

Incident Summary #II-1238269-2021 (#23553) (FINAL)

SUPPORTING INFORMATION	Incident Date	August 15, 2021	
	Location	Chilliwack, BC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Damage	Damage description	The 600-amp fused switch for this electrical service was destroyed as well as the service conductors inside the three service raceways that entered into the top of the fused switch from the building exterior. There was fire damage to the plywood surface that the fused switch was mounted to, as well as minor fire damage on the adjacent wall to the right of the fused switch.
		Damage rating	Moderate
Incident rating	Moderate		
Incident overview	Fire in the 600-amp main electrical service switch at a lumber drying facility that caused damage to the electrical service equipment and building wall.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>The 600-amp, 600-volt, 3 phase electrical service to this building is fed from an overhead private 14.4-kilovolt to 600-volt 3-phase transformer configuration. Overhead cables are ran from the transformers to the exterior of the building and connected to the service conductors that are run in raceways approximately fifteen feet inside the building to the 600-amp main switch. The main electrical load on this 600-amp, 600-volt service is power for control equipment and large fans that circulate air inside oil, and sawdust heated kilns that dry the lumber.</p> <p>The 600-amp, 600-volt fused switch is the first point where the 600-volt conductors terminate inside the building. Each phase of the service conductors terminate on the line side lugs at the top of the switch, and the load side conductors terminate on the lugs at the bottom of the switch. In between the line and load sides of the switch there are fuses installed to provide protection in case of an electrical fault or overload situation that may result in damage to electrical equipment, or a fire. The line and the load sides inside the fused switch make and break contact with each other through movable bus bars called knife blades. These knife blades are controlled by a handle on the exterior of the switch that moves a lever on the inside that actuates a spring mechanism to open or close the knife blades quickly. The spring mechanism is meant to make it impossible to have the knife blades making partial contact between the line and load sides and is meant to allow the switch to be turned on or off under an electrical load.</p>	
	Failure scenario(s)	Due to the knife blades not making complete contact with the line side terminals, over time a large resistance built up on the bus bars inside the 600-amp fused switch. This led to excessive high heat on 'A' phase, and the fuse melted, which started a fire in the switch. The fire spread upwards into the service conductor raceways melting the insulation on the conductors and causing a short circuit when the different phases of conductors contacted each other. This short circuit caused the high voltage fuses at the pole mount transformer bank to drop out disconnecting power to the building.	

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<p>Facts and evidence</p>	<ul style="list-style-type: none">• It was observed that the knife blades were not making complete contact with the lineside terminals (See Figure 1, Photo 1 and Photo 2).• The 'A' phase fuse had the most damage and appears to be the failure point (See Figure 1 and Photo 3).• It was observed that the insulation had been melted from the service conductors which would cause a short circuit to drop out the high voltage fuses (See Figure 2 and Photo 4). <p>Interview with the maintenance electrician who has been providing electrical maintenance to this building for 30 years.</p> <ul style="list-style-type: none">• Stated the 600-amp main switch had not been switched off for at least one year for maintenance.• Stated the 600-amp main switch was not turned off when the electrician arrived on scene because the high voltage fuses had dropped out disconnecting power from the building.• Stated the fuses are most likely original and have never been changed to his knowledge.• Stated the age of the service was approximately 40-50 years old.• Stated the high voltage fuses were blown when he arrived onsite.• Stated the temperature in the electrical room had recently reached 40 degrees Celsius due to summer temperatures.
<p>Causes and contributing factors</p>	<p>It is very likely that due to the old 600-amp main switch not functioning as it should, the knife blades inside the main switch did not make complete contact between the line side conductor terminals. This created a smaller than required current path between the line side terminals and knife blades, which caused excessive heat from more resistance that eventually melted the 'A' phase fuse starting a fire in the switch.</p> <p>A contributing factor to this fire likely could have been the ambient temperature in the room leading up to the incident, causing even more heat inside the 600-amp main switch.</p>

FIGURE 1 - 600-amp fused switch after incident.

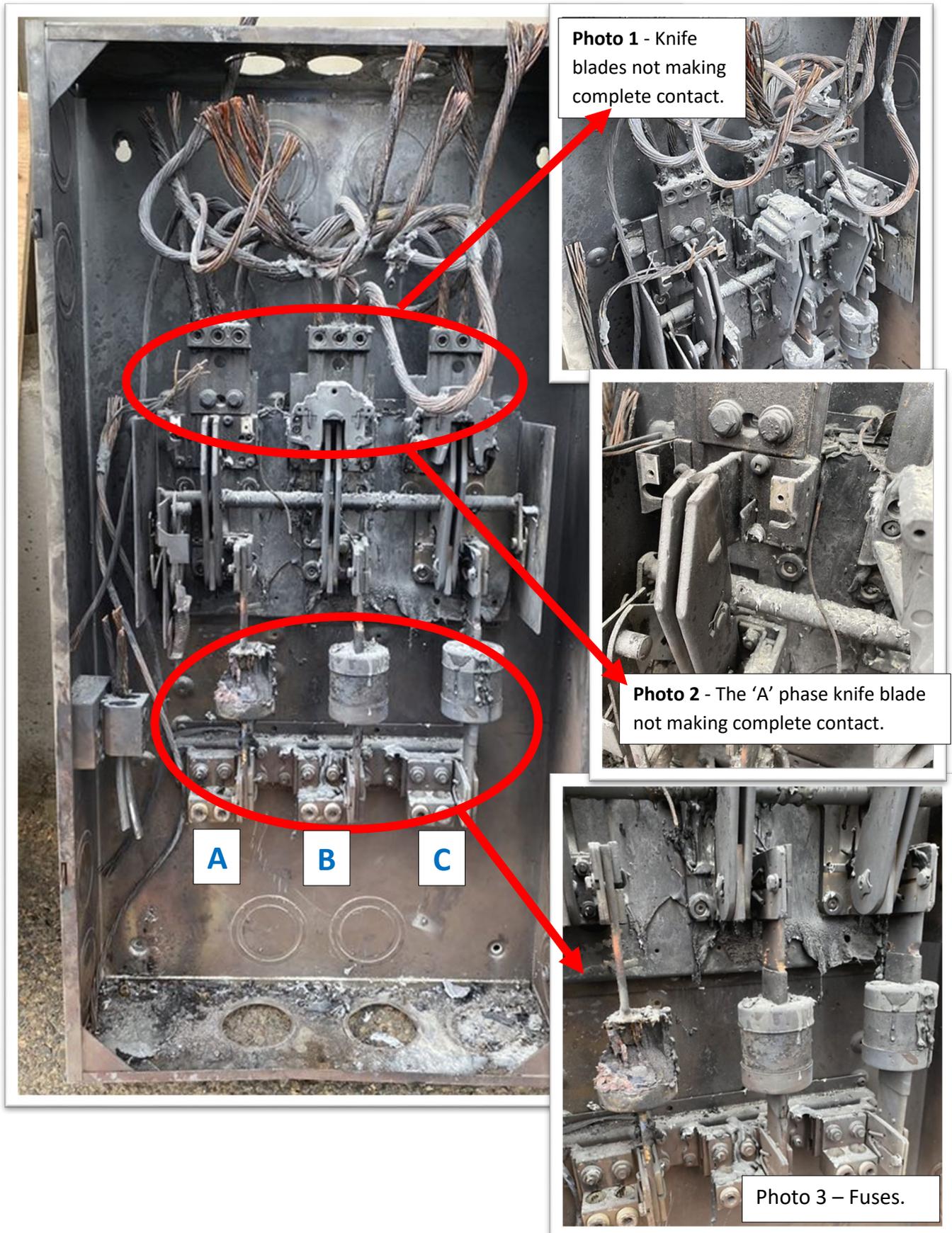


Figure 2

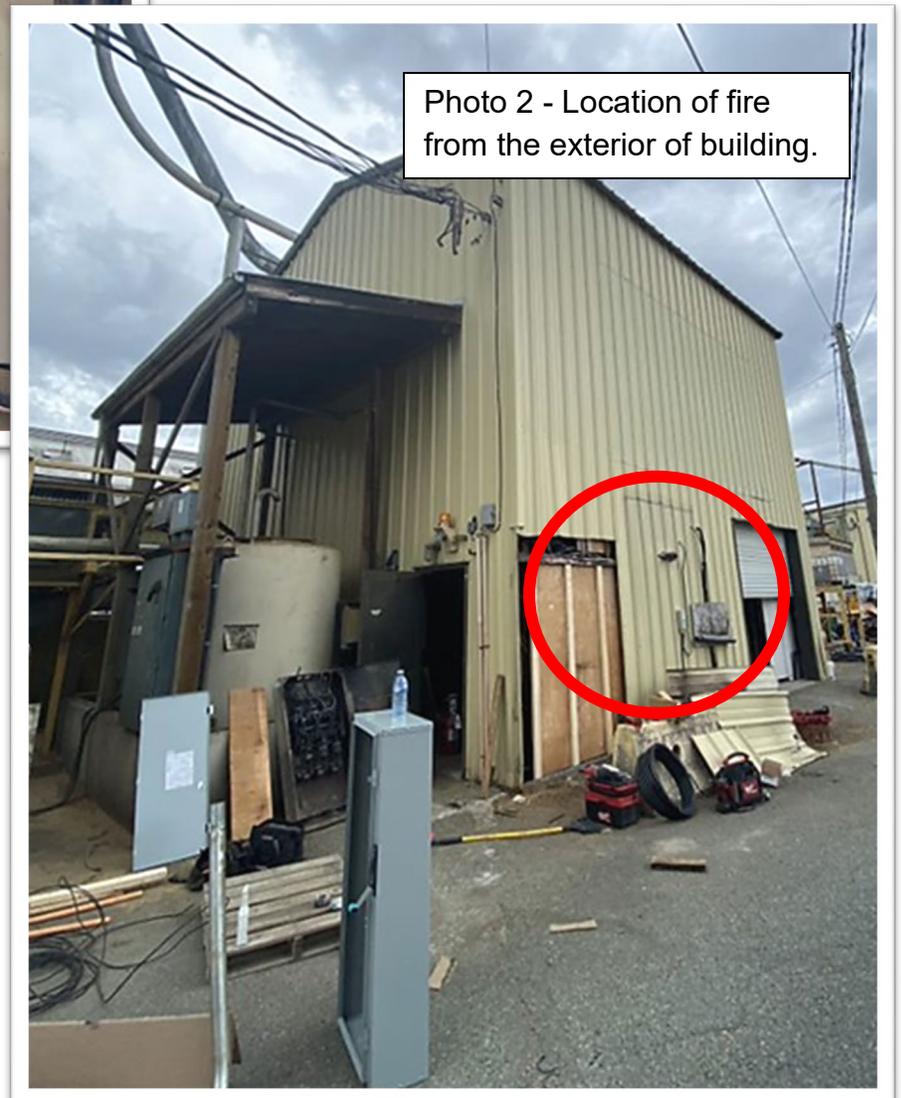




Photo 3 - Damaged service raceways and conductors.



Photo 4 - Damaged service conductors with melted insulation.