Standardization of Joint Interoperable Containerized Modules

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Intro

- Joint: utilized by all military services
- Interoperable/intermodal: interfaces with multiple modes of transportation (rail, road, air, sea)
- Containerized: transport by container, twenty-foot equivalent units (TEUs) in the military
- Modules: individual, self-contained segments



53 foot container being loaded onto a semi-trailer truck

• US Air Force transport of TEU in C-130



• US Marine Kalmar RT240 stacking TEU three-high



 USMC Mobile Facilities with environmental control units protruding from side next to ventilation supply/exhaust



- USS Wright (T-AVB 3) loading Mobile Facilities
 - 167 semi-functional workshops onboard
 - Does not meet ABS regulations for container use at sea





- University National Oceanographic Laboratory System (UNOLS) designed for use at sea on open deck only
 - USCG and ABS approval in 2002
 - Two doors 28" wide
 - Escape hatch 20"x20"
 - Cargo hatch with recessed doors
 - Shipboard connections placed in corner





Regulations

- ABS Guide for Portable Accommodation Modules, February 2020
- Requirements for design and survey of accommodation modules installed onboard ABS-classed Mobile Offshore Drilling Units and Mobile Offshore Installations, Steel Barges and Steel Vessels
- Voluntarily applied to other types of portable modules, as we have chosen to do here
- **ABS approval not required** at any stage of design, build, or survey of this containerized modules



Project Goals (May 2019 to May 2020)

- Define the requirements for containerized workshops and habitability modules in military use today
- Identify the ideal locations, sizes, and materials for the following shipboard interfaces:
 - Access/doors
 - Electrical
 - C4I
 - Ventilation
 - Potable water
 - Sewage
 - Firefighting
 - Compressed air



- Hazardous area protection arrangements
- Ensure all design standards set during the project meet applicable ABS regulations

Container Design

- Cutouts:
 - Piping
 - Electrical
 - Air handler unit
 - Ventilation supply
 - Ventilation exhaust



Note: Structural weight only

• UNLOS container design from 2002 used as base design then reinforced structurally and cutouts updated

Container Design



- General location assigned for piping and electrical
- Separate locations for HVAC on fore/aft ends
- Same size cutouts facilitate use of cable transit and pipe seals
- STI Marine FireStop Cable Transit and Pipe Penetration Seals

Container Design



3: ABS Grade AH36 4: ABS Grade AH36 4.7625: ABS Grade AH36 6: ABS Grade AH36 6.35: ABS Grade AH36 7.9375: ABS Grade AH36 9: ABS Grade AH36 9.525: ABS Grade AH36 10: ABS Grade AH36 12: ABS Grade AH36 12: ABS Grade AH36

Thicknes



- Strength of door was not included in analysis
- Ventilation exhaust above double door
- 9mm insert around opening
- Increased vertical stiffener on sides of door: L 3x2x3/8
- Factor of safety on von Mises stress of 1.11 for combine loading
- Grade AH36: 320 MPa

- As per ABS Guide for Portable Accom. Modules, green water head height loads were applied
- Fixed at bottom four corner fittings of container to secure to deck of the ship



- Triple-stacked configuration on open weather deck considered worst case condition for operational container loading
- Two containers on top connected at four corner fittings using a rigid spring element



• Highest stress areas found at the corners of the doors of the container at the bottom of the stack, but below limit of 1



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Shipboard Military Containers

- Can now assume any container with smaller penetrations, cutouts, and accesses or doors will meet these requirements (so long as they're as structurally robust as the ones modeled here)
- Confine penetrations to fore and aft (short) sides of containers whenever possible to minimize rework for shipboard connections

Questions?



