Guidelines On Fatigue
Module 8

FATIGUE AND THE MARITIME PILOT

Foreword

The Fatigue guidelines contain practical information to assist interested parties (naval architects/Ship designers, owners/operators, Masters, Officers, other crew members and training institutions) to better understand and manage fatigue.

The guidelines provide information on the potential dangers of fatigue and ultimately the effect on the health and safety of the personnel working on ships. The guidelines contain information on the symptoms and causes of fatigue, and address solutions to combat fatigue to improve the associated health problems and help prevent a fatigue related accident occurring.

The guidelines have been divided into nine modules, as follow:

1. Module 1 Fatigue
2. Module 2 Fatigue and the Rating
3. Module 3 Fatigue and the Ship's Officer
4. Module 4 Fatigue and the Master
5. Module 5 Fatigue and the Training Institution and Management Personnel in charge of Training
6. Module 6 Shipboard Fatigue and the Owner/Operator/Manager
7. Module 7 Shipboard Fatigue and the Naval Architect/Ship Designer
8. Module 8 Fatigue and the Maritime Pilot
9. Module 9 Fatigue and Tugboat Personnel
10. Appendix Fatigue related documentation

It is recommended that all parties become familiar with Module 1 prior to using Modules 2-9. Module 1 contains pertinent background information on the subject of fatigue.

Module 8 contains practical information intended for the ***Maritime Pilot***. It is also recommended that the Maritime Pilot becomes familiar with Module 4 - Fatigue and the Master.

Guidelines on Fatigue
Module 8

FATIGUE AND THE MARITIME PILOT

1. WHY AND WHAT SHOULD A MARITIME PILOT KNOW ABOUT FATIGUE?

To begin, fatigue is a biological state to which all individuals are susceptible, regardless of skill, knowledge or training. A pilot's work environment (irregular and lengthy work hours, working at night, unpredictable duty rosters, and traveling to and from their jobs) can significantly contribute to fatigue. Moving a large vessel in confined waters is a high-risk task and the pilot assigned to that task has a responsibility to the State, the Port Authority and the ship's master.

Despite the differences among worldwide pilotage services (deep-sea, harbor, river pilots, etc.) and various pilotage systems (call systems, shift systems, etc.), fatigue is a common issue for all Maritime Pilots. There is no one-fits-all approach for addressing fatigue, but there are certain universal principles (lifestyle, rest, medication, workload, etc.) that must be addressed irrespective of the pilotage service or the pilotage system implemented.

With that understood, this particular module outlines the symptoms and causes of fatigue for the maritime pilot. It further addresses ways to mitigate fatigue, and as a result, can improve the associated health problems and help prevent a fatigue-related accident from occurring. More specifically, this module focuses on the potential risks of irregular and extended work hours (compared to a regular nine to five day), and ultimately, their effect on the health and safety common to Pilots and their areas of operation.

2. WHAT CAN CAUSE FATIGUE?

The primary cause of both acute and cumulative fatigue in Maritime Pilotage is the disruption to the circadian rhythm due to the 24-hour operation and the accumulation of sleep debt. Fatigue can be either work related or non-work related:

Work Related
Unpredictable work and shipping schedules, intense concentration, temperature extremes, adverse weather, and exposure to high-risk situations can all cause fatigue. An Australian[1] study revealed that pilots excreted high levels of adrenaline while providing pilotage services (sometimes taking up to two days to return to normal levels) and that pulse rates increased to over 160. This level of physiological stress is one factor of cumulative fatigue.

Other factors include the workload; the time of day at which the pilotage act is performed; the duration of work periods; the length of breaks within and between work periods; and the time of day and the frequency of duty rosters. Boarding ships with unfamiliar layout, crew etc. (an intrinsic part of maritime pilots' work) is stressful.

Non-work Related

Non-work related fatigue can be linked to a disruption within one's family or social life, financial difficulties or domestic responsibilities. Other contributory causes of fatigue are age and medical fitness. Age related changes such as the need for less sleep, hypertension, loss or deterioration of visual perception, poorer physical condition and the increased need for medication may lead to a decline in human performance. Obviously, certain medical conditions will affect work performance, but some not so obvious conditions are sleep apnea, narcolepsy, and insomnia.

3. HOW DOES FATIGUE AFFECT PILOTAGE PERFORMANCE?

Pilots are managers of high-risk situations that require intense concentration and skill levels, therefore, any decrease in performance can potentially lead to a catastrophe. A pilot error caused by fatigue can endanger the ship, crew, port and the environment.

Some of the more recognizable symptoms of fatigue found in Pilots are stress, mood swings, headaches and gastro-intestinal problems. Fatigue can affect pilot performance by impacting their ability to think clearly, to concentrate, to focus attention appropriately, to assess risky situations, or to act as quickly as necessary.

Table 1 describes some of the possible effects by listing performance impairments and the symptoms associated with them.

TABLE 1
Effects of Fatigue

PERFORMANCE IMPAIRMENT		SIGNS/SYMPTOMS
1	Inability to concentrate	• Unable to organise a series of activities • Preoccupation with a single task • Focuses on a trivial problem, neglecting more important ones • Less vigilant than usual
2	Diminished decision-making ability	• Misjudges distance, speed, time, etc. • Fails to appreciate the gravity of the situation • Fails to anticipate danger • Fails to observe and obey warning signs • Overlooks items that should be included • Chooses risky options • Has difficulty with simple arithmetic, geometry, etc
3	Poor memory	• Fails to remember the sequence of task or task elements • Has difficulty remembering events or procedures • Forgets to complete a task or part of a task
4	Slow Response	• Responds slowly (if at all) to normal, abnormal or emergency situations
5	Loss of bodily control	• May appear to be drunk • Inability to stay awake • Speech is affected, e.g. it may be slurred, slowed or garbled

6	Mood change	• Quieter, less talkative than usual • Unusually irritable
7	Attitude change	• Unaware of own poor performance • Too willing to take risks • Ignores normal checks and procedures • Displays a "don't care" attitude

Long-term effects of fatigue may lead to cardiovascular diseases, gastro-intestinal diseases, psychiatric problems and stress. Other external sources of stress, such as third party intervention and the threat of competition, can impact heavily on the health of pilots.

One of the most alarming consequences of fatigue is uncontrollable *micro sleep* that may last for only a few seconds to a couple of minutes. The problem with micro sleep is that the person is unaware of it having occurred. Micro sleep lapses have been well documented as causing a number of maritime, and other transportation, incidents.

4. WHAT CAN BE DONE TO MANAGE FATIGUE IN PILOTAGE?

The responsibility for controlling the hazards that may contribute to pilot fatigue, through elimination or minimization, should be shared amongst all parties. These parties are: the relevant authority, those who employ the Pilots' services and those who have responsibility for scheduling and the safe transit of Pilots to and from ships, and the individual Pilot. The Pilot side of the responsibility is to observe all safe work practices imposed by international/national/local legislation and to contrive to be fit for work.

Clear and open lines of communication must be established between the Maritime Pilot, those whom employ the Pilot's services, and those responsible for scheduling. Good communication between all parties will promote effective controls for workload management, such as vessel scheduling. Workload management by pilots and the competent authorities is a key component in managing fatigue. This will ensure that Pilots do not work excessive hours and that they have sufficient recovery time.

The relevant authority and pilots should recognize that high-risk operations within the pilotage area are particularly hazardous when undertaken during a circadian dip, especially the one that naturally occurs between 0300 and 0600. For example, the berthing of large tankers at night is prohibited in some ports because of the risk of a spill.

Fatigue Management Systems, such as those instituted in Australia, can help to manage some of the risks associated with fatigue. The Australian system uses a quantitative model to assess the working roster (including rest/work hours, work hours, rest frequency, etc.) in order to balance the hazards that produce fatigue and the forces that lead to recovery. However, it must be noted that not all quantitative models address the fatigue associated with high-risk industries such as pilotage. The use of a fatigue index score modelling[2] to formulate and modify rosters can enable organizations to quantify, compare and predict work-related fatigue. These models have shown improvements in fatigue management affecting the lives of pilots, their families and community.

Educating pilots, their co-workers and families on the underlying physiology of human performance and the lifestyle necessary for a piloting career may assist in reducing the incidence

and consequences of fatigue. Pilots and their families should be aware of the issue of fatigue, the potential consequences, and the practical techniques that can be used to help mitigate fatigue. In summary, pilots should learn to manage their off duty time and lifestyle.

5. WHAT PERSONAL MEASURES CAN A PILOT TAKE TO AVOID FATIGUE?

A pilot should not begin a work period with a sleep debt or an accumulative sleep debt (the normal requirement less the amount of sleep), as this can be potentially dangerous in terms of human performance. In most cases, two consecutive nights of recovery sleep will recuperate a pilot from a sleep debt. (Note, most adults working a 9-5 job accumulate a sleep debt of five to seven hours Monday to Friday and sleep in on the weekend to recover that debt.)

A strategic nap of no more than 30 minutes will aid rejuvenation. Naps longer than 30 minutes will cause sleep inertia where situational awareness is impaired for up to 20 minutes after waking. Management should provide suitable facilities for pilots to take rest breaks between piloting assignments.

When at home, the Pilot should develop a regular pre-sleep routine and sleep in a comfortable environment without noise, light or temperature extremes. A Pilot should not exercise or eat a large meal before sleep. Caffeine should be used sparingly as it has many side effects including hypertension, headaches, mood swings and anxiety.

Pilots should be encouraged to exercise regularly and to maintain a well balanced diet, avoiding "junk foods" which are often too convenient when working at night. Caffeine consumption should be limited to times of operational necessity and avoided for several hours prior to a sleep period.

Avoid alcohol and some over-the-counter medication as these disrupt sleep by disturbing normal sleep patterning. Alcohol in particular suppresses REM sleep (dreaming) and may lead to overall sleep loss. Cold medication containing psuedoephedrine, a stimulant, should be avoided as it can disrupt sleep.

Finally, it is important for Pilots to educate their families about the dangers to health and risk to the community of being a fatigued pilot to gain their support.

6. CASE STUDIES

Reporting incidents and/or accidents that involve near misses, personal injury or damage to equipment can assist the understanding of fatigue within the pilotage workforce and contribute to finding ways to deal with the issues associated with fatigue.

The following casualty investigation reports are provided as illustrative examples:

- The grounding of Panamanian flag vessel "New Reach" occurred on Heath Reef, Great Barrier Reef on May 17, 1999. The Pilot was in an advanced state of drowsiness. The passage was 464 miles and the pilot was on board for 34 hours.

- The grounding of the vessel "Venus" in St Lawrence River occurred on April 17, 1997. Although not the main cause for the grounding, fatigue was a contributing factor. The Pilot was not in the routine of night work on his first duty turn after a vacation. Further, the Pilot was on duty for approximately 24 hours. (Transportation Safety Board of Canada – Report Number M97L0030)

- The collision between the bulk carrier "NIRJA" and the "Hamilton Energy" on December 11, 1993 occurred in Hamilton Harbour, Ontario. The Pilot was not adequately rested having had three consecutive assignments in 24 hours. The Pilot may have misjudged the developing situation and did not take effective action in ample time, as a result of being fatigued. Performance degradation manifested in impaired judgement, probably contributed to the occurrence. (Transportation Safety Board of Canada – Report Number M93C0003)

- The grounding of the "Raven Arrow" in the Johnstone Strait, British Columbia on September 24, 1997. After electing to conduct the navigation of the vessel without assistance from the ship's complement (increasing his workload), the Pilot lost situational awareness and prematurely altered course. Contributing to the occurrence were the following factors: the pilot was probably fatigued (at the time of the occurrence the pilot had been awake for over 19.5 hours); sound navigational principles were not implemented by the bridge team (pilot elected to conduct the navigation of the vessel without assistance from the ship's complement); and the exchange of information between the pilot and officer of the watch was minimal (officer of the watch had some doubts with respect to course alteration but did not challenge the pilot's decision). This report goes beyond the individual pilot and fatigue, and addresses fatigue from the perspective of management by examining pilot scheduling and fatigue management. (Transportation Safety Board of Canada – Report Number M97W0197)

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Guidelines on Fatigue
Module 9

FATIGUE AND TUGBOAT PERSONNEL

Foreword

The Guidelines on Fatigue contain practical information that can assist interested parties (Naval architects/Ship designers, owners/operators, Masters, Officers, other crew members and training institutions) to better understand and manage fatigue.

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10. Appendix Fatigue related documentation

It is recommended that all parties become familiar with Module 1 prior to using Modules 2-9. Module 1 contains pertinent background information on the subject of fatigue.

Module 9 contains practical information intended for ***Tugboat Personnel***. It is recommended that they become familiar with Modules 2, 3 and 4 (Fatigue and the Rating, Fatigue and the Ship's Officer and Fatigue and the Master respectively).

Module 9

FATIGUE AND TUGBOAT PERSONNEL

1. HOW CAN YOU RECOGNIZE FATIGUE IN YOURSELF AND OTHERS?

You may exhibit one or more changes in behavior when experiencing fatigue. However, one very important fact to remember is that people who are fatigued have a very difficult time recognizing the signs of fatigue within themselves. It is difficult for a number of reasons, but largely because fatigue can affect your ability to make judgements or solve complex problems. The following list describes how fatigue affects your mind and body; you may recognize some of these changes in others (with time, you may learn to identify some within yourself):

A. Physically

- Inability to stay awake (an example is head nodding or falling asleep against your will)
- Difficulty with hand-eye coordination skills (e.g., switch selection)
- Speech difficulties (it may be slurred, slowed or garbled)
- Heaviness in the arms and legs or sluggish feeling
- Decreased ability to exert force while lifting, pushing or pulling
- Increased frequency of dropping objects like tools or parts
- Non-specific physical discomfort
- Headaches
- Giddiness
- Heart palpitations / irregular heard beats
- Rapid breathing
- Loss of appetite
- Insomnia
- Sudden sweating fits
- Leg pains or cramps
- Digestion problems

B. Emotionally

- Increased willingness to take risks
- Increased intolerance and anti-social behavior
- Needless worry
- Reduced motivation to work well
- Increased mood changes (e.g., irritability, tiredness and depression)

C. <u>Mentally</u>

- Poor judgement of distance, speed, time, etc.
- Inaccurate interpretation of a situation (e.g., focusing on a simple problem or failing to anticipate the gravity of the situation or failing to anticipate danger)
- Slow or no response to normal, abnormal or emergency situations
- Reduced attention span
- Difficulty concentrating and thinking clearly
- Decrease in ability to pay attention

Whenever alertness is affected by fatigue, your performance will be handicapped.
It is important that you notify your supervisor when you recognize that you or other crewmembers are fatigued. It is important to have an open communication between you and your supervisor regarding fatigue prevention and detection.

2. WHAT CAN CAUSE FATIGUE?

Fatigue may be caused and/or made worse by one or a combination of things such as:

- Lack of sleep
  Only sleep can maintain or restore your performance level. When you do not get enough sleep, fatigue will set in and your alertness will be impaired. (Refer to Section 3)

- Poor quality of sleep
  Fatigue may be caused by poor quality of sleep. This can occur when you are unable to sleep without interruptions or you are unable to fall asleep even though your body tells you to. (Refer to Section 3)

- Insufficient rest time between work periods
  Apart from sleep, rest (taking a break) between work periods can contribute to restoring your performance levels. Insufficient rest periods or postponing assigned rest times (to finish the job early) can cause fatigue. (Refer to Section 3)

- Poor quality of rest
  Disturbances while resting such as being woken up unexpectedly, on call (during port operations), or unpredictable working hours (when arriving in port) can cause fatigue.

- Stress
  Stress can be caused by personal problems (family), problems with other shipmates, long work hours, work in general, etc. A build up of stress will cause or increase fatigue.

- Boring and repetitive work
  Boredom can cause fatigue. You may become bored to the point of fatigue when your work is too easy, repetitive and monotonous and/or bodily movement is restricted.

- Noise or vibration
  Noise or vibration can affect your ability to sleep/rest, and it can affect your level of physical stress, thus causing fatigue.

- Ship's movement
  The ship's movement affects your ability to maintain physical balance. Maintaining balance requires extra energy, which can then cause fatigue. A ship's pitching and rolling motions mean you might have to use 15-20% extra effort to maintain your balance.

- Food (timing, frequency, content and quality)
  Refined sugars (sweets, doughnuts, chocolates, etc.) can cause your blood sugar to rise rapidly to a high level. The downside of such short-term energy is that a rapid drop in blood sugar can follow it. Low blood sugar levels can cause weakness, instability, difficulty in concentrating and in extreme cases unconsciousness. Eating large meals prior to a sleep period may disrupt your sleep.

- Medical conditions and illnesses
  Medical conditions (i.e. heart problems) and illnesses such as the common cold can cause fatigue. The effect depends on the nature of the illness or medical condition but also the type of work being carried out. For example, common colds slow response time and hand-eye coordination in performance.

- Ingesting chemicals
  Alcohol, caffeine and some over-the-counter medications disrupt sleep. Caffeine consumption can also causes other side effects such as hypertension, headaches, mood swings or anxiety.

- Jet-lag
  Jet-lag occurs following long flights through several time zones. It is a condition that causes fatigue in addition to sleep-deprivation and irritability. It is easier to adjust to time zones while crossing from east to west as opposed to west to east. The greatest difficulty in adjustment results from crossing 12 time zones, the least from crossing one time zone. Our bodies adjust at the rate of approximately 1-hour per day

- Excessive work load
  Working consistently "heavy" workloads can cause fatigue. Workload is considered heavy when one works excessive hours or performs physically demanding or mentally stressful tasks. Excessive work hours and fatigue can result in negative effects such as the following:
  - Increased accident and fatality rates;
  - Increased dependence upon drugs, tobacco or alcohol;
  - Poor quality and disrupted sleep patterns;
  - Higher frequency of cardiovascular, respiratory or digestive disorders;
  - Increased risk of infection; and
  - Loss of appetite.

3. HOW CAN YOU PROTECT YOURSELF FROM THE ONSET OF FATIGUE?

A. Sleep Issues

Sleep is the most effective strategy to fight fatigue. Sleep loss and sleepiness can degrade every aspect of a person's performance: physical, emotional and mental. To satisfy the needs of your body, experts agree that you should acquire the following:

- Deep sleep;
- Between 7 to 8 hours of sleep per 24-hour day;
- Uninterrupted sleep.

Here is some general guidance on developing good sleep habits:

- Develop and follow a pre-sleep routine to promote sleep at bedtime (examples are a warm shower or reading calming material).
- Make the sleep environment conducive to sleep (a comfortable bed, a dark, quiet and cool environment encourages sleep).
- Ensure that you will have no interruptions during your extended period of sleep.
- Satisfy any other physiological needs before trying to sleep (examples are if hungry or thirsty before bed, eat or drink lightly to avoid being kept awake by digestive activity and always visit the toilet before trying to sleep).
- Avoid alcohol and caffeine prior to sleep (keep in mind that coffee, tea, colas, chocolate, and some medications, including cold remedies and aspirin, may contain alcohol and/or caffeine). Avoid caffeine at least six hours before bedtime.
- Consider relaxation techniques such as meditation and yoga, which can also be of great help if learnt properly.

B. Rest Issues

Another important factor that can affect fatigue and performance is rest. Rest, apart from sleep, can be provided in the form of breaks or changes in activities. Rest pauses or breaks are indispensable as a physical requirement if performance is to be maintained. Factors influencing the need for rest are the length and intensity of the activities prior to a break or a change in activity, the length of the break, or the nature or change of the new activity.

C. Guidelines on maintaining performance

Here are some general guidelines that can help you maintain performance:

- Get sufficient sleep, especially before any period when you anticipate that you will not get adequate sleep.
- When you sleep, make it a long period of sleep.
- Take strategic naps.
- Take breaks when scheduled breaks are assigned.
- Develop and maintain good sleep habits, such as a pre-sleep routine (something that you always do to get you ready to sleep).
- Monitor your hours of work and rest when opportunity arises.
- Eat regular, well-balanced meals (including fruits and vegetables, as well as meat and starches).
- Exercise regularly.

4. WHAT CAN MITIGATE THE EFFECTS OF FATIGUE?

The most powerful means of relieving fatigue is to get proper sleep and to rest when appropriate. However, a number of things have been identified as potentially providing some short-term relief. Note, however, that these countermeasures may simply just mask the symptoms temporarily –the fatigue has not been eliminated.

- An interesting challenge, an exciting idea, a change in work routine or anything else that is new and different will keep you awake.
- Changing the order of activities, where personnel are assigned tasks that include variety in the nature of tasks, can be beneficial in breaking up job monotony. Mixing tasks requiring high physical or mental work with low-demand tasks can be beneficial.
- Bright lights, cool dry air, music and other irregular sounds can increase alertness.
- Caffeine (encountered in coffee and tea, and to a lesser extent in colas and chocolate) may combat sleepiness in some people for short periods. However, regular usage over time reduces its value as a stimulant and may make you more tired and less able to sleep
- Any type of muscular activity helps to keep you alert; running, walking, stretching or even chewing gum can stimulate our level of alertness.
- Conversation can help you stay awake.
- Controlled, strategic naps can improve alertness and performance (the most effective length of time for a nap is about 20 minutes).

Strategic Napping

Research has identified "strategic napping" as a short-term relief technique to help maintain performance levels during long periods of wakefulness. The most effective length of time for a nap is about 20 minutes. This means that if you have the opportunity to nap you should take it. However, there are some drawbacks associated with napping. One potential drawback is that naps longer than 30 minutes will cause sleep inertia, where situational awareness is impaired (grogginess and/or disorientation for up to 20 minutes after waking. A second is that the nap may disrupt later sleeping periods (you may not be tired when time comes for an extended period of sleep).

5. WHAT CAN BE DONE TO REDUCE CREW FATIGUE ON BOARD TUGBOATS?

There are a number of steps that can be taken to prevent fatigue. Many of the measures that reduce fatigue are unfortunately beyond a single person's ability to influence, such as voyage scheduling, ship design, work scheduling. Steps such as the following (where applicable) are important for the prevention of fatigue on board ship, and are within the tugboat personnel's ability to influence and implement:

- Ensuring the compliance with maritime regulations concerning minimum hours of rest and/or maximum hours of work
- Creating an open communication environment (e.g. by making it clear to the crew members that it is important to inform supervisors when fatigue is impairing their performance and that there will be no recriminations for such reports)
- Scheduling drills in a manner that minimizes the disturbance of rest/sleep periods
- Establishing on-board management techniques when scheduling shipboard work and rest periods, watchkeeping practices and assignment of duties in a more efficient manner

- Assigning work by mixing up tasks to break up monotony and combining work that requires high physical or mental demand with low-demand tasks (job rotation)
- Scheduling tasks with potential hazards for daytime hours, when appropriate
- Emphasizing the relationship between work and rest periods to ensure that adequate rest is received by promoting individual record keeping of hours rested or worked
- Ensuring that shipboard conditions, within the crew's ability to influence, are maintained in a good state (such as maintaining the heating, ventilation and air-conditioning (HVAC) on schedule, replacing light bulbs, and contending with the sources of unusual noise at the first opportunity)
- Establishing shipboard practices for dealing with fatigue incidents and learning from them (as part of safety meetings)
- Increasing awareness of the long-term health benefits of appropriate lifestyle behavior (e.g. exercise, relaxation, nutrition, smoking and alcohol consumption)

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APPENDICES

Foreword

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The outline of the information is related to the potential dangers associated with fatigue and ultimately the effect on the health and safety of the personnel working on ships. The guidelines contain information on the symptoms and causes of fatigue, and addresses solutions to combat fatigue to improve the associated health problems and help prevent a fatigue related accident occurring.

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10. Appendix Fatigue related documentation

It is recommended that all parties become familiar with Module 1, which contains general information on the subject of fatigue, prior to using the rest of the Modules.

The **Appendices** contain reference material on the subject of fatigue, such as extracts from IMO and ILO instruments and lists of references.

APPENDICES

APPENDIX 1

REFERENCES

Module 1

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Module 5

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APPENDIX 2

MODEL FORMAT FOR TABLE OF SHIPBOARD WORKING ARRANGEMENTS[19]

[19] **International Maritime Organization (IMO) & International Labour Office (ILO) (1999)-** *IMO/ILO Guidelines for the Development of Tables of Seafarers' Shipboard Working Arrangements and Formats of Records of Seafarers' Hours of Work or Hours of Rest.* IMO – London, United Kingdom

Model format for table of shipboard working arrangements[20]

Name of ship: _____ Flag of ship: _____ IMO number (if any): _____ Latest update of table: _____ ( ) of ( ) pages

The maximum hours of work or minimum hours of rest are applicable in accordance with : _____ (national law or regulation) issued in conformity with ILO's Seafarers' Hours of Work and the Manning of Ships Convention 1996 (No. 180) and with any applicable collective agreement registered or authorized in accordance with that Convention and with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended, (STCW Convention).[21]

Maximum hours of work or minimum hours of rest[22]: _____

Other requirements: _____

Position/Rank[23]	**Scheduled daily work hours at sea**		**Scheduled daily work hours in port**		**Comments**	**Total daily work/rest[3] hours**	
	Watchkeeping (from - to)	**Non-watchkeeping duties (from - to)[24]**	**Watchkeeping (from - to)**	**Non-watchkeeping duties (from - to)[5]**		**At sea**	**In port**

Signature of Master _____

20 The terms used in this model table are to appear in the working language or languages of the ship and in English.

21 See overleaf for selected extracts from ILO Convention 180 and the STCW Convention.

22 Delete as applicable.

23 For those positions/ranks that are also listed in the ship's safe manning document, the terminology used should be the same as in that document.

24 For watchkeeping personnel, the comments section may be used to indicate the anticipated number of hours to be devoted to unscheduled work and any such hours should be included in the appropriate total daily work hours column.

Selected texts from ILO Convention 180 and the STCW Convention

ILO Convention 180

Art.5 paragraph 1.	The limits on hours of work or rest shall be as follows: (a) maximum hours of work shall not exceed: (i) 14 hours in any 24-hour period; and (ii) 72 hours in any seven-day period; or (b) minimum hours of rest shall not be less than: (i) ten hours in any 24-hour period; and (ii) 77 hours in any seven-day period.
Art. 5 paragraph 2.	Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.
Art. 5 paragraph 6.	Nothing in paragraphs 1 and 2 shall prevent the Member from having national laws or regulations or a procedure for the competent authority to authorize or register collective agreements permitting exceptions to the limits set out. Such exceptions shall, as far as possible, follow the standards set out but may take account of more frequent or longer leave periods or the granting of compensatory leave for watchkeeping seafarers or seafarers working on board ships on short voyages.
Art. 7 paragraph 1	Nothing in this Convention shall be deemed to impair the right of the master of a ship to require a seafarer to perform any hours of work necessary for the immediate safety of the ship, persons on board or cargo, or for the purpose of giving assistance to other ships or persons in distress at sea.
Art.7 paragraph 3	As soon as practicable after the normal situation has been restored, the master shall ensure that any seafarers who have performed work in a scheduled rest period are provided with an adequate period of rest.

STCW Convention

Section A-VIII/1 of the STCW Code (Mandatory)

1. All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch shall be provided a minimum of 10 hours rest in any 24-hour period.

2. The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.

3. The requirements for rest periods laid down in paragraph 1 and 2 need not be maintained in the case of an emergency or drill or in other overriding operational conditions.

4. Notwithstanding the provisions of paragraphs 1 and 2, the minimum period of ten hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not extend beyond two days and not less than 70 hours of rest are provided each seven day period.

5. Administrations shall require that watch schedules be posted where they are easily accessible.

Section B-VIII/1 of the STCW Code (Guidance)

3. In applying regulation VIII/1, the following should be taken into account:

.1 provisions made to prevent fatigue should ensure that excessive or unreasonable overall working hours are not undertaken. In particular, the minimum rest periods specified in Section A-VIII/1 should not be interpreted as implying that all other hours may be devoted to watchkeeping or other duties;
.2 that the frequency and length of leave periods, and the granting of compensatory leave, are material factors in preventing fatigue from building up over a period of time;
.3 the provisions may be varied for ships on short-sea voyages, provided special safety arrangements are put in place.

APPENDIX 3

MODEL FORMAT FOR RECORDS OF HOURS OF WORK OR HOURS OF REST OF SEAFARERS[25]

[25] **International Maritime Organization (IMO) & International Labour Office (ILO) (1999)-** *IMO/ILO Guidelines for the Development of Tables of Seafarers' Shipboard Working Arrangements and Formats of Records of Seafarers' Hours of Work or Hours of Rest.* IMO – London, United Kingdom

Model format for record of hours of work or hours of rest of seafarers[1]

Name of ship: _____ IMO number (if any): _____ Flag of ship: _____ _____

Seafarer (full name): _____ Position / rank: _____

Month and year: _____ Watchkeeper:[2] yes ☐ no ☐

Record of hours of work/rest[3]

Please mark periods of work or rest, as applicable, with an X, or using a continuous line or arrow.

COMPLETE THE TABLE ON THE REVERSE SIDE

The following national laws, regulations and/or collective agreements governing limitations on working hours or minimum rest periods apply to this ship:

_____

I agree that this record is an accurate reflection of the hours of work or rest of the seafarer concerned.

Name of master or person authorized by master to sign this record _____

Signature of master or authorized person _____ Signature of seafarer _____

A copy of this record is to be given to the seafarer. This form is subject to examination and endorsement under procedures established by _____
(name of competent authority)

_____

[1] The terms used in this model table are to appear in the working language or languages of the ship and in English.

[2] Check √ as appropriate.

[3] Delete as appropriate.

Please mark periods of work or rest, as applicable, with an "X", or using a continuous line or arrow

NOT TO BE COMPLETED BY THE SEAFARER[1]

Hours	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Hours of rest in 24-hour period	Comments	Hours of work or rest, as applicable, in any 24-hour period[2]	Hours of work or rest, as applicable, in any 7-day period[2]
Date																												
Hours	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23				

[1] For completion and use in accordance with the procedures established by the competent authority in compliance with the relevant requirements of the Seafarers' Hours of Work and the Manning of Ships Convention, 1996 (Convention No. 180).

[2] Additional calculations or verifications may be necessary to ensure compliance with the relevant requirements of the Seafarers' Hours of Work and the Manning of Ships Convention, 1996 (Convention No. 180) and the International Convention on Standards of Training, Certification and Watchkeeping, 1978, as amended (STCW Convention).

APPENDIX 4

SEAFARERS' HOURS OF WORK AND THE MANNING OF SHIPS CONVENTION, 1996 (NO. 180)

PART I. SCOPE AND DEFINITIONS

Article 1

1. This Convention applies to every seagoing ship, whether publicly or privately owned, which is registered in the territory of any Member for which the Convention is in force and is ordinarily engaged in commercial maritime operations. For the purpose of this Convention, a ship that is on the register of two Members is deemed to be registered in the territory of the Member whose flag it flies.

2. To the extent it deems practicable, after consulting the representative organizations of fishing-vessel owners and fishermen, the competent authority shall apply the provisions of this Convention to commercial maritime fishing.

3. In the event of doubt as to whether or not any ships are to be regarded as seagoing ships or engaged in commercial maritime operations or commercial maritime fishing for the purpose of the Convention, the question shall be determined by the competent authority after consulting the organizations of shipowners, seafarers and fishermen concerned.

4. This Convention does not apply to wooden vessels of traditional build such as dhows and junks.

Article 2

For the purpose of this Convention:

(a) the term "competent authority" means the minister, government department or other authority having power to issue regulations, orders or other instructions having the force of law in respect of seafarers' hours of work or rest or the manning of ships;

(b) the term "hours of work" means time during which a seafarer is required to do work on account of the ship;

(c) the term "hours of rest" means time outside hours of work; this term does not include short breaks;

(d) the term "seafarer" means any person defined as such by national laws or regulations or collective agreements who is employed or engaged in any capacity on board a seagoing ship to which this Convention applies;

(e) the term "shipowner" means the owner of the ship or any other organization or person, such as the manager or bareboat charterer, who has assumed the responsibility for the operation of the ship from the shipowner and who on assuming such responsibility has agreed to take over all the attendant duties and responsibilities.

PART II. SEAFARERS' HOURS OF WORK AND HOURS OF REST

Article 3

Within the limits set out in Article 5, there shall be fixed either a maximum number of hours of work which shall not be exceeded in a given period of time, or a minimum number of hours of rest which shall be provided in a given period of time.

Article 4

A Member which ratifies this Convention acknowledges that the normal working hours' standard for seafarers, like that for other workers, shall be based on an eight-hour day with one day of rest per week and rest on public holidays. However, this shall not prevent the Member from having procedures to authorize or register a collective agreement which determines seafarers' normal working hours on a basis no less favourable than this standard.

Article 5

1. The limits on hours of work or rest shall be as follows:

   (a) maximum hours of work shall not exceed:

      (i) 14 hours in any 24-hour period; and

      (ii) 72 hours in any seven-day period;

   or

   (b) minimum hours of rest shall not be less than:

      (i) ten hours in any 24-hour period; and

      (ii) 77 hours in any seven-day period.

2. Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.

3. Musters, fire-fighting and lifeboat drills, and drills prescribed by national laws and regulations and by international instruments shall be conducted in a manner that minimizes the disturbance of rest periods and does not induce fatigue.

4. In respect of situations when a seafarer is on call, such as when a machinery space is unattended, the seafarer shall have an adequate compensatory rest period if the normal period of rest is disturbed by call-outs to work.

5. If no collective agreement or arbitration award exists or if the competent authority determines that the provisions in the agreement or award in respect of paragraph 3 or 4 are inadequate, the competent authority shall determine such provisions to ensure the seafarers concerned have sufficient rest.

6. Nothing in paragraphs 1 and 2 shall prevent the Member from having national laws or regulations or a procedure for the competent authority to authorize or register collective agreements permitting exceptions to the limits set out. Such exceptions shall, as far as possible, follow the standards set out but may take account of more frequent or longer leave periods or the granting of compensatory leave for watchkeeping seafarers or seafarers working on board ships on short voyages.

7. The Member shall require the posting, in an easily accessible place, of a table with the shipboard working arrangements, which shall contain for every position at least:

(a) the schedule of service at sea and service in port; and

(b) the maximum hours of work or the minimum hours of rest required by the laws, regulations or collective agreements in force in the flag State.

8. The table referred to in paragraph 7 shall be established in a standardized format in the working language or languages of the ship and in English.

Article 6

No seafarer under 18 years of age shall work at night. For the purpose of this Article, "night" means a period of at least nine consecutive hours, including the interval from midnight to five a.m. This provision need not be applied when the effective training of young seafarers between the ages of 16 and 18 in accordance with established programmes and schedules would be impaired.

Article 7

1. Nothing in this Convention shall be deemed to impair the right of the master of a ship to require a seafarer to perform any hours of work necessary for the immediate safety of the ship, persons on board or cargo, or for the purpose of giving assistance to other ships or persons in distress at sea.

2. In accordance with paragraph 1, the master may suspend the schedule of hours of work or hours of rest and require a seafarer to perform any hours of work necessary until the normal situation has been restored.

3. As soon as practicable after the normal situation has been restored, the master shall ensure that any seafarers who have performed work in a scheduled rest period are provided with an adequate period of rest.

Article 8

1. The Member shall require that records of seafarers' daily hours of work or of their daily hours of rest be maintained to allow monitoring of compliance with the provisions set out in Article 5. The seafarer shall receive a copy of the records pertaining to him or her which shall be endorsed by the master, or a person authorized by the master, and by the seafarer.

2. The competent authority shall determine the procedures for keeping such records on board, including the intervals at which the information shall be recorded. The competent authority shall establish the format of the records of the seafarers' hours of work or of their hours of rest taking into

account any available International Labour Organization guidelines or shall use any standard format prepared by the Organization. The format shall be established in the language or languages provided by Article 5, paragraph 8.

3. A copy of the relevant provisions of the national legislation pertaining to this Convention and the relevant collective agreements shall be kept on board and be easily accessible to the crew.

Article 9

The competent authority shall examine and endorse the records referred to in Article 8, at appropriate intervals, to monitor compliance with the provisions governing hours of work or hours of rest that give effect to this Convention.

Article 10

If the records or other evidence indicate infringement of provisions governing hours of work or hours of rest, the competent authority shall require that measures, including if necessary the revision of the manning of the ship, are taken so as to avoid future infringements.

PART III. MANNING OF SHIPS

Article 11

1. Every ship to which this Convention applies shall be sufficiently, safely and efficiently manned, in accordance with the minimum safe manning document or an equivalent issued by the competent authority.

2. When determining, approving or revising manning levels, the competent authority shall take into account:

(a) the need to avoid or minimize, as far as practicable, excessive hours of work, to ensure sufficient rest and to limit fatigue; and

(b) the international instruments identified in the Preamble.

Article 12

No person under 16 years of age shall work on a ship.

PART IV. RESPONSIBILITIES OF SHIPOWNERS AND MASTERS

Article 13

The shipowner shall ensure that the master is provided with the necessary resources for the purpose of compliance with obligations under this Convention, including those relating to the appropriate manning of the ship. The master shall take all necessary steps to ensure that the requirements on seafarers' hours of work and rest arising from this Convention are complied with.

PART V. APPLICATION

Article 14

A Member which ratifies this Convention shall be responsible for the application of its provisions by means of laws or regulations, except where effect is given by collective agreements, arbitration awards or court decisions.

Article 15

The Member shall:

(a) take all necessary measures, including the provision of appropriate sanctions and corrective measures, to ensure the effective enforcement of the provisions of this Convention;

(b) have appropriate inspection services to supervise the application of the measures taken in pursuance of this Convention and provide them with the necessary resources for this purpose; and

(c) after consulting shipowners' and seafarers' organizations, have procedures to investigate complaints relating to any matter contained in this Convention.

APPENDIX 5

RELEVANT REQUIREMENTS OF THE INTERNATIONAL SAFETY MANAGEMENT CODE (ISM CODE)

6. Resources and Personnel

6.1 The Company should ensure that the master is:

1. properly qualified for command;

2. fully conversant with the Company's SMS; and

3. given the necessary support so that the master's duties can be safely performed.

6.2 The Company should ensure that each ship is manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements.

6.3 The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarisation with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.

6.4 The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.

6.5 The Company should establish and maintain procedures for identifying any training which may be required in support of the SMS and ensure that such training is provided for all personnel concerned.

6.6 The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.

6.7 The Company should ensure that the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.

APPENDIX 6

RELEVANT REQUIREMENTS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED IN 1995, AND ITS CODE

Regulation VIII/1
Fitness for duty

Each Administration shall, for the purpose of preventing fatigue:

1. establish and enforce rest periods for watchkeeping personnel; and

2. require that watch systems are so arranged that the efficiency of all watchkeeping personnel is not impaired by fatigue and that duties are so organized that the first watch at the commencement of a voyage and subsequent relieving watches are sufficiently rested and otherwise fit for duty.

Section A-VIII/1
Fitness for duty

1. All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch shall be provided a minimum of 10 hours rest in any 24-hour period.

2. The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.

3. The requirements for rest periods laid down in paragraph 1 and 2 need not be maintained in the case of an emergency or drill or in other overriding operational conditions.

4. Notwithstanding the provisions of paragraphs 1 and 2, the minimum period of ten hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not extend beyond two days and not less than 70 hours of rest are provided each seven day period.

5. Administrations shall require that watch schedules be posted where they are easily accessible.

Section B-VIII/1

Guidance regarding fitness for duty

Prevention of fatigue

1 In observing the rest period requirements, "overriding operational conditions" should be construed to mean only essential shipboard work which cannot be delayed for safety or environmental reasons or which could not reasonably have been anticipated at the commencement of the voyage.

2 Although there is no universally accepted technical definition of fatigue, everyone involved in ship operations should be alert to the factors which can contribute to fatigue, including, but not limited to those identified by the Organization,[26] and take them into account when making decisions on ship operations.

3 In applying regulation VIII/1, the following should be taken into account:

.1 provisions made to prevent fatigue should ensure that excessive or unreasonable overall working hours are not undertaken. In particular, the minimum rest periods specified in Section A-VIII/1 should not be interpreted as implying that all other hours may be devoted to watchkeeping or other duties;

.2 that the frequency and length of leave periods, and the granting of compensatory leave, are material factors in preventing fatigue from building up over a period of time;

.3 the provisions may be varied for ships on short-sea voyages, provided special safety arrangements are put in place; and

4 Administrations should consider the introduction of a requirement that records of hours of work or rest of seafarers should be maintained and that such records are inspected by the Administration at appropriate intervals to ensure compliance with regulations concerning working hours or rest periods.

5 Based on information received as a result of investigating maritime casualties, Administrations should keep their provisions on prevention of fatigue under review.

[26] See IMO resolution A.722(18), paragraphs 2 to 4.4.1.

APPENDIX 7

RESOLUTION A.772(18)
adopted on 4 November 1993

ANNEX

FATIGUE FACTORS IN MANNING AND SAFETY

1 INTRODUCTION

1.1 The purpose of this document is to provide a general description of fatigue, to identify the factors of ship operations which may contribute to fatigue, and to classify those factors under broad categories to indicate the extent to which the factors may be related.

1.2 The objective is to increase awareness of the complexity of fatigue and to encourage all parties involved in ship operations to take these factors into account when making operational decisions.

2 GENERAL DESCRIPTION OF FATIGUE

2.1 Fatigue results in the degradation of human performance, the slowing down of physical and mental reflexes and/or the impairment of the ability to make rational judgements.

2.2 Fatigue may be induced by factors such as prolonged periods of mental or physical activity, inadequate rest, adverse environmental factors, physiological factors and/or stress or other psychological factors.

3 CLASSIFICATION OF FATIGUE FACTORS IN RELATED GROUPS

3.1 In the case of seafarers, among the most commonly recognized and documented causes of fatigue are poor quality of rest, excessive workload, noise and interpersonal relationships. The contributory factors that lead to the above are many and varied. The significance of these factors as contributory causes of fatigue will vary depending on operational circumstances. Some factors will be more manageable than others. Such factors can be grouped as follows:

3.1.1 Management ashore and aboard ship, and responsibilities of Administrations:

- scheduling of work and rest periods;
- manning levels;
- assignment of duties;
- shore-ship-shore support and communication;
- standardization of work procedures;
- voyage planning;
- watchkeeping practices;
- management policy;
- in-port operations;
- recreational facilities;
- administrative duties.

3.1.2 Ship-specific factors:

- level of automation;
- reliability of equipment;
- motion characteristics;
- vibration, heat and noise levels;
- quality of working and living environment;
- cargo characteristics/requirements;
- ship design.

3.1.3 Crew-specific factors:

- thoroughness of training;
- experience;
- crew composition - cohesiveness;
- crew competency and quality.

3.1.4 External environmental factors:

- weather;
- port conditions;
- ice conditions;
- density of vessel traffic.

4 GENERAL DISCUSSION

4.1 Management ashore, aboard ship, and also the responsibilities of Administrations

4.1.1 The prevention of fatigue in the areas of scheduling of shipboard work and rest periods, manning levels, watchkeeping practices and assignment of duties could largely be accomplished by sensible shore-based management and on-board management techniques. It is also recognized that Administrations have an equally important role to play with respect to legislation leading to acceptance, implementation and enforcement in those areas covered by international conventions. Guidelines and provisions should take into account the relationships between work and rest periods to ensure adequate rest. These considerations should include a review of the voyage length, length of port stay, length of service of individual crew members, periods of responsibility and watchkeeping practices.

4.1.2 It is essential that management should provide clear, concise written policy guidance to ensure that ships' crews are familiar with ships' operational procedures, cargo characteristics, voyage length, destination, internal and external communication practices and ship familiarization procedures.

4.1.3 Management should recognize that crews joining a ship need to be adequately rested before assuming on-board duties.

4.2 Ship-specific factors

4.2.1 In designing or modifying ships, existing requirements, recommendations, standards and publications pertaining to the listed factors should be taken into account.
Additionally, allowance should be made in designing ships for the adoption of ergonomic practices to prevent fatigue from these factors.

4.3 Crew-specific factors

4.3.1 Thoroughness of training is considered to be important in the prevention of fatigue. Fitness for duty, including medical fitness, proper working experience and the qualifications and quality of crew members are also considered important in this context.

4.3.2 It is important that management recognizes the potential problems stemming from the employment of multinational crews on the same vessel, a practice that might result in language barriers and in social, cultural and religious isolation, all of which may lead to safety problems.

4.3.3 Special emphasis should be placed by management on issues of interpersonal relationships, loneliness, social deprivation and increased workloads which may occur as a result of small crew complements.

4.3.4 Boredom can contribute to fatigue, and it is therefore necessary to provide seafarers with appropriate stimulation.

4.4 External environmental factors

4.4.1 In respect of the listed external environmental factors, it should also be recognized that they could contribute to fatigue.

APPENDIX 8

PERTINENT IMO INSTRUMENTS RELATING TO FATIGUE

The following IMO instruments were reviewed with regard to their applicability to crew fatigue:

CONVENTIONS and CODES

International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW Convention)

Seafarers' Training, Certification and Watchkeeping Code (STCW Code)

International Code of Safety for High Speed Craft (HSC Code)

The International Safety Management (ISM) Code

ASSEMBLY RESOLUTIONS

A.481(XII)[27] Principles of Safe Manning

A.772(18) Fatigue Factors in Manning and Safety

A.792(19) Safety Culture In and Around Passenger Ships

A.850(20) Human Element Vision, Principles and Goals for the Organization

MARITIME SAFETY COMMITTEE (MSC) CIRCULARS

MSC/Circ.493 Recommendation Related to the Fatigue Factor in Manning and Safety

MSC/Circ.565 Fatigue as a Contributory Factor in Maritime Accidents

MSC/Circ.566 Provisional Guidelines for Conducting Trials in which the Officer Of The Navigational Watch Acts as the Sole Look-Out in Periods of Darkness

MSC/Circ.621 Guidelines for the investigation of accidents where fatigue may have been a contributory factor.

MSC/Circ.675 Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas

[27] Amendments pending adoption by the Assembly at its 21st session.

MSC/Circ.747	Ship/Port Interface
MSC/Circ.813 **MEPC/Circ.330**	List of human element common terms
MSC/Circ.834	Guidelines for Engine-Room Layout, Design and Arrangement
MSC/Circ.982	Guidelines on Ergonomic Criteria for Bridge Equipment and Layout

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