Marina and Boatyard Protection Compliance Challenges

Presented by:
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Maryland State Fire Marshal's Office

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Marine Safety and Fire Protection

Marinas and Boatyards Protection Compliance Challenges

John McDevitt

Fire Service Experience:

Over 25 years in the fire service.

Fire-fighter to the rank of Deputy Chief outside Philadelphia.

A.A.S. Degree in Fire Science Technology.

NFPA 302 Watercraft – Chair

NFPA 303 Marinas and Boatyards

NFPA 1925 Marine Fire-fighting Vessels

IFSTA – Marine Fire Protection

John McDevitt

Marine Industry Experience:

USCG Licensed Captain – 100 Tons – Since 1992

American Boat and Yacht Council

8 ABYC Technical Marine Certifications

Technical Committee Member

Instructor – Marine Electricity

Society of Accredited Marine Surveyors

AMS Certificate

James Coté

Coté Marine LLC

Electrical and Corrosion Control Services

- Marine electrical and corrosion consulting, surveys, investigations, and oversight
- 35 years marine electrical experience
- 20 years as service/engineering manager at the largest marine electrical service firm in South Florida

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Electrical and Corrosion Control Services

- Bachelor of Science in Electrical Engineering
- Master of Business Administration
- IAMI Certified Marine Investigator
- NAFI Certified Fire and Explosion Investigator
- NAFI Certified Vehicle Fire Investigator
- ABYC Certified Master Technician

  Electrical, Corrosion, Diesel Engines, Marine Systems

James Coté

Coté Marine LLC

Electrical and Corrosion Control Services

- ABYC, IAMI, IEEE, NACE, NAFI, NFPA, SAMS, SNAME
- NFPA 302 Fire Protection Standard for Pleasure and Commercial Motor Craft
- NFPA 303 Fire Protection Standard for Marinas and Boatyards
- ABYC Electrical Project Technical Committee
- Chair ABYC Three Phase Electrical Sub-Committee

Ken Bush

- BS Degree in Fire Protection Engineering - University of Maryland
- Fire Protection Engineer - Maryland State Fire Marshal's Office since 1976 - Currently assigned to both Upper and Lower Eastern Regional Offices in Easton and Salisbury.
- Responsible for code enforcement for both new and existing buildings
- Member of Easton, College Park and Ocean City Maryland VFDs

Ken Bush

Active in NFPA code development process since 1977

Member - Safety to Life Committee on Means of Egress, Health Care and Mercantile/Business

Member - Safety to Life Correlating Committee

Member - NFPA Fire Code Committee

Member - NFPA Standards Council

Chairman - NFPA 303 – Marinas and Boatyards

Introduction

The Codes, Standards and Laws in play

The Marina and Boatyard

The Vessels

Fire Suppression Considerations

Conclusions

Question and Answers

Introduction

We won't be covering large merchant vessels over 300 gross tons or the ports that accommodate these vessels.

We will be covering vessels under 300 gross tons, particularly pleasure boats and the marinas and boatyards where they are berthed.

Introduction

The marine industry frequently **escapes mainstream regulation, inspection and enforcement.**

Contractors and the AHJ may not be familiar with the differences in order to meet the marine code requirements.

Consumers are frequently caught off guard by the lack of safety provisions in the marine environment.

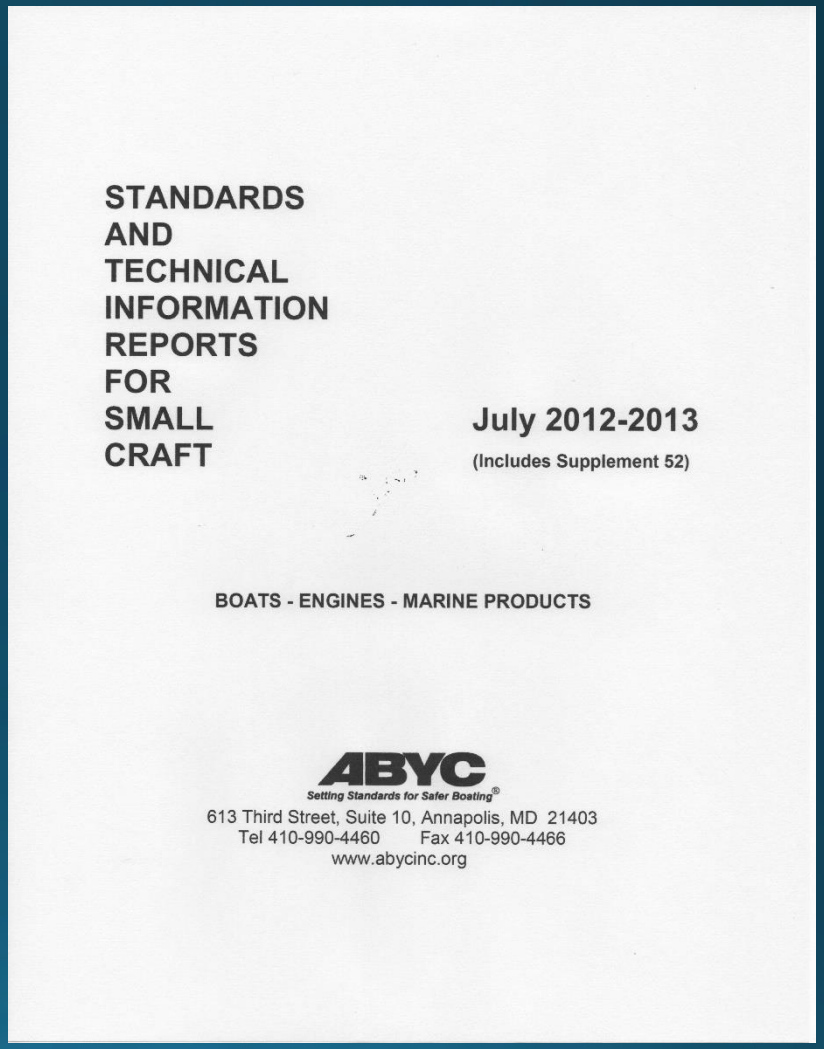
Introduction

The infrequency of a marina fire creates an **away game for fire fighters** featuring a number of different fire suppression challenges.

Fiberglass and fossil fuels present large fire loads. There are frequently **egress restrictions** as well as very challenging fire department access conditions.

The Rules and Regulations for Boats

The ABYC Standards
(Voluntary)



STANDARDS
AND
TECHNICAL
INFORMATION
REPORTS
FOR
SMALL
CRAFT

July 2012-2013
(Includes Supplement 52)

BOATS - ENGINES - MARINE PRODUCTS

ABYC
Setting Standards for Safer Boating®
613 Third Street, Suite 10, Annapolis, MD 21403
Tel 410-990-4460 Fax 410-990-4466
www.abycinc.org

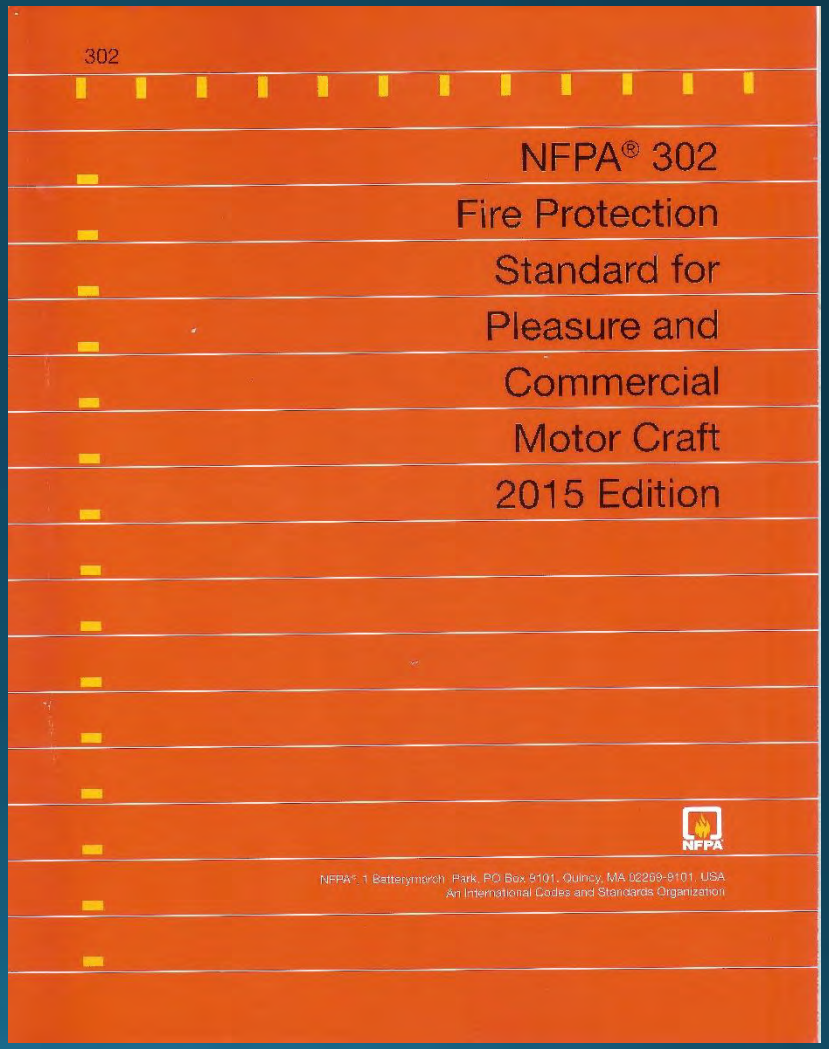
The ABYC Standards

The primary standards writer for the pleasure boat industry.

These rules and regulations are **recommendations** and therefore **voluntary**.

There is **no mandatory inspection** process for pleasure or commercial watercraft.

NFPA
302
Motor Craft
(Voluntary)



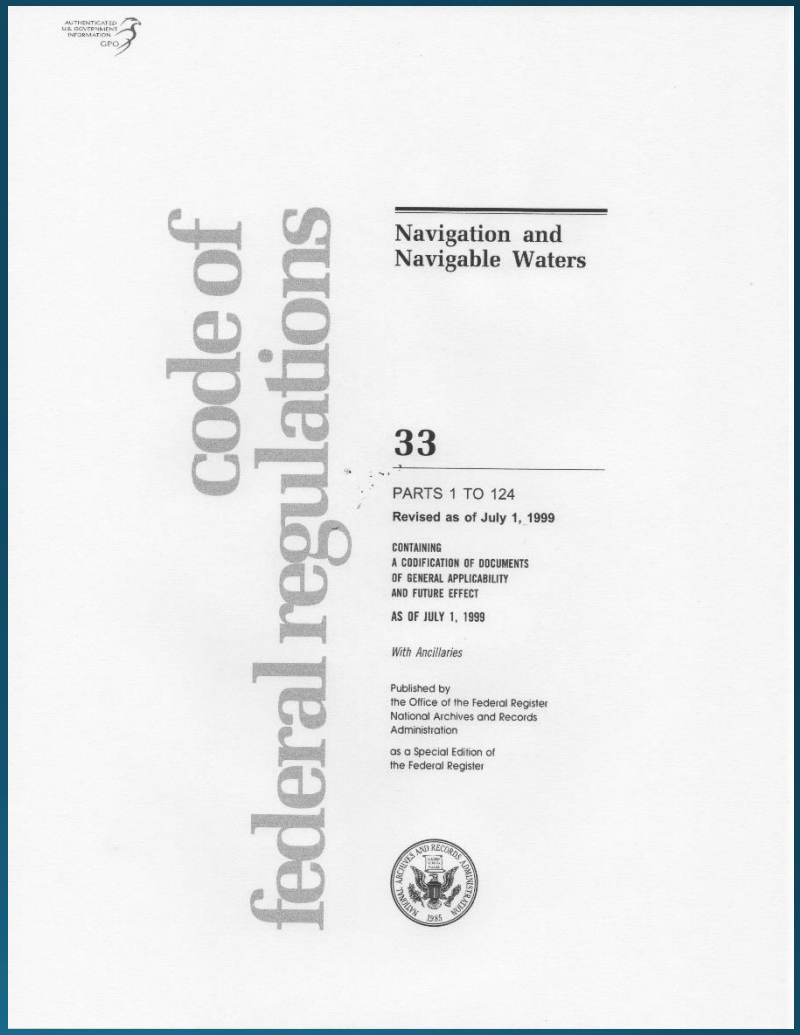
NFPA 302 Watercraft

Very similar to the ABYC requirements. Used by marine surveyors, insurance companies and fire service concerns.

These rules and regulations are also **recommendations** and therefore **voluntary**.

Some additional info: Requires Smoke Alarms, Prohibits Portable Heater use, etc.

CFRs
Code of Federal Regulations
(Law but minimal-
not actively managed)



CFRs – Code of Federal Regulations

The rules and regulations are law.

Not nearly as detailed as the ABYC or NFPA 302.

USCG - Major role change during the past decade.

CFRs – Not actively managed for pleasure vessels.

Little or no changes or additions in over 20 years.

Coast Guard CFR Designations

Inspected – (**Regulated**) - carrying passengers for hire – inspected annually and must have a licensed captain.

Uninspected Commercial – (**Regulation Coming**) - commercial towing (tugs) or fishing vessels, not carrying passengers for hire.

Uninspected Non-commercial – (**Not Regulated**) Recreational or Pleasure boats.

Rules and Regulations for Boats

The rules and practices for building and maintaining boat systems vary considerably from the same rules and practices we use for similar systems on land.

Consumers and some others doing work aboard a boat may not be familiar with the differences between landside and the marine requirements.

Rules and Regulations for Boats

The AHJ (Authority Having Jurisdiction) does not enforce the ABYC Standards, the NFPA 302 Standard or the CFRs and is not involved in a boat's condition unless there is an accident.

Rules and Regulations for Marinas and Boatyards

NFPA
National
Fire
Protection
Association

NFPA – Specific Marine Standards

NFPA 301 - Fire Protection for Merchant Vessels

NFPA 302 – Pleasure and Commercial Watercraft

NFPA 303 – Marinas and Boatyards

NFPA 306 – Gas Hazards on Vessels

NFPA 307 – Fire Protection for Piers and Wharfs

NFPA 312 – Vessels Under Construction and Lay-up

NFPA 1005 – Qualifications for Marine Fire Fighting for Land Based Fire Fighters.

NFPA 1405 – Guide for Land Based Fire Fighters who Respond to Marine Vessel Fires

NFPA - Referenced Marine Standards

NFPA 10 Portable Fire Extinguishers

NFPA13, Standard for the Installation of Sprinkler Systems,

NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.

NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

NFPA 31, Standard for the Installation of Oil-Burning Equipment.

NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.

NFPA 54, National Fuel Gas Code

NFPA 58, Liquefied Petroleum Gas Code.

NFPA72®, National Fire Alarm and Signaling Code.

NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

NFPA 110, Standard for Emergency and Standby Power Systems.

NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems.

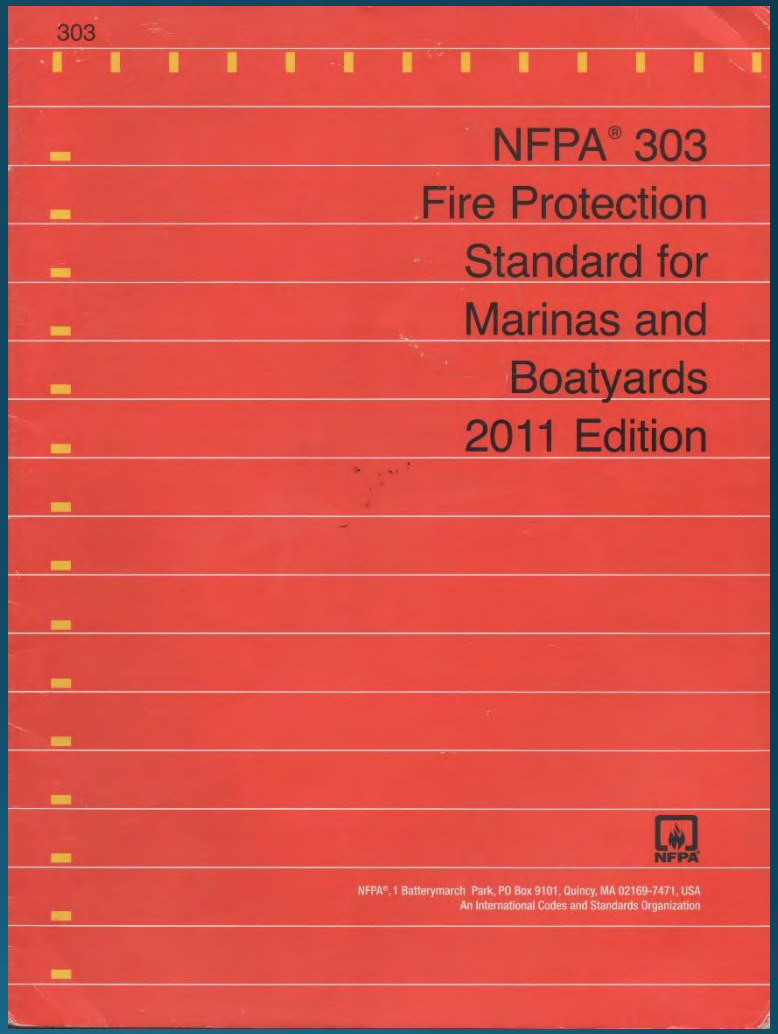
NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances.

NFPA 220, Standard on Types of Building Construction.

NFPA 326, Standard for the Safeguarding of Tanks and Containers For Entry, Cleaning or Repair.

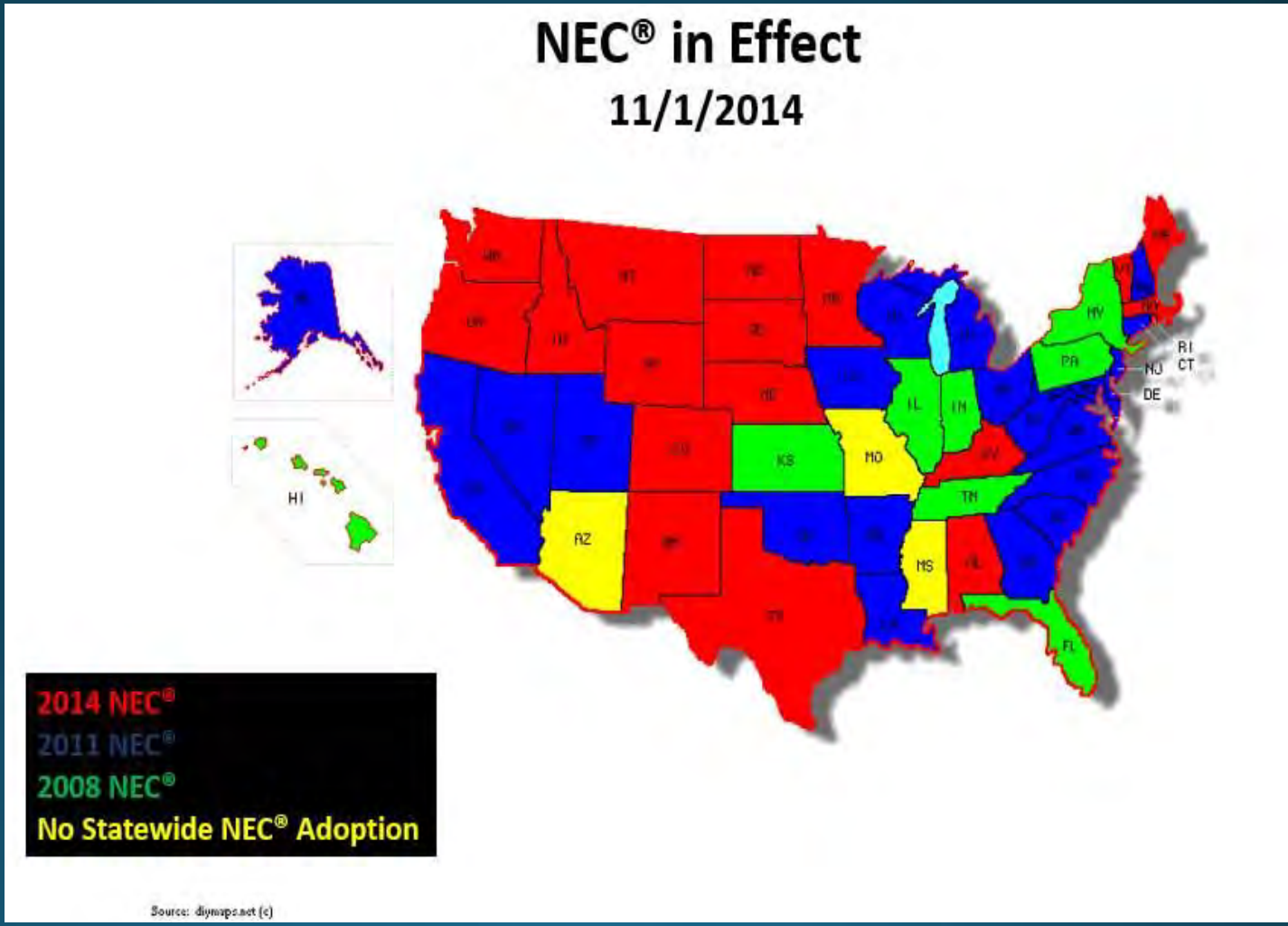
NFPA 2001, Clean Agent Fire Extinguishing Systems.

NFPA 303 Marinas and Boatyards



NEC
NFPA 70
The National Electrical Code

NEC Adoption States



NEC – NFPA 70
National Electrical Code

Includes:

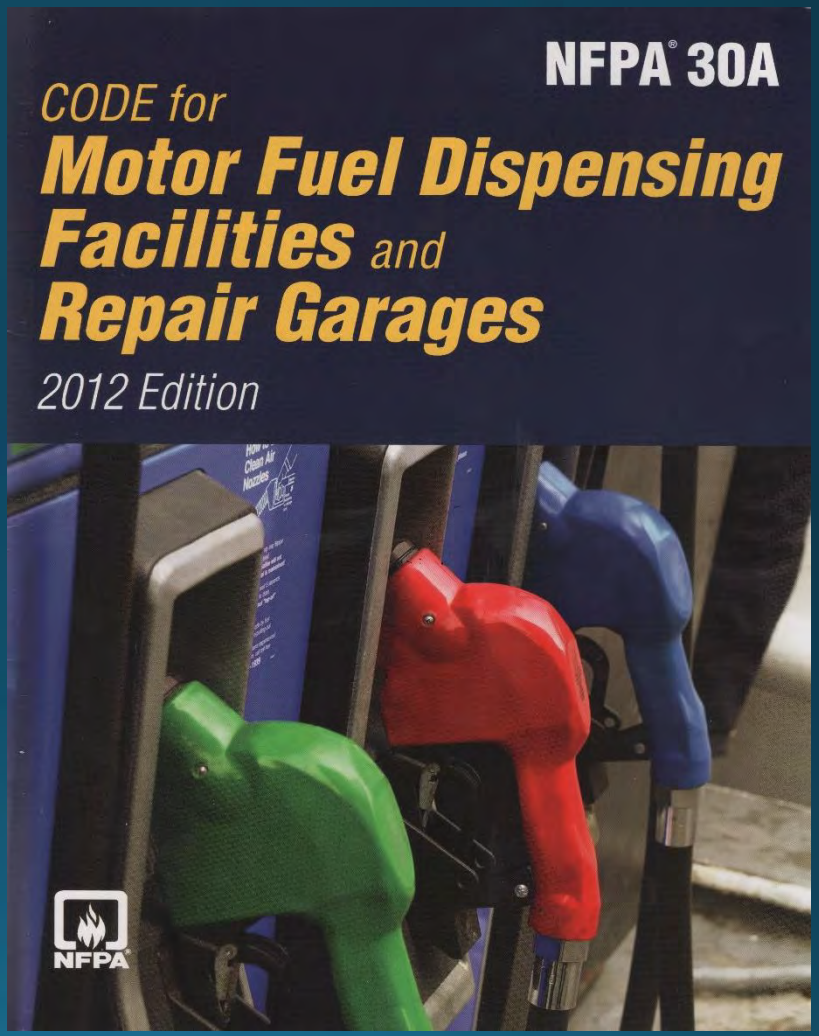
Article 555
Marinas and Boatyards

NEC – NFPA 70
National Electrical Code

Also Includes:
Article 553
Floating Buildings

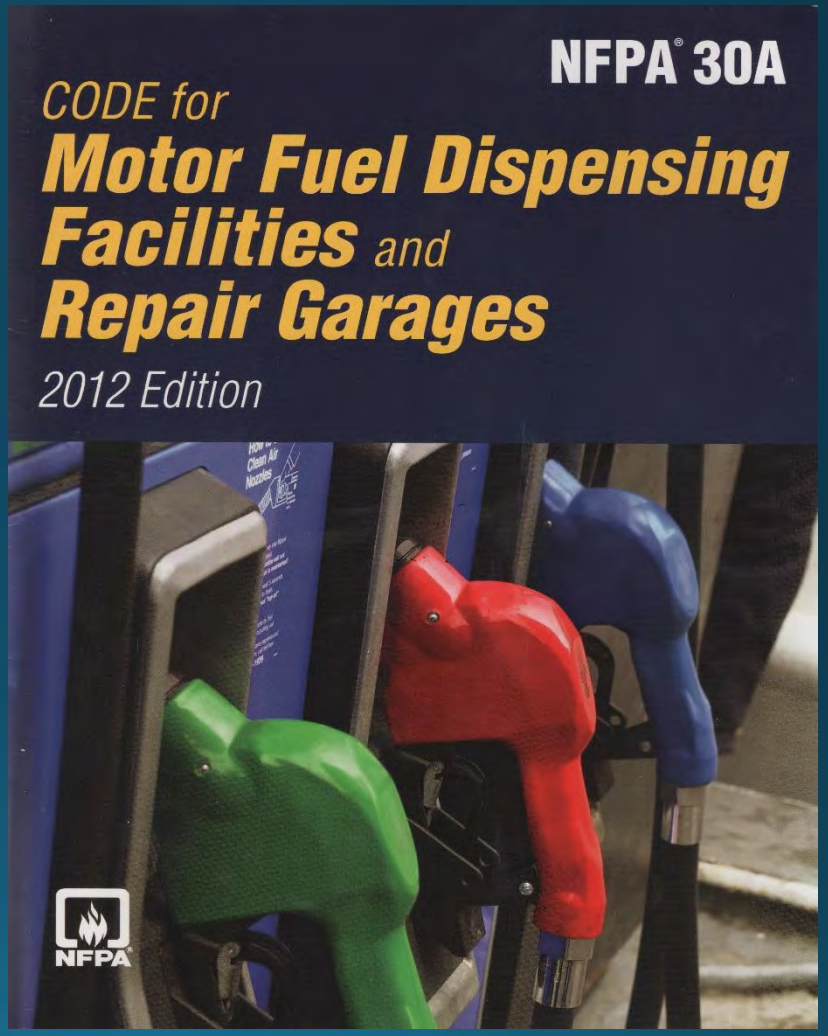
Article 514.3(C)
Fuel Dispensing
in Boatyards
and Marinas

NFPA 30A Fuel Dispensing Facilities



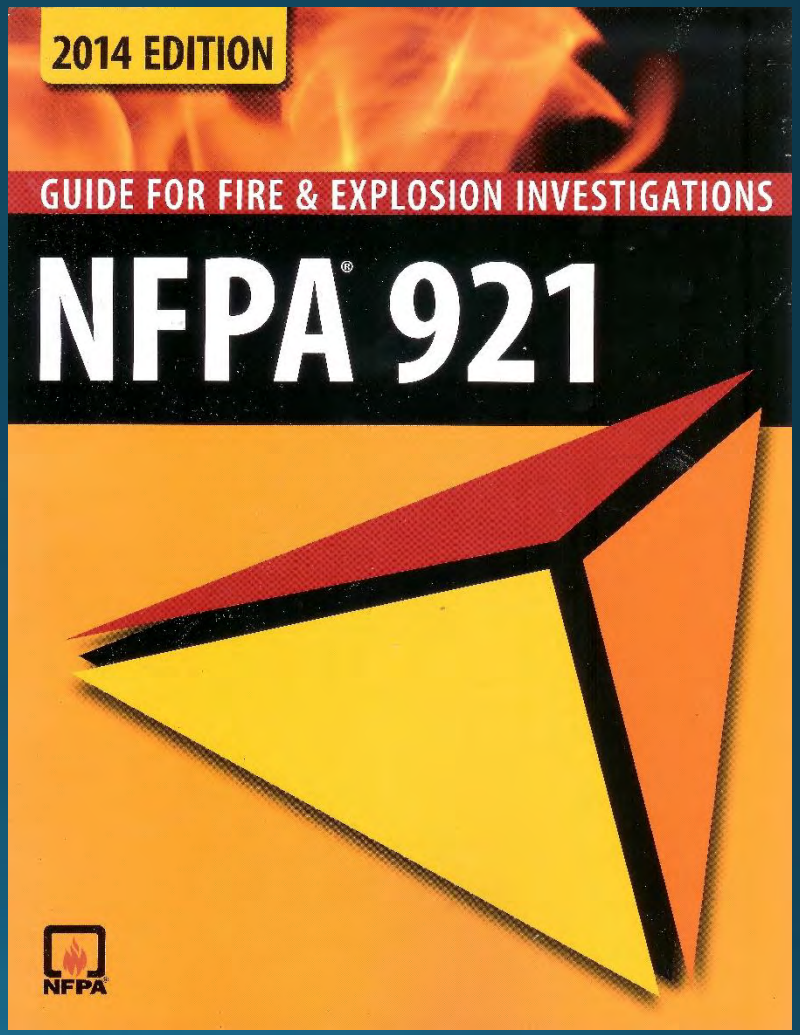
NFPA 30A
Fuel Dispensing

Includes
Chapter 11
Marine Fueling

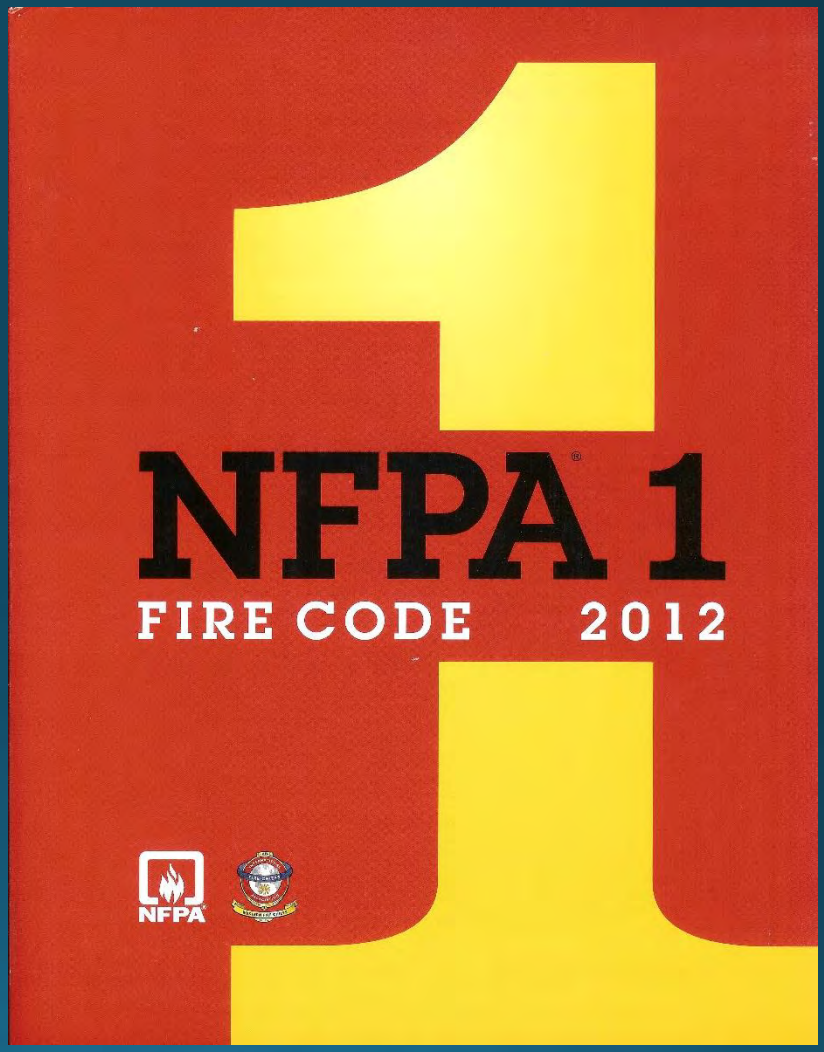


NFPA 921

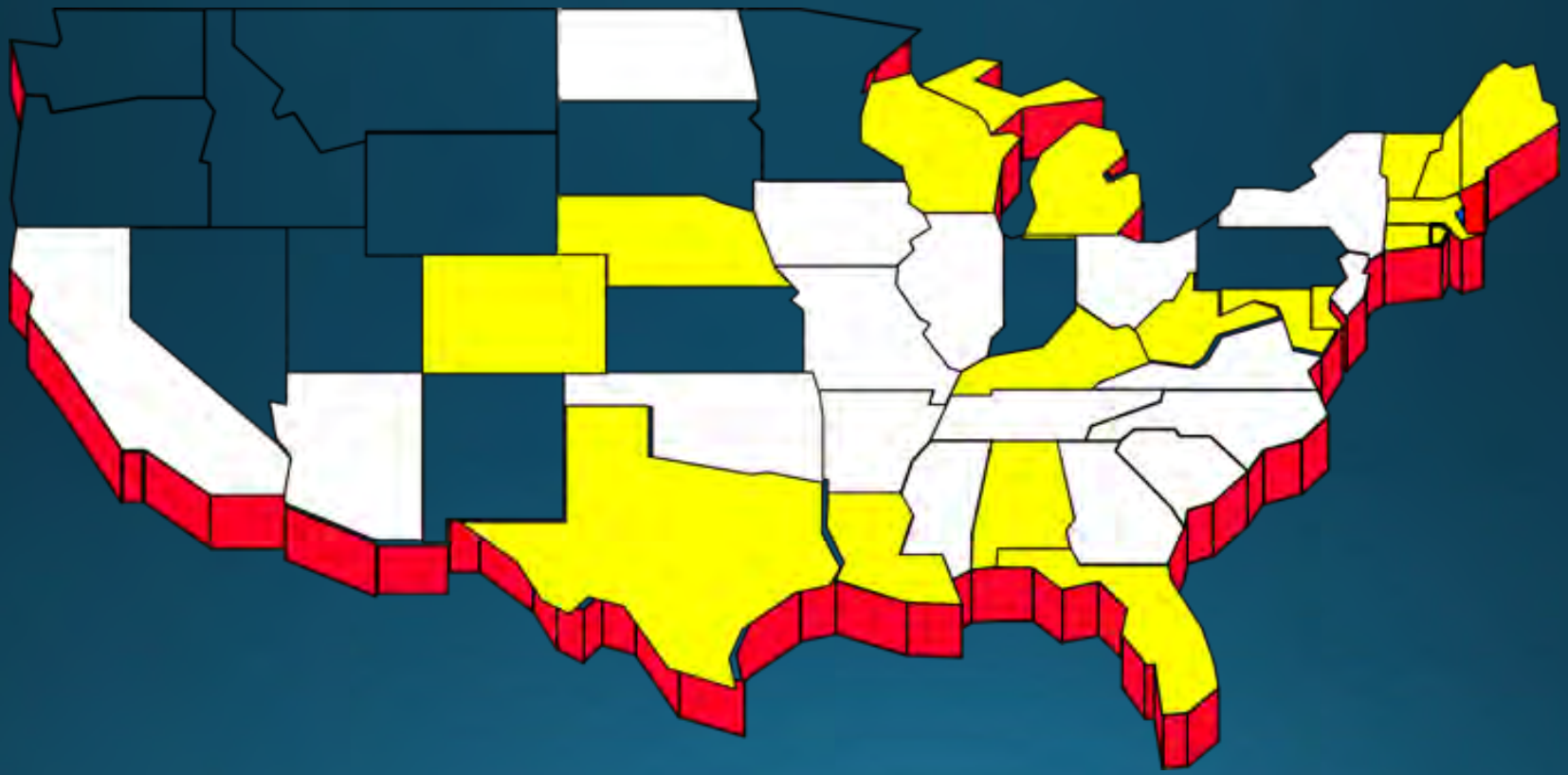
Includes Chapter 30 Marine Fire Investigations



NFPA 1 The Uniform Fire Code



NFPA 1 – The Uniform Fire Code



Yellow shaded states

NFPA 1 – The Uniform Fire Code

Much of NFPA 303 Marinas and Boatyards is included in NFPA 1 as Chapter 28 – Marinas and Boatyards.

Much of NFPA 30A – is also included in NFPA 1 – Chapter 42 - and the requirements for marine fuel dispensing.

NFPA 1 does not include any of NFPA 302 rules and regulations for watercraft.

ICC

International Code Council

IFC
International
Fire
Code

IFC – International Fire Code

Chapter 23 – Section 2310 – Marine Motor Fuel Dispensing Facilities.

Chapter 36 – Marinas

IFC – International Fire Code

2310.1 General. The construction of marine motor fuel dispensing facilities shall be in accordance with

NFPA 30A Fuel Dispensing.

The storage of Class I, II or IIIA liquids at marine motor fuel-dispensing facilities shall be in accordance with this chapter and IFC Chapter 57 Flammable and Combustible Liquids.

IFC – International Fire Code

Chapter 36 – Marinas

Marina regulation has been diminished in the 2012 edition of the IFC to one page.

NFPA 303 Marinas and Boatyards

is referenced in the brief marina chapter as a requirement for marina electrical practices, berthing/storage and fire protection equipment .

IFC – International Fire Code

Chapter 3
General
Requirements

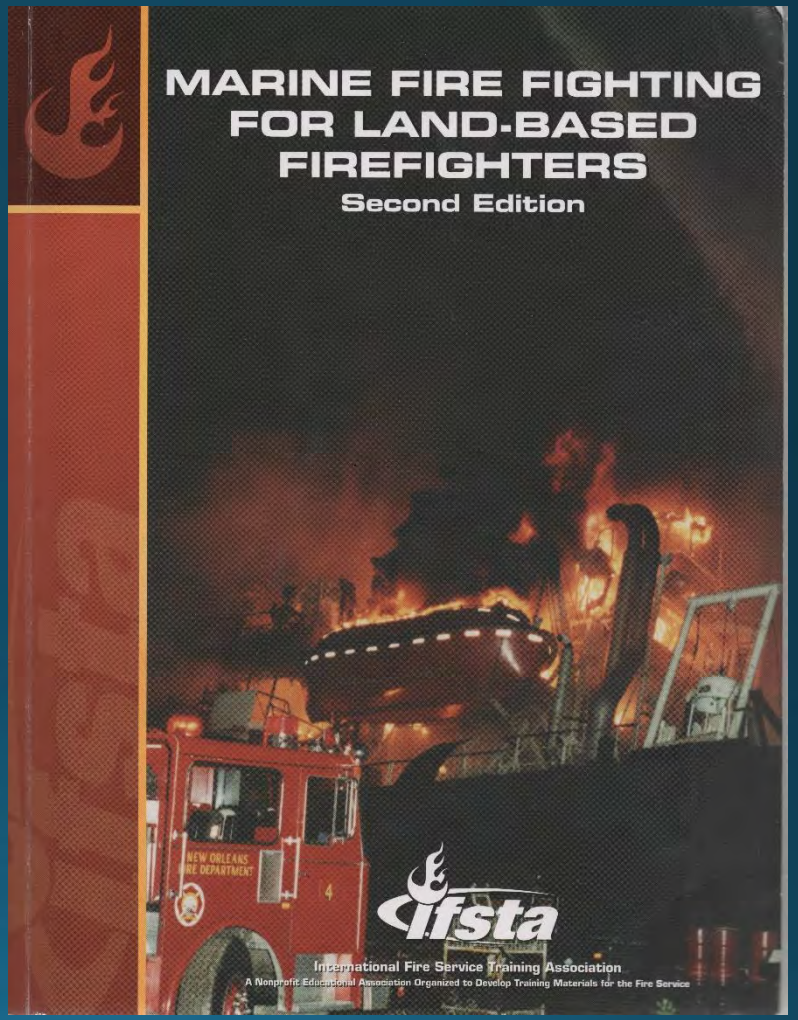
IFC – International Fire Code

Chapter 3 – General Requirements

Liquid- or gas-fueled vehicles, **or motorcraft** shall not be located indoors except as follows:

1. Batteries are disconnected.
2. Fuel in fuel tanks does not exceed one-quarter tank or 5 gallons (19 L) (whichever is least).
3. Fuel tanks and fill openings are closed and sealed to prevent tampering.
4. Vehicles, boats or other motorcraft equipment are not fueled or defueled within the building.

IFSTA
Marine
Fire Fighting
for
Land Based
Fire Fighters



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Scope of NFPA 303

This standard applies to the construction and operation of marinas, boatyards, yacht clubs, boat condominiums, docking facilities associated with residential condominiums, multiple-docking facilities at multiple-family residences, and all associated piers, docks, and floats.

Scope of NFPA 303

This standard also applies to support facilities and structures used for construction, repair, storage, hauling and launching, or fueling of vessels if fire on a pier would pose an immediate threat to these facilities, or if a fire at a referenced facility would pose an immediate threat to a docking facility. This standard applies to marinas and facilities servicing small recreational and commercial craft, yachts, and other craft of not more than 300 gross tons.

Scope of NFPA 303

This standard is not intended to apply to a private, noncommercial docking facility constructed or occupied for the use of the owners or residents of the associated single-family dwelling.

Fire Protection Features

- Portable Fire Extinguishers
- Fixed Fire Extinguishing Equipment
- Fire Standpipe Systems
- In and Out Dry Storage
- Rack Storage
- Hydrants and Water Supplies
- Fire Pumps
- Transmittal of Fire Emergency
- Fire Detectors

Portable Fire Extinguishers

- Placed in accordance with Chapter 5 of NFPA 10 for Ordinary *(Moderate)* Hazard Type.

- Portable fire extinguishers are required on piers and along bulkheads where vessels are moored or are permitted to be moored.

- Protection from weather and environmental elements.

Portable Fire Extinguishers

- Extinguishers listed for Class A, Class B, and Class C fires at the pier/land intersection on a pier that exceeds 25 ft (7.62 m) in length.

- Additional fire extinguishers placed such that the maximum travel distance to an extinguisher does not exceed 75 ft (22.86 m).

Portable Fire Extinguishers

- Installed on two sides of a fuel-dispensing area.
- On piers or bulkheads where long fueling hoses are installed for fueling vessels, additional extinguishers installed on piers or bulkheads for extra (high) hazard type in accordance with NFPA 10.

Fixed Fire Extinguishing Equipment

- Required for new buildings exceeding 500 Sq. Ft. in size which are erected on piers.
- Exception for buildings of Type I or Type II Construction without combustible contents.

Fixed Fire Extinguishing Equipment

- Required for new buildings exceeding 5,000 sq ft.
- Special NFPA 303 definition for “building”.
- Automatic sprinkler system design.
- Combustible fixed piers exceeding 5,000 sq ft. or within 20 ft. of exposures more than 36 in. above mean high water.

Fixed Fire Extinguishing Equipment

Where boats are stored on multilevel racks in buildings, an approved automatic fire-extinguishing system shall be installed throughout the building.

Exceptions for buildings less than 5000 sq ft. (465 sq m.) having multilevel racks where provided with one of the following:
(1) An automatic fire detection and alarm system supervised by a central station complying with *NFPA 72.*
(2) An automatic fire detection and alarm system supervised by a local protective signaling system complying with *NFPA 72.*
(3) A full-time watch service.

Fire Standpipe Systems

Class I standpipe systems in accordance with NFPA14, *Standard for the Installation of Standpipe and Hose Systems* shall be provided:

- For piers, bulkheads, and buildings where the hose lay distance from the fire apparatus exceeds 150 ft (45 m).

- In all buildings used for the rack storage of boats.

Fire Standpipe Systems

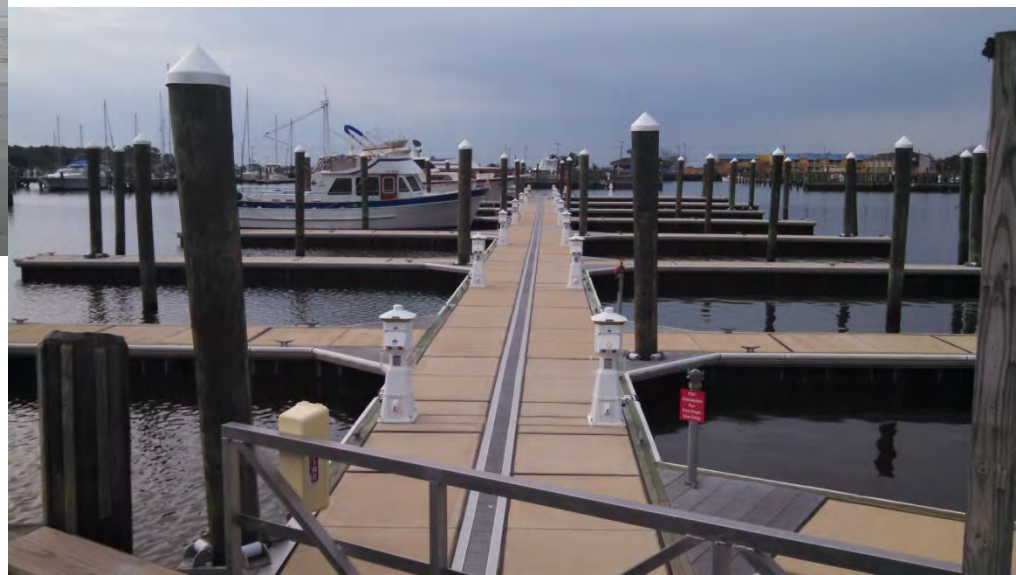
- Hose racks, hoses, and standpipe cabinets shall not be required on piers and bulkheads.

- Supply piping for standpipes on piers and bulkheads shall be sized for the minimum flow rate for 300 gpm.

- Manual dry standpipes shall be permitted.

Fire Standpipe Systems

- Flexible connections shall be permitted on floating piers where acceptable to the authority having jurisdiction.



In and Out Dry and Rack Storage

Water supply and hoses or portable fire extinguishers and wheeled cart assemblies equipped with discharge nozzles capable of reaching all boats on the highest racks shall be provided.

In and Out Dry and Rack Storage

Considerations for Automatic Sprinkler Protection for Interior Rack Storage Areas:

- Various Protection Schemes
  - Types of boats
  - Height or number of tiers
- Sprinkler Discharge Criteria
  - Group A Plastics
  - Full scale testing
  - Storage arrays
- Water Collection
  - Structural stability

In and Out Dry and Rack Storage

Considerations for Adequate Protection for Interior Rack Storage Areas:

- Basic Fire Prevention Practices
  - Separation of repair operations
  - Management inspection procedures
  - Employee awareness and training
- Portable Fire Extinguishers
  - Special extinguishing agents
- Fire Detection Systems
- Fire Standpipe Systems
- Pre-Incident Planning

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Marina and Boatyard
Indoor Rack Storage Sprinkler Protection

Literature and Data Review

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FIRE RESEARCH

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December 2008

Hydrants and Water Supplies

Hydrants and water supplies for fire protection in marinas and boatyards shall be provided in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems; NFPA 14, Standard for the Installation of Standpipe and Hose Systems; and NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.*

Stationary fire pump installations, when required, shall be installed in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection.*

Transmittal of Fire Emergency

All marinas and boatyards shall have a means to notify the fire department rapidly in the event of an emergency.

If a telephone is used, it shall:
- Be available for use at all times.
- Shall not require the use of a coin.

The street address of the facility and the emergency telephone number(s) shall be displayed prominently on a sign at the telephone.

Fire Detectors

- Installed in interior or covered non-sprinklered locations
Rooms containing combustible storage or goods
Rooms containing flammable liquid storage or use
Rooms containing battery storage or maintenance
Rooms containing paint and solvent storage or use
Areas used for enclosed or covered storage of vessels
Areas used for enclosed or covered maintenance of vessels
Areas used for public assembly, dining, or lodging
Rooms used for storing janitor supplies or linens
Kitchens and food preparation areas
Dust bins and collectors
Inside trash storage areas
Laundry rooms
Furnace rooms

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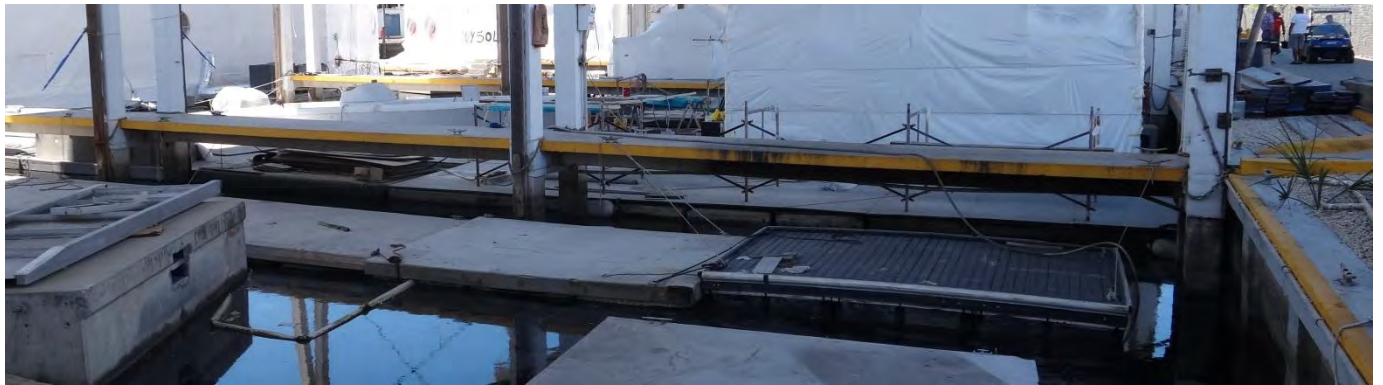
Dockside Electrical Risks and Challenges
NFPA 70: Article 555 [2014]
NFPA 303: Chapter 5 [2011]

- Electrical Datum Plane
- Floating Docks
- Grounding
- Miscellaneous Special Considerations
- Ground Fault Protection & Electric Shock Drowning
- Shore Power Receptacles
- Maintenance and Upkeep

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.2
NFPA 303: Chapter 5.3

Electrical Datum Plane

- Benchmarked Horizontal Plane 610 mm [24 inches] above “normal” high tide or “normal” high water level
- Horizontal Plane 762 mm [30 inches] above a floating dock’s water level (but not less than 305 mm [12 inches] above deck)



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Electrical Datum Plane and Floating Docks

Floating Docks

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.7; 555.13 (A)
NFPA 303: Chapter 5.9.5; 5.9.10

Floating Docks

- Service equipment prohibited but terminal block required
- Cables must be designated for “extra hard usage”
  - Rated 75º C [167º F] minimum
  - Resistant to temperature extremes, oil, acids, etc.
- Feeders must include a common grounding conductor
- Wiring must be secured with non metallic clamps to ***structures*** and be protected from chafing

Floating Docks

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.15
NFPA 303: Chapter 5.5; 5.20

Grounding

- Grounding conductors must be
  - insulated
  - 12 AWG or greater
- Dedicated grounding conductors must be installed to all metal equipment, enclosures, and grounding terminals
- Single point grounding of neutral conductors [*pending*]

Multiple Neutral Grounding Points = Neutral Ground Currents

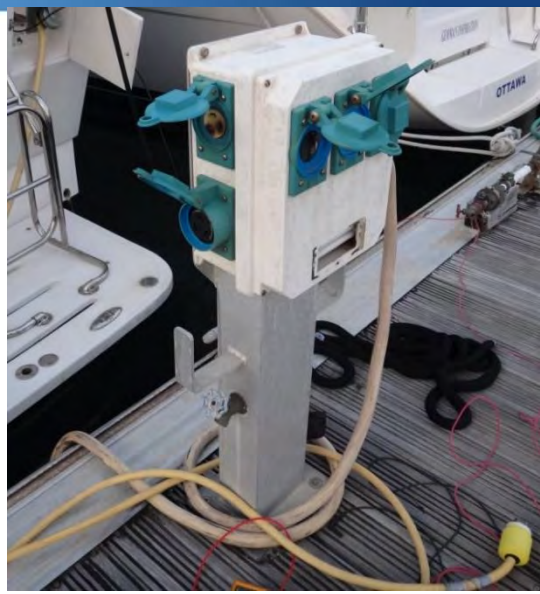
Risks of Multiple Neutral Grounding Points

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.5; 555.9; 555.13; 555.23
NFPA 303: Chapter 5.3.4; 5.4.2; 5.4.4.2; 5.10.1; 5.16.3.4; 5.19.1

Miscellaneous Special Considerations

- No equipment or connections below datum plane
- No connections less than 305 mm [12 inches] above the deck and no splices below datum plane unless in enclosures listed and designated for submersion
- Rigid conduit required above decks
- Must use circuit breakers—***No Fuses!***
- 250 volt/1000 volt maximum rules
  - [480 volt is becoming common]

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.10; 555.19
NFPA 303: Chapter 5.2; 5.4.4.1; 5.14.3; 5.15



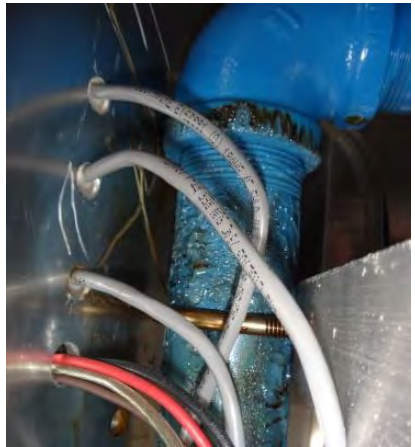
Miscellaneous Marina Considerations

- Only listed equipment can be used
- Unauthorized access is not permitted
- Must be substantially supported, secured to **structures** and clear of mooring lines
- Wet Locations [what dock is not a wet location?]
  - Equipment must be corrosion resistant
  - Holes for mounting hardware must be sealed
  - Weep holes to discharge condensation are required

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.21; 555.22
NFPA 303: Chapter 5.9.2; 5.17; 8.4; 8.7.4; 8.10; 8.12

Miscellaneous Considerations- Hazardous Locations

- Fueling Stations
- Battery Charging Stations
- Paint Shops
- Carpentry Shops



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Dockside Electrical Risks and Challenges
NFPA 70: Article 555.3; 555.17
NFPA 303: Chapter 5.12.6; 5.13

- **Electric Shock Drowning**
- **Risk is Greatest in Freshwater**

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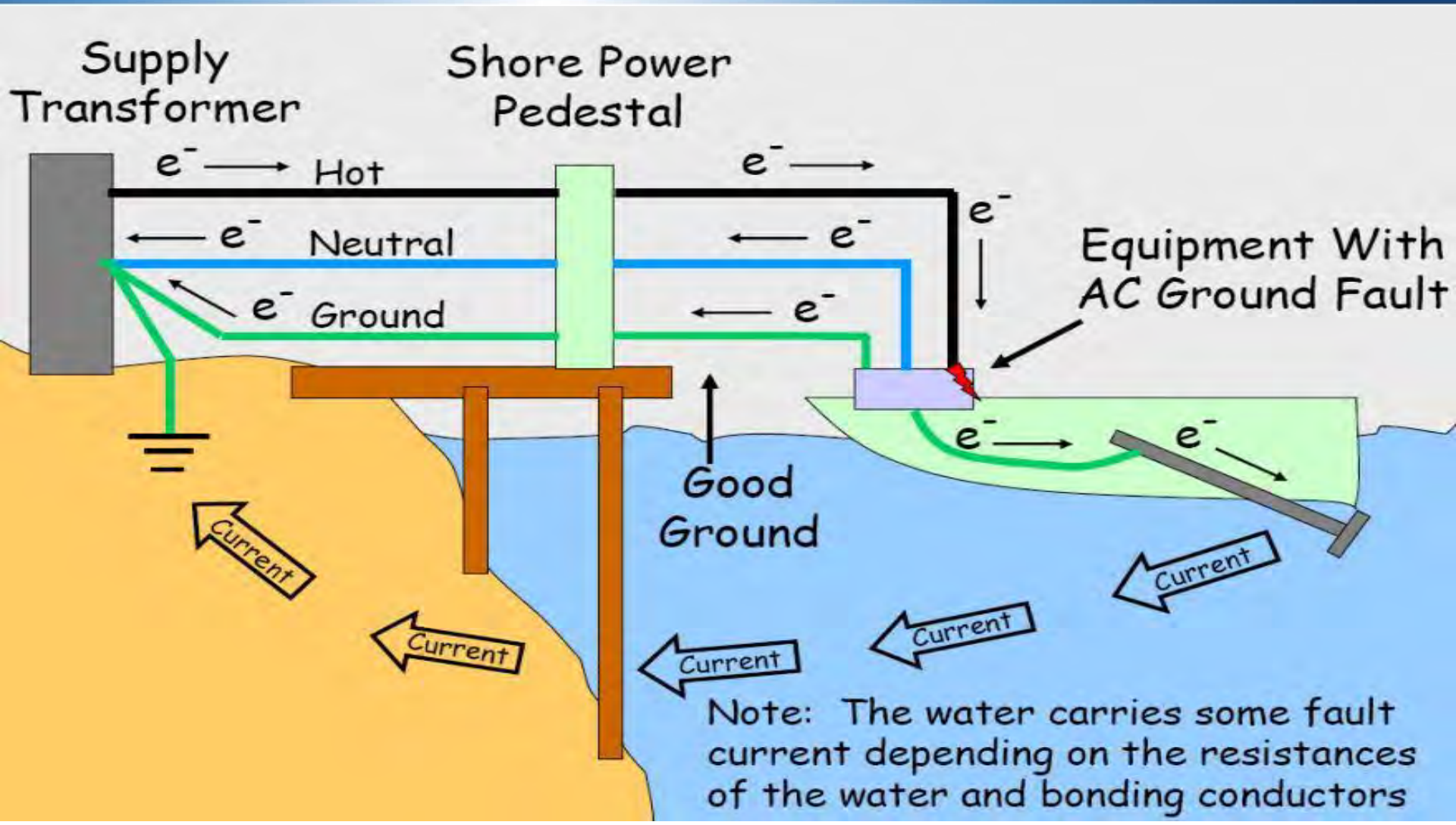
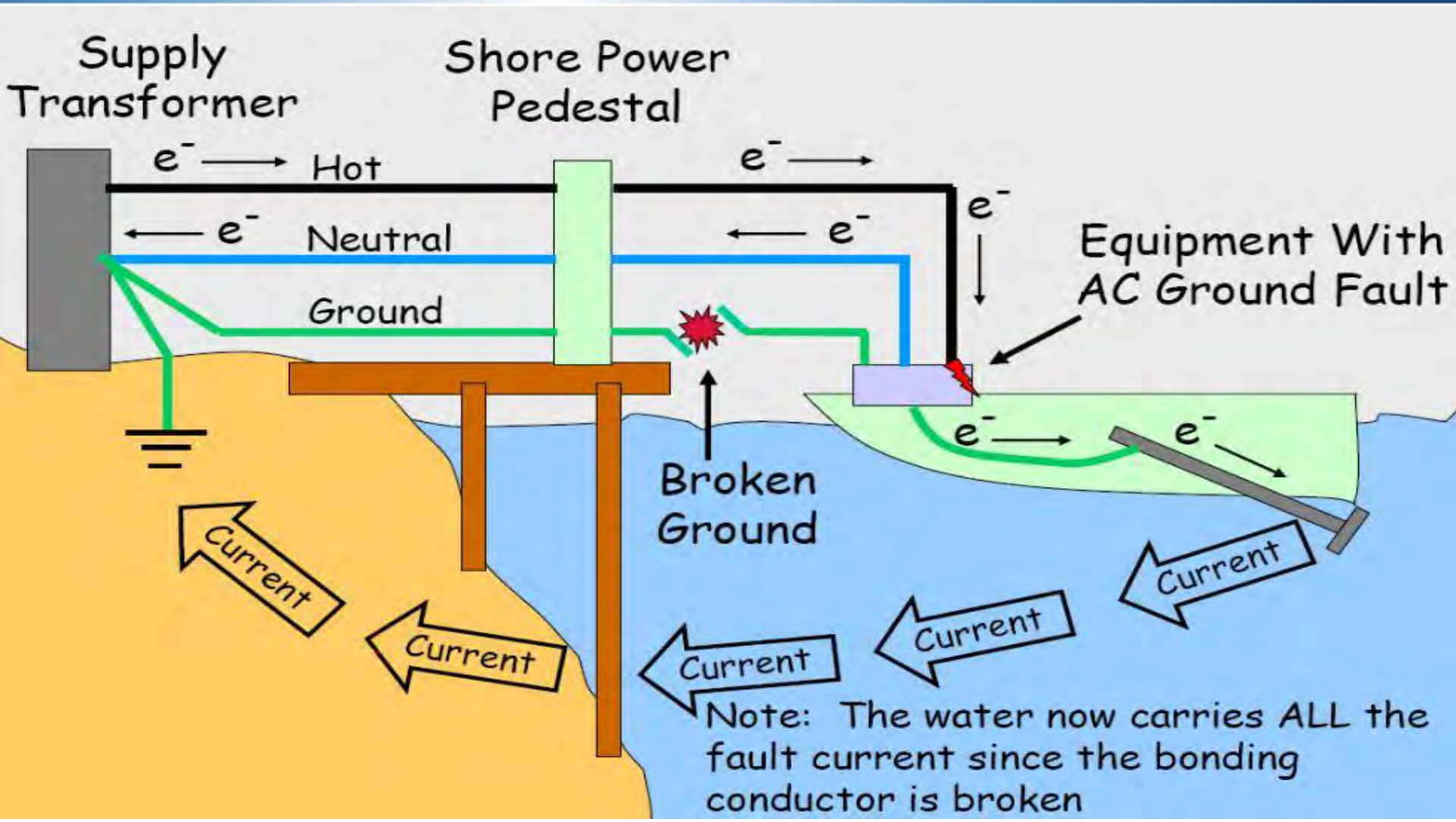
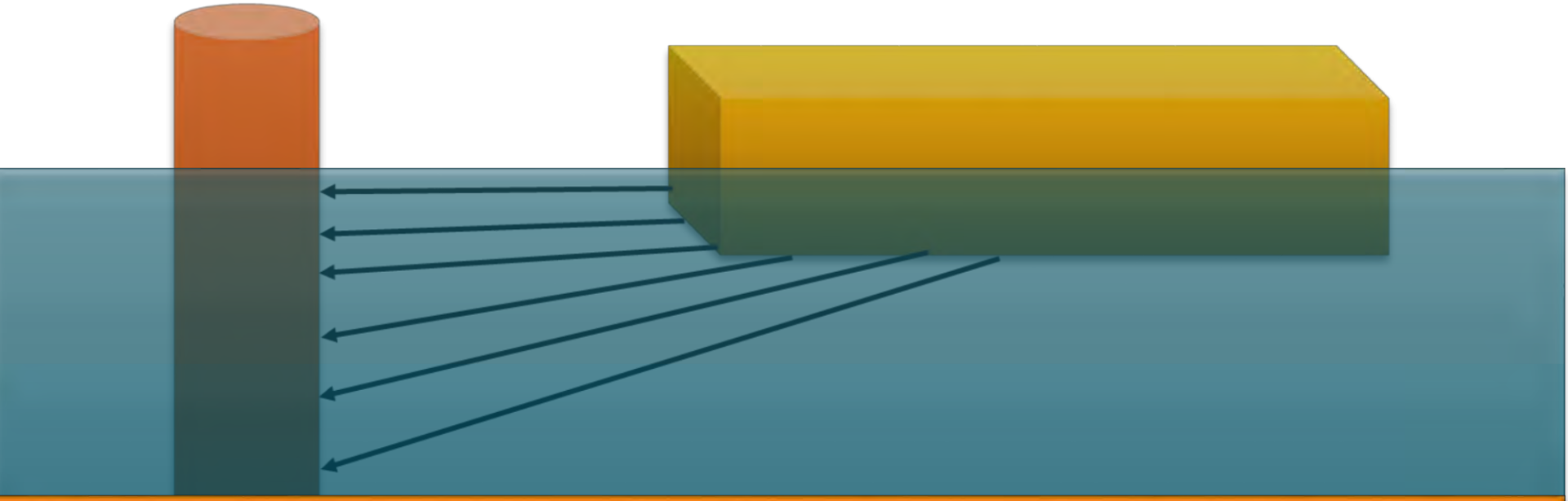


Courtesy of International Association of Marine Investigators



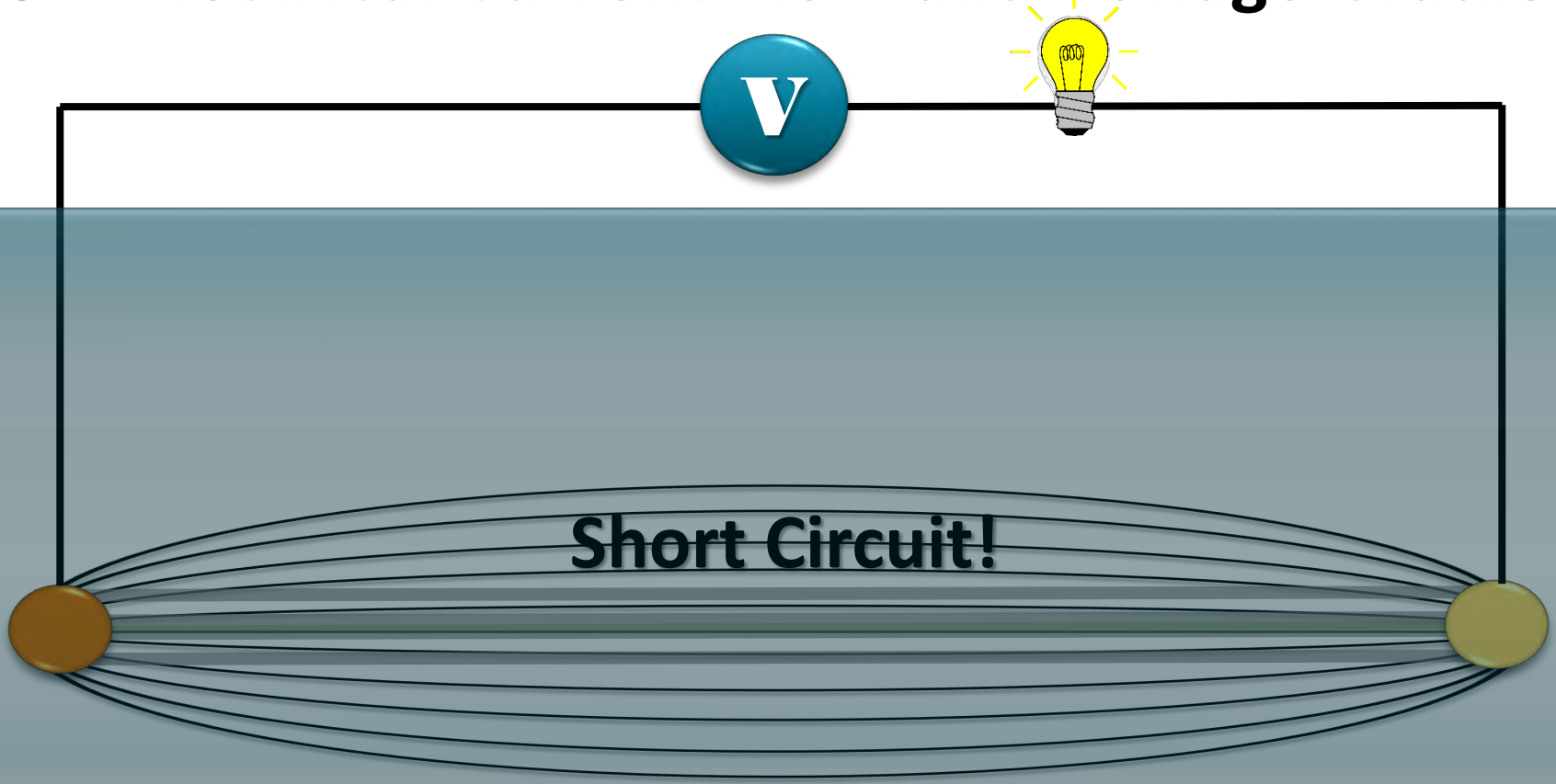
Courtesy of International Association of Marine Investigators

ESD-Electrical Current Flow

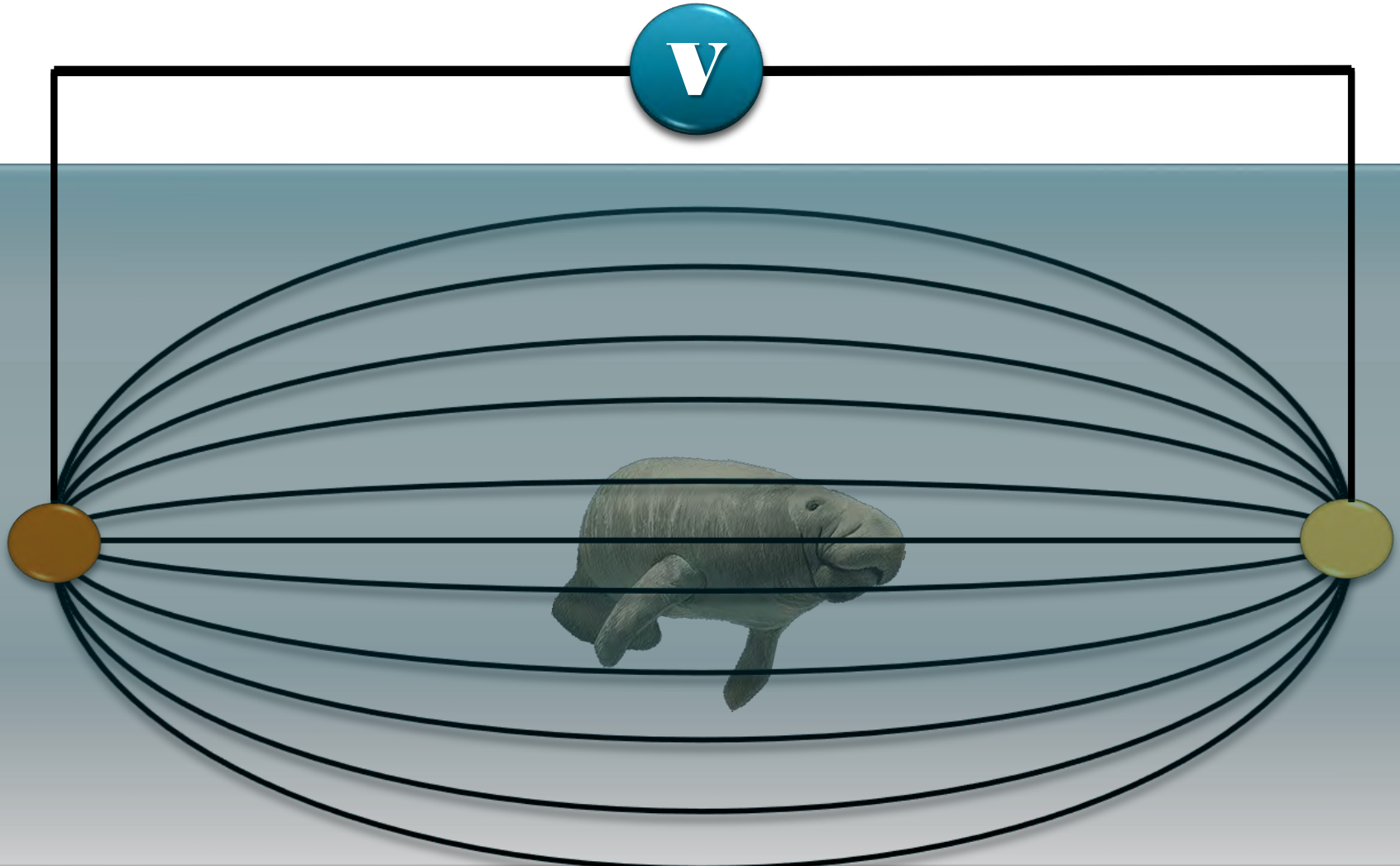


The Electrical Currents Flowing Along the Numerous "Parallel Paths" Will Not All Be Equal, But Some Current Can Be Expected to Flow from Almost All of the Submerged Conductive Points

ESD-Electrical Current Flow and Voltage Gradient

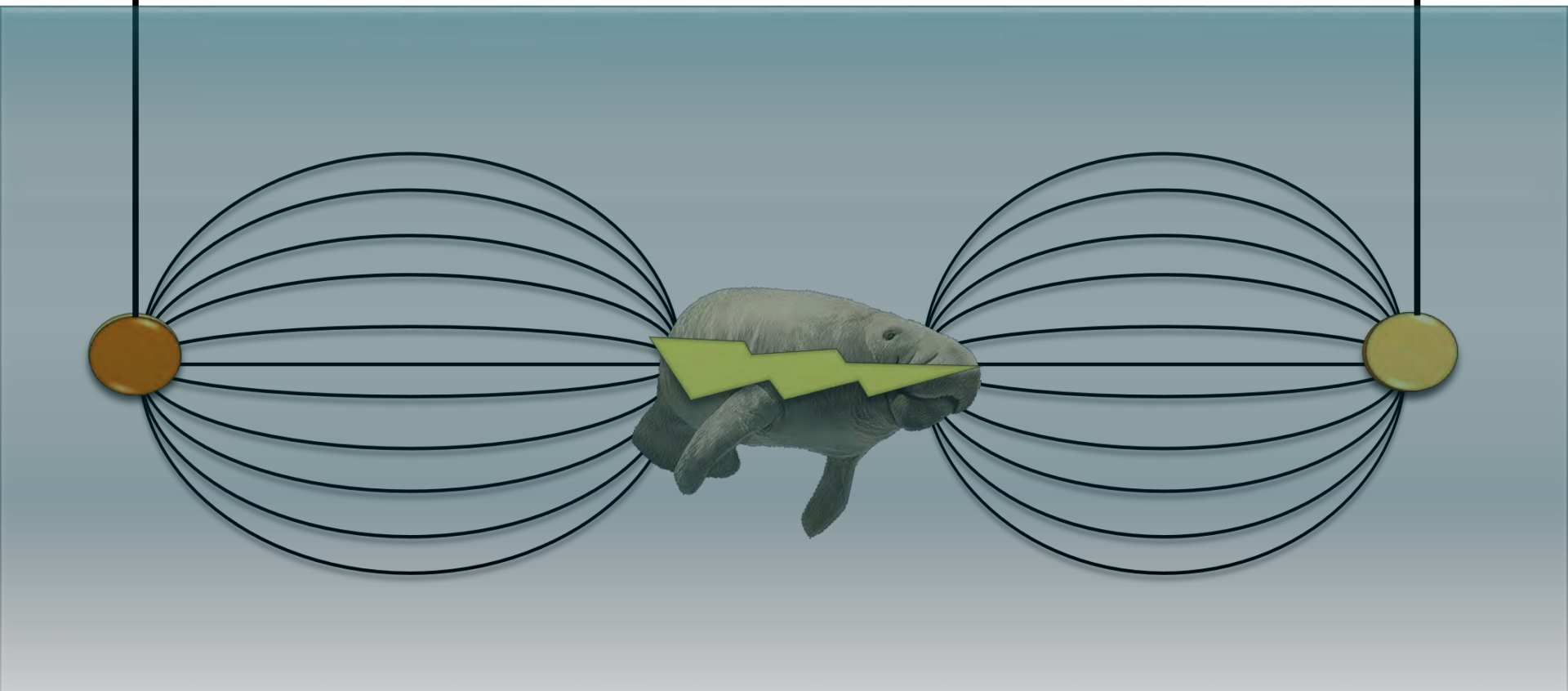


ESD-Electrical Current Flow and Voltage Gradient



ESD-Electrical Current Flow

In ~~fresh or brackish waters, manatee does not have~~ to be directly between the metal objects to receive a shock



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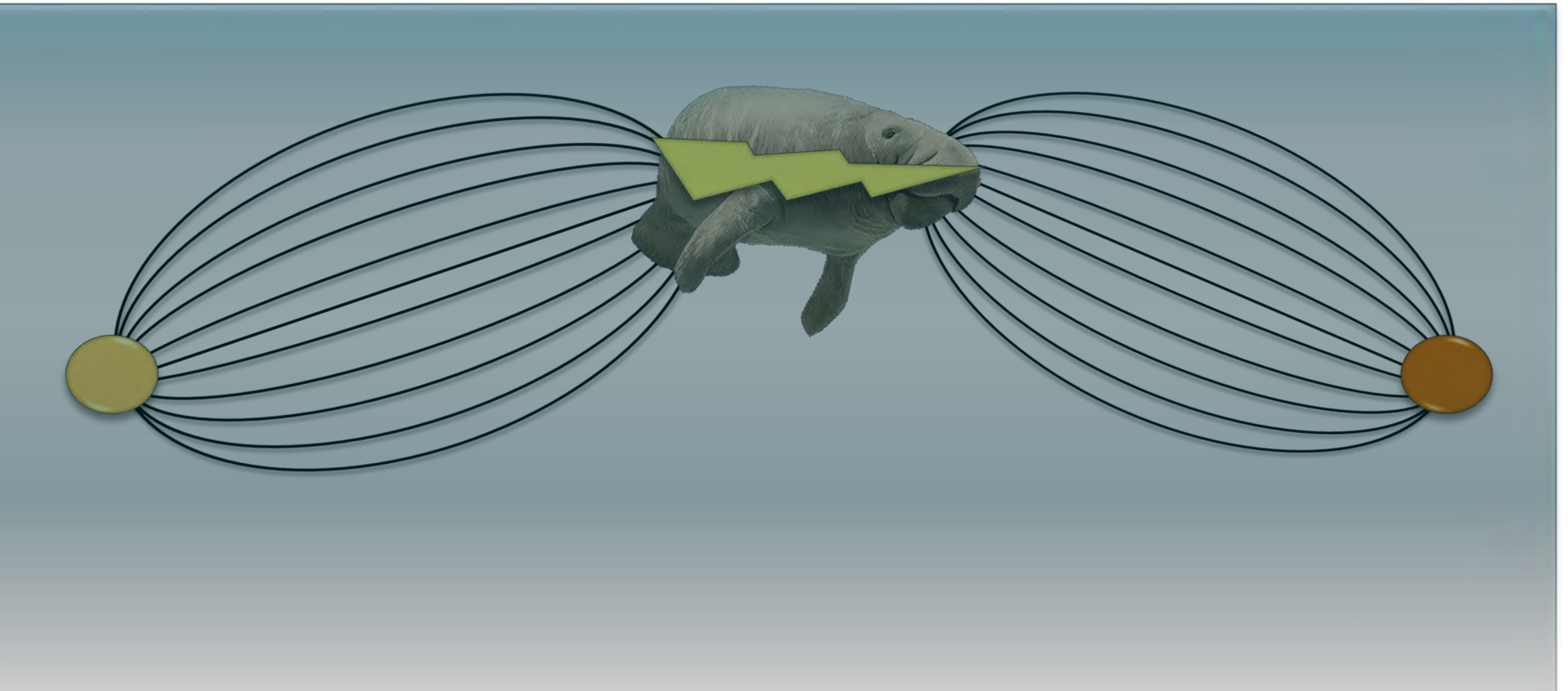

Dockside Electrical Risks and Challenges
NFPA 70: Article 210.8; 210.13; 555.3; 555.19 (B)
NFPA 303: Chapter 5.12.6

Ground Fault Protection

Safety vs. Nuisance Tripping

- 5 milliamperes? GFCI Personnel Protection [UL 943 & UL489]
- 30 milliamperes? GFP for Protecting Equipment [UL1053]
- 100 milliamperes? GFP for Protecting Entire Marina [UL 1053]
- 30 milliamperes -- 100 milliseconds? ELCI [ABYC E-11.11]
  - Equipment Leakage Circuit Interrupter
  - Typically Installed Onboard Near Shore Power Inlet

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Dockside Electrical Testing Tools

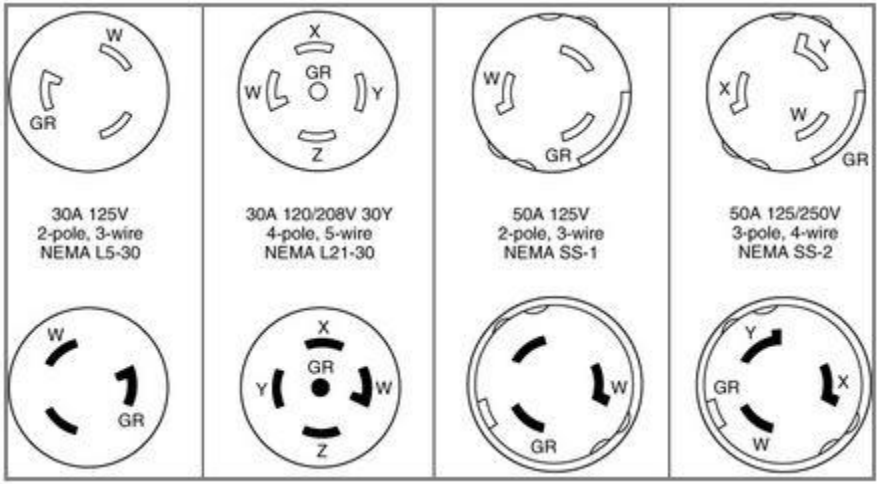
Dockside Electrical Risks and Challenges

Further Reading on Electric Shock Drowning

- **Assessment of Hazardous Voltage/Current in Marinas, Boatyards and Floating Buildings**
  - American Boat and Yacht Council
  - Fire Protection Research Foundation [NFPA]

- **In Water Shock Hazard Mitigation Strategies**
  - David Rifkin and James Shafer
  - United States Coast Guard

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.17; 555.19 (A)
NFPA 303: Chapter 5.12



Shore Power

- 30 amperes 125 volt
- ~~50 amperes 125 volt~~
- 50 amperes 125/250 volt

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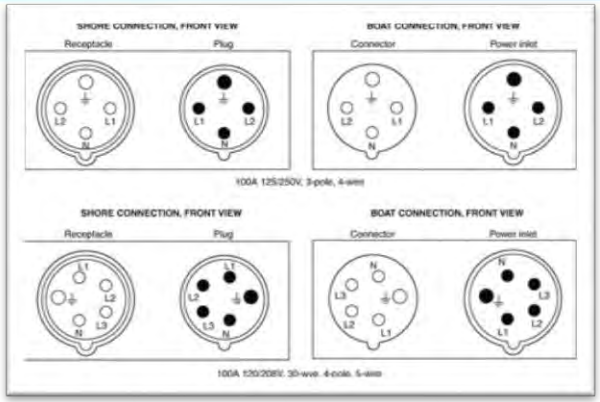
Dockside Electrical Risks and Challenges
NFPA 70: Article 555.17; 555.19 (A)
NFPA 303: Chapter 5.12; 5.13
NFPA 70E



Shore Power

- 100 amperes 125/250 volt single phase
- 100 amperes 120/208 volt three phase
- 100 & 200 amperes 480 volt three phase

Dockside Electrical Risks and Challenges
NFPA 70: Article 555.17; 555.19 (A)
NFPA 303: Chapter 5.10; 5.11; 5.12; 5.13

Shore Power

- ANSI/UL 231 or 1686; ANSI/NEMA WD6
- Must be locking 30 amperes minimum; or pin & sleeve 60 amperes minimum

- Disconnect for each outlet within 762 mm [30 inches]
- Receptacles other than shore power
  - Must be GFCI Protected
  - Must be labeled “Not for Shore Power”

Dockside Electrical Risks and Challenges
NFPA 303: Chapter 5.20

Maintenance [Annual Inspections]

- Grounding integrity and fault currents
- No cable splices or repairs
- No temporary wiring to boats
- No shore power cords in water
- No shore power cords across walkways
- No unsuitable appliances in hazardous areas
- No damaged equipment
- No overloaded circuits
- Restricted areas still secure

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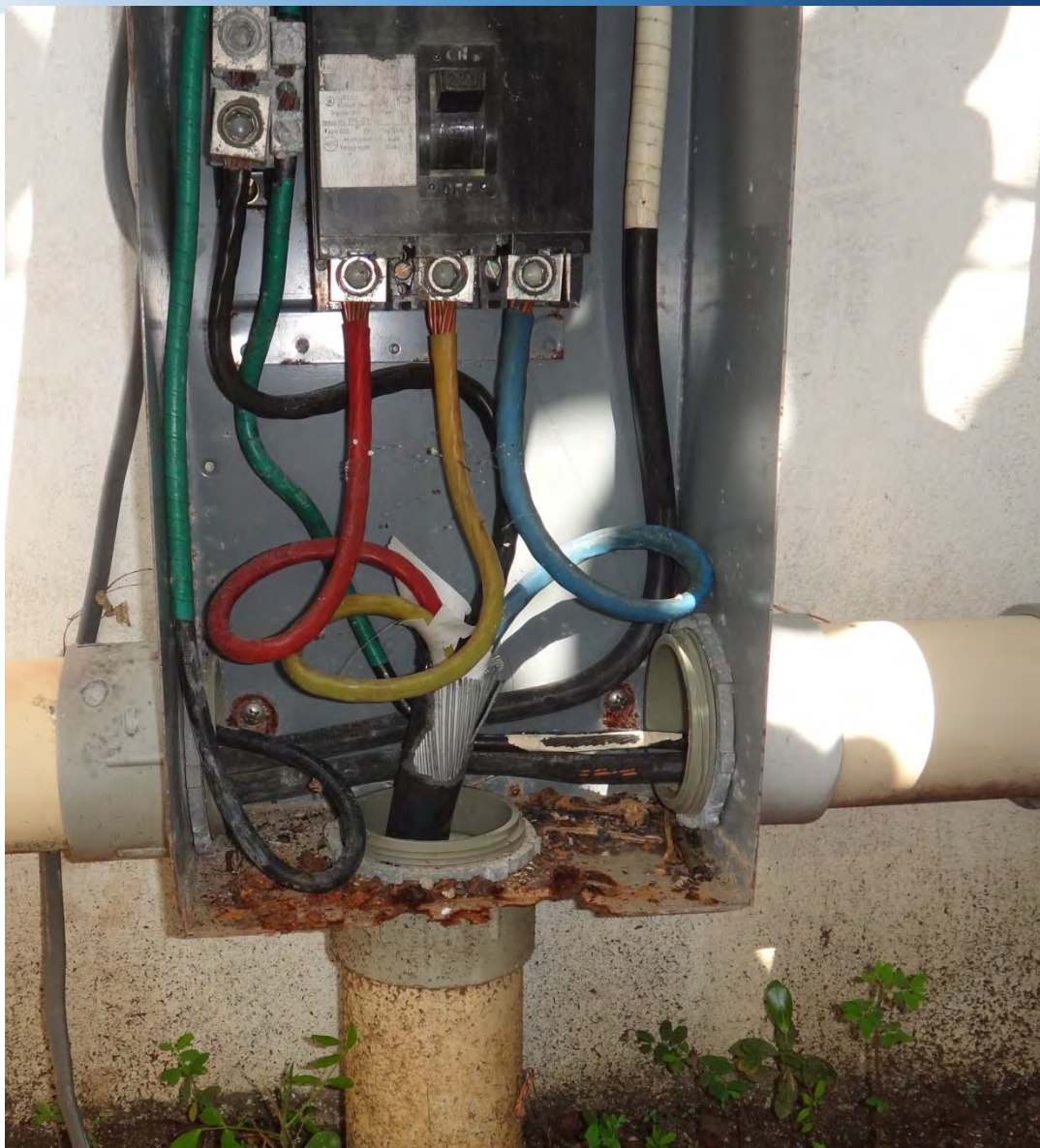

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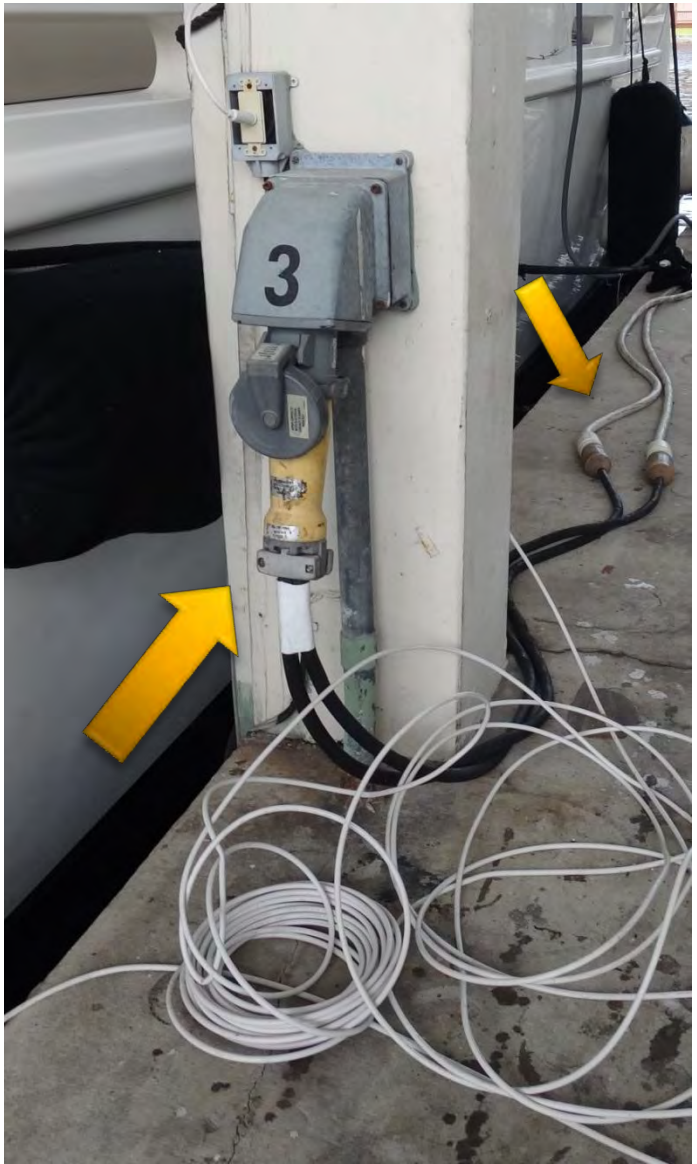

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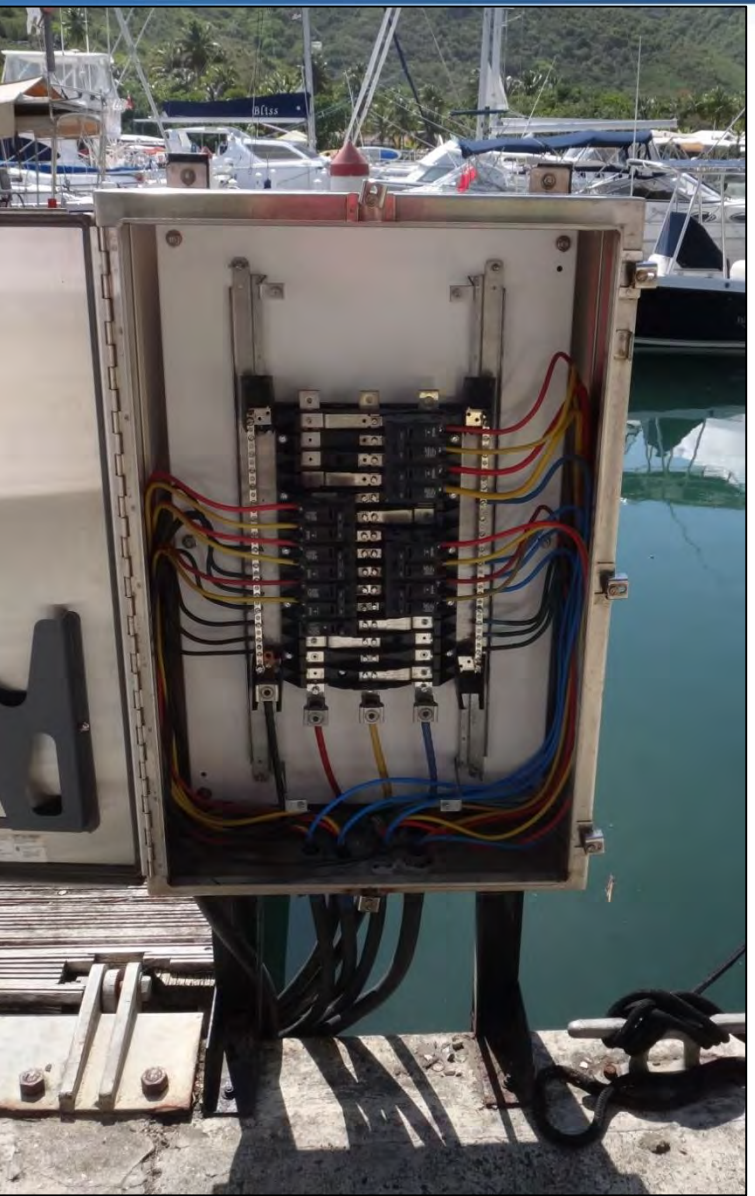

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Onboard Electrical Risks and Challenges

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Onboard Electrical Risks and Challenges for the Marina

NFPA 302

ABYC E-11

CFR, ABS, Lloyds, DNV, Bureau Veritas, RINA, IEC, IEEE, CE

- Municipality Jurisdiction Typically Ends at the Shore Power Cord
- The De Facto AHJs are the Insurance Underwriters
- There Are No Minimum Qualifications for a Marine Electrician
- Offshore Builders May Import Without Electrical or Fire Detection and Suppression System Inspections
- Cognizance of Arc Flash Hazards is Severely Lacking [NFPA 70E]
- Electrical Conduit and Enclosures are not Required
- Stray Current Corrosion [“Electrolysis”]
- Ground Faults [if grounds are not properly connected]

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Onboard Electrical Risks and Challenges For Fire Fighters and First Responders

- Generators and Auto-Start Circuits
- 120 Volt and 240 Volt Inverters
- High Capacity Battery Banks
- Unfused Engine Starting Circuits
- Lithium Ion Batteries
- Solar Panels and Wind Generators
- Arc Flash and Arcing Hazards [No Electrical Enclosures]
- Ground Faults
- Hazardous Locations [Gasoline, Propane, Hydrogen]

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Onboard Electrical Risks and Challenges - Resources

- American Boat and Yacht Council ***abycinc.org***
- International Association of Marine Investigators [IAMI] ***iamimarine.com***
- Society of Accredited Marine Surveyors [SAMS] ***marinesurvey.org***
- National Association of Marine Surveyors [NAMS] ***namsglobal.org***
- Association of Marina Industries ***marinaassociation.org***
- Electric Shock Drowning Prevention Association ***electricshockdrowning.org***
- National Marine Manufacturers Association ***nmma.org***
- United States Coast Guard ***uscg.mil***

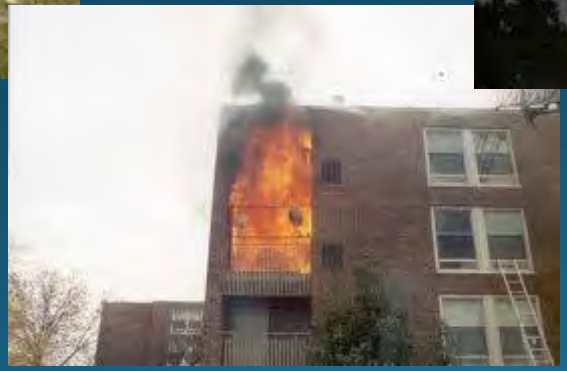
Marine Fire Incident Info

Marine Fire Loss Statistics

Accurate fire loss information is available for every type of fire in America thru NFIRS and the NFPA

Automobiles

Multiple Occupancy



Homes

But we can not easily identify losses –
dollars, injuries and deaths –
from boat fires.

Table 16 ▪ ACCIDENT, VESSEL & CASUALTY NUMBERS BY PRIMARY ACCIDENT TYPE 2014

	Accidents	Vessels Involved	Drowning Deaths	Other Deaths	Total Deaths	Total Injuries	Damages
All Accident Types	4064	5333	418	192	610	2678	$38,874,380
Capsizing	280	293	122	23	145	148	$1,820,603
Carbon monoxide poisoning	6	7	0	0	0	8	$0
Collision with fixed object	452	519	22	29	51	355	$3,441,880
Collision with floating object	54	59	3	0	3	35	$852,413
Collision with commercial vessel	18	35	4	3	7	9	$329,130
Collision with governmental vessel	5	11	0	0	0	0	$28,700
Collision with recreational vessel	937	1954	3	37	40	652	$7,191,605
Collision with submerged object	118	121	8	2	10	55	$1,549,583
Departed vessel	99	103	53	6	59	46	$10,500
Ejected from vessel	151	162	16	7	23	138	$298,050
Electrocution	1	1	0	0	0	1	$6,300
Fall in vessel	147	171	1	2	3	157	$828,146
Falls overboard	281	295	117	43	160	138	$85,440
Fire/explosion (fuel)	152	166	1	2	3	114	$3,240,356
Fire/explosion (non-fuel)	75	88	1	1	2	7	$4,919,886
Fire/explosion (unknown origin)	36	40	0	0	0	8	$3,277,185
Flooding/swamping	463	487	53	17	70	139	$4,273,333
Grounding	359	369	4	9	13	235	$5,597,919
Person struck by propeller	47	49	0	3	3	44	$950
Person struck by vessel	31	36	1	0	1	35	$3,600
Sinking	0	0	0	0	0	0	$0
Skier mishap	292	301	3	5	8	305	$8,530
Sudden medical condition	1	1	0	1	1	0	$0
Other	55	61	0	0	0	49	$1,092,771
Unknown	4	4	6	2	8	0	$17,500

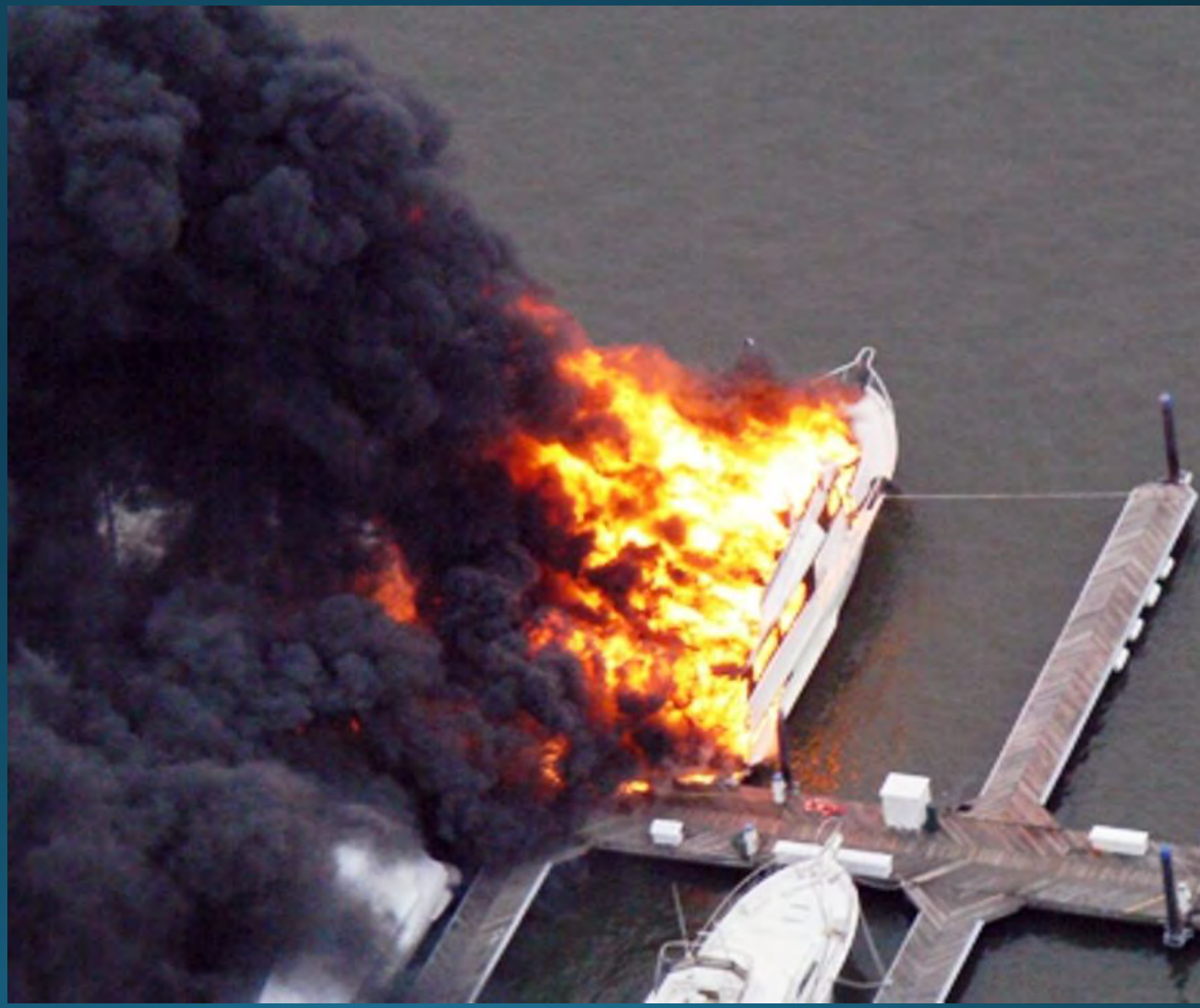
There were
263 boat fire incidents
reported in 2014.
There are over 12,000,000
registered vessels in the
United States.

"Open water" incidents are the focus of the Coast Guard Safety Statistics.

Fires that occur in a marina are typically not recorded in the Coast Guard report.

…and the incomplete Coast Guard Boating Safety Statistics should not be used as a justification for fire safety considerations.

Boating Fire Problems



Absent accurate statistics…
There are three types
of marine fire problems
that represent the
largest losses from fire.

First fire type,

Explosive Vapor Events

Causes are…

Careless Fueling Events…

Grand Rivers, Kentucky

Fatality

Delray Beach Florida

Fatality

Erie Yacht Club

Fatality

...and
unskilled
or
careless
maintenance
events.

Palm Beach Florida

Fatality

Second fire type,

is an open water fires…

…usually starts in the propulsion equipment

…in the engine room.

According to the USCG

Third fire type,

is a marina fire…

…that starts in a single vessel…

…and
55% are
electrical
in origin.
(according to Boat US)

The Three Types of Fire Events

Gasoline vapor events at the fuel dock or during careless maintenance activities.

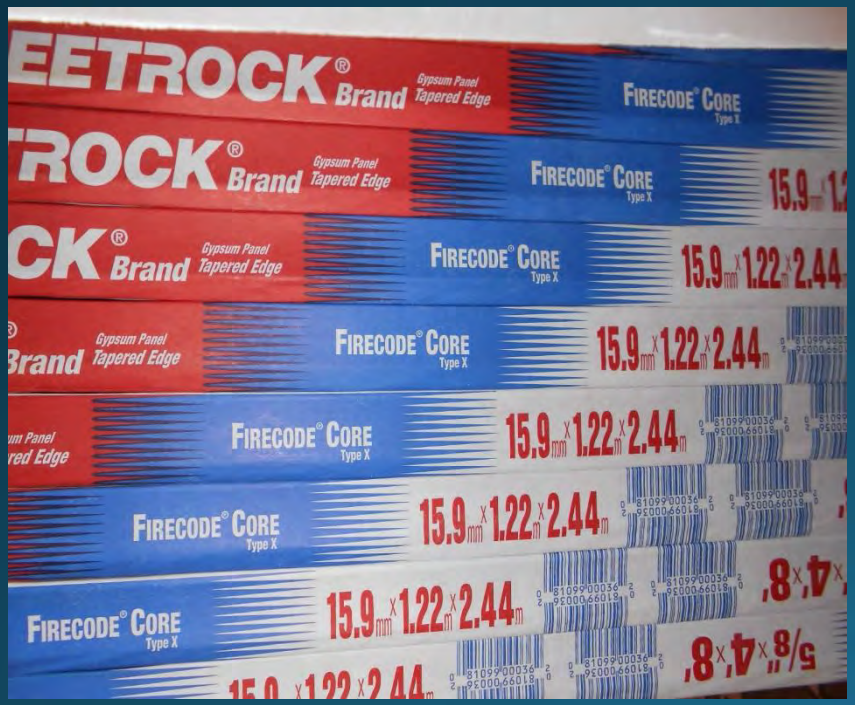
Fires underway, usually undetected engine room fires.

Marina fires that start on a single boat and burn beyond the confines of the boat before the fire can be controlled.

Pertinent Vessel Data

Construction Materials

While we have decreased the combustibility of many land side building materials…



…vessel construction materials are wood, resins, fiberglass and coring.

…and that is not likely to change soon.

A boat fire is usually an aggressive fire…

…and most everything will likely be consumed.

On Board Fuel Storage

17’ to 30’

Usually Gasoline

40 to 300 Gallons

30’ to 40’

Gasoline or Diesel

150 to 350 Gallons

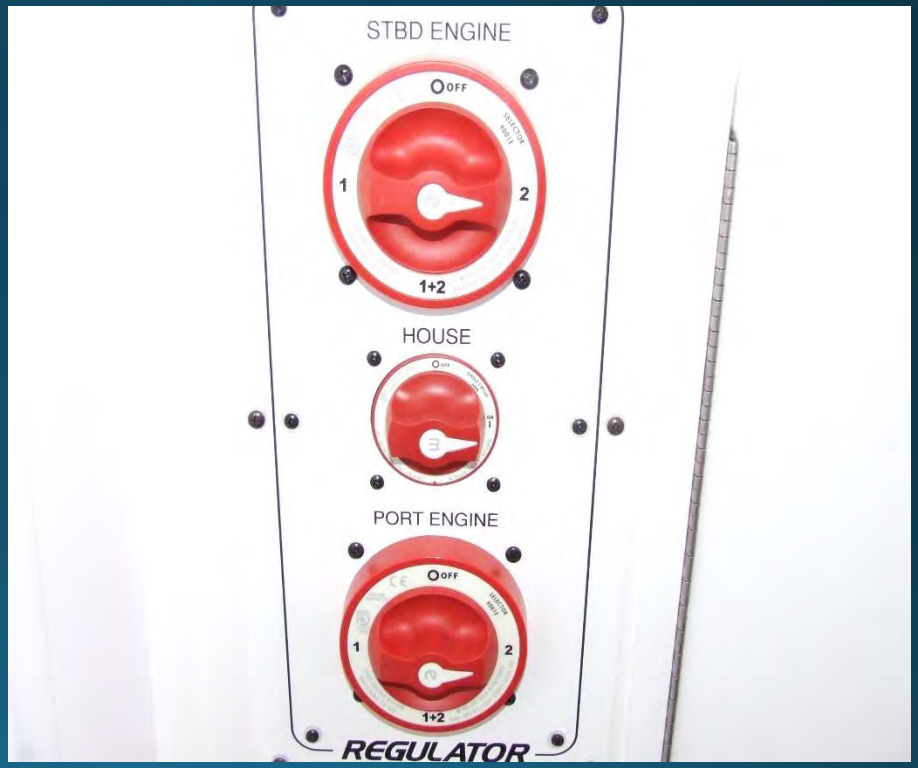
40’and up

Almost always diesel

300 to over 2000 gallons

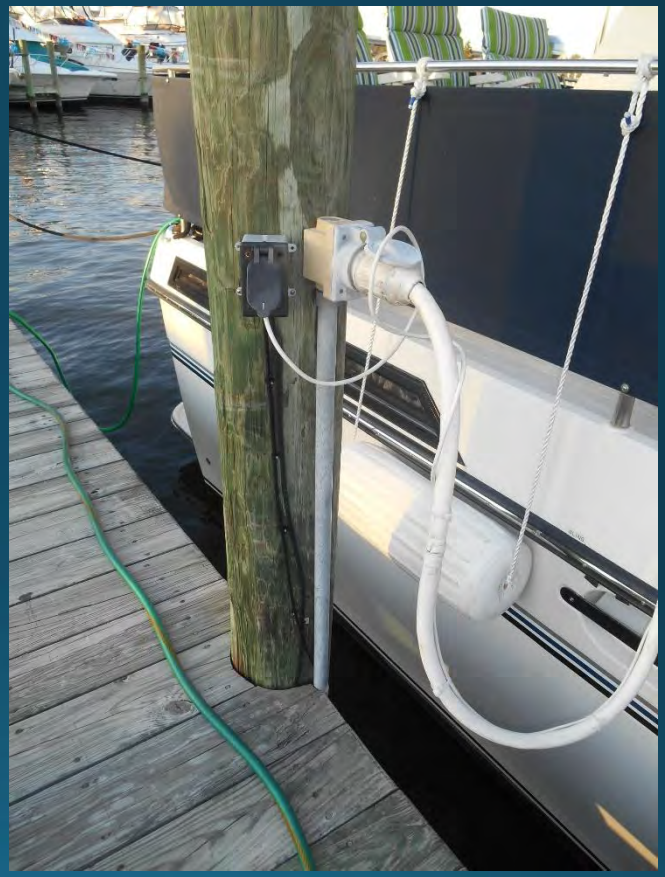
Vessel utilities that must be secured.

DC – Direct Current



AC – Alternating Current

AC – Alternating Current



Should be unplugged

LPG and/or LNG Fuels

Egress from the vessel

Egress

There are two egress concerns for the occupants of a vessel on fire:

Having to leave the boat and enter the water when away from the dock…

and

Exiting from cabin spaces during a fire.

Egress must usually be made into the water.

Egress

Another concern is limited or no egress from some staterooms aboard the boat.

Hatches, small portholes, and no second way out create limitations affecting safe egress from a boat.

Egress - Requirements

ABYC & NFPA: "a second readily accessible means of exit if one exit can be blocked by a fire in a galley or machinery space

Circular – at least 18" in diameter

Other shape – 14.5" minimum dimension or 270 square inches

This hatch meets the industry egress requirements…

…but it can not be reached with out something to stand on.

Lone means of egress is blocked by an inflatable tender.

Blocked Egress

Egress

Double Fatal Fire - March of 2012
Bellingham, WA

"…indication of a kayak stored on top
of the escape hatch
prevented the victim's escape
from the vessel…"

LMY 84 Lower Deck

click here for larger view

Detection

The most significant
Fire Protection
development
in the
20th Century

Detection

The most significant
Fire Protection
shortcoming
in the
marine industry!

Detection

The **NFPA 1192** RV Standard-

"Smoke Alarms. At least one integral battery-operated smoke alarm shall be installed in each fifth-wheel trailer, travel trailer, truck camper or motor home."

The **RV industry** has required and installed smoke alarms since 1982!

Detection

The **NFPA 302** Watercraft Standard

"Smoke Detection. All vessels 26ft or more in length with accommodation spaces intended for sleeping shall be equipped with a single station smoke alarm…"

Detection

The **Coast Guard 46 CFR Part 181.4** for Small Inspected Vessels**.**

"**Commercial Towing Vessels"** (46 CFR 27)
and
"**Commercial Fishing Vessels"** (46 CFR 28).

Detection

The ABYC,
the industry's primary standards writer, also
does not
require, recognize or advise
the industry on smoke alarms.

Vessel fires and / or marina fire incident.

Marina Incident – What to Expect

- Limited access for fire stream placement.
- Long distances from apparatus to suppression activities.
- Unsafe conditions for fire fighters – particularly at night.
- Restricted access for apparatus.
- High number of vessels moored close together.
- Combustible construction materials.
- Large quantities of fossil fuels – gasoline and diesel.
- Minimal use of fire protection equipment and delayed notification.
- Persons living on board – temporarily and permanently.
- Persons unable to egress other vessels and docks.

Marina Fire

"Horizontal High Rise Incident"

Marina fire incidents require proactive consideration

Pre-planning is a must and information must be detailed and up to date.

Who will be the participating agencies?

- Neighboring fire departments and/or fireboats
- Local police
- State, county or local marine police
- US Coast Guard
- Key marina staff
- Other marine entities
- Environmental agencies
- Commercial salvage companies
- …and radio communications with all agencies.

Fire Apparatus may be located very far from the actual fire scene.

Municipal and / or private water supply?

Drafting locations?

Standpipe connections locations and conditions

Electrical (and fuel) shutoff locations

Marina Resources

Dock Carts

Marina Resources

Golf Carts

Marina Resources

Small Workboats

Marina Resources

Spill Containment

Marina Resources

Fire Apparatus

Commercial Marine Towing

Tow-Boat US

Sea Tow

Fire fighting

On
the
fireground

Post Incident Info:

"Firefighters reported 'near miss' falls as a result of confined working space and poor visibility."

Fire Fighter Safety

The first priority!

Firefighters will be working with hose lines on narrow docks

Difficulty operating on decks in full turnout gear

Vessel Stability

1-3/4@
150 gpm

vs.

bilge pump @
1000 gph or
(16 gpm)

Vessel stability should be continuously monitored by a safety officer.

Unnecessary and dangerous exposure to fire fighters (on the bow) must be avoided.

Firefighters must be properly assigned and always accounted for – particularly at night.

All first responders must be aware of their surroundings

Fire fighters in full turnout gear in the water

https://www.youtube.com/watch?v=tZGlr_-vh6Y

https://www.youtube.com/watch?v=igHUhSxE5No

Rescue Considerations

What time of year is it?

Weekend or weekday?

What time of day is it?

How many cars are in the parking lot?

Live a boards are frequently involved in boat fires.

Rescue Considerations

- People trapped in boats involved in fire - tools
- People trapped on boats where egress is blocked by the fire - boats
- People trapped on docks where egress is blocked by the fire - boats
- People not wanting to leave their boats – police.
- Crowd control – police.

Post Incident Info:

"Egress from their vessel was blocked by flames from the other boat that was burning."

Access and Sector considerations

An ‘A’ sector attack may be the only access.

B and/or C sector attacks may be ineffective

D sector attacks may be limited to a fireboat.

Working downwind of a marina fire can be very dangerous.

Drifting "Ghost Boats"

Boats will burn through their lines and drift out of the slip.

Moving the fire vessel as a fire fighting strategy.

Moving the fire vessel away from exposures

Moving the exposures away from the fire vessel is a worthwhile option.

Moving the fire vessel to better access suppression resources.

Moving the fire vessel to safely complete salvage and overhaul.

Foam should be available and may be needed.

Fuel will leave the vessel via the fuel tank vent when the vessel sinks

Foam may be an option on the vessel's construction materials

Boathouses and covered slips

Enhance horizontal fire spread. Should not be considered safe for ventilation operations.

Boathouses

Usually no detection or suppression equipment.

Fireboats

Take time to get underway. Manpower?

Rescue and direct fire fighting activities on the inaccessible side of a marina fire.

Water supply to land based companies.

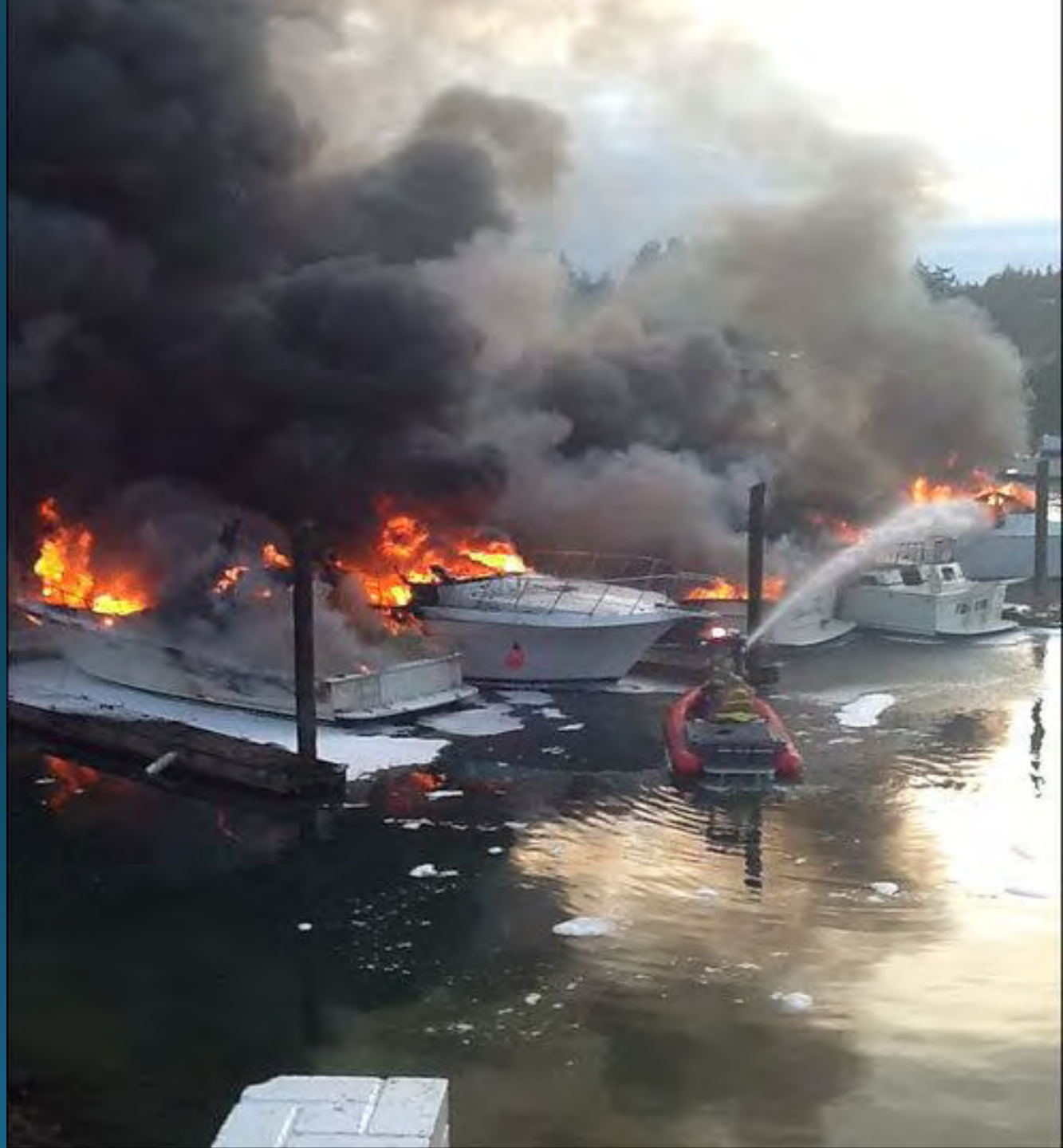
Additional RIT company on the fireboat?

Fireboats

Supplying handlines to firefighters

Fireboats

Direct fire attack



Fireboats can better access the remote sector of a marina fire

Most fireboats will have foam capability.

Environmental concerns

Environmental Concerns

Time is critical.

Boom equipment must be quickly deployed.

Divers and specialized salvage resources

Clean up may be massive and lengthy

Boatyard Incidents

Boatyards

High fire loads

Vessels stored close together

Boatyards

Restricted Access for apparatus

Boatyards

Vessel stability still an issue on land.

Boatyards

Difficult Access for Firefighters

Boatyards

Master streams

Firefighter Safety and Improved Access

Rack storage incidents

Page 60 TRADE ONLY

ROB KRASTEL

Fire started by flare destroys 42 b

Rack Storage

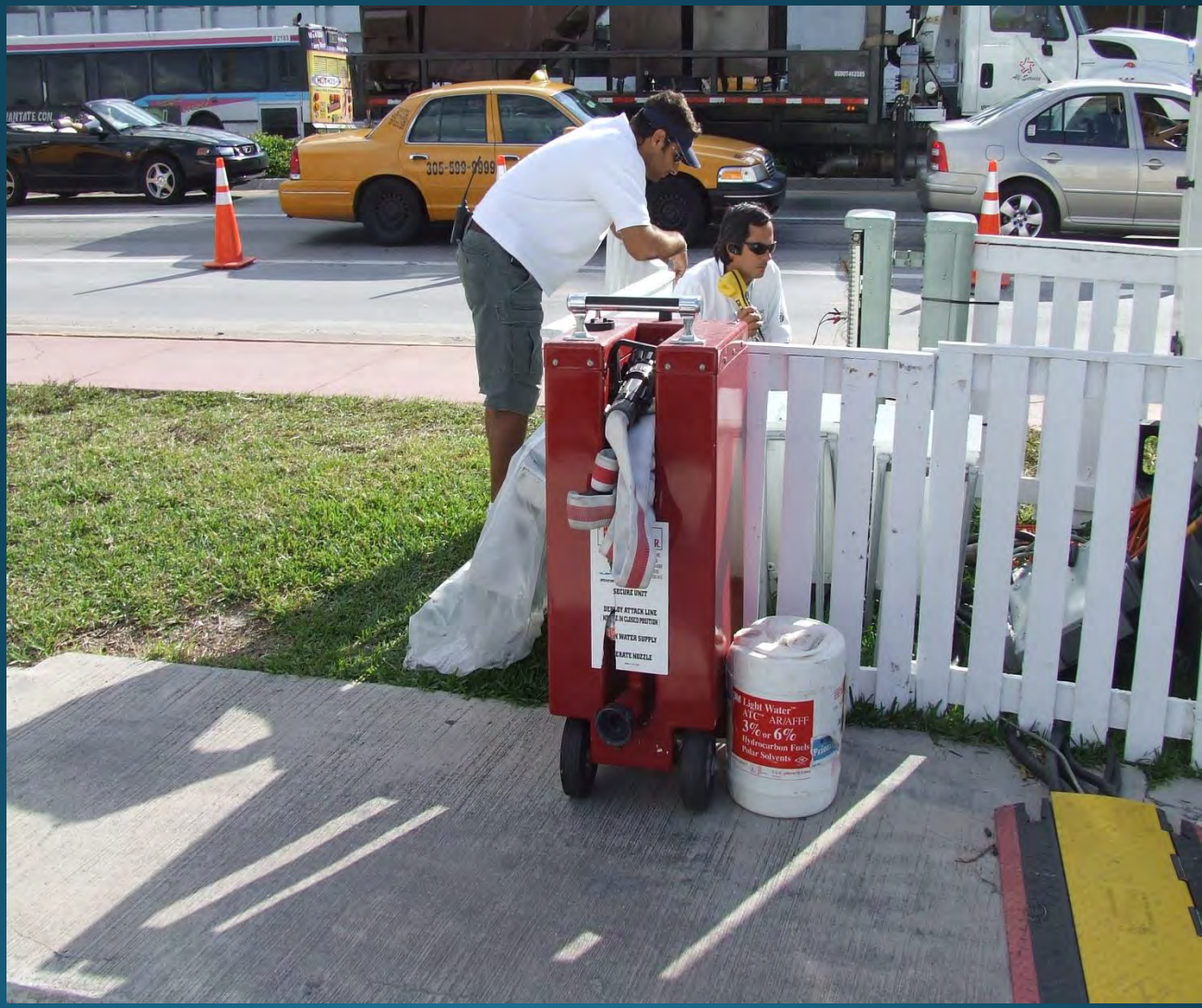
Promotes Lateral Fire Spread

Rack Storage

Subject to Collapse

Temporary Fire Protection Provisions

Temporary Fire Protection Provisions



Securing the fire scene

Preserving Evidence can be a challenge.

Cause and Origin

NFPA 921 Chapter 30 Marine Fire Investigation

Conclusions

Questions and Answers

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