

Incident Summary #II-1314084-2022 (#25792) (FINAL)

SUPPORTING INFORMATION	Incident Date	December 29, 2021	
	Location	Langley	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	2
		Injury description	Shock to pedestrian and pet dog. Individual was treated for shock, with entrance/exit wounds to forearm and knee.
		Injury rating	Moderate
	Damage	Damage description	None
		Damage rating	None
	Incident rating	Moderate	
Incident overview	Failure of a heating system installed in an underground parkade ramp, resulting in a shock to a pedestrian and their pet dog.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>The parkade ramp leading into the underground parkade was designed without a cover. In colder months the ramp can become a hazard, as ice/snow build up on the ramp, which can result in vehicles slipping to enter or exit the parkade.</p> <p>The design build for this residential apartment building to address this issue, is to heat the parkade ramp with a heating cable set installed in the parkade ramp concrete. This heating system is composed of 4 parts. Supply (600V, 20A, 3-phase breaker), heating control panel, control devices and the heating cable set. When installed to manufactures specifications and Canadian electrical code, this heating cable set will auto sense the temperature/snowfall through the control devices and signal the heating control panel to begin heating the concrete, melting any ice or snow build up.</p> <p>The heating cable set in the parkade ramp is a 2-wire circuit that has a low resistance. As current flows through the circuit, the low resistance and current flow through the conductors produce heat which melts any snow and ice. Before being commissioned and energized, these installations are commonly tested to verify the integrity of the insulation. Damage during installation could result in leakage current to ground. Another safety control to prevent a scenario like this, is ground fault circuit protection. Ground fault circuit interrupter functions by monitoring the current entering and exiting a circuit. If flow of the current is not equal (current in versus current out of circuit), and the difference is more than >30mA the device will de-energize the circuit. This difference in the circuit is an indication of a ground fault. This safety control is built into the heating control panel, and for this unit is user adjustable.</p>	

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<p>Failure scenario(s)</p>	<p>Sometime in 2015 the concrete at the top of the ramp (apron), in which the heating cable set was installed began to crack. The developer for the complex had the concrete demolished and removed, to re-pour the apron. In the process, the 600V heating cable set was damaged. A licensed electrical contractor was contracted to repair the damage. The developer sourced an approved repair kit for the cable, but would not arrive in time for the winter, so the cable was field repaired in an un-approved manner. After the repair was completed, the concrete was poured, repairing the ramp. The heating cable system continued to operate till December 2021. (Photo 1)</p> <p>A couple of weeks before the incident, the south side of the ramp failed to heat up, but the breaker or ground fault interrupter had not tripped. The heating system was not de-energized but continued to operate in its faulty state.</p> <p>The GFCI monitor in the heating panel had at some time prior to the incident, had been altered from the factory setting of 30 mA to greater than 850mA.</p> <p>Due to the nature of demolishing and repairing concrete, there is a chance that the non-metallic sheath heating cable may have been damaged in other areas that went undetected. This, coupled with the un-approved repair of the heating cable set likely led to a scenario where the surface of the concrete became energized. As a pedestrian with their dog walked over the concrete walkway, the dog received a shock. Dog's paws are in direct contact with the wet concrete which make them more susceptible to receiving a shock. As the owner attempted to help the dog who was being shocked, they also received a shock as they pulled their dog away from the area. (Photo 2)</p>
<p>Facts and evidence</p>	<p><u>Strata Member Interview:</u></p> <ul style="list-style-type: none"> • Issues with ramp heating over multiple years. Inconsistent heating. • Original concrete started to crack and was repaired by developer. • Pathways of heating cable sets, based off snow melt patterns. <p><u>Pedestrian Interview:</u></p> <ul style="list-style-type: none"> • Provided an account of the injuries to her and her dog. • Witnessed the dog receiving a shock. Provided an account of the dog yelping and convulsing. • Indicated the location where the dog received a shock. Confirmed it was around the area the concrete was repaired. <p><u>Electrical Contractor Interview:</u></p> <ul style="list-style-type: none"> • Heating cable set was damaged in concrete repair. • Repaired without using approved manufacture methods. • Repaired using 600V rated crimps, each connection separately heat shrink with silicone. <p><u>GFCI Monitor Manufacturer Interview:</u></p> <ul style="list-style-type: none"> • The heating panel comes from the manufacturer set at 30mA.

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	<p><u>Safety Officer Observations:</u></p> <ul style="list-style-type: none">• 30mA GFCI rating is the maximum allowed by Canadian Electrical Code.• Heating cable's ground fault circuit interrupter rating was set at >850mA. (Photo 3) Could not verify when the setting was adjusted to beyond the 30mA maximum rating.• Metering of the cable also indicated multiple ground faults in the heating cables. The degree of damage was difficult to identify. Due to all the wiring being concealed in the concrete.• Discoloration in the concrete apron, confirming repairs to the concrete.
Causes and contributing factors	The likely cause of the electrical shock incident was damage to the heating cables during concrete work combined with the setting of the ground fault circuit interrupter above 30 mA.

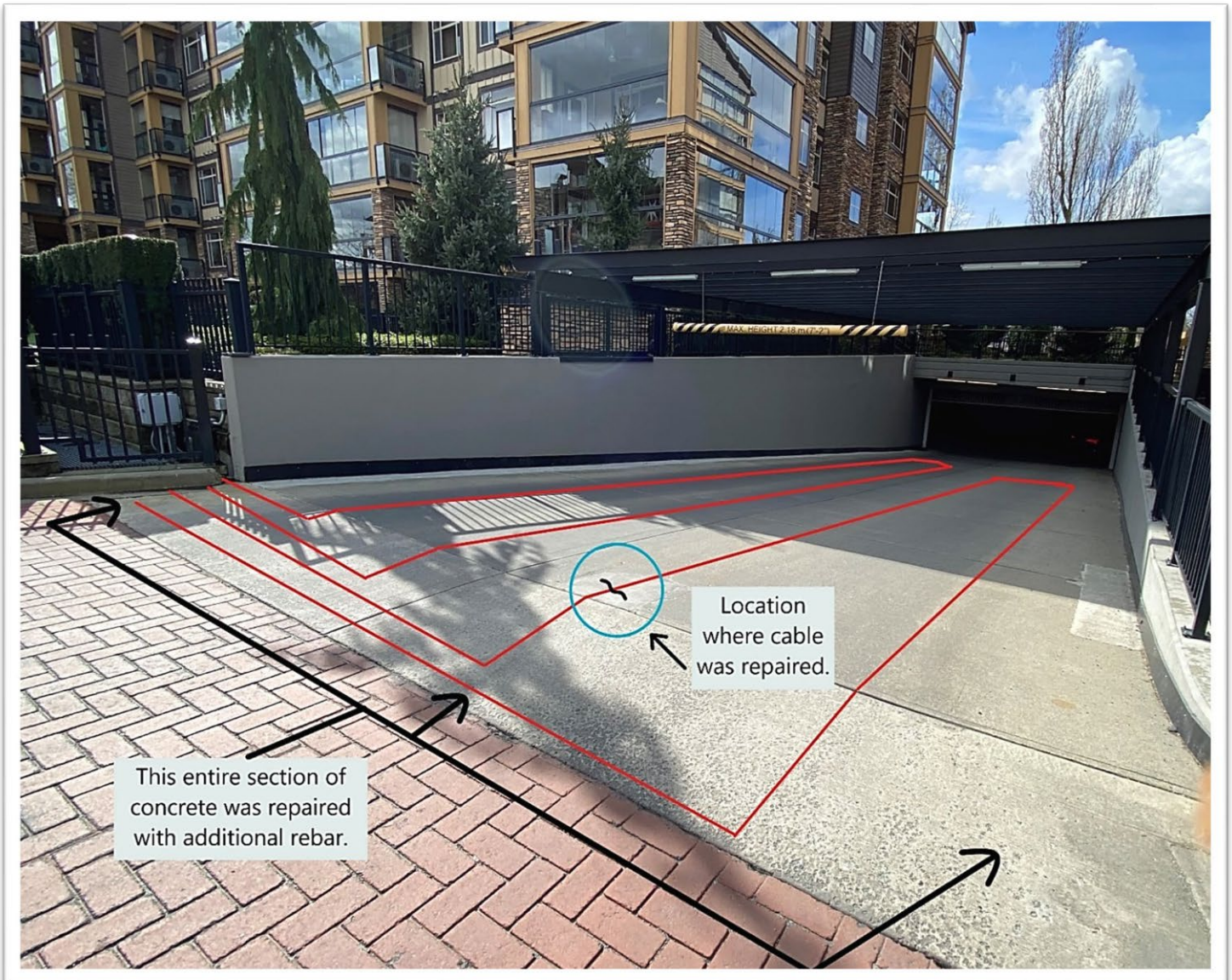


Photo 1 - Ramp where incident took place. Red lines show approximate path of heating cables.



Photo 2 - Where pedestrian and dog received the shock.

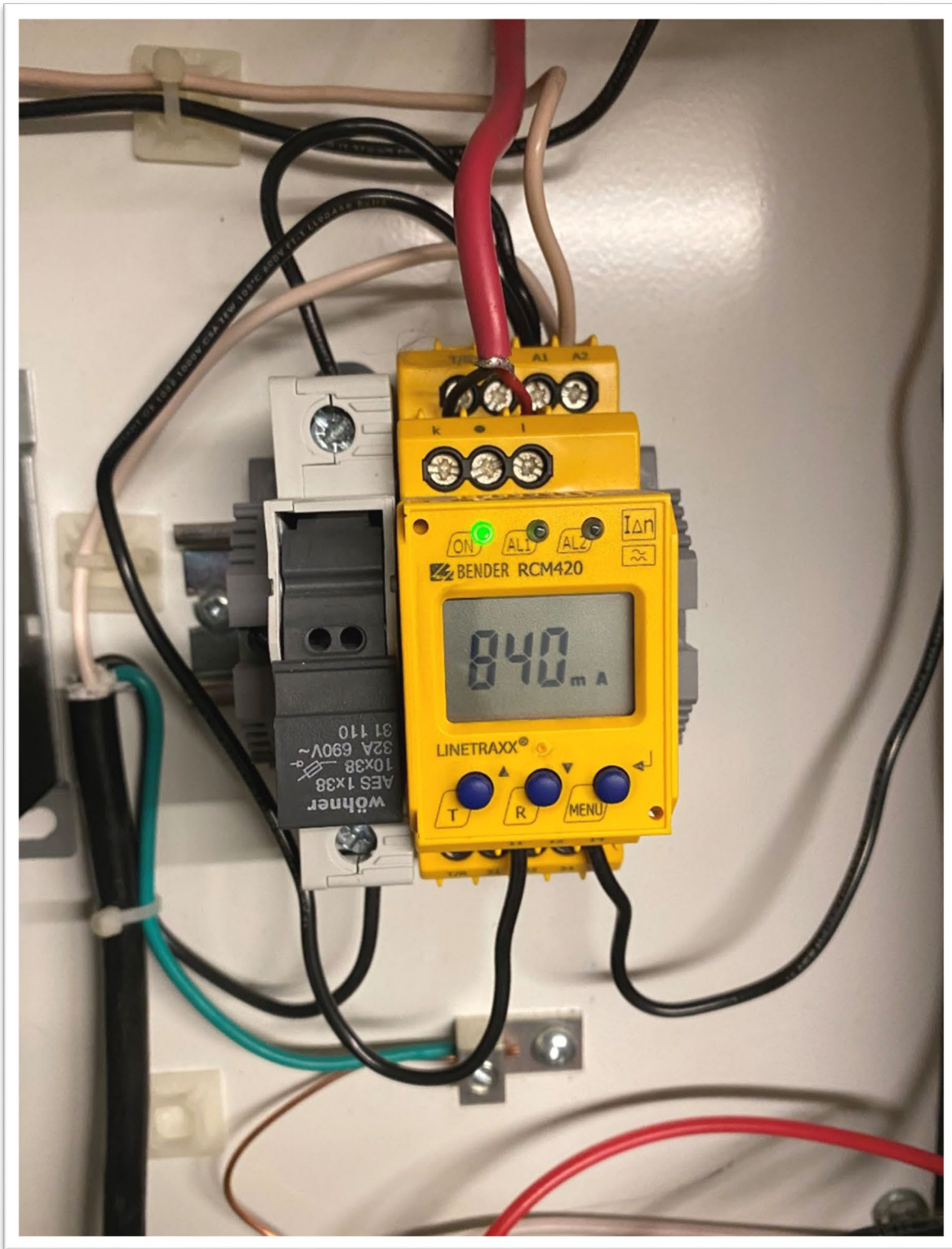


Photo 3 - Control panel for the heating cable system. This relay is responsible for operating the ground fault circuit interrupter. The display shows the 840mA setting. It comes from the manufacture set at 30mA.