LET'S BE PACIFIC™

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38kV Dead-Front Air-Insulated Pad-Mounted Switchgear – Another Federal Pacific 1st

Figure 1. Air-insulated 38kV dead-front pad-mounted switchgear brings security, switching and protection to sub-transmission voltage applications for underground distributions systems. Applications include (1) larger commercial and industrial applications where bulk-power rates are available; (2) step-up applications at large renewable energy installations where sub-transmission voltages are appropriate because of the longer distances that the power has to be transmitted before connection to the grid; and (3) utility sub-transmission infrastructure where overhead service is no longer considered acceptable due to unsightly poles and lines, or extension of existing lines into built up areas where right-of-way land purchases for overhead service are prohibitively expensive or the space is not available because the areas are congested.

Federal Pacific continues its leadership in the development of pad-mounted switchgear with the introduction of the industry's first 38kV air-insulated dead-front pad-mounted switchgear. Live-front 38kV pad-mounted switchgear has been a staple at a number of electric power utility installations for many years. The availability of 38kV dead-front pad-mounted switchgear provides electric-power utilities, industrial facilities, commercial developments and renewable-energy installations with an economic and environmentally friendly alternate choice to liquid-insulated and SF6-gas-insulated equipment. Liquid dielectrics will ignite at some temperature and thus remain a fire hazard; and they are very heavy, which makes it necessary to have a crane on site to lift and position such units. On the other hand, SF6 is the worst greenhouse gas and depletes the ozone layer, plus it is being prohibited by the federal government at its installations, by state governments in areas they can control and in the various Provinces of Canada.

Dead-front pad-mounted switchgear also provides an increased level of security above that of overhead lines with their exposure of equipment to contamination, animals and other obstructions, as well as an increased level of security for operating personnel by significantly reducing direct exposure to any energized parts. Enclosing the energized components in an inner compartment, which has a steel bottom floor, keeps them isolated so that operating personnel are only minimally exposed during normal switching operations and when changing fuses. Exposure only occurs when the insulated components, such as elbows and protective caps, are removed, but even then there is only very limited exposure because the actual energized parts are somewhat recessed and insulated covers can be installed to provide the necessary isolation. Dead-front 38kV units are available only with the SMU-20, DBU or CMU fuse units. Other types of 38kV fuses are too heavy for maneuvering of fuse panels and for handling of fuse assemblies with shotgun sticks.

Figure 2. Federal Pacific's 38kV dead-front pad-mounted switchgear is configured virtually the same as the 15kV and 25kV dead-front designs. The switch-termination compartment at left includes 600-amp bushings (at red dust caps) with phase labels, compartment label and adjacent parking stands. A large polycarbonate viewing window allows verification of switch blade position, which is further supported by a switch-position indicator label at the right side of the window – a black arrow (with yellow background) aligns with the open and closed labels to provide visual indication within the termination compartment of the actual switch position. Of course, switch position is absolutely verified by observing the switchblade position through the viewing window. The depth of the switch-termination compartment is adequate to accommodate piggybacked elbows or an elbow with a 200-amp interface to accept elbow surge arresters or grounding elbows.

Figure 3. Federal Pacific's 600 ampere 38kV Auto-jet® Load-Interrupter Switch remains the switching work-horse in the dead-front configuration as it is in all other voltage-class units. The steel operating arm insures fixtured alignment of switch blades and interrupters. Simultaneity of operation of the three interrupters is verified by 100% high-speed videography of the interrupter's performance. Similarly, 100% x-ray of the interrupters and insulators confirm the dielectric integrity of all bushings, bushing wells and insulators.

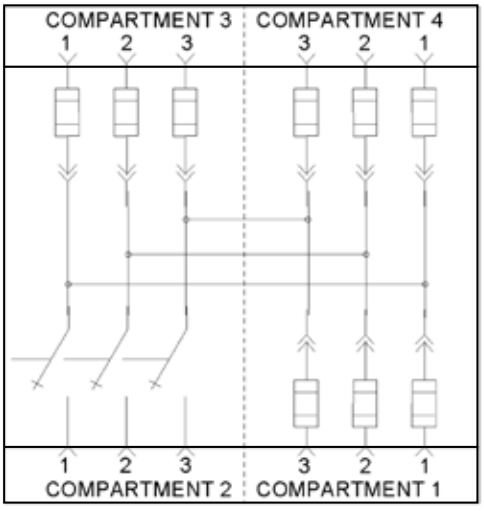

Figure 4. The above one-line diagram illustrates the 38kV PSE-12 configuration, which includes one 600-amp Auto-jet® Load-Interrupter Switch and three (3) three-phase sets of 38kV Federal Pacific fuse mountings, accommodating DBU fuse units, SMU-20 fuse units or CMU fuse units. And, the switchgear is furnished with Federal Pacific's FP-3097 end fittings which accommodate all of these fuse-unit brands.

Figure 5. Two of the fuse compartments of the 38kV PSE-12 are pictured above. The fuses are accessed in the same manner as the fuses in all Federal Pacific dead-front units – move the elbow to break the load, raise the latch and pull the fuse panel to pivot down 90° to the horizontal position, lock the fuse panel in place, move the gravity latch away from the contact rod, and push on the end fitting to unlatch the fuse assembly.

Figure 6. Fuse panels are shown open in one fuse compartment, revealing the typical shutter barrier that closes over the opening to maintain isolation of the interior high-voltage compartment. Fuse assembly is shown installed in center phase. Note that fuse panels are locked down using the locking bracket that secures the fuse panel to the door-opening flange (at arrow).

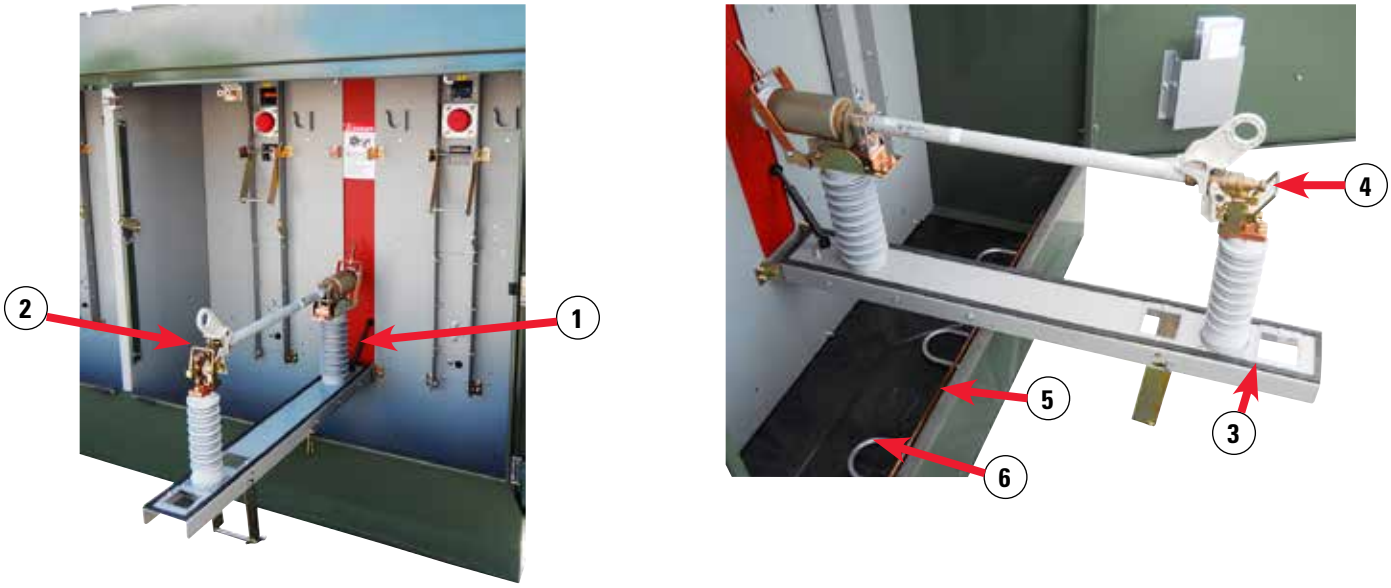

Figure 7. Close-up view of fuse panel at left shows ① black turnbuckle that slides to secure shutter barrier open or closed. Gravity latch ② at top fuse contact keeps fuse assembly secure in the fuse panel. If, for example, the fuse panel is inadvertently slammed closed with force, the latch holds the fuse assembly in place, preventing it from disengaging from the contact. A significant advantage of the Federal Pacific fuse-panel arrangement is that when open, the fuse assembly is clearly isolated from high voltage as the contacts at both ends are visible – the visible break insures complete isolation of the fuse assembly. Close-up view at right shows gasket ③ around the edge of the fuse panel that seals the panel against the equipment-mounting wall to prevent contamination from entering the high-voltage compartment. The gravity-latch ④ at the top fuse contact has been moved off the contact to allow removal of the fuse assembly. The copper ground rod ⑤ is visible near the edge of the door opening. The three cable guides ⑥ extend from the bottom flange of the enclosure and when the cable is properly trained through them and positioned on the parking stand, the cable is kept out of the way when the fuse panel is pivoted open or closed.

Figure 8. The switch-operating handle and its storage pocket are pictured above. The pocket and cover (and its hinge) are of stainless steel. The cover is secured closed using a pentahead bolt and is also padlockable. The handle, which is extendable, is held in place by two clips on the back of the cover when the cover is raised. The handle pocket includes a one-line diagram, a green (open) and (red) closed position indictor with a yellow lever pointing to show the actual switch position. A key interlock (at arrow) is provided and is held captive when the switch is closed. When the switch is opened, the key can be turned and removed, allowing it to be inserted in the corresponding key interlock on the access doors to fuse compartments, so they can be opened. It is this sequence that insures that the circuit is open on the incoming side, de-energizing the fuses (unless backfeeds exists, which must be confirmed by checking for the presence of voltage) before access is obtained to the fuses.