खुदाई हेतु सुरक्षा सावधानियाँ
SAFETY PRECAUTIONS IN EXCAVATION

1. General

Excavation work involves the removal of soil or a mixture of soil and rock, and even some of the most experienced workers have been trapped, buried and injured in an excavation due to:-

i. Collapse of the sides or by external material falling in to the excavation or workers falling into the excavation.
ii. Unsafe access and insufficient means of escape in case of flooding.
iii. Vehicles driven into or too close to the edge of an excavation, particularly while reversing, causing the sides to collapse.
iv. Asphyxiation or poisoning caused by fumes heavier than air entering the excavation, e.g. exhaust fumes from diesel and petrol engines.
v. Due to Insects, Leeches, Vermins, Snakes and Poisons plant present in soil.
vi. Avoiding use of personal safety equipments and not providing fence and guards and warning signals.

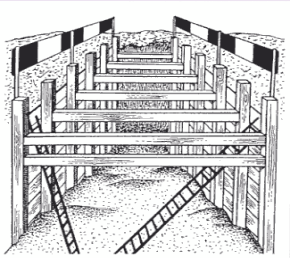
It is quite necessary to aware the workers and officials about the various safety precautions to be adopted during excavation work.

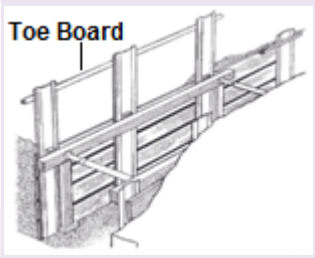
2. Safety precautions

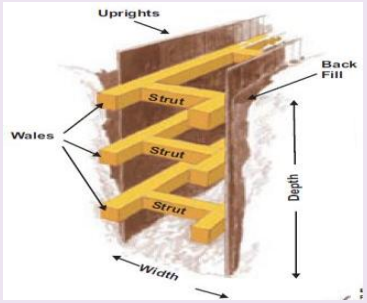
Checklist in the form of Do's and Don'ts for safety precautions as per IS 3764:1992 (Excavation work- Code of safety) to be adopted when the depth of trench is more than 1.5 m is:-

2.1 Supervision:

- Supervisor in charge should be competent person with adequate knowledge of safety rules.
- Complete information on the underground structures (such as water pipelines, sewers, gas mains, electrical conduit system and other civic facilities) should be taken.
- **Ensure that:-**
- No excavation or earthwork below the level of any foundation of building or structure shall be commenced or continued unless adequate steps are taken to prevent danger from collapse of the structure or fall of any part thereof.
- Sides of excavation should be inspected by supervisor during the course of excavation from time to time and after every rain, storm or other hazard-increasing occurrence and protection against slides and carvings should be increased and recorded.
- Safety helmets shall be worn by all persons entering trench where hazards from falling stones, timber or other materials exist.
- Appropriate safety footwear (rubber boots, protective covers, etc) shall be worn by workers/ employees who are engaged in work requiring such protection.
- Only qualified man should be permitted to do work.
- Proper precautions should be taken to prevent accident to the workmen engaged in excavation work and calamities for the general public.
- Proper lighting arrangement and warning signal and boards should be displayed.
- First aid facilities like a first-aid kit should be maintained at the site of work.
- First Aid kit should be kept at a conspicuous place in the charge of trained person(s).
- The kit should be recouped periodically.
- Nearby medical facilities available should be paint on notice board.
- Visitors would not permitted to enter the scene of excavations unless they are accompanied by a supervisor or foreman.
- Excavation areas shall be adequately lighted for night work.
- The vertical sides should be shored and the shoring shall extend at least 30 cm above the vertical sides.
- The side of the excavation or trench should be sloped or battered back to a safe angle of repose, usually 45 degree or be supported by timbering or other suitable means to prevent collapse.
- All trenches in soil more than 1.5 m deep and all trenches in friable or unstable rock exceeding 2 m in depth should be securely shored and timbered.
- Material used in shoring and timbering as per the code IS:3764:1992 (Excavation work-Code of safety)



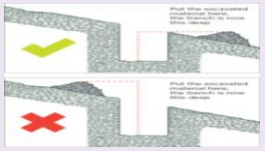




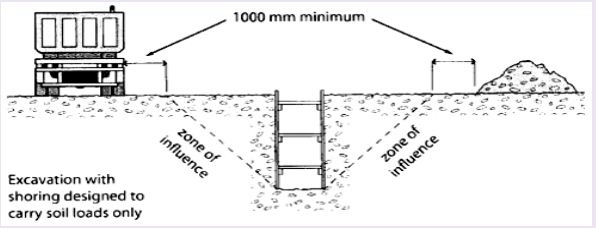
Do's:

- When open space sheating is used a Toe board should be provided to prevent material rolling down the slope and falling into the part of the trench with vertical walls.
- Shoring and timbering shall be carried along with the opening of a trench but when conditions permit, protection work, such as sheet piling may be done before the excavation commences.
- All loose stones, earth, unstable material which might come down on the workers in the trench shall be either removed or the excavated sides adequately braced.



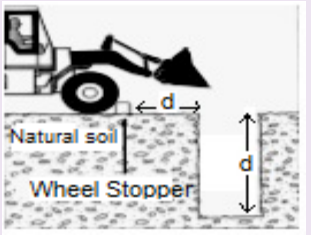


- Do provide a clear berm of a width of not less than one third the final depth of excavation or as required by design.
- In special cases, where the disposal area is limited or where the application of this requirement is impracticable, the person in charge may adopt a berm of reduced width in any case not less than 1 m provided the material being excavated is sufficiently stable and the shoring is designed to carry the additional load. In all such cases substantial toe-boards should be provided to prevent 'roll backs' into the trench.



- Tools or material, such as wheel barrows, shovels, picks, tile, cement and lumber, far enough from the edge of the trench to prevent their being inadvertently knocked into the trench.
- The use of power shovels or draglines in a trench, because of his violent thrust or blows delivered, rapidly renders the banks of the trench unstable and dangerous to people working nearby. These conditions shall be watched for and suitably remedied or eliminated.

- Heavy equipment, such as excavating machinery and road traffic shall be kept back from the excavated sides at a distance not less than the depth of trench or at least 6 metre for trench deeper than 6 metre.
- Adequate and well anchored stop block shall be provided on the surface to prevent operating vehicles from falling accidently into excavation pit. Stop block should be kept at distance not less than the depth of trench (d).





- The workmen shall be adequately spaced to avoid being accidently struck by tools of fellow workmen.
- Pathways shall be non-slippery and shall be of adequate width not less than 75 cm and strong enough.
- Gangways should be of proper construction and adequate width. If planks are used, they shall be laid parallel to the length of gangway and fastened together against displacement.
- Planks should be uniform in thickness and shall be provided with cleats to ensure safe walking.
- Gangways shall be kept clear of excavated material or other obstruction.
- Wherever pathways and gangways are suspended, these should have guard rails and side supports on both sides to prevent fall of workmen into the excavation.

- Ladders shall extend at least one metre above the top of the cut .




- Excavations shall have at least one ladder per 15 m of length in case of hazardous work and per 30 m of length in case of less hazardous works.
- Every part of a trench, in public areas, fences, guards or barricades shall be provided to prevent any accidents.




- Excavation areas shall be adequately lighted for night work. During the hours of darkness all public sidewalks and walkways shall be adequately illuminated and warning lights shall be placed in proper sites to ensure safety of pedestrians and the vehicular traffic.
- At all approaches and exits of the sites of excavations, danger and warning signals shall be placed. In busy or otherwise risky locations a flagman with a red flag shall be posted to warn the public and the approaching trucks and to guide them in proper direction.

- At every part of a trench likely to be frequented by public, suitable warning signal/red light to prevent a person from falling into the trench shall be provided and maintained in place at all times.
- When a workman is required to enter a hazardous trench, a safety rope shall be securely tied to the safety belt worn by him, so that ,if necessary he may be assisted. Or drawn to safety.




- Ensured that no harmful gases or fumes were present in the trench.
- If such gases were present, provide mechanical ventilation to protect the health and safety of persons working in the trench.
- If mechanical ventilators is not adequate, provide respiratory protective equipment.



- Protection against hazards involving insects, vermins, leeches, snakes, and poisonous plants shall involve following precautions.
  - The poisons plants shall be removed or destroyed.
  - Appropriate protective clothing, gloves, Boots, hoods, netting, masks, or other necessary personal protection shall be taken.





  - Repellents.
  - Drainage or spraying of breading areas.
  - Burning or destruction of nests.
  - Use of smudge pots for protecting small areas.
  - Elimination of unsanitary conditions which propagate insects or vermin's.
  - Extermination measures against rodents.
  - Fumigation.
  - Inoculation.
  - Approved first-aid remedies for the affected.
  - Protective ointments shall be provided.
  - Soap and wafer shall be available for washing exposed parts.
  - Immunization treatments, where applicable.
- An overhang is generally made up of overburden frozen or cemented gravel, sand, boulders etc. which is just out from the trench wall or may be part of wall which is standing less perpendicular position shall be removed before further material is taken from that part of the trench where they occur.

- In any trench where such methods have been followed, the cavities left shall be eliminated by cutting back the bank slope before removing any further material from the section of the trench.
- A suitable shelter at a safe location should be provided for workmen to have their lunch and find shelter from sudden storms.



- Foundations, adjacent to and below which excavation is to be made, shall be supported by shoring, bracing or underpinning as long as the trench remains open.
- All trenches over which men or equipment are required to cross shall be provided with walk-ways or bridges. Where the trenches are more than 2 m deep guard rails shall be provided.



Don'ts:

- Should not be permitted to workmen one above the other on steep slopes.
- Location of stockpile should not obstruct the easy access.
- Should not locate the Stockpiles in the immediate vicinity of overhead power lines.
- Materials should not be piled against walls as this may endanger the walls.
- Should not be work under the raised or suspended load.
- Should not be pile up excavated material or load on the edge of excavation, shaft, pit or opening in the ground.
- The vehicle shall not be permitted to be driven near the lip of the excavation.
- Should not forget to warn workers and others when work is in progress.
- Should not block the exists in an excavation area.
- Should not be permitted lone worker in the trench unless there is at least one worker on the ground close by on duty.
- Should not be permitted Borrowing or mining or what is known as 'gophering'.
- No internal combustion engine shall be operated in a trench.
- Drilling and blasting operations should be encountered; safety precautions as laid down in 4081:1986 should be taken.
- Should not ignore the poisons plant like ivy, oak, surmac or other poisonous plants.
- Should not be avoid to use necessary protective clothing, gloves, Boots, hoods, netting, masks etc.
- Avoid steep working face result in from the nature of machinery used. If steep faces, it shall be broken down to a stable slope.

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