

# MAINTENANCE CHALLENGES

MARINA ELECTRICAL SYSTEMS

# TRANSFORMERS & DISTRIBUTION PANELS



- MAINTAIN CLEARANCE
- MAKE SURE PANEL DOORS OPERATE PROPERLY AND ARE LOCKED.

# DISTRIBUTION PANELS



- ALL PANEL DOORS SHOULD BE PLAINLY MARKED
- LOCAL FIRE DEPARTMENT SHOULD HAVE A MAP OF YOUR FACILITY SHOWING THE LOCATION OF MAIN DISCONNECTS.

# DISTRIBUTION PANELS



- ALL DISCONNECTS IN THE PANEL SHOULD BE CLEARLY AND PERMENANTLY LABELED.



# DISTRIBUTION PANELS



# VAULTS



- CHECK TO MAKE SURE VAULTS ARE DRAINING
- SUPPORT & SECURE SPLICES SO THEY DO NOT BECOME SUBMERGED
- MAKE SURE LIDS OPERATE PROPERLY AND THAT THEY CAN BE SECURED
- BE AWARE OF THE TYPE OF CONNECTIONS YOU HAVE IN VAULTS, SOME ARE NOT WATER PROOF.



# SHORE TO FLOAT TRANSITIONS



- OLD STYLE TRANSITIONS – LOOPS THAT HANG IN THE WATER
- MAKE SURE THE KELLEMS GRIPS ARE IN GOOD SHAPE
- BE AWARE OF THE TYPE OF FLEX CONDUIT YOU ARE USING.

# SHORE TO FLOAT TRANSITIONS



- ALL POWER AND COM IN CONDUIT
- MOVEMENT OF THE FLOAT IS ACCOMODATED BY THE CABLE TRAY.



# WATER LINE



- ROTATING CONNECTIONS ON BOTH ENDS ALLOWS FOR A SHORTER LOOP THAT WILL STAY OUT OF THE WATER

# TRANSFORMERS & PANELS ON DOCKS



- PROTECT FROM IMPACTS.
- STAINLESS STEEL, POWDER COATED ALUMINUM OR PLASTIC.
- GOOD LOOKING AND DURABLE BUT SOME ARE HARD TO GET INTO.



# SHORE POWER





# LIGHTING



- SOURCE TYPES:

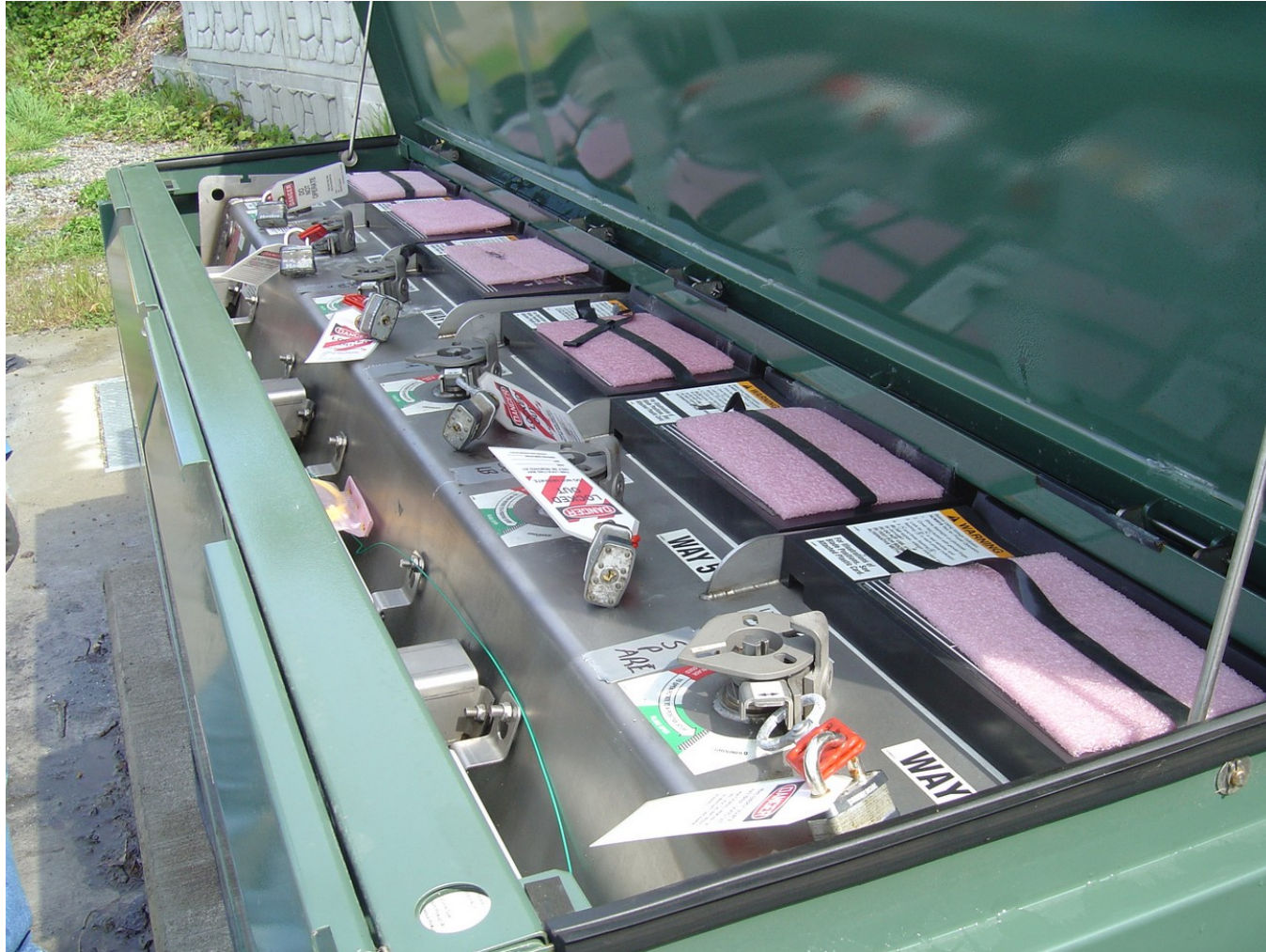
- Incandescent
- H.I.D. – Metal Halide & HPS
- Fluorescent & Compact Fluorescent
- LED & LED Retrofits

# PERSONNEL SAFETY





# LOCK-OUT/TAG-OUT



- WASHINGTON STATE LAW REQUIRES “LOCK-OUT/TAG-OUT” PROGRAMS



# ARC FLASH / P.P.E.

- **DEFINITION OF ARC FLASH:**

- LIGHT AND HEAT PRODUCED FROM AN [ELECTRIC ARC](#) SUPPLIED WITH SUFFICIENT ELECTRICAL ENERGY

- **NEC 2011, PARAGRAPH 110.16**

ARC FLASH HAZARD WARNING

- **NFPA 70E, 2012 EDITION**

- PROVIDES METHODS FOR PERSONAL PROTECTION EQUIPMENT (PPE) SELECTION BY PERFORMING INCIDENT ENERGY ANALYSIS.

- **ARC FLASH STUDY:**

- IDENTIFIES SAFETY BOUNDARY, WORKING DISTANCE, DETERMINES INCIDENT ENERGY AND P.P.E.

- **PERSONNEL SAFETY**

- MITIGATING HAZARDS CAN HELP SAVE LIVES AND HELP REDUCE THE LEVEL OF INJURIES CAUSED BY ARC FLASH



**480 volt 3-phase Arc Flash Demonstration.mp4**

# ARC FLASH / P.P.E.

PPE CATEGORY LEVEL CHART	
 <b>0</b>	<p><b>CATEGORY</b> What Personal Protection Equipment (PPE) You Shall Wear:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cotton Undergarments</li> <li><input type="checkbox"/> Long Sleeved Shirt (Natural Fiber)</li> <li><input type="checkbox"/> Long Pants (Natural Fiber)</li> <li><input type="checkbox"/> Safety Glasses or Goggles</li> <li><input type="checkbox"/> Hearing Protection (Inserts)</li> <li><input type="checkbox"/> Leather Gloves (as needed) or Insulating Gloves w/Protectors</li> </ul> 
 <b>1</b>	<p><b>CATEGORY</b> What Personal Protection Equipment (PPE) You Shall Wear:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cotton Undergarments</li> <li><input type="checkbox"/> Arc Rated Long Sleeved Shirt (or FR Coveralls)</li> <li><input type="checkbox"/> Arc Rated Long Pants (or FR Coveralls)</li> <li><input type="checkbox"/> Hard Hat with Arc Rated Face Shield</li> <li><input type="checkbox"/> Hearing Protection (Inserts)</li> <li><input type="checkbox"/> Safety Glasses or Goggles</li> <li><input type="checkbox"/> Leather Gloves or Insulating Gloves w/Protectors</li> <li><input type="checkbox"/> Leather Shoes (as needed)</li> </ul> 
 <b>2</b>	<p><b>CATEGORY</b> What Personal Protection Equipment (PPE) You Shall Wear:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cotton Undergarments</li> <li><input type="checkbox"/> Short Sleeved "T" Shirt (Natural Fiber)</li> <li><input type="checkbox"/> Arc Rated Long Sleeved Shirt and Long Pants or Arc Rated Coveralls Instead</li> <li><input type="checkbox"/> Hard Hat with Arc Rated Face Shield w/Sock Balacava</li> <li><input type="checkbox"/> Safety Glasses or Goggles</li> <li><input type="checkbox"/> Hearing Protection (Inserts)</li> <li><input type="checkbox"/> Leather Gloves or Insulating Gloves w/Protectors</li> <li><input type="checkbox"/> Leather Shoes (as needed)</li> </ul> 
 <b>3</b>	<p><b>CATEGORY</b> What Personal Protection Equipment (PPE) You Shall Wear:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cotton Underwear</li> <li><input type="checkbox"/> Short Sleeved "T" Shirt (Natural Fiber)</li> <li><input type="checkbox"/> Arc Rated Long Sleeved Shirt and Long Pants</li> <li><input type="checkbox"/> Arc Rated Coveralls (Over the above)</li> <li><input type="checkbox"/> Arc Rated (25 cal) Arc Flash Suite Jacket</li> <li><input type="checkbox"/> Arc Rated (25 cal) Arc Flash Suit Pants</li> <li><input type="checkbox"/> Arc Rated (25cal) Arc Flash Suite Hood</li> <li><input type="checkbox"/> Hard Hat</li> <li><input type="checkbox"/> Safety Glasses or Goggles</li> <li><input type="checkbox"/> Hearing Protection</li> <li><input type="checkbox"/> Arc Rated Leather Gloves or Insulating Gloves w/Protectors</li> <li><input type="checkbox"/> Leather Shoes</li> </ul> 
 <b>4</b>	<p><b>CATEGORY</b> What Personal Protection Equipment (PPE) You Shall Wear:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cotton Underwear</li> <li><input type="checkbox"/> Short Sleeved "T" Shirt (Natural Fiber)</li> <li><input type="checkbox"/> Arc Rated Long Sleeved Shirt and Long Pants</li> <li><input type="checkbox"/> Arc Rated Coveralls (Over the above)</li> <li><input type="checkbox"/> Arc Rated (40 cal) Arc Flash Suite Jacket</li> <li><input type="checkbox"/> Arc Rated (40 cal) Arc Flash Suit Pants</li> <li><input type="checkbox"/> Arc Rated (40 cal) Arc Flash Suite Hood</li> <li><input type="checkbox"/> Hard Hat</li> <li><input type="checkbox"/> Safety Glasses or Goggles</li> <li><input type="checkbox"/> Hearing Protection</li> <li><input type="checkbox"/> Arc Rated Leather Gloves or Insulating Gloves w/Protectors</li> <li><input type="checkbox"/> Leather Shoes</li> </ul> 

Always wear voltage rated rubber glove liners when working above 50 volts in all categories!

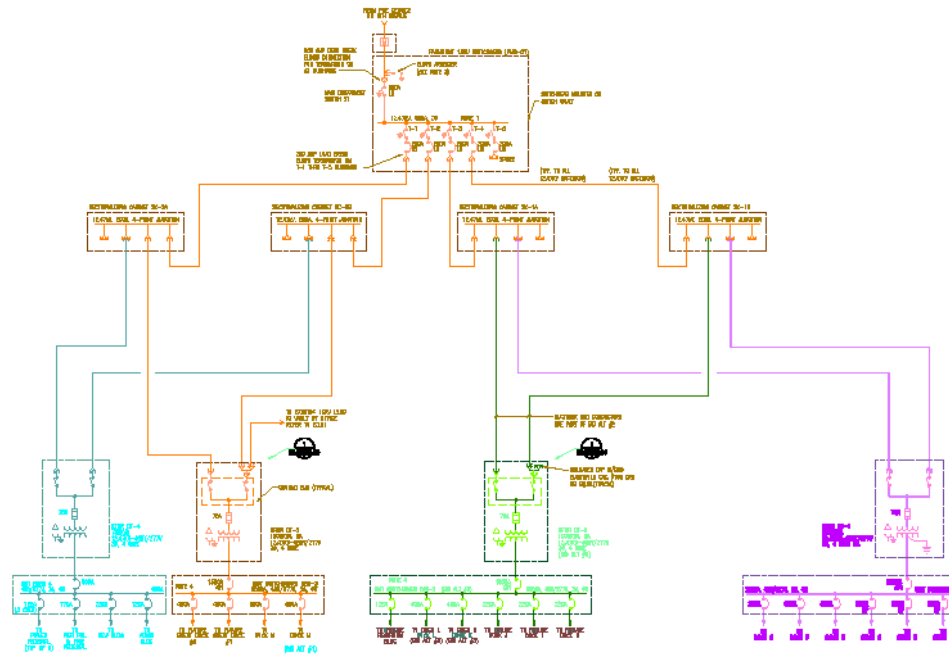
- Clothing:
  - Wear all natural materials
  - No Synthetics



Demo 100A Disc Sw.mp4

# PLANNING

- **MASTER PLANNING / PHASING DURING NEW CONSTRUCTION:**



## • MAINTENANCE AND REPLACEMENT PARTS



# QUESTIONS?

