英　　語　　版
English Version

Waterworks Construction Accident Prevention Action Plan

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Bureau of Waterworks Tokyo Metropollitan Government

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The table below lists frequent waterworks accidents identified through analysis of accident and near-miss data from works ordered by the Bureau. According to accident data from 2008 to 2010, these account for approximately two-thirds of all accidents.
Prevention measures for these frequent accidents are outlined below.

Frequent Waterworks Accidents

1. Third-party accidents

(1) Falling into an excavation hole (2) Contact with a dump truck or backhoe
(3) Tripping and falling (uneven pavement, subsidence around cover plates, cables, hoses, etc.)

2. Accidents involving workers and guides caused by general vehicles (vehicle at fault)

3. Accidents caused by the movement of dump trucks and other heavy machinery

4. Accidents caused by excavation work

Part 1: Workplace accidents involving backhoes
(1) Getting caught / entangled (2) Run over while reversing (3) Debris falling from the bucket
Part 2: Property damage accidents
(1) Buried pipes and cables (2) Overhead lines
Part 3: Soil collapse accidents

5. Paving work: Roller collision accidents

6. Accidents during assembly and dismantling of earth retaining support

(1) Falling from support structures (2) Support materials falling (3) Damage to buried objects during sheet pile driving

7. Accidents during loading and unloading operations using cranes and backhoes

(1) Cranes overturning (2) Suspended loads falling (3) Getting caught between suspended loads
(4) Accidents specific to loading and unloading operations using backhoes

8. Accidents specific to pipe installation work

(1) Dislodgement of water pipes (2) Getting caught or entangled during pipe lifting operations
(3) Workplace accidents during pipe cutting operations

9. Accidents involving falls from ladders

10. Accidents involving workers tripping

(1) Slipping and falling (2) Tripping and falling

11. Accidents related to machinery and equipment operations

(1) Falling from openings, buildings, and equipment (2) Getting caught in, entangled, or electrically shocked by machinery and equipment

12. Accidents caused by strong winds (flying construction signs, etc.)

13. Accidents during tree cutting and felling operations

Frequent Waterworks Accidents & Prevention Measures

This section explains what accidents occur frequently, the causes of their recurrence, and prevention measures for each type of frequent waterworks accident.

1 Third-party accidents

1 Falling into an excavation hole

[What types of accidents occur frequently?]

· Pedestrians or bicycles fall into excavation holes. In some cases, individuals fall while leaning over to look into an excavation hole.

[Why do they recur?]

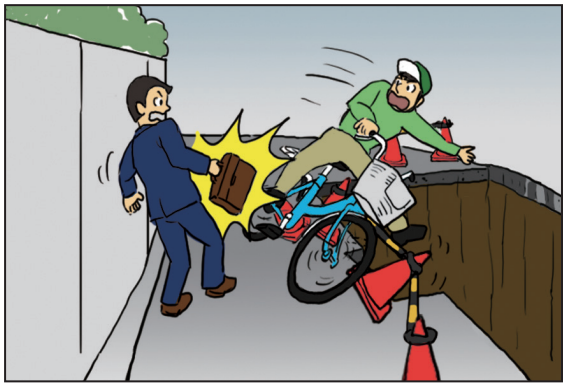
· Insufficient walkway width increases the risk of falling.
(Especially high risk when the walkway width is 1.0 m or less)

· Because cones and bars are low in height, lightweight, and easily moved, they do not reduce the risk of pedestrians or bicycles falling. It should be understood that cones and bars merely indicate the boundary of work areas and cannot prevent falls.

[What prevention measures can be taken?]

· While appropriate guidance by guides is necessary, there are cases in which falls occur when such guidance is not followed. Facility-related measures are required to prevent falls even when guidance is not followed.

· Fall-protection measures are required, such as installing robust fences (right image) with sufficient height (1.2 m or higher) that do not collapse even when leaned on by pedestrians.



Separating walkways with plastic fences

2 Contact with a dump truck or backhoe

[What types of accidents occur frequently?]

· Dump trucks: reverse out of work areas and come into contact with pedestrians or bicycles.

· Backhoes: buckets, suspended loads, etc., protrude from work areas and come into contact with general vehicles.

[Why do they recur?]

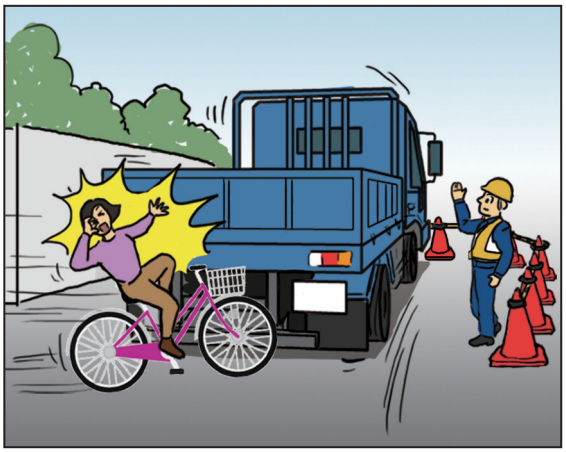
· Pedestrians, bicycles, and vehicles are not visible to dump truck drivers or backhoe operators. Guides are not providing appropriate guidance.

[What prevention measures can be taken?]

· "Stop traffic if any part of heavy machinery or suspended loads extends beyond a work area." Provide strict guidance to contractors who do not comply with this basic rule.

· Install rear-view monitors to enable visual confirmation by drivers and operators without blind spots. Conduct double checks together with guidance by guides to prevent accidents.

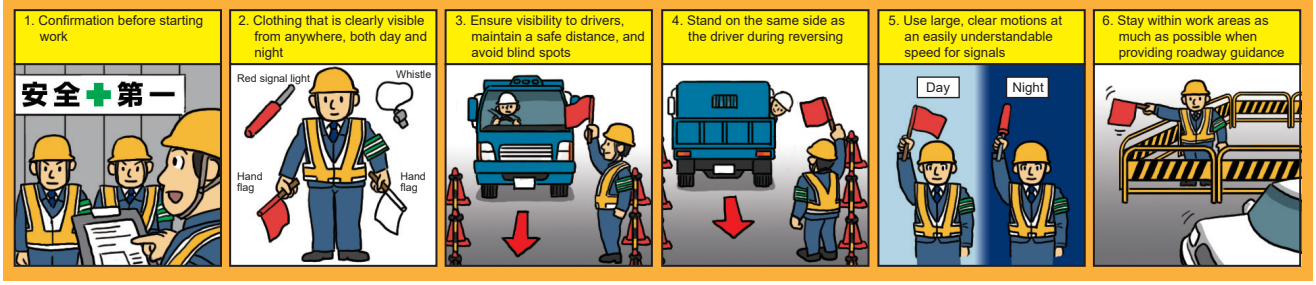
· Establish "no reversing without guidance" as a basic rule and enforce it thoroughly.



"No reversing without guidance" sticker (example)

· Training of guides is important for preventing third-party accidents (see figure below). Assign guides who have received specialized training.
· Receiving proposals for traffic control plans from security companies, etc., with extensive experience in traffic guidance is also effective.

Safety points for guides



3 Tripping and falling

a. Uneven pavement

[What types of accidents occur frequently?]

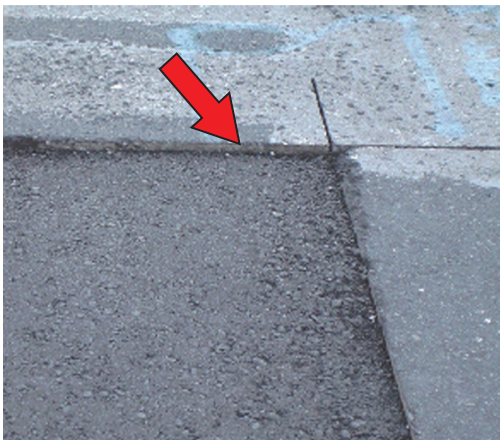
· Pedestrians or bicycles trip over level differences between existing pavement and temporary pavement. Level differences may remain even when transition sections have been constructed, and step heights of up to 5 cm are not uncommon.

[Why do they recur?]

· Temporary pavement is poorly constructed. Level differences are easily created.
· When temporary pavement is left open for extended periods, level differences may occur due to consolidation settlement.

[What prevention measures can be taken?]

· Remember that “fall incidents cannot be eliminated as long as tripping hazards are present.” Do not create level differences with existing pavement, even for temporary pavement.
· Perform daily inspections of temporary pavement sections, and immediately repair any level differences that are found.



Level difference between existing and temporary pavement (poor construction quality)

b. Subsidence around cover plates

[What types of accidents occur frequently?]

· Road surfaces subside around cover plates due to heavy rain and other causes, causing motorcycles, bicycles, etc. to trip and fall. This may result in serious accidents.

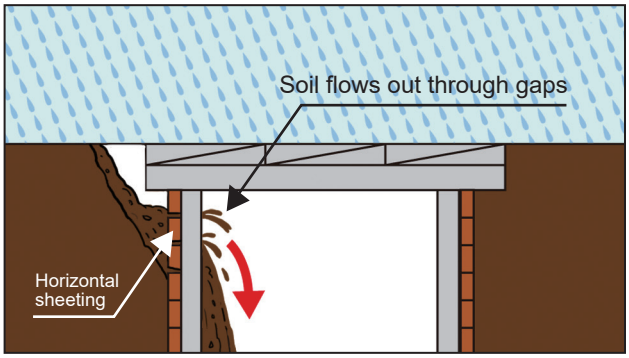
[Why do they recur?]

· Backfilled areas around cover plates are prone to subsidence. Heavy rain and other conditions may cause backfilled soil to flow out through gaps in earth retention, resulting in road surface subsidence.

[What prevention measures can be taken?]

· Subsidence prevention measures include proper installation of earth-retaining supports and sufficient backfilling and compaction.
· Perform daily inspections around cover plates in preparation for subsidence caused by heavy rain, etc.
· Establish a system to always conduct emergency inspections during heavy rain.
· Be ready to promptly implement measures such as entry restrictions when subsidence occurs.

Road subsidence caused by heavy rain



c. Cables and hoses

[What types of accidents occur frequently?]

· Pedestrians and bicycles trip over power cables, water supply hoses, etc., placed on sidewalks and fall.

[Why do they recur?]

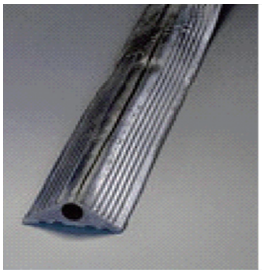
· “We’ll put it away soon!” and “This thickness won’t pose a risk!” are examples of how the risk of tripping over cables, etc., is underestimated.

[What prevention measures can be taken?]

· Eliminate tripping hazards by burying cables and hoses. The use of cable protectors and pedestrian mats (secure edges with duct tape, etc.) is also effective.

· Never leave cables or other items unattended, even for a short period of time.

Cables are buried underground



Cable protector

Pedestrian mat

2 Accidents involving workers and guides caused by general vehicles (vehicle at fault)

[What types of accidents occur frequently?]

· General vehicles collide with workers or guides during work.

[Why do they recur?]

· Work is started without installing safety fences. In many cases, there are issues with the placement of construction signs warning general vehicles, as well as the positioning of guides.

· Accidents occur when workers or guides are outside of work areas.

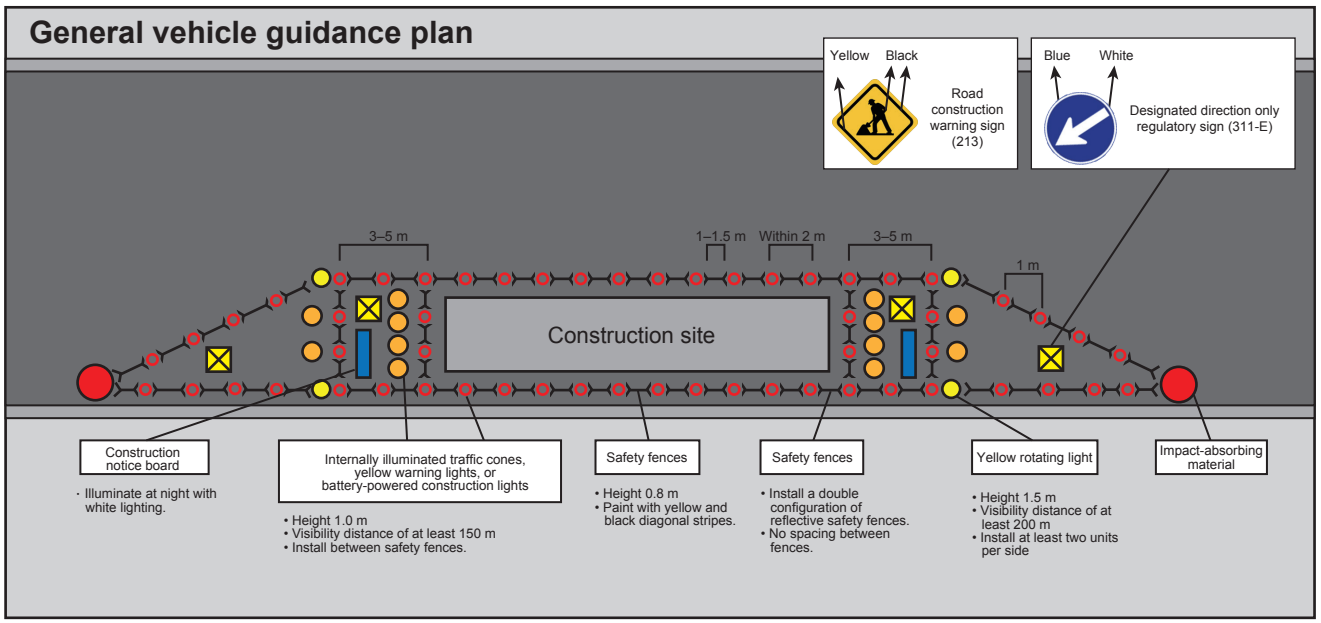
[What prevention measures can be taken?]

· Prepare a plan to prevent the entry of general vehicles into work areas (general vehicle guidance plan) and install work area safety facilities in accordance with the plan before starting work.

· Do not allow workers to work outside work areas. Guides shall provide guidance within work areas as much as possible. "

Work area safety facilities

General vehicle guidance plan



3 Accidents caused by the movement of dump trucks and other heavy machinery

[What types of accidents occur frequently?]

· In the case of backhoes, accidents occur when equipment is simply being moved to a new work area, rather than during excavation work or loading and unloading operations. In many cases, accidents occur when equipment is reversing.

[Why do they recur?]

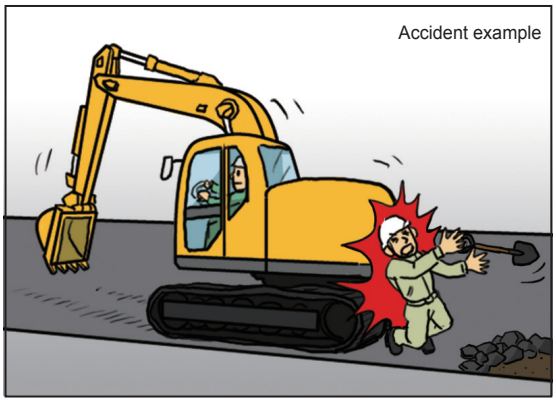
· Accidents occur because workers are present in areas where heavy equipment is moving. When workers are focused on tasks, they often do not notice heavy equipment approaching.

[What prevention measures can be taken?]

· Prepare a work plan that separates heavy equipment movement areas from worker work areas.

· Assign an spotter so accidents are prevented, even if workers are focused on tasks and do not notice heavy equipment approaching. In addition to assigning a dedicated spotter, the site foreman or supervisor is often appropriate for this role. The supervisor shall direct work operations while ensuring worker safety (therefore, the supervisor should not directly perform tasks).

· Equip heavy equipment with rear-view monitors.


Accident example


Prevention measures

< Even simple movement of heavy equipment poses significant risk >

· According to analysis of fatal accident data by work type (2004–2006, nationwide, National Institute of Occupational Safety and Health, Japan), accidents caused by the movement of heavy equipment (including transport operations) rank as the leading cause of fatalities in civil engineering work, with a total of 67 deaths over the three-year period. The fact that this is often not viewed as a high-risk task is a blind spot.

4 Accidents caused by excavation work, Part 1: Workplace accidents involving backhoes

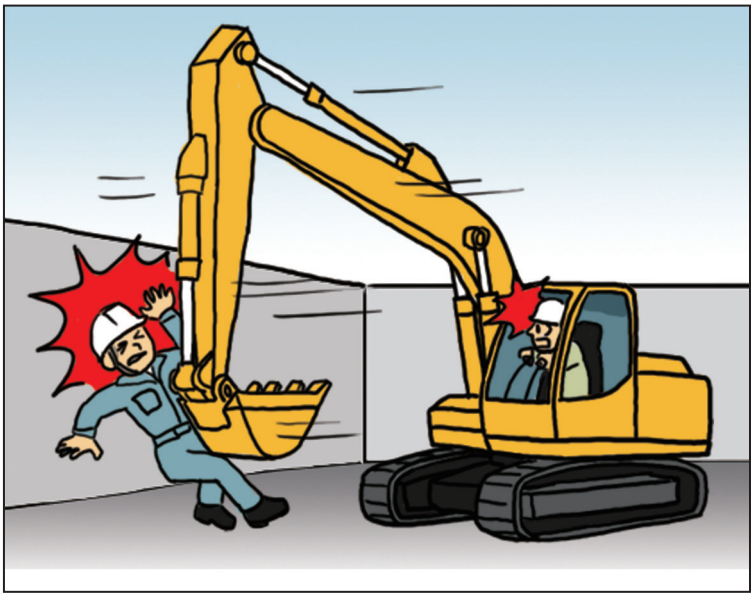
1 Getting caught / entangled

[What types of accidents occur frequently?]

· Getting caught between the bucket and the counterweight while rotating.

[Why do they recur?]

· Work areas for water pipeline installation excavation work are confined, making it difficult to prevent workers from entering the operating radius of backhoes, and operators, with many blind spots, can easily lose sight of workers.



[What prevention measures can be taken?]

- As a general rule, prohibit entry into the operating radius of backhoes, and when entry is unavoidable, always obtain prior approval from the operator.
- As an inherent safety measure, ultra-small swing backhoes, which eliminate the counterweight itself to prevent incidents of getting caught, are recommended. Some models are also equipped with contact prevention equipment.
- Assign an spotter.

Backhoe contact prevention equipment

Ultra-small swing hydraulic excavator

2 Run over while reversing

[What types of accidents occur frequently?]

- Workers or guides are run over while reversing to move to a different excavation location, etc.
- Accidents are caused by reversing far more often than by rotation (see table on right).

[Why do they recur?]

- The operator has blind spots.
  In addition, when operators are focused on tasks, they are less likely to notice nearby workers. Thus, instructing operators to "pay attention to nearby workers" is ineffective and cannot be regarded as a safety instruction.

[What prevention measures can be taken?]

- Implement two layers of safety measures by installing rear-view monitors and assigning spotters and guides.
- Establish "no reversing without guidance" as a basic rule.

Rear-view monitor

Fatalities by backhoe operation type in excavation work (2001–2006, nationwide)

Backhoe operation, etc.	Person(s)
1) Run over while reversing	35
2) Accidents caused by rotation, etc.	17
3) Accidents caused by backhoes overturning	10
4) Run over or caught by movements other than reversing	10
5) Unknown	1
Total	73

Source: National Institute of Occupational Safety and Health, Japan

3 Debris falling from the bucket

[What types of accidents occur frequently?]

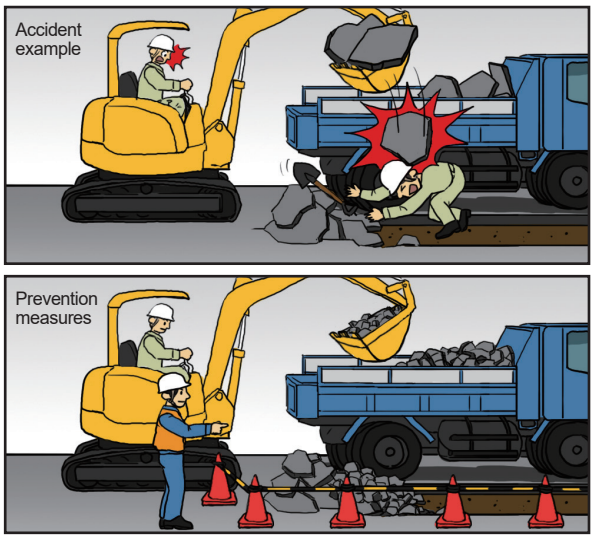
- Debris falls from the bucket and hits nearby workers during pavement removal using a backhoe in trial and main excavation.

[Why do they recur?]

- Pavement debris is not broken down into smaller pieces, causing debris protruding from the bucket to fall.
  Transporting materials at high speed is attempted in an effort to complete work quickly.

[What prevention measures can be taken?]

- Prohibit entry to areas where pavement debris may fall and assign an spotter.
- Break down pavement debris into smaller pieces.
- Reduce rotation speed during transport.



4 Accidents caused by excavation work, Part 2: Property damage

1 Buried pipes and cables

[What types of accidents occur frequently?]

· Buried pipes and cables are damaged during trial and main excavation using backhoes. Damage is often caused when buried objects are shallower than expected.

[Why do they recur?]

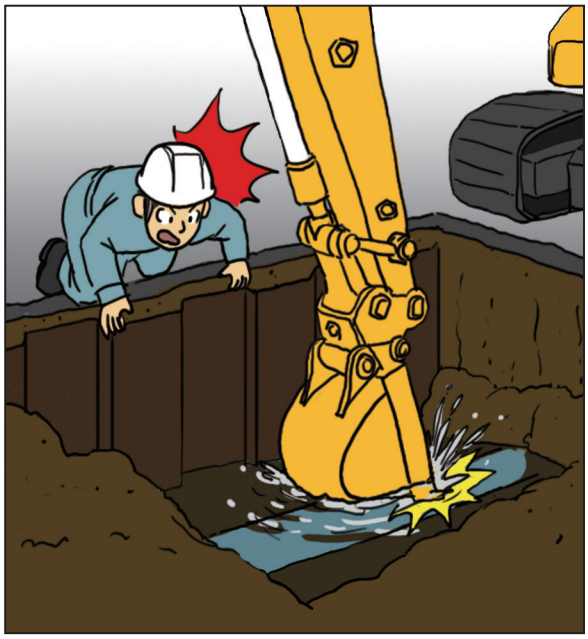
· The primary cause is that buried objects are not located as indicated in the drawings. Excavating with a backhoe without causing damage is extremely difficult when locations are unknown.

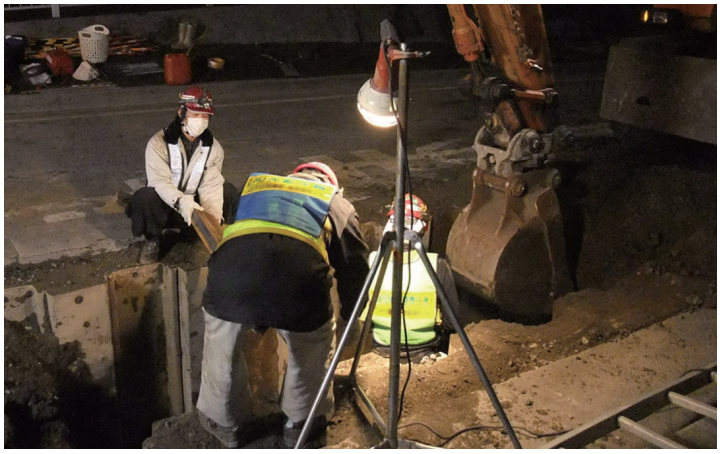
[What prevention measures can be taken?]

· Conduct hand excavation in advance under the supervision of a buried object manager to confirm the exact locations of buried objects.

· The photo on the right shows the positioning of an spotter during advance hand excavation; spotter positioning is critically important.

· If any unidentified buried object is discovered, have it reported to the client. Do not allow unauthorized disposal, as buried objects may be live.





Advance hand excavation spotter

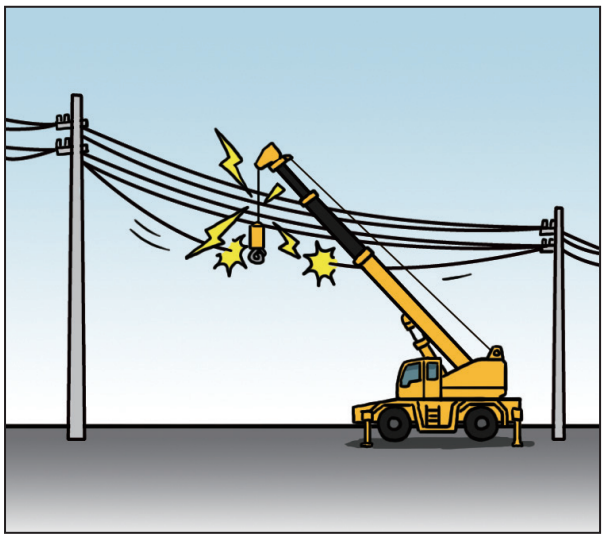
2 Overhead lines

[What types of accidents occur frequently?]

· Overhead lines, including power lines, are damaged by cranes, backhoes, pile drivers, and other equipment.

[Why do they recur?]

· When focused on tasks, operators of cranes and other equipment forget about the presence of overhead lines. There are limitations to an operator's attentiveness.



[What prevention measures can be taken?]

- Confirm the location, type, and owner of overhead lines beforehand and implement protective measures.
- Display "Caution: Overhead Lines" at ground level to prevent operators, who tend to look downward during operation of cranes and other equipment, from forgetting about the presence of overhead lines.
- Assign an spotter.

Overhead line protection

Displaying "Caution: Overhead Lines" at ground level

4 Accidents caused by excavation work, Part 3: Soil collapse

[What types of accidents occur frequently?]

- Soil collapse often occurs during small-scale trench excavation work. The Bureau's soil collapse accident cases have occurred at shallow excavation depths of 0.8 m and 1.3 m.

[Why do they recur?]

- Hazards are underestimated and earth-retention support is not installed on assumptions that "this depth is safe" and "it will be backfilled immediately, so earth retention is unnecessary."
- Workers enter the trench during assembly of earth-retention support or strut placement, despite the risk that soil walls may become unstable, and are caught in soil collapse.

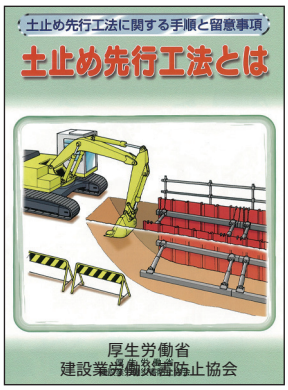
< Perspectives of small and medium-sized construction contractors >

I understand that struts must not be removed without authorization, but the on-site atmosphere can make it seem acceptable…

- Even a soil collapse of 1 m³ can weigh nearly 2 t, posing a significant risk of fatal crushing between soil walls. Soil collapse is extremely dangerous.

[What prevention measures can be taken?]

- Implementation of the "advance earth retention method" (workers do not enter the trench until assembly of support is complete)
- Prepare a work plan that allows strut replacement without workers entering the trench.



5 Paving work: Roller collision accidents

[What types of accidents occur frequently?]

· Nearby workers are run over during roller compaction work. More than half of all paving-work accidents are caused by rollers.

[Why do they recur?]

· Accidents occur because workers are performing other tasks (including edge compaction) near roller operations. When workers are focused on tasks, they sometimes do not notice rollers approaching.

· Because rollers move quickly in all directions, workers are unable to escape.

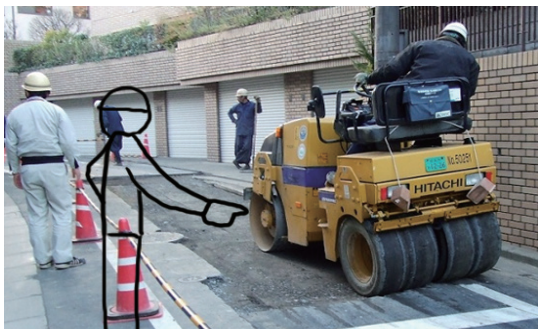
· The roller operator has blind spots when reversing.

[What prevention measures can be taken?]

· An inherent safety measure is to not allow other work within the roller operation area.

· If work inevitably becomes congested, assign spotters to protect the safety of workers.

Compaction work performed by a roller and workers (Congested work is extremely dangerous)



Assigning spotters

6 Accidents during assembly and dismantling of earth-retaining support

1 Falling from support structures

[What types of accidents occur frequently?]

· Falling while walking on struts or wales without using a safety harness.

[Why do they recur?]

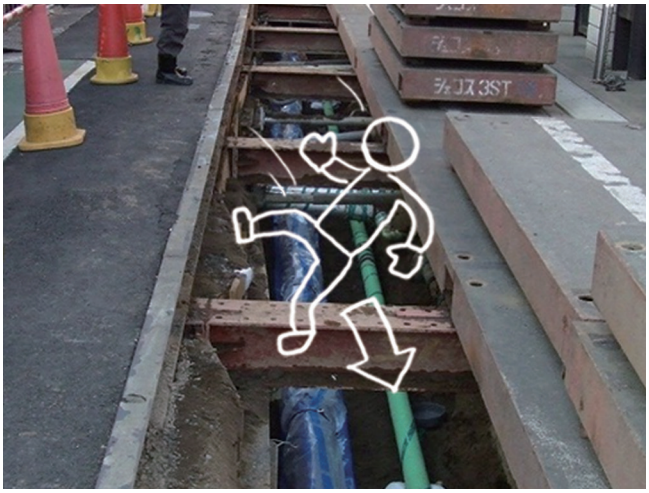
· Workers move on struts or wales because “it’s a shortcut.”

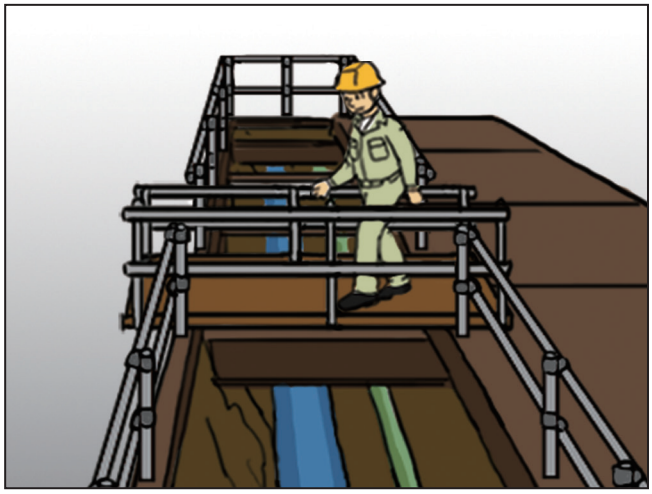
[What prevention measures can be taken?]

· As a basic rule, do not walk on struts or wales. Create a passageway.

· If it is unavoidable to walk on struts or wales, for example, to remove accumulated soil, implement fall-protection measures such as installing lifelines and using safety harnesses.

· Assign an spotter.





2 Support materials falling

[What types of accidents occur frequently?]

· Struts, wales, or other materials fall and hit workers in the trench during assembly of support.

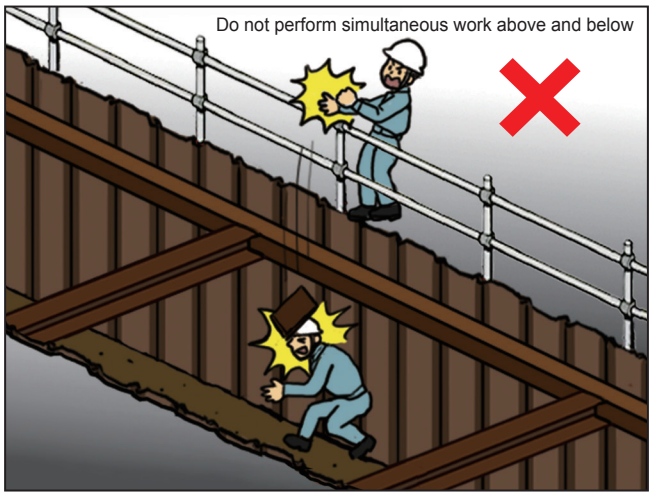
[Why do they recur?]

· The primary cause is simultaneous work above and below.

· Leaving unnecessary steel materials on struts or wales is another cause.

[What prevention measures can be taken?]

· It is impossible to completely prevent support materials from falling. Establish a rule not to perform work above and below simultaneously.



3 Damage to buried objects during sheet pile driving

[What types of accidents occur frequently?]

· Buried pipes and cables are damaged during sheet pile driving. Damage is often caused when the depth exceeds expectations or the location differs from drawings.

[Why do they recur?]

· The primary cause is that buried objects are not located as indicated in the drawings. Installing sheet piles without causing damage to buried objects is difficult when locations are unknown.

[What prevention measures can be taken?]

· Under the supervision of a buried object manager, determine the exact location of buried objects before sheet pile installation by performing manual trenching, and, for deeper objects, by using a probe.

· If any unidentified buried object is discovered, have it reported to the client. Do not allow unauthorized disposal, as buried objects may be live.

7 Accidents during loading and unloading operations using cranes and backhoes

According to analysis of fatal accident data (2004–2006, nationwide, National Institute of Occupational Safety and Health, Japan), this work has the highest number of fatal accidents in construction.

1 Cranes overturning

a. Mobile cranes

[What types of accidents occur frequently?]

- Cranes overturning draw significant public attention and are frequently reported on television. Cranes overturn easily when they lose balance.

[Why do they recur?]

- The ground where the outriggers are extended is insufficiently prepared. Outriggers are not fully extended.
- Operators release the overload protector, believing "the crane can handle more," and lifts a weight beyond the rated load.

[What prevention measures can be taken?]

- Check the load weight and working radius before working, and confirm that the crane is capable of handling them.
- Clarify adequate ground preparation where outriggers are extended and measures to take if outriggers cannot be fully extended.
- Do not allow lifting of loads exceeding the rated load. The prime contractor shall manage the "key" to the overload protector, preventing the operator from carrying it.

Keyhole for releasing the overload protector

b. Truck-loader mobile crane (UNIC truck)

[What types of accidents occur frequently?]

- The majority of overturn accidents occur when unloading cargo from the truck bed.
- Crane operators are also frequently involved in accidents.

[Why do they recur?]

- Cranes can lose balance and overturn when rotating laterally during unloading.
- Trying to lift loads exceeding the rated load.
- Accidents can occur when outriggers are not extended because it is "troublesome."

[What prevention measures can be taken?]

- Check the load weight, working radius, and rated load before working.
- If outriggers cannot be fully extended, clarify measures to follow.
- Remote-controlled cranes are recommended to prevent crane operator accidents.

Remote-controlled cranes

2 Suspended loads falling

[What types of accidents occur frequently?]

· Due to causes such as sling wires breaking or loads shifting, loads fall and hit signalers, attendants, or others.

[Why do they recur?]

· Damage to sling wires (internal damage is difficult to identify).
· Lifting loads off the ground at once without confirming stability.

[What prevention measures can be taken?]

· Confirm work details and responsible personnel before working (1 crane position, 2 signaler, 3 working radius, 4 load weight, 5 lifting method, 6 movement location, etc.).
· Daily inspection of sling wires
· As a basic rule, ensure the load is properly lifted off the ground.

Daily inspection of sling wires

3 Getting caught between suspended loads

[What types of accidents occur frequently?]

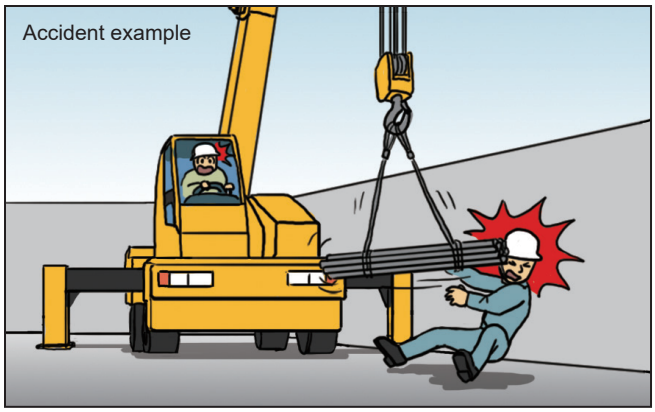
· Workers get caught due to load swing of suspended loads.

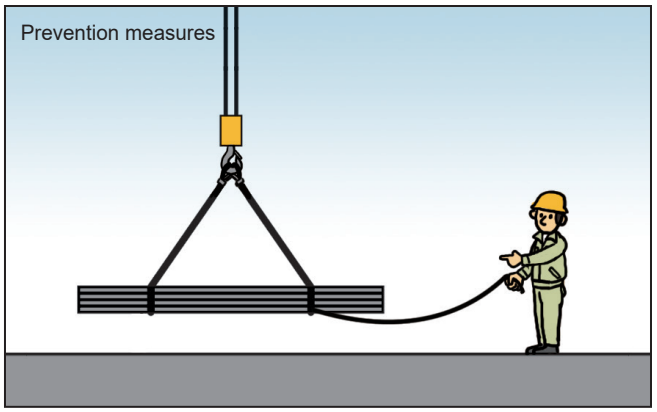
[Why do they recur?]

· Slinging signals are not properly communicated. There is no signaler. No guide rope is attached to prevent load sway. Loads are not properly lifted off the ground.

[What prevention measures can be taken?]

· Attach a guide rope. Attach to both ends for long loads.
· Confirm work details and responsible personnel before working (1 crane position, 2 signaler, 3 working radius, 4 load weight, 5 lifting method, 6 movement location, etc.).
· As a basic rule, ensure the load is properly lifted off the ground.
· Assign a spotter to prevent entry into the rotation area.





4 Accidents specific to loading and unloading operations using backhoes

[What types of accidents occur frequently?]

· Nationwide, fatal accidents are occurring frequently due to overturning backhoes and tilting or dropping of suspended loads.

Loading and unloading operations using backhoes resulting in fatal accidents (2001–2006, nationwide)

By accident type

Cause	Person(s)
1) Backhoe overturning	20
2) Tilting, dropping, etc., of suspended loads	13
3) Contact during rotation, etc.	8
4) Contact during bucket operation, etc.	5
5) Other	5
Total	51

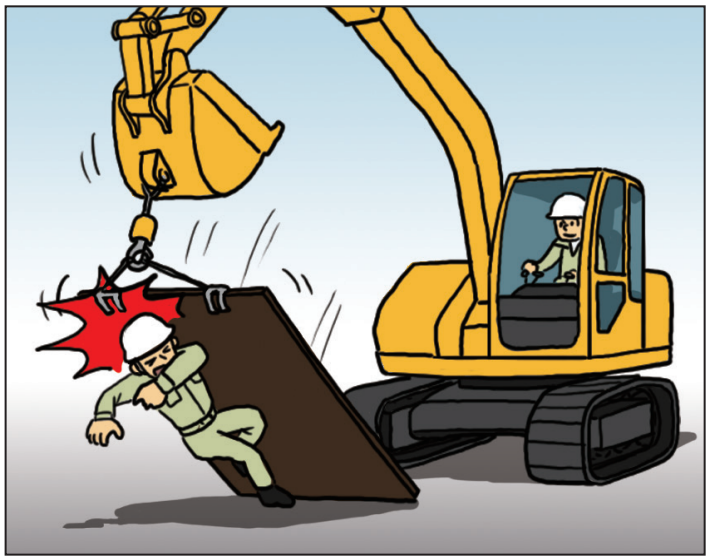
By suspended load type

Suspended load type	Person(s)
1) Steel plates, such as temporary road plates	13
2) Secondary concrete products	12
3) Concrete buckets	5
4) Sheet piles	5
5) Stones	2
6) Compactors, etc.	2
7) Other	12
Total	51

Source: National Institute of Occupational Safety and Health, Japan

[Why do they recur?]

· Suspended loads often consist of heavy items, such as steel plates and secondary concrete products, that can make the machine unstable. Long water pipes are also handled in waterworks.
· There have also been cases where machines overturned when lifting loads exceeding rated capacities.
· Lifting operations on soft ground make backhoes unstable and prone to overturn.



[What prevention measures can be taken?]

· As a general rule, prohibit operations outside the intended use. When using outside the intended use under specific conditions (when unavoidable due to the nature of the work, such as confined work areas, etc.), perform an inspection of the hook safety catch before starting work. Strictly observe the suspended load weight (bucket capacity × 1.8 t, maximum load less than 1 t).
· Use a backhoe with a crane function. (However, even when such equipment is used, violations have been observed in which lifting operations are performed without switching to crane mode to prioritize work efficiency. Monitoring is required.)
· Assign a spotter to prohibit entry into the working radius.

Backhoe with a crane function

8 Accidents specific to pipe installation work

1 Dislodgement of water pipes

[What types of accidents occur frequently?]

· Water pipes come loose when excavating around special pipe sections, such as curved pipes and T-joints, or around valve installation points.

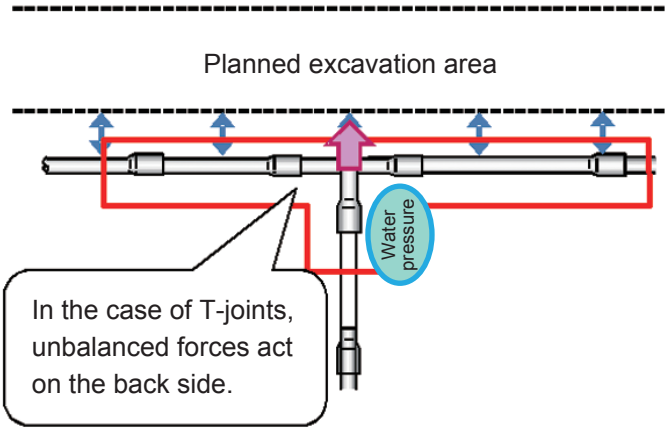
[Why do they recur?]

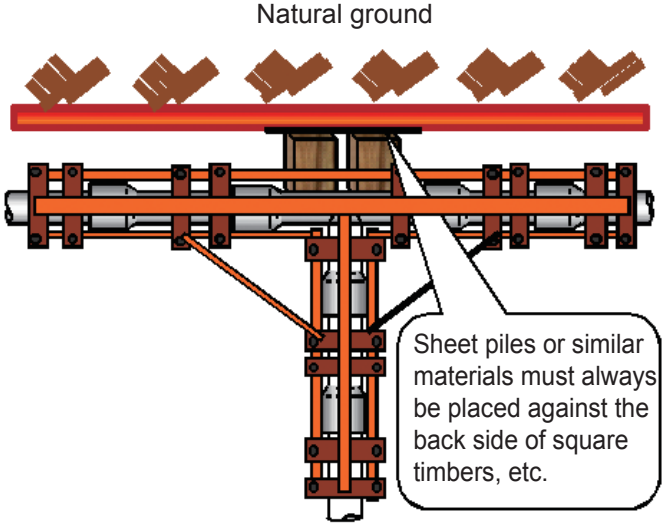
· Water pipes are constantly under significant pressure acting outward from the inside.
· Excavation around water pipes or nearby construction reduces the surrounding earth pressure, greatly increasing the risk of pipe dislodgement. Despite this, temporary protective measures to prevent dislodgement were not installed.
· Work was performed without considering dislodgement, on the assumption that existing pipes would not come loose.

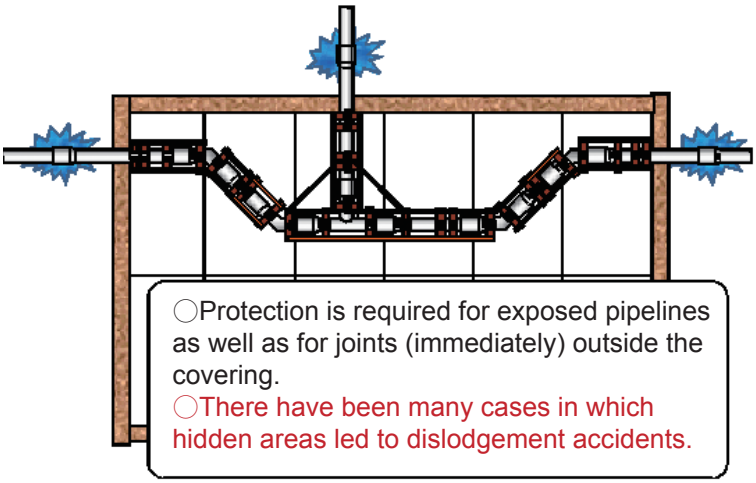
Dislodged pipe due to a lack of protective measures

[What prevention measures can be taken?]

· Conduct trial excavation to confirm the buried locations of existing pipes and pipes owned by other companies before starting work.
· When existing pipes are exposed or when work is to be performed in close proximity, consult with the maintenance department.
· Install necessary protective measures in stages, such as measures to provide reaction force against unbalanced forces generated inside the pipe.
· When removing dislodgement protection, remove the protection in stages.







2 Getting caught or entangled during pipe lifting operations

[What types of accidents occur frequently?]

· Pipes hit workers during pipe lifting operations.

[Why do they recur?]

· Lifting 6 m pipes is difficult and requires advanced techniques.
· Lifted pipes cannot be controlled because no guide rope has been attached.
· Carelessly approaching suspended loads.

[What prevention measures can be taken?]

· Clarify pipe lifting methods and procedures, and ensure they are followed.

< Precautions for pipe lifting and lowering operations >

① When lifting pipes, confirm the pipe weight and center of gravity, and use designated nylon slings and wire ropes covered with rubber tubing, etc. If the pipe's center of gravity is mispositioned, vertical or lateral sway may occur, creating a hazard.
② When lowering pipes, if earth-retaining struts are to be removed, ensure safety to prevent ground collapse.
③ Always remove all foreign matter inside pipes. Exercise caution during jointing, as the spigot may scrape soil from the ground and cause it to enter the pipe.

Source: Tokyo Metropolitan Government Bureau of Waterworks “Guide to Water Pipe Construction”

· In particular, when temporarily removing struts during the lowering of long pipes, always reinforce the earth support and confirm safety before work.
· As a basic rule, attach a guide rope during pipe lifting operations. Attach for small pipes as well. Attach to both ends for long loads.

2 Workplace accidents during pipe cutting

Frequent accident 1

[What types of accidents occur frequently?]
· Getting entangled in cutting machines while trying to remove shavings.

[Why do they recur?]
· Removing shavings while the cutting machine is running.

[What prevention measures can be taken?]
· Always stop the cutting machine when removing shavings.

Frequent accident 2

[What types of accidents occur frequently?]
· Flying shavings hit workers during cutting.

[Why do they recur?]
· Not wearing protective gear

[What prevention measures can be taken?]
· Wear protective gear (protective gloves, protective eyewear, dust mask, earplugs and helmet) when working.

Frequent accident 3

[What types of accidents occur frequently?]
· Coming into contact with cutting machines when cutting existing pipes in trenches.

[Why do they recur?]
· Performing cutting operations in uncomfortable or unstable positions.

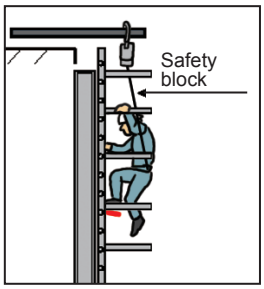
[What prevention measures can be taken?]
· Secure work space to avoid working in uncomfortable or unsafe positions.

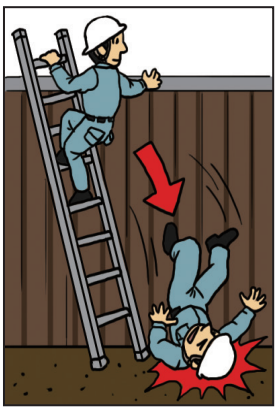
9 Accidents involving falls from ladders

[What types of accidents occur frequently?]
· Falling after losing a step on a ladder.Collapsing ladders.

< Falls from ladders are common in manufacturing >

Falls from ladders and similar equipment (including stepladders) are the most frequent fall accidents in factories and plants, accounting for nearly one quarter of all incidents.





[Why do they recur?]	[What prevention measures can be taken?]
· Ladder not properly set up.	Set up ladders properly (right figure: follow the Ordinance on Industrial Safety and Health).
· Losing balance while working on a ladder.	As a general rule, do not work on ladders.
· Slipping while climbing or descending a ladder with muddy soles.	Install a shoe-washing area to remove mud from soles.
· Climbing or descending a ladder while carrying materials, etc.	Climb and descend with empty hands.
· Falling due to lack of attention.	Use a safety block.

Proper ladder setup

10 Accidents involving workers tripping

1 Slipping and falling

[What types of accidents occur frequently?]

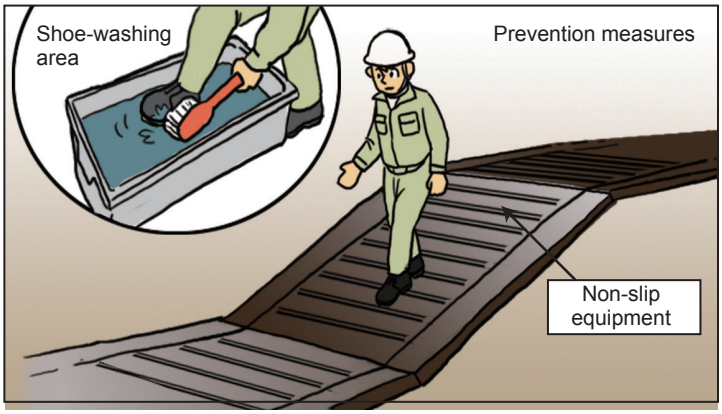
· Slipping and falling while moving around sites.

[Why do they recur?]

· Wet ramps (frozen in winter), temporary road plates, and cover plates are easy to slip on.
· Muddy soles increase the risk of slipping.

[What prevention measures can be taken?]

· First, clarify work passageways.
· Install non-slip measures on ramps (steps, non-slip tape, etc.).
· Install a shoe-washing area.
· Wear slip-resistant safety shoes.



2 Tripping and falling

[What types of accidents occur frequently?]

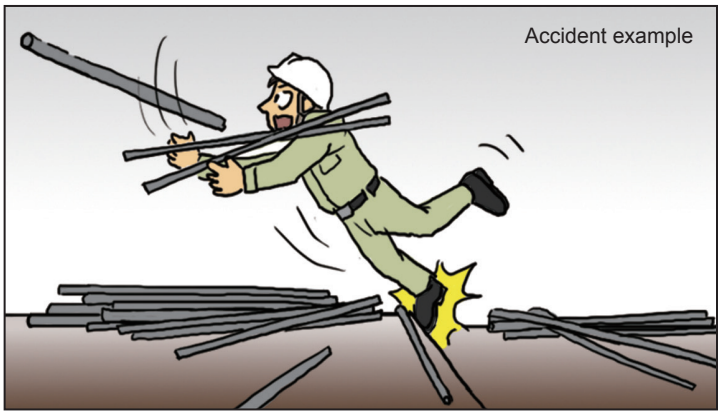
· Tripping and falling while moving around sites.

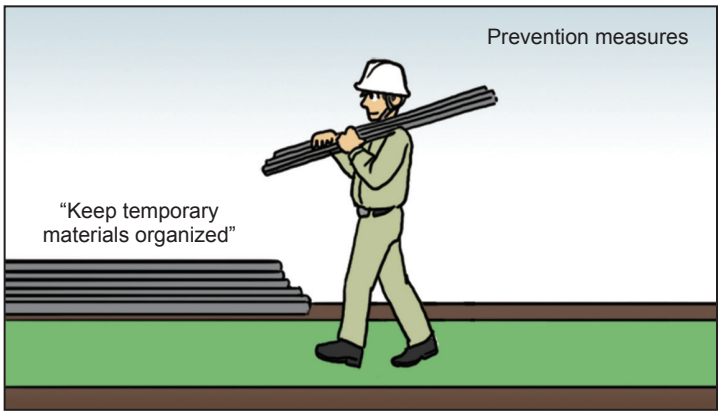
[Why do they recur?]

· There are objects that may cause tripping in work passageways, such as steps, protrusions, or temporarily placed materials.

[What prevention measures can be taken?]

· Tripping accidents cannot be eliminated as long as tripping hazards are present.Secure work passageways and keep them free of objects that could cause tripping.
· Proper organization is important for preventing falls.Organization is easily maintainable with a little attention.
· Eliminate steps with transition sections, protect protrusions with cushioning, and install warning signs.
· Secure appropriate lighting for work passageways.





11 Accidents related to machinery and equipment operations

1 Falling from openings, buildings, and equipment

[What types of accidents occur frequently?]

Falling from openings, buildings, and equipment.

[Why do they recur?]

· Fall-protection measures have not been implemented.

[What prevention measures can be taken?]

· Implement fall-protection measures such as protecting openings.Prohibit passage through areas where measures cannot be implemented.

Fall prevention measures for manholes

Dedicated frame that allows workers to safely climb and descend, as well as the use of safety harnesses during work

2 Getting caught in, entangled, or electrically shocked by machinery and equipment

[What types of accidents occur frequently?]

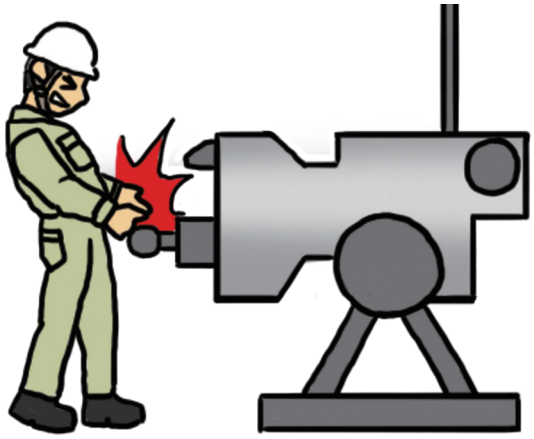
Getting caught in, entangled, or electrically shocked during inspection, maintenance, or repair of machinery and equipment.

[Why do they recur?]

· Not stopping machinery or equipment during inspection, maintenance, or repair.

[What prevention measures can be taken?]

· Stop machinery and equipment when working.For work performed while machinery is running, a notification shall be submitted to the client in advance.
Confirm that the power is off using a detector.



12 Accidents caused by strong winds (flying construction signs, etc.)

[What types of accidents occur frequently?]

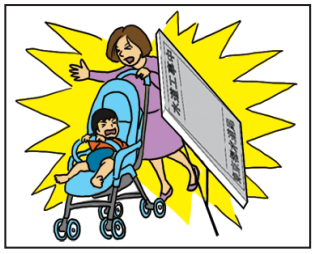
· Construction signs and other objects are blown away by strong winds and hit pedestrians.

[Why do they recur?]

· Unable to respond quickly to sudden strong winds.

[What prevention measures can be taken?]

· Keep spare weights to enable quick responses to sudden strong winds.



Spare weights

13 Accidents during tree cutting and felling operations

Accidents during tree cutting and felling operations are very common. Ranks second highest in fatal accidents by task in civil engineering and first in forestry (according to the National Institute of Occupational Safety and Health, Japan).

Frequent accident 1

[What types of accidents occur frequently?]

· Felled trees hit workers during tree felling operations

[Why do they recur?]

· Felled trees fall in unexpected locations.Closely spaced trees make it difficult to notice nearby workers.

[What prevention measures can be taken?]

· Prohibit entry to all areas where felled trees could fall in case they fall in unexpected directions.

Frequent accident 2

[What types of accidents occur frequently?]

· Injuries during brush cutting operations. Accidents caused by the use of chainsaws

[Why do they recur?]

· Incorrect use of brush cutters or chainsaws.Working in uncomfortable positions

· Obstructions appear suddenly.

[What prevention measures can be taken?]

· Before starting work, confirm how to operate brush cutters and other equipment, and check for obstructions

· Use chainsaws equipped with fail-safe features

· Do not cut branches above eye level

· Wear anti-vibration gloves, protective eyewear, and long-sleeved work clothes

Frequent accident 3

[What types of accidents occur frequently?]

· Falling during pruning operations

[Why do they recur?]

· Hazards are underestimated and fall-protection measures have not been implemented.

[What prevention measures can be taken?]

· Confirm the tree species, trunk and branch thickness, and signs of decay in advance.

· Perform pruning operations in a stable position.Use a safety harness at elevated locations.