



Mike Holt Enterprises, Inc.



This copyright document is not permitted to be shared without written permission from Mike Holt Enterprises. Contact info@mikeholt.com

# **Article 555**

## **MARINAS, BOATYARDS, AND COMMERCIAL AND NONCOMMERCIAL DOCKING FACILITIES**

**Based on the 2017 NEC®**



**EXTRACTED FROM Mike Holt's Illustrated Guide to UNDERSTANDING THE NATIONAL ELECTRICAL CODE® - Vol 2**

July 4, 2017

## NOTICE TO THE READER

The publisher does not warrant or guarantee any of the products described herein or perform any independent analysis in connection with any of the product information contained herein. The publisher does not assume, and expressly disclaims, any obligation to obtain and include information other than that provided to it by the manufacturer.

The reader is expressly warned to consider and adopt all safety precautions that might be indicated by the activities herein and to avoid all potential hazards. By following the instructions contained herein, the reader willingly assumes all risks in connection with such instructions.

The publisher makes no representation or warranties of any kind, including but not limited to, the warranties of fitness for particular purpose or merchantability, nor are any such representations implied with respect to the material set forth herein, and the publisher takes no responsibility with respect to such material. The publisher shall not be liable for any special, consequential, or exemplary damages resulting, in whole or part, from the reader's use of, or reliance upon, this material.

Author: Mike Holt

Technical Illustrator: Mike Culbreath

COPYRIGHT © 2017 Charles Michael Holt



Produced and Printed in the USA

All rights reserved. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems without the written permission of the publisher. You can request permission to use material from this text by either calling 888.632.2633, e-mailing [Info@MikeHolt.com](mailto:Info@MikeHolt.com), or visiting [www.MikeHolt.com](http://www.MikeHolt.com).

For more information, call 888.NEC.CODE (632.2633), or e-mail [Info@MikeHolt.com](mailto:Info@MikeHolt.com).

NEC®, NFPA 70®, NFPA 70E® and National Electrical Code® are registered trademarks of the National Fire Protection Association.



This logo is a registered trademark of Mike Holt Enterprises, Inc.

## ABOUT THE AUTHOR

**Mike Holt** worked his way up through the electrical trade. He began as an apprentice electrician and became one of the most recognized experts in the world as it relates to electrical power installations. He's worked as a journeyman electrician, master electrician, and electrical contractor. Mike's experience in the real world gives him a unique understanding of how the *NEC* relates to electrical installations from a practical standpoint.



You'll find his writing style to be direct, nontechnical, and powerful.

Did you know Mike didn't finish high school? So if you struggled in high school or didn't finish at all, don't let it get you down. However, realizing that success depends on one's continuing pursuit of education, Mike immediately attained his GED, and ultimately attended the University of Miami's Graduate School for a Master's degree in Business Administration.

Mike resides in Central Florida, is the father of seven children, has five grandchildren, and enjoys many outside interests and activities. He's a nine-time National Barefoot Water-Ski Champion (1988, 1999, 2005–2009, 2012–2013). He's set many national records and continues to train year-round at a World competition level ([www.barefootwaterskier.com](http://www.barefootwaterskier.com)).

What sets him apart from some is his commitment to living a balanced lifestyle; placing God first, family, career, then self.

*I dedicate this book to the  
**Lord Jesus Christ,**  
my mentor and teacher.  
Proverbs 16:3*



# ARTICLE 555

# MARINAS, BOATYARDS, AND COMMERCIAL AND NONCOMMERCIAL DOCKING FACILITIES

## **Introduction to Article 555—Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities**

Water levels aren't constant. Ocean tides rise and fall, while lakes and rivers vary in depth in response to rain. To provide power to a marina, boatyard, or docking facility, you must allow for these variations in water level between the point of use and the electric power source. Article 555 addresses this issue.

This article begins with the concept of the electrical datum plane. You might think of it as the border of a “demilitarized zone” for electrical equipment. Or, you can think of it as a line that marks the beginning of a “no man’s land” where you simply don’t place electrical equipment. Once you determine where this plane is, don’t locate transformers, connections, or receptacles below that line.

### **555.1 Scope**

Article 555 covers the installation of wiring and equipment for fixed or floating piers, wharfs, docks, and other areas in marinas, boatyards, boat basins, boathouses, and similar occupancies, including one-, two-, and multifamily dwellings, and residential condominiums. ▶[Figure 555–1](#)

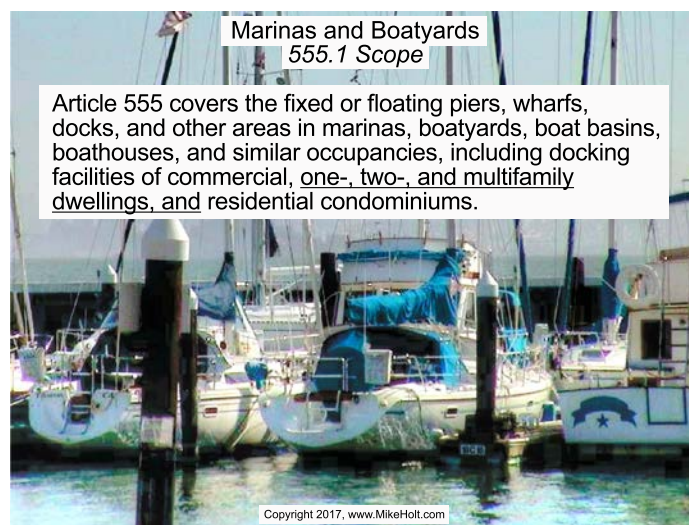
#### **Author’s Comment:**

- GFCI protection is required for outdoor 15A and 20A, 125V receptacles [210.8].

### **555.2 Definitions**

#### ***Electrical Datum Plane.***

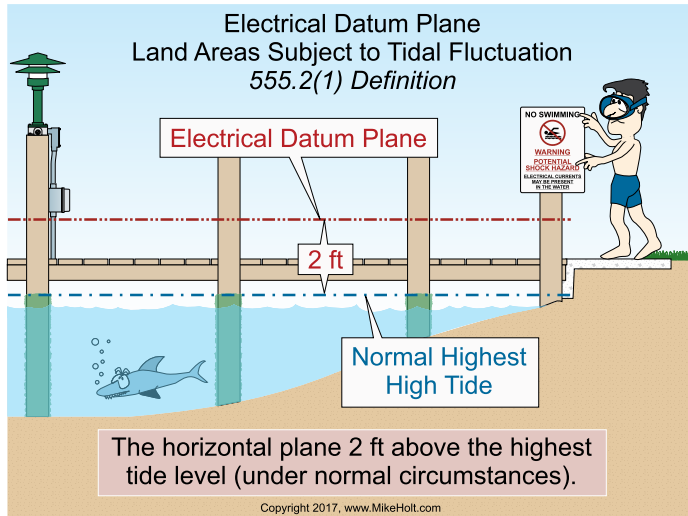
**(1) Land Areas Subject to Tidal Fluctuation.** The horizontal plane 2 ft above the highest high tide that occurs under normal circumstances. ▶[Figure 555–2](#)



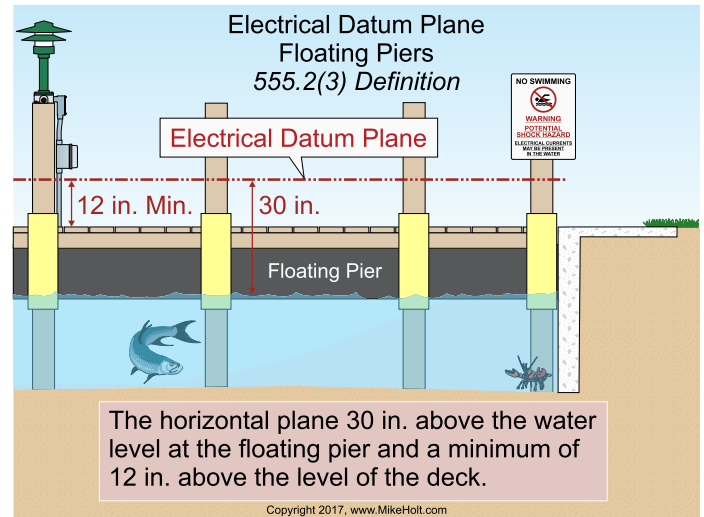
▶[Figure 555–1](#)

**(2) Land Areas Not Subject to Tidal Fluctuation.** The horizontal plane 2 ft above the highest water level that occurs under normal circumstances. ▶[Figure 555–3](#)

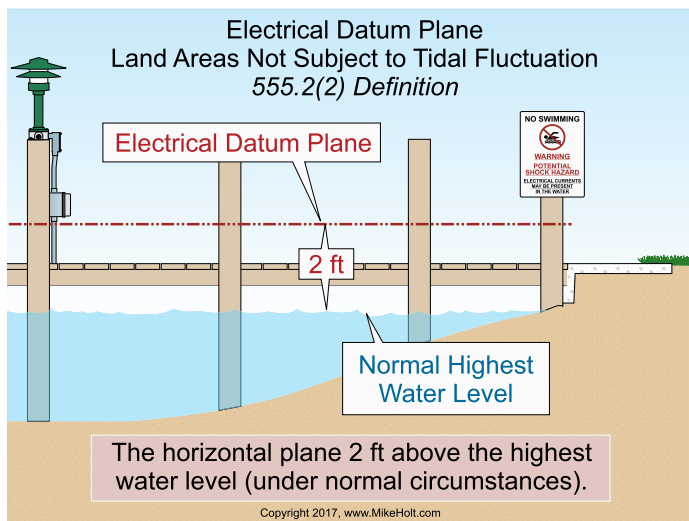




►Figure 555-2



►Figure 555-4



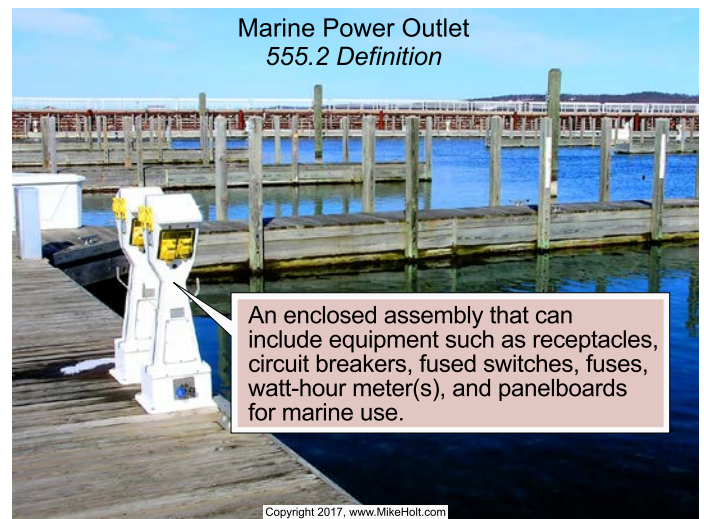
►Figure 555-3

(3) **Floating Piers.** The horizontal plane 30 in. above the water level at the floating pier and a minimum of 12 in. above the level of the deck. ►Figure 555-4

#### Author's Comment:

- This definition is necessary for the location of transformers [555.5], electrical connections [555.9], and receptacles [555.19] near water.

**Marine Power Outlet.** An enclosed assembly that can include equipment such as receptacles, circuit breakers, fused switches, fuses, watt-hour meters, panelboards, and monitoring means approved for marine use. ►Figure 555-5



►Figure 555-5

#### Author's Comment:

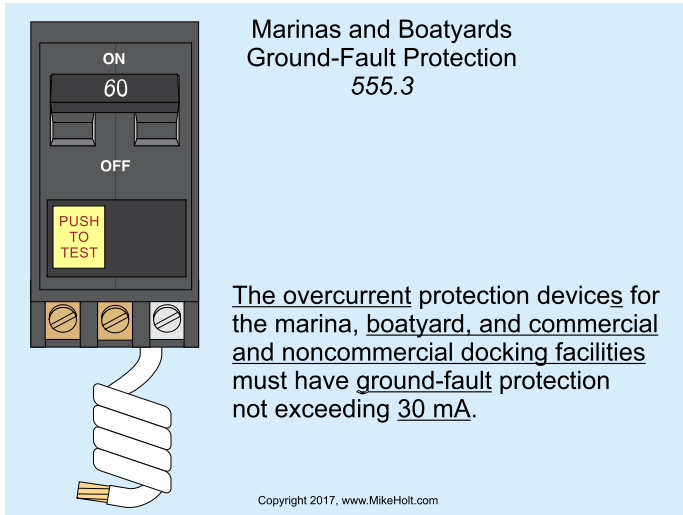
- This definition is necessary for the application of shore power receptacles [555.19(A)(1)] and disconnecting means [555.17(B)].

### 555.3 Ground-Fault Protection



Scan this QR code for a video of Mike explaining this topic; it's a sample from the DVDs that accompany this textbook.

The overcurrent protection device(s) that supply marinas, boatyards, and commercial and noncommercial docking facilities must have ground-fault protection not exceeding 30 mA. ▶Figure 555–6



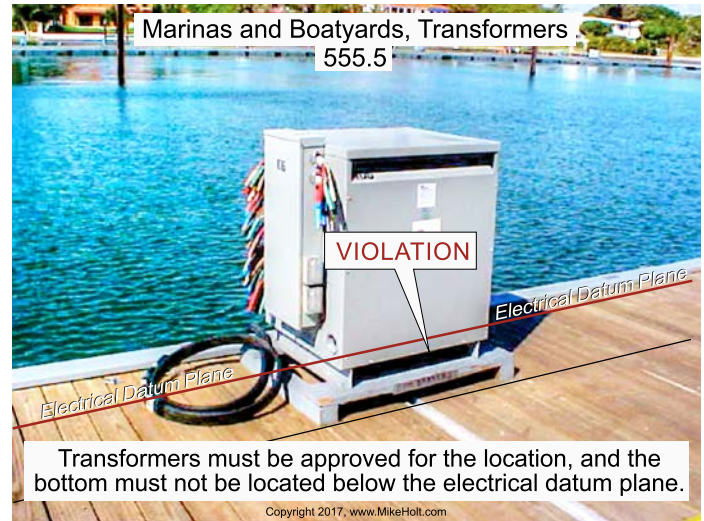
▶Figure 555–6

### 555.5 Transformers

Transformers must be approved by the authority having jurisdiction for the location, and the bottom isn't permitted to be located below the electrical datum plane. ▶Figure 555–7

### 555.7 Location of Service Equipment

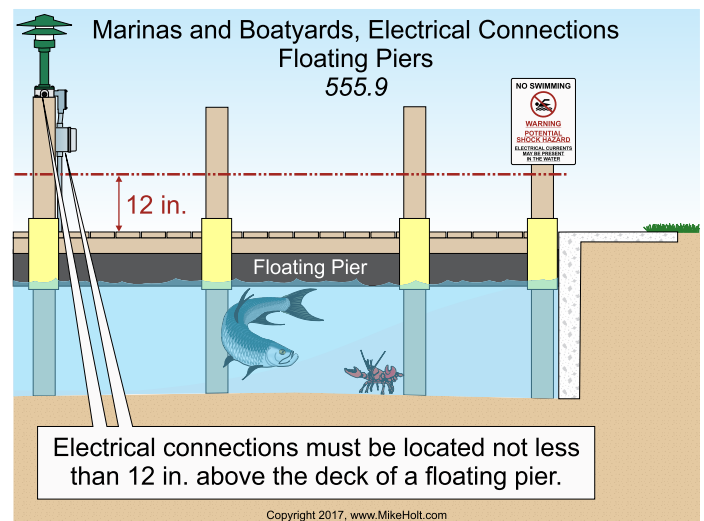
Service equipment for floating docks or marinas isn't permitted to be located on the floating structure.



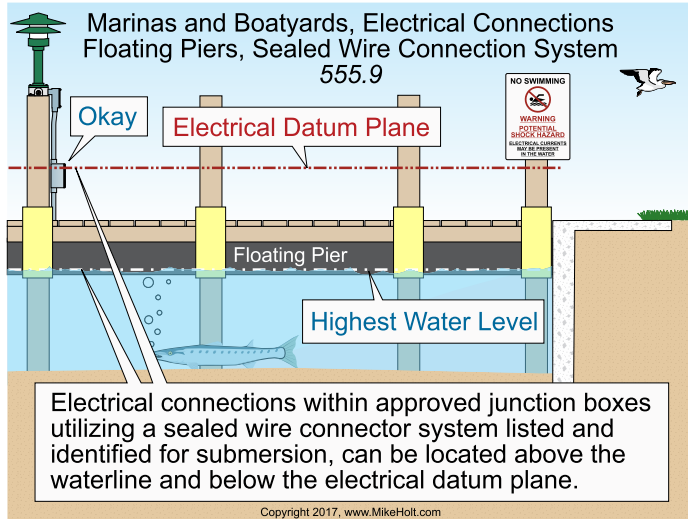
▶Figure 555–7

### 555.9 Electrical Connections

**Floating Piers.** Electrical connections must be located not less than 12 in. above the deck of a floating pier, unless the conductor splices are contained within approved junction boxes utilizing sealed wire connector systems listed and identified for submersion. They must be located above the waterline but below the electrical datum plane for floating piers. ▶Figure 555–8 and ▶Figure 555–9

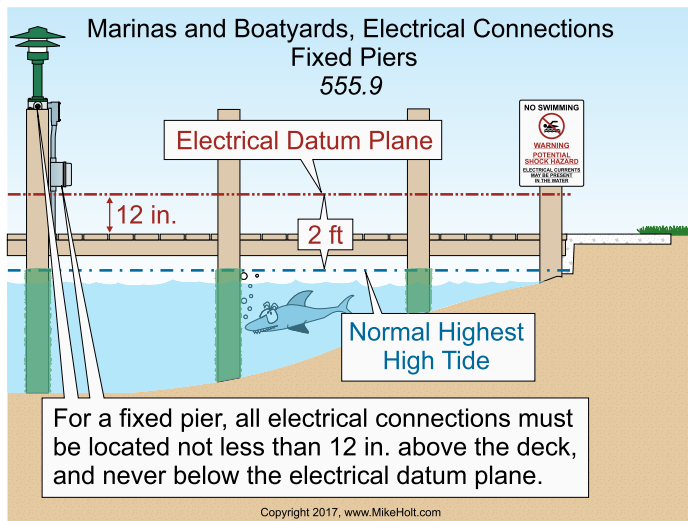


▶Figure 555–8



►Figure 555-9

**Fixed Piers.** For a fixed pier, electrical connections must be located not less than 12 in. above the deck, and never below the electrical datum plane. ►Figure 555-10



►Figure 555-10

## 555.10 Electrical Equipment Enclosures

**(A) Securing and Supporting.** Electrical equipment enclosures must be securely and substantially supported by structural members, independent of any raceway connected to them.

**(B) Location.** Electrical equipment enclosures on piers must be located so as not to interfere with mooring lines.

## 555.12 Load Calculations for Service and Feeder Conductors

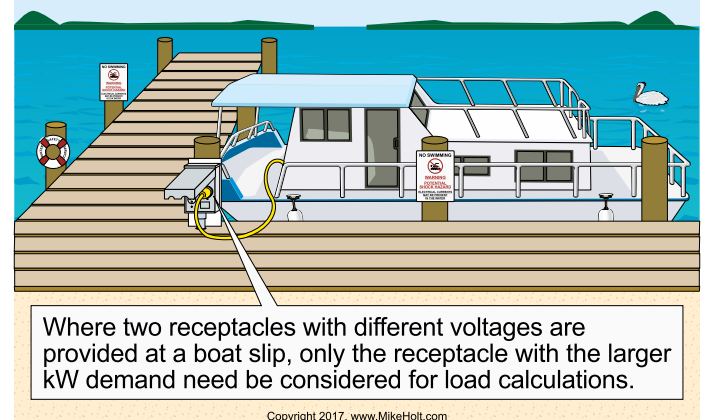
The ungrounded and neutral service or feeder load for shore power receptacles can be calculated using the adjustment factors contained in Table 555.12.

Table 555.12 Adjustment Factors

Number of Receptacles	Sum of the Rating of the Receptacles
1–4	100%
5–8	90%
9–14	80%
15–30	70%
31–40	60%
41–50	50%
51–70	40%
Over 71	30%

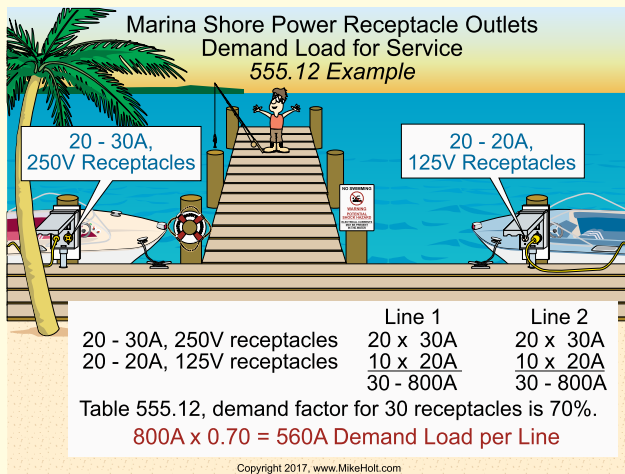
*Table Note 1. If shore power provides two receptacles having different voltages for an individual boat slip, only the receptacle with the larger kilowatt demand rating is required to be included in the calculation.* ►Figure 555-11

Marinas and Boatyards, Shore Power Calculations  
Table 555.12, Note 1



►Figure 555-11

**Example:** What size 120/240V, single-phase service is required for a marina with twenty 20A, 125V receptacles, and twenty 30A, 250V receptacles? ▶Figure 555–12



▶Figure 555–12

#### Solution:

**Step 1:** Determine the receptacle load per line.

	Line 1	Line 2
Twenty 20A, 125V	200A	200A (ten each line)
Twenty 30A, 250V	+ 600A	+ 600A (twenty each line)
	800A	800A

**Step 2:** The calculated load per line for the marina is based on the demand factors listed in Table 555.12 for 30 receptacles (per line).  $800A \times 0.70 = 560A$

**Answer:** 600A

#### Author's Comment:

- There are 40 receptacles in this example but because the 125A are balanced between Line 1 and Line 2 the maximum receptacles connected to any one line after balancing is 30.

## 555.13 Wiring Methods and Installation

### (A) Wiring Methods.

**(1) General.** Any Chapter 3 wiring method is permitted if identified for use in wet locations.

**(2) Portable Power Cables.** Sunlight resistant, extra-hard usage portable power cables listed for wet locations having an outer jacket resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals are permitted.

### (B) Installation.

#### (4) Portable Power Cables.

(a) Portable power cables permitted by 555.13(A)(2) must be:

- Properly supported.
- Located on the underside of the pier.
- Securely fastened by nonmetallic clips to structural members other than the deck planking.
- Not be subject to physical damage.
- Protected against chafing by a permanently installed oversized sleeve of nonmetallic material when cables pass through structural members.

**(5) Protection.** Raceways must be used to protect wiring above the decks of piers and landing stages.

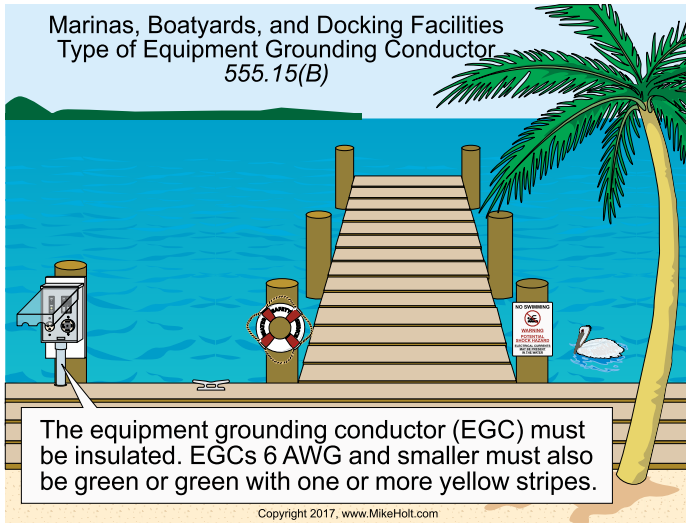
## 555.15 Grounding

**(B) Equipment Grounding Conductor.** The equipment grounding conductor must be an insulated conductor, and conductors 6 AWG and smaller must have a continuous outer finish that's green or green with one or more yellow stripes. ▶Figure 555–13

Equipment grounding conductors 4 AWG and larger or multiconductor cables can be identified in accordance with 250.119.

**(C) Size of Equipment Grounding Conductor.** The insulated equipment grounding conductor must be sized in accordance with 250.122, based on the rating of the overcurrent protection device, but not smaller than 12 AWG.



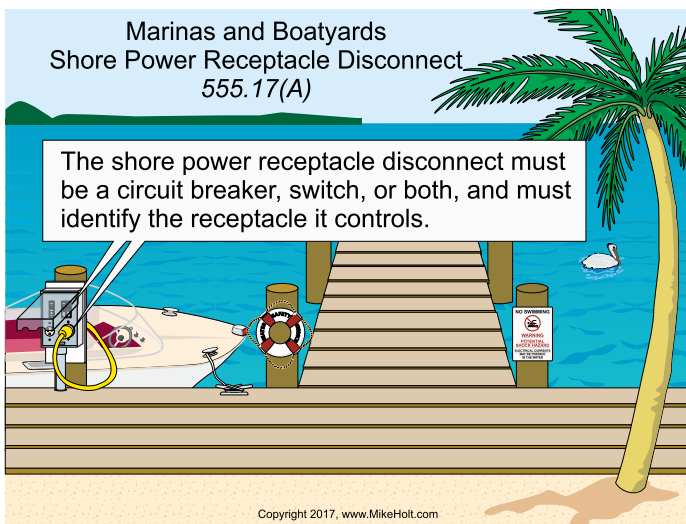


►Figure 555-13

## 555.17 Boat Receptacle Disconnecting Means

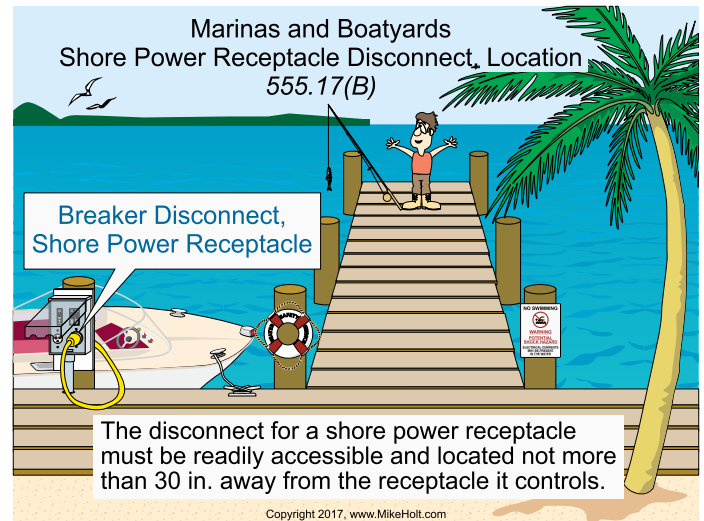
A disconnecting means must isolate each boat from its shore power receptacle.

**(A) Type of Disconnect.** A circuit breaker or switch (or both) must be used to serve as the required shore power receptacle disconnect and it must be identified as to which receptacle it controls. ►Figure 555-14



►Figure 555-14

**(B) Location.** The disconnect for shore power receptacles must be readily accessible and located not more than 30 in. from the receptacle it controls. Circuit breakers or switches located in marine power outlets can be used for the shore power receptacle disconnect. ►Figure 555-15



►Figure 555-15

### Author's Comment:

- This shore power receptacle disconnect is intended to eliminate the hazard of someone engaging or disengaging the boat's shore power attachment plug with wet, slippery hands, and possibly contacting energized blades. The "30-in. requirement" helps someone not familiar with the marina layout to quickly reach the disconnect in an emergency.

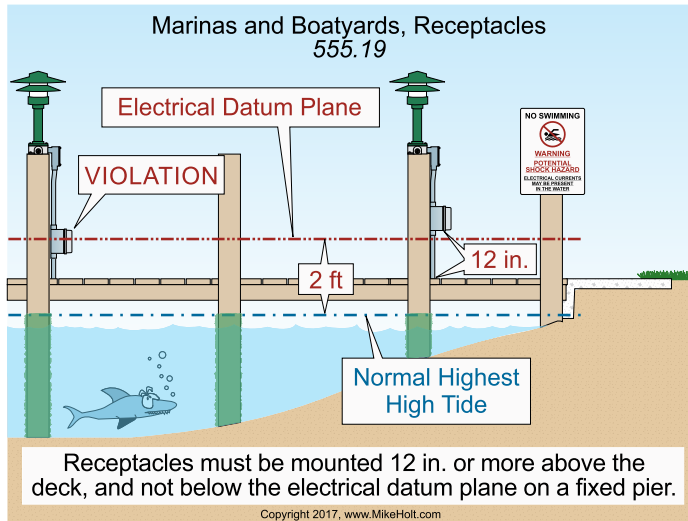
## 555.19 Receptacles

Receptacles must be mounted not less than 12 in. above the deck surface of the pier, and not below the electrical datum plane on a fixed pier. ►Figure 555-16

### (A) Shore Power Receptacles.

**(1) Enclosures.** Receptacles intended to supply shore power to boats must be part of a listed marine power outlet enclosure, be installed in listed enclosures protected from the weather, or in listed weatherproof enclosures. The integrity of the assembly isn't permitted to be affected when the receptacles are in use with a booted or nonbooted attachment plug/cap inserted.





►Figure 555-16

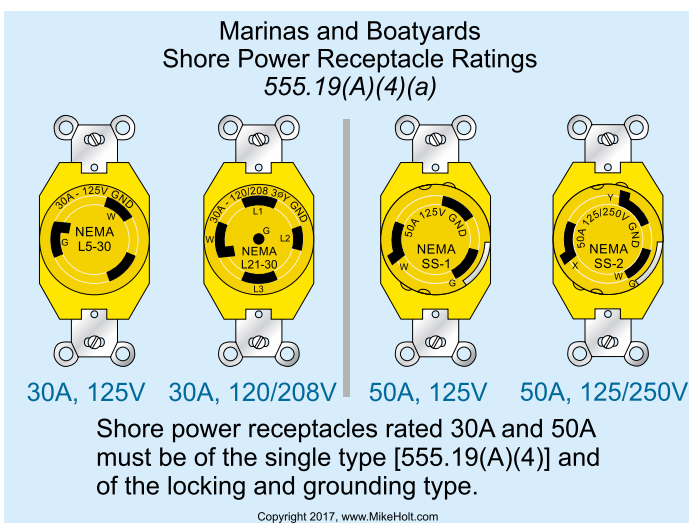
**(3) Branch Circuits.** An individual branch circuit of the voltage class and rating corresponding to the rating of the receptacle must supply each receptacle that supplies shore power to boats.

**Note:** Supplying 120/240V, 3-wire receptacles from a 120/208V, 3-wire supply may cause overheating or malfunctioning of connected equipment.

**(4) Ratings.** Single receptacles that provide shore power for boats must be rated not less than 30A.

(a) Receptacles rated 30A and 50A must be of the locking and grounding type. ►Figure 555-17

(b) Receptacles rated 60A or higher must be of the pin and sleeve type.



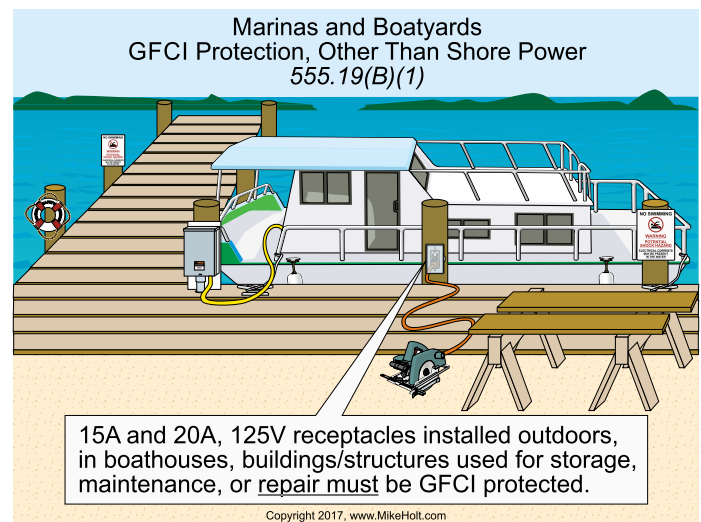
►Figure 555-17

#### Author's Comment:

- The rating of the shore power receptacle doesn't depend on the length of the boat. The *Code* simply sets a minimum rating of 30A and leaves it up to the designer and/or owner to provide the receptacles they deem necessary based on the projected usage of the slips.

#### (B) Other Than Shore Power.

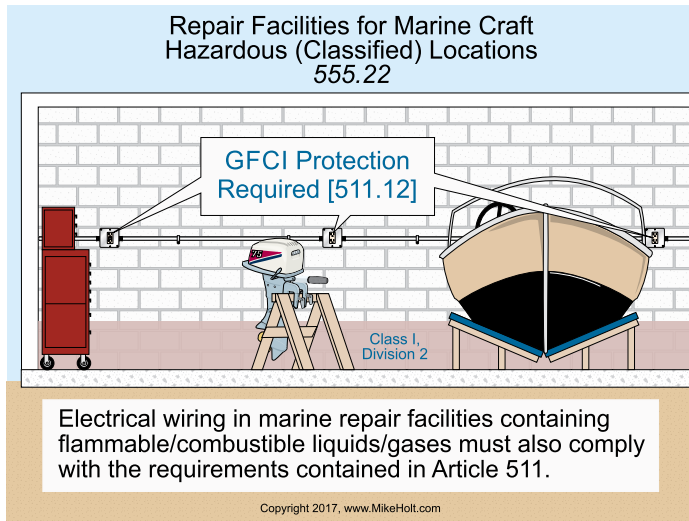
**(1) GFCI Protection of Receptacles.** 15A and 20A, 125V receptacles installed outdoors, in boathouses, buildings/structures used for storage, maintenance, or repair must be GFCI protected. ►Figure 555-18



►Figure 555-18

## 555.22 Repair Facilities

Electrical wiring and equipment at marine craft repair facilities containing flammable or combustible liquids or gases must comply with Article 511 in addition to the requirements of Article 555. ▶Figure 555–19



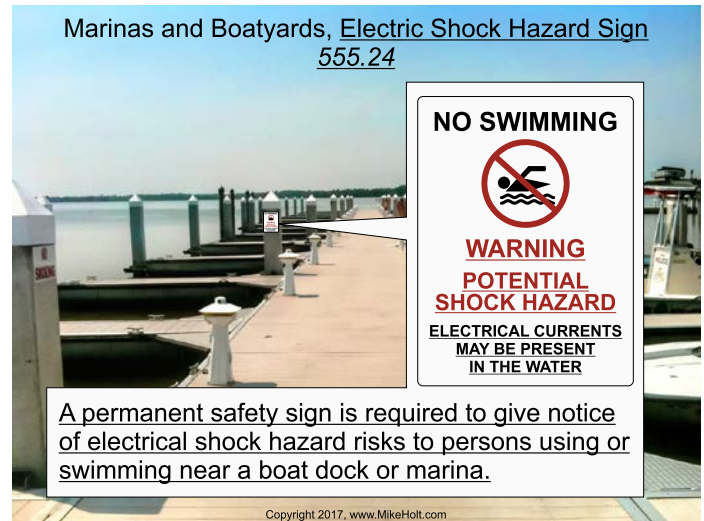
▶Figure 555–19

### Author's Comment:

- Important rules in Article 511 to consider include:
  - ◆ 511.3 Classification of Hazardous Areas
  - ◆ 511.4 Wiring and Equipment in Hazardous (Classified) Locations
  - ◆ 511.7 Wiring and Equipment Above Hazardous (Classified) Locations
  - ◆ 511.9 Explosionproof Seals
  - ◆ 511.12 GFCI-Protected Receptacles

## 555.24 Electric Shock Hazard Signage

A permanent safety sign is required to give notice of electrical shock hazard risks to persons using or swimming near a boat dock or marina, and safety signs must meet all of the following requirements: ▶Figure 555–20



▶Figure 555–20

- (1) The sign must warn of the hazards using effective words, colors, or symbols or combination in accordance with 110.21(B)(1) and be of sufficient durability to withstand the environment.
- (2) The signs must be clearly visible from all approaches to a marina or boatyard facility.
- (3) The signs must state:

**WARNING—POTENTIAL SHOCK HAZARD—  
ELECTRICAL CURRENTS MAY BE PRESENT IN THE WATER.**

20% OFF

# Mike Holt's NEC COMPLETE LIBRARY



| PERFECT FOR ENGINEERS, ELECTRICIANS, CONTRACTORS AND ELECTRICAL INSPECTORS |

There isn't a better way to learn the Code than with Mike's NEC Complete Library. It takes you step-by-step through the NEC® in Code order, combining the unique writing style of Mike's textbooks, with his dynamic teaching style on the training DVDs. You get detailed instructional graphics, great practice questions, and in-depth analysis by Mike and a team of industry experts explaining the rules and their practical application.

**Get your Copy for 20% off list price – use discount code PDF550**

NAME _____		TITLE _____	
COMPANY _____			
ADDRESS _____			
CITY _____	STATE _____	ZIP _____	
PHONE _____			
E-MAIL ADDRESS _____			
<input type="checkbox"/> VISA	<input type="checkbox"/> MASTERCARD	<input type="checkbox"/> DISCOVER	<input type="checkbox"/> AMEX
<input type="checkbox"/> MONEY ORDER	<input type="checkbox"/> CHECK		
CREDIT CARD # _____		EXP. DATE _____	
3 OR 4 DIGIT SECURITY CODE ON FRONT OF AMEX OR BACK FOR ALL OTHERS _____			

## 2017 NEC COMPLETE LIBRARY ORDER FORM

	PRICE	QTY	TOTAL
<input type="checkbox"/> DVD Program	List Price <del>\$599</del> <b>\$479.20</b>	_____	\$ _____
(includes 3 books & 12 DVDs)			
SUB-TOTAL			\$ _____
SALES TAX [FLORIDA RESIDENTS ONLY] ADD 6%			\$ _____
Shipping (5% of total price) - Minimum \$7.50			\$ _____
TOTAL			\$ _____

Mail form to: 3604 Parkway Blvd., Suite 3, Leesburg, Florida 34748  
FOR VOLUME DISCOUNTS PLEASE CALL OUR OFFICE

**Visit:** [www.MikeHolt.com/17DECO](http://www.MikeHolt.com/17DECO) • **Call:** 888.NEC.CODE (632.2633) • **Fax:** 352.360.0983



MIKE HOLT Enterprises