SUB SECTION – A-3.10.3

A-3.10	**CONSTRUCTION**
A-3.10.3	**HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT DURING CONSTRUCTION**

HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT DURING CONSTRUCTION

CAPTIVE POWER PLANT

PROJECT : GGSR PROJECT

OWNER : HMEL

PMC : ENGINEERS INDIA LIMITED

JOB NO. : 6922

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	08/02/2008	ISSUED FOR BIDS	AS	RK	SCB

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ATTACHMENTS

No.	Description	Document No.
I	STANDARD SPECIFICATION FOR HSE MANAGEMENT AT CONSTRUCTION SITES	6922-6-82-0001 Rev.0
II	OISD GUIDELINES FOR SAFETY PRACTICES DURING CONSTRUCTION	OISD-GDN-192
III	OISD GUIDELINES FOR CONTRACTOR SAFETY	OISD-GDN-207
IV	OISD RECOMMENDED PRACTICE FOR INSPECTION AND SAFE PRACTICES DURING ELECTRICAL INSTALLATIONS	OISD-RP-147
V	HPCL's SAFETY REGULATIONS FOR CONTRACTORS	

Abbreviations:

HSE	:	Health, Safety & Environment
OISD	:	Oil Industry Safety Directorate
PMC	:	Project Management Consultant

GENERAL REQUIREMENTS

1.0 Standard Specification for Health, Safety and Environment (HSE) Management (Spec. No. 6922-6-82-0001, Rev.0) attached herewith as Attachment-I, which is required to be followed by EPCC CONTRACTOR during Construction Phase at site.

Inaddition, HPCL's Safety Regulations (Attachment-V) shall also be followed by the EPCC CONTRACTOR.

2.0 EPCC CONTRACTOR shall have a documented HSE policy to cover commitment of the organisation to ensure Health, Safety and Environment aspects in the line of operation.

3.0 It is the responsibility of the EPCC CONTRACTOR to ensure that safe construction procedures are complied with. EPCC CONTRACTOR will also ensure that adequate First Aid medical facilities are available for emergency purpose and that safety practices as per the approved safety procedure are followed by his sub-contractors also.

EPCC 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) Fall arrest measures in place while working at height.
c) Barricading of crane movement areas / Radiography areas
d) Proper earthing of equipments.
e) Proper shoring / strutting of Excavated Areas.
f) Adequate Fire fighting & First-Aid facilities.

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

The responsibilities of the EPCC 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/PMC/TPI during conductance of their HSE Audits.
- Ensure closure of NCs observed during the above audits.

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 are enclosed herewith as Attachment-II & Attachment-III respectively. Safety Recommended Practices for Electrical System (OISD-RP-147) are enclosed as Attachment-IV. These are supplementary requirements to be followed by the EPCC CONTRACTOR at site.

SUB SECTION – A-3.10.3

ANNEXURE - I

SPECIFICATION

FOR

HEALTH, SAFETY & ENVIRONMENT

(HSE) MANAGEMENT

AT PUNJAB REFINERY SITE

PROJECT : PUNJAB REFINERY PROJECT, BHATINDA

OWNER : GURU GOBIND SINGH REFINERIES LTD.

PMC : ENGINEERS INDIA LIMITED

JOB NO. : 6922

Rev. No	Date	Purpose	Prepared by	Checked by	CONST	PROJ
					Approved by	
0	17/12/2007	ISSUED FOR BIDS	AS	RK	HOD(C)	CR

Abbreviations:

AERB	:	Atomic Energy Regulatory Board
ANSI	:	American National Standards Institute
BARC	:	Bhabha Atomic Research Centre
BS	:	British Standard
EIL	:	Engineers India 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
HV	:	High Voltage
IS	:	Indian Standard
IE	:	Indian Electricity
LPG	:	Liquefied Petroleum Gas
LSTK	:	Lump Sum Turn Key
MV	:	Medium Voltage
NC	:	Non Conformity
PPE	:	Personal Protective Equipment
RCM	:	Resident Construction Manager or Site-in-Charge, as applicable
ROW	:	Right of Way
SCC	:	Special Conditions of Contract
SLI	:	Safe Load Indicator
TBM	:	Tool Box Meeting
TPI	:	Third Party Inspection

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1.0 SCOPE

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

This specification is not intended to replace the necessary professional judgement needed to design & implement an effective HSE system for construction activities and the contractor is expected to exceed requirements given 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), Job (Technical) Specifications and Oil Industry Safety Directorate (OISD) guidelines & recommended practices. 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 (regulation of employment and condition of service) Act, 1996
- Job (Technical) specifications
- Relevant International/ National Codes (refer Appendix-A for standards/codes on HSE) including guidelines & recommended practices of OISD
- Statutory requirements

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

3.1 MANAGEMENT RESPONSIBILITY

3.1.1 HSE Policy & Objectives

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

3.1.2 Management System

The HSE management system of the Contractor shall cover the HSE requirements including but not limited to what is specified under clause 1.0 and 2.0 above.

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.

3.1.4 Deployment & qualifications of safety personnel

Contractor as a minimum requirement shall designate/ deploy the following HSE personnel at site:

a) Safety Steward

One for every 500 workers or part thereof. He/She shall possess minimum one year of experience in construction work environment.

b) Safety Supervisor

One for every 1000 workers or part thereof. He/She shall possess minimum two years of work experience in construction work environment.

c) Safety Officer

One for every 1000 workers or part thereof subject to a waive off for a strength less than 250. He/She shall possess a recognized Degree in any branch of engineering or technology or architecture and had a post qualification construction experience of minimum two years or possess a recognized Diploma in any branch of engineering or technology or Graduate in Science stream and had a post qualification construction experience of minimum five years.

Inaddition, he/she shall also possess a recognized degree or diploma in industrial safety.

However, the states where the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2002 have been notified, the requirements of the same shall be followed.

Above is the minimum requirement and the Contractor shall ensure physical presence of a safety personnel at each work location. No work shall be started at site until above safety personnel are physically present at site. The contractor shall submit a safety organogram clearly indicating the lines of responsibility & reporting system and elaborate the responsibilities of safety personnel in the HSE Manual/Programme. He shall furnish Bio-Data/Resume/Curriculum Vitae of the safety personnel he intends to mobilize, at least 1 month before the intended mobilization, for EIL/Owner's approval.

3.1.5 Implementation & Monitoring

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 & faithfully implemented at all levels at site.

3.1.6 Awareness

The contractor shall brief the visitors about the HSE precautions which are required to be taken before proceeding to site and make necessary arrangements to issue appropriate PPEs like hard hats & safety shoes to his visitors.

The Contractor shall promote and develop consciousness about Health, Safety and Environment among all personnel working for the Contractor. Awareness programmes and fabrication shop/work site meetings atleast on monthly basis shall be arranged on HSE activities to cover hazards involved in various operations during construction. During the awareness programme, steps shall be taken by the contractor to motivate & encourage the workmen & supervisory staff by issuing/ awarding them with the tokens/ gifts/ mementos/ monetary incentives.

A verbal warning shall be given to the worker during the first HSE violation. A written warning shall be issued on the second violation and thereafter for the third violation; the services of the worker shall be terminated. For all these violations, penalties shall be imposed separately on the contractor. A record of warnings for each worker shall be maintained by the contractor like by punching their cards.

3.1.7 **Fire prevention & First-Aid**

The contractor shall arrange suitable first aid measures such as First Aid Box (Refer Appendix-B for details), trained personnel to administer First Aid, stand-by ambulance or vehicle and install fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate fire extinguishers (Refer Appendix-C for details) to the satisfaction of EIL/Owner. The contractor's safety personnel shall be trained enough to carry out above activities effectively so as to provide immediate relief in case of an emergency.

3.1.8 **Documentation**

The Contractor shall evolve a comprehensive, planned and documented system for implementation and monitoring of the HSE requirements. This shall be submitted to EIL/Owner for approval. The monitoring for implementation shall be done by regular inspections and compliance to 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 all HSE requirements.

3.1.9 **Audit**

Contractor shall carry out internal HSE audits. He shall also cooperate during HSE audits by Owner/ EIL/ Third Party. Non-Conformances on HSE (including his sub-contractors) brought out during review/audit by his internal audit team as well as EIL/Owner/ Third Party's representative shall be resolved forthwith by Contractor. Compliance report shall be submitted to EIL/Owner promptly.

To this effect, the contractor shall submit an Audit Plan to EIL/Owner indicating the type of audits (internal by self including his sub-contractor, external by EIL/Owner & Third Party) and their frequencies. The contractor shall conduct an internal HSE audit aleast on quarterly basis and submit a report to EIL/Owner.

3.1.10 **Meetings**

The Contractor shall ensure participation of his top most executive at site (viz. Resident Engineer/ Site-in-Charge) in Safety Committee/HSE Committee meetings arranged by EIL/Owner usually on monthly basis or as and when called for. The compliance of any observations during the meeting shall be arranged urgently. The contractor shall assist EIL/Owner to achieve the targets set by them on HSE during the project implementation.

Inaddition, the contractor shall also arrange internal HSE meetings chaired by his top most executive at site on weekly basis and maintain records.

3.1.11 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. Awareness about local laws on this issue shall form part of the Induction Training.

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 shall not be allowed inside the plant complex. Smoking shall be permitted only inside smoking booths expressly designated & authorized by the Owner/EIL.

3.1.12 Penalty

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliance or 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 shall be upto a cumulative limit of

a) 1.0% (one percent) of the contract value for Item Rate or Composite contracts with an overall ceiling of Rs. 10,00,000/- (Rupees ten lakhs).

b) 0.2% (Zero decimal two percent) of the contract value for LSTK, EPC, EPCC or Package contracts with an overall ceiling of Rs.1,00,00,000/- (Rupees one crore).

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 on different types of HSE violations is specified below:

S. No.	Violation of HSE norms	Penalty Amount
1.	For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Full body harness, Face shield, Boiler suit, etc.)	Rs.250/- per day/Item/ Person.
2.	Working without Work Permit/Clearance	Rs.5,000/- per occasion
3.	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.3,000/- per item per day.
4.	Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required like Safety Nets.	Rs.3,000/ per case per day.
5.	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, improper storage/handling).	Rs.100/- per item per day.

6.	Use of domestic LPG for cutting purpose.	Rs.1,000 per occasion.
7.	No fencing/barricading of excavated areas.	Rs.1,000 per occasion.
8.	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.
9.	Non display of caution boards, list of hospitals, emergency services available at work locations.	Rs.500/- per occasion.
10.	Traffic rules violations like over speeding of vehicles, rash driving, wrong parking, not using seat belts, vehicles not fitted with reverse warning alarms.	Rs.1,000/- per occasion.
11.	Absence of Contractor's top most executive at site in the safety meetings whenever called by EIL/Owner	Rs.5,000/- per meeting.
12.	Failure to maintain safety records by Contractor Safety personnel.	Rs.1,000/- per month.
13.	Failure to conduct daily safety site inspection, HSE meeting and HSE audit at predefined frequencies	Rs.1,000/- per occasion.
14.	Failure to submit the monthly HSE report by 5th of subsequent month to Engineer-in-Charge.	Rs.5,000/- per occasion and Rs.100/- per day for further delay.
15.	Poor House Keeping	Rs.1,000/- per occasion
16.	Failure to report & follow up accident (including Near Miss) reporting system.	Rs.10,000/- per occasion
17.	Degradation of environment (not confining toxic spills, spilling oil/lubricants onto ground)	Rs.1,000/- per occasion
18.	Not medically examining the workers before allowing them to work at height, 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.1,000/- per occasion
19.	Violation of any other safety condition as per job HSE plan, work permit and HSE conditions of contract (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, etc.)	Rs.1,000/- per occasion
20.	Any violation not covered above	To be decided by EIL/Owner.

3.1.13 **Accident/ Incident investigation**

All accidents/incidents shall be reported immediately on Format No. HSE-2. Thereafter, a supplementary Accident/Incident investigation report on Format No. HSE-3 shall be submitted. Near Miss incident(s) shall also be reported on Format No. HSE-4. The accidents/ incidents shall be investigated by a team of Contractor's senior personnel 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

Contractor shall ensure that a high degree of house keeping is maintained and shall ensure interalia; the followings:

a. All surplus earth and debris are removed/disposed off from the working areas to designated location(s).

b. Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).

c. 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.

3.3 HSE MEASURES

3.3.1 **Construction Hazards**

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 Job Safety Analysis (JSA) specifically for high risk jobs like working at height & in confined space, deep excavations, radiography jobs, electrical installations, blasting operations, demolishing/ dismantling activities, welding/ gas cutting jobs and submit the findings to EIL/Owner. The necessary HSE measures devised shall be in place prior to start of an activity by the contractor.

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

3.3.2 **Accessibility**

The Contractor shall provide safe means of access 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 access to plant complex shall be strictly regulated. Any person or vehicle entering the complex shall undergo identification check, as per the procedures in force.

3.3.3 **Personal Protective Equipments (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.

Owner may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner. All Safety/ Fire personnel shall preferably wear red colour helmet so that workmen can approach them for guidance during emergencies.

For shot blasting, the usage of protective face shield and helmets, gauntlet and protective clothing is mandatory.

An indicative list of HSE standards/codes is given under Appendix-A.

3.3.4 **Working at height**

The contractor shall issue height permit for working 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 to personal protective equipments.

The permit shall be issued initially for one week or expected duration of an activity and extended further for the balance duration. This permit shall be applicable in areas where specific clearance from Owner's operation Deptt./Safety Deptt. is not required. EIL field Engineers/Safety Officers/Area Coordinators may verify and counter sign this permit (as an evidence of verification) during the execution of the job.

In case work is undertaken without taking sufficient precautions as given in the permit, EIL Engineers may cancel the permit and stop the work till satisfactory compliance is arranged. Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the used permits for verification during audits etc.

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. 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.

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.

Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.

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.

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 have sufficient space to hold the workmen and the tools & tackles including the equipments required for executing the job.

3.3.5 Scaffoldings & Barricading

Suitable scaffoldings 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. When a ladder is used, an extra workman shall 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. Owner/EIL reserves the right to ask the contractor to submit certification and or design calculations from his Engineering regarding load carrying capacity of the scaffoldings.

All scaffolds shall be inspected by a Scaffolding Inspector of the contractor. He shall paste a GREEN tag on each scaffold found safe and a RED tag on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and RED ones shall immediately be removed from the site.

The contractor shall ensure positive barricading 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.

3.3.6 **Electrical installations**

All electrical installations/ connections shall be carried out as per the provisions of latest revision of following codes/standards, inaddition 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.

3.3.6.1 The contractor shall meet the following requirements:

i) 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.

ii) 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 licensed electrician shall be ensured at site round the clock to attend to the normal/emergency jobs.

iii) All switchboards / welding machines shall be kept in well-ventilated & covered shed. The shed shall be elevated to avoid water logging. 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.

iv) Fire extinguishers and insulating mats shall be provided in all power distribution centers.

v) Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.

vi) Proper house keeping shall be done around the electrical installations.

vii) All temporary installations shall be tested before energising, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.

viii) All welders shall use hand gloves irrespective of holder voltage.

ix) 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.

x) 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.

xi) Regular inspection of all installations (at least once in a month)

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

i) 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.

ii) 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.

iii) 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.

iv) All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.

v) All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.

vi) Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm^2 copper shall be used for all single phase hand tools.

vii) Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.

viii) All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multistrand wires / cables.

ix) Cables shall be free from any insulation damage.

x) 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 M high. Minimum head clearance of 6 meters shall be provided at road crossings.

xi) Under ground road crossings for cables shall be avoided to the extent feasible. In any case no under ground power cable shall be allowed to cross the roads without pipe sleeve.

xii) All cable joints shall be done with proper jointing kit. No taped/ temporary joints shall be used.

xiii) 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.

xiv) All cables and wire rope used for earth connections shall be terminated through tinned copper lugs.

xv) 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.

xvi) Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.

xvii) ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

3.3.7 Welding/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. The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrester/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. All welding machines shall have effective earthing. 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.

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, 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, accessories and cranes are used. The contractor shall not be allowed to use defective equipment or tools not adhering to safety norms.

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 equipments mobilized and used by him at the workplace like transport vehicles, engines, cranes, mobile ladders, scaffoldings, work tools, etc.

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 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 equipments.

For jobs like drilling/demolishing/dismantling where noise pollution exceeds the specified limit of 85 decibels, ear muffs shall be provided to the workers.

To avoid upper limb disorders and backaches, Display Screen Equipments' 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 circulation in hands.

The contractor shall arrange health check up 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 reserve the right to ask the contractor to submit test reports. Regular health check-ups are mandatory for the workers assigned with Welding, Radiography, Blasting, Heavy Lift and Height (>2m) jobs. All the health check-ups shall be conducted by registered Medical practitioner and records are to be maintained.

The contractor shall ensure vaccination of all the workers including their families.

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.

Where contact or exposure of hazardous materials exceeds the specified limit or otherwise have harmful affects, appropriate personal protective equipments such as gloves, goggles, 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.

3.3.12 Radiation exposure

a) All personnel exposed to physical agents such as non-ionizing radiation, ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.

b) For ionizing radiation, requirements of Bhabha Atomic Research Centre (BARC)/ Atomic Energy Regulatory Board (AERB) shall be followed.

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 Controller of explosives for collection, transportation, storage of explosives as well as for carrying out blasting operations.

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 in Format No. HSE-9

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 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. The maximum allowable speed shall be adhered to. In case of an alert or emergency, the vehicles must clear all the routes, roads, access.

Dumpers, Tippers, etc. shall not be allowed to carry workers within the plant area and also to & from the labour colony. Hydras shall only be allowed for handling the materials at fabrication/ storage yards and in no case shall be allowed to transport the materials.

3.3.16 Welfare measures

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

- A crèche at site where 10 or more female workers are having children below the age of 6 years.
- Reasonable canteen facilities at site and in labour camps.
- Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers)
- Toilets, drinking water, 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 can not 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.

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. A record of the same shall be maintained.

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.

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 dispose 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, 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.

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.

3.3.21 **Confined Space Entry**

The contractor shall obtain a work permit (Format No. HSE -7) before entering a 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. 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.

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.

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 equipments utilized for the job.

The contractor shall, at all times, be responsible for all rigging activities.

Adequate safety measures such as positive barricading, usage of appropriate PPEs, permit to work, etc. shall be taken during all heavy or critical lifts.

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.

3.4 TOOL BOX MEETING (TBM)

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

TOOLBOX MEETING RECORDING SHEET		
Date & Time		
Subject		
Presenter		
Hazards involved		
Precautions to be taken		
Worker's Name	Signature	Section
Remarks, in any		

The topics during TBM 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

Contractor shall conduct an induction programme on HSE for his workers and maintain records. The Gate Pass shall be issued to only those workers who successfully qualify the induction programme.

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 ;

- Education about hazards and precautions required
- Emergency and evacuation plan
- HSE requirements
- Fire fighting and First-Aid
- Use of PPEs
- Local laws on intoxicating drinks, drugs, smoking in force

Records of the training shall be kept and submitted to EIL/ Owner whenever demanded.

3.6 INSPECTION

The contractor shall carryout daily HSE inspection and record observations at a central location. These inspection records shall be freely accessible to Owner/ EIL representatives. The contractor shall also assist Owner/EIL representatives during the HSE inspections conducted by them.

3.7 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 bonus for completing the job without any lost time accident.

3.8 SELF ASSESSMENT AND ENHANCEMENT

The contractor shall develop a method of check & balance through self assessment & enhancement techniques to ensure following key elements are adhered to:

a) Encourage positive behaviour
b) Plan, organize and communicate
c) Apply standards and procedures
d) Development of competence and well being
e) Management of self & sub-contractors and external relations
f) Management of construction hazards and risks
g) Manage change
h) Manage incident response
i) Learn from experience
j) Audit & Review programmes

By incorporating above key elements in his HSE system, the contractor shall explore the opportunities for continual improvement in the system so that a better performance record could be achieved.

4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR

4.1 ON AWARD OF CONTRACT

The Contractor shall submit a comprehensive Health, Safety and Environment Manual 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 including the following:

- Job procedure to be followed by the Contractor for construction activities including handling of equipments, scaffolding, electric installations, etc. describing the risks involved, actions to be taken and methodology for monitoring each activity.
- EIL/Owner review/audit requirement.
- Organization structure along with responsibility and authority, records/ reports etc. on HSE activities.
- Emergency evacuation plan/ procedures for site and labour camps
- Job Safety Analysis for high risk jobs
- Procedures for reporting & investigation of accidents and near misses.
- HSE Training programmes
- Reference to Rules, Regulations and statutory requirements.
- HSE reporting

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 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), 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.

- to submit, timely, the completed checklist on HSE activities (Format No.HSE-1), Monthly HSE report (Format No.HSE-5), 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. 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.

- display at site office, workplace and prominent locations the list of hospitals, emergency services available, safety signs like Men at work, Speed Limits, Hazardous Area, and HSE Policy, etc.

- provide posters, banners for safe working to promote safety consciousness.

- assess, analyze & mitigate the construction hazards

- carryout audits/inspection at his works as well as sub contractor works as per approved HSE plan/procedure/programme & submit the reports for EIL/Owner review.

- assist & cooperate during HSE audits by EIL/Owner, and submit compliance report.

- generate & submit HSE records/report as per this specification.

- apprise EIL/Owner on HSE activities at site.

- carryout all dismantling activities safely, with prior approval of EIL/Owner representative.

4.3 DURING SELECTION OF THE SUB-CONTRACTORS

The contractor shall review the HSE management system of the sub-contractors covering at the minimum:

- their past experience from HSE point of view for the type of work being assigned to them

- their HSE policies & practices and how often they have been reviewed by the Management

- their HSE track record for the last 5 years highlighting the number of accidents they had, HSE violations, number of NCRs observed during HSE Audits, etc.

- the qualifications and the skills their safety personnel possess

- their procedures in place for selecting the petty contractors
- the self enhancement techniques adopted by them towards HSE
- the HSE promotion measures adopted by them
- the type of penalties imposed on them for violating HSE norms
- the incident/ accident reporting and investigating system they have in place
- the measures they adopted for mitigating the contraction hazards
- the type & frequency of the HSE meetings conducted by them
- the type of PPEs they used at construction sites
- the number of HSE audits conducted by them, their type & frequency
- the Fire-fighting and First-Aid facilities they possess
- the induction and training/ awareness programmes they conducted
- the steps taken by them for continual improvement in the HSE system

5.0 RECORDS

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

1.	HSE Checklist cum compliance report	HSE-1
2.	Accident/ Incident Report	HSE-2
3.	Supplementary Accident/ Incident Investigation report	HSE-3
4.	Near Miss Incident Report	HSE-4
5.	Monthly HSE Report	HSE-5
6.	Permit for working at height	HSE-6
7.	Permit for working in confined space	HSE-7
8.	Permit for radiation work	HSE-8
9.	Permit for demolishing/ dismantling	HSE-9

APPENDIX-A

(Sheet 1 of 2)

A. I.S. CODES ON HSE

SP: 53	Safety code for the use, Care and protection of hand operated tools.
IS: 818	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 (Part -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: 3996	Safety Code of scaffolds and ladders
IS: 4082	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 (Part-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 (Part-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/ 58211
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 Z 49.1
Safe handling of compressed Gases in cylinders	:	P-1 (Compressed Gas Association 1235 Jefferson Davis Highway, Arlington VA 22202 - USA)

APPENDIX-B

DETAILS OF FIRST AID BOX

SL. NO.	DESCRIPTION		QUANTITY
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 Savalon		1 Bottle
7.	Mercurichrome 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.	Tourniqut		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. Benzoine (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

Fire ↓ / Fire Extinguisher →	**Water**	**Foam**	**CO_2**	**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_2	✖	✖	✔	✔	✔
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

Indicative 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/ equipments 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.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
• 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 excavation by 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	➢ Use Safety shoes ➢ Provide platform above reinforcement for movement of workers.

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 hooper ➢ 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) REINFOR-CEMENT	➢ 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 infront of or by the side of driver's cabin. ➢ Do not extend the rods 1/3rd 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 have 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 Electrocution 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 ELCB ➢ Protect electrical cables/equipment's 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 house keeping and first-aid boxes (for details refer Appendix-B) ➢ Don't obstruct assess to Fire extinguishers. ➢ Do not use elevators for evacuation during fire. ➢ Maintain lightening 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_2/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 Electrocution	➢ 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 ELCB ➢ Ensure earthing of machinaries 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 hydrotesting 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 *bomb* 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_2 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 equipments	➢ 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 equipments ➢ 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 atleast 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.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(N) STRUCTURAL 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 ➢ 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

FORMAT NO. : HSE-1 REV 0
HSE CHECKILIST CUM COMPLIANCE REPORT

(Sheet 1 of 6)

PROJECT : _____ REPORT NO. : _____

DATE : _____ CONTRACTOR : _____

INSPECTION BY :_____ OWNER : _____

FREQUENCY : DAILY JOB NO. : _____

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

SL. NO.	ITEM	YES	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 CЄ, 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				
	Other				

FORMAT NO.:HSE-1 REV 0
(Sheet 2 of 6)

	ITEM	YES	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 + 70^0 from horizontal				
e)	Other				

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

	ITEM	YES	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 logs maintained				
d)	Outriggers used				
e)	Signs/barricades provided				
f)	Signals observed and understood				
g)	Qualified operators				
h)	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				

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

	ITEM	YES	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 instructed				
b)	Fire extinguishers checked				
c)	No smoking in Prohibited areas.				
d)	Hydrants Clear				
e)	Other				
12.	**ELECTRICAL**				
a)	Use of 3-core armored cables				
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)	Covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards				
f)	Other				

FORMAT NO.:HSE-1 REV 0
(Sheet 5 of 6)

	ITEM	YES	NO	REMARKS	ACTION
14.	**HANDLING AND STORAGE OF MATERIALS**				
a)	Properly stored or stacked				
b)	Passageways clear				
c)	Other				
15.	**FLAMMABLE GASES AND LIQUIDS**				
a)	Containers clearly identified				
b)	Proper storage				
c)	Fire extinguishers nearby				
d)	Other				
16.	**WORKING AT HEIGHT**				
a)	Erection plan and work permit obtained				
b)	Safety nets				
c)	Full body harness and lanyards; chute lines				
d)	Health Check record available for workers going up?				
e)	Other				
17.	**CONFINED SPACE**				
a)	Work Permit obtained				
b)	Test for toxic gas and sufficient availability of oxygen conducted				
c)	Atleast one person outside the confined space for monitoring deputed				
d)	Availability of sufficient means of entry, exit and ventilation				
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				
b)	Work permit obtained				

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

	ITEM	YES	NO	REMARKS	ACTION
c)	Cordoning of the area done				
d)	Use of appropriate PPE's ensured				
e)	Proper training to workers/supervisors imparted				
f)	Minimum occupancy of workplace ensured				
19.	**HEALTH CHECKS**				
a)	Workers medically examined and found be fit for working i) at heights ii) in confined space				
b)	Availability of First Aid facilities.				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities.				
e)	Measures for dealing with illness.				
f)	Availability of Potable drinking water for workmen & staff.				
g)	Provision of crèches for children.				
h)	Stand by vehicle 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				

_____
Signature of Resident
Engr. With Seal

FORMAT NO. : HSE-2 REV 0
ACCIDENT/INCIDENT REPORT

(To be submitted by contractor after every Accident/ Incident within 24 hours)

Report No.: _____

Name of Site: _____ Date: _____

Name of work: _____ Contractor: _____

Type of Accident/ Incident: ☐ Fatal ☐ Other Lost Time ☐ Non Loss Time ☐ First-Aid case

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Name of the injured :
Age :
Father's name :
Sub-contractor M/s :
Date & time of Accident/ Incident :
Location :

Brief description of Accident/ Incident

Cause of Accident/ Incident

Nature of injury/damage

Medical Aid provided/actions taken

Intimation to local authorities (if applicable)

Signature of contractor with seal

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
SUPPLEMENTARY ACCIDENT/ INCIDENT INVESTIGATION REPORT

Supplementary to Report No:_____ (Copy enclosed)

Project : _____ Site : _____

Name of work :_____ Dated : _____

Contractor :_____ Work Order/LOI No._____

Name of the Injured : Age :
Sub-Contractor M/s :
Date & Time of Accident/ Incident : Location :

Brief Description & Cause of Accident/ Incident

Nature of Injury/Damage

Comments of Medical Practitioner, who attended the victim/injured

---

Suggested improvement in the working condition, if any

Loss of man days and impact on site works

Any other comment by Safety Officer

Signature of Contractor with Seal

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

FORMAT NO. : HSE-4 REV 0

NEAR MISS INCIDENT – SUGGESTED PROFORMA

Report No.: _____

Name of Site: _____ Date: _____

Name of work: _____ Contractor: _____

Incident reported by :

Date & Time of Incident :

Location :

Brief description of incident

Probable cause of incident

Suggested corrective action

Steps taken to avoid recurrence Yes ☐ No ☐

Signature of Contractor
with seal

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

FORMAT NO. : HSE-5 REV 0

MONTHLY HEALTH, SAFETY & ENVIRONMENT (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 : _____ Name of Safety Officer : _____ Job No. : _____

ITEM		UPTO PREVIOUS MONTH	THIS MONTH	CUMU-LATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)				
2) Manhours 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 Meetings 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 Manhours i.e. Number of LTA free manhours from the Last LTA				
16) Frequency Rate (No. of LTA per 2 lacs manhours worked)				
17) Severity Rate (No. of man days lost per 2 lacs manhours worked)				
18) Loss Time Injury Frequency (No. of LTI per 2 lacs manhours worked)				
19) No. of activities for which Job Safety Analysis (JSA) 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) Whether workmen compensation policy taken		Yes		No
27) Whether workmen compensation policy is valid		Yes		No
28) Whether workmen registered under ESI Act, as applicable		Yes		No

Remarks, if any

Date :

Safety Officer/Resident Engineer
(Signature and Name)

To : - OWNER
- RCM EIL (2 copies)

FORMAT NO. : HSE-6 REV 0
PERMIT FOR WORKING AT HEIGHT (ABOVE 2 METER)

(Sheet 1 of 2)

Project site _____ Sr.No. _____
Name of the work _____ Date _____
Name of Contractor _____ Nature of work _____
Total No. of workers _____ Exact location of work _____
Duration of work: from _____ to _____

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

SL. No.	ITEM	DONE	NOT REQD.
1.	Equipment/Work Area inspected	☐	☐
2.	Considered hazard from other routine/non-routine operations and concerned person alerted	☐	☐
3.	ELCB provided	☐	☐
4.	Proper lighting provided	☐	☐
5.	Area cordoned off.	☐	☐
6.	Precautions against public traffic taken	☐	☐
7.	Sound Scaffolding provided	☐	☐
8.	Adequate protected Platform provided	☐	☐
9.	Access and Exit to the area (Ladder properly fixed)	☐	☐
10.	Floor Openings covered	☐	☐
11.	Safety Net provided	☐	☐
12.	Health check of personnel	☐	☐

A. Following personal protective equipment/measures are provided (✓ mark) and used as relevant: Hard hat /Gloves/Goggles/Shoes/Face Shield/Life line/Full body safety harness/ Roof top walk ladder/Any other(pl. specify)
B. This permit shall be available at the work site at all times.
C. Permit shall be issued for maximum one week only (Monday to Sunday)
D. This permit shall be applicable in non-operational areas.
E. After completion of the work, used permits shall be preserved for record purposes
F. Additional precautions, if any _____

Permission is granted to work (See overleaf) = Yes/No

Name of Contractor's supervisor (Initiator)

Name of Contractor's Safety Officer (Issuing Authority)

FORMAT NO. : HSE-6 REV 0
(Sheet 2 of 2)

GRANT OF PERMIT AND EXTENSIONS

Sl No.	Validity Period From_____ To _____	Work Time From _____ Hrs. To _____ Hrs	Initiator (Supervisor of Contractor)	Issuing Authority (Safety Officer) of Contractor	Verification by EIL with date

Additional safety instructions, if any:-

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 _____

Safety Requirements POSITIVE ISOLATION OF THE VESSEL IS MANDATORY

(A) Has the equipment been ?

Y	NR		Y	NR		Y	NR	
☐	☐	isolated from power/steam/air	☐	☐	water flushed &/or steamed	☐	☐	radiation sources removed
☐	☐	isolated from liquid or gases	☐	☐	Manways open & ventilated	☐	☐	proper lighting provided
☐	☐	depressurized &/or drained	☐	☐	cont. inert gas flow arranged	☐	☐	
☐	☐	blanked/ blinded/ disconnected	☐	☐	adequately cooled	☐	☐	

(B) Expected Residual Hazards

☐	☐	lack of O_2	☐	☐	combustible gas/ liquid	☐	☐	H_2S / toxic gases
☐	☐	corrosive chemicals	☐	☐	pyrophoric iron / scales	☐	☐	electricity / static
☐	☐	heat/ steam / frost	☐	☐	high humidity	☐	☐	ionizing radiation
☐	☐		☐	☐		☐	☐	

(C) Protection Measures

☐	☐	gloves	☐	☐	ear plug / muff	☐	☐	goggles / face shield
☐	☐	protective clothing	☐	☐	dust / gas / air line mask	☐	☐	personal gas alarm
☐	☐	grounded air educter/blower /AC	☐	☐	attendant with SCBA/air mask	☐	☐	rescue equipment/team
☐	☐	Fire fighting arrangements	☐	☐	safety harness & lifeline	☐	☐	communication equipment
☐	☐		☐	☐		☐	☐	

Authorization / Renewal (It is safe to enter the confined space)

Date	No. of persons allowed	Name of persons allowed	Signature		Time		Signature
			Contractor's Supervisor	Contractor's Safety Officer	From	To	Workman

Permit Closure :

(A) Entry ☐ was closed ☐ stopped ☐ will continue on ...

(B) ☐ Site left in a safe condition
☐ Housekeeping done

(C) Multilock ☐ removed ☐ key transferred
☐ Ensured all men have come out ☐ Manways barricaded

Remarks, if any:

FORMAT NO. : HSE-8 REV 0
RADIATION WORK PERMIT

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

Location of work :

Source strength :

Cordoned distance (m) :

Name of Radiographing agency :

Approved by Owner/EIL ☐

No. of workers engaged :

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

S. No.	Item description	Done
1.	Safety regulations as per BARC/AERB ensured while source in use/in transit & during storage	
2.	Area cordoned off	
3.	Lighting arrangements for working during nights ensured	
4.	Warning signs/ flash lights installed	
5.	Cold work permit taken (if applicable)	
6.	PPEs like film badges, dosimeters used	

Additional precautions, if any _____

(Radiography Agency's BARC/AERB authorized Supervisor) (Contractor's Safety Officer)

Permission is granted.

Permit is valid from _____ AM/PM _____ Date to _____ AM/PM _____ Date

(Signature of permit issuing authority)

Name : Designation : Date :

Permit renewal :

Permit extended upto		Additional precautions required, if any	Sign of issuing authority with date
Date	Time		

Work completed/ stopped/ area cleared at _____ Hrs of Date _____

(Sign. of permit issuing authority)
Name :

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

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

Name of sub-contractor :
No. of workers to be engaged :

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
1.	Services like power, gas supply, water, etc. disconnected	☐	☐
2.	Dismantling/ Demolishing method reviewed & approved	☐	☐
3.	Usage of appropriate PPEs ensured	☐	☐
4.	Precautions taken for neighbouring structures	☐	☐
5.	First-Aid arrangements made	☐	☐
6.	Fire fighting arrangements ensured	☐	☐
7.	Precautions taken for blasting	☐	☐

(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)

SUB SECTION – A-3.10.3

ANNEXURE - II

OISD - GDN - 192
July, 2000

FOR RESTRICTED CIRCULATION

No.

SAFETY PRACTICES DURING CONSTRUCTION

OISD-GDN-192

Oil Industry Safety Directorate
Government of India
Ministry of Petroleum and Natural Gas

OISD - GDN - 192
July, 2000

FOR RESTRICTED CIRCULATION

No.

SAFETY PRACTICES DURING CONSTRUCTION

Prepared by

COMMITTEE ON
SAFETY PRACTICES DURING CONSTRUCTION

OIL INDUSTRY SAFETY DIRECTORATE
2ND FLOOR, "KAILASH"
26, KASTURBA GANDHI MARG
NEW DELHI-110 001

OISD - GDN - 192
June, 2000

FOR RESTRICTED CIRCULATION

No.

SAFETY PRACTICES DURING CONSTRUCTION

Prepared by

COMMITTEE ON
SAFETY PRACTICES DURING CONSTRUCTION

OIL INDUSTRY SAFETY DIRECTORATE
2ND FLOOR, "KAILASH"
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FOREWORD

The Oil Industry in India is nearly 100 years old. Due to various collaboration agreements a variety of international codes, standards and practices are in vogue. Standardisation in design philosophies, operating and maintenance practices at a national level was hardly in existence. This lack of uniformity coupled with feedback from some serious accidents that occurred in the recent past in India and abroad, emphasised the need for the industry to review the existing state of art in designing, operating and maintaining oil and gas installations.

With this in view, the Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safer operations. Accordingly OISD constituted a number of functional committees comprising of experts nominated from the industry to draw up standards and guidelines on various subjects.

The present document on "Safety Practices during Construction" was prepared by the Functional Committee on "Safety Practices during Construction". This document is based on the accumulated knowledge and experience of industry members and the various national and international codes and practices.

It is hoped that provisions of this document if implemented objectively, may go a long way to improve the safety to reduce accidents in Oil and Gas Industry. Users are cautioned that no document can be substitute for the judgment of responsible and experienced engineer.

Suggestions are invited from the users after it is put into practice to improve the document further. Suggestions for amendments, if any, to this standard should be addressed to:

The Co-ordinator
Committee on "Safety Practices during Construction"
Oil Industry Safety Directorate
2nd Floor, "Kailash",
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NEW DELHI - 110 001.

This document in no way supersedes the statutory regulations of Chief Controller of Explosives (CCE), Factory Inspectorate or any other statutory body, which must be followed as applicable.

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SAFETY PRACTICES DURING CONSTRUCTION

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MEMBERS	
1. Shri U.M. Rao	GAIL, Noida.
2. Shri K.N. Ravindran	CRL, Cochin
3. Shri P.K. Anand	ONGC, Mumbai.
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Shri A.K. Ranjan	OISD, New Delhi

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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 stautory 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 safetry 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:

i) proper storage of materials and equipment;
ii) 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:

i) avoid the risk of fire;
ii) control quickly and efficiently any outbreak of fire;
iii) bring out a quick and safe evacuation of persons.
iv) Inform unit/fire station control room, where construction work is carried out within existing operating area.

5.6.2 Combustible materials such us 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:

i) suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
ii) 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:

a) so placed as to minimise the risk of accidental starting of the machine.
b) 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:

a) designed and tested for the pressure and service for which they are intended;
b) 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:

a) be installed so that they can be started safely and the maximum safe speed cannot be exceeded.
b) 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:

a) the engine should be shut off.
b) care should be taken to avoid spilling fuel;
c) no person should smoke or have an naked light in the vicinity.
d) 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 45^0,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 $1/3^{rd}$ 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_2 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 pyropheric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyropheric 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/draining of liquid used for hydrotesting. The filling/draining 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 tailing 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 45^0 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_2/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 vesta,
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_2 and H_2S 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_2S 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 sulphuide 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_2S.

xvi) Portable H_2S gas detector should be continously 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 contigency plan.

ii) Sub surface safetv 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 safely.

vii) “SCADA" telementry 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_2S 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_2 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 to 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 provided 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.

11.0 REFERRENCES

i) *Factory Act, 1948*

ii) *Indian Electricity Rules*

iii) *Safety & Health in Construction by ILO*

iv) *The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996*

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

SUB SECTION – A-3.10.3

ANNEXURE - III

OISD – GDN – 207

FOR RESTRICTED CIRCULATION ONLY

OCTOBER 2002

CONTRACTOR SAFETY

OISD – GUIDELINES – 207

Oil Industry Safety Directorate
Government of India
Ministry of Petroleum & Natural Gas

OISD – GDN – 207

FOR RESTRICTED
CIRCULATION ONLY

OCTOBER 2002

CONTRACTOR SAFETY

Prepared by
FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

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FOREWORD

The Oil Industry in India is nearly 100 years old. Due to various collaboration agreements, a variety of international codes, standards and practices are in vogue. Standardisation in design philosophies, operating and maintenance practices at a national level was hardly in existence. This lack of uniformity coupled with feedback form some serious accidents that occurred in the recent past in India and abroad, emphasized the need for the industry to review the existing state of art in designing, operating and maintaining oil and gas installations.

With this in view, the Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardizing and upgrading the existing standards to ensure safer operations. Accordingly, OISD constituted a number of functional committees comprising of experts nominated from the industry to draw up standards and guidelines on various subjects.

The present guideline on "Contractor Safety" was prepared by the Functional Committee on "Contractor Safety". This guideline is based on the accumulated knowledge and experience of industry members and various national and international codes and practices.

It is hoped that provisions of this document, if implemented objectively, may go a long way to improve the safety to reduce accidents in Oil and Gas industry. Users are cautioned that no document can be substitute for the judgement or responsible and experienced engineer.

Suggestions are invited from the users after it is put into practice to improve the document further. Suggestions for amendments, if any, to this standard should be addressed to:

The Coordinator
Committee on "Contractor Safety"
Oil Industry Safety Directorate
7th Floor, New Delhi House
27-Barakhamba Road
New Delhi – 110001

This guideline in no way supercedes the statutory regulations of Chief Controller of Explosives (CCE), Factory Inspectorate or any other statutory body, which shall be followed as applicable.

FUNCTIONAL COMMITTEE ON CONTRACTOR SAFETY

LIST OF MEMBERS

Name	Organization	Status
S/Shri		
R N Biswas	Indian Oil Corporation Ltd.	Leader
S K Bag	Indian Oil Corporation Ltd.	Member
K Prakash	Bharat Petroleum Corporation Ltd.	Member
A Tilwankar	Bharat Petroleum Corporation Ltd.	Member
A D Ghorpade	Hindustan Petroleum Corporation Ltd.	Member
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N R Adsul	Bharat Petroleum Corporation Ltd.	Member
M P Jain	Engineers India Ltd.	Member
C M Sharma	Oil Industry Safety Directorate	Member
A K Ranjan	Oil Industry Safety Directorate	Member Coordinator

In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this Guideline.

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
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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.

v) Dissemination of acquired knowledge through training programs and information sharing sessions.

vi) Discussion & review of Fire Prevention & Disaster Management Plan.

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"

2) OISD-GDN-192 on "Safety During Construction"

3) OISD-STD-155 Part(I&II) on "Personnel Protective Equipment"

4) Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996

ANNEXURE I

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

Sl.no.	Code No.	Title
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 Arial 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 1981and 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
1.0	**PERSONNEL PROTECTIVE EQUIPMENT (PPE):** 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				
2.0	**HOUSE KEEPING**				
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				

3.0	**EXCAVATION**				
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 45^0 & 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				
4.0	**PERMITS**				
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				
5.0	**SAFETY IN CUTTING / WELDING/GRINDING**				
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				
6.0	**SAND / SHOT BLASTING**				
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				
7.0	**SAFETY WHILE WORKING AT HEIGHTS / SCAFFOLDING / LADDERS**				
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				
8.0	**SAFETY IN CONFINED SPACE**				
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				
9.0	**SAFETY IN MATERIAL HANDLING**				
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				

	following condition: a) Thoroughly examined by competent person at least once a year or such interval as required by statutory authority. b) Document of such examination are maintained and produced to owner supervisor before use of particular equipment?				
9.5	Whether chain blocks and cables are inspected before each use to assure their sound condition?				
9.6	Whether hoist and lift if used are: a) Properly maintained and thoroughly examined by competent authority at least once in every year. 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.				
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				
10.0	**ELECTRICAL SAFETY**				
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				
11.0	**ROAD WORK**				
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				
12.0	**FORM WORK, REINFORCEMENT**				
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				
13.0	**CONCRETING**				
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				
14.0	**DEMOLISHING (DEMOLISHING BY BLAST NOT CONSIDERED)**				
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				
15.0	**RADIOGRAPHY**				
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				
16.0	**ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS**				
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				
17.0	**EMERGENCY PROCEDURES**				
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				
18.0	**WELFARE FACILITIES**				
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				
19.0	**GENERAL**				
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

SUB SECTION – A-3.10.3

ANNEXURE - IV

OISD-RP-147
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FOR RESTRICTED CIRCULATION

INSPECTION AND SAFE PRACTICES DURING ELECTRICAL INSTALLATIONS

OISD - RECOMMENDED PRACTICE - 147

First Edition, October, 1993
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OIL INDUSTRY SAFETY DIRECTORATE
Government of India
Ministry of Petroleum & Natural Gas

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FOR RESTRICTED CIRCULATION ONLY

INSPECTION AND SAFE PRACTICES DURING ELECTRICAL INSTALLATIONS

Prepared by

COMMITTEE ON
INSPECTION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

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These documents are intended to supplement rather than replace the prevailing statutory requirements.

Note 1 in superscript indicates the changes / modiciations / additions as approved in 20th Safety Council Meeting held in October 2002.

FOREWARD

The Oil Industry in India is 100 years old. Due to various collaboration agreements a variety of international codes, standards and practices are in vogue. Standardisation in design philosophies, operating and maintenance practices at a national level was hardly in existence. This lack of uniformity coupled with feed back from some serious accidents that occurred in the recent past in India and abroad, emphasised the need for the Industry to review the existing state of art in designing, operating and maintaining Oil and Gas installations.

With this in view, the then Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safe operations. Accordingly OISD constituted a number of Functional Committees comprising of experts nominated from the Industry to draw up standards and guidelines on various subjects.

Present document on "Inspection and Safe Practices during Electrical Installations" was prepared by the Functional Committee on "Inspection and Maintenance of Electrical Equipment". This document is based on the accumulated knowledge and experience of Industry members and the various national and international codes and practices.

It is hoped that the provisions of this document if implemented objectively, may go a long way to improve the safety and reduce accidents in the Oil and Gas Industry. Users are cautioned that no document can be a substitute for the judgement of responsible and experienced engineer.

Suggestions for amendments, if any, to this document should be addressed to:

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This standard in no way supersedes the statutory regulations of Chief Controller of Explosive (CCE), Factory Inspectorate or any other Statutory body which must be followed as applicable.

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ON
INSPECTION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

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In addition to the above, several other experts from Industry contributed in the preparation, review and finalisation of this document.

INSPECTION AND SAFE PRACTICES DURING ELECTRICAL INSTALLATIONS

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INSPECTION AND SAFE PRACTICES DURING ELECTRICAL INSTALLATIONS

1.0 INTRODUCTION

Safety in Electrical System deserves maximum attention especially in the hydrocarbon industry, where classified hazardous atmosphere is normally encountered and electricity constitutes one of the major source of ignition (by arcs, sparks and hot surfaces) for fire accidents and explosions etc. Besides equipment damage and property loss, electrical hazards also include injuries and fatalities to personnel due to electric shock and burns.

Institution of Quality Assurance Programmes during the erection stage itself ensures that good quality of materials, superior workmanship under competent supervision, and compliance with standard engineering practices have gone into the work. This is rightly termed "Safety in-built into the System"

Timely inspection and adhering to safe practices as per the guidelines given in this document will go a long way in ensuring safer operations for a longer period of time, of the electrical installations in the Oil Industry.

2.0 SCOPE

This document specifies the minimum inspection requirements and safe practices to be adhered to, in the case of new electrical installations during their erection stage itself. Stagewise inspection of the equipment and installation practices have been discussed. This document is intended only to supplement and not to replace or to supercede the prevailing statutory requirements, which shall also be followed as applicable. Pre-commissioning requirements are excluded from scope for which OISD-137 shall be referred.

3.0 DEFINITIONS

i) Hazardous (Flammable) atmosphere

An atmosphere containing any flammable gas or vapour in a concentration capable of ignition.

ii) Hazardous area

An area shall be deemed to be hazardous area, where:

i) Petroleum having flash point below 65^0 C or any flammable gas or vapour in a concentration capable of ignition is likely to be present;

ii) Petroleum or any flammable liquid having flash point 65^0 C is likely to be refined, blended, handled or stored at or above its flash point.

Zone 0 An area in which a flammable atmosphere is present continuously, or is present for long periods.

Zone 1 An area in which a flammable atmosphere is likely to be present periodically or occasionally during normal operation.

Zone 2 An area in which a flammable atmosphere is not likely to occur in normal operation and if it does occur, it will exist for a short time only.

iii) Non-Hazardous (Safe) Area

An area no part of which has within a hazardous area.

iv) Grouping of Flameproof Enclosures (Apparatus Groups)

Flameproof enclosures shall be classified into two groups as follows:

a) Group- I - for application of coal mining &

b) Group-II- for application of other industries.

Enclosures in Group II shall be further subdivided into IIA, IIB, IIC according to the requirements appropriate to the nature of the flammable atmosphere for which the apparatus is intended.

(For maximum gaps, and diametrical clearances for each group and sub-group of enclosures, Tables 1 and 2 given in IS: 2148 shall be referred).

v) Temperature Classes (T-group)

Permitted maximum surface temperatures of apparatuses, are classified under following six groups viz:

Temperature Class	Maximum Surface Temp. (^{0}C)
T 1	450
T 2	300
T 3	200
T 4	135
T 5	100
T 6	85

(For details IS: 8239 shall be referred.)

vi) Flameproof (or Explosion proof) Enclosure

An enclosure for electrical apparatus that will withstand, when the covers or other access doors are properly secured, an internal explosion of the flammable gas or vapour which may enter it or which may originate inside the enclosure, without suffering damage and without communicating the internal flammation (or explosion) to the external flammable gas or vapour for which it is designed, through any joints or structural openings in the enclosure.

(For details IS: 2148 shall be referred)

vii) Intrinsic Safety

A circuit or part of a circuit is intrinsically safe when any spark or thermal effect produced normally (that is, by breaking or closing the circuit) or accidentally (for example, by short circuit or earth fault) is incapable, under prescribed test conditions, of causing ignition of a prescribed gas or vapour. An intrinsically safe apparatus is one in which all electrical circuits are intrinsically safe.

(For details, IS: 5780 shall be referred)

vii) For other terms such as "Authorised Person", "Engineer-in-Charge" etc. OISD-STD-137 shall be referred.

4.0 SPECIAL REQUIREMENTS

All latest statutory stipulations such as Indian Electricity Act & Rules 1956(latest revision), Petroleum Act & Rules etc., shall be complied with, while carrying out electrical installations, their inspections, testing and commissioning.

Before commencement of electrical installations it should be checked that equipment and other materials are received as per approved specifications and in full quantity as ordered.

Damaged item and/or missing component should be got repaired/replaced as per specifications. During erection all the accessories and loose items shall also be inspected before their assembly/mounting.

Some of the salient aspects listed below shall also be taken care of:

i) Before commencement of electrical installations, the schemes and one line drawings should be got approved from the statutory authorities.

ii) It shall be ensured that the manufacturer of electrical equipment (switchgear, panels etc.) incorporates all statutory provisions. The vendor drawings shall be approved for fabrication only after ascertaining this aspect.

iii) Hazardous area classification drawings shall be studied and selection of electrical equipment shall be in accordance with Chief Controller of Explosives (CCE)'s stipulations. All the indigenous flameproof equipment/ accessories shall have CMRS (Central Mining

Research Station) Test Certificates. In case of imported equipment, even if it is tested and certified from the country of origin, approval should be taken from CCE for using them in hazardous areas. No unauthorised repairs, modifications shall be carried out in the flameproof items (Terminal box, Junction box etc.). Damaged enclosures of flameproof equipment should be replaced with new ones instead of repairing.

iv) The fire insurance requirements [Tariff Advisory Committee (TAC) requirements] shall be incorporated in the system. The schematic and layout drawings should be forwarded to TAC and got approved, prior to commencement of installations.

v) Before taking up any electrical equipment for commissioning, it should be ensured that the entire installations and wiring connections etc. are carried out as per approved drawings.

vi) Selection of contractor/electrical supervisors/wiremen etc. shall be carefully done. Only licensed and component agencies (approved by the State Government licensing board) shall be employed. Full time supervision shall be ensured. The completion certificate and test certificates shall be issued by the contractor with signature of the full supervision directly under the employment of contractor.

vii) No temporary electrical connections shall be provided by non-electrical staff. During the use of such temporary facilities, there shall be licensed electrical supervisor/electrician for safe operation/maintenance. The electrical works, even for temporary use, shall be carried out only by licensed electrical contractor through licensed electricians.

viii) All modifications in the wiring, scheme etc. shall be included in the As-built drawings and such alterations shall be got approved from the Electrical Inspectorate/DGMS - Director General of Mines Safety as applicable, prior to energisation of installations.

ix) Captive power generation (even installation of Diesel Generators) shall require prior sanction of the Electricity Supply Authorities (as per the provisions of the Electricity Supply Act)

x) There shall be approved electrical line clearance-permit system and list of authorised personnel duly exhibited (as per provisions of Indian Electricity Rules)

xi) The compliance of observations/ requirements noted during the Electrical Inspector's inspection shall be adhered to.

xii) Accidents shall be notified to the Electrical Inspectorate (as per Indian Electricity Rules) and State Government authorities and the recommendations of the statutory bodies as a result of investigation, shall be complied with as required.

xiii) The installations & facilities, procedures etc. shall be updated in line with changing legislations from time to time.

xiv) In case the area classification (due to process modification/expansion etc.) gets revised, the electrical installations should be reviewed whether they conform to revised classification. (For example, earlier classified as zone 2, with "increased safety" or "non-sparking type" fixtures may have to be changed to 'Flameproof' type once the area gets revised to zone 1).

xv) No unauthorised addition of loads or modifications in the installations be carried out without prior statutory clearances from Electrical Inspectorate/CCE etc.

xvi) The system should be got inspected by the statutory bodies and final clearance be obtained for energising the installation after attending the defects, if any pointed out during inspection.

xvii) Even after getting approval from statutory bodies, the equipment should not be energised without checking the interlocks provided. Interlocks should not be defeated under any circumstances.

xviii) Pre-commissioning checks as recommended in OISD-137 should be carried out before any electrical equipment is taken up for commissioning.

xix) During installation all safety operating systems, as provided in the design are available and ensured.

xx) During installation, special precaution, related to laying and termination of cables/wires to electronic/ communication/equipment and such other requirement, shall be adhered to.

5.0 STAGEWISE INSPECTION

5.1 GENERATOR

The following shall be checked/ensured:

i) Manufacturers' erection/ commissioning/operation and maintenance manuals are available.

ii) Approach way to Generator foundations is clear

iii) The crane is checked and confirmed that the same has been tested on load.

iv) All lifting tools and tackles are properly sized and tested.

v) Only lifting lugs designated for this purpose, on the Generator, are used for lifting.

vi) Generator manufacturers' recommendations for erection, are followed

vii) After placing Generator on foundation the following are recorded:

a) Insulation Resistance (IR) & Polarisation Index (PI) values of stator and Rotor.

b) Resistance and temperature of Stator and Rotor windings.

(compare with test values recorded at manufacturer's works after making correction for temperature)

viii) Bearing clearances are in order.

ix) Alignment of Generator Rotor and Turbine Rotor is done as per manufacturer's recommendation and readings are recorded.

x) Insulating shims have been provided below Generator and exciter bearing against flow of shaft currents, before aligning rotor.

xi) Bearing housing is dovelled to pedestal after alignment.

xii) By lifting Generator rotor, IR value of rotor shaft with respect to earth is confirmed as per manufacturers' recommendations.

xiii) Generator air gaps at both driven and non-driven end are maintained as per manufacturer's recommendations. However deviation from average shall not be more than + 5%.

xiv) Stator frame is dovelled to base frame after final air gap check.

xv) All couplings viz. between Generator and Turbine, Generator and Exciter are in good condition.

xvi) Generator cooling piping/ducting are in good condition.

xvii) The coolers are pressure tested before taking them in line, in case of water-cooling. (Test pressure shall be 1.5 times the normal working pressure)

xviii) Lubricating oil-piping system is in good condition. The flanges and bolts on lube oil line at the bearing ends are properly insulated to prevent flow of shaft current.

xix) Generator stator and rotor cable connections are okay. Phase sequence of Generator output

connections are okay. Bimetallic washers are in good condition.

xx) Space heater winding and Resistance temperature detector connections (RTDS) are correct.

xxi) Lube oil temperature indicators are in working order.

xxii) Neutral connections on stator are intact.

xxiii) Neutral grounding resistor and its value conform to specifications.

xxiv) Neutral grounding earth pit is installed and connected and value of earth resistance is recorded.

xxv) If there is a link switch in Generator neutral, it is properly interlocked with Main Generator synchronising breaker.

xxvi) All bus ducts are checked for proper sealing.

xxvii) Generator stator body earthing and rotor shaft earthing (if any).

xxviii) Earthing bonds on Generator body and terminals boxes (power and neutral side) are made.

xxix) All slip rings and brushes are in order.

xxx) Carbon brush contact pressure is set to recommended value.

xxxi) All temperature and pressure gauges are tested.

xxxii) All auxiliaries of Generator like lube oil pumps, pilot exciter, rotating diodes (if brushless type), condensate pumps, demisters etc. are in order.

xxxiii) Synchrosing panel, AVR panel, main breaker and synchronising circuits are in good condition.

xxxiv) All PTs and CTs and other connections and polarity are in order.

xxxv) All protective devices are functioning properly and that the inter-tripping/alarms are OK, (by simulation)

xxxvi) All interlocks (by simulation) are functioning properly.

xxxvii) All metering devices are in good condition.

xxxviii) Direction of rotation of barring motor is correct.

xxxix) Following are confirmed to be correct: (if not, corrective actions be taken).

a) Air gap

b) Field winding connections

c) Compound winding connections

d) Brush pressure to recommended values

e) (Grease Lubrication for Bearings, replace bearing packing grease with running grease of antifriction bearings. If journal bearings are used check clearances).

f) Provision of Coupling guard(s), if any.

5.2 MOTOR

The following shall be checked/ensured:

i) Name plate details of motors and suitability to the specified area classification.

ii) The insulation resistance between phase and earth and between phases (wherever provisions exist) of motors is measured before and after connection of the power cables.

iii) No unauthorised site modification for flameproof equipment is done.

iv) Double earthing with proper earth conductor size is provided as per IS: 3043 and earth resistance is within specified limit.

v) When pump and motor are not in the same base plate, both are independently earthed.

vi) Foundation bolts are of proper size.

vii) Correct type and size of cable glands are used and correct method of cable termination is adopted.

viii) Cooling system has been installed in accordance with approved drawings.

ix) Space heater and terminations, are in order.

x) The tag numbers of motor and pump are correct.

xi) Remote OFF and Local ON/OFF facility are available.

Wherever remote start is envisaged, one no. Local/Remote Start Selector switch (lockable type) shall be installed to facilitate Remote start when switch is in Remote Start position. Note 1

xii) All auxiliary equipment like lube oil pumps, cooling water for bearing are available in good condition.

xiii) Provision of canopy, wherever required.

xiv) Facility for removing motor from foundation (for maintenance) is available.

xv) Freeness of shaft and bearing.

xvi) Refer motor manual for special checks and ensure these are carried out.

xvii) Air gaps are within allowable tolerances.

xviii) Measure the insulation resistance at the end of 30 seconds and 60 seconds and calculate the Delectric Absorption Ratio of motor windings for motors rated above 600V. This should be of acceptable value as per relevant standards.

xix) Calculate Polarisation Index of windings for critical HT motors by taking insulation resistance at the end of 1 minute and 10 minutes. The acceptable values of Polarisation Index varies according to the class of insulation. (for acceptable values refer relevant standards)

xx) The direction of rotation is correct.

xxi) All the terminal boxes are tight with proper gasket and fasteners.

xxii) Ensure coupling guard has been provided.

xxiii) Mechanical and electrical checks as per IS 900 are carried out.

xxiv) Ventilation and cooling system.

xxv) Condition of bearing grease/oil

5.3 TRANSFORMER

The following shall be checked/ensured:

i) The name plate details conform with specifications.

ii) All the accessories have been fixed properly.

iii) Proper earthing as per IS: 3043 & 100028 is provided for the transformer body, neutral.

iv) Dielectric strength and acidity of the oil, taking three samples (minimum), (if required, filter the oil)

v) Safety precautions during oil filling, as listed below should be followed:

a) Oil shall be approved quality

b) Each oil drum before being used should be tested for dielectric strength/ water content and acidity.

c) Oil should be filled through streamline filter from the bottom of transformer tank. Use of metal hoses/pipes is recommended for filling transformer oil (in case of rubber hoses sulphur from hoses may get mixed with transformer oil reducing dielectric.

d) Filling rate should be gradual at moderate rates.

e) Tank body and oil filling machine shall be securely earthed.

f) All vents are kept open, while filling, and to be closed after oil starts coming out.

g) Silicate breather to be taken into line after the transformer is filled with oil and conservator oil level is brought down to the normal level and commission the breather.

vi) Oil filtering and conditioning is to be done as per IS: 100028.

vi) The oil levels in the transformer conservator tank and all the bushings is upto the marked point.

viii) There is no oil leakage.

viii) The silica gel is in reactivated condition.

x) The breather pipe is clear from any blocking and contains oil upto the proper level.

xi) The explosion vent diaphragm does not have any dents, accumulation or any oil and air had been released.

xii) The buchholz is mounted correctly, there is no friction in the movement, and the floats are free. There should be no air bubbles inside buchholz relay.

xiii) All the manufacture's' test certificates are available as required.

xiii) Phase sequence and connections for vector group.

xv) The gap of arcing horns for the bushings are provided correctly and earthing connections for the surge diverters have been made.

xvi) The windings and oil temperature thermometer pockets contain oil and the meters are tested and calibrated.

xvii) Provision of copper strip bonding between:

a) Top cover and transformer tank

b) Bushing flange and transformer body

c) Terminal box cover and transformer tankbody.

xviii) The operation of the "OFF LOAD" and "ON LOAD" tap changers on all the tap positions are satisfactory and the brake shoes of tap change motor are in order.

xix) The tap position indicated on the transformer and that on the control panel are the same.

xx) The oil level of tap changer tank is correct and oil has been tested for dielectric strength.

xx) The insulation resistance of control circuit wiring, transformer windings, and all the incoming and outgoing cables have been checked and found in good condition.

xxii) The valve in the cooling system and valve between the buchholz relay and the conservator tank are in open position.

xxiii) All the cooling systems including radiators, automatic starting and stopping of fans etc. are functioning properly.

xxiv) Transformer bushing surfaces are clean.

xxv) All the tools and other materials have been removed from the transformer vicinity.

xxvi) Foundation level is checked and the wheel stoppers are provided in position.

xxvii) Fire protection wall is provided between transformers, wherever oil quantity exceeds 2000 litres.

xxviii) The fire fighting equipment is provided.

xxix) Fencing and gate are provided as per IE Rule and earthed with earthgrid.

5.4 **SWITCHGEAR**

5.4.1) HT/LT/Panel

The following shall be checked/ensured:

i) The lifting lugs provided on the panel are used for lifting and erection purposes.

ii) wherever the switchgear room is situated above the ground level, provision for lifting and shifting the switchgear to this room is available.

iii) The clearances around panel are as per approved drawings.

iv) Number of exit/entry doors of switchgear room are as per approved drawings.

v) Panel is firmly bolted to the base plate which should be grouped properly.

vi) Panel is earthed with required number and size of earthing conductors.

vii) Panels are properly leveled and aligned in all directions.

viii) The tag numbers are prominently displayed on each panel on both front & rear sides, and that they match.

ix) Danger board has been provided.

x) All panel doors fixing bolts are in position and tightened.

xi) Bus bar connecting links are firmly connected with suitable size and type of bolts.

xii) All connections are tight.

xiii) Bus bar insulation wherever provided is in good condition.

xiv) Bus bar support insulators and bushings are not having cracks/damage.

xv) All the openings have been sealed.

xvi) All gaskets are in position.

xvii) Properly tested floor mats have been provided.

xviii) Insulation resistance value of bus bars is acceptable.

xix) Control wiring have been done as per approved drawings.

xx) Relays have been mounted and connected properly.

xxi) External and internal painting are in good condition.

xxii) All components in panels are numbered as per approved drawings and connections ferruled.

xxiii) Shock treatment charts in required number (in local language, Hindi and English) are prominently displayed in switchgear room.

xxiv) Partition, safety shrouds, explosion vents etc. are in position/in good condition.

xxv) Fire extinguishers of correct type and capacity have been provided, in required number.

xxvi) Exhaust fan/ pressurisation system wherever provided are in working order.

xxvii) Bus bar terminal shutters are in order.

xxviii) Unused holes are plugged properly to make panels totally.

5.4.2) HT/LT Breaker

The following shall be checked/ensured:

i) Breaker rack-in-rack out system are in good condition.

ii) Shutter operates satisfactorily while circuit breaker is racked in and out.

iii) No parts of breakers is damaged. Bushings are without any cracks/damage and clean.

iv) Breaker is in fit condition for operation (oil level/SF6 pressure etc.)

v) Breaker interlock mechanisms are operative.

vi) All releases are provided and connected properly as per design drawings.

vii) Alignment of fixed busbar contacts has been properly done with drawout contacts of breakers.

viii) Breaker contact resistance by milli volt drop test is within recommended values.

ix) Spring tension of female contacts (tulip) is in order.

x) Insulation resistance value of breaker is in order.

xi) Breaker operates satisfactorily in "TEST and SERVICE" position.

xii) In case of ACBs, arc chutes should be clean and properly fixed.

xiii) Breaker 'ON' - 'OFF' (Electrical & mechanical) indications are working.

xiv) Breaker carriage alignment is in order inside the cubicle.

xv) Breaker earthing contacts are in order.

xvi) Carriage contact system is in working condition.

xvii) Gaskets of panel doors and covers are in position.

xviii) Earthing bond between panel and door are provided.

xix) Oil level viewing glass of all doors are in position and clean.

xx) Tested oil is used for oil circuit breakers.

5.5 OUTDOOR SWITCHYARD EQUIPMENT

The following shall be checked/ensured:

i) Structure (metallic)

a) All foundations are ready and elevation levels are made as per drawings.

b) Structures are fabricated as per design and are in good condition.

c) Structures are erected in position maintenance safety clearances and all fasteners are tightened properly.

d) Alignment of structure in order.

e) Base of structure is plastered all sides and sloped for avoiding water accumulation.

f) Earthing of structure is done (by strip welding, not by bolting) and connected to grid.

g) Rust protection paint is applied wherever necessary.

h) Identification colours for phases is marked on structure.

i) Tagging of equipment is marked on structure for easy identification.

ii) Insulators

a) Are of correct voltage rating.

b) No cracks/damage/ and surfaces are clean.

c) Handled with care to avoid damage.

iii) Conductors and Bus bars

a) Are of approved design and specification.

b) Stringing is done using proper tools & checks.

c) Sag is maintained to have minimum tension under all weather condition and conform to required line and ground clearances.

d) Expansion joints, if any, on tubular bars, are in good condition.

e) Dead ends of tubular bus bars are sealed to avoid entry moisture, dust etc.

f) Proper fasteners are used for connection and termination.

iv) Protection

a) Overhead earth screen/mast is as per approved design.

b) Switchyard fencing and gate are provided as per IE Rules & Fences earthed and connected to earth grid at number of points (preferably by welding joints)

c) RCC cable trench shall have proper covers.

d) Stone jelly provided should be of proper size and thickness.

e) The water drainage of cable trenches is provided.

v) Lightning Arrestor

a) Voltage and current rating of arrestor match with the approved drawings.

b) Location and spacing between arrestors is as per approved drawings.

c) Height of grading ring above ground is as per approved drawing.

d) Explosion vent is directed away from adjacent equipment.

e) Porcelain surfaces are clean and not damaged.

f) Connections to earth do not pass through any metal pipe.

g) Earth connection from arrestor to counter is insulated from earth.

h) Separate earth pit has been provided for arrestor.

i) Insulation resistance value of arrestor is in order.

j) Line connection is made as recommended.

vii) CT & PT (Current & Potential Transformer)

a) The name plate details are as per approved drawings.

b) Insulator surfaces are clean and free from dust and not damaged.

c) Oil level (if applicable) is normal.

d) No oil leakage.

e) The connections are made properly.

f) Insulation resistance values of CT and PT are in order.

g) Explosion vents in housing of CTs/PTs are in good condition.

h) Identification colours for phases are marked on CT/PT units.

vii) Isolator

a) Name plate details are as per the approved drawings.

b) Clearances for isolators are as per approved drawings.

c) Clearances for isolators are as per approved drawing.

d) Clearances for isolator operating mechanism is in order.

e) Moving parts of mechanism are lubricated.

f) Interlock mechanism with earth switch, if any, is operative.

g) Interlock mechanism between isolator and circuit breaker such that isolator always operate only off load.

h) All three phases close/open simultaneously, including alignment of contacts.

i) Contact pressure is as recommended by manufacturer.

j) Isolators and operating handles and earthed properly.

k) Operating handle is painted red and earthing switch handle (if any) is painted green.

l) Line connections are tight.

m) Locking devices in open and closed conditions are in order.

viii) Circuit breaker

a) Circuit breaker base alignment of all the 3 poles.

b) Separate earthing for all the three poles.

c) No part of breaker is damaged.

d) Interlock mechanism.

e) Controlling cabling with marshaling box.

f) Gasket cover to be tightened, unused holes are to be closed.

g) Ensure weather/vermin proofing busbar connection and the stress free bus terminations.

h) Top up the oil to normal level

i) SF6 gas pressure

j) All the insulators must be thoroughly cleaned.

k) Base foundation bolts must be provided with grease to avoid rusting.

l) All explosion vents are not chocked/blocked.

5.6 BATTERY

The following shall be checked/ensured:

i) Name plate details and number of cells are as per approved drawings.

ii) Sufficient clearance is maintained around battery bank for ease of maintenance.

iii) Acid proof tiles have been provided (for lead acid batteries).

iv) An eyewash shower and wash basin are available nearby.

v) Voltage and specific gravity of all cells are as per manufacturer's recommendations.

vi) Cell terminal connections are tight and coated with petroleum jelly.

vii) Stand and cell insulators are clean.

viii) Wooden stands are painted with anticorrosive paint.

ix) Cell numbers are properly fixed to cells.

x) Float level indicators are free.

xi) Gas vents are provided and free from blockage

xii) Cells have not developed any crack/damage/leak.

xiii) Cells are mounted on treated wooden racks and insulated bases.

xiv) Suitable drainage has been provided for likely electrolyte spillage.

xv) Acid treatment chart is prominently displayed inside the room.

xvi) Cable connections are made with recommended lugs.

xvii) Alkaline batteries are not in the same room where lead acid cells are installed.

Note:

During installation of battery, appropriate Personal Protective equipment should be used.

5.7 LIGHTING EQUIPMENT & ACCESSORIES

The following points shall be checked/ensured:

i) The area classification of the location.

ii) The installation and its components meet the requirements as set by the environmental conditions, and are appropriate to area classification.

iii) The installation conforms to approved drawings.

iv) The location facilitates maintenance of equipment.

v) The distribution box, circuit numbering and loading, are correct.

vi) Connectors are provided in junction boxes and fittings and are of antivibration design wherever necessary.

vii) Switch rating is adequate and as recommended by the designer.

viii) Fuse ratings of the circuits and protective devices are adequate and as recommended by the designer.

ix) All fasteners are provided and tightened (especially for flameproof fixtures) - safety features, such as separation sheets, fuse base screening interlocks, door switches, padlock facilities and pad locks, are in order.

x) No unauthorised site modification is done on flameproof enclosures.

xi) Outdoor lighting panel has weather protection (IP :55) and in provided with canopy wherever necessary.

xii) The gaskets are in position.

xiii) The cable glands are inspected for tightness.

xiv) The glands and lugs are used correctly according to feeder cable size.

xv) The earthing bus bar and cable earthing connections inside the distribution box are made properly.

xvi) The equipment external earthing from the earthing grid is made properly.

xvii) The lighting fixture is earthed externally with adequate size of GI wire (Minimum No. 10 SWG) wherever 2 core cables (in building etc.) are used. In case of usage with 3/4 core cables, 3rd/4th core of the cable should be used for internal earthing connection inside the lighting fixture - surface PVC conduit. the earth wire is run exterior to the conduit, without touching conduit, maintaining proper clearance.

xviii) The earthing resistance.

xix) The fixture is firmly supported.

xx) Support structure and poles are earthed and painted.

xxi) Unused entries are blocked with metallic grommets.

xxii) In flameproof enclosures, unused entries are blanked with flameproof threaded metal plugs.

xxiii) For open type wiring, only cable of recommended type is used.

5.8 CABLE

The following shall be checked/ensured:

I) Cable Laying

a) Cable size, voltage grade and type should comply with Approved For Construction (AFC) drawings.

b) Cable laying is done strictly as per Indian Standard.

c) No damage arises to the cables during laying.

d) Cable routing is planned to be away from heat sources, gas, water, oil, drains piping air-conditioning duct etc.

e) Cables are identified close to their termination point, (Cable numbers are punched on aluminium straps 2 mm thick and securely fastened to the cable, wrapped around it) and also along the route at recommended intervals, by cable number tags.

f) Cable route markers are provided in a permanent way at location of changes in the direction of cables and at intervals of not more than 30M and at cable joint locations.

g) The concrete cable trenches are filled with sand, to avoid accumulation of hazardous gases and RCC covers of trenches in process area are effectively sealed to avoid ingress of chemicals and oil.

h) As far as possible, each cable tray contains only one layer of cables and minimum required vertical clearance between racks is maintained.

i) In the case of cables laid directly underground, the trench bottom is filled with a layer of sand and a protective covering of 75 mm thick second class red bricks then be laid flat, over the sand (Ref. Annexure No. 1 for typical section).

j) Before covering with sands, every cable is given an insulation test and cable which proves defective is replaced.

k) It should be ensured that all the cables (power, control, lighting and communication) are laid completely as per cable schedules and are tested for continuity.

l) All wall openings/pipe sleeves are effectively sealed after installation of cables to avoid seepage of water inside building/lined trench.

m) Where cables rise from trenches to motor, control station, lighting panels etc. these are taken through GI protection pipe sleeves ends of which should be sealed after cabling.

n) Conduit ends above grade are plugged with approved weather proof sealing plastic compound.

o) At road crossing and other places where cables enter pipe sleeves, recommended bed of sand and bricks are provided so that the cable do not slacken and get damaged at pipe ends. Metallic pipe ends should be bell mouthed.

p) A separate earth strip is run along each cable tray. Equipment earthing is taken from the earth grid and not from the cable rack earthing.

q) Cables are clamped on trays using aluminium clamps at intervals not exceeding 3 meters.

r) Cable joints in power & control cables are avoided as far as possible. In case a joint is unavoidable, the following are ensured :

- The number of joints is restricted to minimum.
- The locations of joints are identified with permanent markers.
- All joints in hazardous areas are preferably underground (especially for H.V. cables).
- All joints are carried out as per cable manufacturer's recommendation.

ii) Cable Termination

a) Identification number tags of the cable for the equipment to which the supply is fed are provided correctly at both ends of the cable.

b) The tag size is not less than 2 mm thick and 20 mm wide and of enough length to contain all required details.

c) Cable termination is done with proper crimpling lug and use of antioxidant paste.

d) For cable glands of flameproof design, identification mark on the gland preferably embossing symbol as per IS should be available, and the required CMRS certification is verified.

e) The ferruling on all terminations conforms to wiring drawings.

f) Tightness of all terminations. (Confirm the bimetallic washer, if required, is correctly installed).

g) Earthing connections and earth continuity are in order.

h) Wherever lugs are used for termination, size of lug matches with cable core and material of lug is suitable for application.

i) Proper mechanical protection for the cable is available.

j) Pipes, if provided, are sealed on both ends.

k) Bending radius is as per BIS standard.

l) Before backfilling cable trench, the straight through joints of High Tension cables are tested for leakage current.

m) Cable terminations are done as per the manufacturer's instructions.

n) Insulation resistance values between phases and phase to ground (after termination) in order.

o) Cables near the termination are supported to relieve the strain on the terminals.

5.9 EARTHING GRID

The following shall be checked/ensured:

i) The earthing installation has been done in accordance with IS : 3043, approved earthing drawing and specifications.

ii) The earthmats should be provided as per the AFC (approved for construction) drawings.

iii) The main earth loop is laid at a depth of 500 mm below grade level. Wherever cable trenches are available, the earth lead is laid in the trenches, and firmly cleated to the sidewall of concrete lined trenches. The earthing strip is protected against mechanical damage in process unit areas, the earthing conductor is run along cable trays wherever possible. The earthing conductor is suitably cleated and electrically bonded to the cable tray at regular intervals. The earthing for equipment is tapped from the main earth conductor and not from the cable tray structure.

iv) All joints in the main earth loop are made in such a way that reliable and good electrical connections are permanently ensured. All joints below grade are welded and suitably protected by giving two coats of bitumen and covered with hessian tape. All joints above grade should be given two coats of bitumen to avoid oxidation and insulation film formation of the strip surface. However, if there are specific design guidelines are available the same will prevail to take care of corrosion problems and to ensure thereby good reliability of earthing connections.

v) when two earth strips are jointed by means of welding, lap welding with an overlapping of strip equivalent to double the width of the strip is available and all the four sides are continuously welded. All joints above ground are by means of connector/lugs. A minimum of two bolts of adequate size is used for this purpose.

vi) Conduits in which cables have been installed are effectively bonded and earthed. For this bonding, not less than 6 SWG wire and hose clip are used with brass or GI nut & bolt with min. 5 mm dia.

vii) Earthpit locations are identified by permanent markers.

viii) All earth electrodes are tested for earth resistance by means of standard earth test megger.

ix) Earth resistance of the grid or mat should be maintained sufficiently low and should meet ISI requirement.

x) The electrodes have a clean surface, not covered by paint, enamel, grease or other materials of poor conductivity. All earth electrodes are so located avoiding interference with road, building foundation, column etc.

xi) Individual earth electrodes are provided for each lightning arrestor and lightning mast.

xii) In case of conveyors, the earth strip runs along the entire length of conveyor.

xiii) Disconnect facility is provided for the individual earth pits to check their earth resistance periodically.

xiv) All electrical equipment are doubly earthed in connecting two points on equipment to a main earthing grid. The earthing ring should be connected via links to several earth electrodes. The cable armour will be earthed through the cable glands for L.T. cables. For HT cable, the armour shall be brought out & connected to the earth bus.

xv) In hazardous areas, all major process equipments are connected to the earthing grid by means of welding or nut/bolt connections. In case of nut/bolt connections, spring and back washers are used. All pipes are bonded and earthed on entering the battery limit of the process area.

xvi) The shield wire is connected with the main grid solidly and not through supporting steel structures. All paint, scale, and enamel is removed from the contact surface before the earthing connections are made.

xvii) All earthing connections for equipment earthing are taken from the earth plate mounted above ground, wherever provided.

xviii) Anchor bolts or fixing bolts are used for earthing connection.

xix) All hardware used for earthing installations are hot dip galvanised or zinc passivated. Also spring washers are used for all earthing connections of equipment.

xx) Lighting fixtures and other LT equipment are earthed through the extra core provided in the cable for this purpose.

6.0 EQUIPMENT USED IN HAZARDOUS AREA

The following shall be checked/ensured:

i) Apparatus is appropriate to area classification.

ii) Surface temperature class is correct.

iii) Apparatus sub group is correct.

iv) Apparatus carries the correct circuit identification (apparatus should be positively identified with its circuit to ensure that correct isolation can be carried out).

v) Enclosures, glasses and glass/metal seals are satisfactory.

vi) Machined surfaces are free from corrosion, dirt and paint.

vii) Clearances or gaps are as per approved standard.

viii) There are no unauthorised modifications.

ix) Bolts, glands and stoppers are complete and tight.

x) The equipment is free from dust, dirt and shall be painted if necessary.

xi) All conduits runs and fittings are tight and free from corrosion.

xii) Earthing is made as per standard IS : 3043

xiii) Condition of enclosure gaskets is satisfactory.

xiv) Electrical connections are tight.

xv) Motor fans & couplings are not rubbing on cowls guards.

xvi) Lamp rating & type are correct.

xvii) Wherever compound filling is required, it should be as per installation drawings.

xviii) There is no leakage of compound from stopper or cable boxes.

xix) There is no damage to cables, cable sheaths or cable glands (Particular

attention should be paid to flexible cable used with portable apparatus).

xx) Apparatus is properly protected against corrosion, weather, vibration & other adverse factors.

xxi) Guards, where used, are available in correct position.

xxii) Supporting arrangements are strong and adequate.

7.0 TEMPORARY ELECTRICAL INSTALLATIONS

Check that temporary installation conforms to safety requirements and additionally complies with following recommendations.

i) Load requirement of temporary installations is firmly established and that the load drawn at the times is well within capacity of temporary installations. Maximum permissible no. of welding machines to be connected from individual outlet shall be such that the total connected load shall not exceed the rating of the outlet.

ii) Properly sized plug socket are used to cater the load requirements. All electrical gadgets used shall be of industrial type only and no domestic type shall be used.

iii) Earthing is provided for all portable/static equipments as per IS 3043. In case of 3 phase temporary panels double earthing is to be provided. If required, separate earth pits to be made and resistance recorded. Properly sized not less than No. 8 SWG GI wire shall be used.

iv) Periodical monitoring of load is done to ensure compatibility with switch rating/ cable sizing.

v) Only HRC fuses shall be used and not rewirable type.

vi) Local isolation is accessible and phase and earth can be simultaneously isolated.

vii) Voltage rating of supply matches with safety requirements as stipulated in Factory Rules. For example, when working inside vessels or at heights etc. voltage of electrical appliance shall not be more than 30 volts. In case higher voltage is necessary, isolating transformer shall be used which should have primary and secondary both physically and electrically isolated.

viii) All electrical appliances are properly protected against rain, water, dust etc.

ix) Portable equipment are transported from one site to another only after it is disconnected electrically.

x) Only approved make of switchboard shall be used.

xi) In case the duration of temporary installation exceeds 3 months, approval of schemes for installation shall be obtained from statutory authorities.

xii) Length of flexible wire shall be limited to maximum 30 mts. and there shall be no joints in this length.

xiii) 2 core wires shall be used only for 24 volts and above this voltage, 3 core wires shall be used (P,N & E)

xiv) Whenever portable equipment are used, provision of ELCB shall be considered.

xv) Three-phase power supply connection in LT system should be through 3-1/2 core cables. However in case of LT system having single-phase loads connection should be through 4 core cables.

xvi) Before energising the installation, the engineer-in-charge or his authorised representative should certify the soundness of installation, after conducting prescribed tests as per I.S./I.E. Rules.

Note:

Temporary installations cover construction Power requirement also.

8.0 DOCUMENTATION

i) The installation of equipment shall not commence without keeping ready the following basic documents:

a) All approved for construction (AFC) drawings (including layout, single line diagrams etc.)

b) All approved vendor drawings for equipment and foundations (including schematic, inter connection & wiring drawings)

c) Statutory clearances from the Chief Electrical Inspectorate/DGMS/CEA, CCE as applicable.

d) Test certificates from the manufacturer for having successfully conducted all the prescribed tests at the manufacturer's works (duly certified by owner's Inspector).

ii) The installation after completion shall not be energised without keeping ready the following basic documents:

a) All the field test reports with satisfactory test results as specified in the I.E. Rules/IS/Technical specifications (duly witnessed and certified by owner's Inspector).

b) Completion report from the licensed contractor in the prescribed format given in IS.

c) Statutory clearances from the Chief Electrical Inspectorate/DGMS/CEA etc. as applicable, for energisation of installation along with duly approved drawings.

d) As-built drawings incorporating all field modifications/revisions.

e) Protective Relay settings (supported by the basic calculations to arrive at these settings).

f) Operation/maintenance instruction manuals and list of recommended spares.

9.0 MISCELLANEOUS

The following recommendations shall be adhered to:

i) Fasteners

a) Nut-bolts : Cadmium coated MS bolts : Copper, GI

b) Washers : Tinned copper, Cadmium coated MS; GI
c) Strips : Copper, GI
d) Clamps : GI, Aluminium, Copper, Aluminium alloy
e) Flexible : Tinned copper connection
f) Lugs : Copper, Aluminium, Bimetal
g) Screws : Brass

ii) Lifting Tackles

a) All lifting tackles shall be suitable for the application under consideration and tested before us. Chain pulley blocks shall be well lubricated and tested before use.

b) EOT cranes shall be tested for proper operation and load tested before use.

iii) Insulating Materials

a) Tapes

Shall conform to relevant IS Standards.

Voltage rating of tape shall be suitable for the application.

Number of layers of tape shall be as per the requirements of Voltage level and environmental conditions.

Tapes PVC, Fibreglass, Polyester, Cotton silicone, Empire (material) and with waterproof/fire resistant characteristics.

b) Sheets

Shall be of bakelite DMC, SMC, fibreglass.

c) Sleeves

PVC, Fibreglass, Silicon, rubber, Heat shrinkable sleeves.

d) Compounds

Bitumen, Epoxy, Plastic, Silicon

e) Varnish

Class B/F, of air dying type, Baking type, Stress grading, Varnish

10.0 REFERENCES

The following codes, standards, and publications have either been referred to or used in the preparation of this document and the same shall be read in conjunction with this document:

1) *OISD-STD-137 (Inspection of Electrical Equipment)*

2) *OISD-RP-146 (Preservation of Idle Electrical Equipment)*

3) *OISD-RP-148 (Inspection and Safe Practices During Overhauling Electrical Equipment)*

4) *National Electrical Code NEC-1985 of BIS.*

5) *Bureau of Indian Standards (BIS) IS:5216/IS:732/IS:900/IS:1255/IS:10 0028/IS:2274/IS:3043/IS:3072/IS:31 06/IS:5214/IS:5571/IS:5572/IS:2148/ IS:1646/IS:8239/IS:5780/IS:335/ IS:900*

6) *Indian Electricity Rules – 1956*

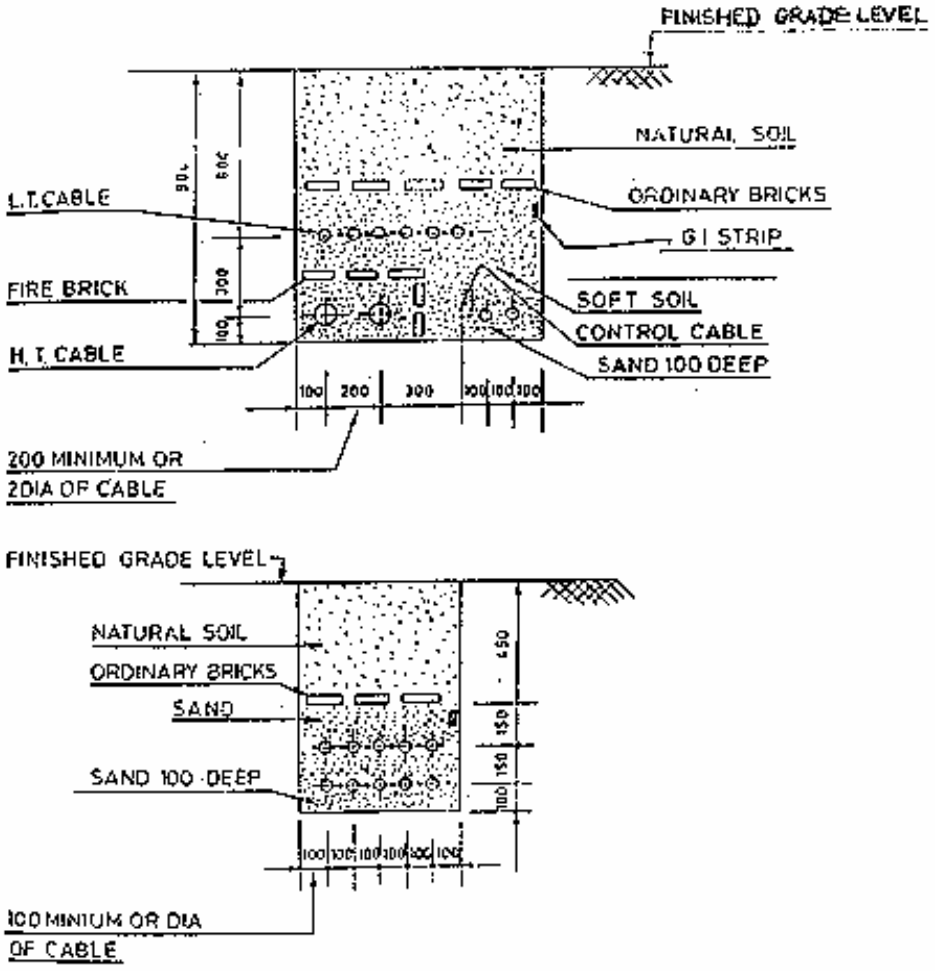
7) *IEEE regulations*

8) *API Recommended Practices*

9) *Instruction manuals for manufacturers.*

ANNEXURE-I
(TYPICAL SECTION OF CABLE TRENCH)

Typical Section With H.T. & L. T. Cables



Typical Section with L.T. Cables only

NOTE

1. LEAVE SPACE FOR LATER ADDITION OF ATLEAST 2 CABLES OR 15% AVERAGE SPARE SPACE REGARDLESS OF EXPANSION
2. IF TELEPHONE CABLES ARE LAID IN THE SAME TRENCH, A CLEARENCE OF 300 MM SHALL BE PROVIDED BETWEEN POWER AND TELEPHONE CABLES.

(DIMENSIONS IN MILLIMETRE)

SUB SECTION – A-3.10.3

ANNEXURE - V

SAFETY REGULATIONS
FOR
CONTRACTORS

HINDUSTAN PETROLEUM CORPORATION LIMITED
VISAKH REFINERY
VISAKHAPATNAM

January - 2001

Original : **June - 1999**

Updated and Reprinted : **January - 2001**

ACKNOWLEDGEMENT

Received the copy of "Safety Regulations for Contractors" January - 2001 of HPCL, Visakh Refinery. I have read the contents and agreed to follow the safety regulations mentioned in the booklet I will also ensure that my sub-contractors/personnel working with me will also follow these safety regulations.

Date :

Signature :

Name :

Designation :

Name & Address of Company :

SAFETY REGULATIONS FOR CONTRACTORS

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SAFETY REGULATIONS FOR CONTRACTORS

1. INTRODUCTION

Some of the important work procedures and safe practices to be followed by contractors while working in the Visakh Refinery Operational area of Hindustan Petroleum Corporation Limited (hereinafter called Company) are listed out in this manual. It is the responsibility of the contractor to ensure that all his men thoroughly familiarise with these procedures and strictly follow them.

The term "Contractors" covers all agencies / persons who render service to the company within its premises in effecting supplies of any description, operating transport or heavy equipment, performing work of any nature or engaging in any activity in response to orders placed by or at the invitation of the company.

Main contractors are responsible for giving the information contained in this booklet to their Sub-contractors and ensure their compliance to these safety regulations. A confirmation for abiding by these Safety regulations to be submitted to company by contractors and sub contractors.

For each job performed by contractor, a Company Supervisor will be designated as the "Company Representative". All questions concerning these rules and regulations, any additional information necessary for the proper performance of contractors work, shall be referred to the company supervisor. Under no circumstances shall any work be started until the company supervisor issues work permit.

It should be clearly understood that all regulations applicable to contractor given herein are only typical but not exhaustive. Contractors should obtain specific instructions pertaining to their jobs as and when necessary from concerned company supervisor.

2. GENERAL RULES

2.1 The contractor shall be responsible for all employees working for him and should explain to them the Safety Regulations and other relevant company procedures.

2.2 The contractor shall abide by the applicable statutes viz., The Factories Act, E.S.I. Act and other Central/State Government rules pertaining to Contractor's work in a continuous process chemical industry.

2.3 The contractor and/or his authorised supervisor shall :

a. Take instructions from the concerned company supervisor before starting any work in the company premises.

b. The contractor should submit detailed execution scheme for critical /high risk job and the same shall got approved by the concerned company supervisors before execution.

c. Consult the concerned company supervisor in the event of difficulty or problem relating to the assigned job or for any clarification pertaining to company procedures.

d. Ensure that all personnel working under him work safely and do not create any hazard.

e. Be held responsible not only for employees working for him (Ref. 2.1) but also persons calling on or doing business with him in the company premises, Ex. Sub-Contractors.

f. Be responsible for explaining all company instructions related to the persons mentioned in (d&e) above and ensuring their compliance.

g. Be responsible for explaining to the sub-contractors/agents and ensuring their compliance with Safety Rules and practices contained herein.

h. Ensure that all persons under his responsibility and connected with his work confine to the designated work place only.

2.4 Prior to commencement of work, contractor shall furnish his Office and Residence address and Telephone number to the company supervisor to facilitate urgent communication in case of emergency.

2.5 Contractor shall not employ any person below the age of 18 years and above the age of 58 years on company assigned jobs.

2.6 To avoid confusion arising from multiplicity of instructions, contractor shall receive instruction only from the designated Company Supervisor except in situation of emergency.

2.7 Contractor / Contractor Supervisor shall maintain Attendance /Leave Record and other records as given in "The Factories Act" and be able to produce them on demand.

2.8 Contractor shall ensure that all the workmen and supervisors working under him are covered under ESI scheme.

2.9 Contractor shall ensure that all the workmen employed by him are medically fit and will submit the **"Fitness Certificate"** on demand.

2.10 Contractor shall not engage any worker/labourer for more than 16 hours of continuous duty on a day.

2.11 Identification / information / caution tags affixed to any system/equipment are not to be tampered or removed under any circumstances.

2.12 Compressed air shall not be used for cleaning clothes.

2.13 While at work be mindful of safety of self and others around you, as well.

2.14 Female workers are not to be employed by the contractor.

2.15 Company Representative and F&S officer are authorised to correct any conditions which they may consider hazardous. In an emergency however, all company supervisors are authorised to act directly with Contractor's supervisor or workmen.

2.16 Contractors and their employees are not permitted to carry cameras or take photographs within the Refinery.

2.17 The contractor has to provide Identification badge to the persons working under him. A white colour helmet with one inch strip/blue colour band to be used by contractor personnel.

2.18 The contractor has to provide a board at the worksite giving the details as per the labour act.

2.19 "Cell Phones" are not allowed inside the company premises".

2.20 Contractor shall ensure that his workmen do not trespass thru operating area.

3. SECURITY CONTROLS

3.1 Contractor's personnel are permitted within Refinery premises only on possession of valid security personal pass.

3.2 It is the responsibility of the contractor or his supervisor to collect the required number of security passes from the security office, for the personnel assigned for work, organise and regulate the entry of security pass-holders in an orderly fashion at the security gate.

3.3 Contractors personnel shall be in possession of the issued security passes while inside the company premises and shall produce the same immediately on demand.

3.4 Security passes are not transferable.

3.5 Contractor shall be responsible for safe conduct and orderly behaviour of his personnel while inside company premises.

3.6 Trespassing through operating areas by contractor's personnel shall not be allowed inside company premises.

3.7 Entry or exit of contractors property, be it materials, tools or equipment, into or from Company premises shall be regulated by suitable documentation in the Material Movement Register maintained by the company at the security gate . Gate passes are not issued for outgoing item belonging to the contractor

3.8 Security of Contractors Materials, tools and equipment and company issued items shall be the responsibility of the contractor.

3.9 Seperate Vehicle/equipment passes shall be obtained by the contractor from the security office for his vehicle / equipment for entering company Premises.

3.10 Company representative will authorise issuance of required number of security passes to contractors, at least '24 hours' prior intimation is required for issuance of additional passes. Passes are valid for the specific period for which they are issued.

3.11 Passes issued in the name of one contractor shall not be used by workmen belonging to any other contractor.

3.12 At the commencement of each month, Contractors shall submit a list of Names of workmen employed by him with address and ESI No. to company Security Manager for arranging passes. On the completion of the job or at the time specified, Contractors should return all the passes to the Company's Security Manager and account for losses if any.

4. CHANGE HOUSE AND TOILET FACILITIES

4.1 Change house and toilet facilities designated for company personnel are not available to contractor's personnel.

4.2 Maintenance of contractor's Change room and Toilet facilities shall be the responsibility of the contractors.

4.3 Contractor's personnel shall not wear loose/fluttering clothes like lungi or dhoties and their dress shall be free from oil or chemicals.

4.4 Open areas, Pipe tracks shall not be used for toilets. Contractors shall advise their workers to use designated facilities

5. CAFETERIA FACILITIES

5.1 Company cafeteria facilities are not available to contractors' personnel.

5.2 Contractors' personnel are permitted to bring their food inside the Refinery; however, their dining shall be restricted to the designated area. The contractor shall be responsible for keeping the dining area clean and tidy.

6. SMOKING REGULATIONS

6.1 Smoking is prohibited inside company premises. Safety matches and cigarette lighters are not permitted inside the Refinery.

7. TRAFFIC REGULATIONS

7.1 All vehicles entering or leaving the Refinery premises shall come to a complete halt at the security gates and shall be offered for checking by the security personnel.

7.2 The maximum speed limit for motor vehicles within the company premises is 20 KMPH; Vehicles and mobile equipment shall be driven cautiously and shall follow all traffic regulations and road signs.

7.3 Contractors' vehicles or mobile equipment shall not enter refinery operating units unless authorised by a hot work permit, strictly on need base approach.

7.4 Two wheelers are not allowed inside Refinery premises.

7.5 Transport vehicles permitted inside the refinery premises with proper flame arrestor and shall be parked in the designated parking area only.

7.6 Vehicles or other mobile equipment shall not be parked in any manner that will block fire hydrant, fire equipment, building exits and walkways etc.

7.7 It shall be the responsibility of the contractor to ensure that materials are properly stacked in the transport vehicles to avoid items dropping from the vehicle while in transit.

7.8 Transporting of materials / equipment which project beyond the periphery of the transport vehicles shall have exclusive company permit and cautionary tags like red flag shall be conspicuously displayed on the projecting items.

7.9 Loitering inside Refinery premises is strictly prohibited

7.10 Walk on walkways where provided, in the absence of which walk on the left side of the road.

7.11 Bicycle may be allowed to ply inside the refinery strictly on need basis, double riding on bicycle is not permitted.

7.12 Contractor's vehicles and bicycles shall normally be parked outside the main gate, Company assume no responsibility for the security for contractors vehicles, in case of theft.

7.13 Contractor's vehicles shall be allowed inside the Refinery premises only if, in possession of a valid Vehicle pass. Vehicle passes shall be issued by Security on approval by Company Representative.

7.14 Vehicle drivers shall leave the driving licence with CISF, while entering the refinery and collect the same while going back.

7.15 Crane, hydra operator should not allow anybody to sit on vehicle body.

7.16 Material being shifted by Trailer Truck should be tied properly.

8. CONTRACTOR'S EQUIPMEMT

8.1 All mobile and stationary equipment, tools and machinery under contractors' control and operating in the company.premises shall have valid certification applicable to each of them and equipment shall be in healthy working condition for safe operation. On demand by company Supervisor, contractor shall produce the "Test certificate" of his equipment.

8.2 Use of equipment involving power, hoisting, towing, pushing, carrying, high temperature/pressure shall be subject to prior permission from the company supervisor before actual application.

8.3 Written company permits where indicated, shall be obtained without fail, prior to any action or operation.

8.4 Preparation for any equipment activity, where indicated, shall be performed as stipulated by the company supervisor.

8.5 **Use of Company Equipment**

a) Contractors shall not use company equipment and tools without obtaining a permission from the supervisor responsible for the equipment or tool.

b) Contractors shall assume full responsibility for proper care of Company equipment and tools which are made available to them for the execution of their work and returning such equipment and tools in good working order.

c) Company will recover from Contractors full cost of repairs to or replacement of equipment of tools in the event they suffer damage (due to abuse) while in Contractor's custody.

9. HOUSE KEEPING

9.1 Maintain good house keeping around work area.

9.2 Must keep work place clean and orderly, Good housekeeping helps to prevent accident .

9.3 While transferring flammable / toxic material from one container to another, avoid spilling; however, should there be any spillage, it shall be disposed off as directed by the Company Supervisor.

9.4 On completion of work, all surplus materials / equipment / tools shall be removed from site. Company supplied surplus items to be returned to warehouse and site should be thoroughly cleaned.

9.5 Throughout any job, housekeeping at Contractor's workspots shall be of a standard acceptable to company.

9.6 Following completion of work, contractor shall clean up job sites to Company's satisfaction.

9.7 Debris shall be disposed off at designated location(s). Metal scrap and other salvageable materials belonging to the company shall be moved to the Refinery Salvage Yard.

9.8 Contractor shall maintain his shed in proper order and ensure that all flammable material is stored properly. Contractor also ensure that power is switched off to his shed before leaving the company premises.

10. WORK PERMIT SYSTEM

The purpose of a 'permit' is to give written permission to a contractor supervisor to carry out a particular job at specific location on a particular equipment or facility. Company representative after ensuring that the equipment / area is safe for carrying out the specified work will issue a permit to work within the specified time.

There are Three types of work permits :-

A) Cold Work Permit

B) Hot Work Permit

C) Blanket Permit

Please see Annexure-I for specimen of work permits.

A. Cold Work Permit

Cold work permits are issued for carrying out work that is Non-hazardous and does not pose the danger of fire or danger to life by asphyxiation, electrocution, exposure to gases/chemicals or working at heights under difficult conditions.

B. Hot Work Permit

Performance of work which (i) constitutes a potential fire hazard or (ii) interferes with normal fire fighting operations shall require a hot work permit.

Typical Examples for **"Hot Work"** permits are

Any job done anywhere within the Refinery premises that requires the use of the following :

a) Arc welding equipment, gas cutting and welding torches, soldering equipment, any type of electric heating devices, blow torches.

b) Usage of diesel generator

c) Grinding wheels

d) Electric drills and other electric equipment including non-explosion proof lights, connections and extension cords

e) Shot and sand blasting and similar spark producing surface preparation

f) Stress relieving pre-heating and induction heating

g) Locating and operating welding equipment, internal combustion engines or any other equipment which may create a source of ignition in hazardous areas

h) Concrete chipping

Making entry for inspection, cleaning or repairs inside

a) Storage tanks
b) Process and yard vessels, towers, drums, exchanger shells etc.
c) Furnace and Boilers
d) Excavations, valve box, sewers or sump where a man's head may be below grade level.
e) Sumps in the oil separator system

-- Driving any automotive equipment inside process and utility areas (Except DM Plant and Drinking water treatment plant) tankfarm, adjacent to any of the sumps in the oil separator and adjacent to the hydrocarbon pump houses and flare stack areas.

-- Entry into or hot work on vessel, drums, sections of the pipelines etc. that contained oil, chemicals or toxic products even at approved area

-- Going to the roof of floating roof tanks when product level is below three metres from top of the tank

-- Radiography

-- Rock blasting

-- Stopping of steam leaks on live line by using Pneumatic drill

-- Hot tapping

-- Working under water Ex:Dredging/shell cleaning at HLPH / LLPH

C. Blanket Work Permit

A Permit issued for working more than 2 consecutive shifts and maximum of 15 days is called as "Blanket permit".

Blanket work permits for long periods may be issued where the work is of a continuous nature and long duration subject to the area /plant having been positively isolated and facilities declared gas free. However, such blanket permit shall be endorsed by the permit issuing authority at the beginning of each shift.

GUIDELINES ON WORK PERMIT SYSTEM

10.1 All activities within Company premises except in exempted areas like Offices, Maintenance shop including garage need authorisation by company and work shall not commence without a written valid work permit.

10.2 Work permits are to be signed by the supervisor responsible for the operation of the equipment / unit or area concerned as "Issuer" and concerned Company Supervisor as "Receiver".

10.3 The contractor shall ask the Company representative for issuing the permit

10.4 Each permit will have details about the "Nature of work" and "Validity". If the contractor supervisor is in doubt he may ask for additional information regarding Safe working procedure to the Issuer/Receiver of the permit.

10.5 Permits are valid only if all check list items in the permit are covered and signed by the authorised company supervisor and their validity holds good only for the duration specified.

10.6 If work is to be continued beyond specified time, permit shall be revalidated.

10.7 Permit shall be in the possession of contractors' personnel in plastic folder at work site for the entire duration of work.

10.8 All conditions and precautions stipulated in the permit shall be strictly adhered to by the contractors' Personnel.

10.9 In the event of a hazardous situation developing during the course of work, the matter shall be immediately reported to the nearest company employee and permit shall be returned to the issuing authority. Work shall recommence only on restoration of the permit by the same authority.

10.10 In the event of an emergency at work site, any company employee is authorised to withdraw the permit and hand it over to the issuing authority.

10.11 On completion of work or on expiry of validity, the permit shall be returned to the issuing authority.

11. PERSONAL PROTECTIVE EQUIPMENT

11.1 All necessary personal safety equipment as considered adequate by the Company Supervisor should be made available for the use to the persons employed at the site. These should be maintained in a condition suitable for immediate use. The contractor should take adequate steps to ensure proper use of equipment by those concerned.

11.2 Safety Helmet is compulsory for all the persons including the civil labourers.

11.3 Safety shoes must be worn by all persons except for personnel doing Civil works such as Excavation. Gumboots to be used for Excavation jobs.

11.4 Other personal protective equipment like Safety goggles, gloves, aprons are to be used as per the risk involved in accordance with company's regulations. Use of such equipment is compulsory as prescribed by company Supervisor / F&S officer who will specify the need of equipment for such jobs.

11.5 Those engaged in welding and cutting works shall be provided with protective equipment such as Welder's helmet, leather hand gloves etc.

12. REPORTING OF "ACCIDENT"

12.1 All accidents minor or major shall be immediately reported in writing to the Company Supervisor.

12.2 All formalities as per statutory regulations shall be carried out by the contractor where warranted.

12.3 Contractor shall assist the company Supervisor in investigating the accident and furnish all details regarding the accident.

13. FIRST AID FACILITY

13.1 In the event of an injury to contractors personnel in company's premises company medical facilities will be available to the injured person strictly as First Aid. Subsequent medical treatment and / or hospitalisation shall be arranged by the contractor at his expense.

13.2 Company ambulance is not available for injured / sick persons of contractor except with prior permission from DGM - F&S/Manager Prod. (Shift)

13.3 In the event of hospitalisation of any contractor personnel, the contractor shall inform the details about the treatment being given to company supervisor and Shift F&S officer at Telephone no. 577592.

14. FIRE FIGHTING EQUIPMENT

14.1 The contractor has to provide adequate fire fighting equipment as specified by the company Supervisor at work site while carrying out hot work.

14.2 ISI quality DCP extinguishers of 10 Kg capacity, Fire water hose of 38 mm size with spray nozzle are the general type of fire fighting equipment to be provided at the work site.

14.3 The fire fighting equipment available at the site shall be in good working condition and periodically tested/ checked as specified by F& S personnel of the refinery.

15. REPORTING OF "FIRE"

15.1 In case a fire is spotted in the Refinery premises, it shall be immediately reported to the nearest company employee who in turn shall dial '77' and inform about the fire.

15.2 In the absence of any company employee, contractor supervisor shall dial phone'77' revealing the person's identity and report about the fire, its location and nature.

15.3 On sounding of refinery fire alarm, contractors' personnel shall STOP their hot work immediately and move to nearby assembly area outside plant and away from Refinery equipment keeping the road and other areas for free movement of vehicles and persons.

15.4 Cold work should also be stopped in affected unit but in other processing units cold work can continue. They shall remain there till instrutions for leaving the area are issued by company supervisor.

15.5 In the event of a fire in the Refinery, the Refinery siren will sound in a wailing fashion.

15.6 The 'All Clear' Signal is the steady sounding of the Refinery Siren for one minute

16. SAFETY PRACTICES

Herewith certain basic safe work practices /procedures are given which are to be followed while carrying out such types of jobs. Additional information for these jobs will be informed /explained by the company Supervisor and or F & S officer, as required.

16.1 Working at Height

a) All the contractor personnel working at a height of more than 2 meters should wear and anchor IS quality safety belt.

b) When hauling operation is in progress ,the grade area to be barricaded with Red & White Colour caution tape.

c) If specified by the company Supervisor fire retardant safety net shall be provided .

d) Proper approach shall be provided to the working platform. Minimum width of working platform of 2 feet shall be maintained and guard rail by manila rope or by pipe to be provided.

e) The hand tools to be shifted in a tool bag at height.

16.2 Ladders:

a) Ladder shall be metallic type.

b) The Ladders to have suitable foot hold and inclination of the ladder shall not be steeper than 1:4 (1 horizontal and 4 vertical).

16.3 Scaffolding

a) Suitable scaffolding shall be provided for workmen for all works that cannot be done safely from the ground.

b) Safe means of access shall be provided to all working platforms of the scaffolding.

c) Material used for scaffolding shall be MS pipes or GI pipes. In no case wooden scaffolding shall be used.

d) In case of scaffolding being used for tank painting/sand blasting, scaffolding at heights of more than 5 metres shall be of double row type for more stability. The vertical distance between two pipes should not be more than 1 Metre and horizontal distance between two pipes should not be more than 2 Metres.

e) Scaffolding to be properly designed so as to prevent collapse, accidental displacement.

f) Scaffolding to be designed for maximum load, in no cases it is to be overloaded.

g) Minimum width of working platform shall be 2 feet. Proper clamps to be used for erection of scaffold. Use of GI wires for tying is not allowed.

h) Wooden planks shall not be used as working platform. Grating of the working platform to be tag welded or properly tied with wire.

i) Guard rail to be provided to the working platform.

j) The grating shall not have any cantilever portion.

k) Sufficient nos of cross bracing to be provided.

16.4 Excavation and Trenching

a) All the excavated pit and trenches shall be cordoned off by Red & White Colour tape to avoid falls.

b) The site of the trenches which are 1.5M or more in depth shall be stepped back to give suitable slope, or securely held by shoring (timber bracing), so as to avoid the danger of sides to collapse. The excavated material shall not be placed within 1 meter of the edge of the Trench. Cutting shall be done from top to bottom. Under no circumstances undercutting to be done.

c) All trenches 4' or more in depth shall at all times be supplied at least with one ladder by which workmen can reach the surface of the ground.

16.5 Hoisting Equipment and Operation

Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following.

a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good condition and in good working order.

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent detects.

c) The contractor has to produce the **"Test Certificate"** of the hoisting equipment in line with Factory Act requirement before starting of the job.

d) Every crane driver or hoisting appliance operator shall be properly qualified and a person having minimum 2 years of experience shall be employed for such jobs.

e) In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting or lowering should be used within its safe working loads. Every hoisting machine and all gear referred to above shall be marked with the safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

f) In case of company machine, the safe working load shall be notified by the Company Supervisor. As regards contractor's machines, the contractor shall notify the safe working load of the machine, whenever he brings any machinery to site of work shall submit to the company Supervisor.

g) The grade area to be barricaded with caution tape at the time of hoisting operation.

h) No body should be allowed to work / stand below the suspended load

i) Materials and tools shall not be thrown from the top, instead to be lowered.

j) Crane and Hydra should not be reversed without a second person guiding for reverse mode.

k) Crane operation after Sunset (during night) is not allowed.

16.6 Working on Electrical Equipment

a) The contractor has to engage a qualified electrician for carrying out the electrical jobs. He has to maintain the record of Testing of ELCB and Earthing on daily basis.

b) Motors, Gearing, Transmission, Electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards

c) When workers are employed on electrical installations which are already energised, insulation mats, suitable PPE such as gloves, and boots as may be necessary shall be provided.

d) The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

e) All the electrical circuit shall be provided with 30 mA sensitive current type Earth Leakage Circuit Breaker (ELCB) including the welding circuit.

f) Minimum two earthings to be provided to all electrical equipment including portable generators. Earthing shall be continuous one.

g) 3 pin plugs shall be used instead of loose wires.

h) Power supply to be provided close to the work site. Source of power supply to be written on Panel. This will help in isolation of power in case of emergency.

i) Cable of proper rating shall be used.

j) The cables laid on the ground shall be protected.

k) Preferably the cable should not have any joints. Joints if there, to be properly jointed and insulated.

l) Only weather proof non-flammable type switch boards shall be used

16.7 Barricading

Contractor shall erect and maintain barricades required in connection with operation to guard the following.

a) Excavated areas

b) Hoisting areas

c) Areas adjudged hazardous by Company Supervisor

Contractors and sub-contractors employees shall become acquainted with barricading practice and shall respect the provision thereof.

Barricades and hazards adjacent to but not located in normal routes of travel shall be marked by red flasher lights at nights.

16.8 Confined Space Working

When work is to be carried out in any close vessel, columns, drums, deep pits or manholes etc the following extra precautions to be taken:

a) Electrical hand lamps of 24V shall be used.

b) Adequate no's of blowers, eductors etc. shall be provided as specified by the company supervisor.

c) Has to provide a person as standby at the entrance of the manhole as standby duty.

d) Communication facility for the person working inside and the standby person , if asked by the company supervisor.

e) Contractor shall ensure usage of additional safety equipment like BA set, Canister mask, Air line respirator while working in confined space. These equipment shall be arranged by the company.

16.9 Welding & Gas Cutting

a) Ensure that welding machine is of good quality and a separate wire is provided for return current

b) For gas Cutting, the Acetylene and Oxygen Cylinder of proper colour coding are used.

c) Flash arrestor to be provided at cutting torch to avoid back fires

d) If cutting is at height the grade area is to be barricaded with Red & White tape. Hot slag to be watered.

e) Welder helmet, Safety Shoes are minimum required personal safety equipment to be provided for welders and gas cutters.

f) The first Cut or weld to be undertaken in the presence of Company Supervisor.

16.10 Maintenance of Safety Devices

All safety devices and Personal Protective Equipment mentioned or described herein shall be maintained in safe conditions and no equipment shall be altered or removed while it is in use.

17 PENALTY FOR NON-COMPLIANCE

The financial penalty levied on the contractors, working inside the refinery premises for non-compliance of Safety regulations spelt in the booklet is Rs. 1000/- per day per location. If the contractor is warned for safety deviation for 3 times at same location, he will be on **" Holiday list"** for maximum of 7 calendar days.

Mode of Accusation

If any deviation from the regulations spelt out in this booklet or from permit conditions is noticed by any Officer of HPCL, he will fill the "Inspection of Work Permit" format and send to Manager F&S/DGM-F&S.(For format please see Annexure -2) On field verification Manager - F&S/DGM-F&S will either warn the contractor or levy the fine of Rs.1000/- . It will be based on the seriousness of the deviations. Contractor will take the "Inspection of Work Permit" copy and pay fine amount in cash at HPCL Cash Office. Contractor shall submit the Xerox copy of the receipt of the payment to F&S to release the Work Permit.

★ ★ ★

Hindustan Petroleum Corporation Limited

VISAKH REFINERY

Issuer Copy

COLD WORK PERMIT

Sl. No. D:

VALID FROM : DATE:_____ HRS_____ TO : DATE:_____ HRS_____

PERMISSION IS GRANTED TO : SECTION / CONTRACTOR :_____ NAME :_____

NATURE OF WORK :_____

LOCATION OF WORK :_____ NO OF PERSONS EMPLOYED :_____

THE FOLLOWING ITEMS SHALL BE CHECKED BEFORE ISSUING THE PERMIT

Item	Done	Not Reqd.	Item	Done	Not Reqd.
1. Equipment/Work area inspected	☐	☐	8. Equipment properly steamed/purged	☐	☐
2. Surrounding area checked/cleaned and covered	☐	☐	9. Iron Sulphide removed/kept wet	☐	☐
3. Equipment electrically isolated and tagged Electrical permit No._____	☐	☐	10. Proper ventilation and lighting provided	☐	☐
4. Running water hose/Portable extinguisher provided	☐	☐	11. Gas test done, found gas free	☐	☐
5. Equipment blinded/disconnected/ Closed/isolated/wedged open	☐	☐	12. Area cordoned off by Red / White tape	☐	☐
6. Equipment properly drained/ Depressurised	☐	☐	13. Standby personnel provided from Operation/Maint./Contractor	☐	☐
7. Equipment water flushed	☐	☐	14. Alternate means of escape Available/Provided	☐	☐

Informed to MOI board Supervisor, Name :_____ (No._____)

SPECIAL INSTRUCTIONS

1. Use relevant personal protective equipment while carrying out the job
2. While working at height of more than 2 metres, usage of safety belt is compulsory
3. This permit must be available at work site at all times.
4. **In case of fire alarm, all work must be stopped. All personnel must leave work site and proceed to Assembly point.**
5. Usage of BA sets while working on gas line is compulsory
6. **For Electrical jobs, use Electrical permit (Blue colour)**
7. Remarks on toxic/hazardous chemicals, if any :_____

_____

SCOPE OF THE JOB DISCUSSED

Signature _____ Signature :_____

Issuer's Name :_____ Receiver's Name :_____

(IN CAPITAL LETTERS) (IN CAPITAL LETTERS)

EXTENSION OF PERMIT

Permit extended upto		Additional precautions required, if any	Signature	
Date	Time		Issuer	Receiver

1. GENERAL GUIDELINES :

A) **Inform to MOI board Supervisor and take a serial No. from him and note on the Permit along with Name :**

B) Prior to issuing / extending the permit check for the following, if applicable.

a) Electrical isolation of equipment

b) Readiness of fire fighting and safety equipment.

c) For working at heights of more than 2 metres usage of Safety belt is compulsory

C). Gas Test Reading : i) HC Gas should not be more than 20% of LEL

ii) H_2S reading should not be more than 2 ppm (TLV-10 ppm)

iii) CO reading should not be more than 10 ppm (TLV -50 ppm))

iv) O_2 reading should not be less than 19.5% by Volume

D). On completion of job or permit validity, return the permit to issuer

2 A) REFUSAL OF WORK / STOPPAGE OF WORK BY :

Name & Signature : Dept. : Opns/Maint/F&S/Proj/

Reason (Hazard) :

-- Informed to permit issuer and receiver about the Hazard and return the permit to issuer

-- Informed to shift F&S Officer, Name : _____

2 B) CORRECTIVE ACTION TAKEN :

-- Identified hazard is eliminated / under control by taking additional Safety Precautions and fresh permit is issued. New Permit No. :_____

-- **This Permit is closed**

_____
Issuer

3. WORK COMPLETED / VALIDITY OF PERMIT IS OVER

Job Completed, Area Cleaned, Scrap shifted to identified area.

Informed to MOI Board Supervisor, Name : _____

This permit is closed.

_____
Signature (Issuer)

Date : Time :

_____
Signature (Receiver)

Date : Time :

Hindustan Petroleum Corporation Limited

Issuer Copy

VISAKH REFINERY

Sl. No. D :

HOT WORK PERMIT

F & S Regd. No. :

VALID FROM : DATE _____ HRS _____ TO : DATE : _____ HRS _____

PERMISSION IS GRANTED TO : SECTION / CONTRACTOR _____ NAME : _____

NATURE OF WORK _____

LOCATION OF WORK _____ NO. OF PERSONS EMPLOYED : _____

ITEMS SHOULD BE CHECKED ACCORDING TO THE NATURE OF THE JOB BEFORE ISSUING THE PERMIT

(I) Excavation / Road closure / Fire water usage / Crane operation / Radiography / Vehicle entry	Done	Not required
1. Clearance obtained from Electrical Dept.	☐	☐
2. Shoring provided	☐	☐
3. Equipment / Area inspected	☐	☐
4. NRV provided on Fire Water inlet	☐	☐
5. Over head High Tension Wires isolated	☐	☐
6. Flame arrestor on exhaust checked	☐	☐
7. Area cordoned off	☐	☐
8. Danger sign displayed	☐	☐
9. Radio-Isotopes kept under Safe Containers	☐	☐
10. H.C. gas testing, reading _____ %	☐	☐
11. Clearance from F & S obtained	☐	☐
(II) Vessel entry/Vessel box up/Hot work/Hot tapping	☐	☐
1. Equipment, work area inspected	☐	☐
2. Surrounding area checked, cleaned up, oil, grass etc. removed	☐	☐
3. Sewers, manholes, CBD etc. & hot surface nearby covered	☐	☐
4. Considered hazard from routine / nonroutine operations and concerned person alerted.	☐	☐
5. Equipment electrically isolated & tagged Electrical Permit No. - - - - - - - -	☐	☐
6. F.W. hose / Portable extinguishers provided & F.W. system checked for readiness	☐	☐
7. Equipment blinded / isolated / disconnected / closed / wedged open	☐	☐

Vessel entry/Vessel box up/Hot work/Hot tapping (Contd.,)	Done	Not required
8. Equipment properly drained & depressurised	☐	☐
9. Equipment properly Steam purged / water flushed	☐	☐
10. a) HC Gas test reading _____ %	☐	☐
b) H_2S gas test reading _____ PPM	☐	☐
c) CO gas test reading _____ PPM	☐	☐
d) O_2 gas test reading _____ %	☐	☐
11. Shield against spark provided	☐	☐
12. Proper ventilation & lighting provided	☐	☐
13. Proper means of exit provided	☐	☐
14. Precautionary tags/boards provided	☐	☐
15. Portable equipment, Nozzles properly grounded	☐	☐
16. Checked Flame / Spark Arrestor on mobile equipment	☐	☐
17. Welding machine checked for safe location.	☐	☐
18 Check for earthing/return connection to the equipment being welded	☐	☐
19. Oxygen and Acetylene cylinders kept outside the Vessel/Tank	☐	☐
20. Standby person provided for vessel entry	☐	☐
21. Standby person provided for fire watch	☐	☐
22. Iron sulphide removed and kept wet	☐	☐
23. Checked for oil/ gas trapped behind lining in equipment	☐	☐
24. Area cordoned off/Precaution against traffic taken	☐	☐

All the above job related conditions and

Gas test done by Signature..... Maint. (Elect.)..... Telephone I/c.....

Name..... Name & Signature Name & Signature

Date & Time..... Inspection..... F&S. .....

Name & Signature Name & Signature

Informed to MOI board Supervisor, Name : _____ (No. _____)

Hazards Identified : Oil leak / Gas leak / Electrical / Fire / Pyrophoric substances / Acid & Alkali/ Loose Earth /

Additional Safety Precautions taken : i)

ii)

iii)

Special Instructions :

1) In case of fire siren, work must be stopped and all contractor workmen must leave work site and proceed to Assembly point.
2) In case of liquid/gas release **STOP** work and immediately inform concerned Operation personnel.
3) Permit must be displayed at work site at all the time in plastic folder.
4) Usage of suitable PPE to be ensured.
5) In case of emergency contact 4444/4851 or (Issuer contact no.)_____
6) Drop Fire & Safety copy of permit in box kept at MOI control room.

SCOPE OF THE JOB DISCUSSED

Signature_____ Signature_____

Issuers Name : _____ Receivers Name_____

(IN CAPITAL LETTERS) (IN CAPITAL LETTERS)

EXTENSION OF PERMIT

Informed to F&S : Yes Time : F&S Inspector's Name :
about extension

Date	Extension upto (Hrs.)	Gas test result % of LEL	Gas test done by (Sign)	Name & Signature of Issuer	Name & Signature of receiver

1. GENERAL GUIDELINES :

1. **Inform to MOI board Supervisor and take a serial No. from him and note on the Permit along with Name :**
2. Prior to issuing / extending the permit check for the following, if applicable.
   a) Flash back arrestor on cutting torch
   b) Provision of ELCB of 30 mA is compulsory if supply power is equal to or more than 230V
   c) Readiness of fire fighting and safety equipment
   d) For working at heights of more than 2 metres usage of Safety belt is compulsory
   e) On telephone inform F&S, take Registration number and write in the box provided.
   On extention each time inform F&S. Regn. No. will be given once per permit.
3. Gas Test Reading : i) HC Gas should not be more than 20% of LEL
   ii) H_2S reading should not be more than 2 ppm (TLV-10 ppm)
   iii) CO reading should not be more than 10 ppm (TLV -50 ppm))
   iv) O_2 reading should not be less than 19.5% by Volume
4. One permit for one job at one location.
5. For Hot tapping jobs take approval from Inspection.
6. For Road closure and Fire water usage take clearance from F&S.
7. For Excavation take clearance from Maintenance (Electrical) and Telephone I/C (HRD)
8. For working on **LIVE** flare header approval from DGM-Operations is to be taken.
9. Usage of BA set while working on gas lines is compulsory.
10. On completion of job or validity of permit, collect the permit and close it.

2 A) REFUSAL OF WORK / STOPPAGE OF WORK BY :

Name & Signature : Dept. : Opns/Maint/F&S/Proj/

Reason (Hazard) :

--Informed to permit issuer and receiver about the Hazard and return the permit to issuer

-- informed to shift F&S Officer, Name : _____

2 B) CORRECTIVE ACTION TAKEN :

-- Identified hazard is eliminated / under control by taking additional Safety Precautions and fresh permit is issued. New Permit No. :_____

-- **This Permit is closed**

_____
Issuer

3. WORK COMPLETED / VALIDITY OF PERMIT IS OVER

Job Completed, Area Cleaned, Scrap shifted to identified area.

Informed to MOI Board Supervisor, Name : _____

Informed to F&S, Name : _____

This permit is closed.

_____
Signature (Issuer)
Date Time :

_____
Signature (Receiver)
Date Time :

Hindustan Petroleum Corporation Limited

VISAKH REFINERY

Receiver Copy
August 2003

Sl. No. D 6

BLANKET PERMIT

F & S Regd. No. :

VALID FROM : DATE _____ TO : DATE : _____

PERMISSION IS GRANTED TO : JOB ENGR. : _____ (CONTRACTOR : _____)

NATURE OF WORK : _____

LOCATION OF WORK _____ NO. OF PERSONS EMPLOYED : _____

Enclose list of jobs proposed with location sketch, duly signed by Issuer and Receiver

Hazards Identified : Oil leak / Gas leak / Electrical / Fire / Fall from Height/ Loose Earth/ Pyrophoric substances / Acid & Alkali /

ITEMS SHOULD BE CHECKED BEFORE ISSUING THE PERMIT : (✓)

(I) Excavation / Road closure / Fire water usage / Painting Vehicle entry / Civil work / Insulation / Housekeeping	Done	Not required
1. Area to be Excavated inspected, found OK	☐	☐
2. Excavation depth.....mts. Shoring required : Yes/No	☐	☐
3. Precautions against LIVE cables taken	☐	☐
4. Precautions against underground sewers taken	☐	☐
5. Area cordoned off, Red & White tape put	☐	☐
6. PPE Checked, found OK	☐	☐
7. NRV provided on Fire water inlet	☐	☐
8. Flame arrestor on exhaust of mobile equipment checked	☐	☐
9. Concrete miller and vibrator checked, found OK	☐	☐
10. For Insulation/Housekeeping/Painting Job location inspected, found OK	☐	☐
11. Identified the area for scrap disposal	☐	☐
12. H.C. gas testing, reading ____ % Initial	☐	☐
13. Clearance from F & S obtained: Shift I/C -	☐	☐
(II) Hot work/Vessel entry / Sand blasting/ Grit blasting / Diesel Engine usage		
1. Equipment, work area inspected	☐	☐
2. Surrounding area checked, cleaned up, oil, grass etc. removed	☐	☐
3. Sewers, manholes, CBD etc. & hot surface nearby covered	☐	☐
4. Considered hazard from routine / nonroutine operations and concerned person alerted.	☐	☐
5. Equipment electrically isolated and tagged	☐	☐
6. F.W. hose / portable extinguishers provided & F.W. system checked for readiness	☐	☐
7. Equipment blinded / isolated / disconnected / closed / wedged open	☐	☐
8. Equipment properly drained & depressurised	☐	☐
9. Equipment properly Steam purged / Water flushed	☐	☐

(II) Hot work/Vessel entry / Sand blasting/ Grit blasting / Diesel Engine usage (contd.)	Done	Not required
10. a) HC gas test reading ____ % Initial	☐	☐
b) H_2S gas test reading ____ PPM Initial	☐	☐
c) CO gas test reading ____ PPM Initial	☐	☐
d) O_2 gas test reading ____ % Initial	☐	☐
11. Shield against spark provided	☐	☐
12. Proper Ventilation and Lighting (24V) provided	☐	☐
13. Proper means of exit provided	☐	☐
14. ELCB checked and found OK (30 mA)	☐	☐
15. Standby persons (Min.2) provided for vessel entry	☐	☐
16. Standby person provided for fire watch	☐	☐
17. Iron sulphide removed and kept wet.	☐	☐
18. Checked for oil/gas trapped behind lining in equipment	☐	☐
19 Grade area barricaded. Required PPE's found OK	☐	☐
20. Flashback arrestor on cutting torch checked	☐	☐
21. Power supply Source / Isolation (Location) written on Panel	☐	☐
22. Box scaffolding provided with good quality gratings	☐	☐
23. Welding Machine / Air Compressor in Non-hazardous area	☐	☐
24. No gas cylinder inside the tank	☐	☐
25. Charged HC lines cordoned off by Red & White Tape	☐	☐
26. Area earmarked for scrap disposal	☐	☐
27. Flame arrestor on exhaust of Mobile equipment checked	☐	☐
28. Check for Earthing / Return connection to the equipment being welded	☐	☐
29. Portable equipment properly grounded	☐	☐
30. Clearance obtained for Dyke cutting from DGM -Opns.	☐	☐
31. Sand blasting Hopper Test Certificate checked, found OK	☐	☐
32. Sand blaster's Air Mask checked, found OK	☐	☐

ADDITIONAL SAFETY PRECAUTIONS :

Issuer : _____ _____ Receiver : _____

Chief Operations Manager — Maint. (Electrical) — Manager (Concerned)

Understood and agreed for all above safety precautions : _____ OK for Blanket Permit : _____

JOB ENGINEER — DGM - F&S

BLANKET PERMIT PROCEDURE

1. A Blanket permit is issued on the basis of location where the multiple jobs (Hot & Cold)are to be carried out at a designated location by a single agency.
2. A joint visit by Issuer, Receiver and Maint. (Elect.) [for Excavation jobs] at work location to list down the site preparation and safety measures to be taken. In case of critical jobs, a representative from F&S to be involved in site visit.
3. Issuer will carry out gas tests and record the reading on the permit and initial.
4. On implementation of "site visit items" a Blanket permit will be issued for 30 calendar days.
5. Issuer will inform Fire House on telephone and note the Registration No. on the permit.
6. Issuer will arrange to submit F&S copy of the permit at Fire House.
7. Issuer shall carry out minimum 2 nos. of surprise visits per week during the execution of jobs and record the visit on the permit.
8. Any additional safety measure (during the surprise visit or due to other constraints) shall be advised by Issuer in writing to Job Engineer for its compliance.
9. If any deviation is noticed during surprise visit, the job will be stopped and permit will be closed. Issuer to inform Receiver and F&S about closure of the permit.
10. Job Engineer shall ensure compliance to all safety precautions. Any deviation from job scope or location, a fresh Blanket permit has to be taken.
11. Permit must be displayed at worksite at all the time in plastic folder.
12. Receiver to inform F&S about the job commencement (only Hot Work) daily on telephone. (Telephone No. 4851)
13. Job Engineer shall explain all the safety precautions to Contractor Supervisor and Workmen.
14. For Radiography, Hot tapping and Stress relieving a separate Hot Work Permit is to be taken.

In Case of Emergency :

- In case of Fire Siren, job to be STOPPED and all contractor workmen must proceed to Assembly point. On "ALL CLEAR" siren, job can be restarted.
- In case of Oil / Gas leak STOP the job and immediately inform to Operations personnel.
- In case of injury : Inform immediately to F&S. Telephone No. : 4851/4849

SURPRISE CHECK : If found OK, put Initial Date & Time below :				Job stopped : Date / Time Hazard :			
INITIAL	INITIAL	INITIAL	INITIAL	INITIAL	INITIAL	INITIAL	INITIAL
Date / Time	Date / Time	Date / Time	Date / Time	Date / Time	Date / Time	Date / Time	Date / Time

JOB COMPLETED ☐ VALIDITY OF PERMIT IS OVER ☐ JOB STOPPED ☐ (Tick appropriate box)

Job completed. Area cleaned. Scrap shifted to identified area ☐

Validity of Permit is over / Job Stopped : Applied for New Permit ☐

This Permit is closed. Informed to Fire & Safety about the Closure of Permit

Date / Signature (Issuer)

Date / Signature (Receiver)

ELECTRIC ISOLATION PERMIT

Section - A Sl. No.

To

The Shift Engineer (Electrical)

A 1) Please arrange to isolate equipment No. _____ of _____ plant for Operation/Mechancial/Electrical/Civil Maintenance.

Details of Job :

_____
Suptd. (Production)

Date _____ TIME _____

To

The Suptd. (Production)

A 2) Equipment No. _____ of _____ plant is electrically isolated and danger tag is put on the supply panel. This is also recorded in the Shift Log book.

_____
Shift Engineer (Electrical)

Date _____ TIME _____

ELECTRIC SUPPLY PERMIT

Section - B Sl. No.

To

The Shift Engineer (Electrical)

B 1) Please arrange to restore power supply to the equipment No. _____ of _____ plant and remove the Danger tag.

_____
Suptd. (Production)

Date _____ TIME _____

To

The Suptd. (Production)

B 2) The Danger tag is removed and the power supply to equipment No. _____ is restored. It is ready for opetation and the same is also entered in the Shift Log book.

_____
Shift Engineer (Electrical)

Date _____ TIME _____

NOTE : Fillin the appropriate Section (A or B)

Annexure-II

INSPECTION OF WORK PERMIT

To : Manager - F&S (SK)

Date : Shift : Location :

Permit No. Contractor :

Issuer : Receiver :

Nature of Job :

ITEM	SAFETY INSPECTION	OBSERVATION
Work Permit	1. Available at Site 2. Properly filled & Signed	
Use of PPE	1. Safety Helmets and Shoes usage 2. Goggles and Gloves usage	
Gas Cutting / Welding	1. Hose Condition 2. Condition of Pressure Regulator 3. Hoses Clamped 4. Provision of Flash back Arrestor	
Electrical Equipment	1. Earthing Provided 2. ELCB Provided (30 mA) 3. No Loose Wires	
Fire Fighting Facility	1. Fire Hoses condition 2. Extinguishers in working condition	
Working at Height	1. Usage of Safety belt 2. Adequate working platform 3. Grade area barricaded	
Excavation	1. Area barricaded by Red & White tape 2. Proper slopping is provided 3. Shoring is provided (for Excavation > 2 mtrs.)	
Sand Blasting	1. Hopper tested at 1.5 times of Maximum working pressure 2. Usage of Sand Blasting Hood	
# Deviations (if any) with details	1. 2. 3.	

Deviations shown to Company / Contractor's Supervisor, Name :

Warned the Contractor / Cash Penalty of Rs. 1000/- is imposed

Manager-F&S / DGM-F&S

Inspected by

cc : Issuer : On compliance reissue the permit.

cc : Receiver : 1. Explain the deviations to contractor and ensure the compliance
2. If penalty, advice the contractor to deposit penalty at cash office (Time 10 A.M. to 12 Noon) and submit copy of receipt to F&S (SK)

cc : Cash Office I/C : Accept the cash under A/c. 087-25. Return the copy of the report to F&S with OR No.