**Fatigue Risk Management Program Manual**

Template for General Operations

Version 1.0

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#### **NOTE TO READER**

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#### **PREFACE**

[*discuss fatigue stressors unique to the Company’s operation or industry*]

#### **ABOUT THIS MANUAL**

This Fatigue Risk Management Program Manual is used by [*insert company name*] (“the Company”) to promote safety in operations and help meet specified safety objectives. The information in this document is intended to communicate the Company’s fatigue risk management policies and to provide personnel with specific directions concerning the identification, mitigation, and handling of fatigue-related risk within the operational environment.

This Manual is applicable to all personnel engaged by the Company in any capacity, whether as a part-time employee, full time employee, casual laborer, or on contract. In the event of any conflict between the information in this document and the provisions of a contract governing a person’s relationship with the Company, such contract shall be primary, and this Manual shall be regarded as secondary.

* 1. **Control and Distribution**

This Manual is controlled by [*insert title of designated personnel*], who is responsible for ensuring that the policies and procedures set forth in this Manual comply with applicable company policies, collective bargaining agreements, and regulatory requirements. The Director of Safety may delegate the duties for maintenance, distribution, and control of this Manual to the FRMP Manager.

### **Document Distribution**

All personnel may access this Manual and related documentation so they can familiarize themselves with the Company’s fatigue risk management policies and procedures as they apply to their work.

This Manual is the property of the Company and shall be returned to the Company upon termination of an individual’s employment or work contract with the Company. Where this Manual is made available electronically, access is restricted to authorized personnel only. Any distribution to third parties requires prior written authorization from the Director of Safety or other duly authorized Company representative.

An electronic version of this Manual can be downloaded from [*specify location*] and hard copies are available in [*specify location*].

### **Master Copy Location**

The master copy of this Manual is stored in electronic format at [*specify location*].

* 1. **Amendments**

This document is reviewed and updated annually as part of the FRMP Performance Evaluation procedures set forth in section 8.3.

Any changes in the Company’s operating procedures (including training processes), applicable laws, and/or the terms of collective bargaining agreements will be incorporated into this Manual as an Amendment. Any Amendment that is considered by the Director of Safety to constitute a significant change to this Manual will be communicated to all employees by the issuance of a Communication in accordance with the Communication Plan set forth in section 7.2.

### **Amendment Process**

The amendment process is as follows:

1. The [*insert title of designated personnel*] prepares a draft of the Amendment in consultation with the Director of Safety. The draft Amendment includes:

* An amendment control sheet
* An updated first page of Section 3.2 – Amendments
* The text of the Amendment itself

1. The Technical Standards Coordinator forwards a copy of the Amendment to [*insert name of applicable body*] for approval.
2. Once the Amendment text is approved by [*insert name of applicable body*], the [*insert title of designated personnel*] prepares the document for distribution, including:

* The Technical Publication Distribution Sheet
* The amendment control sheet
* The amended pages

1. The [*insert title of designated personnel*] issues the amendment package to all Manual holders.
2. Each Manual holder shall:
   * Insert all amendments into their copy of the Manual immediately upon receipt
   * Record the entry on the Amendment Record Sheet
   * Sign the Technical Publication Distribution Sheet and return it to the [*insert title of designated personnel*] to confirm that the amendment was received
   * Advise the [*insert title of designated personnel*] of any errors or omissions found in the Amendment

If a signed Technical Publication Distribution Sheet is not returned to the [*insert title of designated personnel*] within one week of distribution, this individual will follow up by email.

The electronic distribution process of amendments is similar, as follows:

1. The technical support office prepares a PDF copy of the complete manual including the Amendment, along with a PDF of the signed Amendment Record Sheet
2. The [*insert title of designated personnel*] loads the PDF copy to the designated location in the Company’s virtual document storage system
3. All holders of the Manual are advised by a Communication of the Amendment and the reason(s) for it
4. 30 days after the Amendment has been posted, the technical support office shall audit reception notices to ensure complete distribution
5. In the event that the audit reveals that one or more recipients have not opened (read) the document, the [*insert title of designated personnel*] shall follow up with the individuals concerned
   1. **Documents Incorporated by Reference**

* [list applicable documents. Examples may include the Company’s Employee Handbook, Safety Manual, etc.]
  1. **Applicable Regulations**
* [list if applicable]

#### **GLOSSARY**

This section provides definitions for key terms that are used in this Manual.

* 1. **Abbreviations**

DART Days Away/Restricted or Job Transfer

FRMP Fatigue Risk Management Program

IMS Information Management System

OSHA Occupational Safety and Health Administration

SMS Safety Management System

* 1. **Relevant Committees**

**Safety Committee** — Group of Company personnel appointed by management responsible for implementation and operation of the SMS and to ensure that the Company is meeting its safety objectives.

**FRMP Committee** — Group of Company personnel appointed by management who are knowledgeable about the Company’s FRMP and who are responsible for the policies and procedures outlined in this Manual. Additional personnel may be appointed temporarily to the committee by the Safety Committee as needed.

**Occupational Health and Safety Committee** — Group of Company personnel responsible for the occupational health and safety of the workforce. Includes one manager from each department as well as one employee from each department that volunteers to be part of the committee.

* 1. **Key Terms**

**Circadian rhythm** — Human beings are programmed to sleep during the night and to be active during the day. The sleep/wake cycle is a circadian rhythm. The term circadian comes from two Latin words, *circa* (about) and *diem* (day). Thus, circadian rhythms refer to physiological functions that cycle over a day. Examples are the sleep/wake cycle, alertness and performance, body temperature, production of hormones like melatonin and cortisol, and heart rate. These rhythms are regulated by a biological clock in our brains. Circadian rhythms do not generally adjust easily to shift work.

**Commute time** — The time it takes for employees to travel between their worksite and home.

**DART Rate** — A mathematical calculation that describes the number of recordable incidents per 100 full time employees that resulted in lost or restricted days or job transfer due to work related injuries or illnesses.

**Fatigue** — Impaired cognitive and/or physical functioning that may result in an elevated risk of error or accident. For the purposes of this policy, fatigue is due primarily to increased duration of wakefulness and/or reduced duration of sleep.

**Fatigue study** — A process to collect data about employee alertness levels and sleep obtained during a set period of time (e.g., 2 – 4 weeks) in order to quantify fatigue risk in operations.

**Fatigue countermeasures** — Strategies to reduce the likelihood or consequence of an incident when employees are required to work through periods of high fatigue.

**Hazard** — A source of potential error, or an incident or situation with a potential to cause damage to equipment or result in injury or death

Incident — A safety-critical event that results in equipment damage, injury, or death

**Near Miss** — A situation or event that does not result in equipment damage, injury or death, but could potentially do so in different circumstances.

**Manual** — Refers to the most recent version of this document.

**Recovery sleep** — Sleep obtained away from the workplace enables the employee to recuperate from the work period and begin to pay back any sleep debt accumulated while on shift.

**Risk** — Calculation of consequence (potential loss) and likelihood (probability or frequency) of a potential incident

**Shiftwork** — Any work schedule that requires the employee to work at night (between 9 p.m. and 7 a.m.), in the afternoon/evening (after 5 p.m.), weekends (Saturdays/Sundays), very early hours (pre 6 a.m. starts), or longer than eight hours. Managers with flexible schedules that may require them to take work home, come in to work early and go home late, or be on call for 24-hour periods are considered shift workers from a fatigue risk management perspective.

**Sleep debt** — A term used to describe the situation that occurs when an employee does not obtain adequate restorative sleep. A sleep debt can accumulate over a period of days. This debt may result in impaired performance, reduced alertness, and higher levels of sleepiness and fatigue. A sleep debt can only be repaid with recovery sleep.

**Sleep deprivation** — Loss of sleep that can occur either acutely (loss of a complete night’s sleep) or partially (some sleep lost each night over a period of nights). Both result in reduced levels of alertness and performance.

**Sleep duration** — The period between the onset of sleep and waking, less the duration of awakenings.

**Sleep inertia** — The transient impairing effect of sleep on cognitive performance immediately after waking up.

**Work-related causes of fatigue** — Factors contributing to a state of fatigue for which the organization is primarily responsible.

#### **INTRODUCTION**

* 1. **Why Have a Fatigue Risk Management Program?**

OSHA encourages all employers to adopt safety and health programs, which can substantially reduce the number and severity of workplace injuries and alleviate the associated financial burdens on operators.

A Fatigue Risk Management Program is an organized approach to improving safety by actively tracking and mitigating fatigue in the operational environment. Government regulations and/or collective bargaining agreements may stipulate hours of service limits. However, fatigue risk can be present even when operating within such limits. An FRMP provides visibility of potentially hidden fatigue risk in operations and helps ensure that safety objectives are being met.

An added benefit of an FRMP is that it provides a framework to quantify fatigue risk in terms of safety performance indicators. Such metrics are an objective means of evaluating the effectiveness of the Company’s safety culture and can be used as inputs when tracking the impact of safety initiatives on DART scores and OSHA recordables.

* 1. **Fatigue Risk Management Program Components**

The Company’s Fatigue Risk Management Program consists of a set of policies, procedures, technologies, and documentation that work together as a cohesive system. The various components of the Company’s FRMP are illustrated in the figure below.



Figure 1: Components of the Company’s Fatigue Risk Management Program.

For ease of reference, the table below indicates the page number in this manual where each of these FRMP components is described in detail.

|  |  |
| --- | --- |
| Policies |  |
| Statement of Management Commitment  Statement of Safety Objectives and SPIs  Statement of Shared Responsibility  Non-Punitive Fatigue Reporting Policy | page 11  page 11  page 13  page 17 |
| Procedures |  |
| Proactive Monitoring  Identifying Fatigue Hazards  Assessing Risk  Mitigating Risks | page 19  page 28  page 30  page 31 |
| Safety Promotion |  |
| Safety Culture at the Company  Communication Plan  Fatigue Risk Training Program | page 32  page 33  page 36 |
| Quality Assurance |  |
| Continuous Improvement  System Auditing  System Performance Evaluation | page 41  page 42  page 45 |
| Implementation |  |
| Risk Controls  IT Systems  Documentation | page 47  page 49  page 49 |

Figure 2: FRMP Components.

* 1. **Accountability Chart**

The management of safe operations at the Company is structured as illustrated in Figure 3 below. Each position reports to and is accountable to the position immediately above.   
[*Adapt diagram as applicable to Company organization*]



Figure 3: Organizational chart of responsibilities for safety in operations.

Currently, the positions identified in the organizational chart and other positions relevant to fatigue risk management are held by the following individuals:

Accountable Executive [*insert name, title*]

Director of Safety [*insert name, title*]

Medical Director [*insert name, title*]

IMS Manager [*insert name, title*]

Training Program Manager [*insert name, title*]

FRMP Manager [*insert name, title*]

See page 14 for a detailed description of the roles and responsibilities of the personnel involved in the operation of the Company’s Fatigue Risk Management Program.

#### **Fatigue Risk Management Policies**

The Company is committed to ensuring the safety of its operations by actively managing risks associated with fatigue. Management recognizes that fatigue is a hazard that can contribute to accidents or incidents, and has devoted resources to support the goals and principles of fatigue risk management throughout the company’s operations.

### **Purpose**

The Fatigue Risk Management Policies set forth below serve as the framework of the Company’s Fatigue Risk Management Program (FRMP). These policies are intended to communicate clearly the Company’s position on fatigue risk: that it is an occupational and safety hazard that should be measured and mitigated. Every stakeholder in the organization has a role to play in ensuring the safety and wellbeing of employees and the general public, to the extent that the Company’s operations impact the community at large.

### **Scope**

The following policy areas are addressed:

* Management commitment to fatigue risk management (see below)
* Safety objectives and Safety Performance Indicators (SPIs, page 11)
* Shared responsibilities of personnel (page 13)
* Non-punitive fatigue reporting (page 17)

Section 6 of this Manual sets out how the Company realizes each of the above topics with detailed procedures and controls.

* 1. **Statement of Management Commitment**

By implementing an FRMP along with the associated systems, procedures, and quality assurance program, the Company’s management declares a commitment to safe operations. In particular, management has a specific commitment to the actions set forth in the box below:

|  |
| --- |
| Promote effective fatigue risk reporting |
| Provision adequate resources for fatigue risk management at the Company |
| Pursue excellence in the Company’s FRMP with a quality assurance program |

Figure 4: Stated management commitments in relation to fatigue risk management.

The signature of the Accountable Executive on the cover page of this Manual attests to these management commitments.

* 1. **Statement of Safety Objectives**

The Company aspires to achieve the following outcomes as a direct result of operating an FRMP:

* Fatigue risks in operations are proactively managed in accordance with scientific principles and industry best practices
* Fatigue risks are quantified and monitored with validated, biomathematical model-based software systems
* Through a structured training and education program, personnel have an awareness of fatigue risks and strategies to minimize the impact of fatigue stressors, and are familiar with fatigue reporting procedures and available fatigue countermeasures
* All stakeholders in the Company feel well represented in the Company’s policy development and decision-making with respect to fatigue risk management
* All operations comply with a performance-based approach to managing fatigue, defined in terms of specified target values of Safety Performance Indicators (SPIs)

Safety objectives can be measured in terms of Safety Performance Indicators (SPIs). An SPI is a quantitative metric related to a specific area of operations. Each safety objective is associated with one or more SPIs for which the Company has specified target values, as set forth in the table below.

|  |  |  |
| --- | --- | --- |
| **Safety Objective** | **SPI** | **Target Value** |
| Proactively manage fatigue risk in operations | Number of fatigue reports in a calendar month | Less than [*specify*] |
| Quantify and monitor fatigue risks with model-based software systems | Percentage of work shifts exceeding the High Fatigue threshold in one calendar month | Less than [*specify*]% of shifts have a Fatigue Score of [*specify*] or greater |
| Percentage of personnel exceeding the High Fatigue threshold in one calendar month | Less than [*specify*]% of active duty personnel have a Fatigue Score of [*specify*] or greater |
| Provide personnel with training and education about fatigue risks and how they are managed in the Company | Percentage of personnel that are current with established training requirements | More than [*specify*]% |
| Adequately involve stakeholders in fatigue risk management policy and decision-making | Total number of fatigue risk management policy related grievances in one calendar month | Less than [*specify*] |
| [*Add others as applicable. Examples include: DART, OSHA recordables, PVT scores, Samn Perelli scores, training/education test scores, rates of equipment damage, injuries, non-compliance incidents, or accidents.*] | | |

The above targets serve as a means of evaluating the degree to which the Company is achieving its safety objectives.

* 1. **Statement of Shared Responsibility**

All personnel at the Company have a shared responsibility of managing fatigue risk. The specific responsibilities of each group are set forth below.

#### ***Management***

* Create a transparent reporting culture devoid of negative repercussions
* Promote safety as a Company priority
* Budget for technologies and services to support the Company’s fatigue risk management practices
* Stay abreast of new rules or guidance for fatigue risk management in operations published by industry associations and regulatory bodies
* Structure operating schedules so as to minimize fatigue risk
* Accommodate employee requests to desist from active duty when subjective or objective factors indicate elevate fatigue risk
* Provide periodic training for all relevant personnel, including management
* Allocate adequate resources to enable fatigue risk management policies to be met and associated procedures to be followed

#### ***Supervisors***

* Understand how fatigue risk is quantified and know the specific thresholds that trigger fatigue mitigation workflows
* Create duty schedules that minimize fatigue risk within operating constraints
* Alert management to situations or patterns of operations that exhibit systematically elevated fatigue risk
* Follow the policies and procedures of this FRMP Manual
* Communicate with line workers about fatigue risk issues and be receptive to their concerns

#### ***Line Workers***

* Manage off-duty schedule appropriately to set aside adequate time for restorative sleep and rest
* Report for duty sufficiently rested and fit to perform work responsibilities
* Alert management when too fatigued to safely perform duty
* Develop personal fatigue mitigation strategies, including taking advantage of on-duty fatigue countermeasures made available by the Company
* Be alert to fatigue-related safety issues and report them to management
* Cooperate with fatigue studies and other initiatives put in place by the Company to better understand fatigue risk exposures

### **Stakeholder Roles and Responsibilities**

The Company formally authorizes all Company personnel to use their sound judgement to ensure that the Company’s mission is achieved to the best of their individual and collective ability. All Company personnel are expected to demonstrate care for their personal safety and the safety of others by complying with safety policies and standards, avoiding unsafe acts, and reporting unsafe conditions. The Company has defined clear lines of accountability for reporting unsafe acts; the same applies for reporting observed fatigue hazards.

Managing fatigue risk is a responsibility shared by all Company stakeholders. The specific roles and responsibilities of individual personnel and relevant committees are set forth below.

#### ***Accountable Executive***

The Company’s Accountable Executive bears overall responsibility for the Company’s Fatigue Risk Management Program. In particular, the Accountable Executive is responsible for the following objectives:

* Promote a workplace culture of safety and awareness of the hazards of fatigue
* Exercise control of the financial and human resources necessary for operating in accordance with defined safety standards
* Provide oversight and direction to the FRMP Committee and the FRMP Manager during the development, implementation, and ongoing quality assurance of the Company’s FRMP
* Monitor the performance of the FRMP in all areas of the organization
* Furnish the financial and human resources necessary for the proper operation of the Company’s FRMP
* Endorse the Company’s safety policy, Fatigue Risk Management Policy, and other related provisions
* Participate in the Company’s Senior Management Committee, SMS Review Committee, and FRMP Committee
* Exercise executive authority for the compliance of the Company’s operations with the FRMP policies and procedures set forth in this Manual

#### ***Director of Safety***

With regard to the Company’s FRMP, the responsibilities of the Director of Safety include:

* Ensure adherence to the Company’s Fatigue Risk Management Policy by all relevant members of the organization
* Manage and execute overall control of the Company’s FRMP
* Serve as the operations manager responsible for ensuring compliance of the Company’s FRMP with OSHA and other applicable regulatory requirements
* Appoint members of the FRMP Committee
* Communicate information to stakeholders in accordance with the communication plan set forth in this Manual (section 8.2)
* Define, prioritize, and propose safety objectives to senior management

#### ***FRMP Committee***

The responsibilities of the FRMP Committee are to:

* Develop and implement the Company’s FRMP in coordination with all stakeholders including management, employees, labor unions, and regulators
* Maintain the Company’s Fatigue Risk Management Policy
* Update Fatigue Risk Management procedures, controls, and training content as necessary to reflect changes in operations or regulatory requirements
* Authorize any distribution of this FRMP Manual to third parties
* Review and approve modifications to this Manual
* Perform FRMP audits to ensure quality assurance and to validate compliance with FRMP policy and procedures as set forth in this Manual
* Ensure reported fatigue risks are documented and resolved in a timely manner
* Create an appropriate process to solicit feedback from employees, supervisors and managers regarding the Company’s FRMP
* Review information received from the feedback process and apply findings to improve the Company’s FRMP in accordance with quality assurance practices
* Appoint the FRMP Manager

#### ***IMS Manager***

The responsibilities of the Information Management System Manager are to:

* Implement fatigue risk management software technologies and integrate them with the Company’s existing safety monitoring and reporting systems to support the operation of the FRMP
* Conduct analysis of reported safety incidents and other risky events
* Recommend to the Director of Safety a further investigation of safety incidents and other events of interest, when warranted in the judgement of the IMS Manager
* Analyze data trends in the Company’s FRMP and prepare periodic reports for the FRMP Committee

#### ***FRMP Manager***

The responsibilities of the FRMP Manager are to:

* Oversee the ongoing operation of the Company’s FRMP
* Maintain FRMP documentation including the master copy of this Manual
* Provide ongoing communication regarding the Company’s FRMP to management and employees
* Report fatigue-related issues to the FRMP Committee
* Notify the Director of Safety of any unsafe or otherwise risky conditions in Company operations
* Ensure relevant employees receive initial and recurring training as described in section 0
* Ensure all training applicable to the Company’s FRMP is properly documented
* Perform retrospective analysis of fatigue reports and, based on the results of this evaluation process, take appropriate actions as described in section 6.7
* Recommend that the IMS Manager convene a meeting of the IMS Committee when warranted according to the judgment of the FRMP Manager
* Identify fatigue-related information to be communicated to stakeholders in accordance with the communication plan, and prepare drafts of appropriate communication documents on behalf of the Director of Safety
* Perform such other duties as may be assigned in connection with the Company’s FRMP by the FRMP Committee or the Director of Safety

#### ***Quality Assurance Manager***

The responsibility of the Quality Assurance Manager with regard to the Company’s FRMP is to:

* Carry out FRMP Audits as defined in section 8.2
* Report to the Director of Safety and the Accountable Executive any discrepancies between audit findings and the relevant FRMP procedures set forth in this Manual

#### ***Other Directors and Vice-Presidents***

Directors and Vice-Presidents of the Company not specifically identified by role in this Manual shall:

* Assume overall responsibility for the implementation of the Company’s FRMP and IMS to the relevant extent in their departments
* Pursue the achievement of the Company’s stated safety objectives within their respective departments, in accordance with the Company’s Fatigue Risk Management Policy
* Participate in the Safety Management Committee to perform an annual review and restatement of the Company’s safety objectives
* Communicate the Company’s safety objectives to reporting personnel
* Foster a culture of safety in all departmental activities

#### ***Line Workers and Others Requiring FRMP Training***

All members of the Company community are expected to demonstrate care for their personal safety and for the safety of others as they perform their work. In particular, all Company personnel shall:

* Comply with all Company safety standards and policies
* Receive required initial and recurring training
* Avoid unsafe acts
* Report unsafe conditions to supervisors
* Be aware of their responsibilities under the Company’s FRMP

#### ***Supervisors and Managers***

All departmental supervisors and managers are responsible for ensuring that personnel reporting to them are aware of the Company’s FRMP and the related policies and procedures that are relevant to their work.

* 1. **Non-Punitive Reporting Policy**

The Company is committed to continually reducing the risk of fatigue. Aside from developing and implementing procedures for mitigating fatigue risks, collecting data is the primary means of activating the Company’s FRMP and ensuring its success. Data is essential to measuring system performance, auditing compliance with regulations, and performing quality assurance.

### **Reporting Requirements**

In addition to regulatory OSHA reporting requirements, the Company’s FRMP requires employees to:

* Report safety incidents and observations within twenty-four (24) hours of their occurrence. Include in the report description of the trigger events (including the time occurred) and persons associated with incidents.
* Proactively report any known or foreseeable hazards without delay, especially when such information could prevent an accident or injury

The reporting procedure is set forth beginning on page 27.

### **Non-Punitive Policy**

Data always starts with people and the choices they make while performing their work duties. For this reason, the Company wishes to eliminate all barriers to the creation and communication of data by Company personnel.

**The Company will not initiate disciplinary action against an employee who reports a safety incident or risky operational situation.** This means that an employee will not be penalized for disclosing that he or she feels fatigued or even seeks permission for immediate time off from duty.

Exceptions to this policy occur when the matter involves criminal or willful acts and/or the use of controlled substances. Examples of exceptions include:

* Premeditated or intentional acts of violence against people
* Gross negligence or intentional wrongdoing resulting in damage to equipment or property
* Actions or decisions which, in the Company’s judgment, a reasonably prudent employee with relevant training and experience would not take
* Failure to report safety incidents or safety risks

Employees that undermine safety may be subject to disciplinary action. When conducting a decision-making process in such circumstances, management will take into consideration an employee’s compliance with the reporting requirements set forth above.

Outside of these specific and rarely invoked exceptions, employees who make honest mistakes or misjudgments will not be subject to blame, provided they report such incidents in the prescribed manner.

#### **FATIGUE RISK MANAGEMENT PROCESS**

* 1. **Overview**

The process of fatigue risk management consists of a cycle of four steps as illustrated in Figure 5 below. The starting point is monitoring data continuously being collected from operations to seek out fatigue hazards. Once a fatigue hazard has been identified, an assessment is performed to gauge the severity and likelihood of the risk associated with the hazard. The result of this assessment then guides decision-making with respect to how the risk should be mitigated. If it is determined that the fatigue hazard could be avoided in future, appropriate adjustments to operating procedures can be made.



Figure 5: The fatigue risk management process.

* 1. **Understanding Fatigue Risk**

Understanding the fundamentals of fatigue and how it affects job performance, decision making, and well-being in general will improve the ability of personnel to recognize signs of fatigue and identify fatigue hazards as they appear.

### **What Is Fatigue?**

Broadly defined, fatigue is a state of mind and/or body that impairs a person’s ability to perform tasks that are within their competence and training level. Sometimes fatigue is equated to sleepiness—the propensity to fall asleep. While it is true that a lack of sleep or disrupted sleep patterns can result in fatigue, there are other causes of fatigue that are not directly related to sleep.

One way to understand fatigue is to think about its opposite: alertness. When a person is in a reduced state of alertness, he or she can be considered to be fatigued. The accepted standard for objectively measuring fatigue risk, known as the Psychomotor Vigilance Test or PVT, is actually a measure of alertness deficit.

### **Sleep-related Causes of Fatigue**

Just like food, water and air, sleep is a basic biological need that is critical for survival. Sleep allows the body to restore itself and the mind to process the sensory stimuli from the most recent period of wakefulness. Studies have shown that humans require approximately 7.5 hours of high-quality sleep per day to function normally. It is when the quantity or quality of sleep suffers that fatigue risk sets in.

#### **Inadequate Sleep**

Carrying a sleep debt contributes to daytime fatigue. Sleep debt happens when the amount of sleep a person gets on a daily basis is less than the sleep that they need. There are many situations in which this can happen, both at work and at home. Some work-related causes of restricted sleep are:

* Early report times for duty
* Short rest periods
* Extended duty days

Outside of work, a person may experience inadequate sleep as a result of:

* Choosing to spend time in other ways rather than sleeping
* Personal life issues, such as having a new baby or caring for a sick family member
* Medical conditions such as body pain or sleep apnea that compromise the quantity and/or quality of sleep obtained
* Medications that interfere with the body’s natural sleep cycle
* Consuming caffeine in excess or too close to bedtime

Sleep debt can only be “repaid” by getting extended sleep – also known as recovery sleep – for one or more days in succession.

#### **Prolonged Wakefulness**

The need to sleep grows the longer a person is awake. This concept is known as sleep drive. When sleep drive is high, alertness is low. The figure below illustrates how sleep drive changes during a normal 24-hour cycle.



Figure 6: Illustration of sleep drive and how it changes over the 24-hour period of one day.

A prolonged period of wakefulness can result from:

* Extended duty periods
* Significant family or social obligations following a duty period
* Long commute times to or from work
* Sleep issues such as insomnia

#### **Circadian Misalignment**

Unlike owls or mice, humans are not nocturnal. What makes us a daytime species is our biological clock, scientifically known as the circadian rhythm. The biological clock is naturally programmed to up-regulate us during the day and down-regulate us at night, as illustrated in Figure 7 below. The range of time in the cycle that occurs during the night at the lowest part of the curve is known as the window of circadian low (WOCL).

Normally, our biological clock is synchronized to the daylight and dark cycles of the local environment. When we travel across time zones, however, the pattern of daylight and dark cycles becomes mismatched with our biological clock. The result is circadian misalignment, commonly known as jet lag. It can lead to fatigue.

Circadian misalignment can result from:

* Working during the night
* Crossing multiple time zones within a short period of time (i.e. during air travel)
* Rotating from a set of day shifts to a set of night shifts, or vice-versa.



Figure 7: Illustration of the 24-hour cycle of the body’s biological clock. During the day, the brain produces alerting signals. At night, it turns them off.

### **Other Causes of Fatigue**

Work-related and personal factors can also be associated with fatigue risk. It is part of the shared responsibility of individual employees, their colleagues and their supervisors to be aware of the potential presence of these factors and to take them into consideration when assessing fatigue risk.

#### *High Workload*

Work that is associated with a high degree of stress or that requires significant physical or cognitive effort can contribute to fatigue. Simply working longer hours can be fatiguing. In general, a high workload places demands on personnel that cannot always be avoided, either because of the nature of the work or the context in which it is performed. Fatigue is a natural response of the body to these operational demands. Some examples of situations with high workload are:

* Multiple task assignments during the duty day
* Multiple consecutive duty days
* Time pressure conditions
* Work schedule patterns that do not include adequate rest opportunities

#### *Challenging Working Environment*

The surroundings of an individual at work can amplify an existing state of fatigue that was originally triggered by other causes. Some characteristics of the working environment that may have this effect include:

* Poor lighting conditions
* Poor air quality
* Extreme weather conditions
* Engine vibration
* Loud or continuous noise

#### *Personal Factors*

Each individual has a unique set of constraints and circumstances in their life outside the workplace. Sometimes these personal factors limit how much restorative sleep can be obtained between duty periods, as discussed above. In other cases, personal factors can exacerbate an existing fatigue stressor. Among the Company’s workforce, there is likely to be a wide range of personal factors that have the potential to impact fatigue. Here are just a few examples:

* Financial stress
* Separation or divorce
* Chronic illness
* Death of a family member
* Using tobacco or marijuana products
* Alcohol consumption

While it may not be possible to directly address personal issues in the workplace, the Company has an employer’s duty of care for its employees and may be able to offer help; for example, by providing referrals to supporting resources in the community.

### **Fatigue-related Symptoms**

There are many ways in which an employee may appear to be, or act, fatigued. Fatigue-related symptoms fall into three general categories: physical, cognitive, and emotional. Examples of specific symptoms of fatigue within each category are listed below.

#### *Physical Symptoms*

* Repeated yawning
* Bodily weakness
* Lack of energy or motivation
* Heavy or drooping eyelids
* Eye-rubbing
* Nodding off or head drooping
* Headaches, nausea, or upset stomach
* Slowed reaction time
* Slowed or slurred speech

#### *Cognitive Symptoms*

* Difficulty thinking clearly
* Difficulty concentrating on tasks
* Errors of omission
* Lapses in attention
* Failure to communicate important information
* Failure to anticipate events or actions
* Making mistakes even on well-practiced tasks
* Forgetfulness
* Poor decision making

#### *Emotional Symptoms*

* Withdrawn or unenthusiastic mood
* Reduced interest in or emphasis on good performance
* Irritability or heightened emotional sensitivity
* Low morale
* Heightened emotional sensitivity

The recurring presence of fatigue-related symptoms during certain work periods or times of day, especially when exhibited by more than one employee, is an indication that shift scheduling may be an underlying fatigue stressor. Analyzing the situation using a biomathematical model-based fatigue estimation software system can help pinpoint the issue and find a workaround.

* 1. **Fatigue Countermeasures**

When operational demands or other fatigue stressors cause personnel to exhibit symptoms of fatigue, the immediate priority is to file a fatigue report and identify the most appropriate countermeasures to activate in order to mitigate fatigue risk.

***Note:*** *If at any time an employee feels unfit for work, he or she will be relieved of duty and given an opportunity to rest or to go home. The Company’s policy on internal fatigue reporting is set forth in section 5.7, and the detailed procedures for fatigue reporting are described in section 6.4.*

If the employee is experiencing low or moderate levels of fatigue and elects to continue on duty, a number of strategies can be used to reduce the consequences of increased fatigue. These include:

* Restorative Sleep
* Napping
* Supervisor and co-worker monitoring
* Task rotation and reallocation
* Additional breaks and strategic use of caffeine

Each of these fatigue countermeasures is described below.

### *Restorative Sleep*

The most effective fatigue countermeasure is sleep. Personnel are expected to protect opportunities for restorative sleep, especially during off-duty time. Restorative sleep is an extended sleep period of at least 5-7 hours that contributes to increased alertness levels during the waking period that follows.

### *Napping*

Where appropriate, employees may be allowed to take a nap. Usually naps should have a duration of 20 – 30 minutes; however, longer or shorter naps may be more appropriate depending on operational constraints, time of day, and degree of fatigue risk present. For example, when duty periods extend for 16 or more continuous hours (i.e., during extraordinary operations such as outages), longer nap times are advised. Before returning to active duty after a nap, employees should be given sufficient time to overcome the effects of sleep inertia (at least 20 minutes).

### *Supervisor and Co-worker Monitoring*

In instances where operational demands require extended hours of work that may result in employees working through higher levels of fatigue than normal, employees and supervisors will be proactive in observing and acting on fatigue-related symptoms that may be manifested (see section 6.1 for a list of fatigue-related symptoms). In cases where fatigue symptoms are repeatedly observed in an employee, the supervisor shall be informed and measures will be taken to allow the employee to take a break or a nap, or use other strategies to improve alertness (such as exercise, additional breaks, and/or caffeine). For safety-critical work, more attentive supervision may be insufficient, and the employee shall be required to activate additional fatigue countermeasures as required to achieve fitness for duty.

### *Task Rotation and Task Re-Allocation*

Spending an extended period of time on one task, or performing a monotonous task, are known fatigue stressors. Studies have shown that changing tasks in such situations can contribute to a boost in alertness. In order to be most effective, task changes should be limited to not more than 3 – 4 changes per duty period. Any new task assignment should be within the competencies of the employee. Supervisors will rotate work in consultation with concerned employees to ensure that all tasks reassignments meet this requirement.

### *Additional Breaks and Strategic Use of Caffeine*

Employees are responsible for monitoring themselves and for requesting or taking breaks when they feel their alertness levels are impaired. During breaks, employees must follow best practices for countering fatigue effects, which may include mild exercise, napping, healthy snacks and consuming caffeine.

Employees that choose to consume caffeine should do so in a strategic manner—that is, with attention to quantity and timing. Habitual use of caffeine decreases its effectiveness. Studies have shown that consuming up to 50mg of caffeine (approximately the equivalent of one 8oz. cup of coffee) per 24-hour period has a positive impact on alertness, but consuming additional caffeine has limited effect. Also, consuming caffeine within 1-2 hours of bedtime can make it difficult to get to sleep.

The Company does not promote the regular use of caffeine. However, the Company acknowledges that caffeine can be useful in contingency situations to help increase alertness when required.

* 1. **Monitoring Data Collected from Operations**

The essential first step in the fatigue risk management process is to collect data from operations. Only with timely, complete and accurate data can fatigue hazards be properly identified. Good data collection and monitoring practices reduce the likelihood of fatigue hazards remaining unnoticed or undetected.

The Company collects data from operations in several forms. Depending on the nature of the data, it may be collected on a continuous, recurring, or ad hoc basis. The table below summarizes the Company’s data collection program.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DATA FROM: | Source | Frequency | Medium | Format |
| Fatigue Reports | Individual Personnel | as required | [*specify*] | [*specify*] |
| Electronic Fatigue Reports | Individual Personnel | as required | smartphone app | email |
| Accident / Incident Reports | Line Supervisors | as required | [*specify*] | [*specify*] |
| Duty Schedules | [*scheduling system*] | daily | computer data file | [*specify*] |
| Fatigue Scores | Biomathematical model-based fatigue estimation system | continuous | web service | web, PDF |
| PVT Scores | Individual Personnel | in conjunction with fatigue studies | smartphone app | CSV |
| Self-Reported  Fatigue Measures | Individual Personnel | in conjunction with fatigue studies | smartphone app | CSV |

Figure 8: Array of data items collected by the Company as part of the fatigue risk management process.

Information from internal and external sources is integrated into the Company’s FRMP through the Integrated Management System.

### **Internal Fatigue Reporting Procedure**

Fatigue-related risk, errors, and incidents are reported using the Company’s existing reporting framework. [*Specify reporting process*.] Employees shall complete Form [*specify form name*] and submit it to their immediate supervisor. If for some reason this form is not available, reporting via email or telephone is acceptable.

One section of [*specify form name*] form is dedicated to fatigue-related information at the time of the incident or risky situation being reported [*verify*]. This information includes:

* Account of hours worked by the employee during the past two weeks
* Quantity and timing of sleep obtained by the employee during the past 72 hours
* Checklist of fatigue-related symptoms that the employee may have been exhibiting

Upon receipt of a [*specify form name*] form, the supervisor will first determine whether the submission applies to the IMS or to the FRMP. Next, the supervisor will evaluate the severity of the reported incident or hazard (see section 6.6 below). If the severity is negligible or minor, the supervisor will add the report to the [*specify*] database and advise the employee to self-monitor performance, or perhaps reassign tasking if appropriate.

If the fatigue-related report concerns an issue of moderate or high severity, the supervisor shall take one or more of the following actions:

* Allocate focused peer/management supervision to the employee for the duration of the employee’s duty period
* Reassign tasking
* Recommend specified fatigue countermeasures (see section 6.3)
* Cancel the remainder of the employee’s duty period and ensure sufficient time off is scheduled prior to the commencement of the next duty period in order to allow the employee to get the restorative sleep required[[1]](#footnote-1)

If the decision is made to relieve the employee of duty, the Company shall cover the cost of suitable ground transportation (taxi, shared ride service, etc.) for the employee to return home safely. The employee will not be permitted to drive home.

In consultation with management and safety officials, the supervisor will recommend short term corrective actions for preventing similar events, and factors to consider in the FRMP Performance Evaluation process (see section 8.3).

* 1. **Identifying Fatigue Hazards**

The key to effective risk management is identifying hazards. This section provides a definition of fatigue hazards and describes three methods of identifying fatigue hazards in data collected from operations.

### **What is a Fatigue Hazard?**

Fatigue hazards are situations or incidents where a change in operational procedures has occurred as a possible result of fatigue. Not all fatigue hazards compromise safety. Still, given the 24/7 nature of some operations and the potential for accidents, all fatigue hazards must be considered serious and reported promptly.[[2]](#footnote-2)

Below are examples of fatigue hazards that may be observed in operations:

* An employee fails to respond to a change in PP&E resulting from a safety recall or the expiry of a warranty period and continues using expired PP&E
* Fatigue contributes to a duty period not being started or completed
* An employee who has been on leave for several days and is acclimatized to waking at a certain time each day is called upon to work a shift that starts several hours prior to his or her normal waking time
* An employee is observed to be sleeping on the job
* An employee identifies something in their operating environment that could significantly increase their fatigue, or that of others

### **Methods of Identifying Fatigue Hazards**

Fatigue hazard identification can be classified into three categories: predictive, proactive, and reactive. Each method is linked to a specific type of operational data, which may be collected before, during, or after the respective duty period.

#### *Predictive Hazard Identification*

This method seeks to identify fatigue hazards in future operations by examining planned duty schedules before they are actually worked. This can be accomplished with biomathematical modeling of sleep and fatigue based on scheduled duty periods. The Company uses a biomathematical model-based fatigue estimation software system for this purpose.

#### *Proactive Hazard Identification*

Current operations are the focus of proactive hazard identification. In particular, the objective of this method is to quantify fatigue levels exhibited by on-duty personnel. The Company uses biomathematical model-based fatigue estimation software to analyze employee fatigue levels in near real time based on their assigned duty periods.

#### *Reactive Hazard Identification*

Retrospective data analysis is at the core of reactive hazard identification. At the Company, the FRMP Manager reviews fatigue reports as they are submitted by personnel. The FRMP Committee reviews audit reports and incident investigation reports. In terms of duty schedule data, the FRMP Manager can load examine forward-looking schedules using biomathematical model-based fatigue estimation software. Such software systems can also be used to generate reports that facilitate the comparison of planned versus actual duty periods.

As part of the Company’s FRMP documentation, the FRMP Manager maintains a register of fatigue hazards identified. This register includes the following information:

* Unique hazard identification number
* Description of the fatigue hazard
* Potential causes
* Risk assessment in terms of likelihood and severity
* Ranking in terms of mitigation priority
* Risk controls or mitigations enacted
  1. **Assessing Fatigue Risks**

Once a fatigue hazard has been identified, the level of risk that it presents is assessed. The risk assessment process considers the nature of the operational setting of the fatigue hazard as well as the potential impact to operations. If the risk is deemed low and the impact to operations negligible, introducing a simple fatigue countermeasure such as a caffeine dose may be sufficient. However, if the degree of risk is high and safety is under threat, more structured risk controls may need to be implemented.

### **Likelihood and Severity Matrix**

A structured way to approach fatigue risk assessment is to categorize fatigue hazards according to their likelihood and severity. The Company has adopted the safety risk assessment matrix presented in Figure 9 below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Severity:** | | | |
| **Likelihood:** | Catastrophic | Hazardous | Major | Minor |
| Frequent | 5A | 5B | 5C | 5D |
| Occasional | 4A | 4B | 4C | 4D |
| Remote | 3A | 3B | 3C | 3D |
| Improbable | 2A | 2B | 2C | 2D |
| Extremely Improbable | 1A | 1B | 1C | 1D |

Figure 9: Safety Risk Assessment Matrix.

The FRMP Manager shall assign a severity classification to each identified fatigue hazard based on the relevant employee’s Fatigue Score according to the mapping set forth in the table below.[[3]](#footnote-3)

|  |  |
| --- | --- |
| Fatigue Score | Assigned Severity |
| Less than 8.0 | D |
| 8.0 – 11.9 | C |
| 12.0 – 15.9 | B |
| 16.0 or greater | A |

Figure 10: Severity assignment based on Fatigue Score.

The likelihood of the fatigue hazard shall be determined at the discretion of the FRMP Manager based on previous internal and industry experience. To assist in making this determination, the FRMP Manager may consult with superiors and/or the employees that reported or experienced the fatigue hazard.

* 1. **Mitigating Fatigue Risks**

Once a fatigue hazard has been assigned a specific risk assessment classification, the next step is to select an appropriate mitigation strategy. The color shading in Figure 9 indicates the relative priority of mitigating risks associated with identified fatigue hazards. The highest priority risk classifications are shaded in pink, medium priority risk classifications are shaded yellow, and low priority risk classifications are unshaded.

### **Mitigation Priority**

Fatigue hazards that are high and medium priority are serious safety issues. Such fatigue hazards shall be referred immediately to the FRMP Committee, which shall consider which risk controls to put into action. The FRMP Committee will make its determination in accordance with the Company’s Safety Action Plan [*insert reference to appropriate external document*] and considering the context of the relevant fatigue hazard.

Fatigue hazards classified as low priority constitute an acceptable level of risk for the Company. The Company does not require the investment of resources in risk controls or mitigations for low priority fatigue hazards.

### **Specified Mitigations**

The Company has in place a safety action plan to identify appropriate mitigations for risks that are assessed as medium or high priority. This action plan is described in [*specify SMS manual or other applicable safety management policy document*].

With respect to fatigue risks prioritized for mitigation, specific countermeasures are available to be activated, as listed below. Depending on the severity of the risk, one or more of these fatigue countermeasures may applied at the same time.

* Allow the employee a protected on-duty sleep opportunity (20 – to 30 – minute nap)
* Temporarily reassign the employee to a less safety sensitive task
* Ask the employee to take a break
* Augment staffing levels
* Send the employee home on paid time off

Coffee and other sources of caffeine can be made available for use at the discretion of the employee (but should not be prescribed by the Company).

When the immediate fatigue risk has been abated, managers should consider implementing strategies to help prevent the recurrence of this risk. These mitigating strategies may include:

* Adjusting scheduling practices, including shift lengths, number of consecutive shifts in a work set, and shift rotation pattern
* Augmenting staffing levels
* Implementing procedural changes

### **Evaluating Effectiveness**

The Company has developed a set of Safety Performance Indicators (SPIs) to measure the effectiveness of risk controls activated to manage and mitigate fatigue risks. Each SPI has a targeted range of values. To the extent a given SPI remains within its targeted range, the intended outcome of the corresponding risk controls and mitigations is achieved and maintained. Likewise, any unexplained deviation outside the targeted range suggests that risk controls and mitigations are not performing at an acceptable level.

SPIs are defined as *metrics* in the biomathematical model-based fatigue estimation software systems. These metrics are used to evaluate the efficacy of specified risk controls or mitigations, and to evaluate trends in OSHA recordables and DART rates (if applicable).

The Company’s SPI monitoring process is part of its FRMP Quality Assurance program (see section 8).

#### **SAFETY PROMOTION**

The Company actively promotes its commitment to fatigue risk management by fostering a culture of safety and open communication. The Company believes personnel competency is an essential component of safety. For this reason, all safety-sensitive personnel receive periodic assessments of fitness for duty. In addition, the Company has a program of competency-based training for new and existing employees.

* 1. **Safety Culture**

The Company is committed to creating and fostering an informed safety culture. All company stakeholders can benefit from learning how each individual can take responsibility for his or her own fatigue level and fitness for duty. It is equally important to develop a knowledge of what *does work* as well as to have a knowledge of what *does not work* when dealing with fatigue.

Personnel are encouraged to continually self-reflect and bring to the attention of their colleagues and supervisors any fatigue hazards that they discern. The Company wishes to ensure a constructive and non-punitive response, and maintains a Non-Punitive Policy (see section 5.7) in this regard. Also, where it is not possible to use the designated form [*specify form name*] for reporting purposes, it is acceptable to use any other form of reporting (i.e., phone, email, etc.)

The overarching objective of fatigue hazard reporting and communication is to ensure that risks are managed with corrective and/or preventative actions, which are applied not only to address the specific issue at hand but also systematically throughout the organization, as appropriate.

### **Personnel Competency Requirements**

The Company requires all personnel to report for duty sufficiently well-rested to be able to safely perform their work responsibilities. In order to safeguard this principle, the Company requires all personnel in safety-sensitive positions to receive an assessment of fitness for duty at least once per year. The assessment will be performed in conjunction with annual recurring training (see below). [The assessment includes an objective measure of alertness that quantifies fatigue level. Individuals that score below a certain threshold on this measure will be provided with the opportunity for a reassessment. Those that score below the prescribed threshold on a second attempt will be referred to the Company’s occupational health center for a clinical evaluation, the purpose of which is to identify the root cause of the observed alertness deficit and to identify a treatment plan.]

The second competency requirement is skills-based. The Company has developed and maintains a competency-based training program to help personnel meet this requirement. This program is described in detail in the sections that follow.

* 1. **Communication Plan**

The Company’s communication plan is intended to facilitate the clear communication to applicable stakeholders of information related to managing fatigue risk in operations. Potential recipients of information under this plan include employees, operational decision-makers, personnel involved in fatigue risk assessment activities, auditors/reviewers, and managers.

### **Objectives**

The Company’s four FRMP communication objectives are to:

1. Provide required information in a timely manner
2. Reinforce principles of shared responsibility (section 5.6)
3. Foster greater awareness of fatigue as an operational hazard (section 6.1)
4. Encourage feedback to improve the effectiveness of the FRMP (section 5.7)

### **Information Subjects**

This communication plan applies to information about:

* FRMP objectives, policies and procedures and any updates to the same
* Responsibilities of each role held by personnel in the organization
* Recent fatigue-related incidents and the results of any analysis or investigations
* Industry reports, best practices, and scientific developments with regard to understanding and managing fatigue risk
* Results from the analysis of data collected in connection with fatigue audits
* Results from FRMP review processes

### **Process**

All communications shall come from the Director of Safety or a person delegated by this individual. The FRMP Manager is responsible for identifying information to communicate. The FRMP Manager shall draft communication documents and submit them to the Director of Safety for review and dissemination. The medium of communication shall be determined at the discretion of the Director of Safety. There are three formal tools for FRMP and/or IMS communication at the Company, as described in the table below.

|  |  |
| --- | --- |
| [insert name of primary communication system] | Automatically sends communications to all persons assigned to an FRMP/IMS subject or any new subject, as well as updates to that particular subject or any request from the IMS Manager, until the subject is closed. |
| [*insert name of internal messaging board*] | Used to send communications company-wide in the forms of Memos, Bulletins, Alerts and Safety Alerts. Includes an auditing feature to ensure that communications have been delivered and reviewed by the recipient. |
| Email | Email is used to send the minutes of the biweekly Safety Committee meeting to designated personnel. Email is also used to send acknowledgment to all personnel who contribute reports to the FRMP and IMS (excluding anonymous reports). |

Figure 11: Formal communication tools at the Company.

Informal means of communication may include:

* Company bulletin board or blog postings
* Posters or other postings on safety notice boards
* Websites
* Live briefings or presentations

The timing and frequency of communication activities will correspond to how safety-critical the information is, and the nature of the required course of action resulting from the communication.

The FRMP Manager, Director of Safety, and Accountable Executive shall monitor the effectiveness of this communication plan and adjust it accordingly to ensure that the four objectives articulated above are being met, and that all affected stakeholders are receiving and understanding the information they need.

### **Classification**

In order to differentiate between levels of importance and to ensure communications are generated and interpreted consistently among different departments, the Company has established a communication classification system as set forth in the table below. The risk gradations in the table correspond to those identified in the Company’s Risk Assessment Chart.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input | Authorization required by any of: | Risk Assessment | Medium | Notes |
| Urgent matter | Accountable Executive[[4]](#footnote-4)  Departmental Director1  IMS Manager | Red | Safety Alert | Immediate release  Personnel must formally acknowledge receipt |
| Information affecting Policies, Procedures or other departments[[5]](#footnote-5) | Departmental Director  IMS Manager | Orange / Yellow | Bulletin | Personnel must formally acknowledge receipt  Contents categorized by IMS standard priority |
| All other information not classified above | Department Director / Manager | Green | Memo | Distributed  via email |

Figure 12: The Company’s Document Classification and Dissemination Plan.

The timing of documentation dissemination depends on the risk associated with the contents. High risk, urgent or emergency situations require an immediate and precise information release (i.e., Alerts or Safety Alerts).

Note: The classes of information in the table above are not intended to replace or duplicate routine departmental information flows.

* 1. **Training Program**

The Company has a structured fatigue risk education and training program encompassing all personnel. It includes an array of training methods and content modules chosen to meet the training needs of each stakeholder group. Training requirements are controlled, documented, and tracked in [*insert name of applicable IT system*].

### **Initial Training**

All new employees shall receive initial FRMP training in conjunction with the training they normally receive as part of the onboarding process. As part of this initial training, new personnel shall become acquainted with the Company’s commitment to fatigue risk management and the risk controls that are in place to mitigate fatigue risk and promote safety in operations.

### **Recurring Training**

Existing employees shall receive recurring fatigue risk education and training on an annual basis. In addition, existing employees shall receive appropriate training when:

* Their work functions are affected by a material change in FRMP policies and procedures
* They assume a new position or work responsibilities with unique FRMP procedures

In each of these cases, the training shall be provided within 30 days of the applicable event.

The requirement for recurring training shall apply to the following Learning Objectives:

* Fatigue Risk: Key Concepts
* Fatigue Hazard Reporting
* Assessing Fatigue Risk, Root Cause Analysis
* Operating the Company FRMP

### **Training Methods**

The following training methods are currently in use by the Company:

* Classroom instruction
* Live webinar
* Recorded webinar
* Distributed learning via a smartphone app

Classroom sessions and webinars are to be delivered by a competent FRMP instructor. The FRMP Manager determines which training method is optimal depending on the stakeholder group receiving the training and the content being delivered.

### **Learning Objectives**

Figure 13 below identifies the specific learning objectives of each role or stakeholder group at the Company. Individual roles or stakeholder groups are designated a capital letter in the top row of the table, with the following associations:

A Accountable Executive

B Director of Safety

C [*insert designated personnel title*]

D [*insert designated personnel title*]

E [*insert designated personnel title*]

F Quality Assurance Managers

G FRMP Manager

H [*insert designated personnel title*] WHAT IS TITLE?

I IMS Manager

K Line Supervisors

L Other Directors and Vice-Presidents

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Learning Objective | A | B | C | D | E | F | G | H | I | J | K | L |
| Fatigue Risk:  Key Concepts | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fatigue Case Studies | ✓ |  | ✓ |  |  |  | ✓ | ✓ |  | ✓ |  |  |
| Fatigue Hazard Reporting |  | ✓ |  | ✓ | ✓ | ✓ | ✓ |  |  | ✓ |  |  |
| Fatigue Risk: Intermediate Concepts |  | ✓ | ✓ |  |  |  | ✓ | ✓ |  |  |  |  |
| Assessing Fatigue Risk, Root Cause Analysis |  | ✓ | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |
| Biomathematical model-based fatigue scoring software |  | ✓ | ✓ |  |  |  | ✓ |  |  |  |  |  |
| Smartphone app for employees |  |  |  | ✓ |  |  | ✓ |  |  |  |  |  |
| Operating the Company FRMP | ✓ | ✓ |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |

Figure 13: Learning Objectives of individual roles and stakeholder groups at the Company.

The training content of each line item can be found in section 8.

As individual personnel undergo assigned training, the FRMP Manager maintains a record to track completion. Learning is evaluated through quizzes; the pass threshold is 80%.

### **Training Program Content**

The FRMP Committee, in consultation with outside experts, establishes which topics are to be included in the Company’s fatigue risk training program during a meeting of committee members held annually. The following topics are currently part of the program.

#### ***Fatigue Risk: Key Concepts***

* What fatigue is and how it differs from sleepiness
* Key fatigue stressors in operations
* Impact of fatigue on safety
* Interpreting the Fatigue Score
* Understanding sleep: introductory concepts
  + Sleep physiology
  + Sleep debt and recovery
  + Jet lag
* Other fatigue countermeasures
* Overview of the FRMP Manual
  + The Company Fatigue Risk Management Policy
  + Shared responsibilities within the FRMP
  + Risk controls

#### ***Selected Case Studies***

* Case Study 1
* Case Study 2

#### ***Fatigue Hazard Reporting***

* Signs and symptoms of fatigue
* Company’s non-punitive policy on fatigue hazard reporting
* How to complete and submit a fatigue hazard report
* What happens next: possible risk controls following the assessment of a fatigue hazard report

#### ***Fatigue Risk: Intermediate Concepts***

* In-depth topics on sleep
  + Sleep disorders
  + Split sleep
  + Sleep latency
  + Circadian rhythm and the window of circadian low
* Circadian phase shifting with light stimulus
* Model-based fatigue estimates
* Using fatigue countermeasures to reduce peak Fatigue Meter Score during a duty period

#### ***Fatigue Risk Assessment and Root Cause Analysis***

* Steps in conducting an investigation of factors contributing to fatigue risk
* When to conduct a fatigue risk investigation

#### ***Using Fatigue Risk Monitoring Software Systems***

* Biomathematical model-based fatigue estimation software
* Smartphone app for employees

#### ***Operating a Fatigue Risk Management Program***

* Evaluating the effectiveness of a fatigue risk management policy
* Accountability chart and personnel roles & responsibilities
* Developing safety objectives
* Safety Performance Indicators (SPIs) and how they are used to evaluate the effectiveness of the FRMP
* Risk monitoring, identification, assessment, mitigation
* Reporting
* Quality assurance

### **Training Program Development**

Each year, midway between recurring training sessions, the FRMP Manager shall measure the extent to which personnel have retained learning objectives by surveying a random sample of personnel. Based on the findings from this survey, the FRMP Manager shall provide feedback to the FRMP Committee. If a significant portion of survey responders demonstrates a weak or inadequate grasp of the required competencies, the FRMP Committee shall revise training content, training methods, and/or the frequency of recurring training sessions as deemed appropriate.

In accordance with the Company’s commitment to continuous improvement, the FRMP Manager shall stay abreast of developments in the scientific community and the industry body of knowledge about fatigue risk, and shall identify to the FRMP Committee any topics that need to be reviewed or added to the recurring training program.

#### **QUALITY ASSURANCE**

The Company’s FRMP is maintained in accordance with its overall commitment to quality assurance as set forth in [*insert reference to applicable QA program*]. In the context of the Company’s FRMP, quality assurance is a set of administrative and procedural activities to systematically measure and monitor the effectiveness of the FRMP. Specifically, quality assurance consists of:

* Ensuring the FRMP complies with any applicable regulatory requirements
* Ensuring the operation of the FRMP is in accordance with established policies, processes, and procedures
* Evaluating the degree to which specified safety objectives and SPIs are being met

Both compliance and effectiveness are essential to achieve the Company’s safety objectives.

* 1. **Continuous Improvement**

Continuous improvement and monitoring ensures that the Company’s FRMP continues to be relevant, useful, and up to date. The table below identifies the specific procedures The Company has implemented to meet these objectives.

|  |  |  |
| --- | --- | --- |
| Requirement | Frequency | Procedures |
| Perform a system audit of the FRMP | Annually | See section 8.2 |
| Review effectiveness of FRMP in achieving safety objectives | Annually | * IMS Manager prepares an annual report to the FRMP Committee with information on the effectiveness of FRMP processes, the accuracy of SPIs, and a summary of fatigue hazards identified during the preceding year including the risk mitigation actions performed * FRMP Committee meets to discuss the conclusions from the report and endorses recommendations for improvements * Where safety objectives have not been fully met, FRMP Committee tasks the IMS Manager to perform a root cause analysis to identify contributing factors |

Where the continuous improvement and monitoring procedures reveal any findings, the FRMP Committee will implement corrective measures and monitor their effectiveness.

### **Communication**

The Company has made it a priority to provide ongoing communication to stakeholders about the activities and safety performance of the Company’s FRMP, to keep fatigue “top of mind” and encourage the continuing commitment of all stakeholders. A variety of types of communication are used, including e-mail messages, company newsletters, and bulletins. The FRMP Manager, supported by the Director of Safety, is responsible for fatigue risk management program communications, and shall ensure that communications to specific stakeholder groups are timely and relevant to their roles within the organization.

### **External Validation Sources**

As part of the Company’s commitment to continuous improvement of the Company’s FRMP, the FRMP Manager shall keep up to date with changes in the scientific body of knowledge and industry best practices with respect to fatigue risk management. Sources of information that the FRMP Manager may consider to fulfill this requirement include:

* Training events conducted by sleep and fatigue subject matter experts
* Industry organization publications that are relevant to fatigue risk management
* Accident and incident analyses published by regulatory bodies
* Abstracts of fatigue research papers published by scientific journals
* Industry conferences and safety stand-down meetings [*include list*]
  1. **System Auditing**

In order to ensure the Company’s FRMP remains relevant, appropriate, and effective, the Company shall conduct a review of its FRMP at least annually. An FRMP audit is a structured process to determine the extent to which the Company’s FRMP meets specified requirements, which may include regulatory requirements, policies, procedures, or other processes set forth in this Manual.

### **Planning and Execution of FRMP Audits**

The [*insert designated personnel title*] shall be responsible for planning, scheduling, and managing FRMP Audits. In preparation for each audit, the [*insert designated personnel title*] shall prepare an Audit Plan that includes the information outlined in the table below:

|  |  |
| --- | --- |
| System Audit Plan Elements | |
| Personnel | Which personnel will conduct the audit |
| Scope | Topic focus of the audit and how far back in time systems should be examined |
| Criteria | Specific Company policies, processes or procedures with which the degree of compliance is to be determined |
| Schedule | Start date as well as the date of the Safety Committee meeting at which results are to be presented |
| Document ID | Identifying number of the checklist or process flowchart to be completed in conducting the audit |
| Sample | Which part of the Company’s operations is to serve as the sample for the audit |

Figure 14: Outline of the Audit Plan to be prepared for each FRMP Audit.

The IMS Manager shall maintain a set of checklists and process flowcharts to be used as the basis of an audit process. Each document shall be numbered with a Document ID in accordance with the Company’s document numbering system. Prior to preparing an Audit Plan, the IMS Manager will review the relevant checklist or process flowchart document to make sure it reflects any changes that have been made in the Company’s operations since the last time an audit using this document was conducted.

It is not feasible to audit the whole of the Company’s FRMP operations over the course of an entire year. Therefore, the auditor shall choose a representative set of data to serve as the sample for each FRMP audit. The method according to which the sample is chosen shall be determined by the auditor based on experience and industry best practices.

### **Timing of FRMP Audits**

FRMP audits shall be conducted in a one-year audit cycle. Audits shall be scheduled:

* Within one year of the day on which this FRMP is formally adopted at the Company; and
* Each year thereafter.

An incident-related FRMP Audit shall also be conducted in connection with:

* A major incident where fatigue was a contributing factor
* A major change in operations that could adversely impact the level of alertness of employees

The Audit Plan for scheduled audits shall be prepared 15 working days prior to the planned audit start date and be approved by the Director of Safety prior to the commencement of the audit. The Audit Plan for incident-related audits shall be prepared and approved as soon as possible following the incident.

During the incident investigation process, the employees involved will be asked to provide an accurate account of hours worked during the two weeks prior to the event, how much sleep was obtained during the preceding 72 hours, and whether they were experiencing any fatigue-related symptoms. Colleagues and supervisors will also be asked whether they observed any fatigue-related symptoms in the employees involved.

### **Analysis of Audit Results and Corrective Actions**

At the conclusion of each System Audit or Performance Evaluation, the auditor shall prepare a report summarizing findings and making recommendations for any corrective actions or follow up that may be required. This report shall be distributed to the IMS Manager, Director of Safety and other members of the Safety Committee. The report shall also be sent to the Accountable Executive, and saved to the Company’s records management system [*insert specific location*].

The Safety Committee shall approve audit reports and performance evaluation reports, and determine which recommendations are to be followed for corrective or preventative action, as appropriate. All actions to be taken shall be documented in the minutes of the Safety Committee meeting.

The FRMP Manager shall be responsible for implementing the corrective and preventative actions endorsed by the Safety Committee. In particular, the FRMP Manager shall establish an implementation timeline and ensure the actions are communicated to the relevant workforce members.

Within a reasonable timeframe approximately 30 days after the implementation of a given corrective or preventative action, the IMS Manager shall assess the measures taken to ensure they are being effective. An FRMP audit is not considered closed until the IMS Manager has collected evidence or otherwise become satisfied that the audit findings have been suitably addressed.

Audit results shall not be disclosed to external parties unless explicitly authorized by the Accountable Executive or required by law or any applicable regulations.

* 1. **System Performance Evaluation**

The effectiveness of the Company’s FRMP is reviewed every year beginning after the initial FRMP Audit is completed. The purpose of the evaluation is to measure how well the FRMP is functioning in achieving the Company’s safety objectives, and to identify areas that may need improvement.

### **Scope**

All of the components of the Company’s FRMP illustrated in Figure 1 are subject to the FRMP performance evaluation process, including:

* FRM Policy – does it continue to be relevant and applicable to current operations?
* Stakeholder responsibilities – are all roles and functions being performed?
* Safety objectives – have they been attained?
* SPIs – are they accurate in quantifying overall safety?
* Communication and Training Plan – are personnel receiving the information they need?
* Non-Punitive Policy – is it understood by personnel and does it facilitate constructive fatigue hazard reporting?
* Risk controls – do available countermeasures achieve the desired results?
* FRM Procedures: monitoring, identification, assessment, and prioritization of fatigue hazards
* System Auditing procedures

In order to perform the evaluation process efficiently, The IMS Manager may divide the overall task into three phases, focusing on a different subset of the above list during each phase. Each year, the performance review will cover one phase in turn so that all parts of the FRMP are reviewed over a three-year cycle.

### **Inputs**

There are three main categories of information used by the IMS Manager to conduct the FRMP performance evaluation: (a) documents and data generated by the Company’s operations; (b) feedback from personnel about the effectiveness of the Company’s FRMP, whether collected informally, through focus groups with a representative sample of employees, or through an Annual Fatigue Survey of a sample group of employees; and (c) external sources such as industry reports, regulator guidance, or other publications.

Especially relevant inputs are quantitative metrics from the Company’s operation. Examples include:

* Fatigue-related SPIs
* Risk assessments of fatigue hazards reported
* Results of fatigue surveys and studies
* Training program results

Other inputs to be considered include [*specify form name*] report forms.

### **Assessment Process**

To conduct the performance evaluation of the individual components of the Company’s FRMP, the IMS Manager reviews the assembled inputs and considers questions such as:

* Is the FRMP meeting the safety objectives defined in the FRM Policy?
* Are all SPIs within the defined acceptable ranges?
* Are fatigue risks being managed and controlled to acceptable levels?
* Have there been any changes in operations or in the organization that have contributed to increased fatigue risk?
* Are the corrective and preventative actions working as intended, or are changes needed?
* Is the FRMP Manual clear and up to date?
* Have personnel been provided with fatigue-related information and received the appropriate training?
* Is the FRMP able to identify and deal with fatigue-related hazards before they result in an error or incident?
* Is the FRMP able to adapt to changing operational demands, scheduling changes, and contingency situations?
* Is the reporting system adequate for identifying fatigue-related hazards?
* Is the incident investigation and FRMP auditing system working well?
* Are recommendations and lessons learned from safety audits and incident reports acted upon with appropriate corrective or preventative actions?
* Is feedback received from employees, contractors, or customers being incorporated into the Company’s FRMP?

In addition, the IMS Manager shall consider the fatigue risk management process of the Company’s FRMP (see Figure 1) to assess whether the underlying processes are working as expected and to identify any improvements that can be made.

Finally, the FRMP Manager shall perform an annual review of this Manual to ensure it is accurate, up-to-date, and meets all applicable regulatory requirements. Changes in regulations, personnel, personnel responsibilities, Company operations or policies may trigger the need to update this Manual or other FRMP documents (see section 9.1). In addition, new developments in the underlying science as well as information from external sources may create opportunities to improve FRMP documents. Any such changes shall be made in adherence with the Amendments process set forth in section 3.2.

### **Results and Recommendations**

After completing the FRMP performance evaluation, the IMS Manager shall compile a report that presents results and makes recommendations to address any deficiencies discovered. This report shall be delivered to the Accountable Executive.

### **Corrective Actions**

The Accountable Executive will review the findings in the report, approve the recommended corrective actions and improvements to the FRMP, and allocate the appropriate resources to implement the required changes. The FRMP Committee will meet to discuss the results and create a plan to perform the actions endorsed by the Accountable Executive.

Where the recommended actions involve making an amendment to the content of this Manual, such changes will be made in accordance with the amendment process described in section 3.2.

The results of all FRMP performance evaluations, together with documentation of the outcomes of any actions taken to improve the FRMP, will be kept on file for 5 years.

### **Management Review**

In order to keep senior management apprised of any significant fatigue-related risks or near misses in the Company’s operations, the Accountable Executive shall deliver a briefing at annual meetings of the senior management team. The purpose of the senior management review is to solicit feedback on best practices, determine if additional resources should be committed to safety promotion, and approve any changes to the Company’s training program.

During their review meeting, the senior management team shall also discuss hazards listed on the Hazard Registry with emphasis on determining if there is any new technology or practice which can be applied to further reduce the risk of these hazards. Senior management shall also discuss with the Accountable Executive whether there are any new hazards that have surfaced across the Company’s operations that should be added to the Hazard Registry.

#### **FRMP IMPLEMENTATION**

Implementing a Fatigue Risk Management Program begins with adopting appropriate policies, procedures, and safety promotion programs as documented in this Manual. The next step is to put into place the functional components of the program, which includes activating risk controls, installing supporting IT systems, and generating documentation.

* 1. **Risk Controls**

### **Risk Controls Concerning Fitness for Duty**

Employees need to be alert and ready to react to changing conditions in the operation. This requirement is especially important for employees in safety-sensitive roles, such as control room operators.

Fitness for duty has traditionally been limited to drug and alcohol testing, as these stimulants are known to cause impairments to a point that compromises the ability of an individual to safely discharge job duties. In recent years, however, as the scientific understanding of fatigue has advanced, researchers have demonstrated that fatigue risk can contribute to an equally serious impairment of alertness.

The Company conducts fitness for duty assessments annually as part of its occupational health program. [In addition, the Company has adopted a continuous fitness for duty screening framework based on objective measures (e.g. PVT) sensitive to alertness deficits related to inadequate sleep or sleep of insufficient quality.] [*Insert details of PVT screening program, if applicable.*]

#### **Holdovers**

A holdover occurs when an employee is required to continue working in excess of a normal duty period, without prior notification. Since the employee being held over was unable to plan or prepare for the unexpected overtime, the employee’s fatigue level may be higher than what would normally be experienced during a scheduled overtime period. For this reason, supervisors should be especially attentive to fitness for duty issues when managing holdovers. [*insert the following text if PVT screening is available:* Before commencing the overtime work period, employees in safety-sensitive positions must complete a brief PVT test and score below the prescribed threshold (see section 9.7). ]

#### **Call-Ins**

A call-in occurs when an employee that is off duty is unexpectedly called in to work. The fatigue risk associated with call-ins is especially significant if the call comes during the night for an employee that is working day shifts. Supervisors should allow such employees at least 30 minutes to shower, have a light meal, and fully dissipate the effects of sleep latency before leaving for work.

### **Risk Controls During Extraordinary Operations**

Surges of work due to unusual or unexpected operating events are known as extraordinary operations. Members of the workforce engaged in extraordinary operations are particularly susceptible to fatigue stressors. The Company has adopted the following risk controls to follow when scheduling work during extraordinary operations:

|  |  |
| --- | --- |
| Extraordinary Operations Factor | Limit Established by the Company |
| Maximum duty period duration | [*specify*] |
| Minimum rest period frequency during one duty period | [*specify*] |
| Maximum consecutive duty days | [*specify*] |
| Mandatory number of days off between work sets of six or more consecutive duty days | [*specify*] |
| Provisioning of base camp accommodations | [*specify*] |

### **Commuting Home After an Extended Duty Period**

An employee that completes a period of overtime work above a certain limit may be fatigued, and driving home from work in this situation is a potential fatigue hazard. For this reason, supervisors must take care to ensure that employees completing extended duty periods above a specified limit have been provided with alternative means of transportation, or local hotel accommodation if necessary.

* 1. **Information Technology Systems**

A Fatigue Risk Management Program is data driven. Since the Company’s operation spans across multiple divisions and geographies, it generates large volumes of complex data. The Company has invested in computerized systems to facilitate the efficient collection and analysis of this data so that informed decision-making in managing fatigue can occur in real time. These systems are discussed below.

### **Safety Management System**

The Safety Management System used by the Company serves to capture data about operations to provide information essential for root cause analysis of any safety incident.

### **Fatigue Risk Estimation System**

This software system provides a visual representation of fatigue risk in the operation. Fatigue estimates are based on a scientifically validated biomathematical model. This software tool supports the fatigue risk management process by enabling personnel to quickly spot fatigue hazards associated with employee work-rest patterns and gain an understanding of what may be contributing to their appearance.

### **Smartphone App**

This software app for iOS and Android platforms is used by individual employees to respond to survey questions and perform objective fatigue assessments as part of data collection process supporting fatigue audits. It also provides fatigue risk training and individualized fatigue feedback in the context of the employee’s duty schedule to aid in the selection of fatigue countermeasures. In this way, the smartphone app is an essential component of the Company’s safety assurance and promotion processes.

* 1. **Documentation**

The following documents are relevant to the implementation and operation of the Company’s FRMP:

* FRMP Manual (this document)
* FRMP Training Records

All FRMP documents are the responsibility of the Director of Safety. In order to keep accurate control of document revisions and to ensure consistency in the versions in use throughout the Company’s operations, any amendments to these documents are to be made following the Amendments process outlined in section 3.2.

### **Information to Be Retained**

The Company maintains the following FRMP documentation in its database [*indicate storage location*].

* Scheduled and actual duty periods and rest periods of personnel, noting significant deviations and the reasons for them
* Fatigue reports submitted by personnel
* Register of identified fatigue hazards, with corresponding risk assessment, mitigation priority level, and any corrective or preventative actions taken
* Findings from FRMP Audits and Performance Evaluations, including results, recommendations, actions taken, and measured outcomes of those actions
* Results of Annual Fatigue Survey of a sample group of employees
* Minutes of Safety Committee meetings

### **Records and Data Management**

FRMP and IMS Records are identified and controlled through the use of [*identify applicable company IT systems*].

Records and data are saved at an offsite location and backed up in accordance with the Company’s information security policies.

### **Archiving Plan**

When an amendment to an FRMP document is published, the previous version is added to the Company’s document archive. In accordance with the Company’s standard data management practices, archived versions of FRMP documents are retained for four years from the date when each was last in effect.

FRMP and IMS submissions, data base information and investigation reports will be retained for the life of the Company so that trend analysis and the monitoring of the effectiveness of corrective and preventative actions are enabled.

* 1. **Amendment Record Sheet**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Document Version No. | Date Issued | Issued by | Date Approved | Specific sections amended |
| 1.0 |  |  |  | Original version |
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Accountable Executive Safety Director

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Date signed Date signed

* 1. **Appendices**

[*include the following section if applicable.]*

* 1. **PVT Screening Policy**

The Company has adopted a computer-based technology for employees in safety-sensitive roles to conduct alertness tests using the Psychomotor Vigilance Test (PVT) to confirm fitness for duty at specified times during the work shift. The table below sets out the details of this policy.

|  |  |  |  |
| --- | --- | --- | --- |
| Business Unit | Division | Staff Position | Specified Time for PVT Screening |
| [*specify*] | [*specify*] | [*specify*] | [*specify*] |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Fatigue Score Thresholds | | | |
| 0 – X [*specify*] | | | Fatigue risk level acceptable |
| Greater than X | | | Elevated fatigue risk level |

1. Biomathematical­ model-based fatigue estimation software can help supervisors determine what amount of time off is necessary for the employee to regain fitness for duty. [↑](#footnote-ref-1)
2. See section 5.7 for details of internal reporting requirements. [↑](#footnote-ref-2)
3. Fatigue Scores are calculated by biomathematical model-based fatigue estimation software. [↑](#footnote-ref-3)
4. Given the urgent nature of the communication, verbal authorization from the Accountable Executive or Director is acceptable if written authorization is not feasible. [↑](#footnote-ref-4)
5. If information affects policies or procedures *and* affects another department, classify as orange. [↑](#footnote-ref-5)