

It is accepted that maritime personnel work in a physically demanding environment that requires a high degree of alertness and concentration. Fatigued personnel are more vulnerable to error as well as to the many hazards onboard ships and offshore structures. These hazards frequently result in slips, trips, falls, strikes by falling objects, burns, body strains, and other injuries. Injury and accident statistics from Protection and Indemnity Clubs (P&I Clubs) reveal these mishaps are costly to owners and to the industry and contribute to crew member lost-time, reduced work quality, loss of productivity, and vessel delays.

What Elements of Habitability Can Be Influenced by the Design Process?

The objective of incorporating habitability during design is to comply with criteria that will produce suitable overall living and working conditions within design and budget constraints. When absolute adherence to habitability criteria is not possible, design alternatives are employed to improve environmental conditions. Examples of alternatives are dampening noise transmission with acoustic insulation and applying resilience techniques to alleviate vibration.

One major aspect of designing for habitability refers to the ergonomics of the workplace, meaning the design, placement, and arrangement of the various components and spaces onboard where crew members live and work. Unfavorable living and working space design can be improved if addressed early in the planning stages. For example, the decision to locate crew berthing away (or suitably protected) from spaces containing equipment that contributes high levels of noise or vibration is more easily taken before construction has begun.



Habitability design characteristics should be considered concurrently with user expectations (see topic *Cultural Calibration of Vessel and Offshore Installation Designs*), the sizes and dimensions of the expected users, the ship trade, and the areas traded. Expected ship motions, exposures to extremes of heat and cold, and related regional environmental conditions should also be considered (ABS, 2012; ABS, 2012; ABS, 2013).

Listed below are various ambient environmental conditions that impact habitability. The design objective of each variable is discussed with background and design information.

- Noise levels
- Vibration
- Thermal comfort (temperature, humidity, and ventilation)
- Illumination

Noise

The objective of noise design is to establish a satisfactory environment relative to human response to noise. This is to prevent hearing loss as well as to minimize disruption of speech communications and noise-induced annoyance/stress factors. Excessive noise degrades performance during vigilance tasks, complex mental tasks, tasks involving complex motor skills, and communications. Excessive noise can also interfere with speech and other communication tasks (Kryter, 1994). Unexpected intermittent noises are more disruptive than continuous ones, and sudden or impact noises can induce physiological reactions and emotional changes that return to normal after continued exposure. Additional human responses to high levels of noise include

