CONSTRUCTION MANAGEMENT & SAFETY ENGINEERING

MODULE-4

Describe safety measures at construction projects

CONSTRUCTION SAFETY

- Safety in construction is a prime necessity but it often gets neglected on work sites.
- With the advancement in construction technology need for proper attention to safety aspects has become essential for human economic and other considerations.
- The wide range of construction and building activities involving complex techniques especially in apartments construction have led to many new problems of safety.
- Most of the accidents in the construction industry happen due to lack of proper education and training in regard to safety measures and also because of negligence and ignorance on the part of either the worker or management or both.
- It is well known fact that the construction industry in India employs more labor than any other industry.
- The construction industry is also one of the least organized and as a result there is scope for the exploitation of labor.
- In a country like India safety is all the more important because of lack of social security to the family left behind.
- Thus it becomes necessary to consider certain safety measures to prevent accidents.

GENERAL PRINCIPLES OF SAFETY IN CONSTRUCTION:

- Every large construction project such as big apartment construction, or Dam construction should have a safety department headed by an officer. That department should look after safety measures in that project.
- It is necessary to include the safety measures as a clause in the contract document.
- Previous safety record of a contractor is an important consideration in the pre qualifications of contractor.
- Safety is a costly item and no worthwhile programme can be developed without providing finds for it.
- Safety education and training is one of the more important aspects of construction industry.
- Government also needs to improve the safety measures by providing proper inspection. Necessary legislations are to be made.
- It is also necessary that contractor and trade unions shall extend their concern to safety.
- Safety measures should start at the planning and designing.

MAJOR CAUSES OF ACCIDENTS AT PROJECT SITE :

There are many causes of accidents which can be listed as follows.

1. Planning, Designing and Organization

   (a) Planning defects and defects in designing.

   (b) Unsuitable time limits.

   (c) Selecting incompetent contractors.

   (d) Defective supervision of work.

   (e) No Co-ordination between different trades.

2. Execution work.

   (a) Defects in construction.

   (b) Selecting unsuitable materials.

(c) Improper processing of materials.

3. Machinery and equipment

(a) Lack of suitable equipment

(b) Defect in equipment and machinery

(c) Lack of safety devices in using machines and equipment.

4. Management and conduct of work.

(a) In adequate instruction from supervisor regarding the works

(b) Unskilled or untrained operatives

5. Behaviour of workers

(a) Carelessness

(b) Not following the instructions

(c) Negligence

In order to prevent accidents at construction sites, certain safety measures need to be take in the following major activities prove to risks of accidents.

- Excavation
- Drilling and blasting
- Hot bituminous works.
- Scaffolding, ladders, form work and other equipment
- Fabrication and erection
- Storage
- Demolition

EFFECTS OF ACCIDENTS:

- Most of the effects of accidents are in earth work, digging shafts, or tunnels, concreting structural steel erection, drilling piling, welding and electrical fittings.
- Falls from scaffolds, ladders, roof and other heights take a major toll.
- Failure of structures or their collapse and damage due to fire and other mishaps result in major safety failures.

Accidents can result in any of the following:

(i) Loss of human life
(ii) Temporary or permanent injuries to workers
(iii) Loss or damage of materials and equipments
(iv) Loss of time in completion as work
(v) Loss due to workmen compensation insurance and cost involved is redoing the work.

PREVENTION OF ACCIDENTS:

(1) Proper work place layout and material handling.
(2) Machine guarding
(3) Controlling human performance is more difficult and many take the form of
    a. Selection and training to improve the knowledge and skill of the person
    b. Transfer, medical treatment and advice to facilitate personal adjustment.
    c. Proper accommodation, and facilities to the family of the workers.
    d. Education to help people develop proper attitudes
    e. Disciplinary action in rare cases when the above methods are not effective.

SAFETY PRACTICES A CONSTRUCTION SITE:

Due to inherently hazardous nature of work it is not possible to prevent completely injuries.

(a) **Excavation work:** By not providing support for the side even for the shallow trenches it causes many accidents. The sides of trenches should be supported by batters held in position by cross members. Besides this fencing and crossing gang ways should be provided wherever necessary

(b) **Scaffolding:** Scaffolding must be of sound material properly constructed and so braced as tied to the building that there will be no collapse of the structure, Platforms of proper width handrails and boards must be provided for safer working. The scaffolding should be designed to with stand four times the load that it is expected to carry when in use.

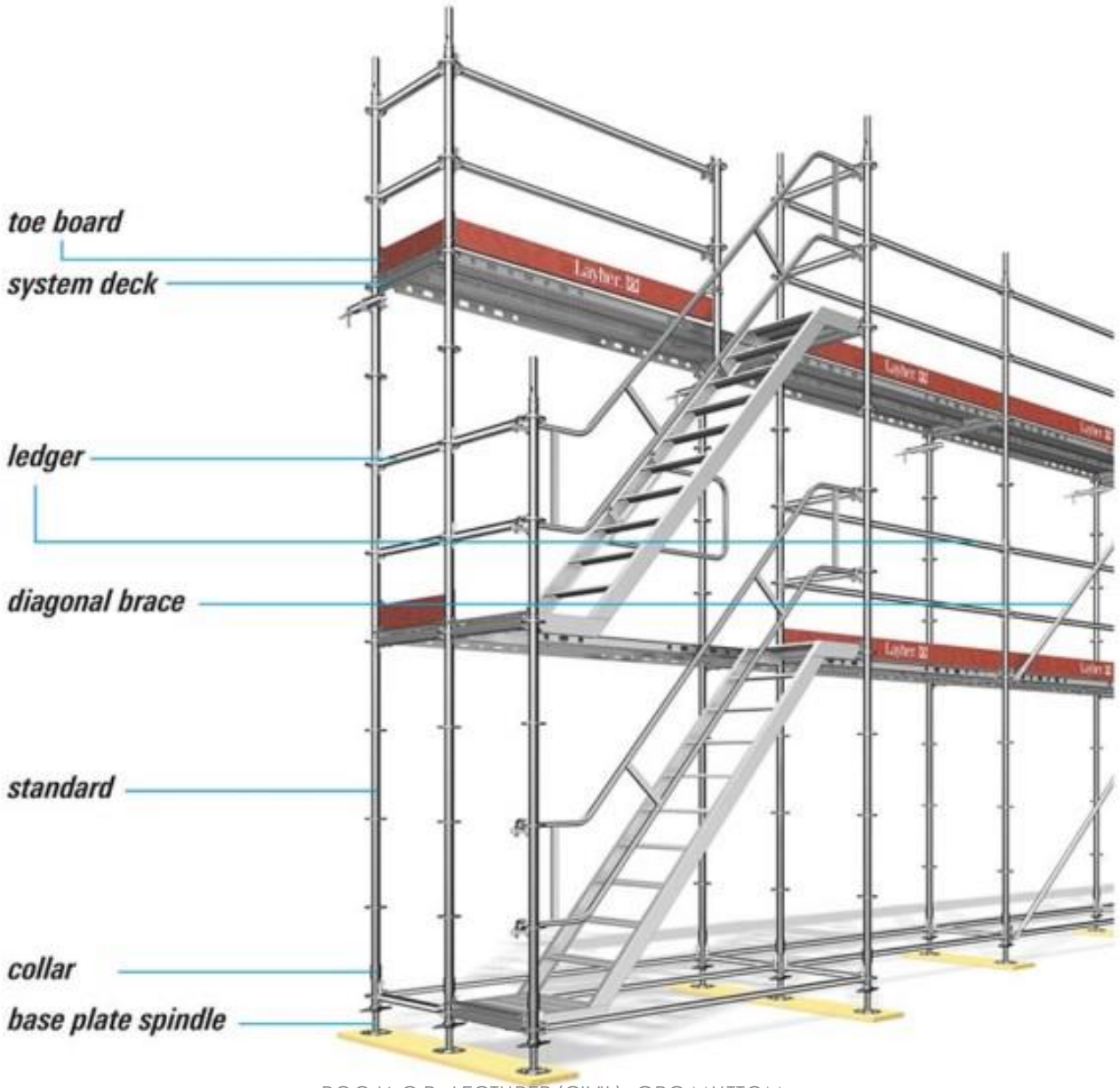
(c) **Roofs:** Accidents due to falls from or through covered with fragile material such asbestos sheets can be prevented by the use of crawling boards and roof ladders. Properly designed.

Prevent trench collapses and save lives:

SLOPE or bench trench walls,

SHORE trench walls with supports, or

SHIELD trench walls with trench boxes


toe board
system deck
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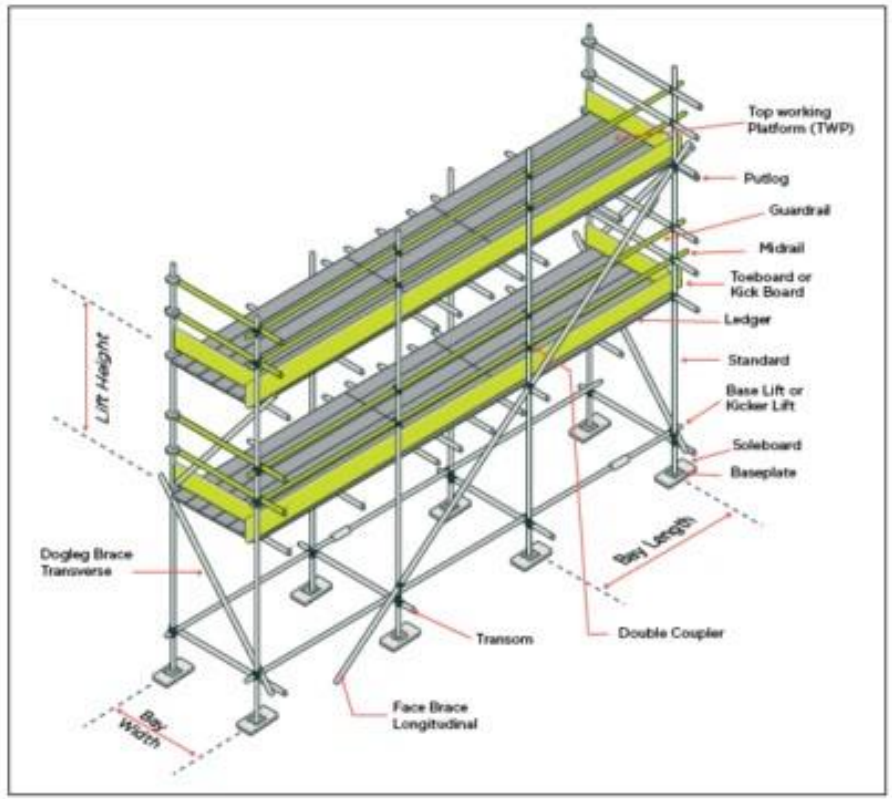
base plate spindle


Top working Platform (TWP)
Putlog
Guardrail
Midrail
Toeboard or Kick Board
Ledger
Standard
Base Lift or Kicker Lift
Soleboard
Baseplate
Lift Height
Bay Length
Dogleg Brace Transverse
Transom
Double Coupler
Face Brace Longitudinal
Bay Width

(d) **Demolition Work:** Accidents occur because of the temptation of such work quickly without taking precautions. Arches, tie rods and berths often carry loads and their removal may cause sudden collapse of building. A few precautions that can help in this regard are given below.

1. All utilities like sewage lives water, electricity or gas supply must be secured by closing or diverting. Protective screens should be provided for all moving machineries
2. Trenches must be shored depending on the type of soil and depth of cutting.
3. Scaffoldings and ladders should confirm to the width and depth restrictions stipulated by safety codes.
4. Ramps should not exceed slopes prescribed by regulations
5. Ropes and wires used for hoisting should be of good quality.
6. Hoisting and signalling while handling heavy materials should be done by qualified and competent person.
7. Handling and transportation of explosives must be done by licenced personnel.
8. Labourers working in roof construction, foundation, excavation, demolition and electrical wiring must be educated on the safety aspects of the particular works.


DANGER
DEMOLITION IN PROGRESS
THE FOLLOWING MUST BE WORN TO ENTER THIS AREA
HEAD PROTECTION
PROTECTIVE FOOTWEAR
HIGH VISIBILITY JACKET
NFDC
NATIONAL FEDERATION OF DEMOLITION CONTRACTORS
alamy


Building Demolition Process
1
Survey the building
2
Remove hazardous materials
3
Prepare the demolition plan
4
Implement safety measures
SafetyCulture

PRECAUTIONS IN HANDLING HAZARDOUS MATERIALS:

1. There should be manuals or training programmes that guide persons in the safe use of these new materials
2. All materials in bags containers or bundles stored in tiers should be stacked, blocked, interlocked and limited in height so that it is stable and secured against sliding or collapse which is fatal to the workers near by handling the materials.
3. Inflammable liquids and grease should be stored in 'NO SMOKING AREA' and properly separated from other stored materials so that workers handling those materials will be cautious. Flammable liquids and lubricants should be handled and transported in safety containers and drums tightly capped.
4. Persons working in hoppers or on high piles of loose materials should be equipped with life lines and safety belts.
5. Petrol or other inflammable liquids with a flash point below 1000F should not be used for cleaning purposes.
6. At every work site suitable arrangements for rendering prompt and efficient first aid to injured persons should be maintained under the guidance of a medical officer.
7. For persons engaged in handling corrosive materials adequate equipment should be provided.

Hazardous Materials Safety Guide

CLASS	STORAGE	HAZARD	PPEs
 Flammable	Segregate Storage	Ignite Easily and Burn Rapidly	
 Corrosive	Store Away From Flammable, Reactives and Health Hazards	Causes Tissue Damage on Contact	
 Reactive	Store Away From Corrosives, Health Hazards and Flammables Hazards	Reacts Violently with Air, Water and Other Substances	
 Health Hazard	Secure Storage in Well Ventilated Stockroom	Toxic if Inhaled, Ingested or Absorbed Through The Skin	
Non Hazardous	Secure Storage in Well Ventilated Stockroom	Presents No More Than a Moderate Hazard	Supervisor's Discretion
 Particularly Hazardous Substances	Carcinogens, Highly Toxic Chemical, and Reproductive Toxins Require Special Precautions. • Develop Standard Operating Procedures (SOPs). • Establish a Designated Work Area. • Use PPEs and Fume Hoods to Control Exposure. • Establish Decontamination and Emergency Response Procedures.		

8. Workers employed on mixing asphaltic materials and stone breakers should be provided with protective foot wear and goggles.
9. Suitable face masks should be supplied for the use of workers when paint is applied in the form of spray particularly lead paints.

OCCUPATIONAL HAZARDS:

Occupational hazards are risks of illnesses or accidents in the workplace. In other words, hazards that workers experience in their place of work. An occupational hazard is something unpleasant that a person experiences or suffers as a result of doing their job.

These may be caused by the worker's exposure to

1. Toxic agents such as dust fumes, gases etc.
2. Physical conditions such as extremes of temperature and humidity, abnormal air pressure vibrations etc.
3. Bacterial infections during employment.

Exposure	Type of Work	Diseases/Condition
1. Silica	Drilling, tunnelling rock crushing grinding, sand blasting screening dry sand etc.	Silicosis
2. Compressed air	Tunnel work caissons	Caisson disease bends
3. Carbon monoxide	Tunnelling, deepening old wells sewer work	Asphyxiation
4. Metals	Sand papering of paint, plumbing glazing, soldering spray painting, handling lead, zinc, copper	Poisoning due to inhalation absorption through skin etc.
5. Irritation causing materials	Handling cement line, acids and solvents	Burns, cracking of skin
6. Asphalt pitch, tar	Handling of hot asphalt, pitch, tar	Eye injuries headache, bronchitis, ulcers and skin ailment.

Control of occupational exposures to injurious materials or working conditions may be accomplished by.

(i) Isolating or enclosing the operation area
(ii) Control at the point of generation
(iii) Dilution with uncontaminated air
(iv) Personal protective devices.

ROLE OF SUPERVISOR/ENGINEER IN ENSURING SAFETY AT CONSTRUCTION SITE:

It is very important that the site engineer/supervisor enforces the safety measures in the work site.

- He must ensure that there is a safe working environment.
- He must regularly inspect and take up the maintenance of all machinery, tools and equipment being used in the works.
- He must be able to render a prompt and efficient first aid service to the injured persons. First aid box should be made available at the site.
- The site engineer should maintain suitable rescue equipment in an efficient state.
- He must take care to keep clean all construction areas and storage yards.
- He is expected to give basic training to the workers and employees about precautions that should be taken with respect to fire prevention, protection and firefighting.
- He must provide and enforce the use of personal protective equipment.
- He must inculcate the 'Safety first' concept in all who are concerned with construction.
- Supervisor/site engineers need to have competency to set up safety systems at work.

SAFETY LEGISLATIONS:

Safety in construction is being taken care of to some extent by the by the bye laws framed by the municipality corporations, public works departments of state and central governments but there is no enforcing machinery to check whether the safety provisions are being followed. So the accidents in the construction industry are not reported.

The Factories Act, 1948 has been amended in 1954, 1990, 1976, 1987 and on November 23, 2010. This is an Act to consolidate and amend the law regulating labour in factories. It came into force on the 1st of April, 1949 as the Factories Act, 1948 and extends to the whole of India (Government of India, 1948).

The Indian Mines Act, which is related to the regulation and inspection of mines, was passed in 1923.

- The main objectives of the **Indian Factories Act, 1948** are to regulate the working conditions in factories, to regulate health, safety welfare, and annual leave and enact special provision in respect of young persons, women and children who work in the factories.
- **The Mines Act, 1952** contains provisions for measures relating to the health, safety, and welfare of workers in the coal, metalliferous and oil mines. The Act prescribes the duties of the owner to manage mines / mining operation and the health, safety in mines.

The objective of the **Workmen's Compensation Act** is to make provisions for the payment of compensation to a workman only, i.e. to the concerned employee himself in case of his surviving the injury in question and to his dependants in the case of his death (Government of India, 1923)

The Employees' State Insurance Act, 1948 is a piece of social welfare legislation enacted primarily with the objective of providing certain benefits to employees in case of sickness, maternity and employment injury, and also to make provisions for certain other matters incidental thereto.

ISO 45001 is an International Standard that specifies requirements for an occupational health and safety (OH&S) management system, with guidance for its use, to enable an organisation to proactively improve its OH&S performance in preventing injury and ill-health.