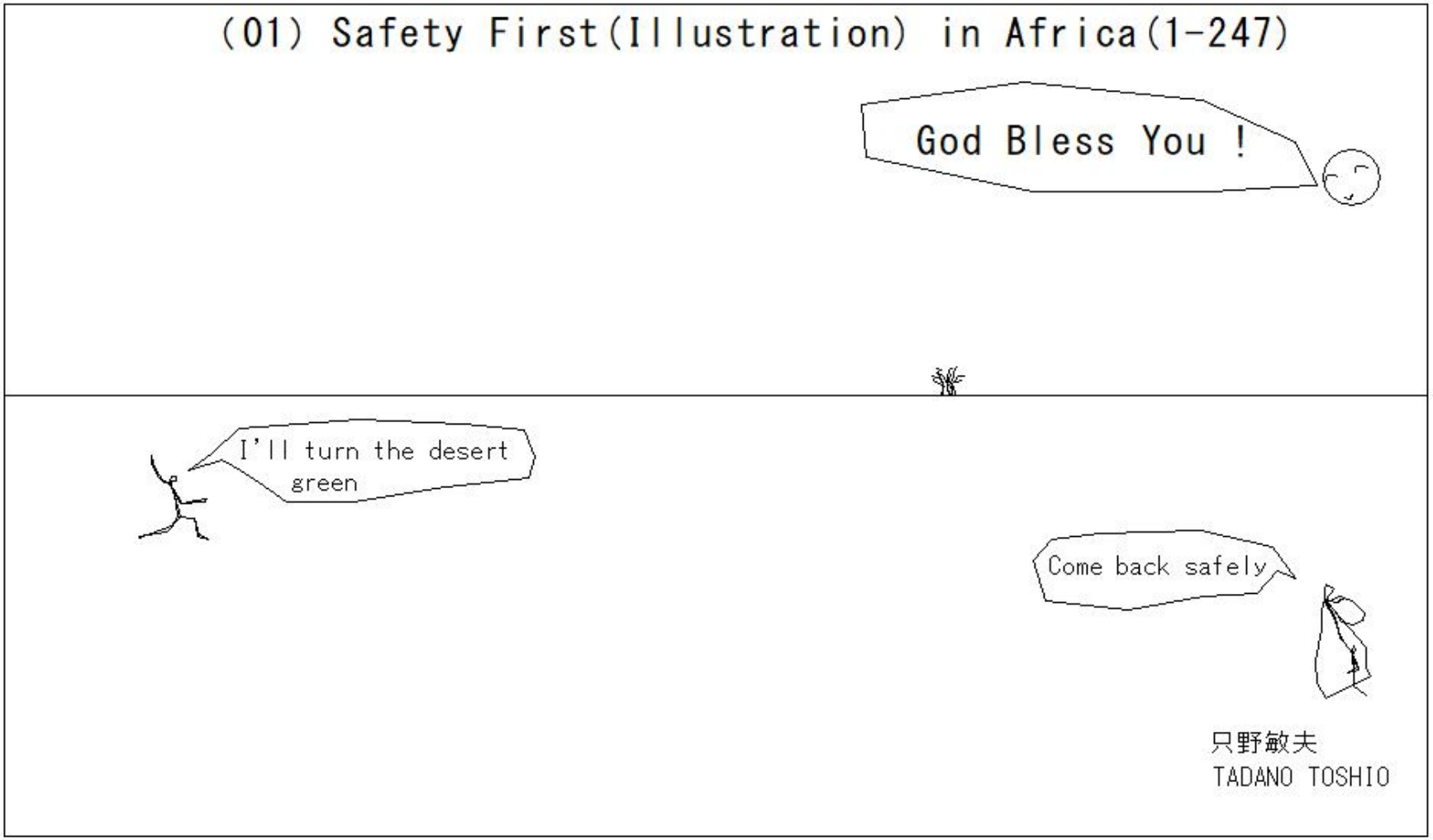
（01）Safety First(Illustration) in Africa(1-247)



Reference

1	土木工学ハンドブック Civil Engineering Handbook	土木学会編 Edited by Japan Society of Civil Engineers	技報堂 GIHODO SHUPPAN Co., Ltd.
2	農業土木ハンドブック Agricultural civil engineering handbook	農業土木学会編 Japan Society of Agricultural Civil Engineers	丸善株式会社 Maruzen Co., Ltd.
3	林業土木ハンドブック Forestry Civil Engineering Handbook		千代田出版 Chiyoda Publishing Co., Ltd.
4	道路構造冷の解説と運用 Explanation and operation of road structure	（2003）	社団法人 日本道路協会 Japan Road Association
5	応用地質用語集 Glossary of applied geological terms		東洋書店 Toyo Shoten Co., Ltd.
6	実用英和対訳 土木用語辞典 Practical English-Japanese translation Dictionary of civil engineering terms		工学出版株式会社 Engineering Publishing Co., Ltd.
7	農業土木用語集 Glossary of agricultural civil engineering terms		東洋書店 Toyo Shoten Co., Ltd.
8	土木施工用語集 Glossary of civil engineering construction terms		東洋書店 Toyo Shoten Co., Ltd.
9	土木コンクリート用語集 Glossary of civil engineering and concrete terms		東洋書店 Toyo Book Book Store
10	土木用語辞典 Dictionary of civil engineering terms	東京工学研究会編 Edited by Tokyo Engineering Study Group	工学出版株式会社 Engineering Publishing Co., Ltd.
11	図解 土質・基礎用語集 Illustrated Glossary of Soil Characteristics and Basic Terms		東洋書店 Toyo Shoten Co., Ltd.
12	図解テキスト 土木一般 (1-5) Illustrated Text General civil engineering(1-5)		市ケ谷出版社 ICHIGAYA Publishing Co., Ltd
13	安全法令ダイジェスト Safety Law Digest		労働新聞社 Labor Newspaper

只野敏夫
Tadano Toshio

1 (S1) Safety management	Safety management
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147 (S147)Electric Shock	Electric Shock
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39 (S39) Work restrictions	Occupational safety and health
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105 (S105) Earth retaining support	Safety measures for excavation work
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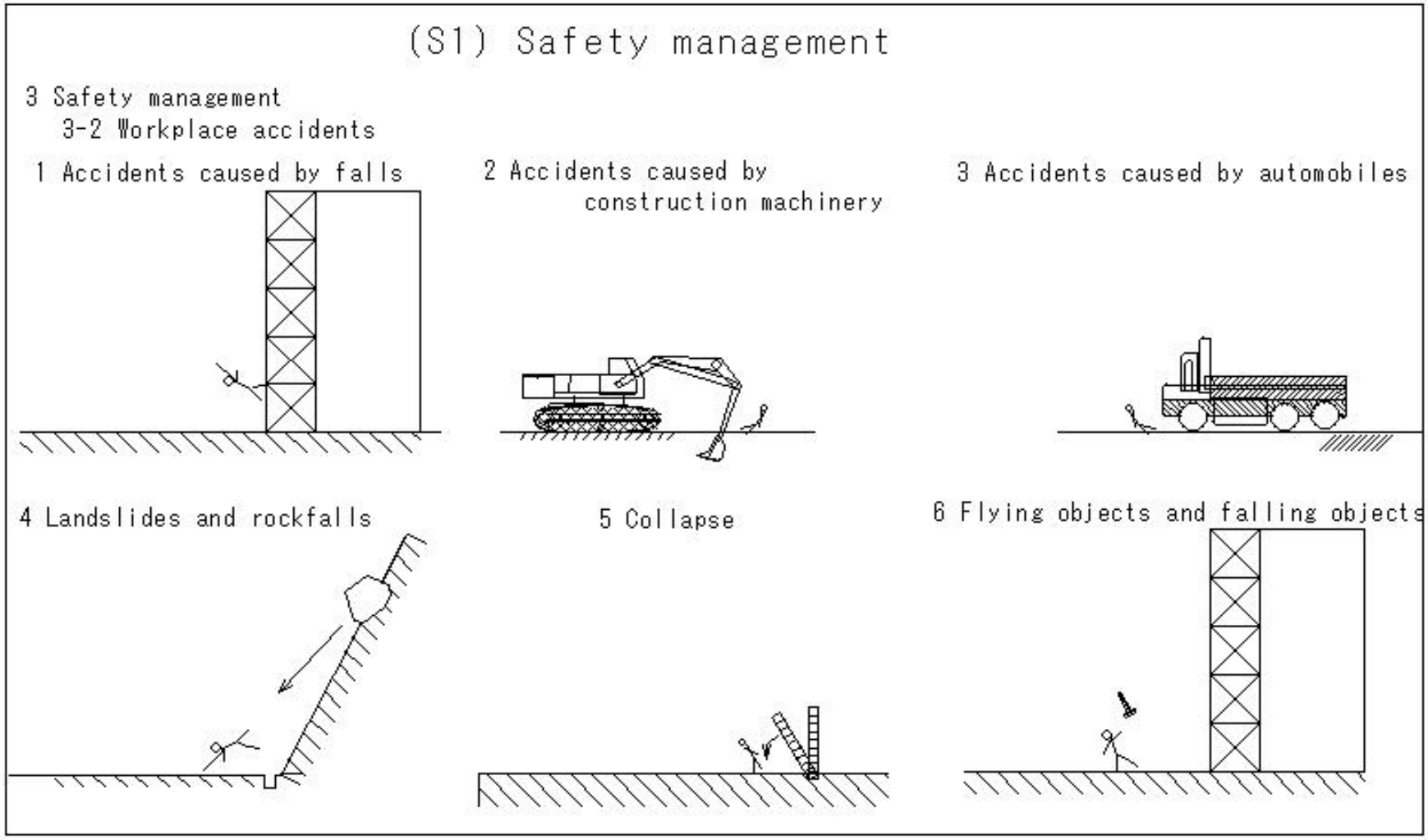
203 (S203)Workplace accidents	Workplace accidents

(S1) Safety management



(S2) Safety management

(S2) Safety management

3 Safety management

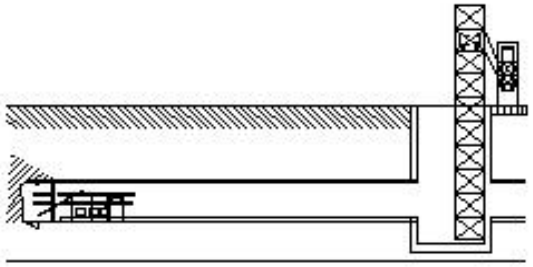
3-2 Workplace accidents

3-2-3 Causes of accidents and countermeasures

1 Unsafe conditions

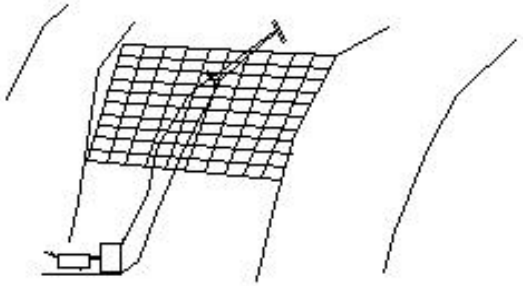
2 Unsafe actions

3 Unsafe human factors



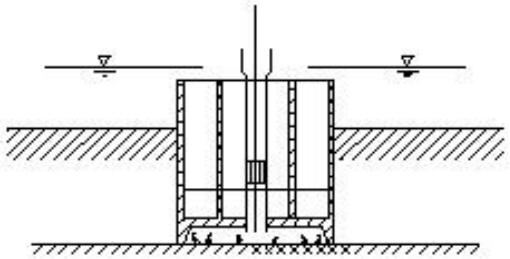
C1051
M420

steel cylinder: shield



C1324
M367

Concrete spraying



M322

Pneumatic caisson

(S3) Safety management

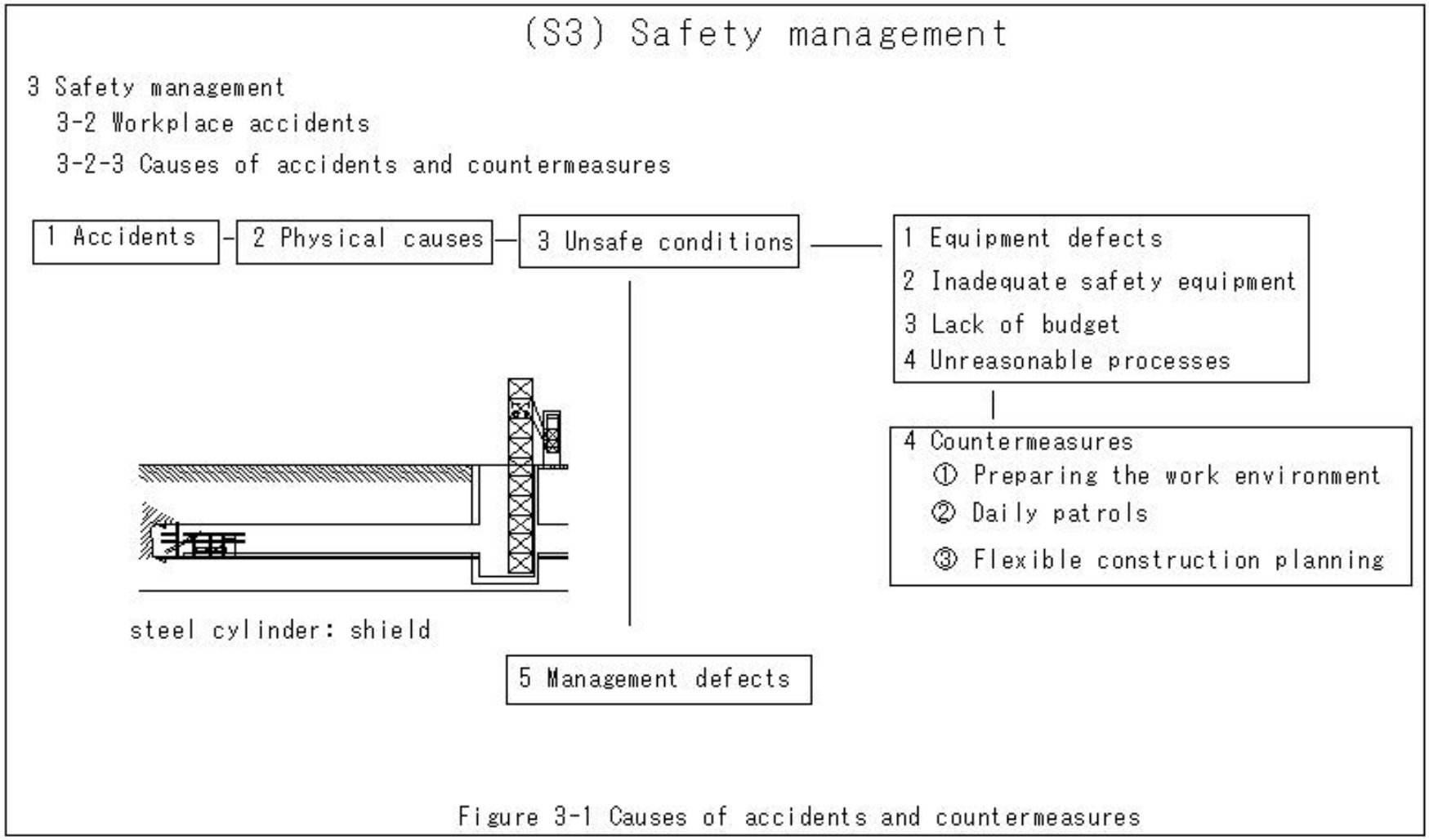


Figure 3-1 Causes of accidents and countermeasures

(S4) Safety management

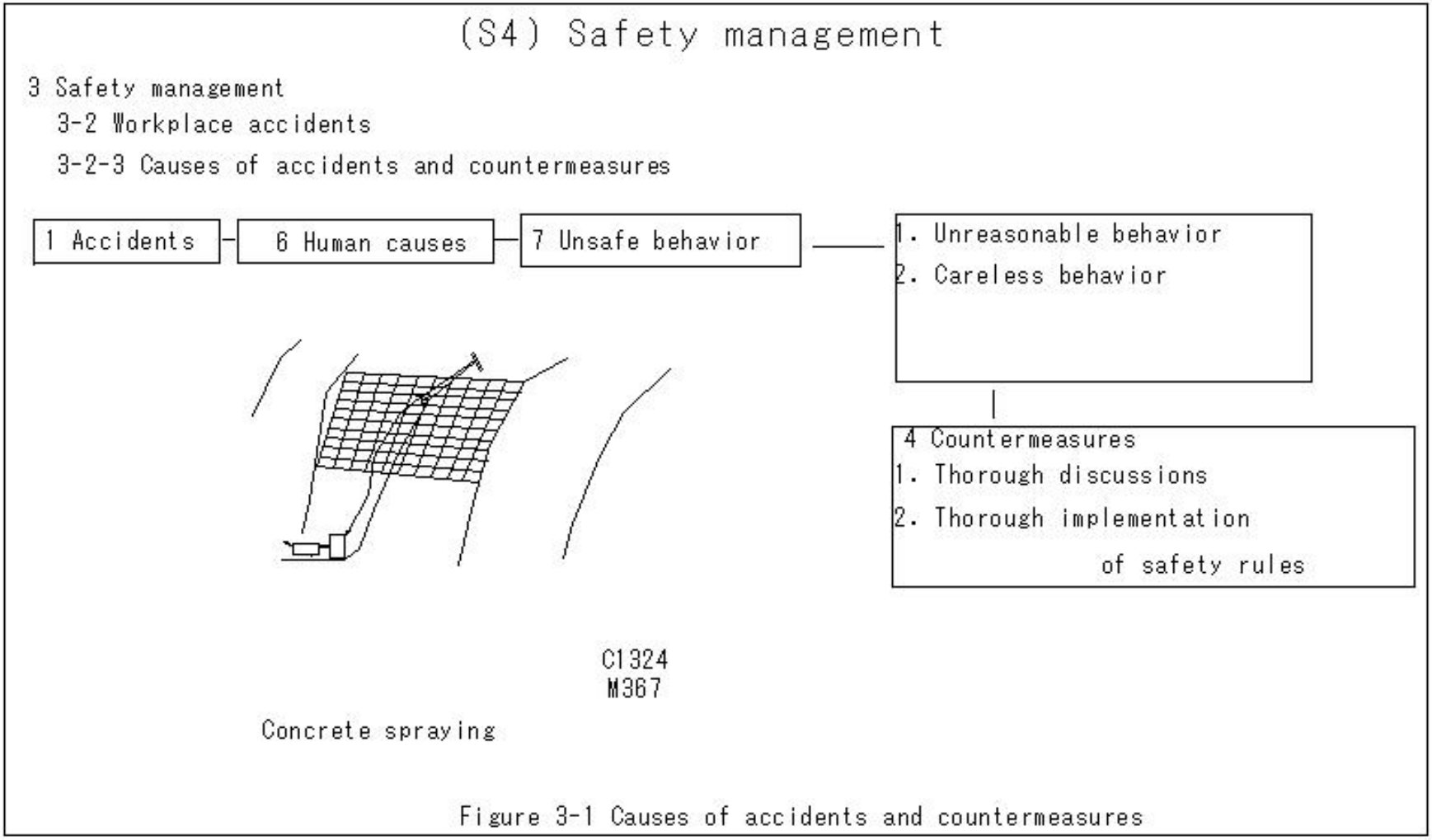


Figure 3-1 Causes of accidents and countermeasures

(S5) Safety management

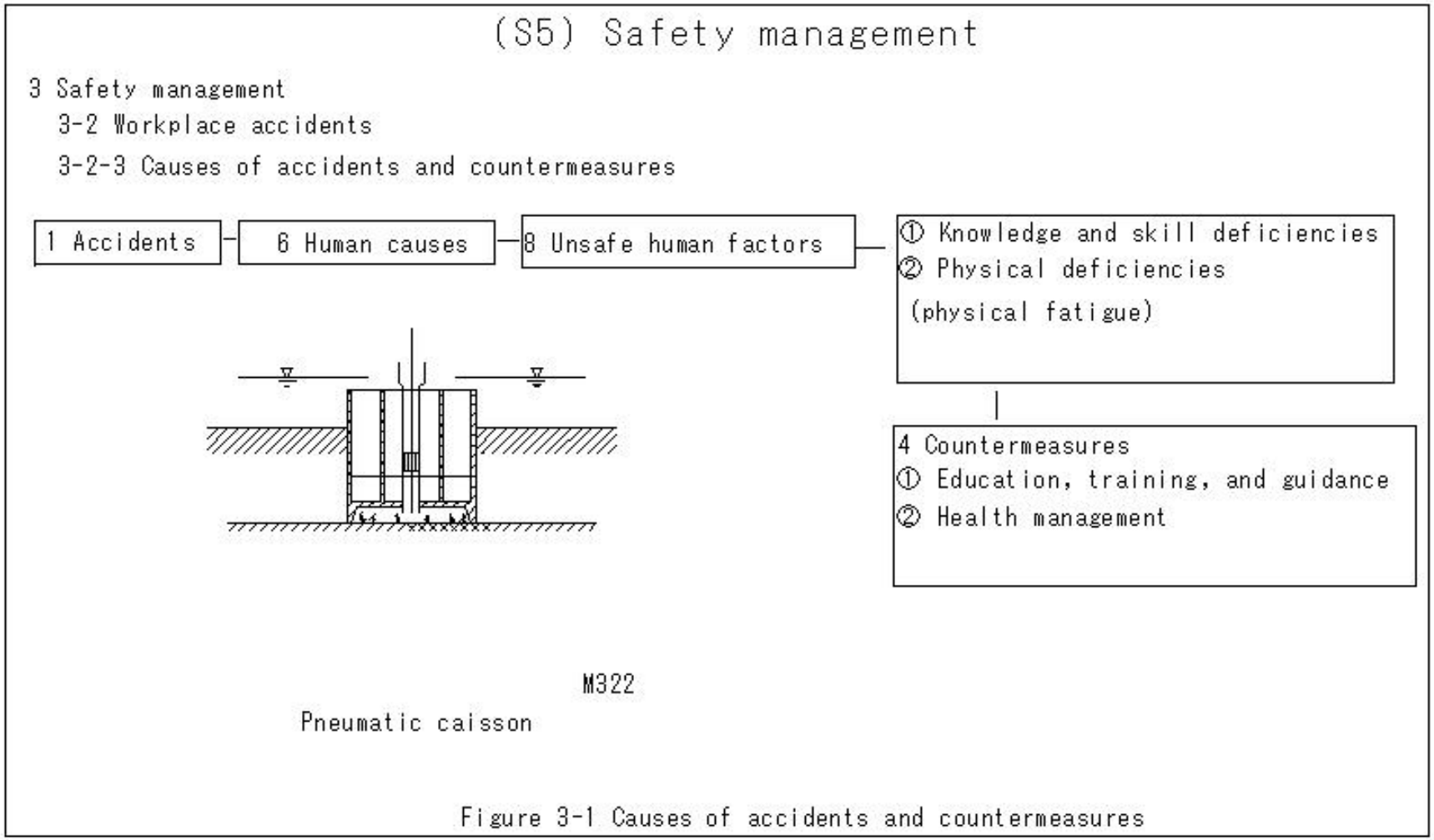


Figure 3-1 Causes of accidents and countermeasures

(S6) Safety management

(S6) Safety management

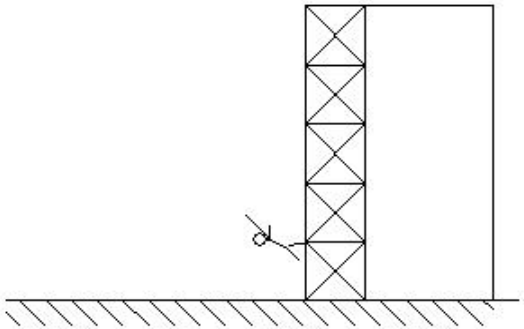
3 Safety management

3-2 Workplace accidents

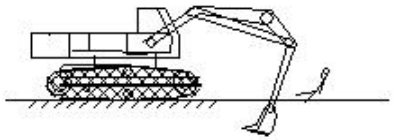
3-2-4 Accident investigation

1) Accident cause - accurately
2) Chemically and objectively investigate
3) Comprehensive judgment
4) Record keeping

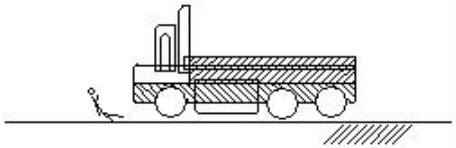
1 Accidents caused by falls



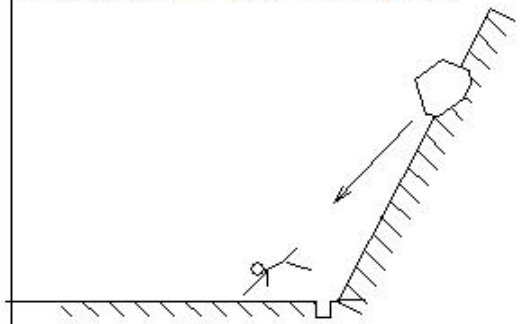
2 Accidents caused by construction machinery



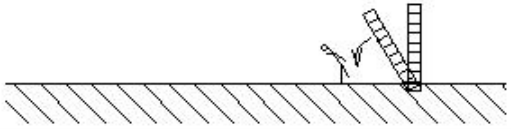
3 Accidents caused by automobiles



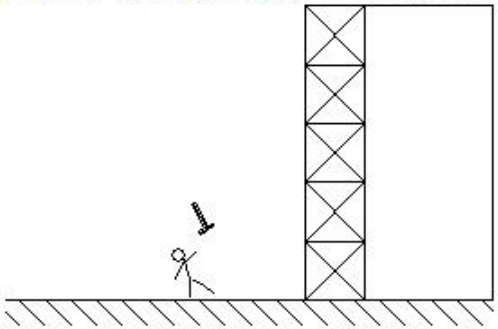
4 Landslides and rockfalls



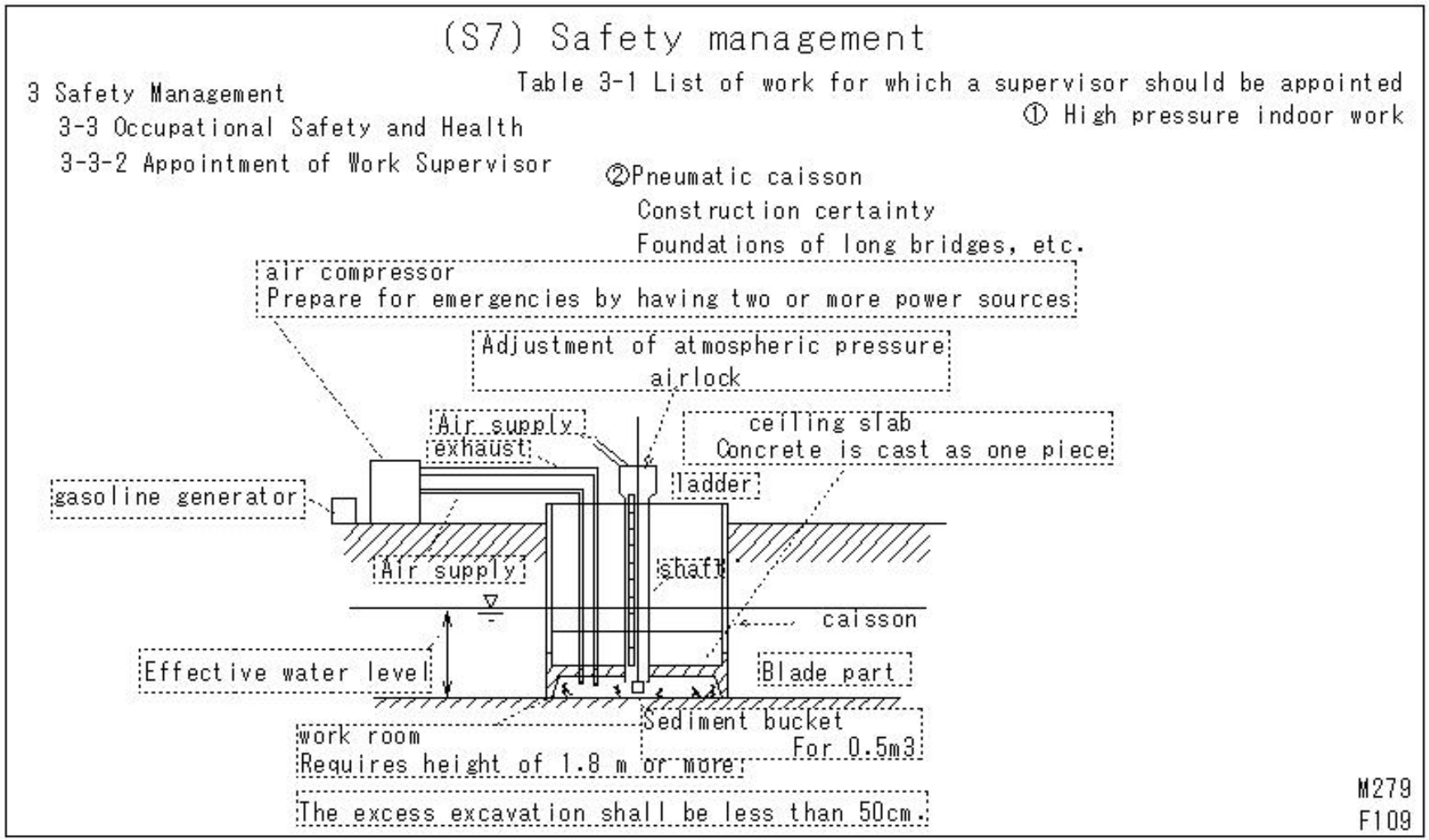
5 Collapse



6 Flying objects and falling objects



(S7) Safety management



(S8) Safety management

(S8) Safety management

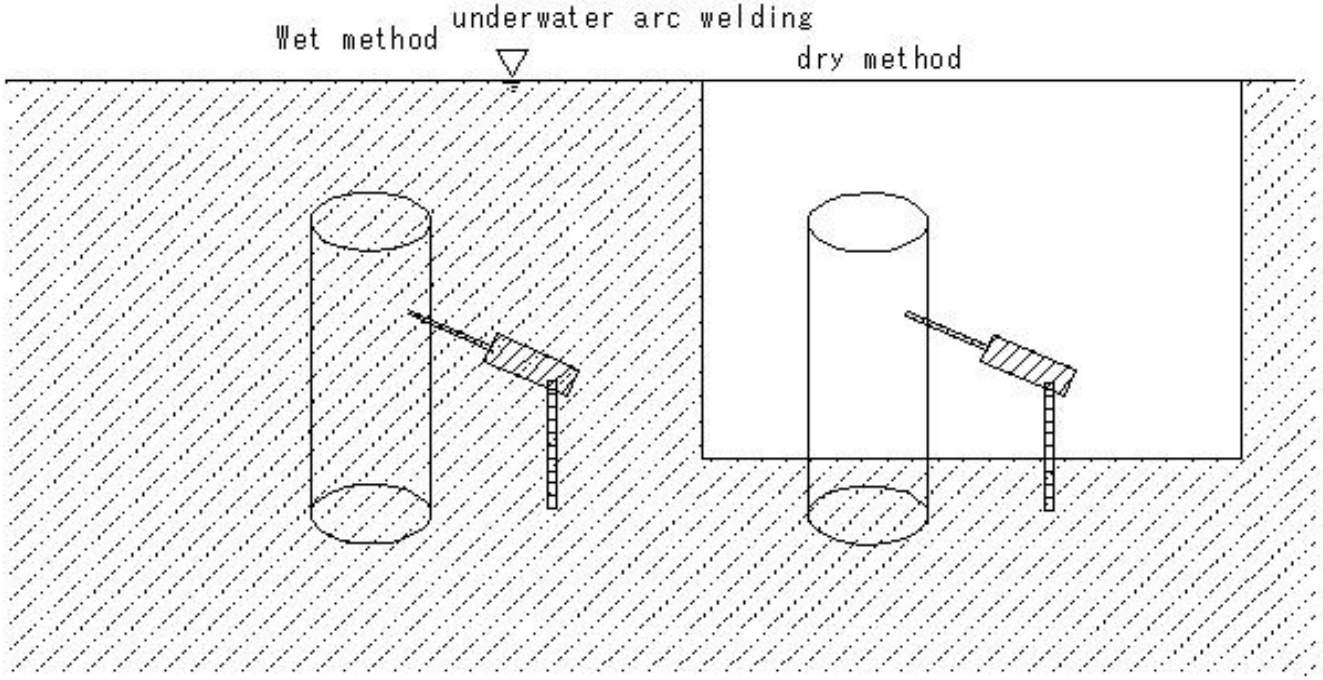
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

② Metal welding, melting or heating work using acetylene



(S9) Safety management

(S9) Safety management

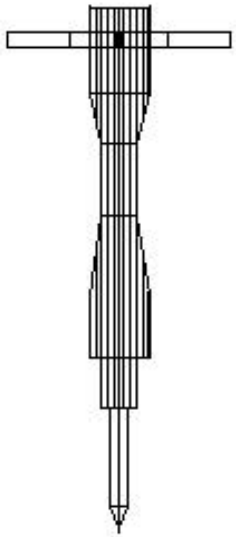
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

③ Work using a concrete crusher



concrete and rock crushing

C1133
M425

(S10) Safety management

(S10) Safety management

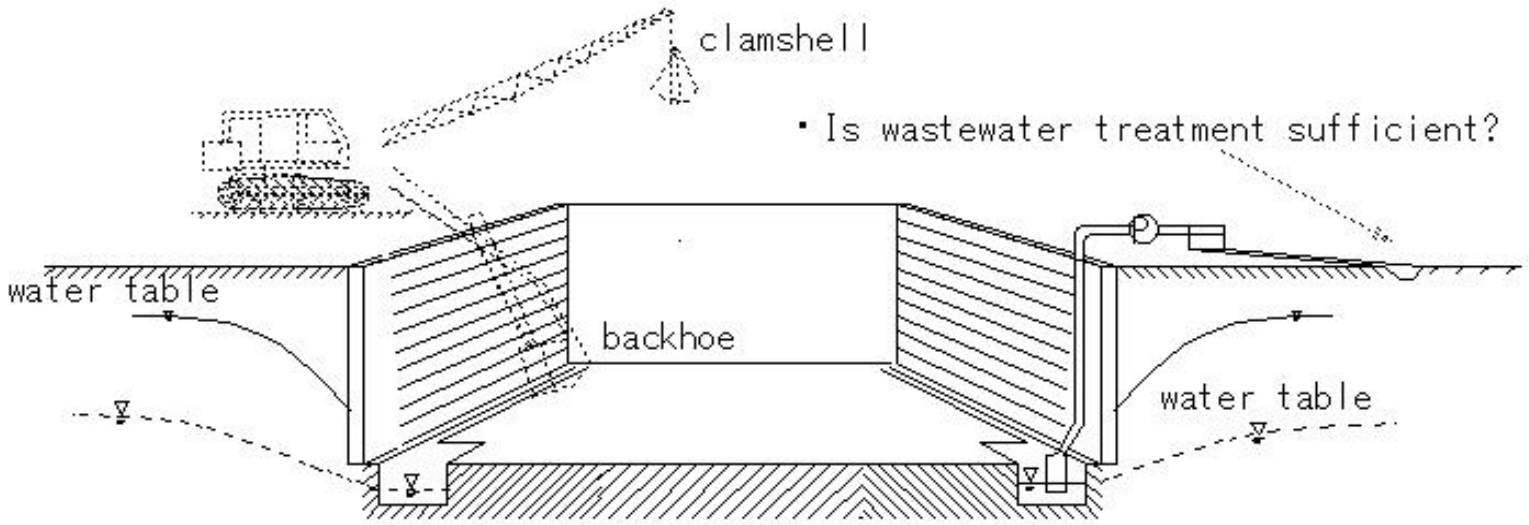
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

④ Excavation of ground with a height of 2m or more



E416

(S11) Safety management

(S11) Safety management

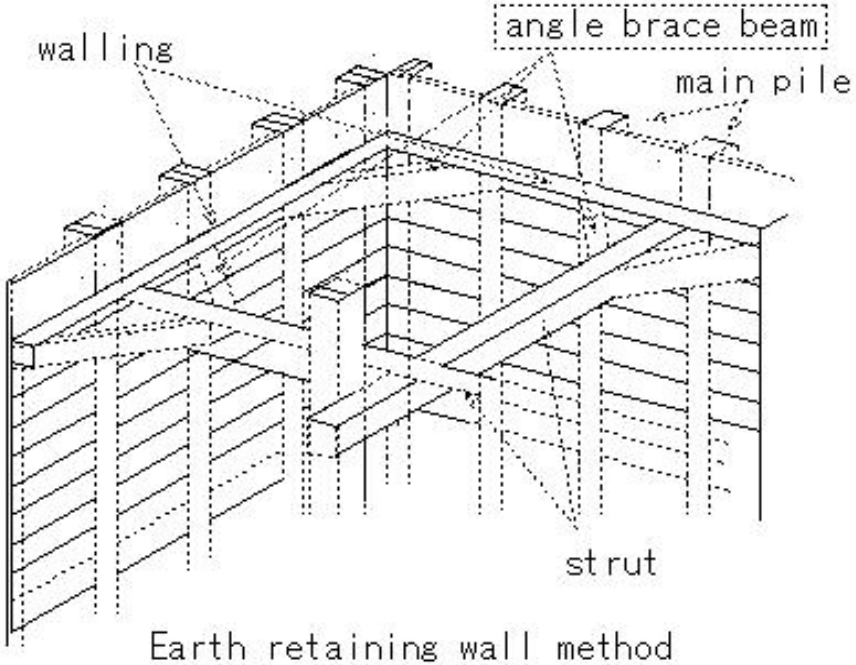
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

⑤ Installation and removal of struts and ribs of earth retaining supports



Earth retaining wall method

E602

(S12) Safety management

(S12) Safety management

3 Safety Management

3-3 Occupational Safety and Health

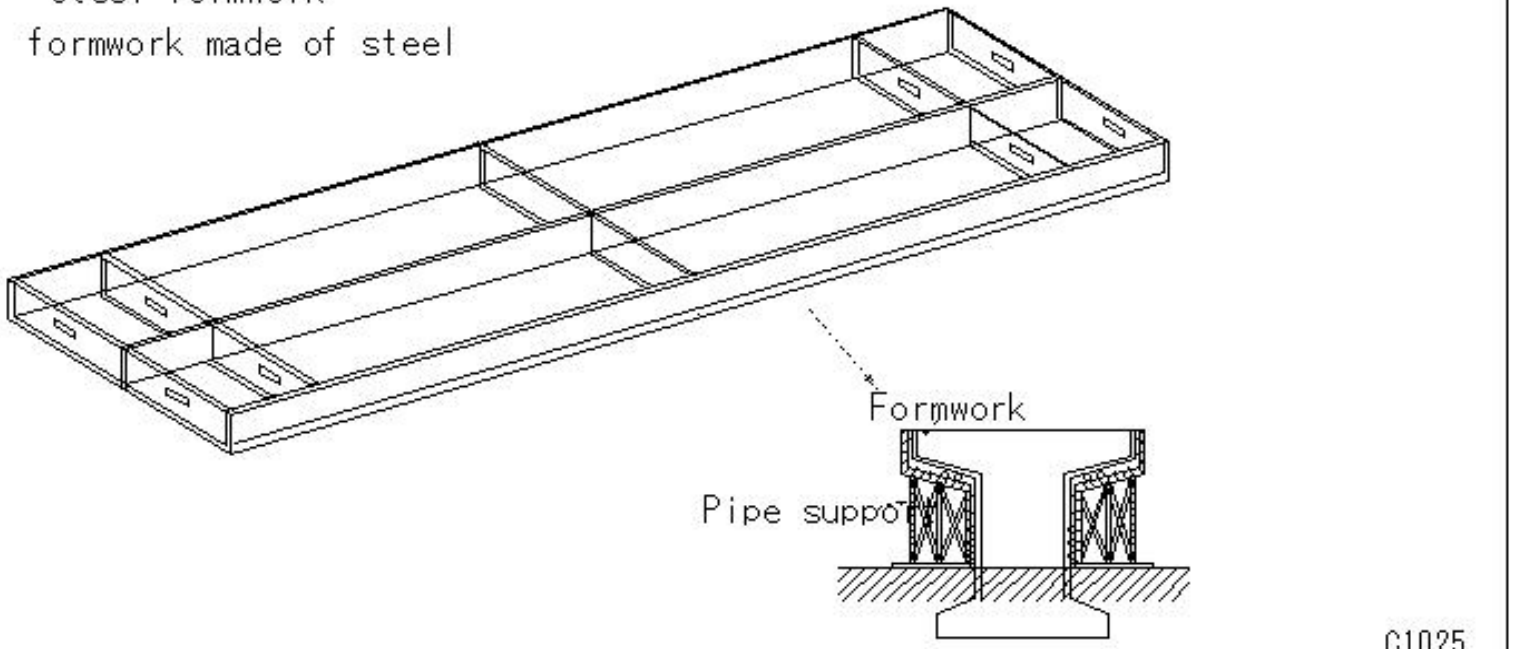
3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

⑥ Assembly and dismantling of formwork supports

Steel formwork

formwork made of steel



C1025

(S13) Safety management

(S13) Safety management

3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

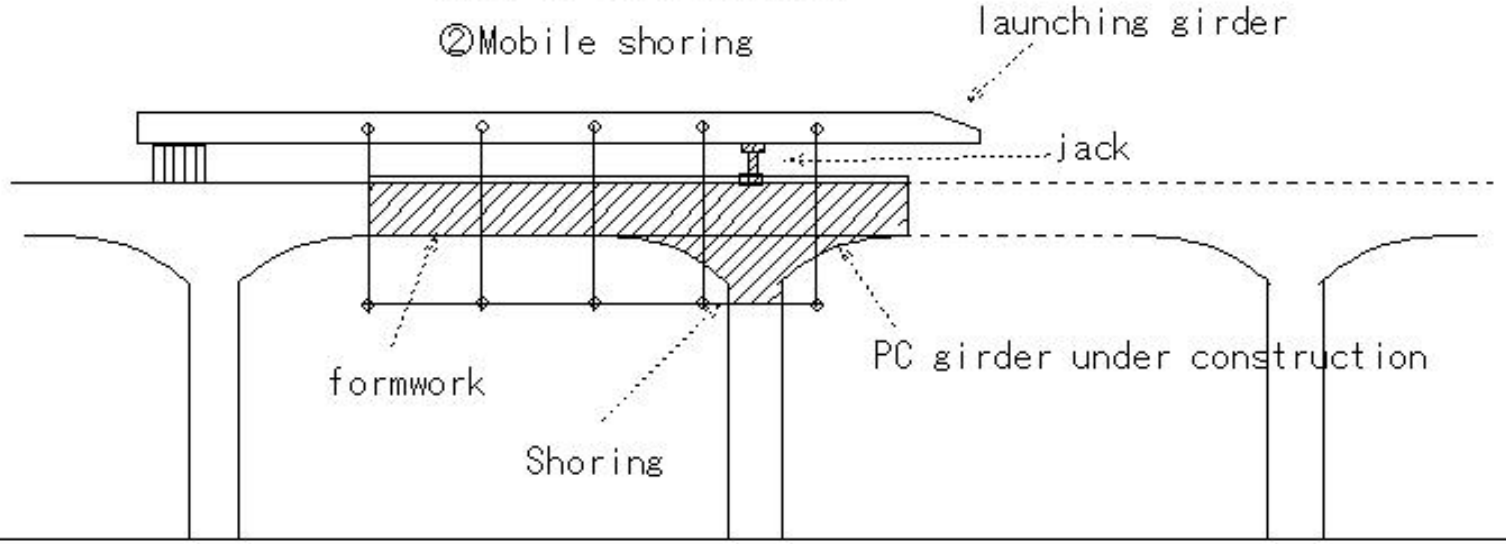
Table 3-1 List of work for which a supervisor should be appointed

⑦ Assembly and dismantling of suspended scaffolding, overhanging scaffolding, and scaffolding with a height of 5m or more

Concrete bridge(Erection)

Cast-in-place method

②Mobile shoring



(S14) Safety management

(S14) Safety management

3 Safety Management

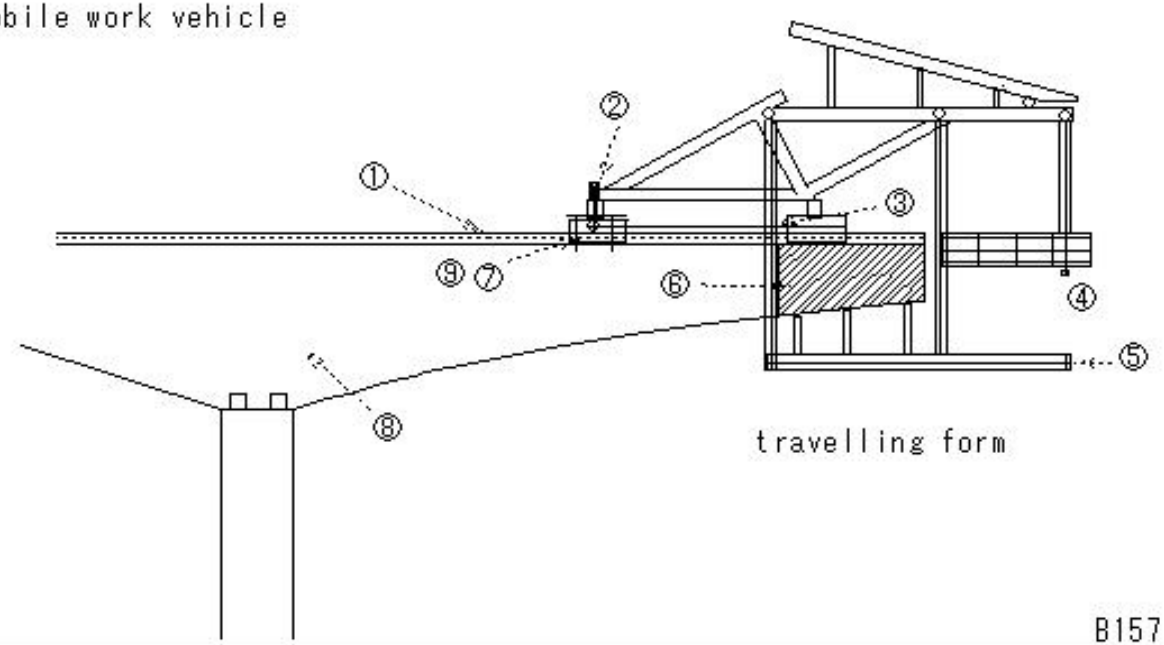
3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

⑧ Assembly and dismantling of steel frames with a height of 5m or more moveable form carrier mobile work vehicle

①moving rail
②anchors
③wheels
④workbench
⑤workbench
⑥formwork
⑦rail anchor
⑧concrete girder
⑨wheels



travelling form

B157

(S15) Safety management

(S15) Safety management

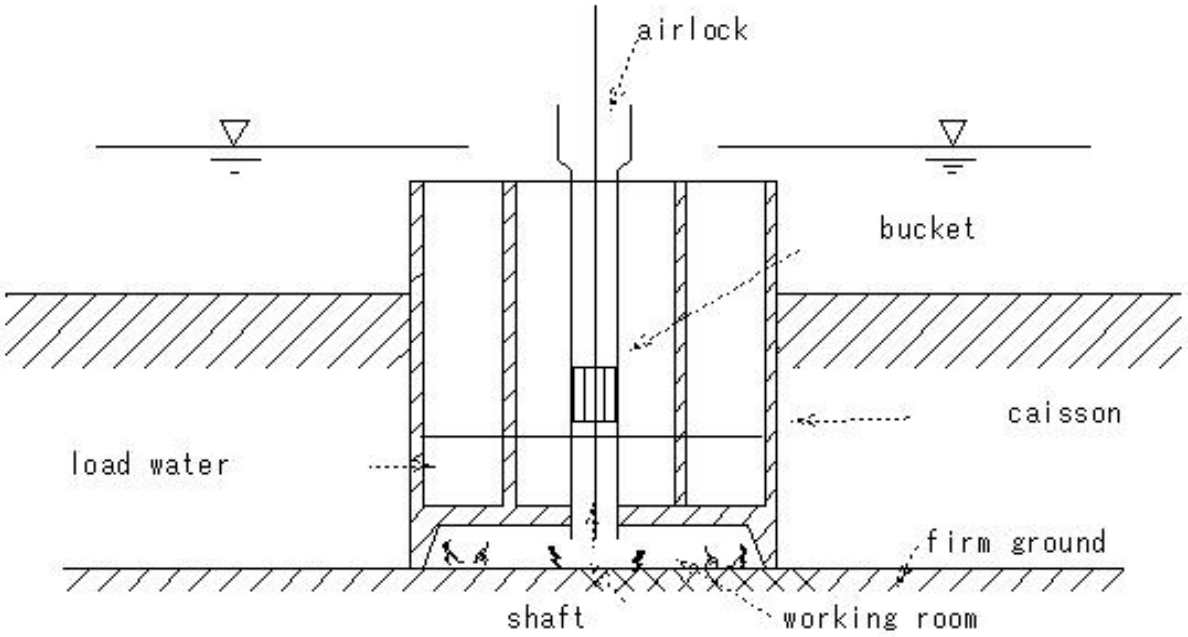
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

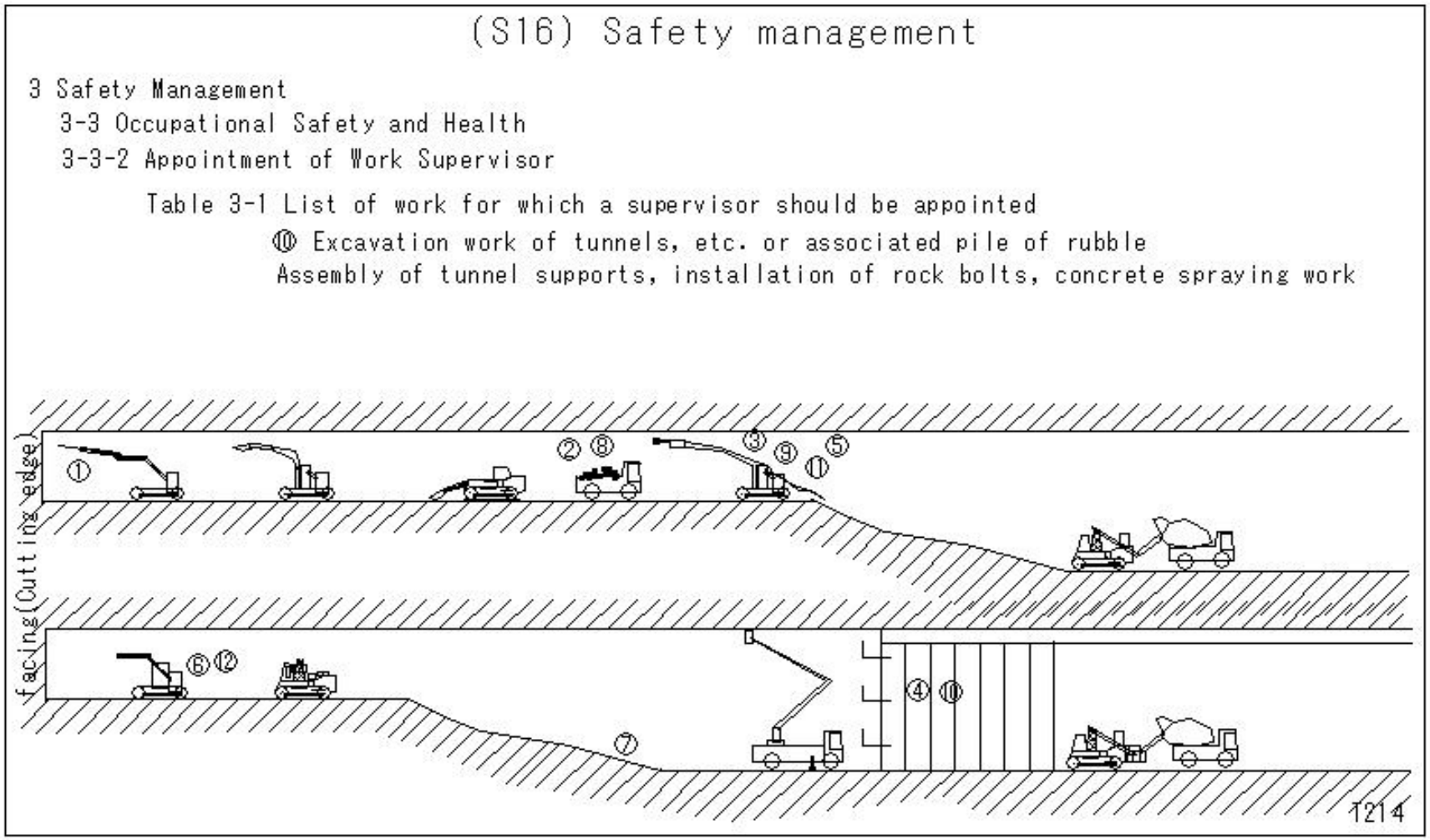
Table 3-1 List of work for which a supervisor should be appointed

⑨ Work in places where there is a risk of oxygen deficiency



airlock bucket caisson load water firm ground shaft working room F58

(S16) Safety management



(S17) Safety management

(S17) Safety management

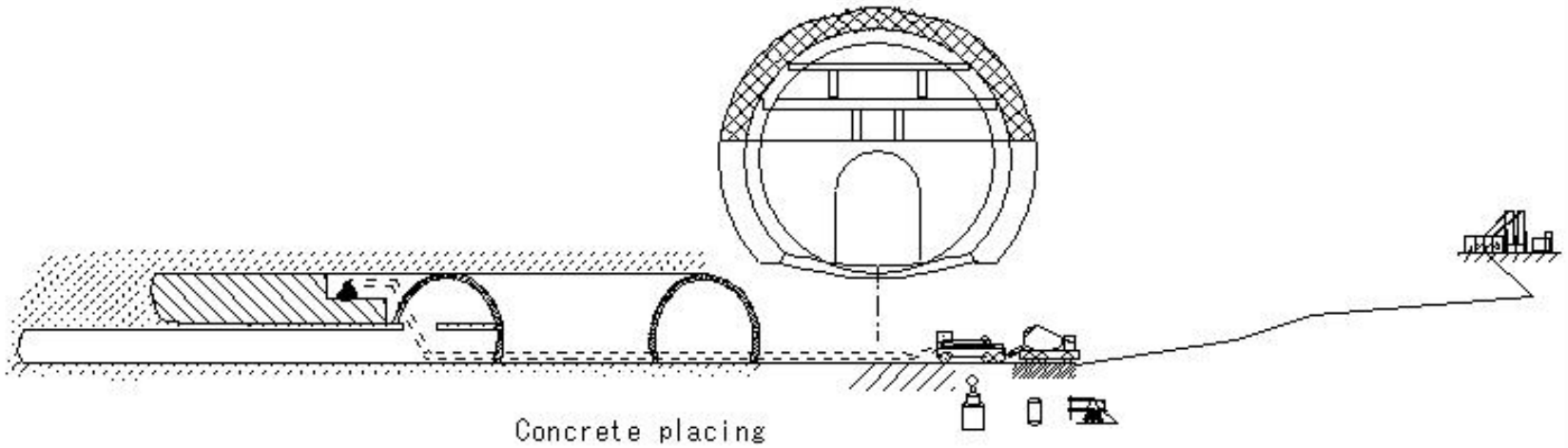
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

⑪ Covering work of tunnels, etc.



Concrete placing

T153

(S18) Safety management

(S18) Safety management

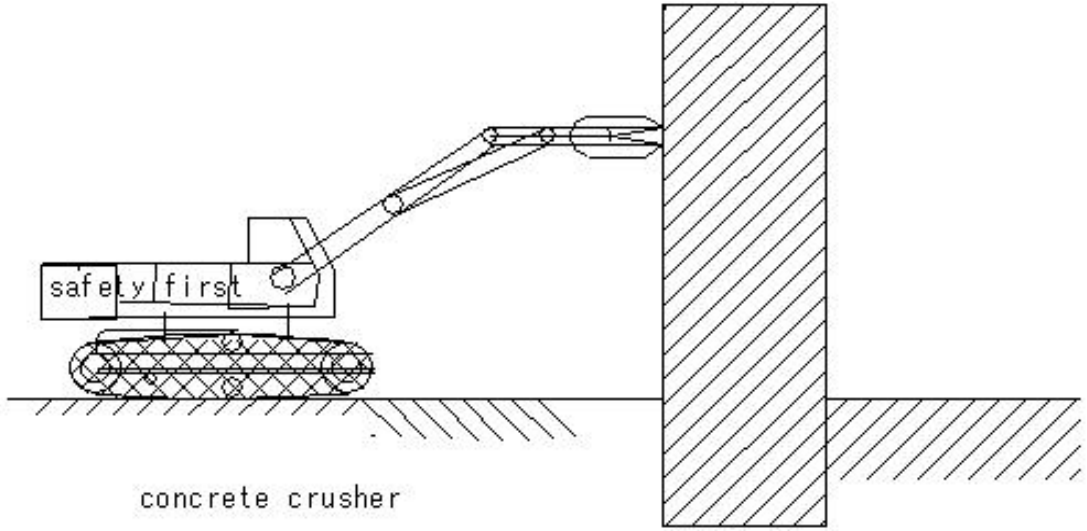
3 Safety Management

3-3 Occupational Safety and Health

3-3-2 Appointment of Work Supervisor

Table 3-1 List of work for which a supervisor should be appointed

⑫ Dismantling or destruction of concrete structures with a height of 5m or more



concrete crusher

M23

E229

(S19) Occupational safety and health

(S19) Occupational safety and health

3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety and Health training

1. In case of a worker is hired (new hire training)
2. In case of the work content is changed (preparation for new hire training)

new hire training

Safety and Health training

(S20) Occupational safety and health

(S20) Occupational safety and health

3 Safety Management

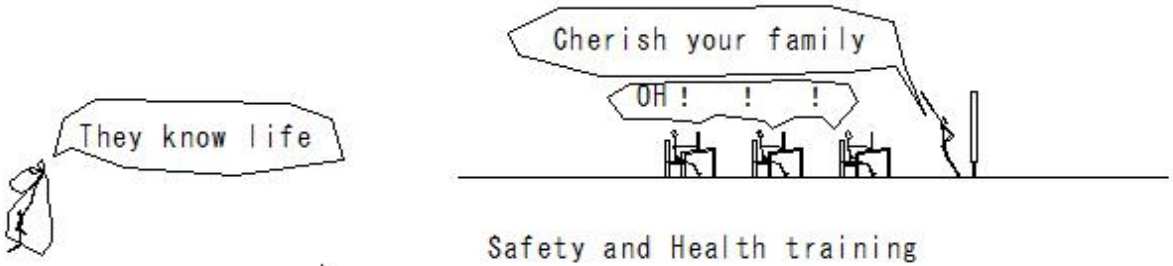
3-3 Occupational Safety and Health

3-3-3 Safety satellite training

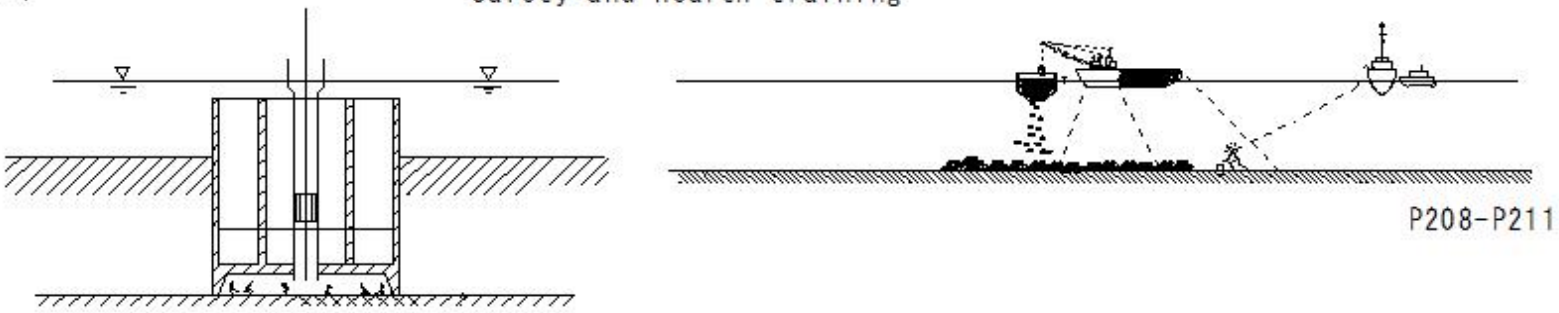
3. In case of a worker is assigned to dangerous or risky work (special training)

4. New foreman/foreman training (foreman training)

special training foreman training



Safety and Health training



P208-P211

F58

S15

(S21) Occupational safety and health

(S21) Occupational safety and health

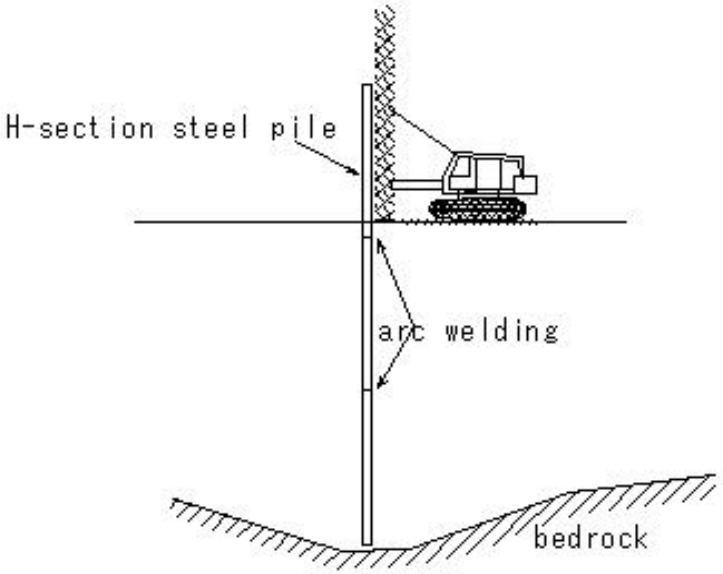
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

①Welding work



M67

F101

(S22) Occupational safety and health

(S22) Occupational safety and health

3 Safety Management

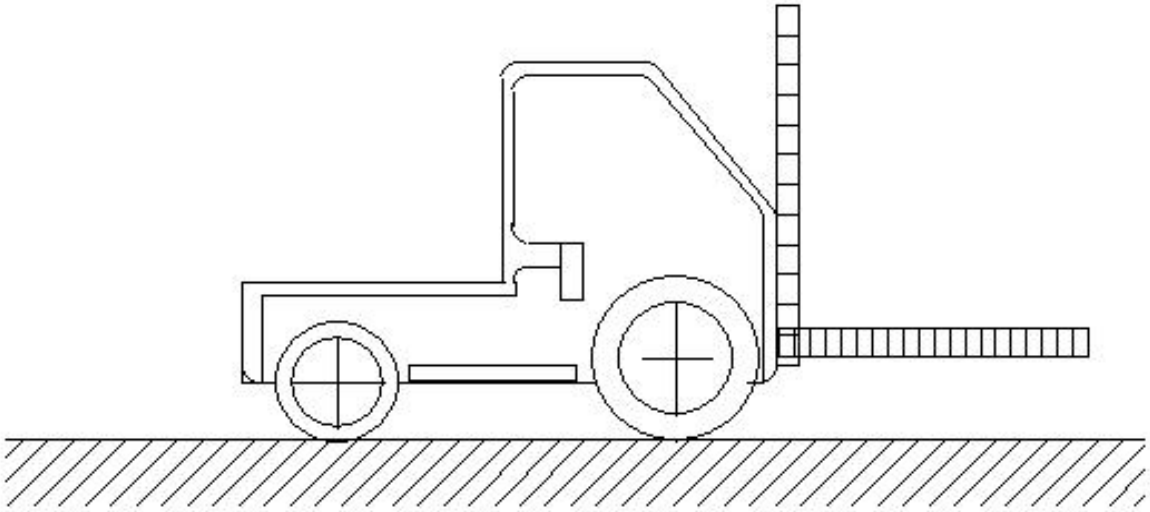
3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

②Driving forklifts weighing less than 1 ton

forklifts



(S23) Occupational safety and health

(S23) Occupational safety and health

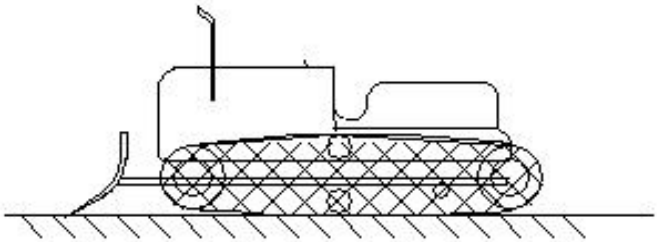
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

③Driving bulldozers weighing less than 3 ton



M1

(S24) Occupational safety and health

(S24) Occupational safety and health

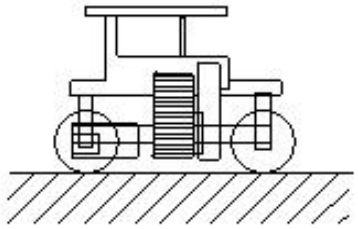
3 Safety Management

3-3 Occupational Safety and Health

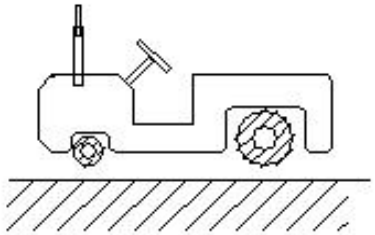
3-3-3 Safety satellite training

Table 3-2 Work requiring special training

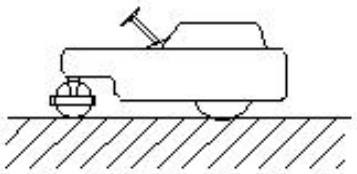
④Driving compaction machines such as rollers



road roller



tire roller



vibrating roller

M106

(S25) Occupational safety and health

(S25) Occupational safety and health

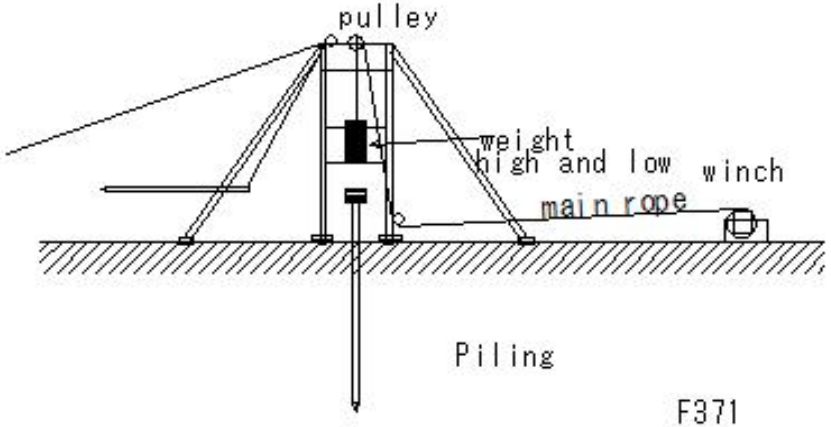
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑤Driving powered hoists, etc.



F371

M338

(S26) Occupational safety and health

(S26) Occupational safety and health

3 Safety Management

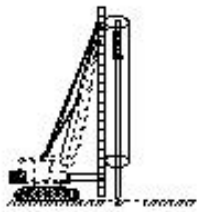
3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

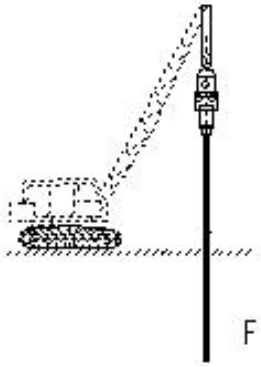
Ⓑ Driving powered pile drivers, etc.

Diesel hammer



F38

Vibrohammer



F101

M62

(S27) Occupational safety and health

(S27) Occupational safety and health

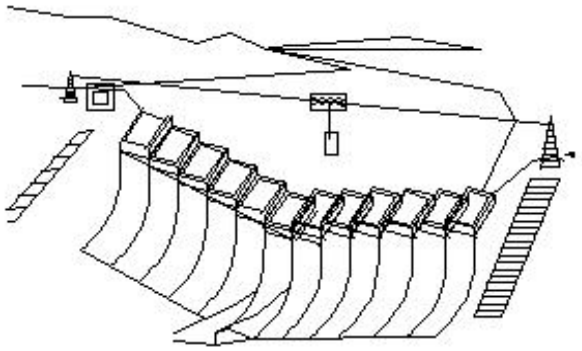
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑦ Driving track equipment, etc.



aerial cableway E232

M128

(S28) Occupational safety and health

(S28) Occupational safety and health

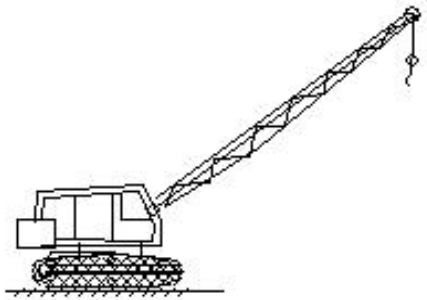
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑧Driving cranes with a lifting capacity of less than 5 ton



E289
M138

(S29) Occupational safety and health

(S29) Occupational safety and health

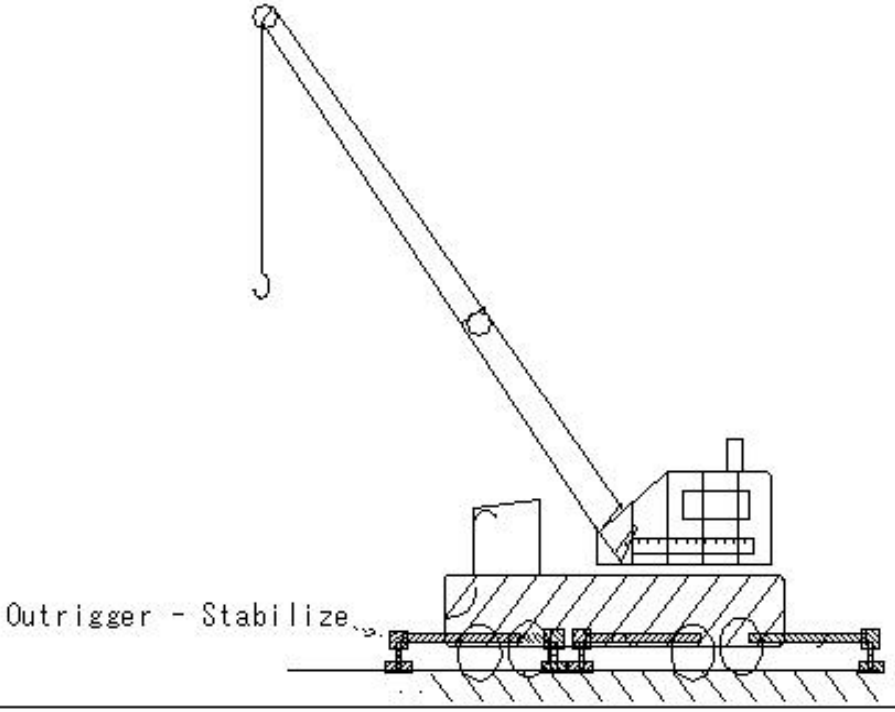
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑨Driving mobile cranes with a lifting capacity of less than 1 ton



B111

M46

(S30) Occupational safety and health

(S30) Occupational safety and health

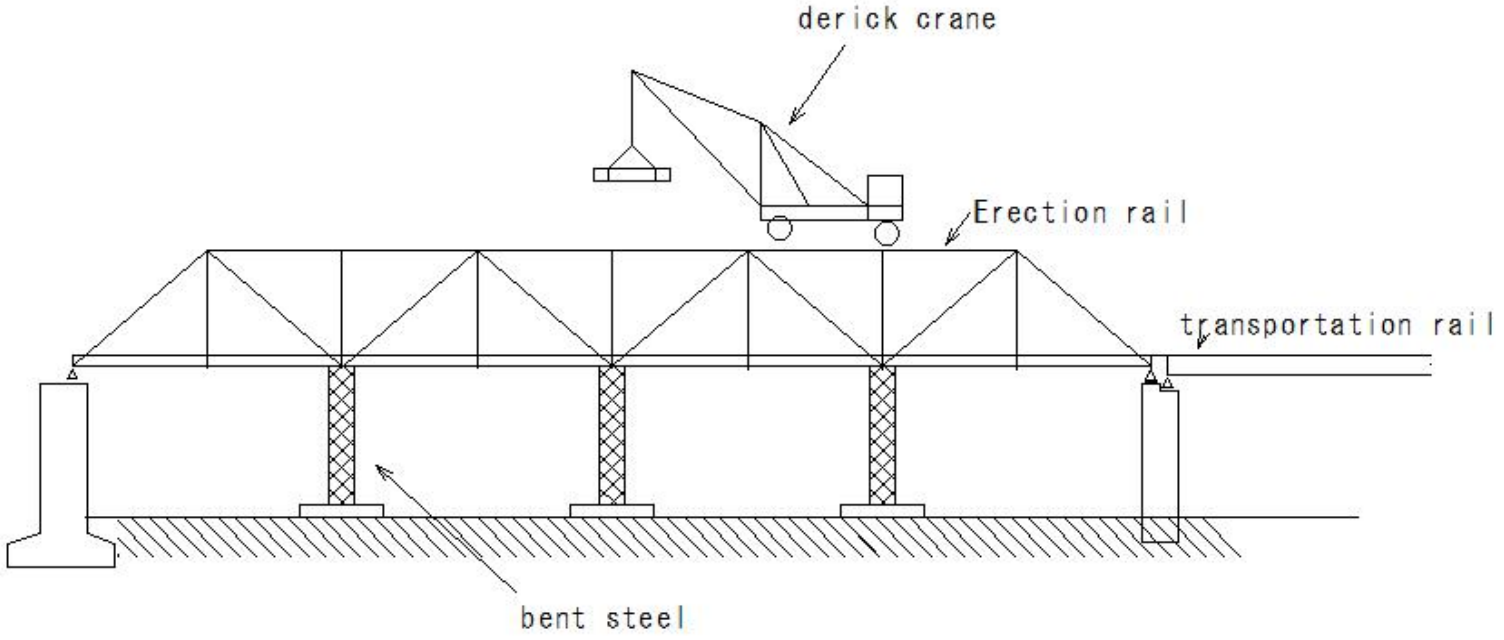
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑩Driving machines with a lifting capacity of less than 5 ton derrick operation work



B417

M49

(S31) Occupational safety and health

(S31) Occupational safety and health

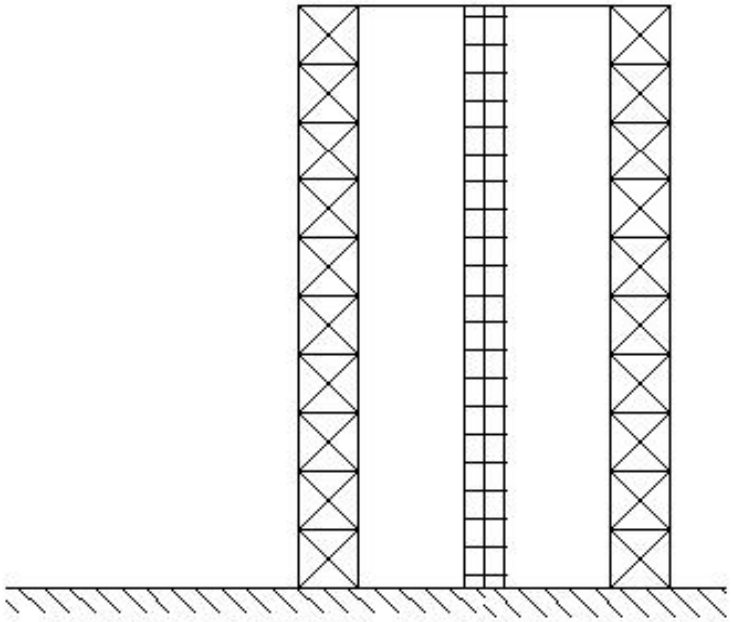
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

①Construction lift operation work



(S32) Occupational safety and health

(S32) Occupational safety and health

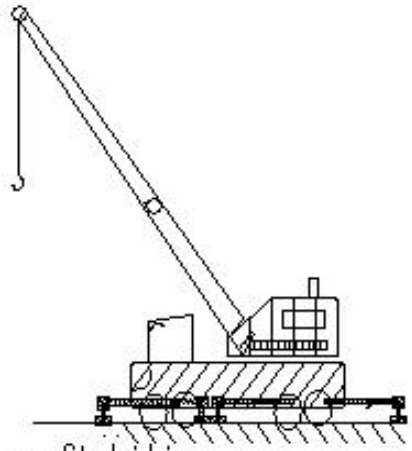
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

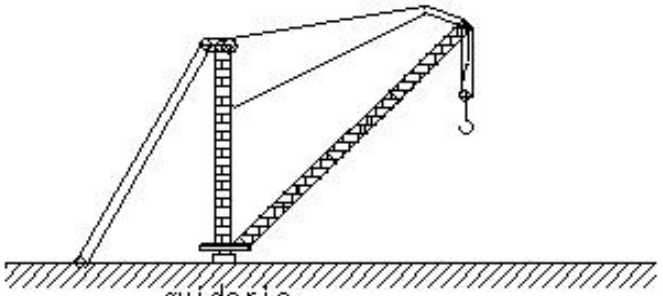
⑫Sling operation work for cranes and mobile cranes with a lifting capacity of less than 1t



Outrigger - Stabilize

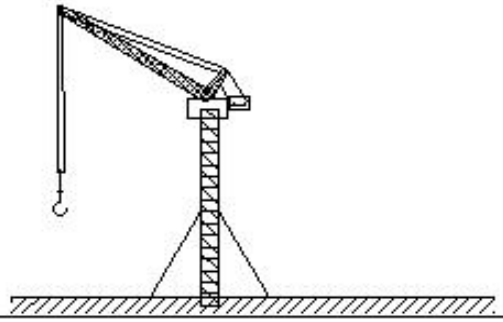
B111

M46



guideric

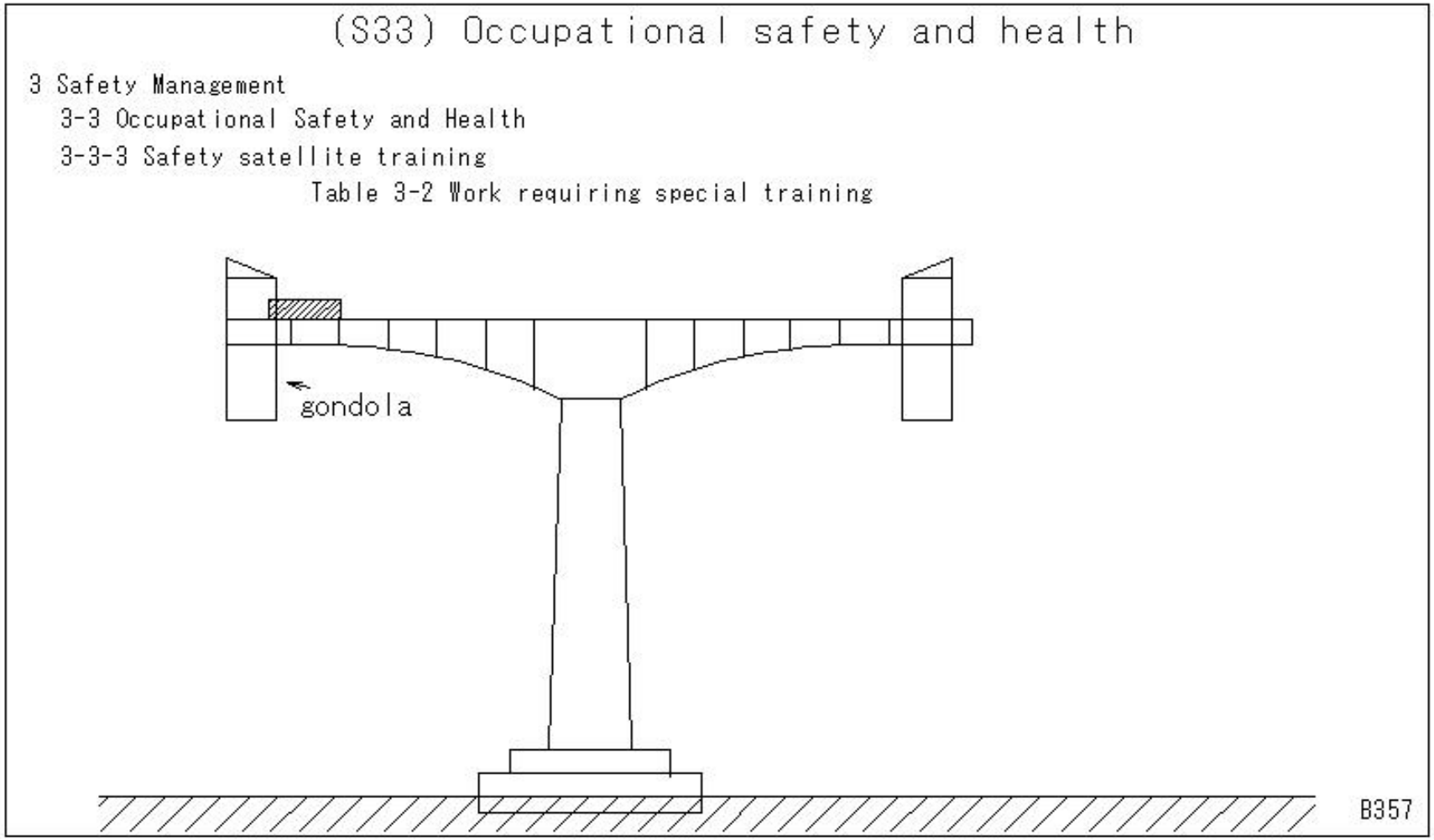
M390



tower crane

M391

(S33) Occupational safety and health



(S34) Occupational safety and health

(S34) Occupational safety and health

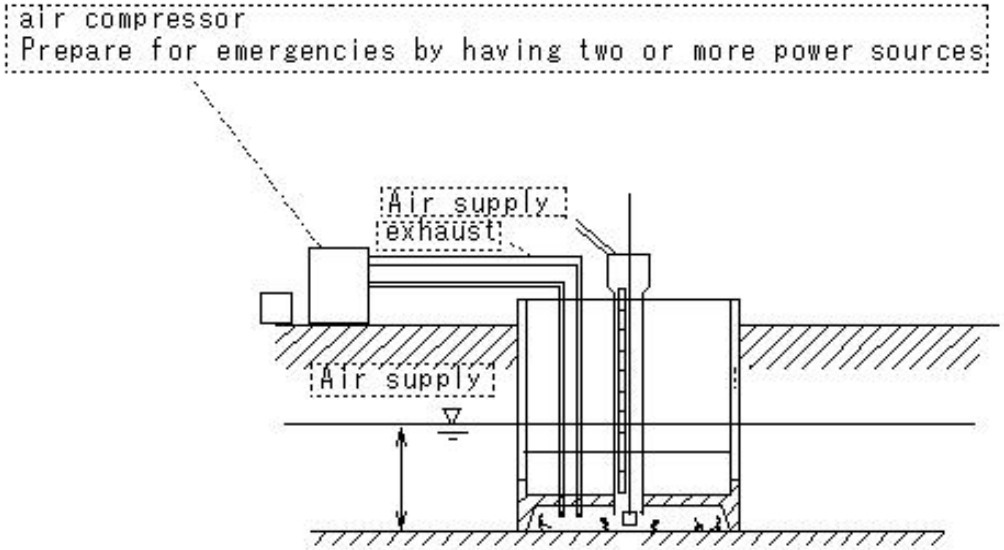
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

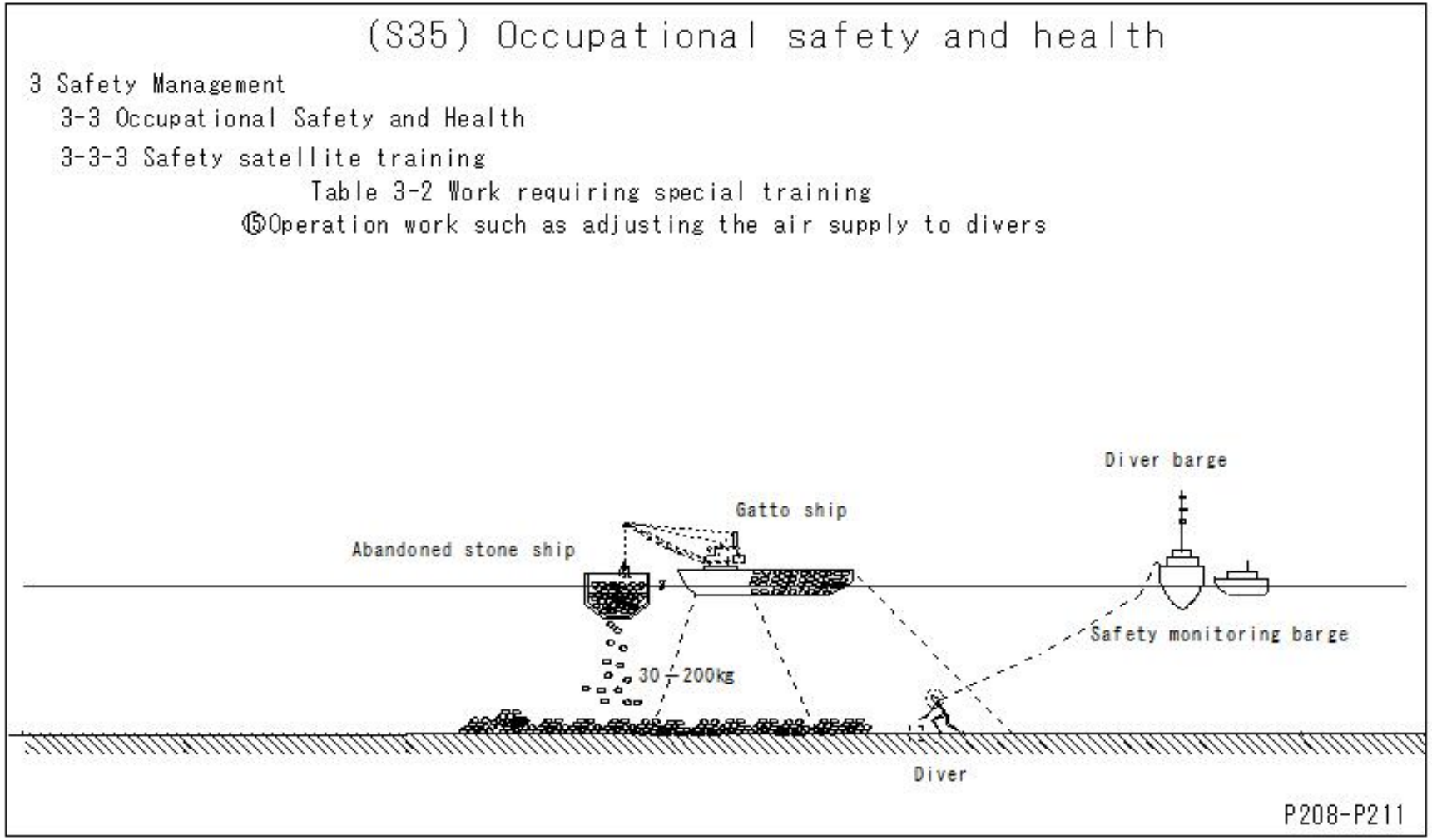
Table 3-2 Work requiring special training

⑭Operation work such as adjusting the air supply to high-pressure work rooms



F59
M262

(S35) Occupational safety and health



(S36) Occupational safety and health

(S36) Occupational safety and health

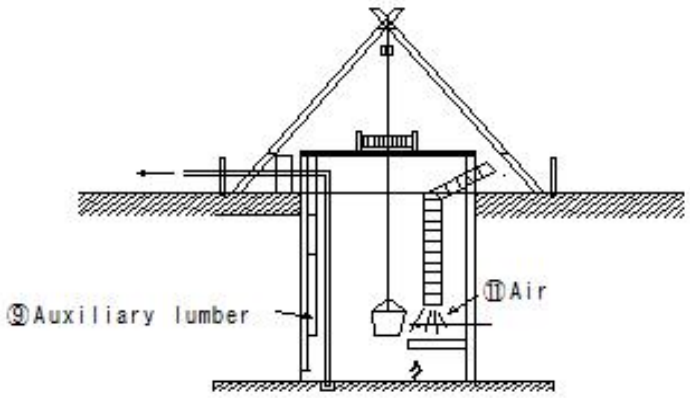
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑯Work related to dangerous work involving oxygen deficiency



F43

(S37) Occupational safety and health

(S37) Occupational safety and health

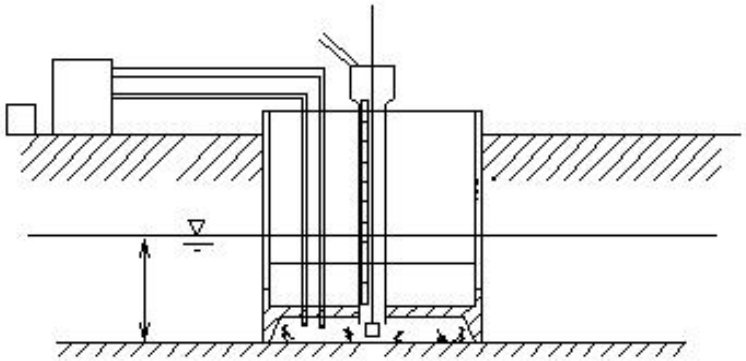
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑦Work related to work inside high-pressure rooms



S15
F59
M262

(S38) Occupational safety and health

(S38) Occupational safety and health

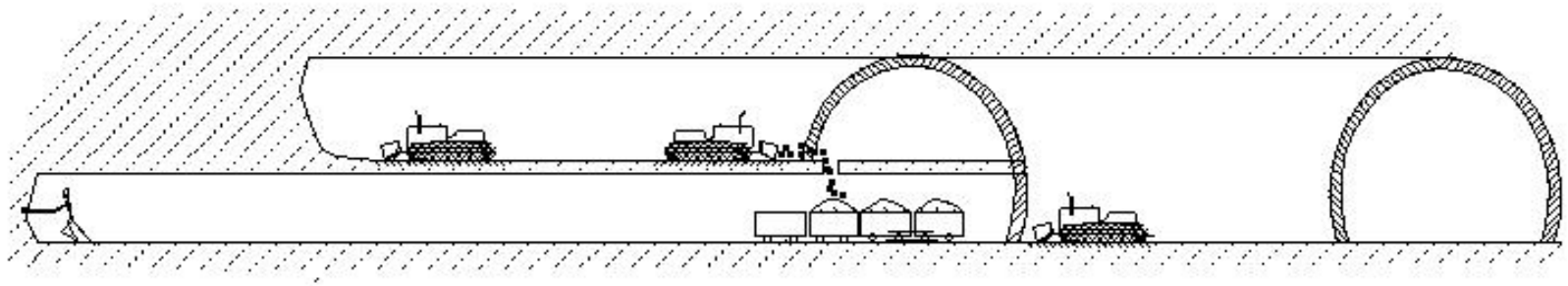
3 Safety Management

3-3 Occupational Safety and Health

3-3-3 Safety satellite training

Table 3-2 Work requiring special training

⑱ Excavation work for tunnels, etc. or the transportation of waste materials associated with this Work related to pouring concrete for covering works, etc.
(Limited to work carried out inside tunnels, etc.)



T255
T45

(S39) Work restrictions

(S39) Work restrictions

3 Safety management

3-3 Occupational safety and health

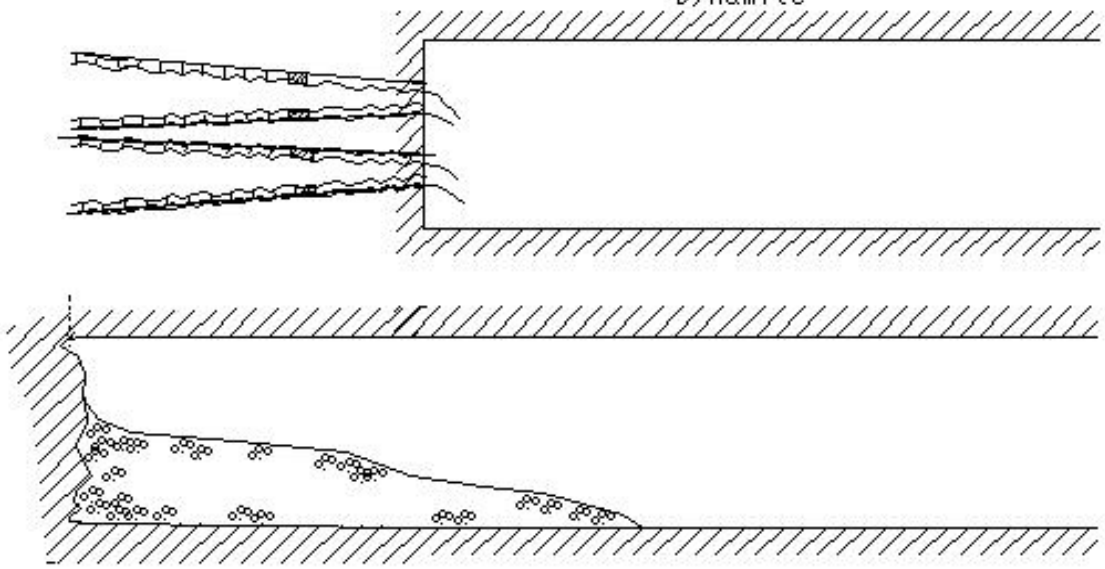
3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

①Work related to drilling, loading, wiring, ignition, and inspection and disposal of unexploded equipment

blasting

Dynamite



T232

(S40) Work restrictions

(S40) Work restrictions

3 Safety management

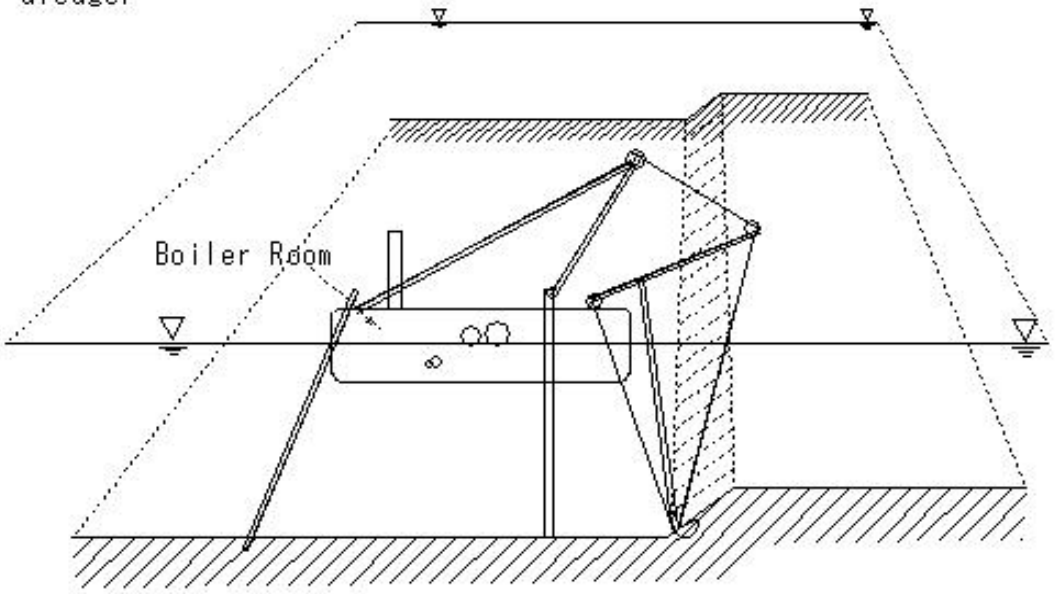
3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

②Work handling boilers (excluding small boilers)

dipper dredger



R432

(S41) Work restrictions

(S41) Work restrictions

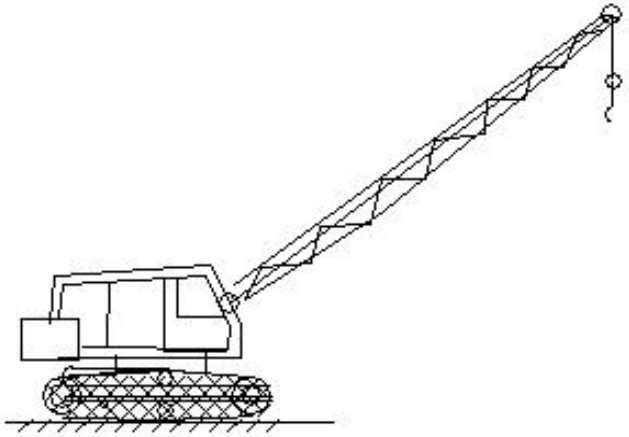
3 Safety management

3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

③Work operating cranes with a lifting capacity of 5t or more



(S42) Work restrictions

(S42) Work restrictions

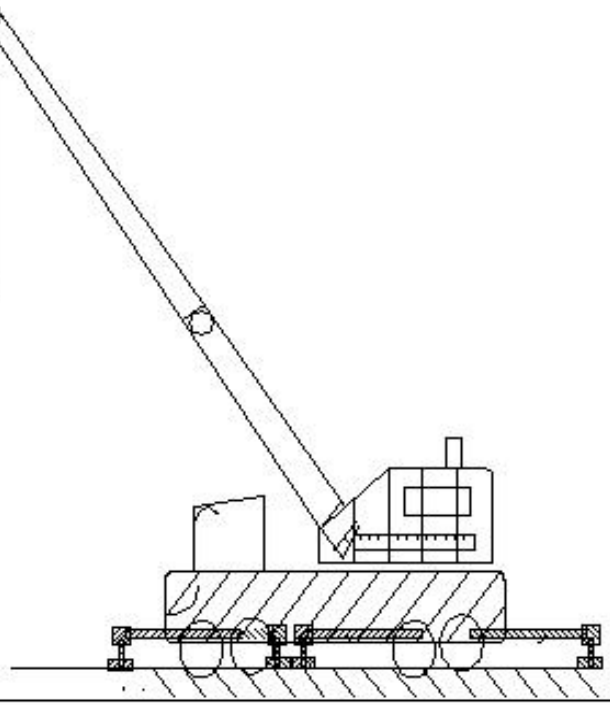
3 Safety management

3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

④Work operating mobile cranes with a lifting capacity of 5t or more



M138

B111

(S43) Work restrictions

(S43) Work restrictions

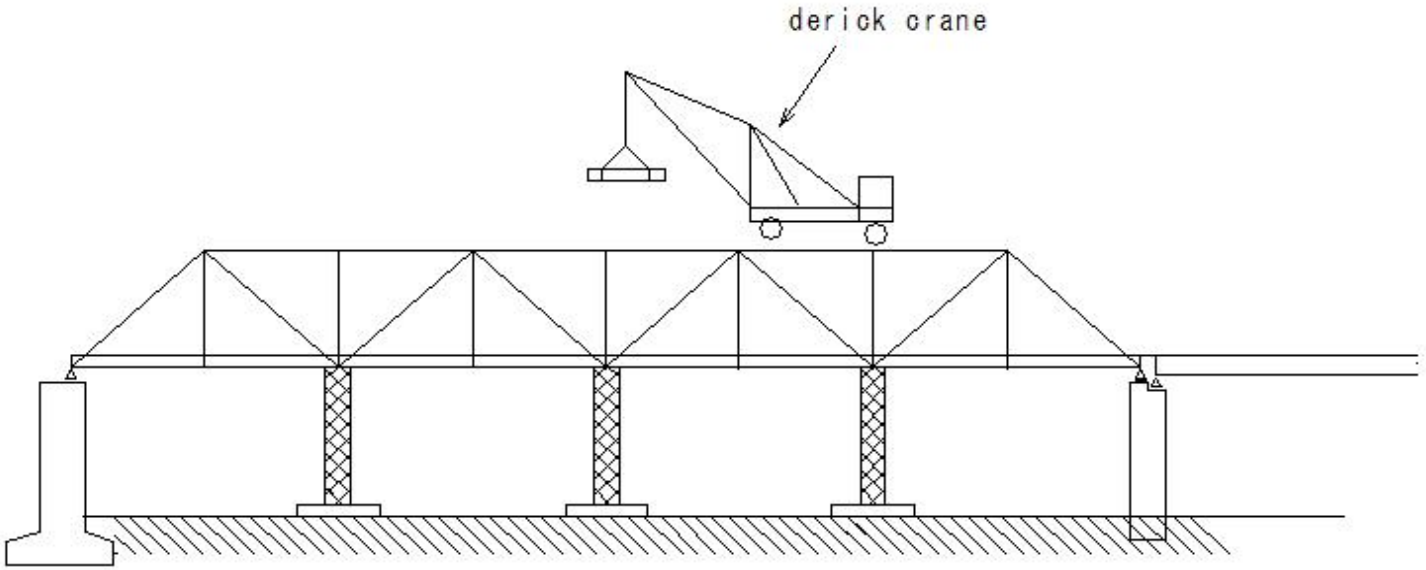
3 Safety management

3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

⑤Work operating derricks with a lifting capacity of 5t or more



B417
M49

(S44) Work restrictions

(S44) Work restrictions

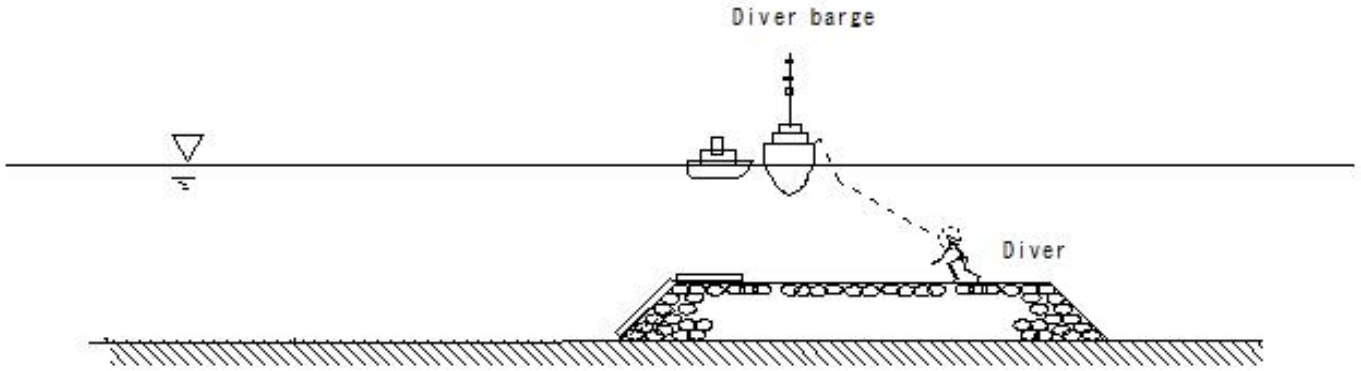
3 Safety management

3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

Ⓑ Underwater work using a diving device and receiving air from an air compressor, etc.



(S45) Work restrictions

(S45) Work restrictions

3 Safety management

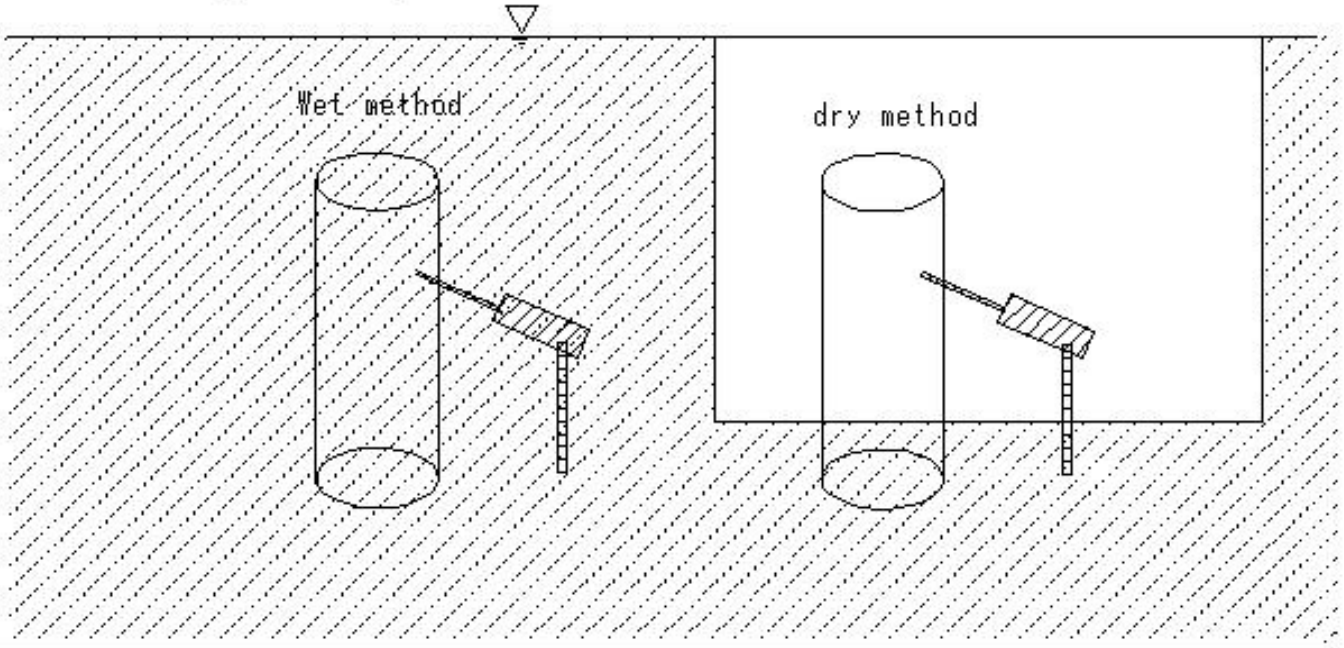
3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

⑦Work welding, cutting, or heating metals using flammable gases, etc.

underwater gas cutting



(S46) Work restrictions

(S46) Work restrictions

3 Safety management

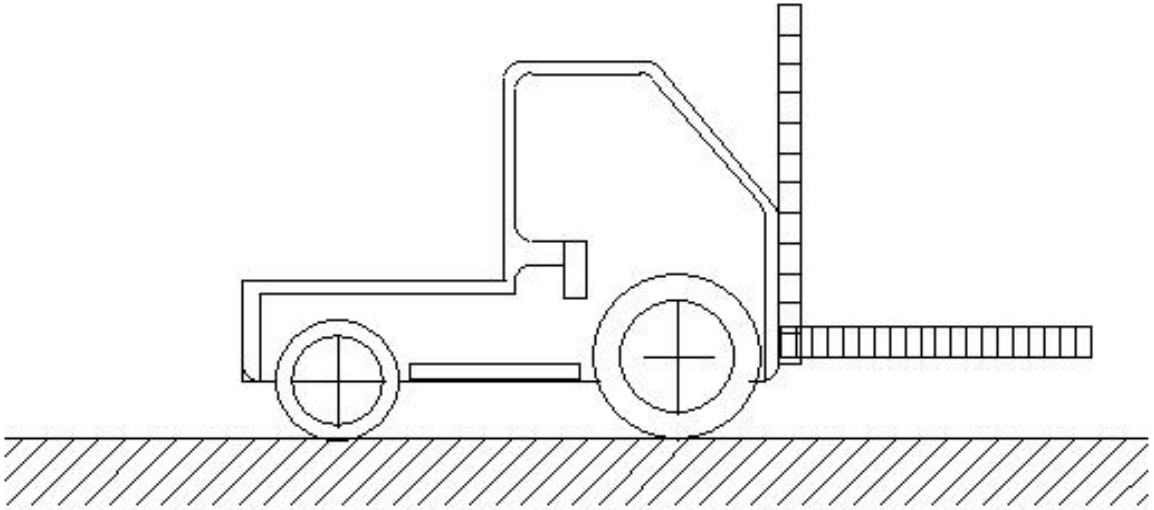
3-3 Occupational safety and health

3.3.4 Work restrictions

Table 3.3 List of work related to work restrictions

⑧Work operating forklifts with a maximum load of 1t or more

forklifts



S22

(S47) Work restrictions

(S47) Work restrictions

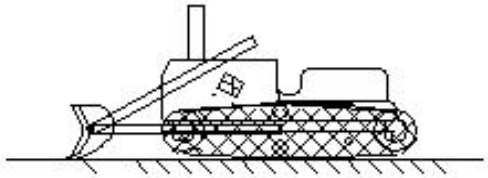
3 Safety management

3-3 Occupational safety and health

3.3.4 Work restrictions

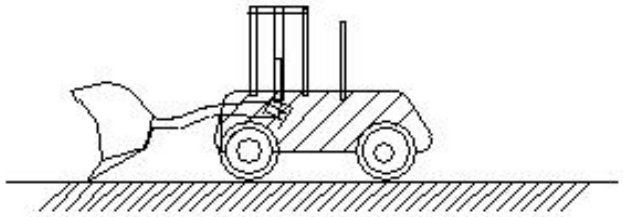
Table 3.3 List of work related to work restrictions

⑨Work operating self-propelled construction machinery with a machine weight of 3t or more



Crawler type tractor excavator

E291



tractor excavator

E292

M392

(S48) Work restrictions

(S48) Work restrictions

3 Safety management

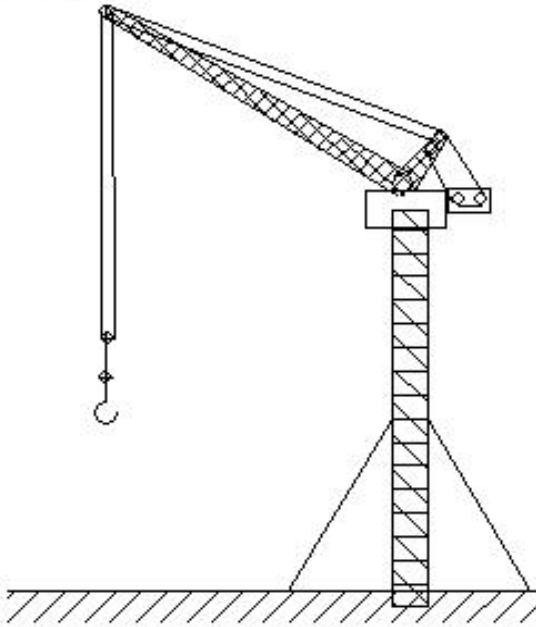
3-3 Occupational safety and health

3.3.4 Work restrictions truck crane

Table 3.3 List of work related to work restrictions

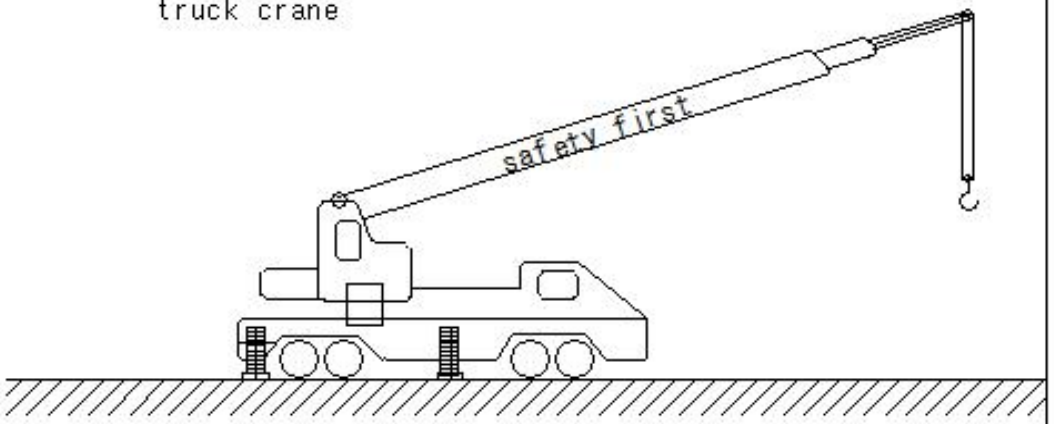
⑩Slinging work for cranes, mobile cranes, and derricks with a lifting capacity of 1t or more

tower crane



M391

truck crane



Outrigger
safety retention device

M393

(S49) Notification of Plans

(S49) Notification of Plans

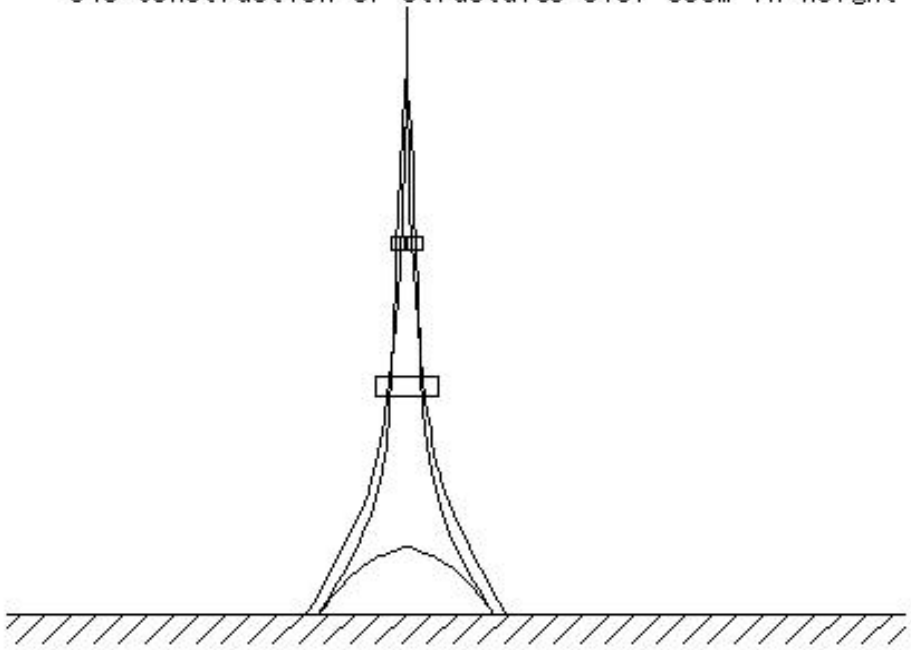
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

①Construction that must be notified to the Minister of Labor 30 days before construction begins

s49 Construction of structures over 300m in height



(S50) Notification of Plans

(S50) Notification of Plans

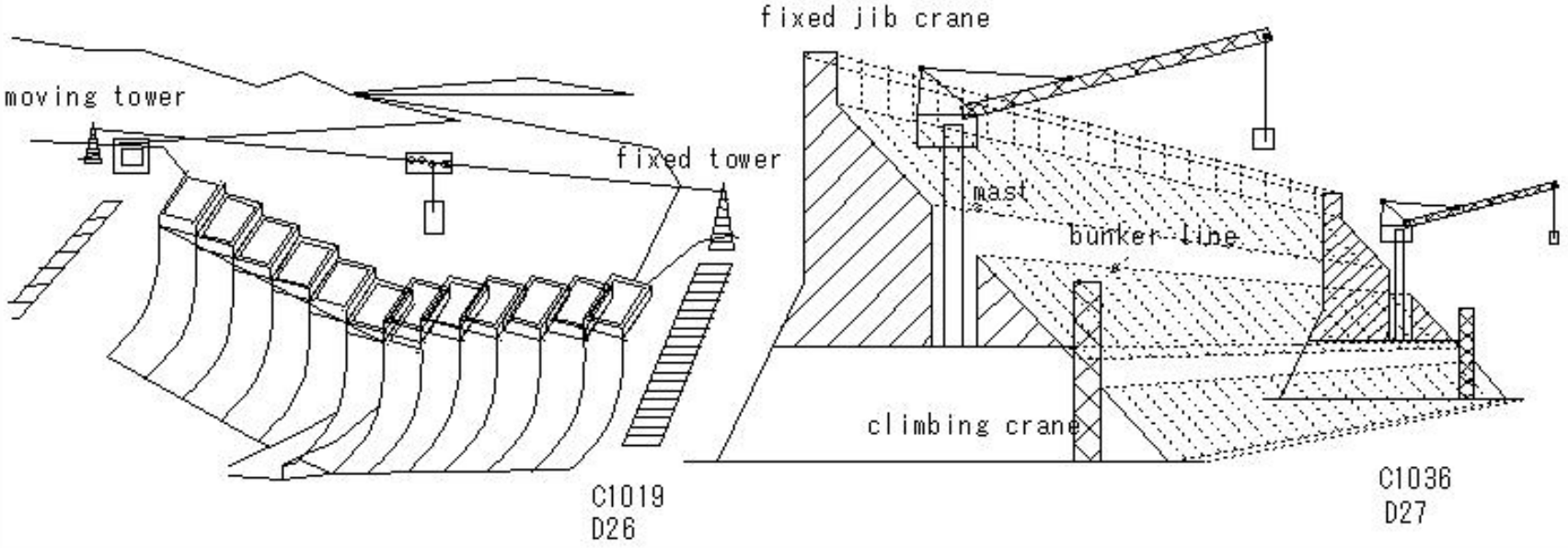
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

①Construction that must be notified to the Minister of Labor 30 days before construction begins

s50 Construction of dams with a height of 150m or more



(S51) Notification of Plans

(S51) Notification of Plans

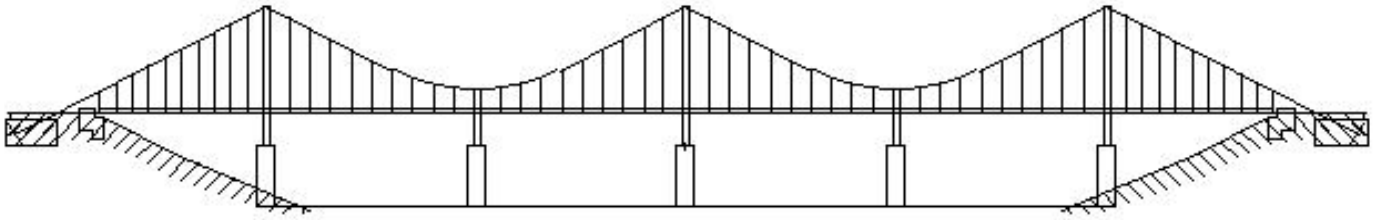
3 Safety Management

3-3 Occupational Safety and Health

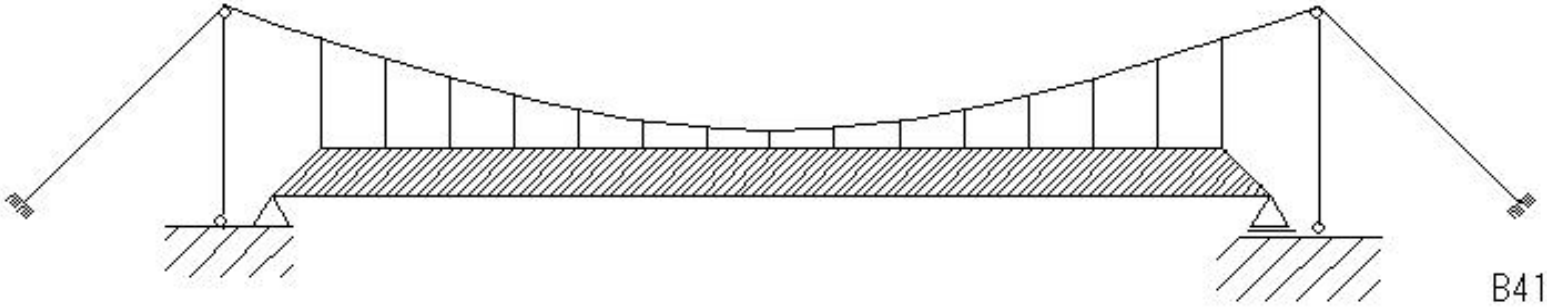
3.3.5 Notification of Plans

①Construction that must be notified to the Minister of Labor 30 days before construction begins

s51 Construction of bridges with a maximum span of 500m or more (suspension bridges 1000m) or more suspension bridge



B215



B419

(S52) Notification of Plans

(S52) Notification of Plans

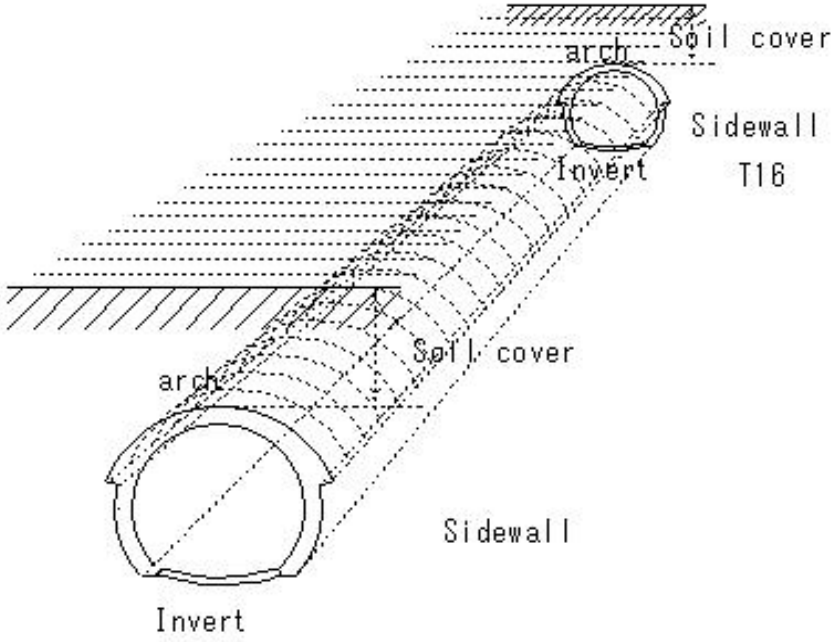
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

①Construction that must be notified to the Minister of Labor 30 days before construction begins

s52 Construction of tunnels over 3000m in length



T195

T16

(S53) Notification of Plans

(S53) Notification of Plans

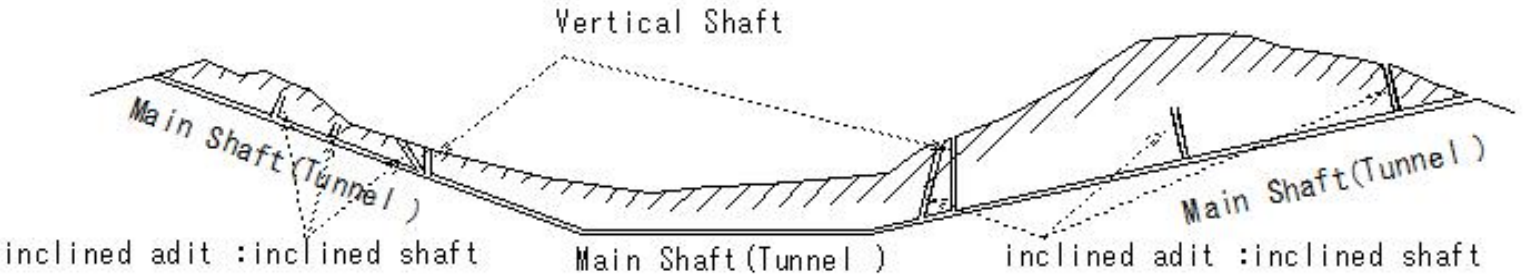
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

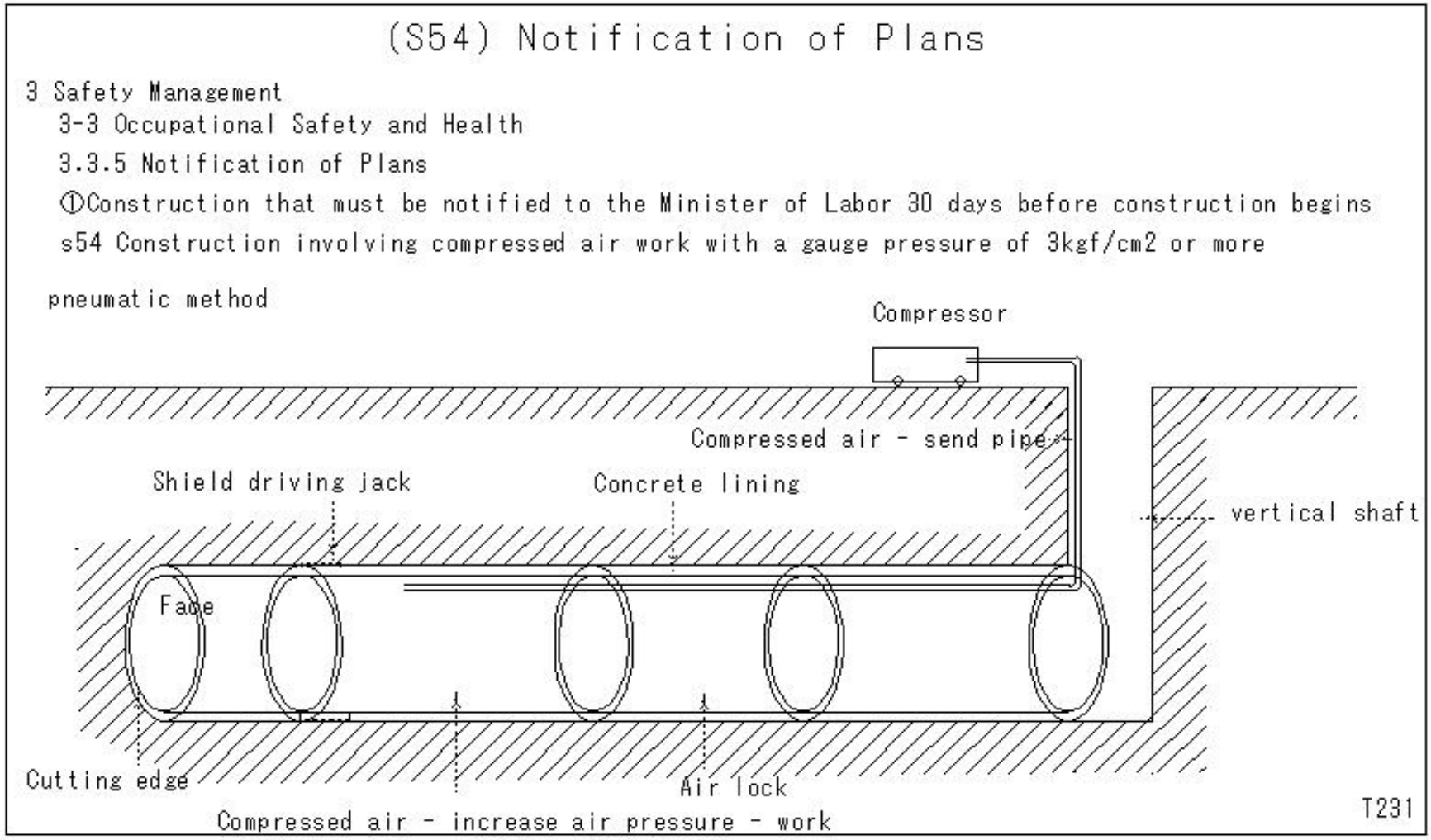
①Construction that must be notified to the Minister of Labor 30 days before construction begins

s53 Construction of tunnels over 1000m in length but less than 3000m
that involve excavating a shaft over 50m deep



T269

(S54) Notification of Plans



(S55) Notification of Plans

(S55) Notification of Plans

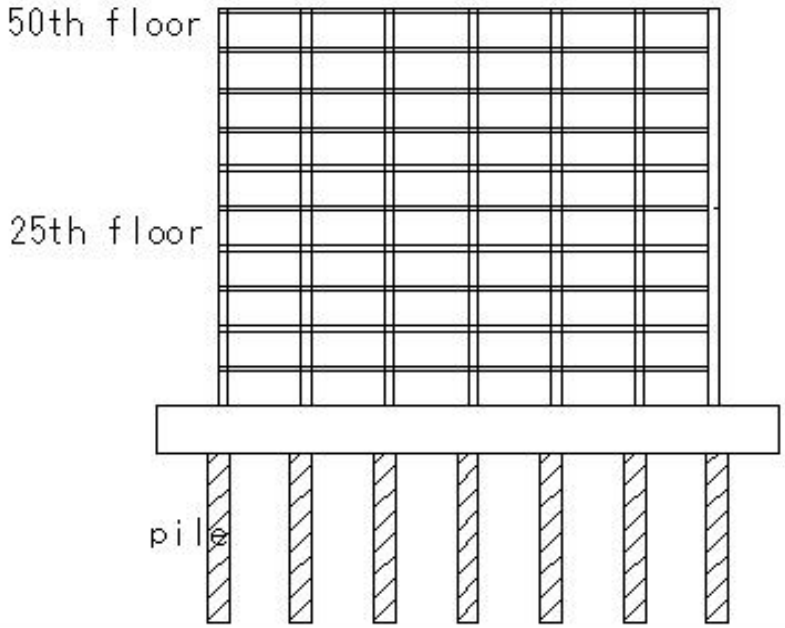
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

②Construction that must be notified to the Chief of the Labor Standards Inspection Office by 14 days before the start of construction

s55 Construction or remodeling of buildings or structures over 31m in height



C918

(S56) Notification of Plans

(S56) Notification of Plans

3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

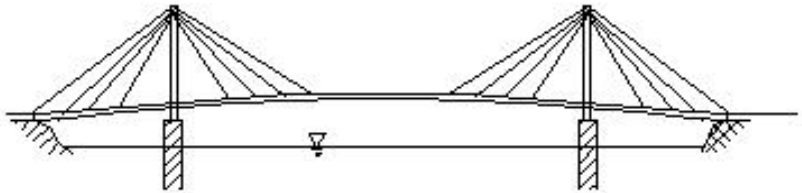
②Construction that must be notified to the Chief of the Labor Standards Inspection Office by 14 days before the start of construction

s56 Construction of bridges with a maximum span of 50m or more

Bridge erection(cantilever erection)

B167

cable-stayed bridge



B174

(S57) Notification of Plans

(S57) Notification of Plans

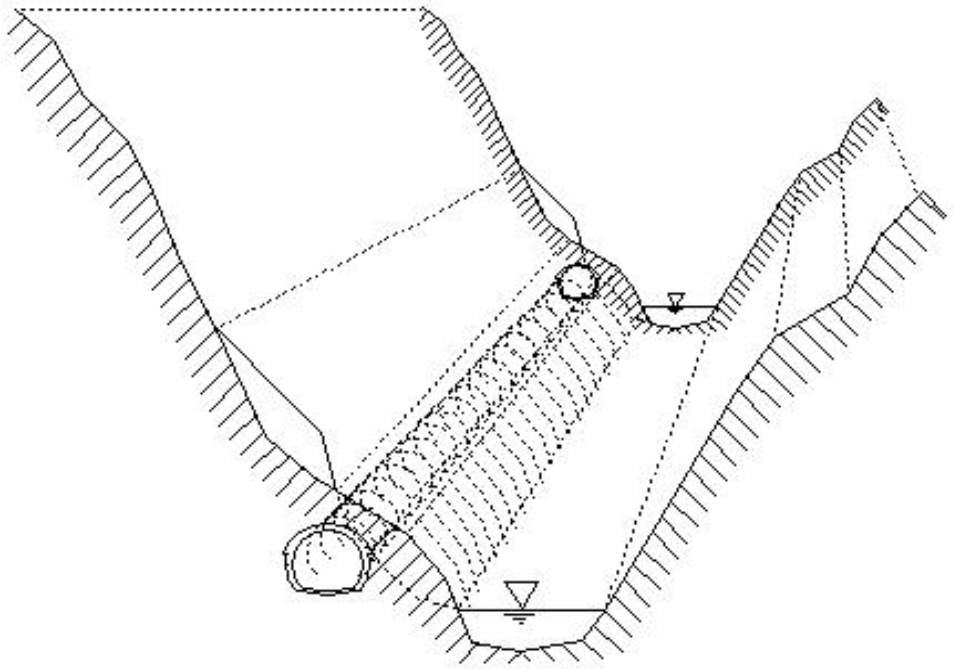
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

②Construction that must be notified to the Chief of the Labor Standards Inspection Office by 14 days before the start of construction

s57 Tunnel construction



T21

(S58) Notification of Plans

(S58) Notification of Plans

3 Safety Management

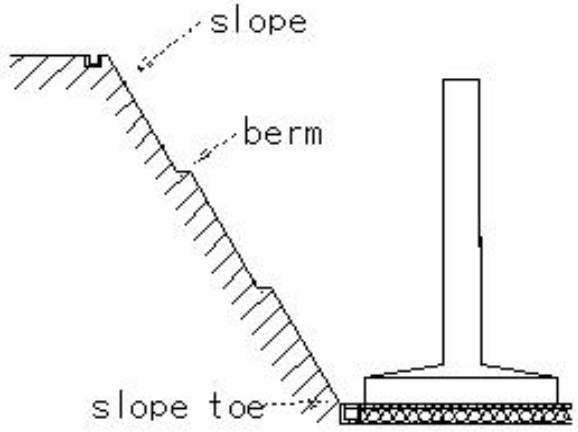
3-3 Occupational Safety and Health

3.3.5 Notification of Plans

②Construction that must be notified to the Chief of the Labor Standards Inspection Office by 14 days before the start of construction

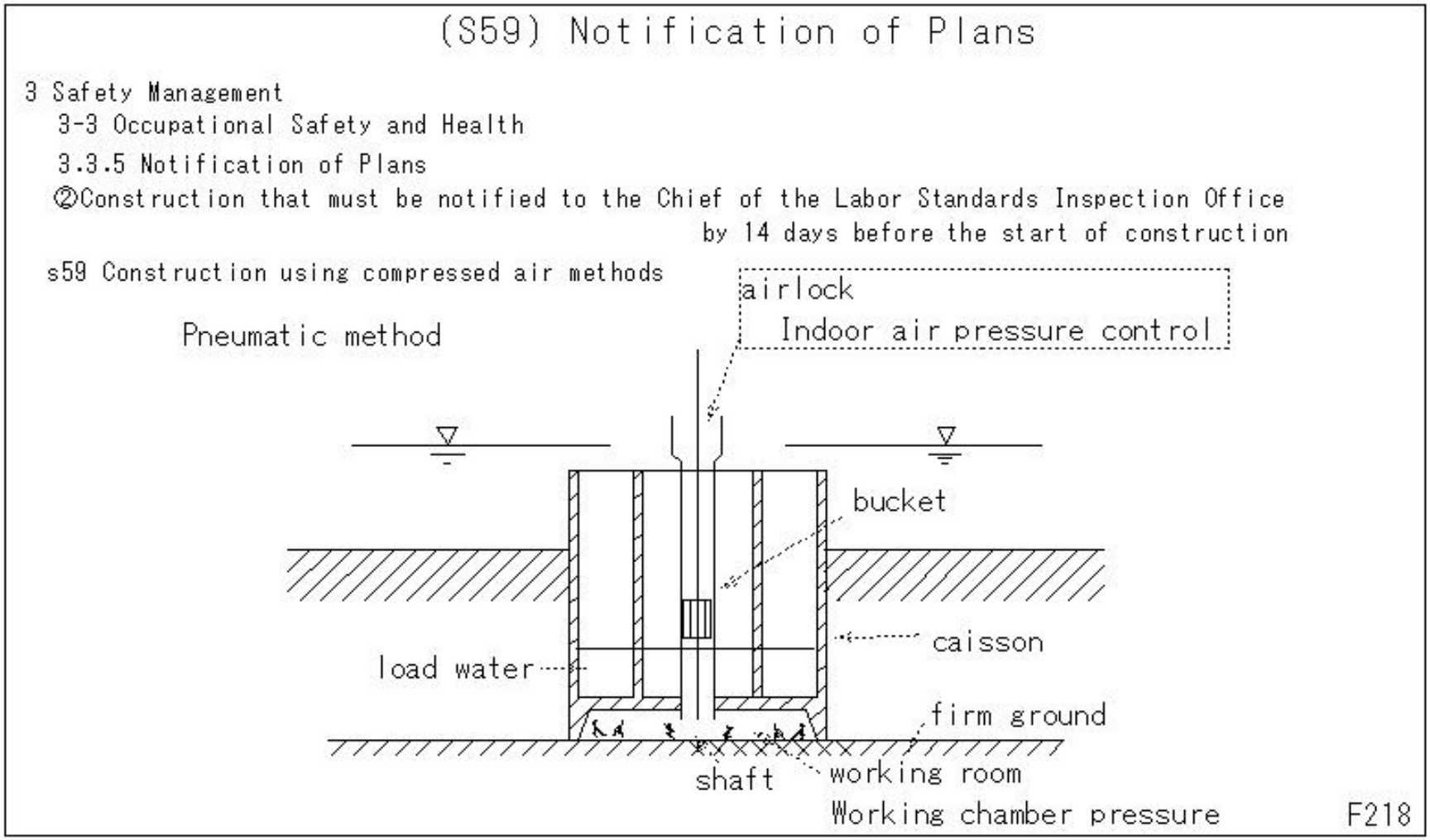
s58 Excavation of natural ground with a height of 10m or more

・Provide berms every 5-10m in height



E405

(S59) Notification of Plans



(S60) Notification of Plans

(S60) Notification of Plans

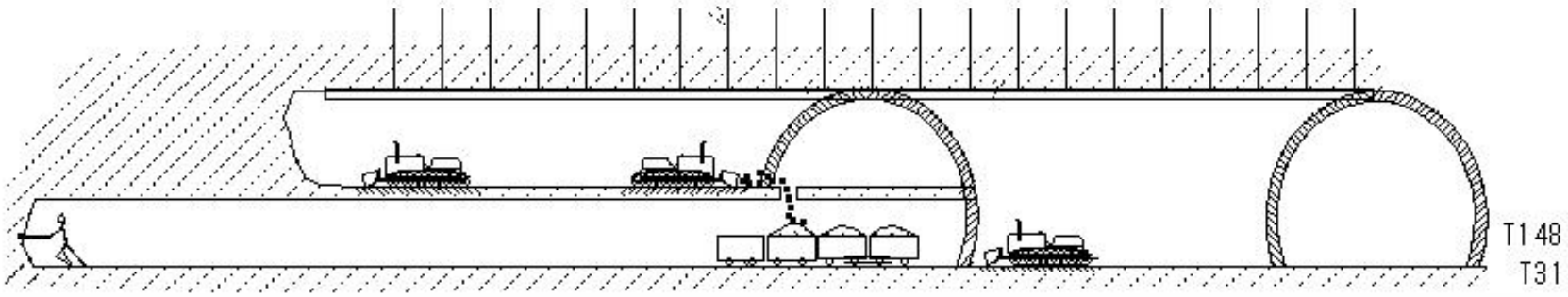
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

③Construction to be notified to the Chief of the Labor Standards Inspection Office before construction begins

s60 Installation of track devices



(S61) Notification of Plans

(S61) Notification of Plans

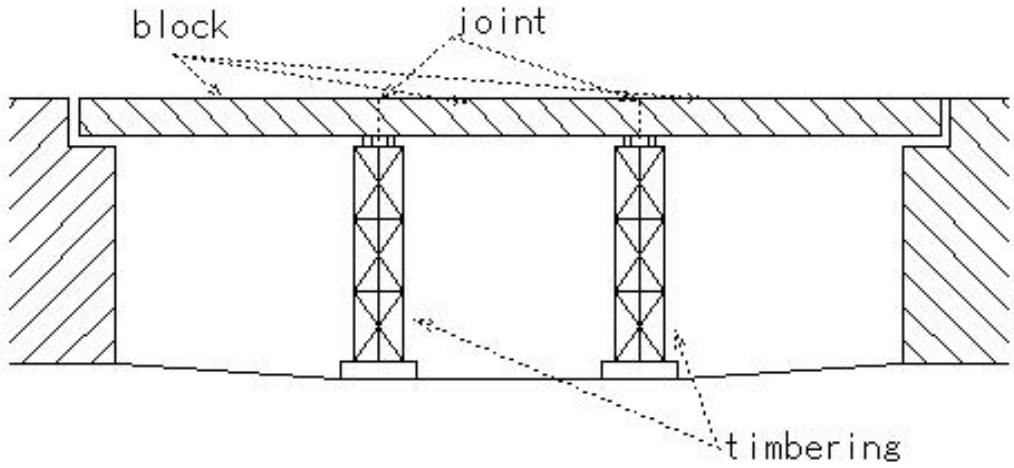
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

③Construction to be notified to the Chief of the Labor Standards Inspection Office before construction begins

s61 Formwork support (for structures with pillars 3.5m or higher in height)



B190

(S62) Notification of Plans

(S62) Notification of Plans

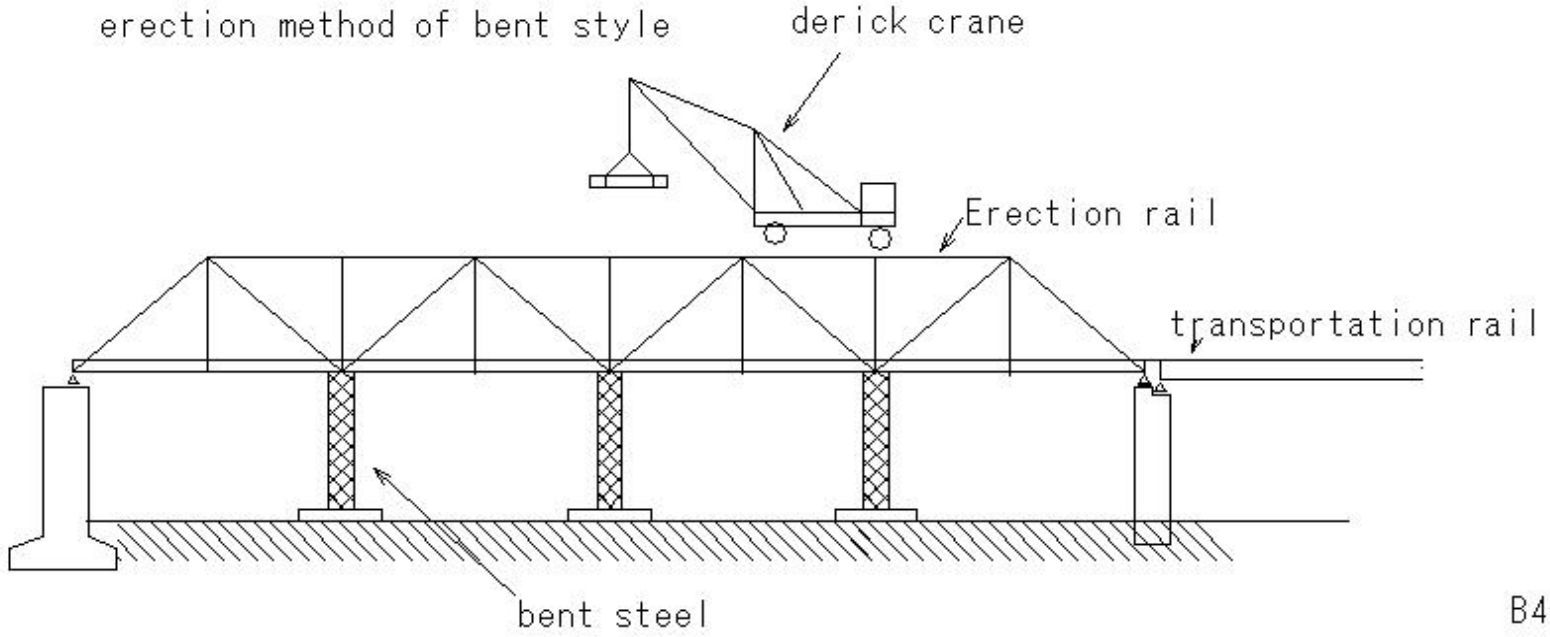
3 Safety Management

3-3 Occupational Safety and Health

3.3.5 Notification of Plans

③Construction to be notified to the Chief of the Labor Standards Inspection Office before construction begins

s62 Erected passage (passageway with height and length of 10m or more)



B417

(S63) Notification of Plans

(S63) Notification of Plans

3 Safety Management

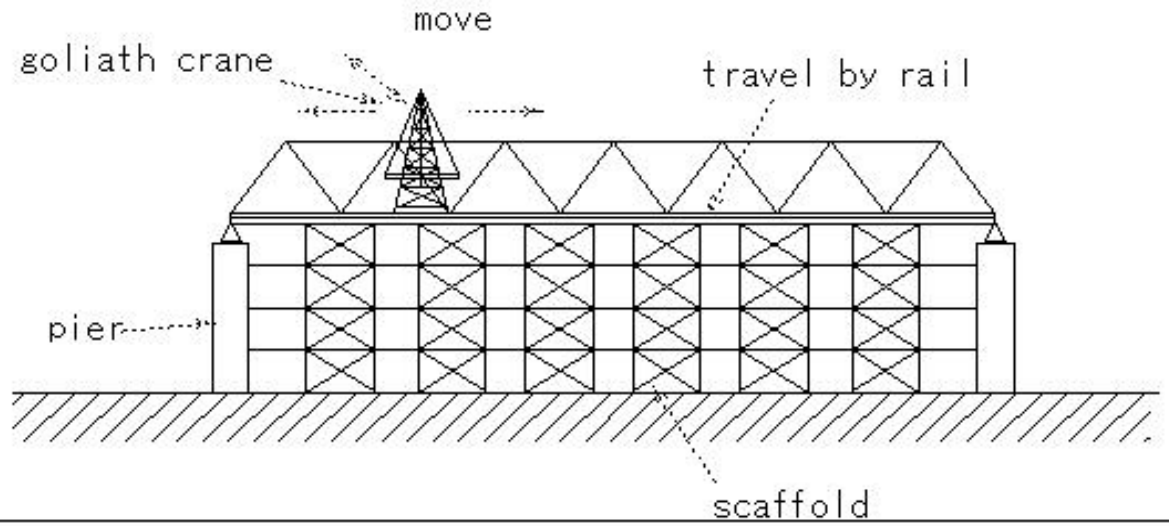
3-3 Occupational Safety and Health

3.3.5 Notification of Plans

③Construction to be notified to the Chief of the Labor Standards Inspection Office before construction begins

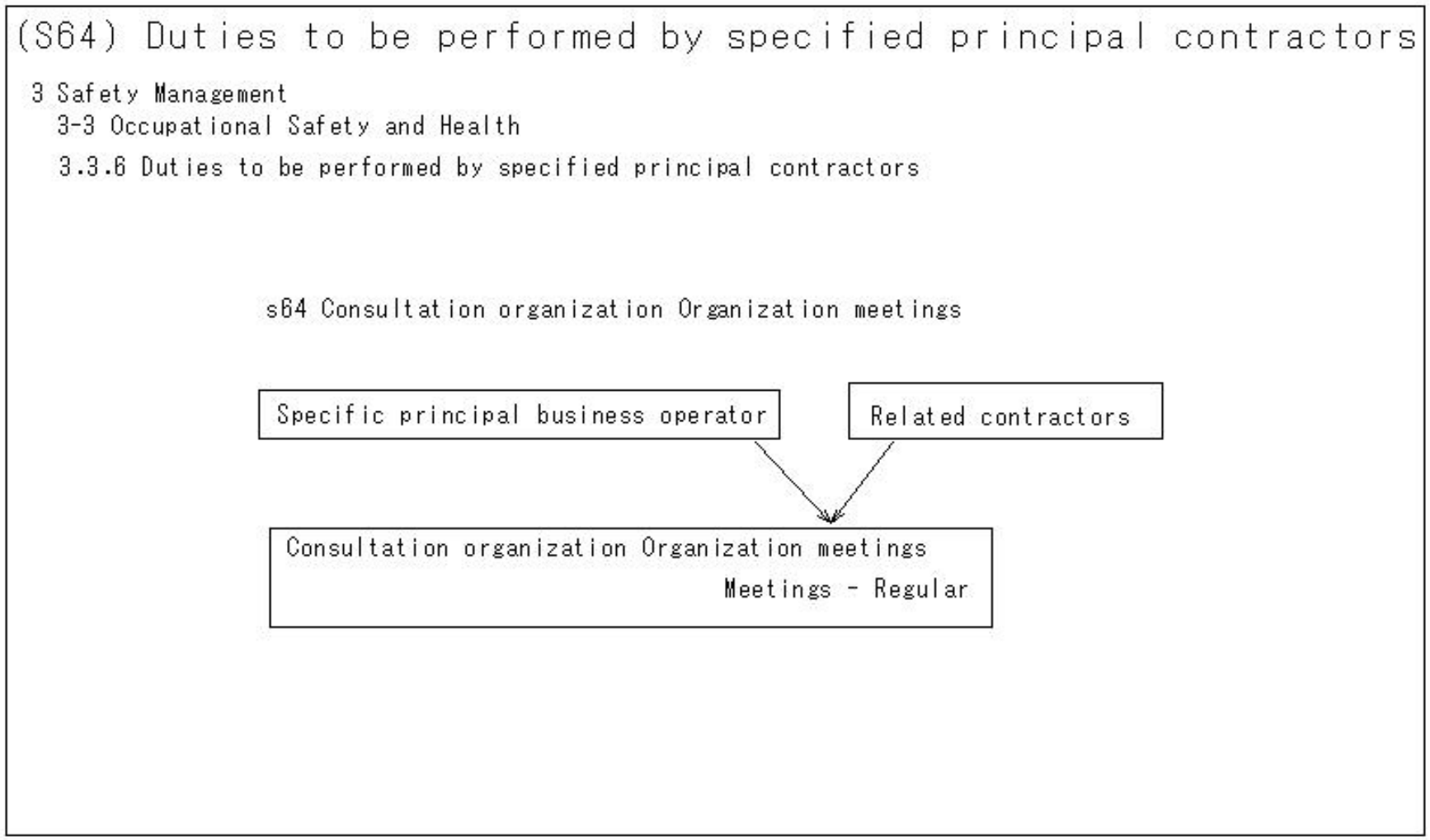
s63 Scaffolding (hanging scaffolding, overhanging scaffolding, scaffolding with height of 10m or more)

staging goliath erection

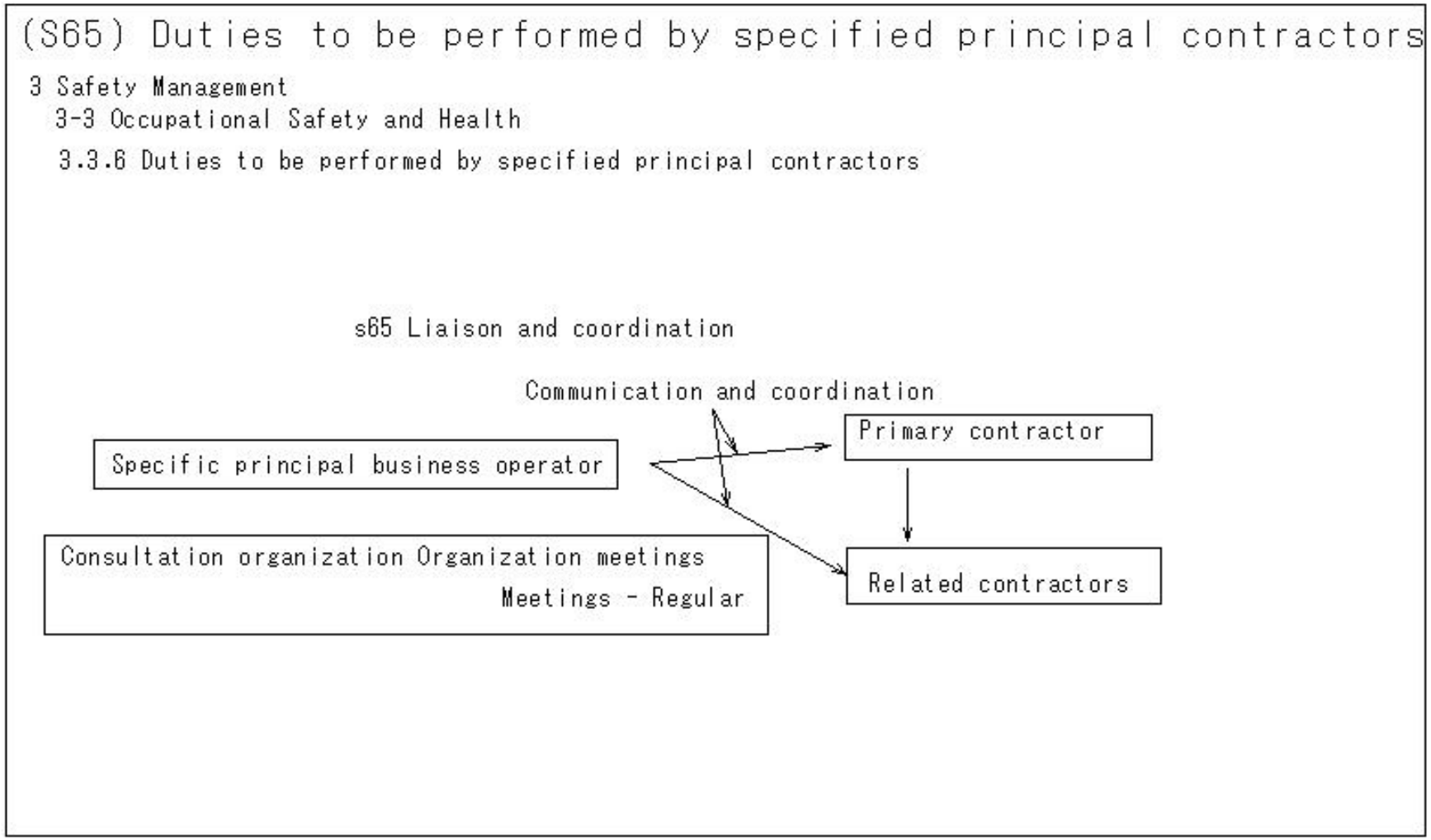


B201

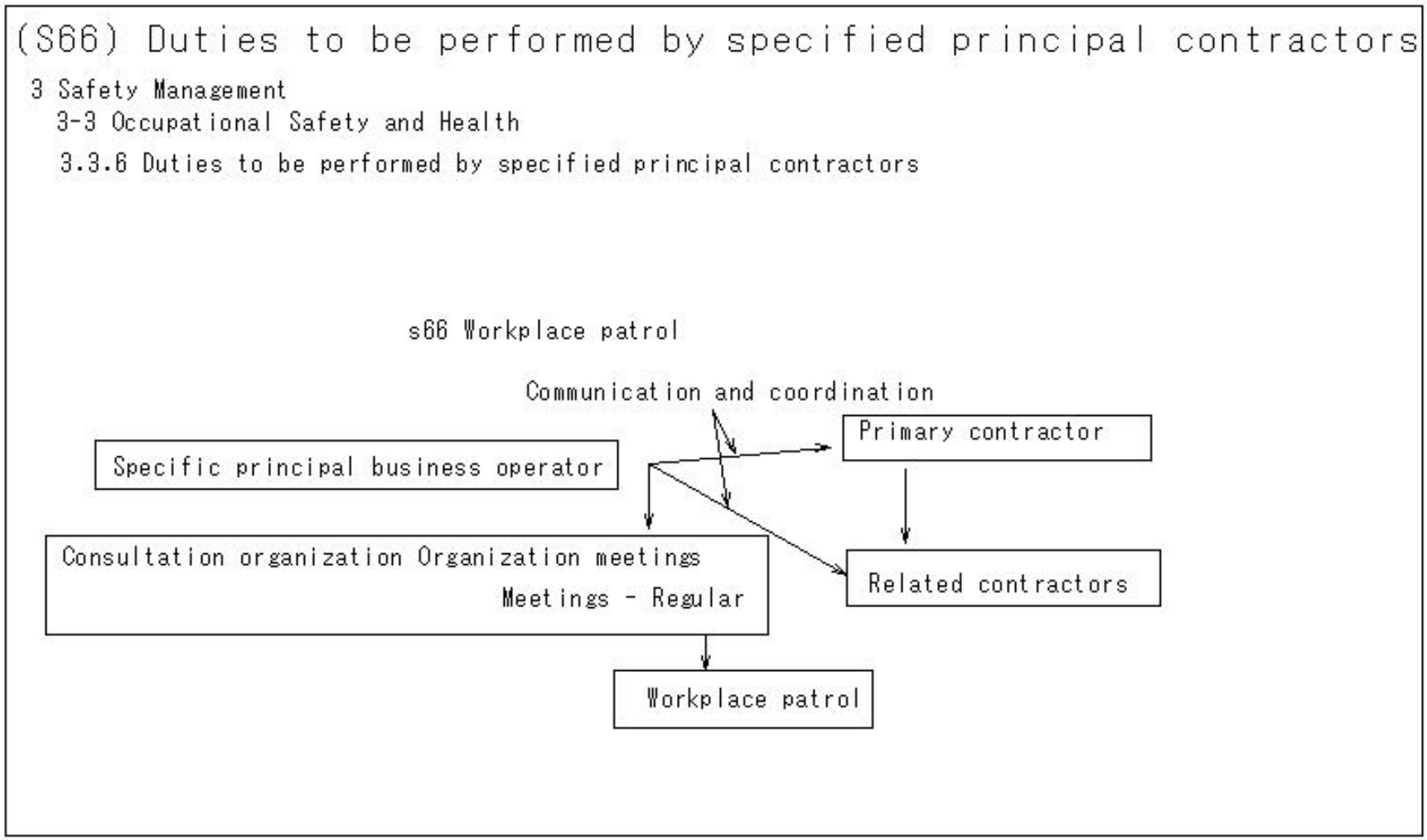
(S64) Duties to be performed by specified principal contractors



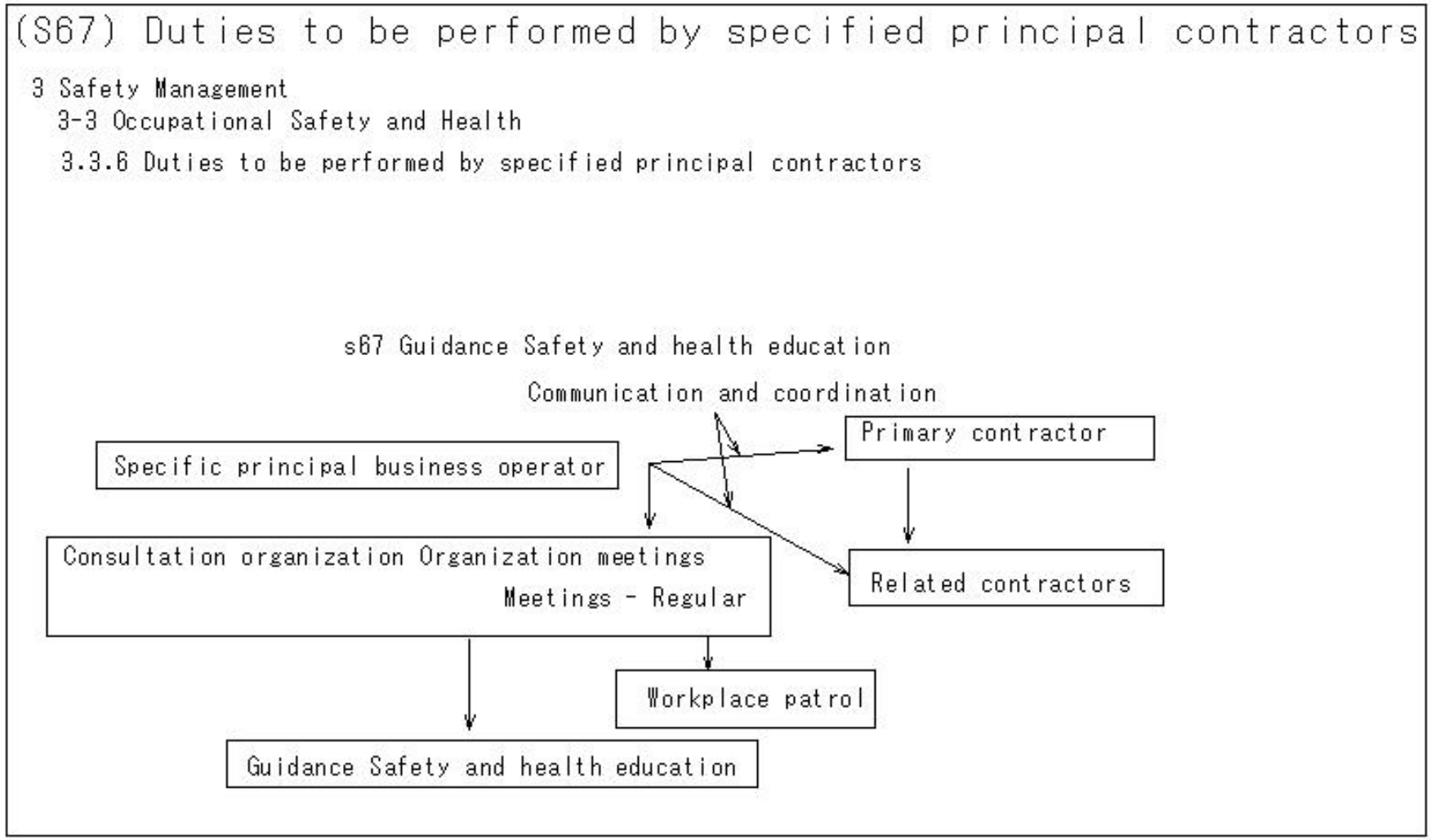
(S65) Duties to be performed by specified principal contractors



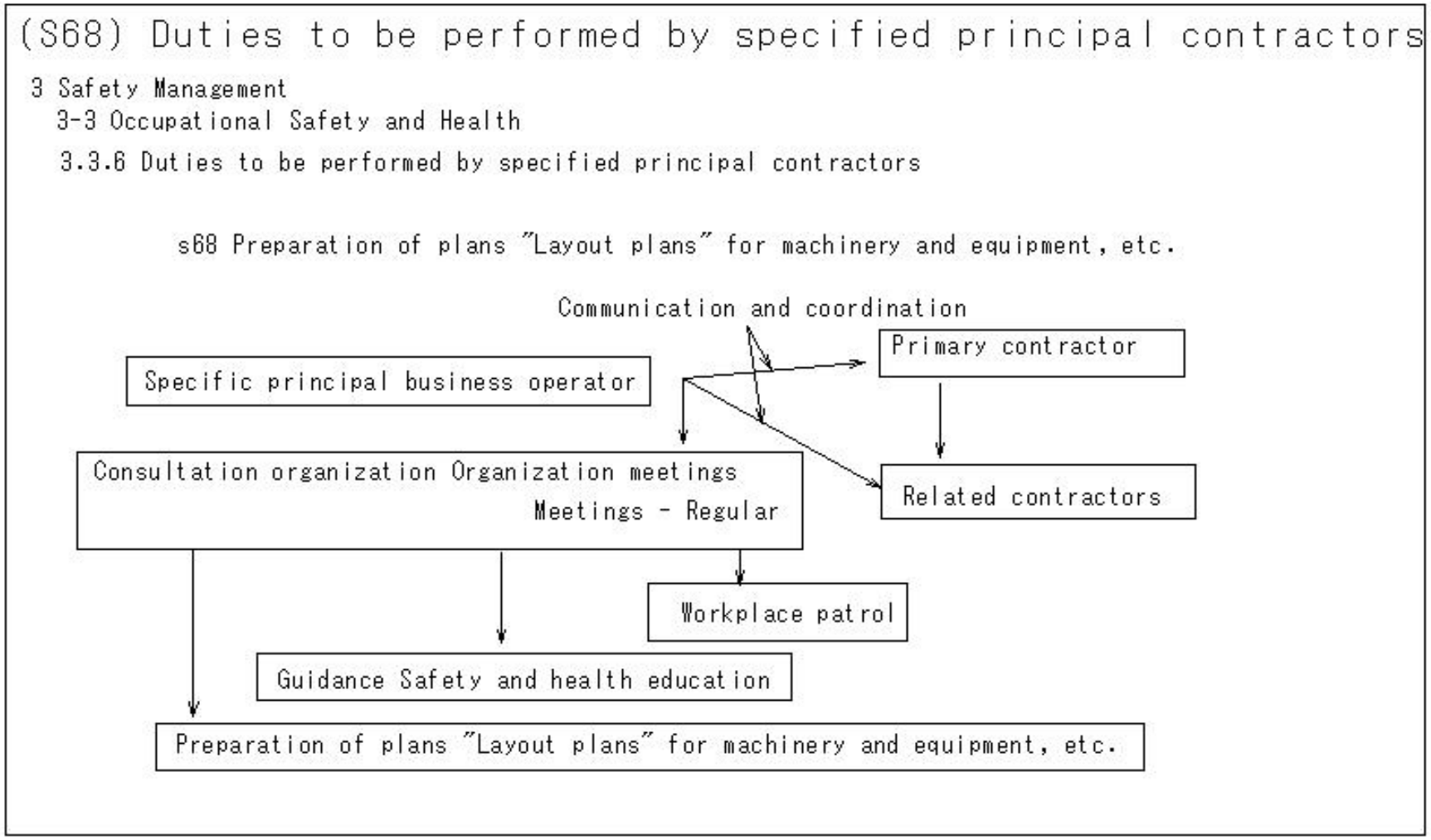
(S66) Duties to be performed by specified principal contractors



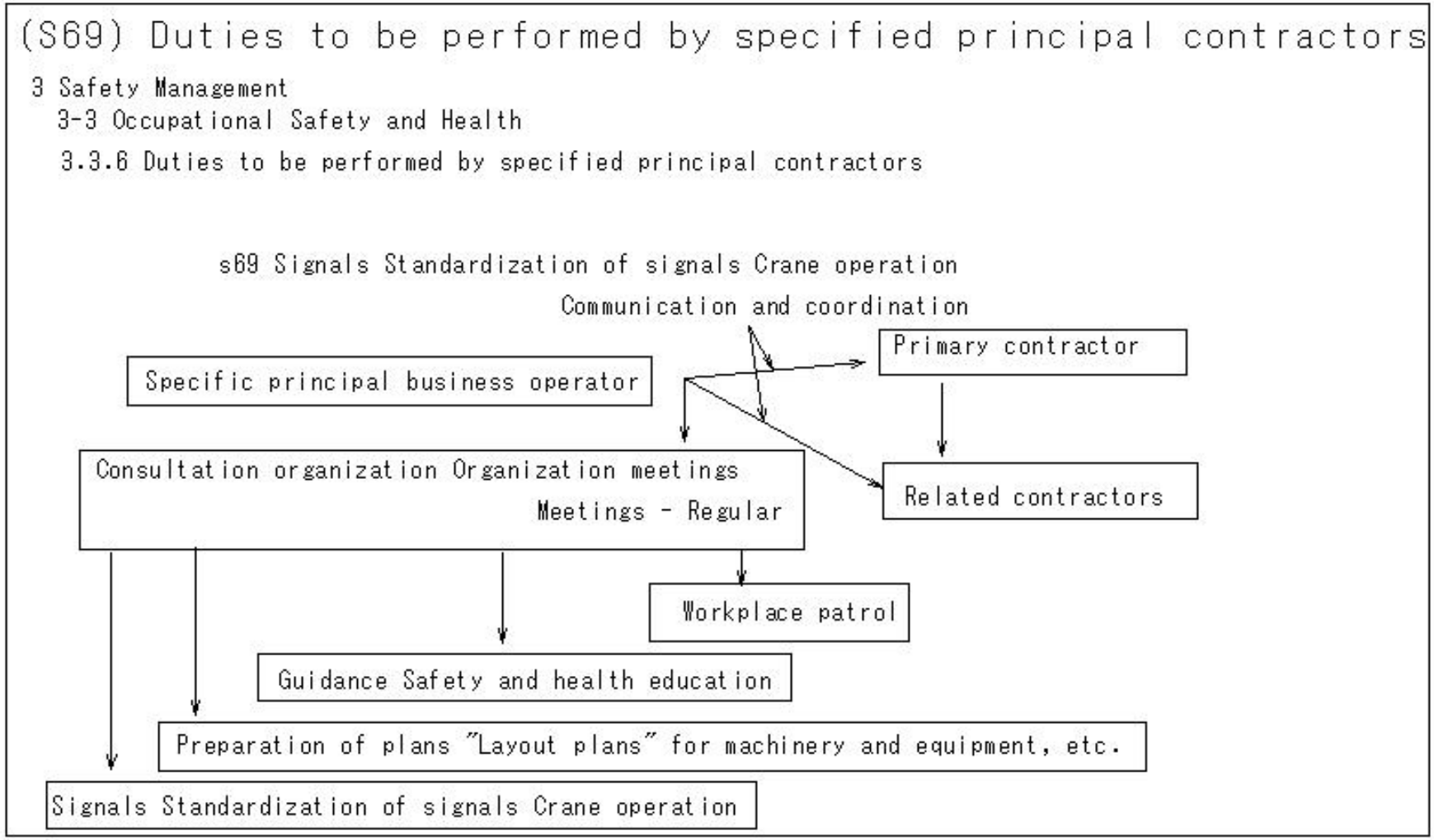
(S67) Duties to be performed by specified principal contractors



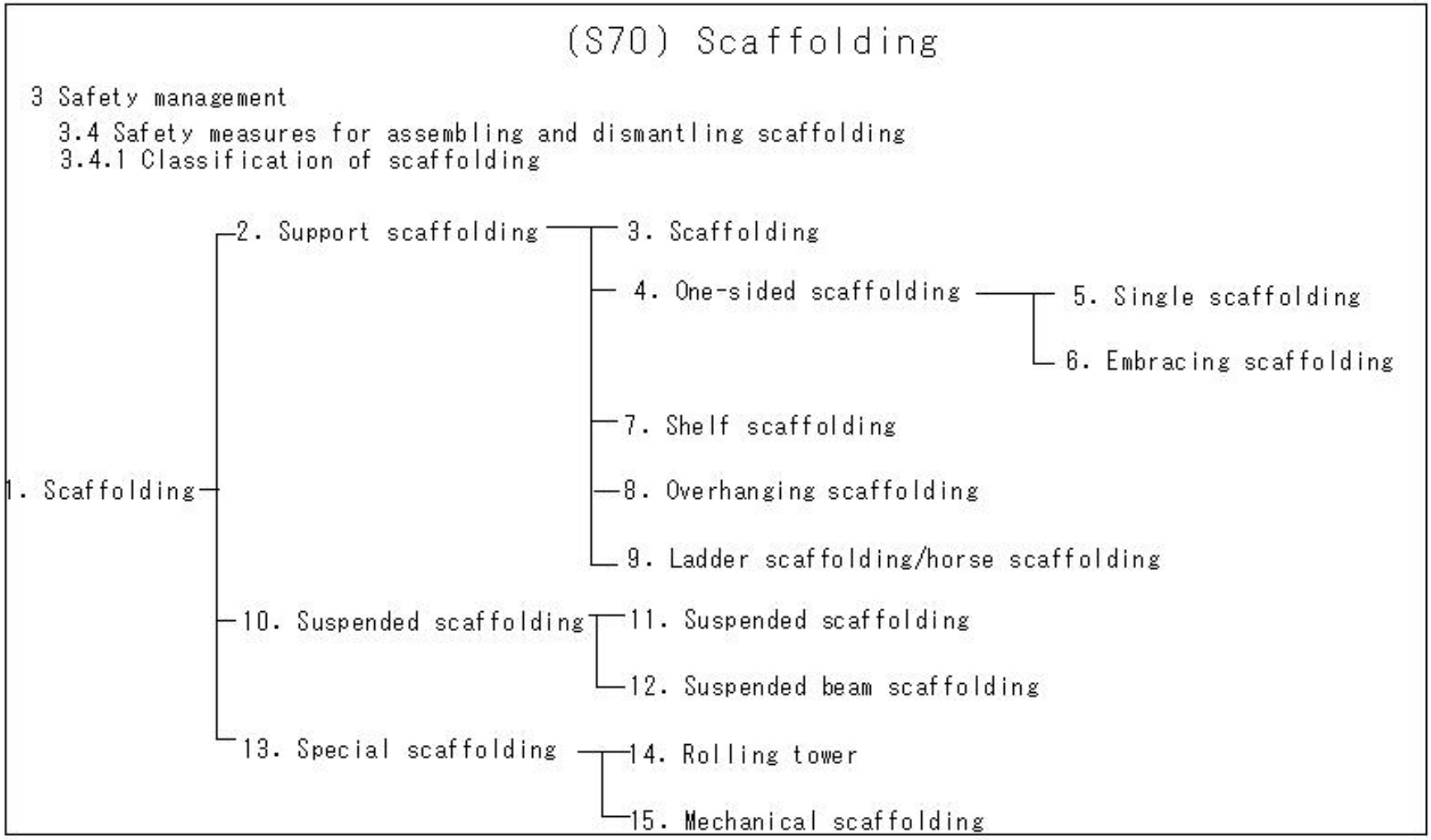
(S68) Duties to be performed by specified principal contractors



(S69) Duties to be performed by specified principal contractors



(S70) Scaffolding



(S71) Scaffolding

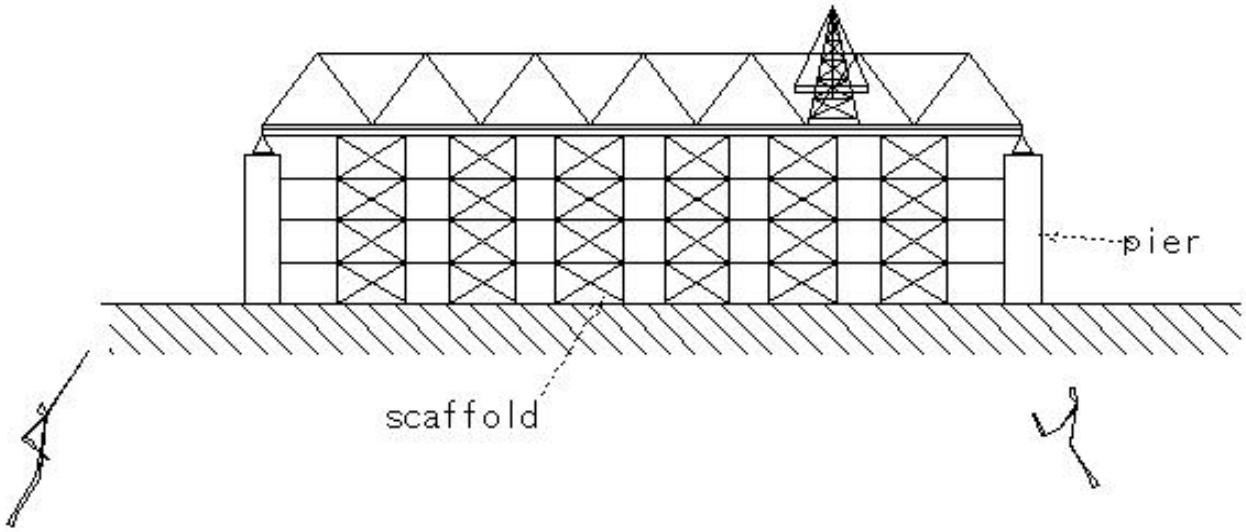
(S71) Scaffolding

3 Safety management

3.4 Safety measures for assembling and dismantling scaffolding

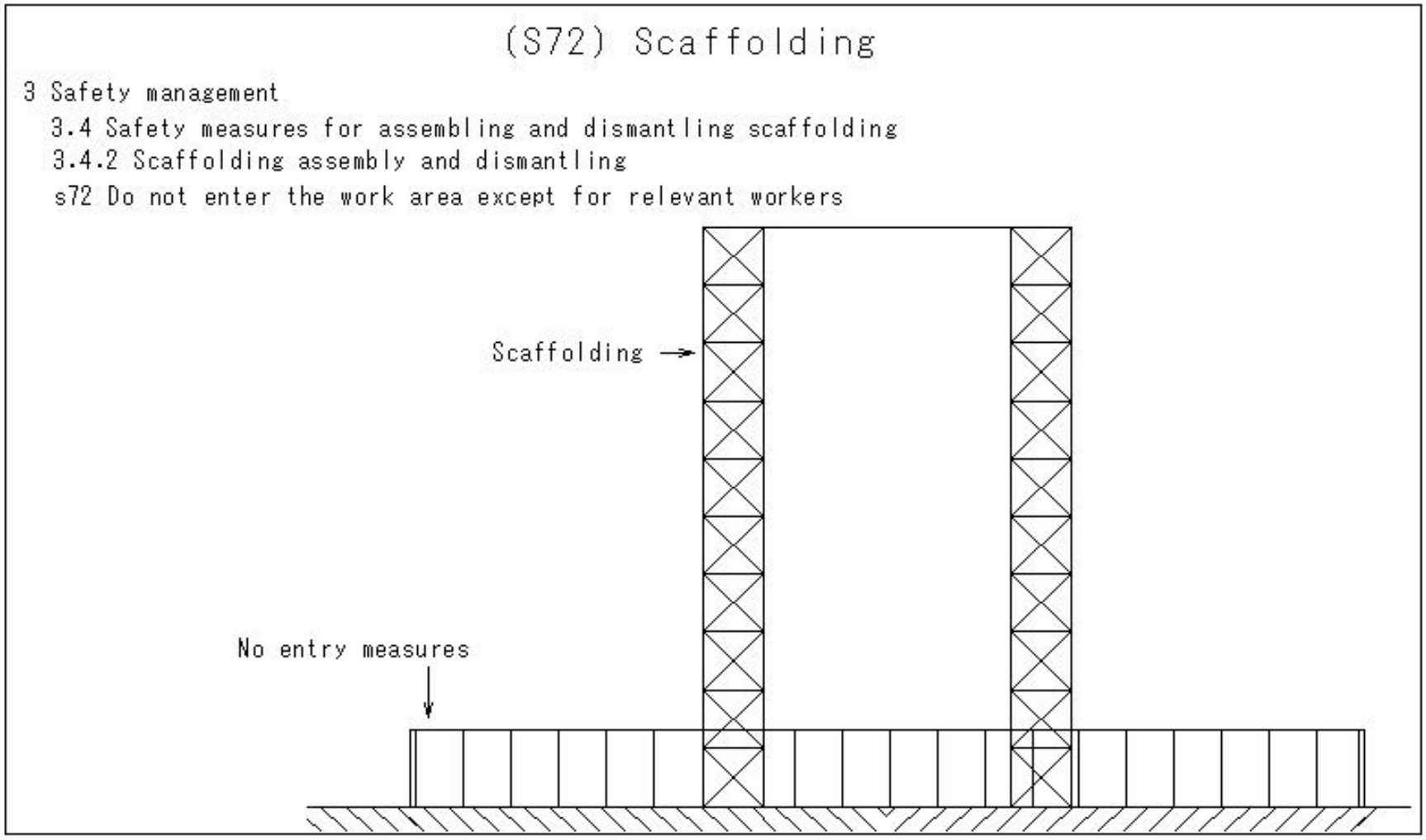
3.4.2 Scaffolding assembly and dismantling

s71 Inform all workers involved in the work content and procedures

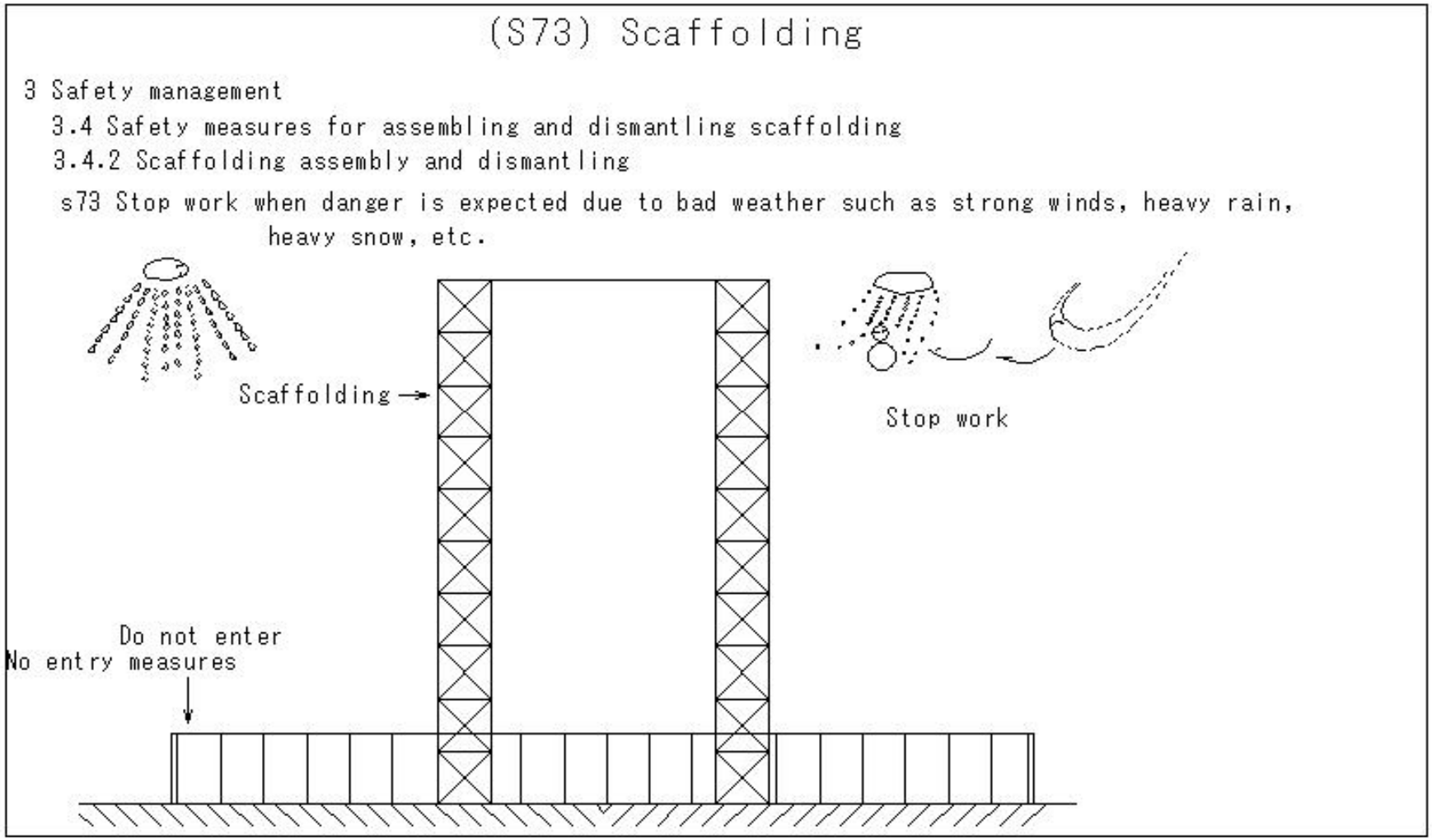


B201

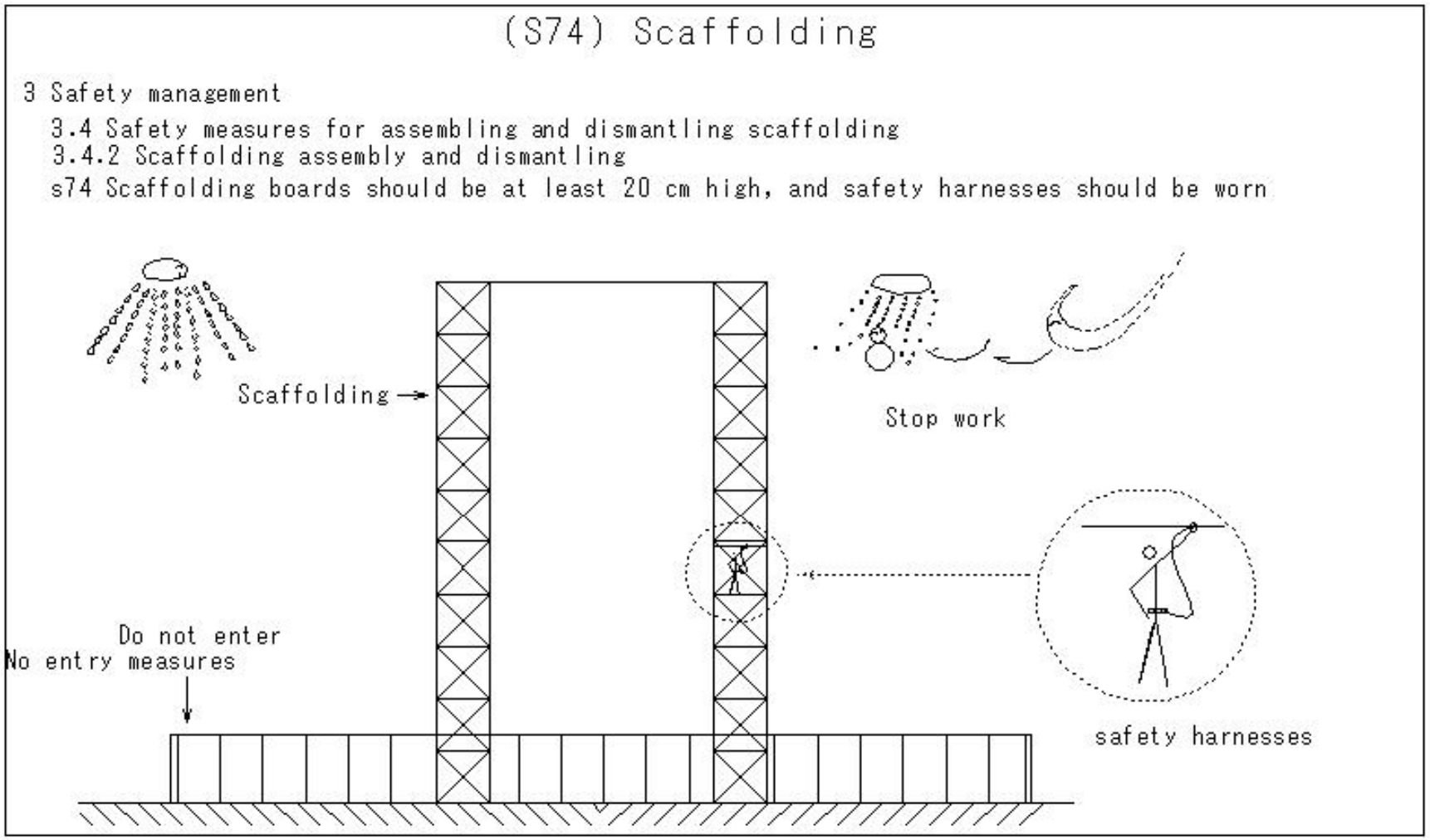
(S72) Scaffolding



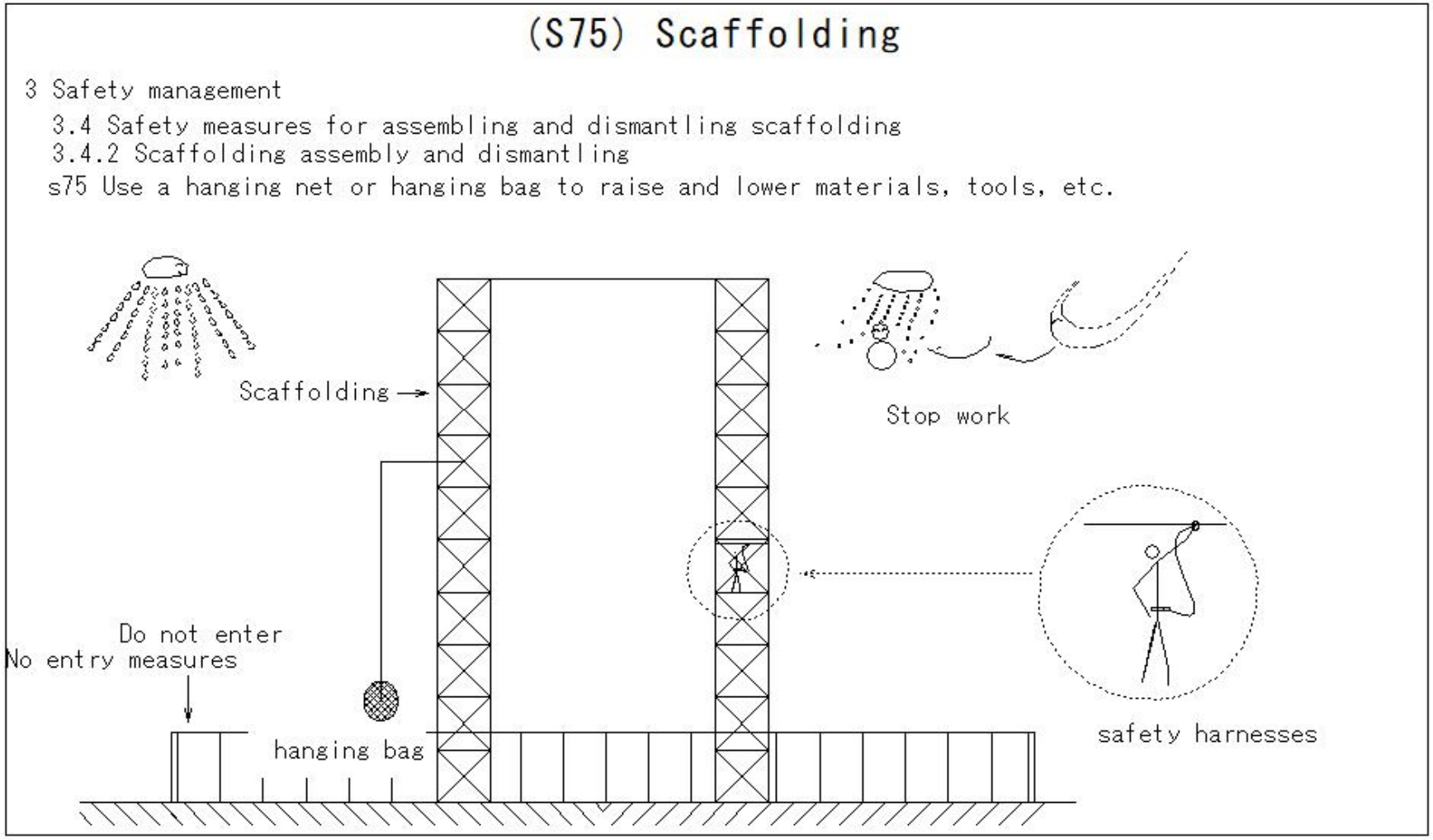
(S73) Scaffolding



(S74) Scaffolding



(S75) Scaffolding



(S76) Inspection of scaffolding

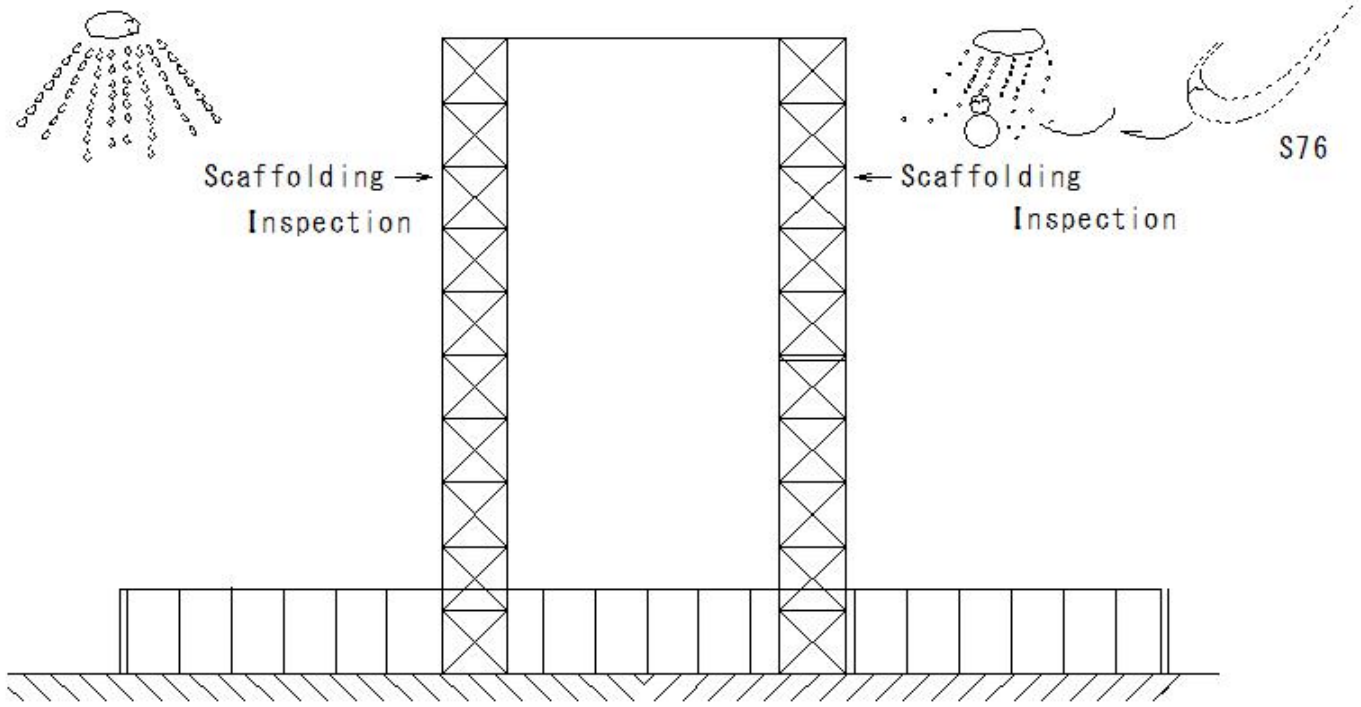
(S76) Inspection of scaffolding

3 Safety management

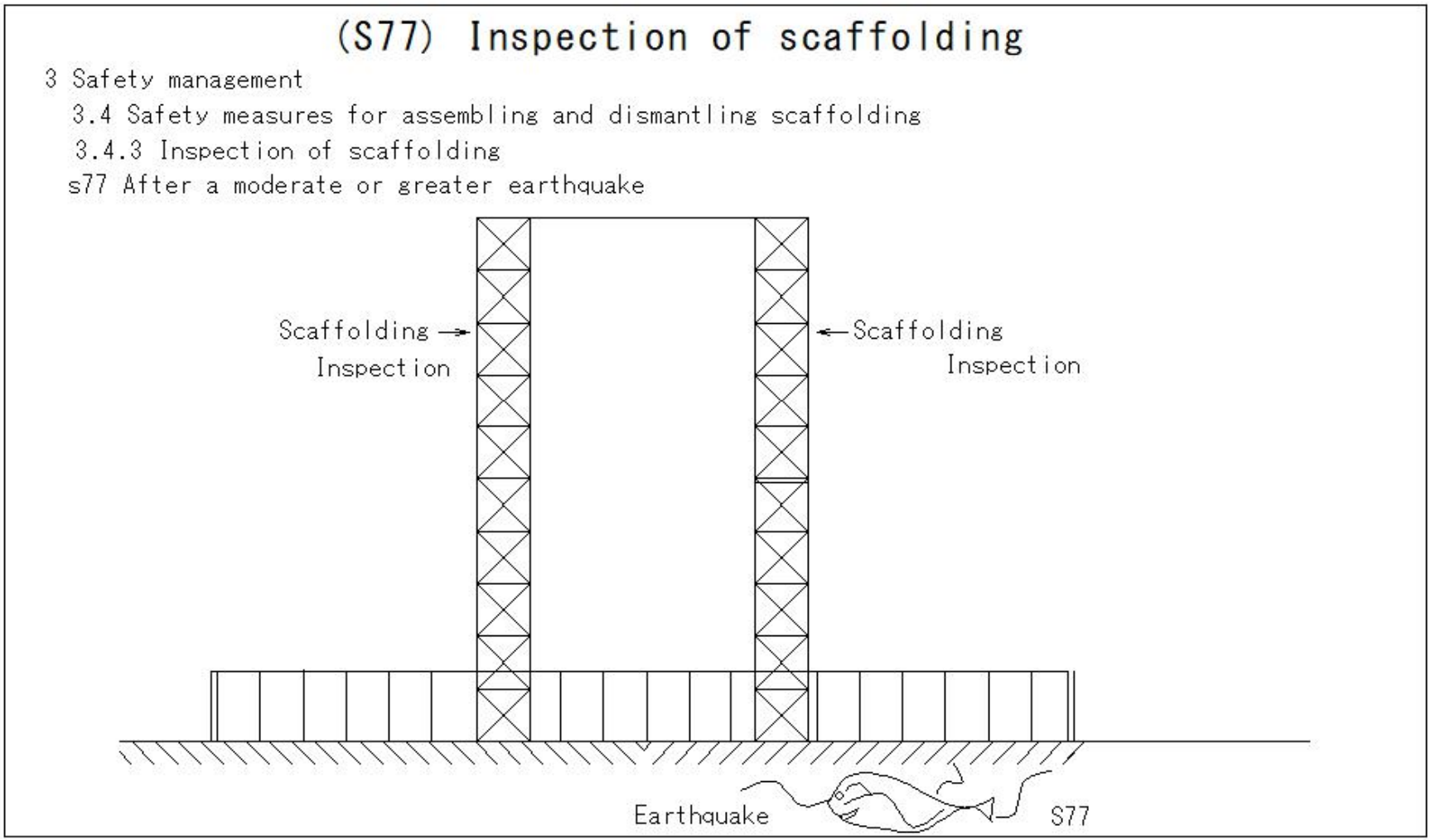
3.4 Safety measures for assembling and dismantling scaffolding

3.4.3 Inspection of scaffolding

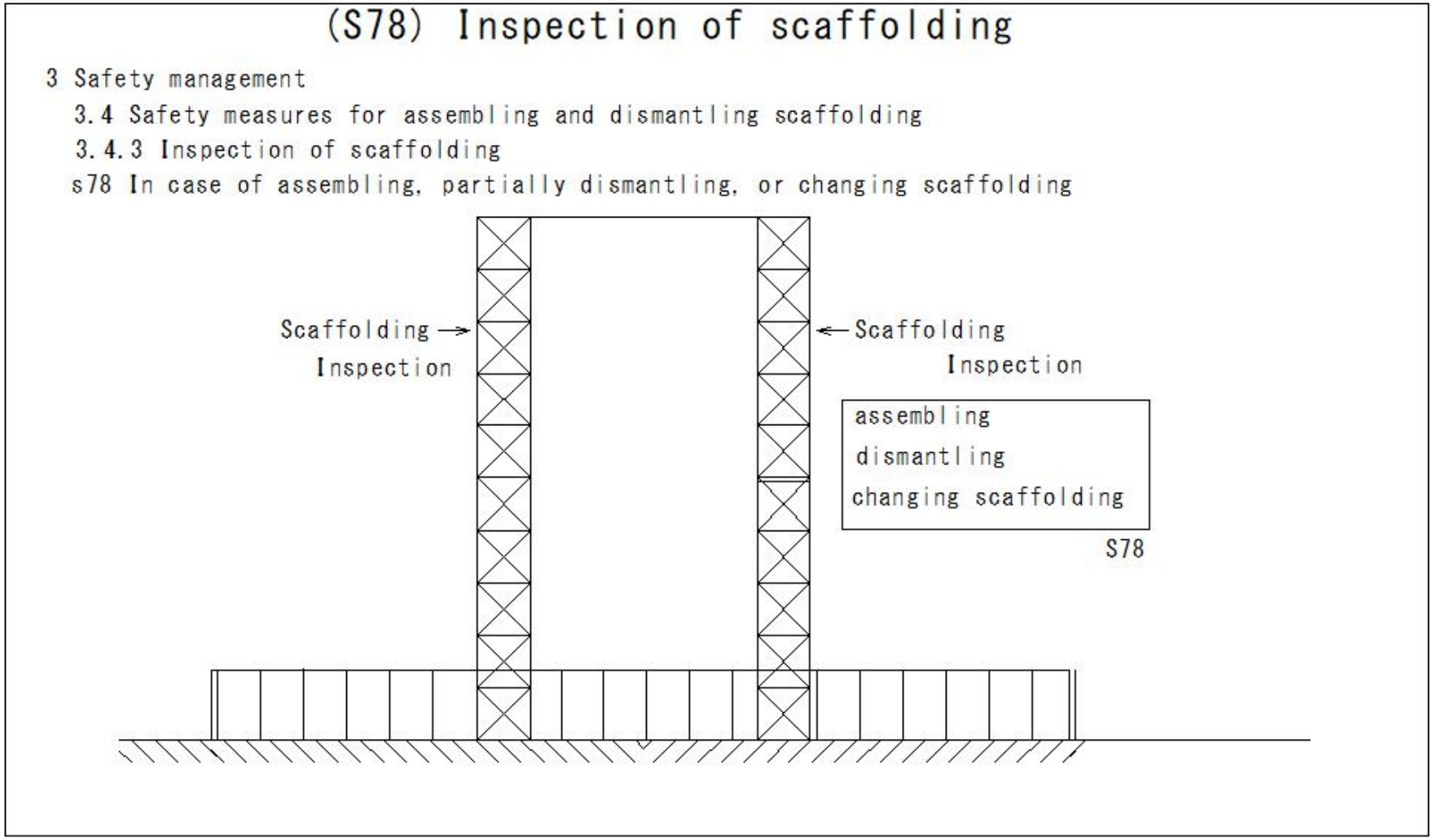
s76 After strong winds, heavy rain, heavy snow, etc.



(S77) Inspection of scaffolding



(S78) Inspection of scaffolding



(S79) Inspection of scaffolding

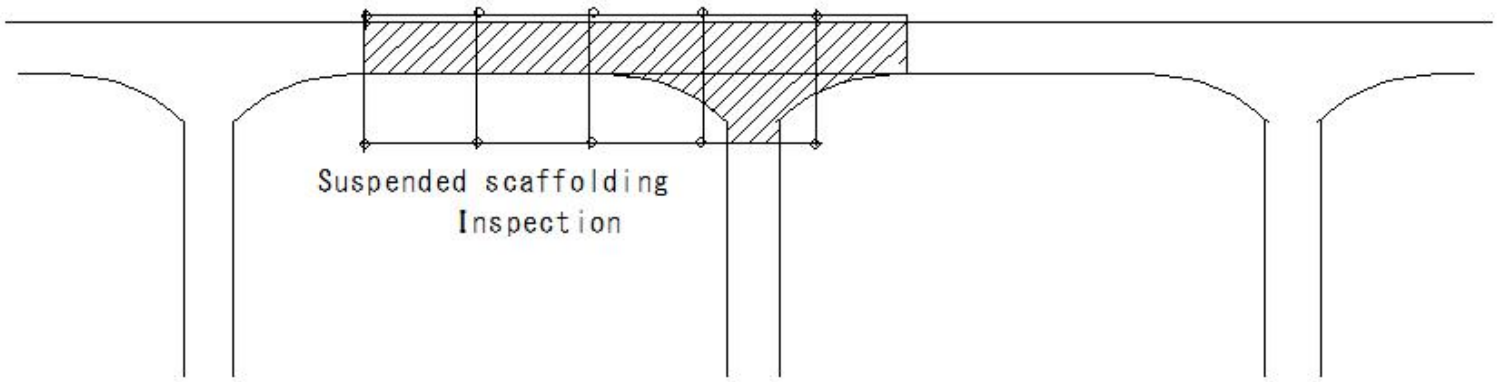
(S79) Inspection of scaffolding

3 Safety management

3.4 Safety measures for assembling and dismantling scaffolding

3.4.3 Inspection of scaffolding

s79 Suspended scaffolding work



(S80) Scaffolding

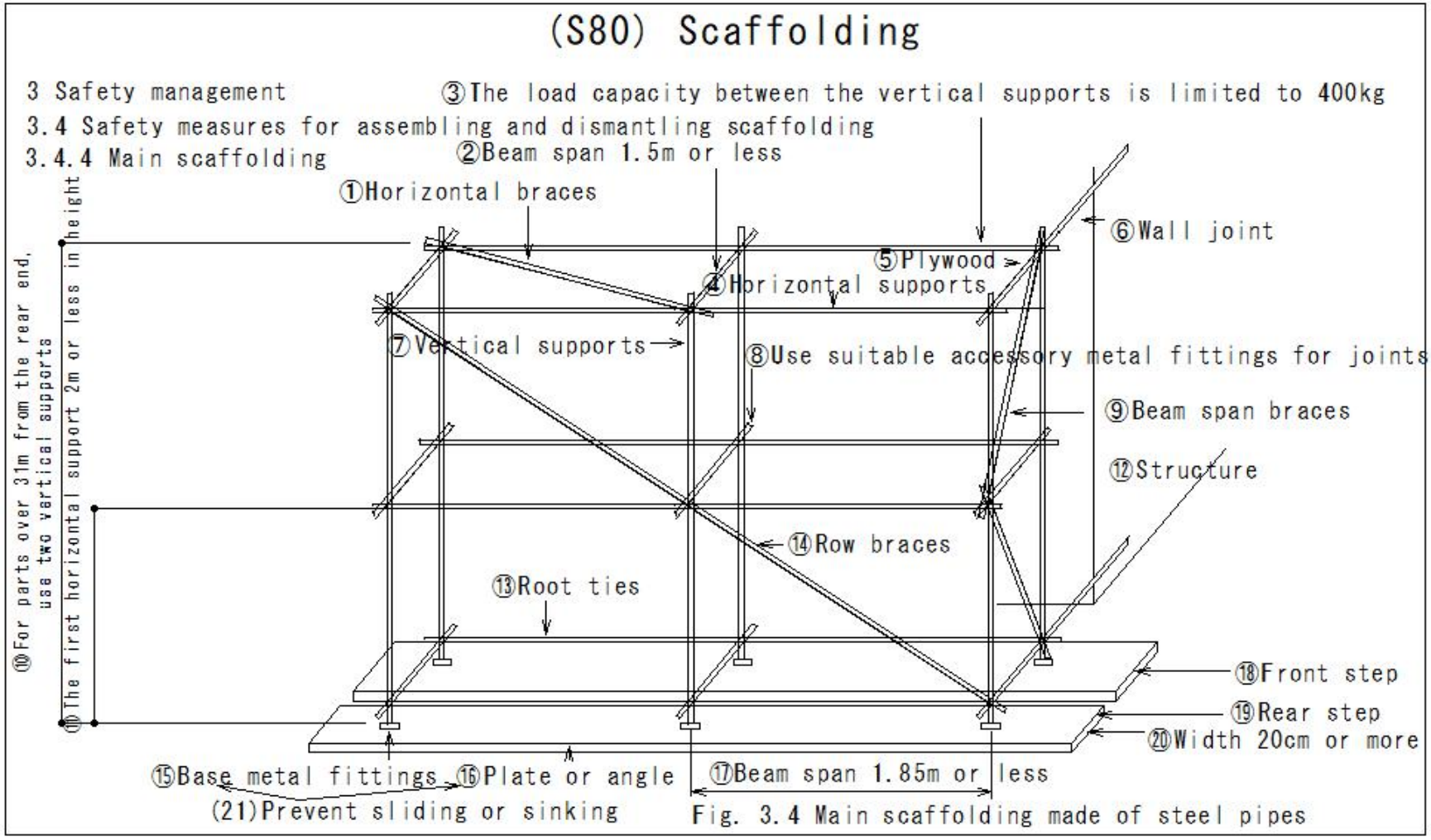


Fig. 3.4 Main scaffolding made of steel pipes

(S81) Scaffolding

(S81) Scaffolding

3 Safety management

3.4 Safety measures for assembling and dismantling scaffolding

3.4.4 Main scaffolding

Materials used

(a) Steel pipe: Wall thickness is 1/24 or more of the outer diameter. Material: Tensile strength 38 kgf/mm2

(b) Joint fittings

(c) Fastening fittings

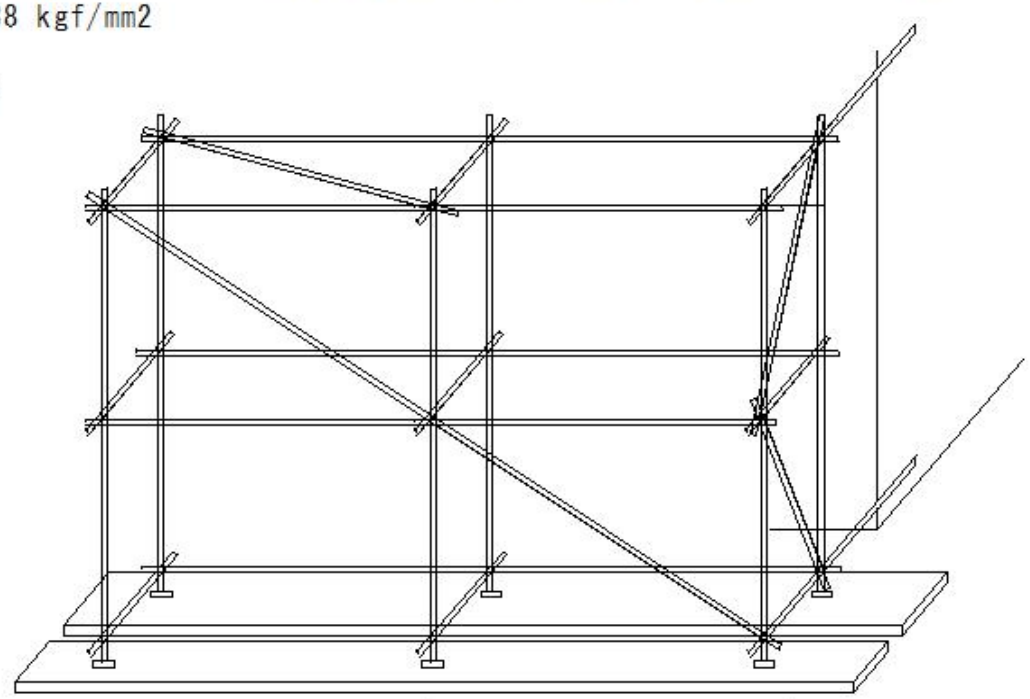


Fig. 3.4 Full scaffolding made of steel pipes

(S82) Scaffolding

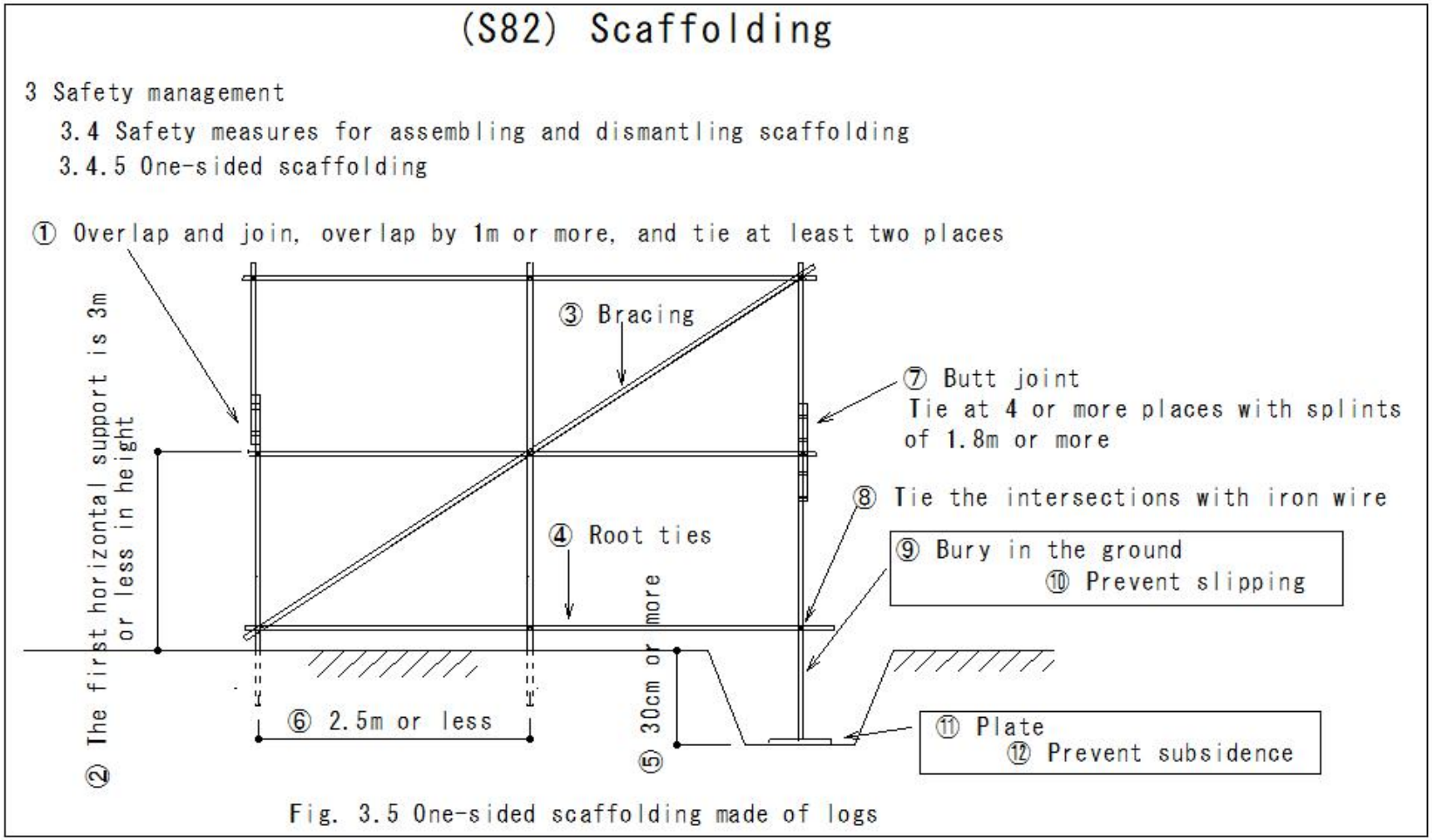


Fig. 3.5 One-sided scaffolding made of logs

(S83) Scaffolding

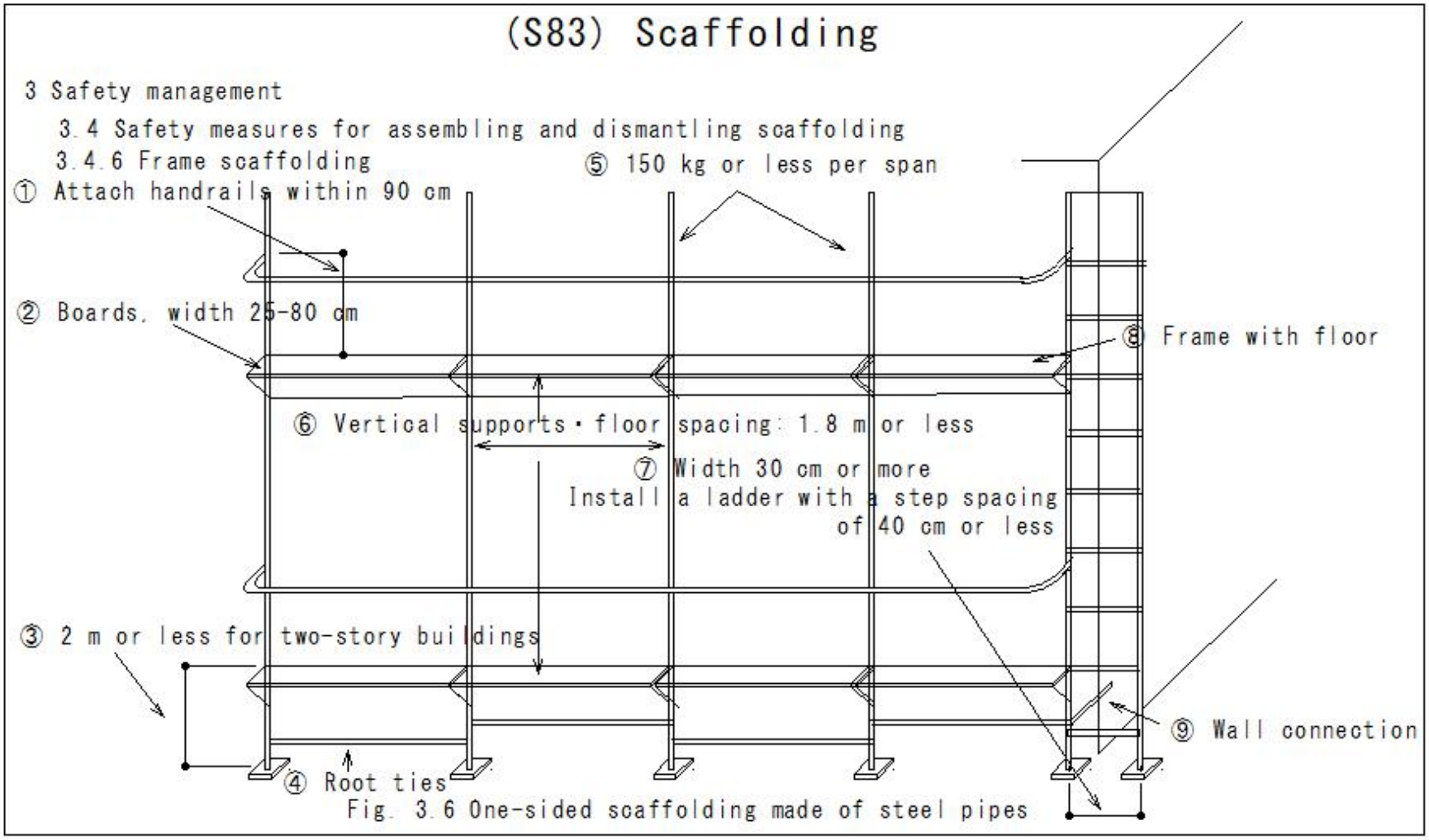


Fig. 3.6 One-sided scaffolding made of steel pipes

(S84) Scaffolding

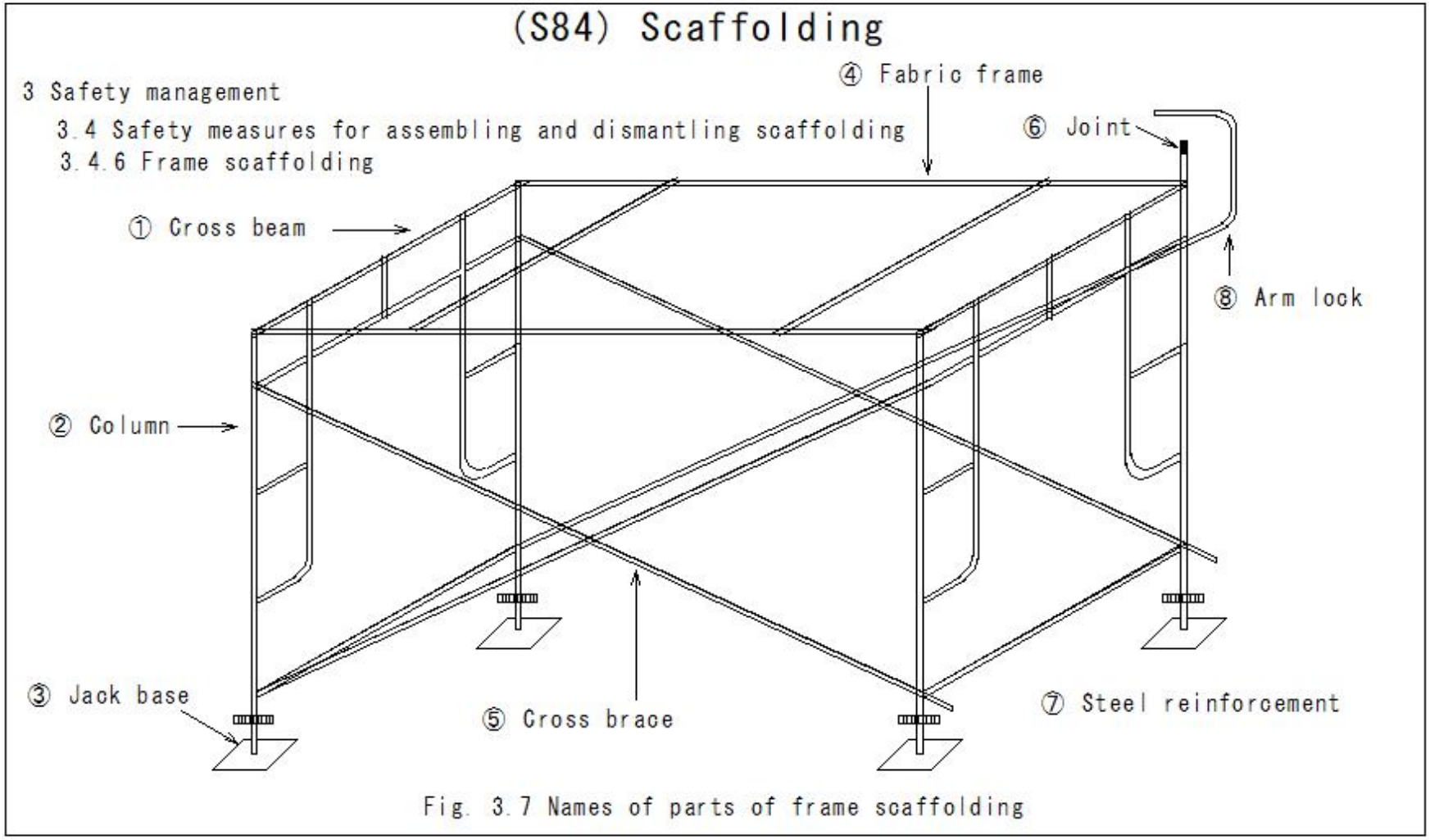


Fig. 3.7 Names of parts of frame scaffolding

(S85) Scaffolding

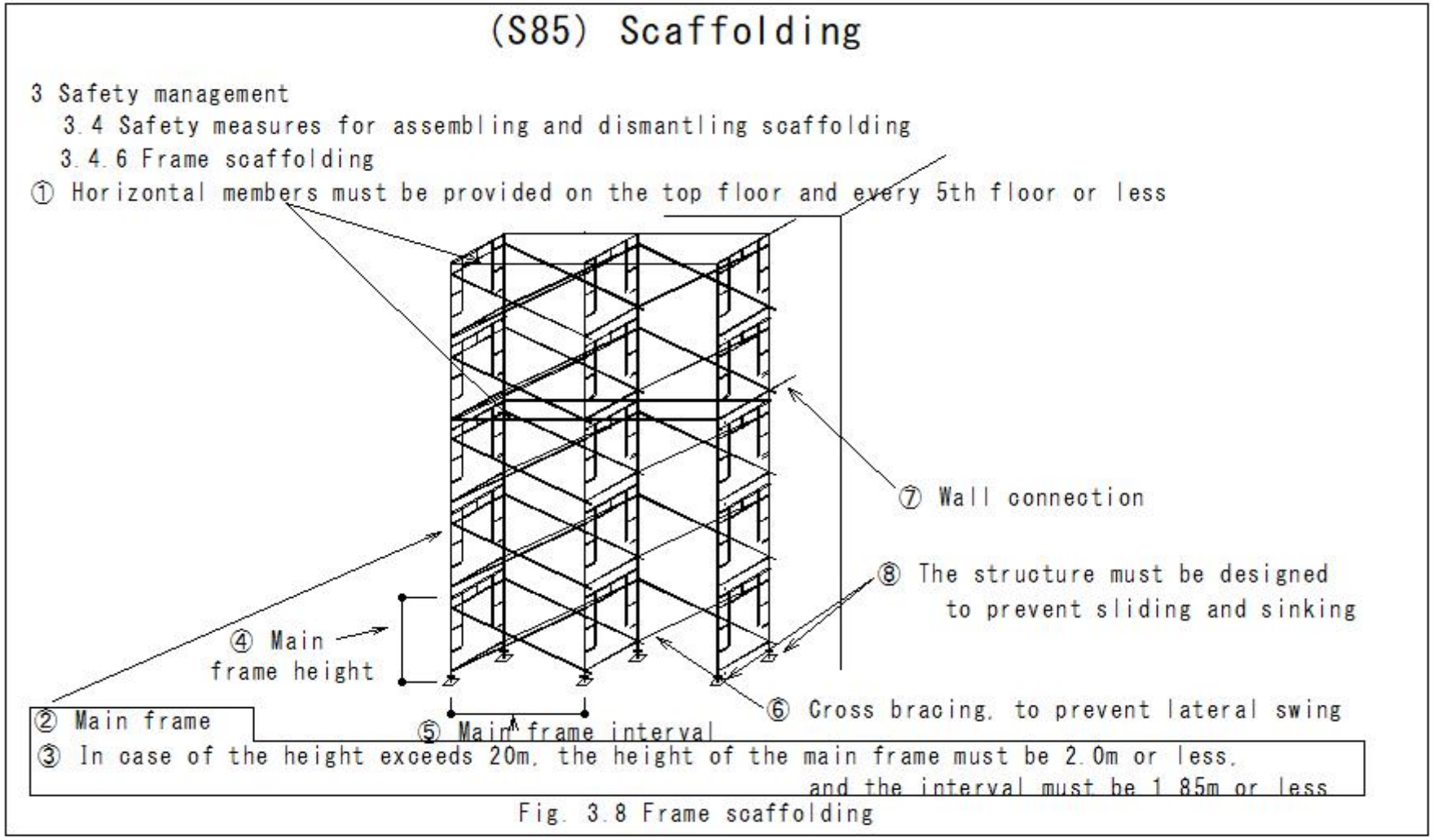


Fig. 3.8 Frame scaffolding

(S86) Scaffolding

(S86) Scaffolding

3 Safety management

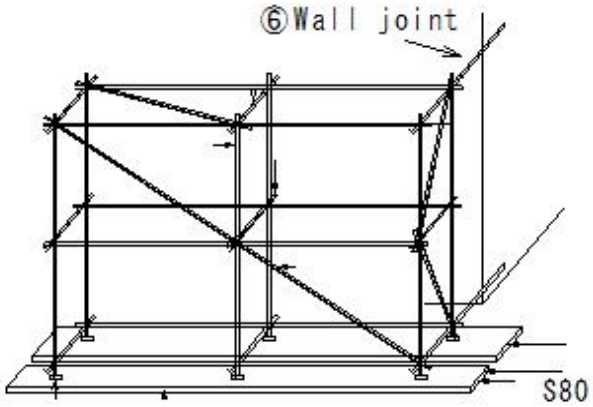
3.4 Safety measures for assembling and dismantling scaffolding

3.4.7 Wall ties or braces

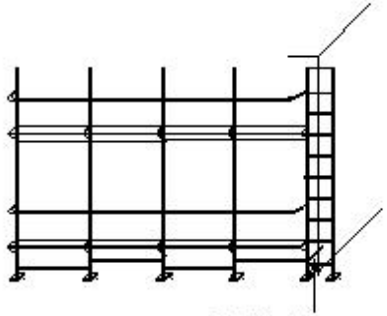
・Collapse prevention

Table 3.5 Wall tie spacing

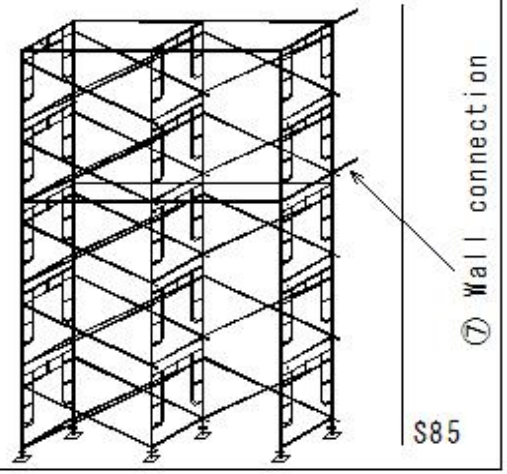
Type	Vertical direction	Horizontal direction
Log scaffolding	5.5m or less	7.5m or less
Single pipe scaffolding	5.0m or less	5.5m or less
Frame scaffolding	9.0m or less	8.0m or less



S80



S83



S85

(S87) Scaffolding

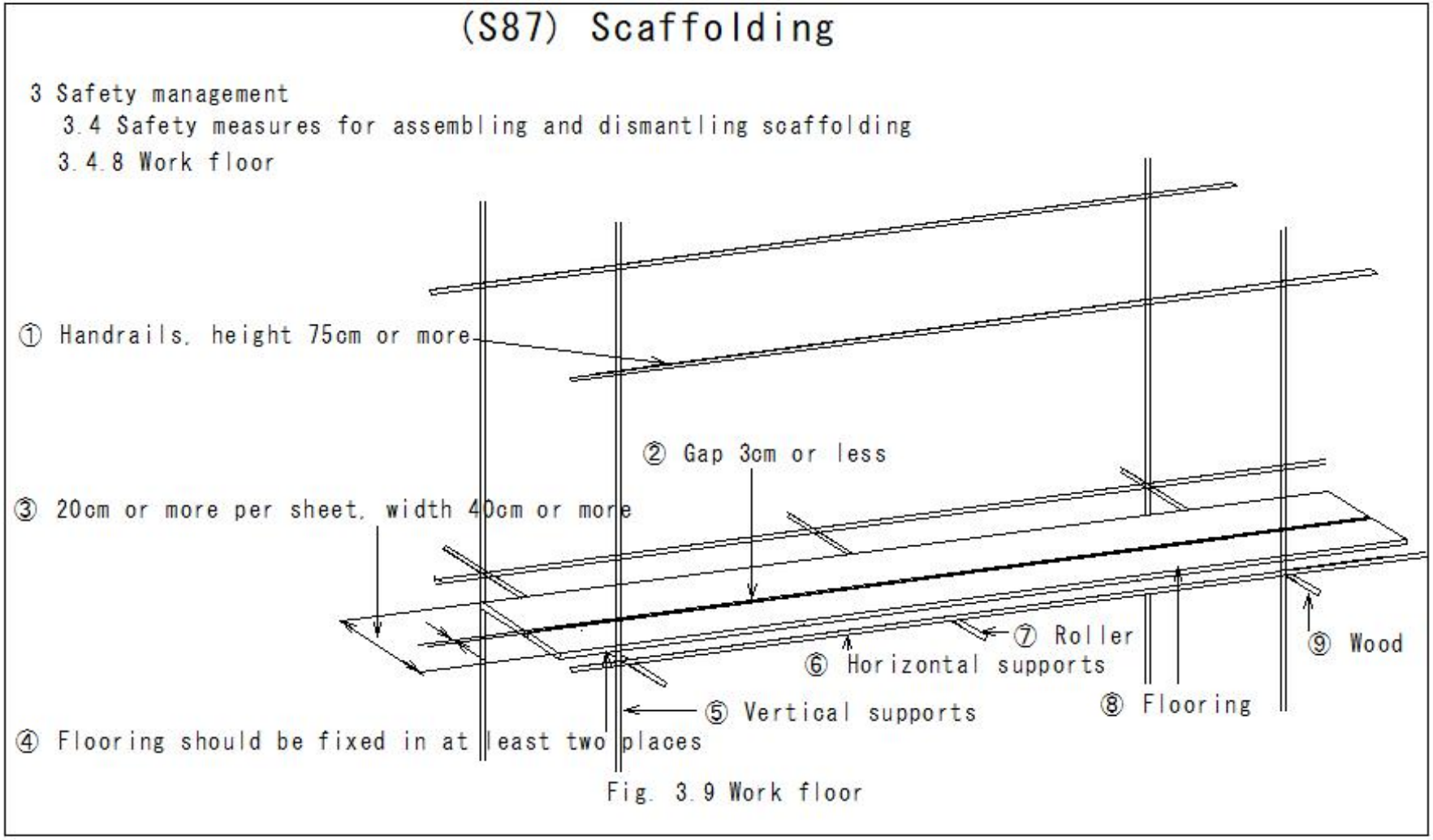


Fig. 3.9 Work floor

(S88) Scaffolding

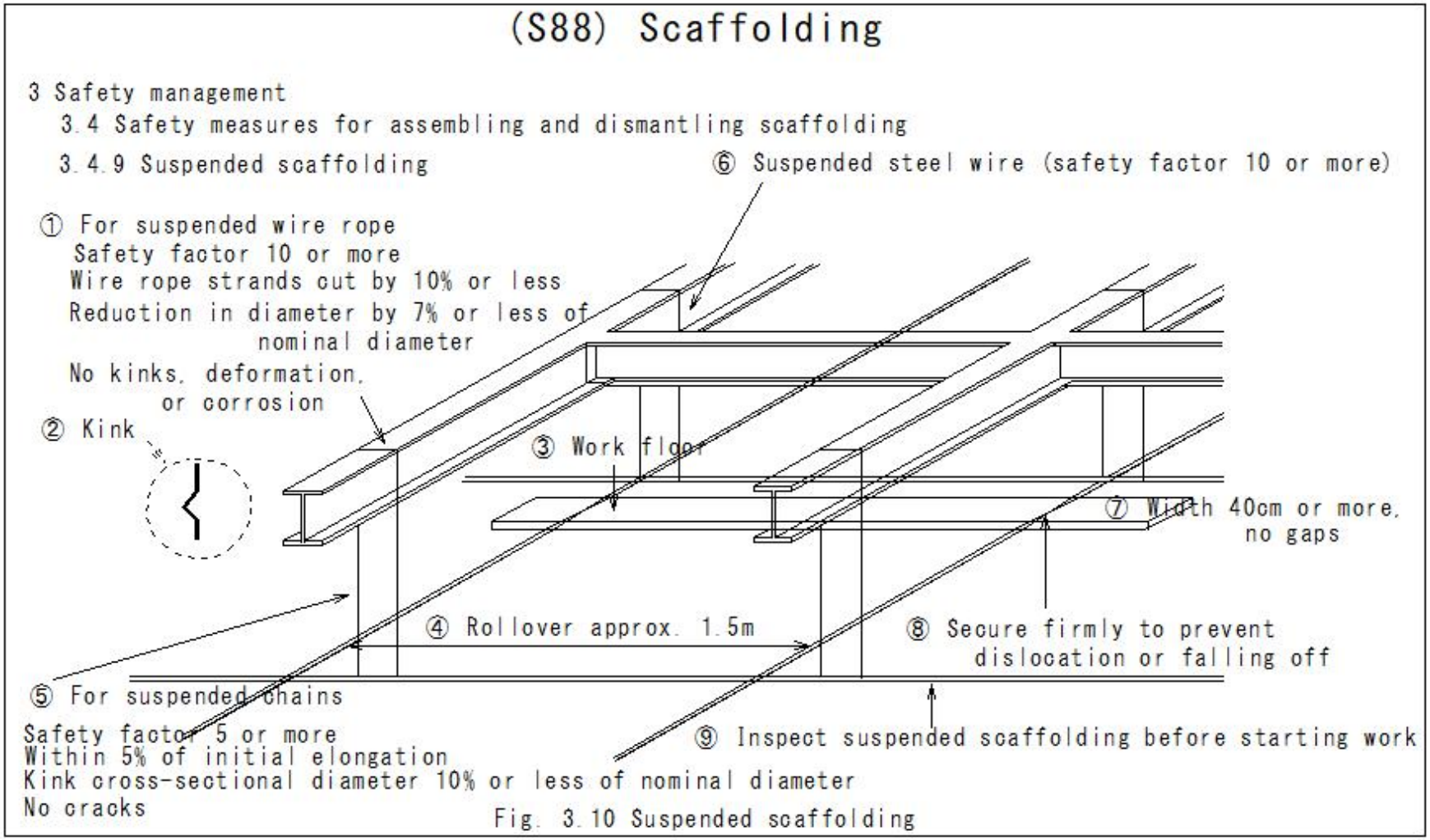


Fig. 3.10 Suspended scaffolding

(S89) Scaffolding

3 Safety management

3.4 Safety measures for assembling and dismantling scaffolding

3-4-10 Ascending pier

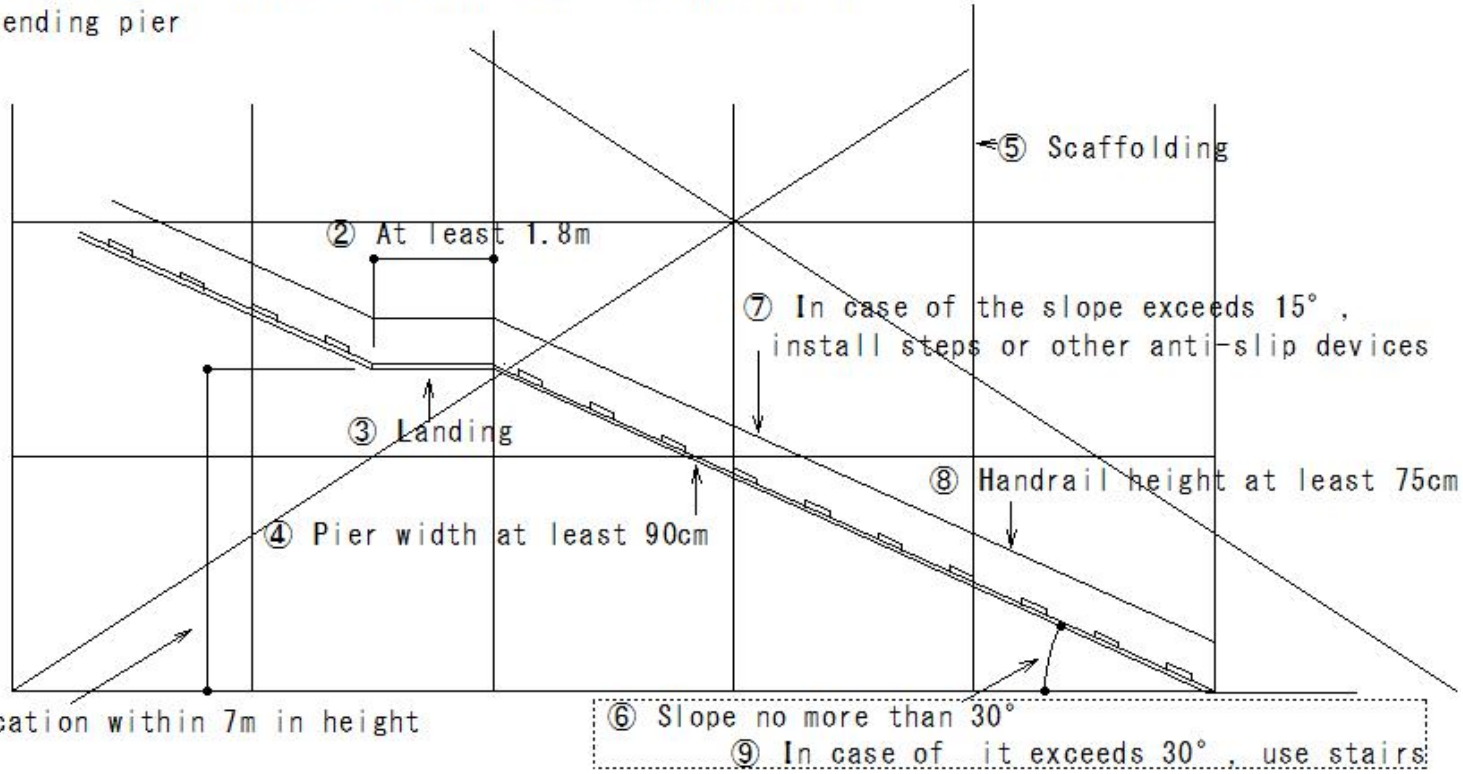


Fig. 3-11 Ascending pier

(S90) Formwork and Shoring

(S90) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.1 Materials

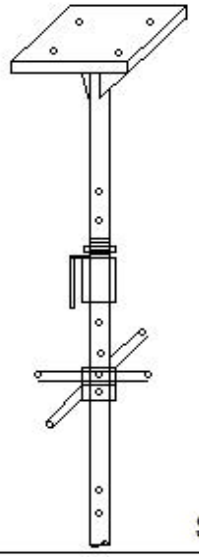
① No damage, deformation, or corrosion

② Main steel material Tensile strength 34kgf/mm2 or more

③ Pipe support

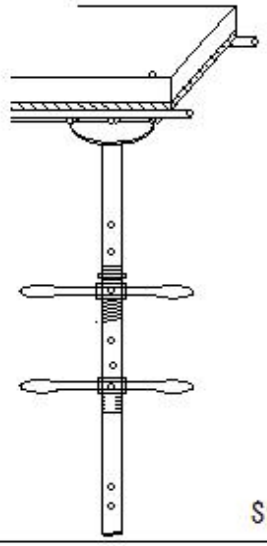
Pipe thickness 2mm or more Single piece

End plate thickness 5.4mm or more Four or more bolt holes Steel end plate



S91

Fig. 3.12 Pipe support



S92

(S91) Formwork and Shoring

(S91) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.1 Materials

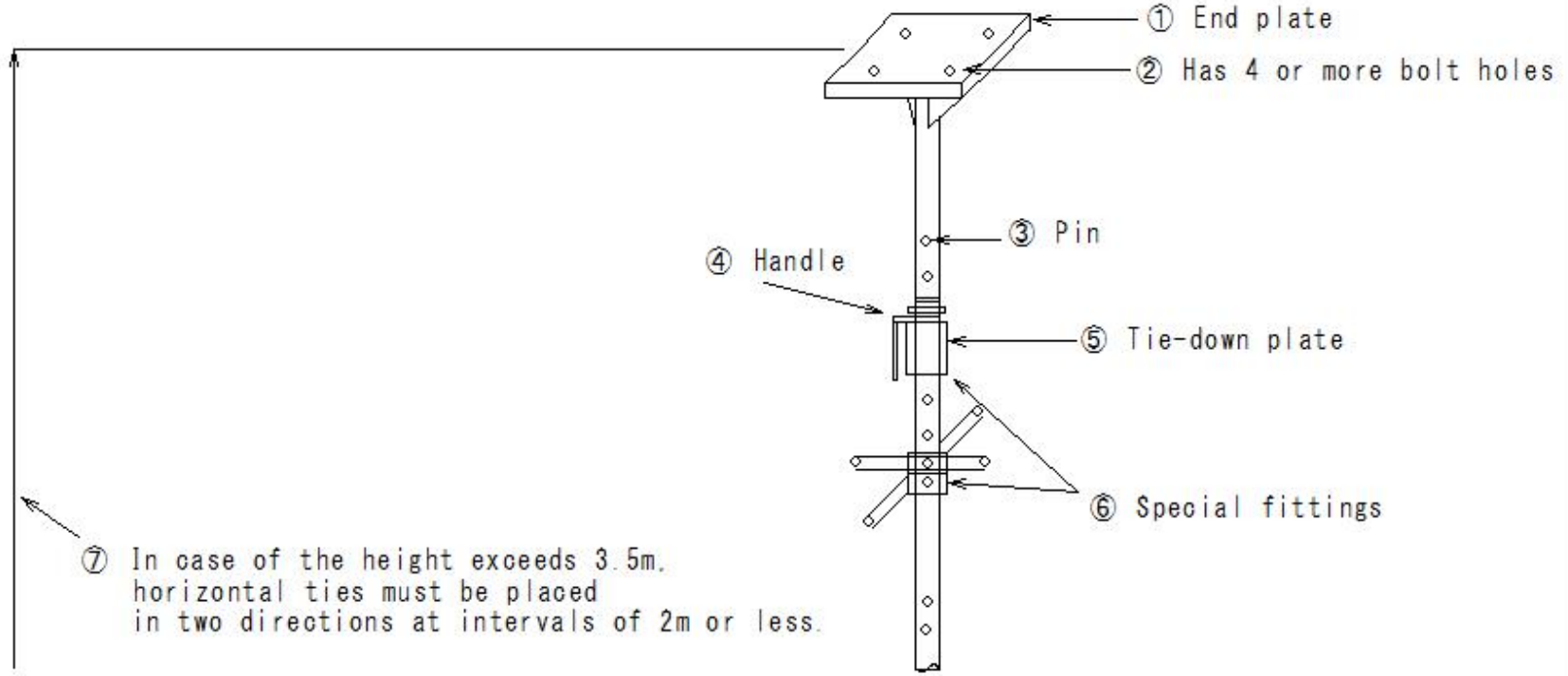


Fig. 3.12 Pipe support

(S92) Formwork and Shoring

(S92) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.1 Materials

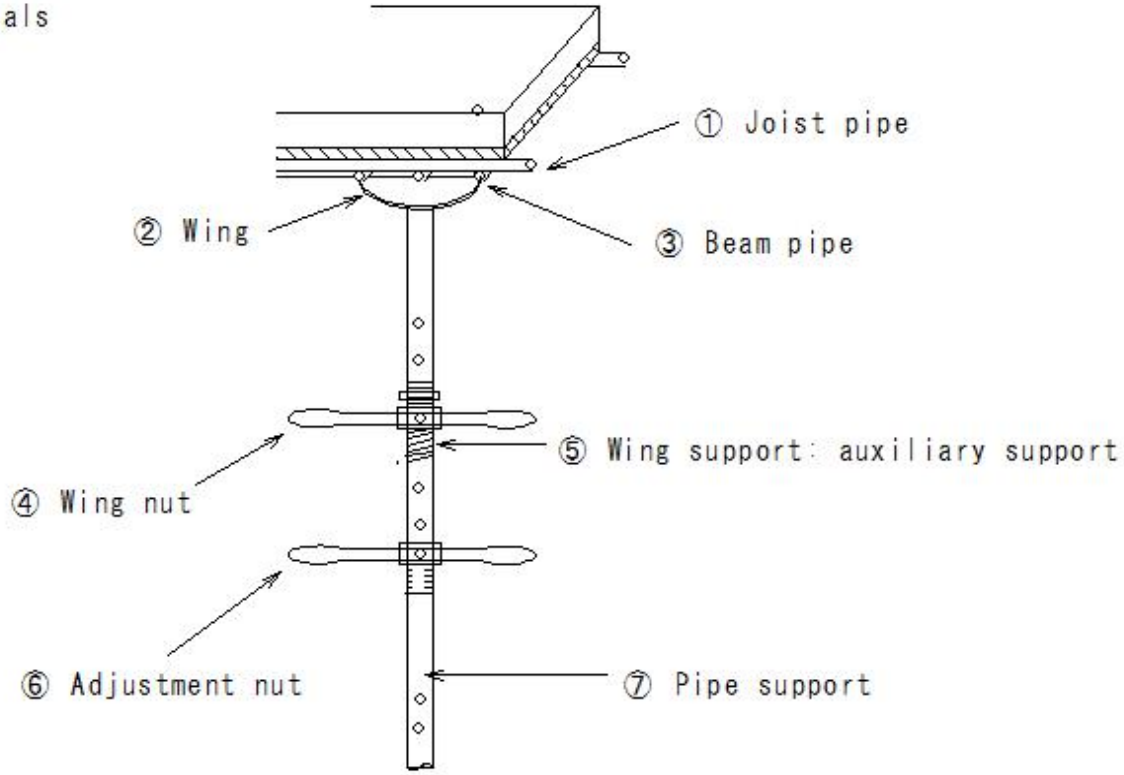


Fig. 3.12 Pipe support

(S93) Formwork and Shoring

(S93) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

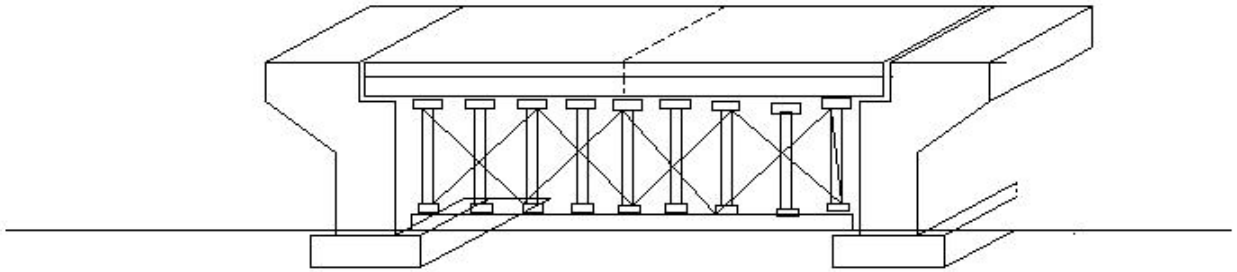
3.5.2 Assembly, dismantling, and inspection

① Planning

① Creating an assembly diagram

② In case of a support is used alone

・Support: Do not exceed the maximum load



(S94) Formwork and Shoring

(S94) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

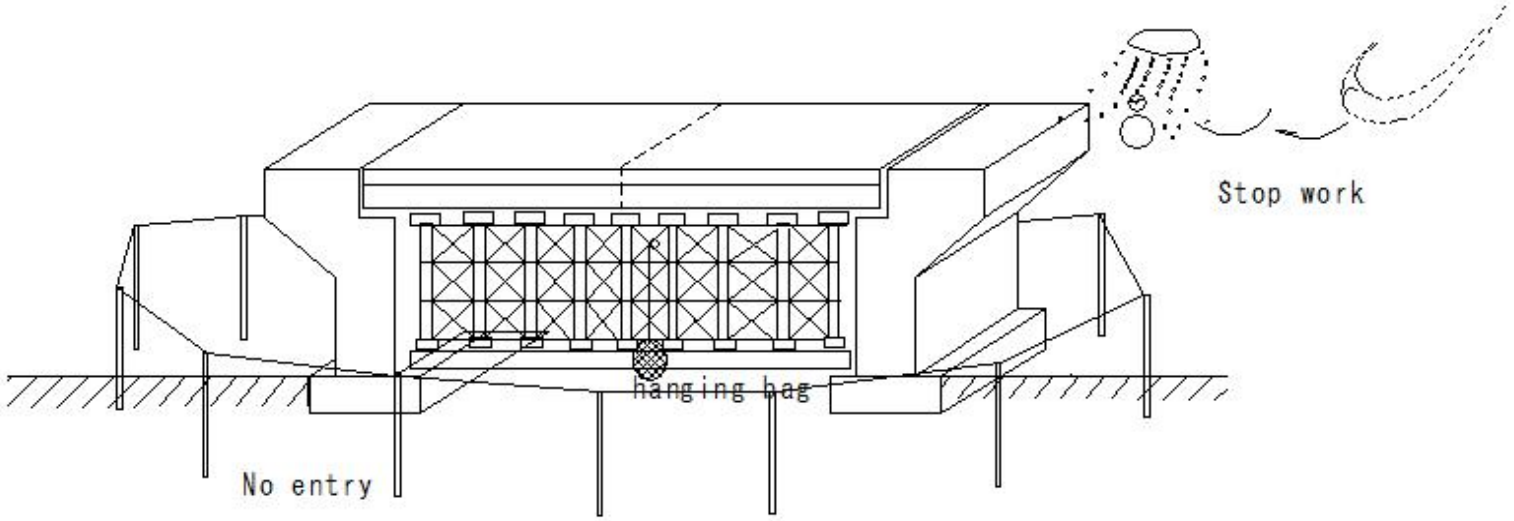
3.5.2 Assembly, dismantling, and inspection

② Precautions for assembly and dismantling work

① No entry to the work area except for related workers

② Strong winds, heavy rain, heavy snow: Stop work

③ Use a hanging net or hanging bag to lift and lower materials, tools, etc.



(S95) Formwork and Shoring

(S95) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

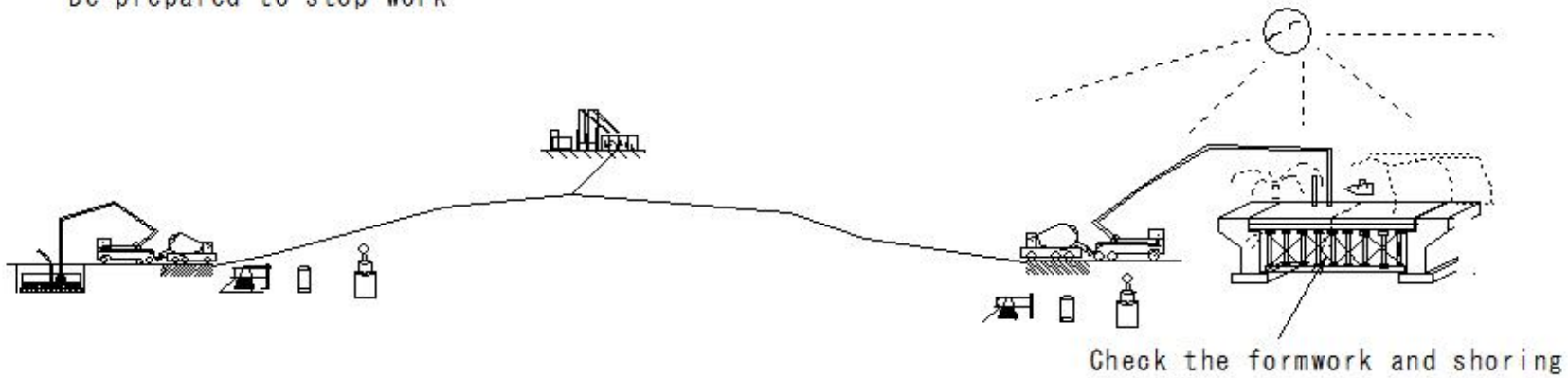
3.5.2 Assembly, dismantling, and inspection

③ Items to check in case of pouring concrete

① Check the formwork and shoring before starting work

② In case of an abnormality is found in the shoring during work

Be prepared to stop work



C1182
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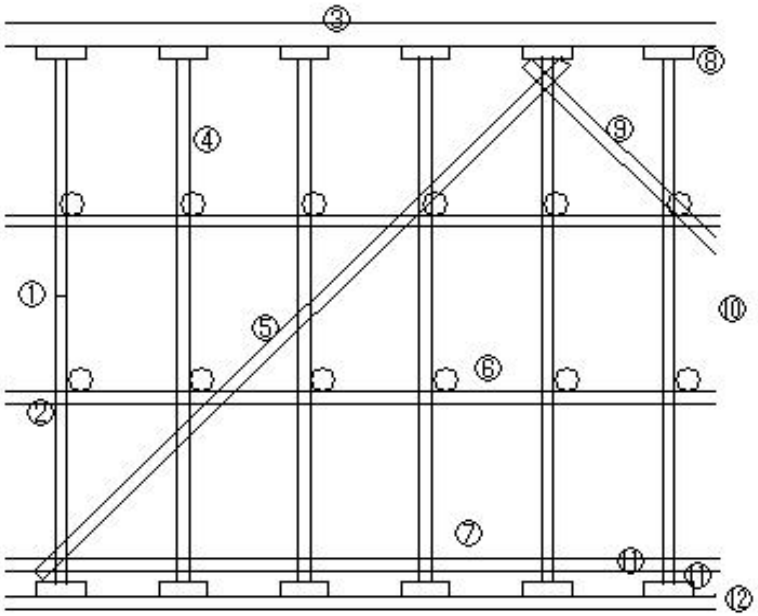
(S96) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.3 Shoring using single-pipe columns



① Joints are butt joints or plug joints
② Joints are fastened using special fittings
③ Beams or joists
④ Columns
⑤ Bracing
⑥ Horizontal ties
⑦ Root ties
⑧ In case of placing beams or joists on the top end, secure them with steel end plates
⑨ Prevent displacement of horizontal ties
⑩ Install horizontal ties in two directions every 2m or less in height
⑪ Fix legs to prevent slipping
⑫ Prevent subsidence by using soffits, pouring concrete, driving piles, etc.

Figure 3.13 Shoring using single-pipe columns

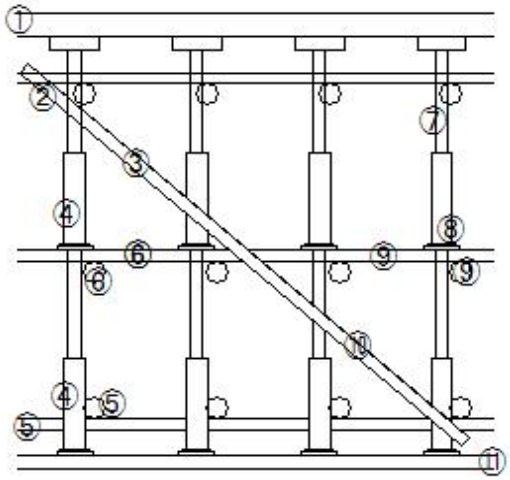
(S97) Formwork and Shoring

(S97) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.4 Shoring using pipe support columns



① Beams
② Fasten joints using special fittings
③ Bracing
④ Do not use more than three pipe supports
⑤ Root ties
⑥ Horizontal ties
⑦ Pipe supports
⑧ Use four or more bolts or special fittings to join
⑨ In case of the height exceeds 3.5m, install horizontal ties in two directions every 2m or less
⑩ Prevent displacement of horizontal ties
⑪ Measures to prevent settlement and sliding are the same as for single pipe columns

Fig. 3.14 Shoring using pipe support columns

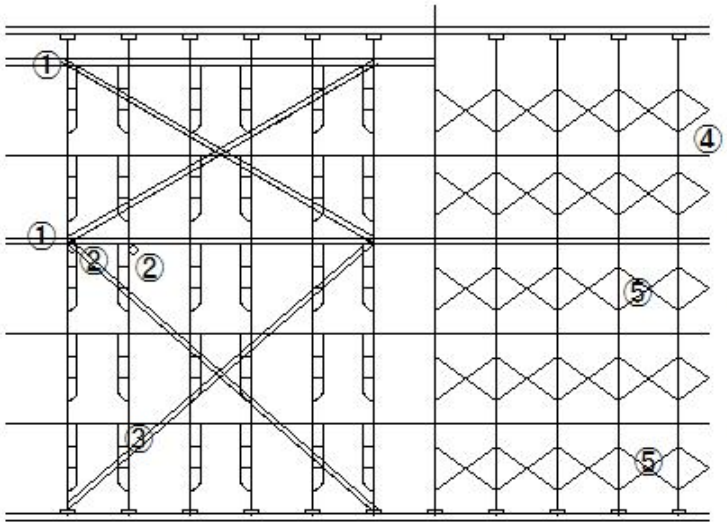
(S98) Formwork and Shoring

(S98) Formwork and Shoring

3 Safety management

3.5 Safety measures for formwork and shoring

3.5.5 Shoring using steel pipe frame supports



① Install a horizontal frame on the top floor and every 5th floor or less

② Install horizontal ties in two directions on the top floor and every 5th floor or less, with 5 frames or less

③ Prevent displacement of horizontal ties with braces, etc.

④ In case of placing beams or joists, attach steel end plates and secure them to beams, etc.

⑤ Install cross braces

Fig. 3.15 Shoring using frame supports

(S99)Structure excavation-Structure - Excavation slope gradient- Soil quality

(S99)Structure excavation-Structure - Excavation slope gradient- Soil quality

Structure - Excavation slope - Soil quality

- Slope open cut method
- Excavation slope gradient
- Soil quality, excavation height, slope gradient

1 Types of geological formations

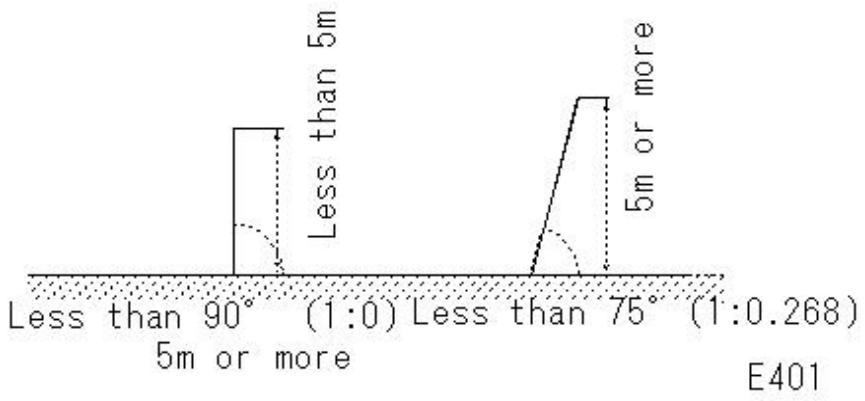
1-1 Bedrock Hard clay

2 Height of excavation surface

2-1 Less than 5m

3 Slope gradient of excavation surface

3-1 90° (1:0)



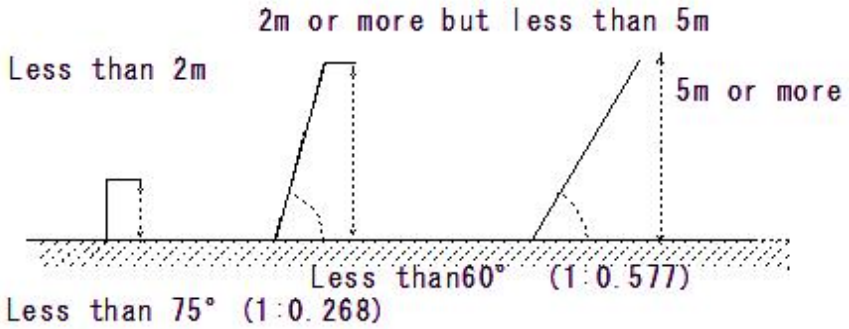
E401

(S100)Structure excavation-Structure - Excavation slope gradient- Soil quality

(S100)Structure excavation-Structure - Excavation slope gradient- Soil quality

Structure - Excavation slope - Soil quality

- Slope open cut method
- Excavation slope gradient
- Soil quality, excavation height, slope gradient



1 Types of geological formations

1-2 Others

2 Height of excavation surface

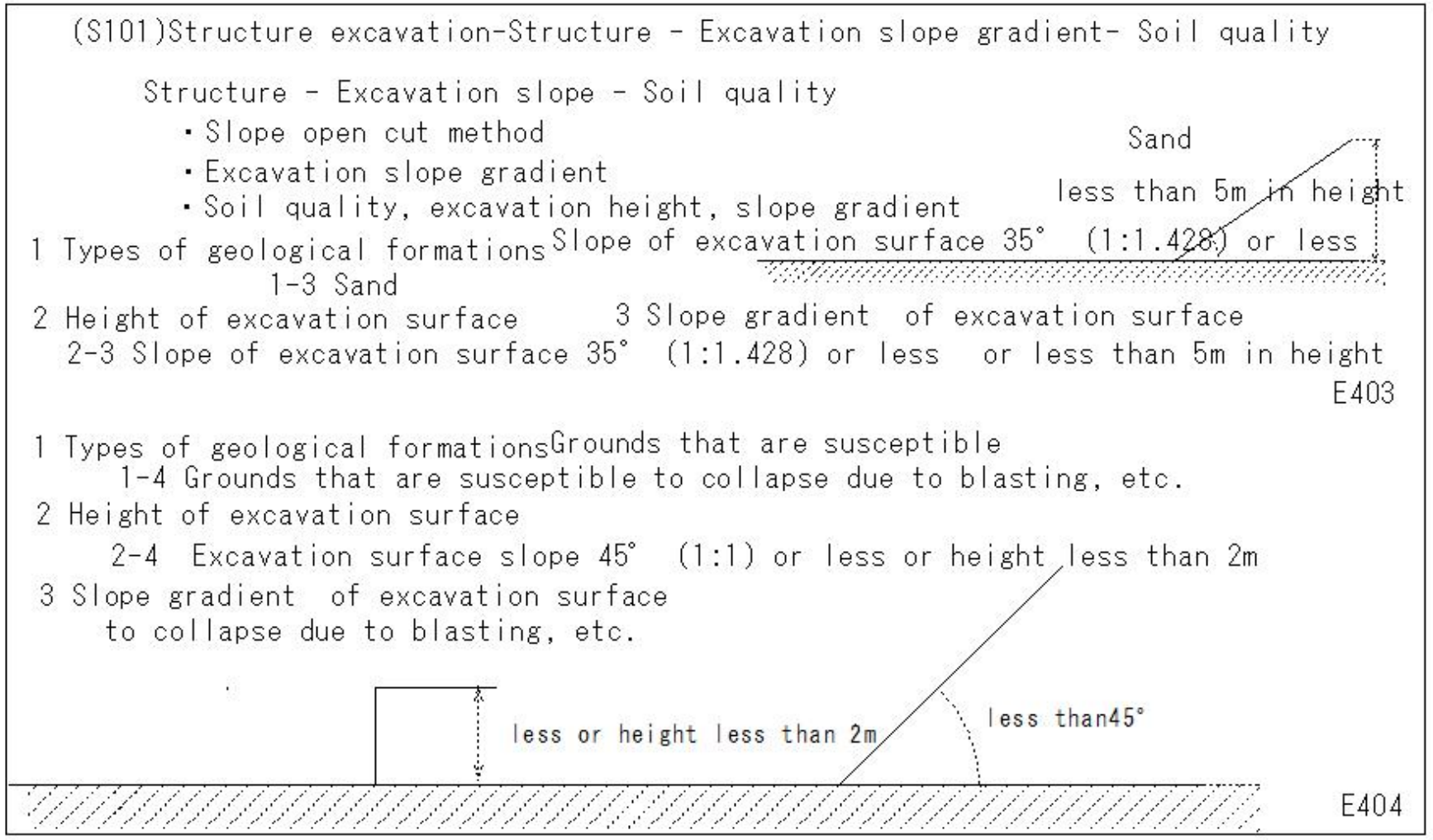
2-2・ Less than 2m ・2m or more but less than 5m ・5m or more

3 Slope gradient of excavation surface

3-2 Less than90° (1:0) Less than75° (1:0.268) Less than60° (1:0.577)

E402

(S101)Structure excavation-Structure - Excavation slope gradient- Soil quality



(S102) Safety measures for excavation work

(S102) Safety measures for excavation work

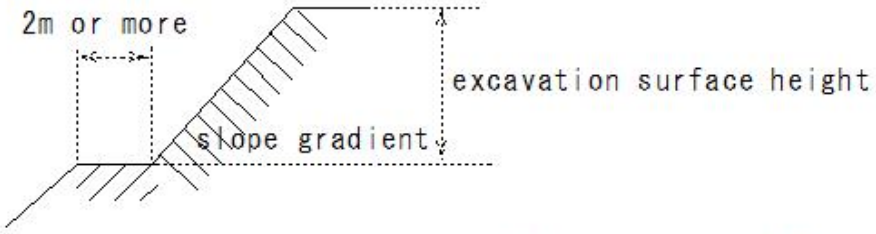
3 Safety management

3・6 Safety measures for excavation work

3・6・1 Open excavation

excavation limits

ground	excavation surface height	slope gradient
A ground consisting of bedrock or hard clay	5m below	90° or less
	5m over	75° or less
Other geological formations	2m below	90° or less
	2-5m	75° or less
	5m over	60° or less
ground made of sand	5m below	35° or less
Rocks that are susceptible to collapse due to blasting, etc.	2m below	45° or less



The excavation surface is separated into horizontal stages of 2 m or more.

E285

(S103) Safety measures for excavation work

(S103) Safety measures for excavation work

3 Safety management

3・6 Safety measures for excavation work

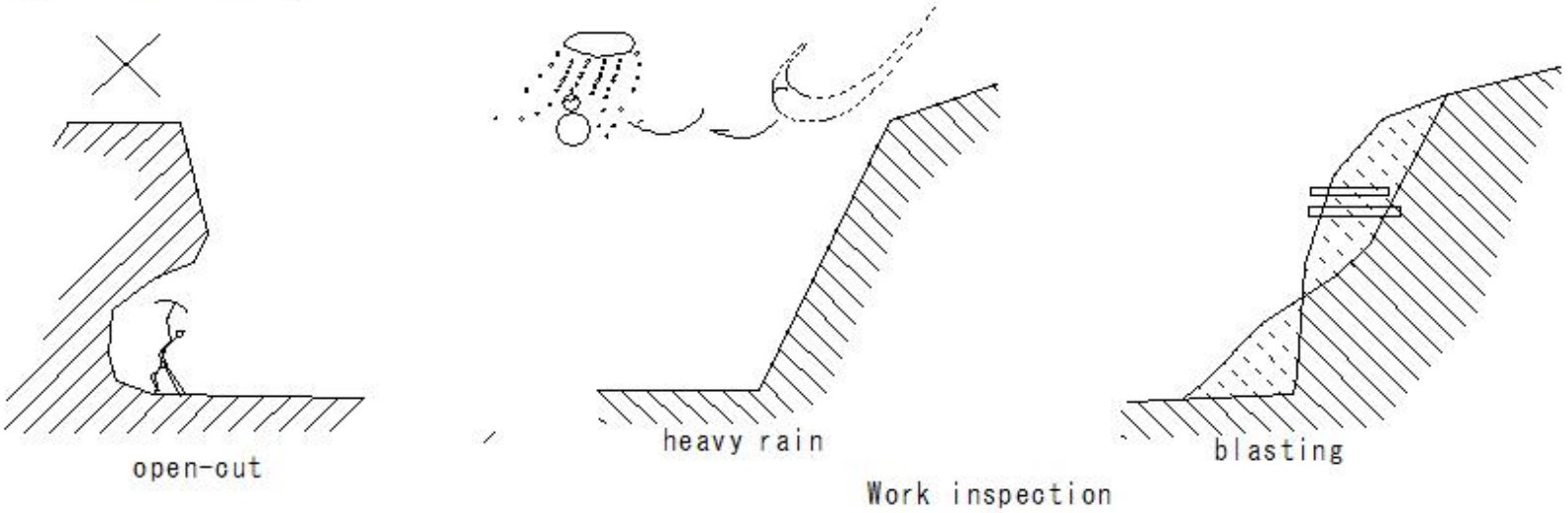
3-6-1 Open excavation

Do not open-cut in slits

Work inspection

Check for loose stones and cracks and their condition

① Before starting work that day
② After heavy rain or a moderate earthquake
③ After blasting



(S104) Safety measures for excavation work

(S104) Safety measures for excavation work

3 Safety management

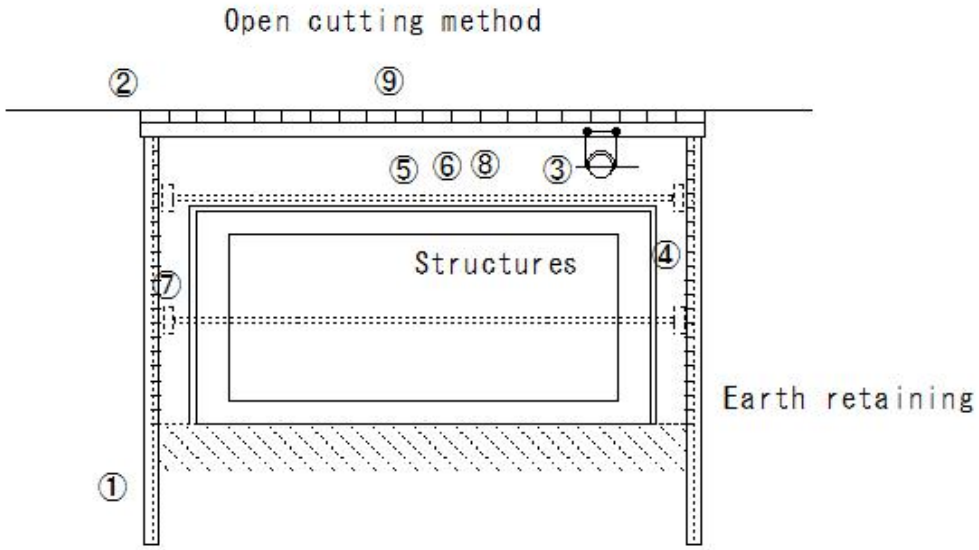
3・6 Safety measures for excavation work

3-6-1 Open excavation

④ Working close to buried objects

Provide adequate protection for buried objects

Do not use excavation machinery if there is a risk of damage



F133

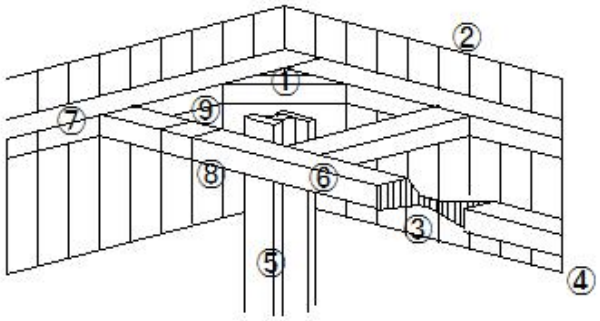
(S105) Earth retaining support

(S105) Earth retaining support

3 Safety management

3-6 Safety measures for excavation work

3-6-2 Earth retaining support



Earth retaining timbering

①angle brace

②Sheet piles

③Compressed materials: angle brace

The joint is a butt joint

④the strut is supported by a structure,

it must be able to withstand the load.

⑤Intermediate support column

⑥strut

⑦walling

⑧Securely attach to sheet piles, piles,

and intermediate support columns

⑨Connection of strut and angle brace

The intersection between the struts is tightened

with plate bolts.

Make it solid by welding, etc.

⑩Inspection

・Period not exceeding 7 days

・In the case of an earthquake of medium or higher magnitude

・case of there is a risk of weakening of the ground due to heavy rain

E286

(S106) Sheet pile installation

(S106) Sheet pile installation

3 Safety management

3-6 Safety measures for excavation work

3-6-3 Sheet pile installation

countermeasure

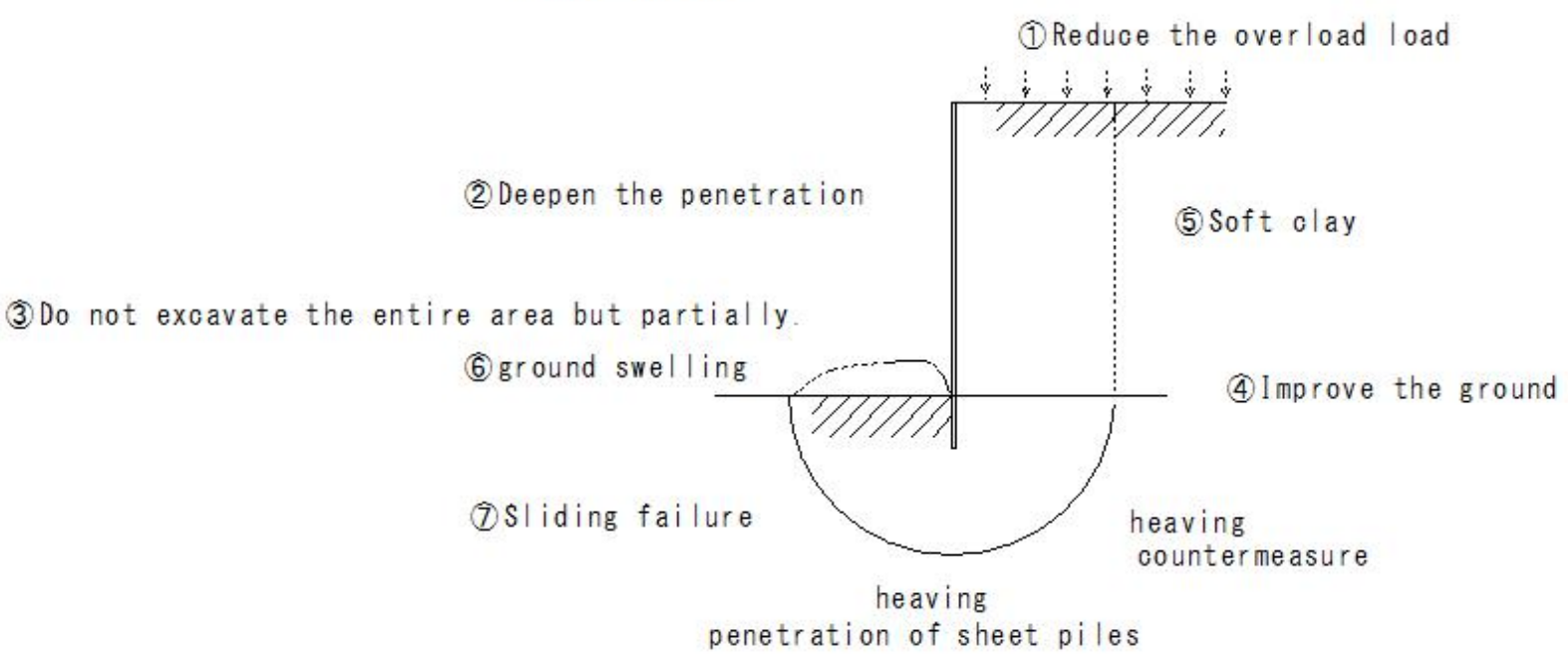


Figure 3-17 Safety measures for sheet piles

E287

(S107) Sheet pile installation

(S107) Sheet pile installation

3 Safety management

3-6 Safety measures for excavation work

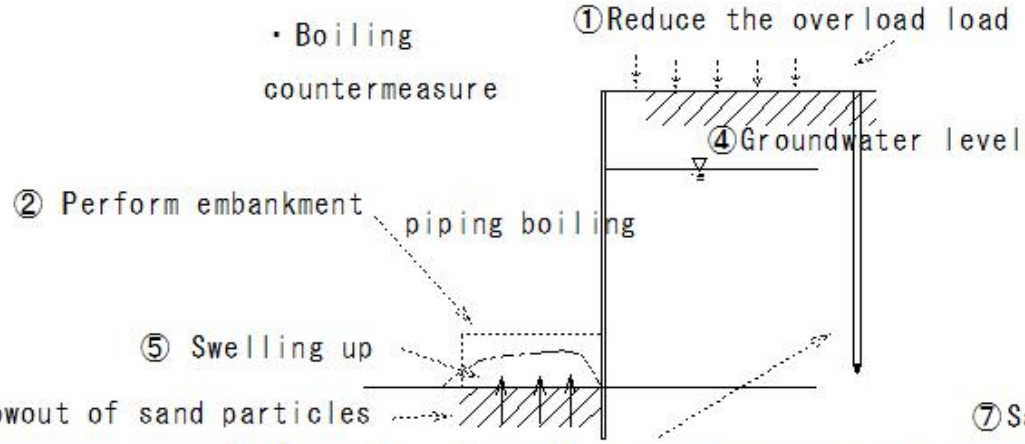
3-6-3 Sheet pile installation

countermeasure

loose sandy ground

This is caused by the difference in water level between the back and front of the sheet pile.

piping boiling



loose sandy ground

This is caused by the difference in water level between the back and front of the sheet pile.

Figure 3-17 Safety measures for sheet piles

E288

(S108) Excavation of tunnels

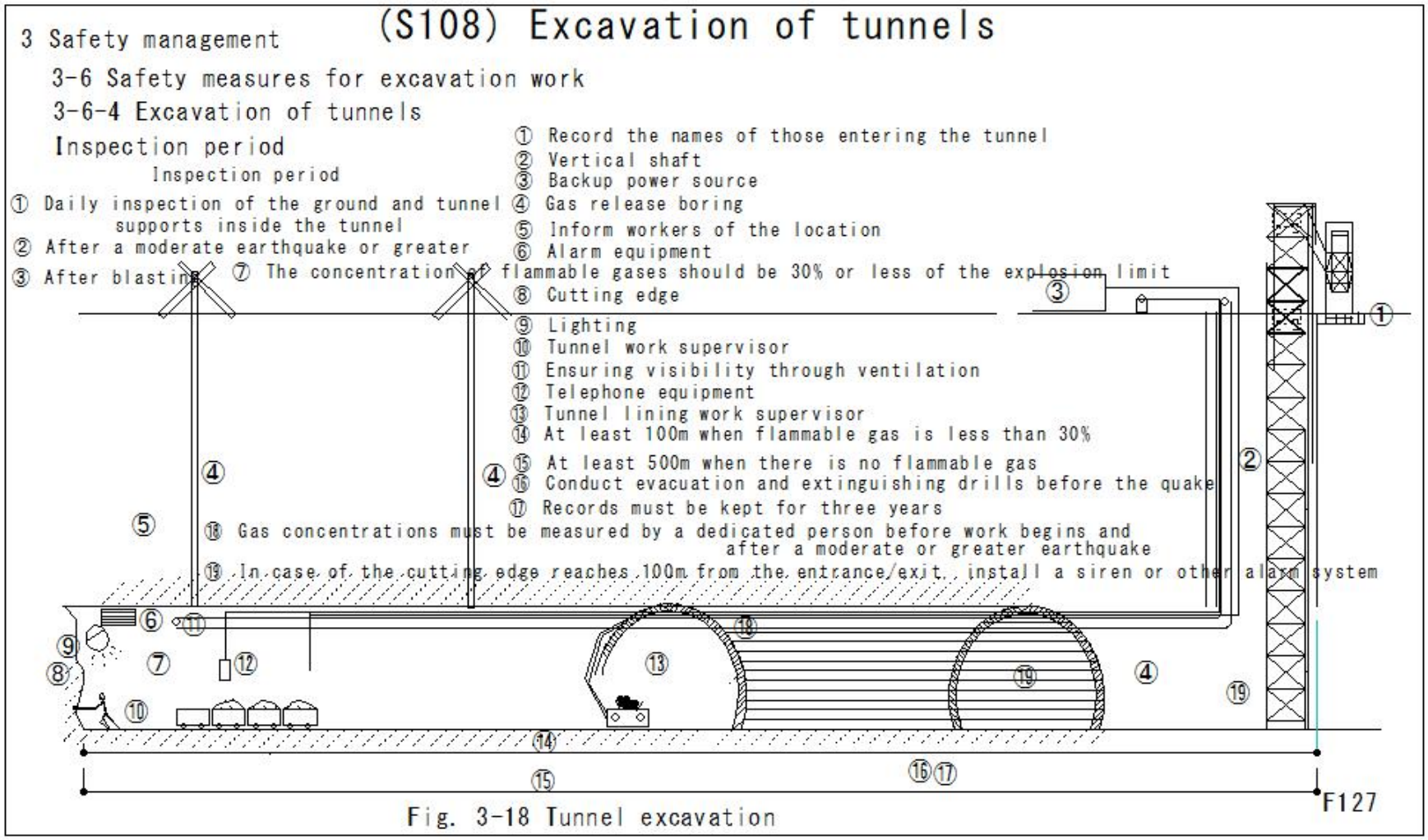


Fig. 3-18 Tunnel excavation

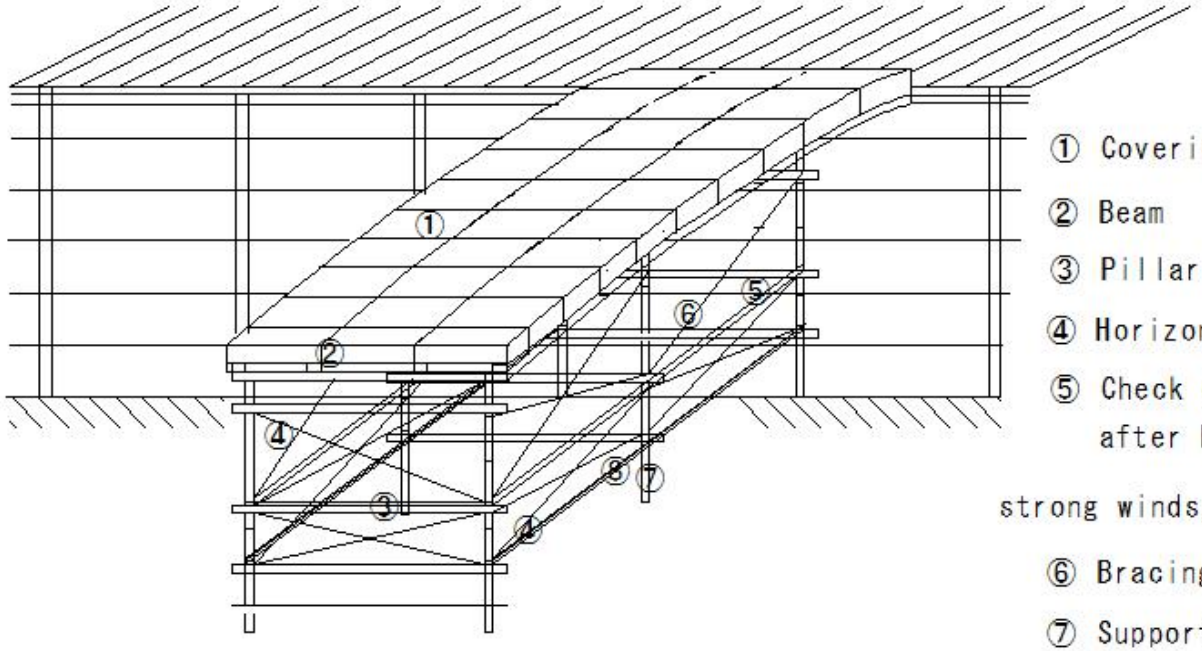
(S109) Work platform

(S109) Work platform

3 Safety management

3.6 Safety measures for excavation work

3.6.5 Work platform



① Covering plate

② Beam

③ Pillar pipe

④ Horizontal connection

⑤ Check before starting work after after bad weather such as strong winds, heavy rain, or heavy snow

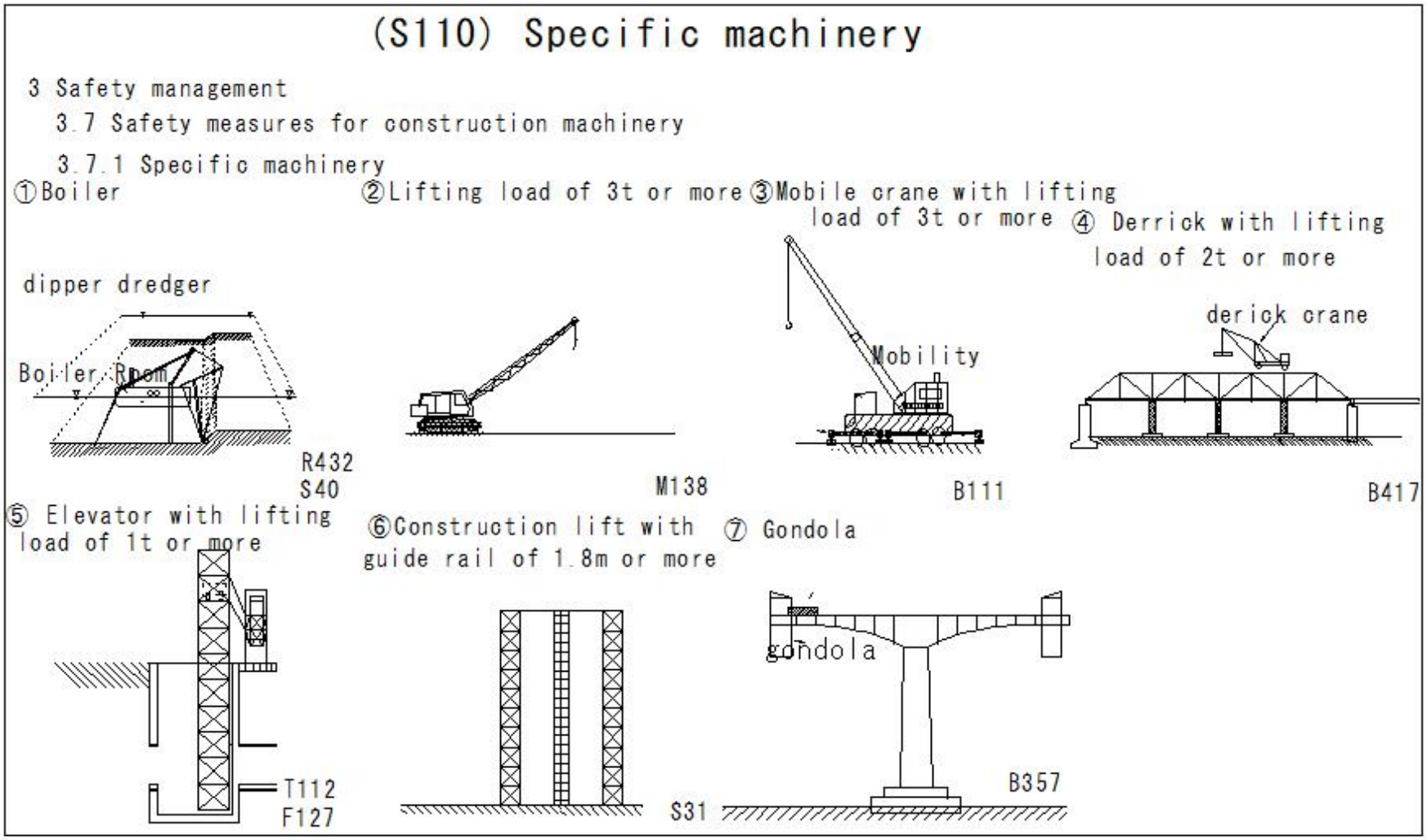
⑥ Bracing

⑦ Support

⑧ Horizontal connection

Fig. 3.19 Regulations for work platform

(S110) Specific machinery



(S111) Vehicle-based construction machinery

(S111) Vehicle-based construction machinery

3 Safety management

3.7 Safety measures for construction machinery

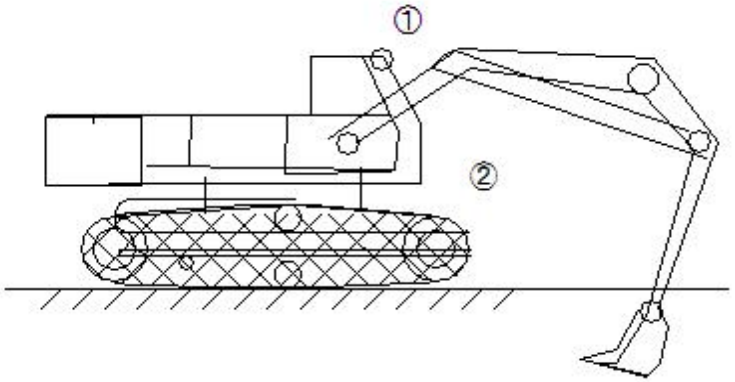
3.7.3 Vehicle-based construction machinery

・Structure

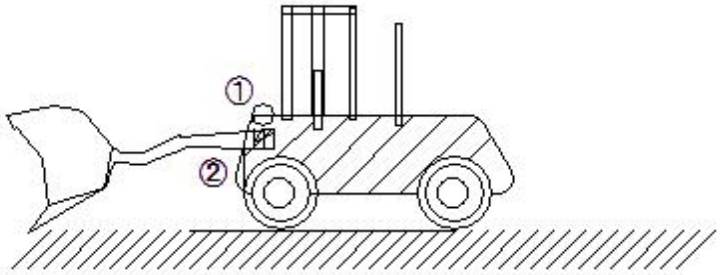
① Equipped with headlights

② Equipped with sturdy head guards

・Speed limit: Set an appropriate speed limit



backhoe



Tractor excavator

(S112) Vehicle-based construction machinery

(S112) Vehicle-based construction machinery

3 Safety management

3.7 Safety measures for construction machinery

3.7.3 Vehicle-based construction machinery

・Things that drivers should observe

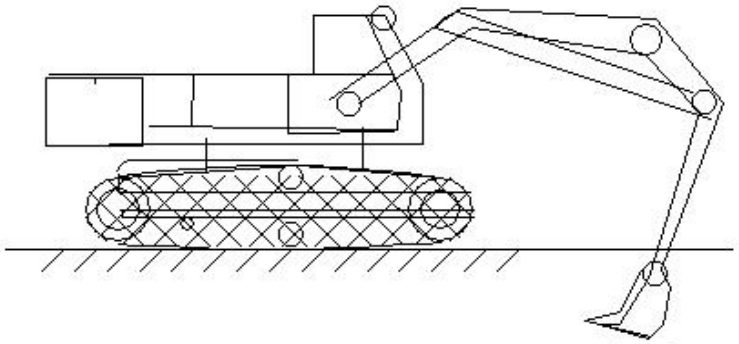
① In case of leaving the driving position

・Lower the bucket, zipper, and other work equipment to the ground

・Stop the engine and apply the travel brake

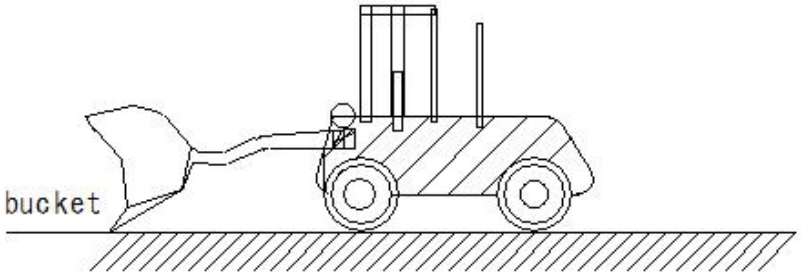
leaving the driving position

brake



backhoe

bucket



Tractor excavator

(S113) Vehicle-based construction machinery

(S113) Vehicle-based construction machinery

3 Safety management

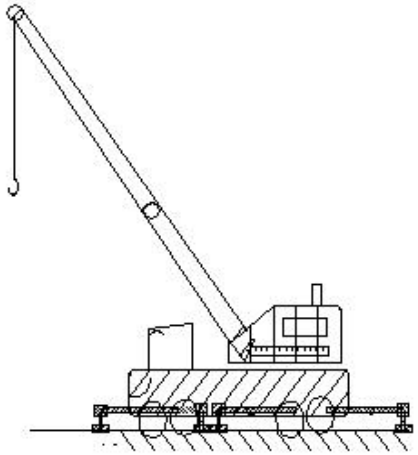
3.7 Safety measures for construction machinery

3.7.3 Vehicle-based construction machinery

・Things that drivers should observe

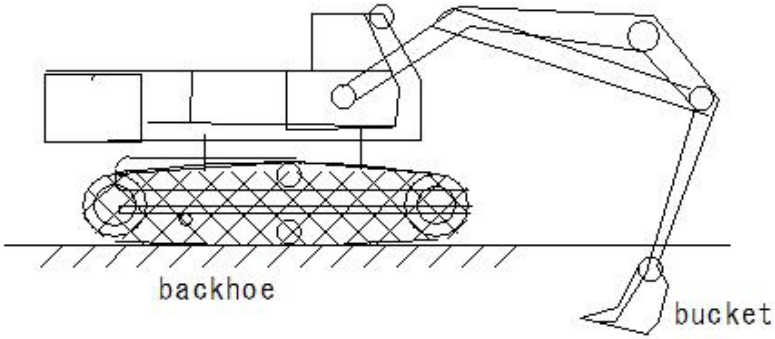
②Do not allow anyone to ride in any seat other than the passenger seat

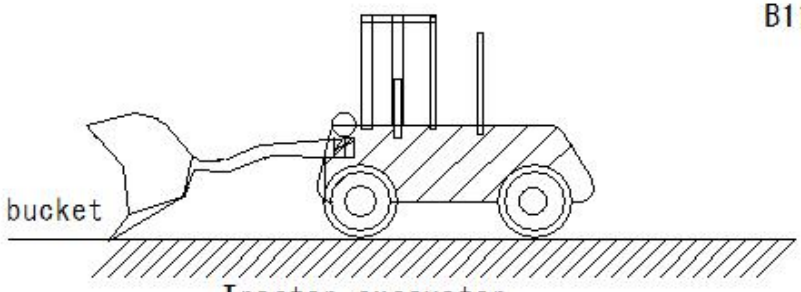
Do not allow anyone to ride



Mobility crane

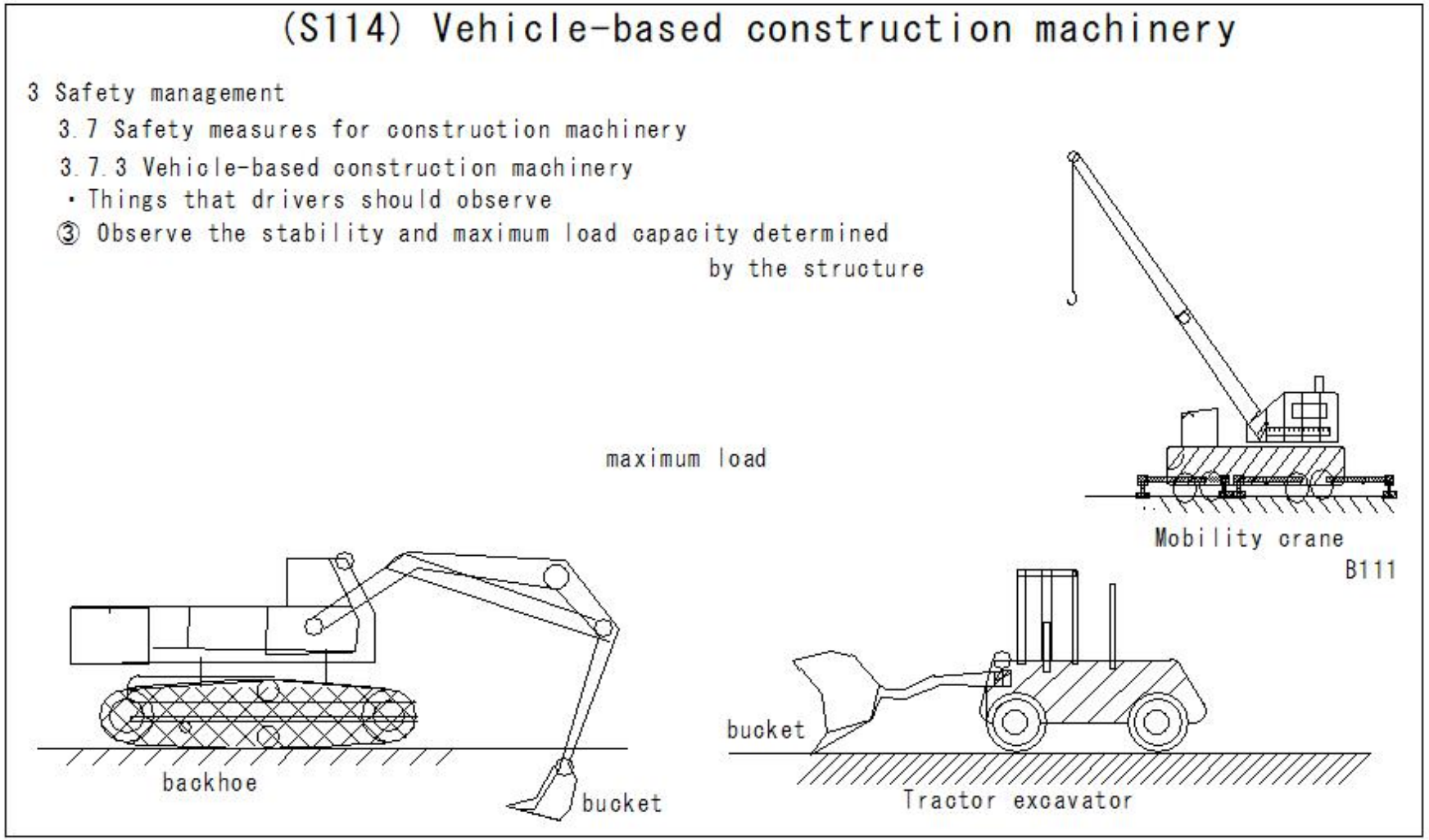
B111





Tractor excavator

(S114) Vehicle-based construction machinery



(S115) Vehicle-based construction machinery

(S115) Vehicle-based construction machinery

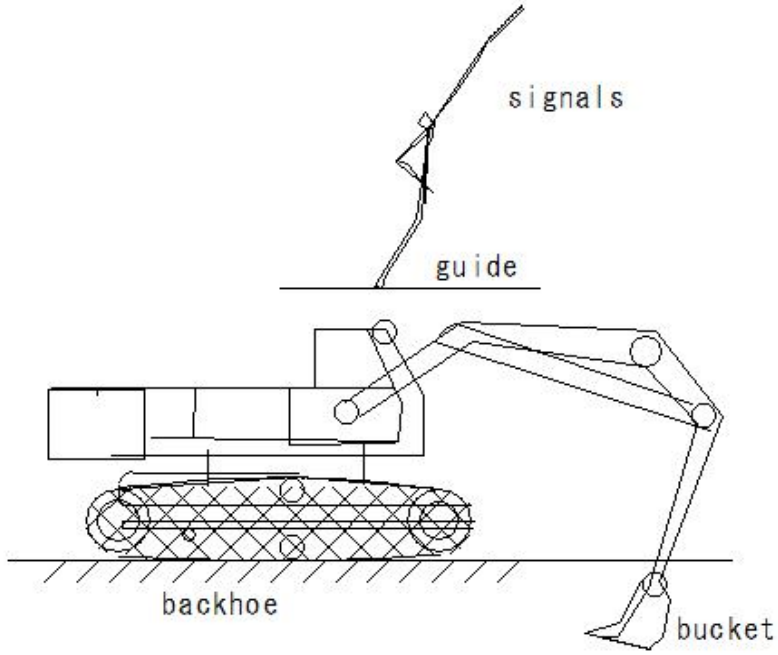
3 Safety management

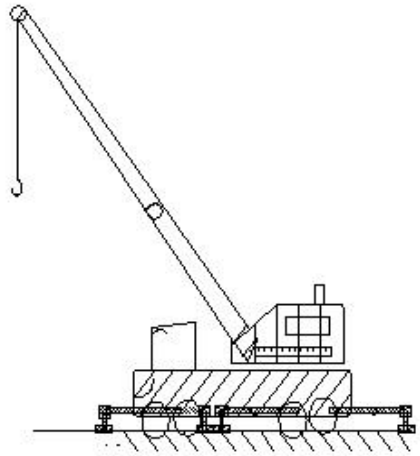
3.7 Safety measures for construction machinery

3.7.3 Vehicle-based construction machinery

・Things that drivers should observe

④ Establish certain signals and follow the instructions of the guide





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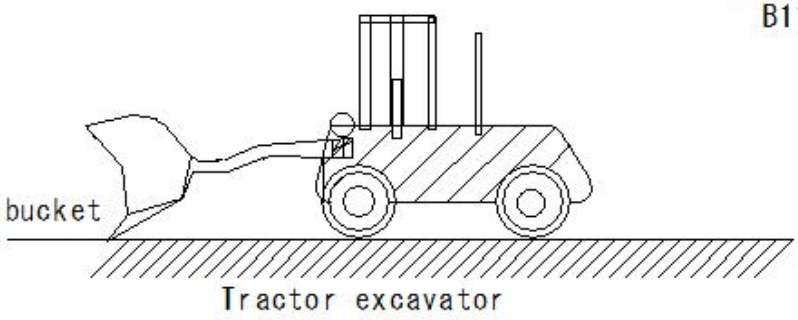
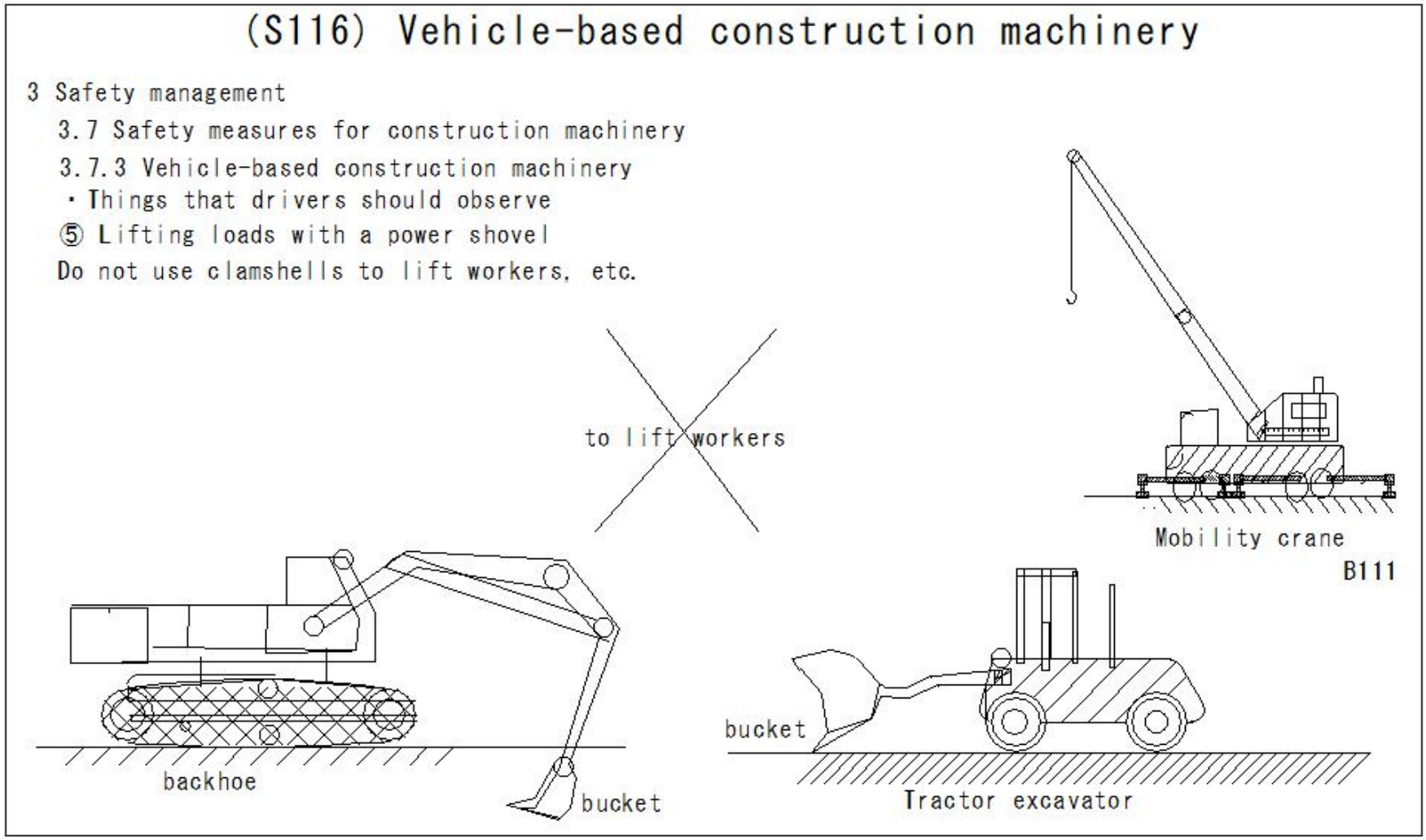


(S116) Vehicle-based construction machinery



(S117) Vehicle-based construction machinery

(S117) Vehicle-based construction machinery

3 Safety management

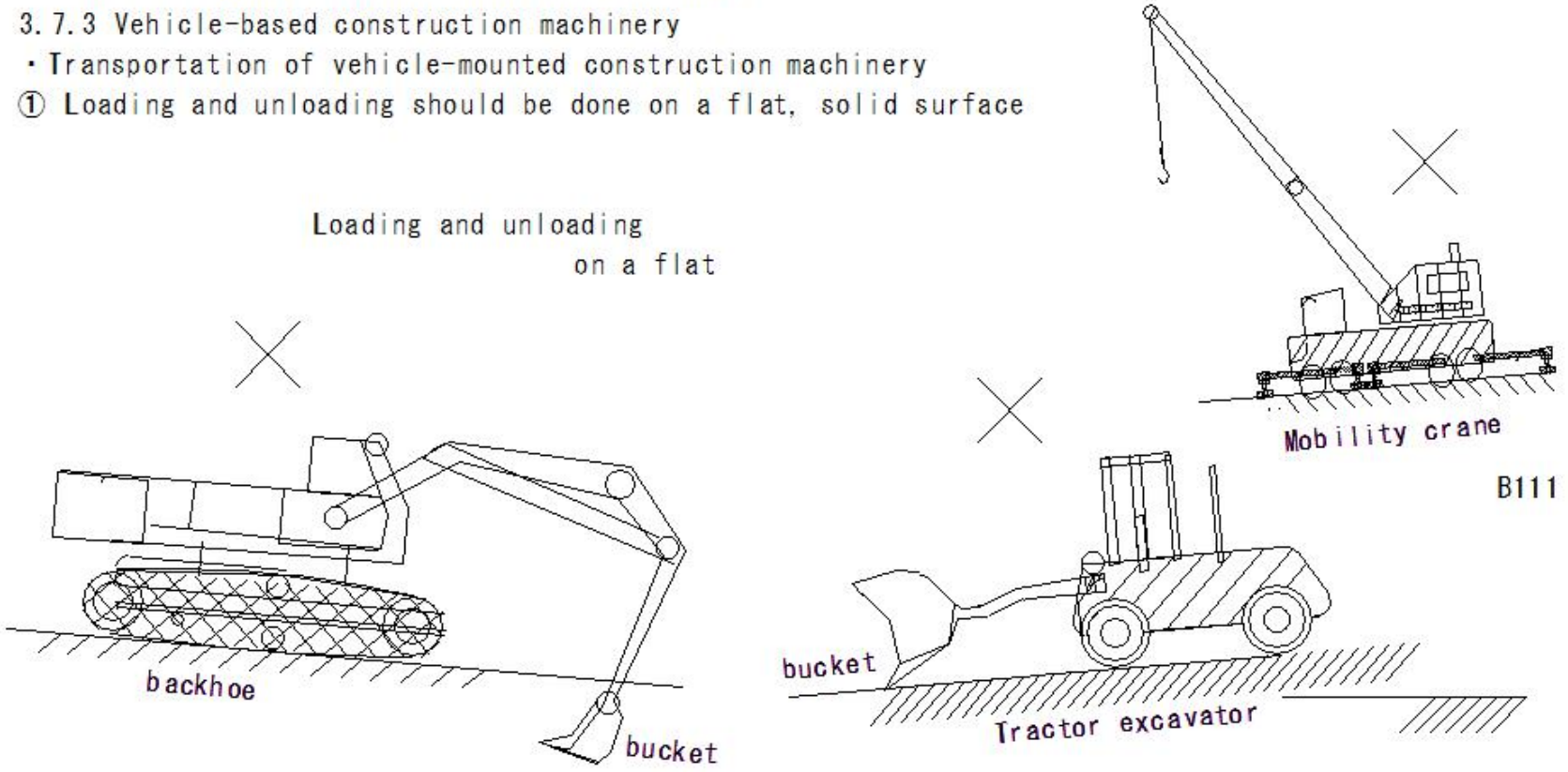
3.7 Safety measures for construction machinery

3.7.3 Vehicle-based construction machinery

・Transportation of vehicle-mounted construction machinery

① Loading and unloading should be done on a flat, solid surface

Loading and unloading on a flat



(S118) Vehicle-based construction machinery

(S118) Vehicle-based construction machinery

3 Safety management

3.7 Safety measures for construction machinery

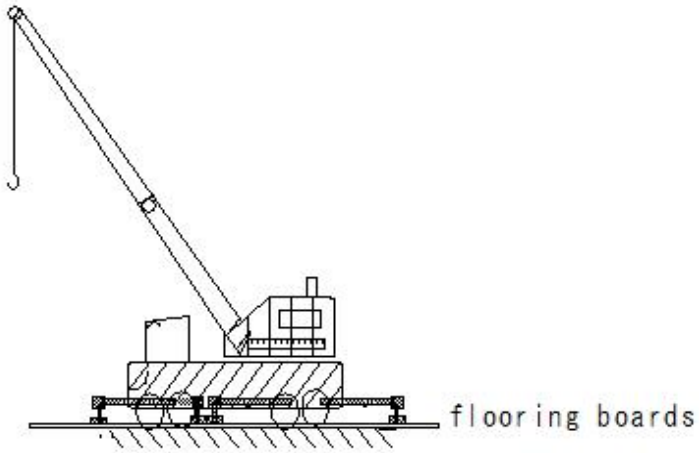
3.7.3 Vehicle-based construction machinery

・Transportation of vehicle-mounted construction machinery

② In case of using flooring boards

・Use ramps with sufficient length, width, and strength

・Install securely with an appropriate gradient



Mobility crane

(S119) Vehicle-based construction machinery

(S119) Vehicle-based construction machinery

3 Safety management

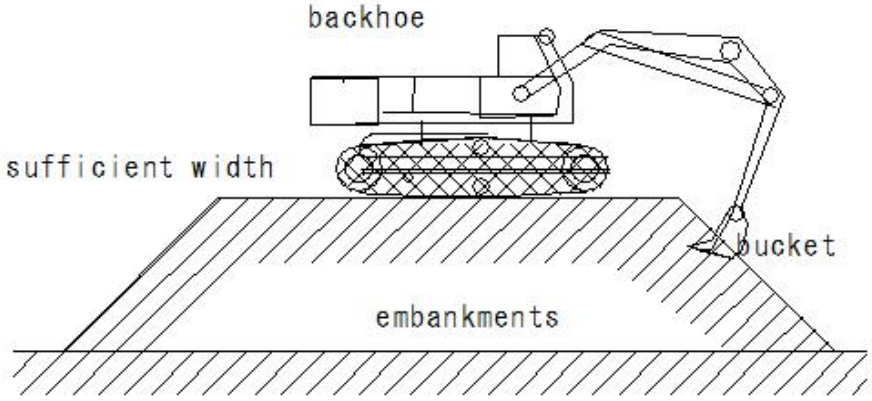
3.7 Safety measures for construction machinery

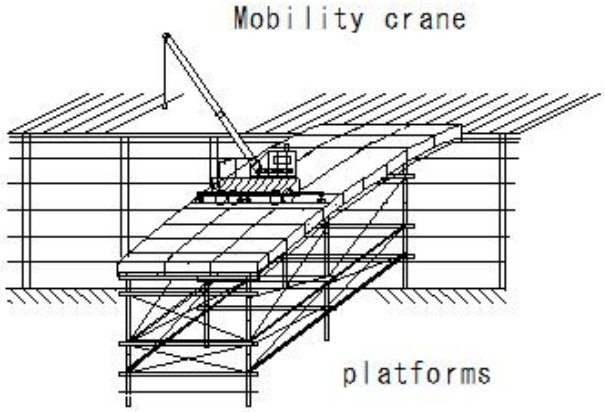
3.7.3 Vehicle-based construction machinery

・Transportation of vehicle-mounted construction machinery

③In case of using embankments or temporary platforms,

ensure sufficient width, strength, and gradient





(S120) Specific voluntary inspections

(S120) Specific voluntary inspections

3 Safety management

3.7 Safety measures for construction machinery

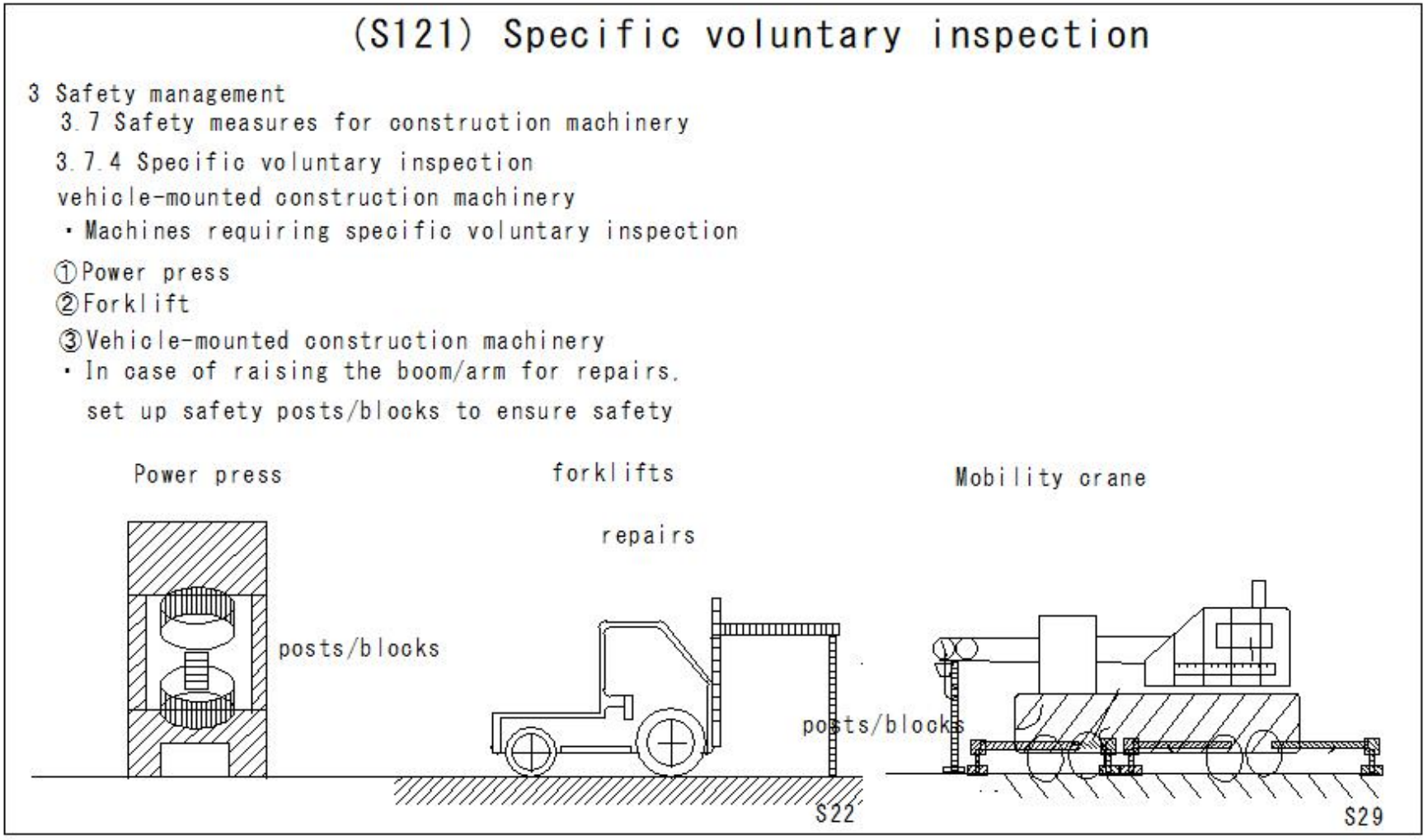
3.7.4 Specific voluntary inspections

(vehicle-mounted construction machinery

Table 3.8 Inspection of vehicle-mounted construction machinery

① Frequency	② Inspection items
③ Once per year	④ Prime mover and power transmission device ⑤ Running gear, steering gear, brakes ⑥ Working gear, hydraulic equipment, electrical system ⑦ Vehicle-related
⑧ Once per month	⑨ Presence or absence of brakes, clutches, steering gear, and working gear ⑩ Presence or absence of damage to wire ropes and chains ⑪ Presence or absence of damage to buckets, zippers, etc.
⑫ Before work begins	⑬ Presence or absence of brakes and clutches

(S121) Specific voluntary inspection



(S122) Pile drivers

(S122) Pile drivers

3 Safety management

3.7 Safety measures for construction machinery

3.7.5 Pile drivers

Key points: Measures to prevent collapse and wire rope safety

① Groove pulley

② Leave at least two turns on the winding body of the hoisting device

③ Wire rope: Safety factor 6 or higher, no joints, kicks, or damage
No more than 10% wire breakage
Reduction in diameter: no more than 7% of nominal diameter

④ Balance weight: Securely fixed to the frame

⑤ Always keep the installation area drained

⑥ Do not pull horizontally when taking in piles

⑦ In case of the ground is soft, use temporary laying plates and laying corners
In case of there is a risk of slipping, secure with piles and wedges

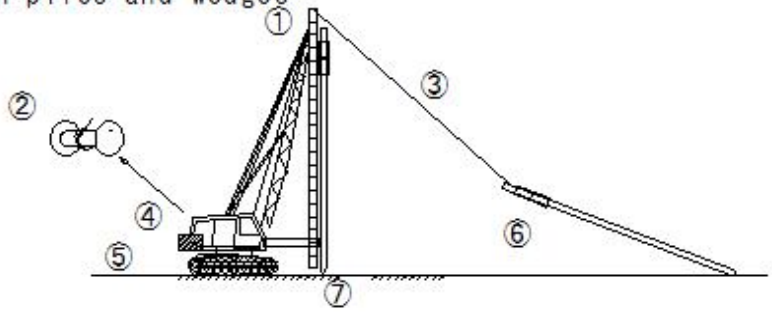


Figure 3.20 Safety measures for pile driving towers

M324

(S123) Mobile cranes

(S123) Mobile cranes

3 Safety management

3.7 Safety measures for construction machinery

3.7.6 Mobile cranes

Table 3.9 Periodic voluntary inspection

① Frequency	② Inspection items
③ Once per year	④ Load test
⑤ Once per month	⑥ Overwinding prevention devices, other safety devices, brakes and clutches, alarm devices ire ropes, chains, hoisting equipment (hooks, grab buckets), wiring, switchboards and controlle
⑦ Before work begins	⑧ Overwinding prevention devices, alarm devices, brakes, clutches, controllers
⑨ Records of voluntary inspections to be kept for 3 years	

(S124) Mobile cranes

(S124) Mobile cranes

3 Safety management

3.7 Safety measures for construction machinery

3.7.6 Mobile Crane

① Do not exceed the range of the jib inclination angle

② Safety valve: Prevents the jib from overextending

③ Load obtained by subtracting the weight of the lifting equipment from the lifting load

④ Display the rated load and do not apply the load beyond the limit

⑤ Backstop: Prevents the jib from swinging

⑥ Do not allow workers to board unless the dedicated boarding device is sufficiently safe

⑦ Overload prevention devices should not be used unless they have a display of certification

⑧ The leader's feet should be similar to those of a pile driver or tower

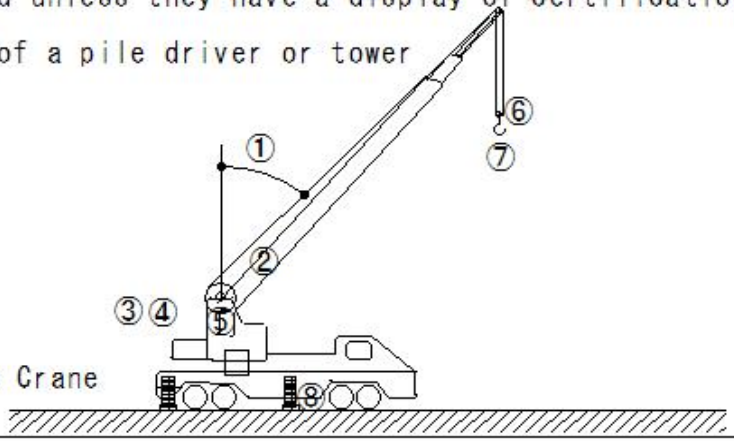


Fig. 3.21 Precautions for Mobile Crane

M393

(S125) Track system

(S125) Track system

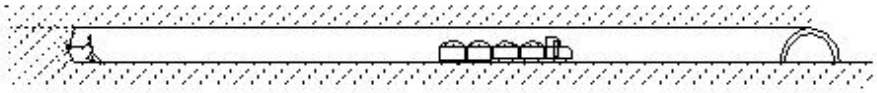
3 Safety management

3.7 Safety measures for construction machinery

3.7.7 Track system

Vehicle operation method

① Method using a powered vehicle



② Method using a hoisting device

③ Method using human power (push)

(S126) Track system

(S126) Track system

3 Safety management

3.7 Safety measures for construction machinery

3.7.7 Track system

Vehicle operation method

① Method using a powered vehicle

① For hand-operated vehicles

・Install emergency stop devices

In case of used at an inclination angle of 30° or more

Install derailment prevention devices

② Improve visibility

③ Install headlights and warning bells

④ Spacing between side walls, etc.: 60cm or more

⑤ Weight of rail

⑥ Gradient: 50/1000 or less

⑦ Equip with manual brakes, and if over 10t,

also equip with powered brakes

⑧ Curved sections: Curve radius 10m or more,

install guard rails to maintain appropriate cant

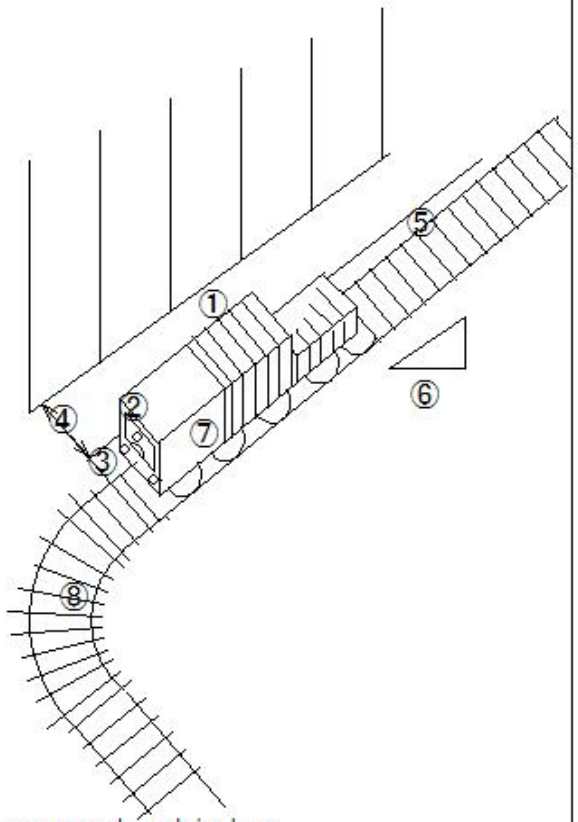


Figure 3.22 Regulations for track equipment for powered vehicles

(S127) Track system

(S127) Track system

3 Safety management

3.7 Safety measures for construction machinery

3.7.7 Track system

Vehicle operation method

② Method using a hoisting device

① For drag cars, safety factor 6 or more

② For handcarts, safety factor 10 or more

③ Loss of number of wires 10% or less

④ No kinks or damage

② Method using a hoisting device

(S128) Track system

(S128) Track system

3 Safety management

3.7 Safety measures for construction machinery

3.7.7 Track system

Vehicle operation method

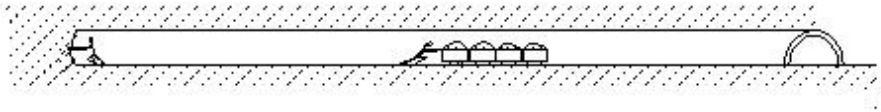
③ For hand-pushed vehicles

① The track must have a curve radius of 5m or more and a gradient of 1/15 or less

② An effective manual brake must be provided when the track has a gradient of 10/1000 or more

③ The vehicle speed must be 15km/h or less on a downward gradient

③ Method using human power (push)



(S129) Blasting work

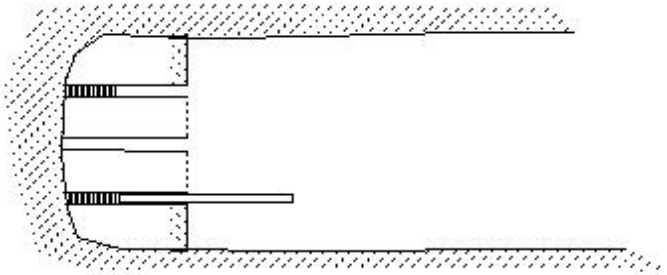
(S129) Blasting work

3 Safety Management

3.8 Safety measures for blasting work

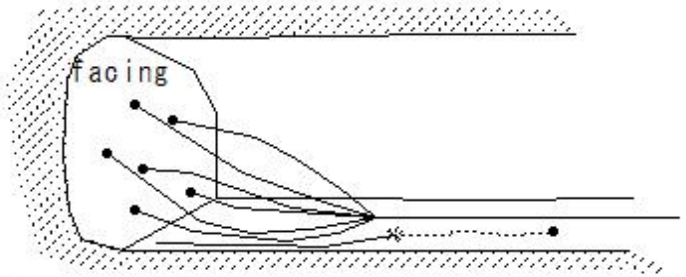
3.8.1 Handling explosives

① Containers must be made of wood or other electrically non-conductive materials



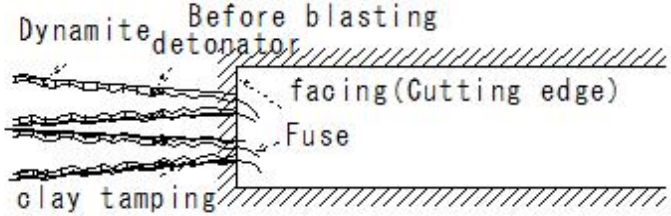
T141

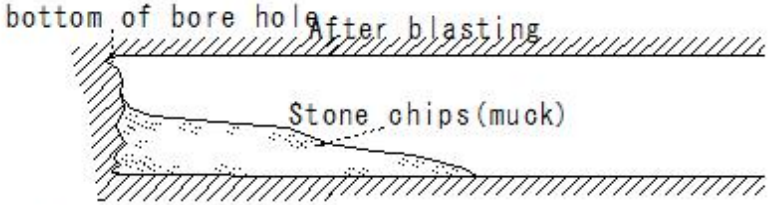
blasting



T143

T38





T232

(S130) Blasting work

(S130) Blasting work

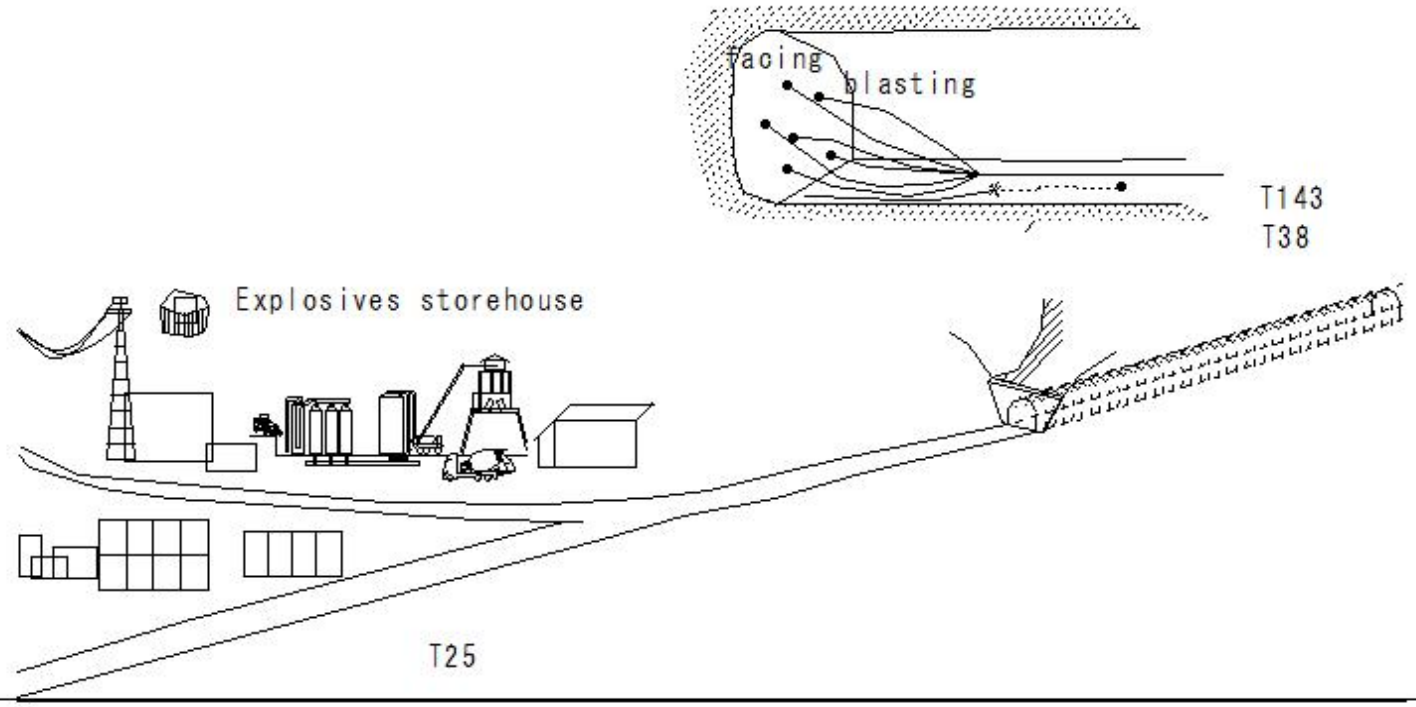
3 Safety Management

3.8 Safety measures for blasting work

3.8.1 Handling explosives

② Gunpowder, explosives, detonating cords, and pyrotechnics must be stored in separate containers

The same applies to transportation



(S131) Blasting work

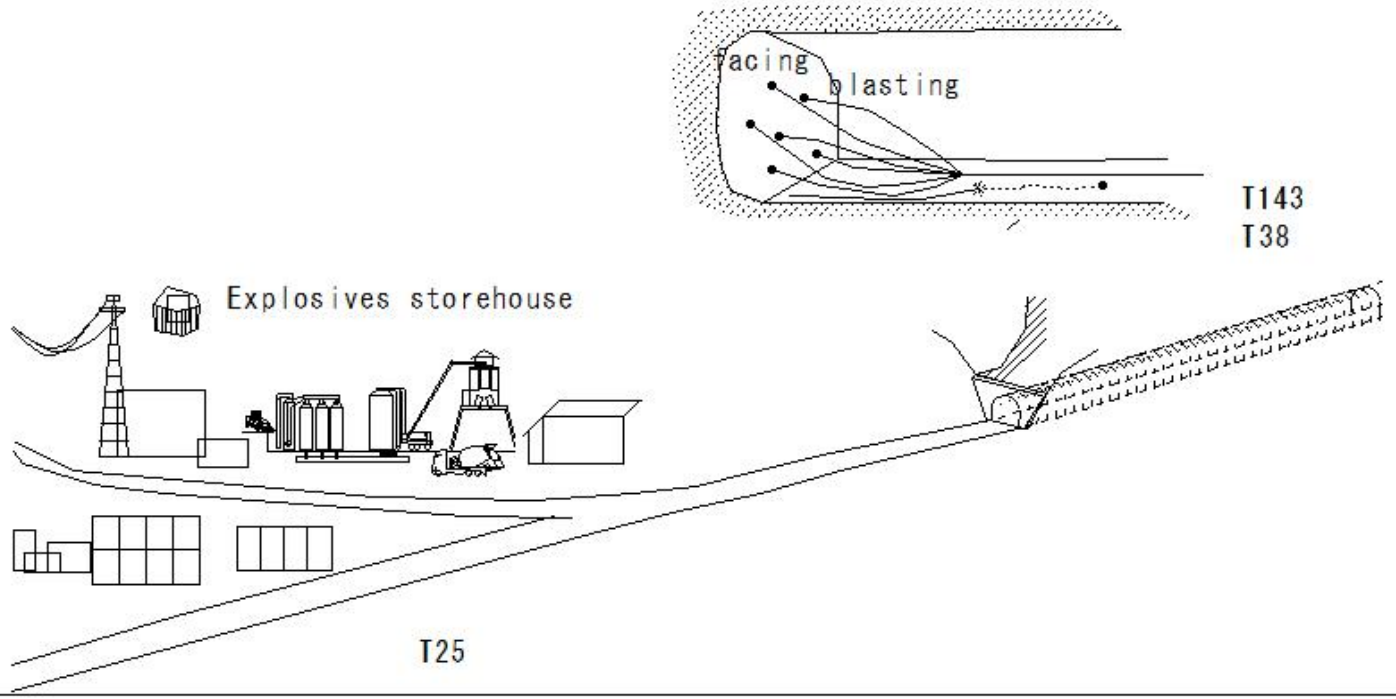
(S131) Blasting work

3 Safety Management

3.8 Safety measures for blasting work

3.8.1 Handling explosives

③ The amount transported must be the amount used in one go



(S132) Blasting work

(S132) Blasting work

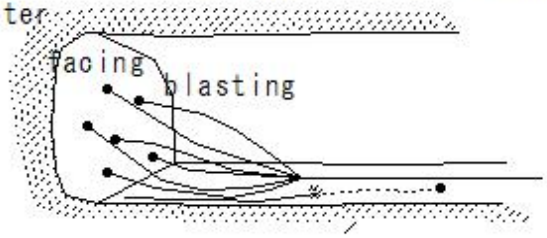
3 Safety Management

3.8 Safety measures for blasting work

3.8.1 Handling explosives

④ Frozen dynamite must not be melted in a dangerous manner such as direct contact with fire or hot objects

Melting must be done using a melter with hot water below 50° C or in a room below 30° C



T143
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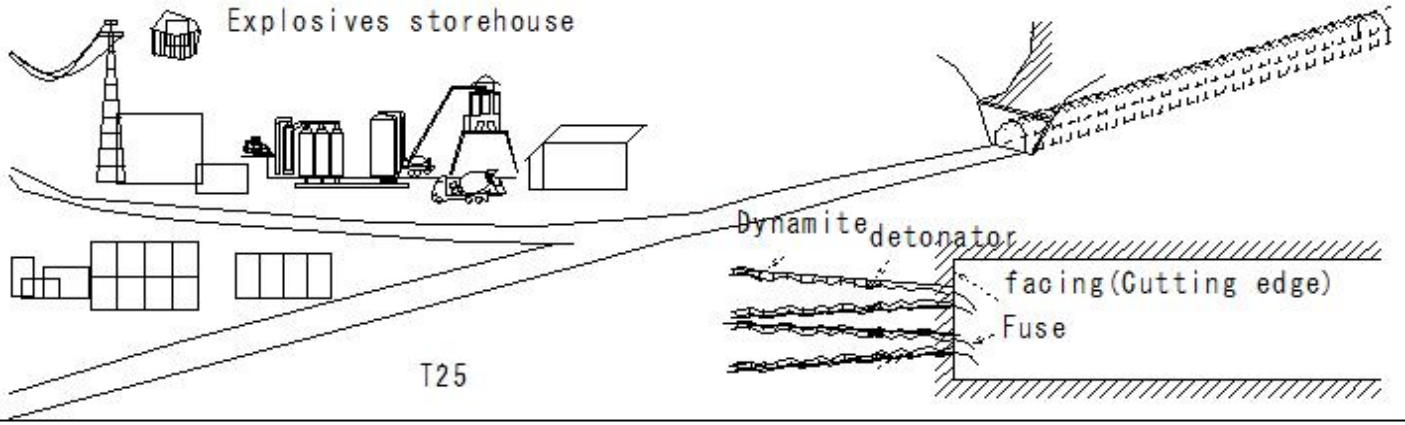


(S133) Blasting work

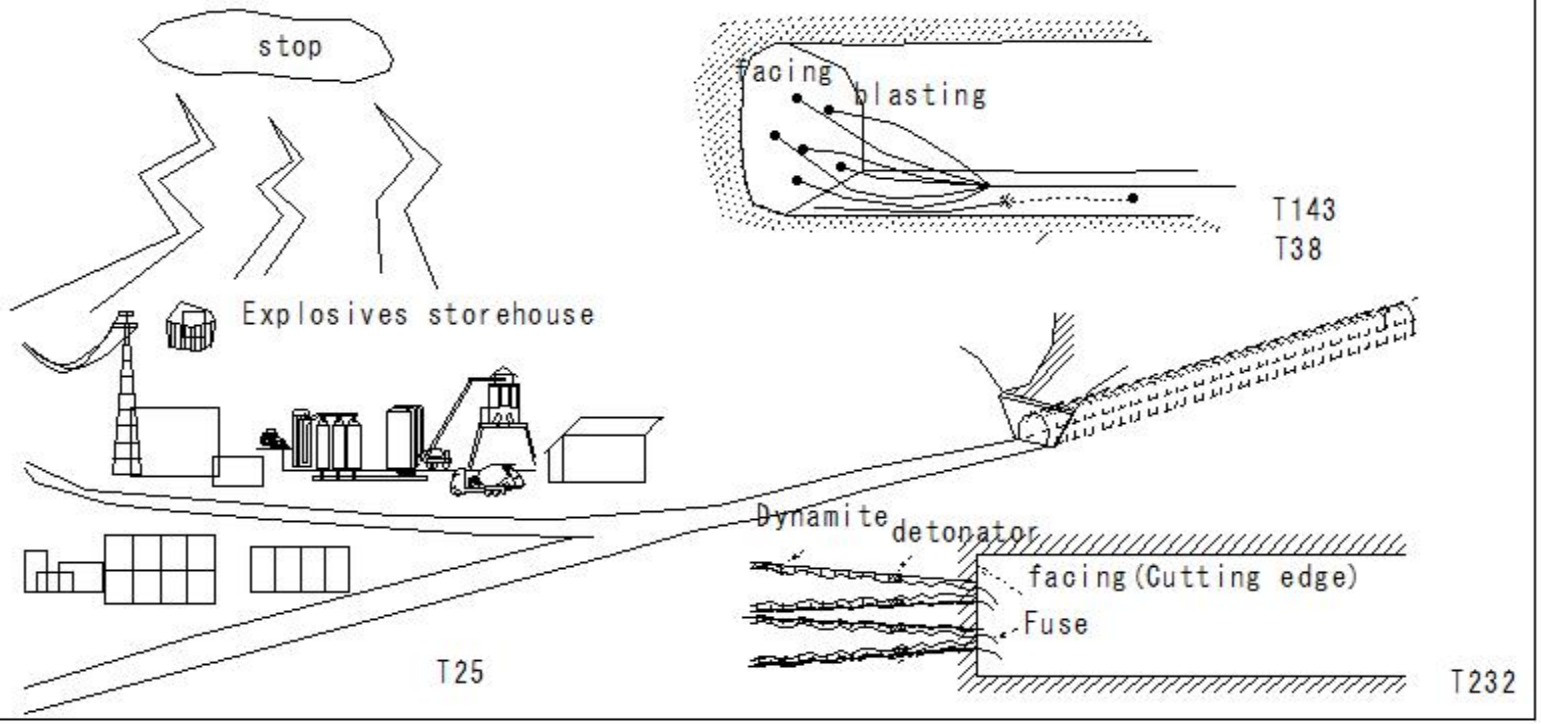
(S133) Blasting work

3 Safety Management

3.8 Safety measures for blasting work

3.8.1 Handling explosives

⑤ In case of there is a risk of lightning, stop work related to electric detonators or electric fuses



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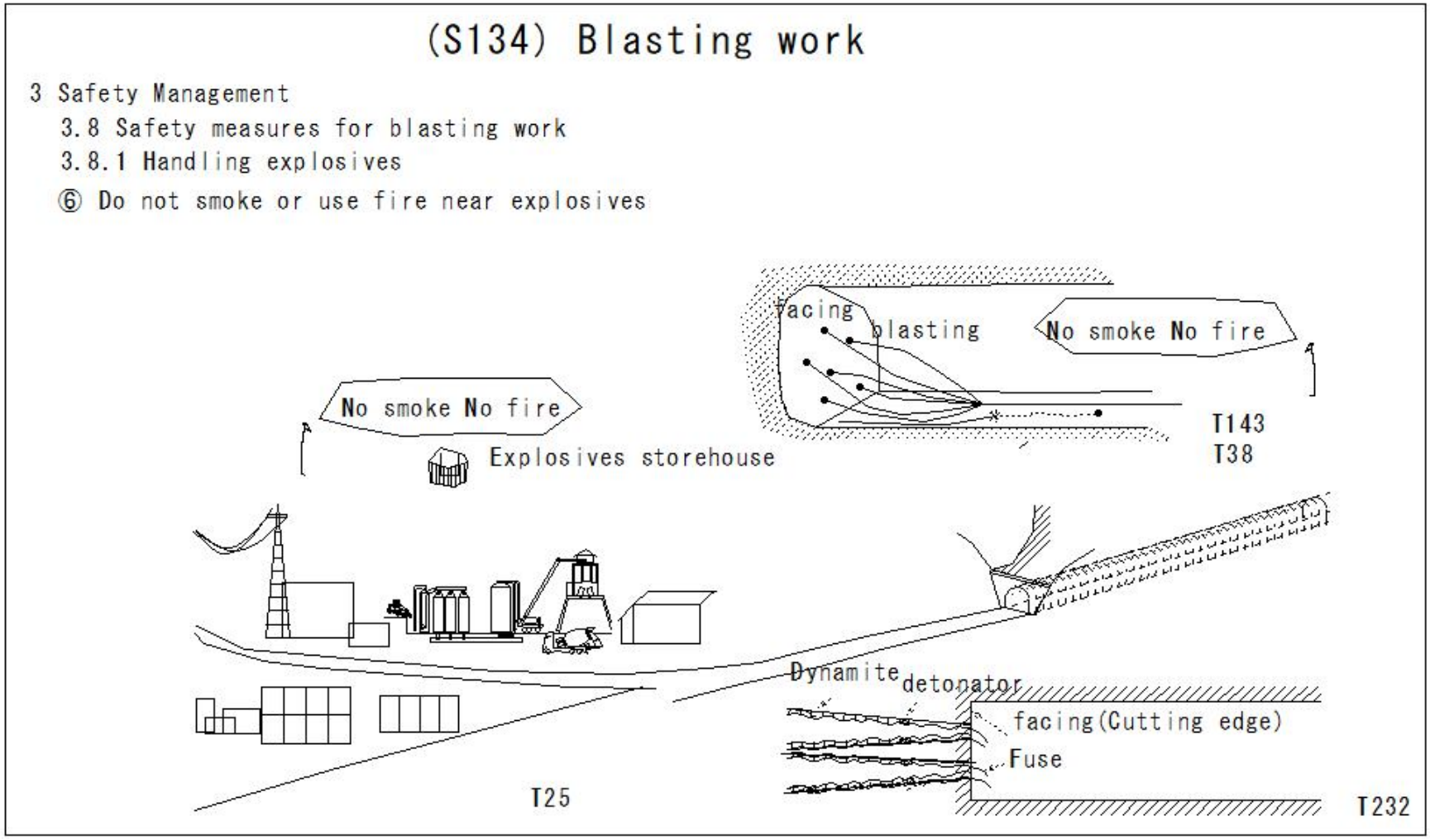
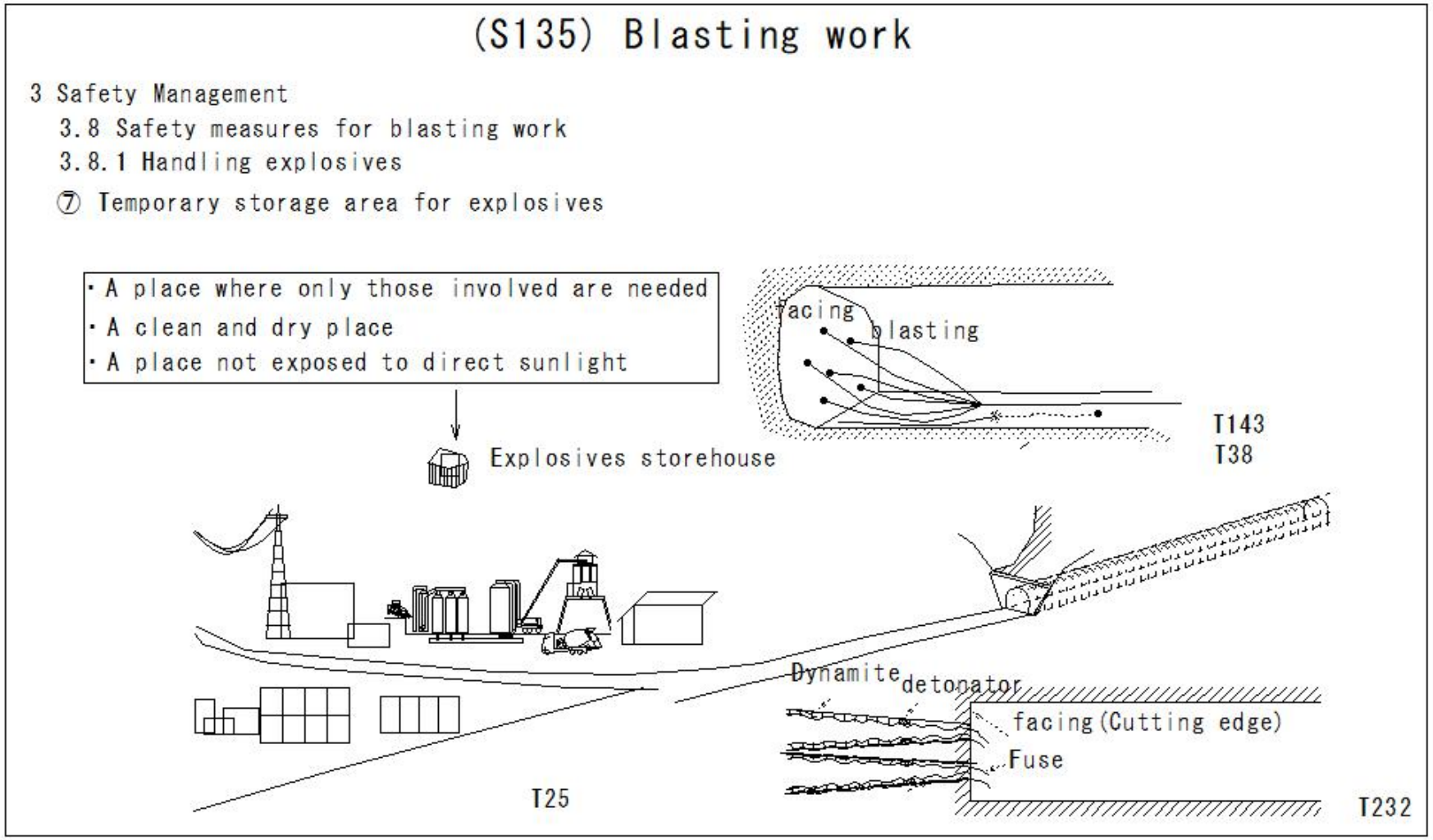


(S135) Blasting work



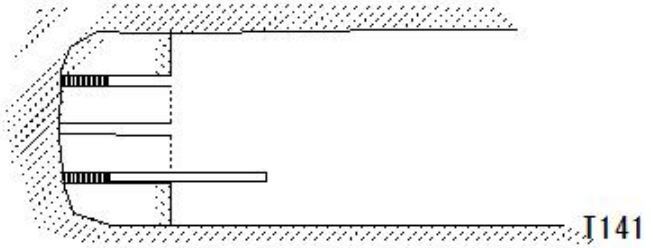
(S136) Blasting work

(S136) Blasting work

3 Safety Management

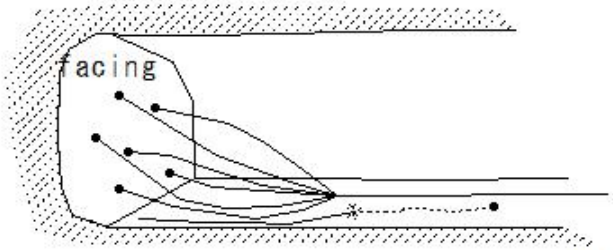
3.8 Safety measures for blasting work

3.8.2 Blasting Work



T141

blasting



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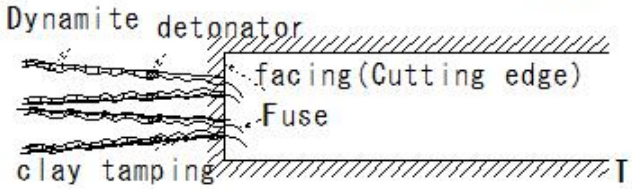

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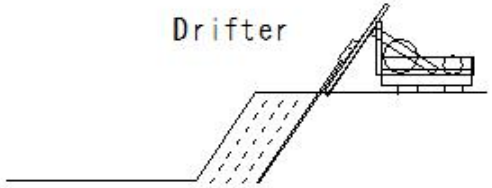


① Drilling and Loading

① Do not use holes from the previous blasting

② Stop drilling when loading

③ No smoking or open flames in the vicinity

④ Loading materials must not contain pebbles with sharp edges

Other non-flammable materials must be used

⑤ Loading tools must be safe against friction, impact, and static electricity (e.g. wood - good, vinyl, metal - not good)

(S137) Blasting work

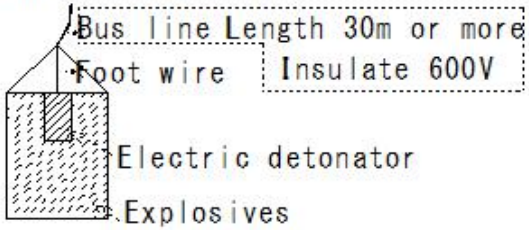
(S137) Blasting work

3 Safety Management

3.8 Safety measures for blasting work

3.8.2 Blasting Work

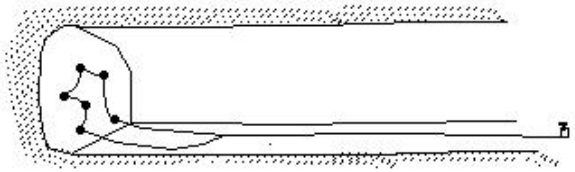
・Electric blasting



① Stop blasting in case of there is leakage (stray) current

② Ensure that a current of 1A or more flows through the circuit

・Safety measures during blasting



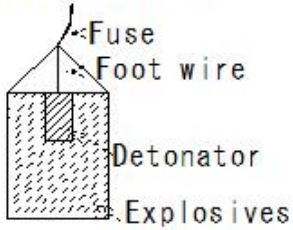
No entry to dangerous areas

Barricade

Sign

Sign with siren, etc.

・Fuse blasting



Fuse

Number of consecutive ignitions by the same person

① 1.5m or more, less than 10 shots

② 0.5-1.5m, less than 5 shots

③ 0.5m or less, 1 shot

Fig. 3-23 Precautions for blasting

(S138) Blasting work

(S138)Blasting work

3 Safety Management

3.8 Safety measures for blasting work

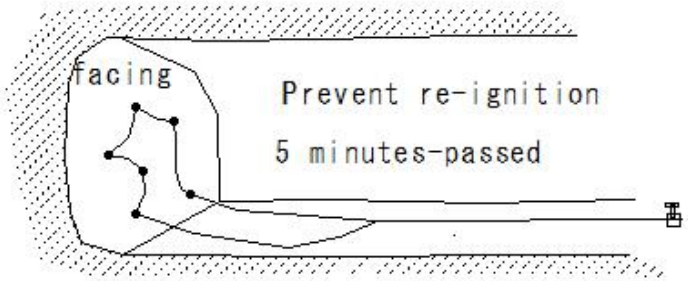
3.8.3 Post-blasting work

① After electric blasting

① Prevent re-ignition: Remove the blasting wire from the igniter and shorten its end

② Do not approach the loading area until more than 5 minutes have passed

Also, do not allow other workers to approach



T144

(S139) Blasting work

(S139) Blasting work

3 Safety management

3-8 Safety measures for blasting work

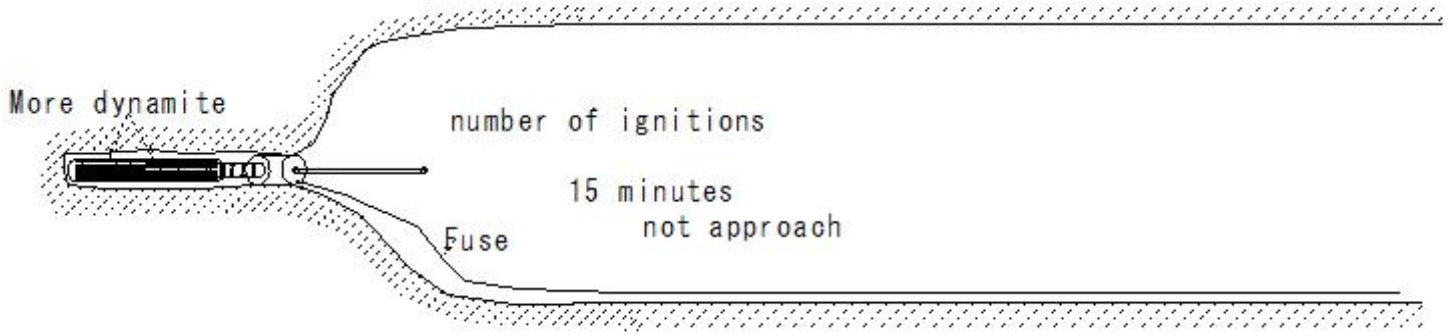
3-8-3 Post-blasting work

② After blasting the fuse

① Check the number of ignitions

② Do not approach the loading area after 15 minutes have passed since blasting

Workers should not approach either



T233

(S140) Blasting work

(S140)Blasting work

3 Safety management

3-8 Safety measures for blasting work

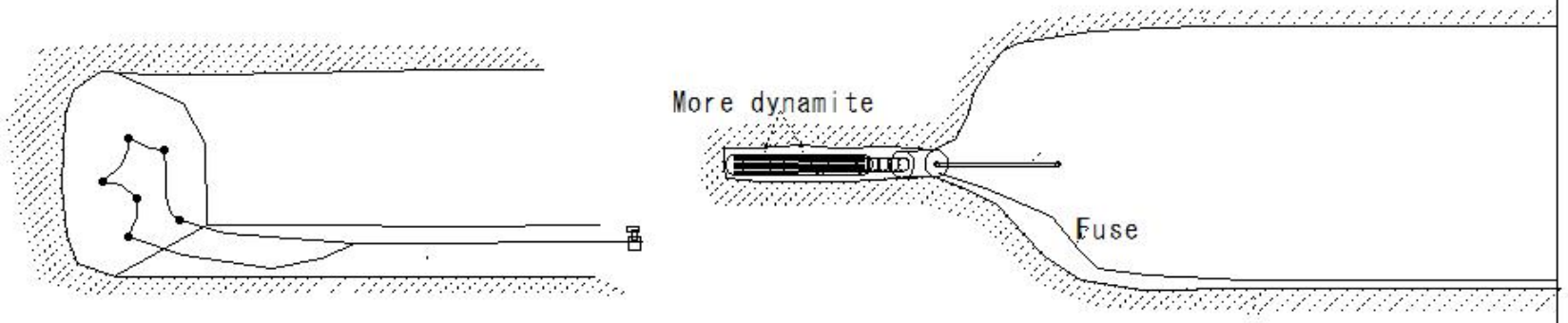
3-8-3 Post-blasting work

③ In case of there is unexploded explosives

① Drill parallel holes at least 60 cm apart from the unexploded blast hole, blast, and collect the unexploded explosives

② Use a water stream from a rubber hose to flush out and collect the explosives and explosives

③ Remove the explosives, reload, and reignite



electric blasting

blasting the fuse

(S141) compressed air work

(S141)compressed air work

3 Safety management

3.9 Safety measures for compressed air work

3.9.1 Equipment

・Equipment defects: Causes oxygen deficiency

① Air supply pipe
② Check valve
③ Automatic alarm for abnormal temperature
④ Install a dedicated exhaust pipe
⑤ Man lock
⑥ Open flames strictly prohibited
⑥-1 Work room - Air volume is 4?3/person7 or more
⑦ Floor area 0.3m2/person or more
Air volume 0.6m3/person or more
⑧ Shield
⑨ Material lock
⑩ Separate from man lock as much as possible

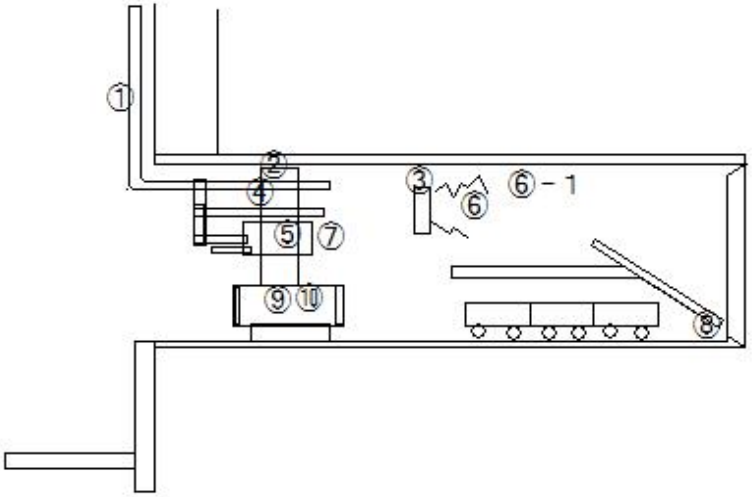


Fig. 3.24 Equipment for compressed air work

(S142) compressed air work

(S142) compressed air work

3 Safety management

3.9 Safety measures for compressed air work

3.9.2 Work management

① Pressurization and decompression speed: 0.80kgf/cm2 per minute

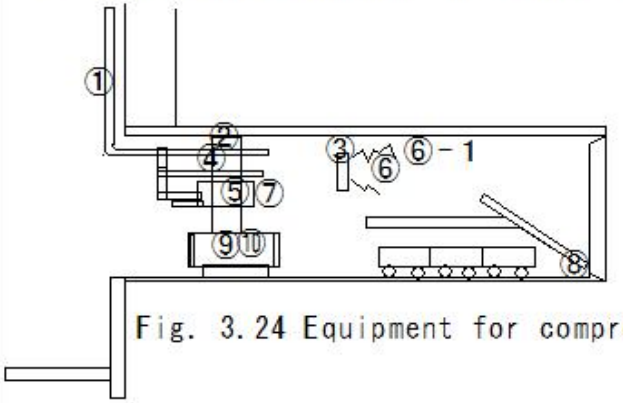
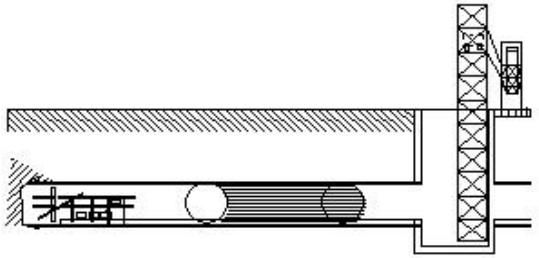


Fig. 3.24 Equipment for compressed air work

S141



②Shield method

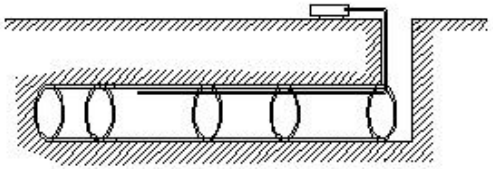
F127

T112

Bulkhead (airlock)

Air pressure shield tunneling

T157



pneumatic method

T231

(S143) compressed air work

(S143)compressed air work

3 Safety management

3.9 Safety measures for compressed air work

3.9.2 Work management

② Workers undergo special health examinations once every six months

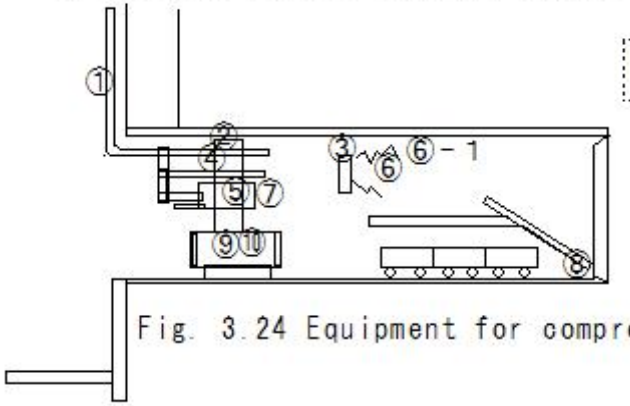
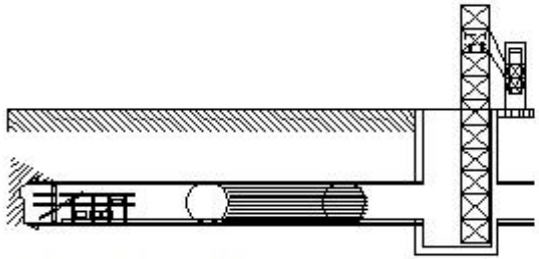


Fig. 3.24 Equipment for compressed air work

S141

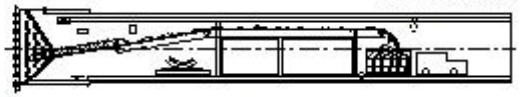
health examinations



②Shield method

F127

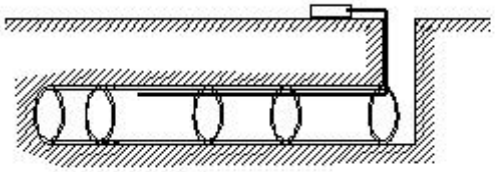
T112



Bulkhead (airlock)

Air pressure shield tunneling

T157



pneumatic method

T231

(S144) compressed air work

(S144)compressed air work

3 Safety management

3.9 Safety measures for compressed air work

3.9.2 Work management

③ For work inside a workroom or shaft where the pressure exceeds atmospheric pressure, a person with a high-pressure indoor work supervisor license must be selected

high-pressure indoor work supervisor license

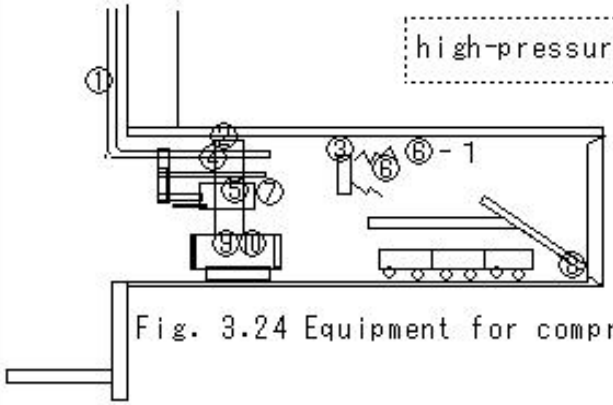
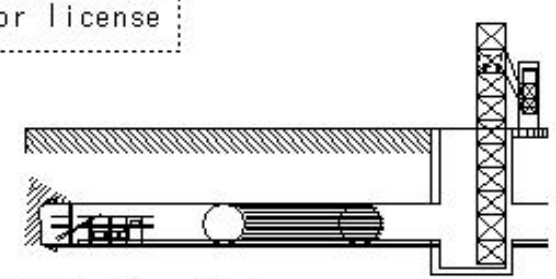


Fig. 3.24 Equipment for compressed air work

S141



②Shield method

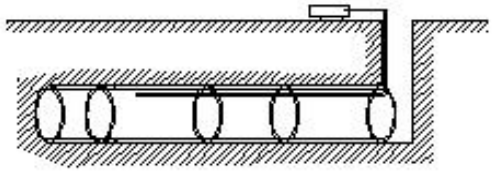
F127

T112

Bulkhead (airlock)

Air pressure shield tunneling

T157



pneumatic method

T231

(S145) compressed air work

(S145) compressed air work

3 Safety management

3.9 Safety measures for compressed air work

3.9.2 Work management

④ To prevent burns, especially when under compressed air, take the following precautions

- Lights must be equipped with guards
- Circuit switches: Use ones that do not scatter sparks around
- Use heaters that do not become hot and become a source of ignition for flammable materials
- Do not perform welding work
- Do not bring in fire, match lighters, or other items that may cause fire

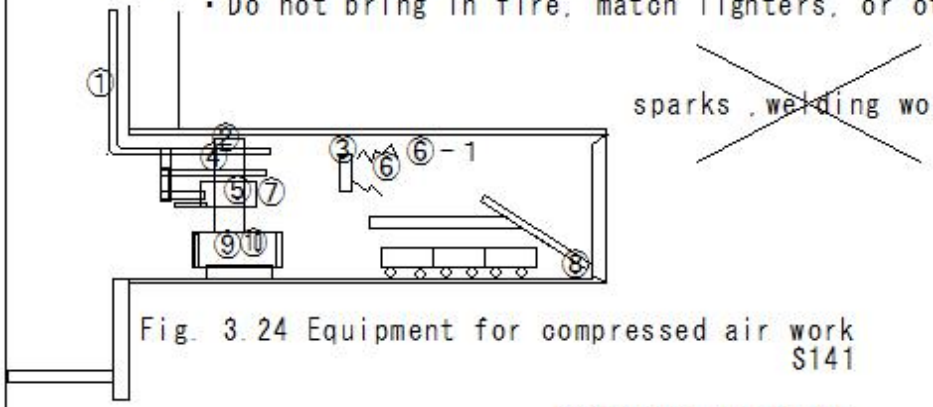
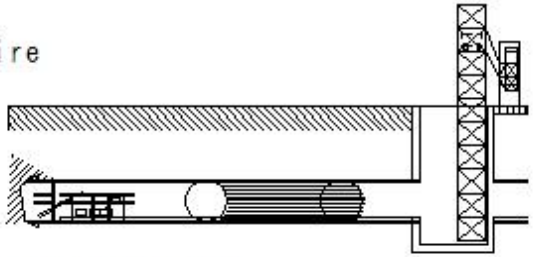


Fig. 3.24 Equipment for compressed air work

S141

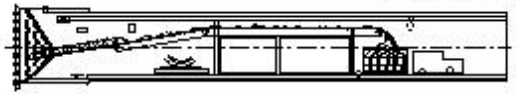


②Shield method

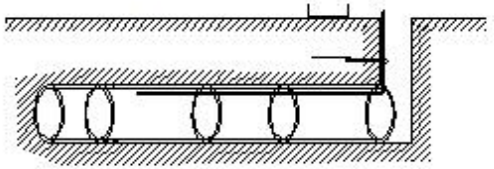
F127

T112

Bulkhead (airlock)



Air pressure shield tunneling T157



pneumatic method T231

(S146)Caisson and Diving Box

(S146)Caisson and Diving Box

3 Safety management

3.9 Safety measures for compressed air work

3-9-3 Caisson and Diving Box

Blasting work inside the caisson should be done only after confirming

① Man lock
② Material lock
③ Inner diameter of exhaust pipe should be 53 mm or less
④ In case of exhausting and lowering the caisson, workers should evacuate to the outside
⑤ Shaft
⑥ Install equipment for safe ascent and descent
⑦ Air supply pipe
⑧ Direct piping without passing through shaft
⑨ Install electric bell and telephone for contact with the outside
⑩ Work room
⑪ Do not work when there is a risk of large amounts of water entering
⑫ Air volume should be 4 m3 or more per person
⑬ Do not enter the work room alone
⑭ Always measure oxygen concentration
⑮ Excavate 50 cm or less below the blade mouth
⑯ Height from the blade mouth to the ceiling should be 1.8 m or more

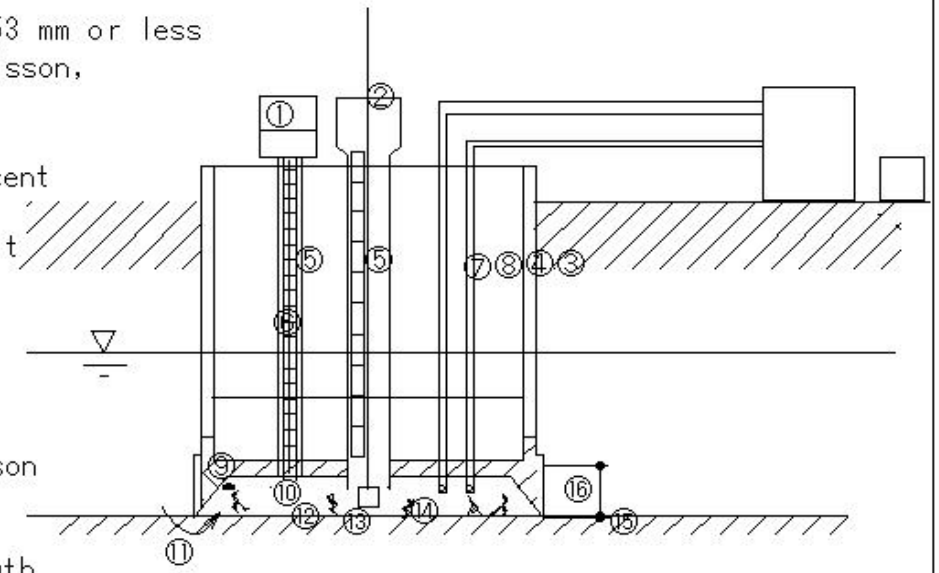
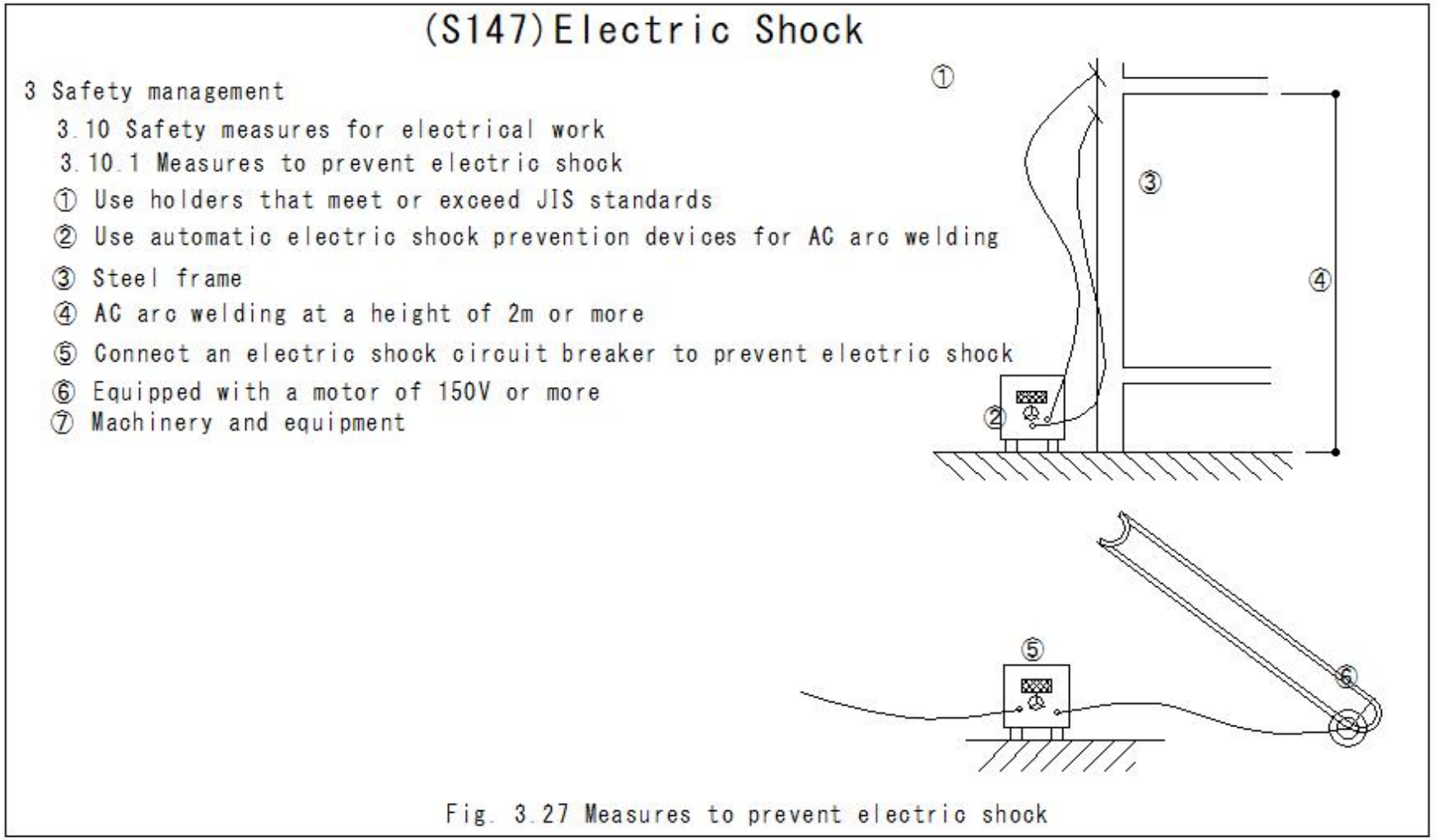


Figure 3-25 Safety measures for caisson construction F59

(S147)Electric Shock



(S148)Electric Shock

(S148)Electric Shock

3 Safety management

3.10 Safety measures for electrical work

3.10.1 Measures to prevent electric shock

Machinery and equipment

① Various regulations for preventing electric shock
② Wiring
③ Attach guards to hand-held lamps
④ Distribution boards
⑤ In case of wet with water or other fluids, use a coating with high insulating properties
⑥ Well pumps
⑦ Do not place on passageways

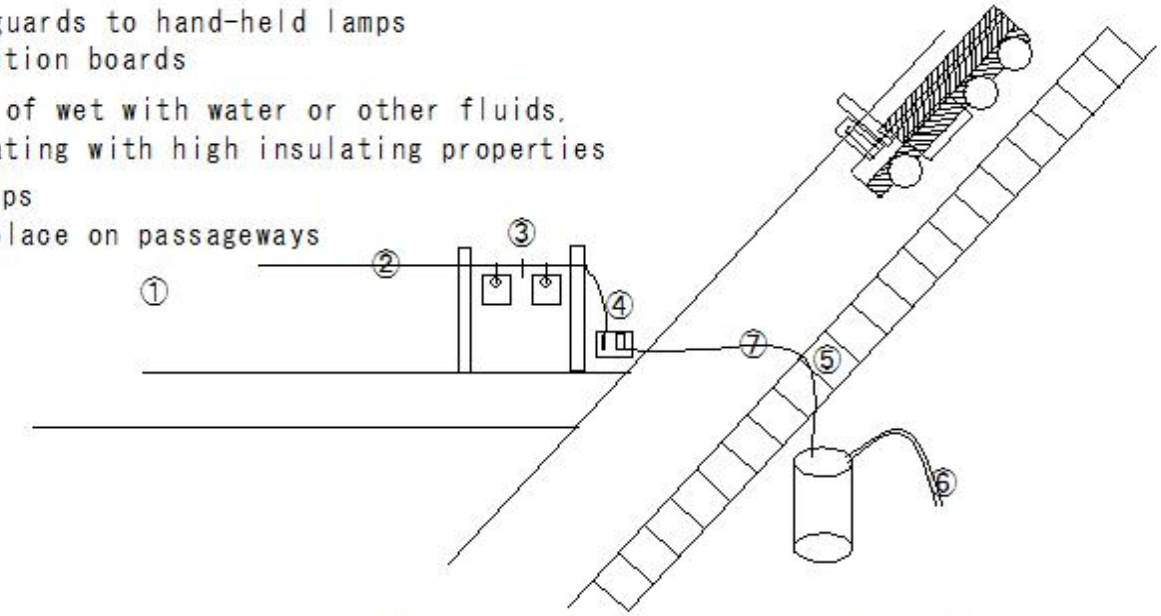


Fig. 3.27 Measures to prevent electric shock

(S149)Electric Shock

(S149)Electric Shock

3 Safety management

3.10 Safety measures for electrical work

3.10.1 Measures to prevent electric shock

Close-proximity work

① Wear insulating protective gear

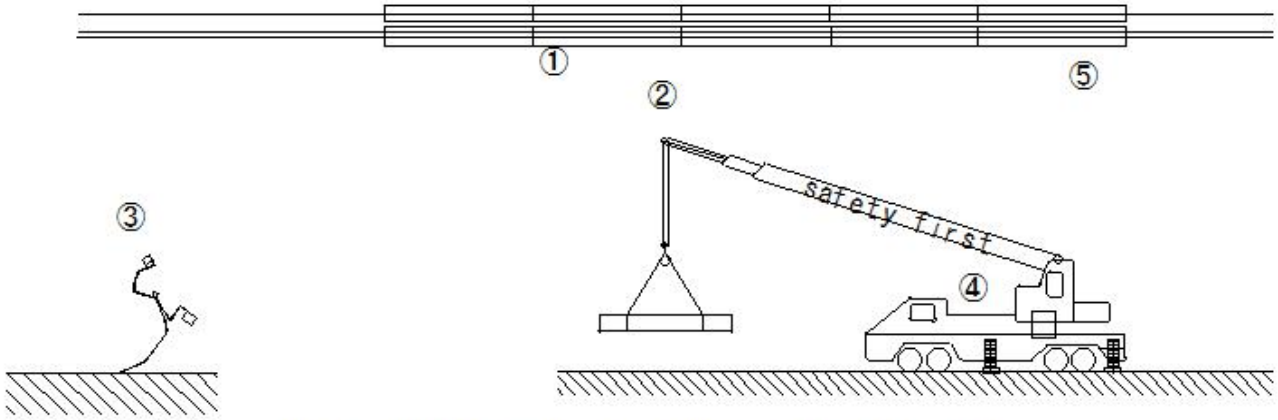
if relocation is not possible

② Close-proximity distance

③ Have a supervisor

④ Follow signals

⑤ Close-proximity to live electrical circuits



M393

Fig. 3.27 Measures to prevent electric shock

(S150)Fall on

(S150)Fall on

3 Safety management

3・11 Safety measures for the fall disaster

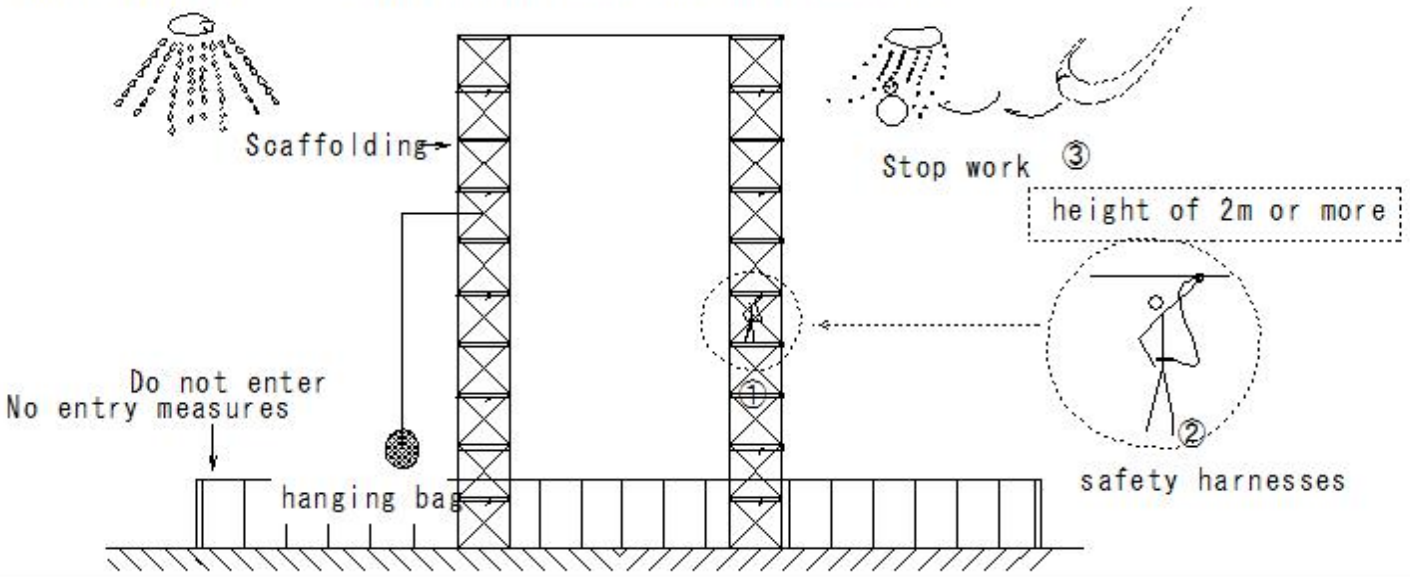
3・11・1 Fall on

① In case of working at a height of 2m or more

①Set up a work platform

②In case of it is not possible to set up a platform, set up a protective net and have workers wear safety harnesses

③Stop work if it is deemed dangerous due to bad weather



S75

(S151)Fall on

(S151)Fall on

3 Safety management

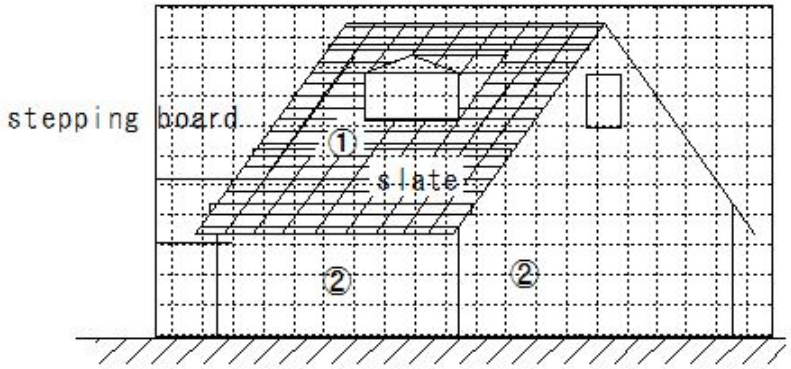
3・11 Safety measures for the fall disaster

3・11・1Fall on

② In case of working on a roof covered with slate or other materials

①Install a stepping board at least 30 cm wide to prevent being pierced

②Install safety netting



(S152)Fall on

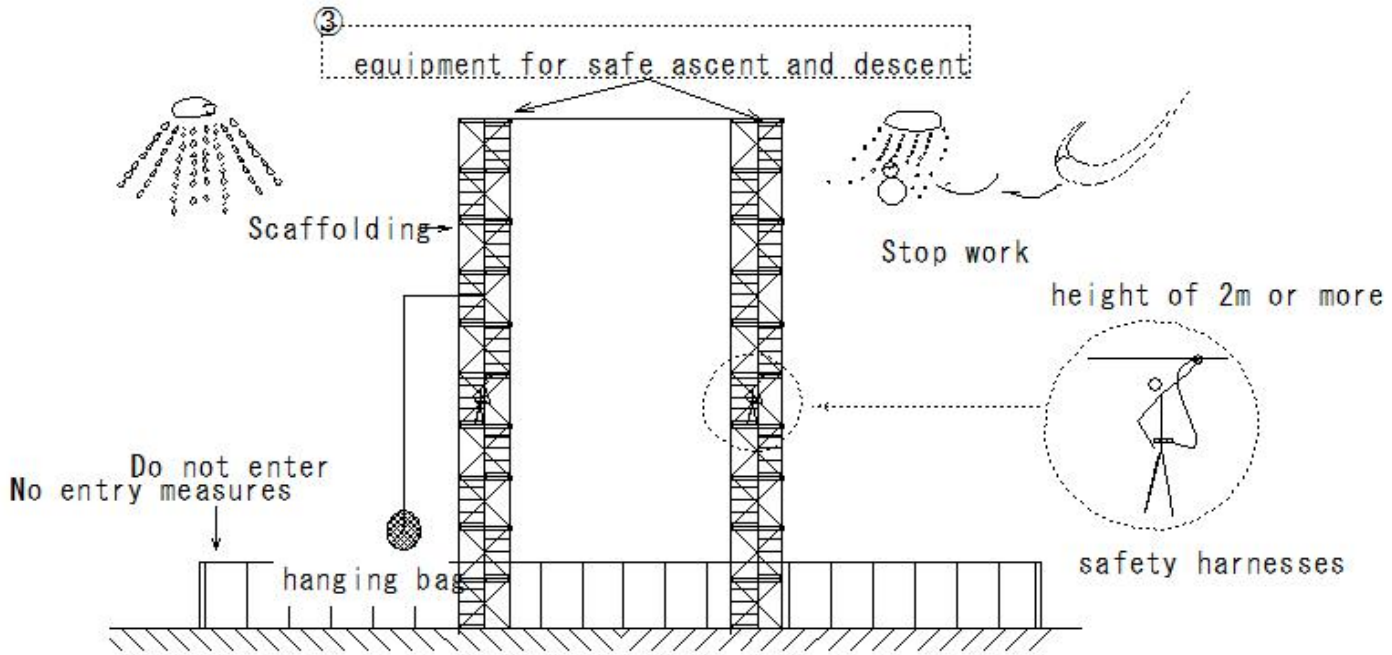
(S152)Fall on

3 Safety management

3・11 Safety measures for the fall disaster

3・11・1 Fall on

③ Install equipment for safe ascent and descent in areas where the height or depth exceeds 1.5m



S75

(S153)Fall on

(S153)Fall on

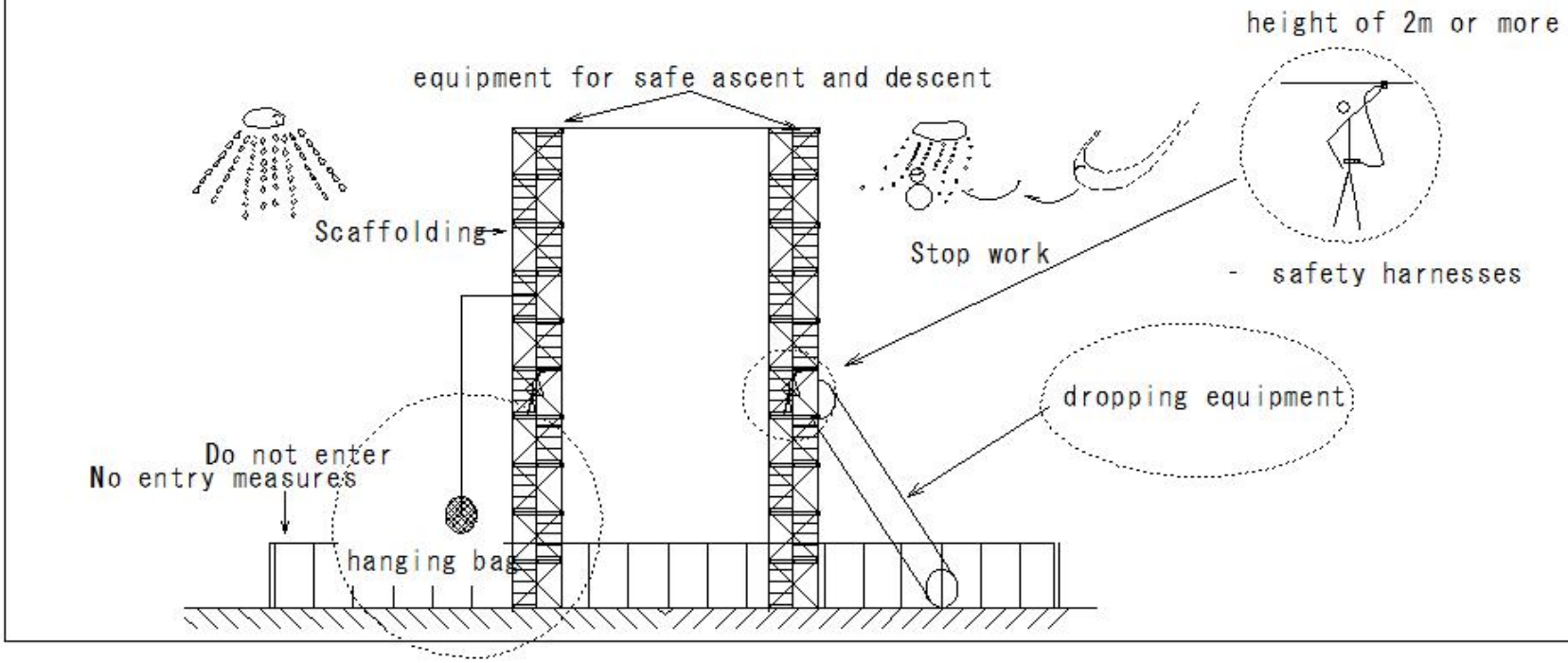
3 Safety management

3・11 Safety measures for the fall disaster

3・11・2 Dropping equipment

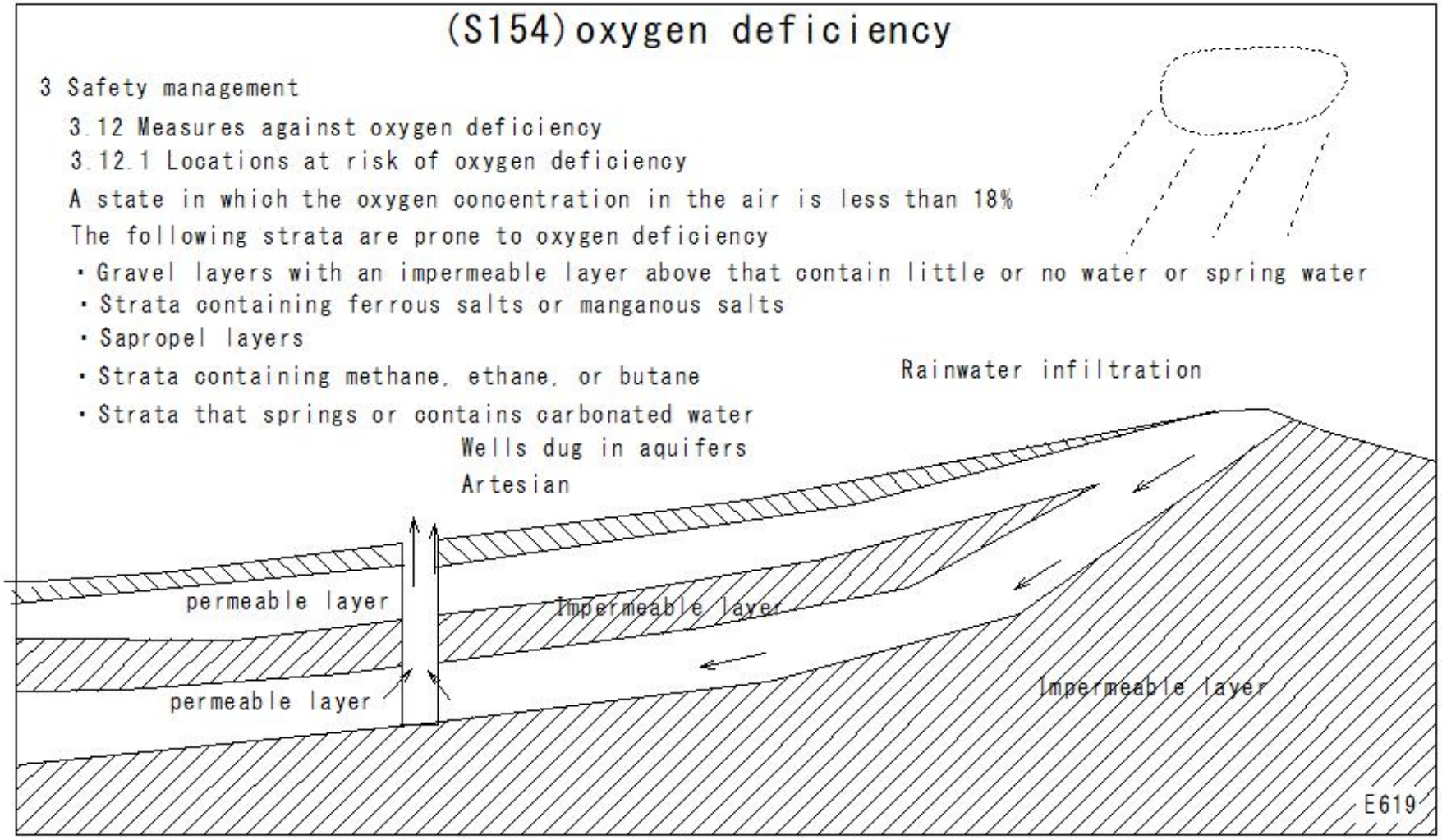
In case of dropping an object from a height of 3m or more,

appropriate dropping equipment must be provided.



S75

(S154)oxygen deficiency



(S155)oxygen deficiency

(S155)oxygen deficiency

3 Safety management

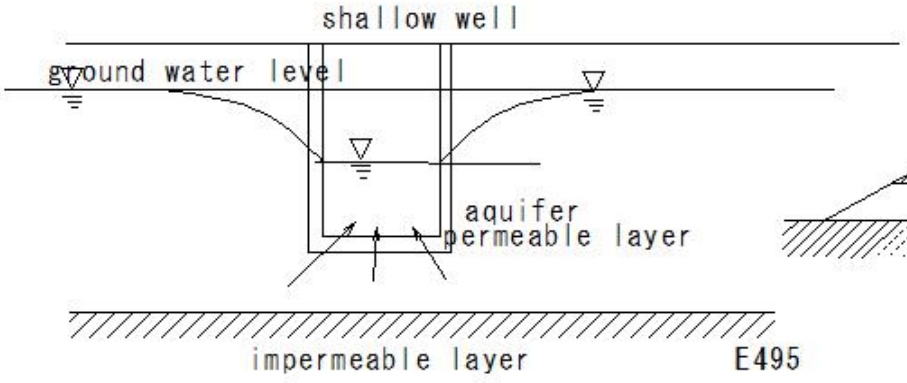
3.12 Measures against oxygen deficiency

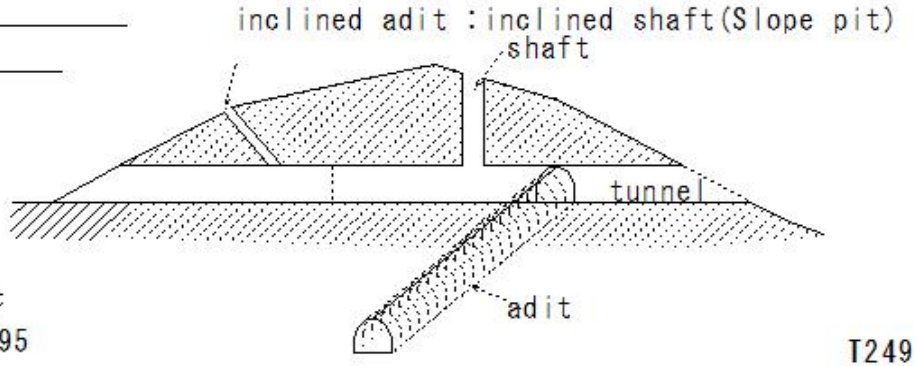
3.12.2 Measures to prevent oxygen deficiency

① Measures to take when working inside wells, shafts, caissons, pits, etc. that are in contact with the strata listed in the previous section or that connect to these strata

- Measure oxygen concentration at all times and keep records for three years
- Ventilate
- Evacuate immediately in the event of a power outage or ventilation interruption
- Use respirators, etc. if ventilation is not possible

② Conduct a preliminary investigation and take measures





(S156) Accommodation

(S156) Accommodation

3 Safety Management

3・13 Safety and Health Measures for the Accommodation

3・13・1 Safety and Health Measures for the Accommodation

① Install night lights in corridors and staircases

② Keep fire extinguishers on hand

③ Installation locations

・No dangerous substances (gas) nearby
・No harmful substances nearby
・No noise or vibration
・No avalanches or landslides
・No risk of flooding

④ Windows must be at least 1/7 of the floor area

⑤ Entrances and doors must open outwards, at least two are required regardless of the number of people

⑥ Staircases: 1 for less than 15 people on the 2nd floor or higher
2 for 15 people or more

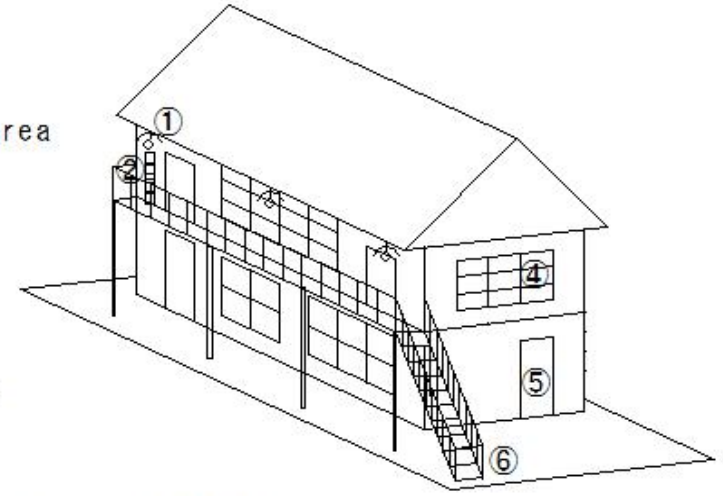


Figure 3-28: Safety in the accommodation

(S157) Accommodation

(S157) Accommodation

3 Safety Management

3・13 Safety and Health Measures for theAccommodation

3・13・2 Dormitory Rules

Dormitory rules must be shown to boarding workers

Rules that infringe on workers' freedom of private life, such as those in the following items, must not be made

1. Requiring approval from the employer for going out or staying out overnight
2. Forcing workers to participate in educational, recreational or other events
3. Restricting freedom of visitation

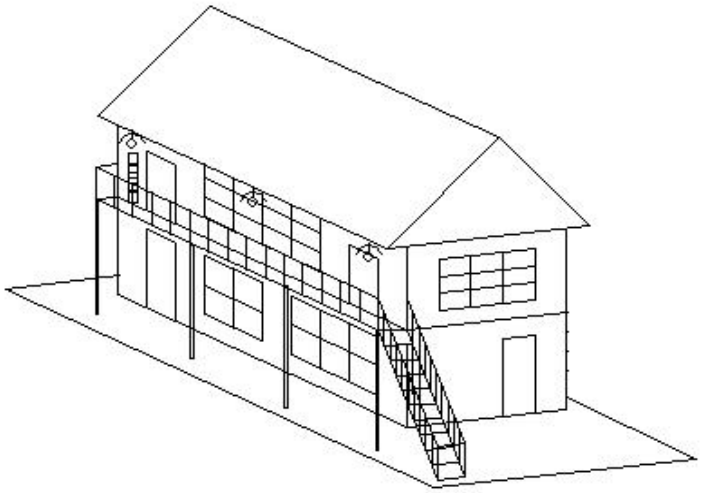


Figure 3-28: Safety in the accommodation

(S158) Accommodation

(S158) Accommodation

3 Safety Management

3-13 Safety and Health Measures for Dormitories

3-13-3 Dormitory Standards

① Corridor width

Bedrooms on both sides: 1.6m or more Other: 1.2m or more

② Corridor

③ Bedroom

④ Bedroom

⑤ Number of residents in each room: 16 or less

30 or less if there is a central passage of 75cm or more

Floor area: 2.5m2/person or more

Wooden floor height: 45cm or more

Ceiling height: 2.1m or more

Residents' names posted at the entrance

⑥ Dining room

⑦ Floors must be planked or concrete dining tables must be provided

Heating equipment must be provided

⑧ Rest room

⑨ Must be provided if 50 or more people are boarding at any one time

⑩ Toilet

⑪ Number of toilet stalls in the toilet: 1 or more for every 15 people or less

⑫ Bathhouse

⑬ Size must allow one person to bathe for every 10 people or less

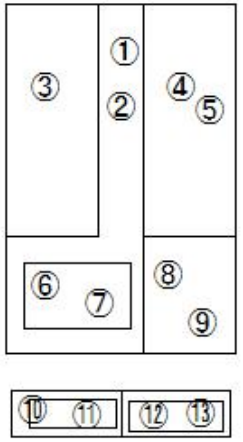


Figure 3-29 Dormitory Standards

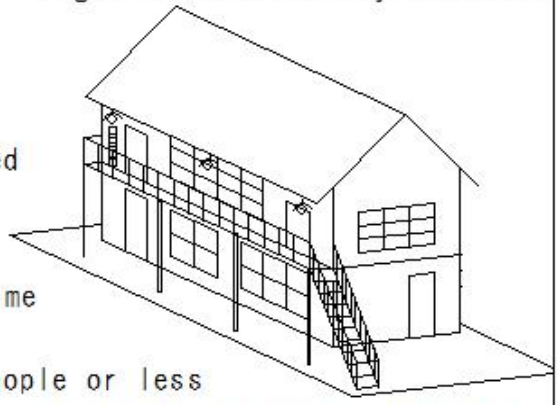


Figure 3-28: Safety in the accommodation

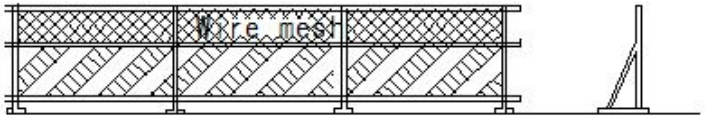
(S159) Public disaster

(S159) Public disaster

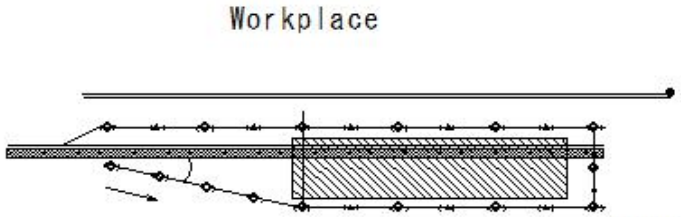
3 Safety management

3.14 Public disaster prevention measures
Construction in urban areas

S159①Worksites (division of worksites, fence standards, entrances and exits)
S160②Traffic measures (signs, safety lights, pedestrian measures, drainage, road surface maintenance)
S161③Maintenance of tracks, etc. (prior consultation with track operators, insulation work, etc.)
S162④Buried objects (safety measures, attendance, confirmation, etc.)
S163⑤Retaining works (soil surveys, piles, beams, etc.)
S164⑥Covering works (reconstruction plates, mounting surface, etc.)
S165⑦Auxiliary methods (chemical injection method, groundwater lowering method)
S166⑧Treatment of spring water, etc. (spring water and leaks, drainage treatment)
S167⑨Treatment of residual soil, etc. (route, commissioning, operation management)
S168⑩Backfilling



S173



S174

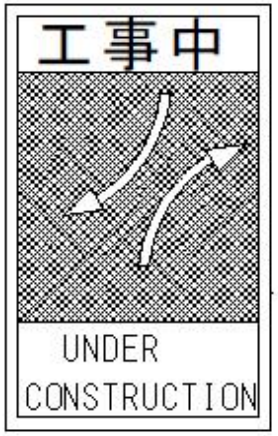
S159①Worksites (division of worksites, fence standards, entrances and exits)

(S160) Public disaster

(S160) Public disaster

3 Safety management

3.14 Public disaster prevention measures
Construction in urban areas
S160②Traffic measures (signs, safety lights, pedestrian measures, drainage, road surface maintenance)



(b) Under construction

H1173

(S161) Public disaster

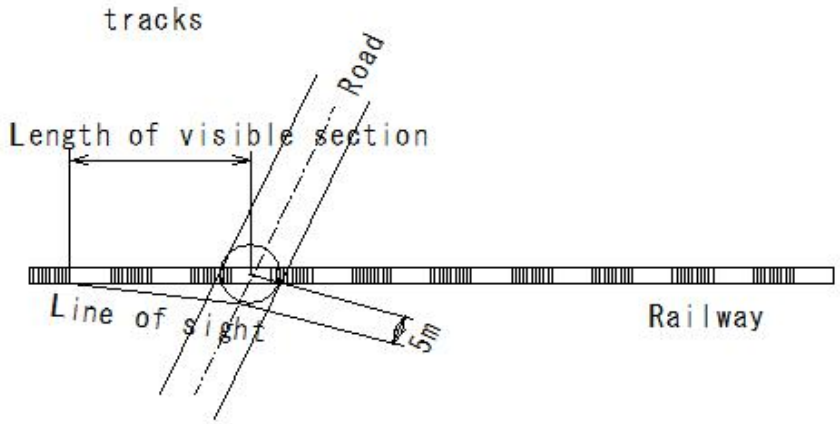
(S161) Public disaster

3 Safety management

3.14 Public disaster prevention measures

Construction in urban areas

S161③Maintenance of tracks, etc. (prior consultation with track operators, insulation work, etc.)



H510

(S162) Public disaster

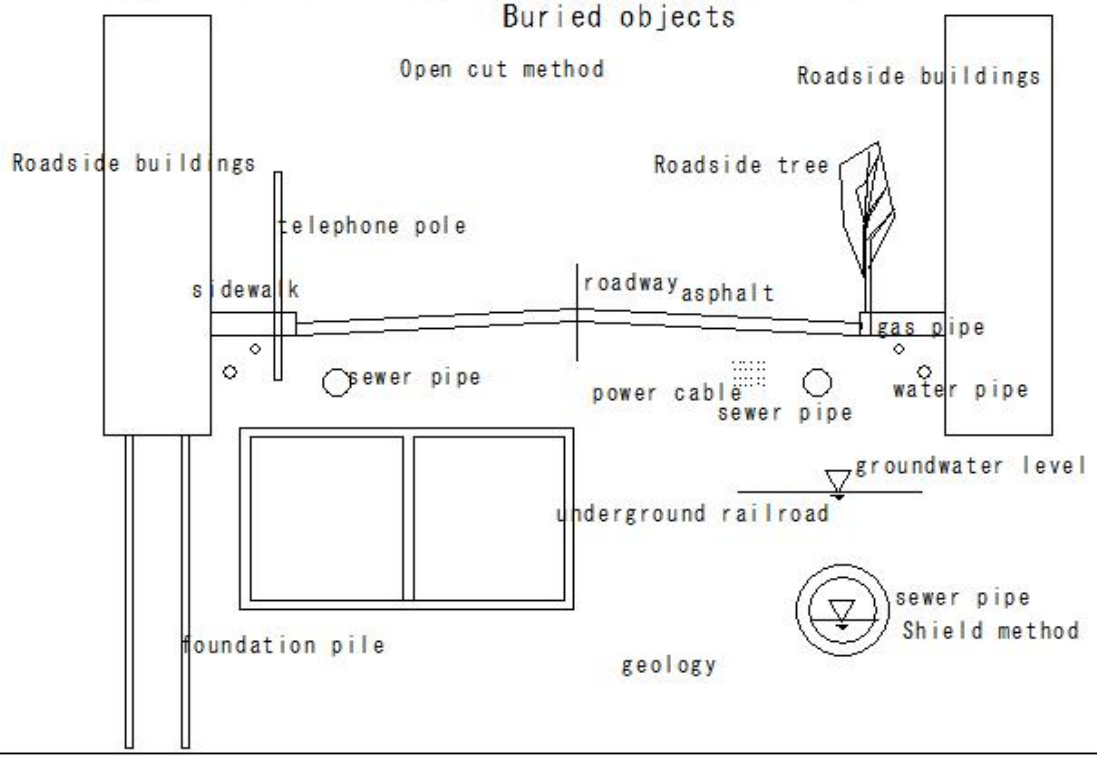
(S162) Public disaster

3 Safety management

3.14 Public disaster prevention measures

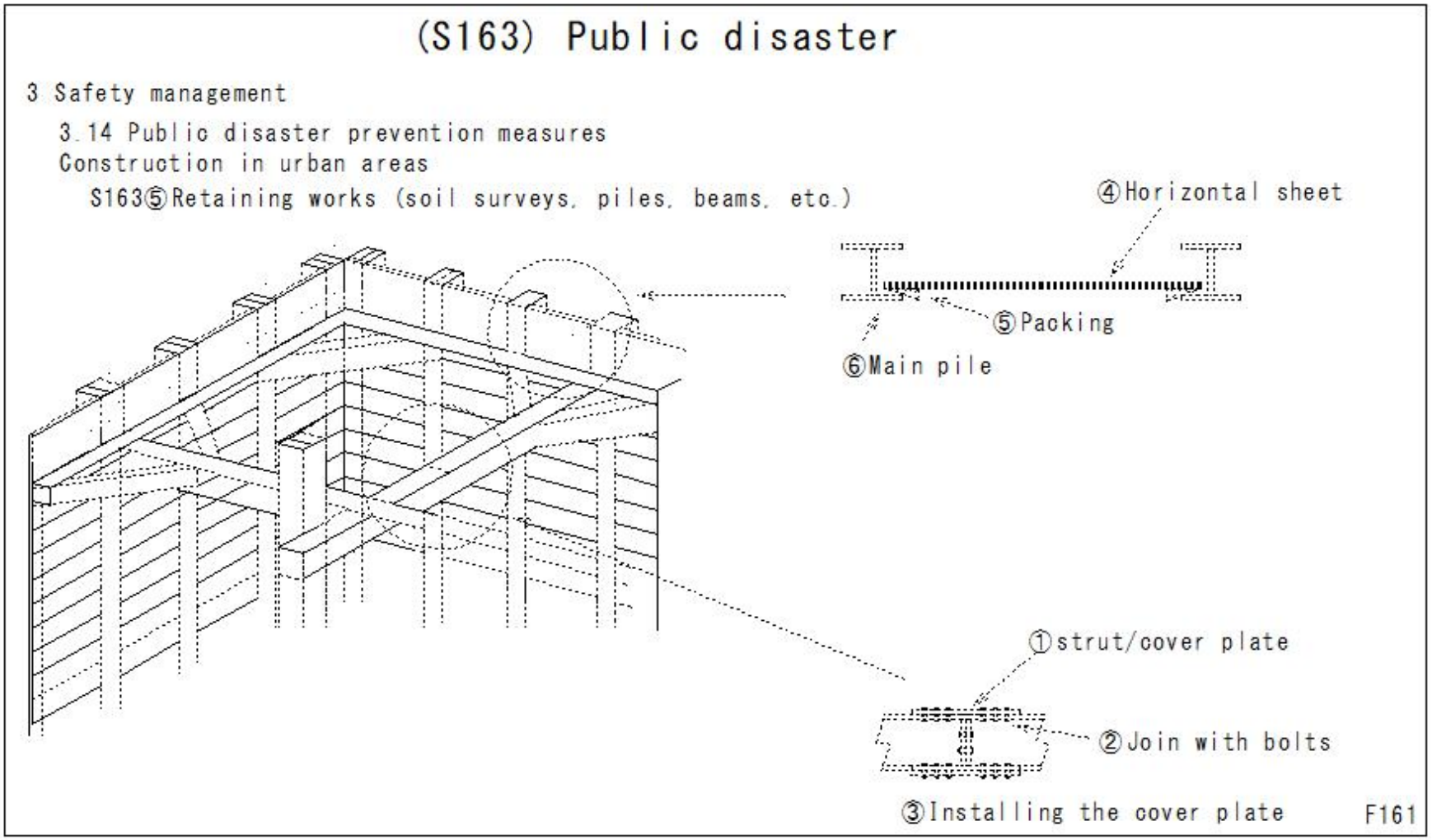
Construction in urban areas

S162④Buried objects (safety measures, attendance, confirmation, etc.)



F128

(S163) Public disaster



(S164) Public disaster

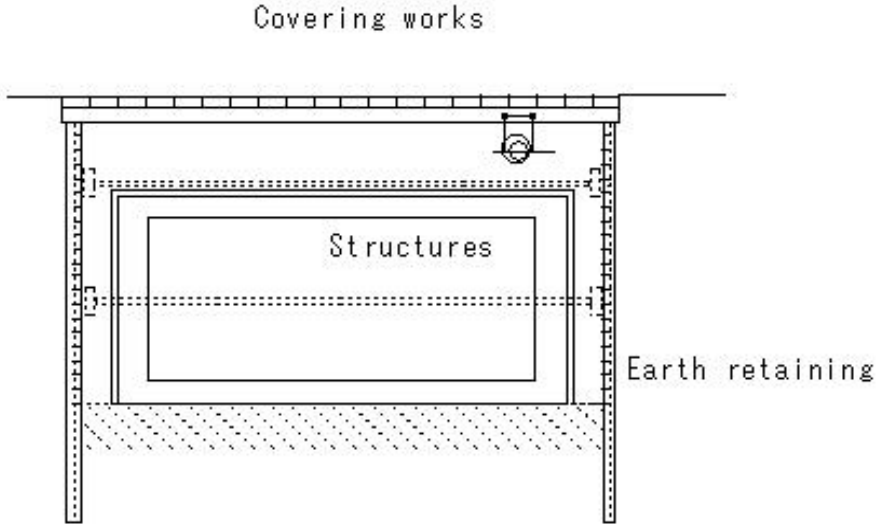
(S164) Public disaster

3 Safety management

3.14 Public disaster prevention measures

Construction in urban areas

S164⑥Covering works (reconstruction plates, mounting surface, etc.)



F143

(S165) Public disaster

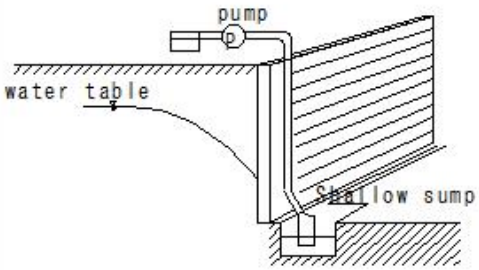
(S165) Public disaster

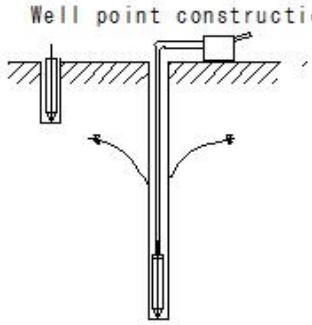
3 Safety management

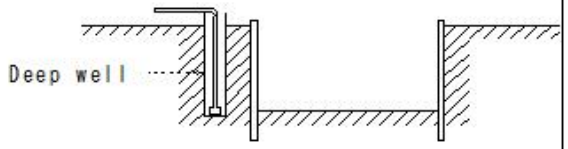
3.14 Public disaster prevention measures

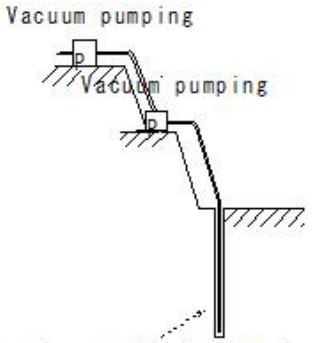
Construction in urban areas

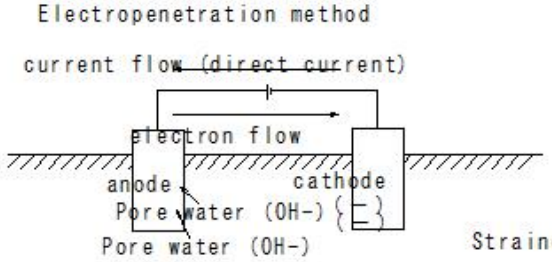
S165⑦Auxiliary methods (chemical injection method, groundwater lowering method)











Strainer (filtering wire mesh) (steel pipe) F92

(S166) Public disaster

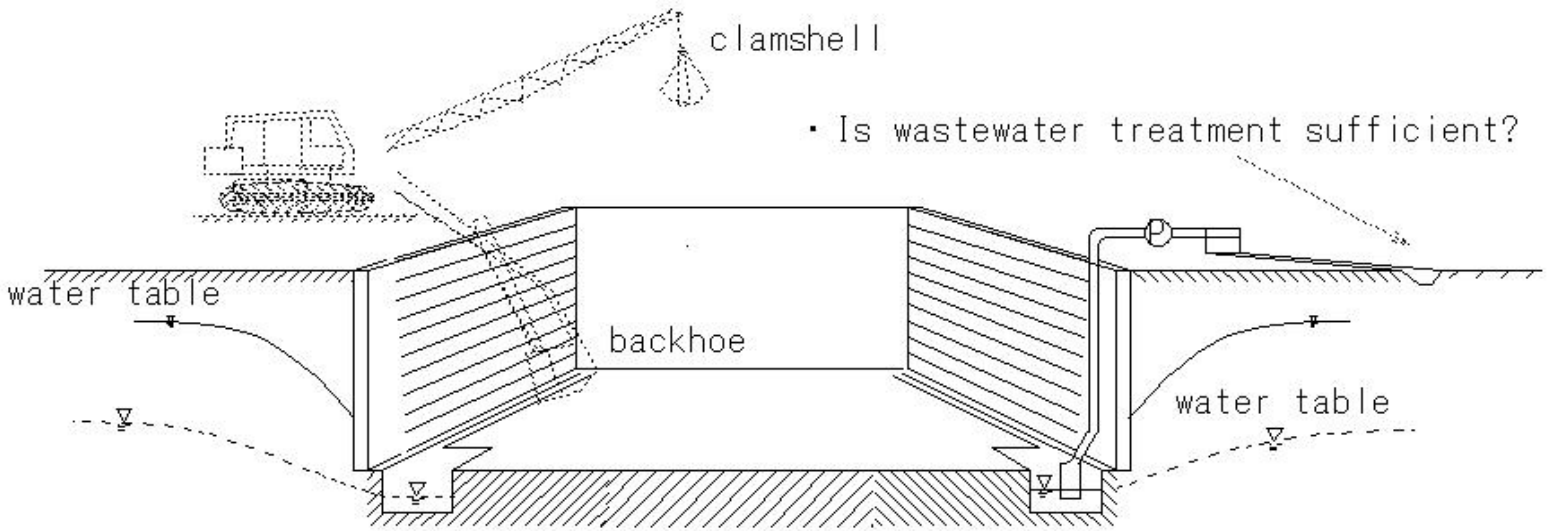
(S166) Public disaster

3 Safety management

3.14 Public disaster prevention measures

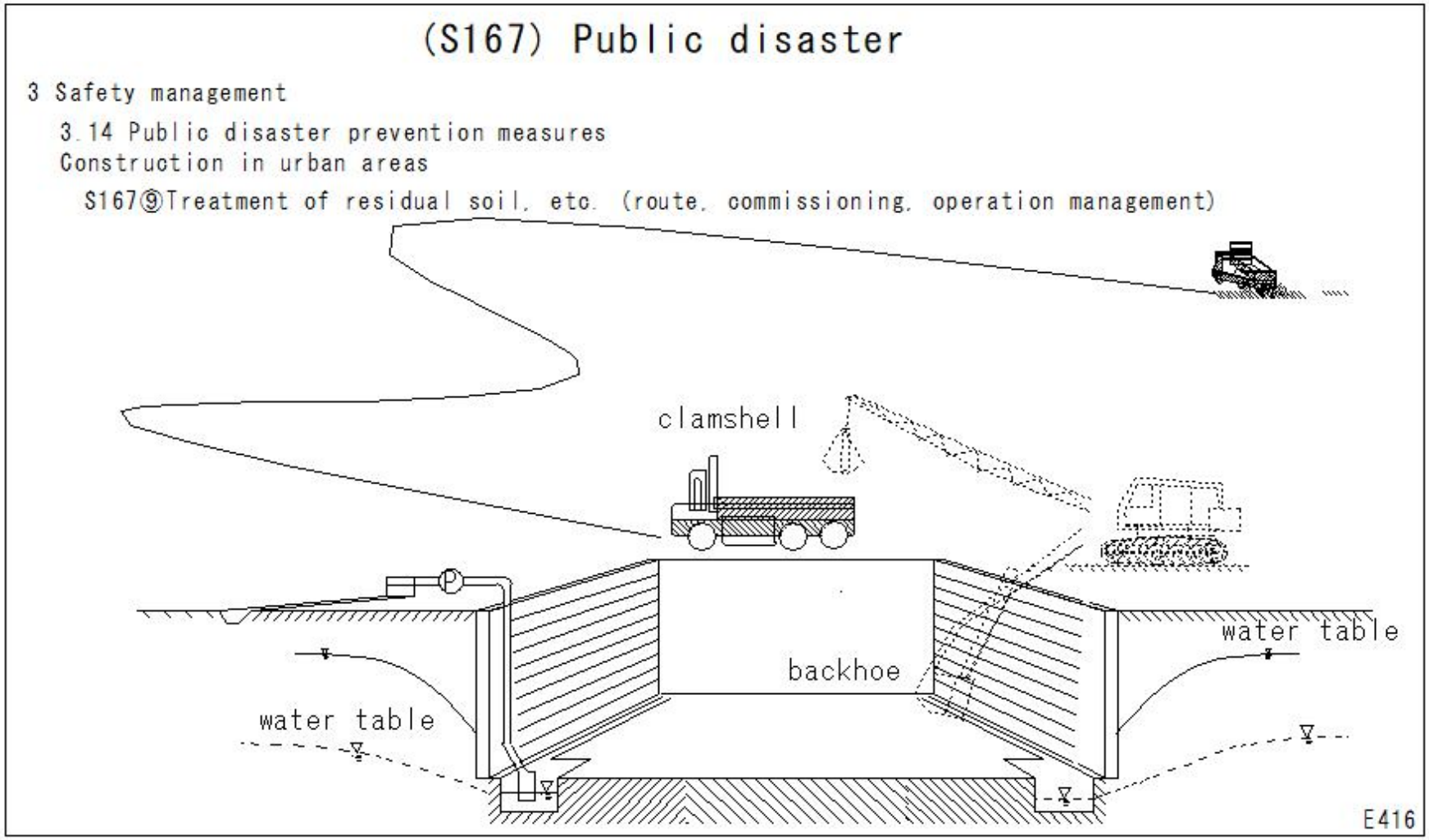
Construction in urban areas

S166⑧Treatment of spring water, etc. (spring water and leaks, drainage treatment)

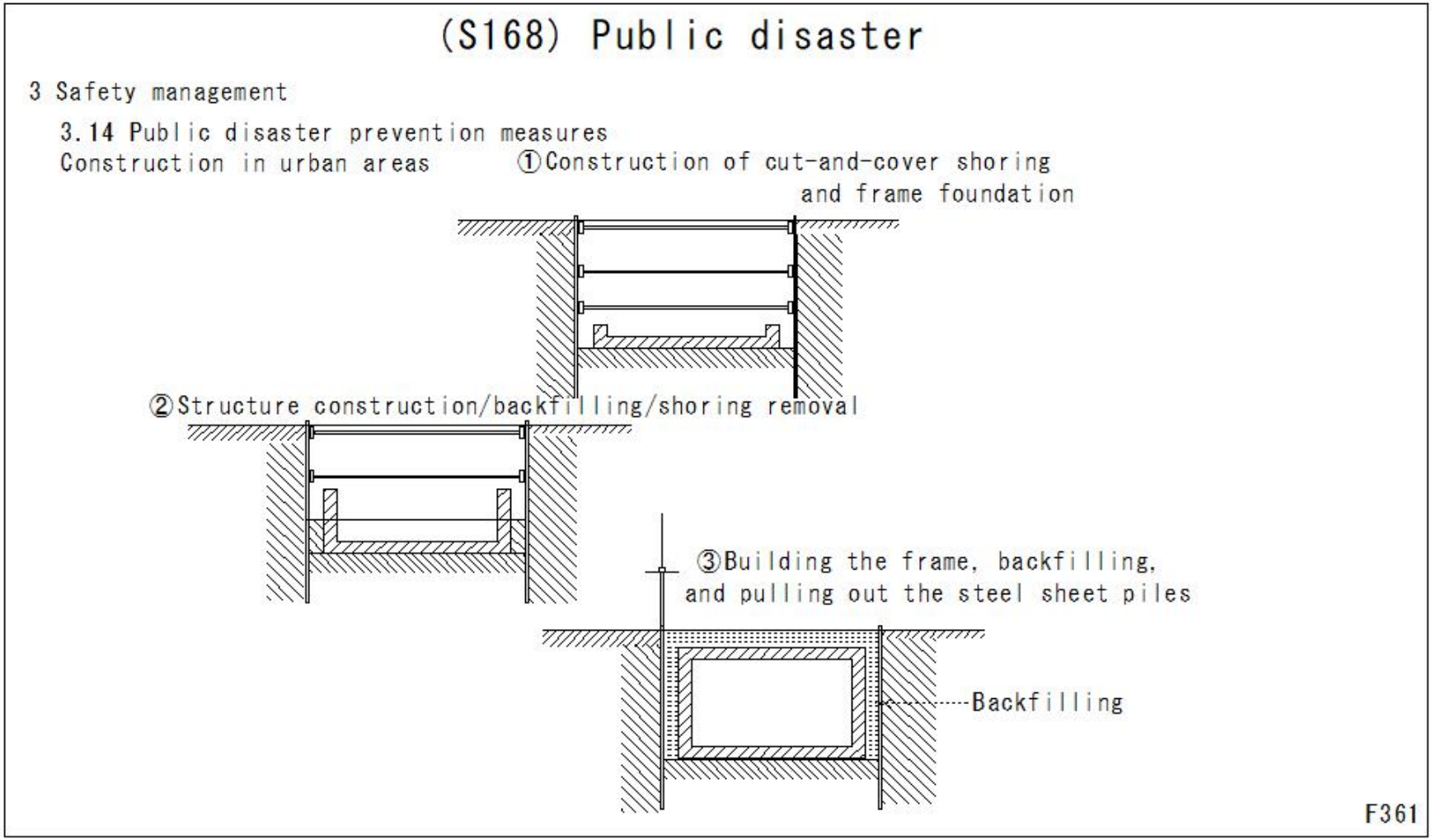


E416-E419

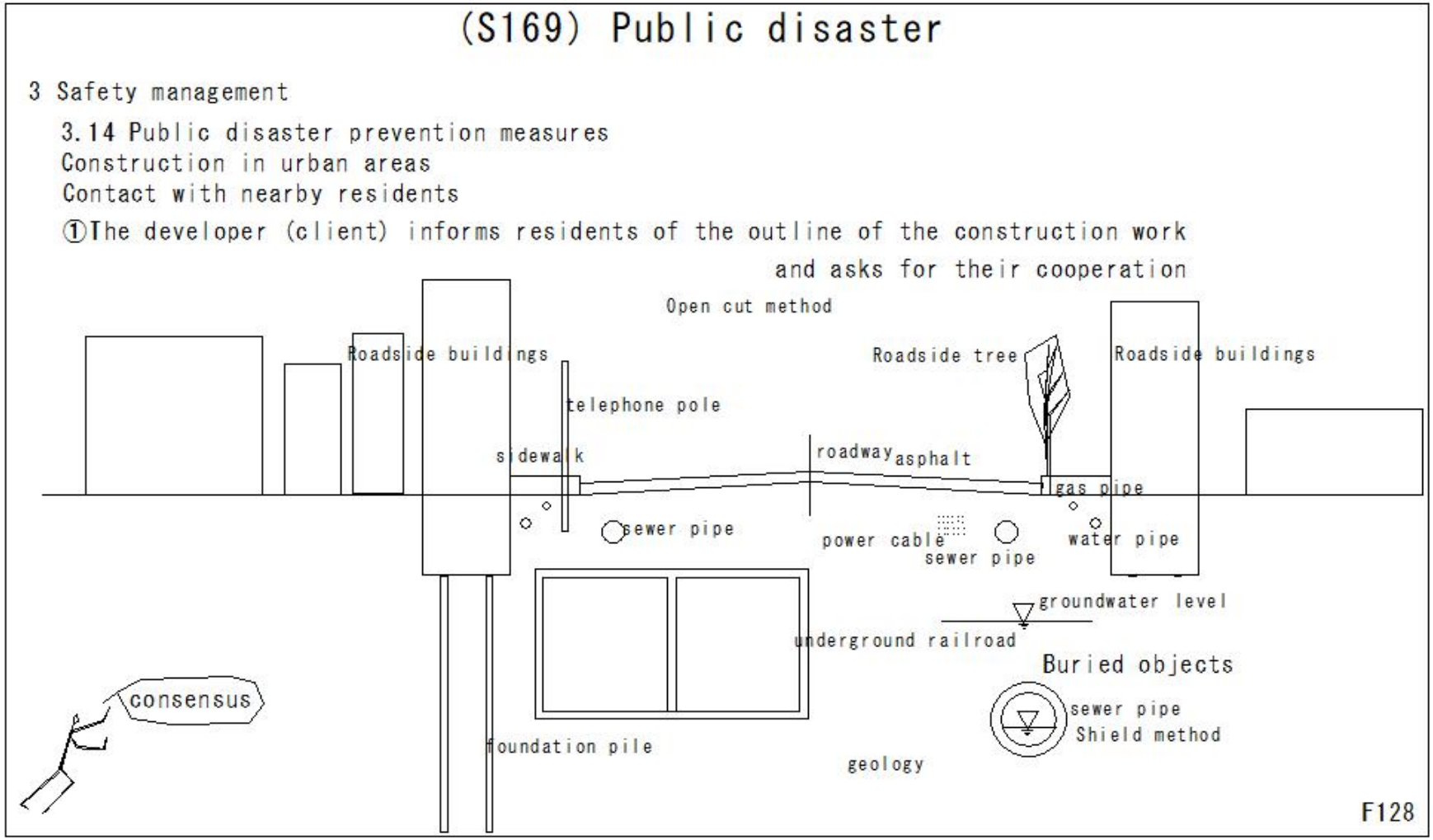
(S167) Public disaster



(S168) Public disaster



(S169) Public disaster

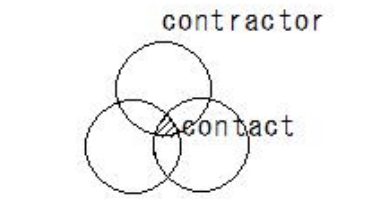


(S170) Public disaster

(S170) Public disaster

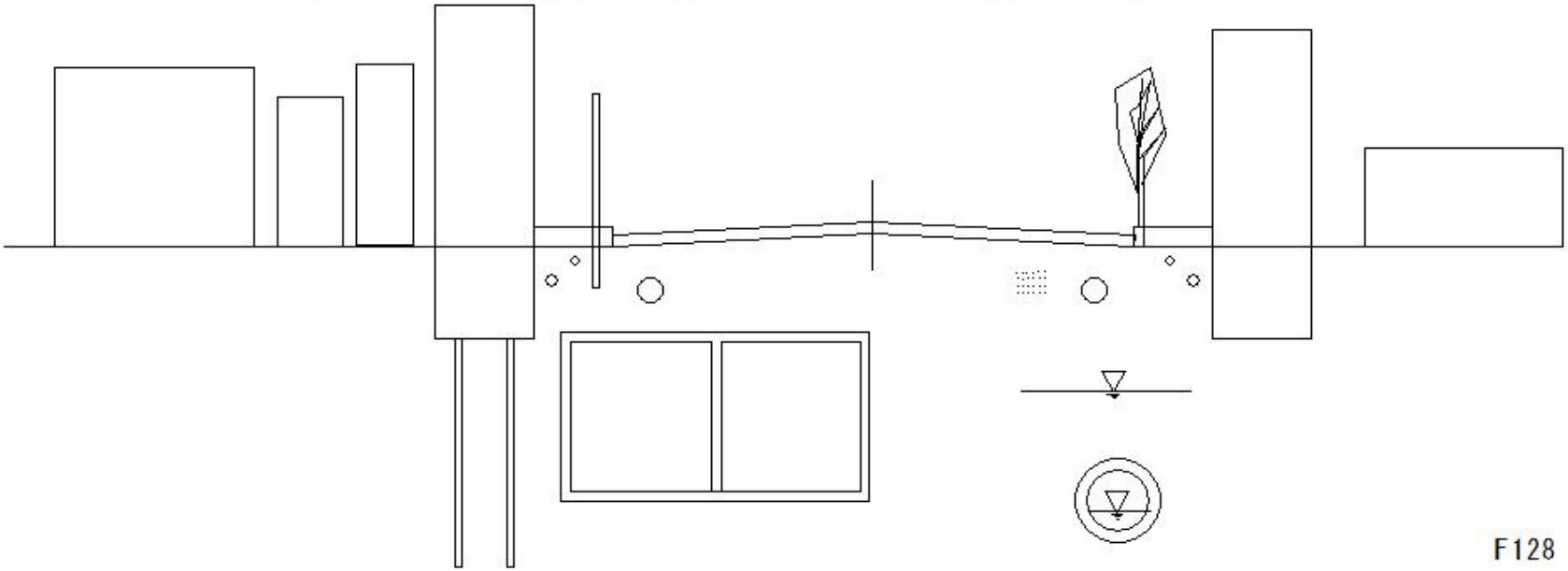
3 Safety management

3.14 Public disaster prevention measures
Construction in urban areas
Contact with nearby residents



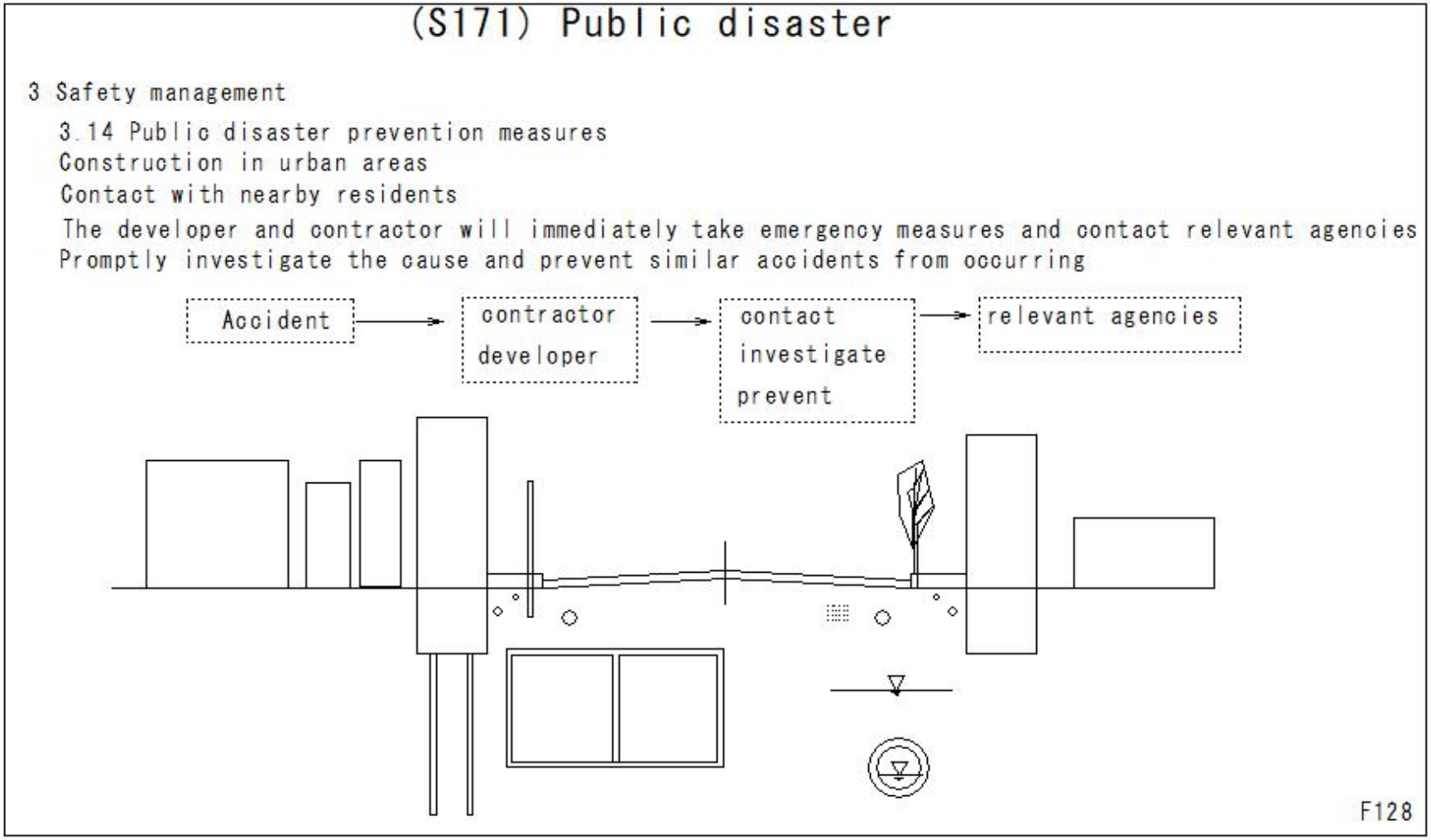
②The contractor will contact the developer and take into consideration the wishes of nearby residents

Regarding traffic regulations, do not interfere and make efforts to publicize



F128

(S171) Public disaster



(S172) Workplace

(S172)Workplace

3 Safety Management

3.14 Public Accident Prevention Measures

3.14.2 Workplace

① Division of the workplace

Clear the boundaries with fixed fences, etc.

Clearly divide the installation locations of materials and machines

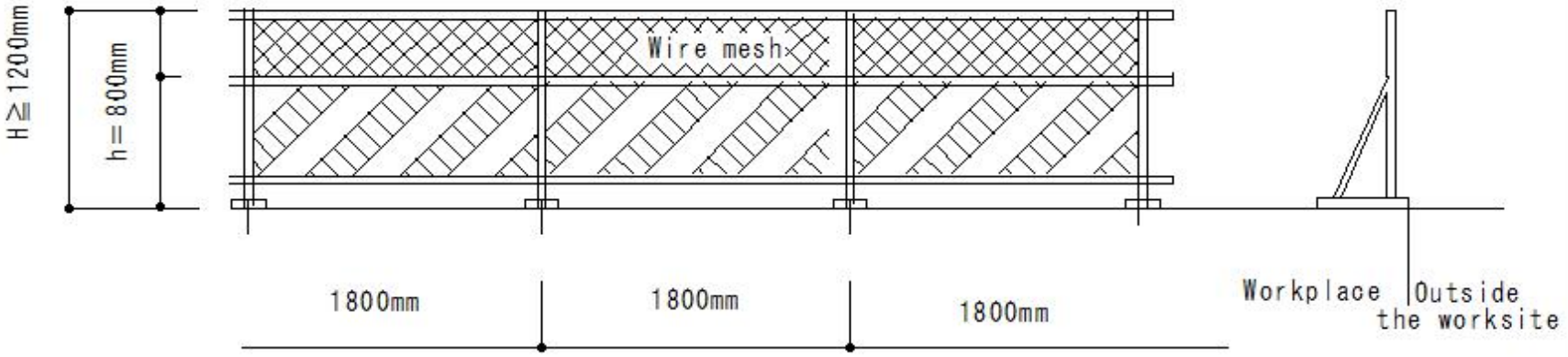


Figure 3.30 Standard diagram of fixed fence

(S173) Workplace

(S173) Workplace

3 Safety Management

3.14 Public Accident Prevention Measures

3.14.2 Workplace

② Fence specifications and dimensions

Fixed fence 1.2m or more

Moveable fence 0.8-1.0m

Length should be 1.00-1.50m

③ Fence coloring Fences should be colored with horizontal and 45° diagonal stripes of yellow and black.

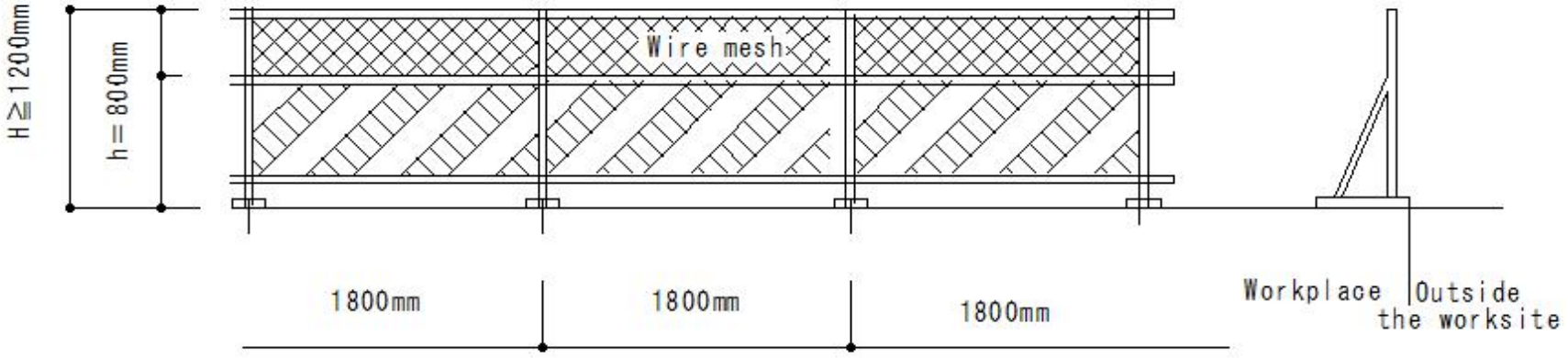


Figure 3.30 Standard diagram of fixed fence

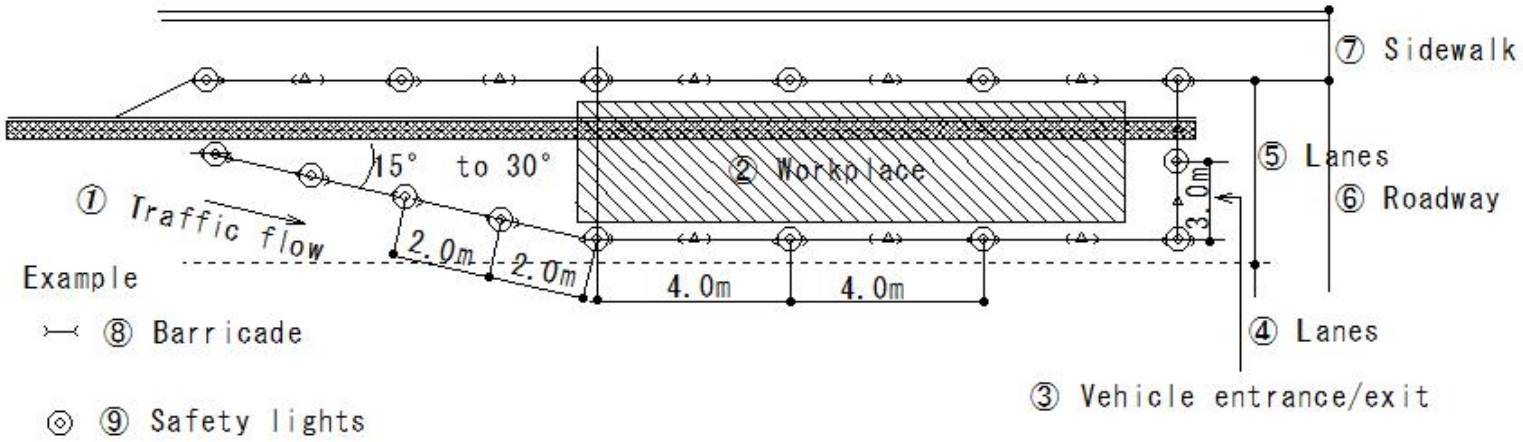
(S174) Workplace

(S174)Workplace

3 Safety Management

3.14 Public Accident Prevention Measures

3.14.2 Workplace

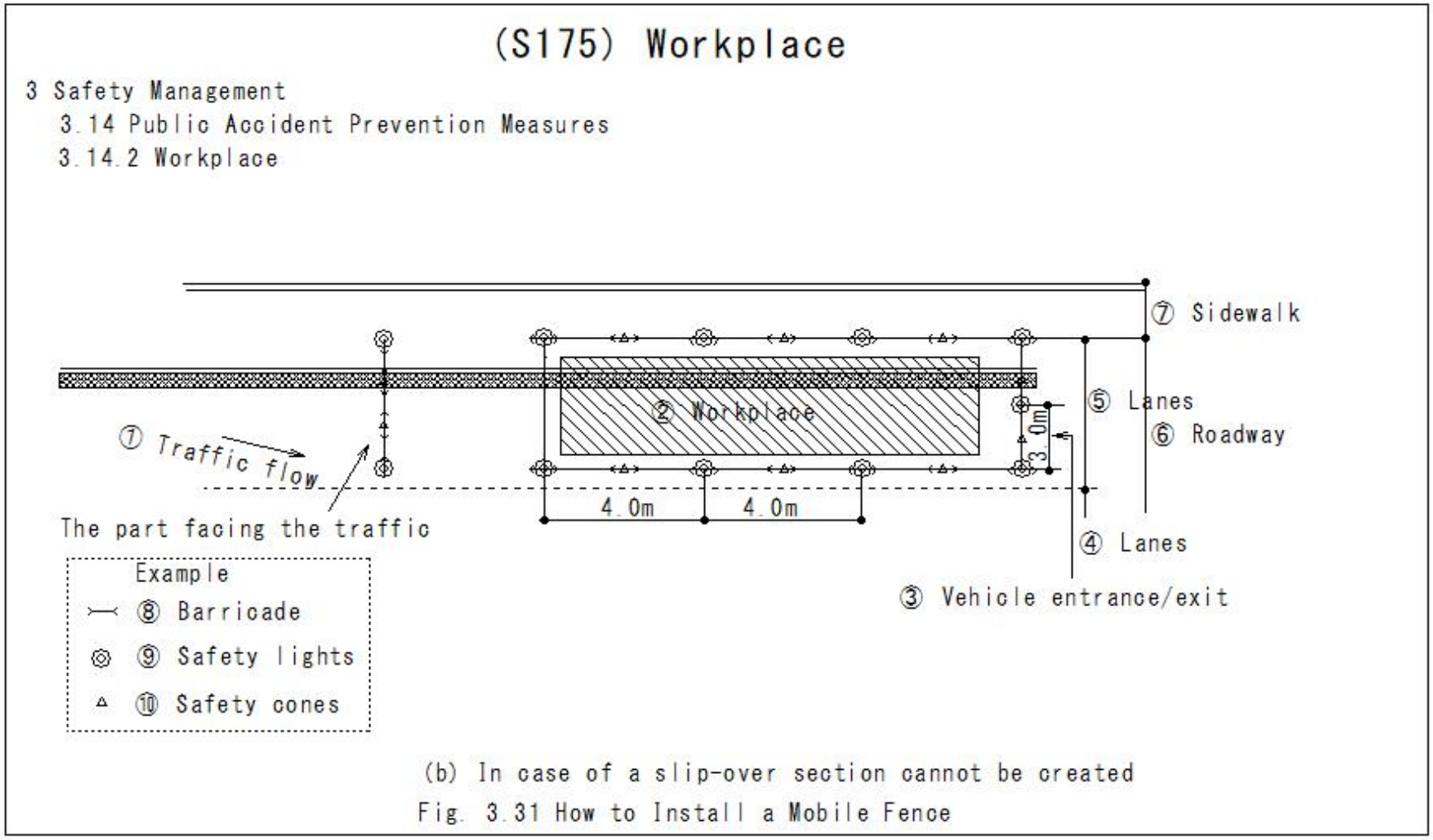


⑪ Caution: When working during the day, replace safety lights with safety cones

(a) In case of a slipway is provided

Fig. 3.31 How to Install a Mobile Fence

(S175) Workplace



(b) In case of a slip-over section cannot be created

Fig. 3.31 How to Install a Mobile Fence

(S176)Traffic measures

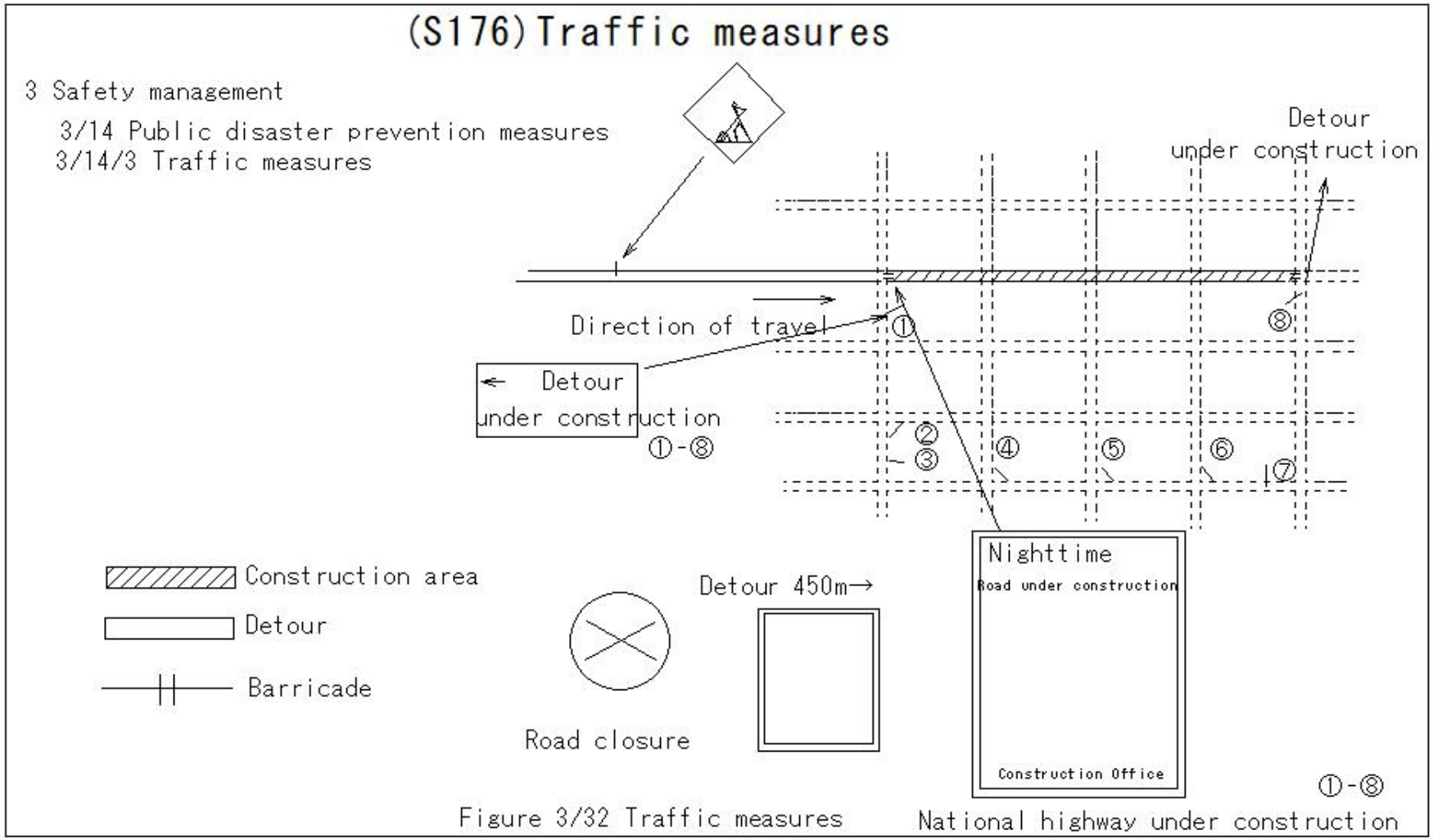
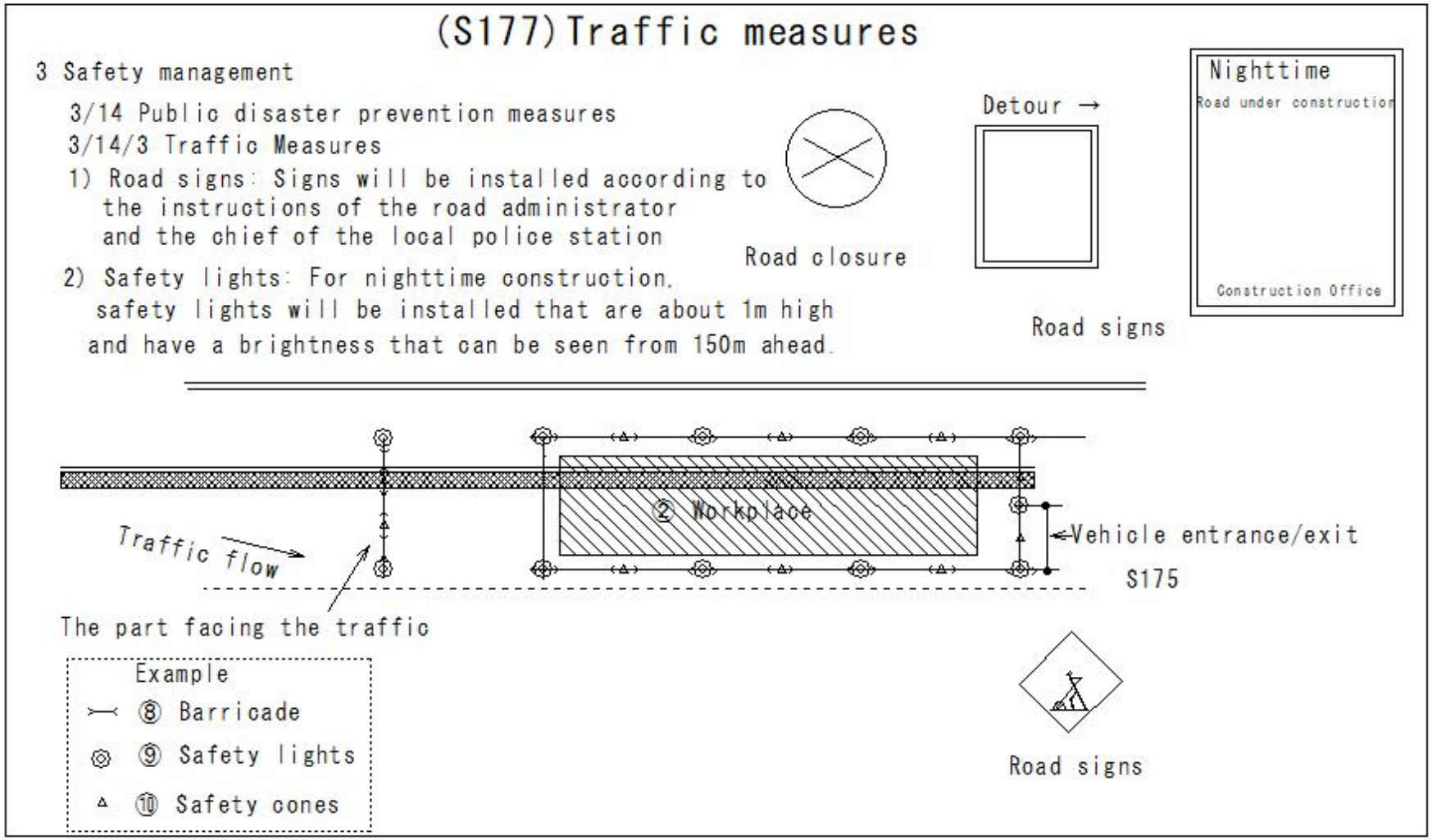
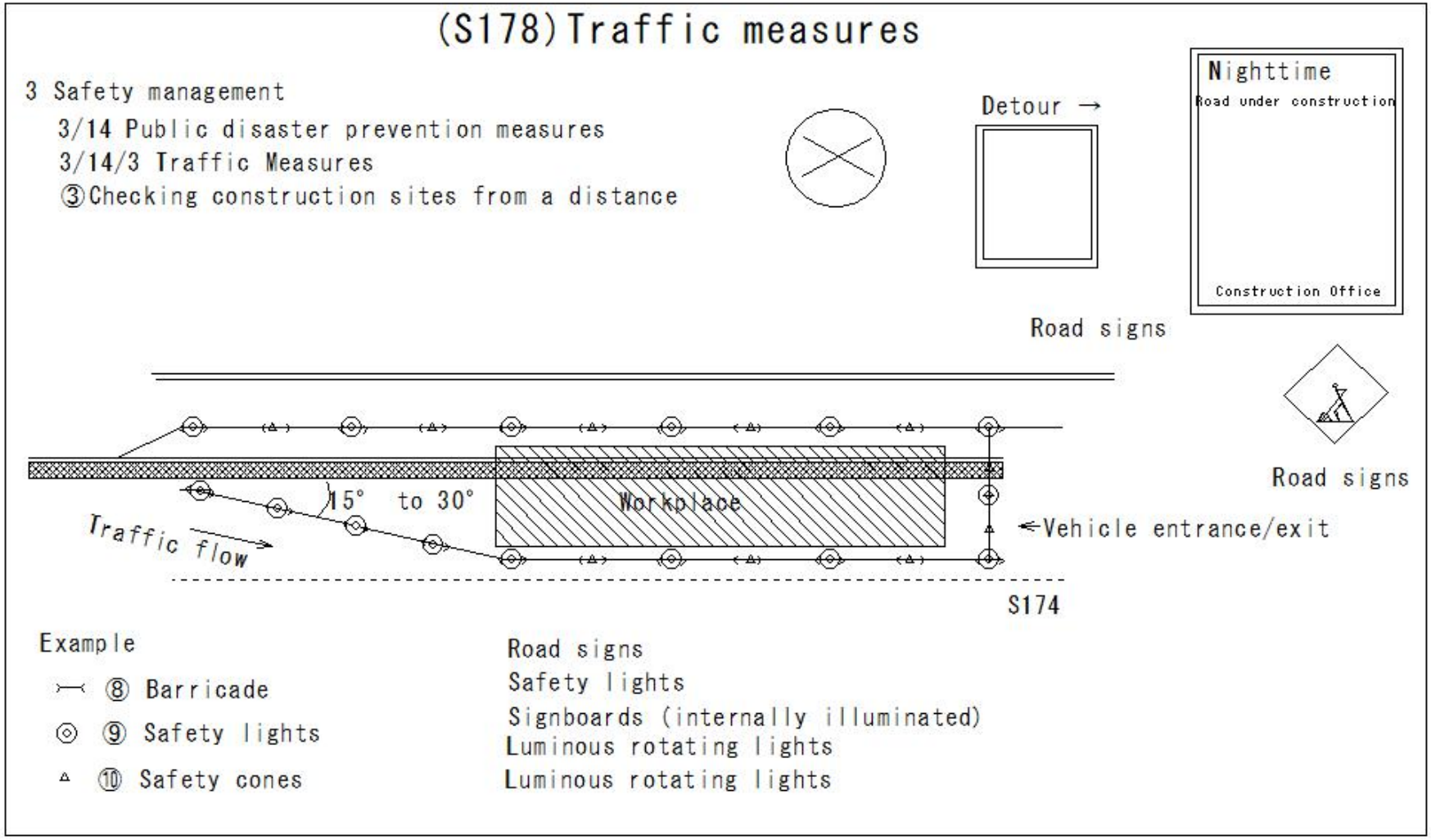


Figure 3/32 Traffic measures

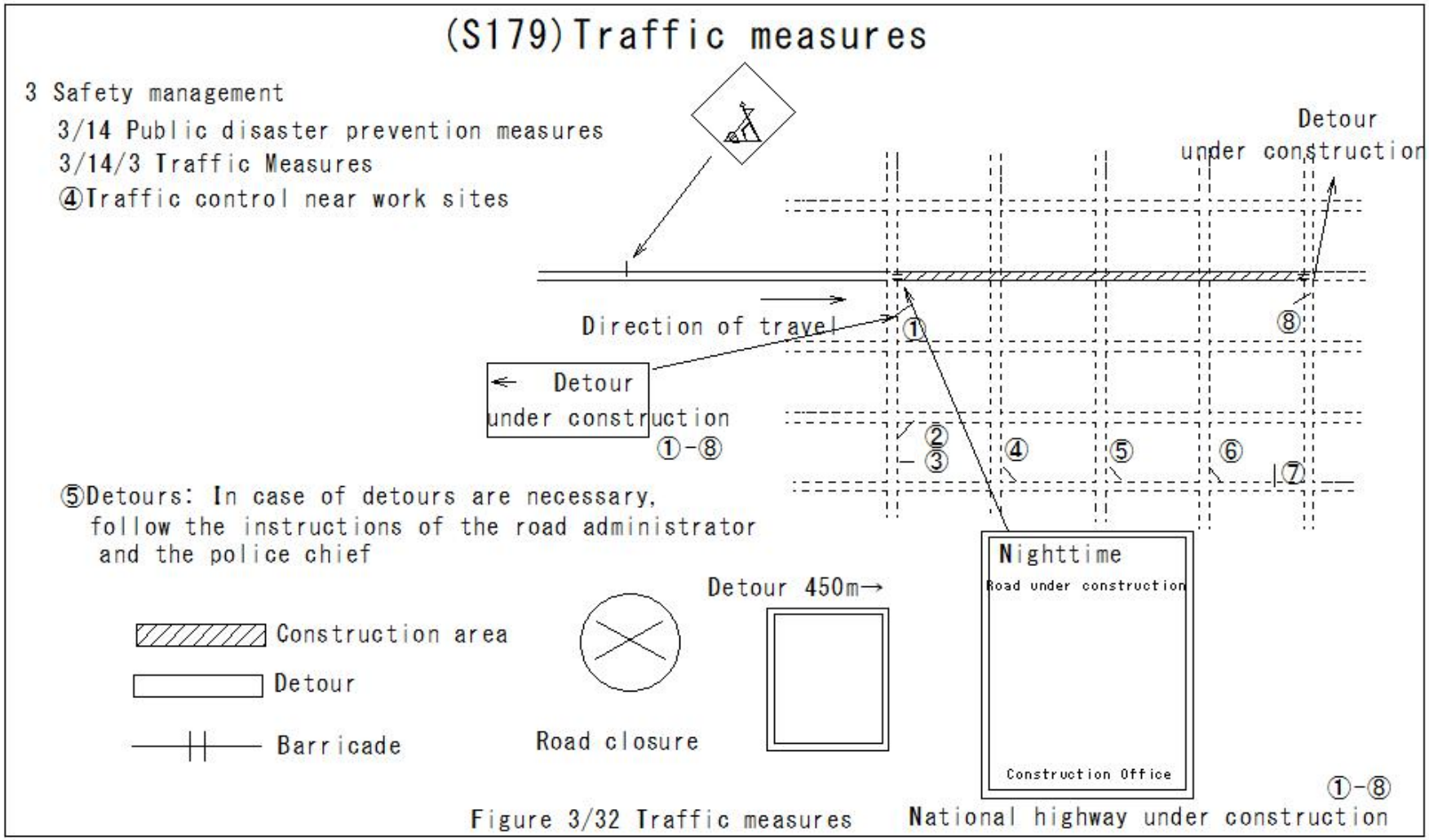
(S177)Traffic measures



(S178)Traffic measures



(S179)Traffic measures



(S180)Traffic measures

(S180) Traffic measures

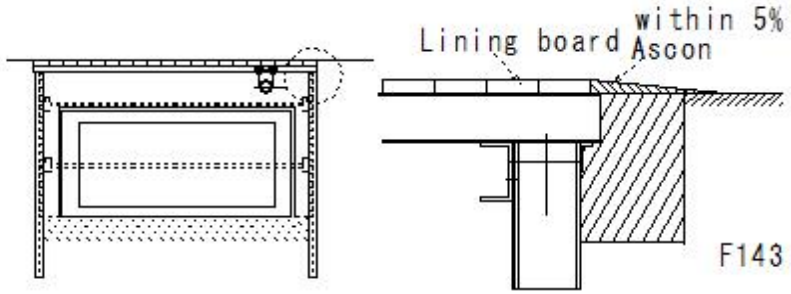
3 Safety management

3/14 Public disaster prevention measures

3/14/3 Traffic Measures

⑥ Road surface maintenance for vehicle traffic

In case of there is a step, make sure the slope is within 5%



⑦ Roadway width

3m for one lane

5.5m for two lanes

In case of the road becomes one lane due to construction, guides are posted

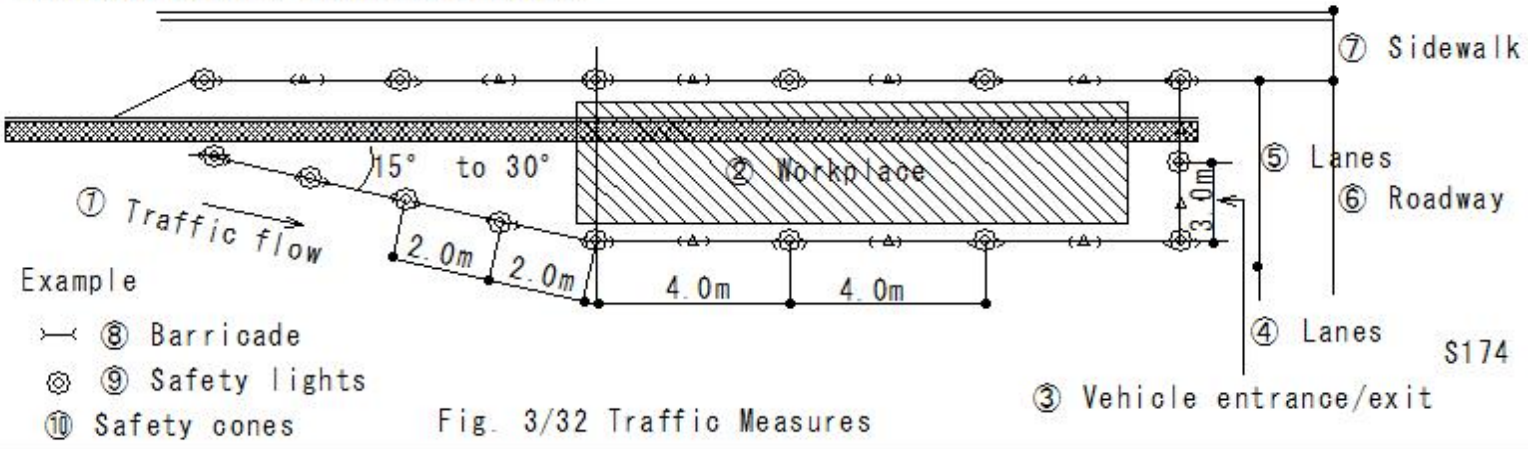


Fig. 3/32 Traffic Measures

(S181)Buried Objects

(S181)Buried Objects

3 Safety management

3/14 Public disaster prevention measures

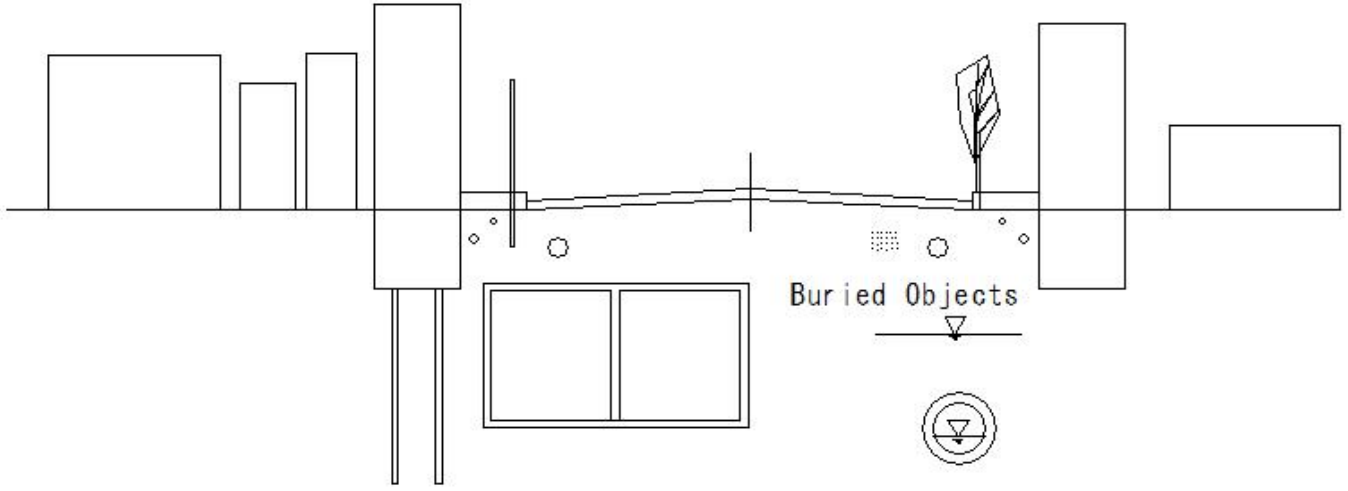
3/14/4 Buried Objects

① Preliminary Safety Investigation

Developer: With the cooperation of the buried object manager, investigate the location, specifications, structure, and date of burial

In the design and specifications, etc., describe the measures necessary for the safety of the buried object and clearly indicate them to the contractor

Investigation



F128

(S182)Buried Objects

(S182)Buried Objects

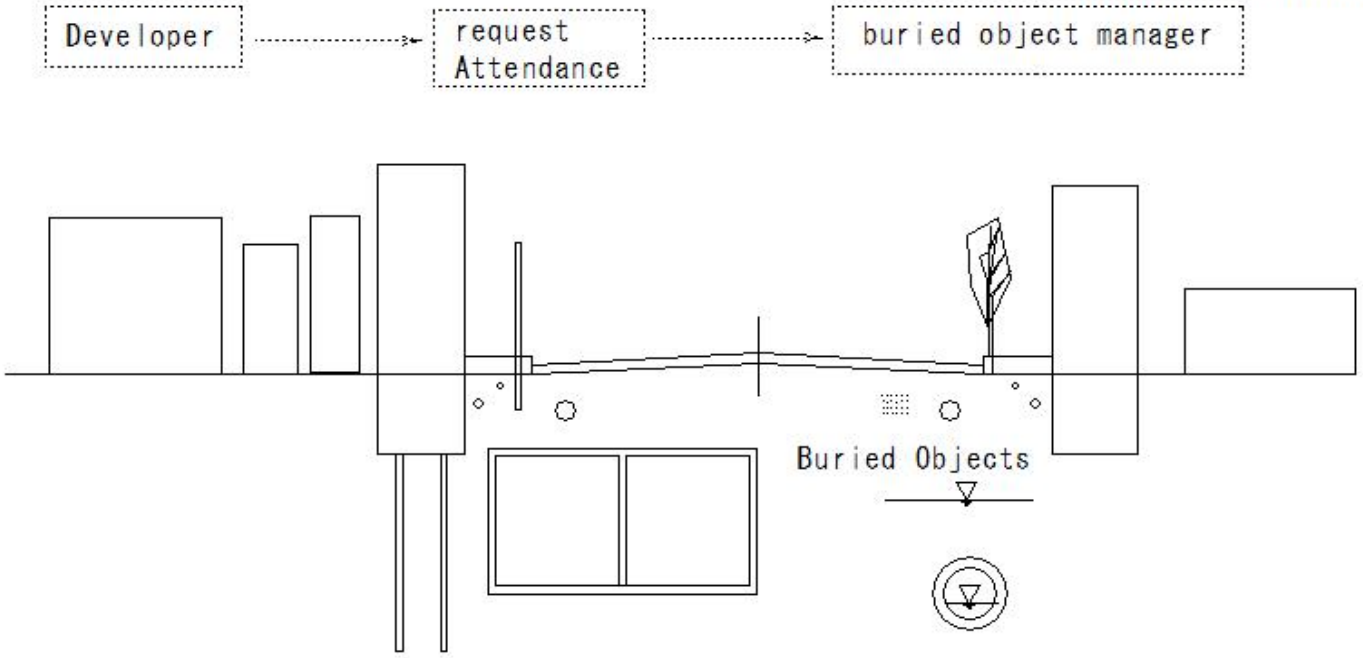
3 Safety management

3/14 Public disaster prevention measures

3/14/4 Buried Objects

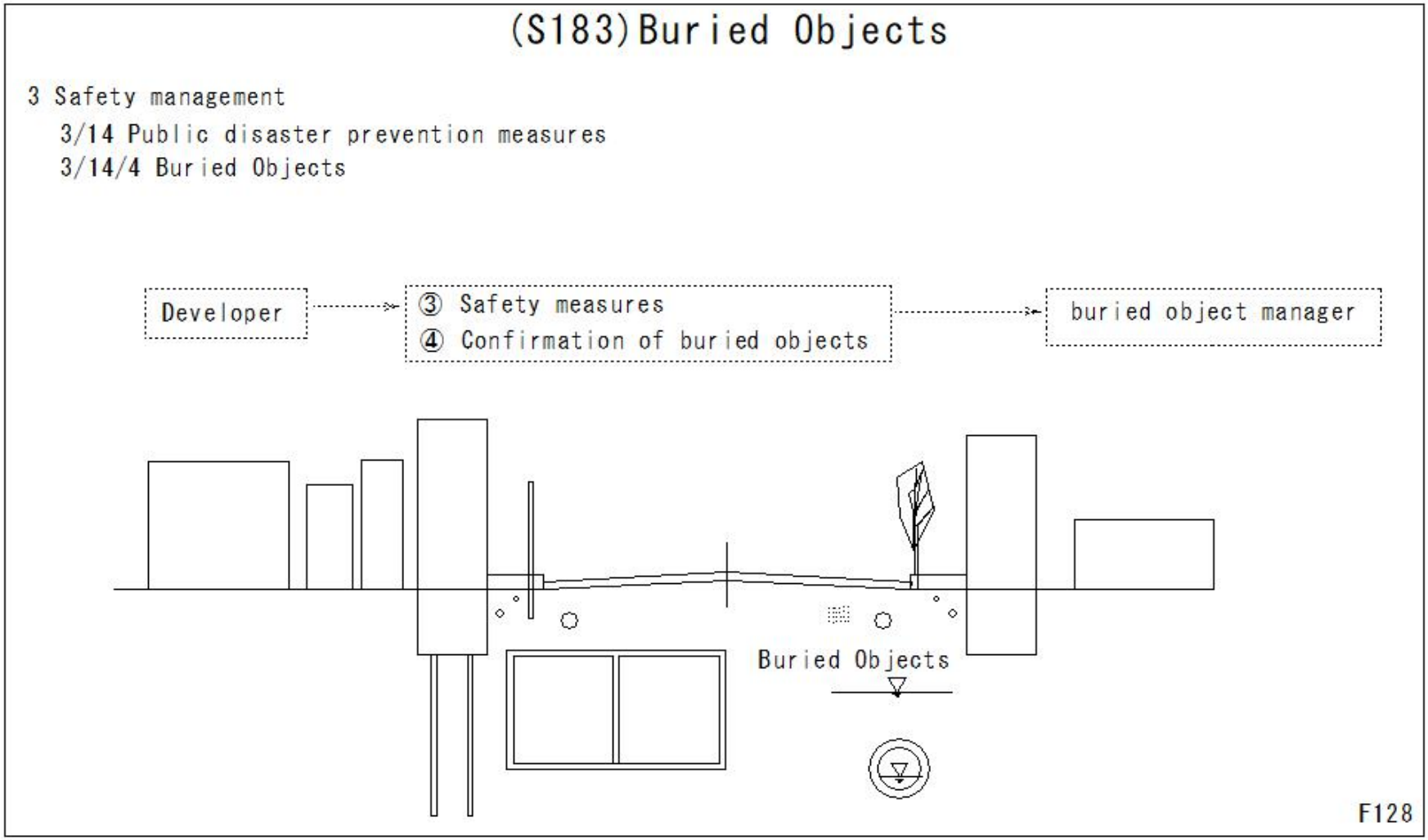
② Attendance

Developer: In case of conducting the investigation, request the buried object manager to be present to confirm the location



F128

(S183)Buried Objects



(S184)Buried Objects

(S184)Buried Objects

3 Safety management

3/14 Public disaster prevention measures

3/14/4 Buried Objects

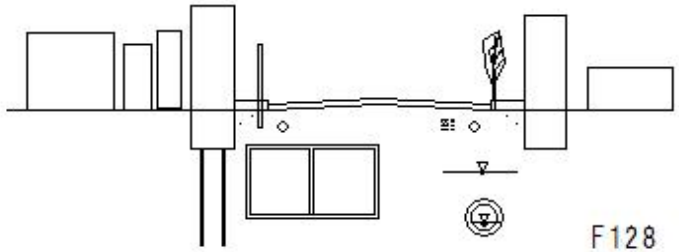
⑤ Cloth digging and pot digging

Constructors must check that there are no buried objects when driving piles, sheet piles, etc., or drilling holes.

Probes must be carried out in conjunction with trial excavation up to about 2m from the location where buried objects are expected.

In case of buried objects are confirmed, dig cloth or pot digging is carried out to expose them.

Constructors



F128

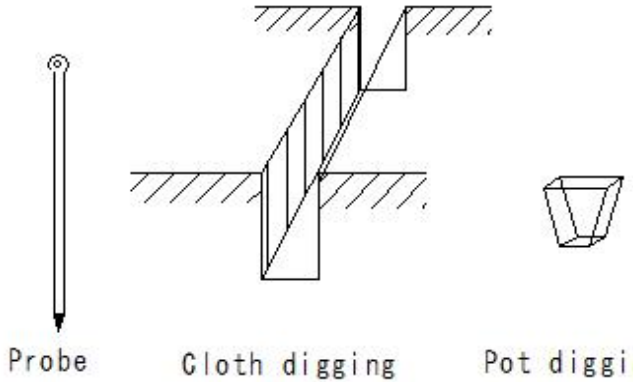


Figure 3-33 Cloth digging and pot digging

(S185)Buried Objects

(S185)Buried Objects

3 Safety management

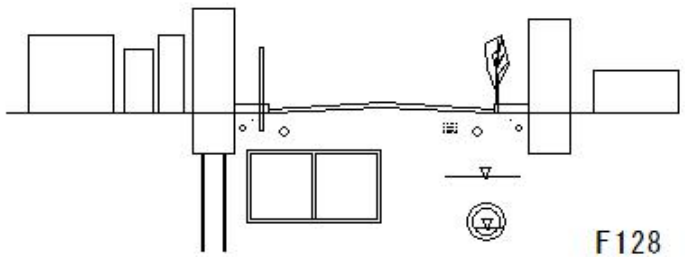
3/14 Public disaster prevention measures

3/14/4 Buried Objects

⑥ Maintaining the security of exposed buried objects

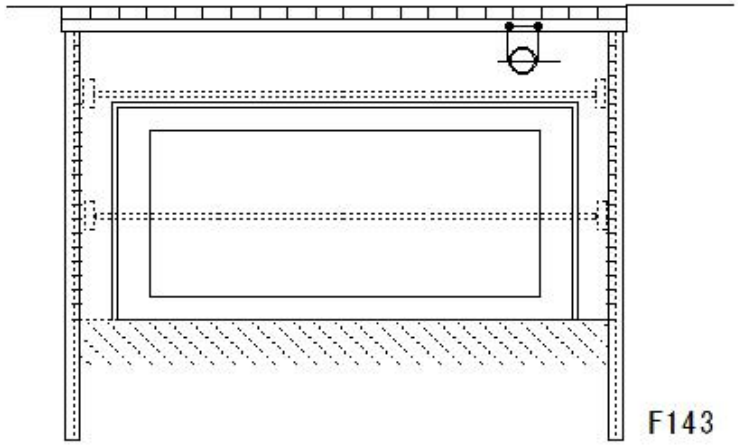
Attach signs to exposed buried objects with the name, necessary security matters, contact information, etc.

In case of damage has already occurred, the contractor will contact the developer and manager and manager and request repair measures.



F128

Maintaining



F143

(S186)Buried Objects

(S186)Buried Objects

3 Safety management

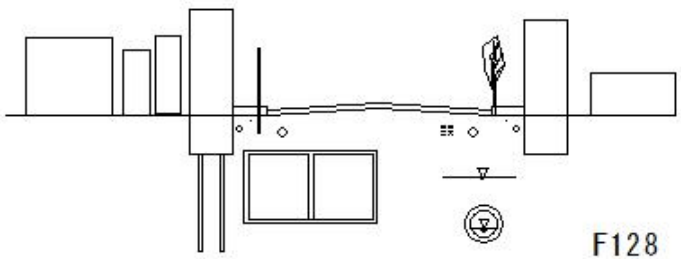
3/14 Public disaster prevention measures

3/14/4 Buried Objects

⑦ Excavation in nearby areas

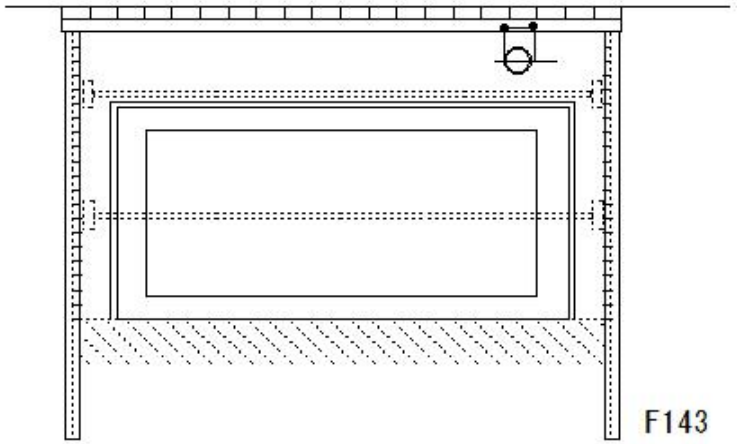
・Pay attention to loosening of the surrounding ground

・Take necessary measures to relocate or reinforce buried objects



F128

Maintaining



F143

(S187)Buried Obiects

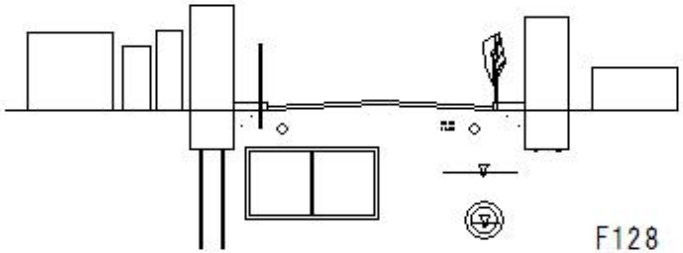
(S187)Buried Objects

3 Safety management

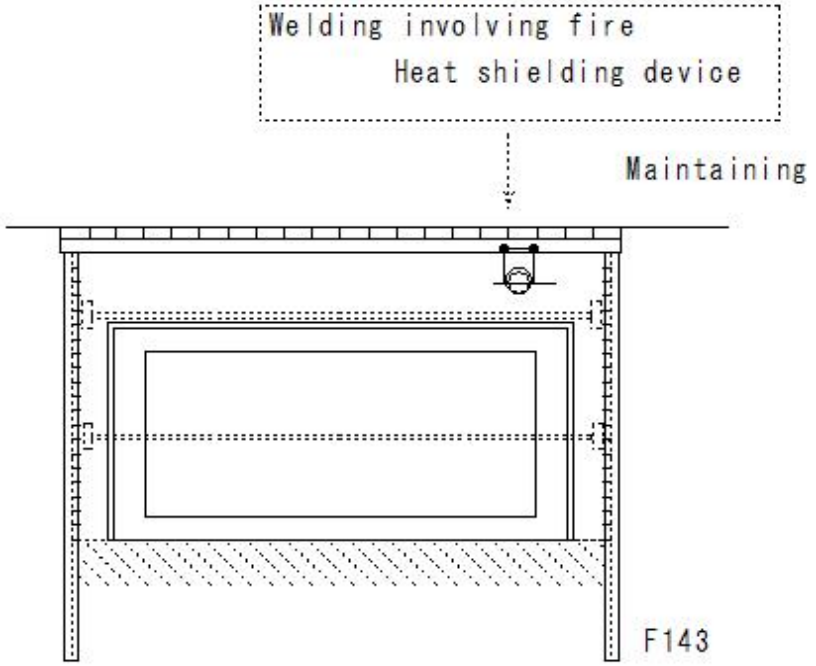
3/14 Public disaster prevention measures

3/14/4 Buried Objects

⑧ In case of using welding, cutting machines, etc. involving fire, check with a detector, etc., and take necessary measures to secure buried objects, such as heat shielding devices

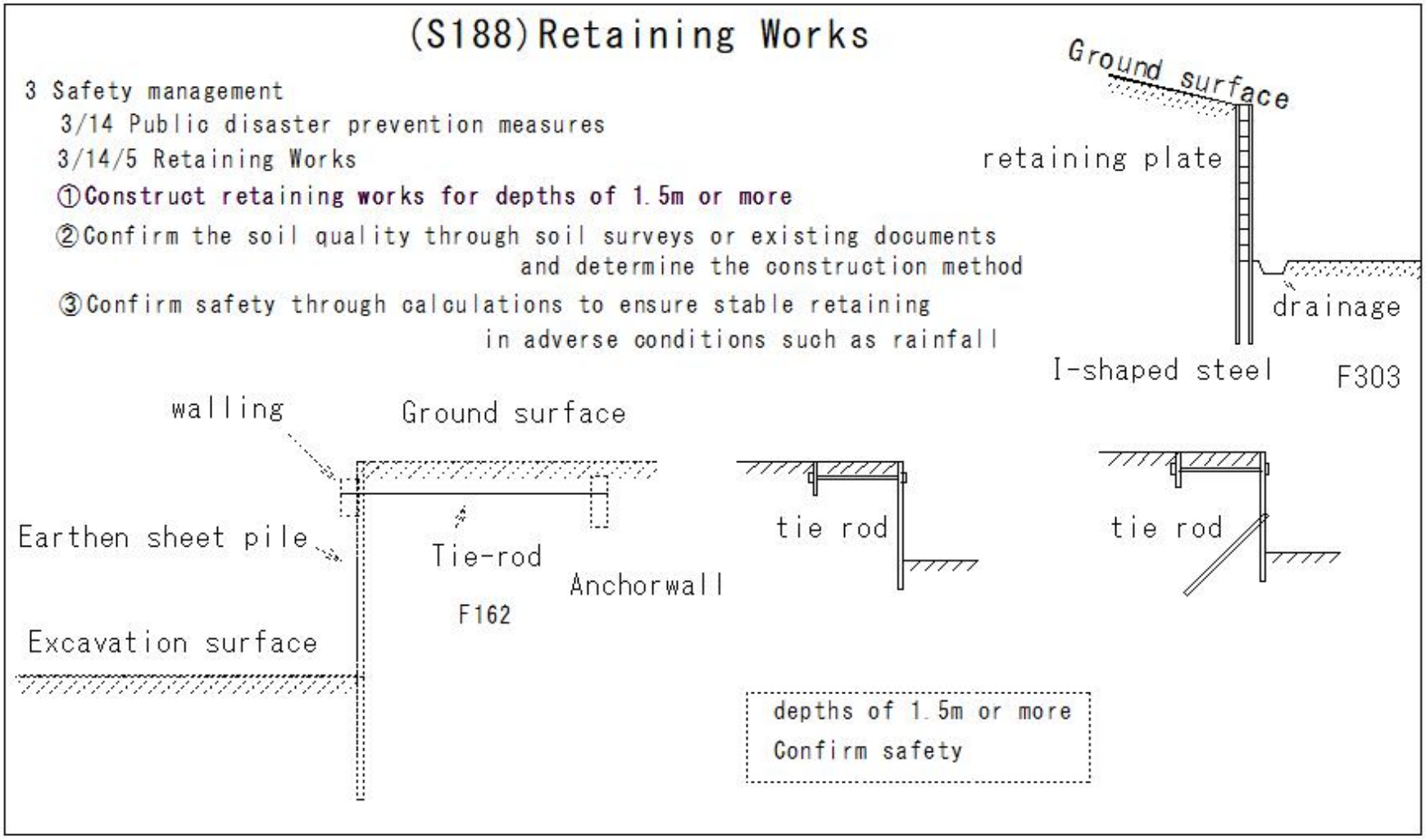


F128



F143

(S188)Retaining Works



(S189)Retaining Works

(S189)Retaining Works

3 Safety management

3/14 Public disaster prevention measures

3/14/5 Retaining Works

④Promptly backfill pot and cloth trenches after pouring

⑤Use steel sheet piles in case of the soil is weak or the groundwater level is high

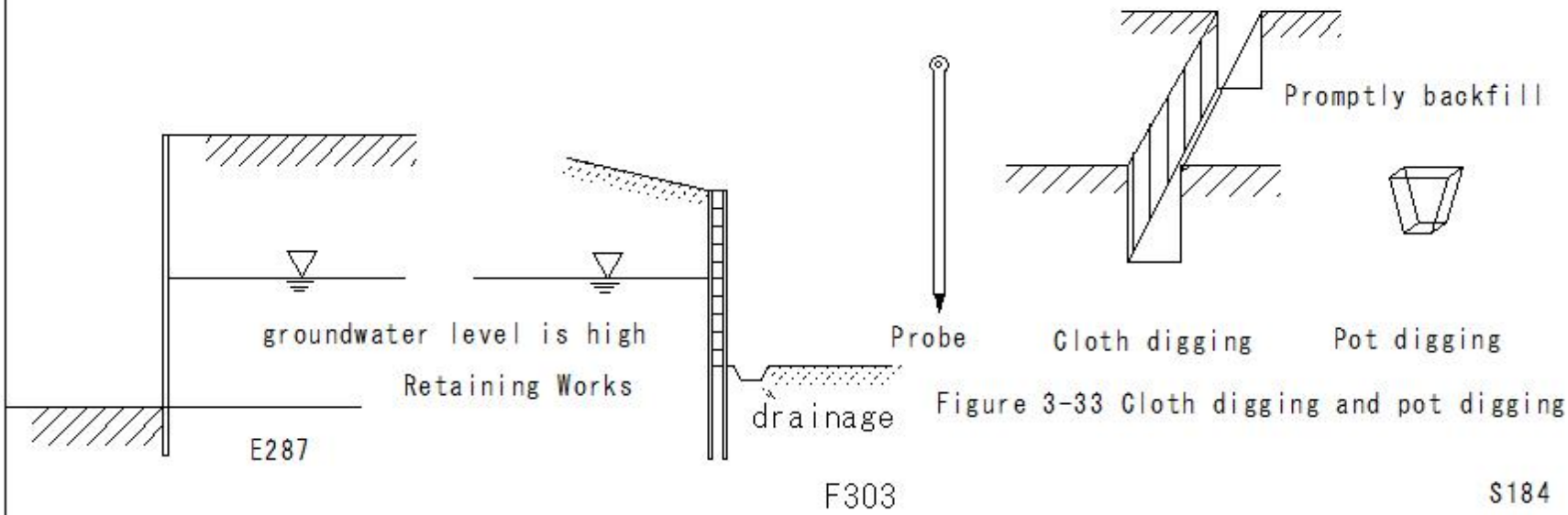


Figure 3-33 Cloth digging and pot digging

(S190)Retaining Works

(S190)Retaining Works

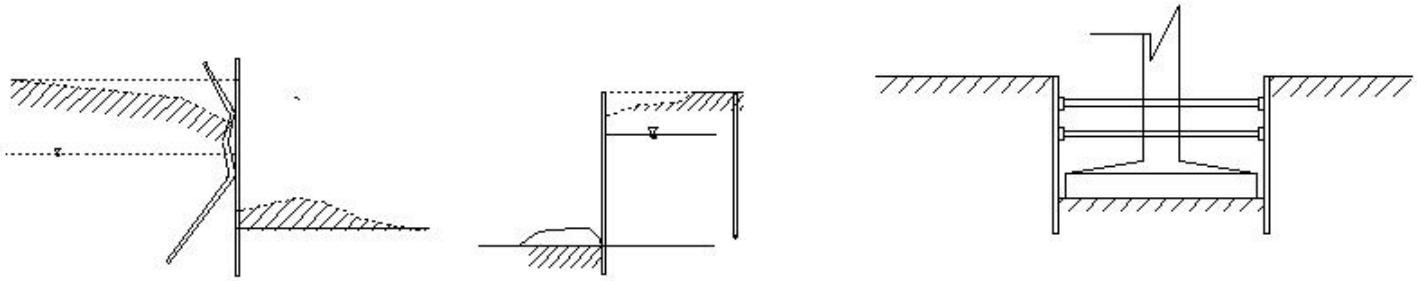
3 Safety management

3/14 Public disaster prevention measures

3/14/5 Retaining Works

⑥ The depth of the piles and steel sheet piles is 1.5m or more for piles and 3.0m or more for steel sheet piles

depth of the piles
piles -1.5m
steel sheet piles-3.0m



Earth retaining wall

E420

(S191)Retaining Works

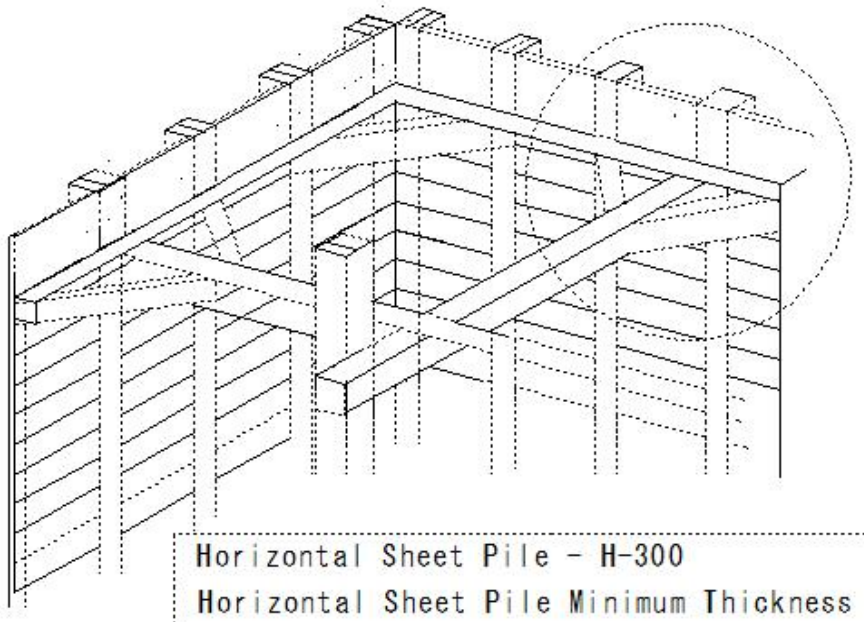
(S191)Retaining Works

3 Safety management

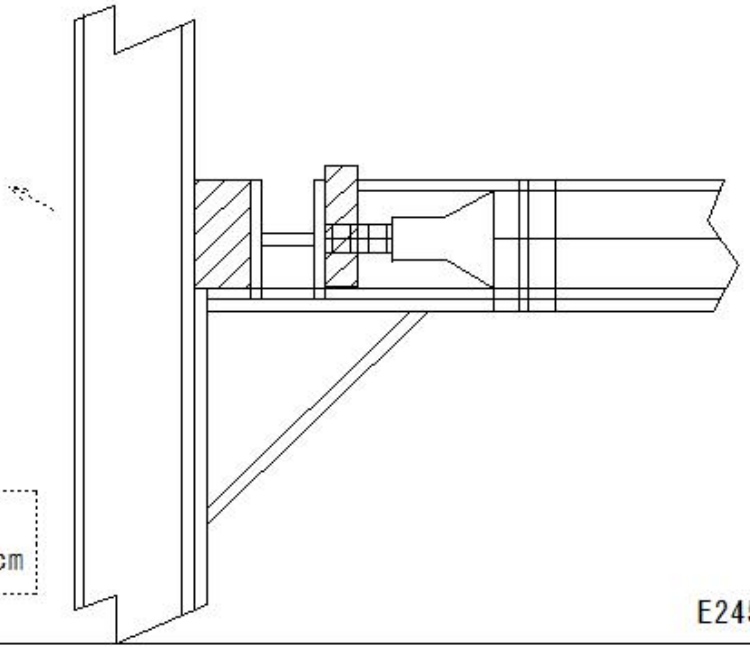
3/14 Public disaster prevention measures

3/14/5 Retaining Works

⑦ Parent Pile Horizontal Sheet Pile Method Earth Retaining Pile H-300 or more
Horizontal Sheet Pile Minimum Thickness 3cm or more



Horizontal Sheet Pile - H-300
Horizontal Sheet Pile Minimum Thickness 3cm



E245

(S192)Retaining Works

(S192)Retaining Works

3 Safety management

3/14 Public disaster prevention measures

3/14/5 Retaining Works

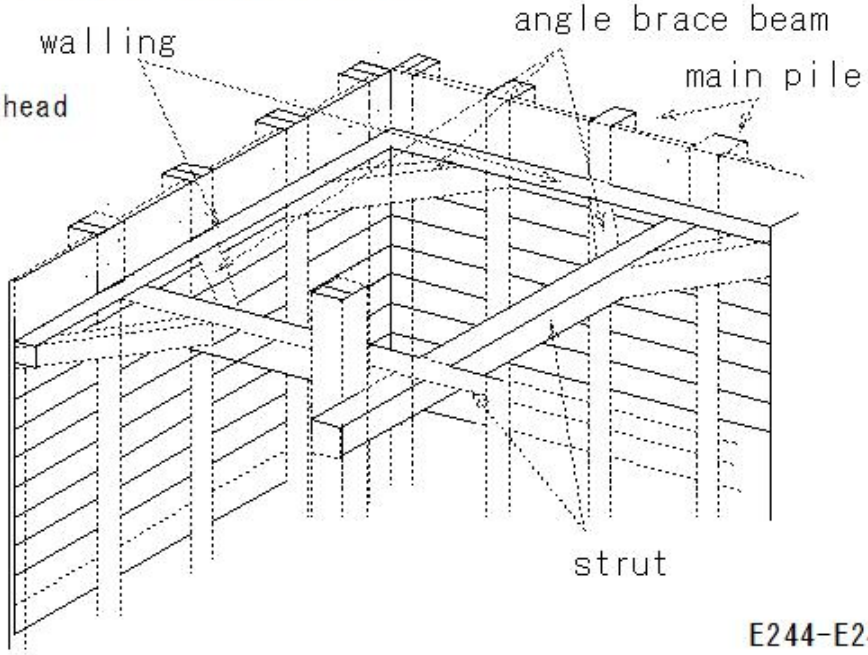
⑧ Steel sheet piles are Type III or higher as standard

⑨ The flaps should be in close contact with the columns or sheet piles, and the members should be H-300 or higher

Spacing between joints is 6m or less

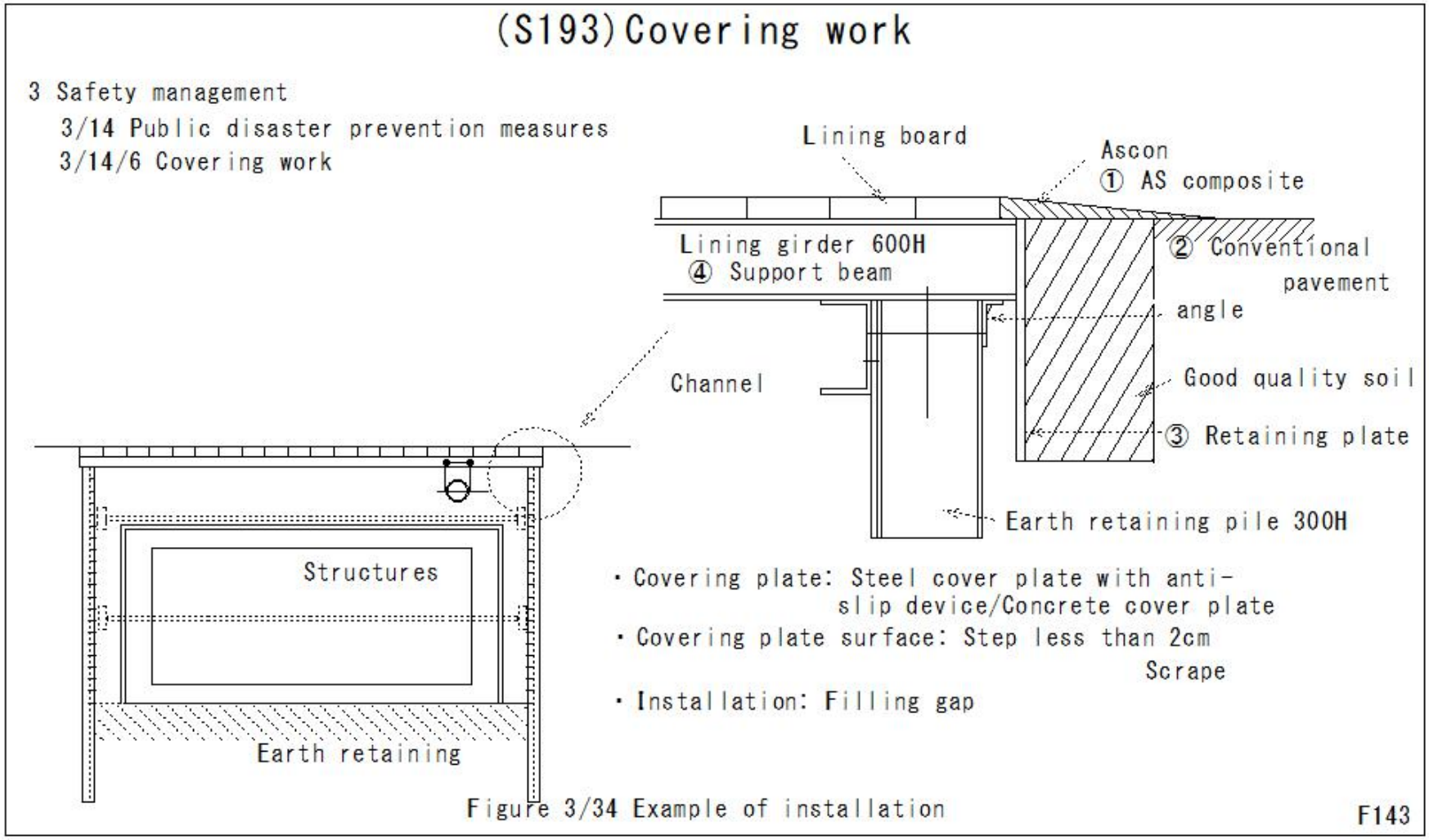
Vertical spacing is 3m or less

The first step should be 1m or less from the head



E244-E249

(S193)Covering work



(S194)Covering work

(S194)Covering work

3 Safety management

3/14 Public disaster prevention measures

3/14/6 Covering work

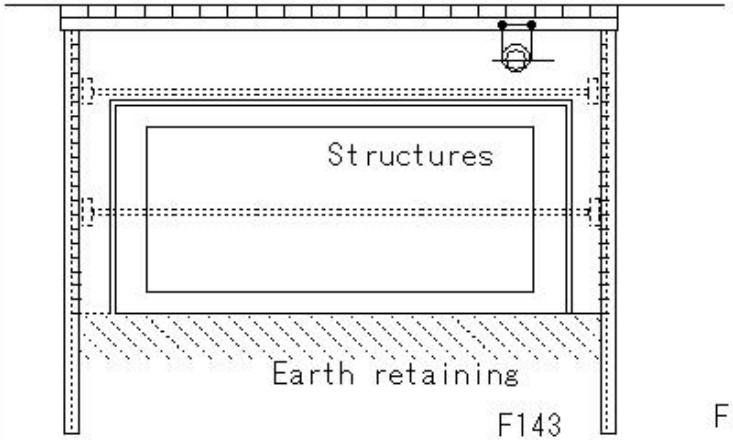
⑤ Bridge surface: Anti-slip material with a thickness of 2cm or more

⑥ Covering plate: Apply anti-slip material

⑦ Covering plate: Structure with no horizontal movement

⑧ Covering plate support beam: Maximum deformation: 2.5cm or less

⑨ Slope of 2.5% or more: Prevents support beam from collapsing



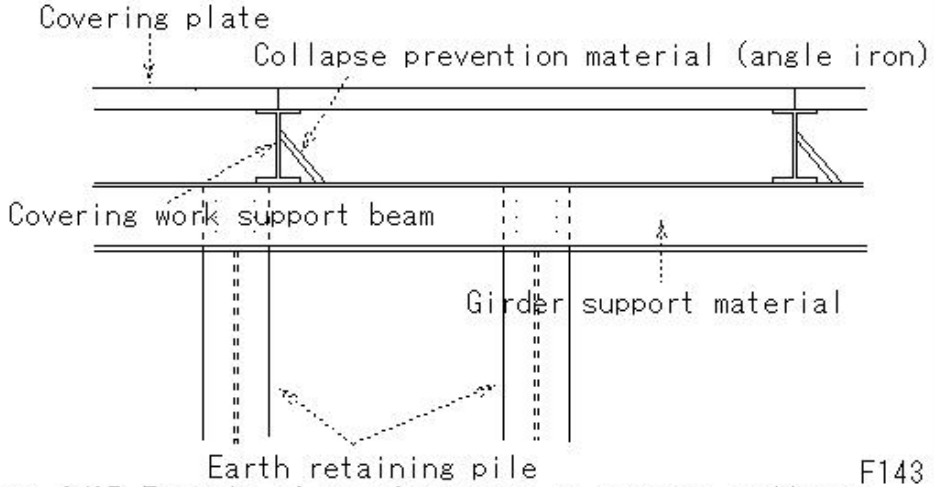


Figure 3/35 Example of reinforcement to prevent collapse

(S195)Gas disaster

(S195)Gas disaster

3 Safety management

3/15 Gas disaster prevention measures

3/15/1 Characteristics of harmful gases

1. Carbon monoxide (flammable, odorless, specific gravity 0.97)

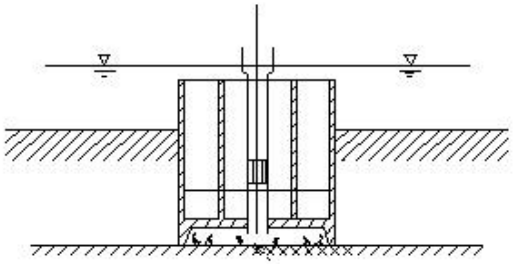
0.02% → Headache

0.08% → Death in 2 hours

0.15% → Death in 1 hour

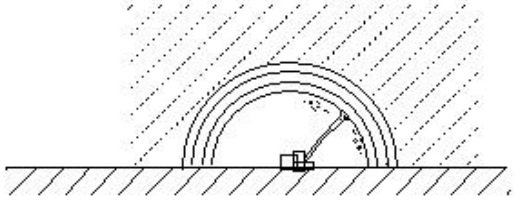
0.30% → Death in 30 minutes

Pneumatic caisson basics



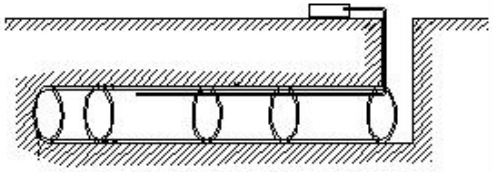
F149

Tunnel(shot crete)



C1384
M400

Tunnel(pneumatic method)



T231

(S196)Gas disaster

(S196)Gas disaster

3 Safety management

3/15 Gas disaster prevention measures

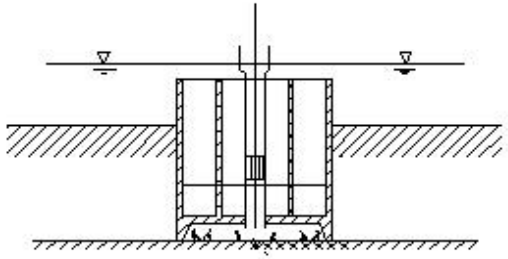
3/15/1 Characteristics of harmful gases

② Carbon dioxide (nonflammable, odorless, specific gravity 1.53)

4% Nausea

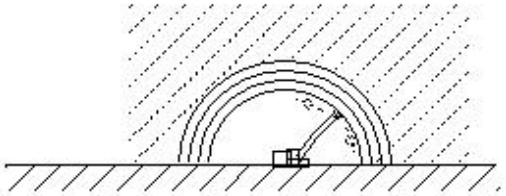
10% Loss of consciousness

Pneumatic caisson basics



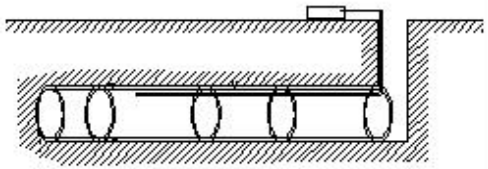
F149

Tunnel(shot crete)



C1384
M400

Tunnel(pneumatic method)



T231

(S197)Gas disaster

(S197)Gas disaster

3 Safety management

3/15 Gas disaster prevention measures

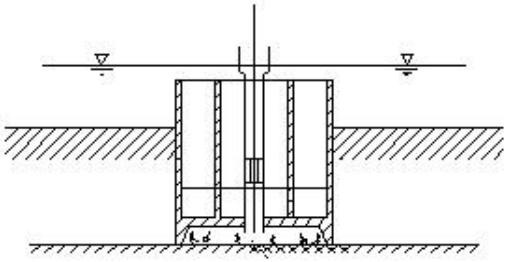
3/15/1 Characteristics of harmful gases

③Methane gas (flammable, tasteless, odorless, colorless, specific gravity 0.56)

Low toxicity

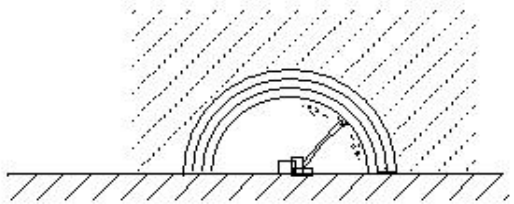
Water-soluble

Pneumatic caisson basics



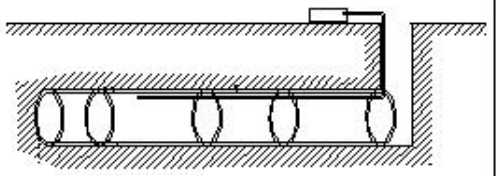
F149

Tunnel(shot crete)



C1384
M400

Tunnel(pneumatic method)



T231

(S198)Gas disaster

(S198)Gas disaster

3 Safety management

3/15 Gas disaster prevention measures

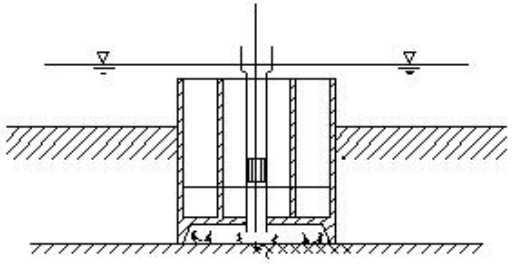
3/15/1 Characteristics of harmful gases

3/15/2 Explosive properties of harmful gases

Explosive limits

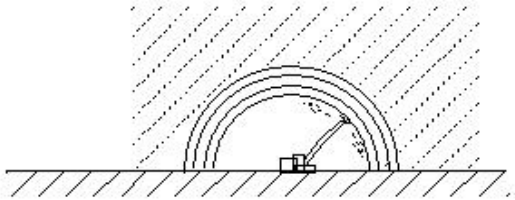
Symbols	Gas name	Explosive limit
CO	Carbon monoxide	12.5%-74%
CH4	Methane	5.4%-14%
C3H8	Propane	2.2%-9.5%

Pneumatic caisson basics



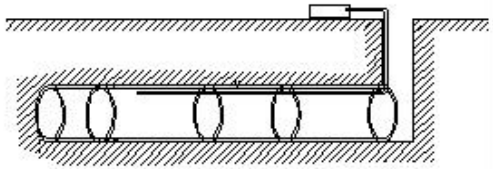
F149

Tunnel(shot crete)



C1384
M400

Tunnel(pneumatic method)



T231

(S199)Gas disaster

(S199) Gas disaster

3 Safety management

3/15 Gas disaster prevention measures

3/15/1 Characteristics of harmful gases

3/15/3 Explosive generation of harmful gases

① Optical combustible gas measuring device - Danger level of mixed gas of 2 or more types - Direct reading possible

② Ventilation

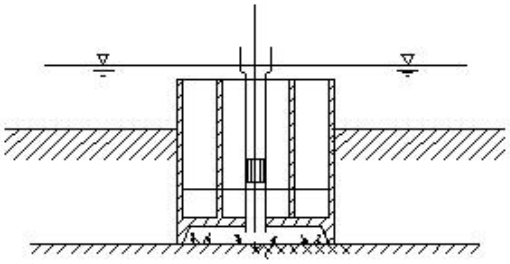
③ Do not bring open flames into the mine

④ In case of loading, use 2 or more people

⑤ Evacuate workers when concentration is 30% or more of the lower explosion limit

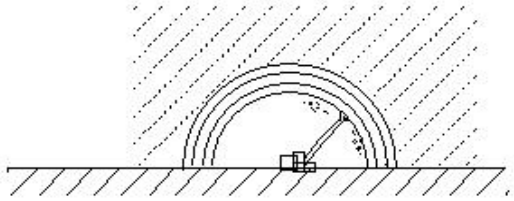
⑥ Organic solvents enter the respiratory system in the form of gas, and also enter through the skin

Pneumatic caisson basics



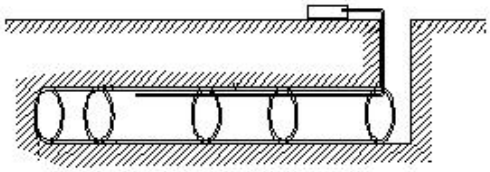
F149

Tunnel(shot crete)



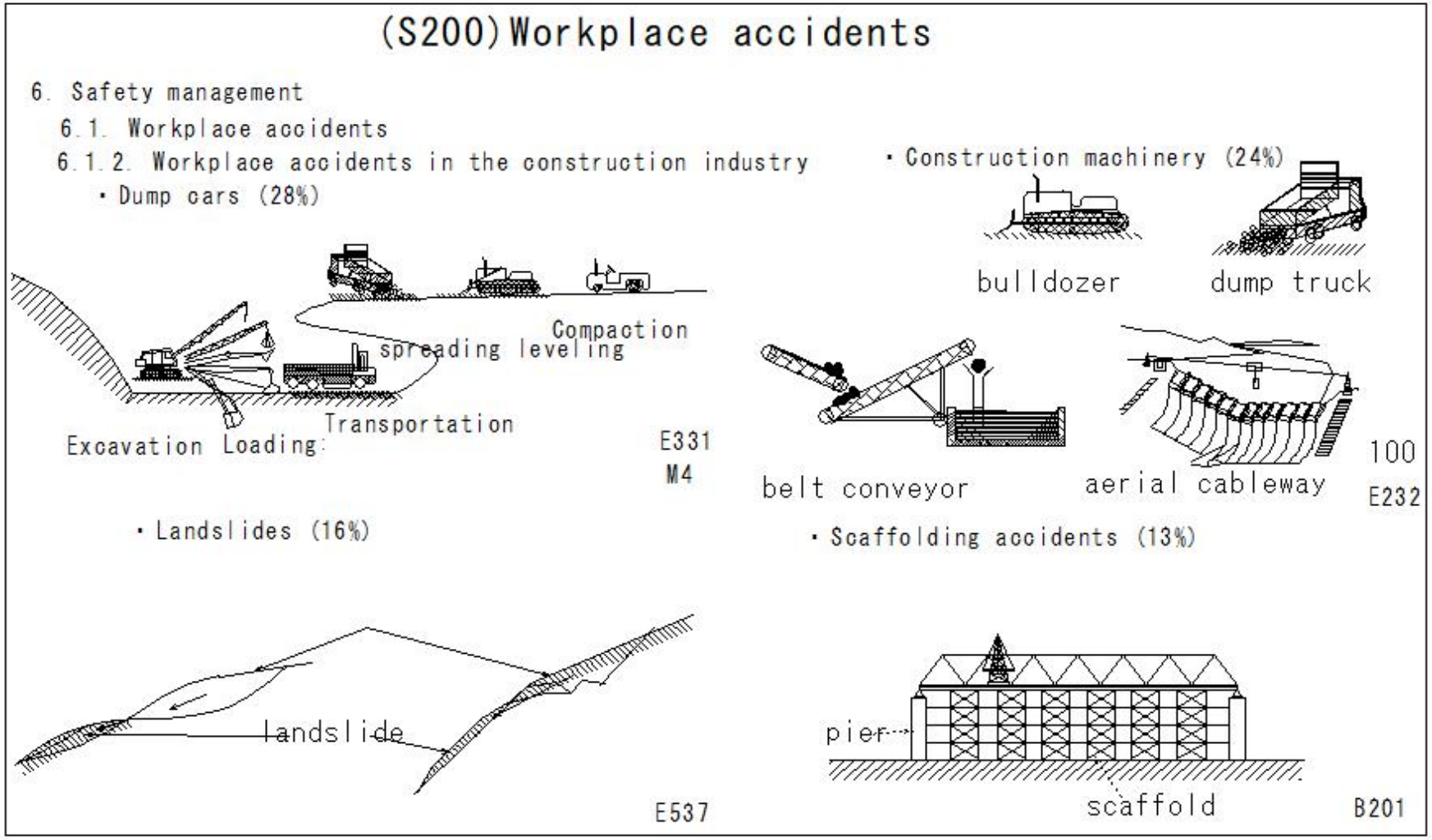
C1384 M400

Tunnel(pneumatic method)



T231

(S200)Workplace accidents

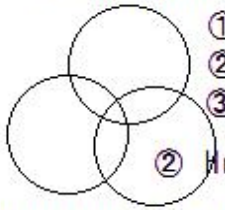


(S201)Workplace accidents

(S201)Workplace accidents

6 Safety Management
6.1 Workplace Accidents
6.1.4 Causes of Accidents

① Structural defects - Countermeasures: careful design and construction



① Structural defects - Countermeasures: careful design and construction
② Equipment defects - adequate maintenance
③ Lack of budget - appropriate budget

② Human factors (incomplete actions)

③ Management factors (defects)

Figure 6-1 Causes and countermeasures of disasters

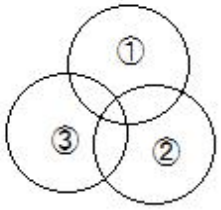
(S202)Workplace accidents

(S202)Workplace accidents

6 Safety Management
6.1 Workplace Accidents
6.1.4 Causes of Accidents

① Structural defects - Countermeasures: careful design and construction

① Structural defects - Countermeasures: careful design and construction
② Equipment defects - adequate maintenance
③ Lack of budget - appropriate budget



② Human factors (incomplete actions)
① Ignorance, immaturity, carelessness - Countermeasures: Utilizing training systems
② Physical fatigue - Countermeasures: Health management

③ Management factors (defects)

Figure 6-1 Causes and countermeasures of disasters

(S203)Workplace accidents

(S203)Workplace accidents

6 Safety Management

6.1 Workplace Accidents

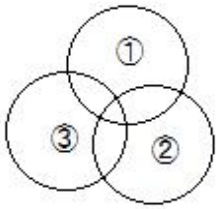
6.1.4 Causes of Accidents

① Structural defects - Countermeasures: careful design and construction

① Structural defects - Countermeasures: careful design and construction

② Equipment defects - adequate maintenance

③ Lack of budget - appropriate budget



② Human factors (incomplete actions)

① Ignorance, immaturity, carelessness - Countermeasures: Utilizing training systems

② Physical fatigue - Countermeasures: Health management

③ Management factors (defects)

① Lack of education - Countermeasures: Education and training

② Lack of work meetings - Countermeasures: Communicating work content: Proper allocation

Figure 6-1 Causes and countermeasures of disasters

(S204)Safety management

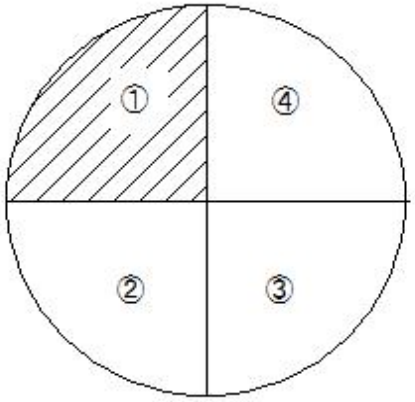
(S204)Safety management

6 Safety management

6/1 Workplace accidents

6/1/5 Implementation of Safety management

① Safety education
② Stimulating safety awareness
③ Standardization of work
④ Machine inspection and maintenance

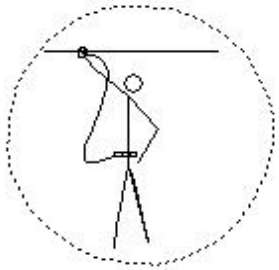


① Safety education

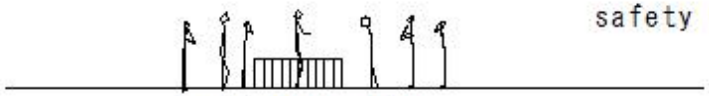
② Understanding of work content

③ Use of safety helmets and safety harnesses

safety helmets



safety harnesses



toolbox meeting

S74

Figure 6/2 Safety management

(S205)Safety management

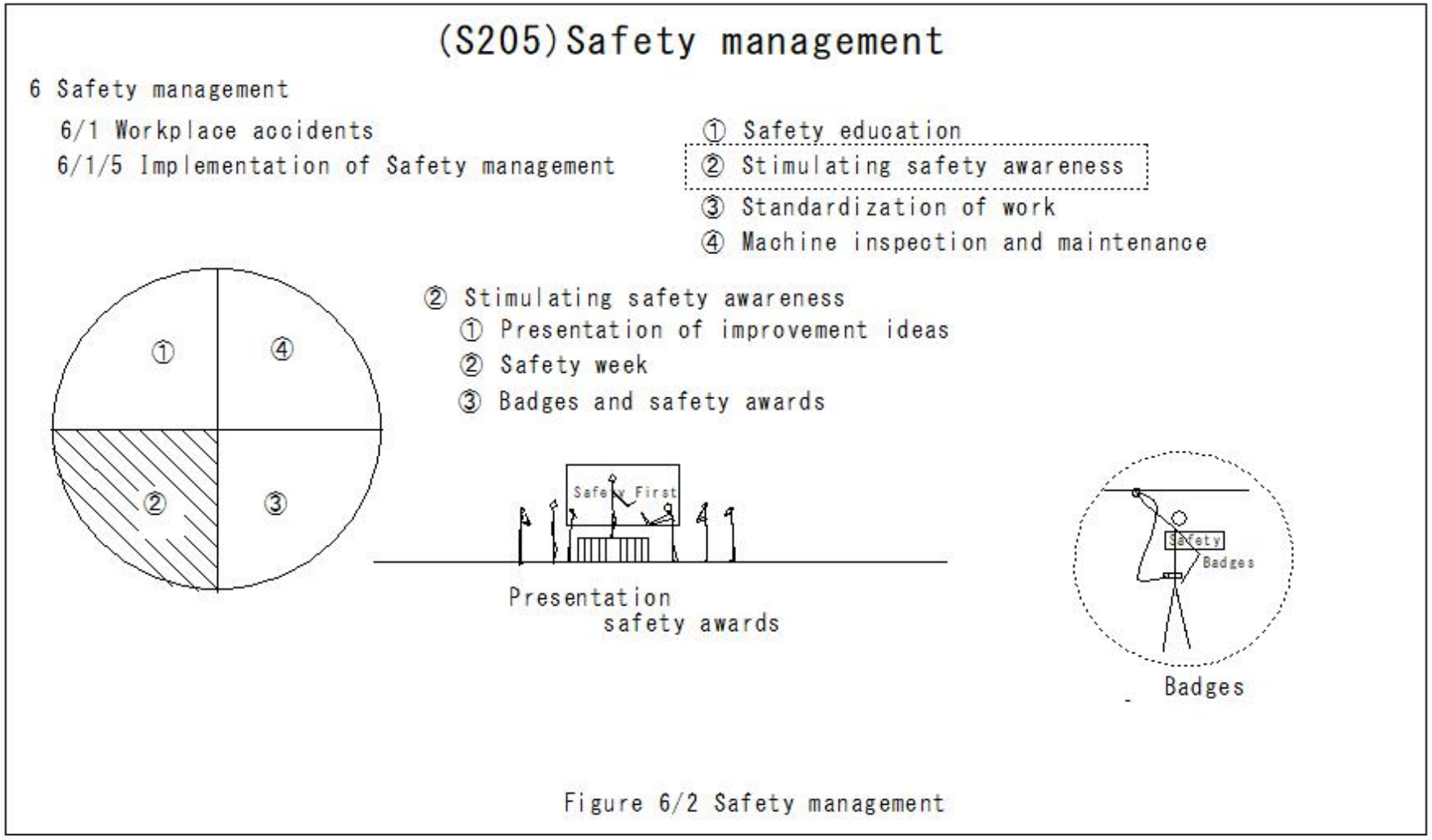
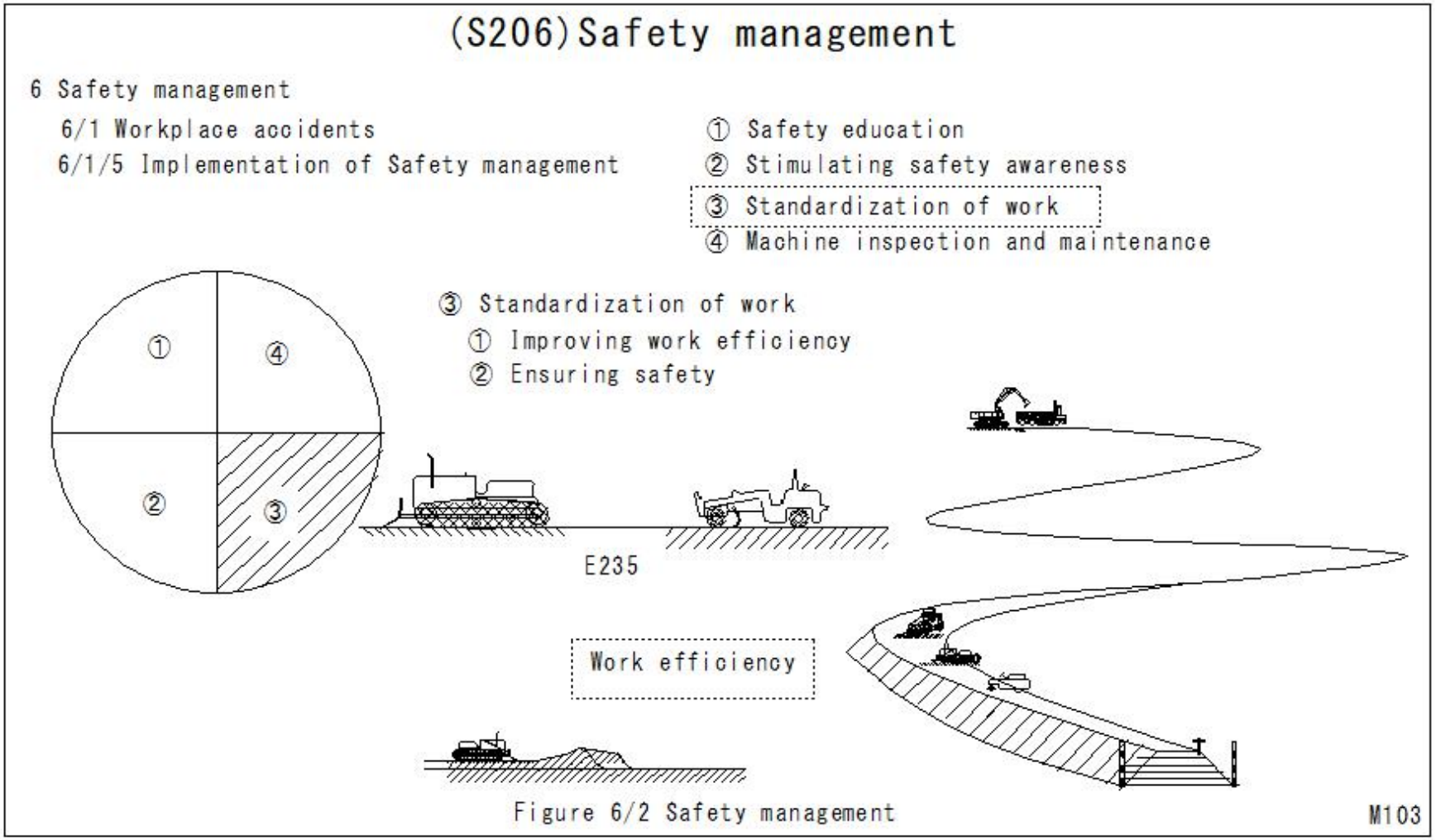


Figure 6/2 Safety management

(S206)Safety management



(S207)Safety management

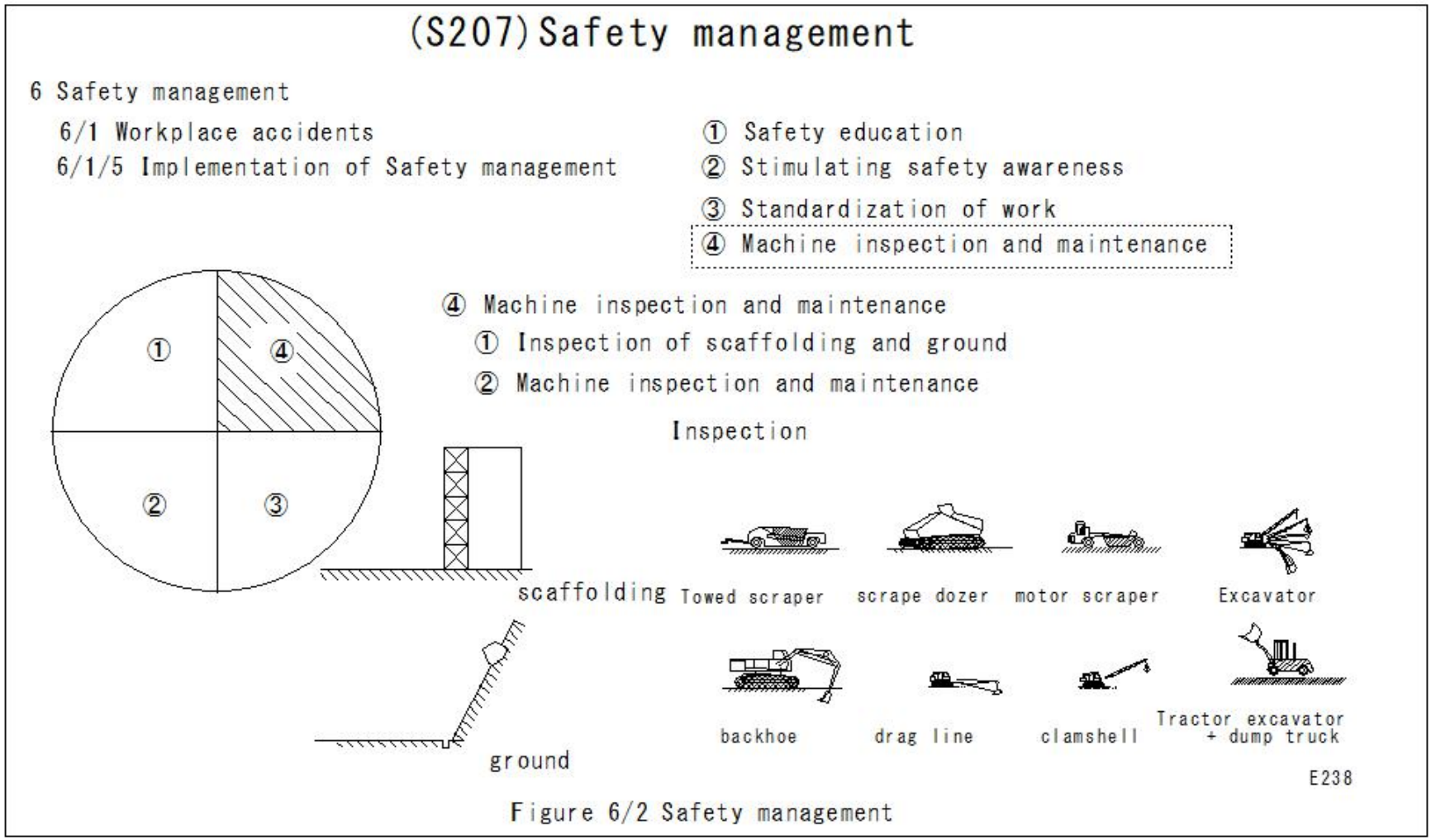
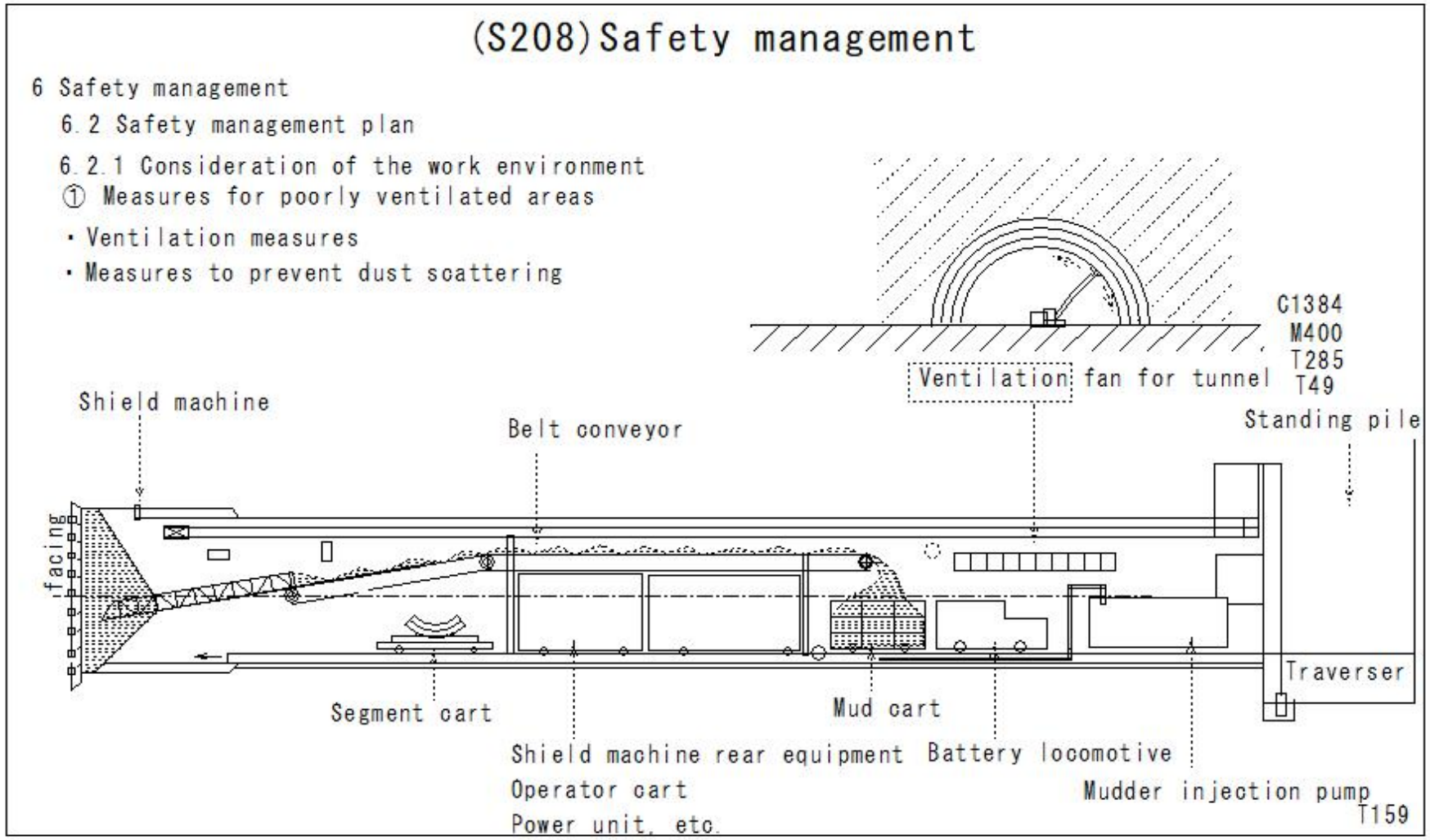


Figure 6/2 Safety management

(S208)Safety management



(S209)Safety management

(S209)Safety management

6 Safety management

6.2 Safety management plan

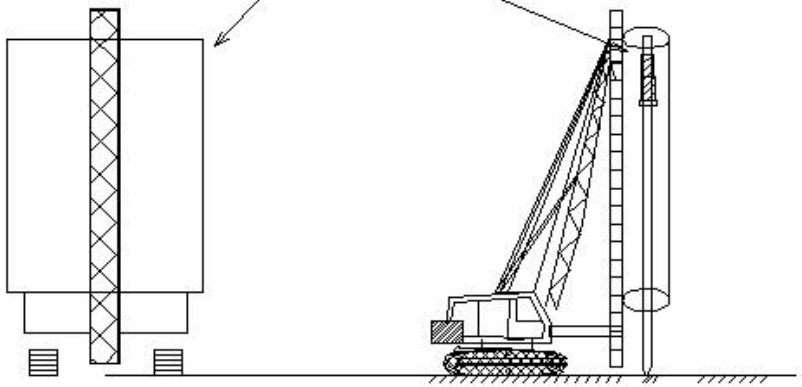
6.2.1 Consideration of the work environment

② Places where intense noise is generated

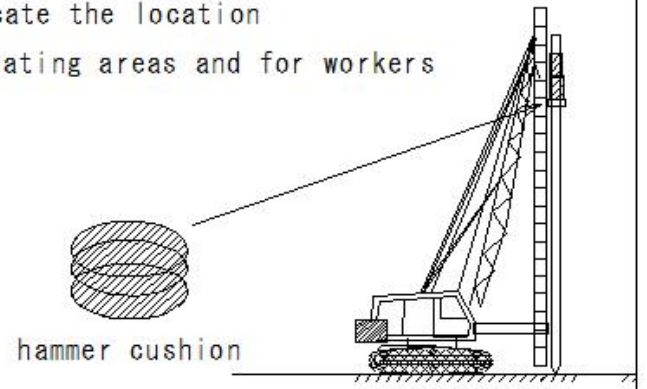
・Inform workers of the noise generation and clearly indicate the location

・Use protective equipment such as earplugs at noise generating areas and for workers

・Soundproof cover

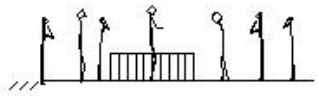


F38



F30

earplugs



toolbox meeting

Inform

(S210)Safety management

(S210)Safety management

6 Safety management

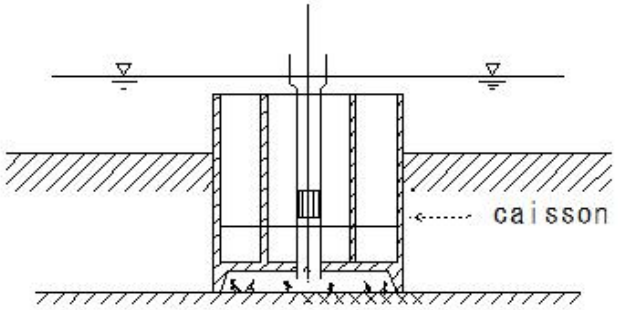
6.2 Safety management plan

6.2.1 Consideration of the work environment

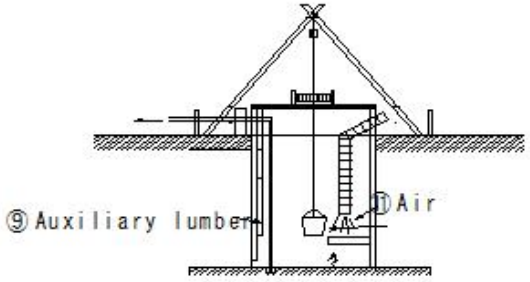
③ Tasks that require measurement of the work environment

- Places where dust is emitted
- Measure the ventilation volume, temperature, and carbon dioxide concentration in a work area inside a mine with ventilation facilities
- Measure the oxygen and hydrogen sulfide concentrations in places where there is a risk of oxygen deficiency

Measure the oxygen and hydrogen sulfide



S15



F43

S36

(S211)Safety management

(S211)Safety management

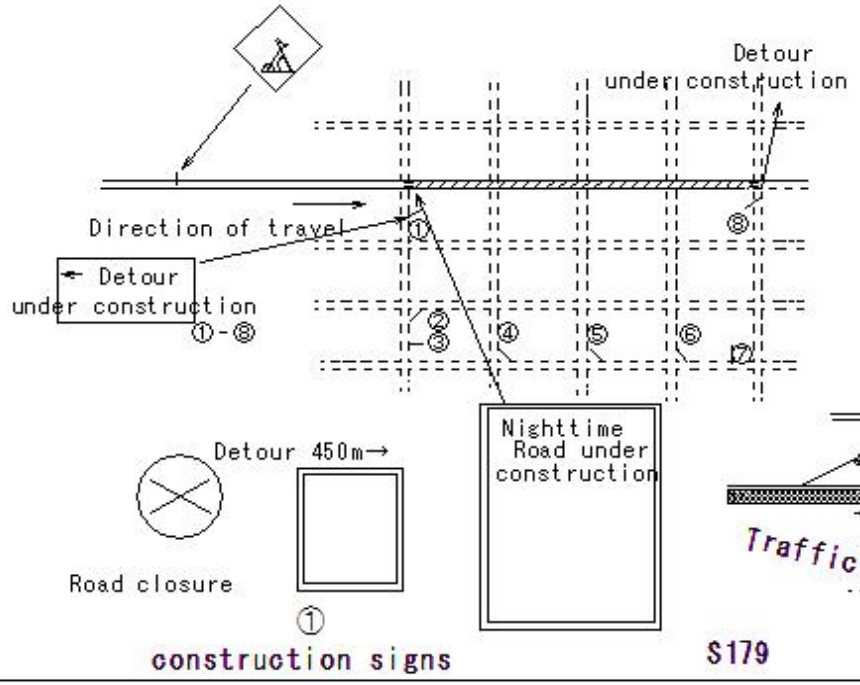
6 Safety Management

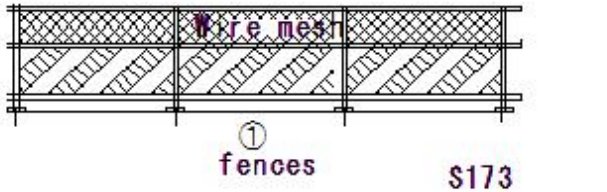
6.2 Safety Management Plan

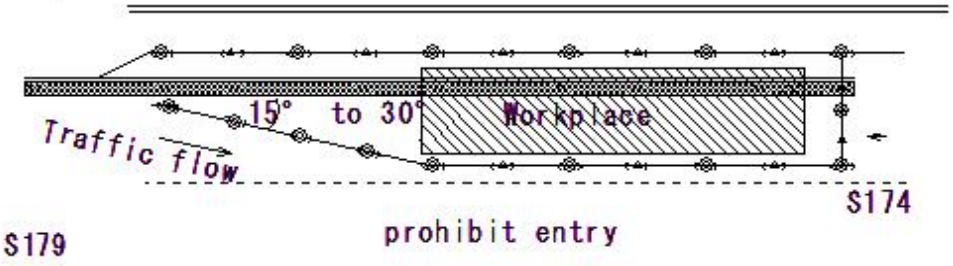
6.2.2 Measures to prevent harm around the construction site

① Install protective structures such as fences to prohibit entry to the construction area

・ Install and maintain fall prevention measures, construction signs, and night lighting







(S212)Safety management

(S212)Safety management

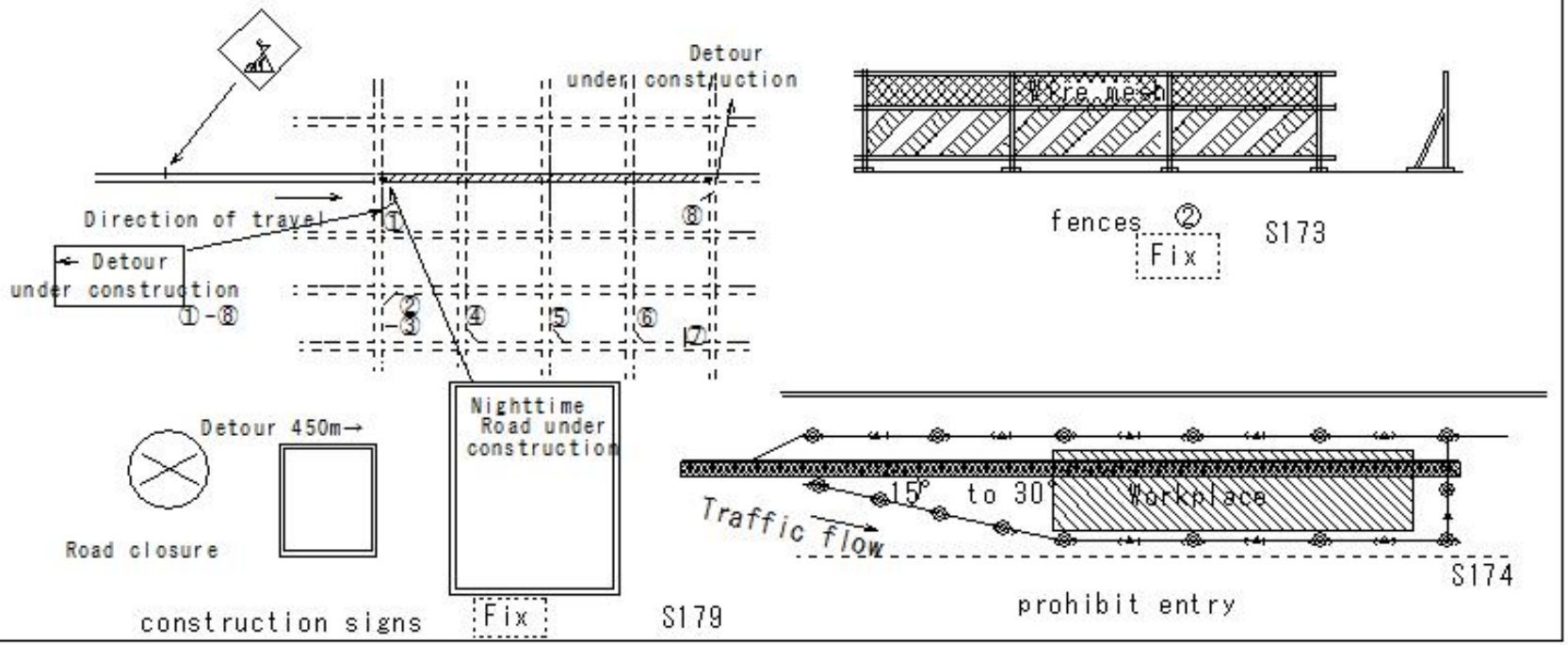
6 Safety Management

6.2 Safety Management Plan

6.2.2 Measures to prevent harm around the construction site

② Fix detour and sign boards to prevent them from falling over due to wind, etc.

・ Thorough maintenance and inspection are performed to make them easily visible to pedestrians



(S213)Safety management

(S213)Safety management

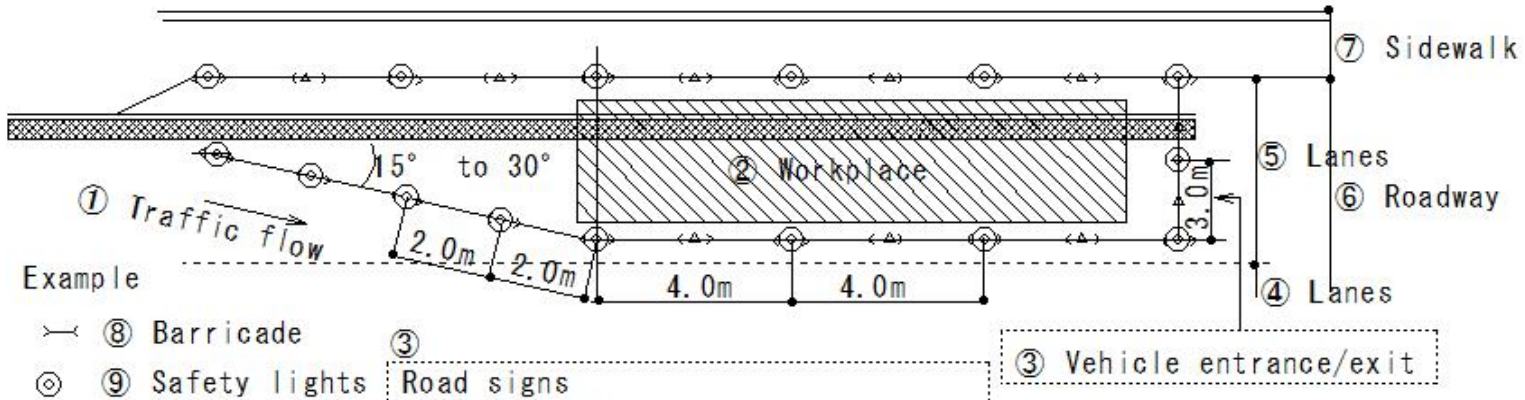
6 Safety Management

6.2 Safety Management Plan

6.2.2 Measures to prevent harm around the construction site

③ To prevent traffic accidents near the entrances and exits of the construction site

・ Lower the sidewalk, take measures to prevent slipping, and install buzzers or yellow rotating lights at the entrances and exits of construction vehicles



③

Road signs
Safety lights
Signboards (internally illuminated)
Luminous rotating lights
Luminous rotating lights

S174
S178

(S214)Safety management

(S214)Safety management

6 Safety Management

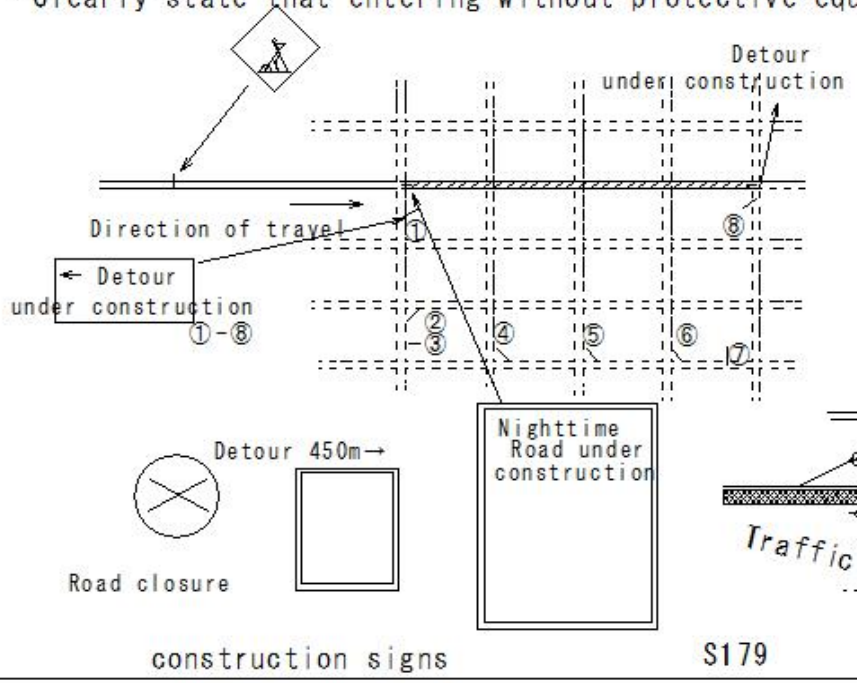
6.2 Safety Management Plan

6.2.2 Measures to prevent harm around the construction site

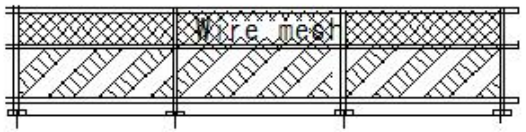
④ Measures to prohibit entry

・Display specific details of the dangers

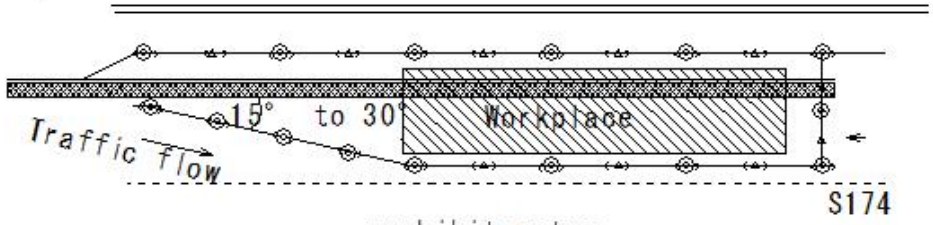
・Clearly state that entering without protective equipment will cause health problems or dangers



construction signs S179



fences S173



S174

prohibit entry S211

(S215)Safety management

(S215)Safety management

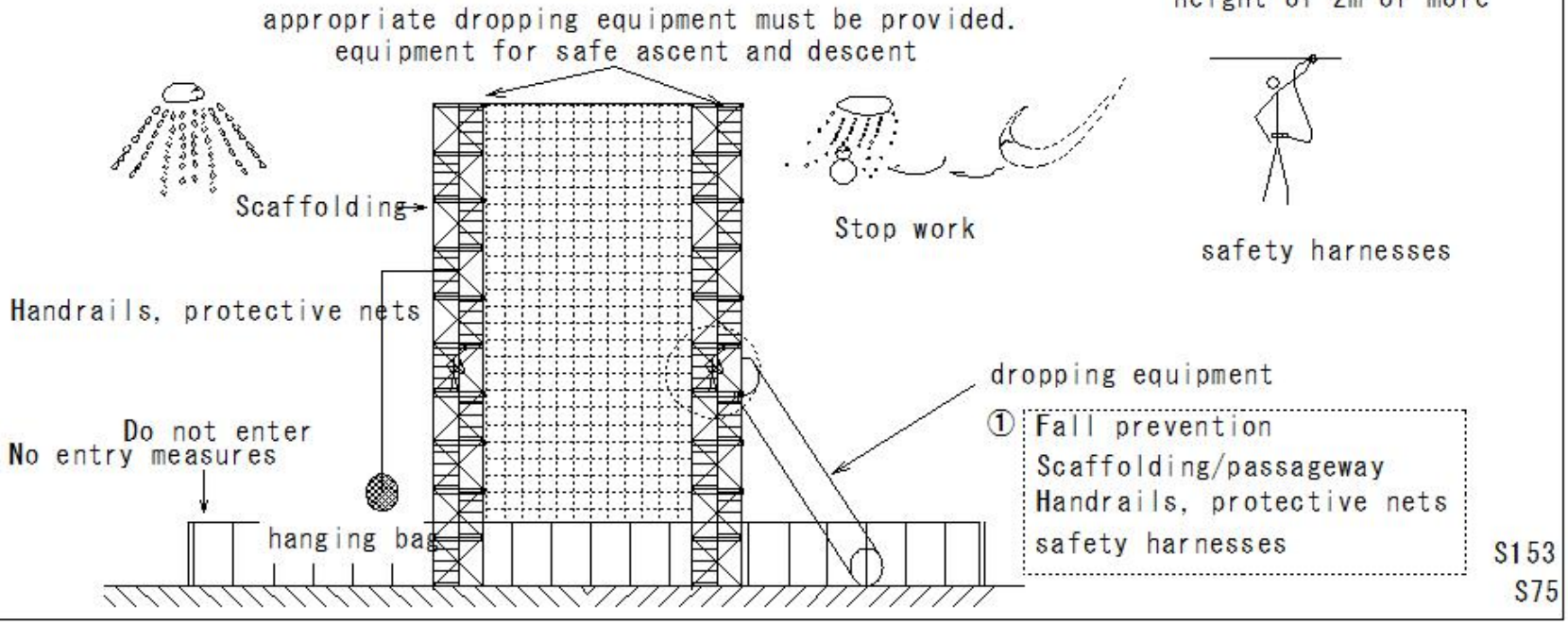
6. Safety management

6.2. Safety management plan

6.2.3. Fall prevention measures

① To prevent falls from scaffolding and walkways, install work floors and handrails at heights of 2m or more.

・In case of there are no handrails, install protective nets and have workers use safety harnesses. height of 2m or more



S153
S75

(S216)Safety management

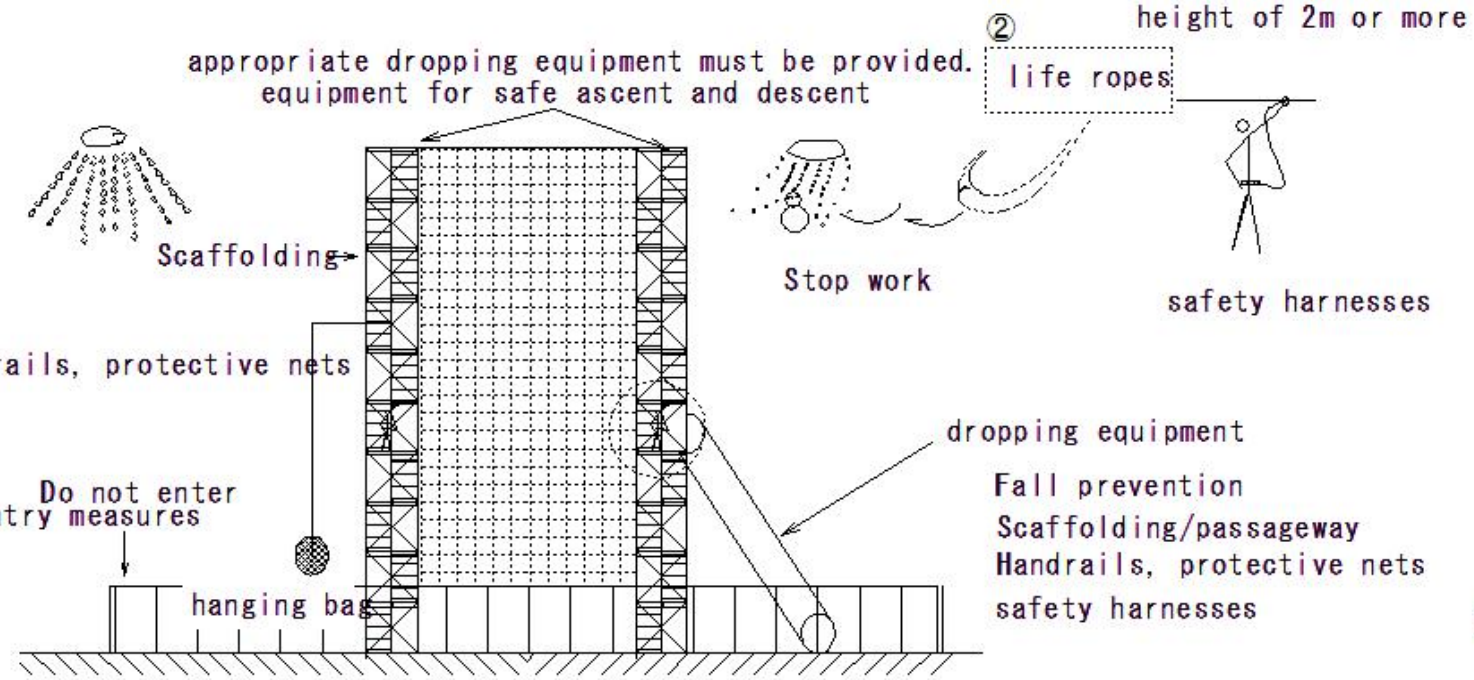
(S216)Safety management

6. Safety management

6.2. Safety management plan

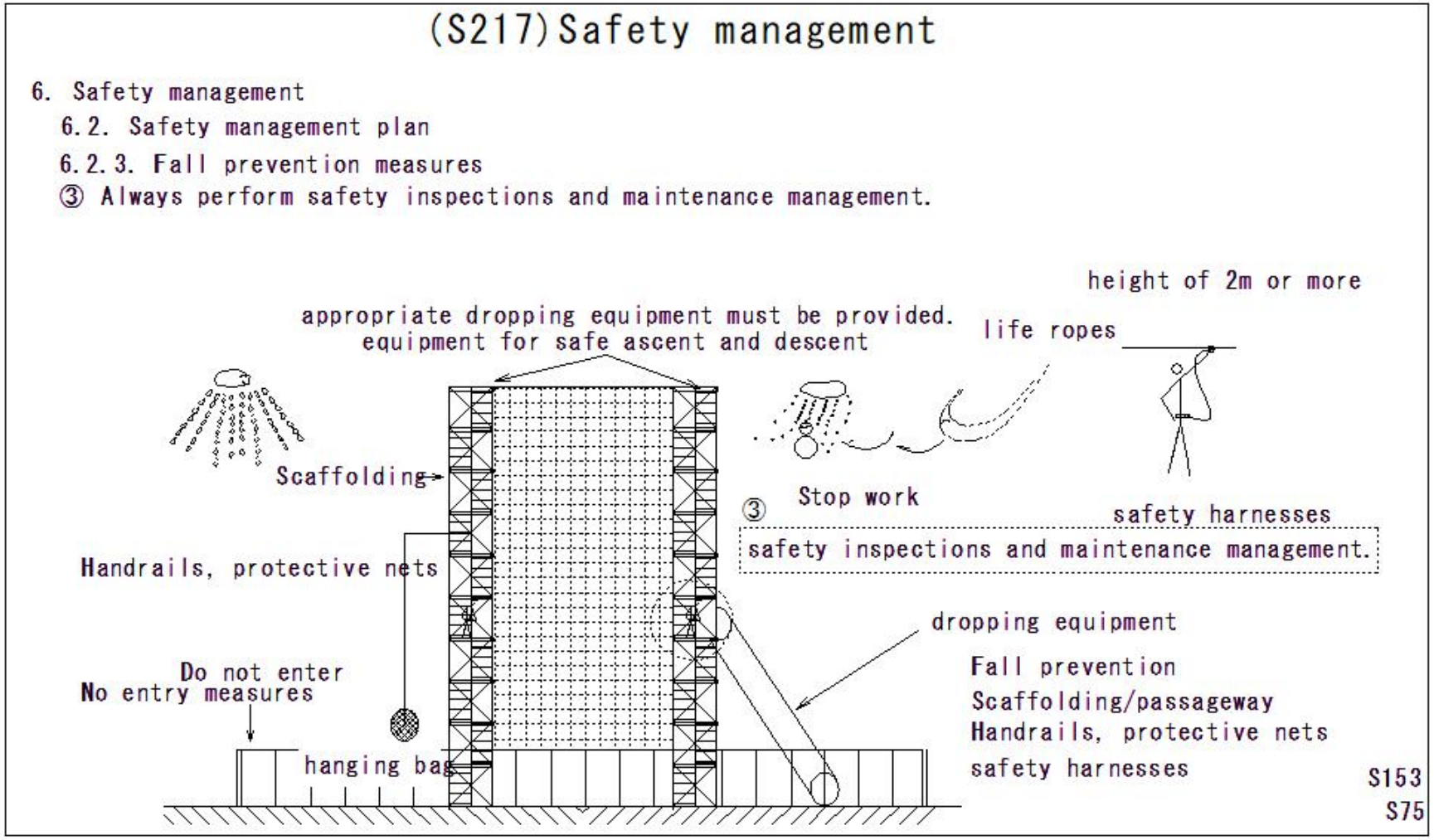
6.2.3. Fall prevention measures

② In case of assembling and dismantling scaffolding and steel frames, install equipment such as life ropes so that safety harnesses can be used easily.



S153
S75

(S217)Safety management



(S218)Safety management

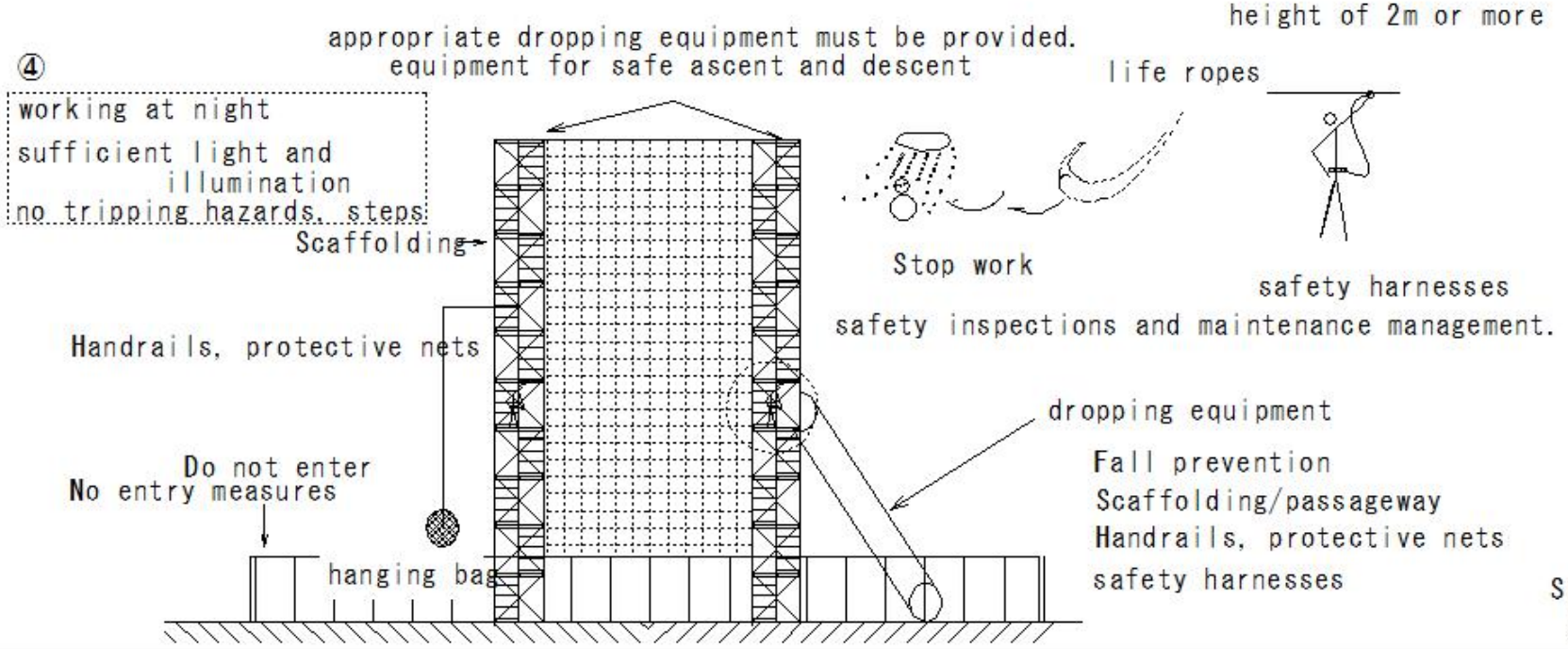
(S218)Safety management

6. Safety management

6.2. Safety management plan

6.2.3. Fall prevention measures

④ In case of working at night, ensure that there is sufficient light and illumination, and maintain a state where there are no tripping hazards, steps, or punctures.



(S219)Safety management

(S219)Safety management

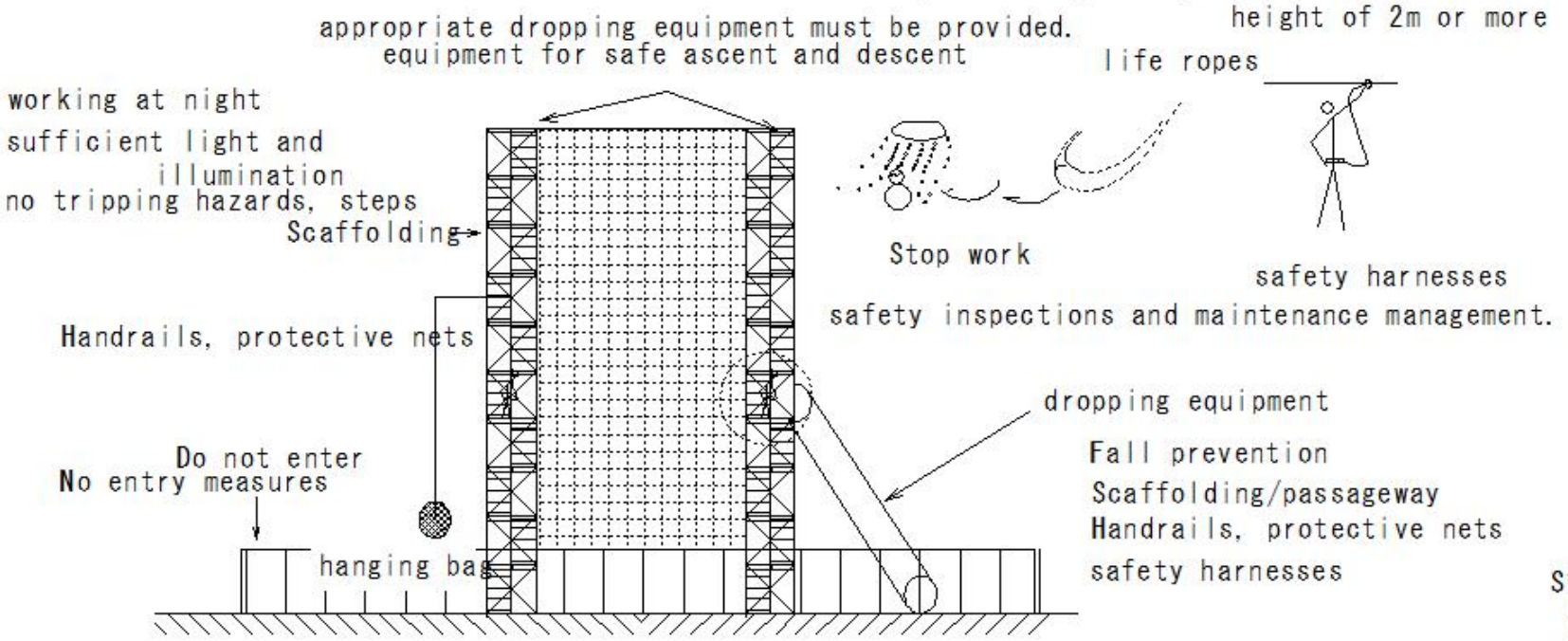
⑤ To prevent falls
handrails
protective nets
supervisor.

6. Safety management

6.2. Safety management plan

6.2.3. Fall prevention measures

⑤ To prevent falls from work floors and openings, use handrails, protective nets, and safety harnesses. When removing fences, prohibit workers from entering and assign a supervisor.



S153
S75

(S220)Safety management

(S220)Safety management

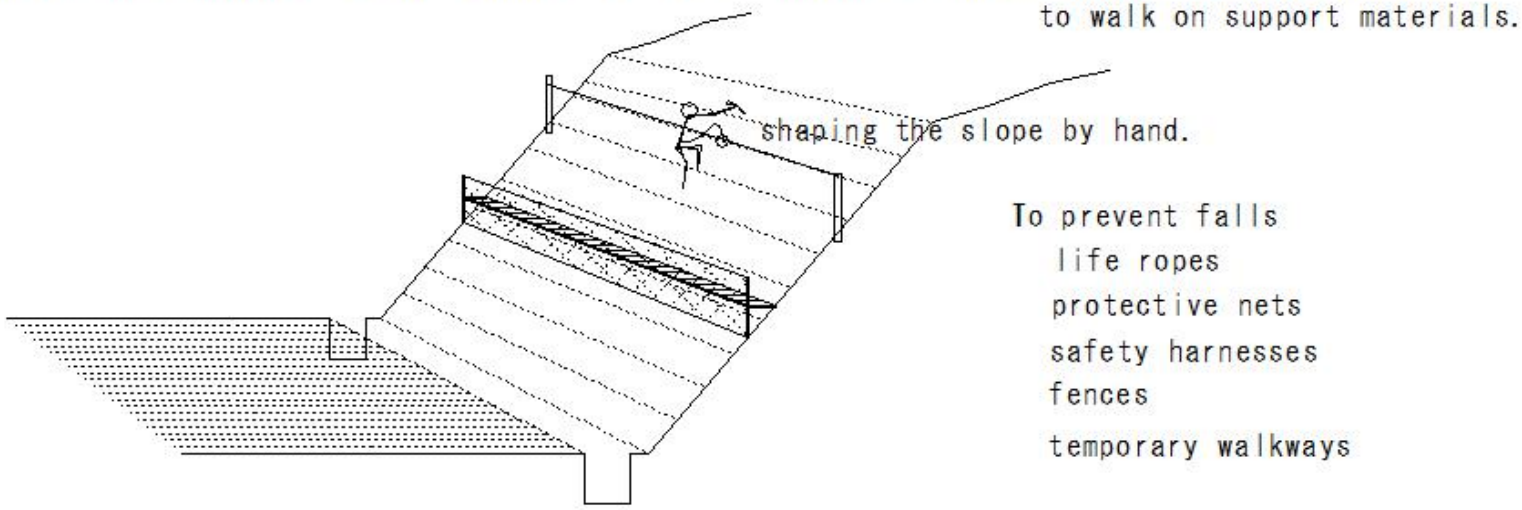
6. Safety management

6.2. Safety management plan

6.2.3. Fall prevention measures

⑥ As a fall prevention measure during excavation work, install protective nets and use safety harnesses when shaping the slope by hand.

Fall prevention measures: Install fences, set up temporary walkways, and do not allow workers to walk on support materials.



(S221) Prevent falling objects

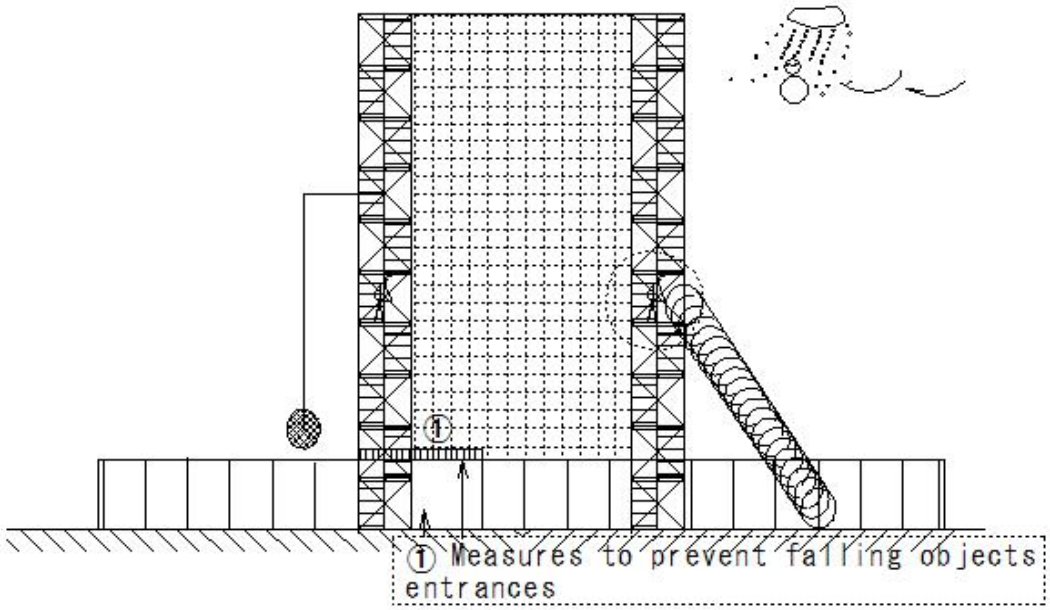
(S221) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

① Measures to prevent falling objects shall be taken at the top of external scaffolding and entrances/exits of structures, and safe passageways shall be designated.



(S222) Prevent falling objects

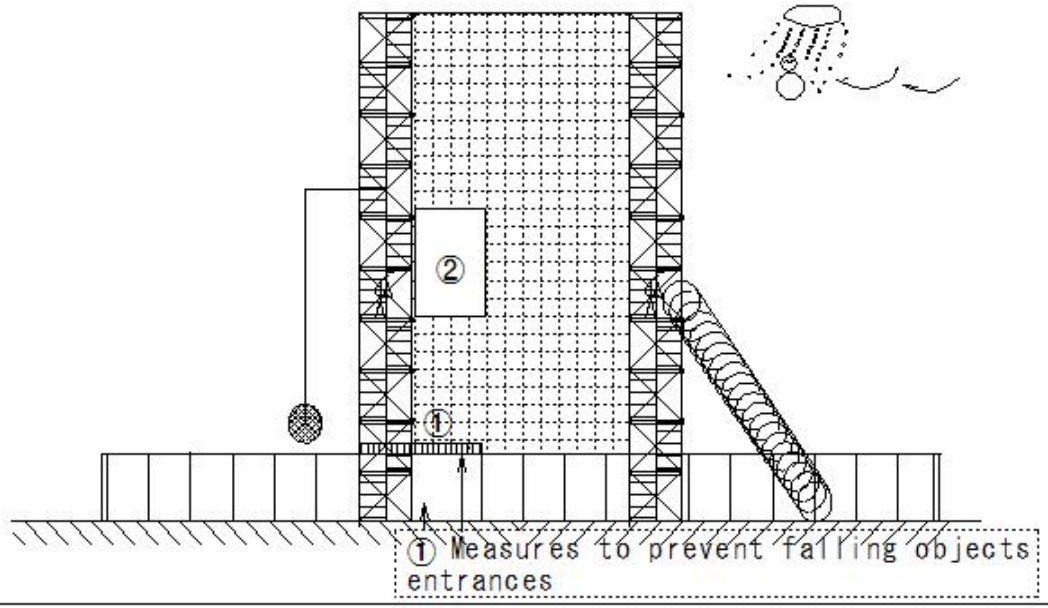
(S222) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

② In case of protective nets/sheets are removed, measures to prohibit entry shall be taken and promptly restored.



(S223) Prevent falling objects

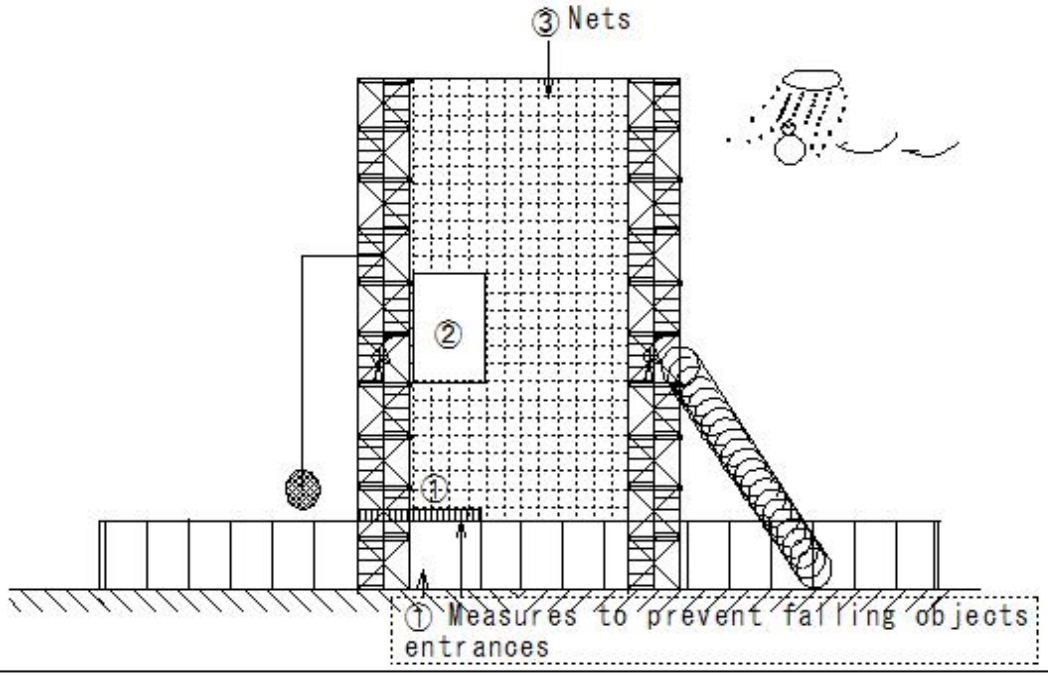
(S223) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

③ Nets shall be used according to purpose, and damaged or disarrayed ones shall not be used.



(S224) Prevent falling objects

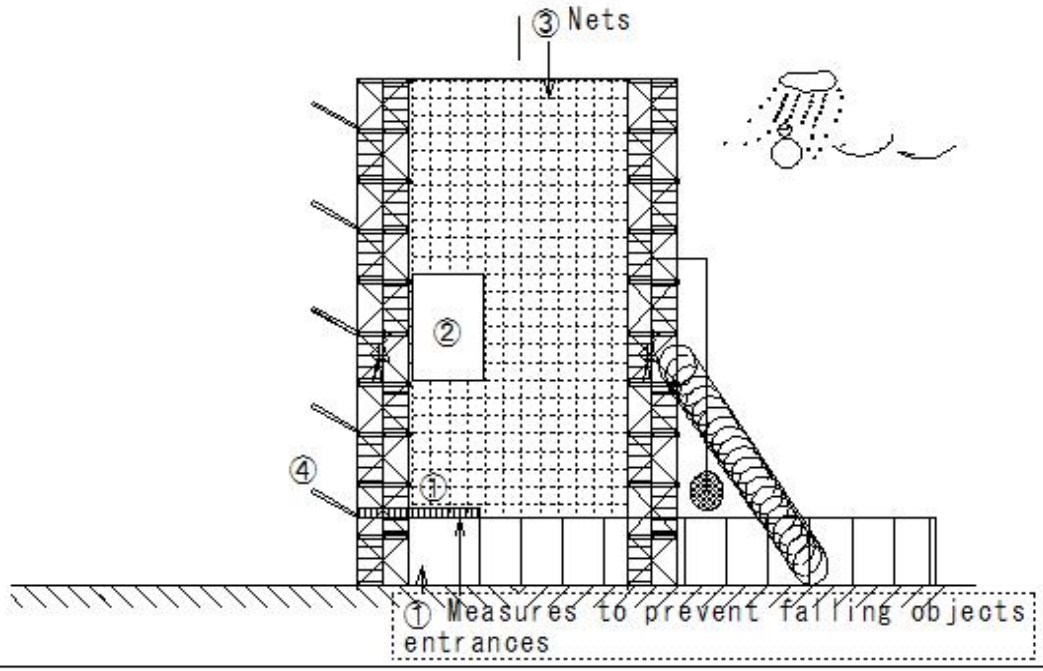
(S224) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

④ In case of close to roads or residential areas, measures to prevent falling objects shall be taken at the site.



(S225) Prevent falling objects

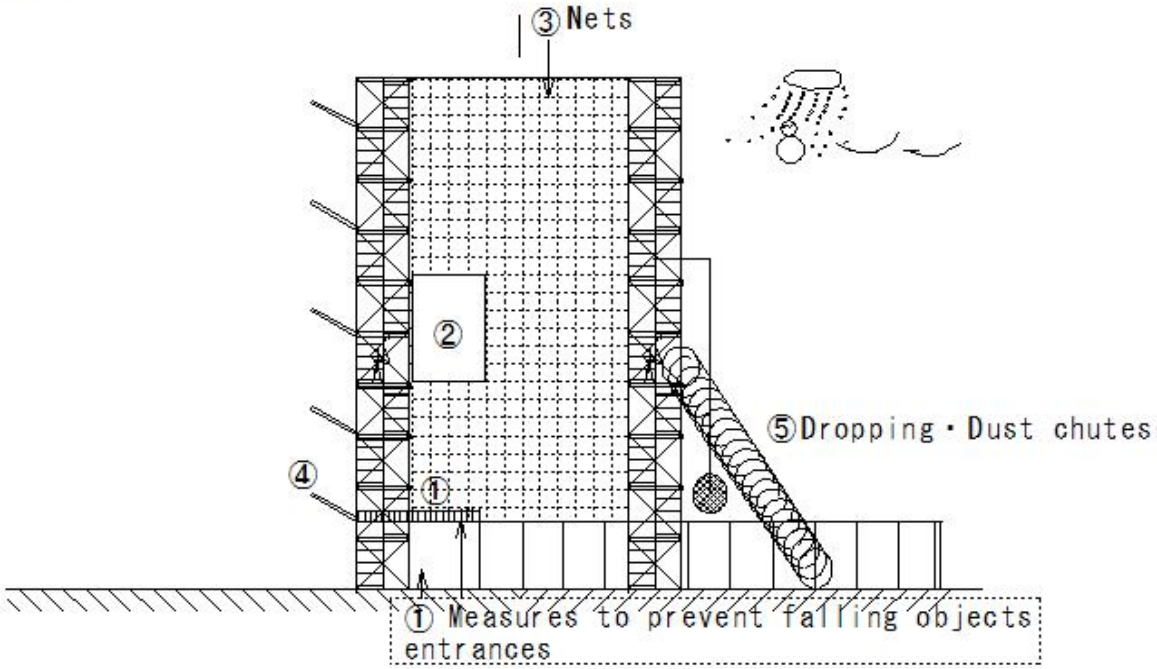
(S225) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

⑤ In case of installing fall equipment, installation shall be made at heights of 3m or more, measures to prohibit entry shall be taken, and chutes for dropping objects and dust chutes shall be provided.



(S226) Prevent falling objects

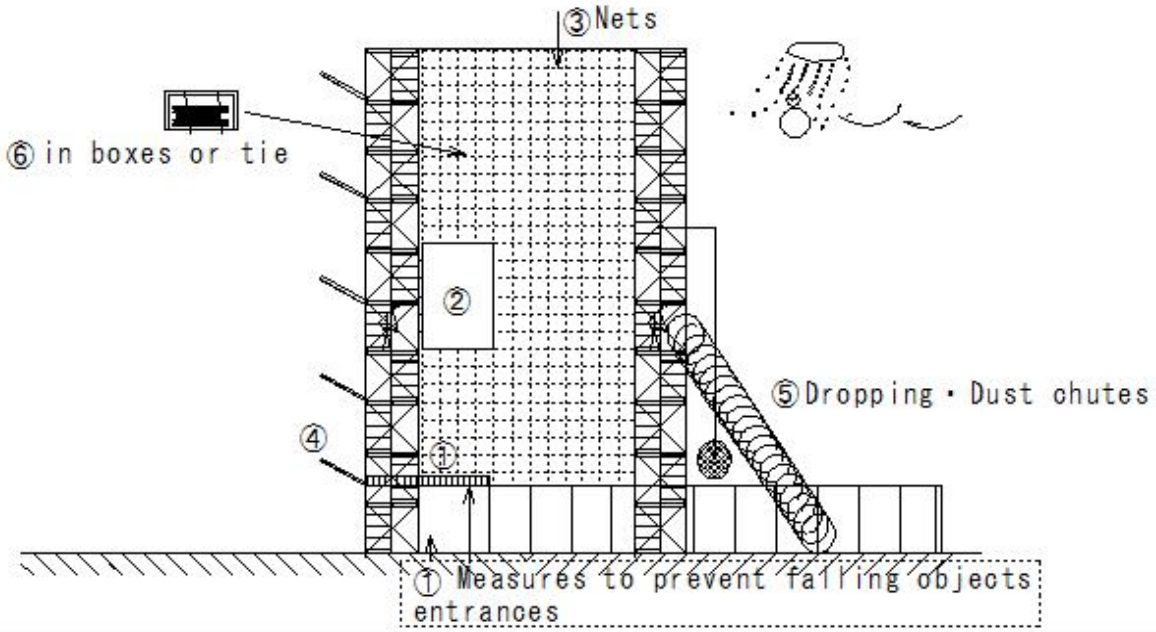
(S226) Prevent falling objects

6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

⑥ In case of accumulating materials for high-altitude work, do not accumulate within 1m of work floors, openings, or shoulders, and when temporarily storing scattered objects, store them in boxes or tie them down tightly, and tie off plywood or other items that are easily blown away by the wind with ropes, etc.



(S227) Prevent falling objects

(S227) Prevent falling objects

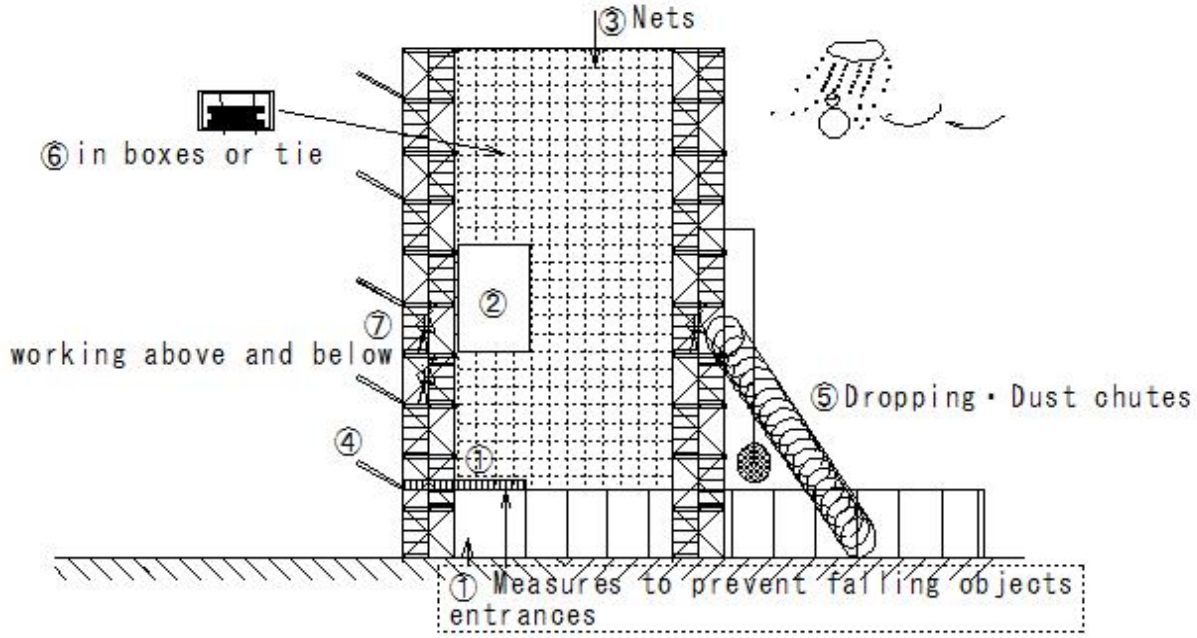
6. Safety Management

6.2. Safety Management Plan

6.2.4. Measures to prevent falling objects

⑦ As a means of communication and coordination when working above and below, thoroughly devise a process and avoid working above and below.

・Measures to prevent falling objects shall be taken



(S228) Mobile crane

(S228) Mobile crane

6. Safety management

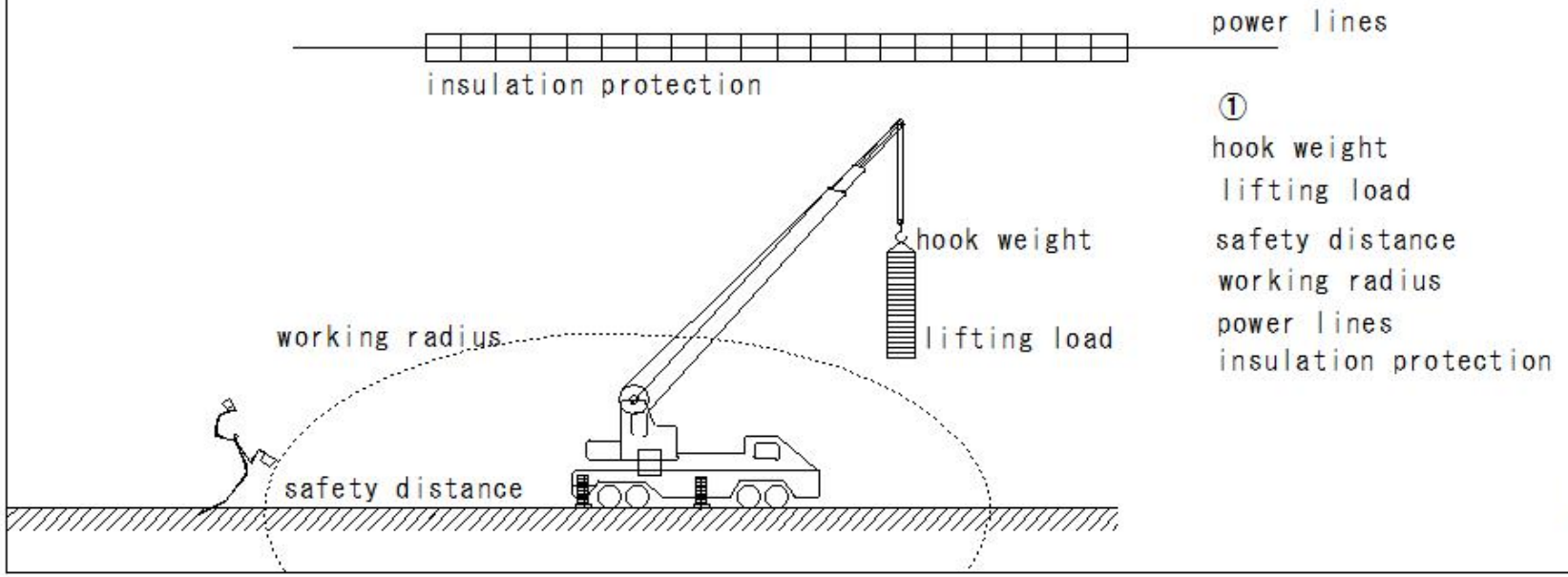
6.2. Safety management plan

6.2.5. Safety measures for mobile crane work

①In case of planning and selecting a mobile crane, check the hook weight, lifting load, and working radius

・Take insulation protection measures near power lines,

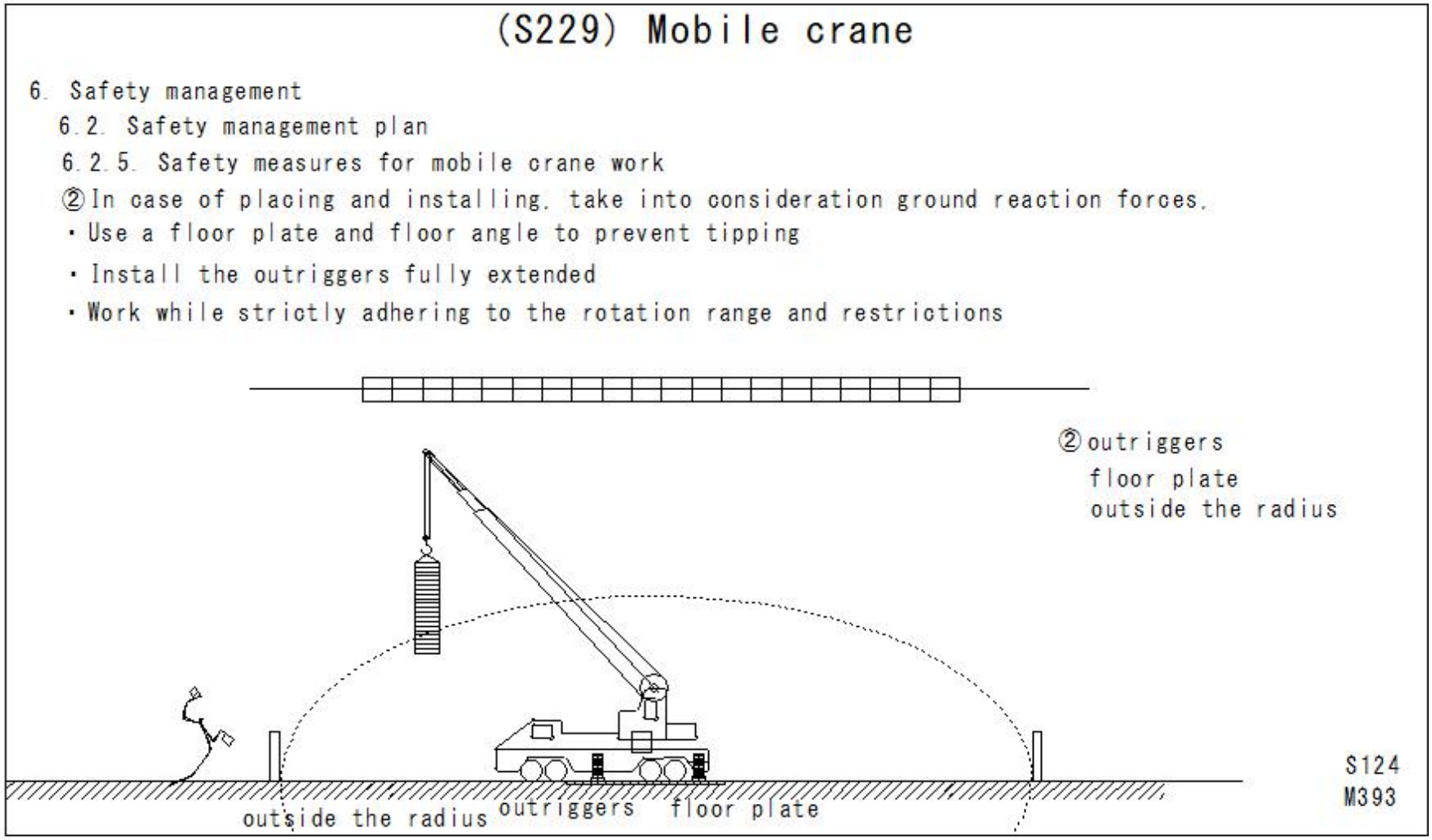
・Plan to work with a designated safety distance



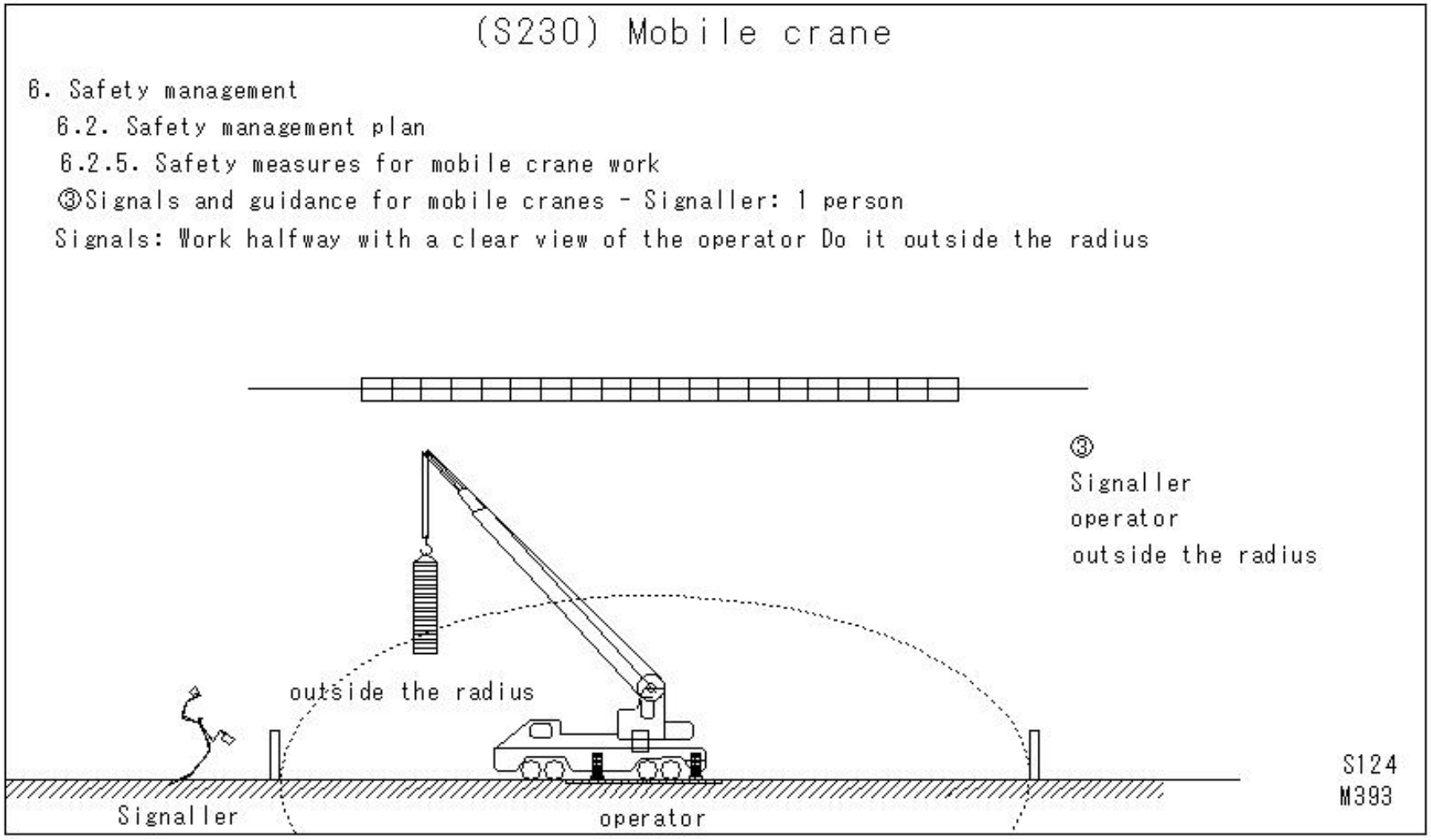
①
hook weight
lifting load
safety distance
working radius
power lines
insulation protection

S124
M393

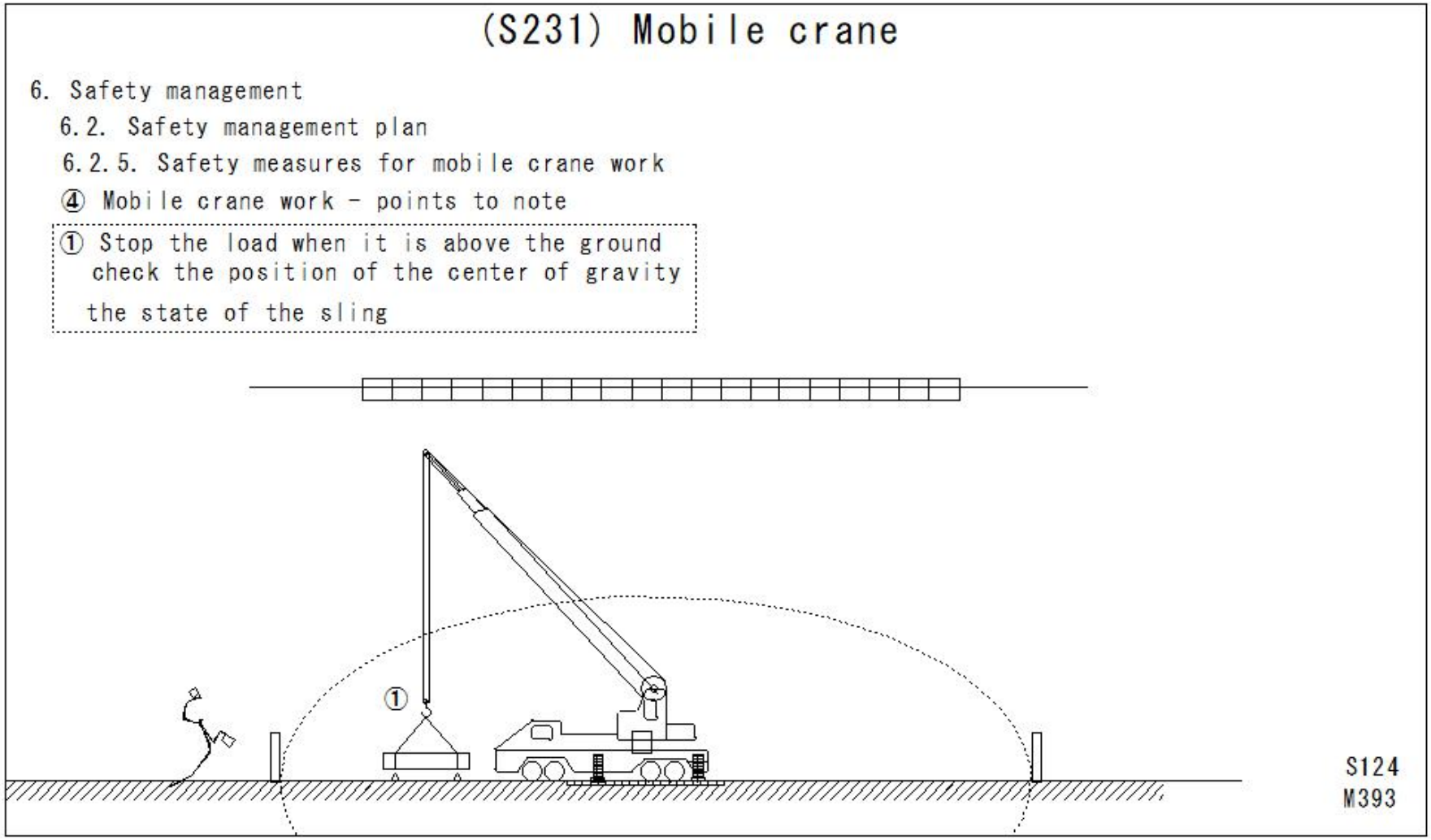
(S229) Mobile crane



(S230) Mobile crane



(S231) Mobile crane



(S232) Mobile crane

(S232) Mobile crane

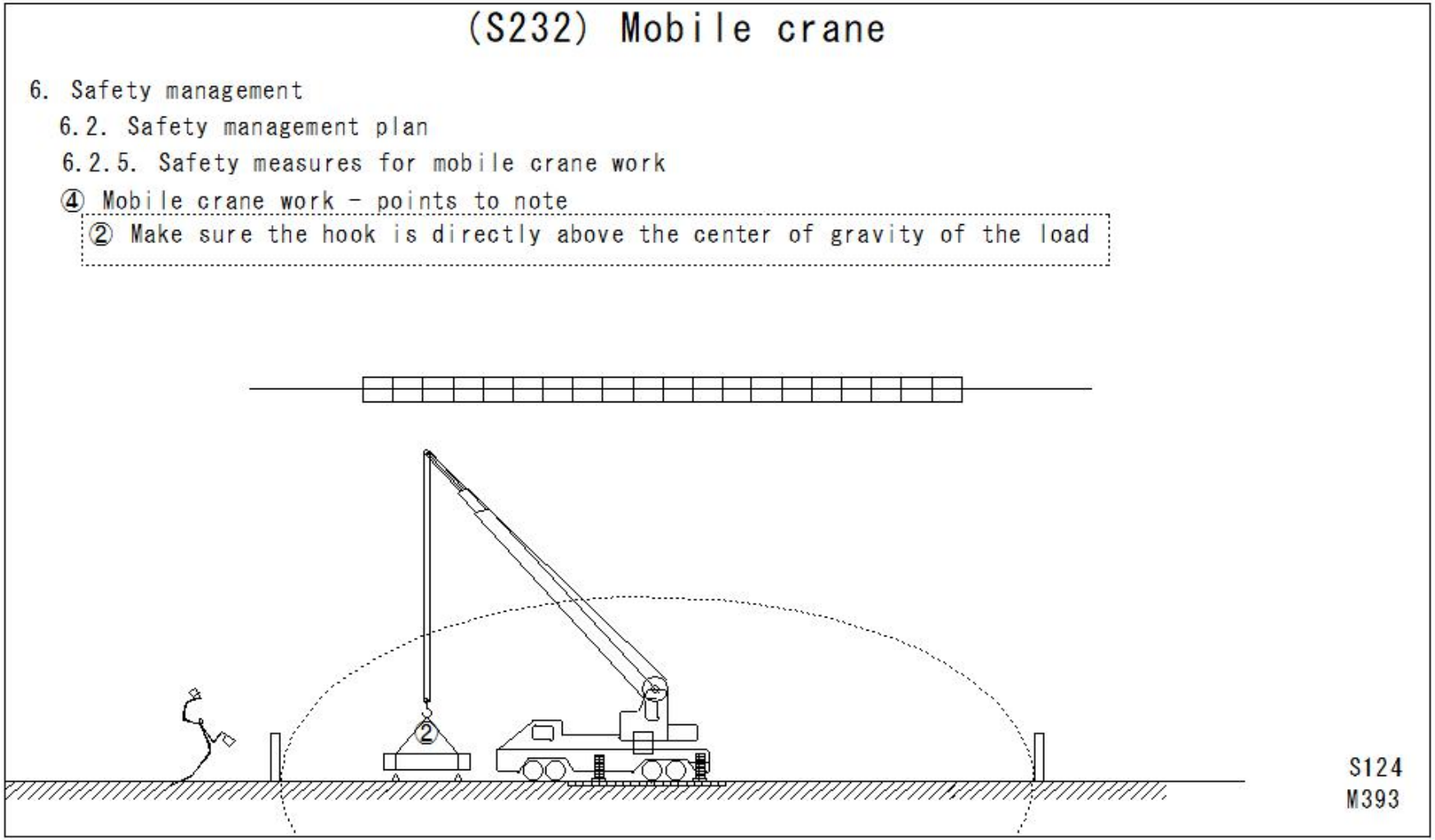
6. Safety management

6.2. Safety management plan

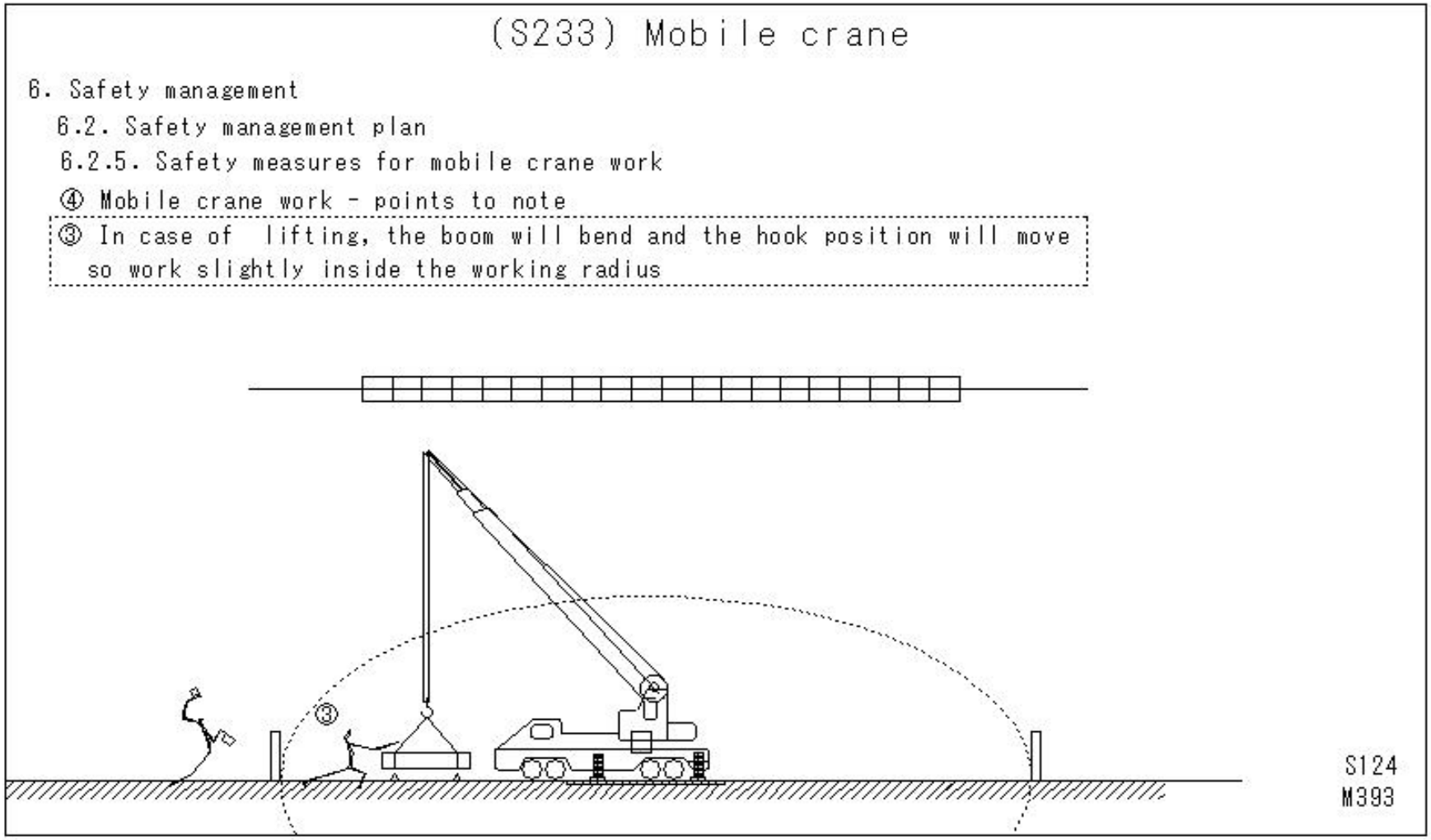
6.2.5. Safety measures for mobile crane work

④ Mobile crane work - points to note

② Make sure the hook is directly above the center of gravity of the load



(S233) Mobile crane



(S234) Mobile crane

(S234) Mobile crane

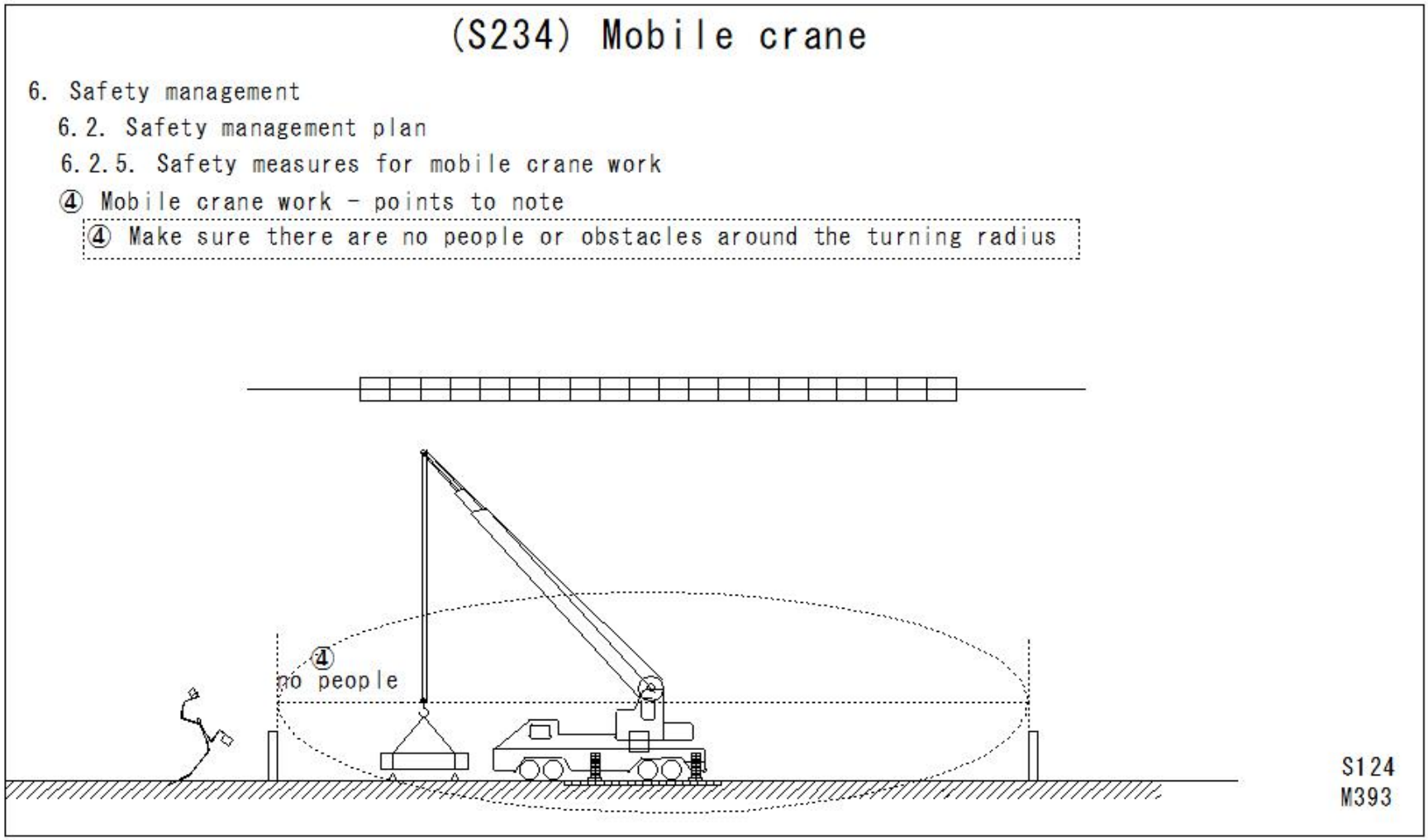
6. Safety management

6.2. Safety management plan

6.2.5. Safety measures for mobile crane work

④ Mobile crane work - points to note

④ Make sure there are no people or obstacles around the turning radius



(S235) Mobile crane

(S235) Mobile crane

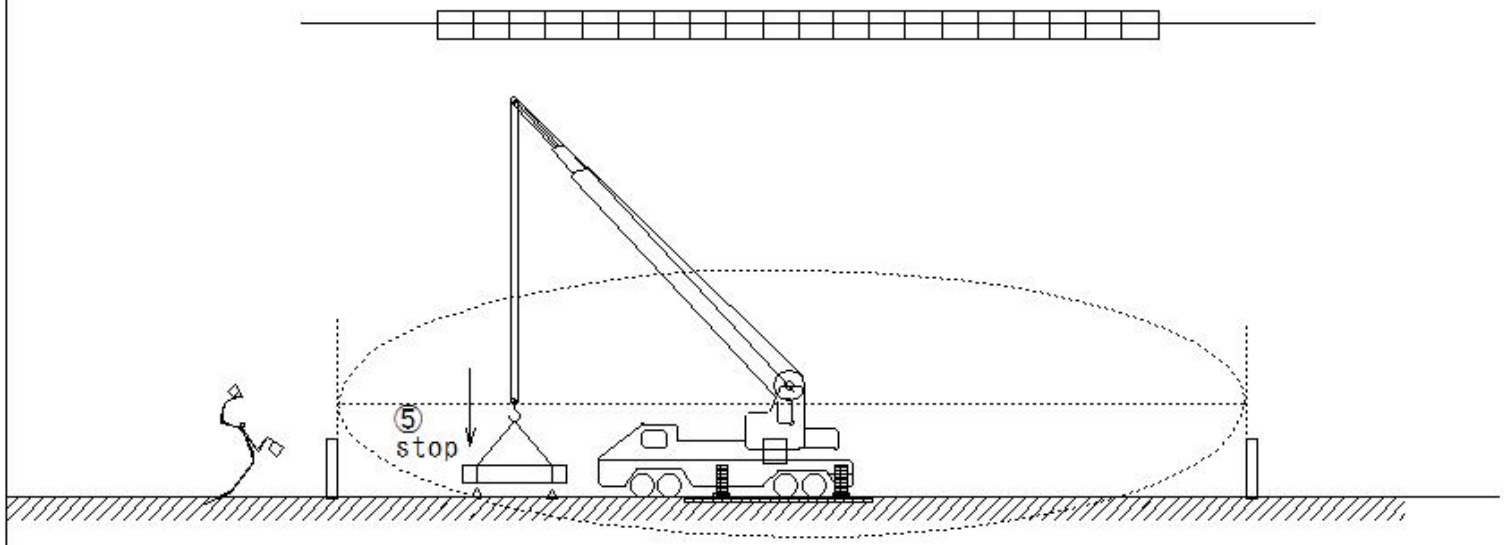
6. Safety management

6.2. Safety management plan

6.2.5. Safety measures for mobile crane work

④ Mobile crane work - points to note

⑤ In case of lowering the load, do not land all at once, stop just before it hits the floor and lower it quietly



S124
M393

(S236) Mobile crane

(S236) Mobile crane

6. Safety management

6.2. Safety management plan

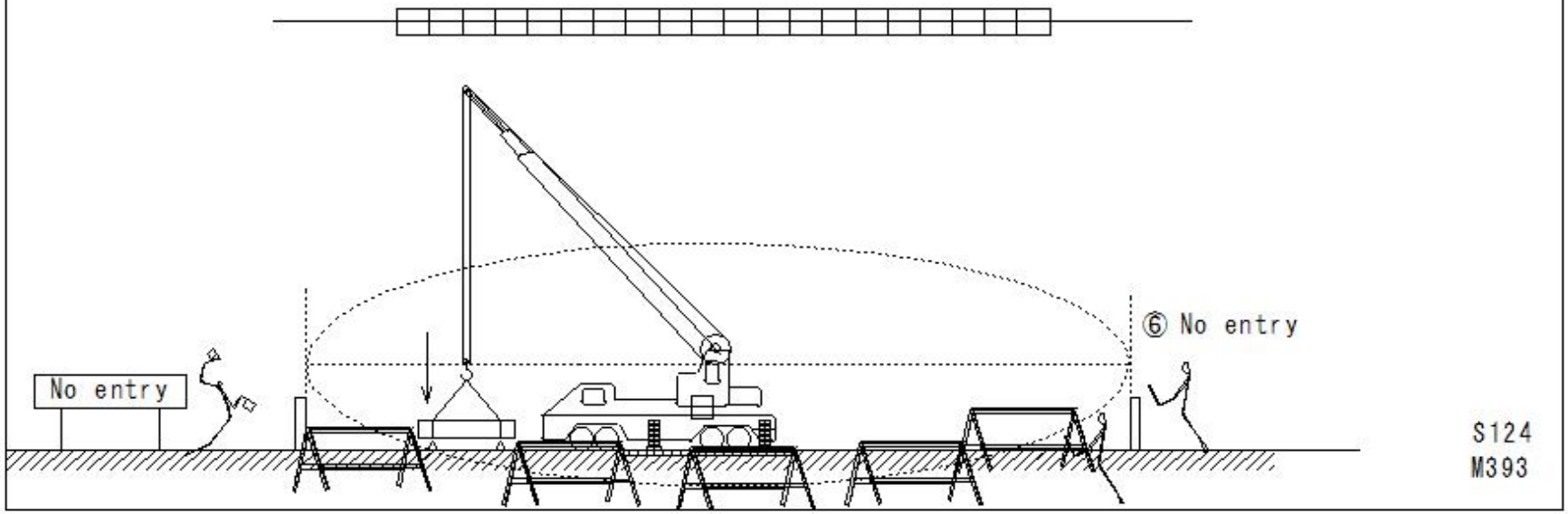
6.2.5. Safety measures for mobile crane work

④ Mobile crane work - points to note

⑥ No entry measures

Do not allow people to enter the working radius while working with a mobile crane

Inform workers with signs, etc.



(S237) Public accidents

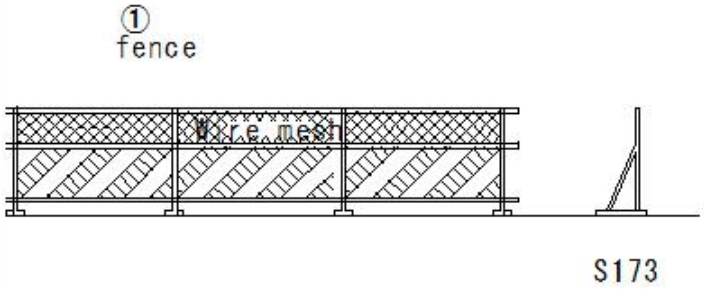
(S237) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)

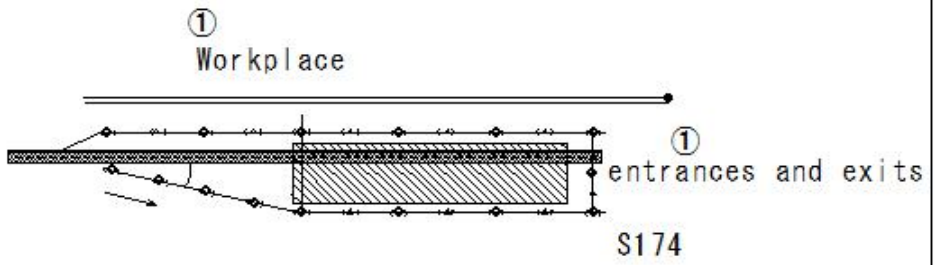
In case of a contractor carries out construction work in an urban area

Minimum technical matters

①Workplace: Workplace classification, fence standards, entrances and exits



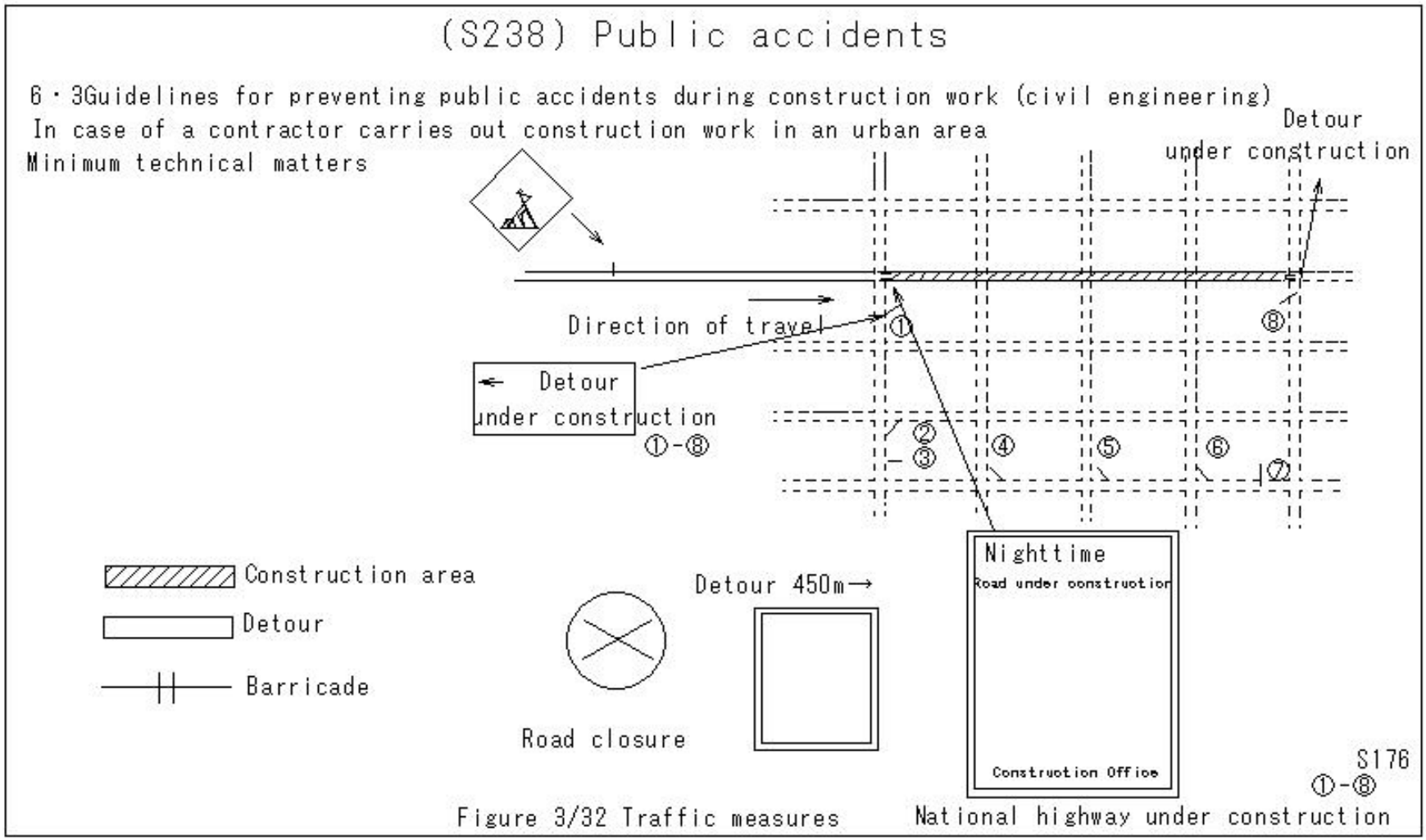
S173



S174

S159

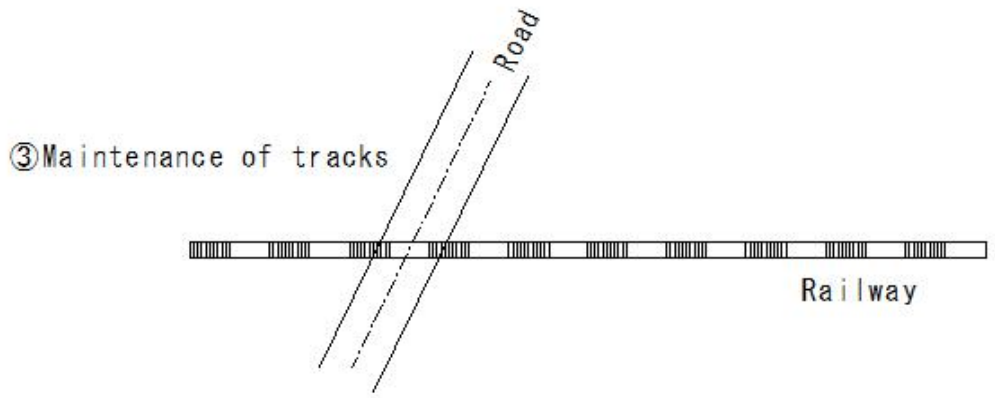
(S238) Public accidents



(S239) Public accidents

(S239) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
③Maintenance of tracks, etc.: Prior consultation with track managers, insulation work

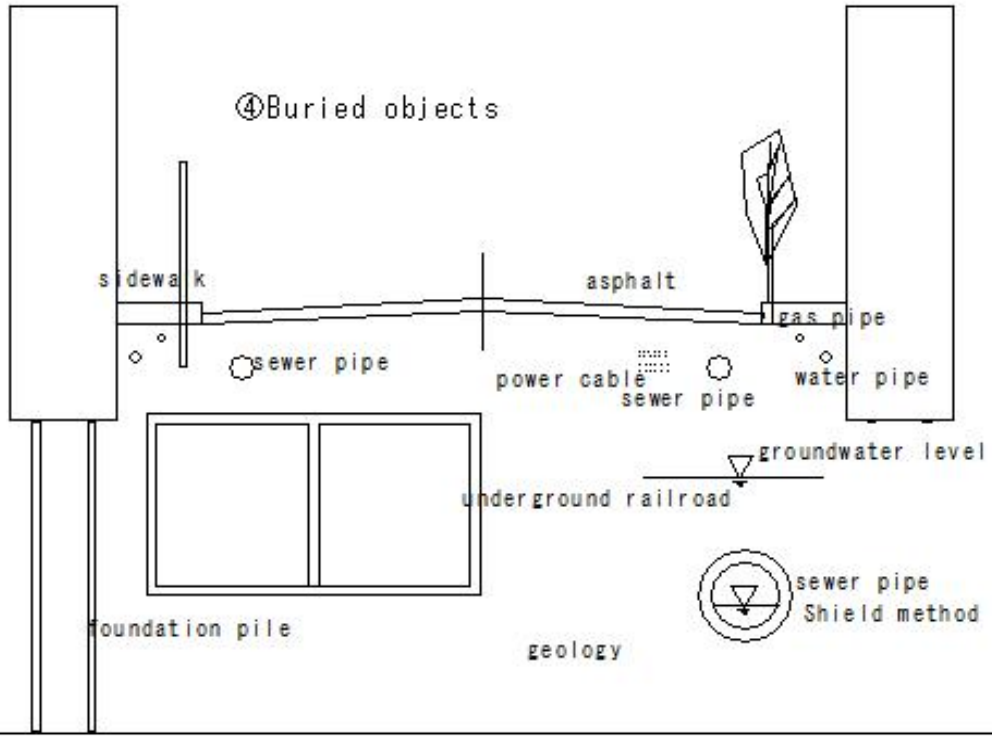


S161
H510

(S240) Public accidents

(S240) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
④Buried objects: Safety treatment, attendance, confirmation

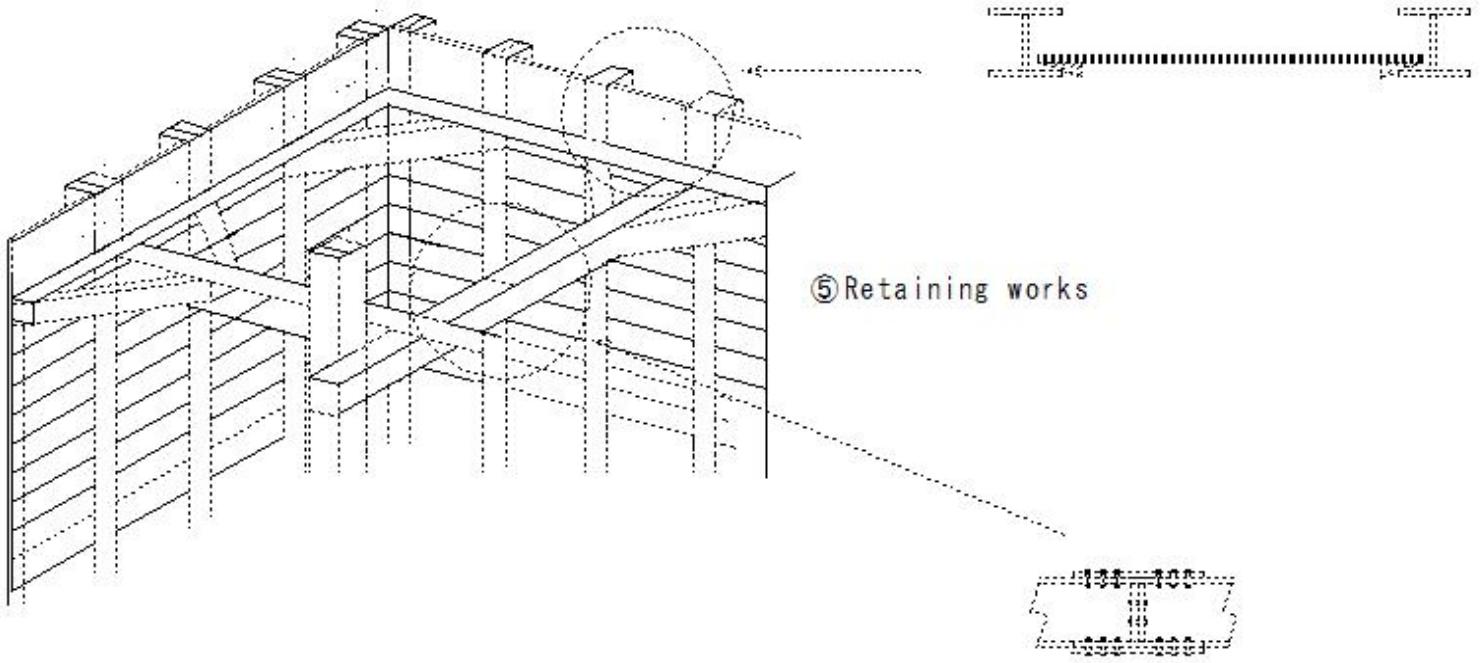


F128
S162

(S241) Public accidents

(S241) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
⑤Retaining works: Soil survey, piles, beams



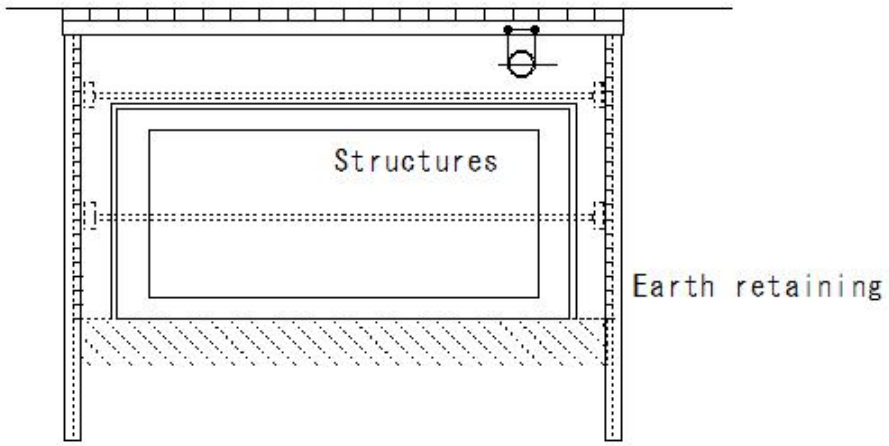
S163
F161

(S242) Public accidents

(S242) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
⑥Covering works: Covering plates, surface of mounting parts

⑥Covering works



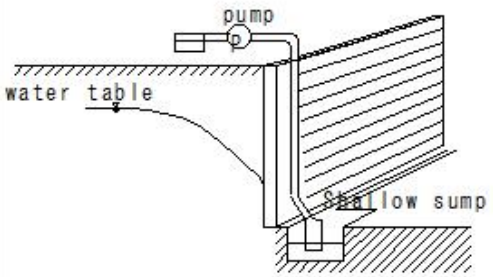
F143
S164

(S243) Public accidents

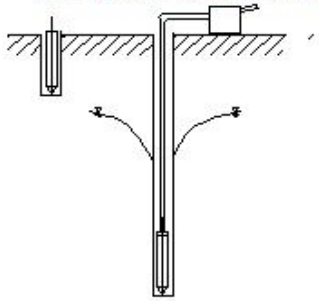
(S243) Public accidents

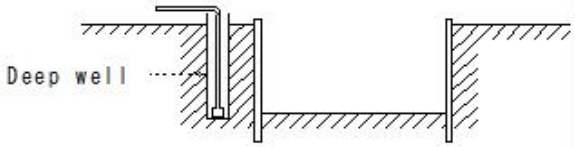
6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
⑦Auxiliary methods: Chemical injection, groundwater lowering method

⑦Auxiliary methods

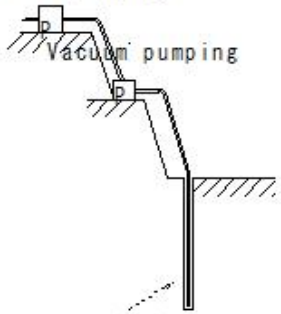


Well point construction method

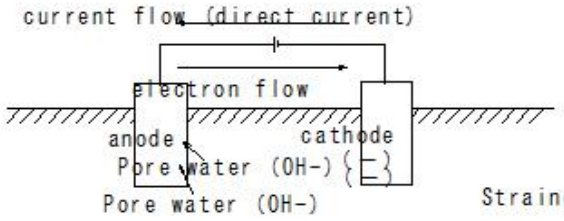




Vacuum pumping



Electropenetration method



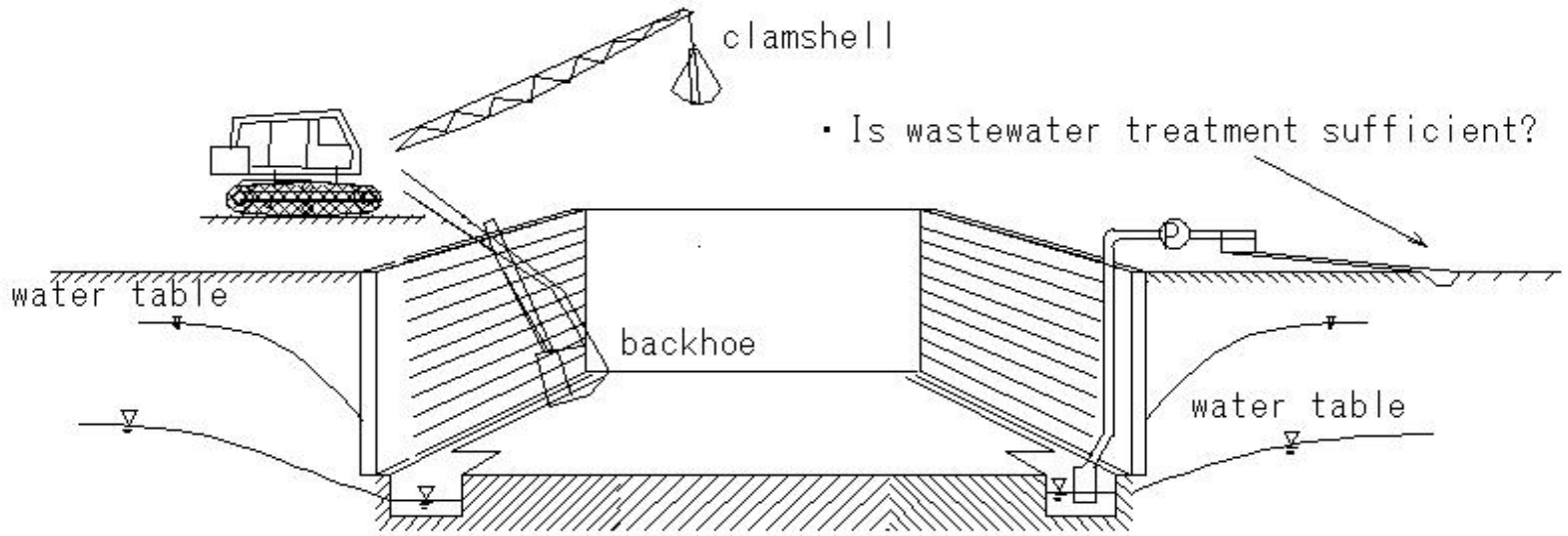
Strainer (filtering wire mesh) (steel pipe)

F92
S165

(S244) Public accidents

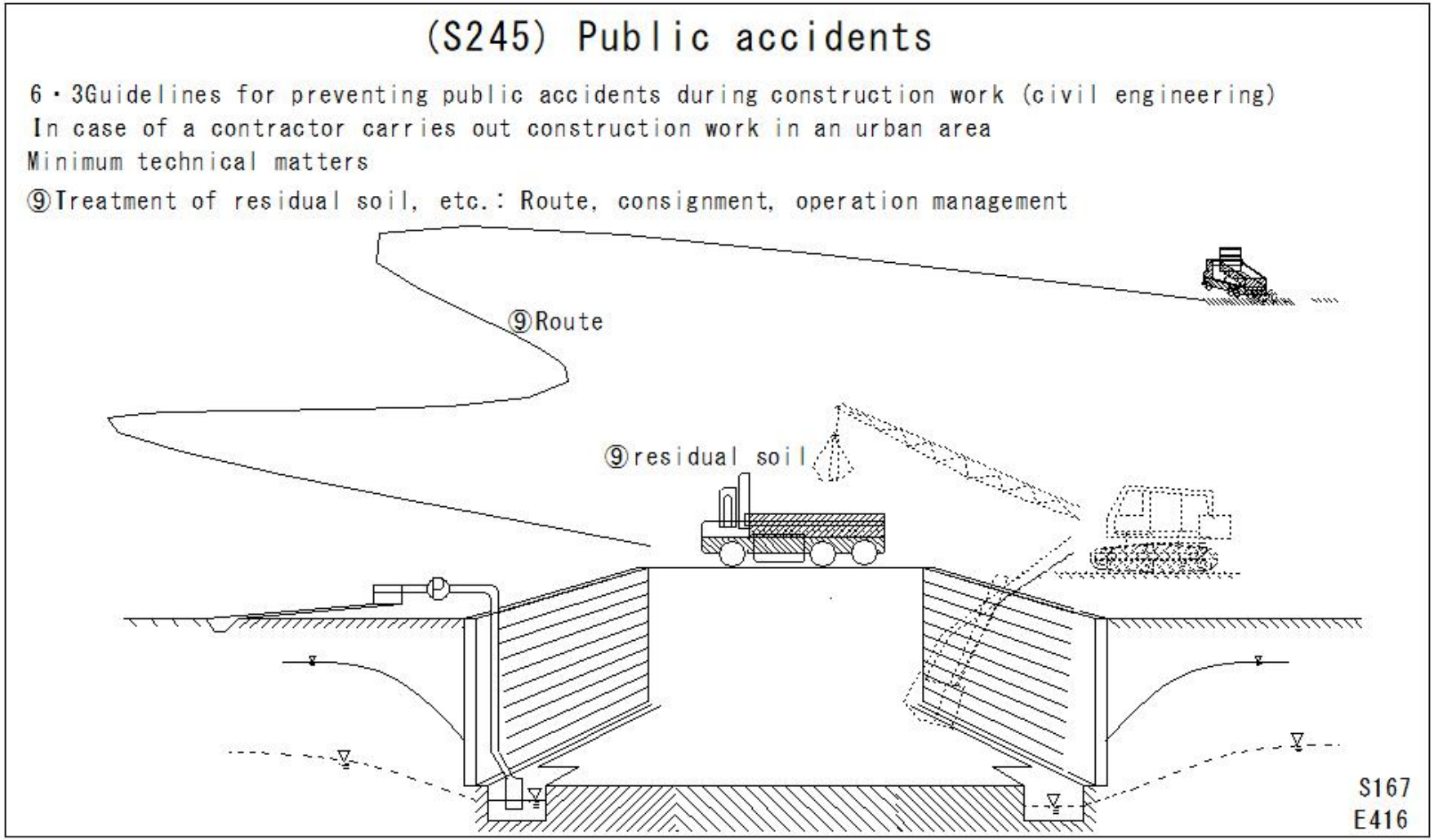
(S244) Public accidents

6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
⑧Treatment of spring water, etc.: Spring water and leaks, drainage treatment

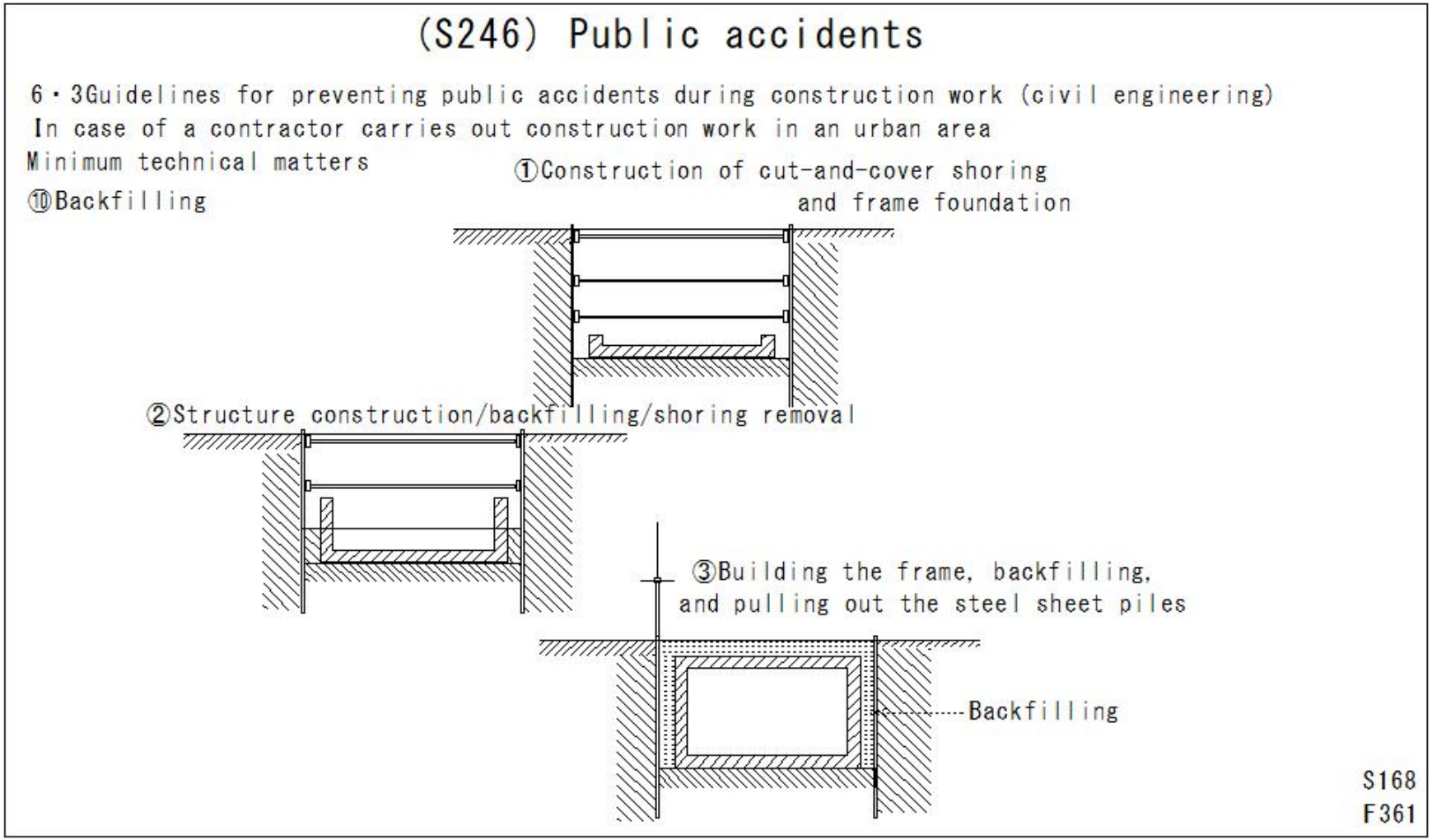


E416-E419
S166

(S245) Public accidents



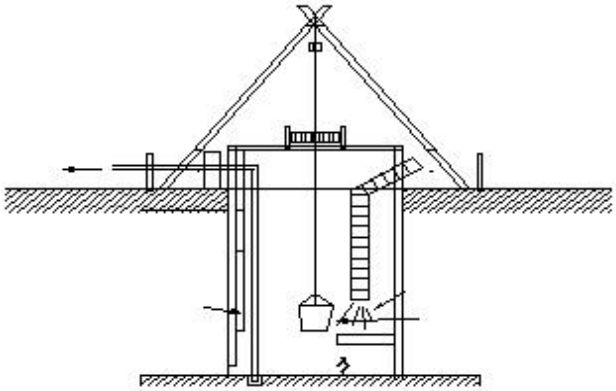
(S246) Public accidents



(S247) Public accidents

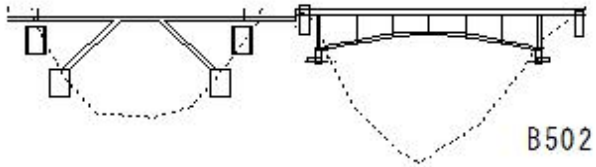
6・3Guidelines for preventing public accidents during construction work (civil engineering)
In case of a contractor carries out construction work in an urban area
Minimum technical matters
⑪Others: Machinery, electricity, shields, tunneling work, work at height, formwork support, prevention of fire and oxygen deficiency

⑪oxygen deficiency



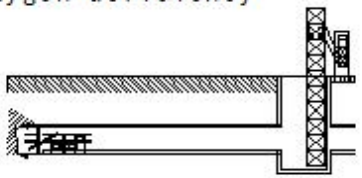
F43
S36

⑪work at height



B502

⑪oxygen deficiency



C1051
M420