

# Introduction to Maritime Regulations

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# Ship Design Process – First Steps



## Identify the Need or Mission

Develop a deep understanding of what the ship is to do. What need is the design intended to satisfy?



## Identify the Constraints

As the mission of the design is being developed, any number of design constraints may be identified. Examples of constraints might include physical limitations such as maximum allowable draft or beam.



## Develop the Economic Model

The design must serve the mission and do so in a manner that meets the requirements of the overall economic model. Factors to consider include costs – capital, operational – reliability, etc.

# Sources of Requirements on Marine Platform Design, Construction, and Operation

Owner

Classification Societies

Regulatory Bodies

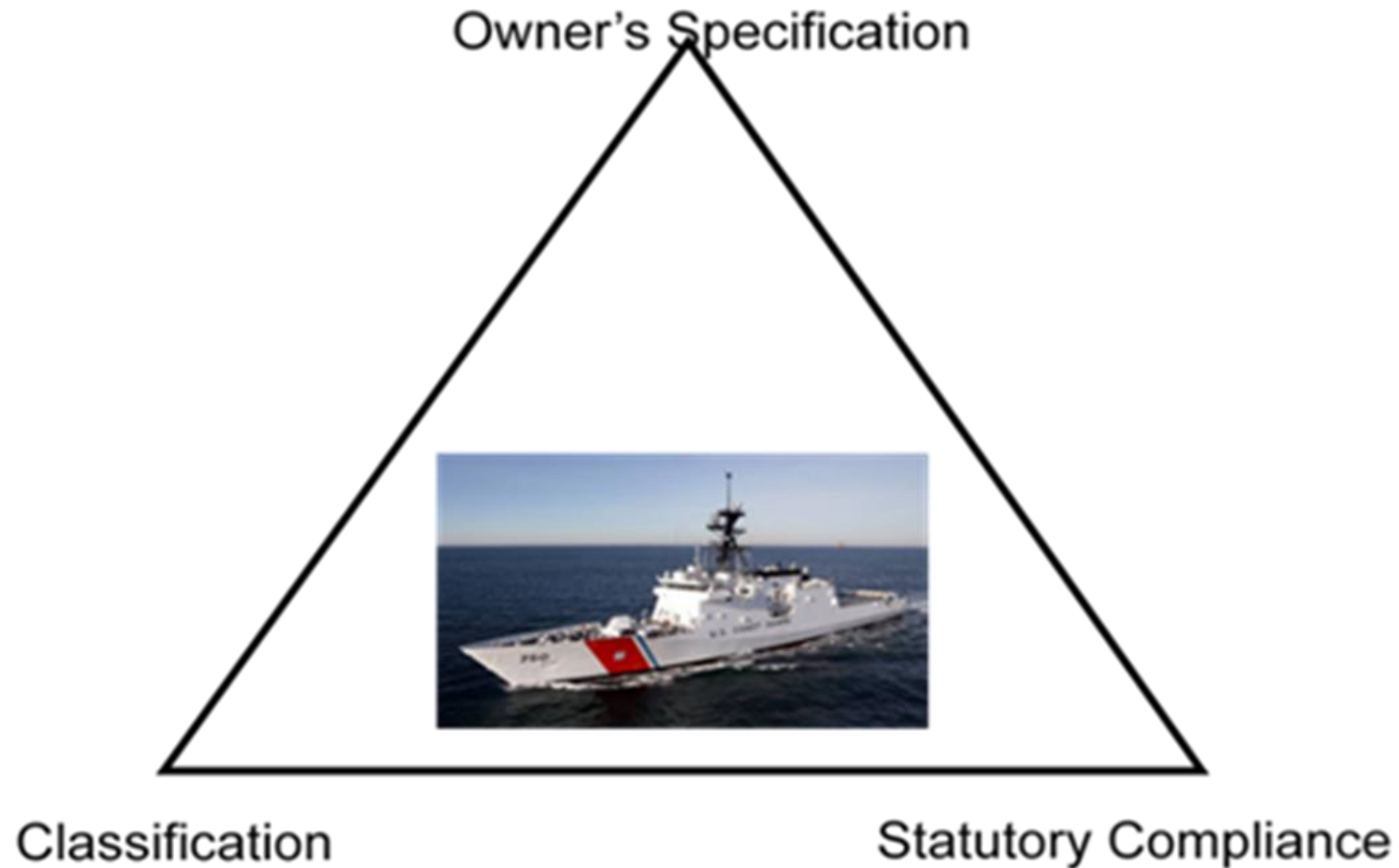
- International
- Flag State
- Port State

Industry Groups – e.g., Oil Companies International Marine Forum (OCIMF)

Charterers

Financial Institutions – Banks, Investors, Insurance Providers

# The Ship Design Triangle



# The parties involved in the activities of the IMO

## Member States

- 176 nations

## Intergovernmental Organizations

- Observer Status
- 66 organizations
- Examples
  - European Commission (EC)
  - Organization for Economic Cooperation and Development (OECD)

## International Non-governmental Organizations (NGO)

- Consultive Status
- 89 Organizations
- Examples
  - Cruise Lines International Association (CLIA)
  - Environmental Defense Fund (EDF)

# The structure of the IMO

## Assembly

- Made up of all member states
- Highest governing body

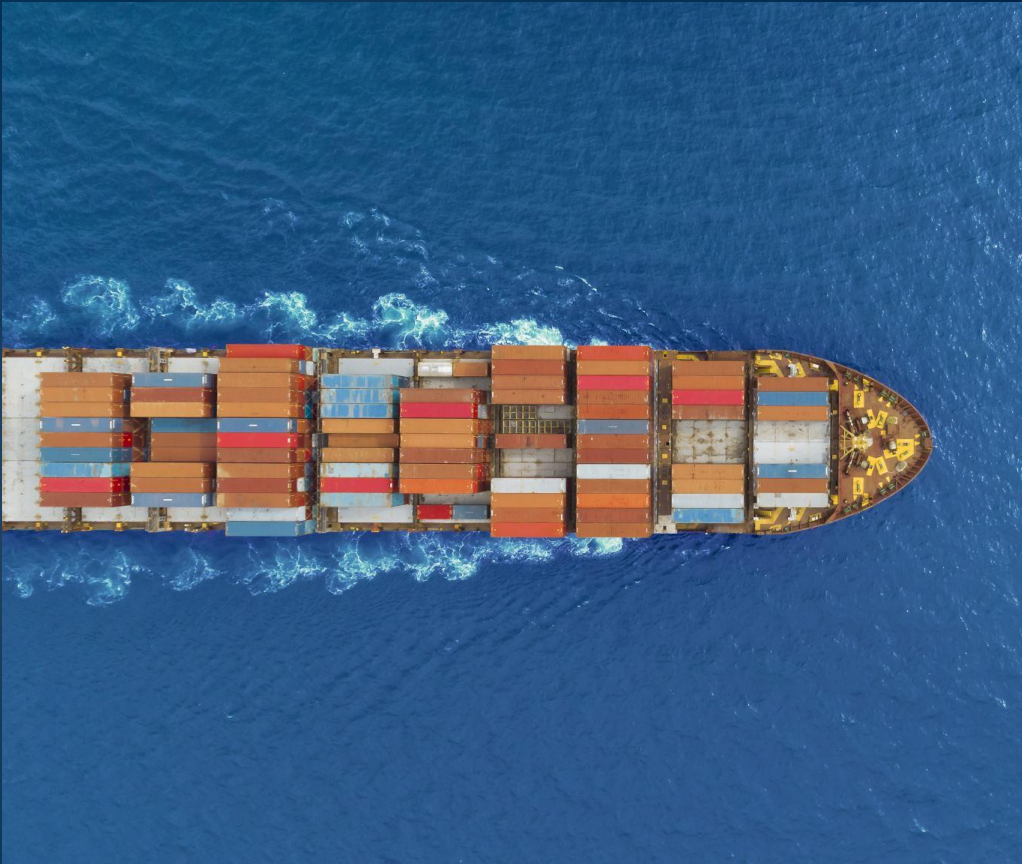
## Council

- Elected by the Assembly
- Acts as the executive organ of the organization

## Committees

- Maritime Safety Committee (MSC)
- Marine Environment Protection Committee (MEPC)
- Legal Committee
- Technical Cooperation Committee
- Facilitation Committee

# Marine Safety Committee (MSC) Subcommittees



- Carriage of Cargoes and Containers (CCC)
- Ship Design and Construction (SDC)
- Implementation of IMO Instruments (III)
- Navigation, Communications and Search and Rescue (NCSR)
- Human Element, Training and Watchkeeping (HTW)
- Ship Systems and Equipment (SSE)
- Pollution Prevention and Response (PPR)



# IMO Regulations and Guidance

## Conventions

- Internationally developed treaties that are binding to all signatory nations

## Codes

- A description of the standard international approach for complying with an aspect of the requirements of the IMO Conventions
- Explicitly states the detailed requirements of aspects of an IMO Convention

## Resolutions

- Mandatory requirements not yet incorporated into a Convention or Code

## Circulars

- Guidance developed by IMO as a recommendatory

## Consensus Standards

- Recognized industry standards such as Class or ISO adopted as either mandatory or recommendatory

# IMO Conventions - examples

Abbreviation	Convention	Year of Adoption
SOLAS	International Convention for the Safety of Life at Sea	1974 as amended
MARPOL	International Convention for the Prevention of Pollution from Ships	1973 (1978, 1997)
STCW	International Convention on Standards of Training Certification and Watchkeeping for Seafarers (and Manila Amendments)	1995
LL	International Convention on Load Lines	1966
TONNAGE	International Convention of Tonnage Measurements of Ships	1969
COLREG	Convention on the International Regulations for Preventing Collisions at Sea	1972
AFS	International Convention on the Control of Harmful Anti-fouling Systems on Ship	2001
BWM	International Convention for the Control and Management of Ship's Ballast Water and Sediments	2004

# MSC – International Convention for the Safety of Life at Sea (SOLAS)

Chapter	Title
I	General Provisions
II-1	Construction – structure, subdivision and stability, machinery, and electrical installations
II-2	Construction – fire protection, fire detection, and fire extinction
III	Life-saving appliances and arrangements
IV	Radiocommunications
V	Safety of navigation
VI	Carriage of cargoes
VII	Carriage of dangerous goods
VIII	Nuclear Ships
IX	Management for the safe operation of ships

# MSC – International Convention for the Safety of Life at Sea (SOLAS)

Chapter	Title
X	Safety measures for high-speed craft
XI-1	Special measures to enhance maritime safety
XI-2	Special measures to enhance maritime security
XII	Additional safety measures for bulk carriers
XIII	Verification of compliance
XIV	Safety measures for ships operating in polar waters
-	Amendments

# MEPC – International Convention for the Prevention of Pollution from Ships (MARPOL)

Section	Title
General	<ul style="list-style-type: none"><li>• International Convention for the Prevention of Pollution from Ships, 1973</li><li>• Protocol of 1978</li><li>• Protocol I: Provisions concerning reports on incidents involving harmful substances</li><li>• Protocol II: Arbitration</li><li>• Protocol of 1997</li></ul>
Annex I	Regulations for the prevention of pollution by oil
Annex II	Regulations for the prevention of pollution by noxious liquid substances in bulk
Annex III	Prevention of pollution by harmful substances carried by sea in packaged form
Annex IV	Prevention of pollution by sewage from ships
Annex V	Prevention of pollution by garbage from ships
Annex VI	Prevention of air pollution by ships

# IMO Codes - examples

Abbreviation	Convention
IS	International Code on Intact Stability
HSC	International Code of Safety for High-Speed Craft
SPS	Code of Safety for Special Purpose Ships
MODU	Code for the Construction and Equipment of Mobile Offshore Drilling Units
FSS	International Code for Fire Safety Systems
LSA	International Life Saving Appliance Code
IMDG	International Code for the Maritime Transport of Dangerous Goods in Packaged Form
IBC	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
GC	Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
INF	International Code for the Safe Carriage of Packages Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships

# Administration and Enforcement of IMO Regulations



The IMO has no enforcement powers of its own



IMO member states national regulations must meet or exceed IMO regulations



Flag states are responsible for verifying that registered ships meet the IMO regulations

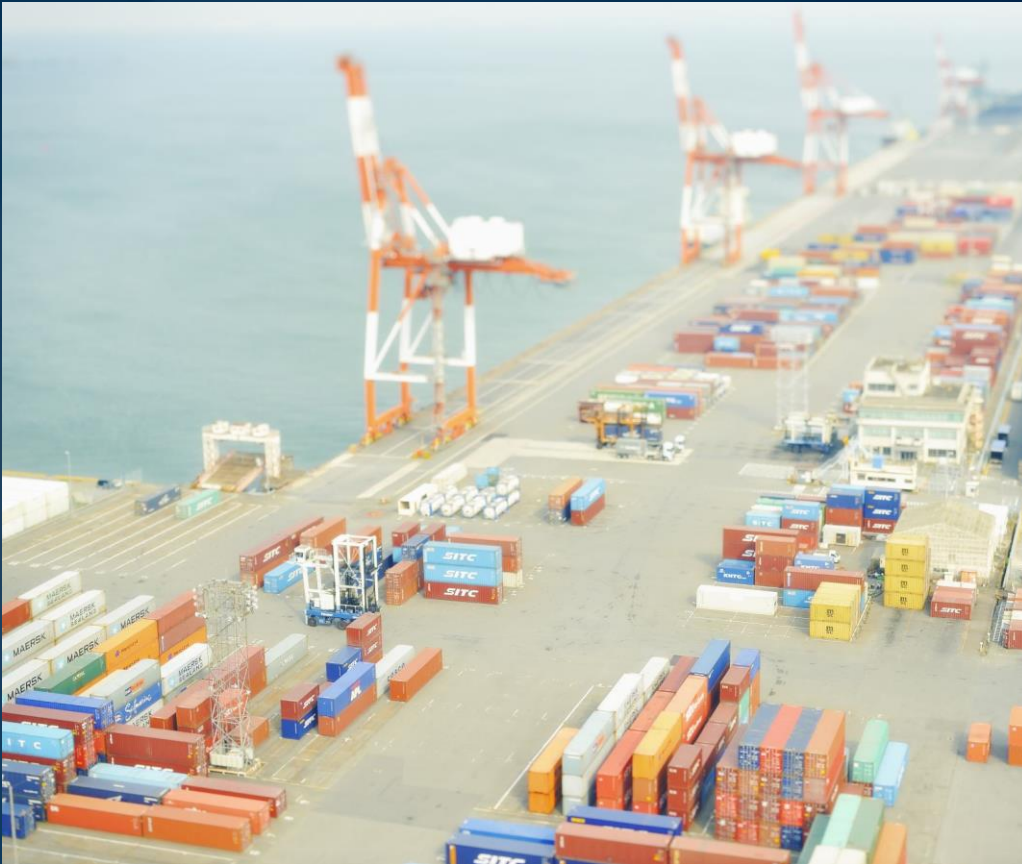
During design phase  
During construction phase  
During operational phase



Port states may verify vessels are operated and maintained in accordance with IMO requirements

Vessels not in compliance with IMO regulations may be detained or banned from territorial waters until corrective actions are taken and verified

# Port States



- The nation that controls a port that an internationally trading ship calls
- Example - When a Panamanian registered ship calls the port of Baltimore, the port state is the United States
- Port States have the right to inspect foreign ships in its ports to
  - Verify that the condition of a ship and its equipment complies with international regulations
  - Verify that a ship is operated and manned in accordance with international regulations
- Inspection schemes fall under the direction of Port State Control Agreements, regional examples include
  - Europe and North Atlantic - Paris MOU
  - Asia and the Pacific - Tokyo MOU
  - Mediterranean - Mediterranean MOU
  - United States - United States Coast Guard



# Flag states

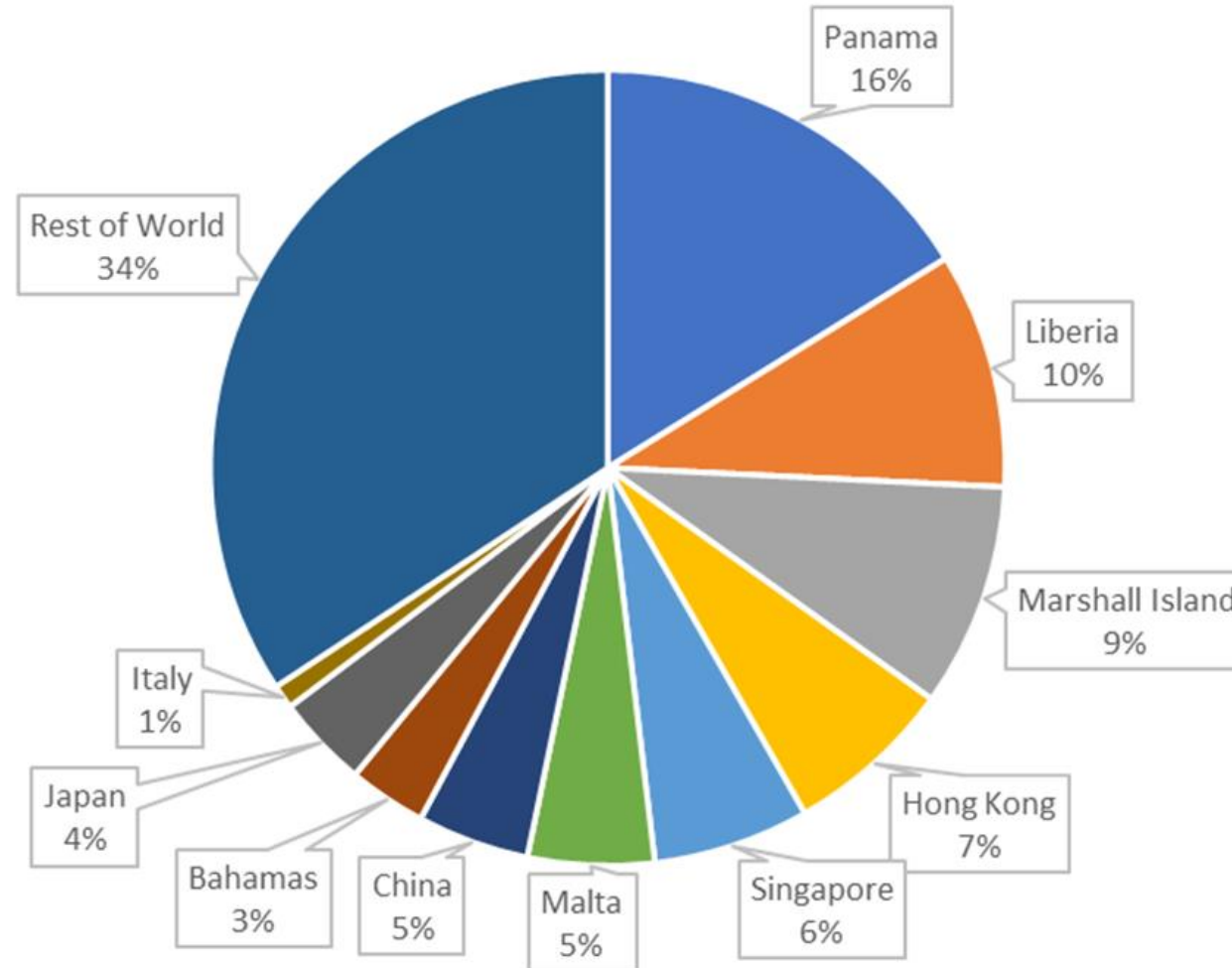


- A nation where a commercial enterprise registers its merchant ships and marine platforms
  - Owners may not need to be citizens in the country where the ship is registered
- Sets the conditions for registration
  - Ownership structure and requirements for the ship
  - Assessment of taxes and fees
  - Manning of asset
  - Design, construction, and operational requirements
  - Inspection regimen
- Member state of the IMO

# Flag State Responsibilities

Maintaining	Maintaining a list of ships registered with the nation
Developing and enforcing	Developing and enforcing maritime regulations
Determining and documenting	Determining and documenting the tonnage of registered ships
Conducting	Conducting regular inspections of ships
Issuing	Issuing required certificates for ships
Participating	Participating in the International Maritime Organization (IMO)
Following	Following applicable international agreements
Regulating	Regulating domestic shipping

# Ten Largest Flag States by Fleet Size by Gross Tonnage (GT) (2020)



Source: [www.unctad.org](http://www.unctad.org)

# United States of America as a Flag State

- The US is a member state of the IMO
- US regulations relating to US flag shipping reflect the IMO Conventions, Codes, and Resolutions
- Certain US regulations exceed the requirements set by the IMO
- Marine safety and environmental protection regulations are contained in the Code of Federal Regulations(CFR)
  - Title 46, Shipping
  - Title 33, Navigation and Navigable Waters
- The roles and duties of the flag state fall to the US Coast Guard (USCG)
- The USCG collaborates with Classification Societies acting as Recognized Organizations (RO) to carry out certain regulatory tasks

# US CFR Title 46 - Shipping

Part	Subject
A	Procedures Applicable to the Public
B	Merchant Marine Officers and Seamen
C	Uninspected Vessels
D	Tank Vessels
E	Load Lines
F	Marine Engineering
G	Documentation and Measurement of Vessels
H	Passenger Vessels
I	Cargo and Miscellaneous Vessels
J	Electrical Engineering
K	Small Passenger Vessels carrying more than 150 Passengers or with Overnight Accommodations for More Than 49 Passengers

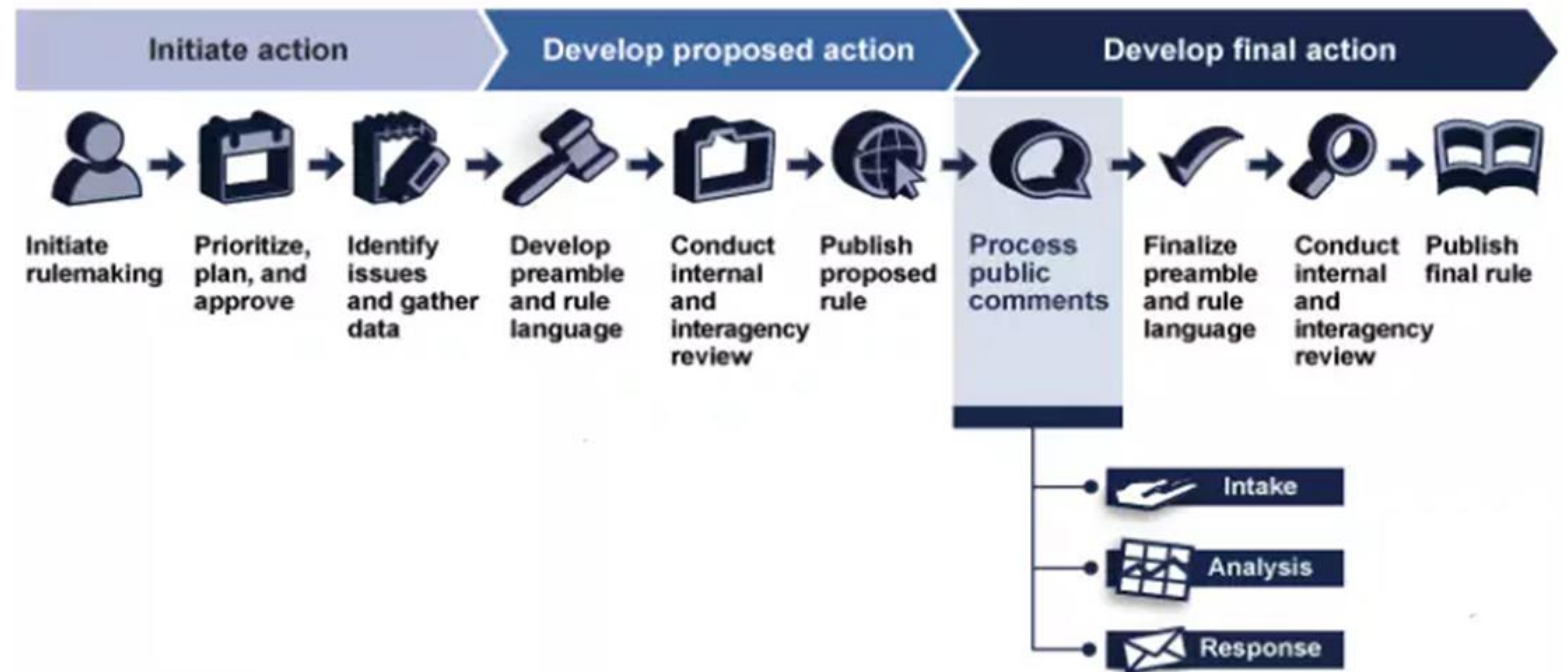
Part	Subject
L	Offshore Supply Vessels
M	Towing Vessels
N	Dangerous Cargoes
O	Certain Bulk Dangerous Cargoes
Q	Equipment, Construction, and Materials: Specifications and Approval
R	Nautical Schools
S	Subdivision and Stability
T	Small Passenger Vessels (Under 100 GT)
U	Oceanographic Research Vessels
V	Marine Occupational Safety and Health Standards
W	Lifesaving Appliances and Arrangements



# How US Regulations are Created

The process for creating federal regulations generally has three main phases: initiating rulemaking actions, developing proposed rules, and developing final rules. In practice, however, this process is often complex, requiring regulatory analysis, internal and interagency reviews, and opportunities for public comments.

[gao.gov](http://gao.gov)



Source: GAO. | GAO-20-383R



# U.S. Regulatory Agencies in Ship Design, Construction, and Operation of US Flag Ships



- United States Coast Guard (USCG)
- United States Environmental Protection Agency (EPA)
- United States Federal Communications Commission (FCC)
- United States Maritime Administration (MARAD)
- United States Public Health Service (USPHS)
- Occupational Safety and Health Administration (OSHA)

# USCG Shipping Regulations and Guidance



## Regulations

Code of Federal Regulations  
46 CFR and 33 CFR



## Policy

Navigation and Vessel Inspection  
Circulars – NVIC  
Policy File Memorandum – PFM  
Marine Safety Center Technical  
Note – MTN



## Consensus Standards

Recognized industry standards  
adopted as mandatory

- Class Society Rules
- ASTM Standards
- Etc.



# USCG Director of Commercial Regulations and Standards

- “develops national regulations, standards, and policies to enhance maritime safety, security, and stewardship; develops and executes an engagement plan for international standards development; and administers a technical compliance program to ensure uniform application of design and operating standards on commercial vessels.” - [www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-Standards-CG-5PS](http://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-Standards-CG-5PS)
- Areas of Expertise
  - Design and Engineering Standards
  - Operating and Environmental Standards
  - Standards Evaluation and Development

# USCG Office of Design and Engineering Standards

- “Responsible for developing and promulgating national regulations and standards that govern the safe design and construction of ships and shipboard equipment.” - [www.dco.uscg.mil/CG-ENG](http://www.dco.uscg.mil/CG-ENG)
- Technical Divisions
  - Naval Architecture – stability, structures, and load lines
  - Systems Engineering – marine electrical and mechanical systems, equipment approvals
  - Lifesaving and Fire Safety Division – lifesaving and fire safety standards and regulations, equipment approvals
  - Hazardous Materials Division – transportation, storage, and handling of hazardous materials in the marine environment

# USCG Office of Operating and Environmental Standards

- “Develops standards regulating maritime industry through international treaties and U.S. statutes, regulations, and policy” - [www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-standards-CG-5PS/office-oes](http://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-standards-CG-5PS/office-oes)
- Divisions
  - Vessel and Facility Operating Standards
  - Environmental Standards



# USCG Office of Standards Evaluation and Development

- “provides project management and economic and environmental analytical services in coordination with other RDP partners to support Coast Guard program offices responsible for overseeing regulations.” - [www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-standards-CG-5PS/office-reg](http://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-standards-CG-5PS/office-reg)
- Divisions
  - Standards Evaluation and Analysis
  - Project Management

# USCG Marine Safety Center

- “supports the people and objectives of the Marine Safety, Security, and Environmental Protection programs through the verification of compliance with technical standards for the design, construction, alteration, and repair of commercial vessels.” – [www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-Standards-CG-5PS/Marine-Safety-Center-CG-MSC](http://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-Standards-CG-5PS/Marine-Safety-Center-CG-MSC)
- Reviews and approves plans for the design, construction, alteration, and repair of US flag and certain foreign flag commercial vessels subject to US and international laws, regulations, and standards.
- Divisions
  - Hull Division – general arrangements, structures, stability, and structural fire protection
  - Engineering Division – machinery, electrical, and control systems and components
  - Tank Vessel/Offshore Division – tankship-specific requirements
  - Tonnage Division – gross and net tonnage admeasurement
  - Vessel Security Division – vessel security plans
- Produces Plan Review Guidance (PRG) documents that specify the nature and requirements of specific design reviews
  - Example – C1-24 Oil and Chemical Tankship Structures

# US Flag, ABS Classed Tanker Example – US Code of Federal Regulations

## Title 46, Shipping - Parts 1-199

Tank Vessels (30-40) – Structures, Systems, Equipment

Load Lines (41-17)

Marine Engineering (50-64)

Documentation and Measurement of Vessels (66-69)

Electrical Engineering (110-113)

Equipment, Construction, and Materials: Specification and Approval (156-165)

Subdivision and Stability (170-174)

Lifesaving Appliances and Arrangements (199)



# US Flag, ABS Classed Tanker Example – US Code of Federal Regulations

## Title 33, Navigation and Navigable Waters - Parts 151-159 and 164

Pollution Prevention (151-159)

Navigation Safety (164)

***Note that as the United States of America is a member state of the International Maritime Organization (IMO), ocean-going ships trading internationally that meet US Flag regulations also satisfy all IMO's international regulations.***



# Classification

***Classification Societies are non-governmental organizations that serve the marine industry by promoting safety, protection of the environment, and protection of property. This promotion is achieved through the development, verification, and maintenance of rules for the design, construction, and maintenance of ships and other marine-related assets. Ship owners select the classification society that they wish to work with. Once selected, the classification society is involved throughout the vessel's design, construction, and operational life. By selecting a classification society, the shipowner agrees to the society's rules and verification systems.***



# US Flag, ABS Classed Tanker Example – ABS Class Rules

## ABS Rules for Building and Classing Marine Vessels

Part 1 – Conditions of Classification

Part 2 – Materials and Welding

Part 3 – Hull Construction and Equipment

Part 4 – Vessel Systems and Machinery

Part 5A – Common Structural Rules for Bulk Carriers and Oil Tankers

Part 5C, Chapter 1 – Vessels Intended to Carry Oil in Bulk (150 meters (492 feet) or more in Length)

Part 5C, Chapter 13 – Vessels Using Gasses or other Low-Flashpoint Fuels

Part 6, Chapter 3 – Specialized Items and Systems, Exhaust Emission Abatement

# Classification Societies

- Classification societies create and maintain technical standards for commercial marine platforms, including ships and floating structures
- Classification societies are non-governmental organizations
  - They may perform certain regulatory services through agreements with Flag and Port States
- Registering a ship with a specific class society is a voluntary transaction
- However, Flag and Port State regulations require categories of commercial marine platforms to be registered with a recognized classification society
- Classification society activities play a significant role in marine platforms' design, construction, and operational phases

# Classification Societies – IACS Members

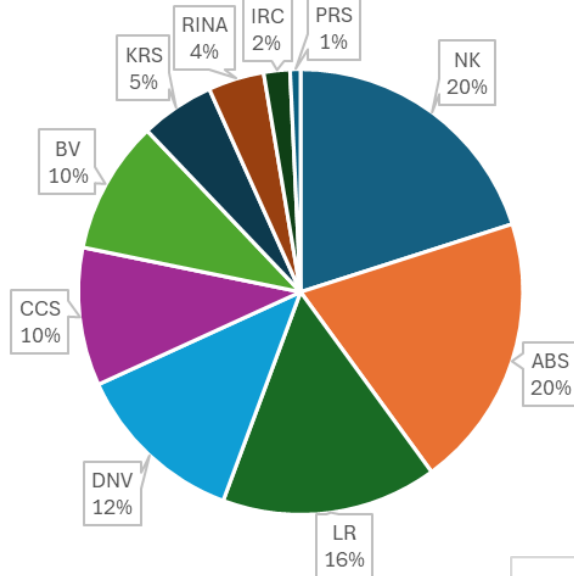
- American Bureau of Shipping (ABS) – <https://www.eagle.org>
- Bureau Veritas (BV) – <https://www.bureauveritas.com>
- China Classification Society (CCS) – <https://www.ccs.org.cn/ccswzen/>
- Croatian Register of Shipping (CRS) - <https://crs.hr/>
- DNV - <https://www.dnv.com/>
- Indian Register of Shipping (IRC) - <https://www.irclass.org>
- Korean Register of Shipping (KRS) - <https://www.krs.co.kr/eng/>
- Lloyds Register (LR) - <https://www.lr.org>
- Nippon Kaiji Kyokai (Class NK ) (NK) - <https://www.classnk.com>
- Polish Register of Shipping (PRS) - <https://www.prs.pl>
- Registro Italiano Naval (RINA) - <https://www.rina.org/en>



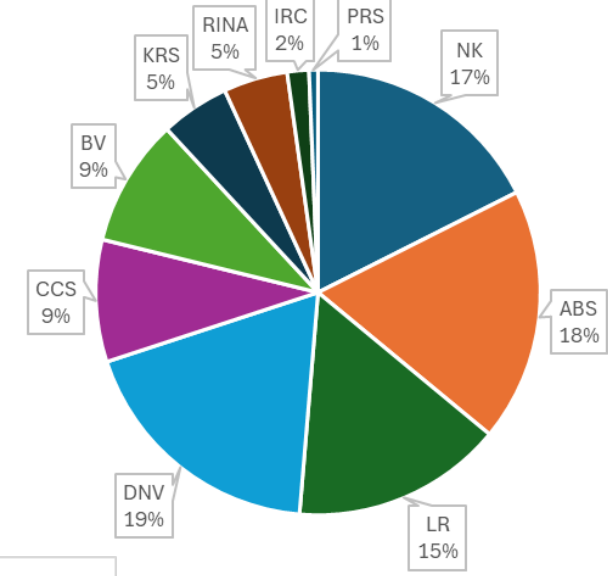
*IACS member societies class over 90% of the world's ships by tonnage.*

# Top 10 Classification Societies 2023

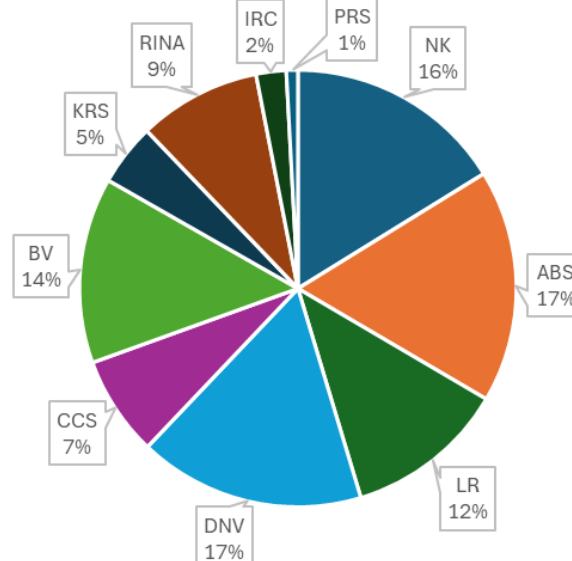
Top 10 Classification Societies by Deadweight



Top 10 Classification Societies by Gross Tonnage



Top 10 Classification Societies by Number of Vessels



Source:

<https://www.lloydlist.com/LL1146894/Top-10-classification-societies-2023>

*The percent values shown are based on the amount classed with the individual class society relative to the total amount classed with the top 10 class societies.*



# Classification Society Rules

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Classification societies develop standards that are called class rules

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Class rules are based on knowledge, research, and industry experience

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Registration with the society requires that the rules be met and verified through plan reviews, physical inspections called surveys, and audits

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Class rules incorporate many other organizations' standards by reference

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Portions of class rules parallel and expand upon flag state and international maritime regulations

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Specific class rules can be prescriptive or performance-based

# Classification Society Rules

- Class Guides are issued to introduce newly implemented classification requirements and act as preliminary rules
- Class Guidance Notes are issued as non-binding guidance providing information about industry best practices and knowledge
- There is a formal process for creating new or altering existing class Rules, Guides, and Guidance Notes

# Classification Rules – Conformity Assurance



## Plan Reviews

Technical review of design plans, calculations, and documentation for a new vessel or vessel modifications

Verifies design complies with the governing Rules



## Type Approval

A voluntary program that allows qualified manufacturers to benefit from having their products pre-certified for use in the marine and offshore sectors

Requires an engineering assessment of the product's design

Requires an assessment of the vendor's manufacturing and quality control processes

Satisfies certification requirements of flag states – US and EU



## Surveys

Physical inspections of the ship by a certified classification society surveyor

Carried out during construction and operational phases of the ship's life

Verifies that the ship as built, maintained, and operated meets the relevant Rule requirements and regulations



## Audits

Independent evidence-based review of an organization's practices and procedures

Verifies that the ship or facility and supporting organizations are operated per Rules, regulations, and internal policies and procedures

# Rule Development/Revision – ABS Process



Proposed Rule Changes (PRC) may be initiated by anyone in the organization – staff, industry, committee members, etc.



Formal Process

Inception to completion takes approximately 1.25 years  
Includes seven separate reviews  
A PRC can be modified or withdrawn at any stage of the review process



Final review and approval provided by the Rules Committee



# Sources of Proposed Rule Changes

- Feedback from the service history of the ABS fleet
- ABS research and development initiatives
- National and international regulatory activities
- IACS Panels and Working Groups
- Professional Technical Societies
- Industry Groups
- Casualty Reports

# Examples of Requirements/Recommendations from Charters and Industry Groups

## Oil Companies International Marine Forum (OCIMF) –

[www.ocimf.org](http://www.ocimf.org)

- Mooring Equipment Guidelines
- Recommendations for Liquefied Gas Carrier Manifolds
- Recommendations for Oil and Chemical Tanker Manifolds and Associated Equipment
- International Safety Guide for Oil Tankers and Terminals

## Tanker Structure Cooperative Forum (TSCF) –

[www.tscforum.org](http://www.tscforum.org)

- Guidance Manual for Tanker Structures

# Additional Standards Generating Industry

- American Boat & Yacht Council (ABYC) – [www.abycinc.org](http://www.abycinc.org)
- Society of International Gas Tanker and Terminal Operators (SIGTTO) - [www.sigtto.org](http://www.sigtto.org)
- Society of Naval Architects and Marine Engineers (SNAME) – [www.sname.org](http://www.sname.org)

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