

LITHIUM-ION
BATTERY
EMERGENCIES
IN THE
MARITIME
ENVIRONMENT:



Objectives



- Understand risk(s) from lithium-ion batteries of different chemistries, state of charge, and physical condition-status in the maritime environment.
- Validate plans and procedures for fire management of a hazmat fire involving lithium-ion batteries for a vessel at sea or at mooring.
- Identify plans and procedures for shore-based firefighting support aboard a vessel or at mooring/pier.
- Identify agreements to support fire management and salvage operations of a hazmat fire involving lithium-ion batteries for a vessel at sea or at mooring.

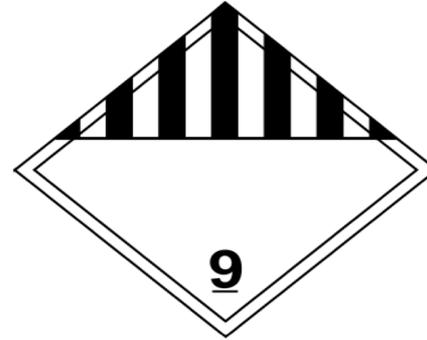
RISK(S) FROM LITHIUM-ION BATTERIES IN THE MARITIME ENVIRONMENT.



Li-ion Battery Risks-Maritime Environment



- Unpredictable chemistry
- Electric vehicles in Ro/Ro spaces
- Electric vehicles and Li-ion batteries in shipping containers
- Li-ion batteries moving by vessel under current regulations
- DDR or end-of-life Li-ion batteries moving by vessel under current regulations.
- Different presentations of Li-ion batteries in use or stored on a vessel.
- Incidents on pier or vessel
- Vessel crew may be well trained but should not be compared to the capabilities of career firefighters.
- Approved CO2 suppression systems have limited effectiveness.



§172.560

Not required for domestic transportation. A bulk packaging containing a Class 9 material must be marked with the appropriate ID number displayed on a Class 9 placard, an orange panel, or a white square-on-point display.

Li-ion Battery Risks-Maritime Environment



- Full-SOC
 - Off-gassing
 - Fire
 - Rapid propagation
 - Deflagration-detonation
- Lower-SOC
 - Off-gassing
 - Fire with ignition source
 - Rapid propagation if thermally insulted
 - Deflagration-detonation

Li-ion Battery Risks-Maritime Environment



“The Good the Bad and the Ugly”:

- **Good**-Containers Above Deck
- **Bad**-Ro/Ro Spaces
- **Ugly**-Containers Below Deck in Cargo Holds



Li-ion Battery Risks-Maritime Environment



“The Good the Bad and the Ugly”:

- **Good-Containers Above Deck**
 - Fight long-duration fire and protect exposures/superstructure from an exterior position.
 - Fire stream water runs overboard through scuppers.
 - Lowest vessel stability concerns.
 - Optimal crew access and deployment of manned/unmanned firefighting appliances.
 - Acceptance procedures and stowage location key.

Li-ion Battery Risks-Maritime Environment



“The Good the Bad and the Ugly”:

- **Bad-Ro/Ro Spaces**
 - Fight long-duration fire and protect exposures/superstructure from an interior position via ladderways and confined spaces is high risk.
 - Fire stream water collects at lower level of vessel/bilge and may overwhelm engineered dewatering systems.
 - Vessel stability concerns if adequate dewatering is not achieved.
 - High risk crew access and deployment of manned/unmanned firefighting appliances.
 - Acceptance procedures and stowage spacing for crew access is critical.

Li-ion Battery Risks-Maritime Environment



“The Good the Bad and the Ugly”:

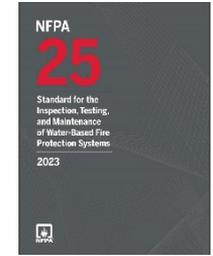
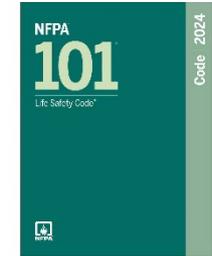
- **Ugly-Containers Below Deck in Cargo Holds**
 - Fight long-duration fire and protect exposures/superstructure from an interior position via ladderways and confined spaces is high risk.
 - Fire stream water collects at lower level of vessel/bilge and may overwhelm engineered dewatering systems.
 - Vessel stability concerns if adequate dewatering is not achieved.
 - High risk crew access and deployment of manned/unmanned firefighting appliances.
 - Acceptance procedures are critical.

Li-ion Battery Risks-Maritime Environment



Critical Factors (influenced by VRP and FCP):

- Confined space hazmat fire!
- Hazmat involved or an exposure
- Orientation and personnel accountability
- Fuel and power secured or isolated
- Ventilation profiles and system status
- Communications (operability of radios below deck)
- Fire Stations Locations
- Fire equipment/appliance compatibility and capabilities
- GPM over BTUs (International Shore Connection)
- Gangway
- Bulkheads
- Hatches
- Ladderways (NFPA 101 Life Safety Code; NFPA 25)
- Orientation to ingress egress paths
- Fixed fire suppression system status/activation
- Dewatering (Vessel fixed systems and portable systems)
- Air supply management
- Entrapment and entanglement hazards
- Smoke explosions (gas deflagration detonation phenomena)
- Resources, staging, logistics, work rest cycles



VALIDATE PLANS AND PROCEDURES
FOR FIRE MANAGEMENT OF A
HAZMAT FIRE INVOLVING LITHIUM-
ION BATTERIES FOR A VESSEL AT SEA
OR AT MOORING.



IDENTIFY PLANS AND PROCEDURES
FOR SHORE-BASED FIREFIGHTING
SUPPORT ABOARD A VESSEL OR AT
MOORING.





Plans and Procedures

■ **Federal On-Scene Coordinators (FOSC):**

- Outlined under:
 - National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Section 300)
- The federal incident commander during an emergency response.
- Highly skilled personnel who conduct, direct, and coordinate emergency response actions as needed; taking necessary actions consistent with federal law to remove a pollution or contamination threat.
- EPA and USCG are the primary agencies that coordinate NCP preparedness and response activities and provide FOSC.



Plans and Procedures

■ **Federal On-Scene Coordinators (FOSC):**

- Are located in and deploy from EPA regional offices and USCG Sectors across the nation.
- Have the authority to conduct, direct, and coordinate all response efforts at the incident scene
- Protect the environment, public health, and worker safety and health.
- Are responsible for developing Area Contingency Plans (ACPs) and chairing Area Committees.



Plans and Procedures

- **Federal On-Scene Coordinators (FOSC):**

- EPA is the lead agency for inland zone
 - Approximately 200-250 FOSCs
- USCG is the lead agency for Coastal Zone
 - 36 USCG Sectors
- Regardless of AOR lead and as needed, FOSC for both EPA and USCG work collaboratively in support of mission objectives and outcomes.



Plans and Procedures

- United States Coast Guard:

- Title 33, CFR

- Chapter 1, Subchapter A, Part 6: Protection and Security of Vessels, Harbors, and Waterfront Facilities
 - Broad powers of the COTP
- Part 155, Subpart I- Salvage and Marine Firefighting
- Part 155, Subpart D- Response Plans
 - USCG Salvage Engineering Response Team (SERT)-Technical Support to USCG units during a vessel casualty
 - Classification Societies; Commercial Naval Architecture; Salvage and Emergency Response Firms

- Title 40, CFR

- Part 300- National Oil and Hazardous Substances Pollution Contingency Plan



Plans and Procedures

Salvage and Emergency Response Firms:

- Regulatory compliant and customer specific:
 - Contingency Plans
 - Emergency Response Plans or Vessel Response Plans (VRP)
 - Security Plans
- Incident management and emergency response

Classification Societies:

- Goal: protection of human lives, property, and marine and coastal environments
- Develops and sets specific standard regarding vessel/ship:
 - Design
 - Building
 - Functional Maintenance

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NFPA®

1005

Standard for
Professional Qualifications
for Marine Fire Fighting for
Land-Based Fire Fighters

2019



NFPA®

1010

Standard on
Professional Qualifications for
Firefighters

2024

Includes
NFPA 1001 | NFPA 1002 | NFPA 1003 | NFPA 1005



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NFPA[®]

1405

Guide for
Land-Based Fire Departments That
Respond to Marine Vessel Fires

2020



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NFPA
307

Standard for the
Construction and Fire Protection
of Marine Terminals, Piers,
and Wharves

2021



Annex E	Marine Firefighting Onboard Vessels Within Municipal Jurisdictions	307- 28
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Annex E Marine Firefighting Onboard Vessels Within Municipal Jurisdictions 307– 28

- Informs marine firefighters (MFF) that vessel owner-operators must meet with the groups contained within the scope of their vessel response plans (VRP).
- Federal Fire Prevention and Control Act of 1974 (PL93-498)
 - firefighting should remain a state and local function
 - U.S. federal government must help if significant fire losses are to be achieved

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- The basis for USCG firefighting activities and assistance for fires aboard commercial vessels in the U.S. is articulated in the following:
 - Ports and Waterways Safety Act of 1972 (PWSA)
 - Section 4202 of the Oil Pollution Act of 1990 (OPA 90)
 - 14 U.S.C 88(b).
- Although the USCG clearly has an interest and functions in marine firefighting (MFF) involving vessels, primary responsibility for maintaining necessary firefighting capabilities in U.S. ports and harbors lies with local authorities.

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- Individual public/municipal authorities responsible to provide and maintain the necessary firefighting capabilities within U.S. ports and harbors have different policies for responding to marine fires:
 - Most will respond only at the pier
 - Some will not go aboard a vessel

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- Vessel Response Plan (VRP) holders (Carriers & Masters) are ultimately responsible for the safety of the vessel under their control, which includes:
 - Providing adequate firefighting protection, per 33 CFR 155.
 - Initiating response activities per the VRP:
 - Initiate fire control plan
 - Notifications including to the qualified individual (QI)
 - Description of shoreside activities for vessel fire response.

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- **The Qualified Individual (QI):**
 - Standing contract with VRP holders to provide continuous response services during marine casualties.
 - Familiar with implementation of VRP
 - Provides rapid communications with authorities
 - Engages response resources
 - Commits funds on behalf of plan holder (\$ amount should be practicable)
 - Will conduct other notifications on behalf of vessel master and during a vessel fire, will notify the salvage and marine firefighting (SMFF) service provider listed in the VRP

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- **The Salvage and Marine Firefighting (SMFF) Service Provider:**
 - External MFF team made up of trained personnel, aside from vessel crew, with capability of boarding and combating a fire aboard a vessel.
 - Brings external vessel MFF systems, personnel, equipment capable of combating a fire from other than aboard the vessel, as well as other needed support.
 - VRP holder must ensure that all SMFF resource providers are integrated into the the response organizations listed in the VRP and how they will coordinate with the same.
 - Currently four SMFF providers nationwide that meet the USCG regulatory standards of 15 selection criteria and 19 services.

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- **Public Firefighting Resources:**
 - Public MFF agencies can be listed as resource providers by agreeing in writing to be included in the VRP.
 - Many choose to respond within or outside their jurisdiction through means such as mutual-aid, but federal law or regulation does not suggest support-encourage response outside their jurisdictions.
 - Should the public MFFs and plan holder come to an acceptable agreement regarding when and where the public resource(s) can be used beyond jurisdictional limits, then that agreement must be included in the VRP.
 - Oil Pollution Act of 1990 (OPA 90) emphasizes the use of private over public resources, public MFF resource providers should only be listed when the plan holder has determined no private resources are available that can meet the response times and the public resource has a responsibility to respond to incidents in the area specified in the VRP.

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- **Public Firefighting Resources:**
 - Each VRP holder and resource should be actively involved in the port partners program(s) (e.g., AMSC or Northern CA. Maritime Transportation System Response and Recovery (MTSRR) Coalition) to enable communications between the resource provider and the local public firefighters and to have input into their locations area contingency plans (ACP) for emergencies and to create workable processes and VRPs for responding to a marine firefighting incident.

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- **Initial Response to MFF:**
 - 26 questions asked by SMFF service providers during initial phases of MFF operations

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- **Movement of a Burning Vessel:**
 - The decision to allow a burning vessel to be moved within a port rests solely with the USCG under authorities granted by the Ports and Waterways Safety Act of 1972 (PWSA) and implemented in 33 CFR 160
 - Considerations and criteria for allowing and denying movement of a burning vessel

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- **Drills and Exercises** (Clear understanding of each participant’s role):
 - Remote assessment and consultation exercises.
 - Quarterly emergency procedures exercises.
 - Annual Shore-based salvage and shore-based MFF management team tabletop exercises.
 - Annual response provider equipment deployment exercises.
 - Triennial exercise of the entire VRP (compliance with the National Preparedness for Response Exercise Program Guidelines (NPREP) will satisfy VRP exercise requirements).
 - Plan holders must meet exercise requirements within 33 CFR 155.4052

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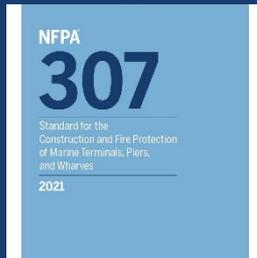


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Within Municipal Jurisdictions 307-28

- **Pre-incident Information and Arrangements:**
 - Plan holders required to develop prefire plans in accordance with NFPA 1405 and attached to the VRP.
 - If plan meets another regulation or recognized international standard it must also be given to the resource provider in lieu of the 1405 plan and attached to the VRP.
 - Integral part of contingency planning.
 - Outlines the responsibilities and actions during a marine fire incident.
 - Principle purpose is to explain the resource provider's role, and support that can be provided, during MFF incidents.
 - Policies, responsibilities, and procedures for coordination of on-scene forces
 - Should be designed for use in conjunction with other state, regional, and local contingency and resource mobilization plans.
 - The SMFF resource provider must also be given prefire plans and certify in writing to the plan holder that it is acceptable and agrees to implement it to mitigate a potential or actual fire.

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- **9 Recommendations for Owners/Operators and Managers of Marine Terminals, Piers, and Wharves that generally advise on:**
 - Communications
 - Considerations
 - Engagement
 - Coordination
 - Plans
 - Agreements
 - Exercises
 - Participation
 - Product development

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Marine Fire Fighting for Land-Based Fire Fighters



Marine Fire Fighting for Land-Based Fire Fighters Course Plan

IDENTIFY AGREEMENTS TO SUPPORT FIRE
MANAGEMENT AND SALVAGE OPERATIONS OF A
HAZMAT FIRE INVOLVING LITHIUM-ION BATTERIES
FOR A VESSEL AT SEA OR AT MOORING.

Agreements to Support Fire Management and Salvage Operations



- **The Salvage and Marine Firefighting (SMFF) Service Provider:**
 - In place?
 - In process of development or update?

- **Public Firefighting Resources:**
 - In place?
 - In process of development or update?

- **Other:**
 - In place?
 - In process of development or update?