TRAINING OF SAFETY MANAGEMENT FOR QUATEST3 STAFF

15,APRIL, 2015

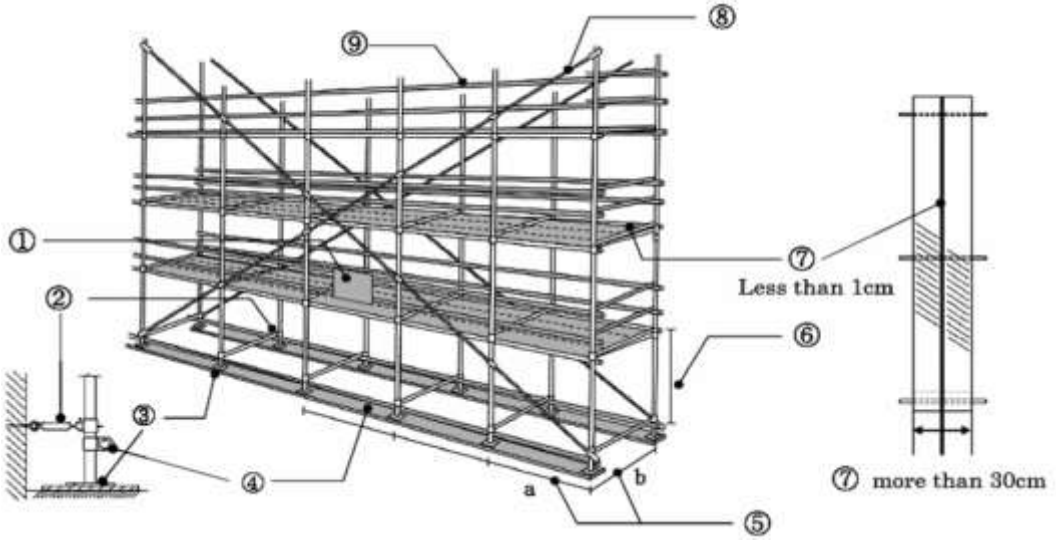
YAMAMOTO MIKIO ,JICA SV

- INDIVIDUAL SAFETY
- AND
- HEALTH MANAGEMENT

1. Prevention of falling, 1.1 Pipe Footing

- **Pipe footing is composed of vertical pipes, horizontal pipes, planks, cramps, joints, metal bases and so on, Check points:**
- **(1) Is maximum loading capacity of footing shown at the conspicuous place?**
- **(2) Are metal fittings to wall used?**
- **(3) Are metal bases for pipes used as base jack?**
- **(4) Are horizontal pipes near metal base installed?**
- **(5) Are metal bases located at the right space?**

Load type	Pipe cross section	a(m)	b (m)
Light load (125kg/m²)	Ø 50mm	**3.0**	**1.2**
Average load (250kg/m²)	Ø 50mm	**2.4**	**1.0**
	Ø 64mm	**2.4**	**1.8**
Heavy load (375kg/m²)	Ø 64mm	**1.5**	**1.5**

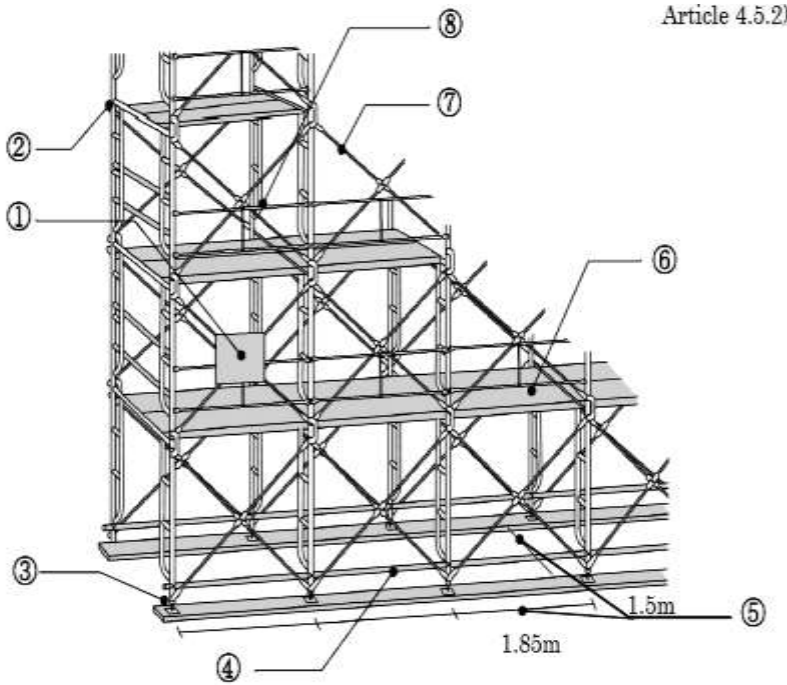


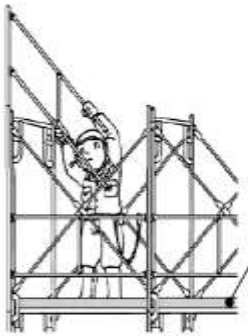
- **(6) Is the height of first footing step less than 2m?**
- **(7) Is the total width of scaffold planks more than 30cm?**
- **Is the gap between scaffold planks less than 1cm?**
- **(8) Are cross bracing used to reinforce the footing?**
- **(9) Are handrail fixed, height is 0,9~1,15m**

1.2 Scaffolding

Scaffolding is composed of frames, bracings, base joints, jack bases and so on.

- **Check points**
- **(1) Is maximum loading capacity of footing shown at the conspicuous place?**
- **(2) Are metal fittings to wall used?**
- **(3) Are jack bases for pipes used?**
- **Are jack bases settled on the board?**
- **(4) Are horizontal pipes near metal**
- **base installed?**
- **(5) Are metal bases located at the**
- **right space? (less 1.5m, less 1.85m)**
- **(6) Is the total width of scaffold**
- **planks more than 30cm?**
- **Is the gap between scaffold planks**
- **less than 1cm?**
- **(7) Are bracings installed at all sides**
- **(8) Are handrails fixed ?**



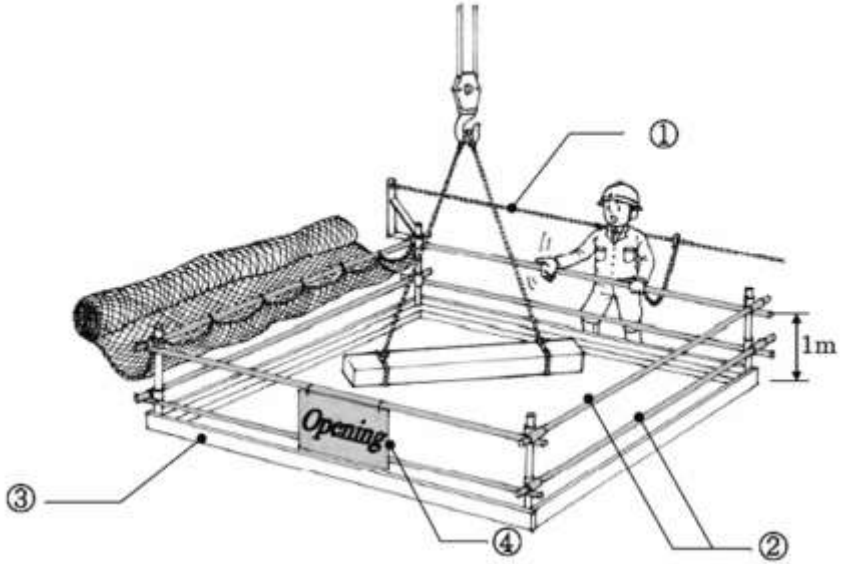


Note:

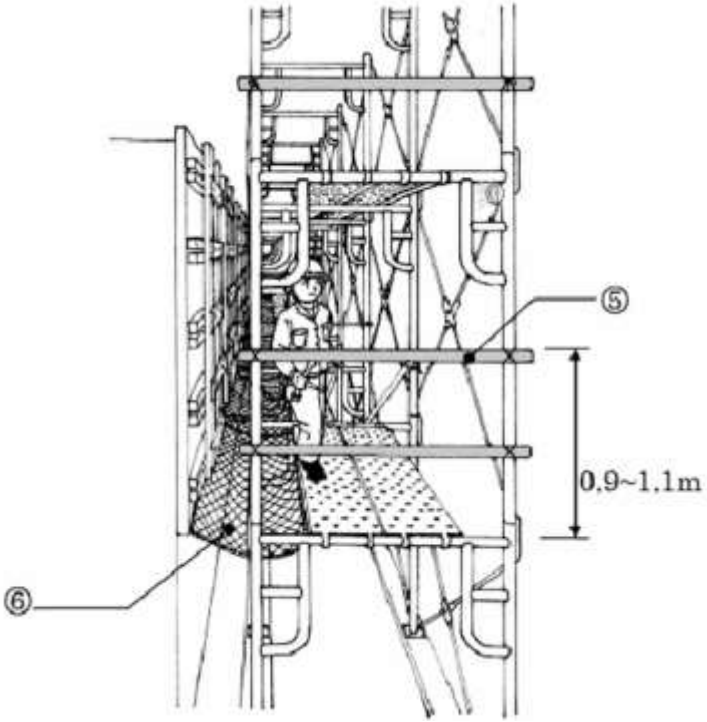
It is better to install toe boards on the scaffold planks. Falling of materials and workers will be prevented by toe boards. (TCXDVN 296-2004, Article 4.5.4)

1.3 Opening section

Fence, handrail and cover must be set up at the potential area of workers falling.

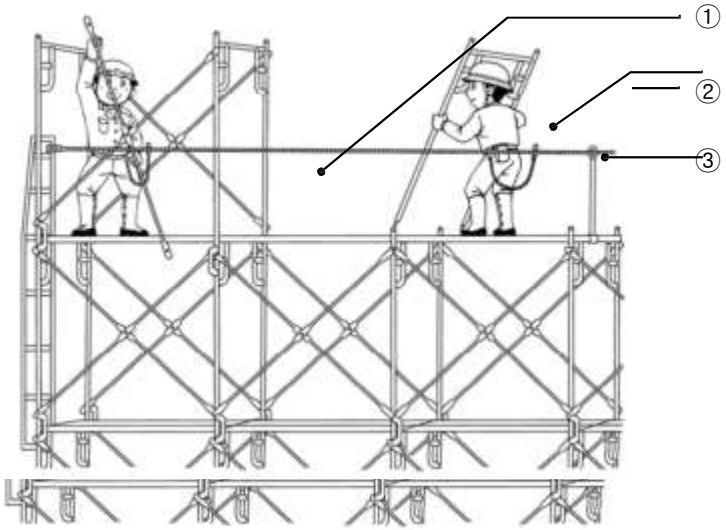


- **Check points:**
- **(1) Is there any facility to tie safety belt?**
- **(2) Is the height of handrail more than 1m? Is there extra pipe between handrail and ground?**
- **(3) Are toe boards installed around the opening?**
- **(4) Is a caution sign shown at the opening?**
- **(5) Is the height of handrail more than 0,9~1,15m?**
- **(6) Is the safety net spread out between planks And structure/framework where spacing is more than 30cm?**



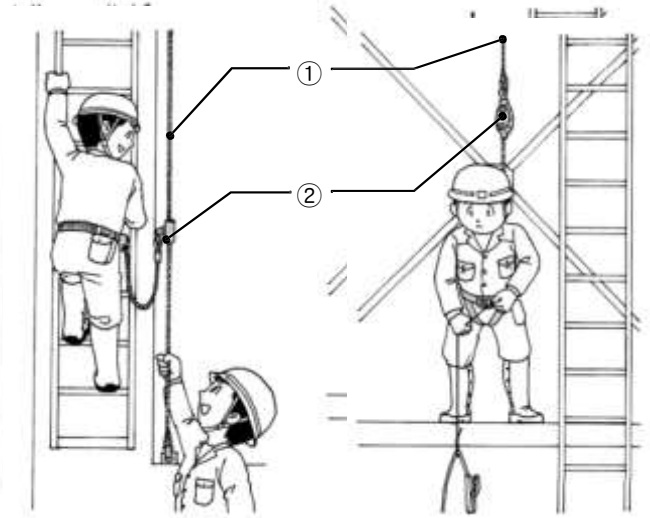
1.4 Safety belt

Worker must use with safety belts and/or harness when they work in high place where handrails are difficult to install.



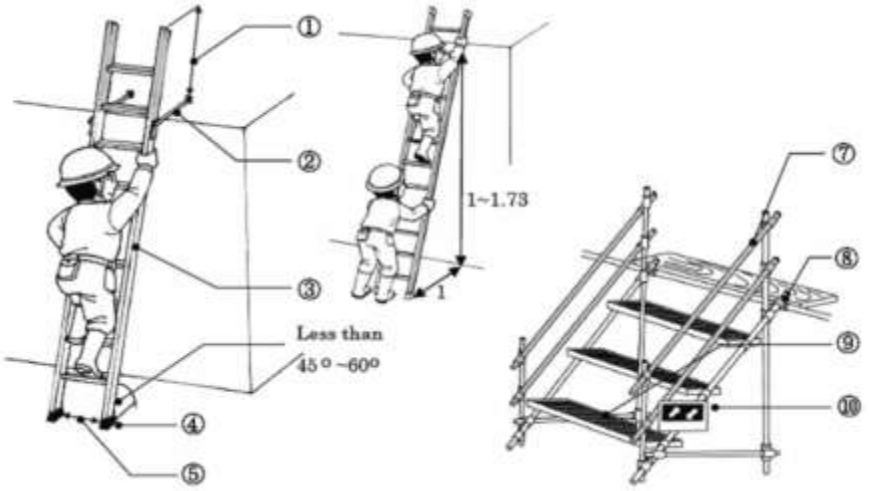
- **Check points:**

- **(1) Is the main rope for hook tightened?**
- **(2) Is the location of hook higher than the waist?**
- **(3) Are spacing of supports adequate?**



1.5 Ascent and Descent

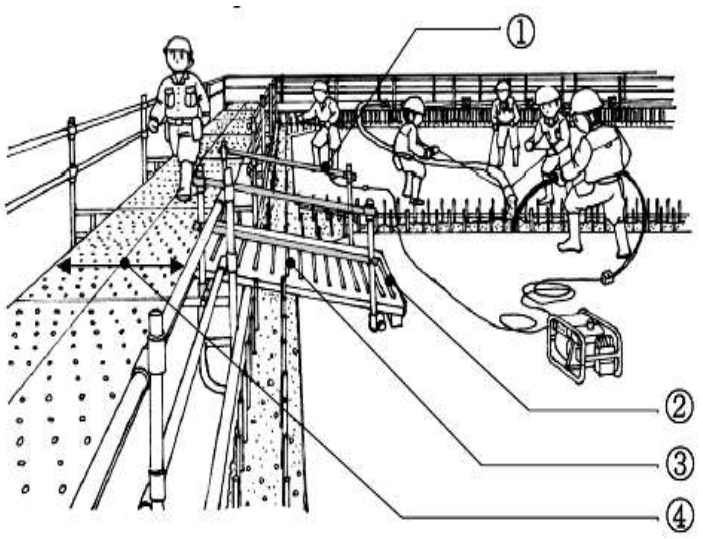
Facilities shall be prepared at the place for ascent and descent where the height(or depth) is more than 1.5m.



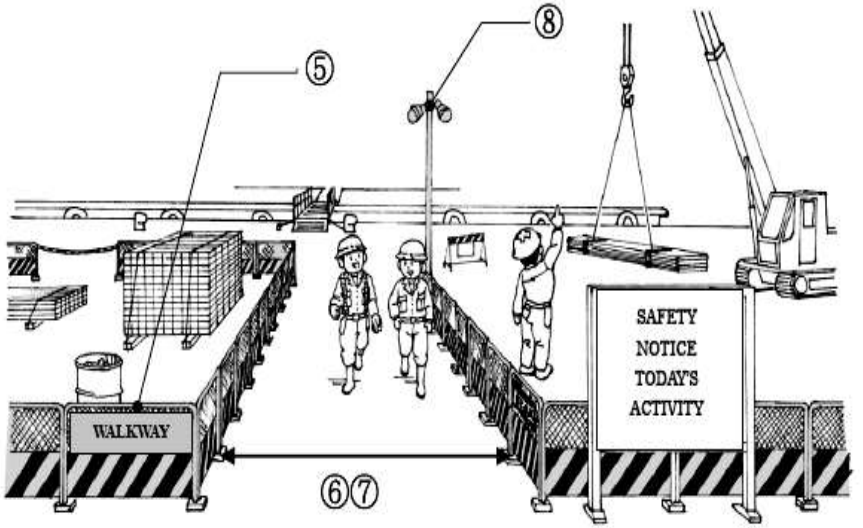
- **Check points:**
- **(1) The length of upper end**
- **Must be more than 60cm**
- **(2) Device to prevent**
- **transposition must be taken**
- **(3) Is there any damage and rot**
- **with material?**
- **(4) Is slip stopper attached to the ladder?**
- **(5) Is the width of ladder more than 30cm?**
- **(6) Is the length of ladder less than 9m?**
- **(7) Is the height of handrail 0,9~1,15m? Is there extra pipe under handrail?**
- **(8) Are pipes fixed to the stable support?**
- **(9) Are traps installed at same spacing?**
- **(10) Is a sign of stairs shown at the right place?**

1.6 Safety walkway

Safety walkways must be arranged at the site to prevent falling and to prevent hit by machines.

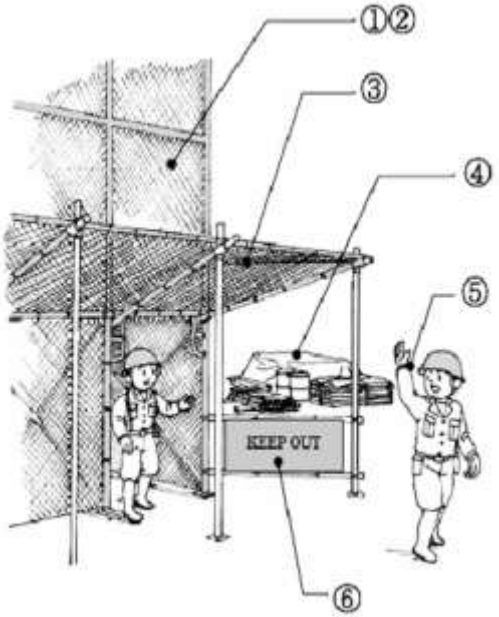


- **Check points:**
- **(1) Is the height of handrail 0,9~1,15m?**
- **Is there extra pipe under handrail?**
- **(2) Is the anti-slip installed?**
- **(3) Are pipes fixed to the stable support?**
- **(4) Is the width of walkway enough?**
- **(Example: more than 40cm in Japan)**
- **(5) Is the sign of walkway shown at**
- **the right place?**
- **(6) Is the width of walkway kept for**
- **intended purpose?**
- **(7) Materials shall not be stored in**
- **the walkway.**
- **(8) Is lights installed by walkway?**

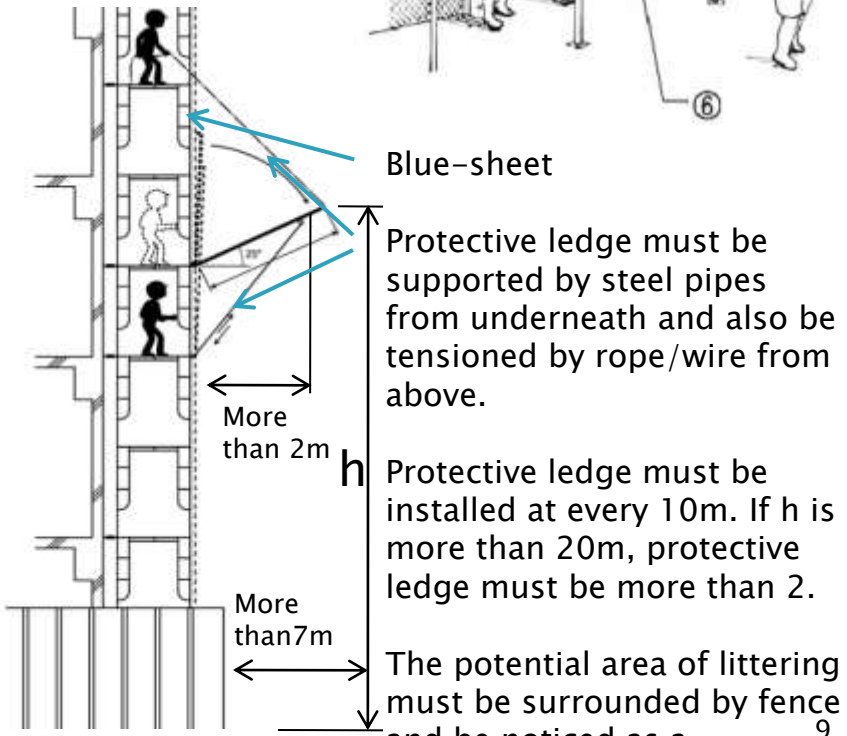


2. Danger by Falling/Littering, 2.1 Facilities to prevent littering

Blue sheets and protect nets are required to install at potential unsafe area where dropped litters will be fallen. (Note: Blue sheets - The sheets to prevent littering from building site and it is commonly known as blue sheets)



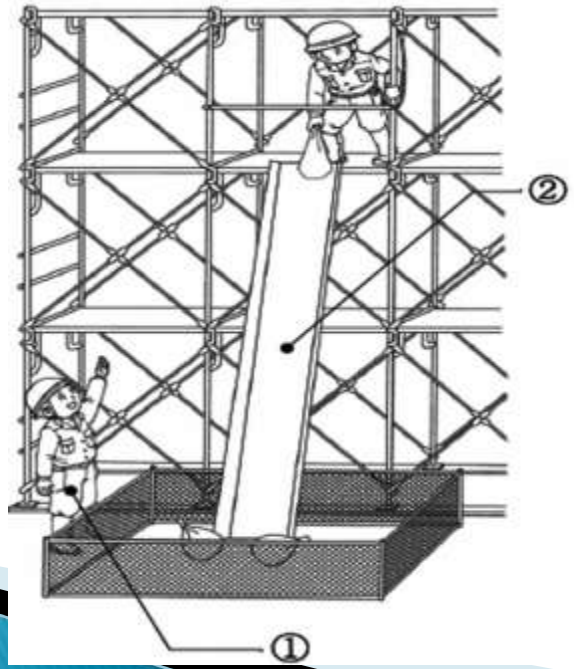
- **Check points**
- **(1) Are blue sheets tied up less than**
- **45cm spacing?**
- **(2) Are blue sheets and pipes tied**
- **Up less than 45cm spacing?**
- **(3) Potential area to be hit by dropped**
- **litters must be protected by net.**
- **(4) Materials should be covered or**
- **tied up with ropes to prevent not to**
- **be blown by wind.**
- **(5) Workers must wear helmet.**
- **(6) Notice of "Keep Out"**

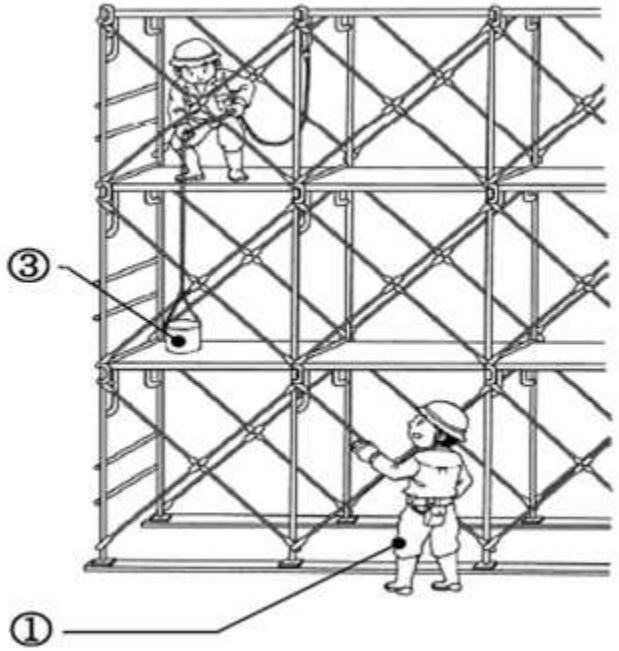


2.2 Chute

It is necessary to prepare chuting equipments/device when materials are dropped from the high place.

- **Check points:**
- **(1) Put up a "Keep Out" sign or arrange a watchman**
- **(2) Chuting device must be used when chuting point is higher than 3m,dropping height is less than 1m**
- **(3) Are ropes and bags used when loading and unloading materials?**

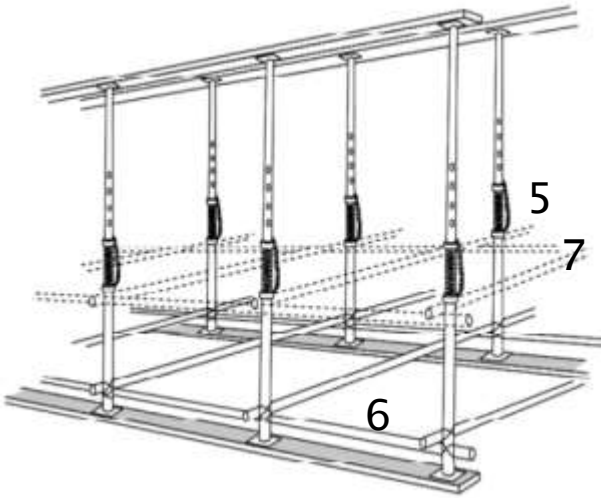


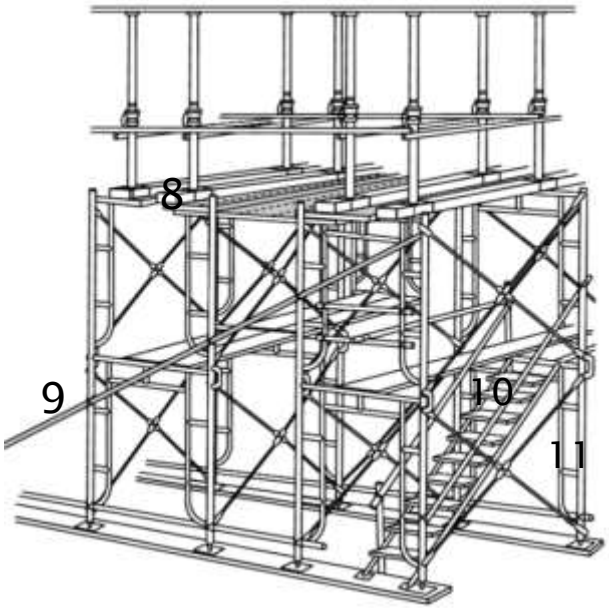


3. Danger by Collapse/Rolling, 3.1 Assemble/Disassembling Supports

The following points are required to check before assembling/ disassembling formworks.

- **Check points:**
- **(1) Are drawings for assembling prepared before starting erection?**
- **(2) Is a chief supervisor appointed for supporting works?**
- **(3) Are actions taken to prohibit people from entering working area without permission?**
- **(4) Works shall be stopped in inclement weather.**
- **(5) Pins must be used to fix the length of supports.**
- **(6) Are horizontal pipes near metal base installed to prevent slips of metal bases?**
- **(7) Extra horizontal pipes must be added at every 2m when the height of support is higher than 3.5m.**
- **(8) Working platform must be set up at the top of scaffold**
- **(9) A diagonal brace must be set up**
- **(10) A stair must be set up to the place higher than 1.5m**
- **(11) All braces must be set up at the right place.**

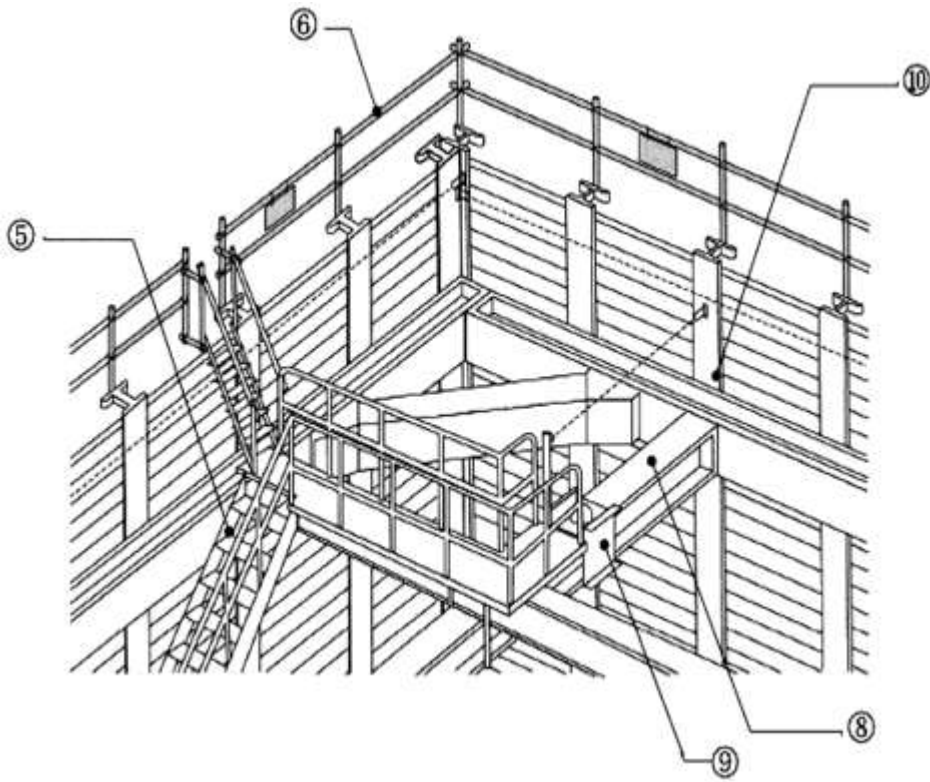




3.2 Retaining Wall Works

Earth retaining work is to prevent deformation of excavation shape, collapse of excavation face and to keep excavation area stable.

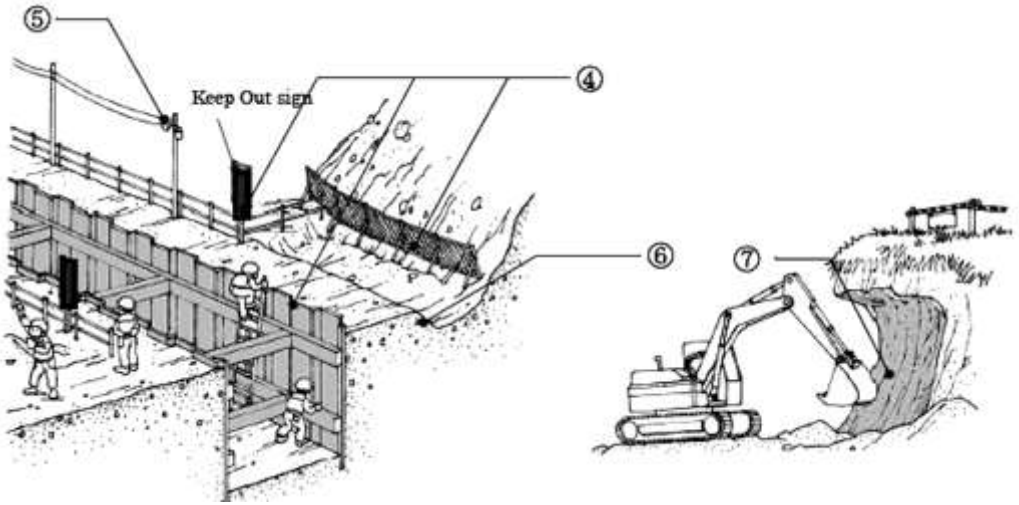
- **Check points**
- **(1) Are drawings for construction prepared before starting?**
- **(2) Is a chief supervisor appointed for supporting works?**
- **(3) Are actions taken to prohibit people from entering working area without permission?**
- **(4) Deformation and damage of Materials shall be checked before its use.**
- **(5) Are stairs set up?**
- **(6) Is the periphery of openings Surrounded by handrails?**
- **(7) Deformation of retaining shall be always monitored.**
- **(8) No weight shall be on struts**
- **(9) The type of joint for struts shall be butt joint**
- **(10) Strut and waling shall be fixed to lagging tightly**



3.3 Excavation of natural ground

The following points are required to check before excavation of natural ground. Excavation for tunnel and quarry are not subject of this item.

- **Check points**
- **(1) Following points must be surveyed before excavation.**
- **• Condition of geological and geological formation**
- **• Existence of cracks, water leakage,**
- **high temperature gas/steam in soil**
- **• Existence of buried objects and its**
- **condition**
- **(2) Is a chief supervisor appointed for**
- **excavation more than 2m deep?**
- **(3) Existence and condition of loose**
- **rocks, cracks and leakage must be**
- **checked before Starting excavation and/or after an earthquake with a seismic intensity of moderate**
- **(4) Collapse potential area must be protected by supports and/or protection nets. "Keep Out" sign must be set up.**
- **(5) Lightings must be set up for night works.**
- **(6) A safety slope must be kept.**
- **(7) Overhang excavation is prohibited. (8) Are drainage facilities and surface drainage set up?**



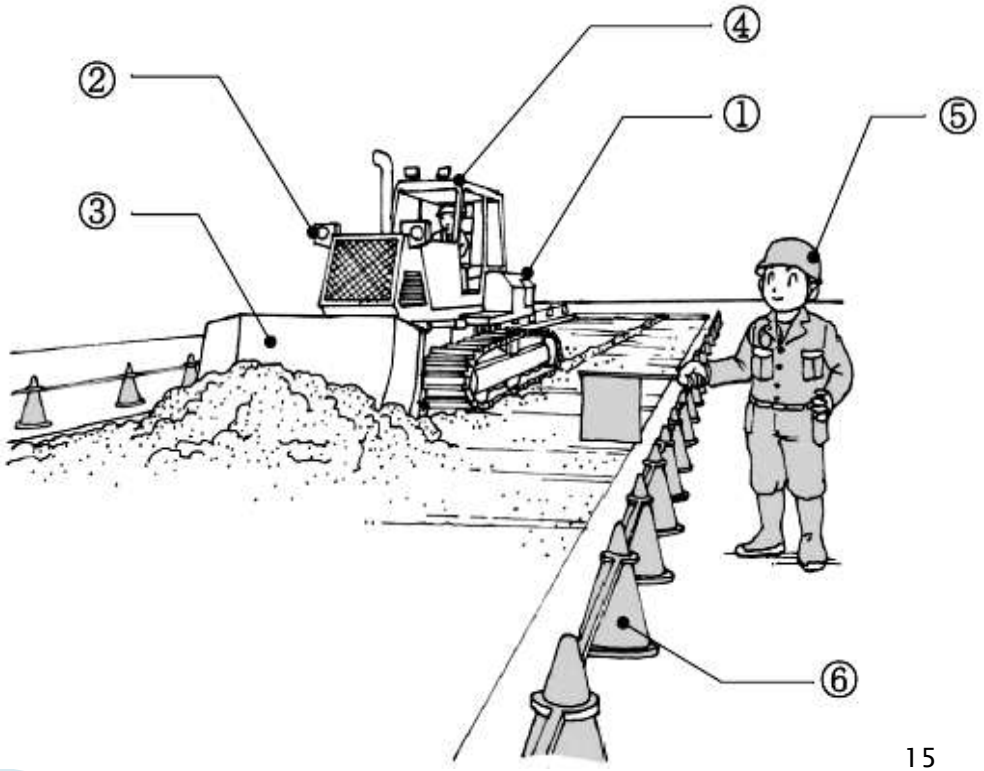
TRAINING OF SAFETY MANAGEMENT FOR QUATEST3 STAFF

22,APRIL, 2015

YAMAMOTO MIKIO ,JICA SV

Self-propelled machines such as bulldozer, motor grader, tractor shovel, wheel loader, backhoe and scraper are the subjects of this item.

- **Check points:**
- **(1) Worker shall not ride on machine except operator sheet**
- **(2) Headlights must be equipped with a machine**
- **(3) When the operator leaves a machine,**
- **he must lay down the blade, set**
- **the brake and remove the key.**
- **(4) Damage of canopy must be**
- **checked before starting operation.**
- **(5) An observer must be arranged**
- **at the place where risks of rolling/**
- **falling exist.**
- **(6) Working area must be marked**
- **clearly to prevent unauthorized**
- **people to enter**



Self – Propelled Machine

Bulldozer

Motor grader

Scraper

Tractor shovel

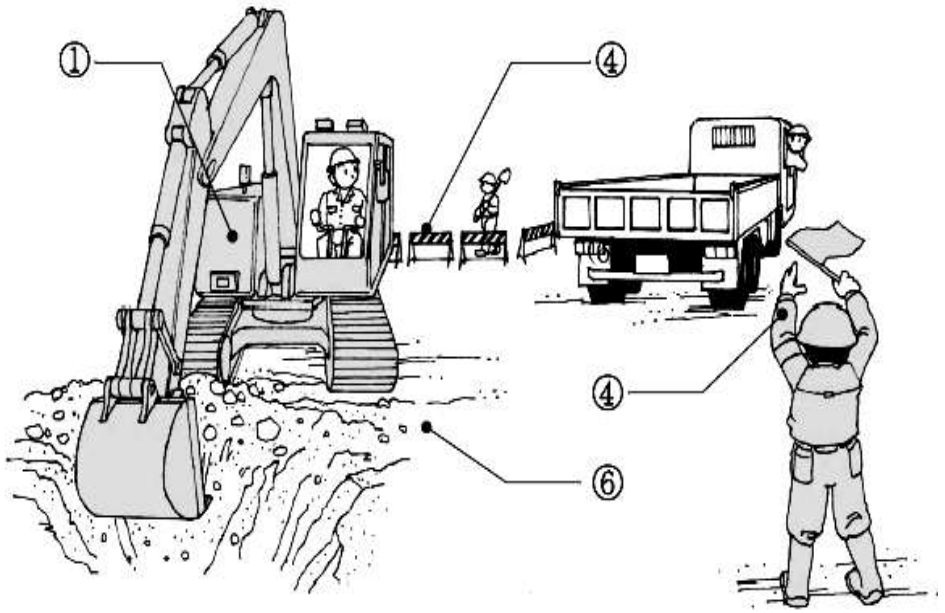
Wheel loader

backhoe

4.2 Excavation machine

Such as power shovel, drag shovel, dragline crane, cram shell, bucket excavator and trencher are the subjects of this item.

- **Check points**
- **(1) Worker shall not ride on machine except operator sheet**
- **(2) When the operator leaves a machine, he must lay down the blade, set the brake and remove the key.**
- **(3) Workers shall not stay in the swinging area of machine during operation.**
- **(4) An observer must be arranged at the right place. "Keep Out“ sign must be set up where necessary.**
- **(5) Machines must be used only for their rightful purpose. (Machines are sometimes used for lifting loads.)**
- **(6) The ground condition must be checked before starting excavation.**



Excavation Machine

Power Shovel

Drag shovel

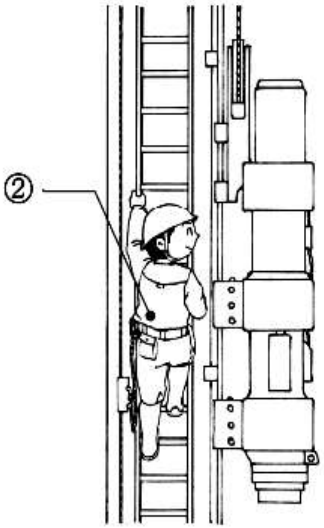
Dragline Crane

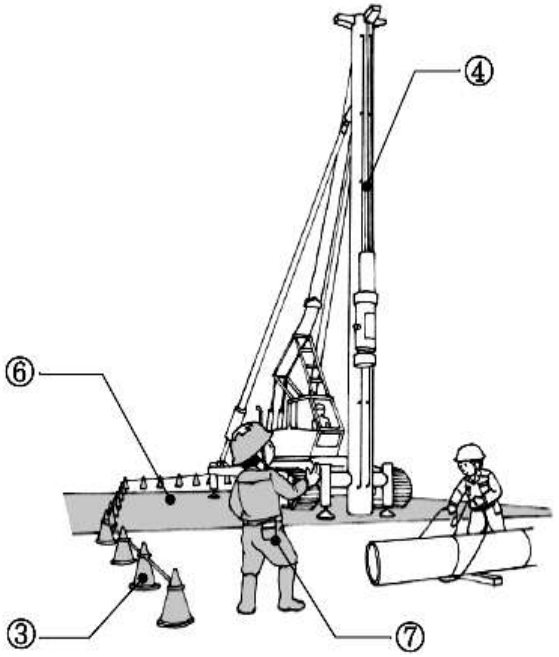
Trencher

4.3 Foundation Works Machines

Such as pile driver, pile extractor, earth drill, reverse circulation drill, earth auger, cast-in-place pile and all casing machine are the subjects of this item.

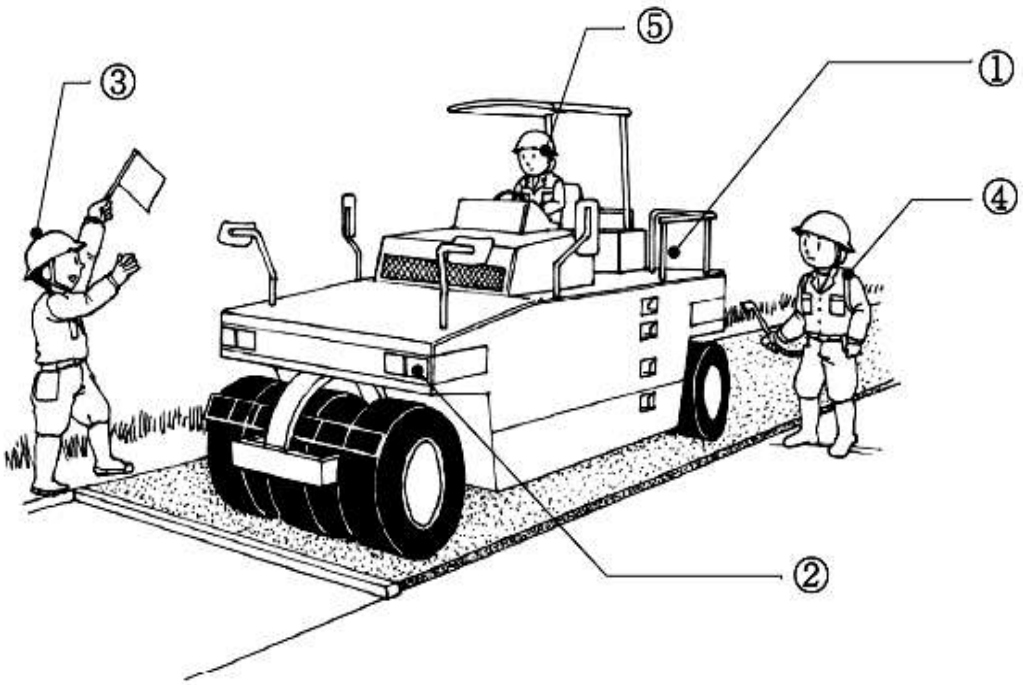
- **Check points:**
- **(1) Worker shall not ride on machine except operator sheet**
- **(2) When a person ascend and descend the lead, he must wear a safety belt which ties to the main safety line.**
- **(3) "Keep Out" sign must be set**
- **up at the right place.**
- **(4) The deformation and wear of**
- **wire rope must be checked.**
- **(5) A winding gear must be free of**
- **weight when the operator leaves**
- **a machine.**
- **(6) A machine must be placed**
- **at level on the stable ground. (7) A person nominated as a signal man can send pre-determined signals to the operator.**





4.4 Compaction machine

Rollers are usually used as compacting equipment for roads and grounds.

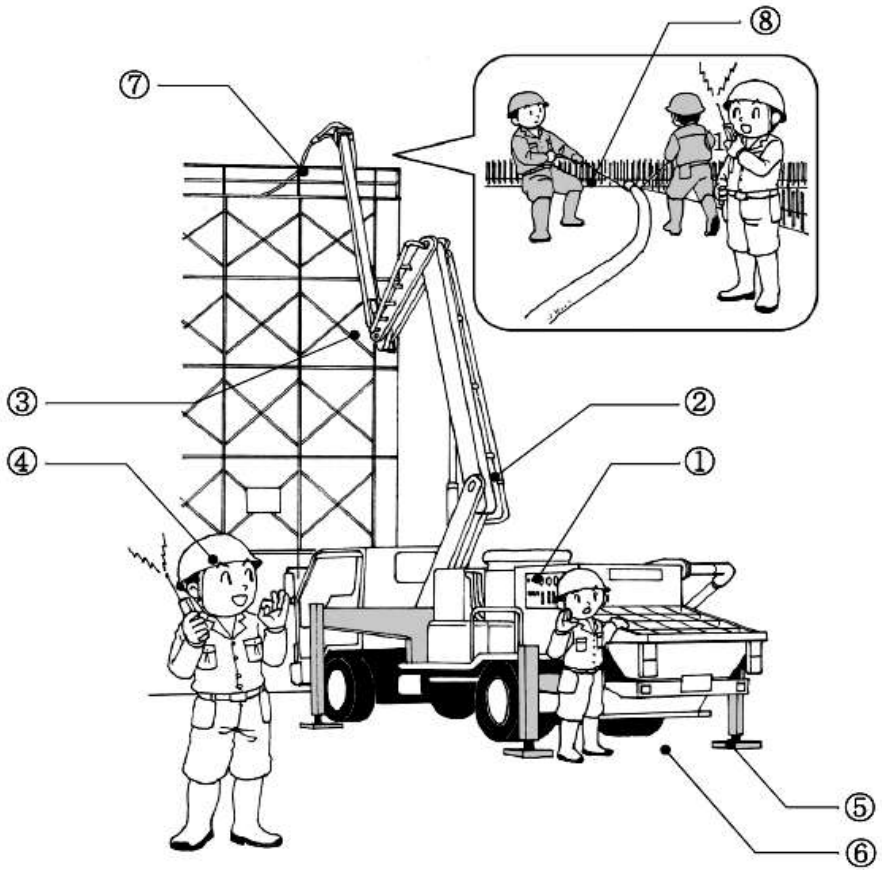


- **Check points:**
- **(1) Worker shall not ride**
- **on machine except**
- **operator sheet**
- **(2) Headlights and alarm**
- **must be equipped with**
- **machine in good conditic**
- **(3) A flagman must be**
- **arranged at the place where risks of rolling/falling exist.**
- **(4) No worker can stand at the blind spot.**
- **(5) When the operator leaves a machine, he must stop the engine, put on the break and remove the key.**

4.5 Concreting machine

Precaution to use a concrete pump is highlighted in this clause.

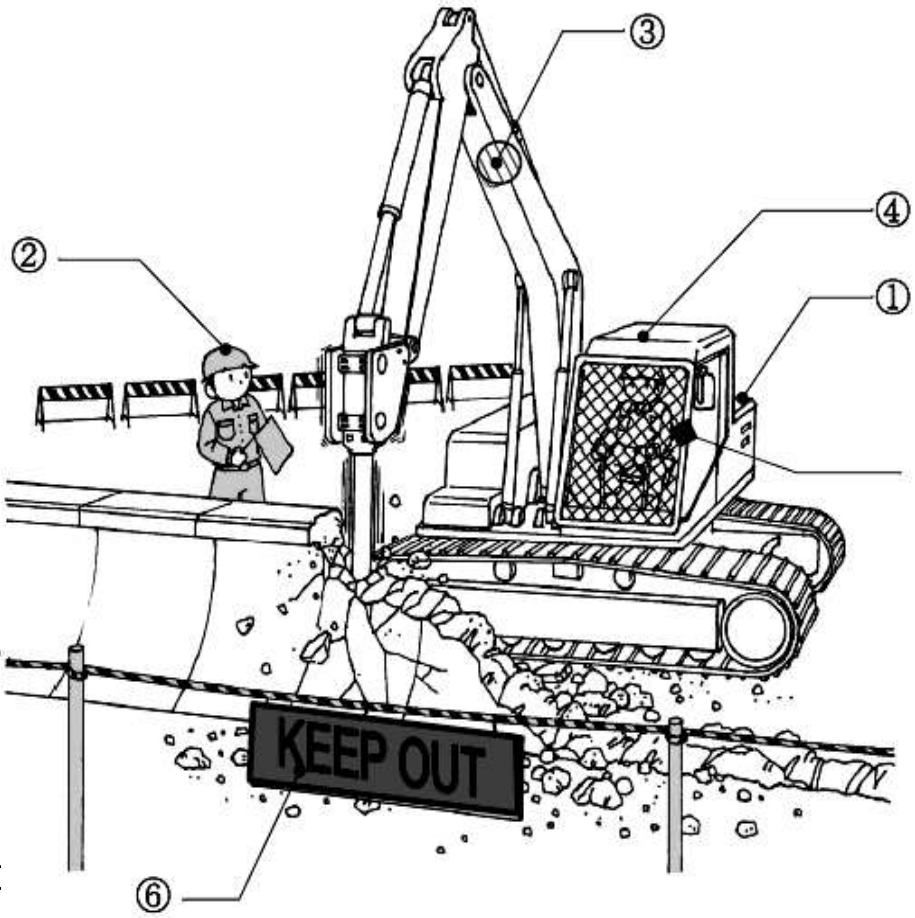
- **Check points:**
- **(1) Worker shall not ride on machine except operator sheet**
- **(2) Concrete hoses must be fastened tightly and anti-swing device for concrete hoses should be arranged.**
- **(3) No person is allowed to work under the boom during concreting.**
- **(4) Workers at nozzle and a concrete pump operator must determine common signals between them for operation.**
- **(5) Outriggers must be extended to the maximum length position.**
- **(6) A concrete pump car must be placed at level on the stable ground.**
- **(7) Concrete boom can be used only for concreting. Don't use it for lifting loads.**
- **(8) No worker can stay at the outlet point of concrete hose.**



4.6 Breaking machines

Precaution to use a breaker is highlighted in this clause.

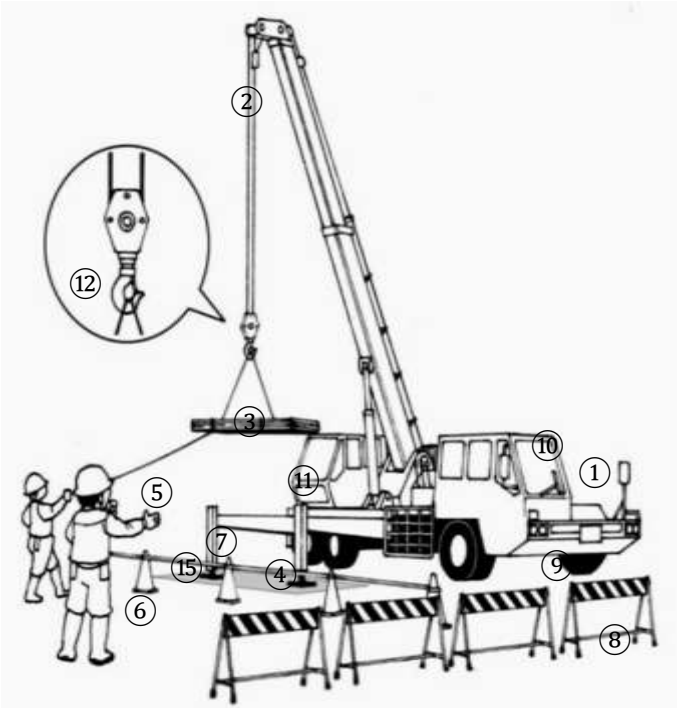
- **Check points**
- **(1) Worker shall not ride on machine**
- **except operator sheet**
- **(2) A flagman must be arranged at the**
- **place where risks of rolling/falling**
- **exist.**
- **(3) Headlights must be equipped with**
- **a machine**
- **(4) When the operator leaves a machin**
- **, He must lay down the blade, set the**
- **brake and remove the key.**
- **(5) The tempered glass must be used at**
- **the front glass of operator sheet or wire /steel Mesh protection must be installed.**
- **(6) "Keep Out" sign must be set up where necessary**
- **(7) Works must be stopped in the inclement weather.**



4.7 Mobile crane

Precautions to use a mobile crane and/or other type of cranes are highlighted in this clause.

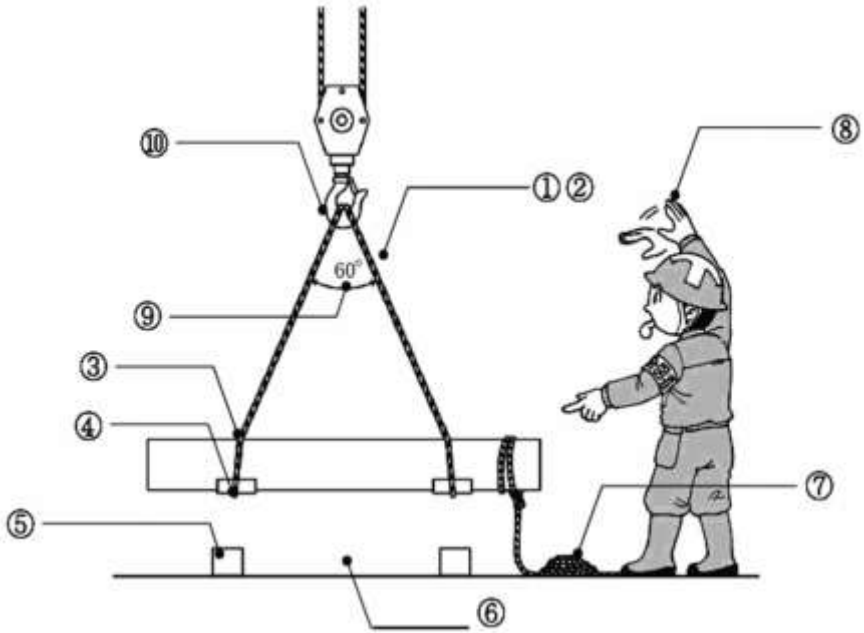
- **Check points (1) Worker shall not ride on machine except operator sheet**
- **(2) An over-winding prevention device is working correctly or not.**
- **(3) The weight of loads must be less than the safe working load**
- **(4) No person can stand under the loads**
- **(5) A lead rope must be used to handle the long load.**
- **(6) A signalman must be arranged for the crane works.**
- **(7) Outriggers must be extended to the maximum length position.**
- **(8) "Keep Out" sign must be set up where necessary**
- **(9) A mobile crane must be placed at level on the stable ground.**
- **(10) An overloading prevention device is working correctly or not.**
- **(11) A safe working load must be exhibited at the crane.**
- **(12) Is the latch of hook working well**
- **(13) Crane works must be stopped when the wind speed from 5 grade**
- **(14) While hanging the load, the operator cannot leave a machine.**
- **(15) Steel plates must be laid down under the outriggers at the soft ground.**



4.8 Slinging works

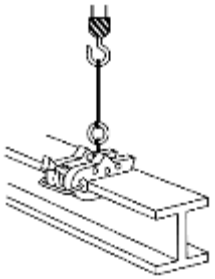
Precaution for slinging works is highlighted in this clause. The most suitable slinging tools must be chose based on the weight and shape of load.

- **Check points:**
- **(1) Check the damage of sling wire such as shapeless and cut**
- **(2) Unifilar wire is not recommended to hang loads. Prural wires should be used**
- **(3) When load off the ground, lifting must be stopped and keep the load stable. Cannot lift and move horizontally at the same time.**
- **(4) Sling wires must be protected by pads at the acute angle corner of loads.**
- **(5) Sleepers must be laid down under the loads**
- **(6) No person can stand under the loads**
- **(7) A lead rope must be used to handle the long load.**
- **(8) A signalman must be arranged for the crane works**
- **(9) An angle between two wires must be less than 60°**
- **(10) Check the damage of hook, shackle and other metal attachments**

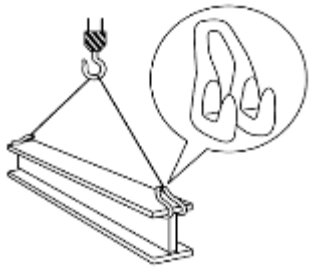


4.8 Slinging works – Detailed Check points

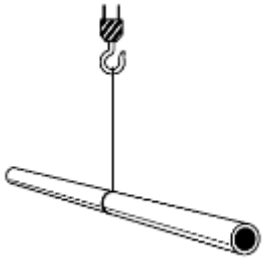
- **Lifting by hooker**



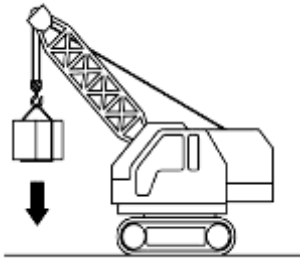
- **Lifting by one cramp**



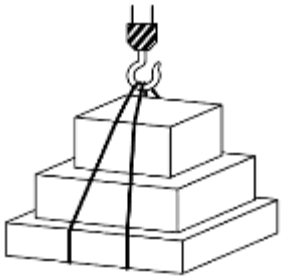
- **One point lifting**



- **Free fall**



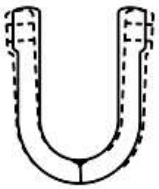
- **Lifting un-combined loads**



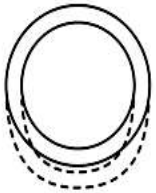
Using unsuitable hook,hackle and other metal attachments

Bended hook

Oval shaped ring



Deformed shackle



- **Using unsuitable wire**
- **Wire with strands are damaged**
- **more t han 10% in one ply**

Wire which strands are damaged at bending portion

Wire kinked

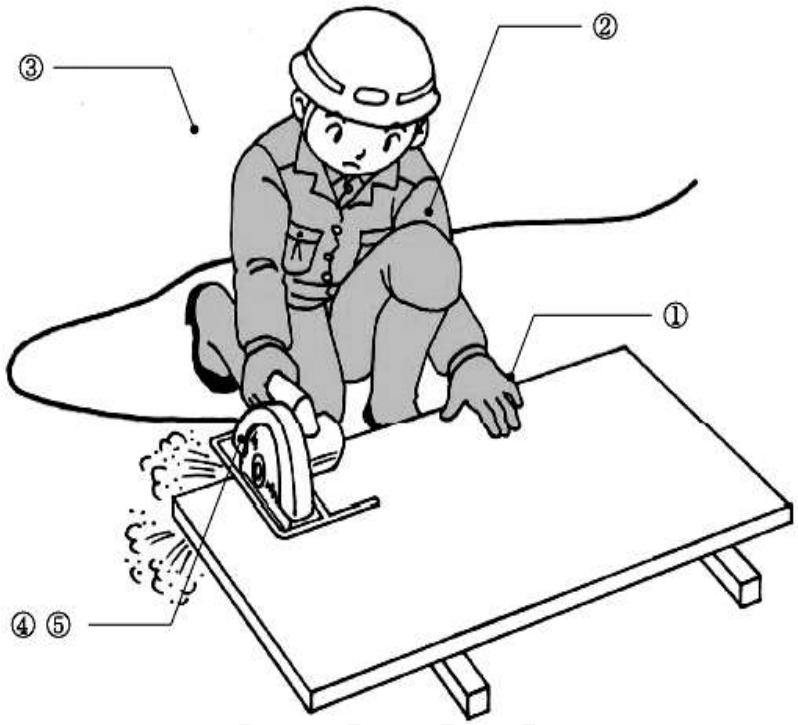
Wire which diameter decrease more than 7% of official diameter

Wire which has considerable deformation/ corrosion

4.9 Electric circular saw (Hand tool type)

Be careful not to be caught your clothes and gloves in a saw when you use an electric circular saw.

- **Check points**
- **(1) Do not wear gloves which are easily caught in saw.**
- **(2) Do not put on clothes**
- **which are easily caught in saw.**
- **(3) Adequate working area**
- **should be secured.**
- **(4) A Protection cover for the**
- **teeth of a saw should be well**
- **functioned.**
- **(5) An "O" connection cord**
- **with cover of machine, stop**
- **device and fastening teeth of a saw must be checked before starting an electric circular saw**



4.10 Grinder

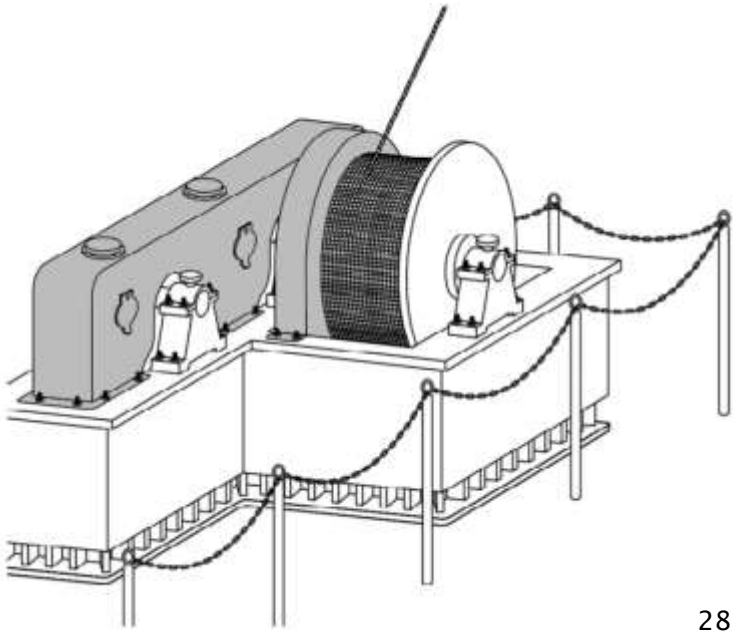
A grinder must be checked before its operation whether it is in good condition or not. Also an operator must pay attention to protect him from the litter.

- **Check points:**
- **(1) The speed of grinder blade must not exceed the maximum allowable circumferential velocity.**
- **(2) An operator must wear a dust mask and dustproof goggles.**
- **(3) A protective cover must**
- **be equipped with a grinder**
- **blade.**
- **(4) A trial operation of grinder**
- **is recommended.**
- **(5) The side face of blade shall**
- **not be used.**
- **(6) A certified person of grinder can replace a new blade and trial operation of grinder.**

4.11 Winch

A winch must be checked before its operation whether it is in good condition or not. Also an operator must pay attention to protect him not to be caught in a winch.

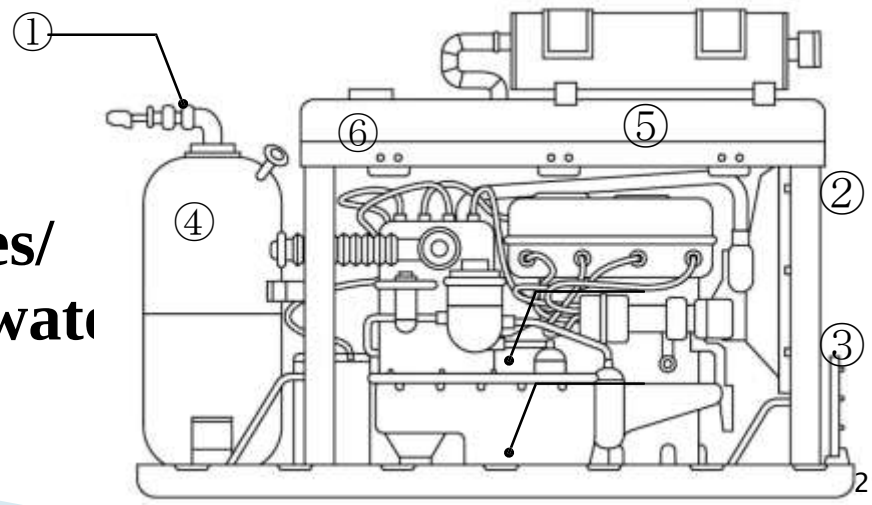
- **Check points**
- **(1) A protective cover must be equipped with a motor and pivot.**
- **(2) A wire rope must be checked before operation and if kink and wear are found don't start a winch.**
- **(3) The condition of an over-winding prevention device, a power cutoff device and other safety devices must be checked before its operation.**
- **(4) Fences must be built around a winch and a "Keep Out" sign must be installed.**
- **(5) A signalman must be designated and only he can send a starting signal of winch**
- **(6) An operator must set the brake and turn off the engine before leaving the operator's seat.**
- **(7) An operator must put on suitable clothes which are not caught in winch easily.**



4.12 Compressor (Engine and motor type)

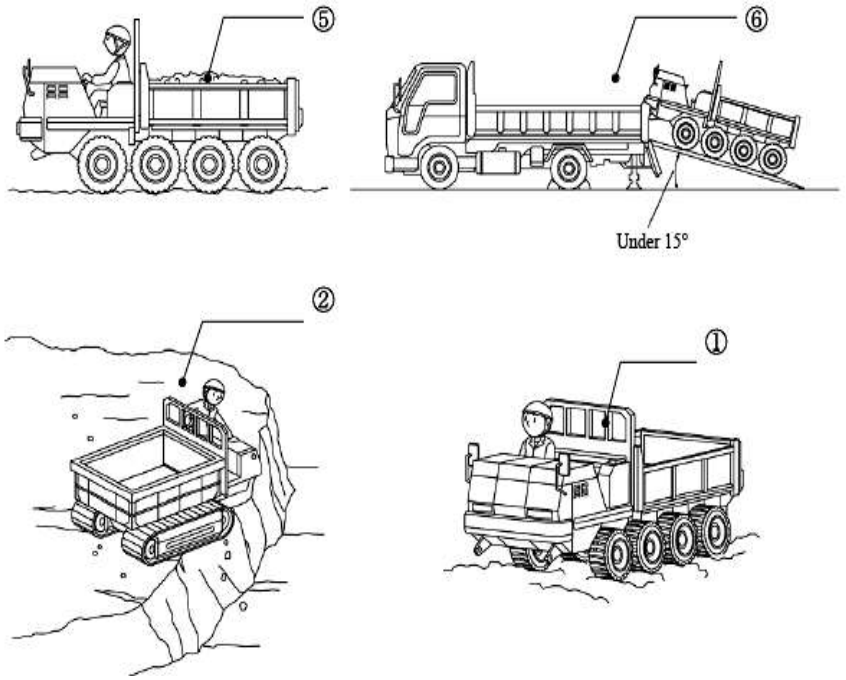
A compressor is sometimes used for the impact wrench and underwater works.

- **Check points:**
- **(1) A valve of compressor is working properly or not.**
- **(2) An air inlet should be located as high as possible.**
- **(3) Toxic gases such as exhaust gas shall be disposed properly.**
- **(4) The temperature of shaft bearing shall be normal.**
- **(5) The temperature of cooling water for motor and the amplitude range of ammeter indicator shall be checked**
- **(6) All facilities including a**
- **Compressor must be checked**
- **before underwater works.**
- **(7) A special induction of valves/**
- **cocks operation for the underwat**
- **works is necessary.**



Attention shall be paid to the speed limit and maximum load of vehicles when vehicles are used for hauling and loading.

- **Check points:**
- **(1) Proper speed limit must be determined based on the shape of ground and ground condition.**
- **(2) The driving route will be secured from subsidence of the ground and collapse of shoulder.**
- **(3) Ingress to approach places where hauling machines have risks to contact machines and materials are prohibited.**
- **(4) Signals must be determined between operators and flagman.**
- **(5) Loads must be placed equally and well balanced on the trucks. Ropes and sheets will be used to prevent loads from collapsing.**
- **(6) A vehicle must be loaded/unloaded at the flat ground. A board/plate to be used for loading/unloading must equip enough length, width and strength. A board/plate must be used at the proper angle.**
- **(7) Worker shall not ride on machine except operator sheet.**



TRAINING OF SAFETY MANAGEMENT FOR QUATEST3 STAFF

6,MAY, 2015

YAMAMOTO MIKIO ,JICA SV

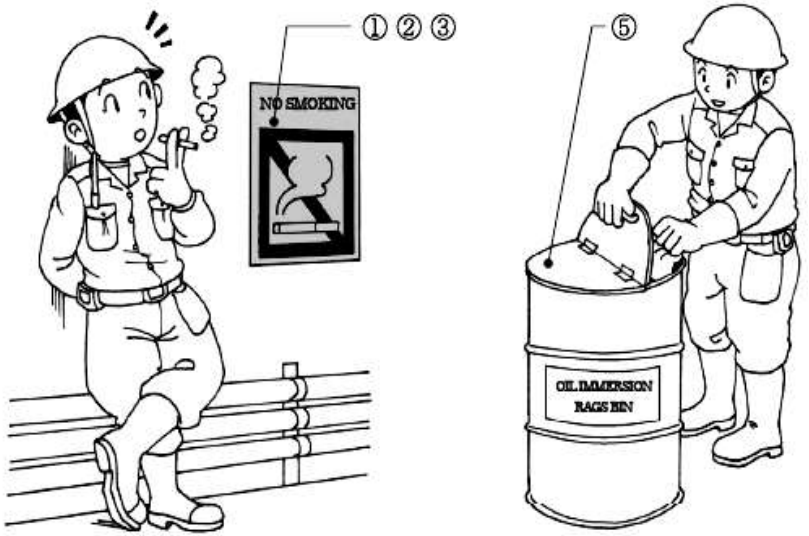
9. Danger by tunnel and underground works, 9.1 Rock falling, Ground collapse

It is necessary to support the stability of the tunnel portal area including tunnel entrance to prevent from rock falling and ground collapse. It is necessary to take "Keep out" measures from the portal area.

- **Check points:**
- **(1) Steel supports, Rockbolts and/or Shotcrete (sometimes all of them) must be used at the tunnel/portal of soft ground to prevent rocks/nature-ground from falling and collapsing.**
- **(2) Protective nets against rock falling must be installed at the tunnel entrance.**
- **(3) Only nominated workers can work for steel supports, rockbolts and shotcrete in the tunnel.**
- **(4) A ventilation system must be established in the tunnel to ventilate the exhaust gas and to keep the good visibility.**
- **(5) Illuminance in the tunnel must be more than 70 lux at level and more than 20 lux at the passage.**
- **(6) Driving paths for tunnel machines must be kept and well maintained in the tunnel.**
- **(7) Watch men for tunnel machines must be arranged for its operation. (usually a tunnel worker can work as a watch men when tunnel machine moves.**
- **(8) Workers in the tunnel must wear helmets**

9.2 Explosion, Fire

It is prohibited not to bring unnecessary fire starter or high inflammable materials in the tunnel and try to prevent tunnel from explosion and fire.



- **Check points**
- **(1) Flammables, matches and lighters are**
- **prohibited to bring in the tunnel**
- **(2) Signs of "No carrying flammables“ must**
- **be shown at the entrance of tunnel or**
- **prominent places.**
- **(3) Prevention measures for explosion**
- **caused by inflammable gases and prevention**
- **measures for fire must be decided by the contractor. Such measures must**
- **be known by workers as common knowledge of workers.**
- **(4) If there is a possibility inflammable gas to be blown during tunnel excavation, degasification is necessary before excavation.**
- **(5) Inflammable materials such as rags, chips of wood and papers must be removed from the tunnel as much as possible or will be covered by nonflammable sheets (6) Extinguishers must be prepared at the place of arc welding and gas cutting/welding places. The location of extinguishers must be noticed to the all workers.**

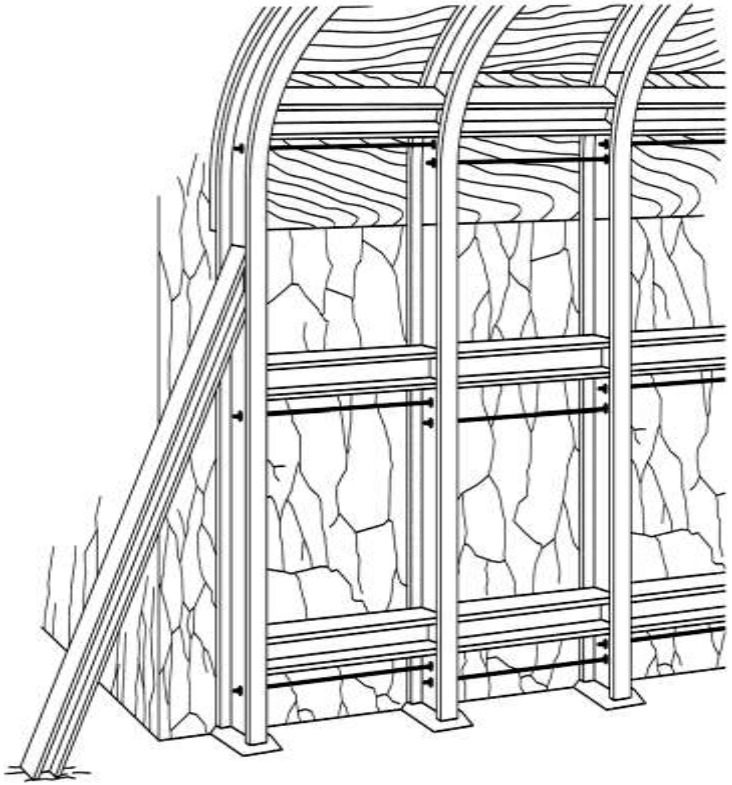
9.3 Evacuation

Installation of alarm devices, the method/route of evacuation and reservation of evacuation goods must be known by workers as common knowledge of workers.

- **Check points:**
- **1) If there are probabilities of rock falling and flushing**
- **underground water, stop all activities immediately and**
- **leave the area.**
- **(2) When the density of inflammable gas reaches 30%**
- **of the lowest limit of explosion, all workers must**
- **evacuate the site.**
- **(3) Warning devices such as siren and alarm must be**
- **installed In the tunnel if the distance between face to outside became more than 100meters. All people working in the tunnel must know the location of warning devices.**
- **(4) In addition to the warning devices, an intercommunication system must be installed in the tunnel if the distance between face to outside became more than 500meters.All people working in the tunnel must know the location of communication system.**
- **(5) Inflammable materials such as rags, chips of wood and papers must be removed from the tunnel as much as possible or will be covered by nonflammable sheets**
- **(6) Warning devices must be maintained well at the all-time.**
- **(7) The standby power for warning devices must be prepared.**
- **(8) Emergency evacuation goods must be prepared in the tunnel**

9.4 Steel Supports

Steel supports must be prepared based on the geological formations, the nature of soil/rock, the groundwater condition, cracks and so on. Appropriate erection and disassembly is necessary according to the condition of ground.



- **Check points:**
- **(1) Steel supports must be not deformed,**
- **not damaged, not corroded.**
- **(2) Steel supports must be designed based**
- **on the information of geological formations**
- **, the nature of soil/rock, the groundwater**
- **condition, cracks, loose stones and so on.**
- **(3) Steel supports must be installed in the**
- **tunnel based on the erection drawing**
- **(4) A set of steel support must be installed**
- **in the same plane.**
- **(5) The condition of steel supports such as the existence of damage,pressure from the ground and the condition of joints must be checked everyday**

9.5 Rescue

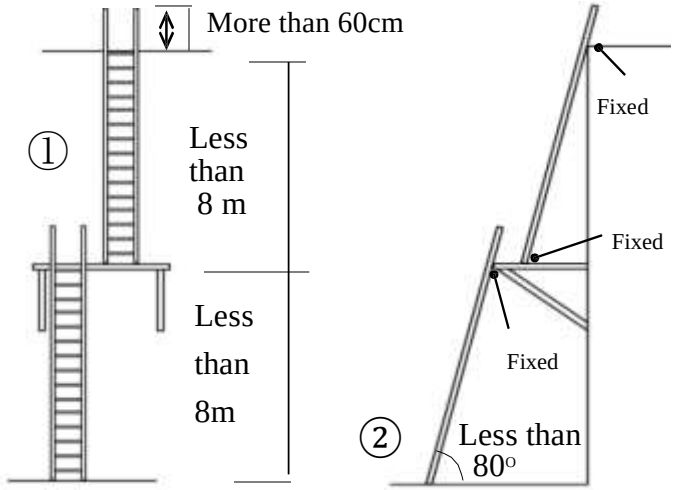
The following check points apply to ①the tunnel which length is more than 1,000 meters, ② the shaft which depth is more than 50 meters, ③ the pneumatic method area which pressure is more than 0.1Mpa.

- **Check points:**
- **(1) Oxygen masks must be equipped at site**
- **(2) Measuring instruments for methane, hydrogen sulfid**
- **monoxide and oxygen density must be equipped at site.**
- **(3) Portable lights must be equipped at site.**
- **(4) Ladders and rope must be equipped at site.**
- **(5) Drills how to use oxygen masks, measuring**
- **instruments, ladders and rope must be**
- **arranged at site.**

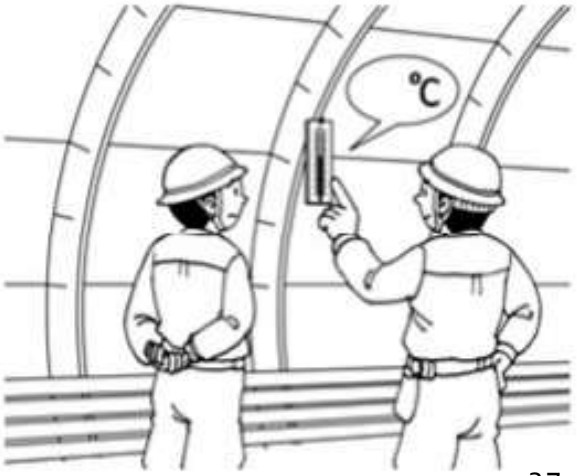
- **(6) Drills of resuscitation and first aid must be arranged at site.**
- **(7) Names of participants for drills, intervals of**
- **drills and contents of drills must be recorded at least for 3 years.**
- **(8) Names of workers and number of workers to work at above mentioned areas**
- **(①, ②, ③) must be grasped/confirmed by the supervisor at all times**
- **(9) A person in charge for resuscitation and first aid must be designated at site.**

9.6 Walkways in tunnels and working environment

Walkways in tunnels must be well ventilated and keeps working environment in good condition.



- **Check points**
- **(1) The length of Ladder must be less than 8 meters.**
- **If the gap of height is more than 8 meters, a landin**
- **shall be arranged on the way to upper place.**
- **(2) The angle of ladder must be less than 80.°**
- **(3) Machines operated on engine can't be used**
- **in tunnel where the ventilation is insufficient.**
- **(4) Measures such as water spray must be arranged in tunnel to prevent dust scattering.**
- **(5) A density of carbon dioxide gas (CO2) in tunnel must be less than 1.5%.**
- **(6) Places where a density of carbon dioxide gas (CO2) is ov**
- **oxygen (O2) is less than 18% are prohibited to enter.**
- **(7) A density of carbonic acid gas (CO2) in tunnel must be**
- **measured every month and be recorded for 3 years.**
- **(8) A ventilation system in tunnel must be checked at least**
- **twice a month and be recorded for 3 years.**
- **(9) The temperature in tunnel must be under 30 and be**
- **measured at least twice a month and be recorded for 3 years.**



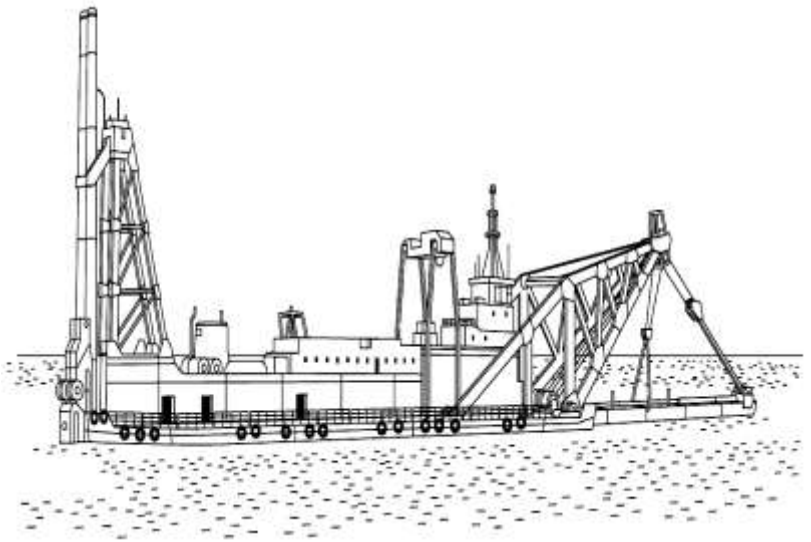
9.7 Quarrying

Quarry means a place where large amounts of stone, etc. are dug out of the ground. Quarrying means excavation/digging at quarries, crushing stones, transportation in quarry, processing stones/rocks and so on. Appropriate management for quarrying is necessary.

- **Check points:**
- **(1) The shape of ground, geological formations and the nature of soil/rock must be checked and be recorded.**
- **(2) A work plan must be prepared for quarrying**
- **(3) A person in charge for quarrying must**
- **be designated.**
- **(4) Blasting notice must be notified the**
- **relevant personnel around a quarry.**
- **(5) Work places at quarry must equip**
- **Sufficient lighting.**
- **(6) A slope of excavation must be kept within**
- **the limit slope.**
- **(7) Counter measures for collapse and cave-in accidents must be arranged.**
- **(8) All person authorized to enter the quarry must wear safety helmets.**
- **(9) A controller for construction machines/vehicles must be designated and he directs traffic of machines/vehicles.**

10. Danger by offshore operation, 10.1 Pump type dredger

Points to note for the pump type dredger are shown below.



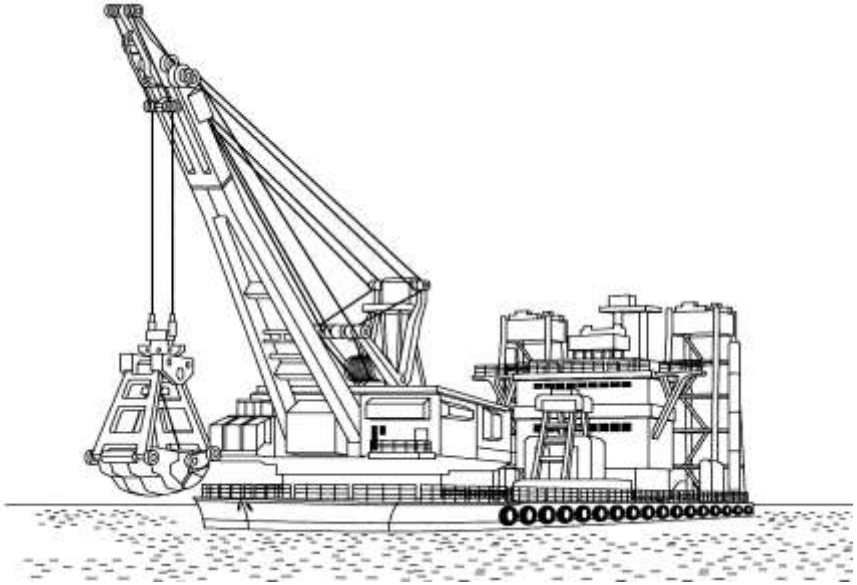
- **Check points:**
- **(1) Contents of work must be notified**
- **to all people concerned with the project.**
- **(2) A qualified person for dredging must**
- **be assigned.**
- **(3) A signalman must be assigned and**
- **common signals must be shared among**
- **workers.**
- **(4) Workers must wear appropriate**
- **clothing, safety protective equipment and life preservers for dredging works.**
- **(5) Safety walkways must be arranged.**
- **(6) Winches and wire ropes must be checked regularly.**
- **(7) Operators and workers cannot stand at the inside of wire's interior angle.**
- **(8) At least two workers are required to work together for night operation on deck.**
- **(9) Condition of mooring must be checked.**
- **(10) Necessary measures must be taken according to weather and ocean phenomena.**
- **(11) The condition of a brake and a stopper of each winch must be checked before starting operation.**

10.2 Grab dredger

Points to note for grab bucket dredger are shown below.

Check points: (1) Contents of work must be notified to all people concerned with the project.

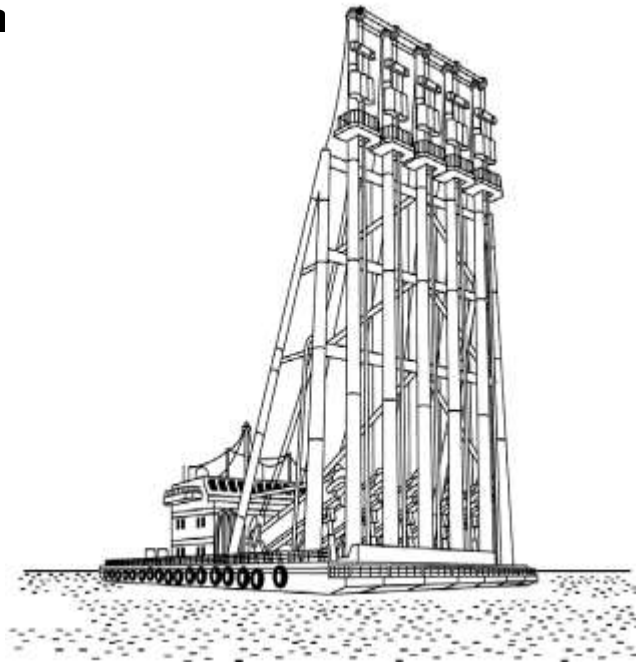
- **(2) A qualified person for dredging must be assigned.**
- **(3) A signalman must be assigned and common signals must be shared among workers.**
- **(4) Workers must wear appropriate clothing, safety protective equipment and life preservers for dredging works.**
- **(5) Safety walkways must be arranged.**
- **(6) Winches and wire ropes must be checked regularly.**
- **(7) Operators and workers cannot stand at the inside of wire's interior angle.**
- **(8) No worker can enter into the swing radius of dredging machine.**
- **(9) When the operator leaves a machine, he must lay down the grab hopper, set the brake and remove the key. (10) Excavated material must be loaded onto a barge equally. Overload is prohibited.**
- **(11) Condition of mooring must be checked.**
- **(12) Necessary measures must be taken according to weather and ocean phenomena.**
- **(13) The condition of a brake stopper of each winch must be checked before**



10.3 Ground improvement ship

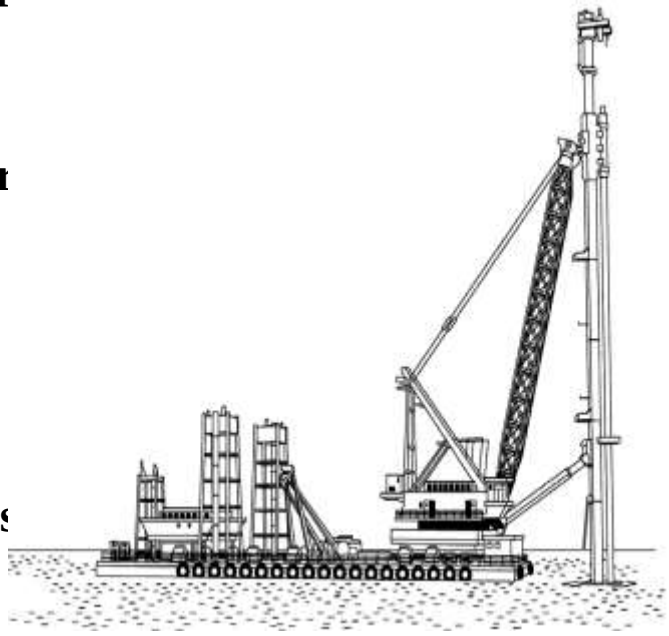
Points to note for the ground improvement ship are shown below.

- **Check points:**
- **(1) Contents of work must be notified to all people concerned with the project.**
- **(2) A qualified person for ground improvement must be a**
- **(3) A signalman must be assigned and common**
- **signals must be shared among workers.**
- **(4) Workers must wear appropriate clothing,**
- **safety protective equipment and life preservers on ship.**
- **(5) Safety walkways must be arranged.**
- **(6) Winches and wire ropes must be checked regularly.**
- **(7) Operators and workers cannot stand**
- **at the inside of wire's interior angle.**
- **(8) Safety belts must be used for works in high places.**
- **(9) Hoppers must be cleaned and inspected according to procedures.**
- **(10) Condition of mooring (main ship and work boat) must be checked.**
- **(11) Necessary measures must be taken according to weather and ocean phenomena.**
- **(12) The condition of a brake and a stopper of each winch must be checked before**
- **starting operation.**



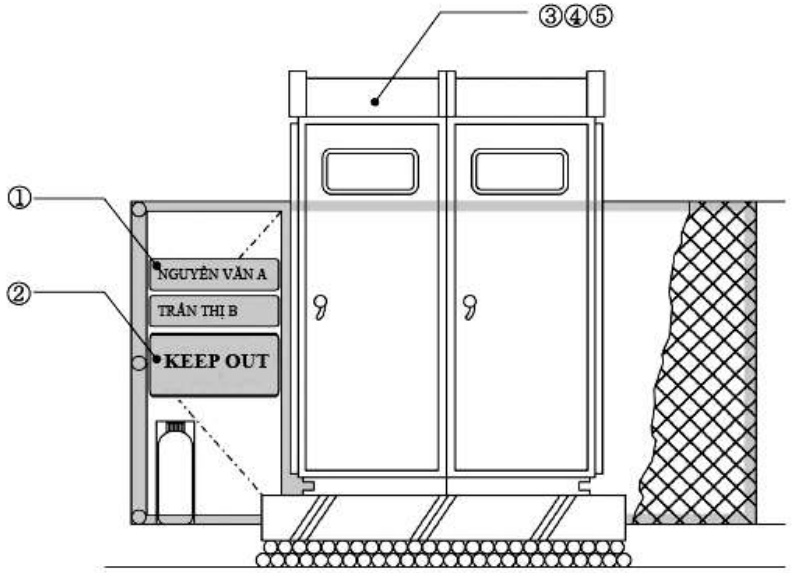
10.4 Pilling ship

- **Points to note for the piling ship are shown below.**
- **Check points**
- **(1) Contents of work must be notified to all people concerned with the project.**
- **(2) A qualified person for piling works must be assigned.**
- **(3) A signalman must be assigned and common signals must be shared among workers.**
- **(4) Workers must wear appropriate clothing, safety protective equipment and life preservers on ship.**
- **(5) Safety walkways must be arranged.**
- **(6) Winches and wire ropes must be checked regular**
- **(7) Appropriate anti rolling measures of piles**
- **must be arranged.**
- **(8) Operators and workers cannot stand at the**
- **inside of wire's interior angle.**
- **(9) Safety belts must be used for works in high places**
- **(10) Nobody can work under suspended loads.**
- **(11) Condition of mooring must be checked.**
- **(12) Necessary measures must be taken according to weather and ocean phenomena.**
- **(13) The condition of a brake and a stopper of each winch must be checked before starting operation.**



5. Danger by electricity, 5.1 Electric substation facilities

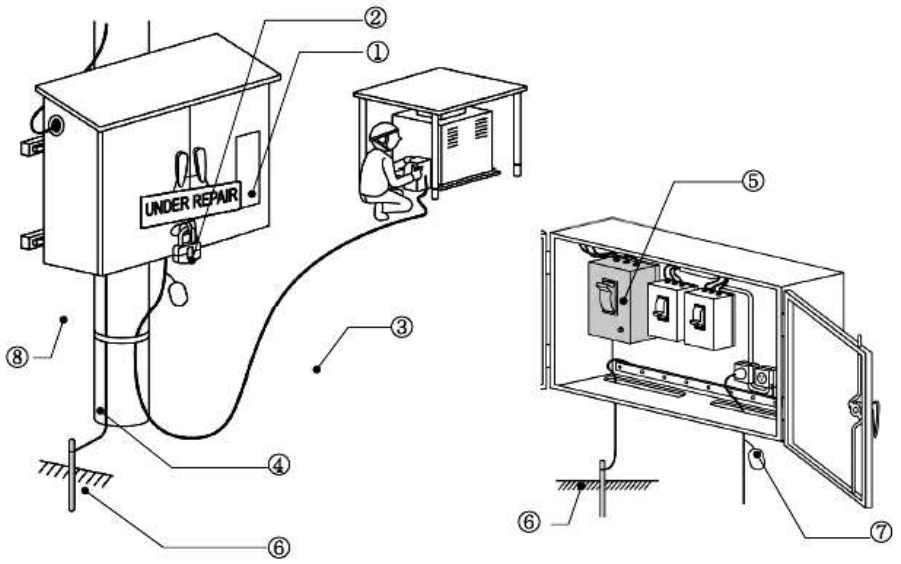
- **Electric substation shall be fenced and prevent ordinary people to enter into inside.**
- **Check points:**
- **(1) The name of person in charge must**
- **be notice onto a (bulletin) board.**
- **(2) No entry fence shall be installed**
- **around facilities and put up a "Keep**
- **Out" sign.**
- **(1) Electric substation facilities should**
- **be inspected regularly, at least**
- **once a month.**



- **(2) Electric substation facilities installed at outdoors shall be**
- **waterproof type.**
- **(3) The substation must equip the necessary luminous intensity for the**
- **operation and inspection.**
- **(1) Regular inspections that are specified in the law (such as weekly and**
- **annual inspections) must be carried out.**

5.2 Distribution board, earth leakage breaker

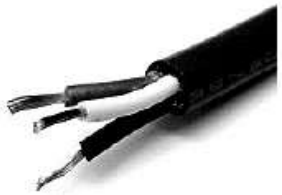
- **Distribution boards and earth leakage breakers must be managed by a person in charge for electric works.**
- **Check points:**
- **(1) A person in charge for distribution board must be appointed.**
- **(2) A tag of "Under Repair" must be hanged at the distribution board And be locked while repairing facilities.**
- **(3) No obstacle shall be placed near the distribution board.**

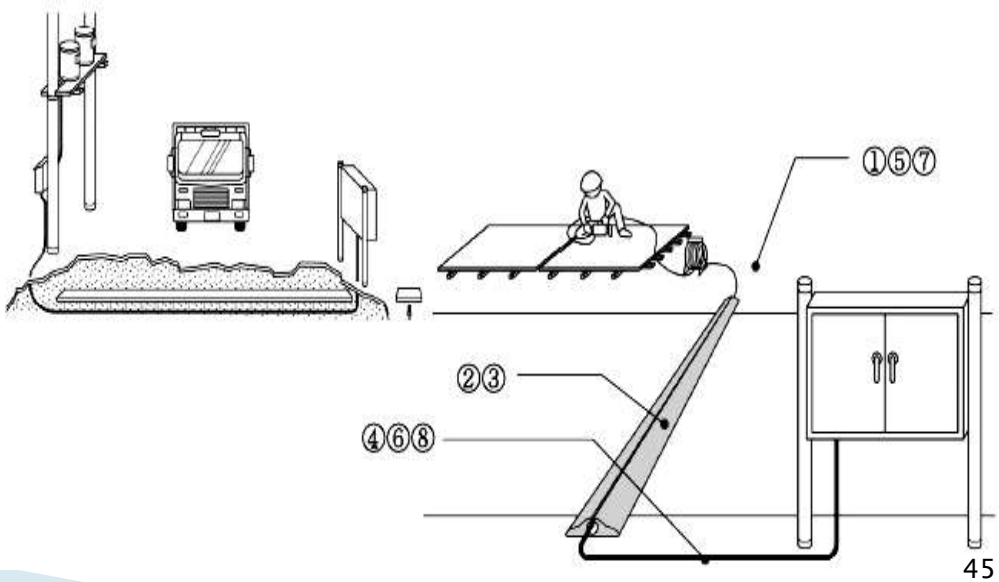


- **(4) Electric cables shall be wired through the holes at the bottom of distribution board.**
- **(5) An earth leakage breaker must work properly.**
- **(6) A ground wire shall be connected to the right place properly.**
- **(7) An electric circuit should be displayed.**
- **(8) The installation height of electric distribution board shall be more than 1.5m at site and more than 2.5m at public road from ground level.**
- **(9) Regular inspections that are specified in the law (such as inspection before in use, inspection of fences at least once a month, etc.) must be carried out.**

5.3 Temporary electric cables

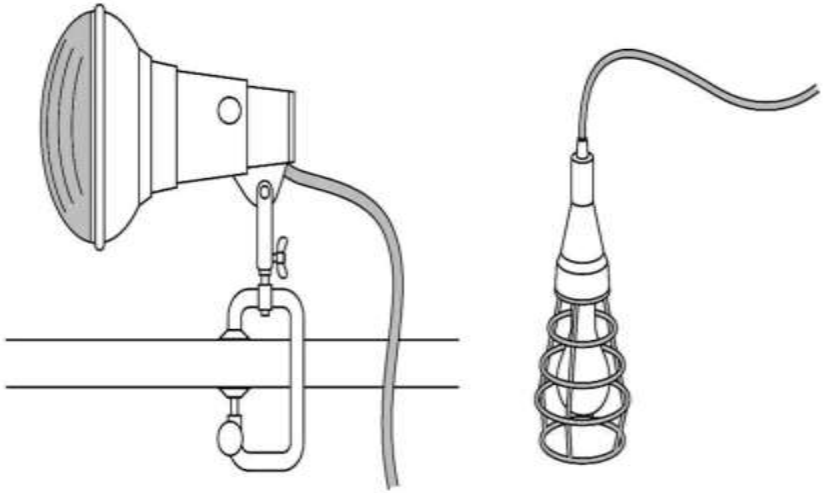
- **Electric movable cables on the roads/passages shall be protected from vehicles and passengers. These cables shall be managed well to avoid damages.**
- **Check points**
- **(1) Electric cables should not touch with high temperature articles.**
- **(2) A cable on the road/passage shall be protected properly.**
- **(3) Covering materials of cable should not be damaged.**
- **(4) Cabtyre (Cabtire) cable shall be used as**
- **movable cables on the roads/passages.**
- **(5) No load shall be placed on the cable**
- **at the floor.**
- **(6) Waterproof type cables and**
- **connecters**
- **shall be used at the wet place.**
- **(7) The edge of live wire shall not**
- **leave without any protection.**
- **(8) Cables and wiring shall be**
- **checked before in[illegible]**





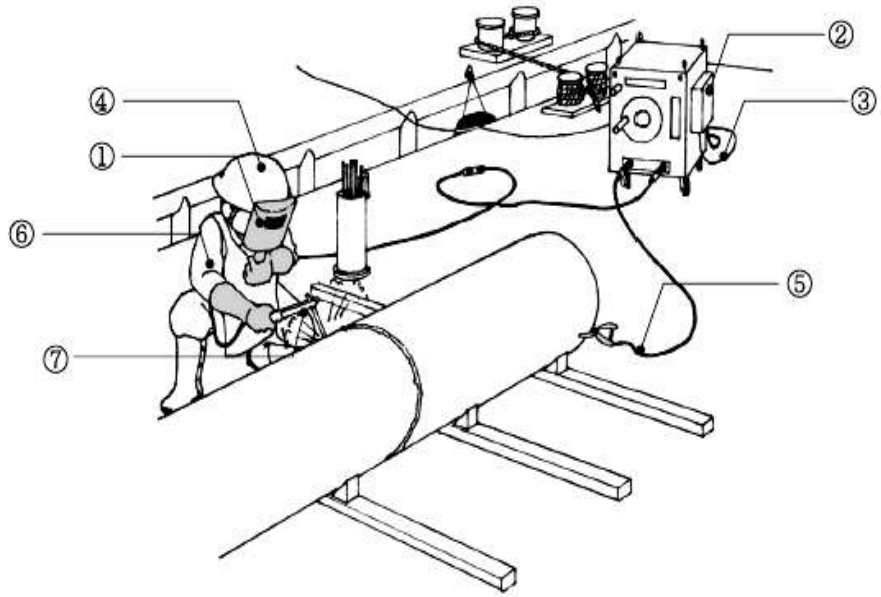
5.4 Lighting

- **Damage of bulbs, sockets and wiring must be checked carefully when the lighting is used.**
- **Check points**
- **(1) Damage of bulbs and**
- **socket**
- **(2) Damage of wiring**
- **(3) Is there any heated**
- **connecting**
- **portion at the electric circuit?**
- **(4) Portable and/or hanged lights must equip bulb-guards**
- **(5) Damaged cabtyre cable shall not be used.**



5.5 Welding

- It is necessary to check the welding cable (such as the existing of leakage, damage of insulating coating, an electric shock) before using welding machine.
- Check points:
- (1) A welder must wear welding mask, gloves and mask.
- (2) The condition of voltage reduction device must be checked before in use.
- (3) Connect the ground wire of the welding machine to the terminal.
- (4) Only persons who completed a special seminar/induction of welding including practical skills test can be engaged in welding works.



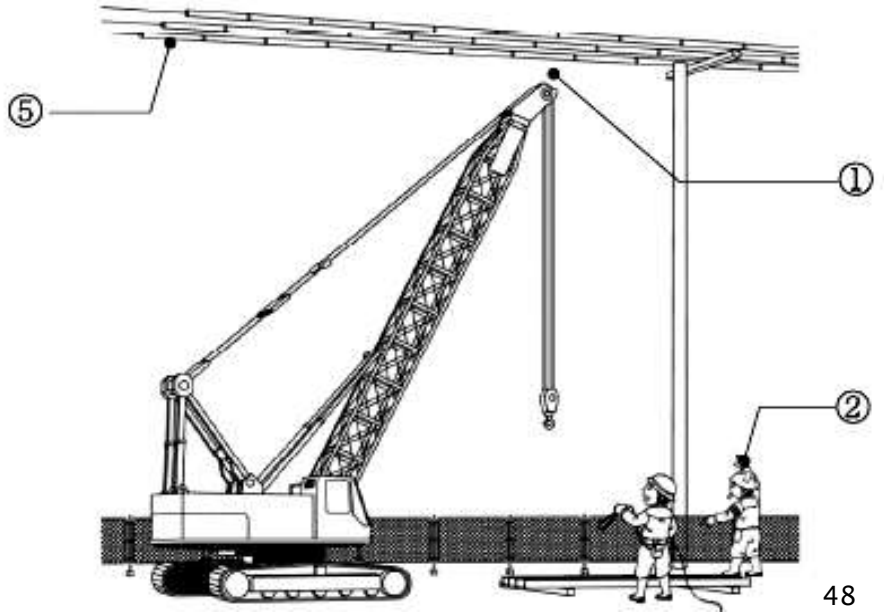
- (5) Damage of insulating coating of welding cable.
- (6) No welding is allowed at the wet place nor by wet body.
- (7) A welding holder for welding rod must meet the standard requirements
- (8) A regular periodical inspection for welding machine is necessary according to the law.

5.6 Operations on near a live cable

- **When electric works will be executed near live cables, necessary measures should be taken to protect an electric shock accident.**
- **Check points**
- **(1) * Keep enough distance from the live cables.**
- **(2) A full-time work supervisor must be arranged.**
- **(3) Workers for inspection and repair of the low voltage circuit, they must use insulation protective gears.**
- **(4) When a mobile crane and a piling machine are used near overhead cables, a staff of an electric power company should attend at site.**
- **(5) Measures for operation on live cables/ High voltage cables: must be protected by protective pipes .**
- **Special high voltage cables: must be relocated or arrange a supervisor who will watch the special high voltage electric works.**

Line voltage (kV)	Minimum allowed distance (m)
Less than 15	0,7
From 15 to 35	1,0
From 35 to 110	1,5
From 110 to 220	2,5
From 220 to 500	4,5

* Safety distance (follow voltage grade) from the live cables



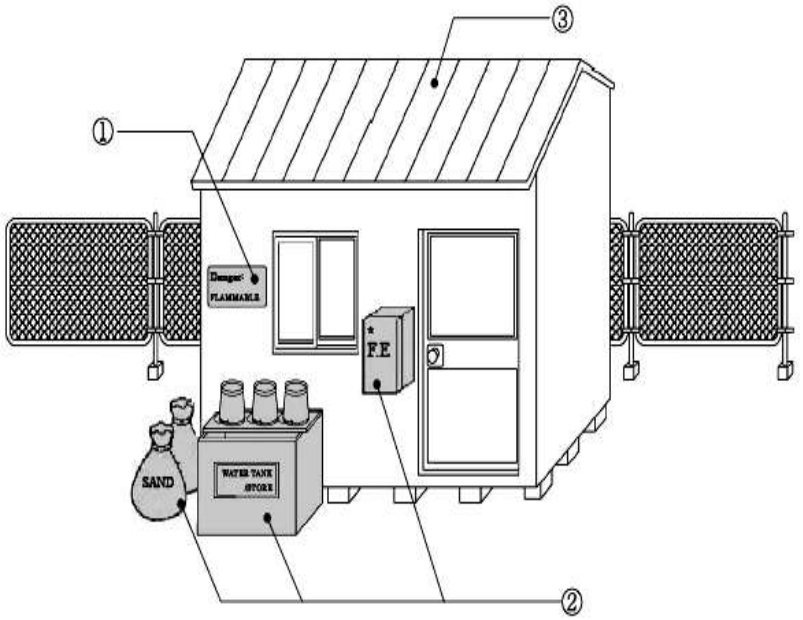
TRAINING OF SAFETY MANAGEMENT FOR QUATEST3 STAFF

13,MAY, 2015

YAMAMOTO MIKIO ,JICA SV

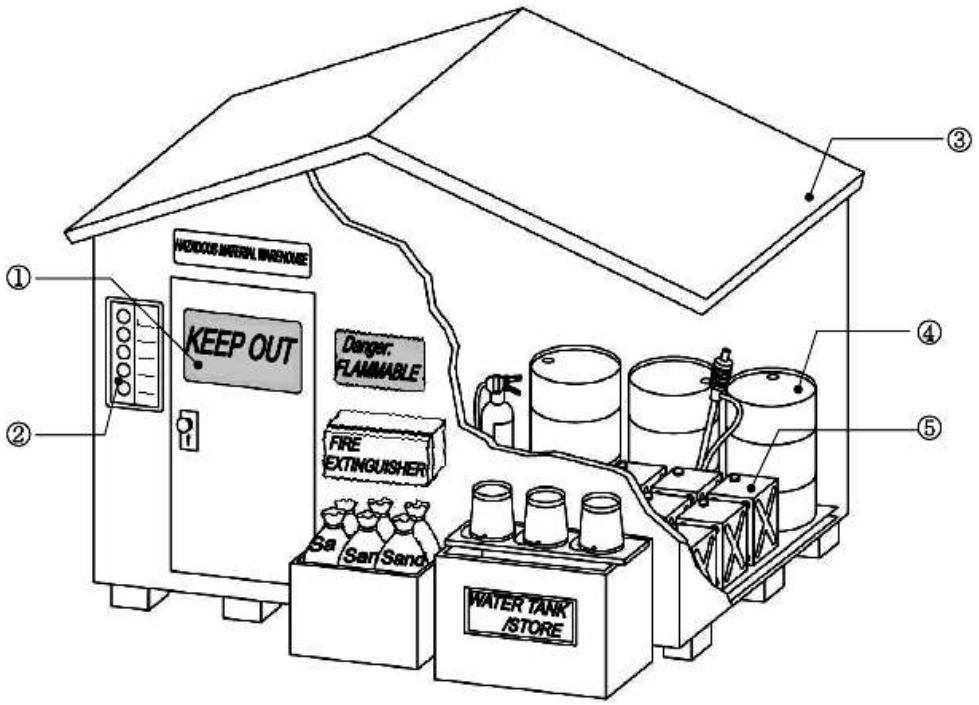
8. Danger by fire and explosion, 8.1 Fire extinguishing

- **Fire extinguishing equipment must be arranged at site base on the size of buildings, places to be used and objects to be extinguished.**
- **Check points:**
- **(1) Signs to prohibit the usage**
- **of fire must be installed.**
- **(2) Adequate equipment for**
- **fire extinguishing must be**
- **installed.**
- **(3) Fire extinguishing**
- **equipment**
- **must be arranged at site base on the size of buildings, places to be used and objects to be extinguished.**



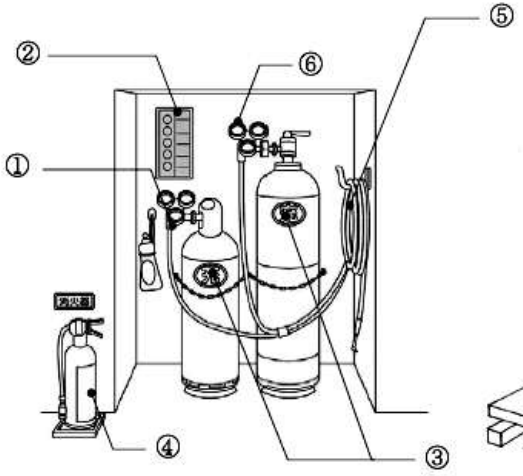
8.2 Handing hazardous material

- **Appropriate management is necessary for fuel storing and for hazardous materials store. Special arrangement is required to handle such material.**
- **Check points:**
- **(1) Signs such as "Keep out" and "Danger: Flammable" must be installed.**
- **(2) A name of person in charge must be noticed at the site where fuel and hazardous materials are handled.**
- **(3) Ventilation is necessary at the an**
- **storage house to prevent fire**
- **explosion which may be caused by**
- **a combustible.**
- **(4) Special attention is necessary**
- **when inflammability and**
- **combustible liquid is poured into**
- **drums.**
- **(5) Drums used for gasoline must**
- **be cleaned before pouring kerosene or diesel oil.**



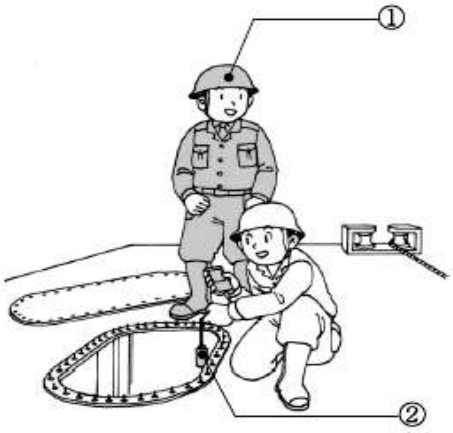
8.3 Gas welding, Gas cutting

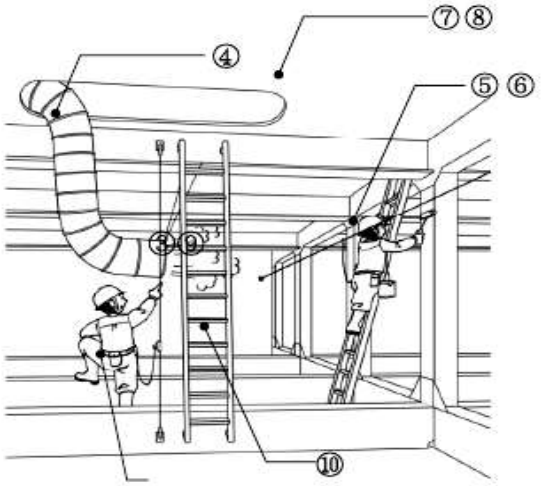
- A welder must wear appropriate clothes and equipment for gas welding and cutting to protect him. Working places should be well-ventilated places..
- Check points
- (1) A gas cutting apparatus must equip a flashback arrester.
- (2) A name of person in charge must be noticed at the site where gas cutting apparatus are used.
- (3) Indication of fill and empty must be shown on the gas/oxygen cylinders.
- (4) Fire extinguisher must be arranged at site where gas apparatus are used.
- (5) Check the damage and crack of hoses before use. Also check gas leakage from the hoses and connection between
- hoses and apparatus.
- (6) Check the damage and disorder
- of gas apparatus's relief valves and
- pressure gages.
- (7) Only qualified persons for gas
- apparatus can use gas apparatus.
- (8) Protection against welding
- litter/spark must be considered. Goggles are useful
- (9) Danger areas of fire and Explosion must be signed as "Danger: Flammable".



11. Health disorder of works, 11.1 Oxygen deficiency

An oxygen deficiency sometimes will happen at old wells, manholes and ship's hold where are kept airtight for a long time. Appropriate care and measures must be taken to prevent oxygen deficiency. Check points:

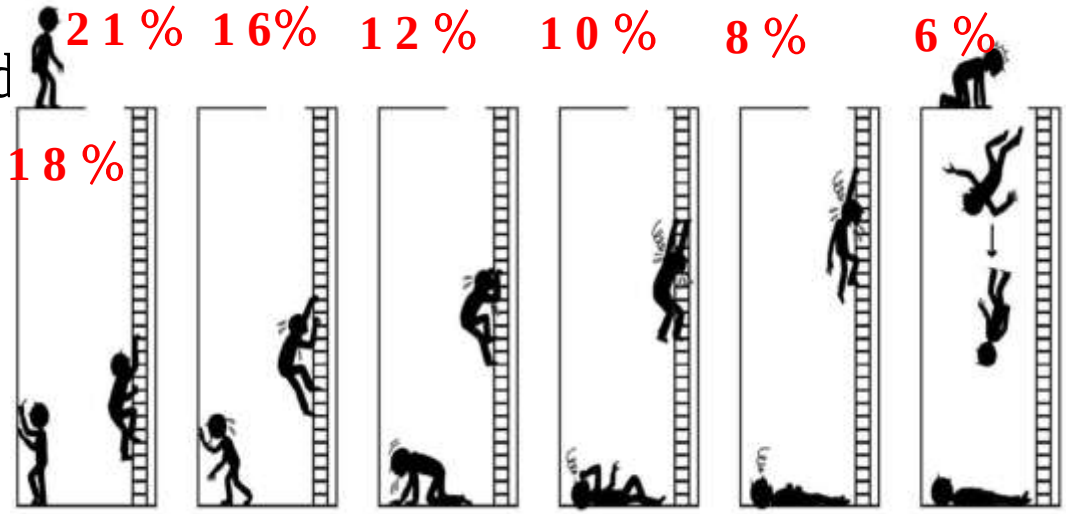




- **(1) A person in charge must be designated.**
- **(2) The oxygen content at above mentioned work places must be measures before work**
- **(3) Safety belts must be used for works at high places.**
- **(4) Working areas must be ventilated. (5) Apparatus more than workers must be arranged at site. Workers must use the apparatus when and where it's required.**
- **(6) Apparatus must be checked every day before starting works.**
- **(7) At places where possibility of oxygen deficiency will happen, a number of persons must be counted before and after works.**
- **(8) People who are not involved in works can't allow entering sites.**
- **(9) All workers must stop work immediately and evacuate site when the possibility of oxygen deficiency happens.**
- **(10) A oxygen deficiency site must prepare emergency equipment (oxygen masks, ladders, ropes, etc.).**

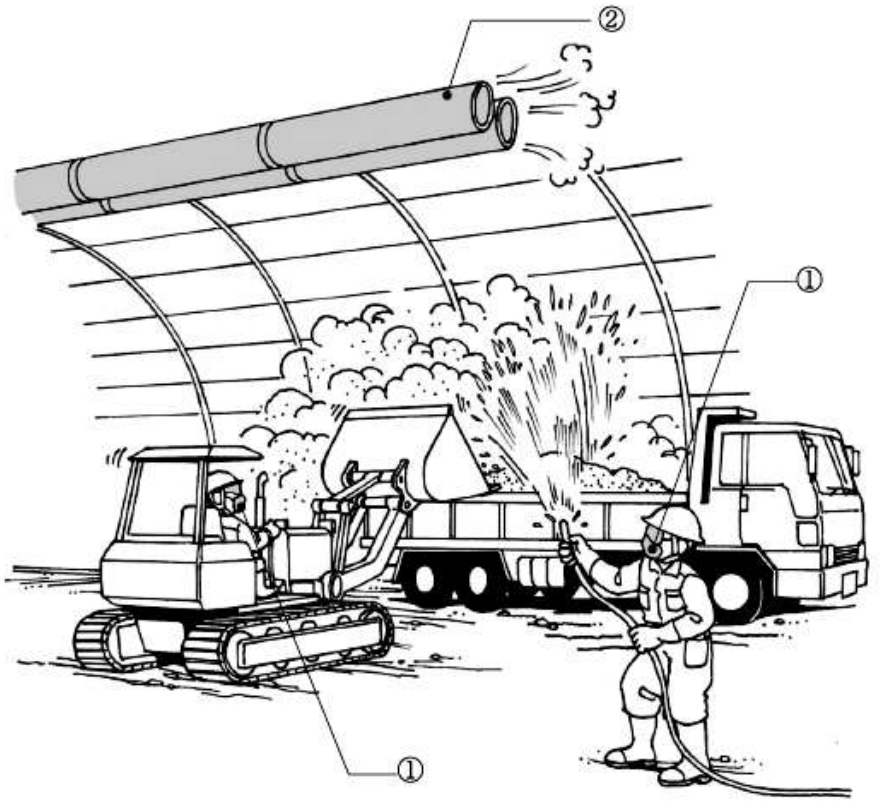
11.1 Oxygen deficiency, Reference

- **Oxygen content and condition of oxygen deficiency are shown below.**
- **21%: Above the ground**
- **18%: Safe limit but need**
- **continuous ventilation**
- **16%: Breath and pulse**
- **increase, headache,**
- **nausea**
- **12%: Dizziness, nausea,**
- **Loss in muscle strength,**
- **can't support his own**
- **weight and fall(→ be killed in a fall)**
- **10%: Facial pallor, unconsciousness, vomiting (→ an airway obstruction → death by suffocation)**
- **8%: Faint, coma, death within 7-8 minutes**
- **6%: Coma, cessation of breathing, convulsion, death within 6 minutes**



11.2 Dust

- **Dust will be occurred by excavation, loading materials, shotcreting, concreting and so on. Protective measures must be taken for such occasions.**
- **Check points:**
- **(1) Dust masks must be**
- **used at the dusty work**
- **place.**
- **(2) Ventilation is required**
- **at the dusty work place.**

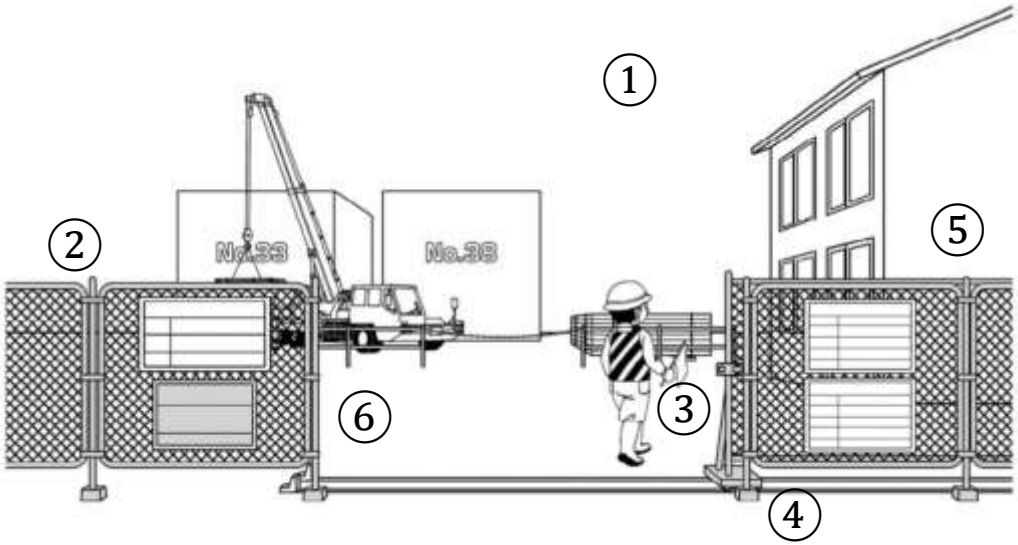


11.3 Vibration, Noise

- **Vibration and noise will be occurred by breaking work, drilling work, bolt fastening work and so on when vibrating machine is used. White finger disease is one of the sick caused by vibration works.**
- **Check points**
- **(1) Personal protective equipment**
- **(vibration protective gloves, earplugs)**
- **must be worn by workers who are**
- **involved vibration and noisy works.**
- **(2) Low vibration and low noise type**
- **machines are recommended to use.**
- **(3) Workers must have medical**
- **checkup for vibrating and noisy works.**
- **(4) Safety induction must be conducted**
- **for workers who are involved in**
- **vibrating and noisy works.**
- **(5) Limited working hours must be specified for vibrating works and noisy. Workers are not able to work beyond such limited working hours**

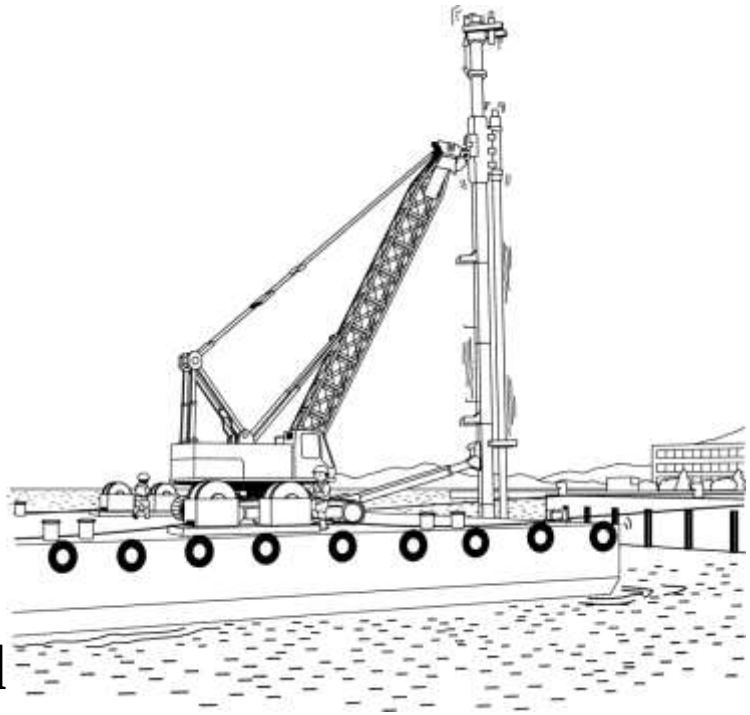
7. Danger to public, 7.1 Signs of Keep out

- It is necessary to install fences and notice boards to prevent third persons not to go inside of site.
- Check points
- (1) Publicity of works to the neighbor residents must be conducted.
- (2) Fences must be installed
- around a site to protect the
- possibility of accident on
- third persons.
- (3) The entrance of site must
- be locked if necessary.
- (4) The structure of entrance
- and measures to prevent
- people not to enter into the
- site must be checked whether it is proper or not.
- (5) The fences must equip enough strength not to be destroyed by a strong wind.
- (6) A notice of "Keep out" must be displayed at the proper position.



7.2 Vibration, Noise

- **It is necessary to prepare countermeasures not to disturb the living circumstance of residents around site.**
- **Check points:**
- **(1) The noise and vibration**
- **shall not exceed the criterion**
- **levels which are specified by**
- **the vibration/noise regulation**
- **law in Vietnam.**
- **(2) A notification of *designated**
- **construction work shall be submitted**
- **to the concerned government offices.**
- **(3) Vibration/noise regulations of concerned municipalities must be checked before starting construction.**



* Designated construction work means that construction work which will cause considerable vibration and/or noise at site.

7.3 Works near buried objects

- **Locations of service lines for gas, electricity, telephone, internet and so on, must be checked and confirmed with concerned companies before construction.**
- **(1) A contractor must arrange a meeting before construction with concerned companies and explain outlines of works. The method of joint inspection and security also should be discussed.**
- **(2) Buried objects at the shallow depth must be checked by the hand test excavation. Attention must be paid not to damage buried objects at the time of test excavation. After locations of buried objects are confirmed, locations must be marked by stakes flags or paint.**
- **(3) An inspector dispatched by a concerned company should attend the site when construction starts.**
- **(4) Measures to prevent an explosion and a fire must be taken when works are close to gas pıpes.**
- **(5) When contractor excavates near buried objects, buried objects must be reinforced or relocated if there is a possibility to be damaged.**
- **(6) Appropriate measures must be prepared and/ or taken to prevent the public to disaster which may be damage of buried objects.**