# SAFETY AUDIT REPORT

## HINDUJA NATIONAL POWER CORPORATION

**PALAVALASA VILLAGE, T. DEVEDA POST, PARAWADA MANDAL, VISAKHAPATNAM DISTRICT, ANDHRA PRADESH - 530031**

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## ACKNOWLEDGEMENTS

M/s **GLOBAL INDUSTRIAL SOLUTIONS, Visakhapatnam** is thankful to the Management of HNPC for giving an opportunity for carrying out the SAFETY AUDIT and for their cooperation and help without which this detailed Plan would not have been possible. Further our Special thanks to Mr. KUMAR, Plant Manager, G Vishnu Murthy DGM (HSE) and other Officers. The courtesy, support, hospitality and cordiality extended to the audit team are highly appreciated.

## DISCLAIMER

This report includes the findings of the Safety Audit of **HINDUJA NATIONAL POWER CORPORATION**

This report is issued within the scope of contract, documents submitted and does not perpetuate into compliance to any statutory regulations and / or codes of any country/region. The discussion of facts, as determined by the investigator, and the views expressed in the report do not assume and are not intended to establish the existence of any duty at law on the part of **Hinduja National Power Corporation**, its employees or agents, contractors, their employees or agents, or any other party. This report neither determines nor implies liability.

This Safety Audit Report is confidential and is the property of **GLOBAL INDUSTRIAL SOLUTIONS, Visakhapatnam** and prepared exclusively for the official use of HNPC and should not be copied, altered, modified. Based on the author's professional experience, knowledge, and judgment, this Report is prepared after taking into consideration of relevant findings and observations during the audit visits.

## NOMENCLATURE USED IN THIS REPORT

| | |
|---|---|
| **HNPC** | HINDUJA NATIONAL POWER CORPORATION |
| **ASAP** | AS SOON AS POSSIBLE |
| **CCE** | CHIEF CONTROLLER OF EXPLOSIVES |
| **DIF** | DIRECTOR OF FACTORIES |
| **TAC** | TARIFF ADVISORY COMMITTEE |
| **HSE** | HEALTH, SAFETY, ENVIRONMENT (UK TERMINOLOGY) |
| **EHS** | ENVIRONMENT, HEATH SAFETY (US TERMINPLOGY) |
| **FE** | FIRE EXTINGUISHER |
| **IS** | INDIAN STANDARD |
| **SWL** | SAFE WORKING LOAD |
| **PCB** | POLLUTION CONTROL BOARD |
| **CPCB** | CENTRAL POLLUTION CONTROL BOARD |
| **IBP** | INTERNATIONAL BEST PRACTICE |
| **NFPA** | NATIONAL FIRE PROTECTIO ASSOCIATION, USA |
| **DGFASLI** | DIRECTORATE GENERAL, FACTORY ADVICE SERVICE AND LABOUR INSTITUTES |

**IS14489-1998-GUIDELINE WHILE CARRYING OUT SAFETY AUDIT**

***`` IS14489 Clause: 4.3.3.2``It should be remembered that purpose of audit is not to comprehensively check implementation of each safety system element. Therefore, the information is to be corrected for a few cases of nonconformity in respect of each element; as a basis for evaluating implementation of that element. Expert opinion is drawn upon based on random sampling the compliance of system elements which are indicative of successful OSH Management.''***

***COMMENTS:***

***Any observation or recommendation in a particular workshop should be construed upon a requirement in other workshop unless otherwise separately stated***
***Examples:***
***-Recommendation for good housekeeping /machine guarding applies to all.***
***-Proper mounting & checking of Fire Extinguishers applies to all***

# EXECUTIVE SUMMARY

## 1.0 Introduction about the Plant

Plant is located in a sparingly populated area close to the sea coast. Plant is spread over in an area of 1123 acres land. With the total installed capacity of the plant is 1040 MW (2 x 520 MW),

Hinduja National Thermal Power Corporation is one of the fully owned Power Plant of HNPC Limited. HNPCL-VIZAG thermal Power project is a coal based power Plant and situated close to the sea coast in a sparingly populated area near village Palavalasa in Visakhapatnam district of Andhra Pradesh. It is situated at about 700Kms away from Hyderabad and 40 km from Visakhapatnam.

Hinduja National Power Corporation is a Hinduja Group company to realize the ambitions of the Group in Power Sector. HNPCL is planning to create a power generation capacity of 10,000 MW over the next ten years at an expected investment of $10 billion across India. The total projected capacity will be a mix of thermal, hydro, nuclear and renewable energy.

As a first step in power sector, HNPC started 1,040 MW coal based merchant power plant in Visakhapatnam district of Andhra Pradesh, India. Government of India and the Government of Andhra Pradesh are fully supporting the development of the power plant. The need for this project comprising the building of 2x520 MW coal-fired units has been identified by Andhra Pradesh State electricity Board (APSEB). This is based on the continually rising demand for electricity in Andhra Pradesh and, more specifically, rising industrial demand in and around the city of Visakhapatnam. Apart from the host State, the project will primarily cater to the growing power needs of the Southern Region, which includes some of the fastest growing economies in the country. HNPCL would also like to expand its capacity in future.

The site is located on the coast of the Bay of Bengal at Pavalavasa, T Deveda Post, Parawada Mandal, Visakhapatnam District in the State of Andhra Pradesh. The project has achieved certain key milestones and is moving at a fast pace. The company is head quartered in Mumbai with its registered office in Hyderabad

## 1.1 Process Elucidation

### 1.1.1 Production of Steam

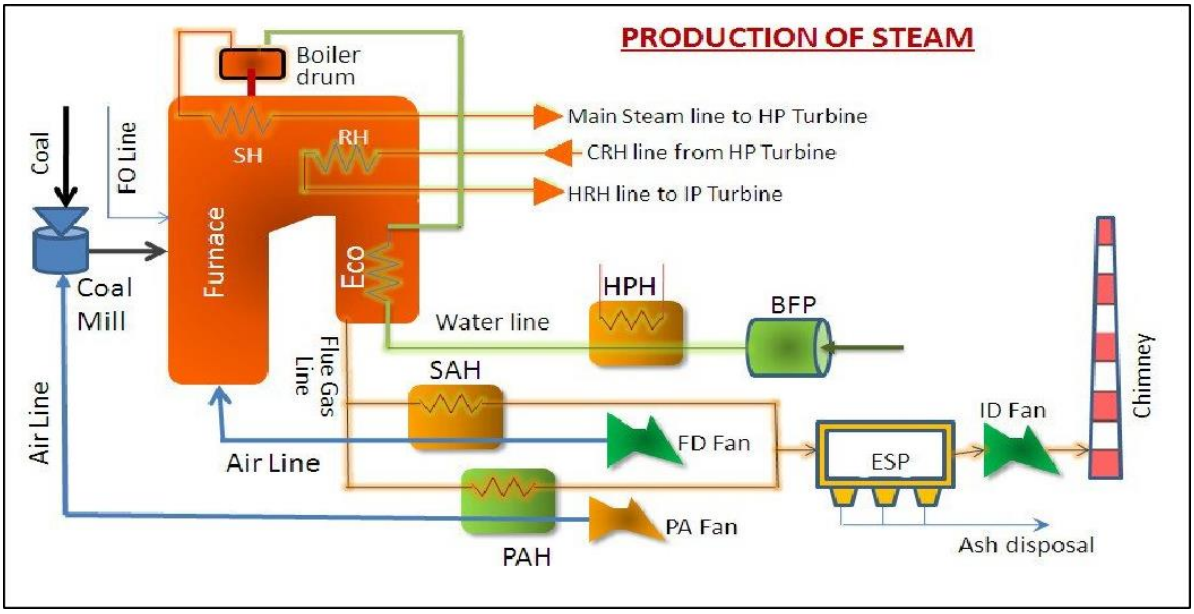
Coal is unloaded in Track Hopper / Wagon tippler / Truck hopper in the coal handling plant. The crushed coal is transported up to the raw coal bunkers with the help of belt conveyors and fed to Coal mills where it is pulverized into powder form. The pulverized fuel is fed to the furnace through coal pipes with the help of hot and cold air mixture from Primary Air Fan (PA Fan). Forced Daft Fan (FD Fan) takes air from atmosphere is heated in the air heaters and sent to the furnace as combustion air.

Boiler Feed Pump (BFP) feeds DM water to the boiler, it passes through Economizer and reaches the Boiler drum from where it goes to water w a l l s o n a l l t h e four sides of the furnace via boiler circulating water pumps (BCW). Water is partly converted into steam as it rises up in the furnace and get separated in the Boiler drum.

Then separated steam from the drum passes to super heaters which are located inside the furnace where it becomes super saturated steam that finally goes to HP Turbine. The exhaust steam from HP Turbine comes back to the boiler where it is reheated and goes back to IP Turbine.

Flue gases from the furnace are extracted by Induced Draft Fan (ID Fan), which maintains balance draft in the furnace with FD Fan. These flue gases emit their heat energy to Water walls, Super heaters, Reheaters, Economizer and finally pass through air pre- heaters and goes to Electro Static Precipitator (ESP) where the ash particles are extracted, so that they do not pass through the Chimney to pollute the atmosphere. The dry ash is collected through vacuum system and is supplied to ash brick plant and cement plants.

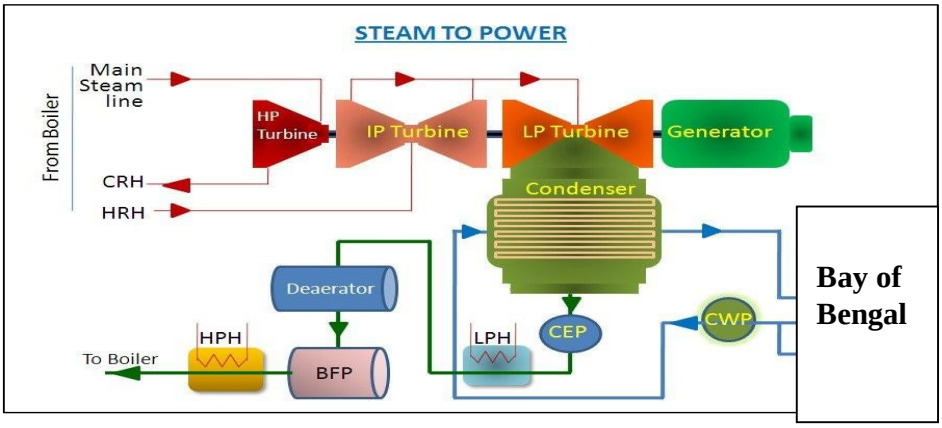
Water used in the boiler is de-mineralized at DM Plant through RO Process.




### 1.1.2 Steam to Power

The Main Steam line conveys steam to HP Turbine through a stop valve and control valves that automatically regulate the supply of steam to the turbine. The steam passes through the number of stages of HP Turbine and some of its heat energy is converted into mechanical energy.

The steam leaving the high pressure turbine (HP Turbine) goes back to the boiler for reheating through CRH (Cold Reheat) and returns by HRH (Hot Reheat) line to the intermediate pressure turbine (IP Turbine). Here it passes through series of stationary and moving blades and some of its heat energy is converted into mechanical energy.



Finally the steam is taken to the low pressure turbine (LP Turbine), the expansion of steam takes place in each of the stages & converts heat energy to mechanical energy. At last stages the blade height will be larger to accommodate the high specific volume of the steam & to extract the more work from the leaving steam.

The mechanical work generated from the HP, IP & LP turbine is converted to electrical energy through generator and generated electric power is evacuated to outside.

The steam from LP Turbine exhausted directly to the Condenser which is located beneath the LP Turbine. The condenser consists of the large vessel containing titanium tubes and cooling water which is extracted from the Bay of Bengal is circulated through titanium tubes and as the steam from the L P turbine passes around these tubes rapidly condensed into water and this condensate is stored in the condenser hot well.

From the condenser hot well, the condensate is pumped by condensate extraction pump (CEP) to deaerator via low pressure heaters. From the deaerator water is feeding to boiler drum by Motor and Turbine driven Boiler Feed Pump (MDBFP & TDBFP) via high pressure heaters (HP Heaters), economizers.

### 1.1.3 Switching and Transmission of Power

The electricity produced in the stator winding of generator is fed through terminal connections to one side of a generator transformer that step up the voltage to 400KV. From here, overhead conductors carry electricity to 400 KV Switchyard where it is fed to a common set of bus bars. Power is evacuated from the station through 400 KV double circuit lines of APTRANSCO to Sub-Station at Kalapaka. Further it is evacuated through 400 KV double circuit various other Substations across the state.

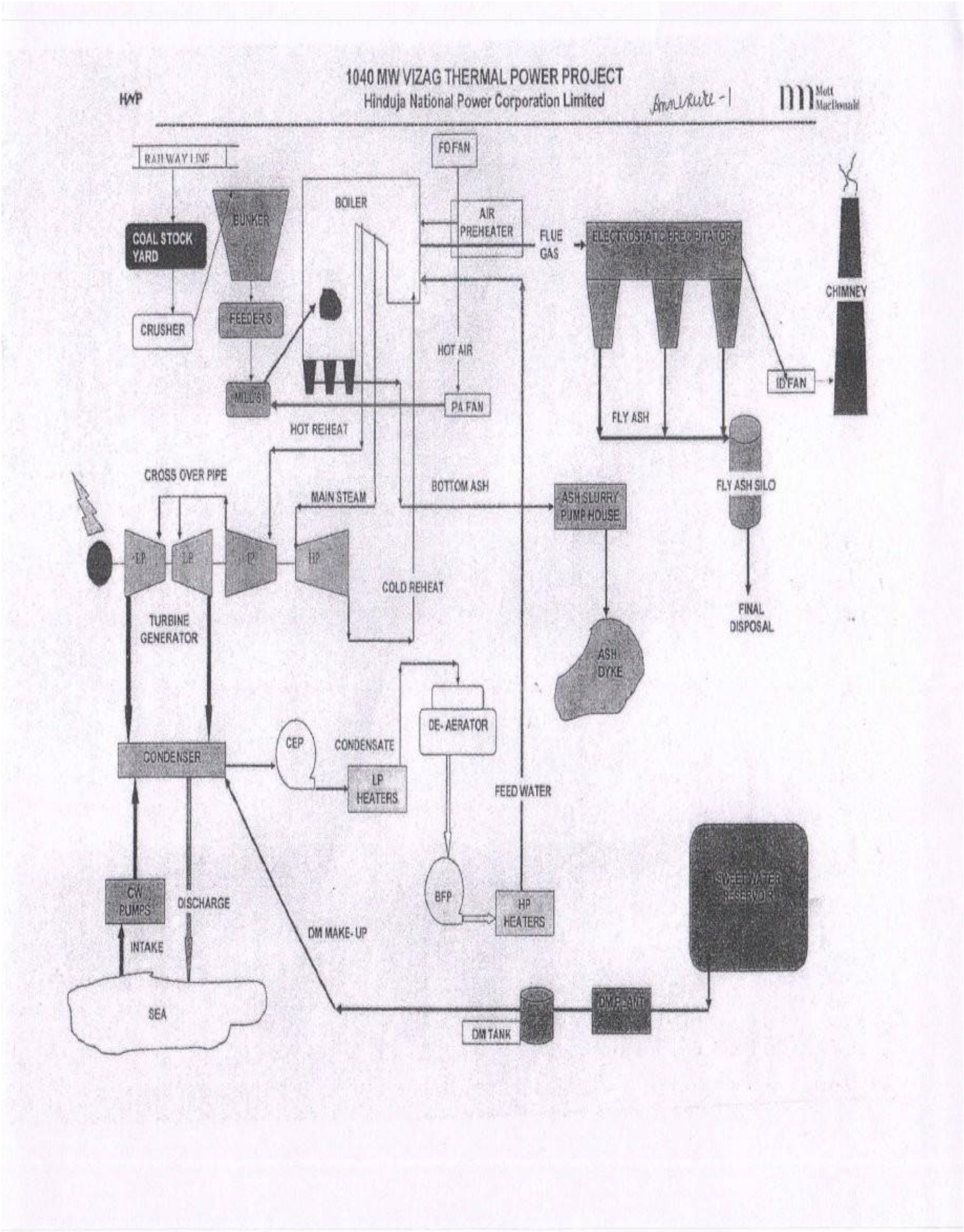
## 1.2 Important Associated Processes / Material having bearing on Plant Emergencies

1. Hydrogen gas is used in Generators for rotor cooling which is generated through electrolysis process in the Hydrogen Generation Plant located within the plant boundary. The Hydrogen plant of HNPCL has a capacity to generate 20 $NM^3/Hr$ of hydrogen (2x50%). The hydrogen is produced by means of water electrolysis in the Electrolyser. The Electrolyser is filled with a solution of KOH in DM water at a concentration of 30%. The electrolysis is achieved by the Passing of direct current from a rectifier through the cells block. The oxygen generated in this electrolysis is vented out to the atmosphere through a pressure balancing seal. There are three important sections for this plant, namely the Electrolyser section, the compressor section and the filling station.

2. HCL and NaOH are used in RO plant in the process of demineralization of water for use in the Boilers to produce the steam.

3. LDO and HFO are used for boiler startup.

## 1.3 Process Flow Diagram



## 2.0 Objectives & Scope of the Audit

**The specific objectives established for the audit were as follows:**

- To assess the extent to which the appropriate management framework is in place to support legislative and central agency requirements for managing the OSH Program.
- To examine whether required components of the OSH Program are in place consistent with legislation and policies and followed as required.
- To assess the degree to which HNPC is fulfilling its training and information sharing responsibilities for a healthy and safe work environment.
- To assess the overall monitoring of the OSH Program and its results
- To carry out complete study of current safety systems and practices and safety culture at HNPC as per the guidelines of Indian Standard IS: 14489- 1998 (Reaffirmed 2002) on "Code of Practice on Occupational Safety and Health Audit focusing on Safety Management systems, hazard assessment of chemicals & gasses chemical storage and handling and adequacy of fire protection and firefighting arrangements
- To carry out systematic, critical appraisal of all potential hazards involving personnel, port, services and operation method.
- To review the existing safety system and suggest possible improvements to the same as per current regulatory requirements.
- To identify potential hazards which are not covered by the safety systems procedures prevalent at the port and suggest possible mitigation measures.
- To improve compliance with relevant statutory provisions and standards & codes of practice.
- To ensure continual improvement in safety performance
- To study existing systems, procedures, plans and programs on Safety, Health and Environment.
- To review the implementation status of such systems, procedures, plans and programs.
- To recommend measures for improving effectiveness of implementation of such systems, procedures, plans and programs.
- To identify areas, situations and practices which are not covered by such Systems, Procedures, Plans and Programs and to recommend development of the same.

The Audit has broadly covered the Indian Standard IS: 14489-1998 (Reaffirmed 2002). All applicable management and technical elements from IS: 14489 have been verified and observations are noted.

This Report does not cover environmental issues in detail other than the stipulated areas as mentioned in the Standard.

### 2.1 Industry Classification

**Hinduja National Power Corporation** is located in Palavalasa Village, T Deveda Post, Pedgantyada Mandal, Visakhapatnam District covering a total area of 1100 Acres It is categorized as a major accident hazard industry as it is producing Hydrogen beyond the threshold limits as stipulated under MSIH Rules1989

### 2.2 Strengths

During the audit, it was found that the senior management was fully committed to Environment, Health and Safety management implementation on the shop floor and has accorded a firm support to the Safety Department and other departments in implementing the same. The following effective systems add to the strengths other Resourceful Fire brigade team day & night against any fire related accidents.

Apart from this, the following systems add to the strengths of Safety Management system.

- Well laid out Factory with full greenery around
- Management Commitment for HSE& support to implementation of Safety systems and procedures
- Qualified Safety Officer responsible for Safety Systems and procedures.
- Valid Statutory Permits
- Good Fire Protection & Fighting Systems in the plant
- Adequate Fire Reservoir with rated Fire pumps
- Resourceful Fire brigade team
- Satisfactory preventive maintenance procedures
- Satisfactory liaison with statutory authorities.
- Resourceful Safety Department with Up to date Records & Documentation
- Good Standard Fire protection & Fighting Measures
- Fully in Compliance with statutory requirements.
- Work Permit System
- Satisfactory Documentation with Departments
- Record of 9.3 million accident-free Man hours achieved from April2016 to Jan2020
- Nil Serious Fire accidents &dangerous occurrence till date

### 2.3 Certifications

**HNPC** does not have any of ISO Certifications as on date as the industry is only 4 years old. It is planning to go for OHSAS 18001 Standard in future.

### 2.4 Statutory Compliance

All the required Statutory Licenses and clearances are taken and found to be valid. Renewal of Air &Water Consent Orders and Hazardous Waste Permits is under process and expected soon.

### 2.5 Positive Audit Observations

1) Good housekeeping and greenery in the plant
2) Safety, Health and Environment policy displayed.
3) Fire Fighting network installed

4) Safety posters displayed on the street poles of the plant
5) Fire Extinguishers provided in all Departments
6) Emergency evacuation plan displayed at all floors of the Administrative building.
7) Testing of lifting tools and tackles carried out
8) No serious accident and dangerous occurrence reported in last five years.
9) Employees are motivated to report near miss.
10) Safety booklet prepared and distributed to all employees.
11) Almost all rotating parts of the equipment are provided with guard.

### 2.6 Key Findings & Areas of Concern

In spite of good practices visible everywhere the under mentioned areas give a feeling that

still safety awareness among a section of employees is not yet complete and needs further reinforcement. While it is a known that there cannot be a factory without any unsafe condition or practice, HNPC is not an exception to this.

Though HNPC adopts and implements safety management systems in all the departments in true spirit, still there is a scope for further improvement by reinforcing best practices in the areas of unsafe conditions and unsafe practices.

The following areas need special attention and more efforts to overcome the observed findings:

- Electrical work practices
- House keeping
- Inadequate Safety Signage
- Testing of Lifting tackles & machines

EOT Cranes /Hoists should display SWL, test date, due date boldly visible from ground level. Though these test records are maintained in files, this information gives an assurance or reminds to the authorities that everything is alright. There should not be any complacency in material handling. All Lifting tackles, machines/ lifts, are tested by Directorate of Factories approved competent person at stipulated intervals. The certificates are valid as on date.

### 2.7 House keeping

Housekeeping on the shop floors needs to be paid with a special attention by the concerned shop floor management staff. The exterior areas of the building premises and surrounds including the scrap yard should be given the same attention as lot of vegetation is grown around accommodating dangerous reptiles.

### 2.8 Roads

HNPC is spread over in 1100 Acres of land having multiple approach roads with T-junctions throughout. Condition of all roads is good without any potholes and gaps. Vehicles are found to be driving on these roads beyond the permissible speed limits. Such rash driving can result collision at T junctions. Provide CONVEX mirrors on all T junctions.

**Parking of Two Wheelers**: Virtually all departments have become a parking place for two

wheelers. Management should arrange separate parking areas near to their working areas for two wheelers considering the troubles faced by employees. The present practice of parking the vehicles should be done in an orderly manner without obstructing the regular traffic on the roads.

### 2.9 Hazardous Chemicals

HNPC is having the following hazardous chemicals in the plant. MSDS is maintained for these chemicals.

**HAZARD CHEMICALS HANDLED AT HNPC**

| Sl. No. | Hazardous Material | Class of Material | Storage Pattern | Capacity |
|---|---|---|---|---|
| 1 | Hydrogen | Class 3&6 | Cylinders | - |
| 2 | HFO | Class-3 | MS Storage Tanks | 1000KL |
| 3 | LDO | Class-3 | MS Storage Tanks | 250 KL |
| 4 | HCL Acid | - | MS Storage Tanks Rubber Lined | - |

### 2.10 Fire Protection System

Fire extinguishers are not uniformly mounted on walls. Pulling them out from the wall will cause sprain on the shoulder.

Further Hydrant stand posts are not serially numbered at many of the locations and some of the hydrant posts are in inaccessible in case of emergency Full details are given in Fire Protection& Fire Prevention section in the detailed report.

### 2.11 Electrical Safety

Electrical Work practices are a major concern and need to be controlled ASAP (As soon as Possible) in view of the critical operations of the plant. Electrical unsafe conditions and practices are shown in AUDIT OBSERVATIONS section.

Earth pit Layout is not displayed in any electrical department or in Substation. Earth pits are not numbered. Record of Resistance checks is maintained

Lightening arrestors have been provided on the tallest structure in HNPC. Please follow-BS EN/IEC 62305 Lightning protection standard; **IS 2309: 1989 (Protection of Buildings and Allied Structures against Lightning code Of Practice)** for any requirement.

### 2.12 Performance Assessment Methodology

In order to assess Safety Management progress, it is moderately essential to measure the current level of performance, without which it would be difficult to know whether the Unit is on continual improvement path or not.

### 3.0 Key Recommendations

- Presently there is Safety Policy, approved by the Plant Manager issued in November, 2016. No subsequent revisions are made. Effective Health and Safety policy set a clear direction for the organization to follow. It contributes to all aspects of business performance as part of a demonstrable commitment to continuous improvement. Responsibilities to people and the

environment are met in ways, which fulfills the spirit and letter of the law. This is an essential requirement of IS Standard IS 14489:1998, which is normally verified during Safety audit process for compliance.

- The Policy needs to be reviewed periodically preferably once in two years to incorporate, any changes occurred during the period and the renewal date should be mentioned. Once made this should be known to each employee. During the audit on verifying with employees of their reading their awareness of the Policy, many employees responded negatively. It is recommended that display the Policy prominently near the main entrance at eye level for public awareness. During training sessions of the plant employees, ensure that they read the Policy and take an acknowledgement having received the copy of the policy and understand the contents. Safety Department should ensure this.

- There is a need to reorient the employees on the aspects of Housekeeping and to set an example of good Housekeeping.

- Licensed Class B Petroleum Installations having bulk storage of HFO& LDO Oil require the corrective actions as highlighted in Table 2 of main report.

- Electrical installation across the HNPC needs corrective measures.

- Take measures to prevent taped wiring found at many plant areas.

- Fused Tube lights should be treated as hazardous waste and disposed as per statute.

- All switches, isolators, etc., should be suitably identified and labeled to ensure that only the correct equipment or process is operated.

- Though Dustbins are provided in the departments, they must be uniform, serially numbered demarcated and labeled.

- Display Color Code Boards which are absent throughout the HNPC indicating the colors used for pipelines, equipment and machinery, which cautions the employees to identify the danger.

- It is found single Fluorescent Tube lights and Ceiling flood lights do not have covers or clamps at many locations in the plant. Fall of hot bulbs is another cause of fire accident. In order to prevent this, ensure that these lights are clamped or provided with covers. The fused tube lights should be sent to hazardous waste disposal as they contain mercury.

- Display of Road safety signs are not adequate considering the vast layout of HNPC. They must be provided at intermittent spaces.

- All Equipment viz Storage tanks and vessels, carboys should be properly identified with Serial number, Capacity, material stored as a best practice of Identification & labeling and should be double earthed diagonally wherever necessary.

- At cross sections of roads, it is suggested to provide Convex mirrors so positioned that In coming vehicles from side roads are seen.

- Incorporate EHS clause while procuring new machinery or equipment so that the equipment arrives with full EHS features incorporated by the Supplier and to save additional cost to provide these safety features.

## 4.0 Conclusion

The detailed Audit report with Recommendations and Corrective Action Plan in the following pages explain the areas needing urgent attention and corrective actions on time based activity with responsibility fixed by the management will be a guiding document to help the employees to put in more concentrated efforts to improve their Safety performance as any elemental increase in performance rating demands more efforts from the present performance.

# DETAILED REPORT

## 5.0 Background and Context

**M/s Global Industrial Solutions, Visakhapatnam**, was awarded to carry out the Safety Audit of HNPC for the current year. Accordingly the Safety Audit was carried on 14,15th February, 2020.

## 5.1 Audit Team

The audit was carried out by 3 member team consisting of **Mr. Rama Krishna N Parasaram**, Competent Person approved by Directorate of Factories, Government of Andhra Pradesh,Telangana Auditor **V.Venugopala Rao** a Certified Safety Specialist from WSO, USA, DGFASLI trained Safety Auditor**, Dr. Prakash Nipaney** and the profiles of Auditors are given in Annexure – 1

## 5.2 Methodology

The methodology used for the audit included the following sequential steps:

- An Opening with Management Personnel of the Unit on the first day of the audit followed by audit visits to departments till the last day of the audit following the audit schedule prepared by the Safety department.
- Discussing with key personnel in groups and individually, as required, to know their views, suggestions or to verify existence of a system/procedure.
- Studying important documents/records.
- Holding a Closing Meeting on the last day of the Audit with the Management Personnel to present important observations & recommendations.
- Submitting the draft safety audit report to the Management with a view to correcting errors &discrepancies in observations, if any.
- Submitting Final Safety Audit Report to the Management after management approval

## 5.3 Opening & Closing Meetings

Opening Meeting was held with Management staff on 14th February at 10.00 AM, after which the audit continued until 15th February, 2020 with a Debrief Meeting at 4.00 PM on 15th February, 2020 wherein executives were present and interacted with the deliberations of the auditors.

The EHS Standards, that are now in circulation do not specify any assessment methodology for measuring management performance but leaves the responsibility on the management.

## 5.4 International EHS Standards

At present, the following global Standards on Occupational Health, Safety and Environmental Management Systems are widely followed.

- ISO 140001: Environmental Management Systems
- OHSAS18001-2007: Occupational Health and Safety Management Systems- requirements
- BS 8800: Occupational Health and Safety Management Systems
- ILO-OSH 2001: Guidelines on Occupational Health and Safety Management Systems
- ANSI /AIHA Z10-2005: Criteria for Occupational Health and Safety Management Systems AS/NZS 4801:2001: Safety Management Systems
- BIS: 14489-1998:Code of Practice for Ooccupanttonal Safetyy & Health Audit

All Standards emphasize on continual improvement. Periodical audits help to identify the concern areas thus prompting corrective actions leading to Continual Improvement.

Apart from this, the standards do not describe any performance assessment methodology to prove whether that the Company has shown progress comparatively from the previous audits.

**What does the Standards Say?**

ISO14001 and OHSAS18001 vide their Rule No 4.5.1 mentioned below, leaves it to the Managements to explore the options, to establish procedures for measurement and monitoring.

***Rule: 4.5.1 Performance Measurement and Monitoring***

***"The organization shall establish, implement and maintain a procedure(s) to monitor and measure OH&S performance on a regular basis. This procedure shall provide for both qualitative and quantitative measures, appropriate to the needs of the organization;"***.

The European methodology is a stringent one and guides the unit to achieve international best practices (IBP) over a period.

Accordingly, all 31 Elements Indian Standard IS: 14489-1998 (Reaffirmed 2002) are sub grouped under five main areas for easy assessment methodology as per European Safety Management Guidelines

- **PREMISES & HOUSEKEEPING**
- **MECHANICAL, ELECTRICAL & PERSONAL SAFE GUARDING**
- **FIRE PROTECTION AND PREVENTION**
- **ACCIDENT RECORDING AND INVESTIGATION**
- **SAFETY ORGANISATION**

The Audit has broadly covered the Indian Standard IS: 14489-1998 (Reaffirmed 2002) All applicable management and technical elements from IS: 14489 have been verified and observations are noted as below.

Simultaneously, guidelines of the following International Standards were also adopted or referred during the audit visits.

- CCPS, USA Guidelines for auditing Process Management Systems
- ILO-OSH 2001: Guidelines on Occupational Health and Safety Management Systems
- ANSI /AIHA Z10-2005: Criteria for Occupational Health and Safety Management Systems

**5.5 Statutory Compliance**

All the statutory Licenses and permits are found to be valid. Renewal of Air & Water Consent orders with hazardous waste permit is under progress and expected to be received soon.

**Safety Organization-Legal Requirements**

Deputy General Manager (HSE), reporting to the Senior Vice President of HNPC. STEAG O&M Company has 4 qualified Fire & Safety personnel reporting to the DGM Safety & Fire of STEAG on all the safety activities namely conducting Safety committee meetings, Safety Audit, Safety day celebration, Accident investigation etc.

**Compliance to other Statutes in HNPC**

| Sl. No. | ACT / RULE | AUDIT COMMENTS |
|---|---|---|
| 1 | Factory Act & AP Factory Rules | Audited |
| 2 | Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) rules 1989 amended in (1994) | Submission of Safety Audit Report is complied with submission of this Report |
| 3 | Gas Cylinder Rules | Complied |
| 4 | Petroleum Act & Rules | Audited and complied |
| 5 | Central Electrical Authority (CEA) Regulation, | Audited &complied |
| 6 | Static and Mobile Pressure vessels (SMPV) Rules. | Not applicable to HNPCL as it has no pressurized Bullets, tanks or pressurized mobile tankers |
| 7 | IS 15656: Hazard identification and risk analysis-Code of practice | Risk identification done &Analysis carried out with time frames for corrective actions |
| 8 | Water Act 1974 to prevent and control water pollution | Renewal of Consent Orders is in process |
| 9 | Air (Prevention and Control of Pollution) Act, 1981 | |
| 10 | Environment Act 1986 | |

**5.6 Areas Audited**

The auditors carried out intensive audit of the below mentioned departments and interacted with department officials to verify the site conditions and practices.

- Boilers
- TG Area
- BOP
- CHP
- AHP
- Occupational Health Centre
- Petroleum Storage
- Stores & Work Shop
- Canteen
- Jetty
- 440 KV Switch Yard

### 5.7 Status on IS14489 Elements of EHS Systems

Status of occupational health and safety management has been verified during the audit visits and furnished in the below Table - 1

**TABLE - 1**

| | ELEMENT | STATUS |
|---|---|---|
| 1. | Occupational safety & Health policy | Available. Issued on 9th August 2016, Needs Revision and reissue. |
| 2. | OS & H organizational set-up | Qualified Safety Officer is appointed and Safety departments functioning. |
| 3. | Education and Training | Scheduled training programs for both employees &contractors are periodically conducted. |
| 4. | Employees participation in OS & H Management | Actively participate in all safety programs |
| 5. | Motivational and promotional measure for OS & H | Safety Day celebrations conducted every year. Safety programs and competitions are regularly conducted. |
| 6. | Safety manual and rules | Safety Manual booklet is printed is available in booklet form |
| 7. | New equipment review/inspection | New equipment is taken to operation after fully inspected by the technical staff |
| 8. | Accident reporting analysis investigation and implementation of recommendations | Accidents are recorded and record is maintained<br>Investigation and Analysis Reporting needs improvement with status of action plan implementation. HNPC has worked 9.3 million accident free man hours till date. |
| 9. | Risk assessment including hazard identification | Carried out with this report. |
| 10. | Safety inspections | Periodically conducted by Fire & safety inspectors. |
| 11. | Health and safety improvement plan/targets | HS objectives and targets are clearly spelt out |
| 12. | First aid facilities – occupational health center | First Aid boxes are available in departments Full-fledged Hospital is in place. |
| 13. | Personal protective equipment | PPE is issued to all employees and usage is strictly enforced. |
| 14. | Good housekeeping | Housekeeping is to be improved in the departments and around external areas of the departments |

| | | |
|---|---|---|
| 15. | Machine and general area guarding | Provided but needs improvement in work practices. Back guarding of rotating parts is also Required as per Factory Act. |
| 16. | Material handling equipment | Recommendations are given in Section |
| 17. | Electrical and personal safeguarding | Observations are highlighted requiring corrective actions |
| 18. | Ventilation, illumination and noise | Well in satisfactory conditions. Noise levels to be carried out |
| 19. | Work environment monitoring system | Stack monitoring to be done for Power house. Management informed that it is being done. |
| 20. | Prevention of occupational diseases including periodic medical examination | No occupational diseases are noted.<br>Periodical medical examinations are conducted by HNPC |
| 21. | Safe operating procedures | HNPC has well drafted Control procedures in place |
| 22. | Work permit systems | Strictly enforced. |
| 23. | Fire prevention, protection and fighting systems | Appreciable Fire Prevention and protection Systems are in place |
| 24. | Emergency preparedness plans: ONSITE Emergency Plan | ONSITE EMERGENCY PLAN is available for every department prepared in 2017. Needs to be updated |
| 25. | Process/Plant modification procedure | Once new process is introduced, after risk study is done by the Safety Inspectors or Safety officer |
| 26. | Transportation of hazardous substances | PCB approved agency, MARIDI is hired for the disposal of hazardous waste |
| 27. | Hazardous waste treatment and disposal | |
| 28. | Safety in storage and warehousing | Stipulated fire safety practices are taken care of in ware houses. Recommended Fire Alarm system in the Stores |
| 29. | Contractor safety systems | Only trained contractors are engaged for working in HNPC. Regular training programs are conducted to the contractors. |
| 30. | Safety for customers (including material safety data sheets) | MSDS for all hazardous chemicals should be maintained and all employees should be conversant with the content. |

### 5.8 Detailed Audit Observations

**Areas for improvement**

1. Safety, Health and Environment Policy was issued on 9th August 2016. As per standard the SHE policy needs to be reviewed once in two years or any change in Process. Awareness on SHE policy periodically organized.
2. Provide Month wise Accident Statistics board at the entrance of the plant.
3. Safety Speed limit posters are displayed on the street poles. The standard Speed Limit Boards on roads are to be displayed as per Motor Vehicle Act.
4. Some of the junction point shall have provision of Convex mirror.
5. Every employee must acknowledge the receipt that he read and understood Safety booklet.
6. All Passenger lifts must have provision of telephone or Public Addressing System to contact in emergency.
7. In majority of locations Fire extinguishers are kept on floor. Extinguishers must be kept at designated place with identification mark.
8. Fire Extinguishers shall be installed above 4 inches from ground as per NFPA Standard.
9. Standard color-coding practice was not observed. Display standard color-coding board at prominent locations of the plant.
10. A lot of structures, hanging platform ladders used during project period are not removed. Now they are creating unsafe conditions at the work places. Action is required for the removal of temporary structures, ladders and hanging platform.
11. Lot of chemicals and material which were procured at the time of commissioning of the plant are not in use. Action is required for their safe disposal.
12. First aid injury record to be maintained.

**Administrative Building**

13. The railing provided on all floors must have toe boards
14. Fire hydrant point in front of Admin Building is obstructed by keeping flower pots and No proper access to hydrant point. Keep hydrant point free from obstruction and shall have safe access

**Service Building**

15. Updated test details of Passenger Lifts to be displayed.
16. The railing provided on all floors must have toe boards to avoid fall of materials to ground.

**Coal Handling Plant**

**Crusher House**

17. All conveyor belts are equipped with fire detection system and protection system. This is statutory compliance.
18. To prevent dust pollution, dust suppression system provided on the transfer points of the conveyor. This is statutory compliance.
19. All conveyors have emergency pull cord.
20. Periodical cleaning of all floors is being done to maintain good housekeeping.
21. As Coal dust is a cause of occupational hazards, all employees must use standard dust mask.
22. A shock proof Rubber mat is missing in front of the electrical panel of ACDB-15 DE System.at ground floor of Crusher House. This is required as per electricity rules.
23. All hoists installed at various floors do not carry details of their capacity and test details. Detail of capacity and test details of all lifting tools and tackles must be displayed.
24. A Guard to the crusher is missing. A guard to be provided on the rotating part of the crusher.
25. Workers working near conveyor systems are wearing loose fitting cloth. All workers working near conveyor system must wear tight. This required to avoid contact of loose

shirt with conveyor system

26. An Electrical board at 1st floor of the house is covered with plastic to protect from dust. Covering of electrical board with plastic sheet is a fire hazard.
27. The directions of all operative handles of pipelines are not visible. The direction of valve opening and closing shall be displayed.
28. It is observed that fire hoses in majority of fire hose boxes missing. It is informed that all hoses are kept in CHP control room. It is recommended that the provision of centralized hose box shall be provided in the Crusher house itself to save time to bring hoses from Control room in case of emergency.
29. Toe board of working platform of VFG 1 & 3 are missing. All working platform must have toe boards to avoid fall of material.
30. A halogen lamp without cover was found near VFG -1. Use of halogen lamp without cover may be a cause of electrical shock or fire. Such unsafe practices are to be avoided.
31. A straight ladder for Racks Pinion and Rims area has no cage. All straight ladder must have cage provision.
32. Lot of cable, pipes are laid on the platform of Racks Pinion and Rims, which are major hitting hazards. All cables or pipelines are to be protected by providing safe cross over on these places.
33. Working platform close to Racks Pinion and Rims, do not have safe access and proper railing. Proper access to Platform and railing along with toe board to the platform to be provided
34. Material on walk way is a tripping hazard. Big size coal pieces found on the walkway of Belt 3 which is obstructing safe movement on the walkway. Ensure no material is accumulated on the walkway.
35. Structure above the conveyor found rusting. Action is required to avoid accumulation of coal dust on the structure resulting to the corrosion of the structure which will have adverse impact on the stability of the structure.
36. A low height passage to access roof of crusher house. Such passage is risky to hit the head. Provide caution board of “MIND YOUR HEAD’” at this passage.
37. A guard to Rotating shaft of Crusher DE – B is missing. Provide safety guard to this shaft.
38. Tall dry grasses around crusher house found which is fire hazard. Action is required for the removal grasses to prevent fire hazard.

**Track hopper**

39. Damaged foundation and support column observed in the Track hopper shed. This is to be rectified to avoid collapse of structure.
40. Road condition is very bad which may lead to toppling of truck. In monsoon risks are very high.
41. BCN 1 B at ground floor of Track hopper has working platform without proper steps and handrail. Provide standard working platform at this location.

**Fire Safety**

42. Provision of Ambo bag is required for artificial respiration.
43. All fire extinguishers and fire hydrant and monitors are to be serially numbered.
44. Damaged glasses of the fire hose boxes are to be replaced.

**Ash Handling Plant**

**Electrostatic Precipitator (ESP)**

45. Lot of electrical cable trays/ pipes are lying on working platform obstructing safe movement. Provide provision of foot over bridge above the cable trays or pipes
46. Top Working platform of the ESP is getting corroded. Action needed for replacement of corroded platform.
47. Heavy leakage of ESP Transformer oil is observed from 7B -12. A tray is provided below all transformer to collect leaked oil, which is connected to a collection tank. These trays are not maintaining properly for free flow of leaked oil to collection tank.
48. The earth pits provided do not have their identification number and test details.

49. An air receiver for compressed gas has no display of its identification number, capacity and test details.

**Ash Silo**

50. Lot of unwanted structures, ladders used during project work are still lying which are creating unsafe condition at workplace. Needs to be removed.
51. A chain of Spouts has either damaged guard or no guard. All rotating chains must have protective guard.
52. Working platform of Ash unloading platform has no toe board.
53. A platform to operate handle during ash unloading has no railing and toe board.
54. Air Receiver of Dry Ash Silo no 19906 has not displayed test details.

**Fuel Oil Pump House**

55. Valid license for storage of flammable material not displayed at the entrance.
56. Sand bucket of the stand are badly damaged will not serve the purpose in case of emergency. All damaged sand buckets are to be replaced with good sand buckets.
57. LDO Storage tanks do not display name of the chemical and capacity.
58. HSD storage tanks have earthing strips, but they are not diagonally place. All storage tanks must have earthing strips which are to be place diagonally.
59. Majority of support structures of pipelines are corroded. All support structures are to be checked periodically and maintained with suitable safety measures.
60. Railing of roof of HSD storage tank is broken. Needs to be rectified.
61. A stair to LDO Tank approach is obstructed with pipeline. Stairs need modification to eliminate unsafe obstruction.
62. An operating wheel handle of a pipeline connected to the storage tank found broken. Broken handle to be repaired.
63. A concrete step need railing in storage tank area.
64. Lot of corroded drum are found outside the storage tanks are to be shifted at designated place.
65. A fire hose box near the gate of Storage tank is badly corroded. Needs to be replaced with good hose box.

**Hydrogen Plant**

66. Fencing of Hydrogen plant boundary is badly damaged. Needs to be repaired.
67. No MSDS of Hydrogen and KOH is displayed in the plant.
68. Tank capacity of KOH, DM water is not displayed. Capacity of two no. of gas holder is also not displayed with name of gas displayed.
69. Gas holders are provided two earthing strips but they are not diagonal.
70. Cable tray is being used as ladder. Stop use of cable tray as ladder, it is for cable laying only.
71. An adhesive tape provided on the cable cover, as the original cover was damaged. Avoid such unsafe practices.
72. Gas cylinder storage areas must have identification level for name of the gas.
73. Ensure safety cap of all empty cylinders are in place.
74. Stair and platform of Gas Cylinder filling station has no provision of handrail. This is to be provided.
75. Two hydrogen cylinders in gas filling station were not secured with chain.
76. A practice of connecting earthing strip to buried metal rod is not a standard earthing practice. Provide standard earth pit.
77. Height of shed for motors, is unsafe. Need to raise height of the shed to prevent hitting hazard.
78. No bonding observed to the flanges of the gas pipelines of gas holder to prevent accumulation of static electricity
79. Cable tray is being used as ladder. Stop such unsafe practices.

**Turbine**

80. Large number of lube oil drums stored at 8.5 mtr floor of Turbine # 2 Floor. Action is required to remove from turbine areas and kept at designated areas.
81. A cable laid at 8.5 mtrs floor creating tripping hazard. Immediate action was taken by depth by keeping a channel on the cable. This action was not satisfactory. Proper cross over is required to eliminate tripping hazard.
82. No shockproof rubber mat found in front of ACBD 1 & ACBD 2 electrical panel. Shock proof rubber mats are to provide in front and back of electrical panels.
83. Gas room – Grating used as platform during project time still in use. Standard platform with provision of safe approach is to be provided.
84. Battery room of Turbine Unit- II had 258 nos. of Ni- Cd battery. Floor is made of acid proof tiles. It is Informed that exhaust fans and lightings are flame Proof. Smoke detector provided.

**Boiler**

85. Boiler Unit – I. At 75 mtr level large numbers of paint containers in open condition are found. Do not allow oil paint containers in unattended condition. Designate a correct place for stacking of empty paint containers.
86. Stairs of Bottom Ash floor is badly damaged. Action is required to make safe for use.
87. A Chain provided for ash conveying line is without guard. All rotating parts require appropriate guard.
88. Scaffolding provided for the maintenance work has no safe access to reach working platform. No railing / toe broad available with scaffolding. Provide a strong, stable with working platform with railing and toe board. Provision of Safe access is also required.

**Electrical and 440 KV Switch Yard**

89. Housekeeping in and around Auxiliary transformer 25 MV needs improved. Lot of used tea cups and plastic sheet found inside the transformer area, This is a cause of fire hazard.
90. Test Details on earth pit near Auxiliary Transformer is not updated.
91. Fencing of 440 KV Switch Yard badly damaged at various places.
92. No provision of earthing of fencing and gate observed. This is statutory requirement.
93. Battery room has unsafe step which is not visible while walking. Display caution message on the floor.
94. Housekeeping of Electrical store room needs improvement.
95. Excess materials are found behind the electrical panel room, near store room.
96. Unsafe Practice of use of electrical wire without pin top observed in Battery room of 400 KV substation.
97. A shed provided above Transformer oil collection pit is unsafe due to its height, may hit head. A safety signage of ‘MIND YOUR HEAD’ to be displayed OR raise height of shed to a safe position.
98. No Resuscitation chart found in the electrical rooms to follow necessary instructions for first aid for injured persons.
99. No stretcher found in the electrical substation.
100. Electrical permit system is in place, but was not produced for verification.
101. As per record there are 182 earth pits throughout the plant, which are being tested twice in a year to check resistance. None of the earth pit of the plant has its identification no., and not displayed details of resistance value, tested on and due date of testing.
102. Huge quantity of used tube lights dumped in front of Substation. SOP needs to be implemented for safe disposal of tube lights
103. Hydrant line provided in front of Substation has no clamped support to its base. All hydrant line is to be clamped with their support. Access to the hydrant point is also not safe.

**DM Plant**

104. Compressed Air Receiver of Sl. No.R12083258 – test details are not updated.
105. Operating wheel connected to Stainer must display its opening and closing direction.
106. Oil spillage observed on the floor creating slip hazard. Adopt practices to control of oil on the floor.
107. Hoist provided for material handling do not carry details of its capacity and testing dates.
108. Battery rooms have 168 lead Acid batteries. Room has acid proof lining on floor and side wall of the room, but lights are not flame proof.
109. Unwanted material was found in the battery. Battery room should not store combustible materials.
110. An opening near storage of chemical drums needs a safe cover to avoid fall in the pit.
111. A trench carrying pipelines has no cover at some places. Need to be provided.
112. A dyke provided for Pre-chlorination and Post chlorination tanks to collect spilled chemical. As per System spilled chemical is to be neutralized. The outlet connecting to neutralization line is blocked due to installation of safety shower.
113. Ultrafiltration zone – Railing missing at the sides of the tank where movement of worker is there. The dozing platform also needs railing to avoid fall of person in the tank.
114. A top railing of ultrafiltration zone at one side has been removed for lifting of chemicals from ground to the top. It is suggested to provide movable type top hand rail.
115. First aid Box is not having required first aid materials. A list of 36 first aid items displayed on the box but hardly 4 or 5 items are available. Name of first aider not displayed. Periodical inspection of first aid item is to be implemented to ensure availability of required first aid items.
116. Access to Storage tanks of Caustic Lye and HCL Storage tank is not safe due to dumping of unwanted materials on the passage.
117. Lot of obstructions during movement observed due to pipelines laid inside the dyke of the storage tanks. Proper crossing bridges are required for safe movement.
118. Around 70 containers of 100 liters capacity of 25 % Ammonia solution is stored. No MSDS of the ammonia is not displayed. No label displayed for storage area.
119. No standing instructions displayed for the drivers and workers for safe unloading of chemical.
120. Ladder without handrail observed in the chemical dozing section of neutralization.
121. A straight ladder without cage and approach to working platform is unsafe. Modification of platform is required to make it safe.
122. 'Clarifier' overflow drain has been provided drain cover to one side only. Other open sides also require drain cover.

## 5. 9 Summarized Audit Observations

### 5.9.1 Premises & Housekeeping

On a quick tour to all the departments and yard areas it gives an impression that the concept of good housekeeping and hygiene is not properly understood by the employees.

A system should be established for monitoring collection and disposal of all scrap materials in open yard and periodically monitored by Safety Department to ensure proper housekeeping.

### 5.9.2 Buildings and Floors

Buildings are maintained in satisfactory condition and are structurally stable. Maintenance of floors and approach ways need corrective actions in identified areas during the audit.

Approach ways to the departments are not safe either blocked by grasses or open drains

### 5.9.3 Aisles & Storages

Marking of Aisles in the departments a best practice and should be implemented in all shops for good housekeeping for arresting material storage within the painted lines allowing free access

### 5.9.4 Road Safety

Condition of all roads is good without any potholes and gaps except in few locations conditions of the roads are not good. Width of the internal roads is suggested to be 7.3 Meters for two-way trafficking Vehicles are found to be driving on these roads beyond the permissible speed limits. Such rash driving can result collision at T junctions. Provide CONVEX mirrors on all T junctions and near left corner of MAIN SECURITY GATE to see vehicles coming in right side to avoid collision.

Provide Speed limit boards at every 1KM distance

### 5.9.5 Parking

Management should arrange separate parking areas duly labeled near to their working areas for two wheelers considering the troubles faced by employees.

### 5.9.6 Stacking & Storage Practices

Storage practices in Stores are good. The existing Godown locking procedure after working hours is appreciable. The stores in charge was requested to circulate the SOP to all concerned

### 5.9.7 Identification & Labeling

All buildings are to be appropriately labeled by conspicuous name boards identifying them.

### 5.9.8 Scrap Bins & Refuse Bins

It is suggested Dust Bins are, numbered and positioned in identified fixed locations in the departments preferably at exits on the floor painted with yellow & black zebra lines.

Please follow the following guidelines as Best Practice

Bins containing oily or other materials must be made of metal and fitted with a tight lid.

- Scrap bins marked
- Practical removal system
- Bins with lids for oily material
- Scrap bin areas marked and demarcated
- Supervision and regular removal

### 5.9.9 Color Coding

Color-coding of pipelines, equipment, panels & machinery is absent Color code display boards should invariably display in all the departments for general awareness to all the employees. Please refer IS 2379: 1990 for guidance.

Labeling of pipelines for differentiating different lines are undertaken along with luminous arrow indicating flow

Please follow the following Best Practice guidelines for COLOR CODE

PURPOSE: For The identification of plant, contents of pipelines, moving machine parts and other accident potential areas by painting or banding them in uniform, standard colors, allows for speedy recognition and warns workers against hazards.

A Color code Board should be prominently displayed at strategic positions and all staff educated to know the meanings of the colors used in the plant for

- Pipelines
- Machinery
- Structures/plant

### 5.9.10 Lighting

Lighting is adequate during daytime with plenty of open space. HNPC is maintaining record of lighting levels during night time.

Lighting levels should be regularly monitored during daytime and night time and actions should be appropriately to improve lighting levels where not confirming to the standard

### 5.9.11 Noise & Ventilation

Natural and artificial ventilation to the departments is adequate**.**

Noise: High noise areas have been identified and caution boards are displayed

### 5.9.12 Occupational Health & Hygiene Facilities

Every care has been taken to ensure that the health of its employees is of top most priority. drinking water is checked for potability.

Pestoflah heaters are provided in Canteen to attract and kill the flies and other insects.

Blood grouping of the employees is maintained, and is displayed in their identity cards. Employees are annually medically examined. Food handlers are examined once in 6 months.

In view of the vast green vegetation, it is noted that poisonous reptiles exist the open land

Anti-snake venom is available always in OHC to attend snake bites victims.

### 5.9.13 Pollution Control; Air, Ground and Water

Air Consent Order and Water Consent Orders are submitted for renewal and are expected to be received soon. Once available display the copies of these Consent Orders in front of main Gate

### 5.9.14 Mechanical, Electrical & Personnel Safe Guarding

In general, guarding of mechanical devices is satisfactory except in certain locations guarding is not up to the mark.

Fan mesh guards in workshop are wide and unsafe The mesh guard should be finger proof.

Ensure Front and back guarding for all drives wherever practicable.

The safeguard must prevent hands, arms or any other part of a worker's body from making contact with dangerous moving parts. As a simple rule it should be pencil proof, which means it should not allow a pencil to pass through.

They must be firmly secure to the machine where possible or secured elsewhere if attachment to the machine is not possible.

**a. Electrical Safety**

Incoming Supply to HNPC is 110KV and the electrical installation is duly approved by Chief Electrical Inspector, AP

Concentrated efforts are needed to improve upon in the electrical work practices Installation approvals and concerned certificates should be readily available at the time of verification with the department

Ensure florescent tube lights & ceiling flood lights are firmly clamped to avoid fall of the tubes and causing fire accidents. The fused tube lights are hazardous and disposed of as per statutes.

Please ensure that all the electricians complete POWER FIRST AID TRAING PROGRAM organized by Red Cross or by St. Johns Ambulance Association.

Master Layout of all Earth pits should be displayed in main MCC ROOM. All earth pits should be appropriately Serial numbered.

Lockout and Tag out procedures are not satisfactory. Ensure that MCC panel doors are closed always and should not be kept open as observed during the audit. Use of pasting tapes on motor connection junction boxes should be avoided as it might get heated up and result in fire and prove disastrous in Hydrogen plan. Instead provide a metal hood fabricated locally suitable to cover the motor against rain water entry.

Electrical engineers should be fully familiar with IS 732: code of practice for electrical wiring installations (third revision). Instances of temporary wiring connections, plugins are observed during the audit. Going forward, all new electrical installations should be 100% compliant with the best practices and any deviation from the established practices should not be permitted.

Provide Artificial Resuscitator in all Switchyard and in control room with First Aid chart displayed along with provision of a stretcher.

**b. Work Permits:**

Presently for critical jobs like working at heights, hot work permits are given The system is satisfactory.

**c. Protective Equipment (Issued: Used)**

PPE like helmets, safety shoes are issued to workers. Largely the usage of helmets and safety shoes.is satisfactory

**d. Material Handling: Lifting Machines**

While these cranes and other lifting are annually checked for statutory compliances by approved competent person, the following observations are made during the audit, which never reflected in the Competent Person's test Reports. The following lapses are observed.

Display **SWL**, Crane number &Test Date & due date of testing prominently visible from the ground.

The statutory testing of the Crane and lifting tackles by the approved competent person was verified and valid.

The inspection observations in the Test Certificates should be clearly written by the Competent Person rather than simply mentioning NOT APPLICABLE/NIL. Further the Crane should be load

tested at 1.25 times and after satisfactory testing, the result should be clearly mentioned in the report. No visual inspection of load testing is acceptable in the report. Ensure that all limit switches on cross &Long travel are tested and found in order with details including information on presence of Safety latch on the pulley hook whether provided or absent.

**e. Pressure Vessels**

Test reports for pressure vessels Air receivers have been verified and found in order. Pressure vessels are inspected annually and certified for continued use. Hydro test of the pressure vessels are not required this year.

**5.10 Fire Protection & Fire Prevention**

The HNPC is protected by 10ft high wall all-round with barbed wire fencing surrounded by sea and entry of any outsider is strictly with a security gate pass. Chances of Sabotage is ruled out with continuous security and vigilance

The HNPC has excellent Fire protection and firefighting system provisions with adequate distribution of Fire extinguishers in the departments.

HNPC is a member of Mutual Aid System with neighboring industries

**5.10.1 Fire Protection System**

Sufficient Fire water storage is available in 2 TANKS for more than 10 hours continuous firefighting which assure adequate fire protection to the HNPC to meet any emergency. The plant is protected by Ring maim Hydrant System with 320 hydrant points all over.685 portable fire extinguishers are provided throughout the plant.

4 Electrical Fire pumps of 410 $M^3$ /hr, 2 Diesel driven Fire Pumps of 410 $M^3$ /hr. and 2 jockey Pumps of 40 $M^3$ / hr. are provided. Hydrant system is always pressurized.

Please follow IS Standard 2190: 2010 (Selection, Installation and Maintenance of First-aid Fire Extinguishers Code of Practice).

Fire Extinguishers containing ODS (Ozone Depleting substances) are absent

**Recommendations**

Bottom of the extinguisher should be 4 inches/100mm above the ground as per NFPA-USA standard given below. Wheeled FE should be on ground only & should not be mounted on wall.

This will facilitate the user to remove the extinguisher without any sprain on shoulder. Demark all the Extinguishers for easy verification

Demark the ground below the extinguisher with YELLOW & BLACK ZEBRA LINES indicating free space to be maintained. Display a red arrow above the Fire extinguisher to be seen from a distance about the presence of FE. Free access to the extinguisher should always be maintained.

**NFPA 10 Standard for Portable Fire Extinguishers states that units weighing 40 lbs. or less be installed such that the top of the unit is not more than five feet above the floor. For units weighing more than 40 pounds, the top of the unit should be no more than 3.5 feet above the floor. There should always be at least four inches between the bottom of the unit and the floor.**

**Lastly, one should note that the extinguishers are meant for small fires at the inception stage but not for major fires.**

### 5.10.2 Fire /Emergency Exits

FIRE & EMERGENCY EXIT Sign boards are absent at many locations and should be exhibited in the departments visible from a distance.

### 5.10.3 Accident Recording & Investigation

Institute procedure for reporting all near miss cases and Dangerous occurrences and maintain record for reviewing in Safety Committee meetings.

Accident Register for all reportable accidents as per Factory Act should be maintained.

It is highly appreciable to note that HNPC has achieved ***9.3 Accident free million man hours*** as on date.

### 5.10.4 Possible Fire Hazards in HNPC

**TABLE-2**

| | | | |
|---|---|---|---|
| **ELECTRICAL FAULTS** | **22%** | **YES** | |
| **ARSON** | **10%** | **NIL** | **Satisfactory HNPC Security / Vigilant measures** |
| **HOTWORK** | **13%** | **YES** | |
| **HOT SURFACES** | **9%** | **YES** | |
| **SMOKING** | **9%** | **YES** | |
| **FRICTION, HEAT&SPARKS** | **7%** | **YES** | |
| **SPONTANEOUS COMBUSTION** | **5%** | **NIL** | **No Chemical processing** |
| **STATIC SPARKS** | **2%** | **YES** | |
| **LIGHTENING** | **1%** | **NIL** | **Lightening Arrestors Provided** |
| **CHEMICAL REACTION** | **1%** | **NIL** | **No Chemical Processing In Departments** |
| **EXPLOSION** | | **YES** | **Due to Hydrogen handling** |

### 5.11 Safety Organization

Qualified Safety Manager is appointed complying with Factory. Act & Rules with supporting staff to drive the safety management effectively.

The department has been maintaining satisfactory documentation with respect to Safety activities. Safety Committee Meetings held on once in quarter as per Safety statutory Regulations and reviews the safety status within the departments. Regular safety training programs are conducted for both employees and contractual men on various topics on safety and material handling. Safety budget is sanctioned on need based. Satisfactory liaison is maintained with all regulatory authorities.

Safety manual has been prepared in a booklet form both in English and regional language and covered all safety topics for general information to the employees and for compliance.

### 5.12 Risk Assessment

Risk Assessment has been carried out against the identified hazards and **Corrective Action Plan with Time Frames Has Been Arrived Vide Table 4.**

### 5.13 Corrective Action Methodology

Explanations are given on the identified risk levels along with vide below Table 3 This will appropriately explain various risks identified during the audit and their severities and their acceptable levels as listed in the **CORRECTIVE ACTION PLAN** given vide **Table - 4**.

HSE Department should take Corrective actions as developed by the Department guided by the above FORMAT

**TABLE-3**

| Category | RISK | Tolerance | Corrective Action Time Period | Comments |
|---|---|---|---|---|
| LOW | Minor | Acceptable | Long term – 1 year | No additional controls are required |
| MEDIUM | Moderate | Acceptable | 3-6 Months | Consideration should be given as to whether the risks can be reduced. |
| HIGH | Statutory Non Compliance - Serious Injury / Fatal | Un Acceptable | Immediate - 7days | Significant Risk reduction measures should be implemented |

**TABLE – 4**

| | OBSERVATIONS / RECOMMENDATIONS | RISK | TIME FRAME |
|---|---|---|---|
| | SAFETY POLICY issued on 9th August 2016 2016. To be revised and issued with date and displayed conspicuously. | Low | 3-6months |
| | Mount Fire Extinguishers on walls with bottom of FE 4 inches from ground to avoid strain on shoulder. While pulling out. | Moderate | 3-6months |
| | Demark the ground below the extinguisher with Yellow & Black zebra lines indicating free space. Display RED Down Arrow Sign 2Mts above the Fire Extinguisher to be seen from a distance. | Low | 3-6months |
| | Fluorescent tube lights should be firmly clamped or covered.to avoid the fall of hot tubes, a contributory cause for fire accidents | Moderate | 3-6months |
| | All Petroleum Bulk Storage& Day tanks should be double earthed with copper wire connected to an earth pit to dissipate static charge resulting to spark. All Flanges pipe line should be provided with a copper bonding strip for the same purpose. | High | Immediate |

| | | | |
|---|---|---|---|
| | All Equipment viz Storage tanks and vessels, carboys should be properly identified with Serial number, Capacity, material stored as International best practice of Identification & labeling and should be double earthed diagonally wherever necessary | Moderate | 3-6months |
| | 2 Floating Roof Tanks in Hydrogen plant to be provided with double earthing and pipe flanges to be provided with copper bonding strips | High | Immediate |
| . | LPG piping connected to LPG Cylinders to be provided with earthing | High | Immediate |
| . | $H_2$ cylinder manifold to be provided with earthing | High | Immediate |
| 0. | Corrosion is extensive on all equipment and fencing of Switch yards. Anti-corrosion paint to be applied | Moderate | 3-6 months |
| 1. | Damaged Fencing on Switch yards to be replaced on urgent basis | High | Immediate |
| 2. | Earthing in the entire plant to be reviewed and reinstalled correctly as per IS STANDARD 3043.1987, as the current practice appears faulty. | High | Immediate |
| 3. | Maintain material safety datasheets (MSDS) of all chemicals used in the plant Everyone should be aware of MSDS of chemicals being handled in the HNPC. | Low | 3-6 months |
| 4. | Ensure minimum width of internal roads as 7 meters and 15Meters at gate entrance for Emergency vehicles maneuverability. | Moderate | 3-6 months |
| 5. | Ensure minimum width of main Security Gate to be 6 meters for vehicle maneuverability with height clearance of not less than 4.5mtrs.and width of Road to be 15Meters for free access to Fire Tender near road corners-*OPTIONAL* | Moderate | 3-6months |
| 6. | Prepare Safety Report & Updating of **ONSITE EMERGENCY PLAN** to be done (Statutory compliance) | High | Immediate |
| 7. | All employees need to be communicated on the aspects of Housekeeping and basic knowledge on operation of Fire Extinguishers with periodical training classes. | Moderate | 3-6 months |
| 8. | All switches, isolators, etc., should be suitably identified and labeled to ensure that only the correct equipment or process is operated. | Moderate | 3-6 months |
| 0. | Display Color Code Boards indicating the colors used for pipelines, equipment and machinery, which cautions the employees to identify the danger. | Moderate | 3-6 months |
| 1. | Road safety signs (Speed limit boards) are not adequate to be provided at intermittent spaces | Moderate | 3-6 months |

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|---|---|---|---|
| 2. | At cross sections of roads, it is suggested to provide Convex mirrors so positioned that incoming vehicles from side roads are seen. | Moderate | 3-6 months |
| 3. | Provide POWER FIRST AID TRAINING TO ELECTRICAL ENGINEERS | Moderate | 3-6 months |
| 4. | Provide Stretcher in Substation and Artificial Resuscitator to be used in case of any electrical shock. | Moderate | 3-6 months |
| 5. | Display Earth Pit layout in Substation. All Earth pits are to numbered.. | Moderate | 3-6 months |
| 6. | Remove green vegetation in and around the departments. | Moderate | 3-6 months |
| 7. | Provide Back guarding for belt driven Compressor in Fire Pump House and in other similar drives | Moderate | 3-6 months |
| 8. | Provide 4-inch TOE BOARDS on all bottom railings on all floors in Admn & HSE & HR Building to stop material falling on persons right below on ground | High | Immediate |
| 9. | Estimate Carbon emissions from your operations and energy used as your Corporate responsibility | Moderate | 3-6 months |
| 0. | Key Technical staff should be fully aware of Statutory regulations | Moderate | 3-6 months |
| 1. | Improve upon LOCKOUT &TAG OUT system as lapses found | Moderate | Immediate |
| 2. | Keep MCC Panel doors Closed | High | Immediate |
| 3. | Maintain Register on Lost time accidents& Near Miss cases | High | **Immediate** |
| 4. | Display Accident Statistics Board in front of plant | Moderate | 3-6 months |
| 5. | Incorporate Acknowledgement page in Safety booklet and file the acknowledgement after issuing to the employees &nonemployees. | Moderate | 3-6 months |
| 6. | Provide Fire Monitor for Hydrogen Plant | Moderate | 3-6 months |

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|---|---|---|---|
| 7. | Ensure free access to Hydrant posts and ensure valves are in place for Fire Hydrant valve handles, hoses found missing in many places. | High | **Immediate** |
| 8. | Display Fire &Emergency Exits, preferably glow signage in plants | Moderate | 3-6 months |
| 9. | Incorporate EHS clause while procuring new machinery or equipment so that the equipment arrives with full EHS features incorporated by the Supplier and to save additional cost to provide these safety features. | Moderate | 3-6 months |

### 5.14 Performance Summary

After critically evaluating the HNPC's safety management performance in various HSE segments, HNPC is suggested to put in more efforts in improving the safety performance in future. This task requires continuous regular training programs at all levels of management including contractors and casuals which will improve the safety awareness over a period of time.

### 5.15 Conclusion

Having known the performance feedback, HNPC management should make sincere efforts to overhaul their present Safety management system by intensifying their inspection systems, training programs and taking corrective measures in time and putting targets in the Staff annual performance appraisals, which will make them indirectly to strive for improved performance.

However, any elemental increase from the present performance calls for serious and sincere efforts for compliance with the audit findings and corrective actions.

**SIGNATURE**

**Date: 19-02-2020**

**Place: VISAKHAPATNAM**

## ANNEXURE - 1

## AUDIT TEAM PROFILES

1. **PARASARAM RAMA KRISHNA NARSIMHACHARYULU M. Tech, M.I.E., F.I.V.**

   Post Graduate Chartered Mechanical Engineer, QA/QC, Industrial Testing, Inspection, Auditing Expert with +19 Years' Experience in India, Middle East, Far East, Africa. Competent Person Government of AP, Telangana, Insurance S&LA, Plant & Machinery Valuer

2. **V. VENUGOPALA RAO CSS.WSO (USA), MIIRM (UK)**

   Mechanical Engineer with over 41 year's industrial experience in India & Abroad. Certified Safety Specialist from UNO Body, USA. Trained Fire Engineer from National Fire Service College, Nagpur. Certified Safety Auditor from DGFASLI. Risk Management Professional Member of IIRSM, UK.

3. **Dr. PRAKASH CHANDRA NIPANEY**

   PhD (Life Sciences), 1990, Calicut University, Kerala, Diploma Industrial Safety, 1994, Annamalai University, Ex. GM (Safety), Jindal Steel & Power Limited, Angul, Orissa. More than 22 yrs. in Safety Management system in Projects and running plants and 14 yrs. in Academic fields.

## ANNEXURE – 2

## RECORDS EXAMINED DURING THE SAFETY AUDIT

1. HSE Policy
2. Safety organization chart
3. Training records on safety fire and first-aid
4. Record of plant safety inspections
5. Accidents and dangerous occurrences- statistics and analysis
6. Accident investigation report
7. Record of tests and examinations of equipment and structures as per statutes
8. Safe operating procedures for various operations
9. Record of Work permits
10. Record of monitoring of flammable and explosives substances at work place
11. Maintenance and testing records of fire detection and fire fighting equipment
12. Medical records of employees
13. Records of industrial hygiene surveys ( noise, ventilation and levels, illumination levels, airborne and toxic substances, explosive gases)
14. Material safety data sheets
15. On-site emergency plans and record of Mock Drills
16. Records of waste disposal
17. Records of effluent discharges to the environment
18. Housekeeping inspection records
19. Minutes of safety committee meetings
20. Approval of layouts; and other approval from statutory authorities
21. Records of any modifications carried out in plant or process
22. Maintenance procedure records
23. Calibration and testing records
24. Shut down maintenance procedures
25. In service inspection manuals, records including that of material handling.
26. Inspection books and other statutory records