Incident Summary #II-1224484-2021 (#22816) (FINAL)

SUPPORTING INFORMATION	Incident Date		July 2, 2021
	Location		Kamloops, BC.
	Regulated industry sector		Electrical - Low voltage electrical system (30V to 750V)
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	Internal arcing and melting of the electrical components within the motor control center (MCC) bucket including damage to the starter coil/contactor, line and load side terminals, and the conductor's insulation.
		Damage rating	Minor
	Incident rating		Minor
	Incident overview		Two dryer circulation fans underwent repairs in an industrial establishment. When one of circulation fans was turned on for the first time for testing purposes, a portion of the electrical equipment caught on fire causing the components of the motor starter to melt.
INVESTIGATION CONCLUSIONS	Site, system and components		A motor control center (MCC) is designed to control electric motors from a central location. A typical motor control center has a common bus bar that provides power to multiple enclosed sections of the equipment. Each section can contain certain components like a motor starter, fuses, circuit breakers, and power disconnects. A magnetic motor starter coil (MAG) is an electromagnetically operated device located in the motor control center that can start and stop a connected motor load through engagement of the contacts within the device. A control circuit is provided to power and engage the contact during normal operation. A human machine interface (HMI) is a user dashboard designed to connect a person to a machine, system, or device. Electricians and operators are given the ability to remotely start/stop a motor from a set location through an HMI. "Bumping" or a "Bump test" is performed to check for the motor's rotation. Power is applied to the motor for a brief second to observe the direction of rotation. If a 3-phase motor rotates in the wrong direction you can simply change any two of the three power leads and it will change the motors rotation to the desired direction. - Manually bumping: This can be achieved by physically pushing in the contactor on the MAG, which allows the internal contacts to engage/connect and start the motor. (This technique requires pushing in a live/energized contactor, manually bumping carries a higher risk as the contacts can misalign).

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	- Automatically bumping: This can be achieved by using the HMI or a start button at a control location, this will engage the coil and close the contacts which will start the motor remotely. Single phase event: A 3-phase motor is meant to be connected to a 3-phase alternating current (AC) power supply (3 conductors) as per the motor's nameplate ratings. A single-phase event occurs when one of the 3-phase conductors becomes disconnected. With the motor connected to only two of the three conductors, it will be single phased and typically draw a higher amount of current which can lead to overheating and failure.
Failure scenario(s)	Near the end of a scheduled workday, two newly repaired circulation fans were to be checked/tested by applying power momentarily to confirm proper directional rotation. The East circulation fan was successfully bump tested using the HMI. When it came time to test the west circulation fan, a bump test was unable to be performed using the HMI because of a control and interlock issues. A decision was made to manually bump the West circulation fan motor. The fan motor was bumped twice by pushing in the magnetic starter coil within the MCC with a screwdriver. The magnetic contactor did not properly engage likely causing a single-phase event, the MCC was shut off and a fire extinguisher was used.
Facts and evidence	Statements and evidence provided remotely during a telephone interview with the onsite electrician, electrical charge hand, maintenance superintendent, regional OHS coordinator, and safety advisor align with the incident timeline provided by the company as seen below. Internal Incident Summary Report Timeline: <u>July 2, 2021 – 5:00PM</u> Electrician completed wiring repairs on Dryer 1 circulation fan motors. - Supervisor asked electrician to bump motors to verify rotation. - Supervisor discussed plan – supervisor was to watch for fan rotation while electrician and standby contractor performed work. - Electrician tried to bump test using the HMI but was unsuccessful. - Electrician informed supervisor that they would need to don Arc Flash Personal Protective Equipment (PPE) and manually bump the mag. - The electrician put on their PPE and bumped the East fan mag - supervisor confirmed correct rotation. - The electrician tried to bump the West fan mag, but the mag locked up and began to spark. - Supervisor noted the rotation was backwards and the fan was making humming sounds. - Electrician stepped backwards while the arcing continued, then disconnected at the main MCC. - Standby contractor electrician used a fire extinguisher on the panel. - Equipment observation: - Melting and discoloration of the line/load side terminals. - Severely melted and floating relay present. - Discoloration and damage to the exterior jacket of the conductors within.

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Causes and contributing factors	It highly probable that manually bumping the magnetic starter coil created an uneven force to be applied across the contacts, allowing a misalignment of the connections creating an arc and a fire to develop.

Figure: 1 – Internal components, floating relay, and damage.

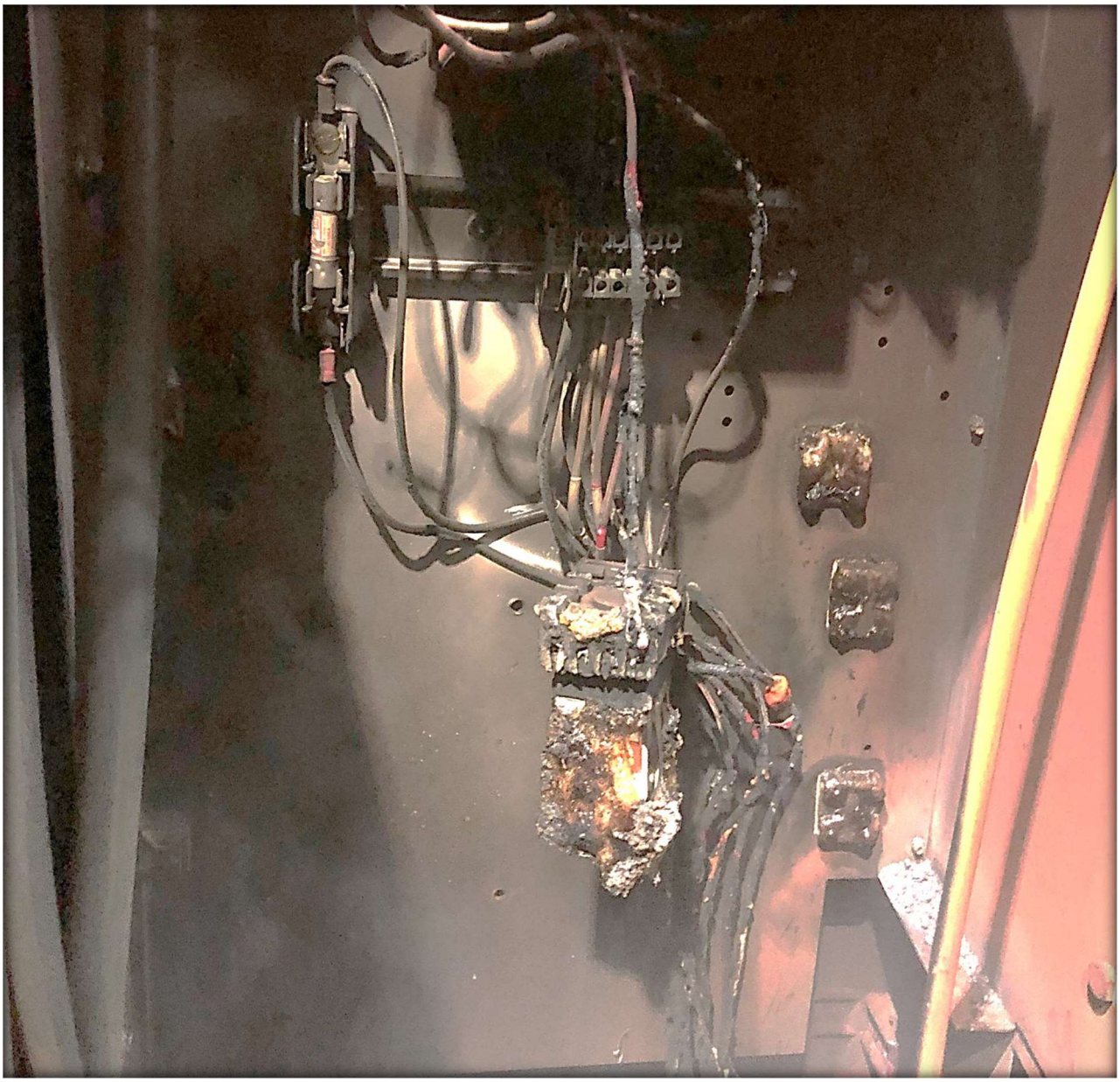

Figure: 2 – Internal damage.

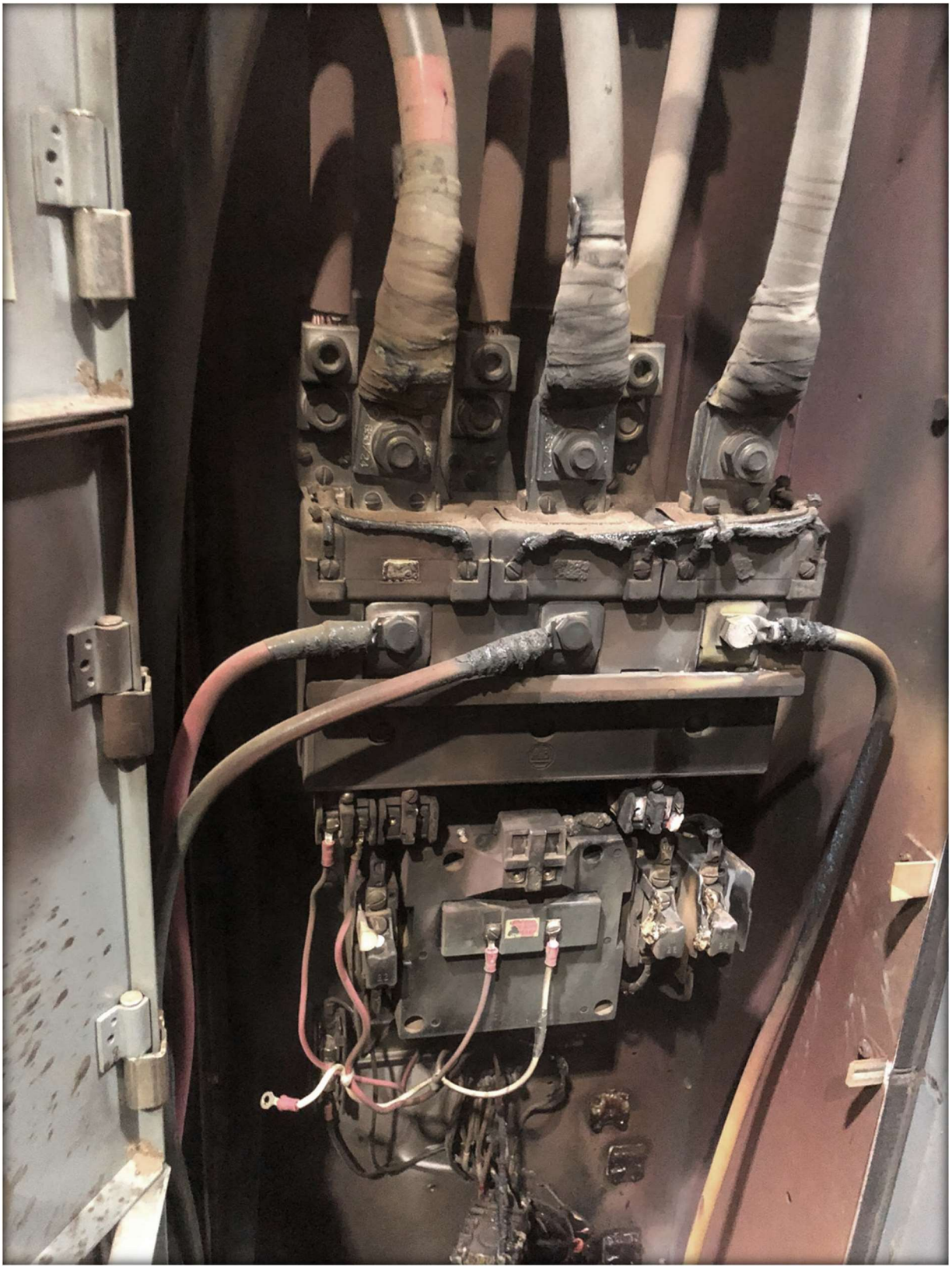

Figure: 3 - Internal components, connections, and damage.

Figure: 4 - Internal fuses, connections, and damage.

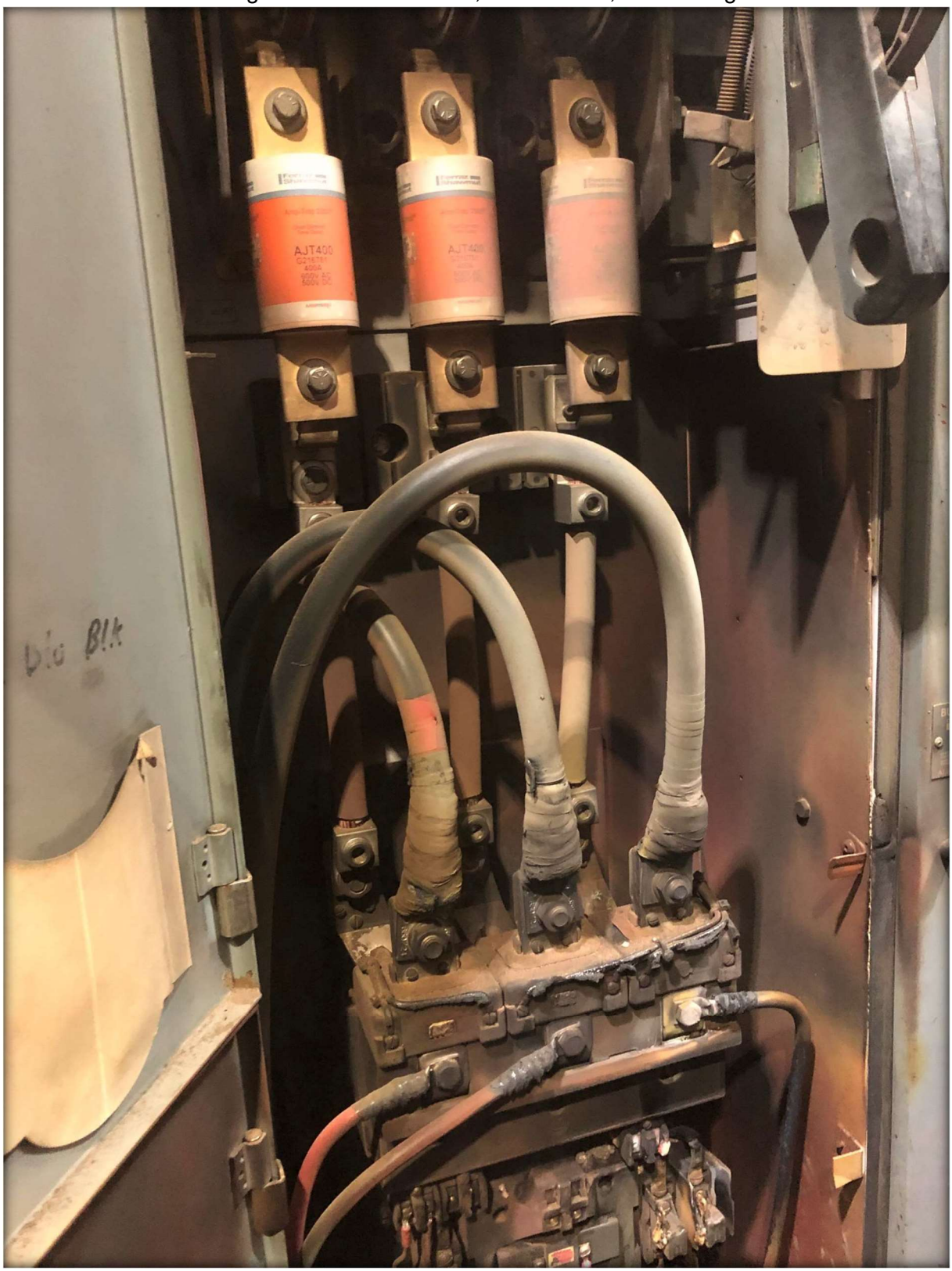

Figure: 5 – Motor Starter.