



SAFETY MANUAL

2015

HPGCL

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CHAPTER 1

SAFETY POLICY

SAFETY POLICY

1.0 HPGCL recognizes and accepts its responsibility for establishing and maintaining a safe working environment for all its employees. This responsibility arises from:

- Corporation's moral responsibility to its employees, to provide the best practicable conditions of work from the point of view of health and safety.
- The obligation to consult with its staff and their representatives to implement policies and procedures developed as a result of discussions.
- Statutory responsibility in respect of health, safety and welfare of employees emanating from relevant legislations such as The Factories Act, The Indian Electricity Act, The Explosive act, The Boiler Act etc.

1.1 Quality, Environment, Health & Safety Policy

HPGCL is an ISO 9001-2008, ISO 14001-2004 and OHSAS 18001-2007 accredited organization.

HPGCL is committed to generate sufficient, uninterrupted environment friendly power for millions consumers of the State of Haryana with optimum efficiency under safe working conditions.

To achieve this goal, HPGCL shall:

- Set & achieve regular targets of Plant efficiency.
- Comply with all applicable legal and other requirement related to Quality, Environment and Occupational Health & Safety (OH&S) issues.
- Prevent pollution & accidents due to our various Plant operations.
- Make continuous improvements in the effectiveness of Quality, Environment and OH&S management systems.
- Reduce the environmental impact from various emissions & discharges from Plant operations, by optimum utilization of resources.
- Improve the Health & Safety of our employees & associates while performing various tasks related to generation of power.

1.2 Corporation's responsibility

The HPGCL shall take all such steps which are reasonably practicable to ensure best possible conditions of work and with this end in view, to do the following:

- To allocate sufficient resources to provide and maintain safe and healthy conditions of work.
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of Plants, machinery and

equipment.

- To ensure that adequate safety instructions are given to all employees.
- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use.
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health and safety.
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge.
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.
- To provide appropriate instruction, training, retraining and supervision in health and safety and first aid and ensure that adequate publicity is given to these matters.
- To ensure proper implementation of prevention and an appropriate fire fighting service, together with training facilities for personnel involved in this service.
- To ensure that professional advice is made available wherever potentially hazardous situations exist or might arise.
- To organize collection, analysis and presentation of data on accident, sickness and incident involving personal injury or injury to health with a view to taking corrective, remedial and preventive action.
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees.
- To publish/notify regulations, instructions and notices in the common language of employees.
- To prepare separate safety rules for each type of occupation/process involved in a project.
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.
- To co-ordinate the activities of the company and of its contractors working on the Company's premises for the implementation and maintenance of safe systems of work, to comply with their legal obligations with regard to the health, safety and welfare of their employees.

1.3 **THE RESPONSIBILITY OF THE EMPLOYEE**

The establishment and maintenance of best possible conditions of work is, no doubt, the

responsibility of Management, it is also necessary that each employee follows prescribed safe methods of work. He should take reasonable care for the health and safety of himself, of his fellow employees and of other persons who may be affected by his actions at work. With this in mind, employees should be health and safety conscious and:

REPORT	Potential hazards
OBSERVE	Safety rules, procedures and codes of practice.
USE	With all reasonable care the tools, equipment, safety equipment and protective clothing provided by the Company; these items should be kept in good condition.
PARTICIPATE	In safety training courses when called upon to do so.
MAKE USE	Of safety suggestions schemes.
TAKE	An active and personal interest in promoting health and safety at work.

1.4 **RESPONSIBILITY FOR IMPLEMENTATION**

- The ultimate responsibility for ensuring the implementation of the policy on health and safety at work rests on the HPGCL Management the Corporate Personnel Division at the corporate level and the concerned Chief Engineers at the Project/Station level. The Officer In-charge of safety will be functionally responsible to the Corporate headquarter for ensuring that the policy is promulgated, interpreted and carried out in the manner expected.
- Immediate responsibility for safety at work is that of the Engineer In-charges of each department/section who are primarily responsible to prevent accidents involving members of their staff and other persons. It is their responsibility to issue clear and explicit working instructions, compliance with which will ensure safe working and to require the effective use of approved equipment.
- Accepted rules, procedures and Codes of Practice which are formulated with proper regard to health and safety consideration must be strictly observed by all concerned. Contracting Agencies executing works should be made responsible through various measures including appropriate provisions in the contract for discharging their safety obligations.
- In designated areas of particular hazard the appropriate Executives are required to authorise, in writing the commencement of any work and, before doing so, personally to satisfy themselves that all necessary safety precautions have been carried out, such Executive incharge must themselves be authorised, in writing as competent to perform these duties.

- Safety Officers are appointed to advise Management on questions of safety at work including advice on the application in particular local situations of the system of work, implementation of Company's Rules and Relevant Codes of Practices in consultation with Area In-charges. They will be consulted in the interpretation of rules and codes being formulated by the Corporate Management and shall advise Management in the investigation and analysis of accidents and circulation of appropriate statistics.
- Major Site Incidents: - The Chief Engineer at each Project/Station is required to ensure that plans are devised for action in the event of fire, major site incident or necessity for evacuating procedure. These plans must be communicated to all staff and rehearsed from time to time.
- Fire-fighting training and the formation of fire-fighting team on a voluntary basis will be encouraged by the Project/Station management.

CHAPTER-2

SAFETY REGULATIONS & GENERAL SAFETY RULES

2.0 SAFETY REGULATIONS

Various regulations governing safety of Plants are broadly as under:-

1. Safety and Health Provision under Factories Act – 1948

- Sections 11 to 20 of the Act contain certain provisions intended to ensure that the conditions under which work is carried on in factories do not affect the health of the workers injuriously.
- Sections 21 to 40A, 40B and 41 of the Act lay down rules for the purpose of securing the safety of workers.
- Section 45 for first-aid boxes as and when required.

2. Safety and Health Measures under other Construction Workers (Regulation of Employment and Conditions of Services) Act 1996.

- Sec. 6 Appointment of registering officers.
- Sec.28-Fixing hours for normal working day, etc.
- Sec. 29-Wages for overtime work.
- Sec. 30-Maintenance of registers and records.
- Sec. 31-Prohibition of employment of certain persons in certain building or other construction work.
- Sec. 32-Drinking water.
- Sec. 33-Latrines and urinals.
- Sec. 36-First-aid.
- Sec. 44-Responsibility of employers.
- Sec. 48-Penalty for failure to give notice of the commencement of the building or other construction work.
- Sec. 49-Penalty for obstructions.

3. Safety provisions under Indian Electricity Rules-2003

- Sec.53 (1) Provisions relating to safety and electricity supply.
- Sec.161 (1), Sec.161 (2) Notice of accidents and inquiries.
- Sec.53 Provisions relating to safety and electricity supply.
- Sec 73(c) Functions and duties of Authority: specify the safety requirements for construction, operation and maintenance of electrical plants and electric lines.

4. Central Electricity Authority

- Rule 4(1) of the (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electrical Lines) Regulations, 2011.

5. Haryana Factories Rules or The Punjab Factory Rules, 1952 As Applicable In The State Of Haryana

- Section 7-A (3) and 41-B(2) for Health & Safety Policy.
- Rule 55 : Safety Precautions.
- Rule 70 : Ambulance Room.
- Rule 71 to 77 : Canteens.
- Rule 78 : Shelters, etc.
- Rule 102 : Special provision dangerous operations.
- Part-II (9) : Handling and storage of chemicals.
- Part-II (11) : Personal protective equipment.
- Part-II (15) : Testing, examination and repair of plant & equipment.
- Part-II (18) : Entry into or work in confined spaces.
- Part-II (20) : Permit to work system.
- Part-II (3) : Protective equipment.
- Rule 69, 69-A, 69 B and 70 for maintaining of FIRST –Aid Box.

2.1 GENERAL SAFETY RULES

2.1.1 Duties of supervisors in Promoting Safety Regulations

(Supervisor's responsibility is only indicative and not limited to the following activities).

1. Each supervisor shall exercise close watch over those employees who report or are assigned to report their duties under his control. He shall ensure that the persons working under him are competent to perform their work safely by adopting safety rules and procedures.
2. Supervisors must take immediate corrective action/follow up whenever unsafe conditions/practices are noticed and must report to the management for issuing periodical/notification.
3. Supervisor shall explain in detail the particular hazard where the employee is working besides the precautions to be taken for ensuring safety of the personnel & the material in the vicinity.
4. Supervisors shall develop safety awareness in the minds of all employees.
5. Supervisors shall ensure that the safety regulation are understood, that all hazards are eliminated wherever possible and all means of egress/Outlet exist, stairways and similar means of escape are clear, workable and thoroughly known to all his men.

6. He must set a good example in knowing and observing all Safety rules and precautions.
7. Supervisors shall investigate and report the root causes of all accidents that take place in their areas of responsibility on such forms as may be prescribed by the company and immediately take/suggest such action so that similar accidents do not reoccur/happen again.
8. Supervisors are required to make contacts with persons working in isolated places.
9. Regular and systematic inspection shall ensure that all tools, equipments, machineries and premises are in safe and operative conditions.
10. Supervisors must take corrective action whenever rules are not observed because a single violation may become a source of major accident and may put the safety of an individual or a group in jeopardy/danger/trouble.

2.1.2 General Safety Rules For All Employees

1. Smoking is not allowed in any part of Fuel Oil Handling/Storage area.
2. All persons will follow work instructions displayed at different sites.
3. Every employee should consider it as a part of his duty to take an active part in all safety related works and follow safety rules.
4. Every employee should insist on the observance of safety rules by fellow employee.
5. Every employee of the Thermal Plant must know the location and procedure for using fire fighting equipment.
6. Never enter work area without helmet.
7. Before starting any job it is to be ensured that the necessary permit/clearance has been obtained.
8. When any dangerous/unsafe condition is observed, it should be immediately reported to supervisor, Fire and Safety Division.
9. Employees should ensure that the job area is cleaned as soon as the job is completed. Good housekeeping will eliminate many unnecessary hazards causing accidents.
10. Always use walkways instead of short cuts. While using roadway, keep to right side so as to see the approaching vehicle.
11. All stairways, platforms and walkways must be kept clean at all times.

12. Walking and moving in work place is to be done carefully. Slipping, tripping or falling should be avoided. Major work should not be attempted while standing on pipelines or fittings.
13. Running during normal operation is to be avoided.
14. Make-shifts of any kind are strictly prohibited.
15. Walking on pipelines is prohibited.
16. No attempt should be made to operate or set in motion any machine or equipment, which are not assigned.
17. Suggestion for any additional guard or improvements to existing guards for additional safety is always welcome.
18. Compressed air must not be used except for process/system requirements.
19. Never look directly in to the arc produced while welding without proper eye protection.
20. Falling objects have caused many injuries. Handle material with care.
21. Keep clear of suspended loads at all times.
22. Horseplay/Fun is strictly forbidden/prohibited. Apply your thoughts to safety and thorough workmanship.
23. Defective equipment of any kind should not be used.
24. Keep the access to firefighting equipment free of obstructions, as these are required to be used in emergencies.
25. Any injury, no matter however slight, must be reported to supervisor immediately and treatment obtained. Even a small accident can become a potential source of permanent disability.
26. Polyester or nylon clothing should not be worn while on duty as they create hazards of static charges.
27. Clothes saturated with oil are to be changed immediately and the affected parts of body are to be thoroughly washed with water. In case of an acid/caustic splash, wash promptly with copious quantity of water and report immediately to medical centre for further treatment/advice.
28. No clothing or other inflammable material should be dried out on steam lines or any other hot equipment.
29. If any gas leak occurs, supervisor and Fire Station are to be informed immediately and the area is to be cordoned off/barricaded.

30. Operators must always stand on the upwind side when taking samples or draining lines or equipment.
31. No maintenance or other type of work should be started in the Thermal Plant without obtaining a clearance certificate from the operating department/control room.
32. When a person is working inside any vessel/confined space, one person must be stationed at the opening of the vessel as a watcher. Persons working in the confined places should use safety belt with a life line. The free end of a life line should be held by the man standing outside the vessel. Breathing apparatus should be worn, if necessary.
33. Protruding nails should be pulled out or bent over.
34. Walking on or over any mechanical or rollers conveyor is strictly prohibited.
35. Goggles or shields must be used when working on emery wheel, chipping, sand blasting or under other circumstances where there are possible eye hazards.
36. When working around moving machinery, the wearing of loose clothing such as dhotis, lunges etc. is strictly prohibited.
37. Employees should not walk on the rail tracks.
38. Passing under railway wagons as a short cut is very dangerous and is strictly prohibited.
39. Sample bottles should not be used for any purpose other than making samples.
40. Motorcycling through/into any operating areas is prohibited.
41. Gas cylinders should never be dropped, especially from trucks or platforms. Always use a special carrier for hoisting the gas cylinders.
42. All traffic signs and regulations must be complied with at all times.
43. Protective valve caps must always be placed on all gas cylinders (Oxygen, Acetylene, Ammonia, Carbon Dioxide, LPG, Chlorine etc.) except when in use.
44. All belts, coupling and moving parts of a machine must be securely guarded at all times (as covered under the Factories Act)
45. Never remove or adjust the guard while the machinery is in motion. The machine must be rendered inoperative by removal of fuses or such other methods before the guard is removed or some repairs/adjustments are carried out. Guards must, however, be put back in position before the machinery is operated.
46. It is strictly prohibited to use gasoline or any other highly inflammable liquid or corrosive chemicals such as caustic soda or acid for cleaning purposes.

47. Ladders, which are defective in any respect such as broken rung/steps etc., must not be used.
48. In placing portable ladders, be sure to pitch them at a safe angle so that they cannot fall backward or slip at the bottom.
49. When ascending or descending, it is important that worker faces the ladder and obtain a firm grip with both hands.
50. Ladders when placed must either be fixed at the top or a man must be stationed to hold the foot of the ladder.
51. Ladders must rise 3 to 4 ft. above the place of landing.
52. Ladder must be carefully lowered and not be dropped on the floor or any other object/structure.
53. When climbing on ladders or structures, carry tools or material in such a way as to provide free use of hands.
54. Never go on a false ceiling, it may break any moment with one's weight while working on asbestos covered roofs, crawling boards or cat ladders must be used.
55. The right way of lifting is to be practiced to avoid sprain/strain. One should bend the knees, keep the body erect and feet close to the object and use leg/arm muscle and avoid forward bending while lifting the material.
56. When electrically driven pumps, compressors etc. are shut down for repairs, the electrical circuit must be isolated before repairs commence.
57. For maintenance work inside vessels or tanks, which are gas free, a low voltage Transformer must be used on the electric light extension cord. The voltage must not exceed 24 Volts.
58. Light globes and bulbs must be replaced only by the electrical department personnel.
59. All storage containers such as tanks, drums etc. containing corrosive chemicals must be clearly marked indicating the nature of the contents.
60. Inserting of bolt or nail in a chain to shorten it should not be practiced. The bolt or nail may slip or break and cause an accident.
61. Persons other than from instrument Section should not tamper with or attempt the repair of instruments.
62. Tools or materials should not be left here and there, where they may accidentally drop on persons below.

63. Gloves must be worn while grinding material on an emery wheel. Gloves are not provided to keep hands clean but to protect against abrasions, splinters, corrosiveness and extreme temperatures. Gloves should not be used while operating machinery without ensuring that these are safe to use.
64. The engines of all vehicles and mobile stationery equipment such as welding machines, air compressors, cranes, bull-dozer etc. must be stopped when being filled with petrol or any other fuel.
65. Acetylene, Oxygen and LPG cylinders must not be taken inside any closed vessel under any circumstances, neither any acetylene torch connected with the cylinders or Generators be left inside any vessel. Torches must always be kept outside the vessel.

CHAPTER-3

REPORTING OF ACCIDENT AND DANGEROUS OCCURRENCE

3.0 Reporting of Accident and Dangerous Occurrence.

All accidents and dangerous occurrences will be reported immediately to the Executive Engineer/Safety officer who will implement an established procedure to ensure that an investigation takes place and recommendations are made to prevent recurrence.

3.1 Principal Causes of Accidents

The basic causes of accidents can be classified under four main categories:

3.1.1 Supervisory Responsibilities:

1. No instruction given/incomplete instruction.
It is the responsibility of the supervisor to give clear and complete instruction to the employees working under him.
2. Standard rules/instructions not enforced.
Supervisor should ensure that standard rules/instructions are being followed.
3. Personal safety devices not provided/used.
It is the responsibility of the supervisor to provide necessary PPE to the employees working under him and ensure that they use the same.
4. Correct or safe tools/equipment not provided.
Supervisor should ensure the availability of correct tools.
5. Inadequate inspection of equipment of jobs.
Machinery tools and equipment should be regularly inspected. Defect, if any, should be rectified immediately.
6. Improper method of working.
Supervisor should ensure that the method of working being followed is proper and safe.
7. Poor job planning.
Poor planning of job may lead to unsafe situation. Supervisor should explain jobs properly to his workmen.
8. Too much rush.
Supervisor should not be in hurry. It may lead to an accident.

3.1.2 Personal Action or Characteristics of Employee:

1. Haste or short cut.
Proper roads/path way is to be used. Short cuts may result in slips and falls.
2. Protective devices not used.
Every employee is expected to use all safe-guards, safety appliances or devices provided for his protection.

3. Improper tools and devices.
Always use proper tools for the job.
4. Horse play or fooling.
Horse play is not allowed inside the Thermal Plant premises. It is a contributing factor for accident.
5. Instruction or rules disregarded.
For smooth working and safe operations, proper rules and instruction are essential. Many accidents happen because the employees sometime deviate from the established rules and procedures.
6. Absent-mindedness.
Every employee should pay proper attention on the job he is doing. Absent mindedness/day dreaming may lead to accident/injury.
7. Inexperience/lack of knowledge.
Every employee should be trained properly and should know his job thoroughly before being put on regular duty.
8. Improper methods of doing work.
A safe workman knows the correct method of performing his job.
9. Loose clothing.
Loose clothing must not be worn. This is the cause of many accidents particularly around moving machinery.
10. Working without authority.
No maintenance job is to be carried out without a valid permit/clearance.

3.1.3 Unsafe Equipment or Materials:

1. Infectively guarded/unguarded equipment.
Proper and adequate guard is to be ensured to the equipment particularly moving equipment.
2. Defective/unsafe equipment.
Equipment should always be maintained in healthy condition. Defective/unsafe equipments are to be rectified/replaced on priority.
3. Improper type of poorly designed equipment.
4. Improper equipment is not to be used as it is a potential safety hazard.
5. Defective material/defective tool.
Tools should always be maintained in perfect working conditions. Defective tool may lead to an accident.

3.1.4 Unsafe Conditions:

1. Poor light.
Adequate light is must to work safely.
2. Poor ventilation.
The working area should be well ventilated.
3. Congestion.
Adequate space should be provided between the equipment.
Working area should not be congested.
4. Improper pilling, storing, stacking.
Materials are to be stored at their designated locations and to be stacked properly.
5. Exit or emergency escapes inadequate or not provided.
Sufficient emergency escape routes are to be provided.
6. Slippery floor/other places open drainage.
7. Floors are to cleaned/washed regular.
8. Trenches/ Drains should be covered properly.
9. Unsafe weather condition.

3.2 Procedure For Reporting of Accidents / Dangerous Occurrences

Objectives

In order to make prompt report of accidents, dangerous occurrences & fire accidents to comply with requirements /obligations under different statutes/Laws; and to inform the concerned authorities within the organization for keeping complete information of accidents for record and analysis, which will be of help in taking remedial measures for recurrence of such accidents.

3.2.1 Procedure for Reporting Near Miss Accidents

- 3.2.1.1 All near miss accidents are to be reported to Head of Safety by the Head of the Department immediately or within 24 hrs.
- 3.2.1.2 Head of Safety should investigate all near miss accidents and circulate the enquiry report along with remedial measures at the Project / Station.

3.2.2 Procedure in Case of Accidents Causing Injuries/ Fatalities

- 3.2.2.1 The executive of the concerned Section where the accident has occurred shall immediately refer the injured to Hospital / Dispensary / First – aid unit with a preliminary report. In addition he shall inform about the accident to Head of the Department, Head of Safety by any fastest mode of communication with full description of accident and details of the injured persons.

- 3.2.2.2 In case of injury to Contractor's employee, the contractor shall immediately inform the accident / dangerous occurrences to Engineer In-charge and Head of Safety by any fastest mode of communication with full description of accident and details of the injured persons and will arrange to the injured to Hospital. The Engineer In-charge shall submit the information of accident.
- 3.2.2.3 In case injured has come / is taken directly to hospital / dispensary / first-aid unit, the Medical Officer will inform about the incident to Head of the Department with a copy to Head of Safety. In case of serious accident, he shall also immediately inform the concerned as above over telephone.
- 3.2.2.4 Subsequently the concerned department / section In-charge will prepare a detailed report of accident within 4 hrs of the accident.
- 3.2.2.5 The Head of Safety will intimate the accident to concerned Statutory Authorities as per the provisions of relevant Act / Rules. However, the State Rules concerned should be referred to for additional provisions, if any.

3.2.3 Procedure in Case of Dangerous Occurrences

As prescribed under the relevant rules made by the State Government with reference to the provision of Section 88-A of the Factories Act, schedule of some common dangerous occurrences

- 3.2.3.1 In case of dangerous occurrences, the same will be informed by Section In charge to Head of Safety, Head of Department.
- 3.2.3.2 The Safety Officer will intimate such dangerous occurrences to Statutory Authorities as prescribed by the State Government.

CHAPTER-4

SAFETY COMMITTEES

4.0 Safety Committees

4.1 Provision for Constitution of Safety Committee:

Rule No. 41st of Factories Act

Model Rules under Factories (Amendment) Act, 1987.

Under the above rules, the following provisions are made for Safety Committee:

1. In every factory
 - a. Wherein 250 or more workers are ordinary employed or
 - b. Which carried on any process or operation declared to be dangerous under Section 87 of the Act; or
 - c. Which carried on 'hazardous process' as defined under Section 2(cb) of the Act; there shall be a Safety Committee.
2. The representatives of the management on Safety Committee shall include:
 - a. A senior official, who by his position in the organization can contribute effectively to the functioning of the Committee, shall be the Chairman;
 - b. A Safety Officer and a Factory Medical Officer, wherever applicable and the Safety Officer in such a case shall be the Secretary of the Committee;
 - c. A Representative each from the operation, maintenance and purchase departments.
3. The Workers' Representatives on this Committee shall be elected by the workers.
4. The tenure of the Committee shall be one year.
5. Safety Committee shall meet as often as necessary, but at least once in every quarter. The minutes of the meeting shall be recorded and produced to the Inspector on demand.
6. Safety Committee shall have the right to:-
 - a. Ask for necessary information concerning health and safety of the workers.
 - b. Seek any relevant information concerning health and safety of the workers.

4.2 Function and duties of the Safety committee shall include:-

- a. Assisting and co-operating with the management in achieving data aims and objectives outlined in the 'Safety Manual' of the occupier;
- b. Dealing with all matters concerning health, safety and environment and to arrive at practicable solutions to problems encountered;
- c. Creating safety awareness amongst all workers;
- d. Undertaking educational, training and promotional activities;
- e. Deliberating on reports of safety environmental and occupational health surveys, emergency plans, safety audits, risk assessment and implementation of the recommendations made in the reports;

- f. Carrying out health and safety surveys and identify causes of accidents;
- g. Looking into any complaint made on the likelihood of an imminent danger to the safety and health of the workers and suggest corrective measures; and
- h. Reviewing the implementation of the recommendations made by it.

4.3 Safety Sub Committee

Where owing to the size of the factory, or any other reason, the functions referred to in Sub Rule (7) cannot be effectively carried out by the Safety Committee; it may establish sub-committees as may be required to assist it.

CHAPTER 5

SUGGESTED CHECK-LIST FOR SAFETY AUDIT

5.0 Suggested Check-List for Safety Audit

Following activities/areas should be checked during the course of Safety Audit.

5.1 Operation and Maintenance Activity:

- a. Coal handling unit.
- b. Boiler area.
- c. Turbine area.
- d. Switch yard area.
- e. Control room.
- f. Hydrogen Generation Plant.
- g. Chlorination Plant.
- h. Other auxiliaries.

In all above activities at least following aspects should be specifically seen:-

- a. Requirements of Factories Act:
All provisions of the Act/Rules sets implementation should be reported.
- b. Requirements of Electricity Act and Rules:
All provisions of the Act/Rules sets implementation level should be reported.
- c. House Keeping.
- d. Approaches.
- e. Illumination.
- f. Ladders.
- g. Supply of personal protective equipments to employees.
- h. Conditions of fire fighting installations.
- i. Preparedness for disaster like fire, explosion, chlorine leakage, etc.
- j. Compliance of IBR.
- k. Any other information, if felt necessary.

5.2 Construction and Erection Activity:

- a. Structural Erection.
- b. Boiler Erection.
- c. Turbine Erection.
- d. Chimney Erection.
- e. Civil Construction.
- f. Other areas not covered above.

In all above activities following areas/system should be specifically seen and it should be a part of report.

- a. Approaches.
- b. Scaffolds.
- c. Ladders.
- d. Lifting equipments and tackles condition and test certificates.
- e. Earthing of electrical equipments.
- f. Condition of electrical wires/cables.
- g. Support for electrical wires/cables.
- h. Employment of competent and authorized electrician for doing electrical repair/addition/alteration.
- i. House keeping.
- j. Guarding of dangerous machines.
- k. Practices adopted during lifting of equipments.
- l. Material handling.
- m. Supply of personal protective equipments to construction workers.
- n. Appointment/nomination of safety officers by the Principal Contractor.
- o. Any other information, felt necessary.

5.3 For plants as well as projects supply and use of personal protective equipments:

- a. Quantum of various personal protective equipments purchased by the Project.
- b. Quantum of personal protective equipments issued to the employees.
- c. Quantum of personal protective equipments stored in the store for regular or emergency requirements.
- d. Average percentage of employees using the given personal protective equipments.

5.4 Constitution and Working of Safety Committee

- a. Number of Meetings held.
- b. Implementation of recommendations.

5.5 Safety Training -

- a. Number of training programmes.
- b. Number of participants.

5.6 Use of Audio Visual Aids for Creation of Safety Consciousness

5.7 Safety Organisation

5.8 Any Other Activities, Found Necessary

Information may be submitted for following also. While assessing for safety award, this information shall be the basis of assessment (to be implemented in second phase)

A. Reporting of Accidents:

- a. Is the accident reporting system effective?
- b. Are all accidents reported to Safety Department?
- c. Is reporting figure of Hospital and safety Department same?
- d. Has the Hospital maintained a separate record of accidents?
- e. What are total numbers of accidents (Fatal/non-fatal) in the Project for the last years?

B. Efforts for enhancing Safety Awareness

- a. Training Programmes - Quote details including number of training programmes, duration of programmes, subject of training and level of participants.
- b. Safety Committee - Detailed constitution including name of members, main suggestions, implementation of main suggestions & Dates of meetings.
- c. Safety Suggestions
Number of safety suggestions received. Details of suggestions, number of suggestions awarded and implemented.
- d. Emergency preparedness.
Enclose emergency plan. Inquire, if it is submitted to State Government and is approved by them.
- e. Celebration of National Safety/Fire Days
Specific activities carried out during the day/week. Collect reading material etc. as distributed.
- f. Investigation of Accidents:
Inquire, if all accidents are investigated. Collect copy of reports and enclose. Find out, if recommendations and implemented.
- g. Prosecutions:
Number of prosecutions filed by State Government against the Plant. Enclose copies thereof.

Check List for Safety Audit:

I Safety:

- 1. Accidents
 - a. Fatal & non fatal Accidents occurred in the station /Project.
 - b. Enquiry Committee recommendations for the above accidents occurred in station/project

- c. Implementation status of Enquiry committee recommendation point wise---List to be enclosed
- d. Details of Penalty imposed on Agencies for above Fatal Accidents occurred in station /Project.
2. Safety Training to Employees:
 - a. Total number of employees in station/Project and number of employees underwent Safety Training.
 - b. Name of Program ,Date of Program ,no of employees attended ---List to be enclosed
3. Employees participation:
Safety committee meeting dates, No of Recommendations in the meeting, Implementation of committee recommendations.
4. Safety Promotional Activities
 - a. Safety week celebration
 - b. Safety month celebration
 - c. Other Safety campaigns
5. Safety literature, Manuals, Rules Job instruction cards released.
6. Compliance to safety statutory requirements as per OHSAS 18001.
7. Cross functional safety Task force for stations
 - a. Constitution of safety task force by Project Head
 - b. Functioning of cross functional Task force and no of observations made.
 - c. Implementation status of above observations –List to be enclosed
8. PPE issue to Employees
 - a. Issue of Helmet, Safety shoe and Dust mask etc. to employees.
 - b. Availability of fall arrestors in station/Project.
9. Housekeeping.
10. Machine Guarding and Double earthing
11. Inspection and testing of following by competent person.
 - a. Goods elevator.
 - b. Passenger Elevator.
 - c. EOT crane & Hoists.
 - d. Pulleys.
 - e. Wire ropes/slings.

- f. Total nos. of above and nos. inspected/tested category wise -List to be enclosed
12. O&M safety Rules and Permit to work system:
- a. Functioning of Permit to work system .
 - b. PTW Audit conducted and its recommendations .
 - c. Implementation of above recommendations –List to be enclosed
 - d. Refresher Training on PTW conducted at station.
13. OHSAS 18001 certification status, date of Surveillance Audit done, Observations.
14. Occupational work place monitoring –coal dust, noise, recording and reporting.
15. Occupational Health check-up, no. of employees working in Hazardous areas ,check-up done.
16. Emergency Preparedness;
- a. Preparation of Disaster management Plan & latest revision made.
 - b. No of mock drills conducted in line with DMP and mock drill observations.
 - c. Implementation of mock drill observations –List to be enclosed.
 - d. No of Training program on DMP and no of persons covered.
17. Safety in Fuel Handling Area.
18. Safety in Water Treatment Plant area.
- a. Inspection of Acid/Alkali Tanks done.
 - b. Availability of Chlorine detection and absorption system in Chlorination Plants
 - c. No. of periodical checking /inspection done at Chlorination plant & Observations made.
19. Contractor Safety systems
- a. Deployment of Qualified Safety Officer by Agencies.
 - b. Safety observations made by Agency safety officer and Review.
 - c. Testing of winches, Elevators, Pulleys, wire rope, slings and Tackles being used by the agencies with records of testing done and identification marks for testing done on the Tools.
 - d. Testing of portable electrical hand tools of Agencies and records.
 - e. Provision of Earth Leakage Circuit Breakers (ELCBs) on Power Supply boards of agency.
 - f. Issue of helmet, Shoe to workers and Relevant records maintained by agency .
 - g. Availability of fall arrestor ,Safety net with Agency.

- h. Safety Training provided to Agency worker and records
- i. Health check up of Agency worker engaged for hazardous area & Height works

20. Statutory compliance

Inspection points communicated by Factory Inspector through his letters during his visits to HPGCL station.

21. Previous Audit Points

- a No of Recommendations of previous year Internal Safety Audit done, No of points implemented & List of pending points
- b No of Recommendations of previous year External Safety Audit done, No of points implemented & List of pending points.
- c No of Recommendations of previous PTW Audit done, No of points implemented & List of pending points.

22. Compliance status of conference/workshop held:

- a Previous Safety officers conference recommendations
- b Electrical workshop Recommendations
- c Occupational Health & safety workshop Recommendations

23. Detail of safety awards won by Station/Project.

II. Fire Detection & Protection System

1. **Fire Station** – Fire Tenders & Pumps, availability of chemicals, working conditions of Fire Tenders & Pumps, periodicity of inspection.
2. **Fuel Oil Storage Tanks** – Hydrant valves, water pressure, water spray system, foam pouring system, detection system, pressure and chemicals conditions, periodical checking etc.
3. **Transformers** – Emulsifier system, nozzles, water pressure, functioning of the system, periodicity of inspections.
4. **Coal Conveyors** – healthy condition of the Water Sprinkler System, Checking of nozzles & valves, periodicity of inspections, Linear Heat Sensing system.
5. **Boiler Burner Front** – Water sprinkler system, working conditions
6. **Cable vaults, control rooms, cable galleries** – water spray system, smoke detectors, water sprinklers and other Fire suppression system like CO2 flooding system etc.
7. Water Pumps for Hydrants & Sprinklers Systems
8. **Fire extinguishers** – placement, working conditions, inspection and testing facilities etc.

9. Fire Detection & Fire Fighting System in the plant excluding the above areas
10. Fire Safety Committees existence, periodicity of meetings, review of previous meetings, major recommendations, if any.
11. Details and status of auto fire extinguishing system in the Plant control room, other vulnerable areas etc.
12. Status of Fire Emergency / control room, location, types and No. of PPE available including self-contained breathing apparatus, Fire suites, other emergency equipments etc.
13. Overall preparedness of the Projects / Stations with respect to Fire Hazards.
14. Any Other areas as required.

III Safety Promotion:

1. Through wall or other supporting hoardings, banners etc. safety requirement shall be popularized for different activities;
2. Films shall be shown by safety department to all Contract Labours depicting hazards and required control measures;
3. Each worker shall be provided one full day training at least once every 6 months.
4. Compliance of all HPGCL Safety Rules and Legal provisions shall be ensured in accordance with GCC provisions. And violators shall be penalized as mentioned therein.

IV Issue of Permit To Work:

Following permits shall be monitored by Engineer In Charge of the same discipline along with Safety Department

1. Permit for working at height.
2. Permit for working in excavated area / confined area.
3. Permit for working near water, where possibilities of drowning exist.

V Other Provisions:

1. Colour Coding of Helmet shall be made to differentiate between main contractor and subcontractor.
2. Penalty shall be imposed on workers if violates Safety provisions.
3. PTW for construction work shall be issued from Safety Department after job safety requirements are submitted by concerned Engineer in Charge.
4. Display of safety violation through projector on the same day at the key locations shall be made.
5. Colour coding for working agencies for easy identification.

CHAPTER-6

SAFETY GUIDLINES FOR CONTRACTORS

6. Safety Guidelines for Contractors

- 6.1 The Contractor shall ensure proper safety of all the workmen, materials, Plant and equipments belonging to him or to HPGCL or to others working at site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and the Engineer-in-charge as he may deem necessary.
- 6.2 The Contractor will notify in advance to the Engineer incharge of his intension to bring any container at site filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. The Engineer-in-charge shall have the right to prescribe the conditions under which such container is to be stored, handled and used during the performance of the works and the contractor shall strictly adhere to and comply with such instructions. The Engineer-in-charge shall have the right at his sole discretion to inspect the material in the container which is required to be used and if in his opinion, its use is not safe , he may forbid its use. No claim due to such prohibition shall be entertained by HPGCL and HPGCL shall not entertain any claim of the Contractor towards additional safety provisions/ conditions to be provided for/constructed as per the Engineer's instructions.
- 6.3 Further, any such decision of the Engineer shall not, in any way, absolve the Contractor of his responsibilities and in case, use of such a container or entry thereof into the site area is forbid by the Engineer, the Contractor shall use alternative methods with the approval of the Engineer without any cost implication to HPGCL or extension of work schedule.
- 6.4 Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying out such provision and/or for storage in accordance with the rules and regulations laid down in Petroleum Act 1914, Explosives Act 1984 and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Engineer. In case, any approval is necessary from the Chief Inspector (Explosives) or any statutory authority, the Contractor shall be responsible for obtaining the same.
- 6.5 All equipments used in construction and erection by Contractor shall meet Indian/ International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation Manual and safety instructions and as per Guidelines / Rules of HPGCL in this regard.
- 6.6 Contractor shall ensure Periodical Examinations and all tests for all lifting/hosting equipment & tackles shall be carried out in accordance with the relevant provisions of

Factories Act 1948, Indian Electricity Act 1910 & amendments thereof and associated Laws/Rules in force from time to time. A register of such examinations and tests shall be properly maintained by the contractor and will be promptly produced as and when desired by Engineer or by the person authorized by him.

- 6.7 The Contractor shall provide suitable safety equipment of prescribed standard to all the employees and workman according to the need, as may be directed by Engineer who will also have right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability.
- 6.8 Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the code of practices/Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives.
- 6.9 The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, good and standard quality of material shall only be used by the Contractor.
- 6.10 The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to HPGCL or other contractors under any circumstances, whatsoever, unless specifically permitted in writing by HPGCL to handle such fuses, wiring or electrical equipment.
- 6.11 Before the Contractor connects any electrical appliance to any plug or socket belonging to the other Contractor or HPGCL, he shall:
 - a. Satisfy the Engineer that the appliances are in good working condition.
 - b. Inform the Engineer of the maximum current rating, voltage and phases of the appliances.
 - c. Obtain permission of the Engineer detailing the sockets to which the appliances may be connected.
- 6.12 The Engineer will not grant permission to connect until he is satisfied that:
 - a. The appliance is in good condition and is fitted with a suitable plug.
 - b. The appliances are fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
- 6.13 No electric cable in use by the Contractor/Owner will be disturbed without prior permission. No weight of any kind will be imposed on any cable and no ladder or similar

equipment will rest against or attached to it.

- 6.14 No repair work shall be carried out on any live equipment. The equipment must be declared safe by the Engineer and a permit to work shall be issued by the Engineer. If Contractor is working on electric lines/equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by Contractor to electricians/workmen/officers.
- 6.15 The Contractors shall employ adequate number of qualified, full time Electricians/Electrical Supervisors to maintain his temporary electrical installation.
- 6.16 The Contractor employing more than 100 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as safety officer to supervise safety aspects of the equipments and workmen who will co-ordinate with the Project Safety Officer. In case of work being carried out through sub-contractors, the sub-contractor's workmen/ employees will also be considered as the Contractor's employees/workmen for above purpose. The name and address of such Safety Officer of Contractor will be promptly informed in writing to Engineer-in-charge with a copy to Safety Officer before start of the work or immediately after any change of the incumbent is made during currency of the contract.
- 6.17 In case any accident occurs during construction/erection of the associated activities undertaken by the Contractor, thereby, causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to HPGCL's Engineer-in-charge in prescribed form and also to all the authorities envisaged under the applicable laws.
- 6.18 The Engineer-in-charge/Executive Engineer (Safety) shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents/ loss to the safety of the persons and/or property and/or equipments. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can appeal if felt necessary, against the order of stoppage of work to the Chief Engineer of the project of such stoppage of work and decision of Chief Engineer in this respect shall be conclusive and binding on the Contractor.
- 6.19 The Contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided in above mentioned Para 6.18 and the period of such stoppage of work will not be taken as an extension of time for completion of work and will

not be the ground for waiver of levy of liquidated damages.

- 6.20 The Contractor shall follow and comply all HPGCL's Safety Rules, relevant provisions of applicable laws pertaining to the safety of workmen, employees, Plant and equipment as may be prescribed from time to time without any demur, protest, contest or reservation. In case of any unconformity between statutory requirement and HPGCL Safety Rules referred above, the later shall be binding on the contractor.
- 6.21 If the contractor fails in providing safe working environment as per HPGCL Safety Rules or continues the work even after being instructed to stop work by the Engineer as provided in above mentioned para 6.18, the Contractor shall promptly pay to HPGCL, on demand by the Owner, compensation at the rate of Rs.5,000/- per day or part thereof till the instructions are complied with and so certified by the Engineer. However, in case of accident taking place causing injury to any individual, the provisions contained in above mentioned para shall also apply in addition to compensation mentioned in this para.
- 6.22 If the Contractor does not take all safety precautions and/or fails to comply with the Safety Rules as prescribed by HPGCL or under the applicable laws for the Safety of the equipment and Plant and for the safety of personnel and the Contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other contractors or HPGCL employees or any other person who are at site or adjacent thereto, then action as per the provision of contract/safety rules shall be taken against the contractor.
- 6.23 Permanent disablement shall have same meaning as indicated in Workmen's Compensation Act. The compensation mentioned above shall be in addition to the compensation payable to the workmen/employees under the relevant provisions of the Workmen's Compensation Act and Rules framed there under or any other applicable laws as applicable from time to time. In case, HPGCL is made to pay such Compensation then the Contractor is liable to reimburse HPGCL such amount.

CHAPTER 7

SAFETY GUIDELINES FOR MECHANICAL WORKS

7.0 Safety Guidelines for Mechanical Works

Employees engaged in machining and mechanical work must be familiar with and observe relevant sections of this manual that apply to all employees. The following refer more specifically to employees performing this type of work.

1. Always wear goggles while operating lathes, drill presses or shapers.
2. Never wear neckties, dangling sleeves or other loose clothing while operating or working close to moving machinery.
3. When using a drill/press, the work should be securely clamped to the table, jig or chuck.
4. Always use a brush to remove cuttings from a machine. Never use your hands.
5. Whenever compressed air is used for cleaning, the same should not be done without the consent of Engineer in-charge.
6. Do not stand in line with high speed wheels. Do not use emery wheels that are out of round. For side grinding, use only the special wheels provided for this work.
7. Before using a grinding wheel, be sure that the guards are in place and that the tools rest is properly spaced. The guard shall be adjusted so that clearance between the grinding surface and the guard is proper. Do not adjust while the wheel is moving.
8. Never use files without handles.
9. Before making repairs to any pump, valve or any other piece of mechanical equipment, be sure that the pressure has been released, fluid are drained and lines are drained or properly isolated.
10. Before starting work on operating equipment, obtain permission from the shift in charge and see that the equipment is properly isolated.
11. Before starting work on a chemical or hot oil equipment, keep proper protective equipment on hand and available for use.
12. Oil spillage should be cleaned up promptly, and waste rags put in metal containers provided for that purpose.
13. Clothing that has become saturated with any chemical or oil should be changed at once. If any portion of the body is affected, it should be washed thoroughly with water. A report must be made to your supervisor.
14. Always keep passageways clear and free of oil and litter.

15. When performing work on internal parts of an engine, be sure that the engine has been properly tagged or locked out of service and a work permit obtained before operating a drill or doing other work likely to cause sparks.
16. Inspect the ceiling hoist thoroughly before lifting heavy loads. Never overload chain hoists or walk under suspended loads. The capacity should be properly marked on the hoist.
17. Always have adequate ventilation when doing metalizing work.

7.1 Moving Equipments

Before starting any equipment with moving parts:

1. Be sure that all safety guards are properly in place.
2. Be certain that all personnel are clear of moving parts.
3. Check start-up procedure.

7.1.1 Before shutting down any equipment with moving parts and turning over to maintenance:

1. Check shut down procedure
2. Shut down the equipment.
3. Be sure that prime mover is secured safely from the power source and check the following:
 - i. Electrical equipment must be shut off at the switchbox and locked until the work is completed.
 - ii. Steam or fuel valves should be closed and locked or blinded until the work is done.
 - iii. If the work is to be done on the prime mover, the fuel or steam must be blinded or double-blocked.

7.1.2 Fencing of Motors etc.

Engineer-in-charge / Supervisor shall ensure at a construction site of a building or other construction works that:

1. All motors, cogwheels, chains, and friction gearing, flywheels, shafting, dangerous and moving parts of machinery (whether or not driven by mechanical power) and steam pipes are securely fenced or lagged.
2. The fencing of dangerous parts of machinery is not removed while such machinery is in motion or in use;
3. No part of any machinery which is in motion and which is not securely fenced is examined, lubricated, adjusted or repaired except by a person skilled for such

- examination, lubrication, adjustment or repairs;
- 4. Machine parts are cleaned when such machines is stopped;
- 5. When a machine is stopped for servicing or repairs, adequate measures are taken to ensure that such machine does not re-start inadvertently.

7.1.3 Lifting And Carrying Of Excessive Weight:

Engineer In-charge/Supervisor shall ensure at the construction site of a building or other constructions work that:

No building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight the maximum limits set out in the following table:

Person	Maximum Weight Load
Adult – man	56 kg
Adult - woman	30 kg
Adolescent – male	30 kg
Adolescent - female	20 kg

Unless aided by any other building worker or a Mechanical device

7.1.4 Slipping, Tripping, Cutting, Drowning and Falling Hazards:

1. All passageways, platforms and other places of construction work at the building or other construction work shall be kept by the employer free from accumulations of dust, debris or similar material and from other obstructions that may cause tripping.
2. Sharp projections, protruding nails or similar projections that may cause injury to a building worker at the building or other construction site shall be removed or otherwise made safe by taking suitably measures.
3. Don't allow any building worker at the building or at other construction work to use the passageway, or a scaffold, platform or any other elevated working surface which is in a slippery and dangerous condition and shall ensure that water, grease, oil or other similar substances which may cause the surface slippery, be removed or sanded, saw dusted or covered with suitable material to make it safe from slipping hazard at a building or other construction work.
4. Wherever building workers at a building or at construction work are exposed to the hazard of falling into water, they shall be provided with adequate equipment for saving themselves from drowning and rescuing from such hazard and if HPGCL authority considers necessary, well-equipped boat or launch manned with trained personnel shall be provided at the site of such work.

5. Every open side or opening into or through which a building worker, vehicle or lifting appliance or other equipments may fall at a building or other construction work , shall be covered or guarded suitably to prevent such fall except where free access is necessary by reasons of the nature of the work.
6. Wherever building workers at a building or other construction work are exposed to the hazard of falling from height while employed on such work, they shall be provided with adequate equipment or means such as safety net etc. for saving them from such hazards. Such equipment or means shall be in accordance with the national standards.
7. Whenever there is a possibility of falling of any material, equipment or building worker at a construction site relating to a building or other construction work, adequate and suitable safety net shall be provided in accordance with the national standards.

7.2 Cranes and Other Lifting Machines and Tackles

7.2.1 Introduction

Lifting machines includes cranes, crabs, winches, tackles, pulley blocks, gin wheels, transporter or runway chain ropes, lifting tackles i.e. chain slings, rope slings, rings, hoods, shackles and swivels etc.

7.2.2 General Instructions

1. The maximum safe working load in kg, should be marked on each hoisting apparatus at a conspicuous place.
2. The hoisting apparatus should not, except for actual testing purposes, be loaded beyond the maximum safe working load.
3. It is the responsibility of the operating personnel and his supervisor to ensure that any equipment is not overloaded.
4. In case of mobile cranes, the safe loads at various angles of the boom and jib should clearly be indicated on such crane and indicators should be affixed showing the angles of the boom or jib in various positions.
5. Loads should be raised and lowered smoothly, avoiding, sudden starts and stops or jerks.
6. It is the duty of the operating personnel and the supervisor-in-charge to ensure that no person remains in a position of danger in the course of lifting operation.
7. Riding on loads being lifted or lifting of personnel up or lowering them on crane ropes is strictly forbidden.
8. When lifting the load which necessitates signals to the operator from the ground or intermediate floors, one man should be detailed for this duty by the person supervising the

job and made known to the operator so that he should take the instructions from the deputed person only.

9. Hands or feet should not be removed from the controls while a load is suspended.
10. If there is a power failure during the operation of an electric crane, the control should be thrown to the off position. The area under the suspended load should be cordoned.
11. Loads should not be carried over the head of other employees.
12. Before lifting and unloading overhead crane, the hooks and slings should be raised to a height above all fixed and moving objects below, such as pedestrians or vehicles etc.
13. When the operator of a crane takes over charge, it is his first duty to check the controls of the crane and see that the crane tracks are clear. He should satisfy himself that:
 - a. All guards, such as guards over gears, couplings, rotating shafts etc. are in place.
 - b. The limit switches and other electrical and mechanical devices are in proper working condition. He should also run the block up or down to see that the wire rope is winding on the drum properly. While doing this, he can scan the rope to see if it has any kinks or exposed broken strands.
14. Before the main switch is closed/on, the operator should check to see that all controls are in “OFF” position.
15. Any defect in the crane including unusual noise or faulty operation such as sparking motors, bridge jumping or binding, slow response from controls etc. should be reported to the Engineer-in-charge for immediate rectification before attempting to lift a load.
16. The crane operator is responsible for the safe operation of the crane and he should follow the following principles:
 - a. Avoid placing an additional strain on the crane or swinging the load. The operator should be certain that the hook is directly over the load to be lifted.
 - b. Loads or equipment should not be moved by sliding or dragging them on the floor or ground.
 - c. The bridge or trolley should not be started before the load is lifted from the ground to the desired height.
 - d. The block should never be lowered to a point where less than two full wraps of the cable are on the drum.
 - e. When a long sling is attached to a load, consideration should be given to the height of the lift, so as to prevent the block from tripping the limit switch.
 - f. The limit switch is a safety device. It is not designed as a control and must not be used to stop the hoist.

- g. When picking up a heavy load, it is advisable to lift the load slightly and test the brake.
- h. When two cranes are operating independently on the same rails, they should maintain a safe distance between them. When two cranes are used to lift the same load, the work should be carefully supervised by a responsible engineer.
- i. The hoisting cable must not be slung round a load to be used as a sling. If a crane is equipped with chain, loads should never be lifted while chain is kinked.
- j. The operator should not allow the crane to bump against rail stops.
- k. When boom cranes are used, the boom should be lowered to a horizontal position when it is not in operation.
- l. If a warning bell, gong, whistle or siren is available, use it to warn everyone that you are starting to move a load.
- m. It is the responsibility of the operator to ensure that the jobs do not fall on overhead electric lines or structures etc. Under no circumstances an attempt should be made to raise electrical wires by anyone other than the electrical personnel.
- n. When any person is working on or near the wheel track of an overhead crane, effective measures should be taken to ensure that the crane does not approach within 6 meters of the place where he is working.
- o. A minimum distance of 2 meters must always be maintained between the boom or load and all power lines or feeders. In case , it is not possible to maintain safe clearance for any particular job, the Engineer-in-charge of such jobs should consult in advance of the operation of the crane with the Electrical authorities so that the power lines may be de-energized to avoid accidents.

7.3 Hoisting Tackles

- 1. All hoisting tackles should conform to the standard specifications.
- 2. Rings, hooks, shackles, swivels and links for hoisting and sling chains should be made of the same material as the chains to which they are fastened. When the latter are of wrought iron of ordinary steel, special care should be considered individually.
- 3. The factor of safety for all hoisting tackles should be as per OEM recommendation.
- 4. All repairs of chains should be done by experienced men or by chain manufactures. Make-shift repairs are dangerous. Do not use bolts or nails to fasten two links together.

7.4 Wire Ropes

- 1. Wire ropes for hoisting, lowering or hauling loads should conform to the standard specifications.

2. The factor of safety for wire ropes should not be less than six.
3. Eye splices and loops for the attachment of hooks, rings and other parts to wire ropes should be provided with suitable thimbles.
4. Size, material and the maximum safe working load should be marked on all cranes/lifting machines by means of metal tags or any another suitable way.
5. Depending upon the physical condition of Wire ropes due to which their strength is affected eg. broken wires (strands), corrosion, kinds etc. same should be immediately removed from service.
6. Ends of wire ropes should be seized to prevent the strands from becoming loose.
7. In order to keep wire rope pliable and prevent from rust, the ropes should be treated at regular intervals with a suitable lubricant free from acid or alkali or as recommended by the OEM.
8. Wire ropes should be stored in a cool place, which is free from moisture, excessive heat and corrosive fumes.

7.5 Fiber Ropes

1. Fiber ropes for hoisting, lowering, or hauling loads should be of high grade Manila hemp or other hemp of equal quality and the factor of safety of such ropes should not be less than ten.
2. Manila rope is stronger, easier to handle and will not kink as badly as sisal or their fiber ropes.
3. When ropes of fiber other than high grade manila rope are used for hoisting purposes, proper allowances should be made for the proportionate tensile strength. All fiber ropes should bear a metal tag indicating the maximum permissible load, date of placing in service and the name of the supplier.
4. Eye splices on fiber ropes should be made round with suitable thimbles.
5. When two ropes have to be joined-it should be spliced instead of being knotted. Splices are safer and stronger than knots for permanent connections. The use of knots reduces the strength of a rope by as much as 50% while a short or long splice reduces it only by 5% to 10%.
6. Rope should not be dragged along the ground, or rough surfaces. Always use padding on sharp edges and corners to avoid cutting of the rope.
7. Fiber ropes should not be used for hoisting purposes or stored in locations where they will be exposed to contact with acid, alkali or other fumes or other destructive chemicals.

8. Always dry the ropes after wetting. A dry unheated room with good ventilation is the best place of storage. Place ropes in loose coils off the floor on wooden pegs. Manila ropes will rot very quickly if it is kept wet and is not properly dried.
9. Wet ropes should not be piled against steam pipes to dry. This will dry out the natural moisture and destroy the life of the fiber.
10. Always inspect ropes at frequent intervals while in use and also before placing it in storage if it has been subjected to any wear or destruction by the action of corrosive chemicals and their fumes.

7.6 Hooks and Rings

1. Hooks and Rings used with chains should be of material at least as good as that of chain. Forged steel is preferable in every case and especially for lifting heavy loads.
2. A ring must be strong enough to carry a load equal to the sum of safe loads of the attached chains.
3. When a hook has been bent by overloading it should be used where there is a danger of catching on an obstruction. The maximum safe working load should be stamped on each hook for hoisting apparatus.

7.7 Slings

1. Slings for hoisting purpose should be of sufficient strength to carry the loads to which they will be subjected.
2. The maximum safe working load should be legibly marked in a suitable manner and the slings should be conforming to standards applicable to chains, wire ropes etc.
3. When placing hoist slings around sharp edges or with projections etc., pads should be inserted between the load and the slings in such places.
4. Where double or multiple slings are used for hoisting purposes, the upper end of the slings should be connected by means of suitable shackle or ring and should not be placed separately in the lifting hook.
5. Hoisting slings that show evidences of cuts, excessive wear or other damages, should be discarded and destroyed.

CHAPTER-8

SAFETY GUIDELINES FOR HANDLING CHEMICALS

Safety Guidelines for Handling of Chemicals

8.0 General

Precautions to be taken in handling the various chemicals used in the Power Houses are as under.

1. Treat all chemicals as toxic.
2. Avoid contact of the chemicals with eyes, bare skin or clothing.
3. Avoid breathing chemicals, dust or vapour.
4. Before starting any job involving use of chemicals:
 - a. Read the instructions on the container.
 - b. If there is an indication on the label that the chemical may be toxic, be sure that you know the specific precautions to be followed in its use. Ask your supervisor if you are uncertain.
 - c. Plan the job to avoid direct physical contact with any chemical or its dust or vapour.
5. All the chemicals used in Plant are not listed. Employees are expected to become familiar with the details of hazardous materials used in their unit or section so that safe handling becomes an integral part of the job.
6. The hydrocarbons we process are all flammable in various degrees depending on their temperature and concentration of their vapours in air. Most of them dissolve fat from the skin. This leads to dryness, cracking and possible dermatitis.
7. Hydrogen gas is hazardous due to its high inflammability and colorless flame due to which it is difficult to detect.
8. The presence of harmful materials in a place of work does not constitute a hazardous condition provided that these materials are handled keeping in view the potential hazard involved.

8.1 Sulphuric Acid

8.1.1 Nature

Sulphuric Acid is a viscous, oily, corrosive liquid with a strong affinity for water, which it removes from organic materials. It chars and destroys Plant, animal or body tissues. In concentrated form, it acts on the skin destroying the epidermis penetrating some distance into the skin and sub-cut-tissues, causing necrosis. Inhalation of acid can cause inflammation of the upper respiratory tract leading to bronchitis and damages to lung tissues. Serious eye injury and permanent corneal damage may result even with small amount of acid in the eyes.

8.1.2 Precautions in Handling

1. Whenever handling sulphuric Acid or when taking up maintenance of lines, vessels or drums etc. which contain or have contained Sulphuric acid, use personal protective Equipment (PPE) such as tight fitting chemical goggles / face shield / hood, rubber apron / jacket, rubber hand gloves, rubber boots etc.
2. Unprotected lights and fires should be kept away from sulphuric acid lines or storage tanks as hydrogen may be evolved from the action of the acid on certain metals.
3. In preparation of equipment for mechanical work, care shall be taken to ensure complete removal of all sulphuric acid from lines, pumps etc. by steaming and flushing prior to handing over for the maintenance work.
4. Avoid all contacts of inhalation of fumes by using a gas mask with a canister to protect against exposure to acid gases.
5. Adequate fresh water supply should be available for emergency washing.
6. Closed vessels should be vented periodically to release hydrogen, if formed.

8.2 Ammonia

8.2.1 Nature

Ammonia is a colorless gas with penetrating pungent suffocating odour. It liquefies under pressure and is soluble in water. When liquid ammonia or ammonia solution is exposed to the air, suffocating fumes are given off which are harmful to the eyes and respiratory organs. Ammonia attacks the skin rapidly and is poisonous if swallowed in solution. It burns when mixed with air in concentration of 16% to 25% by volume. Contact with liquid ammonia can cause frost bite. When contacted in eye, can produce temporary blindness to severe blindness.

8.2.2 Precautions in Handling

1. Rubber gloves, boots and goggles must be worn when working on equipment containing ammonia.
2. Respiratory safety equipment should be used when schedule to work on leaks or when other conditions warrant. Gas masks with canister are useful for concentration upto about 3%.
3. All persons who work on ammonia should be familiar with emergency procedures in case of serious leaks.

8.3 Caustic Soda

1. Caustic soda in the anhydrous form is white to slightly colored pellets. In solution, it is clear to slightly turbid liquid.

2. It causes severe skin burns often resulting in dead ulceration.
3. Eye contact can result in severe damage. Rapid inhalation results in damage to upper respiratory tract and also lung tissues. Ingestion can cause severe damage to inner membranes. Penetration into vital area may be fatal.

8.3.1 Precautions in Handling

1. Use goggles, face shields, rubber aprons, jackets, rubber hand gloves and rubber boots as protective equipment whenever handling Caustic Soda. Be careful about spilled caustic soda while opening its drums making solutions or sampling.
2. Use all the above equipment while going near any leak to stop it.
3. Avoid inhalation of caustic vapours and splashing of caustic soda.
4. Whenever caustic solution is spilled, wash it immediately. Never leave the spillage of this material unattended.
5. Use all the safely equipment (face shields, goggles, rubber aprons / jackets, rubber hand gloves, rubber boots etc) while sampling or doing any other job near or on the caustic handling facility, even if the job is quite small/minor.
6. Always keep a water hose ready nearby.
7. Avoid pipetting by mouth.

8.3.2 Emergency Treatment

1. If any part of the body has been contaminated by Caustic Soda. Wash it off quickly with water.
2. If clothing is contaminated, remove it while under the shower and wash the body thoroughly.
3. If eyes are involved, wash them with abundant quantity of water.
4. Report to nearby hospital for medical attention.

8.4 Chlorine

8.4.1 Nature

Gaseous chlorine is of a yellow green color and has a density two and a half times that of air, so it tends to flow downwards and collect in low spots. Moist chlorine is extremely reactive and attacks metals. It is extremely irritating to the mucous membrane of the eyes and respiratory tract. If taken to lung, it will destroy the tissues and cause severe lung edema. It is so intensively irritating that the concentrations above three to five ppm by volume in air are readily detectable by a normal person. The threshold limit value of chlorine accepted at present is 3 mg/m^3 of air (1ppm).

8.4.2 Precautions in Handling

1. Chlorine leaks must be immediately attended. Leaky valves must be repaired by tightening the packing nut.
2. Containers should be stored with enough room between them so that leak is completely accessible in case of an emergency.
3. Employees who handle chlorine must use respiratory safety equipment.
4. Following procedure should be followed when a leak is detected in a chlorine container:-
 - a. Warn all people to move upwind of the leak and stay out of the contaminated area.
 - b. Notify your supervisor of the leak at once.
 - c. Remove anyone who has been overcome by chlorine. Be sure that the first aid is rendered at once.
 - d. When plugging a leak, wear impervious clothing and suitable respiratory safety equipment.
 - e. If leak cannot be stopped, disconnect the container and move it away from the Plant and personnel to a place where it can empty itself without creating a further hazard.
5. Cylinders should neither be lifted by means of the metal cap nor by a magnet.
6. Unloading platform should preferably be at truck level. One ton container should be handled with suitable cradle with chain slings in combination with a hoist or crane having at least two metric tons capacity.
7. If liquid chlorine or chlorinated water has contaminated skin or clothing, the emergency shower should be used immediately. Skin should be washed with large quantities of water and soap. No attempt should be made to neutralize chlorine with chemicals.
8. Always provide chlorine emergency kit and a neutralization pit near chlorine cylinder handling area.

8.5 Hydrochloric Acid:

8.5.1 Nature:

It is colorless gas with pungent/suffocating odor. It is soluble in water. It is non combustible in nature. Contact with common metals produces hydrogen which may form explosive mixture in air, when heated toxic & corrosive hydrogen chloride gas is released. Inhalation of vapours causes irritation of upper respiratory tract, coughing, burning of throat and choking. Inhalation of higher concentrations can be dangerous. Ingestion can

cause severe irritation, burning of throat etc. Skin contact can cause burns. Contact with eyes can cause severe burns and damage.

8.5.2 Precautions:

Protect container against physical damage. Store in cool well ventilated place away from oxidizing materials. Use face shields, PVC hand gloves and PVC suits to avoid skin and eye contact. In case of eye / skin contact, flush eyes/skin immediately with plenty of water for 30 min. or more and remove contaminated clothing.

8.6 Hydrogen:

8.6.1 Nature:

Hydrogen is colorless / odorless gas lighter than air. It is highly flammable & explosive in nature. Container may explode violently. It reacts vigorously with oxidizing materials. It is relatively nontoxic but can cause asphyxiation by displacing air. Contact of liquid hydrogen with skin can cause frost bite.

8.6.2 Precautions:

Protect the container against physical damage. Outside storage is preferred. Isolate from oxidizing gases especially chlorine. Store in well ventilated place and it should be away from possible source of ignition & combustible materials. Allow to burn unless shut off can be effected. Fight fires from safe distance. In case of contact of liquid hydrogen with skin & eyes, remove contaminated clothing; flush affected area with plenty of water.

CHAPTER-9

SAFETY GUIDELINES FOR ELECTRICAL WORK

SAFETY GUIDELINES FOR ELECTRICAL WORK

9.1 General

Electricity, if not properly used, may be the cause of both fire and personal injury. However, if used in accordance with well established methods, electricity presents one of the safest and most convenient means of illumination, power and heating. Electricity may become a fire hazard through arcing, sparking or over- heating. It presents casual hazards through burns , shocks or fall. Therefore, to minimize and avoid electric hazards, electrical safety rules and rules of electrical installations must be followed strictly.

9.2 Recommendations

1. Electrical department is responsible for installation, alteration, maintenance and up-keep of all equipment for generation, distribution and utilization of electric power. Only qualified members of the department must undertake work on electrical equipment, wiring, alteration of any circuit etc.
2. All wiring installations must comply with the standard electrical code. The following hazards are likely to develop from the wiring itself:
 - a. Corrosion of metal covering or enclosure of conductors.
 - b. Conductors overloaded.
 - c. Joints not properly soldered, taped or otherwise made safe.
 - d. Covers of outlet or junction boxes removed.
 - e. Deterioration of mechanical strength or insulation of conductor.
 - f. Corrosion & loosening of supports.
3. All circuits must be protected by fuses of the correct rating or other over-current protective devices.
4. Conductors of open wiring systems must be separated/electrically insulated from their supports, in contact with pipes, woodwork, other conducting or combustible material.
5. Be sure that all the switches have been put off and proper isolation has been carried out by removing the fuses; taking out breaker trolleys or opening the disconnecter /isolator as the case may be before starting work on any wiring or equipment or overhead lines. Where power is supplied from more than one source, be sure that the supply is cut off from all sources and check that the right switches are cut-off.
6. High tension lines or equipment must be made dead by an Electrical Engineer only or a person deputed by him and preceding rule (4) should be followed. Before starting any work, lines or equipment must be short circuited all the 3 phases and earthed by using Earth electrodes/Earth stick and a clearance certificate must be issued.

7. Use of temporary wiring should be avoided as far as possible. It should either be made permanent or dismantled within certain period after installation. If it may remain in position with the permission and approval of Electrical Engineer who should thoroughly check it at intervals.
8. The electrical department must inspect at regular intervals all portable and temporarily installed electrical equipment and check for earthing when a connection is made.
9. In hazardous areas, only flame-proof electrical equipment, protection must be used. In all dangerous areas, use of extension cords or portable temporary electrical equipment etc. must be avoided as far as possible.
10. Whenever water is used for washing floor or any equipment, protection of electrical equipment must be assured from splashing of water on them. In locations where considerable moisture may be present, specially designed water-tight fittings should be used.
11. Before demolition work is started on any building or process Plant, the wiring, especially the lighting wire must be disconnected from the power supply. The responsibility for disconnecting power supply as above rests with the Engineer-in-charge of demolition work. Electrical department should ensure the disconnection.
12. For the operation of electrical machine, operators are allowed to handle the operating controls only. They must on no account open up or tamper with any other electrical part of the machine. If any defect develops, this must be reported to the Electrical Department.
13. Electrical Department will carry out regular inspection and tightening up of all current carrying and earthing connections on motors and other Plant equipment that might possibly be subjected to vibrations and keep a record in the log book.
14. While extinguishing fire in electrical equipment, the power supply must be switched off first and if the fire still continues, use fire extinguishers having electrically non-conducting extinguishing materials like DCP or CO₂. It is not advisable to use soda acid, foam type extinguishers on fires in electrical equipment. Only DCP or CO₂ extinguishers should be used.
15. Employees should regard all electrical wires as live and dangerous and are warned against permitting any object being handled to come in contact with electrical lines. Any wire found hanging from a pole or any other electrical equipment should be reported immediately to the Electrical Engineer.
16. It is necessary to tag out electrical switches and starters of equipment, so that inadvertent starting of electrical equipment is avoided.

17. Before starting work on a Power Transformer, make sure that it is isolated completely i.e. both from HV and LV side and the residual charge/stored energy is discharged.
18. All employees should wear proper personal protective equipment on all jobs where required. Electrician gloves, rubber mats etc. must be inspected for punctures or other defects/damages before their use each time.
19. While doing work on overhead lines, which may cause danger for the pedestrians passing beneath, a sign to be placed prominently “Danger- Men working overhead”.
20. Do not attempt to free somebody who comes in contact with live conductors with bare hands. Try to disconnect/switch off the power supply, if not possible, put on rubber gloves or thick fold of dry clothing before attempting to release the victim. If live wires are directly upon the victims a dry stick should be used for removing the wires. Artificial respiration to be given If the victim ceases to breath as a result of electric shock as soon as he is freed from the electrical contact.
21. Working areas in the Fuel oil Tank should be adequately illuminated so that work can be done conveniently at night.
22. All temporary electrical connections should be got done to conform to statutory regulations & a certificate obtained by the authorities. As far as possible, the cable to be safely buried to ensure free access to equipments & machinery movement.
23. Earthing of machines and equipment shall be ensured and no open/ bare connections allowed.
24. Danger signals & safety tags in the live areas shall be demonstrated properly.
25. For temporary electrical connection to construction area, main switch board should be at least 1mtr above the ground level.

9.3 Construction, Installation, Protection Operation and Maintenance of Electric Supply Lines and Apparatus

1. All electric supply lines and apparatus shall be of sufficient ratings for power, installation and estimated fault current and of sufficient mechanical strength, for the duty which they may be required to perform under the environmental conditions of installation, and shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals, and property.
2. The relevant code of practice of the Bureau of Indian Standards including National Electrical Code if any may be followed to carry out the purposes of this rule and in the event of any inconsistency, the provision of these rules shall prevail.

3. The material and apparatus used shall conform to the relevant specifications of the Bureau of Indian Standards where such specifications have already been laid down.

9.4. Service Line and apparatus in various working areas.

1. The Electrical Department shall ensure that all electric supply lines, wires, fittings and apparatus belonging to him or under his control for which electric supply is to be given are in a safe condition.
2. Service-lines by the Electrical Department shall ensure to secure the system under all ordinary conditions against electrical, mechanical, chemical or other injury to the installation.
3. The Electrical Department shall also ensure that the installation under his control is maintained in a safe condition.

9.5 Accessibility of Bare Conductors

Where bare conductors are used in a building, the Electrical department shall

1. Ensure that they are inaccessible.
2. Provide in readily accessible position switches for rendering them dead whenever necessary; and
3. Take such other safety measures as are considered necessary.

9.6 Danger Notices

The owner of every medium, high and extra-high voltage installation shall affix permanently in a conspicuous position a danger notice in Hindi or English and the local language of the district, with a sign of skull, bones and voltage level as per the relevant ISS No. 2551 on:

1. Every Motor, Generator, Transformer and other Electrical Plant and equipment together with apparatus used for controlling or regulating the same;
2. All supports of high and extra-high voltage overhead line which can be easily climbed-upon without the help of ladder or special appliances.

Explanation Rails, tubular poles, wooden supports, reinforced cement concrete poles without steps. I-sections and channels shall be deemed as supports which cannot be easily climbed upon for the purposes of this clause.

3. Luminous tube requiring high voltage supply, X-ray and similar high-frequency installations:

Provided that where it is possible to affix such notices on any Generator, motor, Transformer or other apparatus, they shall be affixed as near as possible thereto or the word 'danger' & the voltage of the apparatus concerned shall be permanently painted on it

Provided further that where the Generator, motor, Transformer or other apparatus is within an enclosure one notice affixed to the said enclosure shall be sufficient for the purposes of this rule.

9.7 Instructions for Restoration of Persons Suffering from Electric Shock

1. Instructions, in English or Hindi and the local language of the district and where Hindi is the local language, in English and Hindi for the restoration of persons suffering from electric shock, shall be affixed by the owner in a conspicuous place in every generating station, enclosed sub-stations, enclosed switch-stations and in every factory as defined in clause (m) of section 2 of the Factories Act, 1948 (63 of 1948) in which electricity is used and in such other premises where electricity is used.
2. Copies of the instructions shall be supplied on demand by an officer or officers appointed by the Central or the State Government in on this behalf at a price to be fixed by the Central or the State Government.
3. The owner of every generating station, enclosed sub-station, enclosed switch-station and every factory or other premises to which this rule applies, shall ensure that all authorised persons employed by him are acquainted with and are competent to apply the instructions referred to in sub-rule (1).
4. In every manned high voltage or extra-high generating station, sub-station or switch station, an artificial respirator shall be provided in good working condition.

CHAPTER 10

SAFETY GUIDELINES RELATED TO FIRE

Safety Guidelines Related to Fire

10.1 Introduction:

In view of the fire incident in the power houses, fire protection facilities have to be provided & fire department has to be always well prepared & ready to tackle effectively any fire occurrence. Hazardous situation in the Plant premises cannot be ruled out as materials like wood, plastic, paper, oil, lubricants, electric cables etc. are used.

This fire order provides compiled information on details of fire protection facilities and fire prevention guidelines. It is expected that everyone will study and adopt the procedures and precautions and be well conversant with all responsibility during any emergency situation.

10.2 Fire Extinguishers:

10.2.1 Portable fire extinguishers are provided at conspicuous and accessible locations on each floor so that these can be utilised to control the fire when it is in an incipient stage and easiest to control.

10.2.2 The fire extinguishers provided are of Water Type gas fire extinguishers, Carbon dioxide fire extinguishers, DCP fire extinguishers, AFFF fire extinguishers etc.

1. **Water type gas extinguishers** contain liquid carbon dioxide cartridge surrounded by water. When top knob of extinguisher is hit, the gas cartridge breaks and CO₂ gas forces water to come out through the outlet nozzle in the form of a jet which extinguishes fire primarily by its cooling action. These water type gas extinguishers are good for fighting fires due to plastic, foam, wood, paper etc. These extinguishers should not be used on electrical equipment since water conducts electricity and makes the user vulnerable to electrical shocks.

Directions and precautions for use:

- a. Take the extinguisher from the box and bring it near to the fire.
 - b. Hold up right and remove the safety clip from the knob.
 - c. Strike the knob with the palm of the hand.
 - d. Direct the jet to the base of the flame by means of hose pipe.
2. **CO₂ Type Extinguishers** contain liquid carbon-dioxide in the cylinder body which comes out on opening the valve in the form of gas. CO₂ gas extinguishers extinguish fire by reducing the oxygen content of surrounding air to appoint where combustion can't sustain itself. It is mainly used for fighting fires on electrical or electronic equipment.

Directions and precautions for use:

- a. Carry the extinguisher to the place of fire.
- b. Remove the safety pin and unscrew the valve of the extinguisher.
- c. Direct the jet at the base of the fire starting at one edge and sweeping across the burning material.
- d. When use in open air, Operator should stand upwind direction and apply the gas in a downward direction.
- e. Direct the gas as close as possible to the fire.
- f. The gas at the time of discharge makes considerable noise. The user should, therefore, be well conversant with its operation and prevent the jet from being misdirected during first few vital seconds.

3. DCP Fire Extinguisher can be used on any electrical fire.

Direction and precaution for use:

- a. Pull out safety pin from valve
- b. Aim discharge nozzle at the base of Fire
- c. Pressure control lever of the Extinguisher

4. AFFF Fire Extinguishers can be used for Extinguishing Class 'B' fire involving flammable liquids like petroleum products, HFO, LDO etc. Foam acts as a extinguishing medium by providing blanketing effect.

Direction and precaution for use:

- a. Pull out safety pin from valve.
- b. Aim discharge nozzle at the base of Fire
- c. Pressure control lever of the Extinguisher.
- d. Direct the jet to the base of the flame.

10.3 Fire Exits/Escapes Routes

1. Fire exits are provided on each floor. In the event of a fire, occupants should vacate the building by using either the main staircase or the spiral staircase in fire Exits.
2. The key of the fire Exits are kept in the glass boxes provided at the entrance of the fire Exit. To open the fire Exit, one has to break the glass and take out the key of the fire Exit.
3. All employees should in their own interest, know the fire Exits of various floors.
4. Ensure that fire Exits do not have any obstruction.

10.4 Fire Prevention Measures:

1. An enhanced awareness of fire protection equipment and facilities is the first step

towards fire prevention.

2. Do not smoke in the office as smoking is banned in HPGCL Offices. If any one does in his own interest, we must object and also report.
3. Do not keep electrical appliances "ON" unnecessarily. Switch off fans, tube lights, A/C etc. while leaving the office.
4. Smoke coming out of electrical appliances or smell of burning electrical wiring must be reported to Administrative/Safety Department immediately and supply should be switched off.

10.5 Classification of Fires

Fires are classified in four groups based on the type of material under fire.

1. **Class "A"** fires involve solid materials of organic nature like wood, paper, textiles, etc. A cooling media like water is essential for extinguishing such fires.
2. **Class "B"** fires involve flammable liquids like petroleum products, solvents, paints etc. Blanketing effect with foam or heavy gas like CO₂ is essential for extinguishing these fires.
3. **Class "C"** fires involve gases or liquefied gases under pressure. It is necessary to isolate the burning gas at a fast rate with an inert gas, powder or vaporizing liquid for extinguishment. CO₂ or DCP should be used for extinguish such fires.
4. **Class "D"** fires occur in combustible metals like magnesium, sodium etc. and specialized techniques and extinguishing agents are needed to control such fires. Special dry powder should be used in such cases.

10.6 What to do in Case of Fire:

1. Attempt to extinguish fire using appropriate fire extinguisher.
2. Switch-off power supply in case the fire involved electrical equipment.
3. Inform fire department immediately on telephone numbers displayed at various locations like control room and critical sites fire station security on their Telephone numbers.
4. Use CO₂ or DCP type extinguisher only on electrical fires.
5. In case fire is spreading beyond control then employees should rush to the nearest Fire Exit and leave the floor. Fire brigade staff will take care of fire fighting thereafter.
6. While evacuating the floor, employees should have a quick look for any suspicious or unusual object lying on the floor/passage.
7. Help handicapped colleagues, if any, on your floor or any others who may need help.

10.7 What Not to do in Case of Fire:

1. Do not panic.
2. Do not stop to collect personal belongings.
3. Do not use lifts and make use of staircases only.
4. Never leave the fire Exit door open unnecessarily in the event of fire as smoke may enter the fire Exit staircase thereby making the evacuation of other employees difficult.
5. Water based fire extinguishers should NEVER be used on electrical fires since water conducts electricity thereby making human beings vulnerable to electrical shocks.

10.8 Role of Fire Staff During a Fire:

1. After receiving information the fire personnel should rush to the spot and attempt to extinguish the fire with the suitable fire extinguishers.
2. Inform the Fire Section Control Room about fire incident giving all details like building No., Floor Department or exact location of the site etc.
3. Assist in fire-fighting operation and evacuation/rescue of employees.
4. Ensure that drive way is clear of vehicles for movement of fire brigade vehicles.
5. Stop entry of outsiders/visitors.
6. A record of Fire calls/incidents will be maintained by Fire Department.
7. Every fire incident is to be investigated and preventive measures are to be informed to the concerned.

10.9 Implementation:

1. Corporate Safety Group shall organise meetings at least once a quarter and conduct periodical fire inspections.
2. Training will be provided by Fire Safety Group to employees including those employed on security duties.

CHAPTER-11

OCCUPATIONAL HEALTH & SAFETY

OCCUPATIONAL HEALTH & SAFETY

11.1 Hygiene

Almost all work environments present some kind of hazards. These include burn from hot objects/materials and action by toxic and corrosive chemicals. Contact with the later can produce effects ranging from damage to living tissues, dermatitis etc. In order to prevent oneself from getting affected by these agents, one should follow good hygiene. The general preventive measures to be followed are:

1. **Wash Frequently Using Proper Cleansers:** Use plenty of fresh clean water and soap or other approved cleaner. Do not use petrol, or solvents to clean skin.
2. **Change cloth often:** Do not keep work-soiled clothes on for long. Keep fresh laundered clothes handy and change into them frequently
3. **Remove irritants:** Do not allow irritating matter to remain on skin, wash it right away.
4. **Take showers:** Take a thorough shower bath, before leaving any contaminated area after work. Shower immediately in case of accidental splash of chemicals on skin.
5. **Separate soiled clothing:** Work clothes should not be mixed with the family wash, especially if they are used in hazardous chemical handling areas. Heavily contaminated clothing should not be taken to home. Generally wash them at the work place.
6. **Treat abrasions promptly:** Cuts, scraps, puncture etc. provide ready pathways for toxic materials to enter the blood stream. Wash them immediately and thoroughly, and apply antiseptic and bandage.
7. **Apply barrier creams:** Protective creams or “barrier creams: though not as effective as protective clothing, should be used where wearing protective clothing is not possible, and also as a supplement to protective clothing. The skin surface should be washed thoroughly before applying barrier creams. Wash off with recommended cleansers and reapply frequently.

11.2 First Aid

Although every injured person must be sent to the hospital/First Aid Center without delay, there are always certain first aid measures that may be administered to prepare the patient, and perhaps even save his life, before the doctor’s services can be obtained some of the common injuries and the most important first aid measures are as follows:

1 Shock

Practically every injury of any consequence is accompanied by shock, and every injured person should be treated to prevent or reduce the severity of it. The treatment is

- a. Lay the patient down
- b. Keep him warm

2 Minor Wounds

- a. Do not touch the wound with anything.
- b. Proceed to the hospital immediately.
- c. For wounds with spurting/Jet flow of blood, stop or retard the bleeding by placing a clean bandage, a handkerchief or the like over the wound and applying moderate pressure with fingers on the bandage. In case bleeding still persists, apply a tourniquet, around the arm or leg between the arm, leg wound and the heart and twist tightly enough to stop the circulation of blood to the injured part. The tourniquet must be loosened at intervals for not more than twenty minutes to allow re-circulation of blood or death to limb may result.
 - i. Lay the patient down and keep him warm.
 - ii. Transport by ambulance to medical.

3 Fractures – Definite or Possible

- a. Don't bend or twist a limb to determine whether the bone is broken.
- b. Keep patient lying down and keep him warm.
- c. For fracture on the back & neck or distorted fractures of the arm or leg, don't move the patient, except in cases where the life of the injured is in danger in which case, remove the injured gently. Call the doctor.
- d. For fracture or any other part of body – place the patient gently on stretcher and transport by ambulance to hospital.

4 Burns

- a. Remove the cause of the burning.
- b. Apply cold water to the burn area and wrap in water gel blanket/bandage and lay him on a stretcher.
- c. Transport to hospital by ambulance.

5 Asphyxiation by Drowning, Electrocution, Gas etc.

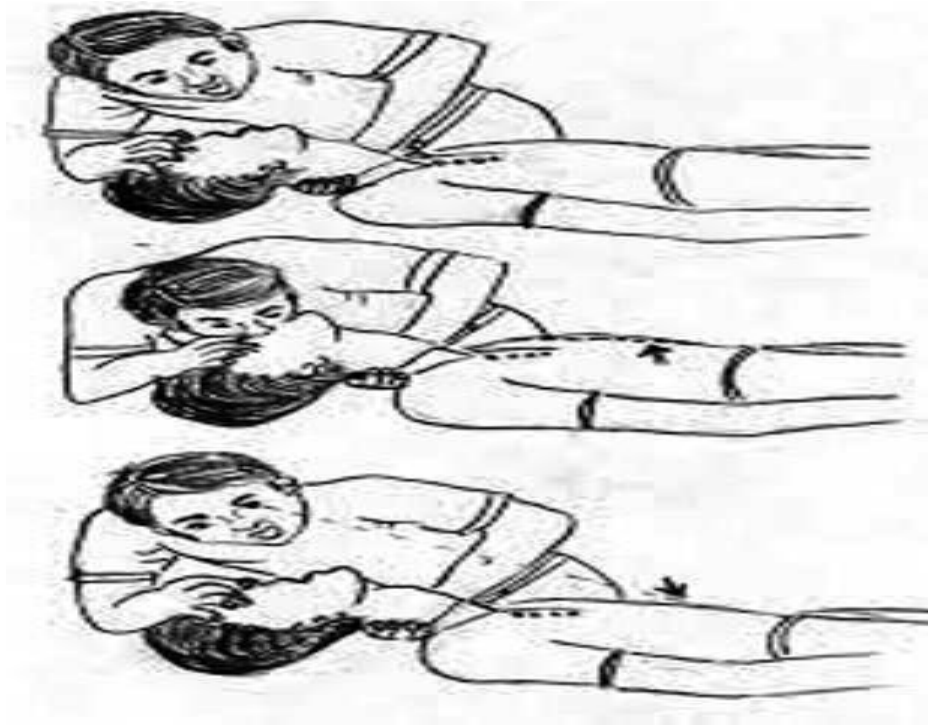
When a person stops breathing as a result of drowning, electric shock suffocation or other causes, artificial respiration or resuscitation/Revival must be given.

The aim of resuscitation/Revival is to prevent damage to the brain and other vital organs, which may occur due to lack of oxygen, prompt ventilation of the lungs, and if necessary, external cardiac compression can re-establish the oxygen requirements. The three main steps to be taken are:

- a. Ensure an open airway.
- b. Ventilate the lungs.
- c. Stimulate heart

6 Mouth to Mouth Respiration Method

- a. Lay the patient flat on his back – raise shoulders.
- b. Tilt the head backward, maintain clear airway (clean the mouth throat for any obstruction)
- c. Open your mouth wide – take a deep breath.
- d. Pinch his nostrils with your fingers.
- e. Seal your lips around his mouth.
- f. Blow into his lungs until they are filled.
- g. Then remove your mouth, watch chest movement.
- h. Repeat 13 times per minute, if his color does not improve, check the cardiac pulse (neck) if there is no response and the pupils are widely dilated color becomes or remains blue gray, the heart has clinically stopped beating. Start immediately external cardiac compression.



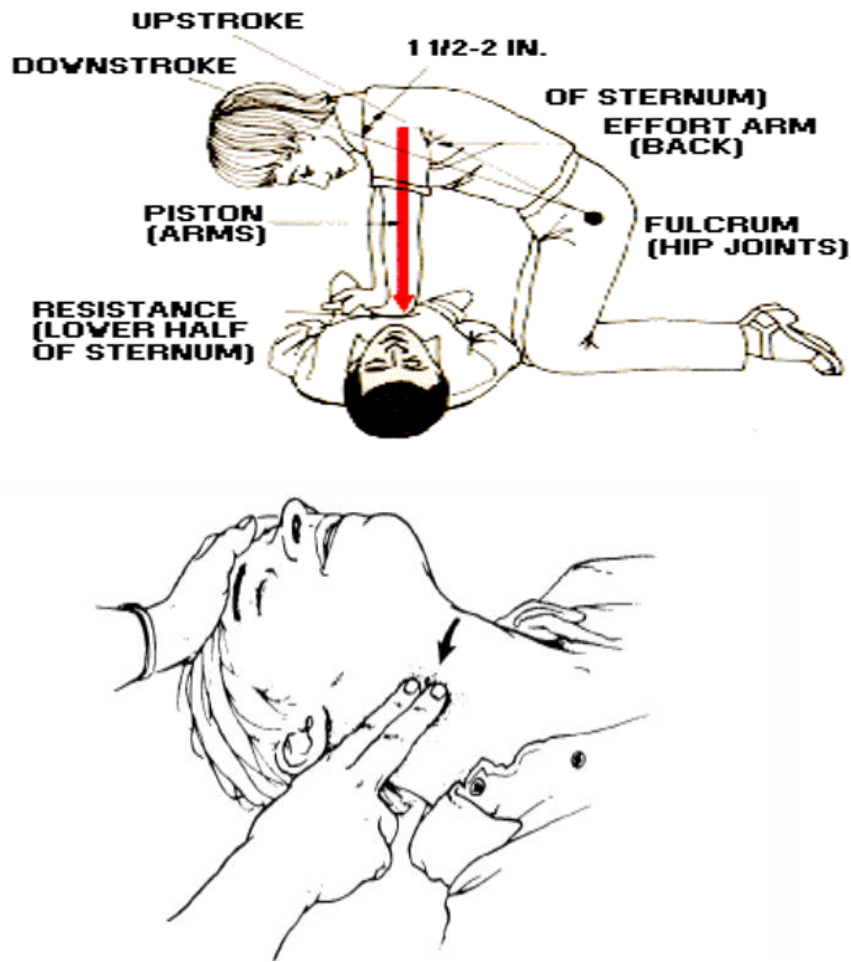
7. External Cardiac Compression

Strike the chest over the heart smartly, this mechanical stimulus may start the heart beating, if still no response, start External Cardiac Compression while continuing to ventilate lungs in the ratio of one inflation of the lungs to six or eight compression of the sternum (Breast Bone)

METHOD

- a. Position yourself at side of patient.
- b. Place the heel of your hand on the lower half of the breast bone keeping the fingers raised
- c. Cover this hand with your other hand
- d. With straight arms, rock forward and down on the lower half of the heart bone.
- e. Repeat the pressure once per second. (This pressure in all cases should be firm and controlled violent action is dangerous)
- f. Check by noting size of the pupils, feeling the cardiac pulse and patient's color. Heart resuscitation/Revival may have to be continued until patient reaches hospital.
- g. The patient must be watched, and if natural breathing stops, artificial respiration should be resumed at once.

- h. In carrying out resuscitation/Revival it may be necessary to change the operator. This change must be made without losing the rhythm of respiration.



11.3 Occupational Health Program

Occupational Diseases:

Occupational disease is defined as a condition that results from exposure in a workplace to a physical, chemical or biological agent to the extent that the normal physiological mechanisms are affected and the health of worker is impaired.

Occupational diseases normally develop over a period of time because of work place conditions. Such conditions might include exposure to chemicals, dust, industrial noise etc. In a power plant occupational diseases primarily occur in dust prone, high noise and chemicals related workplaces.

Objectives of Occupational Health program:

Objectives of Occupational Health Program at Power Plant aim to preserve and promote the health of employees. This program aspires to give better quality of life and promotes well-being of employees which in turn will enhance productivity. Occupational Health

Program covers all aspects of health – Preventive, Promotive, Curative and Rehabilitative.

The main objectives are:-

1. To take requisite necessary steps by concerned departments to prevent occurrence of occupational diseases by using PPEs.
2. To promote and monitor general well being of employees by conducting medical examination comprising medical tests like Audiometry, Pulmonary Lung Function Test, Chest X-ray, Vision Testing, Liver Function Test, Kidney Function Test
3. For early detection and timely curing of occupational diseases medical examination to be conducted on annual basis.
4. To advise proper medical treatment to employees found affected with occupational diseases like hearing loss due to industrial noise, respiratory symptoms due to inhalation of dust particles etc.
5. To relocate/rehabilitate severely affected employees by suitably shifting their workplaces.

Occupational Health diseases are categorized in three parts are mentioned below

A. Part A

1. Infectious and parasitic disease contracted on an occupation where there is a particular risk of contamination.
2. Diseases caused by work in compressed air.
3. Diseases caused by lead or its toxic compounds.
4. Poisoning by nitrous fumes.
5. Diseases by organo phosphorus compounds.

B. Part B

1. Diseases caused by phosphorus or its toxic compounds.
2. Diseases caused by mercury or its toxic compounds.
3. Diseases caused by benzene or its toxic homologues.
4. Diseases caused by nitro and amino toxic dervative of benzene or its homologues
5. Diseases caused by chromium or its toxic compounds
6. Diseases caused by arsenic, or its toxic compounds
7. Diseases caused by radioactive sub-stances and ionising radiations
8. Primary cancer of the skin caused by tar, pitch, bitumen, mineral oil, anthracene, or the compounds, products or residues of these substances
9. Diseases caused by the toxic halogen dervative of hydrocarbons (of the aliphatic and aromatic series)

10. Diseases caused carbon disulphide
11. Occupational cataract due to infrared radiations.
12. Diseases caused by manganese or its toxic compounds
13. Skin diseases caused by physical, chemical or biological agents not included in other items.
14. Hearing impairment caused by noise
15. Poisoning by dinitrophenol or a homo-logue or by substituted dinitrophenol or by the salts of such substances.
16. Diseases caused by beryllium or its toxic compounds
17. Diseases caused by cadmium or its toxic compounds
18. Occupational asthma caused by recognized sensitizing agents inherent to the work process.
19. Diseases caused by fluorine or its toxic compounds

C. Part C

1. Pneumoconioses caused by sclerogenic mineral dust (silicoses, anthraosilicosis, asbestosis) and silicotuberculosis provided that silicosis is an essential factor in causing the incapacity or death.
2. Bagassosis
3. Bronchopulmonary diseases caused by cotton, flax hemp and sisal dust (Byssionsis).
4. Extrinsic allergic alveolitis caused by the inhalation of organic dusts.
5. Bronchopulmonary diseases caused by hard metals

CHAPTER-12

POTENTIAL THERMAL POWER PLANT HAZARDS

POTENTIAL THERMAL POWER PLANT HAZARDS

12.1 General

1. During the course of operation and maintenance of the Plant, care should be taken that the procedures adopted are commensurate with laid down safety rules and codes. Overlooking of any aspect of Plant and personnel could result in injury to personnel and in extreme case, loss of life. During the procurement, installation and erection of the equipment, it should be ensured that all in built safeguards applicable as per the relevant codes of practice have been incorporated. It is important that all safety devices and means for meeting emergencies are kept in good working order so that their immediate availability is assured.
2. **Safety codes must be strictly enforced.** Accidents caused by apparently minor items such as spillage on the floor of slippery materials like oil and greases, snapping of wire slings & shearing of bolts in lifts in excess of capacity or due to broken/damaged strands, loose clothing in the vicinity of rotating objects, such as jobs on lathes or unguarded pulleys & chain drives, failing of temporary structures due to inadequacy or over loading of members, electrical accidents etc. are largely avoidable provided due care is taken to observe safety codes including good housekeeping, issue of proper written work permits, careful checks of lifting devices, provision of guards on rotating machines. Where Plant personnel may have to work in the vicinity, tagging of equipment on which men are working, properly isolating all electrical circuits on which work is in progress and interlocks to avoid inadvertent switching 'on' of circuits, are only but a few instances to illustrate how accidents take place & how they may be avoided. Good house-keeping practices in the power house not only contribute towards clean appearance of the building and equipment but also ensure safe operation and longer life of equipment.
3. All power driven machinery are operational hazards if proper fencing and guards have not been provided. It is not safe to assume that the designer has incorporated all safeguard required for safe operation of the equipment. It is advisable to study & incorporate adequate safeguards of equipment with V-belt drives and pulleys, conveyor head and tail pulleys etc and make modification to suit local operating conditions. A look out is to be kept for careless operators, who owing to misguided views of convenient operation, deliberately by-pass the safety devices provided.
4. Safety goggles must be worn while using portable or stationary grinders to avoid foreign matter causing injury to the eye. Welding operation in the workshop should be carried out with temporary screens placed around the area to avoid exposure to ultra-violet rays of the

people working in the neighborhood. While on field repairs, the workers should be careful not to expose themselves and fail to protect their eyes from welding flashes. The planks used in preparing scaffolding should be adequately secured on both sides to prevent people against catapulting accidents. Manhole covers should always be replaced or a temporary fence built around the opening to avoid accidents. An enclosure should be built around acid and alkali tanks. Material and passenger lifts should be checked thoroughly and frequently to ensure safe operation.

5. Effective means of fire protection have been provided in all the vital areas of the power station. It is mandatory to maintain all the equipment for fire warning and protection in prime condition so that their immediate availability can be assured at all times. The necessary safety instructions shall be inculcated into the O&M personnel by providing them adequate training.

12.2 Causes Of Accidental Fires

1. Calamitous fires can be caused by undetected leakage of turbine oil from the HP oil system or oil leakage from turbine bearing seeping onto hot lagging on adjacent steam pipes and turbine casings or spillage of oil on failure of a joint in the high pressure oil system onto hot surface. Serious fire risk may arise from the leakage in Generator cooling hydrogen circuit. Welding, smoking and other activities causing open flame in the area should be prohibited.
2. Hazards also exist in heated fuel oil system, belt conveyors, cable in confined tunnels, equipment under heavy fault conditions and containing oil, such as Transformer and oil circuit breakers, fuel and light oil storage tank area, hydrogen generation Plant etc. It must be ensured that fire hydrants, CO₂ or foam type fire extinguishers have been provided in all areas where potential fire hazards can be envisaged.

12.3 Fire Protection Measures

The protection system as available in the power Plant can be divided into two main groups as stated below:

12.3.1 Fire Hydrant System

This system covers all the hydrants located in the Plant area. The fire fighting medium is pressurized clear water. The pumps are interlocked to start whenever the line pressure drops below a certain value (on the opening of any hydrants in the system). Jockey pumps are provided to maintain the line pressure at the desired value to take care of small drips. Periodic drill must be conducted to see that the equipment is in prime running condition and available in the event of need. Fire hoses along with associated nozzles must always

be available in close proximity of the hydrants. Pump 'Start' interlocks should be tested under simulated conditions from time to time.

12.3.2 Emulsifier System

1. This protection has been provided to quench heavy duty oil filled Transformers i.e. Generator Transformers, unit Auxiliary Transformers, Station Transformer and Turbine Lube Oil Tank/Pipe work. This system automatically comes into operation through the failure of quartzoid bulb of the sprinklers provided in lines pressurized by compressed air for which a separate compressor has been provided. These bulbs, which are made of quartz, contain a highly expansible liquid, break when the liquid in the bulb expands due to excessive heat produced by fire.
2. This result in the drop of air pressure in the line, which in turn will open a differential air deluge valve provided in the main emulsifier header of the affected Transformer, which results in high pressure water sprinkling on the Transformer from all sides.
3. Daily checks shall be conducted to see whether the water and air line pressure are being maintained. Emulsifier system for each Transformer shall preferably be tested under simulated conditions on long outages of the units, when Transformer is in de-energized state.

12.3.3 Fire Precautions

1. Smoking

- a. Lighting cigarette ends carelessly thrown out of window, on the floor or into waste paper baskets caused numerous fires. Discard them in ash-trays after extinguishing.
- b. Don't smoke in plant premises.

2. Cooking

- a. LPG stoves should be lighted the correct way. The burner should be turned on after holding a lighted match stick or a gas lighter close to the burner.
- b. Cylinder valve should be shut off at the end of the day.
- c. Tube connecting the cylinder and stove should be free from cracks and cuts. Change the same regularly.
- d. While using kerosene stove, never over-pump or attempt to refill it when it is burning.
- e. Store the LPG cylinder in a well-ventilated place.
- f. Instruction card for handling LPG leak emergency should be kept in a really accessible location for reference.

3. Electrical Fires

- a. Do not put too many plugs in one socket. This can generate heat through overloading and burning away the insulation.
- b. Inserting bare wire ends in a socket without a plug will cause arcing and generate heat. Always use a proper plug.
- c. Protect the circuit and equipment against excess current by a correctly rated use.
- d. Leave the repairs and installation to an electrician.
- e. ISI mark for electric switches, stoves, immersion heaters and irons is mandatory. Check for this mark and as far as possible, use other electrical equipment also bearing ISI mark.
- f. Always switch off the appliance after use, especially the heaters, irons, etc.
- g. Switch off mains on vacation.
- h. When you notice a spark or fire in switch board, switch off the mains immediately.
- i. Get the wiring checked for signs of wear & tear and for insulation resistance. If it is less than 1 mega ohm, it needs replacement.
- j. Do not run flexible cords/wires under mats, carpets or through doorways where they may get crushed.
- k. Plumbers, electricians, welders and other repairers may connect their portable electric tools and welding equipment to the power outlets. Check that the rating of the appliance does not exceed rating of the socket.
- l. Use 3 pin plug and heavily insulated cords for all movable electrical equipment.

4. Flammable Materials

- a. Do not dispose off match sticks into rubbish bins before they are completely extinguished.
- b. Follow the instructions of the manufacturer for storage and handling of chemical/cleaning agents that are reactive/flammable.
- c. Some aerosol dispensers which use propane/butane propellants present potential fire and explosion risk. Similarly their lacquer which has volatile ethanol as an ingredient may form explosive mist when dispersed in air. Ignition sources should not be present when these are used.
- d. Store the aerosol cans away from heat source.
- e. Do not attempt to puncture the aerosol cans or throw them into fire. They will explode.
- f. Similar care be taken with paints, varnishes, turpentine and other cleaning solvents.

5. During Fire Emergency

- a. If your clothes catch fire, pour water if it is available. If not, stop where you are, drop to ground and roll. Do not run as it will only fan the flame.
- b. In case of a fire, alert others to evacuate and call fire brigade.
- c. If the fire cannot be fought, leave the room, shut the door and evacuate. Do not wait to collect possessions.
- d. Fire tends to spread upwards. Try to escape to lower floors and then to outside.
- e. Do not use lifts in a fire emergency. Use stairs, preferably the fire escape if available.
- f. Do not hide behind furniture or in toilets or run up to the terrace. If the room is getting smoke filled, use a wet cloth to cover nose and crawl out since the floor level takes longer time to get smoke filled.

12.4 Potential Hazards

1. Fire Hazards in Coal-Yard

Dead storage of coal in a power Plant should be of crushed coal, thoroughly compacted by use of mechanical equipment in separate stacks not higher than about 3 Meters. Few vapour ventilating tubes must be provided in the stack to release accumulated volatile matter. At frequent intervals inside temperature of the stack should be taken and recorded to obtain advance information if conditions of spontaneous combustion appear to be developing. Especially the coal should be thoroughly drenched (as opposed to just wetting) otherwise in the later stage it will assist in the development of a large scale fire.

2. Mobile Cranes

Precaution must be taken to ensure that the booms/jibs are not overloaded and beams are properly fixed before lifting heavy materials. A reference to load radius v/s lifting capacity diagram mounted in the crane must be made especially in case of heavy lifts. Care must be taken to maintain adequate clearance when operating near high voltage lines. Damage to ropes must be observed & timely replacements made as necessary.

3. EOT Cranes

- a. Good condition of wire ropes and their proper greasing must be ensured at all times. Brakes must be tested and set especially before planning heavy lifts. Adequate lighting must be ensured in the area of operation.
- b. It is preferable to conduct all lifting operations through a single line of command to prevent issue of contradictory instruction resulting in mishaps.

4. Electrical Safety

1. In general, electrical safety is achieved through intrinsic in built safety considerations in the equipment design, and strict implementation of the appropriate operation and maintenance codes including competent supervision must be ensured. Electrical accidents are not wholly due to electrical faults. Some situations cannot be always predicted. The real hazard to personnel arises during maintenance or inspection or routine test, when owing to 'human element', failure and omissions risk liability is increased.
2. Proper use of all safeguard such as rubber gloves, rubber soled shoes, properly insulated tools and obtaining of a timely 'Line clear' from the concerned operation staff etc. do much to reduce the risks. Prior information shall be given to the operating personnel well in advance as to which equipment is to be taken up for maintenance. Appropriate warning display signs on the respective control switches must be ensured so that the affected feeder is not inadvertently charged by an operator. Safety belts must be worn by the men working on the switchyard structures.

5. Dangerous Fumes and Lack of Oxygen in Confined Space

1. This is applicable to any chamber, tank, pit, flue or similar confined space in which dangerous fumes are liable to be present to such an extent that it constitutes a hazard to any person entering inside for maintenance purpose. Trial tests must be conducted and the space adequately purged. Continuous pressurized stream of air should be supplied for the convenience of men working inside.
2. Work in boiler furnace and flue gas path should not be started until it is ascertained that the furnace has sufficiently cooled down and adequately ventilated to permit safe entry. Special precautions are necessary in dealing with piled up ash in various passes and pent house. This may appear to be dead at the first sight but on raking the ash may be glowing. All accumulation of ash piles should be removed & cooling of the area must be ensured before permitting entry of the personnel in the area. Scaffolding must be adequately supported and safeguards must be provided against men falling off.
3. When the men are working in the drum, all piped connections connected to common pressurized headers or tanks must be either blanked or both valves shut tightly and tagged and preferably locked in position to prevent accident.

6. Accumulation of Inflammable Dust

1. Dust suppression/collection & safe disposal methods at the wagon tipplers, crusher house, transfer towers, bunker bay etc. have been provided. Their proper functioning must be ensured for the safety of the Plant & personnel. There is a potential danger of explosion and fires in pulverising Plants arising from surge back of hot furnace gases in to the mill. Observation of precautions like closing of hot air gate valves, mill discharge valves and raw coal gate whenever the mill is under shut down for maintenance do much to minimize the danger to personnel, who may be working on or around the mill. Defined means of fire fighting should always be in readiness to combat internal pulveriser fires. Leaks in pulveriser discharge, coal intake piping and pulveriser body joints shall be effectively plugged.
2. While safeguard have been provided to minimize the chances of the outbreak of fires, the operator should always be on the alert in case these safeguards fail.

7. Boiler Furnace Explosions

1. Continued pumping of unlighted oil in a hot furnace, leakage of oil line valves resulting in continuous drips in the furnace, rich pulverized coal-air mixture without adequate combustion air or accumulation of un-burnt pulverized coal in various passes constitute a potential hazard of furnace explosion.
2. The furnace should be properly purged before lighting up. Keeping this in view furnace Supervisory Safeguards System has been built in the scheme to avoid dependence on the operators and to ensure safe operation of the Plant. Flame monitoring is an essential feature of the system.
3. In spite of all safeguard provided there is no substitute for intelligent and careful working in and around the Plant for better availability of Plant and to avoid human misery as a result of accidents.

8. Compressed Air

There are many uses of air in a Thermal Plant. Compressed air is widely used as an instrument and Plant air in process units and for cleaning purposes as well as powering mechanical tools in workshops.

- a. Compressed air should never be used to clean up dust, filling and clothing.
- b. Compressed air should not be used to clean clothes or parts of body of any person.
- c. Horse play with compressed air should never be indulged.
- d. Whenever compressed air is used to clean any pressure vessel or other equipment, air pressure should not exceed 2.0kg/cm²(gauge). Also correct type of hoses and couplings should be used.

9. Hydrogen

1. Increased use of hydrogen in processing during recent years has added a special problem to Plant safety. Burning hydrogen generates tremendous heat and cannot be detected by naked eye.
2. The invisibility of hydrogen flames is a property that has led workmen to walk right in to the flame. The flame is totally carbonless. It also burn very rapidly with typical combination-89% hydrogen and 11% oxygen. When ignited at atmospheric pressure, this mixture has a flame speed of more than 3.3 K.M / second.
3. There is no chance of hydrogen accumulating at ground level, especially in the open. It has a vapour density of 0.07kg/m³ much lighter than air and will rise immediately.
4. Hydrogen being a very light gas diffuses very easily and remains in atmosphere. Therefore, special care should be taken to check hydrogen under pressure, especially in Hydrogen generation units.
5. Because of the wide range of explosive limit of hydrogen (minimum 4.1% and max. 74.2%) extreme precautions are necessary when hydrogen is introduced or withdrawn from a system.

10 Steam

1. Steam is very essential utility used in the Thermal Plant. If used properly & following the right procedures, steam is not a hazard. However, it may be very dangerous to use steam with insufficient knowledge of its limitation and dangers.
2. Steam can cause serious burns if any part of body comes in contact with it. Steam connection to vessels can, therefore, be very serious hazards to maintenance personnel. Therefore, all steam lines to process vessels must be disconnected, blinded off or closed with double block valve and bleeder and the valve wheel must be locked before workmen enter the vessel.
3. Another important feature is the isolation and the de-pressurization of steam lines for maintenance work. There have been many cases where persons have sustained serious burns, even total ones. Any work on steam line should be authorized by competent personnel. Steam can condense to 1/1600 of its original volume. The reduction in volume can cause high vacuum. Hence it is necessary to keep the vent open.
4. Care should be exercised while placing steam lines into service. Steam should be opened slowly to warm up the line slowly and expand thermally. Sudden heating by opening a full head of steam may cause hunting & rupture of the lines. Steam lines

should have drain points at all low points and at the farthest point downstream, to remove condensate and air from the line when being put into service.

5. For using a steam hose, make sure that the hose is secured properly to the steam-line. Open the steam valve gradually and hold the free end of the hose with hand so that it does not play around on its own. Use asbestos hand-gloves while operating the steam hoses/lancers.

11 Coal and Coal Dust:

A. Spontaneous ignition Hazard:

When coal is stored in a small layer or a large stack, the phenomenon of oxidation is certain to take place. Thus there is a tendency of self heating, which will be assisted by the presence of foreign matter such as straw etc. This tendency is effected by both area and type of the coal. The greater the area of the coal exposed surface compared with its bulk, greater is the tendency to self heating in a stack, self heating generally begins in the fine coal and dust. Coal should be stacked under water or in some other way designed to keep out air, or sufficient ventilation should be provided, Coal should not be stacked in large conical heaps. New coal should not be laid down upon old heaps. It should be stacked in quadrangle shape with 10 feet wide roadway all round it to facilitate access.

B. Controlling of fires.

- a. Surface of coal should not be watered, as this accelerates oxidations. Insufficient quantity of water may result in explosion of water gas, while the steam generated will create a draught that will increase the rate of oxidation of the interior of the stack. Small quantity of water at high pressure may be used to keep the surface cool.
- b. Hot area should be isolated from rest of the stock by Bulldozers etc
- c. In an early stage of heating a stack, it may be cooled by inserting a crow bar into the Top of the heap and moving it round so as to produce a funnel shaped hole. Holes are made to prevent the outbreak of a fire.

C. Coal dust:

1. Characteristics of Coal dust and Explosion Hazards:

When a mass of solid flammable material is heated, it burns away slowly layer by layer owing to the limited surface area exposed to the oxygen of the air. The energy produced is liberated gradually and harmlessly because it is dissipated as quickly as it is released. The result is quite different if the same mass of material is ground to a fine powder and intimately mixed with air in the form of a dust cloud. In these conditions the surface area exposed to the air is very great and, if ignition now occurs, the whole of the material will

burn at once. The energy which in the case of the mass was liberated gradually and harmlessly is now released suddenly with the evolution of large quantities of heat and reaction products.

2. **Explosive Concentrations:**

The lower explosive limits for most flammable dusts, such as coal is assumed to be 0.0550 ounces per cubic foot. The explosive limits are not well defined. The explosive range is not solely a function of dust material. The limits vary with the size and shape of the dust cloud.

3. **Causes and Condition of Explosion:**

- a. The concentration of dust and air should be within explosive limits.
- b. A source of heat at or above the ignition temperature is present. Generally explosion occurs in grinding and pulverising mills, in dust extraction Plants and cyclones. They are very frequently caused by the accidental inclusion of foreign particles of steel or stone in grinding or pulverising process, resulting in heat or sparks, though these sparks occur frequently but often in a favorable explosive atmosphere. In dust extraction ducts and cyclones, the cause has frequently been somewhere within the enclosed machinery either by friction or by break down of electric motors or wiring.

4. **Characteristics of coal dust:**

- a. Ignition temperature 610°C .
- b. Minimum spark energy required for ignition 600 milli Joules.
- c. Minimum explosive concentration 55 oz/ 1000 cu. ft.
- d. Maximum explosion pressure 85 psi.

5. **Precautions:**

- a. Fires and explosions in atmospheres of coal dust can be avoided by maintaining humid conditions.
- b. A dust explosion will occur only if coal is in the explosive range and at the same time a suitable source of ignition is present. Preventive measures should be aimed at avoiding the presence of either or preferably both, these factors in the system.

12 Belt Conveyors

Power driven belt conveyors are provided for transport of coal in Thermal Plants. The personnel working in the sections having belt conveyors must take extreme care not to get entangled in the belts. The rule prohibiting the wearing of loose clothing, loose turbans, shawls or Mufflers must be strictly observed.

- a. Persons must not cross over the moving conveyors except via proper access ways provided.
- b. Riding on moving conveyors is strictly forbidden.
- c. Standing on the supporting frame of the open conveyors while loading or removing material or when clearing blockages is strictly prohibited.
- d. In case of closed conveyors and especially when the belt is moving, no person should be allowed to step on to the cover plate. In case the work requires standing or sitting on the cover plate of closed conveyor, a strong wooden plank of sufficient length should be put across the frame and properly secured for men to stand or sit on for the execution of the work.
- e. Touching of moving belts, moving rollers, idlers with hand or with sharp tools is strictly prohibited.
- f. The walk ways alongside conveyors must be kept always free of spillage and other material and must be maintained in a non-slippery condition.
- g. The emergency stop switches and pull wires, wherever provided, should be periodically checked and maintained in good conditions.
- h. Lubrication, adjustments and repairs on the belt conveyors should be undertaken periodically.
- i. The personnel employed on the maintenance of the conveyors must take particular care not to leave tools, cotton waste etc. on the conveyor belt.
- j. Do not start any section of a conveyor without personally ensuring that no foreign materials are lying on the conveyor belt and that no worker is in position of danger.
- k. Maintenance jobs on conveyors shall be undertaken only under authority of safety work permit.
- l. Smoking or use of naked lights near the conveyors handling inflammable material and coal is strictly prohibited.
- m. Appropriate posters and notices will be exhibited near the conveyors warning personnel against wearing loose clothes.
- n. Notices should also be exhibited at prominent places indicating the method of stopping the conveyor in case of emergency.

13 Compressors, Pressure Vessels And Pipe Lines

- i. Fired and unfired pressure vessels, equipment and their connected pipe-lines are in widespread use in Power Plant. These vessels and pipe lines may contain air, explosive and noxious gases, corrosive liquids, steam and solids. They may operate

under high and super high pressure or under full or partial vacuum and in some instance pressure or temperature changes in the vessels may be acute and in rapid succession.

- ii. In view of the above, all employees who are working on such equipment and vessel either for operational or maintenance jobs should be strict in observance of operation instructions and maintenance procedure, laid down of every item of such equipment.
- iii. Every part of the Plant or machinery operated at a pressure greater than atmospheric pressure should be thoroughly examined by a competent person periodically and also after extensive repair etc. and necessary records of all such equipment and tests carried should be maintained as required by Factories Act.
- iv. No maintenance work on any pressure vessels equipment etc. should be undertaken without obtaining a safety permit to start the job. Before opening a vessel, it must be brought to atmospheric pressure.
- v. It must be ensured that the release valve and cocks are open. At least by two pressure gauges it must be ensured that the pressure inside the unit or vessel is atmospheric.
- vi. When manhole covers or cover plates of vessel are to be removed, all bolts or stud nuts should be slackened evenly a few turns at a time until all are slackened off about half way. Covers should then be eased from seating to ensure that inspite of the precautions taken by depressurizing the unit; the cover may not fly off due to any pressure behind the covers. When the cover is clear from its seating, bolts or stud nuts should be opened out to remove the covers.

14 Road Traffic Rules

1. These rules apply to the use of roads within the Thermal Plant boundary. These are in addition to the applicable Government rules. These rules are not inclusive of any safety instructions specifically applicable to different vehicles such as dumpers, mobile cranes, tractors etc.
2. The vehicular traffic must be kept to the left of the road except when passing a bicycle or a parked vehicle, which should be passed on the right. There shall be no cutting of corners.
3. The speed limit for all vehicles on main roads within the Thermal Plant is 25 km per hour.
4. Normal traffic signal should be used by all drivers.
5. There shall be no overtaking of one motor vehicle by another inside the Thermal Plant except in the following cases:
 - i. Slow moving vehicle like crawlers etc. can be overtaken.
 - ii. Fire engines and ambulance vans may overtake vehicle when on emergency duty.

The driver of a vehicle should check his vehicle every day before using it and ensure that the following are in good order to avoid any road accident.

- a. Brakes.
- b. Headlights
- c. Rear end stoplights
- d. Tyres
- e. Windshield and wipers
- f. Horns
- g. Rear view mirror

No one shall drive a motor vehicle on the Thermal roads unless he has a license to drive that vehicle.

The trial running of a motor vehicle to test its brakes or steering mechanism on the Thermal road must be done only by a person designated by the supervisor.

A motor vehicle must be loaded only according to the Government rules. The loading beyond and sides or the front of the vehicles or beyond 1 meter at its back is strictly prohibited. Also care should be taken not to load the vehicles up to a height which may entangle with overhead obstructions. Where this is not possible for any particular work, a responsible person from the concerned section must accompany the vehicle until the material has been unloaded.

Trucks carrying lengthy material hanging outside the tail board of the truck should carry red flags tied at the end of the materials.

Persons must not attempt to board or alight from a motor vehicle in motion. The driver must make sure before starting his vehicle that no one is alighting or boarding.

Vehicles must be started, stopped or turned gently and not suddenly.

Roads must always be kept free of obstruction. During road repair work or any excavation work along the road, proper barricades and suitable caution notices should be displayed.

No vehicles should be parked within 9 meter of any corner or rail crossing or road junction or a fire hydrant. Drivers must not leave their vehicles with engine running.

15 Pedestrians

1. Walk on the right side of Thermal Plant roads to see the approaching vehicles.
2. Avoid taking short cuts through process unit's areas.
3. Do not walk through restricted areas without approval of the appropriate unit supervisor or his delegate.

16 Rules for Bicycle Traffic

1. Double riding on a bicycle within the Thermal Plant is prohibited.
2. The practice of riding on a bicycle while leading another in one hand is prohibited.
3. Always ride in a single file.
4. Give proper hand signals.
5. Keep the bicycle in good condition with proper brakes.
6. Triple riding on a motorbike/scooter inside the Thermal Plant is strictly prohibited. The security personnel should report any violation of traffic rules by any employee of the corporation to the head of the department under whom the employee is working.

The traffic accidents must be reported to the fire & Safety division whether injuries are caused to personnel or not. Necessary action to deal with traffic collisions between motor vehicles and fixed or moving objects shall be taken up by the Fire and Safety Division. This division shall report the accident under the Factories Act, if necessary.

17 Rail crossings:

1. All vehicles, including dumpers, bicycle & pedestrians' should stop at every unmanned rail crossing, watch out on either side and cross the rails only when there is no traffic on the rails.
2. Crossing of rails except at levels crossing is prohibited.

18 Safety in the Railway Yard:

A. Locomotives:

- a. Only authorized and competent personnel should be employed on locomotives.
- b. Keep driving motors stopped while fueling.
- c. Do not move the locomotive with light off when natural light is insufficient.
- d. Do not stand on the buffers of the locomotive.
- e. Actuate the warning devices such as whistle a number of times when approaching a crossing, a building entrance etc.

B. Railway Tracks and Crossing.

- a. Do not sit or sleep near a railway track.
- b. Do not place or dump any material within 2.0 mtr. from either side of a railway track.
- c. The gateman must close gates provided on the level crossing, before the engine or the wagons move on the track.
- d. Exhibit notices, showing 'Danger' or 'Crossing signs' on either side of the tracks near a railway crossing.
- e. Red lights should be provided at such crossing during the night.

- f. Do not leave a wagon across walkways.
- g. Do not allow a vehicle to park near such crossing.
- h. Look both sides before crossing rails.
- i. Do not get tripped or slip on rails by signal wires or point rods while crossing.

C. Shunting Operations

- a. Only authorized and competent person should be employed on shunting operations.
- b. Fly shunting is strictly prohibited. Wagons should be brought to a full stop before the same are cut or coupled together.
- c. Make sure that all workers are clear off the 'Danger Zones'.
- d. Do not leave stationary wagons without securely braking them.
- e. No movement of wagons should be done without the permission of the supervisors.
- f. No person shall pass over or sit on the coupling between the two wagons while the same are in motion.
- g. Do not cross rails by crawling or passing underneath a train or a wagon. Also do not sit or sleep underneath a wagon.
- h. Do not move or push a wagon at the buffers always push from outside the rails.
- i. No adolescent shall be employed in moving, loading or unloading of wagons.
- j. Use scotch blocks/car blocks/rail clamps for stopping the wagons to avoid accidental movement. These devices should not be put before the running wagons. First place the scotch block etc. in position and when the wagon be pushed.
- k. Do not use weak, deteriorated and unsmooth scotch blocks. Make shift tools should not be used for stopping the wagons.
- l. Do not move wagons with door open fully or partially
- m. Keep clear of the flapper doors while opening the same. Falling door may strike you.
- n. Do not move the wagons near tippler & within the areas demarcated by the caution boards "no shunting beyond this limit".
- o. Shunting between the above limits should be with the permission of in-charge of marshalling yard/Assistant in-charge of marshalling yard.
- p. Signal should be given by authorized and competent persons only.

D. Loading and Unloading.

- a. Do not sit or sleep in loaded wagons. You are likely to be sealed and dispatched along with the material.
- b. Do not place or pile the unloaded material near or on the railway track. It may derail the wagons.

- c. Brake down the wagon properly, when it is being loaded, otherwise it may run away and you will fall down from the flapper door on which you are standing.
- d. Use car blocks for keeping the wagon in position while loading or unloading.
- e. Keep the platform clear of loose material otherwise are may slip and fall into the track.
- f. No movement of wagon should be done either by engine or manually near the wagons which are under loading or unloading.
- g. Where gang planks are used for loading and unloading, the same must be secured properly to avoid slipping of the planks.
- h. Do not use stones as car blocks.
- i. Do not move the wagons with crow bars, unless supported with wooden blocks/wedge for leverage. Otherwise, your fingers may be crushed.

19 Safe Handling and Storage of Compressed Gas Cylinders.

Compressed gases pose chemical and physical hazards. Gases can be toxic, inflammable, oxidizing, corrosive, inert or combination thereof. Being in gaseous form and pressurized, it can quickly contaminate a large area in the event of a leak. Therefore, familiarity with the chemical hazards of the gas is necessary. Additional hazard due to compression of gases is that it can make the cylinder to act as rocket. Following are the measures to use compressed gas cylinders safely.

A. General Requirements.

- 1. Contents of the gas cylinder should be clearly identified.
- 2. Do not deface or remove any markings, tags or stencil marks used for identification of contents attached by the vendor.
- 3. Cylinders which do not bear a legibly written, stamped, or stenciled identification of the contents should be segregated and returned to the vendor as soon as possible.
- 4. No person shall in any way interfere with or change the colour painted on a gas cylinder.
- 5. Do not use cylinder as rollers, work supports or jacks.
- 6. Caps used for valve protection must not be removed except when the cylinder is in use. A cylinder cap should be screwed all the way down on the cylinders neck and should fit tightly.

B. Leaking Cylinders.

- 1. If a cylinder containing poisonous gas is leaking, immediately leave the room, close the door (s), pull the nearest fire alarm, evacuate the area and inform from a safe place to the

concerned. The supplier should be contacted for disposal of the cylinder once the emergency situation is stabilized.

2. If a cylinder containing flammable or oxidizing gas is leaking, follow the same steps as above, but turn off all sources of ignition in the room prior to leaving, if the shut offs are accessible. Never attempt to extinguish /off the gas supply, explosive atmosphere could be created.
3. If the leaking cylinder contains inert gases, place the cylinder in a well-ventilated location, preferably an outdoor cylinder storage area and contact the vendor for removal.
4. If a cylinder or valve is noticeably corroded, the vendor should be contacted and their instructions followed. Any other damage that might repair the integrity of the cylinder should be called to the attention of the vendor before the cylinder is returned.
5. All gas lines leading from a gas cylinder should be labeled clearly to identify the gas carried.
6. The practice of transferring compressed gases from one commercial cylinder to another is NOT permitted.

C. Transporting Cylinders

1. Always use a suitable hand cart or similar device and the cylinder must be firmly secured for transporting and unloading. DO NOT roll or drag a cylinder to move it or allow cylinder to strike each other or any other surface violently.
2. Protective valve caps must be secured when moving cylinders. DO NOT lift or move the cylinder by the cap.
3. Ropes or slings should not be used to suspend cylinders unless the vendor has made provisions for such lifting and attachment points are provided on the cylinder.
4. Do not use a lifting magnet for loading or unloading any cylinder.

D. Storing Cylinders

1. All cylinder storage areas must be prominently marked with the hazard class or the name of the gasses to be stored, e.g. Flammable Gas Storage Area, and “No Smoking” signs posted where necessary.
2. Always secure gas cylinders upright (with valve end up) to a wall, cylinder hand truck, cylinder rack or post, unless the cylinder is specifically designed to be stored otherwise.
3. Where gases of different types are stored at the same location, cylinders (empty or full) should be grouped by the types of gas, e.g. flammable, oxidizer or corrosive. Inert gases can be stored with any other type of gas.

4. Filled cylinder should be stored separately from empty cylinder. Cylinders should be used by the “first in, first out” guideline.
5. Cylinders should be stored in a well-ventilated area well away from sparks, flames or any source of heat or ignition such as ovens, furnaces, boilers, incinerators, etc. Also ensure that cylinders are not subjected to direct rays of the sun. Do not use tarpaulin or any other cover in direct contact with cylinders as a protection against the sun rays.
6. Cylinders should not be exposed to continuous dampness, stored near salt or other corrosive chemicals or fumes. Corrosion may damage cylinders and cause their valve protection caps to stick. Cylinders containing corrosive chemicals should be periodically checked to ensure that the valve has not corroded.
7. Avoid prolonged storage of cylinders in corridors.
8. Never store cylinders in elevator lobbies, stair lowers or any other location which could obstruct the safe Exit pathway of the building occupants.

E. Precautions in General Use

1. Never tamper with or attempt to repair or alter cylinders, valves or any safety relief devices. Return cylinders to the vendor for all repairs.
2. Do not attempt to remove a stuck cap by using a lever in the cap ports. The lever may accidentally open the valve when the cap turns.
3. Do not place cylinders where they might become part of an electric circuit or allow them to come into contact with an electrically energized system.
4. Use “Snoop” soapy water for leak detection equipment to ascertain that there are no leaks in the gas transport system.
5. Use pressure regulators which are equipped with pressure relief devices.

F. Utilizing Compressed Gases

1. Before using the gas, read all label information and the data sheets associated with the use of that particular gas.
2. Before attaching cylinders to a connection, be sure that the threads on the cylinder and the connection mate, are of a type intended for gas service.
3. The threads and mating surfaces of the regulator and hose connections should be cleaned before the regulator is attached. Wipe the outlet with a clean, dry, lint-free cloth. Particulate can clog the regulator fitter (if so equipped) or cause the regulator to malfunction.

4. Always use the proper regulator for the gas in the cylinder. Always check the regulator before attaching it to a cylinder. If the connections do not fit together readily, the wrong regulator is being used.
5. Attach the regulator securely with the secondary valve closed and preferably with the regulator flow backed off (counter clockwise) before opening the cylinder valve wide.
6. Do not permit oil or grease to come in contact with cylinders or their valves, especially cylinders containing oxidizing gases.
7. Always use a cylinder wrench or other tightly fitting wrench to tighten the regulator nut and tube connections. Use “backup” wrenches to minimize stress on tubing and fittings where appropriate.
8. Teflon tape should never be used on cylinder connections or tube-fitting connections. Use Teflon only on pipe threads where the seal is made at the threads. All other connections have metal to metal face seals or gasket seals.
9. Open cylinder valves SLOWLY. Point the valve opening away from yourself and other persons. Never use a wrench or hammer to open or close a hand wheel type cylinder valve. If the valve is frozen and cannot be operated by hand, return the cylinder to the vendor.
10. Before a regulator is removed from a cylinder, close the cylinder valve and release all pressure from the regulator.

G. Special precautions for using flammable gases

In addition to the above guidelines, the following measures should be taken when handling flammable gases.

1. Cylinders containing flammable gases (empty or full) should be separated from cylinders containing oxidizing gases by a minimum distance of 1 meter or fire resisting partition wall in between them.
2. Do not store flammable or oxidizing gases near highly flammable solvents, combustible materials or near unprotected electrical connections, gas flames or any other source of ignition.
3. It is preferable to store flammable gases in a ventilated, fire resistant enclosure. If this is not possible, flammable gas cylinders should be stored in a well ventilated space.
4. The quantity of flammable gases in a laboratory should be kept to a minimum.
5. It is preferable to use flow restrictor or surge protectors on flammable gas cylinders so that there cannot to be a sudden large flow of gas if a rupture or other unexpected release happen in the system.

H. Special precautions for using poisonous gases

In addition to the general guidelines, the following measures should be taken when handling poisonous gases:

1. Poisonous gases must be stored in a ventilated enclosure, e.g. fume hood
2. Gas detection systems may be required in laboratories utilizing poisonous gases.
3. The quantity of poisonous gas in a laboratory should be kept to a minimum.
4. Flow restrictors are required on most poisonous gas cylinders.
5. Ensure the pressure-relief devices vent directly to a laboratory exhaust system.

I. Special precautions for using oxidizing gases

In addition to the general guidelines, the following measures should be taken when handling oxidizing gases:

1. Do not permit oil or gases to come in contact with cylinders or their valves, especially cylinder containing oxidizing gases. Regulators and tubing used with oxidizing gases must be specially cleaned to remove oil and other reducing agents. Explosions may occur when pressurized oxidizers, e.g. oxygen, come into contact with grease or oil.
2. Cylinders containing oxygen or oxidizing gases, e.g. chlorine, (empty or full) should be separated from cylinders containing flammable gases by a minimum distance of 1 meter or fire resistant partition wall in the between them.
3. Do not store oxidizing gases near flammable solvents, combustible materials or near unprotected electrical connections, gas flames or other sources of ignition.

12.5 Food Safety

1. Millions of people around the world fall sick as a result of consuming contaminated food and water.
2. Food Contaminating Agents: Bacteria, viruses, parasites, pesticide & veterinary drug residues, food additives, naturally occurring toxins, industrial contaminants etc.
3. Legal Requirements: The Prevention of Food Adulteration Act, 1954 and Rules, 1955 there under require:-
 - a. Analysis of food samples.
 - b. Prescribing food quality standards.
 - c. Notice of food poisoning by medical practitioners.
 - d. Labeling of food giving name, trade name, composition, best before or manufacture date, etc.
 - e. Restriction on dose of irradiation for onions, potatoes, spices, mangoes, rice, dried fruits, meat and meat products etc.

- f. Prohibition of use of inorganic coloring matters.
- g. Restriction on use of synthetic food colors (azo, xanthenes, etc.) in ice-creams, cakes, fruit drinks, etc.
- h. Restriction on use of poisonous metals such as lead, copper, arsenic, tin, zinc, cadmium, mercury, chromium and nickel.
- i. Restriction of use of insecticides on foodstuffs.
- j. Restriction on use of solvent in extraction of cocoa, oils, fats, etc.

Report even slightest doubt about the quality of foods to Food and Drug Administration and local health authorities.

Following are some simple tips to ensure safe and hygienic food in Canteens:

1. Buy raw as well as ready-to-eat food from safe and hygienic sources.
2. Prefer packaged foods and bottled beverage.
3. Insist on Agmark/ISI certified food products.
4. Check for 'Expiry' or 'Best before' date.
5. Ensure that food articles are packed in clean and hygienic wrappers/containers.
6. Avoid fruits with damaged skin.
7. Buy perishable foods last & take them straight Plant to refrigerator.

A. Storage & Handling

1. Refrigerate or freeze perishable foods quickly after purchasing.
2. Store leftovers at temperature below 10 °C.
3. Keep raw meat, poultry, eggs, seafood and their juices away from ready-to-eat foods.
4. Avoid storing cooked food. To possible extent, prepare food freshly and serve immediately
5. Protect food from insects, rodents and animals.
6. Store non-perishable foodstuffs in closed containers away from pesticides, disinfecting agents or other toxic chemicals.
7. Never store foodstuffs in containers which have previously held toxic chemicals such as insecticides, paints, varnishes, thinners, etc.
8. Avoid contact between raw foodstuffs and cooked foods through hands, flies, utensils or unclean surface.

B. Food Preparation

1. Keep the food preparation premises meticulously clean. Keep scraps of food& crumbs in safe covered place and dispose them of quickly.

2. Wash hands thoroughly before you start preparing or serving food and after every interruption especially if you have changed the baby, used the toilet or been in contact with pets.
3. Ensure safe water for food preparation. Boil it if its quality is doubtful.
4. Wash fruits and vegetables thoroughly using plenty of safe water particularly if they are eaten raw, if possible, peel them off.
5. Cut vegetables & fruits first, then raw meat and poultry.
6. Wash cutting boards and utensils with hot soapy water after cutting raw meat and poultry products and before slicing vegetables.
7. Recook the cooked food on addition of any new ingredient.

C. Consumption

1. Wash hands thoroughly using soap before eating.
2. Use clean dishes and utensils to serve food.
3. Never taste food that looks or smells strange to see if you can still use it. When in doubt, do not use it.
4. Don't eat cooked or perishable foods that have been kept in the refrigerator for too long i.e. more than 2-3 days.
5. Prefer pasteurized or boiled milk.
6. Avoid food exposed to dust and flies

12.6 Snake Bite-First Aid and Antivenom

First –Aid

1. Put a tight bandage above the wound. This is very important.
2. Make a cross cut on the wound with a blade.
3. If possible, wash the wound with plenty of water for 10 minutes.
4. Advise victim to remain calm.
5. Rush the victim to medicate/hospital.

12.7 Standards/Guidelines for Control of Noise Pollution from Stationary DG Sets.

The Ministry of Environment and Forests (MoEF), Government of India has specified following standards/guideline for control of noise pollution from stationery Diesel Generator (DG) sets under Rule -3 of the Environment (Protection) Rules, 1986.

1. Noise standards for DG sets (15-1500 KVA)

The total sound power level, L_w , of a DG set should be less than, $94+10 \log_{10} (KVA)$, dB (A), at the manufacturing stage, where KVA is the nominal power rating of a DG set.

2. **Mandatory acoustic enclosure treatment of room for stationary DG sets (5 KVA and above).**
 - a. Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically.
 - b. The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss of for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstance the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for insertion loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.
 - c. The DG set should also be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).
3. **Guidelines for the users of DG sets (5 KVA and above).**
 - a. The manufacturer should offer to the user a standard acoustic enclosure of 25 dB (A) insertion and also a suitable exhaust muffler with insertion loss of 25dB (A).
 - b. The user should make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper fitting and control measures.
 - c. The manufacturer should furnish noise power levels of the unsilenced DG sets as per standards prescribed above.
 - d. The total sound power level of a DG set, at the users end, shall be within 2 dB (A) of the total sound power level of the DG set, at the manufacturing stage, as prescribed above.
 - e. Installation of a DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
 - f. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

CHAPTER-13

PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT

13.1 Introduction

Accidents can be avoided in the following two ways:

- a. By eliminating or reducing the hazards.
- b. By providing proper protective equipment and ensuring their use by concerned personnel.

Our endeavor should be to eliminate hazards completely but it may not be possible in all cases and hence the necessity arises for providing personal protective equipment as a second line of defence. It is very necessary that the selection of the protective equipment is proper. Most of the injuries can be eliminated or minimized by utilizing proper equipment required for the jobs.

13.2 Protective equipment can be divided into two categories:-

- a. Respiratory protective equipment.
- b. Non-respiratory protective equipment

13.2.1 RESPIRATORY PROTECTIVE DEVICES (BREATHING APPARATUS)

Oxygen Deficiency

Every living organ needs constant supply of oxygen. Cells in the brain and the nervous system, if starved of oxygen for more than 4 to 6 minutes can be severely damaged and even died due to permanent damage.

Oxygen deficient atmosphere is a major hazard in the industry. Table below gives the signs and symptoms of a person at rest at different levels of oxygen deficiency.

Oxygen content in air	Sign and symptoms of person at rest
12% to 14%	* Respiration deeper, pulse up, co-ordination poor
10% to 12%	* Respiration fast & shallow, giddiness, poor Judgment, lips blue
8% to 10%	* Nausea, vomiting, unconsciousness, ashen face
6% to 8%	* 8 min- 100% Fatal +6 min- 50% fatal, 4-5 min –Recovery with treatment.
4%	* Coma in 40 sec, convulsion, respiration ceases death

It is important that one should not enter atmosphere containing less than 19 % oxygen without a breathing apparatus set.

The air we breathe is sometimes contaminated with dust, vapours, toxic fumes or gases. Various types of respiratory protective equipment are provided which enable us to breathe in uncontaminated air even in the presence of contamination.

Each type of equipment has a definite purpose but its limitations must be kept in mind. These will not provide protection in an atmosphere contaminated by a substance, which can be absorbed by skin. The details of the Respiratory Protective equipment are as under:-

A. Fresh Air Breathing Apparatus

Necessity

It must be used in all cases when it is necessary to enter an enclosed area where:-

1. Carbon Monoxide or any other combustible/toxic gas is present even in slight concentration.
2. Canister cannot be used because the concentration exceeds the limit for canister.
3. There is a heavy smoke.
4. There is an oxygen deficiency.

B. Demand Flow Air Line Breathing Apparatus.

Introduction

It is constant flow air line respirator which provides complete respiratory, eye and facial protection and is designed for use with a factory compressed air line or a low pressure air compressor.

Application

It is used for extended work in a toxic or oxygen deficient atmosphere either in a factory from the works air lines or in an outside location from a low pressure air compressor. Applications include tank cleaning, zinc spraying and paint spraying or as a maintenance breathing apparatus.

C. Colour codes

Table of colors assigned to canisters or cartridges (IS 8318-1977).

Atmospheric contaminants to be protected against.

Contaminants	Color assigned (As per BIS)
Acid gases	White
Organic vapours	Black

Contaminants	Color assigned (As per BIS)
Ammonia gases	Green
Carbon monoxide gas	Blue
Acid gases and organic vapours	Yellow
Acid gases, ammonia and organic vapours	Brown
Acid gases, ammonia, carbon monoxide and organic vapours Other vapours and gases not listed above	Red Olive
Radioactive materials (Except Tritium and noble gases)	Purple
Dusts, fumes and mists (Other than radioactive materials)	Orange

Notes:

A purple stripe shall be used to identify radioactive materials in combination with any vapour or gas. An orange stripe shall be used to identify dusts, fumes and mists in combination with any vapour or gas.

D. Dust respirator

Dust Respirator may be used for all operations where annoying or irritating gases or dust may be present in such small quantities that the canister gas mask is not needed.

13.2.2 NON-RESPIRATORY SAFETY DEVICES

13.2.2.1 Face and eye protections

A. Eye protection

To protect the eye and face against injuries from flying objects, splashing liquid and harmful rays that cannot always be controlled at the source. Safety goggles, face shields etc are provided. Nearly all eye injuries can be prevented by the use of eye protections.

B. Chipper goggles

These goggles provide protection against impact from flying objects while chipping, cutting, grinding and performing striking operations such as breaking concrete.

C. Gas tight goggles

These goggles provide protection against splashes, sprays and mist of injurious liquids such as chemicals, oil etc. they are required to be worn in areas where possibilities of a splash exist.

D. Burning and gas welding goggles

For injurious light rays from acetylene burning and welding, specially shielded goggles with special lens provide protection for this operation. The shade of lens varies with the operation.

How to use

For maximum protection and comfort, goggles must be properly adjusted to fit the face. The head band should be worn tight enough to hold the goggles firmly to the face.

Care of goggles

1. When goggles are not in use, keep them properly.
2. Keep your goggles and lenses clean.
3. Be sure head bands are in good conditions, get defective bands replaced.
4. The lens must be securely held in the frames. Inspect them for pits or scratches, which may cause eye strain.
5. Be sure to use the correct type of goggles for the hazard involved. Consult your supervisor in case of any doubt.

13.2.3 Face Shields

Certain operations present a hazard to the face as well as to the eyes. In such cases, face shields provide suitable protection. The head band is the only adjustable feature on the face shield. It should be adjusted so as to hold the shield in place. Since the shield is of plastic, it is easily scratched. It should be replaced when these scratches cause interference with the vision.

Selection of eye and face protective equipment

Operation	Hazards	Recommended protector
Burning, cutting, gas, welding	Sparks, harmful rays, molten metal flying particles	Welding goggles (eye-cup type or plate type tinted lenses)
Chemical handling	Splash, acid burns, fumes	Clear goggles and/or shield
Chipping	Flying particles	Clear goggles (chipper)
Electric arc welding	Spark intense rays molten metal	Welding hood (with tinted lenses)
Furnace operations	Glare, heat	Cobalt glasses or face shield (chipper goggles)
Laboratory	Chemical splash, glass breakage	Clear goggles or face shield
Machining	Flying particles	Clear chipper goggles or face shield

13.2.4 Head Protection

Safety helmets are rigid headgears of different materials designed to protect the workman's head –not only from impact but also from flying particles and electric shock or any combination of the three.

13.2.5 Hand protection

1. Protective gloves are required to be used for protection of the hands against the injurious effect of chemical, heat, heavy material, oil, electricity etc.
2. Rubber gloves give protection to the hands against the injurious effect of chemicals.
3. PVC gloves give protection against chemicals and solvents chemicals or oil should be washed from the gloves after use.
4. Canvas gloves should be used while handling material or working on equipment where there is possibility of getting cuts and abrasion on hand.
5. Electrical gloves should be used by employees while working around high voltage lines. These should be thoroughly inspected before use.
6. Asbestos gloves should be used for protecting hands against heat.

13.2.6 Foot protection

Rubber boots are used to protect against chemical, splashes. Safety shoes are used to protect against heavy weight.

13.2.7 Body protection

PVC aprons

These provide protection for the body when working with chemicals aromatics or solvents.

13.2.8 Hearing protection

Any unwanted sound is called noise. It consists of invisible vibrations that enter the ear and create an auditory sensation. Sound can be conducted through solids, liquids or gases. Some important properties of noise in evaluation its effect on man's hearing are intensity, frequency and duration. The louder the noise, the more it is damaging. Also the longer the noise exposure, the greater is the damage to the human hearing mechanism.

A. Ear plugs

This type of plug is inserted into the ear canals and varies considerable both in design and material. Materials used are rubber, soft or hard plastic or cotton.

B. Ear muffs

These cup or muff type devices cover the external ear to provide an acoustic barrier.

13.2.9 Safety Belts

Description

All employees must use safety belts to give protection in performing jobs at elevated locations where adequate protection against falling is not available. Safety belt and body harness with a life line fastened at the back should always be used whenever one works on an elevated location or enters into the tanks or bins so that he can be easily lifted and brought out. Belt and harness for this purpose may be chrome-tanned leather or cotton webbing. Webbing is much stronger than leather and if it is impregnated with rubber or wax, it works reasonably well in the vicinity of chemicals tanks, Well tanned leather is not easily attacked by most chemicals but it should not be left in contact with chemicals for long.

Maintenance and inspection

Life belts must be inspected carefully before each use. Fabric belts must not be used if the outer plies are cut or worn out or if there is any sign of damage from chemicals. All belt hardware must be inspected and replaced if these show any sign of wear. The life line must also be carefully inspected for any sign of damage or wear. If in doubt replace the rope. Be sure that the life line is securely attached to the sling of the belt. If a life belt is exposed to or comes in contact with chemicals during use, clean it immediately. Keep the belt clean, dry and in good condition your life may depend on it.

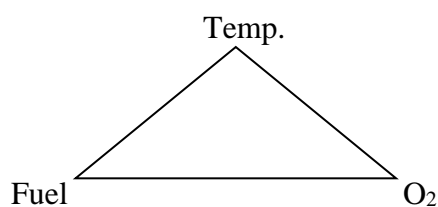
13.3 Safety equipment and their specific use:

FIRE

Because of highly inflammable nature of crude oil and various petroleum products, fire is a major hazard in a Thermal Plant. While fire under controlled conditions and coal serves the industry in various ways by imparting energy for various process needs, uncontrolled fires can become most destructive, causing loss of life, property and facilities.

Fire is produced as a result of chemical reaction between oxygen and carbon or hydrocarbon releasing heat and light energies. There are 3 basic items, which are necessary to cause a fire, viz fuel vapour, oxygen and a source of ignition. This combination causing combustion is known as

“Fire Triangle” and is illustrated in the following figure.



Keeping in view the serious consequences due to fire in any area of Thermal Plant installation, “Fire Protection” is the key objective. Every care should be taken to prevent the occurrence of the fire rather than extinguishing it after it occurs. The occurrence of fire can be prevented if we don’t allow formation of fire triangle by eliminating at least one of its sides.

Only the fuel and the oxygen sides of fire triangle can be removed easily. The fuel air mixture formation can be avoided by preventing air from getting into any system containing hydrocarbons. The source of ignition can also be controlled to some extent by proper guarding and a number of other means such as:

1. All hot work should be carried out under fully authorized “Hot Work” permit and all specific conditions should be met.
2. Smoking is strictly prohibited in oil handling areas of Thermal Plant.
3. No vehicle should be allowed to enter the Thermal Plant area without a valid permit.
4. No make-shift electrical connection should be made as they can also produce ignition hazard.

Since air is one of the sides of fire triangle, it is very important to keep it away from hydrocarbons except in specified situation. There is a possibility of formation of pockets of explosive mixture, and a major hazard can occur if the explosive mixture catches fire due to static electricity which is produced because of agitation of two phases present in the reactor.

5. For burning of a gaseous mixture, in addition to three sides of fire triangle, a fourth condition is necessary, i.e. the fuel and oxygen must be present within certain concentration limits. These limits are known as “Explosive Limits”, and usually expressed as the volumetric percentage of fuel in fuel-air mixture, which upon ignition are capable of propagating flames from one point of ignition throughout the entire mixture. Any process facility must be completely purged of air before being placed in hydrocarbon services. Care must be taken not to let air leak in to any system operation under vacuum. When a vessel is taken out of service, one must ensure total drainage of hydrocarbons, positive isolation, purging with steam, flushing with water and proper ventilation of air by opening manhole covers before allowing entry of any person for maintenance work.

CHAPTER-14

CHECK-LISTS FOR CONSTRUCTION & OPERATION OF PLANT

14.1 CHECKLIST FOR SAFETY IN CONSTRUCTION

14.1.1 Excavation

1. Carrying out ground investigations (including soils and services etc.)
2. Planning for shoring and work system.
3. Providing means for removal of water and soil.
4. Carrying out site inspection and prevention of excessive loading from the excavation edges.
5. Providing gangways for crossing trenches.
6. Providing safe access in excavations.
7. Ensuring no children are left at excavation sites.
8. Providing fencing and warning lights.
9. Providing means for rescue in the event of earth collapse.
10. Providing effective supervision.

14.1.2 Pile Driving

1. Inspecting piling machines for firm grounding.
2. Carrying out inspection of machine for machine guarding .
3. Taking precautions in hoisting piles into position.
4. Providing tight fitting clothes and personal protective equipment's to employees.

14.1.3 Scaffolds

1. Installing according to scaffolds requirements.
2. Inspecting by competent person.
3. Ensuring no overloading of scaffolds/platforms.
4. Securing scaffolds with bracing and ties.
5. Ensuring scaffolds free from defects.
6. Inspecting working platforms of the scaffolds.
7. Inspecting both guard rails and toe boards.
8. Ensuring spacing between guard rails are properly maintained as per standards.
9. Providing means of access to working platforms.

14.1.4 WORKING AT HEIGHTS

1. Covering all floor openings.
2. Providing railings on open sides and lift openings.
3. Securing access staircase/ladders.
4. Providing scaffolds.
5. Inspecting hoists, lifts, cranes & lifting gear.
6. Co-ordination between the working teams is being done.
7. Guarding dangerous parts of machines.
8. Providing safe foothold for work construction.
9. Providing safety belts, helmets and other PPEs and ensuring their use.
10. Providing provision for tying up safety belts.
11. Providing effective supervision to ensure safe operation and practice.
12. Welding/cutting is permitted only after taking safety precaution.
13. Providing means of protection against fall of objects.
14. Providing means of protection against fall of persons.
15. Providing means of access to higher elevations.
16. Providing waste disposal means.
17. Providing lighting, emergency lights and ventilation.
18. Inspecting all the ladders and staircases.
19. Providing safe access to move around the floor.
20. Providing fire protection means.

14.1.5 ELECTRICAL SYSTEMS

1. Ensuring safe component/equipments are used.
2. Providing earth leakage circuit breakers on all electrically operated power tools/equipments.
3. Inspecting power tools before use and ensuring defective tools are discarded.
4. Using 3 core cable and 3 pin plugs for all portable tools and ensuring its earthing.
5. Authorized electrician is only attending all electrical jobs.
6. Ensuring double earthing to all equipments.
7. Ensuring all the electrical system are as per Indian Electricity Rules.
8. Disconnecting and removing all unwanted cables and wires from electrical system.
9. Identification Marks and Numbers are clearly being marked on all electrical distribution boards, switchboards, motors etc.

10. All electrical system components being protected against damage.
11. All electrical joints are being tested to meet the standards.
12. Hand lamps are provided with suitable guards.
13. Providing Personal Protective Equipments including electrical safety shoes, rubber gloves etc.
14. Ensuring unauthorized person shall not have access to electrical system.
15. Protecting all live parts.
16. Ensuring all fuses are of actual current rating.
17. All the joints are being properly insulated and protected against mechanical damages.

14.1.6 WELDING AND CUTTING

1. Providing required Personal Protective Equipments to welders and ensuring their use.
2. Ensuring to protect fall of welding sparks down on the persons working below and combustible material.
3. Combustible material near vicinity of welding / cutting work being protected.
4. Fire extinguisher is kept ready for use in case of emergency.
5. Adequate precautions being taken while welding/cutting operation is done in confined space.
6. Inspecting all the gas cylinders and ensuring the storage, handling and transportation for safety.
7. Inspecting all welding machines and ensuring their cables are properly connected.
8. Inspecting electrode holders.
9. Frames of arc welding machines are effectively earthed.
10. Providing refusal (rejection / waste) boxes to keep refused (rejected) electrodes and other waste material.

14.1.7 Lifting Machines and Tackles

1. All the lifting equipments are tested and certified by competent person/authority.
2. Safe working load marked on all lifting equipments and tackles.
3. Records for all lifting equipments are being maintained .
4. Ensuring only authorized person are using lifting machine.
5. Checking lifting equipments before use.
6. Ensuring safe working load does not exceed.
7. Assessing the load to be lifted.
8. Ensured that lifting and placement of material is done properly.

9. Ensuring standard signals are followed.
10. Inspecting all hoists and lifts & cranes.

14.1.8 DEMOLITION

1. Inspection of the area and structure to be dismantled.
2. Disconnecting all the service lines eg. electricity, water, gas etc.
3. Supporting the uncontrolled collapse of walls, pillars and other structure.
4. Proper means such as chutes are provided to carry the waste material from floor to ground level.
5. The area is fenced and caution boards are provided.
6. Personal Protective Equipments are issued to the workers and ensuring their use.
7. Effective supervision is provided till completion of the demolition and ensured demolition is done systematically.

14.2 CHECKLIST FOR WORKING AT HEIGHT

The following points should be checked and compiled with before start of work at height.

(Please put tick (√) mark in the appropriate box)

LOCATION OF WORK :

DATE:

SR. NO.	POINTS TO BE CHECKED	DONE	NOT REQUIRED (WITH REMARKS)
1.	Work area below is temporarily cordoned / barricaded.		
2.	Openings in Walkways and platforms (if any) are properly barricaded.		
3.	The scaffold erected has iron pipes and clamps in good condition.		
4.	Diagonal / lateral bracings pipes are provided to ensure stability		
5.	Planks / sheets as temporary platform are tied properly using binding wires		
6.	Metallic Planks / sheets used in temporary platforms are in good condition		
7.	Temporary platforms are having side railing and toe guards.		
8.	Working platforms and walkways are free from oily and greasy surface.		
9.	Access ladder is provided to reach the work location.		
10.	Wooden bellies and wooden planks are not used as scaffold		
11.	The slings / pulley blocks / ropes being used are tested for fitness and certificates are available		
12.	Portable electrical equipments are checked for healthiness including earthing / fiber body		
13.	Proper illumination available at work location.		
14.	Workers are wearing Helmet, Shoe, Safety belt		
15.	For anchoring of Safety Belt at height, rigid support / life line is provided.		
16.	Fall arrestors are provided to workers at height in good condition.		
17.	Safety nets are provided below the work location.		

18.	Workers having height experience with physical fitness are only engaged for work at height.		
19.	Workers are briefed on Safety Precautions to be taken (Do's / Don'ts)		
20.	Lone workers are not allowed at height, at uneven, narrow and confined space. Extra care in taken in such cases.		
21.	Supervisory staff of agency is available during the work		

Date:_____

Signature :_____

Name of safety officer of Plant/Agency:_____

14.3 OTHER CHECKLISTS FOR ELECTRICAL WORKS

The following points should be checked and complied with before start of work involving electrical power supply

(Please put tick (√) mark in the appropriate box)

LOCATION OF WORK:

Date:

Sr. No.	Points to be checked	Done	Not Required (with remarks)
1.	Electrical equipment /tools are in sound condition and inspected /tested for its healthiness		
2.	Body earthing is provided to machine / electrical hand tool		
3.	The switches / Fuses/ Plug top used are of appropriate rating.		
4.	The power cable is having three cores in case of single phase and four cores in case of 3 phase supply.		
5.	The joints in power cables are properly insulated		
6.	For Welding cable , job earth and joints are proper		
7.	Electrical machine/tools cables are free from obstruction , contact with water and hot sparks		
8.	ELCB is provided in the supply system		
9.	Use of 24 volts hand lamp in confined space /vessel		
10.	Permit to work has been taken		
11.	Proper access and illumination are available to switch boards and work location		
12.	Safety tags are provided		
13.	Engagement of experienced and authorised workers for doing the work		
14.	Workers are briefed on safety precautions to be taken		

15.	Use of Helmet, Shoes, Gloves , Face shield and Safety belt (height work) by worker		
16.	Worker is not exposed to rain and not standing on wet /water logged location		
17.	Second person is available with the engaged worker		
18.	Agency supervisor deployed		

Checked by

Counterchecked by

Name of Engr/ Supvr: (Agency)

Signature:

Name of Engr: (HPGCL)

Signature:

14.4 CHECKLIST FOR WORKING INSIDE CONFINED SPACE

The following points should be complied with before start of Work / Repair inside confined space.

Please put tick (√) mark in the appropriate box

Location of work

Date

Sr. No.	Points to be checked	Done	Not Req'd. (with Remarks)
1.	The valves on inlet pipes to tank/ vessel are in closed condition		
2.	The closed valves on inlet pipes are locked		
3.	Manholes in tank/vessel are in open condition and are cordoned		
4.	Oxygen content is checked for the space inside tank /vessel and oxygen content is more than the minimum specified (20%)		
5.	The space inside tank /vessel is free from toxic / poisonous gases		
6.	Forced Ventilation arrangements for Air Circulation inside Tank/vessel has been provided		
7.	For Height works inside confined space <ul style="list-style-type: none"> • Diagonal /lateral bracings are provided to pipe scaffold to ensure stability • Access ladder is provided to reach the work location • Planks /sheet used in temporary platform are in good condition and are tied properly using wires 		
8	Workers are wearing Helmet/Shoe / Safety belt in good condition		
9	Dust mask / respirator is provided to workers for protection against dust / fumes		
10	Experienced workers are engaged for work		
11	Portable electrical equipment /fiber body checked ,for its healthiness including earthing		
12	Workers are briefed on Safety Precautions to be taken (Dos/ Don'ts)		
13	24 volts hand lamps provided for inside at work location		
14	Supervisory staff of agency is available		

Checked by
Name of Engr/ Supvr:
(HPGCL)
Signature:

Counterchecked by
Name of Engr: (Agency)
Signature:

14.5 CHECKLIST FOR TRACK HOPPER

Sr. No.	POINT	STATUS	REMARKS
01	Availability of spray system above wagon at whole length of Track Hopper	Available / Not available	
02	Healthiness of spray system above wagon at whole length of Track Hopper	OK / Not OK	
03	Track Hopper Service Bay checker plate condition	Properly fixed / not fixed	
04	Writing of SWL on Hoist at Bottom level	Written / Not written	
05	Writing of Test date on Hoist at Bottom level	Written / Not written	
06	Writing of SWL on Hoist at Top level	Written / Not written	
07	Writing of Test date on Hoist at Top level	Written / Not written	
08	Availability of Fire extinguishers inside Track hopper	Available / Not available	
09	Availability of Ventilation system	Available / Not available	
10	Healthiness of Ventilation system	OK / Not OK	
11	Healthiness of Stair steps up to Bottom level	OK / Not OK	
12	Healthiness of Hand rail at stair up to Bottom level	OK / Not OK	
13	Availability of Toe guard at landing platform of staircase	Available / Not available	
14	Availability of Limit switch at plough feeder	Available / Not available	
15	Availability of Stopper at both end of each rail of plough feeder	Available / Not available	
16	Availability of PA system at Top and Bottom of Track Hooper	Available / Not available	
17	Healthiness of PA system at Top and Bottom of Track Hooper	OK / Not OK	
18	Insulation condition of power cables for plough feeders	OK / Not OK	
19	Sump pump working condition	Working / Not working	
20	Fencing / Covering of sump pit to avoid falling of man and materials	Available / Not available	
21	Illumination at Bottom land	Proper / Not proper	

22	Emergency lighting arrangement at Bottom level for both wall side	Available / Not available	
23	Availability of Hinge door / Table skirt at plough table	Available / Not available	
24	Availability of Pull cord at whole length of conveyer at both sides	Available / Missing	
25	Working condition of Pull cord	OK / Not OK	
26	House keeping at Top level	Satisfactory / Not satisfactory	
27	House keeping at Bottom level	Satisfactory / Not satisfactory	
28	Use of PPEs by Working People	Satisfactory / Not satisfactory	
29	Tail pulley Guard	Available / Not available	

Checked by:

Signature:

Name:

Designation:

Date:

14.6 CHECKLIST FOR CRUSHER HOUSE

Sr. No.	POINT	STATUS	REMARKS
01	Statutory testing of Lift	Done / Not done	
02	Capacity of Lift	Written / Not written	
03	SWL of Lift	Written / Not written	
04	Date of testing	Written / Not written	
05	Healthiness of Lift	Working / Not working	
06	Statutory testing of Hoists	Done / Not done	
07	SWL of Hoists	Written / Not written	
08	Date of testing	Written / Not written	
09	Hoist level at Crusher house floor	Normal / More	
10	House keeping at different floors	OK / Not OK	
11	Use of PPEs by workers	Satisfactory / Not satisfactory	
12	Availability and provision of 24 volt supply arrangement at crusher house floor	Available / Not available	
13	Availability and provision of 24 volt supply arrangement at Vibro feeder floor	Available / Not available	
14	Tightness of inspection gate of crusher	OK / Not OK	
15	Healthiness of floor end railing	OK / Not OK	
16	Healthiness of dust extraction system	Working / Not working	
17	Dust leakage at different floor, (if leakage observed, name of equipment to be mentioned)	Yes / No	
18	Cleanliness of cable tray	Clean / Not clean	

19	Availability of fire extinguisher at different floors	Available / Not available	
20	Healthiness of fire hydrant line at different locations	OK / Not OK	
21	Availability of required pressure in fire hydrant line at different locations	Available / Not available	
22	Emergency Stop Bottom at crusher floor	Available / Not available	
23	Availability of Emergency Stop Bottom at Vibro feeder floor	Available / Not available	
24	Availability of Pull cord at both sides of belt feeder	Available / Not available	
25	Healthiness of Pull cord at both sides of belt feeder	OK / Not OK	
26	Guard for movable pulleys	Available / Not available	
27	Guard of coupling	Available / Not available	
28	Approach to different locations	Available / Not available	
29	Illumination of different floors	Good / Not good	
30	Healthiness of Stair steps	OK / Not OK	
31	Healthiness of Hand rail at stair case	OK / Not OK	
32	Working of PA System at different floors	OK / Not OK	

Checked by:

Signature:

Name:

Designation:

Date:

14.7 CHECKLIST FOR BUNKER

Sr. No.	POINT	STATUS	REMARKS
01	Availability of Dust extraction/Ventilation system	Available / Not available	
02	Healthiness of dust extraction/Ventilation system	OK / Not OK	
03	Seat Belt condition	Properly covered / Not covered	
04	Grizzly hole condition	OK / Not OK	
05	Cleanliness of Cable tray / Electrical panel	OK / Not OK	
06	Cleanliness of walkway	Satisfactory / Not satisfactory	
07	Availability of Limit switch at tipper	Available / Not available	
08	Availability of stopper at both end of each Rail	Available / Not available	
09	Use of PPE by workers	Satisfactory / Not satisfactory	
10	Availability of Spray system over conveyor	Available / Not available	
11	Healthiness of Spray system over conveyor	OK / Not OK	
12	Availability of Fire hydrant point at different locations	Available / Not available	
13	Healthiness of Fire hydrant point at different locations	OK / Not OK	
14	Statutory testing of Hoist	Done / Not done	
15	SWL written on Hoist	Written / Not written	
16	Test date written on Hoist	OK / Not OK	
17	Healthiness of floor end railing	OK / Not OK	

18	Availability of Pull cord at whole length of conveyor at its both sides	Available / Not available	
19	Healthiness of Pull cord	Working / Not working	
20	Availability of sway switch at different locations	Available / Not available	
21	Healthiness of sway switch at different locations	Working / Not working	
22	Availability of Fire Extinguishers at required location	Available / Not available	
23	Availability of Tail Pulley / Head Pulley Guard	Available / Not available	
24	Availability of Coupling guard	Available / Not available	
25	Illumination in Bunker area	Sufficient / Not sufficient	
26	Availability of Emergency Push Bottom at head pulley	Available / Not available	
27	Working of PA System at different floors	OK / Not OK	

Checked by

Signature:

Name:

Designation:

Date:

**14.8 CHECKLIST FOR COAL YARD INCLUDING STACKER, RECLAIMER AND
CONVEYORS**

Sr. No.	POINT	STATUS	Remarks
01	Illumination	OK / Not OK	
02	Tightness of Rail Track.	Proper / Not proper	
03	Availability of stopper at both end of each Rail.	Available / Not available	
04	Availability of Emergency stop button at lower level of Stacker / Reclaimer.	Available / Not available	
05	Healthiness and laying arrangement of power cables.	OK / Not OK	
06	Hand Rail conditions where ever is required at Reclaimer and Stacker.	OK / Not OK	
07	Approach to Reclaimer / Stacker up to Operator's cabin.	OK / Not OK	
08	Provision of Fire hydrant and their healthiness in piles.	OK / Not OK	
09	Availability of Sufficient / Required water pressure in hydrant line.	Available / Not available	
10	Availability of Pull cord for whole length of conveyor on both sides.	Available / Not available	
11	Healthiness of operation of Pull cord.	OK / Not OK	
12	Condition of Drainage system in piles.	OK / Not OK	
13	Any spontaneous fire.	Found / Not found	
14	Housekeeping of the area.	OK / Not OK	
15	Water sprinkler system in pile.	Available / Not available	
16	Use of PPEs by working personnel.	Satisfactory / Not satisfactory	
17	Availability of Fire Extinguishers at Reclaimer and stackers.	Available / Not available	

18	Availability of sway switch in different location along the conveyor.	Available / Not available	
19	Healthiness of sway switch in different location along the conveyor.	OK / Not OK	
20	Availability of Phone / PA System at Reclaimer and Stacker.	Available / Not available	
21	Healthiness of Phone / PA System at Reclaimer and Stacker.	OK / Not OK	
22	Writing of SWL on Hoist.	Written / Not written	
23	Writing of Test Date on Hoist.	Written / Not written	
24	Guard for Head pulley, Tail pulley and coupling of conveyors	Available / Not available	

Checked by

Signature:

Name:

Designation:

Date:

14.9 CHECKLIST FOR MARSHALLING YARD

Sr. No.	POINT	STATUS	Remarks
01	Signalling system in the track	OK / Not OK	
02	Cautioning for speed limit at different locations	Proper / Not proper	
03	Exchange of token system for single line operation	Available / Not available	
04	Loose shunting of wagons not to be done	OK / Not OK	
05	Proper brake system and head light in loco	OK / Not OK	
06	Idle engine	OK / Not OK	
07	Alignment of track to be checked regularly	OK / Not OK	
08	Regular supervision of track by trained gangmen to ensure healthiness of track	OK / Not OK	
09	Fish plates, bolts and pendrol should be checked for its tightness	OK / Not OK	
10	Spreading of uniform and required number of blast / stone for strengthening of tracks	Available / Not available	
11	Points and curves to be checked periodically	OK / Not OK	
12	Regular inspection of bridges and culverts specially during monsoon period	OK / Not OK	
13	Medical check up (Eye sight and Hearing) for drivers, points man and controller	Done / Not done	
14	Regular training for MGR staff	Done / Not done	
15	Maintenance of Loco and Wagons	Done / Not done	

Checked by
Signature:
Name:
Designation:
Date:

CHAPTER-15

WORK PERMIT

15.1 WORK PERMIT

A. Importance of Safety Permit System

In Thermal Plant, it is necessary to have a practicable and sufficiently safe system of isolation of Plants and equipment containing highly flammable, toxic, poisonous and corrosive materials so that the hazards are eliminated and the maintenance jobs are carried out with a higher factor of safety. This can best be achieved by a proper and effective safety work permit procedure which also fulfills the requirement under section 36 and 37 of the factories Act 1948. For the proper isolation of Plants, it is, therefore, very necessary that we have a well laid down safety permit system and all the employee are educated for the follow up of this system. There must not be any relaxation in the observance of safety rules for the well knit safety efforts and the safety permit system must be scrupulously followed. Here it becomes necessary to elaborate as to what safety permit procedure is and how best we can improve upon our procedures. Once the importance of this system is felt by one and all, our objectives for the safe maintenance jobs will automatically be achieved.

B. What is Safety Permit?

It is written authorization for a maintenance job to be done on a system or on equipment after all practicable steps have been taken to ensure the safety of men, material and machines before the job is started and such safe conditions are maintained while job is performed. It may not be always possible to achieve cent percent safe conditions but the system ensures the best possible means of achieving the safe working conditions. However, it may sometimes be difficult to avoid some calculated risk and under such circumstances, it is always advisable to ensure all preparations and precautions.

C. Why it is necessary to issue a written permit?

It ensures a positive and clear communication. It doubly ensures that all the steps necessary to achieve safe conditions of work have really been taken before the job is started and further all the precautions will be taken while performing the job. In the words, no reliance is placed on verbal instructions and communication as these are subject to human errors.

15.2 ISOLATION AND PREPARATION OF EQUIPMENT

A safety work permit has to be issued by the operation personnel to the maintenance personnel enlisting all the precautions, which are to be taken when the work is in progress. In general the following types of jobs need isolation and also a work permit:

1. All hot jobs like hot jobs in vessel, piping, equipment etc. which is likely to contain or had contained explosive gas, liquid or poisonous chemicals.
2. Working on or adjacent to tanks containing inflammable or corrosive substances.
3. Working on electrical system
4. Working on the roof of tank or Plant building
5. Working on any underground drain or on industrial sewage system.
6. Entering vessels or confined place for inspection of maintenance jobs.
7. Jobs involving execution, road cutting, dike cutting.

When the necessity arises for a person to enter into the vessel; the following procedures should be followed.

A. Equipment electrically isolated and tagged

It should be ensured that electrical switches are locked out and caution notice attached. Whenever local locking arrangement is provided in the field, the same should be used.

B. Equipment blinded/disconnected/close/isolated/wedged open

Equipment/vessel should be completely isolated during working period in order to ensure that there is no change in the work environment with respect to presence of toxic/flammable gases, liquid, hazardous chemicals etc in the course of work.

C. Equipment properly drained/de-pressurized

Equipment under pressure should be de-pressurized after isolation. This will be followed by draining/ purging/ water flushing etc. as the case may be.

D. Equipment properly steamed/purged

Purging of equipment (Vessels, pipelines, compressors) is done to free them from flammable hydrocarbons and toxic gases, steam, inert gas, nitrogen are used for gas-freeing of vessels and pipes in Thermal Plant and processing unit. Other means of purging is by displacement with water and final traces of gas removed by air educator. All high point vents should be unplugged, while purging. Purging may be done continuously or in batches to conserve purge medium. It should be done in a systematic manner to cover the entire equipment/Plant and continued till the allowable level of toxic/flammable gas concentration.

E. Proper ventilation and lighting provided

Where natural ventilation is not available, fans/air educators are provided. Some types of works like welding may generate fumes. Facilities may be required for the speedy dispersal of these fumes. Only approved reduced voltage extension lights (24 volts) are to be allowed for work inside vessels, from consideration of personal safety.

F. Proper means of Exit provided

Proper means of Exit is required in case of emergencies developed on account of the work or otherwise. Availability of an alternate route of escape should be considered.

G. Precautionary tags/boards provided

To prevent any unwarranted entry in the work area and also to caution other personnel taking actions which may endanger people working on the permit job, precautionary tags/boards are to be provided. Examples, 'No Entry' sign on roads or 'Caution- Men At Work Inside' on the manhole of a vessel.

H. Standby person provided for vessel entry.

Whenever a vessel is being entered or work is being carried out in confined space, it may be necessary to keep standby persons at the manhole or entry point holding the rope connected to the safety belt of the person inside. In case of any emergency inside or outside the vessel the standby will be able to pull the person out.

15.3 TYPE OF WORK PERMITS:

Based on the nature of work, the work shall be undertaken after issue of work permit. Before commencement of any work, permit must be obtained.

A. CONFINED SPACE OR GASEOUS AREA

Confined space in the Thermal power stations context is defined to have the following four main characteristics.

1. The space has limited or restricted opening for entry or Exit. Making it difficult for an individual to enter with life saving equipment or to rescue an individual in case of emergency.
2. The space is not designed for continuous human occupancy.
3. The space may contain known or potentially hazardous atmospheres. Oxygen deficiency, presence of flammable/explosive, toxic or otherwise injurious, asphyxiating or incapacitating substances.
4. A space where conditions of engulfment of any other recognized serious safety or health hazards may develop or exist.
5. Typical confined space may have one or more of the characteristics. Common confined spaces in Thermal Plants include storage tanks, stills vessels, boilers, ducts, sewers, pipeline, utility manholes, scrubbers, columns, tunnels etc.

6. All these confined spaces need to be entered occasionally for various reasons including inspection and testing of equipment. Process and materials cleaning to remove undesired materials or to prepare for different usage, repair and maintenance operations and rescue of injured or incapacitated individuals.
7. A vessel entry permit must be obtained to enter in vessel.
8. Toxic gases other than petroleum gases may be encountered in the Thermal Plant. Breathing apparatus must be worn or other precautions to be observed.
9. In all case it should be ensured that oxygen level is at least 19.5% and the concentration of toxic gases below the threshold limits. Breathing apparatus of suitable type should be prescribed by the person issuing the vessel entry permit.

Emergency procedures

A detailed procedure to deal with emergency situation related to confined space entry and step-by-step instructions for rescuing an individual from the confined space must be prepared in advance and communicated to all people connected with such operations.

The individual entrant in the confined space must be equipped with full body harness and life line which can be attached to a pulley/and wrench or hand operated hoist to facilitate rescue by stand-by-person/rescue team.

At least one stand-by-person stationed outside the space should maintain continuous communication with the confined space occupant. Stand-by person must be equipped with suitable rescue equipment with lifeline and preferably trained in first aid.

Stand by person should also be in contact with rescue team as the situation warrants it. When suitable demand rescue stand by personnel should not enter the confined space without securing additional help from other stand by rescue personnel. This ensures that the rescue operation receives continuous monitoring.

Appropriate first aid and rescue teams should be alerted before confined space entry work begins indicating date, time, place and expected activity duration. This ensures that some team members are available to respond as needed.

15.4 Training

A comprehensive training programme must explain the following:-

1. Entry permits system, posting of sign and designation of personnel responsible for assigned tasks.
2. Calibration and testing of air monitoring equipment.
3. Preparations and protocol for atmosphere monitoring.
4. Blanking off and disconnecting pipelines and isolation of hazardous energy sources.

5. Purging and use of forced mechanical ventilation.
6. Use of personal protective equipment.
7. Use of rescue equipment and techniques.
8. First aid procedures.
9. Specific responsibility of confined space entrant standbys & rescues personnel etc.

Training of contractor, supervisor and their men

Usually the cleaning or other works in the confined spaces at Thermal Plant are being carried out by contractors, supervisors and workers need to be given basic safety training demanded by such work like.

1. Entry permit system and potential dangers in confined spaces. Danger of unauthorized entry into confined spaces
2. Specific responsibility of confined space entrants, standby and rescue personnel and communication system.
3. Use of rescue equipment and techniques.
4. Use of personal protective equipment.

Suitable training aids/modules and methodologies to cover all such contractors and their workmen who are required to work in the confined spaces.

CHAPTER 16

PERFORMA



(HARYANA POWER GENERATION CORPORATION LIMITED)

PRELIMINARY ACCIDENT REPORT

Department:..... Date:

Name of Injured :

Designation :

Date of birth/age :

Father's Name :

Permanent home address :

Date & hour of accident :

Shift :

Exact Place of accident:

Equipment involved :

Describe briefly, how accident occurred:

Nature & extent of injury = (e.g. Fatal, cut, burn, chemical splash, particle in eyes, blunt injury, Fracture etc.)

Body Part (s) affected (e.g. right leg, left hand, right eyes etc.)

OFFICER INCHARGE/Executive Engineer:-

Name:-

Signature

TO BE FILLED BY MEDICAL OFFICER

I have examined Shri at hours

The nature and extent of injuries are as under:

- The injured is advised rest for: days(s)
w. e. f.
- Injured is fit to resume his normal duties/light work.
- Injured is referred to hospital/admitted in company's dispensary.

MEDICAL OFFICER



(HARYANA POWER GENERATION CORPORATION LIMITED)

Work Permit from Safety Department

Working at Height

Permit No.		Book No.		Date	
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Department:

Description of work:

Check clearance from Shift Charge Engineer, if required:

Expected Outage hours:

Sr. No.	Safety Checks	Yes	No	Not Applicable
1.	Temporary Working Platform			
2.	Guardrails			
3.	Adequate Ladders			
4.	Adequate Illuminations			
5.	Non Slippery Footwear			
6.	Helmet			
7.	Safety Harness/Belt			
8.	Crawl Boards/Safety Nets (For fragile roof working)			

Remarks of Safety Department:

.....

PTW ISSUED BY		PTW ISSUED TO	
NAME		NAME	
DESIGNATION		DESIGNATION	
SIGNATURE		SIGNATURE	
DATE		DATE	
TIME		TIME	

PTW RECEIVED BY		PTW CANCELLED BY (SAFETY)	
NAME		NAME	
DESIGNATION		DESIGNATION	
SIGNATURE		SIGNATURE	
DATE		DATE	
TIME		TIME	

NOTE :

1. The permit shall be issued by Contractor's Engineer to Contractor's Supervisor. Supervisor shall fill all the columns of the format.
2. This requirements relating to issue of Permit shall be checked by Contractor Safety Officer at least in 25% of all cases.
3. The Permit is to be issued only after explaining the workers of hazards of working at height and required safety measures.



Work Permit from Safety Department
Working at Confined Space

Permit No.		Book No.		Date	
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Department:

Description of work:

Check clearance from Shift Charge Engineer, if required:

Expected Outage hours:

CLEARANCE from SAFETY I/C:

SAFETY CHECKS:

1. CLEAR CUT INSTRUCTION TO THE WORKER/CONTRACTOR.
2. ADEQUATE VENTILATION (TO AVOID/MINIMIZE THERMAL STRESS & DUST EMISSION)
3. ADEQUATE ILLUMINATION.
4. WARNING SIGN/CAUTION NOTICE FOR OPENINGS.
5. PROPER FIXING OF ROPE LADDERS.
6. CONTINUOUS SUPERVISION FROM OUTSIDE WITH COMMUNICATION SYSTEM.
7. USE OF PPES i) Nose Mask: Yes/No/N.A. ii) Safety Belt: Yes/No/N.A. iii) Shoes: Yes/No./N.A iv) Goggles: Yes/No/N.A v) Helmet: Yes/No/N.A

Remarks _____ **of** _____ **Safety**
Department:.....

PTW ISSUED BY		PTW ISSUED TO	
NAME		NAME	
DESIGNATION		DESIGNATION	
SIGNATURE		SIGNATURE	
DATE		DATE	
TIME		TIME	

PTW RECEIVED BY		PTW CANCELLED BY (SAFETY)	
NAME		NAME	
DESIGNATION		DESIGNATION	
SIGNATURE		SIGNATURE	
DATE		DATE	
TIME		TIME	



(HARYANA POWER GENERATION CORPORATION LIMITED)

**PERMIT TO WORK
OPERATION DEPARTMENT**

Book No. _____
 Permit No. _____
 Equipment _____
 Type of Main BD/PM _____
 Unit _____

I hereby declare that the following equipments are isolated and safe to work. Caution notice has been fixed to all (Details of isolation to be mentioned below):

.....

Description	ISSUED BY	ISSUED TO
Name in Block Letter		
Designation		
Signature		
Date		
Time		

BREAK DOWN INFORMATION

Stopped at: Date _____ Time _____
 Duration of outage: _____ Hrs.

<u>PTW RECEIVED BY</u>	<u>PTW CANCELLED BY</u>
Name (in Block Letter)	Name (in Block Letter)
Designation	Designation
Signature	Signature
Date	Date
Time	Time

Actual Duration of outage:

Remarks of Department at Work (at the time of cancellation of PTW)

Signature

IN CASE OF EMERGENCY CALL: 1) Dispensary:
2) Safety :



Notice of accident / dangerous occurrence

- 1 Name of occupier (or factory) :.....
- 2 Address of works where accident
Or dangerous occurrence
happened:.....
- 3 Nature of Industry :.....
- 4 **Branch/ Department**
Place where the accident or dangerous
Occurrence happened :.....
- 5. Injured person's Name and
Address
:.....
- 6. (a)Sex:..... (b) Age:.....
(c)Occupation of injured
person:.....
- 7. Local E.S.I. Office to which the
Injured person is attached :.....
- 8. Date and hour of accident or
Dangerous occurrence
:..... (a)Hour at which he started
work:.....

On day of accident. _____

- 10 (a) Cause or nature of accident or dangerous occurrence
- (b) If caused by machinery:
 - (i) Give name of Machine and part
Causing the accident :.....
 - (ii)State whether it was moved by
Mechanical Power at that time
:.....
 - (c) State exactly what injured person

was doing at that time :.....

11 Nature and extent of injuries (e.g. fatal,
Loss of finger, fracture of leg, sealed,
Scratch followed by sepsis)

.....

12 If accident is not fatal, state whether
injured person was disabled for
48 hours or more :.....

13 Name of Medical Officer in attendance
Or injured person :.....

I certify that to the best of my knowledge and belief the above particulars are correct in every respect.

Signature of XEN In-Charge Signature of occupier or (Name).....

Name & Designation of occupier

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

Address

.....

Note- To be completed in legible handwriting or preferably typewritten.



(HARYANA POWER GENERATION CORPORATION LIMITED)

FORM No.2-A

Notice of change of Engineer Incharge

(Prescribed under Rule 15-A)

- (1) Name of factory with current license number _____
- (2) Postal address
- (3) Name of outgoing Engineer Incharge
- (4) Name of new Engineer Incharge with the postal address of his residence and telephone number if installed
- (5) Date of appointment of the new Engineer Incharge

INFORMATION SHEET FOR THE REVISED RENEWAL OF LICENSE			
DETAILS OF RENEWAL APPLICATION		DETAILS OF ORIGINAL LICENSE	
Application No.		License Registration No.	
Application date	___/___/20___	License Date	
For the year	20___	License Serial No.	_____
District	_____	License Renewals	

RENEWAL DETAILS OF LICENCE FOR THE LAST RENEWAL

Renewals	Renewal No.	Date of Renewal	No. of workers	Power Amount	Fee Received	Balance
				H.P.		Rs.

(1a). FULL ADDRESS & SITUATION OF FACTORY/Thermal Plant

Factory Name			
Plot No./Milestone/Village		Works-1	
Sector/Colony/Road/P.O.		Works-2	
City/Teshil		Fax	
Distt.		E-mail	
Pin Code		Website	

(1b.) FULL ADDRESS WHICH COMMUNICATINS RELATING TO THE FACTORY/Thermal Plant SHOULD BE SENT

Plot No./Milestone/Village			
Sector/Colony/Road/P.O.		Works-1	
City/Teshil		Works-2	
Distt.		Fax	
Pin Code		E-mail	

(2) NATURE OF MANUFACTURING PROCESS/PROCESSES

Carried on in the factory during the last twelvemonths (in case of factories already in existence)	POWER STATION ELECTRICITY
To be carried on in the factory during the next twelvemonths (in case of new factories)	POWER STATION ELECTRICITY

(3). PRINCIPAL PRODUCTS MANUFACTURED DURING THE LAST 12 MONTHS/ TO BE MANUFACTURED

Product Name	Electricity
Approximate value	Approximate production capacity

(4). WORKER DETAILS

Maximum no. of workers proposed to be employed on any one day during the year	
Maximum no. of workers employed on any one day during last twelve months	
No. of workers to be ordinarily employed in the factory	

(5). POWER DETAILS

Nature of power installed	Electricity		
Nature of power proposed to be installed	Electricity	Amount of power installed	1360 MW
Maximum amount to power (HP) proposed to be used	(HP)	Amount of power proposed to be installed	Nil

(6). FULL NAME & RESIDENTIAL ADDRESS OF THE PERSON WHO SHALL BE THE Incharge OF THE FACTORY/Thermal Plant FOR THE PURPOSES OF THE ACT.

Title	1 st Name	Sh.	Middle Name	Last Name	Suffix, if any
Plot No./Milestone/Village					
Sector/Colony/Road/P.O.			Works-1		
City/Teshil			Works-2		

Distt.		Fax	
Pin Code		E-mail	

(7). FULL NAME & RESIDENTIAL ADDRESS OF THE OCCUPIER

Title		1 st Name	Sh.	Middle Name	Last Name		Suffix, if any
Plot No./Milestone/Village							
Sector/Colony/Road/P.O.				City/Teshil			
Pin Code				Distt.			

(8). FULL NAME & RESIDENTIAL ADDRESS OF THE OWNER OF THE PREMISES OR BUILING

Title		1 st Name	Sh.	Middle Name	Last Name		Suffix, if any
Plot No./Milestone/Village		PLOT NO.-					
Sector/Colony/Road/P.O.				City/Teshil			
Pin Code				Distt.			

(9a). BUILDING PLAN APPROVAL DETAILS

(9b). POLLUTION CONTFOL BOARD APPROVAL DETAILS

Building approved plan		P.C.B. approved date	
Building approved date		P.C.B. approved no.	

(10) DETAILS OF PAYMENT MADE FOR THE RENEWAL APPLICATION

Amount of Fee			
Paid in Treasury		Paid Date	
Vide Challan no.		Challan Date	

DECLARATION

I certify that the information furnished above is correct to the best of my knowledge and nothing of importance has been concealed while furnishing it.

**Signature of Engineer
Incharge**

Signature of Occupier