BEST PRACTICE MOORING
1st Version
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ABOUT THE PLATFORM ZERO INCIDENTS

The Platform Zero Incidents (PZI) is an initiative of the inland shipping industry. As the name suggests, PZI aims at 0 (zero) accidents in the inland shipping industry. PZI wants to achieve this by:

- Being a Platform in which near misses and incidents are shared among its members.
- Preventing repetition of near misses/incidents by developing best practices and stimulating their use, based on research and analysis of near-miss/incident (trends).
- Building lasting relationships with stakeholders.
- Raising awareness and responsibility for safety within the industry.
- Being the center of expertise in the field of preventing safety and environmental incidents in the inland shipping industry.

This publication helps to achieve PZI's mission and vision. The document has been developed by and for inland navigation.

It can be used for various purposes, such as:

- Reference for crew members and fleet managers.
- Training of crew members.
- Input for safety meetings on board.
- Lesson material for educational institutions.
- As a basis for future discussions on the subject of mooring.
- As a basis for procedures and work instructions.

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Worksession expertgroup mooring
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1. INTRODUCTION

1.1. Why this document?

The mooring of inland shipping is one of the most dangerous tasks, in particular for the deck crew. Accidents occur regularly with serious consequences.

It is therefore important to be aware of these hazards and to take measures to minimize the risk of accidents as much as possible.

This Best Practice Guidance (BPG) of the Platform Zero Incidents, provides you with knowledge to make mooring as safe as possible.

The document is drafted/developed, like all Platform Zero Incidents documents, by inland shipping experts, namely: Fleet Managers, QHSSE-Managers, Ship Owners and Captains. In addition, the publication of this publication takes into account the applicable laws and regulations, such as: RPR, ROSR and ADN.

1.2. How to use this document?

It is certainly not the intention that this document describes the only way of working, because each situation and each barge is different.

However, it can help you as an inland professional, to make the best decisions under various circumstances.

You can use the document as a reference, but certainly also for familiarization and/or training your crew members. In addition, you can use parts of the document during a safety meeting with your crew.

It can increase safety awareness on board, thus avoiding the risk of accidents.

If you have any suggestions to further improve this document, please contact Platform Zero Incidents.

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2. BASIC SAFETY

As described in the previous chapter, mooring is one of the most dangerous proceedings on board. In particular, the deck crew is exposed to different hazards. There are various measures you can take to ensure that the activity is carried out safely. This chapter deals with basic safety, safety that actually applies to all situations you may encounter during the mooring process.

2.1. Safe working environment
A well-stored and cleaned working environment is the basis for safety on board. During the mooring proceedings a messy working environment can lead to tripping, slipping and falling with inconvenient consequences. Therefore the following matters are important:

- Keep the working environment clean and tidy.
- Reduce the risk of slipping by applying anti-slip paint to walkways.
- If possible, have railings to lower the chance of falling over board.
- Provide a well-lit working environment.
- Mark the places where there's a risk of tripping.

2.2. Communication and safety culture
Proper communication between you and your crew members is essential to create a safe working environment. Many accidents occur due to inadequate or unclear communication between crew members.

Therefore, during mooring, make good arrangements regarding mutual communication, such as some standard gestures, see image on the right. If possible, keep eye contact with each other! The use of communication tools, such as a portable phone, is a very effective way of communicating with each other.

Only start with proceedings when you are positive that the crew member understand you and of course that you understand your crew member! Additionally, keep calm while you handle the activities in a controlled manner. People running on board can cause unrest and can be a breeding ground for accidents.

…… Take time to execute the activities safely!
When you see your crew performing unsafe operations, stop work if necessary so that no accidents can occur. Or address crew in a quiet moment against unsafe behavior. A good safety culture is characterized by the fact that crew members can also address the captain on unsafe behavior …… Something to think about!

**Good use of mariphone**

Use of a mariphone promotes effective communication. A number of points for good use:

- Do a radio check before you go to work! The battery may be (almost) empty or the device may be malfunctioning.
- Use an explosion-proof mariphone when transporting dangerous goods.
- Wear a belt that holds the mariphone, many devices have fallen overboard!

2.3. Training and education

A well-trained crew makes a significant contribution to efficient and safe work. Not all crew members immediately have all the necessary skills at the start of their career. It is therefore good to occasionally train/practice or refresh skills together, in between all the busy work. Take a positive stance here; do an exercise as example, give constructive criticism and give compliments if the crew member does the exercise properly! When a crew member masters a skill, his confidence increases and has a positive effect on the quality of the work and the atmosphere on board.

A crew member is practicing throwing a rope around a bollard.
2.4. Personal Protective Equipment (PPE)
It is important that there is sufficient, certified and approved PPE available on board for you and your crew. Keep in mind that wearing or using PPEs are by nature vulnerable measures to prevent accidents, because a proper working of the PPE depends on the crew’s discipline and skill. The crew member also has to deal with stress and fatigue, which may increase the risk of an accident.

...... Wearing a life jacket may prevent you or your crew members from drowning. However, it does not prevent you from falling into the water!
The life jacket is therefore really a final life-saving appliance and should never replace any measures, such as applying anti-slip paint to walkways and working behind the rail that could prevent falling overboard. The following table lists the most important personal protective tools for the mooring process.

<table>
<thead>
<tr>
<th>Type of PPE</th>
<th>Reduces the chance of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life jacket</td>
<td>drowning after falling overboard if the life jacket is</td>
</tr>
<tr>
<td></td>
<td>worn properly!</td>
</tr>
<tr>
<td>Safety shoes with:</td>
<td>- slipping/falling</td>
</tr>
<tr>
<td></td>
<td>- injury to the feet by clenching (see incident: a</td>
</tr>
<tr>
<td></td>
<td>clenched foot)</td>
</tr>
<tr>
<td></td>
<td>Good profile</td>
</tr>
<tr>
<td></td>
<td>- Good profile</td>
</tr>
<tr>
<td></td>
<td>- Steel ‘noses’</td>
</tr>
<tr>
<td></td>
<td>- Good fit</td>
</tr>
<tr>
<td>Safety gloves</td>
<td>- injuries to the hands by, for example, broken wires on</td>
</tr>
<tr>
<td></td>
<td>ropes</td>
</tr>
<tr>
<td></td>
<td>- injury to hands by abrasion caused by ropes</td>
</tr>
<tr>
<td></td>
<td>- clenching (in the last moment)</td>
</tr>
<tr>
<td>Safety helmet</td>
<td>- head injury by falling objects (especially during</td>
</tr>
<tr>
<td></td>
<td>mooring, along a (sea) ship)</td>
</tr>
<tr>
<td></td>
<td>- head injury after loosening/breaking material (e.g.</td>
</tr>
<tr>
<td></td>
<td>ropes, lines, wires, fairleads etc.)</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>- injury to the eyes, for example during lowering of the</td>
</tr>
<tr>
<td></td>
<td>anchor or by a released product</td>
</tr>
<tr>
<td>Reflective clothing</td>
<td>- invisibility to other crew members and/or</td>
</tr>
<tr>
<td></td>
<td>third parties</td>
</tr>
<tr>
<td>Overall</td>
<td>- to get caught in anything</td>
</tr>
<tr>
<td></td>
<td>- coming into contact with product</td>
</tr>
</tbody>
</table>
2.5. Last Minute Risk Assessment (LMRA)

Of course, not all situations and circumstances can be written in a document. With good and conscious workmanship, most accidents can be prevented. Nevertheless, the so-called last minute risk assessment is a useful tool for estimating risks. Below is a brief explanation of the LMRA.

Before starting work, for example, mooring at a lock or connecting to a terminal, perform an LMRA:

- **Rate the risk**
  What could still go wrong / what dangers do you see?
- **Think!**
  What is the cause of this?
- **Take action!**
  What are you going to do to avoid the dangers?

### Explanation LMRA

1. **Assessing the risks**
What risks are still involved in carrying out the work, despite all precautions?

Take care of environmental hazards, such as extreme current, weather conditions (fog, slipperiness, wind), (unusual) changes to a loading/unloading installation (badly accessible or broken facilities such as bollards and stairs) and/or a crew member who didn’t have enough sleep or does not feel fit.

Ask yourself what can happen to you during the execution of the task. What is the potential effect and what are the odds that this effect occurs? Do not start work when the risks in your opinion are not acceptable!

2. **Determining the measures**
What measures can be taken to eliminate the risks still present or make them acceptable.

3. **Implementing the measures**
Take the steps necessary to remove any risks or to make them acceptable. Make sure that the work can be executed safely. If necessary, ask for help to ensure a safe task performance.
3. USE AND MAINTENANCE OF MOORING EQUIPMENT

There are various materials that you use during mooring, such as mooring lines, winches, anchors, fairleads, bollards and spuds. To be able to moor a barge well and safely, it is important that you know the properties and operation of these materials properly. In addition to these features, this chapter will further address the legal requirements, maintenance and controls.

3.1. Legal requirements

In general, each inland vessel of more than 20 meters must comply with the ROSR. These barges should be equipped with the so-called certificate of research (CvO). The certificate describes how to meet the requirements (construction and crew) from the ROSR. This includes the mooring equipment, as described in this chapter. In the future, the legal requirements that apply will be discussed per type of mooring equipment.

3.2. Properties of material

3.2.1. Ropes and lines

A certificate of all ropes and lines must be on board. Ropes and lines consist of roughly 2 different types of materials. The following table describes these, with their respective properties.

<table>
<thead>
<tr>
<th>Material type</th>
<th>Elasticity</th>
<th>MBS</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Low</td>
<td>High</td>
<td>Heavier compared to synthetic materials</td>
</tr>
<tr>
<td>Synthetic</td>
<td>Medium/High</td>
<td>Lower than steel, depending on the type of synthetic material.</td>
<td>Lighter in use than steel wires</td>
</tr>
</tbody>
</table>

**Explanation:**

Elasticity: The higher the elasticity in a mooring line, the more power is built in the entire outstanding line. When the line snaps back or breaks, a medium/high elasticity line will cause the wire to bounce as an elastic. A steel wire which is low or not elastic when breaking will rather "drop down" and thus cause less hazard. Both slipping steel wires and synthetic wires are life-threatening!

A steel wire does not give a "warning" (sound) for breaking and steel wires are harder to put under tension.

MBS - Minimum Breaking Strength: A value given by the supplier (in kilonewtons) for new dry mooring lines. The value is determined on the basis of tests with selection of the same lines. The lowest tension at which the wire is broken is the minimum breaking strength.

There are various types of synthetic materials, such as polyester and polypropylene. Each of these materials has specific properties with respect to, for example: elasticity, minimum breaking strength, chemical resistance, UV light resistance, melting point and weight.
There are also various ropes and lines on the market, which consist of a combination of the mentioned materials. It is important to familiarize yourself with the characteristics of the material, the suitability for your type of work and the requirements mentioned in the certificate of research.

For legislation on hawsers, see, among other things, the ROSR (Article 10.02.2).

…… Always think carefully when choosing wires and ropes when it comes to minimum breaking strength. If necessary choose stronger than regulative!
3.2.2. Winches

A winch is a handy tool to get strings on tension. On larger ships, winches are mainly used because the thicker ropes are difficult to get on tension by hand. However, working with winches requires attention. Especially because many forces are in play, which are not visible to the eye.

Therefore, when using a winch, always be careful for your own and for other people's safety. When the rope is tightened, everything must be carefully monitored, with the following questions being asked:

- Does the rope remain well behind the bollards?
- If I put it on tension, can I not damage anything?
- Am I and others safe if the rope breaks?

For legislation on winches, see, among other things, the ROSR (Article 11.11). The following overview describes various issues.

### Considerations when using winches

**Operation/Use:**
- Every winch is different, one works with a handle, the other with a remote control, the one has a split drum and the other a fairlead etc. It is therefore important that you know how the winch works before it is operated.
- The rope of the winch must be on a safe ‘route’ for the crew. The rope should be secured well under the bollard pins, so that it can’t slip. A rope should be outward as much as possible, in case of a break the crew is in less danger.
- Too many ties on the second split drum can lead to jamming of the rope. This can no longer be loosened.
- After use, the winch must always be put off work! The winch is disconnected and in an emergency or in case of power failure, only the brake must be released to loosen the rope.

**Pull/ Breaking strength:** The rope can break when the winch pulls tighter than the rope can have. An example:

The winch has a pull strength of 10,000 kg and the rope has a breaking strength of 8,000 kg. The rope can break before the maximum pull strength of the winch has been reached.

Also, the breaking strength of the rope may be greater than the tensile strength of the winch. This situation does not involve any hazards because the rope will not break at the maximum tensile strength of the winch. It is important to know the properties (tensile strength / breaking force) of the material.

When this information is unknown, it must be played safely, as follows: **FIXED = FIXED** or **TIGHT = TIGHT**.

**The mooring construction:** The mooring construction (the construction at which to moor) or moor location must always be assessed. Are the bollards on shore not looking very reliable? Then do not pull too hard!
3.2.3. Fairleads and bollards
Fairleads and bollards, among other things, should ‘guide’ the mooringlines towards mooring services ashore.

Fairleads
Breaking fairleads have led to various near misses and accidents in the past. The fairleads are usually mounted separately on the barge’s hull. The fairleads have to deal with great powers from the mooringlines they guide. When these forces are too strong, the fairleads can break. Both the loose fairleads and the slipping mooringline, can lead to very serious injuries or even be fatal.

In practice, fairleads are welded to the barge’s construction for safety reasons. This measure reduces the risk of breakdown drastically, but is still not comparable to the strength of the bollard construction.

Safe ‘aiming’
When using fairleads, the forces should always be led in a safe direction if possible.

In the case of the examples on the left, the fairlead will fly to the "safe" side in case of breaking.

A loose fairlead is by definition never safe, but if it loosens towards the water, it’s less likely that the fairlead strikes a person.

Broken fairlead
A crew member was injured because a fairlead broke off and because of that a rope under tension hit his upper body. The broken fairlead lay about 70 meters further on the deck of an adjoining ship.

Also see Appendix 01: Safety Alert: Fairleads
**Bollards**

Bollards are usually firmly anchored in the construction of the barge. As a result, the strength of the mooring lines is better divided and the chance of breaking the bollard is very small. A delicate part of the bollards are the bollard pins (or bollard pens).

When using the bollard for wire guiding, make sure that the bollard pins are in the correct position so that the wire can’t slip or that all tension is on the pin (if necessary, an additional stroke around the bollard).

If they break under the force, they can cause serious consequences for the crew. That’s why:

****** Never straighten a twisted bollard pin. The pin loses its strength and can break loose with severe consequences for the crew. ******

Also check the condition of the bollards regularly, see also §3.4 Maintenance and controls.

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### False knot

When tying a rope around the bollard, there is a risk that the rope will get stuck to the bollard. Entrapment of ropes may cause **breakage** or the fact that they can’t be loosened. By tying a so-called false knot this is prevented and the forces are also better divided.

The manner in which the false knot is placed around the bollard will determine whether the rope goes up or down.

---

The rope almost slips off from the bolder and also blocks a whip on the left bollard.

The rope is secured on the right bollard and the whips on the left bollard remain free from entrapment.

The rope going out is up and causes entrapment in this example.

The rope going out is down and causes entrapment in this example.

It may also be that in a lock or tide the rope is first raised and then comes down or vice versa. Keep in mind when tying the rope! **Always try to avoid entrapment!**
3.2.4. Anchors
Anchors are used in places where normal mooring is not possible. Important is that the anchors have enough weight so that the barge remains in place. In addition, the anchors must be provided with sufficient chain, see also § 5.1 Anchoring.

...... Wear safety goggles when anchoring. It prevents that you get loose particles in your eyes!

For legislation on anchors, see, among other things, the ROSR (Article 10.01).

3.2.5. Spud poles
A spud pole is a pole that descends under the barge, it can be both fixed and telescopic shape.

The spud pole gets stuck in the bottom of the waterway, the barge is anchored to the bottom. In regulations it has been decided that mooring with spud poles equal to anchoring.

A spud pole must be suitable for the dimensions (length, width, draft), tonnage and weight of the barge.

3.3. Use
A good use of the mooring equipment extends not only the life span, but also reduces the likelihood of accidents. In addition to a clean and tidy working environment (see § 2.2 Safe working environment), a few points are mentioned below.

⚠️ Store mooring wires or ropes in a wire-container or in a place where they cannot damage and from which they can easily be veered.
⚠️ Cover the wire-container with a cover for protection against the sun and frost.
⚠️ Check before commencement of work if the location to be used is free from unwanted materials.
⚠️ Prepare ropes and threads without loops due to risk of clenching (see photo on the right).
⚠️ An important danger of working with wires or ropes is the rebound of this when breaking or sudden loosening of the wire or hawser, for example if the rope is tied around a bollard or fairlead.

When a rope breaks, an huge power comes free, that could lead to life-threatening situations. A rope will always kick back in the direction of where it is from, to the danger zone or snap back zone. **Stay out of the danger zone!** The image on the left is an example of the danger zone marked with the red triangle. However, every situation is different, this also means the danger zone is different each time. It is therefore important per situation to estimate where the danger zone is.
……. **Warn people when they are in danger zone of a rope and have no reason to be there!**

- When using the fairleads, if possible, aim the power away from the barge.
- When using a winch, turn the winch connection off (disengage) as soon as the barge is moored.

### 3.4. Maintenance and controls

Doing good maintenance and carrying out regular checks extends the life of the materials and reduces the risk of accidents. Some points of attention:

- Check the supplier's instructions when determining the frequency of maintenance and service.
- Regularly carry out visual checks on the condition of the mooring equipment. Please note:
  - State of fairleads and bollards (rusting, bollard pins, etc.);
  - Wearing and damaging (kinking and broken wires) of the ropes and wires have a negative impact on breaking strength. Replace them if necessary;
  - Check for winches:
    - the thickness of brake shoes;
    - Lubrication;
    - Rusting;
    - If the rope has been coiled properly around the drum.
4. MOORING AND UNMOORING

A well-moored barge can withstand forces that can cause the barge to move out of position (purpose: backward, forward and lateral displacement of the barge). The following (combination of) forces are capable of that:

- Wind
- Tide
- Current
- Suction by passing ships
- Waves and wave motion
- Change in draft and location of the barge
- Ice

These forces are constantly moving and are rarely the same during the period when the barge is moored. It is therefore important to keep an eye on the changing circumstances throughout the time the barge is moored.

.......... mooring a barge is just as important as keeping the barge well moored!

<table>
<thead>
<tr>
<th>Points of attention during (un)mooring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a throwing line in case of long ropes.</td>
</tr>
<tr>
<td>Do not put unnecessary pressure on your crew, for example, take into account that a rope is not thrown on a bollard at once.</td>
</tr>
<tr>
<td>With height differences bigger than 1 meter, only execute activities when there is someone at the mooring location to take the rope.</td>
</tr>
<tr>
<td>In case the distance between mooring location and barge is larger than 0.5 meter, stay behind the railing.</td>
</tr>
<tr>
<td>Do not stand on bollard or on the railing, they are not intended for this purpose!</td>
</tr>
<tr>
<td>Do not stop the ship on the bollard. If necessary anyway, keep sufficient distance to the bollard to prevent getting stuck.</td>
</tr>
<tr>
<td>Use ladders or gangways to get safely from or onboard (See also Appendix 02: Safety Flash: Ladders and Stairs). If possible, use the rowers.</td>
</tr>
<tr>
<td>Do not walk on mooring posts or fender structures when there is no railing. Keep in mind that these places can be slippery.</td>
</tr>
<tr>
<td>Drop your materials when you are outside the railing and are bound to lose your balance. For example when moving the fender.</td>
</tr>
<tr>
<td>Be alert during cold weather / winter conditions (See also Appendix 03: Safety Alert: Cold Weather).</td>
</tr>
</tbody>
</table>
4.1. Mooring preparation
A good preparation for mooring prevents surprises once the barge is on location. Consider the following points:

- Familiarity with the mooring location. Request information in advance at the loading / unloading location, the waterway manager and / or colleagues.
- Discuss the hazards with your crew and ensure a clear division of tasks.
- Discuss the mode of communication (portable, gestures).
- Lay out the ropes, ready for use.

4.2. Mooring
During mooring, there are always several factors that play a role. The following paragraphs describe some basic principles and situations.

4.2.1. Arriving speed and angle
Generally, the arriving speed prior to mooring should not be too high because too high speed may lead to undesired situations. As a starting point, an acceptance rate of up to 2 km / h can be maintained. In addition, the angle of arriving must be as "flat" as possible, as a general principle an angle of up to 15° can be taken. Of course, factors such as weather, a loaded or non-loaded barge and type of barge (overhang) play a role at the arriving speed and angle, making it difficult to provide one directive for all situations.

... Make sure the barge is as still as possible during mooring, so that the crew can safely secure the barge!

4.2.2. Basic mooring plan on standing water (with winches)
The first step in mooring is always placing a stern end (see illustration). Combined with motors and agitator, this rope ensures that your barge stays in place.

The figure above shows that by the operation of the propeller the barge wants to move forward. The stern end (yellow line) prevents this, so that this forward movement is counterbalanced. By moving in the opposite direction of the side where you are moored, make sure that the stern is pushing "against the wall", as a result of which this movement has also been counterbalanced. The end result is that your barge is now still so you can secure the other ropes.

Lethal accident during mooring
During mooring a crew member ended up between the quay and the ship where he got stuck. Unfortunately, he died from the consequences of the accident.

The main causes of the fatal accident were:
- The crew got off too fast, the ship was not yet at the quay;
- The captain did not have a good view of the crew on deck, in combination with;
- The lack of direct communication between crew members.
When the stern end is set, the other ropes can be secured. Below is shown a basic mooring plan.

**Explanation of the ropes**

Rope 1: stern end (jump) as described above.
Rope 2: The front rope, this rope holds the bow of the vessel together with the stern end (see 1), to the quay and prevents the barge from moving backwards.
Rope 3: Rear rope, holds the stern of the ship against the quay and prevents, together with the stern end (see 1), the barge to move forward.
Rope 4: Achtspring, together with the rear rope (see 3), holds the stern of the barge against the quay and prevents the barge from moving backwards along with the front rope (see 2).

4.2.3. Basic mooring plan on standing water (without winches)
The advantage of winches is that the ropes can be tightened extra tight, so that the barge is firmly docked. However, not all barges have winches. In addition, winches can be broken or there may be power failure in the mechanism.

Mooring without winches requires another technique, described below.

Placing a stitch end is in the same manner as described in § 4.2.2..

......... **When the winches do not work, it is good to control the mooring technique without winches!**
Once the stern end is fixed, the barge is turned away, see picture below. By turning away the stern of the barge, the bow of the vessel comes closer to the shore. Turning away takes place by turning the rudders to the other side and keeping the propeller in forward gear. The arrows indicate which directions the barge is going now. The stern end prevents the barge from moving forward.

![Diagram](image1)

When the barge is turned away far enough, the rudders are moved to the center, see picture below.

The propeller stays in forward gear and manually rope number 2 is secured as tight as possible. The turn away distance depends on the length of the front rope. The longer the rope is, the greater the turning angle (lever).

![Diagram](image2)

......... Do not turn away too much with a "overhanging head" to prevent damage!
The barge is then turned back, see picture below. As the distance between the shore and the barge increases again, the front line (number 2) becomes tighter. During the barge's turning, it may be necessary to veer out the front line, which may be necessary in particular when using steel wires.

Give, when the barge is on the shore, some extra rudder and more gas ahead. This stretches the stern end. Then set rope number 3 as in the picture above. If rope 3 is fixed, the "gas" may be off. The barge comes through the stretch in the stern end, now backwards and rope 3 will be tight. The first 3 ropes are now tight and the barge is therefore firmly moored. For extra safety, use a rear rope (rope 4) to keep the stern better on shore.

4.3. Mooring at locks
When mooring in a lock, a stern end (see rope 1 in the basic mooring plan) and a rear spring (see rope 4 in the basic mooring plan) can be used. The rear jump can be fixed by hand or with a winch. Keep in mind the decay in a lock. Veer or move the ropes or tighten them tight enough.

......... Communicate well when you move or veer ropes!
When moving wires or warps in locks during locking, take care that you cannot get trapped between threads and threads.

4.4. Mooring during current
In standing water, there are usually no external forces working on your barge. With a current it is different, a current will take the barge as it were.

In the image below we assume a current is coming from behind. Starting with rope 5, compared to the basic mooring plan (see §4.2.2 Basic mooring plan).

This replaces rope 3 from §4.2.2. It is a rear rope that maintains the stern and prevents the current from catching the barge and possibly falling around (a very dangerous situation!).
The rear rope (rope 5) is a little further forward, so this can be brought to shore and can be loosened again. If the stern stays well against the side, the force of the current ensures that the barge is completely next to the quay. If rope 5 is fixed, the barge can be further moored with ropes 1, 2 and 4 from the basic mooring plan (see §4.2.2 Basic mooring plan).

4.5. Mooring during tidal flow
A tidal flow causes the water to go up and down. As a result, the tension in the ropes will increase or decrease. It is advisable to use long ropes on tide. A rope has a certain form of elongation (elasticity). The longer the rope, the more elongation. Keep in mind that if steel wires are used, they do not have any form of elongation!

Long ropes also cause the barge to have more room to move beside the quay. By placing the ropes ‘from the outside’ (see picture frame), the angle increases, so that a rope catches better transverse forces. The "false knot" as explained in §3.3 may also be used.

To clarify what is meant by ‘outside’, an additional bollard is placed on this image on the barge. This reality this is not possible of course, but it makes the difference quite clear. The front and rear ropes now stand in comparison with the basic mooring plan, at a transverse angle, which makes the barge better kept. In addition, the ropes are longer, allowing for more stretching.
4.6. Mooring alongside ships
When mooring next to another ship, the size of the neighboring ship plays an important role. Therefore, every situation is different, below are some common issues:

⚠️ **Ropes:** The manner in which the neighboring ship is moored, the following information can be used to assess whether it can be safely moored:
- Are thick or thin ropes used?
- Are there few or many ropes used?
- Are these ropes tight or loose?

By taking these points into account, rope rupture is prevented at the neighboring ship.

⚠️ **Construction:** The construction of the neighboring ship gives information about:
- Can many or few forces be exerted on the bollards of the neighboring ship? Either one should be careful with tight sailing of the knot or tightening of the winches.
- If the ship is (much) shorter then it may be decided to add a number of ropes on the shore. This spares the ropes of the neighboring ship.

........... **In case of doubt: always go for safe! Try to find a solution together with the neighboring ship to be safer moored together!**

4.7. Unmooring
When unmooring, the propeller is set in forward gear, in addition, the rudder is hard over. After this, the ropes are thrown in the opposite order, with the stern end or the rear rope being discarded last. In the case of tide, the flow direction may be changed. Therefore, determine what has become the stern end or rear rope when unmooring.
5. ANCHORING AND USING SPUD POLES

5.1. Anchoring
Anchoring can only be done in the designated places, often accompanied by the board next to it. If in doubt, contact the waterway manager. During anchoring, account must be taken of:

- ▲ Throw the anchors spread horizontally apart so that they don’t get tangled.
- ▲ Insert sufficient chain (see pictures below).
- ▲ The use of one anchor is possible in some cases, but the use of two anchors is always safer.
- ▲ Consider neighboring ships regarding distance and location of anchors. Also take into account the dragging of anchors.

Due to sufficient chain the anchor blades dig well into the ground. Insufficient chain prevents the anchor blades to dig into the ground.

Use anchor deviating circumstances
An anchor can also be used when fastening, for example on a slope, with a strong current or low water. The anchor is thrown, ashore the ropes are fastened. Then the anchor is pulled tight and the barge is free from the slope.
5.1.1. Anchoring on tidal flow

During anchoring on tidal flow, the current will shift (change direction) every 6 hours. A consequence may be that the vessel pulls the anchor over the head, causing it to break out of the ground. This can cause dangerous situations.

To avoid this, two anchors can be put in line in tidal waters. If the direction of flow of current changes, then the ship will be right behind the second anchor (see picture below).

**Important:**

⚠ Be sure to watch the direction of the flow of current when dropping the first anchor. Determine the current direction and lower the anchor on the side where the current comes from (front or back). This prevents the current from taking the ship and from being pushed over its own anchor. Then the second anchor has to be set.

⚠ Watch the rudders and propulsion when dropping the anchors. The ship should be gently moved away from the anchors.

**An example:** When the front anchor falls, the ship should be still or to move backwards slowly.

⚠ Perhaps it is necessary to let the anchor go or catch an anchor. One should take into account that an opposite action is required at the other anchor anker.

**An example:** The front anchor is laid tighter. The chain is therefore shorter at the front. The opposing action is now veering the back anchor because it otherwise counteracts the action at the front.
5.1.2. Anchors on current
When a river has a lot of current flow, two bow anchors can be used. Follow the next steps:

1. Set the outer anchor (see A in the illustration below).
2. Let the barge get closer by the current.
3. If the barge is close enough, the inner anchor (see B in figure below) must be set.
4. When the inner anchor (B) has fallen, the anchor chain of the outer anchor (A) should be held. The anchor chain of the inner anchor (B) must be veered until the barge is in the correct position.

5.1.3. Anchor on an upper river with groynes
When anchoring on an upper river with groynes, slightly more than half the length of the barge should be kept under the groyne. Due to the increasing current along the head of the groyne, the barge is kept from from the groyne. The anchor chain will be almost crossed by the barge moving sideways. This should be taken into account when choosing the position. When the anchored barge lies too high at the groyne, the stern is pushed too far by increasing current along the head or end of the groyne. As a consequence, the barge is pushed between the groynes and additional strain is put on the chain. The barge is anchored restless and in the worst case lie crosswise in the river.
5.2. Use of spud poles
The use of spud poles is not permitted everywhere, mainly because it can cause damage to the bottom of the waterway. The places where it is allowed to use spud poles can be identified by the sign (E6.1) next to it.

In general, only spud poles may be used at the designated places, if in doubt, contact the waterway manager. Mooring with spud poles is the same way as anchoring (see § 5.1 Anchoring), please note the following points:

- Do not lie in the middle of the river, but as close as possible to the side.
- Put the barge angled in the river with the head to the shore. If the pole doesn’t keep you, you fall with your head in the shore and falling around is prevented.
- Keep enough distance from neighboring barges and the way the anchors of these barges are standing. Also take into account the dragging of anchors.
- Keep in mind tide and / or unloading of the barge! The spud pole does not come loose from the bottom when the water and / or the barge rises.

Advantages and disadvantages of using spud poles
Spud poles on inland waterways provide great advantages over the use of anchors. In many cases, they can be used in the same situations as an anchor and do the same work. However, there are certain situations where an anchor benefits to a spud pole. Below are some advantages and disadvantages described.

Advantages of a spud pole:
- Safer when operating: Most spud poles are operated from the wheelhouse. As a result, no people need to get an anchor down on the front and safety risks are prevented.
- Comfort: With one push of the button, spud poles go down and up.
- Less movements of the ship: that is, a ship moves less by current and / or sucking movement of passing ships.
- No chains tangled: it may happen that the ship’s movements cause the anchor chains tangle up, causing a dangerous situation because it is often difficult to break them apart.
- Rounding down: Anchor can be driven over its own anchors, thus pulling the anchors out of the ground. With a spud pole the ship can run around the pole without problems.

Disadvantages of a spud pole:
- No official class point (yet): The ship’s building regulations describe how heavy and strong the anchors should be. There is nothing described about spud poles, despite the fact that a spud pole fulfills the same function.
- Less safe in an emergency: Most spud posts are operated by a hydraulic pump. If a power failure occurs, there is a chance that the spud pole cannot rise. An anchor can always be detached from the ship in an emergency, which releases the ship.
- Limited length: spud poles vary in length. For example, if the spud pole is 11 meters, it can still be used up to 10.5 meters of water beneath the ship.
CONSULTED SOURCES

Publications
- Effective mooring, OCIMF, 3rd Edition, Whiterby Seamanship International
- Mooring – Do it Safely, A guide to prevent accidents while mooring, Seahealth Denmark

Laws, regulations and standards
- ADN (2017)
- Binnenvaart Politie Reglement (BPR), December 1st, 2016
- CEVNI - European Code for Inland Waterways (revision 4)
- European Guideline 2006/87/EG
- Reglement Onderzoek Schepen op de Rijn (ROSR), April 1st, 2016
PLATFOM ZERO INCIDENTS

APPENDIX 01: SAFETY ALERT: FAIRLEAD

PLATFORM ZERO INCIDENTS

SAFETY ALERT: FAIRLEAD

BACKGROUND INFORMATION
There have been several incidents in the past with the construction and use of fairleads resulting in (severe) personal injuries. The tension on the rope around the fairlead can cause for the rope to break loose when it is not properly attached. Moreover, the fairlead can break loose, causing for personal consequences. With this Safety Alert, PZI wants to raise awareness of the potential problem. Additionally, suggestions are made to lower the risk.

EXAMPLE SITUATION

POSSIBLE DANGERS
- Ropes can break loose and cause personal injury;
- The fairlead can break loose causing personal injuries.

MEASURES
- Always take into consideration the safest location when tightening up of lines and make sure to be out of the snap back zone;
- Have the fairlead construction checked by Class during survey both at the building stage and in service;
- Conduct a thorough visual inspection of the existing fairleads by your technical department on a regular basis;
- In case of new construction/fitting, carry out suitable tests to confirm the quality of the connection welds, mooring equipment forces and line directional settings;
- Incorporate the use of fairleads into the mooring procedure, including regular inspection and maintenance;
- In case of doubt, adjust the situation;
- Check whether the winch performance is in line with the original design performance (including anchor winches);
- Provide training and instruction for the safe use of fairleads;
- In the situation where bollards are used as fairleads, make sure the rope cannot slip from the bollards.

POSSIBLE ADJUSTMENT

REFERENCES/SOURCES:
BP Shipping, Downstream Assurance EMEA Safety Bulletin 001/2016

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BIJLAGE 02: SAFETY FLASH: LADDERS AND STAIRWELLS

Platform Zero Incidents

SAFETY FLASH: LADDERS & STAIRWELLS

GOOD PRACTICE

- Clear passage
- Marks and anti-slip
- Good state
- Good lighting
- Secure ladders
- Appropriate footwear
- Hands are free (use backpack)
- Face towards stairs

To prevent stumbling and falling, it is important that ladders and stairs are safe. Even more so in case of an emergency. It can prevent injury.

BAD PRACTICE

- Obstacles
- Dirty stairs
- Bad state (dirty, broken, damaged)
- Things in one hand

ACTION QUESTIONS:

- How is the state of the ladders and stairwells on our ship? (pass through every space)
- What can we do to enhance the state of the ladders and stairwells? What would we need?
- How can we help each other to stay alert?

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BIJLAGE 03: SAFETY ALERT: COLD WEATHER

BACKGROUND INFORMATION
The weather has an influence on the safety of the crew on board. Certainly during the winter, fog, snow and frost have a negative influence. In addition, the days are shorter which affects sight and fatigue.

POSSIBLE DANGERS
- Falling ice from bridges, locks, ships, etc.
- Falling into cold water can cause for a shock and freezing, wearing a lifejacket is therefore of even greater importance.
- Vents of ballast tanks can freeze and therefore cause for damage to the barge.
- Bigger chance of slipping, tripping and falling because of slipperyness.
- Slipperiness on stairs.
- Ice can influence the course of the barge and make maneuvering more difficult.
- Thick floes can cause for damage to hull, bow thruster and rudders

MEASURES
- Pay close attention to the weather forecast.
- Walk calmly and use the anti-slip paths, keep the paths clear from snow and ice and mark them clearly, strew salt in case of snow.
- Wear appropriate PPE (footwear against slipping, helmet against falling ice, lifejacket against drowning, winter clothing against freezing).
- Make sure there is enough lighting on deck.
- Rotate the crew more often when they are working in the cold.
- Discuss the hazards, measures and relevant emergency procedures with the crew and any visitors.
- Spray locks with graphite oil.
- Check heating systems on proper functioning: do not shut off heaters.
- Cover anchor winch, ropes and wires and keep coverplates of hawse pipes ice-free.
- When it looks to go the front early.
- Start the engines early on and let them get to temperature.
- Tap pumps, pipes, hoses and watertaps and protect them against freezing.
- Keep bilges in holds and engineering(s) empty.
- Check engines with closed cooling water systems on anti-freeze.
- Keep batteries filled and under voltage.
- Keep fuel tanks and lubricant tanks that are against the hull as full as possible (condensation).
- Check before loading discharging the loading pumps on flow and check the clocks on rotation considering freezing.
- Be sure that there is enough fuel in case there is a delay underway or when loading discharging is prohibited because of ice.
- Local authorities can enforce convoy sails on certain waterways. Make sure to be aware of the latest local guidelines as well as your predecessor.
- Add to additives to diesel fuel in deck engines/dry tanks to prevent solidification of the paraffin in the diesel fuel.
- Do not force anything when fixing things, the material (steel, brass and plastic) can get brittle.
- Take necessary precautions to prevent glare from a low sun.
- Thick ice can cause damage in the hull. Regular monitoring for leaks from engine rooms, cargo tanks, etc. is recommended.

References/Sources:
Several sources in the industry.

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