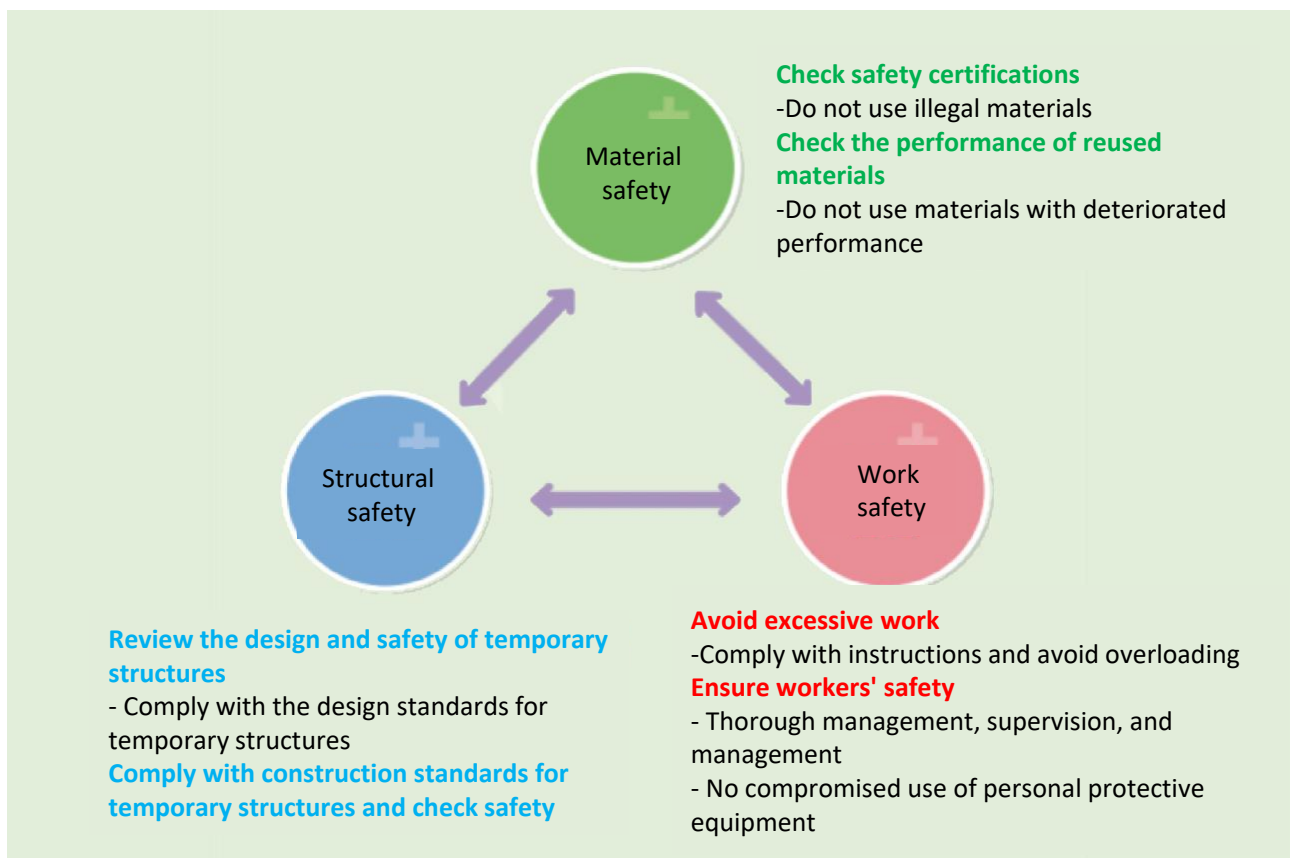


What is scaffolding work?

Scaffolding is a temporary structure installed to effectively work on the hull shell, outside the ship's accommodation area, etc. It is used to transport members, work passageways, and work platforms. Constructability, economic feasibility, and safety must all be considered when selecting a scaffolding method. Steel pipe scaffolding, which is easy to install on curved surfaces, is mainly used at shipbuilding sites.

Steel pipe scaffolding, also called single-pipe scaffolding, is assembled using steel pipe joints or connecting hardware (clamps).



[Safety of temporary scaffolding structures]

Work Procedure and Major Hazards (examples)

① Establish a work plan and arrange materials → ② Control the workplace and inspect before work → ③ Install the scaffoldings → ④ Work on/with the scaffoldings → ⑤ Dismantle the scaffoldings → ⑥ Organize and remove materials

① Establish a work plan (structural review and assembly drawing) and arrange materials.

Harms/Hazards	Improvement measures	Relevant codes
Risks due to failure to review the design and check the strength of equipment to which the work platform is attached	Use things that ensure safety, such as design review and strength testing.	Article 54 of the Rules on Occupational Safety and Health Standards (Scaffolding Materials)
Risk of falling or collapsing due to lack of performance by using or installing defective materials such as uncertified products	- Check safety certifications: steel pipe joints, wall connection hardware, work (passage) scaffolding, clamps, etc. - Voluntary safety verification: steel pipes, side wall brackets, shelf supports, fixed support hardware, etc.	Article 84 (Safety Certification), Article 89 (Report of Voluntary Safety Verification) of the Occupational Safety and Health Act, and Article 54 of the Rules on Occupational Safety and Health Standards (Scaffolding Materials)
Risk of collapse due to incorrect loading of materials	- Avoid unbalanced loading of cargo, removing the cargo from the middle of the loading deck, or loading an excessive amount - Prepare and comply with work plans for handling heavy objects.	Article 38-1 (11) (Work Plan for Handling Heavy Objects), Article 39 (Work Leader), Article 40 (Signals) of the Rules on Occupational Safety and Health Standards
Risk of collision with workers while reversing forklifts	Arrange signalers and install signs prohibiting workers from accessing hazardous areas, such as where cargo is unloaded.	Article 20 (Access Control), Article 38-1 (2) (Work Plan for Unloading and Transport Vehicles), Article 39 (Work Leader), Article 40 (Signal) of the Rules on Occupational Safety and Health Standards



Scaffolding material
(material for temporary
structures)



Materials loaded on a
truck



Unloading with a
forklift



Arrange signalers for
the forklift

② Control the workplace and inspect before work

Harms/Hazard	Improvement	Relevant
Risk of being struck by falling objects while workers move through the workplace with scaffoldings	Control access around the workplace by installing fences or ropes	Article 57 of the Rules on Occupational Safety and Health Standards (Assembly, Disassembly, and Modification of Scaffoldings, etc.)
Risk of insufficient understanding of work details and hazards due to insufficient explanation of work, including work details and harms/hazards	Train workers on the work details (procedures, movement routes, precautions) and safety precautions (protective equipment, hazards) in the work plan, such as conducting TBM before work.	
Risk of slipping or falling due to installing or dismantling scaffoldings in bad weather, such as rain or snow, or forcing work on scaffoldings	- Check the weather conditions and stop work under unfavorable weather (e.g., rain or snow). - Before resuming work, inspect or repair any damage to scaffolding materials, joints or connections, damage or corrosion of connecting materials, collapse or shaking of columns, and shaking of rope attachments or rigging devices.	Article 58 of the Rules on Occupational Safety and Health Standards (Inspection and Repair of Scaffoldings)
Risk of collision or falling while working without wearing personal protective equipment such as a safety helmet or safety belt	- Check and monitor the proper wearing of personal protective equipment such as safety helmets and safety belts. - Check for damage to the safety belt lanyards and hooks, etc.	Article 32 ~ Article 33 of Rules on Occupational Safety and Health Standards (Provision and Management of Protective Equipment)



Install safety facilities



Install signs



Onsite training (e.g., TBMs)



Check the safety belt



Work Procedure and Major Hazards (examples)

Guide for Safety Work for
Installing or Dismantling
Scaffoldings



③ Install/Dismantle the scaffoldings - 1

Harms/Hazards	Improvement measures	Relevant codes
• Risk of accidents when installed by unqualified or inexperienced personnel	• Before deploying workers, check their qualifications, such as: - Those with scaffolding skills qualifications or higher in accordance with the National Technical Qualifications Act; - Those with more than three months of experience in the relevant work (limited to work with a floor height of less than 10 meters); - Those who have completed vocational competency development training in the relevant field in accordance with the National Lifelong Vocational Ability Development Act; - Those who have completed training at an educational institution stipulated in the Rules on Restrictions on Employment in Harmful and Hazardous Work;	Article 3 of the Rules on Restrictions on Employment in Harmful and Dangerous Work and [Appendix 1]
• Risk of fall due to collision with steel pipe collapsed under its own weight while connecting the pillars of steel-pipe scaffoldings	• Take measures to prevent falling when temporarily connecting steel pipes for the installation of steel-pipe scaffoldings. • Encourage, check, and supervise workers to wear personal protective equipment (e.g., safety helmets and safety belts)	Article 32 (Provision of Protective Equipment), Article 33 (Management of Protective Equipment), Article 56 (Structure of Work Platform), Article 57 (Assembly, Disassembly, and Modification of Scaffoldings, etc.) of the Rules on Occupational Safety and Health Standards
• Risk of the steel pipe (horizontal member) supporting the work platform being disengaged and falling to the ground together with the work platform, resulting in collisions with workers on the ground while installing the work platform	• Connect or fix the work platform to two or more supports to prevent the scaffolding material from falling or being disengaged when installing a 2-meter or higher work platform. • Control access on the floor to prevent collisions due to falling materials when installing scaffoldings and work platforms.	
• Risk of losing body control and falling to the end of the work platform due to not wearing a safety belt while installing a scaffolding work platform	• Install safety railings and safety nets in places where workers may fall, such as at the end of a work platform. • If installing safety railings and nets is difficult, install stable equipment to attach safety belts. • Take measures to prevent falls before work, such as having workers wear safety belts while moving and working.	



Work Procedure and Major Hazards (examples)

Guide for Safety Work for
Installing or Dismantling
Scaffoldings



③ Install/Dismantle the scaffoldings - 2

Harms/Hazards	Improvement measures	Relevant codes
• Risk of losing body control and falling to the floor while installing a safety railing at the end of the scaffolding work platform	• Install safety railings and safety nets in places where workers may fall, such as at the end of the work platform. • If installing safety railings and nets is difficult, install stable equipment to attach safety belts. • Take measures to prevent falls before work, such as having workers wear safety belts while moving and working.	
• Risk of losing body control and falling to the floor while installing a safety railing at the end of the scaffolding work platform	• Before starting work, ensure that the wearer is in good condition, such as providing a safety helmet and fastening the chin strap. • When reinforcing steel-pipe scaffolding, wall joints and supports must be installed every 5 m, and if unavoidable due to work needs, install a bar on the scaffolding column or wale. • When working with a risk of falling, take fall prevention measures by installing a work platform and safety railings. • If unavoidable, provide fall prevention measures such as facilities where safety belts can be attached.	*For steel-pipe scaffolding, Article 59 (Necessary Matters when Assembling Steel Pipe Scaffolding), Article 60 (Structure of Steel Pipe Scaffolding) of the Rules on Occupational Safety and Health Standards
• Risk of losing body control and falling to the end of the work platform while dismantling scaffoldings without wearing a safety belt	• Install safety railings and safety nets in places where workers may fall, such as at the end of the work platform. • If installing safety railings and nets is difficult, install stable equipment to attach safety belts. • Take measures to prevent falls before work, such as having workers wear safety belts while moving and working	
• Risk of losing body control falling to the floor through the opening while lifting a work platform placed on top of a floor opening	• Install steel covers, webbing straps, and safety railings, and ensure appropriate lighting in areas with a risk of falling, such as floor openings, to prevent workers from falling and accessing. • When temporarily covering floor openings with a work platform, plywood, etc., secure it firmly to be stable and mark the opening. Then, remove temporary materials and implement safety protection measures such as installing steel covers and safety railings. • When installing or dismantling an opening cover, take measures to prevent falls, such as providing safety belts before work and having workers fasten them to the attachment device before moving and working.	Article 43 of the Rules on Occupational Safety and Health Standards (Protective Measures for Openings, etc.)

*Article 13 (Structure and Installation Requirements of Safety Railings), Article 32 (Provision of Protective Gear), Article 33 (Management of Protective Gear), Article 56 (Structure of Work Platforms), and Article 57 (Assembly, Disassembly and Alteration of Scaffolding, etc.) of the Rules on Occupational Safety and Health Standards apply to all hazards.

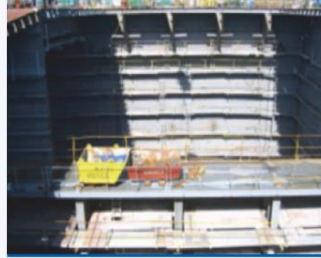
③ Install/Dismantle the scaffoldings -3



Wear safety belts
and install facilities
to attach safety
belts



Scaffoldings installed in a
deck house



Scaffoldings installed inside a
PC vessel



Dismantling
scaffoldings from a
bow block

[Note] Precautions when installing work platforms

- ✓ Use sturdy materials so that the scaffold can withstand the working load.
- ✓ The width of the work platform should be at least 40 cm, and the gap between scaffolding materials should be less than 3 cm.
 - If necessary, the width may be increased to 30 cm or more in narrow workspaces such as ship blocks or engine rooms. Also, if it is difficult to maintain the gap between scaffolding materials below 3 cm due to steel pipe columns, the width may be set below 5 cm for straddling scaffoldings. (If there is a risk of objects falling through the gap, take measures such as controlling access.)
- ✓ Install safety railings where there is a risk of falling. However, when it is difficult to install safety railings due to the nature of the work or when they are temporarily dismantled, install safety nets or have workers use safety belts.



Work Procedure and Major Hazards (examples)

Guide for Safety Work for
Installing or Dismantling
Scaffoldings



④ Work on/with the scaffoldings - 1

Harms/Hazards	Improvement measures	Relevant codes
There is a risk of collapse due to overloading on the top of the scaffolding work platform.	- Display the maximum load on the scaffolding work platform and monitor to avoid overloading (within a maximum of 400 kg between steel tube scaffolding columns). - When assembling scaffolding, comply with installation standards such as spacing between scaffolding columns and walls, spacing between wall joints, and installation of cross braces.	* For steel-pipe scaffolding, Article 60 of the Rules on Occupational Safety and Health Standards (Structure of Steel Pipe Scaffolding)
Risk of falling due to failure to install (or arbitrary dismantling) safety railings at the end of the scaffolding work platform.	Before deploying workers, check whether safety railings are installed at the end of the work platform. If not, install them before work.	
Risk of falling when the work platform bracket fixing bolt is loosened.	Perform a safety inspection before deploying workers and begin work after repairs, such as tightening bolts.	Article 58 of the Rules on Occupational Safety and Health Standards (Inspection and Repair of Scaffoldings)
Risk of falling due to use of iron wire when fixing load-bearing part of work platforms	Use dedicated hardware for load-bearing parts such as work platforms to prevent falls due to derailment of the work platform.	
Risk of falling due to installing work platforms too far away from blocks	Minimize the separation between the work platform and the wall to prevent workers from falling (recommended within 20 cm).	
Risk of falling while moving or working on a scaffolding platform or temporary stairs where safety railings are not installed	- Install safety railings and safety nets in places where workers may fall, such as at the end of the work platform. - If installing safety railings and nets is difficult, install stable equipment to attach safety belts. - Take measures to prevent falls before work, such as having workers wear safety belts while moving and working - When a safety railing is installed at the end of the work platform and temporarily dismantled due to circumstances such as lifting materials to the work platform, reinstall the safety railing immediately after completing the work.	
Risk of losing body control and falling while repairing scaffoldings and leaning out excessively over the safety railings	When maintaining safety facilities, such as repairing or installing safety railings on scaffolding, measures to prevent falls should be taken. For example, workers should be provided with safety belts before work and allowed to move and work only after wearing them.	



Work Procedure and Major Hazards (examples)

Guide for Safety Work for
Installing or Dismantling
Scaffoldings



④ Work on/with the scaffoldings - 2

Harms/Hazards	Improvement measures	Relevant codes
• Risk of losing body control and falling while going up and down using a vertical ladder installed on the outside of the scaffolding	• Install the vertical passages that move between the top and bottom of the scaffolding platform in a safe structure, such as installing them inside the scaffolding. • When installing a vertical ladder outside the scaffolding, install a vertical facility to attach safety belts and fasten the safety belt (low lip) before moving.	
• Risk of tipping due to unsecured access ladder on the block	• Take measures to prevent falls and slips, such as securing vertical ladders. - If the height is over 7 m, install the backrest from 2.5 m from the floor.	Article 24 of the Rules on Occupational Safety and Health Standards (Structure of Ladder Passageways, etc.)
• Risk of falling due to improper installation height of work platforms installed in elevated locations	• Work platforms must be installed in elevated locations at a height interval of less than 2 m.	
• Risk of tipping due to insufficient fixation of equipment used to lift block platforms	• Secure the lifting equipment to the block structure.	

*Article 13 (Structure and Installation Requirements of Safety Railings), Article 32 (Provision of Protective Gear), Article 33 (Management of Protective Gear), Article 56 (Structure of Work Platforms), and Article 57 (Assembly, Disassembly and Alteration of Scaffolding, etc.) of the Rules on Occupational Safety and Health Standards apply to all hazards.



Scaffolding outside a block



Scaffolding outside a block



Scaffolding inside a block



Straddling scaffolding

Major Hazards

✓ Falls

- Risk of falling while working without a safety belt during assembling or disassembling scaffoldings
- Risk of falling when using an unsafely installed ladder to climb scaffolding
- Risk of falling due to the derailment of unfixed scaffolding during movement
- Risk of falling while lying down on scaffolding and welding seams.
- Risk of falling due to slipping off while moving due to wide gap between footrests

✓ Collisions

- Risk of collision with tools or materials falling due to the absence of a toe plate at the end of the work platform
- Risk of collision with tools falling due to wide gap between footrests

Cases of Serious Accidents

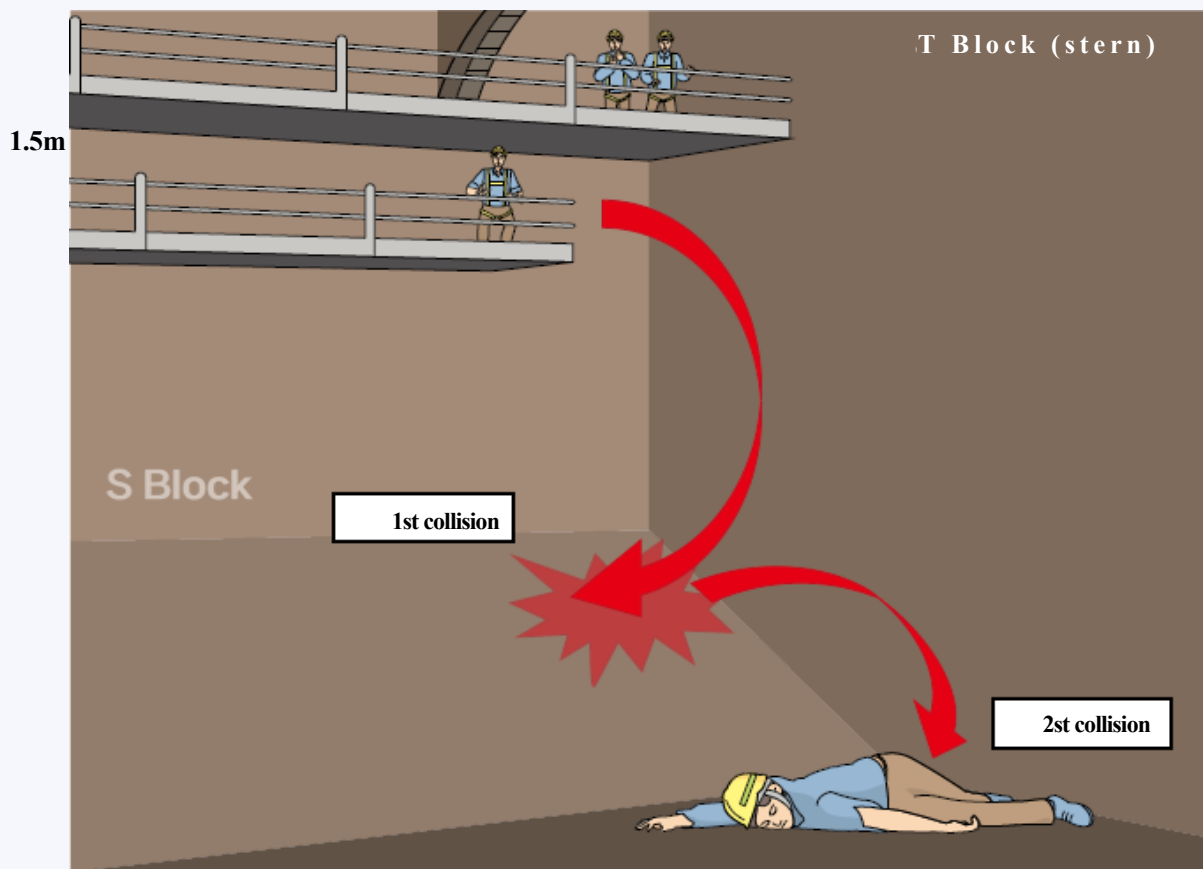
A worker fell from the edge of the scaffold while dismantling the work platform

Guide for Safety Work for Installing or Dismantling Scaffoldings



Outline

A worker was moving with his upper body bent, using a rope and safety belt-attaching equipment to dismantle the work platform installed on the S block within the tank. When dismantling the T-block work platform, the work platform was dismantled prematurely due to overlapping, and he fell to the bottom of the tank about 23 m below from an opening where safety railings were not installed.



The victim fell from the opening at the end of the S block work platform.

*T block: Blocks in the shape of a T that support the shape of the S block and serve as a partition between tanks

*S Block: Blocks assembled on the side of the ship



Cases of Serious Accidents

A primary signaler was caught between the module transporter and the container

Guide for Safety Work for Installing or Dismantling Scaffoldings



Cause of the accident

- **The facility for attaching seat belts was being installed at an inappropriate time.**
 - The facility for attaching safety belts must have been installed to dismantle both the T and S block work platforms. However, the facility was not installed for the S block. Later, the victim tried to install the facility to attach safety belts but fell because he did not have the means to secure his safety belt.
- **Failure to install safety railings**
 - When dismantling a T block, the end of the work platform of the dismantled S block is at risk of falling. A safety railing should have been installed, but was not, to prevent falls when a facility for attaching safety belts had not been installed in advance for dismantling the S block.
- **Lack of illumination due to failure to maintain sufficient lighting**
 - Lighting equipment was installed in T Block, and on the S Block work platform where the injured person moved, the illuminance varied from 23 to 80 lux depending on the location. The accident occurred under low visibility, as the illumination was lower than the standard for passageways or general workplaces.

Preventive measures

- **Install facilities for attaching safety belts in advance**
 - When dismantling a T-block work platform, install the facility for attaching safety belts for dismantling both S-block and T-block work platforms in advance, and ensure that workers dismantling work platforms can always move and work while wearing a safety belt.
- **Install safety railings**
 - There is a risk of falling at the end of the work platform. If the facility for attaching safety belts has not been installed to dismantle the S block in advance, a safety railing should be installed to prevent falling until it is installed.
- **Ensure illuminance by maintaining lighting**
 - The work platform is a moving passageway corresponding to a general workplace during dismantling. To ensure visibility, maintain or install additional lighting facilities that meet the illuminance standard of 150 lux or more.