SUMMARY

We have done a cursory review of many of the Airport structures. This survey uncovered many instances of materials or methods that are not compliant with current National Electrical Code or the NEC in force at the time they were installed. The attached annotated photos document the issues. There are perhaps fifteen commonly found problems, but many instances of each. The history of these problems is not important – fixing them, bringing them into compliance with the NEC, is what is required.

What is the NEC?

The NEC is a minimum safety standard that has been continuously refined since its inception – it provides a structured approach to the methods needed for correct use of electrical materials to create power distribution and control systems that are both useful and safe. Code violations do not always mean an immediate danger… it may take time or a unique event to finally create the fault or situation that could injure or kill. The point is that all deviations from NEC requirements can compromise safety and once identified should be corrected.

Recommended Approach to Repairs

To reiterate, the issues revealed in the pictures are a cursory overview of faulty work that has been installed over the years. It will take a more detailed review of each of the buildings or structures to create an itemized list of the required changes with parts listed, labor estimated, etc. It would probably be most efficient if this gathering and listing of details could be done when repair electricians are on site so that the repairs can be made while all the forces are present. That approach could save many steps like opening the enclosure, taking pictures, securing the enclosure, making a report, and then assigning the task to the electrical worker, etc. Instead, having an inspector working with a competent electrician fixing all of the compliance issues on the spot, starting with the most serious, might work very efficiently.

Not Inspected

Facilities or structures not yet surveyed: runway lighting system and the airport beacon.

The Issues

Here is a sample of some of the most serious issues:

Airport Fuel Island: Vapors and liquid from fueling systems are particularly dangerous when mixed with arcing electrical contacts. The NEC deals with this by defining boundaries for hazardous (Classified) areas such as in the vicinity of fuel storage and transfer systems and requiring certain methods and materials within these boundaries. One of the requirements is to have an emergency disconnect farther than 20ft but not greater than 100ft from the dispensing point. This requirement is not met. Also, electrical

equipment not rated for installation in a Classified area is installed within those areas. If fuel vapor were to be present, arcing in the unsealed contacts in ordinary electrical equipment could ignite it.

Airport Fuel Farm: The required Emergency Disconnect Switch is not labeled. The small office within the Classified (Hazardous) Area has ordinary electrical equipment installed. There are conduits into the Classified Area that are not sealed. The manual transfer switch for use with a portable generator does not have the NEC required minimum working space in front of the switch (also an OSHA problem). The fuel truck block heater cords have an ordinary electrical equipment connector within the Classified Area.

Airplane Hangars: Because of the presence of fuel tanks in the plane, NEC defines certain boundaries inside hangers as classified areas. Within these boundaries, special methods and materials are required. In many hangers there are non-compliant light fixtures over the wings, a classified area. Similarly, there are ordinary receptacles installed as part of original construction as well as ordinary electrical equipment and wiring installed by tenants within classified area boundaries. Rubber cords have been used in place of fixed wire in conduit for temporary connections to the door motors and controls. We also found Service Entrance equipment not properly anchored (it could fail during an earthquake), manual transfer switches installed that are not rated for the available fault current (could fail explosively), raintight fittings installed where wet location fittings are required, Service Entrance grounding not considered when installing manual transfer switches.

AWOS: Unsealed conduits with rodents eating the power conductor insulation, trip hazard in front of the power panel.

Temporary Power: There are transformers on the ramp that were installed as temporary power 30 yrs ago (a temporary power installation is only allowed for 90days). The rubber cord used for the temporary connection is brittle and will fail with any kind of handling due to the UV exposure… it has most likely been in failure or close to failure for some time.

Permanent Buildings: Snow and ice damage to electrical enclosures, improper grounding of system and equipment, open wiring enclosures accessible to non-qualified persons, moisture in panels from improper application of conduit fittings.

Throughout: There are myriad Code and wiring method infractions that would probably be found to be the responsibility of the Airport District were an injury to occur and the cause was investigated.

S.A. Engineering

Electrical Engineering ♦ Control Design ♦ SCADA Design ♦ Water & Wastewater Controls

25 June 2013

Bill Quesnel, P.E..
Acumen Engineering

Ref: Electrical Inspections of TTAD Facilities

Bill,

We have inspected many of the TTAD facilities for National Electric Code compliance. The summary of that effort is attached, a written executive report and a set of annotated pictures.

One of the difficulties with any electrical code issue is that the problems are not easily recognizable to the untrained eye. Unless there's smoke and melted insulation, electrical installations tend to look like they are working without problems. A significant depth of knowledge and experience is needed to recognize the potential life/safety issues inherent in improper use of electrical materials.

Further needs to be done to get this to the point of beginning any repairs, but this is a good start.

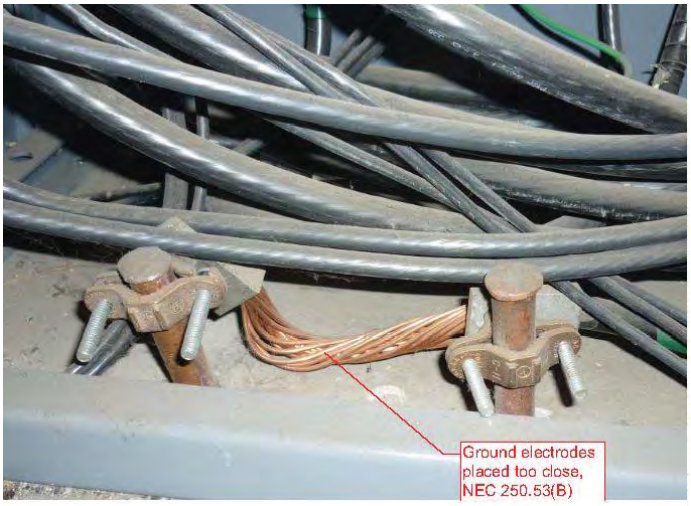
Regards,

Eric Sandel, P.E.
S.A.Engineering

West Side Modular

Acumen Engineering
Truckee Tahoe Airport District

Maintenance Building



FBO

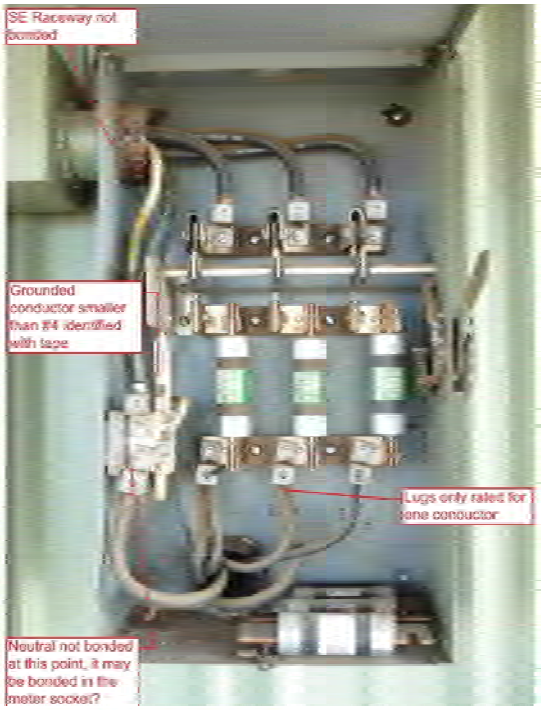

Cord in the ceiling tile
Unsupported box

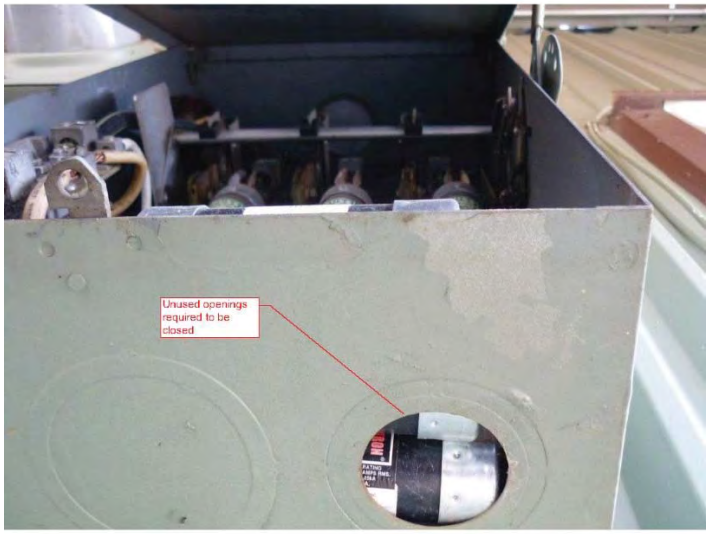

Boxes to be covered

Hangar 1


Lamps not enclosed


Lamps not enclosed
Unsupported raceways

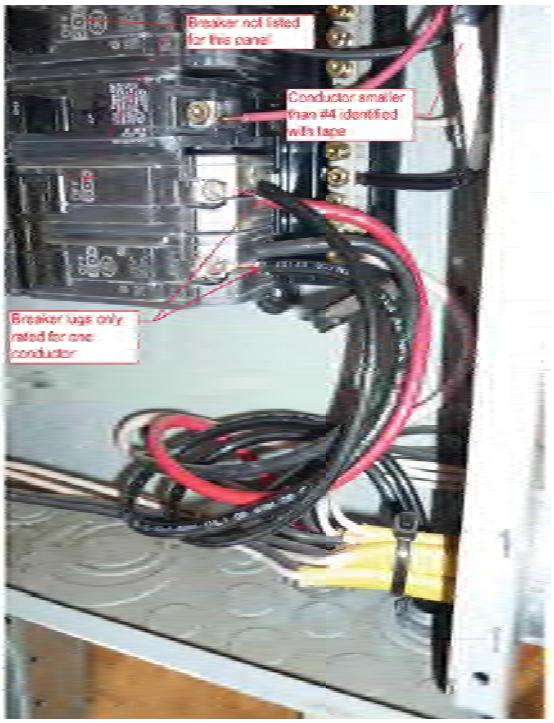

SE Raceway not bonded
Grounded conductor smaller than #4 identified with tape
Lugs only rated for one conductor
Neutral not bonded at this point, it may be bonded in the meter socket?

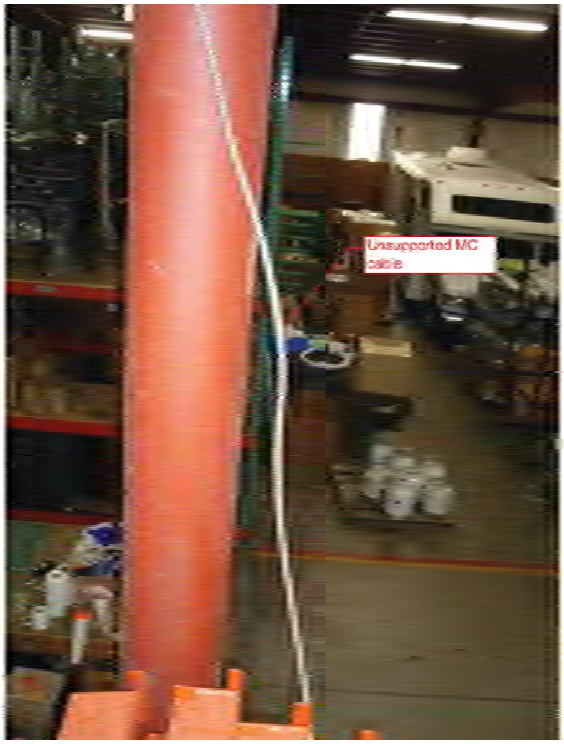

Unused openings required to be closed

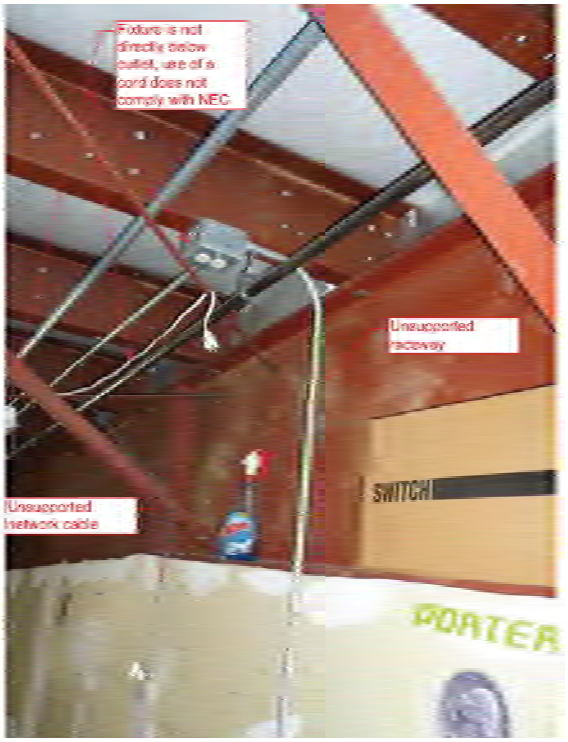
Garage West Side

Warehouse

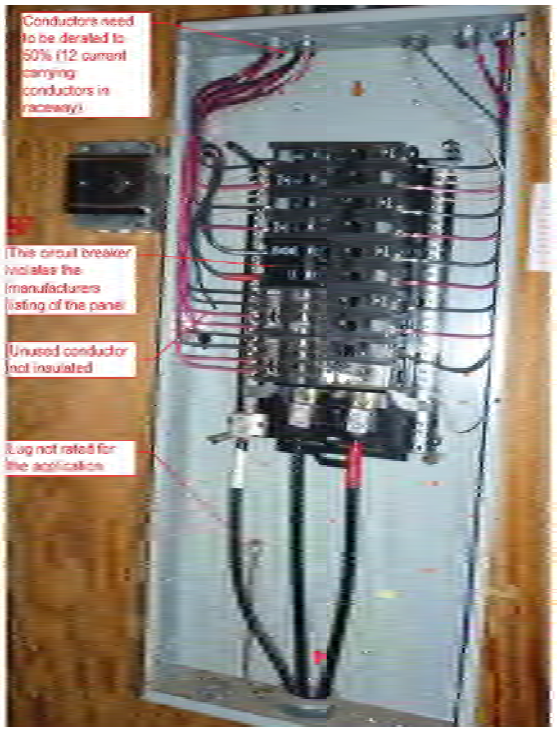

Lug not rated for use or the installation of two conductors

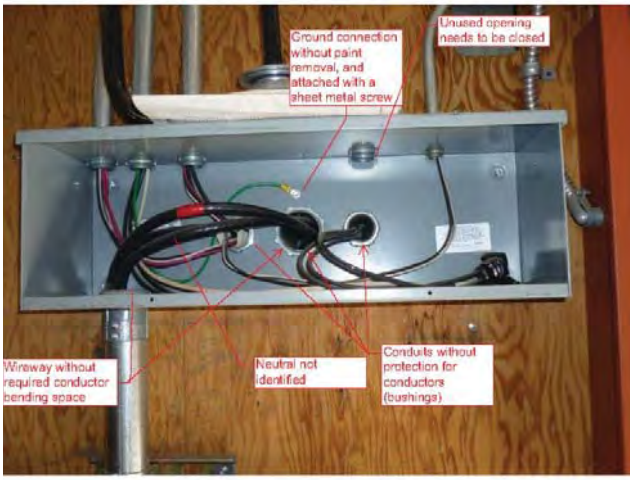

Breaker not listed for this panel
Conductor smaller than #4 identified with tape
Breaker lugs only rated for one conductor


Unsupported MC cable

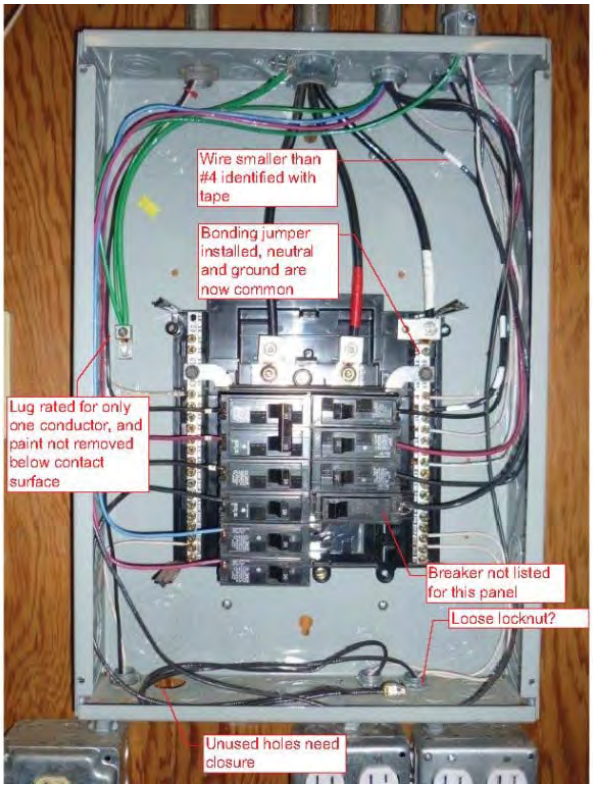

Fixture is not directly below outlet, use of a cord does not comply with NEC
Unsupported raceway
Unsupported network cable
SWITCH
PORTER

Warehouse


Conductors need to be derated to 50% (12 current carrying conductors in raceway)
This circuit breaker violates the manufacturers listing of the panel
Unused conductor not insulated
Lug not rated for the application


Ground connection without paint removal, and attached with a sheet metal screw
Unused opening needs to be closed
Wireway without required conductor bending space
Neutral not identified
Conduits without protection for conductors (bushings)

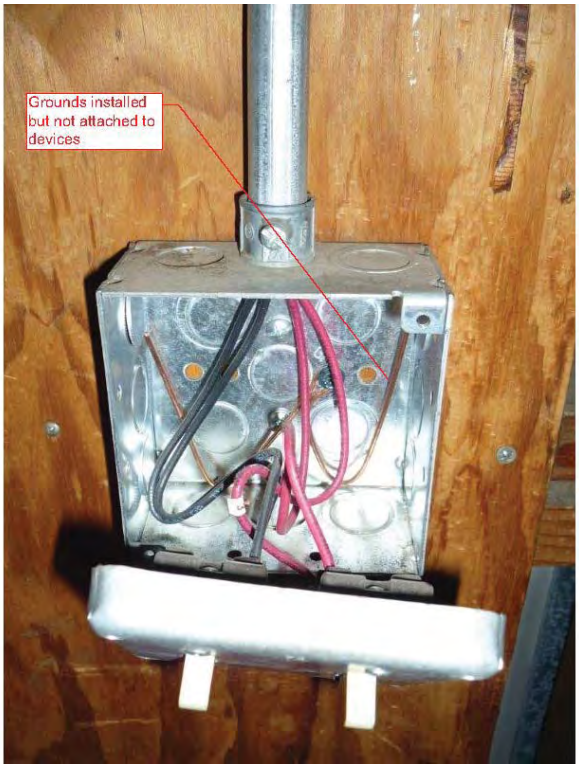

Panel must be field marked to designate feeder panel and breaker, also a warning of hazard


Wire smaller than #4 identified with tape
Bonding jumper installed, neutral and ground are now common
Lug rated for only one conductor, and paint not removed below contact surface
Breaker not listed for this panel
Loose locknut?
Unused holes need closure

Warehouse

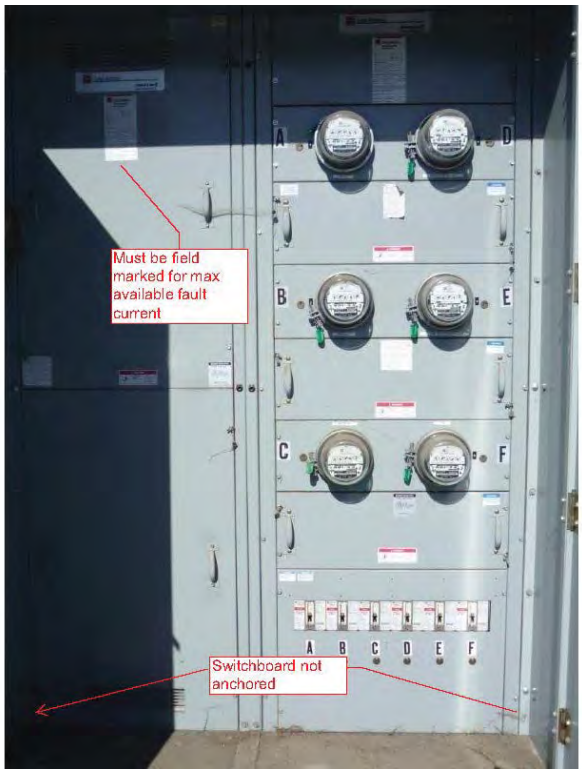

Receptacles are not bonded to equipment ground


Working space about electrical equipment not maintained


Grounds installed but not attached to devices


Disconnect required for motor and controller

Warehouse

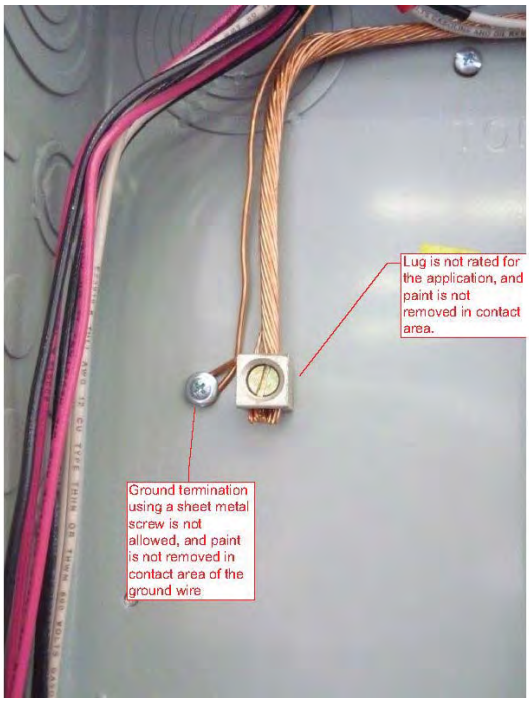

Must be field marked for max available fault current
Switchboard not anchored
A
B
C
D
E
F


Ground bus not extended into UG pull section
Anchors not installed

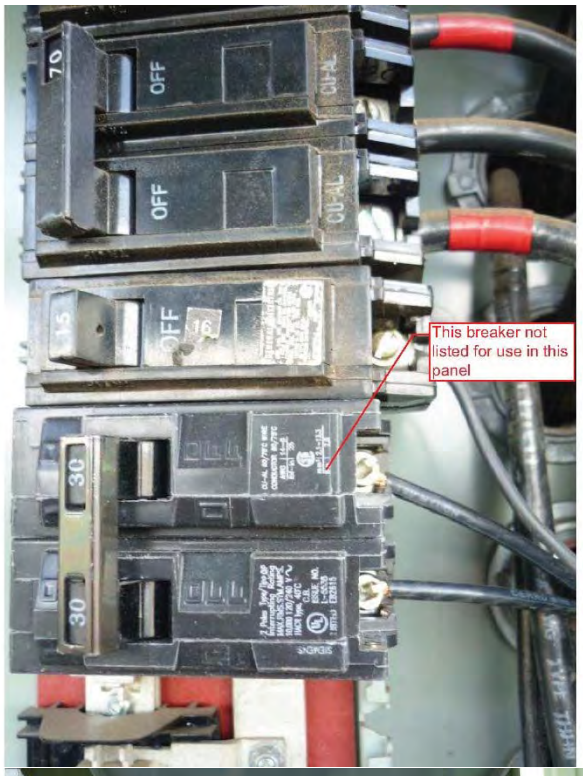

Anchors not installed


Anchors not installed

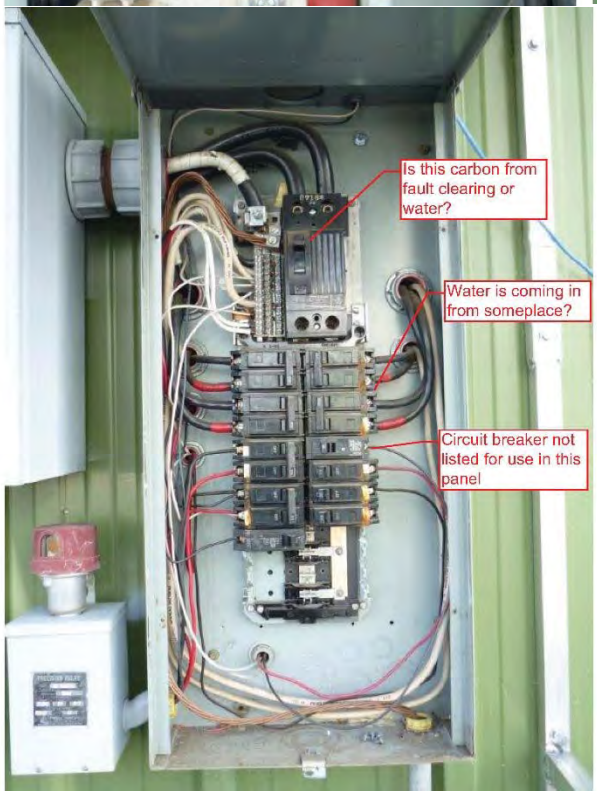
Warehouse

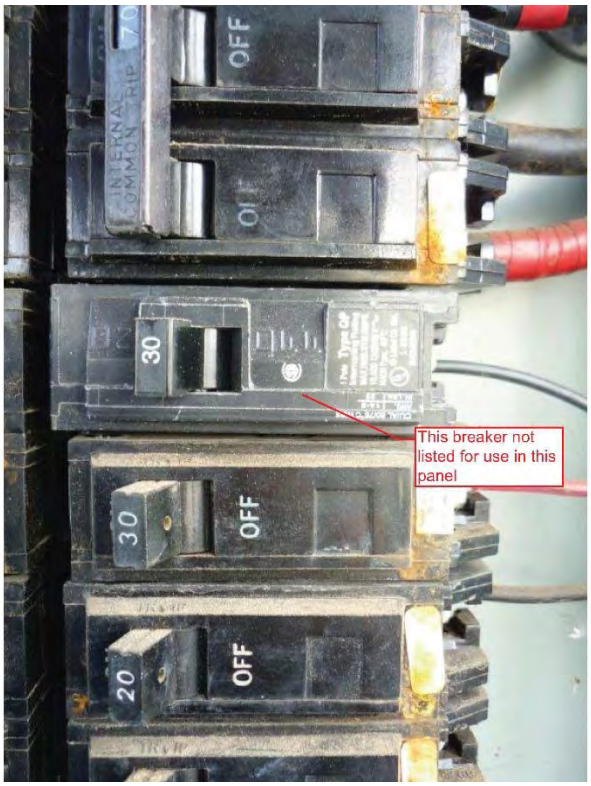

Lug is not rated for the application, and paint is not removed in contact area.
Ground termination using a sheet metal screw is not allowed, and paint is not removed in contact area of the ground wire

Hangar A


This breaker not listed for use in this panel

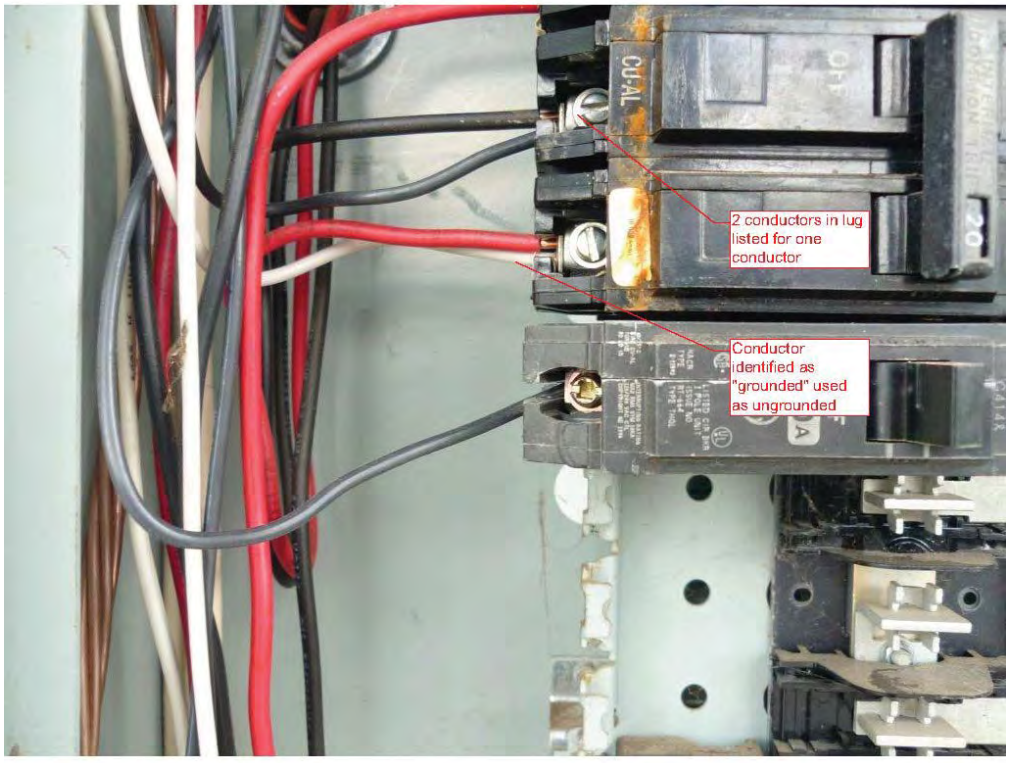

Box not fastened to structure


Is this carbon from fault clearing or water?
Water is coming in from someplace?
Circuit breaker not listed for use in this panel


This breaker not listed for use in this panel

Hangar B

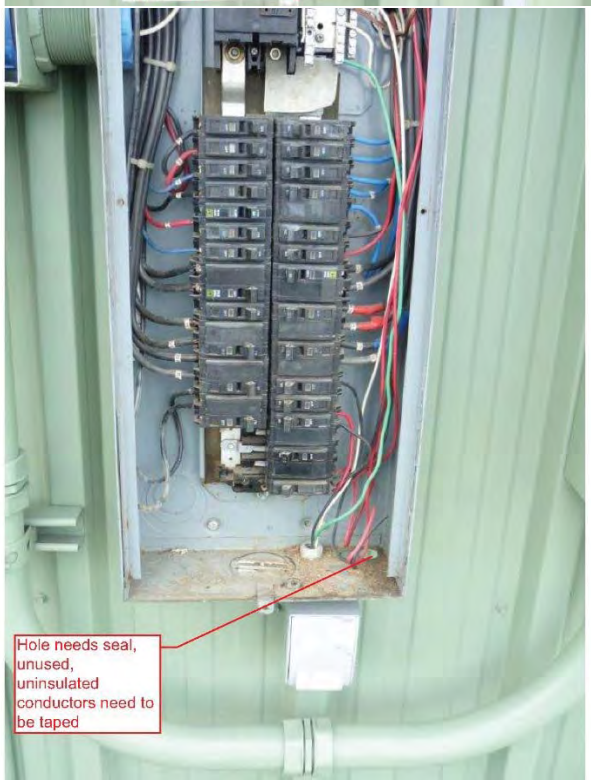

Box not attached
B HANGARS
1-23 ODD
2-24 EVEN
SE Raceway
needs support

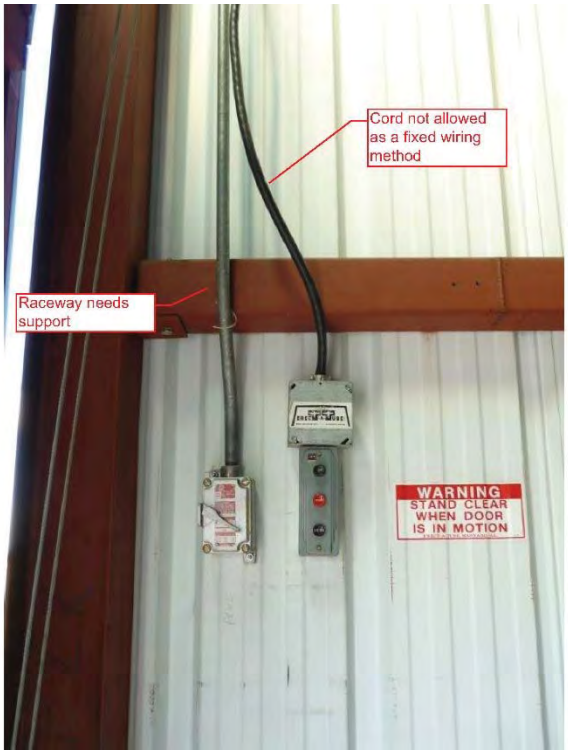

CU-AL
2 conductors in lug
listed for one
conductor
Conductor
identified as
"grounded" used
as ungrounded

Hangar C

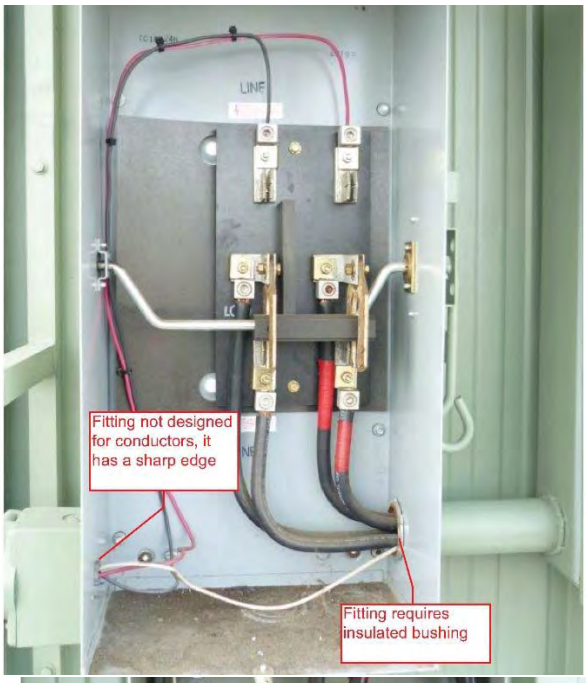

Hole needs seal
Wrong fitting, no bushing

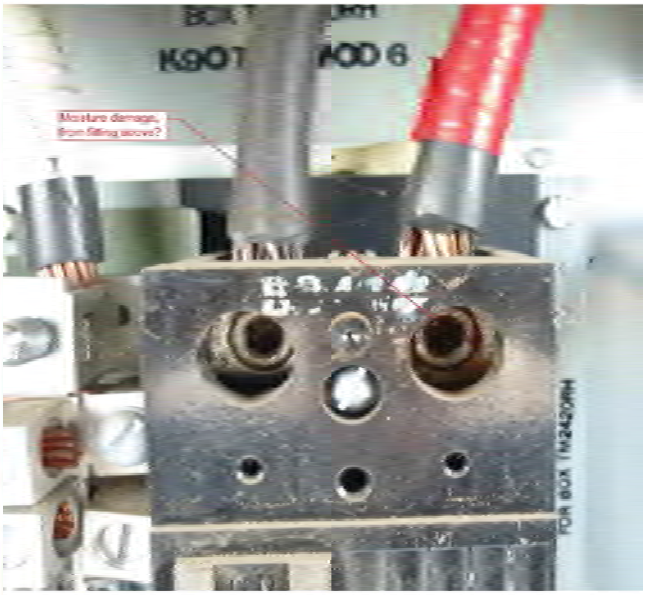

Maintenance required, also, there are two GECs, one should be removed.

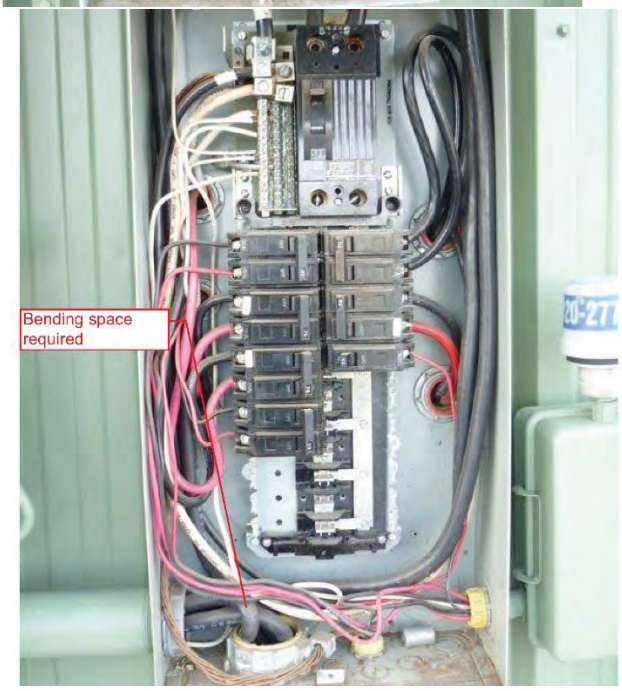

Hole needs seal, unused, uninsulated conductors need to be taped

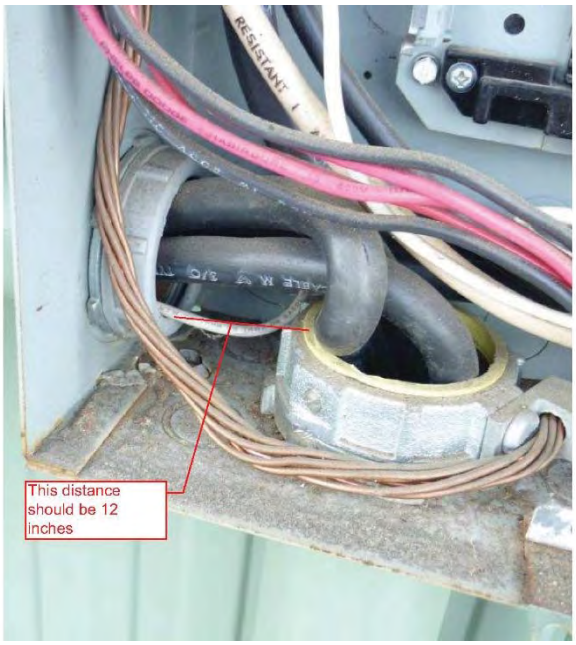

Cord not allowed as a fixed wiring method
Raceway needs support
WARNING
STAND CLEAR WHEN DOOR IS IN MOTION

Hangar D


Fitting not designed for conductors, it has a sharp edge
Fitting requires insulated bushing

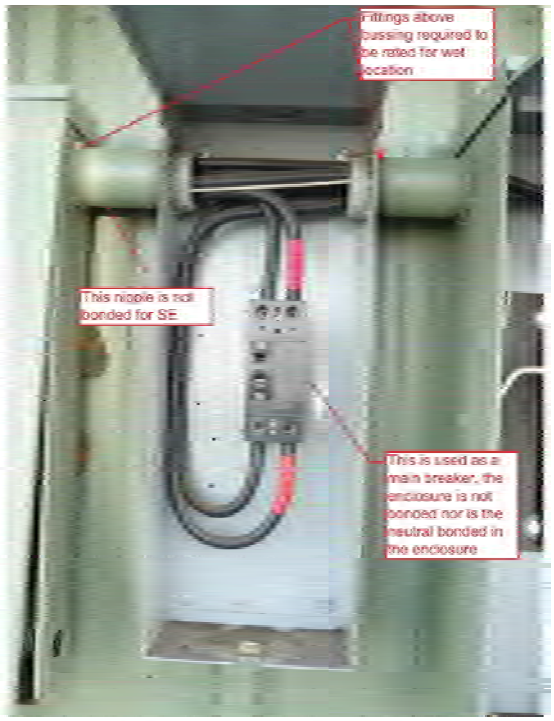

Moisture damage, from fitting above?

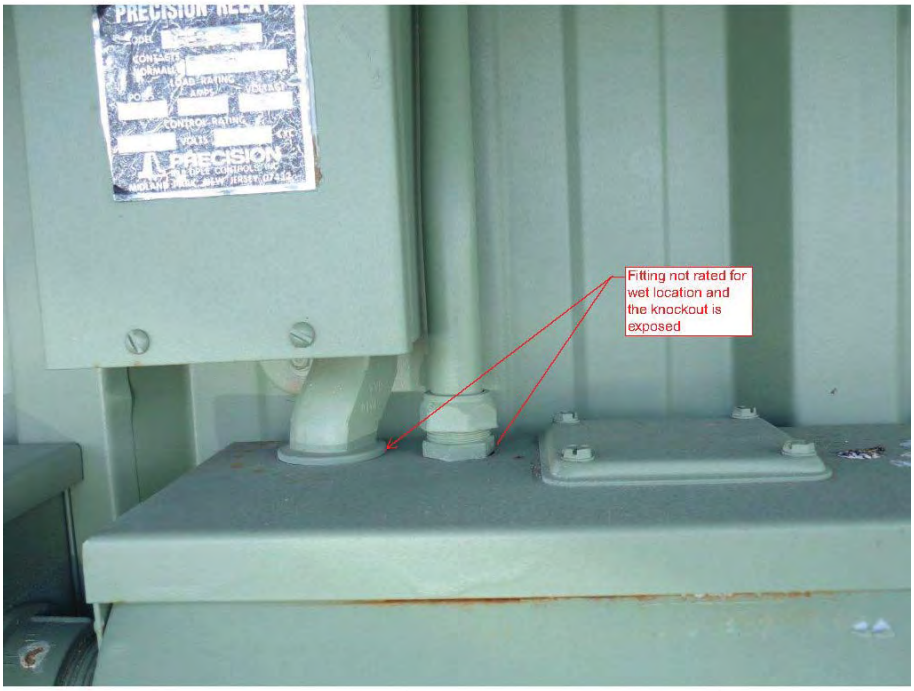

Bending space required


This distance should be 12 inches

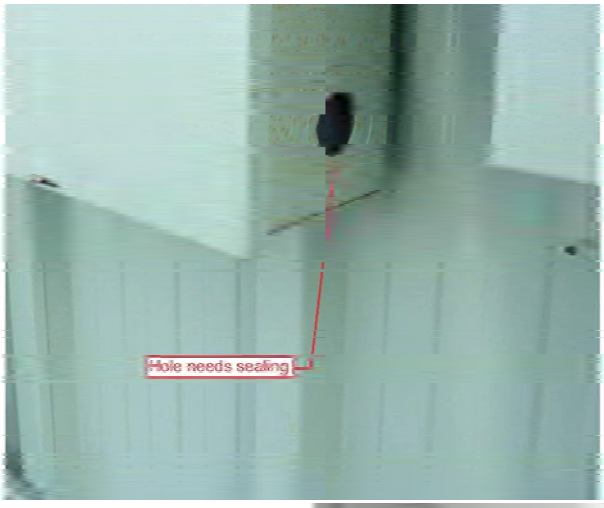
Hangar E

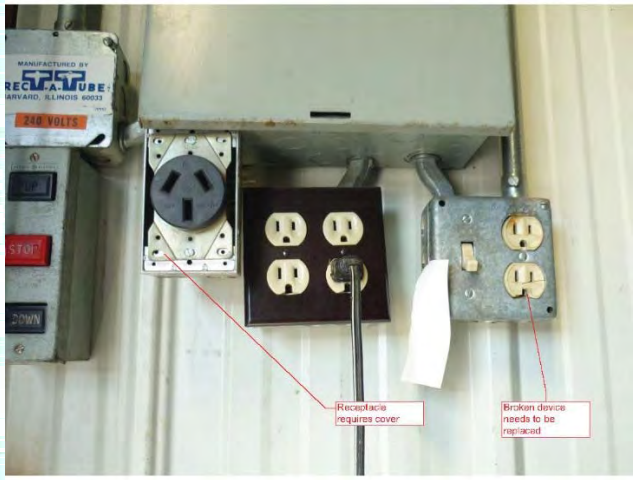

Fixtures above aircraft are required to have enclosed lamps
Receptacle with cords to fixtures must be directly above the fixture
Unsupported raceway


Fittings above bussing required to be rated for wet location
This nipple is not bonded for SE
This is used as a main breaker, the enclosure is not bonded nor is the neutral bonded in the enclosure


PRECISION
Fitting not rated for wet location and the knockout is exposed

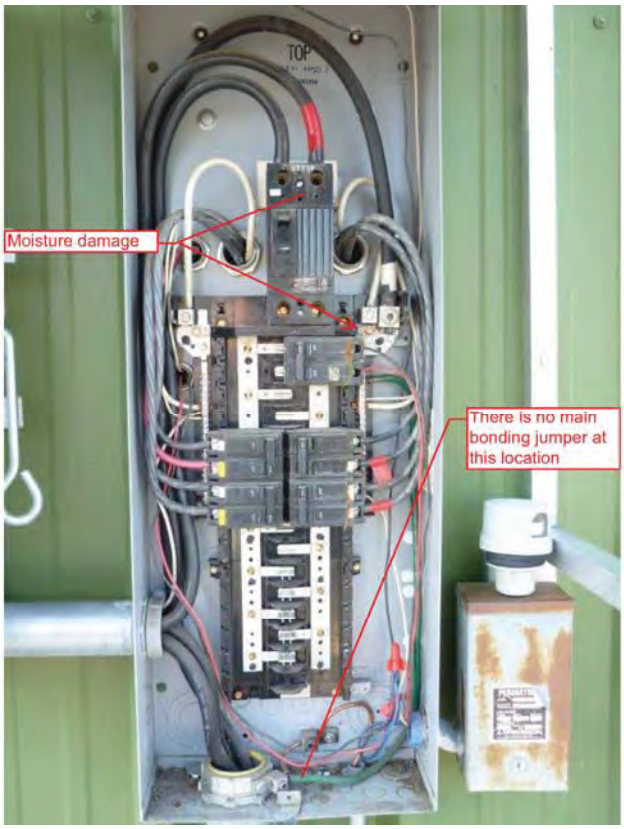
Hangar E

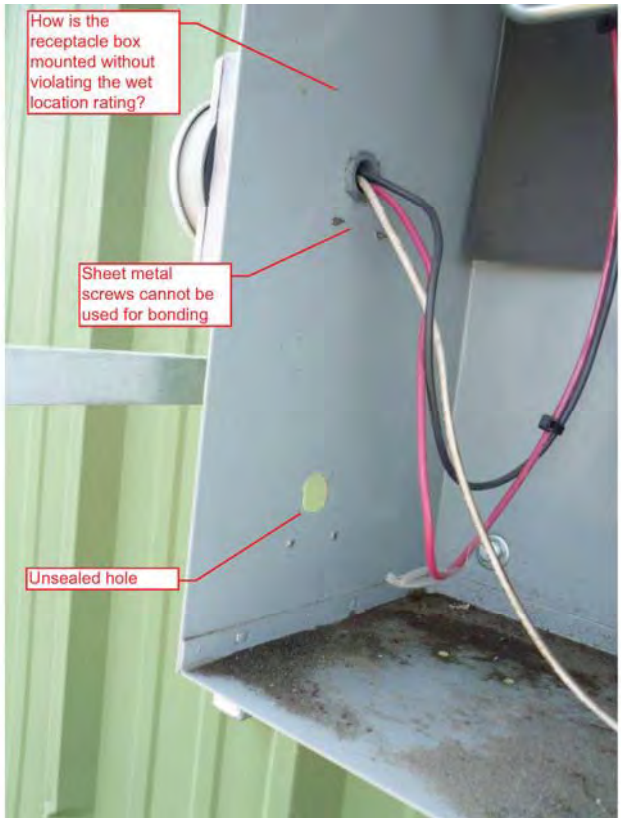

Hole needs sealing


240 VOLTS
STOP
DOWN
Receptacle requires cover
Broken device needs to be replaced


Air compressor and refrigerator have arcing contacts within the Classified area

Hangar F

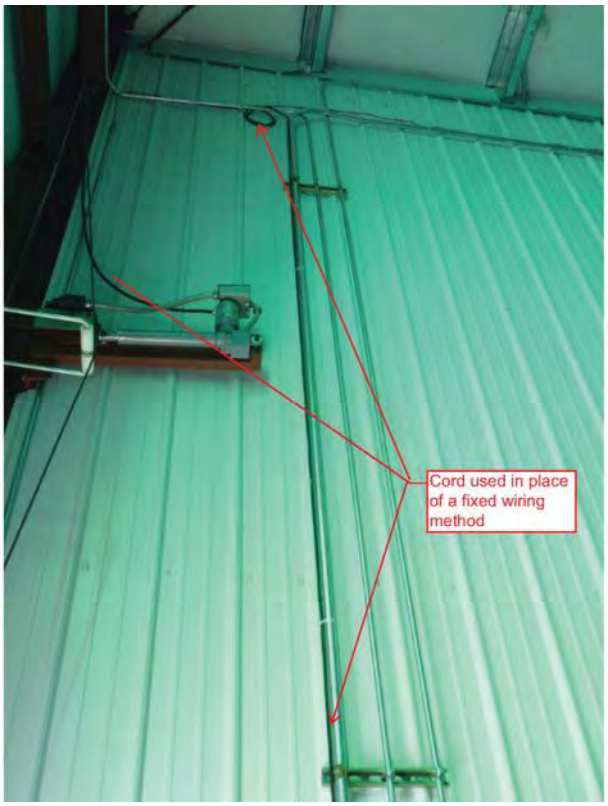

Moisture damage
There is no main bonding jumper at this location


How is the receptacle box mounted without violating the wet location rating?
Sheet metal screws cannot be used for bonding
Unsealed hole

Hangar G

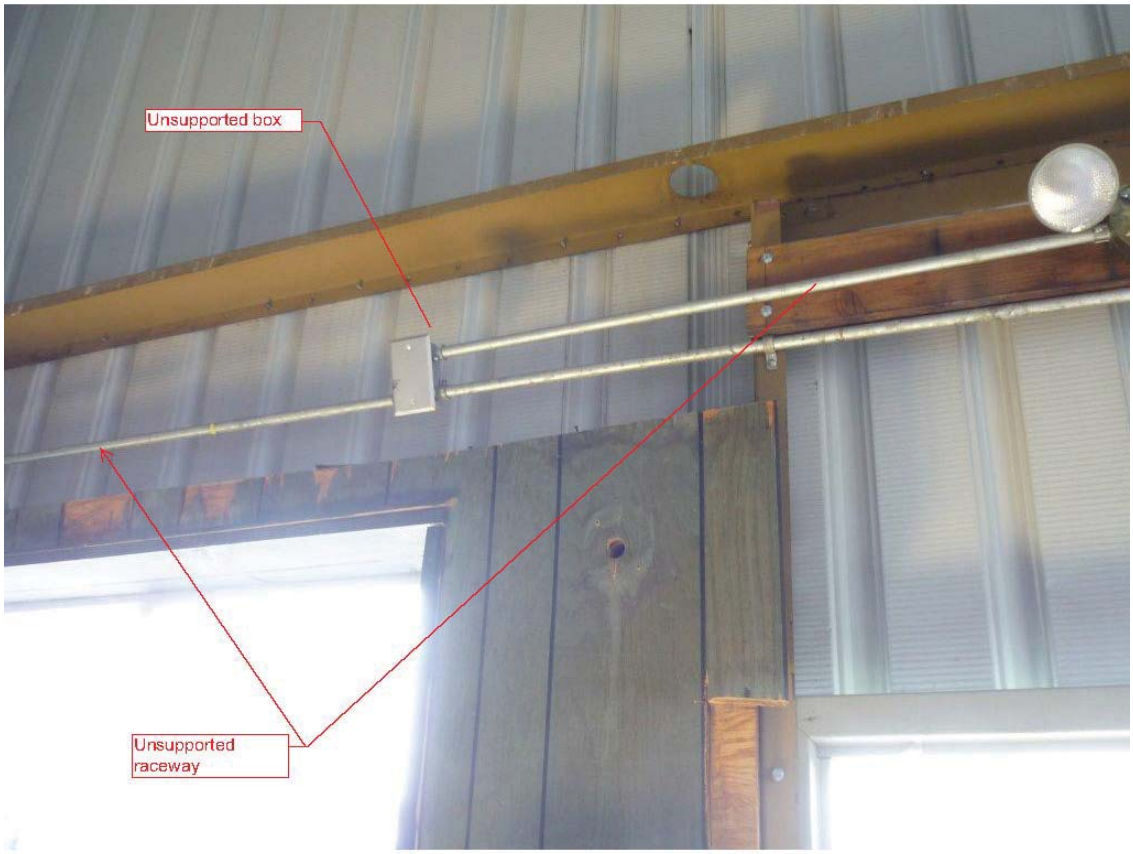
Hangar H


Cord attached to conduit
Cord used in place of a fixed wiring method
Cord entering the Classified area

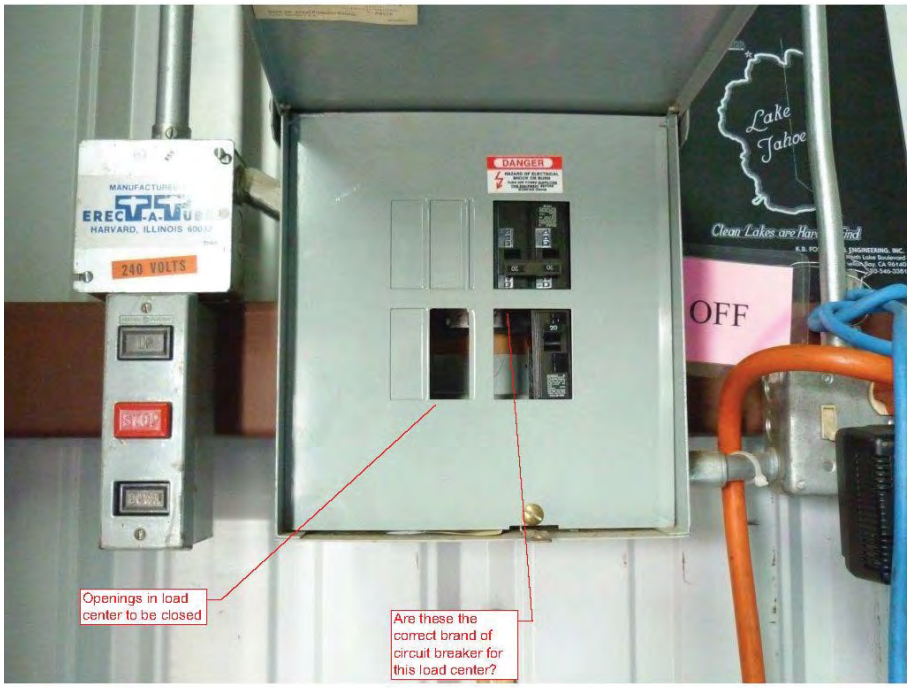

Cord used in place of a fixed wiring method

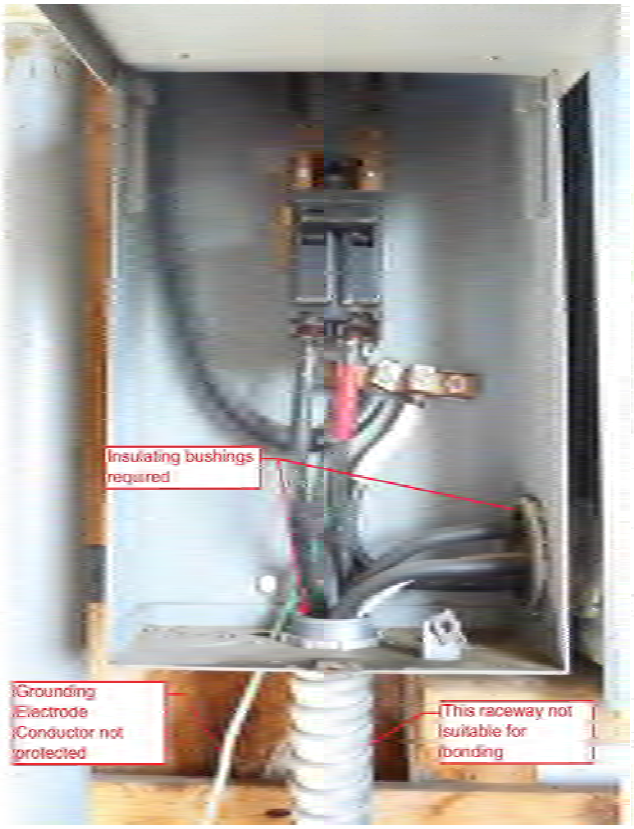
Hangar J


Uncovered lamp
above the
Classified Area


Unsupported box
Unsupported
raceway

Hangar K


DANGER
240 VOLTS
STOP
OFF
Lake Tahoe
Openings in load center to be closed
Are these the correct brand of circuit breaker for this load center?


Insulating bushings required
Grounding Electrode Conductor not protected
This raceway not suitable for bonding

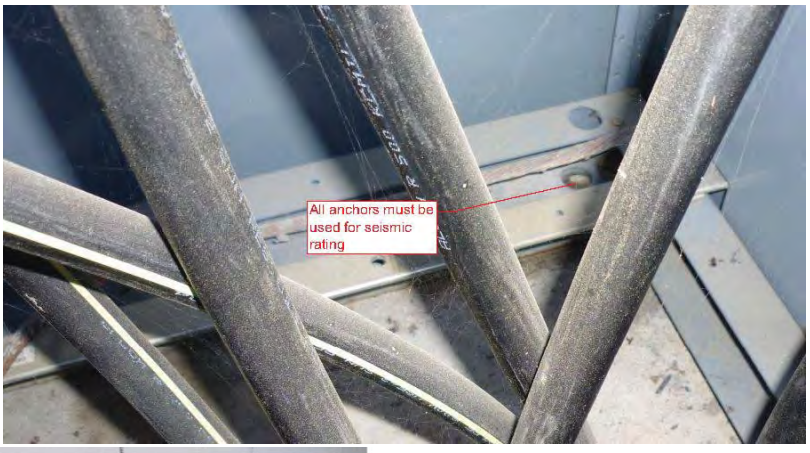
Hangar L


All of the anchors need to be in place to meet seismic requirements

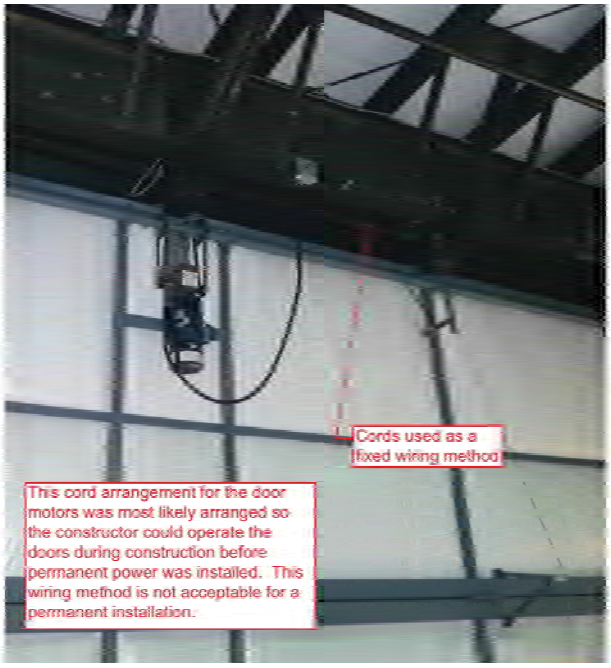

All of the anchors need to be in place to meet seismic requirements


Rubber cords used in place of a fixed wiring method
Unsupported raceway

Hangar M

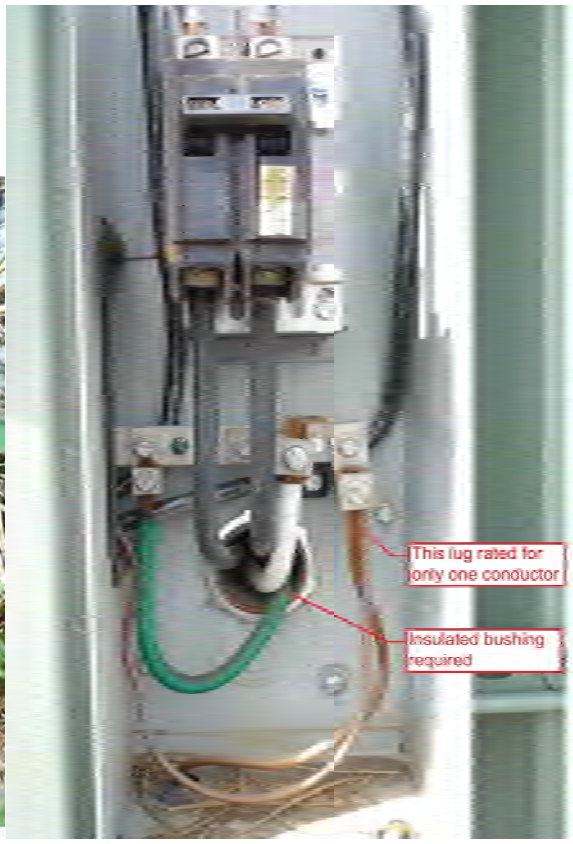

All anchors must be used for seismic rating

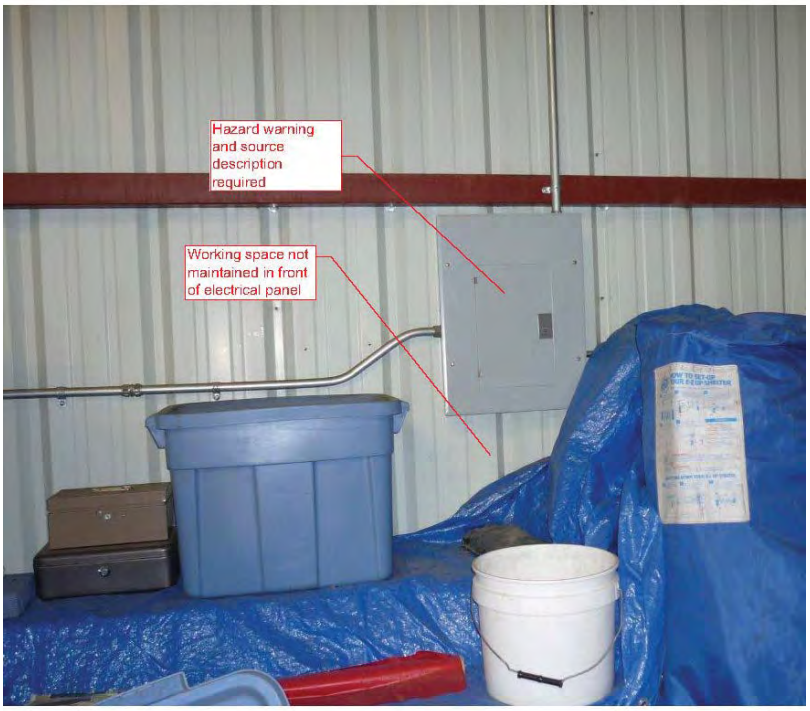

Arcing plug and receptacle above Classified Area
Unsupported cabling
Unprotected lamp above the Classified Area
Arcing plug and receptacle above Classified Area


Cords used as a fixed wiring method
This cord arrangement for the door motors was most likely arranged so the constructor could operate the doors during construction before permanent power was installed. This wiring method is not acceptable for a permanent installation.

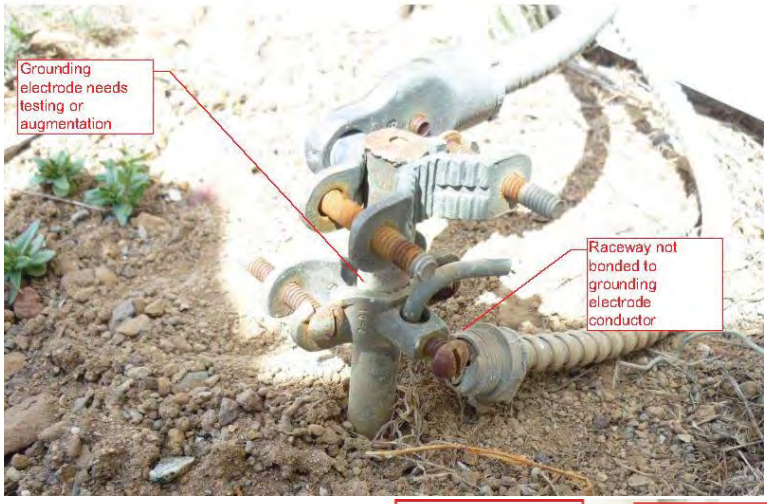

Bell ends required by NEC

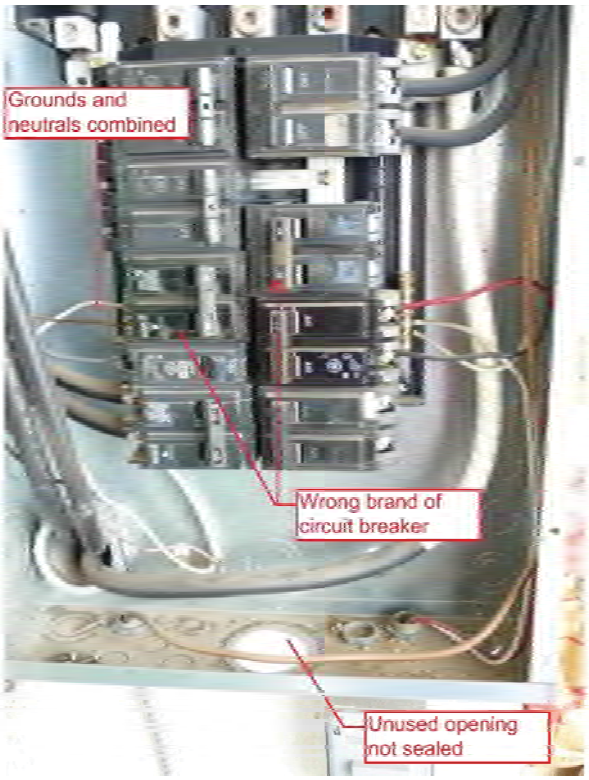
Phoenix Building

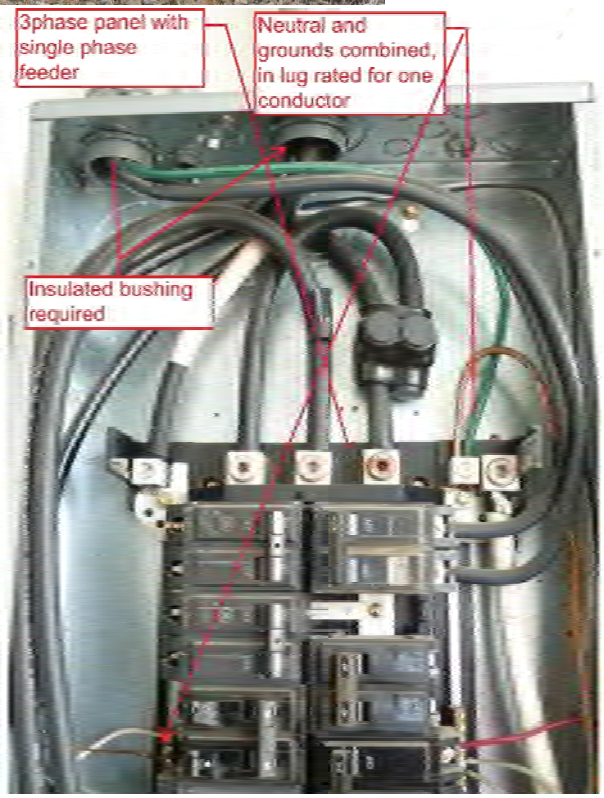


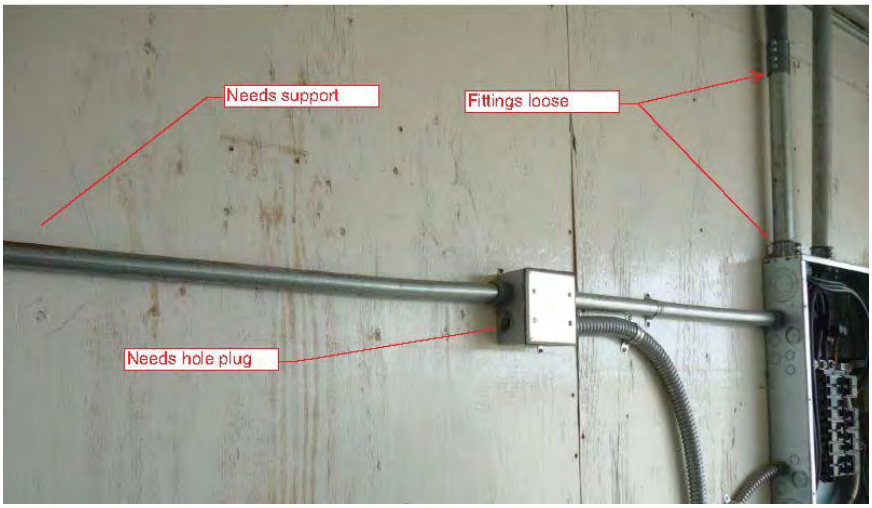


Phoenix Building

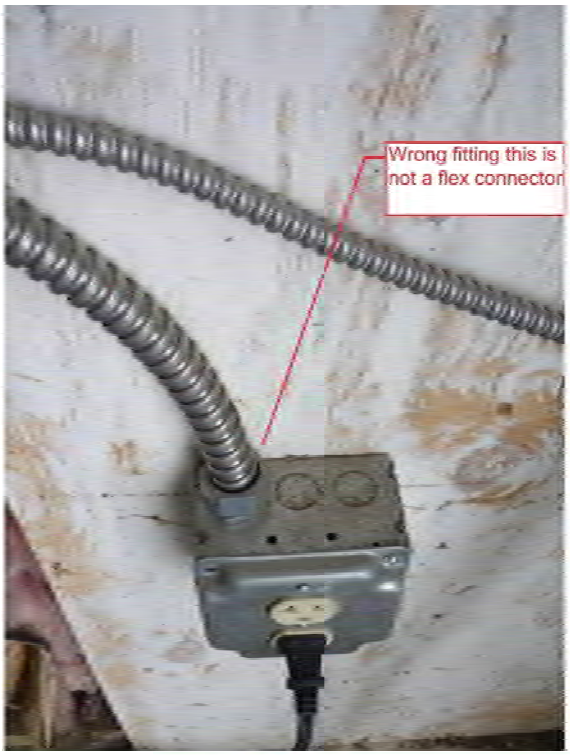

Grounding electrode needs testing or augmentation
Raceway not bonded to grounding electrode conductor

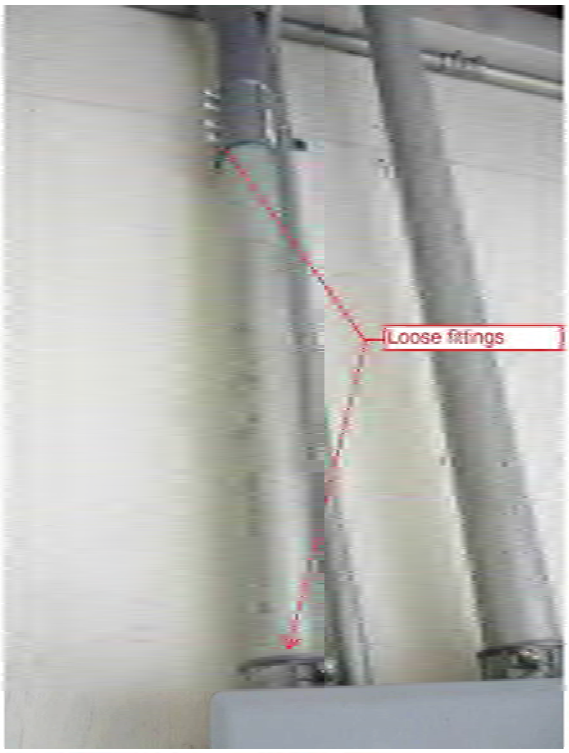

Grounds and neutrals combined
Wrong brand of circuit breaker
Unused opening not sealed


3phase panel with single phase feeder
Neutral and grounds combined, in lug rated for one conductor
Insulated bushing required


Needs support
Fittings loose
Needs hole plug

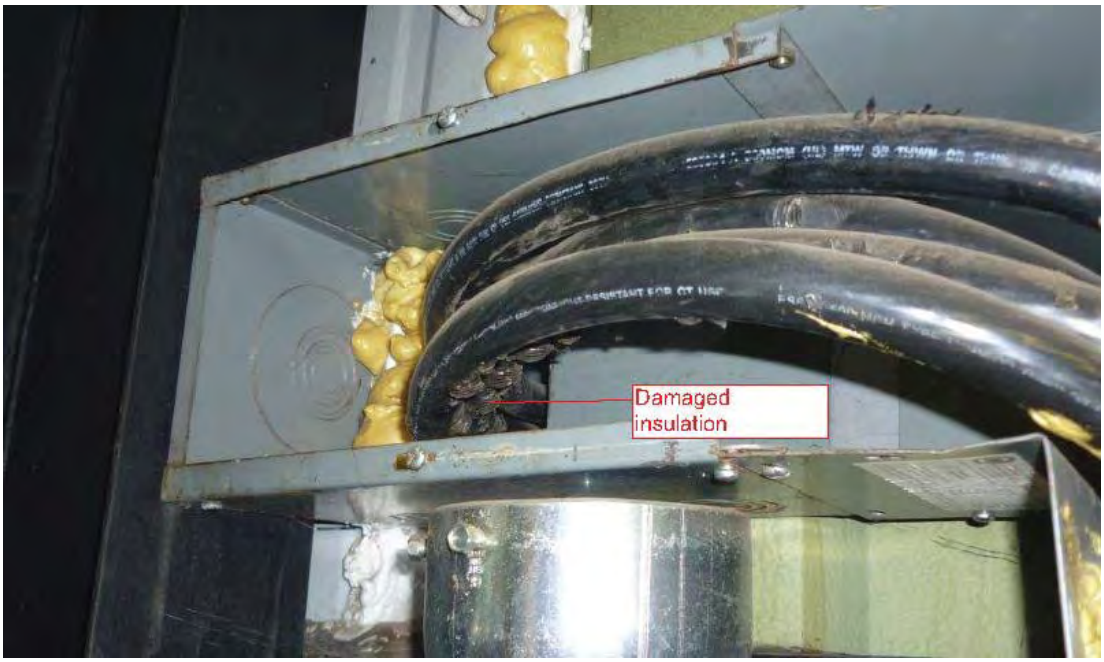

Needs blank cover
Needs fitting removed and hole plugged
Eyesaline
EMERGENCY EYE/FACE WASH

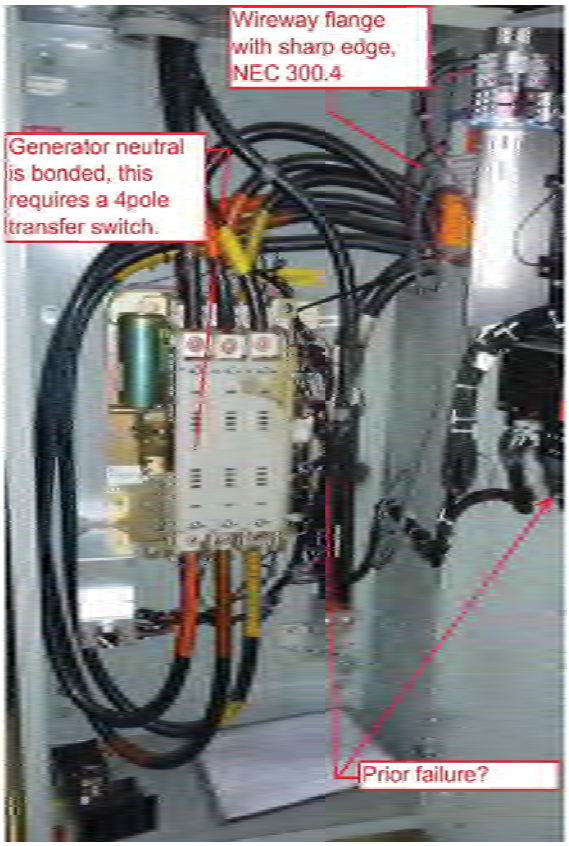

Wrong fitting this is
not a flex connector


Loose fittings


Will require GFCi

Generator Building





Car Rental Building

Fuel Island

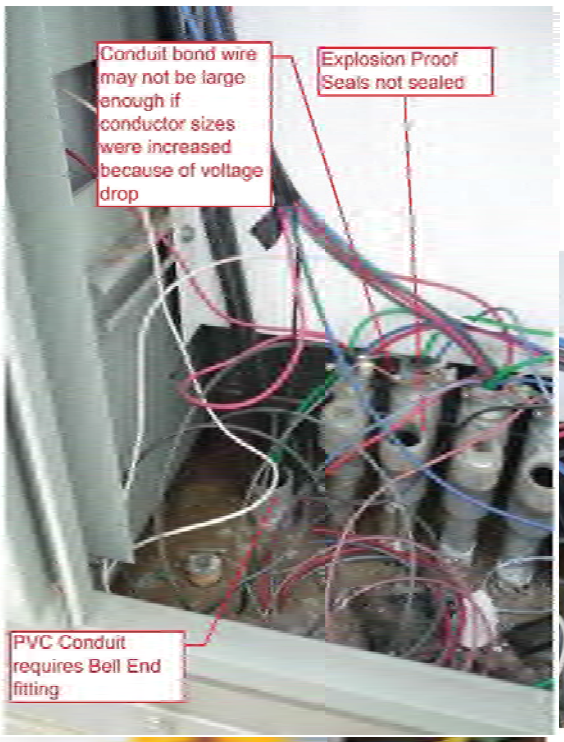

Classified Area is within 10ft of tank
This electrical equipment is not rated to be within the Classified Area

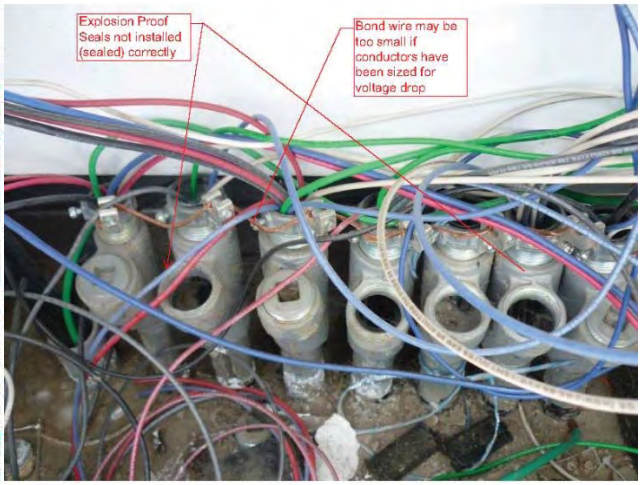

The required emergency switch needs to be no closer than 20ft, and no farther than 100ft
This switch is not grounded, and not rated for use in the Classified Area
Compressor most likely has a switch and a motor that are not rated for the Classified Area


Emergency disconnects are too close to be the required emergency disconnect
Disconnects for compressors are not rated for the Classified Area


This electrical equipment is not rated to be in the Classified Area

Fuel Island


Conduit bond wire may not be large enough if conductor sizes were increased because of voltage drop
Explosion Proof Seals not sealed
PVC Conduit requires Bell End fitting


Explosion Proof Seals not installed (sealed) correctly
Bond wire may be too small if conductors have been sized for voltage drop


Ground resistance too high, install additional electrode


Emergency Disconnect, SE equipment is farther than the max 100ft

Fuel Island

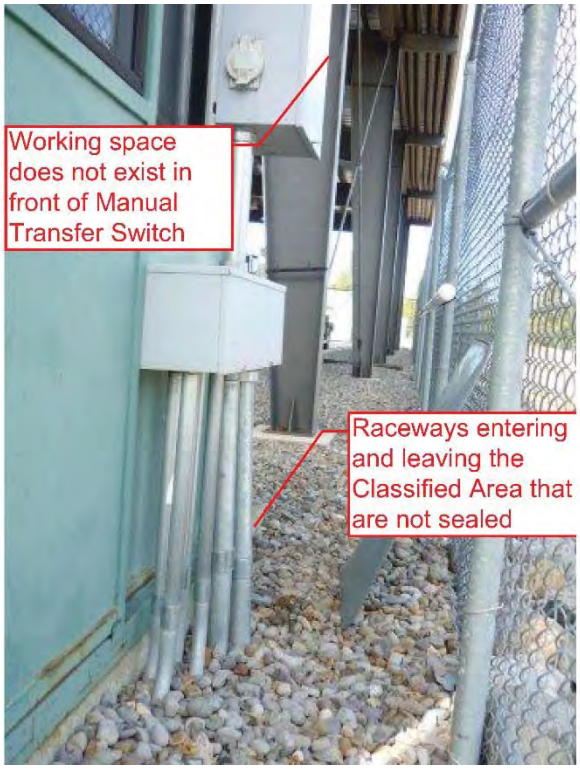

GALLONS
PRICE/GAL
$ 3.80
Chevron
Aviation
Is this signage rated to be in a Classified Area?

Fuel Farm


Raceway support not attached to structure


Electrical equipment in this office is not rated for a Classified Area

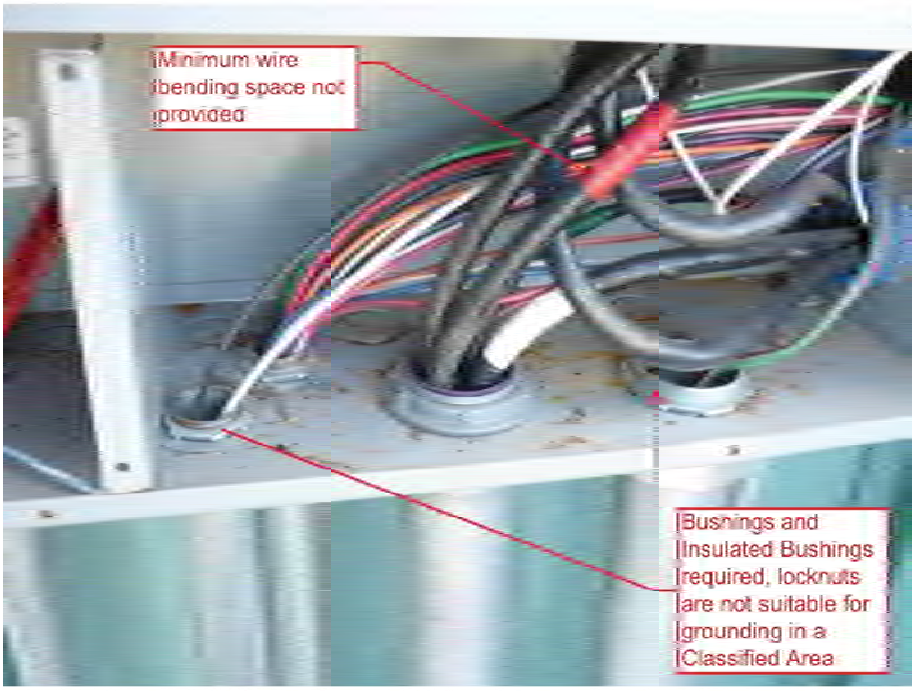

General use cord connector in the Classified Area


Working space does not exist in front of Manual Transfer Switch
Raceways entering and leaving the Classified Area that are not sealed

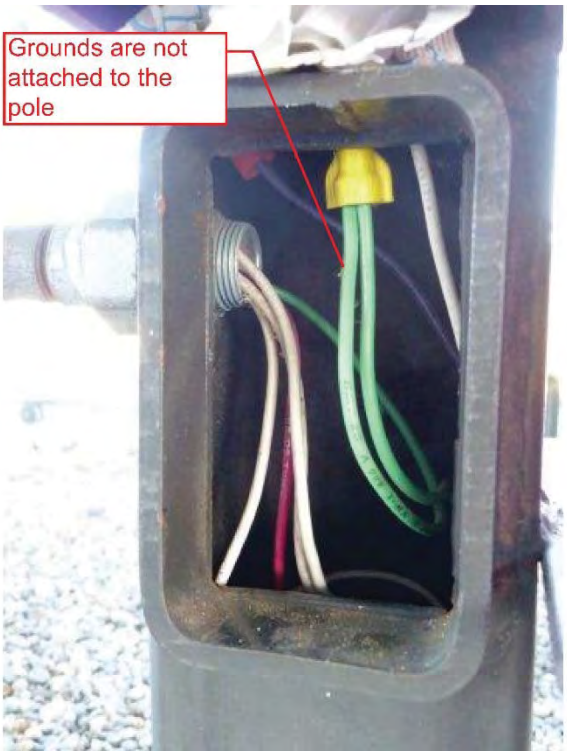
Fuel Farm

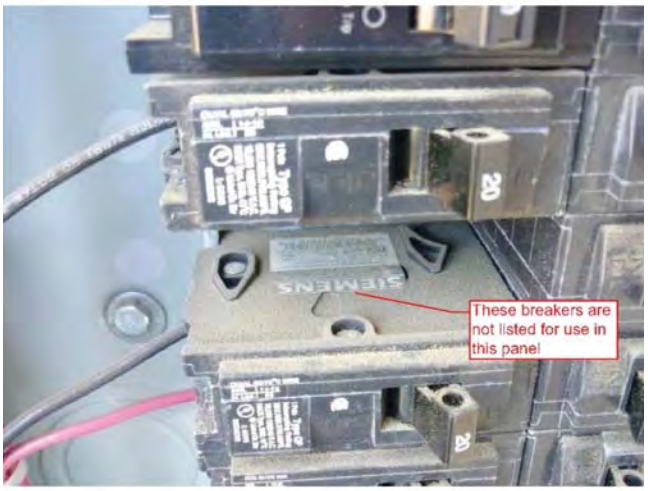

Required working space does not exist


Bushings required
Locknuts are not a suitable bond in a Classified Area


Minimum wire bending space not provided
Bushings and Insulated Bushings required, locknuts are not suitable for grounding in a Classified Area

Fuel Farm


Grounds are not attached to the pole


These breakers are not listed for use in this panel


Myriad unsupported raceways


MOGAS
Unsupported raceway

Fuel Farm


Another seal required here
Unsupported boxes


If this fitting leads into the tank then this is a Class1 Div1 area and the box and LFMC are not suitable wiring methods for the area
Unsupported box
NO SMOKING
FLAMMABLE
DIESEL


This is a 2in NM conduit within the 15ft Classified area from the collection trench, it is the wrong wiring method and is not sealed