PRINCIPLES OF SAFETY IN CONSTRUCTION

State the basic principles of construction safety.

- Every large volume of construction project should have a safety department headed by a safety officer
- Safety measures may be in cooperated as a clause in contract document
- Previous safety record of a contractor is an important consideration in the pre qualification of contractor
- Safety is a cost item developed without providing funds
- 0.2% of estimated cost of construction project is used for safety management
- Safety education and training is the most important aspect of construction industry
- Government needs to improve safety inspection and data collection
- Contractor and trade unions in construction shall extend their concern to safety
- Safety measures should start at planning and design stage itself.
- Educate and train all those working in the organization and those entering a project site about safety norms and the dos and don'ts.
- Adopt safety as part of work culture.
- Conduct mock drills or exercises to check the preparedness and efficiency of safety standards.
- Prepare a safety manual for each organization, Even though safety is the concern of everybody in an organization
- Follow the material handling instructions such as do not use hooks', highly inflammable', 'fragile', 'this side up': 'do not throw etc.

Identify the major causes of accidents at sites.

1. **Planning , organization**
   - Defects in technical planning
   - Fixing unsuitable time limits
   - Assignment of work to incompetent contractors
   - Defective supervision of the work
   - Lack of cooperation between different trades
2. **Execution of works**
   - Constructional defects
   - Use of unsuitable materials
   - Defective processing of materials
3. **Equipment**
   - Lack of equipment
   - Unsuitable equipment
   - Defects in equipment
   - Lack of safety devices or measures
4. **Management and conduct of work**
   - Inadequate preparation of work
   - Inadequate examination of equipment
   - Inadequate instructions from supervisor
   - Unskilled or untrained operatives
   - Inadequate supervision
5. **Workers behavior**
   - Irresponsible acts
   - Unauthorized acts
   - Carelessness

What are the effects of accidents?

What are Types of accidents and its effects?

- Accidents can be classified as minor accidents, major accidents and fatal accidents.
- Minor accidents are those in which only first aid needs to be given.
- Major accidents results in hospitalization
- Fatal accidents are those in which at least one death has occurred.

The major effects of accidents include:

- Cuts and wounds
- Burns

- Bone fracture
- Loss of limbs
- Loss of life
- Loss of materials and machinery
- Psychological fear among workers
- Loss of goodwill of the organization
- Prolonging of project duration
- Legal compensation and several other challenges.

Explain the various safety practices to be followed at project site.
List various safety practices at construction site.

- Formulate safety standards and safety plans for the project site
- Obey safety norms.
- Educate and impart training to everyone at the project site.
- Insist on wearing appropriate safety equipment like helmets, gloves, goggles, safety belt, mask, gumboots etc.
- Follow proper material handling guidelines.
- Do not flow shortcuts.
- It must be ensured that vehicles and machinery are operated only by licensed or trained persons
- Protect all openings with bars and toe boards
- Provide temporary hand rails to all stairs under construction.
- Check the safety of form work, scaffolding and other temporary structures.
- Take precautions against fire, electric shock explosion, bums outs etc.
- Provide first aid kits and training on how to use them, penalize willful safety violators, install safety equipment like fire extinguishers and alarm systems wherever necessary
- Conduct mock drills to check the efficiency and effectiveness of safety
- No employee should be given new assignment without proper explanation of hazards with his fellow employees.
- Employees under influence of intoxicating beverage should not be permitted.
- Employees working around moving machinery should not be permitted to wear loose garments.
- Employees must use standard protection equipment for each job.
- All materials in bags, containers or bundles stored in tries should be stacked, blocked and interlocked and limited in height so that it is stable and secure against sliding or collapse.
- Adequate ventilation should be provided at working place.
- No person should be allowed to enter the wearing space if there is poisonous atmosphere without wearing suitable breathing apparatus and equipping with a life line.
- To prevent drowning on sites adjacent to water suitable rescue equipment should be provided.
- Workers employed on mixing asphaltic materials and stone breakers should be provided with protective foot wear.
- Lead compounds should not be used in the form of spray in interior painting.

State the precautions to be taken in material handling
Precautions in handling hazardous material

- Follow the handling instruction such as do not use hooks, highly inflammable, fragile, this side up etc.
- Do not smell, taste or touch toxic materials.
- Do not throw any material
- Wear appropriate goggles, gloves and masks while handling abrasive, hot, fuming, toxic or dusty materials.
- Follow the Hazardous chemical code instructions while handling hazardous materials.
- Wash skin and eyes in case you come into
- Store the material as per instructions and use them within the specified shelf
- Manuals or training programs to guide persons in safe use of new materials.
- Inflammable liquids and grease should be stored in no smoking area and properly separated from other stored materials.
- Flammable liquids and lubricants should be handled and transported in safety containers and drums tightly capped.
- Persons working in hoppers or high piles of loose materials should be equipped with life line and safety belts.
- Petrol or other flammable liquids with flash point below 1000 F should not be used for cleaning purpose.

- ❖ At every work site first aid shall be issued to injured persons under guidance of medical officer.
- ❖ Persons handling corrosive materials, adequate equipment should be provided.
- ❖ Adequate ventilations shall be provided by suitable respirators to prevent inhalation of dust and fumes injurious to employees.
- ❖ Workers working on asphaltic materials and stone breakers should be provided with protective foot wear.
- ❖ Suitable face mask should be supplied for workers when lead paints are applied in form of spray.

What is meant by occupational hazard? Give two examples.
Identity the various occupational hazards
This is the risk accepted as the consequence of a particular occupation. These are hazards that are inherent with certain categories of occupation. Examples are:

- ➢ Road accidents in the case of vehicle drivers
- ➢ Silicosis in those exposed to fine silica
- ➢ Lead poisoning
- ➢ Chances of tall in the case of people working at heights
- ➢ Repetitive strain injury
- ➢ Spread of epidemics in the case of health workers burns in the case of working in hot surroundings, leakage of toxic factories etc. are also occupational hazards

State the role of the supervisor in maintaining safety at sites.

- ❖ He must ensure safe working environment
- ❖ He is responsible for educating, training and enforcing safety
- ❖ He must regularly inspect and take up maintenance of all machinery, tools and equipment used in the works
- ❖ He must provide efficient first aid to injured persons
- ❖ He should be verify the safety of the temporary structures
- ❖ Site engineer should maintain suitable rescue equipment
- ❖ He must clean all construction areas and storage yards
- ❖ He must give training to workers and employees about precautions with respect to fire prevention, protection and fire fighting
- ❖ He must provide personal protective equipment
- ❖ He must inculcate “safety first” concept in all who concerned with construction
- ❖ Supervisor/site engineers need to have competency to set up safety systems at work

Explain the role of legislation in ensuring safety in the construction

- ❖ The Factories Act: This is an Act consolidate and amend the law regulating labour in factories.
- ❖ The Indian Mines Act: which is related to the regulation and inspection of mines
- ❖ Workmen's Compensation Act: is to make provisions for the payment of compensation to a workman
- ❖ The Employees' State Insurance Act: is for providing certain benefits to employees in case of sickness, maternity and employment injury, and also to make provisions for certain other matters incidental

ENTREPRENEURSHIP

Entrepreneur
It is a person who sets up a business or businesses, taking on financial and other risks with the hope of making profit.

Entrepreneurship

- ❖ It is the process of designing launching and running a new business, which is often initially a small one.
- ❖ It is a purposeful activity in initiating, promoting and maintaining economic activities for the production and distribution of wealth.
- ❖ It involves the capacity to bear risk, to forecast prospects of an enterprise confidence of competence to meet unforeseen and adverse situations.

Entrepreneurs
The people who create these entrepreneurial businesses are called entrepreneurs. Or Entrepreneur is one who innovates and promotes a new venture rise to the occasion and assembles the other factors of production and sets the business going.

Discuss the essential qualities to become an entrepreneur
State the factors which promote entrepreneurship

- Good organizing capacity and initiative
- A strong desire for innovation
- Willingness to take risk and face challenges
- Ability to work in any role
- Leadership quality
- Good interpersonal relationships
- Technical skills
- Desire to serve the society
- Positive attitude and self-drive
- Commitment and confidence
- Marketing skills
- Ability to foresee
- Tactics to overcome hurdles
- Financial management capabilities
- Flare for HR management
- Self confidence
- Self motivation
- Social recognition and motivation
- Government support to startups

What are the expectations of the society from an entrepreneur?
State the role of an entrepreneur in nation building.

- Generate employment opportunities
- Produce what the society needs
- Provide economical products with lesser overhead
- Support large industries by serving as ancillary unit
- Contribute to the economic growth of the nation
- Help the government in lessening un-employment and in the alleviation of poverty
- Integrity and commitment to the society
- Willingness to face challenges
- To be more eco-friendly
- Produce innovative and import substitution materials

Entrepreneurship in construction related activities

- Consultancy services in structural design, interior design, landscaping etc.
- Contract services in construction of buildings, public works etc.
- Manufacturing building materials like building blocks, windows and doors with light weight materials.
- Testing of building materials.
- Structural safety services using non destructive test equipment.
- Surveying works like preparation of layout, alignment of highways etc.
- Technical valuation of properties.
- Establish training institutes for training skilled labour in form work, bar bending etc.
- Establish training institutes for training in computer aided design and drafting software.

Compare and contrast the entrepreneurial style and the conventional managerial style.

ENTREPRENEURIAL STYLE	MANAGERIAL STYLE
Starts an industry without any experience.	Takes up task after an industry is launched.
There is no need specified hierarchy.	Follows hierarchy in delegation of authority and power
There is no specific routine. Everything is done as per the requirement	Follows routine procedures and practices
Innovative and nodal ideas	Does conventional things

Profit is secondary to public service	Profit motivated
Low investment	mass production with least HR
Small organization	large organization
Lower cost	Production overhead is high and higher is cost
Less experience in market	Well experienced
Produces what the society needs	Sells what they produce
More risks and challenges	Lest risk
More freedom in working	Least freedom in flexibility of work
Depends on skill and team work	Depends more on professional skill
May be stand alone on an ancillary unit	Works as a standalone unit
Government support the MSME in many ways	Government support is miniml
Over self confidence.	Experience makes balanced attitudes.
Utilizes resources rationally and economically.	Conventional methods are followed.
Adopts new techniques and produces new commodities.	Sticks to conventional method and cannot change production abruptly.
Has to refine psychological characteristics in an individual.	Sufficiently experienced.
Being an innovator introduce something new to economy.	Normal
Has fairly strong ambition.	Follows systematic and conventional ways.
Searches for a new market hither to unexploited.	Thinks of existing conditions.
There is a complete union of ownership and control.	Deals in organizational aspects. Helps to promote co-ordination.
Need not consult anybody while taking decision.	Has to consult before executing and implementing any decision.

Functions of management?

- **Determine and lay down objective**s and maintain them, objectives should be clear, definite and realistic
- **Putting together bits of information** gathered from different sources to get a picture of situation,
- **Planning** involves analysis of a problem, thinking out forward solution to that problem, outlining the steps to reach objectives
- **Organizing** creation of a structure of functions and duties by a group of people for attainment of objectives, and goals of enterprise
- **Staffing** defines requirements regarding people for job to be done, selecting suitable persons for positions, training subordinates to fulfill the tasks
- **Coordinating** is the essence of management with high productivity depends on interest and willing cooperation of management and workers
- **Directing** –directing, guiding, or counseling combines activities related to guiding, advising and supervising subordinates
- **Motivation-**it is necessary to make the employees to work harmoniously to attain goals
- **Controlling-**call attention to deviations of performance from plans point out trouble spots, and corrective action is taken, leads to finding of difficulties, overcoming difficulties, adjusting operations
- **Promoting Innovation:-**permanent success promotion of innovation is needed, innovation is introduction of new philosophy, idea, policy or procedure

Identify the organizations supporting entrepreneurship and state their role.

- Organization giving financial supports
  - Nationalized banks
  - IDBI (Industrial Development Bank of India)
  - ICICI Industrial Credit and Investment Corporation of India)
  - KFC (Kerala Financial Corporation).
- The major organization that supplies raw material
  - STC (State Trading Corporation)
- Micro, Small and Medium Enterprises (MSME), a branch of the Government of India, is the apex body for the formulation and administration of rules, regulations and laws relating to micro small and medium enterprises in India.
- The Small Industries Service Institute (SISI's) are set up, one in each state, to provide consultancy and training to small and prospective entrepreneurs.
- The National Small Industries Corporation Ltd. (NSIC) is working to fulfill its mission of promoting, aiding and fostering the growth of small-scale industries and industry related small-scale services/businesses in the country
- CSIR (Council for Scientific and industrial Research) is a research and development (R&D) organization sharing their knowhow with small scale industries.
- Exhibitions and Trade Fares organized by the government are excellent opportunities for marketing
- Other organizations supporting the small-scale sector are District Industries Centre (DIC), and Small Industries Extension Training (SIET).

Requirements to become a licensed surveyor

- Any construction, residential, industrial, shopping center, recreation places, restaurants in a town or a city shall be approved by municipalities or corporations.
- Such proposals are submitted in form of drawings like site plan, proposed building, adjacent property boundaries, and existing roads.
- These drawings showing plans, section, and elevation are certified by registered licensed building surveyor.
- He should be thorough with town planning rules during the time of submission of drawings.
- The number of licensed building surveyors shall depend upon nature of town or city, growth of town and determined by council.
- The minimum qualification for a registered building surveyor shall be Diploma in Civil Engineering or Degree in Civil Engineering or corporate membership (Civil) of Institution of Engineers (India).
- He shall submit application form with proof of qualification to municipal authorities and the registration fees according to rule.
- The council shall verify requirements and approve registrations.
- The council also conducts interviews and has got legal right to cancel license of surveyor.

Requirements to become a licensed contractor

- Contractor may be an individual or a group of person registered as a firm.
- They should form a company and shall submit technical and financial viabilities and experiences in construction field.
- Depending upon financial abilities engineering department will register under different classes. ie; A class contractor, B class contractor.
- Before submitting a tender registered contractor should submit a clearance certificate from income tax department.
- After categorizing contactors, registration fee is paid to engineering department.
- This enables contractor to enter into a contract agreement if tender is accepted by an engineer.

Small scale industry

Small scale industry sector to make and ever growing contribution to national economy like production, distribution, development of exports, expansion in employment opportunities, import situations etc.

Factors responsible for growth of small scale industries

- Considerable cost advantage is achieved.
- Reserved product lines for small scale industries, a policy taken by govt.
- Study of economic viability and optimum utilization of capital resources.
- Availability of larger credit from nationalised banks.
- Procurement of imported and scarce raw materials along with existing facilities.

Small scale industry – role in economic development

- Small scale industries is important towards poverty eradication, employment generation, rural development and creating regional balance in promotion.
- Employment generation – provides huge number of employment opportunities.
- Mobilisation of resources and entrepreneur skills – mobilise a good amount of savings and entrepreneur skill, improves social welfare of a country.
- Equitable distribution of income – stimulate redistribution of wealth income and political power within societies.
- Regional dispersal of industries – Utilises local resources and brings dispersion of industries in various parts of country, promotes balanced regional development.
- Provides opportunities for development of technology.
- Indigenisation – Makes use of indigenious organizational and management capabilities by drawing entrepreneurial talent and testing round for new venture.
- Promotes exports.
- Supports the growth of large industries – by providing components, accessories, semi finished goods.
- Better industrial relations.

Requirements of small scale business

- License:-
  - government issued permission to engage in an activity or to operate a business
- Criteria for small scale industry in India
  - Industry employing less than 100 workers
  - Having fixed assets of less than 10lakh need not obtain any license
  - Confirm rules and regulations by state or local authority under factories act

QUALITY MANAGEMENT

Definitions of the terms used in quality systems?

- Quality
  The totality of features and characteristics of a product or service that bear its ability to satisfy stated needs
- Quality policy.
  The overall quality intentions and directions as regards quality. It ultimately forms the key element of corporate policy
- Quality management
  Quality management is the act of overseeing all activities and tasks that must be accomplished to maintain a desired level of excellence.
  This includes the
  - ✓ determination of a quality policy,
  - ✓ creating and implementing quality planning
  - ✓ assurance, and quality control and quality improvement
- Quality control
  It means the operational techniques and activities that are used to fulfill requirements for quality. It is a very broad concept.
- Quality assurance
  It includes all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality

What are the elements of quality?

- Leadership
- Training
- Incentives
- Management
- Myths
- Traps
- Tricks

What do you mean byTotal Quality Management (TQM)

- It is a dynamic process involving all levels in organization to promote improvement in effectiveness and efficiency of all elements in business
- TQM has to improve efficiency and effectiveness by
    - ✓ statistical thinking
    - ✓ Managing with facts
    - ✓ Detect and error prevention

Elements of TQM

- Customers satisfaction
- Employees involvement
- Morale of employees
- Quality control circles and suggestion system
- High revenue
- Lower cost
- Quality control
- Control of production
- Quality planning
- Quality improvement
- Quality implementation
- Quality assurance system
- Vendor control and quality in procurement
- Customer relationship management
- Total organization involvement
- Quality education and training
- Measurement information analysis
- Strategic quality management
- Leadership

Requirements of TQM

- Sound foundation: philosophy,policy,culture,leadership,commitment
- Sound infrastructure:
    - Organisation systems,
    - procedures,
    - Mannuals
    - , customer involvement,
    - suppliers involvement,m
    - training and education,
    - total employee involvement
- Use of specific tools and techniques

Aims of TQM

- Conformance to customer requirements
- Prevention of producing bad quality
- Ideal of zero Defect as performance standard
- Measurement of cost of quality

Quality system

- It is the agreed companywide and plant wide operating work structure documented in effective way
- Integrated technical procedures for guiding coordinated action of people, machines, information of company or plant to ensure customers satisfaction, economical costs of quality

Elements of Quality Systems

- **Management responsibility:**

- ✓ define and document its quality policy to overall corporate policy and identify organizational forms and resources to manage the implementation of quality policy

- **Quality systems**
  - ✓ Establish and maintain documented quality systems to ensure the product confirms to specified requirements
  - ✓ Ensure effective implementation of documented quality procedures and instructions
- **Contract review**
  - ✓ Establishes and maintains procedures for contract reviews for coordination of these activities
  - ✓ Requirements are adequately defined and documented
  - ✓ Any requirement differing from tender are resolved and management should evaluate its capability to meet contractual requirements
- **Design Control**
  - ✓ Establish and maintain procedures to control and verify design outputs meets design input requirements
- **Document Control**
  - ✓ Recognize scope on documentation to be controlled
  - ✓ Identify essential controls
- **Purchasing :**
  - ✓ Understand the steps taken to select subcontractors to meet the requirements
  - ✓ Identify essential features of a purchase
  - ✓ Identify its own responsibility ,purchaser undertakes product verification
- **Purchaser –Supplied Product**
  - ✓ Establish procedures for verification or storage and maintenance of purchaser supplied product
  - ✓ Understand controls in respect of subcontract
- **Product identification and traceability:**
  - ✓ Identify product from drawing, specifications of other document during various stages of production, delivery, and installation
  - ✓ Individual products or batches have unique identification for easy traceability to establish origin of products
- **Process control**
  - ✓ Identify and plan the production in installation processes
- **Inspection and testing**
- **Corrective action**
- **Handling, Storage, Packing and Delivery**
- **Training**
- **Servicing**
- **Statistical technology**

What are the Various ISO standards related to construction?

- ISO 9000 series. By far the most popular family, ISO 9000 is a family of quality management standards. There are fourteen in total ISO 14000 series
- ISO 14000 is a family of standards relating to the environment. It includes multiple standards.
- ISO 22000 series: This standard is focused on the development and implementation of a food safety management system, and can help any organization that works in the food chain.
- ISO 26000 series: A relatively new standard, ISO 26000 focuses on social responsibility and was released in 2010. It cannot be certified, but rather provides guidance on how businesses can operate in a socially responsible way
- ISO 31000 Series: It is very important for an organization in any field to be able to manage risk effectively.
- ISO 45000 series: ISO 45001 Occupational health and safety (OHS). Reduce workplace risks and create safer working environments.
- ISO 50000 series: One of the newest standards, the energy standard ISO 50001:2011 is nevertheless becoming increasingly important. Released in 2011, the standard is meant for companies to put in place an Energy

Management System (EMS) dedicated to improving energy usage and efficiency. This includes reducing an organization's energy footprint by reducing greenhouse gas emissions as well as energy cost.

Merits of ISO 9000

- It is procured by people conversant with problems and failures in industries
- Standards where specifications of Quality System is provided
- Little dictatorial in standard
- Standards have gone to great extent from traditional confines of metal cutting industry and applied with minimum interpretation to food process, service industries, hospitals ,financial institutions etc
- ISO 9004 mentions quality cost, production safety and many other considerations

Demerits of ISO 9000

- Each individual has to interpret guidelines to their own systems requirements
- Models are not specific in nature, intended to apply to all industries or to every activity
- Don't dictate the method of implementing the requirements leads to difficulties
- Standards are applicable in contractual situations conformance to specified requirements to be assumed in all stages of production cycle
- Standards are applicable for specific requirements of a product in terms of design or specification
- ISO 9000 stress on contractual review and states servicing as mandatory requirement
- Standards expects suppliers to demonstrate machine performance and process capabilities as per design specifications

Compare BIS and ISO?

BIS

The Bureau of Indian Standards is the national standard body of India working under the aegis of the ministry of consumer affairs, food & public distribution and government of India. It is established by the bureau of Indian standards act, 1986 which came into effect on 23rd December 1986. BIS is involved in product certification. Their hallmark is ISI. BIS standardization is mainly confined to products meeting the BIS standards. the process followed or environmental impact is seldom considered.

ISO

An international consortium of standardization bodies. The international organization for standardization (ISO) is an international standard setting body composed of representatives from various national standard organization. Founded on 23 February 1947. The organization promotes worldwide proprietary, industrial and commercial standards. Now, it has 162 members. ISO standards are generic in nature and the same standard is applicable to all kinds of organizations. The basic concept is that following a standard procedure will result in quality.