TECHNICAL BULLETIN

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TOPIC: FEDERAL PACIFIC PANELS (FPE)

History:

The history of Federal Pacific “Stab-Loc” Panels (FPE panels)goes as far back as the 1960’s when they were installed in residential applications nationwide. The text below is a result of a study that was conducted by the Consumer Protection Safety Commission as a result of reports that FPE panels were failing to perform their intended functions under normal conditions:

The Commission investigation into Federal Pacific Electric (FPE) circuit breakers began in June, 1980, when Reliance Electric Co., a subsidiary of Exxon Corporation and the parent to FPE, reported to the Commission that many FPE circuit breakers did not fully comply with Underwriters Laboratories, Inc. (UL) requirements. Commission testing confirmed that these breakers fail under certain UL calibration test requirements. The Commission investigation focused primarily on 2-pole residential circuit breakers manufactured before Reliance acquired FPE in 1979.

To meet UL standards, residential circuit breakers must pass a number of so-called "calibration tests." The purpose of these tests is to determine whether the circuit breakers will hold the current for which they are rated and also automatically open or "trip" (shut off the current) within the specified time limits if over-loading of the circuit breakers causes current levels in excess of the breaker's amperage rating. (Overloading can occur because a consumer plugs too many products into a circuit or due to the failure of a product or component connected to that circuit.)

While the Commission is concerned about the failure of these FPE breakers to meet UL calibration requirements, the Commission is unable at this time to link these failures to the development of a hazardous situation.

According to Reliance, failure of these FPE breakers to comply with certain UL calibration requirements does not create a hazard in the household environment. It is Reliance's position that FPE breakers will trip reliably at most overload levels unless the breakers have been operated in a repetitive, abusive manner that should not occur during residential use. Reliance maintains that, at those few overload levels where FPE breakers may fail to trip under realistic use conditions, currents will be too low to generate hazardous temperatures in household wiring. Reliance believes that its position in this regard is supported by test data that is provided to the Commission.

Federal Pacific Electric Panels: Fires Waiting to Happen, Debate Waiting to Be Ended

Federal Pacific Electric "Stab-Lok" service panels and breakers are dangerous and can fail, leading to electrical fires. The problem is that some 240-Volt FPE circuit breakers and possibly

also some 120-Volt units simply may not work. [NOTICE: 11/10/95 A paraphrase of this article was been posted on Internet in 1995]--Dan Friedman

It has been suggested that there are as many as 28 million of these breakers in use in the U.S. which means that in some conditions as many as one million of them may fail to provide proper fire protection.

But where are they? Most homeowners whose houses are served by these panels are unaware of the hazards. So too are some inspectors and contractors. Because most homeowners do not order periodic electrical safety inspections, the presence of these panels is often undiscovered until an inspection made in the course of renovating or selling a property. Our field experience indicates that even when problems occur with this equipment, often it is simply removed or replaced with little publicity. Neither manufacturers nor some electricians are inclined to frighten consumers.

These breakers can fail to trip at an alarming rate. At a modest overload (135% of rating) switches that had never been touched (never mechanically switched) were energized on both poles. These failed 25% of the time, followed by a lockup that meant the switch would never trip in the future at any overload. Once these switches had been flipped on and off (mechanically energized), failures increased to 36%!

Worse, when individual poles on these switches were energized under the same conditions, 51% of the "virgin" switches failed, and for switches that had been mechanically energized, a whopping 65% of them failed!

When a circuit breaker will not trip in response to an overload there is a serious risk of fire.

Homeowners and renovators who encounter these panels should consider replacing them with new equipment. Panel replacement, can involve significant expense, typically $800 to $1200 depending on service size and other factors.2

But identifying one of these defects can lead to an argument and in some cases, even lawsuits! For example, a knowledgeable inspector or contractor observes one of these panels and recommends replacement. An owner or another inspector, unaware of the background, refuses to cooperate, and insists there is "no problem." Who's right?

There is indeed a problem. FPE panels and circuit breakers are a "safety-related defect." In some conditions the equipment may not provide the safety protection (against fire) that was intended.

This defect is associated with FPE panels and circuit breakers manufactured in the 1970's and possibly extending to current equipment. Testing was performed in 1982-3 by Wright Malta Corporation for the US Consumer Product Safety Commission.

What actually happens to cause unsafe conditions? Testing performed on FPE 2-pole (240V) circuit breakers indicated that in some overload conditions, particularly when one pole of the

breaker is overloaded, the circuit breaker will not trip. Some tests showed that as many as 65% of the circuit breakers would malfunction.

Once this malfunction has occurred the breaker is "locked" and it will not trip under any circumstances, creating an even more serious fire hazard.

Are there real-world instances in which a current overload occurs on just a single "leg" of a 240-Volt circuit? Sure. At least some **clothes dryers and electric ranges** split the 240-V delivered to the appliance to run individual components such as a dryer drum motor or individual heater elements. **Multiwire branch circuits** which share a common neutral wire also serve different loads in a building.

Special Notice: Multi-wire Branch Circuits - warning: to avoid overheating neutral wire and shock hazards involving multi-wire branch circuits, it is important to assure that each of the individual circuits is on opposite poles (in the panel) from the other. In most panels this is accomplished, in fact forced, by using a 240-V common-trip-tie breaker (ganged together switches) which forces individual circuits onto opposite poles. However in FPE panels, the panel bus design does not provide this assurance. Ref: "Safe Wiring Practice," Rex Cauldwell, Journal of Light Construction, letter March 1995, p.6.

It is possible that there are similar failures among single-pole (120V) breakers. At least one case of a single-pole 120-Volt FPE GFCI breaker which failed to trip has been reported.

Furthermore, simply purchasing new circuit breakers of the same type from the same manufacturer may not correct the problem. And only special FPE breakers fit in the FPE "Stab-Lok" electric panel.

When this issue was examined in the early 1980's, FPE's opinion was that the chances of an overload occurring on only a single pole of a 240-volt breaker were very small. In our view there are some very common real-world examples where single-pole loading in a 240-volt breaker might include failures: multi-wire branch circuits and in electric clothes dryers where one of the heating elements shorts to the steel case of the dryer.

The circuit breakers do not directly cause an electrical fire. Some other failure must occur which in turn causes an overload of the circuit "protected" by the FPE breaker. When the breaker fails to trip in response to the overload it has failed to provide the protection intended, and a fire may result. That indirection is why we call this a "latent safety defect."

Why we call this a "latent safety defect" rather than just "hazardous" or "dangerous" needs more explanation. Unfortunately, some people who stand to face big costs grasp at fine distinctions about the failure mechanism in order to avoid facing the problem.

When a defect is itself likely to cause injury directly, such as live wires poking out of the wall by the bathroom sink, we call it a "hazard."

When a defect does not directly cause the injury or loss, such as a circuit breaker, which may fail to trip when something else is causing an unsafe over-current, we call it a "latent safety defect.

Either way, it's still a problem that needs prompt attention.

Is this a linguistic debate or is it really an issue in the field? You bet it's an issue. Recently during an examination by a Maryland home inspector an FPE panel was observed and flagged as a potential hazard, which should be remedied. The property owner, concerned about his sale, complained and threatened to sue the inspector.

We were able to provide the inspector with referral to Dr. Jess Aronstein, an engineer in Poughkeepsie, New York, who in turn provided supporting documentation: reports on this problem, a bibliography, and a press release from FPE.

In another example of the dangers of this "latent safety defect," Dr. Aronstein reported that during a disturbance in a jail, a guard hit a gang-switch in an FPE "Stab-Lok" load center in the cell block area. The breaker did not trip. Rather, it shorted to ground in the switch, blowing a hole in the cover plate.

Building inspectors and renovators often face the discovery of a product which is potentially harmful, which should be replaced, but for which there is little public documentation to justify their position.

Disagreement among people affected by this issue means that it's necessary to be able to cite actual research.