



Australian Government
Australian Maritime Safety Authority

Risk Management in the National System

A Practical Guide

December 2020





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■ Introduction

The Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (the National Law) provides a single national framework for ensuring the safe operation, design, construction and equipping of domestic commercial vessels (DCVs). The National Law imposes safety duty obligations on owners and masters of DCVs to ‘so far as is reasonably practicable’ ensure the safety of their vessels, marine safety equipment that relates to the vessel, and the operation of the vessel. DCV owners and masters must implement and maintain Safety Management Systems (SMS) on their vessels to comply with their statutory safety obligations. Documented SMS are one way in which DCV owners can demonstrate that they comply with the SMS requirements of the National Law.

The Marine Order 504 (Certificates of operation and operation requirements — national law) – MO504 specifies the minimum requirements for the safe operation of DCVs.

Marine Order 504 makes clear the owner’s responsibility to manage the risks associated with the operational safety of a DCV. Risk management is a key component in developing an effective SMS.

Marine Order 504 requires that a risk assessment of the operation of any Class 1, 2, 3 & 4 vessels, be carried out which identify:

- key daily tasks to be performed by all crew members
- any potential risks involved in the conduct of any task that may expose the vessel, operational environment, or persons on or near the vessel to unacceptable risk
- the appropriate crew for the vessel
- a person who is responsible for ensuring that actions needed to correct any identified potential risk is carried out.

One of the key responsibilities of a DCV owner is to ensure the risk management process is documented and kept up-to-date. It’s equally important that a DCV owner regularly monitors and reviews the appropriateness and effectiveness of risk controls. Identified risks must be reassessed and risk controls revised as necessary if the vessel’s normal operation changes or if the master considers that the risk to the safe operation of the vessel has changed. These reviews ensure the risk management process remains relevant to the vessel’s ongoing operation and increases the capacity of those involved to effectively manage risk.

References

- AS/NZS ISO 31000
- IALA Guideline – G1138 The Use Of The Simplified IALA Risk Assessment Method (SIRA)
- SA/SNZ HB 436:2013, Risk management guidelines – Companion to AS/NZS ISO 31000:2009
- HB 158—2010, Delivering assurance based on ISO 31000:2009 Risk management – Principles and guidelines

■ Terms associated with risk assessment

Consequence

The type and or severity of harm that a person could sustain if they came in contact with the hazard.

Hazard

A hazard has the potential to cause death, injury, illness or environmental damage, for example: the environment in which the vessel operates unsuitable vessel machinery plant and lifting devices inadequate safety systems. It's everyone's responsibility to identify hazards.

Likelihood

The possibilities, high or low, that someone will come into contact with the hazard.

Risk

Risks arise from interactions with one or more hazards that may have a detrimental impact on safety.

Risk assessment

The process of evaluating the likelihood of an incident or injury:

What could cause harm (hazard)? What could go wrong (risk)? How likely is it to happen (likelihood)? How bad will it be (consequences)?

Risk controls

Risk control is a risk modification process. It involves selecting and implementing one or more control options. Once a control has been implemented it assists with managing the risk. You have many control options.

Elimination or removal of hazards and their associated risks is always the best option. However this is not always feasible or possible. So in these circumstances, risk controls are used to reduce the risks to an acceptable level.

Examples of risk controls are: fire suppression systems, wearing lifejackets when on deck and thorough induction and training programs.

Risk rating

The result of using a likelihood and consequence matrix to determine the severity or rating of a risk.

Risk register

A risk register is a central point where all identified risks are listed. It includes all relevant information to the vessel's risks and must be updated regularly.

■ The risk management process

The following steps should be completed to effectively manage risk as part of the vessel's Safety Management System (SMS). It is important to note that vessel owners, masters and crew should be involved in all of the following four steps of the risk management process.



Step 1 – Identify hazards

Identify and document all hazards associated with the vessel and its operation. This should be the start of your risk register (examples at Appendix A).

Every vessel operation is different and some hazards are likely to be unique to a particular operation. There could be hazards associated with the:

- vessel's machinery, plant and equipment
- the type of operation the vessel is involved in for example dive charter and fishing operations
- the daily activities of the crew such as fuelling, loading of stores and hauling nets
- passenger access and accommodation
- operating area and environment.

EXAMPLE

A commercial fishing vessel owner and crew identify the trawl winch associated with fishing operations is a hazard that poses a potential threat to the safety of crew. The hazard is entered into the vessel's risk register. (Refer Appendix A)



Step 2 – Consider the risks associated with the identified hazards

Once the hazards have been identified consideration needs to be given to the possible impact of these hazards on the safety of people who operate the winch.

The winch has been identified as a potential hazard. The risks associated with the winch are:

- Crew could be injured during its operation by being drawn into the winch.
- Crew could be entangled in the net during setting and dragged overboard.

The associated risks have been recorded in the vessel's risk register at Appendix A.

In order to determine the potential impact of the hazard we need to consider the chance of someone being hurt which we will refer to as the likelihood. We also need to consider the possible harm that it could cause them which we will refer to as the consequence. This is known as the risk assessment phase.

The following tables are based on examples in Australian Standard 31000:2009 and help us to determine the likelihood and consequence.

The vessel owner, master and crew have decided it is **likely** that a crew member could be caught in the trawl winch so they have circled this on the table.

Likelihood table

Category	Explanation
Almost certain	Expected to occur in most circumstances, or often in the life of a vessel's operation.
Likely	Probably occur in most circumstances but unlikely to occur often in the life of a vessel's operation.
Possible	Might occur at some time, unlikely to occur to every vessel but may occur to a few vessels of a particular type.
Unlikely	Unlikely to occur but should be considered as possible.
Rare	So extremely remote that it should not be considered as possible unless exceptional circumstances exist.

Descriptors and value for the “likelihood” of an incident

Category	Descriptor	Percentage	Chance per year
Almost certain	Common event	95%	Weekly occurrence
Likely	Known to occur	60%	Monthly event
Possible	Could occur, heard of it happening	40%	Up to three times a year
Unlikely	Not likely to occur	20%	Once in a year
Rare	Practically impossible	5%	Unheard of occurring

Reference: IALA Guideline - G1138 THE USE OF THE SIMPLIFIED IALA RISK ASSESSMENT METHOD (SIRA)

The vessel owner, master and crew have decided that injuries from the trawl winch could be fatal or very serious, so they assign a consequence rating of **high** as circled.

Consequence table

Category	Human injury	Financial cost	Work/income/reputation	Environment
Catastrophic	Multiple fatalities	Loss of vessel, total loss of income	Operations halted, image / reputation is severely damaged	Extensive environmental damage
High	Fatality	Extensive financial loss	Major disruption to operations, temporary loss of income, image / reputation impacted	Major environmental damage
Medium	Disabling injury requires medical treatment	Significant financial loss	Significant disruption to operations, image / reputation suffers	Significant environmental damage
Minor	First aid treatment for minor cuts, bruises or abrasions	Notable financial loss	Minor disruption to operations	Minor environmental damage
Negligible	No injuries	Negligible financial loss	No adverse effect on operations	Negligible environmental damage

The likelihood and consequence matrix helps the vessel owner, master and crew to use the likelihood and consequence ratings that they've assigned to determine the risk rating. As you will see below, the risk rating for a crew member being caught in the trawl winch is **extreme**.

AMSA risk management matrix

Ref. ISO 31000	Consequence				
Likelihood	Negligible	Minor	Medium	High	Catastrophic
Almost Certain	Moderate	High	Extreme	Extreme	Extreme
Likely	Moderate	High	High	Extreme	Extreme
Possible	Low	Moderate	High	Extreme	Extreme
Unlikely	Low	Low	Moderate	High	Extreme
Rare	Low	Low	Moderate	Moderate	High

Step 3 – Identify and implement ways to control the risks

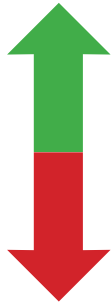
Once the risks have been assessed they need to be controlled. Risks must be either eliminated or reduced to a level that is as low as is reasonably practicable. Risk controls are specific actions taken by vessel owners to eliminate risks or reduce risks to an acceptable level.

Here are some examples of risk controls:

- developing operational procedures
- training and inducting crew
- developing effective emergency response plans
- regular inspection and maintenance of the vessel, the machinery onboard and the equipment
- use of effective personal protective equipment.

The hierarchy of controls as outlined in the table below is part of a globally recognised tool that helps vessel owners, masters and crew to determine the most appropriate approach to control risks. While elimination of the hazard is always the preferred option, it is not always feasible or possible. If a hazard cannot be eliminated steps must be taken to implement a range of risk controls to reduce the risks to an acceptable level.

Hierarchy of controls

Control	Effectiveness	Description
Elimination	 <p>Most effective</p> <p>Least effective</p>	Eliminate the hazard or risk
Substitution		Replace with something similar with less risk
Isolation / engineering		For example – install guards on machine, redesign the task
Administration / training		Implement policies, procedures and training
Personal protective equipment (PPE)		Provide equipment such as gloves, self-inflating lifejackets, personal locator beacons and so on

For the trawl winch the vessel owner, master and crew agree that removal of the winch from the vessel is not a practical step to take. They decide to implement a range of risk control measures to reduce the risk to an acceptable level.

The type of risk controls that can be applied will depend on a number of factors that will vary on a case-by-case basis. Here are some of the factors:

- nature of the hazard
- any limitations or constraints imposed by the design of the vessel, machinery or plant
- competency of crew who interact with the hazard
- cost of control options by comparison with the likelihood and possible consequence of the risk occurrence.

Once suitable risk controls are identified they need to be implemented as soon as possible to help manage the risk.

The vessel owner, master and crew decide the company's existing fitness for work procedure, fatigue management policy and planned maintenance program are sufficient, however, they agree to implement the following risk controls:

1. Standard operating procedures (SOPs) need to be established for operating the trawl winch and for net operations
2. All crew will be introduced to the SOPs at the safety induction when they first join the vessel
3. All crew will receive refresher training every three months to ensure their currency of knowledge of the SOPs
4. An emergency stop will be fitted to the trawl winch
5. Install additional deck lighting for night operations
6. All crew will be provided with personal protective equipment (PPE) and be required to wear their inflatable lifejacket while on deck
7. The new SOPs will form a part of the vessel's SMS.

The risk controls have been entered into the risk register at Appendix A.

Once suitable risk controls are applied, it is useful to re-assess the risk to see if the risk rating has changed. In many cases the likelihood of a risk occurring will reduce when effective risk controls are in place.

The vessel owner, master and crew re-assess the risks associated with the trawl winch once all of the proposed risk controls have been implemented. This time they find that the likelihood has been reduced from likely to **unlikely** and that the possible consequence has been reduced from extreme to **moderate**.

The overall risk rating has therefore dropped from an extreme risk to a moderate risk (see risk matrix below). The details are all captured in the vessel's risk register (see appendix A).

Likelihood	Consequences				
	Negligible	Minor	Medium	High	Catastrophic
Almost certain	Moderate	Moderate	High	Extreme	Extreme
Likely	Low	Moderate	High	High	Extreme
Possible	Low	Low	Moderate	High	High
Unlikely	Very Low	Low	Moderate	Moderate	High
Rare	Very Low	Very Low	Low	Moderate	Moderate

Step 4 – Safety Management System review

Once risk controls have been put in place for all identified risks they should form part of the operation's SMS and be monitored and reviewed to verify their effectiveness. The outcomes of the review and verification process should be documented. If the monitoring and review process identifies a short coming or failure in the risk control measures, the risk assessment process should be revisited.

The Marine Order 504 requires the SMS and therefore the risk management process upon which it is based to be reviewed at least annually. In addition, another trigger for reviewing the risk register could be as a result of a near miss, incident or accident.

The review of the SMS and risk management process ensures their currency and relevance through the DCV owner and crew/s commitment to continuous improvement. Continuous improvement ensures DCV owners and crew are actively involved in the ongoing maintenance of the SMS and risk management process and this is essential to the development of a safety culture.

Appendix A – Risk register examples

Risk registers come in various formats. The following examples are provided as a guide for vessel owners to assist them with the risk assessment and control process, vessel owners have the flexibility to determine which type of risk register best suits their needs. The first entry in the example below shows how the outcomes of the trawl winch risk assessment and control process have been recorded.

Example No. 1

Activity	Hazard / risk	Pre-control		Initial risk rating	Risk control	Post-control		Residual risk rating	Accept Yes or No
		Likelihood ↓	Consequence →			Likelihood ↓	Consequence →		
Fishing	Trawl winch	Likely		High	<ul style="list-style-type: none"> Standard operating procedures for safe use of the winch and net operations Emergency stop installed on trawl winch Installed additional deck lighting for night operations Crew receive safety induction and refresher training Fitness for work and fatigue management policy Master has senior first aid certificate Inspection and maintenance program for winch Non-skid deck PPE for crew (lifejackets, strobe light and personal locator beacons) 	Unlikely	Moderate	Yes	
		High				Medium			
Loading stores	Manual handling injuries and falls	Likely		High		Unlikely	Low	Yes	
		High				Minor			
General	Person overboard, drowning	Possible		High		Unlikely	Low	Yes	
		High				Minor			
Incomplete									

Example No. 2

Here is an example of a simplified risk register, one that might be found on a small commercial fishing vessel. It is important to note, that while not shown in the example the owner/skipper has considered the likelihood and consequence of the risks that have been identified.

Activity	Hazard	Risk	Controls	Controls in place	
				Yes	No
Preparation	Lifting or carrying weights	Manual handling injury	<ul style="list-style-type: none"> Lifting procedure Manual handling training 	✓	
Preparation	Slippery boat ramp or crush between vessel and trailer	Crush injury or slip on boat ramp	<ul style="list-style-type: none"> Suitable footwear Launch and recovery procedure Training and induction 	✓	
Operations	Crew affected by alcohol/drugs	Injury, endanger vessel operations	<ul style="list-style-type: none"> Fitness for work policy 	✓	
Operations	Navigational hazards	Collision, grounding	<ul style="list-style-type: none"> Qualified skipper Good local knowledge Emergency plan Adequate lookout Fitness for work policy 	✓	
Incomplete					

Example No. 3

Activity	Pre-control		Post-control	
	Hazard/risk	Risk rating	Risk controls	Risk rating
Cruise	Passenger overboard	High	<ul style="list-style-type: none"> Deckhand lookouts Life rings, lights Person overboard procedure Training and induction Quarterly drills 	Moderate
Incomplete				
				Person responsible for implementing Owner and master

■ Appendix B – Further example of risk assessment/control and the completed risk register

The owner/skipper and deckhand of a 10 metre outboard propelled long line fishing boat conduct a risk assessment as part of the process of documenting the SMS for the operation. In order to make the task easier they break their operation down into the various activities that they do on a day-to-day basis. As a result of their deliberations and discussions they identify the following hazards and risks.

While not shown in this example the owner/skipper has considered the likelihood and consequence of the risks identified in the following table. The owner/skipper has then recorded the type of controls that are proposed to either eliminate each risk or reduce the likelihood or the potential consequence of each risk. The owner/skipper then develops and documents the relevant policies and procedures that they need to support implementation of the controls. In addition, the owner/skipper ensures that other controls such as personal protective equipment and the inspection and maintenance of the vessel are in place.

Activity	Hazard	Risk	Controls	Controls in place	
				Yes	No
Preparation	Lifting or carrying weights	Manual handling injury	<ul style="list-style-type: none"> Lifting procedure Manual handling training 		
Preparation	Slippery boat ramp or crush between vessel and trailer	Crush injury or slip on boat ramp	<ul style="list-style-type: none"> Suitable footwear Training and induction Launch and recovery procedure 		
Preparation	Adverse weather	Capsize	<ul style="list-style-type: none"> Weather assessment and access to weather information at sea 		
Preparation	Vessel not ready for sea (fuel, maintenance, safety equipment)	Vessel or equipment break down, fire	<ul style="list-style-type: none"> Programmed inspection and maintenance Daily check procedure 		
Preparation	Refuelling	Fire / explosion	<ul style="list-style-type: none"> Programmed inspection and maintenance Refuelling procedure Smoking policy 		
Operations	Crew affected by alcohol/drugs	Injury, endanger vessel operations	<ul style="list-style-type: none"> Fitness for work policy 		
Operations	Navigational hazards	Collision, grounding	<ul style="list-style-type: none"> Qualified skipper Adequate lookout Good local knowledge Fitness for work policy Emergency plan 		
Operations	Knives	Body injury	<ul style="list-style-type: none"> Training and induction Emergency procedure First aid 		
Operations	Hooks – long line	Crewman overboard, severe injury / potential	<ul style="list-style-type: none"> Long line procedure PPE (inflatable lifejackets, knife/lanyard, personal locator beacon) Training and induction 		
Operations	Loss of stability / capsize	Crewman overboard	<ul style="list-style-type: none"> Long line procedure PPE (inflatable lifejackets, knife/lanyard, personal locator beacon) Training and induction 		
Operations	Dangerous by-catch	Crew injury	<ul style="list-style-type: none"> PPE, gloves, 		
Operations	Fire at sea	Fire / explosion	<ul style="list-style-type: none"> Fire extinguisher Smoking policy Emergency plans Programmed inspection and maintenance 		
Operations	Exposure	Heat stress / sunburn	<ul style="list-style-type: none"> PPE (sunscreen, hats) 		
Vessel (trailing/unloading)			As per preparation above		

