Incident Summary #II-983150-2020 (#16673) (FINAL)

SUPPORTING INFORMATION	Incident Date		February 20, 2020
	Location		Abbotsford
	Regulated industry sector		Electrical - Low voltage electrical system (30V to 750V)
	Impact – Injury	Qty injuries	1
		Injury description	During electrical testing after the initial incident the electrician received a minor electric shock to their hand.
		Injury rating	Minor
	Impact – Damage	Damage description	The flexible metal dryer ducting melted and burned the backside of a clothes dryer and surrounding walls. The bonding path in electrical circuits became energized in multiple condo units. The bonding path continued to be energized until the power was turned off.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		A fire occurred behind a stackable washer/dryer in a new unit of a multi-unit condo building that was in the final stage of construction. An electrician that was investigating the cause of the fire received a minor shock when he contacted between the dryer ducting and the electrical outlet .
INVESTIGATION CONCLUSIONS	Site, system and components		A bonding path is established in an electrical system with the intention to ensure all metallic non-current caring parts are electrically at the same potential to minimize shock hazard from a voltage difference between the metal parts. The bonding can be achieved through use of conductors, metallic raceways and bonding screws. The bonding path also provides a low-impedance path back to the source for fault currents, which ensures the operation of protective devices in the event of a fault or circuit failure and prevents potential arcing or overheating caused by the fault current seeking a random path to the source. When the current flowing through the bonding system back to the source is greater than the breaker (protective device) rating, the breaker would trip and stop the current flow. When the bonding path is not a continuous low impedance path to ground, unintended fault currents on the system can travel through equipment, conductive metal parts of buildings and structures. This can cause arcing and heating of high resistance bonding paths, prevent overcurrent devices from tripping, and present an electric shock hazard by allowing standing voltage on isolated metal objects.
	Failure scenario(s)		A three section 120/208V, 800A meter stack was installed on the first floor by an electrical worker without a bonding conductor between each meter stack section and the tap box as required by the manufacturer. The Field Safety Representative for the

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	company did not ensure that the regulated work complied with all requirements before the meter stack was energized. The dryer receptacle in unit 114 was mounted to the metal dryer box with 4 mounting screws. One of the mounting screws holding the dryer receptacle to the metal box pierced the insulation of a ungrounded (hot) conductor connected to the receptacle. When the damaged dryer circuit was turned on, the breaker did not trip and the bonding path became energized. When the receptacle was energized, current flowed on the bonding path conductor from the dryer receptacle in Unit 114 to the panel in Unit 114. The current continued to flow on the bonding conductor back to the meter stack. The meter stack was isolated from the low impedance bonding path in the tap box which went back to the electrical room. The meter stack section also feed units 115,116,117,118 and 119. All of these units bonding conductors are connected in the meter stack, therefore, the bonding paths in unit 115-119 became energized as well. The rigid dryer ducting in unit 115 was installed in such a way that it was making contact with other metallic construction material that provided a path to ground. Current began to flow through the bonded metal frame of the dryer, through the flexible metallic foil duct, to the grounded rigid metal ducting. The dryer ducting from the appliance to the building ducting is made up of flexible metallic foil with a structural metal coil wire inside which has a high electrical resistance. When current flows through a point of high resistance, heat is generated. This heat caused the flexible metallic foil ducting to melt and burn the surrounding area. When an electrician went to investigate the cause of the fire, the electrician turned off power to unit 115. The electrician removed the receptacle from the box and was in contact with the receptacle bond screw. When the electrician made contact with the grounded dryer duct with the other hand, the electrician received a minor shock.
Facts and evidence	Witness statements: - electrical apprentice entered Unit 115 and observed heavy smoke. - the electrical FSR turned off the breaker to Unit 115. - the electrical contractor and the Abbotsford fire department determined the smoke was originating from behind the stackable washer and dryer in the unit. Upon removing the stackable washer and dryer the melted flexible dryer ducting was found, along with scorch marks to surrounding areas. (See photos 1-4.) - The electrical FSR touched the dryer ducting portion that was protruding out of the ceiling and a bonding screw on the dryer receptacle and received an electrical shock to their hand even with the power to the unit being off. - the electrical FSR performed tests in surrounding units and observed voltage on the bonding system in multiple units. Power was then removed from each unit effected.

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	Testing post incident by the electrical contractor: - missing bonding conductor found between 1st floor tap box and 1st floor meter stacks. (See photo 8) - manufacturers installation instructions for meter stack requires ground conductor. - FSR stated that he missed not seeing the bonding cable conductor during his inspection of the meter stack installed by other worker. - once power was returned and the bonding conductor installed, the dryer breaker in unit 114 tripped, notifying the electrical contractor of the location of the fault.(See photo 9 and 10) - pierced conductor was found in unit 114 dryer receptacle. (See photo 5 and 6.)
Causes and contributing factors	The cause of this incident is very likely the electrical contractor piercing the dryer receptacle conductor and not installing the bonding conductor between the meter stack sections as per the manufactures installation instructions. Both of these actions contributed to the flexile dryer ducting becoming energized and hot enough to melt and scorch the surrounding areas. This subsequently caused the electrician to receive a shock when contacting isolated energized equipment. Electrical contractors are required to have a Field Safety Representative (FSR) inspect all work prior to energizing electrical equipment. In this case the FSR inspection did not detect the missing bonding conductor or the pierced branch circuit conductor at the dryer receptacle.

Photo 1: Overall damage to stackable washer, dryer, venting and surrounding area in unit 115.

Photo 2: Fire damage located behind stackable washer and dryer unit 115.

Photo 3: Fire damage behind stackable washer and dryer looking up towards the venting unit 115

Photo 4: Overall photo of damaged stackable washer and dryer in unit 115.

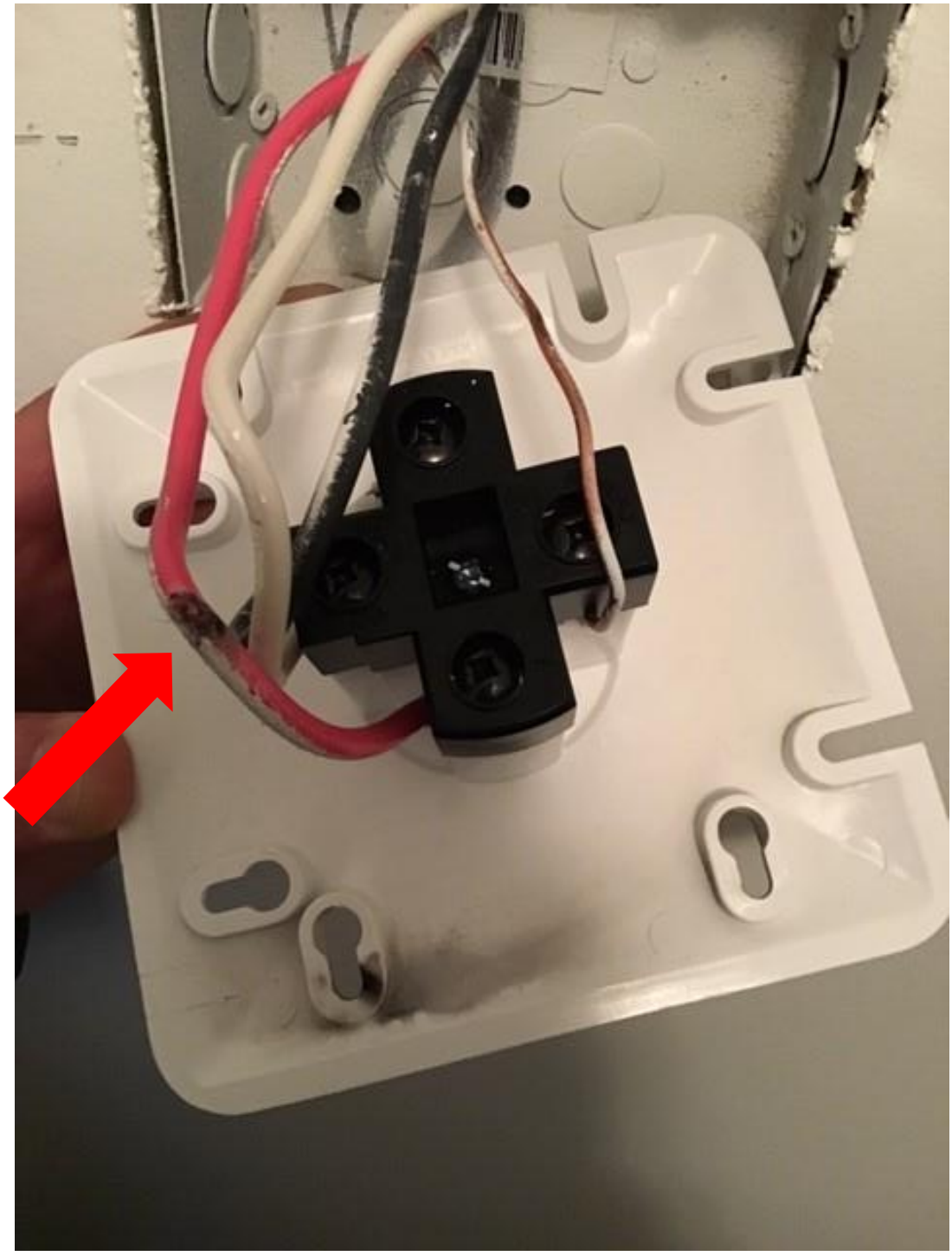


Photo 5: Close up of pierced dryer receptacle wire in unit 114.

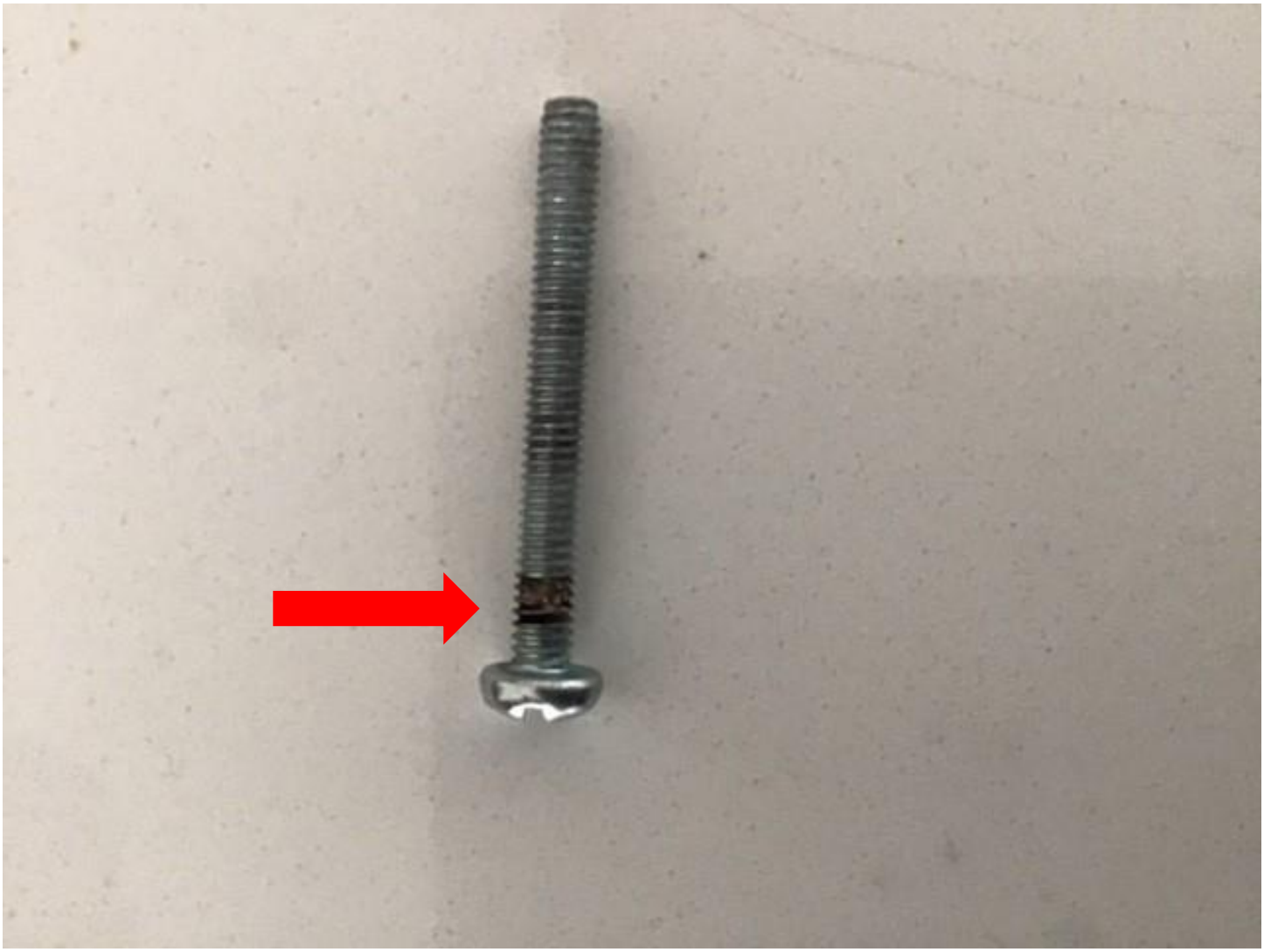


Photo 6: Close up of electrical arcing on the mounting screw that was holding the dryer receptacle in unit 114 to the box in the wall.

Photo 7: Example of multiple ducts touching each other and touching steel studs drops.

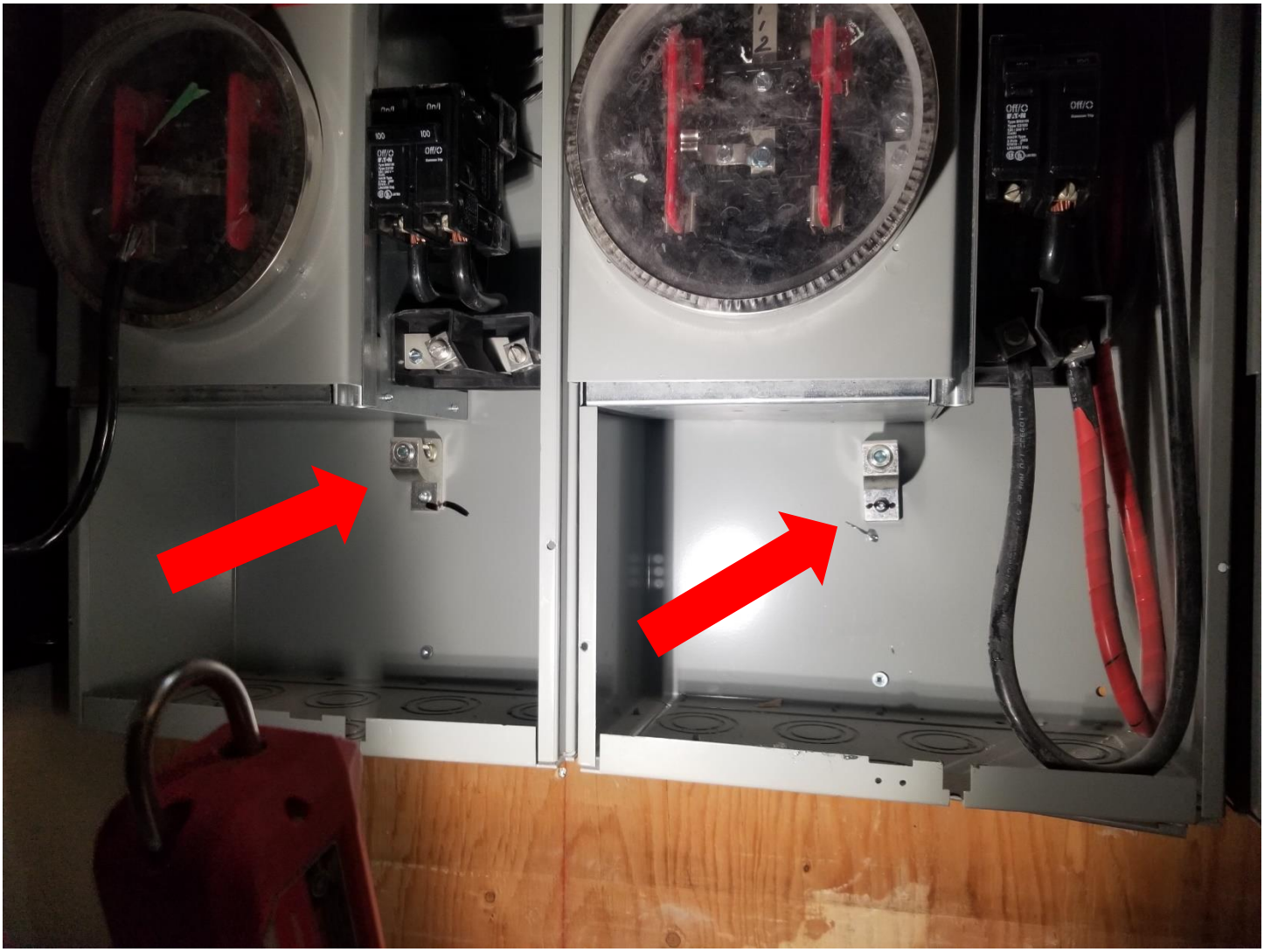
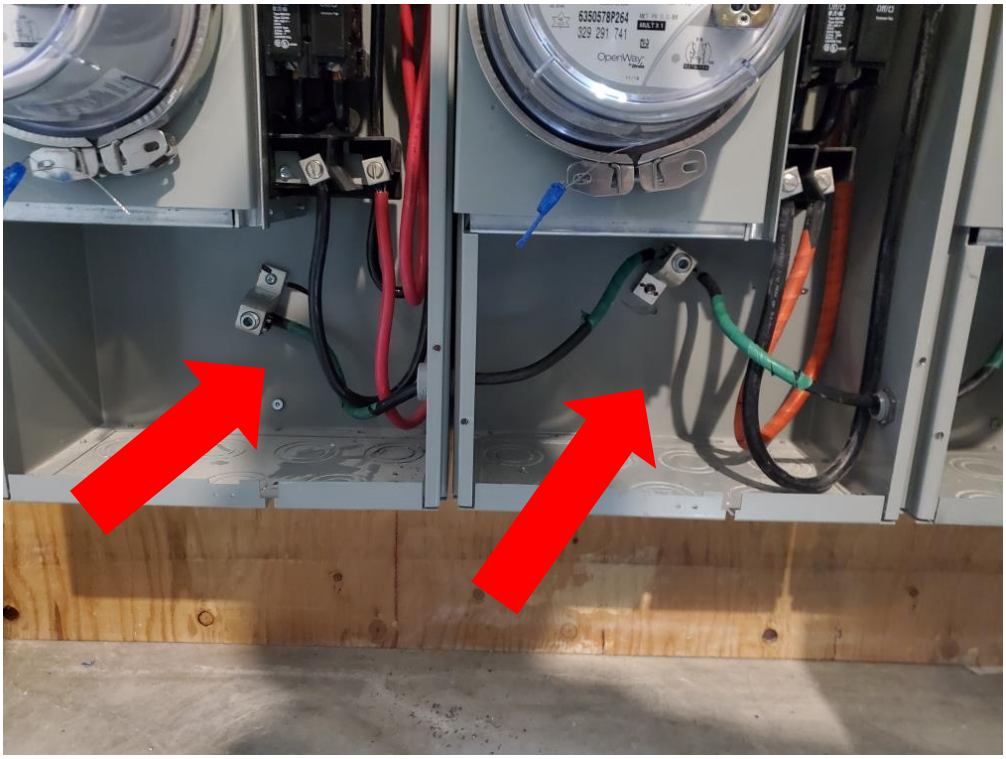


Photo 8: Missing bonding conductor in meter stack to tap box.



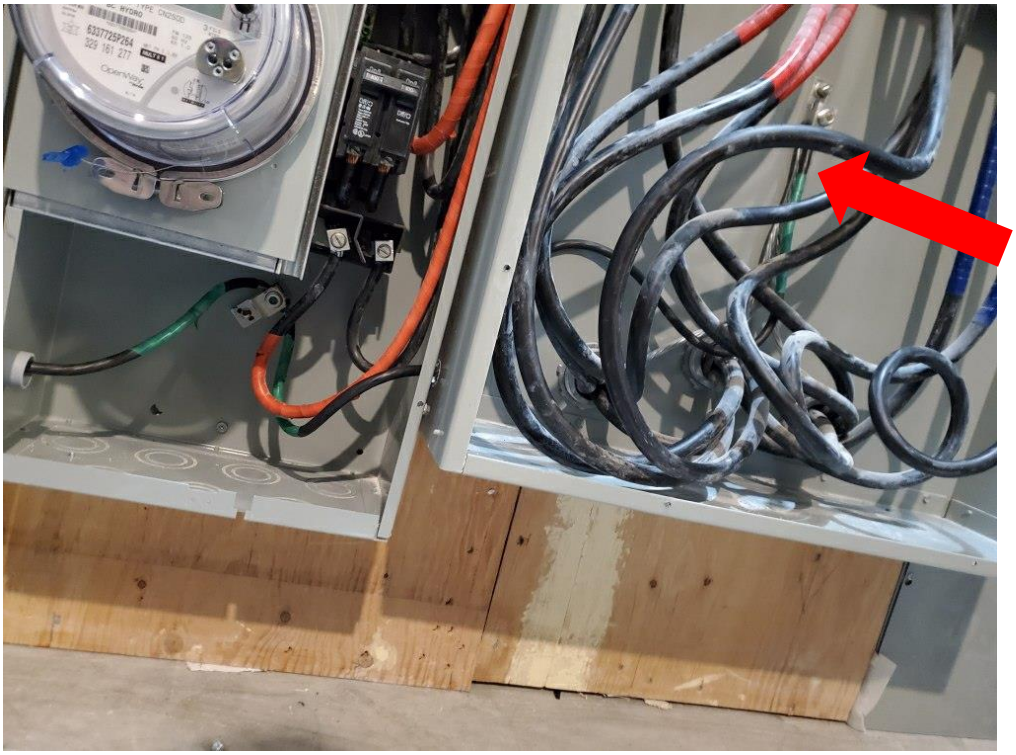


Photo 9 and 10: Bonding conductor that should have been installed in meter stacks to tap box.

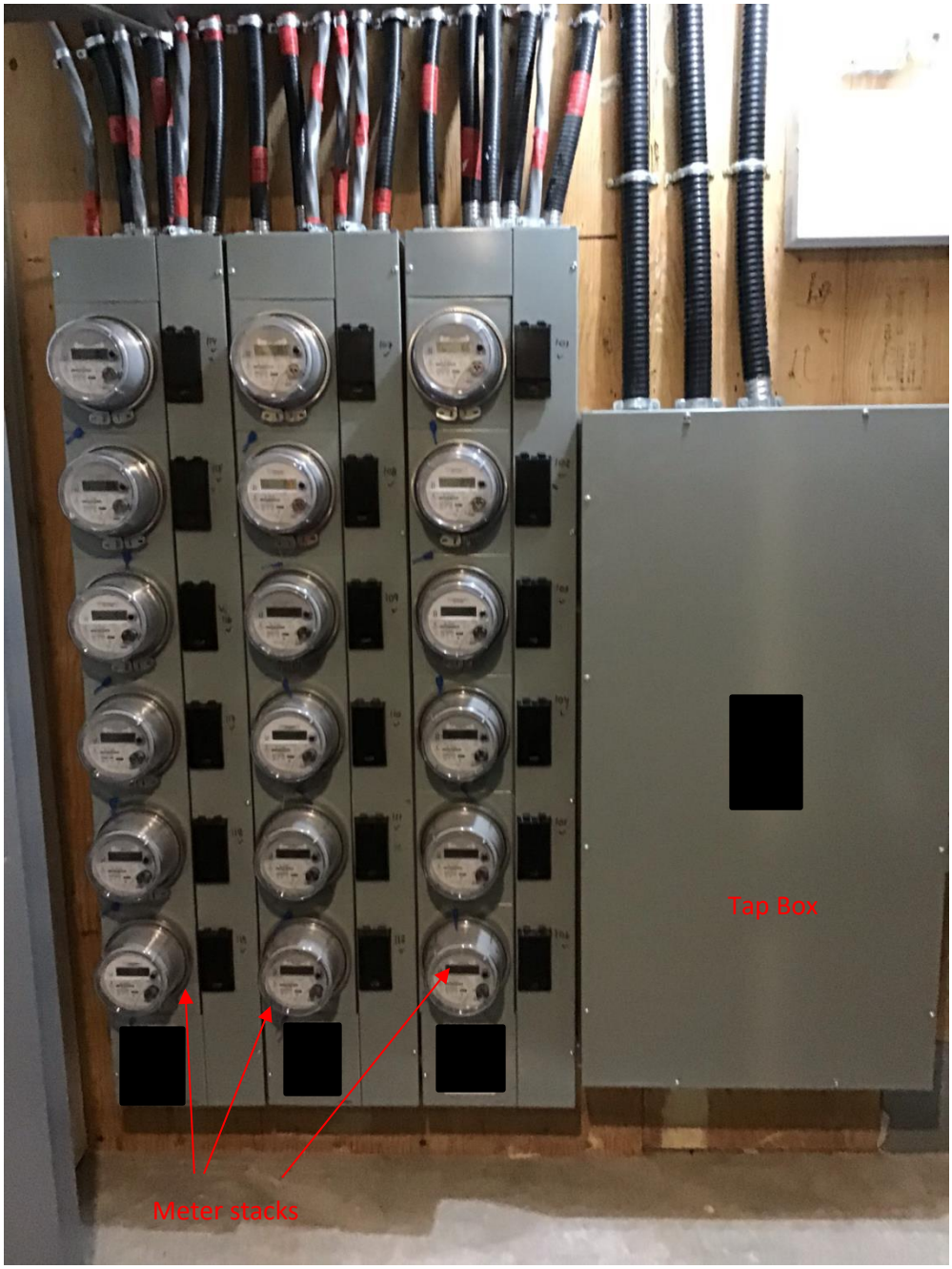


Photo 11: Overall view of meter stacks and tap box on level 1.

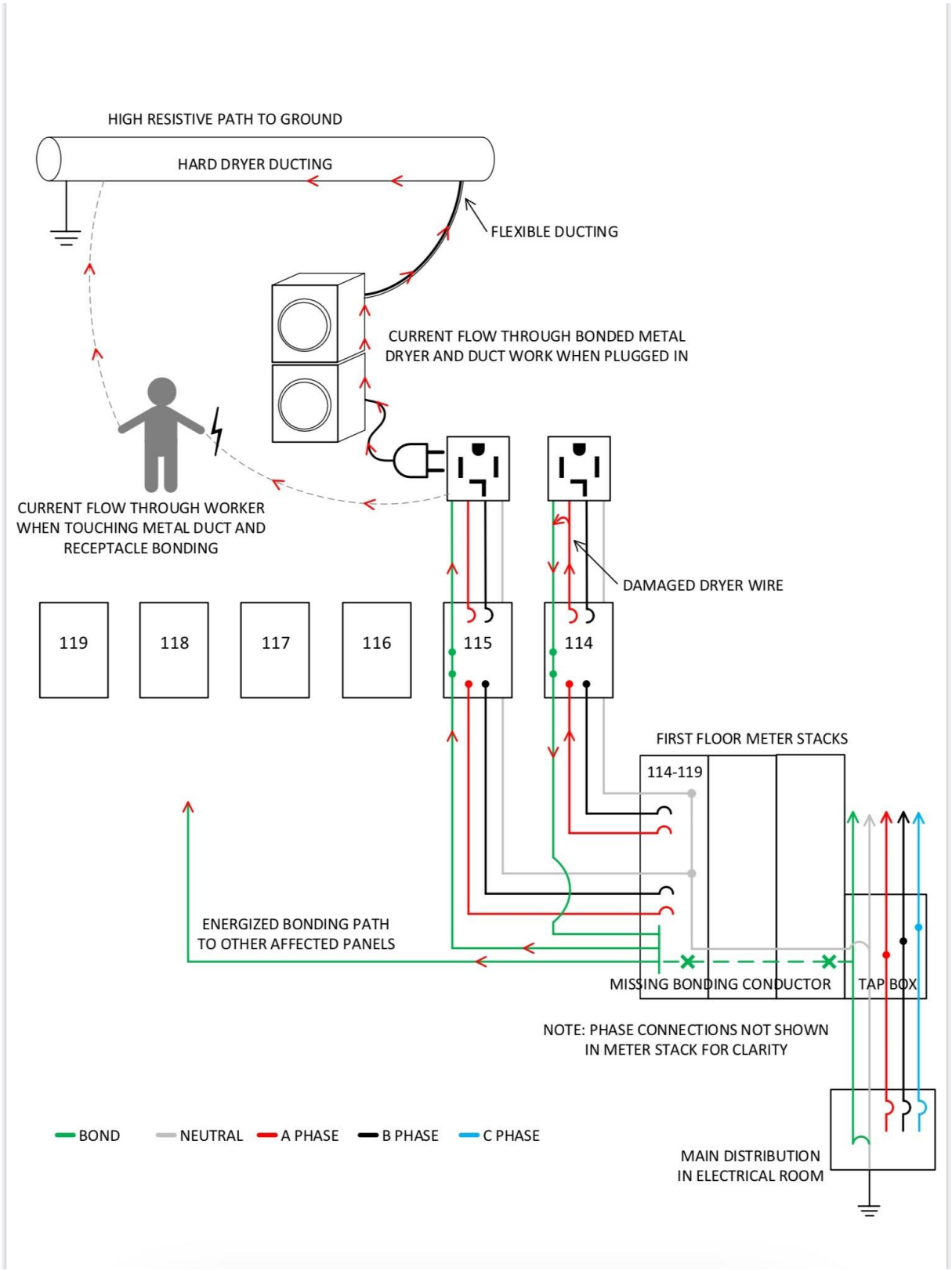


Photo 12: Diagram of incident.