

FATIGUE MANAGEMENT

▾ *For Fishing Boats*



▾ *Get your sleep*
Reduce your risk

▶ *GUIDE TO FATIGUE MANAGEMENT FOR FISHING BOATS*

Introduction

This sector guide is for vessel owners and operators. It contains:

- an example of a fatigue management plan
- accidents that happened
- common causes of fatigue on fishing boats and what to do about them
- key issues in the fishing industry
- Maritime New Zealand recommendations
- legal obligations
- how to write a fatigue management plan
- documenting steps for audit.

Caution. The Health and Safety in Employment Act 1992 requires employers to have effective methods for identifying and assessing hazards at work. Hazards include situations resulting from physical or mental fatigue. This guide lists situations that others in your industry have identified as resulting in fatigue.

Use as a starting point the list of fatigue hazards and how they can be managed. Not all will apply to you, and you may have additional problems not identified here.

Using the list of hazards in this guide does not remove your obligation to identify all hazards. Every vessel and crew are different and will have their own problems with fatigue and solutions for them.

EXAMPLE OF A FATIGUE MANAGEMENT PLAN

About the company

Dave's Seafoods is operated by Dave and his wife Shirley. They own and operate a 14m fishing vessel that trawls in the summer and dredges for oysters in the winter.

They have hired a young crewman called Tom. Dave and Tom go to sea, while Shirley does the books on land.

Fuel prices are high and they must work long hours to provide a small return on their business.

Dave and Shirley were aware that fatigue must be managed in their operation to prevent incidents and to meet their obligations under the Health and Safety in Employment Act 1992.

How they went about developing their fatigue management plan

Dave, Shirley and Tom all attended a FishSAFE course to learn more about fatigue and health and safety. Later they met at Dave and Shirley's house to figure out what would work for them. Shirley wrote the first draft.

Their plan

Dave and Shirley's expectations

Dave and Tom shouldn't work so long as to create dangerous fatigue situations and hence be at risk of poor decisions that cause injury to equipment, people or the environment.

Significant hazards

Significant hazards are listed in the table below, along with a plan to eliminate, isolate or minimise them.

FATIGUE HAZARD	MEASURE TO ELIMINATE/ISOLATE OR MINIMISE	MANAGEMENT ACTION
Long drives to and from the vessel	<ul style="list-style-type: none"> • Spend every second night on vessel • Share vehicle, with one person driving while the other one sleeps • Shirley to drive them to work twice a week, so they can sleep on the drive 	<ul style="list-style-type: none"> • Provide good sleeping quarters • Provide a vehicle • Ensure one person sleeps during the drive (no stereo on)
Working long hours at sea	<ul style="list-style-type: none"> • Implement breaks for food and drink • Share the watchkeeping time • Ensure watchkeepers know the rules • Dave and Tom to swap jobs for a while 	<ul style="list-style-type: none"> • Implement breaks • Assist Tom with watchkeeping training • Ensure there are standing orders • Ensure all training given to Tom

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Their plan continued...

FATIGUE HAZARD	MEASURE TO ELIMINATE/ISOLATE OR MINIMISE	MANAGEMENT ACTION
Working many days in a row (cumulative fatigue)	<ul style="list-style-type: none"> • Have days off to recover, as necessary • Use another crew member 	<ul style="list-style-type: none"> • Shirley to manage time off • Provide time off for Tom • Find another crew member
Dave is fatigued	<ul style="list-style-type: none"> • Dave and Shirley agree that Dave will have a full night at home with a later departure every second trip during the busy season (not necessary if there has been bad weather) • Shirley hides car keys and lets crew know 	<ul style="list-style-type: none"> • Confirm that this is the agreed approach, so Dave does not feel he has to go fishing when the fish are running
Noisy engines create fatigue	<ul style="list-style-type: none"> • Use earmuffs • Ensure good mufflers are used 	<ul style="list-style-type: none"> • Provide earmuffs • Provide muffler
Crew arriving drunk and after being out all night	<ul style="list-style-type: none"> • Have a “no drinking” policy the night before sailing • Delay sailing 	<ul style="list-style-type: none"> • Ensure that employment contract refers to “no drinking” policy • Delay sailing
Crew tired due to young family up all night	<ul style="list-style-type: none"> • Perhaps choose to stay on the boat the night before sailing or sleep in separate bedroom • Delay sailing in order to get some rest • Ask crew if slept OK the night before 	<ul style="list-style-type: none"> • Ensure sleeping quarters OK • Delay sailing • Check box in logbook to ask crew about sleep
Standing and sorting at shellfish tray all day	<ul style="list-style-type: none"> • Take breaks • Swap sides of tray with skipper • Wear comfortable footwear 	<ul style="list-style-type: none"> • Allow breaks • Be flexible • Perhaps provide footwear
Cutting fish all night	<ul style="list-style-type: none"> • Give regular breaks • Reduce catch • Target non-cutting fish 	<ul style="list-style-type: none"> • Allow breaks • Do shorter trawls • Move grounds
Likely to fall asleep at the wheel	<ul style="list-style-type: none"> • Use watch alarm • Get fresh air • Standing orders prohibit use of chair when long hours have been worked and watchkeeper is tired • Match watch times to length of recommended nap times • Know how to recognise fatigue 	<ul style="list-style-type: none"> • Fit watch alarm, have a policy on its use • Open door, minimise the use of heaters • Provide watchkeeping training • Display the <i>Wheelhouse fatigue checklist</i>

Training

Arrange to put crew and skipper through the FishSAFE process and learn more about fatigue and good watchkeeping practices. Get the local maritime safety inspector or SSM company advisor trained in fatigue management to give a talk to the local fishermen's group.

Monitor and review

Dave's Seafoods monitored the situation and sourced another crew to relieve Tom so he could get a break. They also fitted a watch alarm to the vessel and posted standing orders.

Ensure regular discussion about fatigue and let the crew know they must inform you if they are fatigued. Ensure proper use of watch alarms (if fitted) and standing orders.

ACCIDENTS THAT HAPPENED

Most accidents with fatigue as a factor happen in the fishing industry. The following are a sample from official accident reports.

Bronny G – Grounding March 2004

“The crewman then fell asleep. The next thing he recalled was when he was woken by the impact of the vessel grounding near Steep Head....”

FV Joanne – Collision with another vessel May 2004

*“...when there was no response from the **Joanne**, which was still maintaining course and speed... the pilot ordered 5 short and rapid blasts to be sounded.... At 0120 hours, Joanne collided with **Hellas Constellation**.... The skipper, who had not expected to fall asleep, had failed to activate the watchkeeping alarm.”*

FV Poseidon – Grounding April 2004

“Crewman ‘A’ (who should have been relieved by crewman ‘B’ 2 hours before) fell asleep while still on watch, at or about 0215.... At approximately 0340 the vessel grounded....”

Recovery II – Grounding May 2004

“Deckhand took the first watch from 0200 hours.... He fell asleep shortly after 0400 hours that morning and the vessel grounded at about 0530....”

FV Rex – Grounding June 2006

“...the skipper fell asleep when the vessel was about 1 nautical mile from the intended anchorage.... The vessel was reduced to matchwood....”

FV Shangri La – Grounding September 2005

*“...fishing vessel **Shangri La** grounded at Long Point after the watchkeeper had fallen asleep.... A watchkeeper, when sitting in the chair and with his feet on the consol could cancel the (watchkeeping) alarm using his toes.”*

FV Venture – Grounding April 2006

“The skipper stated that, with the benefit of hindsight, it would have been better to be standing and hand steering the vessel on the outward-bound passage, and that in future he would not use the seat in pilotage waters.”

> Knowledge

- > Everyone to read the *Understanding fatigue* brochure
- > Ask your SSM company to give a talk on fatigue management
- > Use proper induction procedures for new crew
- > Monitor new crew members – particularly for night work



COMMON CAUSES OF FATIGUE ON FISHING BOATS AND WHAT TO DO ABOUT THEM

Knowledge

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Lack of knowledge by existing management or crew about fatigue	People either don't know what to do or don't recognise it is a problem, unless they have been told about it.	Employers may not allocate resources or implement fatigue management. Crew don't know what to do or fail to manage their fatigue.	Everyone reads the <i>Understanding fatigue</i> brochure. Ask your SSM company to give a talk on fatigue management. (Doing this with others can cut the cost.)
New crew	Even experienced seafarers, if new to the vessel, will not know the policies and operating practices of the new vessel. Those new to seafaring may not be used to working long hours or rotating shifts, especially at night.	Lack of knowledge can lead to incorrect actions – or inaction. May be more likely to go to sleep when on duty.	Use of proper induction procedures. Monitor new crew members to see how they adapt to night work. Possibly start with shorter hours.

Before sailing

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Owner's expectations	Can encourage unsafe work patterns/practices.	Can result in high levels of fatigue and often combines with high-risk tasks, such as watchkeeping.	Owner to make expectations clear as to realistic maximum hours of work and when breaks should be taken. Monitors performance and gives feedback.
Crew not available	Places additional demands on others.	Others can become fatigued, safety reduced.	Develop contingency plans prior to the situation happening. Consider cancelling services if necessary.

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Crew report in an unfit state to work	Safety can be compromised if a seafarer is not fit to work.	The seafarer is liable to cause safety problems for him/herself and others. Others cover for the unfit seafarer, pushing their own performance beyond safe limits.	<p>Skipper to assess crew for fitness for duty when they report for work. (Employers are obliged to monitor for impairment, if it is an identified hazard that cannot be eliminated or isolated – Health and Safety in Employment Act 1992.)</p> <p>Send home if unfit.</p> <p>Have standby staff available.</p> <p>Sail and require recovery rest immediately, or after leaving enclosed waters.</p> <p>Develop contingency plans prior to the situation happening.</p>

Sleep

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Crew get little sleep when off duty at home, eg partying, young children in the house, second job	Short sleep, especially over several days, makes a person increasingly sleepy and their performance increasingly less reliable.	More prone to making mistakes and making poor safety decisions. Recovery at sea is unlikely and the accumulating effects of sleep loss may get considerably worse.	<p>Include responsibility for crew to turn up fit for work, or notify skipper if they are not fit to work, in employment agreements. (Employees shall take all practicable steps to be safe at work – Health and Safety in Employment Act 1992).</p> <p>Discuss fitness for duty responsibilities with crew. A good sleep the night prior to re-joining the boat should be a priority.</p> <p>Encourage the crew to share the brochure <i>Understanding fatigue</i> with their families.</p>

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Sleep continued...

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Poor quality sleep on board	<p>Poor quality sleep is caused by a number of factors, including:</p> <ul style="list-style-type: none"> • uncomfortable bed • light. Natural light is a cue for waking up • motion/vibration • too hot/cold • alcohol (easy to fall asleep but sleep quality is reduced). 	<p>Poor quality sleep is not restorative. If opportunities to catch up on sleep are not available, cumulative fatigue can become a safety issue.</p> <p>More likely to make mistakes. Injury accidents become more likely, safety decisions more likely to be poorly made.</p>	<p>Fix sleeping environment, if it is a problem.</p> <p>Blackout curtains (possibly using Velcro) installed where possible.</p> <p>Encourage maximum use of breaks for sleep so time asleep is maximised.</p> <p>Purchase sleep masks for crew.</p> <p>Monitor sleep patterns over the work season.</p> <p>Have opportunity for at least 2 nights recovery sleep after each long trip, especially where cumulative fatigue is likely to be a problem.</p> <p>Encourage napping especially at natural sleep times (3.00 – 5.00 pm, after 10.00 pm).</p>
Noisy engine	<p>Hard to get to sleep, poor quality sleep.</p>	<p>Become fatigued as cannot get enough restorative sleep during rest breaks.</p>	<p>A difficult problem. Reducing engine noise/vibration is the best solution.</p> <p>Check if sound proofing can be added and do so if it can be.</p> <p>Some have found sleeping in the wheelhouse helps a little.</p> <p>Earplugs may also assist.</p>
Warm/high temperatures in sleeping quarters	<p>Makes falling sleep more difficult and sleep is more disturbed.</p>	<p>Increases fatigue.</p>	<p>See if ventilation can be installed safely – check with engineers. (Make sure you don't vent warm air into the wheelhouse.)</p>

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Sleep problems (often evident in those over 50 years of age)	Crew member cannot get restorative sleep so likely to be fatigued, even if given reasonable opportunities for rest and recovery.	More prone to making mistakes and making poor safety decisions.	Encourage crew to bring any problems forward. Encourage affected crew to discuss with their doctor. (See www.maritimenz.govt.nz for a list of sleep clinics.)

Working conditions

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Adverse weather and night conditions	Physically tiring (eg rough weather) Mentally demanding (eg fog)	Excessive fatigue develops across a normal working day. Mentally demanding tasks can result in fatigue.	Relief from physical and mental fatigue is obtained by rest (breaks). Ensure there are breaks during the day, so fatigue has less chance to accumulate. Work with crew to determine what results in fatigue, where breaks can be placed in the schedule and how long they should be to alleviate fatigue.

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Working conditions continued...

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Heat/cold	<p>Working in extreme temperatures (hot or cold) impairs performance and workers will not want to work as long.</p> <p>People sleep better when the temperature is cooler.</p>	<p>If seafarers are working in extreme temperatures, they will become fatigued (and their performance impaired) if they are required to work longer than their body can cope with naturally.</p> <p>Moving from a hot inside to a cold outside.</p> <p>Poor quality sleep, if the temperature is not right.</p>	<p>Work with employees to monitor the effects on their performance and fatigue levels.</p> <p>Investigate options for cooling/heating/ventilation on board.</p> <p>Ensure there are breaks during the day, so there are more opportunities to reduce stress on the body.</p> <p>When warm ensure there is a plentiful supply of drinking water available.</p> <p>Wear layers of clothing, with the top layer being easy to remove.</p> <p>Investigate options for cooling/heating/ventilation in sleeping areas.</p>
Long work days	<p>Short sleep.</p> <p>Cumulative fatigue.</p> <p>The sleep drive begins to increase rapidly after about 16 hours awake.</p>	<p>Commuting become high risk.</p> <p>More likely to make mistakes. Injury accidents become more likely, safety decisions more likely to be poorly made.</p>	<p>Employ sufficient staff to allow either shorter days or a smaller number of days worked continuously.</p> <p>Make sure that the number of days worked in a row does not allow fatigue to build unreasonably.</p> <p>Monitor work practices and fatigue levels.</p> <p>Encourage napping, especially at natural sleep times (3.00 – 5.00 pm, after 10.00 pm).</p> <p>If doing two long shots per day for several days have a policy to require the crew to miss one shot every so many days, so they can recover to some extent.</p>

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Long hours with no breaks	Fatigue accumulates with no chance to rest, refuel and recover.	Mistakes become more common, accidents more likely.	Examine work practice (especially when working under pressure) and develop a policy to provide a minimum number of breaks.
Individuals who seek additional work	Long work hours, insufficient time for rest.	High levels of fatigue after long hours/short rest periods. Cumulative fatigue.	Keep an up-to-date record of hours worked and monitor individuals who seek to work additional hours. Establish limits of how much work can be done within specified timeframes. Monitor for employees also working in other jobs, that result in them becoming a fatigue risk.
Wheelhouse environment	Heater on induces sleep. Wheelhouse chair is a comfortable place to be, especially when fatigued.	Watchkeeper falls asleep. Easy to fall asleep in.	Discuss with crew, address in company policy on watchkeeping. Encourage a flow of fresh air. Check on use of heater. Install a functional chair, not a comfortable chair. (While comfort is great, safety should be the main consideration.) Address as part of the watchkeeping policy – prohibit use of the chair in enclosed waters and on inward transits, unless its use increases safety.

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Working conditions continued...

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Clothing	Inappropriate clothing can result in crew either being too hot or cold.	Crew become fatigued unnecessarily.	Wear three layers when conditions are cold: <ul style="list-style-type: none"> • synthetic next to the skin to take away moisture • wool or synthetic-pile for warmth • windproof material. Keep the head covered: it is where most heat is lost from. Wear layered socks and insulated boots to keep feet dry and warm.
Dehydration and running short of energy, especially working when it is hot	Will feel tired and it becomes difficult to perform at an effective level.	Mistakes become more common, accidents more likely.	Place water bottles where they are easy to grab. Encourage staff to use them regularly, especially when doing physical work in warm weather. Drinking little and often is better than having a large drink occasionally.
First night at sea, sensitive to sounds, especially changes in sound	Sleep disturbs easily.	Poor quality sleep results in fatigue.	Use ear plugs.
Watching screens for long periods	Tires the person.	Temporary fatigue levels can be high. Attention is focused largely within the vessel, not outside it.	Take periodic breaks, such as a walk outside.
Computers and game consols	They can encourage crew to play with them, rather than rest. They can also distract those on watchkeeping duty.	Less sleep means increased fatigue.	Have a company policy on the presence and use of computers and game consols.

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Finished fishing operations and commencing transit back to port	Cumulative fatigue, long days and hard physical work can result in fatigue.	Watchkeepers are liable to go to sleep.	<p>Watchkeeping alarm on.</p> <p>First watchkeeper to have 20 – 40 minutes rest before taking the watch (minimises sleep inertia).</p> <p>First watch to be 30 – 40 minutes, then watches to be 2 hourly (to minimise sleep inertia).</p> <p>If coffee or energy drinks are to be used, consume 15 – 30 minutes ahead of when their effect may be needed.</p> <p>Ban use of the chair.</p>
The “close to home” effect	<p>When nearing a destination, sometimes it is possible to fall asleep shortly before arriving.</p> <p>Is often thought to be associated with relaxing the effort of staying awake.</p>	This seems to catch people by surprise.	<p>As you approach your destination, especially if you are a solo watchkeeper at night, stand up and avoid doing anything where you are likely to fall asleep.</p> <p>Address in the watchkeeping standing orders.</p>
Fast turnaround times	<p>Can result in poor quality sleep, if sleeping on board.</p> <p>Little or no opportunity to recover from fatigue from first voyage.</p>	Making mistakes and falling asleep is more likely.	<p>Balance risks from fatigue against more time to get extra rest (about half of all groundings are when leaving port).</p> <p>All sleep to be off the vessel.</p> <p>If the crew are likely to get into heavy alcohol use, delay departure.</p>

Other

FATIGUE HAZARD	WHAT MAKES IT A HAZARD?	WHAT IS THE SAFETY PROBLEM?	OPTIONS TO MANAGE IT
Commuting	Less time for sleep. Cumulative fatigue. Driving during the times of low alertness is particularly risky (at night up to about 6.00 am in the morning, during the mid-afternoon).	Makes a road traffic accident more likely. Injury possible to not only the crew member but also members of the public.	Change work practices so that cumulative fatigue is not an issue. Have coffee available and a place to nap at work before driving. Pay for taxis. Monitor work practices and fatigue levels.
Causes of fatigue unique to your operation	Your vessel.	Your vessel.	Your vessel.

If you have a complicated operation, or if there are fatigue problems you feel you haven't come to grips with, discuss your situation with your SSM company or local maritime safety inspector. The *Fatigue tools for vessel owners* booklet may give you some ideas on how to understand your situation better.

> Before Sailing

- > Owner monitors performance and gives feedback
- > Owner makes expectations about fatigue clear
- > Make contingency if crew not available
- > Skipper to assess crew's fitness for duty



KEY ISSUES IN THE FISHING INDUSTRY

Trawling

Trawling is generally a high-risk operation, as it requires long hours of activity. Risk of injury is high, owing to the use of machinery and long hours of work. The trip home, coming at the end of a long day, is a time groundings happen. In accident investigation it is often found that after stowing the fish the crew head for home, without giving the helmsman a chance to have some sleep. Often the crew feel alert, even though they have worked long hours. This feeling of being OK can quickly disappear, as the watchkeeper is left on his own while the others sleep. In this situation it is critical that the skipper and crew have positive guidance on how to manage their safety. Strategies that should be considered include:

- the first watchkeeper having a 20-30 minute nap before taking his watch (while others finish the work)
- limiting the first watches to 90 minutes. This minimises the effects of sleep inertia for the person coming onto watch. It also means the person on watch does not have too long to stay awake
- making it mandatory to operate a watchkeeping alarm
- in peak fishing seasons, such as hoki in Cook Strait, many owners have found it useful to hire a steaming skipper (especially for vessels over approximately 15 m).

Changing circumstances

Due to the nature of fishing plans often change (eg no fish, lots of fish, bad weather). The skipper has to make on the spot decisions about duties. To improve skipper decision-making, periodically review with the skipper and crew how duties were allocated to see if unsafe conditions were created.

Contingency planning

The worst causes of fatigue often occur unexpectedly. Often you know what these could be (such as the engine breaking down) but you cannot tell if or when they will occur. Making plans to deal with these situations before they happen assists the skipper make better decisions, before they happen. Getting people together to brainstorm what has happened in the past in your operation, and what else may go wrong, is a good way of identifying this type of problem and how to cope with them.

If you have a complicated operation, or if there are fatigue problems you feel you haven't come to grips with, discuss your situation with your SSM company or local maritime safety inspector. The *Fatigue tools for vessel owners* booklet may give you some ideas on how to understand your problem better.

Post standing orders in the wheelhouse.

Watchkeeping alarms

Following accidents where the watchkeeper fell asleep, the fitting of watchkeeping alarms is almost always recommended to owners of fishing boats. While watchkeeping alarms may not prevent crew becoming fatigued, they do provide a way of managing safety when risk is high. Installation of watchkeeping alarms is highly recommended if the crew get less than 7-8 hours sleep per night on board and they work long days (often the last day at sea is a very long day, followed by the trip home). While most fatigue-related accidents happen at night, there are "asleep at the wheel" accidents at all times of the day. About half of all "asleep at the wheel" accidents happen when leaving port.

Watchkeeping alarms should be installed so they operate independently of all other equipment in the wheelhouse. Procedures should be in place so that the watchkeeping alarm is always on when a navigational watch is undertaken. The watchkeeper should not be able to turn the alarm off. If it is key operated, the key should be with an off-watch person. Place the silence switch for the alarm on the opposite side of the wheelhouse to the chair, so the watchkeeper has to get out of the chair to switch it off.

MARITIME NEW ZEALAND ADVICE

Minimum hours of rest

Hours of rest are not the same as time available for sleep. Crew will have personal care and family and personal business to attend to. In addition, sleep at certain times of the day (late morning to early afternoon and early evening) is virtually impossible, as a result of how the body clock works (see brochure *Understanding fatigue*.)

The hours of rest recommended here are a guide only. They are not a legal requirement.

Maritime New Zealand recommends:

- a minimum of 77 hours of rest in a 7-day period
- a minimum of one continuous block of 6 hours sleep per 24 hours. (Disrupted sleep is less restful.)
- two consecutive nights available for sleep between 10.00 pm and 8.00 am, at least fortnightly and preferably once a week. (Recovery sleep needs to take place at night.)

Maritime New Zealand recognises that some operations do require long hours to be worked, either regularly or occasionally. When this occurs Maritime New Zealand recommends that:

- the operation be examined to determine if alternative work arrangements can be put in place
- attention is paid to the risks associated with long hours of work and cumulative fatigue
- additional time off is given to allow recovery.

Cumulative fatigue:

- if cumulative fatigue is to be avoided, 14 hours of sleep per 48 hours is recommended. (The average person requires 7-8 hours of sleep per night to be fully rested.)
- if fatigue accumulation is fast, limit days worked to 1-3, depending how fast fatigue accumulates
- if fatigue accumulation is gradual, limit days worked to 5-6.

Developing a fatigue management plan

Depending on the operation, writing a fatigue management plan may be simple, or “easier said than done”. Regardless of how easy it is to write, the chances are that it won't be 100% right when first written. That is why it is essential to follow these three steps:

1. Develop the draft fatigue management plan. This should be led by the owner, with assistance from the skipper and crew, and others where needed, eg the SSM company.
2. Trial the plan. The trial should be for several weeks.
3. Revise the plan. A number of operators have found it useful to review their plans at the end of each season.

LEGAL OBLIGATIONS

The table below outlines the legal requirements that apply to the management of fatigue, together with suggestions on how to meet them. These requirements are from the Maritime Transport Act 1994 (MTA Act), Health and Safety Employment Act 1992 (HSE Act) and Maritime Rules (Rule).

Table 1 – Laws that apply to fatigue management

LEGISLATIVE REQUIREMENT	EXAMPLES OF STEPS THAT CAN BE TAKEN TO MEET LEGAL REQUIREMENTS
<ul style="list-style-type: none"> Employers to ensure methods for systematically identifying and managing hazards (HSE Act s6). 	<ul style="list-style-type: none"> Survey crew on their experience of fatigue and views on its causes. Conduct accident and incident analysis. Provide checklists on “how to identify fatigue in yourself and others”.
<ul style="list-style-type: none"> Employer to take all practicable steps to eliminate all significant hazards or isolate employees from them (HSE Act s8 and s9). If this is not possible the hazard must be managed so it is minimised (HSE Act s10). Owner and master must establish and implement procedures to ensure that all crew are fit for duty when keeping a watch (Rules 31A (s26 and 27), 31B (s16 and 17), 31C (s14 and 15)). When determining a seafarer’s fitness for duty the owner and master must take into account the relationship between fatigue, alertness and performance (Rules 31A, B, C). 	<ul style="list-style-type: none"> Involve crew in determining what causes fatigue and developing the best response to fatigue hazards. Determine safe manning levels and ensure the vessel is manned to these levels. Develop and post duty schedules. Post checklists on how to identify fatigue. Provide guidance on how to manage fatigued seafarers. Monitor fatigue levels and risk associated with fatigue.
<ul style="list-style-type: none"> Where hazards cannot be eliminated or isolated monitor the employee’s exposure to the hazard and report to employees on the results of the monitoring (HSE Act s10). Owner to carry out internal audits to verify whether safety activities comply with the SSM system (Rule 21). Logbook to include a record of watchkeeping crew, where a vessel is 45 m or more and proceeds beyond restricted limits. Also applies to all vessels on international voyages (Rule 73). 	<ul style="list-style-type: none"> Conduct surveys of crew and any others to whom a duty of care applies. Provide checklists on “how to identify fatigue in yourself and others”. Ensure logbooks include watchkeeping hours. Encourage medical examinations where appropriate.
<ul style="list-style-type: none"> Employer to provide reasonable opportunities for employees to participate in ongoing processes for improvement of health and safety (HSE Act s19B). 	<ul style="list-style-type: none"> Involve crew in identifying hazards. Involve crew in determining the best response to fatigue hazards. Involve crew in on-going monitoring.
<ul style="list-style-type: none"> Employer to provide training and supervision to all employees, so as to promote safety (MTA Act s17 (4) (b) and HSE s13). 	<ul style="list-style-type: none"> Provide training materials and courses, where appropriate. Provide active supervision, Keep records and use them as a management tool.

> Sleep

- > Make a good night's sleep before sailing a priority
- > Ensure sleeping environment allows quality sleep
- > Allow sufficient time off for recovery
- > Encourage crew to bring sleep problems forward



HOW TO WRITE A FATIGUE MANAGEMENT PLAN

Educate before you start

Distribute the brochure *Understanding fatigue* and discuss with your staff or work colleagues. Your SSM company or local maritime safety inspector maybe able to take a short session on fatigue. Sharing training with other vessel owners may lower costs and provide you with additional insights.

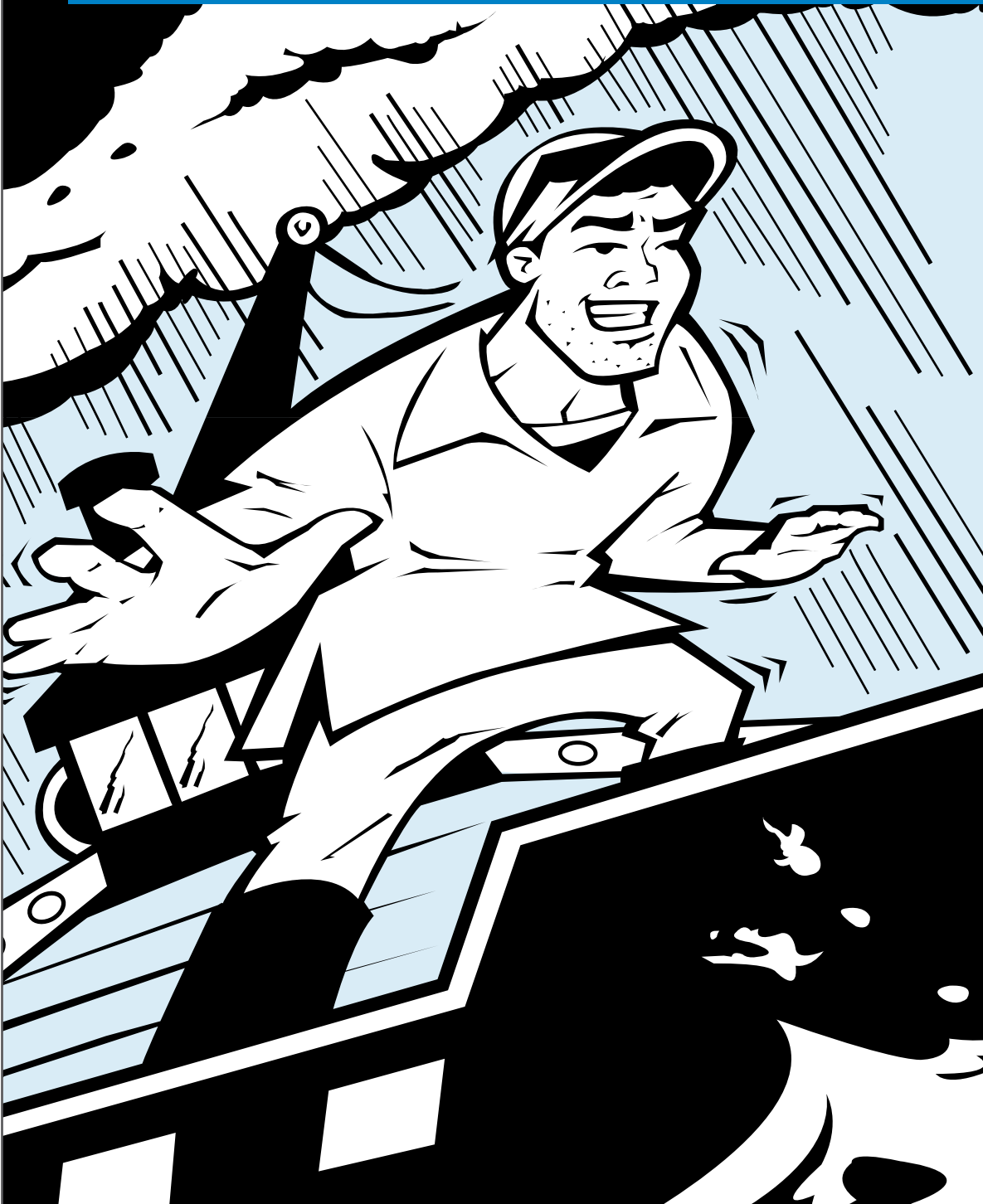
Key parts of a fatigue management plan

Listed below are the key parts of a fatigue management plan, including your main legal responsibilities.

Owner expectations	What is important to the owner, the bottom line for safety. This lets the skipper and crew know how to act in both preventing fatigue and managing it when it can't be prevented.
Identify hazards	Work with your crew, shore staff, and anyone else who may be able to assist, to identify what results in fatigue in your operation. Include both: <ul style="list-style-type: none"> • what causes fatigue on a regular basis • what occasionally causes fatigue.
Managing hazards judged to be significant	Your fatigue management plan must cover the significant hazards identified. In short, a significant hazard is anything that can potentially cause harm to a person (like an injury accident or a vessel grounding which can lead to an injury). For each significant hazard, identify how it can be eliminated, isolated, or if neither of these can be achieved, how it will be minimised. For actions on the vessel, record both what will happen on the vessel and what management will do to make sure the hazard is controlled. (Doing this also helps you show the auditor that you are operating an effective approach to fatigue management.)
Managing hazards judged not to be significant	For hazards you identified and judged to be not significant, you must monitor them to see that they don't develop into significant hazards. Note when you will do this and sign off when you do.
Assign responsibilities	Make sure you document each crew member's responsibilities and have them sign an acknowledgment of these.
Train anyone who needs training	Record what training occurs and make sure those who have training sign off on it.
Trial the draft plan	It is usually not possible to get the fatigue management plan totally right the first time. A 1-2 month trial is useful for fixing any problems.
Monitor, review and revise	Some causes of fatigue may be difficult to manage or may change over time (like crew fitness for duty). These may need to be monitored on a regular basis. Set times when you will review how well the plan worked, such as at the end of a season. Write any changes into the SSM manual.

> Working Conditions

- > Ensure rest breaks when conditions are tough
- > Discuss watchkeeping policy with crew
- > Employ sufficient staff to avoid long work days
- > Monitor fatigue and give feedback



DOCUMENTING STEPS FOR AUDIT

Recording who is involved at each step demonstrates what you have done and who was involved.

ACTION	WHO WAS INVOLVED	METHOD USED	SIGNATURE AND DATE COMPLETED
<p>Educate about fatigue:</p> <ul style="list-style-type: none"> • yourself • staff <p>Read the <i>Understanding fatigue</i> brochure, provide training session with advisor, discuss fatigue together.</p>			
<p>State your expectations</p> <p>What is important, safety-wise, that the crew must know? When does safety take priority over production?</p>			
<p>Identify significant fatigue hazards</p> <p>Work with others, especially the crew; consider the effect of different types of seasons and operating conditions; consider limitations of human biology, especially cumulative fatigue; consider what surprises may occur unexpectedly.</p>			
<p>Develop measures to eliminate, isolate or minimise these hazards</p> <p>Work with others, especially the crew; consider how these measures change for different seasons and operating conditions. Include contingency plans.</p>			
<p>Identify management actions</p> <p>These support measures to eliminate, isolate or minimise hazards.</p>			
<p>Assign responsibilities and train staff</p> <p>You are legally obliged to provide training where a need exists.</p>			
<p>Trial the draft fatigue management plan during the shakedown phase.</p> <p>This is part of SSM procedures, especially for new vessels. It helps sort out any “bugs”.</p>			
<p>Monitor and review</p> <p>How are you going to monitor fatigue and operation of your plan? When and how will you review the plan?</p>			
<p>Revise the plan</p> <p>This is a management action that follows from the review.</p>			



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