

## A Study on Safety Audit System in Indian Engineering Industries

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**Abstract:** Safety audit system is an important tool for identifying and assessing the status of existing occupational safety and health management system in an industry. It is carried out by qualified occupational safety and health professionals or safety auditors. A report of the safety audit is prepared by the audit team bringing out the strength and weaknesses of the occupational safety and health system of the industry along with recommendations for improvements. This paper deals with safety audit system in Indian Engineering Industries and various aspects of safety audit systems.

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### 1. Introduction

The modern industries are complex due to technological advancements and depending upon the nature of operations, it involves hazards of varying degree at each stage. The safety audit covers various occupational safety and health elements like Safety and Health Policy, Safety Organization, Operating Procedures, Work Methods, Working Conditions, Health Hazards, Compliance with Statutory Requirements / Codes of Practice, Personal Protection Standards, Management / Employee Training, Accident Reporting and Investigation etc. Bureau of Indian Standards has formulated a number of standards for various items especially for use in industry. Some important standards are on Boiler, Pressure vessels, Oil Tanks, Electrical works, Gas Cylinder, Material handling, Transport, lifts, Escalators & Rope ways, Safety in Construction, Welding, Workshop practice and Firefighting equipment etc.

National building code (NBC) is an useful reference for standard practices to be followed for construction of buildings, building materials, fire protection, structural design, constructional practices and safety, signs, displays and building services. The services include lighting and ventilation, electrical installation, air conditioning and heating, acoustics, sound insulation and noise control, installation of lifts and hoists. National building code(NBC) includes a separate section on fire protection of buildings.

The Safety Audits can be conducted by external third party agencies or internally by plant/department officials as detailed below:-

- External Audit : These are conducted by the third parties like Central Labour Institute

(CLI)/Regional Labour Institute(RLI), National Safety Council(NSC), consultants etc.

- Internal Audit (In-company)
- Corporate : By headquarters, Personnel from other units of same company.
- Self : In-house; by local plant personnel. Generally, the frequency will depend on the nature and type of activities within each area of operation. Generally the audit can be carried out once in a year. Frequency of shorter duration may be required for specific areas or activities based on inherent OSH deficiencies.

### 2. Objectives

These are the main objectives of the safety audit systems are, To identify deviations from designed and planned operating and maintenance procedures and standards. To identify plant conditions or operating procedures that could lead to an accident and significant losses in life or property. To ensure that the plant and operating and maintenance procedures match the design intent and standards. To keep the operating personnel alert to the process hazards.

To review operating procedures for necessary revisions. To seek to identify equipment or process changes that could have introduced new hazards. To initiate application of new technology to existing hazards. To review adequacy of safety inspections. To look for major risk situations and To recommend measures to improve overall safety performance of the plant.

### 3. Methodology

Ashford [3] indicated in his book that the safe working environment cannot be achieved only by the

authorized channels. He stated that the inadequacies in economic, political, scientific and technological spheres, must overcome to the safe working environment and the difficulties with law enforcement must be noticed. The following methodology may be adopted for carrying out the Safety Audit:-

- Preliminary visit of the Audit team to get acquainted with the plant, machineries, operations, processes, layout etc.
- Discussion with senior management personnel to know the background of the factory, technology adopted, organizational structure, general details of operations / process, status of Occupational Safety and Health, specific OSH problems faced by the management etc.
- Collection of data covering various management and technical elements of Occupational Safety and Health.
- Verification of data collected through plant visits, inspection, discussion with plant personnel etc.
- Analysis of data collected.
- Final meeting of the Audit Team with the senior management personnel of the industry to discuss and brief about the audit findings and recommendations.
- Preparation of Safety Audit Report.
- Bringing out both the strength and weaknesses of existing OSH system in the industry with recommendations for improvements.

### *3.1 Strategies for Collection of Information for Safety Audit*

Clarke [4] explained the various safety management techniques for Building construction sectors and Rafiq et al [6] reviewed the concepts of organizational culture, safety culture, summary of safety culture definitions and researches, models and measurement of safety culture with construction safety. The sources for collecting information and its authenticity are very important for Safety Audit. The following strategy may be adopted for collecting information.

Physical observation and collection of data by actual visit to the plant facilities. Verification of records pertaining to testing, examination, inspection, production, maintenance etc. The information collected as per the above two methods will have to be cross checked wherever necessary for there will be instances wherein a physical verification did not support facts gathered from the records. Likewise, the physical conditions and the level of safety obtaining at site might not have also been reflected

appropriately in the records. Therefore in order to be as objective as possible, it is necessary to cross check the facts gathered by plant visits and facts as recorded in the records.

Wang Jianping et al [7] analysed a multi-agent network security audit system. It can solve problems in a complex environment of independent agencies and Zhou Yarong et al [8] mentioned the objectives of the safety audit in engineering industries in their papers. Since systems and procedures and its adaptation are not only revealed by physical visits or records but also by the knowledge of persons who are operating the plants, it is essential that the discussion of the auditor with the plant personnel becomes one of the important strategies. While the information collected through the three methods discussed above, would be audited against statutory requirements, safe operational practices, plant safety standards etc. there may be areas/situations which needs to be commented upon by the auditor for its adequacy of safety and the level of safety measures. This will have to be done by professional judgement of the auditor for which the experience and objectivity of the auditor are essential. Therefore, this strategy would be adopted as a last step in the strategies. This step will be adopted, rather restricted to, situations which are not covered by statutory requirements, codes of practices or plant safety standards.

### *3.2 Check List Method*

The check list method is based on collection of information through a detailed and comprehensive check list which is developed for assessing the safety level and its adequacy on various aspects. The check list or questionnaire so prepared shall facilitate the auditor to assess the level of safety, compliance details, adequacy of safety measures in respect of each and every audit elements in a comprehensive manner. To bring out of all the relevant details necessary for this purpose, several questions will have to be prepared for the same subject or audit element which will be called sub-elements. Thus, when questions/check list connected with an audit element and its sub-elements are developed properly, information collected in the form of answers or details should enable the auditor to know all that needs to be known about the audit element in question. The check list method is the most common method for carrying out different types of audits.

### *3.3 Collection of Information from Records*

Ann et al [2] has studied the development of safety awareness in various working environments. As mentioned earlier, assessing the extent of safety compliance through records is one of the strategies.

Records are important source for eliciting information relating to safety and health requirements. Whenever we mention records, we mean records pertaining to Safety inspections, testing or examination of plant and equipment required to be maintained as per statutes or maintained as per the management procedures.

An auditor who is desirous of making an in depth and objective assessment of safety would not only rely or restrict his collection of information from records relating to safety but also from other records as well. The suggested list of records for collection of information is as mentioned below:-

- Records pertaining to Safety Inspection Testing and examination maintained either for meeting statutory requirements or on the initiative of the plant.
- Accident Register/Reports.
- First Aid Reports
- Production logs, particularly portion relating to delays due to malfunction of equipment/device failure or equipment/accessories including process interruptions.
- Records relating to tool issues and consumption pattern of raw material.
- Maintenance Records
- Manufacturer's instructions, Machine Manuals etc.

### 3.4 Discussion with Plant Personnel

Lynda et al [5] studied the effectiveness of operational health and safety management systems in various industries. Alison et al [1] studied the various management practices and discussed the most effective practices for reducing employee injury rates. The other strategy is to collect/verify of information through plant personnel which would supplement the information collected from the records as well from personal observations made at site. The information can be elicited from the plant personnel regardless of their level; discussions can be held with Operating Manager to know the extent of important they give and efforts they put in to integrate safety with their day to day work. Similarly the discussion with Supervisors can be used for ascertaining the manner in which they supervise the safe behaviour of Operating Personnel, obtain compliance with safety rules and the aspects of their day to day work on which they integrate safety in their work. Likewise, discussions can be held with operating personnel to ascertain their knowledge about safety aspects. Safety Rules, toxicity data of hazardous substances, the precautions they should observe while at work. The details of information so

collected would be used not only for auditing one audit element but also for more than one element. The knowledge of safety rules, elicited from discussion can be useful while auditing the element 'Plant Safety Rules' and 'Procedures' and 'Safety Training'. Thus, the information collected from the discussion with the same person would be useful for two audit elements.

### 3.5 Professional Judgement

The fourth source or the strategy for collecting information for the audit is through professional judgement. As objectivity which the auditor brings to bear on his judgement, is likely to be doubted this source is used to the minimum extent. Nevertheless, the auditor cannot completely avoid collecting through this source as in some situations this source or method be the only means available. For example, if an auditor desires to collect information under the audit element, 'Operational Safety' about the extent to which plant, machinery or equipment are having guards, protection devices etc. he has to use his professional judgement as a means of confirmatory test by making random sampling. Prior to this confirmatory test, the audit would have audited the other sub-elements relating to this aspect the like the system of maintenance of machine guards, cross checked it with the records pertaining to maintenance, and would have elicited further information from the discussions with the plant personnel. He has to finally confirm the completeness of the efforts by ascertaining the actual position obtaining in the plant for which resorting to the use of professional judgement cannot be avoided. In any plant, the number of such equipment/machinery requiring to be checked for this purpose would be many and in such situations actual count would be quite consuming and 'random sampling' for this purpose. The professional capability of the auditor and whether the samples selected by him are representative of the actual position are aspects failing within the realm of professional judgement. Hence, the auditor reserves this method of collecting information to the minimum extent necessary. To further illustrate this point, one can take up the conditional aspects of plant and machinery, particularly from the point of view of safety. If the records and the systems indicate that the periodic inspections are being carried out confirmatory assessment have to be made using professional judgement. Conditions like corrosion, erosion, rust, wear and tear etc. and the extent to which these conditions would have safety implications are areas which fall within the ambit of professional judgement. Obviously, the auditor would not checking these aspects on each and every item of

equipment or plant or machinery but he will make a random assessment using professional judgement.

To surmise, it has to be pointed out that collecting information for the purpose of Safety Audit would have to be carefully thought out, well planned, meticulous exercise which should be as objective as possible. In doing this, an auditor need to have an undertaking about the process, plant have a preliminary discussion with the plant personnel during which time he would explain the system of audit to the heads of sections of department and get a feed back about their plant systems and practice. He would also explain to them as to how they would have to co-operate with him and interact with him. He could also during the preliminary discussion time decide on the safety aspects which would be taken up for auditing.

Aimed with the details collected during the preliminary discussion, the auditor would then proceed to carefully/prepare the checklist/questionnaire for each and every element and then take up the detailed audit. Proper communication of the observations, analysis and recommendations are as important as carrying out the task itself. The findings of even a good audit, if presented poorly may not produce the desired results. It is therefore important that the auditors should be able to communicate the information clearly and convincingly.

### 3.6 Suggested List of Audit Elements

The suggested lists of audit elements are as below:-

- Occupational safety and health policy
- Occupational safety health set up
- Education and training
- Employees participation in OSH management
- Compliance with statutory requirement
- First-aid & medical programme
- Records and forms
- Identification and assessment of occupational diseases
- Health surveillance and health monitoring
- Health and welfare measures
- Identification of areas, assessment and control (noise and vibration)
- Heat stress and ventilation
- Illumination
- Dusts and fumes
- Gases and vapours
- Materials safety data sheets (MSDS)
- Material handling, transportation and storage
- House keeping
- Waste treatment disposal

Monitoring of workplace environment and all exposures

Local exhaust system and ventilation

Safety in process/operation

Personal protective equipment

Emergency preparedness

Maintenance programmes

General working conditions

### 3.7 Report Writing

The most efficient way of writing a report is to start writing as soon as possible. In external audits, it is highly desirable that the entire report with findings be drafted at the plant site itself. If necessary the audit team could stay on at the site after completion of the field visit for a day for this purpose. If audits are carried out for a few days, it is desirable if the team allocates an hour at the end of each day to discuss and prepare the draft report. It is generally easy to write a rough draft first and then perfect it. Reports are generally made of the broad elements like introduction, body of the report, recommendations and other information and the report should be properly structured.

The following format may be used in writing the report for the Safety Audit:-

- Executive summary
- Detailed Report
- Introduction
- Details of the factory
- Objectives
- Methodology
- Inspections
- Observations, findings and recommendations/suggestions.

If the Safety audit is carried out In-house, details of the factory etc. can either be reduced or eliminated.

Executive Summary is the précis of a report and will tell the reader in a little greater detail the ground covered in the report, the main findings and the recommendations. It is intended for both, very senior people who may not have the time to read the entire report and for others as well who would read the report in detail. Summary should not contain anything that has not been covered in the main report.

### 3.8 Safety Audit Reports – Key Points

Not only deficiencies but also positive points should be covered (with examples).

Photographs could be taken and enclosed in the report, in consultation with the management.

Recommendations should be prioritized.

While making recommendations, the standard on which it is based should be highlighted/referred.

Deficiencies and Recommendations: The observation of deficiencies should give specific cases with locations and details. The recommendations however do not seek to correct these specific instances only but suggest improvements in the system throughout the plant.

The audit report should be in simple language and clear unambiguous terms should be used.

The report should be properly arranged, typed neatly and presented properly.

Issue of the report should not take too long.

### 4. Conclusion

Sufficient efforts must be put in, in the preparation of the Safety Audit report, to make the whole exercise worthwhile. While noting down the details, whether from perusal of records or field visits, the information

noted should be clear and any doubts should be clarified immediately as in-correct information will give a bad impression about the audit exercise. The report should neither be too long nor too short, but just the right size – appropriate to the size of the site/factory audited and covering the relevant points.

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