

Incident Summary #II-1291094-2021 (#25150) (FINAL)

SUPPORTING INFORMATION	Incident Date		November 23, 2021	
	Location		Nelson	
	Regulated industry sector		Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Injury	Qty injuries	0
			Injury description	N/A
			Injury rating	None
	Damage	Damage	Damage description	Motion switch failed internally, overheating and melting, creating black smoke around the device. No damage to the building wiring or device box.
			Damage rating	Insignificant
Incident rating		Insignificant		
Incident overview		A motion switch overheated and caught fire internally. This switch automatically controls all the overhead fluorescent lighting in the building. As a result, the lighting could not be turned on.		
INVESTIGATION CONCLUSIONS	Site, system and components		In the commercial garage, overhead fluorescent lighting has been provided with a single motion switch for control. Under normal operation the motion switch would activate, or turn on, all the overhead fluorescent lighting when movement is detected. The single branch circuit that feeds the overhead lighting and motion switch is protected by a branch breaker set to protect the circuit, wiring and devices from overloading and overheating.	
	Failure scenario(s)		The overhead fluorescent lighting circuit was originally controlled by a wall switch and is protected by a 20-amp circuit breaker. The overhead fluorescent lighting installed has a potential calculated load of up to 16.9 amps, or 2028 watts, on this same 20-amp branch circuit. At some point the wall switch was removed and the present motion switch was installed to control the overhead lights. The motion switch has a maximum rating of 8.3 amps or 1000 watts. The motion switch was used in this circuit beyond its approved ratings and the branch breaker would not properly protect this device. The overloading of the motion switch and the heat it created caused the switch to fail internally, and the branch breaker due to its higher ratings did not react to the overload condition and trip.	
	Facts and evidence		Safety Officer Interviews: The original electrical contractor who installed all the electrical wiring and systems in this building was contacted and asked whether the motion switch was part of the original installation to control the lighting. The contractor indicated that a wall switch was installed as part of his contract and to his knowledge the motion switch was later added by the building owner. The representative from the owner confirmed that there was an upgrade through some of the locally owned buildings, including this one, for energy cost savings and the motion switches were installed in place of the original wall switches. He was unclear of who did the work or if this person was qualified.	

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	Site installation conditions: The lighting branch circuit is protected by a 20-amp breaker to match the lighting load, but the wiring used is 14/2 NMD90 (standard non-metallic building wire), which is rated at a maximum of 15 amps for normal use. The motion switch is rated at a maximum use of 1000 watts, 120 volts and 8.3 amps. The lighting present and controlled by the motion switch consists of 5 – 6 lamp high output fluorescent fixtures rated at 358 watts, 120 volts and 2.98 amps each, and 2 – 2 lamp high output fluorescent fixtures rated at 120 volts and 1 amp each. The overall calculated load is 16.9 amps at 120 volts. In this case the motion switch was not rated to handle the existing lighting load and the installer may not have checked or been aware of this issue. Electrical contractor testing: A measurement of actual lighting power usage under load was taken at the motion switch by the qualified electrician present, and the maximum value found during the testing was 10.13 amps.
Causes and contributing factors	It is likely that the failure of the motion switch was the use of control lighting beyond its maximum allowable ratings. The incorrect installation of the amount of lighting on the original circuit and the use of a breaker larger than the ratings of the wiring may have been a contributing factor to the incident as this may have imposed more heat on the building wiring and motion switch.

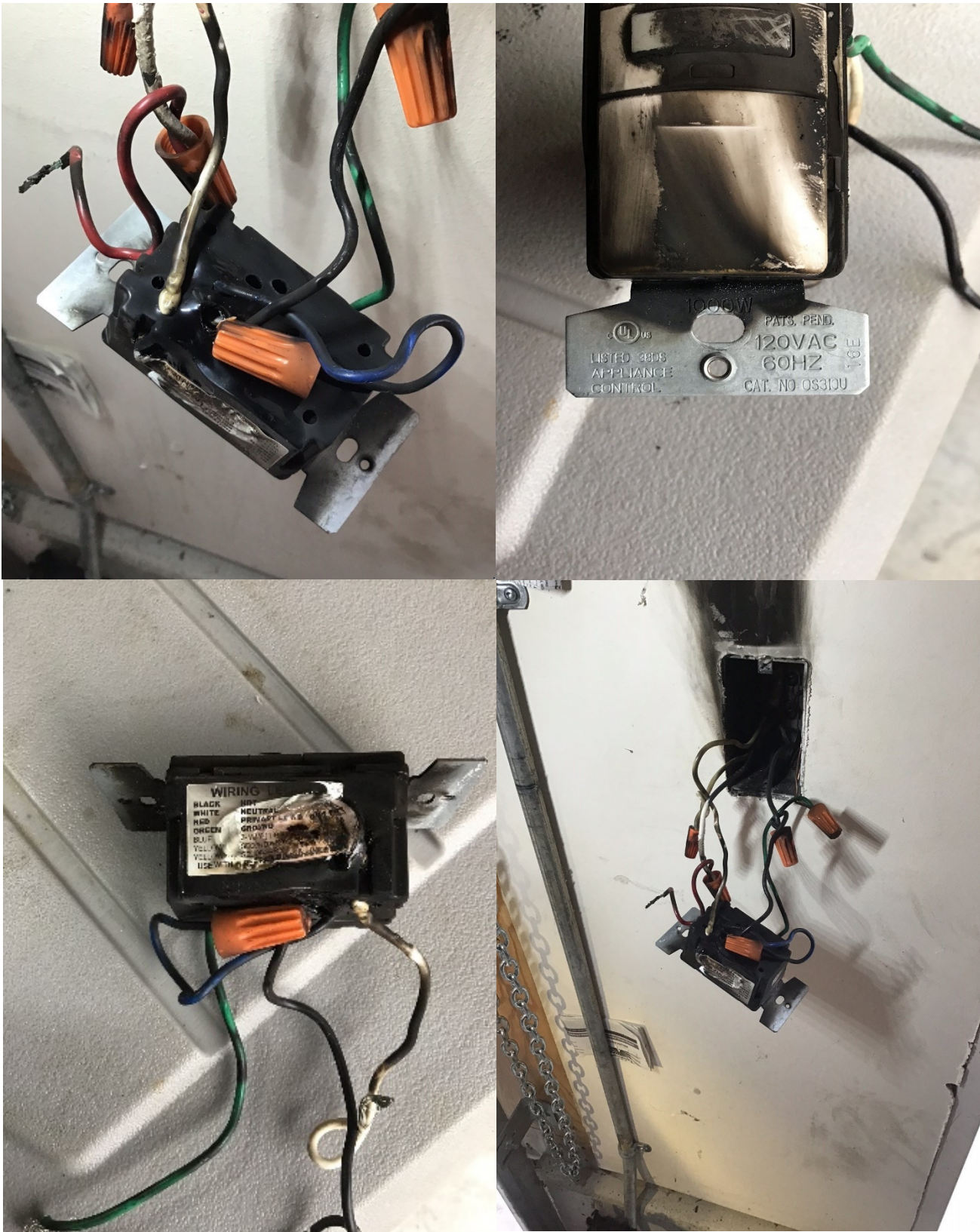


Image 1 - Motion switch

www.technicalsaftybc.ca



Image 3 - Load test: 10.13-amps

CAUTION:

- Must be installed and used in accordance with all applicable electrical codes
- If a bare copper or green ground connection is not available in the wallbox, contact a qualified electrician for installation
- Do not install without proper ground connections
- Do not exceed maximum device ratings

Image 4 - Motion sensor switch instruction sheet caution note

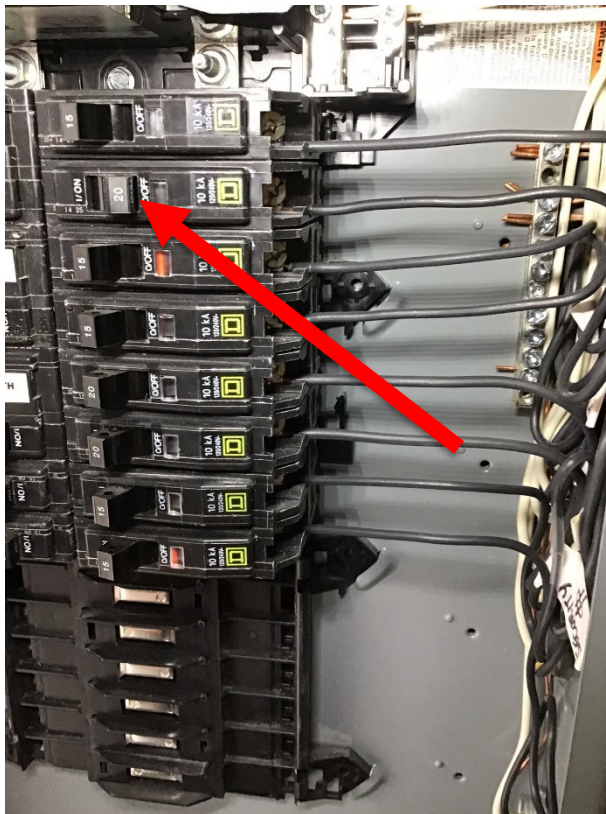


Image 5 - 14/2 NMD90 branch circuit wire (right photo) from the lighting circuit connected to a single pole 20-amp breaker (Red arrow)