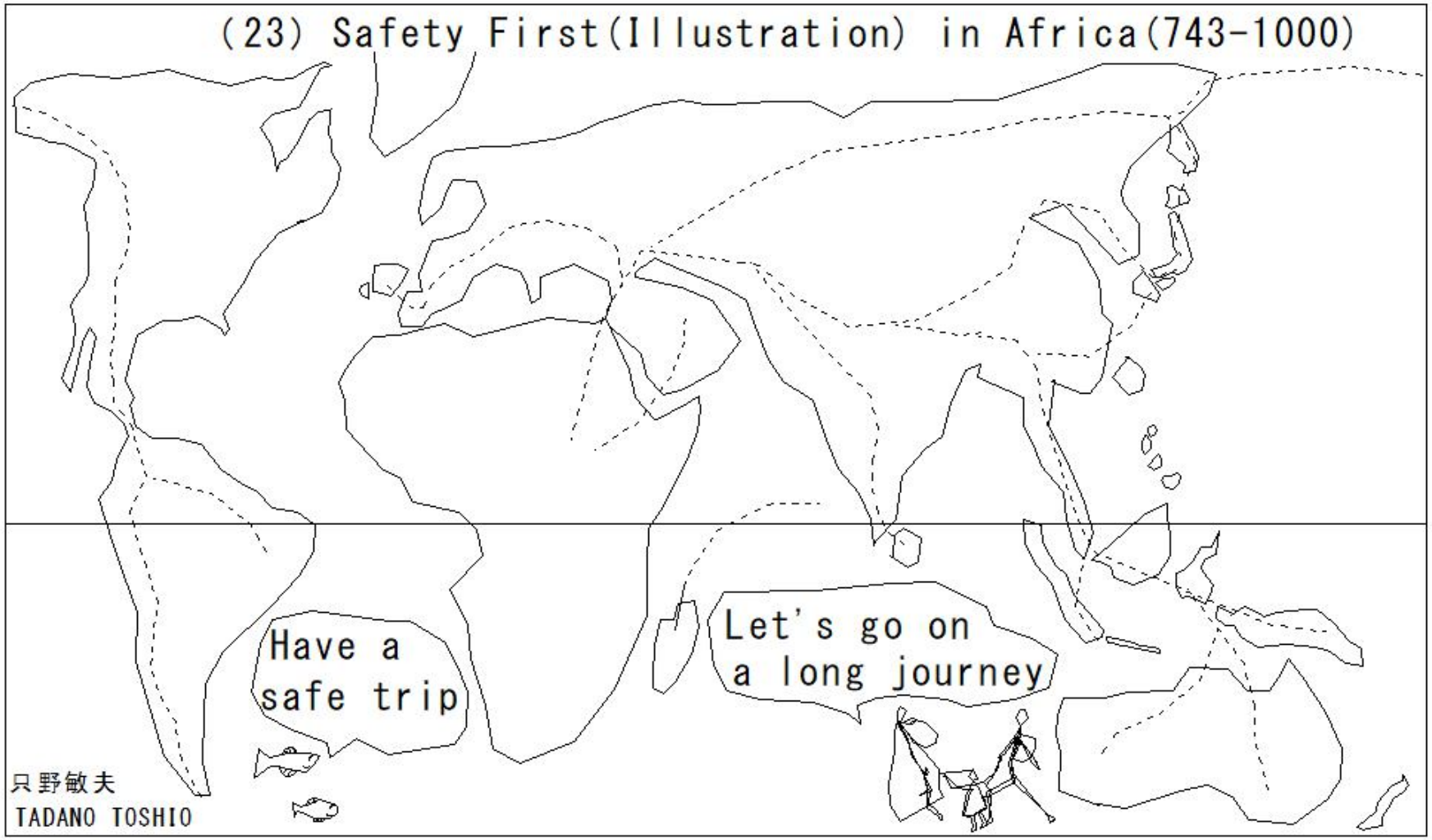
(23)Safety First(Illustration) in Africa(743-1000)



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	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

(S743) Safe passages	Safe passages
(S744) Safe passages	Safe passages
(S745) Safe passages	Safe passages
(S746) Safe passages	Safe passages
(S747) Safe passages	Safe passages
(S748) Safe passages	Safe passages
(S749) Safe passages	Safe passages
(S750) Safe passages	Safe passages
(S751) Safe passages	Safe passages
(S752) Safe passages	Safe passages
(S753) Safe passages	Safe passages
(S754) Safe passages	Safe passages
(S755) Safe passages	Safe passages
(S756) Safe passages	Safe passages
(S757) Ladder	Ladder
(S758) Ladder	Ladder
(S759) Ladder	Ladder
(S760) Ladder	Ladder
(S761) Ladder	Ladder
(S762) Ladder	Ladder
(S763) Ladder	Ladder
(S764) Ladder	Ladder
(S765) Ladder	Ladder
(S766)Erected passageways	Erected passageways
(S767)Erected passageways	Erected passageways
(S768)Erected passageways	Erected passageways
(S769)Scaffolding	Scaffolding
(S770)Scaffolding	Scaffolding
(S771)Scaffolding	Scaffolding
(S772)Scaffolding	Scaffolding
(S773)Scaffolding	Scaffolding
(S774)Scaffolding	Scaffolding
(S775)Scaffolding	Scaffolding
(S776)Scaffolding	Scaffolding

(S777)Scaffolding	Scaffolding
(S778)Scaffolding	Scaffolding
(S779)Scaffolding	Scaffolding
(S780)Scaffolding	Scaffolding
(S781)Scaffolding	Scaffolding
(S782)Scaffolding	Scaffolding
(S783)Scaffolding	Scaffolding
(S784)Scaffolding	Scaffolding
(S785)Scaffolding	Scaffolding
(S786)Scaffolding	Scaffolding
(S787)Scaffolding	Scaffolding
(S788)Scaffolding	Scaffolding
(S789)Scaffolding	Scaffolding
(S790)Scaffolding	Scaffolding
(S791)Scaffolding	Scaffolding
(S792)Scaffolding	Scaffolding
(S793)Scaffolding	Scaffolding
(S794)Scaffolding	Scaffolding
(S795)Scaffolding	Scaffolding
(S796)Scaffolding	Scaffolding
(S797)Scaffolding	Scaffolding
(S798)Scaffolding	Scaffolding
(S799)Scaffolding	Scaffolding
(S800)Scaffolding	Scaffolding
(S801)Scaffolding	Scaffolding
(S802)Scaffolding	Scaffolding
(S803)Work platform	Work platform
(S804)Work platform	Work platform
(S805)Work platform	Work platform
(S806)Work platform	Work platform
(S807)Work platform	Work platform
(S808)Work platform	Work platform
(S809)Work platform	Work platform
(S810)Work platform	Work platform

(S811)Work platform	Work platform
(S812)Work platform	Work platform
(S813)Work platform	Work platform
(S814)Work platform	Work platform
(S815)Work platform	Work platform
(S816)Work platform	Work platform
(S817) Stress check	Stress check
(S818) Stress check	Stress check
(S819) Stress check	Stress check
(S820) Stress check	Stress check
(S821) Stress check	Stress check
(S822) Stress check	Stress check
(S823) Stress check	Stress check
(S824) Falls	Falls
(S825) Falls	Falls
(S826) Falls	Falls
(S827) Falls	Falls
(S828) Falls	Falls
(S829) Falls	Falls
(S830) Falls	Falls
(S831) Falls	Falls
(S832) Falls	Falls
(S833) Falls	Falls
(S834) Falls	Falls
(S835) Falls	Falls
(S836) Falls	Falls
(S837) Falls	Falls
(S838) Falls	Falls
(S839) Falls	Falls
(S840) Falls	Falls
(S841) Falls	Falls
(S842) Falls	Falls
(S843) Falls	Falls
(S844) Falls	Falls

(S845) Safety Net	Safety Net
(S846) Safety Net	Safety Net
(S847) Safety Net	Safety Net
(S848) Safety Net	Safety Net
(S849) Safety Net	Safety Net
(S850) Safety Net	Safety Net
(S851) Safety Net	Safety Net
(S852) Safety Net	Safety Net
(S853) Safety Net	Safety Net
(S854) Safety Net	Safety Net
(S855) Safety Net	Safety Net
(S856) Safety Net	Safety Net
(S857) Safety Net	Safety Net
(S858) Safety Net	Safety Net
(S859) Safety Net	Safety Net
(S860) Safety Net	Safety Net
(S861) Flying objects and Collapses	Flying objects and Collapses
(S862) Flying objects and Collapses	Flying objects and Collapses
(S863) Flying objects and Collapses	Flying objects and Collapses
(S864) Flying objects and Collapses	Flying objects and Collapses
(S865) Flying objects and Collapses	Flying objects and Collapses
(S866) Flying objects and Collapses	Flying objects and Collapses
(S867) Flying objects and Collapses	Flying objects and Collapses
(S868) Flying objects and Collapses	Flying objects and Collapses
(S869) Rope work	Rope work
(S870) Rope work	Rope work
(S871) Rope work	Rope work
(S872) Rope work	Rope work
(S873) Rope work	Rope work
(S874) Rope work	Rope work
(S875) Rope work	Rope work
(S876) Rope work	Rope work
(S877) Rope work	Rope work
(S878) Rope work	Rope work

(S879)	Formwork Support	Formwork Support
(S880)	Formwork Support	Formwork Support
(S881)	Formwork Support	Formwork Support
(S882)	Formwork Support	Formwork Support
(S883)	Formwork Support	Formwork Support
(S884)	Formwork Support	Formwork Support
(S885)	Formwork Support	Formwork Support
(S886)	Formwork Support	Formwork Support
(S887)	Formwork Support	Formwork Support
(S888)	Formwork Support	Formwork Support
(S889)	Formwork Support	Formwork Support
(S890)	Formwork Support	Formwork Support
(S891)	Formwork Support	Formwork Support
(S892)	Formwork Support	Formwork Support
(S893)	Formwork Support	Formwork Support
(S894)	Formwork Support	Formwork Support
(S895)	Formwork Support	Formwork Support
(S896)	Formwork Support	Formwork Support
(S897)	Formwork Support	Formwork Support
(S898)	Formwork Support	Formwork Support
(S899)	Formwork Support	Formwork Support
(S900)	Formwork Support	Formwork Support
(S901)	Formwork Support	Formwork Support
(S902)	Formwork Support	Formwork Support
(S903)	Formwork Support	Formwork Support
(S904)	Formwork Support	Formwork Support
(S905)	Formwork Support	Formwork Support
(S906)	Formwork Support	Formwork Support
(S907)	Formwork Support	Formwork Support
(S908)	Formwork Support	Formwork Support
(S909)	Formwork Support	Formwork Support
(S910)	Formwork Support	Formwork Support
(S911)	Formwork Support	Formwork Support
(S912)	Formwork Support	Formwork Support

(S913) Open Excavation	Open Excavation
(S914) Open Excavation	Open Excavation
(S915) Open Excavation	Open Excavation
(S916) Open Excavation	Open Excavation
(S917) Open Excavation	Open Excavation
(S918) Open Excavation	Open Excavation
(S919) Open Excavation	Open Excavation
(S920) Open Excavation	Open Excavation
(S921) Open Excavation	Open Excavation
(S922) Open Excavation	Open Excavation
(S923) Open Excavation	Open Excavation
(S924) Open Excavation	Open Excavation
(S925) Open Excavation	Open Excavation
(S926) Open Excavation	Open Excavation
(S927) Open Excavation	Open Excavation
(S928) Earth Retaining Supports	Earth Retaining Supports
(S929) Earth Retaining Supports	Earth Retaining Supports
(S930) Earth Retaining Supports	Earth Retaining Supports
(S931) Earth Retaining Supports	Earth Retaining Supports
(S932) Earth Retaining Supports	Earth Retaining Supports
(S933) Earth Retaining Supports	Earth Retaining Supports
(S934) Earth Retaining Supports	Earth Retaining Supports
(S935) Earth Retaining Supports	Earth Retaining Supports
(S936) Earth Retaining Supports	Earth Retaining Supports
(S937) Earth Retaining Supports	Earth Retaining Supports
(S938) Earth Retaining Supports	Earth Retaining Supports
(S939) Earth Retaining Supports	Earth Retaining Supports
(S940) Earth Retaining Supports	Earth Retaining Supports
(S941) Demolishing Concrete Structures	Demolishing Concrete Structures
(S942) Demolishing Concrete Structures	Demolishing Concrete Structures
(S943) Demolishing Concrete Structures	Demolishing Concrete Structures
(S944) Demolishing Concrete Structures	Demolishing Concrete Structures
(S945) Demolishing Concrete Structures	Demolishing Concrete Structures
(S946) Demolishing Concrete Structures	Demolishing Concrete Structures

(S947) Demolishing Concrete Structures	Demolishing Concrete Structures
(S948) Collapse of Exterior Walls	Collapse of Exterior Walls
(S949) Collapse of Exterior Walls	Collapse of Exterior Walls
(S950) Collapse of Exterior Walls	Collapse of Exterior Walls
(S951) Collapse of Exterior Walls	Collapse of Exterior Walls
(S952) Collapse of Exterior Walls	Collapse of Exterior Walls
(S953) Collapse of Exterior Walls	Collapse of Exterior Walls
(S954) Collapse of Exterior Walls	Collapse of Exterior Walls
(S955) Collapse of Exterior Walls	Collapse of Exterior Walls
(S956) Collapse of Exterior Walls	Collapse of Exterior Walls
(S957) Collapse of Exterior Walls	Collapse of Exterior Walls
(S958) Collapse of Exterior Walls	Collapse of Exterior Walls
(S959) Gas welding	Gas welding
(S960) Gas welding	Gas welding
(S961) Gas welding	Gas welding
(S962) Gas welding	Gas welding
(S963) Gas welding	Gas welding
(S964) Gas welding	Gas welding
(S965) Gas welding	Gas welding
(S966) Gas welding	Gas welding
(S967) Arc Welding	Arc Welding
(S968) Arc Welding	Arc Welding
(S969) Arc Welding	Arc Welding
(S970) Arc Welding	Arc Welding
(S971) Arc Welding	Arc Welding
(S972) Arc Welding	Arc Welding
(S973) Arc Welding	Arc Welding
(S974) Arc Welding	Arc Welding
(S975) Arc Welding	Arc Welding
(S976) Arc Welding	Arc Welding
(S977) Gas Pipelines	Gas Pipelines
(S978) Gas Pipelines	Gas Pipelines
(S979) Gas Pipelines	Gas Pipelines
(S980) Gas Pipelines	Gas Pipelines

(S981) Gas Pipelines	Gas Pipelines
(S982) Gas Pipelines	Gas Pipelines
(S983) Gas Pipelines	Gas Pipelines
(S984) Gas Pipelines	Gas Pipelines
(S985) Gas Pipelines	Gas Pipelines
(S986) Gas Pipelines	Gas Pipelines
(S987) Gas Pipelines	Gas Pipelines
(S988) Gas Pipelines	Gas Pipelines
(S989) Gas Pipelines	Gas Pipelines
(S990) Gas Pipelines	Gas Pipelines
(S991) Gas Pipelines	Gas Pipelines
(S992) Gas Pipelines	Gas Pipelines
(S993) Gas Pipelines	Gas Pipelines
(S994) Gas Pipelines	Gas Pipelines
(S995) Gas Pipelines	Gas Pipelines
(S996) Gas Pipelines	Gas Pipelines
(S997) Gas Pipelines	Gas Pipelines
(S998) Gas Pipelines	Gas Pipelines
(S999) Gas Pipelines	Gas Pipelines
(S1000) Gas Pipelines	Gas Pipelines

(S967) Arc Welding	Arc Welding
(S968) Arc Welding	Arc Welding
(S969) Arc Welding	Arc Welding
(S970) Arc Welding	Arc Welding
(S971) Arc Welding	Arc Welding
(S972) Arc Welding	Arc Welding
(S973) Arc Welding	Arc Welding
(S974) Arc Welding	Arc Welding
(S975) Arc Welding	Arc Welding
(S976) Arc Welding	Arc Welding
(S948) Collapse of Exterior Walls	Collapse of Exterior Walls
(S949) Collapse of Exterior Walls	Collapse of Exterior Walls
(S950) Collapse of Exterior Walls	Collapse of Exterior Walls
(S951) Collapse of Exterior Walls	Collapse of Exterior Walls
(S952) Collapse of Exterior Walls	Collapse of Exterior Walls
(S953) Collapse of Exterior Walls	Collapse of Exterior Walls
(S954) Collapse of Exterior Walls	Collapse of Exterior Walls
(S955) Collapse of Exterior Walls	Collapse of Exterior Walls
(S956) Collapse of Exterior Walls	Collapse of Exterior Walls
(S957) Collapse of Exterior Walls	Collapse of Exterior Walls
(S958) Collapse of Exterior Walls	Collapse of Exterior Walls
(S941) Demolishing Concrete Structures	Demolishing Concrete Structures
(S942) Demolishing Concrete Structures	Demolishing Concrete Structures
(S943) Demolishing Concrete Structures	Demolishing Concrete Structures
(S944) Demolishing Concrete Structures	Demolishing Concrete Structures
(S945) Demolishing Concrete Structures	Demolishing Concrete Structures
(S946) Demolishing Concrete Structures	Demolishing Concrete Structures
(S947) Demolishing Concrete Structures	Demolishing Concrete Structures
(S928) Earth Retaining Supports	Earth Retaining Supports
(S929) Earth Retaining Supports	Earth Retaining Supports
(S930) Earth Retaining Supports	Earth Retaining Supports
(S931) Earth Retaining Supports	Earth Retaining Supports
(S932) Earth Retaining Supports	Earth Retaining Supports
(S933) Earth Retaining Supports	Earth Retaining Supports

(S934) Earth Retaining Supports	Earth Retaining Supports
(S935) Earth Retaining Supports	Earth Retaining Supports
(S936) Earth Retaining Supports	Earth Retaining Supports
(S937) Earth Retaining Supports	Earth Retaining Supports
(S938) Earth Retaining Supports	Earth Retaining Supports
(S939) Earth Retaining Supports	Earth Retaining Supports
(S940) Earth Retaining Supports	Earth Retaining Supports
(S766)Erected passageways	Erected passageways
(S767)Erected passageways	Erected passageways
(S768)Erected passageways	Erected passageways
(S824) Falls	Falls
(S825) Falls	Falls
(S826) Falls	Falls
(S827) Falls	Falls
(S828) Falls	Falls
(S829) Falls	Falls
(S830) Falls	Falls
(S831) Falls	Falls
(S832) Falls	Falls
(S833) Falls	Falls
(S834) Falls	Falls
(S835) Falls	Falls
(S836) Falls	Falls
(S837) Falls	Falls
(S838) Falls	Falls
(S839) Falls	Falls
(S840) Falls	Falls
(S841) Falls	Falls
(S842) Falls	Falls
(S843) Falls	Falls
(S844) Falls	Falls
(S861) Flying objects and Collapses	Flying objects and Collapses
(S862) Flying objects and Collapses	Flying objects and Collapses
(S863) Flying objects and Collapses	Flying objects and Collapses

(S864) Flying objects and Collapses	Flying objects and Collapses
(S865) Flying objects and Collapses	Flying objects and Collapses
(S866) Flying objects and Collapses	Flying objects and Collapses
(S867) Flying objects and Collapses	Flying objects and Collapses
(S868) Flying objects and Collapses	Flying objects and Collapses
(S879) Formwork Support	Formwork Support
(S880) Formwork Support	Formwork Support
(S881) Formwork Support	Formwork Support
(S882) Formwork Support	Formwork Support
(S883) Formwork Support	Formwork Support
(S884) Formwork Support	Formwork Support
(S885) Formwork Support	Formwork Support
(S886) Formwork Support	Formwork Support
(S887) Formwork Support	Formwork Support
(S888) Formwork Support	Formwork Support
(S889) Formwork Support	Formwork Support
(S890) Formwork Support	Formwork Support
(S891) Formwork Support	Formwork Support
(S892) Formwork Support	Formwork Support
(S893) Formwork Support	Formwork Support
(S894) Formwork Support	Formwork Support
(S895) Formwork Support	Formwork Support
(S896) Formwork Support	Formwork Support
(S897) Formwork Support	Formwork Support
(S898) Formwork Support	Formwork Support
(S899) Formwork Support	Formwork Support
(S900) Formwork Support	Formwork Support
(S901) Formwork Support	Formwork Support
(S902) Formwork Support	Formwork Support
(S903) Formwork Support	Formwork Support
(S904) Formwork Support	Formwork Support
(S905) Formwork Support	Formwork Support
(S906) Formwork Support	Formwork Support
(S907) Formwork Support	Formwork Support

(S908) Formwork Support	Formwork Support
(S909) Formwork Support	Formwork Support
(S910) Formwork Support	Formwork Support
(S911) Formwork Support	Formwork Support
(S912) Formwork Support	Formwork Support
(S977) Gas Pipelines	Gas Pipelines
(S978) Gas Pipelines	Gas Pipelines
(S979) Gas Pipelines	Gas Pipelines
(S980) Gas Pipelines	Gas Pipelines
(S981) Gas Pipelines	Gas Pipelines
(S982) Gas Pipelines	Gas Pipelines
(S983) Gas Pipelines	Gas Pipelines
(S984) Gas Pipelines	Gas Pipelines
(S985) Gas Pipelines	Gas Pipelines
(S986) Gas Pipelines	Gas Pipelines
(S987) Gas Pipelines	Gas Pipelines
(S988) Gas Pipelines	Gas Pipelines
(S989) Gas Pipelines	Gas Pipelines
(S990) Gas Pipelines	Gas Pipelines
(S991) Gas Pipelines	Gas Pipelines
(S992) Gas Pipelines	Gas Pipelines
(S993) Gas Pipelines	Gas Pipelines
(S994) Gas Pipelines	Gas Pipelines
(S995) Gas Pipelines	Gas Pipelines
(S996) Gas Pipelines	Gas Pipelines
(S997) Gas Pipelines	Gas Pipelines
(S998) Gas Pipelines	Gas Pipelines
(S999) Gas Pipelines	Gas Pipelines
(S1000) Gas Pipelines	Gas Pipelines
(S959) Gas welding	Gas welding
(S960) Gas welding	Gas welding
(S961) Gas welding	Gas welding
(S962) Gas welding	Gas welding
(S963) Gas welding	Gas welding

(S964) Gas welding	Gas welding
(S965) Gas welding	Gas welding
(S966) Gas welding	Gas welding
(S757) Ladder	Ladder
(S758) Ladder	Ladder
(S759) Ladder	Ladder
(S760) Ladder	Ladder
(S761) Ladder	Ladder
(S762) Ladder	Ladder
(S763) Ladder	Ladder
(S764) Ladder	Ladder
(S765) Ladder	Ladder
(S913) Open Excavation	Open Excavation
(S914) Open Excavation	Open Excavation
(S915) Open Excavation	Open Excavation
(S916) Open Excavation	Open Excavation
(S917) Open Excavation	Open Excavation
(S918) Open Excavation	Open Excavation
(S919) Open Excavation	Open Excavation
(S920) Open Excavation	Open Excavation
(S921) Open Excavation	Open Excavation
(S922) Open Excavation	Open Excavation
(S923) Open Excavation	Open Excavation
(S924) Open Excavation	Open Excavation
(S925) Open Excavation	Open Excavation
(S926) Open Excavation	Open Excavation
(S927) Open Excavation	Open Excavation
(S869) Rope work	Rope work
(S870) Rope work	Rope work
(S871) Rope work	Rope work
(S872) Rope work	Rope work
(S873) Rope work	Rope work
(S874) Rope work	Rope work
(S875) Rope work	Rope work

(S876) Rope work	Rope work
(S877) Rope work	Rope work
(S878) Rope work	Rope work
(S743) Safe passages	Safe passages
(S744) Safe passages	Safe passages
(S745) Safe passages	Safe passages
(S746) Safe passages	Safe passages
(S747) Safe passages	Safe passages
(S748) Safe passages	Safe passages
(S749) Safe passages	Safe passages
(S750) Safe passages	Safe passages
(S751) Safe passages	Safe passages
(S752) Safe passages	Safe passages
(S753) Safe passages	Safe passages
(S754) Safe passages	Safe passages
(S755) Safe passages	Safe passages
(S756) Safe passages	Safe passages
(S845) Safety Net	Safety Net
(S846) Safety Net	Safety Net
(S847) Safety Net	Safety Net
(S848) Safety Net	Safety Net
(S849) Safety Net	Safety Net
(S850) Safety Net	Safety Net
(S851) Safety Net	Safety Net
(S852) Safety Net	Safety Net
(S853) Safety Net	Safety Net
(S854) Safety Net	Safety Net
(S855) Safety Net	Safety Net
(S856) Safety Net	Safety Net
(S857) Safety Net	Safety Net
(S858) Safety Net	Safety Net
(S859) Safety Net	Safety Net
(S860) Safety Net	Safety Net
(S769)Scaffolding	Scaffolding

(S770)Scaffolding	Scaffolding
(S771)Scaffolding	Scaffolding
(S772)Scaffolding	Scaffolding
(S773)Scaffolding	Scaffolding
(S774)Scaffolding	Scaffolding
(S775)Scaffolding	Scaffolding
(S776)Scaffolding	Scaffolding
(S777)Scaffolding	Scaffolding
(S778)Scaffolding	Scaffolding
(S779)Scaffolding	Scaffolding
(S780)Scaffolding	Scaffolding
(S781)Scaffolding	Scaffolding
(S782)Scaffolding	Scaffolding
(S783)Scaffolding	Scaffolding
(S784)Scaffolding	Scaffolding
(S785)Scaffolding	Scaffolding
(S786)Scaffolding	Scaffolding
(S787)Scaffolding	Scaffolding
(S788)Scaffolding	Scaffolding
(S789)Scaffolding	Scaffolding
(S790)Scaffolding	Scaffolding
(S791)Scaffolding	Scaffolding
(S792)Scaffolding	Scaffolding
(S793)Scaffolding	Scaffolding
(S794)Scaffolding	Scaffolding
(S795)Scaffolding	Scaffolding
(S796)Scaffolding	Scaffolding
(S797)Scaffolding	Scaffolding
(S798)Scaffolding	Scaffolding
(S799)Scaffolding	Scaffolding
(S800)Scaffolding	Scaffolding
(S801)Scaffolding	Scaffolding
(S802)Scaffolding	Scaffolding
(S817) Stress check	Stress check

(S818) Stress check	Stress check
(S819) Stress check	Stress check
(S820) Stress check	Stress check
(S821) Stress check	Stress check
(S822) Stress check	Stress check
(S823) Stress check	Stress check
(S803)Work platform	Work platform
(S804)Work platform	Work platform
(S805)Work platform	Work platform
(S806)Work platform	Work platform
(S807)Work platform	Work platform
(S808)Work platform	Work platform
(S809)Work platform	Work platform
(S810)Work platform	Work platform
(S811)Work platform	Work platform
(S812)Work platform	Work platform
(S813)Work platform	Work platform
(S814)Work platform	Work platform
(S815)Work platform	Work platform
(S816)Work platform	Work platform

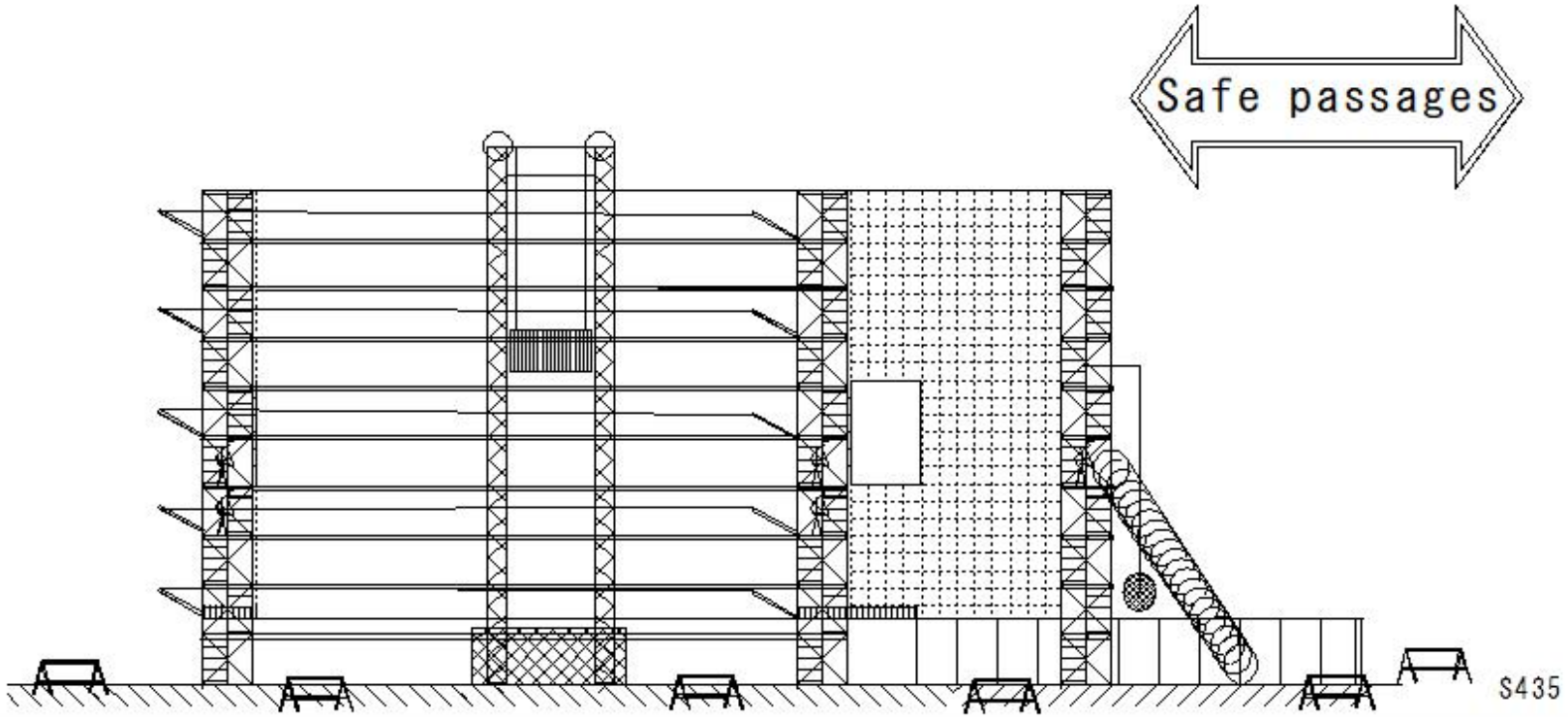
(S743) Safe passages

(S743) Safe passages

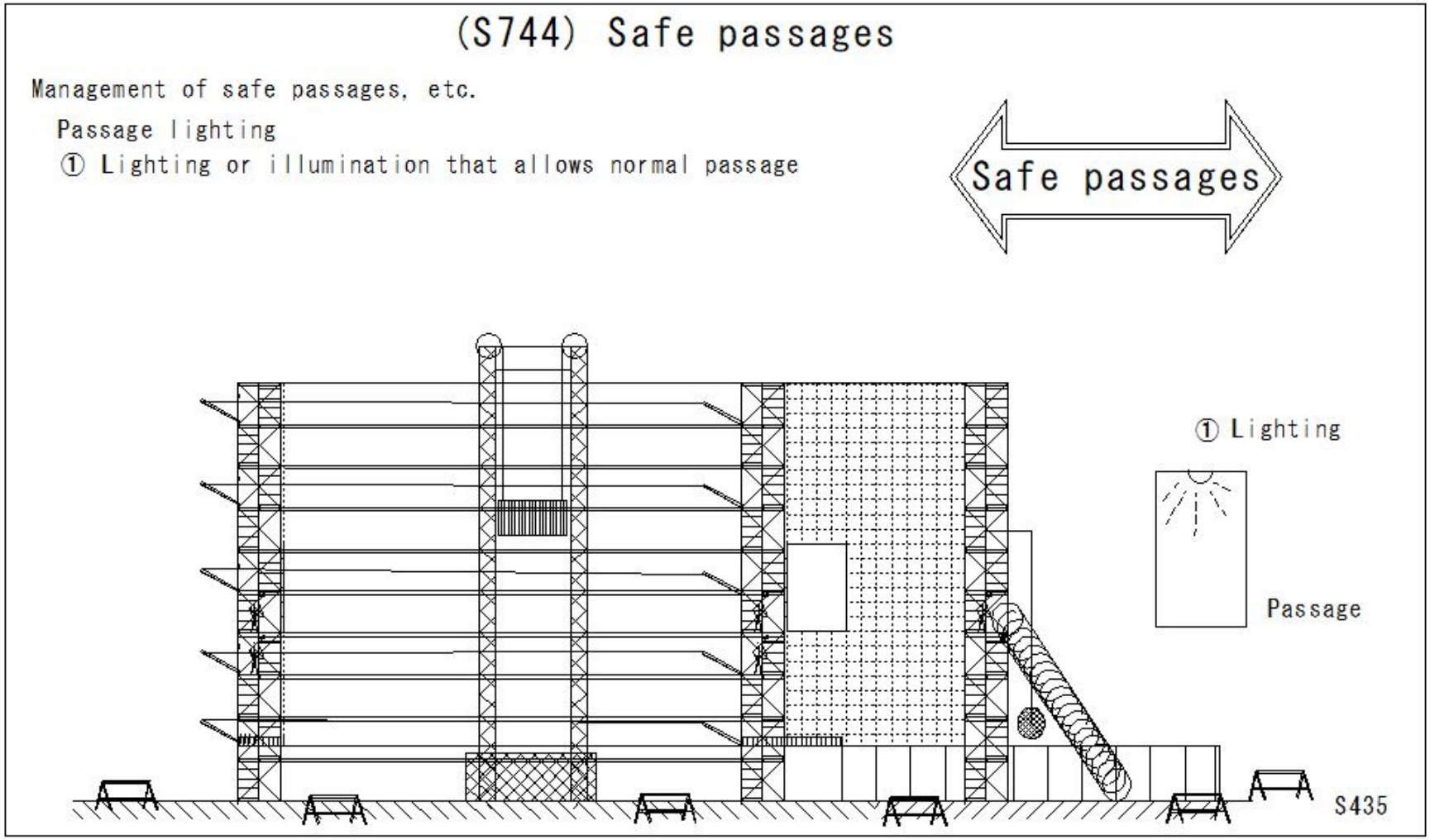
Management of safe passages, etc.

Passages

① Safe passages are provided and maintained effectively in places leading to the work area and within the work area indicate that they are passages



(S744) Safe passages



(S745) Safe passages

(S745) Safe passages

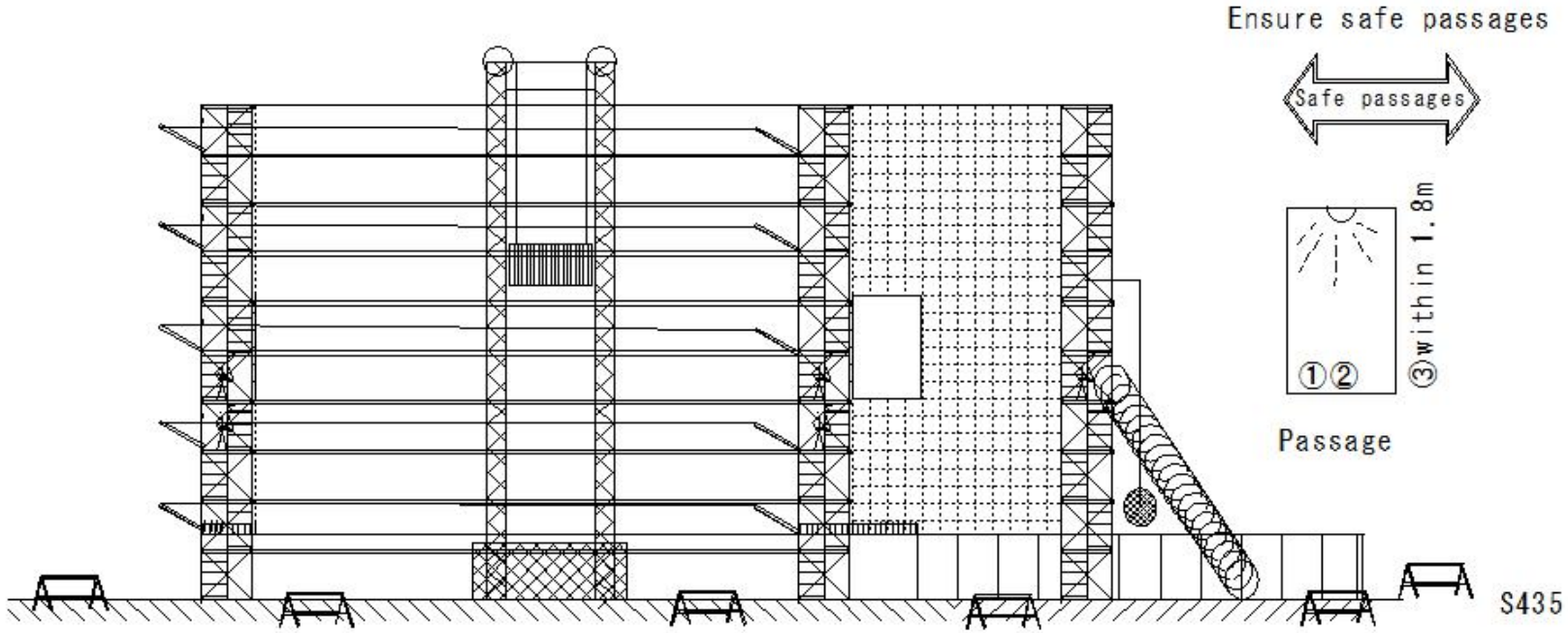
Management of safe passages, etc.

Passages installed indoors

① Have a width appropriate to the purpose

② Maintain a state where there is no risk of tripping, slipping, stepping through, etc.

③ No obstacles within 1.8m in height



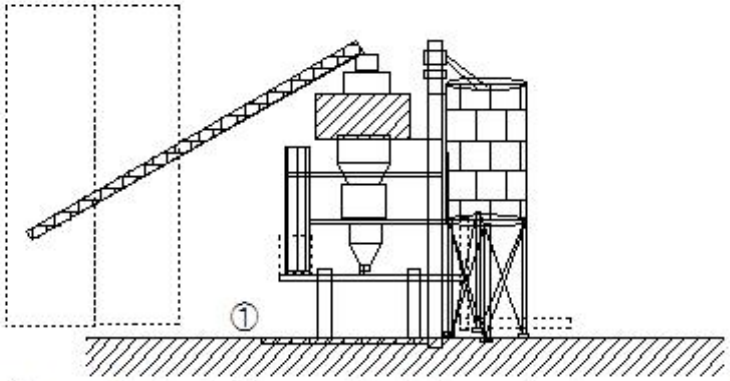
(S746) Safe passages

(S746) Safe passages

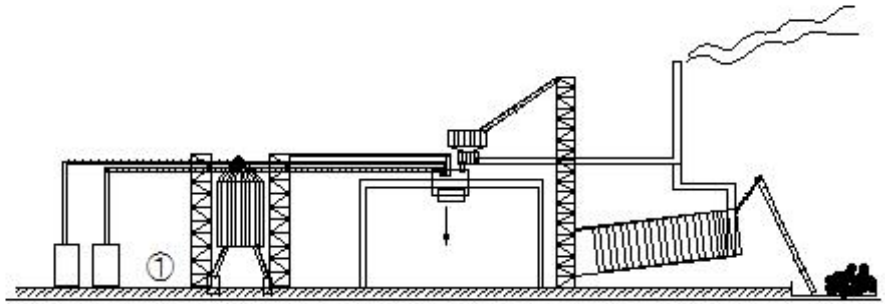
Management of safe passages, etc.

Passages between machines, etc.

① Width 80cm or more



Concrete batching and mixing plant C1031



Asphalt plant M80 M395

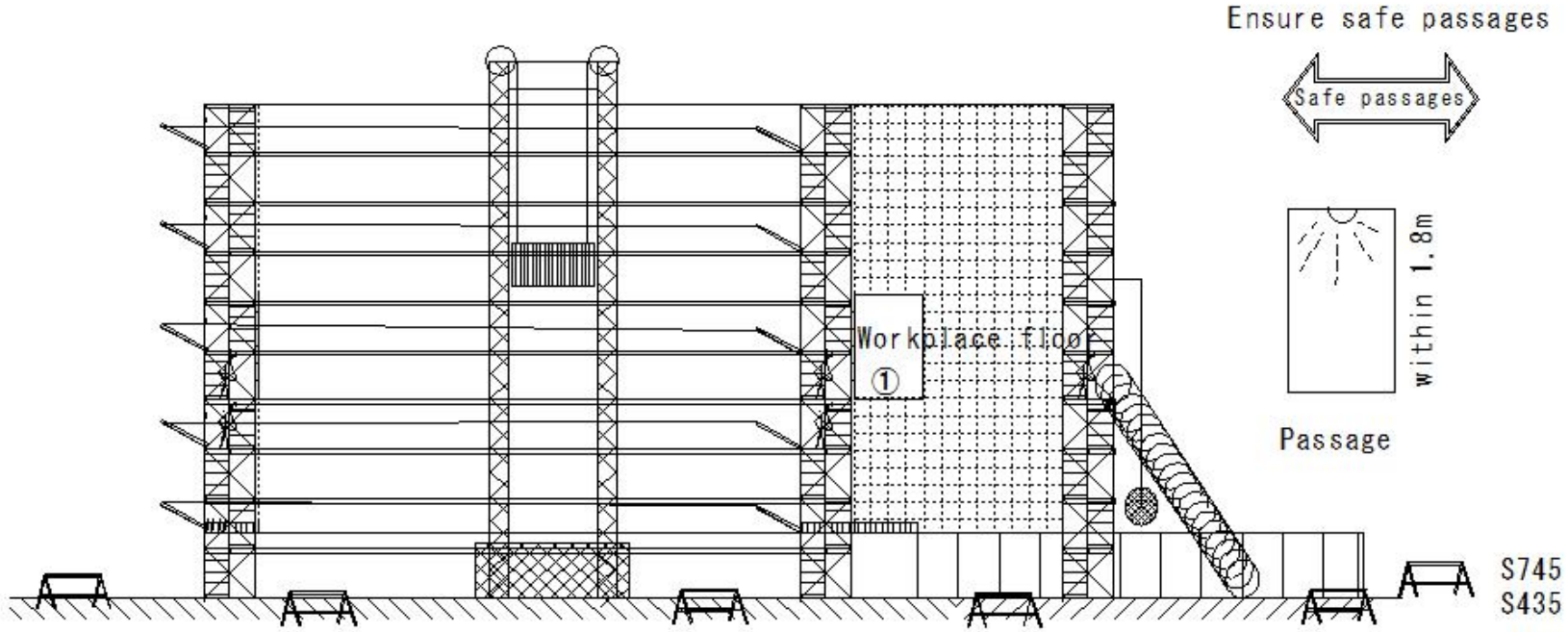
(S747) Safe passages

(S747) Safe passages

Management of safe passages, etc.

Workplace floor

① Maintain a state free of hazards such as tripping and slipping



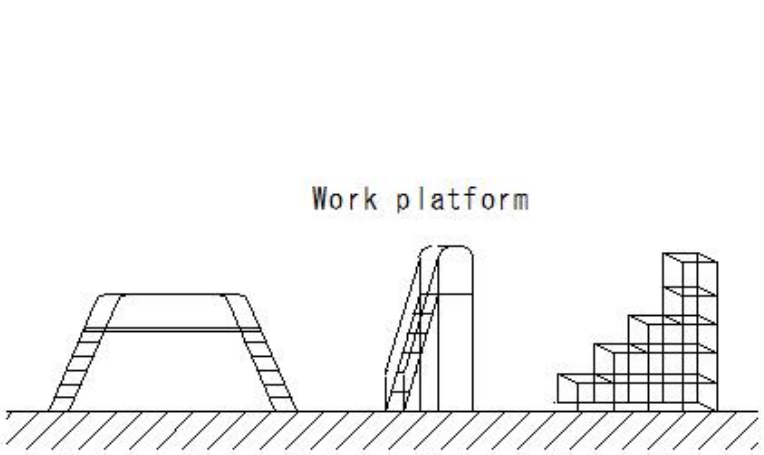
(S748) Safe passages

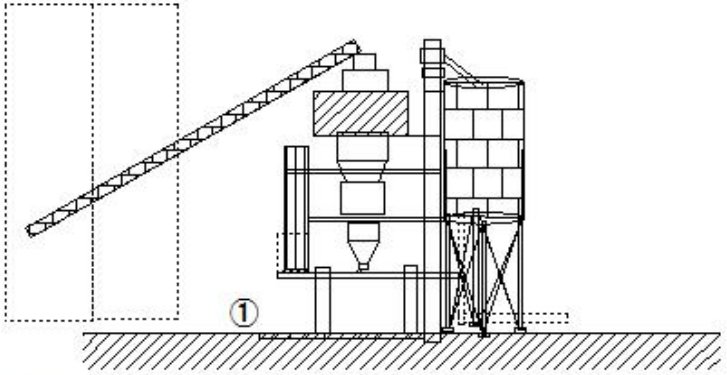
(S748) Safe passages

Management of safe passages, etc.

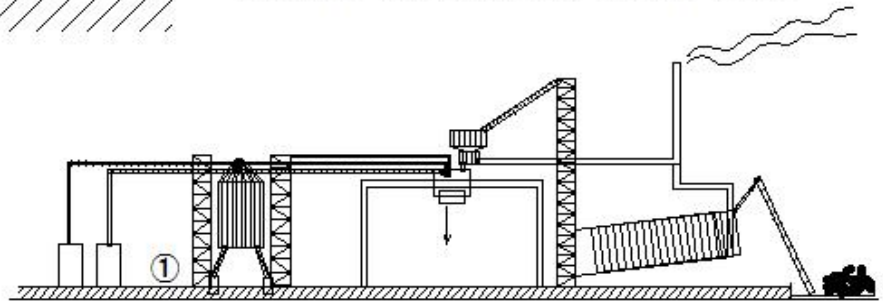
Work platform

① In case of the machine is high, install a safe and appropriate height work platform





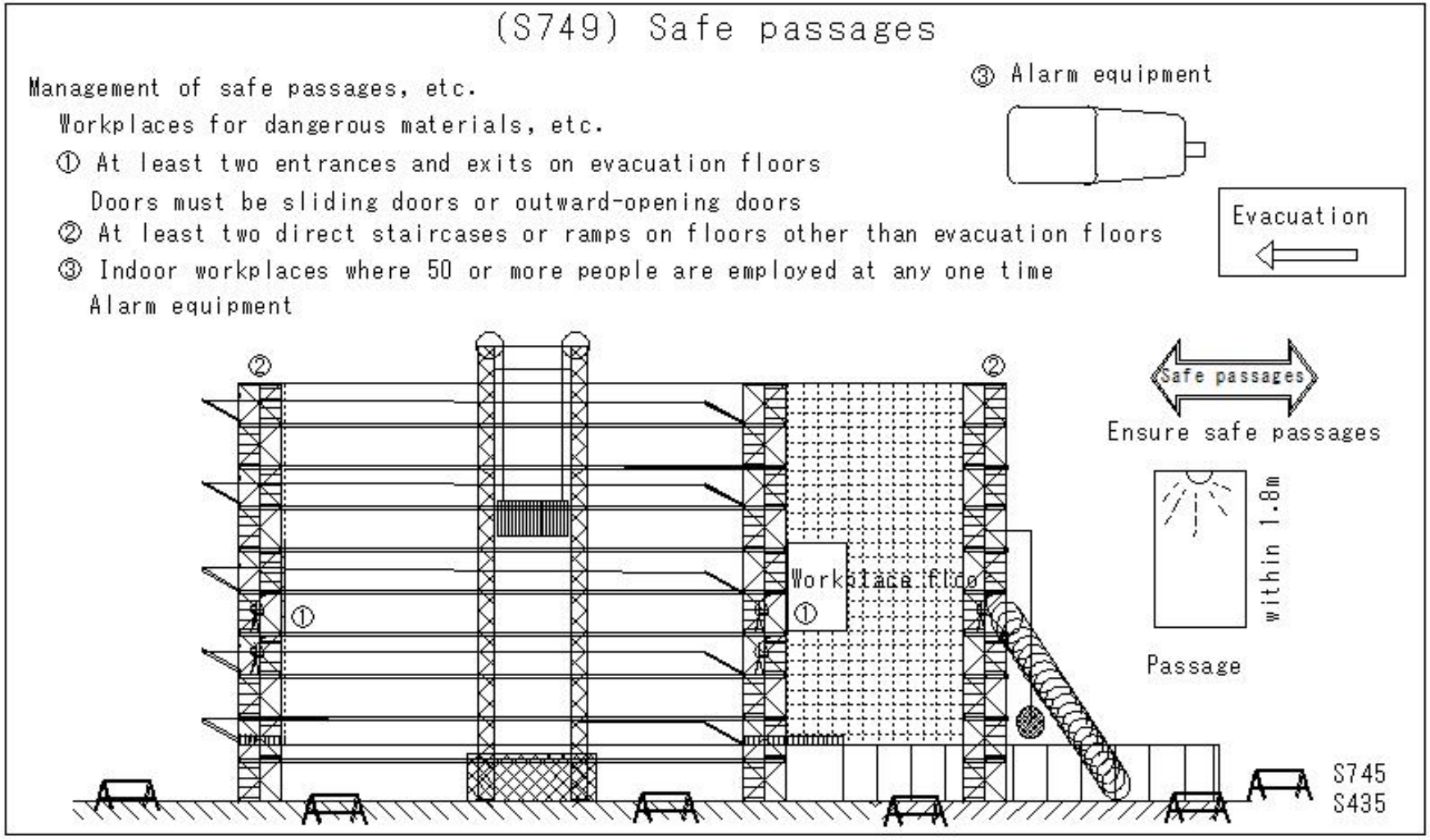
Concrete batching and mixing plant C1031



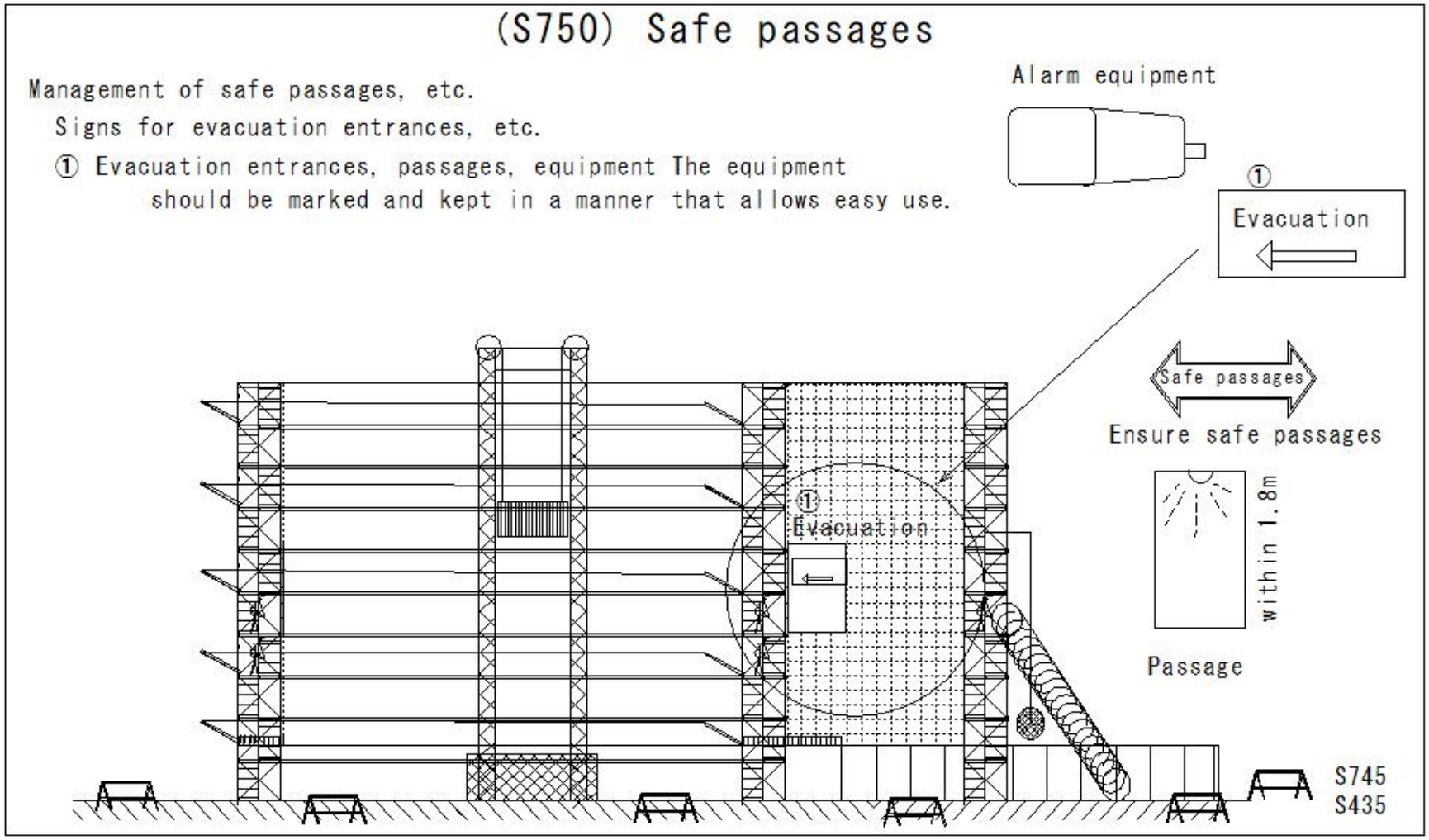
Asphalt plant M80

M395

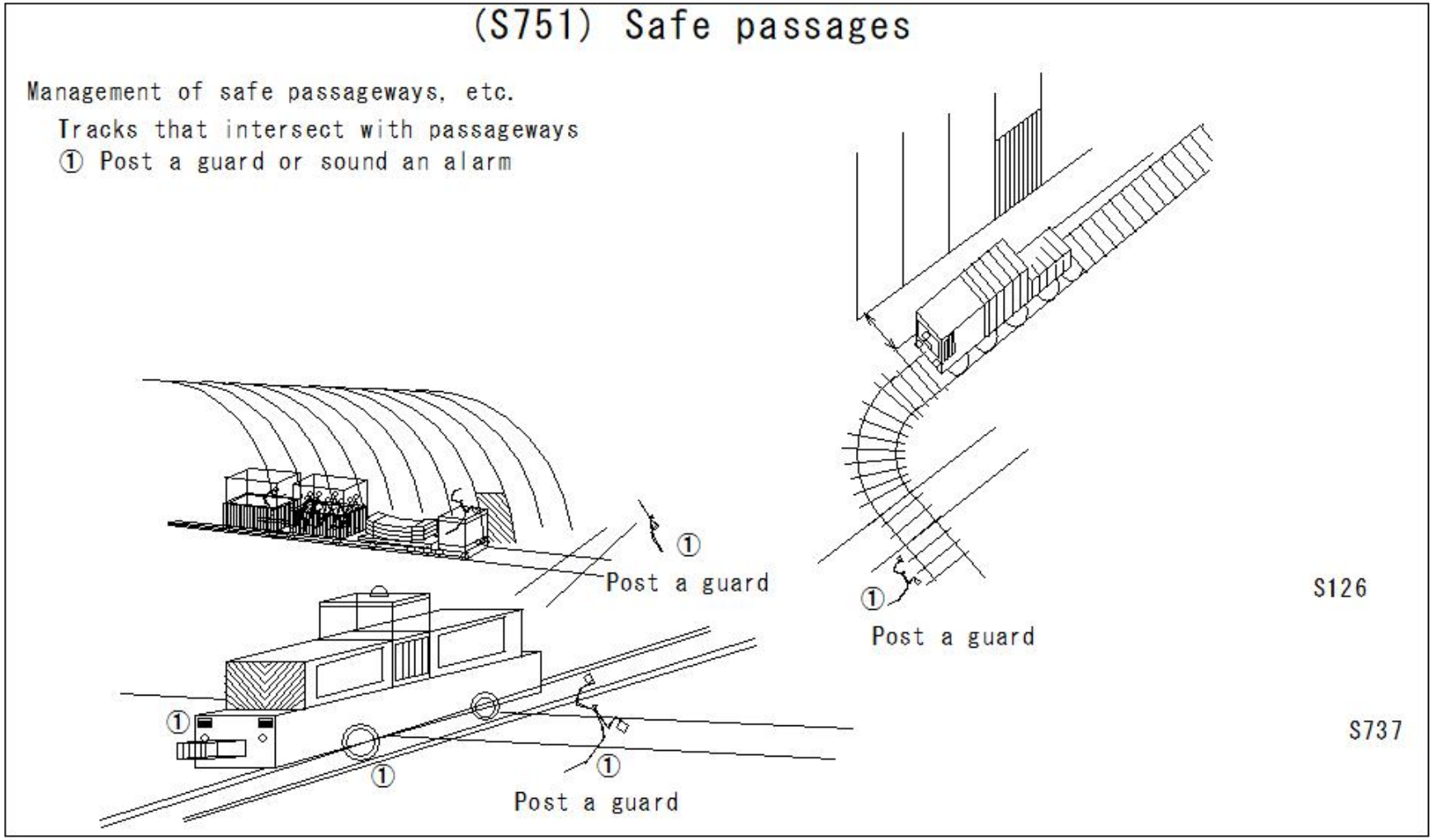
(S749) Safe passages



(S750) Safe passages



(S751) Safe passages



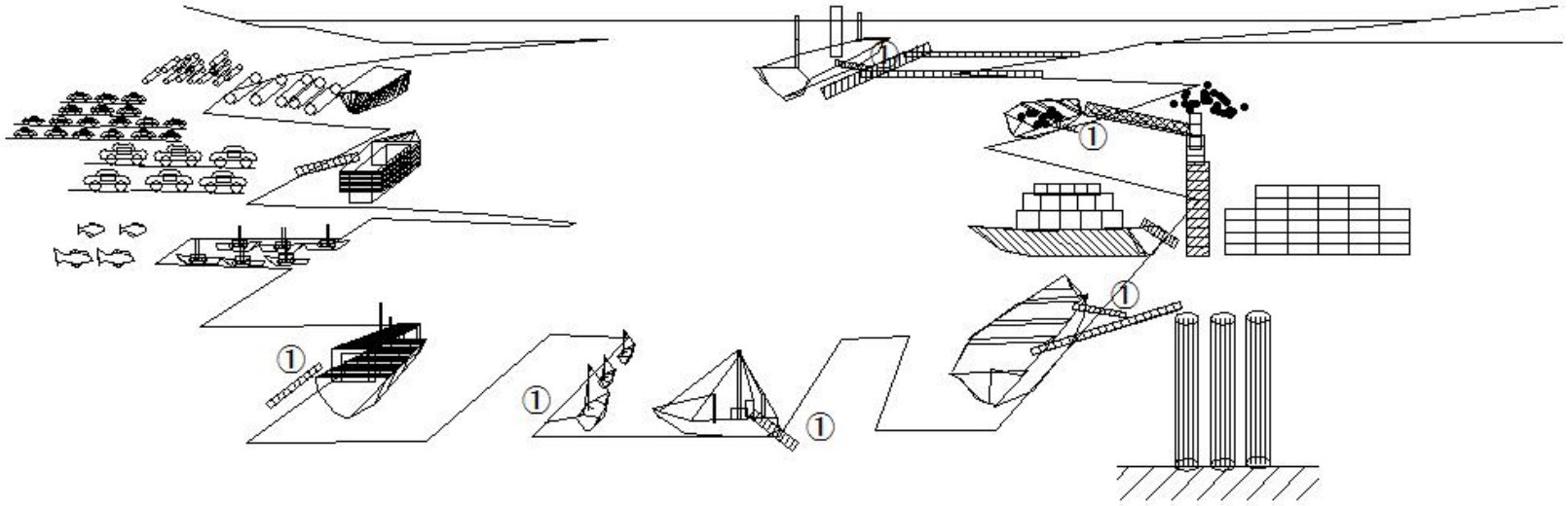
(S752) Safe passages

(S752) Safe passages

Management of safe passageways, etc.

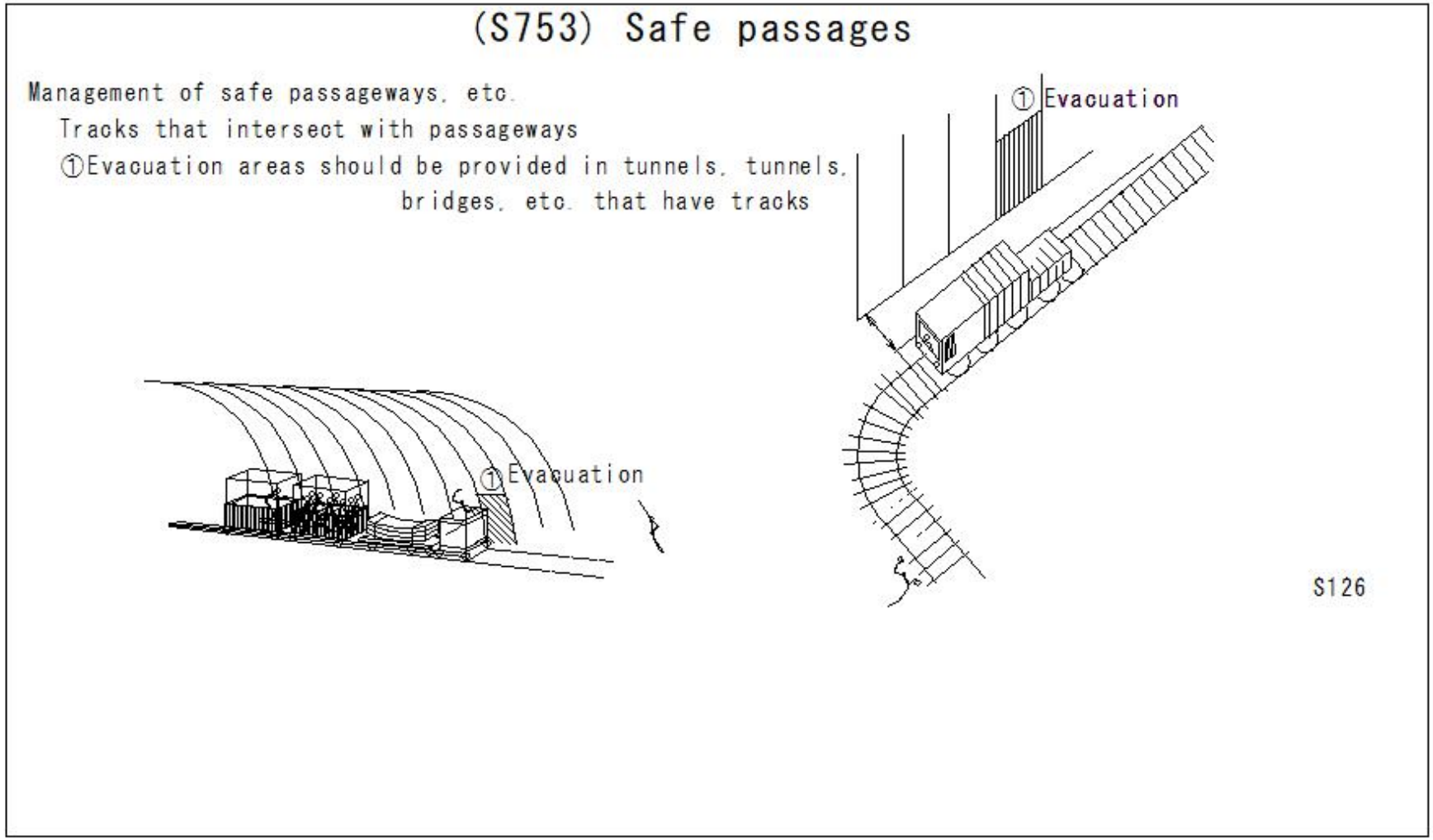
Passage between ships and quays, etc.

① Appropriate passage facilities such as steps and ladders

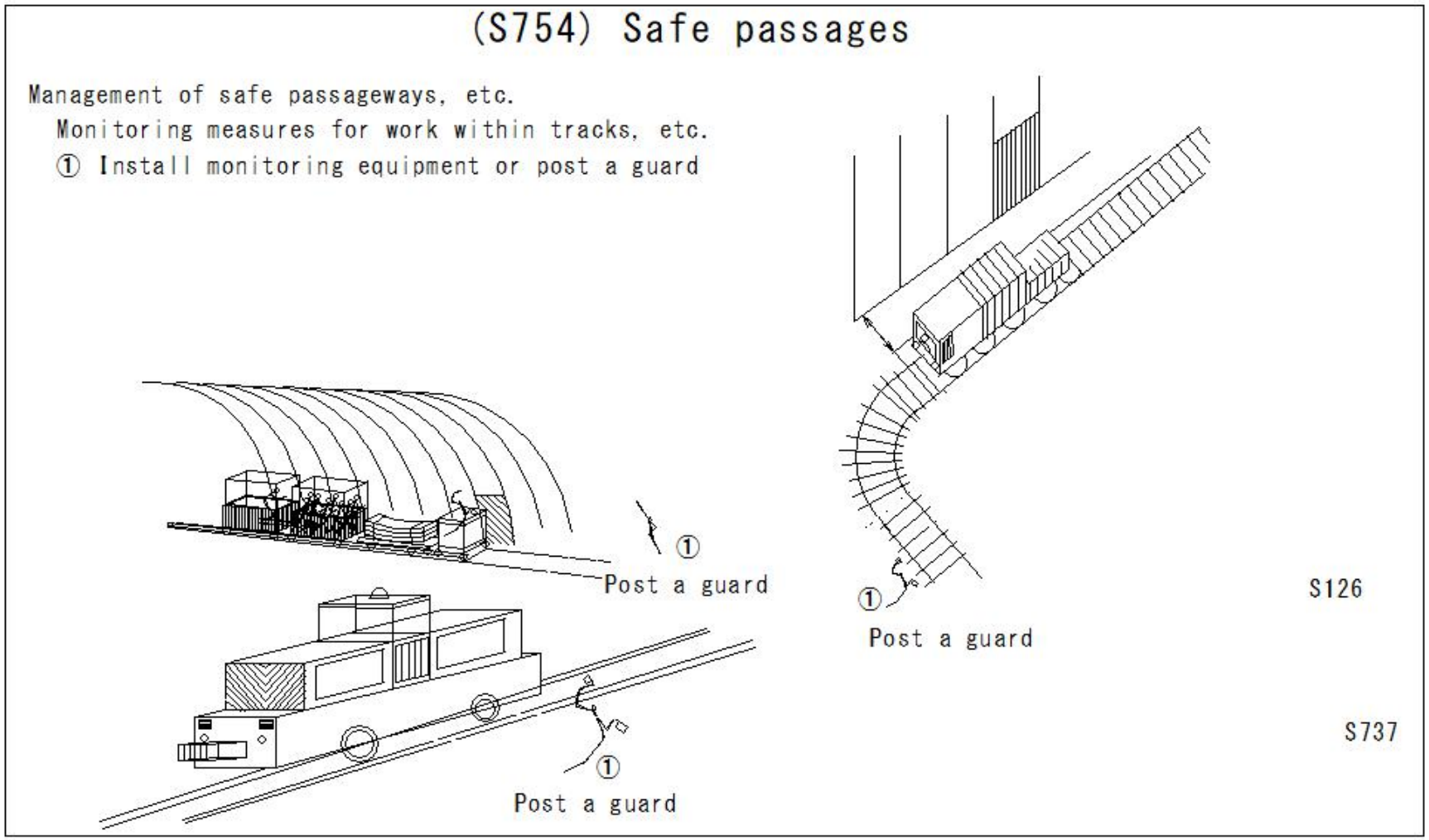


P13

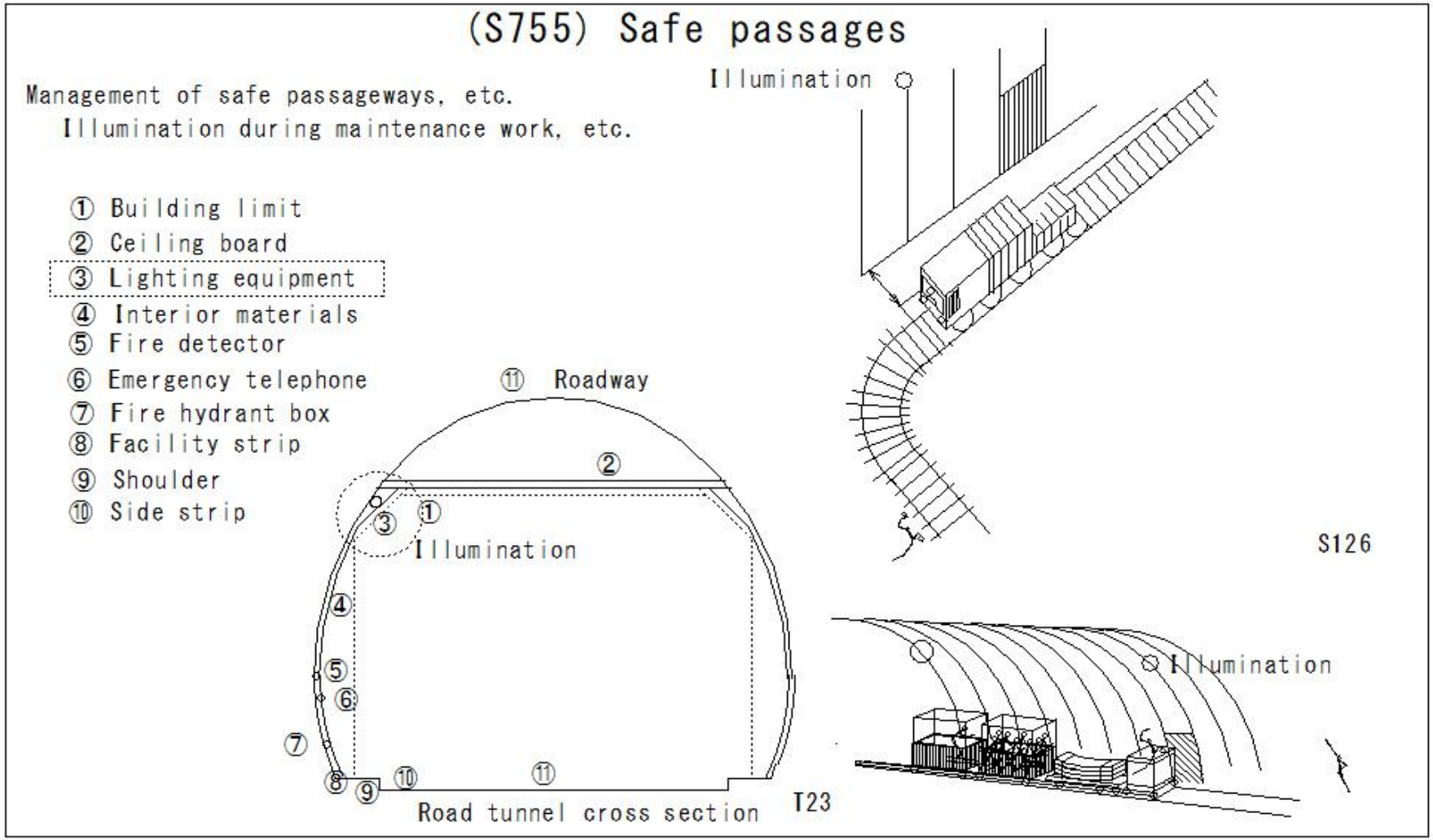
(S753) Safe passages



(S754) Safe passages



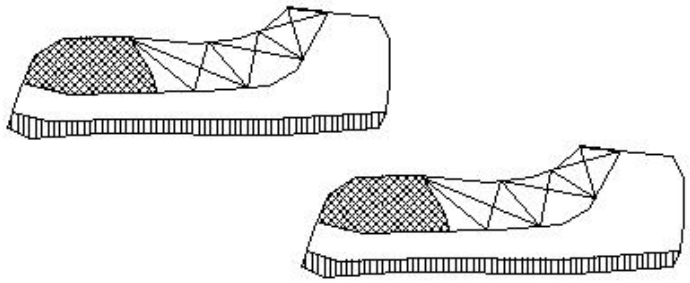
(S755) Safe passages



(S756) Safe passages

(S756) Safe passages

Management of safe passageways, etc.
Use of safety shoes, etc.



safety shoes

(S757) Ladder

(S757) Ladder

Safe work on ladder

Safe work on ladder

① Sturdy structure

② Even spacing of steps

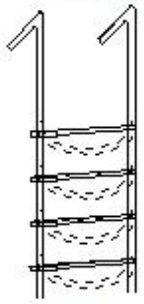
③ Appropriate spacing between steps and wall

④ Fixing the ladder to prevent shifting

⑤ The top of the ladder should protrude
60cm or more from the floor

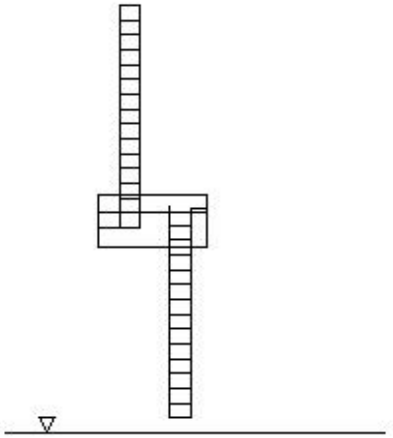
⑥ For ladder runs inside the mine, steps should be provided every 5m or less for lengths of 10m or more

⑦ The slope of ladder runs inside the mine should be within 80 degrees



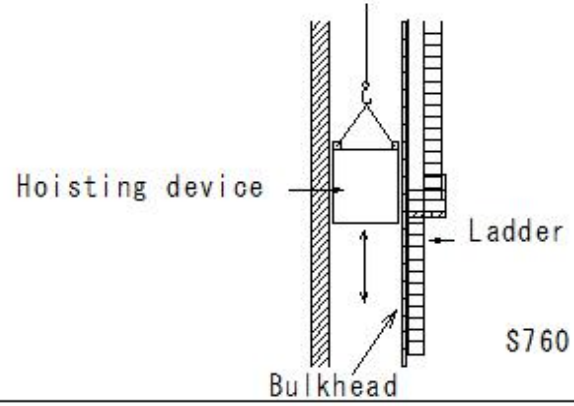
Ladder

S758



Ladder

S759



S760

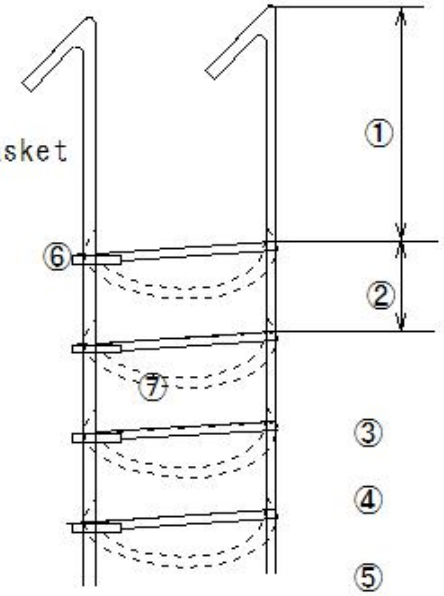
(S758) Ladder

(S758) Ladder

Safe work on ladder

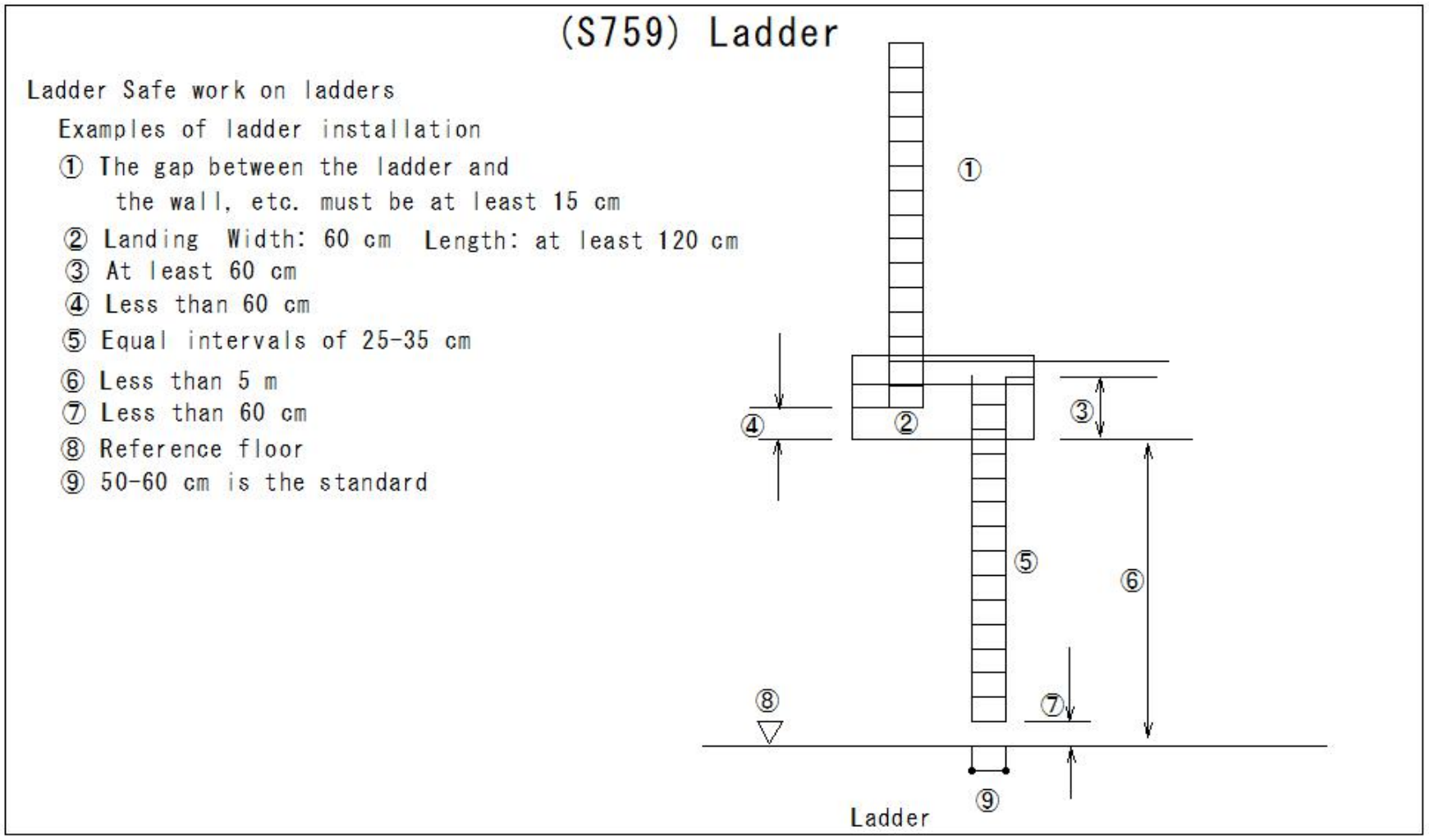
Safe work on ladder

① Protrusion 60cm or more
② Even spacing of 25-35cm
③ Component materials
④ Sturdy structure
⑤ Appropriate spacing
⑥ Fixed foot metal fittings
⑦ It is desirable to provide a basket
⑧ Safety block



Ladder

(S759) Ladder


(S759) Ladder
Ladder Safe work on ladders
Examples of ladder installation
① The gap between the ladder and the wall, etc. must be at least 15 cm
② Landing Width: 60 cm Length: at least 120 cm
③ At least 60 cm
④ Less than 60 cm
⑤ Equal intervals of 25-35 cm
⑥ Less than 5 m
⑦ Less than 60 cm
⑧ Reference floor
⑨ 50-60 cm is the standard
①
②
③
④
⑤
⑥
⑦
⑧
⑨
Ladder

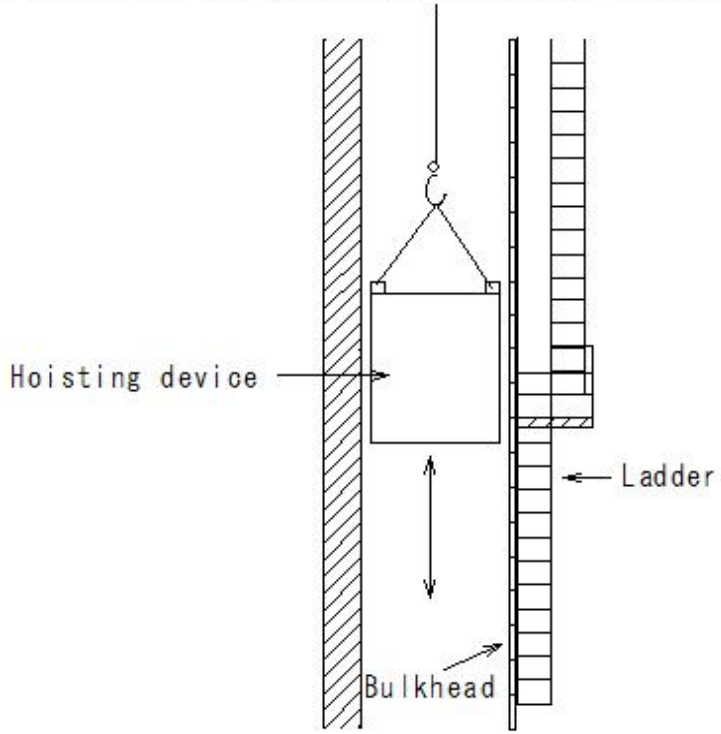
(S760) Ladder

(S760) Ladder

Safe work on ladder

Passageways, etc. installed inside the mine

① Partitions and other bulkheads are installed to prevent contact between workers and the hoist



(S761) Ladder

(S761) Ladder

Safe work on portable ladders

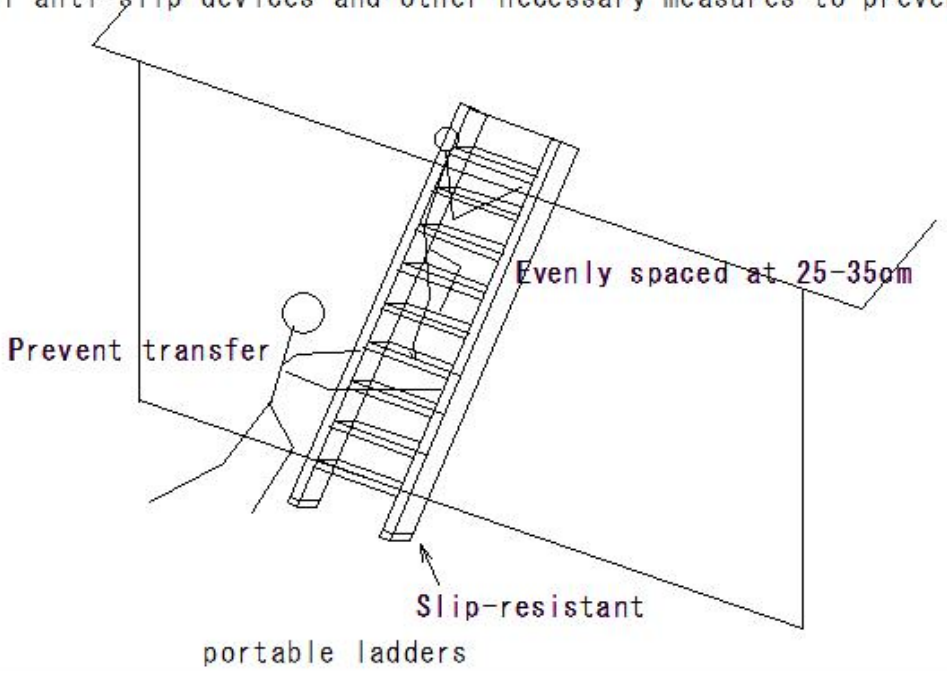
Safe work on portable ladders

① Sturdy structure

② No significant damage or corrosion to the material

③ Width must be at least 30 cm

④ Installation of anti-slip devices and other necessary measures to prevent transfer



(S762) Ladder

(S762) Ladder

Safety work with portable ladders

Measures to prevent transfer

①Attach the top of the ladder to a building, etc.
Another worker supports the bottom of the ladder

②Do not use portable ladders in joints

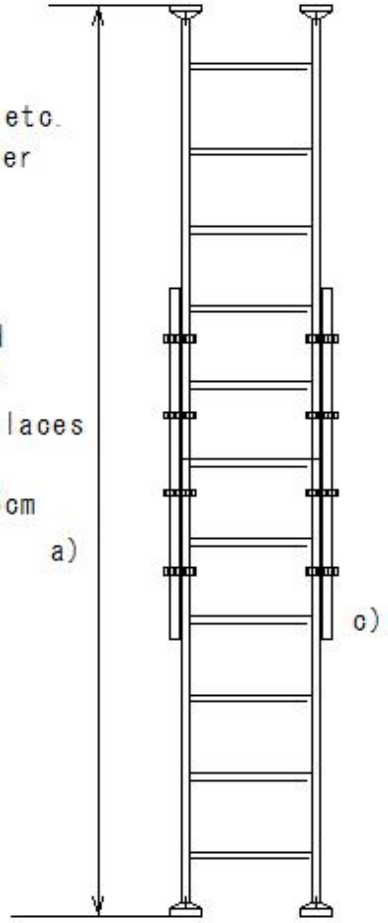
Unavoidable cases

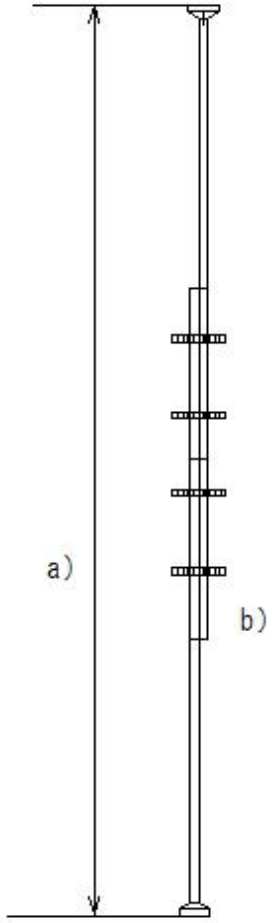
a) Total length is 9m or less

b) Overlap at least 1.5m at the connection and securely fasten at least two places

c) Butt joint: Securely fasten at least four places using splints of 1.5m or more

③Steps are spaced at equal intervals of 25-35cm





(S763) Ladder

(S763) Ladder

Safety work with portable ladders

Measures to prevent transfer

①In case of using an aluminum double ladder as an ascending equipment (ladder run)

② Protrusion: 60cm or more

③ Fix to a building, etc.

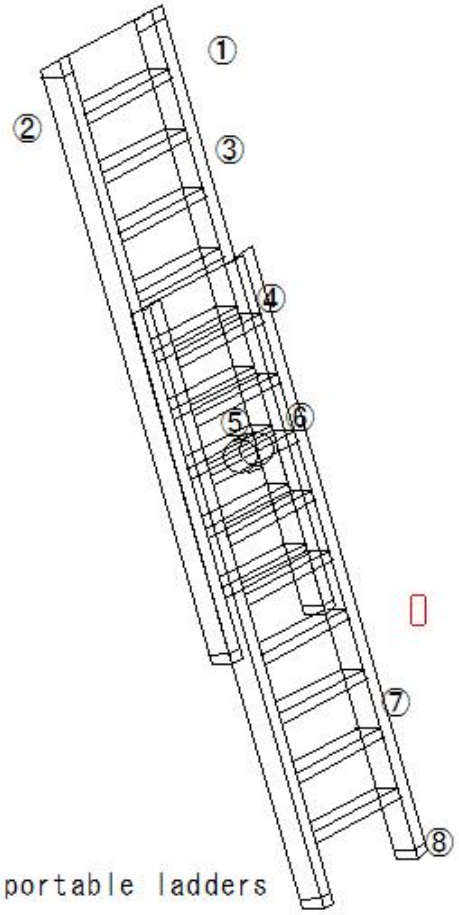
④ Install at an angle where the road surface is horizontal

⑤ Extendable clip

⑥ Stopper

⑦ Lower ladder on the outside

⑧ Leg end fittings



portable ladders

(S764) Ladder

(S764) Ladder

Safe work when using stepladders

Stepladders

① Sturdy structure

② Materials are free of significant damage, corrosion, etc.

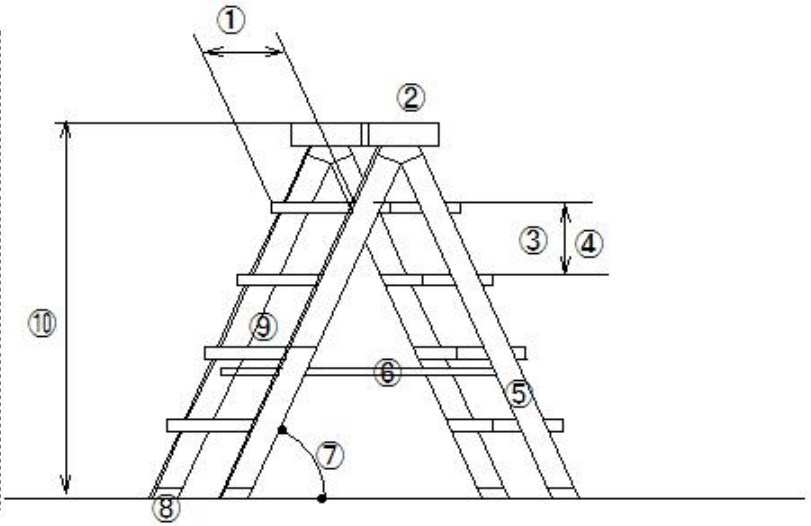
③ Angle between legs and horizontal surface is 75 degrees or less

Fold-down type: Equipped with fittings to ensure angle with horizontal surface

④ Tread surface is the area required to perform work safely

Figure

① Length of top step 30 cm or more
② Tread surface
Width 12 cm or more x length 30 cm or more
③ Equal intervals of 40 cm or less
④ (35 cm or less for aluminum stepladders)
⑤ Column
⑥ Opening stop fittings
⑦ Within 75°
⑧ Leg end fittings
⑨ Tread width 5 cm or more
⑩ Less than 2 m



(S765) Ladder

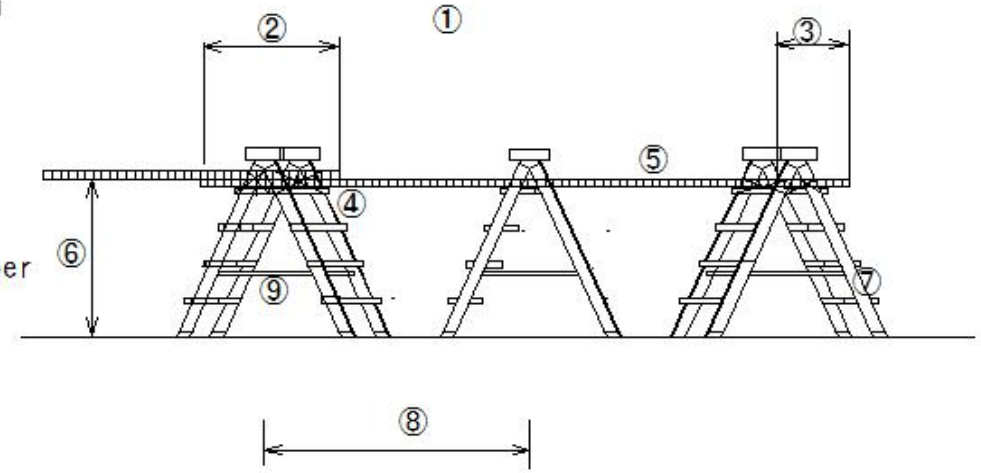
(S765) Ladder

Safe work when using stepladders

Example of stepladder scaffold configuration (height less than 2.0m)

1. Standard scaffold boards are supported at three points, and both ends are fixed to the stepladder
2. In case of two standard scaffold boards are used stacked,
   more than two points of support are acceptable Both ends are fixed to the stepladder
3. Work on protruding parts is prohibited

① Load capacity 150kg or less (however, the distance between stepladders must be less than 100kg)
② Length of overlapping part must be 20cm or more
③ Protruding part must be about 20cm
④ Fastened with rubber bands
⑤ Standard scaffold boards
⑥ Height less than 2m
⑦ Safety stepladder
⑧ 1.8m or less
⑨ Securely fasten with opening stopper



(S766)Erected passageways

(S766)Erected passageways

Management of erected passageways

① Sturdy structure

② Slope is 30° or less

However, for those with stairs or those with sturdy handrails less than 2m high, 30° or more is sufficient

③ For those with a slope of more than 15°, step bars or other anti-slip devices are required

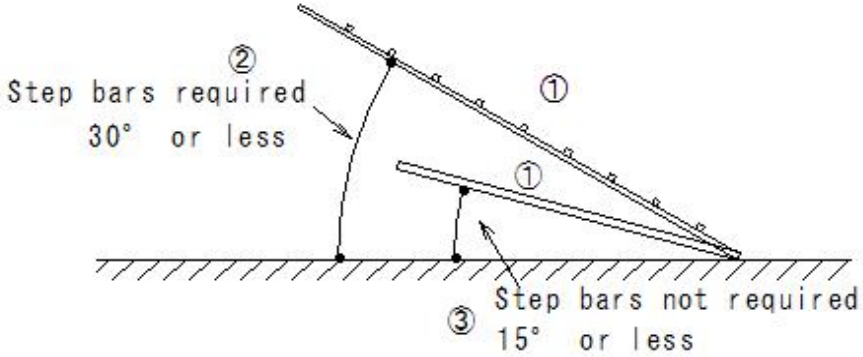
④ Erected passageways

a: Handrails 85cm or more high or equivalent

⑤ For those with a length of 15m or more in the shaft, a landing is required every 10m

⑥ For ascending piers with a height of 8m or more, a landing is required every 7m

Step bars are spaced at equal intervals of 35-40cm



(S767)Erected passageways

(S767)Erected passageways

Management of erected passageways

① Sturdy structure

② Slope is 30° or less

However, for those with stairs or those with sturdy handrails less than 2m high,

30° or more is sufficient

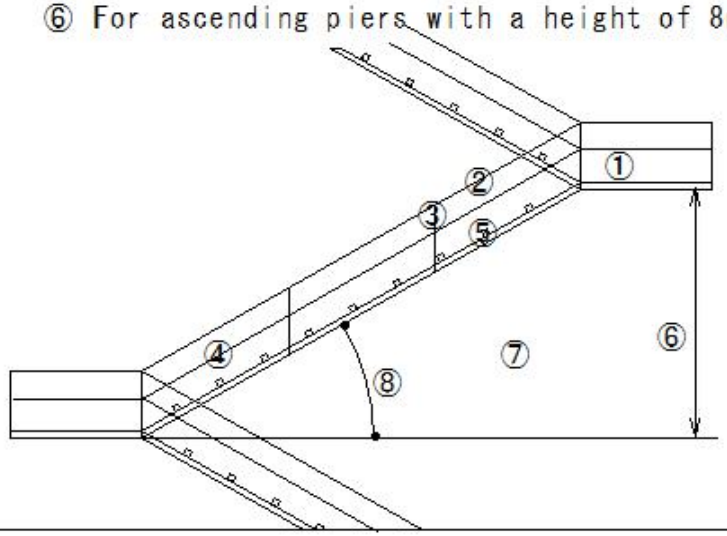
③ For those with a slope of more than 15°, step bars or other anti-slip devices are required

④ Erected passageways

a: Handrails 85cm or more high or equivalent

⑤ For those with a length of 15m or more in the shaft, a landing is required every 10m

⑥ For ascending piers with a height of 8m or more, a landing is required every 7m



Step bars are spaced at equal intervals of 35-40cm

①Landings, work floors, etc.

Landings are 60cm or more wide Length 180cm or more

②Handrail height ≒ 900: single pipe

③Handrail post @ 1,800: single pipe

④Center crosspiece: single pipe

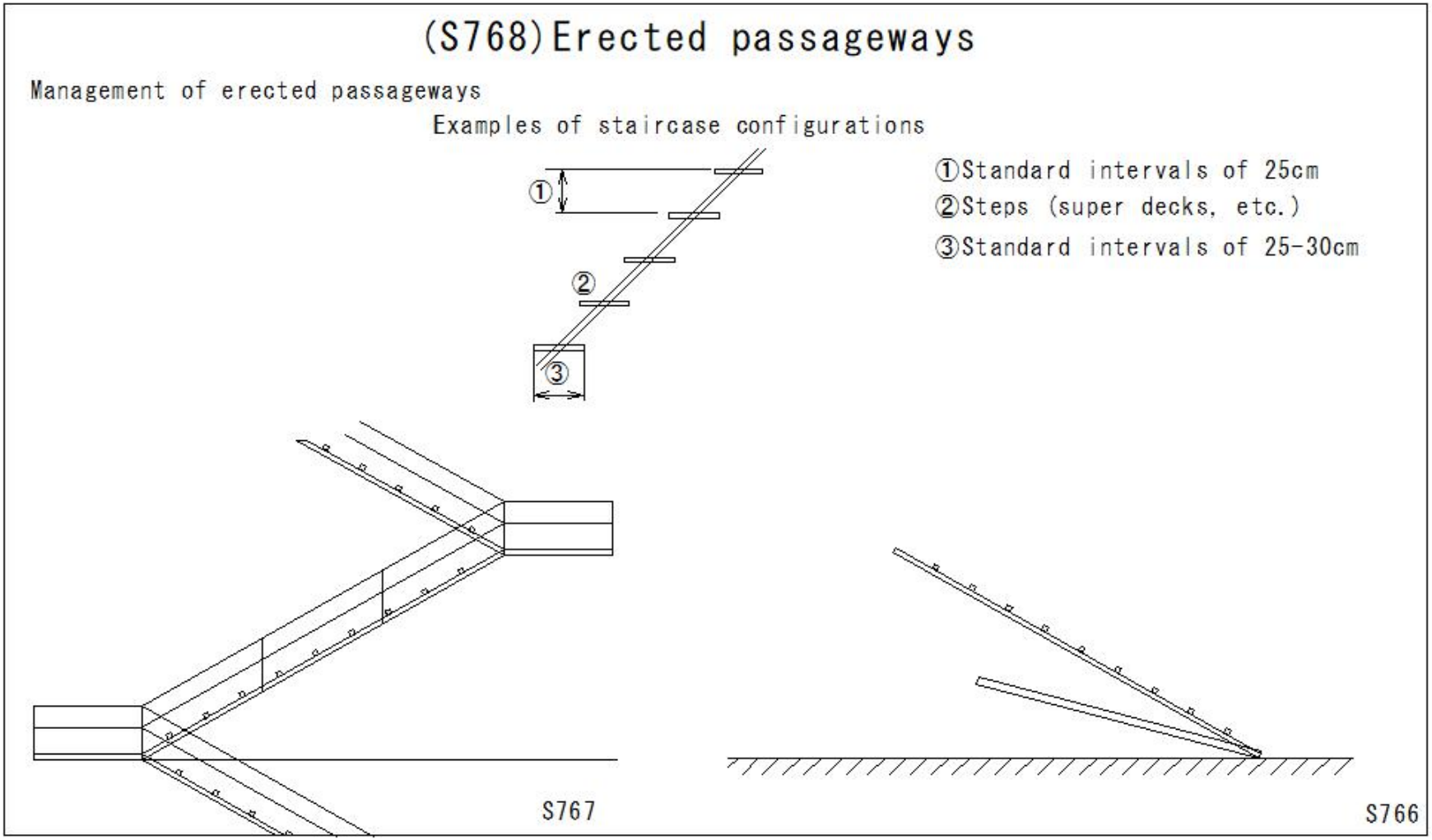
⑤Slip-resistant @ 300-400 Crosspiece nailed

⑥7.0m or less

⑦2 or more scaffolding boards laid

⑧Slope angle 30° or less

(S768)Erected passageways



(S769)Scaffolding

(S769)Scaffolding

Safety work such as assembling scaffolding

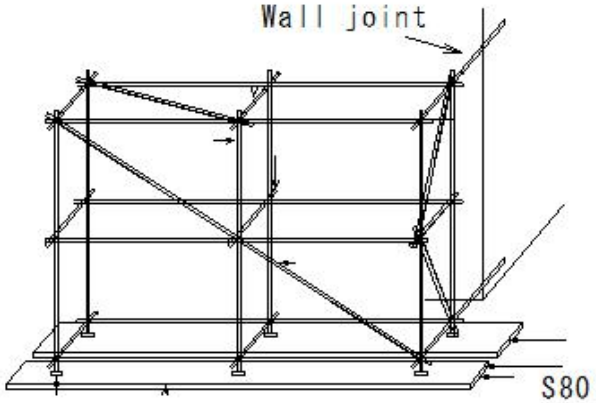
① Check for defects in materials and remove defective products

② Check the functionality of equipment, tools, safety belts and protective helmets, and remove defective products

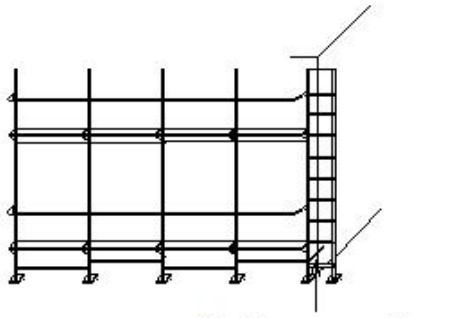
③ Determine the work method and worker placement, and monitor the progress of work

④ Monitor the use of safety belts and protective helmets

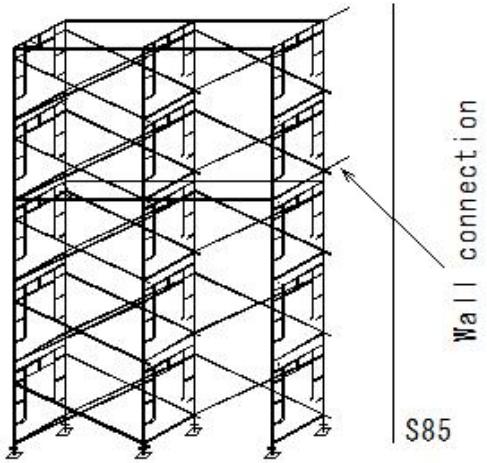
Safety work such as assembling scaffolding
Work supervisor



S80



S83



S85

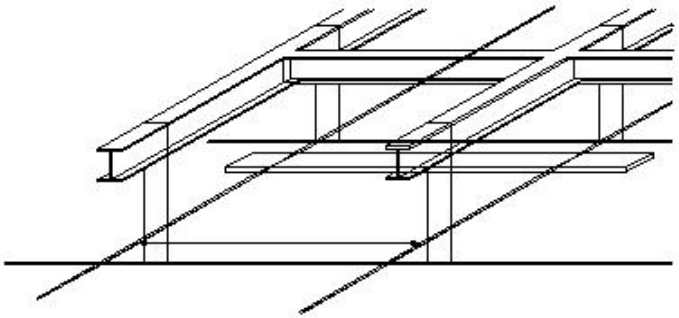
S86

(S770)Scaffolding

Safety work such as assembling scaffolding

Work requiring the appointment of a work supervisor

① Work for assembling, dismantling or modifying suspended scaffolding, overhanging scaffolding or scaffolding with a height of 5m or more



suspended scaffolding S88

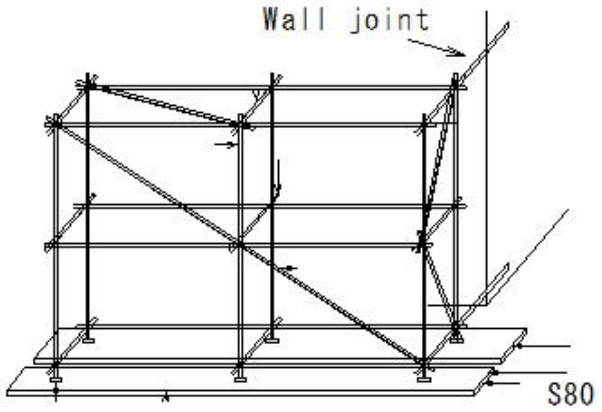
(S771)Scaffolding

(S771)Scaffolding

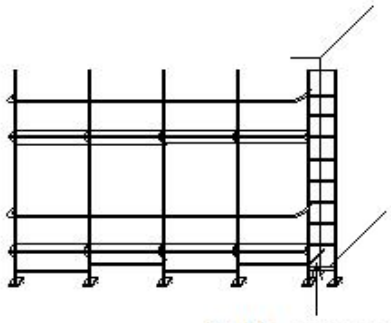
Safety work such as assembling scaffolding

Appointment - Work supervisor

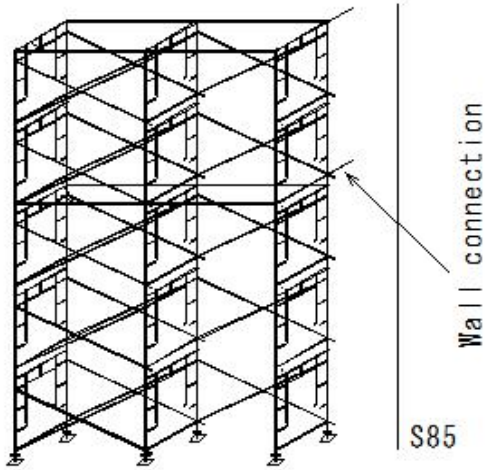
Work for assembling and modifying scaffolding with a height of less than 5m



S80



S83



S85

S86

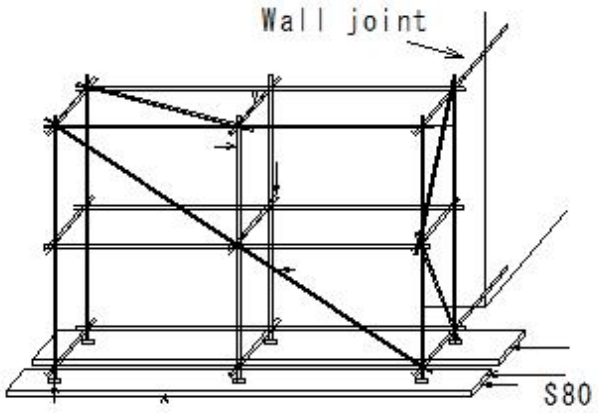
(S772)Scaffolding

(S772)Scaffolding

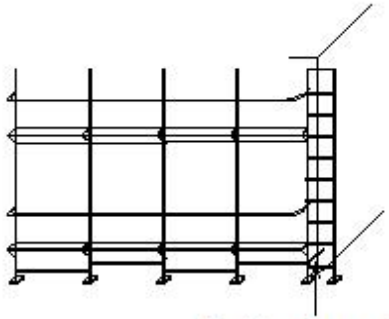
Safety work such as assembling scaffolding

Special training completed

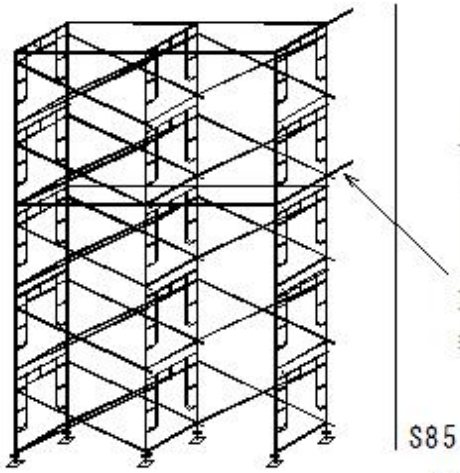
① Work for assembling, dismantling or modifying scaffolding



S80



S83



S85

S86

(S773)Scaffolding

(S773)Scaffolding

Safe work such as assembling scaffolding

Work such as assembling scaffolding

○Assembling, dismantling or modifying suspended scaffolding, overhanging scaffolding or scaffolding with a height of 2m or more

① Inform workers of the timing, scope and order of assembly, dismantling or modification

② Do not allow anyone other than those involved to enter the work area

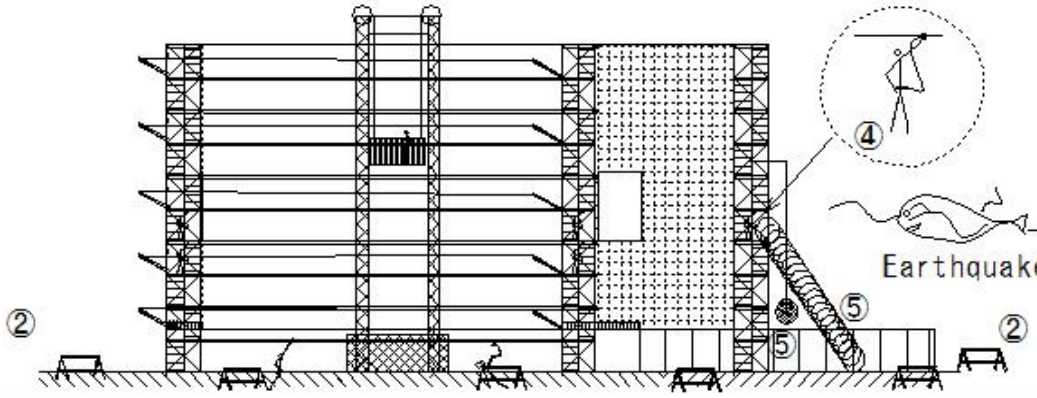
③ Stop work in bad weather

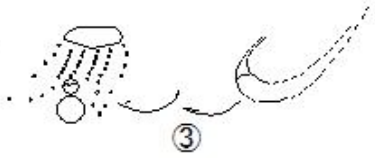
④ Workers: Take measures when fastening, removing, transferring, etc. scaffolding materials

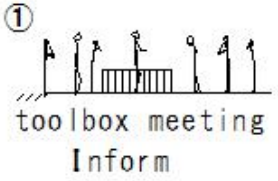
・Install a work floor with a width of 40cm or more

・Equipment for attaching safety harnesses etc., and workers are obligated to use safety harnesses.

⑤ In case of lifting and lowering materials, equipment, tools, etc., use fishing nets, fishing bags, etc.







S436

(S774)Scaffolding

(S774)Scaffolding

Safety work such as assembling scaffolding

Inspection

○ Before starting work, check whether the scaffolding fall prevention equipment has been removed. In case of an abnormality is found, repair it immediately.

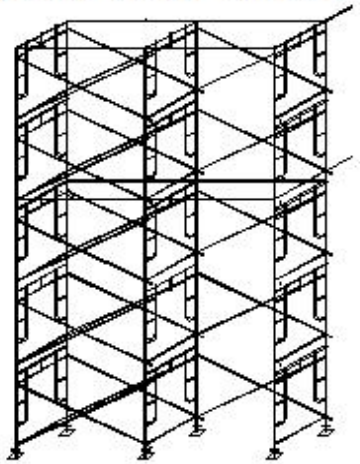
a: Frame scaffolding

① Cross braces and battens with a height of 15 cm to 40 cm, or baseboards with a height of 15 cm or more

② Handrail frame

b: Other than frame scaffolding

Handrails and center piers with a height of 85 cm or more



a: Frame scaffolding

S85

S86

② Handrail frame

Handrails, height 75cm or more

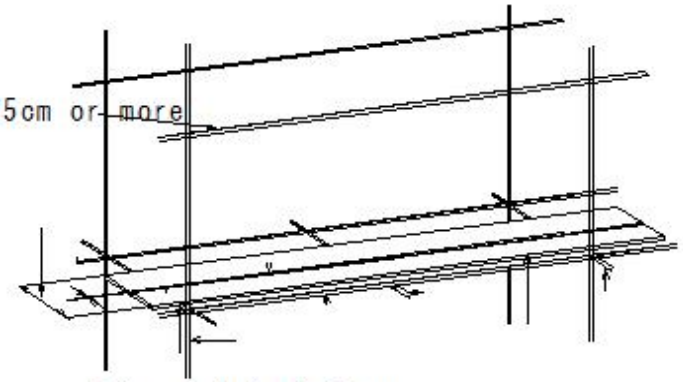


Fig. 3.9 Work floor

S87

(S775)Scaffolding

(S775) Scaffolding

Safety work such as assembling scaffolding

Inspection

○ After bad weather, a moderate earthquake or greater, or after assembling, partially dismantling, or changing scaffolding

Check the following items before starting work on the scaffolding

Immediately repair any abnormalities

① Damage to flooring, installation, and span condition

② Looseness in fastenings, connections, and installations of the vertical supports, horizontal supports, arms, etc.

③ Damage and corrosion condition of fastening fittings, etc.

④ Removal and falling off of the above-mentioned scaffold fall prevention equipment, etc.

⑤ Installation condition and removal or removal of baseboards, etc.

⑥ Subsidence and sliding condition of legs

⑦ Installation condition and falling off of reinforcing materials such as braces, braces, wall connections, etc.

⑧ Damage to the vertical supports, Horizontal supports, and arms

○ In case of an inspection is conducted after bad weather, etc., the results and measures taken are recorded and kept (until the work is completed)

(S776)Scaffolding

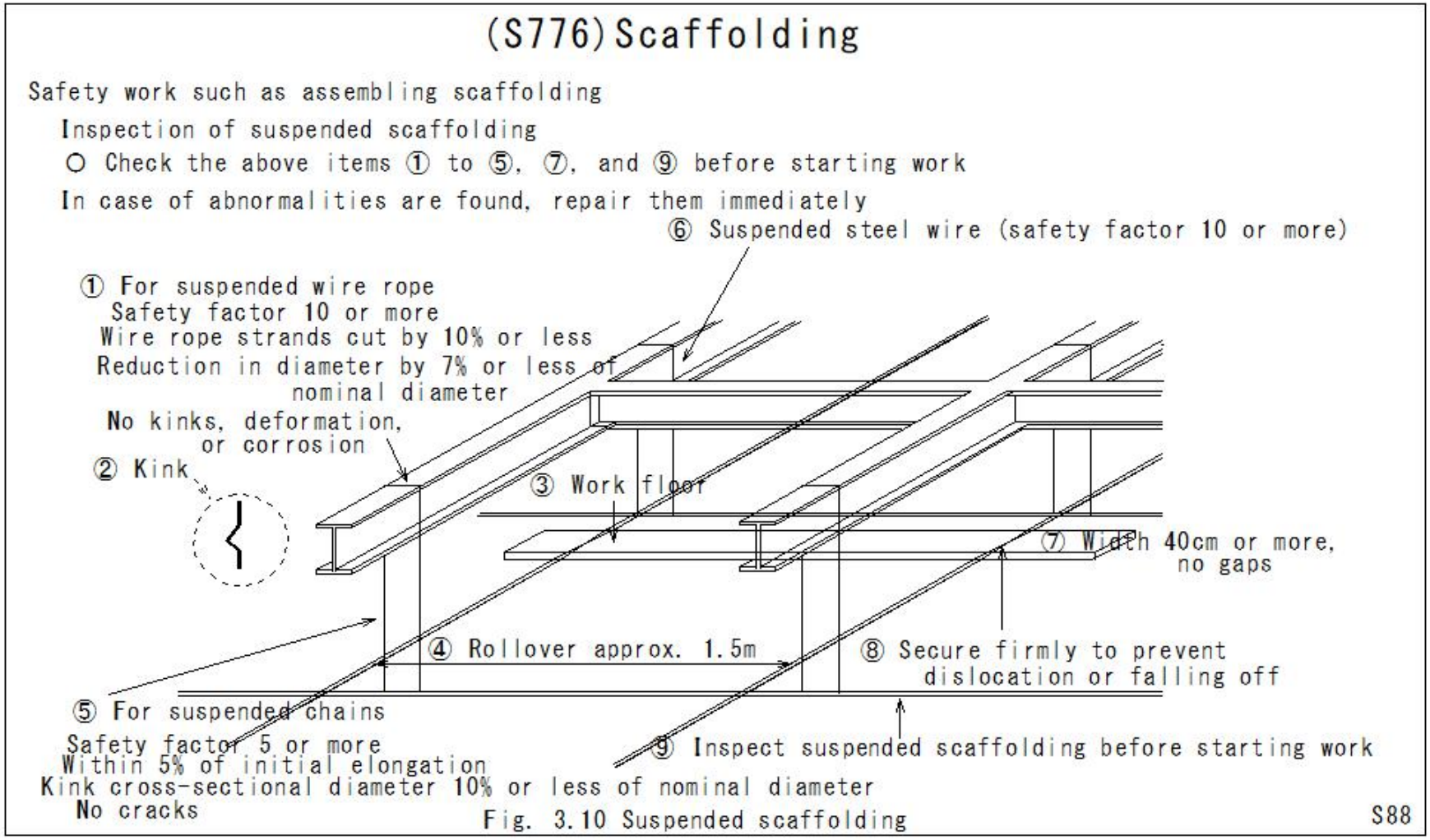


Fig. 3.10 Suspended scaffolding

(S777)Scaffolding

(S777)Scaffolding

Management of the work floor of the scaffold

Work floor

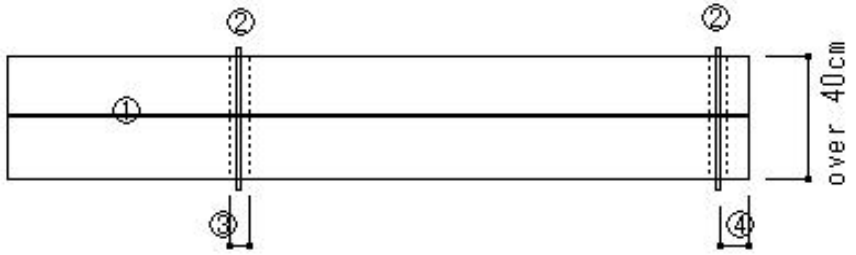
In work areas with a height of 2m or more, a work floor as specified below must be provided

① In case of using standard scaffolding boards
Scaffolding boards are supported at three points
or both ends are fastened to supports

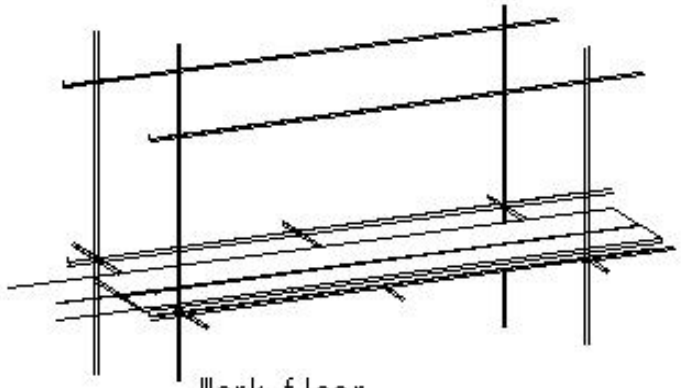
② Both ends are fastened to supports

③ Overlap 20cm or more

④ Protruding parts are 10cm or more and 1/18 or less of the length of the scaffolding board



Work floor



Work floor

S87

(S778)Scaffolding

(S778)Scaffolding

Management of the work floor of the scaffold

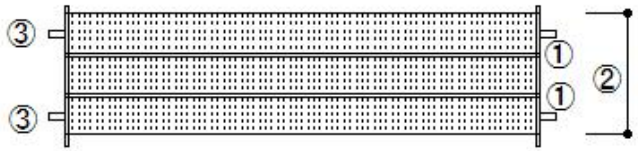
Work floor

②In case of using steel cloth plates

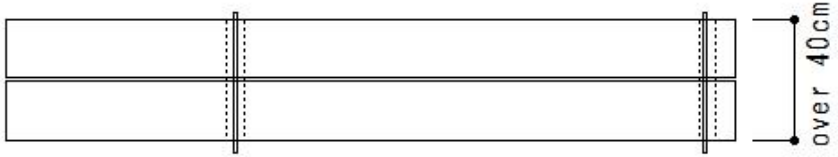
①Gap of 3cm or less

②40cm or more

③Both ends are fixed to supports with nails

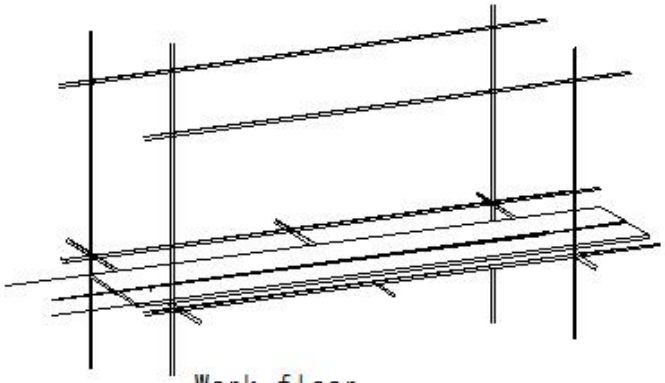


Work floor



S776

Work floor



Work floor

S87

(S779)Scaffolding

(S779) Scaffolding

Management of the scaffolding work floor

③Prevention of falls on the work floor

a. Frame scaffolding

①Cross braces and battens between 15cm and 40cm high, or baseboards over 15cm high

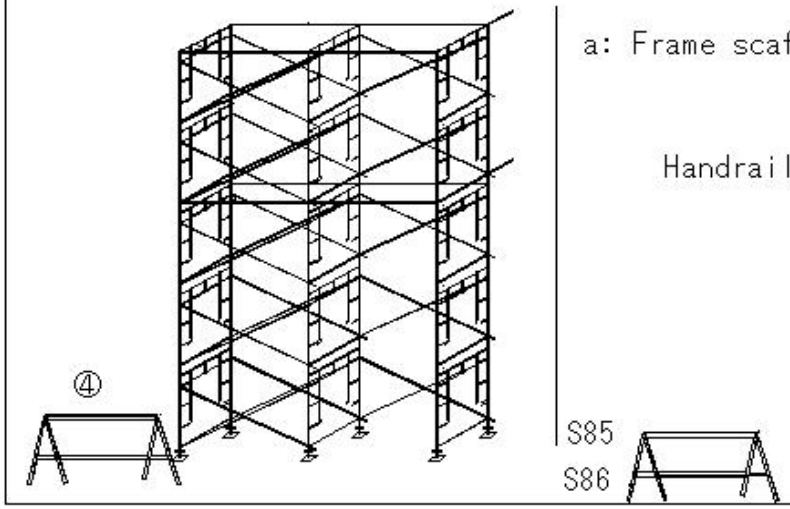
②Handrail frame

b. Other than frame scaffolding

Handrails and central piers over 85cm high

③Install safety belt attachment equipment and instruct workers to use safety belts

④Prohibit entry to anyone other than relevant workers



a: Frame scaffolding

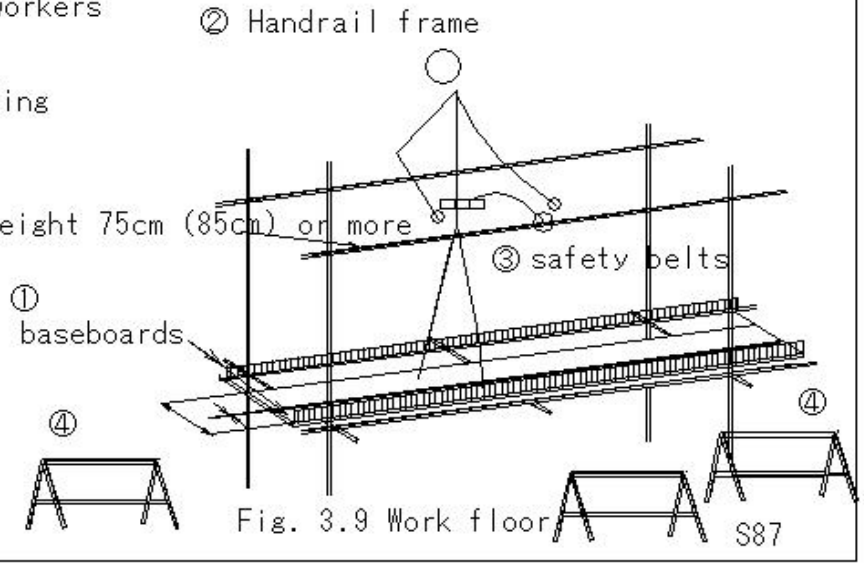


Fig. 3.9 Work floor

(S780) Scaffolding

Management of scaffolding work floor

④Prevent objects from falling

Install baseboards, mesh sheets, or protective nets that are at least 10 cm high

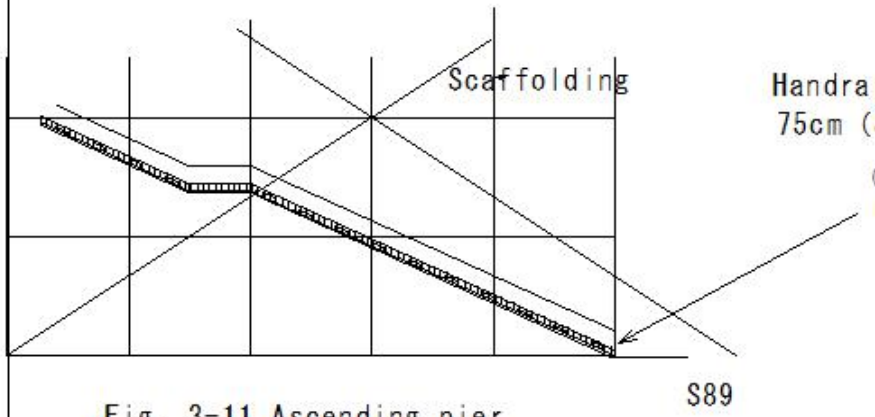


Fig. 3-11 Ascending pier

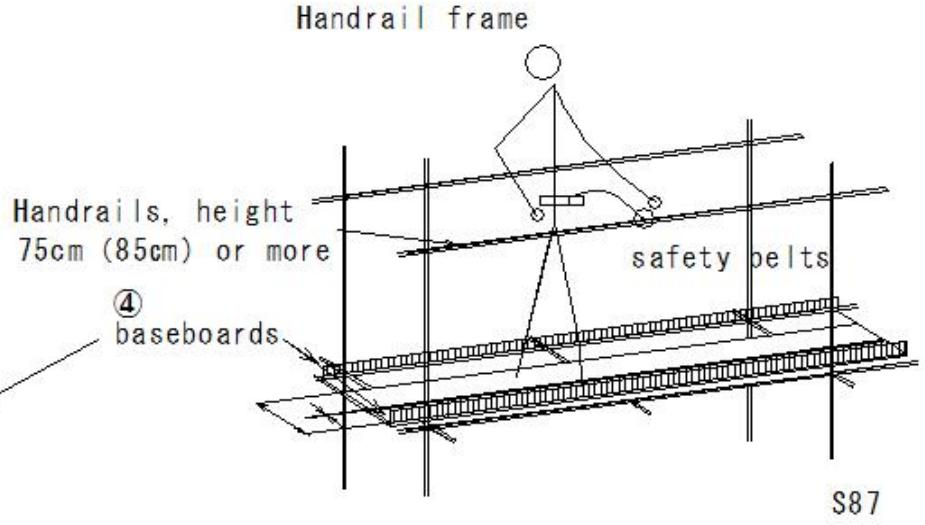
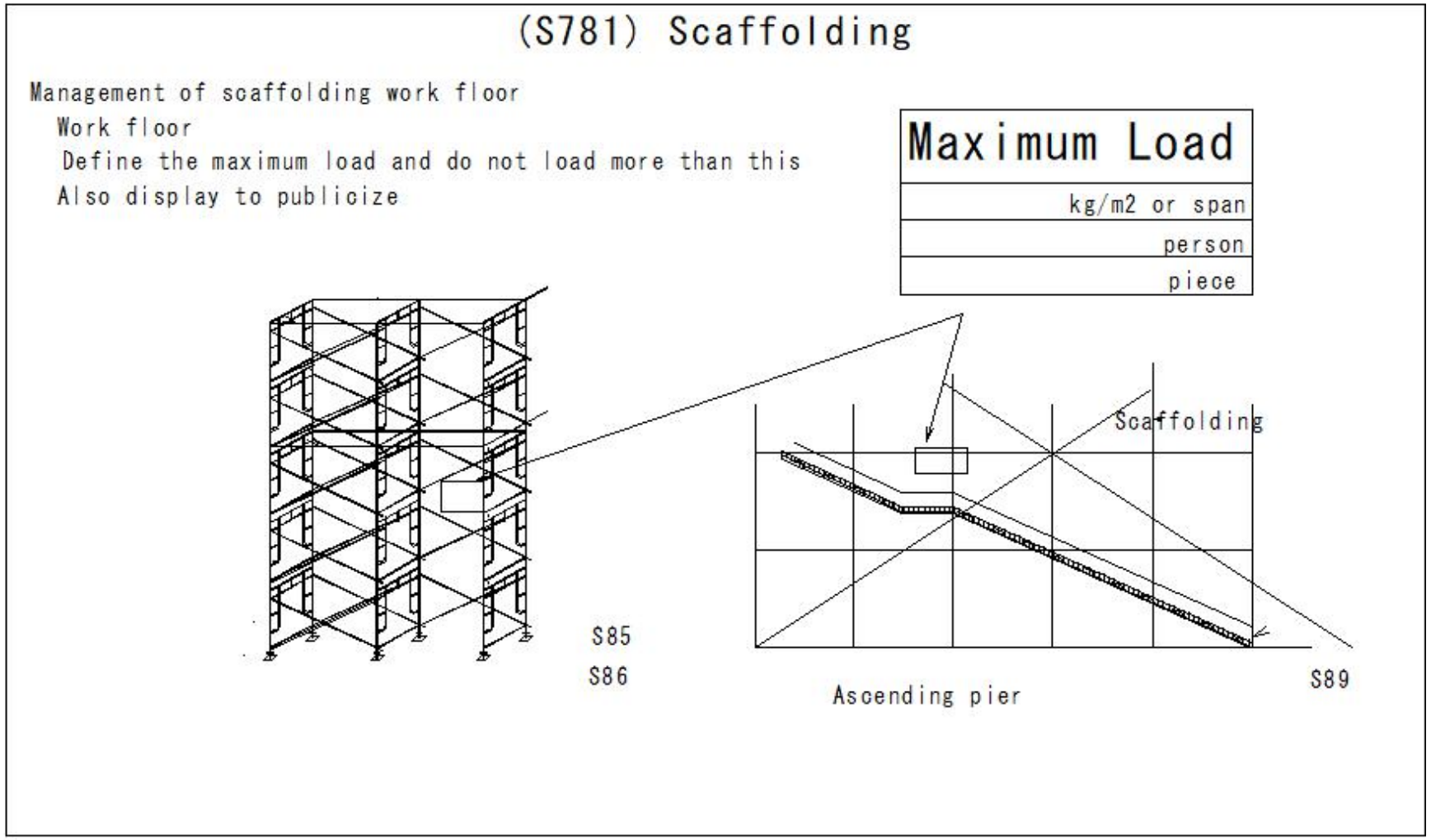


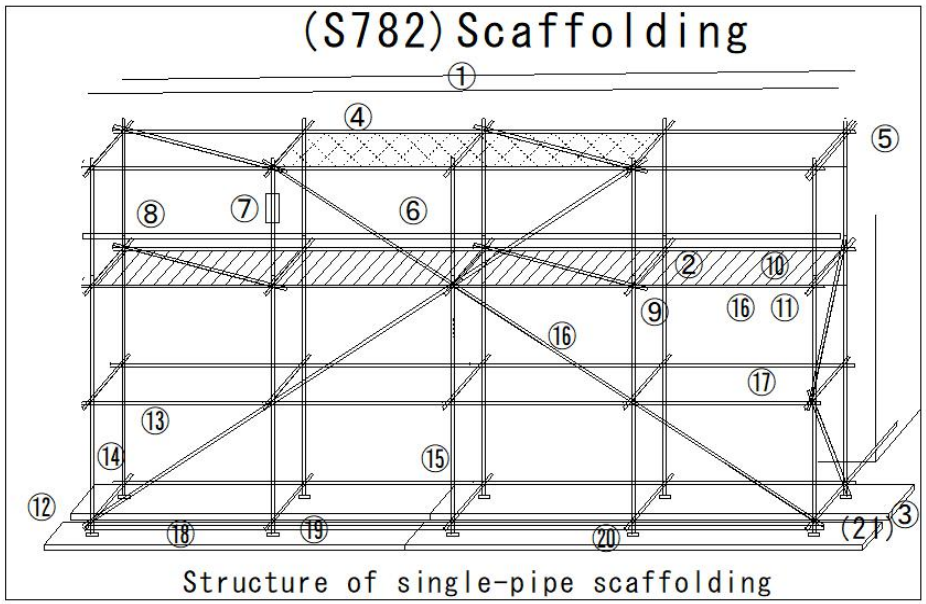
Fig. 3.9 Work floor

(S781) Scaffolding

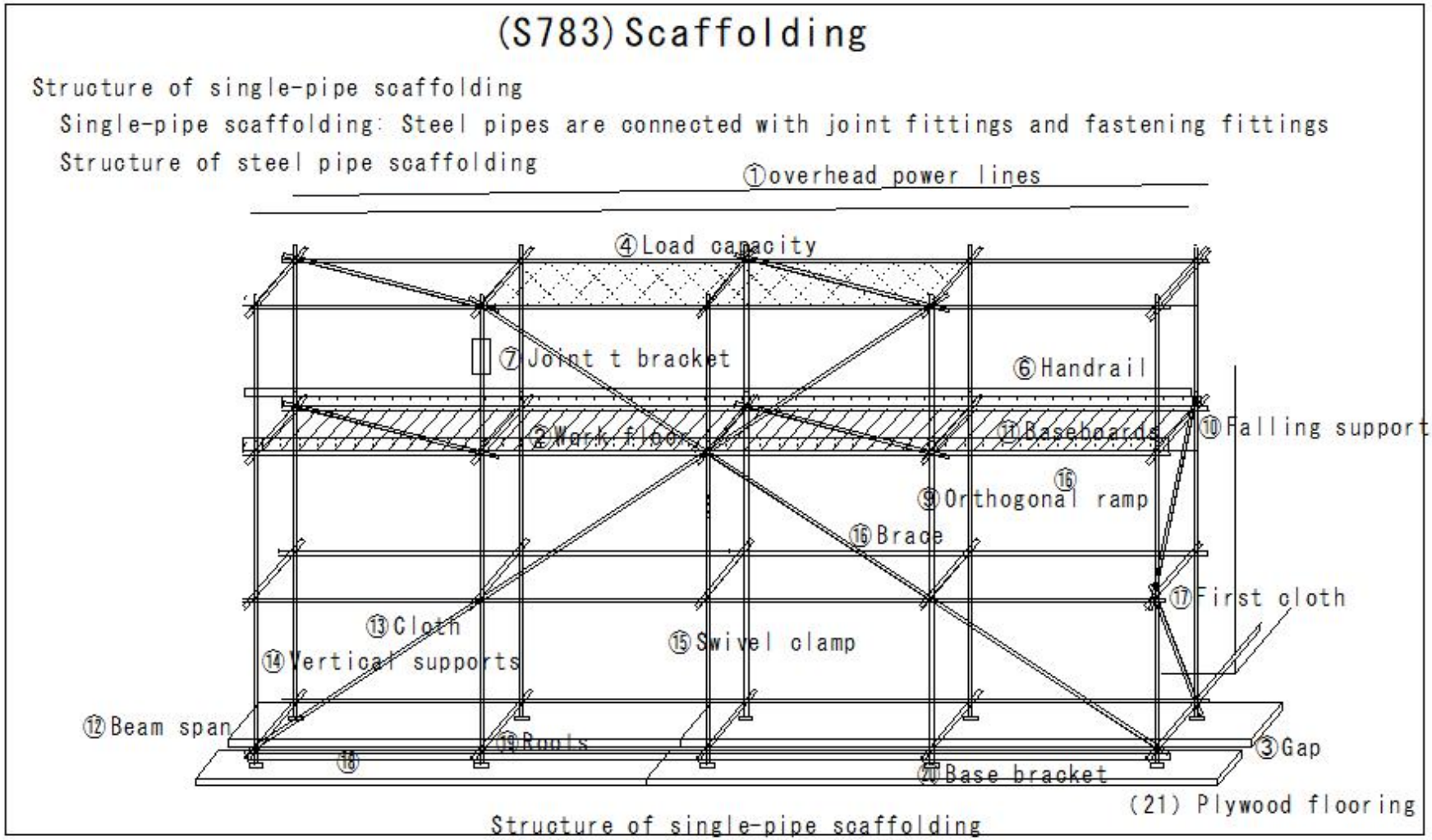


(S782)Scaffolding

(S782)Single-pipe scaffolding
Structure of single-pipe scaffolding
Single-pipe scaffolding: Steel pipes are connected with joint fittings and fastening fittings
Structure of steel pipe scaffolding
①Prevent contact with nearby overhead power lines
②Work floor: Width ≧ 40cm
③Gap ≦ 3cm
Gap between flooring and vertical supports is less than 12cm
④Load capacity between vertical supports does not exceed 40(
⑤Reinforce vertical supports if height exceeds 31m
⑥Handrail: Height 85cm or more
⑦Joint t bracket
⑧35-50cm high
⑨Orthogonal ramp
⑩Falling support
⑪Places where objects may fall: baseboards 10cm or taller
⑫Beam span direction: 1.5m or less
⑬Horizontal supports: Single pipe
⑭Vertical supports: Single pipe
⑮Swivel clamp
⑯Brace Approx. 10m
⑰First Horizontal supports above ground is 2m or less
⑱1.85m or less: Beam direction
⑲Roots：Secure connection with connecting,
fastening, and accessory brackets
Joint brackets should be randomly joined as much as possible
⑲Roots
⑳Base bracket
㉑Plywood flooring
㉒Instructions on fall prevention



(S783)Scaffolding



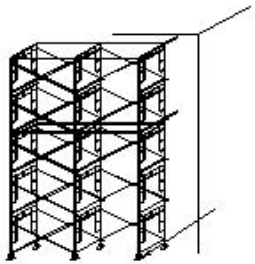
(S784)Scaffolding

Structure of single-pipe scaffolding

Wall connection interval

Type of scaffolding	V/H
①Frame scaffolding	9/8m or less
②Single-pipe scaffolding	5/5.5m or less
③Single-pipe one-sided scaffolding	5/5.5m or less

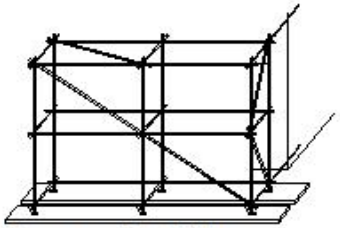
①



Frame scaffolding

S85

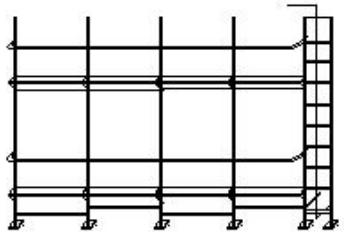
②



Main scaffolding
made of steel pipes

S80

③



One-sided scaffolding
made of steel pipes

S83

(S785)Scaffolding

(S785)Scaffolding

Structure of frame scaffolding

Structure of steel pipe scaffolding

①Prevention of contact with nearby scaffolding for overhead power lines
Relocation or insulation of overhead power lines

②Central crosspiece(Middle bars) ③Handrail column

④Handrail ⑤Wall connection fittings

⑥Gable handrail ⑦Steel Horizontal board

⑧crosspiece: At a height of 15-40cm

⑨ In principle, 45cm or less

⑩ Baseboard: 15cm or more in height

⑪ Places where objects may fall:
Baseboards 10cm or more in height
or mesh sheet protection netting, etc.

⑫ Main frame H≦2m ⑬ Bracing

⑭ Building frame

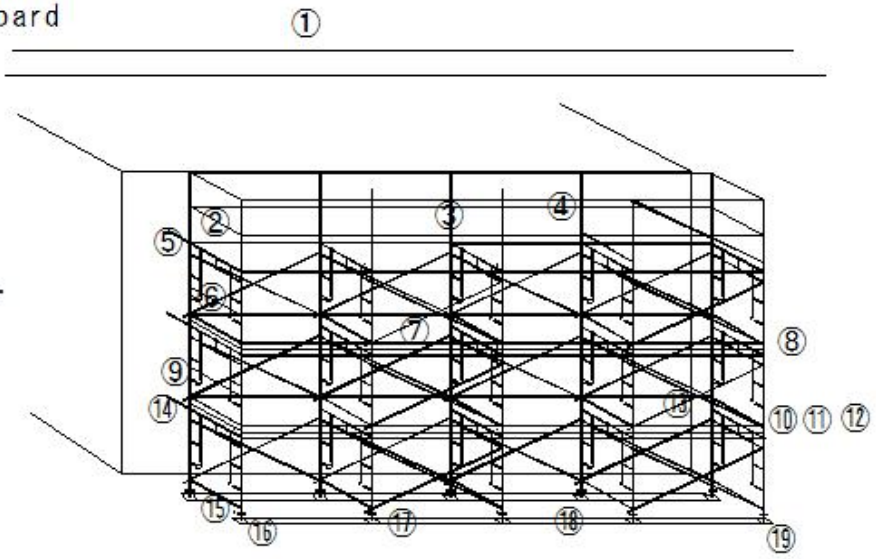
⑮ Beam span direction W≦1.5m

⑯ Jack base

⑰ Plywood flooring Root ties

⑱ Beam row direction L≦1.85m

⑲ Prevents legs from sliding or sinking



Frame scaffolding

S85

(S786)Scaffolding

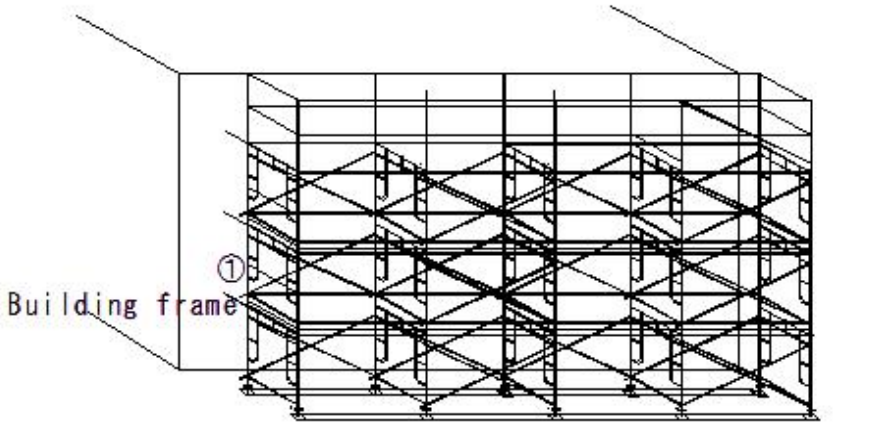
(S786)Scaffolding

Structure of frame scaffolding

Structure of frame scaffolding

Allowable load of building frame

①For standard frame, 4350kgf/frame, for simple frame, 3500kgf/frame



Frame scaffolding

S85
S785

(S787)Scaffolding

(S787)Scaffolding

Structure of frame scaffolding

Structure of frame scaffolding

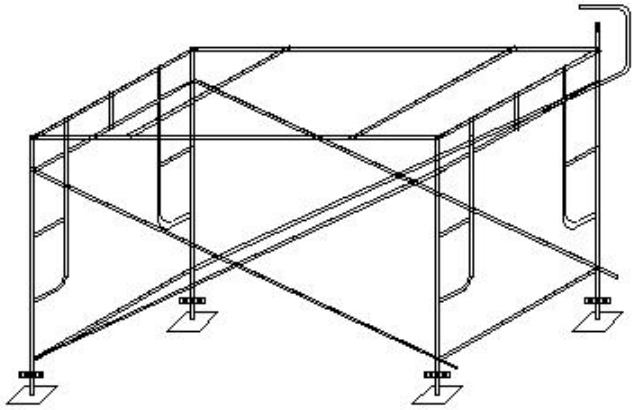
Setting the maximum load per span

①For standard frame W1200, 500kgf or less

For standard frame W900, 400kgf or less

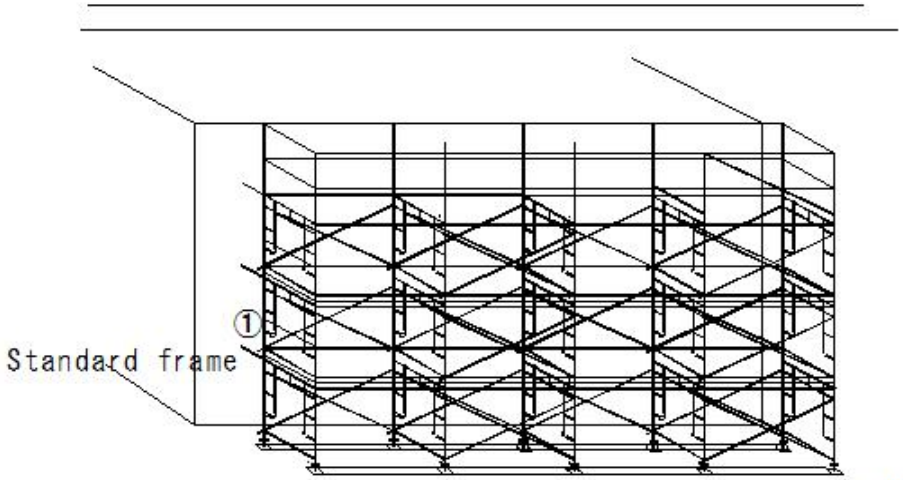
Simple frame, 250kgf or less

For simple frame for small-scale construction, 200kgf or less



Frame scaffolding

S84



Frame scaffolding

S85

S785

(S788)Scaffolding

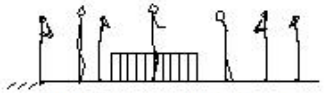
(S788)Scaffolding

Structure of frame scaffolding

Structure of frame scaffolding

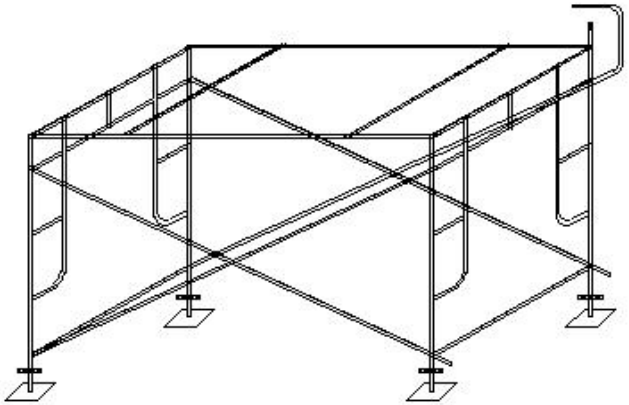
Inform workers of the maximum load

Maximum load



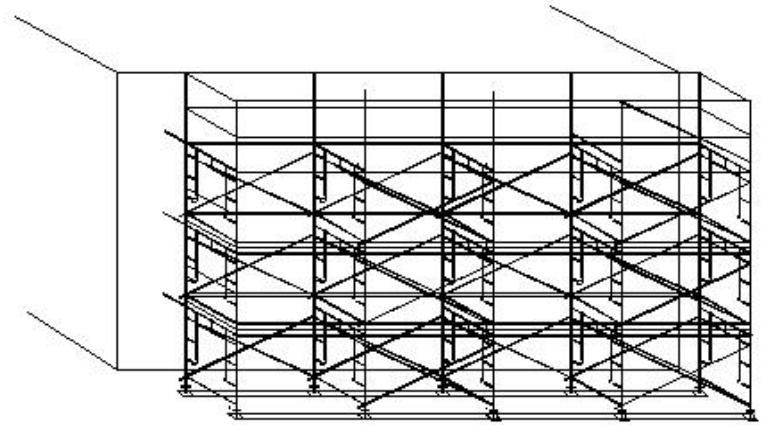
toolbox meeting

Inform



Frame scaffolding

S84

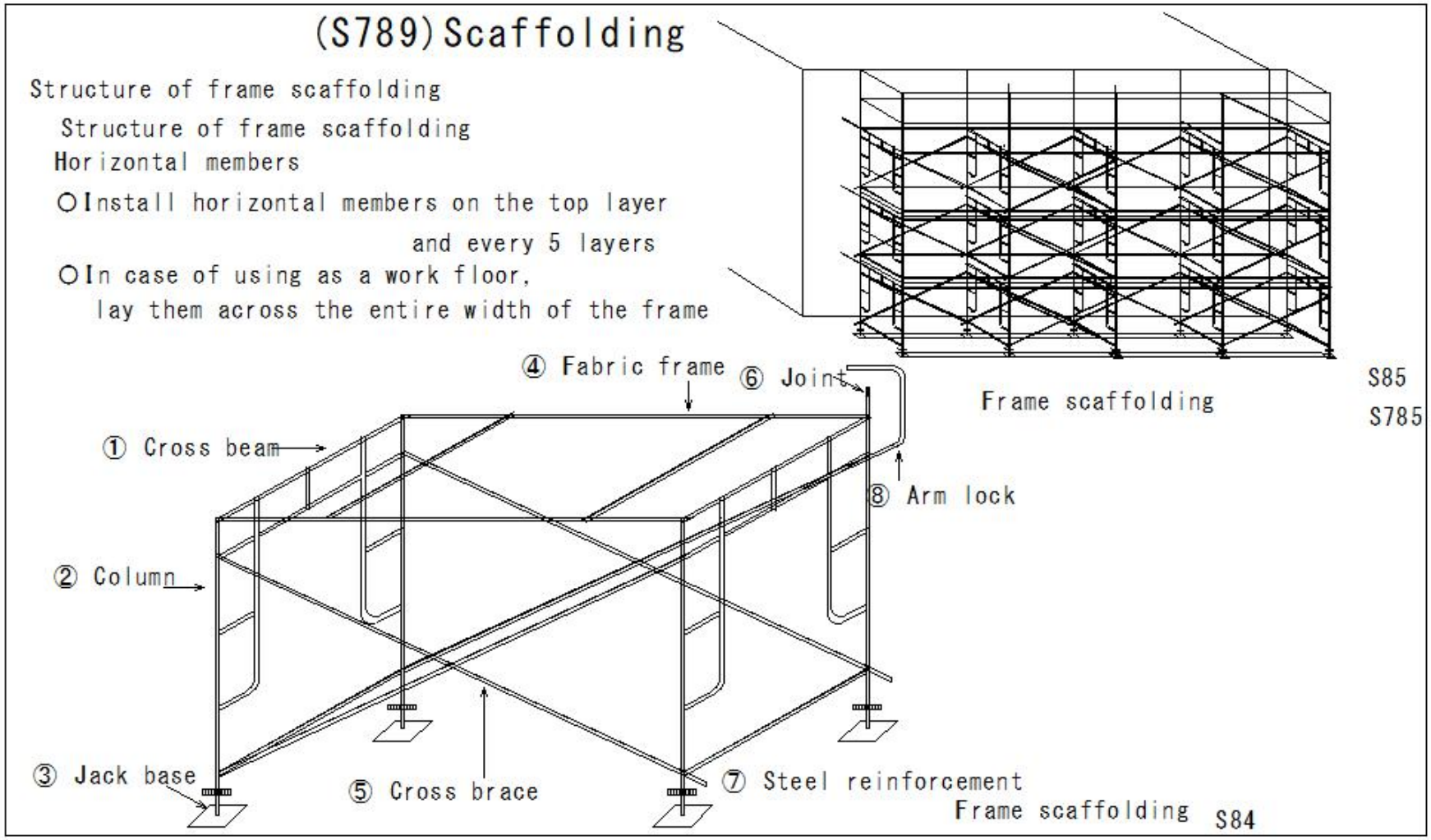


Frame scaffolding

S85

S785

(S789)Scaffolding



(S790)Scaffolding

(S790)Scaffolding

Configuration of one-sided/single-pipe scaffolding with brackets

One-sided scaffolding with brackets

① Load limit

W≦150kg per span per floor

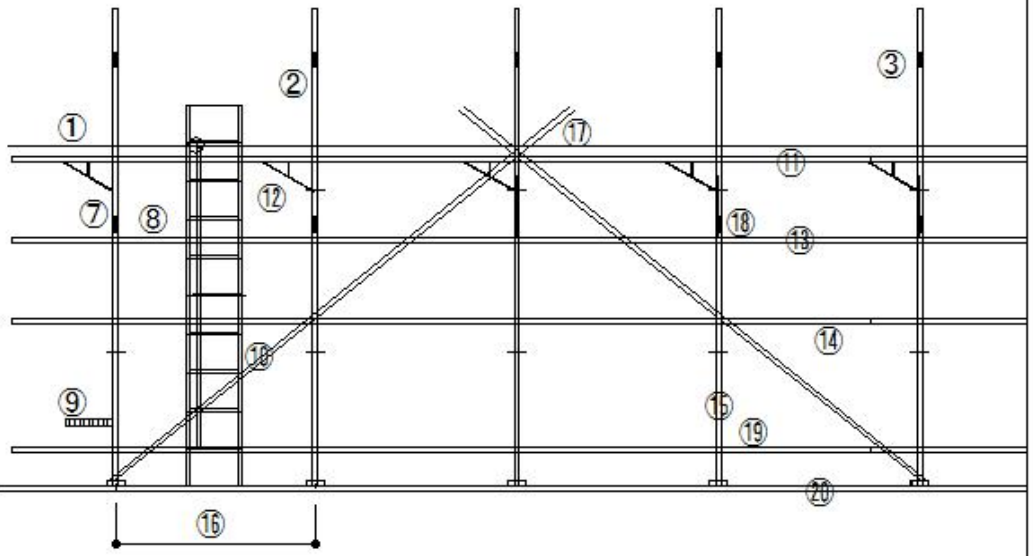
And W≦100kg per Vertical supports

Load limit when loading on each span

W≦100kg

In case of the height exceeds 31m,
reinforce with a set of two

① Horizontal supports
② Joint
③ Joint
④ 31m or less
⑤ 1.8m or less
⑥ 2.0m or less
⑦ Joint
⑧ Handrail
⑨ Wall connection fittings
⑩ Bracing
⑪ Scaffolding board
⑫ Bracket
⑬ Scaffolding board
⑭ Horizontal supports
⑮ Vertical supports
⑯ 1.85m or less
⑰ About 45°
⑱ Joint
⑲ Root tie
⑳ Plywood flooring



(S791)Scaffolding

(S791)Scaffolding

Configuration of one-sided/single-pipe scaffolding with brackets

One-sided scaffolding with brackets

②Scaffolding boards are fastened to each bracket, and overlapped on the brackets

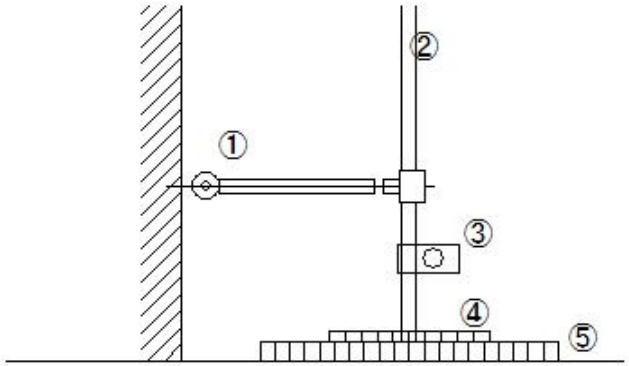
①Wall connection fittings

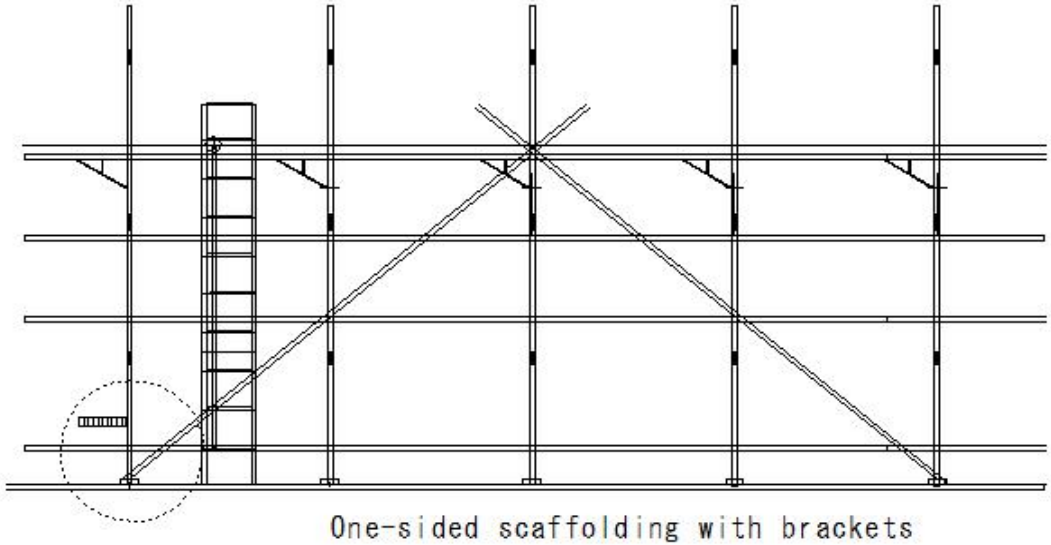
②Vertical supports (single pipe)

③Root connection (single pipe)

④Base fittings

⑤ Flooring





One-sided scaffolding with brackets

(S792)Scaffolding

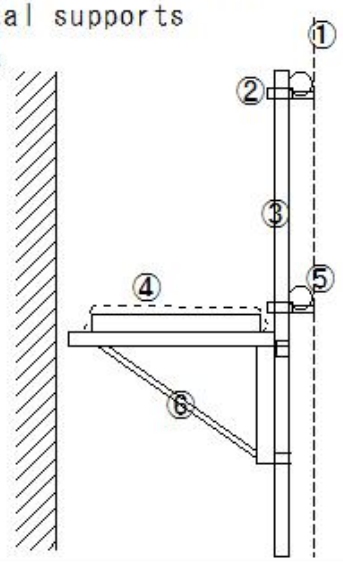
(S792)Scaffolding

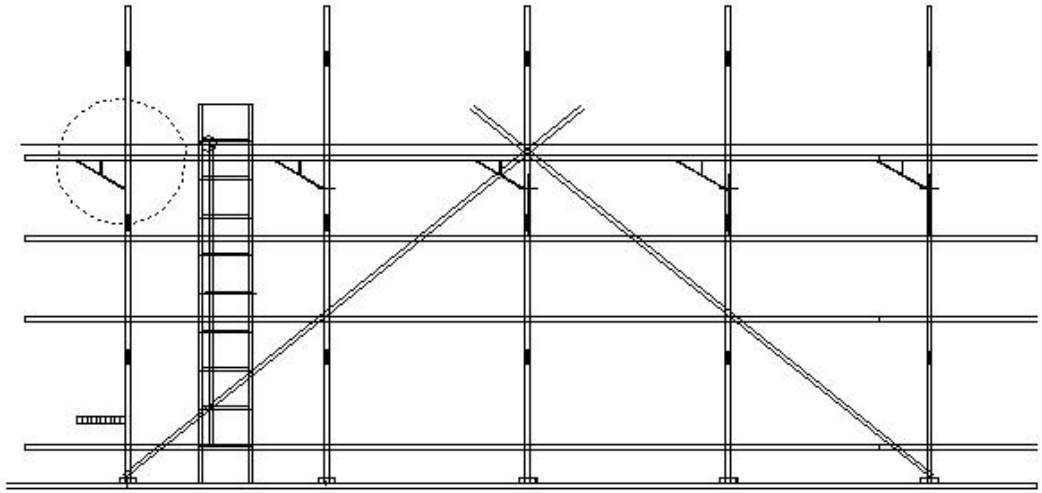
Configuration of one-sided/single-pipe scaffolding with brackets

One-sided scaffolding with brackets

③In case of laying mesh sheets, etc., reinforce the building site and wall connections based on strength calculations

①Mesh sheets, etc.
②Handrails
③Vertical supports
④Bundled scaffolding boards
⑤Horizontal supports
⑥Brackets





One-sided scaffolding with brackets

(S793)Scaffolding

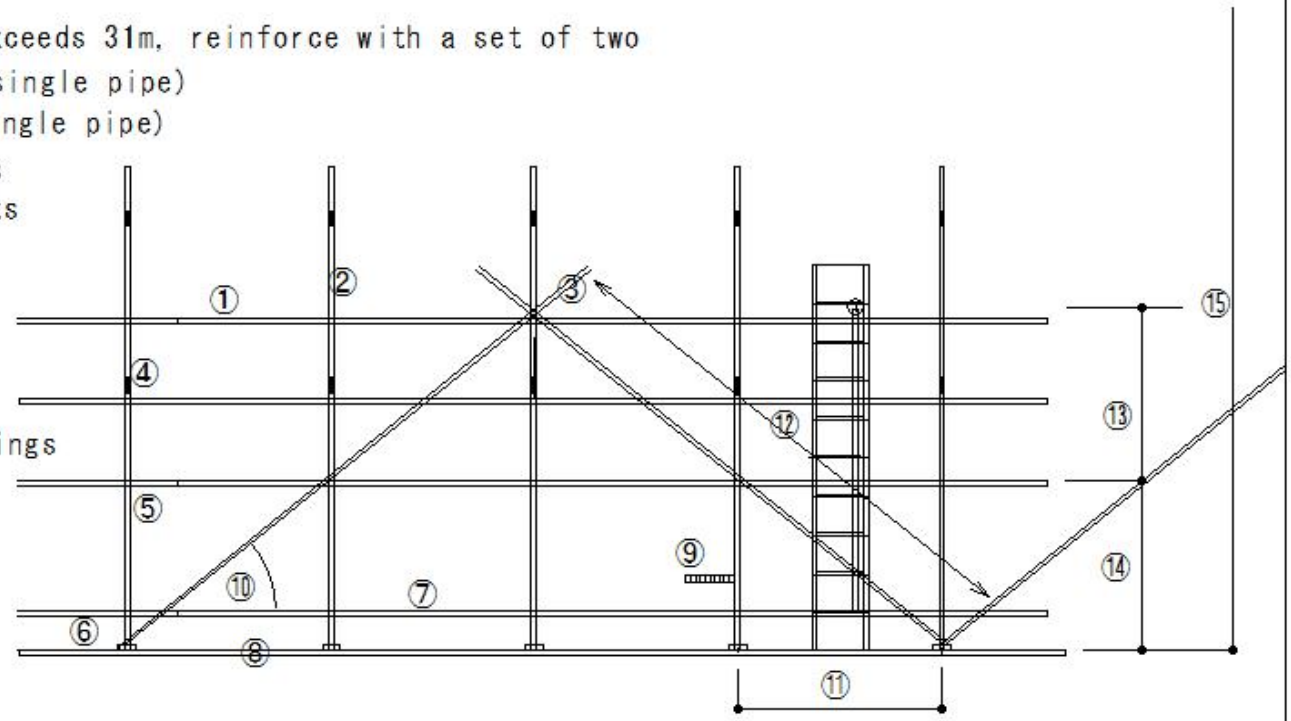
(S793)Scaffolding

Configuration of one-sided/single-pipe scaffolding with brackets

Single-pipe scaffolding

In case of the height exceeds 31m, reinforce with a set of two

① Horizontal supports(single pipe)
② Vertical supports (single pipe)
③ Reinforce with braces
④ Avoid gathering joints
⑤ Orthogonal slump
⑥ Base metal fittings
⑦ Root ties
⑧ Plywood flooring
⑨ Wall connection fittings
⑩ Braces, about 45°
⑪ Scaffolding boards
⑫ Approx. 10m
⑬ 1.8-1.7m
⑭ 2.0m or less
⑮ 31m or less



Single-pipe scaffolding

(S794)Scaffolding

(S794)Scaffolding

Configuration of a suspended scaffold

Suspended scaffold

①The use of defective wire ropes, sling chains, copper wires, and fiber ropes is prohibited

②Suspended wire ropes, etc. - secure installation

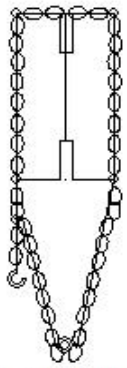
③The work floor must be at least 40 cm wide and have no gaps

④The flooring must be attached to the scaffolding girders, stirrups, etc. to prevent shifting or falling off

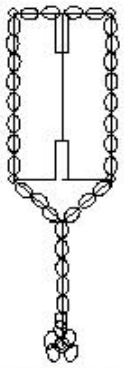
⑤Provide supports for the scaffolding girders, stirrups, and work floor to prevent shaking or shifting

⑥The connections and intersections of the girders of the shelf scaffold must be securely connected or fastening fittings, etc.

How to suspend a suspended shelf scaffold



Loop suspension



Single suspension

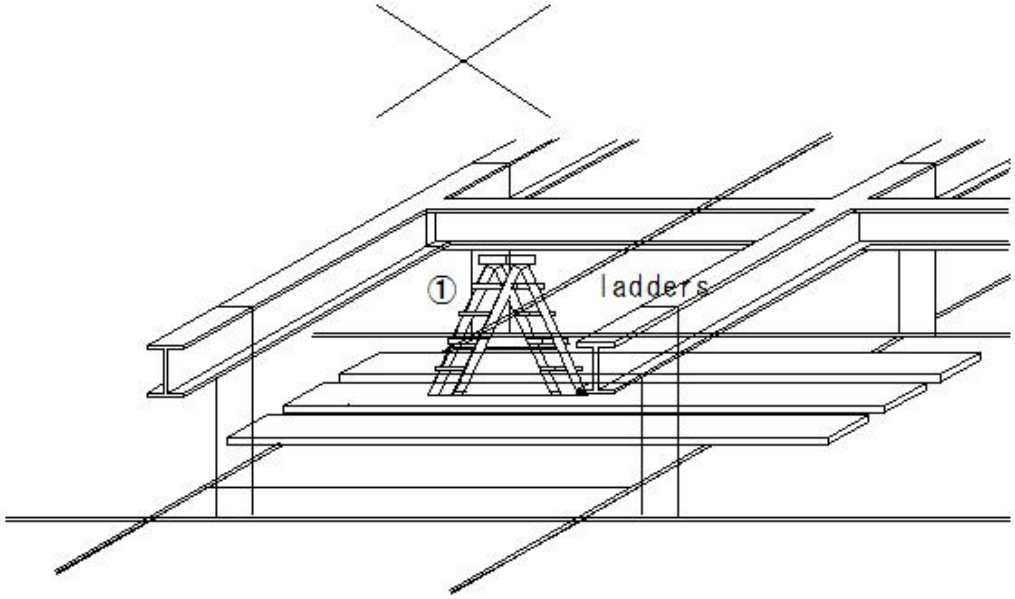
(S795)Scaffolding

(S795)Scaffolding

Configuration of suspended scaffolding

Work prohibited

①Do not use stepladders, ladders, etc. on suspended scaffolding



suspended scaffolding

S770
S88

(S796)Scaffolding

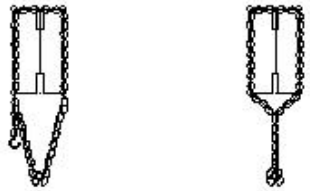
(S796)Scaffolding

Configuration of suspended scaffolding

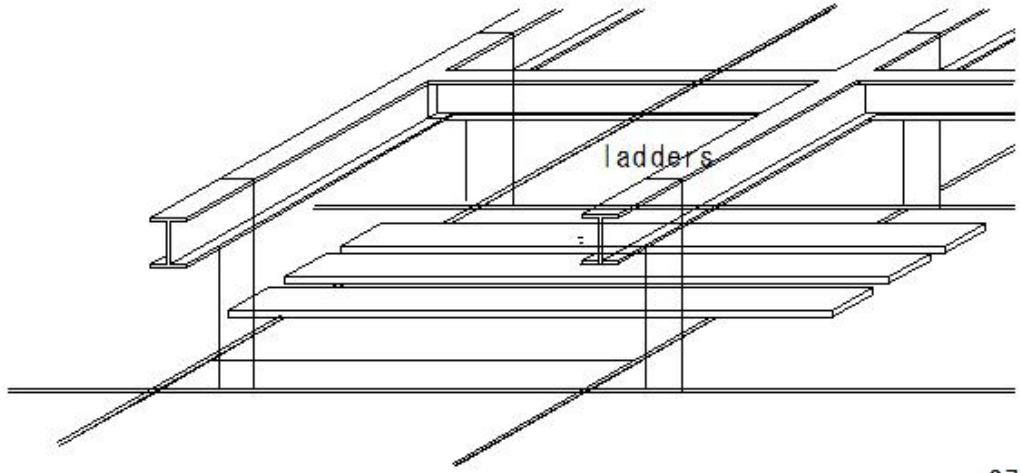
Safety factor of suspended scaffolding

Components of suspended scaffolding		Safety factor
①Suspension wire rope, suspension copper wire		10 or more
②Suspension chain, suspension block		5 or more
③Suspension copper belt, lower and	Steel	2.5 or more
upper supports of suspended scaffolding	Wood	5 or more

Loop suspension Single suspension



S794

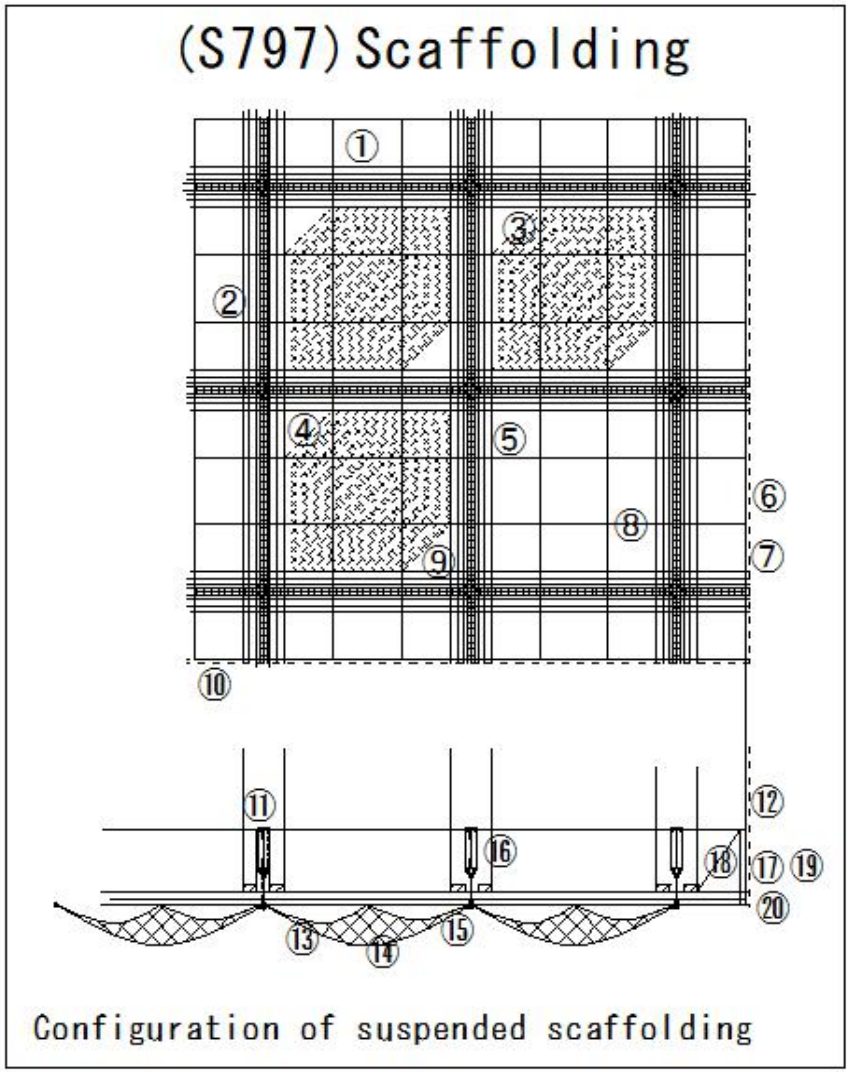


suspended scaffolding

S770
S88

(S797)Scaffolding

(S797)Scaffolding
Configuration of suspended scaffolding
Configuration of suspended scaffolding
①Rolling pipe, hanging chain (all hanging)
②Hanging chain
③Safety netting is installed all over the area
④Work floor, lay two scaffolding boards
⑤Tie up intersections
⑥Mesh sheeting on the periphery, etc.
⑦Handrails on the periphery
⑧Iron pipe @1800 or less
⑨Rolling pipe @1500 or less
⑩Handrails on the periphery Sliding height = 90cm
⑪ Suspension chain @ 1800 or less
⑫ Green netting around the perimeter, etc.
⑬ Iron pipe @ 1800 or less
⑭ Safety netting over the entire surface of each floor
Can also be installed on the top surface of the scaffolding
⑮ Rolling pipe @ 1500 or less
⑯ Suspension chain
⑰ Handrail, single pipe Pipe H = 90cm or less
⑱ Retainer
⑲ Middle crosspiece
⑳ Lay two scaffolding boards
≒1500
≒400-600



(S798)Scaffolding

(S798)Scaffolding

Safety work on rolling towers (mobile scaffolding)

Scaffolding assembly supervisor - Appointment

①Handrails (height 85cm or more, technically 90cm or more)

②Middle rail (height 35-50cm)

③Baseboard

④Handrail frame

⑤Baseboard (10cm or more, technical guidelines)

⑥Middle handrail

⑦Hatch-type Horizontal board

⑧Cross brace

⑨Connecting pin

⑩Stairs

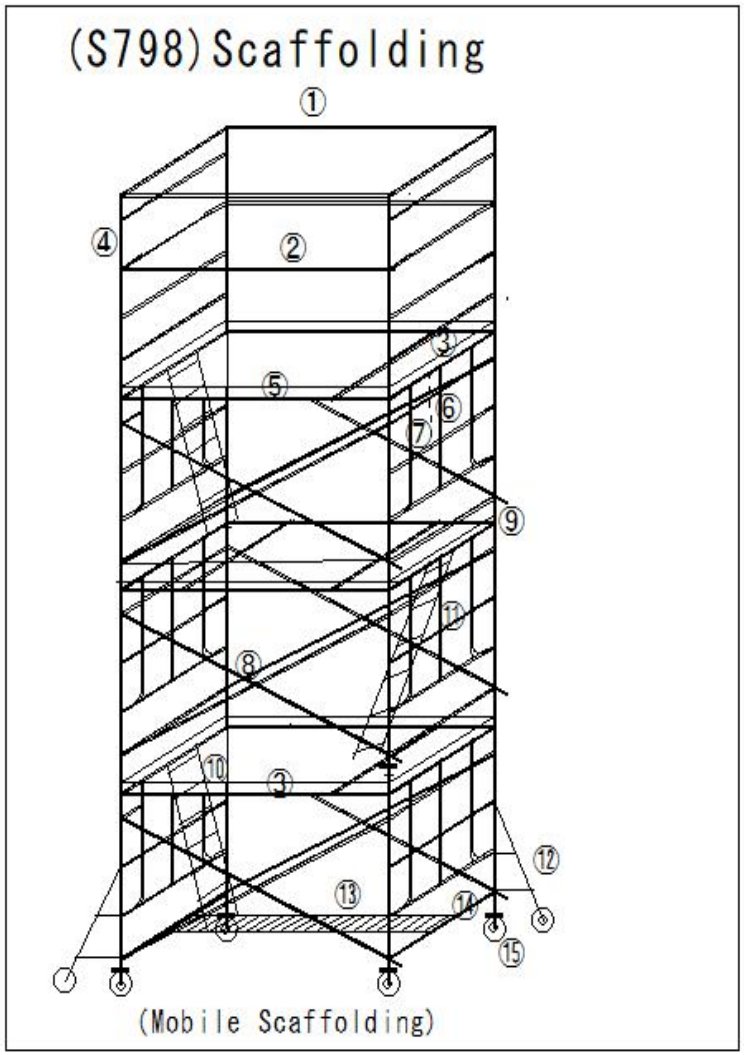
⑪Building frame

⑫Support frame

⑬Steel Horizontal supports

⑭Base pipe

⑮Caster with jack (leg wheel)



(S799)Scaffolding

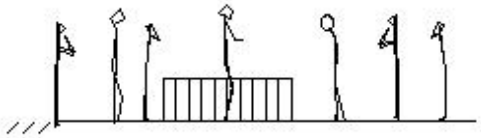
(S799)Scaffolding

Safety work on rolling towers (mobile scaffolds)

Work supervisor - designated

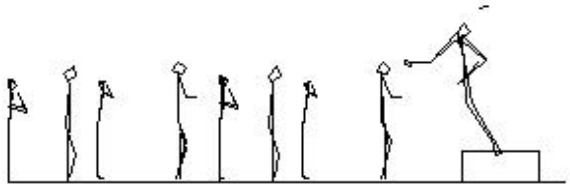
Work to assemble or change scaffolds less than 5m high

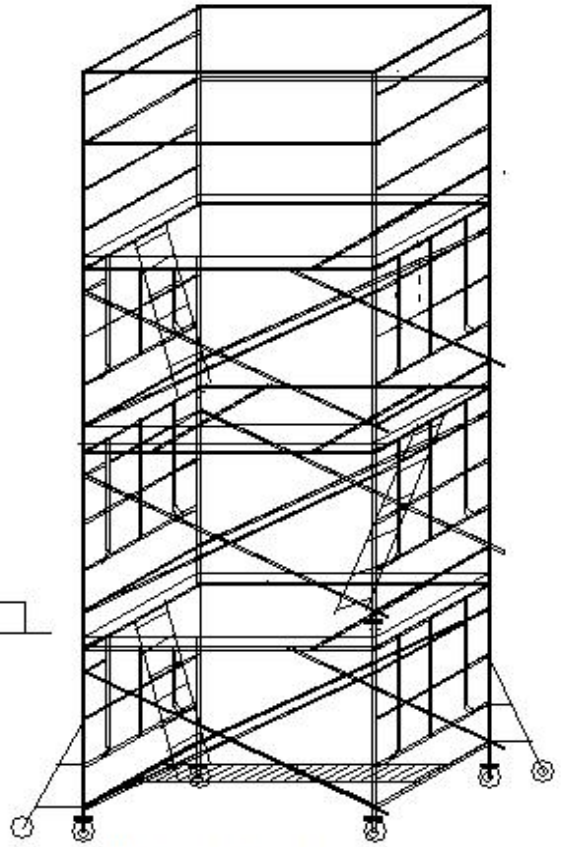
Work supervisor



toolbox meeting

Inform

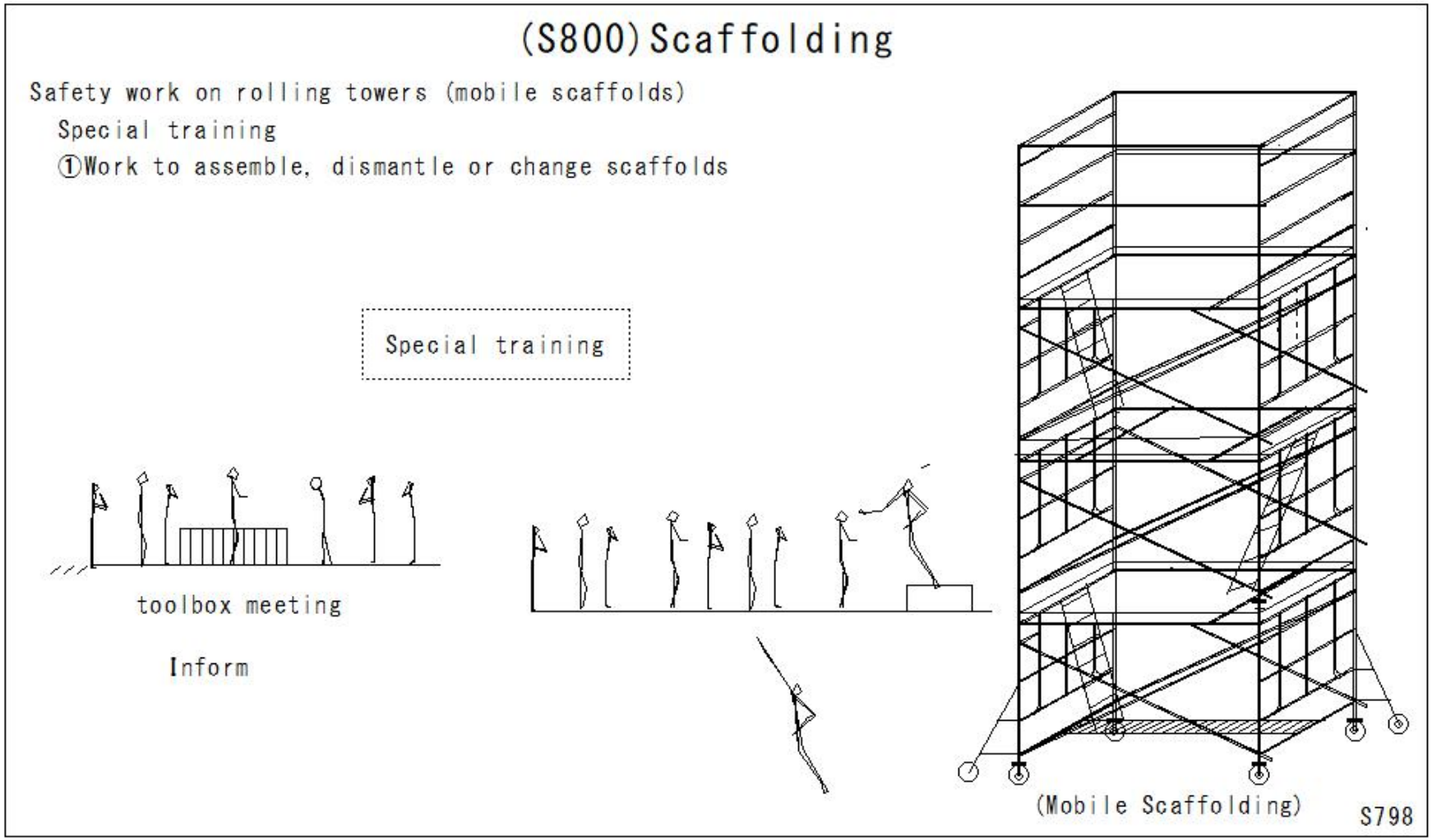




(Mobile Scaffolding)

S798

(S800)Scaffolding



(S801)Scaffolding

(S801) Scaffolding

Safety work on rolling towers (mobile scaffolds)

Precautions for use

①Do not move with a person on the platform

②Always install lifting equipment

③Always lock the wheels when using

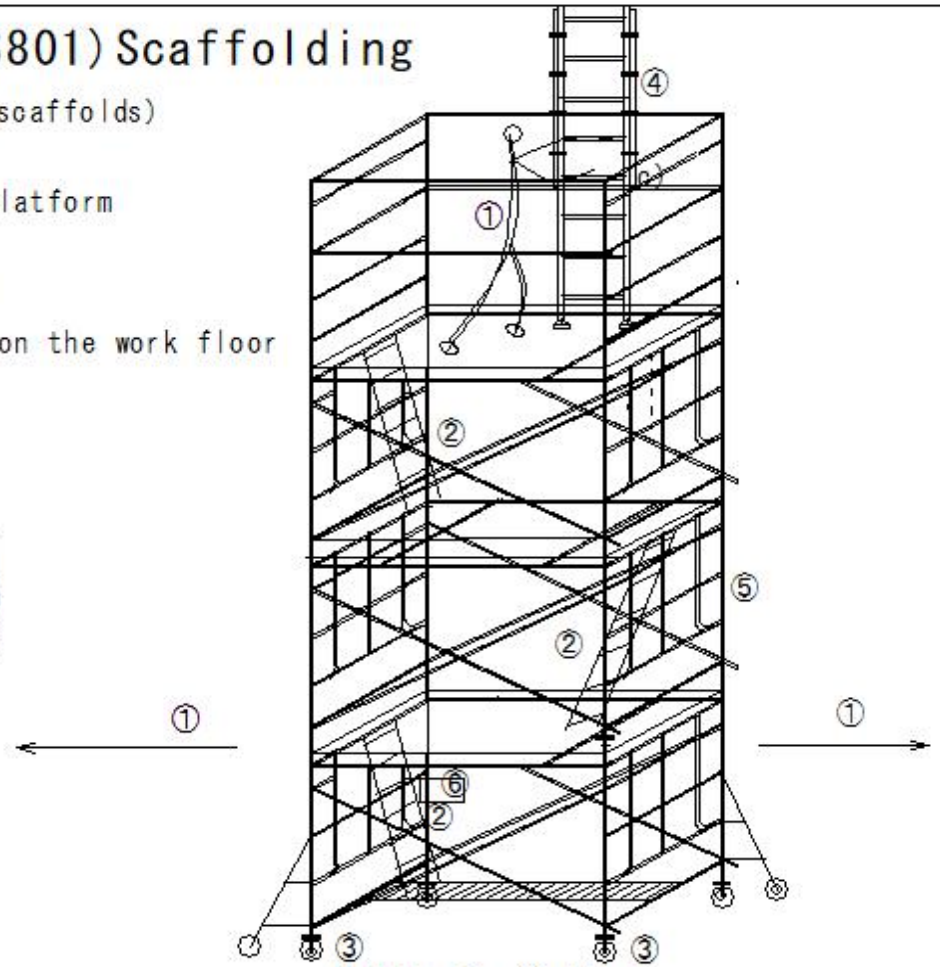
④Do not use stepladders or ladders on the work floor

⑤Materials and safety

⑥Maximum load capacity sign

⑥

Maximum Load
kg/m2 or span
person
piece



(Mobile Scaffolding)

S798

(S802)Scaffolding

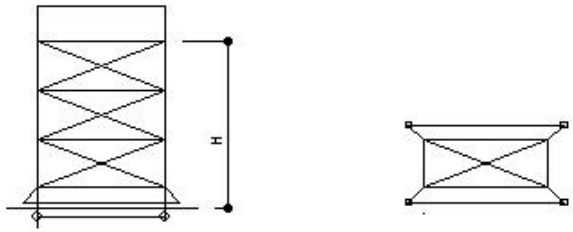
(S802) Scaffolding

Safety work on rolling towers (mobile scaffolds)
Relationship between height and support frame

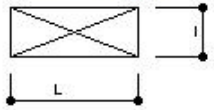
①In case of support frame is used

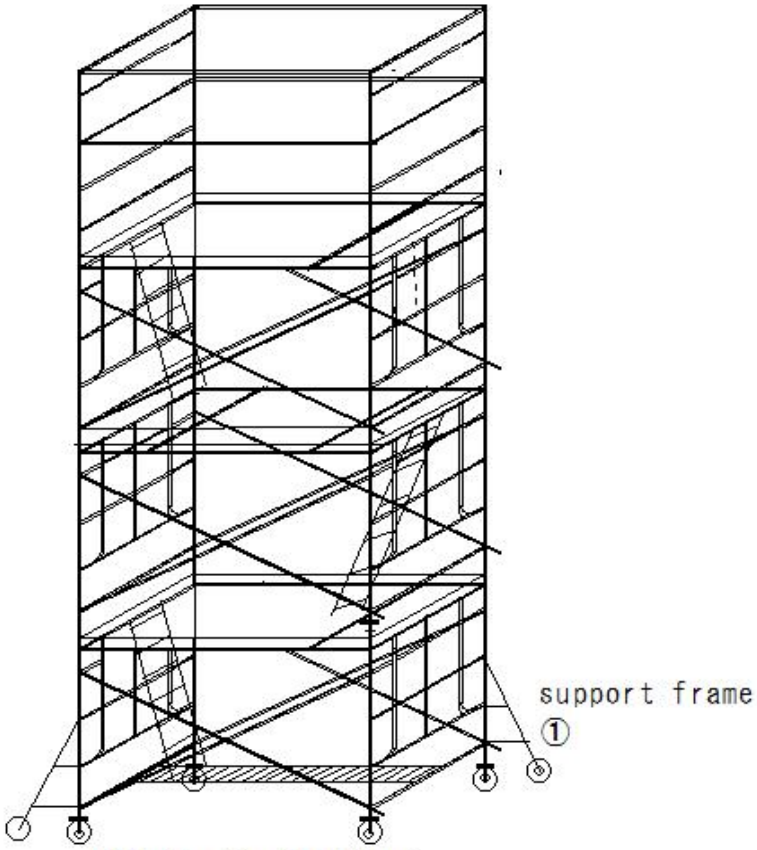
H: Height from the bottom of the leg ring to the work floor (m)

Support frame



②Do not use support frame



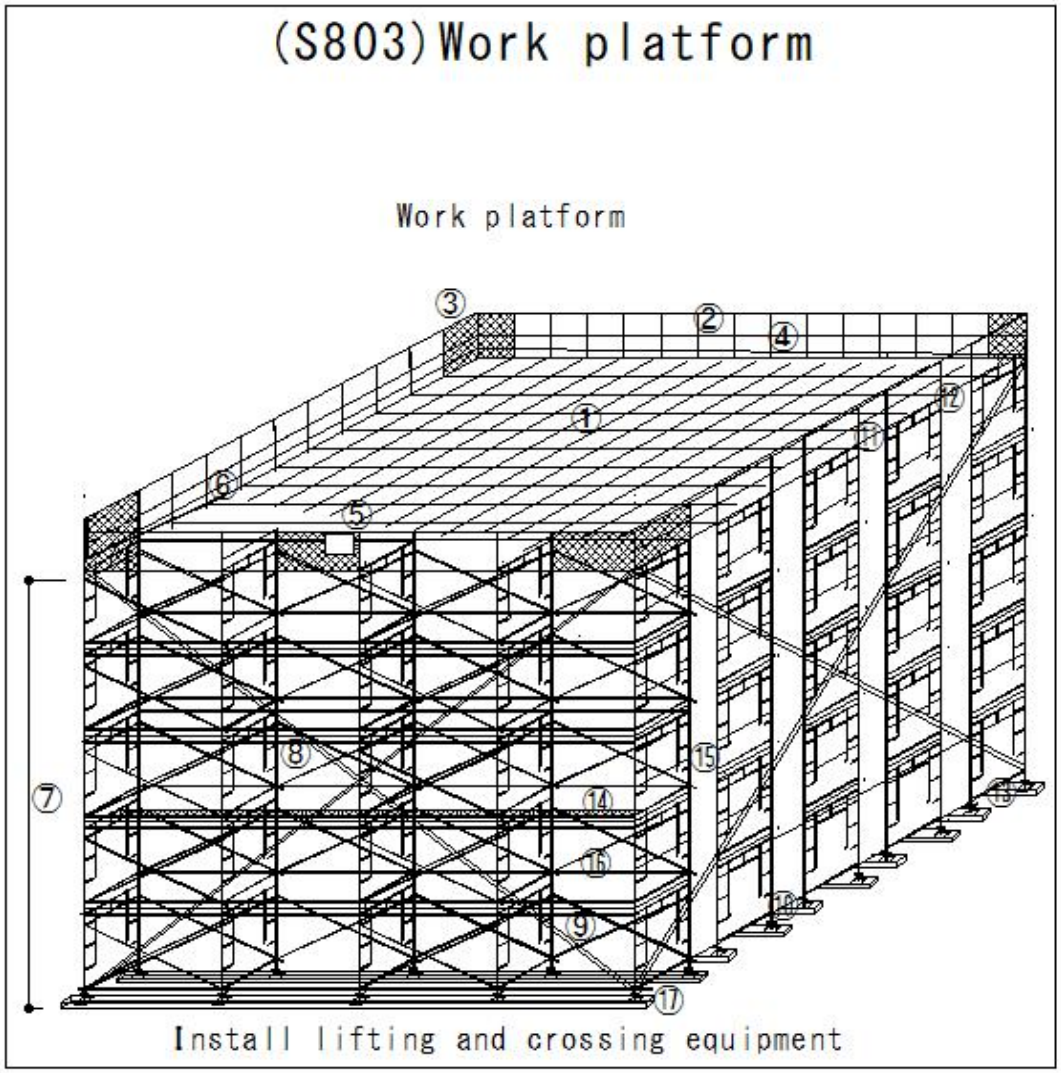


(Mobile Scaffolding)

S798

(S803)Work platform

(S803)Work platform
Safe work on a work platform
Work platform:
Consists of erection pillars and a work platform
For the purpose of installing
and moving materials ・machinery
Over 2m high Used in construction work
①Work platform
②Handrail H≧85cm
③Cover
④Middle rail
⑤Maximum load capacity display
Install in one or more locations
that are easily visible from inside and outside
⑥Baseboard
⑦Height 45m or less
⑧Horizontal ties
⑨Braces
⑩Root ties
⑪Baseboards
⑫Horizontal ties
Install on the top floor, at the ends
of every 5 floors or less, and every 5 frames or les
⑬Root ties
⑭Construction Horizontal boards
⑮Frame
⑯Braces
⑰Jack base



(S804)Work platform

(S804)Work platform

Safe work on work platforms

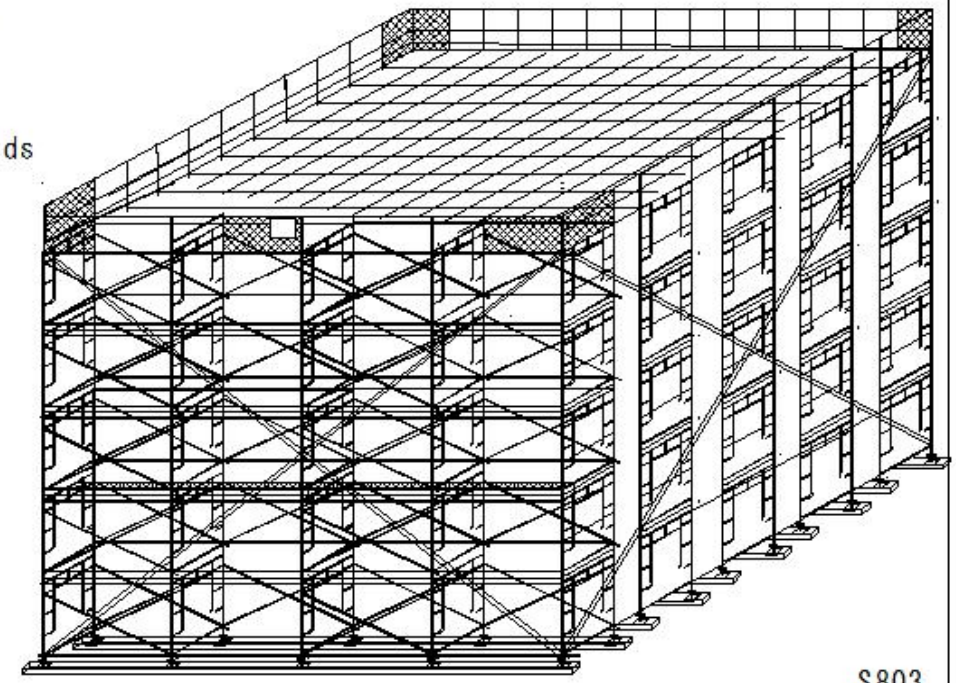
Work platforms

Materials, etc.

①Materials: Do not use materials that are damaged, deformed, or corroded

②Wood used: Free of cracks, insect damage, knots, or fiber inclinations

③Main steel materials used for for work platforms: Complies with standards



S803

(S805)Work platform

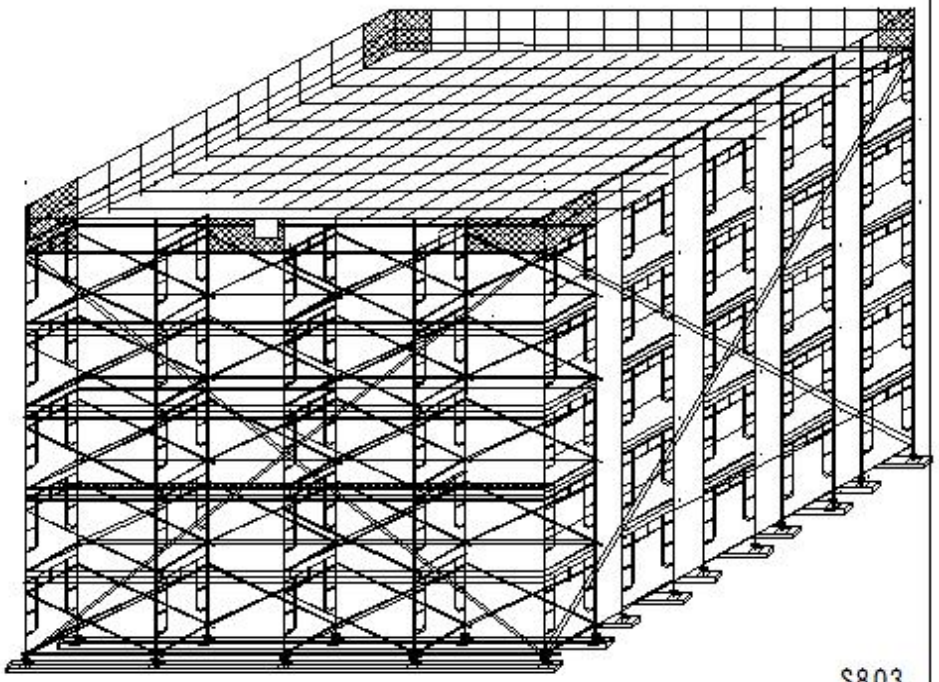
(S805)Work platform

Safe work on work platforms

Structure

①Structure that does not cause significant twisting or bending

Work platform



S803

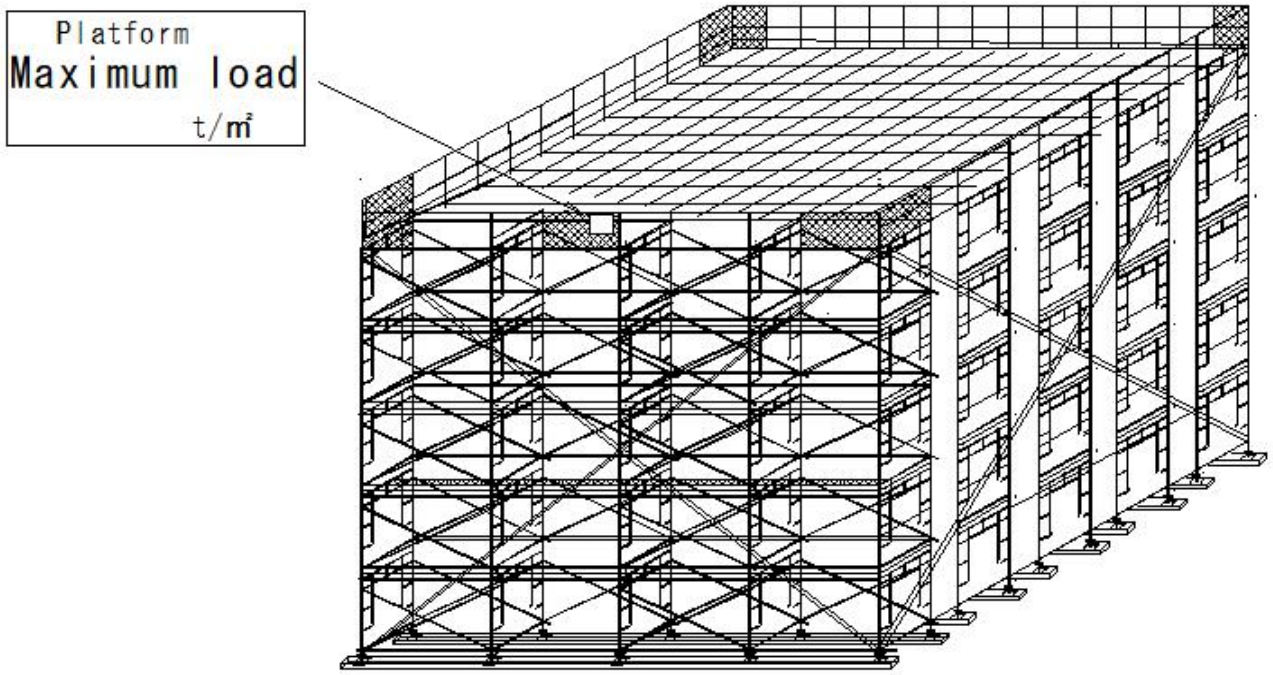
(S806)Work platform

(S806)Work platform

Safe work on work platforms

Maximum load

①Define the structure of the work platform and the maximum load capacity of the work floor, and display and publicize them in a conspicuous place



S803

(S807)Work platform

(S807)Work platform

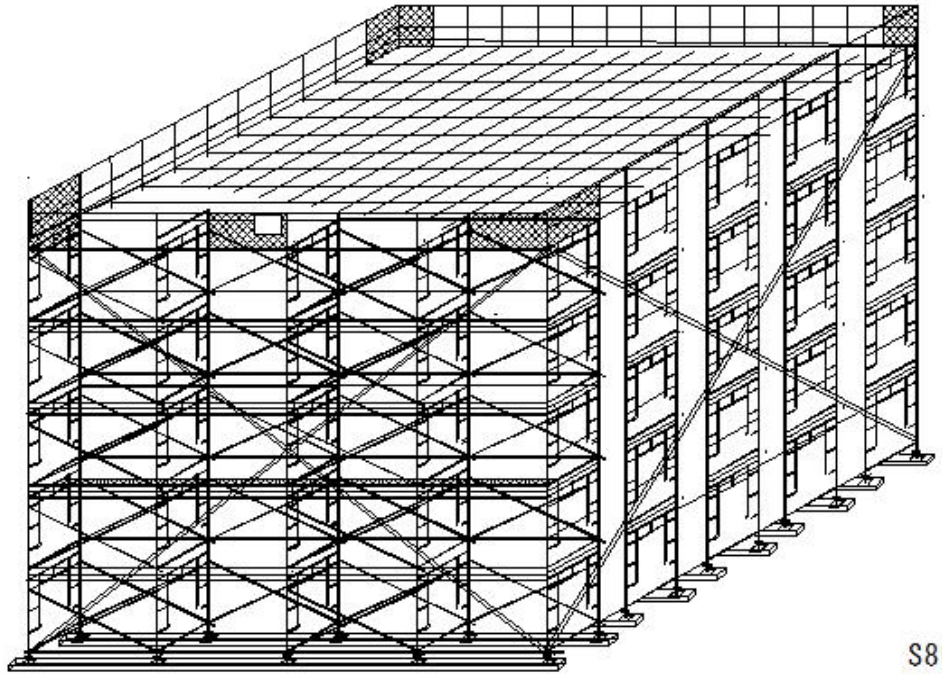
Safe work on work platforms

Assembly drawing

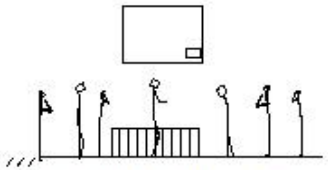
①Create assembly drawing

Arrangement and dimensions of pillars, work floor, beams, joists, lifting equipment, and parts

Work platform



Assembly drawing



toolbox meeting

S803

(S808)Work platform

(S808)Work platform

Safe work on work platforms

Measures for work platform

① Root the pillars to prevent them from sliding or sinking

Set up root ties on the legs

Use floor plates and floor angles

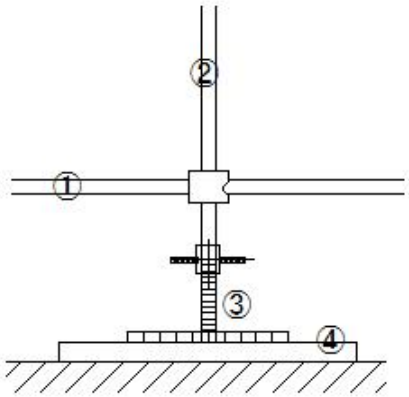
Figure

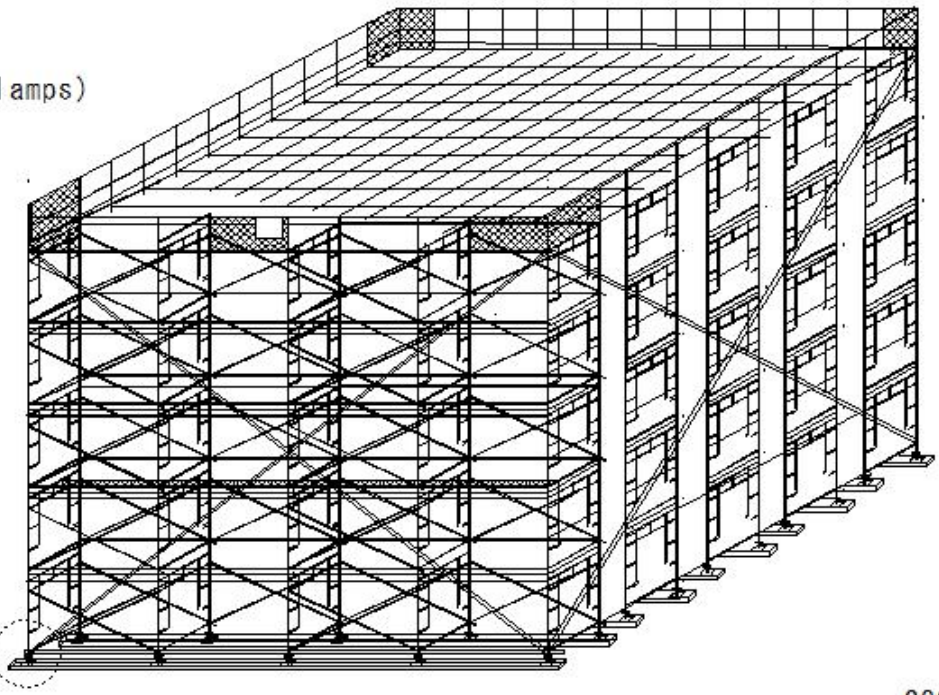
① Ties (single pipe) (fastened with clamps)

② Frame legs

③ Jack base

④ Floor plates





S803

(S809)Work platform

(S809)Work platform

Safe work on work platforms

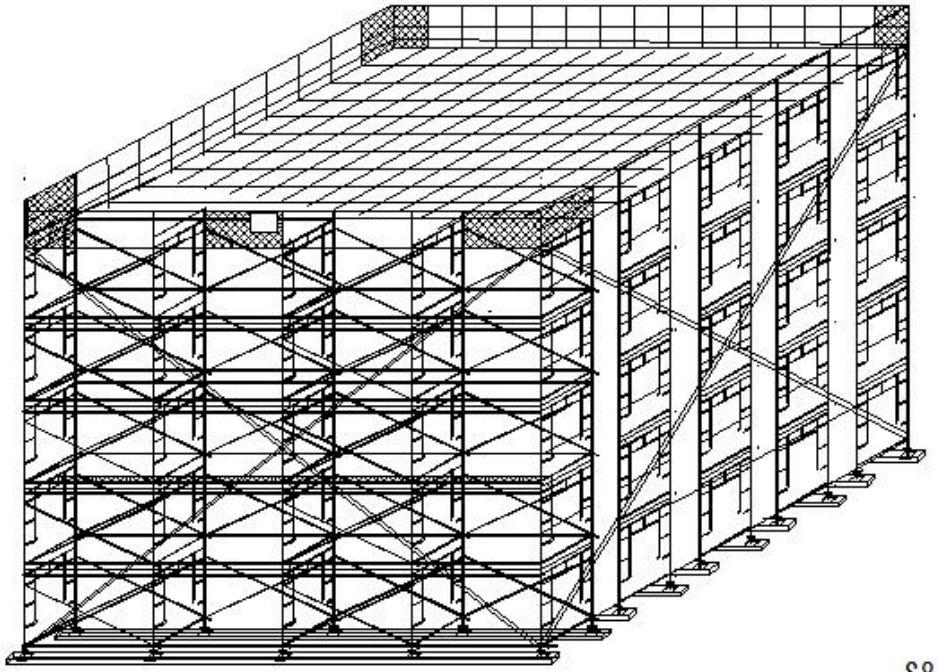
Measures for work platform

② Fastening or attachment parts of pillars, beams, braces, joists, and horizontal connections

Fix with orthogonal joints, bolts, etc. to prevent displacement or falling off

Work platform

Orthogonal joints



S803

(S810)Work platform

(S810)Work platform

Safe work on work platforms

Measures for work platform

③Gap on work platforms over 2m in height must be 3cm or less

Example of work platform configuration

①L: Length of scaffolding

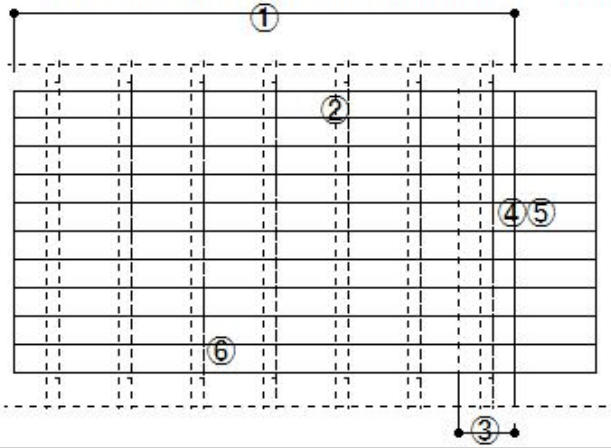
②Joists: Single pipe, steel beam, etc.

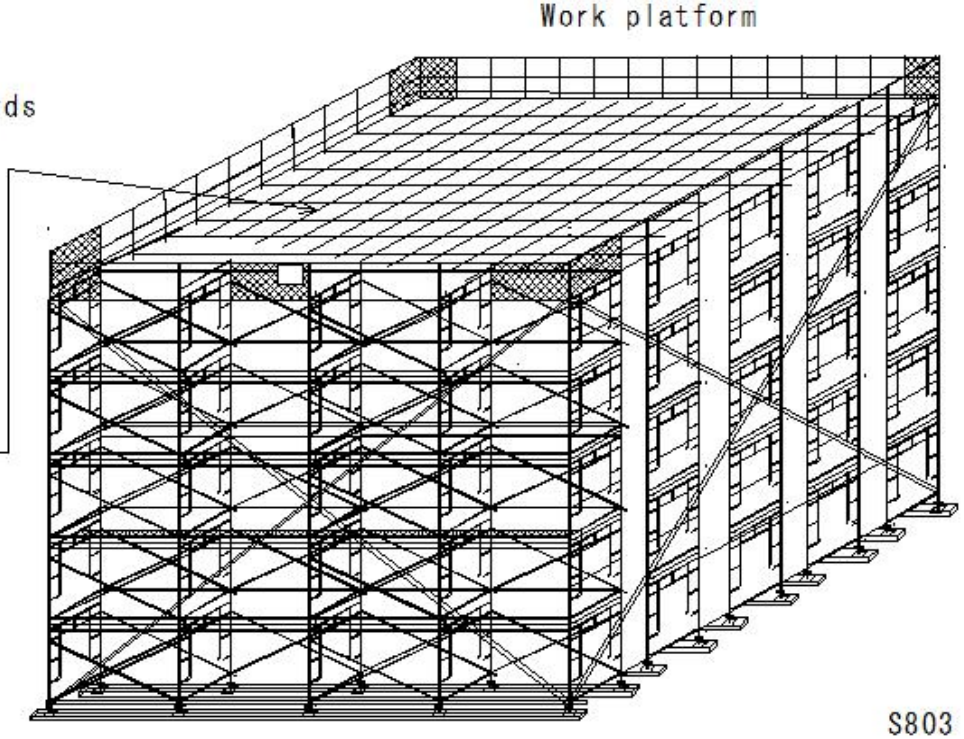
③Overlap 20cm or more: For scaffold boards

④10cm or more, 1/18L or less

⑤For protruding ends of scaffold boards

⑥Work platform:
Plywood scaffold board checker plate





S803

(S811)Work platform

(S811)Work platform

Safe work on work platforms

Measures for work platform

Examples of handrails and baseboards (fixed type)

①Under 2000

②Handrails

③Baseboards

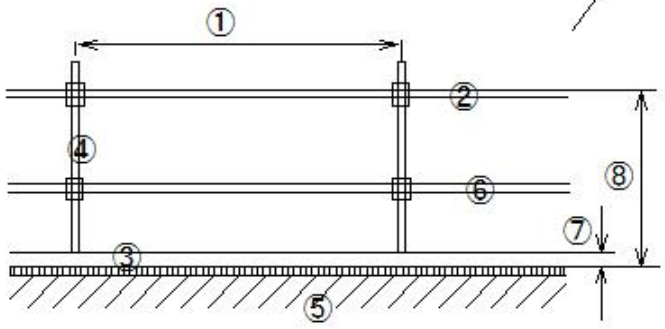
④Handrail posts

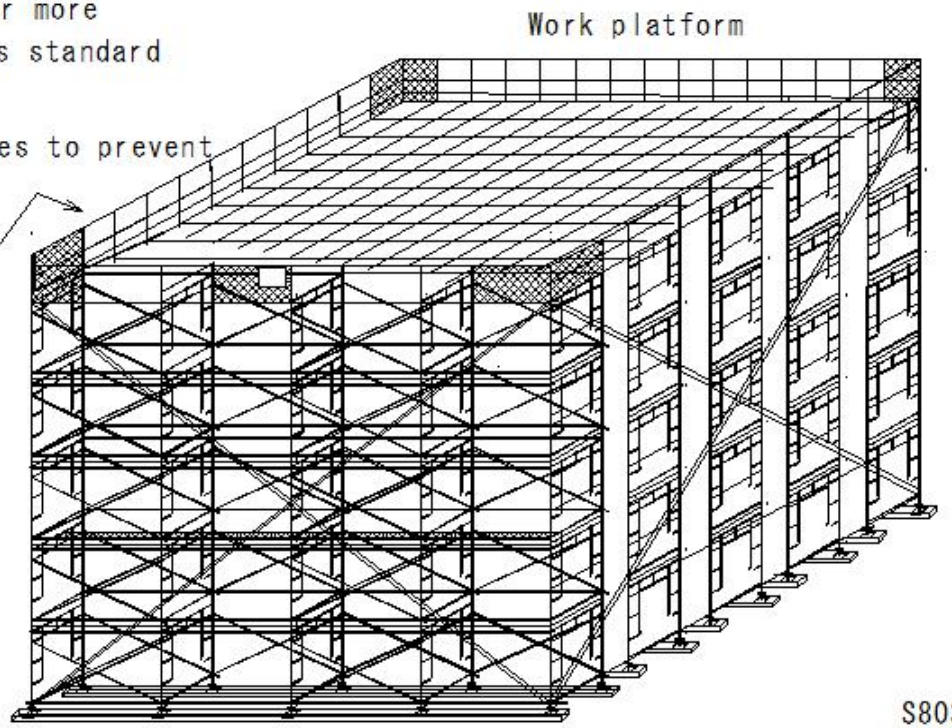
⑤Use handrails, nets, and safety harnesses to prevent falls from the work floor and openings.
in case of removing the fence,
prohibit workers from entering.

⑥Center rail

⑦10cm or more

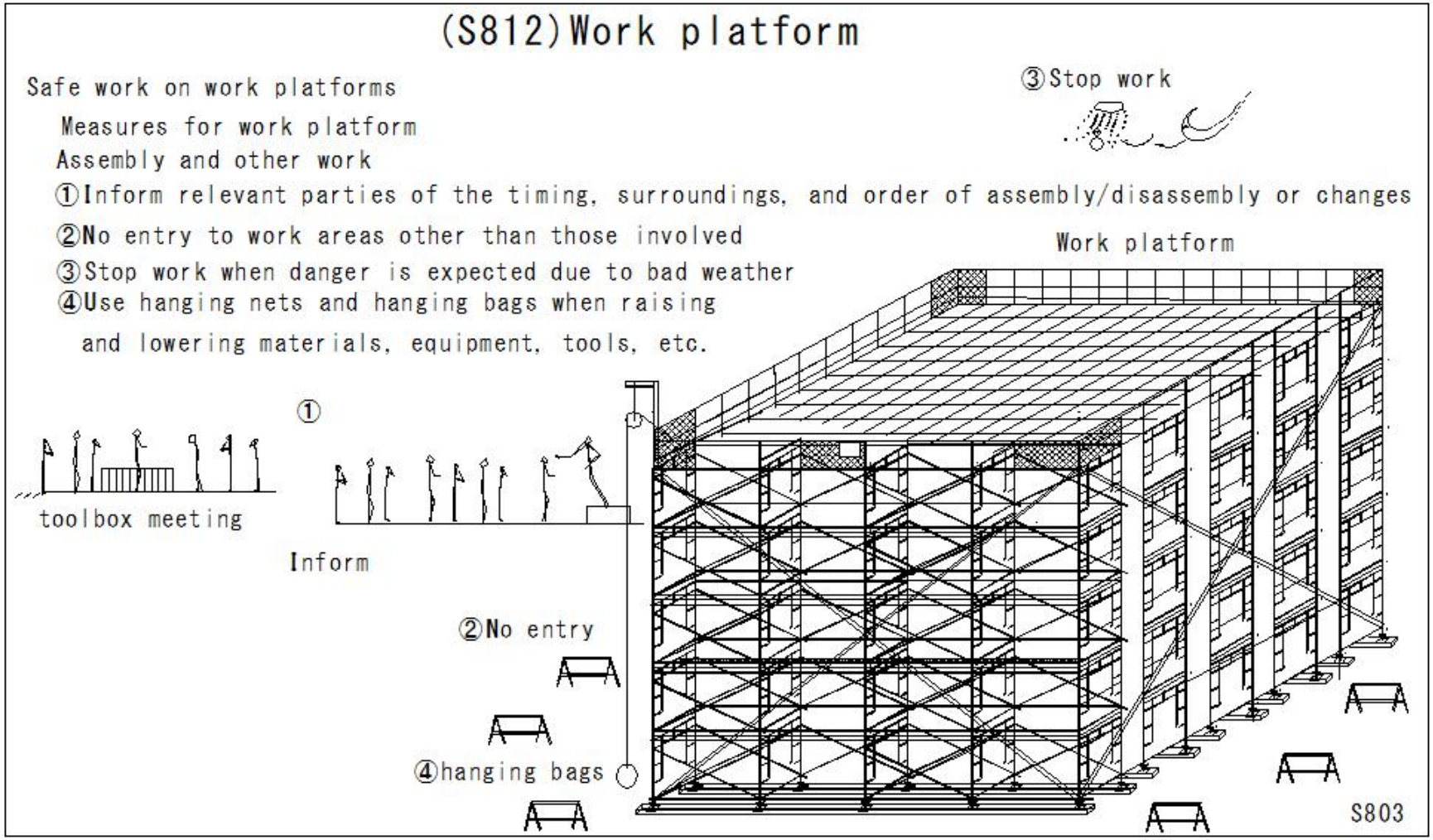
⑧90cm is standard



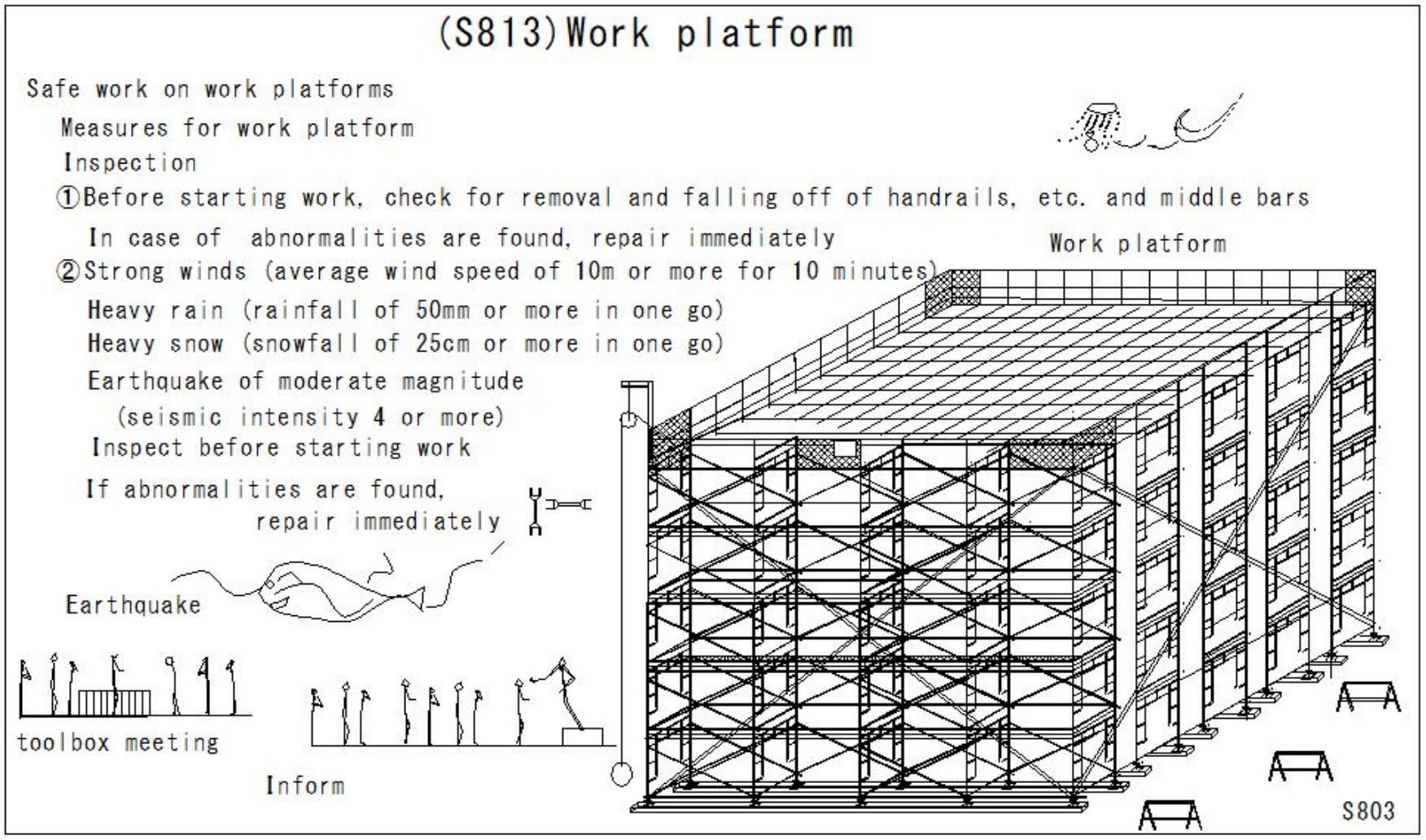


S803

(S812)Work platform



(S813)Work platform



(S814)Work platform

(S814)Work platform

Safe work on work platforms

Measures for work platform

Inspection items before starting work

②Strong winds (average wind speed of 10m or more for 10 minutes)

Heavy rain (rainfall of 50mm or more in one event)

Heavy snow (snowfall of 25cm or more in one event)

Earthquake of moderate intensity (seismic intensity 4 or more)

Inspection items before starting work

①Sliding and sinking condition of supports

②Whether or not there is damage to supports, beams, etc.

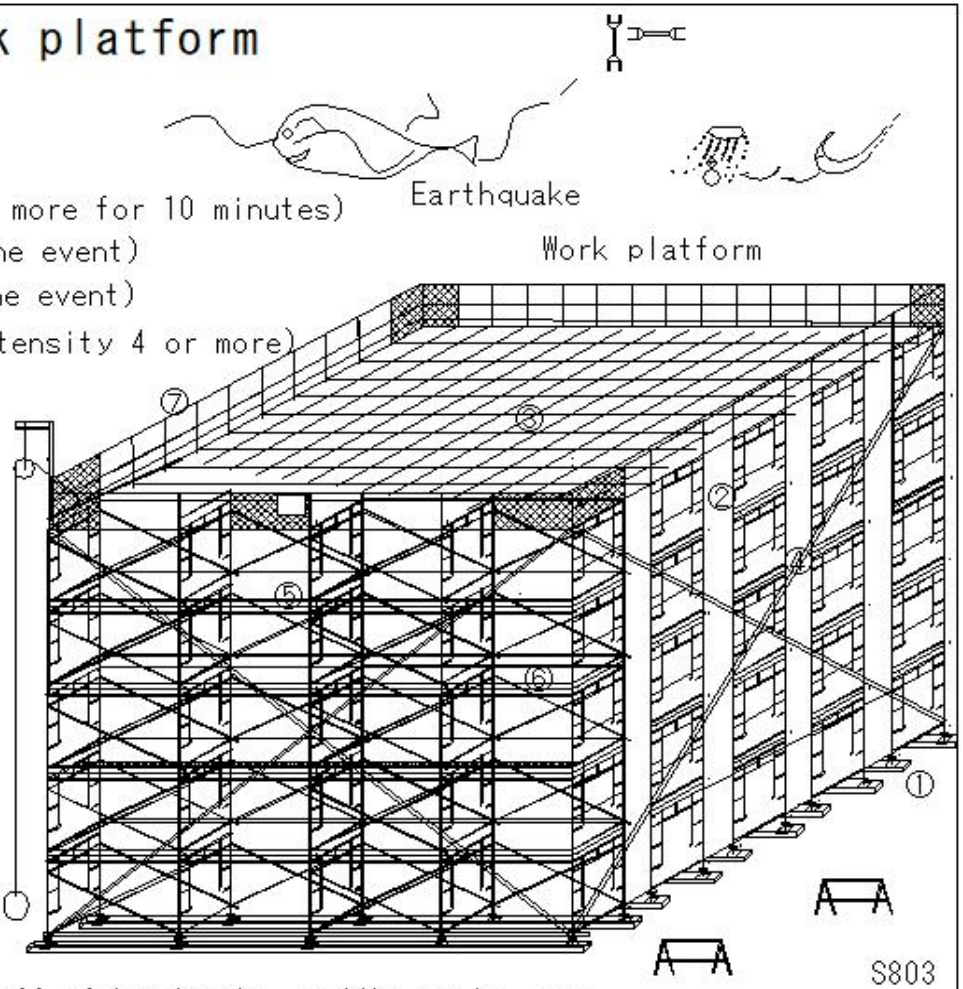
③Damage, installation and hanging condition of flooring materials

④Looseness of fastening parts, connections and installation parts of supports, beams, braces, etc.

⑤Damage and corrosion condition of fastening materials and fastening fittings

⑥Installation condition and removal of reinforcing materials such as horizontal ties and braces

⑦Whether or not there is removal and falling off of handrails, middle rails, etc.



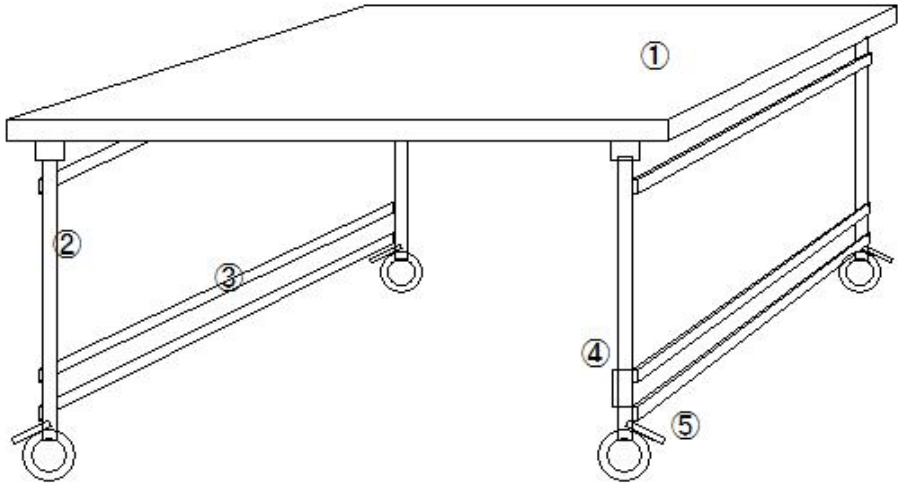
(S815) Work platform

(S815) Work platform

Safe work on mobile indoor scaffolding and portable work platforms

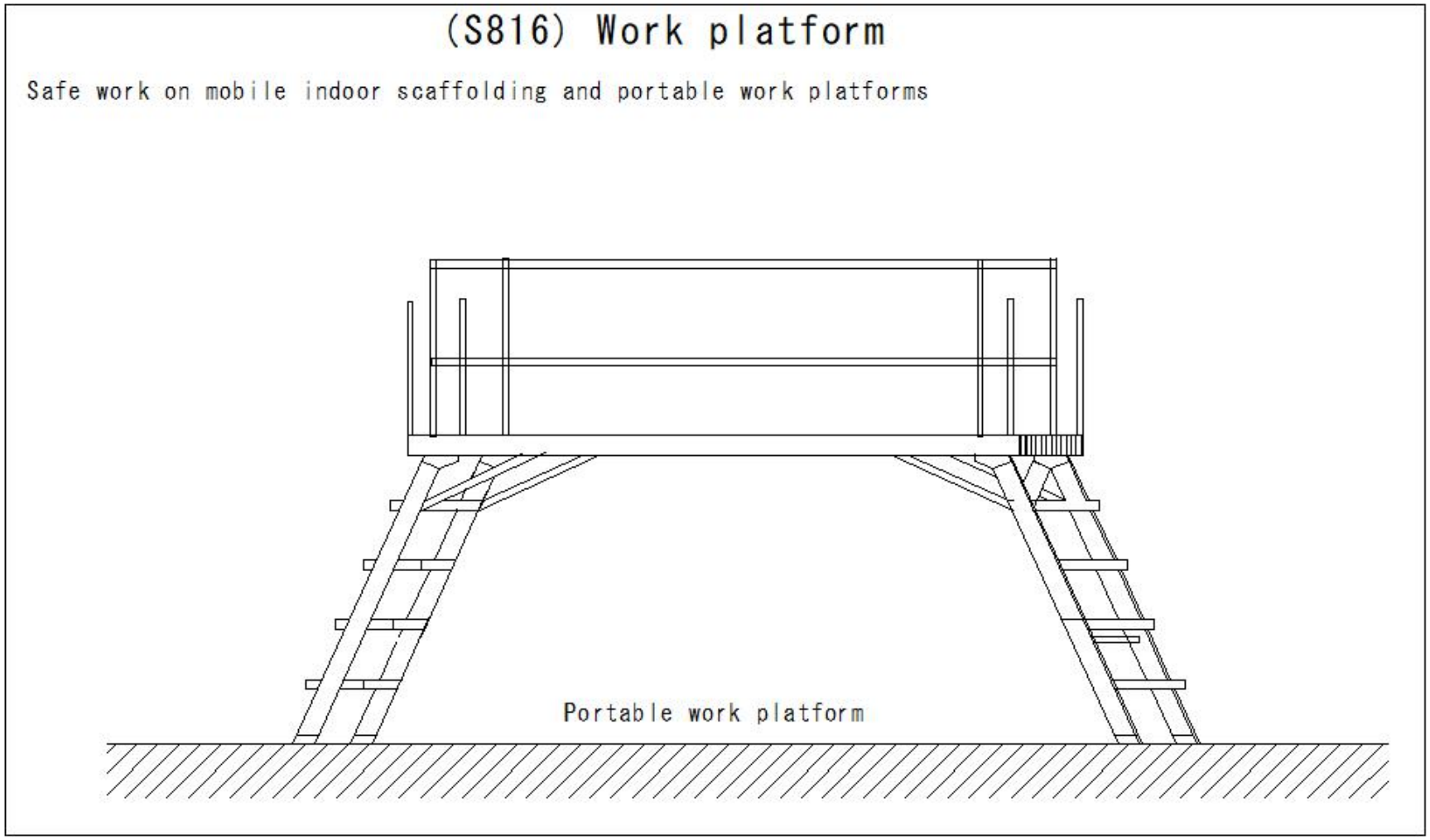
Mobile indoor scaffolding

① Table
② Outer frame
③ Inner frame
④ Bar lock
⑤ Swivel casters



Mobile indoor scaffolding

(S816) Work platform



(S817) Stress check

(S817) Stress check

Stress check system

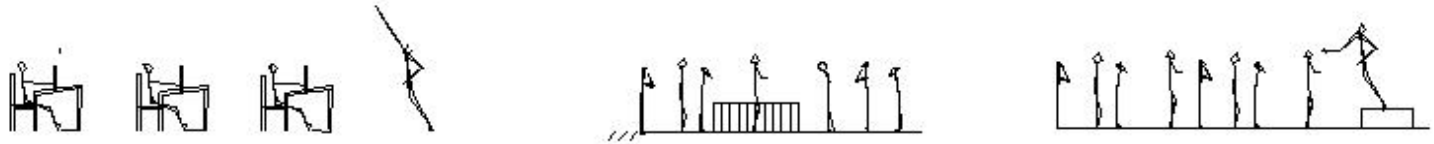
①The main purpose of the stress check system is to regularly check the stress status of workers and prevent it.

②The results are notified to the individual to encourage awareness of their own stress status.

③The risk of individual mental health problems is reduced

④The test results are analyzed collectively to improve the work environment

⑤The employee's mental health is prevented from becoming poor.



①Stress
②Awareness
③Risk
④Work environment
⑤Mental health

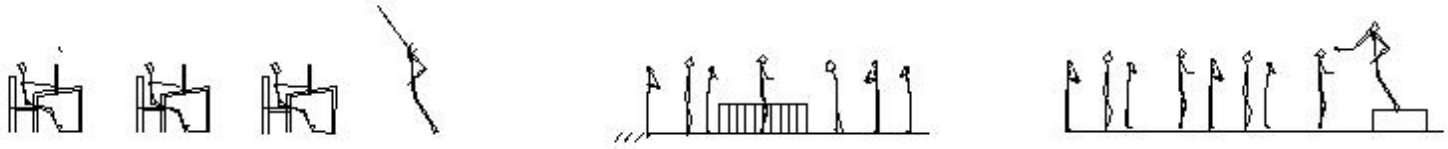
(S818) Stress check

(S818) Stress check

Stress check system
Implementation details

① Conduct a test (stress check) once a year to grasp the degree of psychological stress

① Stress check

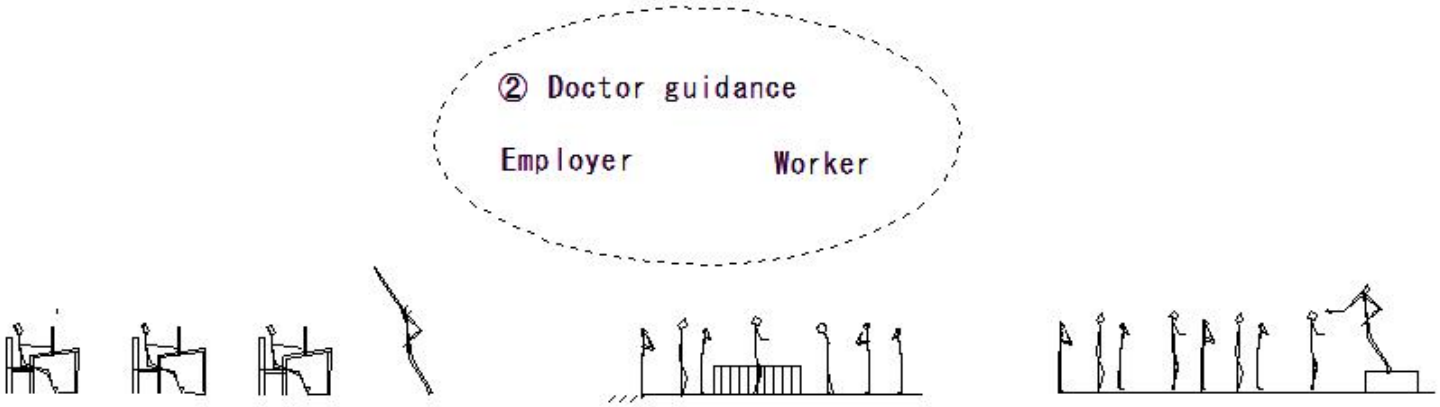


(S819) Stress check

(S819) Stress check

Stress check system
Implementation details

② At the request of the worker, the employer will conduct an interview with a doctor for guidance



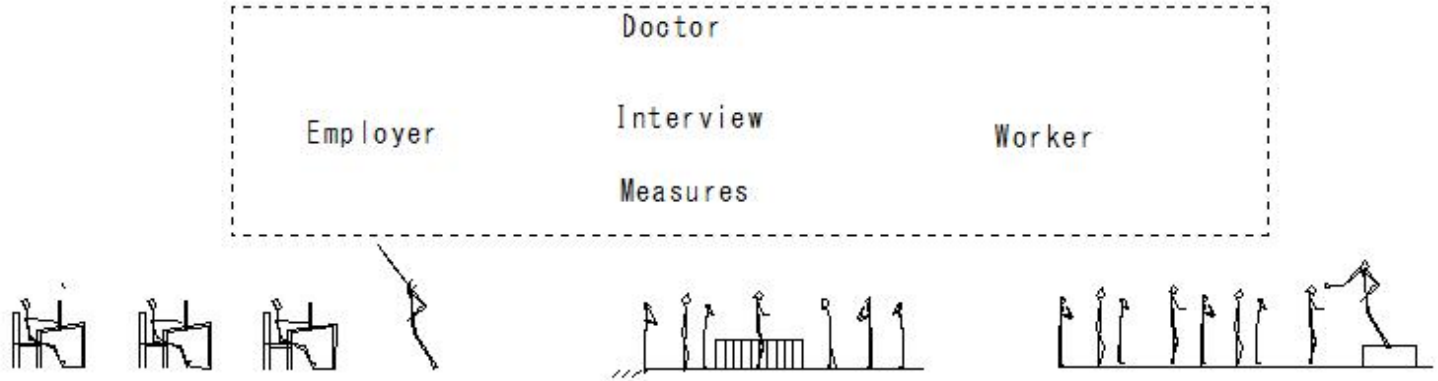
(S820) Stress check

(S820) Stress check

Stress check system

Implementation details

③ The employer will receive the results of the interview and ask the doctor for his/her opinion on the measures to be taken



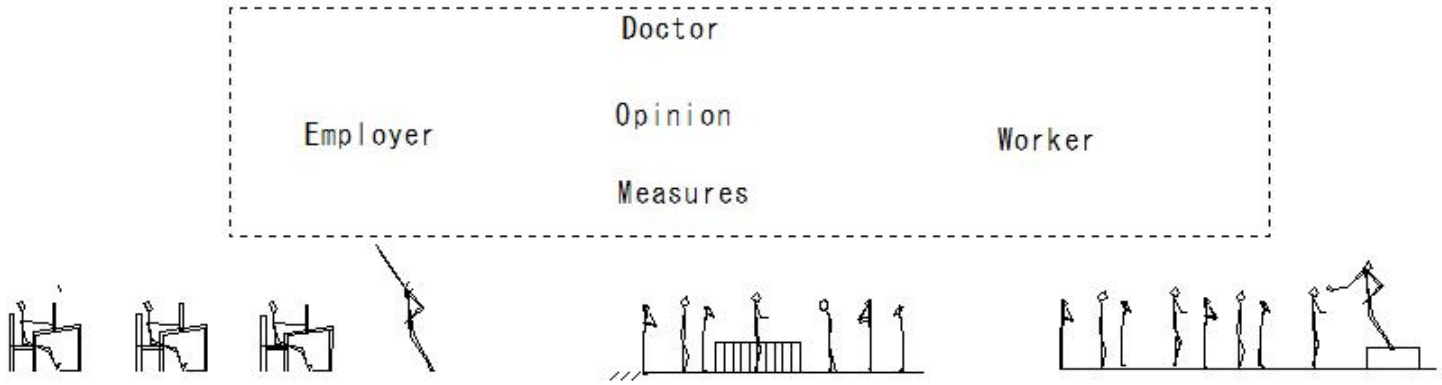
(S821) Stress check

(S821) Stress check

Stress check system

Implementation details

④ Implement follow-up measures based on the doctor's opinion



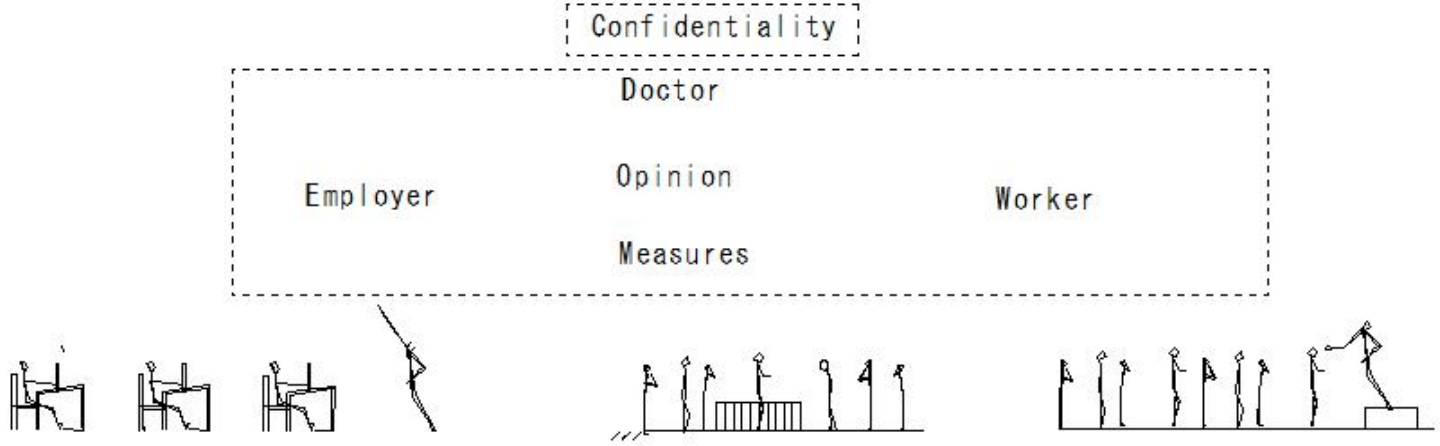
(S822) Stress check

(S822) Stress check

Stress check system

Implementation details

⑤ Those involved in the stress check administration are obligated to maintain confidentiality



(S823) Stress check

(S823) Stress check

Stress check system

Implementation details

Overview of the stress check system

a: Doctors and insurance specialists conduct stress checks

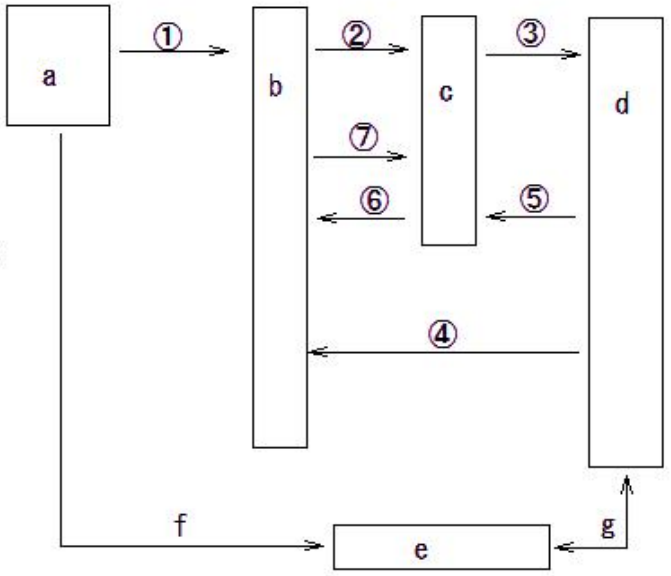
b: Workers
c: Businesses

d: Doctors
e: Medical facilities and counseling agencies

f: Visits and consultations

g: Cooperation

① Notification of results: Promotion of confirmation
② Request for interview
③ Request for interview
④ Conducting interview guidance
⑤ Hearing opinions from doctors
Limits on overtime work
Opinions on work shifts
⑥ Implementation of follow-up measures
⑦ Conducting the work with the consent of the worker



Overview of the stress check system

(S824) Falls

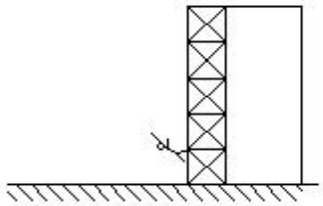
Prevention of dangers due to falls, etc.

Work to assemble, dismantle or modify buildings, etc.

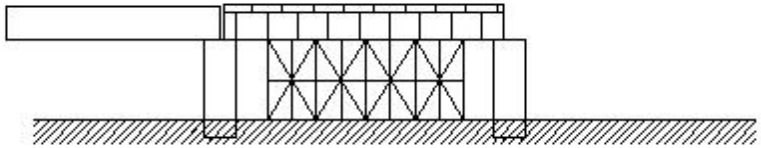
Buildings H≧5m

Bridges H≧5m L≧30m

Scaffolding, etc. H≧5m



S1



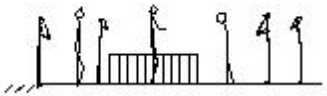
B118

Appoint a work supervisor

Work supervisor

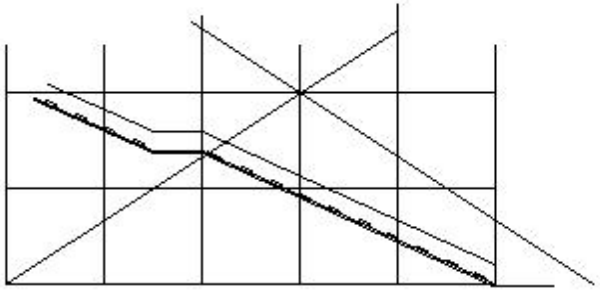
Inform workers of work methods and procedures

Direct command



toolbox meeting

Inform



S89

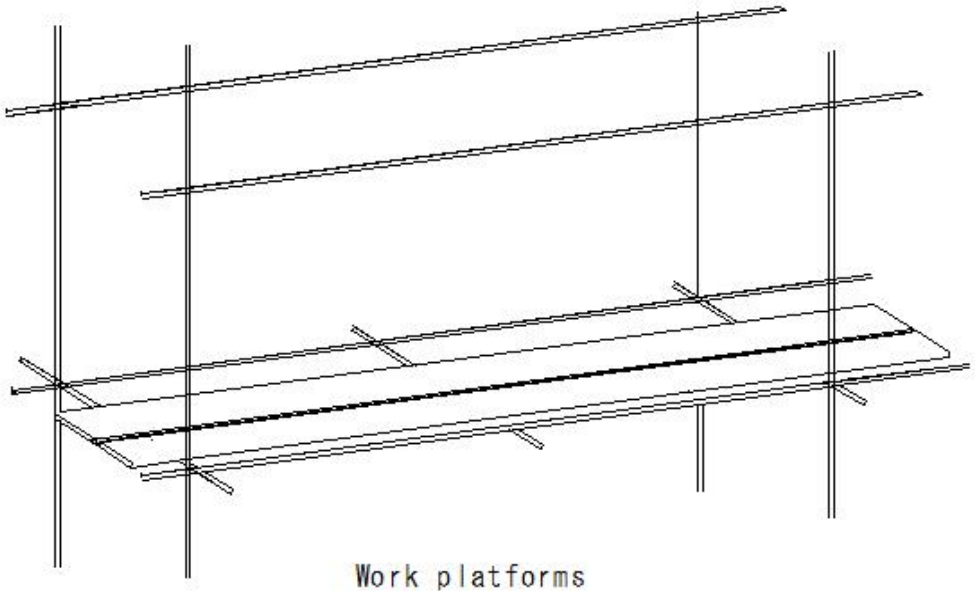
(S825) Falls

(S825) Falls

Prevention of dangers due to falls, etc.

Installation of work platforms, etc.

① Install a work platform when there is a risk of falling at a height of 2m or more.



Work platforms

S87

(S826) Falls

Prevention of dangers due to falls, etc.

Installation of enclosures at the ends of work platforms, etc.

① Install enclosures, handrails, covers, etc. at the ends and openings of work platforms at a height of 2m or more.

In case of installation is difficult or when the enclosures are temporarily removed, install a safety net and use a safety harness.

3.4.8 Work floor

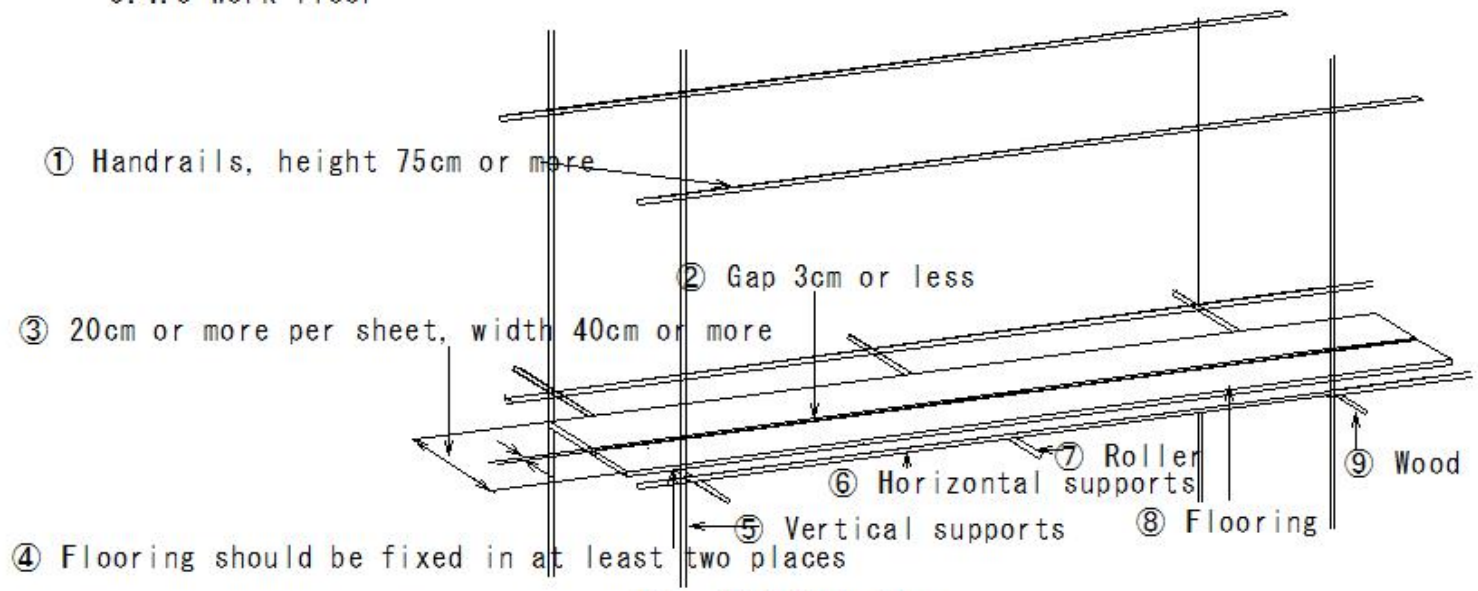


Fig. 3.9 Work floor

(S827) Falls

Prevention of dangers due to falls, etc.

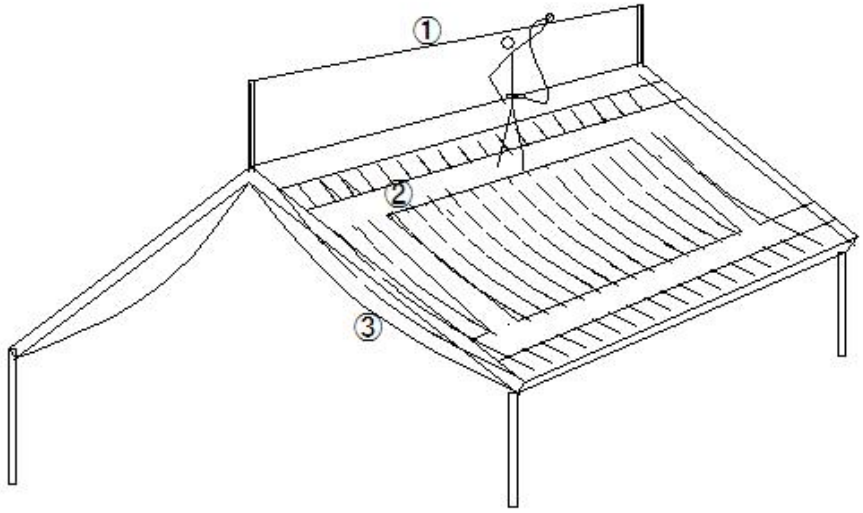
Installation of equipment for attaching safety harnesses, etc.

① Install equipment for attaching safety harnesses when working at a height of 2m or more, and check for abnormalities at any time.

① Install safety ropes and use safety belts

② Stepping boards 30cm or wider

③ Install safety nets



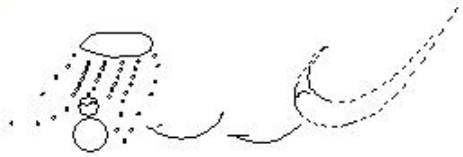
(S828) Falls

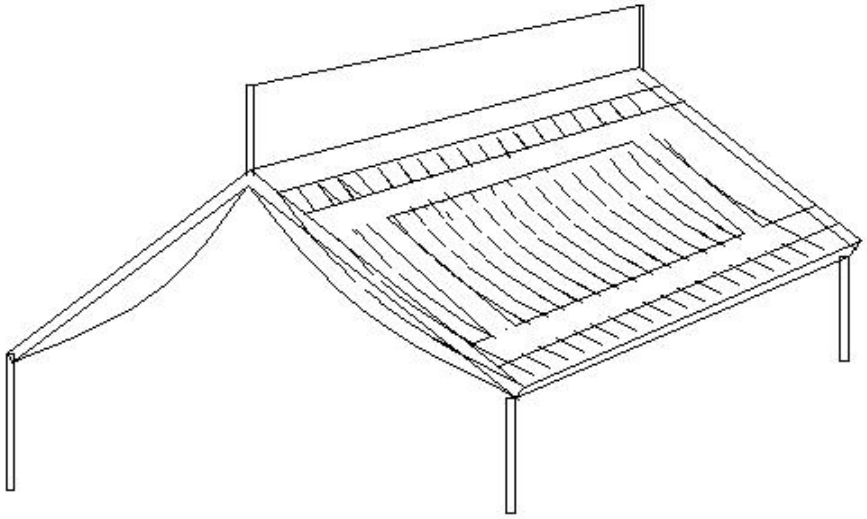
(S828) Falls

Prevention of dangers due to falls, etc.

Preventing danger from falls, etc.

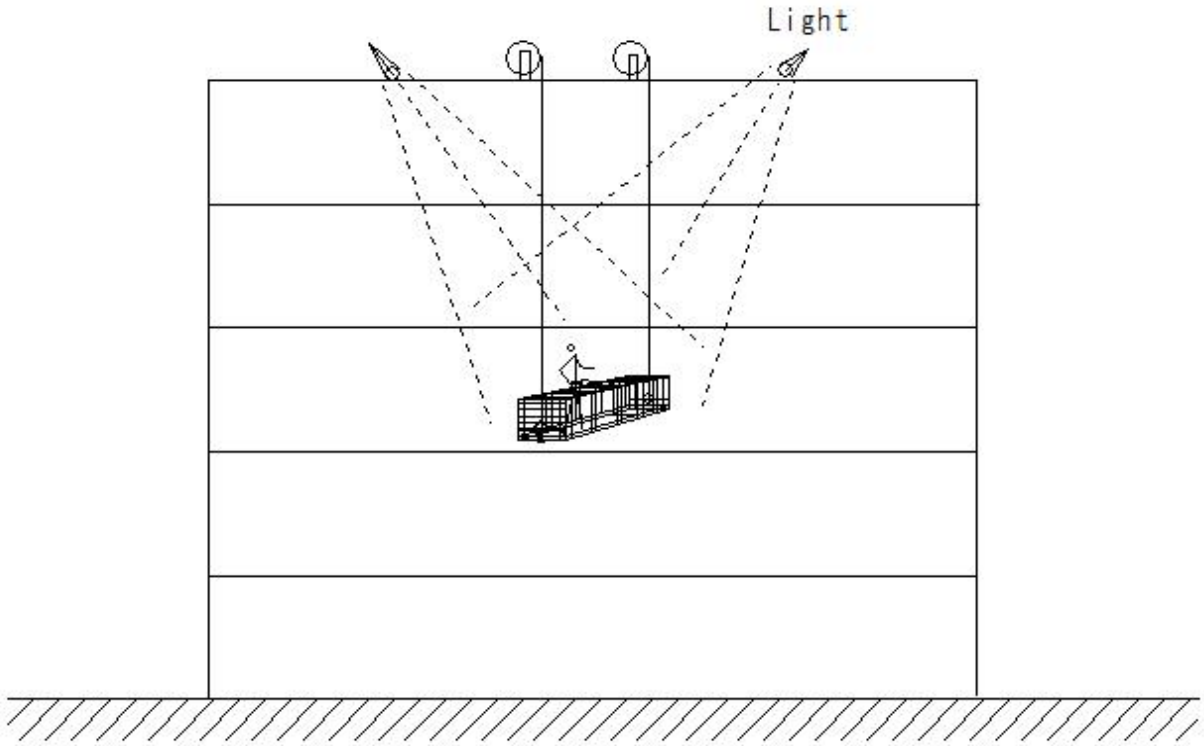
No work in bad weather





(S829) Falls

Preventing danger from falls, etc.
Maintaining light



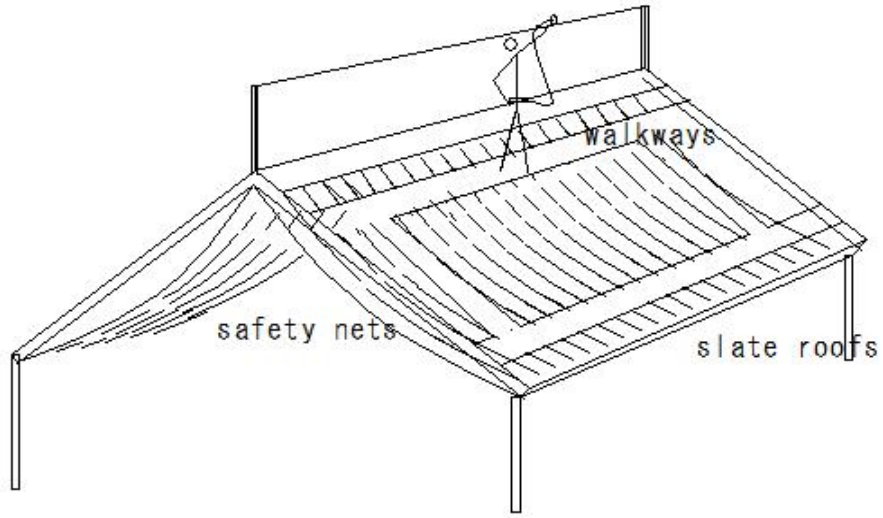
S445

(S830) Falls

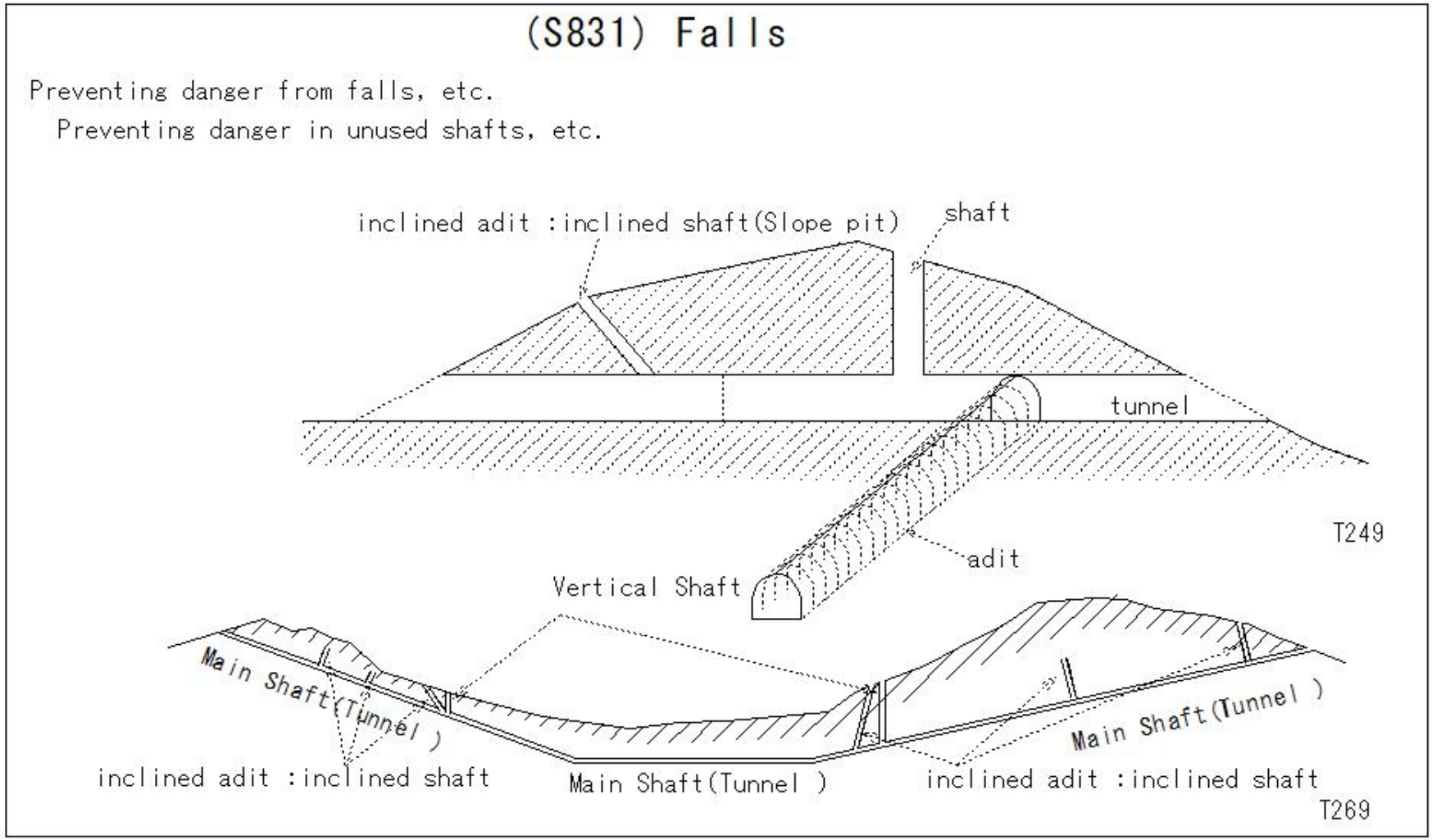
Prevention of dangers due to falls, etc.

Preventing danger on slate roofs, etc.

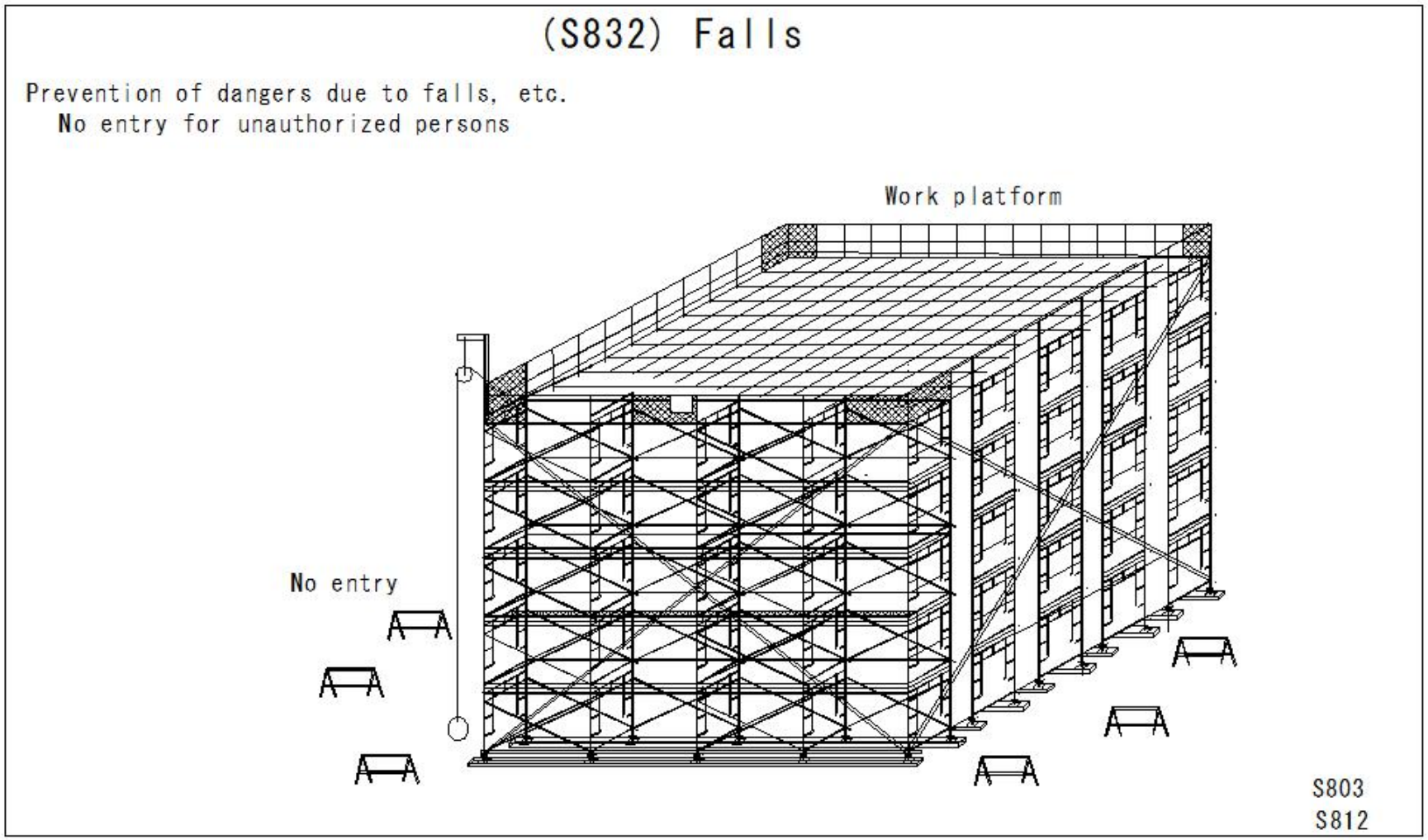
In case of working on slate roofs, install walkways and put up safety nets



(S831) Falls


(S831) Falls
Preventing danger from falls, etc.
Preventing danger in unused shafts, etc.
inclined adit :inclined shaft(Slope pit)
shaft
tunnel
T249
adit
Vertical Shaft
Main Shaft(Tunnel)
inclined adit :inclined shaft
Main Shaft(Tunnel)
Main Shaft(Tunnel)
inclined adit :inclined shaft
T269

(S832) Falls

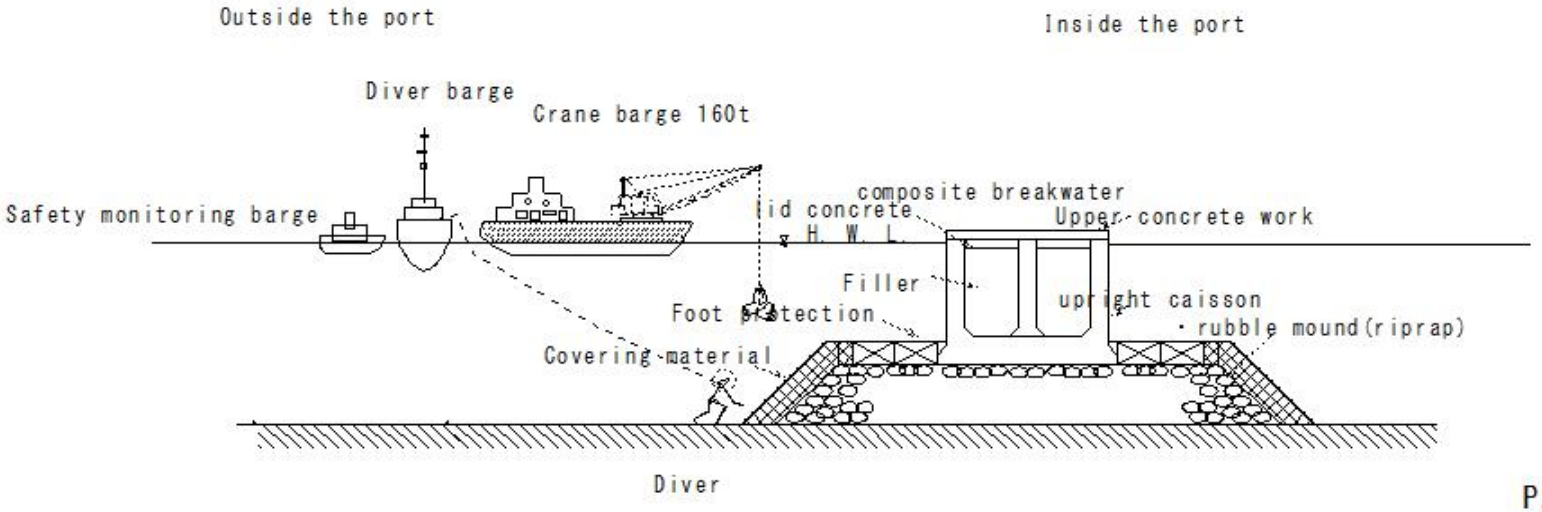

(S832) Falls
Prevention of dangers due to falls, etc.
No entry for unauthorized persons
Work platform
No entry
S803
S812

(S833) Falls

(S833) Falls

Prevention of dangers due to falls, etc.

Prevention of dangers when transporting workers by ship



P22
P185

(S834) Falls

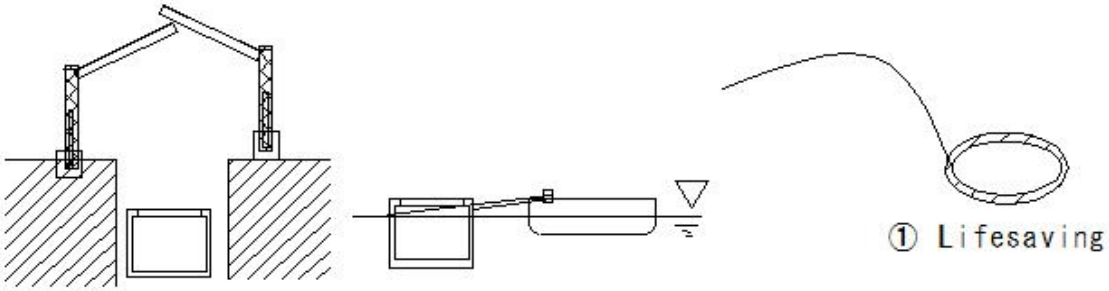
(S834) Falls

Flow of port construction

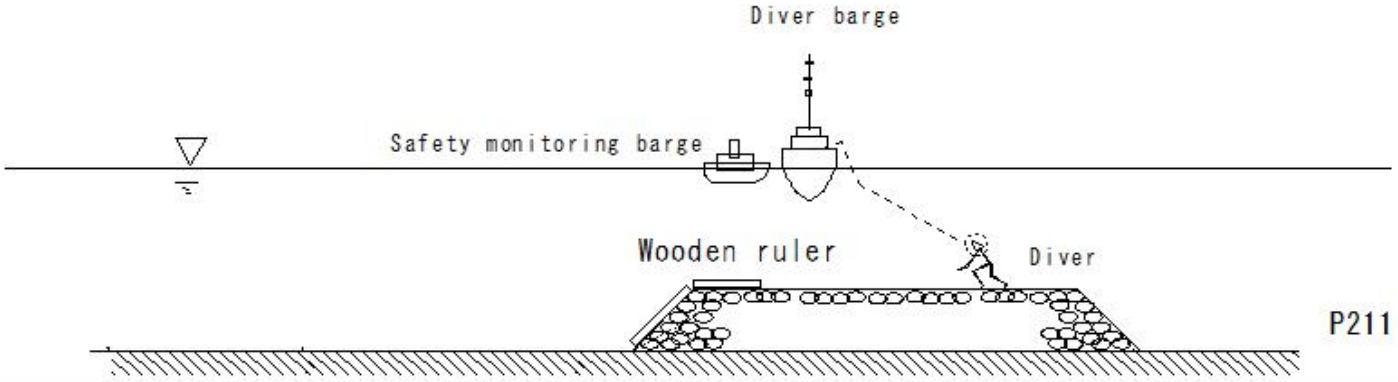
Prevention of dangers due to falls, etc.

Lifesaving equipment, etc.

① Lifesaving equipment such as floats should be provided for work on water

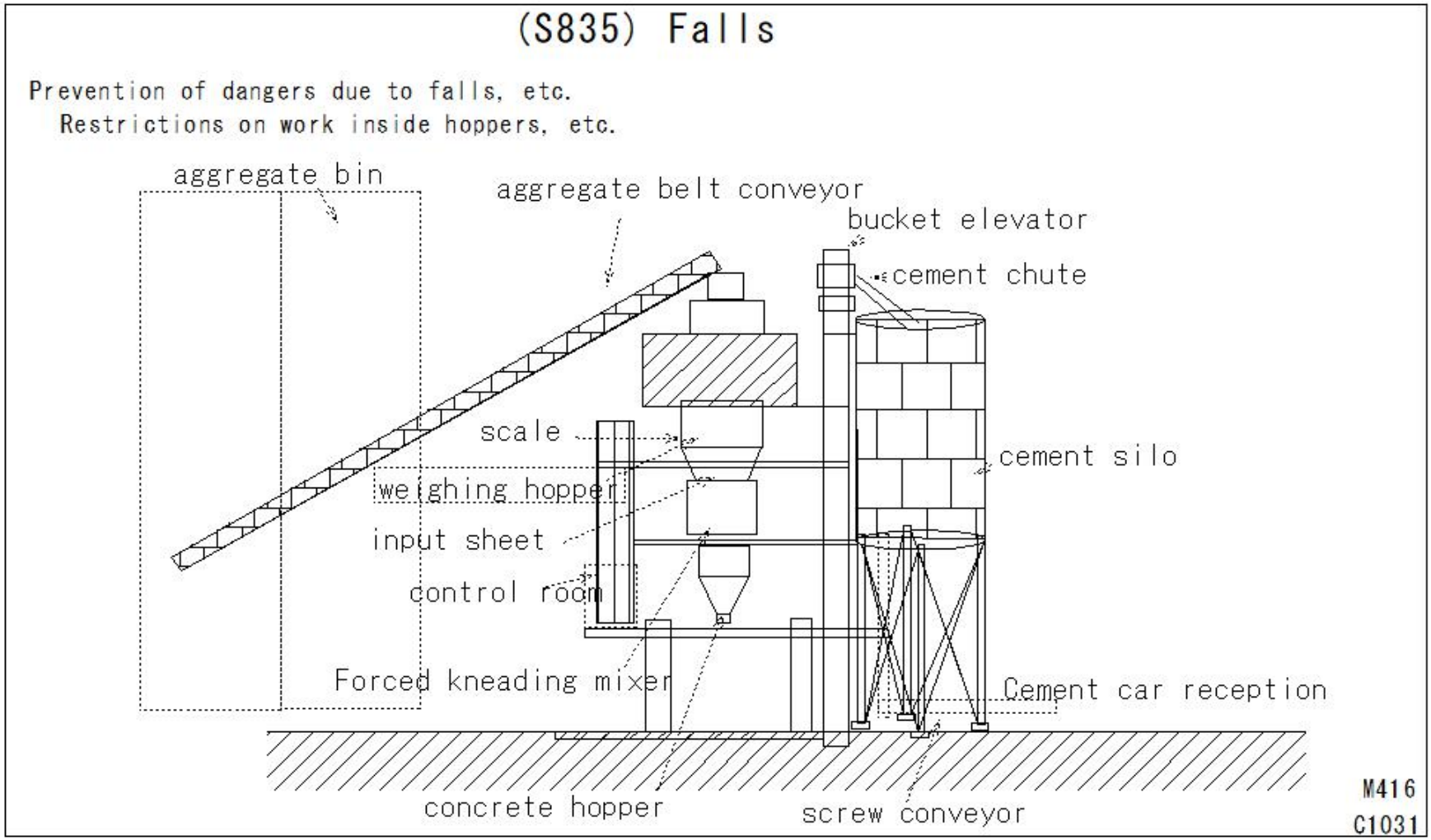


P171

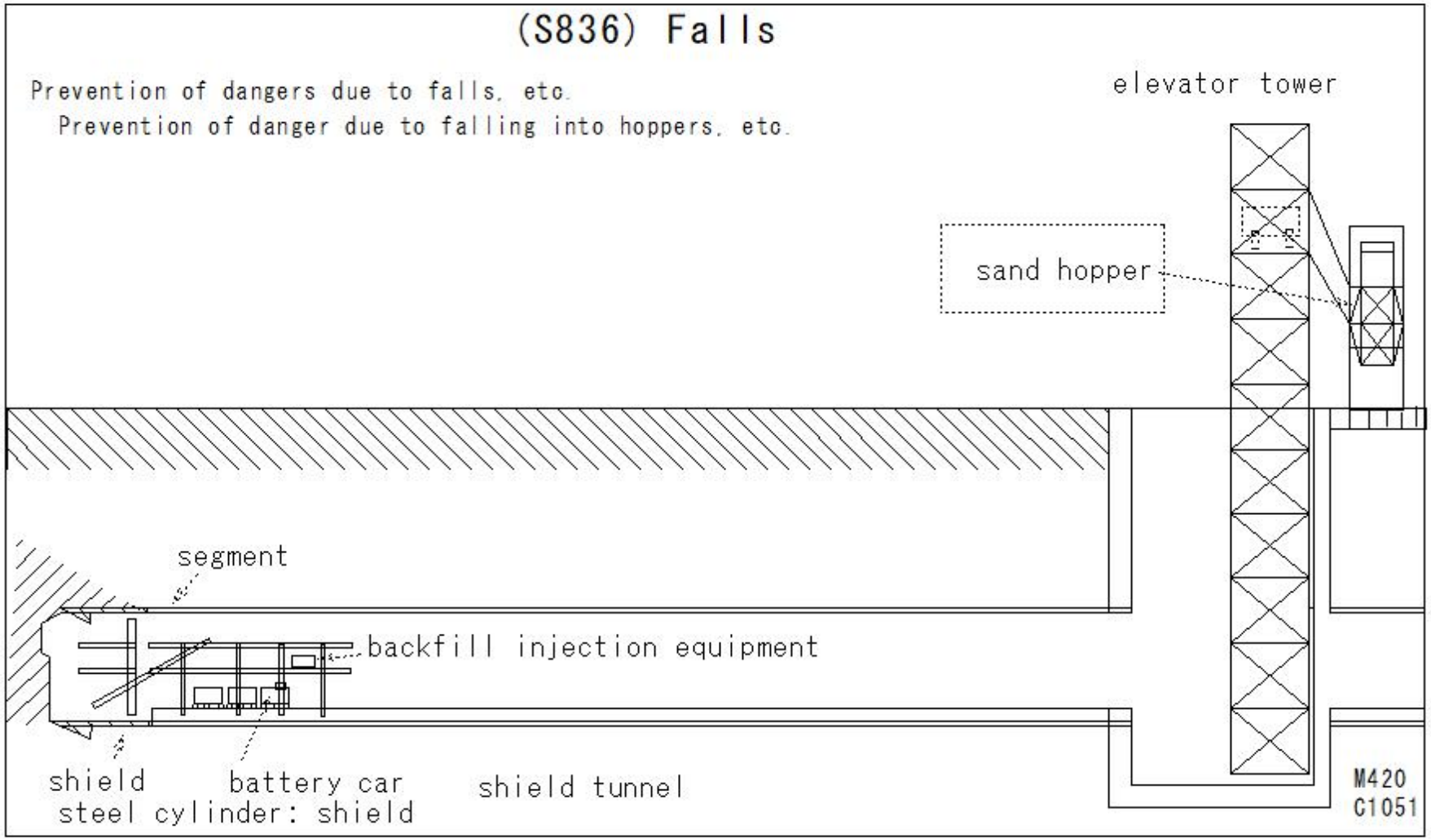


P211

(S835) Falls


(S835) Falls
Prevention of dangers due to falls, etc.
Restrictions on work inside hoppers, etc.
aggregate bin
aggregate belt conveyor
bucket elevator
cement chute
scale
cement silo
weighing hopper
input sheet
control room
Forced kneading mixer
Cement car reception
concrete hopper
screw conveyor
M416
C1031

(S836) Falls


(S836) Falls
Prevention of dangers due to falls, etc.
Prevention of danger due to falling into hoppers, etc.
elevator tower
sand hopper
segment
backfill injection equipment
shield
battery car
shield tunnel
steel cylinder: shield
M420
C1051

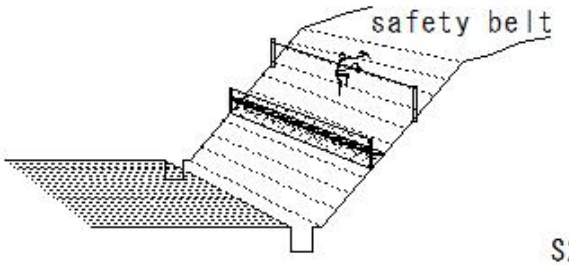
(S837) Falls

(S837) Falls

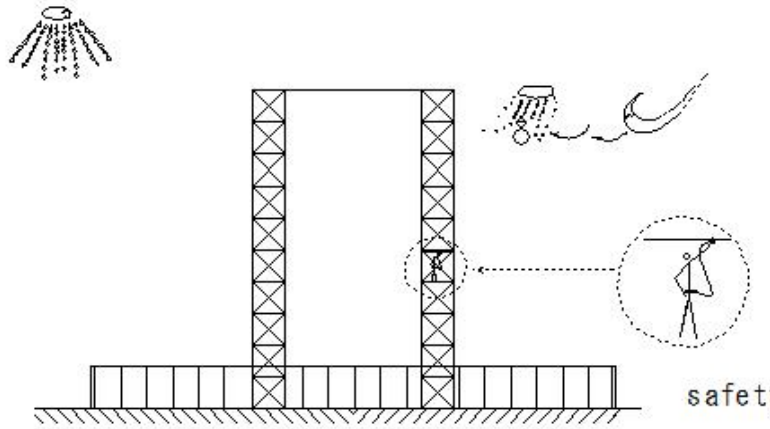
Prevention of dangers due to falls, etc.

Use of safety belts

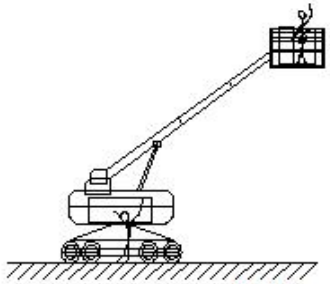
① In case of ordered to use a safety belt, it must be used



S220



S74



S322

aerial work vehicles

S641

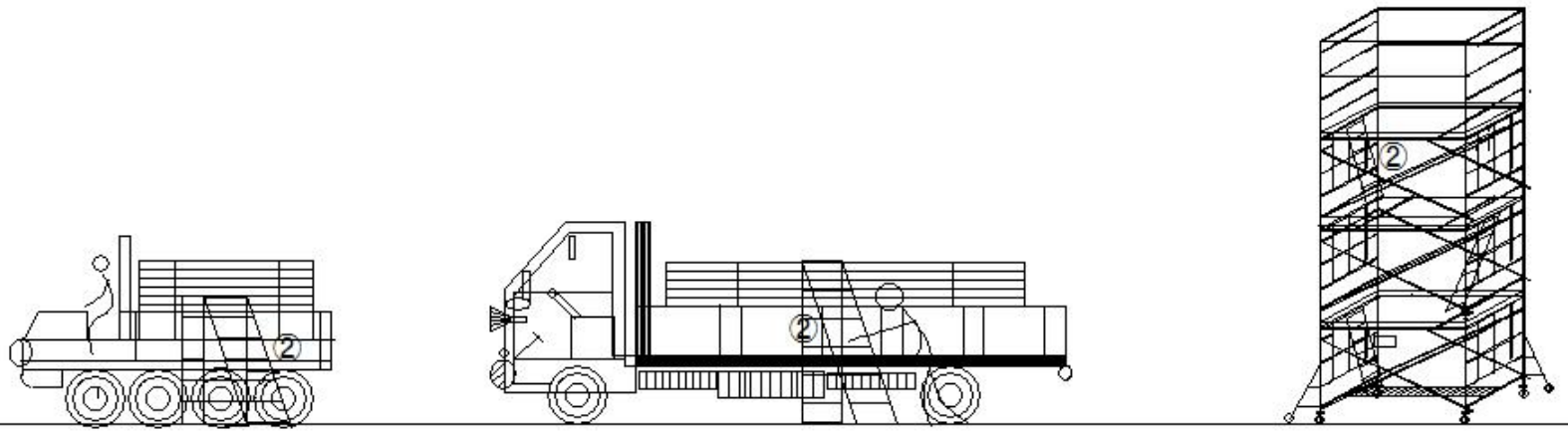
(S838) Falls

Prevention of danger due to falls, etc.

Installation of equipment for ascending and descending

① In case of the height or depth exceeds 1.5m, installation of ascending and descending equipment is required

②Ascending and descending equipment



S611 S623 S801

(S839) Falls

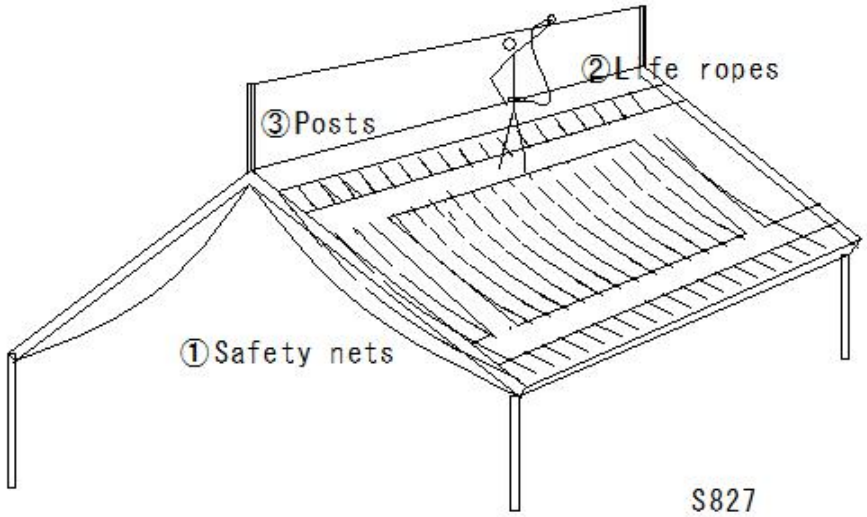
(S839) Falls

Explanation of technical standards for fall prevention equipment, etc.

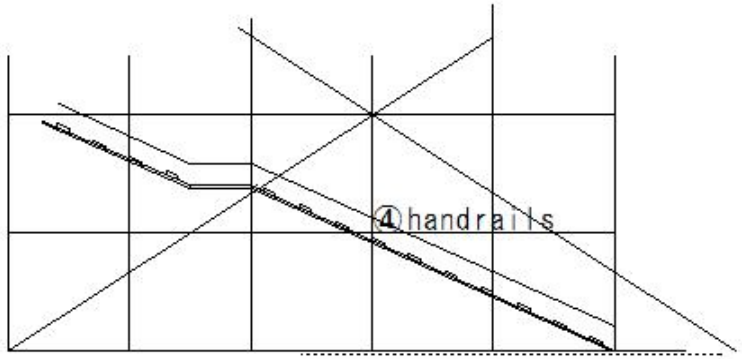
What are technical standards for fall prevention equipment, etc.?

Technical standards for handrails, safety nets, life ropes, posts, etc.

created to prevent fall accidents



S827



Scaffolding

S89

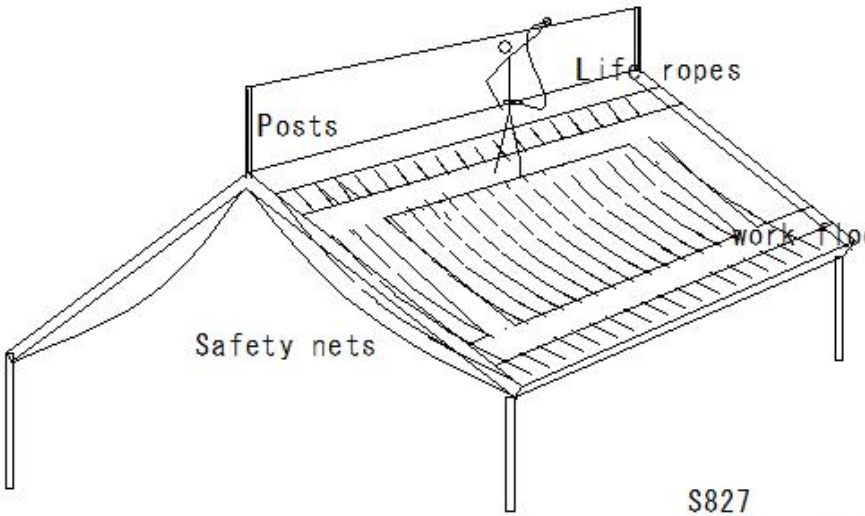
(S840) Falls

(S840) Falls

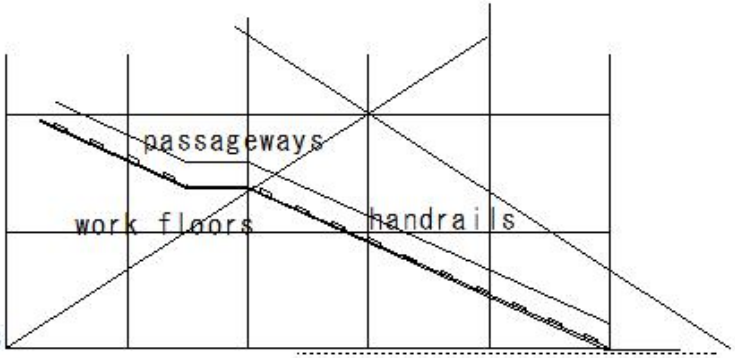
Explanation of technical standards for fall prevention equipment, etc.

Scope

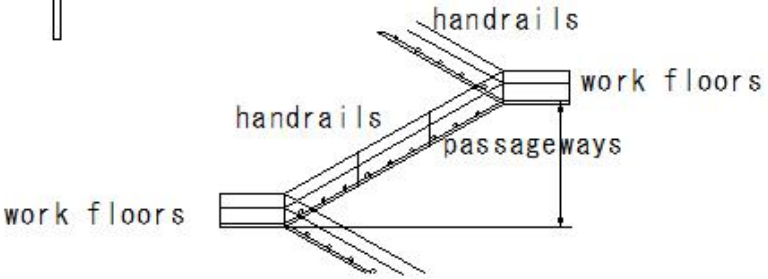
Applies to temporary handrails, etc. installed in passageways, work floors, edges, and openings where there is a risk of falling



S827



Scaffolding S89



Passageways S767

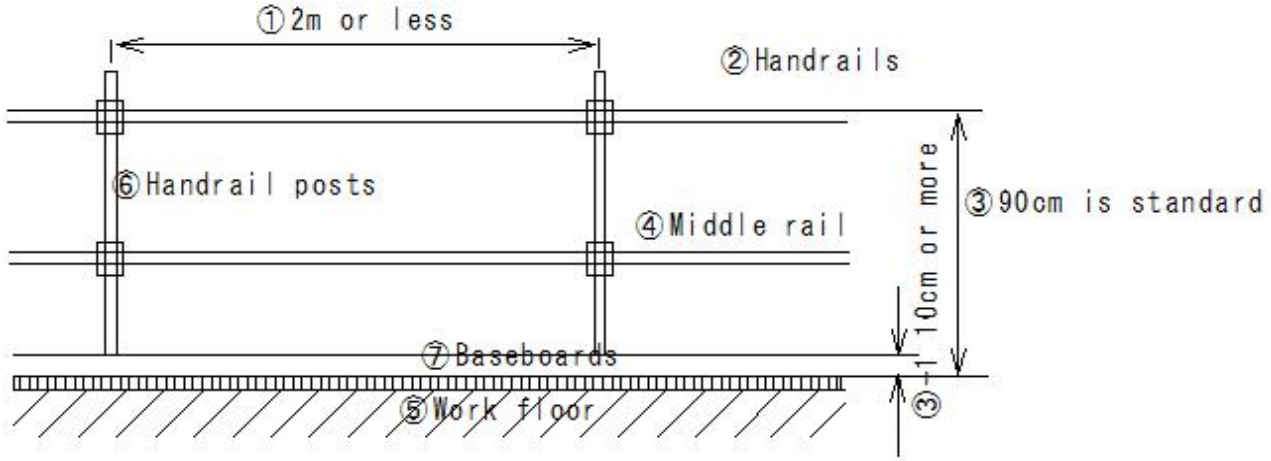
(S841) Falls

Explanation of technical standards for fall prevention equipment, etc.

Handrails

Type 1: Handrails installed at openings for lifting cargo, lifting platforms, landings of temporary stairs, access platforms, upper parts of retaining walls, etc.

Type 2: Handrails other than those for lifting Type 1



Examples of handrail installation

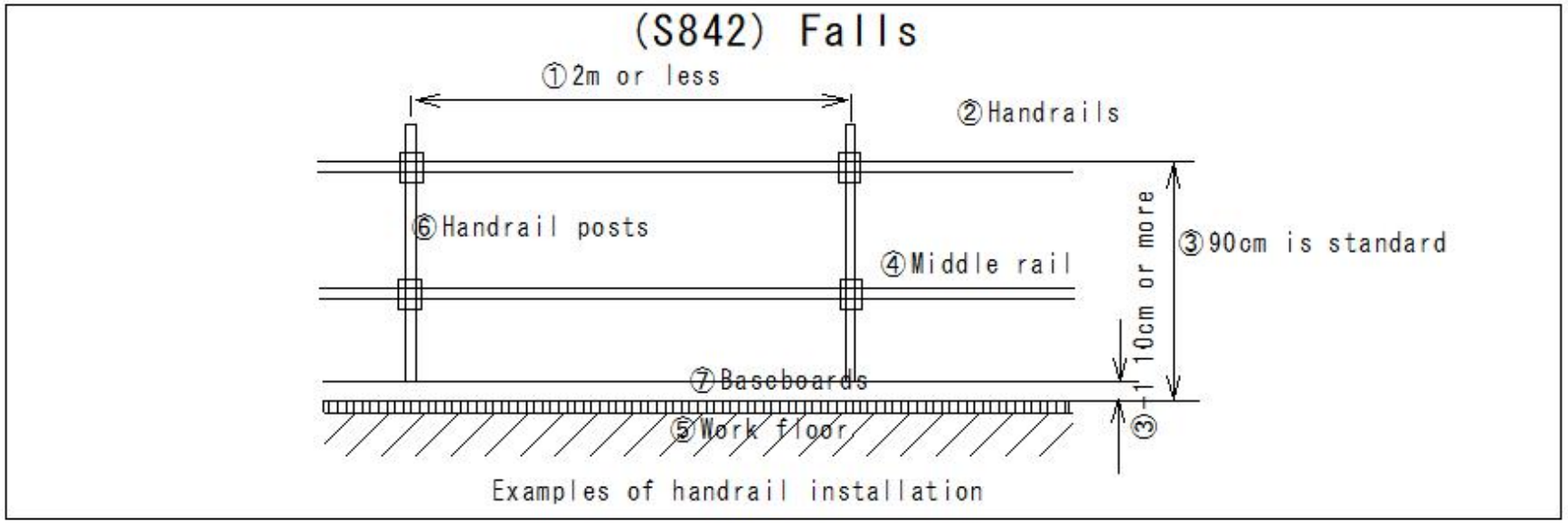
(S842) Falls

(S842) Falls

Explanation of technical standards for fall prevention equipment, etc.

Handrail standard comparison Unit: cm

		Temporary Construction Industry Association
Handrail height	85cm or more: Temporary passageway Middle crosspiece: 35-50cm	95cm or more: Type 2 90cm or more
Center distance between handrail posts	-	2m or less
Baseboard height	-	10cm or more



(S843) Falls

(S843) Falls

dards for fall prevention equipment, etc.

:autions for use

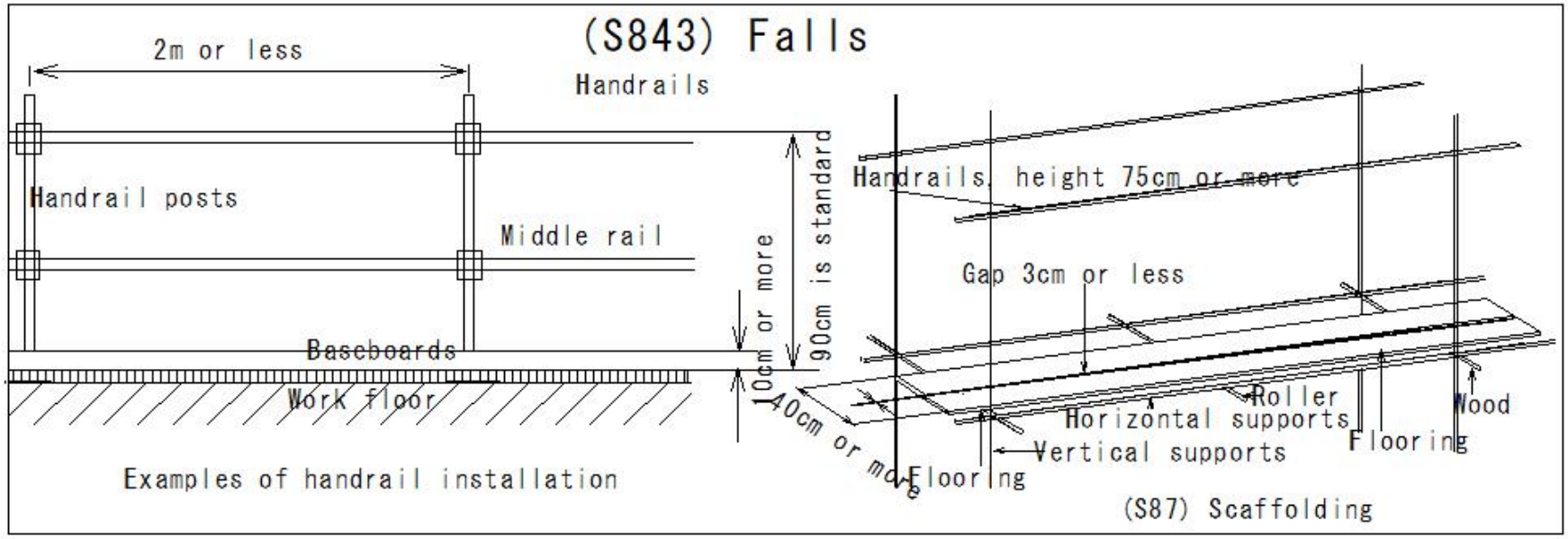
handrails without permission

② Handrails, etc. should not be used as safety belt lanyards or as a lifting point for loads

Do not use them as support points for lifelines, braces, wall ties, scaffolding boards, etc.

③ Do not lean materials against handrails, etc.

④ Do not use handrails or middle rails as step rails to ascend and descend



(S844) Falls

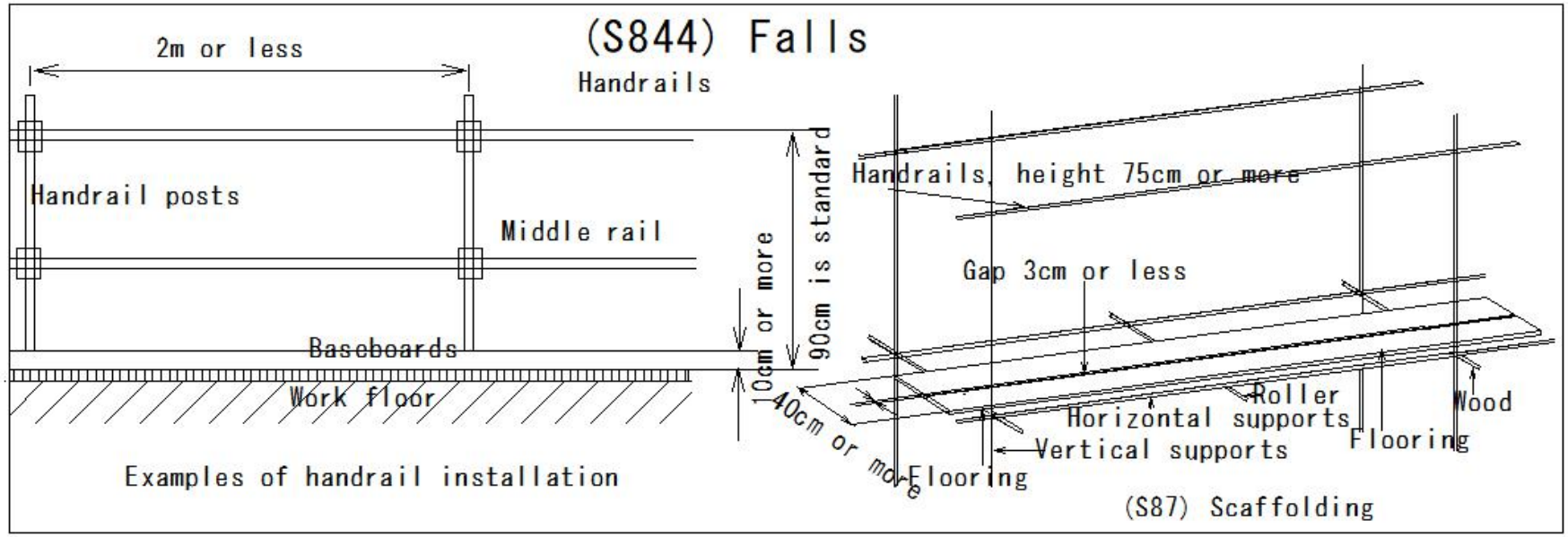
(S844) Falls

Explanation of technical standards for fall prevention equipment, etc.

Inspection and maintenance

① Deformation, damage, corrosion, etc. of each component of handrails, etc.

② Deformation, damage, corrosion, looseness, etc. of the attachment parts of each component of handrails, etc.



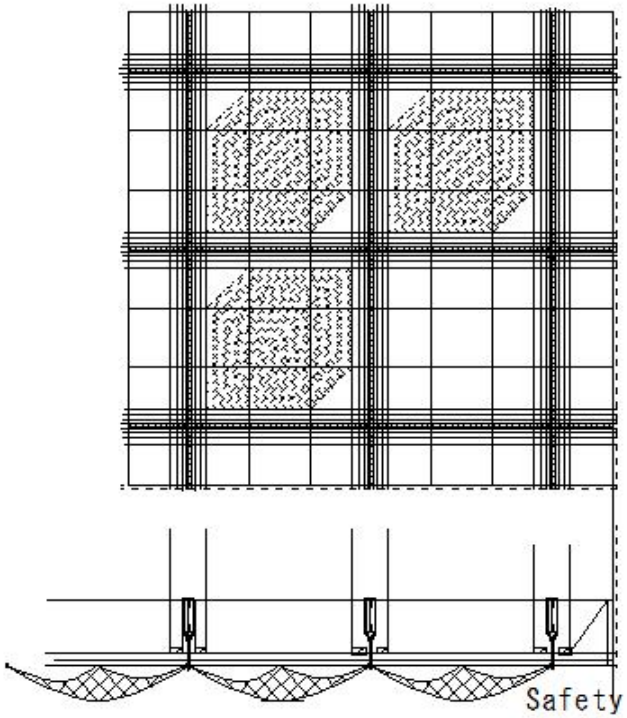
(S845) Safety Net

(S845) Safety Net

Standards for the use of safety nets

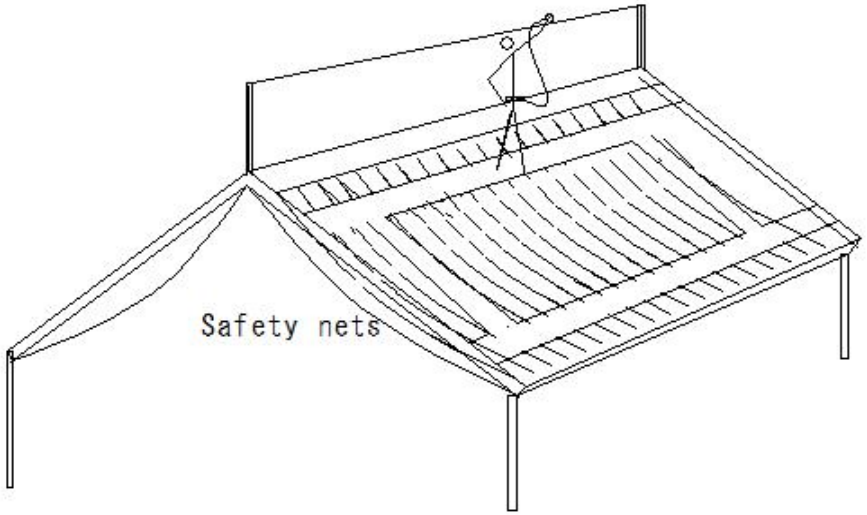
Installation of safety nets in areas where there is a risk of falling

①Install a safety net when it is difficult to install a work platform at a height of 2m or more.



Configuration of suspended scaffolding

S797



S827

S839

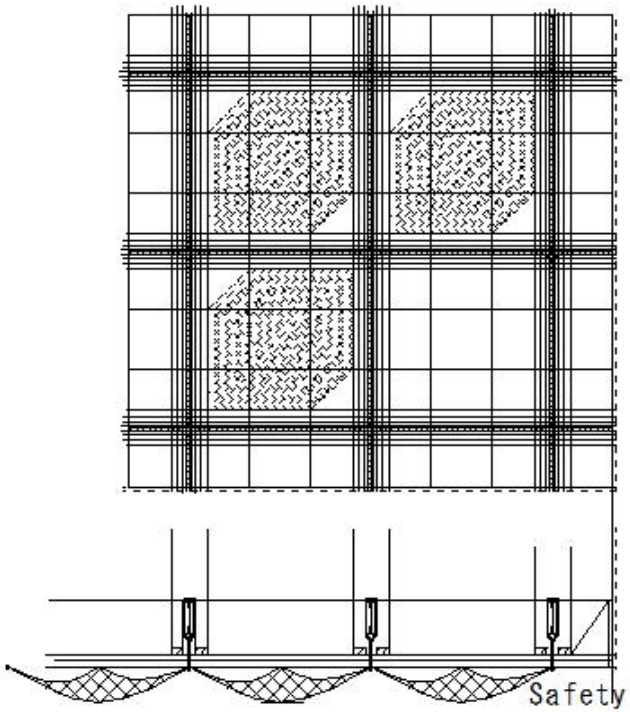
(S846) Safety Net

(S846) Safety Net

Standards for the use of safety nets

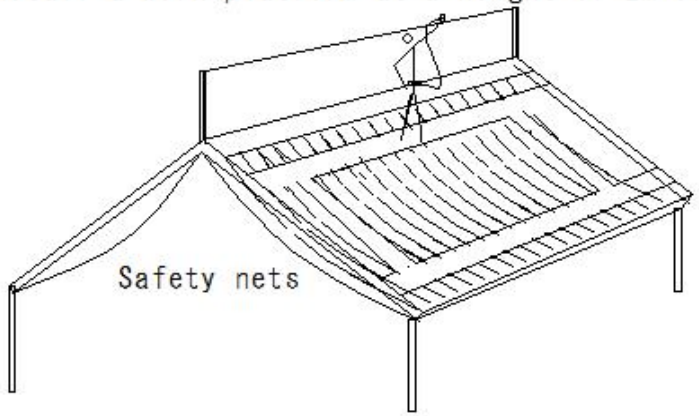
Installation of safety nets in areas where there is a risk of falling

①Install a safety net when it is difficult to install a work platform at a height of 2m or more.



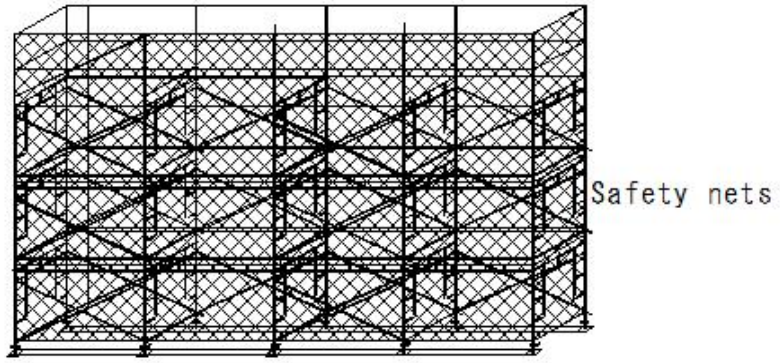
Configuration of suspended scaffolding

S797

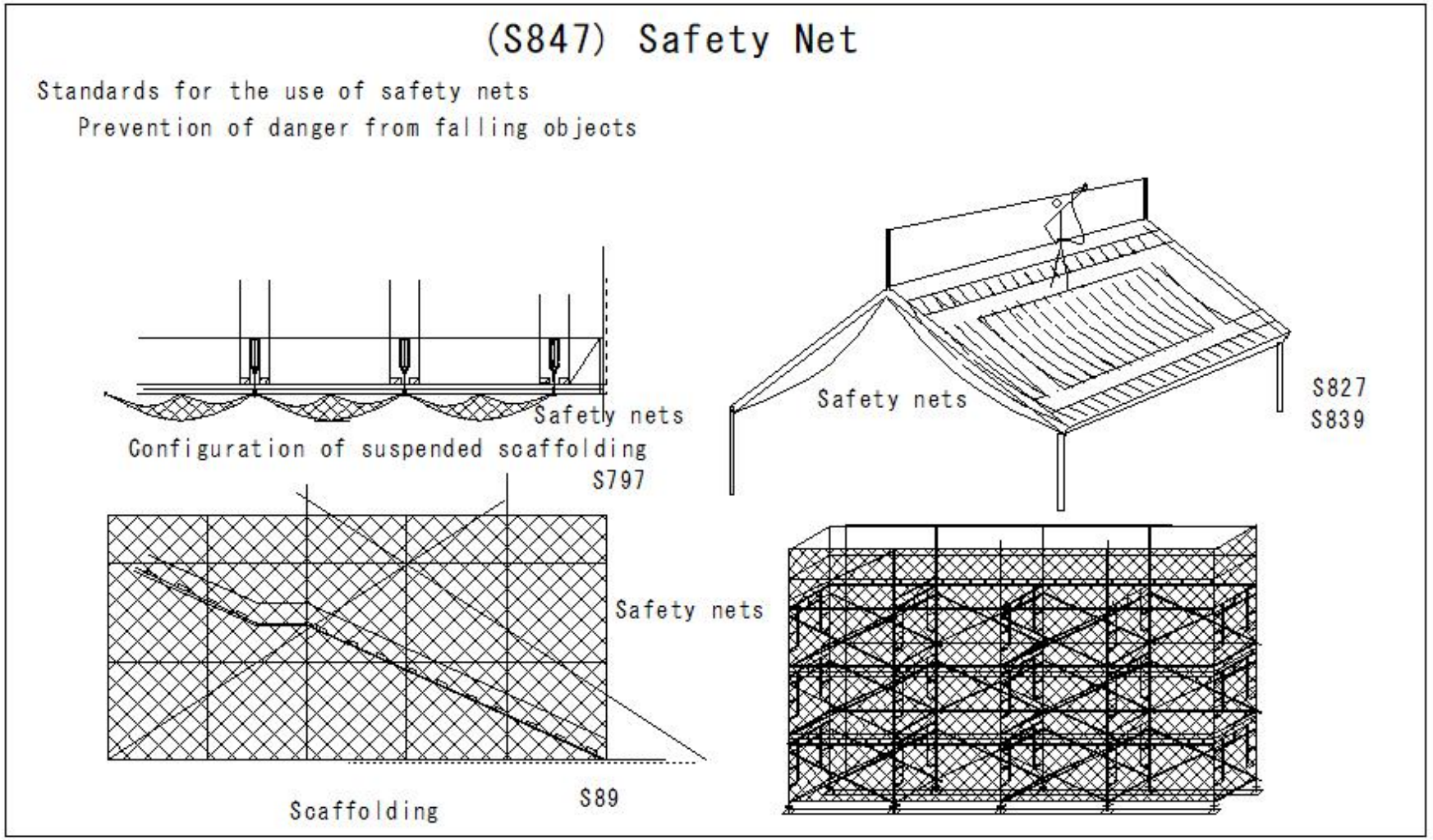


S827

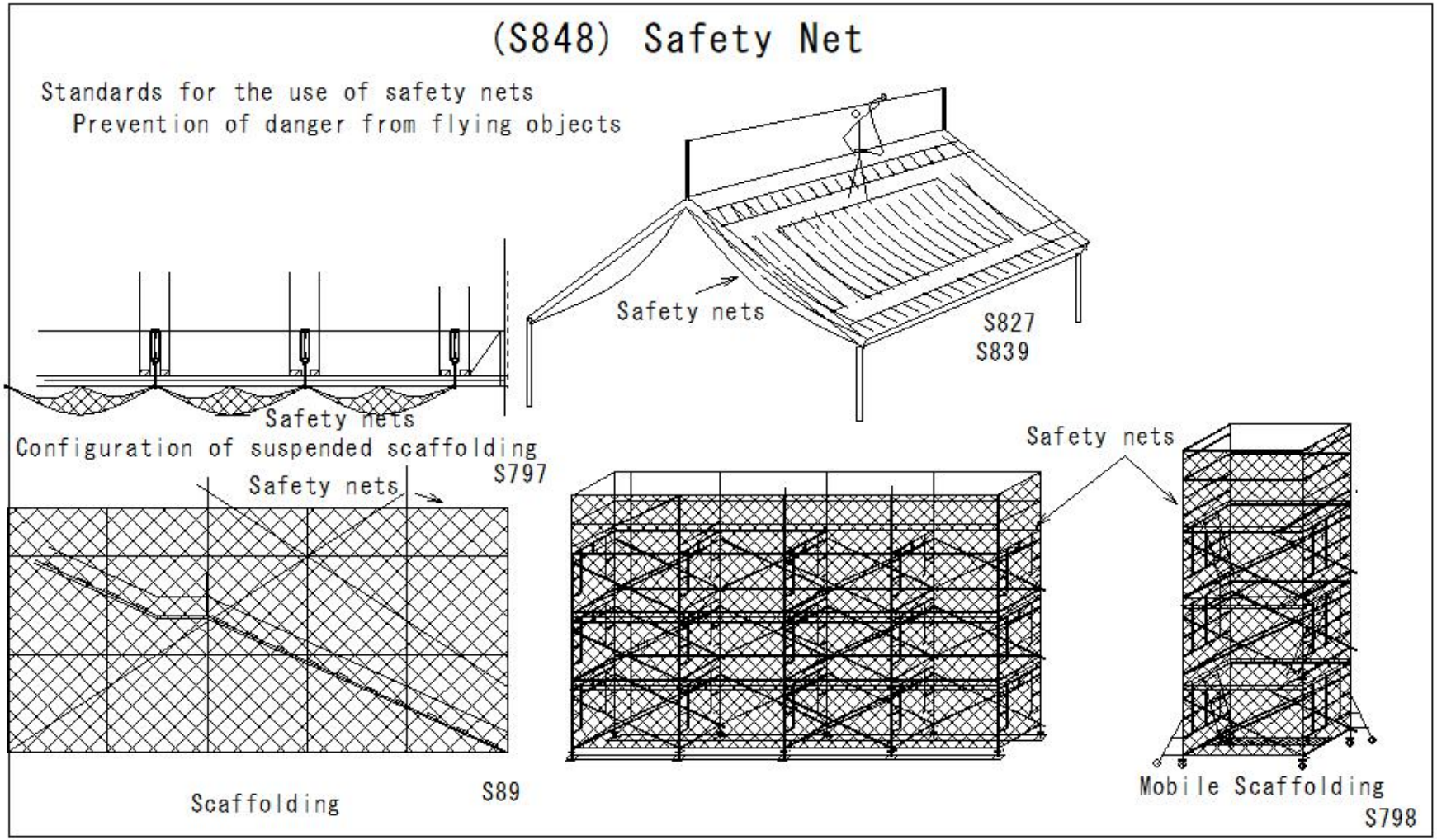
S839



(S847) Safety Net



(S848) Safety Net



(S849) Safety Net

Standards for use of safety nets

Standards for use of safety nets

Installation of safety nets, etc.

Installation position of safety net

①Fall height H1

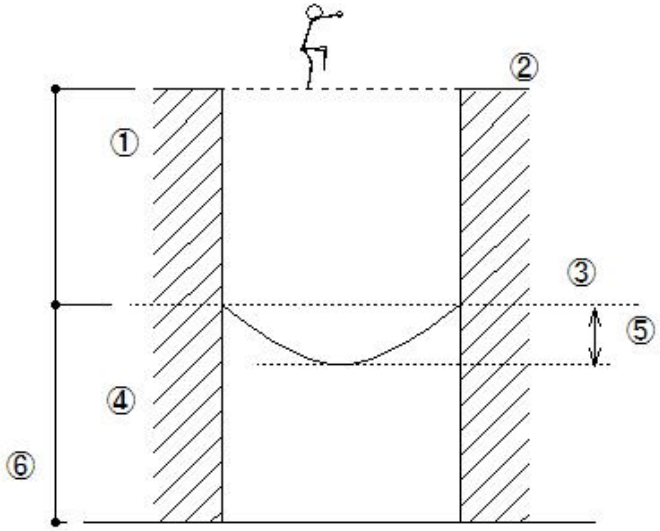
②Work position

③Net support surface

④Hole H2 at bottom of net

⑤Net sagging

⑥Install with sufficient clearance



Collision surface of floor, protrusions, etc.

(S850) Safety Net

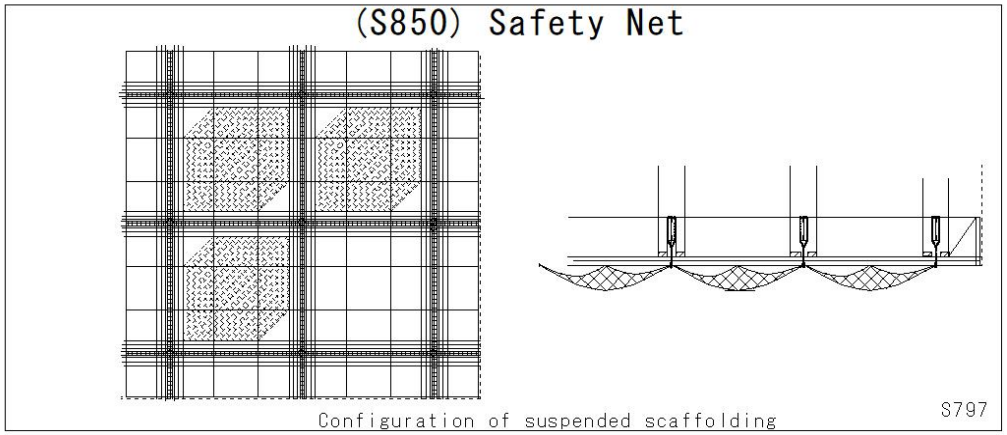
(S850) Safety Net

Standards for use of safety nets

Installation of safety nets, etc.

Strength of net thread, edge net, and hanging net

①Mesh size (cm)	②Strength of net thread when in use (kg)			⑥Strength of net thread, edge net, and hanging net (kg)
	③Knotted net	④Knotless net	⑤Russell net	
10	120	120	120	1500
5	50	-	50	
3	-	-	35	
1.5	-	-	17	



(S851) Safety Net

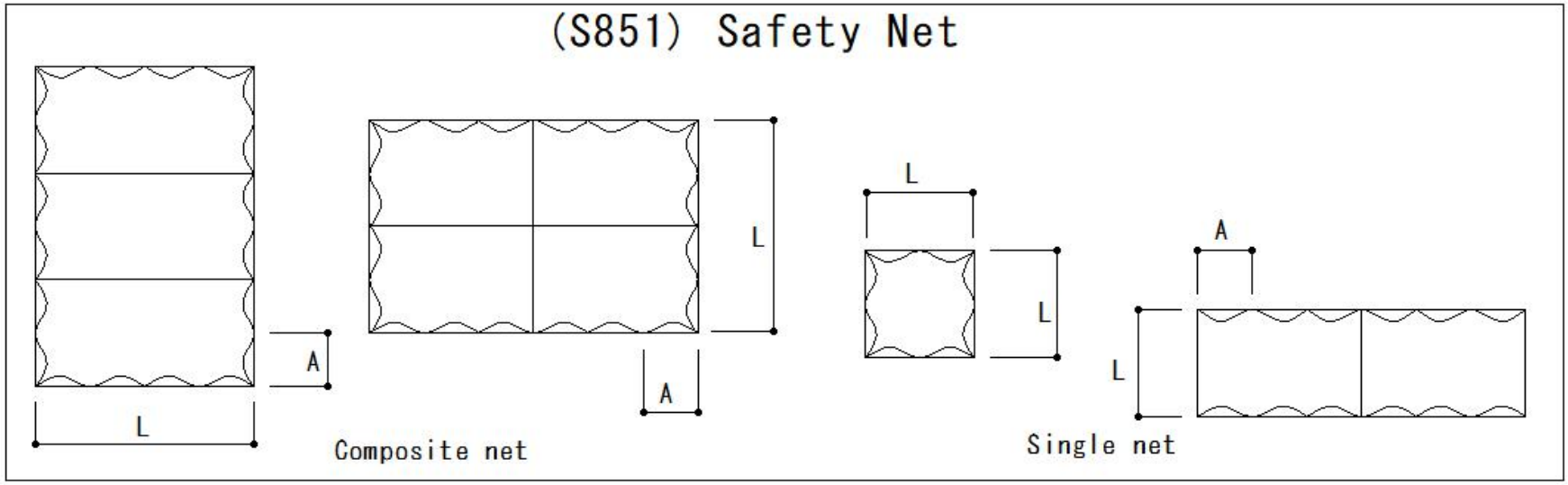
(S851) Safety Net

Safety net usage standards

Safety net installation, etc.

Allowable fall height

①Type of net	②Fall height (H) (m)		⑤Opening at bottom of net (H) (m)		⑧Net sagging (s)
⑨Conditions	③Car body net	④Composite net	⑥10cm mesh	⑦5cm mesh	
L＜A	0.25(L+2A)or less	0.20 (L+2A) or less	0.85 (L + 3A) / 4 or more	0.95/L or more	0.2(L+2A)/3 or less
L≧A	0.75L or less	0.6L or less	0.85L or more	0.95L or more	0.2L or less



(S852) Safety Net

(S852) Safety Net

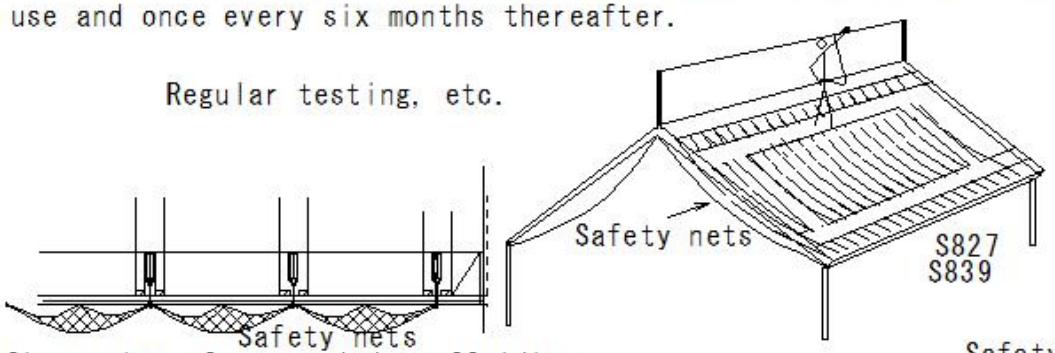
Standards for the use of safety nets

Installation of safety nets, etc.

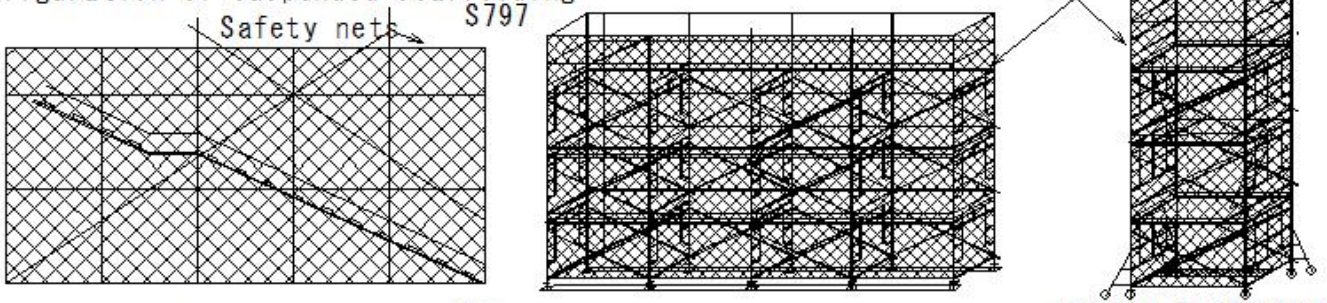
Regular testing, etc.

Nets must be subjected to a constant speed tensile test using test threads within one year of use and once every six months thereafter.

Regular testing, etc.



Configuration of suspended scaffolding S797



Scaffolding S89

Mobile Scaffolding S798

S848

(S853) Safety Net

(S853) Safety Net

Standards for the use of safety nets

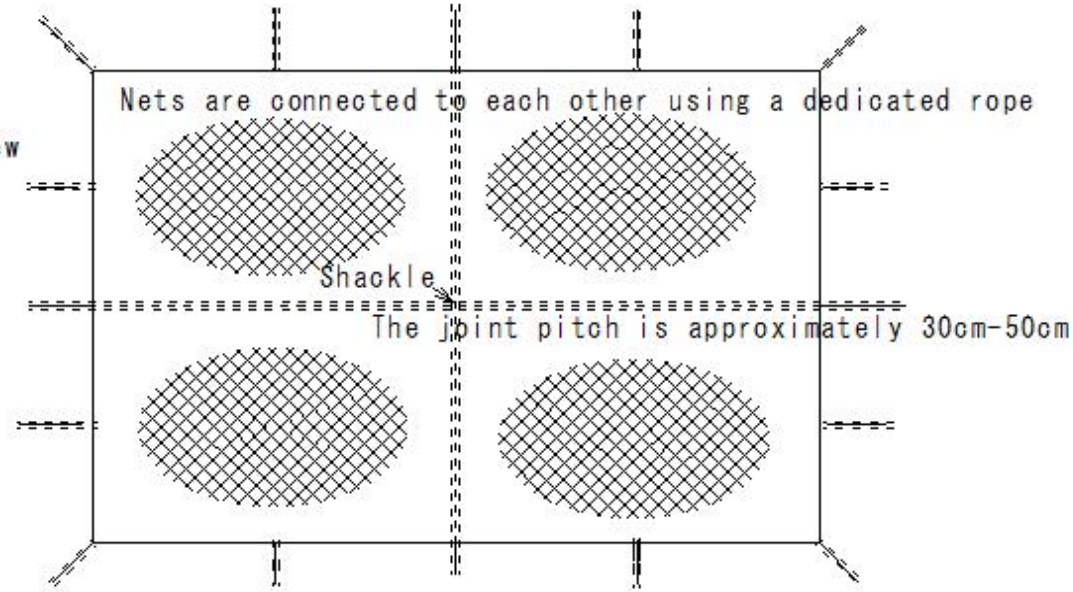
Installation of safety nets, etc.

In case of connecting safety nets

Display

The following information must be displayed in an easily visible place on the net

① Manufacturer's name
② Date of manufacture
③ Tailored dimensions
④ Mesh size
⑤ Strength of net thread when new



(S854) Safety Net

(S854) Safety Net

Standards for the use of safety nets

Installation of safety nets, etc.

In case of connecting safety nets

Use restrictions

Do not use in places where it may be exposed to sparks during welding work

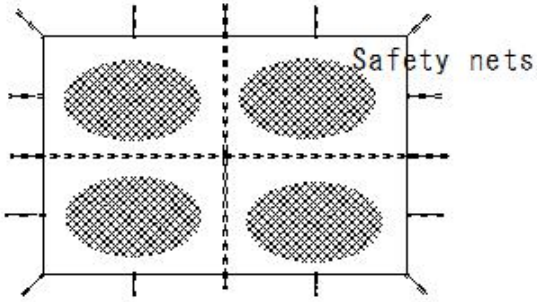
Do not use the following nets

① Nets that do not have sufficient strength

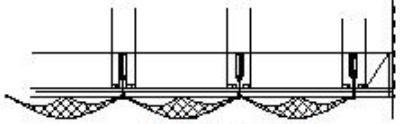
② Nets that have been impacted by falling objects

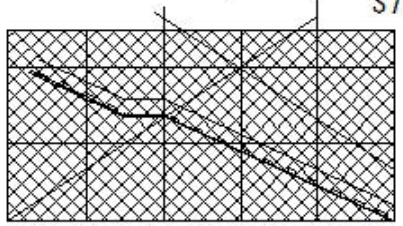
③ Nets with damaged parts that have not been repaired

Configuration of suspended scaffolding

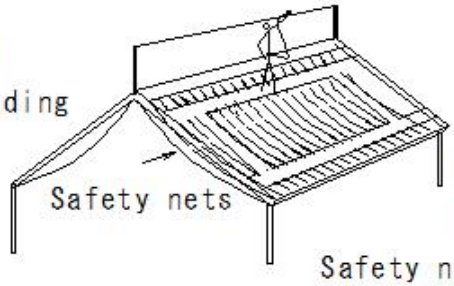


S853



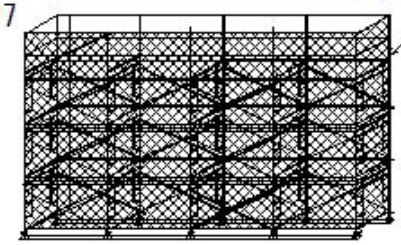


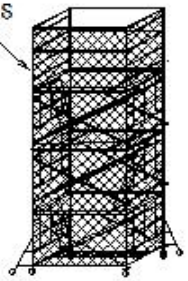
Scaffolding S89



S827

S839





Mobile Scaffolding S798

(S855) Safety Net

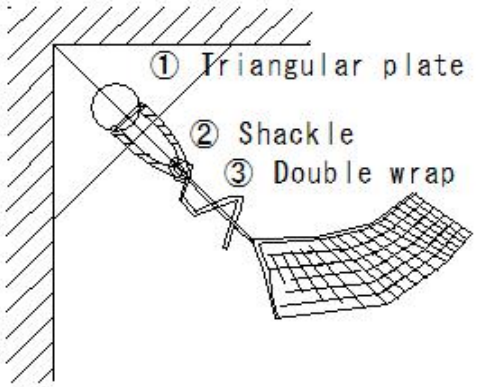
Standards for use of safety nets

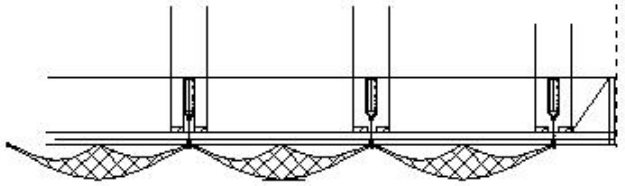
Methods and shapes of securing safety nets

○ Methods of securing safety nets

Attachment (attachment to attachment points)

① Wrap the hanging net around the attachment bracket twice and tie it





Configuration of suspended scaffolding

(S856) Safety Net

(S856) Safety Net

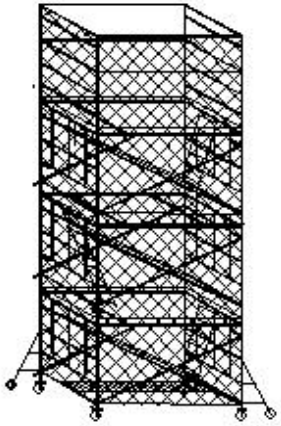
Standards for use of safety nets

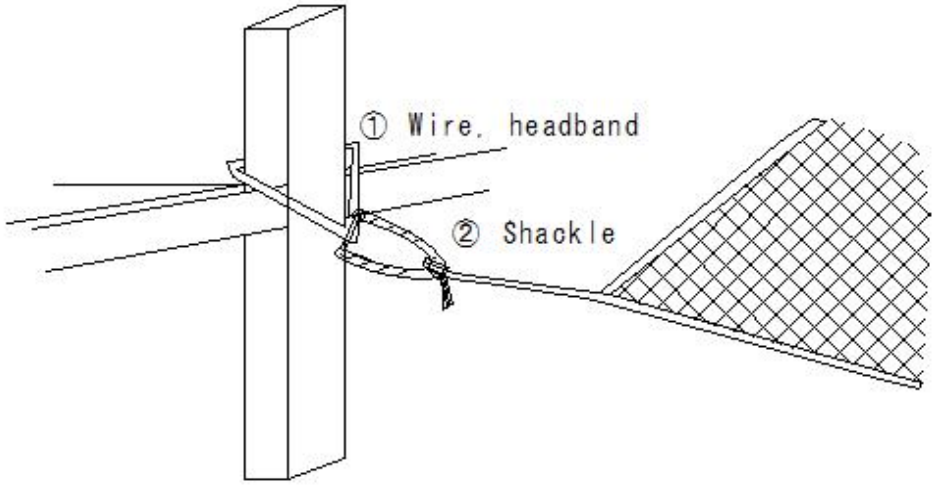
Methods and shapes of securing safety nets

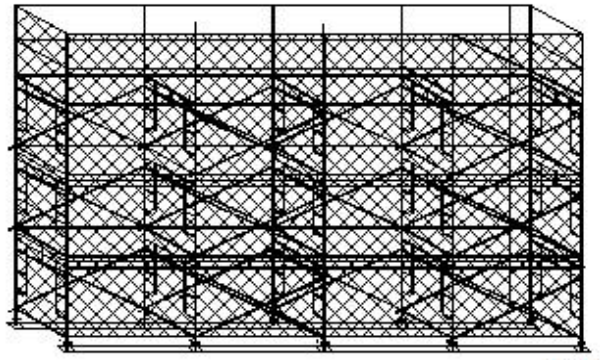
○ Methods of securing safety nets

Attachment (attachment to attachment points)

② For building components with sharp angles, attach with a headband







S848

(S857) Safety Net

(S857) Safety Net

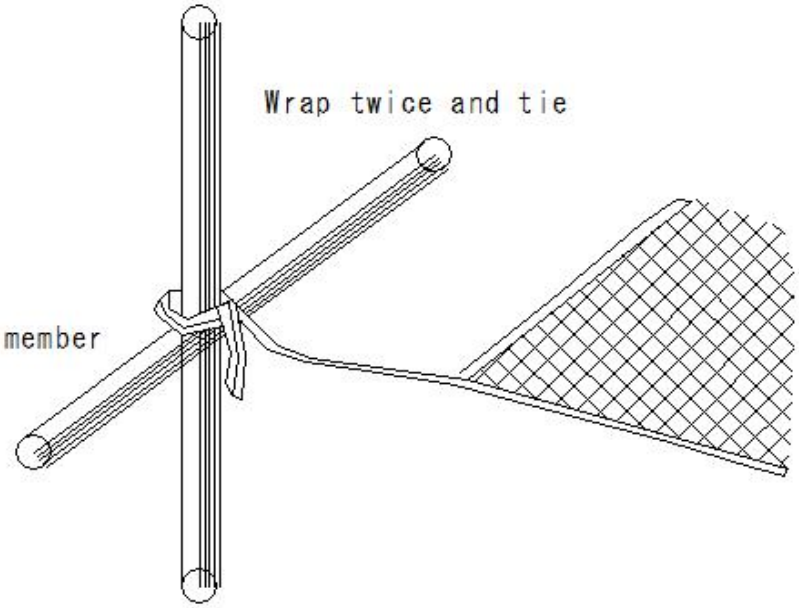
Standards for use of safety nets

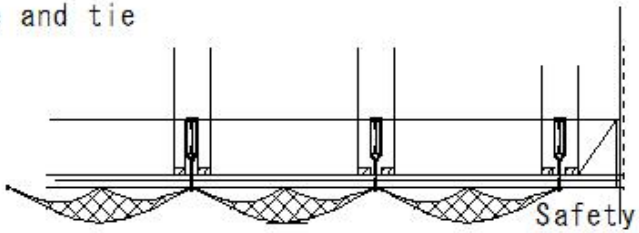
Methods and shapes of securing safety nets

○ Methods of securing safety nets

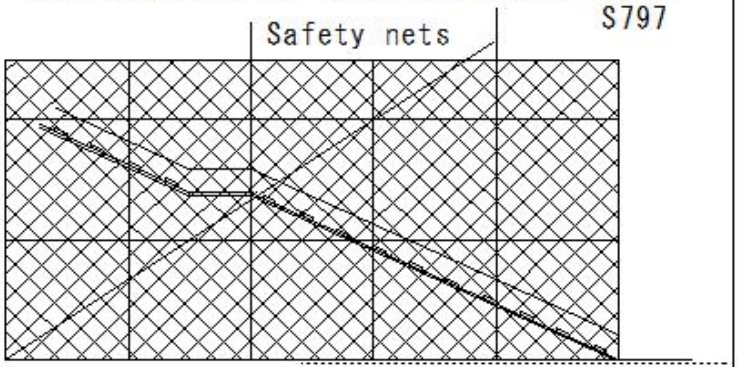
Tie-up (tie-up to attachment point)

③ Building material (without sharp corners): Wrap twice and tie





Configuration of suspended scaffolding S797



S89

(S858) Safety Net

(S858) Safety Net

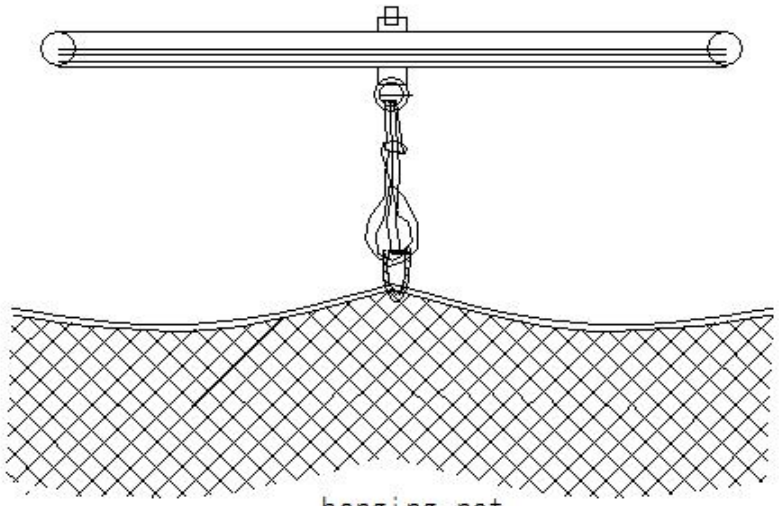
Standards for use of safety nets

Methods and shapes of securing safety nets

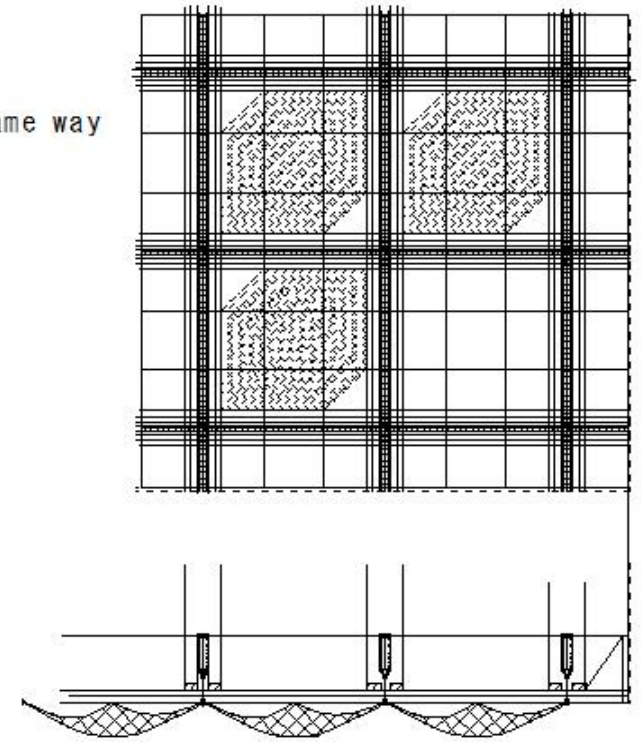
○ Methods of securing safety nets

Tie-up (tie-up to attachment point)

④ In case of there is a middle net, attach it in the same way as a hanging net



hanging net



Configuration of suspended scaffolding

S797

(S859) Safety Net

(S859) Safety Net

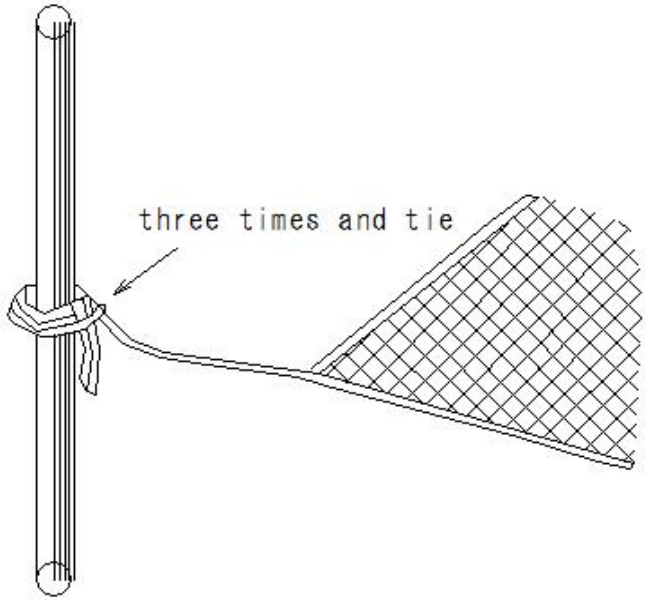
Standards for use of safety nets

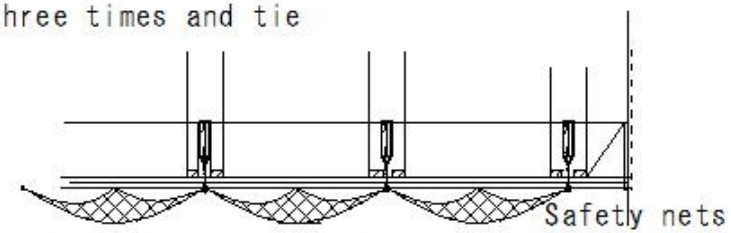
Methods and shapes of securing safety nets

○ Methods of securing safety nets

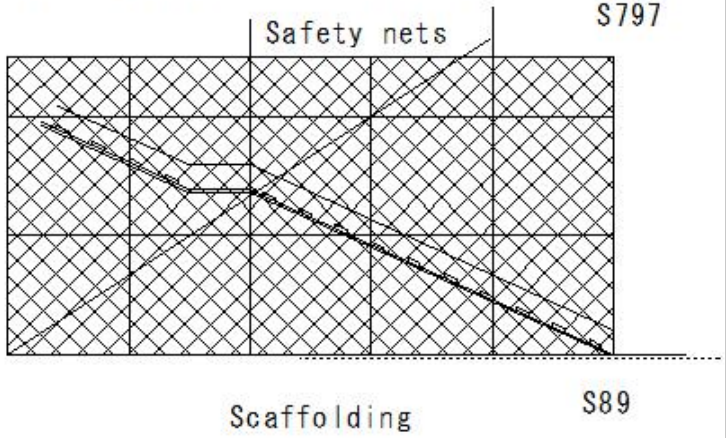
Tie-up (tie-up to attachment point)

⑤ In case of there is no cross member, wrap at least three times and tie





Configuration of suspended scaffolding S797



(S860) Safety Net

(S860) Safety Net

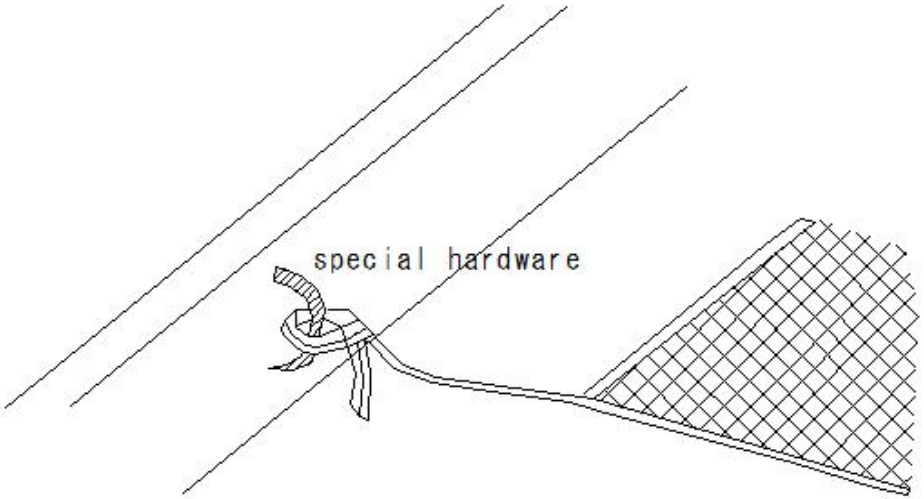
Standards for use of safety nets

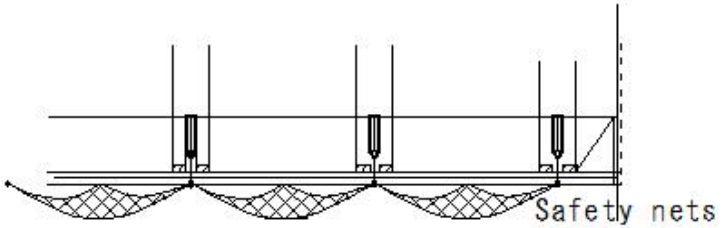
Methods and shapes of securing safety nets

○ Methods of securing safety nets

Tie-up (tie-up to attachment point)

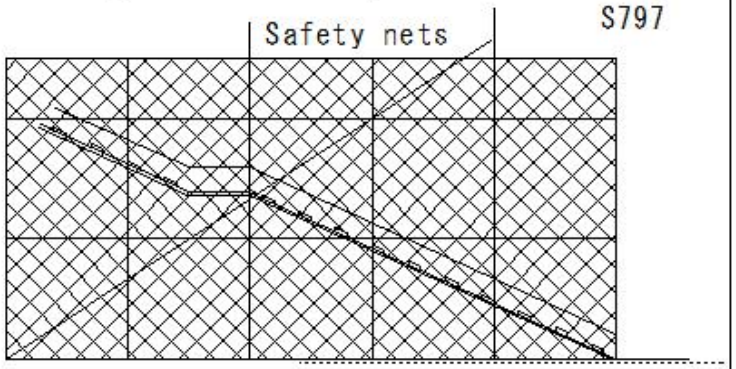
⑥ Tie with rope, attach using special hardware





Configuration of suspended scaffolding

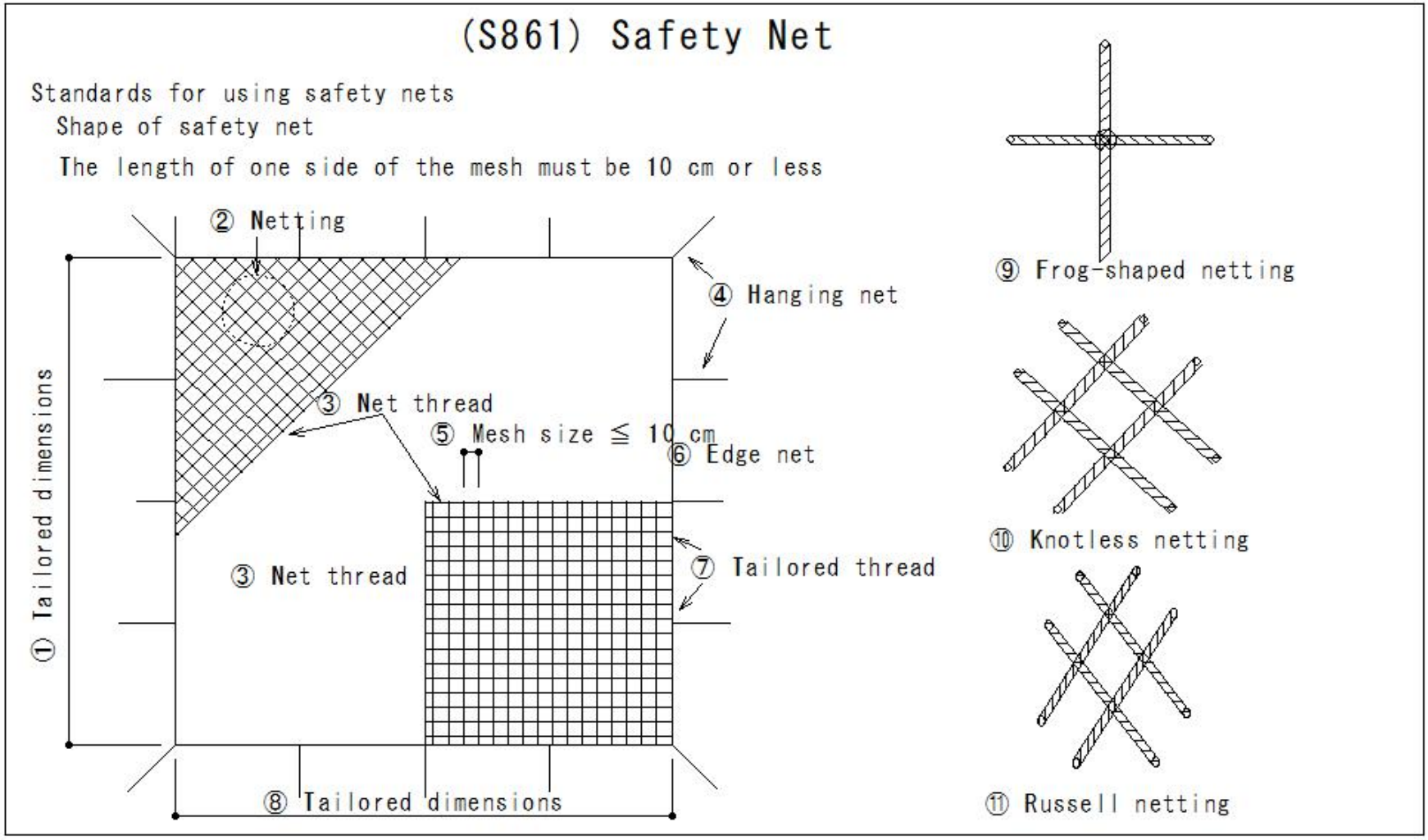
S797



Scaffolding

S89

(S861) Safety Net



(S862) Flying objects and Collapses

(S862) Flying objects and Collapses

Preventing accidents caused by flying objects and collapses

① Preventing dangers caused by ground collapses, etc.

① Make the ground slope safe, remove soil and stones that may fall, and install retaining walls and earth retaining supports, etc.

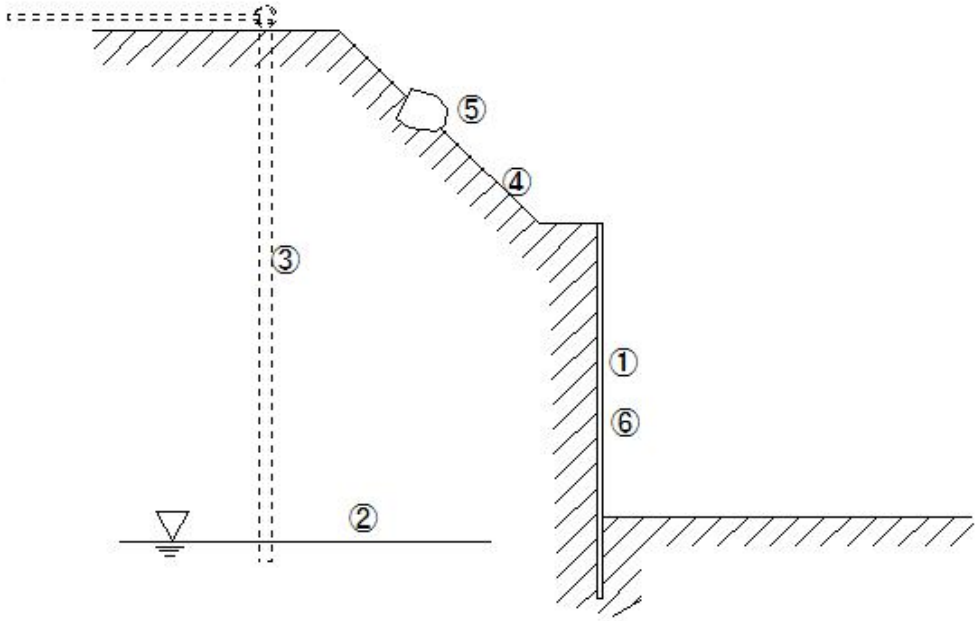
② Eliminate rainwater, groundwater, etc. that may cause damage

③ Eliminate groundwater using well points, etc.

④ Appropriate slope

⑤ Remove loose stones

⑥ Install earth retaining supports



(S863) Flying objects and collapses

(S863) Flying objects and collapses

Prevention of flying objects and collapses

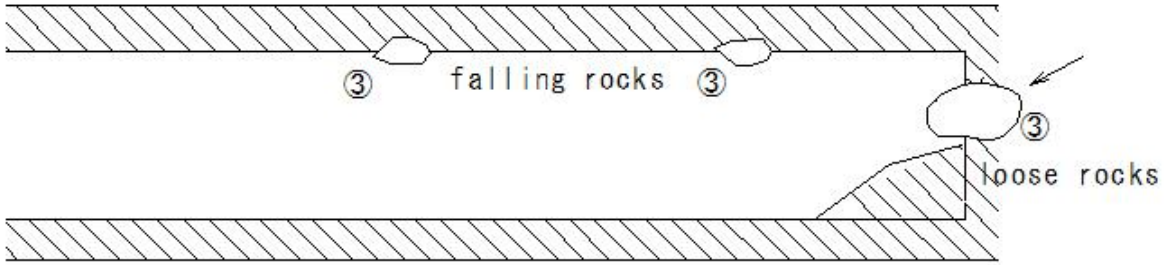
② Prevention of dangers caused by falling rocks, etc.

① Installation of supports to prevent dangers caused by falling rocks, falling surfaces, or collapse of side walls in the mine,

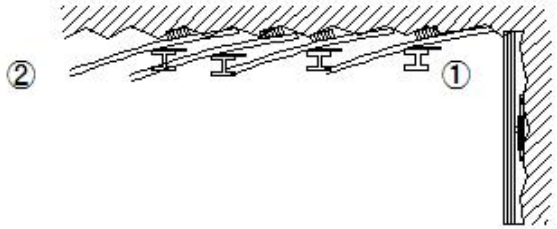
and measures to prevent dangers such as removing loose rocks

② Supports to prevent falling rocks

③ Removal of loose rocks



E497



T187

(S864) Flying objects and collapses

(S864) Flying objects and collapses

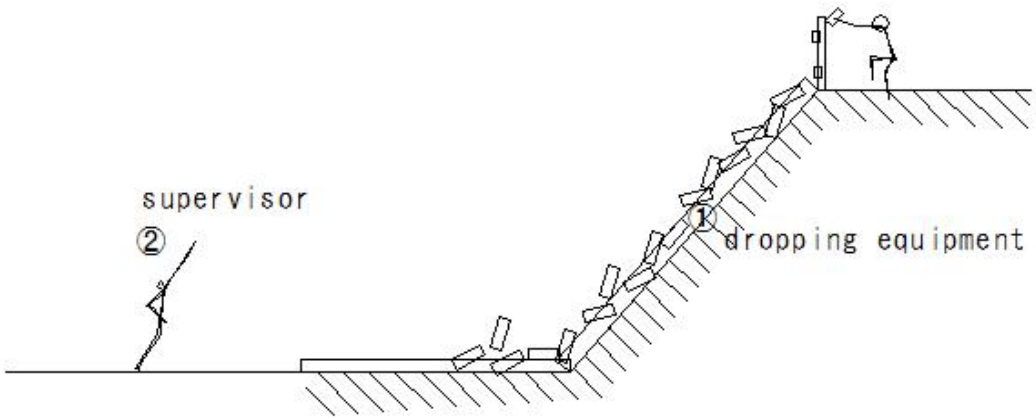
Prevention of flying objects and collapses

③ Prevention of dangers caused by objects being dropped from a height

In case of dropping objects from a height of 3m or more, install appropriate dropping equipment and assign a supervisor

① Installation of dropping equipment

② Assign a supervisor



(S865) Flying objects and Collapses

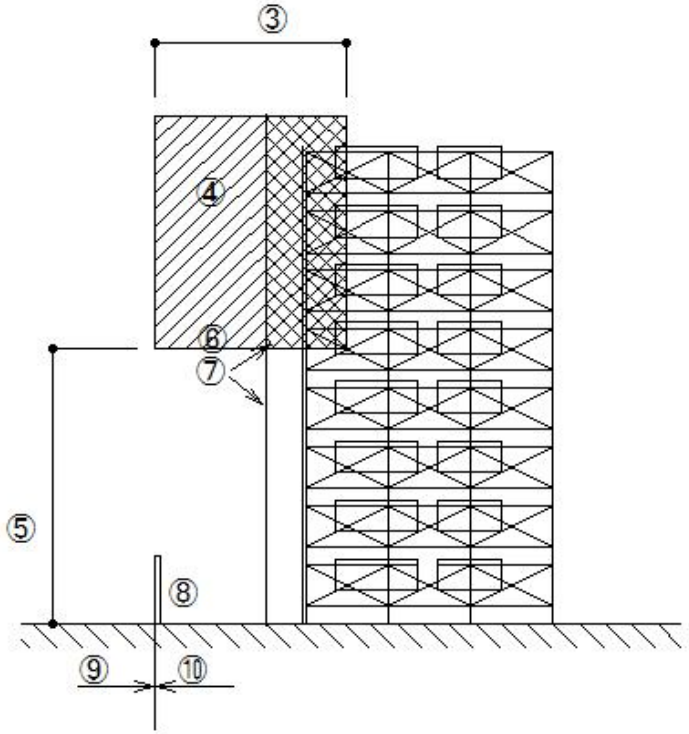
(S865) Flying objects and Collapses

Prevention of flying objects, falling objects, and collapse accidents

④ Prevention of danger from falling objects

In case of there is danger from falling objects,
install protective netting and set up
set up entry areas, etc.

① Falling objects, Caution
② Areas where fall prevention is applicable
③ Within 5 meters
④ Applicable areas
⑤ More than 7 meters
⑥ Iron netting or canvas
⑦ Frame scaffolding
⑧ Temporary enclosure
⑨ General common area
⑩ Work area



(S866) Flying objects and Collapses

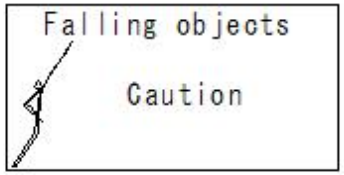
(S866) Flying objects and Collapses

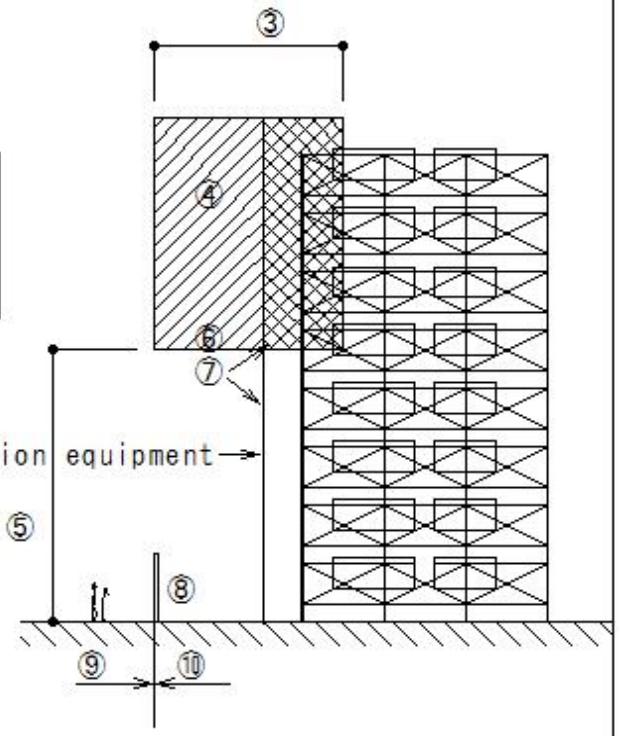
Prevention of flying objects, falling objects, and collapse accidents

⑤ Prevention of danger from flying objects

① In case of flying objects pose a danger to workers, install flying prevention equipment and wear protective helmets

① Falling objects, Caution
② Areas where fall prevention is applicable
③ Within 5 meters
④ Applicable areas
⑤ More than 7 meters
⑥ Iron netting or canvas
⑦ Frame scaffolding
⑧ Temporary enclosure
⑨ General common area
⑩ Work area





safety helmets

(S867) Flying objects and Collapses

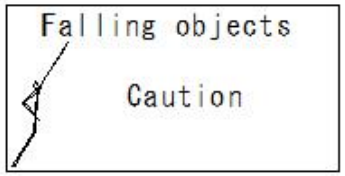
(S867) Flying objects and Collapses

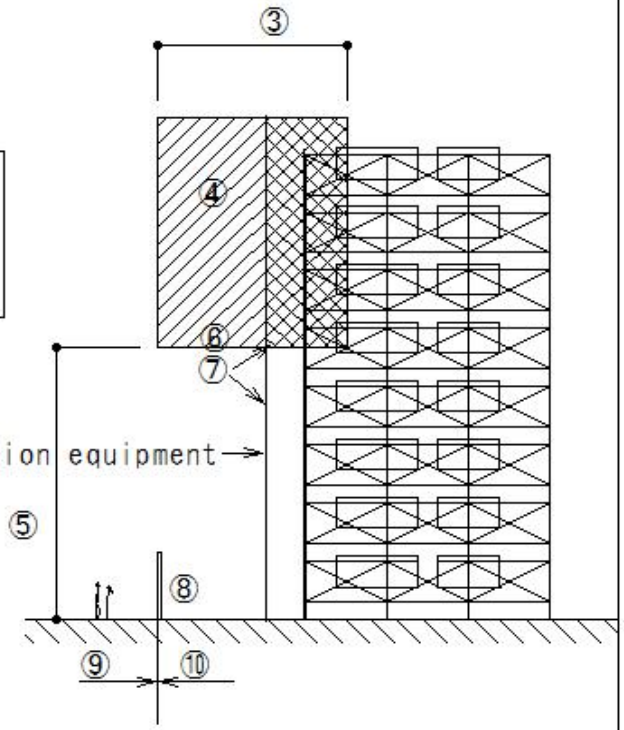
Prevention of flying objects, falling objects, and collapse accidents

⑥ Wearing protective helmets

① Have workers wear protective helmets to prevent the danger of flying or falling objects

① Falling objects, Caution
② Areas where fall prevention is applicable
③ Within 5 meters
④ Applicable areas
⑤ More than 7 meters
⑥ Iron netting or canvas
⑦ Frame scaffolding
⑧ Temporary enclosure
⑨ General common area
⑩ Work area





(S868) Flying objects and Collapses

(S868) Flying objects and Collapses

Preventing falling objects during construction

Protection against falling objects

Within 5m horizontal distance from the boundary line of the construction site

Ground surface to height 7m or more

①Construction site: Cover with iron netting or canvas to prevent danger from falling objects

②The framework to which the iron netting, etc. is attached must have sufficient durability

③The protective fence must extend horizontally 2m or more from the outside of the framework

④At least 20° from the horizontal plane

⑤Protection sheet

⑥Rope

⑦(Assembly/disassembly)When in use

⑧Protective fence attachment part

⑨Wall connection fittings

⑩2210mm

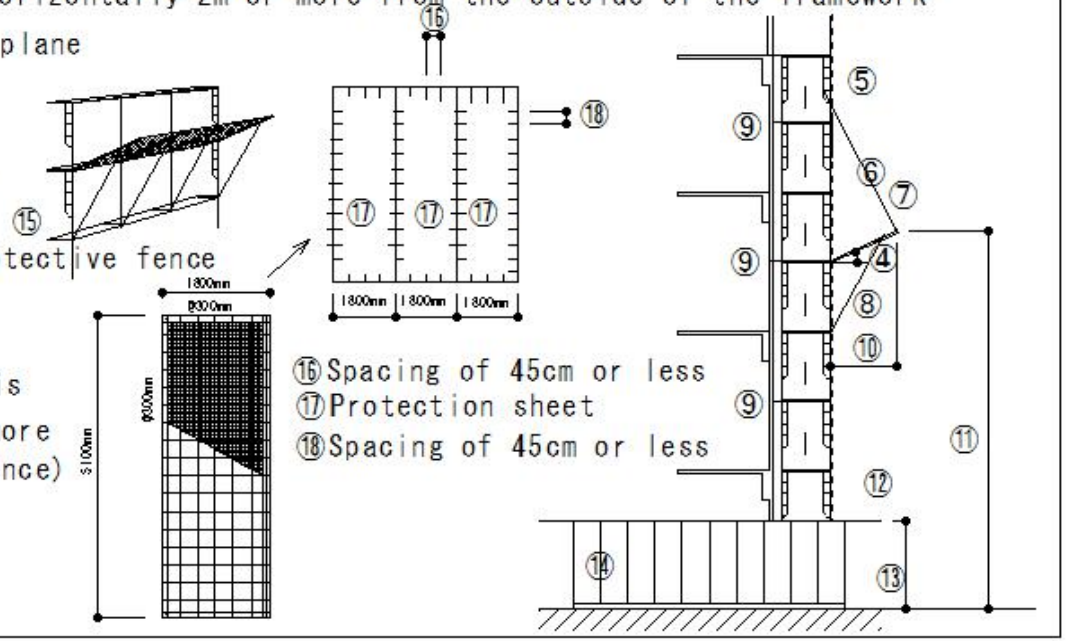
⑪Every 10m

⑫In case of the construction area is 20m or more high, install two or more 4protective shelves (Protective fence)

⑬1.8m or more

⑭Temporary fence

⑮Protective fence

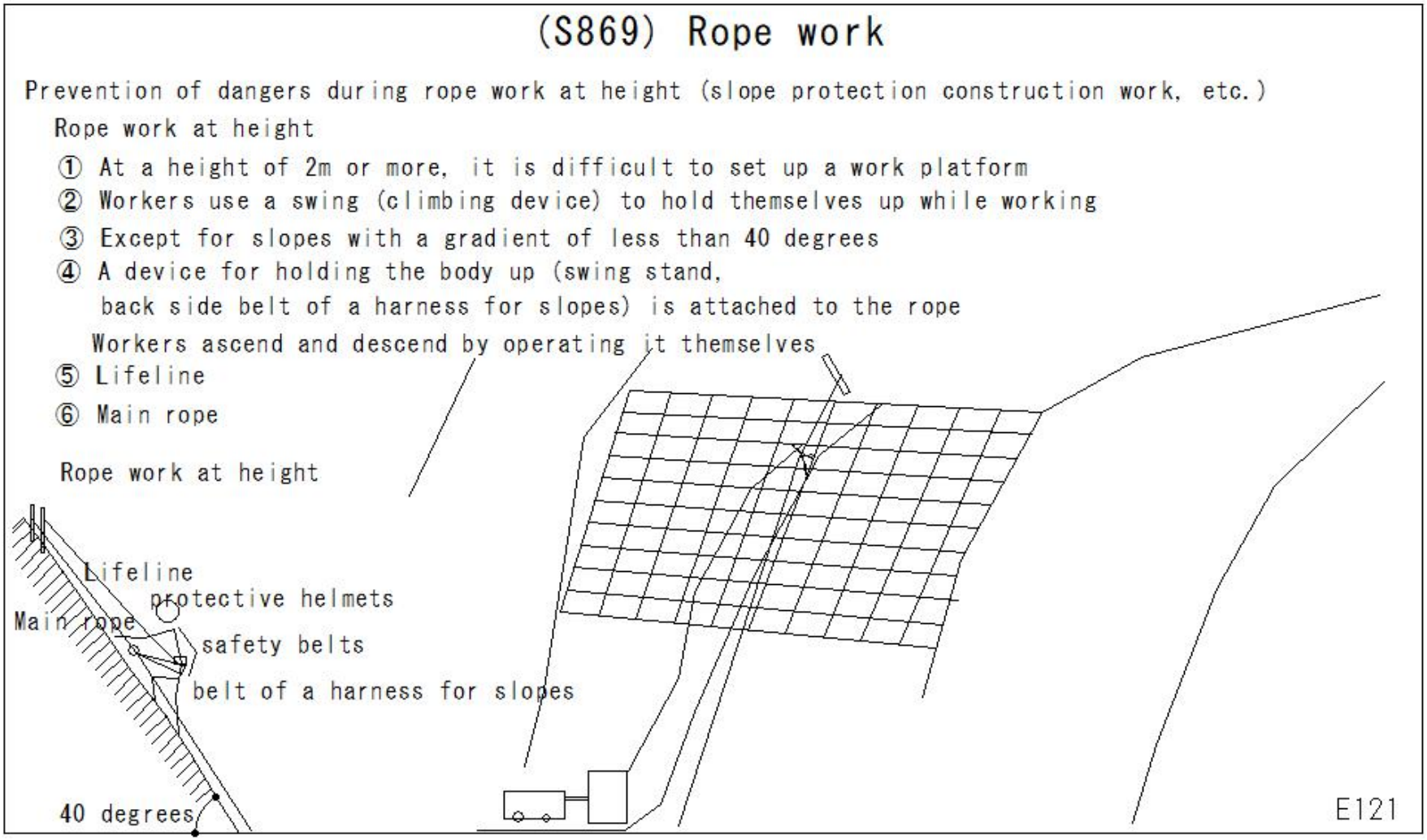


⑯Spacing of 45cm or less

⑰Protection sheet

⑱Spacing of 45cm or less

(S869) Rope work



(S870) Rope work

(S870) Rope work

Prevention of dangers during rope work at height (slope protection construction work, etc.)

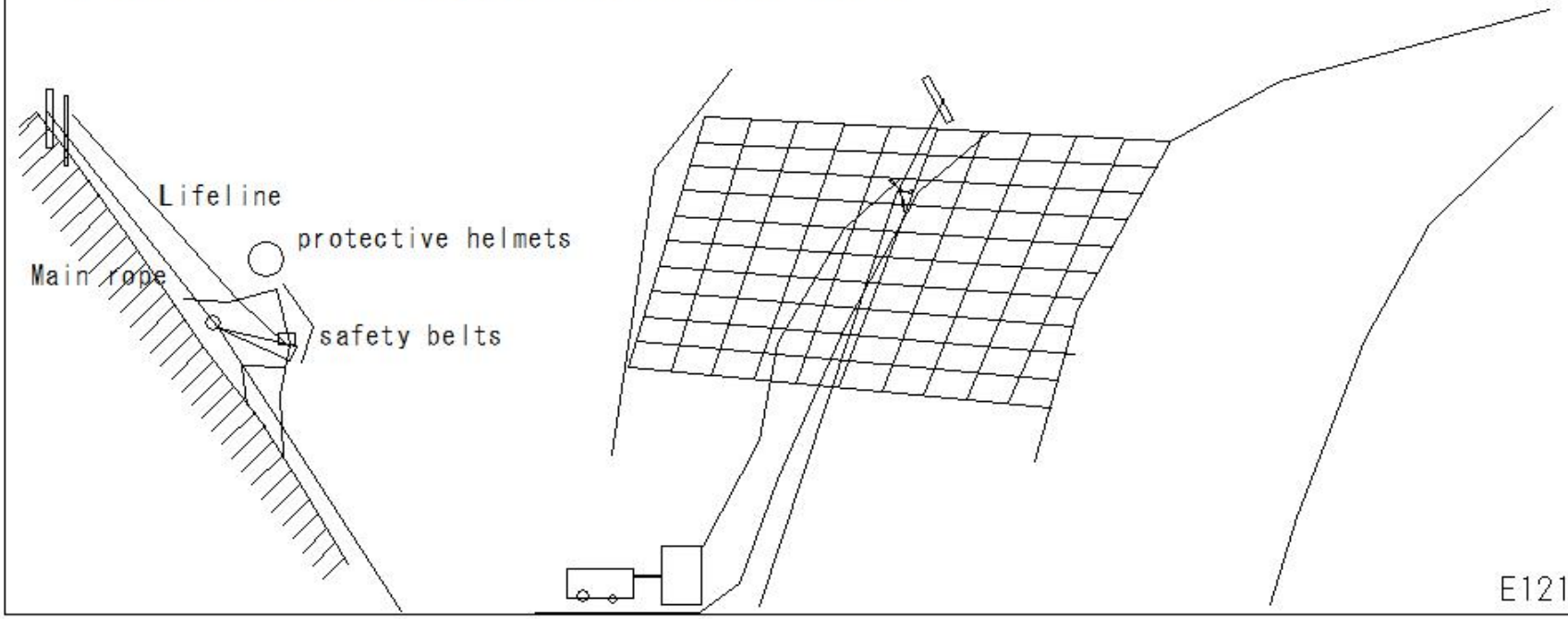
Rope work at height

Employer → Designation → Work supervisor

① Command based on work plan

② Check the condition of ropes, etc.

③ Check the use of safety belts and protective helmets



(S871) Rope work

(S871) Rope work

Prevention of dangers during rope work at height (slope protection construction work, etc.)

Rope work at height

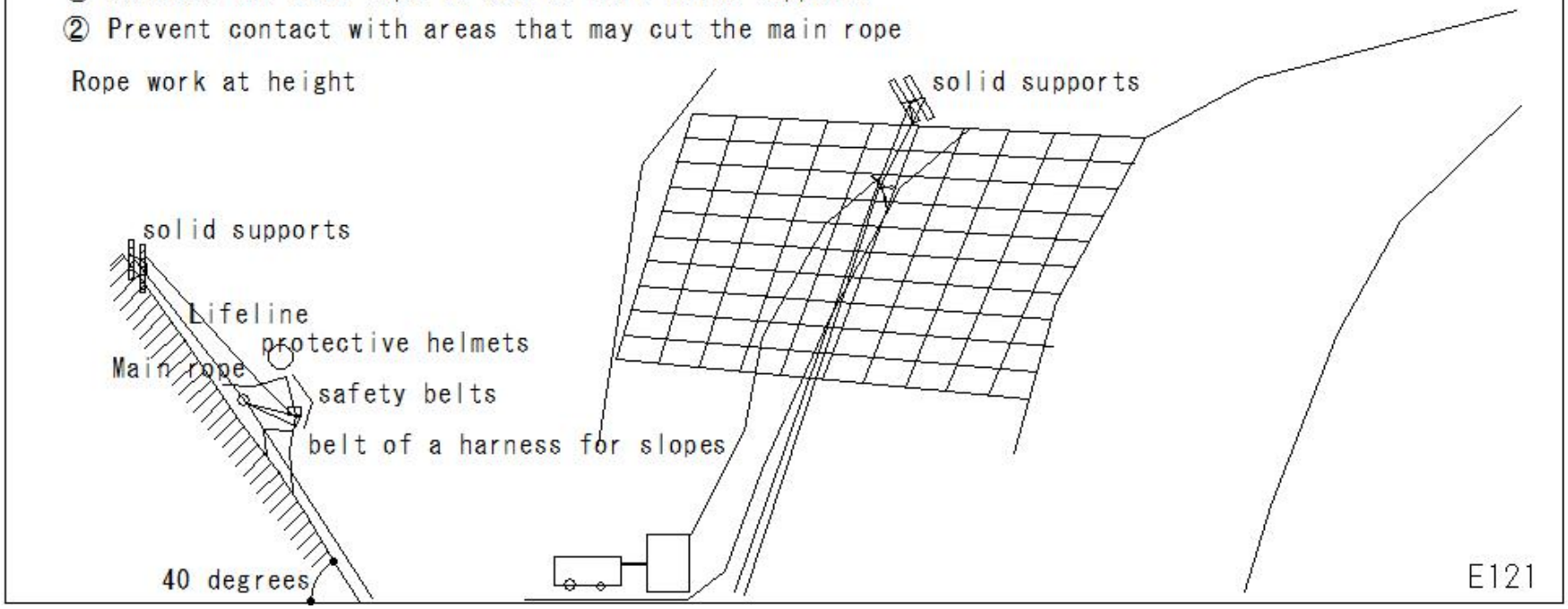
Lifeline installation

○ Install a lifeline for attaching a safety belt other than the main rope

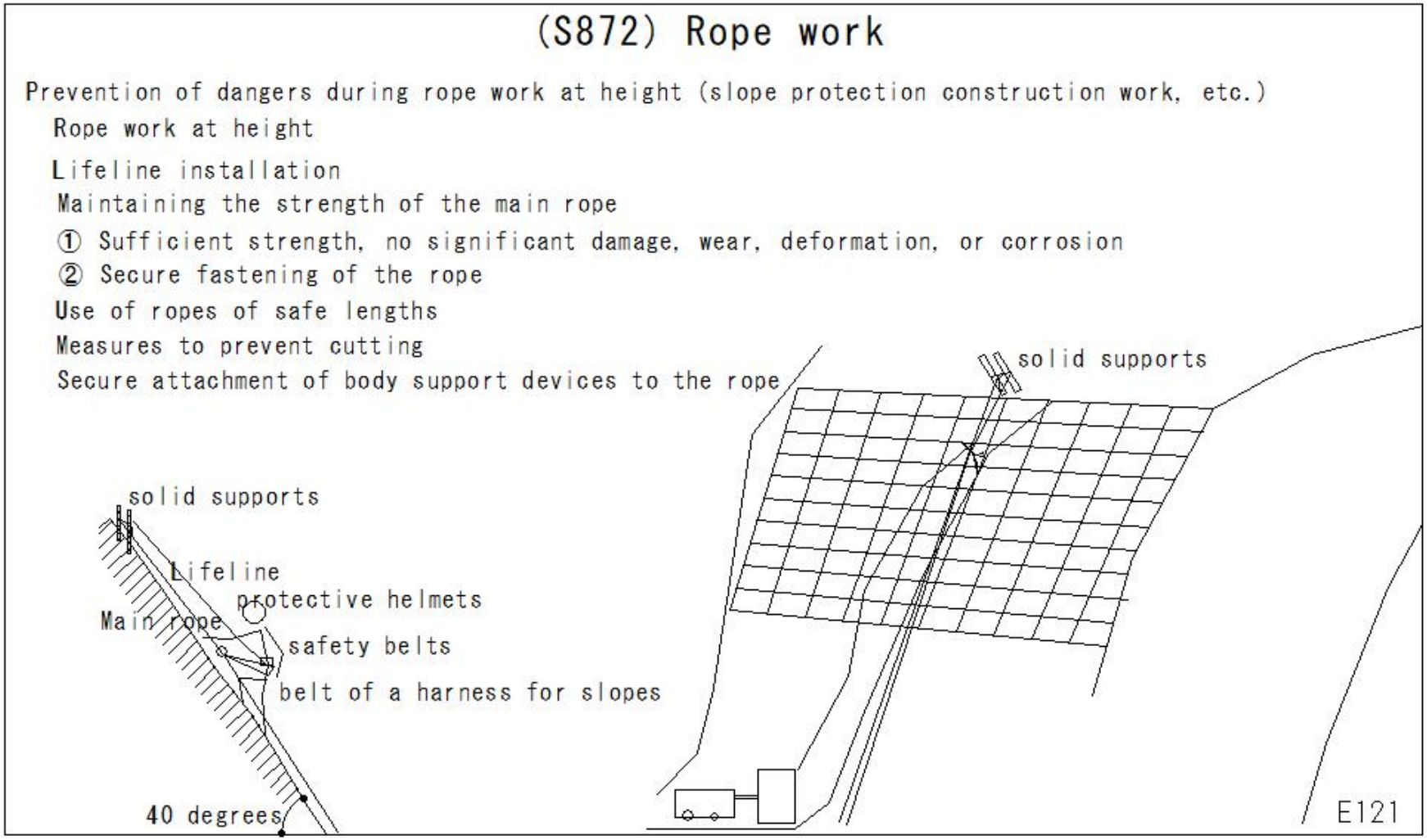
○ Slope, construction work, building cleaning work

① Connect the main rope to two or more solid supports

② Prevent contact with areas that may cut the main rope



(S872) Rope work



(S873) Rope work

(S873) Rope work

Prevention of dangers during rope work at height (slope protection construction work, etc.)

Rope work at height

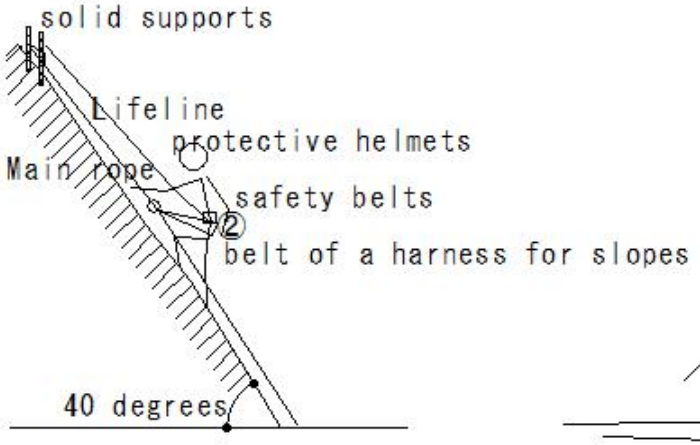
Investigation and recording

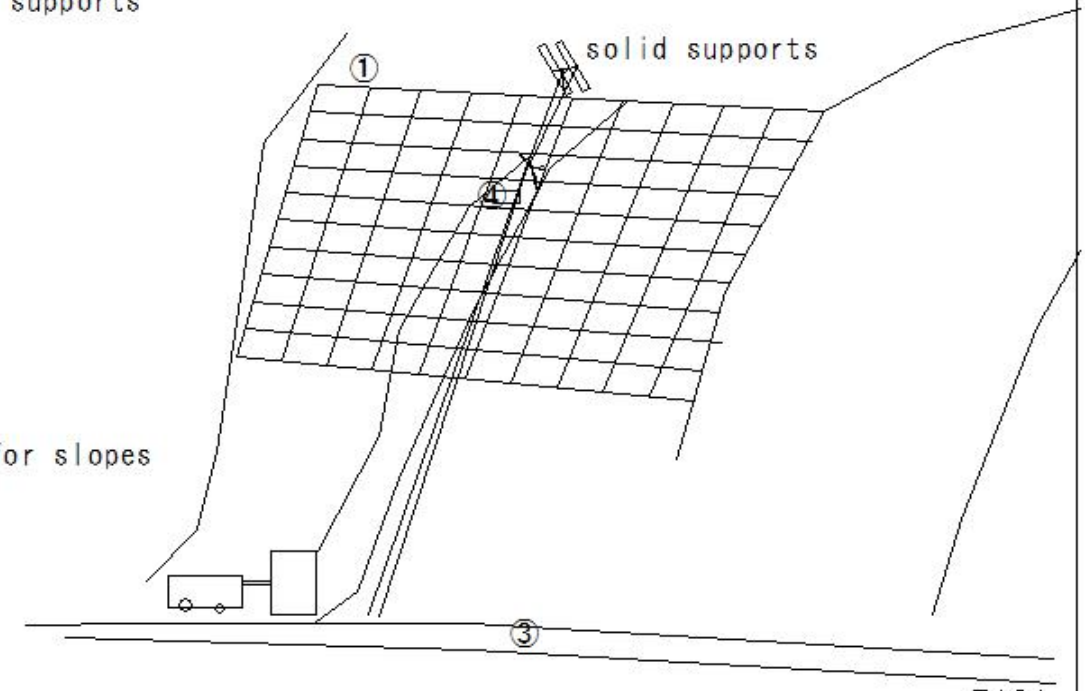
① Conditions at the work site and below

② Conditions of rope fastening and supports

③ Conditions of the passage

④ Areas at risk of cutting





E121

(S874) Rope work

(S874) Rope work

Prevention of dangers during rope work at height (slope protection construction work, etc.)

Rope work at height

① Method and sequence of work

② Number of workers

③ Position of rope supports

④ Type and strength of main rope

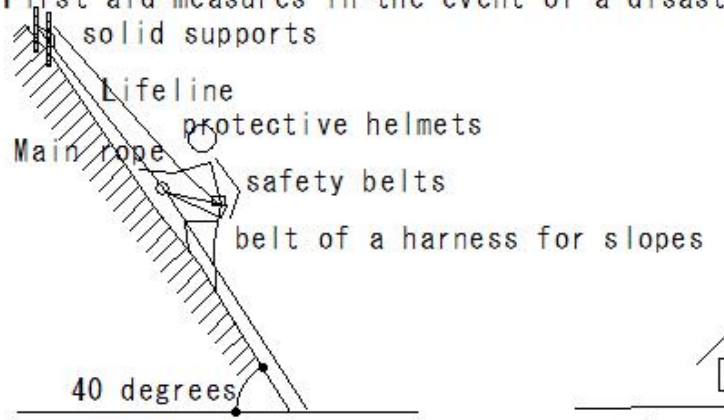
⑤ Length of rope

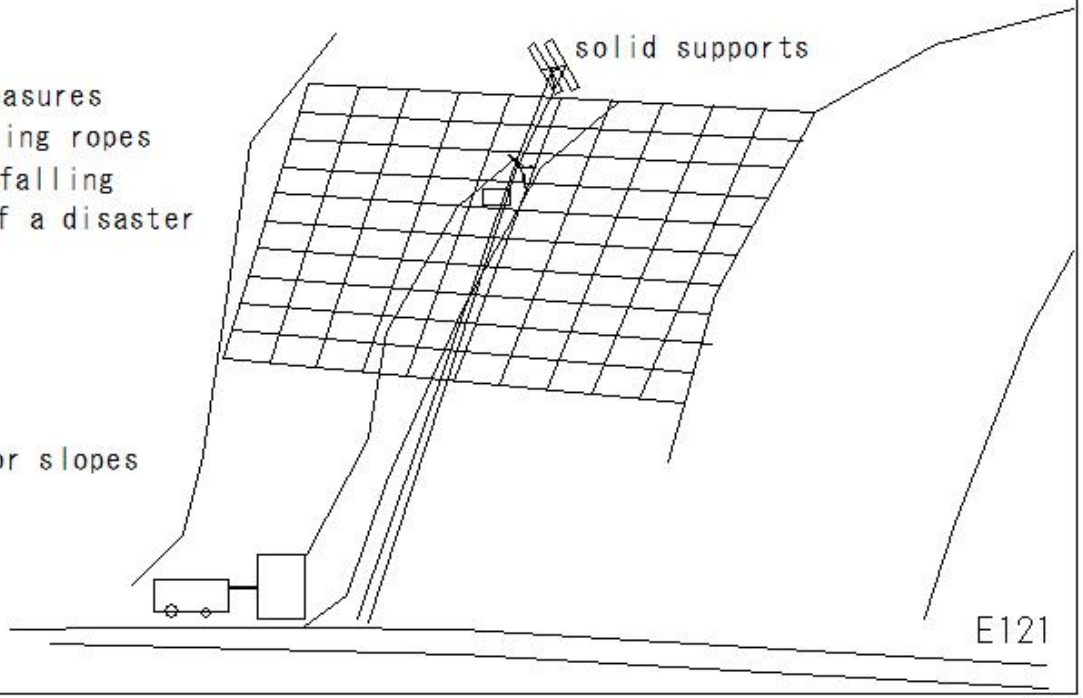
⑥ Cutting hazards and prevention measures

⑦ Measures to prevent falls when tying ropes

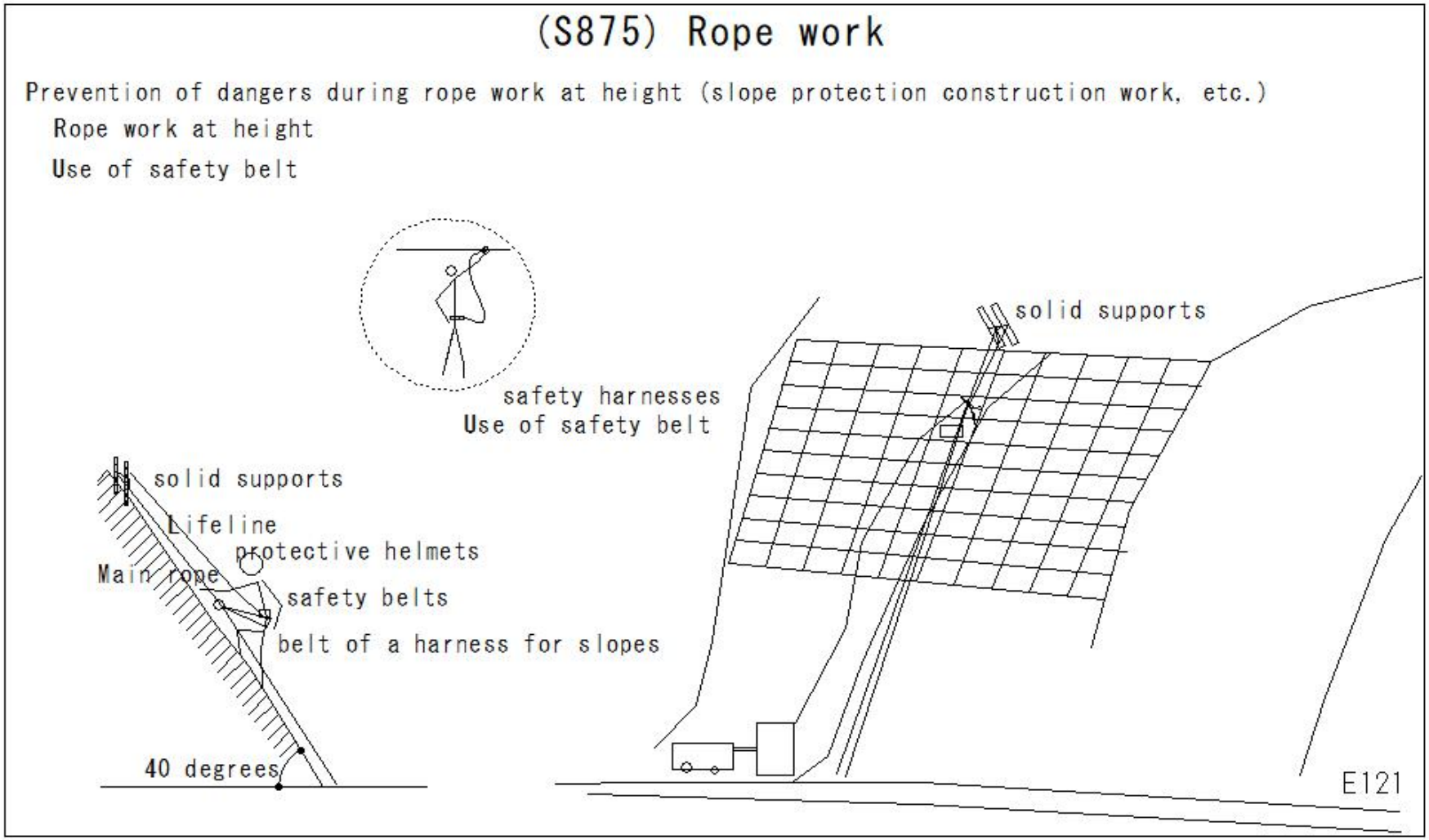
⑧ Measures to prevent objects from falling

⑨ First aid measures in the event of a disaster

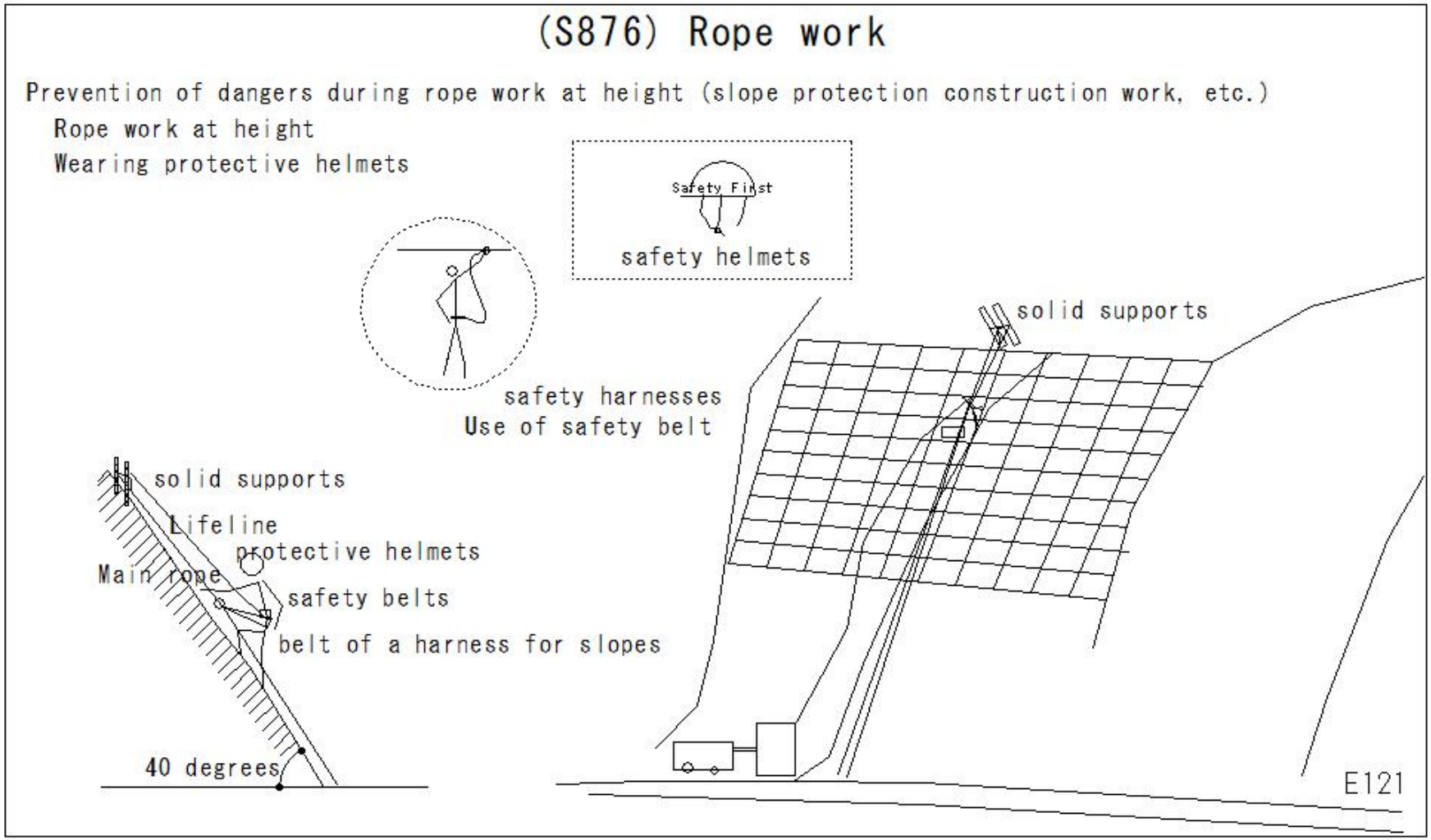




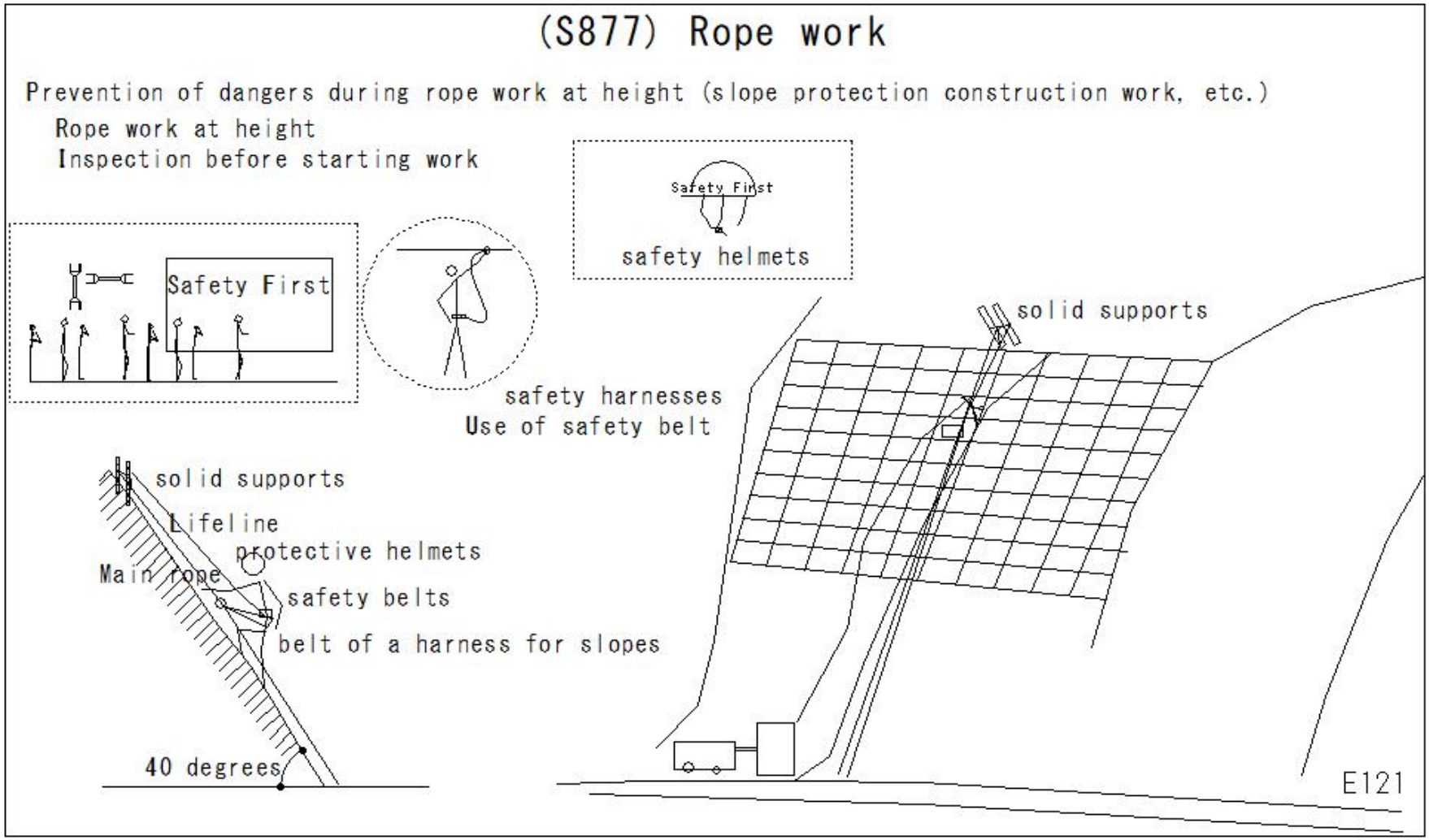
(S875) Rope work



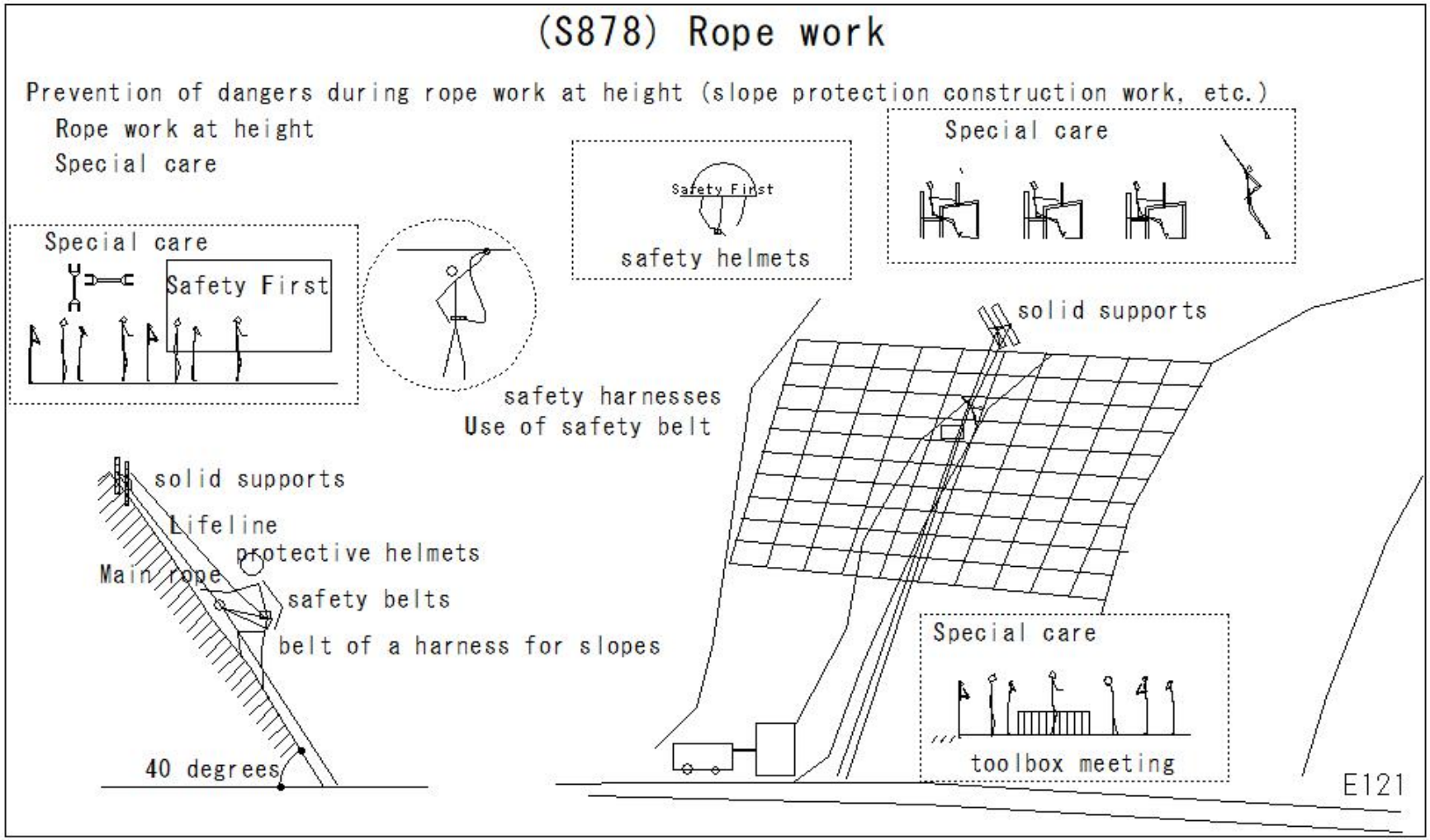
(S876) Rope work



(S877) Rope work



(S878) Rope work



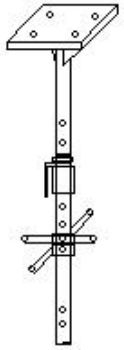
(S879) Formwork Support

(S879) Formwork Support

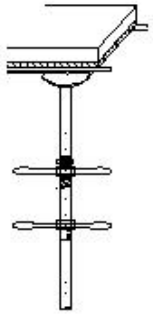
Safe work at formwork support

Materials

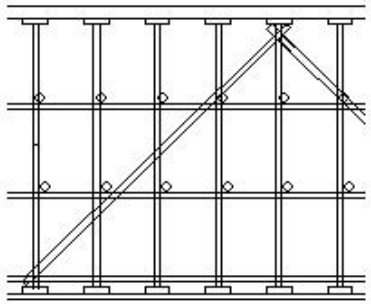
No significant damage, deformation, or corrosion



Pipe support S91

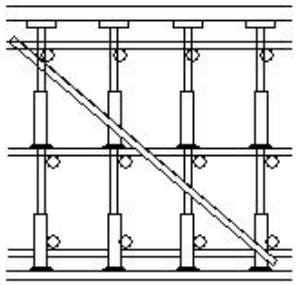


Pipe support



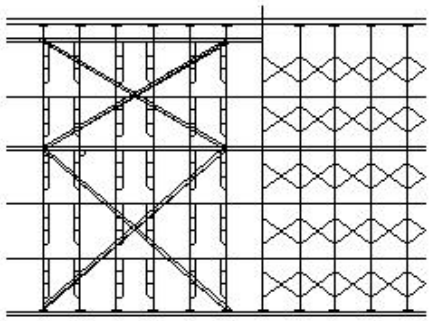
S96

S92 Shoring using single-pipe columns



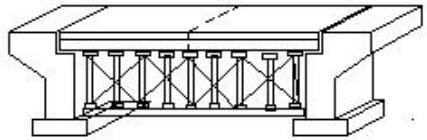
S97

Shoring using pipe support columns



S98

Shoring using frame supports



C765

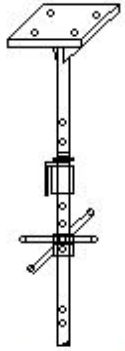
(S880) Formwork Support

(S880) Formwork Support

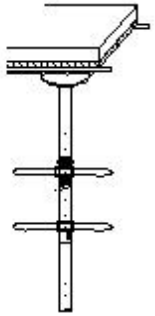
Safe work at formwork support

Steel for pillars and beams

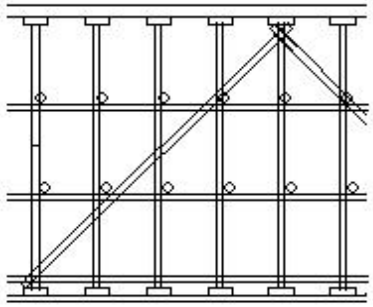
Use suitable products



Pipe support S91

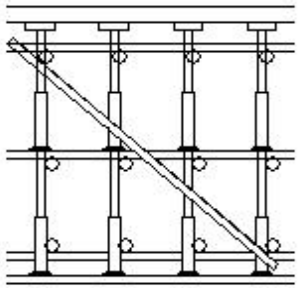


Pipe support



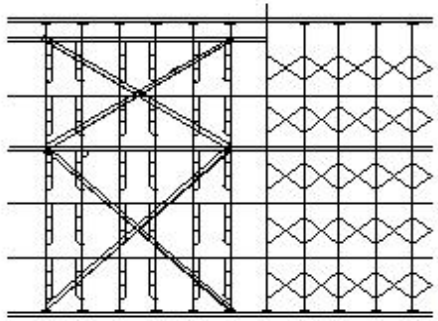
S96

S92 Shoring using single-pipe columns



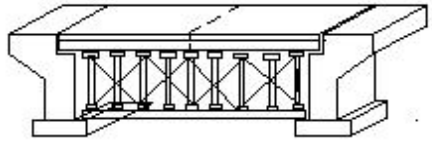
S97

Shoring using pipe support columns



S98

Shoring using frame supports



C765

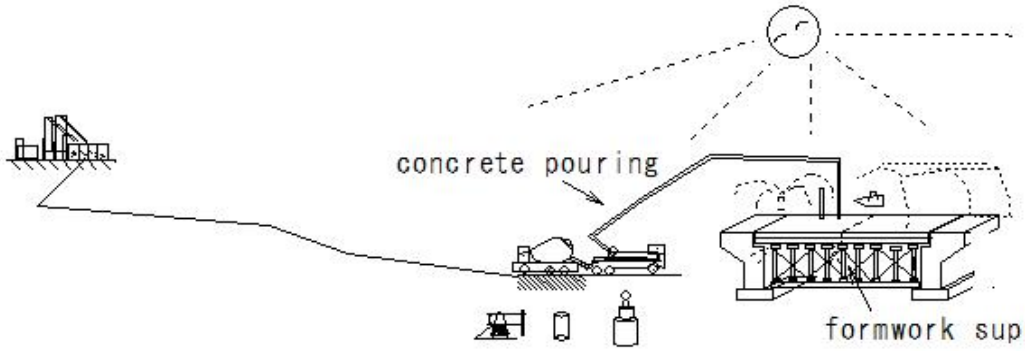
(S881) Formwork Support

(S881) Formwork Support

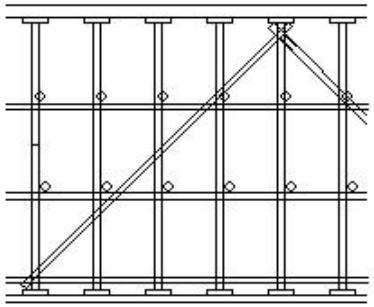
Safe work at formwork support

Structure of formwork support

① A solid structure according to the shape of the formwork and the concrete pouring method

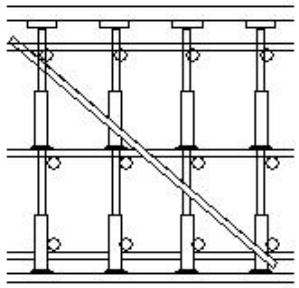


C765



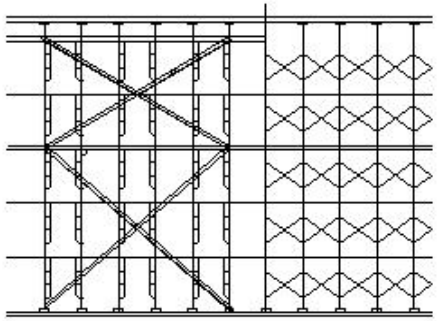
S96

Shoring using single-pipe columns



S97

Shoring using pipe support columns



S98

Shoring using frame supports

(S882) Formwork Support

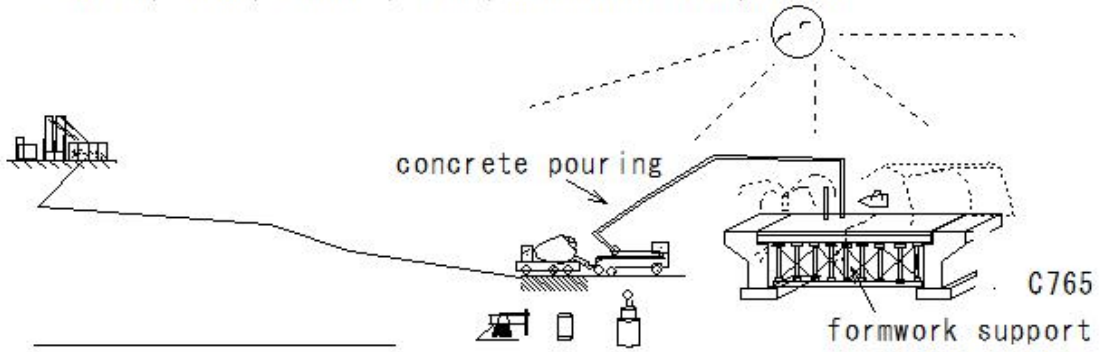
(S882) Formwork Support

Safe work at formwork support

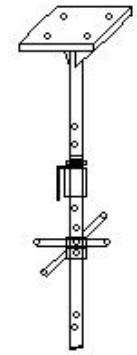
Create an assembly drawing

① Create regardless of whether a notification is required

② Specify the arrangement, joints, and dimensions of pillars, beams, ties, braces, etc., and other components

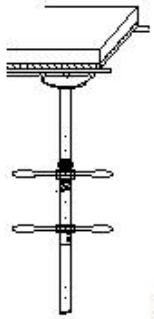


C765



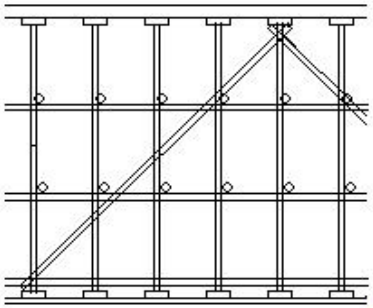
S91

Pipe support



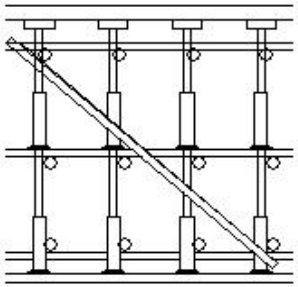
S92

Pipe support



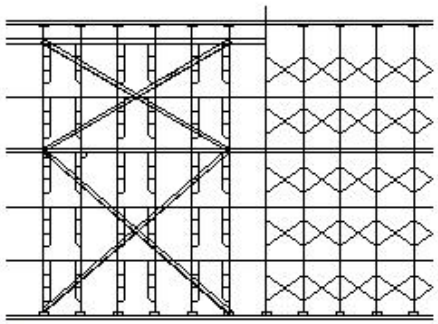
S96

Shoring using single-pipe columns



S97

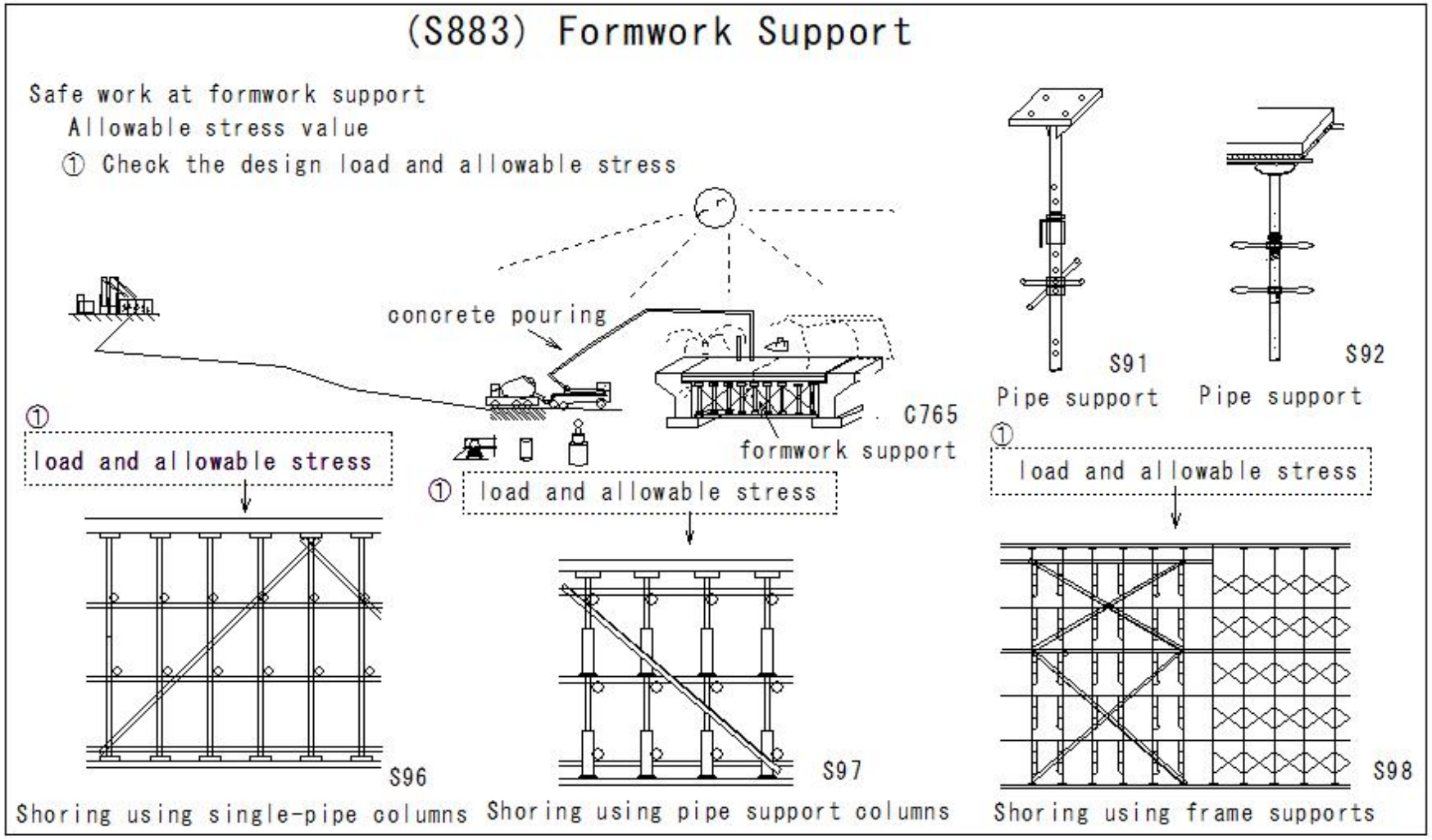
Shoring using pipe support columns



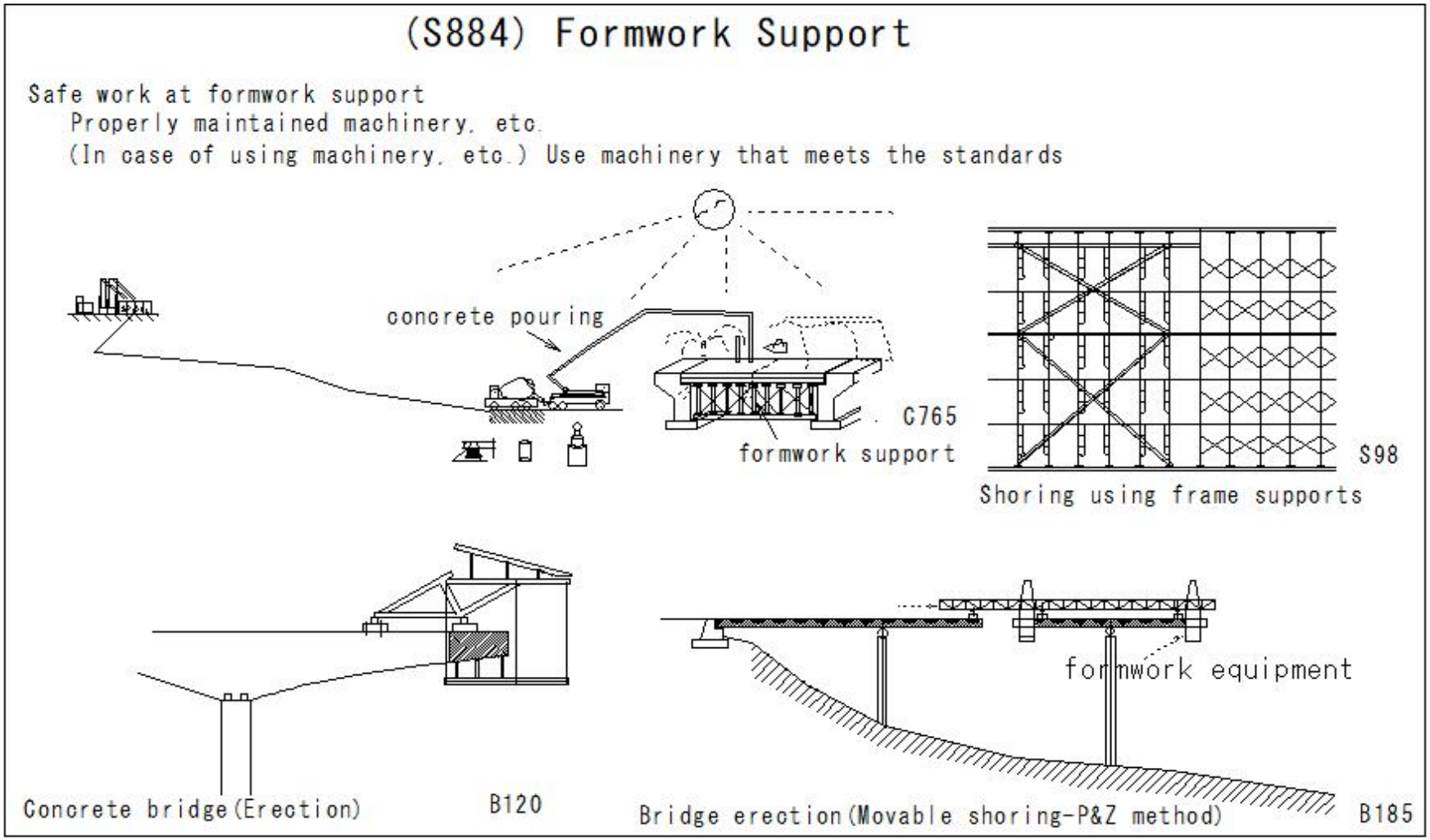
S98

Shoring using frame supports

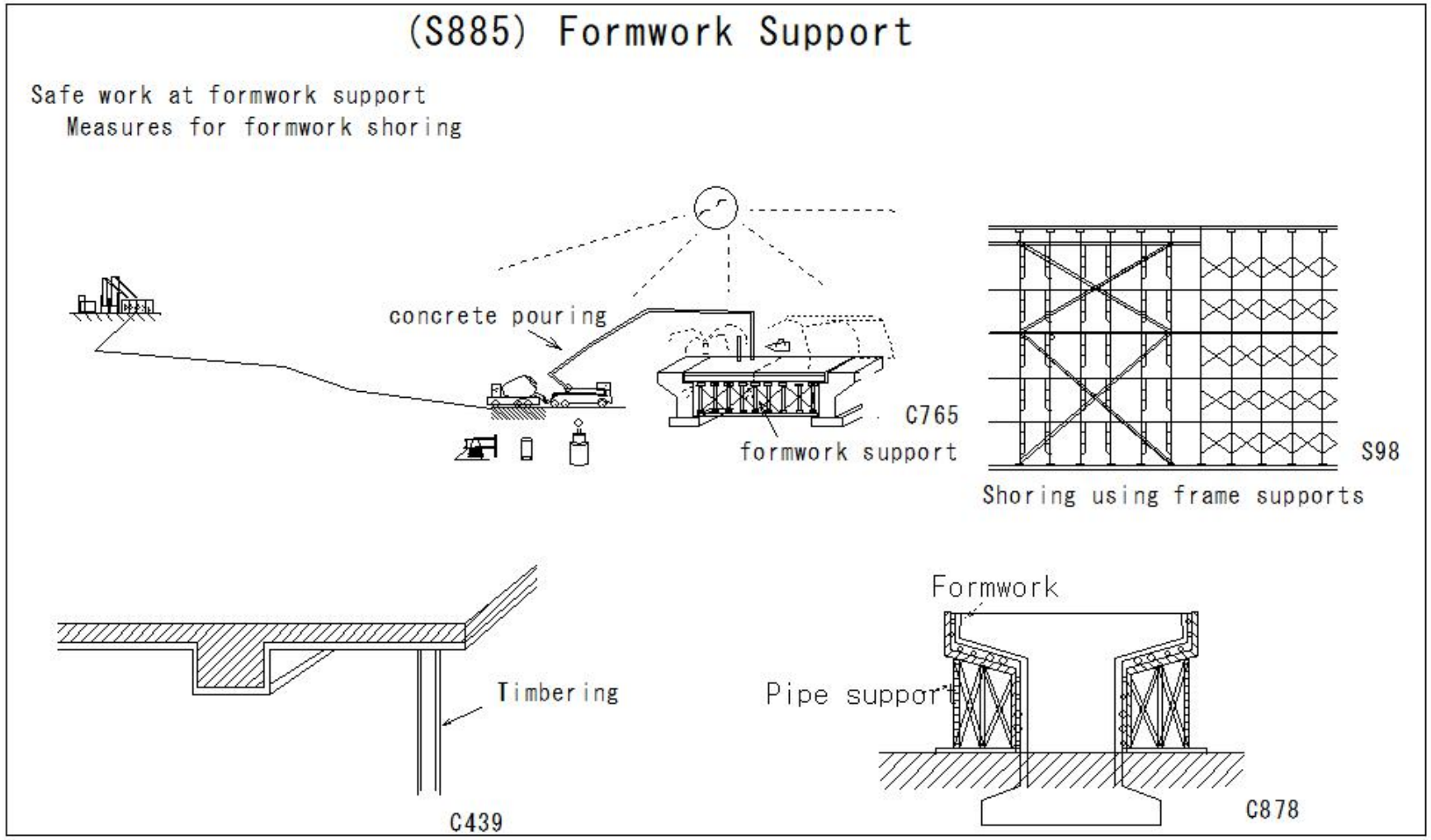
(S883) Formwork Support



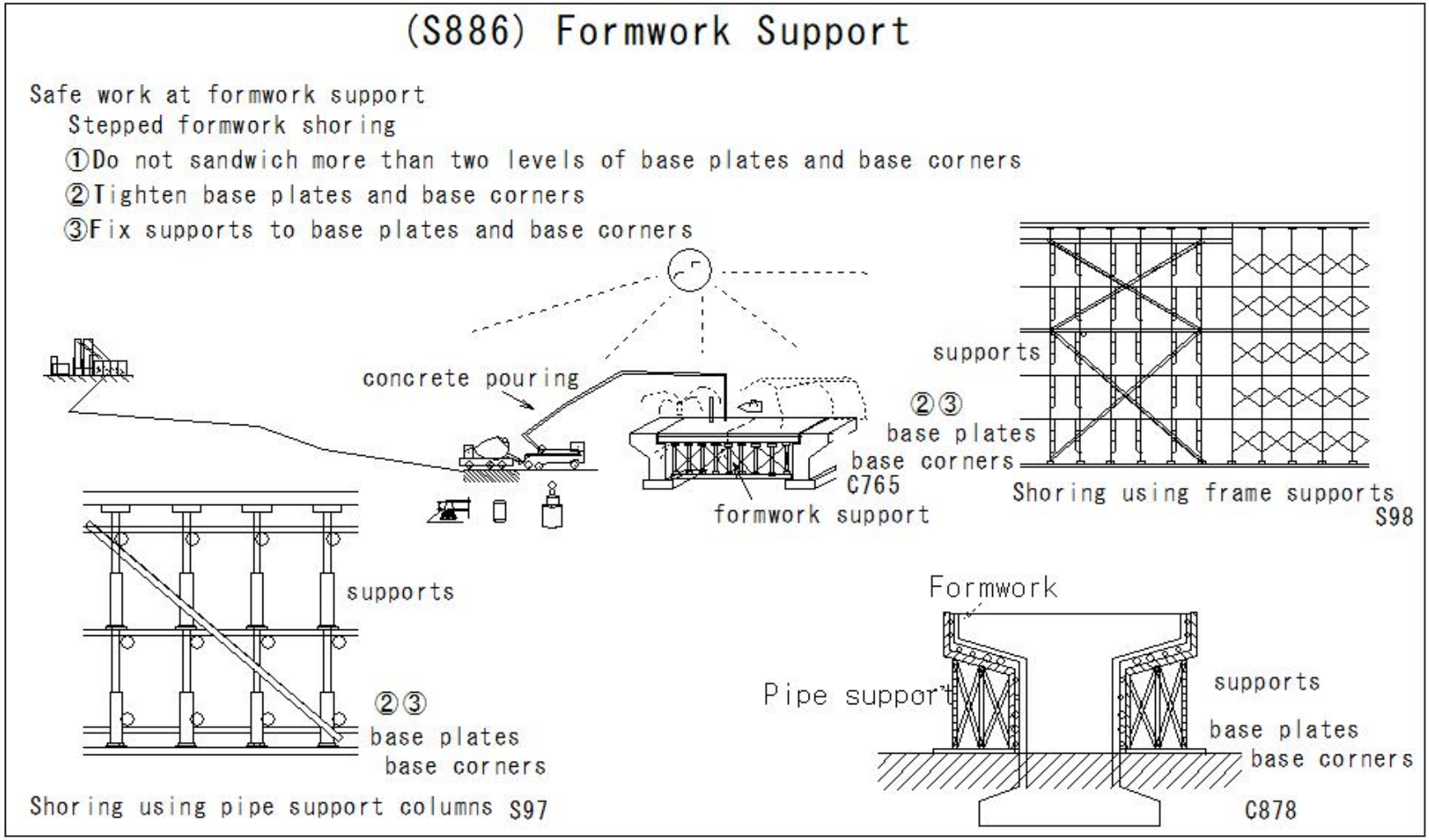
(S884) Formwork Support



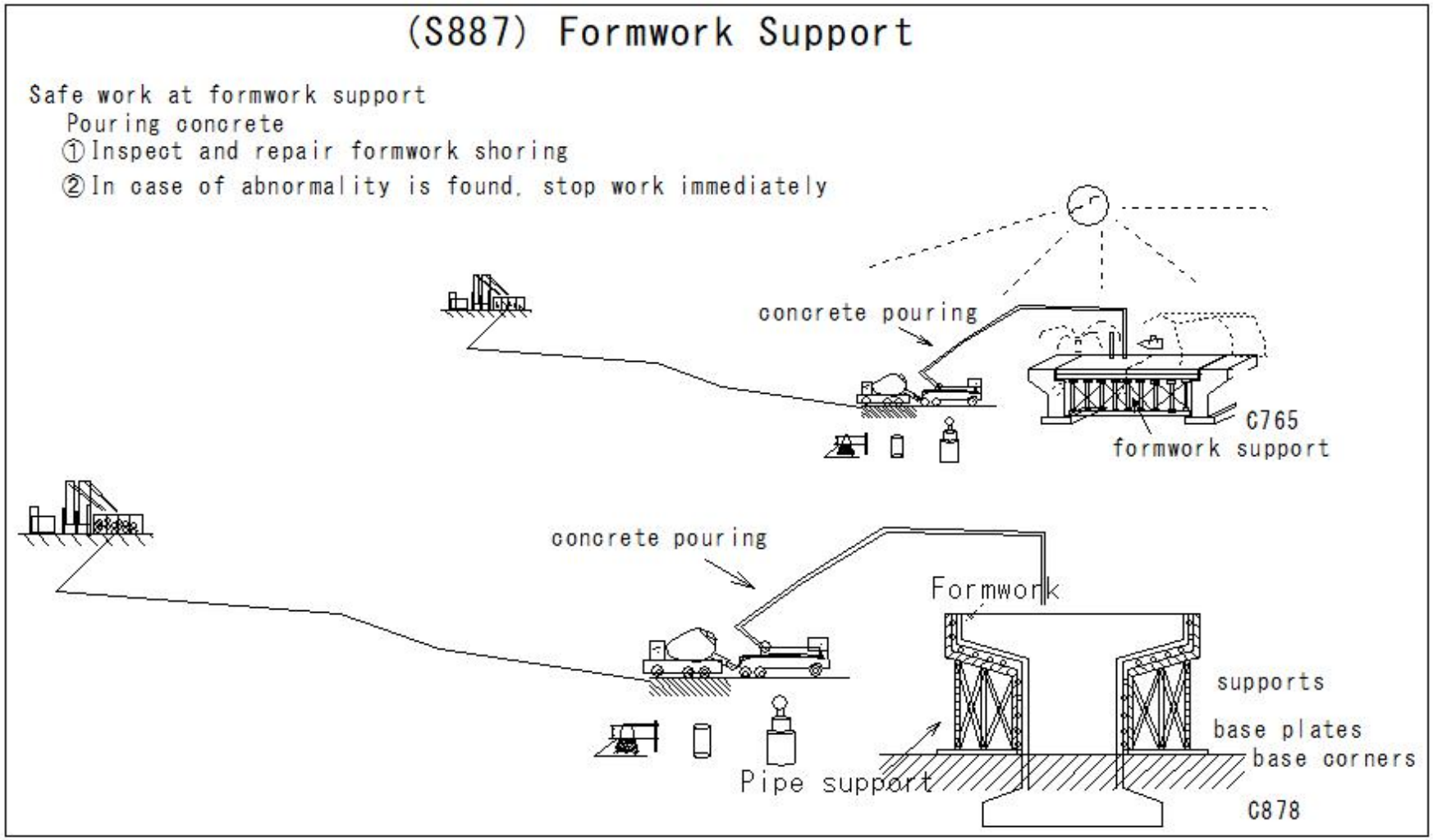
(S885) Formwork Support



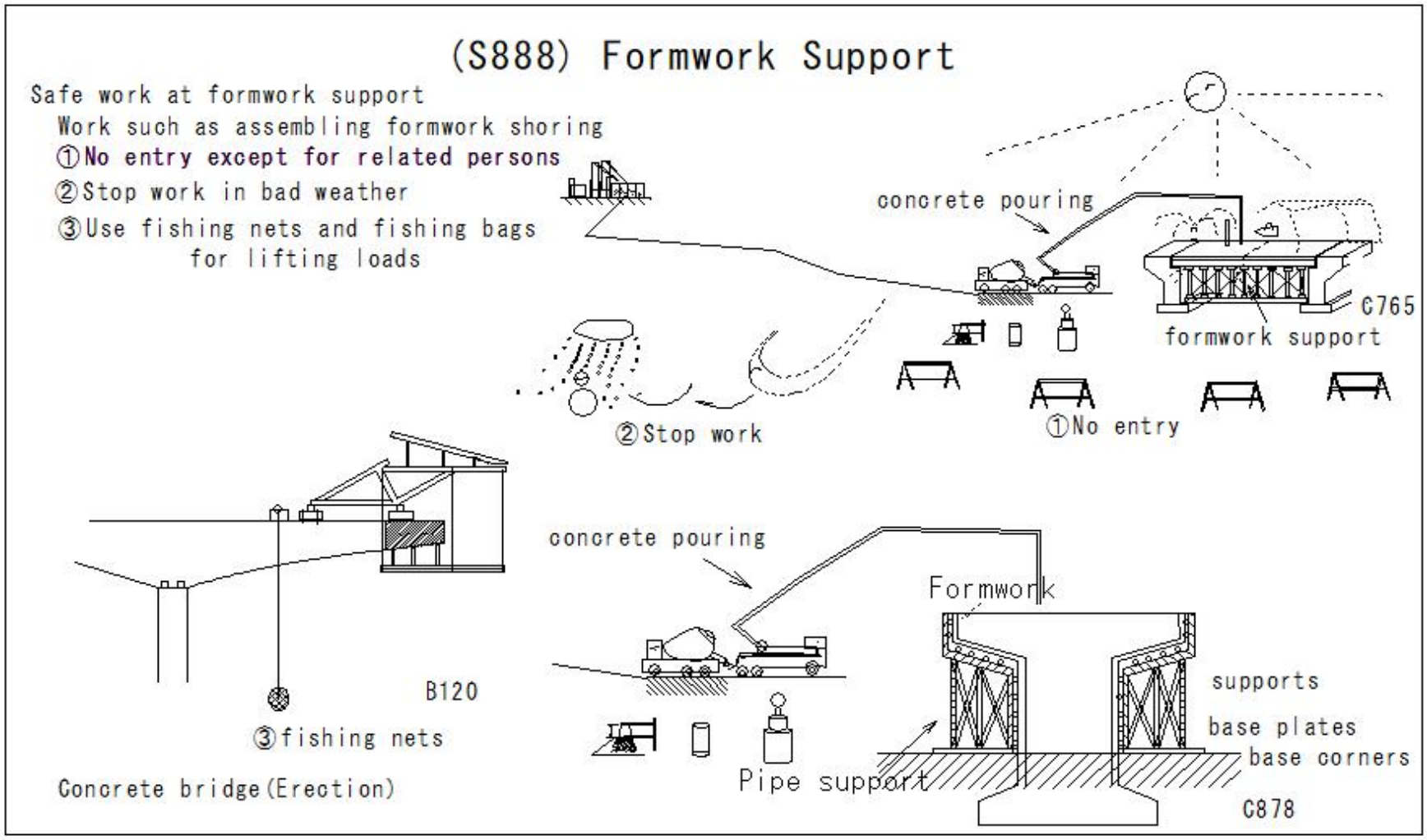
(S886) Formwork Support



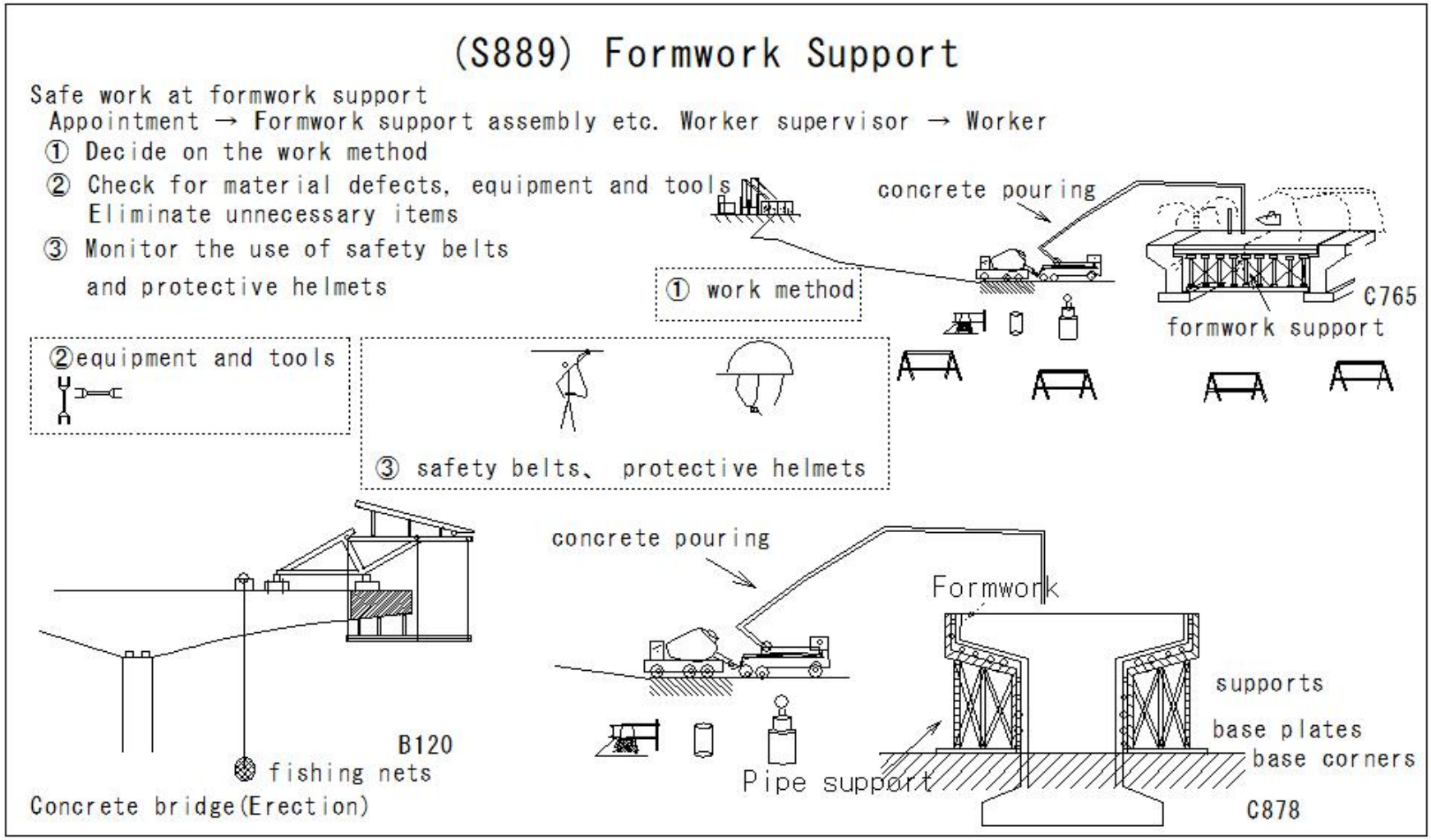
(S887) Formwork Support



(S888) Formwork Support



(S889) Formwork Support



(S890) Formwork Support

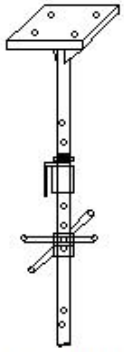
(S890) Formwork Support

Safe work at formwork support

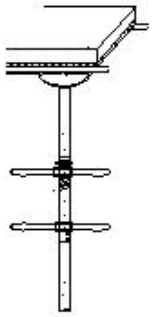
Customer → Formwork support measures

① In case of workers are asked to use formwork support, lend them properly maintained machines, etc.

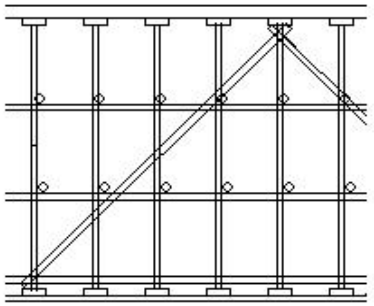
② Use formwork support that meets the standards



Pipe support S91

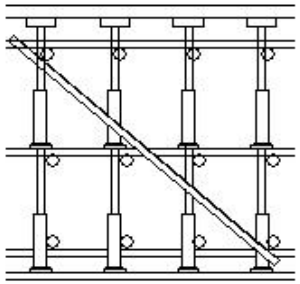


Pipe support



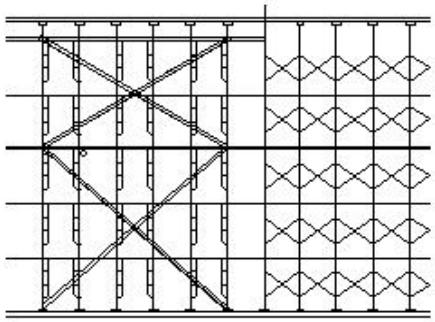
S96

S92 Shoring using single-pipe columns



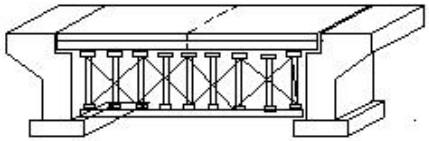
S97

Shoring using pipe support columns



S98

Shoring using frame supports



C765

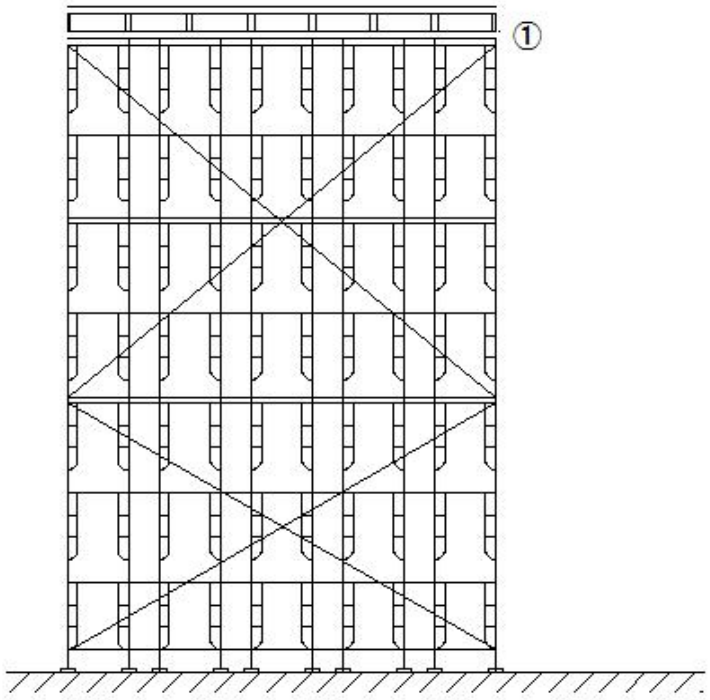
(S891) Formwork Support

(S891) Formwork Support

Configuration of formwork support (steel pipe frame)

Assembly diagram

① The upper end bears horizontal force equivalent to 2.5% of the design load



(S892) Formwork Support

(S892) Formwork Support

Configuration of formwork support (steel pipe frame)

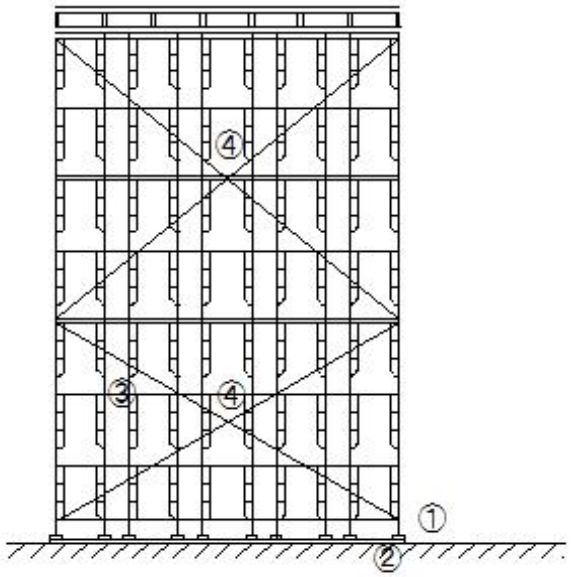
Measures for formwork support

① Fixing the legs, preventing slippage by entangling the roots, etc.

② Using floor plates, preventing sinking during concrete pouring

③ Special joint hardware is used for the joints of the supports

④ Clamps and other hardware are used for joining steel materials



(S893) Formwork Support

(S893) Formwork Support

Formwork support structure (steel pipe frame)

Elevation (frame surface)

①Formwork

②Joists

③Joists

④Up to 5 layers

⑤Up to 5 layers

⑥Jack base or permanent support

Connected to joists to prevent movement

⑦Install a work floor

⑧Horizontal ties (single pipe)

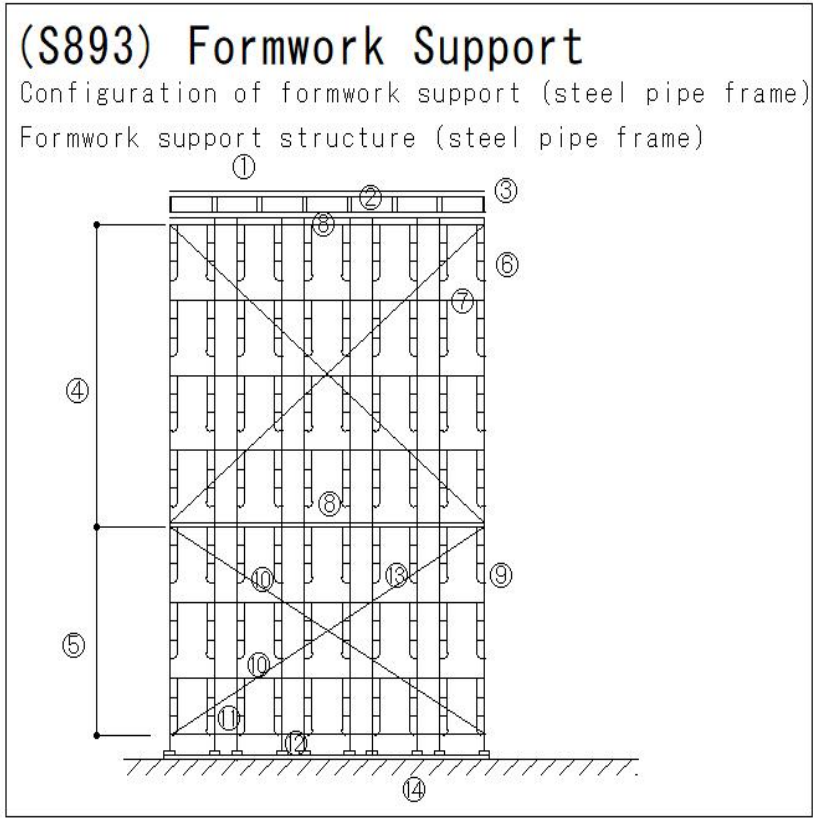
Installed at the top layer, at the ends of every 5 layers, and every 5 frames, and fixed to the building frame with special fittings (clamps)

⑨Formwork

⑩Braces

⑪45°inside and outside

⑫Total load per single pipe is 2.5t or less if the frame is 2 levels or less 2.0t or less if the frame is more than 2 levels



⑬Braces (single pipe)

⑭Install stairs or passages leading to the work floor and indicate their location

(S894) Formwork Support

(S894) Formwork Support

Formwork support structure (steel pipe frame)

Plan

Frame surface direction

①5 frames or less

②5 frames or less

③Brace (single pipe)

④Cross brace (brace) direction

⑤5 frames or less

⑥5 frames or less

⑦Horizontal tie (single pipe)

⑧Cloth frame

⑨Brace (single pipe)

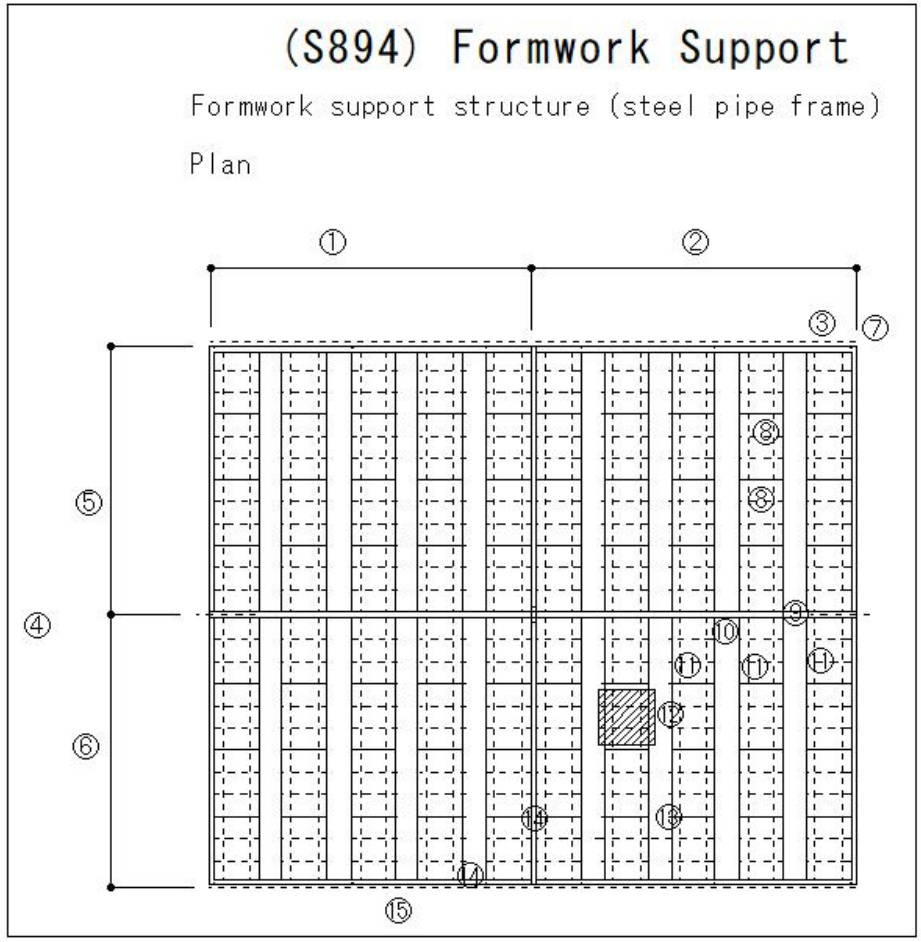
⑩Horizontal tie (single pipe)

⑪Brace

⑫Frame spacing

⑬Frame spacing

⑭Horizontal tie (single pipe)

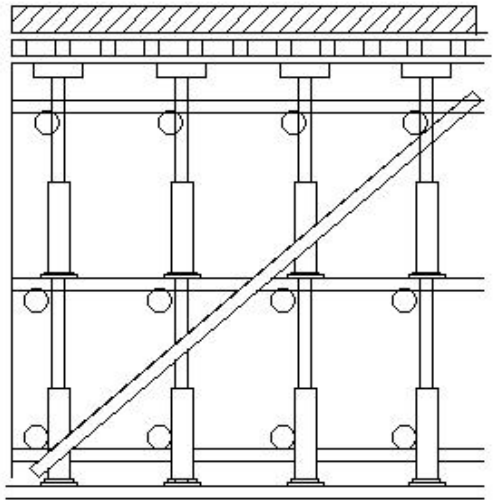


⑮Horizontal tie (single pipe)

(S895) Formwork Support

Formwork support structure (pipe support, single pipe)
Contractor → Appointment → Formwork support assembly supervisor

Supports, beams, ties, braces
Slabs, beams



S97

①Assembly and dismantling of temporary equipment to support formwork used for pouring concrete
Shoring using pipe support columns

(S896) Formwork Support

(S896) Formwork Support

Formwork support structure (pipe support, single pipe)

Pipe support

○No more than 3 pipes

○Connect even if H≦3.5m

d≦20cm

①Joist

②Spring

③The weight of the floor and beam + weight of the formwork + 150kg/㎡ horizontal force is borne by chains, etc.

④Fix the sprung joint and support

⑤The joint is a plug-in joint

Four bolts

⑥Root tie

⑦Horizontal connection/prevention of displacement

Fix the single pipe, etc. to the support with special fittings

⑧Brace

Install at both ends of the horizontal connection

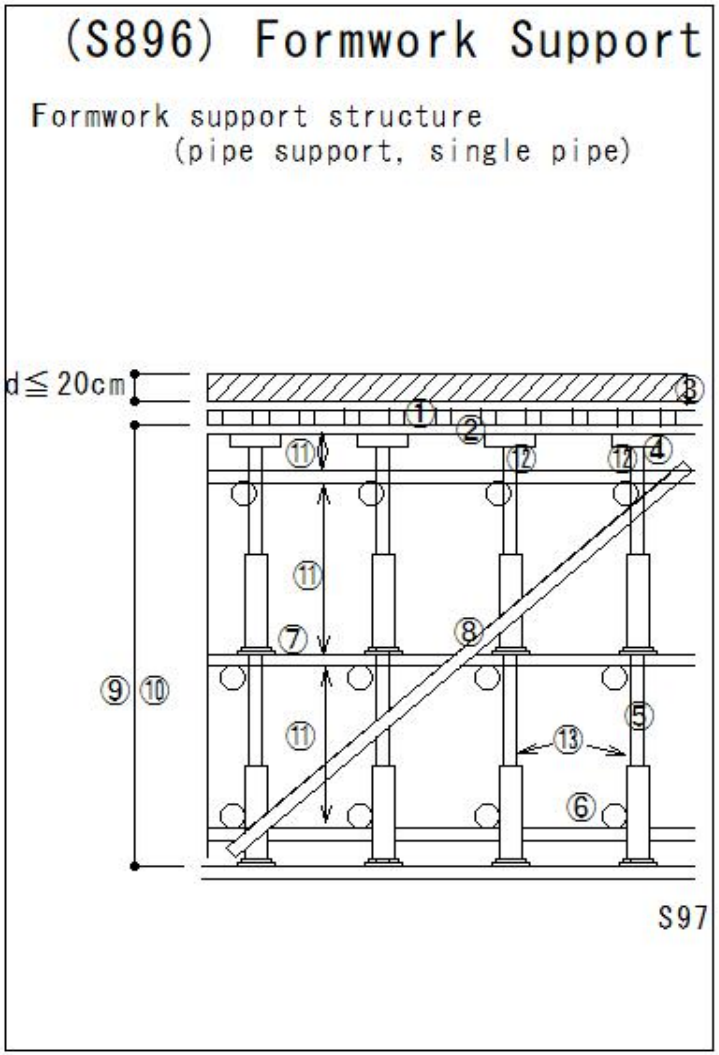
⑨3.5m≦h＜4.7m

⑩3.5m≦h＜7.0m　In the case of two standard supports

⑪Within 2m

⑫Auxiliary support

⑬Standard support

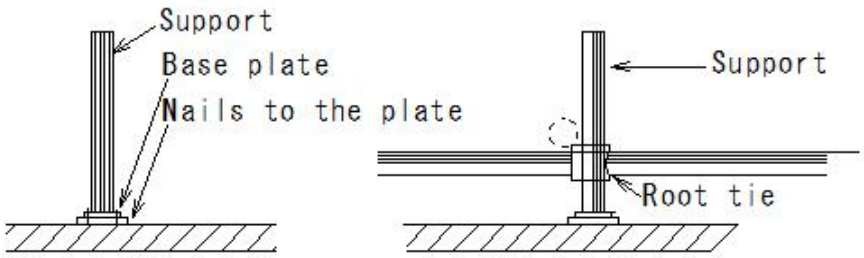


(S897) Formwork Support

(S897) Formwork Support

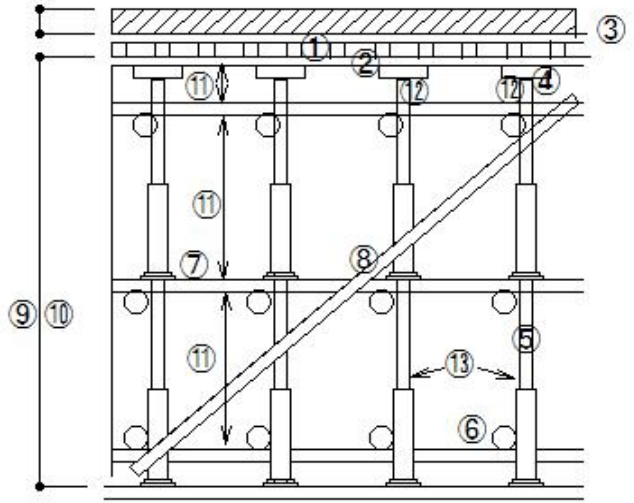
Formwork support structure (pipe support, single pipe)

Plate



Formwork support structure

(pipe support, single pipe)



S97

Root tie: Fastening and fastening fittings are used on pillars

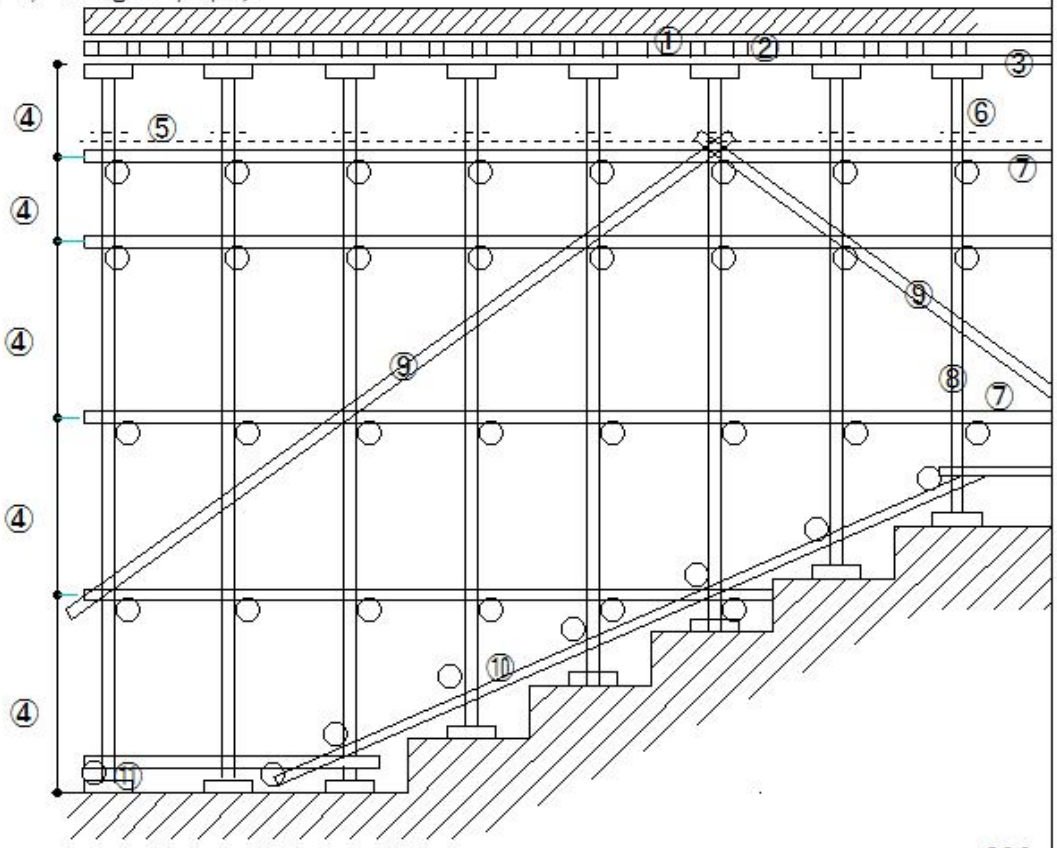
(S898) Formwork Support

(S898) Formwork Support

Formwork support structure (pipe support, single pipe)

Single pipe

① Formwork
② Joist
③ Beam
④ Within 2m
⑤ Set up a work floor
⑥ Adjustable base metal fittings
⑦ Horizontal joint (single pipe)
⑧ Vertical supports (single pipe)
⑨ Bracing (single pipe)
⑩ Root ties (single pipe)
⑪ The total load per leg pipe must be less than 700kg



S96

(S899) Formwork Support

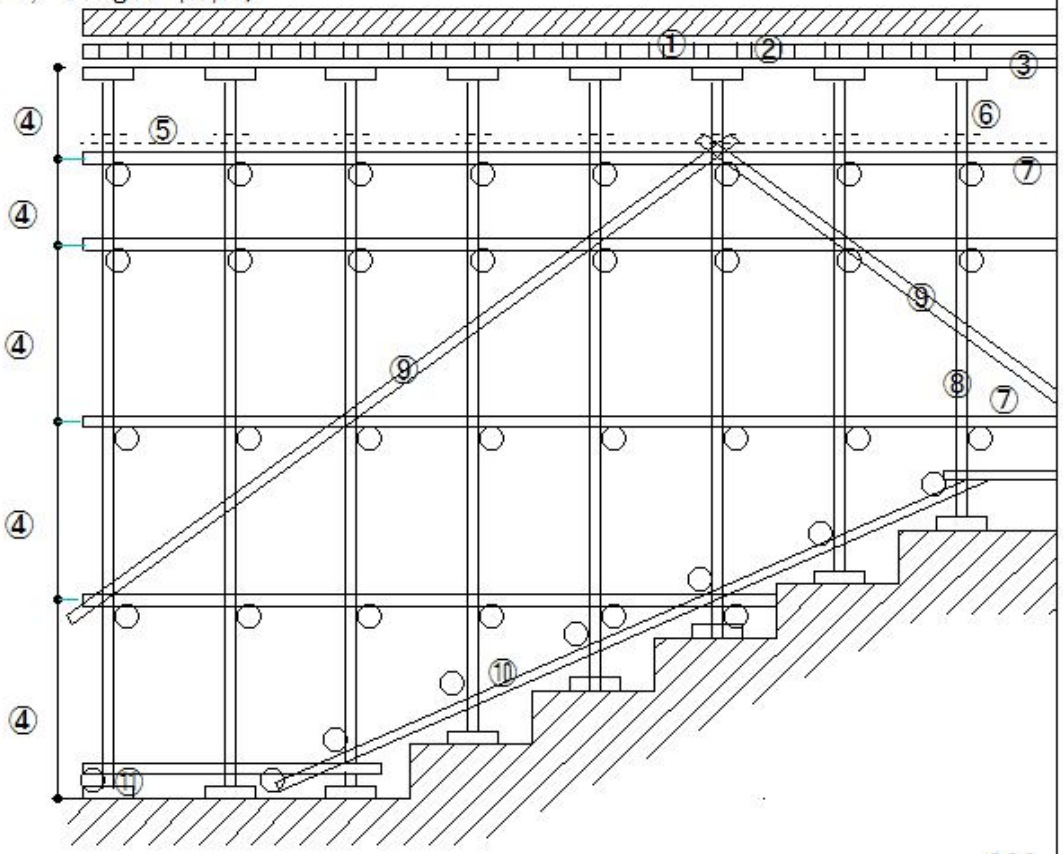
(S899) Formwork Support

Formwork support structure (pipe support, single pipe)

Single pipe

Stepped formwork support

① Formwork
② Joist
③ Beam
④ Within 2m
⑤ Set up a work floor
⑥ Adjustable base metal fittings
⑦ Horizontal joint (single pipe)
⑧ Vertical supports (single pipe)
⑨ Bracing (single pipe)
⑩ Root ties (single pipe)
⑪ The total load per leg pipe must be less than 700kg



S96

(S900) Formwork Support

(S903) Formwork Support

Formwork support structure (assembled steel columns)

○Measures for formwork support

①Floor joists

②Formwork

③Pipes

④Beams (H-shaped steel)

⑤Beams (H-shaped steel)

⑥Work floor (scaffolding boards laid across the entire surface without gaps)

⑦Within 4m

⑧Assembled steel columns

⑨Braces (single pipes)

⑩Fixed to assembled steel columns with special fittings

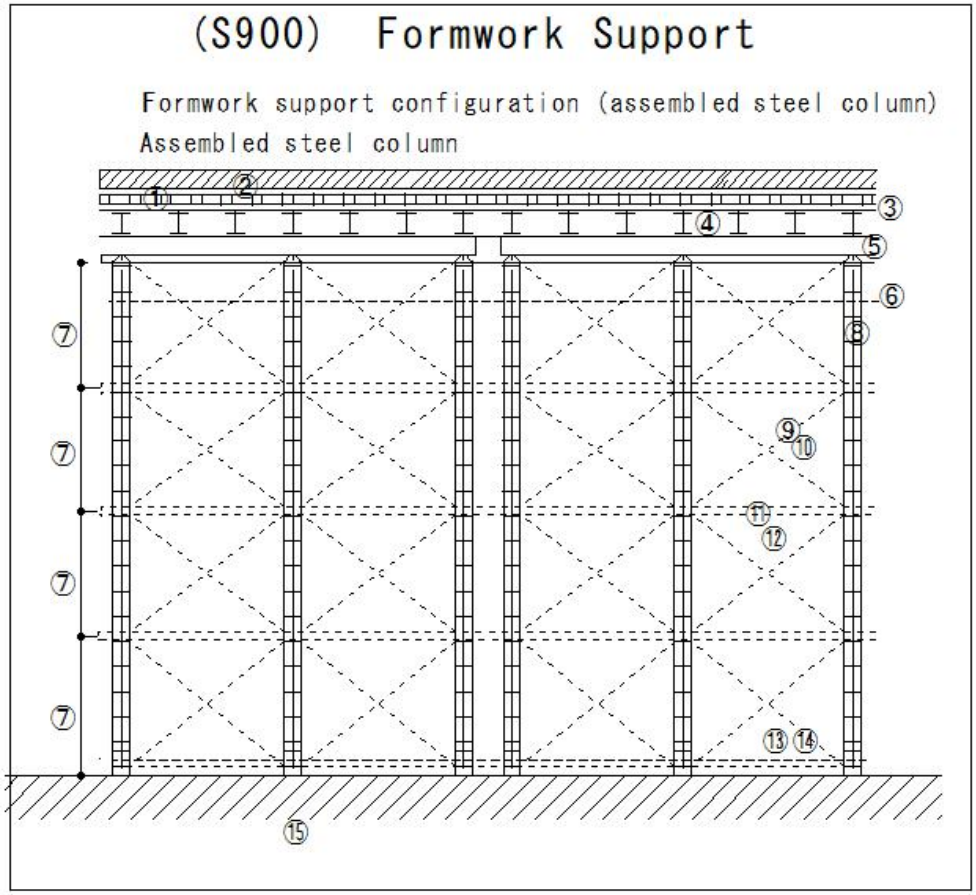
⑪Horizontal ties (single pipes)

⑫Installed in two directions, fixed to assembled steel columns with special fittings, displacement fixed

⑬Root ties

⑭Fixed to assembled steel columns with special fittings

⑮Install stairs or passages leading to the work floor and indicate their location



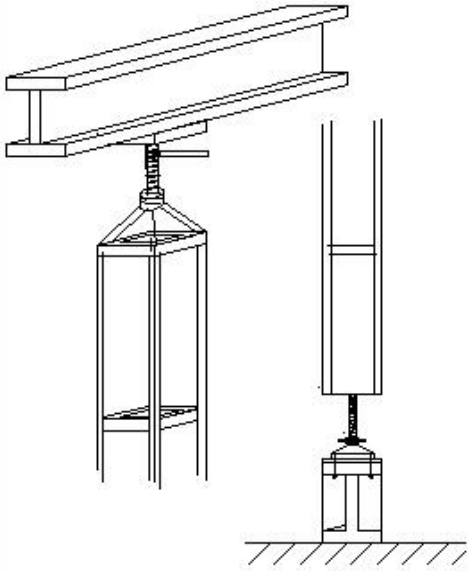
(S901) Formwork Support

(S901) Formwork Support

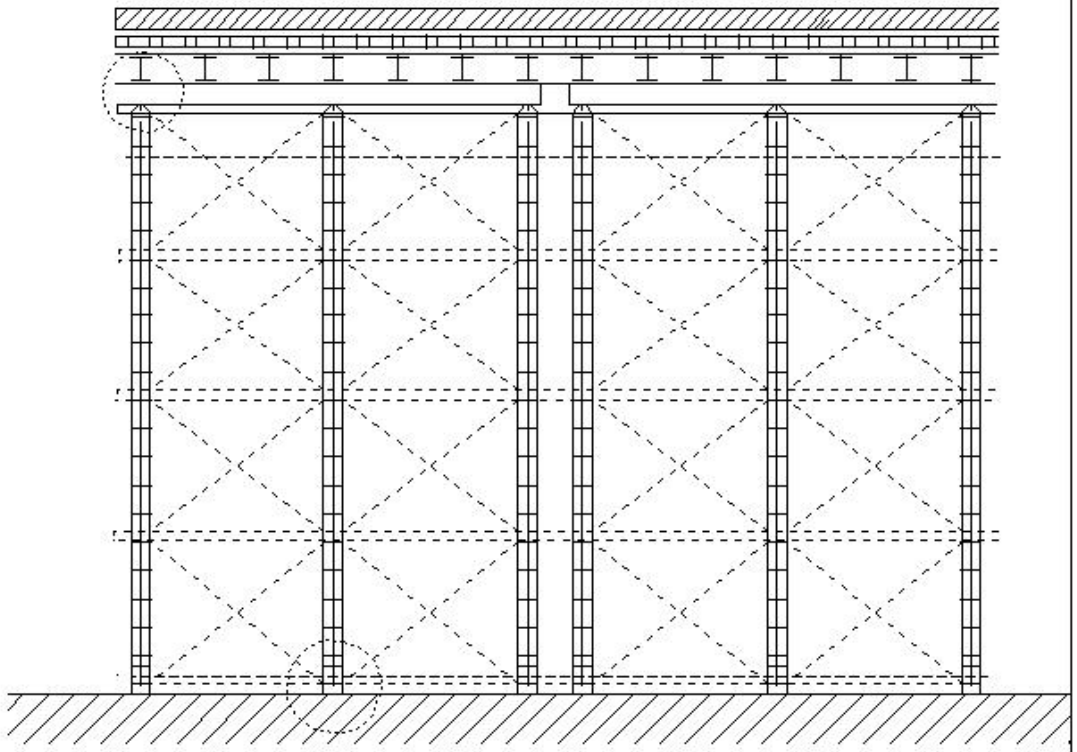
Formwork support configuration (assembled steel column)

○Assembly diagram

Example of assembled steel column



Example of leg reinforcement



Formwork Support

(S902) Formwork Support

(S902) Formwork Support

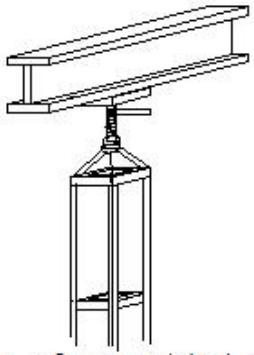
Formwork support configuration (assembled steel column)

○Measures for formwork support

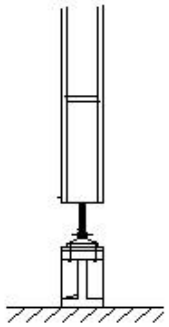
①In case of placing a beam or joist on the top end, attach a steel end plate to the top end and fix it to the beam or joist

②In case of using H-shaped steel as a horizontal member such as a joist or a joist, and if there is a risk of a concentrated load acting on the connection point and the cross section deforming, attach it to a reinforcing material

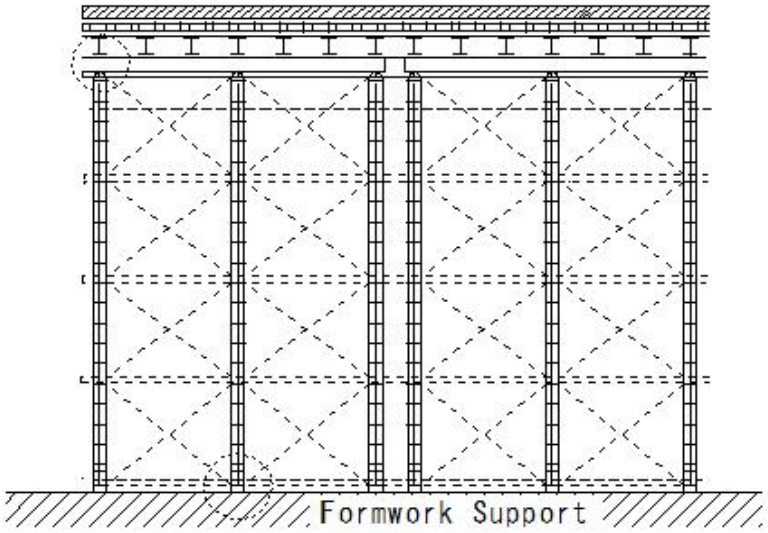
③In case of using H-shaped steel as a support and placing a beam or joist on the top end, attach a steel end plate to the top end and fix it to the beam or joist



Example of assembled steel column



Example of leg reinforcement



Formwork Support

(S903) Formwork Support

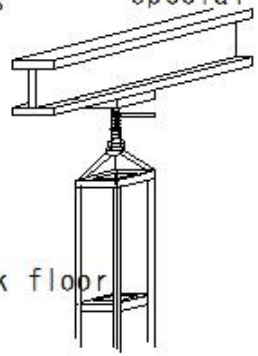
(S903) Formwork Support

Formwork support configuration (assembled steel column)

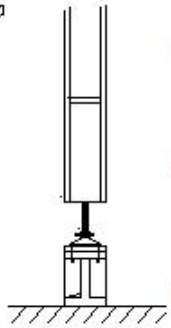
Formwork support structure (assembled steel columns)

○Measures for formwork support

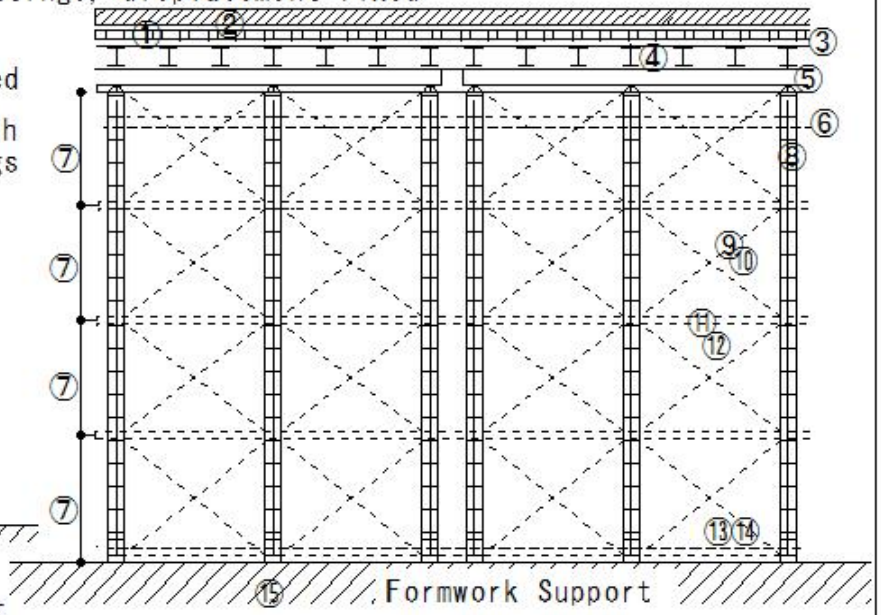
①Floor joists
②Formwork
③Pipes
④Beams (H-shaped steel)
⑤Beams (H-shaped steel)
⑥Work floor
⑦Within 4m
⑧Assembled steel columns
⑨Braces (single pipes)
⑩Fixed to assembled steel columns with special fittings
⑪Horizontal ties (single pipes)
⑫Installed in two directions, fixed to assembled steel columns with special fittings, displacement fixed
⑬Root ties
⑭Fixed to assembled steel columns with special fittings
⑮Install stairs or passages leading to the work floor and indicate their location



Example of assembled steel column



Example of leg reinforcement



Formwork Support

(S904) Formwork Support

(S904) Formwork Support

Formwork support configuration (assembled steel column)

○Measures for formwork support

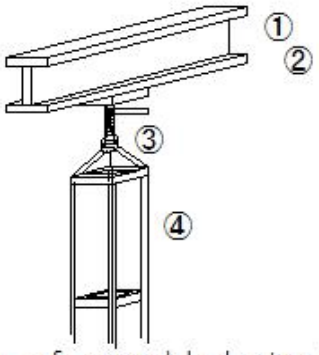
①Beam (H-shaped steel, wood, etc.)

②H-shaped steel: fixed with ϕ16 bolt

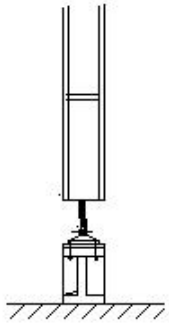
Wood: fixed with ϕ16 bolt and large nail at head

③Square support head

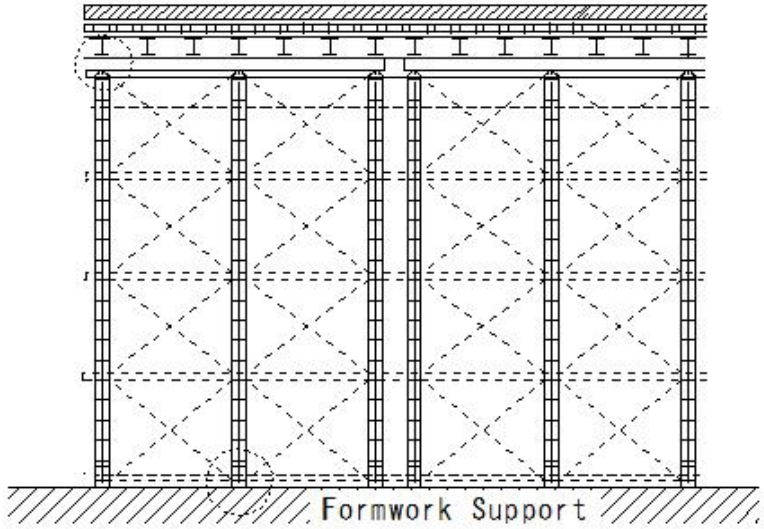
④Square support (ϕ48.6)



Example of assembled steel column



Example of leg reinforcement



Formwork Support

(S905) Formwork Support

(S905) Formwork Support

Formwork support configuration (assembled steel column)

○Measures for formwork support

Example of leg reinforcement

①Steel columns

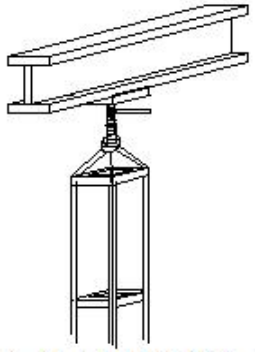
②Fixed with bolts

③H-shaped steel

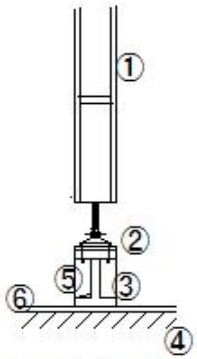
④Ground

⑤(Reinforcement material) Stiffener

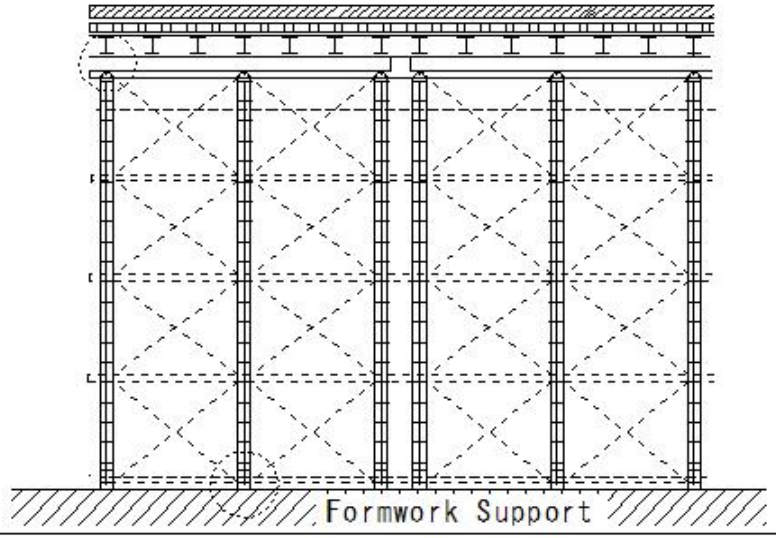
⑥Steel plate



Example of assembled steel column



Example of leg reinforcement



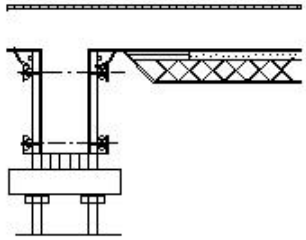
(S906) Formwork Support

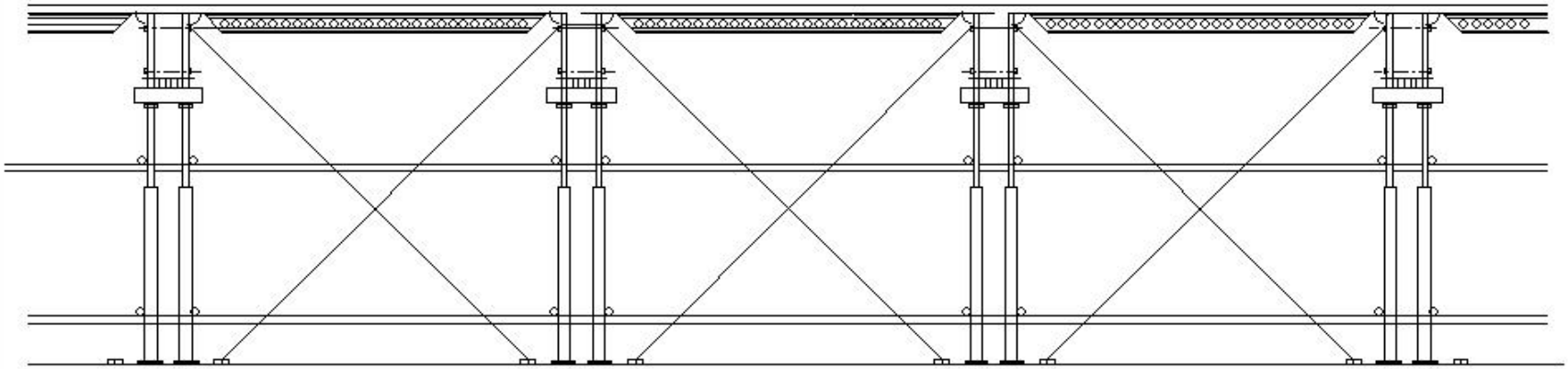
(S906) Formwork Support

Example of formwork support (Beam)

○ Assembly diagram

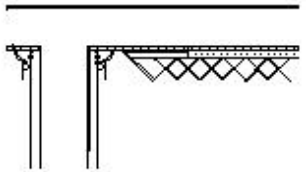
① The upper end bears horizontal force equivalent to 2.5% of the design load





(S907) Formwork Support

(S907) Formwork Support



Example of formwork support (Beam)

Example of formwork support (beam)

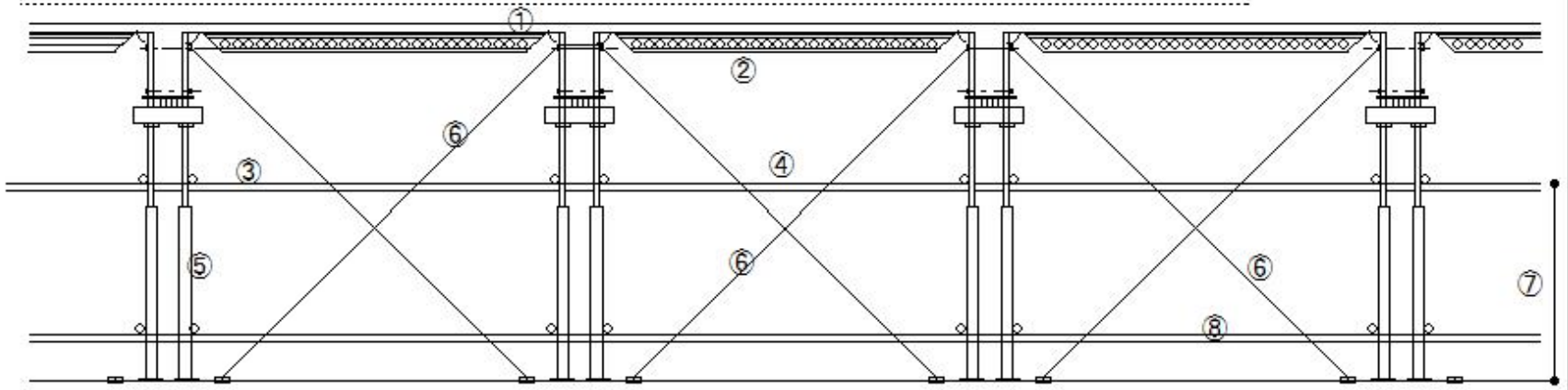
○ Measures for formwork support

① Both ends of the beam are fixed to the support to prevent the beam from sliding or falling off

② Connecting between beams prevents the beam from falling over

③ In case of the height of the pipe support exceeds 3.5m, horizontal connections are provided in two directions within 2m of height

① Plywood keystone plate, etc.	⑤ Pipe support (must be set up in two rows)
② Holly beam,beam, etc.	⑥ Single pipe or pull chain
③ Horizontal connection	⑦ Within 2m
④ Horizontal connection	⑧ Root ties



(S908) Formwork Support

(S908) Formwork Support

Example of formwork support (Beam)

Example of formwork support (beam)

○ Measures for formwork support

⑨ Make sure to drive the wedges in securely

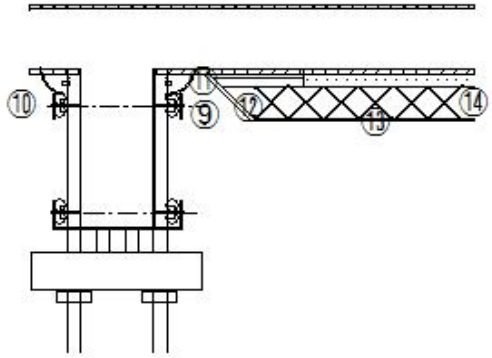
⑩ Support brackets

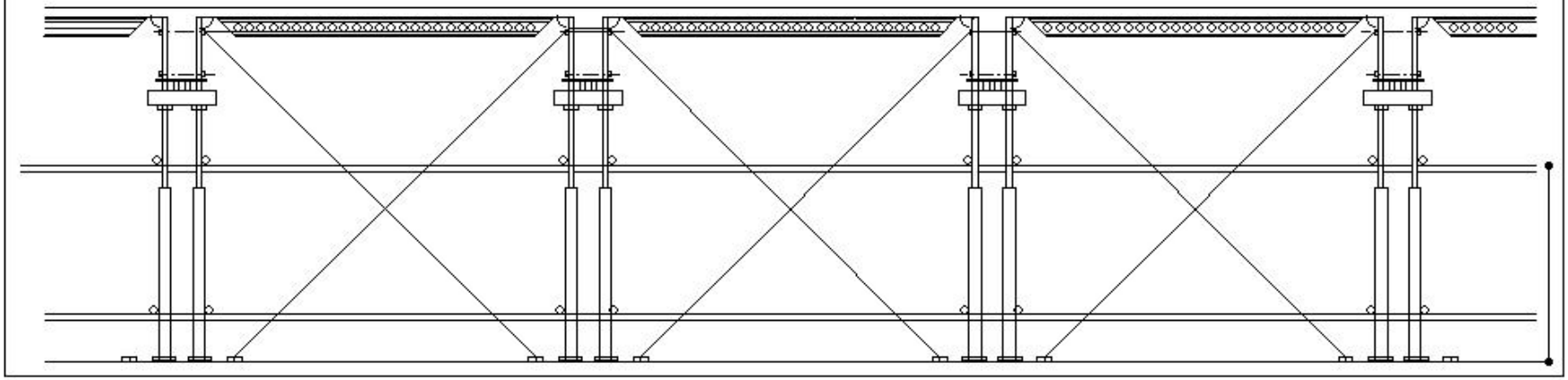
⑪ Stopper

⑫ Side beam

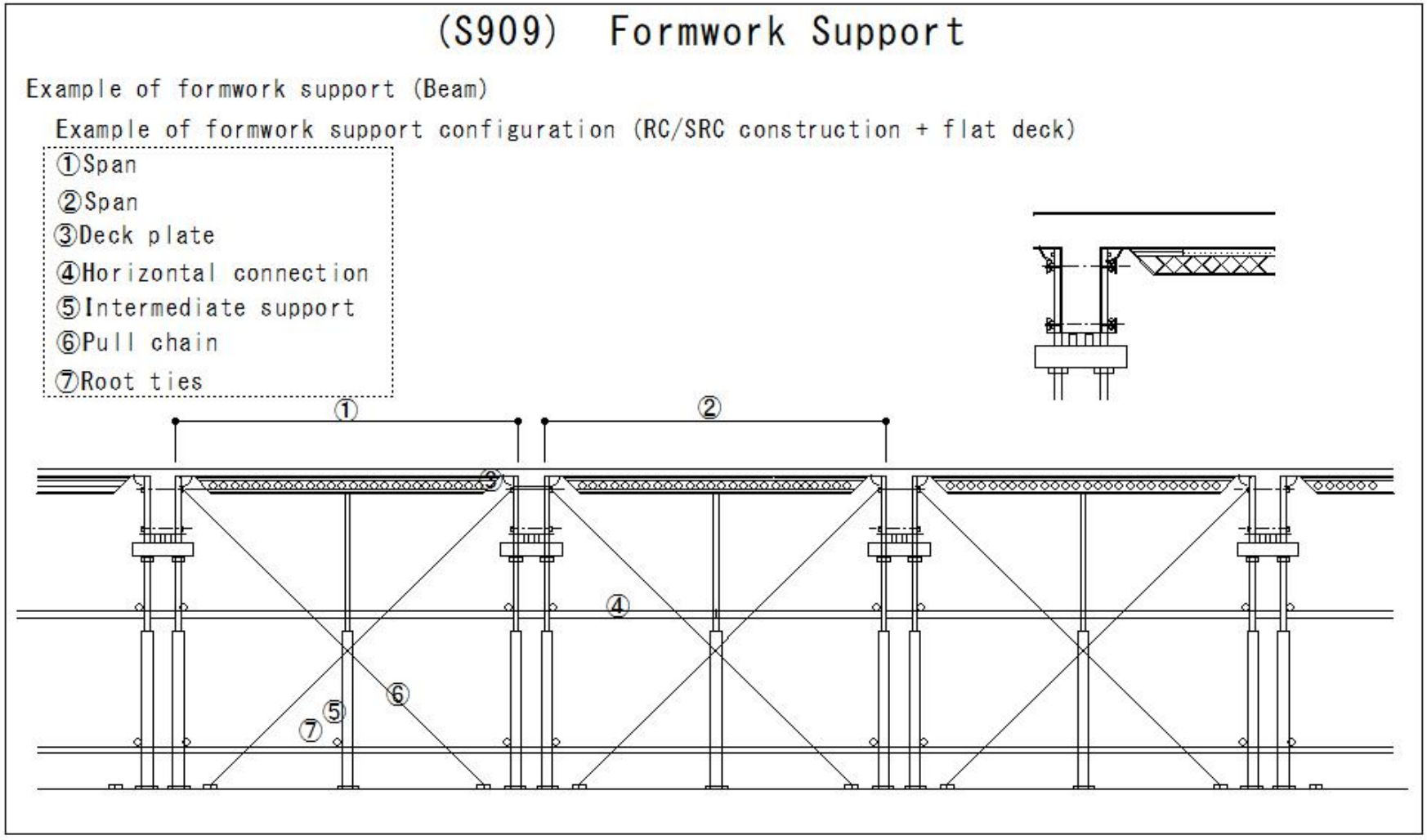
⑬ Main beam

⑭ Make sure to insert the pins securely (4 places)

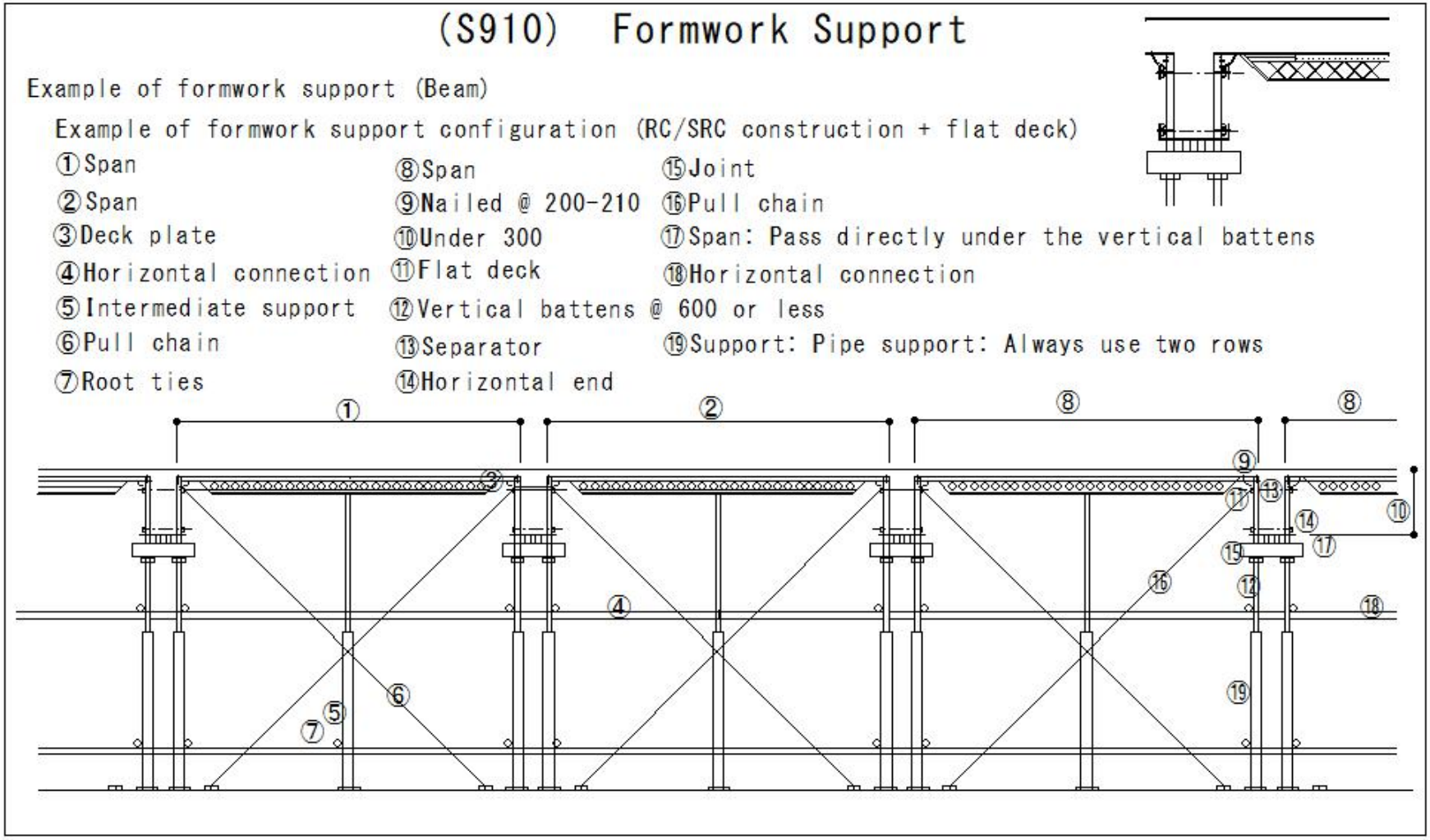




(S909) Formwork Support



(S910) Formwork Support



(S911) Formwork Support

(S911) Formwork Support

Example of formwork support (Beam)

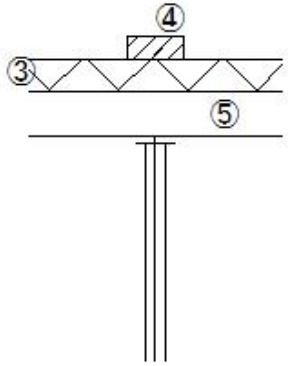
Example of formwork support configuration (RC/SRC construction + flat deck)

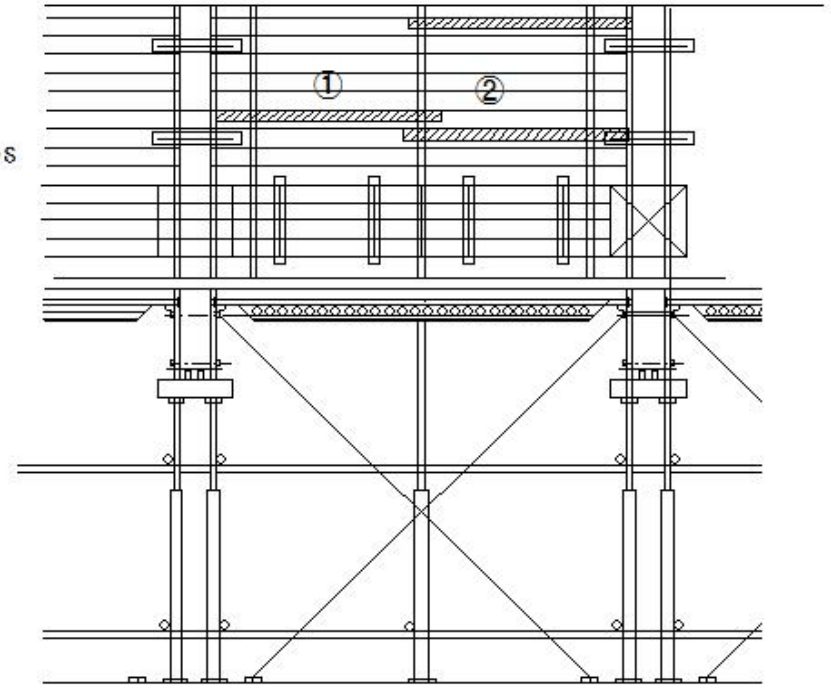
Precautions when placing materials on the deck

A:In case of beam formwork assembly is complete, Figure A

B:In case of beam formwork assembly is not complete, Figure B

① Base plate
② Deck ribs
③ Deck plate
④ Base plate is placed on top of the ribs
⑤ Pillars





(S912) Formwork Support

(S912) Formwork Support

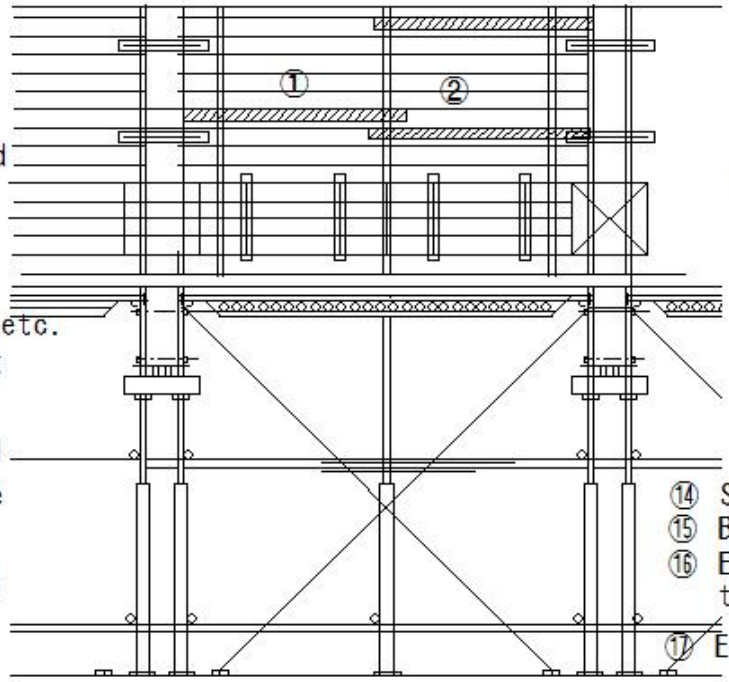
Example of formwork support (Beam)

Example of formwork support configuration (RC/SRC construction + flat deck)

Precautions when placing materials on the deck

A: In case of beam formwork assembly is complete, Figure A

B: In case of beam formwork assembly is not complete, Figure B



① Base plate
② Deck ribs
③ Deck plate
④ Base plate is placed on top of the ribs
⑤ Pillars
⑥ Base plate
⑦ Reinforcement bars, etc.
⑧ Separator tightening is complete
⑨ Base plate is placed on the beam side
⑩ Pull chain
⑪ Intermediate support
⑫ End brace
⑬ Steel bars, etc.

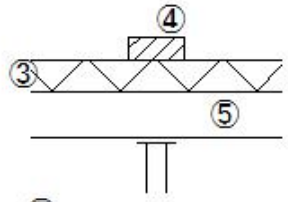


Figure A

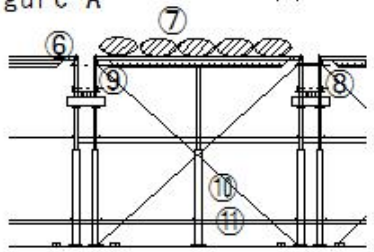
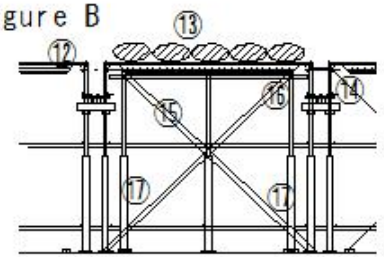


Figure B



⑭ Separator installation completed
⑮ Bracing
⑯ End brace cannot be placed up to the beam side
⑰ End reinforcement support

(S913) Open Excavation

(S913) Open Excavation

Safety work in open excavation

Investigation of work site

①Shape, geology, condition of strata

②Condition of cracks, water, spring water and freezing →

Thorough investigation to determine timing and order of excavation

③Presence and condition of buried objects, etc.

④Presence and condition of high-temperature gas and steam

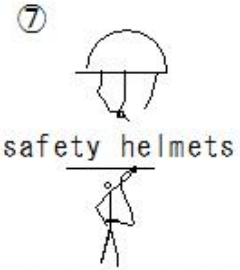
Contractor → Appointment → Ground excavation work supervisor

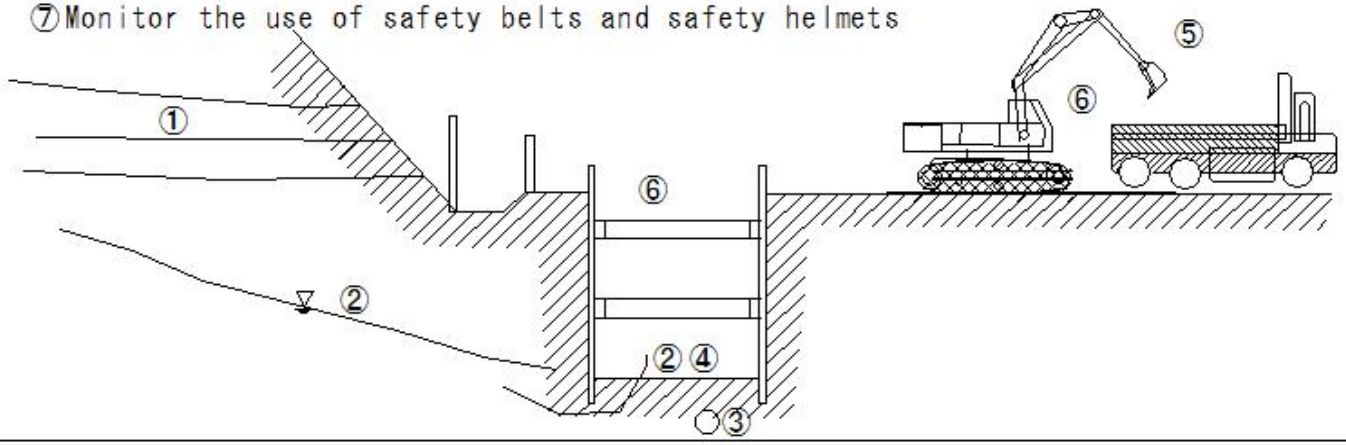
Duties

⑤Determine the work method and take direct command

⑥Inspect tools and equipment, remove defective items

⑦Monitor the use of safety belts and safety helmets





(S914) Open Excavation

(S914) Open Excavation

Safety work in open excavation

Safety work in open excavation

Prevention of dangers due to ground collapse, etc.

①Install shoring and protective nets to prevent dangers due to collapse and falling, and take measures to prohibit entry

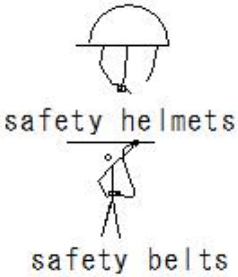
①Sheet piles

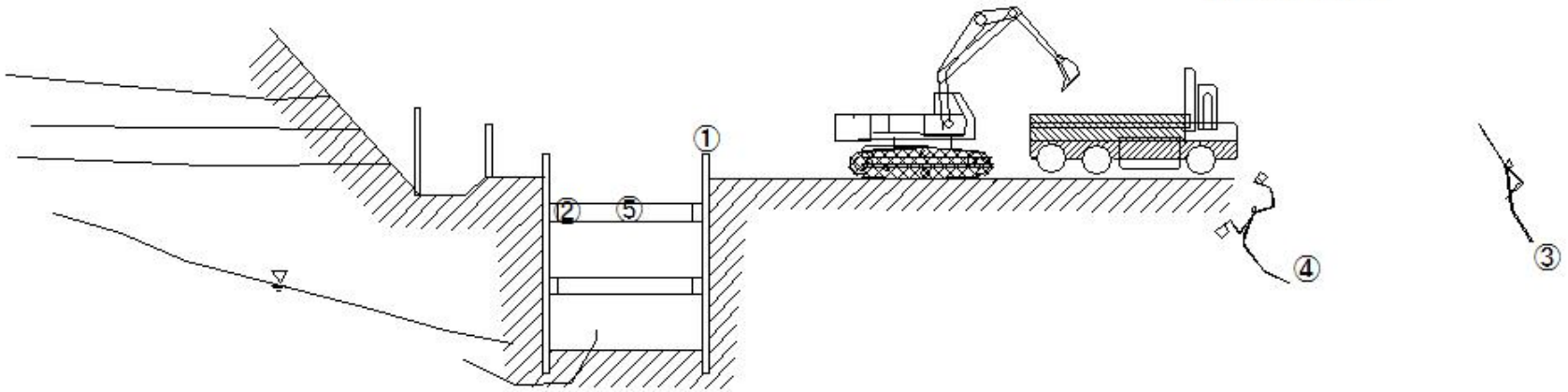
②Walling

③Supervisor

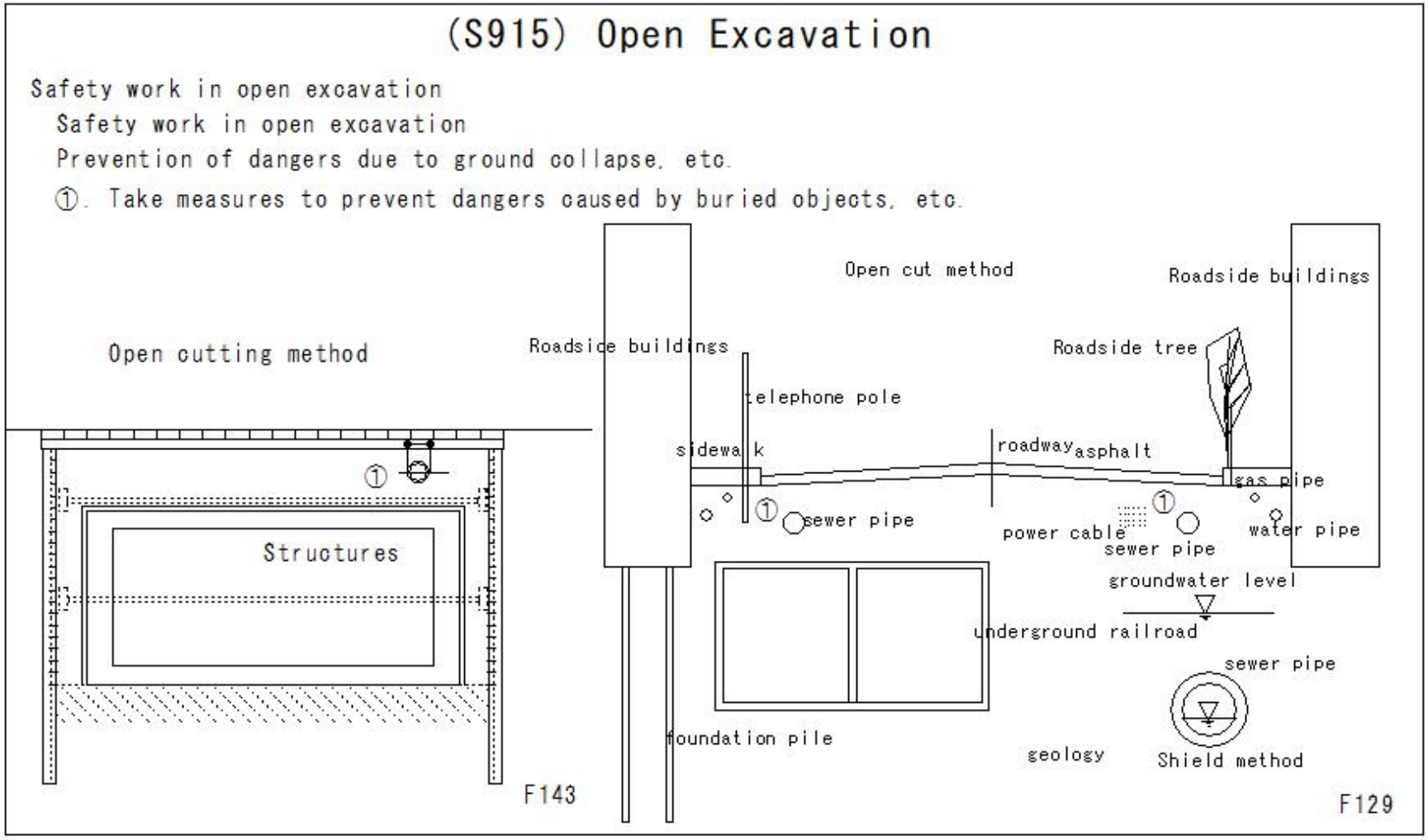
④Guide

⑤Strut

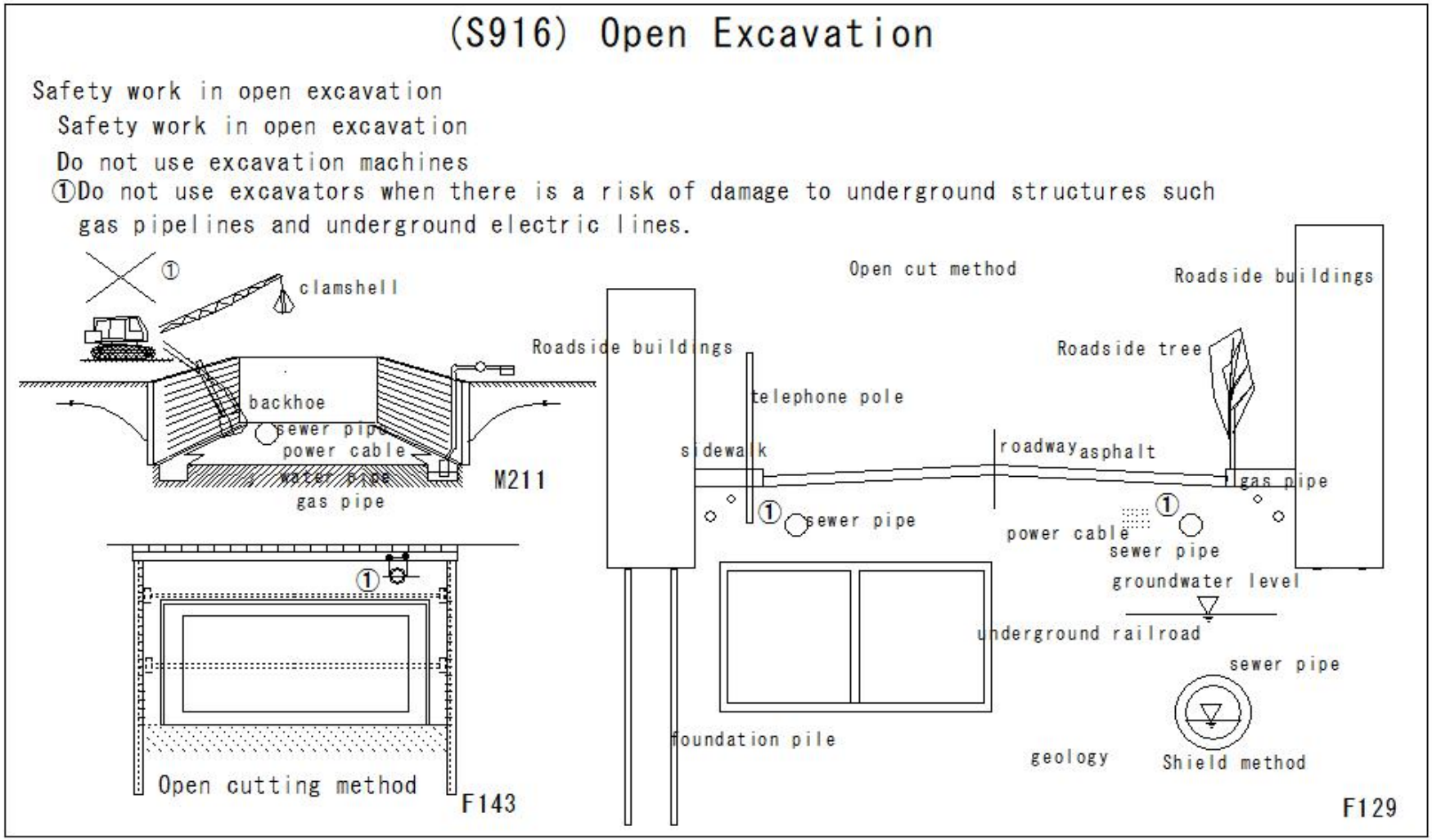




(S915) Open Excavation



(S916) Open Excavation



(S917) Open Excavation

(S917) Open Excavation

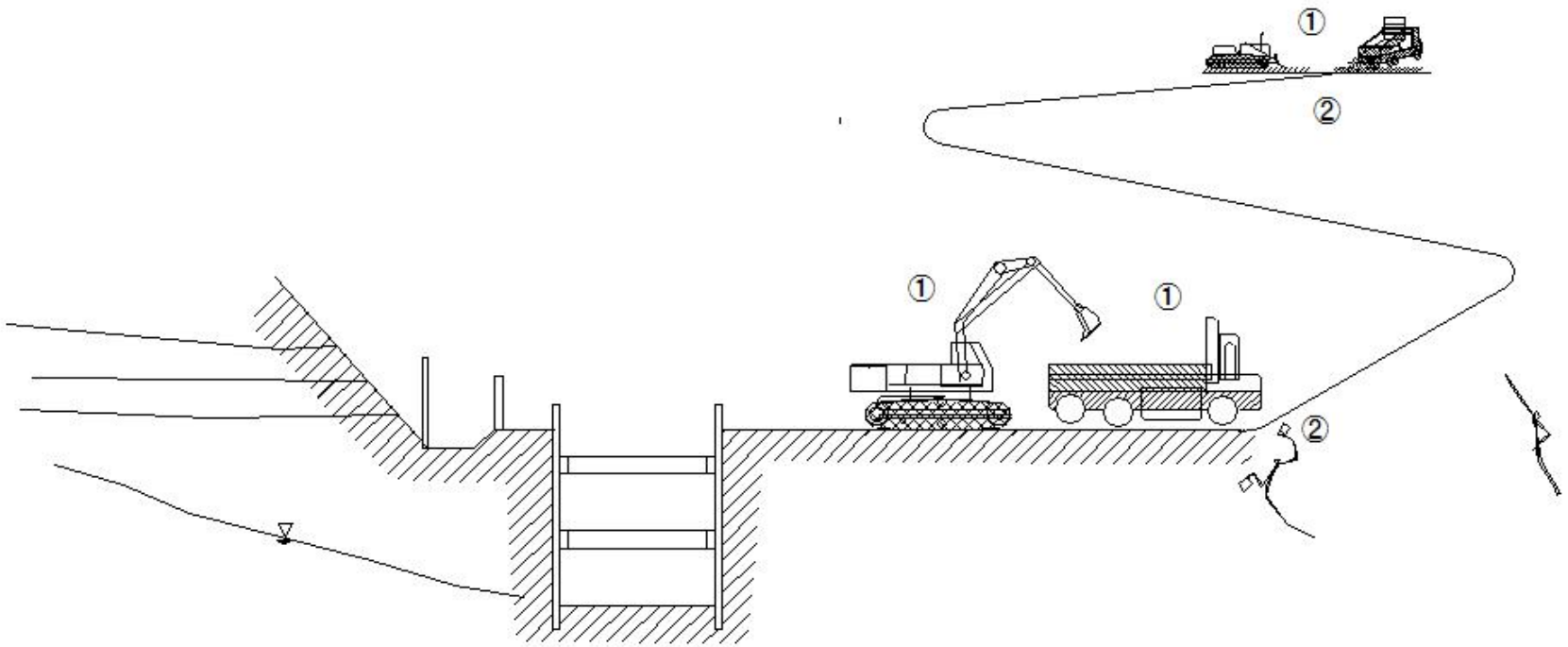
Safety work in open excavation

Safety work in open excavation

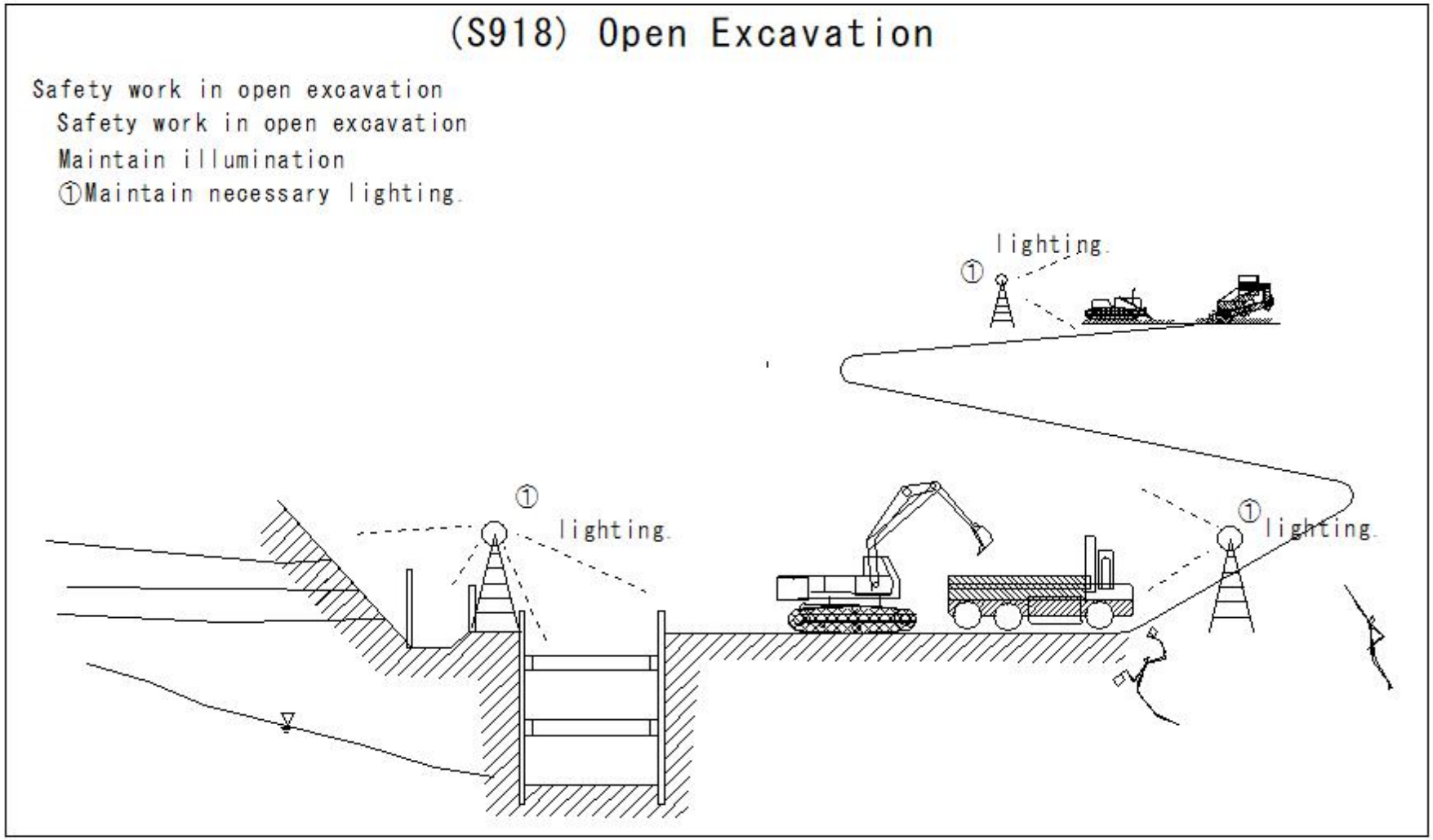
Notify machine operation routes, etc.

①Operation routes for transport machines, excavation machines, and loading machines

②Decide how to enter and exit the soil loading and unloading area and notify relevant parties.



(S918) Open Excavation



(S919) Open Excavation

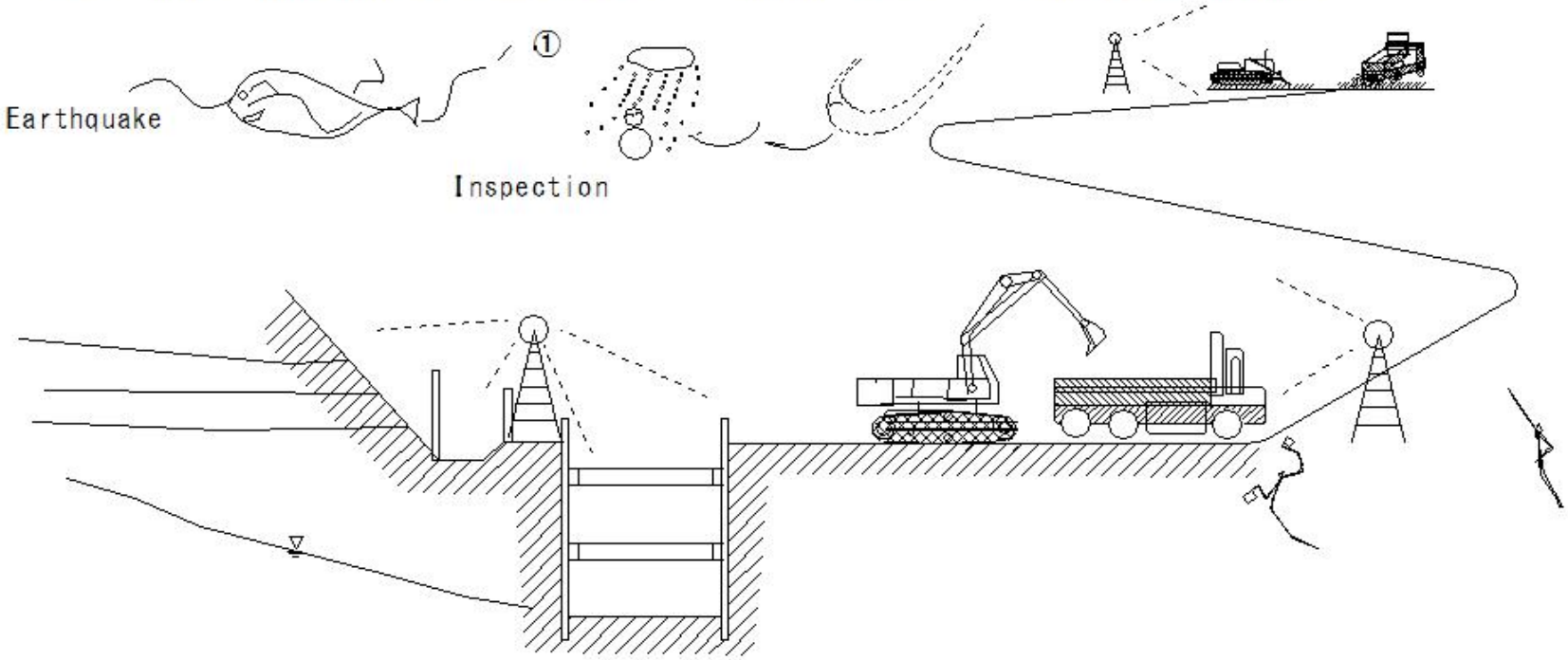
(S919) Open Excavation

Safety work in open excavation

Safety work in open excavation

Inspection

①Appoint an inspector to inspect the work site and surrounding ground before starting work that day, after heavy rain, and after a moderate earthquake (seismic intensity 4 or higher).



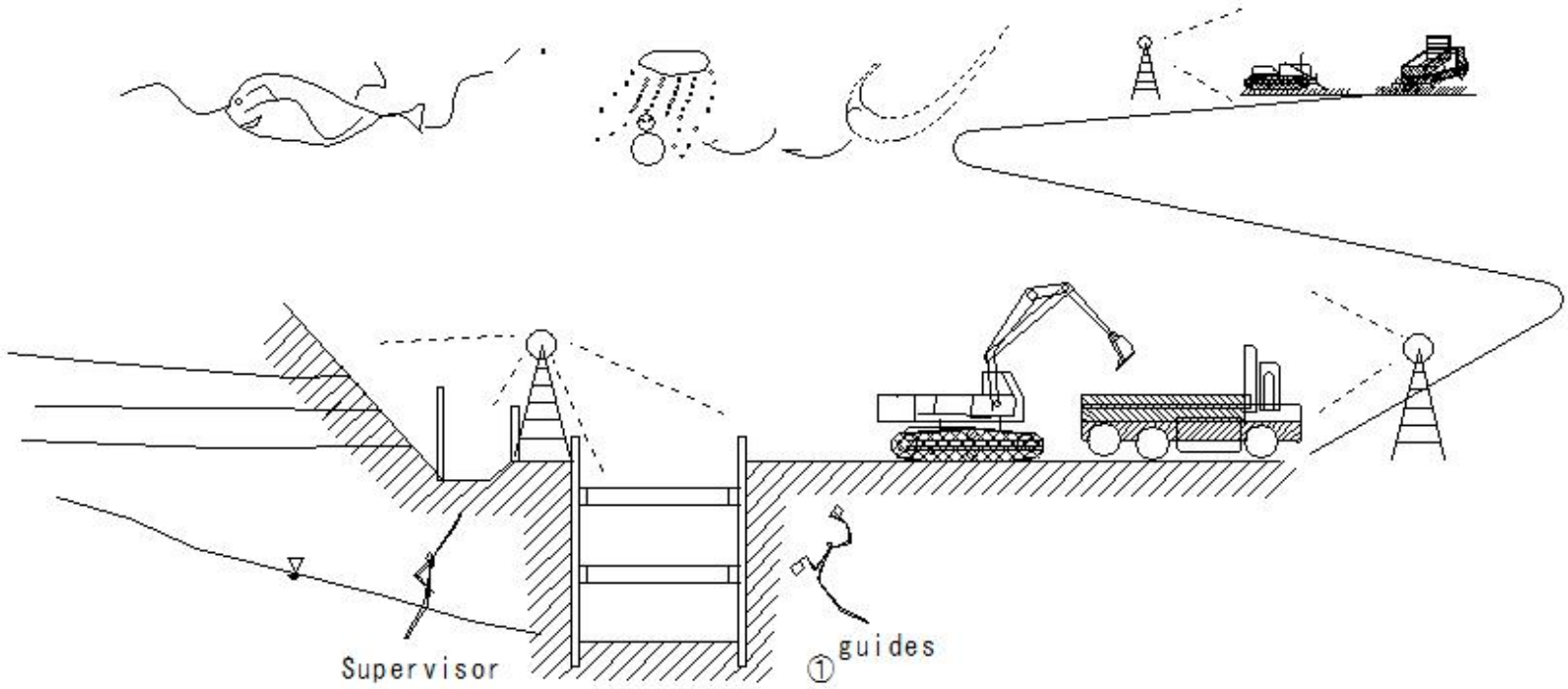
(S920) Open Excavation

(S920) Open Excavation

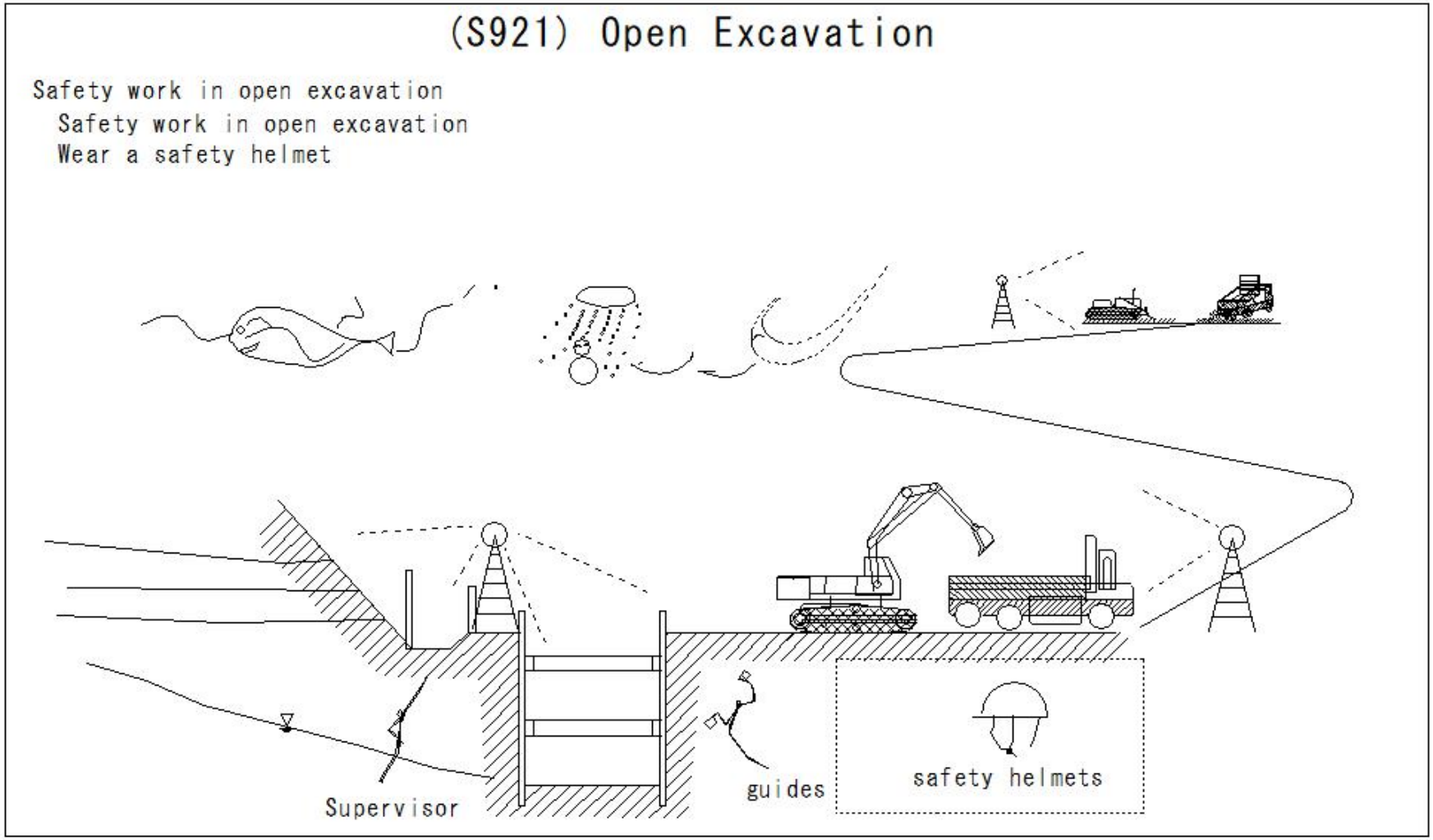
Safety work in open excavation

Safety work in open excavation

①In case of the machine moves backward and approaches the work area of the worker, or there is a risk of the worker falling off, a guide must be stationed.



(S921) Open Excavation

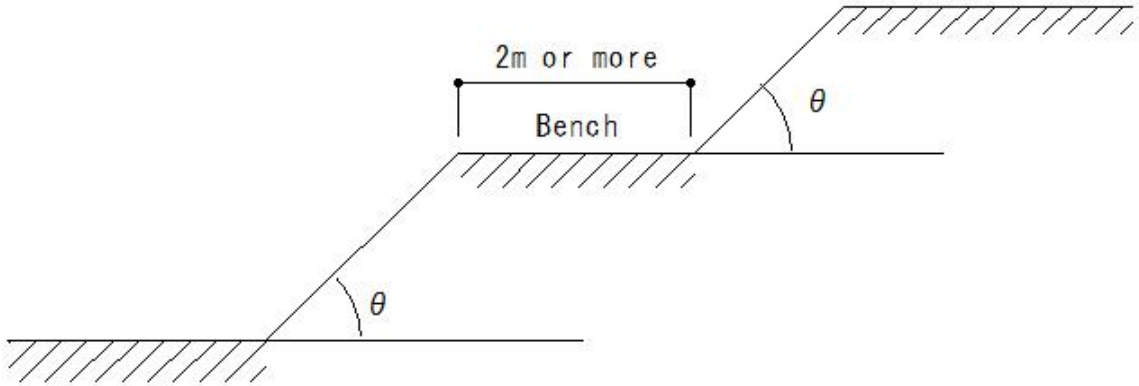


(S922) Open Excavation

(S922) Open Excavation

Standards for the slope of the excavation surface

①Hand-dug excavation (when the excavation surface has a horizontal step of 2m or more in depth)

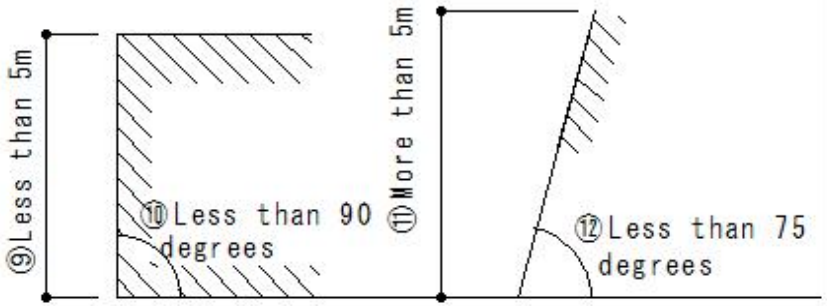


(S923) Open Excavation

(S923) Open Excavation

Standards for the slope of the excavation surface

Prevention of dangers during hand-dug excavation work on ground made of sand, etc.

①Excavation of ground	②Height of the excavation surface	③Slope of the excavation surface	
④Rock or clay ground	⑤Less than 5m	⑥Less than 90 degrees	
	⑦More than 5m	⑧Less than 75 degrees	

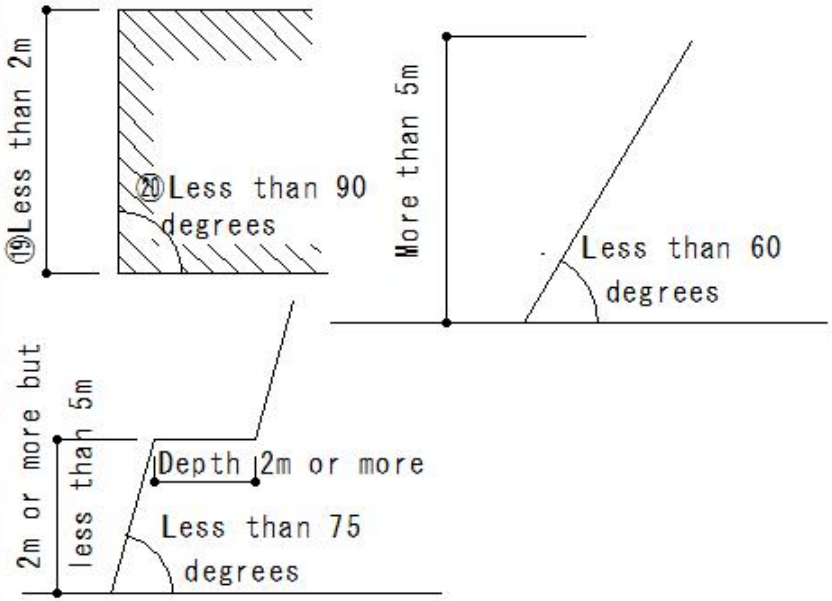
(S924) Open Excavation

(S924) Open Excavation

Standards for the slope of the excavation surface

Prevention of dangers during hand-dug excavation work on ground made of sand, etc.

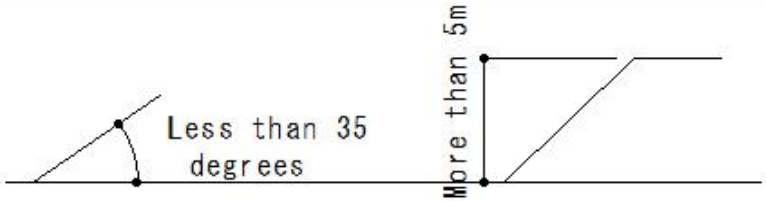
①Excavation of ground	②Height of the excavation surface	③Slope of the excavation surface	
⑫Other ground	⑬Less than 2m	⑯Less than 90 degrees	
	⑭2m or more but less than 5m	⑰Less than 75 degrees	
	⑮More than 5m	⑱Less than 60 degrees	



(S925) Open Excavation

Standards for the slope of the excavation surface

Prevention of dangers during hand-dug excavation work on ground made of sand, etc.

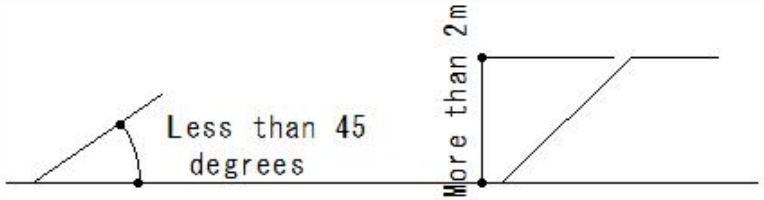
①Excavation of ground	②Height of the excavation surface	③Slope of the excavation surface	
Ground made of sand	Less than 5m or less than 35 degrees		

(S926) Open Excavation

(S926) Open Excavation

Standards for the slope of the excavation surface

Prevention of dangers during hand-dug excavation work on ground made of sand, etc.

①Excavation of ground	②Height of the excavation surface	③Slope of the excavation surface	
Ground that is easily collapsed by blasting, etc.	Less than 2m or 45° or less		

(S927) Open Excavation

(S927) Open Excavation

Standards for the slope of the excavation surface

Preventing the danger of manual excavation work

on sandy ground, etc.

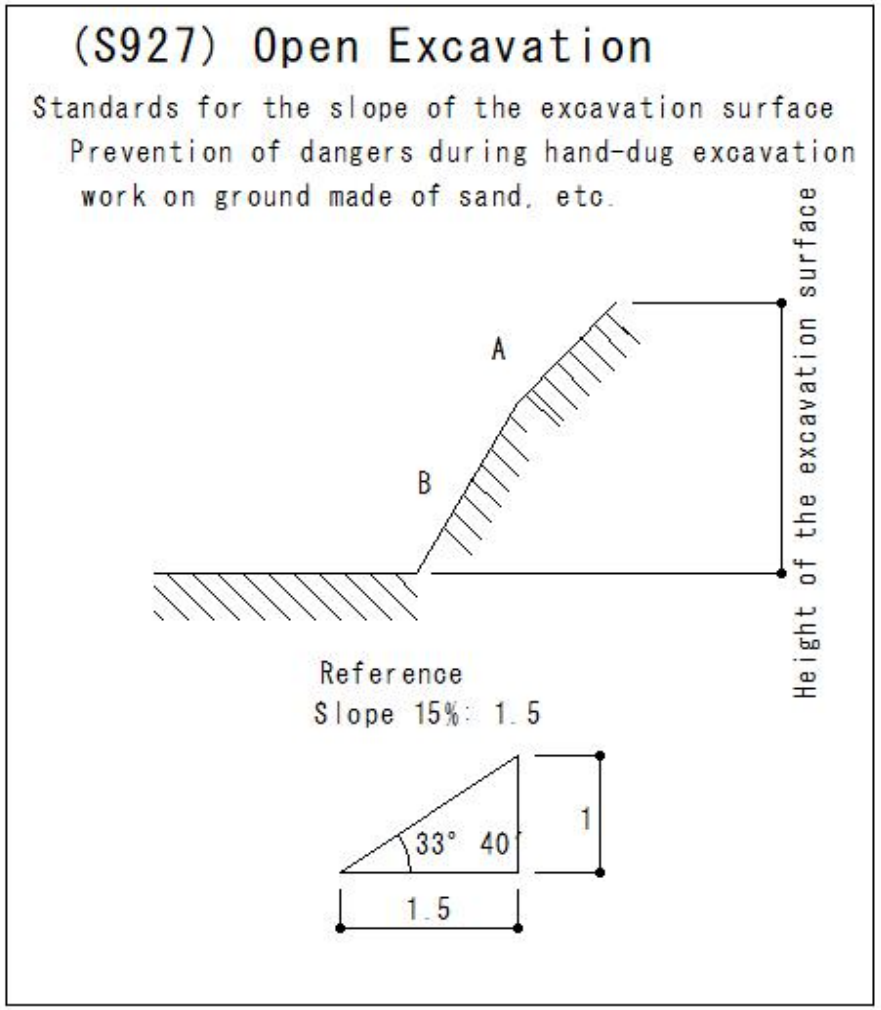
○In case of there are parts with different slopes

on the excavation surface

Height of the excavation surface

Conversion table of slope and angle for general indication

Slope		Slope angle	Gradient		Slope angle
0		90°	0.8	8 minutes	51°20′
0.1	1 minute	84°10′	0.9	9 minutes	48°
0.2	2 minutes	78°40′	1.0	10%	45°
0.3	3 minutes	73°23′	1.2	10% 2 minutes	39°50′
0.4	4 minutes	68°10′	1.5	10% 5 minutes	33°40′
0.5	5 minutes	63°30′	1.8	10% 8 minutes	29°
0.6	6 minutes	59°	2.0	20%	26°30′
0.7	7 minutes	55°			



(S928) Open Excavation

(S928) Open Excavation

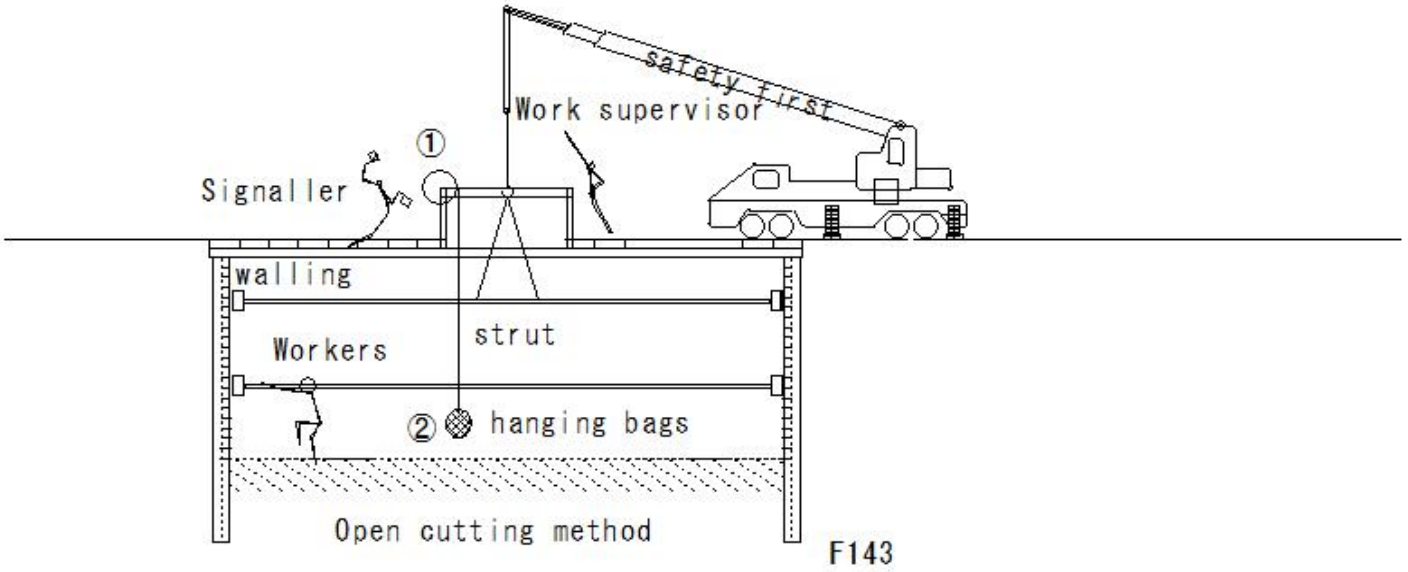
Safe work on Earth Retaining Supports

Work on strut, etc.

○ Installation and removal of strut and walling on earth retaining supports

① Measures to prohibit entry by anyone other than those involved

② Use of hanging nets and hanging bags when lifting and lowering materials, etc.



(S929) Earth Retaining Supports

(S929) Open Excavation

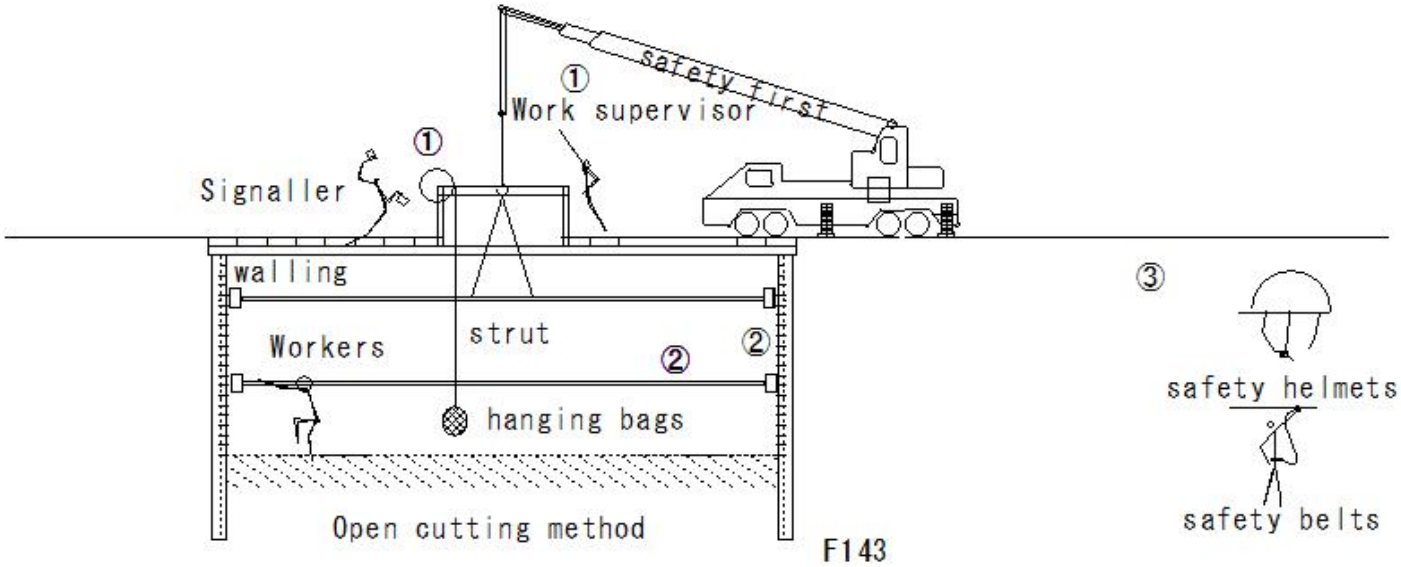
Safe work on Earth Retaining Supports

Contractor → Appointed → Earth Retaining Supports Work Supervisor

① Determine the work method and directly guide the work

② Check for material defects, and check equipment and tools Remove defective products

③ Monitor the use of safety belts and protective helmets



F143

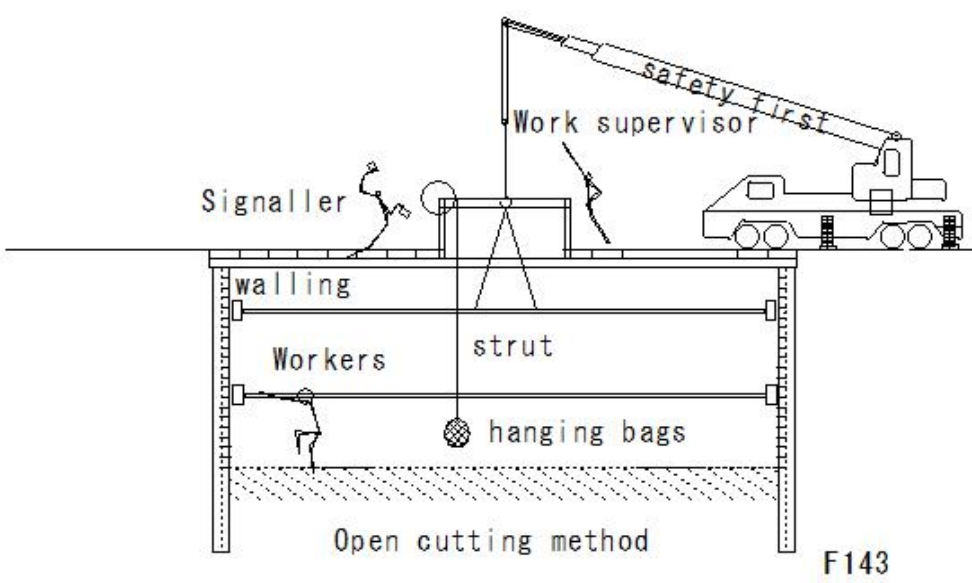
(S930) Earth Retaining Supports

(S930) Open Excavation

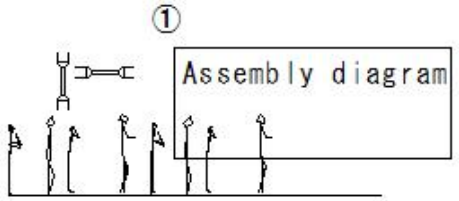
Safe work on Earth Retaining Supports

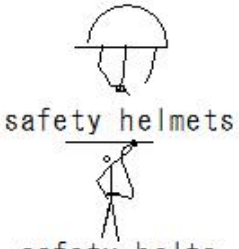
Assembly diagram

① Shows the arrangement, dimensions and materials of the parts, as well as the timing and order of installation



F143





(S931) Earth Retaining Supports

(S931) Open Excavation

Safe work on Earth Retaining Supports

Inspection

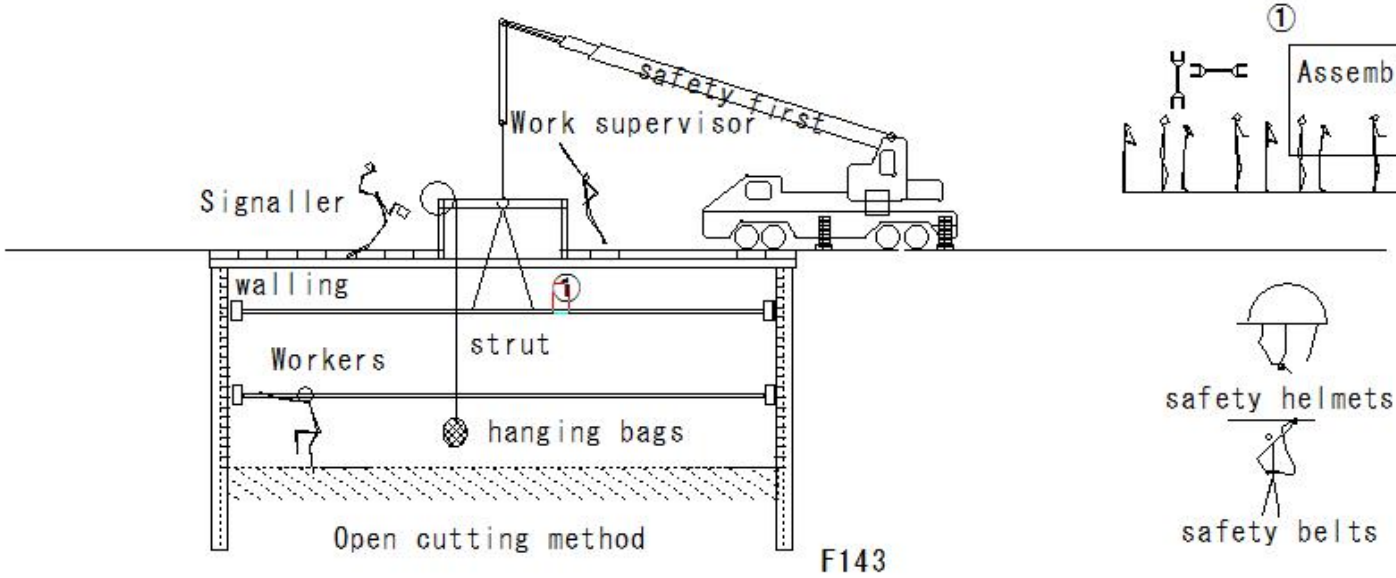
Inspection period

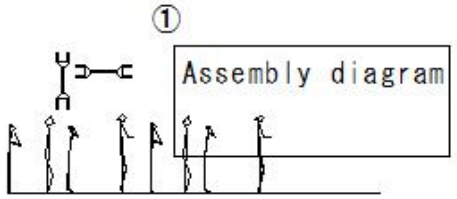
① Within 7 days after installation of supports

② After a moderate earthquake (seismic intensity 4 or higher)

③ In case of there is a risk of the ground suddenly weakening due to heavy rain

Inspection





F143

(S932) Earth Retaining Supports

(S932) Open Excavation

Earthquake

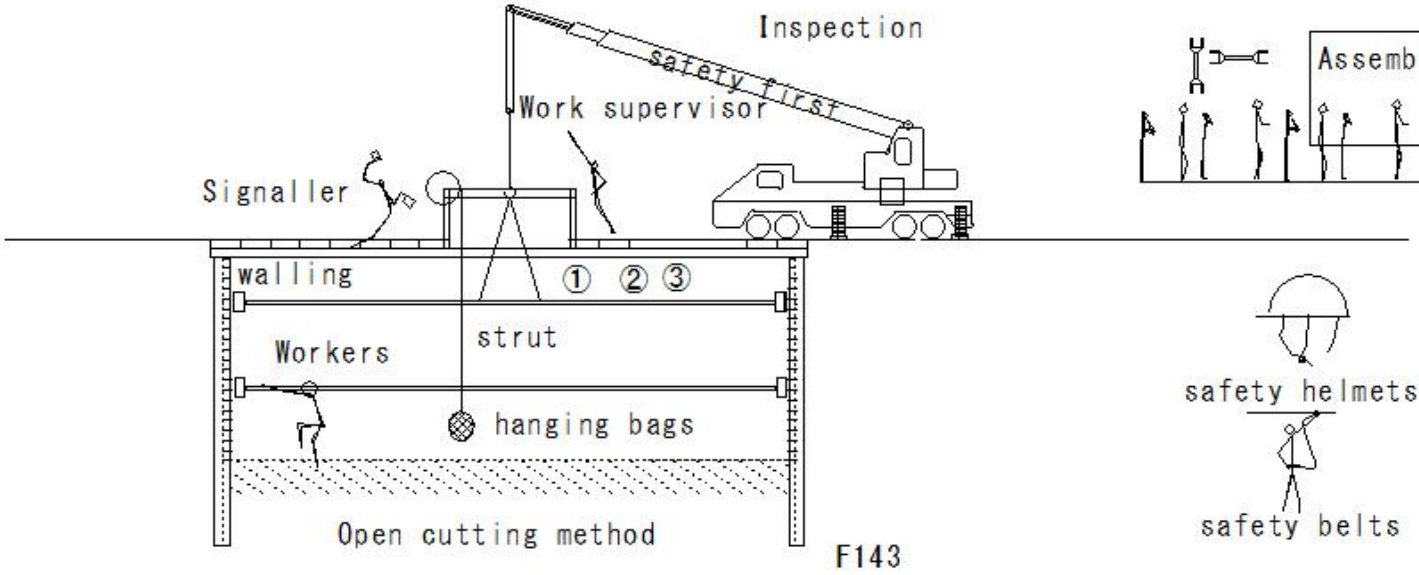
Safe work on Earth Retaining Supports

Inspection items

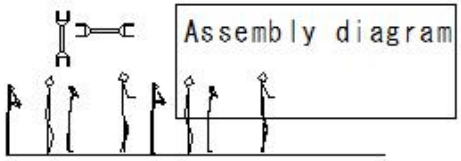
① Damage, deformation, corrosion, displacement, and the presence and condition of fallen components

② Degree of tension on struts

③ Condition of connections, attachments, and intersections of components



F143



(S933) Earth Retaining Supports

(S933) Earth Retaining Supports

Safe work on Earth Retaining Supports

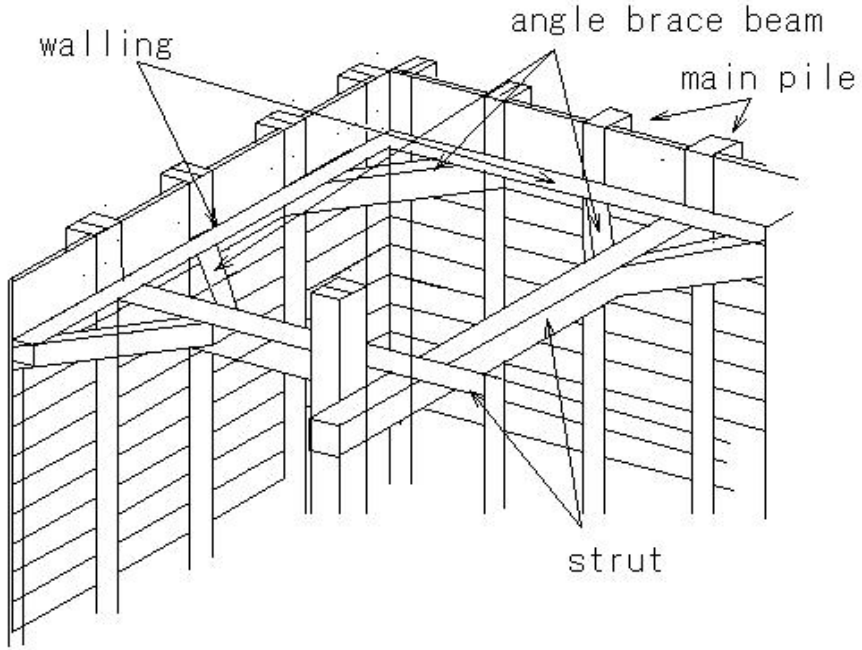
Materials

①Do not use materials that are damaged, deformed or corroded

Structure

②Shape of the ground, geology, and strata

Firm materials according to the condition of cracks, spring water, freezing, and buried objects



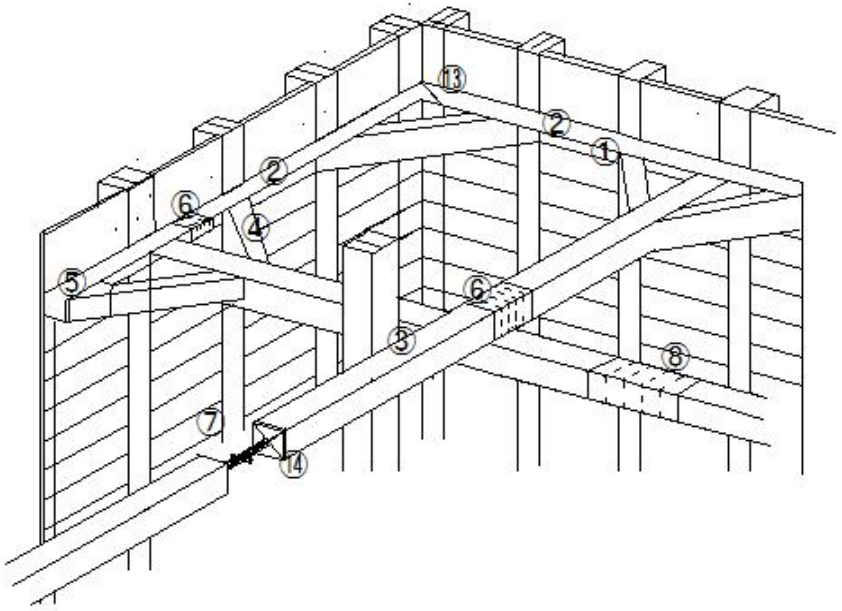
E244

(S934) Earth Retaining Supports

(S934) Earth Retaining Supports

Safe work on Earth Retaining Supports

①walling bracket
②walling
③strut
④angle brace beam
⑤angle brace piece
⑥Cover plate
⑦Jack
⑧Jack cover
⑨Crossing piece
⑩strut bracket
⑪Crossing lock bolt
⑫Retaining bracket
⑬Encounter piece
⑭Auxiliary piece



E244

(S935) Earth Retaining Supports

(S935) Earth Retaining Supports

Safe work on Earth Retaining Supports

Safe work on Earth Retaining Supports

Attachment of components, etc.

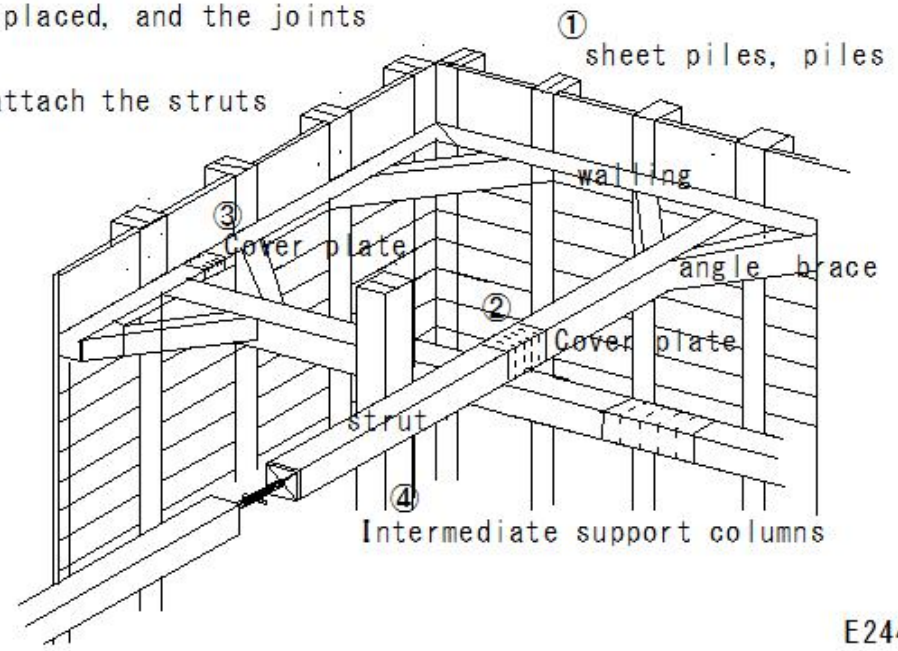
① Securely attach the struts and walling to sheet piles, piles, etc.

② Joints of compression members are butt joints

③ Welded sections of struts

At the intersections, a backing plate is placed, and the joints are secured with bolts and welded

④ Intermediate support columns: Securely attach the struts to the intermediate support materials



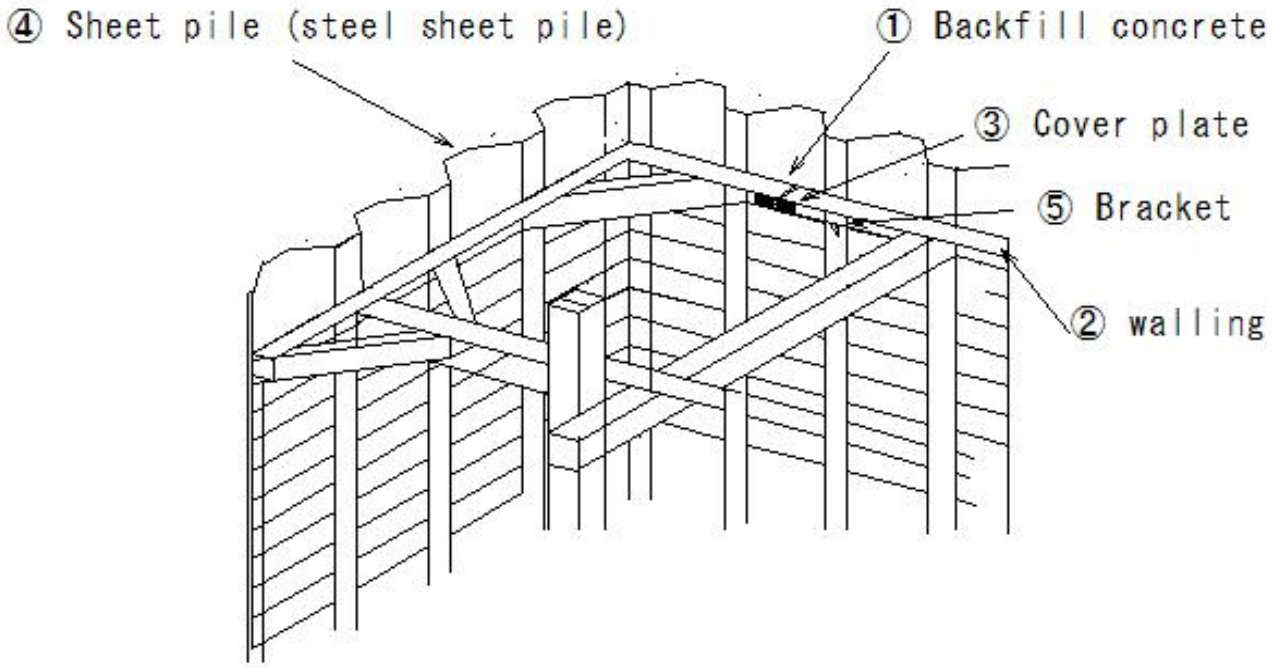
E244

(S936) Earth Retaining Supports

(S936) Earth Retaining Supports

Safe work on Earth Retaining Supports

Examples of strut joints

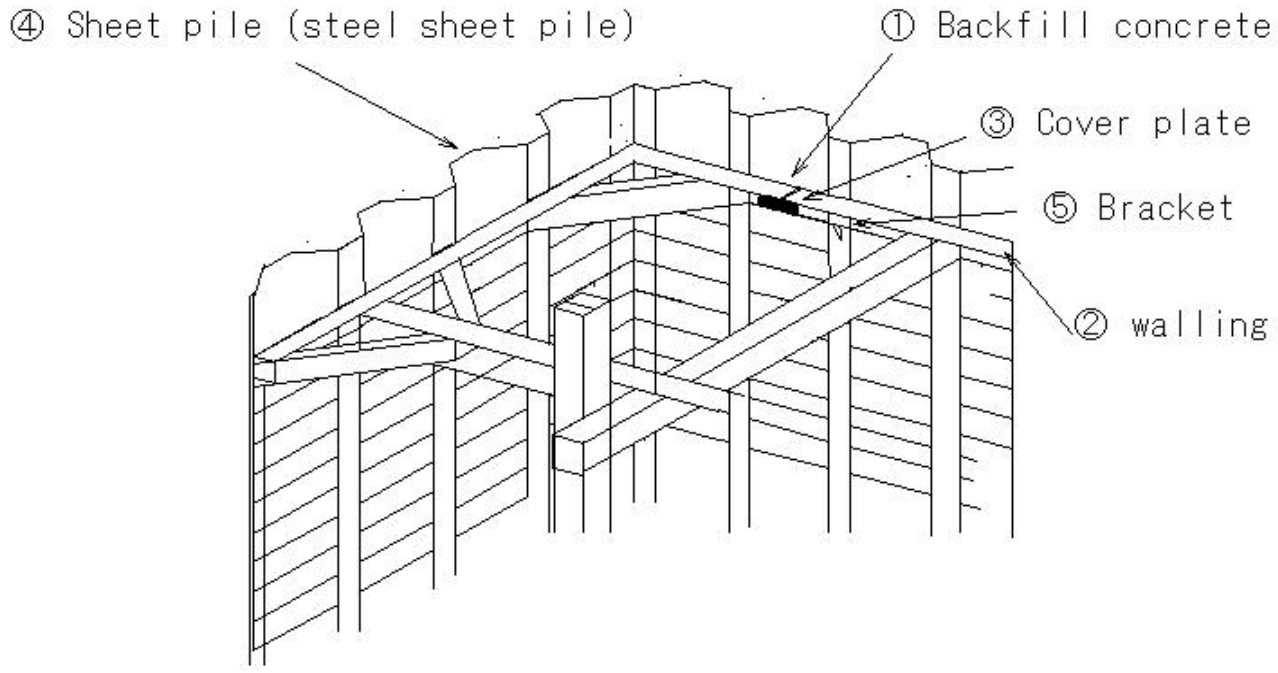


E251
E244

(S937) Earth Retaining Supports

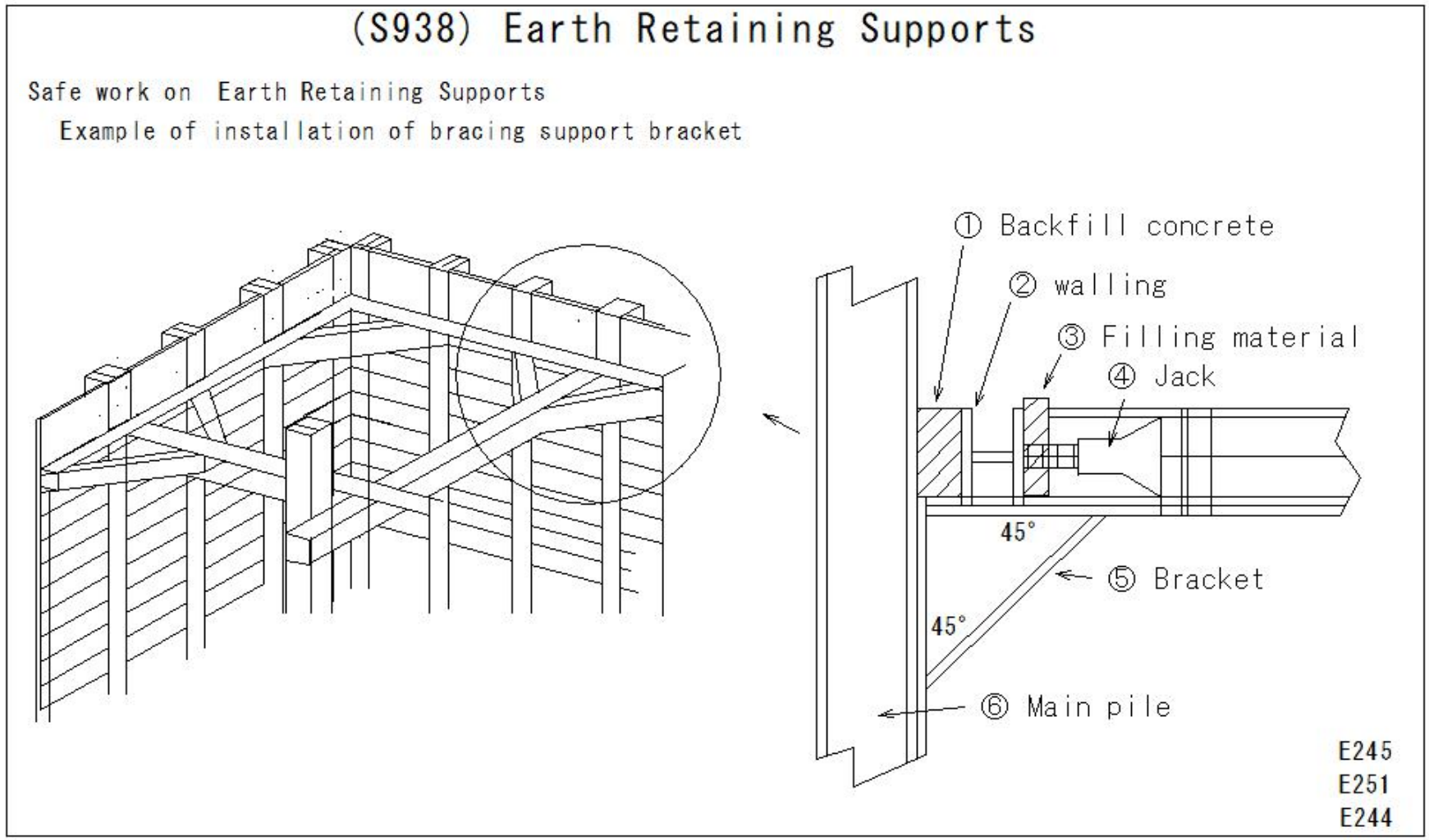
(S937) Earth Retaining Supports

Safe work on Earth Retaining Supports
Examples of strut joints



E251
E244

(S938) Earth Retaining Supports



(S939) Earth Retaining Supports

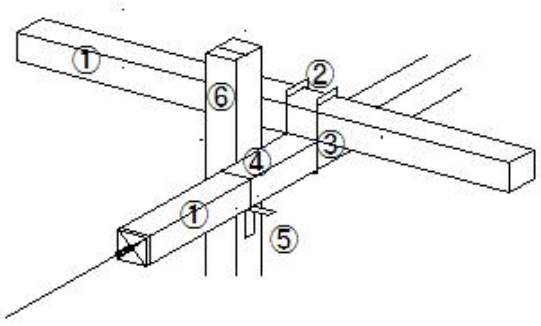
(S939) Earth Retaining Supports

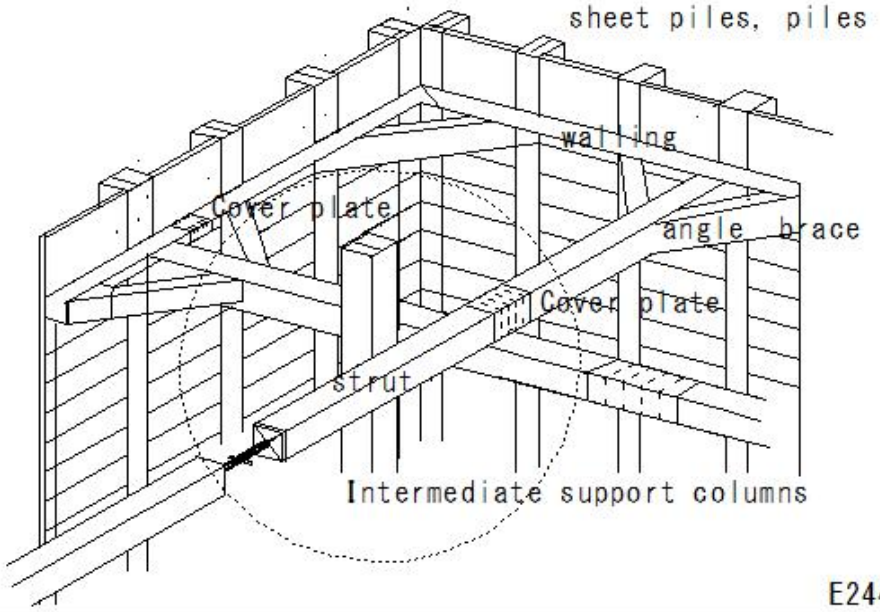
Safe work on Earth Retaining Supports

Safe work on Earth Retaining Supports

Example of joint between intermediate support column and bracing beam

① Strut
② Intersection piece
③ Intersection long bolt
④ Retaining bracket
⑤ Bracing beam bracket
⑥ Intermediate support column





E244

(S940) Earth Retaining Supports

(S940) Earth Retaining Supports

Safe work on Earth Retaining Supports

Safe work on Earth Retaining Supports

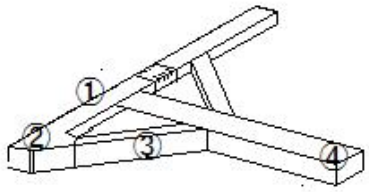
Example of installation of angle brace beam

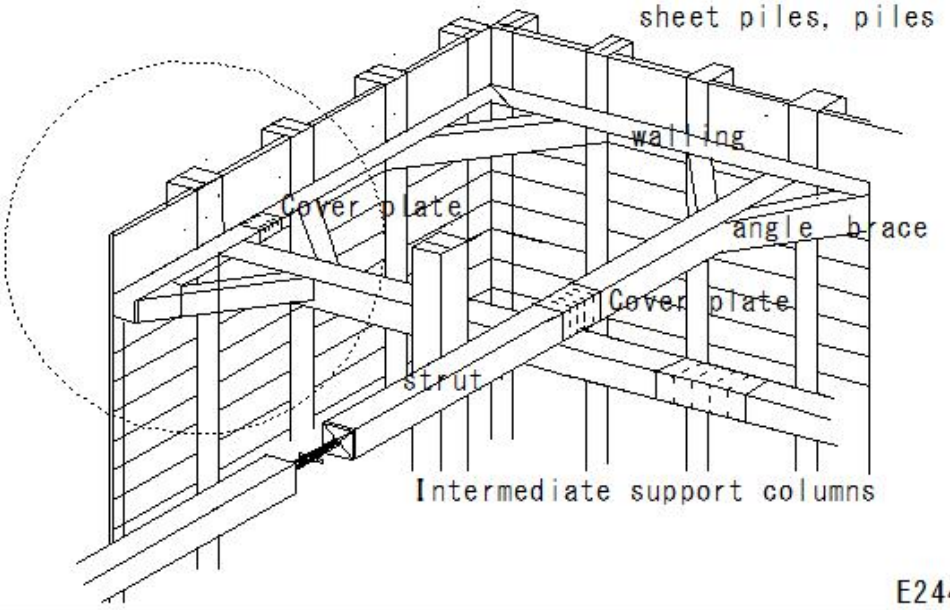
① walling

② angle brace piece

③ angle brace beam

④ strut





E244

(S941) Demolishing Concrete Structures

(S941) Demolishing Concrete Structures

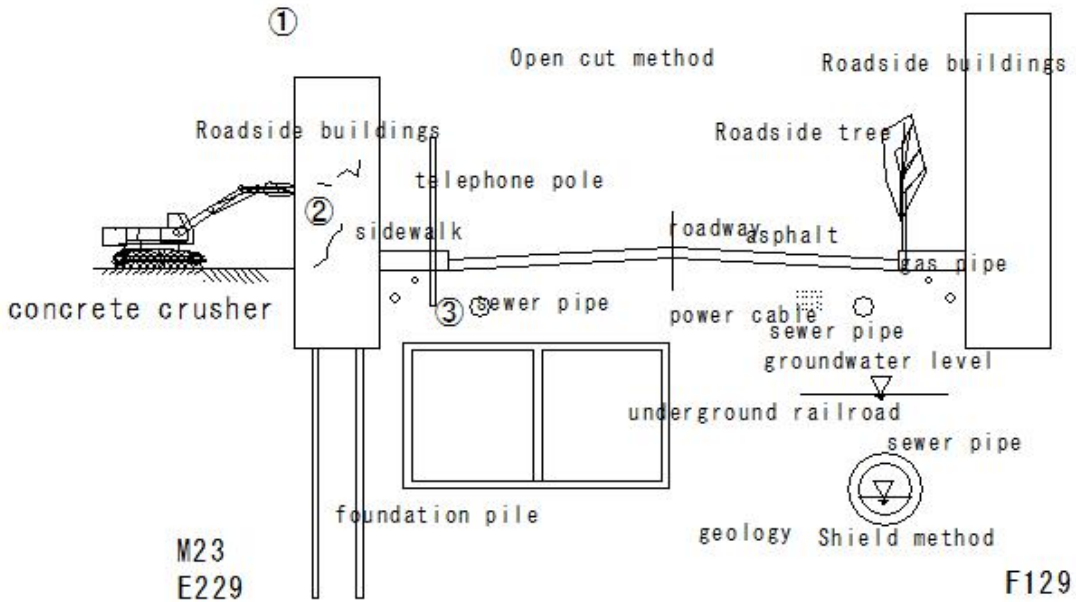
Safe work when demolishing concrete structures

Investigation

① Shape of structure

② Presence or absence of cracks

③ Surrounding conditions (gas pipes, water supply and sewerage, underground buried objects, etc.)

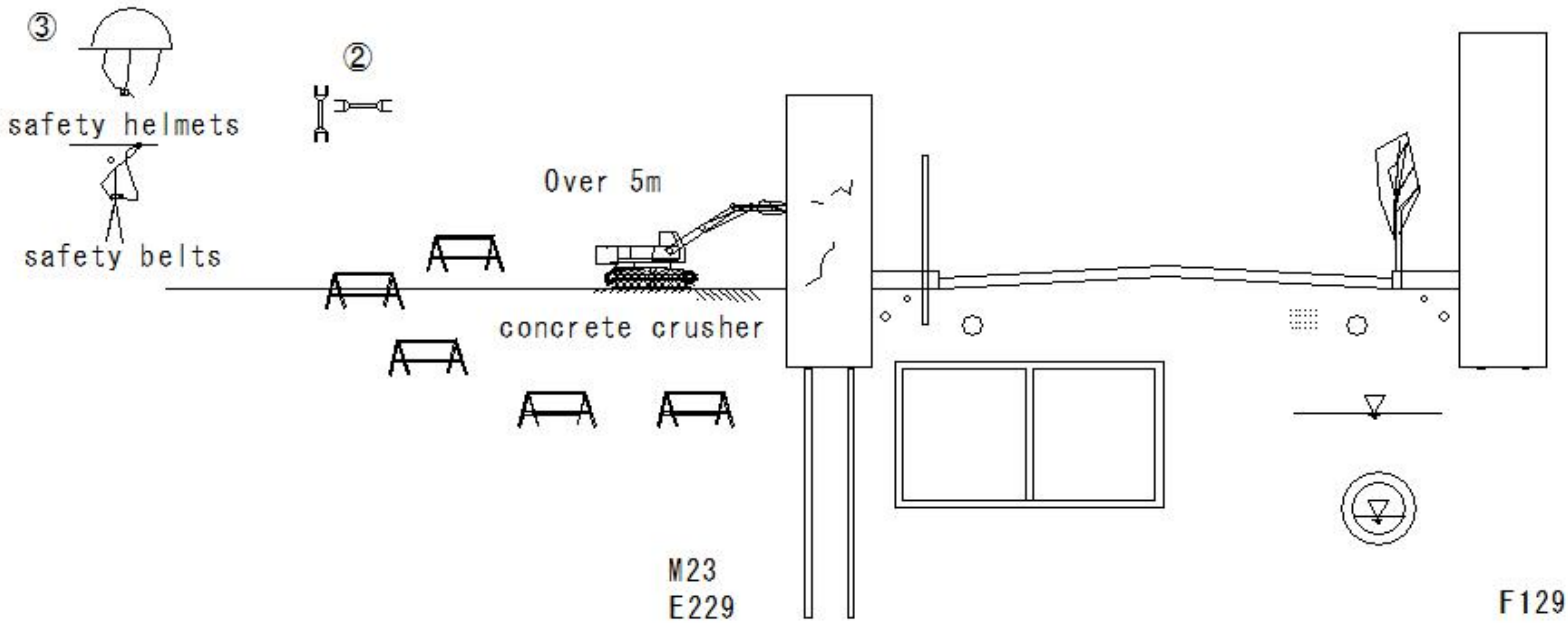


(S942) Demolishing Concrete Structures

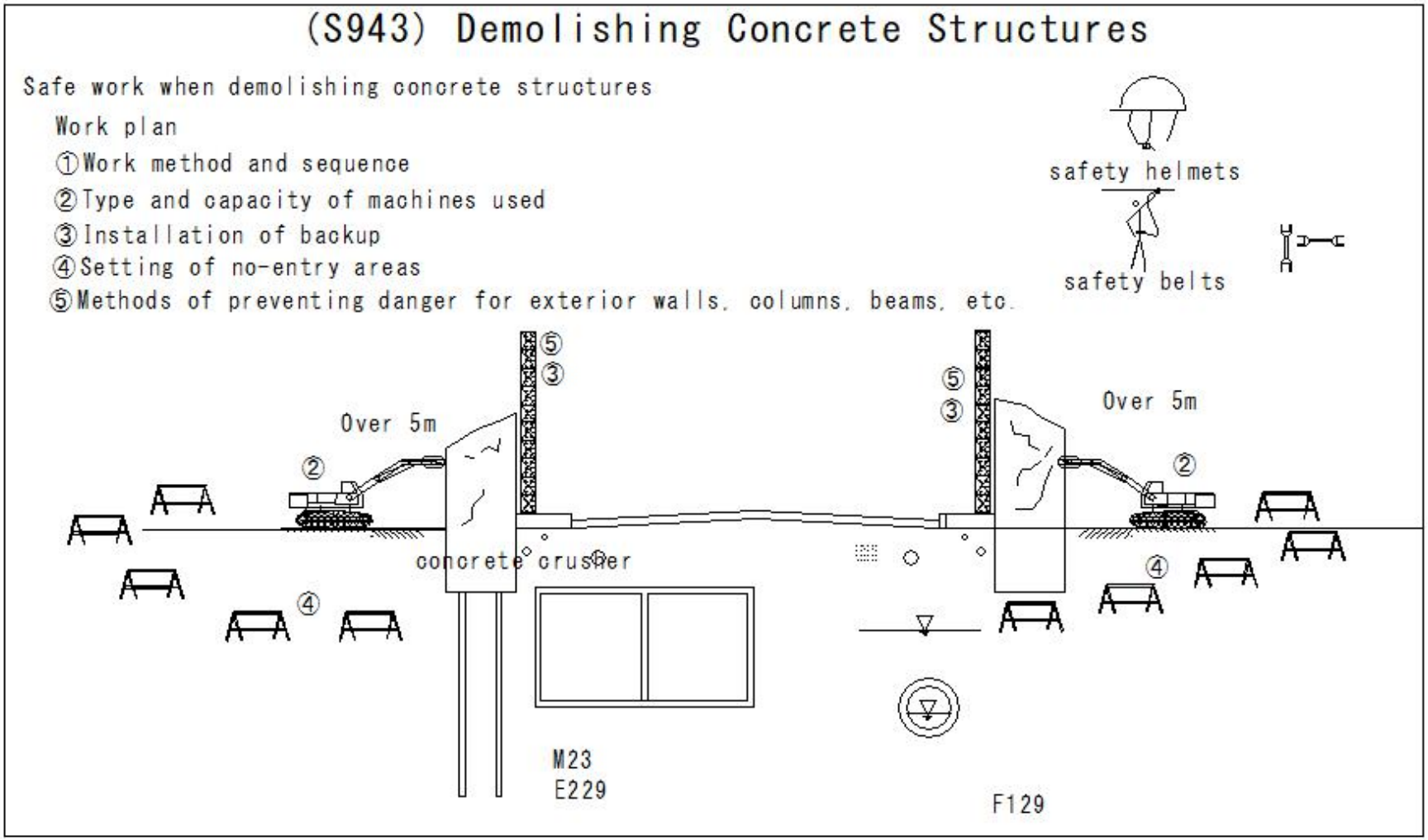
(S942) Demolishing Concrete Structures

Safe work when demolishing concrete structures

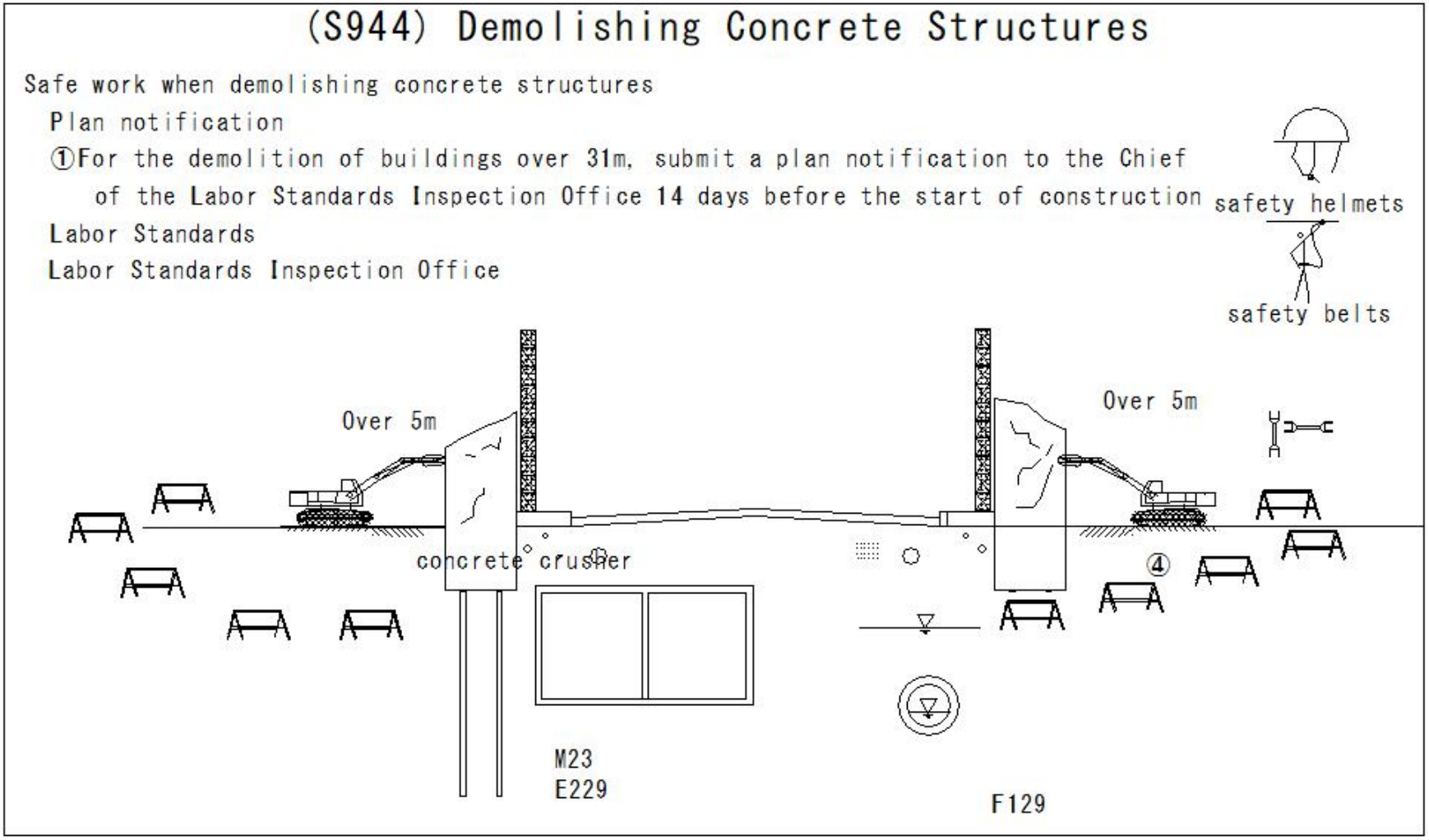
Appointment → Work supervisor
Demolition and destruction of concrete structures over 5m in height
①Determining work method and layout
②Inspection of the functionality of equipment, tools, safety belts and protective helmets
③Monitoring the use of safety belts and protective helmets



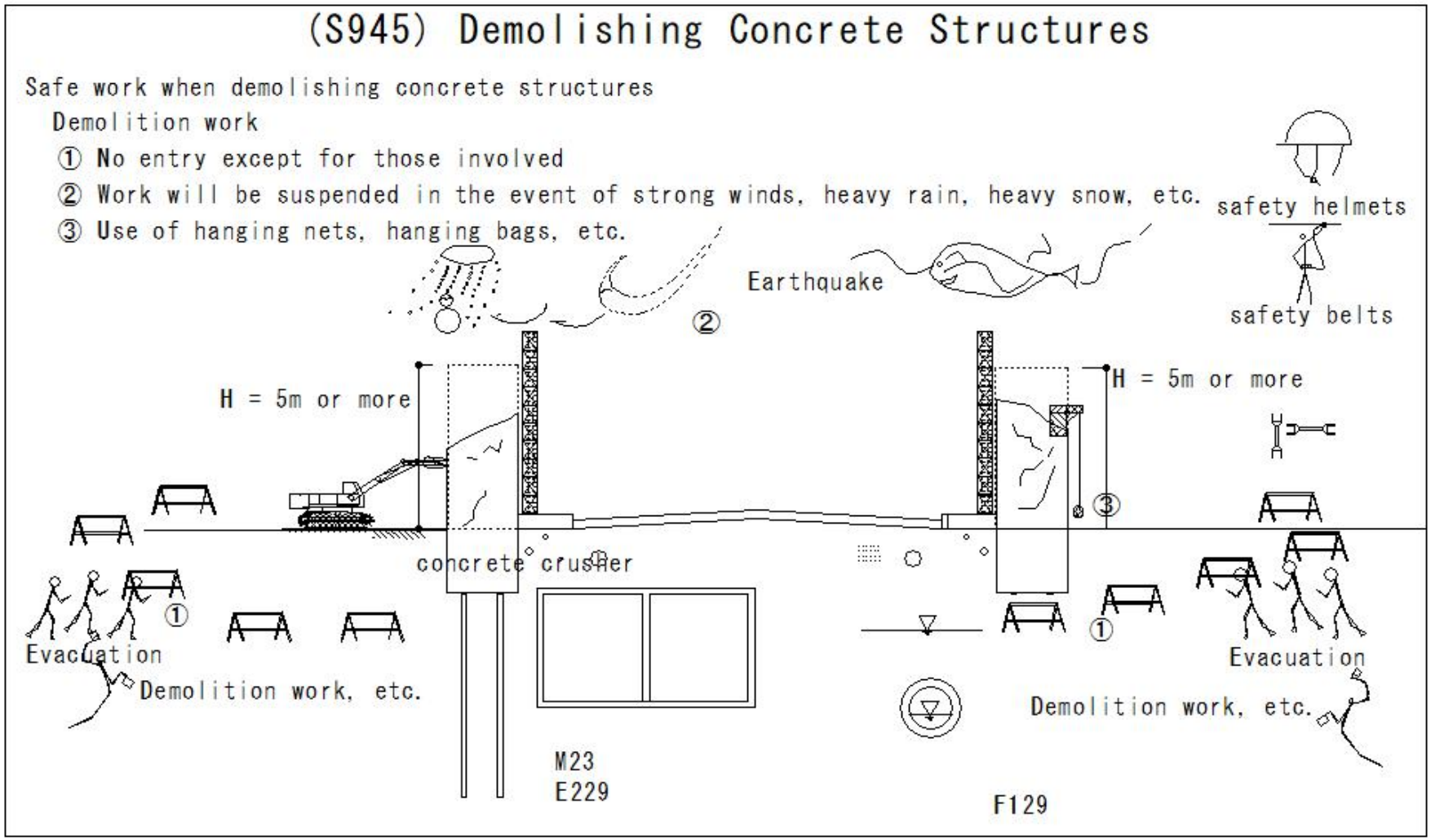
(S943) Demolishing Concrete Structures



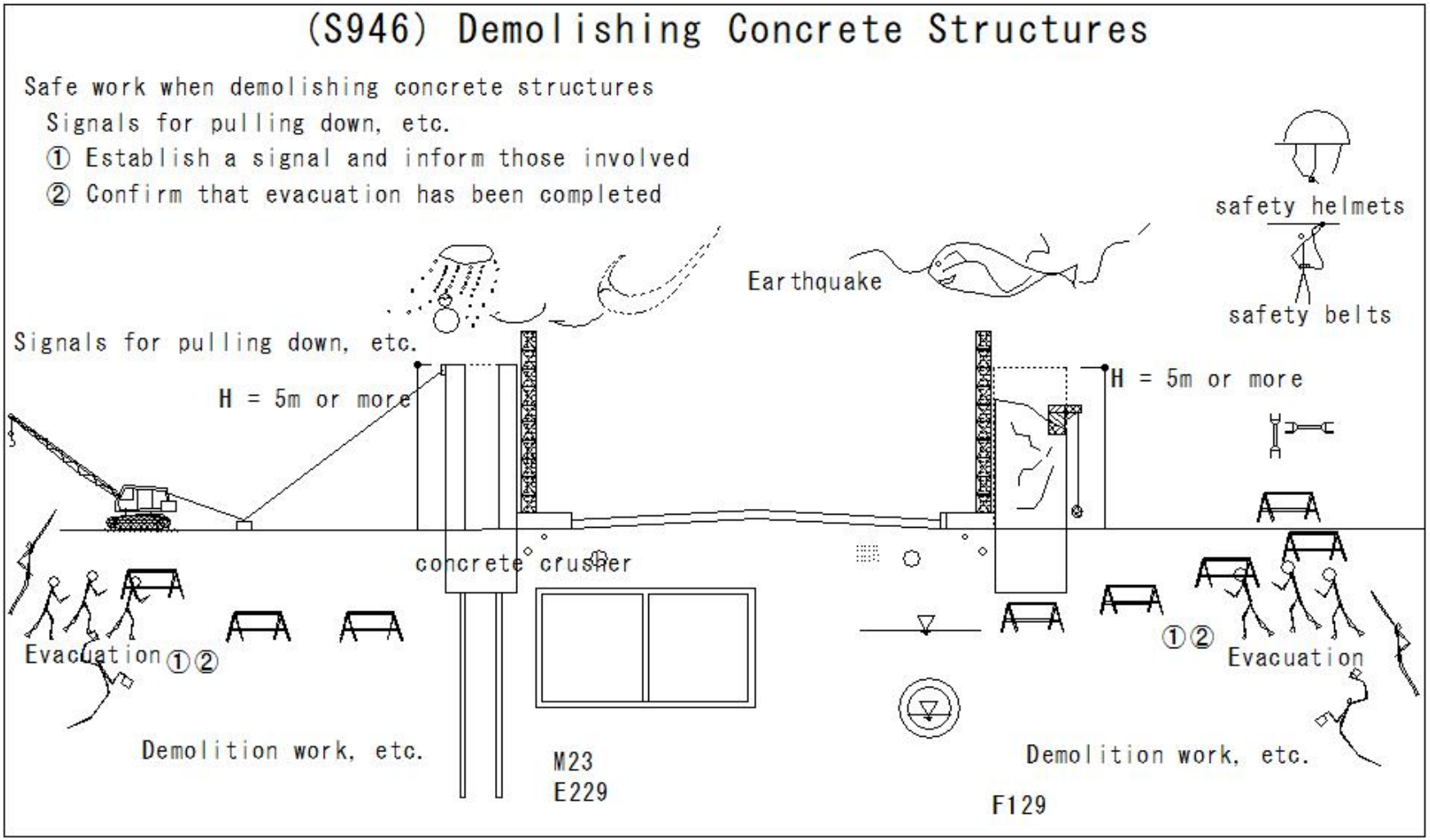
(S944) Demolishing Concrete Structures



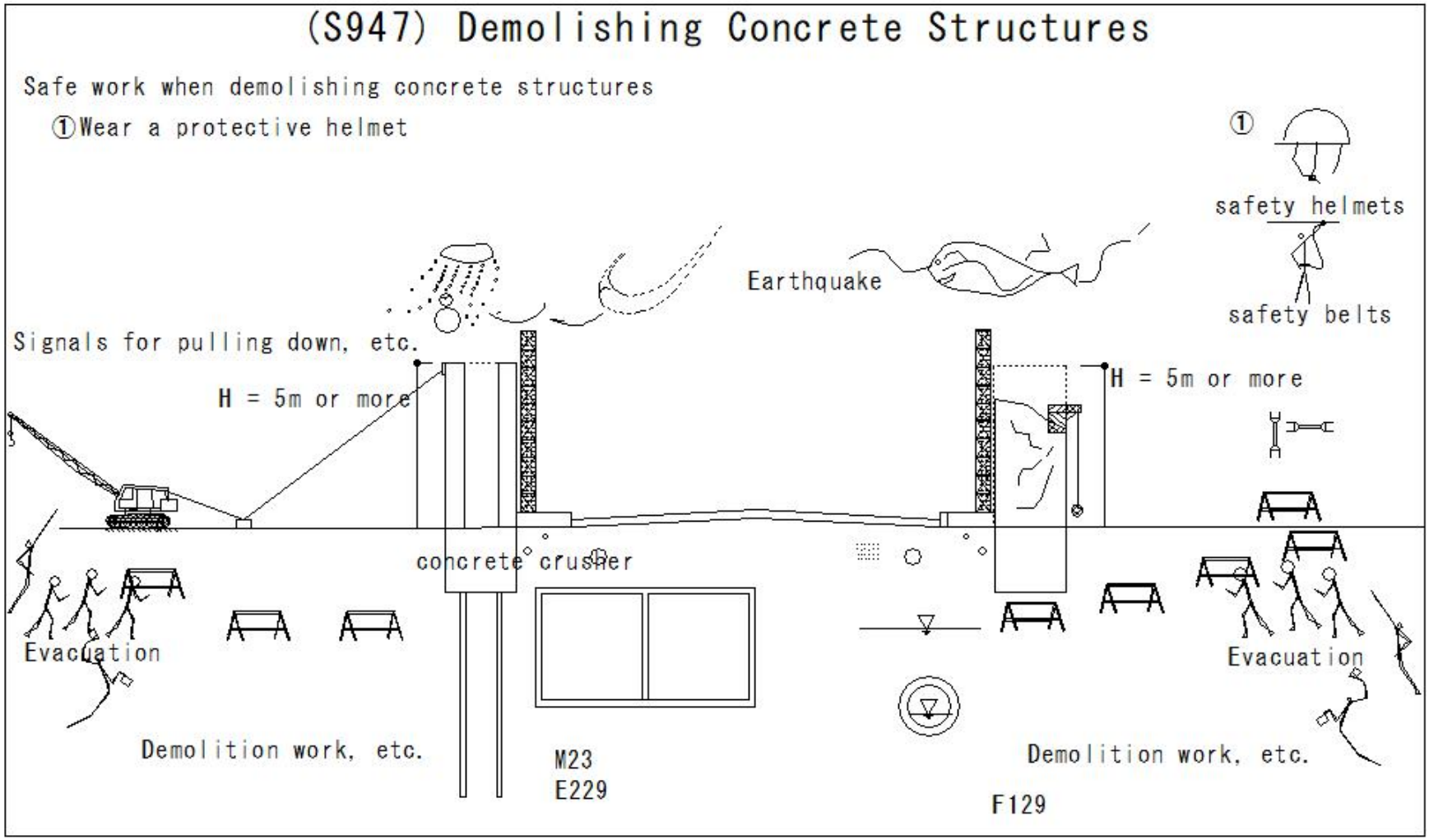
(S945) Demolishing Concrete Structures



(S946) Demolishing Concrete Structures



(S947) Demolishing Concrete Structures



(S948) Collapse of Exterior Walls

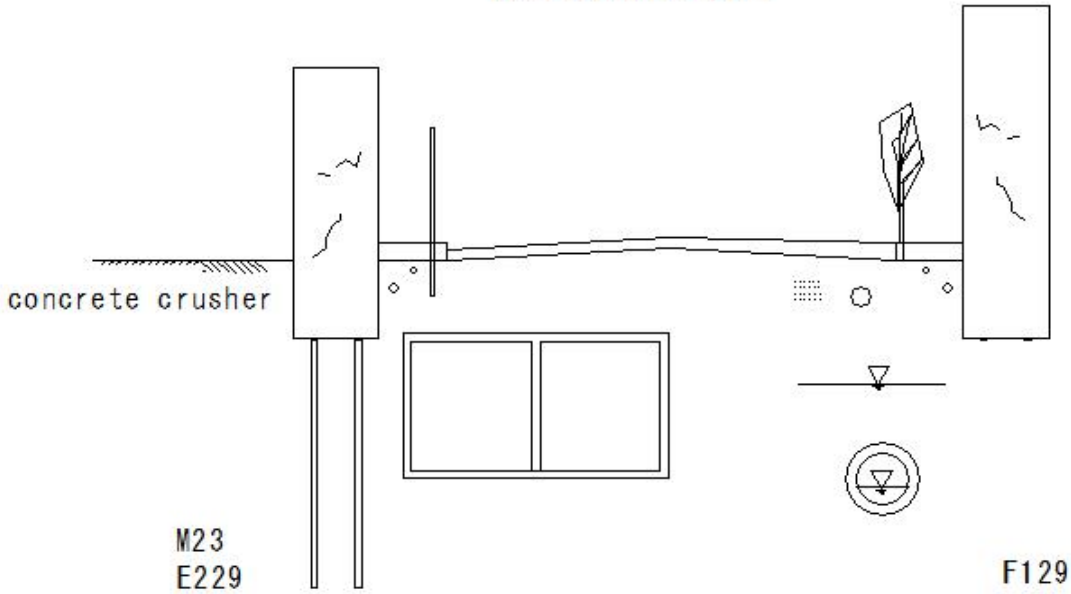
(S948) Collapse of Exterior Walls

Preventing public disasters due to collapse of exterior walls, etc.

1. Providing and collecting information in advance and creating a construction plan through on-site investigations

①. Client: Contractor: Investigate and understand the structure of the demolished building in advance, select a construction method, and create a construction plan

② Client: Provide design documents, expansion and renovation records, etc. to the contractor construction plan



M23
E229

F129

S941

(S949) Collapse of Exterior Walls

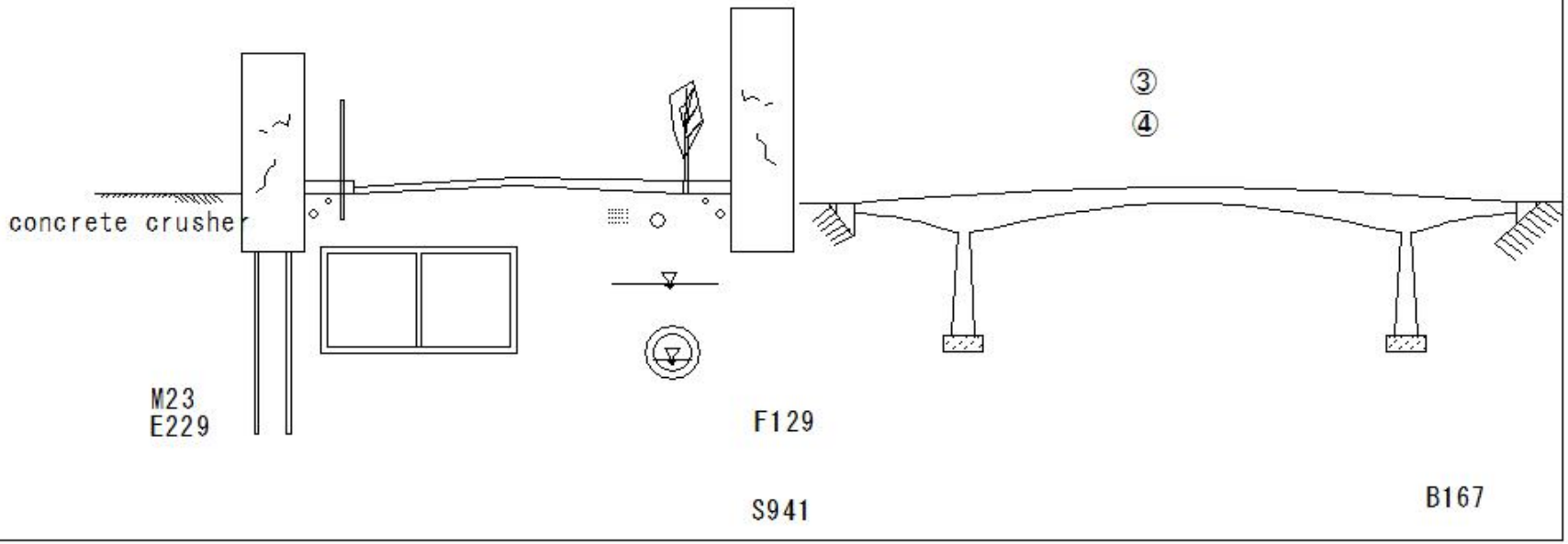
(S949) Collapse of Exterior Walls

Preventing public disasters due to collapse of exterior walls, etc.

① Providing and collecting advance information and creating a construction plan by conducting on-site surveys

③ Contractor: Understanding design documents, etc., visually checking each structural part

④ Contractor: In the case of demolishing large spans, etc., consulting with experts as necessary



(S950) Collapse of Exterior Walls

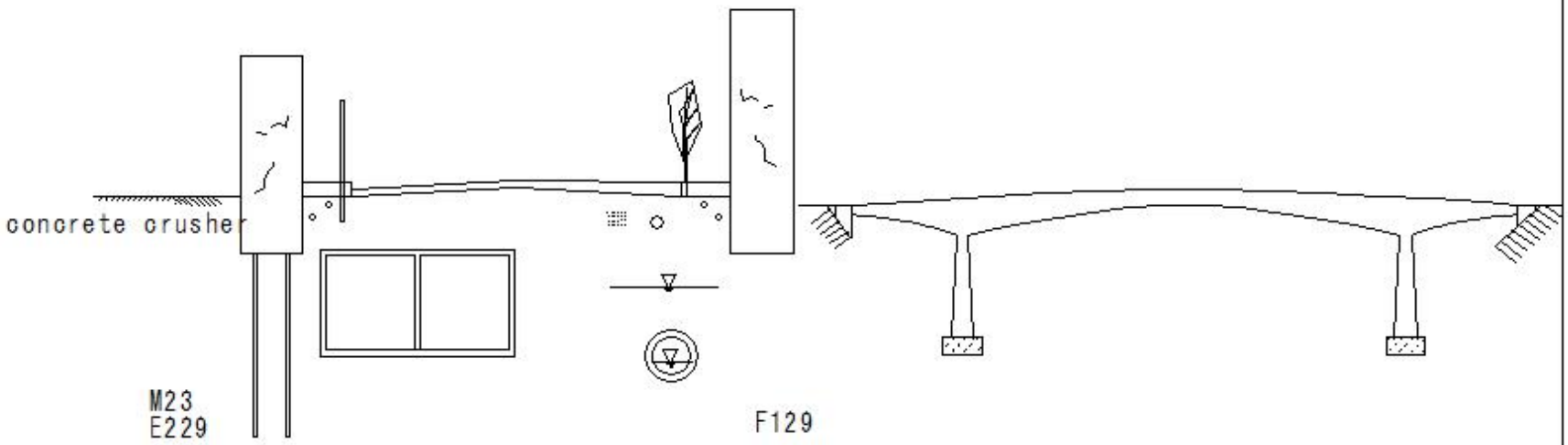
(S950) Collapse of Exterior Walls

Preventing public disasters due to collapse of exterior walls, etc.

② Responding to unexpected situations and appropriately allocating engineers, etc.

① Contractor: In case of unexpected structures, equipment, etc. are discovered during demolition, temporarily suspend construction and consider revising the construction plan

Revising Construction Plan



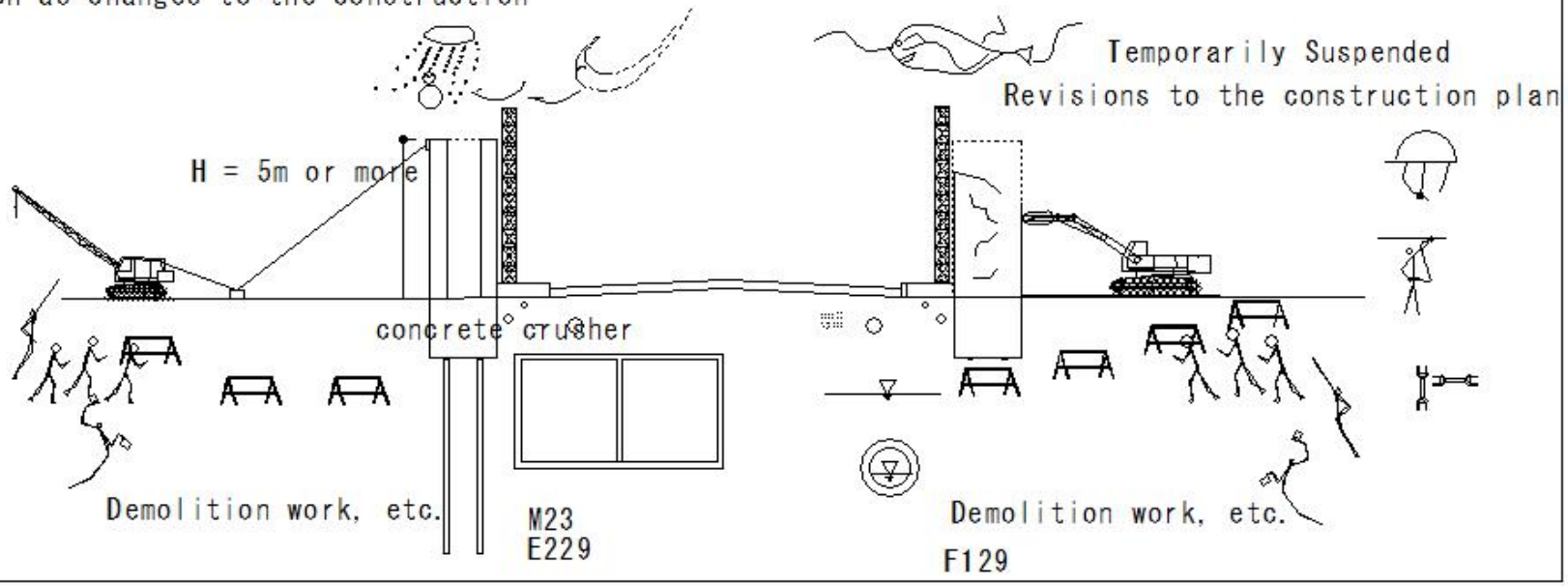
(S951) Collapse of Exterior Walls

(S951) Collapse of Exterior Walls

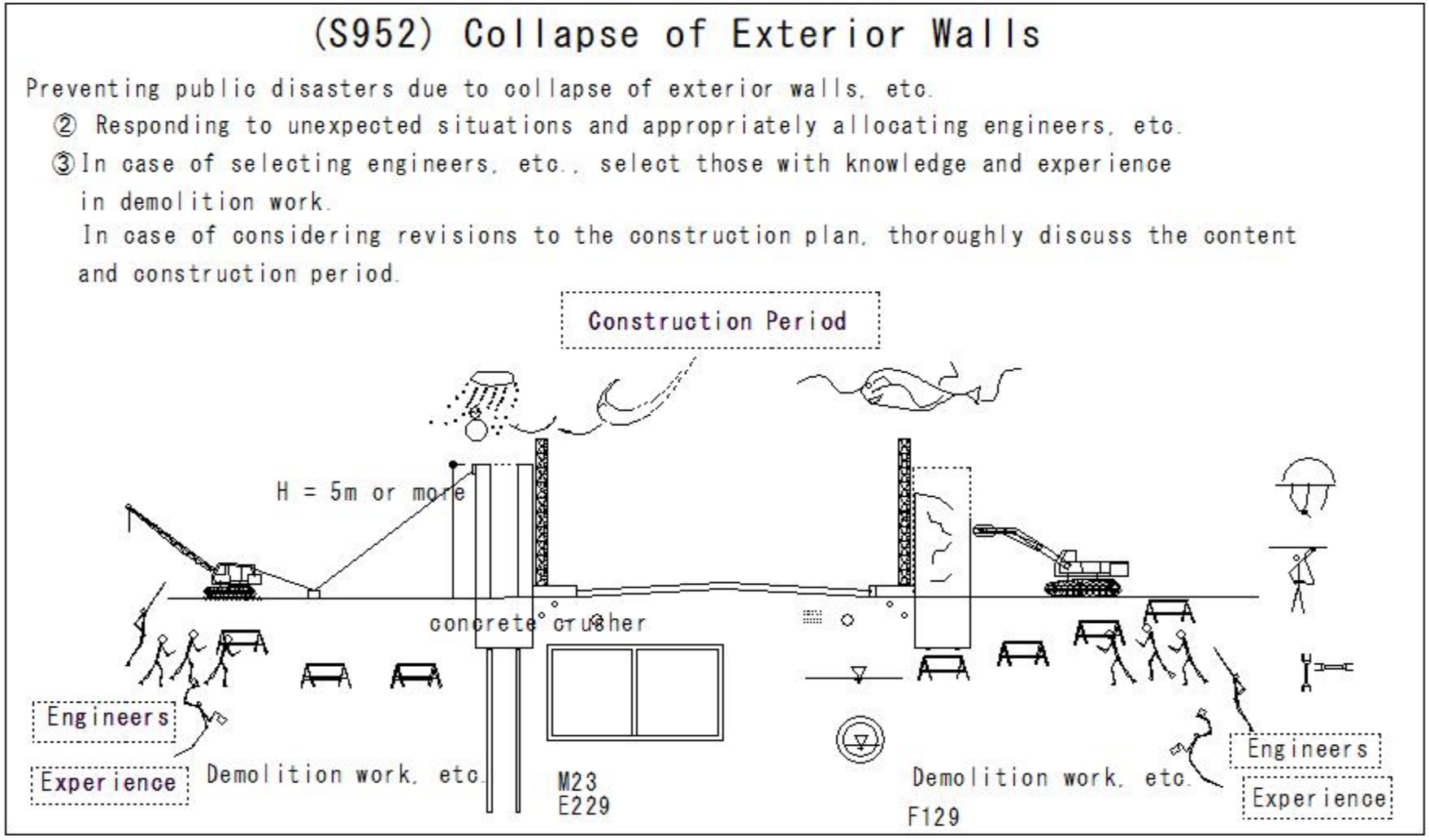
Preventing public disasters due to collapse of exterior walls, etc.

② Responding to unexpected situations and appropriately allocating engineers, etc.

② Constructor: If an unexpected structure is discovered during removal, or if corrosion of steel frames, poor welding, or other unexpected events are discovered, the construction work will be temporarily suspended, necessary investigations will be conducted, method and addition of safety measures, will be considered. and revisions to the construction plan such as changes to the construction



(S952) Collapse of Exterior Walls



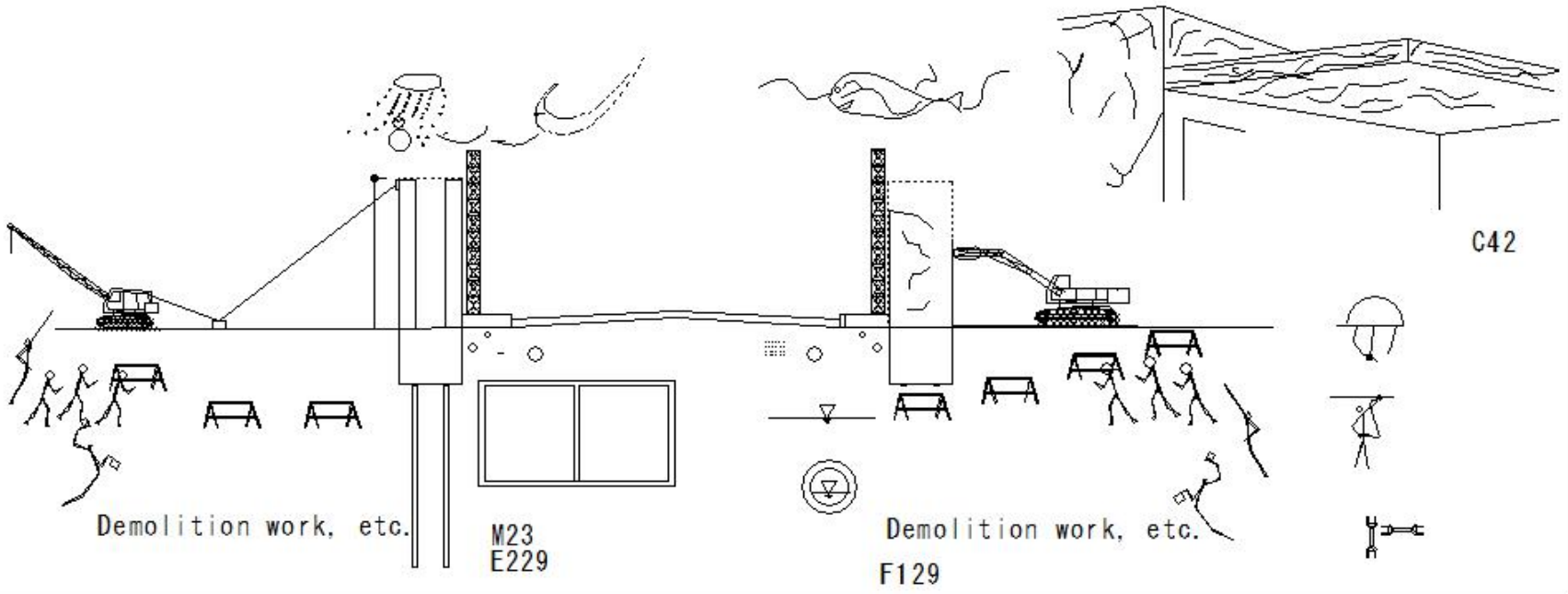
(S953) Collapse of Exterior Walls

(S953) Collapse of Exterior Walls

Preventing public disasters due to collapse of exterior walls, etc.

③ Consideration of exterior walls such as overhanging parts of the building perimeter and curtain walls

① Contractor: Especially in cases where the exterior walls of buildings, such as curtain walls, are not self-supporting, select the construction method, create a plan, and carry out construction appropriately



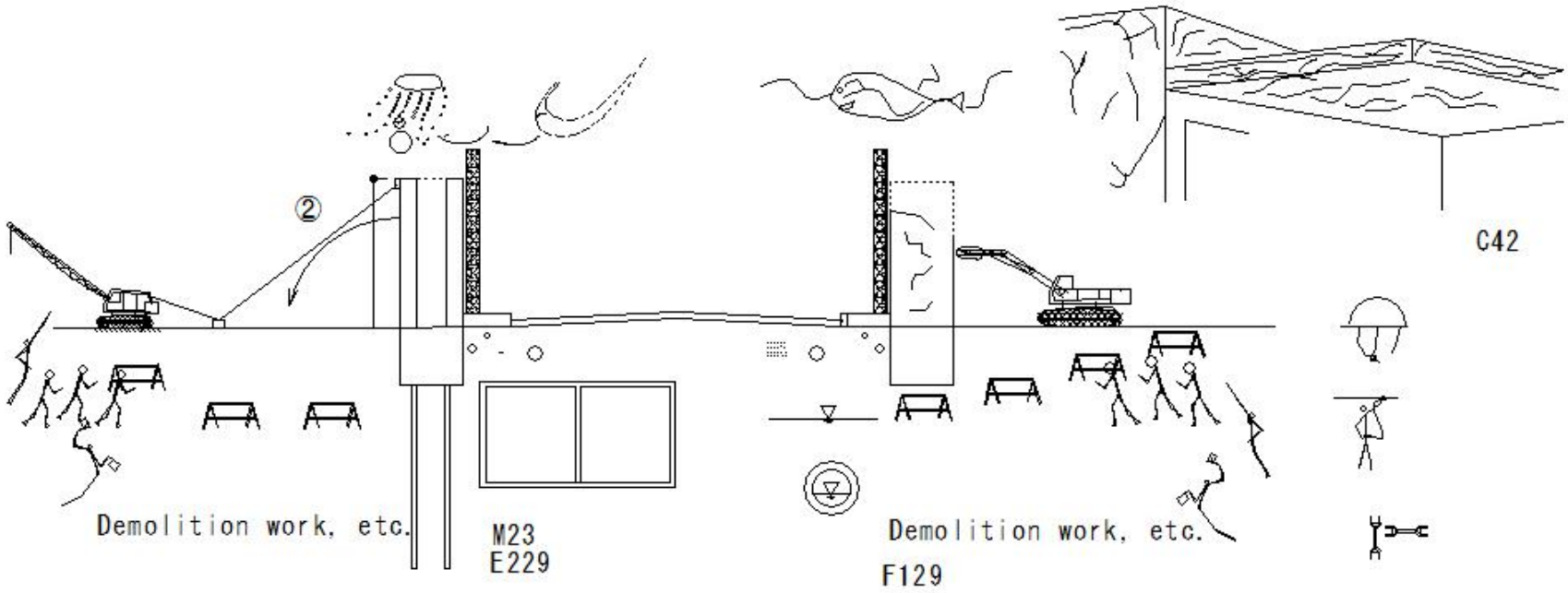
(S954) Collapse of Exterior Walls

(S954) Collapse of Exterior Walls

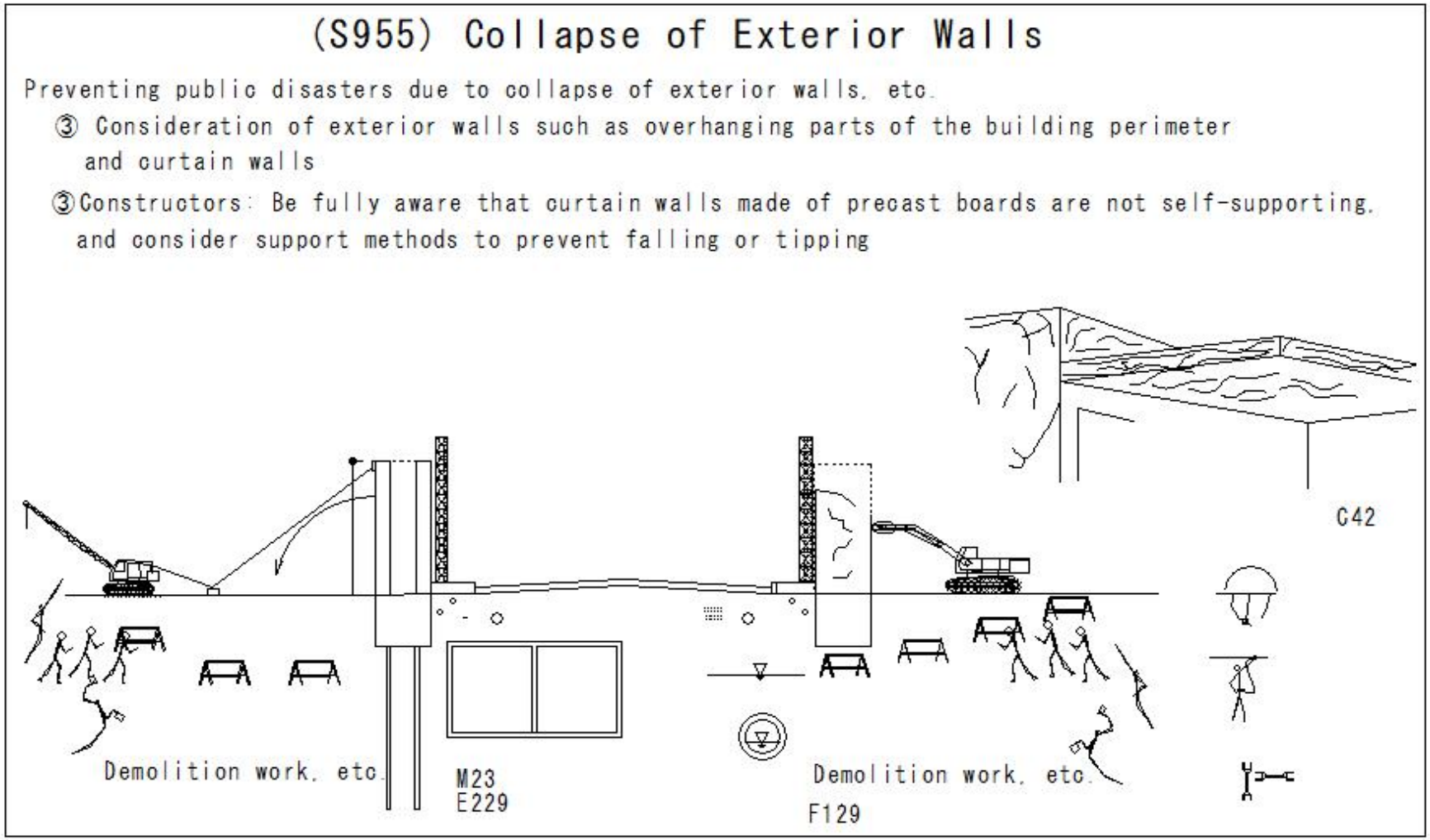
Preventing public disasters due to collapse of exterior walls, etc.

③ Consideration of exterior walls such as overhanging parts of the building perimeter and curtain walls

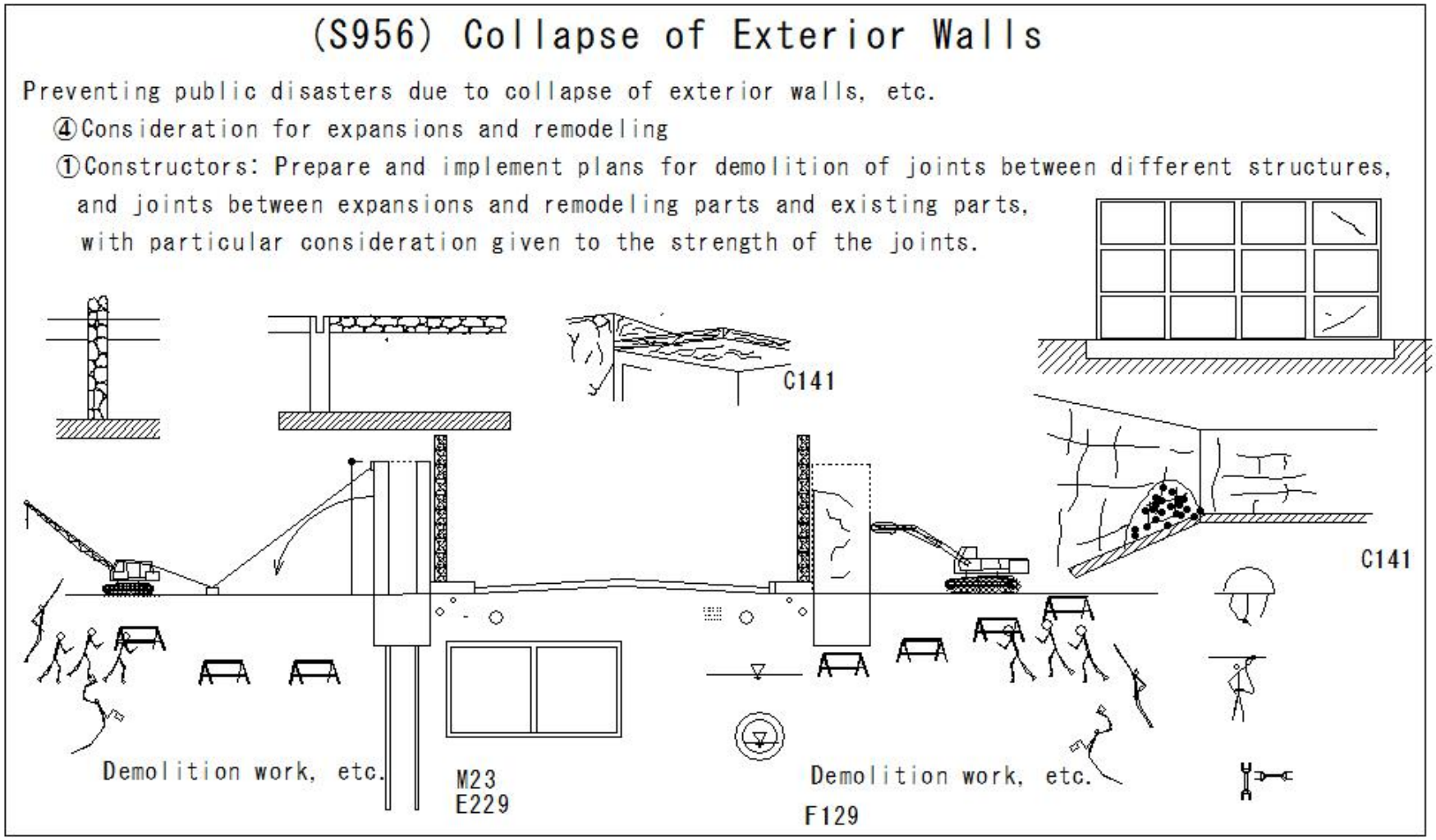
② Contractor: In case of using exterior wall collapse techniques, etc.
Ensure the integrity of the parts to be demolished at the same time and collapse them safely inward without applying excessive force



(S955) Collapse of Exterior Walls



(S956) Collapse of Exterior Walls



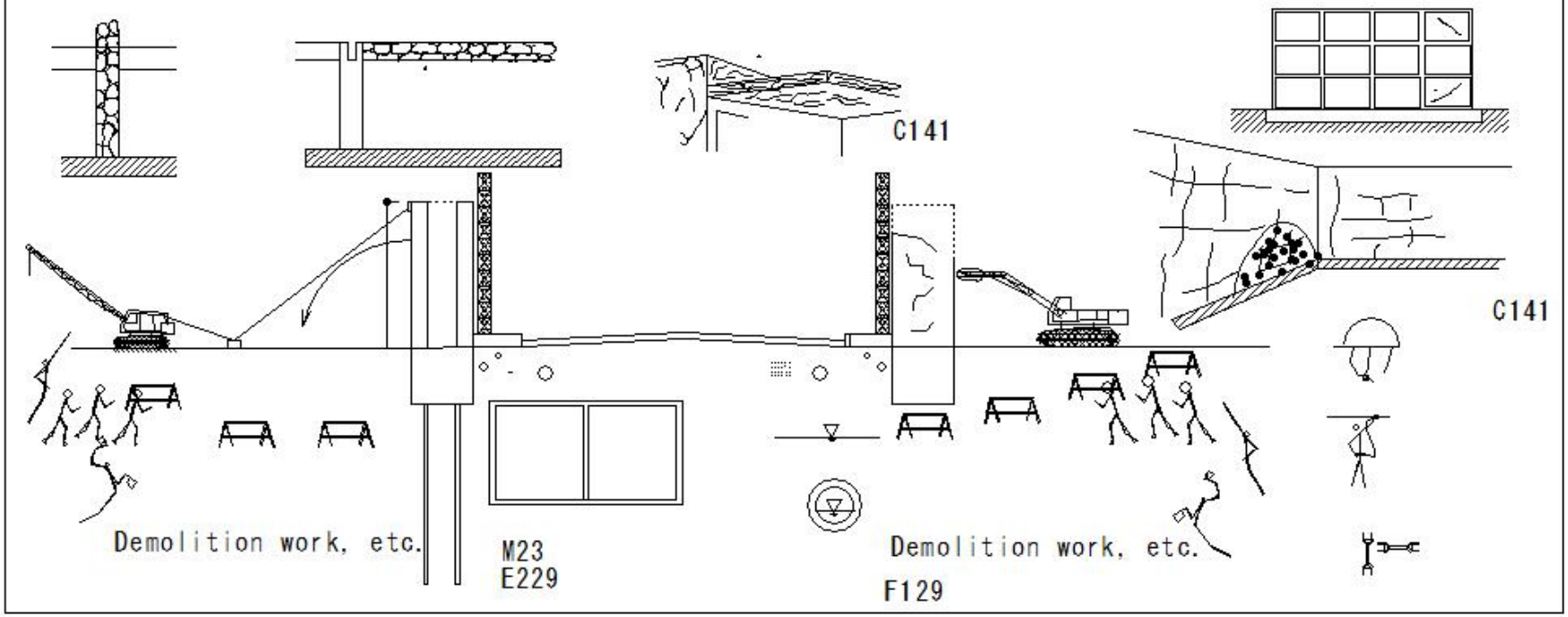
(S957) Collapse of Exterior Walls

(S957) Collapse of Exterior Walls

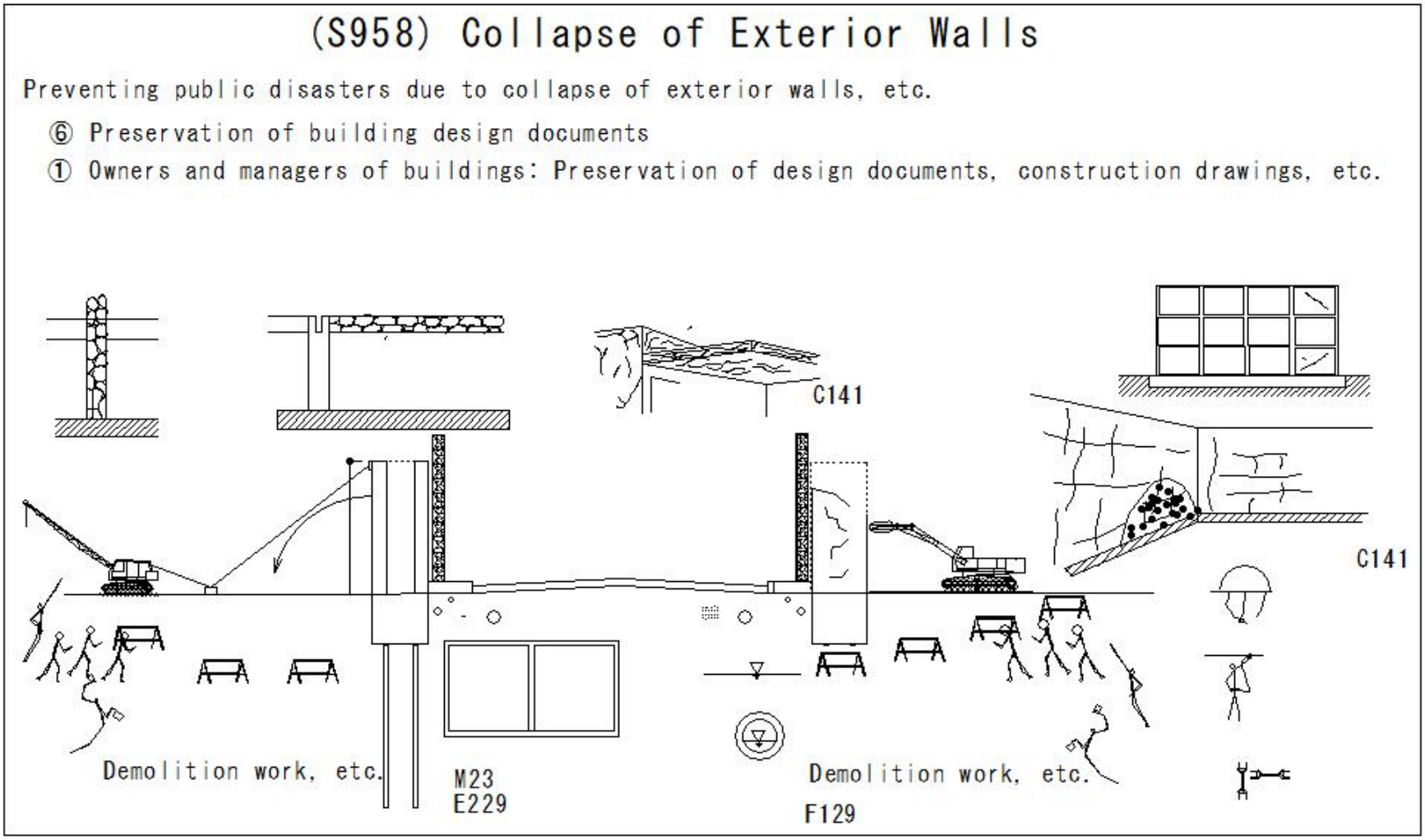
Preventing public disasters due to collapse of exterior walls, etc.

⑤ Consideration for large-scale buildings

Clients and contractors: In the demolition of large-scale buildings
Be fully aware of the impact of accidents, responsibilities,
technical needs, etc., and comply with laws and regulations
Create appropriate contracts, construction plans, and carry out construction work.



(S958) Collapse of Exterior Walls

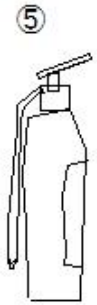


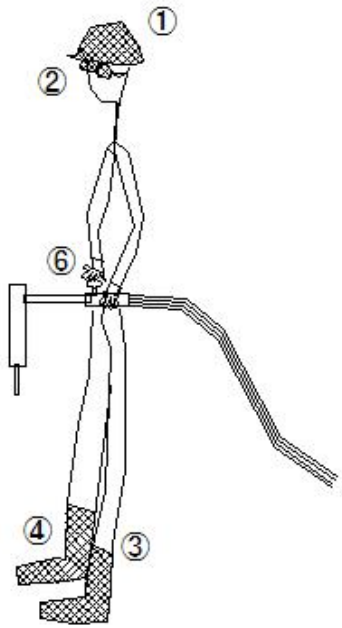
(S959) Gas welding

(S959) Gas welding

Gas welding safety work

- ○ Prepare clothing and equipment
- ① Wear a Protective helmet
- ② Protective glasses for blocking light
- ③ Foot covers
- ④ Safety shoes
- ⑤ Fire extinguisher
- ⑥ Gloves





(S960) Gas welding

(S960) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

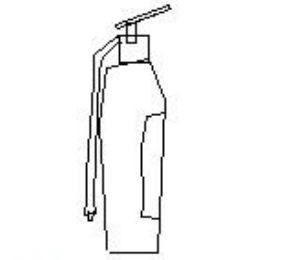
Gas welding work supervisor

① Decide and supervise work methods

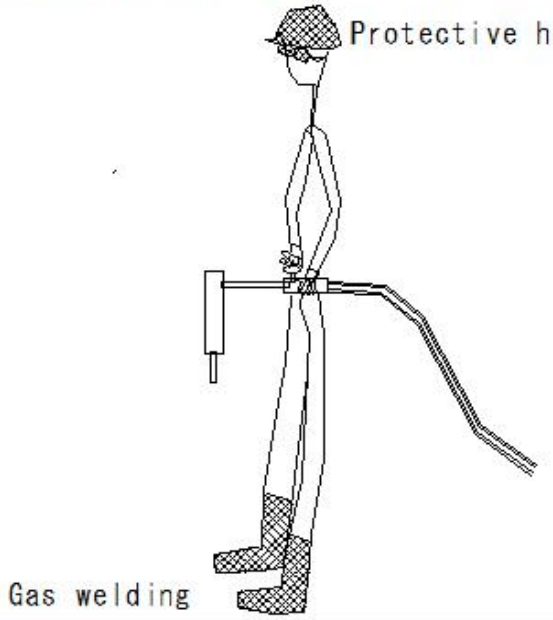
② Monitor the use of protective helmets

③ Check safety devices at least once a day

Gas welding is a welding method in which flammable gas or oxygen is burned to melt and join metals.



Fire extinguisher



(S961) Gas welding

(S961) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

Regular voluntary inspection

① Once every year

② Keep inspection records for three years

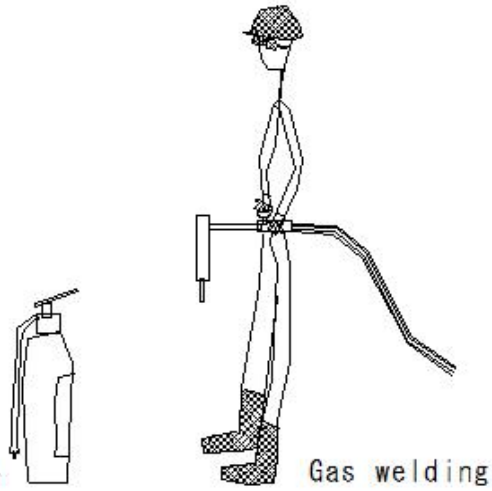
Advantages and disadvantages of gas welding

①It is easy to control the welding work by adjusting the amount of gas.

②It is easy to check the working condition because there are no sparks like in arc welding.

③It does not require electricity, so it can be worked on anywhere.

④It is a dangerous work method because it uses flammable gas.



Fire extinguisher

Gas welding

(S962) Gas welding

(S962) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

Handling gas containers

① Do not install, store, or leave containers in places where open flames are used, ventilation is insufficient, or dangerous materials are handled

② Keep container temperature below 40°

③ Prevent tipping

④ Do not subject to impact

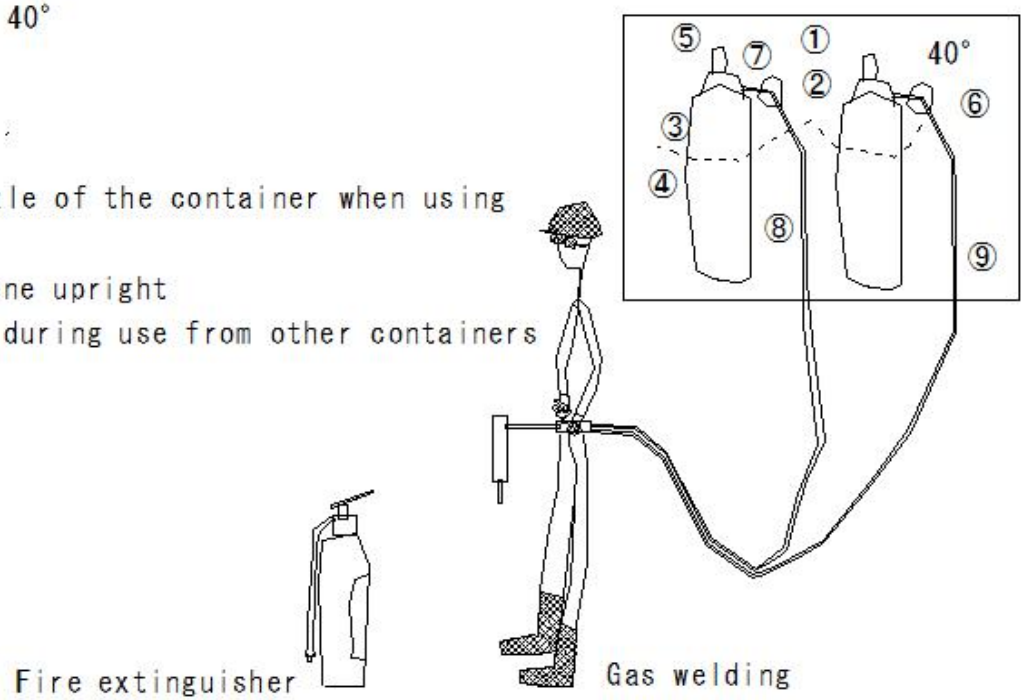
⑤ Cap containers when transporting

⑥ Remove oil and dust from the nozzle of the container when using

⑦ Open and close valves quietly

⑧ Keep containers of molten acetylene upright

⑨ Distinguish containers before or during use from other containers



(S963) Gas welding

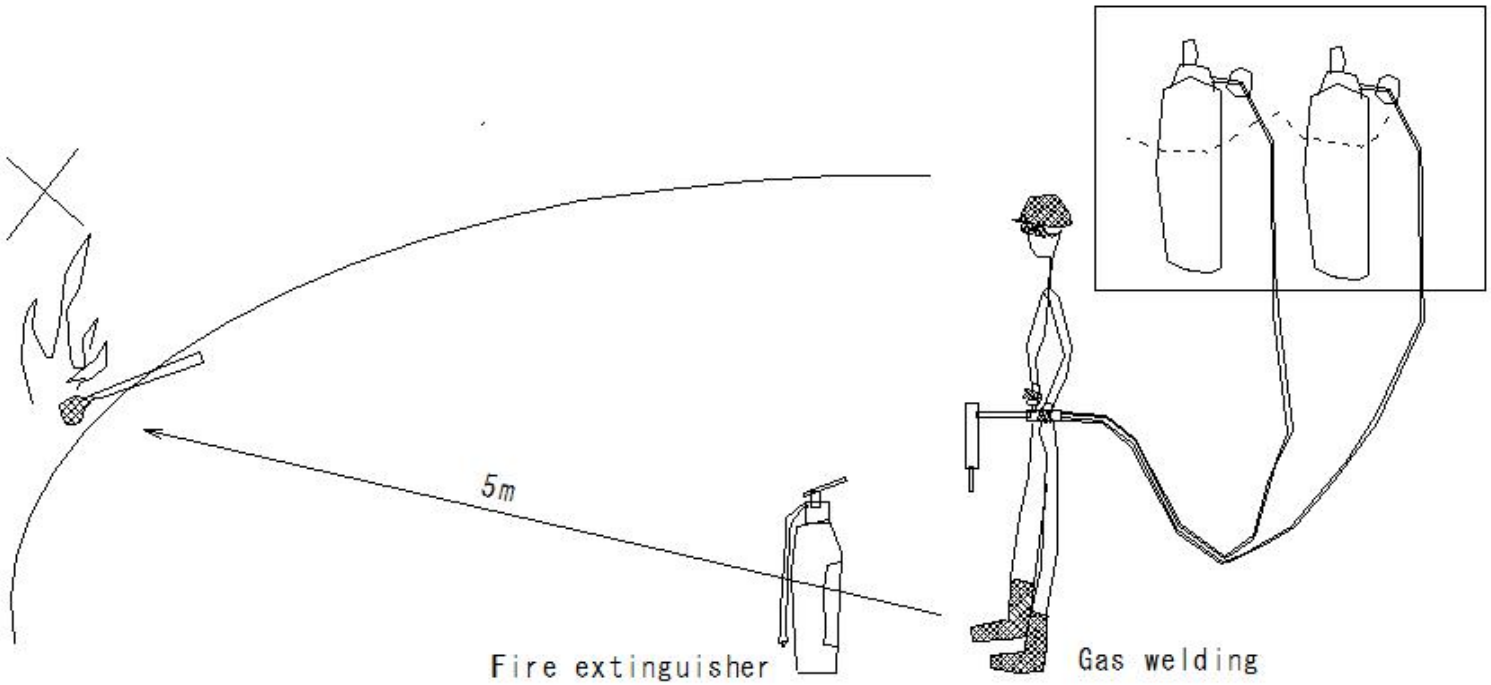
(S963) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

No open flames within 5m

① In case of compressed acetylene gas storage is 40kg or more, notification to the fire chief is required at the start and end of operation



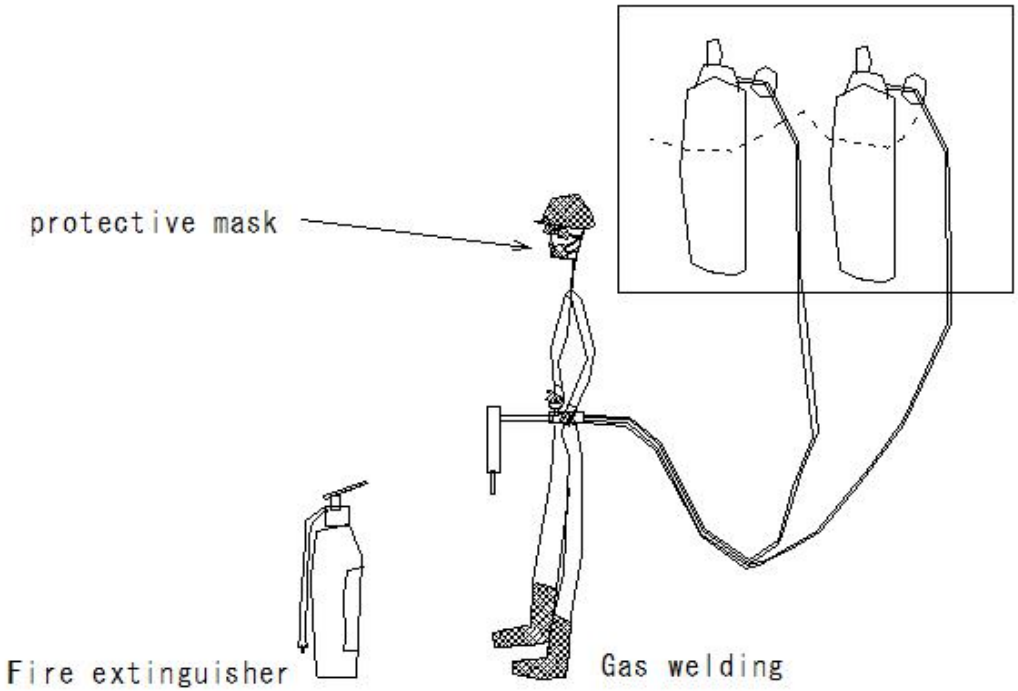
(S964) Gas welding

(S964) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

In case of harmful substances are generated, use protective equipment such as a protective mask



(S965) Gas welding

(S965) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

In case of harmful substances are generated, use protective equipment such as a protective mask

Working in places with insufficient ventilation

① Use hoses and blowpipes that are free of damage and wear

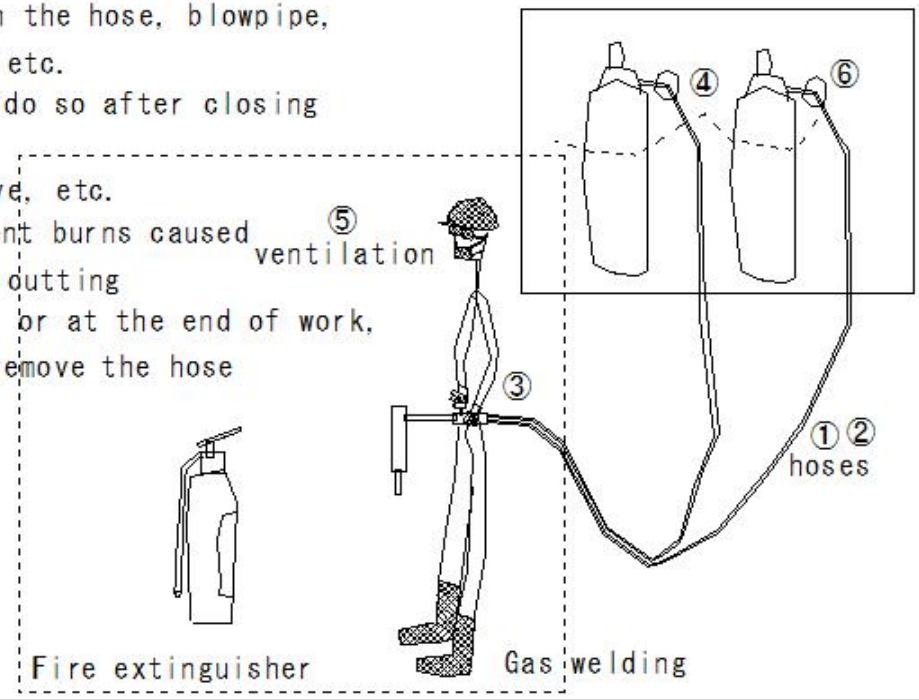
② Securely fasten the connections between the hose, blowpipe, and hoses with hose bands, hose clips, etc.

③ In case of supplying gas to the hose, do so after closing the blowpipe valve, etc.

④ Display the user's name tag on the valve, etc.

⑤ Provide sufficient ventilation to prevent burns caused by the release of excess oxygen during cutting

⑥ In case of leaving the work area during or at the end of work, close the gas supply valve, etc., and remove the hose



(S966) Gas welding

(S966) Gas welding

Gas welding safety work

○ Prepare clothing and equipment

Gas welding work should be performed by those who have completed the skills training course

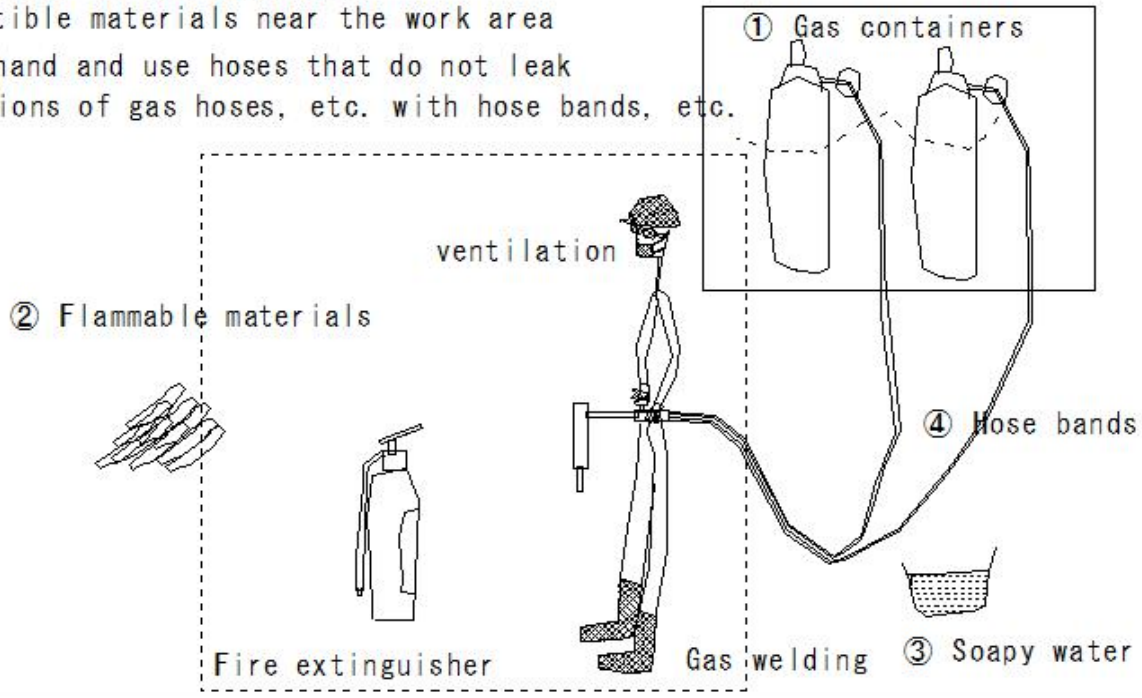
General gas welding work, etc.

① Use flashback prevention devices on gas containers

② Remove flammable and combustible materials near the work area

③ Always have soapy water on hand and use hoses that do not leak

④ Securely fasten the connections of gas hoses, etc. with hose bands, etc.



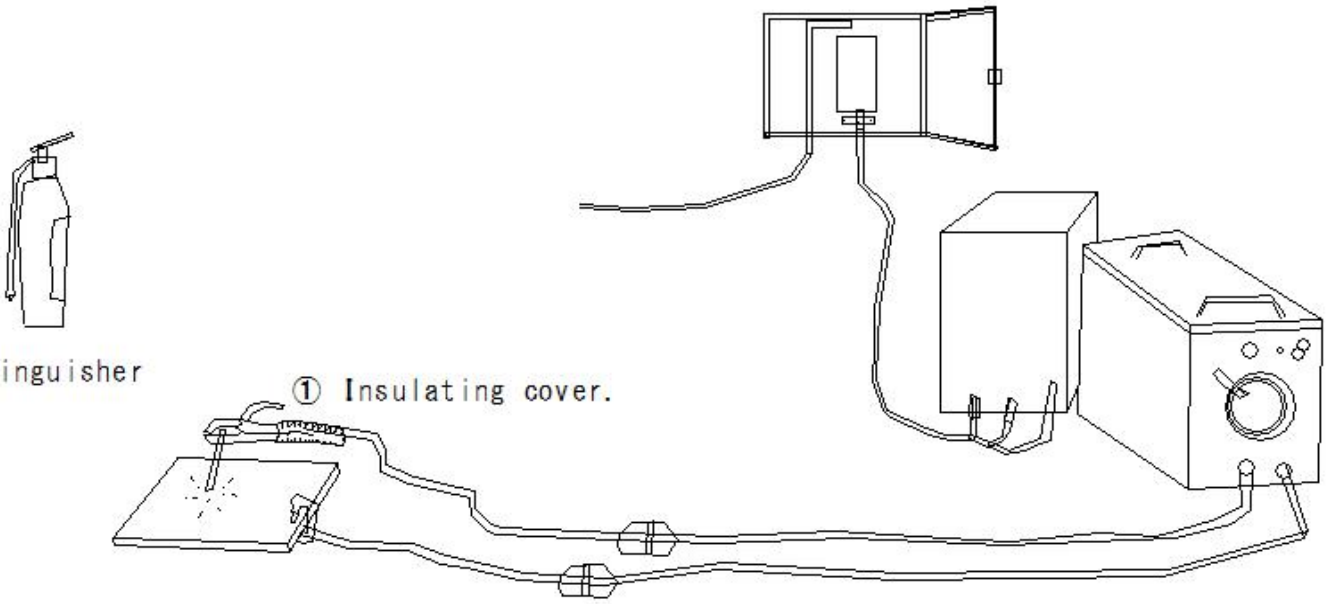
(S967) Gas welding

(S967) Arc welding

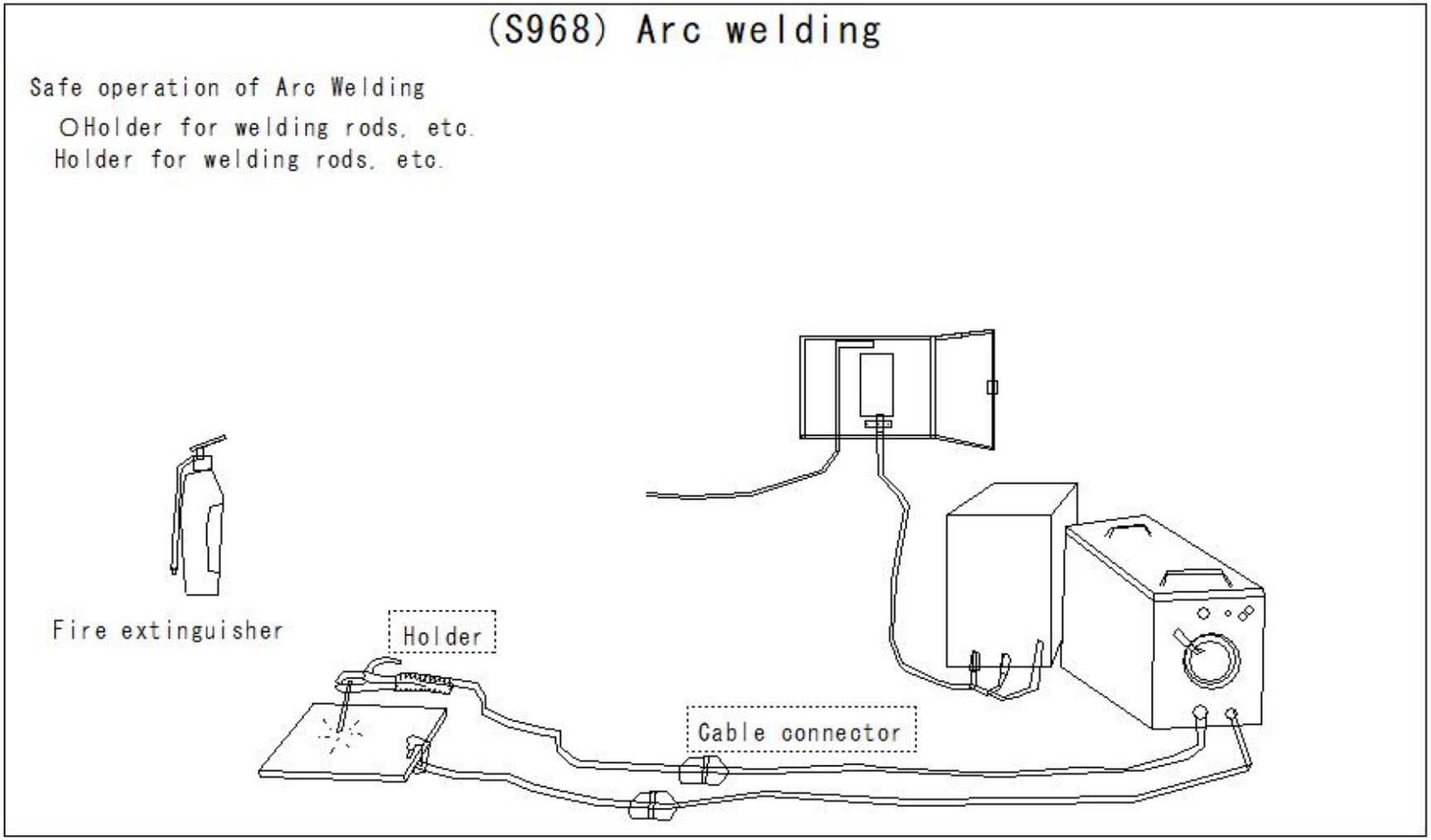
Safe operation of Arc Welding

○ Enclosure of electrical machinery and equipment

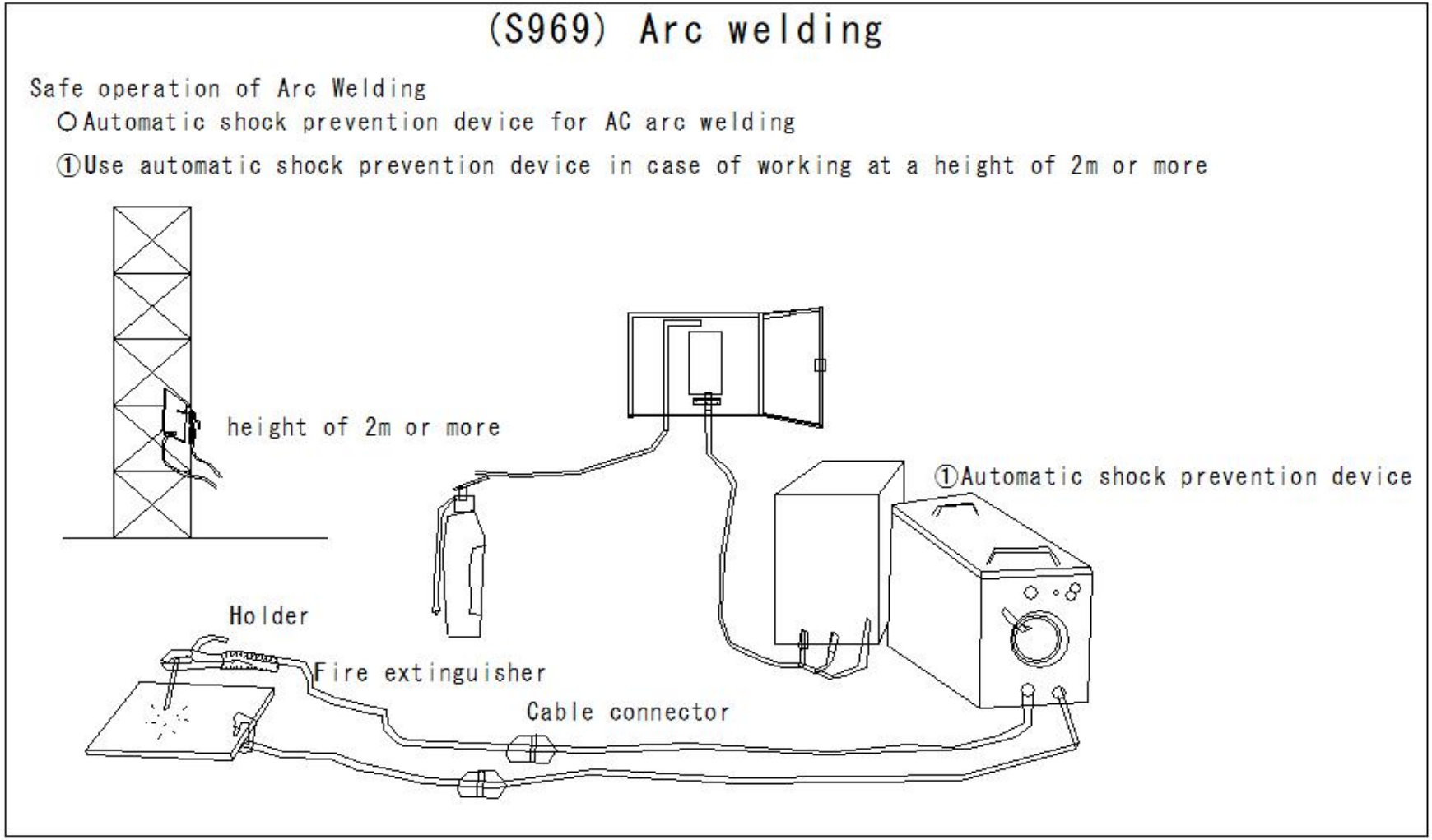
① Cover any items that may come into contact with live parts and cause electric shock with an insulating cover.



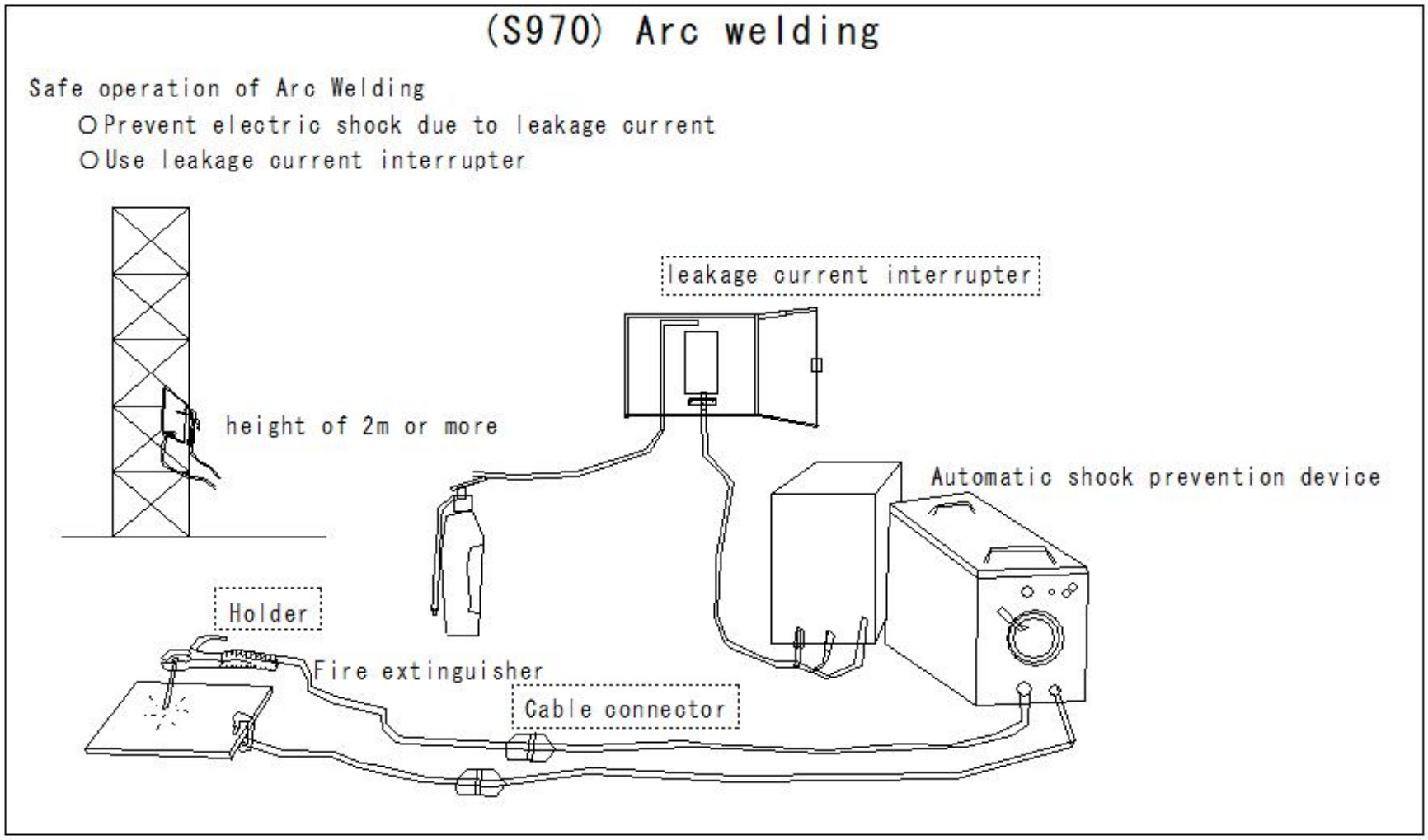
(S968) Arc Welding



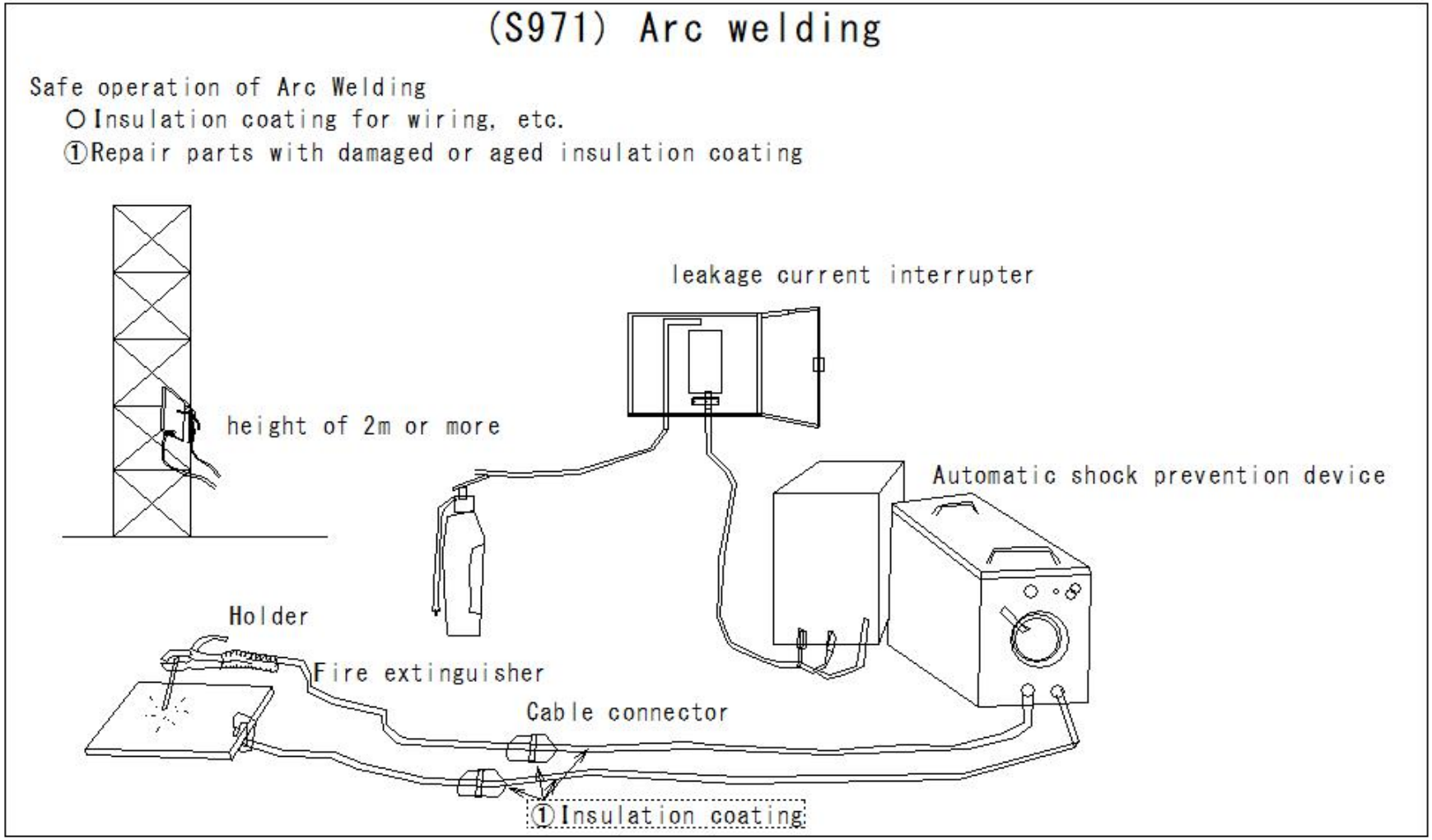
(S969) Arc Welding



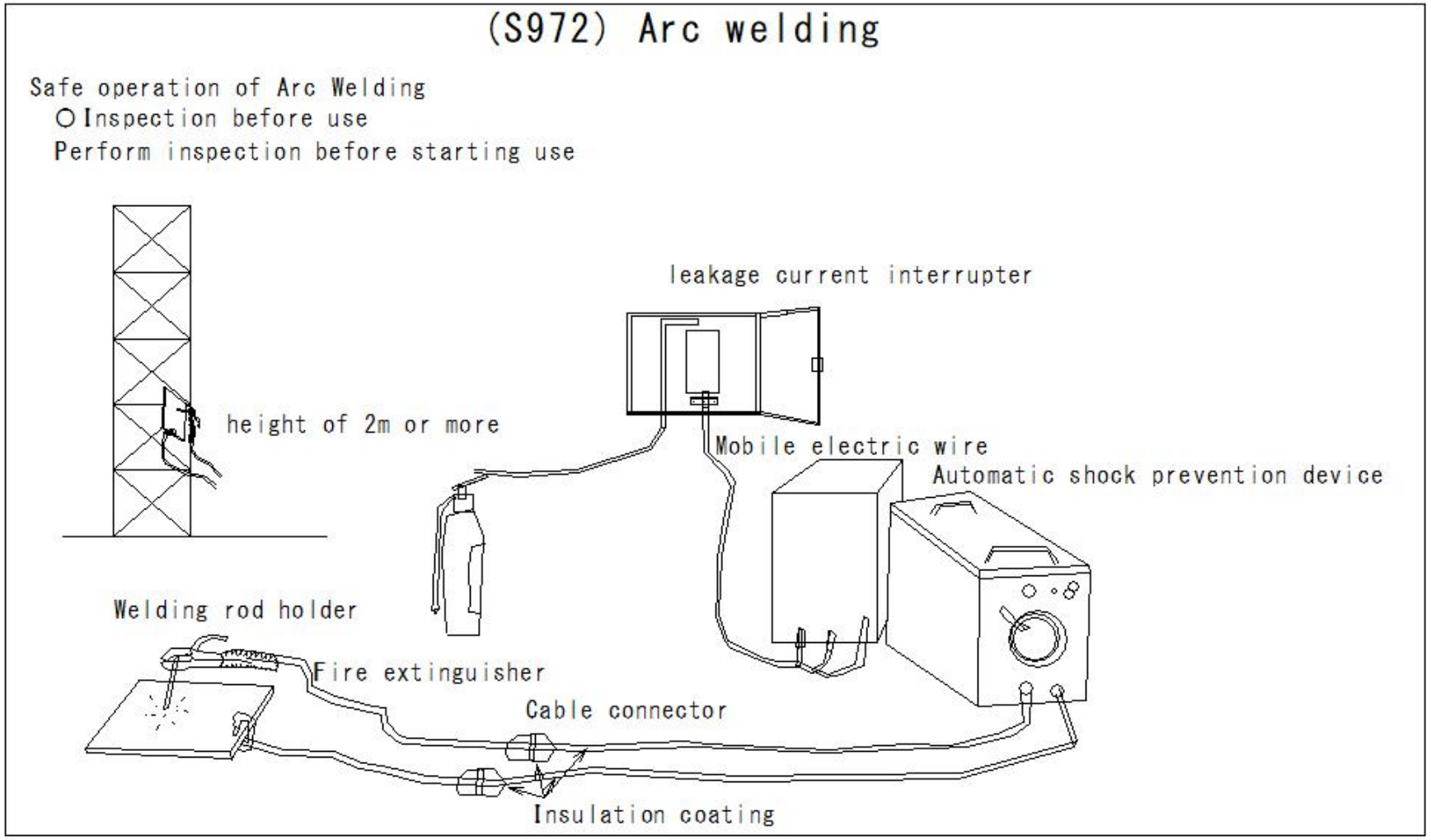
(S970) Arc Welding



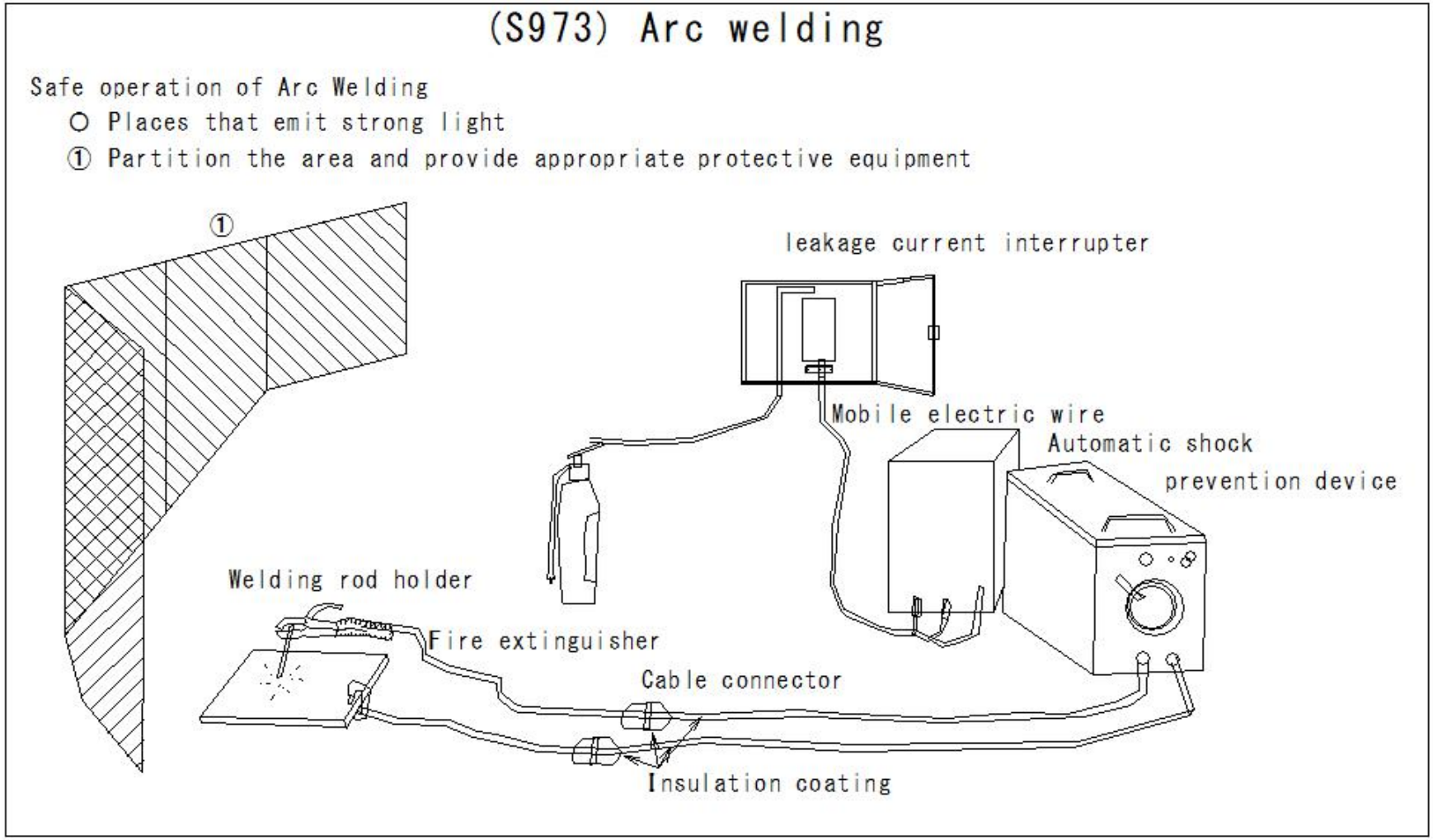
(S971) Arc Welding



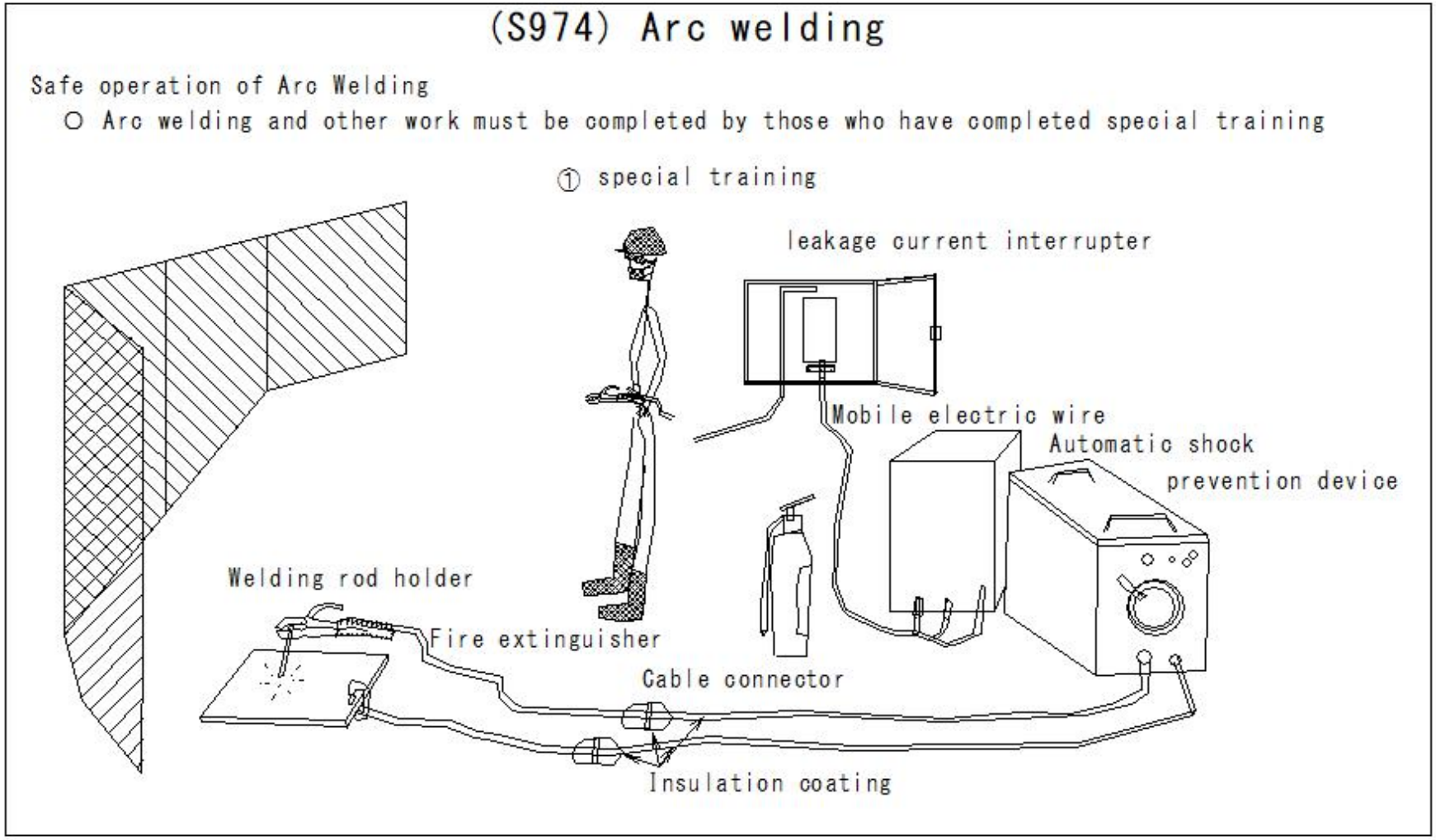
(S972) Arc Welding



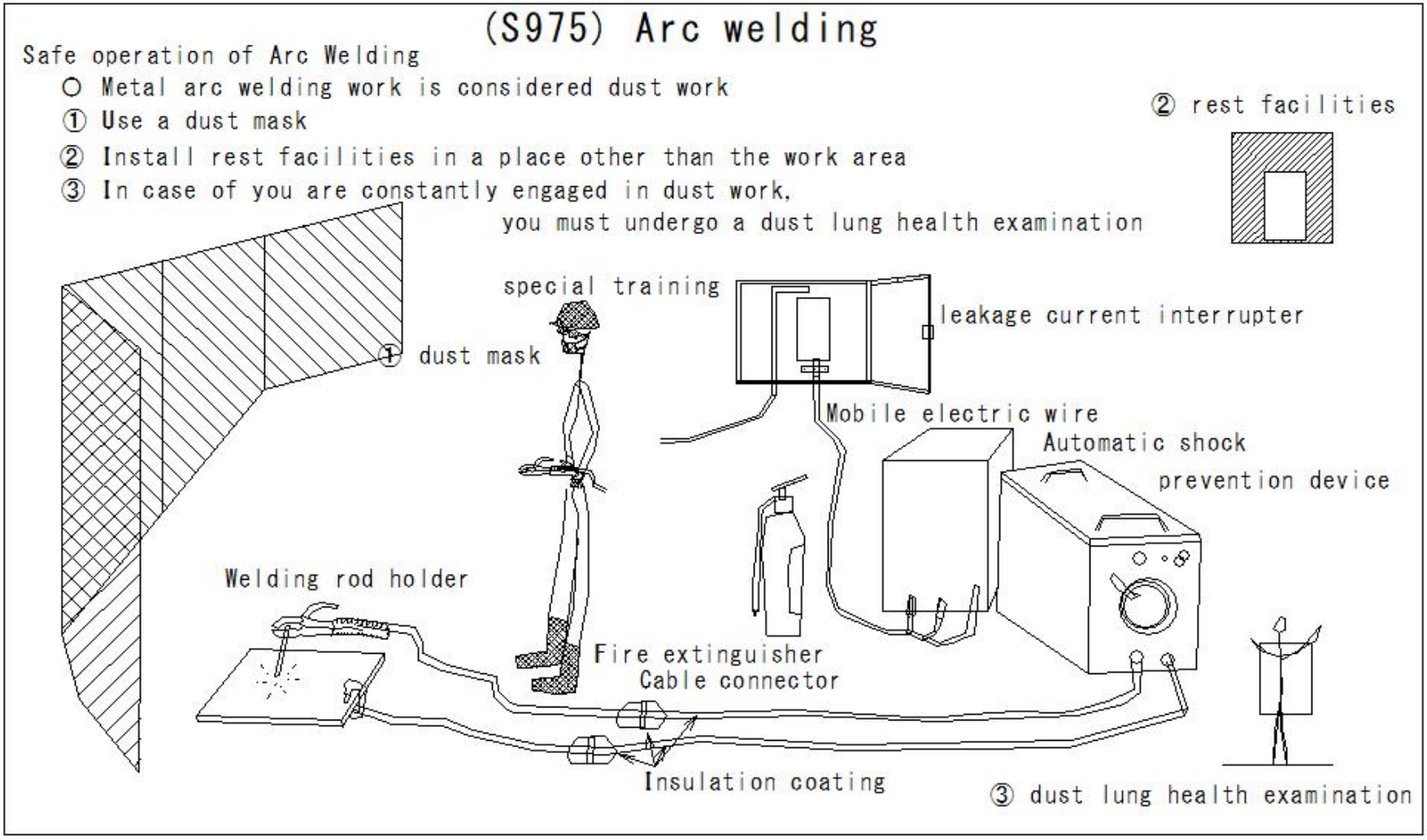
(S973) Arc Welding



(S974) Arc Welding



(S975) Arc Welding

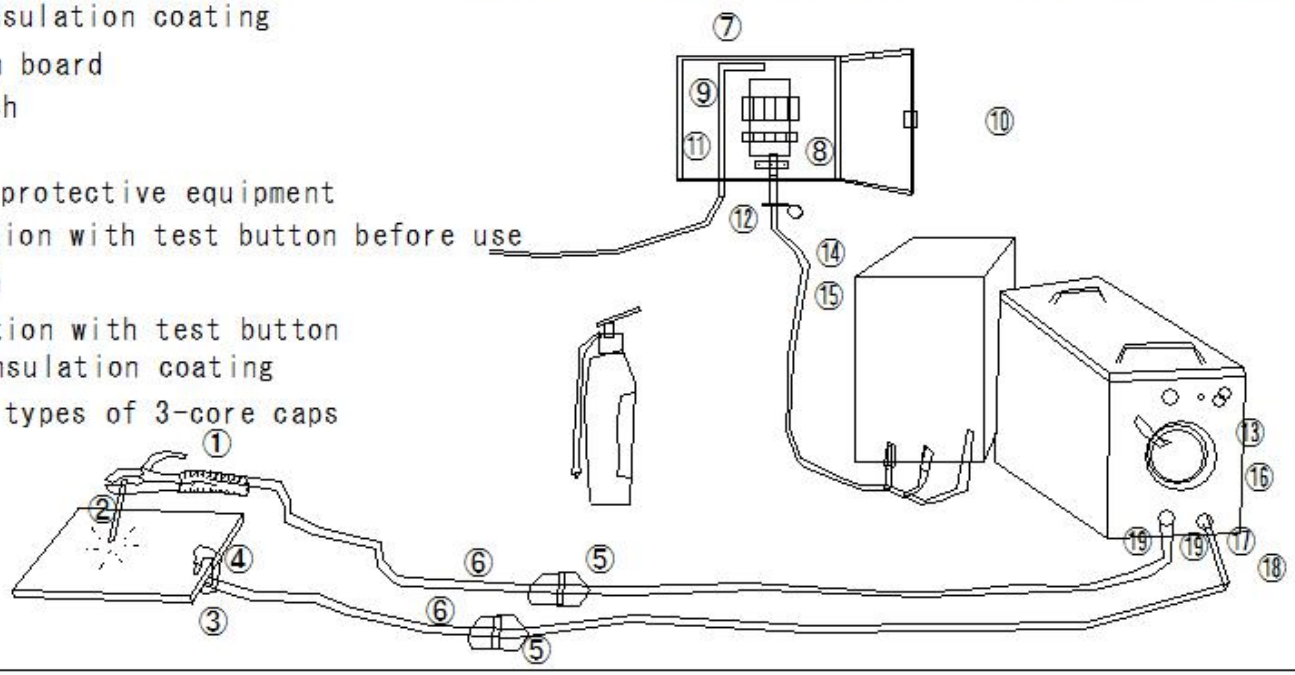


(S976) Arc Welding

(S976) Arc welding

Safe operation of Arc Welding

①Holder
②Welding rod holder
③Damage to earth clamp
④Earth clamp
⑤Damage to welding points
⑥Damage to insulation coating
⑦Distribution board
⑧Branch switch
⑨ELB
⑩Workers use protective equipment
⑪Check operation with test button before use
⑫Use of earth
⑬Check operation with test button
⑭Damage to insulation coating
⑮Two or more types of 3-core caps
⑯Use of automatic electric shock prevention device
⑰Insulation cover for connection
⑱Tightening of cable
⑲Tightening of terminals
Terminal cover, tape wrapping (both input and output)



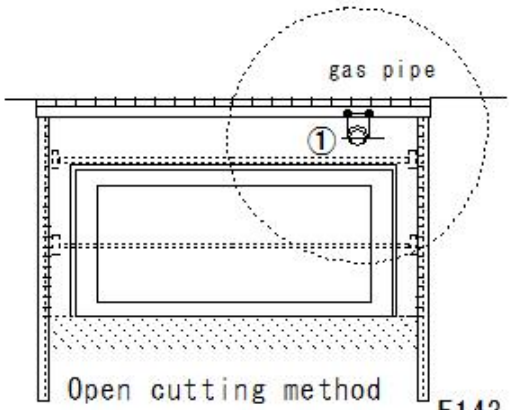
(S977) Gas Pipelines

(S977) Gas Pipelines

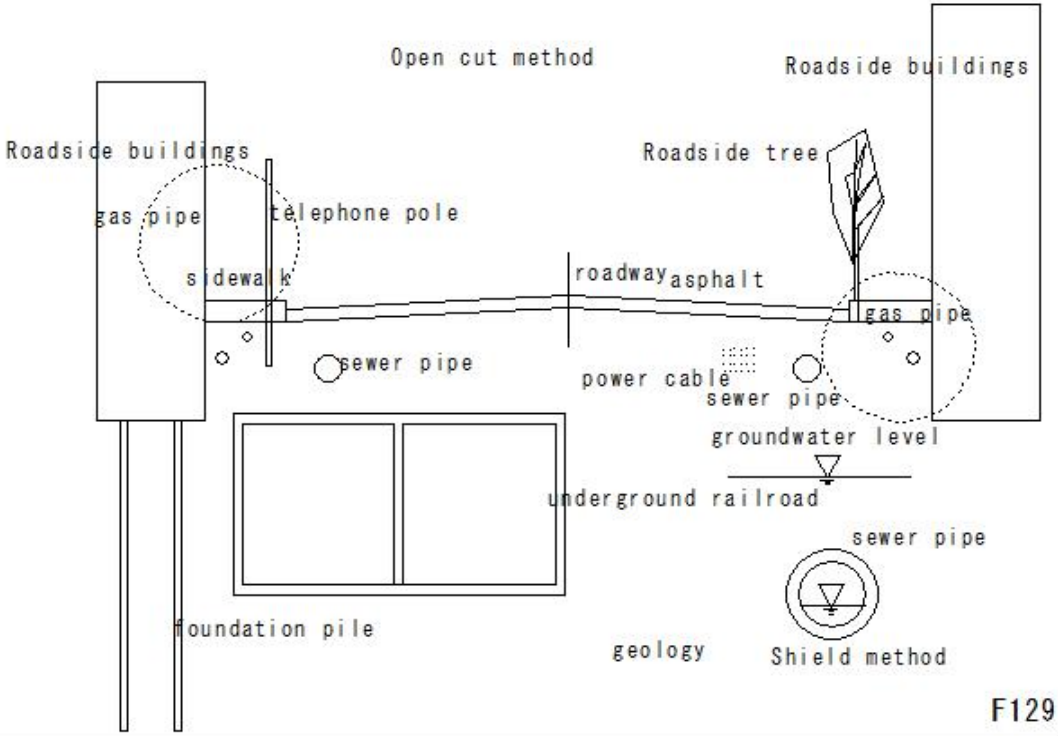
Preventing disasters caused by gas pipelines

Preliminary consultation

① Prior to the start of construction, thoroughly discuss attendance, patrols, safety measures, process, construction method, etc.

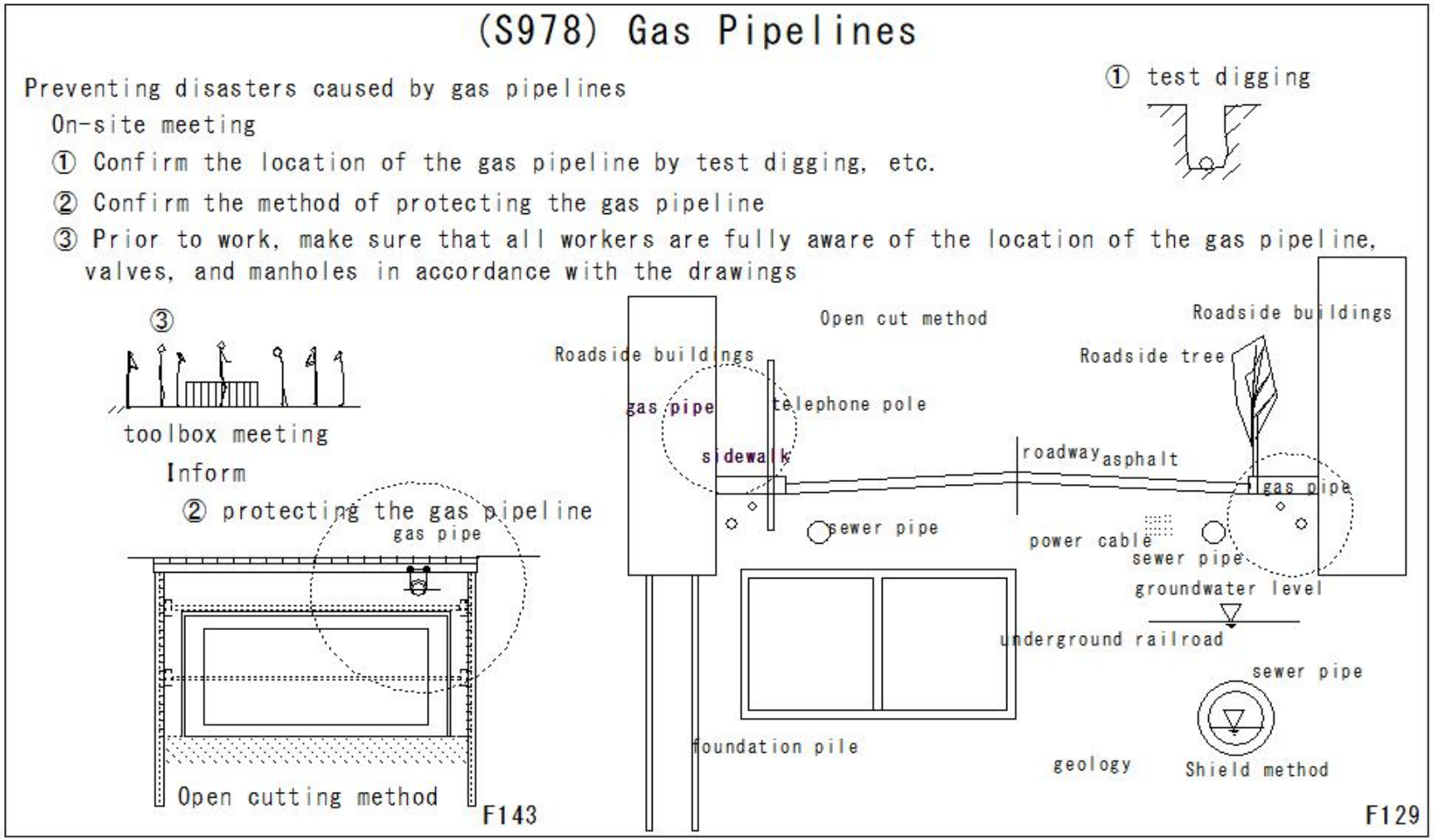


F143



F129

(S978) Gas Pipelines



(S979) Gas Pipelines

(S979) Gas Pipelines

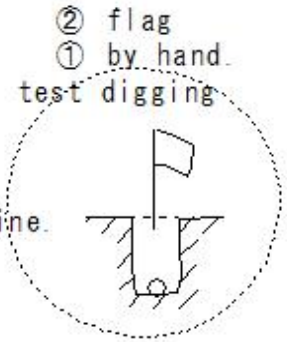
Preventing disasters caused by gas pipelines

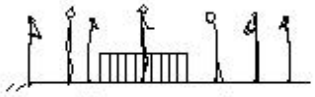
Test digging

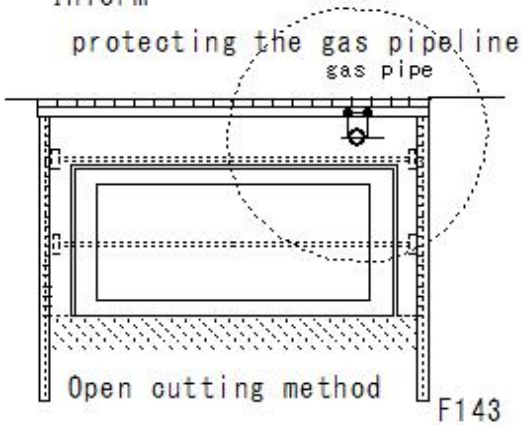
① Test digging is done by hand.

In case of using a pick or pickaxe, be careful not to damage the gas pipeline.

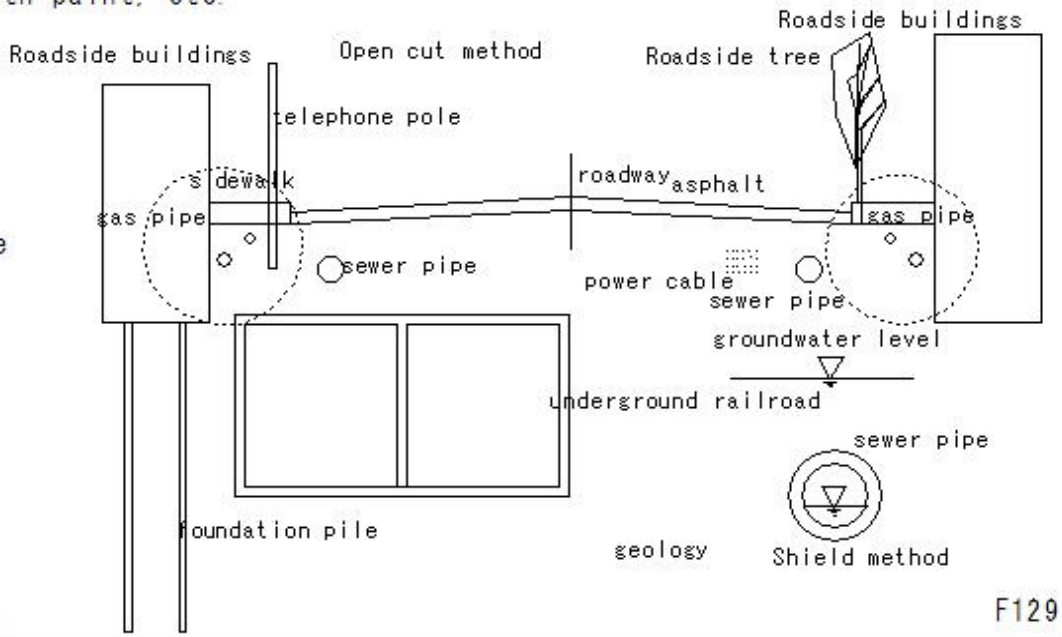
② Confirm the exact location of the gas pipeline by test digging.
Put up a marker such as a stake or flag at the confirmed location,
or mark it on the road surface with paint, etc.







F143



F129

(S980) Gas Pipelines

(S980) Gas Pipelines

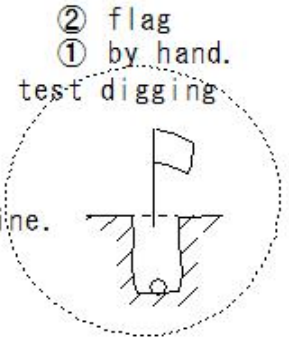
Preventing disasters caused by gas pipelines

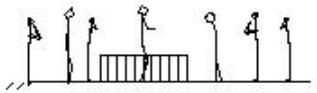
Test digging

① Test digging is done by hand.

In case of using a pick or pickaxe, be careful not to damage the gas pipeline.

② Confirm the exact location of the gas pipeline by test digging.
Put up a marker such as a stake or flag at the confirmed location, or mark it on the road surface with paint, etc.

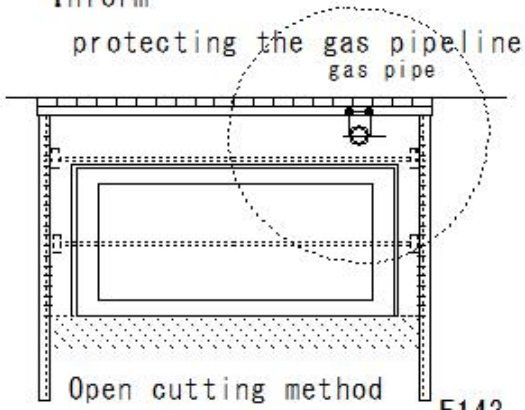


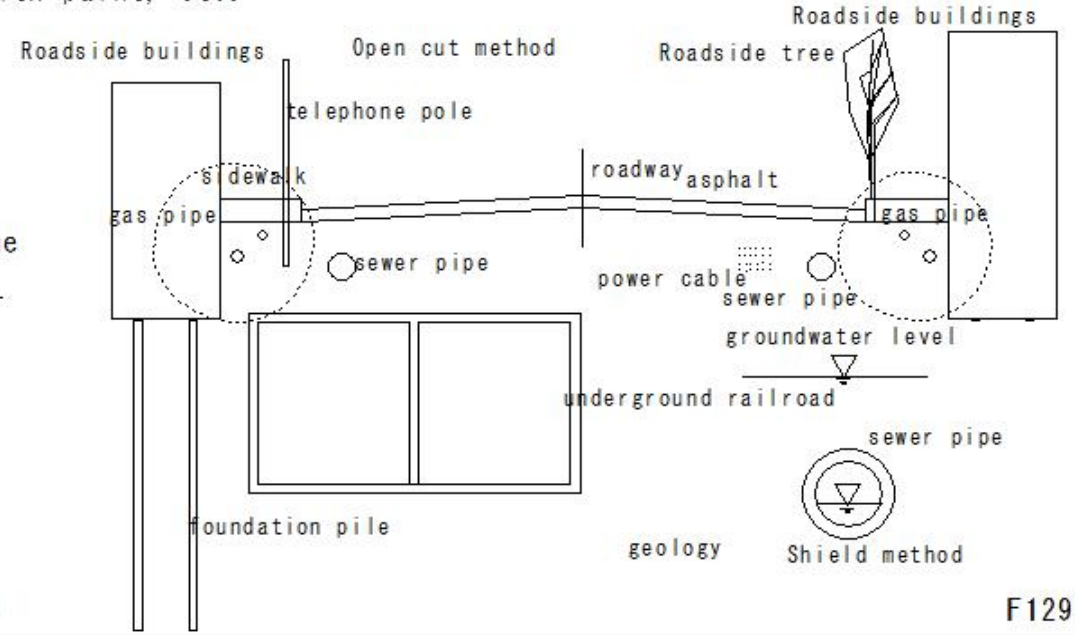


toolbox meeting

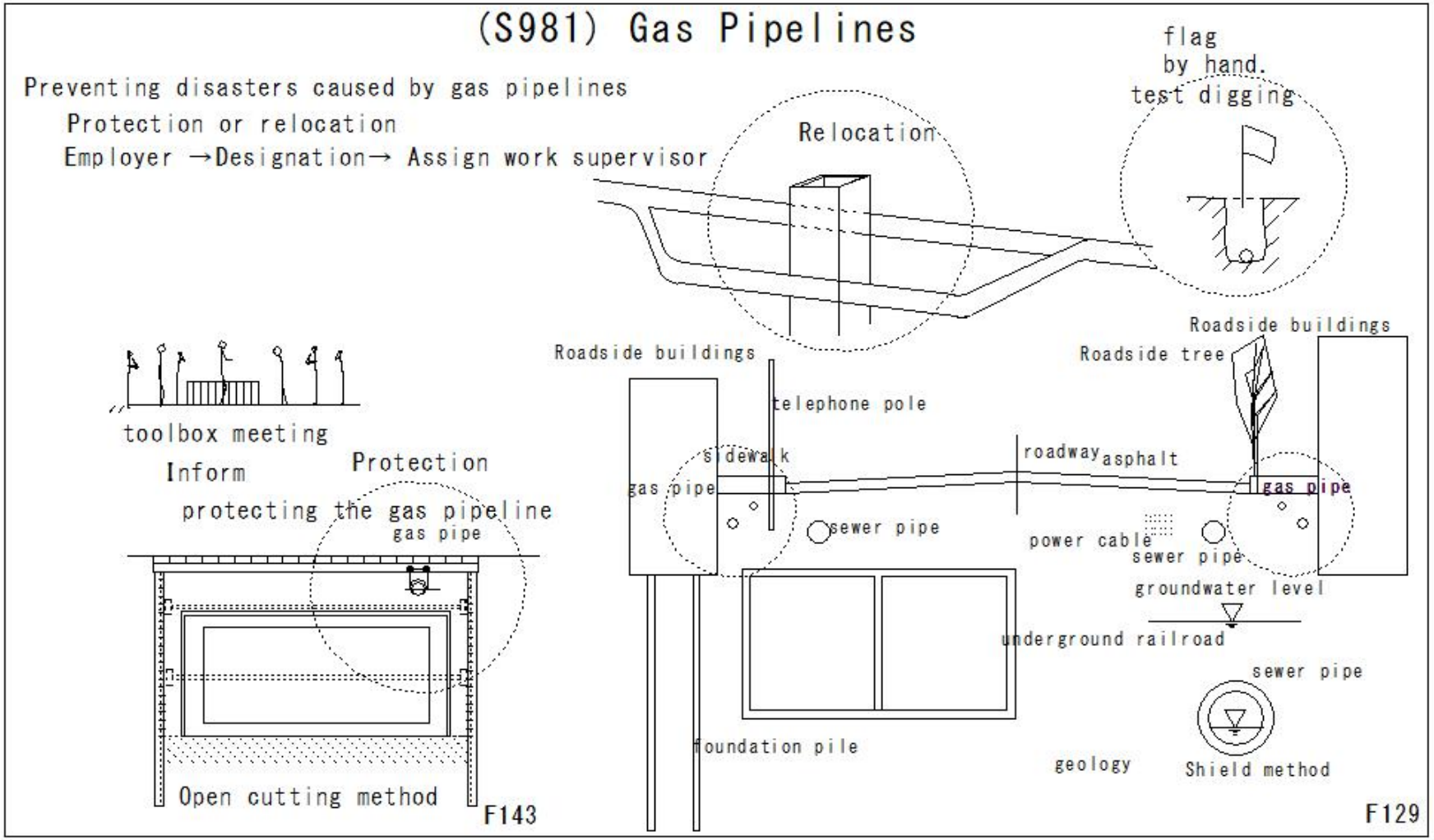
Inform

protecting the gas pipeline

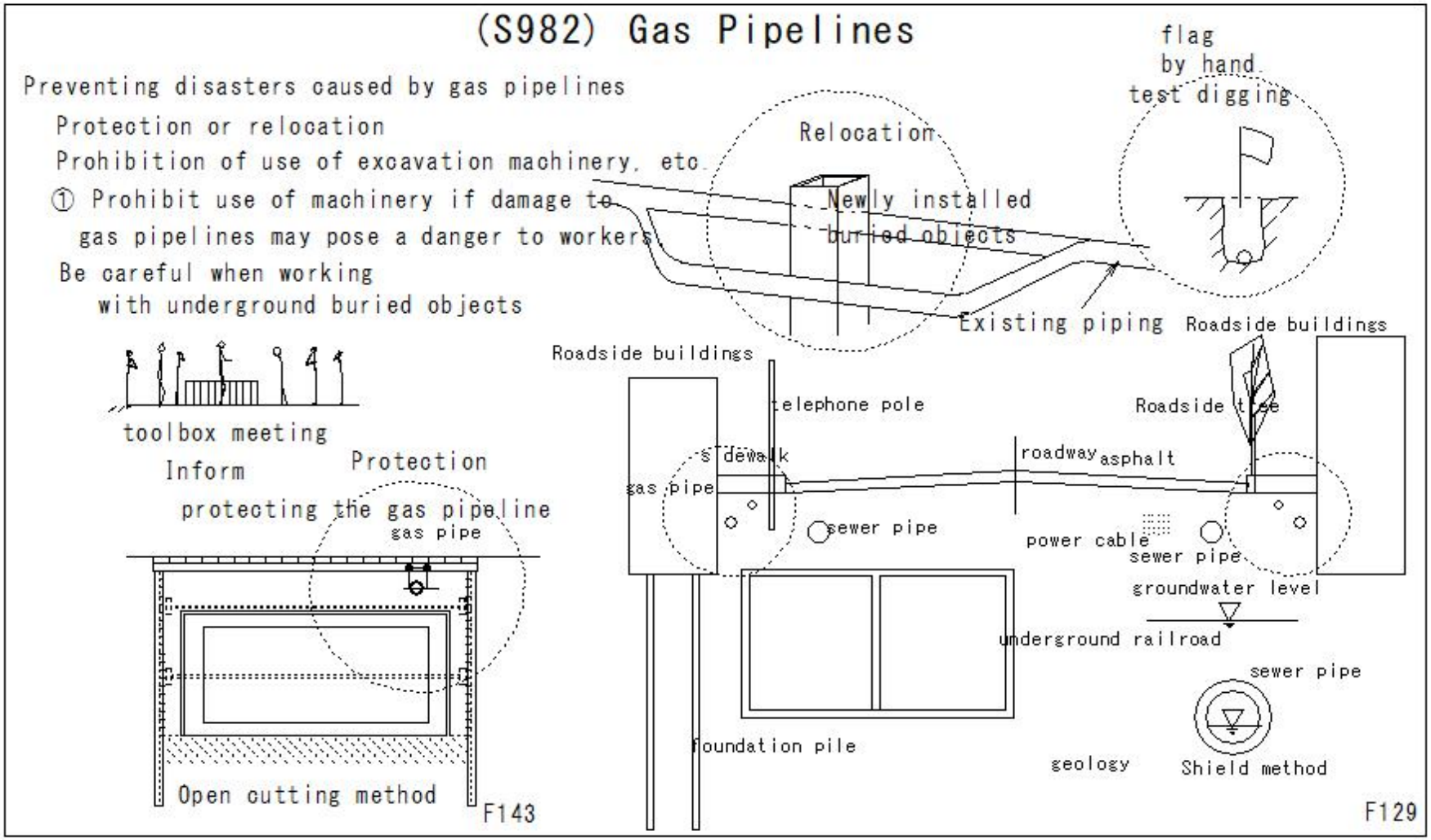




(S981) Gas Pipelines

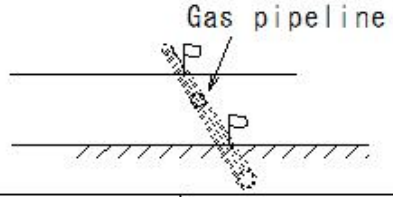


(S982) Gas Pipelines



(S983) Gas Pipelines

(S983) Gas Pipelines

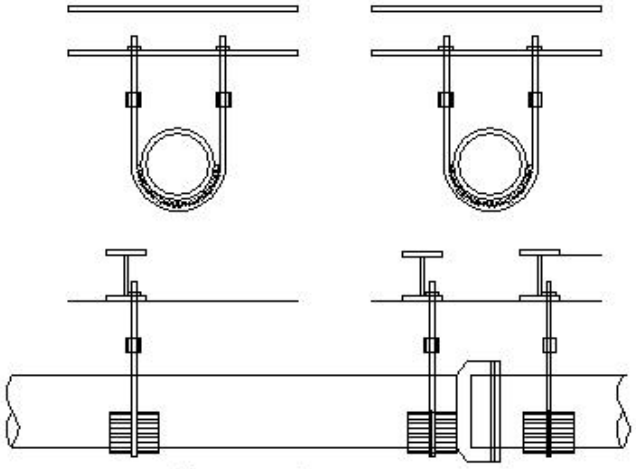


Preventing disasters caused by gas pipelines

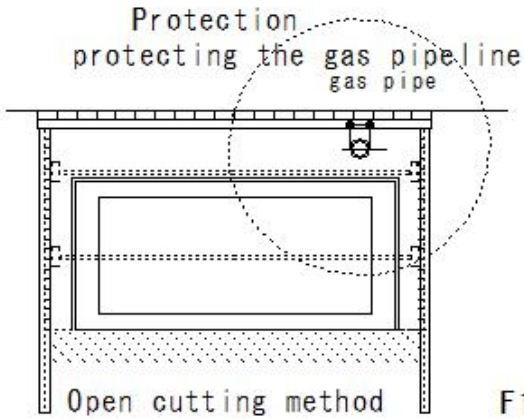
Gas pipeline inspection table

Escape prevention device

Inspection items	Inspection method
① Check for deformation of fixing parts ② Check for abnormalities in escape amount measuring device ③ Measure escape amount ④ Check for loose bolts and nuts	Visual inspection



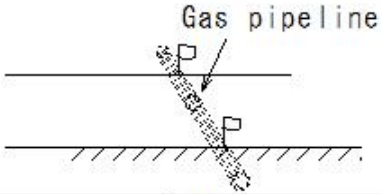
Suspension support S991



Open cutting method F143

(S984) Gas Pipelines

(S984) Gas Pipelines

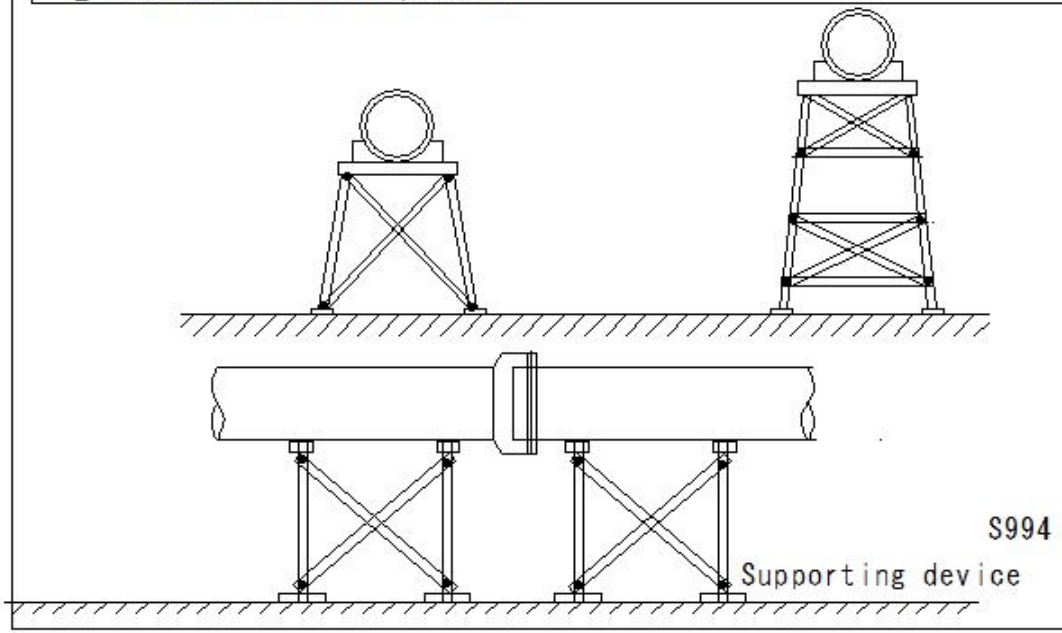


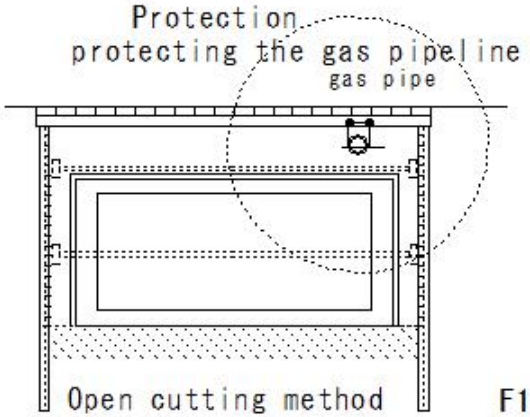
Preventing disasters caused by gas pipelines

Gas pipeline inspection table

Expansion Joint

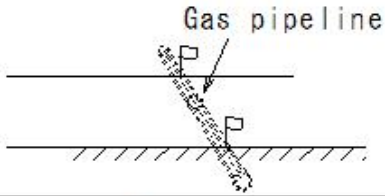
Inspection items	Inspection method
① Bolt Deformation ② Bolt and Nut Looseness ③ Measurement of Expansion	Visual inspection





(S985) Gas Pipelines

(S985) Gas Pipelines

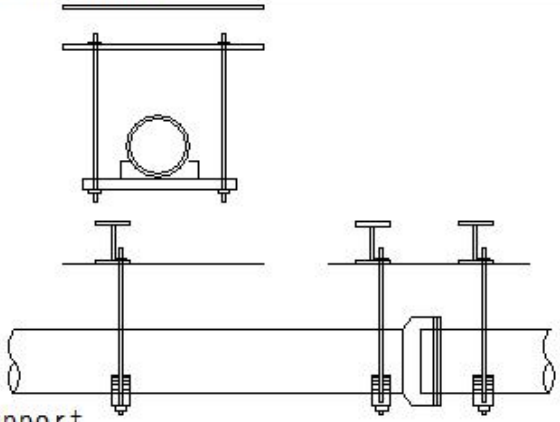


Preventing disasters caused by gas pipelines

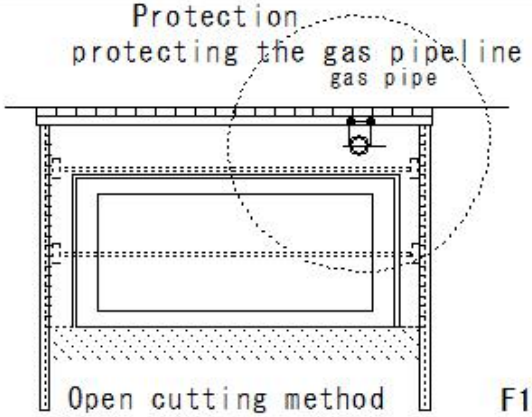
Gas pipeline inspection table

Fixing Device

Inspection items	Inspection method
① Fixed Pile Deformation ② Member Deformation ③ Weld Abnormality ④ Gap with Pipe ⑤ Rubber Plate and Protective Plate Movement	Visual ①～⑤
⑥ Adjustment Bolt Deformation ⑦ Bolt and Nut Looseness	Inspection Hammer or Torque Wrench ⑥⑦



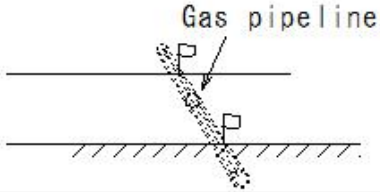
Suspension support S992



Open cutting method F143

(S986) Gas Pipelines

(S986) Gas Pipelines

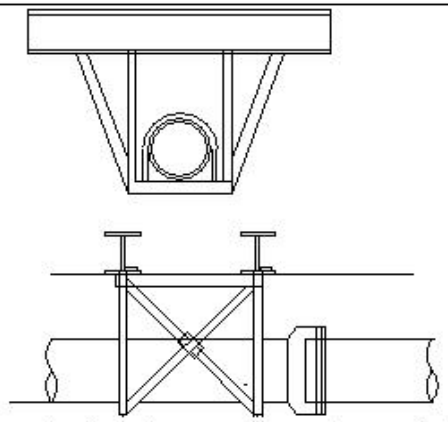


Preventing disasters caused by gas pipelines

Gas pipeline inspection table

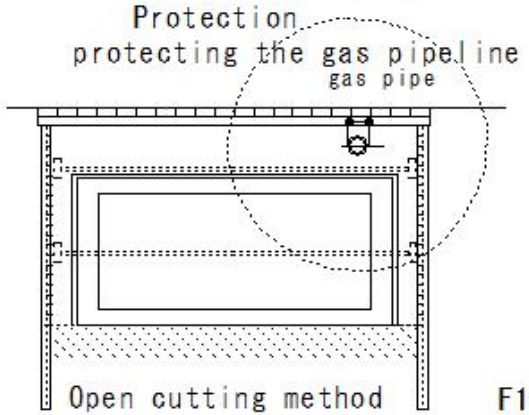
Suspension Protection (Curing)

Inspection items	Inspection method
① Suspension Support Device Looseness and Other Deformation ② Suspension Support Device Corroded ③ Rubber Plate Backing Movement ④ Suspension Beam Deformation ⑤ Weld Abnormality	Visual ①～⑤
⑥ Bolt and Nut Looseness ⑦ Vibration	Inspection Hammer or Torque Wrench, Hand Feeling ⑥⑦



S993

Suspension support for truss structure (steel shape)

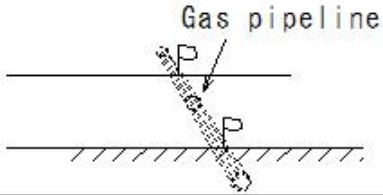


Open cutting method

F143

(S987) Gas Pipelines

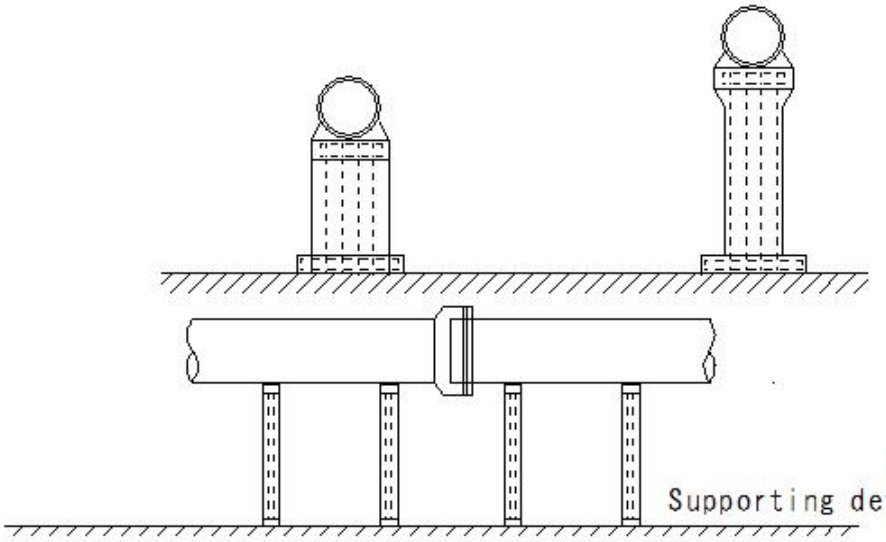
(S987) Gas Pipelines



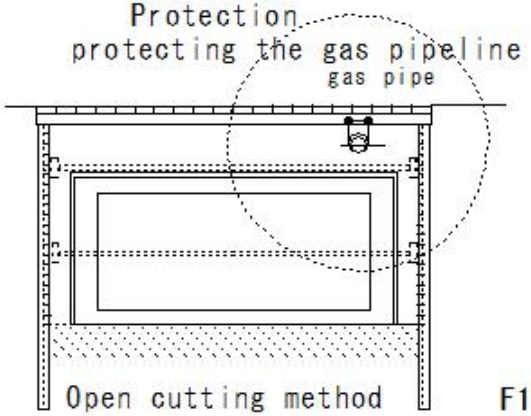
Preventing disasters caused by gas pipelines

Gas pipeline inspection table
Receiving Protection (Care)

Inspection items	Inspection method
①Whether the receiving support is tilted ②Whether the receiving support is damaged ③Whether the rubber plate, fasteners, etc. are deformed ④Whether there is a gap between the receiving support and the pipe	Visual Inspection ①～④



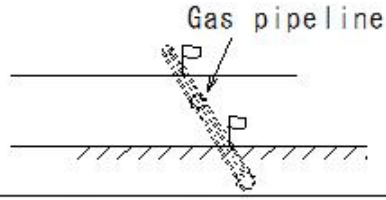
S995
Supporting device



F143

(S988) Gas Pipelines

(S988) Gas Pipelines

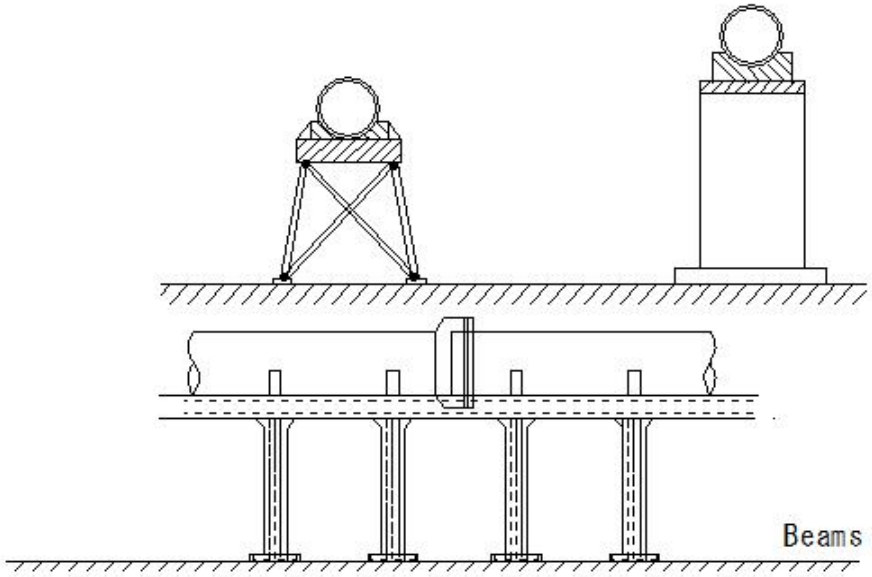


Preventing disasters caused by gas pipelines

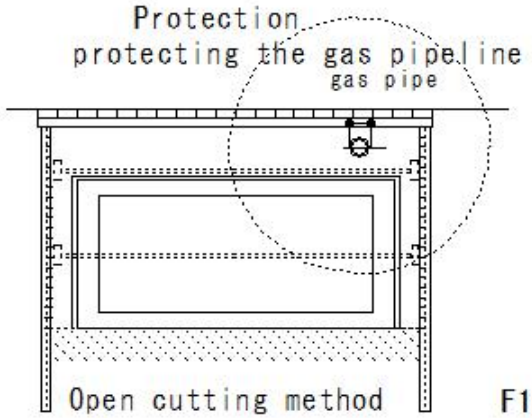
Gas pipeline inspection table

Sway Prevention Device

Inspection items	Inspection method
①Whether the components are deformed ②Whether there is contact with the pipe material ③Whether the bolts and nuts are loose	Visual Inspection ①～② Inspection Hammer or Torque Wrench



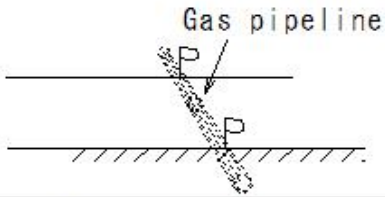
S996



F143

(S989) Gas Pipelines

(S989) Gas Pipelines

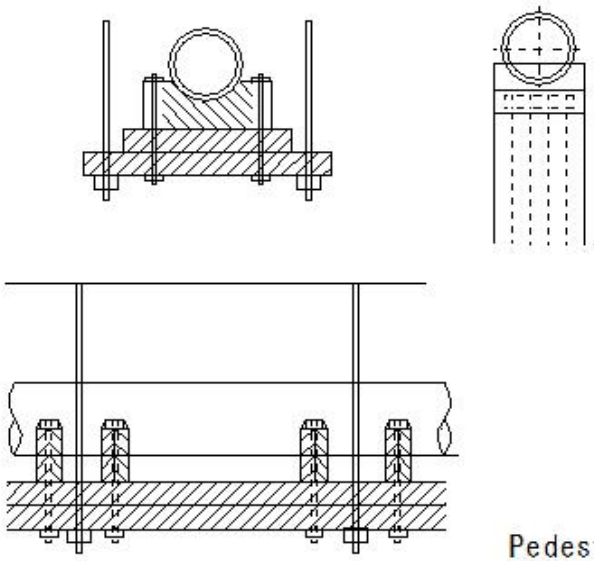


Preventing disasters caused by gas pipelines

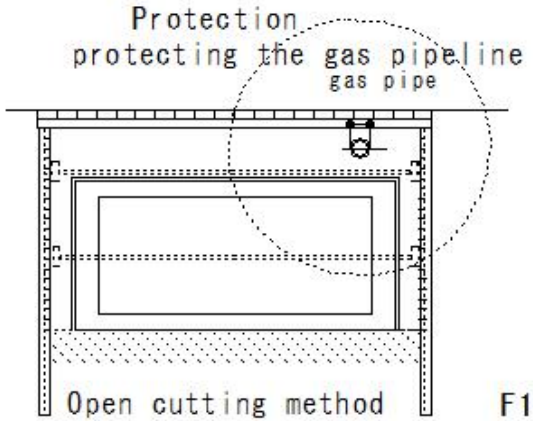
Gas pipeline inspection table

Emergency Shut-Off Device

Inspection items	Inspection method
①Whether there is a load on the bit ②Indication of the position of the valve and ball hole ③Operation status	Visual Inspection ①～③



S998
Pedestals and beams

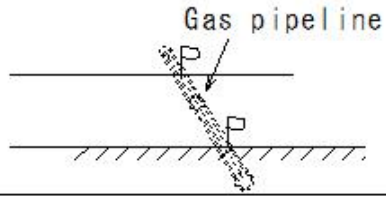


Open cutting method

F143

(S990) Gas Pipelines

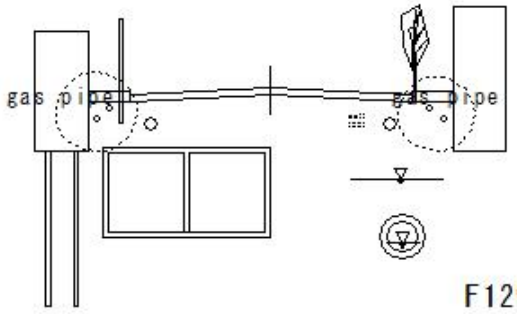
(S990) Gas Pipelines



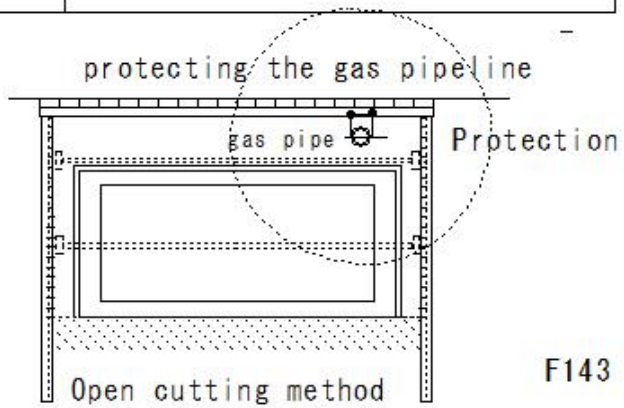
Preventing disasters caused by gas pipelines

Gas pipeline inspection table
Ground movement measurement and others

Inspection items	Inspection method
①Measurement of the amount of settlement of gas supply facilities within the affected area - level and box rule	Level and box rule①
②Whether the observation rod is deformed ③Whether the road surface is deformed ④Status of the landslide prevention wall and covering plate ⑤Good condition of the inspection passage ⑥Whether emergency materials are secured ⑦Good condition of the material inlet	Visual inspection②～⑦



F129



F143

(S991) Gas Pipelines

(S991) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Suspension support

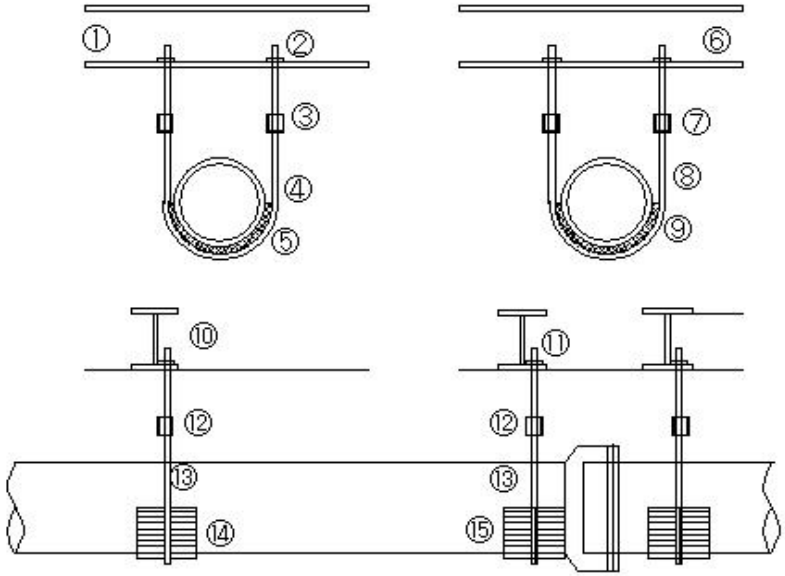
①Support the pipeline immediately when it is exposed

②Adjust the tension of the suspension support so that it is uniform

③Leave a gap between the suspension support and the pipeline joint so that repairs can be made

④Do not directly support the joint with the extraction pipe or the plug

○①Suspension beam
②Nut
③Turnbuckle
④Suspension support
⑤Whether the rubber plate and protective plate have moved
⑥Suspension beam
⑦Turnbuckle
⑧Suspension support
⑨Plate
⑩Suspension beam
⑪Nut
⑫Turnbuckle
⑬Suspension support
⑭Rubber
⑮Plate



Suspension support

(S992) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Suspension support

①Support the pipeline immediately when it is exposed

②Adjust the tension of the suspension support so that it is uniform

③Leave a gap between the suspension support and the pipeline joint so that repairs can be made

④Do not directly support the joint with the extraction pipe or the plug

○Suspension support

⑯Nut

⑰Suspension support

⑱Rust

⑲Support beam

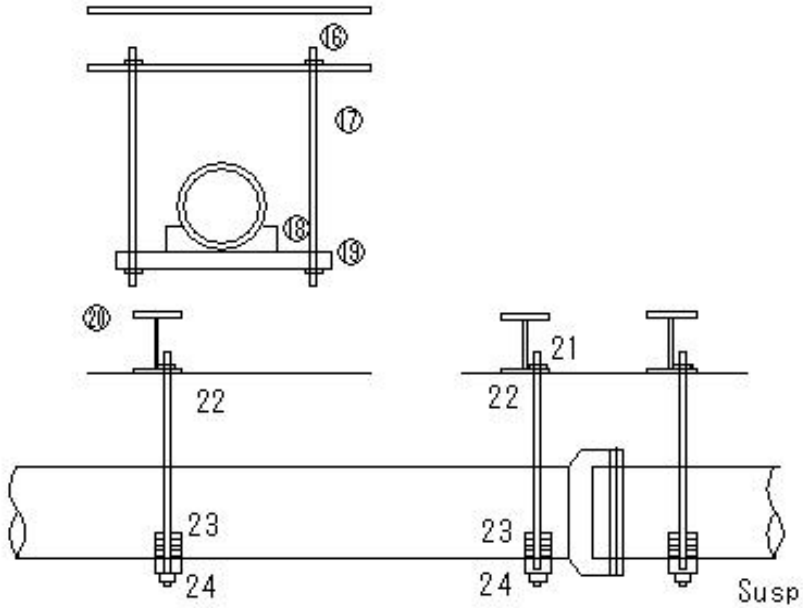
⑳Suspension beam

21.Nut

22.Suspension support

23.Wedge

24.Support beam



Suspension support

(S993) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Suspension support

①Support the pipeline immediately when it is exposed

②Adjust the tension of the suspension support so that it is uniform

③Leave a gap between the suspension support and the pipeline joint so that repairs can be made

④Do not directly support the joint with the extraction pipe or the plug

○ Suspension support

25.Suspension girder

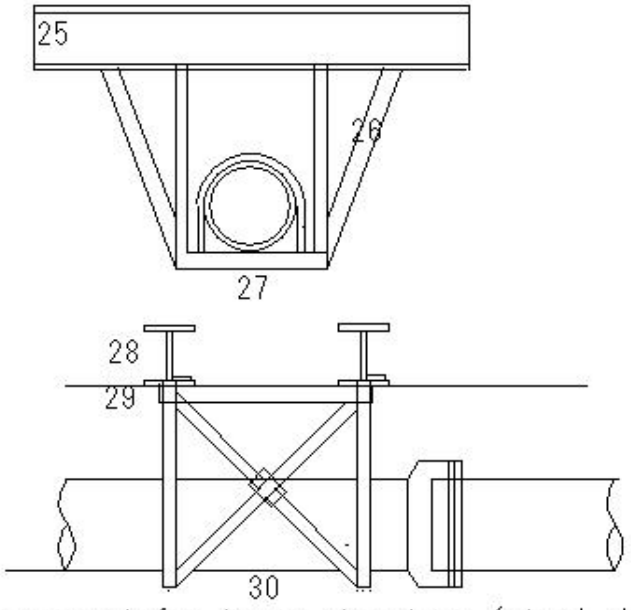
26.Suspension girder

27.Suspension support for truss structure (steel shape)

28.Suspension girder

29.Welding

30.Suspension support for truss structure (steel shape)



Suspension support for truss structure (steel shape)

(S994) Gas Pipelines

(S994) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Supporting device

① Install the supporting device before removing the hanging device

② Fix the supporting device firmly to the foundation

③ Leave enough space between the supporting device and the pipe to allow repairs

④ Do not directly support the joint with the extraction pipe or the plug

○ ① Check for deformation of the bolts

② Supporting device

③ Concrete

④ Supporting device for truss structure (shaped steel)

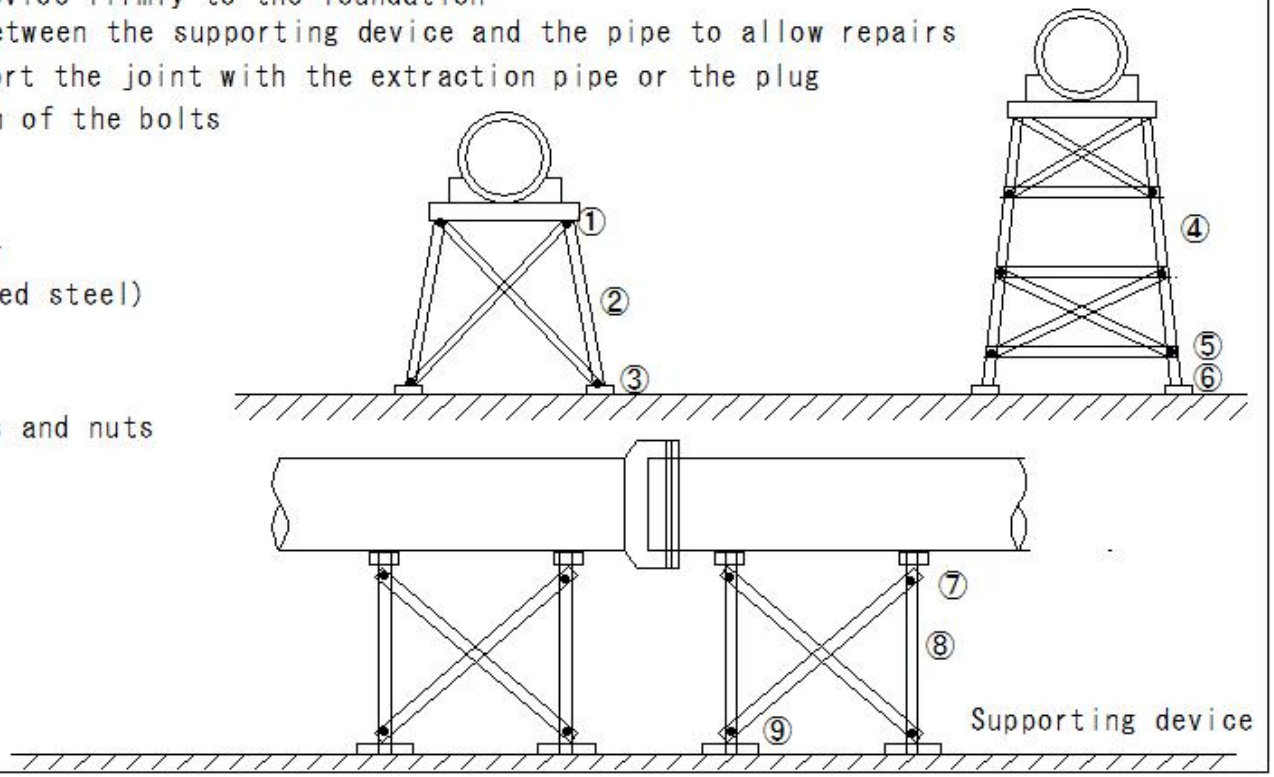
⑤ Bolts

⑥ Concrete

⑦ Check for loose bolts and nuts

⑧ Supporting device

⑨ Concrete



(S995) Gas Pipelines

(S995) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Supporting device

① Install the supporting device before removing the hanging device

② Fix the supporting device firmly to the foundation

③ Leave enough space between the supporting device and the pipe to allow repairs

④ Do not directly support the joint with the extraction pipe or the plug

○ ⑩ Made of reinforced concrete

⑪ Supporting device

⑫ Reinforced bar

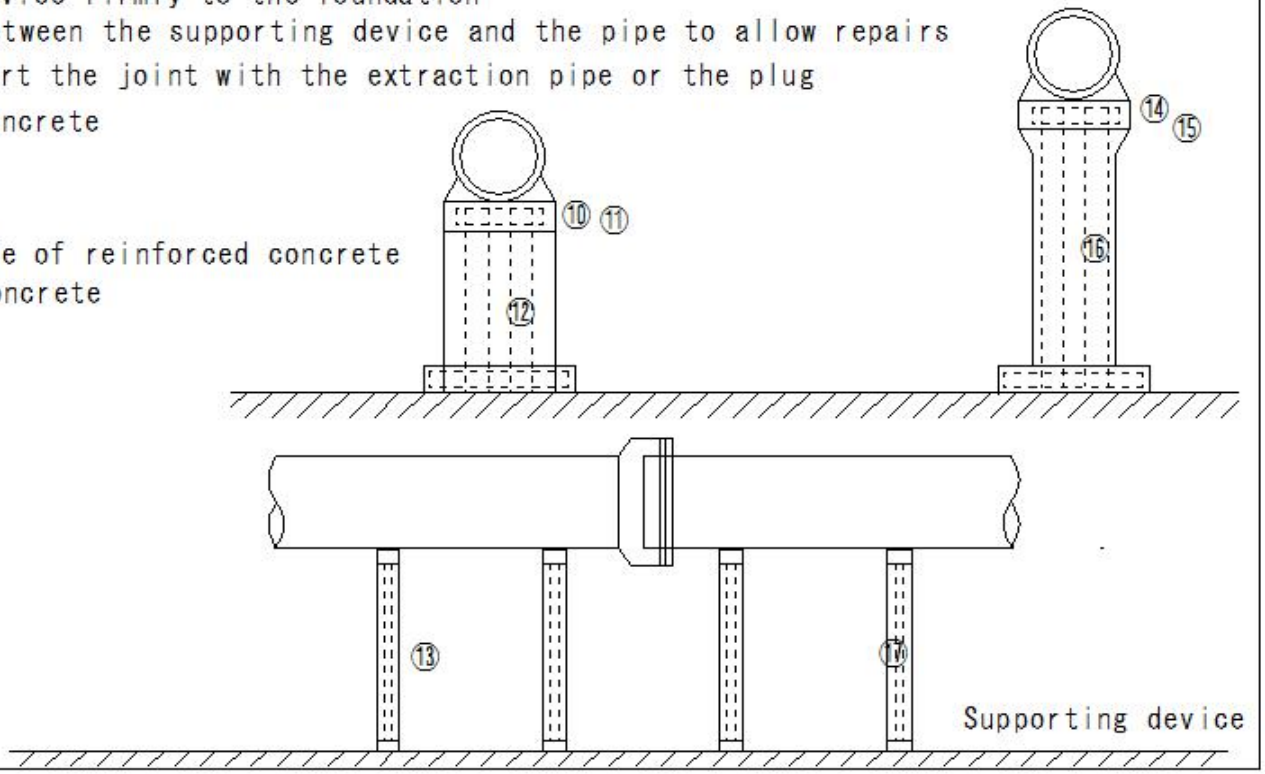
⑬ Supporting device made of reinforced concrete

⑭ Made of reinforced concrete

⑮ Supporting device

⑯ Reinforced bar

⑰ Reinforced bar



(S996) Gas Pipelines

(S996) Gas Pipelines

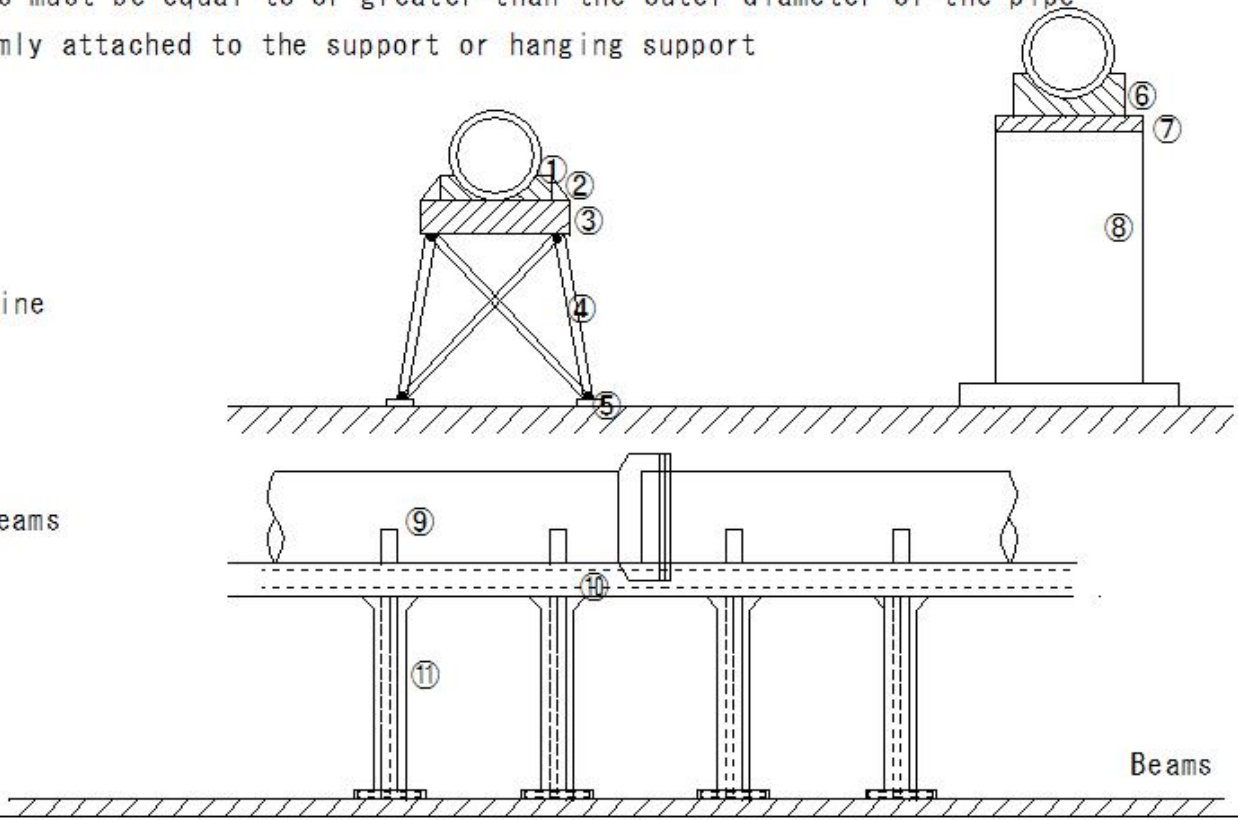
Protective equipment for gas pipelines and how to use them

Beams

① The width of the beams must be equal to or greater than the outer diameter of the pipe

② The beams must be firmly attached to the support or hanging support

○① Support base
② Clamps
③ Beams
④ Support
⑤ Concrete pouring machine
⑥ Support base
⑦ Beams
⑧ Support
⑨ Support base
⑩ Reinforced concrete beams
⑪ Support



(S997) Gas Pipelines

(S997) Gas Pipelines

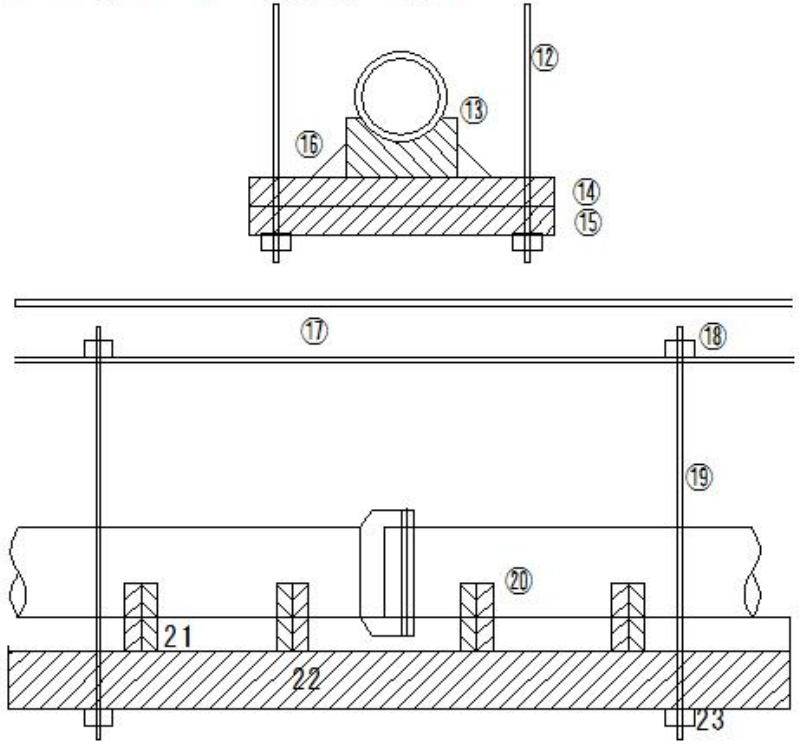
Protective equipment for gas pipelines and how to use them

Beams

① The width of the beams must be equal to or greater than the outer diameter of the pipe

② The beams must be firmly attached to the support or hanging support

○ ⑫ Hanging support (steel bar)
⑬ Support base
⑭ Support beam
⑮ Support girder
⑯ Clasp
⑰ Hanging girder
⑱ Nut
⑲ Hanging support
⑳ Support base
21 Clasp
22 Support beam
23 Support girder



Beams

(S998) Gas Pipelines

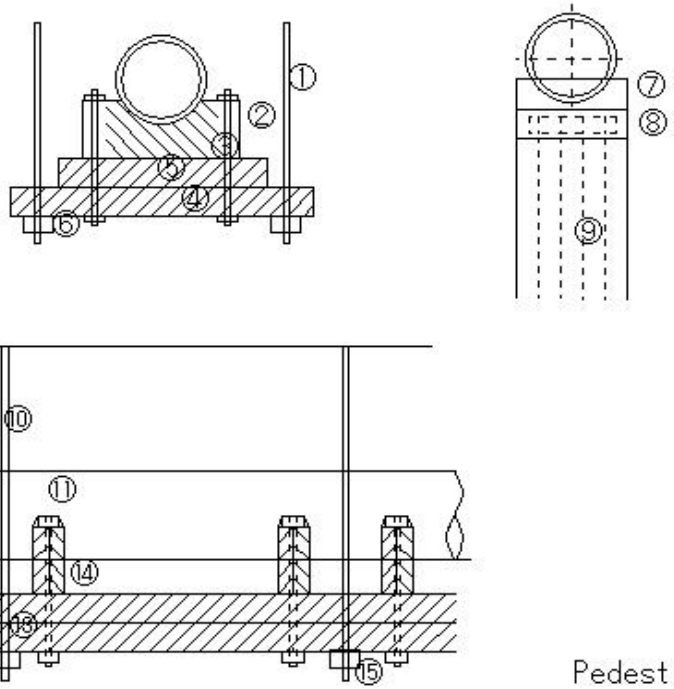
(S998) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Pedestals and beams

① The center line of the pedestal or beam must be aligned with the center line of the pipeline
② The pedestal and beam must be attached to a beam or a hanging support
③ The width of the pedestal must be equal to or greater than the outer diameter of the pipeline

○ ① Hanging support
② Pedestal
③ Bolts
④ Beams
⑤ Beams
⑥ Nuts
⑦ pedestal
⑧ Beams
⑨ Supports
⑩ Hanging support
⑪ Bolts
⑫ Nuts
⑬ Beams
⑭ pedestal
⑮ pedestal



Pedestals and beams

(S999) Gas Pipelines

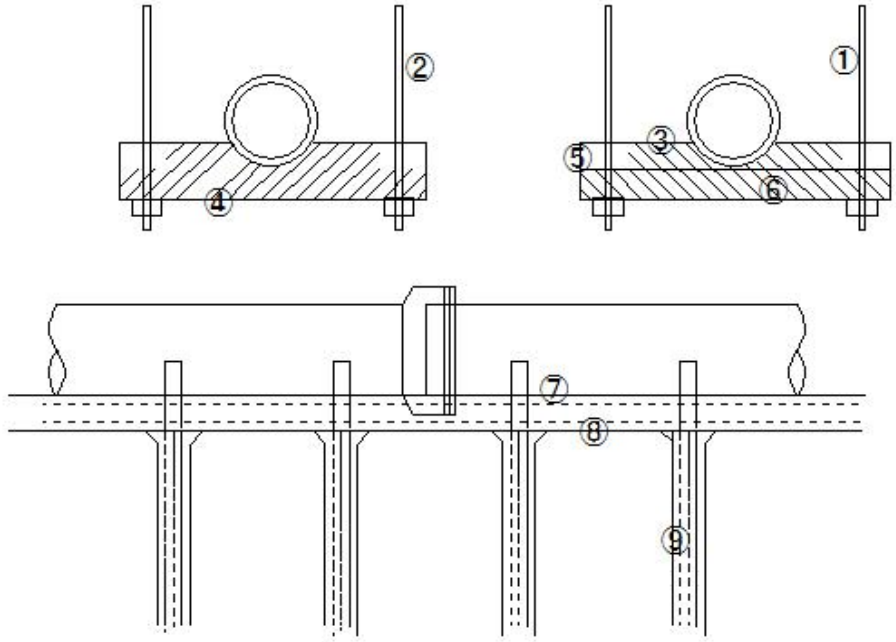
(S999) Gas Pipelines

Protective equipment for gas pipelines and how to use them

Pedestals and beams

① The center line of the pedestal or beam must be aligned with the center line of the pipeline
② The pedestal and beam must be attached to a beam or a hanging support
③ The width of the pedestal must be equal to or greater than the outer diameter of the pipeline

○①Hanging support
②Hanging support
③Clasp
④Support beam
⑤Wedge
⑥Support beam
⑦Support base
⑧Support beam
⑨Support support



Pedestals and beams

(S1000) Gas Pipelines

Types and properties of dangerous gases

①Substance name	②Molecular formula	③Molecular weight	④Specific gravity air = 1	⑤Explosive limit(%)		⑧Permissible concentration (ppm)
				⑥Lower limit	⑦Upper limit	
⑨Acetylene	C2H2	26	0.9	2.5	100	-
⑩Ammonia	NH3	17	0.57	16	25	25
⑪Methane	CH4	16	0.56	5	15	-
⑫Hydrogen	H2	2	0.07	4	75	-
⑬Carbon monoxide	CO	28	0.97	12.5	74	50
⑭Hydrogen sulfide	H2S	34	1.2	4	44	10
⑮Gasoline	CnHm	-	3.5	1.4	7.6	100
⑯Toluene	C6H5CH3	92	3.1	1.4	6.7	100
⑰Propane	C3H8	44	1.6	2.2	9.5	-
⑱Sulfurous acid gas	SO2	64	2.2	-	-	5
⑲Carbon dioxide	CO2	44	1.5	-	-	15000
⑳Nitrogen dioxide	NO2	46	1.5	-	-	5