



ABS Human Element Notations (HAB & ERGO)

Agenda

Topics

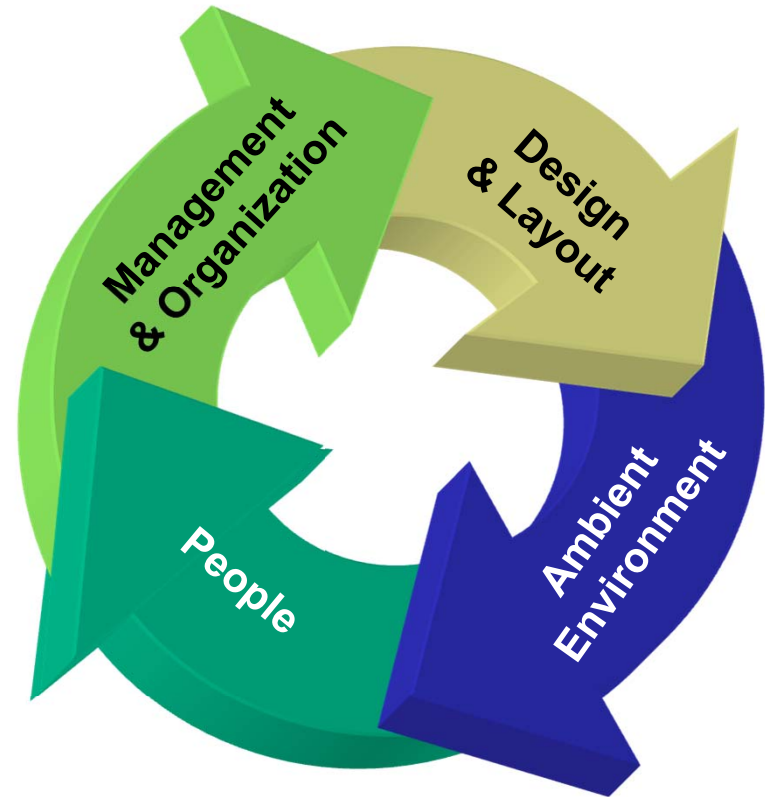
Overview of S&HF Group

Crew Habitability Notations

Ergonomic Notations

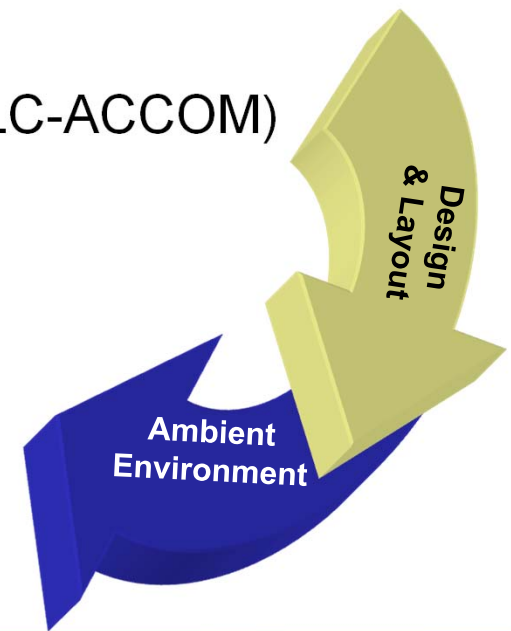
Addressing the Human Element

- Mission is to:
 - Improve human performance and safety
 - Reducing human error
 - Increasing productivity
- ABS has organized its approach around four areas
- We have advanced projects and products in support of these areas



ABS Human Factors Products/Current Projects

- Design and layout/ambient environment
 - Guidance Notes on the Application of Ergonomics to Marine Systems
 - Guidance Notes on the Ergonomic Design of Navigation Bridges
 - Guides for Crew Habitability on Ships, Offshore Installations, Workboats and MODUs
 - Guides for Passenger Comfort on Ships and Yachts
 - Guide for Means of Access for Inspection
 - Guide for ILO MLC Title 3 - Accommodations (MLC-ACCOM)
 - Guide for Ergonomic Notations
 - Guidance Notes on Noise and Vibration Control
 - Guidance Notes for Implementing HFE into the Design of Offshore Installations
 - **Guidance Notes for Ergonomics to Marine Engineering Spaces**



ABS Human Factors Products/Projects

- Management and organization
 - Guidance Notes on the Investigation of Marine Incidents
 - Guidance Notes for implementing HFE into the design of offshore installations
 - Guidance Notes on the Safety Culture and Leading Indicators for Safety Assessments
 - Guidance Notes for the Development of Procedures and Manuals
- People
 - Mariner Personal Safety (MPS) project



What is Habitability?

- Providing the living (accommodations design) and working conditions (ambient environment) necessary to sustain personnel to the level required to perform tasks safely and effectively
- Why design for habitability?
 - Important for recruiting
 - Important for retention
 - Improve crew performance



ABS Habitability Guidance

- Guides
 - Crew Habitability on Ships
 - Crew Habitability on Workboats
 - Crew Habitability on Offshore Installations
 - Crew Habitability on MODUs
- Notations Offered
 - HAB, HAB+, HAB++
 - HAB(WB), HAB+(WB), HAB++(WB)
 - HAB(OS), HAB+(OS), HAB++(OS)
 - HAB(MODU), HAB+(MODU), HAB++(MODU)



ABS HAB Guides Under Revision

- Modification of the accommodation area criteria
- Entry-Level (HAB) noise criteria to be updated to reflect the new IMO Code on Noise (IMO Res. MSC.337(91))
- Update of the lighting criteria



Guide for Crew Habitability on Ships

- Applicability
 - Oil or Chemical tankers
 - Bulk or Combination carriers
 - Container carriers
 - Multi-purpose cargo vessels
 - Passenger vessels (Crew Areas)



Guide for Crew Habitability on Workboats

- Applicability
 - Offshore support vessels
 - Tug boats
 - Tow boats
 - Dredgers
 - Research vessels
 - Anchor handling vessels
 - Any other vessel providing services to offshore oil and gas exploration and production (including SPS)



Guide for Crew Habitability on Offshore Installations

- Applicability
 - Tension leg platforms (TLPs)
 - Floating production, storage and offloading (FPSOs)
 - Spars
 - Fixed platforms
 - Any other buoyant or non-buoyant structure supported by or attached to the seafloor

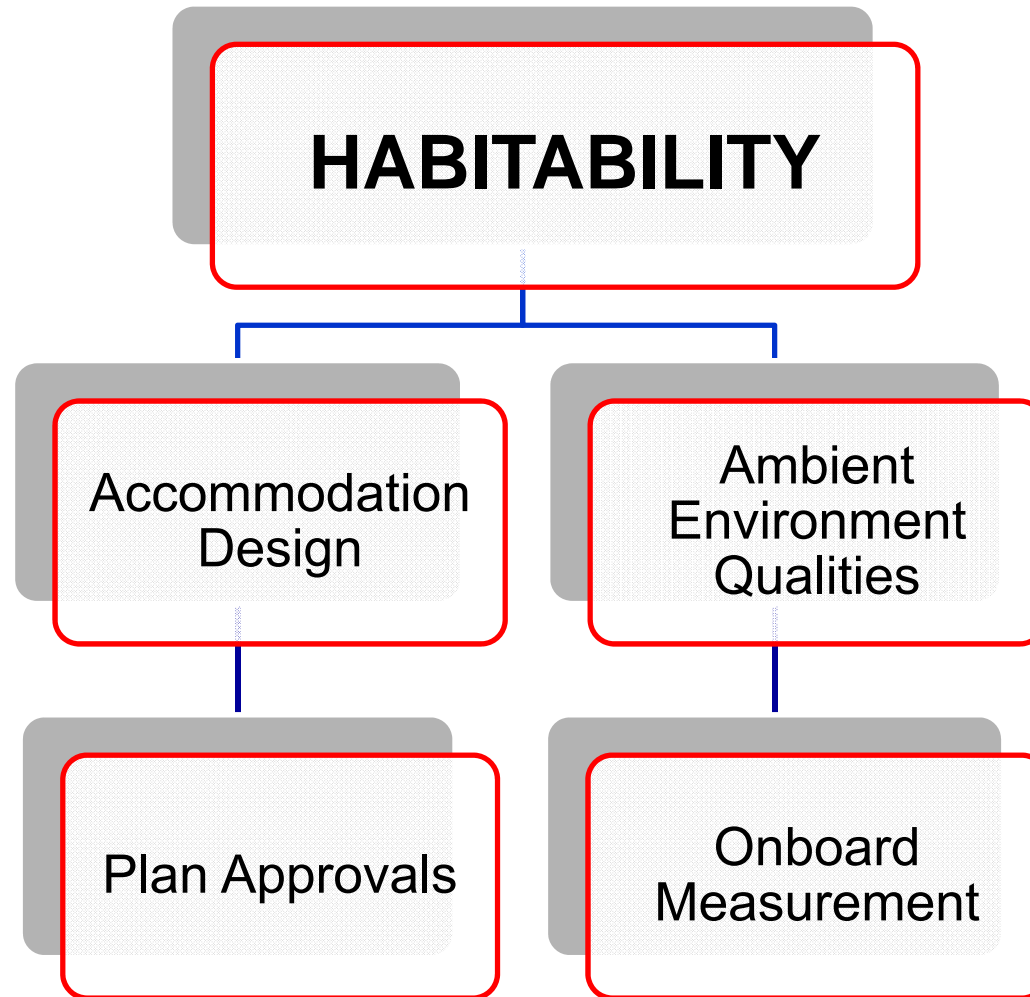


Guide for Crew Habitability on MODUs

- Applicability
 - Drillships
 - Drill barges
 - Self elevating drilling units (SEDUs)
 - Column stabilized drilling units (CSDUs)
 - Any other vessel used for the purpose of drilling



HAB Guide Contents



ABS Habitability (HAB) Guidance

- Crew Accommodations
 - Access/Egress
 - Crew cabins
 - Sanitary spaces
 - Offices
 - Food services areas
 - Recreational facilities
 - Laundry and medical areas
- Ambient environment
 - Human whole-body vibration
 - Noise
 - Indoor climate
 - Lighting

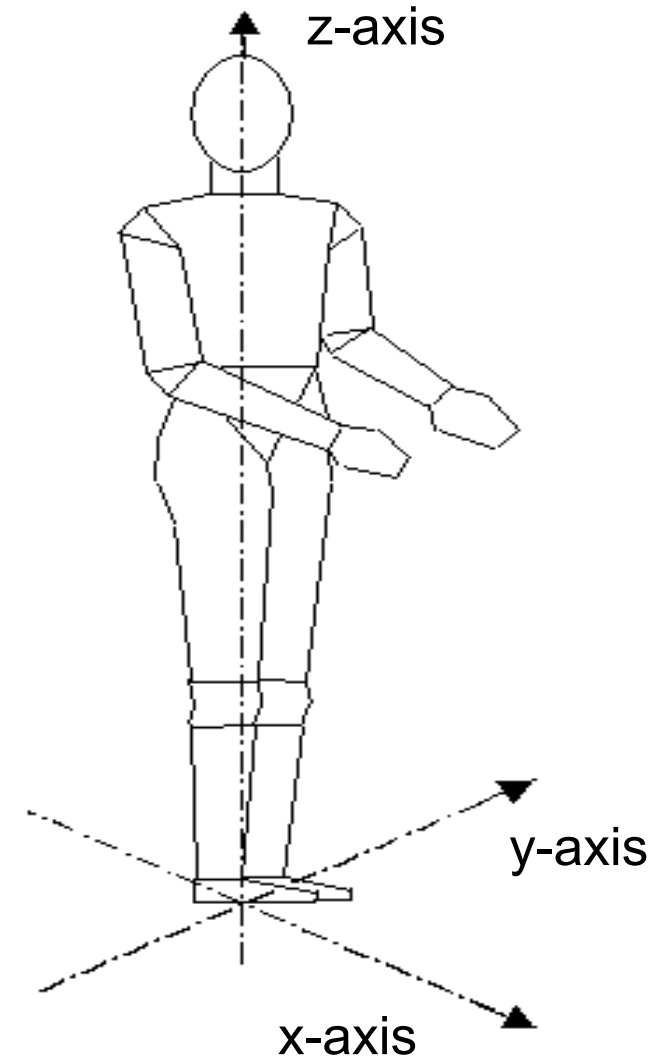


Human Whole-body Vibration (WBV)

- There are two main types of human vibration:
 - Whole-body vibration
 - Hand arm vibration
- Whole-body vibration is transmitted to the body as a whole, generally through the supporting surface (that is, feet, buttocks, back, etc.)
- Frequencies of interest
 - 1.0 Hz to 80 Hz
 - This range has the most impact on human performance
 - Speech 1-20 Hz
 - Reading (instruments) 1-12 Hz
 - Reading (text or displays) 1-50 Hz
 - Control manipulation 1-30 Hz
 - Depth perception 25-50 Hz
 - Visual task performance 10-80 Hz

Human Whole-body Vibration (WBV)

- Basis of methodology
 - ISO 6954
 - ISO 2631
 - ISO 8041 (Instrumentation)
- Criteria based on:
 - Crew task performance
 - Enhanced habitability
 - Different sized vessels
 - Different operational modes



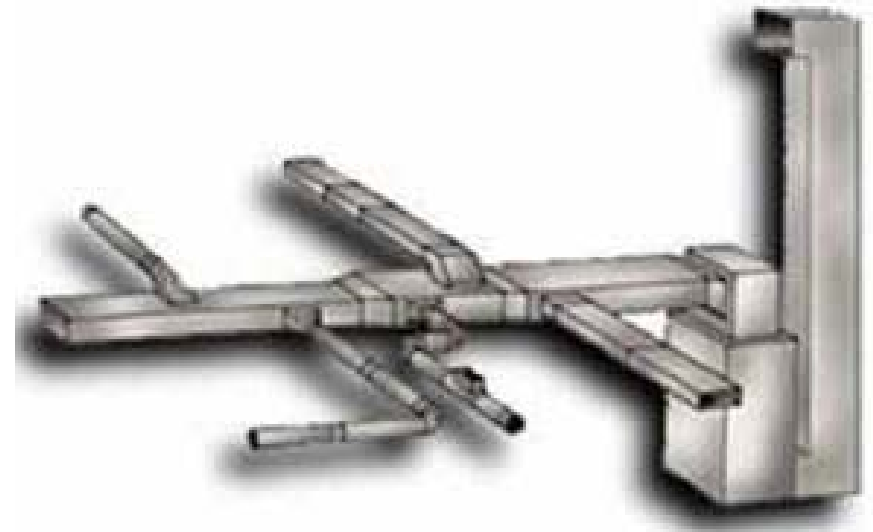
Noise

- Adverse and/or improper levels can:
 - Cause speech interference
 - Interfere with concentration and thought processes
 - Disrupt sleep
 - Cause fatigue and aggression
- Basis of methodology
 - ISO 2923
 - IEC 61672 (Instrumentation)
- Criteria based on
 - Activities in a space
 - Communication needs
 - Different operational modes



Big Contributor: HVAC Noise

- HVAC-induced noise as high as 8 dB
- Potential Solutions:
 - Design-related:
 - Configurations including largest feasible duct size, gradual turns
 - Use of HVAC silencers and/or resonators
 - Tuning of resonators to the blade frequency
 - Reduction of pressure changes
 - Installation-related:
 - Proper supports for exhaust and piping systems
 - Secure ventilation ductwork piping systems will reduce vibration against shipboard structures



Indoor Climate

- What determines comfort?
 - Ambient environmental factors
 - Air temperature
 - Air speed
 - Humidity
 - Individual factors
 - Age, gender
 - Fitness level
 - Activities performed
 - Clothing insulation



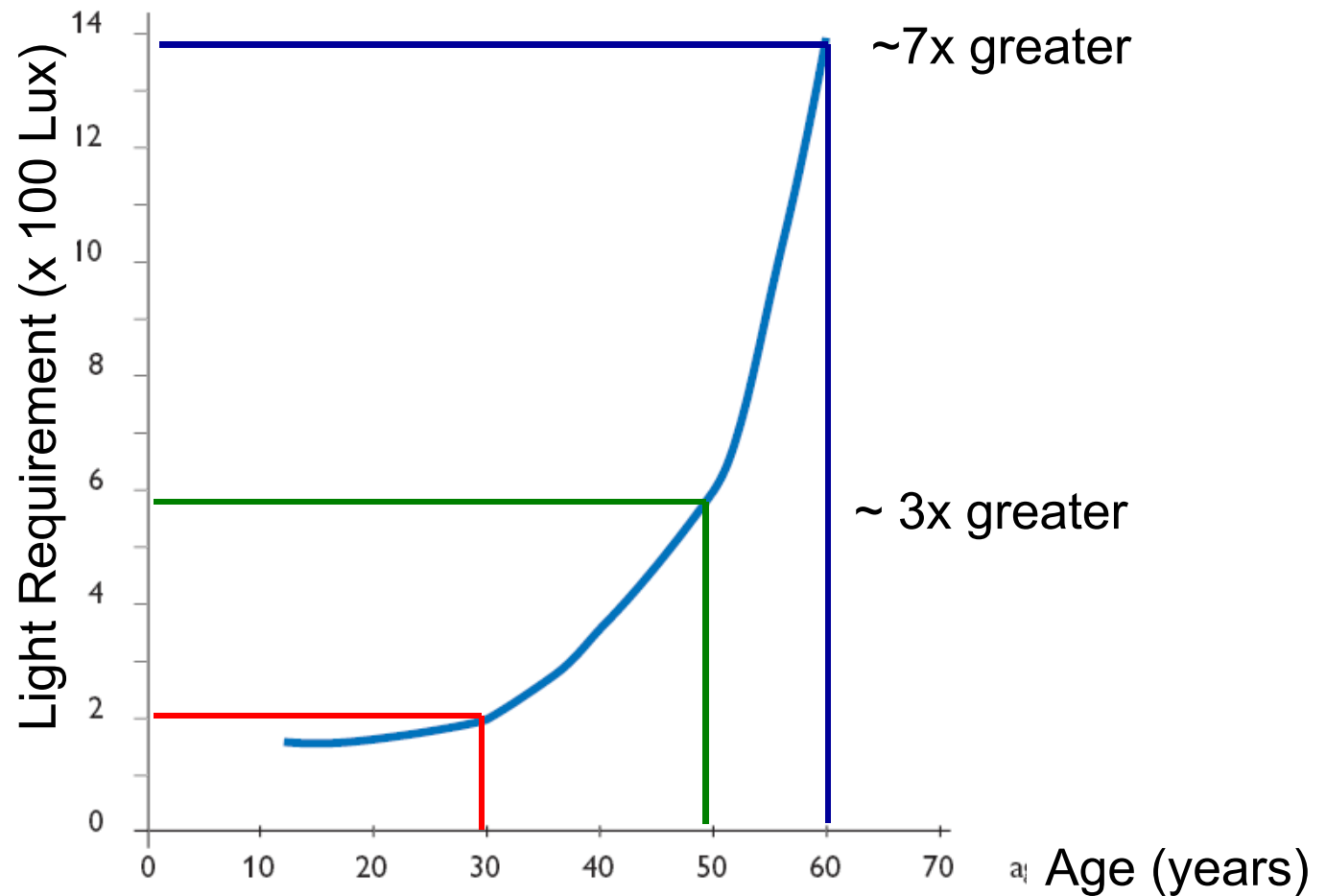
Lighting

- Objective is to provide lighting to accommodate crew visual task performance and safety
- Criteria provided for:
 - Entrances and passageways
 - Cabins, staterooms and sanitary spaces
 - Dining spaces
 - Recreation spaces
 - Crew work spaces



Lighting Requirements

- Relationship of age and light required for reading small print



Test Plans

- Developed for each ambient environmental aspect
- Plans include:
 - Documentation and drawings
 - Test personnel
 - Test conditions
 - Measurement locations
 - Data acquisition and instruments
 - Test schedule
- Resulting test reports will go the attending surveyor

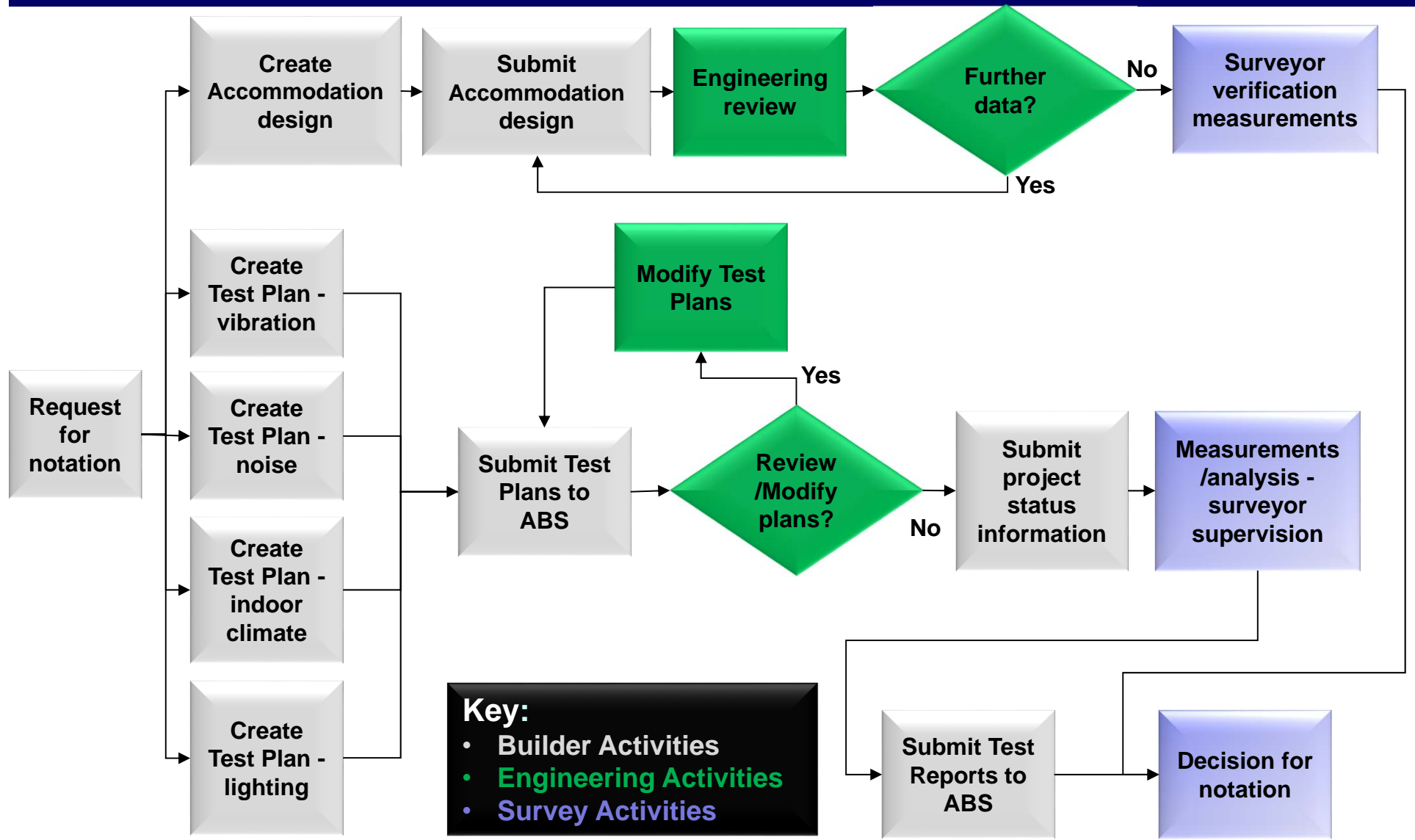


Ambient Environmental Testing Specialists

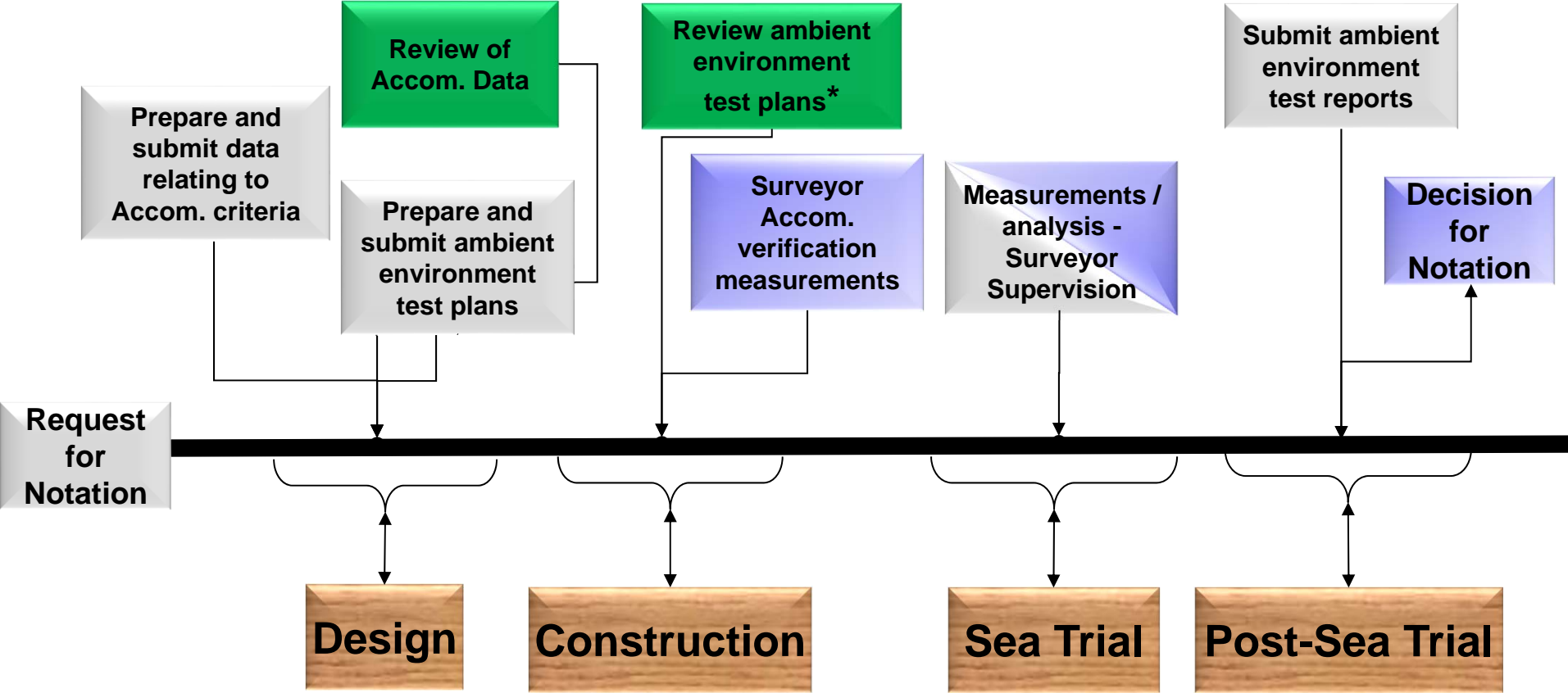
- Testing personnel have the **right equipment**
- Testing personnel have the correct **knowledge and skill** to use the equipment
- Testing equipment has current **calibration certificates**
- Testing personnel can develop an appropriate **Test Plan**
- Testing personnel can develop an appropriate **Test Report**
- Testing personnel can act **independently** of any production related function within the yard



Process for Obtaining the HAB Notation



HAB: Event Schedule



* Under certain conditions lighting and indoor climate measurements may be taken during construction or dockside after construction

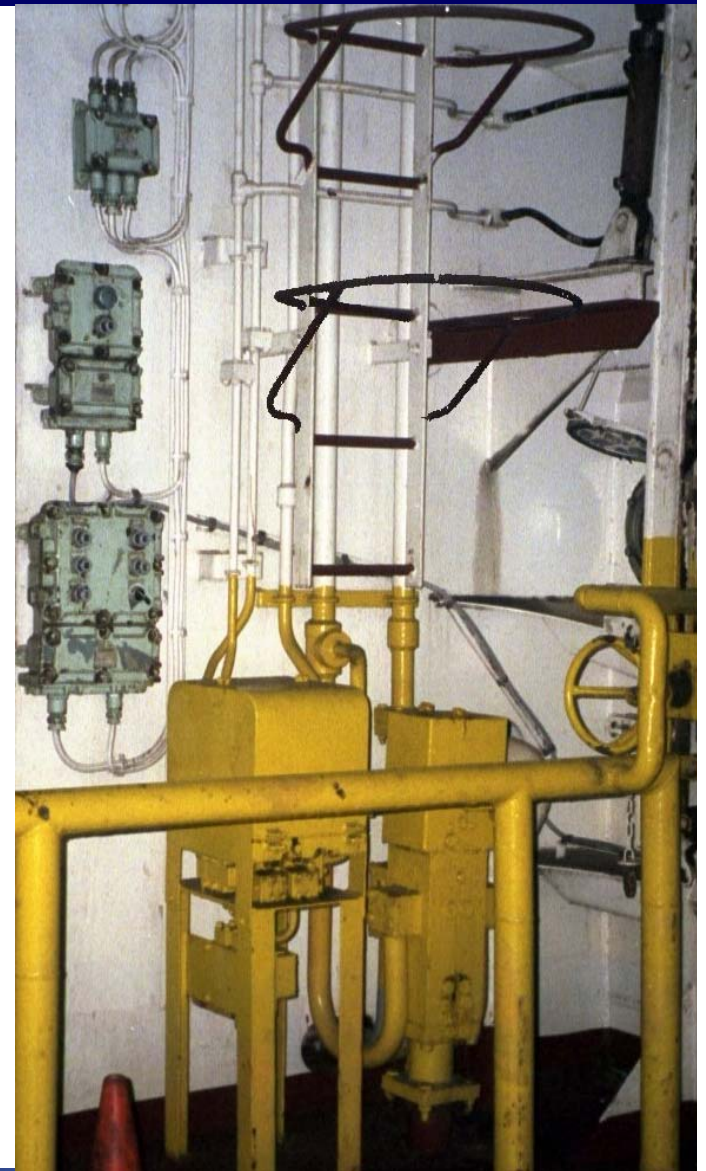
- Key:**
- Builder Activities
 - Engineering Activities
 - Survey Activities

Habitability Related Projects (July 2014)

Category	In Operation	Design/ Construction	Total
HAB/HAB+/HAB++	3	16	19
HAB(WB)/HAB+(WB)	10	66	76
HAB(OS)/HAB+(OS)	2	0	2
HAB(MODU)/HAB+(MODU)	0	8	8
MLC-ACCOM	27	106	133
TOTAL	42	196	238

Mariner Personal Safety (MPS) Project Overview

- Objective obtain and review incident and close call reports
- Collected approximately 85,000 records (injuries and close calls)
- Database represents more than 1,600 vessels and 45,000 mariners
- Constructed a database to:
 - Identify trends
 - Create benchmarking statistics
 - Identify potential corrective actions
 - Identify potential lessons learned
- Develop and share results



Near Misses Related to Access Aids

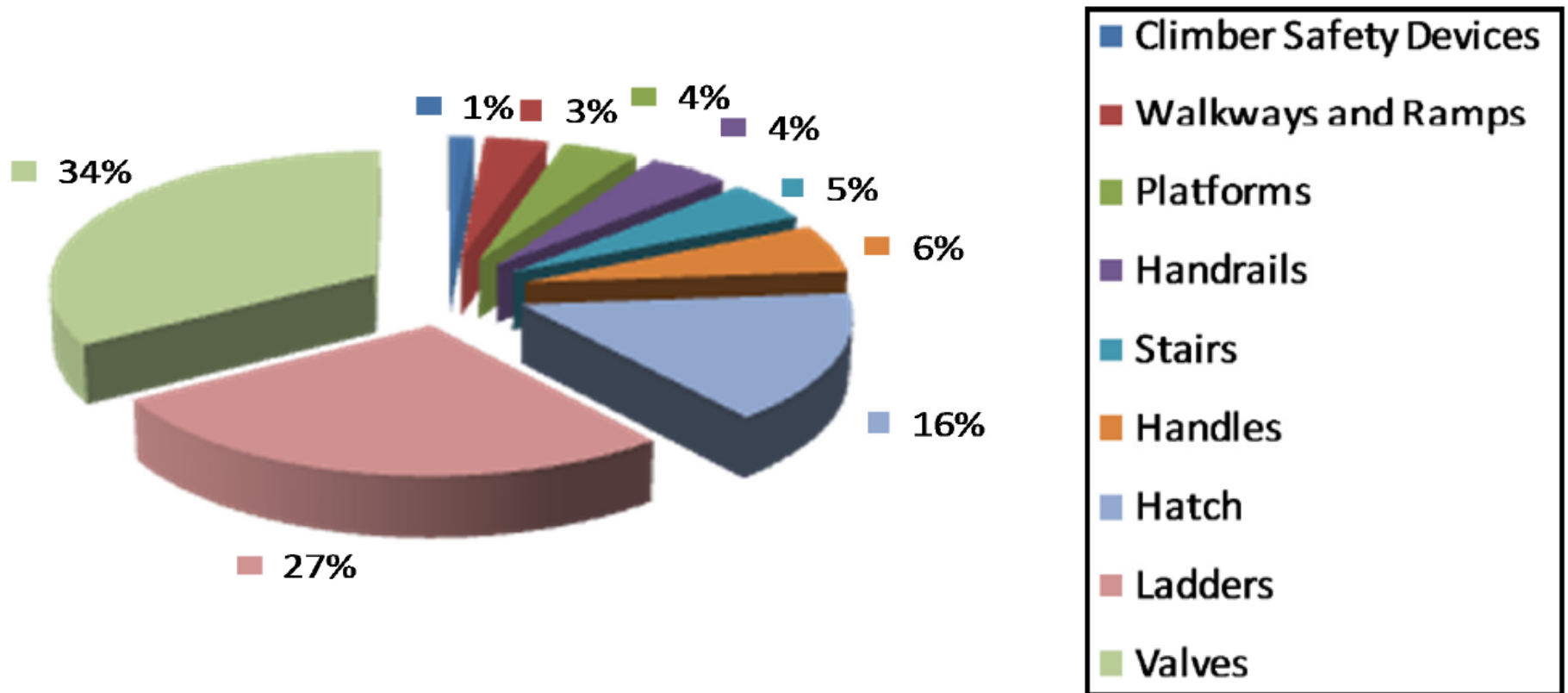


Chart data represents ~22% of all crew near misses

Crew Injuries Related to Access Aids

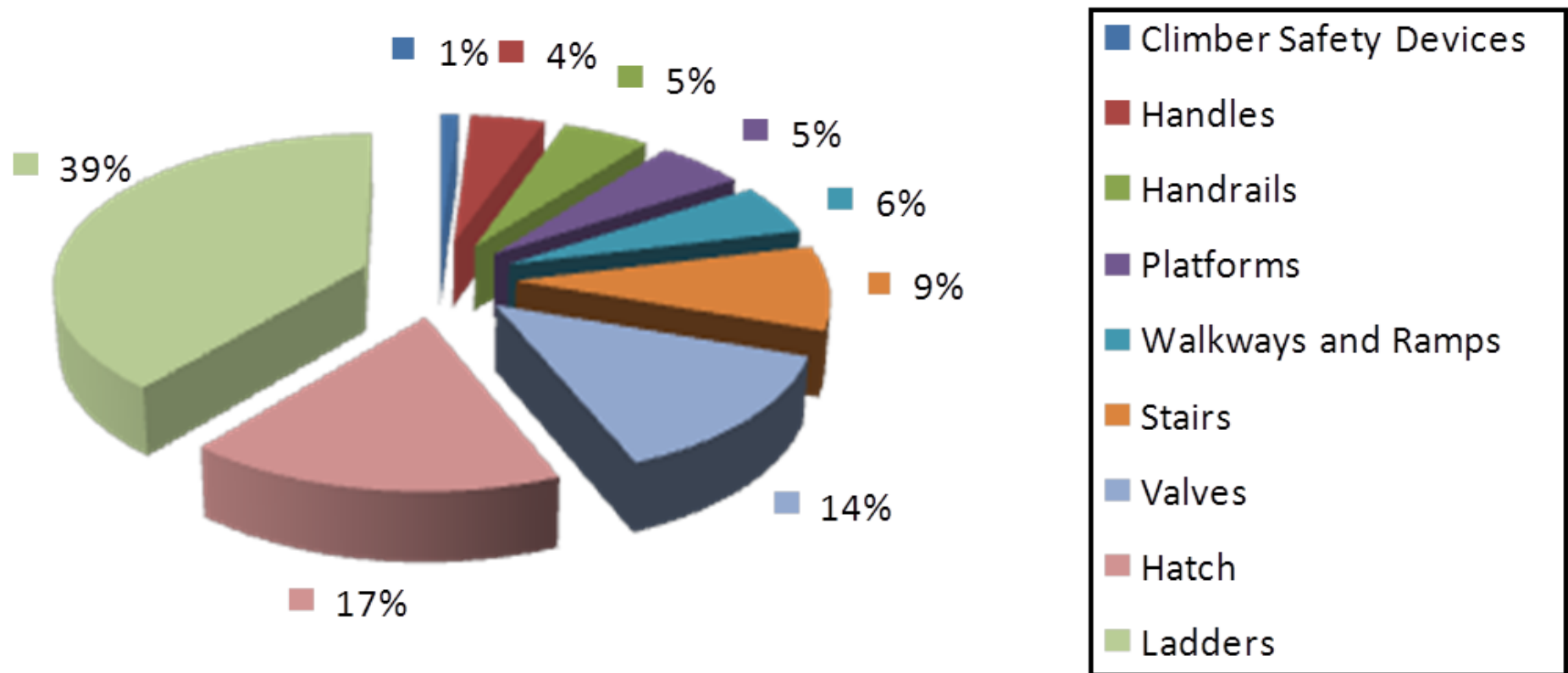


Chart data represents ~24% of all crew injuries

ABS Guide for Ergonomic Notations

- Addresses structural aspects of four vessel areas
- Can be applied to ships or offshore structures
- Ergonomic notations for:
 - Topside interface design
(ERGO TOP)
 - Enclosed space and hull interface design
(ERGO ES)
 - Maintenance access and design
(ERGO MAINT)
 - Valve locations, access and operation
(ERGO VALVE)



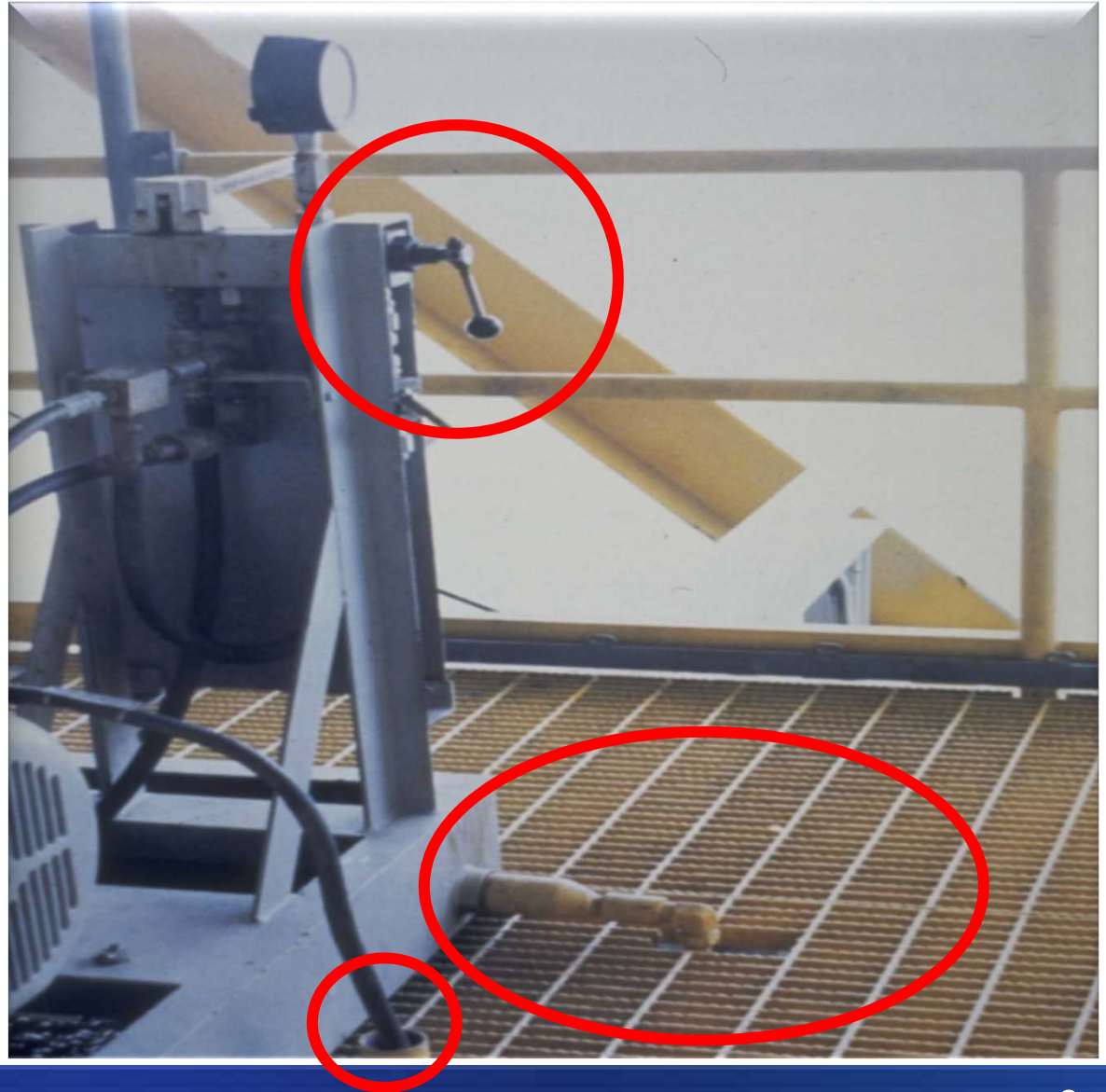
ABS Guide for Ergonomic Notations

- Requirements limited to human and vessel structure compatibility
 - Anthropometry
 - Biomechanics
 - Reach and working envelopes
- Cognitive factors not addressed (e.g., information display)
- Environmental factors not addressed (e.g., noise, vibration)



Ergonomic / Safety Hazards

- Appropriate design of the workplace?



Ergonomic / Safety Hazards

- Appropriate design of the workplace?



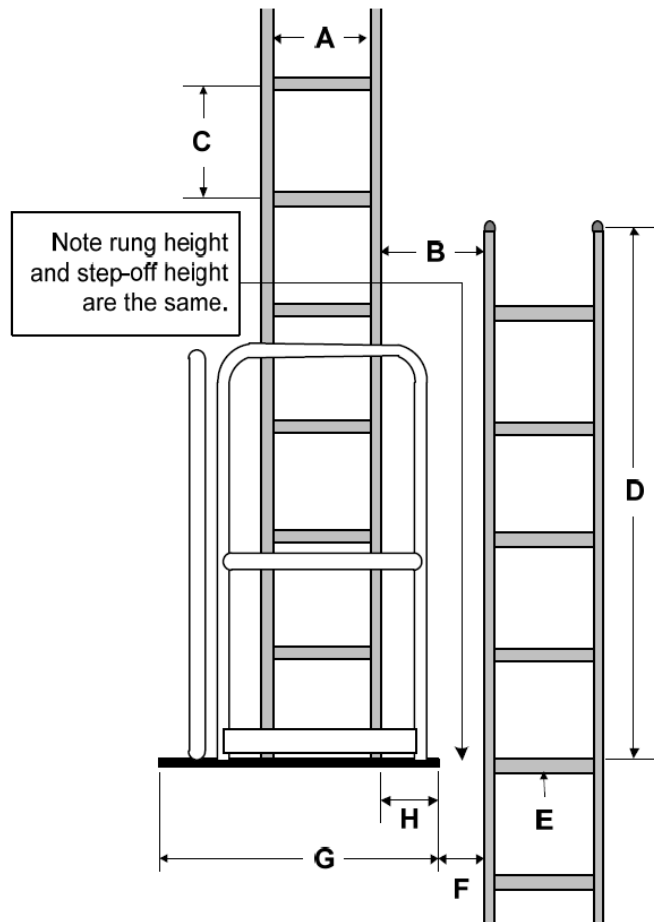
Ergonomic Notation Topics

- Stairs, walkways and ramps
- Vertical and inclined ladders
- Guard rails and climber safety devices
- Fall protection from secondary fall points
- Work platforms
- Handles
- Hatches
- Doors and scuttles
- Manual valve operation, access, location and orientation
- Maintenance access



ERGO TOP (example)

Staggered Vertical Ladder



Dimension		Requirements
A	Stringer separation	400 to 450 mm (16.0 to 18.0 in.)
B	Horizontal separation between two vertical ladders, stringer to stringer	≥ 225 mm (9 in.) ≤ 450 mm (18 in.)
C	Distance between ladder rungs (rungs evenly spaced throughout the full run of the ladder)	≥ 275 mm (11.0 in.) ≤ 300 mm (12.0 in.)
D	Stringer height above landing or intermediate platform	≥ 1350 mm (53.0 in.)
E	Rung Design – (Can be round or square bar, where square bar is fitted, orientation shall be edge up)	Square bar 22 mm (0.9 in.) × 22 mm (0.9 in.) Round bar 25 mm (1.0 in.) diameter
F	Horizontal separation between ladder and platform	≥ 150 mm (6.0 in.) ≤ 300 mm (12.0 in.)
G	Landing or intermediate platform width	≥ 925 mm (36.5 in.)
H	Platform ladder to Platform ledge	≥ 75 mm (3.0 in.) ≤ 150 mm (6.0 in.)



ERGO ES (Enclosed Space)

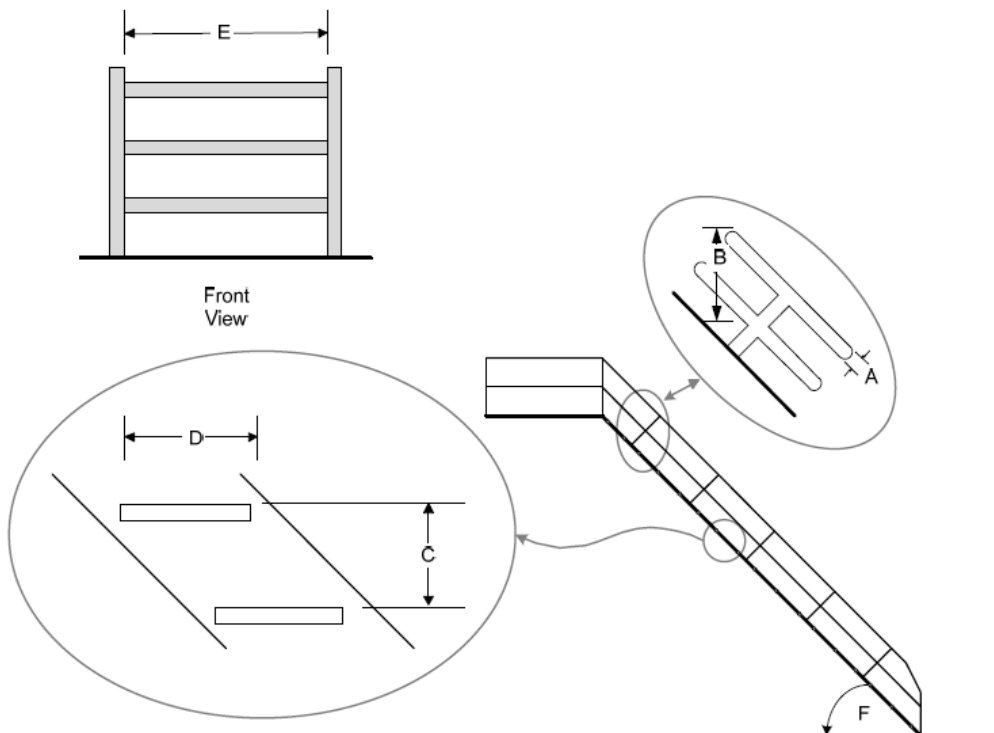
- Areas within the hull, below the main deck
- Similar coverage as topsides, tailored for cargo and machinery access including:
 - Ladders and walkways
 - Hatches and passages
 - Lifting devices
 - Doors and scuttles



ERGO ES (example)

Inclination of Ladders

<i>Dimension</i>	<i>Requirements</i>
Inclined Ladders	45 to 60 degrees
Vertical Ladders	80 to 90 degrees

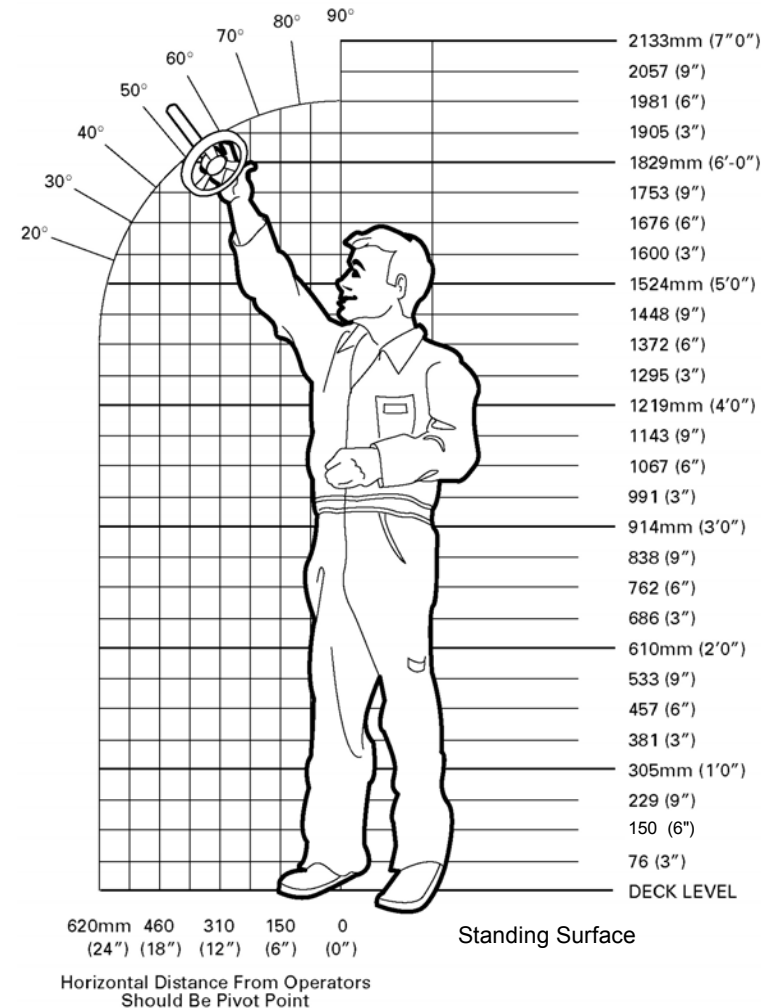


Inclined Ladders

	<i>Dimension</i>	<i>Requirements</i>
A	Handrail/guardrail diameter	≥ 40 mm (1.5 in.) to ≤ 50 mm (2.0 in.)
B	Handrail/guardrail height (from leading edge of tread)	≥ 915 mm (36.0) and ≤ 1000 mm (39.0 in.)
C	Tread/step spacing – equally spaced along entire ladder	≥ 200 mm (8.0 in.) and ≤ 300 mm (12.0 in.)
D	Step depth Use of square bar is optional	≥ 100 mm (4.0 in.)
E	Handrail/guardrail to handrail width	≥ 450 mm (18.0 in.) ≤ 560 mm (22.0 in.)
F	Angle of inclination	45 to 60 degrees

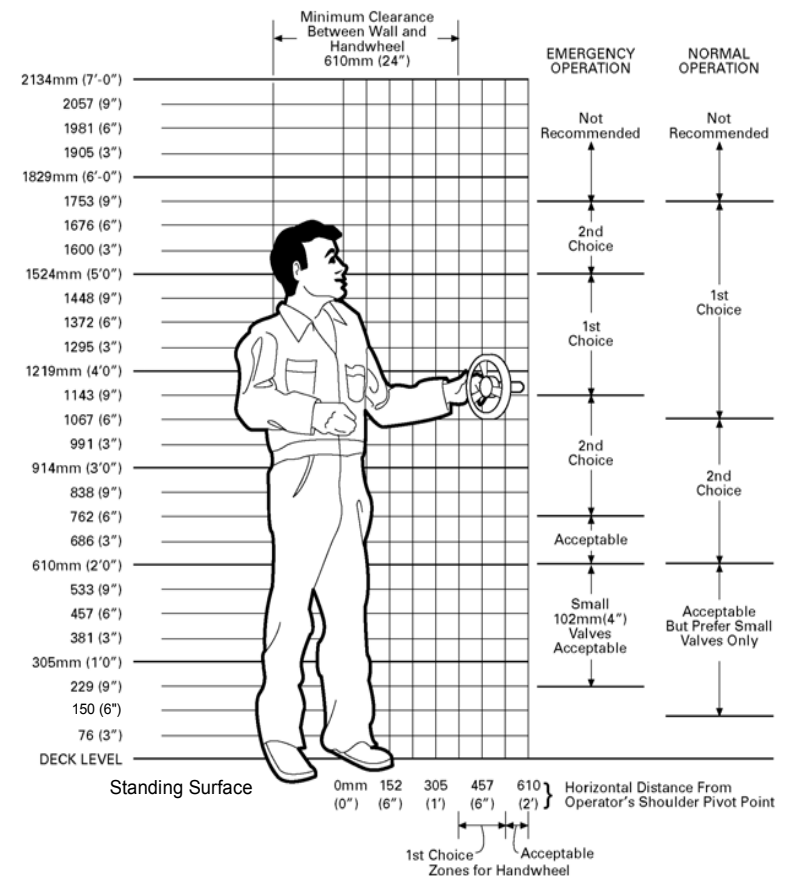
ERGO VALVE

- Addresses design and accessibility of valves
- Manual and motor operated (for maintenance)
- Topics include:
 - Valve criticality and location, access, reach envelopes
 - Mounting heights and orientations
 - Mode(s) of operation, biomechanics of operation
 - Force requirements, support devices (extenders, bars)



ERGO VALVE (Valve Criticality Analysis)

- Category 1 – valves critical for safety or operations or are also used frequently for routine maintenance
 - Example
 - Emergency shutdown valves
- Category 2 – valves not critical for operations but required for routine maintenance
 - Example
 - Condensate drain valves
- Category 3 – valves not critical for operations and are infrequently used
 - Example
 - Valves used in drydock only



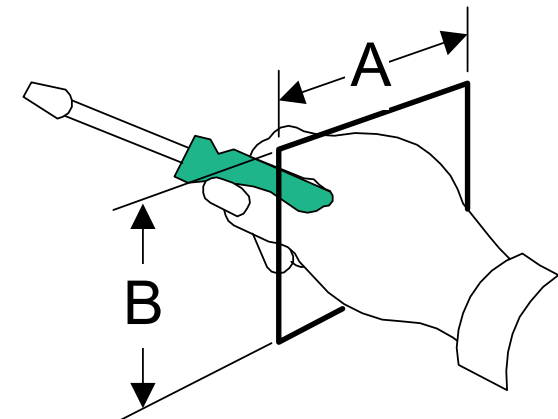
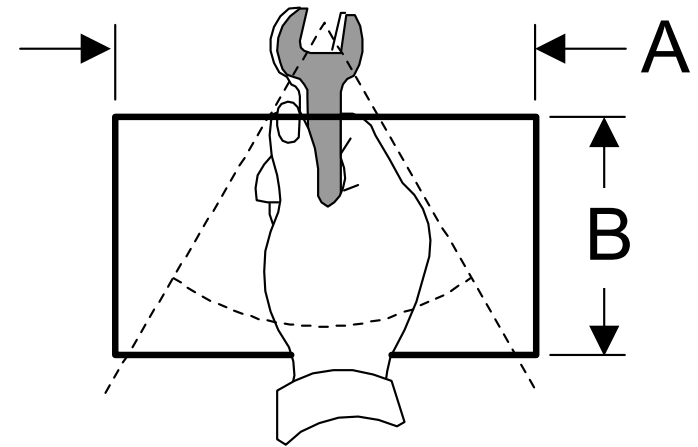
Criticality Analysis: Valves

- Analysis to determine Category 1 and 2 valves
- Analysis participants:
 - Vessel designers
 - Construction yard
 - Owner's representatives
 - ABS Engineering and Survey
- Category 1 and 2 valves follow the **ERGO VALVE** criteria in the Guide



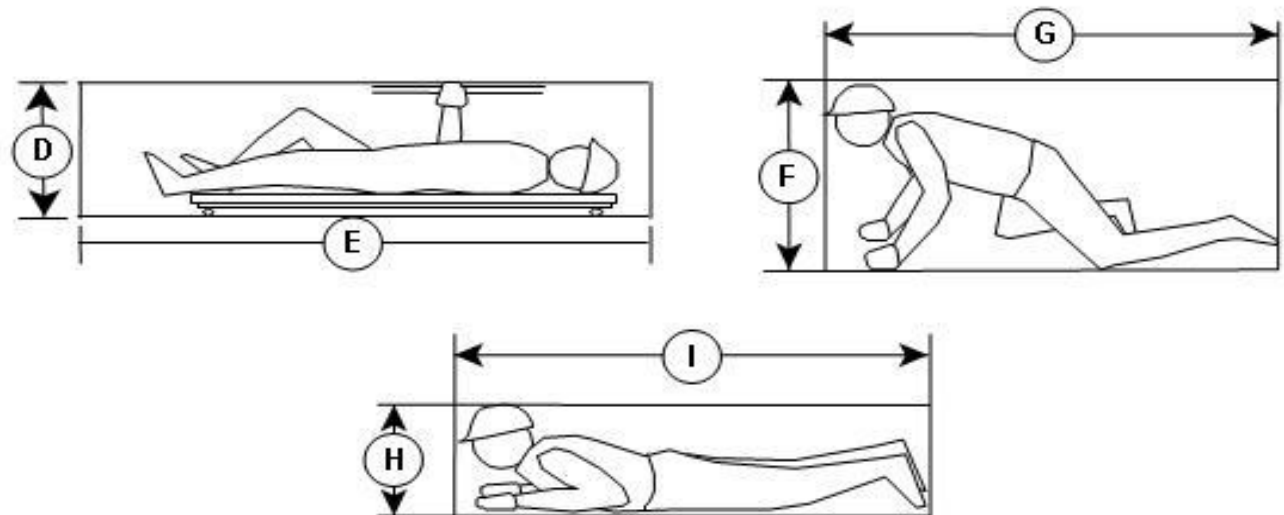
ERGO MAINT (Maintenance)

- Addresses maintenance accesses and workspace, generally on or below the main deck
- Topics include:
 - Access openings, maintenance platforms
 - Reach and access envelopes
 - Space for tools and parts storage
 - Provisions for storage
 - Lifting and moving devices
 - Safety devices



ERGO MAINT (Maintenance)

- Category 1 Maintenance or Operational Access
 - Maintenance/operational actions that are system and safety critical
- Category 2 Maintenance or Operational Access
 - Maintenance or operational actions that are performed frequently
- Category 3 Maintenance or Operational Access
 - Maintenance or operational actions which are considered to be non-critical



Criticality Analysis: Maintenance

- Analysis to determine Category 1 and 2 maintenance activities
- Analysis participants:
 - Vessel designers
 - Construction yard
 - Owner's representatives
 - ABS Engineering and Survey
- Category 1 and 2 maintenance activities follow the **ERGO MAINT** criteria in the Guide



Obtaining a Notation

- Design Compliance Verification
 - The following plans and information shall be submitted to ABS Engineering for the purpose of review in the context of the **ERGO** notations being sought
 - Details of arrangements of the components and structures appropriate for the notation(s)
 - Diagrammed details of each of the above components and structures
 - Any vendor documentation or certifications pertinent to applying the requirements to the design.
 - Surveyor follow-up physical verification of ergonomic criteria
- Results
 - The ABS Engineering ergonomic assessment, and ABS Surveyor verification measurements, shall be reviewed by the ABS Surveyor for determination of notation confirmation

...one final point

- Your thoughts?





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