

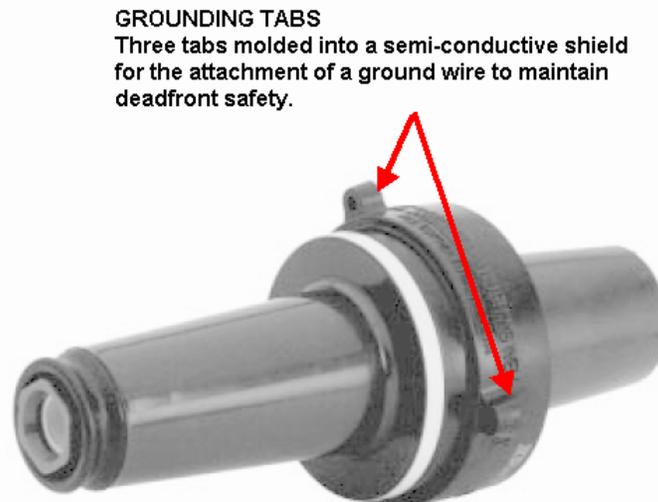
## Loadbreak Bushing Inserts Missing Ground (Drain) Wires

**Concern** – During recent underground circuit inspections, many padmount transformers have been found that do not have ground (drain) wires attached between the transformer tank and the bushing insert. **Without the drain-wire, it is possible to build up charge on the insert. This charge may discharge gradually over time to the well or elbow in which case there may be erosion/tracking. The charge may also discharge rapidly if contacted by a grounded item. In this case, bodily injury or equipment damage may occur.**

No incidents or problems have been reported at 15 kV and below due to these missing drain-wires; however, this bulletin is intended to help make all line personnel aware of this potential hazard.

**Action** – When working in dead-front transformers or switchgear, be aware that this potential hazard may exist. If an outage is necessary to perform other work in such equipment where drain-wires are not connected to the bushing inserts, then add the drain-wires before re-energizing the equipment. Note: As described in the Background Information of this document, the potential exposure to this hazard is minimal.

**Background Information** – The bushing drain-wire requirement only applies to transformers or switchgear with bushing inserts (Figure 1). Bushing inserts are field replaceable and screw into bushing wells installed in the equipment.



**Figure 1 – Loadbreak Bushing Insert**

If the equipment has integral bushings, then the drain-wires are not needed (Figure 2). Integral bushings are one-piece, non-field replaceable.

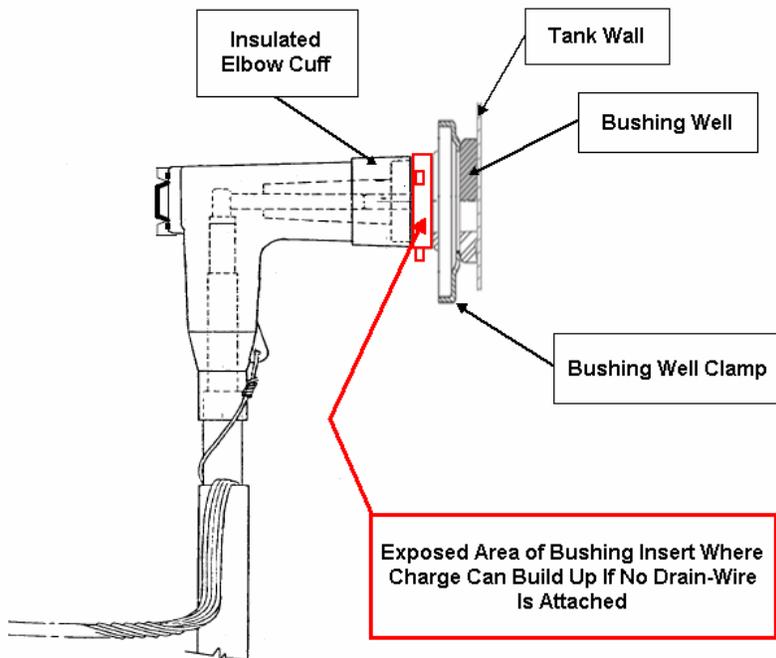
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**Figure 2 – Integral Loadbreak Bushing  
(Does not have grounding tabs)**

AmerenUE switched from integral bushings to bushing wells with bushing inserts in the late 1980's or early 1990's. (It is not known when the Ameren Illinois utilities switched from integral bushings to bushing inserts.) It is possible that some of the transformers identified with missing drain-wires may be of the integral bushing type and if such is the case, this concern does not apply.

Provided that the loadbreak elbow or insulating cap has their ground tabs connected to ground with a drain-wire, the exposure to this static discharge hazard is minimal. The bushing well is bonded to the tank wall; the bushing well clamp is bonded to the tank wall; and the elbow connector cuff covers most of the bushing insert. With this in mind, the area of exposure for an ungrounded bushing insert is shown in Figure 3.



**Figure 3 – Portion of Ungrounded Bushing Insert  
That May Develop a Static Charge**

## Loadbreak Bushing Inserts Missing Ground (Drain) Wires

The following picture (Figure 4) shows a bushing insert properly grounded with a drain-wire. A piece of concentric neutral wire from the cable may be used to make the drain wire.

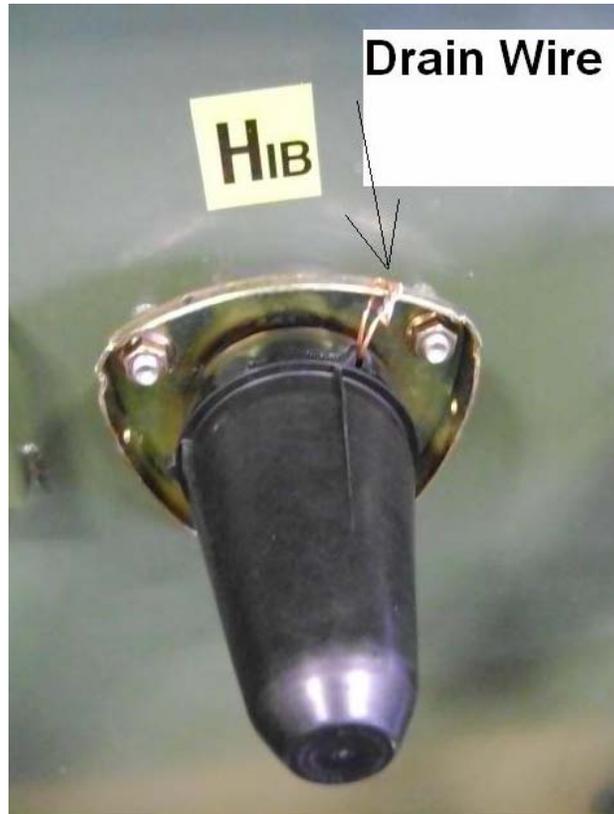


Figure 4 –Bushing Insert Properly Grounded with a Drain-Wire

If you have any questions on this issue, please contact Dave Goodwin (314-206-0165), Harry Hayes (314-554-3233), or Ed Bradley (314-554-3177).