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Delta to Wye system conversions

Caution should be exercised when converting Delta systems to Wye.

You must ensure that all unintentional grounds are removed before the system is converted.

Hazard

There have been a number of incidents and fires where, as part of a distribution system upgrade, the system transformer has been changed from a Delta secondary (3 Wire) to a Wye secondary (4 Wire) system.

Issue

By design, a ground fault condition on a Delta system will not operate an overcurrent device; it will only indicate a grounded phase conductor.

A potential fire could be introduced when the supply transformers are changed to a Wye secondary system if all ground faults are not removed prior to the new service being energized. A fault would be introduced into a grounded system. Closing a switch into a fault can be extremely hazardous. The results may be immediate with the operation of the overcurrent device or, if the fault is of a high enough impedance, it may allow significant current to flow without the overcurrent device operating, causing a fire.

Solution

In addition to the normal procedure, the following safety procedures are suggested when converting Delta to Wye:

1. Inspect the electrical system being converted, paying particular attention to the status of the Ground Fault Indication Lights (GFI) and ensure that the GFIs are functioning properly.
2. If the GFI indicates a fault (indicators of different brightness could be a sign of partial faults) further tests should be conducted to find the source of the fault. The fault may be further inside the building, outside the building or in another building on the same system. ALL FAULTS MUST BE CLEARED BEFORE CONVERSION IS ATTEMPTED.
3. It is important that a "Grounded Circuit Conductor" (or neutral) be brought into the building, as per the Ontario Electric Safety Code (OESC), be grounded as per Rule 10-204 and bonded as per Rule 10-624 whether or not the customer has an immediate or perceived need for a neutral. This connection is essential for clearing faults on the system.
4. The grounded conductor shall not be smaller than that permitted by OESC Rule 10-204(2), which means it shall be sized per Table 16A or 16B and comply with OESC Rule 4-024. Also, a check should be performed to see if the existing equipment is rated high enough for any increase in the Available Fault Current (AFC) Level. (See OESC Rules 14-012 and 14-014)
5. Once converted, the loads can be connected and checked again for ground faults. A current on the grounded conductor may be an indication of a potential problem.
6. Overcurrent devices that operate once energized could be an indication of a fault remaining on the system and should not be ignored. Further investigation shall be conducted.
7. The redundant Ground Fault Indicators should be removed.
8. Where Delta-Wye conversions are completed on facilities that had external buildings/structures fed with no continuous bonding back to the main service distribution, Code compliant bonding is required to be installed to ensure that overcurrent protection operates as required. (With phases now referenced to ground and no fault return path, a fire hazard could be present where fault current tries to find an alternate path ie: metallic gas pipe, communication cable etc.)
9. A connection authorization from the Electrical Safety Authority shall be arranged before re-energization.

Note:

On large services that are solidly grounded, OESC Rule 14-102 may require the addition of Ground Fault Protection.