

Toolbox Talks 2

076: Unsafe Conditions: Switchboard Installation

Discussion leader duties for this session:

Think about the various steps involved in switchgear installation, and what unsafe conditions might exist with each one.

What this Safety Talk covers:

This Safety Talk addresses unsafe conditions that may exist during the installation of switchboards and switchgear.

Discussion notes:

Unsafe conditions related to startup testing

- Clutter or debris in work area. If you're using a lift truck, the real danger isn't in moving an enclosure to the installation site. It begins when you're trying to position a big enclosure in those last few inches. Any little part or tool in the wrong place can set you up for injuries to your back or fingers. Before the enclosure arrives at its final destination, make sure things are picked up and the area's clear. Your alternative is reaching under heavy enclosures with your fingers. Obviously not the better choice.
- Poor lighting. The lighting may look great, before the equipment arrives. But a tall enclosure can turn good lighting into bad, so you work in shadows and blind spots. Have a person on hand who is free to move lights as needed.
- Insufficient manpower. If you don't have enough people to do the job safely, ask for help or contact your foreman. Don't forget to have a person available for moving lights, placing shims, using levels, taking measurements, and doing other work that supports those who are physically handling the enclosure.
- Bad weather and outdoor installation. Even with outdoor enclosures, weather can be a safety problem. Assess the possibility of water intrusion and provide some kind of temporary shelter or barrier to guard against it.
- Unstable equipment. These installation jobs often take several days. Make sure all equipment is stable before leaving for the day. Check it again when you arrive. For example, if a section of gear is on roller bars, make sure it's still secured in place. Rodents chew straps, things come loose in the night, and so on.
- Voltage present. This can happen if you're joining new sections to existing switchgear. Use a meter to verify that the switchboard is dead. Switchboards may have two or more feeders, control power circuits, and station batteries that will maintain lethal voltages even if the main disconnecting means is open. Also, conductors can act as capacitors and store a charge. Drain the voltage by momentarily shorting the conductor to system ground. And don't forget those power factor correction capacitors.
- Resistance tests not completed prior to energization. These tests allow you to find wiring errors or misplaced tools so that you don't create an arc blast.
- Covers and doors not secure at time of energization. Secure them. They are your primary protection in the event of an arc blast.
- Grounding/bonding errors. Metallic enclosures must be bonded per Part V of Article 250. If they aren't, you'll have a shock hazard. A ground rod isn't a bonding jumper.

Review and discussion

1. Why should you make sure the installation area is clear of clutter before trying to set an enclosure in place?
2. Suppose you take considerable time to get the lighting just right before the enclosure arrives. What can keep your efforts from paying off? What's

3. How do you know if you don't have enough people to do the job safely? And if that's the case, what should you do? *[Note to Presenter: Even an experienced foreman might miss something related to this particular installation. If you think you need another person or two, speak up. Telling your foreman you were short-handed after someone loses three fingers doesn't help.]*
4. What protective measures can you take in foul weather? *[Note to Presenter: Switchgear work in foul weather usually involves emergency replacement of components, not new construction or the installation of entire enclosures. But sometimes there's a need to keep construction moving forward even when the weather isn't cooperating. If the weather is getting into the gear, that will create safety and scheduling problems later. It may take days to properly dry soaked equipment. Stop work and cover things up to stop water intrusion. Then, let your foreman know what you had to do and why.]*
5. Suppose you'll be installing a section of gear a few days from now. It's sitting on rollers and the roller assembly is securely strapped to structural steel. Why should you check this when you start work the next day?
6. How can voltage be present during switchgear installation, and what should you do to protect yourself?
7. Why do you need resistance tests on a new installation?
8. Why is it important to secure covers and doors before energizing switchgear?
9. The drawings show two ground rods driven next to the switchgear, and a connection from the grounding lug to these rods. Is this technically correct? *[Note to Presenter: This serves no purpose. It's a waste of time and materials, and it can also create confusion as to Article 250 compliance.]*
10. In the previous situation, what is the correct connection? *[Note to Presenter: Article 250 requires a bonding jumper from that "grounding connection" to the main bonding jumper. The panelboards, supply transformer, and raceways need to be at the same potential. The only way to do this is with bonding jumpers. As dirt is a high resistance conductor, it isn't an effective bonding path. Per Ohm's Law, there will be a voltage across that high resistance.]*

[illegible]