September 3, 2024

United States Department of the Interior
National Park Service
Denver Service Center
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

ATTENTION: Susan Lehmann

Dear Susan,

REFERENCE: NPS Arc Flash Evaluation - KLGO
Trip Report

On 05/20/24 through 05/22/24 Jason Gold, with Consolidated Contracting & Engineering, and Connor Zietlow with RSA Engineering travelled to Skagway to investigate the electrical distribution systems. The intent of the site visits were to gather enough information on the equipment to provide an accurate arc flash calculation, provide warning labels for the equipment, and determine any code deficiencies. Any equipment which is single phase and 240V, or less, an arc flash calculation is not required. See one-line diagrams for further information on site electrical systems. The following report will address any code issues awe discovered as part of our investigation.

General:
In existing installations where receptacles are being replaced, per NEC 406.4(D), new receptacles are required to conform with the most recent adoption of the NEC. Example: All housing unit receptacles replaced are required to be UL tamper-resistant type and have AFCI protection, and all receptacles replaced in areas of assembly, per NEC 518, are required to be UL tamper-resistant type.

Maintenance Shop:
The Maintenance Shop electrical system starts with (3)15KVA pole-mounted transformers feeding underground to an exterior building mounted current transformer (CT) cabinet in use as a pull box, with a remote meterbase (Image #1) located adjacent. From the CT, the secondary service laterals route inside to a 120/208V, 600A, 3Ø, 4W Square D type QED switchboard a 600A main circuit breaker with a shunt trip accessory which functions as a CT and building disconnect, denoted as 'CT Main Breaker'. The shunt trip breaker in 'CT Main Breaker' has an exterior keyed switch (Image #2) utilized as the exterior building disconnecting means.

'CT Main Breaker' feeds a 120/208V, 600A, 3Ø, 4W Square D type I-line main lugs only distribution panel denoted as panel 'MDP' (Image #3) located directly adjacent. Panel 'MDP' feeds (3) 120/208:120/240V, 3 KVA, 1Ø dry type(buck-boost) transformers (Image #4), and (4) 120/208V, 225A, 3Ø, 4W Square D type NQOD panelboards with main lugs only denoted as Panels 'B' (Image #6), 'C' (Image #7), 'D' (Image #8), and 'M' (Image #9). The (3) dry-type transformers are fed via a 250A 3-Pole circuit breaker, and the four panels 'B', 'C', 'D', and 'M' are fed via 100A 3-Pole circuit breakers.

The (3) 120/208:120/240V, 3 KVA, 1Ø dry type transformers work in parallel to provide a voltage boost to the 120/208V, 3Ø system to provide 130/230V, 3Ø power to panel 'A' (Image #5), a Square D 225A, 240V, 3Ø, 4W type NQOD panel with 225A 3-Pole main circuit breaker and a nominal voltage of 130/230V. The intent of boosting the voltage is to provide power to equipment that is rated for 230V so that it preforms closer to its potential maximum output.

Code Deficiencies

1. Knockout seal (KO) is missing for compressor and junction box located in mechanical room. Provide KO for all unused openings per NEC 110.12(A).
2. Lighting in electrical room is controlled by an occupancy sensor switch. Remove and provide new toggle switch for lighting in electrical room per NEC 110.26(D).
3. Receptacle located adjacent to panel 'B' and panel 'A' has neutral and hot terminated backwards. Disconnect receptacle and reinstall in accordance with receptacles installation instructions per NEC 110.3(B).
4. Receptacle faceplate is missing screws. Provide screws to satisfy installation instructions per NEC 110.3(B).
5. Disconnect on circuit 22 of Panel 'A' is missing KO. Provide KO for unused openings per NEC 110.12(A).
6. Light switch located in kitchen is missing a faceplate. Provide faceplate for light switch per NEC 404.9(A).
7. Recessed luminaire located in kitchen is not securely fastened and is falling out of ceiling. Resecure luminaire in mounting location and provide additional supports in accordance with NEC 410.30.
8. Conduit feeding junction box in attic is missing straps within 3' of box. Provide additional conduit supports to ensure conduit is securely fastened per NEC 352.30(A).
9. KO is missing for junction box located in wood shop. Provide KO for unused openings per NEC 110.12(A).
10. Receptacle adjacent to drinking fountain is not GFCI. Replace receptacle, or branch circuit breaker, with new GFCI receptacle per NEC 422.5(A).
11. Exterior receptacle does not have a "while in use" cover. Provide an enclosure that is weatherproof whether or not the attachment plug is inserted per NEC 406.9(B).
12. Conex's adjacent to building are fed with unprotected SO cable penetrating directly into the conex providing permanent power to lighting and receptacles with no exterior disconnecting means. Demolish SO cable to source and provide properly sized conduit/wire per NEC 225.31. New conduit/wire shall be rated for passing through Connex, properly protected, and provided a disconnecting means (Image #10).
13. Panel 'M' FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
14. Panel 'D' has sprinkler main located above panel violating the dedicated equipment space as required by NEC 110.26(E). Relocate sprinkler main to be located out of the dedicate equipment space of the panel.
15. Panel 'B' and 'M' circuit directories appears to be out of date. Trace out existing circuits in panels and provide clear, evident, and distinguishable typed circuit directories for each in accordance with NEC 408.4.

Electrical Recommendations

1. Data outlet is missing cover plate. Recommend providing cover plate to protect wire integrity.
2. Fuel alarm is non-functional. Recommend further investigation into the cause of failure, and appropriate measures taken to restore system functionality.
3. Panel 'B', 'C', 'D' and 'M' have neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutral are handle-tied together or provided with dedicated neutrals.
4. Panel 'B' circuits 32-38 have poorly landed conductors. Recommend de-energizing circuits and re-landing conductors.

Panel ‘A’ circuit #10 disconnect enclosure and table saw disconnect are grounded via the metallic raceway per NEC 250.118. Due to seismic activity, we recommend providing a dedicated bare or green insulated conductor as the equipment grounding conductor.

Maintenance Garage:

The Maintenance Garage electrical system starts with (3)15KVA pole-mounted transformers feeding down to an exterior pole-mounted combination meterbase disconnect (CMD) (Image #11) with 120/240V, 100A 2-Pole service disconnect. The CMD feeds down into a pole-mounted 120/240V, 125A, 1Ø, 3W Square D type QO load center with main lugs, denoted panel ‘Ext’ (Image #12). Panel ‘Ext’ routes into the garage to feed a 120/240V, 100A, 3Ø, 3W Square D type QO load center with 200A 3-Pole main circuit breaker denoted as Panel ‘Garage’, via a 100A, 2-pole breaker. Panel ‘Garage’ feeds an exterior Square D 200A fused disconnect used as a pull box via a 20A 2-Pole breaker. From the pull box cable is fed to an interior 120/240V, 100A, 1Ø, 3W ITE load center with 100A 2-Pole main circuit breaker denoted as Panel ‘Cold Storage’.

Code Deficiencies

1. KO is missing from junction box feeding garage door opener. Provide KO for unused openings per NEC 110.12(A).
2. Pull station is located approximately 5’-0” above finished floor. Relocate pull station to be between 42” to 48” above finished floor per NFPA 72 17.15.
3. There are instances of junction boxes and lighting not securely fastened at cold storage location. Ensure all junction boxes and lighting is securely fastened per NEC 314.23 and NEC 410.30(A).
4. Exterior receptacle does not have a “while in use” cover (Image #14). Provide an enclosure that is weatherproof whether or not the attachment plug is inserted per NEC 406.9(B).
5. KO is missing from Panel ‘Ext’ feeding garage door opener. Provide KO for unused openings per NEC 110.12(A).
6. Panel ‘Ext has double landing neutrals. Double landing conductors is not an approved means of installation in accordance with instructions for equipment and is not allowable per NEC 110.3(B) unless equipment is listed. Remove load side neutral wire from double landed lug and use spare lug to bond to neutral bar.
7. Panel ‘Ext’ has no equipment grounding conductors feeding receptacles. This is not a code violation assuming receptacles are properly bonded to conduit via grounding terminal bonding jumper or the receptacle has direct metal-to-metal contact with the backbox per NEC 250.146. Due to the age and condition of the equipment, we find this unlikely. Ensure that receptacles are properly bonded to conduit. If not, either properly bond to conduit per NEC 250.146 or provide equipment grounding conductors per NEC 250.64 to establish an effective path to ground per 250.4(3).
8. Conductors from CMD to Panel ‘Ext’ are undersized for existing overcurrent protection device. Replace #4 AWG conductors with #2 AWG conductors that are properly sized for 100A 2-Pole breaker per NEC 310.16.
9. Panel ‘Ext’ does not have panel schedule. Trace out circuit in panel and provide clear, evident, and distinguishable typed circuit directories for panelboard per NEC 408.4.
10. Panel ‘Garage’ is a 3Ø panel fed with (2) conductors, with jumper connecting phase A to phase C. Ensure bus lugs are rated for number/size of conductors terminating on them, and that no two circuits on the (2) A phase busses are wired to share the same neutral.
11. Panel ‘Cold Storage’ enclosure is not bonded to ground. Bond enclosure to establish an effective path to ground per NEC 250.110.
12. Conductors from Panel ‘Garage’ to Panel ‘Cold Storage’ are undersized for existing circuit breaker. Replace #10 conductors with #2 conductors that are properly sized for 100A 2-Pole breaker per NEC 310.16.

Electrical Recommendations

1. Receptacle below Panel 'Ext' has one outlet not functioning. Recommend replacing with new weatherproof wet rated receptacle with "While In Use" cover.
2. Panel 'Ext' has neutrals that are shared between circuits, with no handle-ties. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or dedicated neutrals installed.
3. Panel 'Ext' is in poor condition and is beginning to rust. Recommend replacing with new NEMA 3R panelboard with similar bus and voltage ratings.
4. Panel 'Garage' has a breaker taped in the 'on' position. Recommend site investigation towards the reason with appropriate steps taken to remedy the issue.
5. Panel 'Garage' breakers 18, 20, 22 have hot heat signatures. Recommend site investigation towards cause with appropriate steps taken to ensure an electrically safe environment.
6. Panel 'Garage' is in poor condition. Recommend replacing with new NEMA 1 panelboard with similar bus and voltage ratings.
7. Panel 'Cold Storage' has multiple abandoned conductors. Recommend demolishing abandoned conductors and associated conduit and junction boxes back to source.
8. Exit signs are non-illuminated type and past expected lifespan. Recommend replacing with new powered LED exit signs.
9. Emergency lighting is non-functional, and there are instances of emergency lights with heads removed and missing cover plates. While they may not be required due to the size and occupancy of the building, recommend repairing or replacing non-functioning emergency lights with new LED in existing locations.
10. Panel 'Garage' is grounded per 250.118 with the use of metallic raceway. Due to seismic activity, we recommend providing a dedicated bare or green insulated conductor as the equipment grounding conductor.

Curatorial Storage:

The Curatorial Storage electrical system starts with (3)15KVA pole-mounted transformers feeding down to an exterior pole-mounted combination meterbase disconnect (CMD). Due to insufficient access, we assume that the CMD is a 120/240V, 200A Midwest CMD with a 2-Pole service disconnect. The CMD routes inside to feed a 120/240V, 225A, 1Ø, 3W Square D type NQOD panelboard denoted Panel 'CS' (Image #15).

Code Deficiencies

1. No code deficiencies were observed for this system.

Electrical Recommendations

1. CMD is beginning to rust. Recommend replacing with new equipment with similar bus and voltage ratings.
2. Panel 'CS' has branch circuits that are sharing neutrals without handle ties. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or provide dedicated neutrals.

White Pass Depot Visitor Center/Admin Building:

The White Pass Depot Visitor Center/Admin Building electrical system starts with a 25 KVA pole-mounted transformer feeding down to an exterior pole-mounted meterbase (Image #16). The meterbase feeds a 120/240V, 400A, 2-Pole service disconnect. The service disconnect routes underground and into the Admin Building to feed a 120/240V, 400A, 1Ø, 3W Square D type I-Line distribution panel denoted as Panel 'A' (Image #17).

Panel 'A' feeds (2) 120/240V, 225A, 1Ø, 3W, Square D type NQOD panelboards denoted Panel 'E' (Image #21) and 'B' (Image #18) and (2) 120/240V, 225A, 1Ø, 3W, Square D type NQOD panelboards denoted Panel 'C' (Image #19) and 'D' (Image #20), via 50A, 150A, 125A, and 125A 2-Pole circuit breakers respectively. Additionally, Panel 'A' feeds a 120/240V, 30A, Square D safety switch for the fire alarm control panel via a 20A 2-Pole breaker.

Code Deficiencies

1. Electrical/Mechanical room DD113 is using an occupancy sensor (Image #22) to control lights. Remove and provide standard toggle switch for lighting in electrical room per NEC 110.26(D).
2. Electrical/Mechanical room DD113 has multiple instances of KOs missing. Provide KO for unused openings per NEC 110.12(A).
3. Electrical/Mechanical room DD113 has instances of conduit not securely supported and fastened. Ensure conduit is securely supported and fastened per NEC 358.30.
4. Electrical/Mechanical room with Panel 'B' is using an occupancy sensor to control lights. Remove and provide standard toggle switch for lighting in electrical room per NEC 110.26(D).
5. Electrical/Mechanical room with Panel 'B' has multiple instances of KOs missing. Provide KO for unused openings per NEC 110.12(A).
6. Electrical/Mechanical room with Panel 'B' has unstrapped conduit leaving Panel 'B'. Ensure conduit is securely supported and fastened per NEC 358.30.
7. Pull stations are all located above 48" above finished floor. Per conversations with on-site personnel, exemptions have been made regarding emergency egress and exit sign requirements, which could also pertain to pull station mounting-heights. If exemption has been made to allow alternate mounting-height no work required. Otherwise relocate pull station to be between 42" to 48" above finished floor per NFPA 72 17.15.
8. Bulb socket fixtures location in crawl space are not GFCI protected. Replace with GFCI type fixture or provide GFCI breaker for circuit per 210.8(A).
9. Service disconnect has no visible marking or amperage. Legibly mark rating of electrical equipment and purpose per NEC 110.21(A) and 110.22(A).
10. Service disconnect is badly rusted and needs replacing. Integrity of electrical equipment is compromised per NEC 110.12(B). Replace service disconnect with new equipment with similar bus and voltage ratings.
11. Ground and neutral are bonded at service disconnect and panel 'A'. Disconnect bond in panel 'A' between neutral and ground to eliminate objectionable current per NEC 250.6.
12. Conduit leaving panel 'A' is not securely fastened. Provide conduit support to ensure conduit is securely fastened per NEC 352.30(A).
13. Safety switch feeding FACP is not red or lockable. Provide red identification and breaker lockout per NFPA 10.6.5.2.3 and 10.6.5.4 respectively.

14. Panel ‘C’ has multiple objects in the working clearance. Remove objects from working clearance required by NEC 110.26.
15. Panel ‘B’ enclosure is not grounded. Provide an equipment grounding conductor to panel ‘B’s enclosure per NEC 250.110
16. Panel ‘B’ circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.
17. Panel ‘E’ has a table in the working clearance. Remove table from working clearance required by NEC 110.26.

Electrical Recommendations

1. Service disconnect is badly rusted. Recommend replacing with new equipment with similar bus and voltage ratings.
2. Electrical/Mechanical room DD113 and Electrical/Mechanical room with Panel ‘B’ both have inadequate lighting levels. Recommend replacing existing fixtures with higher lumen level LEDs compatible with existing lighting controls.
3. Electrical/Mechanical room DD113 has instances of missing flex cable wrapping. Recommend replacing flex cable with appropriate wrapping.
4. Electrical/Mechanical room with Panel ‘B’ has abandoned receptacles. Recommend demolishing abandoned receptacles alongside associated junction boxes, conduit and wire.
5. Emergency lighting is sparce and old, but functional. Recommend demolishing all existing emergency lighting and replacing with new LED products with new layout to provide emergency egress lighting as recommended by IBC 1008.3.5.
6. FACP is in trouble at the time of site visit. Recommend that licensed technician trouble shoot and repair existing fire alarm to conform with NFPA 72.
7. Panel ‘A’ has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or provide dedicated neutrals.
8. Panel ‘A’ is old and interior of panelboard is crowded. Recommend replacing with equivalent panelboard with more space, terminating conductors on new breakers, and reorganizing/re-labeling circuits for a clean and organized solution.
9. Panel ‘A’ has fuel piping routed behind. Recommend relocating panelboard further away from existing fuel piping.
10. Panel ‘B’ and ‘C’ have neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or provide dedicated neutrals.
11. Panel ‘D’ has conduit entering knockout which overtime has begun heaving panel out of place. Recommend cutting conduit 4’ from panel and replacing with flexible metal conduit to rectify problem and prevent future heaving issues.
12. Panel ‘B’ has multiple abandoned conductors. Recommend demolishing abandoned conductors and associated conduit.
13. Panel ‘E’ has neutrals that are shared between circuits 8 and 10. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or provide dedicated neutrals.

14. Panel ‘E’ dead front is missing 2 screws. Recommend providing 2 new screws to securely fasten cover.

Pantheon and Red Front Buildings:

The Pantheon and Red Front Buildings electrical system starts with a pad-mounted transformer which feeds a 120/240V, 600A, 2-Pole, 3W Square D Meter-Pak with (4) meterbase/main disconnects (Image #23). The meter pack individually subfeeds and meters the (4) panels denoted ‘H’, ‘Pantheon’, ‘L’, and ‘N’.

Panel ‘H’ (Image #25) is a 120/240V, 125A, 1Ø, 3W, Square D type QO load center with main lugs, fed via a 200A 2-Pole breaker. Panel ‘H’ feeds a buffer tank and WHSB, via a 150A and 60A 2-Pole breaker respectively.

Panel ‘Pantheon’ (Image #26) isa 120/240V, 125A, 1Ø, 3W Homeline load center a 100A 2-Pole main circuit breaker, fed via a 150A 2-Pole breaker.

Panel ‘L’ (Image #27) is a 120/240V, 225A, 1Ø, Square D type NQOD panelboard with a 200A 2-Pole main circuit breaker, fed via a 200A 2-Pole breaker.

Panel ‘N’ (Image #24) is a 120/240V, 225A, 1Ø, 3W, Square D type NQOD panelboard with a 225A 2-Pole main circuit breaker, via a 200A 2-Pole breaker. Panel ‘N’ feeds a 120/240V, 125A, 1Ø, 3W, Square D type QO load center with main lugs only denoted as Panel ‘Q’, via a 100A 3-Pole breaker. Panel ‘Q’ (Image #26) feeds Buffer Tank #1, and Air Source Heat Pumps via two 50A 2-Pole breakers.

Code Deficiencies

1. Polaris connectors in meterpak are missing protective caps. Provide new protective caps to ensure the conductors are guarded against accidental contact per NEC 110.27(A).
2. Exterior receptacle does not have a “while in use” cover. Provide an enclosure that is weatherproof whether or not the attachment plug is inserted per NEC 406.9(B).
3. There are multiple instances of electrical equipment in Red Front mechanical room missing covers. Provide a cover to protect against accidental contact per NEC 110.27(A).
4. Junction boxes in mechanical room of red front are missing covers. Provide new covers for all junction boxes as required per NEC 314.25.
5. Conduit in crawl space in not securely fastened. Provide conduit support to ensure conduit is securely fastened per NEC 352.30(A).
6. MC cable is routed through concrete wall in crawl space appears to not be listed for use in concrete masonry walls (330.12(2)(a)). Replace MC cable with cable rated for use in this environment.
7. There are instances of abandoned communication cable and wire within the red front building. Remove accessible portions of abandoned cables not planned for future use and tag cables that are intended for future use per NEC 800.25.

Electrical Recommendations

1. Switches in red front building are missing screws in cover plate. Recommend providing new screws.

Kalvik House:

The Kalvik House electrical system starts with a pad-mounted transformer (Image #29), assumed to be 30KVA, 1Ø, due to lack of visible markings, which feeds a combination meterbase disconnect (CMD) (Image #30) with a 120/240V, 200A, 2-Pole service disconnect. The CMD feeds a 120/240V, assumed 125A, 1Ø, 3W, Square D type QO load center with 200A 3-Pole main circuit breaker denoted as Panel 'House' (Image #31) located in the boiler room. The CMD also feeds a 120/240V, 1Ø, 3W, Square D type QO load center with 125A 2-Pole main circuit breaker denoted as Panel 'Bunkhouse' (Image #32), via a 100A 2-Pole breaker. Due to lack of visible markings and incoming feeder size, Panel 'Bunkhouse' is assumed to have a bus rating of 125A.

Code Deficiencies

1. In the Kalvik House, Screws securing dryer outlet in housing have stripped threads and no longer can secure outlet in housing. Replace dryer outlet with new in existing location to ensure dryer outlet is properly supported per NEC 314.23.
2. Dryer in Kalvik House is not GFCI protect. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current minimum NEC requirements. Recommend replacing breaker in panel 'House' with new GFCI type per NEC 210.8(A)(10).
3. Metal-clad (MC) cable feeding dryer is not securely fastened (Image #33). Securely fasten MC cable per NEC 352.30(A).
4. There are no smoke alarms in the building. Provide smoke alarms in accordance to IBC 907.
5. Electrical equipment in the garage is fed directly from house panel without a disconnect. Garage is a separate building and requires a disconnect per NEC 225.32. Provide building disconnect per NEC 225.32.
6. Panel 'House' does not have any visible ground rods. Ensure ground rods are present at all buildings and bonded together to form the grounding electrode system per NEC 250.50.
7. Panel 'House' has split type breaker. Due to the age of the panel, it is unclear whether or not this breaker is listed for use in the panel. Ensure breaker type is listed for use. If not replace for listed breaker per NEC 110.3.
8. Panel 'House' has a 30A 2-Pole breaker feeding a well pump with #12 conductors. Since this could be considered a motor load, having an overcurrent protection device sized for greater than the amperage of the conductors could be allowable, however recommend further investigation into the amperage and horsepower rating of the well pump.
9. Panel 'House' is missing KOs. Provide KO for unused openings per NEC 110.12(A).
10. Panel 'House' has instances of neutral wires in a slightly burnt condition. Damaged conductors are not suitable for work per NEC 110.12(B). Replace with new.
11. CMD knockout is compromised and likely to fall out. Provide KO for unused openings per NEC 110.12(A).
12. CMD conductor bend radius appears to be maxed out. Ensure conductor bend radius does not exceed 5 times the diameter of the conductor per NEC 334.24.
13. CMD deadfront has been cut to fit conduit/conductors. A cut deadfront compromises the safety and integrity of the electrical panel per NEC 110.27 and also voids UL listing. Provide new deadfront to adequately guard against accidental contact.
14. Panel 'Bunkhouse' has neutral, and grounds bonded together. Neutral and ground bonded together downstream of a service disconnect is in violation of NEC 250.24(A)(5). Disconnect neutral and ground bond(s) at this panel.
15. Panel 'Bunkhouse' enclosure is not bonded to ground. Provide bond to ground per NEC 250.4(A)(2).

16. CMD panel schedule has been written in pencil and is barely distinguishable. Trace out circuit in panel and provide clear, evident, and distinguishable typed circuit directories for panelboard per NEC 408.4.

Electrical Recommendations

1. There are instances of abandoned receptacles in the laundry room. Recommend demolishing abandoned receptables, junction boxes, and wiring back to source.
2. Panels 'House' and 'Bunkhouse' do not have Arc Fault Interrupting Circuits (AFCI) protected breakers. Recommend providing new AFCI breakers for all panels, and providing dual AFCI/GFCI breakers for circuits that currently have GFCI breakers per NEC 210.12. This was likely not a code requirement at the time of installation but is now.
3. Panel 'House' is in poor condition. Recommend replacing with new equipment with similar bus and voltage ratings.
4. Panel 'Bunkhouse' does not have anti-oxidant compounds on aluminum conductors where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.

Ranger Station Office/Dyea Cook House:

The Ranger Station Office/Dyea Cook House electrical system starts with a pad-mounted transformer (Image #34) feeding a combination meterbase disconnect (CMD) (Image #35) with a 120/240V, 200A, 2-Pole service disconnect. The CMD feeds a 120/240V, 200A, 1Ø, Cutlet Hammer type Series A panelboard with 100A 2-Pole main circuit breaker denoted as Panel 'Office' (Image #40), via a 100A 2-Pole breaker. Panel 'Office' feeds a 120/240V 1Ø RV pedestal panel denoted, panel 'RV' and a 120/240V, 100A, 1Ø, Square D type QO load center with main lugs only denoted as Panel 'Pump Shack' (Image #43) via 50A and 40A 2-Pole breakers.

The CMD also feeds 120/240V, 125A, 1Ø, 3W, Square D type QO load center with 125A 2-Pole main circuit breaker denoted as Panel 'PR1' (Image #37). Panel 'PR1' feeds a 120/240V, 125A, 1Ø, Square D type QO load center with 125A 2-Pole main circuit breaker denoted as Panel 'BR' (Image #36). Panel 'BR' has (2) sets of conductors landing on the feed through lugs which in turn power to (2) 120/240V, 125A, 1Ø, 3W, Square D type QO load centers with 125A 2-Pole main circuit breakers denoted as Panels 'PR2' (Image #38) and 'PR3' (Image #39).

Code Deficiencies

1. Private residence 1, 2, and 3 have no smoke detectors. Provide smoke detectors per IBC 907.2.11.2
2. Ranger Office has instances of receptacles with broken cover plates (Image #41). Replace all broken receptacles per NEC 110.12(B).
3. Ranger Office has instances of conduit missing straps. Provide additional conduit straps to ensure conduit is securely fastened per NEC 352.30(A).
4. Feeder conductors for panels 'PR2' and 'PR3' are undersized being #6 AWG for the 125A main circuit breakers (MCB) they both serve. Either downsize breakers to 60A or upsize feeders to #1 AWG to adequately size per NEC 310.16.
5. CMD has no panel schedule. Trace out circuits in panel and provide clear, evident, and distinguishable typed circuit directories for panelboard per NEC408.4.
6. No ground wire from CMD to Panel 'Office'. Provide ground wire from CMD to Panel 'Office' to ensure panel is adequately grounded per NEC 250.4(A)(1).
7. Panel 'Office' is using #12 conductors for 30A 2 Pole breakers in two locations in the panel. #12's are undersized for non-motor load on a 30A 2 Pole breaker. Replace with #10 AWG conductors per NEC 310.16.

8. Panel ‘Office’ is missing KOs. Provide KO for unused openings per NEC 110.12(A).
9. Panel ‘Office’ has bare copper leaving a knockout and not terminating anywhere. Extend and connect bare copper to new/existing ground rods as required NEC 250.50.
10. In Panel ‘PR1’ neutral and ground are bonded together. Neutral and ground bonded together downstream of a service disconnect is in violation of NEC 250.24(A)(5). Remove neutral and ground bond at this panel.
11. Panel ‘PR1’ is using #12 conductors for 30A 2 Pole breaker. #12’s are undersized for non-motor load on a 30A 2 Pole breaker. Replace with #10 conductors per NEC 310.16.
12. Panel ‘PR1’ is missing KOs. Provide KO for unused openings per NEC 110.12(A).
13. Panel ‘BR’ has a double landing on a feed through lugs to Panel ‘PR2’ and ‘PR3’. Ensure terminals are listed for landing two conductors per NEC 110.3(B). If not, subfeed panels ‘PR2’ and ‘PR3’ through new breakers.
14. In Panel ‘BR’, the neutrals and grounds are bonded together. Neutral and ground bonds together downstream of a service disconnect is in violation of NEC 250.24(A)(5). Remove neutral and ground bonds at this panel.
15. Panel ‘BR’ is using #12 conductors for 30A 2 Pole breakers in two locations in the panel. #12’s are undersized for non-motor load a 30A 2 Pole breaker, replace with #10 conductors per NEC 310.16.
16. Panel ‘BR’ PVC conduit is missing a threaded hub. Provide a bushing/adapter where conduit enters panelboard per NEC 352.46.
17. Panel ‘PR2’ is using #12 conductors for 30A 2 Pole breakers in two locations in the panel. #12’s are undersized for a 30A 2 Pole breaker. Replace with #10 conductors per NEC 310.16.
18. In panels ‘PR2’, ‘PR3’, and ‘Pump Shack’ neutral and ground are bonded together. Disconnect bond in panel ‘PR2’ between neutral and ground to eliminate objectionable current per NEC 250.6.
19. Panel ‘PR3’ overcurrent protection device does not adequately protect the conductors per NEC 310.16. Replace existing #12 AWG conductors serving 30A 2 Pole breaker with #10 AWG conductors.
20. Panel ‘Pump Shack’ has instances of MC cable missing straps (Image #42). Provide additional conduit support to ensure conduit is securely fastened per NEC 352.30(A).
21. Panel ‘Pump Shack’ has a GFCI breaker with damaged housing. Replace GFCI breaker with new 20A, 1-pole breaker listed for in the existing panel use per NEC 110.4(B).

Electrical Recommendations

1. All building devices are typically in poor condition and at the end of their lifespan. Recommend replacing all devices with new in existing locations.
2. All dwelling/residence panelboards are missing AFCI protected breakers. Recommend providing new AFCI breakers for all panels and providing dual AFCI/GFCI breakers for circuits that currently have GFCI breakers per NEC 210.12. This was likely not a code requirement at the time of installation.
3. Panel ‘Office’ has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutral are handle-tied together or provide dedicated neutrals.
4. Panel ‘Office’ does not have anti-oxidant compounds on aluminum conductors where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.

5. Panel 'Office' is using a flexible metal conduit (FMC) connector as a 90 degree connector between electrical metallic tubing (EMT) and knockout. Recommend replacing with FMC connector with 90 degree EMT connector.
6. Panels 'PR1' and 'BR' do not have anti-oxidant compounds on aluminum conductors where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.

NPS Cederhouse:

The NPS Cederhouse electrical system starts with a 15KVA pole-mounted transformer (Image #43) feeding an exterior combination meterbase disconnect (CMD) (Image #44) with a 120/240V, 200A, 2-Pole service disconnect. CMD feeds a 120/240V, 200A, 1Ø, 3W, Square D type QO load center with main lugs only, denoted as Panel 'A' (Image #45).

Code Deficiencies

1. Garage receptacles are not GFCI. Replace with GFCI type receptacles per NEC 210.8(A)(2).
2. Washer is not GFCI protected. Replace receptacle serving washer with GFCI type receptacle per NEC 210.8(A)(10).
3. LB cover is not secured. Resecure cover plate. If screws are stripped replace LB with new to protect conductors per NEC 110.12.
4. Extension cord is running through an attic access hatch to provide attic lighting (Image #46). Flexible cords are cables should not be used as a substitute for fixed wiring and are not permitted through openings such as a hatch per NEC 400.12. Provide junction boxes, conduit, and wire as required to energize attic lighting.
5. Panel 'A' has working clearance violation. Remove all foreign systems/material within the working clearances of the panel as required by NEC 110.26.
6. FACP breaker within Panel 'A' is not red or lockable. Provide red and lockable breaker for FACP per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively
7. Panel 'A' is missing missing KO. Provide KO for unused openings per NEC 110.12(A).
8. NM cable entering knockout of Panel 'A' is missing cable clamp/connector. Provide romex connector to ensure cable is appropriately secured and protected per NEC 213.5(C).

Electrical Recommendations

1. There are instances of aluminum conductors without anti-oxidant compounds where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.
2. Panel 'A' is missing AFCI protected breakers. Recommend providing new AFCI breakers for all panels and providing dual AFCI/GFCI breakers for circuits that currently have GFCI breakers per NEC 210.12. This was likely not a code requirement at the time of installation.
3. Dryer is not GFCI protected. Recommend replacing receptacle serving dryer with GFCI type receptacle per NEC 210.8(A)(10). This was likely not a code requirement at the time of installation.

Mascot Saloon:

The Mascot Saloon electrical system starts with (3)37.5KVA pole-mounted transformers (Image #47) feeding a current transformer (CT) cabinet. The CT cabinet feeds a post mounted meter base, which in turn feeds a 120/240V, 400A, 3-Pole service disconnect (Image #48).

The service disconnect feeds a 120/208V, 400A, 3Ø, 4W Square D type NQ panelboard with 400A 3-Pole MCB, denoted as panel ‘M’. Panel ‘M’ subfeeds a 120/208V, 150A, 3Ø, 4W Square D type NQOD panelboard with 150A 2-Pole MCB, denoted as panel ‘A’ and a buffer tank, via two 150A 2-Pole breakers. There is a Schneider remote meter monitoring the panel ‘M’ breaker feeding panel ‘A’ (Image #49).

Panel ‘A’ feeds panels ‘H’ and ‘C’ via (2) 100A 2-Pole breakers respectively. Panel ‘H’ is a 120/240V, 100A, 1Ø, 3W Square D type NQOD panelboard, with a 100A 2-Pole MCB. Panel ‘C’ is a 120/240V, 100A, 1Ø, 3W Square D type QO load center with main lugs only.

Code Deficiencies

1. KO is missing for emergency light located in mechanical/electrical room. Provide KO for unused openings per NEC 110.12(A) or replace emergency light with new LED type in existing location.
2. NEMA 14-50R receptacle is missing a faceplate and fed with unprotected cable. Provide receptacle faceplate per NEC 406.5 and protect cable per NEC 300.4.
3. Light switch Janitor room has a broken faceplate. Provide faceplate for light switch per NEC 404.9(A).
4. Fridge receptacle located in garage is missing GFCI protection. Replace existing receptacle serving fridge with GFCI trype receptacle per NEC 210.8(A).
5. Garage door pushbutton is missing cover plate. Provide cover plate to protect internal components and ensure safety per NEC 110.27(A).
6. Self-illuminating type exit signs are past expiration date. Provide new exit sign per IBC 1013.
7. Service disconnect conductors are damaged. Provide electrical tape on damaged portions of conductor, cut damaged conductor off and splice with new conductor, or provide entirely new conductors to ensure conductor insulation integrity per NEC 110.12.
8. Panel ‘A’ FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
9. Panel ‘A’ panel schedule is illegible. Trace out circuit in panel and provide clear, evident, and distinguishable typed circuit directories for panelboard per NEC section 408.4.
10. Panel ‘A’ has abandoned conductors exposed in panelboard without caps. Provide caps on all exposed conductors in panel board to prevent conductors from unintentionally being reenergized.
11. Panel ‘H’ has a covered picture frame impeding access to remove panel cover. Remove all objects that impede access and working space to electrical equipment per NEC 110.26.
12. Panel ‘H’ has multiple instances of KOs missing. Provide KO for unused openings per NEC 110.12(A).
13. Panel ‘H’ is missing blank space cover. Provide blank space cover to prevent accidental contact with live electrical parts per NEC 408.7.

Electrical Recommendations

1. Exterior receptacles are in poor condition and are nearing the end of their useful lives. Recommend replacing with new exterior receptacles.
2. Building disconnect does not have anti-oxidant compounds on aluminum conductors where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.

3. Panel ‘M1’ does not have anti-oxidant compounds on aluminum conductors where they terminate on dissimilar metals. Recommend providing anti-oxidant to reduce risk of corrosion, per NEC 110.14.
4. Panels ‘M1’, ‘A’, ‘H’, and ‘C’ have neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together.
5. Panel ‘H’ panel schedule is written on cardboard. Recommend providing printed panel schedule with unique, legible identifiers for each branch circuit.
6. Panel ‘C’ is in fair condition but is nearing the end of its useful life. Recommend replacing with new equipment with similar bus and voltage ratings.
7. Exit signs are non-illuminated type. Per conversations with on-site personnel, the city has granted an exception to the IBC allowing NPS to installed non-invasive non-illuminated exit signs. Although there is an exception to the code in place it is still our recommendation to replace with new illuminated exit signs per IBC 1013.3.
8. There are instances of abandoned exterior and interior luminaires. Recommend removing luminaires if not intended for future use.

Lynch & Kennedy:

The Lynch and Kennedy system starts with (3) 100KVA pole-mounted transformers feeding a combination meterbase disconnect (CMD) with a 120/208V, 200A, 2-Pole main circuit breaker. The CMD feeds underground to a 120/208V, 225A, 1Ø, Square D type NQOD panelboard with a 225A 2-Pole main circuit breaker denoted as Panel ‘Elec’ (Image #50). Panel ‘Elec’ has a surge protective device (SPD) mounted to the inside of the enclosure.

Code Deficiencies

1. Second floor exit sign batteries are dead. Either replace batteries in exit sign or replace with new LED type exit sign to provide emergency egress signage per IBC 1013.3.
2. Second floor switch faceplate is damaged. Replace faceplate for light switch per NEC 404.9(A).
3. Combination emergency light and exit sign is non-functional. Either replace batteries in unit or provide new LED type to satisfy the requirements IBC 1013.3 and IBC 1008.3.5.
4. Panel ‘Elec’ uses a 277V color scheme on a 120/240V, 1Ø panel. Properly re-label conductors with the correct 120/240V color scheme using colored tape or markers per NEC 210.5.
5. Panel ‘Elec’ has a surge protection device mounted to the inside of the enclosure. Confirm surge protection device is UL listed to be mounted to the interior of a panelboard. If not listed, remove from panelboard.
6. Panel ‘Elec’ FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
7. Panel ‘Elec’ circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.

Electrical Recommendations

1. First floor light contactor in electrical/mechanical room is loose in housing. Recommend taking appropriate measures to tighten and secure light contactor.
2. Panel 'Elec' has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutrals are handle-tied together or provide dedicated neutrals.
3. Panel 'Elec' has multiple abandoned conductors. Recommend demolishing abandoned conductors and associated conduit and junction boxes.
4. Receptacle adjacent to FACP is missing screw in faceplate. Recommend providing additional screws to satisfy installation instructions.
5. Communication cable entering junction box in mechanical/electrical room is missing knock out protective bushing (Image #51). Recommend providing protective bushing to protect cable against physical damage in accordance with BICSI and TIA standards.

Pacific Clipper Line Office, Verbauwhedes Cigar Store, Confectionary, Cribs, and Boas Tailor & Furrier Shop

The Pacific Clipper Line Office, Verbauwhedes Cigar Store, Confectionary, Cribs, and Boas Tailor & Furrier shop are all fed form an electrical system starting with (3) 100KVA pole-mounted transformers. These transformers feed a 120/240V, 400A, 3-Pole fused service disconnect that was locked at time of inspection. The service disconnect feeds a ITE modular metering meter pack with (6) meters/services disconnects. Due to the lack of visible markings the meter pack is assumed to be rated 400A, 120/208V, 3Ø. One of these meters/service disconnects is abandoned and the other 5 feed panelboards denoted as Panel 'B-1, 'D-1', 'F', 'G', and 'E', via 150A, 150A, 100A, 125A, and 125A 2-Pole breakers.

Inside the Pacific Clipper Line Office, Panel 'B-1' is a 120/240V, 225A, 1Ø, 3W Square D type NQOD panelboard with 150A 2-Pole main circuit breaker located on the 1st floor. Panel 'B-1' feeds a 120/240V, 100A, 1Ø, 3W Square D type NQOD panelboard with 100A 2-Pole main circuit breaker denoted as Panel 'B-2' located on the 2nd floor, via a 100A 2-Pole breaker.

Inside the Boas Tailor & Furrier shop, Panel 'D-1' is a 120/240V, 150A, 1Ø, 3W ITE indoor loadcenter with a 150A 2-Pole main circuit breaker located on the 1st floor. Panel 'D-1' feeds a 120/240V, 100A, 1Ø, 3W ITE indoor loadcenter with 100A 2-Pole main circuit breaker denoted as Panel 'D-2' located on the 2nd floor.

Inside the Valve Pit, Panel 'F' is a 120/240V, 100A, 3W, ITE indoor load center with a 100A 2-Pole main circuit breaker.

Inside the Verbauwhedes Cigar and Confectionary store is a 120/240V, 100A, 3W, Square D type QO load center with a 100A 2-Pole main circuit breaker.

Inside the Verbauwhedes Cribs is a 120/240V, 100A, 3W, Square D type QO load center with a 100A 2-Pole main circuit breaker.

Code Deficiencies

1. The Pacific Clipper Line Office:

a. Junction box in second floor office is missing a cover plate. Provide new covers for all junction boxes as required per NEC Section 314.25.
b. Fire alarm does not signal notification devices in the Pacific Clipper Line Office when Curatorial Storage alarm triggers even though the Pacific Clipper Line Office is expected to exit. Conduct code study to ascertain FA signaling requirements in buildings with share FA system. Rectify existing FA system in buildings to provide notification per NFPA 72 24.4.2.2.1.T
c. Water heater located in mechanical/electrical room has a liquid tight conduit connector loose (Image #52). Secure liquid tight conduit connector per NEC 350.42.
d. There are instances of broken and missing junction boxes in the Electrical/Mechanical room. Replace broken and provide new junction box covers as required per NEC Section 314.25.
e. There are instances of broken receptacles and receptacles covers in the electrical/mechanical room. Replace all broken receptacles and covers with new per NEC 110.12(B).
f. Lighting in mechanical/electrical room is controlled by an occupancy sensor switch. Remove and provide standard toggle switch for lighting in electrical room per NEC 110.26(D).
g. Receptacles in bathroom and storage room adjacent are not GFCI type but could be provided GFCI protection by an unmarked GFCI type breaker. Confirm. If not, replace receptacles with GFCI type per NEC 422.5(A).
h. Track lighting channel and 90-degree conduit connection is falling off/missing. Secure track lighting and conduit bend per NEC 110.12.
i. Panel ‘B-2’ FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
j. Panel ‘B-2’ circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.
k. Panel ‘B-1’ cover is bent to allow feeder conduit to enter bottom of panel. Bending a panelboard voids the UL listing per NEC 110.3(B). Provide a new panelboard cover and reroute incoming feeder conduit to fit not impede new cover.

2. <u>Valve pit</u>:
   a. There exists a junction box without a cover (Image #53). Tuck in conductors and provide new junction box covers as required per NEC Section 314.25.
   b. Water line below Panel ‘F’ appears to be violating Panel ‘F’ working clearance. Relocate everything that may interfere with working clearance for Panel ‘F’ per NEC 110.26(E)(1).
   c. Junction box outside of building fed with liquid tight flexible conduit (LMFC) without conduit support. Properly secure/support and fasten LFMC in accordance with NEC 350.30.
   d. Panel ‘F’ conductors feeding baseboard heater from 30A 2-Pole breaker are #12 AWG. Replace conductors with #10 AWG per NEC 310.16.
   e. Panel ‘F’ circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.
3. <u>Verbauwhedes Cigar Store and Confectionary</u>:
   a. Panel ‘E’ is missing KO. Provide KO for unused openings per NEC 110.12(A).

   b. Panel ‘E’ FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
   c. Emergency lighting at the second floor stairs of Verbauwhede’s building is non-functional. Repair or replace non-functioning emergency lights to ensure path of egress is illuminated under loss of power IBC 1008.3.5.
   d. Extension cord located in building is routed through a door and downstairs. If permanent means of power is desired, recommend providing, else disconnect extension cord and power devices from other sources that do not route through doors per NEC 400.12(3).
   e. Toggle switch on second floor of building is damaged and non-functional. Replace with new toggle switch per NEC 110.12(B).
   f. Track lighting on first floor of building is connected by cord and plug. Disconnect cord and plug connection and provide branch circuit connection per NEC 410.51(A).
4. Verbauwhedes Crib Building:
   a. Conduit in crawlspace not adequately secured/supported as required by NEC 353.30(A). Provide additional straps to secure/support conduit in accordance with the NEC.
   b. At the time of inspection building data outlets were not secured to walls. Properly secure all data outlets to walls per NEC 300.11(A).
   c. Panel ’G’ has double landing neutral and grounds on neutral bar. Enclosure is bonded to neutral bus. Disconnect neutral landing on existing neutral bus, use existing neutral bus as new ground bus, and provide new dedicated neutral bus to eliminate objectional current per NEC 250.142(B).
5. Boas Tailor & Furrier shop:
   a. Boiler electrical junction box and connection points are open. Close up all junction boxes and electrical connection points. Provide coverplates as required to make installation electrically safe in accordance with NEC 314.25.
   b. Building has multiple instances of pull stations located above 48” above finished floor. Relocate pull station to be between 42” to 48” above finished floor per NFPA 72 17.15.
   c. Panel ‘D1’ FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
   d. Panels ‘D1’ and ‘D2’ have neutral, ground, and enclosure bonded together. Completely separate ground and neutral buses and ensure panelboard enclosure is bonded to ground bus and not neutral bus per NEC 250.142(B).
   e. Panel ‘D1’ circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.
   f. Panel ‘D2’ 30A 2-Pole breaker feeds an electric heater with #12 AWG conductors. Upsize conductors to #10 AWG per NEC 310.16.

Electrical Recommendations

1. The Pacific Clipper Line Office:
   a. Panel ‘B-1’ schedule is not in panel door. Schedule is taped above. Recommend relocating panel schedule in panel door to protect it against damage or from removal.
2. Valve pit:

   a. No recommendations for this area.
3. Verbauwhedes Cigar Store and Confectionary:
   a. Per note on breaker, Panel 'E' is having nuisance tripping on branch circuit breaker in panelboard. Recommend additional site investigation and troubleshooting to identify cause of nuisance tripping so that problem may be remedied.
   b. Panel 'E' has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutral are handle-tied together.
4. Verbauwhedes Crib Building:
   a. Panel 'G' has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutral are handle-tied together or provide dedicated neutrals.
   b. Building has IT switch and patch panels located in the crawlspace. Recommend relocating all telecom equipment (switched, patch panels, etc.) away from crawlspace.
5. Boas Tailor & Furrier shop:
   a. Exterior GFCI receptacle breaker was tripped at the time of our inspection. Due to safety concerns the breaker was not reset during our inspection. Recommend additional site investigation and troubleshooting to identify cause of fault so that problem may be remedied.
   b. Exterior switch does not function with existing lighting. Lighting is assumed to have a burnt-out bulb or abandoned in place. Recommend additional site investigation and troubleshooting to identify cause of non-functionality so that problem may be remedied.
   c. Water heater located in mechanical/electrical room has a loose liquid tight conduit connector. Since we were unable to check the entire building for this issue, recommend checking and tightening all liquid tight conduit connectors in building as required by NEC 350.6.

Martin Itjen House:

The Martin Itjen House electrical system starts with a 50KVA pole-mounted transformer feeding overhead distribution to a 120/240V, 200A, 1Ø Siemens combination meterbase disconnect (CMD) with a 200A 2-Pole service disconnect. CMD feeds a 120/240V, 100A, 1Ø, 3W Square D type QO load center with 100A 2-Pole main circuit breaker denoted as Panel 'A'.

Code Deficiencies

1. Panel 'A' FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.
2. Electric furnace in crawlspace is cord and plug connection without GFCI protection. Replace existing receptacle with GFCI type receptacle per NEC 210.8(A)(4).
3. Panel 'A' circuit directory appears to be out of date. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.

Electrical Recommendations

1. No exit signs or emergency lighting in building. Recommend providing exit signs and emergency lighting along path of egress.

Soapy

The Soapy electrical system starts with a pole-mounted transformer feeding overhead distribution to a 120/240V, 1Ø combination meterbase disconnect (CMD) with a 200A 2-Pole service disconnect. The CMD feeds a 120/240V, 200A, 1Ø, 3W Square D type QO load center with main lugs only denoted as Panel 'B'.

Code Deficiencies

1. Mechanical shed and Exhibit building both have instances of unsupported flexible metal conduit (FMC). Properly secure/support and fasten FMC in accordance with NEC 348.30(A).
2. Exhibit building crawlspace has instances of LB covers missing. Provide covers for all LB conduit fittings per NEC 314.16(C).
3. Pull stations in Mech room appear to be mounted too high. Relocate pull station to be between 42" to 48" above finished floor per NFPA 72 17.15.
4. Panel 'A' is missing blank space covers. Provide blank space covers to prevent accidental contact with live electrical parts per NEC 408.7.

Electrical Recommendations

1. MC cable which fed the now removed Pump B has been abandoned in place. Recommend demolishing MC cable.
2. Panel 'A' has neutrals that are shared between circuits. Note that this may have not been a code requirement when the equipment was installed and therefore could be "grandfathered" but does not meet the current NEC minimum requirements. Recommend that all circuits with shared neutral are handle-tied together or provide dedicated neutrals.

Boss Bakery

The Boss Bakery electrical system starts with a 15KVA pole-mounted transformer feeding overhead distribution to a combination meterbase disconnect (CMD) with a 100A 2-Pole service disconnect. The CMD feeds a 120/240V, 100A, 1Ø, 3W ITE load center with a 200A 2-Pole main circuit breaker denoted as Panel 'Elec'.

Code Deficiencies

1. FACP LCD display is non-functional. Repair or replace non-functional components of fire alarm system in accordance with NFPA 10.3.2.
2. Telephone dialer has free air conductors routing to a receptacle with a missing KO (Image #54). Provide KO for unused openings per NEC 110.12(A).
3. Electrical/Mechanical room lighting is controlled by an occupancy sensor switch. Remove and provide standard toggle switch for lighting in electrical room per NEC 110.26(D).
4. Receptacle for water fountain is not GFCI protected. Replace receptacle with GFCI type receptacle, or breaker, per NEC 210.8.
5. Pull stations appear to be above 48" high. Relocate pull station to be between 42" to 48" above finished floor per NFPA 72 17.15.
6. Emergency lighting is non-functional throughout entire building. Repair or replace non-functioning emergency lights to ensure path of egress is illuminated under loss of power IBC 1008.3.5.
7. No exit signs throughout the building. Provide exit signs per IBC 1013.3.
8. Panel 'Elec' FACP breaker is not red or lockable. Provide red identification and breaker lockout per NFPA 72 10.6.5.2.3 and 10.6.5.4 respectively.

9. Panel ‘Elec’ 30A 2-Pole breaker feeds an electric heater with #12 conductors. Upsize conductors to #10’s per NEC 310.16.
10. Panel ‘Elec’ has neutral, ground, and enclosure bonded together. Completely separate ground and neutral buses, and ensure panelboard enclosure is bonded to ground bus and not neutral bus per NEC 250.6.
11. Panel ‘Elec’ main circuit breaker (MCB) is bent off of the bus bar. Re-install MCB so that it is properly aligned per NEC 110.3(B).
12. Panel ‘Elec’ is using copper wire as a handle tie. Replace with UL listed handle tier per NEC 110.3(C).
13. Panel schedules are barely legible. Trace out existing circuits in all panels and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.

Electrical Recommendations

1. Switch for general lighting is located approximately 18” above finished floor. Recommend re-installation at 48” above finished floor.

Arctic Meat CO/YMCA Gym

The Arctic Meat Co/YMCA gym electrical system starts with a pole-mounted transformer feeding to a building mounted weatherhead, via overhead distribution. The weatherhead feeds down into a 120/240V, 400A, 1Ø, 3W Square D meterpak combination meterbase disconnect (CMD) with (2) 200A 2-Pole service disconnects. The first service disconnect feeds a 120/240V, 250A, 1Ø, 3W, Square D type QO load center with 200A 2-Pole main circuit breaker denoted as Panel ‘A’. The second CMD service disconnect feeds a 120/240V, 250A, 1Ø, 3W Square D type QO load center with main lugs only, denoted as Panel ‘B’.

General Note:

Building still under construction. Some code deficiencies and recommendations may not apply once construction is completed.

Code Deficiencies

1. Once construction is completed, verify that finished electrical installation is compliant with NEC 2020 and NFPA 72.
2. Lighting in mechanical/electrical room is controlled by an occupancy sensor switch which also not installed per the signed electrical drawings. Remove and provide standard toggle switch for lighting in mechanical/electrical room per NEC 110.26(D).
3. Panel ‘A’ circuit directory appears to be inaccurate. Trace out existing circuits in panel and provide clear, evident, and distinguishable typed circuit directory for each in accordance with NEC 408.4.

Electrical Recommendations

1. FACP not completed. System still being installed. Verify system is compliant with NFPA 72 once completed.
2. Abandoned conductors from old lighting are capped and hanging in the air (Image #55). Verify all conductors are properly terminated or removed after construction.
3. Multiple Junction boxes with weatherproof enclosures but no device installed. Verify devices or blanks are installed after construction is completed.
4. Flex conduit, MC, and other race ways not properly supported in crawl space (Image #56). Verify proper supports were added once construction is completed.

5. The crawl space only has temporary lighting. Verify permanent lighting is installed after construction is completed per NEC 210.70.
6. Panel B contains a 30A/1P breaker with two #12 copper conductors landed on it which are rated for 20A. Verify if the load served is a motor or non-motor load and if #12 conductors are code compliant for load. If code compliant, no work required. If not code compliant, conductors or breaker will need to be replaced with the proper size after construction is completed.

Moore House / Coop

The Moore House / Coop electrical system starts with a 25KVA pole-mounted transformer feeding a 120/240V, 200A, 1Ø, 3W, Siemens combination meterbase disconnect (CMD) with (3) meters/service disconnects. The three meter/service disconnects feed panelboards denoted Panel 'Chicken Coop', 'Garage', and 'Mech', via 200A, 100A, and 200A 2-Pole breakers respectively. Feeder supplying panel 'Garage' is tapped at the CMD to provide power to a 120/240V, 100A, 1Ø, 3W Square D type NQOD panelboard denoted Panel 'A'.

Panel 'Chicken Coop' is a 120/240V, 225A, 1Ø, 3W Square D type QO load center with a 200A 2-Pole main circuit breaker, Panel 'Garage' is a 120/240V, 125A, 1Ø, 3W Square D type QO load center with a 125A 2-Pole main circuit breaker, and Panel 'Mech' is a 120/240V, 200A, 1Ø, 3W Square D type NQOD panelboard with a 200A 2-Pole main circuit breaker.

Code Deficiencies

1. Knockout seals are missing in chicken coop building. Provide knockout seal for unused openings per NEC 110.12(A).
2. Junction boxes in chicken coop missing covers. Install missing covers per NEC 314.25.
3. LB in chicken coup missing covers. Install missing covers per NEC 314.25.
4. PVC leaving chicken coop panel not adequately secured/supported (Image #57). Provide additional PVC conduit straps to secure/support conduit in accordance with NEC 352.30.
5. Liquid-tight flexible non-metallic conduit (LFNC) leaving Panel 'Chicken Coop' is without conduit support. Properly secure/support and fasten LFNC in accordance with NEC 356.30.
6. Lighting in electrical room of chicken coop is controlled by an occupancy sensor switch. Remove and provide standard toggle switch for lighting in electrical room per NEC 110.26(D).
7. Conduit bodies in Moore House crawl space missing covers. Install covers per NEC 314.25.
8. There are instances of abandoned data cables in Moore House crawl space. Remove data cables per NEC 800.25.
9. Fixture in Moore House attic dangling and not properly secured. Secure fixture per NEC 410.30.
10. The chicken coop panel feeds both Moore House and a nearby cabin but neither building has a disconnecting means on the exterior or interior of the building. Install a means of disconnect for each building per NEC 230.70.
11. The buffer tank is hooked to a 70A 2-Pole breaker and is supplied with #8 copper conductors AWG which are rated to 40A. Verify the demand on the buffer tank name plate and replace either the breaker or the conductors with the appropriate size.

Electrical Recommendations

1. No electrical recommendations for this area.

Duplex

The Duplex electrical system starts with a pole-mounted transformer feeding a 120/240V combination meterbase disconnect (CMD) with three meters/service disconnects. The three meter/service disconnects feed panelboards denoted Panel 'Mech', 'West', and 'East' via 100A, 150A, and 150A 2-Pole breakers respectively.

Panel 'Mech' is a 120/240V, 125A, 1Ø, 3W, Siemens type S1 panelboard which feeds a 120/240V, 100A, 1Ø, 3W, Square D type QO load center, with 100A 2-Pole main circuit breaker, denoted Panel 'Garage', via a 50A 2-Pole circuit breaker.

Panels 'East' and 'West' are 120/240V, 250A, 1Ø, Siemens type S1 panelboards with main lugs only.

Code Deficiencies

1. West duplex exterior GFCI receptacle will not trip. Replace outside receptacle with new GFCI weather-resistant type receptacle per NEC 210.8 (A).
2. West duplex washer not GFCI protected. Provide GFCI protection for washer per NEC 210.8 (A).
3. West duplex receptacle in living room missing face plate. Install a faceplate on the uncovered receptacle in living room per NEC 314.25.
4. West duplex switched receptacle under sink not GFCI protected. Replace receptacle with GFCI type receptacle per NEC 210.8 (A).
5. West duplex data faceplate not properly secured. Secure data faceplate per NEC 314.25.
6. West duplex above counter receptacle within 6' of sink and not GFCI protected. Replace receptacle with GFCI type receptacle per NEC 210.8 (A).
7. East duplex exterior GFCI receptacle will not trip. Replace outside receptacle with GFCI weather-resistant type receptacle per NEC 210.8 (A).
8. East duplex washer not GFCI protected. Provide GFCI protection for washer per NEC 210.8 (A).
9. East duplex above counter receptacle within 6' of sink and not GFCI protected. Replace receptacle with GFCI type receptacle per NEC 210.8 (A).
10. East duplex bedroom receptacle has an open neutral. Re-terminate neutral on receptacle per manufacturer installation instructions in accordance with NEC 110.14 (A).
11. East duplex switched receptacle under sink not GFCI protected. Replace receptacle with GFCI type receptacle per NEC 210.8 (A).
12. East duplex east deck exterior receptacle has broken in-use cover. Replace with extra-duty in use cover per NEC 406.9 (B).
13. Switch in garage is damaged. Replace switch in garage per NEC 110.12(B).
14. Ground wire on exterior of building is not terminated on anything and is left freely. Provide further site investigation to identify purpose of ground wire. If ground wire is necessary for grounding system properly install it per NEC 110.14 (A). If not ground wire is not necessary, remove.
15. Ground and neutral are bonded in garage electrical panel. Install a ground bar and unbound the neutral and ground in the panel per NEC 250.142(B).
16. Unsupported Romex leaving garage panel. Cable must be supported per NEC 334.30.

17. LFNC leaving Panel ‘Garage’ is without conduit support. Properly secure/support and fasten LFNC in accordance with NEC 356.30.
18. Garage panel is missing KOs. Provide and install KOs per NEC 110.12(A).
19. Panel ‘A-1’, ‘B-1’, and ‘Mech’ circuit directories appears to be out of date. Trace out existing circuits in panels and provide clear, evident, and distinguishable typed circuit directories for each in accordance with NEC 408.4.

Electrical Recommendations

1. Mechanical room emergency lights are non-functional. Recommend repairing or replacing non-functioning emergency lights to ensure path of egress is illuminated under loss of power.
2. Ground wire laying across floor in crawl space (Image #58). Identify purpose of ground wire and either remove or properly install it.
3. East and west duplex dryers not GFCI protected. Note that this may have not been a code requirement when the equipment was installed and therefore could be “grandfathered” but does not meet the current NEC minimum requirements. Recommend providing GFCI protection for dryers.

Image #1 – *Maintenance Shop – CT cabinet & Remote Meterbase*

Image #2 – *Maintenance Shop – CT Main Breaker Exterior Keyed Switch*

Image #3 – *Maintenance Shop – MDP*

Image #*4 – Maintenance Shop – (3) 1Ø Transformers*

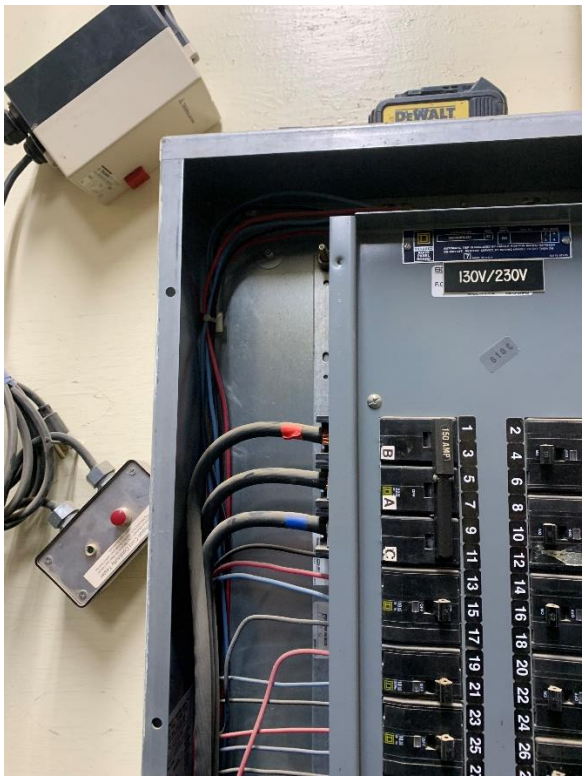


Image #5 – *Maintenance Shop - Panel 'A'*

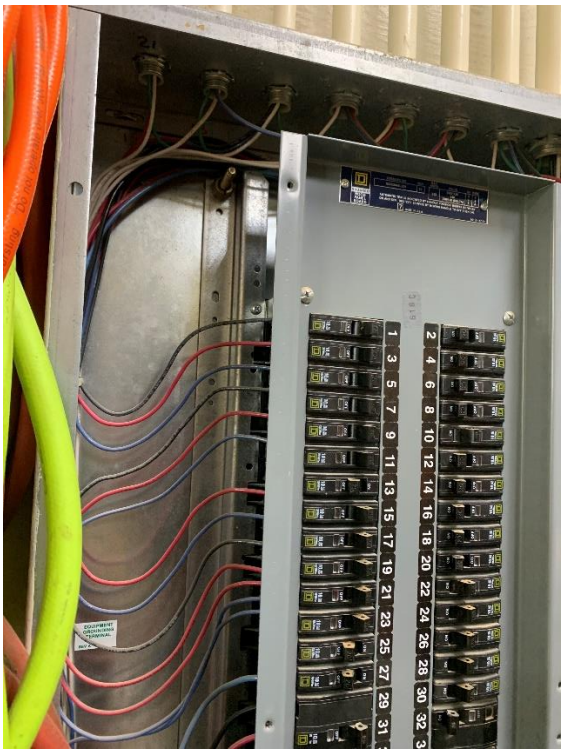


Image #6 – *Maintenance Shop - Panel 'B'*

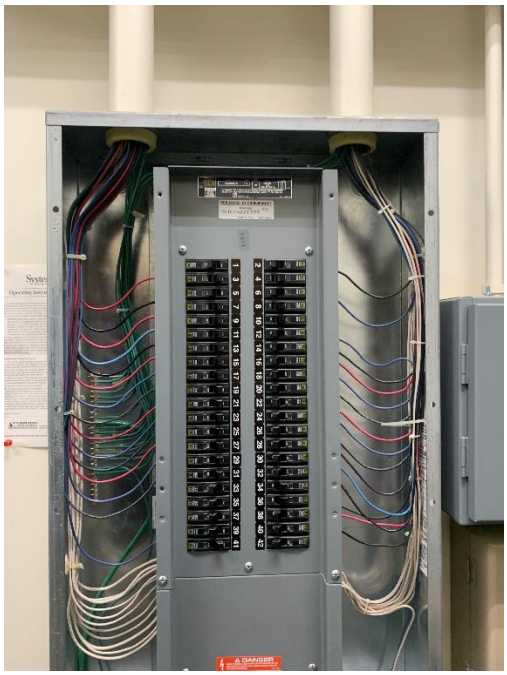


Image #7 - *Maintenance Shop – Panel 'C'*

Image #8 - *Maintenance Shop – Panel 'D'*

Image #9 – *Maintenance Shop – Panel 'M'*

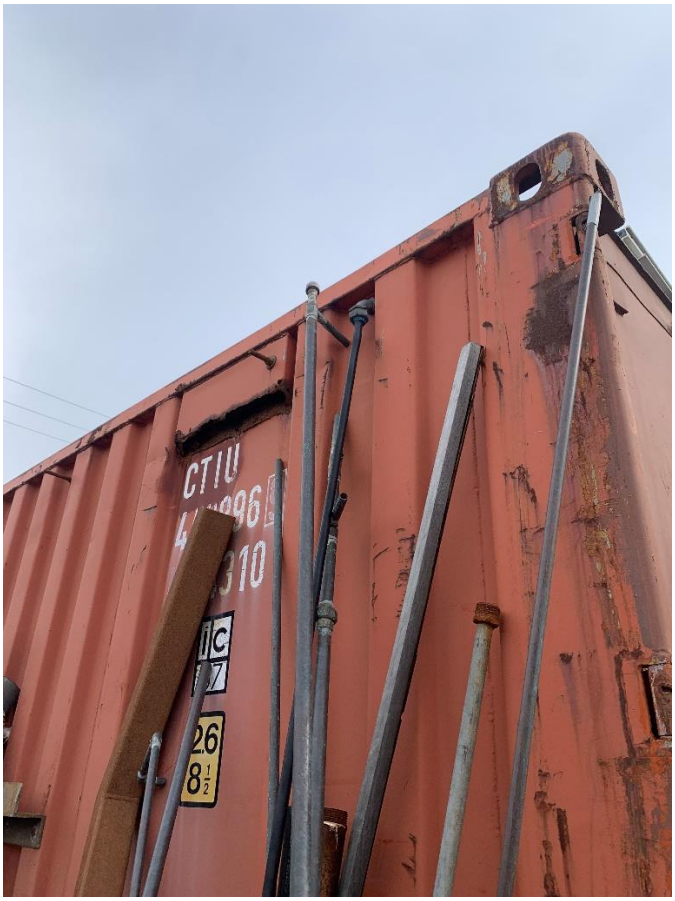


Image #10 – *Maintenance Shop – Connex*

Image #11 – *Maintenance Garage – CMD*

Image #12 – *Maintenance Garage – Panel 'Ext'*

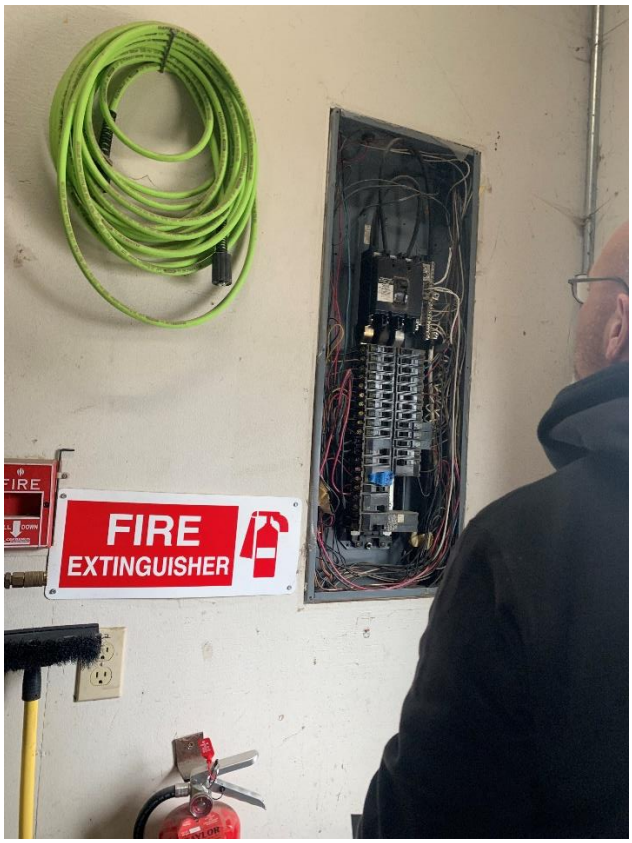


Image #13 – *Maintenance Garage - Panel 'Garage'*

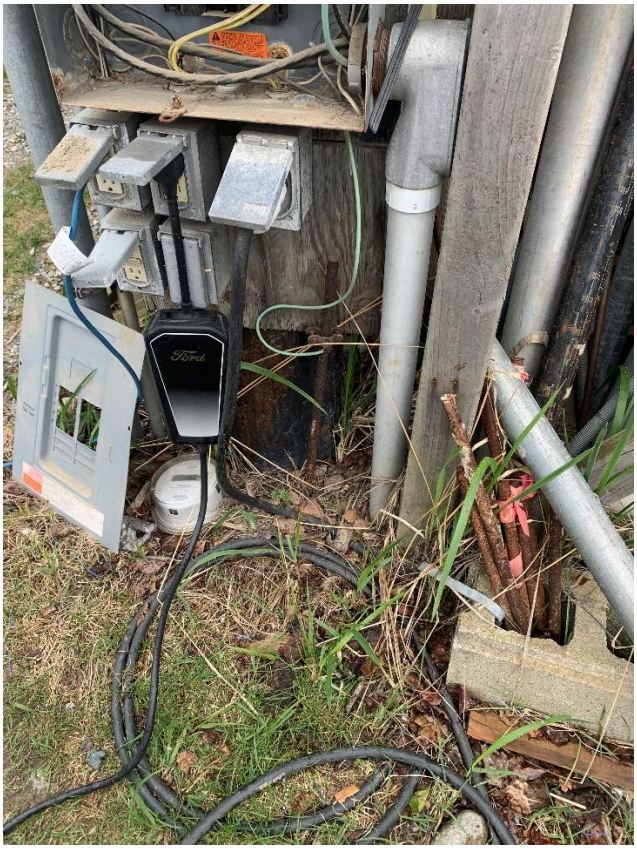


Image #14 – *Maintenance Garage - Exterior Receptacle*

Image #15 – *Curatorial Storage – Panel 'CS'*

Image #16 – *White Pass Depot Visitor Center/Admin Building – Meterbase & Service Disconnect*

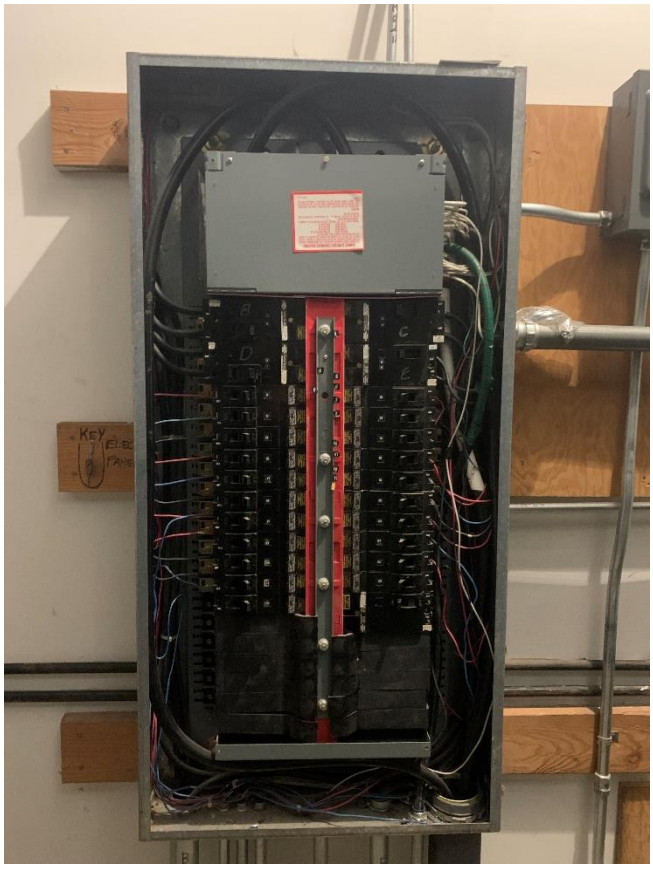


Image #17 – *White Pass Depot Visitor Center/Admin Building – Panel 'A'*

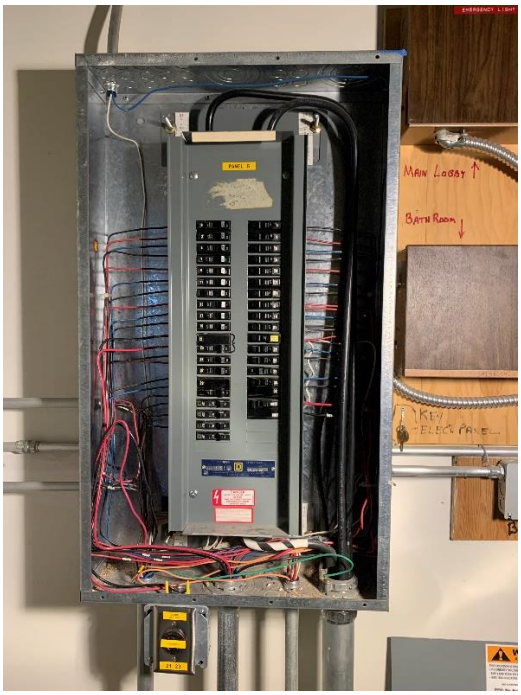


Image #18 – *White Pass Depot Visitor Center/Admin Building – Panel 'B'*

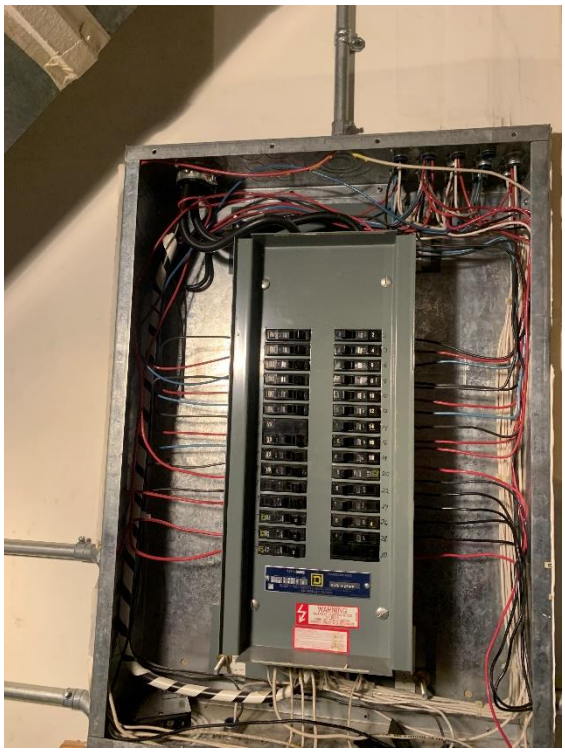


Image #19 – *White Pass Depot Visitor Center/Admin Building – Panel 'C'*

Image #20 – *White Pass Depot Visitor Center/Admin Building – Panel 'D'*

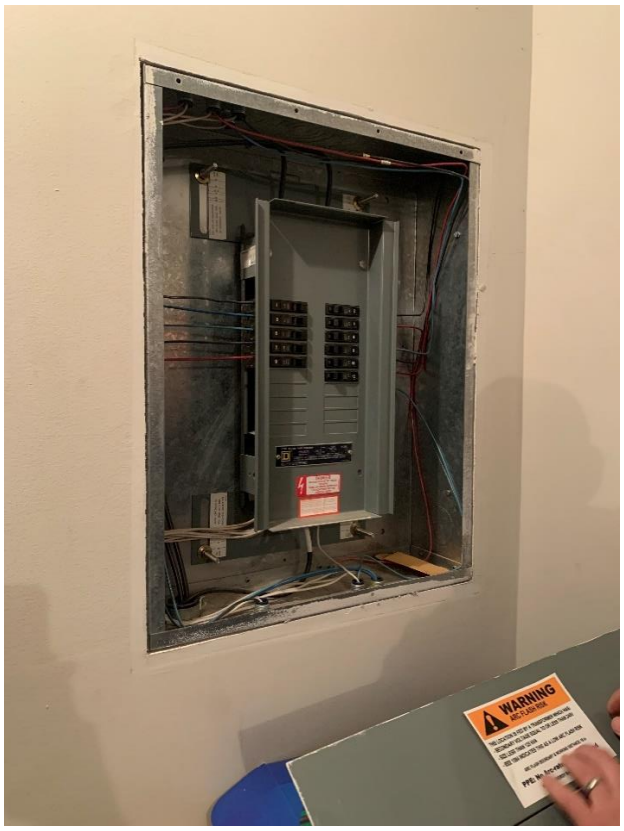


Image #21 – *White Pass Depot Visitor Center/Admin Building – Panel 'E'*

Image #22 – *White Pass Depot Visitor Center/Admin Building – DD113 Occupancy Sensor*

Image #23 – *Pantheon and Red Front Buildings – Meter-Pak Main Disconnects*

Image #24 – *Pantheon and Red Front Buildings – Panel 'N'*

Image #25 – *Pantheon and Red Front Buildings – Panel 'H'*

Image #26 – *Pantheon and Red Front Buildings – Panel 'Q'*

Image #27 – *Pantheon and Red Front Buildings – Panel 'L'*

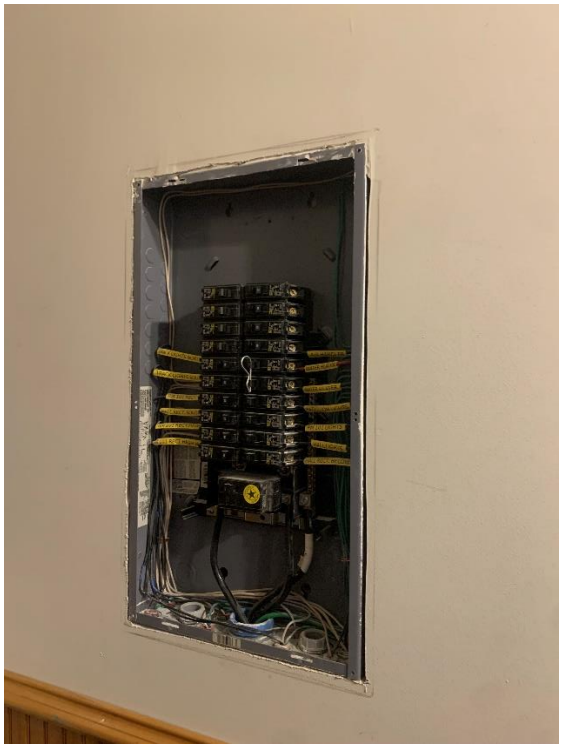


Image #28 – *Pantheon and Red Front Buildings – Panel 'Pantheon'*

Image #29 – *Kalvik House – Pad-Mounted Transformer*

Image #30 – *Kalvik House - CMD*

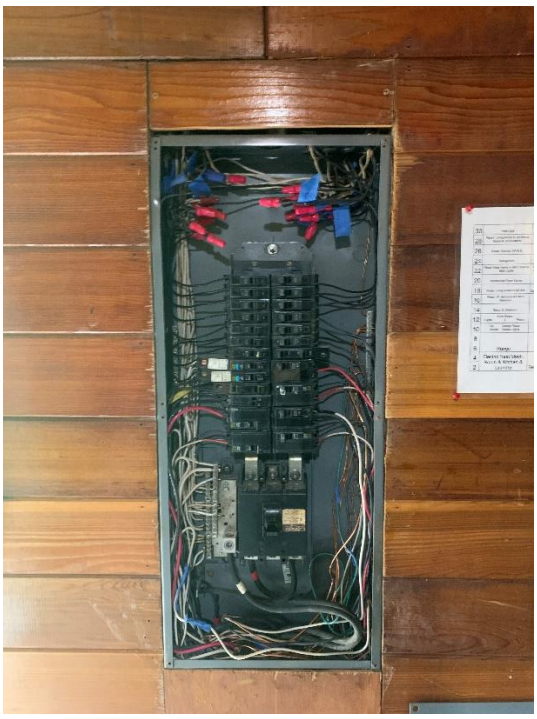


Image #31 – *Kalvik House – Panel 'House'*

Image #32 – *Kalvik House – Panel 'Bunkhouse'*

Image #33 – *Kalvik House – Dryer*

Image #34 – *Ranger Station Office/Dyea Cook House – Pad-Mounted Transformer*

Image #35 – *Ranger Station Office/Dyea Cook House – CMD*

Image #36 – *Ranger Station Office/Dyea Cook House – Panel 'BR'*

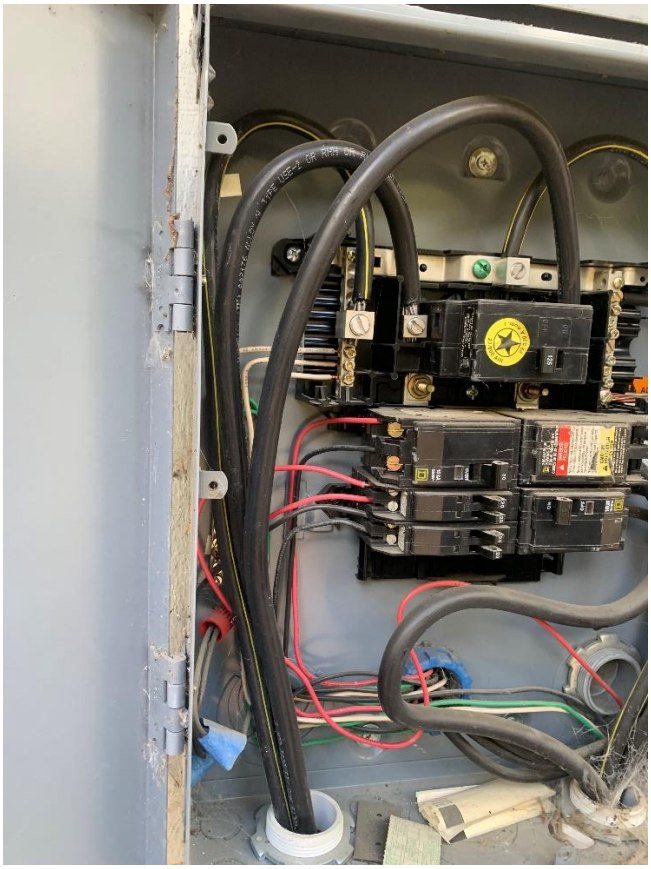


Image #37 – *Ranger Station Office/Dyea Cook House – Panel 'PR1'*

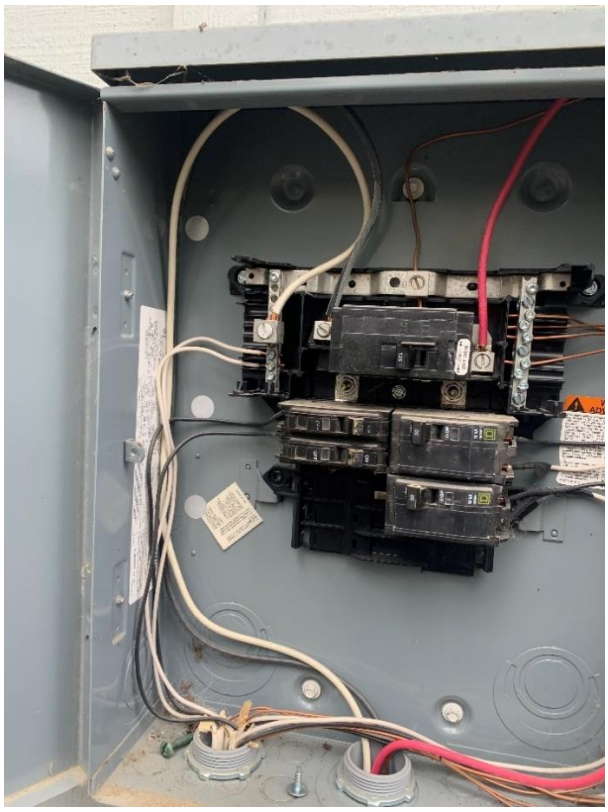


Image #38 – *Ranger Station Office/Dyea Cook House – Panel 'PR2'*

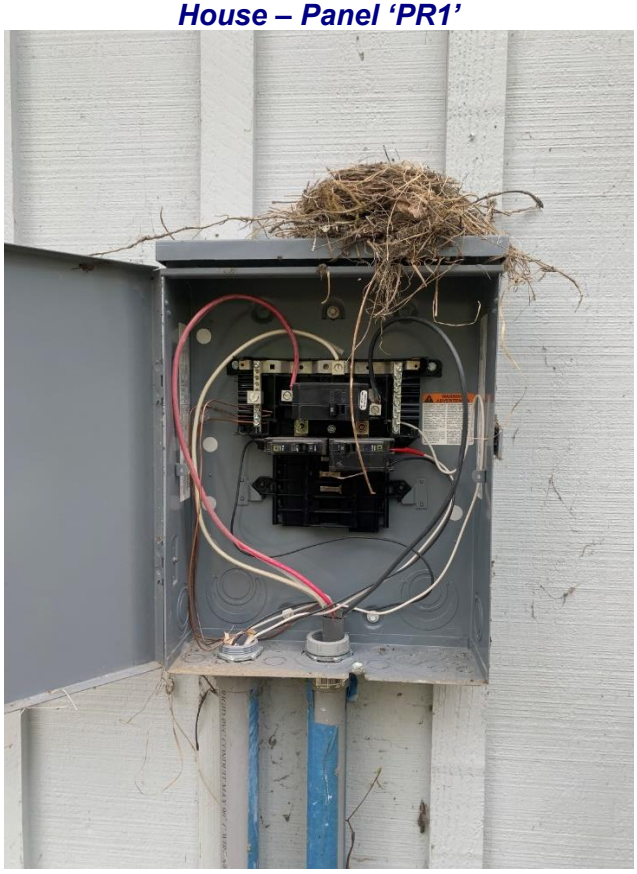


Image #39 – *Ranger Station Office/Dyea Cook House – Panel 'PR3'*

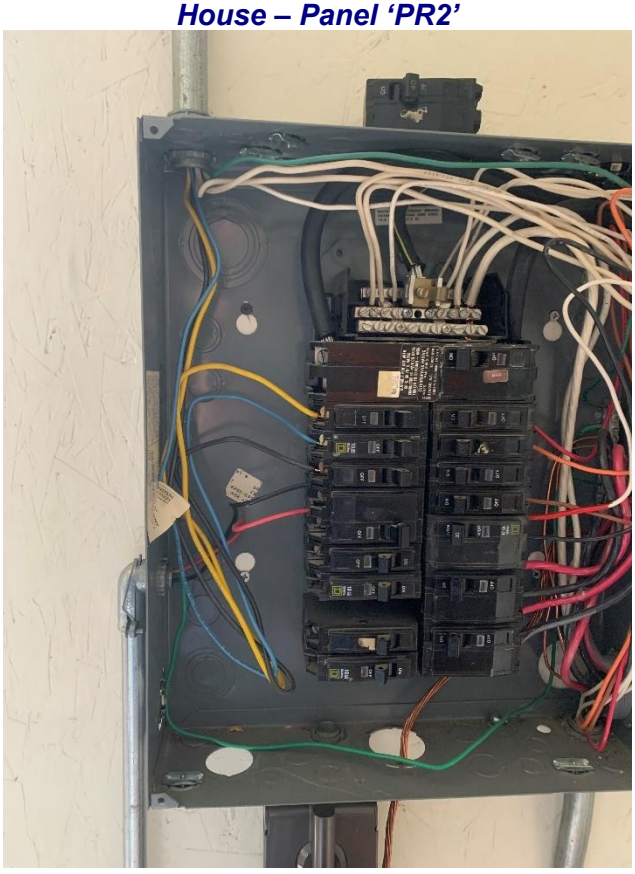


Image #40 – *Ranger Station Office/Dyea Cook House – Panel 'Office'*

Image #41 – *Ranger Station Office/Dyea Cook House – Broken Receptacle*

Image #42 – *Ranger Station Office/Dyea Cook House – MC Cable Missing Straps*

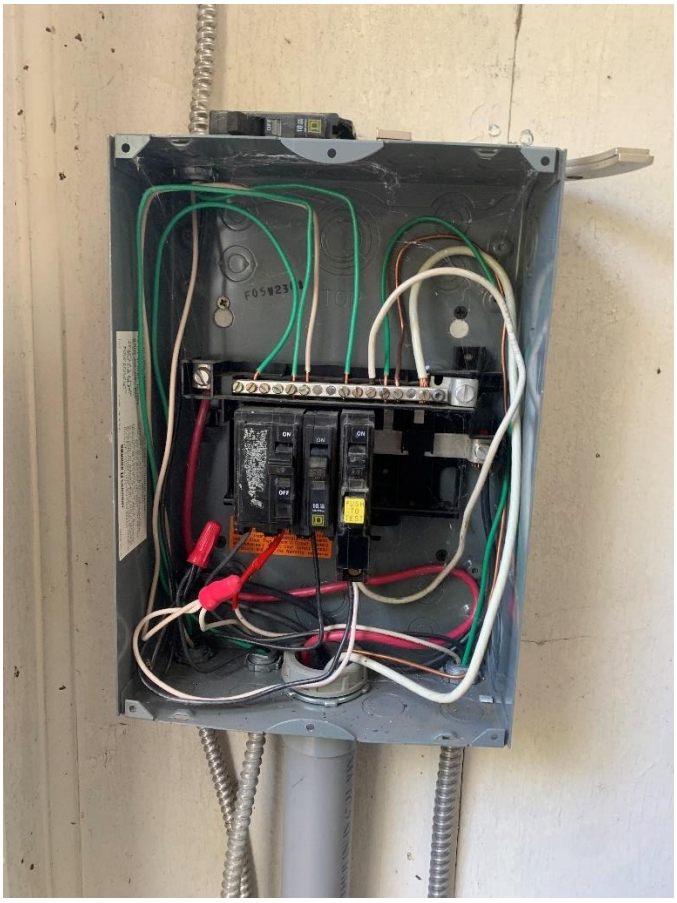


Image #42 – *Ranger Station Office/Dyea Cook House – Panel 'Pump Shack'*

Image #43 – *NPS Cederhouse – Pole-mounted Transformer*

Image #44 – *NPS Cederhouse – CMD*

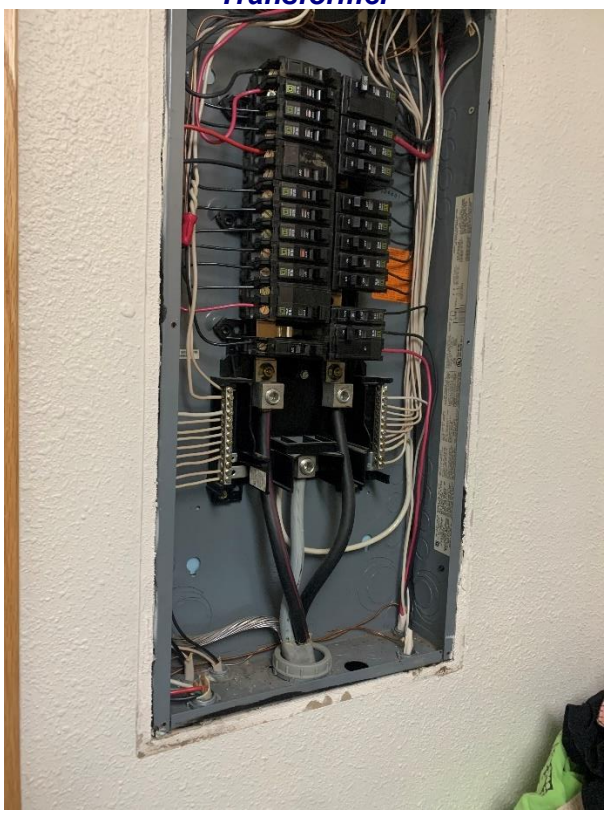


Image #45 – *NPS Cederhouse – Panel 'A'*

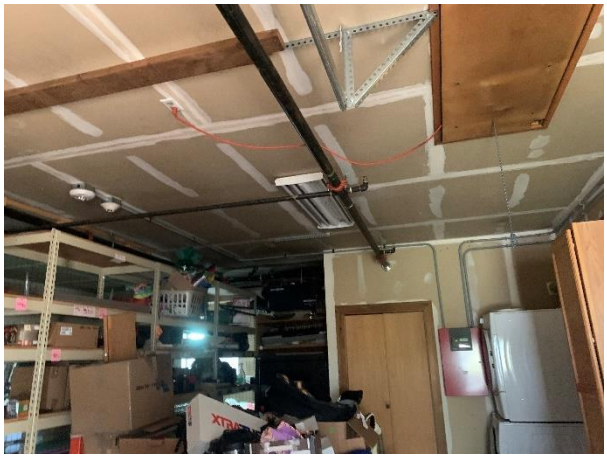


Image #46 – *NPS Cederhouse – Attic Hatch*

Image #47 –*Mascot Saloon – Pole Mounter Transformers*

Image #48 –*Mascot Saloon – CT Cabinet, Meterbase, & Service Disconnect*

Image #49 –*Mascot Saloon – Panel 'M'*

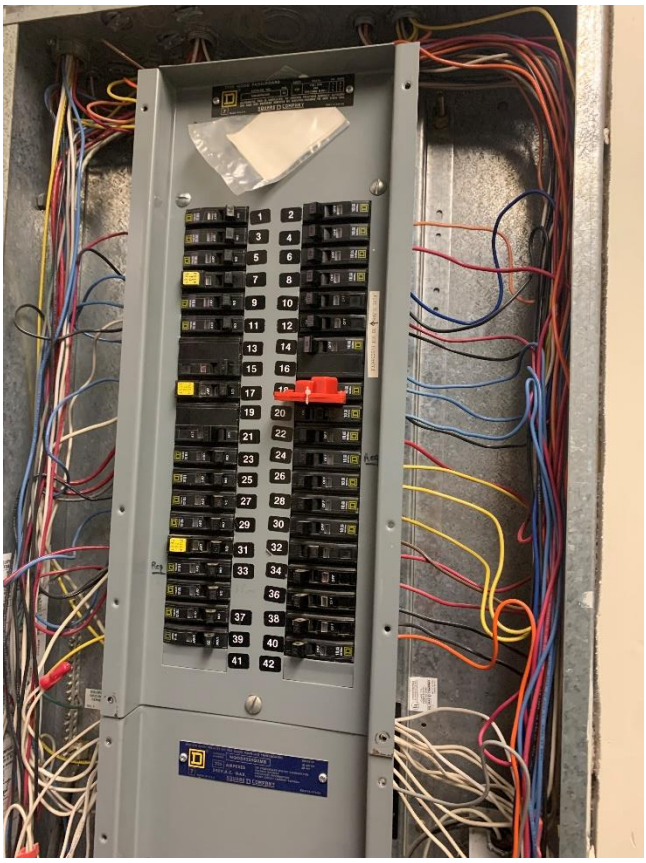


Image #50 – *lynch and Kennedy – Panel 'Elec'*

Image #51 – *lynch and Kennedy – Junction Box*

Image #52 – *The Pacific Clipper Line Office – Water Heater*

Image #53 – *Valve Pit – Junction Box*

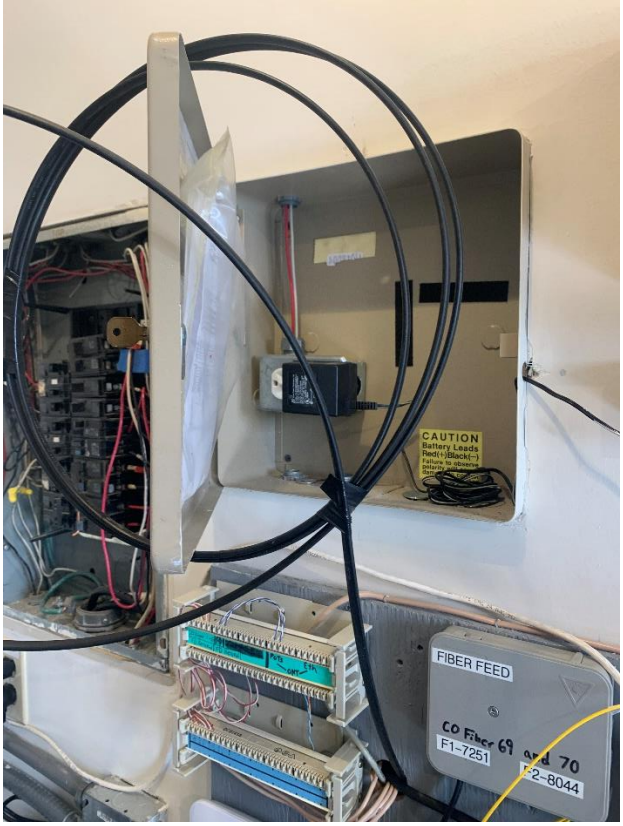


Image #54 – *Boss Bakery - Receptacle and Telephone Dialer*

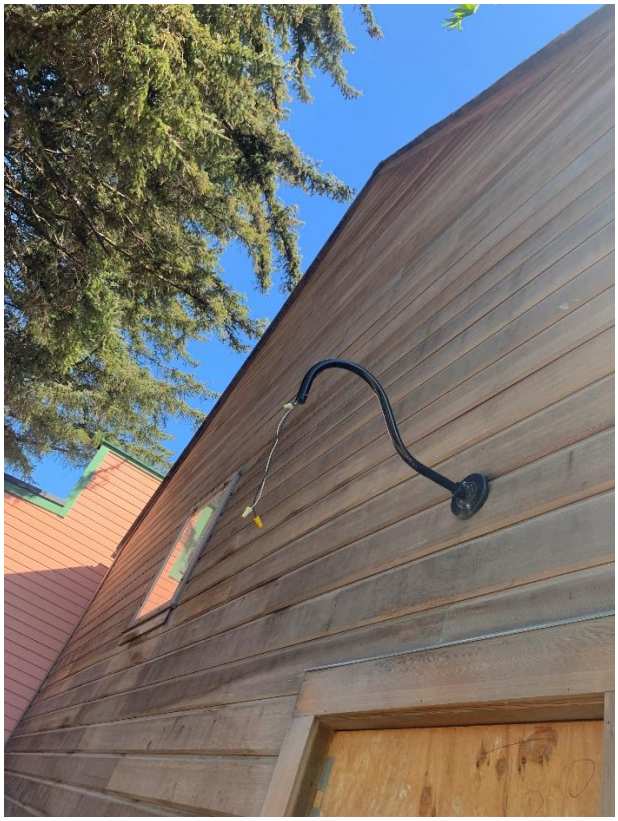


Image #55 – *Arctic Meat CO/YMCA Gym – Open Air Conductors*

Image #56 – *Arctic Meat CO/YMCA Gym – Conduit in Crawl Space*

Image #57 – *Moore House / Coop – PVC Leaving Panel 'Chicken Coop'*

Image #58 – *Duplex – Ground Wire*

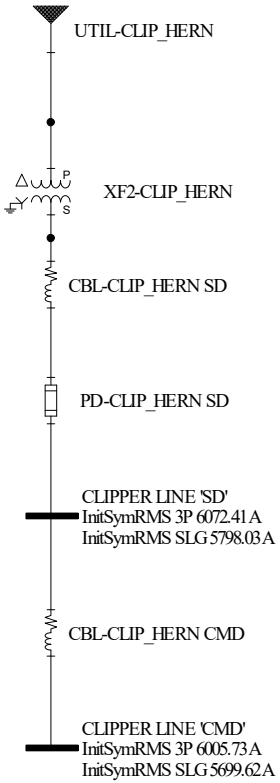
If you have any questions concerning the above, please do not hesitate to call me.

Sincerely,

Patrick Collins

Patrick Collins, P.E.
Electrical Project Engineer

csz/pcc/hhm
24-0352/M3144



KLGO - ARC FLASH ANALYSIS - CLIPPER/HERN
FACILITY ONE-LINE DIAGRAM
AUGUST 31, 2024

Project: Clipper_Horn
Base Project

DAPPER Fault Analysis Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage	-------- Contribution Data --------					PU (100 MVA Base)		
					Duty	Units	X/R			R PU	X PU
UTIL-CLIP_HERN	BUS-0005	In	12,470	3P:	1,000,000	MVA	9,999.00		Pos:	0.0000	0.0001
				SLG:	333,333	MVA	9,999.00		Zero:	0.0000	0.0001

Cables

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------				Per Unit (100 MVA Base)		
					Size	Cond. Type	Duct Type	Insul		R pu	jX pu
CBL-CLIP_HERN CMD	CLIPPER LINE 'SD'	In	2	5	3/0	Copper	Magnetic	PVC	Pos:	0.4652	0.2999
									Zero:	1.4660	0.7385
	CLIPPER LINE 'CMD'										
CBL-CLIP_HERN SD	BUS-0008	In	2	35	3/0	Copper	Magnetic	PVC	Pos:	3.2562	2.0993
									Zero:	10.2620	5.1694
	CLIPPER LINE 'SD'										

2-Winding Transformers

Xformer Name	In/Out Service	----------Primary & Secondary---------- Bus	Conn.	Volts	FLA	Nominal kVA	Z PU (100 MVA Base)	R pu	jX pu
XF2-CLIP_HERN	In	BUS-0005	D	12,470	2	50.0	Pos:	22.0000	36.0000
			WG	208	139		Zero:	22.0000	36.0000
		BUS-0008							

Project: Clipper_Horn

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

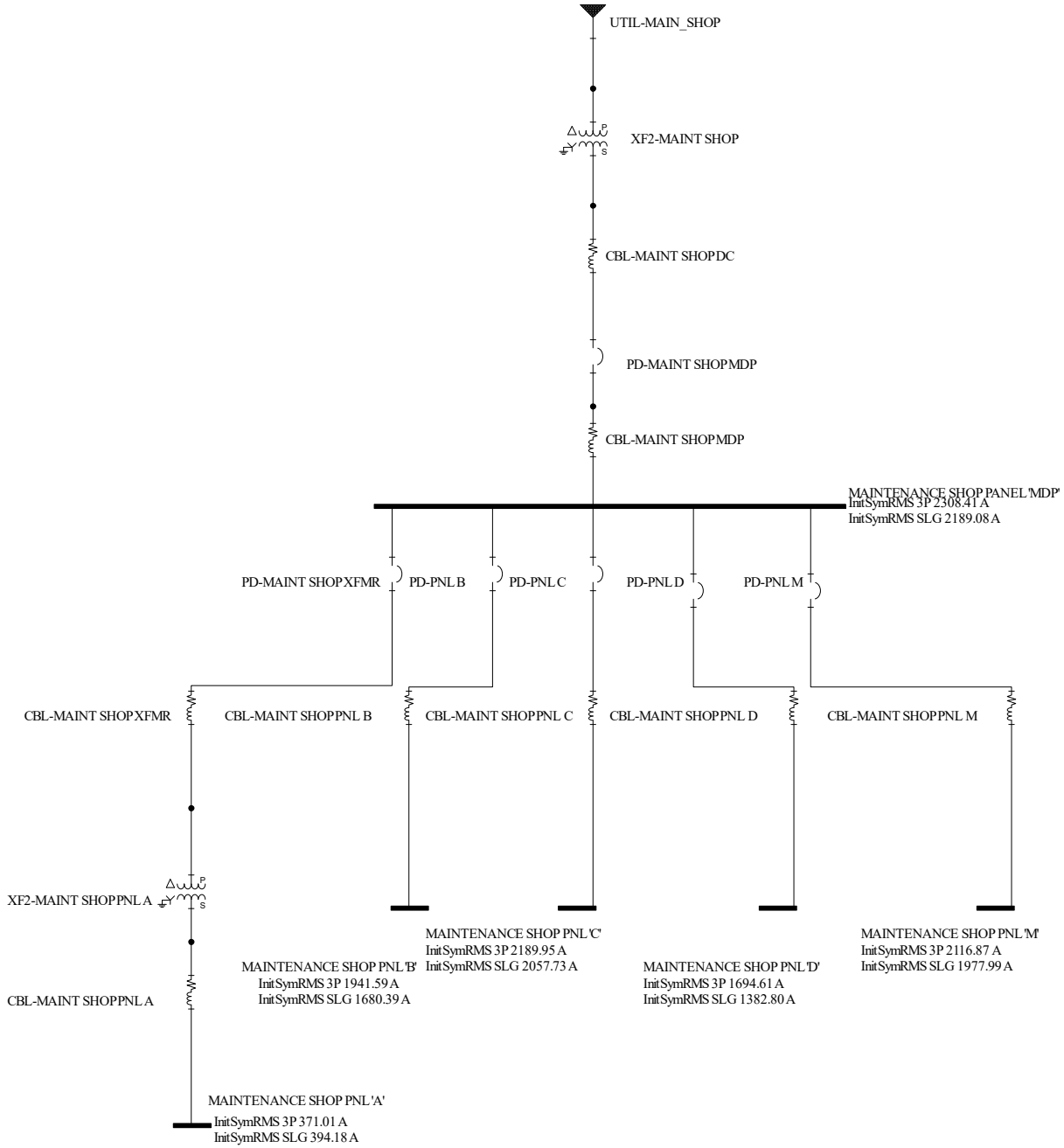
Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

				----------Initial Symmetrical Amps----------				----------Asymmetrical Amps----------				---Init Sym Neutral Amps---	
Bus Name	**---------Contributions---------**			**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
CLIPPER LINE 'CMD'				**6,006**	**5,700**	**0**	**0**	**6,094**	**5,762**	**0**	**0**		
	CBL-CLIP_HERN CMD	CABLE	In	6,006	5,700	0	0	6,094	5,762	0	0	5,700	
CLIPPER LINE 'SD'				**6,072**	**5,798**	**0**	**0**	**6,166**	**5,867**	**0**	**0**		
	CBL-CLIP_HERN CMD	CABLE	In	0	0	0	0	0	0	0	0		
	CBL-CLIP_HERN SD	CABLE	In	6,072	5,798	0	0	6,166	5,867	0	0	5,798	

Project: Clipper_Horn
Base Project

Arc Flash Evaluation Report

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Arc Duration	Arc Type	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
CLIPPER LINE 'CMD'	0.208	PD-CLIP_HERN SD	6.01	2.51	6.01	2.51	2.000	0.000	2.000	In Box	76.52	24.00	7.65	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
CLIPPER LINE 'SD'	0.208	PD-CLIP_HERN SD	6.07	2.54	6.07	2.54	2.000	0.000	2.000	In Box	77.13	24.00	7.75	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit



KLGO - ARC FLASH ANALYSIS - MAINTENANCE SHOP
FACILITY ONE-LINE DIAGRAM
AUGUST 31, 2024

Project: Maintenance_Shop
Base Project

DAPPER Fault Analysis Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage		-------- Contribution Data -------- Duty	Units	X/R		PU (100 MVA Base) R PU	X PU
UTIL-MAIN_SHOP	BUS-0001	In	12,470	3P:	1,000,000	MVA	9,999.00	Pos:	0.0000	0.0001
				SLG:	333,333	MVA	9,999.00	Zero:	0.0000	0.0001

Cables

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Per Unit (100 MVA Base)	R pu	jX pu
CBL-MAINT SHOP DC	BUS-0002	In	2	150	350	Copper	Magnetic	PVC	Pos:	6.5528	8.5117
									Zero:	20.6465	20.9585
	BUS-0013										
CBL-MAINT SHOP MDP	BUS-0013	In	2	7	350	Copper	Magnetic	PVC	Pos:	0.3058	0.3972
									Zero:	0.9635	0.9781
	MAINTENANCE SHOP PANEL 'MDP'										

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Per Unit (100 MVA Base)	R pu	jX pu
CBL-MAINT SHOP PNL A	BUS-0012	In	1	35	2	Copper	Non-Magnetic		Pos:	15.3707	3.6404
									Zero:	24.4395	9.2629
	MAINTENANCE SHOP PNL 'A'										
CBL-MAINT SHOP PNL B	MAINTENANCE SHOP PANEL 'MDP'	In	1	50	2	Copper	Magnetic		Pos:	23.3450	6.7608
									Zero:	73.5716	16.6420
	MAINTENANCE SHOP PNL 'B'										
CBL-MAINT SHOP PNL C	MAINTENANCE SHOP PANEL 'MDP'	In	1	15	2	Copper	Non-Magnetic		Pos:	7.0035	1.6191
									Zero:	11.1328	4.1189
	MAINTENANCE SHOP PNL 'C'										
CBL-MAINT SHOP PNL D	MAINTENANCE SHOP PANEL 'MDP'	In	1	95	2	Copper	Magnetic		Pos:	44.3556	12.8456
									Zero:	39.7860	31.6198
	MAINTENANCE SHOP PNL 'D'										
CBL-MAINT SHOP PNL M	MAINTENANCE SHOP PANEL 'MDP'	In	1	25	2	Copper	Non-Magnetic		Pos:	11.6725	2.6985
									Zero:	18.5547	6.8648
	MAINTENANCE SHOP PNL 'M'										
CBL-MAINT SHOP XFMR	MAINTENANCE SHOP PANEL 'MDP'	In	1	20	2	Copper	Non-Magnetic		Pos:	8.7833	2.0803
									Zero:	13.9654	5.2931
	BUS-0010										

2-Winding Transformers

Xformer Name	In/Out Service	----------Primary & Secondary---------- Bus	Conn.	Volts	FLA	Nominal kVA	Z PU (100 MVA Base) R pu	jX pu

Xformer Name	In/Out Service	----------Primary & Secondary---------- Bus	Conn.	Volts	FLA	Nominal kVA	Z PU (100 MVA Base)	R pu	jX pu
XF2-MAINT SHOP	In	BUS-0001	D	12,470	1	15.0	Pos:	86.6667	66.6667
			WG	208	42		Zero:	86.6667	66.6667
		BUS-0002							
XF2-MAINT SHOP PNL A	In	BUS-0010	D	208	17	6.0	Pos:	453.3333	286.6667
			WG	230	15		Zero:	453.3333	286.6667
		BUS-0012							

Project: Maintenance_Shop

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

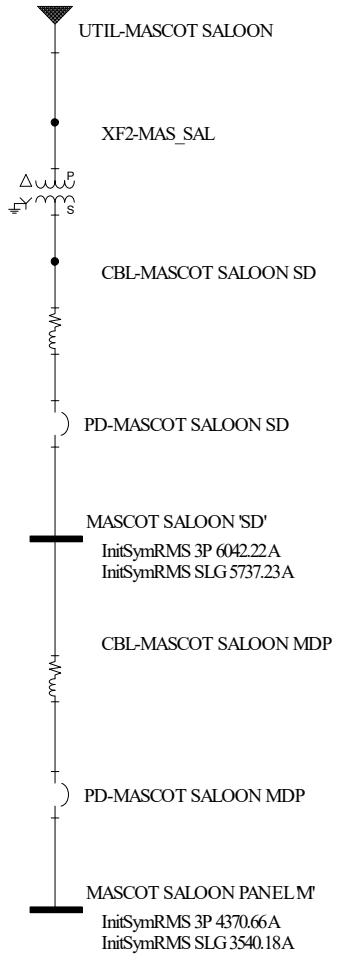
			----------Initial Symmetrical Amps----------				----------Asymmetrical Amps----------				---Init Sym Neutral Amps---	
Bus Name	**---------Contributions---------**		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
MAINTENANCE SHOP PANEL 'MDP'			**2,308**	**2,189**	**0**	**0**	**2,309**	**2,190**	**0**	**0**		
CBL-MAINT SHOP PNL B	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MAINT SHOP PNL C	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MAINT SHOP PNL D	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MAINT SHOP PNL M	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MAINT SHOP XFMR	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MAINT SHOP MDP	CABLE	In	2,308	2,189	0	0	2,309	2,190	0	0	2,189	
MAINTENANCE SHOP PNL 'A'			**371**	**394**	**0**	**0**	**371**	**394**	**0**	**0**		
CBL-MAINT SHOP PNL A	CABLE	In	371	394	0	0	371	394	0	0	394	
MAINTENANCE SHOP PNL 'B'			**1,942**	**1,680**	**0**	**0**	**1,942**	**1,680**	**0**	**0**		
CBL-MAINT SHOP PNL B	CABLE	In	1,942	1,680	0	0	1,942	1,680	0	0	1,680	
MAINTENANCE SHOP PNL 'C'			**2,190**	**2,058**	**0**	**0**	**2,191**	**2,058**	**0**	**0**		
CBL-MAINT SHOP PNL C	CABLE	In	2,190	2,058	0	0	2,191	2,058	0	0	2,058	
MAINTENANCE SHOP PNL 'D'			**1,695**	**1,383**	**0**	**0**	**1,695**	**1,383**	**0**	**0**		

Bus Name	---------Contributions---------		----------Initial Symmetrical Amps---------- 3 Phase	SLG	LLG	LL	----------Asymmetrical Amps---------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps--- SLG	LLG
CBL-MAINT SHOP PNL D	CABLE	In	1,695	1,383	0	0	1,695	1,383	0	0	1,383	
MAINTENANCE SHOP PNL 'M'			**2,117**	**1,978**	**0**	**0**	**2,117**	**1,978**	**0**	**0**		
CBL-MAINT SHOP PNL M	CABLE	In	2,117	1,978	0	0	2,117	1,978	0	0	1,978	

Arc Flash Evaluation Report

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Arc Duration	Arc Type	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
MAINTENANCE SHOP PANEL 'MDP'	0.208	MaxTripTime @2.0s	2.31	0.93	0.00	0.00	2.000	0.000	2.000	In Box	37.74	18.00	3.92	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
MAINTENANCE SHOP PNL 'A'	0.208	PD-MAINT SHOP XFMR	0.37	0.37	0.37	0.37	2.000	0.000	2.000	In Box	10.12	18.00	0.38	No Arc-rated PPE Required
MAINTENANCE SHOP PNL 'B'	0.208	PD-PNL B	1.94	0.77	1.94	0.77	2.000	0.000	2.000	In Box	33.36	18.00	3.22	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
MAINTENANCE SHOP PNL 'C'	0.208	PD-PNL C	2.19	0.87	2.19	0.87	2.000	0.000	2.000	In Box	36.35	18.00	3.69	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
MAINTENANCE SHOP PNL 'D'	0.208	PD-PNL D	1.69	0.66	1.69	0.66	2.000	0.000	2.000	In Box	30.28	18.00	2.76	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Arc Duration	Arc Type	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
MAINTENANCE SHOP PNL 'M'	0.208	PD-PNL M	2.12	0.84	2.12	0.84	2.000	0.000	2.000	In Box	35.48	18.00	3.55	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit



KLGO - ARC FLASH ANALYSIS - MASCOT SALOON
FACILITY ONE-LINE DIAGRAM
AUGUST 31, 2024

Project: Mascot Saloon
Base Project

DAPPER Fault Analysis Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage	-------- Contribution Data --------					PU (100 MVA Base)		
					Duty	Units	X/R			R PU	X PU
UTIL-MASCOT SALOON	BUS-0001	In	12,470	3P:	1,000,000	MVA	9,999.00		Pos:	0.0000	0.0001
				SLG:	333,333	MVA	9,999.00		Zero:	0.0000	0.0001

Cables

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------				Per Unit (100 MVA Base)		
					Size	Cond. Type	Duct Type	Insul		R pu	jX pu
CBL-MASCOT SALOON MDP	MASCOT SALOON 'SD'	In	2	175	250	Aluminum	Magnetic	PVC	Pos:	18.1213	7.7663
									Zero:	57.1145	19.1325
	MASCOT SALOON PANEL 'M'										
CBL-MASCOT SALOON SD	BUS-0002	In	2	40	250	Aluminum	Magnetic	PVC	Pos:	4.1420	1.7751
									Zero:	13.0547	4.3732
	MASCOT SALOON 'SD'										

2-Winding Transformers

Xformer Name	In/Out Service	----------Primary & Secondary---------- Bus	Conn.	Volts	FLA	Nominal kVA	Z PU (100 MVA Base)	R pu	jX pu
XF2-MAS_SAL	In	BUS-0001	D	12,470	2	50.0	Pos:	22.0000	36.0000
			WG	208	139		Zero:	22.0000	36.0000
		BUS-0002							

Project: Mascot Saloon

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

			----------Initial Symmetrical Amps----------				----------Asymmetrical Amps----------				---Init Sym Neutral Amps---	
Bus Name	**---------Contributions---------**		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
MASCOT SALOON PANEL 'M'			**4,371**	**3,540**	**0**	**0**	**4,380**	**3,542**	**0**	**0**		
CBL-MASCOT SALOON MDP	CABLE	In	4,371	3,540	0	0	4,380	3,542	0	0	3,540	
MASCOT SALOON 'SD'			**6,042**	**5,737**	**0**	**0**	**6,120**	**5,787**	**0**	**0**		
CBL-MASCOT SALOON MDP	CABLE	In	0	0	0	0	0	0	0	0		
CBL-MASCOT SALOON SD	CABLE	In	6,042	5,737	0	0	6,120	5,787	0	0	5,737	

Arc Flash Evaluation Report

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MASCOT SALOON 'SD'	0.208	PD-MASCOT SALOON SD	6.04	2.28	6.04	2.28	2.000	0.000	2.000	In Box	68.84	18.00	10.24	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
MASCOT SALOON PANEL 'M'	0.208	PD-MASCOT SALOON MDP	4.37	1.86	4.37	1.86	2.000	0.000	2.000	In Box	59.62	18.00	8.13	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit