

when to address specific risk factors, CEMS requires that certain process elements be present to ensure an effective implementation scheme. Those elements are summarized in Figure 1 of Enclosure (1).

Increasing numbers of vessels and operating companies continue to adopt crew endurance management practices, each in a way to suit its unique situation. As CEMS becomes an essential element of many companies' Safety Management Systems, those evaluating these programs will need standard criteria upon which to base their assessment. This Circular provides guidelines for use by vessel owners, operators, third-party auditors, Coast Guard Officers in Charge, Marine Inspection (OCMI), marine casualty investigators, and others to aid in their assessment of the veracity and effectiveness of a company's or vessel's CEMS program.

2. Action.

- a. **Vessel Masters, Owners, and Operators:** All masters, owners, and operators of vessels considering implementing CEMS, as well as those already practicing it, should familiarize themselves with the criteria in this NVIC. This information may be used in conjunction with references (a) and (g) to establish a fully developed CEMS program. These criteria may also be useful for to develop measurements for an ongoing CEMS program.
- b. **Third-Party Auditors, Vetting Agents, and Other Independent Evaluators:** All persons responsible for evaluating CEMS programs or Safety Management Systems that include CEMS, should familiarize themselves with these guidelines. These criteria may be useful for assessing the veracity and effectiveness of a company's or vessel's CEMS program.
- c. **U.S. Coast Guard:** Officers in Charge, Marine Inspection (OCMIs) , Chiefs of Inspections Department and Senior Investigating Officers (SIOs) should:
 1. Bring this circular to the attention of vessel masters, owners, and operators, auditors, vetting agents, and others who may benefit from an improved understanding and awareness of CEMS program evaluation criteria.
 2. Use these criteria when evaluating the contribution of fatigue to a marine casualty and to assess the effectiveness of a company's CEMS program in managing or mitigating fatigue or endurance risk factors.

3. Directives Affected. None.

4. Background. The causes for the vast majority of marine-related casualties are rooted in human factors. A large number of casualties have been specifically attributed to the human factor of crew fatigue. Fatigue is also known to play a contributing role in casualties where other types of human factors are present (e.g., situational awareness, operator decision making).

This problem is not unique to the maritime industry. Fatigue is an issue for any 24-hour-a-day operation, particularly those involving shift work (medical, transportation, manufacturing, etc.). There is an abundance of scientific research to support the fact that fatigue increases the risk of

accidents and adversely impacts alertness and cognitive abilities. There is also research indicating that shift work and fatigue contribute to chronic health problems. While there is research describing solutions to various aspects of the fatigue problem, these methods are not considered as they relate to each other and the overall system.

Traditionally, regulators of transportation industries have used hours of service and manning requirements to address crew fatigue. While these requirements form a critical part of an overall strategy to combat fatigue, they are unable to completely resolve the complex and interrelated factors that influence crew fatigue by themselves.

Normal maritime operations expose crewmembers to a variety of stressors and operational risk factors such as irregular work periods, temperature extremes, heavy workloads, and extended separations from family members. Left unmanaged, these risk factors degrade crewmember endurance, and thereby both performance and safety.

In response to this situation, the U. S. Coast Guard Research and Development Center developed CEMS, a system of tools and practices maritime operators can use to increase productivity while managing risk factors affecting crew endurance. CEMS specifically helps operators to identify the full spectrum of factors affecting crew endurance and control these risk factors by means of proven practices and procedures.

These proven practices and procedures apply to the full scope of endurance management, not simply to fatigue or sleep management. In other words, CEMS encompasses the full range of environmental, physiological, operational, and psychological risk factors affecting performance and safety in normal maritime operations.

5. Discussion. While no process could guarantee the complete elimination of fatigue as a concern, CEMS has been designed to ensure the greatest possible improvements in crew endurance. The efficacy of CEMS, as demonstrated by scientific field tests, originates from its systems approach addressing interrelated risk factors aboard maritime platforms.

To ensure effectiveness, an organization's CEMS implementation process should include certain elements deployed in the recommended order as described in reference (b) and in Enclosure (1). These elements or process steps, are fairly general in nature, allow considerable flexibility, and should fit within the implementing organization's Safety Management System. One exception to the recommended order is to begin with the Crew Endurance Coach. An organization considering adopting CEMS may choose to first acquire a coach as he/she serves as a champion and provides consistent support for CEMS. The learning objectives for the CEMS Coaches course are provided in Enclosure (3). These objectives describe what a CEMS Coach or an acceptable alternative must know to demonstrate sufficient coaching skills.

Enclosure (4) is a job aid that provides guidelines for evaluating an implementation effort. Due to the continuous-improvement nature of CEMS, the checklist can be used to document the progress that has been made and identify areas that can be improved.

6. Implementation. Effective immediately, individuals responsible for evaluating an organization's Crew Endurance Management program or Safety Management System that

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includes CEMS should refer to the guidance in Enclosures (1) and (4). This guidance is intended to provide a relative basis upon which to evaluate a given implementation effort and to assist an organization in identifying and addressing areas for improvement.

This guidance may also be useful to those investigating a marine casualty to consider the impact of a given CEMS program towards preventing, reducing the risk of, or mitigating the consequences of a casualty. When evaluating a CEMS program, the investigator should consider extenuating circumstances that might affect an organization's progress, such as the length of time since its initial implementation began.

7. Disclaimer. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative approach (you are not required to do so), you should contact the Chief, Human Element and Ship Design Division (CG-5211) at (202) 372-1355 who is responsible for implementing this guidance.

8. Changes. The Coast Guard will post this NVIC on the web at www.uscg.mil/hq/g-m/nvic/index00.htm and post changes as necessary. The Coast Guard will issue and post time-sensitive amendments as an "urgent change" message on the USCG website for the benefit of the industry. Please submit any suggestions for improvement of this circular in writing to Commandant (CG-5211).



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- Encl: (1) Critical Elements of an Effective Crew Endurance Management System:
An Evaluation Criteria for Auditors
(2) Endurance Risk Factors
(3) Trained Coaches/Acceptable Alternatives
(4) CEMS Program Evaluator Checklist/Job Aid

Critical Elements of an Effective Crew Endurance Management System: An Evaluation Criteria for Auditors

General Evaluation Guidance:

Persons evaluating an organization's crew endurance management program should bear in mind that the Crew Endurance Management System (CEMS) is meant to be used in a cyclical, continuous-improvement process. This process includes a number of specific steps which should be completed sequentially (see Figure 1). However, the implementing organization should not be expected to perfect each step in the process before moving forward. Rather, the implementing organization should:

1. Follow, as closely as is practical, the process described in the addendum to *Crew Endurance Management Practices: A Guide for Maritime Operations* (Section II: Implementing a CEM Program).
2. Demonstrate consistent, positive progress towards each next step in the process.
3. Demonstrate a good-faith effort to address relevant risk factors.

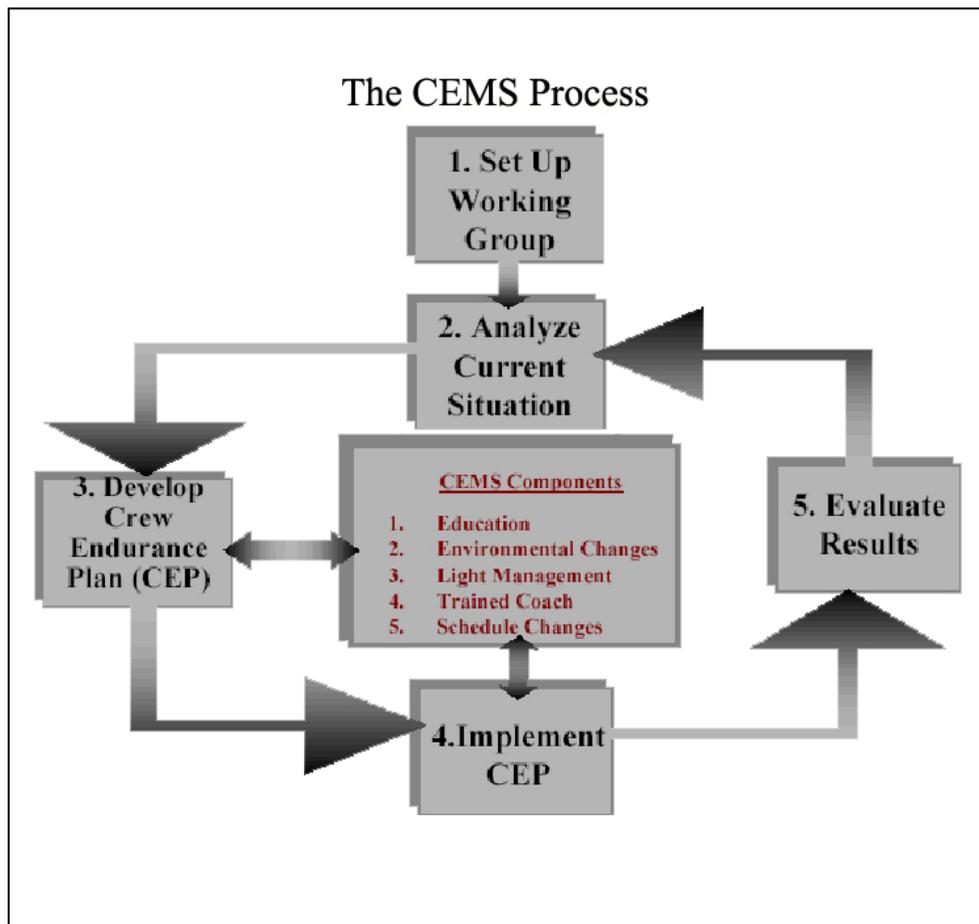


Figure 1. The CEMS process.

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If the implementing organization has an existing Safety Management System, it is recommended that CEMS be incorporated into that system rather than implemented as a stand-alone program. Consequently, some details of the CEMS process may need to be modified to fit within that existing system. The general nature of the CEMS process is sufficiently flexible to allow this to occur. Persons evaluating such an effort should look for evidence that an organization has followed the general guidance given above and the underlying requirements of each process step.

The evaluation criteria to follow, broken down into requirements in the order of the process steps, should enable the evaluator to determine the organization's overall progress. Enclosure (4) can serve as a checklist to record an organization's implementation progress.

Step 1. Establishment of a Crew Endurance Working Group (CEWG)

It is best to have a distinct Crew Endurance Working Group (CEWG) for each vessel. However, some implementing organizations may find it more practical to establish one CEWG for an entire company. Regardless of the approach selected, it is essential that the CEWG be able, for each vessel participating in CEMS, to:

- Identify the relevant endurance risk factors
- Create a collaborative network of participants
- Develop and deploy a specific CEMS plan
- Sustain vertical alignment of an organization
- Assess cycles of continuous improvement

Membership: To be effective, a CEWG should include or represent all those individuals who stand to be affected by the implementation of a CEMS program. A CEWG might consist of the following individuals:

- One or two company officers
- The company operations manager
- The captain of the vessel
- Other licensed deck officers
- The department heads
- A member of the engineering department
- A cook
- One or more deckhands

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The composition of the CEWG should enable communication both up and down the organization's hierarchy. The CEWG will be best served by including at least one Coast Guard Certified Crew Endurance Coach/Expert to facilitate effective communication of CEMS methods and processes. Communication is crucial to identifying and mitigating relevant risk factors, and helps build vertical alignment.

While there are no specific requirements for how often a CEWG should meet, those evaluating a CEMS program should consider whether the frequency, content of discussion, and outcomes of meetings by the group are appropriate for meaningful progress. Relevant characteristics of the implementing organization, such as size and type of operation, should be taken into account when evaluating the pace, activity level, goals, and effectiveness of the CEWG. Where an organization combines the function of the CEWG with an existing group, the evaluator should consider whether this group is actively serving all the purposes of the CEWG as outlined above.

Step 2. Analysis of Current Situation and Identification of Endurance Risk Factors

The essential part of this step is to ensure that the organization has made a thorough assessment of risk factors through its CEWG. It should consider all relevant risk factors which pertain to individuals and their work/rest environment. Factors considered should include but are not limited to those listed in enclosure (2). It is important to note that not all risk factors will occur with equal frequency for all organizations.

Identifying that risk factors are present should not be viewed as an indication of the state of a vessel's safety or an organization's safety program. Such risk factors may be present in any 24 hour – 7 day a week operation. Organizations that have identified their most prominent risk factors have actually taken the first step to improving safety simply by increasing awareness. Such action should be taken as evidence of an advancing safety culture.

The presence of a risk factor does not necessarily indicate that an organization must immediately address every factor to be considered as practicing CEMS. Some solutions may be beyond the organization's reach. In other cases, actions needed to address a risk factor may be inconsistent with the company's operation. In any case, the implementing organization has to prioritize which risk factors to address so as to maximize the greatest overall reduction in risk for the least cost. Prioritization of risk factors and determining the best mitigation strategies takes place in the next step of the process.

Scope of Analysis: The CEWG's risk assessment should take into account the risk factors for each of the participating vessels. Even if a group of similar vessels doing

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similar work is being considered, there may be significant differences in the way that the crews on board each vessel live and work.

Job Aids: CEWGs are strongly encouraged to avail themselves of existing job aids to assist in performing this analysis. These tools are available on the CEMS website: www.uscg.mil/hq/g-m/cems/cems_tool_download.htm and in the references (a-b).

Step 3. Development of a Crew Endurance Plan (CEP)

There is no set format for the Crew Endurance Plan. The organization implementing CEMS should develop the CEP in a format that is most appropriate to its particular management and operation. Reference (a), the original Crew Endurance Guide (pp. 19-24), provides an example of a CEP that includes specific recommendations for operational and environmental risks.

Regardless of the format, the CEP should contain specific recommendations to address those risk factors identified by the CEWG as being the most critical to address. These recommendations will generally fall into two major categories:

1. Operational Recommendations include changes to policies, practices, or procedures related to vessel operation and may include:

- Watches (schedule changes, napping).
- Light management.
- Time management (shower and meal times).

2. Environmental Recommendations include changes to the work and rest environment and may include:

- Shipboard policies (courtesy to off-watch sleepers, avoiding excessive use of throttle).
- Physical changes (making sleeping areas darker, quieter, and more comfortable, increasing lighting in certain areas of the vessel).

Deciding which risk factors to address and developing appropriate recommendations are two of the most important jobs of the CEWG. The implementing organization should not be expected to change everything at once. In general, it should focus on low-cost, high-return items first while making a good-faith effort to address each risk factor as much as

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possible. The CEP should include some discussion on which risk factors were/were not addressed and why the selected recommendations were chosen.

In addition, the CEP should address the five CEMS components: education, environmental changes, light management, trained coaches, and schedule changes. The implementing organization should address these CEMS components in sequence. The degree to which the CEP addresses each component will depend upon where the organization is in the implementation process.

The checklist in enclosure (4) can be used as guidance to determine the extent to which an implementing organization has addressed each CEMS component.

Step 4. Implementation of the Crew Endurance Plan (CEP)

This step is the most important part of the process, yet it can also prove to be the most challenging. When considering an organization's progress with this step, the evaluator should look for evidence that the participants are making a good-faith effort to address those recommendations identified in the CEP. Some recommendations are easier to implement, and others may take longer to show results. In general, the evaluator should expect to see progress over time.

Enclosure (4) may be useful for determining the current status of the organization and to track the organization's progress over time. Computer-based tools for gathering these measures are available from the CEMS website at: http://www.uscg.mil/hq/g-m/cems/cems_tool_download.htm

The evaluator should also take into account extraordinary events that may affect progress. For example, a vessel or company recovering from an extreme catastrophe such as a hurricane, may find it difficult to make progress with the recommendations. Consistent with the continuous-improvement nature of CEMS, the evaluator should look for as much progress as can reasonably be expected under the circumstances.

Special Note about Coaches: The role of the coach is to provide consistent support for CEMS implementation. This includes responding to crewmembers' questions on a daily basis about sleeping problems, light management, dietary recommendations, and how to adapt to new watch schedules. The coach also assists with risk assessment and is a critical player in the development of the Crew Endurance Plan.

Having an onboard coach has been proven to be an effective method to provide consistent support for CEMS implementation. A company should have at least one trained coach or an acceptable alternative onboard each vessel to help initiate and oversee its CEMS

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implementation effort. An acceptable alternative should be able to demonstrate the same knowledge as a trained coach, as described in enclosure (3). If evaluators have questions about whether or not a company's approach is appropriate, they should contact the Coast Guard.

Step 5. Evaluation of Results

This step is largely a repeat of Step 2, with emphasis on determining the effectiveness of recommendations from the Crew Endurance Plan. The evaluator should look to see that the risk assessment of Step 2 was repeated as illustrated in Figure 1 and that there was some effort to use these results in future iterations of the continuous improvement cycle.

It is also certainly within the scope of each organization to track company-related measures such as:

- Safety improvements and statistics.
- Health and well-being measures.
- Employee turnover.
- Any other subjective measure of implementation.

Endurance Risk Factors

In Step 2 of the Crew Endurance Management System (CEMS) process, an implementing organization takes a look at its operations to determine what risk factors may negatively affect the crew's endurance. Factors considered should include, but not be limited to, those mentioned here. Evaluators may use Enclosure (4) to record and track these characteristics.

A. 15 Individual Risk Factors as described in the Decision Support Software Tool¹

Sleep duration, sleep quality, sleep fragmentation, synchronization with circadian rhythm, change of work/rest schedule (irregular hours), extended work hours, opportunities to make up sleep (nap), diet, workload, work-related stress, opportunities to exercise, sense of control, external environment (including motion sickness), family stress, and isolation from family.

B. Additional Risk Factors to Consider

Drug usage (caffeine, alcohol, and over-the-counter medications), health (general sickness and chronic disease), and other considerations such as sleep disorders.

Travel time to and from the vessel: *distance traveled between the vessel and the residence, activities conducted while en route, sleeping arrangements/overnight accommodations, etc.*

C. Environmental Risk Factors

Work environment: *light intensity conducive to proper light management, noise intensity, temperature, air quality, vessel motion/vibration.*

Sleeping environment: *light, noise, temperature, air quality, vessel motion/vibration.*

Vessel operating environment: *temperature* (humidity, extreme heat or cold), *marine operating environment* (wind, weather changes, icing, sea state, tides, currents, high and low water), *operational demands* (down time, workload surges, routine vs. dynamic schedule), and *operating policies* (courtesy to crew sleeping off-watch, allowing napping, vessel maneuvering, alternate meal and/or shower times).

¹ Available from U.S. Coast Guard, Commandant (CG-5211) by request and also on the CEMS website at http://www.uscg.mil/hq/g-m/cems/cems_tool_download.htm

Trained Coaches/Acceptable Alternatives

Ideally, each vessel should have a trained CEMS Coach or an acceptable alternative. These coaches model good endurance management practices through their own personal behaviors, actively encourage crewmembers to follow these practices themselves, and monitor and reinforce adherence to the Crew Endurance Plan. Coaches also provide information to crewmembers on the science behind CEMS including diet, exercise, caffeine use, environmental stressors, psychological conditions, sleep, and body clock management.

The following is a detailed teaching syllabus written by learning objective that describes what a trained CEMS Coach or an acceptable alternative must know to demonstrate sufficient coaching skills. All content and learning objectives are provided in detail through the references described below, which can be downloaded from the CEMS website at <http://www.uscg.mil/hq/g-m/cems/index.htm>.

CEMS Coaches Training: Learning Objectives

The references below are abbreviated as follows:

Guide	Crew Endurance Management Practices: Guide to Maritime Operations
DST	Decision Support Tool
SSW	Self-Sustained Workshop Tool

System Concepts/Roles/Models (SSW)

- Can define crew endurance in maritime operations (Guide 3)
- Can define Red Zone (Guide 4-6)
- Can identify endurance risk factors (DST)
- Can describe implementation procedures (Guide 8-9)
- Can identify implementation path failure (Guide 9)
- Can identify working group members (Guide 13-14)
- Can define sleep and shiftwork (Guide A-3)
- Can define light management and the body clock (Guide A-3)
- Can define stress (Guide 59-62)
- Can define caffeine and the use of over-the-counter medications (Guide A-3)
- Can define diet
- Can define cold-related illness (Guide 50-52)
- Can define heat-related illness (Guide 53-55)
- Can define motion sickness (Guide 57-58)
- Can analyze endurance risk factors (Guide 69-77)
- Can develop crew endurance plans (Guide 69-77)

Trained Coaches/Acceptable Alternatives

Managing the Red Zone (SSW)

- Can identify factors influencing Red Zone (Guide 31-32)
- Can define energy and its production (Guide 32-33)
- Can identify symptoms of low energy levels (Guide 33-34)
- Can identify methods to control energy levels (Guide 35)
- Can identify biological clock (Guide 36, A-3)
- Can develop tools to regulate clock (Guide 36, A-3)
- Can develop tools to optimize work schedules (Guide 37-39, A-3)
- Can implement light management techniques (Guide 39, A-3)
- Can control shiftwork adaptation (Guide 40-46, A-4)

Performance Stressors in Maritime Operations

- Can control cold-related illness (Guide 50-52)
- Can control heat-related illness (Guide 53-55)
- Can control motion sickness (Guide 57-58)
- Can control physical and mental stress (Guide 59-62)
- Can control over-the-counter drugs and prescription medications (Guide 63)

Implementing a CEM Program (SSW)

- Can develop the program by setting up working group, analyzing the current situation (DST), and drawing up a CEM plan (Guide 69-77)
- Can deploy the program by enlisting full crew support, implementing recommended modifications, and coaching consistency (Guide 77-79)
- Can assess the program under real-world conditions (Guide 79-80)

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Purpose: This job aid is intended to provide CEMS evaluators a relative basis upon which to evaluate a given implementation effort and to assist an organization in identifying and addressing areas for improvement. CEMS, by design, is a non-prescriptive process, and therefore many of these checklist items are subjective/qualitative in nature. Use additional pages where appropriate, to identify details regarding any particular component. Due to the continuous-improvement nature of CEMS, it is also important to compare and contrast previous checklists to establish a trend of improvement. In that regard, capture quantitative data where appropriate.

Company/Organization:

Person conducting evaluation (include title and organization):

Date of evaluation: _____

Date of last evaluation: _____

Date CEMS implementation began: _____

Total number of crewmembers in the organization: _____

Number of vessels in the company/organization: _____

Number of crew per vessel: _____

Number of certified coaches/acceptable alternatives: _____

Number of certified experts: _____

Number of CEMS-trained personnel: _____

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

<p>Step 1. Establishment of a Crew Endurance Work Group (CEWG)</p>	
<p>Has one CEWG for the company been established, several shared among vessels, or one CEWG for each vessel? If not, what plan is in place to identify, evaluate and address endurance risk factors?</p> <p>When was each CEWG established?</p>	
<p>List the membership of the CEWG (names and positions):</p>	<p>Is the membership representative of all levels of the organization that will be affected <i>(management/company officers, captain, pilot/bridge personnel, department head, deckhands, cooks)?</i></p> <p>If not, what types of representation are missing?</p> <p>Does the membership support vertical alignment¹?</p>
<p>Is there evidence of reasonable levels of activity by the CEWG? That is, does the working group keep up adequate momentum towards identifying problems, deciding upon and implementing solutions, and re-evaluating the results? How often does the CEWG meet?</p>	

¹ The composition of the CEWG should include or represent varied individuals who stand to be affected by CEMS implementation to enable communication both up and down the organization’s hierarchy. All members should understand CEMS so they can better identify and mitigate risk factors. All CEWG members should also “buy into” CEMS – otherwise, someone may try to stall or undermine progress.

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Step 2. Analyzing the Current Situation and Identifying Risk Factors

Evaluation Date: _____

Did the implementing organization evaluate all relevant risk factors? Why/why not? *(Include evidence of this evaluation using either the Decision Support Software (DSS) Tool records or other evidence the crew considered the risk factors on the next page (photocopies of crew results, summaries of results, etc.))*

What risk factors did the CEWG decide to address?

If the CEWG considered more than one vessel, were relevant risk factors identified for each individual vessel?

Did the CEWG also consider the general health of its crewmembers, their use of medications, and the environmental risk factors listed in enclosure (2)?

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Example of a Method for Analyzing the Current Situation and Identifying Risk Factors

DSS Worksheet - 15 Risk Factors

	HOW MANY DAYS PER WEEK DO YOU EXPERIENCE:	# of DAYS
1	INSUFFICIENT DAILY SLEEP DURATION (less than 7-8 hours of uninterrupted sleep in a 24-hour period)	
2	POOR SLEEP QUALITY (awakenings due to work-related disruptions, vessel motion, or noisy environment)	
3	SLEEP FRAGMENTATION (breaking sleep into multiple naps; cannot schedule 7-8 hours of continuous sleep)	
4	SCHEDULING MAIN SLEEP PERIOD DURING THE DAY (while "day oriented")	
5	CHANGING WORK / REST SCHEDULES (rotating between day and night work / changing watch schedule)	
6	LONG WORK HOURS (more than 12 hours)	
7	NO OPPORTUNITIES TO MAKE UP LOST SLEEP (napping is not possible)	
8	POOR DIET (high fat / fried foods, high sugar content, frequent caffeine consumption, inadequate hydration)	
9	HIGH WORKLOAD (high physical and / or mental effort requirements)	
10	HIGH WORK STRESS (extreme environment, sustained physical / mental workload, rotating work schedules, authoritarian leadership style)	
11	NO OPPORTUNITY FOR EXERCISE (lack of time, or no equipment / facilities)	
12	LACK OF CONTROL OVER WORK ENVIRONMENT OR DECISIONS (not allowed to contribute in problem identification and resolution / lack of participation in decision processes)	
13	EXCESSIVE EXPOSURE TO EXTREME ENVIRONMENTS (cold, heat, high seas, etc.)	
14	FAMILY STRESS (child or parent care, divorce, finances, etc.)	
15	ISOLATION FROM FAMILY (problems maintaining contact with family)	

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Step 3. Developing a Crew Endurance Plan (CEP)

Is there a CEP for each vessel, for a group of vessels, and/or for the company as a whole?

What actions (within the organization's reach) were taken to address identified risk factors? Describe this effort. Also, provide the rationale to postpone/leave risk factors unaddressed.

Are all five CEMS components (labeled "a"- "e" on the following worksheets) addressed?

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

a. CEMS Component #1

Education

Does the CEP address education? _____ If so, please answer the following questions.

Who is trained in CEMS and how extensive is the training (introductory, coaches, expert, 1,2, or 8 hour)?

How is the training delivered (shoreside, onboard, video, SSW etc.) ?

Who delivers such training, and what are their qualifications?

How often is the training delivered?

How many crewmembers have been trained?

How is this training tracked?

If off-the-shelf training is used, what is the source of this training?
Has the U.S. Coast Guard accepted this training?

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

<p>b. CEMS Component #2</p> <p>Environmental Changes</p> <p><i>Does the CEP address environmental changes? _____</i></p> <p><i>Please either provide details for each block, OR, if unaddressed, the rationale to postpone work to a later time.</i></p>
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Were modifications made to support light management ...	
...in the work environment?	...in the sleeping environment?

Were modifications made to reduce noise and vibration levels?	
...in the work environment?	...in the sleeping environment?

Were modifications made to improve air quality (temperature, humidity, odors, etc.)?	
...in the work environment?	...in the sleeping environment?

Were modifications made to reduce ship motions?	
...in the work environment?	...in the sleeping environment?

<p>Does the CEP include Operational Recommendations regarding <i>temperature</i> (i.e. policies regarding breaks and amount of time workers are exposed to extreme heat, extreme cold, and/or humidity), the <i>marine operating environment</i> (wind, weather changes, icing, sea state, tides/currents, and/or high/low water), <i>operational demands</i> (down time, workload surges, and/or routine vs. dynamic schedule), and/or <i>operating policies</i> (courtesy to crew sleeping off-watch, allowing napping, vessel maneuvering, and/or alternate shower and/or meal times)?</p>

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

c. CEMS Component #3

Light Management

Does the CEP address light management? _____

For each factor, please either provide details OR, if unaddressed, the rationale to postpone work on this factor for now.

Does the crew onboard the vessel use a light management plan?

Are light management strategies defined for each watch rotation?

Does the plan address individual crewmembers on different watches?

Have light intensities been measured and changes been made in support of light management?:

Work Areas	Rest Areas	Transition Areas	Policies
A. Is light intensity increased in some areas? Where?	Is lighting dimmed or reduced in some areas? Where?	How are transition areas such as passageways or galleys handled?	Do vessel policies support these light management practices? If so, provide examples.
B. What type of bright/artificial lighting is used? Do crewmembers understand its purpose and safe use?			
C. Is the crew exposed to light pre-watch, during watch, or post-watch?			

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

d. CEMS Component #4

Recruiting Trained Coaches or Acceptable Alternatives

This is the most important of the five CEMS components, and one of the first steps involved in getting a CEMS program started.

Is there a knowledgeable resource about CEMS and crew endurance risk factors? What are their qualifications (i.e. certified coach, expert acceptable alternative) Is it one person for the company, one person for each vessel, or many shared among vessels?

Is there a person aboard each vessel to coach individuals towards operation/position/watch-specific Crew Endurance Plans and to provide continuous feedback? If not, what plan is in place?

Who and/or what provides CEMS training and education to the vessel(s) crew(s)?

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

**e. CEMS Component #5
Schedule Changes**

Does the CEP address schedule changes? _____

If not, why not? _____

Were schedule changes implemented? If so, was this done as the last of the five CEMS components?

Does the schedule allow for 7-8 hours of continuous, uninterrupted sleep?

Are watch periods at the same time each day? How many days to they remain on the watch schedule?

Has a light management plan been developed for the watch schedule(s)?

Does the schedule account for variable environmental conditions?

Does the schedule allow those on the night watch to retire before sunrise?

Does the schedule account for commuting and crew changes?

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Step 4. Implementing a Crew Endurance Plan (CEP)

What actions were taken to implement the recommendations in the CEP?

Have there been any extraordinary circumstances preventing implementation progress?

Does the vessel or organization's status indicate positive progress with implementation? Please discuss.

CEM PROGRAM EVALUATOR CHECKLIST / JOB AID

Step 5. Evaluating Results

Has this step been done? _____

If so, please answer the following questions.

When evaluating CEP implementation results, did the organization reconsider all relevant risk factors for each vessel?

Is there evidence that the implementing organization attempted to use these results when developing an updated set of recommendations for the CEP?

Did it work? Why or why not?

How often are risk factors re-evaluated?