CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

GUIDE

Atlantic Canada Offshore Petroleum Industry Escape, Evacuation and Rescue

June 2010

2010-0017

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about 90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a $110-billion-a-year national industry that provides essential energy products.

2100, 350 – 7 Avenue S.W.
Calgary, Alberta
Canada T2P 3N9
Tel (403) 267-1100
Fax (403) 261-4622

403, 235 Water Street
St. John's, Newfoundland and Labrador
Canada A1C 1B6
Tel (709) 724-4200
Fax (709) 724-4225

www.capp.ca • communication@capp.ca

Contents

1 Introduction

The Atlantic Canada Offshore Petroleum Industry Escape, Evacuation and Rescue Guide is the culmination of a joint effort among offshore industry operators, drilling contractors and regulatory authorities. The resulting Guide is intended to assist operators with respect to escape, evacuation and rescue (EER) by establishing the broad performance goals of escape, evacuation and rescue emergency response. The concept of a performance or goal based approach to escape, evacuation and rescue was envisioned in the report by the Royal Commission on the *Ocean Ranger* Marine Disaster, 1985 recommendations 81 and 107.

The principle objectives of this Guide are to describe both the approach and important considerations to be used in determining the escape, evacuation and rescue measures to be implemented on an offshore installation. These measures contribute to the safety of all personnel in the event of an emergency situation.

For the purpose of this Guide, the EER process is considered in five elements:

1. Safety Planning and Management of Escape, Evacuation and Rescue
2. Escape, Muster and Personnel Survival Equipment
3. Precautionary (normally dry) Evacuation
4. Emergency (normally semi-dry or wet) Evacuation
5. Rescue.

For each of the elements the following are provided:

- **Performance Goals** to be achieved.
- **Expectations** of each goal to help the operator understand the scope of the goals.
- **Guidance notes** to be used to supplement the expectations where appropriate. They describe recognized practices which should be considered in developing the measures for EER.

Users of this Guide should first ensure compliance with the statutory requirements applicable to the offshore installation. The expectations included in this Guide are not necessarily statutory in nature. Regulations relevant to escape, evacuation and rescue regulations applicable in the Atlantic Canada Offshore Petroleum Areas are cited at the end of this Guide. References are also made to additional material that may be helpful to the operator in achieving the goals. Such references include other guides, international standards and industry best practices that may offer effective alternative means of achieving the goals and intent of the Guide. All references are provided for information purposes only.

The Guide recognizes that operators have an obligation pursuant to the Accord legislation to provide evacuation systems that are “fit for purpose” and to reduce

risk to a level that is as low as is reasonably practicable. In this regard, the Guide also provides a framework for demonstrating that operators are using the best available technology.

Throughout this document the use of the word "shall" indicates provisions that are mandatory as per prevailing regulation. "Should" indicates provisions to be considered. “Can” and “may” identify possibility and permission. Informative provisions are denoted by the use of “is" and "are”.

2 Scope

This Guide describes the performance goals, expectations and guidance notes for escape, evacuation and rescue measures on offshore installations that require a certificate of fitness to operate in the Canadian Atlantic Canada offshore petroleum area. This Guide applies to existing and future installations, including those that have been or might be brought into the jurisdiction, and excludes construction vessels, heavy lift vessels, supply vessels and standby vessels.

3 Approach

This Guide takes a goal-setting approach that focuses on achieving a desired result rather than on how that result is achieved. The operator is responsible for meeting or exceeding goals and choosing the means by which to do so.

This Guide presents clear statements of the goals and corresponding expectations of what is required and sufficient to be addressed in order to achieve adequate safety with respect to escape, evacuation and rescue.

Successful escape, evacuation and rescue systems require a structured, systematic approach to developing strategy, arrangements and procedures to respond to emergency situations on offshore installations. This should begin with identifying and assessing credible major hazard events on the offshore installation that may require escape, evacuation and rescue. The results of the assessment should be used to assist in selecting appropriate risk reduction measures to be incorporated in an escape, evacuation and rescue strategy. Relevant performance standards should be set.

A performance standard is a verifiable standard, established by the operator, of the performance required for a system, item of equipment, person or process that is used as a basis for demonstrating achievement of a given goal. Performance standards can be quantitative or qualitative. They are typically defined in terms of a relevant measure or measures, such as reliability, functionality, availability, survivability, independence, time or distance. They should clearly contribute to the overall goal of reducing the risk of harm. Each standard should provide a basis for monitoring and maintaining the required fit for purpose performance of the equipment, procedure, or system throughout its lifecycle, and should take into account the circumstances specific to the installation and its operation.

The resulting escape, evacuation and rescue plan should be an integral part of the operator's safety management system.

The operator's escape, evacuation and rescue plan, safety plan and safety management system may form the basis of possible requests for variances to specific regulatory requirements as contemplated in the Accord Acts. The Offshore Petroleum Boards have established processes to evaluate and grant variances to regulatory requirements where appropriate safeguards and documentation are presented.

4 Definitions

Abandonment	Abandonment refers to the combined processes of escape and evacuation as personnel leave an installation in an emergency.
ALARP	As low as reasonably practicable. Within a risk management framework, ALARP reasoning can be applied as part of risk evaluation and control. The evaluation includes a determination of the tolerability, or acceptability of the risks in terms of stakeholders' interests, which is the basis for decisions concerning measures to reduce risk using ALARP principles.
Atlantic Accord	Canada-Newfoundland and Labrador Offshore Petroleum Resources Accord Implementation Act or the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act.
Atlantic Canada	For the purposes of this document, *Atlantic Canada* refers to the combined offshore area regulated by the Canada-Nova Scotia Offshore Petroleum Board and the Canada-Newfoundland and Labrador Offshore Petroleum Board
Dry evacuation	Dry evacuation includes any method whereby personnel are able to transfer directly from an offshore installation to a place of safety without entering the sea. This would typically include evacuation by helicopter, evacuation by dry link, such as bridges between adjacent installations, and direct transfer to a vessel.
Escape	Escape refers to the process of moving from a place of danger to a place of safety. This typically involves personnel moving via escape routes from where they are at the time of alarm to muster stations, which are normally located within a temporary refuge, and then to a means of evacuation.
Evacuation	The departure of personnel from an installation when it is no longer deemed to be safe.
Evacuation hierarchy	Means of evacuation can be organized as a hierarchy of options listed in order of increasing risk. Each method of evacuation of greater risk serves as a backup to the lower risk option that precedes it. For example, the preferred means of evacuation would typically be by helicopter followed by other dry means of evacuation such as direct transfer by dry link—a bridge to another installation, or to a vessel. In circumstances where helicopter or other dry means of evacuation are not available the main means of semi-dry evacuation might be TEMPSC followed by other means of semi-dry evacuation such as slides and chutes. Among the simplest alternatives are wet evacuation systems such as scramble nets, ladders, or other means of entering the sea individually.
Fit for the purpose	A procedure, equipment, or system whose performance goal (captured in an explicit performance standard) is demonstrated to be adequately met via appropriate performance measures or benchmarks is thus fit for the purpose for which it is intended.
Flight *or* Individual evacuation	In some extreme conditions, personnel can not use planned evacuation procedures and equipment, but rather must flee the hazard independently, usually individually. This is sometimes referred to as flight, or direct escape to the sea, and normally involves means for individual evacuation.
FPSO	Floating Production, Storage and Offloading System

Inherent safety	Inherent safety practice is a risk minimization strategy used, for example, in the chemical process industry, that aims to reduce or eliminate hazards and the severity of their consequences by applying design principles at early stages of a facility's design. Risk minimization may also be achieved through active measures such as controls and emergency shutdown systems, and procedural measures such as operating procedures, including emergency response. Examples of inherent safety practices are *substitution*, whereby safer materials and equipment are used rather than lesser alternatives; *error tolerance*, whereby equipment and processes are made more robust and tolerant of errors; *making status clear*, whereby ambiguity in equipment's status and information overload is avoided; and *simplification*, whereby equipment, systems, and procedures are designed to avoid complexities and reduce potential for errors.
Installation	According to the Atlantic Accord legislation, "installation" means a diving installation, a drilling installation, a production installation, or an accommodation installation.
MODU	Mobile Offshore Drilling Unit
Muster area	A relatively safe, protected place. Muster areas are normally located within a temporary refuge, providing a place for personnel to gather while the initiating event and its status are investigated, and the emergency response is undertaken, including preparations for evacuation.
OIM	Offshore Installation Manager is the person in charge of the installation at all times. The OIM is responsible for the safety of onboard personnel, the integrity of the installation and the conduct of the operation in accordance with applicable regulations and policies.
Operator	According to the Atlantic Accord, "operator" is a person who has applied for or who has been granted an authorization to conduct a petroleum related activity.
Performance objective, performance goal	The objective of a procedure, equipment or system.
Performance measure	A means by which performance can be measured objectively.
Performance benchmark	Accepted, measured performance for a given set of known conditions can constitute a performance benchmark.
Performance standard	A performance standard is a statement, expressed in qualitative or quantitative terms, of the performance required of a system, item of equipment, person or procedure. It is used as the basis for managing hazards (planning, measuring, controlling, or auditing) through the lifecycle of an installation. A performance standard is specified by the operator and accounts for the circumstances on a particular installation. It can employ such measures as functionality, availability, reliability, survivability, independence, time, or distance.
Personal survival equipment	Personal survival equipment includes personal floatation devices, immersion/survival suits, visual signals, and smoke/gas hoods. This term does not apply to personal protective equipment such as safety shoes or hard hats.
Place of safety	A place of safety is considered to include: • another platform • an attendant marine vessel • a flotel • dry land
Practicable	Practicable means feasible, capable of being put into practice or of being used. This is not the same as practical, which means efficient and workable, rather than theoretical.

Precautionary evacuation	Precautionary down-manning or precautionary evacuation is a planned procedure typically using a dry evacuation method. Evacuation by helicopter and direct transfer are both contingent on external resources.
Rescue	Rescue is the process of moving evacuees to a safe place after evacuation, such as from a lifeboat to a rescue vessel. This stage of the EER process is complete when personnel have been removed from the hazard to a place of safety where medical attention is available.
Semi-dry Evacuation	Semi-dry evacuation includes any method whereby personnel are able to transfer indirectly from an offshore installation to a place of safety without entering the sea. This would typically include evacuation by TEMPSC, escape chute, and other means of marine evacuation whereby personnel are substantially protected from the physical environment and credible major hazards that could give rise to evacuation. Normally, semi-dry means of evacuation would be available independent of external resources and used when dry means, such as helicopter or dry link, are unavailable.
Temporary Refuge (TR) *or* Temporary Safe Refuge (TSR)	A temporary refuge is a designated place on the platform to which personnel have recourse as part of the escape process. A temporary refuge, also known as a temporary safe refuge, should provide an appropriate degree of protection from explosion, fire, smoke, gas releases, and other hazards during the time between the initiating event and the decision to evacuate.
TEMPSC	Totally Enclosed Motor Propelled Survival Craft.
Wet Evacuation	Wet evacuation includes any method whereby personnel transfer to a place of safety by entering the sea.

5 Performance Goal: Safety Planning and Management of EER

The operator shall ensure that planning for and management of escape, evacuation and rescue are explicitly addressed in an emergency response plan as part of the operator's overall safety management system.

The operator's safety management system shall incorporate planning that assures fitness for purpose of the escape, evacuation and rescue system over the lifecycle of the installation.

5.1 Expectations: Safety Management System

The operator shall have a safety management system that ensures all credible major hazards related to the facility and its operation are identified. The circumstances that may necessitate an escape, evacuation and rescue response are a subset of the major hazards to the installation.

5.1.1 Guidance: Identification of Credible Hazards

An important basis for many of the decisions concerning escape, evacuation and rescue is the identification of credible major hazards and the ensuing scenarios that could occur, particularly those scenarios that might lead to an abandonment of the installation. Through risk analysis an estimate can be made of the probability of each initiating event associated with EER, along with the number of personnel at risk.

Events can be described in terms of their physical characteristics, for example, gas or smoke plume from a gas release or fire; extent of radiant heat from a fire; and overpressure due to an explosion.

5.1.2 Guidance: Consequences of Hazards on the Installation

Under each type of credible hazard scenario the consequences should be assessed in terms of the damage or impairment of the installation, the number of people to potentially be injured or killed by the initiating event, the vulnerability of the installation to the initial hazard or subsequent escalation, and the overall likelihood of being able to carry out a successful abandonment operation.

The safety management system shall ensure that all measures necessary to reduce the risks to personnel from major hazards to as low as reasonably practicable (ALARP) are identified and implemented.

5.1.3 Guidance: Inherent Safety

Wherever practicable, the operator should apply the principles of inherent safety at the concept safety stage, where it has the greatest potential to reduce risks and lowest cost impacts.

5.2 Expectations: Emergency Response Plan

An emergency response plan that forms part of the operator's safety management system, shall address the management of escape, evacuation and rescue arising from specified credible major hazards.

5.2.1 Guidance: Consequences of Hazards on EER

The impacts of hazards can have a direct bearing on the availability of lifesaving appliances and provide the basis for specific performance measures. For example, a lifeboat might be damaged by the initial hazardous event or rendered unavailable as a result of being engulfed in a smoke plume. Risk assessments, both quantitative and qualitative, can help to identify and evaluate possible means of control, mitigation and protection for the credible hazards.

The emergency response plan should include the response command structure and means of communication, as well as arrangements between the operator and others who might be involved in a planned emergency response.

The emergency response plan should incorporate organizational management responsibilities and identify emergency procedures and training requirements, as well as equipment and hardware.

5.2.2 Guidance: Integrated Planning

Decisions concerning escape, evacuation and rescue should be based on an analysis of the entire emergency response system. This should help guide resource allocation to the areas that will benefit most in terms of overall safety improvement or risk reduction and help avoid conflicting decisions.

5.3 Expectations: EER Plan

The operator's plan for escape, evacuation and rescue should specify and document the provisions made for escape, evacuation and rescue.

5.3.1 Guidance: EER Planning

The planning for the EER system is an integral part of the process of reducing risks to as low as reasonably practicable. The operator's performance standards concerning escape, evacuation and rescue should not be treated as separate from the broader assessment and control of risks, and decisions concerning the tolerability of residual risk. The plan should explain how the performance goals will be met through appropriate demonstrations.

The plan should explain how the operator ensures that in circumstances necessitating an emergency response personnel have a reasonable expectation of avoiding harm in the physical environment conditions that can reasonably be expected to prevail during operations. The plan should cover the duties of the operator in each phase of the EER response:

i) to provide adequate means for individual personnel to protect themselves and for personnel to escape the potential harm posed by credible hazards;
ii) to provide adequate means for personnel, including injured personnel, to abandon the installation following controlled procedures; and
iii) to provide adequate means and support for the rescue and recovery of personnel to a place of safety where medical assistance is available.

5.4 Expectations: Lifecycle Approach

The management of the escape, evacuation and rescue system should provide for the full lifecycle of the installation, from planning through operation and decommissioning, and include provisions for managing changes to the installation or its operation.

5.4.1 Guidance: Lifecycle Approach to Safety Management

Taking a lifecycle approach ensures that the safety management system will remain current. A lifecycle is usually described in phases such as analysis, during which the overall safety issue is identified and assessed; realization, during which the solution to the safety issue is developed; and operations, during which the solution is used.

5.5 Expectations: Risk Reduction

Recognizing that there is some uncertainty associated with identifying hazards and assessing risks, it follows that while a given performance standard set by an operator might be shown to be adequately achieved using one or several options, the operator should use the option that affords the greatest level of safety, as long as it is economically achievable.

Reducing risks to as low as reasonably practicable (ALARP) ensures that the operator not accept a level of residual risk that, while meeting a nominally acceptable target, can still be substantially reduced without incurring disproportionate costs.

5.5.1 Guidance: Best Available Technology:

This principle is sometimes referred to as best available technology not entailing excessive costs (BATNEEC), or best available technology economically achievable (BATEA).

When assessing best available technology for EER equipment or processes consideration should be given to:

a) comparable equipment, process, or methods that have been demonstrated to be effective in similar working situations;

b) technology advances and changes in scientific knowledge and understanding;

c) economic and practical feasibility of suitable technology; and

d) timeline for implementation.

5.6 Expectations: Training

The operator shall ensure that all persons at/on an installation, or in transit to or from an installation, receive instruction in and are familiar with safety and evacuation procedures and with their roles and responsibilities in the contingency plans, including emergency response procedures.

6 Performance Goal: Escape, Muster and Personal Survival Equipment

Escape is typically initiated by an alarm, followed by personnel moving to muster areas normally located within a temporary refuge. The operator shall provide means to enable personnel to minimize potential harm throughout the escape process:

i) Alarms and Communication

The operator shall ensure that in the event of an emergency that may necessitate escape, evacuation and rescue, means are in place to warn personnel and to communicate with them during the emergency.

ii) Escape and Muster

The operator shall ensure that appropriately protected escape routes, muster areas, temporary refuges, and evacuation stations are available and arranged to allow implementation of an orderly, planned escape procedure, followed if necessary by an evacuation procedure.

Protection of muster areas and temporary refuges shall be sufficiently robust to provide sustained protection for the duration of the emergency or until a decision is taken to evacuate.

iii) Personal Survival Equipment

The operator shall provide sufficient personal survival equipment to afford means of protection from credible hazards, and from the elements, particularly due to immersion in the sea.

6.1 Expectations: Alarms and Communication

Means to warn all personnel of an emergency should include appropriate audible and visible alarms.

Where different types of alarms are used to differentiate emergencies, these should be made known to all personnel.

Alarms and signage should conform to international standards where practicable.

6.1.1 Guidance: Standard Alarms

Where practicable, and in particular for new installations, alarms and signage in the operating region should be standardized, reflecting the fact that personnel may occasionally work on more than one installation.

Alarms should continue to be audible and visible throughout the emergency.

Reliable means should be provided to allow personnel in different parts of the installation to communicate with others on board during an emergency.

Means should also be available to communicate with those external to the installation who might be involved in an emergency response.

6.2 Expectations: Escape Routes

All areas of an installation where people may be expected to be present during their normal course of duties shall have more than one escape route, situated as far apart as is practicable.

Escape route planning should account for potential impairment of escape routes and evacuation equipment during any credible emergency event.

Escape routes from accommodation and work spaces should be engineered so that they remain unobstructed, taking into account potential operating conditions.

6.2.1 Guidance: Obstructions to Escape Routes

Personnel must be provided with at least two means of egress from spaces or work areas where they could be expected to be working. This is to ensure that at least one of these routes is available in the event of an emergency even though one of the routes may be impaired due to the emergency or operating conditions. This includes inadvertent obstructions posed by doors that cannot be opened quickly or at all, for example, in the case of a floating platform with a list or by unsecured equipment that might shift during an emergency.

All escape routes to muster areas, temporary refuges and evacuation stations shall be adequately marked by signage and emergency lighting.

6.3 Expectations: Muster Areas and Temporary Refuges

Muster areas should be accessible via redundant escape routes and should provide for further protected movement of personnel to temporary refuges and evacuation stations via continued escape routes.

Means to provide basic medical treatment should be available at muster areas and temporary refuges.

6.4 Expectations: Planned Protection from Credible Hazards

The escape routes, muster areas, temporary refuges, and evacuation stations should remain functional, as far as is reasonable, for as long as they are needed during any credible emergency scenario and should meet the performance standards set by the operator.

6.4.1 Guidance: Standard of Protection

Performance standards can include, for example, target levels of functionality, availability, reliability, survivability, and independence for the time required for mustering under all credible major hazards. Such standards can support design decisions based on the technical specifications concerning, for example, levels of blast protection, insulation, and escape route redundancy.

The operator should ensure that personnel are adequately protected so that they can implement the appropriate emergency response escape and

muster procedures, followed by evacuation procedures should those be deemed necessary.

6.4.2 Guidance: Planned Evacuation Scenarios

The decision to evacuate can be based in part on a comparison between the status of the existing event and its potential for escalation. Such factors as the integrity of the installation, availability of the means of evacuation and rescue, number of injured personnel, and the operator's emergency response plan should be considered.

6.5 Expectations: Personal Survival Equipment

The operator is responsible for providing sufficient personal survival equipment such as personal flotation devices, immersion/survival suits, visual signals, breathing apparatus, and smoke/gas hoods.

Such equipment is not a primary means of protection; it is meant to afford basic protection to personnel when other planned means of protection either fail or are unavailable, or are supplemental protection when other means are available.

The type of equipment, the number and size of the units of each, and their distribution around the installation should take into account the number and sizes of personnel on board and their locations during operations as well as the likelihood that equipment will be impaired by initiating hazards.

6.6 Expectations: Implementation of Escape Provisions

The operator should specify and document provisions made for alarms and communication, for escape and muster and for personal survival, including the types of equipment, their capacities and arrangements and associated performance standards.

6.7 Expectations: Maintenance of Escape Provisions

Operators shall ensure that the fitness of all means of communication, passive and active protective measures and personal survival equipment on board is maintained in accordance with established performance standards and / or an approved inspection and maintenance program.

6.8 Expectations: Training

Operators shall ensure that all personnel on board are provided with training and are familiar with the emergency escape and mustering procedures, and in the use of personal survival equipment on board. Personnel should be familiar with alarms and signage, escape routes, muster areas, temporary refuges, and evacuation stations. They should also be aware of where they muster and how they account for themselves and others in an emergency.

7 Performance Goal: Precautionary and Dry Evacuation

The operator shall ensure that in circumstances that may necessitate a precautionary evacuation or precautionary down-manning, all personnel have reasonable access to a dry means of evacuation.

7.1 Expectations: Dry Evacuation

The operator should provide adequate means for personnel, including injured personnel, to evacuate the installation as a precautionary measure.

Means of precautionary evacuation include helicopter, direct transfer to standby or supply vessels, evacuation by dry link such as a bridge between adjacent installations, and other means that are used for routine transportation of personnel. They normally do not involve entering the sea.

7.2 Expectations: Expected Utility

The operator should assess the expected availability and effectiveness of the means of dry evacuation and their use in precautionary evacuation and in emergency evacuation.

7.2.1 Guidance: Assessment of Utility

> This requirement does not mean that helicopters, bridge links, or other dry means of evacuation should be available at all times, but rather that if these are the means of precautionary evacuation, then the likelihood of their being available under all credible evacuation scenarios should be assessed. This assessment can include such factors as limiting effects of the physical environment conditions, vulnerability of dry means of evacuation to impairment due to various hazards, and time required to mount an effective response using resources external to the installation.

When such means can be expected to be unavailable, then emergency response planning should concentrate on other means of evacuation, which would normally entail semi-dry evacuation.

7.3 Expectations: Implementation of Evacuation Provisions

The operator should specify and document all means of dry evacuation, including the types of equipment, their capacities and arrangements and associated performance standards.

7.4 Expectations: Training

The operator shall ensure that all personnel on board are provided with training and are familiar in the use of dry evacuation systems and the procedures for their use in precautionary and emergency procedures. Personnel should be aware of the operator's key performance measures.

8 Performance Goal: Semi-dry and Wet Evacuation

The operator shall ensure that in circumstances that necessitate a semi-dry evacuation, all personnel:

(i) have access to an evacuation system;

(ii) be able to embark and be launched safely, clear the installation and survive until rescued; and

(iii) have a reasonable expectation of avoiding harm during the evacuation process in the physical environment conditions that can reasonably be expected to prevail during operations.

8.1 Expectations: Semi-dry Evacuation

The operator shall provide means of semi-dry evacuation that are independent of external resources and are the planned means of emergency evacuation when dry means of evacuation are unavailable.

The main means of semi-dry evacuation include evacuation by Totally Enclosed Motor Propelled Survival Craft (TEMPSC), and other means of evacuation whereby personnel are substantially protected from the physical environment conditions and the hazards that might give rise to the evacuation.

Semi-dry evacuation also includes evacuation by equipment such as davit-launched rafts and evacuation systems that include rafts in combination with slides or chutes.

8.1.1 Guidance: Protection

Rafts do not offer as much protection from hazards or the elements as some other marine evacuation systems such as lifeboats, but they can avoid immersion in the sea.

8.2 Expectations: Evacuation Capacity and Access

The operator shall ensure that the means of semi-dry evacuation are of sufficient capacity to evacuate all personnel, including injured personnel, on the installation at any given time.

The capacities and arrangements of the semi-dry means of evacuation should be determined and justified on the basis of an assessment of the credible hazard scenarios and distributions of personnel during operations, including peak manning operations.

8.2.1 Guidance: Evacuation Capacity

The distribution and redundancy of means of evacuation should account for the nature and location of the initiating hazard and vulnerability to impairment. Lifeboats are typically arranged adjacent to temporary refuges, in a location relatively well protected from such hazards as blast and fire. The vulnerability of the means of evacuation to various major hazards should be considered and appropriate measures taken to ensure adequate survivability and availability, including through redundancy.

Further, the means of evacuation should be accessible from a temporary refuge or muster station via a safe route.

8.2.2 Guidance: Time Available

A detailed assessment of each major hazard that could give rise to a semi-dry evacuation should include an estimate of the time available for personnel to muster and evacuate. These can be incorporated into appropriate performance measures.

8.3 Expectations: Evacuation Planning: Physical Environment Conditions

The operator should know the expected capabilities of the means of evacuation in the range of physical environment conditions that can be expected to occur in the operating area, taking into account the location and arrangement of the evacuation stations.

This is site and installation specific: the operator should recognize how risk increases as weather conditions deteriorate and reduce the risk to as low as reasonably practicable.

Knowledge of the performance capabilities of the selected means of evacuation, including launching and clearing, should be incorporated into operational planning, including emergency response plans, recognizing residual risks that exceed any of the limits of the means of evacuation.

8.3.1 Guidance: Physical Environment Limits

In choosing the means of evacuation, the operator should recognize explicitly how physical environment conditions affect or limit the performance capabilities of evacuation. The performance of evacuation systems normally degrades as such weather conditions as wind, waves, sea ice, fog, and icing deteriorate. A design physical environment limit is the mildest environmental condition in which the lifeboat is unseaworthy or incapable of being safely launched. Conditions that cause capsizing or motions excessive enough to be detrimental to the evacuees' well-being constitute such a limit, as does an inability to make way. Evacuation using the system should not be planned for the corresponding environmental conditions. The deterioration in performance up to the operational physical environment limits should be accounted for. A practical application of such knowledge could be that the OIM would have a set of objective evacuation performance benchmarks and associated risks for EER operations in a range of physical environment conditions. Comparing these benchmarks to risks under an emerging major hazard scenario would provide a rational basis for decisions regarding preparations to make the installation as safe as practicable. Such preparations might include limiting some types of work, staging a planned production slow/shut down, and deciding whether and by what means to abandon the installation.

8.4 Expectations: Wet Evacuation by Individual Means

In some circumstances, life-saving appliances such as scramble nets, ladders, or other individual means of entering the sea, as well as inflatable throw-over life rafts, should be provided as a last means of leaving the installation when other planned means either fail or are unavailable.

The emergency response plan should recognize that such equipment is to be used only as a last resort.

8.4.1 Guidance: Last Resort

It should be recognized that such equipment is typically used by individuals who are fleeing, rather than by groups following procedures, and that the emphasis in evacuation and rescue planning should be on prevention of the need to evacuate, dry evacuation, followed by semi-dry evacuation.

8.5 Expectations: Integration of Evacuation and Rescue

The operator should ensure that the means of evacuation, including lifeboats, life rafts and life-saving appliances used as a last resort by individuals are matched with a corresponding capability and availability of means of rescue and recovery.

8.5.1 Guidance: Integrated Means of Evacuation and Rescue

Means of evacuation should be integrated with means of rescue and recovery. Further, evacuation should not be planned in scenarios or physical environment conditions in which means of rescue and recovery are not available, or in which the risks are higher than staying on board the installation.

8.6 Expectations: Implementation of Semi-dry and Wet Evacuation Provisions

The operator should specify and document all means of semi-dry and wet evacuation including the types of equipment, their capacities and arrangements and associated performance standards.

8.7 Expectations: Maintenance Semi-dry and Wet Evacuation Provisions

The operator should ensure that the fitness of all semi-dry and wet evacuation equipment on board are maintained in accordance with performance standards.

8.8 Expectations: Training

The operator shall ensure that all personnel on board the installation are provided with training in the use of the semi-dry and wet evacuation equipment on board; this includes any specialist training required for designated personnel to operate the equipment. Personnel should be aware of the operator's key performance measures.

9 Performance Goal: Rescue

The operator shall ensure that in the event of an evacuation, corresponding means of rescue are available to ensure all personnel have a reasonable chance of reaching a safe place within a reasonable time under the prevailing circumstances and physical environment conditions.

9.1 Expectations: Rescue Resources and Coordination

The operator should provide the means of and support for the rescue and recovery of personnel to a safe place where medical attention is available.

Means of rescue include standby vessels that may be contracted to provide the service, vessels launched from the installation itself [A], neighboring installations or other vessels (e.g. fast rescue craft), and national responders such as Search and Rescue, which might include helicopter borne Search and Rescue Technicians.

9.1.1 Guidance: External Resources

Rescue operations may include support from sources other than the operator.

9.1.2 Guidance: Rescue Operations Plan

All measures that the operator plans to bring to bear on rescue operations, whether they are under the operator's direct command and control or not, should be described in the safety management system or equivalent.

9.1.3 Guidance: Command-Control-Communication

The procedures for command, control and communication among the rescue resources are the responsibility of the operator to develop and maintain, in co-operation with the rescue resources.

9.2 Expectations: Rescue Capacity and Access

The capacity of the means of rescue shall correspond to the evacuation capacities and be sufficient to rescue all personnel evacuating the installation at any given time.

9.2.1 Guidance: Rescue Capacity Assessment

Planning for the rescue response should include consideration of the nature of the initiating hazard and its potential escalation in terms of the vulnerability to impairment of the various means of rescue. For example, a gas release, smoke plume, or radiant heat may limit a rescue vessel's ability to approach the installation safely. Appropriate measures should be taken to ensure adequate capacity of rescue means in credible scenarios.

The operator should treat the means of rescue as integral to the means of evacuation: they should work together.

9.3 Expectations: Rescue Planning – Physical Environment Conditions

Rescue planning shall account for the limitations of the rescue operations in the range of physical environment conditions that can be expected to occur in the operating area.

The risks associated with operations in conditions that exceed any of the limits of the means of rescue should be recognized and the operator should explain explicitly in the safety management system, or equivalent, how these risks could be mitigated in such conditions.

The performance capabilities of the selected means of rescue, as defined in appropriate performance standards or procedures, should be incorporated into operational planning, including emergency response plans.

9.3.1 Guidance: Physical Environment Limits

In choosing the means of rescue, the operator should recognize explicitly how the performance of rescue operations might be degraded as a function of deteriorating weather conditions, up to any upper operational physical environment limit or limits, for example due to inadequate maneuvering control of a rescue vessel to carry out recovery operations, or of rescue craft responders to recover personnel from the sea.

9.4 Expectations: Place of Safety

The operator should ensure that appropriate places of safety are available to effect a complete rescue operation and that evacuees are rescued to a safe place in a timely manner.

9.4.1 Guidance: Planned Rescue Scenarios

A detailed assessment of each evacuation scenario, including human factors associated with the physical environment conditions and the expected time available to respond with an emergency rescue operation is critically important as it may govern the choice of the means of rescue and how these are deployed. For example, for some installations, it may be deemed necessary to maintain rescue facilities by using an appropriately equipped rescue vessel that stands by at all times. This may be the best way of meeting a performance standard that specifies the time to respond to emergencies. Further, the same vessel may be equipped with fast rescue craft that can also serve as a means of rescue for man overboard situations.

An adequate place of safety includes the availability of specified human and physical resources to recover personnel and give appropriate medical treatment.

9.5 Expectations: Implementation of Rescue Provisions

The operator should specify and document the means of rescue, including the types of equipment, their capacities, the manner in which they are deployed and how they are coordinated, and associated performance standards.

9.6 Expectations: Maintenance of Rescue Provisions

The operator should make arrangements to ensure that the fitness of all rescue equipment is maintained in accordance with performance standards. [E]

9.7 Expectations: Training

The operator shall ensure that all personnel on board the installation are provided with training and are familiar with their designated responsibilities and duties in the use of rescue equipment and procedures. This includes any specialist training required for designated personnel to operate equipment during rescue operations. Personnel should be aware of the operator's key performance measures.

The operator shall ensure that all personnel under the operator's control external to the installation and identified in the escape, evacuation and rescue plan as supporting the rescue operations, are provided with training and are familiar with the execution of the emergency response plan in accordance with their designated responsibilities and duties.

10 References

Note that references to the Offshore Area Petroleum Drilling and Production Regulations and the Offshore Petroleum Installations Regulations apply to both the Newfoundland and Nova Scotia versions bearing the same titles. With respect to occupational health and safety, these are referred to as Offshore Petroleum Occupational Health and Safety Requirements in Nova Scotia, and Draft Petroleum Occupational Safety and Health Regulations in Newfoundland. References in the Guide to the Offshore / Petroleum Occupational Health and Safety Requirements / Regulations apply to both the Newfoundland and Nova Scotia versions bearing these slightly different titles.

References are provided for information only and are cited based upon review during the development of this Guide.

10.1 Regulations

Offshore Petroleum Drilling and Production Regulations

Offshore Petroleum Installations Regulations

Offshore Petroleum Occupational Health and Safety Regulations / Requirements

10.2 Guidance References: Safety Planning and Management

ISO 17776. Petroleum and natural gas industries – Offshore production installations – Guidelines on tools and techniques for hazard identification and risk assessment. ~ The scope of this international standard includes a description some of the main tools and techniques that are used for the identification and assessment of hazards associated with offshore petroleum installation activities. It provides guidance on how these tools and techniques can be used to assist in the development of strategies both to prevent hazardous events and to control and mitigate events that may arise.

HSE S1 1995/743. Offshore installations regulations: Prevention of fire and explosion, and emergency response on offshore installations (PFEER). Health & Safety Commission. ~ This HSE (UK) code includes regulations, approved code of practice, and additional guidance on (i) preventing fires and explosions, and protecting personnel from any that occur, and (ii) ensuring effective emergency response in circumstances that may require escape, evacuation, and rescue.

ISO Standard 13702. Petroleum and natural gas industries – Control and mitigation of fires and explosions on offshore production installation – Requirements and guidelines. ~ The scope of this international standard includes a description of the objectives, functional requirements, and guidelines for the control and mitigation of fires and explosions on offshore petroleum installations. It includes fire and explosion evaluation and risk management, installation layout, emergency shutdown, emergency power systems, fire protection, explosion mitigation and protection, EER, and maintenance.

API Recommended Practice (RP 14J): Recommended practice for design and hazards analysis for offshore production facilities. ~ This standard deals with

process risk assessment and includes relevant guidance regarding the identification and analysis of credible hazards.

Bollinger, R.E., Clark, D.G., Dowell, R.M. III, Ewbank, R.M., Hendershot, D.C., Lutz, W.K., Meszaros, S.I., Park, D.E., Wixom, E.D., Crowl, D.A. (ed.). 1996. Inherently safer chemical processes: A life cycle approach. Center for Chemical Process Safety, AIChE, John Wiley. ~ This is one example of guidance on inherent safety. It may also be useful in terms of the life cycle approach.

ISO 15544. Petroleum and natural gas industries – Offshore production installations – Requirements and guidelines for emergency response. ~ This international standard describes the objectives, functional requirements, and guidelines for emergency response measures on offshore petroleum installations. These measures include emergency response strategy and plans, command and control and communication, competence of personnel, maintenance of emergency of emergency response equipment, and EER.

NORSOK Standard Z-013. 1998. Risk and emergency preparedness analysis. ~ This NORSOK standard establishes requirements for planning, execution and use of risk and emergency preparedness analysis.

CAPP Guide: Atlantic Canada Offshore Petroleum Industry Standard Practice for the Training and Qualifications of Personnel. ~ This CAPP guide contains a description of the minimum qualifications and certificated safety training requirements of personnel working in Canada's Atlantic Canada offshore petroleum industry.

ISO/CD 19906: 2007. Petroleum and natural gas industries – Arctic offshore structures. Chapter 18 Escape, evacuation and rescue; and Appendix A18 Escape, evacuation and rescue. ~ This is a draft of an ISO standard.

10.3 Guidance References: Escape, Muster and Personal Survival Equipment

ISO 17631 standard: Ships and marine technology – Shipboard plans for fire protection, lifesaving appliances and means of escape. ~ With reference to paragraph 6.1, the ISO 17631 international standard specifies graphical symbols and illustrations used on ships for matters such as life-saving appliances, means of escape, and fire protection.

IMO Resolution A.952(23). Graphical symbols for shipboard fire control plans. ~ With reference to paragraph 6.1, this IMO resolution provides relevant detailed specifications for symbols that might be useful as a basis for a performance standard in the context of this Guide. This resolution also aims to harmonize symbols with the ISO 17631 standard cited above.

IMO MSC/48(66). International life-saving appliance code (LSA Code). International Maritime Organization. ~ With reference to paragraph 6.1, the IMO's LSA Code (Chapter VII) provides relevant detailed specifications that might be useful as a basis for a performance standard in the context of this Guide.

IMO MSC/Circ.1238 2007 (currently under review, possible amendments pending at time of publication of CAPP EER document). Interim guidelines for evacuation analysis for new and existing passenger ships. International Maritime Organization. ~ With reference to paragraph 2.2, a recent IMO interim guideline deals with the matter of escape planning in considerable detail and might be useful as a basis for a performance standard in the context of this Guide.

IMO MSC/48(66). International life-saving appliance code (LSA Code). International Maritime Organization. ~ With reference to paragraph 6.5, the IMO's LSA Code (Chapters II and III) provides relevant detailed specifications that might be useful as a basis for a performance standard in the context of this Guide.

ISO 13702: 1999(E), 14 Evacuation, escape, and rescue.

ISO 13702: 1999(E), B.12.2 Escape routes, B.12.3 Command structure, B.12.4 Mustering,

B.12.5 Communications during an emergency.

ISO 13702: 1999(E), B.12.7 Personal survival & escape equipment.

ISO 15544: 2000(E), 11 Escape, refuge, evacuation, and rescue.

ISO 15544: 2000(E), F.1 Escape, F.2 Refuge and muster areas.

HSE S1 1995/743, PFEER Regulations 11 Communication, 13 Mitigation of fire and explosion, 14 Muster area etc., 18 Suitability of personal protective equipment for use in an emergency, 20 Life-saving appliances.

10.4 Guidance References: Precautionary and Non-Marine Evacuation

No additional citations or guidance notes are offered.

10.5 Guidance References: Semi-dry and Wet Evacuation

IMO MSC/48(66). International life-saving appliance code (LSA Code). International Maritime Organization. ~ With reference to paragraph 8.1, the IMO's LSA Code (Chapters IV and VI) provides relevant detailed specifications that might be useful as a basis for a performance standard in the context of this Guide.

ISO 15544: 2000(E), 11 Escape, refuge, evacuation, and rescue.

ISO 15544: 2000(E), F.3 Evacuation, rescue, and recovery.

ISO 13702:1999(E), 14 Evacuation, escape, and rescue.

ISO 13702:1999(E), B.12.6 Evacuation and escape to the sea.

ISO 13702:1999(E), C.5 Typical inspection and testing frequencies.

HSE S1 1995/743, PFEER Regulations 15 Arrangements for evacuation, and 16 Means of escape (individual, last resort means of evacuation in case arrangements for marine evacuation fail).

10.6 Guidance References: Rescue

IMO MSC/48(66). International life-saving appliance code (LSA Code). International Maritime Organization. ~ With reference to paragraph 9.1, the IMO's LSA Code (Chapters V and VI) provides relevant detailed specifications that might be useful as a basis for a performance standard in the context of this Guide.

ISO 13702:1999(E), 14 Evacuation, escape, and rescue.

ISO 13702:1999(E), B.12.8 Recovery and rescue.

ISO 15544: 2000(E), 11 Escape, refuge, evacuation, and rescue.

ISO 15544: 2000(E), F.3 Evacuation, rescue, and recovery.

10.7 Other References

Royal Commission on the *Ocean Ranger* Marine Disaster. 1985:

'There are those who seek reduction of risks through increased regulation. During the past few decades, there has been a great increase in regulatory control without comparable discernible benefit. Regulations do not themselves ensure safety and may be counterproductive in their consequences. Responsibility for safety may become a complacent acceptance of rules and regulations, and the evolving technology that is applied may be only as good as the rule and the rule formulators.'

Recommendation 81. 'That (a) more extensive guidance notes be developed. (b) insofar as it is practical, regulations be framed in terms of principles, performance standards and criteria, which supplemented with a comprehensive body of guidance notes, are made available in a consolidated form.'

Recommendation 107. ' That (a) government and industry without delay establish performance standards [regarding evacuation systems]…'