



RRB ALP Engineering Drawing Study Plan, Part IV PDF

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SAFETY IN ENGINEERING

Safety is a discipline which requires identification and control of causal factors in engineering in order to provide value to organizations.

There are many goals of engineering safety and some of these are as follows:

Reduce accidents, Control or eliminate hazards, Develop new methods on safety efforts, Maximize public confidence with respect to product safety.

Important Definition:

Safety: This is conservation of human life and its effectiveness and the prevention of damage to items as per mission requirements.

Unsafe condition: This is any condition under the right set of conditions that will result in an accident.

Accident: This is an unplanned and undesired event.

Safety Management: This is the accomplishment of safety through the efforts of others.

Hazard: This is the source of energy and the physiological and behavioral factors which when uncontrolled effectively, result in harmful occurrences.

Safe: This is protected against any possible hazard.

Safety Management work: This is accomplishing safety by using per suasive approaches and information in a closed loop system.

Safety assessment: This is qualitative/quantitative determination of safety.

Safeguard: This is a barrier guard, device, or procedure developed to protect people.

Safety movement: This started during world war II when all of the various practitioners of occupational health and safety realized the desperate need for cooperative efforts.

Unsafe act: This is an act that is not safe for and individual/employee.

Accident report: This is a document that records the findings of an accident investigation the accident cause/causes and the recommended measures.

Unsafe behavior: This is the manner in which an individual conducts himself/herself that is unsafe to himself/herself or others.

Hazard control: This is a means of lowering the risk from exposure from a perceived hazard.

Injury: This is a wound or other specific/certain damage.

Safety plan: This is a series of procedures followed to enable all safety related requirements of an item to be identified and satisfied.

Software process: This is a series of procedures followed to enable all safety related requirements of an item to be identified and satisfied.

Software safety: This is the freedom from software related hazard.

Software hazard: This is a software condition prerequisite to an accident.

Hazard and It's type: A hazard is any practice, behavior or condition or combination of these that can cause injury or illness to people or damage to property.

- **Material Handling Hazards.** Manual material handling can involve lifting, carrying, lowering, pushing, and pulling. All of these activities can lead to muscle strains, tears and pulls of the back, shoulders, arms and abdomen. Handling of hazardous materials, such as corrosives, flammables and reactive is another key area.
- **Machine Hazards.** Any machine can be a hazard, especially those with moving parts that can get tangled in a worker's clothes or come into contact with a worker's body.
- **Energy Hazards.** Workers can be seriously injured by the sudden movement of machine components, electrical shock or other releases of energy when they are adjusting or maintaining equipment.



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- **Work Practice Hazards.** Failure to have or to follow safe work practices is a significant cause of injuries. Performing work safely in accordance with established safe work procedures is a fundamental element in the control of safety hazards.
- **Confined Space Hazards.** Confined spaces are workspaces where hazardous gases, vapours, dusts or fumes may build up or where an oxygen-deficient atmosphere may be created. Examples include: storage tanks, vaults, pits, vats, silos, pipelines, ducts and tunnels.
- **Physical Hazards.** Physical hazards are forms of energy that can harm the body if exposed.
- **Chemical Hazards:** Chemical hazards can take the form of solids, liquids, vapors, gases, dusts, fumes or mists.
- **Biological Hazards:** Biological hazards are living things or substances produced by living things that can cause illness in humans.
- **Ergonomic or Work Design Hazards:** Ergonomic hazards arise from the design and organization of work. They can harm the body by placing strain on the musculoskeletal system and overloading the muscles, tendons, joints, ligaments, nerves and blood vessels.
- **Stress or Psychosocial Hazards:** Workplace stressors can lead to excess stress or distress and have been identified as important factors in many types of illness, including heart disease and high blood pressure.
- **Accident Causation theory:** The **domino theory** is operationalized in the statements known as the axioms of safety and assumes that there are five specific factors in the sequence of events leading up to an accident (i.e., ancestry/social environment, fault of person, unsafe act/mechanical or physical hazard, accident, and injury). The **human factor theory** assumes the occurrence of accidents to a chain of events ultimately caused by human error and in turn human error is caused by three broad factors inappropriate response, overload, and inappropriate activities. The fundamental basis of the **epidemiological theory** is that the models used for studying the relationships between environmental factors and disease can also be utilized to determine causal relationships between accidents and environmental factors. The **accident/incident theory** is basically an extension of the human factors theory and it introduces new elements such as the decision to err, systems failure, and ergonomic traps. The **systems theory** assumes any condition in which an accident might occur as a system with three specific elements: environment, human or person (host), and machine (agency). The combination theory tells that no one individual model theory can describe all accidents as their actual causes may combine parts of various different models.

SAFETY MANAGEMNET

Safety policy include the following:

The Health and Safety at Work Act says we need to set our policy out in writing and then bring it into effect. Most businesses set out their policy in three parts: The statement of intent section sets out our commitment to managing health, safety and the environment effectively and what you want to achieve. The organization section states who is responsible for what. The arrangements sections are the detail of what we are going to do in practice to achieve the aims set out in your statement of intent.

Safety Promotion: Although safety can to some extent be engineered into equipment and processes, it is still necessary to motivate employees to perform their' work safely. An effective safety program must be persuasive; it must provide a stimulus to which employees will" respond positively.



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Safety Committee: A safety committee is most useful mechanism for facilitating the necessary co-operative effort that is essential to success in accident prevention. It should consist of representatives from top management, supervision from the workers. It should act as an advisory body and meet regularly.

SAFETY FUNCTIONARIES

There are a number of specialized safety functionaries known by different designations such as safety-officers, safety advisers, safety directors, who are mainly appointed to administer the organization's safety policies and programs.

- 1. Safety Officer:** Safety officer advise and assist the factory management in the fulfillment of its obligations, stationary or otherwise, concerning prevention of personal injuries and maintaining a safe working environment. The safety officer is to performer the duty of the psychologist. He can create a much wider and quicker acceptance or industrial psychology as a practical aid in safe and efficient production. His duties are as follows:
- 2. Safety Director:** Safety director is the head of safety functionaries. The director of safety performs a number of significant tasks which are as follows:
 - Formulation and administration of the safety program.
 - Acquisition of the latest and best hazard control information.
 - Advising on safety-related issues, to managers at all levels.
 - Reporting to top management periodically, on a regular basis, on. the organization's safety effort.
- 3. Safety Adviser:** The functions of the safety advisor is advisory, leaving executive decisions. The functions of the safety advisor is advisory, leaving executive decisions for line managers. The role and function of the safety adviser will normally include:
 - Monitoring the implementation of the organization's health and safety policy.
 - Advising line management to assist them in meeting some of their health and safety responsibilities.
- 4. Safety Engineer:** Safety engineer in many industry and government operations generated an inherent dichotomy. Since the responsibility of safety engineers may involves making decisions that can slow production, delay testing, and otherwise impede the organization's overall assigned mission. This put the safety engineer in the position of being an outside to the production organization on which his or her decisions may have the greatest impact. The safety engineer must be free of coercion in making decisions and, must not be under the influence of the production group, which might tend to interpret safety considerations by their effect on production levels or schedule. The responsibilities of safety engineers may include the preparation of safety procedures and other safety related documents, safety training, issuance and control of personal safety equipment, consultation and advice on safety aspects of new or changed processes, and inspection of ongoing work to ensure that appropriate safety requirements are being followed. Safety engineers generally work closely with reliability and quality assurance personnel and, in some organizations, these two functions may be placed in the same group.
- 5. Safety Department :** In an every organization for effective safety and health management a well organized safety department is constituted.
 - To establish the norms and guidelines for the provision of safety of sites, employees, materials, equipment and structures.
 - To prepare checklists, manuals, and other documents for use by the line management' in carrying out their functions.



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- To supervise safety at site and within the organization.
- To give advice on all safety matters in accordance with the safety policy.
- To maintain all safety records, prepare reports and monitor the same to all concerned.
- To conduct safety training in the organization.
- To carry out safety audit periodically.
- To discharge all statutory obligations of the organization regarding safety, and maintain liaison with the government safety machinery and other industry association.
- To organize competitions, posters, melas and such other activities that promote safety consciousness amongst employees.

Safety Planning: Planning is the process of deciding in advance the future course of action. Planning is must for achieving industrial safety. Planning forms the backbone of any management activity including industrial safety management. Planning for safety includes considerations like role of employees/management, participation of workers, experience of workers, age and other factors of workers, actual working procedures and conditions etc.

Safety Audit: The objective of the audit is to determine the effectiveness of the organization's safety and loss prevention measures and this can be broadly stated as under:

- (a) To carry out a systematic critical appraisal of all potential hazards involving personnel, plant and machinery and the work methods.
- (b) To ensure the standards set for occupational health and safety fully satisfy the legal requirements as well as management's laid down safety promotional programmers.

Safety audit examines and assesses in detail the standards of all facets of a particular activity.

Occupational Safety and Health:

Occupational health and safety is a discipline with a broad scope involving many specialized fields. It encompasses the social, mental and physical well-being of workers, that is the "whole person". Occupational health comprises the identification, evaluation and control of processes and substances that may harm people, cause their discomfort or damage their environment. Safety is an organized and conscience effort to prevent accidents and minimize risks. Common human tendency, one quite often neglects safety. One looks at it only when an accident takes place. The purpose of the act is to assure working men and women safe and healthful working conditions. The act is applicable to every employer engaged in business affecting commerce. It is not for the self-employed or to workers to the extent they are covered by other federal safety and health laws. It was first signed at U.S. in December 1970.

In India : The principal health and safety laws are based on British factory Act 1948, and has been amended in 1954, 1976, 1987. Following the Bhopal gas disaster, a special chapter on occupational and safety to safeguard workers employed in hazardous industries was added. Other key legislation dealing with occupational safety and health (OSH) are: Mines act (1952), Dock workers act, 1986, plantation labor act 1951, petroleum act: 1934, insecticide act 1968, Indian Boiler act 1923, Indian atomic-energy act 1962, Radiological protection act 1971, Manufacture, storage and import of hazardous chemicals rules 199, electricity act 2002. The Constitution of India contains specific provisions on occupational safety and health of workers. Article 24 states that no child below the age of 14 years shall be employed to work in any factory or mine or engaged in any other hazardous employment.



The Directorate General of Factory Advice Service and Labor Institutes (DGFASLI) and the Directorate General of Mines Safety (DGMS) the two field institutes of Labor Ministry strive to achieve the principle~ enshrined in the Constitution of India in the area of occupational safety and health in factories, mines, and ports.

Directorate General of Factory Advice Service and Labor Institutes (DGFASLI):

The Directorate General of Factory Advice Service and Labor Institutes, Mumbai, which is an attached office of the Ministry of Labor functions as a technical arm of the Ministry in matters concerned with safety, health and welfare of workers in factories and docks. It assists the Central Government in formulation and review of policy

Directorate General of Mines Safety: The Directorate General of Mines Safety is a 'subordinate office of the Ministry of Labor. It has its headquarters at Dhanbad with its zonal, regional and sub regional offices spread all over mining areas. It is entrusted with the responsibility, of enforcing the provisions of the Mines Act, 1952, and the Rules and Regulations framed thereunder in coal, metal/ ferrous and oil mines.

National Safety Council: The main objective of the Council which is an independent and self supporting national. level institution, has been to generate, develop and maintain a movement of safety awareness at the national level To achieve this objective, the Council conducts a variety of educational, training and promotional activities.

12th Five year Plan Schemes in Respect to Safety: During the 12th five year plan period (2012- 2017), DGFASLI process to operate the following seven plan schemes:

- (i) Strengthening of DGFASLI organization and OSH in factories.
- (ii) Strengthening of enforcement system in ports and docks.
- (iii) Development of regional labor institute, Faridabad as Centre of excellence in safety systems in MSME & Chemical process units.
- (iv) Effective implementation of systems at work place in Manufacturing and port sector.
- (v) Identification, Elimination and control of Silicosis in India.
- (vi) Identification, Elimination and control of Asbestosis in India.
- (vii) Strengthening of enforcement systems in factories-establishment of industrial safety, occupational health and work environment Centre in the state factory directorate.



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