned therein shall be adhered to. An attendant shall be positioned outside a confined space for extending help during an emergency. Effective communication shall be maintained between personnel in confined space and outside by combination of visual/voice or portable radio. Compressed gas cylinders shall not be taken into confined space. Entry Register for confined space to be maintained with the name and time of entry/exit. All appropriate PPEs and air quality parameters shall be checked before entering a confined space. It shall be ensured that the piping of the equipment which has to be opened is pressure- free by checking that blinds are in place, vents are open and volume is drained. Inside



confined space works, only electrical facilities/ installations of 24V shall be permitted. Contactor shall ensure usage of safe & suitable arrangement of oxygen supply for individual workmen (during the course of work in confined space), if oxygen concentration is found to be less than 19.5% (v/v) there.

### 3.3.22 Heavy Lifts

- The contractor shall submit detailed rigging studies plan for EIL/ Owner approval prior to lifting equipment which cannot be erected with a crane of approx. 100 MT capacity due to constraints of its dimensions, location of foundation height, approach & weight.
- Contractor shall generate the format no:HSE-15 “Permit for heavy lift/critical erection”
- The Safe Working Load (SWL) and manufacturer’s serial numbers shall be clearly marked on the slings and the lifting gears, either by tagging, stamping, engraving or embossing.
- Prior to actual lifting activities, contractor shall check the validity of the crane inspection certificate issued by statutory/ competent authority. This requirement shall also apply to all rigging equipment’s utilized for the job.
- The contractor shall, at all times, be responsible for all rigging activities.
- The Contractor shall ensure medical fitness of all workmen who are engaged / involved in erection of equipment’s, vessels etc. and such fitness checks shall be carried-out every six months interval with the help of a registered medical practitioner & record shall be maintained
- Adequate safety measures such as positive barricading, usage of appropriate PPEs, permit to work, etc. shall be taken during all heavy or critical lifts.
- For lifting any material (irrespective of shape, size or volume), at any height, it is always advisable to prepare a Plan of Erection (PoE) taking into consideration hazards & risks associated therein – this can enable people to put their own experiences of various natures & side-by-side establish a practical method for risk-free erection / lifts. The contractor shall prepare PoE & shall document the same, when risks are identified as “medium” or “high” and the same shall be approved by its competent / qualified engineer.

### 3.3.23 Key Performance Indicators

The contractor shall measure an activity in both leading & trailing indicators for statistical and performance measurement. The activities pertaining to key performance indicators are covered in Monthly HSE Report (Format No. HSE-5). The contractor shall try to achieve a statistically fair record and strive for its continual improvement.

Leading Indicators viz :-

- Number of Safety Inductions carried-out at site (for workmen & staff members)
- Number of HSE inspections carried out
- Number of “Safety Walk Through” carried-out by site-head.
- Number of HSE shortfalls / lapses identified per contractor& closed-out in time.
- Number of Safety Meetings conducted (in-house / with contractors)
- Number of HSE Audits made (internal & external) vis-à-vis non conformances raised
- Number of HSE Awareness / Motivational program conducted by contractors
- Number of HSE Trainings conducted at site for supervisors & workmen
- Study of Near miss case reported
- Encouragements / Awards / Recognitions to workmen, job supervisors & field engineers.
- Suggestions for improvement

Trailing Indicators viz :-

- Calculation of HSE statistics viz frequency rate, severity rate, LTA free manhours, etc.
- Analysis of incidents / accidents (nature, severity, types etc.)
- Study of Incident / Accident with respect to :-
  - Variety
  - Period of the year / project span
  - Timings of the incident / accident
  - Age profile of victims
  - Body parts involved
  - Penalty levied for causing incident / accident

### 3.3.24 Unsuitable Land Conditions

Contractor shall take appropriate measures and necessary work permits/clearances if work is to be done in or around marshy areas, river crossings, mountains, monuments, etc. The Contractor shall make right assessment and take all necessary action for developing work areas to make them safe & suitable for crane operations or other vehicular movement before carrying out any project related activity / operation. Contractor shall take all necessary actions to make the surroundings of its site establishments (site office, stores, lay-down area etc.) work-worthy safe and secure.

### 3.3.25 Under Water Inspection

Contractor shall ensure that boats and other means used for transportation, surveying & investigation works shall be certified seaworthy by a recognized classification society. It shall be equipped with all life saving devices like life jackets, adequate fire protection arrangements and shall possess communication facilities like cellular phones, wireless, walkie-talkie. All divers used for seabed surveys, underwater inspections shall have required authorized license, suitable life saving kit. Number of hours of work by divers shall be limited as per regulations. EIL/ Owner shall have the right to inspect the boat and scrutinize documents in this regard.

### 3.3.26 Excavation

The Contractor shall obtain permission from competent authorities prior to excavation wherever required.

The Contractor shall locate the position of buried utilities (water line, cable route, etc.) by referring to project / plant drawing / in consultation with EIL/Owner. The Contractor shall start digging manually to locate the exact position of buried utilities & thereafter use mechanical means.

The Contractor shall keep soil heaps at least 1.5 M away from edge or a distance equal to depth of pit (whichever is more).

All excavated pits greater than 10 Sq.M plan area and depth more than 1.5M shall have at least two access routes for ingress and egress. Also, additional access routes shall be provided such that distance between any two access routes shall not be more than 20M.

The Contractor shall maintain sufficient “angle of repose” during excavation – shall also provide slope or suitable bench as decided by EIL / Owner.

The Contractor shall arrange “battering” or “benching” wherever required for preventing collapse of edge of excavations.

The Contractor shall identify & arrange de-watering pump or well-point system to prevent earth collapse due to heavy rain / influx of underground water.

The Contractor shall arrange protective fencing/ barricading with warning signal around excavated pits, trenches, etc. along with minimum 2 (two) entries, exits/ escape ladders.

The Contractor must avoid “underpinning” / under-cutting to prevent collapse of chunk of earth during excavation

The Contractor shall use “stoppers” to prevent over-run of vehicle wheels at the edge of excavated pits/ trenches.

The Contractor shall arrange strengthening of “shoring” & “strutting” proactively to avoid collapse of earth/ edges due to vehicular movement in close proximity of excavated areas/ pits/ trenches, etc.

### 3.4 Tool Box Talks (TBT)

Contractor shall conduct daily TBT with workers prior to start of work and shall maintain proper record of the meeting. A suggested format is given below. The TBT is to be conducted by the immediate supervisor of the workers

The Contractor shall conduct TBT before start of every morning or evening shift or night shift activities, for alerting the workers on specific hazards and their appropriate dos & don'ts. The Contractor shall provide sufficient rests to the site workmen and their foremen to avert fatigue & thereby endangering their lives during the course of site works.

TOOLBOX TALK RECORDING SHEET		
Date & Time		
Work Location		
Subject (Nature of work)		
Presenter		
Hazards involved		
Precautions to be taken		
Worker's Name	Signature	Section
Remarks, in any		

The topics during TBT shall include

- Hazards related to work assigned on that day and precautions to be taken.
- Any forthcoming HSE hazards/events/instruction/orders, etc.

The above record can be kept in local language, which workers can read. These records shall be made available to EIL/ Owner whenever demanded.

### 3.5 Training & Induction Programme

- Initial induction of workers into Construction oriented activities and appraising them about the methodology of works and how to carry-out safely and the same should not be inter mixed with Tool Box Talks or HSE Training. In this regard careful action should be made & maintained for imparting HSE induction to every individual, irrespective of his task/designation/level of employment, whereas, HSE Training should be imparted to specific person/group of people who are to carry-out that specific task more than once – for example, Riggers must be trained for working at heights, welders must be trained for work in confined space, fitters/carpenters, masons must be trained for work at heights, etc.

- Contractor shall conduct Safety induction programme on HSE for all his workers and maintain records. The Gate Pass shall be issued only to those workers who successfully qualify the Safety induction programme.
- The Contractor shall brief the visitors about the HSE precautions which are required to be taken before their proceeding to site and make necessary arrangements to issue appropriate PPEs like Aprons, hard hats, ear-plugs, goggles & safety shoes etc., to his visitors. The Contractor shall always maintain relevant acknowledgement from visitor on providing him brief information on HSE actions.
- Contractor shall ensure that all his personnel possess appropriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about
  - Potential hazards to which they may be exposed at their workplace
  - Measures available for prevention and elimination of these hazards

The topics during training shall cover, at the minimum: -

- Why safety should be considered during work - explanation
- Education about hazards and precautions required
- Employees' duties & responsibilities
- Emergency and evacuation plan
- HSE requirements during project activities
- Fire fighting and First-Aid
- Use of PPEs
- Occupational health issues – dos & don'ts
- Local laws on intoxicating drinks, drugs, smoking in force
- Common environmental subjects – lighting, ventilation, vibration, smoke/fumes etc.
- Records of the training shall be kept and submitted to EIL/ Owner.
- The Contractor shall make regular program for conducting Safety Training on various topics related to various activities & their safe-guarding utilizing experienced persons / outside agency / faculty. A program for Safety Training (indicative list as per Appendix –F) shall be furnished by the Contractor in its HSE Plan.
- For offshore and jetty jobs, contractor shall ensure that all personnel deployed have undergone a structured sea survival training including use of lifeboats, basket landing, use of radio communication etc. from an agency acceptable to Owner/EIL.

### **3.6 ADDITIONAL SAFETY REQUIREMENTS FOR WORKING INSIDE A RUNNING PLANT**

As a minimum, the contractor shall ensure adherence to following safety requirements while working in or in the close vicinity of an operating plant:

- a) Contractor shall obtain permits for Hot work, Cold work, Excavation and Confined Space from Owner in the prescribed format.
- b) The contractor shall monitor record and compile list of his workers entering the operational plant/unit each day and ensure & record their return after completing the job.

- c) Contractor's workers and staff members shall use designated entrances and proceed by designated routes to work areas only assigned to them. The workers shall not be allowed to enter units' area, tanks area, pump rooms, etc. without work authorization permit.
- d) Work activities shall be planned in such a way so as to minimize the disruption of other activities being carried out in an operational plant/unit and activities of other contractors.
- e) The contractor shall submit a list of all chemicals/toxic substances that are intended to be used at site and shall take prior approval of the Owner.
- f) Specific training on working in a hydrocarbon plant shall be imparted to the work force and mock drills shall be carried out for Rescue operations/First-Aid measures.
- g) Proper barricading/cordoning of the operational units/plants shall be done before starting the construction activities. No unauthorized person shall be allowed to trespass. The height and overall design of the barricading structure shall be finalized in consultation with the Owner and shall be got approved from the Owner.
- h) Care shall be taken to prevent hitting underground facilities such as electrical cables, hydrocarbon piping during execution of work.
- i) Barricading with water curtain shall be arranged in specific/critical areas where hydrocarbon vapors are likely to be present such as near horton spheres or tanks. Positioning of fire tenders (from owner) shall also be ensured during execution of critical activities.
- j) Emergency evacuation plan shall be worked out and all workmen shall be apprised about evacuation routes. Mock drill operations may also be conducted.
- k) Flammable gas test shall be conducted prior to any hot work using appropriate measuring instruments. Sewers, drains, vents or any other gas escaping points shall be covered with flame retardant tarpaulin.
- l) Respiratory devices shall be kept handy while working in confined zones where there is a danger of inhalation of poisonous gases. Constant monitoring of presence of Gas/Hydrocarbon shall be done.
- m) Clearance shall be obtained from all parties before starting hot tapping, patchwork on live lines and work on corroded tank roof.
- n) Positive isolation of line/equipment by blinding for welding/cutting/grinding shall be done. Closing of valve will not be considered sufficient for isolation.
- o) Welding spatters shall be contained properly and in no case shall be allowed to fall on the ground containing oil. Similar care shall be taken during cutting operations.
- p) The vehicles, cranes, engines, etc. shall be fitted with spark arresters on the exhaust pipe and got it approved from Safety Department of the Owner.
- q) Plant air should not be used to clean any part of the body or clothing or use to blow off dirt on the floor.
- r) Gas detectors should be installed in gas leakage prone areas as per requirement of Owner's plant operation personnel.
- s) Experienced full time safety personnel shall be exclusively deployed to monitor safety aspects in running plants.



### 3.7 Self Assessment and Enhancement

The contractor shall develop a method of check & balance through self assessment & enhancement techniques and shall explore the opportunities for continual improvement in the HSE system.

### 3.8 HSE Promotion

The contractor shall encourage his workforce to promote HSE efforts at workplace by way of organizing workshops/ seminars/ training programmes, celebrating HSE awareness weeks & National Safety Day, conducting quizzes & essay competitions, distributing pamphlets, posters & material on HSE, providing incentives for maintaining good HSE practices and granting incentives / bonus for completing the job without any lost time accident.

### 3.9 Lock Out and Tag Out (LOTO) for Isolation of Energy Source

- Contractor shall follow the LOTO/ Isolation procedure of owner for all energy source isolations installed/under purview by/of owner i.e. “Brown field”
- For all the other energy source (not under purview of client/owner) i.e. “Green field” Contractor shall develop a system to ensure the isolation of equipments, pipelines, Vessel, electrical panels from the energy source covering following as minimum:-
  - Identification of all energy source viz electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, radiation and other forms of stored or kinetic energy.
  - Establishing the energy isolation devices viz: manually operated electrical circuit breakers, disconnection switches, blind flanges, etc.
  - Installation of Lock Out devices for preventing the inadvertent release of stored energy and Tag Out devices (“Danger”, “Do Not operate” or Do not Remove” tags) to indicate that testing, maintenance or servicing is underway and the device cannot be operated until the tag out device is removed.
  - Lock Out and Tag out log book
  - Permit for isolation and de-isolation of energy source as per format NO: HSE-16
  - Availability of competent persons like experienced operators at substations, pump house, units, etc, supervisors etc.
- Contractor shall ensure that all the sources are locked out and tagged properly before giving clearance to start the job.
- After the completion of job, contractor shall ensure all tools and tackles are removed and nobody is present in the working area and signing on LOTO log book.
- Only on confirmation of above the contractor will remove their lock and tag from the isolation points and give instructions for energizing the same. Only the person carrying out the task shall himself carry the key for the lock in /Lock out.

## 4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR

### 4.1 On Award of Contract

The Contractor shall submit a comprehensive Health, Safety and Environmental Plan or programme for approval by EIL/Owner prior to start of work. The Contractor shall participate in the pre-start meeting with EIL/Owner to finalize HSE Plans which shall including the following:

- HSE policy & Objectives
- Job procedure to be followed by the Contractor for construction activities including handling of equipment's, scaffolding, electric installations, etc. describing the risks involved, actions to be taken and methodology for monitoring each activity. Indicative list of procedures is enclosed as Annexure-H
- EIL/Owner review/audit requirement.

- Organization structure along with responsibility and authority, on HSE activities.
- Administrative & disciplinary steps involving implementation of HSE requirements
- Emergency evacuation plan/ procedures for site and labour camps
- Procedures for reporting & investigation of accidents and near misses.
- HSE Inspection
- HSE Training programmes at project site
- HSE Awareness programmes, at project site
- Reference to Rules, Regulations and statutory requirements.
- HIRAC
- Environment Aspect Impact Register
- Legal Register
- HSE documentation viz reporting, analysis & record keeping.

#### 4.2 During Job Execution

Contractor shall implement approved Health, Safety and Environment management programme including but not limited to as brought out under para 3.0. Contractor shall also ensure:

- to arrange workmen compensation insurance, registration under ESI Act, third party liability insurance, registration under BOCW Act etc., as applicable.
- to arrange all HSE permits before start of activities (as applicable), like permits for hot work, working at heights (Refer Format No. HSE-6), confined space (Refer Format No. HSE-7), Radiation Work Permit (Refer Format No. HSE-8), Demolishing/ Dismantling Work Permit (Refer Format No. HSE-9), Permit for erection/modification & dismantling of scaffolding (Refer Format No:HSE-14), Permit for heavy lift/critical erection (Refer Format No:HSE-15) ,Permit for energy Isolation & De-isolation” (HSE-16) ,storage of chemical /explosive materials & its use and implement all precautions mentioned therein. In this regard, requirements of *Oil industry Safety Directorate Standard No. Std-105 "Work Permit Systems"* shall be complied with while working in existing Oil or Gas processing plants. List of the persons involved shall be maintained as annexure to the work permit issued for a particular activity.
- to submit, timely, the completed checklist on HSE activities in Format No.HSE-1, Monthly HSE report in Format No.HSE-5 (use of web based package ([www.eil.co.in/conthse](http://www.eil.co.in/conthse)) is compulsory wherever the facility is available else a hard copy is to be submitted), accident/incident reports, investigation reports etc. as per EIL/Owner requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to EIL/Owner.
- that his top most executive at site attends all the Safety Committee/HSE meetings arranged by EIL/Owner and carries out safety walk regularly. Only in case of his absence from site that a second senior most person shall be nominated by him, in advance, and communicated to EIL/Owner for performing the above tasks.
- display at site office and at prominent locations HSE Policy, caution boards, list of hospitals, emergency services available, safety signs like Men at work, Speed Limits, Hazardous Area, various do's & don'ts, etc.
- provide posters, banners for safe working to promote safety consciousness.
- identify, assess, analyze & mitigate the construction hazards& incorporate relevant control measures before actually executing site works. (HIRAC = Hazard Identification, Risk Analysis and Control).
- identify, assess, analyze & mitigate the environmental impact & incorporate relevant control measures through Environmental Aspect Impact Register
- Identify and comply to all applicable HSE related legal requirements by preparing and maintaining a Legal register
- arrange testing, examination, inspection of own as well as borrowed construction equipment's / machinery (stationary & mobile) before being used at site and also at periodical interval, through own resources and also by 3<sup>rd</sup> party competent agencies (as

deemed fit in statutes). Records of such test, examination etc. shall be maintained & shall be submitted to EIL/Owner as & when asked for.

- carryout audits/ inspection (internal & external) at his works as well as sub-contractor works as per approved HSE plan/ procedure/ programme & submit the compliance reports of identified shortfalls for EIL/Owner review.
- arranging HSE training for site workmen (of his own & sub-contractors) through internal or external faculty at periodical intervals.
- Assistance & cooperate during HSE audits by EIL/Owner or any other 3<sup>rd</sup> party and submit compliance report.
- Generate & submit of HSE records/report as per this specification.
- apprise EIL/Owner on HSE activities at site regularly.
- carry-out all dismantling activities safely, with prior approval of EIL/Owner representative.
- The Contractor shall ensure that “Hot works” and painting works do not continue at the same place / location at project site for which chance or probability of “fire” incident exists.

#### 4.3 During Short Listing of the Sub-Contractors

The contractor shall review the HSE management system of the sub-contractors in line with the requirements given in this specification. The contractor shall be held responsible for the shortcomings observed in the HSE management system of the sub-contractor(s) during execution of the job.

#### 5.0 RECORDS

At the minimum, the contractor shall maintain/ submit HSE records in the following reporting formats:

Safety Walk Through Report	HSE-1
Accident/ Incident Report	HSE-2
Supplementary Accident/ Incident Investigation report	HSE-3
Near Miss Incident Report	HSE-4
Monthly HSE Report	HSE-5
Permit for working at height	HSE-5
Permit for working in confined space	HSE-7
Permit for radiation work	HSE-8
Permit for demolishing/ dismantling	HSE-9
Daily Safety checklist	HSE-10
Housekeeping Assessment & compliance	HSE-11
Inspection of temporary electrical booth/installation	HSE-12
Inspection for scaffolding	HSE-13
Permit for erection/modification & dismantling of scaffolding	HSE-14
Permit for heavy lift/critical erection.	HSE-15
Permit for Energy isolation and de-isolation.	HSE-16
Permit for Excavation	HSE-17
Inspection reports of Equipment/tools/tackles	*
Report of Toolbox talks	As indicated in specification
PPE issue report/register	*
Site inspection reports	*
Training records	*

(\*) The formats shall be developed in consultation with EIL/Owner.



**APPENDIX-A  
(Sheet 1 of 2)**
**A. IS CODES ON HSE**

SP: 53	Safety code for the use, Care and protection of hand operated tools.
IS: 838	Code of practice for safety & health requirements in electric and gas welding and cutting operations
IS: 1179	Eye & Face precautions during welding, equipment etc.
IS: 1860	Safety requirements for use, care and protection of abrasive grinding wheels.
IS: 1989 (Pt -II)	Leather safety boots and shoes
IS: 2925	Industrial Safety Helmets
IS: 3016	Code of practice for fire safety precautions in welding & cutting operation.
IS: 3043	Code of practice for earthing
IS: 3764	Code of safety for excavation work
IS: 3786	Methods for computation of frequency and severity rates for industrial injuries and classification of industrial accidents
IS: 3696	Safety Code of scaffolds and ladders
IS: 4083	Recommendations on stacking and storage of construction materials and components at site
IS: 4770	Rubber gloves for electrical purposes
IS: 5121	Safety code for piling and other deep foundations
IS: 5216 (Pt-I)	Recommendations on Safety procedures and practices in electrical works
IS: 5557	Industrial and Safety rubber lined boots
IS: 5983	Eye protectors
IS: 6519	Selection, care and repair of Safety footwear
IS: 6994 (Pt-I)	Industrial Safety Gloves (Leather & Cotton Gloves)
IS: 7293	Safety Code for working with construction Machinery
IS: 8519	Guide for selection of industrial safety equipment for body protection
IS: 9167	Ear protectors
IS: 11006	Flash back arrestor (Flame arrestor)
IS: 11016	General and safety requirements for machine tools and their operation
IS: 11057	Specification for Industrial safety nets
IS: 11226	Leather safety footwear having direct moulded rubber sole
IS: 11972	Code of practice for safety precaution to be taken when entering a sewerage system
IS: 13367	Code of practice-safe use of cranes
IS: 13416	Recommendations for preventive measures against hazards at working place

**APPENDIX-A  
(Sheet 2 of 2)**
**B. INTERNATIONAL STANDARDS ON HSE**

Safety Glasses	:	ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646/ 58311
Safety Shoes	:	ANSI Z 41.1, AS 2210, EN 345
Hand Gloves	:	BS 1651
Ear Muffs	:	BS 6344, ANSI S 31.9
Hard Hat	:	ANSI Z 89.1/89.2, AS 1808, BS 5240, DIN 4840
Goggles	:	ANSI Z 87.1
Face Shield	:	ANSI Z 89.1
Breathing Apparatus	:	BS 4667, NIOSH
Welding & Cutting	:	ANSI Z49.1
Safe handling of compressed:P-1		(Compressed Gas Association Gases in cylinders 1235 Jefferson Davis Highway, Arlington VA 22202 - USA)
Full body harness	:	EN-361
Lanyard	:	EN-354
Karabiner	:	EN-362 and EN-12275

**APPENDIX-B****DETAILS OF FIRST AID BOX**

<b>SL. NO.</b>	<b>DESCRIPTION</b>	<b>QUANTITY</b>
1.	Small size Roller Bandages, 1 Inch Wide (Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 Inches Wide (Hand & Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 Inches Wide (Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing (Burn Dressing Large)	4 Pkts.
5.	Cotton Wool (20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon	1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water	1 Bottle
8.	Ammonia Solution (20 ml.)	1 Bottle
9.	A Pair of Scissors	1 Piece
10.	Adhesive Plaster (1.25 cm X 5 m)	1 Spool
11.	Eye pads in Separate Sealed Pkt.	4 pcs.
12.	Tourniquet	1 No.
13.	Safety Pins	1 Dozen
14.	Tinc. Iodine/ Betadin (100 ml.)	1 Bottle
15.	Polythene Wash cup for washing eyes	1 No.
16.	Potassium Permanganate (20 gms.)	1 Pkt.
17.	Tinc. Benzoin (100 ml.)	1 Bottle
18.	Triangular Bandages	2 Nos.
19.	Band Aid Dressing	5 Pcs.
20.	Iodex/Moov (25 gms.)	1 Bottle
21.	Tongue Depressor	1 No.
22.	Boric Acid Powder (20 gms.)	2 Pkt.
23.	Sodium Bicarbonate (20 gms.)	1 Pkt.
24.	Dressing Powder (Nebasulf) (10 gms.)	1 Bottle
25.	Medicinal Glass	1 No.
26.	Duster	1 No.
27.	Booklet (English& Local Language)	1 No. each
28.	Soap	1 No.
29.	Toothache Solution	1 No.
30.	Vicks (22 gms.)	1 Bottle
31.	Forceps	1 No.
32.	Note Book	1 No.
33.	Splints	4 Nos.
34.	Lock	1 Piece
35.	Life Saving/Emergency/Over-the counter Drugs	As decided at site

Box size: 14" x 12" x 4"

Note : The medicines prescribed above are only indicative. Equivalent medicines can also be used.  
A prescription, in this regard, shall be required from a qualified Physician.

**APPENDIX-C****TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS**

<div>Fire Extinguisher →</div> <div>Fire ↓</div>	Water	Foam	CO <sub>2</sub>	Dry Powder	Multi-purpose (ABC)
Originated from paper, clothes, wood	✓	✓	can control minor surface fires	can control minor surface fires	✓
Inflammable liquids like alcohol, diesel, petrol, edible oils, bitumen	✗	✓	✓	✓	✓
Originated from gases like LPG, CNG, H <sub>2</sub>	✗	✗	✓	✓	✓
Electrical fires	✗	✗	✓	✓	✓

LEGEND :     ✓ :     CAN BE USED

                 ✗ :     NOT TO BE USED

**Note:** Fire extinguishing equipment must be checked atleast once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.

**APPENDIX-D****List of Statutory Acts & Rules Relating to HSE**

- The Indian Explosives Act and Rules
- The Motor Vehicle Act and Central Motor Vehicle Rules
- The Factories Act and concerned Factory Rules
- The Petroleum Act and Petroleum Rules
- The Workmen Compensation Act
- The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules
- The Indian Electricity Act and Rules
- The Indian Boiler Act and Regulations
- The Water (Prevention & Control & Pollution) Act
- The Water (Prevention & Control of Pollution) Cess Act
- The Mines & Minerals (Regulation & Development) Act
- The Air (Prevention & Control of Pollution) Act
- The Atomic Energy Act
- The Radiation Protection Rules
- The Indian Fisheries Act
- The Indian Forest Act
- The Wild Life (Protection) Act
- The Environment (Protection) Act and Rules
- The Hazardous Wastes (Management & Handling) Rules
- The Manufacturing, Storage & import of Hazardous Chemicals Rules
- The Public Liability Act
- The Building and Other Construction Workers (Regulation of Employment and Condition of service) Act
- Other Statutory Acts like EPF, ESIS, Minimum Wage Act.

**APPENDIX-E (Sheet 1 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(A) EXCAVATION  Pit Excavation upto 3.0m	Falling into pit	Personal injury	Provide guard rails/ barricade with warning signal. Provide atleast two entries/ exits. Provide escape ladders.
	Earth Collapse	Suffocation/ Breathlessness Buried	Provide suitable size of shoring and strutting, if required. Keep soil heaps away from the edge equivalent to 1.5m or depth of pit whichever is more. Don't allow vehicles to operate too close to excavated areas. Maintain atleast 2m distance from edge of cut. Maintain sufficient angle of repose. Provide slope not less than 1:1 and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock. Battering/benching the sides.
	Contact with buried electric cables Gas/ Oil Pipelines	Electrocution Explosion	Obtain permission from competent authorities, prior to excavation, if required. Locate the position of buried utilities by referring to plant drawings. Start digging manually to locate the exact position of buried utilities and thereafter use mechanical means.
Pit Excavation beyond 3.0m	Same as above plus Flooding due to excessive rain/ underground water	Can cause drowning situation	Prevent ingress of water. Provide ring buoys. Identify and provide suitable size dewatering pump or well point system.
	Digging in the vicinity of existing Building/ Structure	Building/Structure may collapse Loss of health & wealth	Obtain prior approval of excavation method from local authorities. Use under-pining method. Construct retaining wall side by side.
	Movement of vehicles/ equipment's close to the edge of cut.	May cause cave-in or slides. Persons may get buried.	Barricade the excavated area with proper lighting arrangements. Maintain at least 2m distance from edge of cut and use stop blocks to prevent over-run. Strengthen shoring and strutting.

**APPENDIX-E: (Sheet 2 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
Narrow deep excavations for pipelines, etc.	Same as above plus Frequent cave-in or slides	May cause severe injuries or prove fatal	Battering/ benching of sides. Provide escape ladders.
	Flooding due to Hydro- static testing	May arise drowning situation	Same as above plus Bail out accumulated water. Maintain adequate ventilation.
Rock by excavation blasting	Improper handling of explosives	May prove fatal	Ensure proper storage, handling & carrying of explosives by trained personnel. Comply with the applicable explosive acts & rules.
	Uncontrolled explosion	May cause severe injuries or prove fatal	Allow only authorized persons to perform blasting operations. Smoking and open flames are to be strictly prohibited.
	Scattering of stone pieces in atmosphere	Can hurt people	Use PPE like goggles, face mask, helmets etc.
Rock excavation by blasting (Contd.)	Entrapping of persons/ animals.	May cause severe injuries or prove fatal	Barricade the area with red flags and blow siren before blasting.
	Misfire	May explode suddenly	Do not return to site for atleast 20 minutes or unless announced safe by designated person.
Piling Work	Failure of pile-driving equipment	Can hurt people	Inspect Piling rigs and pulley blocks before the beginning of each shift.
	Noise pollution	Can cause deafness and psychological imbalance.	Use personal protective equipments like ear plugs, muffs, etc.
	Extruding rods/casing	Can hurt people	Barricade the area and install sign boards. Provide first-aid.
	Working in the vicinity of 'Live-Electricity'	Can cause electrocution/ Asphyxiation	Keep sufficient distance from Live-Electricity as per IS code. Shut off the supply, if possible. Provide artificial/rescue breathing to the injured.
(B) CONCRETING	Air pollution by cement	May affect Respiratory System	Wear respirators or cover mouth and nose with wet cloth.
	Handling of ingredients	Hands may get injured	Use gloves & other PPE.
	Protruding reinforcement rods.	Feet may get injured	Provide platform above reinforcement for movement of workers or provide end caps for protection on reinforcement bars.

**APPENDIX-E : (Sheet 3 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Earthing of electrical mixers, vibrators, etc. not done.	Can cause electrocution/asphyxiation	Ensure earthing of equipments and proper functioning of electrical circuit before commencement of work.
	Falling of materials from height	Persons may get injured	Use hard hats. Remove surplus material immediately from work place. Ensure lighting arrangements during night hours.
	Continuous pouring by same gang	Cause tiredness of workers and may lead to accident.	Insist on shift pattern. Provide adequate rest to workers between subsequent pours.
	Revolving of concrete mixer/vibrators	Parts of body or clothes may get entrapped.	Allow only mixers with hopper. Provide safety cages around moving motors. Ensure proper mechanical locking of vibrator.
Super-structure	Same as above plus Deflection in props or shuttering material	Shuttering/props may collapse and prove fatal	Avoid excessive stacking on shuttering material. Check the design and strength of shuttering material before commencement of work. Rectify immediately the deflection noted during concreting.
	Passage to work place	Improperly tied and designed props/planks may collapse	Ensure the stability and strength of passage before commencement of work. Do not overload and stand under the passage.
(C) REINFORCE- MENT	Curtailment and binding of rods	Persons may get injured	Use PPE like gloves, shoes, helmets, etc. Avoid usage of shift tools.
	Carrying of rods for short distances/at heights	Workers may get injured their hands and shoulders.	Provide suitable pads on shoulders and use safety gloves. Tie up rods in easily liftable bundles. Ensure proper staging.
	Checking of clear distance/cover with hands	Rods may cut or injure the fingers	Use measuring devices like tape, measuring rods, etc.
	Hitting projected rods and standing on cantilever rods.	Persons may get injured and fell down	Use safety shoes and avoid standing unnecessarily on cantilever rods. Avoid wearing of loose clothes.



**APPENDIX-E: (Sheet 4 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Falling of material from height	May prove fatal	Use helmets. Provide safety nets.
	Transportation of rods by trucks/ trailers	Protruded rods may hit the persons	Use red flags/lights at the ends. Do not protrude the rods in front of or by the side of driver's cabin. Do not extend the rods 1/3 <sup>rd</sup> of deck length or 1.5m whichever is less.
(D) WELDING AND GAS CUTTING	Welding radiates invisible ultraviolet and infra-red rays	Radiation can damage eyes and skin.	Use specified shielding devices and other PPE of correct specifications. Avoid thoriated tungsten electrodes for GTAW.
	Improper placement of oxygen and acetylene cylinders	Explosion may occur	Move out any leaking cylinder. Keep cylinders in vertical position. Use trolley for transportation of cylinders and chain them. Use flashback arrestors.
	Leakage/ cuts in hoses	May cause fire	Purge regulators immediately and then turn off. Never use grease or oil on oxygen line connections and copper fittings on acetylene lines. Inspect regularly gas carrying hoses. Always use red hose for acetylene & other fuel gases and black for oxygen.
	Opening-up of cylinder	Cylinder may burst	Always stand back from the regulator while opening the cylinder. Turn valve slowly to avoid bursting. Cover the lug terminals to prevent short circuiting.
	Welding of tanks, container or pipes storing flammable liquids	Explosion may occur	Empty & purge them before welding. Never attach the ground cable to tanks, container or pipe storing flammable liquids. Never use LPG for gas cutting.

**APPENDIX-E: (Sheet 5 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(E) RADIOGRAPHY	Ionizing radiation	Radiations may react with the skin and can cause cancer, skin irritation, dermatitis, etc.	Ensure Safety regulations as per BARC/AERB before commencement of job. Cordon off the area and install Radiation warning symbols. Restrict the entry of unauthorized persons. Wear appropriate PPE and film badges issued by BARC/AERB.
	Transportation and Storage of Radiography source	Same as above	Never touch or handle radiography source with hands. Store radiography source inside a pit in an exclusive isolated storage room with lock and key arrangement. The pit should be approved by BARC/AERB. Radiography source should never be carried either in passenger bus or in a passenger compartment of trains. BARC/AERB has to be informed before source movement. Permission from Director General of Civil Aviation is required for booking radio isotopes with airlines.
	Loss of Radio Isotope	Same as above	Try to locate with the help of Survey Meter. Inform BARC/AERB (*)
(F) ELECTRICAL INSTALLATION AND USAGE	Short circuiting	Can cause Electrocutation or Fire	Use rubberized hand gloves and other PPE. Don't lay wires under carpets, mats or door ways. Allow only licensed electricians to perform on electrical facilities. Use one socket for one appliance. Ensure usage of only fully insulated wires or cables. Don't place bare wire ends in a socket. Ensure earthing of machineries and equipments Do not use damaged cords and avoid temporary connections. Use spark-proof/ flame proof type field distribution boxes.

(\*) Atomic Energy Regulatory Board (AERB),  
Bhabha Atomic Research Centre (BARC)  
Anushaktinagar, Mumbai – 400 094

**APPENDIX-E: (Sheet 6 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Do not allow open/bare connections. Provide all connections through 30mA ELCB. Protect electrical cables/equipments from water and naked flames. Check all connections before energizing.
	Overloading of Electrical System	Bursting of system can occur which leads to fire	Display voltage and current ratings prominently with 'Danger' signs. Ensure approved cable size, voltage grade and type. Switch off the electrical utilities when not in use. Do not allow unauthorized connections. Ensure proper grid wise distribution of Power.
	Improper laying of overhead and underground transmission lines/cables	Can cause electrocution and prove fatal	Do not lay unarmoured cable directly on ground, wall, roof of trees. Maintain atleast 3m distance from HT cables. All temporary cables should be laid atleast 750 mm below ground on 100 mm fine sand overlying by brick soling. Provide proper sleeves at crossings/ inter-sections. Provide cable route markers indicating the type and depth of cables at intervals not exceeding 30m and at the diversions/ termination.
(G) FIRE PREVENTION AND PROTECTION	Small fires can become big ones and may spread to the surrounding areas	Cause burn injuries and may prove fatal	In case a fire breaks out, press fire alarm system and shout "Fire, Fire". Keep buckets full of sand & water/ fire extinguishing equipment near hazardous locations Confine smoking to 'Smoking Zones' only. Train people for using specific type of fire fighting equipments under different classes of fire. Keep fire doors/ shutters, passages and exit doors unobstructed. Maintain good housekeeping and first-aid boxes (for details refer Appendix-B). Don't obstruct access to Fire extinguishers. Do not use elevators for evacuation during fire. Maintain lightning arrestors for elevated structures. Stop all electrical motors with internal combustion.

**APPENDIX-E : (Sheet 7 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Move the vehicles from dangerous locations. Remove the load hanging from the crane booms. Remain out of the danger areas.
	Improper selection of Fire extinguisher	It may not extinguish the fire	Ensure usage of correct fire extinguisher meant for the specified fire (for details refer Appendix-C). Do not attempt to extinguish Oil and electric fires with water. Use foam cylinders/ CO <sub>2</sub> / sand or earth.
	Improper storage of highly inflammable substances	Same as above	Maintain safe distance of flammable substances from source of ignition. Restrict the distribution of flammable materials to only min. necessary amount. Construct specifically designed fuel storage facilities. Keep chemicals in cool and dry place away from heat. Ensure adequate ventilation. Before welding operation, remove or shield the flammable material properly. Store flammable materials in stable racks, correctly labeled preferably with catchment trays. Wipe off the spills immediately.
	Short circuiting of electrical system	Same as above Can cause Electrocutation	Don't lay wires under carpets, mats or door ways. Use one socket for one appliance. Use only fully insulated wires or cables. Do not allow open/bare connections. Provide all connections through 30mA ELCB. Ensure earthing of machineries and equipments.
(H) VEHICULAR MOVEMENT	Crossing the Speed Limits (Rash driving)	Personal injury	Obey speed limits and traffic rules strictly. Always expect the unexpected and be a defensive driver. Use seat belts/ helmets. Blow horn at intersections and during overtaking operations. Maintain the vehicle in good condition. Do not overtake on curves, bridges and slopes.
	Adverse weather condition	Same as Above	Read the road ahead and ride to the left. Keep the wind screen and lights clean. Do not turn at speed. Recognize the hazard, understand the defense and act correctly in time.

**APPENDIX-E : (Sheet 8 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Consuming alcohol before and during the driving operation	Same as above	Alcohol and driving do not mix well. Either choose alcohol or driving. If you have a choice between hitting a fixed object or an on-coming vehicle, hit the fixed object. Quit the steering at once and become a passenger. Otherwise take sufficient rest and then drive. Do not force the driver to drive fast and round the clock. Do not day dream while driving.
	Falling objects/ Mechanical failure	May prove fatal	Ensure effective braking system, adequate visibility for the drives, reverse warning alarm. Proper maintenance of the vehicle as per manufacturer instructions.
(I) PROOF TESTING (HYDROSTATIC/ PNEUMATIC TESTING)	Bursting of piping Collapse of tanks Tanks flying off	May cause injury and prove fatal	Prepare test procedure & obtain EIL/ Owner's approval. Provide separate gauge for pressurizing pump and piping/equipment. Check the calibration status of all pressure gauges, dead weight testers and temperature recorders. Take dial readings at suitable defined intervals and ensure most of them fall between 40-60% of the gauge scale range. Provide safety relief valve (set at pressure slightly higher than test pressure) while testing with air/ nitrogen. Ensure necessary precautions, stepwise increase in pressure, tightening of bolts/nuts, grouting, etc. before and during testing. Keep the vents open before opening any valve while draining out of water used for hydro-testing of tanks. Pneumatic testing involves the hazard of released energy stored in compressed gas. Specific care must therefore be taken to minimize the chance of brittle failure during a pneumatic leak test. Test temperature is important in this regard and must be considered when the designer chooses the material of construction.

**APPENDIX-E : (Sheet 9 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 345 KPa (50 psi) or 10% of the test pressure. The gas used as test fluid, if not air, shall be nonflammable and nontoxic.
(J) WORKING AT HEIGHTS	Person can fall down	May sustain severe injuries or prove fatal	Provide guard rails/barricade at the work place. Use PPE like full body harness, life line, helmets, safety shoes, etc. Obtain a permit before starting the work at height above 3 meters. Fall arrest and safety nets, etc. must be installed. Provide adequate working space (min. 0.6 m). Tie/weld working platform with fixed support. Use roof top walk ladder while working on a slopping roofs. Avoid movement on beams.
		May hit the scrap/material stacked at the ground or in between	Keep the work place neat and clean. Remove the scrap immediately.
	Material can fall down	May hit the workers working at lower levels and prove fatal	Same as above plus Do not throw or drop materials or equipment from height i.e. do not <i>bomb</i> materials. All tools to be carried in a tool-kit Bag or on working uniform. Remove scrap from the planks. Ensure wearing of helmet by the workers working at lower levels.
(K) CONFINED SPACES	Suffocation/drowning	Unconsciousness, death	Use respiratory devices, if reqd. Avoid over crowding inside a confined space. Provide Exhaust fans for ventilation Do not wear loose clothes, neck ties, etc. Fulfill conditions of the permit.

**APPENDIX-E: (Sheet 10 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Check for presence of hydrocarbons, O <sub>2</sub> level. Obtain work permit before entering a confined space. Ensure that the connected piping of the equipment which is to be opened is pressure free, fluid has been drained, vents are open and piping is positively isolated by a blind flange.
	Presence of foul smell and toxic substances	Inhalation can pose threat to life	Same as above plus Check for hydrocarbon and Aromatic compounds before entering a confined space. Depute one person outside the confined space for continuous monitoring and for extending help in case of an emergency.
	Ignition/ flame can cause fire	Person may sustain burn injuries or explosion may occur	Keep fire extinguishers at a hand distance. Remove surplus material and scrap immediately. Do not smoke inside a confined space. Do not allow gas cylinders inside a confined space. Use low voltage (24V) lamps for lighting. Use tools with air motors or electric tools with max. voltage of 24V. Remove all equipments at the end of the day.
(L) HANDLING AND LIFTING EQUIPMENTS	Failure of load lifting and moving equipment's	Can cause accident and prove fatal	Avoid standing under the lifted load and within the operating radius of cranes. Check periodically oil, brakes, gears, horns and tyre pressure of all moving machinery. Check quality, size and condition of all chain pulley blocks, slings, U-clamps, D-shackles, wire ropes, etc. Allow crane to move only on hard, firm and leveled ground. Allow lifting slings as short as possible and check gunny packings at the friction points. Do not allow crane to tilt its boom while moving. Install Safe Load Indicator. Ensure certification by applicable authority.



**APPENDIX-E : (Sheet 11 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Overloading of lifting equipments	Same as above	Safe lifting capacity of derricks and winches written on them shall be got verified The max. safe working load shall be marked on all lifting equipment's Check the weight of columns and other heavy items painted on them and accordingly decide about the crane capacity, boom and angle of erection Allow only trained operators and riggers during crane operation.
	Overhead electrical wires	Can cause electrocution and fire	Do not allow boom or other parts of crane to come within 3m reach of overhead HT cables. Hook and load being lifted shall preferably remain in full visibility of crane operators.
(M) SCAFFOLDING, FORMWORK AND LADDERS	Person can fall down	Person May sustain severe injuries and prove fatal	Provide guard rails for working at height. Face ladder while climbing and use both hands. Ladders shall extend about 1m above landing for easy access and tying up purpose. Do not place ladders against movable objects and maintain base at 1/4 unit of the working length of the ladder. Suspended scaffolds shall not be less than 500 mm wide and tied properly with ropes. No loose planks shall be allowed. Use PPE, like helmets, safety shoes, etc.
	Failure of scaffolding material	Same as above	Inspect visually all scaffolding materials for stability and anchoring with permanent structures. Design scaffolding for max. load carrying capacity. Scaffolding planks shall not be less than 50x250 mm full thickness lumber or equivalent. These shall be cleated or secured and must extend over the end supports by at least 150mm and not more than 300mm. Don't overload the scaffolds. Do not splice short ladders to make a longer one. Vertical ladders shall not exceed 6m.
	Material can fall down	Persons working at lower level gets injured	Remove excess material and scrap immediately. Carry the tools in a tool-kit bag only. Provide safety nets.

**APPENDIX-E: (Sheet 12 of 12)****CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
(N) STRUCTU- RAL WORKS	Personal negligence and danger of fall	Can cause injury or casualty	Do not take rest inside rooms built for welding machines or electrical distribution system. Avoid walking on beams at height. Wear helmet with chin strap and full body harness while working at height. Use hand gloves and goggles during grinding operations. Cover or mark the sharp and projected edges. Do not stand within the operating radius of cranes.
	Lifting/ slipping of material	Same as above	Do not stand under the lifted load. Stack properly all the materials. Avoid slippage during handling. Control longer pieces lifted up by cranes from both ends. Remove loose materials from height. Ensure tightening of all nuts & bolts.
(O) PIPELINE WORKS	Erection/ lowering failure	Can cause injury	Do not stand under the lifted load. Do not allow any person to come within the radii of the side boom handling pipes. Check the load carrying capacity of the lifting tools & tackles. Use Safe Load Indicators (SLI) Use appropriate PPEs.
	Other	Same as above	Wear gum boots in marshy areas. Allow only one person to perform signaling operations while lowering of pipes. Provide night caps on pipes. Provide end covers on pipes for stoppage of pigs while testing/ cleaning operations.
(P) GRIT BLASTING	Pollution in neighboring area, hit by grits and high pressure air	Can cause personal injury	Ensure the blasting is done in enclosed shed. Keep safe distance while blasting operations. Wear positive pressure blast hood or helmet with view-window, ear-muff/plug, gloves, overall or leather coat /apron, rubber shoes.

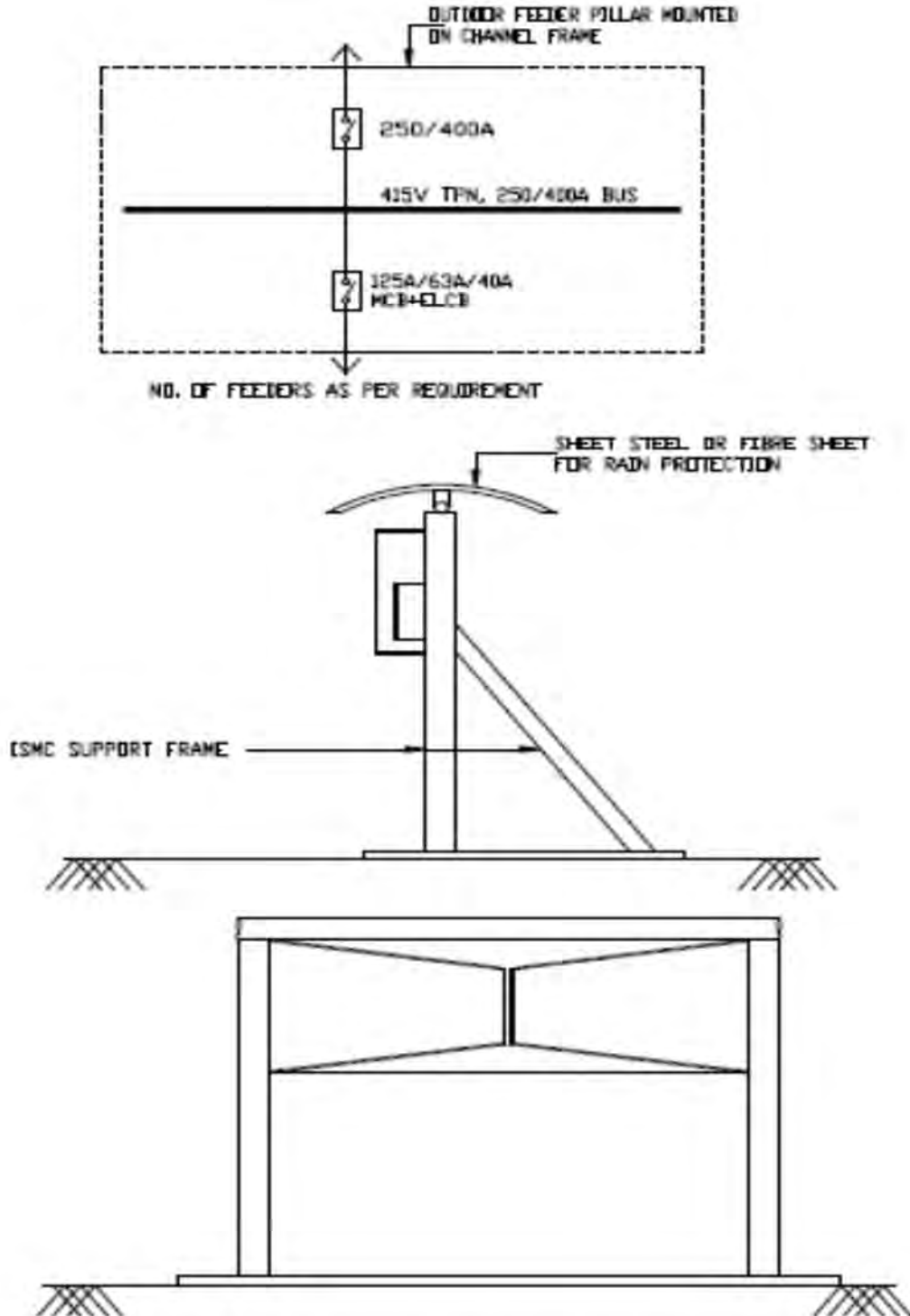
**APPENDIX-F****TRAINING SUBJECTS / TOPICS**

(For contractors' personnel)

1. The Law & Safety – Statutory Requirement / Applicable statutes / Duties of employer / employee
2. Policy & Administration – Why HSE? / Duties & Responsibilities of Safety Personnel at project site / Effect of incentive on accident prevention
3. HSE & Supervision – Duties of Supervisor / HSE integrated supervision/ Who should be held responsible for site accidents?
4. Safety Budget / Cost of Accidents – Direct costs / Indirect costs
5. Hazard Identification / Type of hazards / HIRAC
6. Behavioural Safety & Motivation
7. Housekeeping – Storage / Stacking / Handling of materials / Hydra handling
8. Occupational Health in Construction sector
9. Personal Protective Equipments – Respiratory & Non- respiratory
10. Electricity & Safety – ELCB / Fuse / Powered tools / Project illumination
11. Handling of Compressed Gas – Transportation / Storage / FBAs / Fire prevention
12. Machine Safety – Machine guarding / Maintenance
13. Transportation – Hazards & risks in transp. of materials / ODC consignments
14. Cranes & Other Lifting machinery – Legal requirements vis-à-vis essential safety requirements.
15. Communication – HSE Induction/ TBTs/ Safety Committee/ Safety meeting/ Safety propaganda/ Publicity.
16. Excavation – Risks & Dangers / Safety measures
17. Working at Heights – Use of ladder / Work on roofs / Scaffolds / Double harness lanyards / Life-line / Fall arrester / Safety Nets / Floor openings
18. Hazards in Welding & important safety precautions
19. Gas Cutting – Hazards & safety measures
20. Fire prevention & fire protection

## APPENDIX - G

## CONSTRUCTION POWER BOARD (typ.)



## NOTES:-

1. CONTRACTOR TO INSTALL TEMPORARY CONST. POWER BOARD AS SHOWN IN THE DRG. ITS LOCATION SHALL BE EASILY ACCESSABLE.
2. POWER DISTRIBUTION BOARD SHALL BE EARTHED AT TWO POINTS BY MINIMUM 40X5MM GI STRIP FROM THE AVAILABLE GRID OR DIRECTLY CONNECTED TO TWO DIRECTLY DRIVEN EARTH ELECTRODES.
3. DISTRIBUTION BOARD SHALL BE FABRICATED BY USING 14MM CRCA SHEET STEEL WITH HINGED DOORS AND ALL COMPONENT MOUNTED IN IT.
4. ALL INCOMING AND OUTGOING CABLES SHALL HAVE BOTTOM ENTRY.

**APPENDIX-H****LIST OF PROCEDURES (MINIMUM) TO BE FORMING PART OF HSE PLAN:-****A. HSE Management Procedures:**

- HSE Risk Management (including HIRA)
- HSE Legal Compliance and Other Requirements
- HSE Objectives & Performance
- HSE Training and Competence (including Induction)
- HSE Motivation & Award Scheme
- HSE Audits
- HSE Meetings
- HSE Sub Contractor Management
- HSE Emergency Management
- HSE Incidents Reporting and Management
- HSE Reports
- HSE Management System Review
- HSE Change Management
- HSE procedure for Behaviour based Safety
- First Aid & Management
- Roles, Responsibility, Accountabilities and Authorities

**B. Job procedures/ Safe Operating procedures**

- Setting Up Site & Signages
- Handling of Electrical Appliances
- Working at Height
- Confined Space Entry
- Permit to Work (including hot works)
- Housekeeping
- Lifting Operations
- Transportation of Materials including Manual Handling
- Compressed Air Tools and Units
- Earthmoving Operations & excavation
- Scaffolding
- Fire Prevention/ Protection
- Hazardous Substance Handling & Storage
- Radiation Hazard
- Personal Protective Equipment

**FORMAT NO. : HSE-1 REV 0****(Sheet 1 of 6)****SAFETY WALK-THROUGH REPORT**

(Name &amp; signature of walk through performer to be inserted at the bottom of each page)

Project : \_\_\_\_\_ Report no. : \_\_\_\_\_

Date : \_\_\_\_\_ Contractor : \_\_\_\_\_

Inspection by : \_\_\_\_\_ Owner : \_\_\_\_\_

Frequency : Monthly Job no. : \_\_\_\_\_

Note : Write 'NA' wherever the item is not applicable

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
1.	HOUSEKEEPING				
a)	Waste containers provided and used				
b)	Sanitary facilities adequate and Clean				
c)	Passageways and Walkways Clear				
d)	General neatness of working areas				
e)	Other				
2.	PERSONNEL PROTECTIVE EQUIPMENT				
a)	Goggles; Shields				
b)	Face protection				
c)	Hearing protection				
d)	Foot protection				
e)	Hand protection				
f)	Respiratory Masks etc.				
g)	Full body harness conforming to CC, EN 361				
h)	Hard hat (HDPE)				
i)	Other				
3.	EXCAVATIONS/ OPENINGS				
a)	Openings properly covered or barricaded				
b)	Excavations shored				
c)	Excavations barricaded				
d)	Overnight lighting provided				
e)	Other				

Safety walk-through performer (Name &amp; Signature) .....

FORMAT NO. : HSE-1 REV 0

(Sheet 2 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
4.	WELDING & GAS CUTTING				
a)	Gas cylinders chained upright				
b)	Cables and hoses not obstructing				
c)	Screens or shields used				
d)	Flammable materials protected				
e)	Live electrode bits contained properly				
f)	Fire extinguisher (s) accessible				
g)	Other				
5.	SCAFFOLDING & BARRICADING				
a)	Fully decked platforms				
b)	Guard and intermediate rails in place				
c)	Toe boards in place				
d)	Adequate shoring				
e)	Adequate access				
f)	Positive barricading for critical activities				
g)	Installation of warning signs				
h)	Other				
6.	LADDERS				
a)	Extension side rails 1 m above				
b)	Top of landing				
c)	Properly secured				
d)	Angle + 70° from horizontal				
e)	Other				

Safety walk-through performer (Name &amp; Signature) .....



**FORMAT NO. : HSE-1 REV 0**
**(Sheet 3 of 6)**

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
7.	HOISTS, CRANES AND DERRICKS				
a)	Condition of cables and sheaves OK				
b)	Condition of slings, chains, hooks and eyes O.K.				
c)	Inspection and maintenance log-books maintained				
d)	Outriggers used				
e)	Reverse horn installed / active / coupled with gear				
f)	Signs/barricades provided				
g)	Signals observed and understood				
h)	Qualified operators				
i)	Other				
8.	MACHINERY, TOOLS AND EQUIPMENT				
a)	Proper instruction				
b)	Safety devices				
c)	Proper cords				
d)	Inspection and maintenance				
e)	Other				
9.	VEHICLE AND TRAFFIC				
a)	Rules and regulations observed				
b)	Inspection and maintenance				
c)	Licensed drivers				
d)	Other				

Safety walk-through performer (Name &amp; Signature) .....

**FORMAT NO. : HSE-1 REV 0**
**(Sheet 4 of 6)**

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
10.	TEMPORARY FACILITIES				
a)	Emergency instructions posted				
b)	Fire extinguishers provided				
c)	Fire-aid equipment available				
d)	Secured against storm damage				
e)	General neatness				
f)	In accordance with electrical requirements				
g)	Other				
11.	FIRE PREVENTION				
a)	Personnel trained & instructed to make use of facility				
b)	Fire extinguishers checked periodically & record maintained				
c)	No smoking in Prohibited areas.				
d)	Fire Hydrants not obstructed				
e)	Regular fire drill conducted				
12.	ELECTRICAL				
a)	Use of 3-core armored cables everywhere				
b)	Usage of 'All insulated' or 'double-insulated' electrical tools				
c)	All electrical connection are routed through ELCB				
d)	Natural Earthing at the source of power (Main DB)				
e)	Continuity and tightness of earth conductor				
f)	Effective covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards maintained				
f)	DCP extinguishers arranged & licensed electrician engaged at site				

Safety walk-through performer (Name &amp; Signature) .....

FORMAT NO. : HSE-1 REV 0

(Sheet 5 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
14.	HANDLING AND STORAGE OF MATERIALS				
a)	Safely stored or stacked				
b)	Passageways clear / free from obstructions				
c)	Fire fighting facility in place				
15.	FLAMMABLE GASES AND LIQUIDS				
a)	Containers clearly identified / protected from fire				
b)	Safe storage & transportation arrangement made				
c)	Fire extinguishers positioned nearby				
d)	Facilities kept away from electric spark, hot spatters & ignition source.				
16.	WORKING AT HEIGHT				
a)	Approved Erection plan and work permit in place				
b)	Safe access, Safe work platform & Safety nets provided				
c)	Life lines, Fall arrester, Full body harness with double lanyards used;				
d)	Health Check record available for workers going up?				
e)	Protective handrails arranged around floor openings				
17.	CONFINED SPACE				
a)	Work Permit obtained from requisite authority				
b)	Test for toxic gas and sufficient availability of oxygen conducted & status				
c)	Supervisor present at site & at least one person outside the confined space for monitoring deputed				
d)	Availability of safe means of entry, exit and ventilation (register for entry & exit maintained)				
e)	Fire extinguisher and first-aid facility ensured				
f)	Lighting provision made by using 24V Lamp				
g)	Proper usage of PPEs ensured				
18.	RADIOGRAPHY				
a)	Proper storage and handling of source as per BARC/ AERB guidelines (authorized radiographer available)				
b)	Work permit obtained				

Safety walk-through performer (Name &amp; Signature).....

**FORMAT NO. : HSE-1 REV 0**
**(Sheet 6 of 6)**

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
c)	Cordoning of the area done				
d)	Use of appropriate PPE's ensured				
e)	HSE training to workers/supervisors imparted during the fortnight (indicate topic)				
f)	Minimum occupancy of workplace ensured				
19.	HEALTH CHECKS				
a)	All Workers medically examined and found be fit for working at heights (slinging, rigging, painting etc.) in confined space in excavation / trenching in shot blasting				
b)	Availability of First Aid box with contents				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities.				
e)	Measures for dealing with illness at site & labour camps.				
f)	Availability of Potable drinking water for workmen & staff.				
g)	Provision of crèches for children.				
h)	Stand by vehicle / ambulance available for evacuation of injured				
20.	ENVIRONMENT				
a)	Chemical and Other Effluents properly disposed				
b)	Cleaning liquid of pipes disposed off properly				
c)	Seawater used for hydro-testing disposed off as per agreed procedure				
d)	Lubricant Waste/ Engine oils properly disposed				
e)	Waste from Canteen, offices, sanitation etc. disposed properly				
f)	Disposal of surplus earth, stripping materials, Oily rags and combustible materials done properly				
g)	Green belt protection				

Safety walk-through performer (Name &amp; Signature) .....

FORMAT NO. : HSE-2 REV 0

(Sheet 1 of 3)

**ACCIDENT / INCIDENT REPORT**

(To be submitted by Contractor after every Incident / Accident within 24 hours to EIL/ Owner)

Report No.: \_\_\_\_\_ Date: \_\_\_\_\_

Project site: \_\_\_\_\_ Name of work: \_\_\_\_\_

Contractor's name: \_\_\_\_\_ Contractor's Job Engineer (name) \_\_\_\_\_

<b>Non-disabling injury (Non-LTA)</b>	Hospitalized but resumed duty before end of 48 hrs	
<b>Disabling injury (other LTA)</b>	Hospitalized & failed to resume duty within next 48 hrs	
<b>Fatal (LTA):</b>	Death / Expiry	
<b>First Aid case (non LTA)</b>	Resume duty after first aid	

Name of the injured: \_\_\_\_\_ Father's name of victim: \_\_\_\_\_

Sub Contractor's Name: .....

Gate Pass No.: ..... Age: \_\_\_\_\_ Yrs. Victim's medical fitness exam. (Pre-empl.) date: \_\_\_\_\_

**Date & time of Accident / Incident:** \_\_\_\_\_

Names of Witnesses: (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_

**Profession of victim:**

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c. operator	
Engineer		Manager		Other/ specify	

**Qualification**

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

**Job Experience**

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

**Location where the incident happened:** \_\_\_\_\_

\_\_\_\_\_

**FORMAT NO. : HSE-2 REV 0**
**(Sheet 2 of 3)**
**Activity / Works that were continuing during incident / accident: -**

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

**What exactly the victim was doing just before the incident / accident? .....**

.....

.....

**Nature of injury:**

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

**Parts of body involved in incident / accident**

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Trunk (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

**Accident type:**

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					

**FORMAT NO. : HSE-2 REV 0**
**(Sheet 3 of 3)**
**Medical Aid provided:-** (indicate specific aids / treatment etc.)

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**Actions taken to prevent recurrence of similar incident / accident:** .....

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**Intimation to local authorities** (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA.

If yes, to whom .....

Safety Officer  
(Signature and Name)  
Stamp of Contractor

Site Head / Resident Construction Manager  
(Signature and Name)

To : Owner  
: RCM/Site-in-charge EIL (3 copies)

└─ Divisional Head (Constn.) through RCM  
└─ Project Manager, EIL, through RCM



FORMAT NO. : HSE-3 REV 0

(Sheet 1 of 5)

**SUPPLEMENTARY INCIDENT / ACCIDENT INVESTIGATION REPORT**  
**TICK THE APPROPRIATE ONE AS APPLICABLE (furnish within 72 hours)**

Supplementary to Incident / Accident Report No: \_\_\_\_\_ (Copy enclosed)

Report No.: \_\_\_\_\_ Date: \_\_\_\_\_

Project site: \_\_\_\_\_ Name of work: \_\_\_\_\_

Contractor's name: \_\_\_\_\_ Contractor's Job Engineer (name) \_\_\_\_\_

<b>Non-disabling injury (Non-LTA)</b>	Hospitalized but resumed duty before end of 48 hrs	
<b>Disabling injury (other LTA)</b>	Hospitalized & failed to resume duty within next 48 hrs	
<b>Fatal (LTA):</b>	Death / Expiry	
<b>First Aid case (non LTA)</b>	Resume duty after first aid	

Name of the injured: \_\_\_\_\_ Father's name of victim: \_\_\_\_\_

Sub Contractor's Name: .....

Gate Pass No.: ..... Age: \_\_\_\_\_ Yrs. Victim's medical fitness exam. (Pre-empl.) date: \_\_\_\_\_

**Date & time of Accident / Incident:** \_\_\_\_\_

Names of Witnesses: (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_

**Profession of victim:**

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c. operator	
Engineer		Manager		Other/specify	

**Qualification**

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

**Job Experience**

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

**Location where the incident happened:** \_\_\_\_\_

\_\_\_\_\_

**FORMAT NO. : HSE-3 REV 0**
**(Sheet 2 of 5)**
**Activity / Works that were continuing during incident / accident: -**

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

**What exactly the victim was doing just before the incident / accident? .....**

.....

.....

**Particular of tools & tackles being used and condition of the same after incident/accident:**

.....

.....

**Description of Incident/Accident (How the incident was caused):**

.....

.....

.....

**Nature of injury:**

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

**Parts of body involved in incident / accident**

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Trunk (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

**FORMAT NO. : HSE-3 REV 0**
**(Sheet 3 of 5)**
**Accident type:**

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					

Name &amp; Designation of person who provided First-Aid to the victim: .....

Name &amp; Telephone number of Hospital where the victim was treated .....

Mode of transport used for transporting victim – Ambulance / Private car / Tempo / Truck / Others

How much time taken to shift the injured person to Hospital .....

In case of FATAL incident, indicate clearly the BOCW Registration No. of the victim/ Company  
.....

Comments of Medical Practitioner, who treated / attended the victim/injured (attached / described here) .....

What actions are taken for investigation of the incident, please indicate clearly – (Video film / Photography / Measurements taken etc. ....)

**Immediate cause** (Please tick the right applicable) –

Hazardous methods or procedures inadequately guarded		Poor housekeeping		Inadequate or improper PPE	
Environmental hazards (excess noise/ space constraint/ inadequate ventilation)		improper illumination/ Moving on oval surface		Working on dangerous equipment	

FORMAT NO.: HSE-3 REV 0

(Sheet 4 of 5)

Failure to secure		Horse-play		Failure to use PPE	
Inattention to surroundings		Improper use of hands & body-parts		By-passing safety devices	
Unsafe mixing or placement of tools & tackles		Bypassing standard procedures		Failure in communication	
Operating without authority		Improper use of equipment or tools & tackles		drug or alcoholic influence	
excessive haste		Others(specify)			

**Basic cause**

Over confidence		Impulsiveness		over-exertion	
Faulty judgement or poor understanding		Failing to keep attention constantly		Nervousness & Fear	
Fatigue		Defective vision		Ill health or sickness	
Slow reaction		Others(specify)			

**Root cause**

Inadequate Engg		Improper Design		Inadequate Planning & organization	
Inadequate knowledge		Inadequate skill		Inadequate training	
Inadequate supervision		Improper work procedure		Inadequate compliance with standard	
Substandard performance		Inadequate maintenance		Improper inspection	
Others(specify)					

Loss of man days and impact on site works, (if any) –

**Remarks from Contractor's Safety Officer/ Engineer –**

Was the victim performing relevant tasks for which he was engaged /employed? Yes / No

Was the Supervisor present on work-site during the incident? Yes / No

Have the causes of incident rightly identified? Yes / No

Cause of Accident was \_\_\_\_\_

**FORMAT NO. : HSE-3 REV 0**

**(Sheet 5 of 5)**

Remedial measures recommended by **Safety Officer of Contractor** for avoiding similar incident in future :

.....

.....

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.....

**Intimation to local authorities** (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA.

If yes, to whom .....

.....

Safety Officer  
(Signature and Name)

Site Head / Resident Construction Manager  
(Signature and Name)  
Stamp of Contractor

To : Owner  
: RCM / Site-in-charge of EIL (3 copies)  
→ Divisional Head (Constn.) through RCM  
→ Project Manager EIL, through RCM

**FORMAT NO. : HSE-4 REV 0**
**NEAR MISS INCIDENT/ DANGEROUS OCCURRENCE SUGGESTED PROFORMA**  
(to be submitted within 24 hours)

- **Near Miss** : Human injury escaped & no damage to property, equipment or interruption to work.
- **Dangerous Occurrence**: Damage to property, equipment or interruption of work, but not resulting in personal injury/ illness, e.g. Fire incident, collapse of structure, crane failure, etc.

Report No.: \_\_\_\_\_

Name of Site: \_\_\_\_\_

Date: \_\_\_\_\_

Name of work: \_\_\_\_\_

Contractor: \_\_\_\_\_

Incident reported by : \_\_\_\_\_

Date &amp; Time of Incident : \_\_\_\_\_

Location : \_\_\_\_\_

Brief description of incident  
\_\_\_\_\_  
\_\_\_\_\_Probable cause of incident  
\_\_\_\_\_  
\_\_\_\_\_Suggested corrective action  
\_\_\_\_\_  
\_\_\_\_\_

Steps taken to avoid recurrence

Yes ☐No ☐

To : Owner  
: RCM/Site-in-charge EIL (3 copies)

└─ Divisional Head (Constn.) through RCM  
└─ Project Manager EIL, through RCM

**FORMAT NO. : HSE-5 REV 1****MONTHLY HEALTH, SAFETY & ENVIRONMENTAL (HSE) REPORT**

(To be submitted by each Contractor)

Actual work start Date: \_\_\_\_\_

For the Month of: \_\_\_\_\_

Project: \_\_\_\_\_

Report No: \_\_\_\_\_

Name of the Contractor: \_\_\_\_\_

Status as on : \_\_\_\_\_

Name of Work : \_\_\_\_\_

Job No : \_\_\_\_\_

(Contractor in consultation with EIL shall generate the reports through web based package(www3.eil.co.in/eilhse)only.

ITEM	UPTO PREVIOUS MONTH	THIS MONTH	CUMULATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)			
2) Total Man-hours worked			
3) Number of Induction programmes conducted			
4) Number of HSE meetings organized at site			
5) Number of HSE awareness programmes conducted at site			
6) Number of Tool Box Talks conducted			
7) Number of Lost Time Accidents (LTA)	Fatal		
	Other LTA		
8) Number of Loss Time Injuries (LTI)	Fatalities		
	Other LTI		
9) Number of Non-Loss Time Accidents			
10) Number of First Aid Cases			
11) Number of Near Miss Incidents			
12) No. of unsafe acts/ practices detected			
13) No. of disciplinary actions taken against staff/ workmen			
14) Man-days lost due to accidents			
15) LTA Free man-hours i.e. LTA free man-hours counted from the Last LTA (enter date: .....)			
16) Frequency Rate (No. of LTA per 2 lacs man-hours worked)			
17) Severity Rate (No. of man days lost per 2 lacs man-hours worked)			
18) Loss Time Injury Frequency (No. of LTI per 2 lacs man-hours worked)			
19) No. of activities for which HIRAC completed			
20) No. of incentives/ awards given			
21) No. of occasions on which penalty imposed by EIL/ Owner			
22) No. of Audits conducted			
23) No. of pending NCs in above Audits			
24) Compensation cases raised with Insurance			
25) Compensation cases resolved and paid to workmen			
26) No of Vehicular Accident cases			
27) No of fire/Explosion cases			
28) Whether workmen compensation policy taken		Yes	No
29) Whether workmen compensation policy is valid		Yes	No
30) Whether workmen registered under ESI Act, as applicable		Yes	No
31) Whether HIRAC Register prepared and updated		Yes	No
32) Whether Environment Aspect Impact Register prepared and updated		Yes	No
33) Whether Legal Register prepared and updated		Yes	No
Remarks, if any			

Date:

Prepared by Safety Officer  
(Signature and Name)

To : - OWNER

- RCM EIL (2 copies)

Approved by Site Head / Resident Construction Manager  
(Signature and Name)



**FORMAT NO. : HSE-6 REV 0**  
**PERMIT FOR WORKING AT HEIGHTS (ABOVE 2.0 METER)**  
(In duplicate to be issued daily for site and for office)

Permit No..... Name of Main Contractor.....  
Name of work executing agency / sub agency / vendor .....  
Date..... Exact Location of work.....  
Nature of work ..... Duration of work (from) ..... (to) .....  
Number of workers covered within this permit .....  
(List enclosed with name & gate pass numbers.)

Sl. No.	Items / Subjects	Status of compliance (Yes / No)	
1	Work areas / Equipments inspected		
2	Work area cordoned off		
3	Adequate lighting is provided		
4	Precautions against public traffic taken		
5	Concerned persons in & around have been alerted & cautioned		
6	Hazards / risks involved in routine / non-routine task assessed and control measures have been implemented at specific task		
7	ELCB provided for electrical connection & found working		
8	Ladder safely attached / fixed		
9	Scaffoldings are checked and TAGs are found used correctly		
10	Working platforms are provided and are found sound /safe for use		
11	Safe access & egress arrangements (e.g. ladders, fall arresters, life-lines etc.) are satisfactorily incorporated		
12	a. Openings on platform / floors are effectively cordoned / covered		
	b. Safety Nets are provided wherever required		
13	Use of following safety gadgets by people working at area under this permit, is checked and found satisfactory - Safety helmet Safety harness (full body) with double lanyard Safety Shoes Safety gloves Safety goggles		
14	Housekeeping of work area found satisfactorily tidy / clean & clear		
15	Adequate measures have been taken for works being continued at the ground level, when simultaneous works are permitted overhead at that very location.		
16	Materials are not thrown from heights on to ground		
17	Medical examination of workers are made & found satisfactory		
18	Responsible job engineer / supervisor found physically present at work spot for overall administration of work as well as safety of people.		

Above items have been checked & compliance has been found in place. Hence work is permitted to start / continue at the above-mentioned location. Work shall not start till identified lapses are rectified.

Additional Precautions, if any .....

Work Permit issued by  
Contractor Engineer/ RCM

Verification By  
Contractor Safety Officer

**AT THE END OF THE DAY/WORK:**

All works at height are completed & workmen have returned safely from work location at (time)  
..... (date) .....

(Sig. Contractor Engineer)

FORMAT NO. : HSE-7 REV 0

**CONFINED SPACE ENTRY PERMIT**

Project site \_\_\_\_\_ Sr. No. \_\_\_\_\_  
Name of the work \_\_\_\_\_ Date \_\_\_\_\_  
Name of Contractor \_\_\_\_\_ Nature of work \_\_\_\_\_  
Exact location of work \_\_\_\_\_

<b>Safety Requirements POSITIVE ISOLATION OF THE VESSEL IS MANDATORY</b>								
<b>(A) Has the equipment been ?</b>								
Y	NR		Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	Isolated from power/steam/air	<input type="checkbox"/>	<input type="checkbox"/>	water flushed &/or steamed	<input type="checkbox"/>	<input type="checkbox"/>	radiation sources removed
<input type="checkbox"/>	<input type="checkbox"/>	isolated from liquid or gases	<input type="checkbox"/>	<input type="checkbox"/>	Man ways open & ventilated	<input type="checkbox"/>	<input type="checkbox"/>	proper lighting provided
<input type="checkbox"/>	<input type="checkbox"/>	depressurized &/or drained	<input type="checkbox"/>	<input type="checkbox"/>	cont. inert gas flow arranged	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	blanked/ blinded/ disconnected	<input type="checkbox"/>	<input type="checkbox"/>	adequately cooled	<input type="checkbox"/>	<input type="checkbox"/>	
<b>(B) Expected Residual Hazards</b>								
<input type="checkbox"/>	<input type="checkbox"/>	lack of O <sub>2</sub>	<input type="checkbox"/>	<input type="checkbox"/>	combustible gas/ liquid	<input type="checkbox"/>	<input type="checkbox"/>	H <sub>2</sub> S / toxic gases
<input type="checkbox"/>	<input type="checkbox"/>	corrosive chemicals	<input type="checkbox"/>	<input type="checkbox"/>	pyrophoric iron / scales	<input type="checkbox"/>	<input type="checkbox"/>	electricity / static
<input type="checkbox"/>	<input type="checkbox"/>	heat/ steam / frost	<input type="checkbox"/>	<input type="checkbox"/>	high humidity	<input type="checkbox"/>	<input type="checkbox"/>	ionizing radiation
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
<b>(C) Protection Measures</b>								
<input type="checkbox"/>	<input type="checkbox"/>	gloves	<input type="checkbox"/>	<input type="checkbox"/>	ear plug / muff	<input type="checkbox"/>	<input type="checkbox"/>	goggles / face shield
<input type="checkbox"/>	<input type="checkbox"/>	protective clothing	<input type="checkbox"/>	<input type="checkbox"/>	dust / gas / air line mask	<input type="checkbox"/>	<input type="checkbox"/>	personal gas alarm
<input type="checkbox"/>	<input type="checkbox"/>	grounded air duct/ blower/ AC	<input type="checkbox"/>	<input type="checkbox"/>	attendant with SCBA/air mask	<input type="checkbox"/>	<input type="checkbox"/>	rescue equipment/ team
<input type="checkbox"/>	<input type="checkbox"/>	Fire fighting arrangements	<input type="checkbox"/>	<input type="checkbox"/>	safety harness & lifeline	<input type="checkbox"/>	<input type="checkbox"/>	communication equipment
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
<b>Authorization / Renewal (It is safe to enter the confined space)</b>								
	No. of persons allowed	Name of persons allowed	Signature			Time		Signature
			Contractor's Supervisor	Contractor's Safety Officer		From	To	Workman
<p><b>Permit Closure :</b></p> <p>(A) Entry    <input type="checkbox"/> was closed    <input type="checkbox"/> stopped    <input type="checkbox"/> will continue on .....</p> <p>(B)    <input type="checkbox"/> Site left in a safe condition    <input type="checkbox"/> Housekeeping done</p> <p>(C) Multilock    <input type="checkbox"/> removed    <input type="checkbox"/> key transferred</p> <p>         <input type="checkbox"/> Ensured all men have come out    <input type="checkbox"/> Man-ways barricaded</p> <p>Remarks, if any:</p>								

FORMAT NO. : HSE-8 REV 0

### RADIATION WORK PERMIT

Project : Sr. No. :  
Name of the work : Date :  
Name of site contractor : Job No. :

Location of work :

Source strength :

Cordoned distance (m) :

Name of Radiography agency : Approved by Owner/EIL ☐

No. of workers engaged :  
(List enclosed with name & gate pass numbers.)

The following items have been checked & compliance shall be ensured during currency of the permit:

S. No.	Item description	Done
	Safety regulations as per BARC/AERB ensured while source in use/in transit & during storage	<input type="checkbox"/>
	Area cordoned off / safe working platform provided	<input type="checkbox"/>
	Lighting arrangements for working during nights ensured	<input type="checkbox"/>
	Warning signs/ flash lights installed	<input type="checkbox"/>
	Cold work permit taken (if applicable)	<input type="checkbox"/>
	PPEs like film badges, dosimeters used	<input type="checkbox"/>

Additional precautions, if any \_\_\_\_\_

(Radiography Agency's BARC/AERB authorized Supervisor)

Permission is granted.

Permit is valid from \_\_\_\_\_ AM/PM \_\_\_\_\_ Date to \_\_\_\_\_ AM/PM \_\_\_\_\_  
Date

(Signature of permit issuing authority of site contractor)

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Date: \_\_\_\_\_

Permit renewal:

Permit extended upto		Additional precautions required, if any	Sign. of issuing authority with date (of site contractor)	
Date	Time			

Work completed/ stopped/ area cleared at \_\_\_\_\_ Hrs of Date \_\_\_\_\_  
(Sign. of permit issuing authority)

Name & Signature of site contractor:

**FORMAT NO. : HSE-9 REV 0**  
**DEMOLISHING/DISMANTLING WORK PERMIT**

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :

Name of sub-contractor : No. of workers to be engaged:  
(List enclosed with name & gate pass numbers.)

Line No./ Equipment No./ Structure to be dismantled :

Location details of dismantling/ demolition with sketch : (clearly indicate the area)

The following items have been checked & compliance shall be ensured during currency of the permit:

S. No.	Item description	Done	Not Applicable
	Services like power, gas supply, water, etc. disconnected	<input type="checkbox"/>	<input type="checkbox"/>
	Dismantling/ Demolishing method reviewed & approved	<input type="checkbox"/>	<input type="checkbox"/>
	Usage of appropriate PPEs ensured	<input type="checkbox"/>	<input type="checkbox"/>
	Precautions taken for neighbouring structures	<input type="checkbox"/>	<input type="checkbox"/>
	First-Aid arrangements made	<input type="checkbox"/>	<input type="checkbox"/>
	Fire fighting arrangements ensured	<input type="checkbox"/>	<input type="checkbox"/>
	Precautions taken for blasting	<input type="checkbox"/>	<input type="checkbox"/>

(Contractor's Supervisor)

(Contractor's Safety Officer)

Permission is granted.

(Permit issuing authority)

Name :

Date :

Completion report :

Dismantling/ Demolishing is completed on \_\_\_\_\_ Date at \_\_\_\_\_ Hrs.

Materials/ debris transported to identified location ☐ Tagging completed (as applicable) ☐

Services like power, gas supply, water, etc. restored ☐

(Permit issuing authority)

CONTRACTOR'S NAME

**FORMAT NO. : HSE-10 REV 0****DAILY SAFETY CHECKLIST**

(To make use of before start of day's work)

Project : Sr. No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :

**Description of Job decided to perform : -**

- Use of PPE / Safety Gadgets**

Sl. No	PPEs	Compliance (Yes / No)	Sl. No	PPEs	Compliance (Yes / No)
1	Safety Helmets		6	Face Shield	
2	Safety Shoes		7	Full body harness	
3	Hand Gloves		8	Fall Arrest System	
4	Dust Mask		9	Safety net	
5	Safety Goggles		10	Horizontal life-line made of steel wire, (dia not less than 8.0 mm.)	

(Serial No. 1 &amp; 2 are compulsory for everyone. Specify &amp; ensure use of other safety gadgets as required for the job)

- Identify following important unsafe conditions: -**

Sl. No	Conditions	Yes / No
1	Access to work site / emergency escape clear	
2	Soil / Loose earth kept away from excavated pit / slope / ladder provided	
3	Electrical wire / welding lead lying entangled on ground / welding m/c. booth accessible	
4	Elevated work platform / open ends are protected	
5	Ground area cordoned off before lifting works or erection at height / ground area checked & cordoned-off before start of height works	
6	Structural members / erected pipes / wooden boards/pieces etc. are safely anchored at heights and are not likely to fall down on people when working beneath	
7	Rope ladders tied-up on tall steel structures, long before are removed to get rid of their use	
8	Any Other	

- Indicate actions taken, if status of any of the above items is found "No"**

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.....

- Specific Safety guidelines / precautions, if any (communicated thro' TBT)**

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- Above conditions and PPE compliances are checked by undersigned and correct status are indicated after verification**

 Inspected by  
 Contractor Engineer

 Verification By  
 Contractor Safety Officer

**FORMAT NO. : HSE-11 REV 0**
**(Sheet 1 of 2)**
**HOUSEKEEPING ASSESSMENT& COMPLIANCE**

Project : Sr. No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :  
 Name of contractor : Fortnightly

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non-satisfactory/ No	Remarks	Action
1.	Cleanliness at the Main entry / access of site				
2.	Ground condition / floor areas free from water-logging / oil spillage				
3.	Ground & elevated floors free from rubbish / wastes / accumulated debris / scraps.				
4.	Manholes / openings are covered / fenced				
5.	Trenches are barricaded / walkways are in place				
6.	Drains are cleaned / not choked / not occupied by dumped materials				
7.	Sufficient CAUTION boards / instructions displayed				
8.	Construction machinery are maintained & parked in orderly manner.				
9.	Movement of site people are not obstructed because of dumping / storing of construction materials				
10.	Access/ egress to Electrical Distribution Boards/ Panels clear from wires / cables / earth-strips etc.				
11.	Electrical panel rooms / sheds / MCC / Control rooms / Substations etc. are clean & tidy and not used for storing dress / clothes, tiffin-box or bicycles.				
12.	Passage behind Elec. panels are free for access				
13.	Fire extinguishers / fire-buckets are accessible without any difficulty.				
14.	Stair-steps, platforms & landings are clear & tidy				
15.	Sheds / rooms & work areas have got sufficient illumination as well as ventilation.				
16.	Cables / Wires / welding leads are routed / hanged appropriately & are not creating unsafe condition.				
17.	Stacking / storing of insulation materials or their packing.				
18.	Removal or cleanliness of left-over sand, concrete, brick-bats, insulation-materials, excess earth, wastes etc.				
19.	Storing / stacking of sand, metal chips, re-bars, steel pipes, valves, fittings etc.				
20.	One escape route at ground & minimum two escape routes at elevation available.				

**FORMAT NO. : HSE-11 REV 0**

**(Sheet 2 of 2)**

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non-satisfactory/ No	Remarks	Action
21.	Captions / Posters / Slogans on various safety instructions are displayed legibly in local language				
22.	Cable trenches are water-free or regular arrangement for taking out accumulated water exists.				
23.	Windows of rooms / offices are regularly cleaned				
24.	Facilities for cycle sheds, drinking water, washing, rest-rooms etc. are maintained in tidy manner.				
25.	Toilet, Urinals, Canteen / kitchen / pantry etc. are maintained & free from obnoxious smell.				
26.	Construction tools / tackles are stored systematically - the items are tagged / tested / certified by competent third party.				
27.	Sufficient numbers of Dust-bins / Waste-bins found at site and are regularly emptied.				

Additional remarks, if any -

.....  
.....  
.....

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer



**FORMAT NO. : HSE-12 REV 0**

**INSPECTION OF TEMPORARY ELECTRICAL BOOTH / INSTALLATION**

Project : Sr. No. :  
Name of the work : Date :  
Name of contractor : Job No. :  
Sub Station No./Booth No Location:

SL NO	SUBJECTS	OBSERVATION (YES /NO)	ACTION TAKEN
1	Switchboards installed properly are in order and protected from rain & water-logging.		
2	Adequate illumination provided for switchboard operation during night hours & the lamps are protected from direct human contact.		
3	Voltage ratings, DANGER signs, Shock-Treatment-Chart displayed in the installation / booth		
4	Fire extinguisher (DCP or CO <sub>2</sub> ) & Sand Bucket kept in close vicinity of Switchboards		
5	Valid License & Competent Electrician / Wireman available & name/ license no. displayed at booth / installation.		
6	General housekeeping in & around booth / installation found in order.		
7	Cable-route-markers for U/G cables provided.		
8	Monthly inspection report of Electrical hand tools available in booth / installation.		
9	Insulated Mat provided in front of Elec. Panels.		
10	Rubber hand gloves available/ used by Electricians		
11	Availability of CAUTION boards for shutdown & / or repairing works.		
12	All incoming & outgoing feeders have proper MCCB / HRC fuses / Switches.		
13	Switchboards "earthed" at two distinctly isolated locations.		
14	Switchboards have adequate operating space at the front face & at the rear face too.		
15	All connections provided through 30mA ELCB.		
16	Testing records of all ELCBs available at site		
17	Only industrial type plugs & sockets are used.		
18	Temporary connections are 3-core double insulated & free from cuts & joints and 3 <sup>rd</sup> core is earthed at both ends		
19	Socket boards are properly mounted on stand & protected from water ingress.		
20	Electrical equipments operating above 250V have two earthing / double earthing.		
21	All incoming / outgoing cables are properly glanded & terminated with "lugs".		
22	Switch-boards are of industrial variety / type.		
23	Sketch for installation / connection (SLD) made & pasted& other safety labels/display boards		
24	Labeling of incoming / outgoing feeders made.		
25	All hand lamps are protected from direct contact.		
26	All electrical cable / joints are in safe condition		

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer

FORMAT NO. : HSE-13 REV 0

(Sheet 1 of 2)

### INSPECTION FOR SCAFFOLDING

Project : Sr. No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :

Sl. No	Description	Yes	No	N.A	Actions taken
1	Whether work permit is obtained to take up work at height above 1.5 Mts?				
2	Whether atmospheric condition is "stormy" or "raining" and works at heights have been permitted?				
3	Whether steel pipes scaffoldings are used for units /off-site areas?				
4	Whether scaffolding has been erected on rigid/firm/leveled surfaces / ground? Whether "foot-seals" or "base-plates" are used beneath the up-rights (vertical steel pipes)				
5	Whether scaffold construction is as per IS specification with toe-board and hand-rails (top-rail as well as mid-rail)?				
6	Whether distance between two successive up-rights are less than 2.5 Mts (height of scaffold & load carrying capacity governs the distance between two uprights)				
7	Whether all uprights are extended at least 900 mm above the top most working platform (to enable fitting of handrails)?				
8	Whether vertical distance of two successive ledgers is satisfactory? (varying between 1.3 Mts. To 2.1 Mts)				
9	Whether the peripheral areas of working at height are cordoned-off? (for avoiding accident to people arising out of dropped / deflected materials)				
10	Whether platform is provided? Is it safely approachable?				
11	Whether end of scaffold platform / board are extended beyond transoms? (125mm to 150 mm)				
12	Whether CE / IS approved quality and worthy conditioned full-body safety harness (with double lanyard & karabiners) are used while working at heights?				
13	Whether life-line of safety harness is anchored to an independent secured support capable of withstanding load of a falling person?				
14	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person / vehicle?				
15	Whether clamps used are of good condition, of adequate strength and free from defects?				
16	Whether ladder is placed at secured and leveled surface?				
17	Whether water-pass and oil-spills are avoided around the scaffold structure?				
18	Whether ladder is extended 1.5mts. above the landing point at height?				
19	Whether more than one access/egress provided to the scaffold?				
20	Whether ladder used are of adequate length and overlapping of short ladders avoided?				
21	Whether metallic ladders are placed much away from near-by electrical transmission line?				
22	Whether rungs of ladder are inspected and found in good order?				
23	Whether fall-arresters provided on both the access/egress routes?				
24	Whether diagonal (cross) bracings are provided at regular interval on the scaffold?				
25	Whether working platform on the scaffold has been made free from "jolt" or "gap"?				
26	Whether tools or materials are removed after completion of the day's job at heights?				
27	Whether a valid Permit for Work (PFW) is obtained before taking up work over asbestos or fragile roof?				
28	Whether sufficient precaution is taken while working on fragile roof?				

**FORMAT NO. : HSE-13 REV 0**

**(Sheet 2 of 2)**

Sl. No	Description	Yes	No	N. A	Actions taken
29	Whether provision is made to arrange duck ladder, crawling board for working on fragile roof?				
30	Whether scaffold has been inspected by qualified civil engineers prior to their use?				
31	Whether the scaffolding has been designed for the load to be borne by the same?				
32	Whether the erection and dismantling of the scaffolding is being done by trained persons and under adequate supervision?				
33	Whether safety net with proper working arrangement and life-line has been provided?				
34	Whether TAGS (Green for acceptable and Red for incomplete/unsafe scaffolds) are used on scaffolds?				
35	Whether sufficient illumination is provided in and around the scaffold and access?				
36	Whether emergency rescue / response arrangements are made in place				

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer

FORMAT NO. : HSE-14 REV 0

(sheet 1 of 2)

**PERMIT FOR ERECTION / MODIFICATION & DISMANTLING OF SCAFFOLDING**

Project : Sr. No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :  
 Nature of activities : Duration: From.....To.....

SL. No.	SUBJECTS / ITEMS	DONE	NOT DONE	REMARKS
1	Specific task of Erection / Modification / Dismantling of scaffolds, identified & TAGGED accordingly (before as well as after carrying-out jobs).			
2	People engaged in doing the job are identified & are certified by Job Engineer of Main Contractor as experienced / trained.			Names to be noted
3	Concerned persons are alerted by the Job Engineer of Main Contractor in connection with possible hazards & what the workmen MUST do / MUST not do.			
4	Verification by Job Engineer of Main Contractor made for confirming that all persons permitted to carry-out the jobs are making use of Helmet, Safety Shoes, Goggles, Gloves & Double lanyard safety harness and other relevant PPEs.			
5	Area of work is effectively cordoned-off / barricaded / illuminated.			
6	For taking-up / lowering down Scaffolding members / clamps / couplings etc. appropriate ropes / pulleys/ chains etc. have been arranged for use (not to throw any item) & the same have been verified as "fit for purpose".			
7	Items / members of scaffold, being lowered are removed from the area & stacked correctly.			
8	Ropes, chains, pulley blocks etc. being used for lifting or lowering scaffold items, are inspected by the Job Engineer & their certifications as well as physical conditions have been found O.K, before signing this PERMIT.			
9	Safety Net / Life-line / Fall Arresters etc. are arranged in position and Job Engineer has found working conditions favourable for activities to start.			
10	Scaffold erection or dismantling tasks are being supervised by Experienced Engineer / Competent person.			
11	Only competent & experienced people have been selected / engaged in Scaffolding erection, modification or dismantling tasks.			
12	Adequate & effective actions for traffic and movement of people around the cordoned-off area taken to avoid inadvertent incident			
13	Working platforms are protected with handrails & toe-boards.			
14	Access & Exit (for reach & escape) are safe for use by people.			
15	Tools, tackles to be used for above jobs are verified by job Engineers of Main contractor as genuinely good and tied-up at height (to prevent their fall).			
16	Site important Telephone Nos. are made known to everyone			
17	SOP (Safe Operating Procedure) for the specific task is made & followed too.			
18	Emergency vehicle has been arranged at work locations.			

- This permit for work shall be available at specific work location all the time.
- After completion of work, permit shall be returned to safety cell of main contractor, without fail.
- This Permit shall be issued maximum upto (Monday to Sunday).
- Additional Precautions, if any

- .....  
**ACCORD OF PERMISSION** (to be ticked) - YES ( ) / NO ( )

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer

**FORMAT NO. : HSE-14 REV 0**
**(sheet 2 of 2)**

Everyday Site working conditions & performance of workmen shall be assessed / checked by Contractor Site Engr. and Safety Officer shall verify the same.

	Name / Sign.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Site Engr.								
Safety Off.								

FORMAT NO. : HSE-15 REV 0

**PERMIT FOR HEAVY LIFT / CRITICAL ERECTION**

Project : Sr. No. :  
Name of the work : Date :  
Name of contractor : Job No. :  
Nature of activities : Duration: From.....To.....  
Location of work : Name /Type of crane :  
Equipment/Structure to be erected: Wt. of equipment/ structure to be erected :

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1	Is the crane type suitable for lift or as per erection procedure?				
2	Is the crane have the correct number of counterweights fitted?				
3	Availability of Load Certification of crane from authorized agency.				
4	Is the load chart of crane available in crane cabin/or with Crane operator?				
5	Is the device to check the Wind speed in crane is working? Is the safety features in crane are working?				
6	Availability of Load certification of slings and other accessories from authorized agency				
7	Availability of Licensee/certificate for crane operator from authorized agency.				
8	Availability of approved HIRAC for the subject activities.				
9	Availability of approved erection/rigging procedures.				
10	Availability of temporary gratings/ platforms for critical lifting(as applicable)				
11	Tool Box conducted before erection?				
12	Has the area been cordoned off?				
13	Are the authorized persons during erection are identified?				
14	Does each person identified for erection understand their roles and responsibilities?				
15	Is the ground on which crane will rest or outrigger support are correct?				
16	Is hard stand requirement (if any) complied?				
17	Is the communication system (viz. walkie talkies, etc. are working properly?				
18	If more than one crane is lifting the load, is an Intermediate rigger will supervise the lift?				
19	If there is other obstruction within the operating radius of the crane, have correct precautions been taken to prevent collision?				
20	All the persons are wearing the requisite PPE?				

Inspected & Issued by  
Contractor Engineer/RCM

Verification By  
Contractor Safety Officer

FORMAT NO. : HSE-16 REV 0

### PERMIT FOR ENERGY ISOLATION & DE-ISOLATION

Project : Sr. No. :  
Name of the work : Date :  
Name of contractor : Job No. :

ENERGY ISOLATION PERMIT	
<ul style="list-style-type: none"> <li>Clearance required from: ..... Hrs ..... Date To ..... Hrs ..... Date</li> <li>Name of equipment/ energy source etc. ....</li> <li>Nature of job to be done: .....</li> <li>Area: ..... Location: .....</li> </ul>	
<b>PERMIT VALIDATION</b> I hereby authorize the .....personnel (performer) to isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for maintenance/repair.  Issuing authority Area –Incharge/RCM Signature: Date: Name:	<b>PERFORMING AUTHORITY</b> The work and precautions will be carried out under my overall responsibility.(Testing/execution engineer)  Signature: Date: Name:
<b>SAFETY PRECAUTIONS FOR CLEARANCE</b> 1. Notify workers of intent to de- energize <input type="checkbox"/> 2. Obtain lock, tag or locking/tagging devices <input type="checkbox"/> 3. Shut down, de-energize, dissipate any residual energies. <input type="checkbox"/> 4. Apply lock ,tag and locking and/or tagging devices <input type="checkbox"/> 5. *Any other job specific precautions <input type="checkbox"/> 6. Verify effectiveness of lockout by attempting to restart. <input type="checkbox"/> 7. Proper PPE is ensured <input type="checkbox"/>  I certify that the energy source mentioned above is isolated from all sources and is safe to start the work.  Tag No: ..... Lock No: .....  Issuing authority Area –Incharge /RCM Signature: Date: Name: <b>(*to be included by contractor in consultation with EIL/owner)</b>	<b>NORMALISING AFTER CLEARANCE</b> 1. Notify workers of intent to re- energize <input type="checkbox"/> 2. Conduct visual inspection to confirm that the danger zone is clear of workers <input type="checkbox"/> 3. Conduct visual inspection to confirm that tools, equipment's danger zone is clear of workers <input type="checkbox"/> 4. Reposition the safety devices (interlocks, valves, guards, covers, sensors, as applicable, etc.) <input type="checkbox"/> 5. *Any other job specific normalizing details <input type="checkbox"/> 6. Remove lock, tag and locking and/or tagging devices. <input type="checkbox"/> 7. Re-energize. <input type="checkbox"/> 8. Confirm system is operating properly & safely. I certify that the energy source mentioned above is isolated from all sources and is safe to start the work.  Tag No: ..... Lock No: .....  Issuing authority Area –Incharge /RCM Signature: Date: Name: <b>(*to be included by contractor in consultation with EIL/owner)</b>
ENERGY DE-ISOLATION PERMIT	
<b>PERMIT VALIDATION</b> I hereby authorize the .....personnel (performer) to de- isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for normal operation..  Issuing authority Area –Incharge/RCM Signature: Date: Name:	<b>PERFORMING AUTHORITY</b> I hereby certify that the equipment/energy source mentioned above has been de-isolated and is ready for normal operation. (Testing/execution engineer)  Signature: Date: Name: Countersigned by Issuing authority



**FORMAT NO. : HSE-17 REV 0****PERMIT FOR EXCAVATION**

(depth 2m and above)

**(Sheet 1 of 2)**

Project : Sr. No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :  
 Job Description : Location:  
 Size of excavation :

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1	Suitable and sufficient risk assessments and method statements has been carried to ensure that the work shall be undertaken in accordance with specification and standard.				
2	Are plans/details of underground services available and the same has been reviewed?				
3	Has survey done to locate the services/obstacles etc.				
4	Has the live services (electrical, water line, air line, telephone line, etc.) has been disabled for carrying out the job.				
5	Is adequate barriers/ fences to protect the excavation are in place?				
6	Is Adequate warning signs are in place?				
7	Is Assessment of ground conditions done and remedial action (if any) taken?				
8	Safe access / egress (e.g. ramp / steps / ladders etc.) provided for site workmen & supervisors.				
9	Is the excavation work being undertaken in proximity of structure, etc.? If Yes, it's effect is considered?				
10	Availability of competent person for supervising the excavation work?				
11	Adequate safe arrangement to prevent collapse of edges (e.g. shoring / strutting / benching / sloping etc.) made at site.				
12	Hard barricades (at least 1.0M away from edge & for excavation near site access roads) with warning signs/caution boards are provided				
13	Accumulation / passage-ways of water at periphery of excavation / trench stopped/ restricted.				
14	Is the equipment being used for excavation has been checked for adequacy and is in good working condition having all the safety features?				
15	Age & fitness of workmen ensured by medical test before engagement in job?				
16	Arrangement of Monitoring of possible oxygen deficiency or obnoxious gases done & action taken?				

**PERMIT GRANTED - Yes / No***(List enclosed with name & gate pass numbers.)*
 Name & Signature of Site Engr.  
 Contractor (Initiator)

 Name & Signature of Safety Officer  
 Contractor (Issuing authority)

FORMAT NO. : HSE-17 REV 0

**PERMIT FOR EXCAVATION**

(Sheet 2of 2)

**NOTES: -**

1. Slopes or benches for excavation beyond 2.0M depth shall be designed & approved by Contractor's site head.
2. Excavated earth to be kept at least 1.5M away from edges.
3. Safety helmets, Safety shoes or gum-boots, gloves, goggles, Face shield, Safety Harness shall be essential PPEs.
4. Permit shall be made in **duplicate** and original shall be available at site of work.
5. Permit shall be issued for maximum **one week** only (Monday to Sunday).
6. After completion of works, permit shall be closed & preserved for record purpose.

**GRANT OF PERMIT AND EXTENSIONS**

Sl. No.	Validity period From ____ To ____	Working Time From ____ To ____	Initiator (site Engr. of Main Contractor)	Issuing authority (Safety Officer of Main Contractor)	Review by EIL / Owner (Remarks with date)
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Additional safety instructions if any: -

- 1.
- 2.
- 3.



STANDARD SPECIFICATION FOR HEALTH, SAFETY &  
ENVIRONMENTAL MANAGEMENT  
AT CONSTRUCTION SITES

STANDARD SPECIFICATION No.  
**6-82-0001 Rev. 7**  
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FORMAT NO.

:

HSE-18 REV 0

(Sheet 1of 2)

IDENTIFICATION OF ENVIRONMENTAL ASPECTS, IMPACT ASSESSMENT AND CONTROL MEASURES

S. No	Activity	Environmental Aspect	N/A/E	Environment Impact	Control Measures	Consequences						Risk Level	Significant	Gaps/ Recommendations
						A	B	C	D	E	F	G	Yes/No	



## STANDARD SPECIFICATION FOR HEALTH, SAFETY & ENVIRONMENTAL MANAGEMENT AT CONSTRUCTION SITES

STANDARD SPECIFICATION No.

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### INITIAL ENVIRONMENT REVIEW TECHNIQUE

<b>Environmental Impacts</b>	AP = Air Pollution	WP = Water Pollution	LC = Land Contamination	DNR = Depletion of Natural Resources	NP = Noise Pollution
------------------------------	--------------------	----------------------	-------------------------	--------------------------------------	----------------------

Scale	Quantity (A)	Occurrence (B)	Severity of Impact (C)	Detection (D)	Control (E)	Legal and other requirements (F)
1	Negligible	Very Rare	Negligible visual impact	Immediately	Available & effective at place	In compliance or not applicable
2	Low	Once a month or less	Causes Discomfort or Nuisance	Within 1 hour	Has in-built Secondary control	
3	Moderate	Once a day	Resource Depletion	Within 8 hours	Needs human Intervention	
4	High	Several times a Day	Affects Aquatic Life, flora, fauna or global issue	Within 24 hours	Mechanism in place but not reliable	
5	Excessive	Continuous	Human health effect	More than 24 hours	Absent or no effective control	Not in compliance

**Risk Level - G : A x B x C x D x E x F**

Aspects with score of **100 and above** are considered as significant.

Also, Irrespective of the score, all legal noncompliance's to be considered as significant

Condition	
N	NORMAL
A	ABNORMAL
E	EMERGENCY



**STANDARD SPECIFICATION FOR HEALTH, SAFETY &  
ENVIRONMENTAL MANAGEMENT  
AT CONSTRUCTION SITES**

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**FORMAT NO. : HSE-19 REV 0 HIRAC**

RISK IDENTIFICATION						DESIRED CONTROLS & EXISTING GAPS, IF ANY		RISK ASSESSMENT				RECOMENDED CONTROL ACTIONs TO REDUCE THE RISK LEVEL	ACTION BY	REMARKS
S. No.	Activity	Activity type (R/NR)	Hazards	Condition (N/AN/E)	Associate d Risk	Desired Control Measures	Gaps If Any	Probabil ity (P)	Impact (I)	Risk R= P*I	Risk Classifi cation			

**Likelihood** – Possibility of occurrence of risks based on present gaps (technological / operational / competence / measurement and monitoring);

**UL:** Unlikely, **L:** Likely, **VL:** Very Likely, **FR:** Frequent, **C:** Continuous

**Impact** –

**SI:** Slight Injury, **MI:** Minor Injury, **MJ:** Major Injury, **SF:** Single Fatality, **MF:** Multiple Fatalities

**Level of consequence** – Refer Guidance criteria for this i.e. possible degree of damage;

**Condition- N:** Normal, **AN:** Abnormal, **E:** Emergency


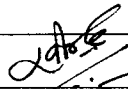

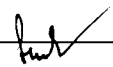
**Activity Type: R-** Routine, **NR-** Non Routine

**RISK** –

**L:** Low Risk, **M:** Moderate Risk, **H:** High Risk

# बोलीकर्ता से गुणवत्ता प्रबंधन प्रणाली अपेक्षाओं हेतु विनिर्देश

## SPECIFICATION FOR QUALITY MANAGEMENT SYSTEM REQUIREMENTS FROM BIDDERS

1	12.03.15	General Revision	 QMS Standards Committee	 QMS Standards Committee	 MPJ	 SC
0	04.06.09	Issued as Standard Specification	QMS Standards Committee	QMS Standards Committee	SCT	ND
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
Approved by						

**Abbreviations:**

CV	-	Curriculum Vitae
ISO	-	International Organization for Standardization
MR	-	Material Requisition
PO	-	Purchase Order
PR	-	Purchase Requisition
QA	-	Quality Assurance
QMS	-	Quality Management System

**QMS Standards Committee**

**Convener:** Mr. M.P. Jain

**Members:** Mr. A.K. Chaudhary (Insp.)  
Mr. S.K. Kaul (C&P)  
Mr. R.K. Trivedi (Engg.)  
Mr. Ravindra Kumar (Const.)  
Mr. Tilak Raj (Projects)  
Mr. Vinod Kumar (CQA)



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5.0	QUALITY SYSTEM REQUIREMENTS .....	4
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## **1.0 SCOPE**

This specification establishes the Quality Management System requirements to be met by BIDDER for following purpose:

- QMS requirements to be met by suppliers/contractors after award of work/ during contract execution.

## **2.0 DEFINITIONS**

### **2.1 Bidder**

For the purpose of this specification, the word "BIDDER" means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

### **2.2 Project Quality Plan**

Document tailored from Standard Quality Management System Manual of BIDDER, specifying how the quality requirements of the project will be met.

### **2.3 Owner**

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

## **3.0 REFERENCE DOCUMENTS**

6-78-0002	Specification for Documentation Requirements from Contractors
6-78-0003	Specification for Documentation Requirements from Suppliers

## **4.0 QUALITY MANAGEMENT SYSTEM – GENERAL**

Unless otherwise agreed with EIL / Owner, the BIDDER proposed quality system shall fully satisfy all relevant requirements of ISO 9001 "Quality Management Systems – Requirements." Evidence of compliance shall be current certificate of quality system registration to ISO 9001 or a recent compliance audit recommending registration from a certification agency. The quality system shall provide the planned and systematic control of all quality related activities for execution of contract. Implementation of the system shall be in accordance with BIDDER'S Quality Manual and PROJECT specific Quality Plan.

## **5.0 QUALITY SYSTEM REQUIREMENTS**

### **5.1**

BIDDER shall prepare and submit for review / record, Project Quality Plan / Quality Assurance Plan for contracted scope / job. The BIDDER'S Quality Plan shall address all of the applicable elements of ISO 9001, identify responsible parties within BIDDER'S organization, for the implementation / control of each area, reference the applicable procedures used to control / assure each area, and verify the documents produced for each area. The Project Quality Plan shall necessarily define control or make reference to the relevant procedures, for design and engineering, purchase, documentation, record control, bid evaluation, inspection, production/manufacturing, preservation, packaging and storage, quality control at

construction site, pre-commissioning, commissioning and handing over (as applicable) in line with contract requirement and scope of work.

- 5.2** BIDDER shall identify all specified or implied statutory and regulatory requirements and communicate the same to all concerned in his organization and his sub contractor's organization for compliance.
- 5.3** BIDDER shall deploy competent and trained personnel for various activities for fulfillment of PO / contract. BIDDER shall arrange adequate infrastructure and work environment to ensure that the specification and quality of the deliverable are maintained.
- 5.4** BIDDER shall do the quality planning for all activities involved in delivery of order. The quality planning shall cover as minimum the following:
- Resources
  - Product / deliverable characteristics to be controlled.
  - Process characteristics to ensure the identified product characteristics are realized
  - Identification of any measurement requirements, acceptance criteria
  - Records to be generated
  - Need for any documented procedure

The quality planning shall result into the quality assurance plan, inspection and test plans (ITPs) and job procedures for the project activities in the scope of bidder. These documents shall be submitted to EIL/Owner for review/approval, before commencement of work.

- 5.5** Requirements for sub-contracting / purchasing of services specified in contract / tender shall be adhered to. In general all outsourced items will be from approved vendors of EIL. Wherever requirements are not specified, or approved sub vendors do not exist, the sub-contractor shall establish and maintain a system for purchasing / sub-contracting to ensure that purchased product / service conforms to specified requirements. Criteria for selection of sub-contractor, evaluation, re-evaluation, maintenance of purchasing data and verification of purchased product (sub-contractor services), constitute important components of this requirement.
- 5.6** BIDDER shall plan and carry production and service provision under controlled conditions. Controlled conditions shall include, as applicable
- a) the availability of information that describes the characteristics of the product
  - b) the availability of work instructions
  - c) the use of suitable equipment
  - d) the availability and use of monitoring and measuring devices
  - e) the implementation of monitoring and measurement
  - f) the implementation of release, delivery and post-delivery activities
- 5.7** BIDDER shall validate any processes for production and service provision where resulting output cannot be verified by subsequent monitoring and measurement. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.
- 5.8** BIDDER shall establish a system for identification and traceability of product / deliverable throughout product realization. Product status with respect to inspection and testing requirements shall be identified.

- 5.9 BIDDER shall identify, verify, protect and safeguard EIL / Owner property (material / document) provided for use or incorporation into the product. If any Owner / EIL property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the EIL / Owner.
- 5.10 BIDDER shall ensure the conformity of product / deliverable during internal processing and delivery to the intended destination. Requirements mentioned in the tender shall be adhered to.
- 5.11 BIDDER shall establish system to ensure that inspection and testing activities are carried out in line with requirements. Where necessary, measuring equipments shall be calibrated at specified frequency, against national or international measurement standards; where no such standard exists, the basis used for calibration shall be recorded. The measuring equipments shall be protected from damage during handling, maintenance and storage.
- 5.12 BIDDER shall ensure effective monitoring, using suitable methods, of the processes involved in production and other related processes for delivery of the scope of contract.
- 5.13 BIDDER shall monitor and measure the characteristics of the product/deliverable to verify that product requirement has been met. The inspection (stage as well as final) by BIDDER and EIL / Owner personnel shall be carried out strictly as per the ITPs forming part of the contract. Product release or service delivery shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by relevant authority and where applicable by Owner / EIL.
- 5.14 BIDDER shall establish and maintain a documented procedure to ensure that the product which does not conform to requirements is identified and controlled to prevent its unintended use or delivery
- 5.15 All non-conformities (NCs) / deficiencies found by the BIDDER'S inspection / surveillance staff shall be duly recorded, including their disposal action shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the BIDDER so that similar NCs including deficiencies do not recur.
- 5.16 All deficiencies noticed and reported by EIL / Owner shall be analyzed by the BIDDER and appropriate corrective and preventive actions shall be implemented. BIDDER shall intimate EIL / Owner of all such corrective and preventive action implemented by him.
- 5.17 BIDDER should follow the standards, specifications and approved drawings. Concessions/Deviations shall be allowed only in case of unavoidable circumstances. In such situations Concession/deviation request must be made by the BIDDER through online system of EIL eDMS. URL of EIL eDMS is <http://edocx.eil.co.in/vportal>.
- 5.18 BIDDER shall have documented procedure for control of documents.
- 5.19 All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, then handed over to EIL / Owner as per contract requirement (Refer Specification Nos. 6-78-0002 - Specification for Documentation Requirements from Contractors and 6-78-0003 - Specification for Documentation Requirements from Suppliers), or disposed as per relevant project procedure.

## 6.0 AUDITS

BIDDER shall plan and carry out the QMS audit for the job. Quality audit programme shall cover design, procurement, construction management and commissioning as applicable including activities carried out by sub-vendors and sub-contractors. This shall be additional to the certification body surveillance audits carried out under BIDDER'S own ISO 9001 certification scheme.

The audit programmes and audit reports shall be available with bidder for scrutiny by EIL / Owner. EIL or Owner's representative reserves the right to attend, as a witness, any audit conducted during the execution of the WORKS.

In addition to above EIL, Owner and third party appointed by EIL/Owner may also perform Quality and Technical compliance audits. BIDDER shall provide assistance and access to their systems and sub-contractor / vendor systems as required for this purpose. Any deficiencies noted shall be immediately rectified by BIDDER.

## 7.0 DOCUMENTATION REQUIREMENTS

BIDDER shall submit following QMS documents immediately after award of work (Within one week) for record / review by EIL / Owner.

- Organization chart (for complete organization structure and for the project)
- Project Quality Plan/Quality Assurance Plan
- Job specific Inspection Test Plans, if not attached with PR
- Job Procedures
- Inspection/Test Formats

In addition to above QMS documents, following documentation shall be maintained by the BIDDER for submission to EIL / Owner on demand at any point of time during execution of the project.

- Quality Manual
- Certificate of approval for compliance to ISO: 9001 standard
- Procedure for Control of Non-conforming Product
- Procedure for Control of Documents
- Sample audit report of the QMS internal and external audits conducted during last one year
- Customer satisfaction reports from at least 2 customers, during the last one year
- Project QMS audit report
- Technical audit reports for the project
- Corrective action report on the audits

Documents as specified above are minimum requirements. BIDDER shall submit any other document/data required for completion of the job as per EIL/Owner instructions.



सामान्य कार्यों (ईपीसीसी/  
एकमुश्त टर्नकी संविदाओं)  
के लिए निरीक्षण एवं परीक्षण  
योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP)  
FOR GENERAL WORKS  
(EPCC/LSTK CONTRACTS)

2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	14.07.2006	ISSUED AS STANDARD SPECIFICATION	AS	MPJ	VNP	VJN
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

**Abbreviations:**

AFC	:	Approved For Construction
CF	:	Ceramic Fibre
PMC	:	Project Management Consultant
SS	:	Stainless Steel like A312 TP 304, 316, 321, 304L, 316L, 316Mo, etc.

**Construction Standards Committee**

**Convenor:** Sh. T.K. Sen ,ED (Construction)

**Members:**

Sh. SN Bhatnagar, GM (Construction)  
 Sh. MK Garg, GM (Construction)  
 Sh. A K Mishra, GM (Construction)  
 Sh. Janak Kishore, DGM (Projects)  
 Sh. Rajeev Jain, DGM, (C&P)  
 Sh. Udayan Chakravarty, AGM (Piping)  
 Sh. Ravindra Kumar, AGM (Construction)  
 Sh. D Jana, AGM (Construction)



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## GENERAL NOTE

*The enclosed ITPs are indicative and shall be followed for developing the job specific ITPs for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (for specific activities) are the minimum and the Engineer-In-Charge may decide to increase Hold Points/ Witness Points while approving the job specific ITPs. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.*

*Contractor to submit job specific reporting formats with the aid of enclosed sample reporting formats and job procedures for the jobs for which ITP's are attached and submit to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.*

## LEGEND

**HP : Hold Point ;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.

The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

**W : Witness Point ;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.

After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

**Rw : Review of Contractor's documentation.**

**S : Surveillance Inspection by Owner/ EIL.**

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

**WC : 100% Supervision and Examination by Contractor.**

**Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages**

ITP NO: 2501

**PAINTING WORKS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
<b>A.</b>	<b>BEFORE FABRICATION</b>		
1.	Availability of Valid calibration certificates of instruments/ testing equipment's	WC	RW
2.	a) Approved supplier, product and supplier's materials test certificate	WC	Note 1
	b) Check manufacturing date, expiry period and shelf life	WC	Note 1
3.	a) Physical condition of materials; original manufacturers packing/ containers	WC	Note 1
	b) Confirm identification/ Transfer of identification of materials before painting	WC	Note 1
4.	a) Adequacy of blasting machine capacity for blast cleaning	WC	--
	b) Type and quality of abrasive being used for blast cleaning	WC	--
	c) Adequacy of Airless spray equipment, air spray equipment and paint brushes	WC	--
5.	Check quality of dry air for blast cleaning and spray application	WC	--
6.	Inspection of blast cleaning operation		
	- Inspect for surface cleanliness by visual stds. of ISO 8501	WC	--
	- Measurement of surface profile by Micrometer/Elkometer/Stylus instrument	WC	--
7.	Wet film thickness ( including primer) and over coating interval for each coat of paint during application	WC	--
8.	Dry film thickness after final coat (wherever applicable)	WC	S
9.	Inspection of final curing/ drying, adhesion, hardness, surface finish, sagging, hiding and pinhole detection	WC	--
10.	Painting identification band/ code, etc.	WC	--
11.	Acceptance prior to shifting to fabrication shop, if applicable	WC	Rw

**Note:** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2501

**PAINTING WORKS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
<b>B.</b>	<b>AFTER INSTALLATION</b>		
1.	a) Approved supplier product : Suppliers materials test certificate	WC	Note 1
	b) Manufacturing date, expiry period and shelf life	WC	Note 1
2.	Physical condition of materials; original manufacturers packing/ containers	WC	Note 1
3.	Confirm completion of		
	a) Hydrostatic testing of piping	WC	--
	b) Mechanical clearance of structure & equipment's	WC	--
4.	a) Adequacy of surface preparation tools and tackles	WC	--
	b) Check the quality of surface preparation	WC	--
5.	a) Performance test for paint applicator for spray application	WC	--
	b) Adequacy of airless spray equipment and air spray equipment and paint brushes and quality of dry air for paint application	WC	--
6.	Wet film thickness and over coating interval for each coat of application	WC	--
7.	Dry film thickness after final coat	WC	S
8.	Identification of color bands, direction marking	WC	--
9.	Identification of color bands, direction marking	WC	--
10.	Final Acceptance	WC	HP
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

**Note:** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2505

**INSULATION WORKS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
<b>1.</b>	<b>PRIOR TO APPLICATION OF INSULATION</b>		
	a. Material Test certificates from supplier of insulation material and acceptance thereof	WC	Note 1
	b. Check testing, if required	WC	Note 1
<b>2.</b>	<b>DURING APPLICATION OF INSULATION</b>		
	a. Surface preparation	WC	--
	b. Fixing of spacer rings and checking their spacing	WC	--
	c. Fixing of support rings and checking their spacing in case of vertical piping	WC	--
	d. Fixing of insulation lugs and angle rings in case of vessels, tanks, etc.	WC	--
	e. Thickness of insulation	WC	--
	f. Aluminium foil for S.S. Piping/Vessels	WC	--
	g. Overlap of cladding at vertical and horizontal joints	WC	--
	h. Expansion joints, if any	WC	--
	i. Inspection windows	WC	--
	j. S.S. foil for S.S. piping	WC	--
	k. Final finish	WC	W
<b>3.</b>	<b>ADDITIONAL CHECKS FOR COLD INSULATION</b>		
	a. Wooden supports	WC	--
	b. Vapour barrier	WC	--
	c. Vapour sealant	WC	--
	d. Insul coat	WC	--
	Review Test and Inspection Documents	WC	Rw

**Note:** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2510

**REFRACTORY LINING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
1	<b>PRIOR TO START OF LINING</b>		
	i) Material Test certificates from suppliers	WC	Note 1
	ii) Field tests and tests from approved laboratories	WC	Note 1
	iii) Availability of Refractory specialist at site (Contractor's/ Vendor's)	WC	HP
2	<b>DURING LINING</b>		
	A) INSULATING FIRE BRICKS		
	i. Clearance for completion of structural works including cleats/ lugs/ anchors/ hooks, etc.	WC	--
	ii. Cleanliness of the surfaces to be lined	WC	--
	iii. Insulating layer application, wherever applicable	WC	--
	iv. Metal foil application, wherever applicable	WC	--
	v. Checking of bricks for their soundness (squareness, cracks and for any other damages)	WC	--
	vi. Mix proportion	WC	S
	vii. Laying of bricks as per specifications	WC	S
	viii. Line and verticality	WC	S
	ix. Identifying location of expansion joints	WC	S
	x. Filling expansion joints, wherever applicable	WC	S
	xi. Finishing works	WC	Rw

ITP NO: 2510

**REFRACTORY LINING**

SL. NO	ACTIVITY	CONTRACTOR	EIL
	B) INSULATING CASTABLE CONCRETE		
i.	Clearance for completion of structural steel work including cleats/ support lugs/ anchors/hooks, etc.	WC	S
ii.	Cleanliness of the surface to be lined	WC	S
iii.	Insulating layer application, wherever applicable	WC	--
iv.	Metal foil application, wherever applicable	WC	--
v.	Fixing of wire mesh	WC	--
vi.	Fixing of shuttering/ scaffolding and providing pockets for pouring mortar	WC	--
vii.	Mix proportion	WC	
viii.	Identifying location of expansion joints	WC	--
ix.	Ramming of mortar for achieving uniform density	WC	--
x.	Filling expansion joints, wherever applicable	WC	--
xi.	Wetting of previous layer prior to casting the Construction joints	WC	--
xii.	Pointing	WC	--
xiii.	Curing	WC	--
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

- Note:**
- 1) For incoming material inspection please refer ITP no: 6-82-1010.
  - 2) Surveillance/witness may be increased in case of boilers, heaters, etc. as per specific requirements given in the specifications.



ITP NO: 2515

**CERAMIC FIBRE LINING**

SL. NO	ACTIVITY	CONTRACTOR	EIL
<b>1</b>	<b>PRIOR TO START OF LINING</b>		
	i. Material Test certificates from suppliers	WC	Note 1
	ii. Field tests and tests from approved laboratories, if applicable	WC	Note 1
	iii. Availability of Refractory specialist at site (Contractor's/ Vendor's/PMCs)	WC	HP
<b>2</b>	<b>DURING LINING</b>		
	i. Clearance for completion of structural works including welding of cleats/ lugs/ anchors/hooks, etc.	WC	S
	ii. Cleanliness of surfaces to be lined	WC	--
	iii. Laying of Ceramic fibre blanket layer wise (As per AFC drawings)	WC	--
	iv. Provision of cups locks/ arrangement for CF lining holding	WC	--
	v. Identifying location of expansion joints	WC	S
	vi. Filling expansion joints as per specifications/ AFC drawings	WC	--
	vii. Finishing works	WC	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**Note:** 1) For incoming material inspection please refer ITP no: 6-82-1010.



**INSPECTION & TEST PLAN  
GENERAL WORKS**

STANDARD SPECIFICATION No.

**6-82-2500 Rev 2**

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**Format No.: G-01  
FIELD PAINTING PRIMER / FINISH PAINT FOR STRUCTURAL STEEL**

<b>PROJECT :</b>										<b>FORMAT NO :</b>					
<b>Name of Work :</b>										<b>REPORT NO :</b>					
<b>FOA No :</b>															
<b>Page :</b>										<b>DATE :</b>					
<b>Surface Preparation Method :-</b>			<b>Type of Primer/Finish Paint/Shade :-</b>				<b>Application Method :</b>			<b>Humidity :</b>					
<b>Surface Preparation Standard :-</b>							<b>Paint Manufacturer :</b>			<b>Temperature :</b>					
<b>Blasting Type:-</b>			<b>Batch No:</b>				<b>BT Certificate No :</b>			<b>Dew point :</b>					
<b>(Shot &amp; Grit/Copper Slag/Sand)</b>			<b>Base :</b>				<b>Shelf Life :</b>			<b>Weather Condition</b>					
<b>B.T Certificate No of Shot &amp; Grit:-</b>			<b>Hard :</b>												
			<b>Calib.certificate No: 1) Profile :-</b>												
<b>DRAWING NO :</b>							<b>GRID NO :</b>				<b>ELEVATION :</b>				
Sl. No.	Particulars/Item/Mark No	DESCRIPTION	MEASUREMENT				Coating Layer	Actual D.F.T. (In Micron)		Acceptance			Remarks		
			L (mm)	B (mm)	THK (mm)	NOS		Required	Actual	Acc/Rej	Contractor	EIL			
1															
2															
3															
4															
5															
<b>CONTRACTOR</b>										<b>EIL</b>					
<b>Signature :</b>															
<b>Name :</b>															
<b>Date :</b>															



**INSPECTION & TEST PLAN  
GENERAL WORKS**

STANDARD SPECIFICATION No.

**6-82-2500 Rev 2**

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**Format no: G-02**

**FIELD PAINTING PRIMER/FINISH PAINT OF EQUIPMENT**

<b>PROJECT :</b>						<b>FORMAT NO :</b>					
<b>Name of Work :</b>						<b>REPORT NO :</b>					
<b>FOA No :</b>											
<b>Page :</b>			<b>JOB No :</b>						<b>DATE :</b>		
<b>Surface Preparation Method :-</b>						<b>Type of Primer/Finish Paint/Shade :-</b>			<b>Application Method :</b>		
<b>Surface Preparation Standard :-</b>									<b>Paint Manufacturer :</b>		
<b>Blasting Type:-</b>				<b>Batch No:</b>			<b>BT Certificate No :</b>				
<b>(Shot &amp; Grit/Copper Slag/Sand)</b>				<b>Base :</b>			<b>Shelf Life :</b>				
<b>B.T Certificate No of Shot &amp; Grit:-</b>				<b>Hard :</b>							
<b>Calib.certificate No: 1) Profile :-</b>								<b>2) DFT Meter :-</b>			
<b>EQUIPMENT NO:</b>								<b>DESIGN TEMP :</b>			
<b>Primer :-1<sup>st</sup> Coat</b>				<b>Finish Paint: 1<sup>st</sup> Coat</b>				<b>Finish Paint: 2<sup>nd</sup> Coat</b>			
<b>Humidity :</b>				<b>Humidity :</b>				<b>Humidity :</b>			
<b>Temperature :</b>				<b>Temperature :</b>				<b>Temperature :</b>			
<b>Dew point :</b>				<b>Dew point :</b>				<b>Dew point :</b>			
<b>Weather Condition :</b>				<b>Weather Condition :</b>				<b>Weather Condition :</b>			
<b>Type of Paint</b>	<b>DFT</b>	<b>Acceptance</b>		<b>Type of Paint</b>	<b>DFT</b>	<b>Acceptance</b>		<b>Type of Paint</b>	<b>DFT</b>	<b>Acceptance</b>	
		<b>Contractor</b>	<b>EIL</b>			<b>Contractor</b>	<b>EIL</b>			<b>Contractor</b>	<b>EIL</b>
<b>Contractor</b>								<b>EIL</b>			
<b>Signature :</b>								<b>Signature :</b>			
<b>Name :</b>								<b>Name :</b>			
<b>Date :</b>								<b>Date :</b>			



**INSPECTION & TEST PLAN  
GENERAL WORKS**

STANDARD SPECIFICATION No.

**6-82-2500 Rev 2**

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**Format no: G -03  
FIELD PAINTING PRIMER/FINISH PAINT (PIPING)**

<b>Owner :</b>						<b>Format no:</b>				
<b>Consultant :</b>						<b>Report no:</b>				
<b>Unit :</b>						<b>Date :</b>				
<b>Project:</b>						<b>Contractor:</b>				
<b>Name of Work:</b>						<b>FOA no:</b>				
<b>Job no:</b>										
<b>Time :</b>			<b>Relative Humidity:</b>	<b>Ambient Temp :</b>	<b>Surface Temp :</b>	<b>Dew Point Temp:</b>		<b>Weather Condition:</b>		
<b>Painting Material System:</b>			<b>Temperature Range:</b>	<b>B. DFT:</b>	<b>Calibration Certificate no:</b>	<b>Due Date:</b>		<b>Shade/color:</b>		
		<b>Material Brand:</b>	<b>Manufacturer:</b>	<b>Certificate no:</b>	<b>Batch no:</b>	<b>Shelf life upto:</b>		<b>Application</b>		
<b>S. No.</b>	<b>Line No/ Spool Particulars/ Item</b>	<b>Size (In Inch)</b>	<b>Length</b>	<b>Area / Zone</b>	<b>Coating Layer</b>	<b>Actual D.F.T (In Micron)</b>		<b>Acceptance</b>		
						<b>Required</b>	<b>Actual</b>	<b>Acc/Rej</b>	<b>Cont.</b>	<b>EIL</b>
		<b>Total</b>								
<b>Signature:</b>	<b>Contractor</b>			<b>EIL</b>						
<b>Name :</b>										
<b>Date</b>										



## INSPECTION & TEST PLAN GENERAL WORKS

STANDARD SPECIFICATION No.

6-82-2500 Rev 2

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Format no: G -04

## INSPECTION REPORT FOR INSULATION WORK – EQUIPMENT

<b>PROJECT :</b>				<b>FORMAT NO :</b>			
<b>Name of Work :</b>				<b>REPORT NO :</b>			
<b>FOA No :</b>				<b>DATE :</b>			
<b>Page :</b>				<b>REV.</b>			
<b>DRAWING NO :</b>				<b>ELEVATION</b>			
<b>GRID NO :</b>		<b>ZONE</b>					
<b>SURFACE PREPARATION :-</b>		<b>Accepted /Not accepted</b>		<b>VISUAL INSPECTION :-</b>		<b>Accepted /Not accepted</b>	
SL NO	ACTIVITY & ITEM NO	Thickness of Insulation	Visual Inspection	SURFACE AREA INSULATED			REMARK
				FROM	TO	SURFACE AREA (SQM)	
1	Lagging of Insulation Materials						
2	Sheeting / Cladding work						
3	Miscellaneous						
	a) Inspection window						
	b) Valve boxes						
	c) Flange covers						
	d) Expansion joints						
	e) SS Foil for SS Piping						
4	For COLD INSULATION						
	a) Wooden support	ACCEPTED / NOT ACCEPTED					
	b) Vapour barrier	ACCEPTED / NOT ACCEPTED					
	c) Vapour sealant	ACCEPTED / NOT ACCEPTED					
	d) Insul. Coat	ACCEPTED / NOT ACCEPTED					
HOT INSULATION (Visual & position of seam to prevent water penetration)				ACCEPTED / NOT ACCEPTED			
COLD INSULATION (Visual & Sealing)				ACCEPTED / NOT ACCEPTED			
FINAL FINISH				ACCEPTED / NOT ACCEPTED			
		<b>Contractor</b>		<b>EIL</b>			
Signature :							
Name :							
Date :							



**INSPECTION & TEST PLAN  
GENERAL WORKS**

**STANDARD SPECIFICATION No.**

**6-82-2500 Rev 2**

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**Format no: G - 05  
INSPECTION REPORT FOR INSULATION WORK - PIPING**

<b>PROJECT :</b>															<b>FORMAT NO :</b>									
<b>Name of Work :</b>															<b>REPORT NO :</b>									
<b>FOA No :</b>																								
<b>Page :</b>															<b>DATE :</b>									
SR. NO.	LINE NO.	DIA	R. Mtr.	OP. TEMP	INSULATION		SPACER RING			MOISTURE BARRIER		HEAT TRACER PUTTY APPLICATION			FIXING OF ALUMINIUM SHEET			REMARKS						
					TYP	THK	QTY	Cont.	EIL	CONT.	EIL	QTY	CONT.	EIL	QTY	CONT.	EIL							
<b>REMARKS:</b>																								
		<b>CONTRACTOR</b>								<b>EIL</b>														
<b>Signature</b>																								
<b>Name</b>																								
<b>Date</b>																								

सिविल, संरचना एवं  
वास्तुकला कार्यों (ईपीसीसी/  
एकमुश्त टर्नकी संविदाओं)  
के लिए निरीक्षण एवं परीक्षण  
योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP)  
CIVIL, STRUCTURAL &  
ARCHITECTURAL WORKS  
(EPCC/LSTK CONTRACTS)

2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	17.10.2005	ISSUED AS STANDARD SPECIFICATION	MPJ	SPS	VNP	VJN
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						



**Abbreviations:**

AFC	:	Approved For Construction
BM	:	Bench Mark
CI	:	Cast Iron
CPT	:	Cone Penetration Test
GI	:	Galvanized Iron
IRC	:	Indian Road Congress
JB	:	Junction Box
MS	:	Mild Steel
MT	:	Magnetic Particle Testing
NDT	:	Non Destructive Testing
PCC	:	Plain Cement Concrete
PQR	:	Procedure Qualification Record
PT	:	Penetration Testing
PVC	:	Poly Vinyl Chloride
PWHT	:	Post Weld Heat Treatment
RCC	:	Reinforced Cement Concrete
RF	:	Reinforcement
SPT	:	Standard Penetration Test
U/G	:	Under Ground
WBM	:	Water Bound Macadam
WPS	:	Welding Procedure Specification

**Construction Standards Committee**

**Convenor:** Sh. T.K. Sen, ED (C)

**Members:** Sh. SN Bhatnagar, GM (Construction)  
 Sh. MK Garg, GM (Construction)  
 Sh. A K Mishra, GM (Construction)  
 Sh. Janak Kishore, DGM (Projects)  
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 Sh. Ravindra Kumar, AGM (Construction)  
 Sh. D Jana, AGM (Construction)

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## GENERAL NOTE

*The enclosed ITPs are indicative and shall be followed for developing the job specific ITP's for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities) are the minimum and the Engineer-In-Charge may decide to increase Hold Points/ Witness Points while approving the job specific ITP's. Activities for which ITP's are not provided in this specification contractor to develop and get the same approved by EIL/Owner before start of the work. In general role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs*

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The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

**W : Witness Point ;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.

After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

**Rw : Review of Contractor's documentation.**

**S : Surveillance Inspection by Owner/ EIL.**

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

**WC : 100% Supervision and Examination by Contractor.**

**Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages**

ITP NO. : 2701

**LAND & TOPOGRAPHICAL SURVEY**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Boundary markings and submission of drgs./sketches	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	W
3.	Block levels, contour plans, establishing permanent bench marks with ref. to Survey of India B.Ms. by check levels and submission of relevant drgs. & records	WC	S
4.	Protection of control points, permanent bench marks and regular rechecking	WC	S
5.	Submission of Master plan showing monuments, structures exposed rocks, weirs, water works, ponds, underground services if crossing that area, etc.	WC	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2702

**SOIL INVESTIGATION**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Positioning of test location	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	W
3.	Boring & sampling	WC	S
4.	In-situ testing (SPT, CPT, Plate load test, Soil Resistivity, Block vibration test, etc.)	WC	S
5.	Lab testing (as applicable)	WC	W/ Rw
6.	Monitoring of water level	WC	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2703

**SITE GRADING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearing and stripping of soil including disposal of unsuitable material	WC	S	-
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	HP
	b) Field calibration, if any	WC	S	-
3.	Taking and plotting of initial levels at specified intervals for cutting as well as filling areas	WC	S*	S*
4.	Classification (Levels of strata) and testing of filling soil for suitability including preparation of Lead Charts to filling/disposal areas.	WC	S	-
5.	Proper warning of explosions, misfires and storage of explosive materials (As applicable).	WC	-	S
6.	Breaking up of clods, lumps, etc. at the time of filling and compaction.	WC	S	-
7.	Identification and suitability of borrow areas for filling soil/murum including verification of payments for royalty, etc.	WC	Rw	-
8.	Compaction test for earth filling in specified layers including finished areas.	WC	Rw	-
9.	Verification of final finished grade levels.	WC	S*	S*
10.	Computation of Earth works.	WC	Rw*	Rw*
11.	Record of tree cuttings, stacking of blasted rocks and other quarry materials including handing over to Owner	WC	S	S
12.	Preparation of "As built drawings	WC	Rw	Rw
13.	Removal of Surplus earth/excavated material and leveling in disposal areas.	WC	S	-
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B: All fillings

CAT C: All cuttings.

\* In case quantum of earthwork is required to be certified by EIL then HP.

ITP NO. : 2704

**EXCAVATION**

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	HP	RW
	b) Field calibration, if any	WC	W	S	-
2.	Layout checking	WC	S	-	-
3.	Taking initial levels	WC	S	-	-
4.	Slopes of excavation, benching, overburden, shoring & strutting (in case of deep excavation)	WC	S	S	-
5.	Check for sub-soil water, dewatering requirements as per specifications.	WC	S	S	S
6.	Bottom level of excavation and compaction	WC	S	S	S
7.	Stacking of different type of soils separately	WC	S	-	-
8.	List of obstacles encountered (cables, pipes, conduits, etc)	WC	S	S	-
9.	Barricading of excavated pits for safety & protection from rain	WC	S	S	S
	<b>FOR HARD ROCK</b>				
1	Obtaining license from district authorities for undertaking blasting operations	WC	Rw	Rw	Rw
2	Storing of explosive materials as per explosive rules	WC	S	S	S
3	Prominent display of red flags around the area to be blasted	WC	S	S	S
4	Check the dimensions of bore holes	WC	S	S	S
5	Stacking of hard rock for useable/non useable including handing over to owner	WC	S	S	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**CAT A :** Equipment foundations, Plant buildings, Technological structure, etc.**CAT B :** Non Plant buildings, pipe racks, pipe culverts, bridges, etc.**CAT C :** Boundary walls, wing walls, manholes, drains, etc



ITP NO. : 2705

**BACK FILLING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Selection of materials/selected earth	WC	W	S	S
2.	Check for treatment of soil, if any	WC	S	S	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	HP	HP
	b) Field calibration, if any	WC	W	S	-
4.	Filling in specified layers, consolidating, watering.	WC	S	-	-
5.	Compaction tests for layers	WC	W	S	Rw
6.	Filling to required levels	WC	S	-	-
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**CAT A:** Equipment foundations, Plant buildings, Technological structure, etc.**CAT B:** Non Plant buildings, pipe racks, pipe culverts, bridges, etc.**CAT C:** Boundary walls, wing walls, manholes, drains, etc

ITP NO. : 2706

**UNDERGROUND PIPING (RCC/ CI)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Checking of material	WC	NOTE 1	NOTE 1
2.	Adequate slope, benching in excavation for safety purposes (if required)	WC	S	
3.	Layout, line & level	WC	S	-
4.	Laying & jointing, grouting at manholes/chambers	WC	S	-
5.	Check for supports/ firm bed/ sub soil water level	WC	S	-
6.	Testing for leakages by blocking pipe ends	WC	W	W
7.	Hydro-testing and other tests, Removal of blockages, Cleaning & flushing of system	WC	W	W
8.	Backfilling in layers	WC	Rw	Rw
9.	Check for MS rungs in proper position, inlet/outlet pipe levels in manholes	WC	S	S
10.	Preparation of "As-built drawings"	WC	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.**CAT B:** Main Plant Buildings, Utilities, Offsites etc.**CAT C:** Non Plant Buildings, Technological Buildings, Admn. Buildings, Gate House, Security Rooms, etc.

ITP NO. : 2707

**WBM ROADS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	RW
	b) Field calibration, if any	WC	S	-
2.	Layout checking including Road crossings and taking initial levels	WC	S	S
3.	Approval of source & checking/testing of materials (wherever required)	WC	NOTE 1	NOTE 1
4.	Filling (if any), compaction, providing cambers in sub-base including levels	WC	S	S
5.	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material	WC	-	-
6.	Check for camber and levels over metalling	WC	S	S
7.	Spreading murrum/ sand, watering and rolling	WC	S	-
8.	Checking thickness after each layer and rectification thereof (if any)	WC	S	S
9.	Checking quantity of aggregate by excavation of trial pits as per IRC Code	WC	W	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT B:** Roads subjected to heavy loading, connected to main highway, main plant roads**CAT C:** Balance Roads

ITP NO. : 2708

**BLACK TOPPING (PREMIX CARPETING) &  
BITUMINOUS MACADAM (BM)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Note 1
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	S
3.	Surface preparation & check for camber/level	WC	S
4.	Checking/ testing of material wherever required	WC	W
5.	Tack coat application	WC	-
6.	Laying of Premix carpeting/ BM including rolling	WC	S
7.	Application of Seal coat	WC	-
8.	Check for camber and levels	WC	S
9.	Check for bitumen temperature and consumption	WC	S
10.	Thickness check of Premix carpet/ BM	WC	S
11.	Removal of surplus earth	WC	-
12.	Berm preparation	WC	-
13.	Final Inspection	WC	W
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2709

**TANK PADS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CAT B
1.	Approval of source of materials	WC	NOTE 1	NOTE 1
2.	Stripping the area	WC	-	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	RW
	b) Field calibration, if any	WC	W	S
4.	Layout and marking of ground level	WC	S	-
5.	Excavation to required level, compaction of sub-base	WC	W	S
6.	Checking/ testing of materials	WC	W	S
7.	Filling selected materials in specified layers, rolling, watering	WC	S	-
8.	Compaction tests	WC	W	Rw
9.	Gravel filling under annular ring with compaction and adding graded filler material (As applicable)	WC	W	S
10.	Anti-corrosive layer, consolidation	WC	S	-
11.	Premix carpeting on side slopes	WC	S	S
12.	Preparation of “As-built drawing” for erection	WC	Rw	Rw
13.	Check for settlement of pads during hydro testing of tanks	WC	W	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT A:** All Site fabricated steel storage tanks for process fluid/ Hydrocarbon, floating roof, tanks having capacity 600cum or 10m dia. and 8 m height.**CAT B:** Site fabricated steel storage tanks for Raw water, Fire water, waste water, DM water, etc. and all tanks not covered under “CAT A”.

ITP NO. : 2710

**MICRO GRADING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW
	b) Field calibration, if any	WC	-
2.	Taking initial levels	WC	S
3.	Clearing/ Removal of extra soil, debris, etc. from site by transportation	WC	-
4.	Taking final levels	WC	S
5.	Verification of gradient of ground	WC	-
6.	Finishing of ground surface by hand compactor/ Roller (As applicable)	WC	S
7.	Final inspection	WC	W
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

ITP NO. : 2740

**FOR UNDERGROUND PIPING (CARBON STEEL)**

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
<b>A.</b>	<b>PRIOR TO FABRICATION</b>			
1	Incoming materials	WC	NOTE 1	NOTE 1
2.	Welding Filler Material Approval/Qualification			
	i) Review of Manufacturer's Test Certificates/ other documents	WC	RW	RW
	ii) Testing, if any	WC	Rw	Rw
3.	WPS/PQR			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Welding of test coupon and subsequent Testing, if applicable	WC	W	W
	iii) Approval of Final WPS/PQR	WC	HP	HP
4	Certification & approval of welders	WC	Rw	Rw
5.	NDT Procedure Qualification			
	i) Review of proposed Procedure	WC	Rw	Rw
	ii) Testing	WC	Rw	Rw
	iii) Approval of NDT procedure	WC	HP	HP
6.	Preparation of sketches from General Arrangement drawings	WC	Rw	-
7.	Joint numbering	WC	Rw	-
8.	Approval of colour coding scheme	WC	Rw	-
9.	Monitoring of colour coding on pipes & fittings	WC	S	-
<b>B.</b>	<b>FABRICATION (SHOP &amp; FIELD)</b>			
1.	Material as per piping class (check w.r.t. approved colour coding procedure)	WC	W	
	i) Fit-up check	WC	S	Rw
	ii) Dimensional check	WC	S	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: -6-82-1010.**CAT B** : All pressure lines, Fire Water line, Cooling Water line, etc.**CAT C** : Balance Works



ITP NO. : 2740

**FOR UNDERGROUND PIPING (CARBON STEEL)**

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
2.	Pre-heat (if any)	WC	S	-
3.	Check for purity of purging/shielding Gas (if any)	WC	S	-
4.	Purging (if any)	WC	S	-
5.	Shielding rate (if any)	WC	S	-
6.	Baking of Electrodes	WC	S	-
7.	Inter-pass cleaning & Temperature check.	WC	S	-
8.	Visual check of completed welds	WC	S	-
9.	PT/MT	WC	S	-
10.	Radiography marking (for Random Radiography)	WC	W	W
11.	Radiography Interpretation	WC	W	W
<b>C.</b>	<b>HYDROSTATIC/ PNEUMATIC TESTING</b>			
1.	Procedure Review	WC	Rw	Rw
2.	Correctness of Testing arrangements	WC	S	-
3.	Calibration of Pressure Gauges	WC	-	-
4.	R.F. Pad testing, if any	WC	S	-
5.	Scrutiny of test packs for Mechanical & NDT Clearance (Refer UG-01)	WC	HP	HP
6.	Air/Water Flushing (preliminary)	WC	S	S
6a.	Addition of corrosion inhibitors, if required – Approval of make & quality	WC	S	S

**CAT B** : All pressure lines, Fire Water line, Cooling Water line, etc.**CAT C** : Balance Works

ITP NO. : 2740

**FOR UNDERGROUND PIPING (CARBON STEEL)**

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
7.	Pneumatic/ Hydrostatic testing	WC	S	S
8.	Draining of water & Air drying	WC	S	S
<b>D.</b>	<b>LAYING</b>			
1.	Trench excavation and levels	WC	S	-
2.	Cleaning of pipe surface	WC	S	-
3	Approval of wrapping/coating material manufacturers	WC	Note 1	Note 1
4.	Approval of agency for wrapping & coating	WC	Rw	Rw
5.	Sample test of coating materials in approved laboratory	WC	Rw	Rw
6.	Application of primer	WC	S	S
7.	Coal tar temperature	WC	S	-
8.	Coating & wrapping	WC	S	S
9.	Check Thickness of coating (if applicable)	WC	S	-
10.	Calibration of Holiday tester	WC	Rw	Rw
11.	Holiday testing	WC	W	S
12.	Peel test	WC	W	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT B** : All pressure lines, Fire Water line, Cooling Water line, etc.**CAT C** : Balance Works

ITP NO. : 2740

**FOR UNDERGROUND PIPING (CARBON STEEL)**

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
14.	Lifting arrangement	WC	S	-
15.	Lowering (levels & orientation of branches)	WC	S	-
16.	Checking of wrapping & coating for damages during lowering, their repair, Holiday Testing, etc.	WC	S	S
17.	Back filling & compaction	WC	S	-
18.	Location, Brickwork, plaster of valve pit	WC	-	-
19.	Top cover & Finish of valve pit	WC	S	S
<b>E.</b>	<b>SYSTEM COMPLETION</b>			
1.	Tie in joints	WC	Refer 2740A	Refer 2740A
2.	Scrutiny of test packs for system testing	WC	Refer 2740B	Refer 2740B
3.	System testing	WC	W	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**CAT B** : All pressure lines, Fire Water line, Cooling Water line, etc.**CAT C** : Balance Works

ITP NO. : 2740A

**TIE IN JOINTS FOR UNDERGROUND PIPING (CARBON STEEL)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
A.	Fit up	WC	W
B.	Root Run DP	WC	W
C.	Final Run DP	WC	W
D.	Radiograph Review	WC	HP
E.	PWHT Hardness	WC	RW
F.	RF Pad Testing	WC	HP
G.	Cleaning & Priming	WC	S
H.	Coating, Wrapping	WC	W
I.	Peel Test	WC	HP
J.	Holiday Testing	WC	HP
K.	Checking For Any Damage In Wrapping & Coating After Lowering, Their Repair Holiday Testing, Etc.	WC	W
L.	Back Filling	WC	S

ITP NO. : 2740B

**MECHANICAL COMPLETION RECORD FOR  
UNDERGROUND PIPING (CARBON STEEL)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Clearance for flushing & testing	WC	Rw	Rw
1a.	Mechanical clearance			
	- Conformity with drawing	WC	HP	Rw
	- Material as per Specification	WC	Rw	Rw
1b.	Welding & NDT clearance			
	- Material as per Specification	WC	Rw	Rw
	- Fit-up check record	WC	Rw	Rw
	- Visual check of completed welds	WC	Rw	-
	- PT/MT	WC	Rw	Rw
	- Radiography	WC	Rw	Rw
	- PWHT & hardness	WC	Rw	Rw
	- RF pad testing	WC	Rw	Rw
2.	Flushing & Pressure testing	WC	W	W
3.	Coating & wrapping			
	- Surface preparation	WC	Rw	-
	- Primer application	WC	Rw	Rw
	- Coating, wrapping & peel test	WC	Rw	-
	- Holiday check	WC	Rw	Rw
4.	Laying			
	- Trench leveling	WC	Rw	Rw
	- Lowering & checking for damages in wrapping & coating, their repair, Holiday testing, etc.	WC	Rw	Rw
	- Backfilling	WC	Rw	Rw

CAT B : All pressure lines, Fire Water line, Cooling Water line, etc.

CAT C : Balance works

ITP NO : 2741

**PLAIN CEMENT CONCRETE**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	S	Rw
2.	Checking of layout and materials, compaction of sub –grade	WC	S	-
3.	Mix proportion	WC	S	-
4.	Check for shuttering, dewatering if any.	WC	-	-
5.	Concreting with proper compaction	WC	-	-
6.	Checking of top level of PCC	WC	Rw	-
7.	Curing	WC	-	-
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT B : for filled-up area

CAT C : for cutting area

ITP NO : 2742

**REINFORCED CEMENT CONCRETE (SUBSTRUCTURE)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	HP	HP
	b) Field calibration, if any	WC	Rw	Rw	Rw
3.	Checking of layout & condition of PCC/ leveling course	WC	S	S	-
4.	Incoming material checking	WC	NOTE 1	NOTE 1	NOTE 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering including its condition, quality and rigidity.	WC	S	S	-
7.	Check for sub-soil water & dewatering arrangement, if any	WC	S	S	-
8.	Reinforcement & covers to reinforcement	WC	S	S	S
9.	Inserts, Anchor bolts and pipe sleeves, pockets, dowels, etc.	WC	S	S	S
10.	Pour Card	WC	W	W	Rw
11.	Check for obstacles encountered (Electrical conduits, pipe lines, etc.)	WC	S	S	-
12.	Concreting, testing, compaction & finishing	WC	W	S	Rw
13.	Casting of cubes	WC	S	S	S
14.	Curing	WC	S	S	-
15.	Testing of cubes	WC	W	W	W
16.	Removal of shuttering	WC	S	-	-
17.	Check for water tightness, rendering, if any	WC	S	S	S
18.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.

**CAT A:** Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour ,etc.

**CAT B:** Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc

**CAT C:** Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

ITP NO : 2743

**REINFORCED CEMENT CONCRETE (SUPER STRUCTURE)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CATA	CATB	CAT C
1	Approval of source of materials	WC	HP	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment	WC	HP	HP	HP
	b) Field calibration, if any	WC	Rw	Rw	Rw
3.	Checking of layout	WC	S	S	-
4.	Incoming material inspection	WC	Note 1	Note 1	Note 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP	HP
6.	Check for line & level of shuttering and scaffolding/ vertical bracing including hoisting arrangements.	WC	S	S	-
7.	Reinforcement & covers to reinforcement	WC	S	S	S
8.	Inserts, bolts, pipe sleeves, MS rungs, concealed electrical conduits, fan hooks, dowels, etc. including welding if any	WC	S	S	-
9.	Pockets/ openings	WC	S	S	-
10.	Expansion joints, if any	WC	S	S	-
11.	Check for water stops, slopes, stoppers, if any	WC	S	S	-
12.	Pour Card	WC	W	W	Rw
13.	Concreting, testing, compaction & finishing	WC	W	S	S
14.	Casting of cubes	WC	S	S	S
15.	Curing	WC	S	S	-
16.	Testing of cubes	WC	W	W	W
17.	Removal of formwork/ staging	WC	S	-	-
18.	Verification of dimensions viz AFC drawings and tolerances	WC	S	S	S
19.	Check for water tightness, rendering, if any	WC	S	S	-
20.	Preparation of As built drawings.	WC	Rw	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

**CAT A:** Super structure of foundations for Critical equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and super structure of any other foundation with RCC Quantity > 250 Cum. in single pour, Slabs of plant and non-plant buildings, etc.

**CAT B:** Unit Pipe racks, plant buildings and super structure of other equipment not covered in category A, etc

**CAT C:** Non critical pipe racks (branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit and balance works.



ITP NO : 2745

**RCC PAVEMENT/FLOORING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Approval of source of materials	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	S
3.	Layout checking/ excavation of all new foundations	WC	-
4.	Incoming material inspection	WC	NOTE 1
5.	Design of mix & establishment of strength at site by trial mix	WC	HP
6.	Check for proper back filling/compaction/ completion of sub - Structure works	WC	S
7.	Check for edges of shuttering, alternate panels	WC	-
8.	Check for slopes, thickness of flooring	WC	S
9.	Shuttering, reinforcement (as applicable)	WC	-
10.	Check for expansion joints/ Construction joints	WC	S
11.	Check for concealed pipe embedment, earthing, if any	WC	-
12.	Check for dividing strips, as applicable	WC	S
13.	Concreting, finishing, etc	WC	S
14.	Checking for line, levels, slopes, joints, thickness of flooring viz. AFC drawings	WC	S
15.	Curing	WC	S
16.	Grinding & polishing, as applicable	WC	S
17.	Testing of concrete cubes (as applicable)	WC	W
18.	Preparation of "As Built Drawings"	WC	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2746

**BRICK MASONARY**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	RW	RW
	b) Field calibration, if any	WC	Rw	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Cleaning of surface	WC	-	-
4.	Wetting/soaking of bricks	WC	S	S
5.	Cement mortar proportion	WC	S	S
6.	Staging & scaffolding	WC	-	-
7.	Hacking of adjacent concrete surface	WC	S	S
8.	Check for bond/closers, thickness of joints	WC	S	-
9.	Line, level & plumb	WC	S	S
10.	Raking out joints, keys in brick work, if any	WC	S	S
11.	Check for placement of Reinforcement bars in case of partition brick work	WC	S	S
12.	Embedment of fixtures	WC	S	S
13.	Curing	WC	-	-
14.	Preparation of 'As Built' Drawings	WC	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT B** : Load bearing walls**CAT C** : Balance works

**ITP NO : 2747**  
**STRUCTURAL STEEL WORKS**

S. NO	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
<b>A</b>	<b>PRE – FABRICATION ACTIVITIES</b>				
1.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP	HP	RW
	b) Field calibration, if any	WC	S	S	Rw
2.	Incoming material inspection	WC	Note 1	Note 1	Note 1
3.	Welding Filler material approval/ qualification				
	a) Manufacturing test certificates/ documents	WC	Rw	Rw	Rw
	b) Testing, if any	WC	W	W	W
4.	Approval of WPS/ PQR	WC	HP	HP	HP
5.	Welders performance qualification	WC	W	W	Rw
6.	Layout checking	WC	S	-	-
7.	Welding equipment and accessories	WC	S	-	-
8.	Preparation and approval of Fabrication drawings	WC	Rw	Rw	-
<b>B</b>	<b>FABRICATION ACTIVITIES</b>				
1.	Materials as per design drawing	WC	Rw	Rw	Rw
2.	Check straightness and non-warping of members	WC	S	S	-
3.	Dimensional and fit-up checks including provision of slopes for deflection wherever required	WC	S	S	-
4.	Visual check for welding	WC	S	S	-
5.	Grinding including surface preparation for painting and application of primer	WC	S	S	Rw
6.	Checking paint as per specs, shelf-life, etc.	WC	S	S	-
7.	Application of specified paint, painting thickness, etc.	WC	S	S	-
<b>C</b>	<b>FIELD ERECTION ACTIVITIES</b>				
1.	Lifting arrangements including test certificates of lifting tackles	WC	S	S	Rw
2.	Correctness of location	WC	S	-	-
3.	Orientation of bracing, lugs	WC	S	-	-
4.	Alignment & levels	WC	S	-	-
5.	Field welding (if any)	WC	S	S	-
6.	Grouting	WC	S	S	-
7.	Finishing coat of paint, thickness of paint etc.	WC	S	S	S
8.	Preparation of As-built drawings	WC	Rw	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.

**CAT A:** Steel structures pertaining to equipments i.e. compressors, reactors, columns, stacks, Technological structures.

**CAT B:** Steel structures pertaining to Unit Pipe racks, and other equipments not covered in category A, etc.

**CAT C:** Steel structures of Non critical pipe racks (branch pipe, offsite pipe rack, etc) plant buildings and non-plant buildings, pipe sleepers, manhole, catch pit, walkways, platforms at grade levels, etc.

ITP NO : 2748

**PILING WORKS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
1.	Approval of source of materials	WC	Rw	Rw	Rw
2.	Layout and ground level	WC	S	S	-
3.	Incoming material inspection	WC	Note 1	Note 1	Note 1
4.	Design of mix & establishment of strength at site by trial mix	WC	HP	HP	HP
5.	Driving of piles & check for set point	WC	S	S	-
6.	Check for depth of bore and lowering of cage measuring	WC	S	-	-
7.	Pour Card	WC	HP	HP	Rw
8.	Concreting, testing	WC	W	S	S
9.	Casting of cubes/Testing	WC	W	S/W	S
10.	Check for cut off level of concreting & quantity of concrete poured	WC	S	-	-
11.	Lifting of casing pipe	WC	S	S	-
12.	Pile load tests (lateral/vertical/cyclic/pull out)	WC	W	Rw	Rw
13.	Submission of pile load test report	WC	Rw	Rw	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.

**CAT A:** Critical foundations of equipments i.e. compressors, reactors, columns, stacks, foundations subjected to dynamic loading and any other foundation with RCC Quantity > 250 Cum in single pour, Technological structures, etc.

**CAT B:** Unit Pipe racks, plant buildings and other equipment foundations not covered in category A, etc.

**CAT C:** Non critical pipe racks(branch pipe, offsite pipe rack, etc.) non-plant buildings, pipe sleepers, manhole, catch pit, etc.

ITP NO : 2771

**ANTI-TERMITE TREATMENT**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material inspection & spraying devices including personal protective equipments like facemask, gloves, shoes, etc.	WC	HP & Note 1
2.	Preparation of surface for taking dosage of emulsion by ramming of each layer of soil by roding the earth at specified intervals	WC	-
3.	Backfilling and compaction in specified layers along with application of emulsifier along the sides of masonry & RCC structures	WC	S
4.	Compaction of top surface for taking dosage of emulsifier by roding the earth at specified intervals for the entire floor area before concreting	WC	-
5.	Check for consumption of emulsifier utilized	WC	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2772

**PLASTERING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Check for completeness of all hidden jobs like piping, conduiting, etc.	WC	-	-
2..	Check for grading of sand, Mix proportion	WC	S	S
3.	Sample preparation for finish and its approval	WC	W	S
4.	Neeru application on plaster (as applicable)	WC	S	-
5.	Hacking and cleaning the surface, removing loose particles, wetting the surface	WC	-	-
6.	Checking of plaster thickness, plumb & even surface	WC	S	-
7.	Check for grooves, openings, rounding off the corners, hollowness in plaster	WC	-	-
8.	Curing	WC	S	-
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	

**CAT B:** Area requiring special finish (e.g. pebble dash finish etc.)**CAT C:** Balance works.

ITP NO. : 2773

**DOORS, WINDOWS AND VENTILATORS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Check for sections & dimensions	WC	S	-
3.	Line, level & plumb	WC	-	-
4.	Section joinery details	WC	Rw	-
5	Grouting with lugs/ dash fasteners	WC	-	
6	Check for fixtures & fittings	WC	S	S
7	Check for thickness & type of glazing	WC	-	-
8	Check for rubber gasket, anodizing (as applicable)	WC	-	-
9	Brand/ shade of paints, no. of coats including surface preparation	WC	S	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT B:** Main plant buildings**CAT C:** Balance works

ITP NO. : 2774

**PAINTING (BUILDING WORKS)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Completion of surface preparation	WC	-	-
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Confirmation of colour, shade & brand	HP	-	-
4.	Check for number of coats and thickness	WC	S	-
5.	Curing, if any	WC	S	-
<b>INSPECTION &amp; TEST DOCUMENTS</b>				
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.**CAT B:** Main plant buildings**CAT C:** Balance works



ITP NO. : 2775

**SANITARY FITTINGS**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Checking of sample (as applicable)	WC	S	-
3.	Check completeness of finishing works w.r.t. line, level & position	WC	S	-
4.	Check proper fixing of the sanitary fittings to give aesthetic appeal	WC	S	-
5.	Check for leakage	WC	S	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.**CAT B:** Main plant buildings**CAT C:** Balance works

ITP NO. : 2776

**WATER PROOFING (ROOF)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Surface preparation for screeding/ water proof plastering	WC	W
2.	Mix proportion, thickness of screeding/ plastering & slope towards rain water pipes	WC	S
3.	Formation of groove at specified height on parapet wall	WC	-
4.	Incoming material inspection, no. of coats, application procedure and consumption.	WC	S/Note 1
5.	Termination of material in groove on vertical plane	WC	S
6.	Check for hollowness, bubbles in water proofing, if any	WC	S
7.	Conducting a sample of water proofing test by flooding the area for specified interval (as applicable)	WC	S
8.	Cleaning of surface	WC	-
9.	Submission of Guarantee in the requisite Performa	WC	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO : 2777

**FALSE FLOORING AND FALSE CEILING**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
	<b>FALSE FLOORING</b>		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Cleaning base floor	WC	-
4.	Painting base floor with Polyurethane based paint (as specified)	WC	S
5.	Proper line, level & layout	WC	S
	<b>FALSE CEILING</b>		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Surface preparation of panel boards	WC	-
4.	Proper line, level & cut-outs	WC	S
5.	Painting of panel boards	WC	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2778

**UNDER DECK INSULATION**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Incoming material checking including density	WC	Note 1
2.	Checking of adhesive, fasteners for anchorage	WC	S
3.	Fixing of scaffolding, ladders, platforms	WC	S
4.	Fixing of under-deck insulation with adhesive	WC	-
5.	Fixing of dash fasteners at defined spacing	WC	-
6.	Finishing	WC	S
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

**NOTE : 1)** For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO. : 2779

**ROOFING ACCESSORIES**

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT B	CAT C
1.	Incoming material inspection	WC	HP/Note 1	HP/Note 1
2.	Check for mitring, overhang, laps, etc.	WC	S	-
3.	Slopes line, level of sheets, barge boards, ridges & gutters, overhang of sheets	WC	S	-
4.	Bolting by drilling only, length of bolts, nos., anodizing and type of washers	WC	S	-
5.	Check for slopes of rain gutters, down take pipes, north lighting curves/ supports for gutters	WC	S	-
6.	Check for leakage/ passing of light	WC	S	-
	<b>INSPECTION &amp; TEST DOCUMENTS</b>			
	Review Test and Inspection Documents	WC	Rw	Rw

**NOTE :** 1) For incoming material inspection please refer ITP no: 6-82-1010.

2) Fixing arrangement need to be reviewed with respect to contract specifications.

**CAT B:** Important structures (e.g. Compressor House, Warehouse and Pump House etc.)**CAT C:** Balance works.

ITP NO. : 2799

**LIGHTING WORKS (NON PLANT BUILDINGS)**

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	Prepare detailed conduit layout diagram as per the approved electrical drawing	WC	W
2.	Provide /PVC/GI sleeves in columns/beams at identified locations to facilitate laying of conduit on later date.	WC	S
3.	Ensure conduit & accessories material is inspected at site before using	WC	W
4.	Ensure that the conduit is laid in line with execution drawings & provide pull-wires as per requirement.	WC	S
5.	Check correctness of drop/JB locations	WC	S
6.	Check threaded joints are proper	WC	S
7.	Ensure all JB/Fan box are properly stuffed with jute	WC	S
8.	Ensure conduits are properly tied to reinforcement bars to prevent floating during concrete	WC	S
9.	Ensure proper supporting of conduit lengths wherever required	WC	S
10.	Ensure adequate chasing depth for conduit portion coming inside brick walls	WC	S
11.	Check workmanship towards joints and presence of any foreign material inside the conduits	WC	S
12.	Ensure wiring material is inspected at site before use	WC	W
13.	Ensure correctness of lighting wire size and no. of wires as per the drawing in each conduit portion	WC	S
14.	Preparation of "As Built" drgs.	WC	Rw
	<b>INSPECTION &amp; TEST DOCUMENTS</b>		
	Review Test and Inspection Documents	WC	Rw

ठेकेदार द्वारा सप्लाई की गई सामग्रियों  
के लिए आवक सामग्री की जांच हेतु  
निरीक्षण एवं परीक्षण योजना (आईटीपी)

## INSPECTION & TEST PLAN (ITP) FOR INCOMING MATERIAL CHECKING FOR CONTRACTOR'S SUPPLIED MATERIALS

1	14.10.2015	REVISED AND REISSUED	DJ	MKG	TKS	SC
0	04.07.2011	ISSUED FOR IMPLEMENTATION	SM	SM	MKG	DM
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

**Abbreviations:**

ATT	:	Anti Termite Treatment
CGI	:	Corrugated Galvanized Iron
CS	:	Carbon Steel
EOT	:	Electric Operated Traction
FLM	:	Flood Light Mast
HOT	:	Heat Operated Traction
HT	:	High Tension
HV	:	High voltage
IMIR	:	Incoming Material Inspection Report.
IRN	:	Inspection Release Note
ITP	:	Inspection Test Plan
KW	:	Kilo Watt
LR	:	Lorry Receipt
LT	:	Low Tension
LV	:	Low Voltage
LEL	:	Low Explosive Detectors
MOC	:	Material of Construction
MTC	:	Manufacture Test Certificate
NACE	:	National Association of Corrosion Engineers
PLC	:	Programmable Logic Control
PRDS	:	Pressure Reducing and De-superheating Stations
QAP	:	Quality Assurance Plan
RCC	:	Reinforced Cement Concrete
SS	:	Stainless Steel
TC	:	Test Certificate
TPIA	:	Third Party Inspection Agency

**Construction Standards Committee**

**Convenor:** Sh. T.K. Sen, GM (I/C) (Construction)

**Members:** Sh. S N Bhatnagar, GM (Construction)  
 Sh. MK Garg, GM (Construction)  
 Sh. Janak Kishore, DGM (Projects)  
 Sh. Rajeev Jain, DGM, (C&P)  
 Sh. Udayan Chakravarty, AGM (Piping)  
 Sh. Ravindra Kumar, AGM (Construction)  
 Sh. D Jana, AGM (Construction)



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## GENERAL NOTE

1. The enclosed ITP is indicative and shall be followed for developing the job specific ITP for checking of incoming material supplied by contractor. The provisions indicated for stage wise inspection by EIL/ Owner are the minimum and the Engineer-In-Charge may decide to increase Hold Points/ Witness Points. Activities not included in the ITP shall be included by the contractor in job specific ITP and the same to be approved by EIL/Owner before start of the work.
2. Contractor to prepare job specific reporting format with the aid of enclosed sample reporting format and job procedure for inspection coverage as per the ITP. Same shall be submitted to EIL/Owner for approval, before commencement of the job. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

## LEGEND

**HP : Hold Point**

A point which requires inspection/verification and acceptance by Owner/EIL before any further processing is permitted.

The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

**W : Witness Point**

An activity which requires witnessing by Owner/EIL when the activity is performed.

After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

**Rw : Review of Contractor's documentation.**

**S : Surveillance Inspection by Owner/ EIL.**

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, review of quality documentation & records, personnel qualifications, etc.

**WC : 100% Supervision and Examination by Contractor.**

**Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages.**

SL NO	ACTIVITY	CONTRACTOR	EIL / OWNER (\$)			Records to be submitted/ Format No.
			CAT 1	CAT2	CAT 3	
<b>A</b>	<b>Document Checking</b>					
1	Check whether vendor/ source is approved	WC	HP	Rw	Rw	G-01
2	Availability of QAP/ ITP duly approved by TPIA	WC	Rw	Rw	Rw	G-01
3	Availability of MTC / IRN (Availability of stage wise Inspection Reports/ Certificates in case of inspection by TPIA, Inspection Reports of Contractor)	WC	HP	Rw	Rw	G-01
4	Availability of certificates from statutory bodies, if applicable	WC	HP	Rw	Rw	
5	Delivery challan/ LR	WC	Rw	Rw	-	G-01
<b>B</b>	<b>Physical Verification</b>					
1	Checking for Inspection stamp/ Identification mark	WC	W*	S	S	G-01
2	Correlation of MTC w.r.t. Heat nos./ Batch no./ Lot no.	WC	HP	W*	W*	G-01
3	Physical assessment of Quantity	WC	S	S	-	G-01
4	Certification of condition of material	WC	W	S	S	G-01
<b>C</b>	Sampling for field tests / tests from approved laboratories, if applicable	WC	W	W	W	G-01
<b>D</b>	Review of field test reports/ test reports if applicable	WC	Rw	Rw	Rw	G-01
<b>E</b>	Review & Endorsement on MTC/IRN/TC etc.	WC	HP	HP	HP	G-01
<b>F</b>	Endorsement on IMIR	WC	HP	HP	HP	G-01

**NOTES:**

- (\$) A generic categorization plan could be framed based on following guideline and as per Table A.
- (\*) Sampling plan for checking of bulk items shall be as per discretion of EIL.
- General :
  - 1) EIL/OWNER and contractor shall jointly finalize the list of incoming materials and categorize in line with inspection categorization plan for bought out items. The items not covered in Table A shall be finalized by Engineer In charge /Owner.
  - 2) In general Sl. no. of the ITP: A (1, 3, 4 & 5) B, E and F shall be applicable to both (#) and (@) i.e. items with and without TPI/EIL inspection.
  - 3) In general Sl. no. of the ITP: A (2), shall be applicable to (@) i.e. items with TPI/EIL inspection.
  - 4) In general Sl. no. of the ITP: C and D shall be applicable to (#) i.e. items without TPI/ EIL inspection.
  - 5) All items to be procured from approved vendors / source as per list enclosed in the contract/ approved vendor list. Prior approval for the source / vendor to be taken for items not listed in the contract / approved vendor list.
  - 6) Anodisation / galvanization shall be ensured in shops having proven track record and samples are to be tested to check galvanizing / anodizing prior to dispatch to sites.

**CAT 1 CRITICAL:** The materials requiring long time impact to meet the stipulation of end user. Completely engineered and inspected as per the contract.

**CAT 2 MAJOR:** The materials requiring lesser time impact on end user. Specified to Industry standards, lower design category (not fully reviewed of detailed Engg. but all interfaces checked) and with complete compliance with code, however requiring limited inspection.

**CAT 3 MINOR:** Standard items, fit for the purpose with minimal Engg. review.

**TABLE: A**

SL NO	CAT 1 (CRITICAL)	CAT 2 (MAJOR)	CAT 3 (MINOR)
<b>Items without TPI / EIL Inspection (#)</b>			
1	Refractory Materials	<ul style="list-style-type: none"> <li>• Cement</li> <li>• Reinforcement</li> <li>• Structural Steel</li> <li>• Brick and Tile Brick</li> <li>• Asphalt (Bitumen)</li> <li>• Paint</li> <li>• Sanitary Wares</li> <li>• Sanitary Fittings (Pipes &amp; Fittings)</li> <li>• Chemicals for ATT</li> <li>• Acid Resistant Tiles and Mortar</li> <li>• Marble</li> <li>• Mechanical Hardener for Flooring</li> <li>• Grouting Compound</li> <li>• Wood for Doors and Windows</li> <li>• Ventilator</li> <li>• Flush Door</li> <li>• Paneled Door</li> <li>• Roof Treatment Materials</li> <li>• False Ceiling &amp; Flooring Materials</li> <li>• RCC Hume Pipes</li> <li>• Anchor Fasteners</li> <li>• Foundation Bolts</li> </ul>	<ul style="list-style-type: none"> <li>• AC Sheets/ CGI Sheets</li> <li>• Particle Board</li> <li>• Glazing Glass</li> <li>• All Galvanized/ Anodized items like GI Pipes</li> <li>• Door/ Window Frames</li> <li>• Pre-Coated Sheets</li> <li>• Steel Doors</li> <li>• Rolling Shutters</li> <li>• Cable Ducts/ Trays</li> <li>• Lightning Arrestors</li> <li>• Street Light Poles</li> <li>• Earthing items</li> </ul>
<b>Items with TPI / EIL Inspection (@)</b>			
1	<ul style="list-style-type: none"> <li>• All Process Compressor, Pumps (with Drive above 110 KW).</li> <li>• Diesel Generators</li> <li>• Vessels (Thickness more than 50 mm) and All Vessels with MOC NACE, Alloy Steel, Clad Steels, Inconel.</li> </ul>	<ul style="list-style-type: none"> <li>• All Types of Pumps, Compressors Excluding Category 1</li> <li>• Fans, Blowers, Conveyors and Material Handling Equipments. Vessels (Thickness less than 50 mm) and other Vessels excluding Category 1</li> <li>• Trays and Tower Internals</li> <li>• Burners for Fired Heaters</li> <li>• EOT / HOT Crane</li> <li>• De Super Heaters &amp; PRDS Air Pre Heaters, Damper, Soot Blowers</li> <li>• Expansion Joint, Gas and Liquid Filters</li> <li>• Pipes/ Piping Material (Flanges, Fittings etc. AS, SS, Clad Steel, Inconel, NACE)</li> </ul>	<ul style="list-style-type: none"> <li>• Hoists</li> <li>• Pipes &amp; Piping Materials (Carbon Steel &amp; Other) excluding Category 2</li> <li>• Gauges Glass</li> <li>• Pressure Gauges, Temperature Gauges, Draft Gauges</li> <li>• Tape Coat Materials</li> <li>• Gratings</li> <li>• Insulation Materials</li> <li>• All Fasteners, Gaskets.</li> </ul>

SL NO	CAT 1 (CRITICAL)	CAT 2 (MAJOR)	CAT 3 (MINOR)
	<ul style="list-style-type: none"> <li>All Columns, Reactors, Heat Exchangers,</li> </ul>	<ul style="list-style-type: none"> <li>All types of Valves</li> <li>All Fire Fighting Equipments, including Deluge Valves LRM, Sprinklers.</li> <li>FLM with Fittings</li> <li>HV/ MV/ LV Switch Gear, Bus Ducts</li> <li>Fire Alarm System</li> <li>HV/ LV Motors</li> <li>DC System including Consoles</li> <li>PLC, Batteries &amp; Battery Chargers, Capacitor Banks</li> <li>Plant Communication System, UPS &amp; Transformer</li> <li>Variable Speed Drives</li> <li>Tank Level Indicator/ Instruments</li> <li>All Control Valves, Pressure Relief Valves, Breather Valves</li> <li>Meter-Flow-Annubar, Solenoid Valve, Annunciators with Panels, Self-Actuating Pressure Control Valves.</li> <li>Temperature Sensing Element RTD's</li> <li>Thermowell and Thermocouple</li> <li>Mass Flow Meters , Pressure Switches, Flow Switches , Level Switches (Explosion Proof)</li> <li>Flow Sensing Element Orifice Plate &amp; Flanges, Pitot Tube Analyzers - LEL Detectors, Level Instruments</li> <li>Transmitters</li> <li>Flame Arrestors</li> <li>Panel Control and Accessories</li> <li>All Cables (Power, Control, Lighting etc.)</li> <li>All Types of Hazardous area Fittings &amp; Fixtures.</li> </ul>	

**Note:** For any material not covered above, the inspection requirement shall be decided by EIC based on the criticality.

**INSPECTION & TEST PLAN  
INCOMING MATERIAL CHECKING**

**Format No: G: 0 1 REV 0  
INCOMING MATERIAL INSPECTION REPORT**

Report No. :  
Date :

Project : Unit : Name of Work :  
Contractor : Consultant : Job No. :  
Work order No.: P.O. No. & Date : LR No. :

Sl. No.	SOR Item No.	Material Description/ Tag No.	Date of Receipt	Qty. Received	Qty. Accepted	Manufacturer/ Vendor	MTC No./ IRN No. with Date/ Field, Lab Test, etc.	Heat/ Batch No.	Ref. Invoice/ Challan No.	Observation/ Remarks/ Storage Instruction

**Notes :**

INSPECTION ACTIVITY AT SITE (Tick as applicable)

- |   |   |  |
|---|---|--|
| 1. Quantity verified and found in order <input type="checkbox"/>      | 2. Material condition appears to be good <input type="checkbox"/> | 3. Heat/Batch/Tag No. mentioned on the material <input type="checkbox"/> |
| 4. Color coding done as applicable <input type="checkbox"/>           | 5. Site identification mark on material <input type="checkbox"/>  | 6. Correlation w.r.t. IRN/MTC/Lab Tests report <input type="checkbox"/>  |
| 7. TC verification w.r.t. IRN/Spec/QAP, etc. <input type="checkbox"/> | 8. Check for Vendor/Source approval <input type="checkbox"/>      | 9. Special Requirement if any. <input type="checkbox"/>                  |

Based on above, materials are accepted.

\_\_\_\_\_  
Contractor Field Engineer  
Name:

\_\_\_\_\_  
Contractor RCM / Site In-charge  
Name:

\_\_\_\_\_  
EIL Field Supervisor  
Name:

\_\_\_\_\_  
EIL Lead Engineer/ Area Coordinator/ Spread In-charge  
(Countersigned)  
Name:

<b>PROJECT EXECUTION AND ASSURANCE PLAN</b>
<b>CONSTRUCTION SUPERVISION AND MANAGEMENT BY EPCC CONTRACTOR</b>

## **CAPTIVE POWER PLANT (CPP) PACKAGE**

**PROJECT : VISAKH REFINERY MODERNISATION PROJECT**

**UNIT : 606**

**OWNER : HPCL VISAKHAPATNAM**

**PMC : EIL**

**JOB NO. : B016**

0	12.05.2017	ISSUED FOR BIDS	P K Rai	R Kumar	CGM(C)
<b>Rev. No</b>	<b>Date</b>	<b>Purpose</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>

## CONSTRUCTION SUPERVISION AND MANAGEMENT

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APPENDIX - A                      QUALITY ASSURANCE AND QUALITY CONTROL MANAGEMENT DURING CONSTRUCTION

APPENDIX - B                      HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT DURING CONSTRUCTION

List of Attachments:

Attachment-I	Inspection & Test Plans (ITPs)	B016-00-19-41-2000 Rev 0
Attachment-II	Standard Specification for Positive Material Identification (PMI) at Construction Sites	6-82-0002, Rev.3
Attachment-III	Standard Specification for Colour Coding of Piping Materials	6-82-0003, Rev.2
Attachment-IV	Standard Specification for Application of Torque and Hydraulic Bolt Tension for Flange Joints	6-76-0002, Rev.2
Attachment-V	Standard Specification for Erection of Equipment and Machinery	6-76-0001, Rev.3
Attachment-VI	Format for Observation on Quality Aspects (OQA)	B016-00-606-19-41-0001 F1
Attachment-VII	Format for Observation on Safety Aspects (OSA)	B016-00-606-19-41-0001 F2
Attachment-VIII	Requirement For Implementation Of Software For Piping Construction Management	B016-00-000-19-41-1001
Attachment-IX	Digital Radiography Requirements	B016-00-000-19-41-1002



## 1.0 GENERAL

- 1.1 The CONTRACTOR shall construct Plant/Facilities in accordance with the requirements of the Technical Standards/ Specifications, with proven/good engineering practices and procedures. Such Facilities shall be safe, reliable and suitable for their intended purpose.
- 1.2 The CONTRACTOR shall provide all supervision, labour, construction equipments, tools & tackles, materials and consumables, temporary facilities, Construction utilities, Drinking Water, Restroom, washroom Facilities etc. and render all support services necessary for the construction. Provision of construction power and water shall be as per Special Conditions of Contract (SCC)/ General Conditions of Contract (GCC). Drinking Water will be provided by Owner at one point nearer to location inside refinery. From the point to site, piping along with the installation of water coolers will be in the scope of Contractor.
- 1.3 The CONTRACTOR shall plan, execute, manage and control all the construction activities for the facilities forming a part of this contract.
- 1.4 The CONTRACTOR shall arrange insurance coverage for all the personnel engaged by him for the work as per statutory rules, regulations and local laws.
- 1.5 The CONTRACTOR shall insure all the materials and equipments against fire, flood, earthquake, theft, etc. as per SCC/ GCC brought for the job till the Plant/Facilities are commissioned and handed over to the OWNER.
- 1.6 The CONTRACTOR to ensure mechanizing the construction activities to a great extent.
- 1.7 The CONTRACTOR is deemed to have full knowledge of the applicable laws and regulations, conditions of labour, local conditions, the site conditions, environmental aspects and shall comply with the requirements thereof.
- 1.8 The CONTRACTOR is required to organize and mobilize Construction Management Services in a systematic and sequential manner to ensure that the Plant installation is carried out in accordance with the approved engineering drawings, specifications, standards, QA/QC procedures etc. and its mechanical completion is achieved within targeted time schedule. Construction Management and Supervision is to be carried out by the CONTRACTOR himself by deploying persons on his rolls and this activity is not to be sub-contracted in any case.

For this purpose, the Contractor shall deploy a Construction Management Team headed by a qualified & experienced person at site. The Construction Management team shall include engineers/ specialists in QA/QC, Project Control (Planning, scheduling, monitoring), contracts, construction supervision, progress measurement/billing, safety, warehousing, purchasing etc. Key personnel including the Head should have sufficient qualification/experience and should not be changed without concurrence from Owner/PMC.

Curriculum vitae of all key Construction Personnel shall be submitted to Owner/PMC at least 3 months before deployment. Owner/PMC reserves the right to interview these personnel before their mobilization.

- 1.9 The CONTRACTOR shall ensure delegation of adequate and sufficient powers (including financial) to the Head of his Construction Team for effective and smooth functioning of the construction management. HO support shall be provided to the Head of Construction Team at site during construction on all matters of project execution including the following:
  - Field engineering.
  - Vendor specialists required during construction.
  - Rectification/replacement of defective supplies, if any, noticed during construction.
  - Expediting replacement of imported items found short/damaged.
  - Required documentation for the material management & material inspection at site

- Compilation and submission of Field Inspection documents in requisite copies as per contract
- Documentation to meet statutory requirements.

1.10 The construction supervision, co-ordination and management activities shall be carried out by the CONTRACTOR in accordance with the construction procedures developed and submitted by the CONTRACTOR and approved by Owner/PMC. CONTRACTOR shall prepare construction schedules within the framework of overall contract schedule and submit to Owner/PMC for approval. CONTRACTOR shall plan, execute, monitor and control construction activities as per the approved construction schedule. The schedule so prepared shall be reviewed periodically and backlog if any related to availability of work front/ materials shall be brought to the notice of Engineer-in- Charge and corrective actions to be taken to meet the monthly/ overall Construction targets.

CONTRACTOR shall depute a project team at site during construction phase under a project coordinator for providing above-mentioned support to the Head of Construction Team.

1.11 The CONTRACTOR shall procure material like cement, reinforcement bars and structural steel from approved vendors only. The CONTRACTOR shall establish and maintain a material testing laboratory for carrying on field tests during execution of contracts under different disciplines by sub-contractor's, at no extra cost to Owner. The entire test equipments deployed shall have valid test/calibration certificates traceable to relevant national/ international standards. Such material tests, for which testing facility at site is not established, shall be carried out by CONTRACTOR at testing laboratories approved by Owner/PMC at no extra cost. CONTRACTOR shall maintain the test records and the same shall be made available for review/ inspection of Owner/PMC. Further, Owner/PMC reserve the right to witness/ inspect testing at the laboratory at no extra cost to Owner/PMC.

1.12 Construction supervision and management functions to be performed by the CONTRACTOR shall include the following as key functions for effective execution, monitoring and control:

- Planning, scheduling, monitoring & reporting.
- Construction supervision, discipline wise.
- Quality assurance and quality control, discipline wise.
- Shipping, custom clearances, inland transportation
- Warehouse management and material control.
- Field engineering/Purchase.
- Health, Safety and Environment (HSE) Management
- Enforcement of statutory rules/ regulations and Labour Laws
- Personnel/administration/Industrial Relations
- Billing and invoicing
- Finance and Accounts
- Security

1.13 Whenever the hookup is to be done with the facilities under operation, efforts shall be made by the CONTRACTOR to complete the work and restore the system expeditiously. If required the work shall be continued round the clock.

## **2.0 EXECUTION OF WORKS**

The CONTRACTOR'S work during construction shall include but not be limited to the following:

- i. Prepare and submit all the Plans, Procedures and documents to Owner/PMC as specified in the contract.
- ii. Establish requisite site organization staffed by competent and experienced specialists, supervisors and inspectors.

- iii. Supervise, Coordinate and manage the activities performed at site by him and by his sub-contractors for execution of work and render all technical/specialist services.
- iv. Plan and schedule the construction work, monitor and take timely corrective action when required to adhere to approved execution schedule.
- v. Plan, allocate and mobilize required resources, manpower, and construction equipment/materials, commensurate with construction plan/schedule.
- vi. Provide all temporary facilities required for Construction including drinking water, lighting, office space, electronic transmission of drawings & documents, printing facilities, rest rooms, crèches, first-aid, fire protection system, toilets, canteen facilities, labour hutments, transport facilities for the workers and staff.
- vii. Prepare & implement Quality Control and Quality Assurance plan.
- viii. Prepare & implement Health, Safety & Environment (HSE) plan.
- ix. Report beforehand and take approval from Owner/PMC regarding use of any equipment and/or material not conforming to the contract, drawings and specifications.
- x. Execute and supervise all additional works and modification works as required or suggested by Owner/PMC as a part of approved change orders.
- xi. Erect and install the equipments and materials according to the approved specifications and procedures.
- xii. Establish required Field Inspection and Testing Laboratories at site to carryout tests as specified in the standards/specifications of the contract.
- xiii. To organize and obtain all applicable clearances/approvals from statutory bodies/authorities, as required by the laws of land for the work executed at site shall be the responsibility of the Contractor under the contract.
- xiv. Obtain approval of Owner/ PMC for Welding Procedure Specifications (WPS)/ Procedure Qualification Records (PQR) as required. Carry out inspection, non-destructive tests and analyze and certify acceptability of all welds and materials in accordance with specified Technical Standards. Carry out inspection and testing of incoming materials as per agreed procedures.
- xv. Organize and conduct Weekly Project Review meeting related to site construction activities.
- xvi. Provide daily work progress reports and detailed weekly and monthly progress reports summarizing percentage completion of the work including status of drawings, materials and effects on approved schedule, areas of concern and corrective actions required thereof. Contractor shall also identify any foreseeable delays in any aspect of the WORK and take corrective actions to eliminate/minimize the effect on Overall Completion Schedule. All progress shall be quantified.
- xvii. Take photographs and video recording of Project Construction Progress on regular basis and submit the same to Owner/PMC on monthly basis along with the Monthly Progress Report.
- xviii. Prepare and submit safety and labour relation procedures in line with all applicable codes, regulations and OWNER'S requirements.
- xix. Supervise and monitor all safety and labour relation functions as per agreed procedures and applicable laws of the land and report to Owner immediately for any violations and injuries.
- xx. If any part of the facilities is completed and is under operation, while other parts of the facilities are under construction, or work is to be carried in running Plant , it is essential

that rigid safety rules be prepared and maintained for all works in accordance with the requirements of Owner/PMC.

- xxi. Maintaining all the records generated during project execution up-to-date and made available to Owner/PMC whenever requested. These records shall be handed over to Owner on completion of the work at no extra cost to Owner.
- xxii. Carryout warehouse management and material control in accordance with approved procedure.
- xxiii. Take all necessary precautions and required actions to protect construction work and materials from damage by local weather conditions and ongoing construction activities in the vicinity, theft and pilferage etc. till handing over of the plant to Owner.
- xxiv. Damages, if any, occurred to the existing facilities at the site during execution of the job shall be intimated to Owner / PMC immediately and the damages shall be rectified promptly without any extra cost to Owner.
- xxv. Take insurance policies for materials in transit and storage-cum-erection risk and other insurance covers required for men and materials at site as per SCC/ GCC in consultation with Owner.
- xxvi. Undertake housekeeping including sweeping, clean up to maintain cleanliness, sanitation, removing excess materials, temporary facilities, scaffolding, etc. on Daily basis till handed over to Owner.
- xxvii. Prepare and submit to Owner/PMC the following daily reports for construction activities covering the following:
  - a. Weather
  - b. Manpower deployment category wise
  - c. Construction Equipments
  - d. Work Progress
- xxviii. Ensure the control of all works with regard to its impact on the surrounding environment.
- xxix. Ensure all hot works are performed outside hazardous areas and in compliance with OWNER'S Safety Permit System requirements wherever applicable.
- xxx. Arrange and coordinate the visits of suppliers representatives/specialists at site as per instruction of Engineer In-Charge.
- xxxi. All material handling equipment, tools, tackles, hoisting and lifting equipments/ machineries should be subjected to required load test initially and then periodically, to ensure safe/stable operation.
- xxxii. Organize field engineering work, wherever required and ensure timely resolution of interface problems / site constraints in consultation with Owner/PMC.
- xxxiii. Prepare and certify material reconciliation statement on completion of work to enable Owner to take over the surplus materials, as applicable.
- xxxiv. Organize the codification and handing over of surplus materials (as applicable) and spares/ tools and tackles to the Owner on completion of work.
- xxxv. Provide weekly/daily activity plan for site inspection.
- xxxvi. Develop a phased mechanical completion program to facilitate sequential Pre-commissioning/Commissioning activities in a logical manner to meet the Overall Project Schedule.

- xxxvii. Remove / demolish all temporary structures/ establishments/ facilities created by the Contractor / his sub-contractors during the execution of the work and restore the site to its original condition.
- xxxviii. Carry out tightening of flange joints by using hydraulic tensioner/ torque wrench as per specifications. Contractor shall ensure that stud bolts are ordered extra long to facilitate tensioning.
- xxxix. Organize safety induction programme for their manpower before deployment on work and at regular intervals thereafter.

CONTRACTOR shall draw up a detailed activity list of pre shutdown activities and shutdown activities and submit the same for the approval of the Owner/PMC. All endeavors shall be made to maximize the pre-fabrication before the planned shut down and to minimize the work during shutdown period. All such activities shall be identified and appropriately planned for temporary supports, scaffolding, clamping arrangements, enabling works, etc. so that the quantum of the work during the shutdown can be minimized.

### 3.0 EXECUTION PLANS

CONTRACTOR shall submit Construction Execution Plan to Owner/PMC for review/approval during kick-off meeting. The Plan shall detail the execution methodology of the CONTRACTOR during construction phase of the PROJECT covering following aspects as minimum –

#### 3.1 Construction Management Plan

CONTRACTOR shall submit Construction Management Plan to Owner/PMC for approval during kick-off meeting. The Plan shall detail the management methodology to be applied during the construction phase of the PROJECT, along with a list of procedures to be utilized in undertaking the work.

All reference procedures and detail work plans referred to in this document must be submitted for review and approval by Owner/PMC at least (4) four weeks in advance of actual commencement of the activity concerned.

#### 3.2 Construction Execution Plan:

It shall include the following as minimum:

##### 3.2.1 Contractor's manpower and man-hour histogram by major section and discipline and their manpower deployment schedule on monthly basis.

##### 3.2.2 Major equipment mobilization plan on monthly basis with short description. CONTRACTOR to develop this plan with due consideration to maximize the mechanization of construction activities.

Other plans of Contractor and procedures to be submitted at least four (4) weeks/as stipulated in tender prior to start of respective activity at site, include the following as a minimum:

- a. Develop/ prepare pre-shut down/ shut down and post shut down plan/ schedule, if applicable including resource mobilization plan. Preliminary / Pre shut down plan shall be submitted during Kick-off meeting and detailed Shutdown plan at least 12 months in advance shall be submitted to Owner/PMC for approval.
- b. Develop/ prepare construction/erection plan/procedures and submit to Owner/ PMC for approval.
- c. Temporary facilities, etc.
- d. Piling plan
- e. Barricading Plan
- f. Scaffolding plan

- g. Excavation and underground work plan
- h. Heavy transport and heavy lifting plan (Rigging Plan),
- i. Pre-fabrication / Modularization plan
- j. Other activity plans e.g. piping, equipment and steel structure erection plan etc.
- k. Monsoon counter measures and preparation
- l. Emergency Evacuation Procedure
- m. Storm Management Plan
- n. Schemes to carry out works in inclement weather

Contractor shall ensure that lay down area (as applicable) given to him shall be utilized optimally.

### 3.3 Sub-Contracting Plan

A minimum of the following activities shall be performed by the CONTRACTOR directly and shall not be subcontracted:

- a) Project Management
- b) Planning
- c) Procurement
- d) Construction Management
- e) Commissioning

If CONTRACTOR proposes to engage sub-contractor(s) for the execution of some of the activities at site, a preliminary sub-contracting plan along with the identified scope of work for each sub-contract shall be furnished by the CONTRACTOR to the Owner/PMC at the time of bid submission. However, the credentials of proposed Sub-contractor(s)'s shall be submitted by the CONTRACTOR on award of work, which shall be evaluated by Owner/PMC at SITE for acceptance. CONTRACTOR shall not be permitted to change the sub-contractor under any circumstances without prior approval of Owner/PMC. Non-compliance of the above shall be strictly dealt within relevant provision(s) of the contract.

The sub-contracting plan shall cover

- i) Sub-contracting philosophy and plan
- ii) List and scope of work of each subcontract
- iii) Subcontract administration plan
- iv) Organization chart of each sub-contractor.

The list and major scope of each subcontract shall not be changed from those of the CONTRACTOR'S plan unless specially approved by OWNER.

## 4.0 TEMPORARY FACILITIES

The CONTRACTOR shall arrange the following temporary facilities as the minimum (including for his sub-contractors also):

- i) Exact location of temporary work area, access and general layout inside the area.
- ii) Planning and description of the temporary facilities such as:
  - a. Identification of borrow earth area (if required)/excess earth dumping yards
  - b. Site office and Fabrication yards, Open storage area and Warehouse



- c. Miscellaneous workshops including maintenance area for construction equipments.
- d. Temporary roads including access road to Plant, fencing and gates
- e. Security, watch & ward, security gates, etc.
- f. Utility supply systems viz. Construction power with DG Sets, construction water, drinking water etc.
- g. Area lighting
- h. Fire fighting equipments
- i. Drainage and Sanitation
- j. Camp Accommodation/ Rest Rooms/ Dining rooms.
- k. Mobile toilets and necessary arrangement for cleaning and disposal from refinery to outside refinery.
- l. Field Testing Laboratory
- m. Radiography Source Pit as per BARC Guidelines
- n. Film processing and viewing labs
- o. Communication facilities viz. Telephone, Fax, E-mail, electronic transmission of drawings./ documents, etc.
- p. Hutments, transport, Pantry and Canteen for staff and workers. Hutments/ labour colony shall not be allowed inside the refinery complex.
- q. Vehicle parking area including construction equipments.
- r. First aid arrangement/ medical and health care facilities
- s. Gate pass for workmen/officials/ vehicles as per OWNER security system.
- t. Work Permits as per Owner's prevailing system.

CONTRACTOR shall develop the temporary facilities layout for approval of Owner/PMC.

## 5.0

### CONSTRUCTION PLANNING, SCHEDULING, MONITORING & REPORTING

The CONTRACTOR shall be responsible for construction Planning, Scheduling, Monitoring and Reporting activities at site in line with the overall master schedule and details stipulated elsewhere in the document.

The CONTRACTOR shall submit constructability report to Engineer In charge/ Owner within 60 days from the date of award of contract after detailed study for execution to meet the time schedule.

## 6.0

### QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The CONTRACTOR shall be responsible for ensuring quality of construction (including materials) carried out by him/his approved sub-contractors in accordance with the requirements given in Appendix-A for Quality Assurance / Quality Control (QA/QC) during construction including all documents referred therein.

## 7.0

### WAREHOUSE MANAGEMENT & MATERIAL CONTROL

The CONTRACTOR shall construct/ build warehousing facilities (both covered and open) appropriate for storing materials required for the job. The facilities shall include proper lighting, fire protection system, office/rest rooms/toilets for warehouse personnel.

The CONTRACTOR shall obtain all statutory approvals from concerned authorities for all warehouse equipment, instruments etc. The CONTRACTOR shall comply with statutory regulations for storage of any material covered under Explosives rules.

The CONTRACTOR shall be responsible for carrying out the Warehouse Management and Material Control in accordance with the approved warehousing procedure and material control procedure, which is to be submitted by the CONTRACTOR during kick-off meeting. The activities shall include but not limited to:

- Transport Liaison, both for imported materials as well as materials procured indigenously, from the time of dispatch up to receipt at site.
- Transportation Plan (i) from source to site (ii) site to erection location.

- Receipt, Handling, Identification, Inspection (including confirmation by an Alloy Analyzer for Alloy Steel, Stainless Steel and other Exotic Materials) and Acceptance, Storage and Preservation of Materials, Codification of all materials including free issue materials to be supplied by OWNER.
- Filing of insurance Claims and follow up.
- Documentation for control and accounting of materials.
- Generation and upkeep of Traceability Records for materials.
- Materials Control & Issue.
- Inventory Checks.
- Field Requisition and Purchase.
- Spare & Non Sparking Tools including handing over of mandatory Spares/Tools to the OWNER as per the terms of the contract.
- Material Appropriation and Handing Over of all items to OWNER with Owner's codification system as per terms of contract.
- Security.
- Taking up with suppliers on short supplied items and placing replacement orders for lost/damaged items.
- Intimating to there HO regarding short/lost/damaged items received at site and further replacement action, as applicable.

**CONTRACTOR shall generate and issue following reports:**

- Fortnightly statement of consignments in transit.
- Daily report of material received.
- Material receipt status and inventory status w.r.t. material delivery schedule
- Material Inspection Report with respect to materials received at site
- Report on Over/Short/Reject/Damage (OSRD) receipts against each consignment on receipt at warehouse.
- Weekly status of consignments, Material Receipt Report (MRRs)
- Monthly status of field purchase.
- Monthly status of over, short, reject & damage (OSRD) settlement.
- Monthly status of piping material MTO V/s Actual receipt.
- Log Register of Rotating Equipments maintenance
- Daily Stock Position of Cement
- Any other report as desired by Owner/PMC.

## **8.0 FIELD ENGINEERING**

CONTRACTOR shall be responsible for controlling and issue of technical drawings and documents, preparation of field sketches, field modifications, checking/preparation of as- built drawings, etc. CONTRACTOR should have adequate facilities for incorporating field changes, preparation of As-built drawings, Printing machines and Drawing & Document Control System.

## **9.0 FIELD TENDERING**

CONTRACTOR shall be responsible for carrying out field tendering activities, as required from the site itself.

## **10.0 FIELD PURCHASE**

CONTRACTOR shall be responsible for carrying out field purchase activities, as required.

Field Purchase items are restricted to those required for running and maintenance of the field offices, items required to expedite construction work and items found short, missing or damaged against the main order when received at the site. Any material purchased from field for usage in the plant should have proper inspection certificate and should be purchased from Owner/PMC approved suppliers. If required by OWNER/ PMC, check testing of the material samples selected by Owner/PMC shall be carried out by CONTRACTOR without any extra commercial implication.



## 11.0 HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

The CONTRACTOR shall be responsible for Health, Safety and Environment (HSE) Management at construction site for the construction activities to be carried out by the him/his approved sub-contractors in accordance with the requirements mentioned in Appendix-B for Health, Safety and Environment Management during construction.

CONTRACTOR shall be working in an operating refinery. All measures required for safe construction are to be ensured for Process safety Management and safe work practices. Besides all personnel employed in the job to follow safety requirements of Owner/PMC, the movement of CONTRACTOR's personnel will be restricted to their workplace only.

## 12.0 HOUSE KEEPING

It is the responsibility of the CONTRACTOR to maintain general cleanliness and proper housekeeping at work site. CONTRACTOR shall organize disposal of excavated earth /garbage/ rubbish/scrap, etc. on day to day basis to identified disposal areas/safe areas and forward daily report for the same indicating the details of men and machinery deployed for the purpose; if asked by Owner/PMC.

Wastage and serviceable/ unserviceable scrap generated during dismantling and regular works shall be segregated and dumped in designated locations in consultation with Owner/PMC. Earth and landfill materials shall be dumped at locations identified by Owner/PMC, otherwise outside the Project Site and the required fees charged by the local authorities shall be borne by the CONTRACTOR without any extra cost to OWNER.

## 13.0 INDUSTRIAL LABOUR RELATIONS

CONTRACTOR shall be responsible for industrial relation functions and implementation of labour laws at site. CONTRACTOR'S staff shall be suitably trained and experienced in Labour Relation functions so as to ensure a good relationship with labour and to prevent the occurrence of industrial disputes resulting in subsequent delays or work stoppages. In particular, CONTRACTOR shall maintain close liaison with Owner/PMC.

CONTRACTOR shall maintain proper liaison with Statutory Authorities and local bodies and shall be responsible to implement and observe all statutory laws at site. CONTRACTOR must have in his staff; a well experienced Labour Relation Officer, preferably from local area.

CONTRACTOR shall maintain the records of wages paid in a wage register, PF, etc. as per statutory regulations.

CONTRACTOR shall report immediately to Owner/PMC any problems including labour disputes, fight, and work stoppages. A written report shall be submitted to Owner/PMC within 24 hours of the incident.

CONTRACTOR must submit a Labour Relation Plan including their sub-contractor(s) prior to the start of the work/within one month of award of the contract, whichever is earlier, mentioning as a minimum:

- A detailed estimate of the number of labour, both indirect and direct, sorted by craft.
- Outline recruiting plans for all manpower requirements.
- Identify personnel involved with labour relations and outline procedures to mitigate labour disputes & problems.
- Labour welfare plan

CONTRACTOR shall hold labour relations meeting twice a month with their work force as well as a separate meeting with the Owner.

## 14.0 CONSTRUCTION EQUIPMENTS

The Contractor is required to organize and mobilize the construction equipments and other tools/tackles in a sequential manner and ensure that plant installation is carried out in a

mechanized manner to the extent possible and its mechanical completion is achieved within targeted time schedule.

Contractor shall ensure deployment of the following construction equipment as a minimum as per requirement to the maximum extent –

- i. Cranes of different capacities required for erection/ handling of materials.
- ii. Hydraulic axle Trailer / SPMT for transportation of equipments, as required
- iii. Trailers
- iv. Tower Cranes
- v. Boom Lift/Man Lifts
- vi. Portable Alloy Analyzers with print out facility
- vii. Batching plants (To be established outside the project complex)
- viii. Concrete Boom Placer
- ix. Semi automatic / Automatic cutting & beveling machines
- x. Semi automatic / Automatic welding machines
- xi. Auto UT (TOFD+PAUT) Machine
- xii. Hanging Scaffold in pipe rack to facilitate continuous piping erection work
- xiii. Equipments for Digital Radiography
- xiv. X-ray and Gamma ray Radiography sources
- xv. Stress Relieving Equipments with Recording facility
- xvi. Bar Bending/Cutting Machine
- xvii. All weather fabrication sheds
- xviii. Automatic Blast cleaning and Painting machine
- xix. Welding machines
- xx. DG sets
- xxi. Electrical and Instrumentation equipments/measuring devices etc.
- xxii. Bevel Cutting Machines
- xxiii. Test Pumps
- xxiv. Compressors
- xxv. Lux Meter
- xxvi. Gas and Mechanical cutting devices
- xxvii. Various inspection / measuring devices

The Contractor shall, without prejudice to his responsibility to execute and complete the work strictly as per the specifications and other laid down procedures, execute all the work by mechanizing the construction activities to the maximum extent by deploying all necessary construction equipments/machinery of adequate capacities and numbers.

Contractor shall be responsible for arranging all facilities for torque tightening/tensioning of bolts/fasteners as specified. Contractor shall ensure that stud bolts are ordered extra long by one diameter to facilitate tensioning. Guidelines for torque tightening/tensioning are specified in specifications for boxing up of flanged joints, as referred in APPENDIX- A.

In order to minimize fabrication at site, Contractor to fabricate all (major) fabricated items at their vendor works to the maximum extent possible due to limitation of space at site and transported to site with maximum length of consignment transportable by sea and road. Contractor shall carry out the route survey/ study for transportation of 'Over Dimensioned Consignments' including waterways from source of manufacture/supply to site well in advance of placement of order to ensure unhindered transportation of the same to construction site. Contractor shall arrange Cranes of suitable capacities to match with the erection requirements. Crane movement roads are to be clearly identified and marked on the plot plan before planning of such movement. Construction of hard stands for positioning of crane in the fabrication yard and at erection site/locations including approach roads to the hard stands from the plant roads shall be

Contractor's responsibility. The hard stands shall be suitable for the crane loads (self load + equipment load) to facilitate erection works and to be tested for any settlement.

For the purpose of Equipment/ Structural steel Erection, the Contractor shall deploy a Rigging team headed by a Rigging Foreman/Engineer reporting to concerned Area Engineer. Area Engineer should be well conversant with various erection techniques and shall be responsible for preparing erection schemes in accordance with the approved procedures and based on crane manuals and suiting to plant layout. Area Engineer shall have to foresee various other construction activities in the surroundings areas while planning erection schemes including safety aspects of man and machinery also.

Contractor shall prepare erection schedule in line with the overall project schedule of the Plant in phased manner with erection schemes of various equipments, vessels and submit to Owner/PMC for approval. Monitoring and control of erection schedule and erection activities shall be carried out by the contractor as per the approved construction procedures.

For efficient working and maintenance of construction aids, Contractor shall establish and maintain crane yard / workshop equipped with regular maintenance facilities for various construction aids for carrying out routine field maintenance during performance of the contract. Temporary approach road and hard stands, wherever required for the movement of the Cranes and other vehicles for equipment erection and transportation of material shall be properly planned and made by the Contractor. Weekly/fortnightly maintenance shall be planned in such a way that the same does not hamper the erection schedule.

During performances of the work, Contractor must ensure that structures, materials and equipments are adequately braced with Guys, Struts or any other means as deemed fit & approved by Owner/PMC. Such means shall be supplied and installed by the Contractor as required till the erection works is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to works executed by other agencies. All lifting tools, tackles and cranes shall be tested periodically by statutory/ competent authorities for their load carrying capacity. Such relevant valid/test certificates shall be submitted to Owner/PMC for review before actual use of the tools, tackles and cranes.

Contractor shall submit the construction equipment deployment schedule at the time of kick off meeting. Daily construction equipment deployment report will also be submitted by the Contractor to Owner/PMC in the performa approved by Engineer In charge.

Contractor shall ensure the timely augmentation of the men, equipments and machinery depending upon the exigencies of the work to meet the overall project schedule and as per instructions of Owner/PMC.

## **15.0 CONSTRUCTION MANPOWER**

The Contractor is required to organize and mobilize construction staff/ manpower in a sequential manner to ensure that the work is carried out in accordance with the construction schedule. Mobilization of construction staff should be such that the progress achieved in phased manner should match with the overall Project Schedule. Key Personnel i.e. Resident Construction Manager, Site In-charge, Lead QA/QC Engineer, Lead Planning Engineer, Safety officer, Discipline Engineer for execution of job shall be deployed meeting the qualification and experience requirement of Document No. 7-82-0003.

For this purpose, the Contractor shall clearly indicate in his construction methodology whether work shall be done departmentally or by engaging sub-contractor or the combination of both. Contractor shall prepare detailed methodology for the work to be carried out departmentally as

well as through sub-contractors clearly, defining the scope and responsibility of Contractor and his sub-contractors.

The works of all sub-contractors shall be managed by the construction staff of the main Contractor who shall perform the duties of construction management and shall administer, coordinate, and inspect the works of the sub-contractor(s) and be responsible for the Quality and timely completion of respective works. The Contractor shall establish the pre-requisites for successful completion of sub-contractor (s) work. However, by deploying the sub-contractor (s), as approved by Owner/PMC for any discipline, does not absolve the Contractor of his total responsibility under the subject contract.

The Contractor must note that in case of any sub-contractors' failure to execute the works as per standards/specifications/drawings and/or negligence & disobedience in carrying out any order or instruction of Owner/PMC, the same shall be viewed very seriously and any action as deemed fit in accordance with provision(s) of the contract shall be taken by Owner/PMC.

Contractor shall submit the construction manpower deployment schedule at the time of kick off meeting. Daily construction manpower deployment report shall also be submitted by the Contractor to Owner/PMC on approved format. Any additional manpower of any category required to be deployed during the actual execution of the work to meet the Project time schedule and as instructed by Owner/PMC, shall be mobilized by the Contractor within a reasonable time. Mobilization of such additional manpower by the Contractor shall not entitle him for any additional compensation at all.

All construction supervision, coordination and management activities shall be carried out by the Contractor in accordance with the construction procedures approved by Owner/PMC. Contractor shall prepare construction schedules based on the Overall Project Schedule and submit the same to Owner/PMC for approval. Monitoring and control of the construction activities shall be carried out as per the approved construction schedule & procedures.

During the execution of works at site, if the Contractor engages sub-contractor (s) for execution of works at site as per approval obtained from Owner/PMC in line with contract provision(s) and in the event sub-contractor complains in writing to the Owner with regard to the non-payment of their dues from the Contractor for the works executed by them (excluding final payments and payments due after termination of sub-contractors' services by the main Contractor), Owner/PMC reserves the right to make such payment to the sub-contractors directly based on approved measurements with due notice to the Contractor. Owner/PMC shall release such payments to sub-contractor at the cost and risk of the Contractor in order to ensure smooth execution of work at site. All such payments made by Owner/PMC to the sub-contractor(s) shall be deducted from the running account bills or any other payments due to the Contractor.

The above provisions shall also be applicable in case of construction materials procured at site by the Contractor from the suppliers.

## **16.0 ODC CRITERIA**

The Maximum Transportable dimensions (inclusive of all projections & saddle height)/ weight shall be finalized based on detailed route survey to be carried out by the EPC contractor. The responsibility of contractor shall include route survey from fabrication shop to refinery gate, from refinery gate to erection / assembly site inside the refinery, arranging and providing loading/unloading facilities, obtaining clearances from statutory organizations like PWD, state electricity boards etc.

The Contractor shall minimize site works and prepare schemes for carrying out maximum works at vendor works and transport the equipments in sections.

Transportation of all completed sections, segments and equipment from shop to site and unloading the same at designated storage yard shall be in the scope of the contractor. All ODC equipments are to be transported by Hydraulic axles only. Contractor shall submit the detail report and Transportation Procedure after award of the job.

EPC Contractor shall implement following measures in view of constraints w.r.t limited space availability at project site-

- a) Maximize the pre-fabrication work for equipments at vendor works.
- b) Maximize simultaneous / parallel working on multiple fronts.
- c) Maximize work at ground to ensure good progress, quality, and safety.
- d) Erection of structures is to be planned in modular form.
- e) Erection of all columns, Vessels, Reactors etc. in dressed up conditions i.e. erection along with circular platforms, insulation (if applicable) and down comers.

Bidder shall visit the site at bid stage to acquaint himself with the site conditions at project site and furnish detail execution schedule and resource mobilization plan along with the offer to meet the Project schedule.

## 17.0 IMPLEMENTATION PLAN AND SITE REQUIREMENTS

### • Piping Works

Use of commercially available Piping Construction management software by to be ensured by EPC Contractor so that accurate tracking and control can be exercised for piping works (Refer document No B016-00-000-19-41-1001).

Use of Digital radiography by EPC Contractor to the extent possible, which will provide Real time digital imaging and helps faster interpretation (Refer Doc. No. B016-00-000-19-41-1002). Use of Selenium based source for radiography to be implemented as per Instruction of Engineer-in-charge so that radiography can be done with minimum interference with other construction activities.

Use of Close Proximity & AUT (PAUT + TOFD) for major piping NDT. Contractor will be allowed to carry out Radiography with Close Proximity technique & AUT (PAUT + TOFD) Inside Refinery. However, in case Radiography with other technique is required to be carried out, same shall be done with prior approval of Engineer In-charge.

## 18.0 INTERFACE WITH OTHER CONTRACTORS

CONTRACTOR shall ensure that his interface with other CONTRACTORS is smooth and cordial. In case of any dispute, Owner/PMC decision shall be binding.

Owner/PMC may arrange weekly/fortnightly/monthly interface meetings. The CONTRACTOR shall depute concerned personnel to attend these meetings.

Generally, the following interfaces may be present:

- CONTRACTOR shall allow movement of persons/ material/ equipment/ vehicles belonging to other CONTRACTORS or Owner/PMC through the roads constructed by him.
- CONTRACTOR shall coordinate with 'neighboring' contractors for maintaining elevations/levels of various interconnecting services.
- CONTRACTOR shall not dump his earth, scrap or any material in other Contractors' area. He shall cooperate with Owner/PMC in maintaining good housekeeping throughout the complex.

- CONTRACTOR shall ensure proper drainage and no water logging in his area/other areas.
- If requested by the Owner/PMC, CONTRACTOR shall allow testing of materials of other Contractors in his laboratory, in case of emergency.
- CONTRACTOR shall clearly define in the interface meeting with other contractors their erection / construction interface at their Battery limits.

## **19.0 CHECKLIST FOR INSPECTION OF FLANGED JOINTS**

Requirements specified in standard specification for application of torque and hydraulic bolt tension for flange joints No. 6-76-0002 shall be followed by the CONTRACTOR.

# ANNEXURE-III

## TO

## PROJECT EXECUTION PLAN

## PROJECT SPECIFIC RECOMMENDATIONS FOR IMPLEMENTATION BY EPC

## CAPTIVE POWER PLANT PACKAGE

## TENDER NO. B016-606-02-43-PG-T-7810

<b>PROJECT</b>	<b>:</b>	<b>VISAKH REFINERY MODERNISATION PROJECT</b>
<b>UNIT No.</b>	<b>:</b>	<b>606</b>
<b>OWNER</b>	<b>:</b>	<b>M/s HPCL, VISAKHAPATNAM</b>
<b>LOCATION</b>	<b>:</b>	<b>VISAKHAPATNAM, INDIA</b>
<b>PMC</b>	<b>:</b>	<b>M/s ENGINEERS INDIA LIMITED</b>
<b>EIL JOB No.</b>	<b>:</b>	<b>B016</b>

A	24.05.2017	ISSUED FOR TENDER	SD	NP	JKM
<b>Rev. No</b>	<b>Date</b>	<b>Purpose</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>

## **1.0 ENVIRONMENTAL MANAGEMENT PLAN DURING CONSTRUCTION**

The following environmental management plan shall have to be strictly followed by CONTRACTOR during execution of the contract

### **1.1 Air Environment**

- Ensuring preventive maintenance of vehicles and equipment.
- Ensuring vehicles with valid Pollution under Control certificates are used.
- Avoiding unnecessary engine operations.
- Implementing dust control activities such as water sprinkling on unpaved sites.
- Controlled vehicle speed on site.
- Ensuring vehicles are covered during transportation of material.

### **1.2 Water Environment**

- Monitoring water usage at work sites to prevent wastage.
- A new STP as a part of envisaged IETP will be installed for treatment of sanitary waste water.

### **1.3 Land Environment**

- Restricting all construction activities inside the project boundary.
- Ensuring the top soil is not contaminated with any type of spills.
- Ensuring any material resulting from clearing and grading should not be deposited on approach roads, streams or ditches, which may hinder the passage and/or natural water drainage.
- Developing project specific waste management plan and hazardous material handling plan for the construction phase.

Moreover, there will be no construction camps to be located within refinery or at any outside place close to Refinery.

### **1.4 Noise Environment**

- Ensuring preventive maintenance of equipments and vehicles.
- Avoiding unnecessary engine operations (e.g. equipment with intermittent use to be switched off when not working).
- Ensuring DG sets are provided with acoustic enclosures and exhaust mufflers.



### 1.5 Socio-economic Environment

- Conducting awareness programs for workers.
- Monitoring speed and route of project-related vehicles
- Determining safe, legal load limits of all bridges and roads that will be used by heavy vehicles and machinery.
- Determining allowable traffic patterns in the affected area throughout the work week will be made based on community use, include a consideration of the large turning requirements of certain vehicles/machineries that might increase congestion and traffic hazards.
- Consolidating deliveries of materials and personnel to project sites, whenever feasible, to minimize flow of traffic.
- Minimizing interruption of access to community for use of public infrastructure.
- Providing prior notice to affected parties when their access will be blocked, even temporarily.
- Preventing use of drugs and alcohol in project-sites.
- Preventing possession of firearms by project-personnel, except for those responsible for security.

Vehicular congestion on the approach road to Visakha Refinery complex in view of movement of men and machinery due to proposed project can be prevented by following measures (Implementation of these will considerably reduce the traffic on the road):

1. To carry out the prefabrication work outside of site for structural fabrication and piping pre fabrication for the project, so that only finished products will be transported to the project site. Also, for any other items which require pre fabrication, the same shall be done away from site. This action will drastically reduce the truck movements carrying raw materials.
2. Plan to transport the fabricated material during night to reduce the traffic during day time.
3. Transportation of bulks (fabricated spools) in a controlled manner, i.e. allow them to transport the bulks as per the project schedule requirement, rather than allowing them to transport and dump the bulks at site as and when the prefabrication is completed at their workshop. Plan in such a way that minimum required materials for the work is brought to site from pre-fabrication shops and stored at site. (Materials required for one week erection job only would be allowed to keep at site)

4. Opting for Ready Mix Concrete (RMC) for concrete works will avoid the constant movement of the trucks carrying materials such as cement, sand and aggregates. Similarly option for use of pre- cast units also will be explored.
5. Usage of **tower cranes to minimize crane movements** and vehicle movements inside refinery. This will be used for civil works, structural erection and erection of piping spool.
6. **By carrying out the major fabrication at outside the project site and opting for RMC and other mechanized construction / use of advanced technologies, the manpower requirement for project execution also will be reduced substantially**, which in turn reduce the vehicles carrying the manpower for the project as well as avoid the traffic snag due to the large no of workers entry / exit during morning and evening hours.
7. Proper planning and close monitoring for transporting heavy equipments and ODC consignments including route survey inside the refinery and outside the refinery.

All ODC consignments will be brought to site only during night time and all arrangement for getting the equipment/consignment unloaded immediately up on arrival will be done upfront to avoid any traffic congestion at site and outside the site.

### 1.6 Biological Environment

- Closing of trenches as soon as possible of construction.
- Prevent littering of work sites with wastes, especially plastic and hazardous waste.
- Training of drivers to maintain speed limits.
- Development of green belt during construction phase.

## 2.0 RECOMMENDATIONS OF COMSTRUCTION SAFTETY DURING ` CONSTRUCTION OF VRMP

- Proper Barricading of the new proposed unit to be done from live running process units during construction phase. Hydrocarbon detectors to be provided along the barricading to detect any hydrocarbon in vicinity of construction area.
- Proper material movement path within the Refinery to be identified during the construction phase of the VRMP.
- Detailed HSE Plan & HSE Philosophy to be developed by EPC contractors during construction phase of the VRMP.

- It is suggested to carry out HAZID, SIMOPS studies during pre-execution phase of VRMP to get a detailed overview of the hazards during construction phase and should be suitably mitigated.

## **2.1 General Recommendations**

- Proper checking of contract people for Smoking or Inflammable materials to be ensured at entry gates to avoid presence of any unidentified source of ignition.
- Ensure that vehicles entering the Refinery should be fitted with spark arrestors as a mandatory item.
- In order to prevent secondary incident arising from any failure scenario, it is recommended that sprinklers and other protective devices provided on the tanks to be regularly checked to ensure that they are functional.
- Emergency security / evacuation drills to be organized at organization level to ensure preparation of the personnel's working in Refinery for handling any extreme situation.
- For positively pressurized building, both Hydrocarbon & Toxic detectors need to be placed at suction duct of HVAC. HVAC to be tripped automatically in event of the detection of any Hydrocarbon / toxic material by detector.

## **2.2 Escape Routes**

- Ensure sufficient escape routes from the site are available to allow redundancy in escape from all areas.
- Ensure sufficient number of windsocks throughout the site to ensure visibility from all locations. This will enable people to escape upwind or crosswind from flammable / toxic releases.
- Provide sign boards marking emergency/safe roads to be taken during any exigencies.

निर्माण स्थलों पर निगरानी और मापने के  
उपकरणों की अंशांकन आवश्यकताएँ

# CALIBRATION REQUIREMENTS OF MONITORING AND MEASURING DEVICES AT CONSTRUCTION SITES

0	28.04.2015	Issued as Standard	DJ	MD	SC
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
					Standards Committee Convenor
					Standards Bureau Chairman

**Abbreviations:**

ABS	:	ABS Consultancy
BIS	:	Bureau of Indian Standards
BV	:	Bureau Veritas
CEIL	:	Certification Engineers International Ltd.
DNV	:	Det Norske Veritas
IRS	:	Indian Registrar for Shipping
LRS	:	Llyod's Register Group Limited
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
PMI	:	Positive Material Identification

**Construction Standards Committee**

**Convenor:** Sh. M Deshpande, ED (Construction)

**Members:** Sh. S N Bhatnagar, GM (Construction)  
Sh. Rakesh Nanda, GM (Piping)  
Sh. Rajeev Jain, DGM, (C&P)  
Sh. Janak Kishore , DGM (Projects)  
Sh. Ravindra Kumar , AGM (Construction)  
Sh. D Jana, AGM (Construction)

**Requirement for control of monitoring and measuring devices.**

Sl. No.	Description	Calibration requirements	Frequency	Remarks
<b>A.</b>	<b>Civil-Survey</b>			
A.1.	Theodolite	To check for permanent adjustments by traversing and observing the closing error	once in a year or project duration whichever is earlier	Record to be maintained (See note below)
A.2.	Levels	To check by Backsight/ Foresight readings, the temporary adjustments of level	Every use	Record to be maintained (See note below)
A.3.	Steel measurement tapes	----	----	a. "Freemans" make or BIS approved make shall be used. b. Mutilated, or broken tapes shall not be used. c. Marking on the tape shall be legible
A.4.	Cross staff	---	---	Same as 3b&3c above
A.5.	Distomat	Actual Physical Verification at Site	Before using first time at site	Records to be maintained
A.6.	Total Station	To check for permanent adjustments by traversing and observing the closing error, etc.	once in a year or project duration whichever is earlier	Record to be maintained (See note below)
<b>B.</b>	<b>Civil Laboratory</b>			
B.1.	All balances-Mechanical	Check for zero error	Whenever used	---
B.2.	Weigh Batcher/Batching Plant	Calibration of scales	Once in three Months	Records to be maintained
B.3.	Cube testing machine	Calibration certificate from manufacturers or from reputed calibrating agency.	As per manufacturer specification or once a year whichever is earlier	Records to be maintained
B.4.	Moisture Meter	Calibration of scales	6 months	Records to be maintained

**Note:** If Error is found, it has to be sent to manufacturers or their authorized agents for rectification and certification. Reputed calibrating agency shall be NABL accredited for relevant testing.



Sl. No.	Description	Calibration requirements	Frequency	Remarks
<b>C.</b>	<b>Mechanical/ Electrical/Welding</b>			
C.1	Pressure Gauges	Calibration certificate from reputed laboratories or calibrate by dead weight testers with standard weights or with master Gauge	Once in 6 months	Records to be maintained
C.2	Dial gauges	Check for Zero Error	Whenever used	---
C.3	Dead Weight Tester	Calibration from manufacturer or reputed Calibrating agency. Calibration certificate shall not be older than one month from the date of mobilization.	As per manufacturer's recommendation or once in a six month whichever is earlier.	Records (Calibration certificate) to be maintained
C.4	Vernier caliper/ screw gauge	Check for Zero error	Whenever used	---
C.5	Holiday tester	Calibration from manufacturer or reputed calibrating agency or by calibrating by zeep meter.	Once in 6 months	Records to be maintained
C.6	Elcometer	Check with standard test films supplied by the manufactures	Before use	Records to be maintained
C.7	Universal Testing Machine	Calibration Certificate from any reputed third party inspection agency. viz, CEIL, LRS, BV, ABS, DNV or IRS.	As per manufacturer's recommendation or once a year whichever is earlier	Records to be maintained
C.8	Charpy V-notch Impact testing machine	Calibration Certificate from any reputed third party inspection agency. viz, CEIL, LRS, BV, ABS, DNV or IRS.	As per manufacturer's recommendation or once in a year whichever is earlier	Records to be maintained
C.9	Hardness Testing Machine	Check with the standard test block supplied with the machine as per manufacturer's Recommendation	Before use	Records to be maintained
C.10	Chemical Analysis ,ex :PMI etc.	Check with the standard samples	Before use	Records to be maintained
C.11	Various Digital and Analog meters	Calibration Certificate from reputed laboratories or the manufacturer	Once in Six Months or as per manufacturer's recommendation whichever is earlier.	Records to be maintained

**Note:** If Error is found, it has to be sent to manufacturers or their authorized agents for rectification and certification. Reputed calibrating agency shall be NABL accredited for relevant testing.

Sl. No.	Description	Calibration requirements	Frequency	Remarks
C.12	Variable current, voltage and resistance generators	Calibration Certificate from reputed laboratories	Once in Six months	Records to be maintained
C.13	Temperature/ Pressure Recorders	Calibration from manufacturer or any reputed calibrating agency	Once in Six months	Records to be maintained
C.15	Temperature gauges	Calibration Certificate from reputed laboratories	Once in Six months	To be discarded in case of damage or malfunctioning
C.16	Thermocouples	Manufacturer's Certificate or Chemical Check	---	---
C.17	Vibration probes	Calibration from reputed laboratory	Once in a year	To be discarded in case of damage or malfunctioning
C.18	Decibel-meter	Calibration from reputed laboratory	Once in a Year	- do -



**Note:** If Error is found, it has to be sent to manufacturers or their agents for rectification and certification & reputed laboratory shall be NABL accredited for relevant testing.



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**WORK DURING MONSOON.**

1. Contractor must take due cognizance of the presence of rainy season / days in his scheduled completion period and accordingly, shall take all necessary actions to protect, reorganize and progress the work, uninterruptedly during the monsoon period.
2. Contractor to collect all meteorological data from the local authority and collect necessary information about the intensity, frequency and period of rainy season.
3. No extension of time due to interruption /suspension of work, water logging, reduced /slowing down of progress, non-availability of manpower etc., whatsoever may be the reason, shall be tenable on account of monsoon and further no claim for stand-by of manpower and equipment, other resources etc shall be paid for.
4. The successful bidder shall be required to submit within 15 days of Letter of Acceptance of offer / award of work, to the Engineer-in-Charge / HPCL his contingency plan for work during monsoon clearly stating their methodology / strategy to progress uninterruptedly during monsoon mentioning the deployment of resources viz, numbers, capacity, category of equipment and manpower on a weekly basis for approval. The contingency plan shall include all provisions for constructing and maintaining temporary infrastructure like approach road, temporary drains in and around work area, dewatering whether natural or forced to keep the work area free from water logging so as to maintain the same always in a state worthy of vehicular, human and equipment movement. The work area shall be so isolated as to restrict run-off from the adjacent areas in the work area / site.
5. Contractor shall put up temporary sheds for fabrication of formwork and reinforcement. For fabrication of steelwork / piping proper rainproof shed with concretized floor of adequate area shall be made.
6. Additionally, localized (structure wise) monsoon protection shall be provided in order to facilitate work.
7. The contractor must indicate the structures / areas that he would like to progress (as per the project schedule and priority) particularly during the monsoon clearly indicating the sub-phases of construction like foundation / sub structure, superstructure etc.
8. Contractor shall procure and stock sufficient quantities of materials (if required, outside the plant premises, the land for which is to be arranged by the contractor at his cost and expenses) viz. coarse and fine aggregates, bricks etc. adequate for the planned volume of the work during the monsoon, well in advance of the onset of same so that progress of work is not affected on this account. The Engineer-in-charge shall be free to inspect such storing arrangement (particularly at places outside of the plant areas), at any appropriate time as deemed fit by him.
9. All electrical installations, equipment shall be placed on plinths above ground under proper rain shed to avoid any inundation, short circuit and hazards of electrocution.
10. Contractor shall organize his work particularly for the underground activities in foundation, excavation in a way that instead of opening up fronts everywhere and in scattered locations (provided there is no priority concern) only those many structures and /or areas

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should be worked where concerted and continuous effort and resources could be engaged to bring the work up to the desired level expeditiously to minimize any rework resulting from water accumulation / rain.

11. To maintain the standard welding quality and progress, localized welding booth in sufficient numbers as per instruction of Engineer- in charge shall be installed for protection against wind and rain.
12. Contractors item rates shall be include all costs and expenses including supply of materials required for monsoon protection like tarpaulins, shed, structural, GI sheet etc. for the above provisions and no separate payment shall be made on this account.

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**OISD GUIDELINES-192, OISD GUIDELINE-207**

**[ANNEXURE – XIV TO SPECIAL CONDITIONS OF CONTRACT]**

## **SAFETY PRACTICES DURING CONSTRUCTION**

**OISD-GDN-192**

**Oil Industry Safety Directorate  
Government of India  
Ministry of Petroleum and Natural Gas**

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# SAFETY PRACTICES DURING CONSTRUCTION

## 1.0 INTRODUCTION

Safety in Construction Management deserves utmost attention especially in the hydrocarbon industry, such as Exploration, Refineries, Pipelines and Marketing installations, Gas Processing units etc. Construction is widely recognised as one of the accident prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel; same needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behaviour, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality of materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to in built safety into the system.

The objective of this standard is to provide practical guidance on technical and educational framework for safety and health in construction with a view to:

- (a) prevent accidents and harmful effects on the health of workers arising from employment in construction;
- (b) ensure appropriate safety during implementation of construction;
- (c) provide safety practice guidelines for appropriate measures of planning, control and enforcement.

## 2.0 SCOPE

This document specifies broad guidelines on safe practices to be adhered to during construction activities in oil industry. However, before commencing any job, specific hazards and its effects should be assessed and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to

replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. For Personal Protective Equipment, OISD-STD-155 (Part I&II) shall be referred to. The scope of this document does not include the design aspects and quality checks during construction.

## 3.0 DEFINITIONS

Definitions of various terminology are given below:

- *Adequate, appropriate or suitable* are used to describe qualitatively or quantitatively the means or method used to protect the worker.
- *Brace*: A structural member that holds one point in a fixed position with respect to another point; bracing is a system of structural members designed to prevent distortion of a structure.
- *By hand*: The work is done without the help of a mechanised tool.
- *Competent Authority*: A statutory agency having the power to issue regulations, orders or other instructions having the force of law.
- *Competent person*: A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.
- *Execution agency*:  
Any physical or legal person, having contractual obligation with the owner, and who employs one or more workers on a construction site
- *Owner*:  
Any physical or legal person for whom construction job is carried out.  
It shall also include owner's designated representative/consultant/nominee/agent, authorised from time to time to act for and on its behalf, for supervising/

coordinating the activities of the execution agency.

- *Hazard:* Danger or potential danger.
- *Guard-rail:* An adequately secured rail erected along an exposed edge to prevent persons from falling.
- *Hoist:* A machine, which lifts materials or persons by means of a platform, which runs on guides.
- *Lifting gear:* Any gear or tackle by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.
- *Lifting appliance:* Any stationary or mobile appliance used for raising or lowering persons or loads.
- *Means of access or egress:* Passageways, corridors, stairs, platforms, ladders and any other means for entering or leaving the workplace or for escaping in case of danger.
- *Scaffold:* Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance as defined above.
- *Toe-board:* A barrier placed along the edge of a scaffold platform, runway, etc., and secured there to guard against the slipping of persons or the falling of material.
- *Worker:* Any person engaged in construction activity.
- *Workplace:* All places where workers need to be or to go by reason of their work.

#### 4.0 GENERAL DUTIES

##### 4.1 GENERAL DUTIES OF EXECUTION AGENCIES

###### 4.1.1 Execution agency should:

- i) provide means and organisation to comply with the safety and health measures required at the workplace.
- ii) provide and maintain workplaces, plant, equipment, tools and machinery and organise

construction work so that, there is no risk of accident or injury to health of workers. In particular, construction work should be planned, prepared and undertaken so that:

- (a) dangers, liable to arise at the workplace, are prevented;
  - (b) excessively or unnecessarily strenuous work positions and movements are avoided;
  - (c) organisation of work takes into account the safety and health of workers;
  - (d) materials and products used are suitable from a safety and health point of view;
  - (e) working methods are adopted to safeguard workers against the harmful effects of chemical, physical and biological agents.
- iii) establish committees with representatives of workers and management or make other arrangement for the participation of workers in ensuring safe working conditions.
  - iv) arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.
  - v) provide such supervision to ensure that workers perform their work with due regard to safety and health of theirs as well as that of others.
  - vi) Employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.
  - vii) satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.
  - viii) Ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.

- ix) Organise for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.
- x) establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.
- xi) provide appropriate first aid, training and welfare facilities to workers as per various statutes like the Factories Act, 1948 etc. and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement as per OISD-STD-155 (Vol. I & II) on Personnel Protective Equipment. They should also provide access to workers to occupational health services.
- xii) Educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect safety and health.
- xiii) Ensure that except in an emergency, workers, unless duly authorised, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.
- xiv) Ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorised to operate, maintain or use.
- xv) Ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment etc.
- xvii) Obtain the necessary clearance/permits as required and specified by owner
- xviii) As per the Govt. circular as amended from time to time all contractors who employ more than 50 workers or where the contract value exceeds Rs. 50 crores, the following facilities are to be provided by contractor at site :
- Arrangement for drinking water
  - Toilet facilities
  - A creche where 10 or more women workers are having children below the age of 6 years
  - Transport arrangement for attending to emergencies
- xix) should deploy a safety officer at site
- 4.2 GENERAL DUTIES OF OWNERS**
- 4.2.1 Owners should:
- i) co-ordinate or nominate a competent person to co-ordinate all activities relating to safety and health on their construction projects;
  - ii) inform all contractors on the project of special risks to health and safety;
  - iii) Ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to safety practices before starting the job.
- 5.0 SAFETY PRACTICES AT WORK PLACES**
- 5.1. GENERAL PROVISIONS**
- 5.1.1 All openings and other areas likely to pose danger to workers should be clearly indicated.
- 5.1.2 Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.
- 5.1.3 Never use solvents, alkalis and other oils to clean the skin.
- 5.1.4 Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.



- 5.1.5 Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles.
- 5.1.6 No loose clothing should be allowed while working near rotating equipment or working at heights.
- 5.2 MEANS OF ACCESS AND EGRESS**
- Adequate and safe means of access (atleast two, differently located) to and egress from all workplaces should be provided. Same should be displayed and maintained.
- 5.3 HOUSEKEEPING**
- 5.3.1 Ensure:
- proper storage of materials and equipment;
  - removal of scrap, inflammable material, waste and debris at appropriate intervals.
- 5.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.
- 5.3.3 Workplaces and passageways, that are slippery owing to oil, grease or other causes, should be cleaned up or strewn with sand, sawdust, ash etc.
- 5.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES**
- 5.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.
- 5.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- 5.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.
- 5.4.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.
- 5.5 PREVENTION OF UNAUTHORISED ENTRY**
- 5.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorised persons.
- 5.5.2 Visitors should not be allowed access to construction sites unless accompanied by or authorised by a competent person and provided with the appropriate protective equipment.
- 5.6 FIRE PREVENTION AND FIRE FIGHTING**
- 5.6.1 All necessary measures should be taken by the executing agency and owner to:
- avoid the risk of fire;
  - control quickly and efficiently any outbreak of fire;
  - bring out a quick and safe evacuation of persons.
  - Inform unit/fire station control room, where construction work is carried out within existing operating area.
- 5.6.2 Combustible materials such as packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place.
- 5.6.3 Places where workers are employed should, if necessary to prevent the danger of fire, be provided with:
- suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
  - an adequate water supply at sufficient pressure meeting the requirements of various OISD standards.
- 5.6.4 To guard against danger at places having combustible material,

workers should be trained in the action to be taken in the event of fire, including the use of means of escape.

5.6.5 At sites having combustible material, suitable visual signs should be provided to indicate clearly the direction of escape in case of fire.

5.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected particularly in high structures and where access is restricted.

## 5.7 LIGHTING

5.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.

5.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.

5.7.2 Artificial lighting should not produce glare or disturbing shadows.

5.7.3 Lamps should be protected by guards against accidental breakage.

5.7.4 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

## 5.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS

### 5.8.1 General Provisions

- i) Plant, machinery and equipment including hand tools, both manual and power driven, should:
  - a) be of proper design and construction, taking into account health, Safety and ergonomic principles.
  - b) be maintained in good working order;
  - c) be used only for work for which they have been designed.

d) be operated only by workers who have been authorised and given appropriate training.

e) be provided with protective guards, shields or other devices as required.

ii) Adequate instructions for safe use should be provided.

iii) Safe operating procedures should be established and used for all plant, machinery and equipment.

iv) Operators of plant, machinery and equipment should not be distracted while work is in progress.

v) Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.

vi) Where trailing cables or hose pipes are used they should be kept as short as practicable and not allowed to create a hazard.

vii) All moving parts of machinery and equipment should be enclosed or adequately guarded.

viii) Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.

ix) Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

### 5.8.2 Hand tools

i) Hand tools should be repaired by competent persons.

ii) Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.

iii) When not in use and while being carried or transported sharp tools should be kept in sheaths, shields, chests or other suitable containers.

iv) Only insulated or nonconducting tools should be used on or near live electrical installations.

- v) Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

### 5.8.3 Pneumatic Tools

- i) Operating triggers on portable pneumatic tools should be:
- so placed as to minimise the risk of accidental starting of the machine.
  - so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.
- ii) Hose and hose connections for compressed air supply to portable pneumatic tools should be:
- designed and tested for the pressure and service for which they are intended;
  - fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.
- iii) Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel.
- iv) Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

### 5.8.4 Electrical Tools

- i) Low voltage portable electrical tools should generally be used.
- ii) All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.
- iii) All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

### 5.8.5 Engines

- i) Engines should:
- be installed so that they can be started safely and the maximum safe speed cannot be exceeded.
  - have controls for limiting speed.

- c) have devices to stop them from a safe place in an emergency.

- ii) IC engines should not be run in confined spaces unless adequate exhaust ventilation is provided.

- iii) When IC engines are being fuelled:

- the engine should be shut off.
- care should be taken to avoid spilling fuel;
- no person should smoke or have an naked light in the vicinity.
- a fire extinguisher should be kept readily available.

- iv) Secondary fuel reservoir should be placed outside the engine room.

## 6.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

- Excavation
- Scaffolding, Platforms & Ladders
- Structural Work, Laying of Reinforcement & Concreting
- Road Work (Laying of roads)
- Cutting /Welding
- Working in Confined Space
- Proof/Pressure Testing
- Working at Heights
- Handling & Lifting Equipments
- Vehicle Movement
- Electrical
- Offshore
- Demolition
- Radiography
- Sand/shot blasting/ spray painting
- Work above water

The safe practices to be followed during the implementation of above construction activities are given below:

### 6.1 EXCAVATION

- 6.1.1 All excavation work should be planned and the method of excavation and the type of support

- work required should be decided considering the following:
- i) the stability of the ground;
  - ii) the excavation will not affect adjoining buildings, structures or roadways;
  - iii) to prevent hazard, the gas, water, electrical and other public utilities should be shut off or disconnected, if necessary;
  - iv) presence of underground pipes, cable conductors, etc.,
  - v) the position of culvert/bridges, temporary roads and spoil heaps should be determined;
- 6.1.2 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required decided.
- 6.1.3 All excavation work should be supervised.
- 6.1.4 Sites of excavations should be thoroughly inspected:
- i) daily, prior to each shift and after interruption in work of more than one day;
  - ii) after every blasting operation;
  - iii) after an unexpected fall of ground;
  - iv) after substantial damage to supports;
  - v) after a heavy rain, frost or snow;
  - vi) when boulder formations are encountered.
- 6.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth upto 3.0m should be maintained. Based on site conditions, provide proper slope, usually  $45^{\circ}$ , and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.
- 6.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or depth of trench whichever is greater.
- 6.1.7 Don't allow vehicles to operate too close to excavated area. Maintain atleast 2m distance from edge of excavation. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.
- 6.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.
- 6.1.9 If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.
- 6.1.10 Barricade at 1m height (with red & white band/self glowing caution board) should be provided for excavations beyond 1.5m depth. Provide two entries/exits for such excavation.
- 6.1.11 Necessary precautions should be taken for underground utility lines like cables, sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.
- 6.1.12 Water shall be pumped/bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.
- 6.1.13 During rains, the soil becomes loose. Take additional precaution against collapse of side wall.
- 6.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.
- 6.1.15 In case of mechanised excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. The mechanised excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the

machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.

- 6.1.16 In case of blasting, follow strictly IS:4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation.

## **6.2 SCAFFOLDING, PLATFORMS & LADDERS**

### **6.2.1 Metal as material of construction**

- i) A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.
- ii) Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.
- iii) Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.
- iv) Every scaffold and part thereof should be constructed :
  - (a) in such a way so as not to cause hazards for workers during erection and dismantling;
  - (b) in such a way so as guard rails and other protective devices, platforms, ladders, stairs or ramps can be easily put together;
  - (c) with sound material and of requisite size and strength for the purpose for which it is to be used and maintained in a proper condition.
- v) Boards and planks used for scaffolds should be protected against splitting.
- vi) Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.
- vii) Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.

- viii) Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.
- ix) Scaffolds should be designed for their maximum load as per relevant code.
- x) Scaffolds should be adequately braced.
- xi) Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.
- xii) A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.
- xiii) Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.
- xiv) Scaffolds should be inspected and certified:
  - (a) before being taken into use;
  - (b) at periodic intervals thereafter as prescribed for different types of scaffolds;
  - (c) after any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.
- xv) Inspection should more particularly ascertain that:
  - (a) the scaffold is of suitable type and adequate for the job;
  - (b) materials used in its construction are sound and of sufficient strength;
  - (c) it is of sound construction and stable;
  - (d) that the required safeguards are in position.
- xvi) A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.
- xvii) Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be



displaced in consequence of normal use.

- xviii) If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

### 6.2.2 Lifting appliances on scaffolds

- i) When a lifting appliance is to be used on a scaffold:
- (a) the parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
  - (b) any movement of the scaffold members should be prevented;
  - (c) if practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

### 6.2.3 Prefabricated scaffolds

- i) In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.
- ii) Frames of different types should not be intermingled in a single scaffold.
- iii) Scaffolding shall be erected on firm and level ground.
- iv) All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.
- v) Entry to scaffolding should be restricted.
- vi) Erection, alteration and removal shall be done under supervision of experienced personnel.
- vii) Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.
- viii) Each supporting member of platform shall be securely fastened and braced
- ix) Where planks are butt-joined, two parallel putlogs shall be used, not

more than 100mm apart, to give support to each plank.

- x) Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided.
- xi) The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.
- xii) Erect ladders in the "four up-one out position"
- xiii) Lash ladder securely with the structure.
- xiv) Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.
- xv) When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in "four up-one out position."
- xvi) Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.
- xvii) The width of ladder shall not be less than 300mm and rungs shall be spaced not more than 300mm.
- xviii) Every platform and means of access shall be kept free from obstruction.
- xix) If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.
- xx) Workers shall not be allowed to work on scaffolds during storms or high wind. After heavy rain or storms, scaffolds shall be inspected before reuse.
- xxi) Don't overload the scaffolding. Remove excess material and scrap immediately.
- xxii) Dismantling of scaffolds shall be done in a pre-planned sequential manner.

#### 6.2.4 Suspended scaffolds/boatwain's chair

- i) In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.
  - (a) platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;
  - (b) the number or anchorage should be compatible with the dimensions of the platform;
  - (c) the safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;
  - (d) the anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;
  - (e) the ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;
  - (f) Before use, the whole structure should be checked by a competent person.

#### 6.2.5 Bamboo Scaffolding

- i) In general, it should be avoided as far as possible. It should not be used in the unit/off-site areas and where hot work is to be done.
- ii) For construction and maintenance of residential and office buildings, situated outside explosive licensed area, bamboo scaffold, if used, should conform to provisions given in IS-3696 (Part 1)-1987.

### 6.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

#### 6.3.1 General provisions

- i) The erection or dismantling of buildings, structures, civil

engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.

- ii) Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.
- iii) Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.
- iv) Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilising are easily fixed to the formwork structure.

#### 6.3.2 Erection and dismantling of steel and prefabricated structures

- i) The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:
  - (a) ladders, gangways or fixed platforms;
  - (b) platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
  - (c) safety harnesses and lifelines, catch nets or catch platforms;
  - (d) Power-operated mobile working platforms.
- ii) Steel and prefabricated structures should be so designed and made that they can be safely transported and erected.
- iii) In addition to the need for the stability of the part when erected, the design should explicitly take following into account:
  - (a) the conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
  - (b) Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them

- easily on the structural steel or prefabricated parts.
- iv) The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:
    - (a) to withstand with a sufficient margin the stresses to which they are subjected;
    - (b) Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appliance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
    - (c) To avoid imbalance or distortion of the lifted load.
  - v) Storeplaces should be so constructed that:
    - (a) there is no risk of structural steel or prefabricated parts falling or overturning;
    - (b) storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions;
    - (c) racks are set on firm ground and designed so that units cannot move accidentally.
  - vi) While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.
  - vii) Every lifting appliance should:
    - (a) be suitable for the operations and not be capable of accidental disconnection;
    - (b) be approved or tested as per statutory requirement.
  - viii) Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.
  - ix) Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:
    - (a) be of such shape and dimensions as to ensure a secure grip without damaging the part;
    - (b) be marked with the maximum permissible load in the most unfavourable lifting conditions.
  - x) Structural steel or prefabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.
  - xi) When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.
  - xii) While structural steel or prefabricated parts are being erected, the workers should be provided with appliances for guiding them as they are being lifted and set down, so as to avoid crushing of hands and to facilitate the operations. Use of such appliances should be ensured.
  - xiii) A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be imperiled, even by external agencies such as wind and passing loads before its release from the lifting appliance.
  - xiv) At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.
  - xv) During transportation within the construction area, attachments such as slings and stirrups mounted on structural steel or prefabricated parts should be securely fastened to the parts.
  - xvi) Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.



- xvii) When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.
- xviii) When adverse weather conditions such as snow, ice and wind or reduced visibility entail risks of accidents, the work should be carried on with particular care, or, if necessary, interrupted.
- xix) Structures should not be worked on during violent storms or high winds, or when they are covered with ice or snow, or are slippery from other causes.
- xx) If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.
- xxi) The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a strong support.
- xxii) Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.
- xxiii) When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded
- xxiv) Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.
- xxv) Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.
- xxvi) Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.
- xxvii) Open-web steel joists that are hoisted singly should be directly

placed in position and secured against dislodgment.

### 6.3.3 Reinforcement

- i) Ensure that workers use Personnel Protective equipment like safety helmet, safety shoes, gloves etc.
- ii) Don't place the hand below the rods for checking clear distance. Use measuring devices.
- iii) Don't wear loose clothes while checking the rods.
- iv) Don't stand unnecessarily on cantilever rods.
- v) To carry out welding/cutting of rods, safety procedures/precautions as mentioned in Item No. 6.5 to be followed.
- vi) For supplying of rods at heights, proper staging and/or bundling to be provided.
- vii) Ensure barricading and staging for supplying and fixing of rods at height.
- viii) For short distance carrying of materials on shoulders, suitable pads to be provided.
- ix) While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not extend  $1/3^{\text{rd}}$  of deck length or 1.5M which ever is less and tied with red flags/lights.

### 6.3.4 Concreting

- i) Ensure stability of shuttering work before allowing concreting.
- ii) Barricade the concreting area while pouring at height/depths.
- iii) Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.
- iv) Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may effect their integrity.

- v) Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.
- vi) Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.
- vii) Earthing of electrical mixers, vibrators, etc. should be done and verified.
- viii) Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.
- ix) Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.
- x) Don't allow unauthorised person to stand under the concreting area.
- xi) Ensure adequate lighting arrangements for carrying out concrete work during night.
- xii) Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.
- xiii) During pouring, shuttering and its supports should be continuously watched for defects.

#### **6.4 ROAD WORK**

- 6.4.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.
- 6.4.2 Filled and empty bitumen drums shall be stacked separately at designated places.
- 6.4.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.
- 6.4.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.
- 6.4.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen

with aggregate, shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.

- 6.4.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal sheet, to prevent anything falling in it,
- 6.4.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.
- 6.4.8 For cement concrete roads, besides site barricading and installation of warning signs for traffic diversion, safe practices mentioned in the chapter on "Concreting", shall also be applicable.

#### **6.5 CUTTING/WELDING**

- 6.5.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken: -
  - i) A dry chemical type fire extinguisher shall be made available in the work area.
  - ii) Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.
  - iii) Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.
  - iv) All covers and panels shall be kept in place, when operating an electric Arc welding machine.
  - v) The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipments etc.
  - vi) The welding receptacles shall be rated for 63 A suitable for 415V, 3 Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.
  - vii) All cables, including welding and ground cables, shall be checked for

- any worn out or cracked insulation before starting the job. Ground cable should be separate without any loose joints.
- viii) Cable coiling shall be maintained at minimum level, if not avoidable.
  - ix) An energised electrode shall not be left unattended.
  - x) The power source shall be turned off at the end of job.
  - xi) All gas cylinders shall be properly secured in upright position.
  - xii) Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.
  - xiii) Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.
  - xiv) When not in use, valves of all cylinders shall be kept closed.
  - xv) All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.
  - xvi) Forced opening of any cylinder valve should not be attempted.
  - xvii) Lighted gas torch shall never be left unattended.
  - xviii) Store acetylene and oxygen cylinders separately.
  - xix) Store full and empty cylinders separately.
  - xx) Avoid cylinders coming into contact with heat.
  - xxi) Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.
  - xxii) If cylinders have to be moved, be sure that the cylinder valves are shut off.
  - xxiii) Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.
  - xxiv) Do not use matches to light torches, use a friction lighter.
  - xxv) Move out any leaking cylinder immediately.
  - xxvi) Use trolleys for oxygen & acetylene cylinder and chain them.
  - xxvii) Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.
  - xxviii) Ensure that hoses are free from burns, cuts and cracks and properly clamped.
  - xxix) Avoid dragging hoses over sharp edges and objects
  - xxx) Do not wrap hoses around cylinders when in use or stored.
  - xxxi) Protect hoses from flying sparks, hot slag, and other hot objects.
  - xxxii) Lubricants shall not be used on Ox-fuel gas equipment.
  - xxxiii) During cutting/welding, use proper type goggles/face shields.
- ## 6.6 WORKING IN CONFINED SPACES
- ### 6.6.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.
- i) Shut down, isolate, depressurise and purge the vessel as per laid down procedures.
  - ii) Entry inside the vessel and to carry out any job should be done after issuance of valid permit only in line with the requirement of OISD-STD-105.
  - iii) Ensure proper and accessible means of exit before entry inside a confined space.
  - iv) The number of persons allowed inside the vessel should be limited to avoid overcrowding.
  - v) When the work is going on in the confined space, there should always be one man standby at the nearby manway.

- vi) Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel.
- vii) Ensure requisite O<sub>2</sub> level before entry in the confined space and monitor level periodically or other wise use respiratory devices.
- viii) Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.
- ix) Ensure adequate ventilation or use respiratory devices.
- x) Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, gas masks shall be used by everyone while entering.
- xi) Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.
- xii) Use 24V flameproof lamp fittings only for illumination.
- xiii) Use tools with air motors or electric tools with maximum voltage of 24V.
- xiv) House keeping shall be well maintained.
- xv) Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.
- xvi) Don't wear loose clothing while working in a confined space.
- xvii) In case of the vessels which are likely to contain pyrophoric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyrophoric substances. Otherwise, these should be always kept wet by suitable means.
- xviii) The cutting torches should also be kept outside the vessel immediately after the cutting.
- xix) The gas cylinders used for cutting/welding shall be kept outside.
- xx) All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.
- xxi) To the extent possible sludge shall be cleared and removed from outside before entering.
- xxii) No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.
- xxiii) Communication should be always maintained between the worker and the attendant.

## 6.7 PROOF/PRESSURE TESTING

- 6.7.1 Review test procedure before allowing testing with water or air or any other fluid.
- 6.7.2 Provide relief valves of adequate size while testing with air or other gases.
- 6.7.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.
- 6.7.4 Inform all concerned in advance of the testing.
- 6.7.5 Keep the vents open before opening any valve for filling/drainage of liquid used for hydrotesting. The filling/drainage should not exceed the designed rate for pressure testing.
- 6.7.6 Provide separate gauges of suitable range for pressurising pump and the equipment to be tested.
- 6.7.7 Provide gauges at designated locations for monitoring of pressures.

6.7.8 Check the calibration of all pressurising equipment and accessories and maintain records.

6.7.9 Take readings at pre-defined intervals.

## **6.8 WORKING AT HEIGHTS**

### **6.8.1 General Provision**

- i) While working at a height of more than 3 meters, ISI approved safety belt shall be used.
- ii) While working at a height of more than 3 meters, permit should be issued by competent person before commencement of the job.
- iii) Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.
- iv) All tools should be carried in tool kits to avoid their falling.
- v) If the job is on fragile/sloping roof, roof walk ladders shall be used.
- vi) Provide lifeline wherever required.
- vii) Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.
- viii) Keep working area neat and clean. Remove scrap material immediately.
- ix) Don't throw or drop material/equipment from height.
- x) Avoid jumping from one member to another. Use proper passageway.
- xi) Keep both hands free while climbing. Don't try to bypass the steps of the ladder.
- xii) Try to maintain calm at height. Avoid over exertion.
- xiii) Avoid movements on beam.
- xiv) Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

### **6.8.2 Roof Work**

- i) All roof-work operations should be pre-planned and properly supervised.

ii) Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.

iii) Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.

iv) Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.

v) Roofing brackets should fit the slope of the roof and be securely supported.

vi) Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.

vii) On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.

viii) All covers for openings in roofs should be of substantial construction and be secured in position.

ix) Roofs with a pitch of more than 10 should be treated as sloping.

x) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.

xi) During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off the roof.

xii) Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.

xiii) A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.



**6.8.3 Work on tall chimneys**

- i) For the erection and repair of tall chimneys, scaffolding should be provided. A safety net should be maintained at a suitable distance below the scaffold.
- ii) The scaffold floor should always be at least 65 cm below the top of the chimney.
- iii) Under the working floor of the scaffolding the next lower floor should be left in position as a catch platform.
- iv) The distance between the inside edge of the scaffold and the wall of the chimney should not exceed 20 cm at any point.
- v) Catch platforms should be erected over:
  - (a) the entrance to the chimney;
  - (b) Passageways and working places where workers could be endangered by falling objects.
- vi) For climbing tall chimneys, access should be provided by:
  - (a) stairs or ladders;
  - (b) a column of iron rungs securely embedded in the chimney wall;
  - (c) Other appropriate means.
- vii) When workers use the outside rungs to climb the chimney, a securely fastened steel core rope looped at the free end and hanging down at least 3 m should be provided at the top to help the workers to climb on to the chimney.
- viii) While work is being done on independent chimneys the area surrounding the chimney should be enclosed by fencing at a safe distance.
- ix) Workers employed on the construction, alteration, maintenance or repair of tall chimneys should not:
  - a) work on the outside without a safety harness attached by a lifeline to a rung, ring or other secure anchorage;
  - b) put tools between the safety harness and the body or in pockets not intended for the purpose;

- c) haul heavy materials or equipment up and down by hand to or from the workplace on the chimney;
- d) fasten pulleys or scaffolding to reinforcing rings without first verifying their stability;
- e) work alone;
- f) climb a chimney that is not provided with securely anchored ladders or rungs;
- g) Work on chimneys in use unless the necessary precautions to avoid danger from smoke and gases have been taken.
- x) Work on independent chimneys should not be carried on in high winds, icy conditions, fog or during electrical storms.

**6.9 HANDLING AND LIFTING EQUIPMENT:****6.9.1 General Provisions**

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

- i) There should be a well-planned safety programme to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;
- ii) All lifting appliances shall be examined by competent persons at frequencies as specified in "The Factories act".
- iii) Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.
- iv) Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.
- v) Check periodically the oil, brakes, gears, horns and tyre pressure of all moving equipments like cranes,

- forklifts, trailers etc as per manufacturer's recommendations.
- vi) Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.
  - vii) Allow lifting slings as short as possible and check packing at the friction points.
  - viii) While lifting/placing of the load, no unauthorised person shall remain within the radius of the boom and underneath the load.
  - ix) While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.
  - x) Control longer jobs being lifted up from both ends.
  - xi) Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.
  - xii) During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.
  - xiii) Allow crane to move on hard, firm and leveled ground.
  - xiv) When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.
  - xv) Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.
  - xvi) Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.
  - xvii) No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.
- 6.9.2 Hoists**
- i) Hoist shafts should be enclosed with rigid panels or other adequate fencing at:
    - (a) ground level on all sides;
    - (b) all other levels at all points at which access is provided;
    - (c) all points at which persons are liable to be struck by any moving part.
  - ii) The enclosure of hoist shafts, except at approaches should extend where practicable at least 2mt above the floor, platform or other place to which access is provided except where a lesser height is sufficient to prevent any person falling down the hoistway and there is no risk of any person coming into contact with any moving part of the hoist, but in no case should the enclosure be less than 1mt in height.
  - iii) The guides of hoist platforms should offer sufficient resistance to bending and, in the case of jamming by a safety catch, to buckling.
  - iv) Where necessary to prevent danger, adequate covering should be provided above the top of hoist shafts to prevent material falling down them.
  - v) Outdoor hoist towers should be erected on firm foundations, and securely braced, guyed and anchored.
  - vi) A ladderway should extend from the bottom to the top of outdoor hoist towers, if no other ladderway exists within easy reach.
  - vii) Hoisting engines should be of ample capacity to control the heaviest load that they will have to move.
  - viii) Hoists should be provided with devices that stop the hoisting engine as soon as the platform reaches its highest stopping place.
  - ix) Winches should be so constructed that the brake is applied when the control handle is not held in the operating position.
  - x) It should not be possible to set in motion from the platform a hoist, which is not designed for the conveyance of persons.

- xi) Winches should not be fitted with pawl and ratchet gears on which the pawl must be disengaged before the platform is lowered.
  - xii) Hoist platforms should be capable of supporting the maximum load that they will have to carry with a safety factor.
  - xiii) Hoist platforms should be equipped with safety gear that will hold the platform with the maximum load if the hoisting rope breaks.
  - xiv) If workers have to enter the cage or go on the platform at landings there should be a locking arrangement preventing the cage or platform from moving while any worker is in or on it.
  - xv) On sides not used for loading and unloading, hoist platforms should be provided with toe-boards and enclosures of wire mesh or other suitable material to prevent the fall of parts of loads.
  - xvi) Where necessary to prevent danger from falling objects, hoist platforms should be provided with adequate covering.
  - xvii) Counterweights consisting of an assemblage of several parts should be made of specially constructed parts rigidly connected together.
  - xviii) Counterweights should run in guides.
  - xix) Platforms should be provided at all landings used by workers.
  - xx) Following notices should be posted up conspicuously and in very legible characters:
    - (a) on all hoists:
      - on the platform: the carrying capacity in kilograms or other appropriate standard unit of weight;
      - on the hoisting engine: the lifting capacity in kilograms or other appropriate standard unit of weight;
    - (b) on hoists authorised or certified for the conveyance of persons:
      - on the platform or cage: the maximum number of persons to be carried at one time;
    - (c) on hoists for goods only:
      - on every approach to the hoist and on the platform: prohibition of use by persons.
  - xxi) Hoists intended for the carriage of persons should be provided with a cage so constructed as to prevent any person from falling out or being trapped between the cage and any fixed part of the structure when the cage gate is shut, or from being struck by the counterbalance weight or by articles or materials falling down the hoistway.
  - xxii) On each side in which access is provided, the cage should have a gate fitted with devices which ensure that the gate cannot be opened except when the cage is at a landing and that the gate must be closed before the cage can move away from the landing.
  - xxiii) Every gate in the enclosure of the hoist shaft which gives access from a landing place to the cage should be fitted with devices to ensure that the gate cannot be opened except when the cage is at that landing place, and that the cage cannot be moved away from that landing place until the gate is closed.
- 6.9.3 Derricks**
- Stiff-leg derricks**
- i) Derricks should be erected on a firm base capable of taking the combined weight of the crane structure and maximum rated load.
  - ii) Devices should be used to prevent masts from lifting out of their seating.
  - iii) Electrically operated derricks should be effectively earthed from the sole plate or framework.
  - iv) Counterweights should be so arranged that they do not subject the backstays, sleepers or pivots to excessive strain.
  - v) When derricks are mounted on wheels:



- a) a rigid member should be used to maintain the correct distance between the wheels;
- b) they should be equipped with struts to prevent them from dropping if a wheel breaks or the derrick is derailed.
- vi) The length of a derrick jib should not be altered without consulting the manufacturer.
- vii) The jib of a scotch derrick crane should not be erected within the backstays of the crane.

#### **Guy derricks**

- i) The restraint of the guy ropes should be ensured by fitting stirrups or anchor plates in concrete foundations.
- ii) The mast of guy derricks should be supported by six top guys spaced approximately equally.
- iii) The spread of the guys of a guy derrick crane from the mast should not be more than  $45^{\circ}$  from the horizontal.
- iv) Guy ropes of derricks should be equipped with a stretching screw or turnbuckle or other device to regulate the tension.
- v) Gudgeon pins, sheave pins and fool bearings should be lubricated frequently.
- vi) When a derrick is not in use, the boom should be anchored to prevent it from swinging.

#### **6.9.4 Gin poles**

- i) Gin poles should:
  - (a) be straight;
  - (b) consist of steel or other suitable metal;
  - (c) be adequately guyed and anchored;
  - (d) be vertical or raked slightly towards the load;
  - (e) be of adequate strength for the loads that they will be required to lift/move.
- ii) Gin poles should not be spliced and if a gin pole is composed of different elements, they should be assembled in conformity with their intrinsic material strength.

- iii) Gin poles should be fastened at their feet to prevent displacement in operation.
- iv) Gin poles, which are moved from place to place and re-erected, should not be taken into use again before the pole, lifting ropes, guys, blocks and other parts have been inspected, and the whole appliance has been tested under load.
- v) When platforms or skips are hoisted by gin poles, precautions should be taken to prevent them from spinning and to provide for proper landing.

#### **6.9.5 Tower cranes**

- i) Where tower cranes have cabs at high level, persons, capable and trained to work at heights, should only be employed as crane operators.
- ii) The characteristics of the various machines available should be considered against the operating requirements and the surroundings in which the crane will operate before a particular type of crane is selected.
- iii) Care should be taken in the assessment of wind loads both during operations and out of service. Account should also be taken of the effects of high structures on wind forces in the vicinity of the crane.
- iv) The ground on which the tower crane stands should have the requisite bearing capacity. Account should be taken of seasonal variations in ground conditions.
- v) Bases for tower cranes and tracks for rail-mounted tower cranes should be firm and level. Tower cranes should only operate on gradients within limits specified by the manufacturer. Tower cranes should only be erected at a safe distance from excavations and ditches.
- vi) Tower cranes should be sited where there is clear space available for erection, operation and dismantling. As far as possible, cranes should be sited so that loads do not have to be handled over occupied premises, over public thoroughfares, other construction works and railways or near power cables.

- vii) Where two or more tower cranes are sited in positions where their jibs could touch any part of the other crane, there should be direct means of communication between them and a distinct warning system operated from the cab so that one driver may alert the other of impending danger.
- viii) The manufacturers' instructions on the methods and sequence of erection and dismantling should be followed. The crane should be tested before being taken into use.
- ix) The climbing operation of climbing tower cranes should be carried out in accordance with manufacturers' instructions. The free-standing height of the tower crane should not extend beyond what is safe and permissible in the manufacturers' instructions.
- x) When the tower crane is left unattended, loads should be removed from the hook, the hook raised, the power switched off and the boom brought to the horizontal. For longer periods or at times when adverse weather conditions are expected, out of service procedures should be followed. The main jib should be slewed to the side of the tower away from the wind, put into free slew and the crane immobilised.
- xi) A windspeed measuring device should be provided at an elevated position on the tower crane with the indicator fitted in the drivers' cab.
- xii) Devices should be provided to prevent loads being moved to a point where the corresponding safe working load of the crane would be exceeded. Name boards or other items liable to catch the wind should not be mounted on a tower crane other than in accordance with the manufacturers' instructions.
- xiii) Tower cranes should not be used for magnet, or demolition ball service, piling operations or other duties, which could impose excessive loading on the crane structure.

#### **6.9.6 Lifting ropes**

- i) Only ropes with a known safe working capacity should be used as lifting ropes.
- ii) Lifting ropes should be installed, maintained and inspected in accordance with manufacturers' instructions.
- iii) Repaired steel ropes should not be used on hoists.
- iv) Where multiple independent ropes are used, for the purpose of stability, to lift a work platform, each rope should be capable of carrying the load independently.

#### **6.10 VEHICLE MOVEMENT**

- 6.10.1 Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.
- 6.10.2 Don't overload the vehicle.
- 6.10.3 Obey speed limits and traffic rules.
- 6.10.4 Always expect the unexpected and be a defensive driver.
- 6.10.5 Drive carefully during adverse weather and road conditions.
- 6.10.6 Read the road ahead and ride to the left.
- 6.10.7 Be extra cautious at nights. Keep wind screens clean and lights in working condition.
- 6.10.8 All vehicles used for carrying workers and construction materials must undergo predictive/preventive maintenance and daily checks
- 6.10.9 Driver with proper valid driving license shall only be allowed to drive the vehicle
- 6.10.10 Routes shall be leveled, marked and planned in such a way so as to avoid potential hazards such as overhead power lines and sloping ground etc.
- 6.10.11 While reversing the vehicles, help of another worker should be ensured at all times
- 6.10.12 An unattended vehicle should have the engine switched off
- 6.10.13 Wherever possible one-way system shall be followed
- 6.10.14 Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle

- 6.10.15 Load should be properly secured
- 6.10.16 The body of the tipper lorry should always be lowered before driving the vehicle off.
- 6.10.17 Signs/signals/caution boards etc. should be provided on routes .

## **6.11 ELECTRICAL**

### **6.11.1 General Provisions**

- i) Only persons having valid licenses should be allowed to work on electrical facilities.
- ii) No person should be allowed to work on live circuit. The same, if unavoidable, special care and authorisation need to be taken.
- iii) Treat all circuits as "LIVE" unless ensured otherwise.
- iv) Electrical "Tag Out" procedure "MUST" be followed for carrying out maintenance jobs.
- v) Display voltage ratings prominently with "Danger" signs.
- vi) Put caution/notice signs before starting the repair works.
- vii) All electrical equipment operating above 250V shall have separate and distinct connections to earth grid.
- viii) Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.
- ix) Make sure that electrical switch boards, portable tools, equipments (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry and then only use them. Check proper earthing.  
  
All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.
- x) Don't work wet on electrical system.
- xi) Don't overload the electrical system.
- xii) Use only proper rated HRC fuses.
- xiii) Industrial type extension boards and Plug sockets are only to be used.
- xiv) ELCB for all temporary connections must be provided. Use insulated 3 pin plug tops.
- xv) All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.
- xvi) All Power cables to be properly terminated using glands and lugs of proper size and adequately crimped.
- xvii) Use spark-proof/ flame proof type electrical fittings in Fire Hazard zones as per area classification under OISD-STD-113.
- xviii) Check installations of steel plates/pipes to protect underground cables at crossings.
- xix) Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.
- xx) Maintain safe overhead distance of HT cables as per Indian Electricity Rules and relevant acts.
- xxi) Don't connect any earthing wire to the pipelines/structures.
- xxii) Don't make any unsafe temporary connections, naked joints/wiring etc.
- xxiii) Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.
- xxiv) Check at periodic intervals that pins of sockets and joints are not loose.
- xxv) Protect electrical wires/equipments from water and naked flames.
- xxvi) Illuminate suitably all the work areas.
- xxvii) All switchboards should be of MS structure only and incoming source should be marked.
- xxviii) Hand lamps should not be of more than 24V rating.
- xxix) Fire extinguishers (DCP/CO<sub>2</sub>/Sand buckets) should be kept near

temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.

xxx) Insulating mats shall be provided in the front and back end of switch boards.

xxxi) All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and external explosion.

Periodic checking/certification of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed along with maintaining a register at site signed by competent authority.

xxxii) A notice displaying following, should be kept exhibited at suitable places:

- a) prohibiting unauthorised persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;
- b) containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;
- c) specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.

xxxiii) No other cables/pipes to be laid in trench used for electrical cables.

xxxiv) Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.

xxxv) Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.

**NOTE:** A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per Indian Electricity Rules.

#### 6.11.2 Inspection and maintenance

- i) All electrical equipment should be inspected before taking into use to

ensure suitability for its proposed use.

ii) At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.

iii) Apart from some exceptional cases, work on or near live parts of electrical equipment should be forbidden.

iv) Before any work is begun on conductors or equipment that do not have to remain live:

- a) the current should be switched off by a responsible authorised person;
- b) precautions should be taken to prevent the current from being switched on again;
- c) the conductors or the equipment should be tested to ascertain that they are dead;
- d) the conductors and equipment should be earthed and short-circuited;
- e) neighbouring live parts should be adequately protected against accidental contact.

v) After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person after the earthing and short-circuiting have been removed and the workplace reported safe.

vi) Electricians should be provided with approved and tested tools, and personal protective equipment such as rubber gloves, mats etc.

vii) All conductors and equipment should be considered to be live unless there is a proof of the contrary.

viii) When work has to be done in dangerous proximity to live parts the current should be cut off. If for operational reasons this is not possible, the live parts should be fenced off or enclosed by qualified staff from the sub-station concerned.

**6.11.3. Testing**

- i) Electrical installations should be inspected and tested and the results recorded.
- ii) Periodic testing of the efficiency of the earth leakage protective devices should be carried out.
- iii) Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

**6.12 OFFSHORE****6.12.1 General**

The isolated nature of offshore installations are hazardous. They call for greater need for safety and survival at offshore. Safety at offshore is safety of installations and safety of personnel. Safety problems and accidents at offshore have high risks due to limited space, helicopter operation, sea transport etc. Following are the general safety guidelines to be followed in addition to the safety guidelines stipulated for specific jobs dealt later on:

- i) Workers should be well trained to do their job independently with high degree of self-control and self-discipline.
- ii) On arrival at offshore, everyone should be briefed about the safety rules to be followed at offshore, evacuation system etc. All personnel should wear overall (dangri), helmet and shoes for personnel protection.
- iii) In case of emergency, workers should follow instruction of Field Production Superintendent (F.P.S.) In certain cases instructions may be given to abandon the offshore installation and evacuate the persons to safe location.
- iv) To overcome above problems, offshore personnel must receive training for using life saving appliances and other personal survival techniques.
- v) Any person working at offshore should have one person as standby for any eventuality.

**6.12.2 Drilling Rigs**

- i) Location of jack up rigs should not be less than 5 Kms from shipping route. Orientation of the rig, wind direction etc are required for safe landing of helicopter. Information w.r.t. sea currents, wind speed, Hi-lo tide etc are required for mooring of supply vessels.
- ii) Sea bed condition at every location should be ensured for safety of rig.
- iii) Radio and other communication facilities should be such to maintain contact with base all times.
- iv) During toeing of rig, the rig deck should be clear of load, toeing lines should be in good condition and tensions in various toeing lines should be constantly monitored.
- v) Few steps during toeing are:
  - a) crane booms should be secured to their vestr,
  - b) all hatches and water tight doors should be closed,
  - c) number of personnel on board should be restricted,
  - d) evacuate in case of emergency and operation should be completed preferably in day light.

**6.12.3 Drilling**

- i) In view of CO<sub>2</sub> and H<sub>2</sub>S gas cut from well, effective ventilation should be provided where drilling is in progress.
- ii) Safety alarm shall be checked in advance in view of failure of ventilation system.
- iii) Suitable sensors for H<sub>2</sub>S and Methane should be function tested time to time and suitable colour code should be given.
- iv) Working areas of the crane should be illuminated during night to avoid accident.
- v) Clear space should be available for despatch and receipt of load and, in particular, basket transfer of passengers. Persons engaged in loading/unloading of materials should be protected from falling into the sea.



- vi) Signal light should be fitted at the top of the jib.
- vii) Crane hook should be fitted with safety latches.
- viii) Experienced person should be engaged in operation of specific equipment like winches, cranes etc.
- ix) At least three cable turns shall always be there on the winch drum.
- x) Adequate communication like walkie talkie, round robin phone should be available between the crane operator, supervisor and helper.
- xi) Crane operation should be completely stopped during helicopter landing/taking off.
- xii) Except for helicopter landing deck, all decks, platforms, bridges, ladders should have rigid and fixed guard rails atleast one meter high and should have one intermediate rail midway between the handrail and 100 mm toe board.
- xiii) Wooden ladders shall not be used at offshore.
- xiv) Flow sensor in the flow line should be ensured for safe working and to avoid blow out.
- xv) Hydrogen sulphide gas In offshore is of great risk and at 10 ppm (0.001%) concentration in air, a person should not be exposed for more than 8 hours, If concentration is more, then breathing apparatus should be used. Corrosion of equipment is also caused by H<sub>2</sub>S.
- xvi) Portable H<sub>2</sub>S gas detector should be continuously used.

#### 6.12.4 Production Platforms

- i) In case hydrocarbon is released due to overpressure, leak, overflow, gas blow etc., shut down process to stop flow of hydrocarbon. Prevent ignition of released hydrocarbon and in case of fire shut in the process complex and follow emergency contingency plan.
- ii) Sub surface safety valve (SSSV) below the well head should be actuated during uncontrolled well - flow and they should be regularly checked.

- iii) Surface safety valve or SDV should be checked for no gas leakage from bleed port / flange etc., in the well head area. It should not be in "mechanical override" or bypassed from panel.
- iv) High pressure gas lift lines - blowdown system should be O.K.
- v) Auto actuation of SDVs in the inlet of pressure vessels should be O.K. and in "normal position" from shutdown panels. A record of status of switches normal/bypassed in auto-con\* panels (PSH, PSL, LSL, ILSL) should be maintained.

#### \* Shut Down Panels

- vi) Welders rectifier set and electrical connections to it should be checked and approved by electrical-in-charge for proper electrical safety.
- vii) "SCADA" telemetry system if available should be operational for remote opening and closing of wells at unmanned platforms (through RPMC).
- viii) Local ESD/FSD (near the work site) should be provided for jobs of very critical nature, so that the persons working can access it immediately in emergency for safety. Safety officer should judge the requirement & inform FPS for the same.
- ix) Railings and Gratings etc. in and around work area should be O.K. and inspected to avoid slippage of man into sea.
- x) Emergency shut down (ESD) system is initiated when an abnormal condition is detected. ESD should be checked once in six months.
- xi) Platform should be manned round the clock.
- xii) Welding and cutting work should be regulated by hot work permit.
- xiii) All detectors should be calibrated as per recommendation of the manufacturer.
- xiv) No system should be by-passed which affects the system of platform.

- xv) In H<sub>2</sub>S field platforms, due care shall be taken as per recommendations.
- xvi) Follow the instructions of F.P.S. during stay at platform

#### 6.12.5 Fire Prevention And Control

- i) Provision be made for safe handling and storage of dirty rags, trash, and waste oil. Flammable liquids and chemicals applied on platform should be immediately cleaned.
- ii) Paint containers and hydrocarbon samples, gas cylinders for welding and cutting should be stored properly. Cylinders should be transported in hand-cart.
- iii) Smoking should be restricted and no smoking area should be identified.
- iv) Special attention should be given to crude oil pump seals, diesel and gas engines which are potential source of ignition in the event of failure.
- v) Fire and smoke detectors i.e. ultraviolet heat, thermal and smoke detector should be function tested once in three months.
- vi) Fire is controlled in offshore by water spraying, Halon, CO<sub>2</sub> flooding, DCP and sprinkler system.
- vii) Foaming agent is applied for controlling fire in liquid hydrocarbon. The system is not effective in gas fire.
- viii) Light weight breathing system should be used.
- ix) The fire control plan at offshore should reveal control station, fire alarms and fire detectors, deluge valves and sprinkler, fire extinguishing appliances, fireman outfit and ventilation system.
- x) Fire fighting equipment should be maintained in ready to use condition.

#### 6.12.6 Life Saving Appliances

- i) Life boats with a speed of 6 knots and carrying capacity upto 50 persons are used in offshore.
- ii) No. of life boats on one installation should have a capacity to

accommodate twice the number of persons onboard installation.

- iii) Launching appliances and life boat equipment should be checked every week.
- iv) Boat landing areas should be adequately illuminated.
- v) Life raft has no power and they rely on drift.
- vi) Life jacket lifts the wearer after entering water.
- vii) Life buoys are used to rescue persons if any person accidentally falls in the sea.
- viii) All life saving appliances should be inspected by the MMD surveyor /sr. officials once a year.
- ix) Every life boat shall be inspected once a week.
- x) Every life boat and life raft should be serviced once a year by a competent authority,

#### 6.12.7 Safety Precautions during Helicopter Transportation

- i) Passenger briefing regarding safety rules while travelling in helicopter should be carried out before boarding the helicopter.
- ii) Emergency procedure should be briefed to all the passenger In case helicopter is to ditch into the sea.
- iii) Heli-pad should have a non-skid surface. Nylon rope net should be stretched on the deck.
- iv) Proper drainage should be available on helideck.
- v) There should be no obstruction on the helideck itself and within 3 meters of its parameter. Closest super structure above the helideck should have red obstruction light.
- vi) While landing fire crew of two persons should be standby adjacent to helideck.
- vii) Heli-deck should be properly illuminated for night landing.
- viii) During switching off helicopter, persons should not be allowed to go out/ towards helicopter

## 6.13 DEMOLITION

### 6.13.1. General provisions

- i) When the demolition of any building or structure might present danger to workers or to the public:
  - (a) necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;
  - (b) the work should be planned and undertaken only under the supervision of a competent person.
- ii) Before demolition operations begin:
  - (a) structural details and builders' drawings should be obtained wherever possible;
  - (b) details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;
  - (c) an initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;
  - (d) a method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;
- iii) All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.
- iv) If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.
- v) As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.
- vi) The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.
- vii) Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.
- viii) The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.
- ix) Care should be taken not to demolish any parts, which would destroy the stability of other parts.
- x) Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.
- xi) To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.
- xii) Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.
- xiii) Where a deliberate controlled collapse technique is to be used, expert engineering advice should be obtained, and:
  - (a) it should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;
  - (b) it should only be used on sites that are fairly level and where there is enough surrounding space for all operatives and equipment to be withdrawn to a safe distance.
- xiv) When equipment such as power shovels and bulldozers are used for



demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.

- xv) If a swinging weight is used for demolition, a safety zone having a width of at least one-and-a-half times the height of the building or structure should be maintained around the points of impact.

#### **6.13.2. Demolition of structural steelwork**

- i) All precautions should be taken to prevent danger from any sudden twist, spring or collapse of steelwork, ironwork or reinforced concrete when it is cut or released.
- ii) Steel construction should be demolished tier by tier.
- iii) Structural steel parts should be lowered and not dropped from a height.

#### **6.14 RADIOGRAPHY**

- 6.14.1 All radiography jobs shall be carried out as per BARC Safety Regulations
- 6.14.2 During field radiography, nearby area around the radiation source should be cordoned off.
- 6.14.3 If the field radiography is to be done at the same location repeatedly, it is advisable to provide either a wire fencing around or a temporary brick enclosure.
- 6.14.4 Special permission/permit should be taken for radiography from area-in-charge.
- 6.14.5 As far as possible, field radiography should be done only during night time when there is little or no occupancy there.
- 6.14.6 Radiation warning signals should be pasted all along the cordoned off area.
- 6.14.7 Entry into the restricted area by unauthorised persons should be strictly prohibited during exposure.
- 6.14.8 The radiation level alongwith the cordon should be monitored by a suitable and well-calibrated radiation survey meter.

- 6.14.9 All personnel working with radiography sources should wear appropriate protective equipment and film badges issued by BARC.

- 6.14.10 Protection facilities such as manipulator rod, remote handling tongs, lead pots, radiation hazard placards and means of cordon off shall be available at each site.

- 6.14.11 The radiography source shall never be touched or handled directly with hands.

- 6.14.12 The package containing radiography cameras and sources should never be carried by public transport like bus, train etc.

- 6.14.13 Radiography sources and cameras, when not in use, should be stored inside a source pit with lock and key arrangement as approved by BARC. The storage room should preferably be located in an isolated area of minimum occupancy and radiation level outside the storage room should not exceed 0.25 mR/hr as per BARC Regulations.

- 6.14.14 In case of an accident (due to loss or of damage to radiography source), action should be taken in line with BARC Safety Rules/Guidelines.

#### **6.15 SAND/SHOT BLASTING/ SPRAY PAINTING**

- 6.15.1 Sand blasting should be used only after approval from competent person.

- 6.15.2 Air Compressor used for sand/shot blasting/painting should have guard and positioned away from the work place.

- 6.15.3 Exhaust of the prime mover, if IC engine is used, should be directed away from the work place.

- 6.15.4 In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.

- 6.15.5 The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.

- 6.15.6 The operator of sand/shot blasting/painting should wear suitable PPE's including mask.
- 6.15.7 Adequate measures to be taken to suppress dust/spray particle.
- 6.15.8 Sand used for sand blasting should be suitably covered & protected from rain/moisture.
- 6.15.9 When these activities are done in confined places, adequate measure to be taken for proper ventilation.

## 6.16 WORK ABOVE WATER

### 6.16.1 General Provisions

- i) Where work is done over or in close proximity to water & where possibility of drowning exists, provision should be made for:
  - a) Preventing workers from falling into water;
  - b) The rescue of workers in danger of drowning;
  - c) Safe and sufficient transport.
- ii) Provisions for the safe performance of work over or in close proximity to water should include, where appropriate, the provision and use of suitable and adequate:
  - a) fencing, safety nets and safety harnesses;
  - b) lifebuoys, life jackets and manned boats;
  - c) protection against such hazards as reptiles and other animals.
- iii) Gangways, pontoons, bridges, footbridges and other walkways or work places over water should:
  - a) possess adequate strength and stability;
  - b) be sufficiently wide to allow safe movement of workers;
  - c) have level surfaces free from tripping hazards;
  - d) be adequately lit when natural light is insufficient;
  - e) where practicable and necessary, to prevent danger, be provided with toe-boards, guard rails, hand ropes etc.
  - f) be secured to prevent dislodgment by rising water or high winds;
  - g) if necessary, be equipped with ladders which should be sound, of sufficient strength and length and be securely lashed to prevent slipping.

- iv) All deck openings including those for buckets should be fenced.

### 6.16.2 Rescue & Emergency procedures

- i) Persons who work over water should be provided with some form of buoyancy aid. Life jackets should provide sufficient freedom of movement, have sufficient buoyancy to bring persons to the surface and keep them afloat face upwards, be easily secured to the body, be readily visible by way of self luminous paint/strip.
- ii) Nobody should work alone on or above water.
- iii) Each worker should be trained in the procedure to be followed in the event of an emergency.

## 7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS

In addition to general safety precautions as outlined above for the activities in Clause 6.0, following additional safety precautions need to be taken for the sites within the operating area or nearby, where presence of Hydrocarbons cannot be ruled out.

- i) No job shall be carried out without a valid permit. Permit should be in line with OISD-STD-105 "Work Permit System".
- ii) Smoking should be prohibited in all places containing readily combustible or flammable materials and "No Smoking" notices be prominently displayed.
- iii) In confined spaces and other places where flammable gases, vapours or dusts can cause danger, following measures should be taken:
  - (a) only approved type electrical installations and equipment, including portable lamps, should be used;
  - (b) there should be no naked flames or source of ignition;
  - (c) oily rags, waste and clothes or other substances liable to spontaneous ignition should be removed without delay to a safe place;
  - (d) ventilation should be provided.

- iv) Regular inspections should be made of places where there are fire risks. These include the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations.
- v) Welding, flame cutting and other hot work should only be done after issuance of work permit in line with the requirement of OISD-STD-105 after appropriate precautions, as required, are taken to reduce the risk of fire. For carrying out other jobs also, OISD-STD-105 should be followed strictly.
- vi) Fire-extinguishing equipment should be well maintained and inspected at suitable intervals by a competent person. Access to fire-extinguishing equipment such as hydrants, portable extinguishers and connections for hoses should be kept clear at all times.
- vii) All supervisors and a sufficient number of workers should be trained in the use of fire-extinguishing equipment, so that adequate trained personnel are readily available during all working periods.
- viii) Audio means to give warning in case of fire should be provided where this is necessary to prevent danger. Such warning should be clearly audible in all parts of the site where persons are liable to work. There should be an effective evacuation plan so that all persons are evacuated speedily without panic and accounted for and all plant and processes shut down.
- ix) Notices should be posted at conspicuous places indicating:
  - (a) the nearest fire alarm;
  - (b) the telephone number and address of the nearest emergency services.
- x) The work site shall be cleared of all combustible materials, as Sparks and molten metal coming from the welding job can easily ignite combustible materials near or below the welding site. If the combustible materials cannot be removed from the area, the same shall be properly shielded.
- xi) A dry chemical type fire extinguisher shall be made available in the work area. Also fire protection facilities like running hoses etc. as per permit should be complied with.
- xii) Wherever required, welding screens shall be put up to protect other equipment in adjoining areas against flying sparks. Material used should be metal/asbestos/water curtain.
- xiii) Welding or cutting of vessels/equipments used in Hydrocarbon/hazardous chemicals shall be done after proper gas freeing and verifying the same with the explosive-meter.
- xiv) The confined space/equipment shall be gas freed and cleaned.
- xv) Absence of any toxic gas and any flammable gas above explosion limit shall be ensured with the help of gas detection instrument and explosive meter respectively.
- xvi) Used and hot electrode stubs shall be discarded in a metal bucket.
- xvii) Use approved and certified flame arrestors for vehicles.
- xviii) Work permit to be obtained, if construction work is carried out within existing operating area.

## 8.0 FIRST AID

First aid facilities should be provided in line with various statutory regulations like factory act etc. However following care should be taken:

- i) First aid, including the provision of trained personnel should be ensured at work sites. Arrangement should be made for ensuring the medical attention of the injured workers. First aid box should be as per the Factory rules.
- ii) Suitable rescue equipment, like stretchers should be kept readily available at the construction site.
- iii) First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.

- iv) First-aid kit or boxes should not keep anything besides material for first aid in emergencies.
- v) First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and stocked.
- vi) Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life saving techniques and in rescue procedures.
- vii) Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

## 9.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s). All accidents should be reported as per OISD Guidelines (OISD-GDN-107) and Factories act, 1948.

All accidents (major, minor or near miss) should be investigated, analysed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

## 10.0 SAFETY AWARENESS & TRAINING

Safety awareness to all section of personnel ranging from site-in-charge to workmen helps not only preventing the risk but also build up the confidence. Time and expenditures also get saved as a result.

Safety awareness basically seeks to persuade/inform people on safety besides supplementing skill also. Awareness programme may include followings:

- i) **Poster:** Posters with safety slogan in humorous, gruesome demonstrating manner may be used to discourage bad habits attributable to accidents by appealing to the workers' pride, self-love, affection curiosity or human aspects. These should be displayed in prominent location(s).
- ii) **Safety Sign Boards:** Different type of message of cautioning, attention, notice etc. should be displayed at the appropriate places for learning/awareness of the workmen while working at site.
- iii) **Films & Slides:** Film(s) narrating the accident including the causes and possible remedial ways of preventing the recurrence of a similar accident should be displayed at regular intervals. Slides consisting main points of the film show may also be shown to workers.
- iv) **Talks, lectures & conferences:** The success of these events would depend much on audience's understandings of the speaker (s). The speakers are to be knowledgeable and good presenter. Speakers should know to hold the attention and to influence the audiences.
- v) **Competitions:** Organise competition(s) between the different deptts/categories of workers. The sense of reward/recognition also will improve safety awareness and result in enhancing safety levels.
- vi) **Exhibitions:** Exhibitions also make the workers acquainted with hazards and means of preventive measures.
- vii) **Safety Publication:** Safety publications including pocket books dealing with ways of investigation and prevention in the field of safety and so on, may be distributed to workers to promote the safety awareness.
- viii) **Safety Drives:** From time to time, an intensive safety drive by organising a safety day or a safety week etc. should be launched.
- ix) **Training:** Training for covering the hazards for different trade should be imparted. Training should also include the specific hazards related

to a job in addition to the general safety training as has been dealt in various chapters and should include all workers. Reference may be drawn from OISD-STD-154.

- iii) *Safety & Health in Construction by ILO*
- iv) *The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996*

#### **11.0 REFERENCES**

- i) *Factory Act, 1948*
- ii) *Indian Electricity Rules*

## ANNEXURE I

**LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF  
INDIAN STANDARDS**

Sr.no	Code No.	Title
01. IS : 818		Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
02. IS : 875		Code of practice for Structural safety of buildings: Masonry walls
03. IS : 933		Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
04. IS : 1179		Specification for Equipment for Eye and Face Protection during Welding – First Revision.
05. IS : 1904		Code of practice for Structural safety of buildings: Shallow foundations
06. IS : 1905		Code of practice for Structural safety of buildings: Masonry walls
07. IS : 2171		Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision.
08. IS : 2361		Specification for Building Grips – First Revision.
09. IS : 2750		Specification for Steel Scaffoldings.
10. IS : 2925		Specification for Industrial Safety Helmets – First Revision.
11. IS : 3016		Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision.
12. IS : 3521		Industrial safety belts and harnesses
13. IS : 3696 – Part I		Safety Code for Scaffolds and Ladders : Part I – Scaffolds.
14. IS : 3696 – Part II		Safety Code for Scaffolds and Ladders : Part II – Ladders.
15. IS : 3764		Safety Code for Excavation Work.
16. IS : 4014 -Part I & II		Code of practice for Steel tubular scaffolding
17. IS : 4081		Safety Code for Blasting and Related Drilling Operations.
18. IS : 4082		Recommendations on staking and storage of construction materials at site
19. IS : 4130		Safety Code for Demolition of Buildings – First Revision.
20. IS : 4138		Safety Code Working in Compressed Air-First Revision
21. IS : 4756		Safety code for Tunneling works
22. IS : 4912		Safety requirements for Floor and Wall Openings, Railings and toe Boards –First Revision.
23. IS : 5121		Safety Code for Piling and other Deep Foundations.
24. IS : 5916		Safety Code for Construction involving use of Hot Bituminous Materials.
25. IS : 5983		Specification for Eye Protectors – First Revision.
26. IS : 6922		Structures subject to underground blasts, criteria for safety and design of
27. IS : 7155		Code of recommended practices for conveyor safety
28. IS : 7205		Safety Code for Erection on Structural Steel Works.

Sr.no	Code No.	Title
29.	IS : 7069	Safety Code for Handling and Storage of Building Materials.
30.	IS : 7293	Safety Code for Working with Construction Machinery.
31.	IS : 7323	Guidelines for operation of Reservoirs
32.	IS : 7969	Safety code for handling and storage of building material
33.	IS : 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals.
34.	IS : 8989	Safety Code for Erection of Concrete Framed Structures.
35.	IS : 9706	Code of Practices for construction of Arial ropeways for transportation of material
36.	IS : 9759	Guidelines for de-watering during construction
37.	IS : 9944	Recommendations on safe working load for natural and man-made fibre roap slings
38.	IS : 10291	Safety code for dress divers in civil engineering works
39.	IS :10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects.
40.	IS :10386 – Part II	Safety Code for Construction, Operation and Maintenance of River Valley Projects.
41.	IS : 11057	Code of practice for Industrial safety nets
42.	IS : 13415	Code of Practice on safety for Protective barriers in and around building
43.	IS : 13416	Recommendations for preventive measures against hazards at working places



**OISD – GDN – 207**

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**OCTOBER 2002**

## **CONTRACTOR SAFETY**

**OISD – GUIDELINES – 207**

**Oil Industry Safety Directorate  
Government of India  
Ministry of Petroleum & Natural Gas**

## CONTRACTOR SAFETY

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## CONTRACTOR SAFETY

### 1.0 INTRODUCTION

Oil and Gas operations like Drilling, Production, Refining, Transportation and Distribution are inherently hazardous. A large number of contractor workforce is deployed to carry out construction, maintenance and other jobs. The analysis of the incidents in the Petroleum Sector indicates that a large number of incidents involved contractor workforce and have resulted in either casualty or injury besides leading to property damage and operational interruptions and environmental degradation.

In order to improve the safety levels of oil installations, the contractor safety is of utmost importance and there is a need to institute a good contractor safety system.

### 2.0 SCOPE

This standard covers broadly the guidelines on the management system for enhancing the safety levels of the contractor workforce deployed in construction, maintenance and operation activities in the hydrocarbon industry.

The safety precautions to be taken while carrying out different activities during construction / maintenance have separately been covered in OISD-GDN-192 on "Safety Practices during Construction".

### 3.0 DEFINITIONS

#### Work station/Work site

A place/unit where the job is carried out by contractor/executing agency in specified manner with safety, during construction phase or in operation phase.

#### Owner

Any physical or legal person/entity for whom prescribed job is carried out.

It shall also include owner's designated representative / consultant /nominee / agent, authorised from time to time to act for and

on its behalf, for supervising / co-ordinating the activities of the contractor/execution agency.

#### Contractor / Executing Agency

A physical or legal person/entity having contractual obligation with the owner, and who deploys one or more worker on the site.

#### Contractor Worker

It covers all workmen who are either self-employed or employed through contractor, the casual workers and includes contractor's supervisor, working at a location / site employed directly by Owner or through their contractor.

#### Incident

An incident is an unplanned, uncontrolled, unintended or unforeseen event, caused by unsafe acts and / or unsafe conditions, resulting in or having the potential to result in personal injury and/or property damage.

#### Consultant

Consultant is a physical or legal person/entity engaged by owner to provide the consultancy services to owner for management of the contract on their behalf or as specified.

#### Designer

Designer is a physical or legal person / entity engaged by owner to provide design services of a work site.

#### Owner's Representative / Engineer In Charge

The Owner's representative/Engineer-in-charge is the one, who has been designated by the owner to manage the contract.

#### Owner's Safety Officer

A properly trained person designated by owner who ensures safety at work site.

#### 4.0 DUTIES/ RESPONSIBILITIES

##### 4.1 OWNER

##### 4.1.1 Owner's Management

The commitment to safety has to be emphasised by the owner by practice by its own management and employees at all levels. The duties and responsibilities of owner should include:

- i) To institute a mechanism for identification and compliance of all applicable statutory rules & regulations (Refer Annexure I for a list of few important Bureau of Indian Standards & statutory regulations).
- ii) To provide specific information to contractors and make workers aware on the hazards associated with job assigned.
- iii) To provide information about Risk Mitigation measures available at the place of work.
- iv) To provide the contractor with information on Owners Safety Plan & Regulations, Emergency Management Plan, lockout/ tag out procedure, confined space entry, work permit system, excavation/trench permit system etc.
- v) To specify rules (e.g. for security including access arrangements) and safety rules such as fire protection, first aid arrangements, Work Permit systems etc.
- vi) To provide comprehensive list of statutory regulations / standards and specification, to be complied with during execution of contract, in the tender document itself.
- vii) To ensure training of the contractor workforce, medical examination, and proper usage of safety equipment.

viii) To specify the requirements of Health, Safety and Environment (HSE) (commensurate with the nature of job) in Pre- Qualification criteria.

ix) To designate Engineer-in-charge and safety officer.

x) To arrange for a multi-disciplinary safety audit team to conduct surprise / regular safety audits and monitor the implementation of the recommendations.

xi) To introduce suitable schemes for motivation of the contractor worker to adhere to safety guidelines.

xii) To review safety practices & their implementation through periodic surprise visit of the work sites and monthly review meeting.

xiii) To develop the HSE plans and incorporate the same in the tender document.

xiv) To liaise with external agencies like press, public etc and with law enforcement, regulatory, statutory agencies etc.

xv) To report to statutory agencies on safety compliance and accidents, if any.

##### 4.1.2 Owner's Representative/Engineer-in-charge

The duties & responsibilities of engineer-in-charge should include:

- i) To ensure that all Contract requirements including Health, Safety, Environment & Security are complied with.
- ii) To ensure that contractor workforce deployed is adequately qualified, trained and in state of health to commensurate with the requirements of the job.
- iii) To ensure that the Tools / Tackles and Machinery being used are properly

tested and are in sound working conditions and necessary resources proposed for providing safe place of work and necessary PPE are being used.

- iv) To take the required necessary corrective action immediately upon noticing or receipt of a report on noncompliance or any such condition which poses a threat to health, safety or environment. If during the course of execution of the contract, any situation of non-compliance with the contractor's safety and health plan are noticed / reported, the same will be taken up with the contractor for correction. In the event of repeated non compliance, suitable action to be initiated as per the contract.
- v) To ensure that the incidents are reported to all concerned within stipulated timeframe.
- vi) To ensure submission of a plan for safe working (Method Statement) from contractor and approval of the same by competent person / department.
- vii) To ensure that Work Permit System in line with OISD-STD-105 is adhered to.
- viii) To ensure availability of all the documentation needed for the execution of contract.
- ix) To ensure that the quality controls have been maintained during fabrication/erection and all jobs required for safe commissioning have been carried out.
- x) To ensure safe dismantling of all temporary facilities/connections put up by the contractor, after completion of work.
- xi) To compile a report on the safety performance (at the conclusion of each contract or periodically such as annually for renewable and long-term

contracts), which is to be considered in future when selecting contractors.

- xii) To ensure that the Consultant, contractor and sub-contractor employ / designate qualified & trained Safety Engineer / Officer commensurate with requirement of the job.

#### **4.1.3 Owner's Safety Officer**

The duties & responsibilities of the Owner's Safety Officer should include:

- i) To assess the hazards associated with jobs in consultation with all concerned and establish safe working procedure including identification of the escape routes.
- ii) To establish a written record of factors which can cause injuries and illnesses.
- iii) To undertake routine/surprise inspections of all work sites and identify unsafe conditions & practices, if any. Check for compliance of the safety practices being followed with approved HSE Plan.
- iv) To investigate promptly the incidents (including near-miss) in order to advise corrective and/or preventive action.
- v) To maintain statistical information for use in analyzing all phases of incidents and events involving contract personnel.
- vi) To provide the means for complying with the reporting requirements for occupational injuries and illnesses.
- vii) To check whether the proposed working arrangements are safe and satisfactory, particularly at the interface between the contractor's planned work and owner's existing facilities.
- viii) To communicate to the Contractor the imposed restrictions which may affect the work/personnel such as the temporary closure of a corridor or electrical isolation of equipment.

- ix) To review and monitor the contractor's adherence to approved HSE plan and all applicable environmental, health, and safety requirements.
- x) To ensure that Consultant, Contractor's Managers, Supervisors and workmen at all levels (who will plan, monitor, oversee and carry out the work) undergo Health, Safety and Environmental training in their respective responsibilities with respect to conducting work safely and with due regard for the protection of the environment.
- xi) To identify areas of operations where specialized training is required to deal with potential dangers.
- xii) To document and to bring to the attention of the Owner's Supervisor and Contractor any non-compliance/violation of the safety norms against approved safety and health plan or safety and health requirements and also raise these issues in the Safety Committee Meetings.
- xiii) To take part in Tool Box Meetings at random and to ensure maintenance of records.

## 4.2 CONTRACTOR

### 4.2.1 Contractor's Management

Duties & responsibilities of the contractor should include the following:

- i) To implement safe methods and practices, deploy appropriate machinery, tools & tackles, experienced supervisory personnel and skilled work force etc. required for execution.
- ii) To prepare a comprehensive and documented plan for implementation, monitoring and reporting of Health, Safety and Environment (HSE) and implement the same after its approval.

- iii) To nominate qualified & trained Safety Engineers / Officers reporting to the Site in charge, for supervision, co-ordination and, liaison for the implementation of the safety plan.

Similar HSE Plan should be implemented at the sub- contractor's or supplier's site /office. However the compliance with the HSE Plan is to be the sole responsibility of the Contractor.

- iv) To arrange suitable facilities in liaison with the owner for drinking water, toilets, lighting, canteen, crèche etc as applicable as per Laws/ Legislation at site and also arrange for workmen compensation insurance, third party liability insurance, registration under ESI / PF act etc as applicable.
- v) To arrange for fire protection equipment as per the advice of owner.
- vi) To ensure that its employees have completed appropriate health and safety training as required by the statute / regulation and also as per requirements of the Owner / Consultant. The documentation of such training imparted to all its employees should be maintained and produced for verification as required.
- vii) To comply with all the security arrangements of owner.
- viii) To ensure that the plant and equipment used on-site by him / his employees is correctly registered, controlled and maintained in sound working condition.
- ix) To ensure availability of First Aid boxes and First Aid trained attendant.
- x) To ensure that all incidents including near misses are reported to all concerned immediately.

In construction projects where sub-contractors are engaged, the contractor should set out the responsibilities, duties and safety measures that are expected of

the sub-contractor's workforce. These measures should include the provision and use of specific safety equipment, methods of carrying out specific tasks on safety and the inspection and appropriate use of tools.

The responsibilities indicated separately under contractor's Supervisor, Safety Officer and contract worker are contractually that of the Contractor and legally binding on the Contractor only. However the specific detailing as above has been given separately for guidance and operational convenience.

The selection of sub contractors, if employed, should be approved by the owner. Sub-contractor should comply fully with all safety rules and conditions applicable to the main contractor.

#### **4.2.2 Contractor's Supervisor / Safety Officer**

Duties & responsibilities of the Contractor's supervisor/Safety Officer should include the following:

- i) To ensure strict compliance with work permit system by carrying out work only with appropriate work permits and after ensuring that all safety precautions / conditions in the permit are complied with and closing the same after job completion.
- ii) To ensure that required guards and protective equipment are provided, used, and properly maintained.
- iii) To ensure that tools and equipment are properly maintained and tested.
- iv) To plan the workload and assign workers to jobs in commensuration with their qualification, experience and state of health.
- v) To ensure that the workers understand the work to be done, the hazards that may be encountered, and the proper precautions/procedure for carrying out the work safely.
- vi) To take immediate action to correct any violation of safety rules observed or reported.
- vii) To ensure that the workers likely to be exposed to hazardous chemicals/materials have access to appropriate Material Safety Data Sheets (MSDS), wherever applicable, and provide necessary mitigation measures.
- viii) To ensure inspection and certification of all tools (hand operated as well as mechanically operated) being used. Defective tools shall be immediately removed.
- ix) To ensure that appropriate warning signboards or tags are displayed.
- x) To ensure that workers have proper training for their job assignments, including use of appropriate PPE and first aid fire fighting equipment.
- xi) To comply with all applicable safety and health standards, rules, regulations and orders issued by competent authority pertaining to the assigned activities.
- xii) To ensure that sick and/or injured workers receive appropriate first aid and/or medical attention.
- xiii) To report each incident and/or injury in accordance with established procedures and assist in investigation.
- xiv) To take necessary action for correction of any unsafe act / condition at the workplace. However, in case the same is outside the limits of authority, it should be reported to Owner's Engineer-in-charge immediately.
- xv) To conduct daily inspections to ensure compliance with safety standards, codes, regulations, rules and orders applicable to the work concerned.



- xvi) To ensure that workers under their supervision are aware of their responsibilities.
- xvii) To arrange daily tool box meeting and regular site safety meetings and maintain records in the required formats. (Refer Clause 5.9.1)
- xviii) To arrange stand-by supervisor/ worker where situations so demand.
- xix) To develop methods and display banners/posters to inculcate safety consciousness.
- xx) To attend training and ensure participation of his workers for training as per schedule arranged by the Owner / Consultant and keeps himself updated.
- xxi) To keep records of number of persons working at the site.
- xxii) To keep a constant liaison with Engg-in-charge / owners' representative on safety issues.
- xxiii) To maintain accident & nearmiss record in a register.
- xxiv) To ensure that only PPE of the approved type by owner is used at site.

A separate Safety Officer should be assigned, where more than 100 workers are employed at site. For smaller jobs, the supervisor should assume the role of the safety officer also.

#### 4.2.3 Contract workers

The duties & responsibilities of the contractor worker should include the following:

- i) To perform work safely as per the job requirement and instructions.
- ii) To inform all concerned regarding unsafe conditions/acts.

- iii) To wear PPE as stipulated and necessary for the job.
- iv) To inform promptly to their supervisor regarding all work related incidents resulting in personal injury, illness and/or property damage.
- v) To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

### 4.3 CONSULTANT

The activities and responsibilities covered under the scope of the Owner may be delegated to the consultant in those cases as applicable, based on the respective contract conditions. The primary responsibility of Consultant is to ensure compliance with agreed HSE plan for the contract by the Contractor. However those responsibilities conferred on Owner as Principal employer cannot be delegated to consultant.

Where the consultant's scope involves Engineering and Design, those factors under **Designer** should also be applicable.

In all cases, the Consultant's scope should include submission of latest HSE plans for work under his and Contractor's purview and implementing the same till job completion. It should conform to owner's overall HSE plan. This should include Guidelines and Implementation and Reporting Methodology to be followed with required report formats.

Adequate number of Safety Officers shall be provided by the Consultant with necessary skills required for the work to be performed.

The Consultant shall review the documents submitted by the contractor and advise owner on acceptance as well as advise suitability and number of Contractor's safety officers / supervisors.

### 4.4 DESIGNER

The Process Designer should identify all hazards and risks likely to be encountered during fabrication, erection including

dismantling, Pre-commissioning, commissioning and Performance run to meet the Guarantees and advise the risk mitigation measures.

All the hazards and safety measures to be adopted while handling Dangerous chemicals and Catalysts should be detailed by the Process Licensor and the same should be again included in the scope of the suppliers. Specific write ups/MSDS should be obtained from Patented single source suppliers also.

Designs should recognize, include and apply safe practice during preparation, construction and subsequent operational use and maintenance after completion of the Project.

All documents including drawings and calculations are to be originated, checked and approved in accordance with latest international codes, standards, specifications and design basis philosophy.

**Preferred use of low risk materials, policy on hazardous substances, preferred use of low noise and dust-suppressed equipment etc. should be encouraged.**

## 5.0 SAFETY MANAGEMENT

### 5.1 JOB SAFETY ANALYSIS (JSA)

Job safety analysis (JSA) provides a mechanism by which the contractor, safety officer or supervisor take a detailed look at how an individual task is performed and its inherent hazards and preventive measures. This procedure helps in integrating accepted safety and health principles and practices into a particular operation. In a JSA, each step of the job is examined to identify potential hazards and to determine the safest way to do the job.

A job safety analysis includes five steps as below:

- Select a job
- Break the job down into a sequence of steps
- Identify the hazards against each of these steps (based on knowledge of

accident, causes of injuries and personal experience) and determine the preventive measures to overcome these hazards

- Apply the controls to the hazards
- Evaluate the controls

### 5.2 CRITERIA OF SELECTION OF A CONTRACTOR

“Contractor Safety” can be ensured to a large extent if competent agency for execution of assignment or job, based on HSE system agreed upon by owner, is selected. It is necessary to assess his capabilities and competencies to perform work safely.

A databank should be developed for all the contractors for their past performance on HSE aspects. An attempt should also be made to get similar data from other similar industries.

The data required will depend upon complexity involved in the job and type / size of resources required. Format needs to be suitably developed depending upon size, nature of the job & hazard associated therein. The format designed should also take care of the skill required to carry out the job.

Performance review is essential for all type of contractors. It helps in recording actual performance/experience with contractors while the contract is in progress. It is essential that resources agreed as per the contract are reviewed at mobilization stage for ensuring compliance from the day one and thorough effective supervision / monitoring system are at place.

This activity also helps in taking timely action in case of unsatisfactory performance to correct the situation and ensure safe work during execution period and deciding about suitability of the contractor for future jobs.

The periodicity of such performance review will depend upon size/type/complexity of contract. However, the performance should be reviewed at least at mobilisation stage and at the end of the contract.

### 5.3 SITE PLANNING AND LAYOUT

Before starting the construction/maintenance job at existing workplace in operation or green field locations, following should be ensured: -

- i) Details regarding location of workshop/ fabrication yard, site office, stores, laboratory, electrical installations, placement of construction machinery, medical and welfare facilities, lighting underground and above ground piping route, cable route etc. should be decided prior to commencement of the work in consultation with owner / Consultants and implementation should be ensured. Layout should be displayed at strategic locations.
- ii) The resources required to meet any emergency situations like fire fighting, first aid etc. should be planned and mobilized as per the job requirement.
- iii) The sequence or order in which work to be done and any hazardous operations or processes should be identified.
- iv) Free access to site shall be provided with clear roads, passage, gangways, staircases etc. Access to construction site should be leveled, open and free from any obstructions like construction material or scrap/waste, exposure to hazards such as falling materials, material handling equipment and vehicles. Any pit or ditch shall be covered or barricaded.
- v) Arrangements should be made to maintain good housekeeping at site. Scrap and debris generated out of construction work should be removed/disposed off at a regular interval as directed. Emergency exit should be provided in case of blockade of primary exit.
- vi) Suitable warning notices and also the routes to and from welfare facilities should be displayed prominently.

vii) Pedestrian pathways and routes for vehicular traffic (light/heavy vehicles including material handling equipment) should be earmarked.

viii) Artificial lighting to be provided at places where work continues or workers pass by after sunset or in case natural light is insufficient like confined spaces.

ix) Keep all equipment /machines under cover to prevent them from dust, rain/flood water, heat etc. and follow storage instructions as applicable for each of them.

### 5.4 GATE ENTRY PROCEDURE

Gate entry at any site / workplace / unit is to be restricted to ensure entry of only authorised persons / vehicles.

5.4.1 Entry procedure for all contractor worker should be as follows:

#### A. Issuance of Pass

- i) The passes are to be issued after the owner's representative/engineer-in-charge forwards the application of the contractor providing complete details of the workers being engaged. The contractor may be asked to submit Character & Antecedents (C&A) verification of individual worker from concerned authorities.
- ii) With regard to issuance of passes for all vehicles including material handling equipment, owner's representative / engineer-in-charge should forward the application only after ensuring that all documents pertaining to the fitness of the vehicle/equipment and valid driving license of the driver etc. are available.
- iii) The passes should be serially numbered with address, contractor name, identification mark, signature of the worker etc.
- iv) Special colour code for passes should be used for persons entering different

areas like Administrative Block, Unit area, Project Area (wherever applicable).

- v) Contractor workers engaged on routine basis for long periods should be provided with monthly photo pass.
- vi) Special permit is required separately for working beyond normal working hours and holidays.

## **B. Gate Entry**

- i) Entry of the contractor's employees should be permitted with valid gate passes only.
- ii) Entry of contractor's workers should be allowed in presence of authorized representative of contractor.
- iii) Records of persons at the time of entry/exit should be maintained.
- iv) At the entry gate of the location, a physical checking for non-carrying of lighter, matchboxes, explosives etc. should be carried out.
- v) Gate passes/Identity Cards should be displayed on persons at all the times.
- vi) For Mega-projects at existing / operating installations, it is preferable to have a separate gate for entry of contractor workers and also the project areas should be segregated fencing from operational area by fencing / other physical means.
- vii) No vehicle should be allowed to enter in an operational area without proper flame arrestor.
- viii) Awareness on Safety through training / posters etc. highlighting Do's and Don'ts should be spread within entire contractor workforce. Video/Audio tapes on Safety Topics should be played preferably.
- ix) For occasionally engaged labourers such as for material handling etc., spot photograph may be preferably

taken with two copies (one for preparing the pass and other for attachment with gate register). Specific advice and recommendation of User Department may be given due cognizance. Relevant details are to be written. The pass should be collected back at the gate after day's work.

### **5.4.2 Tank Truck Loading (TTL) Operation :**

At the loading / unloading location, a large no. of Tank Trucks of petroleum products enter the installation. Crew members are generally not regular entrants. The procedure should be as follows:

- i) The gate pass should be issued to the individual crew members on written request of the transporter mentioning TT registration nos., License and certificate of training as per MV rule 9.
- ii) Character & Antecedent (C & A) verification of the TTL crew through local police is to be done preferably and record maintained.
- iii) For loading/unloading purpose, register entry at security gate is made before allowing entry into the premises with recording of names of crew members, time of entry, pass Sr. No., TT no. etc.
- iv) For loading/unloading, crew is allowed entry alongwith TT only, after checking of TT from explosive/security point of view.
- v) Out time, invoice no., Destination etc., are recorded while TTs go out of the security gate.

### **5.5 TRAINING**

Training is to educate contractor workforce on various hazards associated with the job/workplace and on the respective preventive / mitigation measures to avoid untoward incidents.

- i) Workers should be adequately and suitably:
    - (a) informed of potential safety and health hazards to which they may be exposed to at their workplace;
    - (b) instructed and trained in the measures available for the prevention, control and protection against those hazards.
  - ii) No person should be employed in any work at a workplace unless that person has received the necessary information, instruction and training so as to be able to do the work competently and safely. The competent authority should, in collaboration with employers, promote training programs to enable all the workers to read and understand the information / instructions related to safety and health matters.
  - iii) The information, instruction and training should be given in a language understood by the worker and written, Oral, visual and participative approaches should be used to ensure that the worker has assimilated the information.
  - iv) Every worker should receive instruction and training regarding the general safety and health measures common to the workplace. This should include:
    - (a) general rights and duties of workers at the workplace;
    - (b) means of access and egress both during normal working and in an emergency;
    - (c) measures for good housekeeping;
    - (d) location and proper use of welfare amenities and first aid facilities provided;
    - (e) proper use and care of the items of personnel protective equipment and protective clothing provided to the worker;
  - (f) general measures for personal hygiene and health protection;
  - (g) fire precautions to be taken;
  - (h) action to be taken in case of an emergency;
  - (i) requirements of relevant safety and health rules and regulations.
- Copies of the relevant safety and health rules, regulations and procedures should be available to workers upon the commencement of and upon any change of employment.

### 5.5.1 Training Techniques

#### a) Lectures

This technique should be applied when it is required to transfer information in local language to a large contractor workforce with controlled content and time.

#### b) Case Study

This is an effective technique based on the presentation of case of real events by Trainer to highlight probable causes like Human Error, ignorance about the job etc.

#### c) Videos

Videos, an effective technique of communication, should be used to display the right techniques of performing a task in a safe manner and hazards associated with a job.

#### d) Demonstration at site

Right way to do a job should invariably be demonstrated to workers at the site itself. The right way is also a safe way. Hazards due to wrong procedures, short cuts and their adverse effects etc. should also be highlighted.

### 5.5.2 Training/Awareness Module and Frequency

**A.** General Safety Training to all categories of contractor employees should be imparted before induction and annually thereafter. No person should be allowed to enter the installation without undergoing this training. This training program may cover:

- i) Mandatory uses of PPE like Cotton clothes, Helmet, Safety Shoes, Safety Belts etc.
- ii) Probable Hazards
- iii) Important Telephone No / Escape route
- iv) First Aid
- v) Use of Fire extinguisher

The contractor workers, if engaged in operation of the plants/facilities, should be trained in line with Clause No. 4.6 of OISD-GDN-206 on "Safety Management System". For other categories of contractor workers, training modules for different category employees are as follows:

#### **B. Contractor Supervisor**

Contractor Supervisor should be trained in accordance with the provision of clause no. 5.1.1.2, 5.2.7, 5.3.10, 5.6.12 and 5.7.8 of OISD-STD-154 on 'Safety Aspects in Functional Training'

#### **C. Contractor Worker**

Yearly training programme should be carried out for contractor worker and the records should be maintained. The training programme should cover at least the following:

- i) Worker responsibility for safety of himself and work area.
- ii) Associated hazards with the job and job area including electrical shock hazards.

- iii) Importance of First Aid fire fighting equipment, their use & operations
- iv) Communication system at the installation
- v) Fire / Accident Reporting procedure
- vi) General Safety rules
- vii) Safety Measures during execution of job such as:
  - Welding / Cutting / Grinding
  - Working at height
  - Confined space entry
  - X ray / radiation
  - Erection / Dismantling of scaffolding
  - Tank construction and repairs
  - Handling of chemicals etc.
- viii) Importance & use of PPE
- ix) Emergency Routes
- x) Assembly Points
- xi) Job Specific Training

#### **D. Consultant / Contractor**

Awareness program should be carried out for Consultant / Contractor at the time of induction. This program should cover at least the following:

- i) Responsibility of contractor for safety of their personnel and work area
- ii) Hazardous property of Petroleum products and chemical used
- iii) Communication system
- iv) Fire / Accident Reporting procedure
- v) Medical facility available
- vi) Statutory requirements



- vii) Importance of First Aid equipment and required at the site
- viii) Work Permit system
- ix) Direct/ Indirect losses due to accident
- x) Safety Measures while executing the jobs such as:
  - Welding / Cutting / Grinding
  - Working at height
  - Confined space entry
  - X ray / radiation
  - Erection / Dismantling of scaffolding
  - Tank construction and repairs
  - Handling of chemicals etc.
  - electrical jobs
- xi) Safety training needs of their supervisors and workers
- xii) Importance & Use of PPE at the site
- xiii) General Safety rules at the installation

## **E Security Personnel**

Training program should be carried out for Security personnel at the time of induction and annually thereafter and the records should be maintained. The training program should cover at least the following:

- i) Layout of Plant and Facilities
- ii) Vulnerable locations
- iii) Safety regulations (Statutory and in company)
- iv) Fire Protection Facilities and Locations
- v) Role in case of Fire / Disaster
- vi) Emergency Procedure and Drills
- vii) Industrial First Aid
- viii) Use of Personnel Protective Equipment
- ix) Disaster Management Plan

## **5.6 INSPECTION / AUDIT**

Inspection / Audit is a tool to evaluate compliance of all safety requirements. Most of the information could be gathered

through site inspection using ready-made check lists to ensure that contractors / agencies abide by the safety rules and norms while working at operating / construction sites.

A checklist, while carrying out different type of jobs, should be developed based on hazards associated with the job being performed and requirements as per OISD-GDN-192 on "Safety Practices during Construction". Typical format is enclosed at Annexure II, which should be modified to suit the requirement of the site / job to be done.

Before starting the work and at regular intervals thereafter, Contractor's Supervisor/safety Officer and Owner's representative / Engineer-in charge/safety Officer should inspect as per the checklist so prepared to ensure that contractor has prepared to start the work with all safety precaution required for safe execution of job.

## **5.7 PENALTIES FOR NON-COMPLIANCE**

Financial or other type of penalties like seizure of gate passes, stoppage of work for a limited period etc. may be levied on the contractors or their workers for non-compliance of safety rules. A provision of suitable accident severity based penalty clause for contractor may be incorporated to ensure adherence of systems and procedures. A few of the usual non-compliance are as follows:

- Non-usage of PPEs like Safety helmet / Safety shoes / Safety goggles / Respiratory protection etc. by the contractor personnel
- Non-usage of the safety belt and life line by the workers while working at height
- Non-provision of basic safety requirement such as 24 V lamp for working in confined space, uncertified / non standard lifting tools, earth leakage protection & earthing connections for electrical appliances as per Indian Electricity Rules, emergency isolation switches etc.



- Violation of Safety Permit conditions like Fire fighting equipment
- Non-barricading of area while rigging, digging etc.
- Working without valid work permit
- Unauthorised road closure/blockage

## **5.8 INCIDENT REPORTING AND INVESTIGATION SYSTEM**

All the incidents including near-miss should be reported immediately by contractor's Supervisor to Contractor and owner's Supervisor/Engineer-in-charge, who should inform to Owner's Safety Officer and owner's Management. Owner's Safety Department will be required for onward reporting as per OISD, Statutory requirements.

All accidents regardless of the extent of injury or damage should be investigated in order to find probable causes, lessons learnt thereof and remedial measures required to prevent its recurrence.

The incident investigation should be done as per provision of clause no. 4.12 of OISD-GDN-206 on 'Safety Management System'. All the recommendations of investigation / Enquiry Report need to be monitored closely for its implementation. A proper record needs to be maintained to ensure implementation of all the recommendations and same should be reviewed from time to time.

## **5.9 SAFETY COMMITTEE MEETINGS**

Following three type of safety committee meetings should be held aiming at raising the level of safety consciousness at the site:

### **5.9.1 Toolbox meeting**

To maintain awareness, update training and convey important safety and health information, contractor supervisors should conduct tool box meetings at least weekly and also prior to start of any work. All the contractor workers should attend this meeting. The owner's supervisor/Engineer-in-charge and safety officers should also

attend these meetings on random basis. Tool box meeting should be conducted more frequently depending upon circumstances. Record of the same can be maintained in the following typical format.

### **TOOLBOX MEETING FORM**

SUBJECT :  
 PRESENTER :  
 DATE :  
 TIME : From..... To.....  
 CONTENT IN BRIEF :

Participant's Name	Signature
-----	-----
-----	-----
-----	-----

### **5.9.2 Site Safety Committee Meeting**

Primary purpose of this safety committee is to enable owner, contractor and workers to work together to monitor the site safety and health plan so as to prevent accidents and improve working condition on site. Its size and membership will depend on the size and nature of job.

The safety committee should include representatives of owner, consultant, contractor identified as safety officer/supervisor. It should be headed by Engineer-in-charge.

The safety committee should have regular and frequent meetings, atleast fortnightly, to discuss the safety and health program on site and to make suggestions for improvement. The meetings should be documented with a time bound action plan. The functions carried out by safety committee should include:

- i) Review compliance of pending items of last Safety meetings.
- ii) Consideration of the reports of safety personnel.
- iii) Discussion of accident/near-miss and illness reports in order to make appropriate recommendation for prevention.

- |  |   |
|--|---|
| iv) Examination/evaluation of suggestions made by workers.   | 2) OISD-GDN-192 on "Safety During Construction"   |
| v) Dissemination of acquired knowledge through training programs and information sharing sessions. | 3) OISD-STD-155 Part(I&II) on "Personnel Protective Equipment"                                      |
| vi) Discussion & review of Fire Prevention & Disaster Management Plan.                             | 4) Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996 |
| vii) To send recommendation to Apex Body for consideration/approvals.                              |   |

### **5.9.3 Safety Review Meeting by Location Head**

This meeting should be headed by the Location head and attended by Owner's Supervisor/Engineer-in-charge, owner's safety Officer and all concerned department heads. Prime purpose of this review is to ensure that all the recommendations of various committees are being complied with and to take decisions on critical points raised. This meeting should take place at least once in every quarter. All the investigation reports/ audit findings with status of implementation of recommendations should be discussed.

### **5.10 SAFETY EQUIPMENT / PERSONNEL PROTECTIVE EQUIPMENT**

The type of safety equipment to be used is decided based on the job requirement. Selection should be made based on OISD-GDN-192, OISD-STD-155 (Part I & II) and the job requirement. Safety equipment / Personnel Protective Equipment (PPE) shall be of approved make. Contractor shall provide necessary training to each employee regarding proper usage and upkeep of PPE including its limitation.

A register showing stock and issue of PPE should be maintained by the contractor at site and must be available for inspection.

### **6.0 REFERENCES**

- 1) OISD-GDN-206 on "Safety Management System"

**ANNEXURE I****LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS**

<b>Sl.no.</b>	<b>Code No.</b>	<b>Title</b>
1	IS: 818	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
2	IS: 875	Code of practice for Structural safety of buildings: Masonry walls
3	IS: 933	Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
4	IS: 1179	Specification for Equipment for Eye and Face Protection during Welding – First Revision
5	IS: 1904	Code of practice for Structural safety of buildings: Shallow foundations
6	IS: 1905	Code of practice for Structural safety of buildings: Masonry walls
7	IS: 1989 – Part II	Leather Safety Boots and shoes for heavy metal industry
8	IS: 2171	Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision
9	IS: 2361	Specification of Building Grips – First Revision
10	IS: 2750	Specification for Steel Scaffoldings
11	IS: 2925	Specification for Industrial Safety Helmets – First Revision
12	IS: 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision
13	IS: 3521	Industrial Safety Belts and harnesses
14	IS: 3696 – Part I	Safety Code for Scaffolds and Ladders: Part I – Scaffolds
15	IS: 3696 – Part II	Safety Code for Scaffolds and Ladders: Part II – Ladders
16	IS: 3764	Safety Code for Excavation Work
17	IS: 4014 – Part I & II	Code of Practice for Steel Tubular Scaffolding
18	IS: 4081	Safety Code for Blasting and Related Drilling Operations
19	IS: 4082	Recommendations on stacking and storage of construction materials at site
20	IS: 4130	Safety Code for Demolition of Buildings – First Revision
21	IS: 4138	Safety Code for working in compressed air – First Revision

22	IS: 4756	Safety Code for Tunneling works
23	IS: 4912	Safety requirements for Floor and Wall openings, Railings and toe boards – First Revision
24	IS: 5216 – Part I & II	Recommendations on safety procedures and practices in electrical work
25	IS: 5121	Safety code for piling and other deep foundations
26	IS: 5916	Safety Code for Construction involving use of Hot Bituminous materials
27	IS: 6994 – Part I	Specifications for safety gloves: Part I – Leather and Cotton gloves
28	IS: 5983	Specification for Eye Protectors – First Revision
29	IS: 6922	Criteria for safety and design of structures subject to underground blasts
30	IS: 7155	Code of recommended practices for conveyor safety
31	IS: 7205	Safety Code for Erection on Structural Steel Works
32	IS: 7069	Safety Code for Handling and Storage of Building Materials
33	IS: 7293	Safety Code for Working with Construction Machinery
34	IS: 7323	Guidelines for operation of Reservoirs
35	IS: 7969	Safety Code for handling and storage of building materials
36	IS: 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals
37	IS: 8989	Safety Code for Erection of Concrete Framed Structures
38	IS: 9706	Code of Practices for construction of Aerial ropeways for transportation of material
39	IS: 9759	Guidelines for de-watering during construction
40	IS: 9944	Recommendations on safe working load for natural and manmade fibre rope slings
41	IS: 10667	Guide for selection of industrial safety equipment for protection foot and leg
42	IS: 10291	Safety Code for dress divers in civil engineering works
43	IS: 10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects
44	IS: 10386 – Part II	Safety Code for Construction, Operation and Maintenance for

## River Valley Projects

45	IS: 11057	Code of Practice for Industrial Safety Nets
46	IS: 13415	Code of Practice on safety for Protective barriers in and around building
47	IS: 13416	Recommendations for preventive measures against hazards at working places

**Statutory Regulations**

Latest Statutory Acts and Rules, as given below, may be referred:-

1. The Petroleum Acts 1934 and Petroleum Rules 2002
2. The Factory Act, 1948 (As amended by Factory Amendment Act 1987) and concerned Factory Rules
3. The Water (Prevention and Control of Pollution) Act 1974 & Rules 1975
4. The Environment (Protection) Act 1986
5. The Manufacturing, Storage and Import of Hazardous Rules 1989
6. The Hazardous Wastes Management (Management & Handling) Rules 1989
7. The Indian Electricity Act 1901 and Rules 1956
8. The Indian Explosive Acts, 1884 & The Indian Explosive Rules 1983
9. The Gas Cylinder Rules 1981 and the static & Mobile Pressure Vessels (Unfired) Rules 1981
10. The Indian Boiler Act 1923 and Regulations 1950
11. The Public Liability Act 1991 as amended in 1992
12. The Motor Vehicle act 1988 and Central Motor Vehicle rules 1989
13. Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996

In addition to above, various other statutory acts like EPF, ESIS, Minimum wage act and other local statutory requirements shall also be complied with.

**ANNEXURE II****CHECK LIST FOR SAFETY INSPECTION / AUDIT**

Job \_\_\_\_\_ Location \_\_\_\_\_ Date of Audit \_\_\_\_\_ Frequency \_\_\_\_\_

Inspected by \_\_\_\_\_ Contractor (s) \_\_\_\_\_

Sl.no.	ITEM	YES	NO	NA	REMARKS / ACTION
<b>1.0</b>	<b>PERSONNEL PROTECTIVE EQUIPMENT (PPE):</b> Are following PPEs being used as per the job requirements?				
1.1	Safety Helmets				
1.2	Safety Shoes				
1.3	Gum Boots				
1.4	Safety Belts with life line				
1.5	Gloves				
1.6	Ear Plug				
1.7	Goggles				
1.8	Shield Glass				
1.9	Face Protection				
1.10	Breathing Apparatus				
1.11	Canister Mask				
1.12	Hand wash / Eye wash/ Respirating filter / cloth				
1.13	Boiler Suit				
1.14	Others				
<b>2.0</b>	<b>HOUSE KEEPING</b>				
2.1	Whether Waste Bins are provided / used				
2.2	Are Passageways / Walkways clear?				
2.3	Is General neatness O.K.?				
2.4	Is the Ground free from oil, grease etc. and is not found to be slippery?				
2.5	Others				

<b>3.0</b>	<b>EXCAVATION</b>				
3.1	Whether soil stability is checked?				
3.2	Whether proper shoring for the excavation is provided to prevent cave-in for side of slope >45 Degree?				
3.3	Whether proper precautions have been taken if the excavation is adjoining to heavy structure like building, street and roadways?				
3.4	While excavating whether proper slope usually 45° & suitable benches of 0.5 m width at each 1.5 m depth are provided?				
3.5	Whether barricading of 1m height with glowing caution board is provided for excavation beyond 1.5m depth?				
3.6	Whether excavating earth is placed beyond 1m of the edge of the trench?				
3.7	Whether heavy vehicle movement is restricted to come too close to the excavating area?				
3.8	Whether necessary precaution is taken for underground pipes, sewers, cables by contractors?				
3.9	Whether excavation hot work permit is taken?				
3.10	Whether extra precaution is taken for bailing out water properly while excavating?				
3.11	During rains whether the excavation is done with extra precaution to prevent caving in?				
3.12	Whether two separate entry/ exit points with necessary ladders / steps, as per requirement, have been provided?				
3.13	Whether one person is available at all the time to communicate any hazards noticed with workers working in deep trenches or excavation?				
3.14	Whether necessary precautions like				



	regular gas testing are being taken in areas having hydrocarbons and LPG so that no gas accumulation takes place in the trenches.				
3.15	Whether IS: 4081-1986 & Indian Explosive act & rules for storage, handling & carrying of explosive material and execution of blasting operation is followed?				
3.16	Whether in case of mechanised excavation, caution board is provided for do's and don'ts like 'Nobody to enter' within one meter of the extreme reach?				
3.17	Whether the following are inspected during excavation work :- a) Boulder formation encountered b) Collapsing / development of cracks of sides c) Marked damage to support d) Unexpected fall of ground e) Inspection of site after each blast.				
3.18	Others				
<b>4.0</b>	<b>PERMITS</b>				
4.1	Whether valid work permit is issued to start any work?				
4.2	Whether all conditions of the permit are fulfilled before starting the job?				
4.3	As noted in the permit, whether compliance of all the recommendations are ensured?				
4.4	Whether permits are available at work site all the times?				
4.5	Whether hot work permit registered in fire station?				
4.6	Whether permits are being closed after the completion of job?				
4.7	Others				
<b>5.0</b>	<b>SAFETY IN CUTTING / WELDING/GRINDING</b>				
5.1	Whether LPG / Oxygen / Acetylene/ Gas				

	cylinders are kept outside only while working in confined space?				
5.2	Are Acetylene /LPG cylinders kept in upright position and secured at designated places under shed – wet gunny bags wrapped around it if the same is under sun at designated place?				
5.3	Check cylinder and cylinder valves for any kind of damage?				
5.4	Whether protective valves are kept on cylinder while not in use?				
5.5	Whether proper means and method for transportation of cylinders to avoid dropping and rolling are being adopted / followed?				
5.6	Whether gas cylinders, regulators are kept away/free from oil and grease?				
5.7	Whether all hoses were found to be free of any damage or crack?				
5.8	Whether oxygen and acetylene cylinders are stored separately?				
5.9	Whether color coding is being used for easy identification of different type of cylinders and hoses?				
5.10	Whether cylinder keys are available near the cylinder?				
5.11	Whether gas torches with NRV with flash back arrestor of approved make are only being used?				
5.12	Whether pressure gauges are in working condition and checked from time to time?				
5.13	Whether welding shields are used while welding?				
5.14	Whether proper earthing for welding machines are provided?				
5.15	Whether power is taken from approved sources (welding receptacles)?				
5.16	Whether welding receptacles are properly grounded?				

5.17	Whether welding cables are maintained in good condition and without any joints/cuts?				
5.18	Whether to avoid short circuit, welding machines are protected against rain?				
5.19	Whether earth connectors are securely connected to the job and not to the adjoining pipeline or structure?				
5.20	Whether flame arrestor of DG set is of approved make and quality?				
5.21	Others				
<b>6.0</b>	<b>SAND / SHOT BLASTING</b>				
6.1	Whether sand blasting is used only after getting approval from competent authority?				
6.2	Whether air compressor used for sand / shot blasting are positioned away from work place?				
6.3	Whether exhaust of the prime mover is directed away from the work place?				
6.4	Whether in case of motor driven compressor, the body of the motor as well as the compressor is properly earthed?				
6.5	Whether line operator of sand/shot blasting wear suitable PPEs including mask?				
6.6	Whether adequate measures are adopted to confine dust/spray particles?				
6.7	Whether adequate measures are taken for proper ventilation while the work is done in confined space?				
6.8	Others				
<b>7.0</b>	<b>SAFETY WHILE WORKING AT HEIGHTS / SCAFFOLDING / LADDERS</b>				
7.1	Whether work permit is obtained to take up work at height above 3 mts?				
7.2	Whether steel pipes scaffoldings are used in unit/off site areas?				

7.3	Whether provision for suitable platform with all scaffoldings are made? Whether its construction is as per specification with toe board and railing?				
7.4	Whether the area below working at height is cordoned?				
7.5	Whether suitable platform is provided?				
7.6	Whether ISI approved quality and good condition safety belts are used while working at heights?				
7.7	Whether life line of safety belt is Anchored to an independent secured support capable of withstanding load of a falling person?				
7.8	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person?				
7.9	Whether ropes used are of good condition and adequate strength free of defects?				
7.10	Whether ladder is placed at secured and leveled surface?				
7.11	Whether it is extended 1.5 Mts. Above the landing point?				
7.12	Whether ladder used are of adequate length and tying short ladder is avoided?				
7.13	Whether metallic ladders are placed away from electrical system?				
7.14	Whether tools or materials are removed after completion of the day's job at heights?				
7.15	Whether a valid permit is obtained before taking up work on asbestos or fragile roof?				
7.16	Whether sufficient precaution is taken while working on fragile roof?				
7.17	Whether provision is made to arrange duck ladder, crawling board for working at fragile roof?				
7.18	Whether scaffolding has been erected on rigid / firm / levelled surfaces only?				

7.19	Whether scaffold has been inspected by competent person prior to being put in use?				
7.20	Whether the scaffolding has been designed for the load to be borne?				
7.21	Whether the erection and dismantling of the scaffolding is being done only by trained persons and under supervision?				
7.22	Whether safety net with proper working arrangement and life line has been provided?				
7.23	Others				
<b>8.0</b>	<b>SAFETY IN CONFINED SPACE</b>				
8.1	Whether a permit is obtained to enter a confined space?				
8.2	Whether gas test for hydrocarbon, toxic gas, oxygen level is obtained before entering any confined space?				
8.3	Whether adequate oxygen level is ensured in confined space before entering? If not, whether all precaution like using of Breathing Apparatus set is ensured?				
8.4	Whether, in case of chance of ingress of hydrocarbon gases / toxic gases, Personnel Monitoring System (PMS) is used or not?				
8.5	Whether only in presence of a supervisor, worker enters in confined space?				
8.6	Whether provision of sufficient means of entry and exit is available?				
8.7	Whether provision of ventilation to remove welding fumes, dust, exhaust gases are made?				
8.8	Whether provision of 24V (Hand lamps with cage as per OISD-STD-155) light for working inside space is made?				

8.9	Is it strictly ensured that a stand-by trained person is standing outside before a person enters a confined space and communication is being maintained all the time with workers working inside?				
8.10	Whether life belt with one end under control of stand-by person outside is kept while working in confined space?				
8.11	Whether Personnel protective Equipment are in good condition as specified in the permit?				
8.12	Whether absence of Hydrogen Sulfide, CO or other toxic gas is ensured before entering into a confined space? If yes, whether proper required PPE like BA, Gas Mask are used.				
8.13	Whether boxing up is being done only as per the approved procedures and by competent persons?				
8.14	Whether all the safety precautions listed in OISD-GDN-192 are taken while working in sewers, OWS etc.?				
8.15	Whether proper house keeping is being maintained inside the confined space?				
8.16	Whether training has been provided to workers working in the confined space and the workers only of sound health are being asked to work in the confined space?				
8.17	Others				
<b>9.0</b>	<b>SAFETY IN MATERIAL HANDLING</b>				
9.1	Whether all lifting tools, tackles, machines, chains, ropes etc. are of sound construction, made of sound material and maintained in good condition?				
9.2	Whether safe working load, date of testing visibly marked/painted on the equipment?				
9.3	Whether lifting tools, tackles are of adequate strength for the load to be handled?				
9.4	Whether all parts including the working gears fixed or movable of every lifting machine, chain, rope, tackles specify the				

	<p>following condition:</p> <p>a) Thoroughly examined by competent person at least once a year or such interval as required by statutory authority.</p> <p>b) Document of such examination are maintained and produced to owner supervisor before use of particular equipment?</p>				
9.5	Whether chain blocks and cables are inspected before each use to assure their sound condition?				
9.6	<p>Whether hoist and lift if used are:</p> <p>a) Properly maintained and thoroughly examined by competent authority at least once in every year.</p> <p>b) A register to be maintained to record particulars of such examination in prescribed forms and shall be produced to the owner supervisor before use.</p>				
9.7	Whether area below the movement of boom of crane is cleared to avoid injury from falling objects?				
9.8	Whether it is ensured that crew of truck leave the truck in crane handling area before starting loading / unloading, if not involved in rigging operation?				
9.9	Whether transporting material from one place to another is done by suitable means?				
9.10	Whether carrier with sufficient capacity without projecting parts is used for transporting materials?				
9.11	Whether riggers engaged are well trained and conversant with signaling procedures including night signalling if required?				
9.12	Whether permission of authorized person is obtained before working on or near an overhead crane?				
9.13	Whether trained riggers are available all the time along with crane?				



9.14	Whether barricading has been done to ensure no unauthorised person enters in the working area of the crane?				
9.15	Whether lifting plan has been prepared and approved before start of the work?				
9.16	Whether route of crane movement has been planned before the crane moves out of the garage?				
9.17	Whether it has been ensured that no electrical cable come within 3 metres or safe distance from the boom of the crane?				
9.18	Whether boom is being kept in the horizontal position or locked while idling?				
9.19	Whether material is being stacked / destacked in trucks with the help of wedges to ensure no slippage while loading / unloading takes place?				
9.20	Whether the forklift / crane is being operated only by trained person?				
9.21	Others				
<b>10.0</b>	<b>ELECTRICAL SAFETY</b>				
10.1	Has the Electrical Line Clearance procedure been followed involving electrical and other concerned Dept. and filling of formats?				
10.2	Have Danger Signs with Voltage rating/ Men at work signboards been displayed at both Sub Station as well as the work site?				
10.3	Has the contractor worker understood the electrical circuit on which he is going to work with probable electrical hazards and mitigation measures to be adopted?				
10.4	Whether contractor has engaged electrician (s) having valid electrical licence in line with provisions in Indian Electricity Rules?				

10.5	Have all checks prior to switching operation been carried out and authorisation of owner/ user section obtained subsequently?				
10.6	Have all earthing links on electrical conductors removed before charging the line/ apparatus?				
10.7	Have PPE as prescribed under Indian Electricity Rules been in place, kept healthy and used?				
10.8	Are earthing and bonding arrangement of non-current carrying metallic parts in line with provisions of Indian Electricity Rules – 1956 amended time to time as IS: 3043?				
10.9	Have electrical part of OISD-GDN-192 and Clause No. 9.0 for Temporary installations in OISD-173 been understood and followed wherever applicable?				
10.10	Are flexible wires having voltage of 240 volts above earth potential taken through PVC conduits?				
10.11	Whether portable hand lamps with a voltage rating of not more than 24 volts used with flameproof enclosures in confined spaces within columns, vessels etc?				
10.12	Have the Switches, MCBs, fuses etc. been inspected for proper ratings?				
10.13	Has Earth Leakage Circuit Breaker (ELCB) been used on the incoming side to protect against leakage of current? Is the device tested every time the work is started?				
10.14	Whether all portable appliances are provided with insulated Three pin Plugs and socket arrangement?				
10.15	Whether industrial type extension boards and plug sockets are used?				
10.16	Has the electrical equipment brought to site by contractor been inspected by owner's supervisor/ safety officer for damage/cuts/abrasion etc? Is record of				

	Insulation Resistance, wherever required , being kept?				
10.17	Have standard practices for termination of conductors/ cables been followed (e.g. use of proper lugs, crimping tool, cable glands etc)? Is cable armour in continuity from feeding point to load?				
10.18	Are the Contractor supervisor and workmen well acquainted with first aid for electrical shock?				
10.19	Are the wires/ cables identifiable along their route towards the load by using colour coding and/or markers?				
10.20	Others				
<b>11.0</b>	<b>ROAD WORK</b>				
11.1	Whether site is barricaded and provided with warning signs including night warning lamps/ self glowing markers at appropriate location for diversion of traffic?				
11.2	Whether mixing aggregates with bitumen is done with the help of batch mixing plants? If no, whether adequate precautions have been taken?				
11.3	Whether road rollers, bitumen sprayers, pavement finishers are driven by experienced drivers with valid driving licenses?				
11.4	Whether the worker handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate are provided with PVC hand gloves rubber shoes with pegging upto knee joints?				
11.5	Others				
<b>12.0</b>	<b>FORM WORK, REINFORCEMENT</b>				
12.1	Whether form work, shuttering, shoring etc. are adequately designed and provided to erect the structure and to support the expected load?				

12.2	Whether staging (support) for shuttering is designed for loads like worker movement, impact load and other incidental loads during construction?				
12.3	Whether workers use PPEs at work site?				
12.4	Whether all safety procedures are adopted while cutting rod?				
12.5	Whether proper staging and bundling is provided for supplying rods at height?				
12.6	Whether sufficient cross bracings are provided for high staging works at vulnerable points?				
12.7	Others				
<b>13.0</b>	<b>CONCRETING</b>				
13.1	Whether the concreting area is barricaded?				
13.2	Whether vibrator hoses, pumping concrete accessories are in healthy condition and mechanically strong?				
13.3	Whether it is ensured that no pipe line in concrete pumping system is attached to any temporary strut such as scaffolds etc.?				
13.4	Whether it is checked that safety guards around moving parts are provided in concrete mixer/ machines?				
13.5	Whether earthing of electrical mixers, vibrator etc. are checked?				
13.6	Whether entry of unauthorised person in the concreting area is restricted?				
13.7	Whether adequate lighting arrangement is made in the concreting area if working during night?				
13.8	Whether PPEs like gum boots, gloves and dust masks etc. are being used?				
13.9	For overhead or underground work, whether form work and shuttering have been checked so that the same do not collapse during concreting?				

13.10	Others				
<b>14.0</b>	<b>DEMOLISHING (DEMOLISHING BY BLAST NOT CONSIDERED)</b>				
14.1	Has the stability of structure been examined by competent person and found OK?				
14.2	Are non-sparking tools being used, if required?				
14.3	Is intermittent clearing operation being done to keep the area reasonably tidy and clean?				
14.4	Whether effective barricading has been provided?				
14.5	Whether Electrical and other facilities like water, oil, gas pipelines have been isolated/protected?				
14.6	Whether the plan of demolition (including sequence of activities) has been prepared and approved prior to start of the work?				
14.7	Others				
<b>15.0</b>	<b>RADIOGRAPHY</b>				
15.1	Are safety precautions for handling of source as per guidelines of BARC being followed?				
15.2	Is the potency of the source being used within acceptable limits as per the BARC regulations?				
15.3	Is the area being cordoned with proper signs during radiography?				
15.4	Does proper place exist as per BARC regulations for storage of source / Personnel safety equipment?				
15.5	Does the radiographer has valid certificate of radiography from competent authority (BARC)?				
15.6	Is radiographer using Exposure Meter / Dosi Meter?				
15.7	Whether minimum occupancy of the				

	premises / workplace is being ensured while radiography is in progress?				
15.8	Is permit system being followed?				
15.9	Others				
<b>16.0</b>	<b>ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS</b>				
16.1	Are jobs being carried out with a valid work permit only as per OISD-STD-105 "Work Permit System".				
16.2	Is smoking prohibited in all places containing combustible or flammable materials and "No Smoking" notices prominently displayed.				
16.3	Are only approved type electrical installations and equipment, including portable lamps, being used?				
16.4	Are oily rags, waste, wooden materials and clothes or other substances liable to spontaneous ignition being removed?				
16.5	Are the combustible materials properly shielded in case same cannot be removed from the area?				
16.6	Has welding screens (like metal/asbestos/ water curtain) been put up to protect other equipment / facilities/ OWS/ drains in adjoining areas against flying sparks, as may be required?				
16.7	Is Gas-testing being done with the means of a calibrated Gas detection Meter prior to start of Hot work and being done subsequently at regular intervals as per the requirement?				
16.8	Are regular inspections being done of places where there are fire risks like in the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations?				
16.9	Are fire-extinguishing equipment being placed at strategic locations and are kept well maintained and inspected at suitable intervals by a competent person.				
16.10	Are access to fire-extinguishing equipment such as hydrants, portable				



	extinguishers and connections for hoses kept clear at all times?				
16.11	Are all supervisors and a sufficient number of workers trained in the use of fire-extinguishing equipment?				
16.12	Are audio means, to give warning in case of fire provided, audible in all parts of the site where persons are liable to work?				
16.13	Is there an effective evacuation plan in place so that all persons are evacuated speedily without panic?				
16.14	Others				
<b>17.0</b>	<b>EMERGENCY PROCEDURES</b>				
17.1	Is signaling / siren system effective?				
17.2	Is arrangement for rescuing affected person adequate?				
17.3	Are signs showing emergency exit route installed?				
17.4	Is emergency exit route clear of obstacles?				
17.5	Is communication system adequate?				
17.6	Whether emergency vehicle with driver has been provided to meet any emergency situation?				
17.7	Does any tie-up with hospitals or local doctors exist?				
17.8	Has the assembly point for workers in case of emergency been identified and earmarked?				
17.9	Has training been provided to a few workers for First Aid?				
17.10	Others				
<b>18.0</b>	<b>WELFARE FACILITIES</b>				
18.1	Is hygienic conditions prevailing at labour camps?				
18.2	Are First Aid facilities available?				

18.3	Does proper sanitation exist at site office and labour camps?				
18.4	Does any arrangement of medical facilities like tie ups with nearby hospital exist?				
18.5	Is proper drinking water facility available for workmen & staff?				
18.6	Are crèches provided for children (if applicable)?				
18.7	Is any proper place/canteen/restroom provided for eating food and taking rest?				
18.8	Is any place earmarked for storing / keeping clothing?				
18.9	Is Adequate washing facility available?				
18.10	Does proper ventilation at working place exist?				
18.11	Others				
<b>19.0</b>	<b>GENERAL</b>				
19.1	Are illumination levels at workplace and passages adequate?				
19.2	Is communication system adequate?				
19.3	Are display and caution boards provided at strategic locations?				
19.4	Are road barriers being used for blocking any roads/passage?				
19.5	Has the structure been adequately secured against storm/high winds during construction/ erection?				
19.6	Are the equipment properly earthed?				
19.7	Are vehicles being checked like brakes, oil, lights etc. on regular basis?				
19.8	Is compressed air being used only for its intended purpose and not for any other purpose?				
19.9	Are only proper clothes and not loose clothes being used while working around				





	machinery?				
19.10	Are nails or other sharp objects being removed or bent?				
19.11	Are machine guards over moving parts of machinery such as coupling, pulley, wheel etc. installed?				
19.12	Whether after maintenance of machinery the guards are securely fitted before putting into operation?				
19.13	Are working platforms / gangways provided with hand rails & toe guards?				
19.14	Are swing platforms provided with chains & secured adequately when not in use?				
19.15	Are the approaches to work sites being maintained & kept clear of obstacles?				
19.16	Whether engines of equipment entering into the operating area have exhaust and muffler system with approved spark arrestor?				
19.17	Whether vehicles/engine driven equipment, electrical equipment and tools used are certified?				
19.18	Whether contractors inform his workers about hazards and safe procedures?				
19.19	Whether sufficient care is taken so that spark do not go outside working enclosure & falls below?				
19.20	Whether contractor's qualified / trained supervisor is present?				
19.21	Whether all exhausts of engines are provided with approved type of flame arrestors and exhaust is not facing toward the place where the workers are working?				
19.22	Others				

**Signature of the Auditor**

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### **CONTRACTORS' LABOUR REGULATIONS**

1. These regulations may be called Model Contractors Labour Regulations.
2. **Definition :** In these regulations, unless otherwise expressed or indicated, the following words and expressions shall have the meaning hereby assigned to them :
  - (a) "Labour" means workers employed by a contractor, directly or indirectly through a sub-contractor, or by an agent on his behalf to do any skilled, semi-skilled or unskilled manual, supervisory, technical or clerical work.
  - (b) "Fair Wage" means wages, which shall include wages for weekly day of rest and other allowances, whether for time or piece work, after taking into consideration prevailing market rates for similar employments in the neighbourhood but shall not be less than the minimum rates of wages fixed under the payment of Minimum Wages Act.
  - (c) "Wages" shall have the same meaning as defined in the Payment of Wages Act.
  - (d) "Contractor" for the purpose of these regulations shall include an agent or subcontractor employing labour on the work taken on the contract.
  - (e) "Inspecting Officer" means any Labour Enforcement Officer or Assistant Labour Commissioner of the Chief Labour Commissioner's Organisation.
  - (f) "Prescribed" means prescribed under the Contract Labour (Regulation and Abolition) Act, 1970 and Rules framed thereunder.
3. **Notice of commencement :** The Contractor, shall within SEVEN days of commencement of the work, furnish in writing, to Inspecting Officer of the area concerned the following information:
  - (a) Name and Situation of the work.
  - (b) Contractor's name and address.
  - (c) Particulars of the Department for which the work is undertaken.
  - (d) Name and address of sub-contractors as and when they are appointed.
  - (e) Commencement and probable duration of the work.
  - (f) Number of workers employed and likely to be employed.
  - (g) "Fair wages" for different categories of workers.
    - (i) Number of hours of work to constitute a normal working day : The number of hours which shall constitute a normal working day for an adult shall be NINE hours. The working day of an adult worker shall be so arranged that it is inclusive of intervals, if any, for rest, it shall not spread over more than twelve hours on any day. When a worker is made to work for more than NINE hours on any day or for more than FORTY EIGHT hours in a week, he shall, in respect of overtime work, be paid wages at double the ordinary rate of wages.
    - (ii) Weekly day of rest : Every worker shall be given a weekly day of rest which shall normally be a Sunday unless otherwise fixed and notified at least TEN days in advance. A worker shall not be required or allowed to work on the weekly rest day unless he has or will have a substituted rest day, on one of the five days immediately before or after the rest day, provided that no substitution shall be made which

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will result in the worker working for more than ten days consecutively without a rest day for a whole day.

4. Where, in accordance with the foregoing provisions, a worker works on the rest day and has been given a substituted rest day, he shall be paid wages for the work done on the weekly rest day at the overtime rate of wages.

(NOTE : The expression "ordinary rate of wages" means the fair wage the worker is entitled to.)

5. **Display of notice regarding Wages, Weekly Day of Rest etc. :** The contractor shall, before the commencement of his work on the Contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the works, notice in English and in the local Indian language, spoken by majority of workers, giving the rate of fair wages, the hours of work for which such wages are payable, the weekly rest days workers are entitled to and name and address of the Inspecting Officer. The Contractor shall send a copy each of such notices to the Inspecting Officers.



6.1 **Fixation of Wage Periods :** The Contractor shall fix wage periods in respect of which wages shall be payable. No wage period shall normally exceed one month.

6.2 **Payment of wages :**

- (i) Wages due to every worker shall be paid to him direct. All wages shall be paid in current coins or currency or in both. The wages shall be paid without deductions of any kind except those specified by Central Government by General Order or Special Order in this behalf or permissible under the Payment of Wages Act.
- (ii) Wages of every worker employed as contract labour in an establishment or by Contractor are less than one thousand, such workers shall be paid within SEVEN days from the end of the Wage period; and before the expiry of the 10th day from the end of the wage period accordingly as the number of workers exceed 1,000.
- (iii) When employment of any worker is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before expiry of the second working day from the date on which his employment is terminated.
- (iv) All payment of wages shall be made at the work site on a working day except when the work is completed before expiry of the wage period, in which case final payment shall be made at the work site within 48 hours of the last working day and during normal time.

(NOTE : The term "working day" means a day on which labour is employed, and the work is in progress)

7. **Register for Workmen :** A register of workmen shall be maintained in the prescribed form and kept at the work site or as near to it as possible, and the relevant particulars of every workmen shall be entered therein within THREE days of his employment.
8. **Employment Card :** The Contractor shall issue an employment card in the Form appended to these regulations to each worker on the day of work or entry into his employment. If a worker already has any such card with him issued by the previous employer, the Contractor shall merely endorse that Employment Card with relevant entries. The Contractor may, alternatively, issue an attendance-cum-wage slip to each worker in the form appended. This card shall be valid for a wage period. The Contractor shall mark attendance on the cards twice each day and again after the rest interval, before he actually starts the work. On termination of employment, the

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Employment Card shall again be endorsed by the Contractor, service certificate issued and returned to the Worker.

9. **Register of Wages etc.:**



- (i) A register of Wages-cum-Muster Roll in the prescribed Form shall be maintained and kept at the work site or as near to it as possible.
- (ii) A wage slip in the prescribed Form shall be issued to every worker employed by the Contractor at least a day prior to disbursement of wages.

10. **Fines and deductions which may be made from Wages :**

- (i) Wages of a worker shall be paid to him without any deduction of any kind except the following:
  - (a) Fines ;
  - (b) Deduction for absence from duty, i.e. from the place of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent ;
  - (c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money which he is required to account for, where such damage or loss is directly attributable to his neglect or default ;
  - (d) Deductions for recovery of advances or for adjustment of overpayment of wages. Advance granted shall be entered in a register ; and
  - (e) Any other deduction which the Corporation may from time to time allow.
- (ii) No fines shall be imposed on any worker say in respect of such acts and omissions on his part as have been approved by the Chief Labour Commissioner or Competent Authority.
- (iii) No fine shall be imposed on a worker and no deductions for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.
- (iv) The total amount of fines which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the wages payable to him in respect of that wage period.
- (v) No fine imposed on a worker shall be recovered from him in installments, or after expiry of sixty days from the date on which it was imposed. Every fine shall be deemed to have been imposed on the day of the act or commission in respect of which it was imposed.
- (vi) The Contractor shall maintain both in English and the local Indian language, a list approved by the Chief Labour Commissioner or Competent Authority clearly stating the acts and commissions for which penalty or fine may be imposed on a workman and display it in good condition in a conspicuous place on the work site.
- (vii) The Contractor shall maintain a register of fines and the register of deductions for damage or loss in the prescribed Forms which should be kept at the place of work.
- (viii) The Contractor shall display in a conspicuous place of work the list of acts and omissions for which the fines can be imposed. They are as under :
  1. Willful insubordination or disobedience, whether alone or in combination with other.
  2. Theft, fraud or dishonest in connection with the Contractors beside a business or property of Corporation.



DRAWING NO. 1000	
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3. Taking or giving bribes or any illegal gratification.
4. Habitual late attendance.
5. Drunkenness, fighting, riotous or disorderly or indifferent behaviour.
6. Habitual negligence.
7. Smoking near or around the area where combustible or other materials are locked.
8. Habitual indiscipline
9. Causing damage to work in the progress or to property of the Corporation or of the Contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving of false information regarding name, age, father's name etc.
13. Habitual loss of wage cards supplied by the employers.
14. Unauthorised use of employer's property of manufacture or making of unauthorised articles at the work place.
15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Corporation and for which the Contractor is compelled to undertake rectification.
16. Making false complaints and/or misleading statements.
17. Engaging trade within the premises of the establishments.
18. Any unauthorised divulgence of business affairs of the employers.
19. Collection or canvassing for the collection of money within the premises of an establishment unless authorised by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimidating any workmen or employer during the working hours within the premises.
22. Non-observance of Safety norms/practices applicable to the Worksite.
11. **Register of Accidents** : The Contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars :
  - (a) Full particulars of the labourers who met with accident.
  - (b) Rate of wages.
  - (c) Sex
  - (d) Age
  - (e) Nature of accident and cause of accident
  - (f) Time and date of accident
  - (g) Date and time when admitted in hospital
  - (h) Date of discharge from the hospital
  - (i) Period of treatment and result of treatment
  - (j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
  - (k) Claim required to be paid under Workmen's Compensation Act.

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- (l) Date of payment of compensation
- (m) Amount paid with details of the person to whom the same was paid.
- (n) Authority by whom the compensation was assessed
- (o) Remarks
12. **Preservation of Registers** : The Register of Workmen and the Register of Wages cum-Muster Roll required to be maintained under these Regulation shall be preserved for 3 years after the date on which the last entry is made therein.
13. **Enforcement** : The Inspecting Officer shall either, on his own motion or on a complaint received by him, carry out investigations and send a report to the Engineer-in-charge specifying the amounts representing Workers' dues and amount of penalty to be imposed on the Contractor for breach of these Regulations, that have to be recovered from the Contractor, indicating full details of the recoveries proposed and the reasons therefor. It shall be obligatory on the part of the Engineer-in-charge on receipt of such a report to deduct such amounts from payments due to the Contractor.
14. **Disposal of amounts recovered from the Contractor** : The Engineer-in-charge shall arrange payment to workers concerned within FORTY FIVE days from receipt of a report from the Inspecting Officer. In cases where there is an appeal, payment of workers dues would be arranged by the Engineer-in-charge wherever such payments arise, within THIRTY days from the date of receipt of the decision of the Regional Labour Commissioner (RLC).
15. **Appeal against decision of Inspecting Officer** : Any person aggrieved by a decision of the Inspecting Officer may appeal against such decision to the RLC concerned within THIRTY days from the date of decision, forwarding simultaneously a copy of his appeal to the Engineer-in-charge. The decision of the RLC shall be final and binding upon the Contractor and the workmen.
16. **Representation of parties** :
- (i) A workman shall be entitled to be represented in any investigation or enquiry under these Regulations by an officer of a registered trade union of which he is a member or by an officer of a Federation of Trade Unions to which the said trade union is affiliated or where the workman is not a member of any registered trade union, by an officer of a registered trade union, connected with, or by any other workman employed in the industry in which the worker is employed.
- (ii) A contractor shall be entitled to be represented in any investigation of enquiry under these Regulations by an officer of an Association of Contractors of which he is a member or by an officer of a Federation of Association of Contractors to which the said association is affiliated or where the Contractor is not a member of any Association of Contractors, by an officer of association of employers, connected with, or by any other employer engaged in the industry in which the Contractor is engaged.
- (iii) No party shall be entitled to be represented by a legal practitioner in any investigation or enquiry under these Regulations.
17. **Maternity benefits for female employees** : The Contractor shall extend the leave, pay and other benefits as admissible to the female employees. No maternity benefits shall be admissible to a female worker unless she has been employed for a total period of not less than 6 months immediately proceeding the date on which she



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- proceeds on leave. The Contractor shall maintain a register of maternity benefits in prescribed form, and shall be kept in all places of work.
18. **Inspection of Books and other documents** : The Contractor shall allow inspection of the Registers and other documents prescribed under these Regulations by Inspecting Officers and the Engineer-in-Charge or his authorised representative at any time and by the worker or his agent on receipt of due notice at the convenient time.
  19. **Submission of Returns** : The Contractor shall submit periodical returns as may be specified from time to time.
  20. **Amendments** : The Corporation may, from time to time, add to or amend these Regulations, and issue such directions as it may consider necessary for the proper implementation of these Regulations or for the purpose of removing any difficulty which may arise in the administration thereof.

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**Major Free Issue Items**

- a) Equipment related with FA and PA system



# सामग्री निर्गम एवं रिकोन्सिलिएशन के लिए शर्तें

## CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIALS

1	24.01.2014	Reaffirmed & Issued as Standard	SM	DJ	RKD	SC
0	21.05.2008	Doc. No. 6-10-0001 Rev 0 has been revised and issued as Standard	AS	GKI	SCB	VC
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

**Abbreviations:**

MS	:	Mild Steel
OFC	:	Optical Fibre Cable
OTDR	:	Optical Time Domain Report

**Construction Standards Committee**

**Convenor:** Sh. RK Das, ED (Construction)

**Members :** Sh. M Deshpande, GM (Construction)  
Sh. M Natarajan, GM (C&P)  
Sh. Rakesh Nanda, GM (Piping)  
Sh. S Mukherjee, DGM (Construction)  
Sh. Janak Kishore, DGM (Projects)  
Sh. D Jana, AGM (Construction)

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## 1.0 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued by Owner, following conditions for issue of material in addition to other conditions specified in the contract shall be applicable:

- 1.1 Necessary indents shall be raised by the Contractor as per procedure laid down by the Engineer-in-Charge from time to time, when the materials are required for incorporation in permanent works.
- 1.2 Materials shall be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer-in-Charge.
- 1.3 The Contractor shall bear all other cost including lifting, carting from issue points to work site/Contractor's store, custody and handling etc. and return of surplus/serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-Charge. No separate payment for such expenditure shall be made.
- 1.4 No material shall be allowed to be taken outside the plant without a gate pass.
- 1.5 The Contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

## 2.0 RETURN OF UNUSED MATERIAL/ SCRAP

- 2.1 All unused/scrap materials shall be the property of the Owner and shall be returned in good and acceptable condition category wise by the Contractor at his own cost to Owner's Store(s).
- 2.2 No credit shall be given to the Contractor for return of scrap. The Contractor should quote the rates accordingly. Contractor shall make his own arrangements for weighing the cut offs to be returned to Owner's stores.
- 2.3 In case the Contractor fails to return unused materials/ accountable scrap, then recovery for such quantity of materials, not returned by the Contractor shall be affected at following penal rates from the Contractor's bills or from any other dues of the Contractor to the Owner:

S. No.	Material		Penal Rates
1.	(a)	Penal rate for non return of accountable scrap	Issue Rate + 25% or Landed Rate + 25% (in case issue rate are not indicated in the contract)
	(b)	Penal rate for return of serviceable materials in excess of permitted % allowances	
	(c)	Penal rate for issuance of unplanned OFC jointing kits	
2.	(a)	Penal rates for non return of Unused material and or penal rate for generating scrap in excess of permitted % allowances	Twice the Issue Rates or Twice the Landed Rates (in case Issue Rates are not indicated in the Contract)
	(b)	Penal rate for using excess amount of materials like cement than permitted % allowances	

NOTE: 1) Landed Rate shall be arrived from the latest Purchase Order of respective material received at site by Owner/EIL.



- 2) In case more stringent penal rates have been indicated elsewhere in the Contract (based on Project requirement), the same shall supersede the above rates.

### 3.0 CEMENT

- 3.1 Cement as received from cement Manufacturer/Stockists shall be issued to the Contractor. The theoretical weight of cement in each bag for issue purpose shall be considered as 50 Kg or 20 bags per MT. However, cement bags weighing upto 4% less shall be accepted by the Contractors and charged for as full bag.

- 3.2 The Contractor is required to submit the design mix for different grades of concrete, keeping in view the requirements stipulated in IS:456 and IS 10262, specifically regarding durability, slump and water cement ratio and specific gravity of materials brought to site as analyzed in the laboratories. The design shall be based upon absolute volume method and theoretical consumption of cement shall be worked out on this basis. For other than concrete items, the coefficients for consumption of cement shall be adopted as per CPWD practice.

- 3.3 The permissible variation between Cement actually used on the job and theoretical consumption worked out on the basis stipulated in above para 3.2 and as determined by Engineer-in-Charge shall be 3% (Three percent only).

If the actual consumption is more than 103% of the theoretical consumption, then recovery at the penal rates for the quantity of cement beyond the limit of 103% of theoretical consumption shall be affected as per clause 2.3 above.

- 3.4 Unused quantity of cement shall be returned by the Contractor to the Owner's stores in good condition only.
- 3.5 The Contractor shall maintain a good store for storing cement issued to him. The flooring of the storage house, the clearances of cement bags from the side walls/ floor & stack height etc. shall be as instructed by the Engineer-in-Charge.
- 3.6 The contractor shall maintain a Cement Register in prescribed format and update the entries on daily basis.
- 3.7 The cement store shall be offered for inspection and verification by the Engineer-in-Charge or his authorized representative at any time when the Engineer-in-Charge feels the need to do so.
- 3.8 Empty cement bags shall be the property of the Contractor and shall have to be disposed off by him.

### 4.0 REINFORCEMENT BARS / STRUCTURAL STEEL / PLATES

- 4.1 The scrap allowance for the reinforcement bars/structural steel including steel plate issued by the Owner, shall be total 2% (1.5% accountable and 0.5% unaccountable) of the actual consumption as incorporated in the works.
- 4.2 All serviceable reinforcement bars/structural steel/steel plates shall be issued in available length/shapes/sizes and no claims for extra payment on account of issue of non-standard lengths/shapes/sizes and bending etc. shall be entertained. Reinforcement bars and structural steel shall be issued on weight basis as per normal warehousing practice. In exceptional circumstances, the reinforcement bars/ structural steel, if issued on linear measurement, the IS coefficients for unit weight shall be considered. For the purpose of billing and accounting, only linear measurements shall be taken and weight shall be calculated as per IS coefficients in three decimals. The difference in unit weight as per IS and actual as issued, if any, shall be



to Contractor's account and Contractor is deemed to have considered the same at the time of bidding.

- 4.3 Reinforcement bars/structural steel/steel plates shall be issued only for those items where Owner's supply has been specifically mentioned in Schedule of Rates/ Scope of Supply. The storage of these items shall be done in such a way so as to avoid rusting/ damage to any kind to the materials.

- 4.4 All reinforcement bars/structural steel (except M.S. Plates) in length of 2 meters and above shall be considered as serviceable materials provided the material is in good and acceptable condition. Reinforcement bars/structural steel section (except M.S. Plates) in lengths less than 2M shall be treated as scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

- 4.5 For the purpose of accounting of the plates, all plates measuring not less than 1 Sq.m in area and having any dimensions not less than 200mm when returned to Owner's store, shall be considered as serviceable material. All other pieces shall be treated as wastage/scrap. The Contractor shall prepare a plate cutting diagram in such a way that the minimum scrap is generated. Also the cut plates should be used at proper places to reduce the scrap.

- 4.6 The serviceable cut pieces as mentioned in 4.4 & 4.5 above shall be considered as unused material for reconciliation purpose.

- 4.7 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

## 5.0 PIPING MATERIALS

- 5.1 All serviceable pipes shall be issued in available lengths/shapes and no claims for extra payments on account of issue of non-standard length & shape shall be entertained. Pipes shall be issued on linear measurement basis. All valves, flanges, fittings etc. shall be issued on number(s) basis. Contractor shall store the materials in such a way so as to avoid mixing of different types of material and shall maintain complete identification and traceability at all times.

- 5.2 The scrap allowance for pipes issued by the Owner shall be 3% (2.5% accountable + 0.5% unaccountable) of the actual consumption as incorporated in the works.

- 5.3 All pipes in length of 2 meters and above shall be considered as serviceable material provided the material is in good and acceptable condition and has clear identification and traceability (Manufacturer's name, heat number/batch number and test certificates). Pipes in lengths less than 2M shall be treated as scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

- 5.4 All unused/scrap pipes, valves, flanges, forged fittings like elbows, reducers tees shall be returned by the Contractor category wise duly cleaned, greased and spec. marked at his own cost to Owner's stores.

- 5.5 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.



## 6.0 EQUIPMENTS

Various equipment/materials intended for the installation shall be received by Owner in unpacked, skid mounted, crated, packed or loose condition and shall be stored in the warehouses and open yards. In general, materials shall be issued to the Contractor in 'as received' condition. It shall be the Contractor's responsibility to draw, load and transport all materials from Owner's designated places of issue to the point of installation and return all packing materials like steel frames, wooden boxes/scrap etc. to Owner's stores.

All materials supplied by the Owner shall be duly protected by the Contractor at his own cost with appropriate preservative like primer, lacquer coating, grease etc. as required.

## 7.0 CABLES

Appropriation of cables shall be done as follows:

- 7.1 All the surplus and serviceable cables out of the cables quantity(ies) issued by the Owner to the Contractor shall be returned by the Contractor to the Owner's store in good condition and as directed by the Engineer-in-Charge.
- 7.2 The Contractor shall be allowed a cutting/wastage allowance (accountable scrap) of 1.5% for power cables and 3% for the control cables. This cutting/wastage allowance shall be computed on the length of cables actually laid, measured and accepted.
- 7.3 All cables being returned to store should carry Aluminium sheet tags indicating the size & type of cable. Cables of less than 15 meters length shall be termed as scrap. Cables of lengths 15M and above shall be termed as serviceable material & shall be returned size wise and category wise to the Owner's store in wooden drums. Cables of serviceable length being returned to stores in drum(s) shall be accepted only after Megger value continuity test and physical measurement is carried out by the Contractor to the satisfaction of Engineer-in-Charge. Empty cable drums and major packing material (as decided by Engineer-in-charge) shall be Owner's property and shall be returned to Owner's Store/designated place without any additional cost.

The contractor shall strive to avoid generation of cut pieces of length 15m and above, as far as practicable, by effectively planning & executing the construction works.

- 7.4 While carrying out material appropriation with the Contractor, the above points shall be taken into account. All serviceable materials returned by the Contractor (size wise & category wise) shall be deducted from the quantity(ies) issued to the Contractor for the respective sizes. Scrap generated for power cable and control cable shall also be returned to Owner's store on Lot basis. Wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

## 8.0 LINE PIPES

- 8.1 All bare/ coated line pipes as per Line Pipe specifications shall be issued on linear measurement basis. The serviceable line pipes shall be issued in available lengths and shapes and no claim for extra payment on account of issue of non-standard length and shape shall be entertained. Contractor shall store and maintain the line pipes in proper manner to avoid mixing of different classes of pipes. Contractor shall maintain complete identification and traceability at all times. All cut pieces when returned to Owner's storage points after beveling, shall be considered as serviceable material provided:

- a) Corrosion Protection Coating is intact.

- b) Pipe pieces have pipe specifications, manufacturer's logo/name and heat number duly authenticated with hard stamp of the authorized inspector as per approved procedure.

All cut pieces of pipes measuring less than 2 M shall be treated as wastage/scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

- 8.2 For the purpose of accounting of bare/ coated line pipes, following allowances shall be permitted:

- |    |  |       |
|----|--|-------|
| a) | Unaccountable wastage  |       |
| -  | upto 100 Km  | 0.1%  |
| -  | 101 to 500 Km  | 0.07% |
| -  | beyond 500 Km  | 0.05% |
| b) | Scrap (All cut pieces of pipes measuring less than 2 Meter)                | 0.25% |
| c) | Serviceable materials (All cut pieces of pipe measuring 2 Meter and above) | 0.5%  |

The percentage allowance shall be accounted on the basis of pipe book chainage for main pipeline.

- 8.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

## 9.0 OPTICAL FIBRE CABLE

- 9.1 For the purpose of accounting of optical fibre cable, all cut pieces measuring in length of 40 m and above when returned to Owner's storage points shall be treated as serviceable materials. All cut pieces of cable measuring less than 40 M shall be treated as scrap.

For the purpose of accounting of OFC (Optical Fibre Cable) following allowances shall be permitted:

- |    |   |       |
|----|---|-------|
| a) | Unaccountable wastage                                     | 0.5%  |
| b) | Scrap (All cut pieces of cables measuring less than 40 M) | 0.25% |
| c) | Serviceable material (measuring 40m to 750m)              | 0.25% |

The percentage allowance shall be accounted on the basis of pipe book chainage for main pipeline.

Cables returned in original drum (measuring 750m and above) with Optical Time Domain Report (OTDR) shall be considered as unused material.

- 9.2 The contractor shall strive to avoid generation of cut pieces of length 40m and above, as far as practicable, by effectively planning & executing the construction works.

- 9.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.



#### 10.0 OFC JOINTING KITS

The Contractor shall make a schedule for use of Cable jointing kits and get the same approved from Engineer-in-charge. The quantity mentioned in this schedule shall be termed as 'planned' usage quantity which shall be issued to the Contractor. However, any jointing based on site requirements as decided by Engineer-in-charge shall be included in planned quantity.

Any unplanned jointing required to be carried out by the Contractor due to reasons not attributable to Owner/EIL shall be issued from spare quantity, if available with Owner. Such unplanned OFC Jointing Kits shall be charged from the contractor at penal rates as per clause 2.3 above.