

Marine Electrical Systems

Safety, reliability and preventive maintenance



Shore Power

Any wiring aboard that carries a variety of 120 or 240 volt, 30 or 50 amp services.

All can be lethal in more ways than one



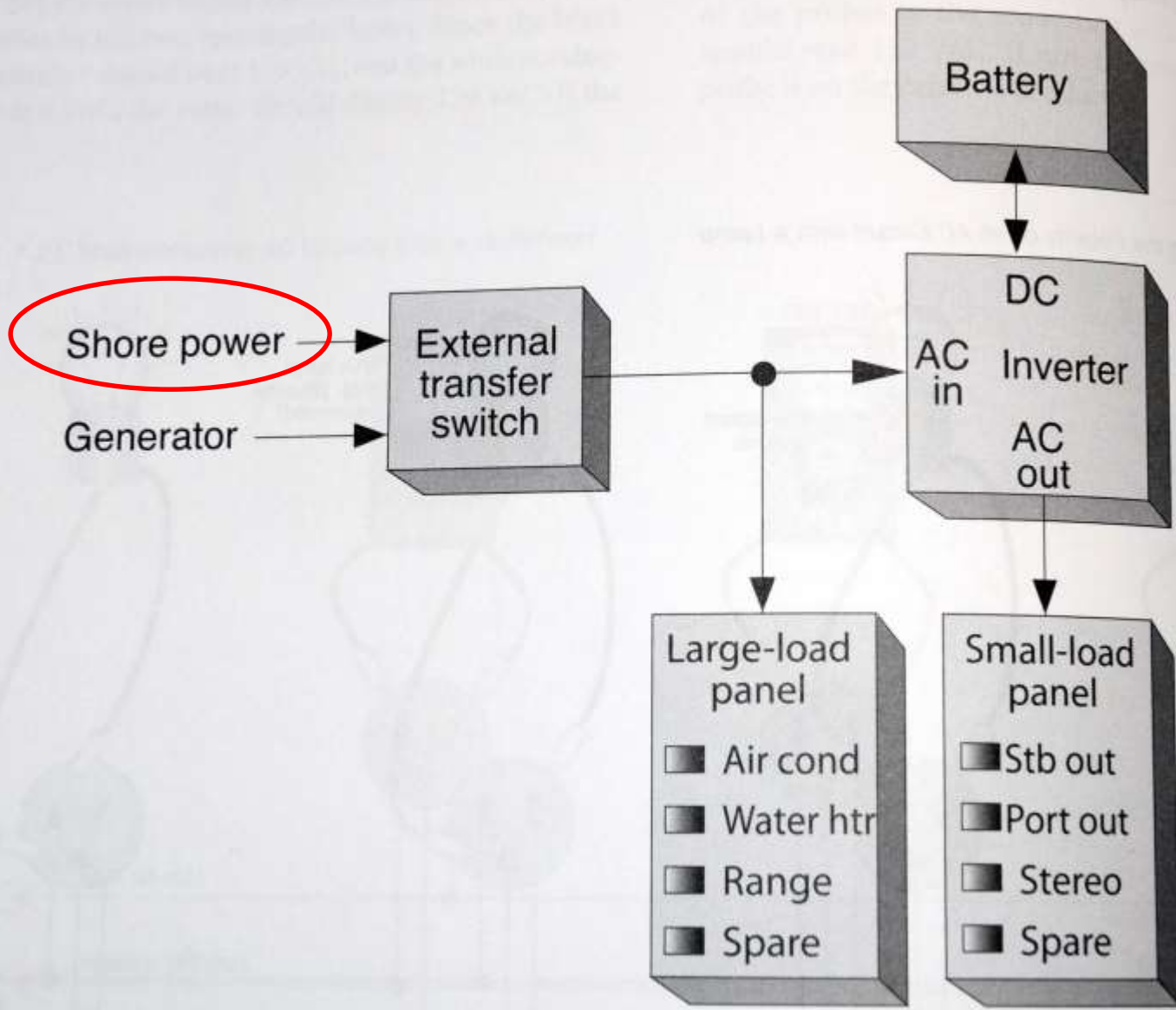


Diagram courtesy Charlie Wing's "Boatowner's Illustrated Electrical Handbook" 2nd ed.

Marine Electrical Systems Require Respect

Southside Sentinel

Serving Middlesex County and adjacent areas of the Middle Peninsula and Northern Neck

Vol. 103, No. 45

Urbanna, Virginia 23175 • February 18, 1999

Two Sections • 50¢ per copy

Deltaville boat fire claims life of 11-year-old girl

Father in critical condition

by Larry S. Channing

Emotions and daffodils, the words "We love you Whitney," and a drawing of a child's hand tacked to a charred boat piling served as a memorial this week to an 11-year-old girl who lost her life in a boat fire on Valentine's Day weekend.

The accident occurred Saturday night at Powell's Marina on the south branch of Jackson Creek in Deltaville. Whitney Haynes of Richmond was killed when her father's fiberglass sailboat, *Jolly Mon*, caught fire while moored at the marina.

The father, 49-year-old Paul

Haynes of Deltaville, suffered severe burns and was taken by Nightingale helicopter to Norfolk Sentara Hospital where he is in critical condition.

The fire apparently started shortly after 10 p.m. A boater at the marina smelled something burning as he walked his dog, said marina owner Leonard Powell. "Then he saw a glow, and then the boat was an inferno."

Haynes, who lived on the boat, was either thrown overboard during the fire or jumped into the water. He has second and third degree burns over the upper part of his

"It is a hard reminder that this was a real life lost and such a tragic accident. I haven't slept well since it happened."

—Richard Purcell, LMVFD Chief

body and is in "very" critical condition, said Richard Purcell, chief of the Lower Middlesex County Volunteer Fire Department (LMVFD), which responded to the blaze.

Haynes was helped to shore by other boaters as *Jolly Mon* was engulfed in flames. "He was in shock and burned badly," said Powell. "All he could do was watch it burn

up with his daughter inside."

Whitney had gone down to the V-berth to sleep prior to the outbreak of the fire.

Whitney was visiting her father in Deltaville over the weekend, said friend Lori Close. Whitney lived in Richmond with her mother, Susan, and would regularly visit her father on weekends. Whitney's parents are divorced.

The fire spread in the boat moored next to *Jolly Mon* and the two boats were ablaze when the LMVFD arrived on the scene, said Purcell.

"We were informed that a child might still be inside one of the boats," said Purcell. "We knocked the fire down in five to six minutes and then began rescue operations, but the boat sank within a matter of minutes."

The Mathews County Rescue Dive Unit responded to the scene and was able to retrieve Whitney's body from inside the cabin, said Purcell.

Haynes was transported to the Deltaville firehouse by the Middlesex County Volunteer Rescue Squad. The Nightingale helicopter picked him up a short time later and flew him to the Norfolk Sentara burn unit.

Haynes is a photographer, construction worker and boat tipper who has lived in the Deltaville area for a couple of years. He is known locally by the nickname, "*Jolly Mon*."

Purcell said a medical examiner



The charred remains of *Jolly Mon* were brought to the surface Tuesday at Powell's Marina in Deltaville. (Photo by Larry Channing)

won, but no "official" findings have determined the cause of the fire. It has been ruled a "boating accident" by the U.S. Coast Guard.

There is speculation that two new electric beams recently installed by Haynes may have played a part in the fire. Also, there was a propane tank aboard, said Powell.

"It did not appear to be an explosion," said Purcell, who noted that Haynes' hands were severely burned, causing speculation that the fire may have started when Haynes was lighting something.

Haynes has second and third degree burns over the upper part of his

body and a local minister assisted in informing the mother of her daughter's death. The mother, her husband and her parents drove to Deltaville from Richmond the night of the tragedy.

"It was a horrible time," said Powell. "The type of thing doesn't happen often. . . . thank the Lord."

"It is a hard reminder that this was a real life lost and such a tragic accident," said Powell. "I haven't slept well since it happened. When you join the fire department you know there is a possibility that you are going to run into these types of things once in a while. You just



Statistically, more electrical fires are caused by shore power than any other single source aboard. Is it any wonder?



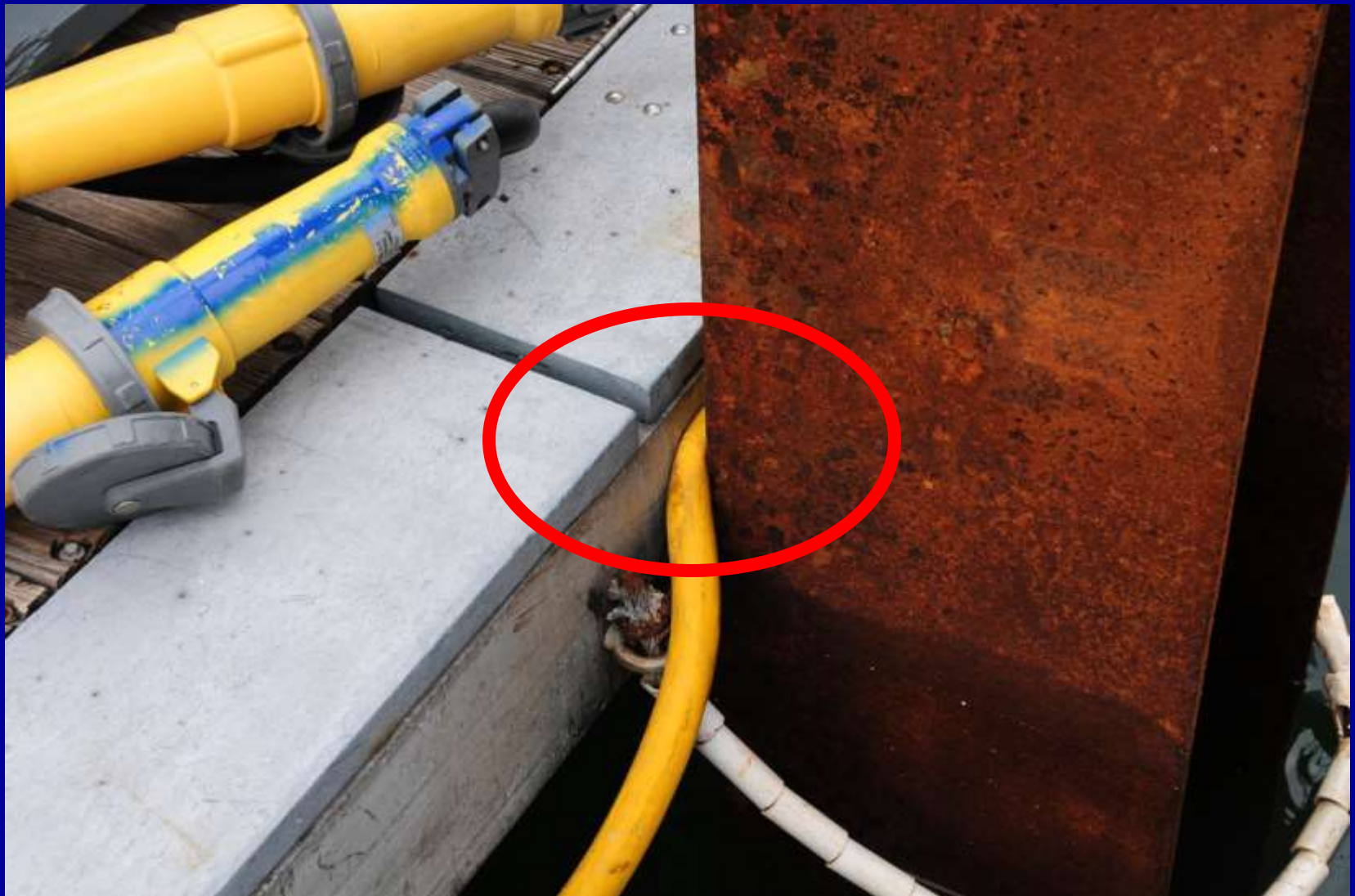
PM requirements are amplified by their “temporary” nature and the environment in which these systems operate



Don't ignore the signals when you see them
You may be *legally* responsible



Why is shore power the leading cause of fire aboard?



The worst damage
may be hidden



One of the most common causes of shore cord overheating and failure...



PM: Rinse salt off, remove corrosion
and protect regularly



Observe proper shore power cable etiquette

PM Alert, never connect or disconnect a shore power cable that is energized.

Dock and/or vessel main breakers must be OFF before making or breaking connections



Shore Power OCP: What does it do and where should it be?



What doesn't your shore power main circuit breaker do?



Alternatives to the familiar shore power plug



Smart Plug

Marinco EEL



All receptacles, *and any other shore power connections,* must be contained within an enclosure



The importance of and differences between strain relief and chafe protection





An especially dangerous scenario in the case of an isolation transformer

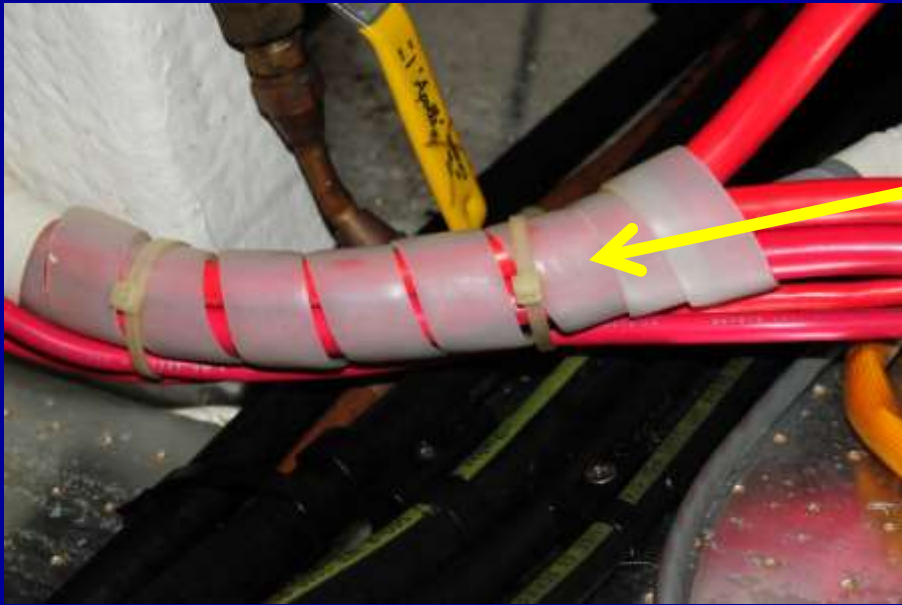


Purpose-made strain relief connectors also afford chafe protection.



Chafe protection, on the other hand,
does not afford strain relief





Discontinuous spiral wrap lacks fire retardance and ABYC compliance

Split loom carries ABYC approval and it has a fire retardance rating



Inverters



While they are, for the most part, maintenance free, installations can be complex and fraught with potential failure or worse.



Common safety defects

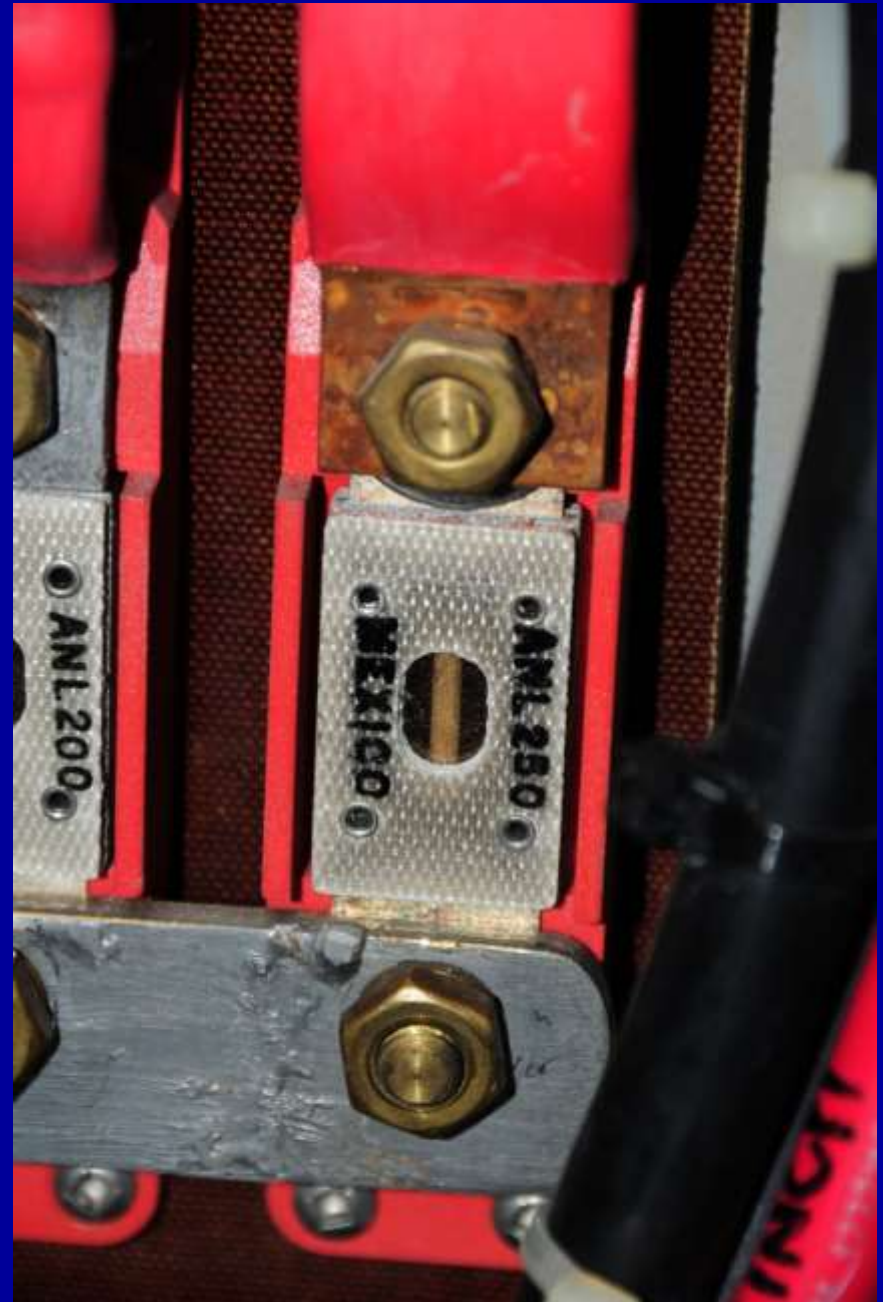
- Undersized ground
- Direct bearing terminal



Installation directly above a battery bank



Nearly all inverter manufacturers call for Class T rather than ANL fuses. A common installer oversight.



Use Class T fuses on all large battery banks.

Why and how large is large?



Hardware; inverters are heavy and require substantial support.



What's wrong with this picture?
Installers must read instructions for all gear.



Steve's tech blog stevedmarine.com/blog/
facebook.com/stevedmarineconsulting.com



Transformers

Isolation, Polarization and Boosting



Transformer Location

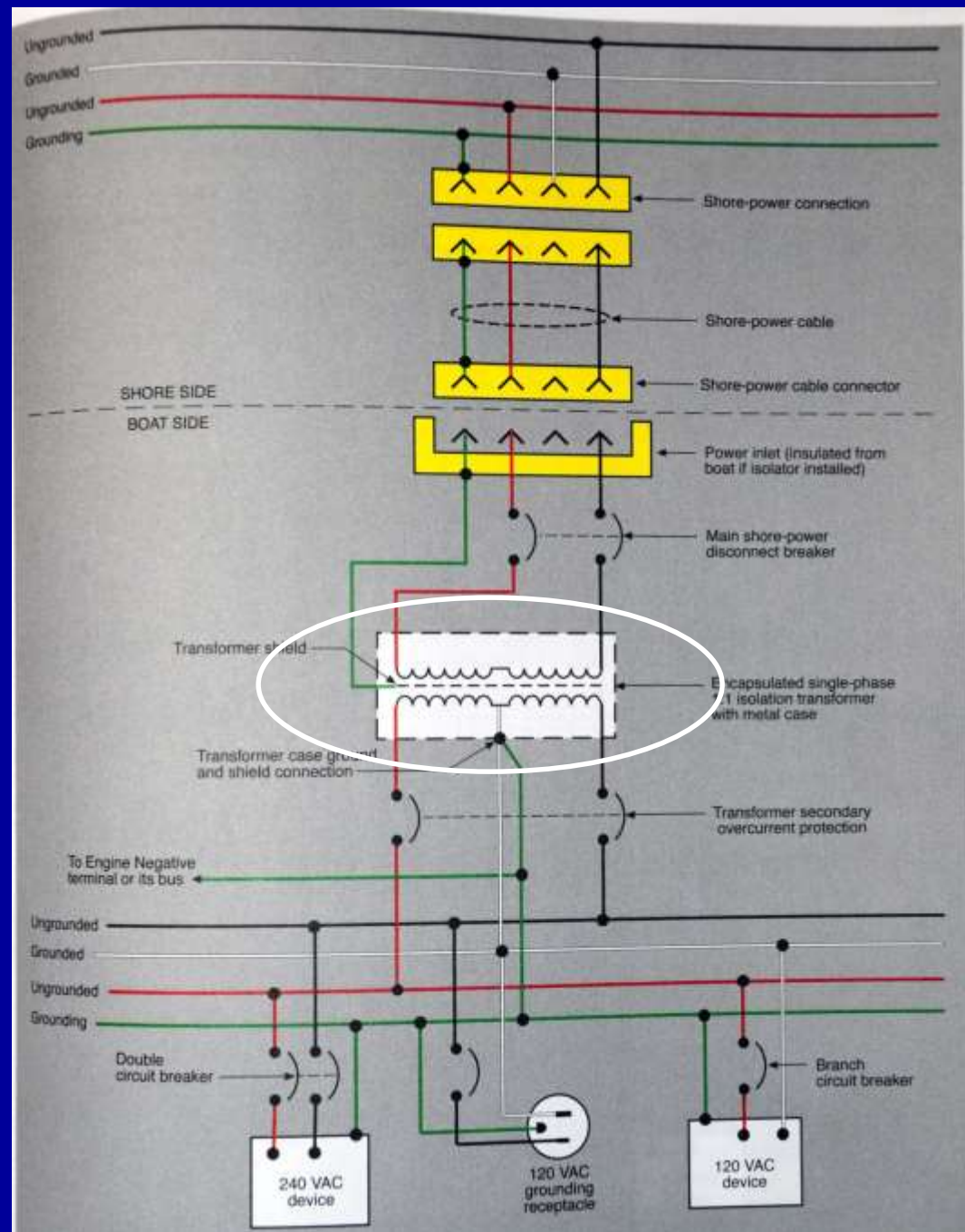


Diagram courtesy Charlie Wing's "Boatowner's Illustrated Electrical Handbook" 2nd ed

Isolation and
Polarization
transformers.

What's the
difference,

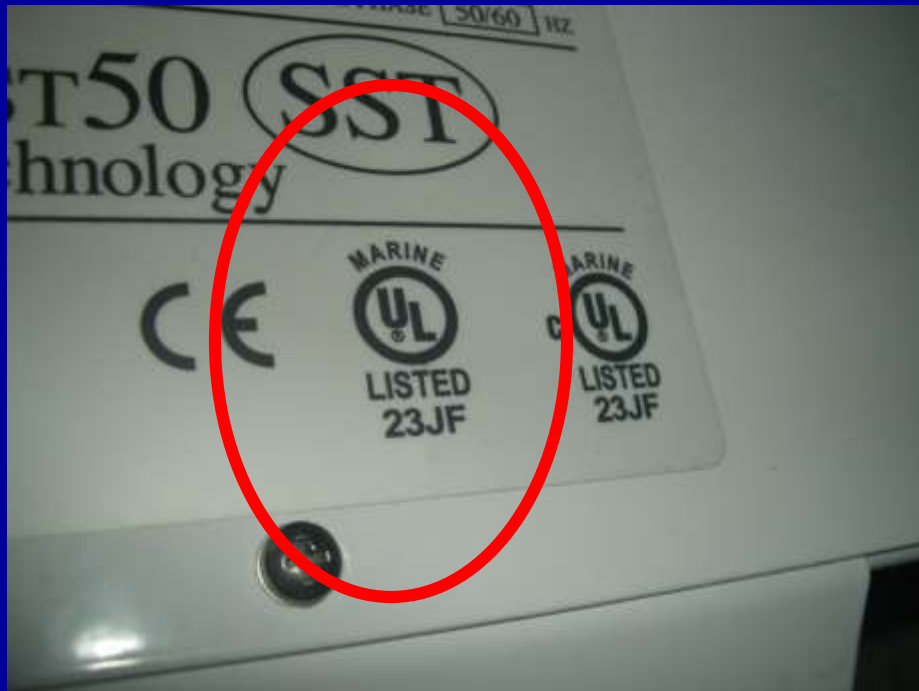
What do they do
and why would I
need one?



Shore power leakage, a potentially lethal fault. “Safe” threshold is 30 milliamps.



Should I pay more for a “marine” transformer or is that a waste of money?



With boosting...



Connections in an ordinary transformer



A UL Marine Transformer...

MARINE ISOLATION POWER TRANSFORMER

WARNING - FIRE HAZARD
DO NOT STORE EQUIPMENT ON OR NEXT TO ISOBOOST 50. THIS UNIT IS DESIGNED TO OPERATE HOT AND MUST HAVE FREE AIR FLOW TO PREVENT OVERHEATING OR DAMAGE TO ADJACENT MATERIAL.

INPUT CONNECTION
INPUT BETWEEN L1-L2
SHORE GROUNDING TO SH
208/240 VAC
50 AMPS



OUTPUT CONNECTION
OUTPUT BETWEEN L1-L2
NEUTRAL TO N
BOAT GROUNDING TO GND
120/240 VAC
42 AMPS (BOOST)
50 AMPS (NON-BOOST)

APPROX. WEIGHT 250 LBS.
CAT. NO. Y3-ISOBOOST50-A
SERIAL NO. 09410007
SINGLE PHASE 30/90 Hz

110 °C RISE INSUL. SYS. 220A
12.0 KVA CONTINUOUS % IMP. 2.14
208/240 PRIMARY VOLTAGE CLASS H
120/240 SECONDARY VOLTAGE UL NO. E182633

ISOBOOST50 SST
SoftStart Technology

Charles
www.charlesindustries.com
847-806-6300
Service 217-932-2317 / 800-430-6523
U.S.A.

CE LISTED 23JF
UL LISTED 23JF



Galvanic Isolator

The next best thing to an isolation transformer,
For PM purposes you *must* have one or the
other



Galvanic Isolator Location

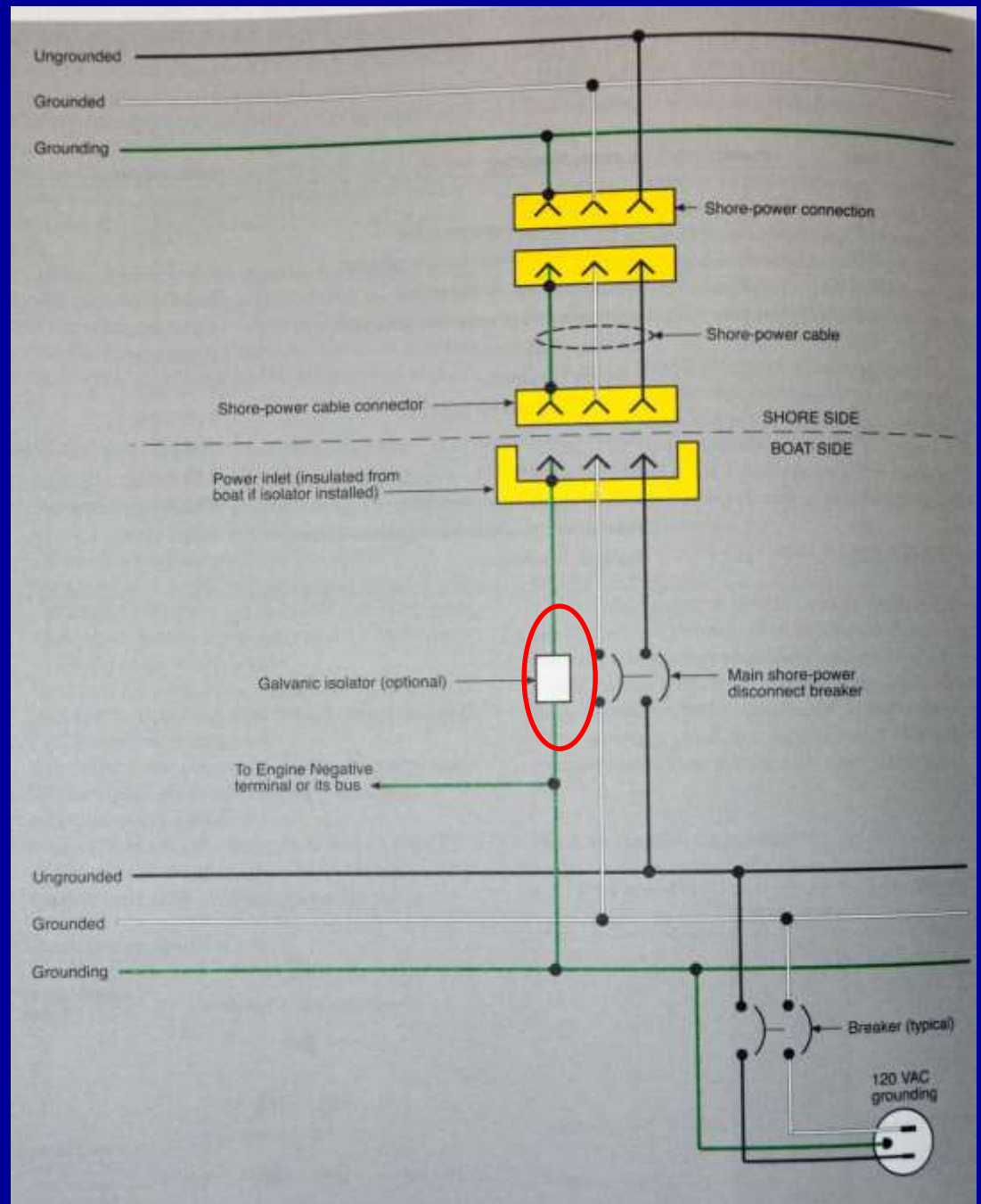


Diagram courtesy
Charlie Wing's
"Boatowner's
Illustrated Electrical
Handbook" 2nd ed



Look for UL
Marine approval,
“Fail Safe” design
and ABYC
compliance

Not all GI's
are created
equal



ELCI

A new standard for electrical protection



GFI's Required;

Head, galley,
engine room,
machinery
spaces and
bilges and on
weather decks



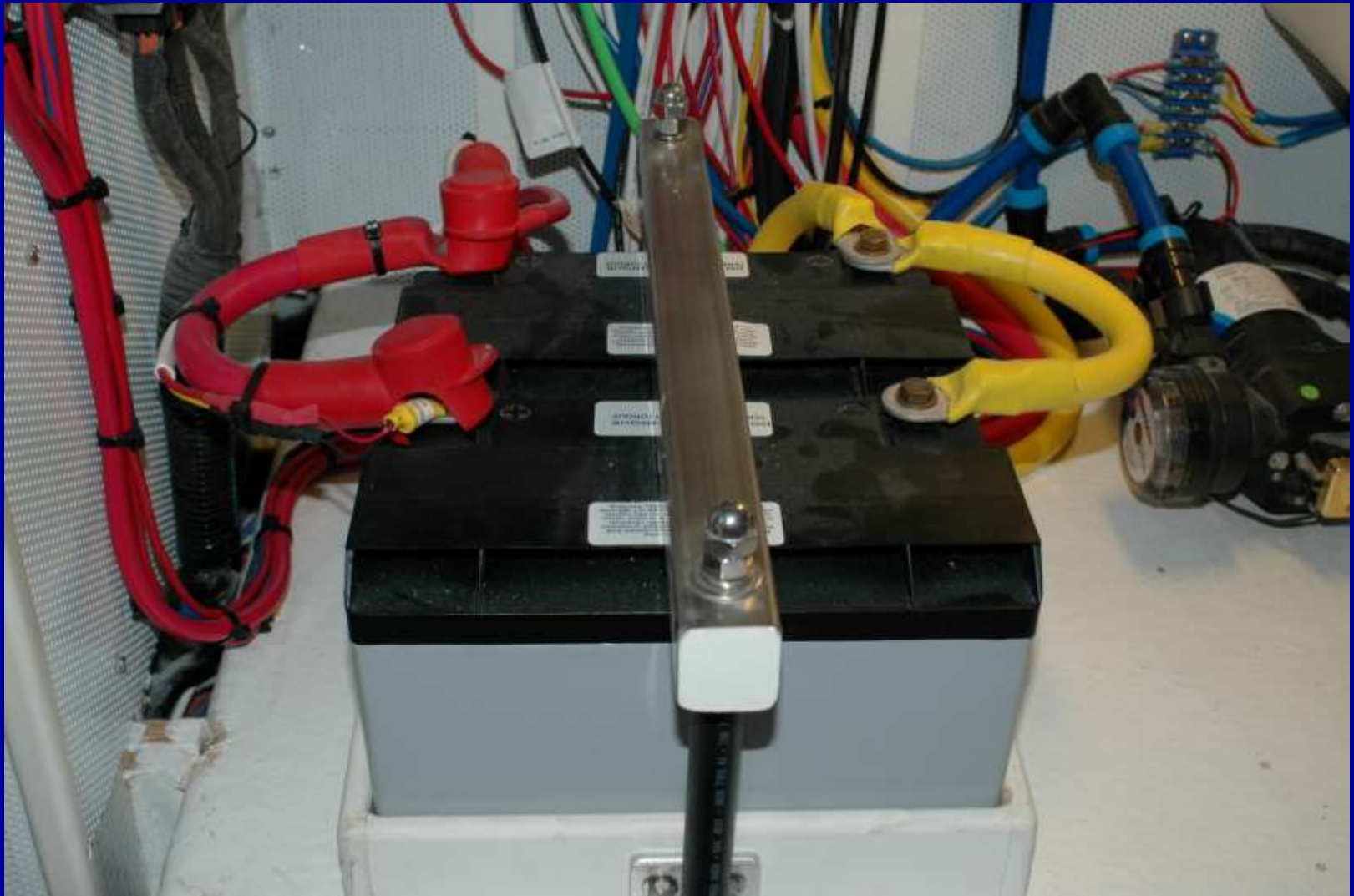
Batteries



A battery's lifespan is directly proportional to the care it receives



Battery stability...



If boxes are employed they must immobilize battery and they must be ventilated at the uppermost part of the lid.



Large battery Bank Issues



Battery shelf/support must be robust especially for offshore vessels



Avoid battery sandwiches, cool batteries last longer



Secure batteries

Just don't use fuel lines to do it.



Over-current Protection & Battery Disconnects

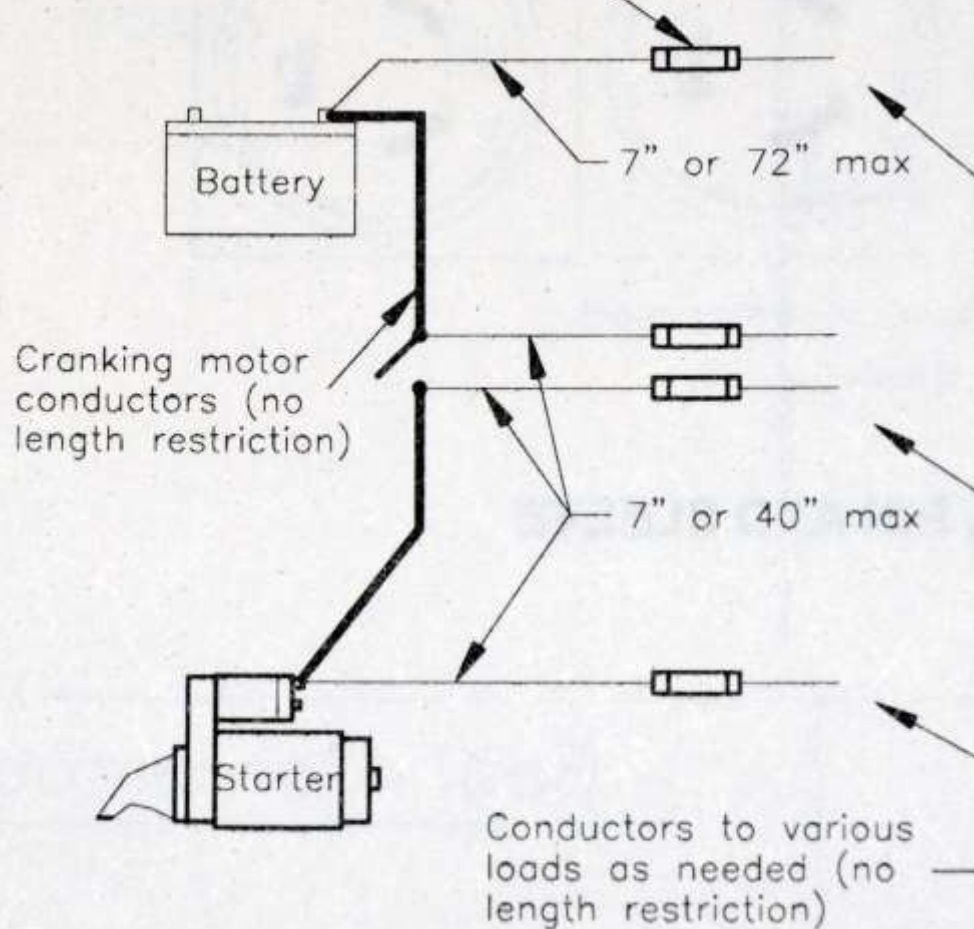


The 7"/72" rule

USCG and ABYC guidelines for DC over-current (fuses and circuit breakers) protection. The most oft violated guideline in marine electrical systems

SINGLE BATTERY (See E-11.10)

Overcurrent protection device
(fuse or circuit breaker)



Inadequate or non-existent over-current protection leads to cable overheating and fires, period.



One of the more frequent OCP location violations; battery charger and inverter installations

For charger and inverters, OCP must be located at the battery





For high output
externally regulated
alternators, OCP
must be at alternator
and battery



Easily accessible main battery disconnect switches, used to de-energize *almost* everything.

Aboard 90% of the vessels I inspect I find serious electrical safety issues. So...



Thank you

