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 - BELA
Trip Report

On 12/04/23 through 12/06/23 Jason Gold, with Consolidated Contracting & Engineering, and Caleb Kopp with RSA Engineering travelled to Nome to investigate the electrical distribution systems. The intent of the site visit was 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 in the electrical systems. For any equipment that is single phase and 240V, or less, an arc flash calculation was not required. See one-line diagrams for further information on site electrical systems. The following report will address any code issues we discovered as part of our investigation. All power distribution systems at BELA are single phase only, and as such no arc-flash analysis was performed.

Bunkhouse:

The Bunkhouse electrical system is served via a pole-mounted transformer fed to a building-mounted weatherhead from the overhead utility distribution system (Image #1). This weatherhead feeds a current transformer (CT) cabinet with meterbase (Image #2). The CT cabinet feeds a 120/240V, 400A, 2-Pole, 3W, Square D service disconnect, fused at 300A (Image #3). The service disconnect then feeds a 120/240V, 400A, 1Ø, 3W Square D Type NQOD panelboard, Panel 'MDP' (Image #4). Panel MDP feeds (2) 120/240V, 225A, 1Ø, 3W Square D Type NQOD main lugs only panelboards, Panel 'A' and Panel 'B' via (2) 150A 2-Pole breakers.

Code Deficiencies

1. Neutral and ground are not bonded at service disconnect (Image #7). Provide a #2 AWG Cu main bonding jumper to connect the neutral and ground bus at service disconnect per NEC section 250.28.
2. Panel 'MDP' is missing knockout seal. Provide knockout seal for unused openings per NEC 110.12(A).
3. Panel 'MDP' FACP breaker is not red or lockable (Image #4). Provide red identification and breaker lockout per NFPA 106.5.4.
4. There were instances of junction boxes with missing covers in the mechanical room (Image #8). Provide new covers for all junction boxes as required per NEC Section 314.25.
5. First floor mudroom and mechanical room are missing emergency lighting. Provide emergency lighting to illuminate path of egress in both areas per IBC 1008.3.
6. Panel 'A' and Panel 'B' are missing Arc Fault Circuit Interrupting (AFCI) breakers. Replace existing breakers with new AFCI type as required by NEC 210.12.

Electrical Recommendations

1. Panel 'A' and Panel 'B' 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 provide dedicated neutrals.
2. Panel 'A' breaker 27 'Headbolt Heaters' was tripped at the time of our site visit. Recommend identifying and fixing cause of trip.
3. Service grounding electrode conductors appear to be damaged and do not have a proper knockout (Image #9). Recommend a comprehensive investigation and repair of existing building's grounding system.

Duplex 203:

The Duplex 203 electrical system is served via a pole-mounted transformer fed to a building-mounted weatherhead from the overhead distribution (Image #10). This weatherhead feeds a building-mounted 120/240V, 400A, 3-Pole, 3W, Square D type knife switch service disconnect, with no fuses (Image #11). The service disconnect feeds a 120/240V, 400A, 2-Pole, 3W Square D 3-gang combination meterbase/main disconnect (CMD) with 150A 2-Pole, 150A 2-Pole, and 100A 2-Pole breakers. Rating of the multi-meter service gear is assumed based on service size as there were no visible markings.

One 150A 2-Pole breaker feeds a Unit A which was inaccessible at the time of the site visit. We are assuming the same electrical distribution as Duplex building 205 for this unit. With that assumption the 150A-2 Pole breaker would feed a 120/240V, 225A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'A1' located inside the building. Panel 'A1' has a 60A 2-Pole breaker which feeds a 120/240V, 60A, 3-Pole, 3W, Square D type fused disconnect fused at 60A, denoted as 'A-Disc'. 'A-Disc' then feeds a 120/240V,100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'A2'.

Another 150A 2-Pole breaker feeds a 120/240V, 225A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'B1', located inside the building (Image #12). Panel 'B1' has a 60A 2-Pole breaker which feeds a 120/240V, 60A, 3-Pole, 3W, Square D type fused disconnect fused at 60A, denoted as 'B-Disc' located on the exterior of the building (Image #13). 'B-Disc' feeds a 120/240V, 100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'B2' (Image #14).

The last breaker on the service disconnect is a 100A 2-Pole breaker feeding a 120/240V, 100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'M1', located inside the building.

Code Deficiencies

1. Electrical system does not have a ground rod. Instead, the grounding electrode conductor is currently connected to pilings. Provide ground rods and connect to existing system per NEC 250.53.
2. 'B-disc' is not grounded. Provide #10 equipment grounding conductor per NEC 250.118.
3. There were instances of junction boxes with missing covers in the building (Image #15). Provide new covers for all junction boxes as required per NEC Section 314.25.
4. #6 bare copper bonding jumper has been disconnected from a water pipe. Reconnect bonding jumper to existing water pipe per NEC 250.104(A).
5. Service disconnect is missing overcurrent protection. Provide fuses in existing knife switch service disconnect per NEC 230.90. Alternately the multi-meter pack may stand as the service disconnects for the building and the switch may be removed and feeders spliced. A service grounding electrode, per comment 1, and neutral-ground bond would need to be installed in multi-meterpack per NEC article 250.

Electrical Recommendations

No recommendations for this building.

Duplex 205:

The Duplex 205 electrical system is served via a pole-mounted transformer (Image #16) feeding to a building-mounted weatherhead from the overhead utility distribution system (Image #17). The weatherhead feeds a building-mounted 120/240V, 400A, 3-Pole, 3W, Square D type knife switch service disconnect, with no fuses. The service disconnect feeds a 120/240V, 400A, 2-Pole, 3W Square D 3-gang CMD with 150A 2-Pole, 150A 2-Pole, and 100A 2-Pole breakers (Image #18). Rating of the multi-meter service gear is assumed based on service size as there were no visible markings.

One 150A 2-Pole breaker feeds a 120/240V, 225A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'A1' located inside the building (Image #19). Panel 'A1' has a 60A 2-Pole breaker which feeds a 120/240V, 60A, 3-Pole, 3W, Square D type fused disconnect fused at 60A, denoted as 'A-Disc'. Rating of the disconnect is assumed to be similar to other equipment due to no visible markings. 'A-Disc' feeds a 120/240V,100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'A2' (Image #20).

Another 150A 2-Pole breaker feeds a 120/240V, 225A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'B1', located inside the building (Image #21). Panel 'B1' has a 60A 2-Pole breaker which feeds a 120/240V, 60A, 3-Pole, 3W, Square D type fused disconnect fused at 60A, denoted as 'B-Disc'. 'B-Disc' feeds a 120/240V, 100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'B2' (Image #22).

The last breaker on the service disconnect is a 100A 2-Pole breaker feeding a 120/240V, 100A, 1Ø, 3W, Square D Type NQOD Panelboard with main lugs only, Panel 'M1', located inside the building.

Code Deficiencies

1. Electrical system does not have a ground rod, grounding is currently connected to pilings. Provide and install ground rods to existing system per NEC 250.53.
2. 'A-Disc' was identified as not being grounded on site. Provide equipment grounding conductor to disconnect per NEC 250.118.
3. 'B-Disc' was identified as not being grounded on site. Provide equipment grounding conductor to disconnect per NEC 250.118.
4. Service disconnect is missing overcurrent protection. Provide fuses in existing knife switch service disconnect per NEC 230.90. Alternately the multi-meter pack may stand as the service disconnects for the building and the switch may be removed and feeders spliced. A service grounding electrode, per comment 1, and neutral-ground bond would need to be installed in multi-meterpack per NEC article 250.

Electrical Recommendations

1. There are recorded instances of shared neutrals on Panels 'A1', 'A2', and 'B1'. 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.

Warren House:

The Warren House electrical system is served via a pole-mounted transformer feeding to a building-mounted weatherhead from the overhead utility distribution system (Image #24). The weatherhead feeds down to a 120/240V, 100A, 1Ø, 3W, Square D CMD with 100A 2-Pole breaker (Image #25). Rating of the disconnect breaker is assumed due to lack of visible markings. CMD routes to an interior 120/240V,100A, 1Ø, 3W, Square D type QO Load Center denoted as Panel 'A' (Image #26). Rating of the load center is based on feeders as there were no visible markings on the equipment.

Code Deficiencies

1. Panel 'A' schedule is not legible. Trace out circuit in panel and provide clear, evident, and distinguishable typed circuit directories for panelboard per NEC section 408.4.
2. Panel 'A' lugs are double tapped (Image #27). Confirm with manufacturer that lugs are listed for multiple conductors per NEC 110.14 and provide label as appropriate.
3. There are instances of conduit not being securely supported and fastened in this building. Ensure conduit is securely supported and fastened per NEC 358.30.
4. Panel 'A' has a knockout seal missing. Provide knockout seal for unused openings per NEC 110.12(A).

Electrical Recommendations

1. Panel 'A' 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.
2. There were instances of wires going through asbestos. Recommend re-routing existing wiring through non-asbestos insulated material while taking appropriate precautions to ensure no contact is with asbestos.

Image #1 – *Bunkhouse - Weatherhead*

Image #2 – *Bunkhouse – CT Cabinet & Remote Meterbase*

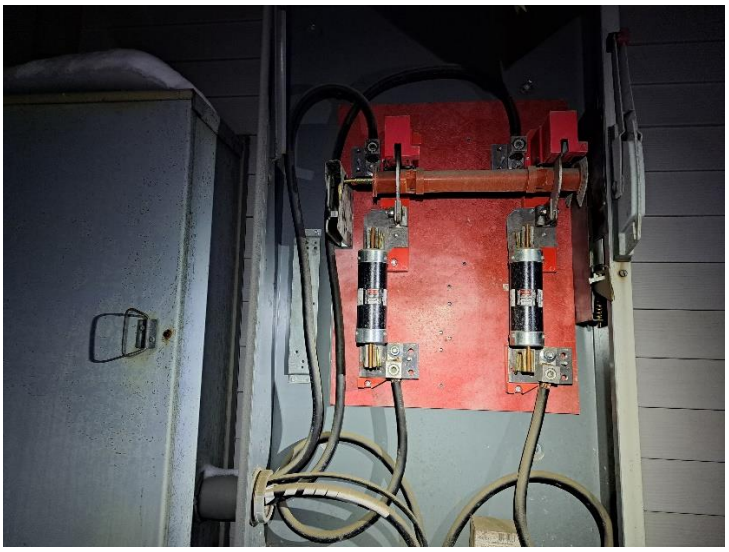

Image #3 – *Bunkhouse – Service Disconnect*

Image #*4 – Bunkhouse – Panel 'MDP'*

Image #5 – *Bunkhouse - Panel 'A'*

Image #6 – *Bunkhouse - Panel 'B'*

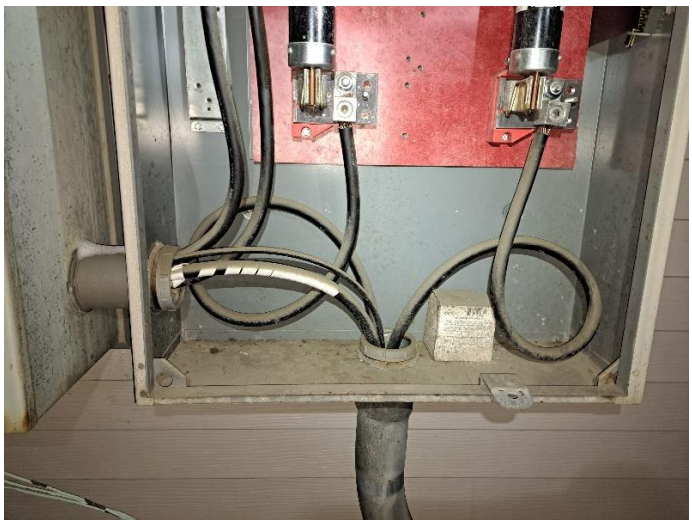

Image #7 – *Bunkhouse – Service Disconnect*

Image #8 – *Bunkhouse – Mechanical Room Junction Box*

Image #9 – *Bunkhouse - CT Cabinet Grounding Electrode Conductors*

Image #10 – *Duplex 203 – Weatherhead*

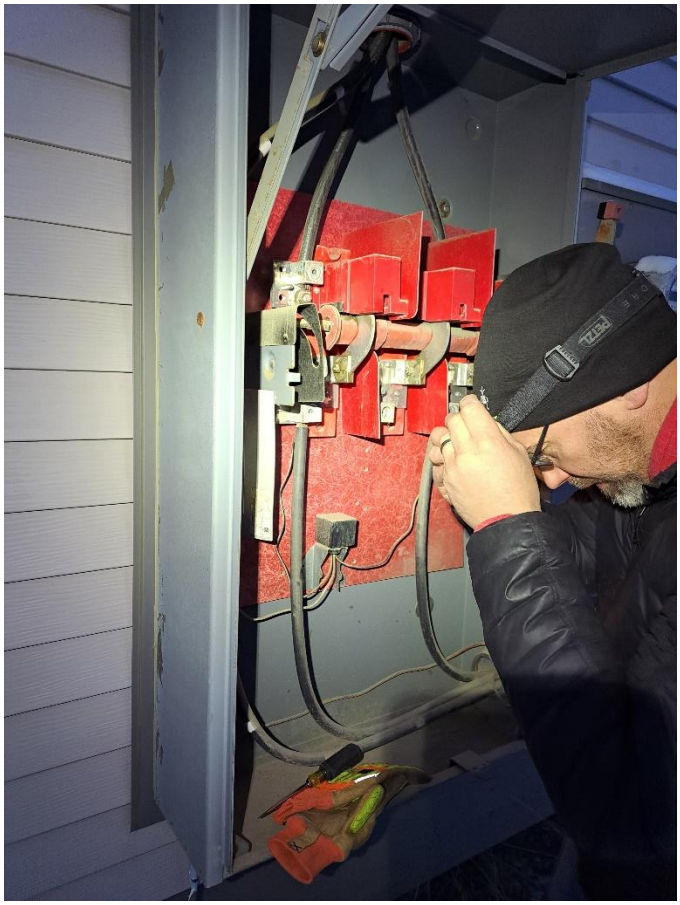

Image #11 – *Duplex 203 – Service Disconnect*

Image #12 – *Duplex 203 – Panel 'B1'*

Image #13 – *Duplex 203 - 'B-Disc'*

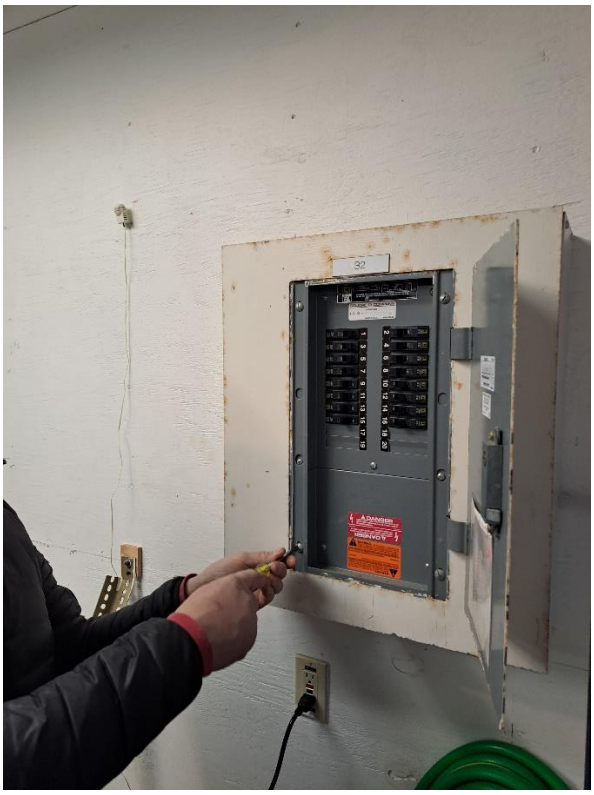

Image #14 – *Duplex 203 Panel - 'B2'*

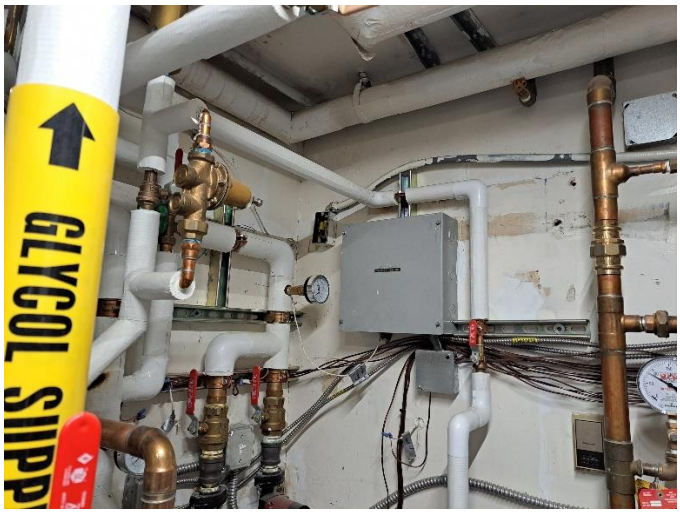

Image #15 – *Duplex 203 – Junction Box*

Image #16 – *Duplex 205 – Pole-mounted Transformer*

Image #17 – *Duplex 205 - Weatherhead*

Image #18 – *Duplex 205 – Service Disconnect & CMD*

Image #19 – *Duplex 205 – Panel 'A1'*

Image #20 – *Duplex 205 – Panel 'A2'*

Image #21 – *Duplex 205 – Panel 'B1'*

Image #22 – *Duplex 205 – Panel 'B2'*

Image #23 – *Duplex 205 – Panel 'M1'*

Image #24 – *Warren House – Utility Pole*

Image #25 – *Warren House – Combination Meterbase 100A 2-Pole Service Disconnect*

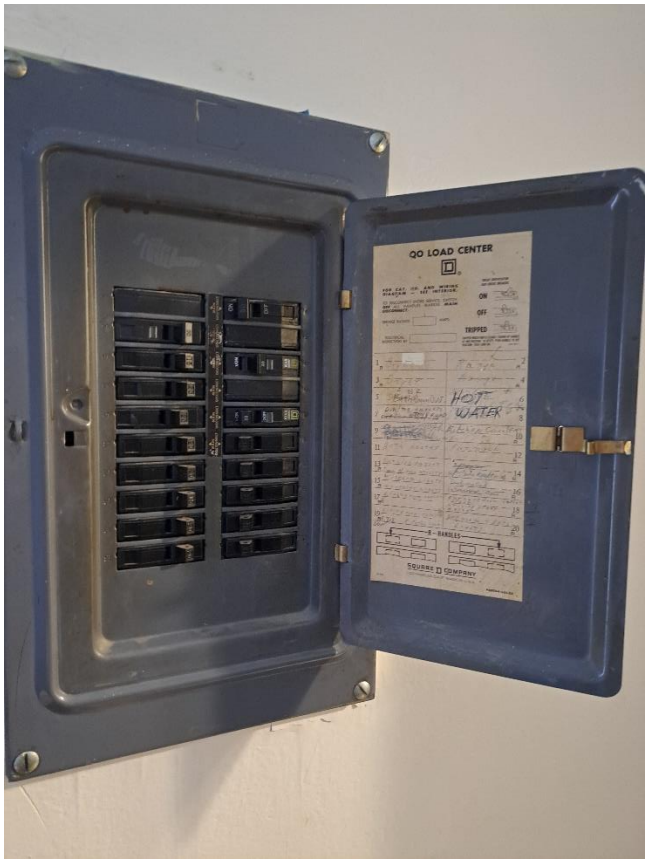

Image #26 – *Warren House – Panel 'A'*

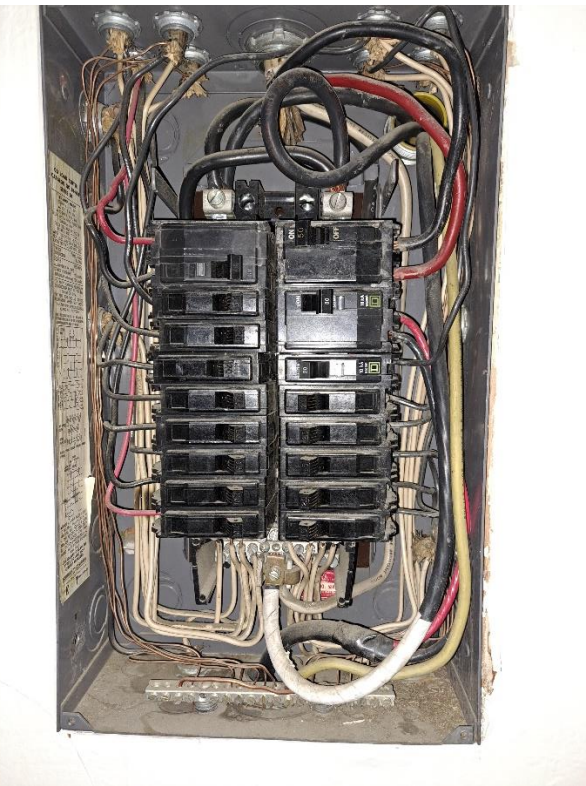

Image #27 – *Warren House – Panel 'A' Cover Off*

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

Sincerely,

Jeremy Maxie, P.E., LC, RCDD
Principal Electrical Engineer

jam/ab/hhm
24-0348/M3144