Standards, Specifications, Regulatory Requirements, Classification Societies

Shipboard Power System Fundamentals

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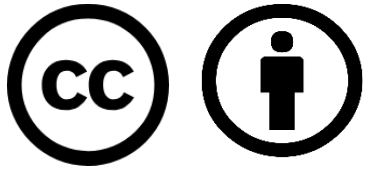

Essential Questions

What are the characteristics and applicability of the various types of technical documents?	Understand
How doe one find out which standards and specifications to use?	Apply
Where can standards and specifications be found?	Apply
What are variances (deviations and waivers) and when are they used?	Understand

Introduction

- Types of technical documents
  - Shipbuilding specifications
  - Project peculiar documents (PPD)
  - International treaties
  - Regulations
  - Classification society rules
  - Specifications
  - Standards
  - Manuals
  - Handbooks, recommended practices, and guides
- Created and maintained by
  - Customers
  - Design agents
  - International organizations
  - Governments
  - Classification societies
  - Professional societies

Shipbuilding specification

- Part of the legal contract between the customer and a shipyard.
  - Details the required properties of the ship and its systems.
  - Should lead to both parties having a common understand of the scope of the contract.
- Product of the design work starting with concept studies through the end of contract design.
- Governs work performed by the shipyard and its suppliers during detail design (product design) and construction.
- Invokes a number of other technical documents.
  - Invoked documents become legally binding.
- Usually only one or a few ships are procured using the same shipbuilding specification.
  - Long periods of time between contracts may lead to changes due to:
    - Changing requirements
    - Equipment obsolescence
    - Updated specifications, standards, and regulations
    - Lessons learned

Project Peculiar Documents

- Project Peculiar Documents (PPDs) are used for new systems, equipment or technologies where applicable standards or specifications do not exist.
- PPDs are intended to be used only for a short period of time.
  - Should be converted to traditional standards or specifications once the PPD's content is table and proven through procurements.
  - Use of PPDs over long periods of time not recommended.
    - Uncertainty as to market size may result in industry bidding custom solutions.
    - Can result in unique and expensive equipment.

International Treaties

- International Maritime Organization (IMO)
  - Agency of the UN
  - Responsible for safety and security of ships (SOLAS)
  - Responsible for prevention of pollution by ships (MARPOL)
  - Member nations enforce SOLAS and MARPOL
- Flag administration
  - SOLAS and MARPOL require flag administrations to periodically inspect and survey every ship
  - Flag administration often delegates some or all inspects and surveys to approved classification societies (such as ABS)
  - Flag administration for U.S. naval ships performed by the U.S. Navy

Regulations

- Most countries have laws that govern the design, construction, and operation of ships.
- U.S. commercial ships should adhere to the Code of Federal Regulations (46 CFR).
- U.S. naval vessel classes are required by 10 USC § 8669b to have a senior technical authority with authority to establish, monitor, and approve technical standards, tools, and processes.

Classification Society Rules

- Classification societies (such as ABS) publish rules that govern
  - Design and construction of ships
  - Surveys
  - Maintenance
  - Specialized equipment
- Periodic inspections and survey by the classification society while the ship is operational ensures the vessel continues to adhere to the rules; the vessel is said to be maintained “in class”
- Keeping a vessel in class is usually a requirement for obtaining marine insurance

Specifications

- Describe a product or service that is to be procured
- Detail specifications
  - “A specification that specifies design requirements, such as materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. A specification that contains both performance and detail requirements is still considered a detail specification.”
    - Testing concentrates on conformance: the prescribed design and methods are presumed to result in an acceptable product.
- Performance specification
  - “A specification that states requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics.”
    - Testing addresses both whether the design will achieve the desired requirements, and whether the end product or process conforms to the design.
- Can include options that the buyer can incorporate into the procurement contract
- Usually invoke other specifications and standards
  - May result in exponentially growing list of applicable specifications and standards.

Standards

- Common to multiple specifications or contracts.
- Types:
  - Interface standards
  - Design criteria standards
  - Manufacturing process standards
  - Standard practices
  - Test method standards
- Items or services are purchased based on specifications and a statement of work; standards are invoked by the specification or statement of work.

Manuals

- Take on many forms.
  - Technical manuals
  - Operations / procedure manuals
  - Training manuals
  - User manuals
  - Maintenance and service manuals
- Usually produced for training, but may include requirements for procurements.
- Generally better to extract requirements out of a manual into a specification instead of invoking the manual.

Handbooks, recommended practices, and guides

- Not intended to include requirements
- Intended to educate the user
- Recommended practices include a preferred method to accomplish a task
- Guides may present multiple methods, but not indicate a preferred method
- Handbooks may provide examples and data as well as preferred methods and lessons learned
  - May include recommendations on how to implement other standards and specifications

Identifying applicable technical documents: While developing shipbuilding specification

- Common to start with shipbuilding specification from a previous ship acquisition. Do so with caution …
  - Requirements may be different
  - Specifications and standards may have changed
- Best practice is to use requirements tracing software
  - Trace specification language to requirements (or design decisions for derived requirements)
  - Some requirements may not be in acquisition documents: Regulations and International treaties
- Higher-level documents can provide guidance
  - Classification society rules (ABS MVR)
  - IEEE Std 45.1 and IEEE Std 45.3
  - Naval Combatant Design Specification
  - NAVSEA T9300-AF-PRO-020 Electrical Systems Design Criteria and Practices (Surface Ships) for Preliminary and Contract Design
- Specification effectivity date
  - Date established in the contract to determine which version of a specification or standard to use
  - Ships of a class procured many years after the first ship of the class should examine the impact of changing the specification effectivity date
    - Can result in additional costs to meet new requirements.
    - New requirements may be in conflict with other requirements.

Identifying applicable technical documents: While implementing shipbuilding specifications

- The contract, including the shipbuilding specification, should be used to identify the required standards and specifications
- Technical requirements in regulations and international treaties should also be identified
- Shipyard engineers should be familiar with applicable manuals, handbooks, recommended practices and guides
  - Enable the engineers to effectively and efficiently complete design work
  - Examples include
    - IEEE Std. 45 series
    - NAVSEA T9300-AF-PRO-020

Sources of standards and specifications

Organization	Website
ABS	https://ww2.eagle.org/en.html
ANSI	https://www.ansi.org/
API	https://www.api.org/products-and-services/standards/
ASME	https://www.asme.org/
ASTM	https://www.astm.org/
DNV	https://www.dnv.com/
IACS	https://iacs.org.uk/
IEC	https://www.iec.ch/homepage
IEEE	https://ieeexplore.ieee.org/Xplore/home.jsp
IMO	https://www.imo.org
ISA	https://www.isa.org/
NEMA	https://www.nema.org/
NFPA	https://www.nfpa.org/
UL	https://www.ul.com/
US Department of Defense	https://quicksearch.dla.mil/qsSearch.aspx

Variances, deviations, and waivers

- Variance.
  - Condition where a product does not conform to specifications but is still intended to be installed onboard ship.
    - Usually requested by the OEM.
    - Engineering agent for the customer approves or disapproves the variance.
  - Does not change the specification.
    - Future products are still expected to adhere to the specification.
- Deviation.
  - Variance requested prior to the manufacture of the product.
- Waiver.
  - Variance requested after the manufacture of the product.
- If the same variance is repeated for the manufacture of the same product, consideration should be given to changing the specification.
- Many variances can lead to risks.
  - In-service engineers may have difficulty understanding the configuration of the system.
    - An excessive number of variances is often cited as a contributor in failure review reports.
  - Variance reduction
    - Replace non-conforming parts with conforming parts
    - Change specifications to incorporate the variances