

Best practice: Seafastening on mobile offshore units

Working Together for Safety Recommendation 038E/2022



SfS
Samarbeid for Sikkerhet

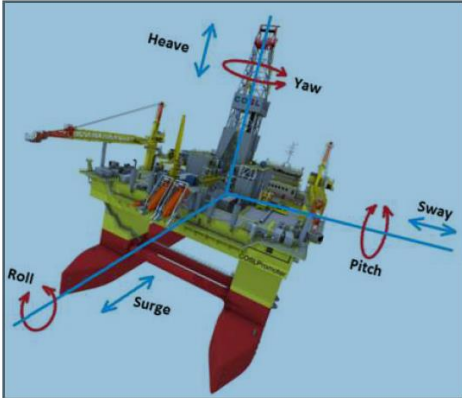
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1. Introduction

Unsecured equipment and cargo may move due to horizontal forces. These forces may be a result of roll, pitch, wind and horizontal acceleration/retardation in adverse weather conditions. Even on large mobile offshore units, such motion may arise quickly and unexpectedly. This may cause cargo to shift, resulting in damage to equipment and injuries to personnel.



Several undesirable incidents involving injuries caused by shifting cargo on mobile offshore units have been reported. SfS has therefore been requested to prepare a best practice recommendation for seafastening on such units. The recommendation builds on measures that have been suggested following accidents, and existing procedures available at some companies. Applicable regulations, standards and routines from the shipping industry, where good seafastening routines have been developed, are also included in this recommended practice.

The recommendation is not exhaustive, and the individual unit must assess which measures are best suited for the facility in question.

2. Purpose

The purpose of this recommendation is to:

- Ensure the planning, execution and completion of the seafastening of cargo and movables on board rigs / mobile units
- Reduce the risk of incidents occurring
- Increase knowledge within the area of seafastening
- Raise awareness of the necessity of possessing the relevant competence

3. Scope

Working Together for Safety's recommendations apply primarily to Norwegian offshore activities, but the individual company is also free to use this recommended practice in connection with activities outside the Norwegian Continental Shelf.

4. Changes from the previous version

Some minor corrections and some additions have been made in this revision. Several examples of recommended storage (pipes and dangerous cargo) and securing are included in the revised recommendation. In additions some linguistic improvements and corrections have been made.

5. Definitions

Mobile offshore unit: A mobile offshore unit is any floating mobile offshore unit, of any hull type, used in connection with activities undertaken by the subsea petroleum industry. Examples include drilling units, accommodation units, floating storage and offloading units (FSOs), floating production storage and offloading units (FPSOs), floating drilling production storage and offloading units (FDPSOs), and well intervention units (ref. the Norwegian Maritime Authority).

Temporary stowage of cargo: Temporary stowage of cargo refers to the stowage of all cargo that cannot be regarded as an integrated part of the mobile offshore unit. Equipment used in production and drilling operations (e.g. third-party equipment such as wireline and logging units) should be handled and secured as permanent equipment – e.g. with permanent welds, container locks, or the equivalent.

Cargo securing devices: All permanent and movable equipment used to secure cargo.

Deck plan: A plan which identifies the areas/locations that shall be used for stowage, for both temporary and longer-term storage of equipment, and associated weight limits.

6. Rules and recommendations

Section 3 of the Framework Regulations

Regulations No. 856 of 4 September 1987 - the Construction Regulations

Regulations concerning risk analysis for mobile offshore units (the Risk Analysis Regulations)

Regulations of 17 December 1986 No. 2318 - the Living Quarters Regulations

Regulations of 20 December 1991 No. 878 concerning stability, watertight subdivision and watertight/weathertight closing means on mobile offshore units (the Stability Regulations)

Regulations of 4 December 2015 No. 1392 - the Towing Regulations

Regulations of 4 September 1987 No. 859 concerning protective, environmental, and safety measures on mobile offshore units (the Protective, Environmental and Safety Regulations)

NORSOK R-003 Safe use of lifting equipment

IMO Res.A.714 Code of safe practice for cargo stowage and securing

Offshore Norway Guideline 116: Recommended guidelines for packing, securing and transport, as well as user inspection of load containers.

GOMO chapters 3, 5 and 9

DNV-ST-N001 Marine operations and marine warranty

7. Regulations

7.1 *Norwegian regulations*

Section 3 of the Framework Regulations states that relevant technical requirements given in the Norwegian Maritime Authority's regulations for mobile offshore units may be used. However, this also means that some of the Norwegian Maritime Authority's seafastening requirements are not directly required, since these are not regarded as technical requirements.

For Norwegian units: The most important 'seafastening requirement' included in the Norwegian Maritime Authority's rules is found in section 12 of the Regulations concerning protective, environmental and safety measures on mobile offshore units: "All pipes, bits, spare parts, steel plates and profiles, etc., shall be stored in a suitable and proper manner, and secured to withstand a heeling corresponding to the maximum heeling angle which the unit may have at the assumed damage as defined in section 21 of the Stability Regulations (17 degrees)."

The Stability Regulations also set requirements regarding the stability information to be included in the operations manual. The Towing Regulations also include seafastening requirements.

Section 507 of the Norwegian Maritime Code regarding mobile offshore units registered in Norway specifies which of the Code's other requirements apply to such units. Section 131 states that "Before a voyage begins the master shall ensure that the ship is seaworthy, including that it is sufficiently equipped, manned and supplied with provisions and in proper condition for the reception, carriage and preservation of the cargo." Section 507 states that "What is laid down regarding the master and the first mate applies correspondingly to the person with the highest authority on board the unit and to his or her permanent deputy." This legal basis may therefore also be used as a seafastening requirement.

7.2 *International legislation and standards*

ISM Code: Internationally, this applies to self-propelled drilling units.

For units registered in Norway, this applies to all mobile offshore units.

SOLAS chapter II-1, rule 4 requires a "cargo securing manual", but this only applies to ships if the flag state does not require such a manual for mobile offshore units specifically.

IMO Res. A.714 concerns "safe practice for cargo stowage and securing".

GOMO sets competence requirements for onboard personnel (chapter 5) and cargo handling (chapter 9).

8. Good Practice – Seafastening

With regard to seafastening on mobile offshore units, it is important to remember that such units may have very different characteristics; they may be anchored or use DP, have differing heeling curves / undulations, and vary in how their stowage areas are designed. Some units feature wooden decks in these areas, while others have steel decks. These various conditions must be emphasised and considered when assessing seafastening needs.

All stowage areas should feature ample brackets/eyes for use with securing equipment. Chests, containers etc. should have lids that ensure that contents are safely contained.

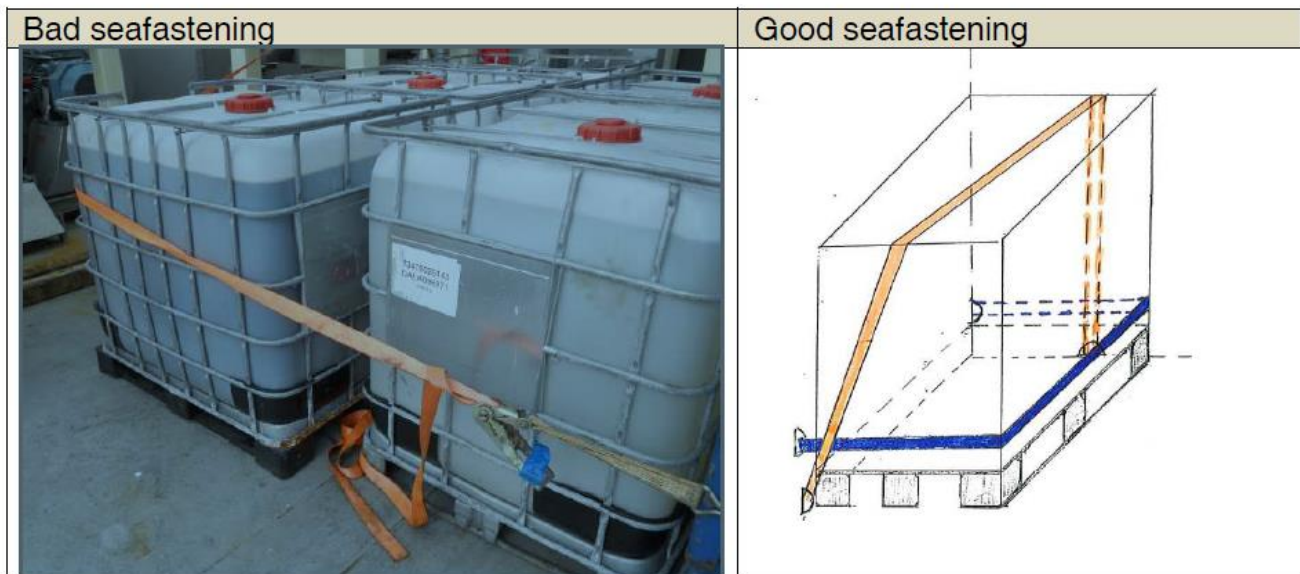


Figure 1: Cargo items should be secured to permanent eyes, not only to each other

Permanent steel bumpers are recommended between cargo areas and escape routes, emergency exits and hatchways, and cargo should be positioned as close to the bumpers as possible.



Figure 2: Cargo positioned as close to bumper as possible

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Stowage areas should be kept clean and tidy, with securing equipment stored in boxes or similar close to the cargo areas.

Slippery steel decks should be avoided, unless they have solid bumpers/frames in all directions. Landing mats are recommended in both permanent and temporary storage locations. Movable mats must have holes to avoid a vacuum. Alternatively, high-friction paint or other types of anti-slip coating may be used, or a full or partial wooden deck. Note the increased risk of tripping where partial wooden decks are used.




Permanent mats	Movable mats	Storage of movable mats
 A photograph showing a permanent landing mat on a steel deck. The mat is yellow with a red border and is laid out on a green-painted steel surface. It is surrounded by industrial equipment and structures.	 A photograph showing a movable landing mat. It is a blue metal frame with a green mat inside, sitting on a green-painted steel deck. The mat has holes in it to prevent vacuum.	 A photograph showing the storage of movable mats. A yellow metal frame holds several stacks of red, perforated mats. The mats are stacked on a green-painted steel deck.

Figure 3: Permanent and movable landing mats

Pipe and casing are usually stored in dedicated areas. Check that the total weight, and point loads, do not exceed the capacity of the tyre; especially when non-dedicated areas are used. Use movable poles to adapt storage area to loads. Pipes and casing are landed on wooden planks. Use wooden wedges in addition to chain to secure pipe and casing from rolling. The chain must be dimensioned both to stopping rolling and prevent movements in the longitudinal direction.



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Lifting equipment which has been used to secure cargo should not subsequently be used in lifting operations (due to unknown loads and therefore possible damage). Chain hooks should only be secured to appropriate eyes/shackles, and not to the chain itself (see Figure 4).

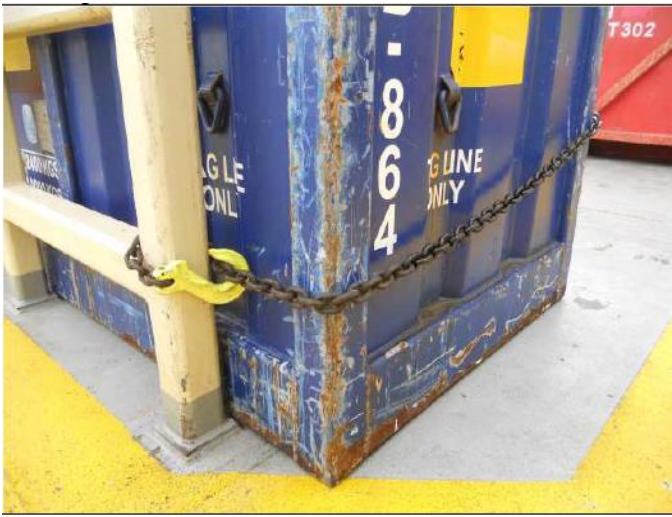

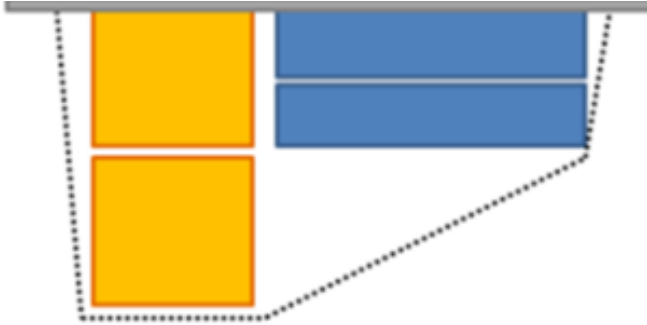
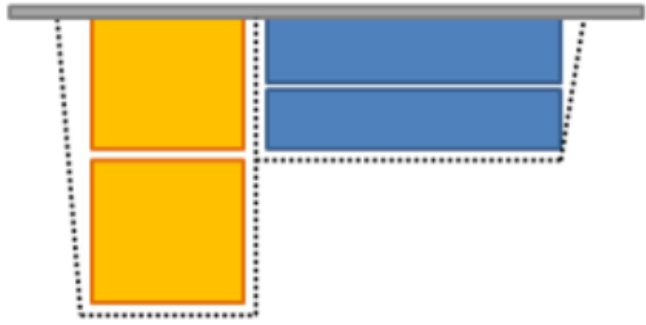
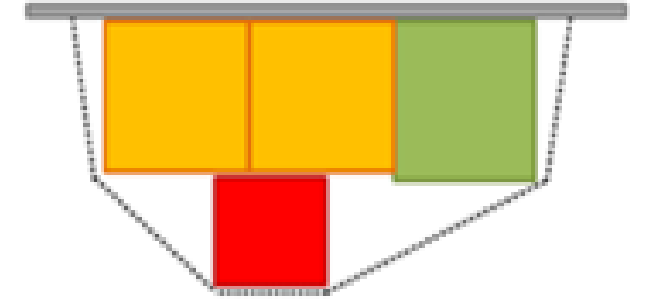

Wrong use of chain hook	Correct use of wire lashing strap
	
	
	

Figure 4: Incorrect and correct use of chains

Containers/equipment used for production and drilling operations (e.g. 3rd party equipment such as wireline and logging units) should be treated and secured as permanent equipment - for example by welding, container locks or similar. See figure 5.




Welded support for shorter periods	Welding with additional support for higher vertical forces	Container lock (ISO lock)
		

Figure 5: Securing of containers

Containers or other items which are regarded as temporary but moved often (e.g. waste containers, gas bottles, etc.) should have a permanent location and be able to be secured with a minimum of extra securing work (use of frame, container lock, etc.).

Freestanding load shall be secured with minimum four lashings evenly distributed on both sides of the load and angled 30 - 60 degrees (see figure 6). The sum of the lashings maximum load capacity (MSL) shall be at least 2 x weight of the load. This to ensure that the lashings will be able to secure the load in all directions. Good friction between the load and the deck must be secured.

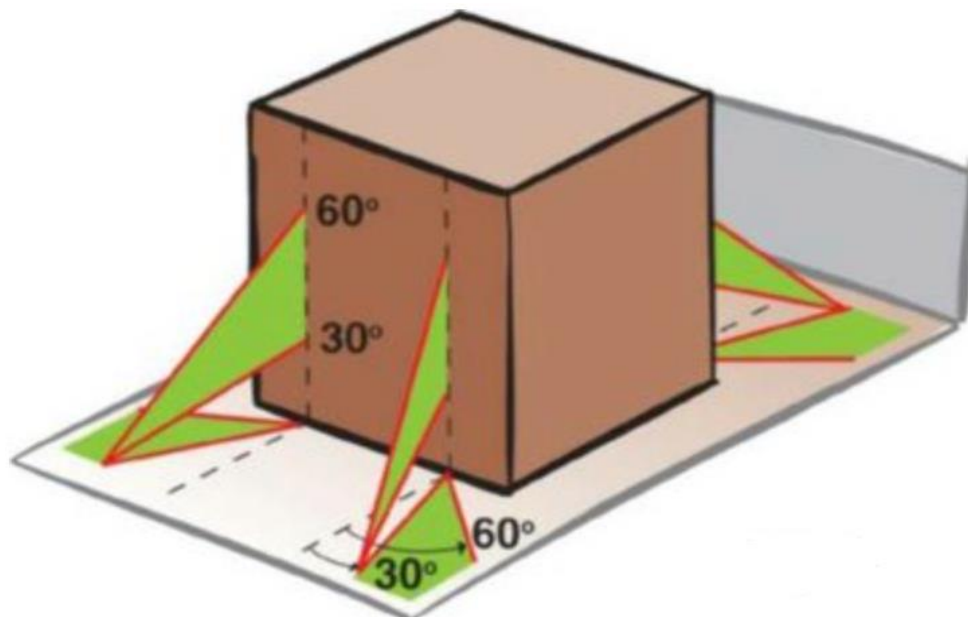


Figure 6 - Securing free load example: A 10-ton unit shall have 4 lashings; each with an MSL of 5 tons, distributed as shown above.

All securing equipment should be visually inspected prior to use, and any devices showing signs of damage (deformed chain links, buckled wires, torn fibre straps, etc.) should be disposed of. The establishment of disposal criteria (equivalent to that for lifting equipment) should be considered.

According to Norwegian regulations ([regulations on the handling of flammable, reactive and pressurized substances as well as equipment and facilities used for handling](#)), hazardous cargo (explosives, chemicals, radioactive substances, etc.) should not be stowed near other substances they may react with (cargo segregation principle). The regulation is further detailed in [dsb's themeguide on storage of dangerous goods](#).

Remember that indoor items must also be secured:

- Office chairs should not have wheels
- Trolleys should feature wheels that can be locked
- Other equipment can be screwed/bolted in place, or secured using baggage straps / double-sided tape.

Always ensure that escape routes cannot be blocked by loose objects/equipment.

8.1 Responsibilities and roles:

It is the operating company (shipowner) that has the overall responsibility for arranging and monitoring that the securing of equipment is sound at all times. The requirements in the regulations to handle a minimum of 17 degrees of heeling in any direction apply to all equipment on board.

The responsible company should establish, implement and further develop a safety management system - including the preparation of a manual for securing cargo. For Norwegian-flagged ships and movable installations, this is a requirement in the Maritime Act. A plan showing where different types of loads are to be placed should be drawn up for each facility.

The master / platform manager has the overall authority and responsibility for making decisions regarding safety on board mobile offshore units. In addition, everyone on board has a responsibility to help ensure that the safety system is followed on board. Remember that this means that everyone must participate in securing not only containers, but also personal effects on board.









A practical way of delegating responsibility is to allocate responsibility for seafastening within the relevant area to the area responsible (as defined in the work permit system).


8.2 *Planning and good routines:*

It is important to monitor and regularly check all cargo to prevent items from shifting and potentially causing accidents. A dedicated adverse weather policy, which clearly defines what shall be done to prevent cargo from shifting in adverse weather conditions, should also be prepared. Unit-specific guidelines regarding what constitutes adverse weather, and what measures should be implemented in the event of the various criteria, should be developed in addition, e.g. in the event of winds of over 40 knots: No crane operations, restrict underhull access, restrict outdoor areas for usual access, etc. Routines for inspections following adverse weather must also be included.

In addition to securing cargo against undesirable shifting at sea, cargo should also be secured so that it does not block escape routes and means of evacuation in the event of collision/allision, running aground or failure of the ballast system.

Appendix A: Examples of hazardous conditions

Image	Element	Potential hazard	Measures
	Insufficient risk assessment prior to starting the work	All hazards that may occur during execution of the work not considered	All parties to be involved in the work must take part in the risk assessment
	Insufficient knowledge of cargo stowage and seafastening	Injuries to personnel Damage to equipment False sense of safety	Training in correct use of onboard securing equipment (what to use when)
	Low friction on deck Wet/slippery deck Steel on steel stowage Grease and ice	Sliding/shifting cargo Injuries to personnel Damage to equipment	Consider use of high-friction paint in the relevant area Wait for a break in the weather before commencing the work
	Adverse weather	Shifting of cargo Injuries to personnel Damage to equipment Insufficient/poor seafastening Unit instability	Check all temporary cargo and seafastening prior to bad weather Establish and adhere to adverse weather procedure
	Change in the unit's centre of gravity	Tilting/listing Injuries to personnel Damage to equipment	Check placement of load inside containers Seafastening must maintain the cargo's centre of gravity
	Rooms/areas where flammable goods are stored Fire hydrants	Weakening of securing devices Blocked fire hydrants	Use chain and wire slings in these areas* Check that fire hydrants are not blocked by cargo
	Blocking of escape routes	Integrity and safety of unit Injuries to personnel	Keep escape routes clear!
	Sharp edges on secured cargo	Injuries to personnel Damage to equipment	Protect lashing straps against sharp edges

	Incorrect use of fastening points and bumpers	Integrity of unit Damage to equipment	Only use permanent fastening points to secure cargo
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* If a fire in an area leads to a weakening of the securing (barrier) which could cause an escalation or danger in the event of overturning, flammable securing devices means cannot be used.

Appendix B: Overview of securing devices

Cargo	Weight	Recommended securing equipment
Small items such as pallets, etc.	< 1-2 tonnes	Fibre straps
Medium-weight cargo	2-10 tonnes	Chain and wire securing devices
Heavy cargo	> 10 tonnes	Consider welding of permanent securing points. Secure against bumpers or other cargo
Pipes		Secure with dunnage and wooden wedges or in appropriate secured stacking racks
Gas bottles		Gas bottles which are not stored in bottle racks must be secured with chain/wire. Loose bottle racks must also be secured

The basic rule of thumbs for securing loads are as follows:

Freestanding load shall be secured with minimum four lashings evenly distributed on both sides of the load and angled 30 - 60 degrees (see figure 6). The sum of the lashings maximum load capacity (MSL) shall be at least 2 x weight of the load. This to ensure that the lashings will be able to secure the load in all directions. Good friction between the load and the deck must be secured.

TO AVOID INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT: RESPECT BARRIERS, ALWAYS REMEMBER TO DOUBLE-CHECK ALL SEAFASTENING, AND REPORT THE STATUS TO THE CONTROL ROOM AFTER CARGO OPERATIONS.