

Incident Summary #II-828248-2019 (#11504) (FINAL)

SUPPORTING INFORMATION	Incident Date	March 20, 2019	
	Location	Prince George, BC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	1
		Injury description	An electrician sustained burns and strained back muscles.
		Injury rating	Minor
	Damage	Damage description	No Damage
		Damage rating	None
Incident rating	Minor		
Incident overview	An electrician was shocked by an energized non-metallic sheathed cable (NMD90) that was partially damaged. The cable was part of the emergency lighting system that was being removed and relocated due to a renovation.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>An emergency lighting system was undergoing some minor renovations when an electric shock incident occurred. The emergency lighting system consists of an emergency lighting pack and extra low voltage (12 volts DC) emergency lights located through the commercial building.</p> <p>The emergency lighting pack is supplied by a separate circuit breaker powered through a multi-tap transformer that allows this style of emergency pack to be connected to a variety of input voltages. At this location the voltage is 120 volts AC. This equipment could also be connected to 277, or 347 volts AC. Whenever one voltage tap is used, the other tap wires on the same transformer winding become energized. The un-used tap wires are kept isolated, with their wire ends capped.</p>	
	Failure scenario(s)	The primary winding taps of the emergency lighting pack input transformer were not properly capped off. The 347 volt tap wire was pushed into the area of the extra low voltage terminal board. Only the batteries were disconnected and not the incoming 120 volt circuit breaker supplying the emergency lighting pack. With the vibrations during construction the 347 volt uninsulated wire end made contact with the extra low voltage circuit board terminal energizing the emergency lighting wiring.	
	Facts and evidence	The emergency lighting pack was not properly locked out. Proper lock out procedures as per Rule 2-304 of the BC electrical code were not followed. Only the DC batteries were isolated while the AC input circuit was left energized. Due to the 347 volt tap on the input transformer primary winding not being properly isolated 347 volts was energized and exposed. At some point during the renovation it was possible that the 347 volt wire moved (e.g. due to vibration) and contacted the extra low voltage lighting terminal that had the wiring under renovation connected to it. During renovation the extra low voltage wiring had been damaged. The onsite electrician grabbed the wiring (NMD 90) to get it out of the way and to tape up the exposed end. While holding the damaged cable in one hand his other hand came in contact with the bare bond wire. This completed the circuit between the damage expose live conductor in one hand and the bond (ground) wire in the other.	

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Causes and contributing factors

The incorrect termination of a 347 volt conductor wire likely created an unsafe condition and potential for electric shock. By not following proper lock out procedures for an emergency lighting pack an exposed energized conductor was left unsecured inside the emergency lighting pack. This energized expose conductor then came into contact with the extra low voltage wiring running into the area of the building being renovated. This extra low voltage wiring was damaged during the renovation. The onsite electrician grabbed the wiring to secure it out of the way and tape up the end. This was when the electrician was shocked with 347 volts.



Photo 1: The emergency lighting pack is situated just to the right and above the electrical distribution panel that supplies it.



Photo 2: As noted on the panel directory circuit 12B supplies the emergency lighting pack.

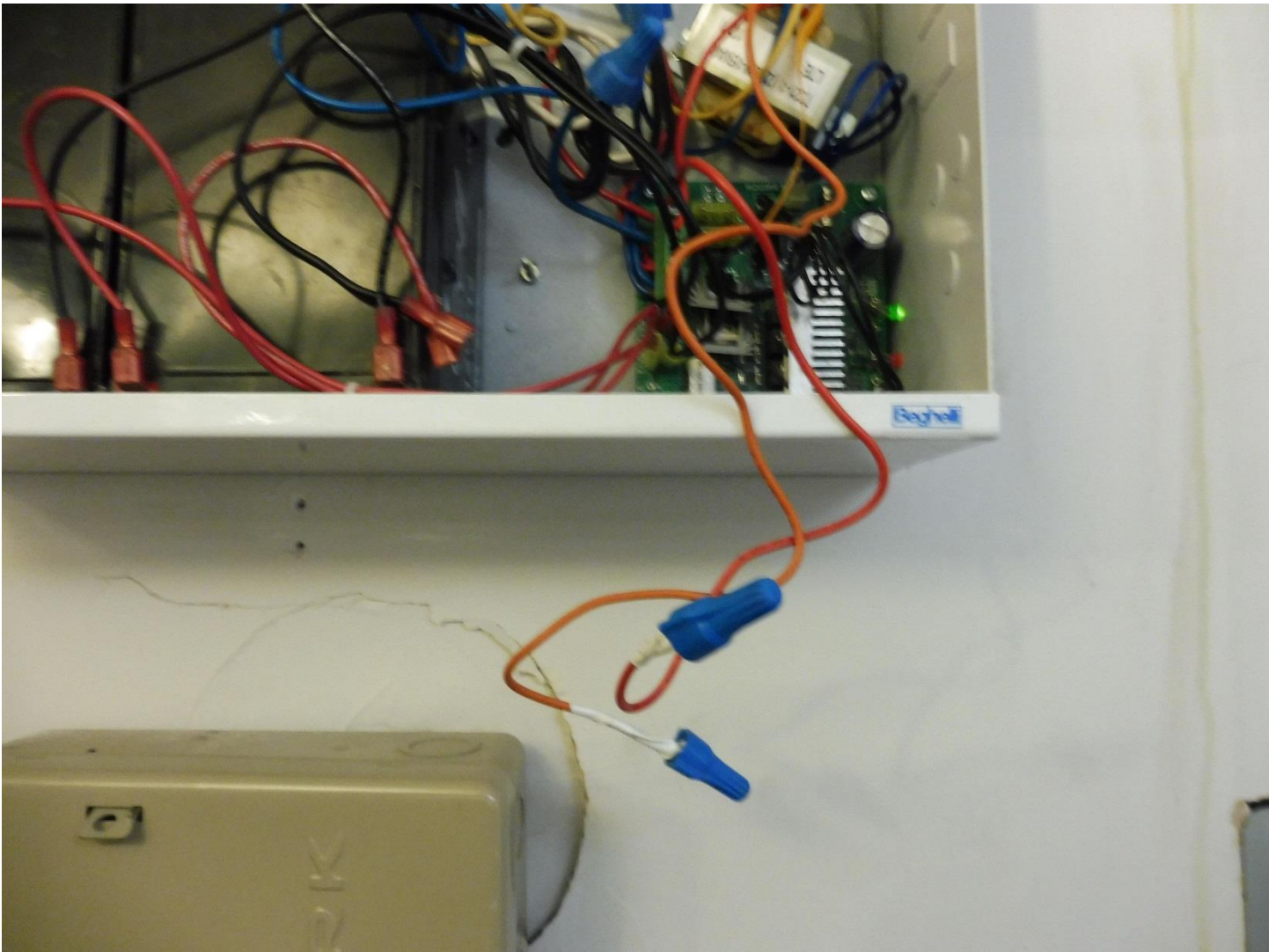


Photo 3: The 277 volt (orange) and 347 volt (red) transformer tap wiring have now been properly isolated with tape and wire nuts. During the renovation the electrician pulled the wiring from the batteries to prevent the 12 volt lighting power from energizing the emergency light wiring.



Photo 4: Tag on the input transformer showing the different input wiring.