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How Safe Are “Low Voltage” Systems?

By Ryan Jackson, Draper, Utah

The world of electricity is full of misconceptions and misunderstandings. Many of the things we were told to be true simply aren't, and many of the concepts that many people have held dear are not true either. One of these misconceptions that I'm sure we have all been told is that low voltage systems are safe from an electrical shock or fire perspective. Nothing could be farther from the truth. Just ask the owner of the building that I just returned from who had a fire from a low voltage lighting system that resulted in losses probably over \$100,000, in addition to the loss of business during the business closure, the structure damage to the trusses that created the roof assembly, and the water damage from the fire suppression system.

Now, before we get too far, we need to understand this elusive term “low voltage”. What exactly does it mean? Article 411 of the NEC implies that it is between 0-30 volts. Article 720 governs certain installations up to 50 volts. Article 725 governs many “low voltage” installations, but it also contains rules that govern up to 600 volts! So which is it? Well, it really doesn't matter that much. Fire is a function of heat, as we all know. The amount of heat that a given circuit can produce is a function of not only the voltage, but the current (amperage) as well. When you read Article 725, you will find that there are different classifications of “low voltage” circuits, depending upon the power source. A more accurate phrase for what is commonly referred to as “low voltage” is “power limited”. A power limited circuit is one that has a transformer (or other source) that limits the output voltage to a given value of both voltage and current. It is the combination of these that may or may not make a circuit safe.

When we look at the rules for class 2 wiring, we find that they are very lenient. For example, the doorbell circuit in a typical dwelling unit doesn't need to be in a raceway or a chapter 3 cable assembly, because the amount of power that the doorbell transformer can create is very, very small. In other words, there is no way you can light a fire with it!

Low voltage lighting systems, however, are a very different thing. The fire that I discussed earlier was caused by a low voltage system that ran at 24 volts and had a 600VA transformer. This means that the “low voltage” side of the circuit had 25 amps available...more than enough to start a fire and more than enough to deliver a fatal electrical shock. So what are the rules for low voltage lighting systems? Well...they are the same as any other wiring in the building! The output wiring must be installed in a chapter 3 wiring method, such as MC cable, EMT, NM cable, et cetera. Simply installing insulated 12 AWG conductors, or installing low voltage cable is NOT code compliant. Splices are also required to be enclosed in a box, just like a 120 volt circuit. The fire that I observed was started at a free air splice, which ignited the surrounding wood of the building and put lives in danger.

Currently the state of Utah does not require low voltage and limited energy installers to have a professional license. This needs to change immediately, so the installers, inspectors and even designers can become more educated on the very real dangers associated with “low voltage” circuits that, quite simply, are not “safe”.

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