Restoring Type PSE Dead-Front Pad-Mounted Switchgear Following Immersion in Flood Waters

Supplement to Inspection and Maintenance Recommendations (Instruction Bulletin IB-2B-800)

Qualified Persons

⚠ WARNING

The equipment covered by this publication must be selected for a specific application and it must be operated and maintained by **Qualified Persons** who are thoroughly trained and knowledgeable in the installation, operation, and maintenance of underground power distribution equipment along with the associated hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment. Proper installation is the responsibility of the operating and construction personnel and the utility performing and authorizing the work. Completion of these instructions implies no further warranty by the manufacturer.

A **Qualified Person** is defined in the National Electrical Code (NEC/NFPA-70) as:

One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.

The specific electrical safety training requirements to be considered a qualified person are detailed in **NFPA-70E, Article 110.1(D), Employee Training**. Some of the requirements from the 2012 edition are shown below. For the specific detailed training requirements for a Qualified Person make certain to refer to the most recent applicable edition.

These training requirements would include, but are not limited, to the following key points:

- The skills and techniques necessary to distinguish exposed energized parts from other parts of electrical equipment.
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed.
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- Tasks performed less often than once per year have additional training requirements.

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment. Additionally, the recommendations in this instruction bulletin are not intended to supersede or to take the place of established utility safety guidelines and established practices. If there is any question, consult with your foreman or supervisor, as appropriate.

Please refer to OSHA 29 CFR 1910.399 and NFPA 70E Articles 100 and 110.

This supplement is to be used in conjunction with Instruction Bulletin IB-2B-800, "Inspection and Maintenance Recommendations for Dead-Front Pad-Mounted Switchgear, Type PSE". All Caution, Warning, Danger, and other Notes in that document apply to this supplementary document.

Air insulated switchgear, be it Live-Front (PSI) or Dead-Front (PSE), is not designed to be submersible. Once water touches, or comes in proximity to, energized parts or interrupting components, there is a substantially increased probability of immediate electrical failure or delayed electrical or mechanical failure of the switchgear. This supplement addresses the corrective actions to address exposure to a submerged condition.

When conditions warrant, barriers and insulators can be cleaned with a non-alcohol and non-solvent based cleaner that does not leave a residue when dry. Any residue must be removed. Any barrier showing swelling or warping should be replaced.

⚠ WARNING

When cleaning components, NEVER use any industrial strength cleaners. NEVER apply lubricants to the probe contact or the tulip contact, which are the interrupting contacts. NEVER use any solvent-based or flammable products on any components in the pad-mounted switchgear. Solvents and flammable products can attack non-metallic components of the equipment and reduce electrical and mechanical properties.

Before Opening the Switchgear

⚠ DANGER

The following inspection and maintenance procedures must be performed with the current-carrying parts completely de-energized and isolated from voltage. Any attempt to perform the inspection and maintenance with the current-carrying parts energized may result in electrical arc flash that can cause equipment damage, personal injury or death.

Initial Inspection after Flooding Event

1. If water has reached the floor-plate in the medium voltage compartment of a PSE dead-front pad-mounted switchgear unit (the top of the base spacer or bottom of the switchgear, if there is no base spacer), then action must be taken to preserve and restore the switchgear.

⚠ WARNING

The switchgear must be completely de-energized from all sources before any attempt is made to enter switchgear. Follow normal system operating practices to de-energize the unit, test for voltage and ground the unit before any work is performed.

2. If the switchgear has been submerged above the level of the switch interrupters or the fuse-mounting interrupters, the user may want to consider replacement, since it will be difficult to fully clean the interiors of the interrupters, reassemble, and realign them by other than factory personnel.

Standard Cleaning and Maintenance

3. Perform the Inspection and Maintenance functions recommended in Federal Pacific Instruction Bulletin IB-2B-800, including cleaning materials, lubrication, as well as the recommendations and procedures contained in this supplement.

⚠ NOTICE

Barriers, viewing windows and insulators can be cleaned with a non-alcohol and non-solvent based cleaner that does not leave any residue when dry. Residue must be removed.

Flooded Switchgear - Additional Steps

4. PSE Dead-Front Switchgear which has been flooded and is deemed suitable for restoration to service will require the additional inspection, cleaning, and maintenance.

⚠ WARNING

Current carrying parts must be completely de-energized from all sources before any maintenance is performed on these parts. Follow normal system operating practices to de-energize, test for voltage and ground these parts before any work is performed. Any attempt to perform the inspection and maintenance with the current-carrying parts energized may result in electrical arc flash that can cause equipment damage, personal injury or death.

a. Remove the roof. There are six sets of clamps and bolts (three on each side) in the termination compartments.

b. Remove the internal barriers. Take care not to damage barriers during removal or reinstallation.

⚠ WARNING

When removing barriers, care must be taken to keep the barrier clean and dry. Contamination on barrier can lead to tracking and arcing. Clean off any contamination with a non-alcoholic and non-solvent based cleaner that does not leave any residue.

c. Remove and clean or discard (and replace with new) the screened vent screens at the bottom of the medium-voltage compartment.

d. Rinse the interior of the switchgear with low pressure clean water and flush out any debris or water-soluble surface contaminants.

e. Clean the bus, the interrupters, the support insulators, and the barrier boards.

f. Rinse thoroughly with clean water

g. Dry with compressed air or other similar approved means.

h. After cleaning and drying, inspect all insulators and bushings to make certain there is no surface damage, including any imbedded permanent discolorations or cracks.

- All damaged, discolored, or cracked insulators must be replaced.

i. After cleaning and drying, inspect all barriers, make certain that there is no surface damage, including any imbedded permanent discoloration or warping.

- All discolored barriers must be replaced.
- Warped barriers must be inspected to make certain that correct "Electrical Clearances" are met, as specified in Table 1, and replace if necessary.

j. After cleaning and drying, inspect all metallic components of the switches and fuse mountings for corrosion. Operating components such as door latching mechanisms, springs, probes, switchblades, contacts, bus, ground studs and ground bars, and hardware items, such as nuts, bolts, washers, etc. displaying corrosion must be replaced.

k. Lubrication of Non-Current Carrying Parts – Non-current carrying parts, such as operating mechanisms, hinges and latches, may be lubricated with any lubricants that the user has determined to be suitable for such applications.

⚠ CAUTION

Do not put any lubricant on switch probe or puffer contacts. Refer to Inspection Bulletin IB-2B-800, section 10, "Lubrication of Current Carrying Parts".

l. Lubrication of Current Carrying Parts – NYE Reolube 363 is the only approved lubricant for current carrying parts, as listed below. Apply only a thin coat of lubricant.
- Fuse panel main contact stab.
- Contact interface at the fuse-mounting lower contact (hinge end).
- Contact interface at the fuse-mounting upper contact (receiver).
- Main-contact stab (stationary contact) on the Auto-jet® switches.

m. Install new vent plugs (or re-install cleaned existing plugs) at the bottom of the medium voltage compartment.

n. Verify that all bolts remain torqued for tightness and circuit continuity.

o. Reinstall the barriers.

p. Remove the old roof gasket and install a new roof gasket.

q. Ensure that the roof and interior are dry before re-installing.

r. Verify the integrity of terminations in accordance with the terminator manufacturer's recommendations. Replace any cable accessories or other third party components as appropriate.

s. Verify the integrity of SML-20 components and end fittings, FP-3097 end fittings, SMU-20 and DBU fuse units/refill units and SML-4Z fuse holders and refill units in accordance with the fuse manufacturer's recommendations.
- All fuses and fuse refill units in the switchgear which were not sealed and known to be free of moisture must be considered to be potentially damaged and are to be discarded and replaced.
- A silencer that has been submerged must be replaced as any residue inside may clog the exhaust path and cause a misoperation of the fuse assembly when a subsequent fuse operation occurs.

t. Replace instruction manuals and any damaged or obscured nameplates, ratings labels and hazard alerting signs (DANGER, WARNING, and CAUTION) of the pad-mounted switchgear.

u. **BEFORE RETURNING THE SWITCHGEAR TO SERVICE:**

i. With the equipment de-energized, perform one or two mechanical operations of each switch and fuse mounting to verify correct operation and alignment as described in Federal Pacific Instruction Bulletin IB-2A-210 – "Instructions for Installation and Operation, Type PSE. Dead-Front Pad-Mounted Switchgear, 15kV – 25kV."

ii. Verify the integrity of the insulation system in the equipment by applying high potential testing in accordance with applicable industry standards and the utility standard operating practices.

iii. As the combined effect of having many components submerged in water, which may have been polluted with heavy levels of contamination, and where there is a potential for hidden damage or hazards to go unnoticed, it is recommended that the unit be energized by a means the is initiated from a location OTHER THAN by operating the components such as switches and fuses in the specific switchgear unit being returned to service. For this purpose, Federal Pacific has developed a CO_2 actuated Portable Remote Operating Mechanism (PROM). Refer to Federal Pacific for details on this product.

5. If there is any doubt or suspicion about any component, it should be replaced.

Replacement Parts and Labels

If parts or labels are required, they may be ordered by contacting your local Federal Pacific Representative. A directory of the representatives can be found at www.federalpacific.com. **You may also contact Federal Pacific directly at 276-466-8200.**

If parts or labels are ordered, the unit serial number must be provided along with the part description.

Table 1 — Recommended Electrical Clearances

15kV, 25kV Pad-Mounted Unit Rating kV BIL	Recommended Clearances (minimum, in inches)				
	Phase-to-Phase or Phase-to-Ground Without Barrier	Phase-to-Phase or Phase-to-Ground With Barrier	Energized Bus (or device) to Barrier	Barrier-to-Ground in Vicinity of Energized Bus (or device)	Terminator or Insulator Skirts to Barrier
95	5-1/2"	3"	1"	3/4"	1/2"
125	7-1/2"	5"	2-1/4"	2"	1-1/4"

Notes: