The U.S. Commercial Maritime Industry

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The U.S. Commercial Maritime Industry

- The U.S. Maritime Industry is an essential part of the nation's economy, which is responsible for the transportation of 40% of the goods imported and exported by value, as well as the production of a large amount of electricity and energy resources.
- The U.S. Commercial Maritime Industry is made up of many sub-sectors including:
  - U.S.-flag vessels engaged in domestic trade
  - U.S.-flag vessels engaged in international trade
  - Offshore industries including offshore wind as well as offshore oil and gas
  - Port and infrastructure facilities necessary for receiving, loading and unloading, fueling, and supplying vessels
  - Shipbuilding and repair facilities
  - Other supporting industries

The Jones Act

- The Jones Act is a federal law which is one of the most influential for the U.S. maritime industry.
- Requirements include that goods transported between U.S. ports (referred to as cabotage) are transported aboard vessels that fit this criteria:
  - The vessel must be owned by a U.S. based company with 75% U.S. citizen ownership.
  - The crew must have U.S. persons making up its majority.
  - The vessel must have been built and registered in the U.S.
- The Jones Act was introduced as part of the Merchant Marine Act of 1920, to ensure the availability and readiness of trained merchant sailors and cargo vessels without relying on foreign countries, as well as stimulate U.S. shipbuilding.

The U.S.-Flag Domestic Trading Fleet

- The U.S.-Flag domestic trading fleet sails within the United States through rivers, canals, lakes, intracoastal waterways, and oceans along the coasts or separating U.S. ports.
- There are approximately 41,000 vessels making up the domestic trading fleet, the majority of these being tugs and barges. The rest are made up of offshore supply vessels, ferries, dredges, and approximately 100 large ocean-sailing cargo ships.

The U.S.-Flag International Trading Fleet

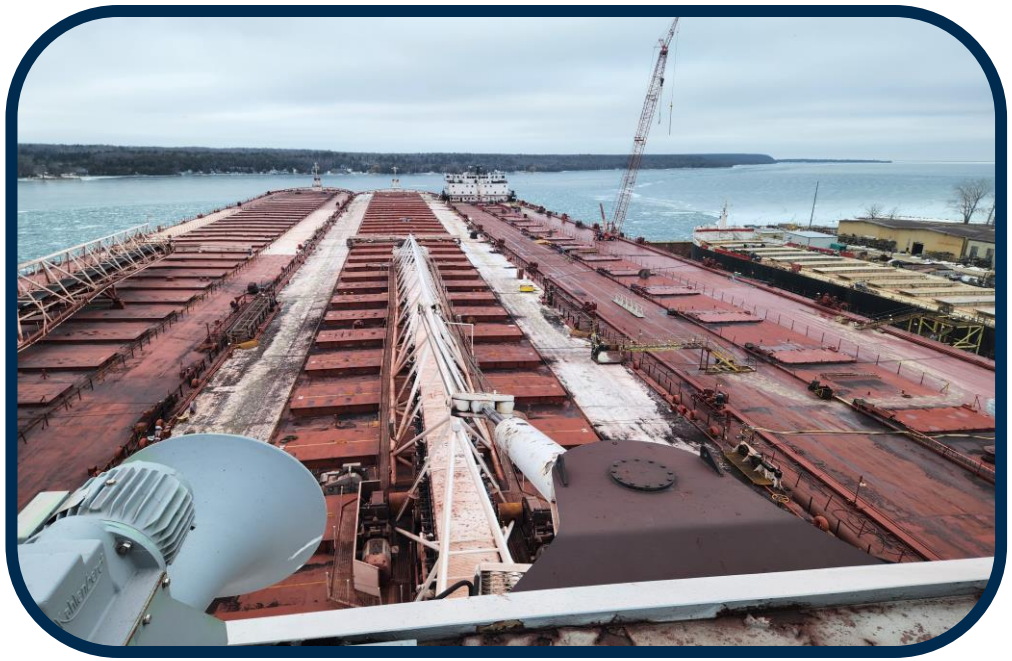
- U.S.-flag vessels engaged in international trade transport goods which in 2016 accounted for 1.5% of U.S. waterborne imports and exports.
- The majority of these vessels transport military and other government-owned or impelled cargo, as cargo preference laws in place require U.S.-flag vessels to transport a significant portion of these goods.
- There are approximately 80 large vessels engaging in international trade.

Inland Waterways

Source: U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels (army.mil)

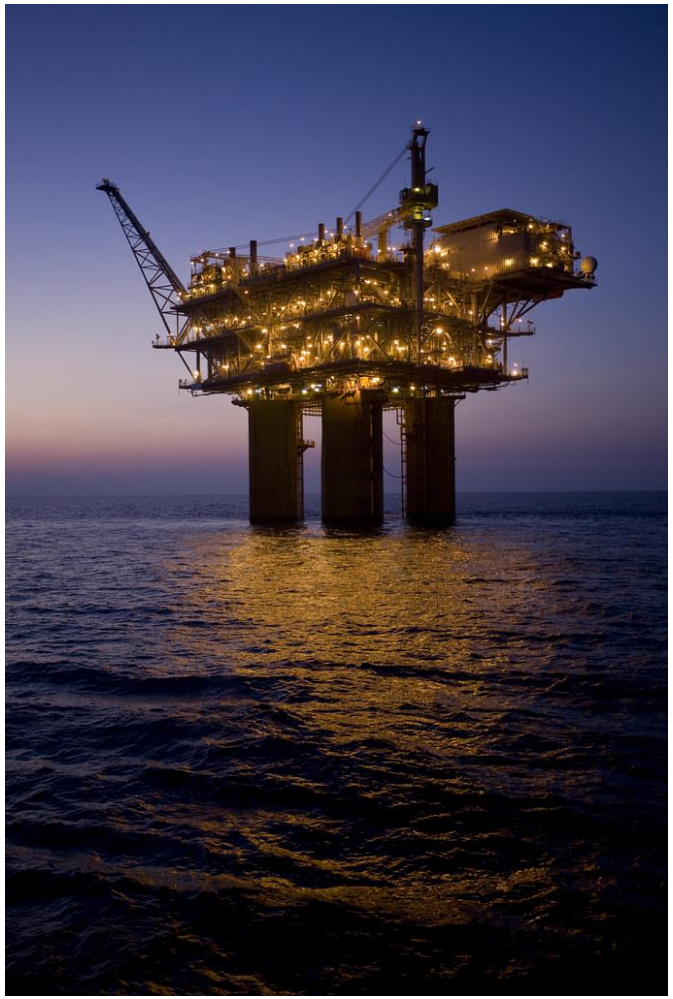
- The U.S. contains over 25,000 miles of navigable waters, including rivers, canals, and intracoastal waterways. The majority of these are in the eastern part of the country, containing the Mississippi river and other connecting waterways such as tributary rivers and the Gulf intracoastal waterway.
- Transportation of goods is often done by “tows” which are barges lashed together that are then pushed by a tug. Depending on the specific waterway, tows can consist of up to 40 barges, providing a high level of efficiency.
- Vessels operating in the inland waters of the U.S. must follow the Inland Rules. These Rules serve as “rules of the road” and indicate things such as right of way, vessel movement reporting requirements, light and sound signals, and other requirements to prevent accidents and collisions.

Lakes Freighters



- The U.S. fleet of freighters which navigate the great lakes are some of the largest U.S. flag ships engaged in commercial trading.
- These vessels are principally engaged in transporting iron ore, coal, limestone, and cement between ports in the great lakes.
- Due to the presence of fresh water in the great lakes which is not as corrosive as salt water, ships in these waters tend to have longer lifetimes. As of 2024 there are still some large vessels operating which are over 50 years old. This also results in different Classification and Regulatory requirements being applicable to these vessels.

U.S. Offshore Oil and Gas Industry



- The U.S. offshore oil and gas industry consists of many units and facilities including:
  - Offshore drilling units
  - Offshore Production units
  - Subsea pipelines
  - Offshore supply vessels
  - Other vessels engaged in transporting personnel, supplies, and produced commodities to and from offshore facilities.
- The majority of these units and facilities are located in the Gulf of Mexico, where in 2022, offshore oil production accounted for 15% of all U.S. crude oil output. These are located in land leased for drilling and production by the Bureau of Land Management, with several other government bodies regulating the industry.

U.S. Offshore Wind Industry

- Offshore wind power is an industry still in its early stages of development in the United States, with the first commercial offshore windfarm beginning operation in 2016. Offshore wind farms are for the most part being located in leased federal land in the outer continental shelf, in areas with high wind resources in the east coast, west coast, and great lakes.
- Vessels and facilities involved in this industry include:
  - Offshore wind turbines and wind farms
  - Subsea cables and offshore substations
  - Vessels and mobile offshore units engaged in the construction, maintenance, repair, and supply of wind turbines and their related infrastructure.

U.S. Shipyards

- There are many commercial shipyards and shipbuilding facilities located across the west coast, east coast, great lakes, and inland waters of the United States. These shipyards engage in the construction of government vessels as well as commercial U.S. flagged vessels which need to be built in the United States to comply with the Jones Act.
- In 2019, there were 154 private shipyards across the U.S. currently engaged in shipbuilding which directly or indirectly supported 393,390 jobs. Additionally, there were over 300 shipyards engaged in ship repairs but not actively engaged in shipbuilding.

Commercial Ship Specifications

- Technical specifications are important contractual documents describing the characteristics of a new vessel as well as which Rules, standards, and procedures are to be followed during all stages of design and construction.
- These are decided based on the desired purpose of the vessel according to the owner, working with the designer, the shipbuilder, and vendors.
- Technical specifications should be easy to understand, limiting the potential for mistakes or misunderstandings.
- Technical specifications can evolve throughout the design and construction process to factor any changes in scope or processes.

Commercial Ship Specifications

- Technical Specifications may include:
  - Requirements for the dimensions of a ship so that it may be as large as possible while maintaining the ability to transit a specific area such as the Suez or Panama canals.
  - Other particulars of the vessel such as cargo capacity, tonnage, speed, engine and machinery present, and desired accommodation.
  - What class of vessel this will be and which Class Society if any will Class the vessel.
  - What Class Notations the ship will be built to.
  - Which industry standards must be followed during the design and construction process.

Offshore Industry Specifications

- Technical Specifications may include:
  - Requirements for the size of the unit, the depth at which it will operate, and which classification society's rules and notations it will be built to.
  - Weather the unit will be fixed, moored, or positioned utilizing dynamic positioning.
  - That a unit is built to host specific equipment, and its design permits its operation.
  - The type of access there will be to the unit, such as weather a helipad is included aboard.
  - That the unit has the ability and space to host a specific number crew.
  - That the unit is able to endure through its intended lifetime, potentially by including cathodic protection systems.

Small Craft Regulations and Standards

Credit: Unsplash – Nick Fewings

- Small crafts have different definitions depending on the type and regulatory context, but some examples include
  - For National Oceanic Atmospheric Administration Fisheries this is 30 feet or less in length
  - For the US Environmental Protection Agency this is 80 feet or less
  - For International Society of Classification Societies this is less than 65 meters in length for cargo ships and under 90 meters for non-cargo ships
- Under certain sizes, for some types of vessels, there may be fewer existing regulations
- The majority of small vessels are leisure boats and fishing vessels
- As such, most regulations regard aspects for these types of vessels
- These regulations include guidelines to hulls, fishing machinery, and other related equipment

Commercial Maritime Regulations

Code of Federal Regulations

- In the United States, many regulations govern shipbuilding and the maritime industry. Many of these regulations are contained within the Code of Federal Regulations (CFR), which are the regulations promulgated by the departments and agencies of the United States' federal government.
- These regulations apply to vessels sailing under the U.S. flag or operating in U.S. waters.

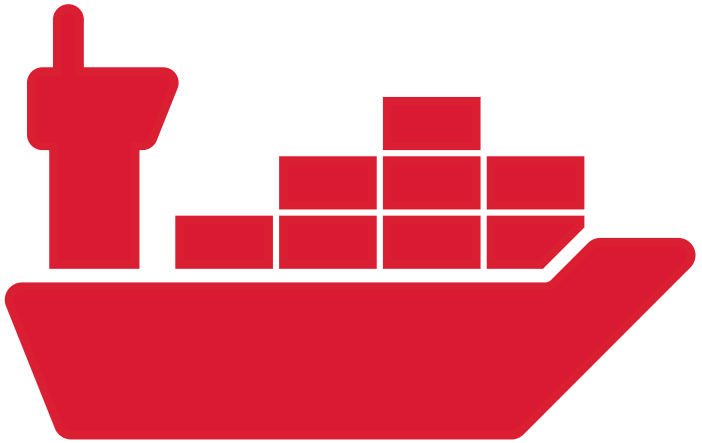
Code of Federal Regulations

The following are some of the CFR titles governing the maritime industry:

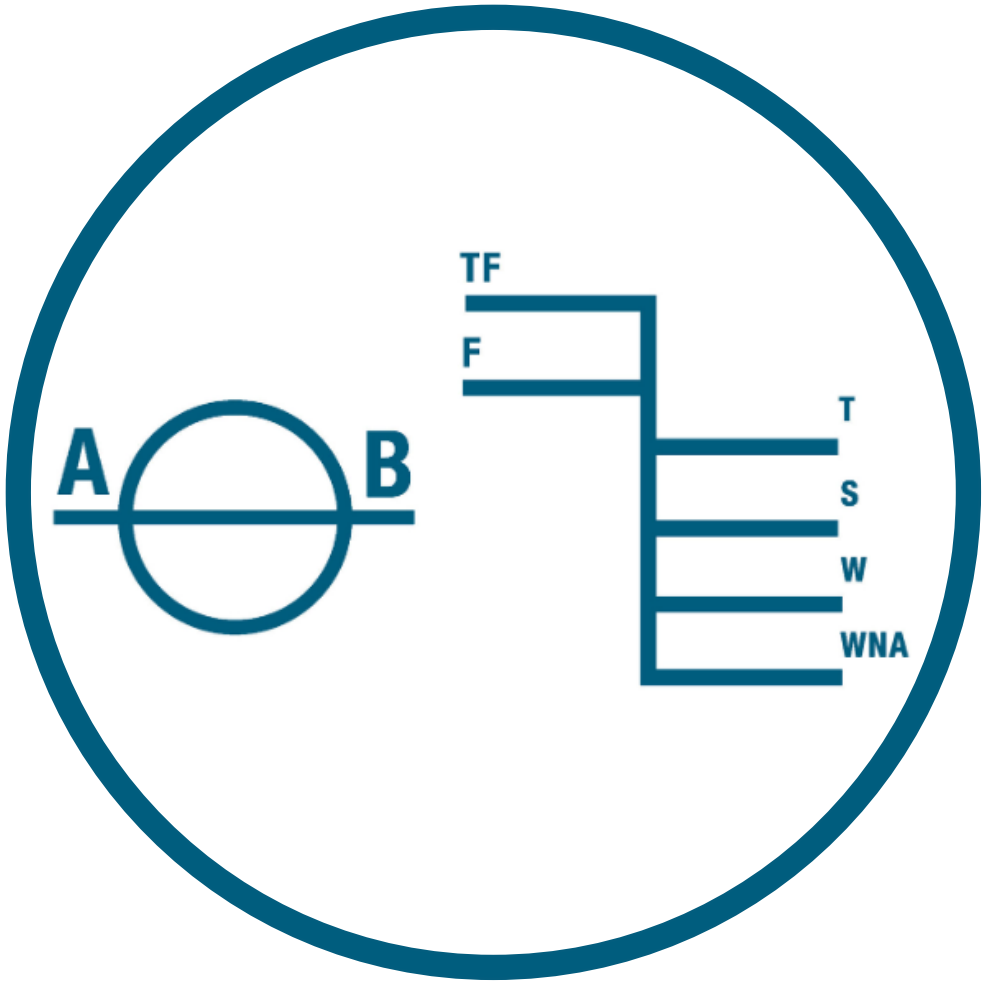
- Title 29 Labor:
  - Governs requirements pertaining to labor, containing unique requirements for the maritime industry.
- Title 33 Navigation & Navigable Waters:
  - Governs navigation within as well as the operation and maintenance of navigable waters in the U.S.
- Title 40 Protection of Environment:
  - Governs requirements pertaining to the environment, which include ocean dumping, energy and toxic substances policies which involve the maritime industry.
- Title 46 Shipping:
  - Governs all the regulatory requirements which ships and barges engaged in shipping must follow in the United States
- Title 49 Transportation:
  - Governs requirements pertaining to transportation, which include among other elements requirements for the maritime transportation of hazardous materials.

CFR Title 46: Shipping

- CFR Title 46 Chapter IV Subchapter B deals with shipping in the foreign commerce
- The primary purpose is to cover the regulations that govern international shipping relative to the USA
- Most importantly, it covers the operator agreements that detail international requirements and tariffs
- This subchapter covers:
  - Licensing and Registration
  - Operator Schedules
  - Financial Responsibilities
  - References to the shipping act of 1984



Load Lines



- The main purpose of load lines is to indicate the nominal legal limit a vessel can be loaded
- The load lines are denoted with a circle with a line crossing through it and the Class letter designation letters on each end
- Alongside the load line is a secondary line that allows for higher or lower water levels relative to the density of the water being passed
- For example, a vessel that passes through both salt and fresh water will have a lower salt line due to the higher density
- The same concept applies for warm and winter conditions
- Load lines are also known as Plimsoll Lines

Regulations in the Offshore Industry

SUBCHAPTER B—OFFSHORE

PART 250—OIL AND GAS AND SULPHUR OPERATIONS IN THE OUTER CONTINENTAL SHELF

Subpart A—General

AUTHORITY AND DEFINITION OF TERMS

Sec.
250.101 Authority and applicability.
250.102 What does this part do?
250.103 Where can I find more information about the requirements in this part?
250.104 How may I appeal a decision made under BSEE regulations?
250.105 Definitions.

PERFORMANCE STANDARDS

250.106 What standards will the Director use to regulate lease operations?
250.107 What must I do to protect health, safety, property, and the environment?
250.108 What requirements must I follow for cranes and other material-handling equipment?
250.109 What documents must I prepare and maintain related to welding?
250.110 What must I include in my welding plan?
250.111 Who oversees operations under my welding plan?
250.112 What standards must my welding equipment meet?
250.113 What procedures must I follow when welding?
250.114 How must I install, maintain, and operate electrical equipment?
250.115 What are the procedures for, and effects of, incorporation of documents by reference in this part?
250.116–250.117 [Reserved]

GAS STORAGE OR INJECTION

INSPECTION OF OPERATIONS

250.130 Why does BSEE conduct inspections?
250.131 Will BSEE notify me before conducting an inspection?
250.132 What must I do when BSEE conducts an inspection?
250.133 Will BSEE reimburse me for my expenses related to inspections?

DISQUALIFICATION

250.135 What will BSEE do if my operating performance is unacceptable?
250.136 How will BSEE determine if my operating performance is unacceptable?

SPECIAL TYPES OF APPROVALS

250.140 When will I receive an oral approval?
250.141 May I ever use alternate procedures or equipment?
250.142 How do I receive approval for departures?
250.143–250.144 [Reserved]
250.145 How do I designate an agent or a local agent?
250.146 Who is responsible for fulfilling leasehold obligations?

NAMING AND IDENTIFYING FACILITIES AND WELLS (DOES NOT INCLUDE MODUS)

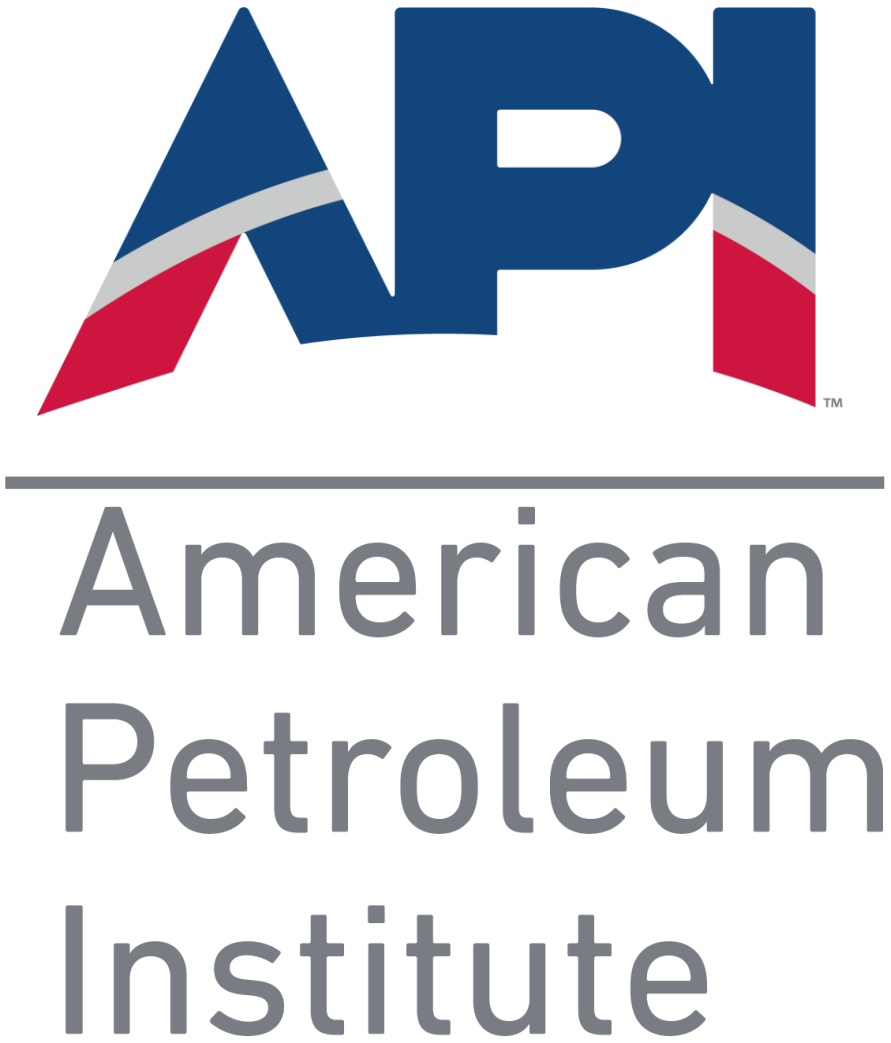
250.150 How do I name facilities and wells in the Gulf of Mexico Region?
250.151 How do I name facilities in the Pacific Region?
250.152 How do I name facilities in the Alaska Region?
250.153 Do I have to rename an existing facility or well?
250.154 What identification signs must I display?
250.160–250.167 [Reserved]

SUSPENSIONS

250.168 May operations or production be suspended?

- There are many applications to the offshore industry:
  - Oil and Gas Drilling
  - Offshore Mining
  - Offshore Wind Farms
- Offshore activities are subject to the jurisdiction where the they occur, up to a certain distance
- In the USA this is everything within the Economic Exclusivity Zone
- To conduct activities in this area, there are certain regulations that must be followed
- A non-exhaustive list includes:
  - 30 CFR Part 250 Subpart D – Oil and Gas Drilling
  - 30 CFR Part 585 – Renewable Energy on the continental shelf
  - 15 CFR Part 971 – Deep Seabed Mining Regulations

Standards Enforced by Regulations



Credit: American Petroleum Institute

- To allow for regulatory standardization, some legislation specifically calls out some organizations
- The American Petroleum Institute (API) is one standardization organization called out in certain CFRs like:
  - 43 CFR Part 3170 Subpart 3174 – Measurement of Oil
- Additionally, there are other regulations that call out Class societies by name (ABS) like:
  - 46 CFR – Shipping
  - 19 CFR Part 115.6 Subpart B – Designated Certifying Authorities
  - 48 CFR Part 3052.2 - Inspection and Manner of Doing Work (USCG)
  - 33 CFR Part 96 – Rules for the Safe Operation of Vessels and Safety Management Systems

USCG Publications

Credit: United States Coast Guard

- Along with regulatory bodies, the United States Coast Guard (USCG), regularly releases guidance for vessel builders, owners, operators, etc. to follow
- The Navigation and Vessel Inspection Circular (NVIC) provides detailed guidance about the enforcement or compliance with a certain Federal marine safety regulations and Coast Guard marine safety programs
- These do not have force of law, but they are important tools for complying with existence law
- These are used internally in the Coast Guard to ensure adequate action by field personnel
- These can cover everything from Ballast Water Management for Control of Non-Indigenous Species in US Water to a Bulk Liquid Cargo Finding Aid

International Regulations

Credit: Jean-Marc Ferré UN Photo/Jean-Marc Ferré

- There are numerous bodies and documents that govern the international regulations for marine shipping
- The highest global authority falls to the International Maritime Organization (IMO)
- From them, we have the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL)
- The individual nation states also set their own regulations that import and export vessels must follow in order to port
- There are additional requirements for vessels who wish to flag with a certain nation
- For the USA, the Flag administrative work falls under the Coast Guard (USCG)

IMO Regulations

Credit: IMO

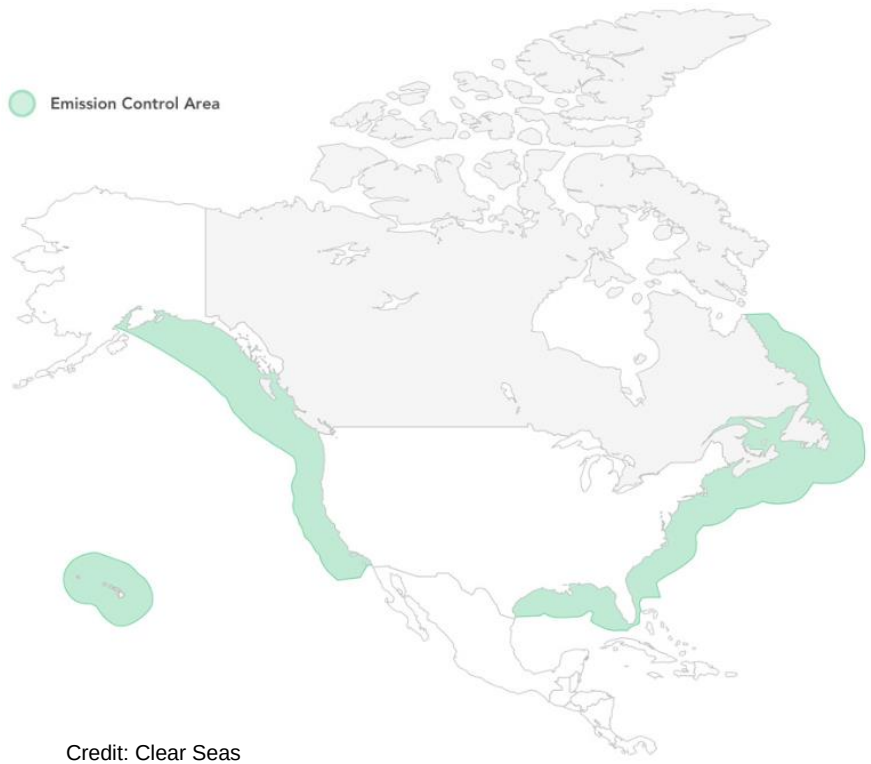
- Alongside Class societies, there is an international shipping regulatory body as part of the United Nations
- The International Maritime Organization (IMO) details guidelines for marine activities
- In their role, they have released important documents for regulation involving:
  - Safety of Life at Sea (SOLAS)
  - Prevention of Pollution of the Marine Environment (MARPOL)
  - 2050 Sustainability Goals
  - International Maritime Dangerous Goods Code (IMDG)
  - Polar Code
  - International Safety Management Code (ISM)
  - International Grain Code

MARPOL

Credit: IMO

- MARPOL is the International Convention for the Prevention of Pollution from Ships
- It is one of the most important international marine environmental conventions
- The US is a signatory to 5/6 parts of the convention
- Compliance has resulted in significant environmental progress for the United States
- It is composed of 6 different annexes
  1. Prevention of pollution by oil & oily water
  2. Control of pollution by noxious liquid substances in bulk
  3. Prevention of pollution by harmful substances carried by sea in packaged form
  4. Pollution by sewage from ships
  5. Pollution by garbage from ships
  6. Prevention of air pollution from ships

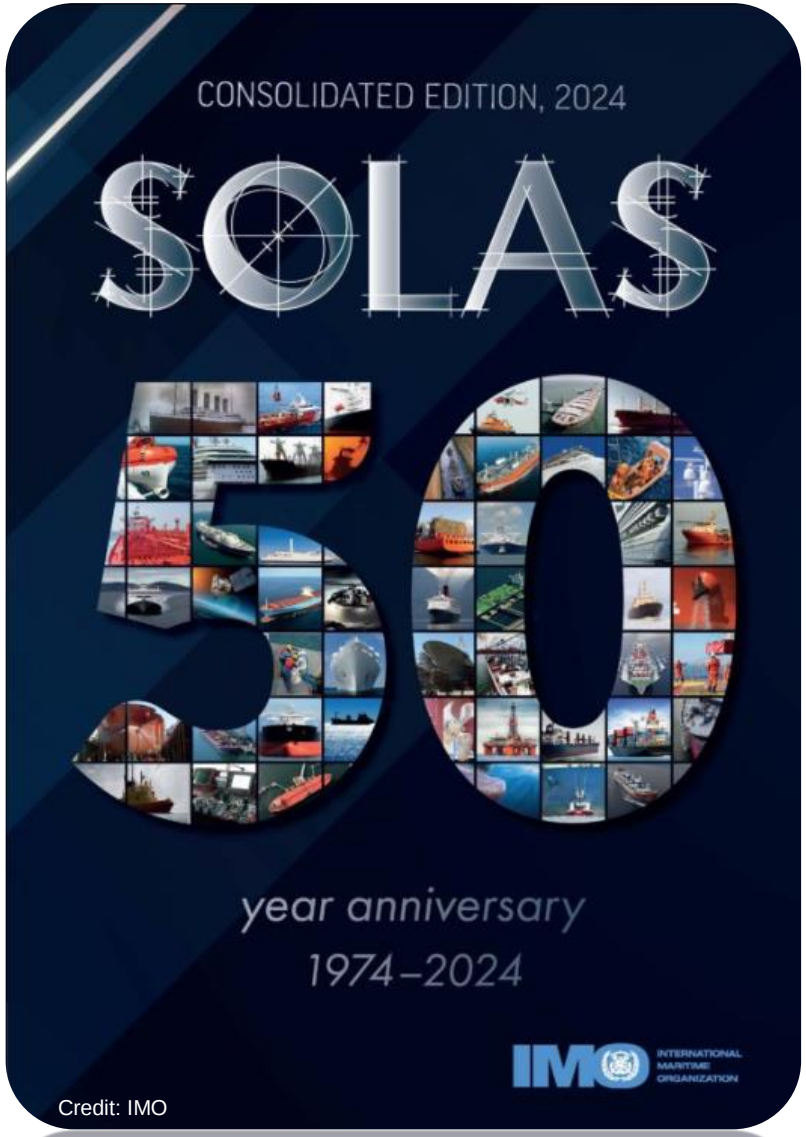
Emission Control Areas



Credit: Clear Seas

- Emission Control Areas (ECAs) are sea areas where strict controls are established to minimize airborne emissions from ships as defined by Annex VI
- These areas specifically restrict emission of Sulfur Oxides, Nitrous Oxides, Ozone Depletion Substances, and Volatile Organic Compounds
- The areas have been established using increasingly stringent requirements over years since its inception
- The areas have helped in the easing of emission growth since put in force
- There are four ECAs:
  1. The Baltic Sea
  2. The North Sea
  3. The North American ECA
  4. The US Caribbean ECA

SOLAS



Credit: IMO

- SOLAS is the International Convention for the Safety of Life at Sea
- The treaty sets out to establish minimum safety standard in the construction, equipment, and operation of commercial vessels
- It consists of 14 chapters that vessels are required to follow by inspection from signatory Flag states:
    1. **Chapter I – General Provisions**
    2. **Chapter II**
        a. **Chapter II-1 – Construction – Subdivision and stability, machinery and electrical installations**
        b. **Chapter II-2 – Fire protection, fire detection and fire extinction**
    3. **Chapter III – Life-saving appliances and arrangements**
    4. **Chapter IV – Radiocommunications**
    5. **Chapter V – Safety of navigation**
    6. **Chapter VI – Carriage of Cargoes**
    7. **Chapter VII – Carriage of dangerous goods**
    8. **Chapter VIII – Nuclear ships**
    9. **Chapter IX – Management for the Safe Operation of Ships**
    10. **Chapter X – Safety measures for high-speed craft**
    11. **Chapter XI**
        a. **Chapter XI-1 – Special measures to enhance maritime Safety**
        b. **Chapter XI-2 – Special measures to enhance maritime security**
    12. **Chapter XII – Additional safety measures for bulk carriers**
    13. **Chapter XIII - Verification of compliance**
    14. **Chapter XIV - Safety measures for ships operating in polar waters**

Regulatory Bodies and Enforcement

Credit: United States Coast Guard

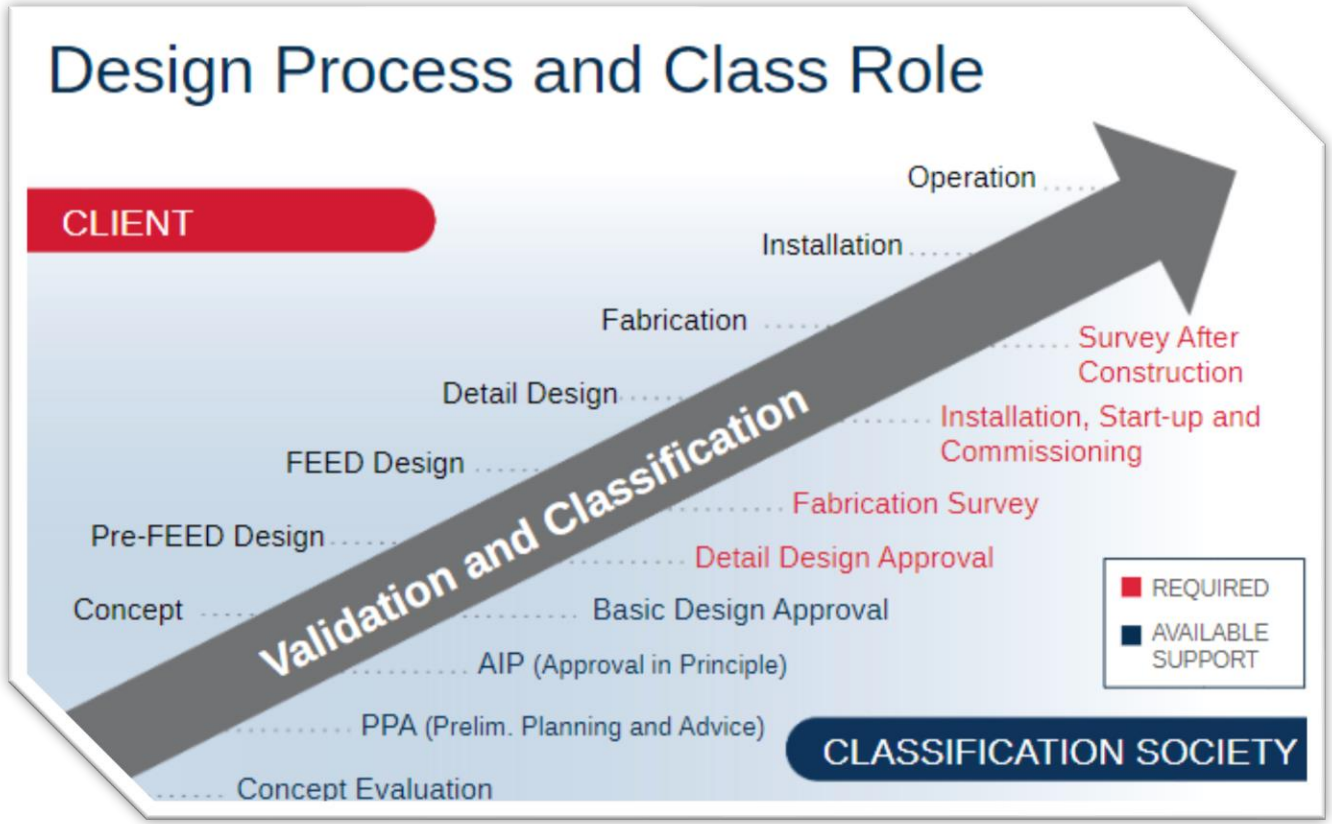
- In the United States, congress and departments in the executive branch are responsible for developing regulation on its waters
- These departments includes, among others:
  - The Environmental Protection Agency
  - The National Oceanic and Atmospheric Administration
  - The State Department
- Enforcement of these regulations falls on the United States Coast Guard
- Additionally, their mission is broken down into three parts:
  - Maritime Safety
  - Maritime Security
  - Maritime Stewardship
- The Coast Guard is separated over 9 divisions across two sectors, Pacific and Atlantic

Ship Classification

Overview of Classification

- Classification is a method of verifying the integrity of the design, construction, and condition of a ship or offshore structure by ensuring its compliance with a set of Rules and guides developed by a Classification Society.
- Classification is different from a certificate as it corresponds to the entire life-cycle of a unit, while a certificate corresponds to a specific moment in time. A vessel or unit is in Class if they are in compliance with the requirements set forth by the Classification Society, and it ceases to be in Class if the Classification Society determines it applicable due to a lack of compliance.
- An illustration of this is that if certification is like a picture, Classification is like a video, ensuring continuous compliance throughout the life of a vessel.

Overview of Classification



- Classing a vessel or offshore unit provides many benefits to groups
- The most pertinent is the compliance to Flag administration standards
- Classing also allows for insurance conformity, assuring coverage and in some cases lower rates
- This also allows for designs to be developed alongside experts in the standards throughout the process
- The society an organization may choose for their processes depends on many factors such as:
  - Location
  - Vessel/Technology Type
  - Previous Class Experience

History of Classification

Credit: Levantine Heritage

- The history of classification societies, and how they began on Lloyd's Coffee house in London.
- Before Class societies, vessel owners would buy old ships in very poor condition, repaint them, and rename them.
- They would insure them for an inflated sum and wait for them to sink .
- Classification was implemented to protect the lives of crews and the property of owners/insurers.

Classification in the United States

- Chartered in 1862, the organization began as the American Shipmaster's Association with a function to certify ship captains for safe ship operations.
- They would later publish their first rules for classing wooden and metallic vessels.
- The organization rebranded to the American Bureau of Shipping in 1898 with a change in focus to the Classification of ships.
- ABS grew modestly until after the second world war, where it saw worldwide expansion.
- To date, they have expanded to the point where they have Classed over 200M tons worldwide.
- Today, ABS works to adapt to a changing climate and is developing new rules to accommodate innovation in these new sectors.

World's Classification Societies

Credit: IACS

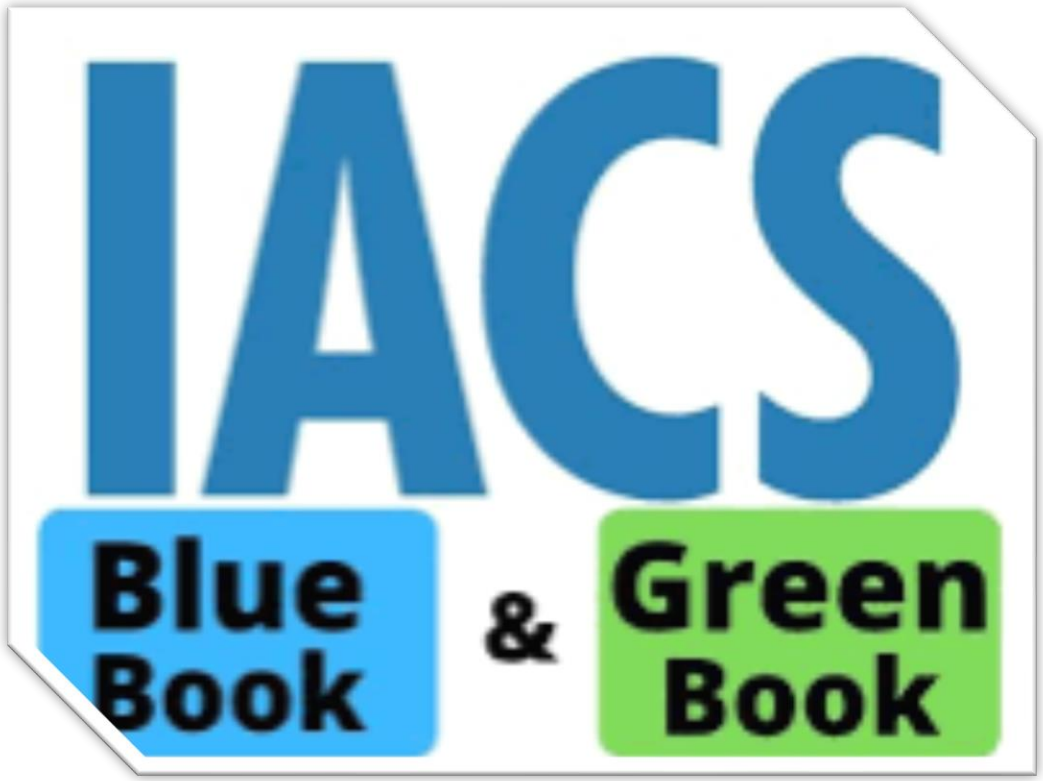
- International shipping is a complex system of engineering, governments, and people.
- It is important that there is an official structure that governs so that systems are run smoothly.
- Classification Societies exist to fulfill this role.
- Certifications from a Class Society allow for assurance of compliance.
- This assurance allows for Flag states to confidently accept vessels from other jurisdictions.
- Additionally, this allows for insurance companies to offer decent rates with a certain degree of confidence.

World's Classification Societies

Credit: IACS

- There are many difference Classification Societies based out of different countries
- To assure a level of standards by the Class Societies, a United Nations organization was set up
- This organization is known as the International Association of Classification Societies (IACS)
- IACS is composed of the world's 11 largest Class Societies:
- Of these, the three largest members are a part:
  - American Bureau of Shipping (ABS)
  - Det Norske Veritas (DNV)
  - Lloyd's Register (LR)

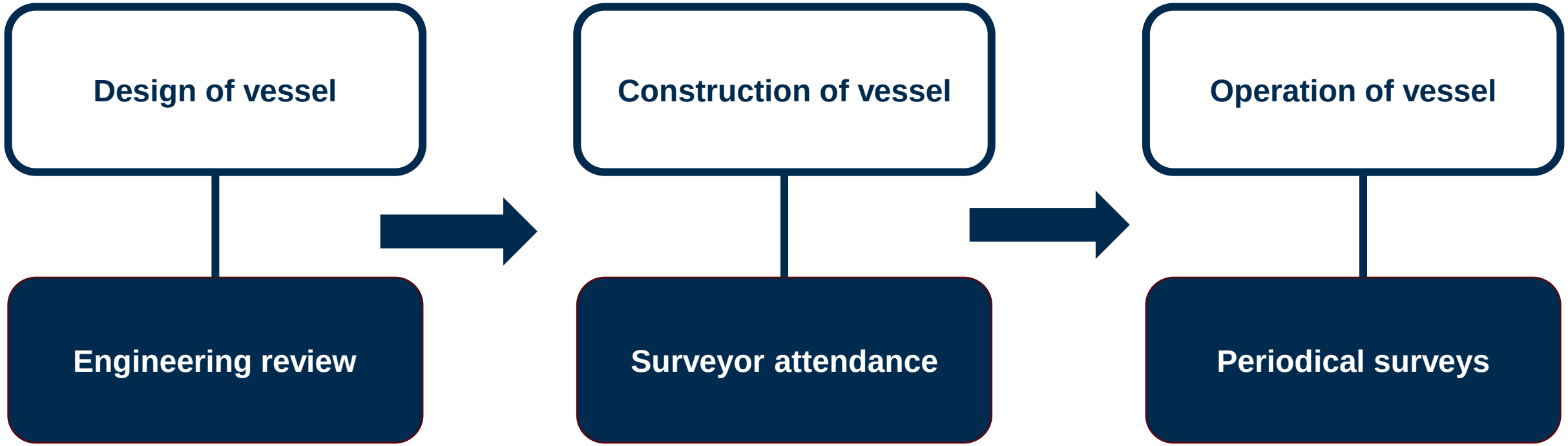
IACS Requirements



Credit: IACS

- IACS works to develop and promote minimum technical requirements for member Class societies to adhere to
- The unified requirements, recommendations, etc. are published in different mediums, but most can be accessed through the blue and green books
- The Blue Book contains adopted resolutions for ship classification and IMO regulations
- The Green Book contains adopted resolution and recommendations from the IACS governing body
- Resolutions include Unified Requirements, Unified Interpretations, Procedural Requirements, and Recommendations

Flowchart of Classification



Engineering Review

- ABS Engineering spans across many disciplines such as:
  - Structural,
  - Mechanical
  - Electrical
  - System
  - Stability
- Clients will provide detailed drawings, any design calculations or analysis, and control and process diagrams for ABS review.
- ABS Engineers will review and verify that the vessel design is compliant with ABS Rules and any applicable industry standards.

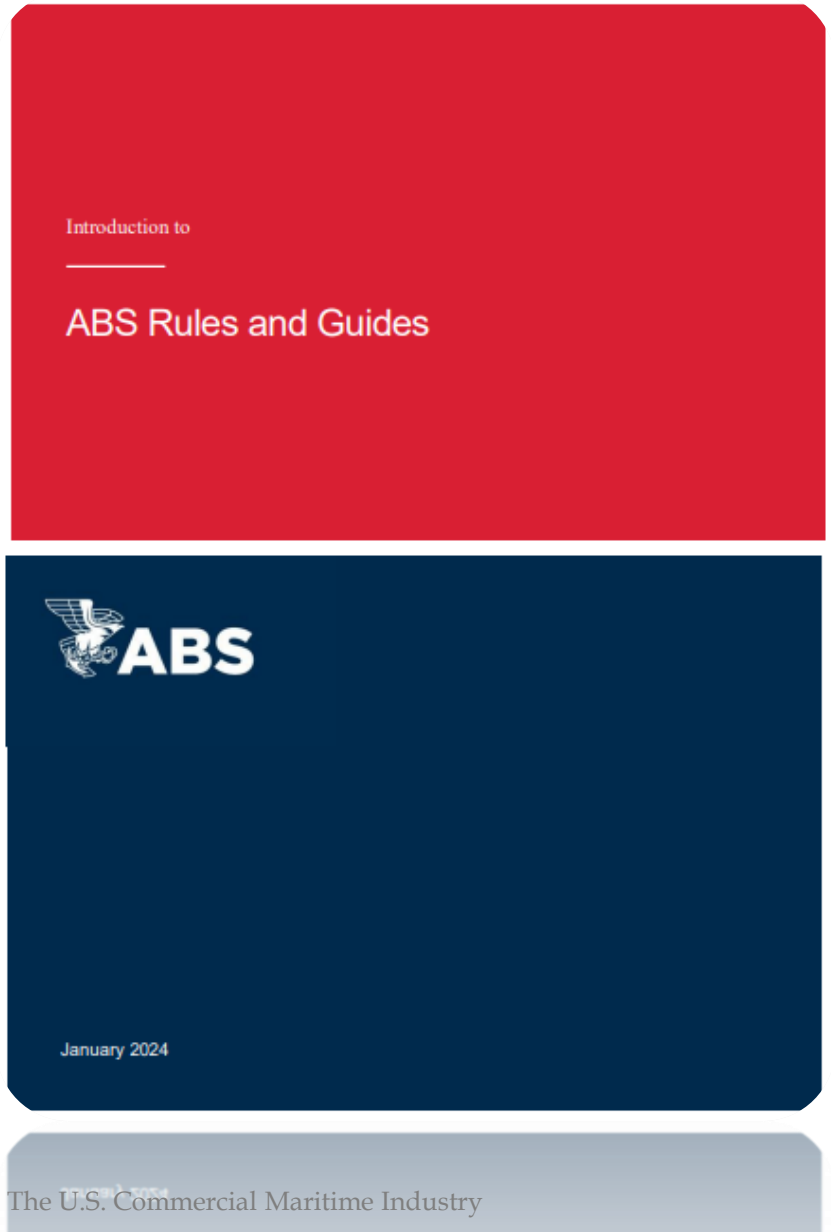
Surveyor Attendance

- Surveyors need to ensure that the construction is in accordance with the approved engineering plans.
- They need to identify and verify other aspects that cannot be covered by engineering drawings. The standard surveyor checklist is to be completed.
- They need to verify and ensure that all engineering and surveyor comments are closed in a timely manner to avoid any delays.
- Any unsafe or non-compliant arrangements or system designs need to be pointed out and addressed in a timely fashion to avoid service delivery issues.

Statutory Surveys

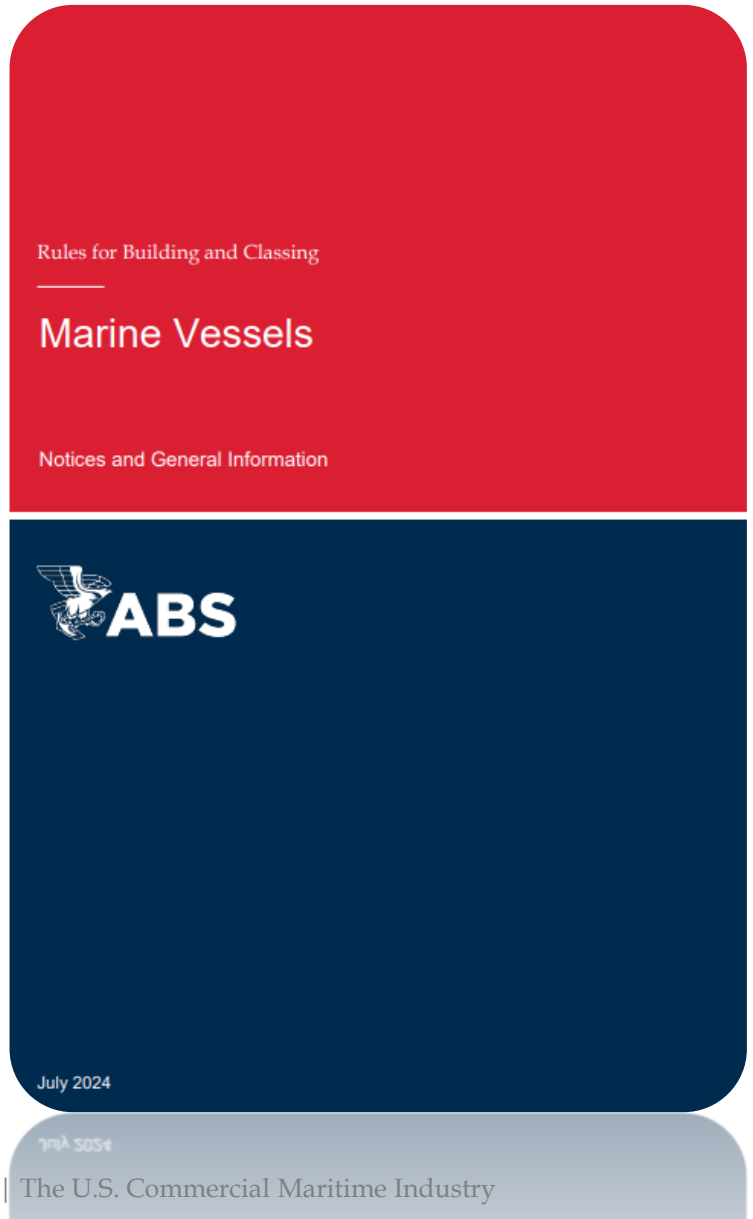
- For the US, as a Flag administration, guidelines issued are enforced by the US Coast Guard
- Classification Societies may survey vessels or offshore units on behalf of the US Coast Guard
- In doing so, they are confirming compliance with Flag state safety and environmental legislation
- Additionally, a Class surveyor may confirm compliance with international treaties regarding:
  - Pollution
  - International Security
  - Safety Management Schemes
- It is their responsibility to report back to the Coast Guard on the health of the vessel and any defects that may need to be addressed by the owner or require further follow up

Rules and Requirements of Classification



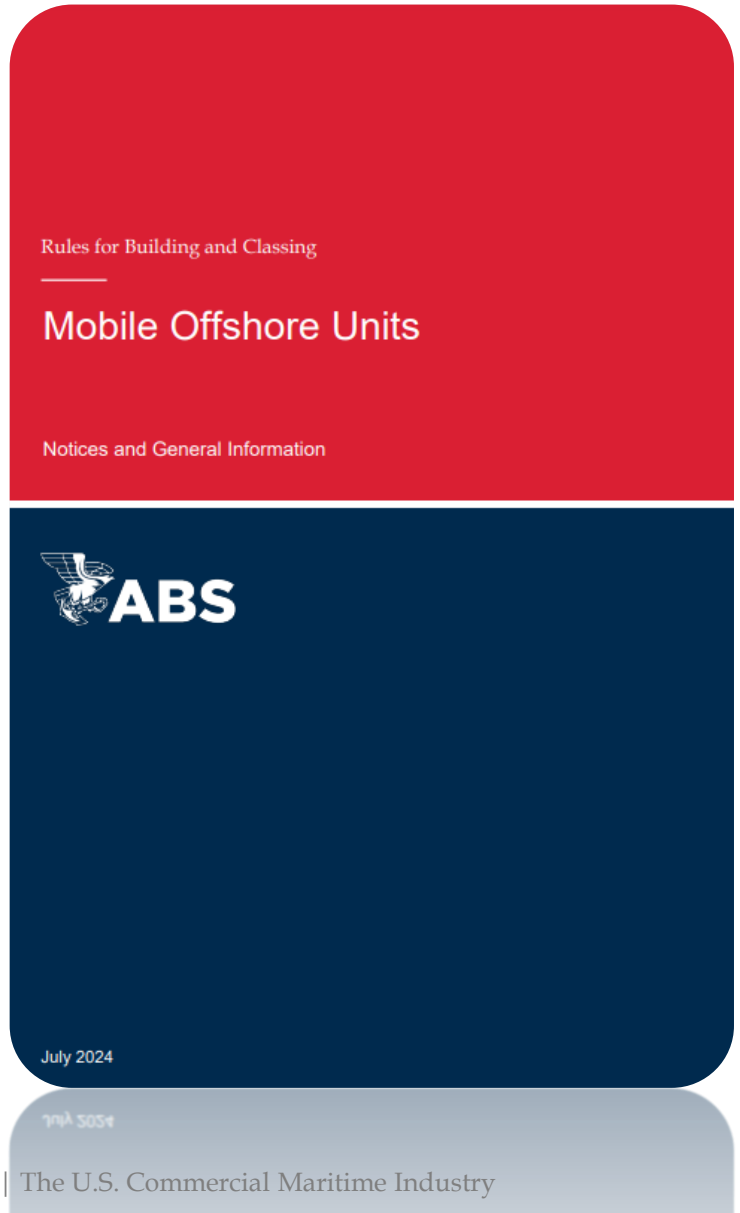
- Rules and Requirements are published standards released by Classification Societies
- They detail conditions that need to be met for Classification
- This process typically includes:
  - Technical review of design plans
  - Attendance at the construction in the shipyard by a Surveyor
  - Consideration for satisfactory compliance certificate
  - Introduction into program for periodical surveys to ensure continued compliance
- All vessels, systems, etc. that have prescriptive requirements will see a similar process
- Anything that is novel will go through a separate process for approval

Marine Vessel Rules



- The Marine Vessel Rules (MVR) are the standard prescriptive guidelines for the construction and classing of marine vessels
- A guiding standard for the American Bureau of Shipping, organizations are required to comply with the MVR to have their vessel Classed
- Alternatively arranged systems are still recommended to follow the MVR as a baseline for their designs
- The Rules consist of seven parts that cover rules for classification, novel concepts, hull construction, etc.
- The MVR is also specific to the many different vessel types like passenger ships, cargo vessels, and more

Mobile Offshore Unit Rules



- The Mobile Offshore Unit (MOU) rules are similar to the MVR in that they guide the rules for the Classification of offshore units
- The distinction between vessels and offshore units is in their function
- Offshore units typically perform a function in offshore waters, but are not involved in shipping activities
- Some examples of this are:
  - Oil and Gas Drilling Platforms
  - Pipe and Cable Laying Units
  - Offshore Renewable Energy Instillations (OREI) e.g. wind farms
- The rules consist of 8 parts covering the construction, materials, etc. for offshore units and alternative arrangements
- Different forms of units are discussed

Guides

- Guides are similar to Rules in that they list out requirements for processes, systems, or other technology
- Contrary to Rules, Guides are optional that allow for builder, operators, etc. to conform to a higher standard
- These can be useful for Flag state conformity, preferentiality in the regulatory landscape or different plans with insurance companies
- Guides are also not subject to the technical review committee like the Rules
- These optional notations can also be dropped without effect to Class although there may be consequences elsewhere

Related Standards Organizations

Recognized Standards Organizations

Credit: IAMSP

Credit: SNAME

Credit: ASNE

- Worldwide, there are thousands of recognized standard organizations
- Their roles cover different aspects of engineering, healthcare, government services, and more
- Many offer official certifications of compliance that allow for special entry or rates by accompanying organizations
- Some organizations are more niche in the topics they covers
- Others, like the International Organization of Standards are broad and all-encompassing

Applicability of Standards

- Standards are directly applicable in every aspect of the marine industry
- This includes everything from the vessel construction to the health and safety of the vessel operators
- Compliance to official standards allows for assurance of design proficiency
- Some standards allow for compliance certification
- These certifications allow for design preference by consumers and more preferential insurance rates

ASTM

Credit: ASTM

- The American Society for Testing and Materials (ASTM) is an organization that develops technical and safety standards.
- These standards are typically used in metals, textiles, consumer products, and more..
- Some ASTM that affect everyday life include:
  - ASTM A313 – Standards for stainless steel spring wire
  - ASTM A213 – Standards for commercial stainless-steel tubing
  - ASTM E21 – Standards for testing metallic materials at high temperatures
  - ASTM D903 – Standards for Test Methods for Peel or Stripping Strength of Adhesive Bonds

ANSI

Credit: ANSI

- The American National Standards Institute (ANSI) is an organization that develops standards, conformity assessment, and more in the USA.
- The standards that they develop cover topics like manufacturing, healthcare, automotive services and more.
- Some ANSI standards that affect everyday life includes:
  - ANSI A14.1 – Standards for Ladders
  - ANSI A1264-2 – Provision of Slip Resistance on Walking/Working Surfaces
  - ANSI Z10 – Occupational Health and Safety Management Systems

ISO

Credit: ISO

- The International Organization for Standardization (ISO) is a worldwide federation that develops and promotes standards.
- These envelop a wide range of fields like technology, testing, working conditions, societal issues and more.
- Some standards that effect everyday life include, but are not limited to:
  - ISO 45001 – Occupational Health and Safety
  - ISO 8601 – Date and Time Format
  - ISO 13485 – Medical Devices
  - ISO 22000 – Food Safety Management
  - ISO 13216 – Child Seats for Cars

IEEE

Credit: IEEE

- The Institute of Electrical and Electronics Engineers (IEEE) is an organization that defines standards around electronic equipment.
- These standards encompass everything from ethernet cables to consumer electronic robotics.
- Some IEEE standards that affect everyday life include:
  - IEEE 802.11 – Standards for Wi-Fi
  - IEEE 11073 – Family Standards for medical devices
  - IEEE 802 – Family Standards for wired connectivity
  - IEEE 1547-2018 – Standards for connecting renewable energy sources

ASHRAE

Credit: ASHRAE

- The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) is a professional organization developing standards for:
  - Heating
  - Ventilation
  - Air conditioning
  - Indoor air quality
  - Energy efficiency
- Standards typical revolve around industrial HVAC and Efficiency requirements
- Some common standards include, but are not limited to:
  - ASHRAE 90.1
  - ASHRAE 55
  - ASHRAE 170
  - ASHRAE 62.1
  - ASHRAE 189.1
  - ASHRAE 188

NFPA

Credit: NFPA

- The National Fire Protection Association (NFPA) is a global nonprofit founded in 1896.
- They are dedicated to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards.
- NFPA codes cover the following:
  - Fire Code
  - Hydrogen Technology Code
  - Commissioning of Fire Protection and Life Safety Systems
  - Integrated Fire Protection and Life Safety System Testing
  - Portable Fire Extinguishers
  - Low-, Medium-, and High-Expansion Foam
  - Medium-, and High-Expansion Foam Systems
  - And much more

Thank You

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