

PART II. HIGH RISK ACTIVITIES MANAGEMENT

1. Work at heights
2. Excavation and Trenching
3. Confined Spaces
4. High Energy Hazards
5. Lifting operations cranes and crane safety
6. Mobile vehicles incidents
7. Hot works (including fire and explosions)
8. Demolition and structural instability
9. Soil stability (ground and strata failure) and climate considerations
10. Works near water / drowning
11. Working in congested areas
12. Transfer of precast building components in congested areas
13. Tree cutting in congested areas
14. Sewer and sanitation work

HIGH RISK ACTIVITIES MANAGEMENT



01. Work at heights

Working at height involves significant risks that demand strict preventive measures and adherence to regulatory standards. This section sets baseline requirements to ensure a consistent, structured approach to hazard control across all worksites before any elevated work begins.

- 1 Requires strict compliance with national laws and international standards.
- 2 Conduct a site-specific risk assessment before starting any elevated work.
- 3 Only trained and authorized personnel may perform work at height.
- 4 Use certified, inspected, and maintained access and fall protection equipment.
- 5 Develop and rehearse emergency rescue procedures prior to work.
- 6 Establish exclusion zones below elevated work areas to protect others.
- 7 Select PPE based on height and fall clearance.



Source: Aninver

01. Work at heights

HIERARCHY OF FALL PROTECTION

The Hierarchy of Fall Protection is a prioritized system for mitigating fall hazards, moving from the most effective to the least effective control measures. It's a structured approach that helps ensure the best possible protection for workers.



Hierarchy of fall protection

Source: Anchor Safe

01. Work at heights

Work at Heights

DO'S	DONT'S
 Follow the hierarchy of fall protection—eliminate hazard first.	 Don't begin work at heights without a risk assessment.
 Ensure proper guardrails or harnesses are in place.	 Don't use makeshift platforms or unsecured ladders.
 Conduct inspections of PPE and anchor points.	 Don't reuse fall arrest equipment after a fall without inspection.
 Train all workers on fall protection systems.	 Don't assign untrained workers to elevated tasks.

Do's and Don'ts in work heights

02. Excavation and trenching



Excavation and trenching pose serious risks, including collapses, underground utility strikes, and hazardous atmospheres. A cubic yard of soil can be deadly if trenches lack proper protective systems. Standard safety controls must be in place before starting any excavation work.

02. Excavation and trenching

Main risks associated to excavation and trenching



Collapse of excavations: Trench collapses are often fatal. Use appropriate supports based on soil conditions and include them in the method statement.



Falling into excavations: Install guardrails or trench box extensions to prevent falls. Reroute foot traffic or use covered walkways where needed



Undermining structures: Survey nearby structures before digging. Use supports (e.g., shoring, underpinning) if there's any risk of collapse.



Underground/overhead services: Locate and mark all utilities before excavation. Avoid power lines or follow strict safety procedures.



Water inflow: Water weakens trench stability. Use dewatering systems and engineered supports where needed.



Tree damage: Avoid cutting major roots; this may destabilize trees and breach environmental regulations.

Source: Aninver

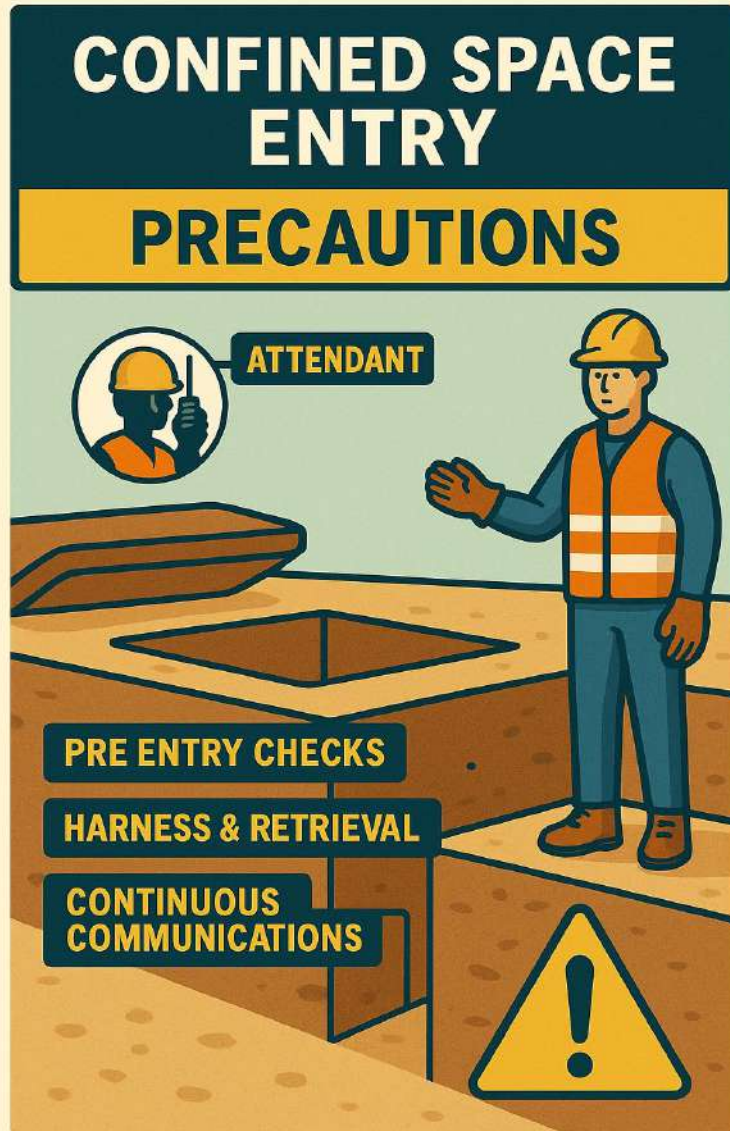
02. Excavation and trenching

Excavation and trenching

	DO'S		DONT'S
	Use trench boxes, shoring, or sloping as appropriate.		Don't allow entry into unsupported trenches >1.2m deep.
	Keep spoil piles at least 0.6 m from trench edges.		Don't park heavy equipment near open trenches.
	Test for underground utilities before digging.		Don't start excavation without a utility survey.
	Protect trench edges with guardrails or barricades.		Don't leave open trenches unmarked.

Do's and Dont's in excavation and trenching

03. Confined Spaces



Confined spaces pose serious risks like asphyxiation and toxic exposure, so entry must follow a strict permit system with atmospheric testing, continuous monitoring, and ventilation as needed. There are some critical factors workers need to be aware:

CRITICAL FACTORS

- A competent person must assess and control hazards before entry.
- Confirm if entry is necessary; avoid if possible.
- Confined space work requires entrants (inside) and attendants (outside).
- Entrants must wear proper PPE; attendants monitor and manage emergencies.
- Continuous atmospheric testing and ventilation.
- Rescue equipment and trained teams with emergency plans must be on-site.
- Maintain continuous communication between entrants and attendants.

03. Confined Spaces

Confined Spaces

	DO'S		DONT'S
✓	Use pre-entry atmospheric testing and continuous monitoring.	⊘	Don't enter without verifying oxygen and gas levels.
✓	Always have a trained attendant outside.	⊘	Don't allow solo confined space entry.
✓	Use harnesses and retrieval equipment.	⊘	Don't ignore PPE requirements.
✓	Have rescue plans and equipment on site.	⊘	Don't enter unless a rescue plan is in place.

Do's and Dont's in confined spaces

04. High energy hazard



Source: Aninver

High energy hazards refer to **tasks or environments where workers are exposed to potentially lethal forms of stored or active energy**. These include but are not limited to electrical systems, pressurized lines, rotating equipment, hydraulic or pneumatic systems, fuel lines, and energized mechanical systems. Improper isolation or control of such energy can cause severe injuries including burns, crushing, electrocution, or amputation.

04. High energy hazard

Electrical Safety and Lock-out/Tag-out (LOTO) Best Practices:

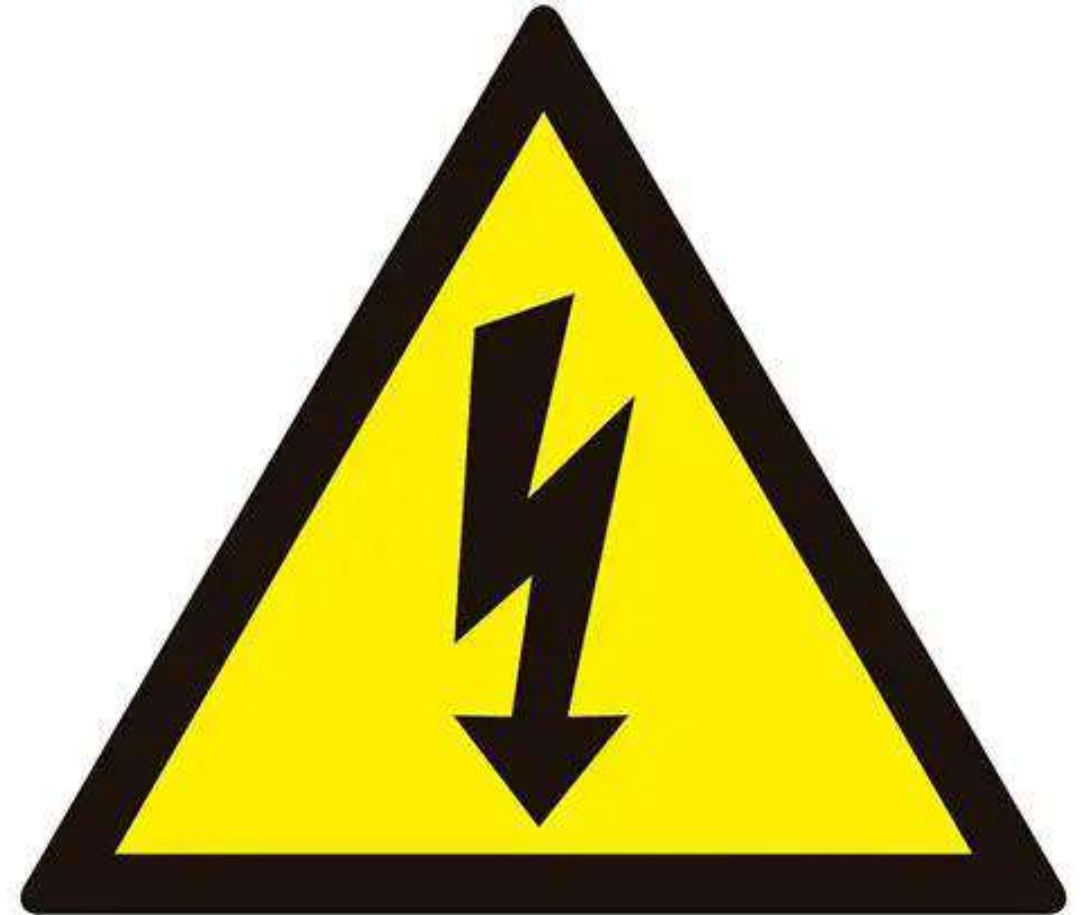
Training: Provide comprehensive, ongoing employee training to recognize hazards, use PPE correctly, and respond to electrical emergencies.

Maintenance: Qualified personnel must perform regular inspections and preventive maintenance to detect faults before accidents occur.

LOTO Procedures: Implement strict Lock-out/Tag-out protocols to prevent accidental energization; ensure all personnel are trained and comply.

Personal Protective Equipment (PPE): Use appropriate PPE when working near live circuits.

Risk Assessments: Conduct regular evaluations to identify hazards, assess controls, and improve safety measures.



Source: Aninver

04. High energy hazard



Source: Aninver

Additional Controls:

Only **certified electricians** should work on energized systems, using arc-rated PPE and insulated tools.

Equipment must be grounded, tested, and verified by a second qualified person, especially during high-voltage tasks.

Functional testing and safety verification are required before re-energizing circuits.

04. High energy hazard

Hot works and electrical safety

DO'S	DONT'S
 Use a hot work permit system with fire watch.	 Don't conduct hot work near flammables without precautions.
 Maintain fire extinguishers on-site.	 Don't start work without verifying extinguishing readiness.
 Perform Lock-out/Tag-out for electrical systems.	 Don't work on live circuits without clearance and PPE.
 Provide arc-rated PPE and insulated tools.	 Don't neglect PPE for even short-duration tasks.

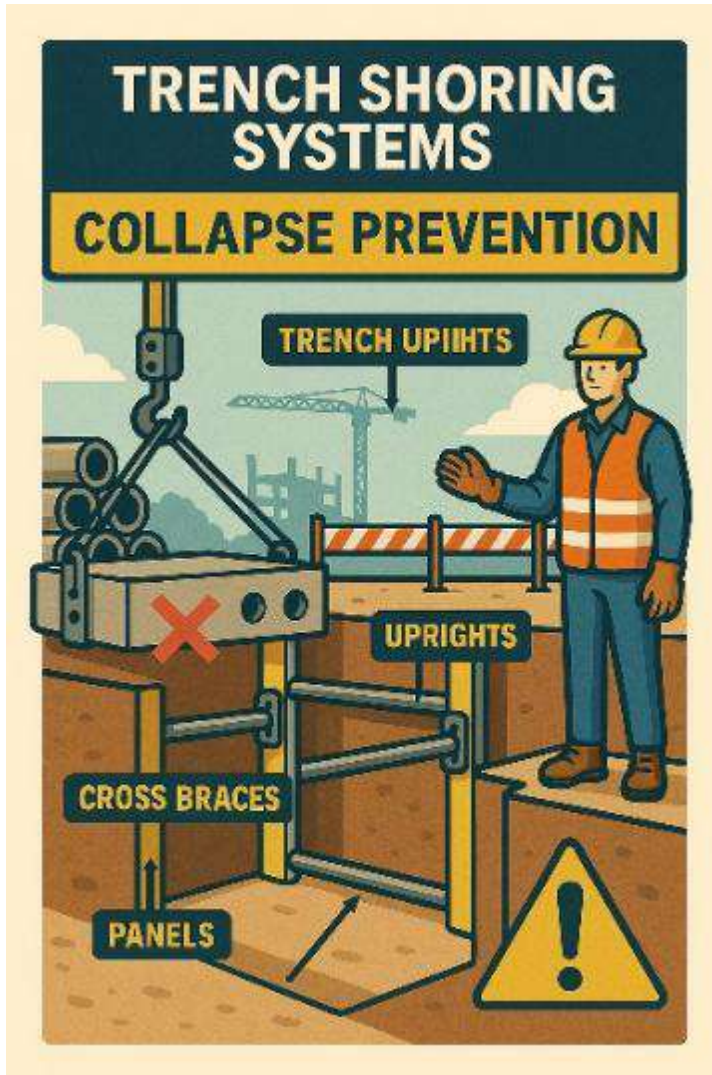
Do's and Dont's in hot Works and electrical safety

05. Lifting operations – cranes and crane safety

Lifting operations in construction are high-risk activities involving complex loads and dynamic forces, **requiring strict safety measures to prevent accidents. Effective management hinges on certified equipment, thorough planning, risk assessments, and clear communication to protect personnel and property.** Depending on the complexity and risk level, lifting activities range from routine lifts with generic plans to complex operations demanding detailed engineering, specialized supervision, and rigorous controls.



05. Lifting operations – cranes and crane safety



- ▶ Lifting in construction is high-risk due to complex loads and dynamic forces.
- ▶ All lifting equipment must be:
 - Certified by an accredited agency
 - Clearly tagged with inspection dates
 - Used within rated load limits
 - Subject to daily checks and formal inspections
- ▶ Lifting activities require a qualified supervisor and a lifting plan with load calculations, risk assessment, and communication protocols.
- ▶ Lifts are categorized by risk level:
 - **Routine/low-risk:** Use generic plans with on-site risk assessments and safety briefings.
 - **Complex/high-risk:** Require detailed engineering plans, specialized gear, enhanced supervision, and emergency preparedness.

05. Lifting operations – cranes and crane safety



Basic Workplace Safety and Health (WSH) rules for lifting operations

- 1 Report to your supervisor if you feel unwell
- 2 Balance and rig the load securely before lifting.
- 3 Report any defective lifting gear to your supervisor
- 4 Follow the lifting plan and instructions closely
- 5 Fully extend all lorry crane outriggers on firm level ground.
- 6 Barricade lifting zone and do not suspend loads over persons

05. Lifting operations – cranes and crane safety

Lifting operations and crane safety

DO'S	DONT'S
 Prepare a lifting plan for every lift.	 Don't improvise lifting procedures.
 Use only certified lifting equipment.	 Don't exceed the rated capacity (WLL).
 Assign trained riggers, spotters, and signallers.	 Don't perform lifts without communication.
 Conduct a dry run for complex lifts.	 Don't lift in poor weather or high wind conditions.

Do's and Dont's in lifting operations and crane safety

06. Mobile vehicles incidents

Operator competency and authorization

KEY HIGHLIGHTS:

1. **Competency Essentials:** Operators must be trained, tested, and certified per national/international standards (e.g., ISO 9926, OSHA 1926), and medically fit for the specific equipment.
2. **Training Scope:** Includes operational procedures, equipment limits, pre-start inspections, load handling, site-specific hazards, and emergency responses.
3. **Authorization Requirement:** Only formally authorized personnel may operate equipment; authorization must be documented and securely maintained (e.g., in CMMS or onboarding platforms).



Source: Aninver

06. Mobile vehicles incidents

Operator competency and authorization

4. **Access Control:** Technologies like RFID tags or smart keys help restrict machine use to authorized operators only.
5. **Ongoing Evaluation:** Competency and authorization must be revalidated every 1–3 years or after major incidents, equipment changes, or procedural updates.
6. **Supervisor Role:** Supervisors must routinely monitor operator behavior and enforce immediate corrective actions if unsafe practices are observed.



Source: Aninver

06. Mobile vehicles incidents

Heavy equipment poses significant risks on construction sites, particularly when there is close interaction with workers. To prevent collisions and injuries, a structured safety approach combining trained personnel, physical controls, and technology is essential.

Heavy equipment interaction and spotter protocols



High Risk: Heavy equipment poses serious collision hazards due to poor visibility and unclear routes.

Spotters: Trained spotters must guide operators using standard signals, high-visibility PPE, and constant communication.

Separation: Physically divide pedestrian and equipment paths; enforce exclusion zones around active machinery.

Technology: Use alarms, sensors, and cameras; never reverse without a spotter.

HEICP: Define movement plans, comms protocols, restricted zones, and authorized operators.

Oversight: Perform audits and track near misses to refine safety practices and training.

Source: Aninver

06. Mobile vehicles incidents

Selection, inspection and maintenance

Safe equipment use starts with **proper selection**, regular inspection, and structured maintenance. Poor practices cause major injuries and losses, especially in low- and middle-income countries. Aligning with international standards is essential for safety and efficiency.

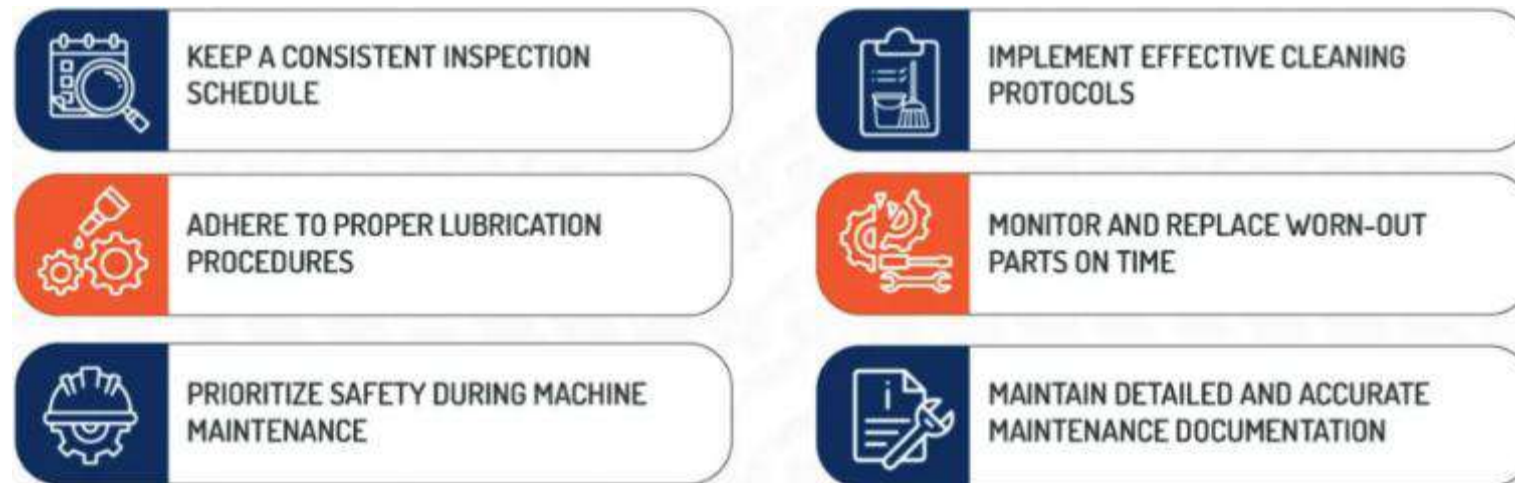


Source: Aninver

06. Mobile vehicles incidents

Selection, inspection and maintenance

A comprehensive maintenance system for construction plant and machinery must go beyond merely fixing what is broken. Instead, it should follow a tiered approach incorporating **preventive, proactive, and reactive** strategies to ensure operational integrity, worker safety, and cost-efficiency.



Machinery maintenance – Best practices

Source: SM Global

06. Mobile vehicles incidents

Selection, inspection and maintenance

Safe plant and machinery management is key to reducing construction site risks. We can highlight three pillars: proper equipment selection and maintenance, trained operators, and clear interaction protocols.



1
Know Your
Equipment



2
Commit to
Maintenance Plan



3
Right
Maintenance
Tools



4
Repetitive
Maintenance Cause



5
Maintenance
Schedule



6
Train Workers



7
Maintenance
Requirements



8
Collect & Store Data



9
Increase Data
Accessibility



10
Create Maintenance
Checklist

Heavy construction equipment maintenance tips

Source: Clue

07. Hot Works (including fire and explosions)

Hot works refer to activities that generate open flames, sparks, or high temperatures, such as welding, grinding, cutting, soldering; pose ignition risks, while electrical tasks can cause shocks, arc flashes, or electrocution. Due to the elevated risk, **all hot work activities must be authorized** through a hot work permit system before commencing work in fire-prone areas, ensuring fire extinguishers are nearby, flammable materials are cleared, and a fire watch is maintained during and after the task.



Source: Aninver

08. Demolition and structural instability

Demolition work is among the most hazardous phases of a construction project, involving the intentional dismantling of structures that may already be unstable or degraded. Demolition activities expose workers to falling debris, structural collapse, dust inhalation, and hazardous materials (e.g., asbestos, lead paint). The unpredictability of how structures behave during demolition, makes **comprehensive planning essential** under the supervision of competent professionals



Source: Aninver

08. Demolition and structural instability

Demolition work requires careful and thorough planning to ensure the safety of personnel and the surrounding environment. This involves structural assessments, utility isolation, management of exclusion zones, and selecting appropriate methods and sequences to minimize risks and control dust and debris.

- 1 Submit a demolition plan prior to work.
- 2 Decommission and verify isolation of all utilities before starting demolition.
- 3 Conduct pre-demolition structural assessments.
- 4 Establish safety zones with barricades, signage, and trained spotters.
- 5 Use mechanical demolition with coordinated operators and inspections;
- 6 Implement dust suppression and debris management;



08. Demolition and structural instability

Demolition and structural stability

	DO'S		DONT'S
✓	Develop a detailed demolition plan approved by a competent engineer,	⊘	Don't begin demolition without a plan or site-specific risk assessment.
✓	Isolate all utilities (electricity, gas, water, telecom) before starting work.	⊘	Don't assume services are disconnected—always verify and lock out.
✓	Establish and clearly mark exclusion zones around the structure with barricades and danger signage.	⊘	Don't allow untrained personnel or unauthorized visitors into active demolition zones.
✓	Use top-down methods in space-constrained areas to reduce the risk of uncontrolled collapse.	⊘	Don't use high-reach methods in tight spaces without engineered analysis.
✓	Ensure machines are inspected and operated by trained personnel only.	⊘	Don't conduct dry demolition near sensitive receptors (e.g., public spaces, hospitals).
✓	Preserve structural elements supporting scaffolding or adjacent structures until alternatives are in place.	⊘	Don't allow simultaneous manual and mechanical demolition in the same zone.

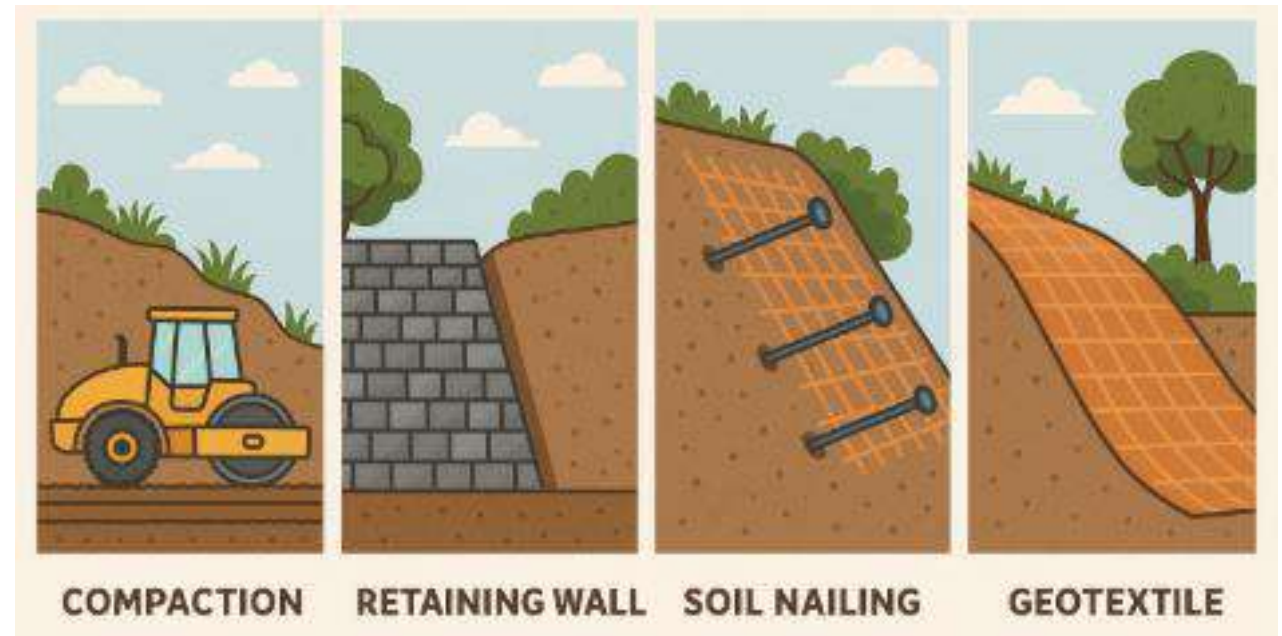
Table 11: Do's and Dont's in demolition and structural stability

09. Soil stability and climate considerations

Definition: Soil stability and climate considerations refer to the integrated assessment of **how climatic conditions influence the mechanical behaviour and structural reliability of soil in construction** and infrastructure environments. This concept addresses how rainfall, snow, temperature extremes, and seasonal variations affect soil performance and site safety, with direct implications for excavation, compaction, slope design, application of external elements such as walls, geotextiles or soil nailing, and foundation integrity

Risks:

- ✓ Slope failure and landslides
- ✓ Trench collapse and flooding
- ✓ Erosion and sediment runoff
- ✓ Freeze-thaw cycles
- ✓ Soil shrinkage and cracking
- ✓ Dust generation and equipment hazards



Source: Aninver

09. Soil stability and climate considerations



Source: Aninver

Preventive measures :

- Retaining walls, soil nailing, and terracing.
- Proper surface drainage systems to divert water from slopes.
- Avoid cutting into slopes during or immediately after rainfall.
- Protective systems based on soil classification and depth.
- Install dewatering systems.
- Stabilize disturbed areas using geotextiles.
- Install silt fences, sediment traps, or check dams to control runoff.
- Ensure construction does not block or redirect natural waterways.
- Use frost-resistant construction materials.
- Avoid placing concrete or backfill during freeze conditions.
- Compact fill in layers to reduce water infiltration that could freeze.
- Monitor ground temperatures.
- Stabilize soil to reduce shrink-swell behaviour.
- Maintain consistent moisture levels during dry seasons.

10. Works near water / drowning

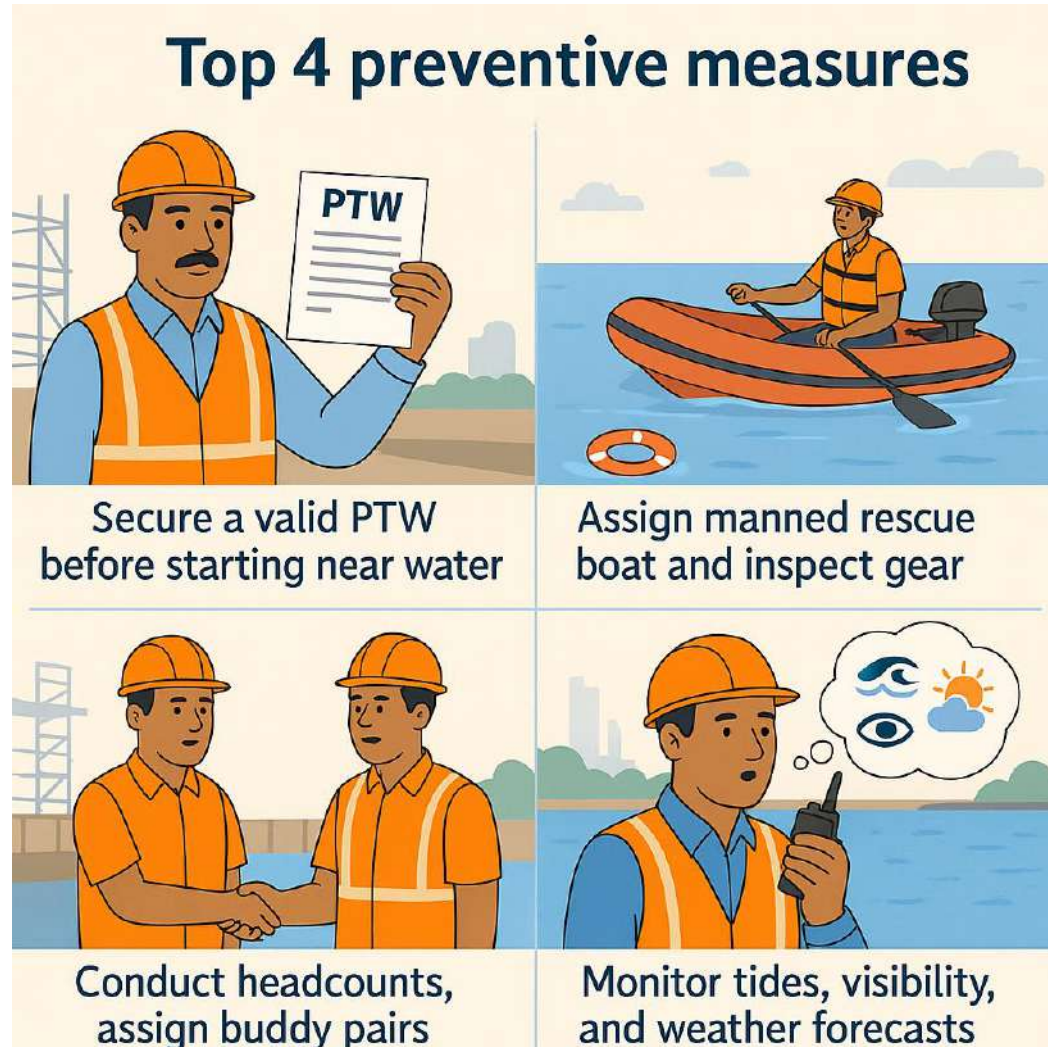
Works near or over water refer to all construction or industrial activities carried out **in proximity to, above, or directly on water bodies** such as rivers, canals, ports, reservoirs, or marine environments. These activities include but are not limited to bridge building, pile driving, jetty construction, dredging, floating equipment operations, and inspections over water.

Work must always be:

- Planned, permitted, and supervised by a competent person,
- Executed by trained and certified personnel,
- Conducted with fall prevention, flotation, and rescue equipment in place



11. Working in congested areas



Top 10 preventive measures:

1. Secure a valid PTW before starting near water
2. Assign manned rescue boat and inspect gear
3. Conduct headcounts, assign buddy pairs
4. Monitor tides, visibility, and weather forecasts
5. Train workers in CPR and retrieval drills
6. Use lifelines, harnesses, and guardrails where applicable
7. Ensure lighting for night or low-visibility operations
8. Establish clear communication systems (radios, signals)
9. Install barriers or floating safety nets where needed
10. Designate and brief a dedicated rescue team on standby

11. Working in congested areas

Working in congested areas refers to the **planning and execution of construction activities in environments with limited physical space**, high pedestrian or vehicular traffic, and proximity to sensitive public infrastructure. These conditions create heightened risks of accidents, delays, and disruptions due to reduced manoeuvrability, poor visibility, and constrained logistics. Typical challenges include material handling on narrow roads, utility shifting, tree cutting or replanting in traffic zones, and the movement of oversized elements like precast segments in urban corridors.

Most common Risks:



Source: Aninver

11. Working in congested areas



Source: Aninver

Top 10 preventive measures:

1. Install clear warning signs around work zones.
2. Assign trained traffic flaggers and spotters.
3. Use physical barriers to separate pedestrian paths.
4. Limit vehicle speeds near work zones.
5. Conduct detailed utility mapping.
6. Liaise with utility companies.
7. Mark underground utilities clearly.
8. Designate separate zones.
9. Display project information boards.
10. Schedule disruptive tasks.
11. Avoid storing excavated soil or materials.
12. Cover loose materials.
13. Always maintain clear and accessible routes.
14. Do not block public roads.
15. Train all site staff on emergency evacuation protocols

12. Transfer of precast building components in congested areas

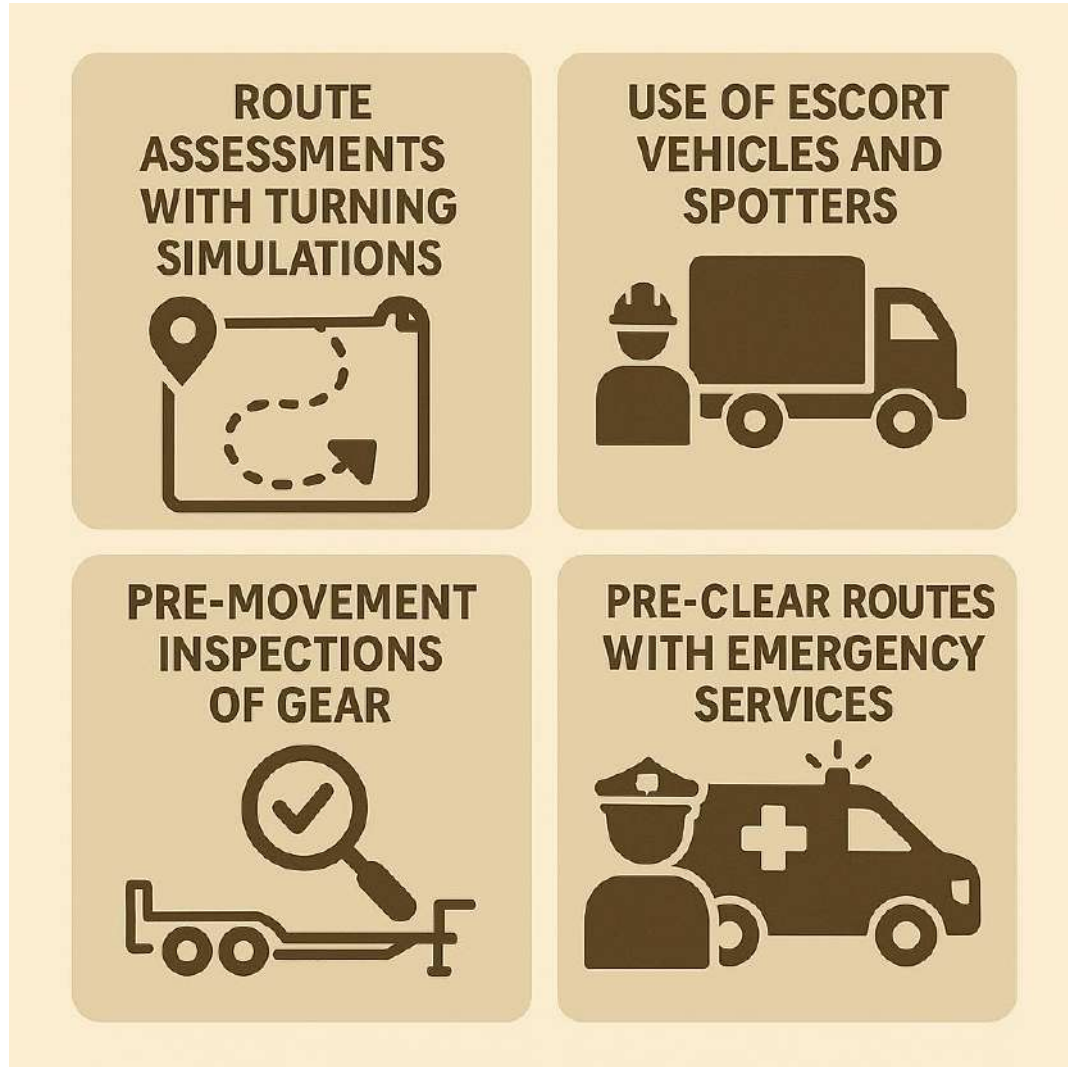
The transfer of precast building components, such as beams, girders, slabs, and segments for metro rails or high-rise buildings, through congested urban roads refers to **the logistical operation of moving oversized, heavy, or long elements within areas with limited space**, high traffic volume, and complex infrastructure. These operations pose **elevated safety, traffic, and community risks** due to restricted turning radii, overhead obstructions, and proximity to pedestrians, residences, and utilities.

Main risks associated with transferring precast structures



Source: Aninver

12. Transfer of precast building components in congested areas



Top 10 preventive measures:

1. Perform detailed route assessments with turning simulations.
2. Temporarily relocate or shield obstructions along the route.
3. Use escort vehicles and spotters to control intersections and blind spots.
4. Install temporary lighting and warning signs during night shifts.
5. Use low-bed trailers with proper load distribution and anchoring.
6. Conduct pre-movement inspections of all lifting and transport gear.
7. Maintain slow, consistent speeds and avoid sharp turns or sudden stops.
8. Train drivers and riggers in emergency brake and balance management.
9. Pre-clear routes with emergency services and traffic authorities.
10. Use dynamic traffic diversion plans with signage and mobile barriers.

13. Tree cutting in congested areas

Tree cutting in congested areas refers to **the controlled removal, pruning, or relocation of trees in environments with limited space**, high traffic density, overhead infrastructure, and active pedestrian presence. These operations pose elevated risks due to falling branches, interference with power lines or utilities, obstruction of roads, and potential injury to the public or workers. Safe execution requires careful planning, stakeholder coordination, visibility controls, and mitigation of environmental and social impacts.



Source: Aninver

13. Tree cutting in congested areas

Main risks associated with tree cutting in congested areas



Top 10 Preventive measures :

1. Install rigid barricades and exclusion zones around the entire felling perimeter
2. Use visual and audio warnings during cutting .
3. Conduct toolbox talks with crews before beginning tree-related tasks
4. Assign spotters to monitor surroundings and stop work if hazards emerge
5. Map nearby utilities (overhead and underground) before cutting
6. Use rope-controlled descent for large limbs near structures
7. Coordinate with traffic police for diversions or lane closures
8. Perform tree cutting during off-peak hours or weekends
9. Notify residents, businesses, and stakeholders in advance
10. Document ecological or safety reasons for tree removal

14. Sewer and sanitation work

Definition: Sewer and sanitation work involve activities related to the inspection, cleaning, upgrading, and installation of drainage and sewage systems. Hazards include exposure to toxic gases, biological pathogens, confined space entry, and illegal or unsafe manual scavenging. Indian law prohibits manual sewer entry without safety protocols.

Main risks associated with sewer and sanitation work



Source: Aninver

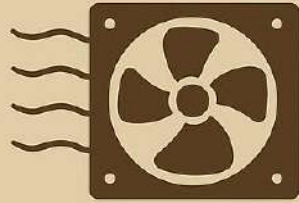
13. Tree cutting in congested areas

PREVENTATIVE MEASURES

RISK ASSESSMENT PRIOR TO ENTRY



CONTINUOUS FORCED-AIR VENTILATION



USE OF MULTI- GAS DETECTORS



EMERGENCY RESCUE PROCEDURES



Top 10 preventive measures :

1. Conduct a confined space risk assessment prior to entry.
2. Conduct a confined space risk assessment prior to entry.
3. Use a permit-to-work system with clear entry and exit procedures.
4. Test atmospheric conditions.
5. Ensure continuous forced-air ventilation in deep or enclosed spaces.
6. Use multi-gas detectors.
7. Provide workers with respiratory protection.
8. Provide impermeable PPE, including gloves, rubber boots, and coveralls.
9. Train workers to recognize symptoms of gas exposure.
10. Establish and drill emergency rescue procedures, including first aid and oxygen provision.