CHAPTER - VI

SAFETY MANAGEMENT SYSTEM

IN VISAKHAPATNAM STEEL PLANT

The last two decades has seen many technological innovations that have contributed to automated, more reliable and cost effective safety management techniques, equipments and systems. Responsiveness & competence needs to be created among the Indian Industry about tools & methodologies of safety techniques to understand and mitigate the hazards they are dealing with on a day-to-day basis, and create a safe working environment, for its own machinery, employees and community around. The code of practice on safety management system will be very useful for engineering industries in order to eliminate hazards and for providing safe work environment to employees.

The safety and protection of people, equipment and the environment is a serious concern in the Engineering industries. Many industries have recognized the advantages of Safe Work Environments and are progressively adopting Safety Management System to prevent hazardous events, avoid production & manpower losses and other fallouts associated with industrial accidents. Safety management system also assists industries to enhance employee knowledge of operations, improve technical procedures, maintain accurate process safety information and increase overall facility productivity.

Safety Management System is a term used to refer to a comprehensive business management system designed to manage occupational safety and health elements in the workplace. A Safety Management System provides a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective.
Safety Management System can be defined as a businesslike approach to safety. It is a systematic, explicit and comprehensive process for managing safety risks. As with all management systems, a safety management system provides for goal setting, planning, and measuring performance. A safety management system is woven into the fabric of an organization. It becomes part of the culture, the way people do their jobs.

Safety Management system is a proactive and systematic approach for identification, evaluation, mitigation, prevention and control of hazards that could occur as a result of failures in process, procedures, or equipment. Increasing industrial accidents, loss of life & property, public scrutiny, statutory requirements, aging facilities and intense industrial processes, all contribute to a growing need for Safety Management Program to ensure safety and risk management.

For the purposes of defining safety management, safety can be defined as the reduction of risk to a level that is as low as is reasonably practicable. There are three imperatives for adopting a safety management system for a business - these are ethical, legal and financial.

There is an implied moral obligation placed on an employer to ensure that work activities and the place of work to be safe, there are legislative requirements defined in just about every jurisdiction on how this is to be achieved and there is a substantial body of research which shows that effective safety management (which is the reduction of risk in the workplace) can reduce the financial exposure of an organisation by reducing direct and indirect costs associated with accident and incidents.
Procedures of Safety Management System:

- Publication of the responsibility and duties of the personal involved in the safety management system
- Investigation of safety incidents and the implementation of corrective measures
- Registration and control of safety standards including a register of the significant incidents.
- Internal and external publication of the safety investigation results and the obtained experiences.
- To establish regular audits and revisions to ensure that the corrective actions are executed.
- Early detection of the deviations and/or procedures that can degrade or deteriorate the safety levels.
- Detection of the equipment deterioration used in the safety management system.
- The personnel involved in the system, report the detected risks to the appropriate level of the organization.

Management of Safety at Visakhapatnam Steel Plant:

General safety measures are the safety measures which are generally followed in any industrial organisation. These are common to all the manufacturing industries, whatever may be the product they are manufacturing. General safety measures are to be taken care right from the design stage itself. Some of the important General safety measures are: - Layout, Housekeeping, Guarding, Illumination/Lighting, Ventilation, Stacking, Dust safety, Usage of Personal Protective Equipment (PPEs).
Steel industry is a combination of complex and large-scale operations and processes. Steel is used in such a large variety of products and application, that it will not be easy to find a single substitute to me all the qualities of steel.

Safety at VSP is largely the responsibility of Safety Engineering Department (SED), who has limited control on tasks being performed at various works departments. Safety engineering department advises and assists the management in the fulfillment of the obligation concerning prevention of accidents and maintaining a safe working environment. SED imparts regular safety training as well as refresher safety training to the regular employees and contractor workers. SED conducts safety inspections and co-ordinates with the department for corrective actions in respect of unsafe conditions and unsafe actions. SED conducts safety campaigns such as safety competitions, painting of various safety slogans and pictures to promote the safety awareness amongst the employees. SED co-ordinates the procurement of quality safety appliances to the employees.

**Hazards in Visakhapatnam Steel Plant:**

A steel industry is extremely hazardous by its very nature. The nature of various hazards in Visakhapatnam Steel Plant is detailed below in Table (6.1):
<table>
<thead>
<tr>
<th>NATURE OF HAZARD</th>
<th>SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Burns</td>
<td>Exposure to liquid oxygen, liquid nitrogen and liquid argon</td>
</tr>
<tr>
<td>Asphyxiation</td>
<td>Release of Nitrogen, Argon, Oxygen, CO gas, BF gas, LD gas, Mixed gas</td>
</tr>
<tr>
<td>Fire/Explosions due to Spillage Of Liquid Metal</td>
<td>Spillage/Transfer of liquid metal, liquid steel and hot slag</td>
</tr>
<tr>
<td>Heat Radiations due to Hot Metal Handling</td>
<td>Spillage of liquid metal, liquid steel and hot slag</td>
</tr>
<tr>
<td>Accidents due to Material Handling Equipment</td>
<td>Connected with all Material Handling Equipments</td>
</tr>
</tbody>
</table>

**Hazardous Equipments / Installations in Visakhapatnam Steel Plant:**

In an integrated steel plant, the steel making process involves a number of hazardous processes starting from raw material handling, melting of iron ore, and converting iron into steel till the finished products. Also, the by-product plants, captive power plant, utilities & other auxiliary plants use considerable amount of
hazardous chemicals and these hazardous materials are stored in bulk storages like tanks, cylinders, drums, and gas holders etc., installed in the plant posing major risks.

The equipments used for handling and processing these materials are subjected to hazardous chemical reactions and may cause undesirable accidents. From the detailed HAZOP study, various possible hazards and their associated processes & equipments are identified. The list of these identified hazardous equipments in the plant is given in following pages. The potential hazards from the above identified equipments and from the various hazardous operations/processes in the plant have been analysed and the possible causes for occurrence of such hazards, likely consequences and the remedial action required are suggested. “Hazard Analysis (HAZAN)” has been carried out on the most serious hazards to find out the probability of occurrence and the consequences on the surroundings in the event of their happening.

Hazard Identification and Risk Assessment (HIRA) is given thrust and more than 3000 risks with appropriate control measures have been prepared till now. Activities of all the persons having access to the work place are considered for preparing HIRA and risk controls. Legal and other statutory requirements pertaining to Occupational Health and Safety are identified, documented and implemented as part of risk control.

Hazards associated with activities of persons, equipment and machineries used are assessed by a systematic approach involving all the persons concerned and taking help from past experiences, other steel plants and media sources. The applicable legal requirements, Material Safety Data Sheet (MSDS) obtained from suppliers and other OH&S requirements are taken into consideration while evaluating the HIRA and Risk control measures.
Risk involved in each hazard is assessed taking into account the probability of occurrence and the severity of harm. Master list of the Statutory Acts applicable to manufacturing industry is prepared and each and every activity of the employee and worker is reviewed systematically. The risk controls are determined based on the assessed risk and applicable legal requirements.

**Emergency Action Plan:**

Emergency Planning begins with the identification and assessment of the principal hazards which are normally fire, explosion and toxic release. With the growing complexity of the process plants, more systematic and searching methods for risk identification and quantification have been developed over the years.

Generally the emergencies that occur in process plants are classified into two categories. The one whose effects remain within the boundary limits of the plant is known as On-Site Emergency and the one where the effects go beyond the boundary limits is known as Off-Site Emergency. In VSP, the requirements of the On-Site Emergency Plan are addressed.

This On-Site Emergency Plan is prepared in accordance with the guidelines provided by the Ministry of Environment & Forests (MoEF), Govt. of India, for the Visakhapatnam Steel Plant covering the various hazardous processes and the bulk storages of hazardous materials, toxic gases etc., in different departments of VSP.

Emergency is an incident or calamity caused by deficiencies in the system, accident, natural causes, or deliberate intent and resulting in: serious damage or destruction to records and facilities; a sudden threat to personal safety; or major disruption of operations. The aim of a disaster management plan is to detail the action plan to be implemented to minimise the losses through optimum utilisation of
resources available in the organization as well as the resources available with the external agencies.

The objective of the EAP is to make maximum use of the combined resources of the factory and the outside services to:

- Initially contain and ultimately bring the incident under control
- Minimize damage to property and environment
- Effective rescue and treatment of casualties
- Safeguard personnel in the premises
- Provide information to relatives
- Identify any dead
- Provide authoritative information to news/media
- Secure safe rehabilitation of affected areas
- Preserve relevant records and equipment for subsequent inquiry into the cause and circumstances of emergency

**Risk Control Facilities at Visakhapatnam Steel Plant:**

To minimize the losses and risks to human, plant & equipment due to an incident, various risk control measures are available in VSP. These are mainly identification of Emergency Control Rooms from where the incident could be brought under control, Fire Fighting Facilities, Rescue facilities & PPEs, First Aid/Medical facilities, Communication facilities, clearly demarked escape routes/Evacuation Zones and Assembly points.

**Control Rooms / Emergency Control Center:**

For effective control of any emergency, it is advisable that the complete emergency control procedures are coordinated from a single spot only which should
be away from the likely areas of hazards so that it is safer from the effects of the emergency incident and should be easily accessible. Keeping this in mind, the existing Control Rooms are identified as the Primary Emergency Control Rooms and the Area Shop Office is identified as the Alternate Control Room for each department. The Plant Control is identified as the Main Emergency Control Center.

**Fire Fighting Facilities Available at Visakhapatnam Steel Plant:**

It has been identified that one of the major hazards present in the plant is fire due to flammable gases and other hazardous materials like Benzene, Fuel Oils, CTF, Coal, Hot metal and Electrical Fires. Effective control of fire at the beginning stage itself is very much essential otherwise it may prove to be a disaster. For combating fire, a well planned Fire Fighting System is provided in the plant.

**These include:**

- Automatic Fire Fighting System
- Fire Detection Alarms (FDA) System
- Fire Hydrants
- Fire Extinguishers
- Fire Tenders
- Manual Call points
Health & Safety Policy:

Visakhapatnam Steel Plant has adopted integrated Quality, Environment, Occupational Health and Safety, policy that is given below. The policy is displayed at prominent locations across all departments.

The Visakhapatnam Steel Plant committed:
- To meet the needs and expectations of customers and other interested parties;
- To prevent injury and ill health of all persons working under our control; and
- To prevent pollution.

To accomplish above, the organisation will:

- Supply quality goods and services to customers’ delight.
- Document, implement, maintain & periodically review the management systems including the policy, objectives and targets.
- Focus on conservation of natural resources and energy with concern for Environment.
- Comply with all relevant legal, regulatory and other requirements applicable to products, activities and processes in respect of Quality, Safety, Occupational Health & Environment and also ensure the same by contractors.
- Continually improve Quality, Safety, Occupational Health & Environment performance.
- Encourage development and involvement of employees.
- Maintain high level of Quality, Safety, Occupational Health & Environment consciousness amongst employees and contract workers by imparting education and training.
This policy is communicated to all persons working under our control and is made available to public.

**Safety & Health Organisation:**

The HOD of the SED designated as DGM (Safety) is assisted by number of Safety Officers. In addition each department is having one safety co-ordinator. The occupational health of the employees and contract workers is periodically monitored as per the established procedure and frequency at the OHRC which has three qualified physicians and support nursing staff. A 160 bed Multispecialty Hospital is also available for treatment of various ailments.

**Safety Committee:**

A Two-Tier safety committee system is established. Each department has a Safety committee having equal representation of workers and management level personnel. The committee meets at monthly interval and a record of the proceedings is maintained. The safety coordinator of the department is responsible for organizing the meetings.

There is a Central Safety committee having equal representation from workers and management. It meets at quarterly intervals and the minutes of the meeting are recorded. The DGM (Safety) is responsible to organize the meeting and circulate the report.

**Safety Budget:**

Annual safety budget is prepared and utilization is monitored on regular basis. Budget is arrived at through budget meetings.

**Accident Reporting, Investigation & Analysis:**

Every department maintains incident register, which includes accidents and near-miss/close call/dangerous occurrences. In case of accidents, joint investigation is
carried out by a committee consisting of the concerned departmental person, Zonal personnel in-charge and the Zonal safety Officer. The identified actions are implemented which are reviewed in the monthly departmental safety committee meeting and in the plant level central safety committee meetings. Over a period of time there is reduction in fatal and reportable accidents. The target for accident rate for the year is identified and monitored.

**Safety Inspections:**

Monthly safety inspection of all departments is carried out by Safety Engineering Department. Additionally, half-yearly Safety Audit is performed including all aspects of Occupational Health & Safety for all the areas.

**Safety Education & Training:**

One day training is provided to contractor employees on emergency preparedness, safety precautions, use of PPEs and plant related information etc. and a photo identity pass is issued for entry at the gate. Separate pass is issued for work at height after training and medical examination. Audio visual aids are used to impart training. Once in 6 months retraining is given to plant personnel and the training records are maintained.

**Safety Communication:**

The Visakhapatnam Steel Plant is provided with both intercoms (called “Max”) and external P&T telephones in all the departments/ sections. All the Control Rooms and the Main Emergency Control Center are provided with Hot Lines, Public Address System (PAS), Despatcher System, wireless sets and internal & external telephones. Telex and Fax facilities are also provided for external communications. Emergency telephone nos. like fire, first aid/medical post, gas safety, water supply and safety engineering dept. are clearly marked in control rooms. Wireless sets are provided to
the personnel working in critical zones. Depending on the situation the concerned personnel will communicate the incident to fire department/gas safety or others.

**Safe Operating Procedures / Work Permit System:**

Appropriate procedures, work instructions, operation control procedures are established and issued to all concerned for safe & effective operation. Training to contractor employee is given before deputing on day to day activities. Work Permit system is implemented for hot work, Electrical isolation and Non-Isolation works.

**Personnel Protective Equipment (PPE):**

List of PPEs provided at fire station is as shown in Table (6.2).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>S. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Proximate suit</td>
<td>8</td>
<td>BA sets</td>
</tr>
<tr>
<td>2</td>
<td>Fire Entry suit</td>
<td>9</td>
<td>Asbestos hand gloves</td>
</tr>
<tr>
<td>3</td>
<td>Fire fighting suit</td>
<td>10</td>
<td>BA trolleys</td>
</tr>
<tr>
<td>4</td>
<td>Safety Goggles</td>
<td>11</td>
<td>Helmet Fireman</td>
</tr>
<tr>
<td>5</td>
<td>FR coat blue</td>
<td>12</td>
<td>Helmet Alexander</td>
</tr>
<tr>
<td>6</td>
<td>Gum boots</td>
<td>13</td>
<td>Life jacket</td>
</tr>
<tr>
<td>7</td>
<td>Helmet Safety</td>
<td>14</td>
<td>Life buoy</td>
</tr>
</tbody>
</table>

**Fire Protection / Emergency Preparedness / Plant Layout:**

A good fire fighting system is implemented in the plant, with quarterly inspections and testing of all fire extinguishers are done. Majority of employees are trained in use of portable fire extinguishers. A plant layout indicating hydrant location is prepared. Periodic mock drills are conducted as per annual plan. Actions are taken on the observations identified during mock drills. Color coding for piping is
established in the plant. A mutual aid scheme is established with neighboring industries. Appropriate assembly points are identified in the premises. Emergency Action plan including on site emergency preparedness is documented and copies made available to all locations.

**Pressure Vessels / Lifting Tackles:**

All pressure vessels are identified and covered under annual testing by competent authority. Hydro test is conducted once in 5 years and records maintained. Engineering is responsible for arranging annual inspection of lifting tackles, and all are found to be covered as per frequency. Operators found to be conversant with operation of such equipments. All test reports are maintained at respective departments which were verified during departmental visit.

**General safety measures followed at Visakhapatnam Steel Plant:**

The Plant layout has been specially designed after studying many steel plants in India and abroad to ensure orderly movement of materials. Visakhapatnam Steel Plant selected the state of the art technologies with built in extensive safety features. Safety and occupational health of employees and others is ensured in the design and layout of the installations and equipment. The layout is designed in a spacious area for orderly movement of materials. Roads are well laid and very spacious. Rail traffic movement designed in such a way to minimise rail-road crossings to avoid road accidents. Illumination has taken care since from the design stage and it is excellent in Visakhapatnam Steel Plant. Owing to the geographical location and layout Visakhapatnam Steel Plant is very good at ventilation. Keeping Fire safety in view Fire hydrant pipeline and landing valves are provided all along the conveyor galleries. To control the generation of dust, dust suppression (sprinkling water) and dust extraction systems are provided at all the ore and coal tipplers and conveyors.
**Personal Protective Equipment (PPEs):**

Personal protective equipment is defined as equipment designed to be worn or held by the worker to protect him or her against hazards likely to endanger his/her health and safety at work. PPE should be used when the risks cannot be avoided. PPE supplied to the employees by the organisation should meet ISI standards. Personal protective equipment is of two types, i.e. i) general PPE, ii) specific type. Personal protective equipments (PPE) which are common to all are called general type PPE. Safety helmet and safety shoe comes in this category. Anybody before entering into the shop floor has to wear these personal gadgets. Specific types of personal protective equipments are those which are used to get protection for a specific type of hazard.

**Different types of PPE provided by Visakhapatnam Steel Plant are:**

- Helmet( HDPE/Fiber Glass)
- Ear muff / Ear plugs(foam type)
- Smelter goggles
- Gas cutting goggles
- Toughened clear flat goggles
- Face shield heat resistant
- Industrial safety spectacles
- Nose masks
- Dust masks
- Dust mist respirator
- Face/eyewash fountain
- Welder face shield with attachment
- Safety shower & eye wash
- Industrial safety spectacles
- Canvas gloves
- PVC hand gloves
- Electrical hand gloves
- Hand gloves- canvas
- Hand gloves- leather faced
- Hand gloves full leather
- Hand gloves- canvas faced
- Leather apron
- Ankle patties made of wool
- Safety skin paste
- Safety shoes (for ladies/gents)
- Boot rubber
- Gum boots
- Fire Retardant (FR) coat
- PVC overall
- Fire resistance suit
- Fire gel blanket
- Safety belts
- Rope ladders
- First aid box
- Wind socks

**Hazard Control:**

For controlling the hazards first the organisation has to identify the possible involved hazards in the job or in the process. Then suitable corrective actions,
preventive measures and safety measures to mitigate the hazards can be planned. The hazard identification, risk assessment and risk control processes are carried out as proactive measures i.e. before introduction of a new process, procedure, or materials or implementation of a modification to prevent the occurrence of any incident. With the existing control measures in place, the residual risk assessment is carried out for taking suitable safety measures to prevent injuries or ill-health. VSP being an ISO 18001 certified company, the HIRA is done systematically. Further, the Organisation has its own occupational health service and research centre. Health check-ups for its employees are a regular phenomenon. In general occupational health checkups are conducted to the employees regularly on annual basis. For some of the zones/departments where radioactive materials and benzol products are handled, for them health checkup are conducted in every six months by the Occupational Health and Safety Research Centre. The Visakhapatnam Steel Plant has a dedicated Environmental Management Department (EnMD) to conduct the atmospheric surveys in and around the Plant on a regular basis. Hazard control measures are the basic safety measures to reduce accidents in an organisation. To take necessary controls over hazards, organisation should investigate the accidents / incidents cause-wise and preventive measures are to be planned accordingly.

**Accidents and Safety Measures:**

Work accident is an unintended occurrence arising out of and in the course of employment of a person. All accidents, however, need not result in injuries. If a person slips and falls, an injury may or may not result. He further asserts that if the accident caused did not culminate in an injury this time, it may result in to a serious injury next time and hence action to prevent such accidents shall not be neglected. All the accidents are to be recorded in the accident record register as per Rule 104 of The
A.P Factories Rule, 1950 in the Form No: 26 as “Accident Book and Register of Accident and Dangerous Occurrences”.

Accidents are categorized as follows:

**Non-Reportable:**

If the injured person is prevented from working for a period of less than forty-eight hours, is a non-reportable accident.

**Reportable Accident:**

Any accident which causes any bodily injury, by reason of which the person injured is prevented from working for a period of forty-eight hours or more, is a reportable accident.

**Fatal Accidents:**

Accident which involves fatalities (death) is called fatal accidents. According to Sec 88 of The A.P Factories Rules, 1950 all these accidents (reportable or fatal) are to be reported to state government authorities by Form No: 18 by the manager/occupier of the factory shall send a report thereof within 24 hours after the expire or 48 hours from the time of the accident or the dangerous occurrence.
**Dangerous occurrences:**

Any dangerous occurrence is incident like explosion, fall of EOT cranes, gas leakages, collapse of building/equipment/structures, etc. in which there is no bodily injury, disability or death. As per Sec 88-A of The A.P Factories Rules, all these incidents are to be reported to state government authorities by Form No: 18A.

**Accidents Evaluation and Reporting in Visakhapatnam Steel Plant:**

The Safety Engineering Department in Visakhapatnam steel plant (SED) operates centrally. Immediately after receiving the accident information the concern department informs the details of the accident to SED. All the accidents / incidents in the plant are recorded centrally as per Factories Act in SED. The concern department HOD takes steps to investigate all incidents and non-conformances with the help of SED and take necessary corrective and preventive actions.

All incidents are reported by the person responsible (shift in-charge/ section in-charge etc.) to the HOD, plant control and SED immediately. Reporting of incidents to the statutory authorities is done by SED in accordance with the procedure.

All concerned are informed by the HODs by circular about the immediate actions to be taken upon observations of accidents, incidents or non-conformances. The incidents are investigated jointly by the designated responsible person of the department and zonal safety officer to find out the root cause and the joint investigation report is prepared.

Fatal accidents are investigated by the standing fatal accident committee and medium and major fire accidents by the standing fire accident committee both constituted by senior management members. In all investigations witnesses are enquired and the effected person is also enquired, where possible. In the case of fatal accidents and fire accidents (medium or major), witness statements are taken.
Modifications to the existing controls and the new controls needed are implemented to ensure that corrective actions are taken and they are effective.

**Causes of accidents:**

In 1931 Heinrich, said that “a painfully obvious and simple truth is that people cause accidents, not the things”.

Certain conditions are involved in accident causation. The accident may occur due to unsafe condition or by unsafe act of the person or it may be the combination of both. On the other way we can say that the accident cannot happen just like that it may happen due to unsafe act or by unsafe condition. The unsafe condition can be detected by various measures/methods and it can also be prevented. But the unsafe act/unsafe practices can be eliminated only by proper training and by cultivating safe work practices. It all depends up on the behavior of individual and the people involved.

As per the great authors who have studied about safety and developed lot of theories about the accident prevention like, Heinrich Domino theory, Bird’s theory, Peterson’s theory all these theories of accident prevention says that the near miss accidents are to be taken care all the time. The near miss accidents are the symptoms of a major accident. That is why the experts opined that the authorities should take care of the near miss accidents to avoid major accidents.

Frequency rate of the accidents is computed as number of injuries per million man hours worked i.e.

\[
F_R = \frac{\text{Number of reportable loss time injuries}}{\text{Man – hours worked}} \times 1,000,000
\]
Accident rate alone does not reflect a safe work environment. A company may have a low incident rate, but have a high number of lost work days associated with each incident. A high severity rate is like a red flag, signaling serious safety concerns. The longer it takes an employee to return to work after an accident. Since severity rate SR is based on the lost time injuries reportable to the statutory authorities,

$$S_R = \frac{\text{Man days lost due to reportable lost time injury} \times 10^6}{\text{Man hours worked}}$$

Safety Measures:

Various safety measures against the hazards are:

Noise safety measures, Vibration safety measures, Chemical safety measures, Electrical safety measures, Gasses safety measures, Confined Space safety measures, safety measures while working at Heights, Work-to- Permit system, Written protocols, etc. Unsafe acts and unsafe conditions are the major causes to provoke the accidents in the industry. For this reason the safety inspections covers these two causes as major points.

Safety Audits:

The safety audits are conducted internally and externally by the qualified and competent authorities. Internal audits of Occupational Health and Safety Management Systems are carried out in all the areas, to determine whether the OHSMS is effectively implemented and maintained as per the standards of OHSAS 18001:2007. Qualified executives are identified from various departments and they are trained by M/s. BVCI to carry out these audits. Each department is audited at least four times a year by the internal OHSMS auditors.
The audit result is recorded in the respective internal OHSMS audit reports. These reports are distributed to the auditee / the Head of the Department of the area audited and the chief Management Representative (MR). The auditee, in consultation with the HOD, takes the corrective actions on the non-conformities/observations found during the audit. Follow up audit is carried out to verify and record the implementation and effectiveness of the corrective actions taken.

**Training on Safety Measures:**

Knowledge alone is not sufficient to perform the job in industries, but sufficient training is also necessary to perform the job efficiently and effectively. ‘Knowledge gives guidance where as training give perfection’. Thereby the training improves the skills of an employee. In Visakhapatnam Steel Plant training in various aspects of safety, fire fighting and occupational health, are organised by SED, T&DC, CISF (Fire wing), and Occupational Health Safety and Research Centre (OHS&RC).

**Information and Communication:**

Effective communication is essential for a positive culture at the workplace. Transparency in communication is mandatory at all levels for better understanding of work and better bonding among individuals. The plant is also equipped with a wide communication facility of telephones, wireless sets and all the Executives are provided with cell phone connectivity. The Non-Executives are also paid the limited cell phone charges. This shows that the organisation want to maintain proper means of communications in the site and off the site. The following Tables and Figures gives the details of the various statistics regarding safety training, accidents at Visakhapatnam Steel Plant and the analysis report of the accidents since the year 2006-07.
### Table 6.3 Training Data of Regular Employees

<table>
<thead>
<tr>
<th>Program Title</th>
<th>06-07</th>
<th>07-08</th>
<th>08-09</th>
<th>09-10</th>
<th>10-11</th>
<th>11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Safety</td>
<td>3454</td>
<td>3734</td>
<td>3333</td>
<td>3202</td>
<td>3478</td>
<td>3608</td>
</tr>
<tr>
<td>Gas Safety</td>
<td>298</td>
<td>302</td>
<td>262</td>
<td>412</td>
<td>338</td>
<td>325</td>
</tr>
<tr>
<td>Electrical Safety</td>
<td>206</td>
<td>259</td>
<td>159</td>
<td>269</td>
<td>235</td>
<td>251</td>
</tr>
<tr>
<td>EOT Crane Safety</td>
<td>197</td>
<td>196</td>
<td>105</td>
<td>90</td>
<td>149</td>
<td>146</td>
</tr>
<tr>
<td>Safety in Material Handling</td>
<td>255</td>
<td>353</td>
<td>213</td>
<td>408</td>
<td>467</td>
<td>374</td>
</tr>
<tr>
<td>Safety with Conveyor Belts</td>
<td>23</td>
<td>27</td>
<td>14</td>
<td>49</td>
<td>49</td>
<td>58</td>
</tr>
<tr>
<td>Special Programmes</td>
<td>223</td>
<td>169</td>
<td>368</td>
<td>13</td>
<td>616</td>
<td>2338</td>
</tr>
<tr>
<td>Safety &amp; Occ. Health Mgt</td>
<td>287</td>
<td>251</td>
<td>225</td>
<td>245</td>
<td>219</td>
<td>221</td>
</tr>
<tr>
<td>Safety with Rotating Eqpts.</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Training - Khalasis</td>
<td>-</td>
<td>-</td>
<td>99</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Junior Trainees</td>
<td>-</td>
<td>-</td>
<td>347</td>
<td>420</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BBSM</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>OHSAS Awareness Program</td>
<td>-</td>
<td>-</td>
<td>63</td>
<td>425</td>
<td>128</td>
<td>96</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4943</td>
<td>5291</td>
<td>5233</td>
<td>5533</td>
<td>5679</td>
<td>7517</td>
</tr>
</tbody>
</table>

### Figure 6.1 Training Details of Regular Employees

Source: Annual safety Training Report, VSP
### Table 6.4 Accident Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>NR</th>
<th>Re</th>
<th>F</th>
<th>Total</th>
<th>FR</th>
<th>IR</th>
<th>SR (Including Fatal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>16</td>
<td>60</td>
<td>04</td>
<td>80</td>
<td>1.24</td>
<td>2.98</td>
<td>488.90</td>
</tr>
<tr>
<td>2007-08</td>
<td>02</td>
<td>56</td>
<td>02</td>
<td>60</td>
<td>1.12</td>
<td>2.7</td>
<td>280.34</td>
</tr>
<tr>
<td>2008-09</td>
<td>03</td>
<td>44</td>
<td>05</td>
<td>52</td>
<td>0.95</td>
<td>2.27</td>
<td>610.05</td>
</tr>
<tr>
<td>2009-10</td>
<td>02</td>
<td>42</td>
<td>03</td>
<td>47</td>
<td>0.87</td>
<td>2.09</td>
<td>386.83</td>
</tr>
<tr>
<td>2010-11</td>
<td>04</td>
<td>34</td>
<td>03</td>
<td>41</td>
<td>0.67</td>
<td>1.61</td>
<td>366.53</td>
</tr>
<tr>
<td>2011-12</td>
<td>01</td>
<td>27</td>
<td>01</td>
<td>29</td>
<td>0.50</td>
<td>1.20</td>
<td>139.04</td>
</tr>
<tr>
<td>2012-13</td>
<td>--</td>
<td>22</td>
<td>24</td>
<td>46</td>
<td>0.85</td>
<td>1.36</td>
<td>--</td>
</tr>
<tr>
<td>Up to Nov.</td>
<td>--</td>
<td>22</td>
<td>24</td>
<td>46</td>
<td>0.85</td>
<td>1.36</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: For 2012-13 Expansion area accidents data also included.
Table 6.5 Details of Manpower and Mandays Lost

<table>
<thead>
<tr>
<th>Year</th>
<th>Mandays Lost</th>
<th></th>
<th></th>
<th>Manpower</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reg.Emp</td>
<td>Cont. Emp</td>
<td>Total</td>
<td>Reg.Emp</td>
<td>Cont. Emp</td>
<td>Total</td>
</tr>
<tr>
<td>2006-07</td>
<td>423</td>
<td>781</td>
<td>1837</td>
<td>14355</td>
<td>7125</td>
<td>21480</td>
</tr>
<tr>
<td>2007-08</td>
<td>1168</td>
<td>1284</td>
<td>2452</td>
<td>14355</td>
<td>7125</td>
<td>21480</td>
</tr>
<tr>
<td>2008-09</td>
<td>939</td>
<td>629</td>
<td>1568</td>
<td>14355</td>
<td>7125</td>
<td>21480</td>
</tr>
<tr>
<td>2009-10</td>
<td>7305</td>
<td>12712</td>
<td>20017</td>
<td>13770</td>
<td>7791</td>
<td>21561</td>
</tr>
<tr>
<td>2010-11</td>
<td>7647</td>
<td>12614</td>
<td>20261</td>
<td>15100</td>
<td>7930</td>
<td>23030</td>
</tr>
<tr>
<td>2011-12</td>
<td>1266</td>
<td>6532</td>
<td>7798</td>
<td>14771</td>
<td>8598</td>
<td>23369</td>
</tr>
</tbody>
</table>

1. Incident Rate = \( \frac{45 \times 10^6}{21561} \) = 2.09

2. Severity Rate = \( \frac{20017 \times 10^6}{21561 \times 300 \times 8} \) = 386.83

3. Frequency Rate = \( \frac{45 \times 10^6}{21561 \times 300 \times 8} \) = 0.87

Note: Above Data up to 2008-09 pertains to regular employees only and that of 2009-10 onwards it includes both of regular and contractor employees.

Man-Days lost and Severity Rate are computed by considering man-days lost in fatal cases also i.e. 6000 days per fatal.

Source: Annual Accident Report, VSP
Figure 6.2 Total No. of Accidents

Total Accidents

Source: Annual Accident Report, VSP

Figure 6.3 No. of Fatal Accidents

Source: Annual Accident Report, VSP
Table 6.6 Cause-Wise Analysis of Accidents in VSP

<table>
<thead>
<tr>
<th>S. No.</th>
<th>TYPE OF ACCIDENT</th>
<th>06-07</th>
<th>07-08</th>
<th>08-09</th>
<th>09-10</th>
<th>10-11</th>
<th>11-12</th>
<th>12-13 (Apr-Nov.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Slip and Fall</td>
<td>08</td>
<td>11</td>
<td>20</td>
<td>13</td>
<td>06</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>02</td>
<td>Material Handling</td>
<td>15</td>
<td>09</td>
<td>08</td>
<td>07</td>
<td>06</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>03</td>
<td>Hit By Moving Object</td>
<td>11</td>
<td>05</td>
<td>05</td>
<td>03</td>
<td>07</td>
<td>04</td>
<td>03</td>
</tr>
<tr>
<td>04</td>
<td>Hit By Falling Object</td>
<td>08</td>
<td>05</td>
<td>05</td>
<td>03</td>
<td>07</td>
<td>04</td>
<td>03</td>
</tr>
<tr>
<td>05</td>
<td>Electrical</td>
<td>06</td>
<td>04</td>
<td>03</td>
<td>-</td>
<td>02</td>
<td>-</td>
<td>02</td>
</tr>
<tr>
<td>06</td>
<td>Hot Metal Burns</td>
<td>05</td>
<td>02</td>
<td>03</td>
<td>05</td>
<td>01</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>07</td>
<td>Burns due to Other Hot Objects</td>
<td>12</td>
<td>08</td>
<td>02</td>
<td>04</td>
<td>04</td>
<td>01</td>
<td>19</td>
</tr>
<tr>
<td>08</td>
<td>Pressed Between Objects</td>
<td>12</td>
<td>06</td>
<td>03</td>
<td>08</td>
<td>06</td>
<td>08</td>
<td>05</td>
</tr>
<tr>
<td>09</td>
<td>Struck Against Objects</td>
<td>01</td>
<td>01</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>01</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Miscellaneous</td>
<td>05</td>
<td>09</td>
<td>03</td>
<td>04</td>
<td>02</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>80</strong></td>
<td><strong>60</strong></td>
<td><strong>52</strong></td>
<td><strong>47</strong></td>
<td><strong>41</strong></td>
<td><strong>29</strong></td>
<td><strong>46</strong></td>
</tr>
</tbody>
</table>

Source: Annual Accident Report, VSP
### Table 6.7 Incident Statistics (Cause-wise)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>CAUSE</th>
<th>2010-11.</th>
<th>%</th>
<th>2011-12.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slips &amp; Falls</td>
<td>06</td>
<td>14.63%</td>
<td>10</td>
<td>34.48%</td>
</tr>
<tr>
<td>2</td>
<td>Pressed Between Objects</td>
<td>06</td>
<td>14.63%</td>
<td>08</td>
<td>27.59%</td>
</tr>
<tr>
<td>3</td>
<td>Material Handling</td>
<td>06</td>
<td>14.63%</td>
<td>00</td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>Hit by Falling Objects</td>
<td>07</td>
<td>17.07%</td>
<td>04</td>
<td>13.79%</td>
</tr>
<tr>
<td>5</td>
<td>Hot Metal Burns</td>
<td>01</td>
<td>2.43%</td>
<td>01</td>
<td>3.45%</td>
</tr>
<tr>
<td>6</td>
<td>Other Hot Objects</td>
<td>04</td>
<td>9.76%</td>
<td>01</td>
<td>3.45%</td>
</tr>
<tr>
<td>7</td>
<td>Electrical</td>
<td>2</td>
<td>4.88%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>8</td>
<td>Hit by Moving Objects</td>
<td>07</td>
<td>17.07%</td>
<td>04</td>
<td>13.79%</td>
</tr>
<tr>
<td>9</td>
<td>Struck Against Objects</td>
<td>0</td>
<td>0%</td>
<td>01</td>
<td>3.45%</td>
</tr>
<tr>
<td>10</td>
<td>Miscellaneous</td>
<td>2</td>
<td>4.88%</td>
<td>00</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

**TOTAL** | 41 | 100% | 29 | 100%

Source: Annual Accident Report, VSP