

ALERTNESS GUIDE... Light Management

Guide Objective: Use discussion topic to educate on the use of light management as a way to control light exposures to assist night workers with their sleep-work schedule. This will result in more energy and alertness while working at night, through their lowest period of energy, when their body clocks normally direct them to sleep.

This guide is the basic use of light exposure for the night worker to be more alert while working a night shift and to achieve a better quality of sleep afterwards. These basic principles and recommendations summarized here supplement, not replace, the in-depth light management training received at CEMS Coaches training. Also, light management will be more effective if done in concert with other aspects of CEMS.

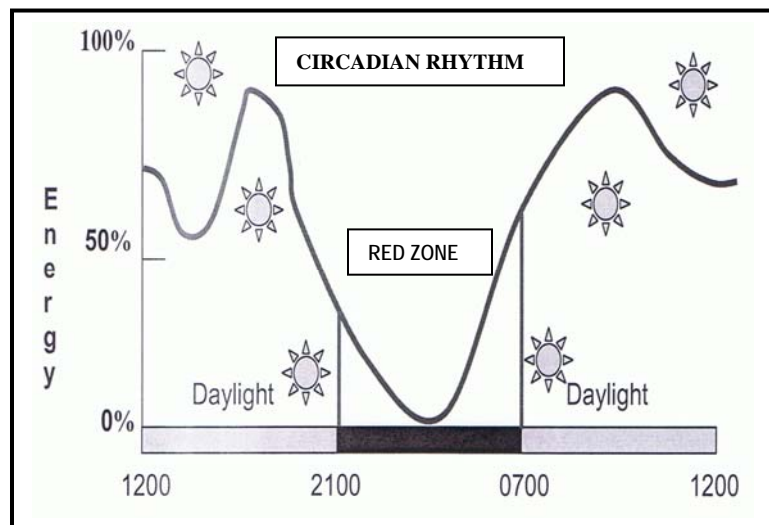
Discussion:

Light management is the practice of using a regimen of controlled light exposures to adapt the body clock for a new sleep-work schedule. At its most basic, light management is about using light inputs that mimic the effects of daylight to keep the body awake and alert during watch, and avoiding the same inputs to help fall asleep afterwards.

Night shift workers often work in dimly-lit environments during most of their shift. Also, the end of a night shift usually coincides with sunrise, sending bright light “wake up” signals to workers heading to bed, making it difficult for them to fall asleep.

Exposure to bright light can suppress the sleep-inducing hormone – melatonin – making it easier to stay awake while working in your Red Zone. Note Red Zone in diagram above and definition on page 2. Not being exposed to bright light within 3 hours of going to bed will make it easier to fall asleep and to get a better quality sleep.

The following pages outline recommendations for crewmembers that live on vessels, crewmembers that work on dinner bucket boats and either go home after each shift or stay in company provided quarters during their hitch and shoreside workers, like shore tankerman, that go home after completing their job.



Definitions / Explanations of Terminology Used in this Guide:

Bright Light – Sunlight; 1,000 lux artificial white light; 300 lux monochromatic green light.

Circadian Rhythm – The daily ebb and flow of body energy and alertness over a 24 hour period.

Dim Light – Artificial white light dimmer than 1000 lux or monochromatic green light dimmer than 300 lux will reduce the stimulation of bright light. The lower the intensity the least amount of stimulation by the light.

Lux – Unit of measurement for light intensity.

Melatonin – Hormone that regulates sleep/wake cycles and helps an individual to sleep. Exposure to bright light suppresses production of melatonin and lowers melatonin levels during the night.

Night Vision - The ability to see in a dark environment. Use of any light (white light or monochromatic green light) prior to going into a dark environment will affect night vision. The adaptation time will vary so make sure enough time between exposure to bright light and going into the wheelhouse, onto a barge or driving home after your shift at night is given for the adaptation.

Red Zone – Period of lowest energy when mental energy and performance are at their all time lowest, usually between 2100 – 0700.

Sleep Inertia – The tendency, after awakening, to feel sleepy and sluggish. The feeling usually passes in 15 minutes but it can help to have a cup of caffeine, bright light or start becoming active.

Light Management...

Live-On Vessels

The following recommendations benefit crewmembers working the back watch through their Red Zone. The front watch may follow some of the recommendations to get a better quality of sleep during their main sleep period and during their afternoon off period when a nap could be beneficial. The use of bright light reinforces the new day-watch schedule for the body clock and establishes the current time-of-day as the beginning of their day. These recommendations are based on a square 6, 7/5 or 8/4 (2-watch) schedule.

Most crewmembers get their main sleep during certain off watch periods. These examples are based on these periods. They are as follows:

Watch/Schedule - Off Watch Times w/Main Sleep Period highlighted

	FRONT WATCH	BACK WATCH
Square 6 (Traditional)	0000 – 0600; 1200 – 1800	0600 – 1200; 1800 – 0000
Square 6 (Alternate)	2300 – 0500; 1100 – 1700	0500 – 1100; 1700 – 2300
7,7,5,5 (Alternate)	2200 – 0500; 1200 – 1700	0500 – 1200; 1700 – 2200
8,8,4,4 (Alternate)	2100 – 0500; 1300 – 1700	0500 – 1300; 1700 - 2100

Note: The information on the following pages is based on the off watch times and main sleep periods highlighted above. For individuals that may get their main sleep during their other off period apply the same principles from the following information to your particular situation to get optimum endurance and reduce fatigue.

Back Watch – To Stay Awake While On Watch

- If a crewmember sleeps during the late afternoon off period, upon waking up, exposure to bright light up until time to go on the night watch is recommended. Even exposure to bright light for 30 minutes prior to going on watch at night can be beneficial.
- Exposure to bright light while in the wheelhouse, on the barge or in other work areas may not be possible during the night so the only opportunities for this type of exposure may be prior to going on watch.
- If exposure to bright light is possible while on watch it should be used up to 3 hours before the normal sleep period when they get off watch in the morning.
- If not able to use the bright light this whole period, possible exposure times as short as 10-15 minutes per hour could be beneficial. These “spurts” of light would alert the body that it is “daytime” by suppressing melatonin.

Back Watch – To Fall Asleep After Watch

- Minimize exposure to bright light intensities 3 hours before the normal sleep period so that melatonin can be released and start inducing sleep as you get off watch in the morning.
- Watch schedules should be adjusted so the back watch can get off duty in the morning prior to sunrise. If this isn’t done, dark wrap around sunglasses with UV protection can be used to block out sunlight.
- Since the back watch should not be exposed to bright light before going to bed in the morning they should keep the lights dim in the galley to eat a light meal and in the hallway, bathroom and bunkroom.
- If there are individuals from both watches in the galley at the same time keep the lights dim until the individuals on the back watch go to bed so their brains aren’t triggered that it’s time to wake up and reduce the melatonin in their system.
- Follow the guidelines in the Alertness Guide on Environmental Improvements to make the bunkroom conducive to sleep (room darkening shades, cool temperature, white noise, comfortable bedding, etc.) and to improve lighting on the vessel (high intensity lighting, dimmer switches, night lights, etc.)
- Minimize light exposure during sleep/rest.

EXAMPLE:

Square 6 (Traditional)

* Average main sleep period is highlighted in this example.

Back Watch:

0000 – 0600 (on)

0600 – 1200 (off)

1200 – 1800 (on)

1800 – 0000 (off)

* Key times to:

Seek Bright Light – 2330 - 0300

Seek Dim Light – 0300 to bedtime

Avoid Light – Bedtime to 1130 and while napping during 1800 – 0000 off period.

Square 6 (Alternate)

* Average main sleep period is highlighted in this example.

Back Watch:

2300 – 0500 (on)

0500 – 1100 (off)

1100 – 1700 (on)

1700 – 2300 (off)

* Key times to:

Seek Bright Light – 2230 - 0200

Seek Dim Light – 0200 to bedtime

Avoid Light – Bedtime to 1030 and while napping

during 1700 – 2300 off period.

Front Watch – To Stay Awake While On Watch

- This normally isn't a problem since its daylight during most of this watch. If this is a problem review the standards for the back watch and apply the same concepts.

Front Watch – To Fall Asleep After Watch

- Since it is dark when the front watch gets off watch at night they already have a supply of melatonin in their bodies so they should be able to get quality sleep. To ensure that they maintain the optimum amount of melatonin they should avoid bright light, as much as possible, 3 hours before their scheduled bedtime.
- Keeping a dim to dark bunkroom to wind down during the afternoon off period will enable the crewmember to get a quality nap or short sleep period.

EXAMPLE:

Square 6 (Traditional)

* Average main sleep period is highlighted in this example.

Forward Watch:

0600 – 1200 (on)
1200 – 1800 (off)
1800 – 0000 (on)
0000 – 0600 (off)

* Key times to:

Seek Bright Light – 1730 to 2100
Seek Dim Light – 2100 to bedtime
Avoid Light – Bedtime to 0530 and while napping during 1200 – 1800 off period.

Square 6 (Alternate)

* Average main sleep period is highlighted in this example.

Forward Watch:

0500 – 1100 (on)
1100 – 1700 (off)
1700 – 2300 (on)
2300 – 0500 (off)

* Key times to:

Seek Bright Light – 1630 to 2000
Seek Dim Light – 2000 to bedtime
Avoid Light – Bedtime to 0430 and while napping during 1100 – 1700 off period.

NOTE: If alternate schedules are used, apply the same principles to seeking bright and dim light and avoiding light.

Light Management...

Dinner Bucket Boats

The following recommendations are for crewmembers working on vessels but leaving the vessel after their shift ends. Note that some companies have quarters where their crewmembers stay when they get off the boat during their hitch. These quarters should follow the same light management recommendations as for vessels and home.

Shore Tankerman

The following recommendations are for shore tankerman that leave the job site when they are finished their job. Their unique situation is that there is usually no set schedule for them and this can result in challenges with their work environment, travel time and time at home. Although light management may be a challenge because of the lack of a schedule it's not impossible.

Light Management...

Dinner Bucket Boats & Shore Tankerman

Back Watch or Night Shift - To Stay Awake While On Watch or At Job

- Exposure to bright light when you wake up reinforces the new day-watch schedule for the body clock and establishes the current time-of-day as the beginning of their day.
- If a crewmember sleeps during the late afternoon off period, upon waking up, exposure to bright light up until time to go on the night watch is recommended. Even exposure to bright light for 30 minutes prior to going on watch at night can be beneficial.
- Exposure to bright light while in the wheelhouse, on the barge or in other work areas may not be possible during the night so the only opportunities for this type of exposure may be prior to going on watch.
- If exposure to bright light is possible while on watch it should be used up to 3 hours before the normal sleep period when they get off watch in the morning.
- If not able to use the bright light this whole period, possible exposure times as short as 10-15 minutes per hour could be beneficial. These “spurts” of light would alert the body that it is “daytime” by suppressing melatonin.

Back Watch or Night Shift - To Fall Asleep After Watch or Job

- If you plan to go to sleep when you get home or to the company quarters after work avoid bright light 3 hours prior to going to bed.
- Exposures to bright light or sunlight when finishing your shift can make it more difficult to go to sleep when you get home. If you need to leave the vessel or your work site during sunlight hours wear wrap around sunglasses with UV protection until you get to your sleeping quarters or bedroom at home.
- Minimize exposure to bright light intensities 3 hours before the normal sleep period so that melatonin can be released and start inducing sleep as you get off watch in the morning.
- Since the back watch or night shift should not be exposed to bright light before going to bed in the morning they should keep the lights dim, wherever their location, in the galley/kitchen to eat a light meal, in the hallway, bathroom and bunkroom/bedroom.
- If there are individuals from both watches or family members in the galley/kitchen at the same time keep the lights dim until the individuals going to bed leave the area so their brains aren't triggered that it's time to wake up and reduce the melatonin in their system.
- Follow the guidelines in the Alertness Guide on Environmental Improvements to make the bunkroom/bedroom conducive to sleep (room darkening shades, cool temperature, white noise, comfortable bedding, etc.) and to improve lighting in the living/sleeping quarters (high intensity lighting, dimmer switches, night lights, etc.)
- Minimize light exposure during sleep/rest.

Front Watch or Day Shift - To Stay Awake While On Watch or At Job

- This normally isn't a problem since its daylight during most of this watch. If this is a problem review the standards for the back watch and apply the concepts to this watch.

Front Watch or Day Shift - To Fall Asleep After Watch or Job

- Since it is dark when the front watch gets off watch at night they already have a supply of melatonin in their bodies so they should be able to get quality sleep. To ensure that they maintain the optimum amount of melatonin they should avoid bright light, as much as possible, 3 hours before their scheduled bedtime.
- Follow the guidelines in the Alertness Guide on Environmental Improvements to make the bunkroom/bedroom is conducive to sleep (room darkening shades, cool temperature, white noise, comfortable bedding, etc.) and to improve lighting in the kitchen, hallways, living room/common area, bathroom and bedroom (high intensity lighting, dimmer switches, night lights, etc.)

Summary:

Each company, operation, vessel and employee is unique and will need to address their individual circumstances to put Light Management in place. Education on the proper use of lighting is essential to the success of a Light Management program. These changes need to be monitored to continually improve the maritime industry for all employees whether they live on a vessel, leave the vessel after each shift or work shoreside.

Resources for additional information on Light Management:

Crew Endurance Management Practices -

A Guide For Maritime Operators

A Guide For Maritime Operations ADDENDUM

These manuals are available for downloading on the Crew Endurance Management System section of the USCG Human Element & Ship Design Division Web Site:

<http://www.uscg.mil/hq/cg5/cg5211/>