

What is a transporter?

Transporters are optimized for transporting large, heavy objects. Unlike stationary transporting and unloading equipment such as cranes, transporters can be relocated and are often used in workplaces where large, heavy objects are frequently transported. In particular, it is frequently used in shipbuilding workplaces that handle large, heavy objects (structures) such as ship blocks.

Types and structures

● General

	General transporter (T/P)	Module transporter (M/P)
Photo		
Driving speed	10~15 km/h	Up to about 5 km/h
Driver's seat	Two seats (front, back)	None
Driving method	Operated from the driver's seats	Operated by wired or wireless controllers
Structure	The operation and loading units are integrated	Each unit is connected to the power pack (operation unit) <linking two or more units>
Loading capacity	150 to 1,000 tons, depending on models	Varies depending on the number of units connected
Loading method	The transporter moves to the bottom of heavy objects (e.g., blocks) and loads the cargo by raising the loading table hydraulically.	

● Examples of safety devices



Emergency stop



Load detection



Headlight, taillight,
turn signals



Rearview mirror,
rear camera



Fire extinguishers,
emergency tools

Necessary Workers and Their Roles (example)

Type	Description	Equipment	Protective equipment
Driver	- Operates the transporter in the driver's seat and with wired/wireless controllers - Designated with the qualifications stipulated by each workplace ※ The Occupational Safety and Health Act does not separately stipulate a driver's qualifications.	Controllers for module transporters	Safety helmet, safety shoes, safety gloves, safety glasses, earplugs, etc.  Safety helmet, safety glasses Earplugs Safety vest, safety gloves Safety gaiter, safety shoes
Signaler (guide)	- Guides transporter operation (signal) - Signal regulations for each workplace, including radio and hand signals - Arranged around the machine to help drivers for safe operation - The primary and secondary signaler are placed at the front and rear. - The primary signaler should always be located at the front. - Two or more people per equipment ※ Reinforce measures to prevent accidents such as being caught between equipment and facilities or colliding with forklifts.	- Signaling equipment - Walkie-talkies, whistles, signal flags, etc. - Clothing: different colored vests, safety helmets, etc., to be distinguished from regular workers - Nighttime: glow-in-the-dark vest, glow-in-the-dark stick-on bicycles, light stick, flashlight, etc. - If necessary, vehicles (e.g., bicycles)	
Support worker	Installs or removes supports when loading and unloading blocks	Forklifts, skid loaders, etc.	



Signalers are placed at the front and rear when transporting a block.
(The location and number of signalers may vary depending on the shipyard.)

Work Procedure and Major Hazards (examples)

① Prepare a work plan → ② Prepare and check before work → ③ Check the objects to be loaded (e.g., blocks) → ④ Load → ⑤ Transport → ⑥ Unload

① Prepare a work plan

Harms/Hazards	Improvement measures	Relevant codes
• Unreasonable work schedule - Excessive workload, lack of drivers and signalers compared to the workload, unfavorable weather conditions, mixed work, etc.	• Check and adjust the work schedule - Identify workload, work environment, available equipment, and available workers before work.	Article 38-1 (2) (Work Plan for Unloading and Transporting Vehicles) and (11) (Work Plan for Handling Heavy Objects) of the Rules on Occupational Safety and Health Standards
• Inappropriate work plan	• Build a concrete work plan. - Block stacking diagrams with block size and weight - Transporter specifications - Work details and methods, operation routes, etc. - Placement of drivers and signalers - Safety measures against falling, tipping, and collision	



Large blocks are being transported using a transporter.





Work Procedure and Major Hazards (examples)

Guide for Safe
Work with
Transporters

② Prepare and check before work

Harms/Hazards	Improvement measures	Relevant codes
• Failure to check abnormal conditions of transporters - Tire damage/wear and air pressure abnormalities - Cylinder malfunction and hydraulic oil leak - Breakdown of braking system, steering system, etc. - Alarms, instrument panel abnormality - Rear (side) camera and radio operation, etc. • Risk of collision due to failure to take precautions against interferences with buildings, equipment, and loading blocks on the driving route. • Confusion is due to duplicated or unclear arrangements of workers	• Supervisors, drivers, and signalers inspect the transporter and, if abnormalities occur, stop using it and request repairs. - Abnormalities in braking systems, steering systems, unloading equipment, hydraulic systems, tires, headlights, taillights, turn signals, rear (side) cameras, radios, etc. • Check for interference on the driving route and take action before work. • Check the position of workers to prevent confusion due to duplicated arrangements.	Article 35-2 of the Rules on Occupational Safety and Health Standards (Inspection Before Work by Supervisors)
• Due to insufficient effort to deliver information, workers are unaware of the work details and harms/hazards.	• Before starting work, educate workers on the work details (procedures, movement routes, precautions) and safety precautions (protective equipment, checking for hazards) in the work plan through TBMs, etc.	Article 38-1 of the Rules on Occupational Safety and Health Standards (Preliminary Investigation and Preparation of Work Plans)
• Not wearing protective equipment or wearing it incorrectly - Risk of hearing loss due to not wearing earplugs - Risk of collision due to not wearing safety helmets, etc.	• Wear appropriate protective equipment for harms/hazards at work. - Basic protective equipment: safety helmet, safety glasses, safety shoes, earplugs, mask, gaiter - Signaler: safety vest, walkie-talkie, whistle, flashlight, light stick, glow-in-the-dark vest (at night), raincoat, and safety boots (when raining) - Driver: walkie-talkie	Articles 32 to 34 of the Rules on Occupational Safety and Health Standards (Provision of Protective Equipment and Exclusive Protective Equipment)
• Risk of musculoskeletal disorders when working with heavy objects such as supports	• Adequate warm-up exercises, such as stretching before work	Articles 656 to 666 of the Rules on Occupational Safety and Health Standards (Work Related to Musculoskeletal System Injuries)



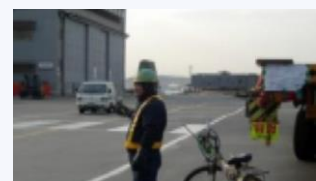
Check the tires



Check the main switch



Check the emergency switch



Traffic control



Work Procedure and Major Hazards (examples)

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Harms/Hazards	Improvement measures	Relevant codes
• Risk of tipping or falling due to poorly securing the cargo	• Check for any falling objects and that the cargo is secured correctly and welded.	
• Risk of collision with signalers and transporters due to protrusion at the bottom of the block	• Attach a caution sign to the lower protrusion and be aware of signalers when entering the bottom of the block. - Avoid moving under the block.	
• Damage to cables and hoses when entering the block without checking the location of welding cables and hoses	• When checking blocks, secure the road by removing obstacles on the access road, such as organizing surrounding cables and hoses.	Article 22 of the Rules on Occupational Safety and Health Standards (Installation of Passages)

*Article 38-1 (2) and (11) (Work Plan for Unloading and Transporting Vehicles, Work Plan for Handling Heavy Objects), Article 39 (Work Leader), and Article 40 (Signals) of the Rules on Occupational Safety and Health Standards applies to all hazards.



Check protrusions





Work Procedure and Major Hazards (examples)

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④ Load

Harms/Hazards	Improvement measures	Relevant codes
• Interference with surrounding facilities and blocks when entering the factory (shelter)	• Signaler: thoroughly check for interference (equipment, blocks, supports). Driver: drive slowly according to the signal.	
• Risk of crush and falling when the signaler deviates from the correct position or steps backward while signaling	• Signaler: Maintain a safe distance (more than 5 m) from the transporter. - Guide while visually checking the direction of movement. - Take fall preventive measures, such as installing safety railings in places with a risk of falling.	
• Risk of collapsing or tipping during transportation due to excessively installed supports and elevated center of gravity - Injuries due to fingers being pinched or falling when installing the support	• For safety, when installing supports: - Do not use handrails and work in unsafe positions. - Prohibit unsafe installations, such as stacking supports in multiple stages. - Prohibit arbitrary lifting or lowering by the driver. - Be sure to work with one support at a time.	
• Risk of collision with pedestrians or vehicles due to failure to attach warning signs such as a safety flag on the protrusions of the block	• Prevent collisions by attaching caution signs, such as safety flags, to the ends of blocks (at least 4 locations). - Install fluorescent or LED flags so they are visible at night.	
• Risk of weight tipping (overturning) due to unbalanced load or insufficient installation (fixing) of support.	• Minimize the center of gravity and left/right bias. Check the support's height and prohibit multi-level stacking. Secure it when necessary. - If applicable, drain rainwater accumulated on the block before transporting.	
• Risk of collision with workers organizing the supporters on the skid loader (or forklift) carrying the supporters.	• Prohibit workers from accessing the skid loader's (or forklift's) working radius and have the driver check the surroundings.	Article 172 of the Rules on Occupational Safety and Health Standards (Prevention of Contact)

*Article 38-1 (2) and (11) (Work Plan for Unloading and Transporting Vehicles, Work Plan for Handling Heavy Objects), Article 39 (Work Leader), and Article 40 (Signals) of the Rules on Occupational Safety and Health Standards applies to all hazards



Loading 1



Loading 2



Loaded and secured

⑤ Transport

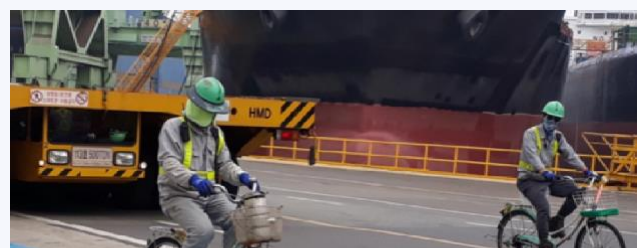


Harms/Hazards	Improvement measures	Relevant codes
Risk of the signaler colliding with the transporter due to not maintaining a safe distance	Maintain a safe distance from the signaler and transporter. Follow standards at each workplace - Front: 10~15 m between the signaler and equipment (block) (example) - Rear: 5~10 m between the signaler and equipment (block)	
Interference with the factory (shelter), surrounding loading blocks, and equipment	Signaler: Thoroughly check for surrounding interference in advance. Driver: Follow the signals and drive slowly.	
Risk of collision between equipment such as forklifts and signalers while moving	When driving, the signaler must control surrounding vehicles, and forklifts and vehicles must slow down and follow the signaler's control.	
Risk of the block tipping over due to speeding on curves, slopes, and uneven areas.	Drive slower than the speed limit on curves, slopes, and uneven areas.	Article 98 of the Rules on Occupational Safety and Health Standards (Designation of Speed Limits, etc.)
Risk of collision when driving without returning to standard mode after changing driving mode	Driver/Signaler: thoroughly check driving mode (wheel rotation) according to driving method	
Risk of cargo tipping over due to sudden stop while moving	No sudden stopping or sudden acceleration while driving the transporter	
(Wireless remote control) Unable to control module due to poor remote-control signal (sudden stop, etc.)	(Wireless remote control) Thoroughly check operating status and prevent confusion	

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Bicycle for signals



Guide when moving

Work Procedure and Major Hazards (examples)

⑥ Unload

Harms/Hazards	Improvement measures	Relevant codes
Risk of collision due to failure to check the left-right spacing and height between buildings (shelters), facilities such as cranes, and surrounding blocks	- Check the safety clearance at the top/left/right before entering a gate. *Follows standards for each workplace - When entering, maintain a distance of 200 mm or more between the block and the surroundings (example) - When stacking blocks, maintain a distance of at least 500 mm between blocks (consider that the blocks are pushed when unloaded from the transporter).	
Risk of pinching the hands when installing the support	- For safety, when installing supports: - Use handles and work in safe positions. - Do not allow the driver to arbitrarily lower the cargo. - Install one support at a time.	
Risk of collision or being caught when the signaler deviates from its correct position	Prevent the signaler from leaving its designated position. (Keep a safe distance from the hazardous area in case of the transporter is tipped over)	
Risk of falling when walking backward while guiding	- Implement fall preventive measures such as safety railings in places with a risk of falling. - Check for obstacles and openings when walking backward while guiding.	Article 42 of the Rules on Occupational Safety and Health Standards (Prevention of Falls)
Risk of collision with workers when installing supports with a skid loader (forklift)	Maintain a safe distance from the skid loader (forklift) and observe the surroundings.	
Risk of musculoskeletal injury and supporters tipping while moving (adjusting) the supporter manually.	Prohibit manual adjustment (use a skid loader or forklift).	
Risk of damaging the supports and the blocks tipping over due to ground settlement when an insufficient number of supporters are installed compared to the block weight	- Install an appropriate number of supports considering the safe load for each block weight. - Observe the standards for installing supporters	

*Article 38-1 (2) and (11) (Work Plan for Unloading and Transporting Vehicles, Work Plan for Handling Heavy Objects), Article 39 (Work Leader), and Article 40 (Signals) of the Rules on Occupational Safety and Health Standards applies to all hazards.



Unloading 1



Unloading 2



Secure the bottom



Block to be unloaded



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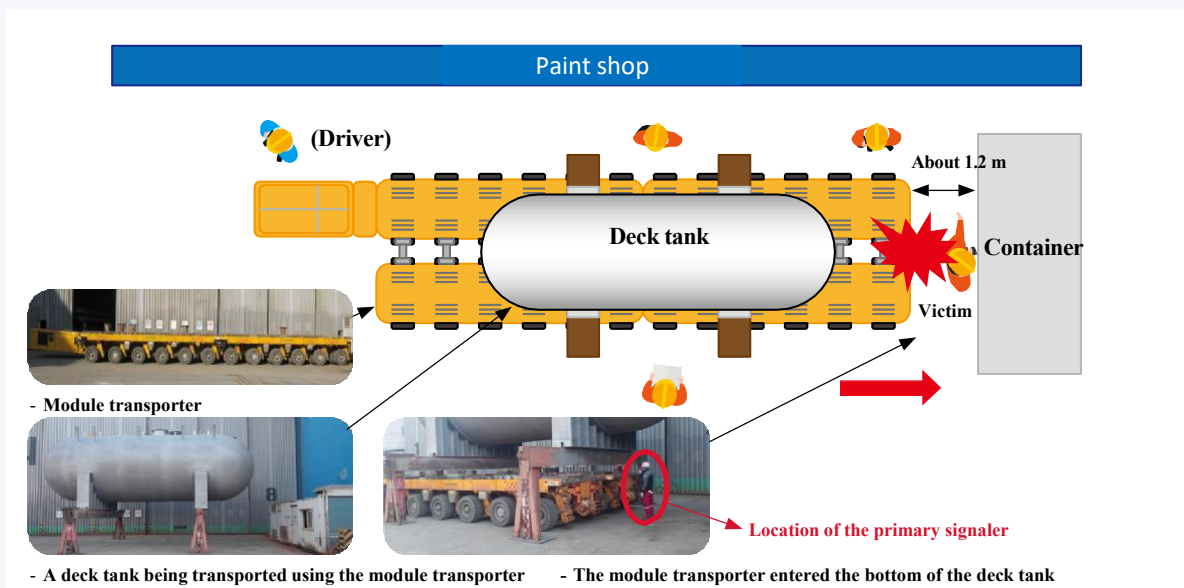


[Note] Work during nighttime (example)

- ✓ Working at night requires more attention, as accidents are more likely than during the day due to insufficient visibility and poor sense of distance.
- Ensure illumination by installing sufficient lighting in the workplace or passages (75 lux for passage, 150 lux or more for regular work)
- To help workers identify themselves at night, provide them with glow-in-the-dark vests, flashlights, light sticks, and bicycle warning lights.
- Check whether the transporter's headlights, taillights, etc. are operating normally and manage various equipment and loads to be easily identified by attaching luminous signs and LED indicators to the ends and protrusions of the load.

Outline

In front of the paint shop, five workers, including signalers, from a contractor, were operating a module transporter to transport a deck tank. The primary signaler got caught between the module transporter and the container.



Cause of the accident

- The module moved without a signal from the signaler.
 - The driver operated the module without a signal from the signaler.
- The signaler was placed in inappropriate positions.
 - The primary signaler stood at the front of the module, where there was a risk of collision or jamming. Instead, the primary signaler should have been moved to the side of the module after completing tasks such as checking the center and alignment of the module transporter at the front.
- The details of the work plan for handling heavy objects were inappropriate.
 - A work plan for handling heavy objects for the module transporter was prepared, but it did not include operating routes, work methods, or preventive measures against the risk of collision or being caught.
- The side emergency stop devices limited preventive measures against collisions in the front.
 - An emergency stop device was installed on both sides of the unit. However, it could have been activated only by manually pressing it. Therefore, collisions could not have been prevented because the device could not be activated immediately when the risk of collision with the signaler or any other objects was recognized from the front of the unit.

Preventive measures

- Drive module transporters after understanding signals from a signaler
 - Drivers must drive only after confirming a signal from the signaler to avoid collision.
- Change the position of signalers
 - A primary signaler must immediately move to the side where there is no risk of colliding with or getting caught by the module after checking the center and balance from the front of the module.
- Thoroughly prepare a work plan for handling heavy objects
 - A work plan for handling heavy objects must include measures to avoid collision or jamming together with the module transporter's operation route and work method.
- Install an emergency stop bar on the front of module transporters.
 - Install an emergency stop bar to stop the module transporter automatically when it comes into contact with the front signaler or any other objects.

