Marine Firefighting

35

Section IV - Technical Operations

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Revised - April 2, 2020

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Preface

NFPA Standard 1005, Standard for Professional Qualifications for Marine Firefighting for Land-Based Fire Fighters, has been established to outline the specific requirements for Marine Fire Fighter I and II training and certification.

This document is not in any form meant to replace, substitute, or circumvent NFPA Standard 1005, nor imply that our firefighters are qualified, certified, or otherwise trained to the level of a Marine Firefighter I or II. That being stated, it is not practical to state that the San Diego Fire-Rescue Department and its firefighters are not qualified to respond to a marine vessel fire. The SDFD has been, and will continue to be called upon to respond to these incidents, assess its hazards and implement a plan of action. Under the Memorandum of Understanding for Joint Firefighting Operations on San Diego Unified Port District marinas, piers, docks, and waterborne incidents, the San Diego Fire-Rescue Department (SDFD) will be responsible for providing personnel, equipment, and firefighting expertise to combat the fire. Therefore, the purpose of SDFD Drill Manual Chapter 35, Marine Firefighting, is to raise our education and training level for marine firefighting incidents to an "Awareness" level to assist us in making safe and effective decisions.

The end state of this document is to provide for an operational environment that is more readily able to recognize and assess risk, formulate strategy, manage and coordinate tactics, and effectively communicate the plan while providing for firefighter safety on marine firefighting incidents.

Introduction

The San Diego Fire-Rescue Department has had several significant boat and shipboard fires since our inception in 1889. Fortunately for us, we have not incurred any significant injuries or deaths to our firefighters during these incidents; although we have had several near misses. Marine Firefighting is an extremely high risk, low frequency event. For most of our current firefighters, they will likely go their entire career without ever engaging in a significant shipboard firefighting incident. For the few who have, their experience is likely limited to a singular event or based off previous training or incidents prior to joining our Department (Navy, Coast Guard, etc.). Regardless of the low frequency, the potential for a significant marine fire incident in San Diego is present, and the SDFD will be called upon to act. Similar to highrise fires, we have an obligation and duty to the citizens of San Diego, our fellow firefighters, and ourselves to educate and train to a proficient level on how to mitigate these incidents.

Maritime Law

Masters (or Captains of a vessel) do not have to accept fire-fighting assistance from the fire service. Under the concept of Force Majeure in international law, Masters who declare their vessels in distress can claim a right to immunity from the laws of any local jurisdiction. The presence of the local fire department does not relieve the Master of responsibility or command for the vessel. In fact, the Master of a vessel has the legal authority to refuse access to the vessel for emergency workers, which includes assistance with firefighting operations, rescue, or any other emergency. Although this example is extreme and hopefully unlikely, it illustrates the importance for incident commanders to establish a unified command with the Master of the vessel and closely coordinate actions once permitted on board.

Once fire-fighting efforts have been initiated by the fire department, the Master should not countermand orders given by the incident commander to fire service personnel unless these actions clearly endanger the safety of their crew. Additionally, the crew members of a vessel are responsible to the Master and take orders only from the Master. It is very important that local fire departments understand that they may not be in charge of firefighting operations onboard a vessel unless they are asked to take charge by the vessel's Master.

Flag State

The Flag State is the nation in which a vessel is registered. This is usually indicated in paint on the stern of the vessel and by a flag that is flown on the stern. A vessel that flies the flag of the U.S. is registered in the U.S. and complies with our rules and regulations for maritime vessels and industries. A vessel flying a flag from a different nation is registered and is in compliance with the rules and regulations of that particular nation. Why this is relevant to firefighters is that there are a wide range of differing rules and safety regulations depending on which country the vessel is registered under. The United States accepts vessels from many different countries, therefore, it should be expected that a wide range of mechanical conditions, safety equipment, fire protection systems, and crew training onboard the vessel may be encountered.

Figure 35-1 P Many foreign commercial and merchant ships chose to fly Panama's flag in order to avoid the stricter maritime regulations imposed by their own countries. Panamanian flagged vessels offers the advantages of easier registration (often online) and the ability to employ cheaper foreign labor.

Territorial Waters & International Waters

Territorial waters extend out 12 nautical miles from the coast line. Vessels within this range are subject to the laws and regulations of that nation. Vessels beyond the 12 nautical miles are in International Waters are subject to the laws of their flag state.

Maritime Roles & Responsibilities

Like the fire service, the maritime industry is founded and operated on a hierarchical command and ranking structure. Understanding these titles, roles and responsibilities is important for firefighters for coordinating joint operations and working in the unified command structure.

Captain of the Port (COTP) – U.S. Coast Guard officer who has broad powers for safety and security over all vessels and ports for a given area. The COTP has the direct control of USCG resources and the ability to request both federal and commercial resources.

Marine Firefighting Coordinator (MFC) – USCG Marine Safety Officer who responds to marine fire incidents and acts as the on-scene liaison for the COTP to the incident commander.

Qualified Vessel Personnel – Crew members, marine industry personnel, or other shipping company personnel who are trained in the operations of the vessels systems.

Port Authority – The San Diego Port Authority is comprised of a seven-member commission that represents the cities of Chula Vista, Coronado, Imperial Beach National City, and the City of San Diego. The board establishes policies under which the Port's staff, supervised by the President and Chief Executive Officer, conducts its daily operations.

Commercial Vessel Positions & Ranks

Master – Person in command of a merchant vessel.

Captain – Person in charge of a merchant or passenger vessel.

Chief Mate – Deck officer immediately responsible (and next in rank) to a vessel's Master aboard a merchant vessel. Oversees the Deck Department. Also referred to as Chief Officer or First Mate.

Officer of the Watch (OOW) – Deck officer on duty of a commercial vessel, designated by the Master who is responsible for vessel.

Deck Department – Members of the crew who are responsible for handling,

mooring, and navigating the vessel; keeping watch; caring for cargo; performing at sea maintenance.

Chief Engineer – Senior Engineering officer responsible for the satisfactory working and upkeep of the main and auxiliary machinery on board a vessel.

Military Vessel Positions & Ranks

Commanding Officer (CO) – Person in charge of a naval vessel and has the ultimate responsibility and control over the safety and operation of the ship. Presence of the local fire department does not relieve the CO of command of the vessel or overall responsibility for the safety of the ship. The CO of a military ship is addressed as captain, regardless of their military rank held.

Executive Officer (XO) – Officer immediately responsible (and next in rank) to a vessel's CO aboard a naval or coast guard vessel. Oversees several department heads.

Command Duty Officer (CDO) – Officer designated by the CO, who is responsible for the vessels operation and safety during any 24-hour period.

Officer of the Deck (OOD) - Deck officer on duty of a naval or coast guard vessel, designated by the CDO who is responsible for vessel operations and safety for a 4 hour "watch" period. Any problem aboard a naval or coast guard vessel is first brought to the attention of the Officer of the Deck. If the OOD cannot resolve the problem, it is then forwarded up the chain of command to the CDO, XO, then CO.

Engineering Officer – The ship's officer in charge of the engineering department. Engineering department oversees machinery, damage control, and firefighting operations.

Maritime Rank/Chain of Command		
Civilian	*Military*	*Fire Department*
Port Authority	Captain of the Port	Mayor/Council
Master/Captain	Commanding Officer	Fire Chief
Chief Mate	Executive Officer	Assistant Fire Chief
Officer of the Watch	Command Duty Officer	Shift Commander
	Officer of the Deck	
Deck Department	Crew/Sailors	Fire Operations
Chief Engineer	Engineering Officer	Logistics

San Diego Harbors

Port of San Diego

Established in 1962, the Port of San Diego was created by the California State Legislature to manage San Diego Bay and surrounding waterfront land. The Port of San Diego is the fourth largest of the 11 ports in California and is comprised of five-member cities – Chula Vista, Coronado, Imperial Beach, National City and City of San Diego.

The Port oversees two maritime cargo terminals, two cruise ship terminals, 22 public parks, the Harbor Police Department and the leases of hundreds of tenant and subtenant businesses around San Diego Bay. These include 17 hotels, 74 restaurants, three specialty retail centers and numerous other attractions including museums and bay tours.

Mission Bay

Mission Bay is the largest man-made aquatic park in the country consisting of 4,235 acres, approximately 46% land and 54% water. The combined area makes Mission Bay Park the ninth largest municipally-owned park in the United States.

Predominantly occupied with recreational boating, fishing, and sailing, Mission Bay does play host to several marinas, a yacht club, boat repair facilities and sport fishing operations. The SDFD Lifeguard Headquarters is also located at the entrance to the Mission Bay Channel.

Fixed/Port Facilities

San Diego and Mission Bay are host to a wide variety of fixed facilities that support an even more diverse set of maritime activities. Although not dominated by any one industry, San Diego and Mission Bay are host to marine vessels used for sport and commercial fishing, military operations, shipbuilding, cargo ships, cruise ships, recreational sailing, and pleasure crafts, just to name a few. All these marine activities are supported with land based and port facilities, which are worthy of discussing with regards to marine firefighting, as they bring their own specific and unique hazards and challenges.

Shipyards & Dry-Docks

Shipyards and dry docks are among the most dangerous waterfront locations for emergency responders. Many fires have occurred in vessels under construction or repair, most often from welding accidents or carelessness. As a result, some shipyard and dry docks have their own fire departments (NASSCO Fire Department is one local example). Efforts should be made early to establish communications with these resources, as they often can provide detailed information regarding the facility,vessels, fire protection systems, as well as the hazards present.

The highest concentration of commercial shipyards in San Diego Bay are found between the 10th Ave and 24th Street Terminals and is commonly referred to as the "working waterfront." Thirty-six properties are in this area off of Harbor Drive and is home to NASSCO, BAE Systems, Pacific Tugboat Service, and several other repair facilities.

Figure 35-2 NASSCO Shipyard

Shipyards

A shipyard is a facility used for the construction, refit, and repair of vessels. These vessels may be found tied to docks, piers, floating in the water dry docked, or out of the water on lifts blocks jacks.

Shipyard Hazards

Firefighters responding to vessel fires in shipyards can anticipate the following hazards and challenges:

- Few, if any, crew members will be aboard the vessel to assist with information regarding hazards, fire protection systems, etc.

- Close access to the vessel for fire apparatus will be prevented by mooring lines, hoses, pipes, cables, electrical, wiring and industrial equipment.
- Fire protection systems may be inoperative or locked out for repairs.
- Fire Extinguishers and other firefighting equipment may have been removed for servicing or testing.
- Holes cut in bulkheads and decks create fall hazards and allow for rapid spread of fire and smoke.
- Internal ladders may be removed, restricting access and escape.
- Temporary hoses and cables prevent the closing of doors and hatch covers.
- Deck plates may be removed, creating fall hazards.
- Oxyacetylene tanks and other hazardous materials may be temporarily on board the vessel.
- Paint supplies, thinners, accelerants and other flammable materials may found throughout the vessel.

Figure 35-3 This large boat lift operaes out of "Boat Works" in Chula Vista. Boat lifts can be found in most boat yards in San Diego and Mission Bay

Figure 35-4 Graving Dock at NASSCO Shipyard

Dry dock

A dry dock is an enclosed area into which a vessel is floated into, then water is removed, or the vessel is lifted from the water, leaving the vessel dry for repairs, cleaning, or construction. Depending on the size and location, a vessel may be removed and stored for maintenance in a shipyard by a variety of methods such as a boat lift, graving dock, floating dry dock or marine railway. Once removed from water, the vessel may be placed on wood cribbing, jack stands, a lift, or other blocking.

Boat Lift

A boat lift is a self-propelled mobile crane with slings attached to winch cables that is driven out over the water above the boat by way of channels or rails. The sling is lowered underwater where the boat is floated over the slings, then raised out of the water by the winches. The boat is then driven by the crane into the shipyard where the vessel is placed on jack stands or cribbing.

Graving Dock

Similar to a large, in-ground swimming pool at the water's edge. A gate at one end allows a vessel to float into the dock. The gate is then closed so that water can be pumped out of the graving dock, al-

lowing the vessel to set down on support blocks. This allows for work to be performed on the underwater portion of the hull.

Floating Dry Dock

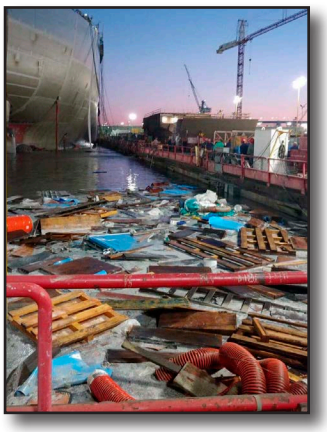
A floating dry dock is a platform with two tall wing walls. The platform is open on the ends and when afloat, it resembles a U-shaped structure. Flooding tanks in the bottom submerge the dry dock to allow for a vessel to float in between the wing walls. Water is then pumped out of the floating dry dock's bottom tanks to allow it to rise. The vessel is then settled onto blocks on the deck of the dock and raised out of the water.

Figure 35-5 Floating Dry Dock used by BAE Systems San Diego.

Dry Dock Hazards

Firefighters responding to vessel fires in dry docks can anticipate all the previous listed challenges and hazards for shipyards with the following additional hazards

- Vessels in dry dock present extreme fall hazards due to the hard surface of the dry dock floor. Gangways to vessels on floating dry docks, ship lifts, or marine railways are located 40 to 60 feet above ground level. In some cases, scaffolding, stair towers and holes cut in the side of the vessel under repair provide additional means of access.
- The surfaces of any dock or railway are coated with marine organisms that present an extremely slick surface when wet.
- The blocks supporting a vessel in dry dock are not usually designed to support a loaded vessel. Application of large amounts of water from firefighting raises the possibility of block failure.
- A vessel out of the water exposes the hull to more damage from fire because the underwater portion of the hull does not have the cooling effect of water while it is in dry dock.
- The surface of floating docks and dry-docks may be saturated with oil and other combustibles, which is a contributing factor to rapid fire spread around and under boats on dry-docks. Wooden blocks and cribbing exposed to fire can lead to catastrophic failure.



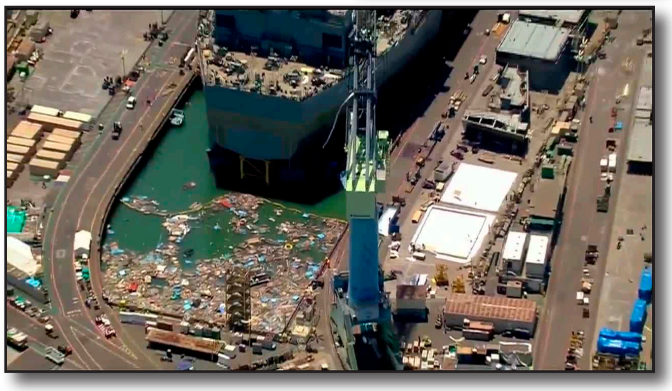


Figure 35-6 A U.S. Navy ship was damaged and several ship workers nearly drowned when the gate to a graving dock at NASSCO unexpectedly failed, flooding the dock. Engine 7 - July 12, 2018

SDFD Firefighter Near-Miss

"Hopper" Incident at NASSCO

Incident #FS13132060 - 11/21/2013

San Diego Fire-Rescue Department units responded to a commercial structure fire at a shipyard in Engine 7's district. During extinguishment operations adjacent to a ship in dry dock, a near miss occurred when a vacuum unit or "hopper" that weighed approximately 16,000 pounds and contained dust from a sandblasting operation unexpectedly tipped over. At the moment the hopper tipped over, it narrowly missed E7's Captain as well as a civilian worker and could have seriously injured or killed several others who were working in or around the hopper.

Read Full Safety Report - "Hopper" Incident

Anchorages & Moorings

Figure 35-7 Mooring

An anchorage is a designated area where vessels often wait until docking space becomes available or for clearance by customs authorities. Anchorages may also be designated for special purposes such as explosive loading/unloading or quarantine while awaiting public health clearance. Vessel incidents are logistically more difficult to manage at anchorages and every effort should be made to relocate the vessel to a pier or a wharf in an emergency situation.

A mooring is any permanent structure to which a vessel may be secured, typically a buoy attached to an anchor. Moor-

ings for pleasure craft exist within San Diego Bay and Mission Bay. There is no dock access or utility services to these vessels and are typically accessed by small row or power boat. As with an anchorage, a vessel on fire in a mooring will require assistance from fire or tugboats to move the vessel to a dock or pier for access.

Bulk Terminals

A bulk terminal is a handling area for large amounts of unpacked commodities carried in holds and tanks of cargo vessels and tankers. These goods are loaded and unloaded by conveyors, pipeline, or cranes. Bulk terminals are classified as either liquid or dry bulk facilities.

Figure 35-8 10th Ave Marine Terminal is handles Dry Bulk, Liquid Bulk, and Intermodal Cargo

Dry Bulk Facilities

A dry bulk facility handles cargo, such as wood chips, grain, cement, scrap metal, coal, or other dry goods. The cargo is off-loaded using conveyors, piping, or hoses and stored in silos or elevators on site. Dry bulk facilities may have limited or no vehicle access and pose significant challenges.

The 10th Avenue Marine Terminal in San Diego receives vessels importing bulk quantities of cement, fertilizer, soda ash, and sugar on a quarterly basis. These bulk materials are off-loaded and stored in the southern most warehouse of the terminal (Warehouse C) until they can be loaded on to rail cars via the conveyor system.

The 10th Avenue Marine Terminal also has a cold storage warehouse on the north end of the terminal (Warehouse B) used for the storage of refrigerated items. The main hazard with Warehouse B is the presence of an ammonia refrigeration plant.

Bulk Liquid Storage Facilities

Bulk liquid storage facilities handle a wide range of liquid cargo such as crude oil, LPG, food products (molasses) and other liquid hazardous materials. Bulk liquid storage facilities are likely to have extensive piping and storage tanks present. Piers may have limited or no vehicle access and significant hazards due to extensive pipelines carrying water, steam, hydraulic fluid, and products under high pressures.

The 10th Avenue Marine Terminal has five bulk liquid storage tanks; three contain jet fuel that is plumbed directly to Lindbergh Field, one contains

Figure 35-9 Bulk Liquid Storage Facilities at 10th Ave Marine Terminal (top) and Naval Base Point Loma (bottom).

diesel fuel, and one contains marine grade oil (MGO) which requires heating to transfer due to its very high viscosity. The bulk liquid storage tanks at the marine terminal are supplied from the tank farm on Friars Rd and I-15. These tanks are visible and accessible to emergency vehicles from Harbor Drive.

Intermodal Facilities

Figure 35-10 Intermodal Facility at 10th Ave Marine Terminal

Intermodal facilities provide the ability to move cargo rapidly from one means of transportation to another using standardized shipping containers (often referred to as sea-tainers). Hundreds, sometimes thousands, of loaded and/or empty containers may be present at a facility. A wide variety of problems are associated with containers, ranging from improper placarding, poor bracing, undeclared dangerous cargo, and leaking cargo. Container stacks create narrow driving lanes and poor access for fire crews.

Although San Diego is not a large port for shipping goods, we do have an intermodal facility located at the 10th Avenue Marine Terminal that is currently operated by Dole. Four billion bananas per year arrive via weekly delivery from a Dole container vessel to the Port of San Diego. These vessels arrive from Central America and distribute their cargo throughout the U.S. via intermodal shipping containers on trucks at this site. Because the bananas require refrigeration to remain fresh, each shipping container is equipped with a refrigeration unit containing ammonia.

Explosive Loading/Unloading Facilities

Explosive loading/unloading facilities range from materials for mining operations, to fertilizers, to weapons manufacturing and storage. These facilities are highly regulated, usually well protected by security and fire-suppression systems and have extensive contingency plans for emergency management. Incidents at a facility of this type must start with a unified command with a representative of the facility and entail a well-coordinated action plan.

Although incidents at this type of facility would be rare for San Diego firefighters to respond to, the most likely opportunity to encounter an incident of this nature would be on a military base or vessel. Ammunitions, explosives and O.R.M (Other Regulated Material) should be an expected hazard when responding to incidents at the various Navy and Coast Guard facilities Coordination with military and facility representatives are imperative prior to taking any action at a facility of this type.

Roll-On/Roll-Off (RO/RO) & Vehicle Terminals

Roll-on/roll-off and vehicle terminal facilities are associated with the operation of ferries, import and export of automobiles and trucks, and the handling of containerized cargo and military vehicles. The major hazard associated with this type of facility is the large numbers of partially fueled motor vehicles using diesel, gasoline, or propane fuels that are parked near one another, presenting a significant exposure problem.

Figure 35-11 RO/RO Vessel offloading vehicles at the 24th St Terminal in National City

The 24th Street Terminal in National City is the Port of San Diego's primary Roll-on/Roll-off terminal. It receives approximately twenty-five "RO/RO" vessels per month delivering nearly a half-million vehicles per year (1 in 10 cars) to the United States. As an overflow or back-up to the 24th St Terminal, the 10th Avenue Terminal may also receive "RO/RO" vessels and store vehicles for loading on to rail for export.

Marinas

Figure 35-12 Harbor Island Marina (top) and Shelter Island Marina (bottom).

Together, San Diego and Mission Bays have over one-hundred public or private marinas. A marina is a floating structure used primarily for the service, repair, sale or moorage of boats in berths. Marinas are primarily occupied by pleasure boats, fishing and charter boat, and other commercial vessels generally under sixty-five feet in length. The number of occupants in a marina will vary widely, but during peak seasons and favorable weather, occupancy onboard vessels can be anticipated to be high.

The San Diego Fire Department responds to multiple reported and working vessel fires at marinas each year. For this reason, it is imperative that crews conduct frequent pre-fire planning and drills at their local marinas. This training, coupled with accurate pre-fire plan documentation, will pay dividends for responding to an actual incident. Crews should become familiar with each marina's hazards, fire protection system, and utilities well before an actual incident occurs.

Marina Fire Hazards

Fuel load and fire potential in a marina can be very easily underestimated. Smaller vessels can carry hundreds of gallons of gas or diesel, while a 50' sport fishing boat may carry up to 1000 gallons. Many boats found in marinas are constructed out of fiberglass and are volatile and toxic when burning. Boats in marinas are frequently moored close together, which results in an immediate exposure issue to other boats and a life safety issue to occupants. Fires occurring in marinas often spread rapidly and persons can find their

Figure 35-13 Marina fires present a significant exposure hazard

escape routes blocked by fire. In many cases, marinas are constructed with floating docks or piers that may not support a large number of firefighters and their equipment. In addition, these piers may have fuel lines, electrical cables, and sewage piping running on or under them.

Figure 35-14 Typical utility cabinet found on marinas and boat docks

Marina Utilities

Similar to the utility systems found in structures, each individual slip in a marina should have a utility shut-off switch/valve to isolate power, water, cable, etc. These shut-off points are often housed in small cabinets directly adjacent to each slip. If utilities cannot be secured for each individual slip, breakers/valves can be located near the entrance to the dock to secure the entire dock.

Marina Fire Protection Systems

Fire protection systems found at marinas are typically limited to extinguishers and dry standpipe systems. Although some wet systems with hose cabinets may be encountered, they are often not required. Fire protection systems found at marinas are continuously exposed to the harsh weather conditions and elements which may adversely affect their operation and reliability. Additionally, some standpipe systems may use PVC pipes or fittings that can fail under normal firefighting pumping pressures. Because of this, firefighters should be prepared to preform hoselays the entire length of a dock or pier and should use caution when connecting to marina standpipe systems for primary firefighting lines and operations.

Figure 35-15 Boatyards in Shelter Island (top) and Chula Vista (bottom).

Boatyards

A boatyard is usually part of a marina operation and serves many different needs for boaters. Storage, maintenance, finishing, painting, welding and woodworking are all normal activities found in a typical boatyard. Flammable and combustible liquids, batteries, epoxies, and resins are also frequently found. Boats are often stored on trailers, blocks, or small stand, and may be unstable during fire department operations. Many of the same hazards found in shipyards are found in boatyards, just on a much smaller scale.

Fuel Docks

A fuel dock is a floating gas station for vessels with pumping equipment at its end and fuel lines that often run the length of the dock. Fuel shutoffs are required on the land side of such docks. Firefighting equipment is usually limited to a standpipe system extending the length of the dock with intakes at the ramps and discharges along the dock. Fuel tanks are located on land and can be a considerable distance from the pumps, requiring long runs of plumbing to the fuel dock. The most serious and frequent hazard associated with fuel docks is the potential for a rapid flash fire involving gasoline vapors. The heavier than air gasoline vapors can find their way into open spaces down deep into the vessel's hull. When these vapors encounter an ignition source, a flash fire or explosion may result.

San Diego has fuel docks located on San Diego Bay and Mission Bay. Fuel docks may offer gasoline diesel fuel, or marine grade oil (MGO).

San Diego Bay

- Shelter Island (two facilities)
  - Used for fueling small vessels and pleasure craft
  - Fuel Types – Gasoline and Diesel
- Harbor Island Fuel Dock (West end)
  - Used for fueling small vessels, pleasure craft, fishing vessels
  - Fuel Types – Gasoline, Diesel, Marine Grade Oil
- 10th Ave Terminal
  - Used for fueling commercial and passenger vessels
  - Fuel Types – Diesel and Marine Grade Oil
- Navy Base Point Loma
  - Near Ballast Point
  - Used for fueling military and naval vessels
  - Fuel Types – Diesel and Marine Grade Oil

Figure 35-16 Harbor Island Fuel Dock (above) and Fuel Pier at Navy Base Point Loma (below)

Mission Bay

- Dana Landing Tackle Shop
  - Used for fueling small vessels, pleasure craft, fishing vessels
  - Fuel Types – Gasoline and Diesel

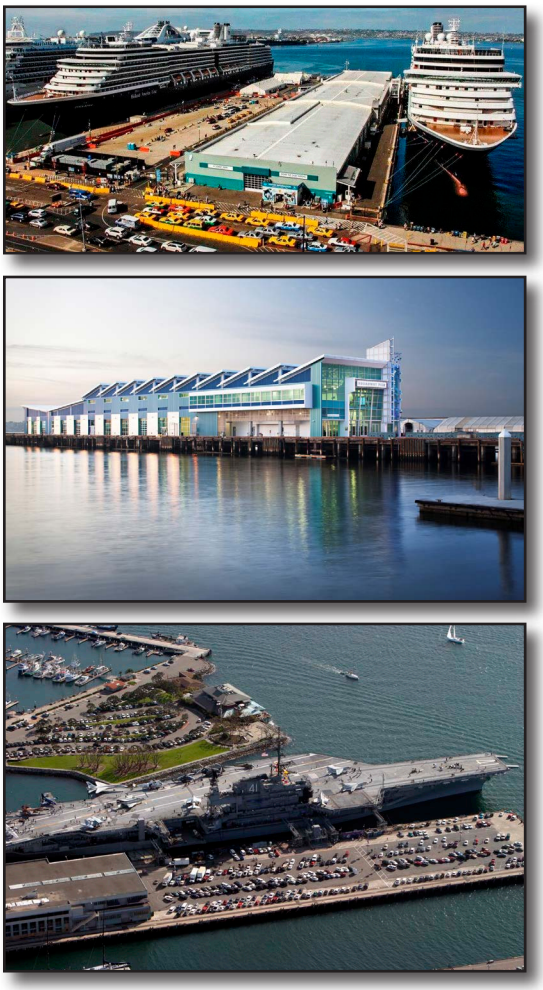


Figure 35-17 B Street Cruise Ship Terminal (top), Broadway Pier (middle), Navy Pier (bottom).

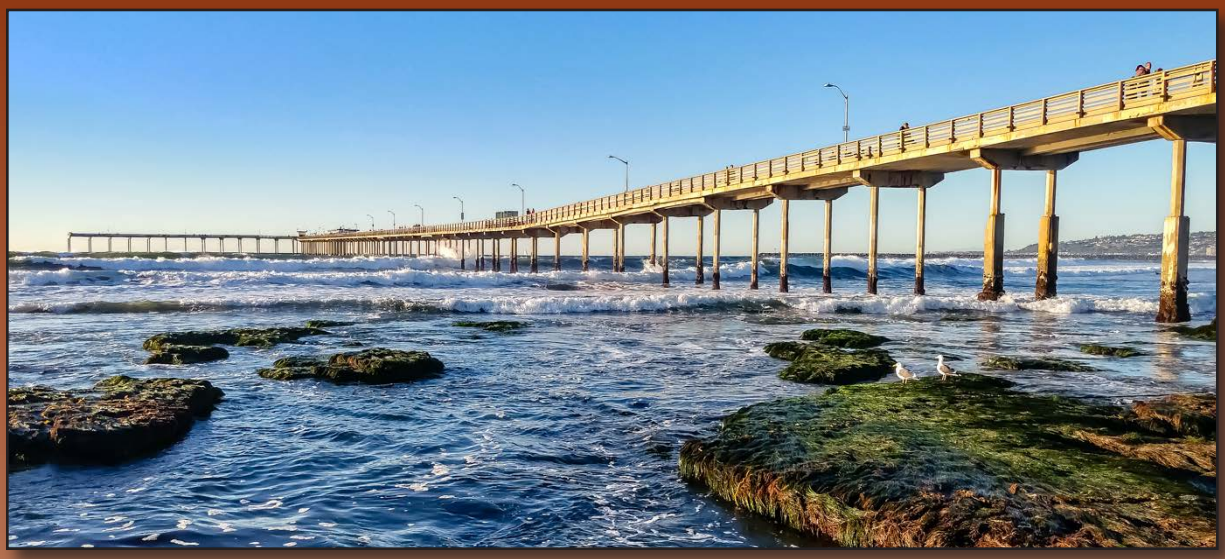
Piers & Wharves

Piers and wharves are structures built over the water and designed for the loading and unloading of vessels, businesses, or promenade areas. The most important consideration for firefighters is to note the condition of the pier or wharf and how it is supported below the decking. Wood pilings are subject to underwater decay and attack by marine organisms that can severely compromise its structural integrity. Often the wood pilings are coated in creosote or an asphalt barrier to protect the structure from the elements. However, when exposed to fire, this coating produces dense smoke, toxic gas, and rapidly spreads fire to the underside of the decking. Unless marked with a vehicle weight limit, serious consideration must be given before directing crews to drive fire apparatus out onto a pier or wharf.

Although many of the piers/wharves in San Diego Bay are now constructed out of concrete pilings, there are still numerous piers/wharves with wood pilings that have varying degrees of structural integrity. The following are some of the more common piers/wharves in San Diego Bay:

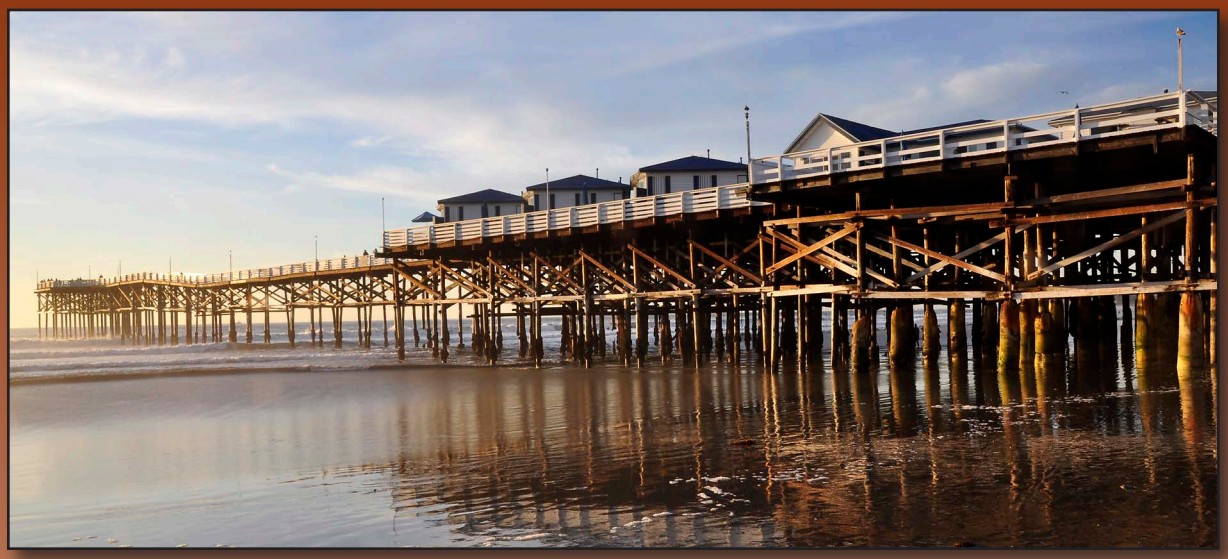
- Grape Street Docks – Poorly Maintained
- B Street Cruise Ship Terminal
- Broadway Pier
- Navy Pier (USS Midway)
- G Street Mole (aka Tuna Harbor)
- Tuna Wharf (Location of Norton Sound Fire 2018)

Ocean Beach Municipal Pier



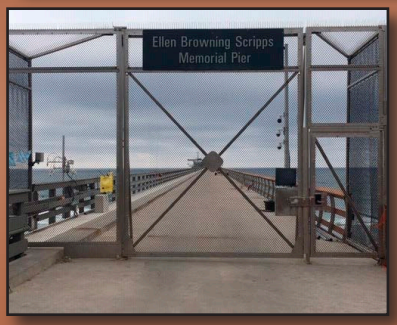
- **OB Pier is the longest concrete pier on the West Coast at 1971 feet**
- **Constructed in 1966**
- **Open 24 hours - closes when the surf is high**
- **No FDC, Standpipe or Sprinkler System**
- **1 1/2” hose cabinet plumbed to city water main (no fire pump)**
- **Cafe has a deep fryer with hood system**
- **Fire Response Considerations**
  - No Fire Apparatus Permitted on Pier
  - Use of utility rig will be required for pulling hose/shuttling crews & gear
  - 1700’ hoselay from the foot of the pier to the cafe

Crystal Pier - Pacific Beach



- **Crystal Pier is constructed of wood pilings with a wood decking**
- **Constructed in 1927**
- **32 Cottages equipped with kitchenettes, bedrooms, lving room and private decks operate as a hotel on the pier.**
- **Fire Response Considerations**
  - Do not drive fire apparatus onto pier
  - Gate to pier is closed during certain hours, knox box provided for fire access
  - Cottages are not sprinklered
  - FDC for Dry Standpipe
  - Preplumbed hose cabinet/house line near cottages
  - Ensure fire does not extend below decking to support structures, consider posting a look out below from the beach

Scripps Pier - La Jolla



- **Pier is all constructed of concrete with heavily reinforced access gates**
  - Gates are constructed of 3" stainless steel square tubing
  - Gate mechanism is heavily reinforced and will possibly require a Rescue Saw for access
  - Chain mesh is heavy gauge, with small diameter openings preventing climbing
- **No Fire Protection Systems or Standpipes**
- **Access limited to Scripps Personnel -** Not a public pier
  - At least a dozen boats are stored on the pier limiting access for Fire Apparatus
- **Overhead 3-Ton Crane**
  - Crane is used for launching and retrieving the research boats
- **Remote Lab facilities -** used primarily for running scientific tests on sea water
- **Pump Station -** lcoated at the end of the pier for supplying sea water to Birch Aquarium and UCSD buildings
- **Aqueduct - A 2'x3' aqueduct runs from the pump station to the entrance of the pier. This aqueduct, is covered with ½" thick removable plastic lids running the entire length of the pier.**
- **Sea Water Filtration System (Sea Water Filtration pic) - The sea water filtration system is located next to the entrance to the pier.**

Figure 35-18 The aerial image on the left is of Naval Base Point Loma. Visible are the above ground storage fuel tanks. Less visible are the 22 underground fuel storage tanks, recognizable by the cut-away pads in the photo on the left. Photo to the right shows the access doors to the underground munition bunkers. These photos depict just two of the many and varied significant hazards that are found at our local military installations.

Military Facilities

Military bases have numerous hazards and attributes that firefighters should be aware of. The major hazards include the presence of weapon systems, fuel transfer and storage facilities, warehouse facilities, aviation facilities, military explosive depots and even the possibility of nuclear power or weapons storage.

Military Base and Vessel Incidents

As previously noted, the military bases of San Diego have their own resources, Federal Fire Department, who are specifically trained in the unique hazards of these bases and facilities. Despite this, SDFD and other civilian fire agencies may be called upon to assist per mutual aid agreements for large scale incidents. **The most critical factor when responding to a military base and/or vessel related incident is to establish a Unified Command with Military personnel and Federal Fire Department resources to coordinate your actions.**

Types of Vessels

Passenger Vessels

A passenger vessel is defined as any vessel that carries people for hire.

Figure 35-19 Small Passenger Vessels

Small Passenger Vessels

- Under 100 gross tons and less than 200 feet in length
- San Diego Bay & Mission Bay
- Examples of small passenger vessels in San Diego
  - Whale Watching Tours
  - Dinner Cruises
  - Harbor Tours
  - Coronado Passenger Ferry
  - Sport Fishing Vessels
  - Chartered Yachts

Tactical / Hazard/ Safety Considerations – Small Passenger Vessels

- These vessels generally have small crews that may have only basic firefighting skills, training, or equipment available to them.
- These vessels may or may not have an international shore connection (ISC).
- Fixed fire suppression systems may be found in the engine room on some vessels.
- These vessels are equipped with portable fire extinguishers and may have “fire stations” (hose cabinets with water outlets).
- If crew/passenger cabins are present, they are typically quite small with narrow passageways making advancing hoselines, search and rescue more difficult.
- The most common type of fires on these vessels occur in the engine rooms, cooking galleys, or trash receptacles.

Large Passenger Vessels

- Over 100 gross tons and greater than 200 feet in length.
- San Diego Bay – B Street Cruise Ship Terminal
- Large Passenger Vessels home porting in San Diego
  - Holland America
  - Celebrity
  - Disney
  - Royal Caribbean
- Similar to life safety high-rise buildings, these vessels are highly regulated under International Maritime Organization (IMO) standards and equipped with many features to guard against fire spread and keep fire to the area of origin.

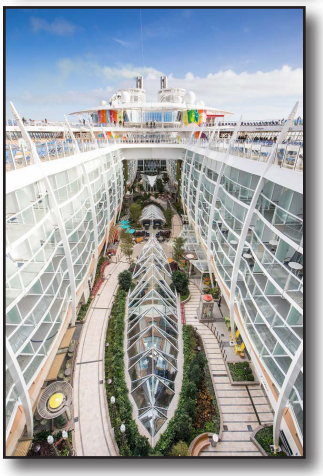


Figure 35-20 The interior of large passenger vessels often is unrecognizable as a ship, resembling more like an apartment complex or hotel.

Tactical / Hazard/ Safety Considerations – Large Passenger Vessels

- Large Passenger Vessels are constructed with many small compartments accessed by narrow passageways. Serious consideration should be given to the use of rope/tag lines to assist crews in reduced visibility entry. For non-IDLH areas of the ship, flagging or banner tape may be used to guide crews through the large vessel to proper staging areas, etc.
- These vessels have accommodations and facilities similar to luxury hotels; networks of inconspicuous doors and passageways that allow the crew to move around the vessel and provide services without using the passenger areas. Although maps are posted in many locations on the cruise ship, they often do not show these hidden corridors.
- Many hidden voids, chutes and compartments are found throughout the

ship, making the task of checking for extension very difficult.

- They carry large numbers of passengers who receive minimal safety information. Crowd management and evacuations during these emergencies will be a challenge
- Crew members tend to be very diverse and a large percentage do not have a good understanding of the English language.
- Expect high fuel load in passenger compartments with many synthetic materials.
- Large passenger vessels are also equipped with large, complex ventilation systems that may contribute to the spread of smoke or fire. Securing the ventilation systems should be made a high priority.
- Instead of the standardized numbering of levels and decks that are found on most vessels, cruise ships often use creative names such as the "Marina Deck," "Bahama Deck," etc. This can cause confusion for the Incident Commander and crews when communicating exactly where the fire and crews are operating on the ship.
- Multiple alarms, strike teams and mutual aid assistance will likely be required to combat a working large passenger vessel fire due to firefighter fatigue, need for air bottles/air supply, and to assist with rescues and evacuation of potentially thousands of passengers and crew members.

Pleasure Craft

Figure 35-21 Pleasure Craft

Pleasure crafts are recreational vessels of varying sizes and are further divided into the following categories: Power pleasure craft, Sail pleasure craft, Multi-hull pleasure craft and Houseboats.

- Pleasure crafts are the most common type of vessels found in both San Diego and Mission Bays.
- SDFD has had numerous fire incidents with these types of vessels.

Tactical / Hazard/ Safety Considerations – Pleasure Craft

- Often involve composites and fiberglass in their construction causing them to burn hotter and more toxic. Proper PPE and continuous use of the SCBA during all phases of the incident is required.
- The use of water must be applied conservatively to fires on these vessels. The weight of the water that accumulates in the hull can easily destabilize, capsize or sink the vessel.
- Efforts to perform firefighting operations from the dock without boarding the vessel should be encouraged if possible. Boarding smaller pleasure craft during firefighting operations significantly increases your risk due to the added weight of the water and firefighting personnel on board who can destabilize a vessel.
- De-watering operations are often required after the fire is extinguished.
- Thorough gross decontamination of all PPE and SCBA should be completed immediately following these fires and prior to returning to the station.
- Utilities to docked pleasure craft are typically easy to secure by disconnecting the shore power line and/or the breaker switch on the dock.

Bulk Liquid Carriers (Tankers)

Bulk Liquid Carriers are most often referred to as tankers or tank vessels and can be further classified into the following four main groups. Petroleum Carriers, Chemical Carriers, Liquefied Gas Carriers and Bulk Liquid Carriers.

- San Diego Bay is not regularly visited by Bulk Liquid Carriers, however, numerous vessels pass offshore to the ports of Long Beach, Los Angeles and other West Coast ports. Although small, there is a potential that a tanker with an emergency occurring offshore could seek refuge or assistance in San Diego Bay.

Figure 35-22 Bulk Liquid Tankers in San Diego Bay

Tactical / Hazard/ Safety Considerations – Bulk Liquid Carriers

- With the exception for the liquefied gas carriers, a tanker may carry several types of product during its life and sometimes numerous different liquid cargoes at the same time.
- Tankers are capable of carrying tremendous quantities of liquids in specially designed tanks.
- Some tankers carry different liquids in different tanks.
- A tanker also has the ability to pump off its own cargo during the off-loading process. Because of the pumps, there often is a great deal of piping on the main deck of the tanker. Care should be taken to preserve the integrity of the piping.
- There is no access to the tanks when loaded.
- On deck fire protection includes water/foam monitors, fire stations, special fittings for lights and electric devices.

Dry Bulk Carrier Vessels

A Dry Bulk Carrier typically loads with cargos such as grain, coal, iron ore, and scrap steel. The cargo is loaded by either crane or conveyor belt into the hold.

San Diego Bay typically receives no more than six dry bulk carrier vessels per year. These vessels import items such as cement, sugar, and soda ash for loading onto the rail cars at the 10th Ave Marine Terminal.

Figure 35-23 Dry Bulk Carrier Vessels deliver cement, sugar, and soda ash to 10th Ave Marine Terminal in San Diego

Tactical / Hazard/ Safety Considerations – Dry Bulk Carriers

- A dry bulk vessel typically has an aft house, which holds the crew's quarters and engine space.
- Forward of this house may lay several large cargo holds along the center line of the vessel.
- Below and next to the tanks may be ballast tanks.
- Forward of the holds is the bow of the vessel. Each hold is separated from the other by watertight bulkheads. The holds may or may not be protected by a fixed firefighting system.
- Access to the hold is typically gained either through narrow vertical ladders to the bottom or by removal of the deck hatch cover.
- Historical fire hazards associated with this type of vessel can be compared to the hazards of grain silos; spontaneous combustion, dust explosions and expansion of product due to the addition of water (which affects the vessel's stability).

Break Bulk Carrier Vessels

The Break Bulk Carrier is a vessel that typically carries palletized cargoes, such as crates, bags or barrels. Additionally, they may carry cargoes that cannot be stowed in containers. This includes machinery, like bulldozers, back hoes and the like.

The 10th Ave Marine Terminal receives regular shipment of a variety of break bulk cargo, bringing in such items as ship yard steel for ship construction, steel coils, and other heavy lift items too large to transport long distances by rail or roadway.

Tactical / Hazard/ Safety Considerations – Break Bulk Carriers

- The cargo holds are separated vertically by watertight bulkheads. To allow access to the cargo while in port, watertight doors may be opened to allow travel fore and aft through the vessel below the main deck.
- Cargo is loaded either through deck hatches or through a side port.
- Break-bulk carriers may or may not have a fixed firefighting system within the holds, although fire stations (FDC and hose) should be in each space.
- Access to the holds can occur either through the main deck hatch or via a hold fore or aft and then by transiting longitudinally through watertight doors to other spaces.
- Break bulk vessels usually have their own cargo cranes aboard and can be distinguished by their “sticks.”
- Historical fires aboard a break bulk carrier includes most any type of product, ranging from cars to bags of grain, bales of wheat to drums of hazardous materials. Break bulk carriers can also have refrigerated holds that carry cargo such as bananas or other perishable products.

Figure 35-24 Examples of break bulk cargo include a wide variety of items and hazards

Container Vessels

Figure 35-25 Container Vessel

A container ship is the modern evolution of the dry bulk carrier. In order to move more palletized cargo faster, vessels were designed to accept the containers straight from railcars or the chassis of trucks.

- The Dole company operates three sister container vessels out of the 10th Avenue Marine Terminal and receives approximately 50,000 containers of bananas and pineapples per year from container vessels.
- The Dole container vessels typically arrive on a Sunday and depart on Tuesdays.
- Due to the limited amount of Bay front real estate on San Diego Bay, Dole is the only commercial container vessels operating on a regularly scheduled basis.

Tactical / Hazard/ Safety Considerations – Container Vessels

- A container vessel may have either a forward or aft house with an amidship or aft engine space.
- The cargo holds are separated lengthwise along the vessel into bays. Containers are placed in these bays by special shore side cranes. After a bay is filled, a hatch cover is placed over it to ensure watertight integrity and then additional containers may be loaded upon the decks.
- Within the containers any type of cargo may be found. Hay, steel, home electronics, hazardous materials, wine, fresh vegetables, etc., can all be carried aboard the same vessel.
- Access to the container spaces is extremely limited.
- Cargo holds may be equipped with fixed extinguishing systems.

Roll-On/ Roll-Off Vessels/ Car Carriers

The Roll-On/Roll-Off (Ro/Ro) is a vessel that carries vehicles on their own wheels. Typically looking like a large floating box, the Ro/Ro vessel has a forward house located above the top-most deck of the vessel. The interior of a Ro/Ro vessel looks much like a parking garage found in many cities.

San Diego Bay receives approximately twenty-five "Ro/Ro" vessels per month to the 24th Street Marine Terminal in National City, bringing in nearly 500,000 vehicles per year.

Tactical / Hazard/ Safety Considerations – Roll-On/Roll-Off Vessels

- Ramps, ladders and elevators allow access throughout the vessel.
- These vessels can have low overheads, many decks, and sometimes straight, flat sides.
- Fixed firefighting systems in the form of sprinklers and CO2 will likely exist.
- The vehicles will have a small amount of gas in their tanks and their batteries connected to the terminals.
- Hazardous materials are found in the form of fluids and batteries in the vehicles.
- Cargo is not limited to passenger vehicles. Semi-truck and trailers, heavy equipment, rail cars, tankers, military equipment, and even aircraft are transported on "RO/RO" vessels.

Figure 35-26 Roll-On/Roll-Off Vessels (RO/RO) make regular visits to the 24th St Marine Terminal in National City

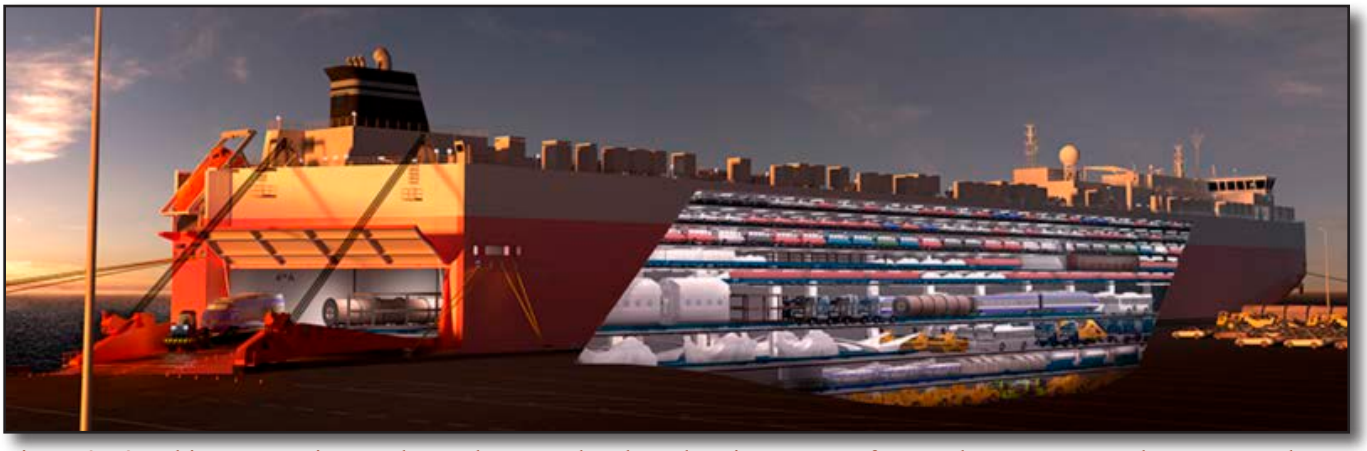


Figure 35-27 This cutaway image shows the many levels and various types of cargo that are commonly transported on Roll-On/Roll-Off vessels

Special-Purpose Vessels

Barges/ Barge Carriers

Figure 35-28 Freight barges (top) and petroleum/bulk liquid barges (bottom) are both used in San Diego bay.

Barges can carry any material that is carried by a larger ship. Barges often are used where deep-draft vessels cannot travel. Barges are not self-propelled and are delivered to their destination by tugboats. Barges fall into two categories, petroleum/ bulk liquid barges and freight barges. Petroleum/bulk liquid barges are inspected by the Coast Guard, while freight barges are not.

Both petroleum/bulk liquid barges and freight barges can be found in San Diego Bay. The petroleum/bulk liquid barges are used for transferring diesel fuel and marine grade oil from the 10th Ave Terminal to the cruise ships in port. This allows the cruise ships to fuel up while remaining docked at the B Street Cruise Terminal/Broadway Pier. Freight barges are used for the temporary transfer of goods in the bay.

Tactical / Hazard/ Safety Considerations – Barges/Barge Carriers

- Entry into any type of barge should be considered a confined space entry and the appropriate guidelines should be followed.
- Barges are divided into individual tanks or voids.
- Some petroleum barges may contain a double hull that contains a void space between the bottom and the inner hull for protection from oil pollution.
- Barges often do not have their own firefighting capabilities beyond the portable extinguishers required by regulations.
- Freight barges may carry bulk cargo or containers on deck.

Tugboats/Towboats

Figure 35-29 Pacific Tugboat Servies (top) and Crowley Marine Tugboats

Tugboats and towboats are used to assist ships in berthing and to transport barges from one point to another. Inland style towboats are the "pusher" type with a square bow for pushing individual or strings of barges. Tugs that operate off shore have a conventional bow.

San Diego Bay is home to three private tugboat companies that operate various size tugboats with varying capabilities:

- Pacific Tugboat Services
- Crowley Maritime Tugboats (Red & White boats out of 10th Ave Terminal)
- Chouest Tugboat Services (Orange & Yellow / Military Contractor only)
- The tugboats operated in San Diego Bay generally have fire pumping capabilities with deck guns/monitor nozzles. Some tugboats may also be

equipped with dewatering and dry chemical extinguishing capabilities.

- Tactical / Hazard/ Safety Considerations – Tugboat Vessels
- The normal crew for these vessels are from three to seven persons.
- Propulsion is provided by diesel engines. Winches are operated with hydraulics supplied by the main engines or by auxiliary engines.
- Some towboats may be equipped with fixed extinguishing systems in their engine rooms and limited firefighting equipment on deck.

Figure 35-30 Chouest Tugboat Services is a Military Contractor that provides tug services for the Navy

Commercial Fishing Vessels

Commercial fishing vessels can be found in lengths up to 600 feet and with crews of as many as 140 persons. However, San Diego commercial fishing vessels predominantly tend to be 100' or smaller in length and staffed with minimal crew members. Most of the commercial fishing fleet in San Diego is found in the G Street Mole location of the bay where approximately 60 vessels port. Historically, the commercial fishing vessels in San Diego have been maintained in less than ideal conditions due to an exemption from certain safety regulations. However, in recent years, the Port of San Diego has successfully overturned this legal loop-hole and now requires that all commercial fishing vessels undergo USCG safety inspections and be insured.

Figure 35-31 The majority of San Diego's commerical fishing fleet are found in the G Street Mole near Sea Port Village

Tactical / Hazard/ Safety Considerations – Commercial Fishing Vessels

- Because of the nature of their work, many fishing vessels carry hazardous materials onboard which can present additional problems to fire fighters responding to a fire.
- Historically, many fishing vessels are not inspected and modifications to the hull and equipment may produce circumstances that significantly affect the way the Marine Fire Fighter approaches these vessels. The vessel's stability may be altered significantly from its original design by modifications made at a later date.
- Onboard refrigeration systems can produce toxic gases when exposed to heat. Any white smoke can indicate Phosgene gas production and proper respiratory protection should be in place throughout the incident.

Other Vessels

Figure 35-32 A research vessel operated by Scripps Institute of Oceanography operates off La Jolla Shores

The following is a list of some of the many other types of vessels that may be encountered in the San Diego and Mission Bays:

- Fireboats
- Cable Vessels
- Dredges
- Research Vessels
- Drilling Vessels

Floating Structures

Figure 35-33 Museum ships (top) and Coastera restaurant both fall under the classification of floating structures and are not inspected by the USCG.

Floating structures are structures, generally without propulsion, that are located on the water and used for a variety of commercial, maintenance, recreational or residential purposes. These structures are typically anchored, moored or secured in place.

Permanently Moored Vessels

A vessel that is removed from navigation and is not inspected by the USCG. Examples include restaurants, hotels, museums and business offices on a barge. One example of a permanently moored vessel in San Diego is the restaurant Coastera. This is an event/dining area floating on the bay that is accessible by a dock attached to the restaurant on the southern end of Harbor Island.

Museum Ships

Museum Ships such as the USS Midway, Steam Ferry Berkeley, San Salvador, HMS Surprise, and Star of India present their own set of hazards and challenges due to the modifications made, various states of decay and non-functional systems on board.

Military Vessels

Because of the heavy presence of military vessels in San Diego Bay, the Navy has stated that they will utilize civilian fire department resources for combating fires on board their vessels to supplement their operations when their resources are not sufficient. Naval damage control crews are on site 24 hours a day, 365 days a year. Even while their vessels are in dry dock or undergoing repairs in a shipyard, Navy personnel are assigned to perform these duties should an incident occur.

Vessel Familiarization & Construction

Basic Terminology

Before we can begin to understand how a vessel is constructed and learn about its features, one must have a basic understanding of the common terminology used in the maritime industry. Below is a simplified list of common terms used in this next section. For a complete and thorough list of maritime terminology, refer to the last section of this chapter, "Maritime Glossary & Definitions."

- **Bow** - Front end of boat or vessel
- **Stern** - Back end of boat or vessel
- **Starboard** - Right side of a boat or vessel when facing forward
- **Port** - Left side of a boat or vessel when facing forward
- **Bulkhead** - One of the vertical partitions dividing the ship into compartments
- **Deck** - A floor or platform of a ship extending from one side of the ship to the other
- **Main Deck** - The uppermost continuous deck of a ship that runs from bow to stern.
- **Frame** - Structural members of a vessel that attach perpendicular to the keel to form ribs
- **Keel** - The main structural member of the ship that runs down the centerline, extending from bow to stern. The "backbone" of the ship.

Ship Structure

The structure of a modern vessel is composed of numerous parts that provide for strength, watertight integrity, safety and practicality. In general, a ship is a large floating box, usually made of steel. This external box is, in turn, strengthened by frames, the keel, beams, stringers, and girders.

Keel

To give a brief overview of the structure, strengths and weaknesses of a vessel one should begin at the keel. The keel is the backbone about which the vessel is constructed. A rigid beam that runs fore and aft along the vessel's bottom; the keel connects the vessel's bow to its stern.

Hull

The vessel's hull, or shell plating, is designed mainly to provide for water tightness and factors greatly into the strength of a vessel. Since hull plating covers the complete external side of a vessel, it forms the sides of the box needed for a ship to float. The shell plating is connected to the frames.

Frames & Frame Numbering

Attached at intervals along the keel are the frames. Vessels are framed in a manner similar to buildings. An internal "skeleton" of vertical and horizontal frames with an external "skin" of plating provide the main ship's structure. The lower end of the frames attached to the keel while the upper ends attach to brackets that support the deck. Frames, similar to human ribs, provide the internal structure to support the decks and outer shell. The frames are numbered as a means of identifying and locating them as to their fore and aft position on board. The numbers are stenciled upon or posted on a plate attached to the frames where they are exposed. They are a good way for firefighters to keep track of position between bow and stern.

Whether the frames are numbered beginning in the bow or stern will vary depending on the vessel's country of origin. There are three basic frame numbering systems in use today.

Bow to Stern

Beginning at the bow with frame number one, frames are numbered consecutively to the stern of the ship. This will be the most common of the three.

Stern to Bow

Beginning at the stern with frame number one and counting consecutively to the bow of the ship. This system is quite rare.

Amidships to Each End

Beginning at the center of the vessel and counting consecutively in both directions to either end. This system results in duplicate frame numbers going in both directions. It will be found almost exclusively on double ended car ferries. These frame numbers will require an end number (1 or 2) as an additional reference to determine frame location. The end numbers are generally shown with the frame number i.e. 1-1, 1-2, 1-3, or 2-1, 2-2, 2-3 etc.

Decks, Levels, Platforms

The deck completes the top and bottom sides of the watertight box. Decks are defined as a floor/surface extending horizontally from one side of a ship to the other. Decks separate the vessel vertically like the floors of a multi-story building or highrise.

Levels are horizontal surfaces created by an elevated walkway or grating. In Military vessels, a "level" is any floor above the main deck. In commercial vessels, a level could be below the main deck in a machinery room.

Platforms are horizontal surfaces that only extend partway through the vessel,

unlike a deck where the surface will typically extend the entire length/width of the vessel.

Vessel Orientation / ICS Naming & Terminology

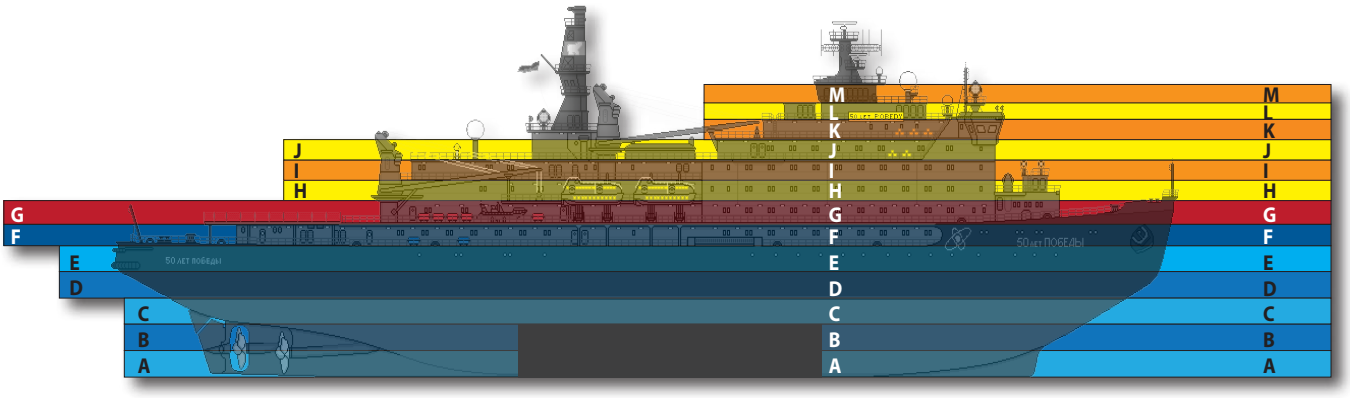
A significant challenge for firefighters is that in the maritime industry, there is no one established standard method of numbering (or naming) of frames and decks from one vessel to another. Depending on the type of vessel, there are general commonalities that exist for naming the decks and levels, however, one standard system for all types of vessels does not exist. For example, the terms deck, platform, level, bridge, and other creative names are all used to describe the "decks" of a vessel. Some number the decks from the bottom up, some start numbering in the middle on the main deck and go in both directions. Frames also are not standardized. Most vessel frames are numbered from front to back. Others, like the roll-on/roll-off car carriers that come into San Diego are numbered back to front. This makes creating pre-established ICS terminology very difficult for the fire service.

To reduce the confusion, a top priority for incident commanders is to meet with the Ship's Captain and obtain the ship's Fire Control Plan before beginning operations. The fire control plan will have a map of every deck/level of the vessel and how it has been named. It is recommended that the I.C. should then use the naming convention for that particular vessel to communicate with both the fire crews and crews of the vessel for the duration of the incident. Doing this will accomplish the following:

- It will be the same "language" and terminology as the ship's crew
- Firefighters on board the vessel can use the stenciled/painted name of the deck and frame numbers found in all stairwells/ladderwells to reference their location and it will match the fire control plan for the IC.
- If a FF gets lost, RIC can reference the fire control plan to locate them more easily.

For operations on board to be coordinated and successful, it will require a strong command presence to slow crews down and ensure they have received a very thorough briefing on their assignments and have had a chance to reference the fire control plan themselves.

Vessels that are smaller in size, but still pose a significant hazard may not have a fire control plan, such as the "Norton Sound." For incidents of this nature, it will be incumbant on the IC to determine the most appropriate naming system and effectively communicate it to the crews.



	Military Vessel	Commercial Vessel	Commercial Vessel	Passenger Vessel	Passenger Vessel
M	0-7 Level	0-7 Deck	0-7 Deck	Flying Bridge Deck	Flying Bridge Deck
L	0-6 Level	0-6 Deck	0-6 Deck	Deck 11	Sun Deck
K	0-5 Level	0-5 Deck	0-5 Deck	Bridge Deck	Bridge Deck
J	0-4 Level	0-4 Deck	0-4 Deck	Deck 10	Marina Deck
I	0-3 Level	0-3 Deck	0-3 Deck	Deck 9	Bahamas Deck
H	0-2 Level	0-2 Deck	0-2 Deck	Deck 8	Fiji Deck
G	0-1 Level	0-1 Deck	0-1 Deck	Deck 7	Maui Deck
F	*Main Deck*	*Main Deck*	*Weather Deck*	*Main Deck*	*Tahiti Deck*
E	Second Deck (2)	Second Deck (2)	A Deck	Deck 5	Moorea Deck
D	Third Deck (3)	Third Deck (3)	B Deck	Deck 4	Molokai Deck
C	Fourth Deck (4)	Fourth Deck (4)	C Deck	Deck 3	Carribean Deck
B	Fifth Platform (5)	Fifth Platform (5)	D Deck	Deck 2	Europa Deck
A	Sixt Platform (6)	Sixt Platform (6)	E Deck	Deck 1	Salsa Deck

Figure 35-34 This figure illustrates the many different naming conventions used for identifying decks, levels and platforms of a vessel depending on its type. Although there are general commonolities in the industry, one set standard does not exist.

US Military Vessels

On US military vessels, the decks are numbered from the main deck in both directions with levels above the main deck being numbered 0-1, 0-2, 0-3, 0-4 etc. as you travel upward. The main deck is 1 and decks below are numbered 2, 3, 4, etc., as you travel down toward the bottom of the vessel. Frames are numbered sequentially from the bow of the ship, increasing incrementally moving aft, or to the stern of the ship. Frame and deck identification on US Military vessels are highly visible and stenciled on the walls of bulkheads throughout the ship.

Cargo & Passenger Vessels

For commercial and passenger maritime vessels, the numbering and naming of frames, decks, levels, and platforms can be any number of styles or types. Additionally, on cargo and passenger vessels, the frame numbers are not as well marked and may be hidden by decorative finishes. In general, frame numbers are most often found above or near doors through watertight bulkheads

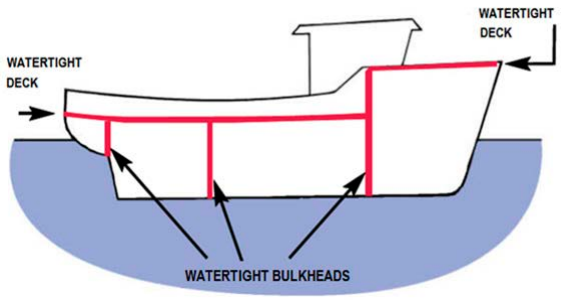
Because of the variations in methods of numbering decks and frames, it is imperative that incident commanders make obtaining the ships fire control plan and diagram a priority. If a firefighter becomes lost, or injured, locating an actual compartment number and communicating it outside will allow their location to be pinpointed on the Fire Control Plan. One of the biggest challenges an incident commander will have is effectively communicating the location of the fire, victims, crew, or other ship systems to firefighting crews who may not have a diagram or map to reference.

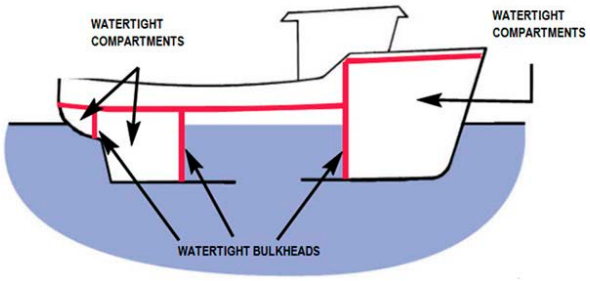
Fire and Flooding Boundaries – Watertight Bulkheads

All ships are constructed with a built-in containment factor in the event of fire or flooding. Watertight bulkheads are placed intermittently down the length of the vessel, dividing it into zones. These bulkheads run from one side to the other, and from the keel to one of the upper decks. Usually this is the second deck or main deck, well above the water line.

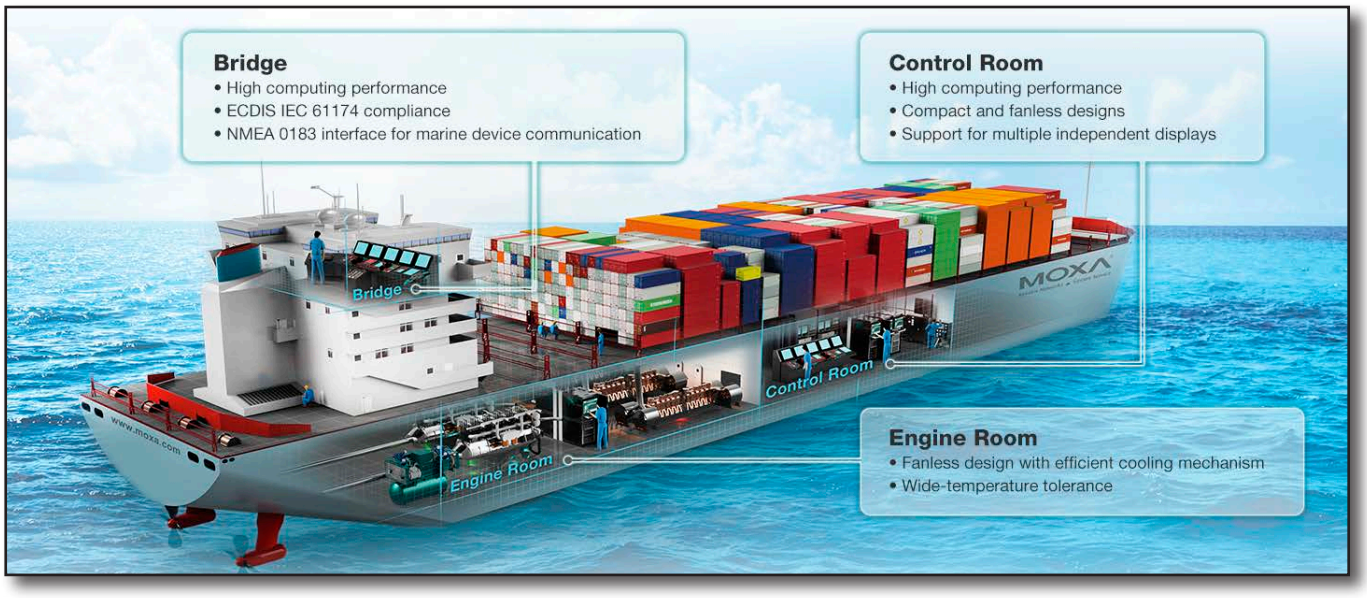
Watertight bulkheads are designed with limited openings in them, thereby preserving the integrity of each zone. Any openings/doors that are present in watertight bulkheads must also be watertight.

Many other bulkheads also serve as fire boundaries, much the same as rated fire walls in buildings. Any openings or doors in these bulkheads must have the same fire resistive rating as the bulkhead itself.





Main Vessel Spaces



Bridge

The Bridge is the control space of a vessel, also known as the pilot house, and is generally located on the forward end of the top deck of the superstructure. The bridge contains important items pertinent to firefighters, such as lifesaving equipment, communication systems, smoke detection and fire alarm panels, fire pump controls, and controls for remote-operated water tight doors and fire doors.

Figure 35-35 The Bridge of a modern day commercial vessel

Control Room

Vessels may be provided with a control room. This space contains system information and is equipped to control engine speed, direction, fire protection systems, ventilation and remote operated doors. The control room also serves as a backup to the bridge controls. If the bridge is inaccessible, the control room may provide a good alternative to control the vessel's systems under the guidance of the vessel's engineers.

Figure 35-36 Control room of a modern day commercial vessel

Fire Control Room

Some vessels contain a separate fire control room, which should contain the vessel's fire control plan, vessel emergency procedures plan, fire alarm annunciator panels, fire protection system controls and control for water tight and fire doors. These items are duplicates of what is also found on the bridge.

Additional Vessel Arrangements

- **Accommodation Spaces** – Crew Berthing or living quarters
- **Storage Spaces** – Hazardous Material storage, trash, sewage tanks
- **Cargo Spaces** – Dry Bulk or Liquid Bulk
- **Machinery Spaces** – Contains equipment that propels the vessel, generates electricity, HVAC, water pumps, fire protection systems

Doors & Hatches

Figure 35-37 Quick Acting watertight door

Opening doors and hatches should be done with caution and done so slowly during firefighting operations, not allowing the "dogs" or latches to clear the edge of the door until firefighters can check for pressure or back draft conditions. Failing to use caution when opening the doors can cause injury or death. The doors can weigh up to 350 lbs. and may unexpectedly open violently when pressurized smoke conditions exist in the area behind the door.

Hatches, once opened, should be secured in the open position. Changes in vessel trim or list could cause the hatch to close. Additionally, hatches are surprisingly heavy, do not place your hands or fingers in the area of the rim of the hatch in the event it should unexpectedly close.

Closing Doors & Hatches should be done so with extreme caution, especially when done remotely, as this can possibly trap victims or firefighters in the spaces. An additional hazard of closing doors remotely may cause the door to pinch or sever a hoseline being used by firefighters.

Passageway Doors

Passageway doors are found in spaces that do not require any special protection and are not much different from the doors found in a home with the exception that they will most likely be made of metal. Such doors will be found where the only concern is to enclose the space.

Figure 35-38 Individually Dogged watertight door

Quick Acting Watertight Doors

Quick acting watertight doors are opened and closed by operating one handle that activates all of the dogs in unison. These doors will only be found fitted to a watertight bulkhead and are used where there is a higher frequency of opening and closing. (On military ships they may operate with a wheel.)

Individually Dogged Watertight Door

Individually dogged watertight doors require that each of the dogs be operated separately. This type of door is best suited for openings that need to maintain a watertight integrity and won't require frequent opening and closing

Remote Control/Automatic Watertight Doors

In some places it is necessary or desirable to have a watertight door that is not kept closed because of very frequent use. However, in the event of an emergency these doors can be automatically or remotely closed. A common location for this type of door would be between the engine room and the shaft alley. They can be remotely operated from the bridge or control room electronically or hydraulically. These doors will usually have a manual wheel or crank at the door location and on a deck or two above in case of system failure.

Figure 35-39 Remote controlled automatic wateritight door

Cargo Hatches

These hatches are used for covering the large openings into the cargo holds. They are watertight and may require the use of cranes to remove them.

Figure 35-40 Cargo Hatch

Access Hatches (Scuttles)

Access hatches are nothing more than a watertight door that provides access through a deck instead of a bulkhead. Although not the same size as a door, (scuttles are generally round) they operate in much the same way. They are utilized for gaining access to spaces, such as cargo holds. This eliminates the larger cargo hatches need to be removed to facilitate human entry. On some of these hatches, the dogging/locking device may be wheel operated.

Figure 35-41 Access Hatch (Scuttle)

Shipboard Systems

A large vessel must provide all the functions required by a small, self-sustained city. These systems are very complex and pose significant risks and hazards to firefighters. A vessel's systems should only be operated by members of the vessel's crew. Improper operation by firefighters may cause system failure, endangering the lives of persons aboard the vessel or cause events threatening the structural stability of the vessel.

Figure 35-42 Draft marks indicate the amount of vessel beneath the water

The following is a list of the systems commonly found on large vessels:

- Power Generation & Lighting – 4000 Volts or higher is common (AC and/or DC power)
- HVAC – Often powered by electricity or steam
- Fuel and Ballast Transfer Systems
- Mooring Systems
- Steering Systems
- Propulsion Systems – Steam or Gas Turbine, Diesel Engine, Electric Motor
- Communication Systems – Internal & External
- Cargo Handling Systems – Conveyor, Cranes, Lifts
- Fire Protection Systems

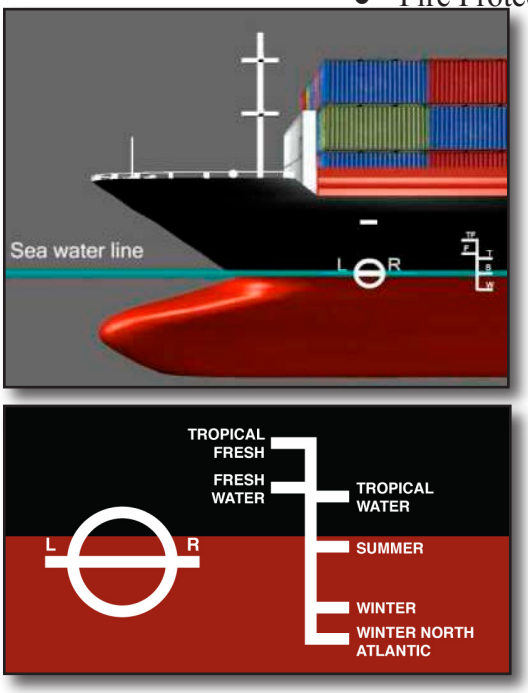


Figure 35-43 Load Line (also known as Plimsol Line) inicates the maximum draft to which a vessel can be submerged and remain stable. This depth varies depending on the type and temperature of water the ship is in.

Draft Marks

Draft marks are located at the bow, amidship (middle) and stern of a vessel on both the port and starboard sides. Draft marks may be in units of feet (US) or meters (metric). Draft marks indicate the amount of vessel that is beneath the water line. It is important for firefighters to continuously take note of and monitor where the waterline is in relation to the draft marks during firefighting operations. Changes in the draft mark readings will indicate the stability and other important information about the stress acting on the hull of a vessel.

Calculations using the vessels draft markings should be performed continuously by trained personnel to recognize changes in a vessels list (lean), increase in draft (sinkage), and changes in trim (nose up/down). Continuous observations and recordings of draft markings during firefighting operations provide time for corrective action before vessel failures occur. For example, increases in draft may indicate too much water is being applied and/or dewatering efforts are not effective. A vessel that is listing or out of trim may cause water to flow into unintended areas and lose stability to the point of capsizing.

Load Line

Near the amidships draft mark is a symbol known as the load line (also known as the Plimsol line). This mark indicates the maximum draft to which a vessel can be submerged for reasons of stability or hull strength.

Shipboard Fire Protection Systems

The fire detection and suppression systems found on vessels have many similarities to those found in commercial and highrise buildings. Although there are some operating pressure limitations, fire departments can supply vessels with water and pressure through the international shore connection (ISC) just like we would a standpipe to a building. Vessels also tend to be provided with more extensive, fixed-fire suppression systems than a commercial building and can often be the best option for fire attack. The following is a brief overview of some of the more common fire protections systems found on commercial vessels. Prior to utilization of any of the vessel's systems, the vessel's engineer must be consulted and actions coordinated with the vessel's crew.

Fire Detection & Alarm Systems

- Smoke Detectors
- Heat Detectors
- Flame Detectors
- Alarm Panel – control panel will be found on bridge
- Automatic System Operations
  - Automatic air handling / pressurizing stairwells
  - Elevator recall to main deck
  - Close fire doors/smoke dampers
  - Turn off engines or other systems

Fixed Fire Suppression Systems

- Carbon Dioxide
  - Locations – Engine, generator, machinery rooms, cargo holds
  - Hazards – Asphyxiation, static discharge
- Halogen / Clean Agents
  - Locations – Engine, generator, electronic, machinery rooms
  - Hazards – Asphyxiation, carcinogenic
- Steam Smothering
  - Locations – Boiler rooms, galleys, pump rooms
  - Hazards – Scalding

Figure 35-44 Many commercial vessels are equiped with carbon dioxide extinguishment systems similar to the one pictured here

- High & Low Expansion Foam
  - Locations – Engine, generator, machinery rooms, cargo holds
  - Hazards – Disorientation, smoldering fire, slip and fall
- Dry Chemical Agents
  - Locations - Engine, generator, machinery rooms, cargo holds
  - Hazards – Respiratory distress
- Water Sprinkler Systems
  - Locations – Passenger or crew accommodation areas
  - Hazards – Vessel stability, excessive water weight

Figure 35-45 In the maritime industry, a "fire station" is merely an area staged with hose, FDC, and firefighting equipment.

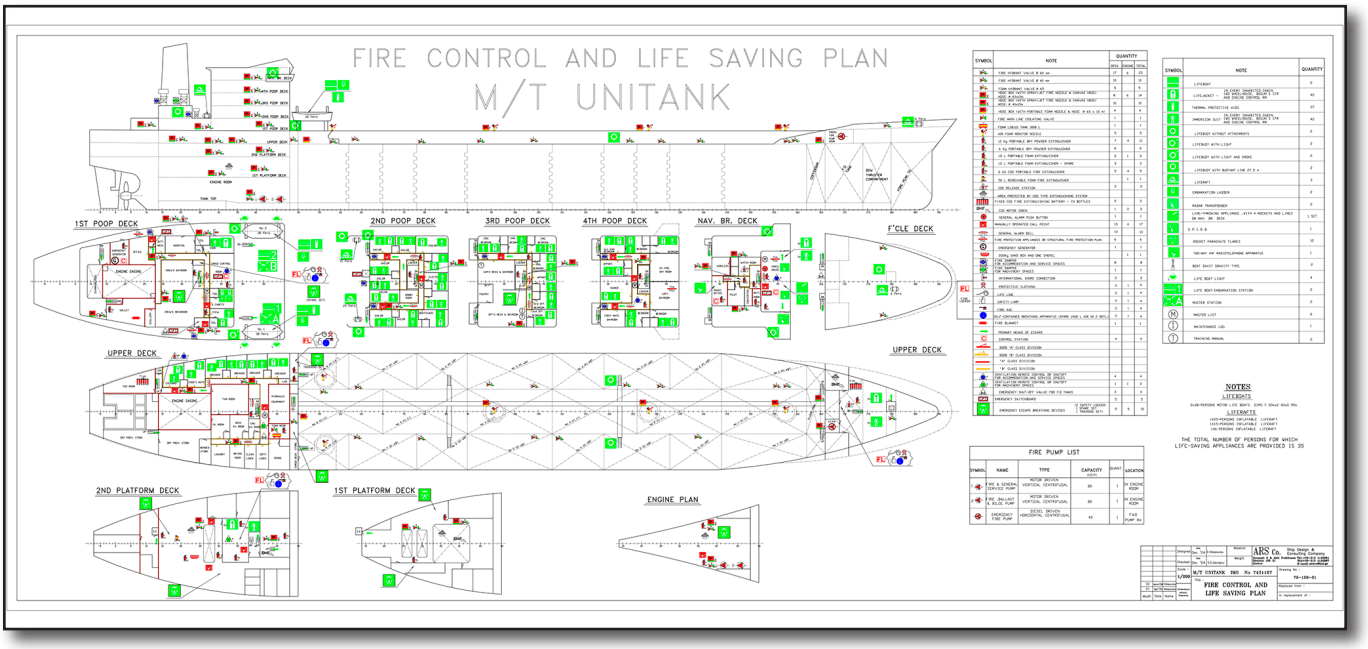
Fire Main

The fire main system is the vessel's primary means for getting water to the location of the fire for the vessel's crew. Shore based firefighters should not rely on the ships fire main system as their primary means of fire attack.

The fire main consists of the following components:

- International Shore Connection (ISC)
  - Max rated pressure of 150 psi
  - Minimum of one on each side of vessel
- Fire Pumps – typically, a vessel has a minimum of two
- Fire Stations – A vessel's version of a hose cabinet and standpipe outlet
- Fire Main Piping
  - Consult crew to determine systems max pressure
  - Even though FDC may be metal/brass, the piping may be PVC. Pressures greater than 100 psi may cause failure.
  - Some systems operate as low as 50 psi.

Shipboard Fire Control Plans



For fire incidents onboard a vessel, one of the most valuable assets on the ship is the fire control plan. The information an Incident Commander needs to fight a fire on a ship, such as general layout and dimensions, firefighting systems and other systems that have a direct impact on firefighting are included in the fire control plan. Of note, fire control plans are not typically found on tugs, barges and most commercial fishing vessels.

Location of Plan

U.S. regulations regquire the fire control plan to be permanently stowed in a prominently marked weather-tight enclosure outside the deck house. All large vessels are mandated to have them at three locations where you board the vessel. In the past, even when marine firefighters were aware that the fire control plan existed, they had trouble finding it. In response to this problem, the International Maritime Organization (IMO) published specific guidance on locating and marking the fire control plan enclosure.

The enclosure should be a painted red storage box or cylindrical container and is often referenced as the “red tube” where the oversized printed plans are stored. A red/white sign should also indicate the location of the Fire Plan. If the enclosure is not adjacent to the gangway, there should be guide signs with a red arrow to help shore side firefighting personnel locate the Fire Control Plans

Figure 35-46 Fire Control Plans are required by U.S. Regulations as well as many other countries. Obtaining and reviewing the fire control plan must be made a priority by first arriving companies prior to initiating fire attack operations.

International Shore Connection

In case of fire aboard a ship, the onboard fire system may be of use to the shore-based firefighter. Using the "International Shore Connection", the vessel's fire main may be connected to a fire department supply line. Per international standard, all merchant vessels are required to have aboard an international shore connection that may be fitted to a hydrant aboard the vessel. There is no requirement that the vessel carry a connection that fits the numerous types of hoses found in every port where it may conduct business. Therefore, each responding fire department should have its own international shore connection to adapt to the fire department thread.

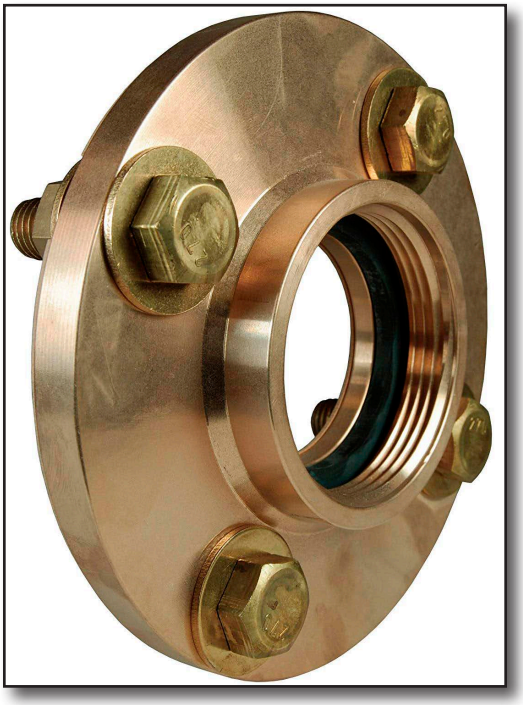


Figure 35-47 Municipal fire departments are responsible for providing the supply side of the International Shore Connection.

To successfully complete this mating of equipment, the shore-based fire service must have a connector that can be married to the ship's connector. The use of the ship-owned International Shore Connection provides a standard international flange; the local fire department owned International Shore Connection connects to the shore fire main providing another standard flange. These flanges are then bolted together to connect the two systems.

The International Shore Connection is tested to 150 psi. Care should be taken to avoid over-pressurizing this device or the ship's fire main system. The ships system is normally tested to 100-125 psi. Therefore, it is strongly recommended that the ship's flange be connected directly to the vessel's fire main, if possible, and not to the vessel's fire hose.

The international shore connection can usually be found in a damage control locker (emergency equipment room) or permanently attached to the fire main. There are two connections required to be aboard (one per side). To locate the international shore connection, the ship's fire plan should be consulted. This plan will detail the location of all the firefighting equipment.

If the vessel's fire main is used, it should be treated like a standpipe and after charging, a visual inspection should be made to determine the integrity of the system.

Mooring Equipment

A vessel is secured to a pier or wharf by mooring lines or wires (metal cables). Depending on the size of the vessel, these lines or wires may be several inches in circumference and require multiple people to move them. Mooring lines and wires can present the following hazards and concerns to firefighters.

- Due to tides and changing cargo loads, mooring lines require continual adjustment which is often accomplished by using automatic winches onboard the vessel.
  - If lines are not adjusted and become too taut, the vessel may heel (lean or tilt), causing lines to stress to the point of failure.
  - If lines are not adjusted and become too slack, the vessel may move away from the pier, causing failure of hoses and electrical connections and/or the gangway may pull away from the vessel or pier.
- Failure of a mooring line or wire under stress can happen without warning and is potentially deadly. Several fatalities have occurred due to the catastrophic failure of a mooring line or wire.
- Loss of a vessel's ability to produce power makes it nearly impossible to adjust the mooring lines of a large vessel.
- Mooring lines are considered a high priority exposure that must be protected from fire. Failure to do so may allow the vessel to float adrift.
- Firefighters should avoid working or staging in the area of mooring lines unless unavoidable. A safety circle should be set up around the mooring lines with a radius equal or greater than the length of the line.
- Although slight creaking or groaning sounds of mooring lines is not unusual, loud cracking noises and the appearance of smoke from a synthetic line are indications of heavy strain and imminent failure.
- Firefighters should not handle mooring lines or equipment. Only trained personnel should perform these adjustments and any request to do so should go through the unified command structure.

Figure 35-48 Only qualified ship personnel should handle mooring lines

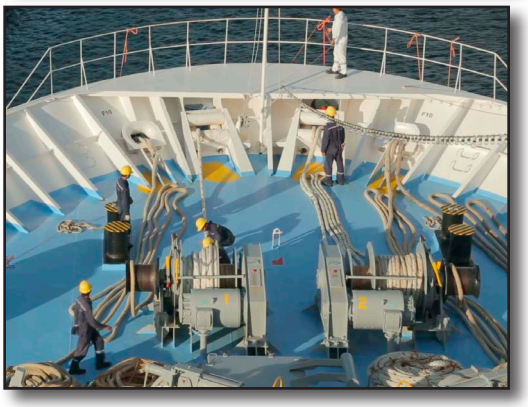


Figure 35-49 Mooring winches on large vessels use automated systems to keep the proper amount of tension on the lines when tied to the pier in order to allow for tidal changes.

Marine Firefighting Tactics

Search

The search techniques utilized by SDFD for structure fires are a solid foundation for performing searches in marine vessels. In addition to the basic search techniques outlined in the Search and Rescue chapter of the SDFD Drill Manual, the following considerations should by emphasized for searches on board vessels:

- Advancement into a vessel should be methodical and organized, taking note and communicating your location (deck and frame number) as you proceed.
- Constant contact must be maintained with the bulkhead or other structure to minimize the possibility of getting lost or falling through unprotected openings.
- Disorientation in a vessel is very easy, thermal imagers should be used by search crews in addition to the use of a search lines or rope.
- Search lines/ropes should be utilized even in light smoke or minimally reduced visibility conditions. Visibility in a vessel can rapidly decline without warning. It is advisable for search lines/ropes to be anchored to a safety zone or the entrance to the vessel. This search line/rope may be the only means of finding your way out and/or RIC finding you in an emergency.
- Consider using a sounding tool or 6' pike pole to feel in front of you as you advance to avoid falling through unprotected openings or hatches.
- Strict adherence to the SDFD Air Management Policy for vessel fires is critical to firefighter safety.

Rescue/Victim Removal

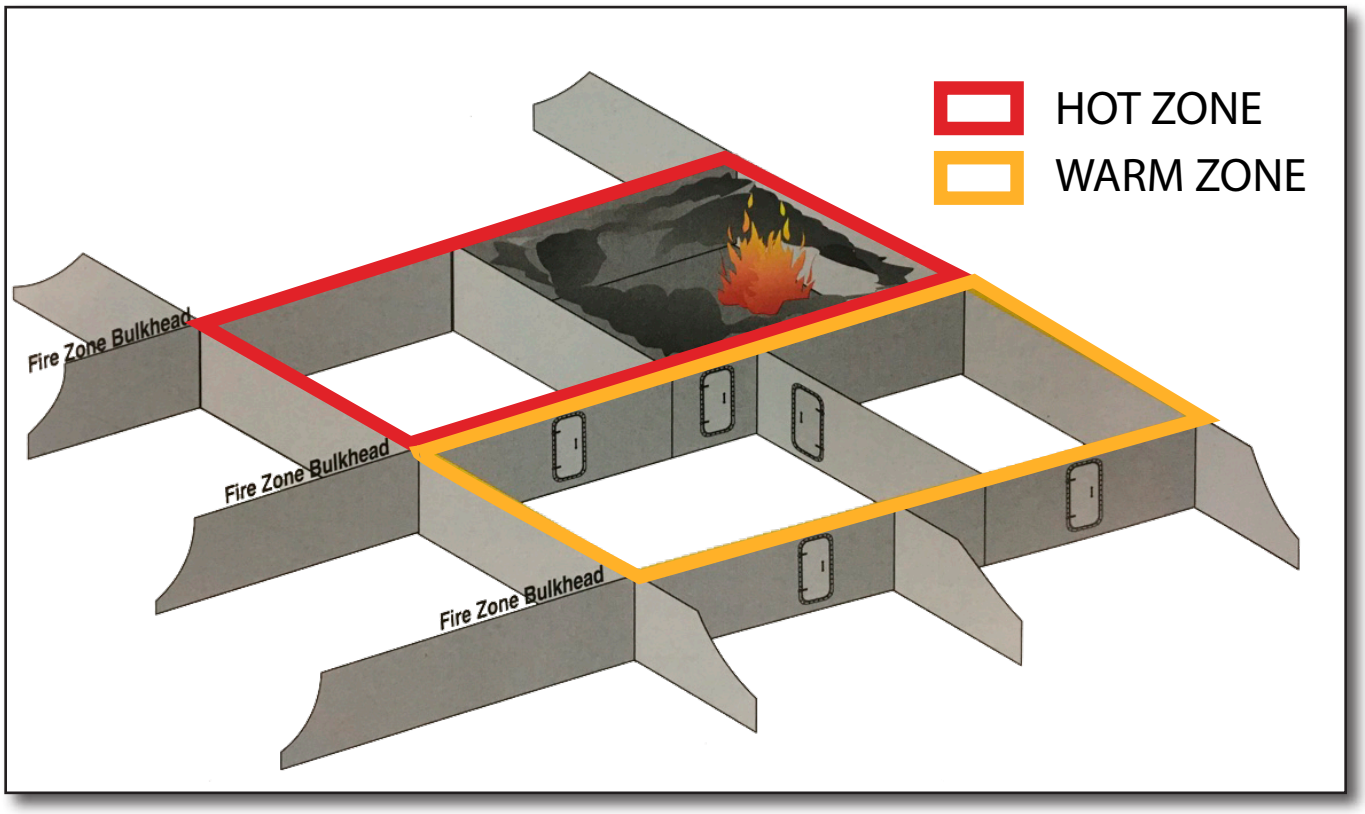
The rescuing of victims, crew members, or firefighters from a vessel can prove to be very challenging, exhausting, and a time consuming operation. The rescuing of victims in a structure fire can push firefighters to the limits in the best of circumstances, in a marine vessel fire, the obstacles and hazards encountered are numerous and amplified. Below are some considerations with rescue operations from a marine vessel.

- Narrow passageways, hatch and door coamings, and steep ladders are abundant on a vessel, requiring rescuers to lift and carry victims over the obstacles.
- Rescuing downed firefighters in a vessel is especially challenging due to our PPE and SCBA. Standard drags or victim carries may not work in

certain areas of the vessel as they may snag on ladders or door coamings. Stokes baskets may be too long or bulky to make tight corners or through hatches, and RIC Bags may be difficult to move in conjunction with the victims.

- Passageways and vertical ladder openings are likely to be filled with smoke and hot gasses, acting like a chimney, hampering rescue efforts.
- Special rescue techniques in these environments should be practiced and utilized.
- The utilization of USAR and technical rescue teams for search and rescue operations is highly encouraged.

Fire Boundaries

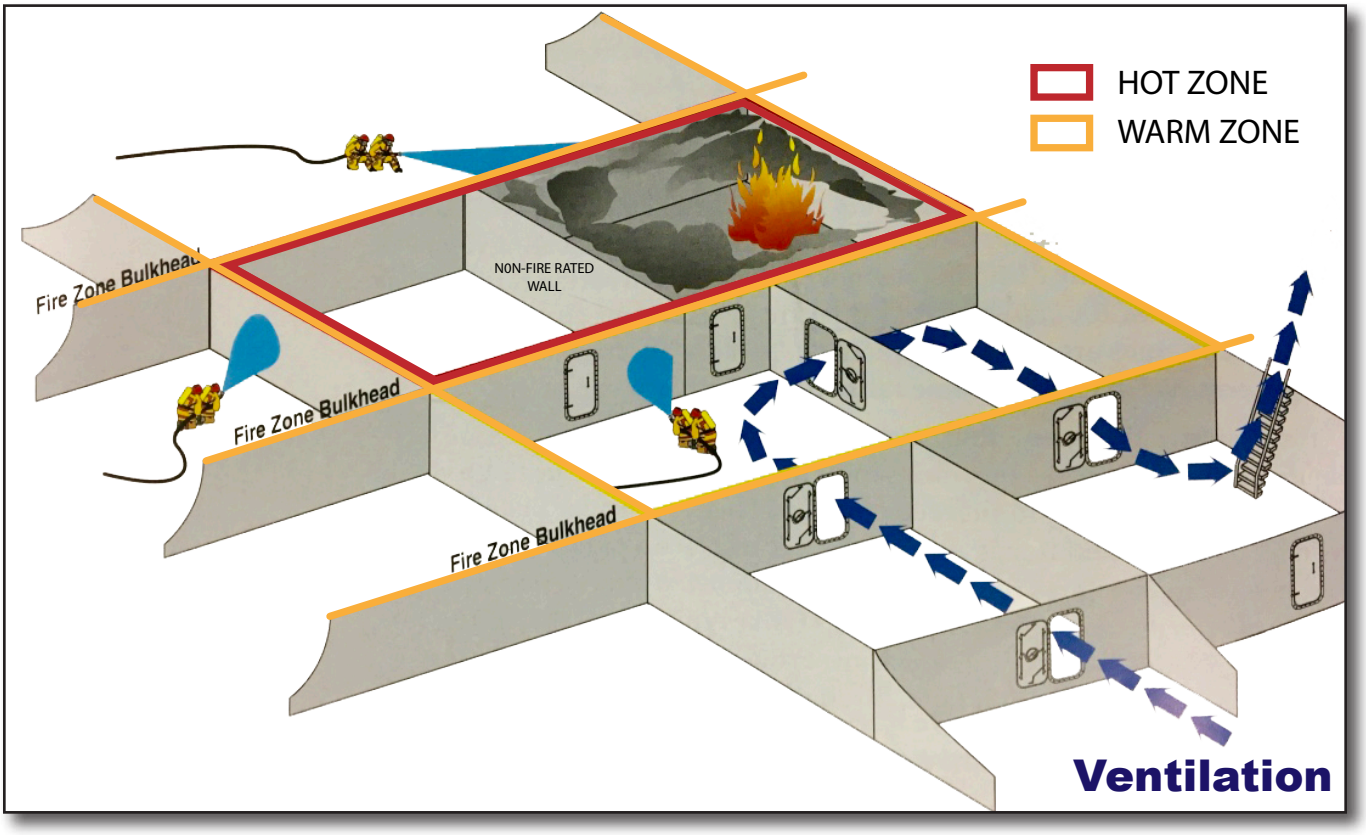


If a fire is large in size and/or cannot be quickly extinguished, fire boundaries should be established to confine the smoke and fire as best as possible to the area of origin. Metal vessel structures rapidly conduct and radiate heat to compartments on all six sides, with the greatest temperature rise occurring in the bulkhead space above a fire. Air temperatures in bulkheads located above a fire in a vessel have been found to reach 600 degrees Fahrenheit in less than 20 minutes due to the conduction of heat through the vessels steel structure.

Primary Boundary "Hot Zone"

A primary boundary or "hot zone" should be established by securing the bulkhead doors and hatches on all six sides of the area. By creating a "hot zone" it will help minimize the spread of fire, smoke and toxic gases.

- Creating a "hot zone" should be coordinated and created by securing the doors/hatches from the lowest areas of the ship working upward. If crews close the doors and hatches starting at the top of the vessel first, smoke build up will become pressurized and work its way out of lower, unsecured openings and impact areas of the vessel that may not have been previously effected.
- Once established, the "hot zone" should only be entered by fire personnel for extreme situations and with close coordination with the Incident Commander.
- HVAC and utilities should be secured to the "hot zone."
- Fixed vessel fire suppression systems may be used for extinguishing a fire in the "hot zone" if present.



Secondary Boundary "Warm Zone"

A secondary boundary or "warm zone" should next be established on all six sides of the hot zone. This "warm zone" is for firefighting operations.

- Hose lines, using a narrow fog pattern and minimal GPM in short 1 to 2 second durations, should be used to cool the bulkhead walls, floor, and

ceiling of the "hot zone." If steam production is minimal or tolerable to firefighters, longer duration of water burst may be used to cool bulkheads.

- A priority should be placed on cooling the bulkhead space directly above the fire as this will prove to be the most significant exposure.
- The use of TIC's are especially useful in the "warm zone" to determine areas of greatest heat.
- In the "warm zone," doors and hatches should remain open for the advancement of personnel, hose lines, tag lines, and ventilation. However, if necessary to control smoke flow, debris carriers may be hung over doors and hatches to help minimize the spread of smoke and gases yet still allow passage of equipment and firefighters.
- Several hose lines will be required to be in place to effectively cool all six sides of the "hot zone" as movement from the various bulkheads with charged hose lines may prove too slow and ineffective.

Fixed Fire-Suppression Systems

Total flooding fixed fire-suppression systems are only effective when the fire compartment, "hot zone," is sealed, allowing the oxygen levels that support combustion to drop. This includes systems that discharge Carbon Dioxide, Halon, or Dry Chemical. An exception to this is foam fixed suppression systems, which do not require a sealed space to be effective.

The decision to use a total fixed fire-suppression system must include the commitment to be patient. Vessel fires have the potential to last for several days, even when using fixed suppression systems; close monitoring, multiple reapplications of the extinguishing agent, and continuous cooling of the "hot zone" bulkhead should be expected.

Fire Attack

The ability to establish fire boundaries, utilize fixed suppression systems and cool the bulkheads may not be sufficient to keep the fire in check or allow it to be extinguished. In this case, a direct fire attack operation may be considered or utilized. As firefighters, we are very familiar and highly trained with advancing hose lines, utilizing the proper nozzles, fire streams, GPM, and performing other firefighting techniques. **The shipboard environment often proves to be the ultimate test of applying direct fire attack skills in the harshest of environments. Adaptability and versatility to SOG's should be expected and never taken lightly.**

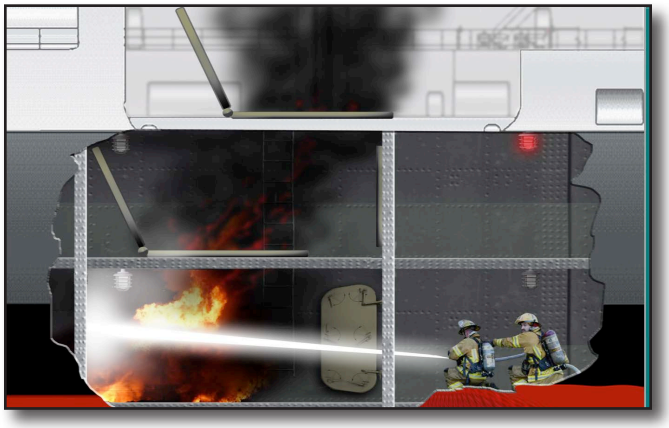


Figure 35-50 Direct fire attack tactics may be necessary if confining the fire to the bulkheads by establishing fire boundaries, utilizing fixed suppression systems, and cooling the bulhead walls is not sufficient.

Fire Hose Advancement

- Minimum of two hose lines – primary & back up lines should come from shore based firefighting apparatus. Do not rely on shipboard "fire stations" alone to mount your fire attack.
- Take the time to reference the ship's fire control plan and diagram for large vessels to plan out your best route to the fire. Additionally, identify an escape route and safety zone/area for fire attack crews.
- Hose lines should advance from the same direction, preferably up wind, and attempt to be in a position where the nozzle firefighters are attacking the fire from below or at the same deck level as the fire. Avoid advancing lines below deck through doorways, ladders, or hatches that are acting like a chimney, ventilating hot smoke and gasses.
- Although extremely high risk and not advised, if hose lines must be advanced vertically from above the fire, remain standing rather than drop to your knees, as the heat is coming up from below you. Cool the decking as you advance downward. Firefighters have compared this experience to standing in a frying pan.
- Attempt to stretch the hose lines dry until you reach the "warm zone." One properly flaked and you have ensured you have enough working line, call for water.
- Proper hose flaking is critical. Excessive hose can become easily kinked in the tight bulkhead spaces and passageways.
- Advancing charged hose lines through the tight passageways, ladders, multiple decks and bulkheads requires teamwork and coordination. On past incidents, it has been noted that 8 to 10 firefighters were often required to advance 200 feet of 1 ¾" charged hose inside a vessel.

Hot Zone Entry

Entry into the "hot zone" of a vessel is a high-risk operation and should not be attempted when the following conditions are present:

- Firefighters in full PPE are experiencing high heat down to their knee level.
- Bulkheads or doors are too hot to touch with the back of a gloved hand.
- Firefighters boot soles begin sticking to the deck.
- Intolerable amounts of steam are generated by water used to cool decks or bulkheads.
- Hot fuel or other liquids are spilling out of the vents of tanks located within the "hot zone."

If after thorough completion of a risk assessment by the Incident Commander it is determined that entry into the "hot zone" will be required, consider the following:

- Rapid egress from a vessel is generally not possible and the path of egress

is likely to be the same as the path of heat and gasses once the "hot zone" is opened.

- Strategic planning of entry into the "hot zone" must be pre-planned using the vessel's fire control plan.
- Insulated bulkheads with fire ratings may not give firefighters a true sense of the amount of heat they will experience once opening the doors to the "hot zone."
- The importance in the use of thermal imagers for measuring temperatures by experienced firefighters cannot be understated.

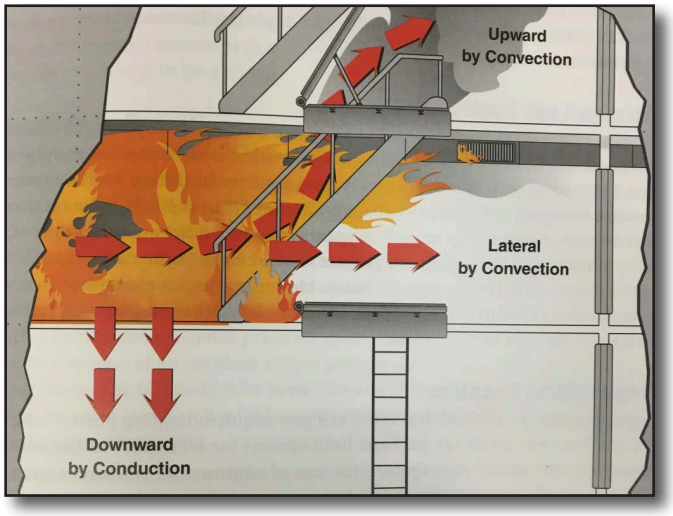


Figure 35-51 Methods of heat transfer in the shipboard environment. This illustration also is a reminder that the path of firefighter egress is often going to be the same path as the flow of supereheated smoke and gases.

Opening Doors to "Hot Zone"

- Have a plan to secure the door shut quickly if conditions are too extreme
- A charged hose line must be in place
- Check the bulkhead door for excessive heat by
  - Using the back of a gloved hand
  - Short bursts of water checking for steam production
  - TIC
  - Paint flaking or bubbling off bulkhead
- Excessive heat within the "hot zone" is likely to cause the doors and locking mechanisms to warp and jam. FE tools, such as a sledge hammer, may be necessary to operate the dogs/locks.
- Carefully observe the movement of the door and smoke patterns around the door before releasing the last dog/lock as extreme pressures may be built up behind the door, causing it to open violently.
- If possible, operate the last dog/lock with a tool or rope to control the swing of the door from a safe position.

Fire Stream Tactics

Fire stream selection varies, as there are opportunities to use both fog and straight stream patterns depending on the type of fire and environment. Firefighters must use their experience and judgment to determine which pattern will be most effective for the conditions presented to them.

- Fog or partial fog patterns are effective at extinguishing fires in confined spaces or bulkheads by rapid cooling, however, this rapid cooling results in excessive steam production and can be extremely dangerous to firefighters if they are applying a fog pattern while inside the same space.

- Straight stream patterns are effective for reach and penetration with less steam production, however, more water may be required to be applied to accomplish the same cooling effect as a fog nozzle.
- Regardless of the stream utilized, firefighters should apply water in short bursts, pause to let the steam settle, repeat and advance as necessary.
- The use of Class A foam or CAFS may also be a good option for fire attack crews. Generally speaking, a thicker, higher percent foam concentrate tends to be more effective at cooling and lasting longer in the high heat environment of a fire within a vessel's bulkhead.

Laddering Vessels

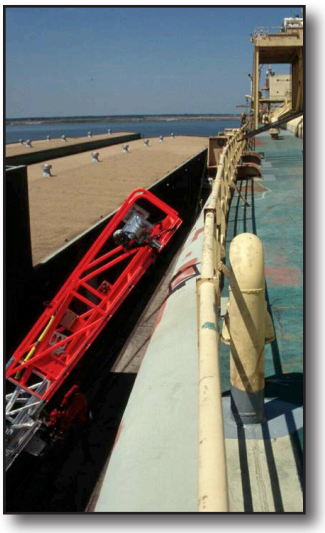


Figure 35-52 Ladders must be continuously monitored and frequently adjusted as the tide is continously changing, causing the vessel to rise and fall up to 8 feet every six hours.

The use of ground and aerial ladders to access a vessel requires extreme caution as the vessels can unexpectedly shift or list due to changing conditions. Additionally, a vessel may rise/fall as much as eight feet in a 6-hour period due to tidal changes. If aerials are used as a standpipe to establish a water supply or for crews to access the vessel, avoid crossing the aerial over the plane of the vessel's railing.

When ground ladders are used, they should NOT be tied off to the vessel (as is the standard practice of SDFD for placing ground ladders to structures). Ground ladders should not be left in place for long durations without being monitored and adjusted. As the tide rises/falls, the ladders will shift and climbing angles will change.

Ventilation

Ventilation strategies vary depending upon the type of vessel, location and conditions of a fire. Natural ventilation, positive pressure ventilation, mechanical ventilation through the ships systems, or a combination of all three should be considered. **The most important factor when determining the proper method for ventilating a vessel is to utilize the unified command process and build a plan using qualified personnel from the vessel. Standard ventilation techniques utilized by land-based firefighters have had devastating outcomes due to a lack of understanding of how the vessel's ventilation systems operate.**

Positive Pressure Ventilation Encouraged

- A short, direct path for the hot smoke and gases to exhaust to the outside atmosphere is present. This may be through a hatch, door, stack, or bulkhead.
- Firefighters cannot isolate the fire space and are unable to use the fixed fire-suppression systems.

DO NOT USE Positive Pressure Ventilation

- Fire is in a space without a direct ventilation path to the weather deck or outside.
- Fire is in an accommodation space formed from modular construction, creating hidden voids.
- Evidence of fire extending through the vessel's ventilation system is present.
- Fire is in a space with a fixed fire-suppression system in operation.

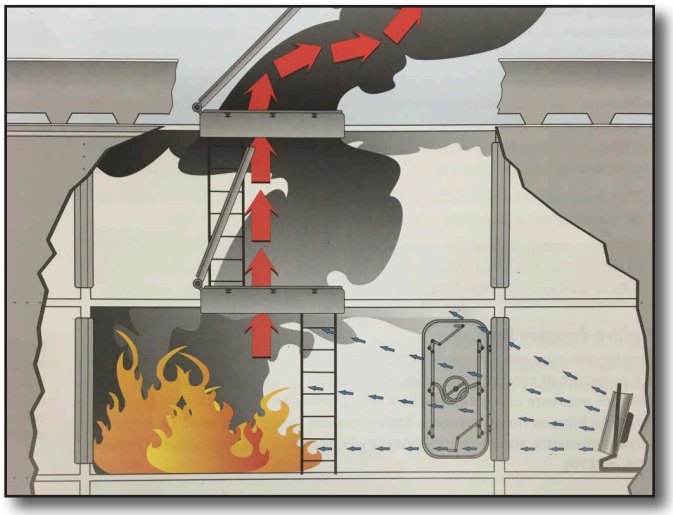


Figure 35-53 PPV may be effective if a short and direct path exists for the heat and smoke to be exhausted outside.

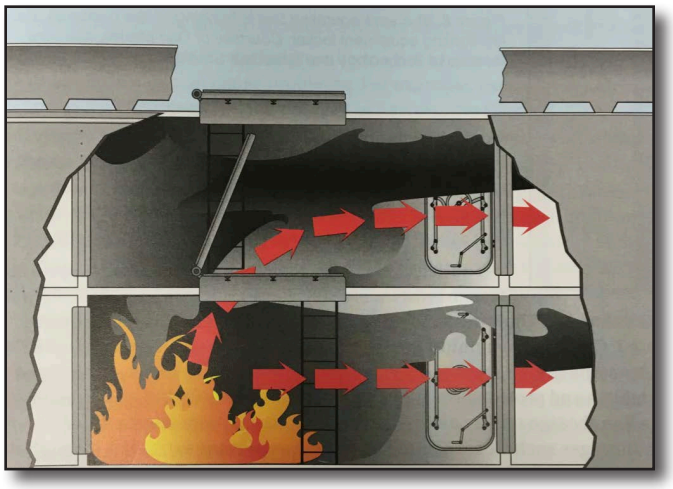


Figure 35-54 PPV should not be utilized if the heat and smoke cannot be immediately exhausted to the outisde. There are numerous examples where PPV was utilized in the Marine Firefighting Environment that resulted in civilian and firefighter deaths due to poor coordination during ventilation operations.

Salvage & Overhaul

The principles of salvage and overhaul on a vessel are the same as those for a structure fire. However, the following complications can be expected:

- Furnishings are often fastened in place to prevent moving. It will not be possible to remove the furnishings and difficult to check for extension behind them.
- Access to concealed spaces is considerably more difficult and time consuming when checking for extension due to the steel structure. Specialty tools and saws may be required.
- Piping and electrical cabling bundles and runs must be thoroughly examined during overhaul as heat can be conducted long distances within them.

Dewatering

Water entering a vessel due to damage or fire-fighting activities must be continuously removed to maintain vessel stability. Dewatering must be given a high priority. Personnel and resources should be assigned to conduct dewatering procedures concurrent with the firefighting efforts. Dewatering operations must also consider the possibility of fuel and other contaminants present in the discharged water and take appropriate measures to contain them. Coordination with Harbor PD, Lifeguards, and/or USCG with dewatering and containment operations are encouraged.

There are three main methods for dewatering a vessel:

External Drains

On larger vessels, water may be removed using the scuppers on the weather deck. Often these scuppers are kept in the closed position to prevent any spills or contaminants that occur on the weather deck from entering the water/ocean. By simply ensuring that these scuppers are in the open position will allow fire-fighting water to drain overboard.

Internal Drains

Some large vessels are plumbed with internal drains on the various decks. These drains lead to a holding tank at the bottom of the vessel's hull and vary widely in their size and capacity. By ensuring that the drains are kept free of debris and clogs will be effective in removing water from the decks of a vessel.

One important consideration when using internal drains is to coordinate this operation with the ship's crew. The holding tanks have pumps to remove the water from the holding tanks, however, if the ship's systems are compromised or not working, the use of internal drains may not be a viable option.

Pumping Equipment

Pumping equipment is an additional option to utilize for dewatering a vessel. Pumping equipment falls into the following three general categories:

Bilge Pump

Bilge pumps are a piece of equipment found on most vessels that are in the lowest parts of the hull where excess water may accumulate. These electrically powered pumps automatically activate when water accumulates to a predetermined level, however, they may also be manually activated by controls at the helm or bridge. Failure of the vessel's electrical system will result in the inoperability of the bilge pump. Bilge pumps should not be utilized if a suspected fuel leak or vapors are present in the bilge area as this could lead to an explosion. Additionally, electrically powered pumps in saltwater presents a shock hazard.

Portable Pump

Portable pumps can be used for dewatering purposes and vary widely in their size and capacity. Portable pumps may be powered by air, hydraulic, electric motors, or gasoline/diesel engines.

Submersible Pump

On smaller vessels, submersible pumps can be used for dewatering. Sump pumps are small, economical, and light weight electrically powered devices that can be placed into small openings where portable pumps may not be a viable option. Ventilation of the confined space should be performed prior to utilizing a submersible pump to reduce the risk of explosion due to flammable vapors.

Eductor

Eductors operate on the Venturi principal and are similar in operation to the foam eductors used by firefighters. Water is pumped through a hose line, passes through an eductor, drawing in water from the vessel, then is discharged through a separate hose line. Eductors are found on both the Lifeguard and Harbor PD fireboats and are the primary method used for dewatering.

Figure 35-62 Dewatering operations are an important consideration the IC must begin to coordinate early on with the assistance of Lifeguards, Harbor PD, and/or USCG

Environmental Factors in Marine Firefighting

Environmental considerations are perhaps the area least considered by firefighters responding to marine incidents, but can play a significant factor in managing the incident. Temperature, fog, wind, currents, and tides are all factors for consideration for marine firefighting, with wind and tides being the most critical for shore-based operations in San Diego.

Wind

Wind can greatly affect fire conditions and the ability for firefighters to mount an effective fire attack. Wind causes waves to form which in turn cause the vessel to move in all directions complicating all aspects of emergency operations onboard. The degree of movement will vary depending on the size of the vessel and whether the vessel is anchored, moored, or tied off to a dock.

Large vessels, such as cruise ships, car carriers, and cargo ships present considerable surface area to the wind. Wind blowing a vessel away from the pier may cause mooring lines to break, allowing the vessel to drift. As a result, vessel mooring lines must be tended by qualified personnel from the ship or the vessel must be held against the pier by tugs.

Similar to the hazards of high-rise firefighting, wind can also intensify fire conditions inside of large vessels when port holes, doors, or windows that are in-line with wind direction.

Tides

Figure 35-55 High Tide (top) vs. Low Tide (bottom) over a six hour period.

Tides are the vertical movements of the waters on earth due to the combined gravitational forces of the sun and moon. The tides we experience are semi-diurnal, meaning that we have two high tides and two low tides in a 24-hour period (24 hours and 50 mins to be more accurate). Tidal ranges vary greatly depending on your location; however, San Diego generally experiences a tidal range of up to seven feet.

Understanding and factoring in tidal changes to your incident plan are critical to firefighters for the following reasons:

- Marine firefighting incidents are long in duration, often lasting multiple days. With a tidal change approximately every six hours, it will be a factor in your incident.
- Access to vessels from shore by ladder or gangway will be affected, as the vessel moves up and down relative to the pier (not a factor on floating docks). Ground ladders should avoid being lashed off to the vessels and continually adjusted to ensure the ladder is at a safe height and climbing angle.
- Positioning of aerial ladders and truck companies is

critical. Aerial ladders should avoid crossing the edge of the vessel and attempts should be made to position the ladder alongside of it. If this cannot be accomplished and aerial ladders must cross over the vessel side, firefighters must ensure adequate clearance to avoid damaging the apparatus due to vessel movement. Tidal vessel movement may be so slow as to pass unnoticed, but if not monitored closely, can cause significant damage to the ladder. Similarly, sudden vessel movement can cause damage to aerial ladders as well, due to wind chop, wakes from other vessels, or sudden load shifts on the vessel.

- Large vessels are moored using synthetic ropes or wire rope and held at the proper tension to the pier by automatic winches. If power is lost to the vessel, these winches may become inoperative. If the tide is falling, the result may be a vessel with slacked lines that can potentially allow it to drift from the pier. Worse, if the tide is rising, the result may be a vessel with lines that become tensioned to the point of failure, creating a significant hazard to firefighting personnel
- Tidal changes can also overstress gangways, utility supply hoses (fuel, electrical, water) and cargo transfer lines.

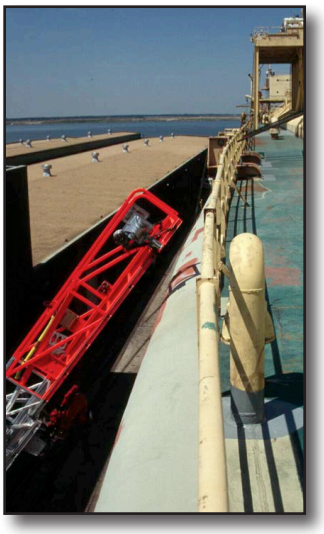


Figure 35-56 Aerial ladder placement should avoid crossing over the edge of the vessel to allow for tidal movement.

San Diego Marine FF Resources

San Diego Lifeguards

San Diego Lifeguards provide marine firefighting assistance through the use of three fire boats. At minimum, one of these fire boats is available and staffed 24/7 with three lifeguards and is equipped with basic firefighting equipment, tow lines, pumps eductors, and BLS level first aid equipment. Although they primarily service Mission Bay, they are available to Incident Commanders to assist with any incident in the San Diego Bay with a 20 to 30 minute response time.

Crew Capabilities

Fireboats have a standard compliment of three lifeguards. Lifeguards can support fire operations with the following duties:

Rescue – Fireboats can rescue personnel from the water as well as evacuate from vessels and marinas that are on fire.

Exposures – Fireboats can use onboard water supplies to cool exposures or even remove them under tow to prevent fire spread.

Extinguishment – Fireboats can be placed anywhere along the water's edge in water a minimum of 5' deep. This makes them available for direct attack via hand lines or the deck monitor. Additionally, the fireboat can provide water supply to land based fire fighters. In ship fires, fireboats can provide hull cooling and water supply.

Overhaul – A basic rule in marine firefighting is "what goes in, must come out." Each fire boat has pump out capabilities that range from 300-700 GPM dependent upon the vessel being used.

Water RIC – More than basic water rescue, lifeguards at scene are equipped with an SCBA and each vessel holds SCUBA gear. With the ability to access and visualize different points in the fireground, fireboat crews can also ensure that there is a timely and effective response to firefighters who may end up in the water.

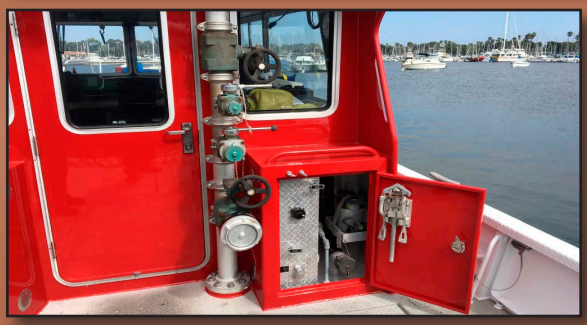
San Diego Lifeguards - Marine I

- **35’ Seaway Rescue Boat - 2004**
- **Fire Pump Capacity**
  - 1500 GPM @ 90 PSI
  - One 2 ½” monitor fog nozzle on bow
  - Two 2 ½” standpipes with gated wyes for water supply (250 GPM)
- **Fire Hose**
  - 100’ of 2 1/2” Hose
  - 300’ of 1 1/2 Hose
- **28 gallons of Class A foam**
- **Class A, B, C extinguishers**
- **Dewatering capabilities**
  - 300 GPM Pump
  - 60 GPM Pump
- **600’ ½” polypropylene line for towing**
- **Radio Communications:**
  - San Diego City 800 MHz System
  - VHF Marine Radio

San Diego Lifeguards - Marine II

- **32' Seaway Rescue Boat - 1994**
- **Fire Pump Capacity**
  - 1500 GPM @ 90 PSI
  - One 2 ½" monitor fog nozzle on bow
  - One 2 ½" standpipes with gated wyes for water supply (250 GPM)
- **Fire Hose**
  - 100' of 2 1/2" Hose
  - 300' of 1 1/2 Hose
- **28 gallons of class A foam**
- **Class A, B, C extinguishers**
- **Dewatering capabilities**
  - 300 GPM Pump
  - 60 GPM Pump
- **600' ½" polypropylene line for towing**
- **Radio Communications:**
  - San Diego City 800 MHz System
  - VHF Marine Radio

San Diego Lifeguards - Marine III



- **43’ Hike Metal Patrol Boat - 2015**
- **Fire Pump Capacity:**
  - 1750 GPM @ 200 PSI
  - 1600 GPM @ 80 PSI
  - Two 500 GPM adjustable fog monitors remotely controlled
  - 4” supply standpipe
  - Two 2 ½” standpipe outlets with gated wyes
  - Three 1 ¾” standpipe outlets
- **Fire Hose**
  - 100’ of 2 1/2” Hose
  - 300’ of 1 1/2 Hose
- **50 gallons of Class A foam**
- **Class A, B, C extinguishers**
- **Dewatering capabilities**
  - 300 GPM Pump
  - 60 GPM Pump
- **600’ ½” polypropylene line for towing**
- **Radio Communications:**
  - San Diego City 800 MHz System
  - VHF Marine Radio

San Diego Harbor PD

Fire Boats

The San Diego Port Authority owns five multi-role fire boats which are operated by a rotating staff of Harbor PD Officers. These fireboats have a standard compliment of 2 HPD officers. The goal of the Port Authority is to have two fireboats staffed and operational 90% of the time; one boat serving north San Diego Bay and the second boat serving the south end of San Diego Bay. If only one boat is in service, it will be staffed with a 3-person crew of HPD officers.

Capabilities

HPD provides the following duties in a fire operation:

Rescue – Fireboats can rescue personnel from the water as well as evacuate from vessels on fire and marinas.

Exposures – Fireboats can use onboard water supplies to cool exposures or even remove them under tow to prevent fire spread. Goal is to keep exposures in place.

Extinguishment – Fireboats can be placed anywhere along the water's edge in water a minimum of 5' deep. This makes them available for direct attack via hand lines or the deck monitor. Additionally, the fireboat can provide water supply to land based fire fighters. In ship fires, fireboats can provide hull cooling and water supply. HPD is also able to go interior for fire attack and/ or able to complete a search and rescue.

Overhaul /Dewatering– Each fire boat has dewatering capabilities through the use of eductors and portable pumps.

Water RIC – Harbor PD officers on these boats are not lifeguards. They can however, provide the option of SCUBA divers to the IC. It should be noted also that Harbor PD divers are not always available on boats (they have an approx. 15-20 min. response time and a diver may not be on duty all the time). If a diver is requested by the IC, they will be on the boat, dressed in a wetsuit, on standby.

San Diego Harbor PD - Marine 1, 2, 3, 4, 5

- **36' Metal Craft Marine Firestorm**
- **Two vessels in service in SD Bay**
- **Shelter Island: Unit 602**
- **Southbay: Unit 604**
- **Top speed 40mph/ 36kts**
- **Fire Pump Capacity:**
  - 1750 GPM 200PSI
  - 1 roof mount "Elkhart" electronically controlled monitor nozzle
  - 1 manual bow monitor
  - 1 starboard rear deck "Copperhead" monitor
  - 4" supply standpipe
  - 1 port aft wye gate riser
- **Dewatering capabilities**
- **80 gallons of F-500 (wetting and encapsulating agent) foam tank**
- **1 Class A, B, C extinguisher**
- **1 CO2 extinguisher**
- **100' of Amsteel rope for towing and rope with a grappling hook**

U.S.C.G.

The Coast Guard no longer provides fire boat/fire suppression services.

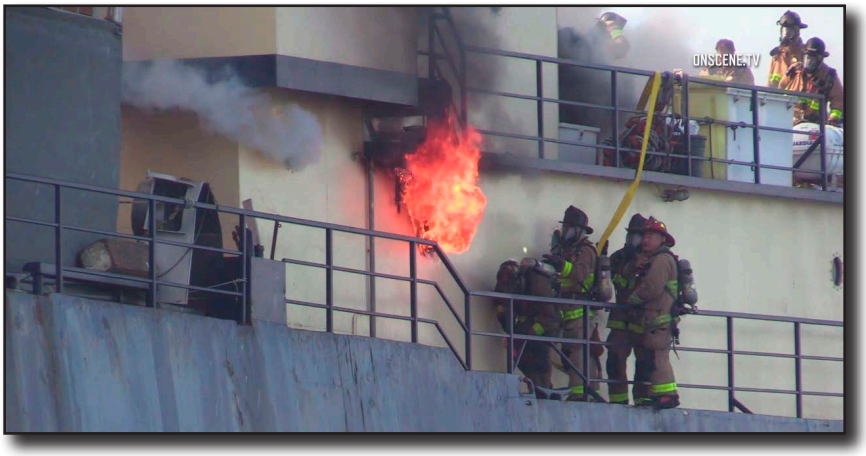
U.S. Navy

The US Navy does not operate any fire boats. Instead, they contract out their tugboat/fire boat services to civilian contractor, Edison Chouest, recognizable by the standard yellow and orange paint scheme. These tugboats have the capabilities to pump large quantities of water, however, are only designated for the Navy and are not readily available for civilian operational purposes or responses in San Diego Bay.

Figure 35-57 Military Contractor, Edison Chouest, operates tugboats for the US Navy.

Significant SDFD Marine Firefighting Incidents

Norton Sound



September 29, 2017: The "Norton Sound" caught fire while docked near Seaport Village on 750 Harbor Dr. The 120 ft. fishing vessel fire started in the lower levels. Due to the seat of the fire being in the lower levels, firefighters had an arduous time gaining access. Visibility was very poor during the operation due to the billowing thick black smoke. Crews had to regroup during the operation and launch a coordinated attack. A total of 100 firefighters were used to knock the main body of the fire down. Unified command was established due to the multiple agencies involved in the incident. The fire took 51 hours to burn all the way out. The vessel was a total loss.

Lessons Learned/ Considerations

- Be cautious of hot surfaces
- Ensure fire crews are sounding the ground to avoid open hatches and space due to poor visibility
- Consider requesting Foam Tender 28
- Consider requesting San Diego Lifeguards for water RIC operations

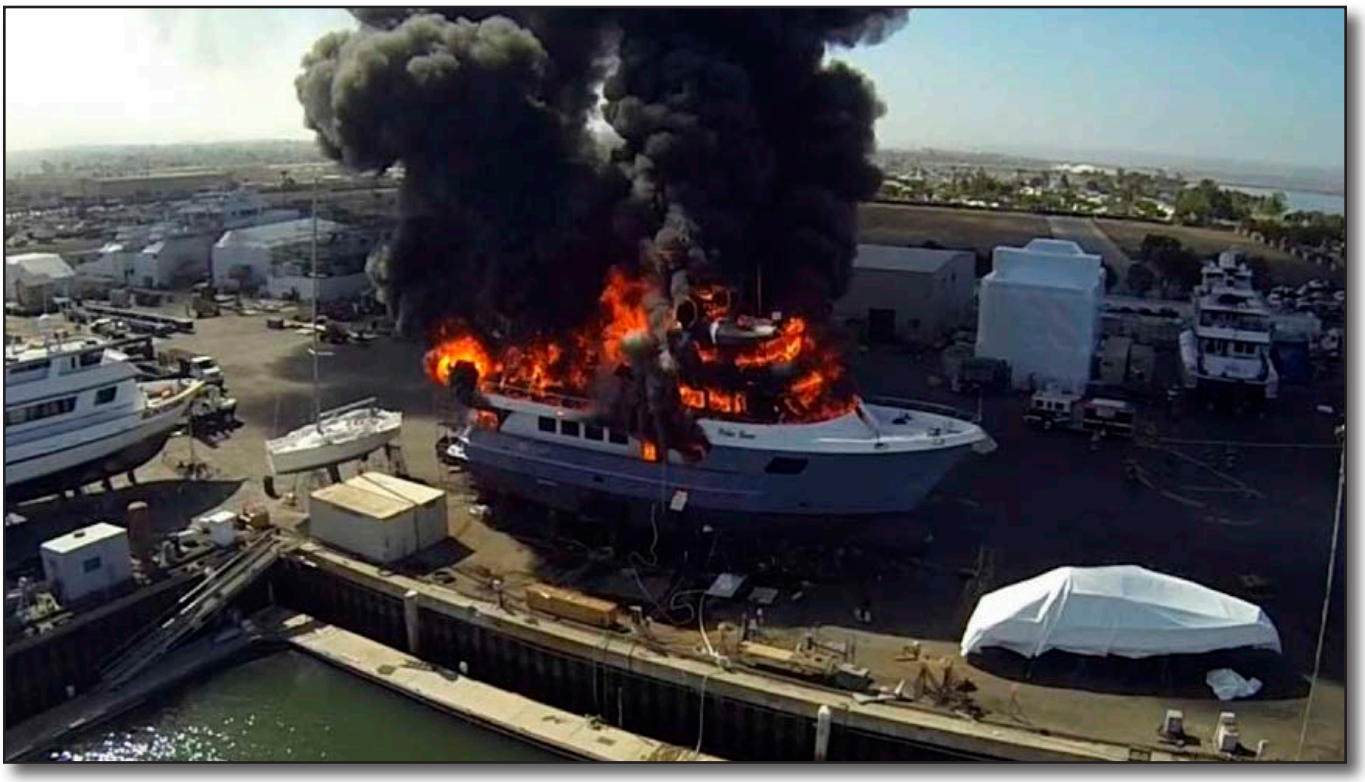
Pacific Tug Boat Fire

August 14, 2016: The tugboat "Chief" was docked on the 1400 block of Cesar E. Chavez Parkway broke out into flames. The fire was thought to be started by a lit cigarette in the galley located in the lower deck. The fire spread quickly throughout the boat. Fire crews took approximately 35 minutes to contain the fire. Total damage was estimated at $300,000. One off-duty tug boat employee perished in the fire.

Lessons Learned/ Considerations

- Due to ship's steel construction the surfaces were extremely hot.
- Monitor water level onboard vessel.
- Assign a position to watch draft marks on side of vessel also the vessels leveling.
- Monitor bilge pumps to ensure that they are working properly.
- Establish a water rescue group.

CVFD Polar Bear



June 19, 2014: The 110ft yacht "Polar Bear" caught fire in a Chula Vista boat yard on the 900 block of G St. The Polar Bear was in dry dock getting repairs done after its winter voyage to Costa Rica. The fire was thought to have started by welding work being completed. The yacht smoldered for hours after the main fire was knocked down. $24 million was the estimated total damage amount.

Lessons Learned/ Considerations

- Reports of large amount of fuel on board
- Difficulties with water penetration due the yacht being designed to keep water out
- Move exposures away from hazard
- Vessel stability, yacht was on jack stands

"Sea Siesta" – 57' Pleasure Yacht - Harbor Island

December 2013

https://www.youtube.com/watch?v=62Req61f7XY

Lessons Learned/Shared

- The fire was a fuel fed fire that was on the lowest level of the boat.
- Owner of the boat was at scene and Fire Attack questioned owner on best access to fire area.
- "Access was extremely confusing as the access to the lowest level was directly below the ladder leading to the second level. This was impossible to find in the extreme smoke, zero visibility conditions and loss of dexterity with structure gloves."
- The smoke encountered was heavy pressurized yellow/green smoke with zero visibility.
- "I was unable to see the screen of the TIC even when holding it directly against my mask due to the volume and pressure of the smoke."
- "Fire Attack was very difficult due to limited access and egress from boat. The boat entry access was only as wide as my shoulders so attack crew was single file and stacked on one another. Only one crew or 3 people at most was able to access the boat at one time to attempt fire attack."
- "Truck company began cutting holes in fiberglass hull, scuttle hatches and portholes, this only accelerated the fire and provided for fire spread."
- "Harbor PD fire boat was originally used as a water source with multiple 2 ½" lines placed on the dock, but was tied up directly next to burning boat. Once the boat flashed and began active burning the PD boat and all hose lines had to be moved creating a gap in water delivery."
- "Harbor PD has to tie up to become a water source, so locating an open spot for them is key."
- The second PD boat began defensive water stream application but shortly after flowing water had a mechanical failure leaving the scene with no water source.
- "If you use Harbor PD as initial water supply make sure they are spotted appropriately and you have a secondary water source available."
- "RIC and Back up crews were staged too close to boat on fire and were down wind causing exposure to crews while in standby mode, should have been staged in different area not exposing crews."

- No Water RIC was established.
- “Fire Attack made three attempts to find seat of fire with no success, begin to think of different strategy if multiple attempts have been made and fire conditions are not getting better or only getting worse. This fire flashed only 1 min after fire attack decided to pull out and go defensive.”

Maritime Glossary & Definitions

Accommodation Spaces
Spaces designed for living purposes for occupants of a vessel.

Aft (After)
The direction toward the back or stern of the vessel.

Anchorage
An area identified for safe anchoring.

Athwartship
Side to side, at right angles to the fore and aft center line of ship

Auto Terminal
A terminal where automobiles are the commodities handled.

Ballast
A weight, liquid or solid added to a ship to ensure stability.

Ballast Tank
A watertight compartment to hold liquid ballast.

Beam
The breadth (i.e., width) of a ship at its widest point.

Berth
The mooring of a boat alongside a bulkhead, pier, or between piles. A sleeping space.

Bilge
The lowest inner part of a ship's hull.

Bitts
A pair of heavy metal posts fastened on a deck to which mooring lines are secured.

Boom
A long pole extending upward at an angle from the mast of a derrick to support or guide objects lifted or suspended. A floating barrier used to confine materials upon the surface of the water (e.g., oil).

Bow
The front end of a boat or vessel.

Break Bulk Terminal
A terminal where commodities packaged in bags, drums, cartons, and crates are commonly, but not always, palletized and loaded and unloaded.

Bulkhead
One of the upright, vertical partitions dividing a ship into compartments and serving to retard the spread of leakage or fire. A fixed pier or wall back-filled to be continuous with the land.

Bulk Terminal
A terminal where unpacked commodities carried in the holds and tanks of cargo vessels and tankers and generally transferred by such means as conveyors, clamshells, and pipelines are handled.

Camber
The arch of a deck, when viewed from either end of the vessel. Designed to shed water from boarding seas.

Center line
A line that runs from the bow to the stern of the vessel and is equidistant from the port and starboard sides of the vessel; also known as the "lubber's line."

Chief Mate
The deck officer immediately responsible to the vessel's Master. (Also see Mate).

Crude Oil
Unrefined petroleum.

Coaming
The raised framework around deck or bulkhead openings to prevent entry of water.

Cofferdam
A void between the compartments or tanks of a ship for purposes of isolation.

Companionway
An interior stair-ladder used to travel from deck to deck, usually enclosed.

Container Terminal
A terminal that is designed to handle containers that are carried by truck or rail car where transported over land.

Damage Control Locker/Emergency Gear Locker
A locker used for the storage of emergency equipment.

Deadlight
Watertight steel shutter used to protect a porthole

Deck
A platform (floor) extending horizontally from one side of a ship to the other.

Dolphin
A series of pilings located off a pier that are used to moor a vessel.

Double Bottom
A void or tank space between the outer hull of the vessel and the floor of the vessel.

Draft
The depth of a vessel's keel below the waterline.

Dry Bulk Terminal
A terminal equipped to handle dry goods that are stored in tanks and holds on the vessel.

Dunnage
Loose packing material (usually wood) protecting a ship's cargo from damage or movement during transport.

Escape Trunk
A vertical trunk fitted with a ladder to allow trapped personnel to escape if trapped.

Fairlead
A guide permanently attached to part of the vessel through which a line is lead.

Fantail
The stern overhang of a ship.

Fire Control Plan
A set of general arrangement plans that illustrate, for each deck, the fire control stations, fire-resisting bulkheads, and fire-retarding bulkheads, together with particulars of the fire detecting, manual alarm, and fire extinguishing systems, fire doors, means of access to different compartments, and ventilating systems, including locations of dampers and fan controls. The plans are to be stored in a prominently marked weather-tight enclosure outside the deck house for the assistance of shore side firefighting personnel.

Fire Station
A location for the firefighting water supply outlet, hose, and equipment onboard ship

Fire Warp or Fire Wire
Wire rope or other fireproof materials of sufficient strength to tow the vessel in the event of fire. Fire warp should be hung from the forward and after ends of the vessel at a position that allows easy retrieval by a vessel for towing; the other end of the fire warp is attached securely to the vessel.

Flame Screen
A portable or fitted device incorporating one or more corrosion resistant wire woven fabrics of very small mesh used for preventing sparks from entering a tank opening or for a short period of time preventing the passage of flame, yet permitting the passage of gas.

Forecastle
The section of the upper deck of a ship located at the bow, forward of the foremast. A superstructure at the bow of a ship where maintenance shops, rope lockers, and paint lockers are located.

Forward (Fore)
The direction toward the bow of the vessel.

Frame
The structural members of a vessel that attach perpendicularly to the keel to form the ribs of the vessel.

Freeboard
The vertical distance between the waterline and the main deck.

Gangway
The opening through the bulwarks (sides) of a ship or a ship's rail to which an accommodation ladder used for normal boarding of the ship is attached.

Gross Ton
Not a measure of weight. A measure of a vessels internal capacity. A gross ton equals 100 cubic feet.

Gunwale or Gunnel
The upper edge of a side of a vessel or boat designed to prevent items from being washed overboard.

Hazardous Atmosphere
Any atmosphere that is oxygen deficient, contains a toxic or disease producing contaminant, or is potentially explosive. A hazardous atmosphere may or may not be immediately dangerous to life and health.

Hawsepipe
Large steel pipes in the bow of a vessel through which the anchor chain runs over the side.

Heeling
1. Tipping to one side.

2. Causing a ship to list.

House
A superstructure above the main decks.

International Shore Connection
A universal connection to the vessel's firemain to which shore side firefighting water supplies can be connected. This allows use of the vessel's fire stations and associated hoses. This connection is required on all vessels over 500 gross tons (454 m tons) subject to SOLAS, and on U.S.-inspected vessels over 1000 gross tons (907 m tons).

Jacob's Ladder
A rope or chain ladder with rigid rungs.

Keel
The principal structural member of a ship, running fore and aft on the center line, extending from bow to stern, forming the backbone of the vessel to which the frames are attached.

Kingpost
A short stub mast on which a derrick may be hung.

Ladder
All staircases, often nearly vertical, onboard vessels.

List
An inclination to one side; a tilt.

Main Deck
The uppermost continuous deck of a ship that runs from bow to stern.

Master
The captain of a merchant ship.

Mate
A deck officer on a merchant ship ranking below the Master.

Mooring
1. Equipment, such as anchors, chains, or lines, for holding fast a vessel.

2. The act of securing a vessel.

3. A location at which a vessel can be moored. Any location where a boat is wet-stored or berthed. Locally, it might be used to differentiate between permanently anchored moorings and slips.

OBO
A vessel that is designed to carry either bulk cargo such as grain or coal or liquid cargo such as petroleum products. The vessel's appearance is similar to that of a bulk carrier.

Overhead
The vessel equivalent of a ceiling.

Passageway
A corridor or hallway.

Peak, After
The space immediately in front of the stern of the ship

Peak, Fore
The space immediately behind the stem of the ship.

Platforms
1. Any flat-topped vessel, such as a barge, capable of providing a working area for personnel or vehicles.

2. A partial deck in the machinery space.

Port Side
The left-hand side of a ship when facing forward.

Rake Tank
A tank at the extreme, shaped portion of the bow or stern of a barge.

Riser
A pipe leading from the firemain to the fire station (hydrants) on upper deck levels.

Roll-on/Roll-off (Ro/Ro)
A form of cargo handling utilizing a vessel designed to load or unload cargo that rolls, such as automobiles or tractor-trailer units.

Scupper
An opening in the side of a vessel through which rain, sea, or firefighting water is discharged.

Shaft Alley
A narrow, watertight compartment through which the propeller shaft passes from the aft engine room bulkhead to the propeller.

Shaftway
A tunnel or alleyway through which the drive shaft or rudder shaft passes.

Should
Indicates a recommendation or that which is advised but not required.

Slop Tank
A tank designated to store oily waste for subsequent ecologically approved disposal.

Starboard Side
The right-hand side of a ship as one faces forward.

Stern
The after end of a boat or vessel.

Stevedore
A person employed for the loading and unloading of vessels sometimes called a longshoreman.

Superstructure
An enclosed structure above the main deck that extends from one side of the vessel to the other.

Tankerman
Any person holding a certificate issued by the Coast Guard attesting to his/her competency in the handling of Flammable or combustible liquid cargo in bulk.

Tank Top
The lowest deck, top plate of the bottom tanks.

TEU (Twenty Equivalent Unit)

Standard unit of measure for container ships. A twenty-foot container is one TEU.

Tides

The periodic variation in the surface depth of the oceans, and of bays, gulfs, inlets, and tidal regions of rivers, caused by the gravitational pull of the sun and moon.

Towboat

A powerful, small vessel designed for pushing larger vessels.

Trim

The difference between the draft forward and the draft aft.

Tug

A powerful, small vessel designed for towing larger vessels.

Tween Decks

Cargo decks between the main deck and the lower hold.

Ullage Hatch

An opening in a tank hatch that allows measuring or sampling of liquid cargo.

Vertical Zone

The area of a vessel between adjacent bulkheads.

Watertight Bulkhead

A bulkhead (wall) strengthened and sealed to form a barrier against flooding in the event that the area on one side fills with liquid.

Watertight Door

A door that is designed to keep water out.

Watertight Transverse Bulkhead

A bulkhead through which there are no openings and that extends from the tank top up to the main deck, built to control flooding.

Winch

A stationary, motor-driven hoisting machine having a drum around which a rope or chain winds as the load is lifted.

References

1. IFSTA Marine Fire Fighting for Land-Based Firefighters – 2nd Edition, April 2010
2. Seattle Fire Department Training Guide #22-1 Ship Construction / #22-2 Marine Awareness
3. San Diego Fire-Rescue Department - Draft version of Marina Firefighting/Shipboard Firefighting – Captain Cliff Joralmon, Captain Joe Diko. 2003 & 2007
4. Josefina Kahlidy & Bruce Cummings, Marine Terminal Supervisor of Maritime Operations - Unified Port of San Diego. May 19, 2019.
5. SDFD Lifeguard Drill Manual – "Fire Boats" - Brian Clark
6. San Diego Harbor PD - Marine Unit - Seargeant Chris Scheil
7. Long Beach Fire Department - Marine FF PPT, IES LLC
8. Pacific Beach Pier Photos & Information - Sean Brambir / Rob Fox
9. Scripps Beach Pier Photos & Information - John Cerruto

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Captain - Chad Willenberg / Jack Middleton

Lifeguards - Rob Brown / Mike Cranston / Brian Clark

NOTE: If you have any additional information or content that you feel would be appropriate to contribute to this Chapter or would like to report any errors or misrepresentations, please contact the SDFD Training Division or email the Drill Manual Revision Staff at

SDFDDrillManualTeam@SanDiego.gov

Revisions/Updates

Date	*Revision/Update Description*
4/2/2020	Correction of grammatical errors.
4/2/2020	Correction: .....(MGO) which requires heating to transfer due to its very **low** viscosity. <Corrected to> (MGO) which requires heating to transfer due to its very **high** viscosity. (Page 35-12)