

Incident Summary #II-1454740-2022 (#30195) (FINAL)

SUPPORTING INFORMATION	Incident Date	October 20, 2022	
	Location	Golden, BC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Damage	Damage description	Electrical short damage to transformer is non-reparable causing a permanent loss of equipment and temporary loss of operations.
		Damage rating	Moderate
	Incident rating	Moderate	
	Incident overview	<p>During an underground installation at the site, the excavator equipment while digging hooked the transformer grounding conductor and ground plate. The force applied to the grounding conductor caused the transformer coils and terminations to physically shift.</p> <p>Damage beyond repair occurred to the internal components of the transformer resulting in an electrical short.</p>	
INVESTIGATION CONCLUSIONS	Site, system and components	<p>Different components of an electrical system need different voltages that may not be readily available by the supply authority. When these voltages are not available, a transformer will be installed to step-up or step-down the voltages as required.</p> <p>These transformers have a magnetic core, primary winding, secondary winding, and isolated termination points which sometimes require external grounding of these transformer components. These external grounding components include a conductor and a grounding electrode which are buried on the exterior of the buildings in the soil at a specified depth.</p> <p>This transformation of the voltages allows the end user the required voltage to run their electrical equipment.</p>	
	Failure scenario(s)	<p>An excavator was digging close to the building with spotters present. The excavator bucket hooked onto the grounding conductor. The pulling force applied to the grounding conductor caused the transformers internal components to physically shift clockwise putting strain on the windings and XO termination point on the secondary insulating bar inside the transformer causing them to bend and break the insulating bar. During this the X3 termination point and XO busbar met each other causing an electrical short thus melting the bus and the X3 winding end.</p>	
	Facts and evidence	<p>Site visit occurred with site FSR electrician and apprentice; both were witness to incident.</p>	

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	<p>Electricians witnessed the excavator unknowingly dig up the grounding conductor and plate. It was evident that the grounding conductor and plate were not initially installed at an adequate depth and no caution tape was present.</p> <p>Extreme force applied to grounding conductor eventually caused it to break and damage the conductor and conductor insulation throughout length.</p> <p>Fail point in the transformer is the XO termination point where the grounding conductor was terminated on. The force applied on the grounding conductor caused the entire secondary bar to bend. During this bend the X3 termination point had contacted the XO busbar causing an electrical short under load. Electricians noted hearing a loud bang at this time. Charring and smoke damage could be observed in transformer.</p> <p>Safety Officer contacted the original installer and confirmed that they did not bury the grounding conductor and plate at an adequate depth nor was caution tape installed due to frozen ground.</p>
Causes and contributing factors	<p>It is certain that the shallow unmarked depth of the system grounding conductor is the primary cause of the damage that occurred to the transformer during the excavation of a trench near the building that houses the electrical equipment.</p>



Photo 1 - Exposed copper is due to strain on conductor from excessive force from excavator.

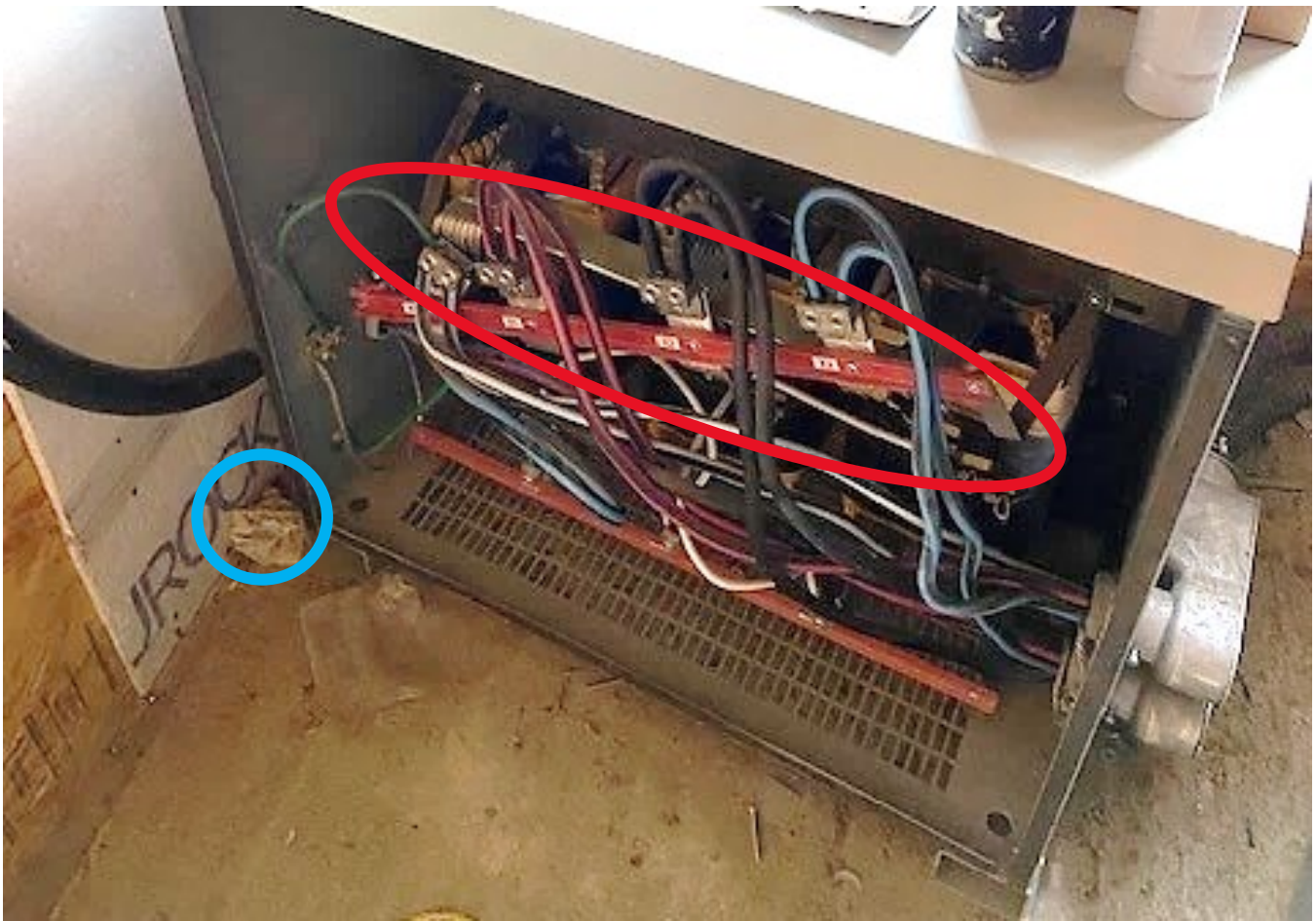



Photo 2 - BLUE - 4" clockwise rotation of transformer due to grounding conductor being pulled on. **RED** - Damaged secondary insulating bar should be level.




Photo 3 - Damage to grounding conductor insulation due to excess strain.

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	PRIM	600 V	ANN	KVA	150
	SEC	208Y / 120	BIL 10KV	TYPE	TWPF-AL
	MODEL	AMT150A1	3 PH	HZ	60

THREE PHASE DRY TYPE TRANSFORMER / TRANSFORMATEUR DE TYPE SEC TRIPHASÉ

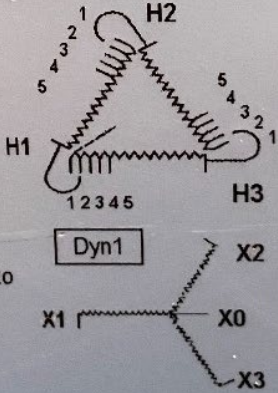
Primary:

Voltage	% Tap	Jumpers To:
630	105.0	1-1-1
615	102.5	2-2-2
600	100.0	3-3-3
585	97.5	4-4-4
570	95.0	5-5-5

Secondary:

Voltage	Phase	Connect loads to
208	3	X1-X2-X3
120	1	X0-X1
		X0-X2
		X0-X3

AL WDG



IMP [%]	6.5
CLASSE/CLASS	220°C
ÉLÉV/RISE	150°C
SPÉC/SPEC	8036
CONNECT	AL9CU
POIDS/WT	927 LBS
BOITIER/ENCL	3R
SÉRIE/SN	9233-119

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Photo 4 - Transformer nameplate information

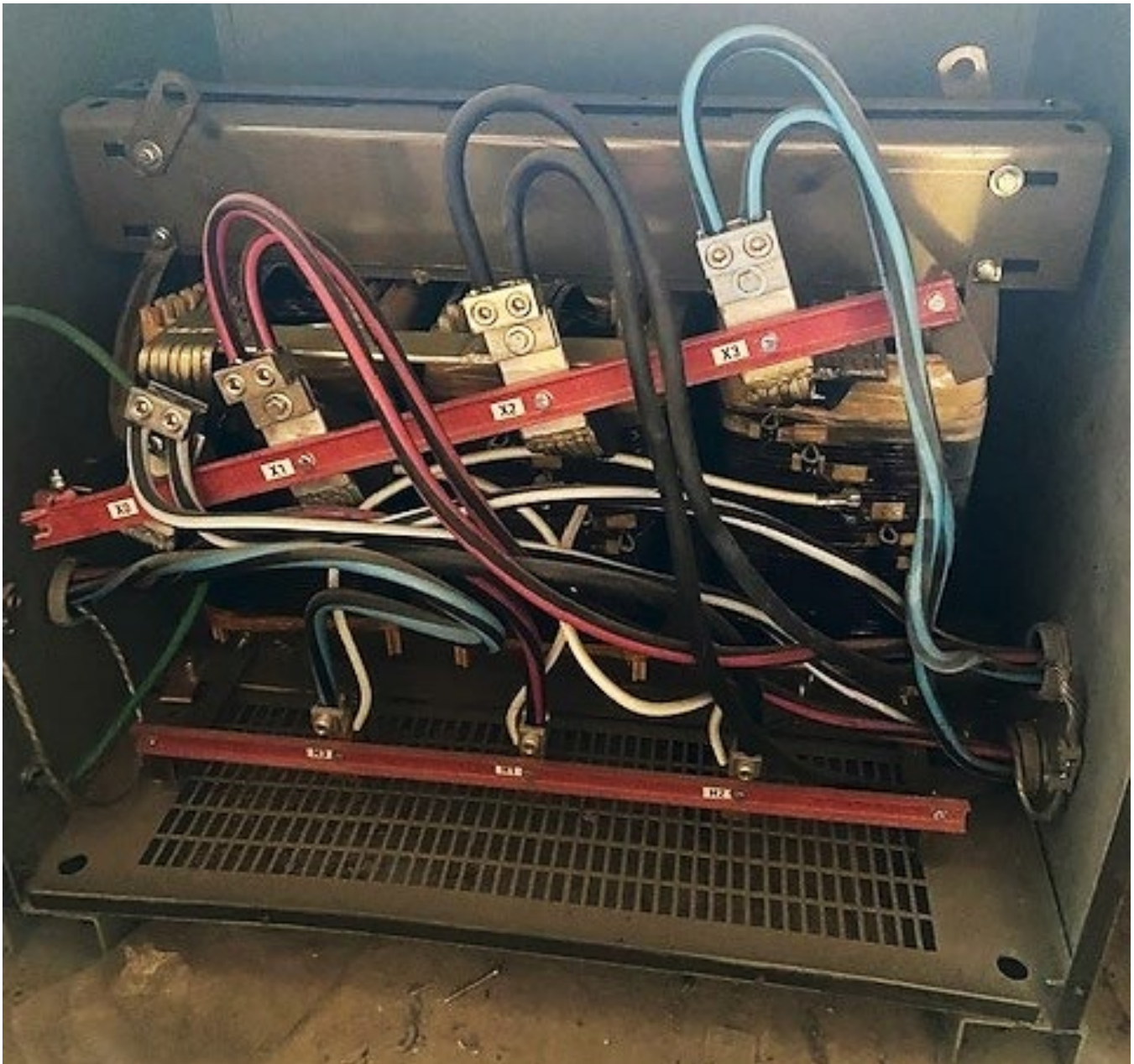


Photo 5 - Secondary insulating bar, should be level, but was pulled down by the X0 point on the left side. Smoke damage throughout.

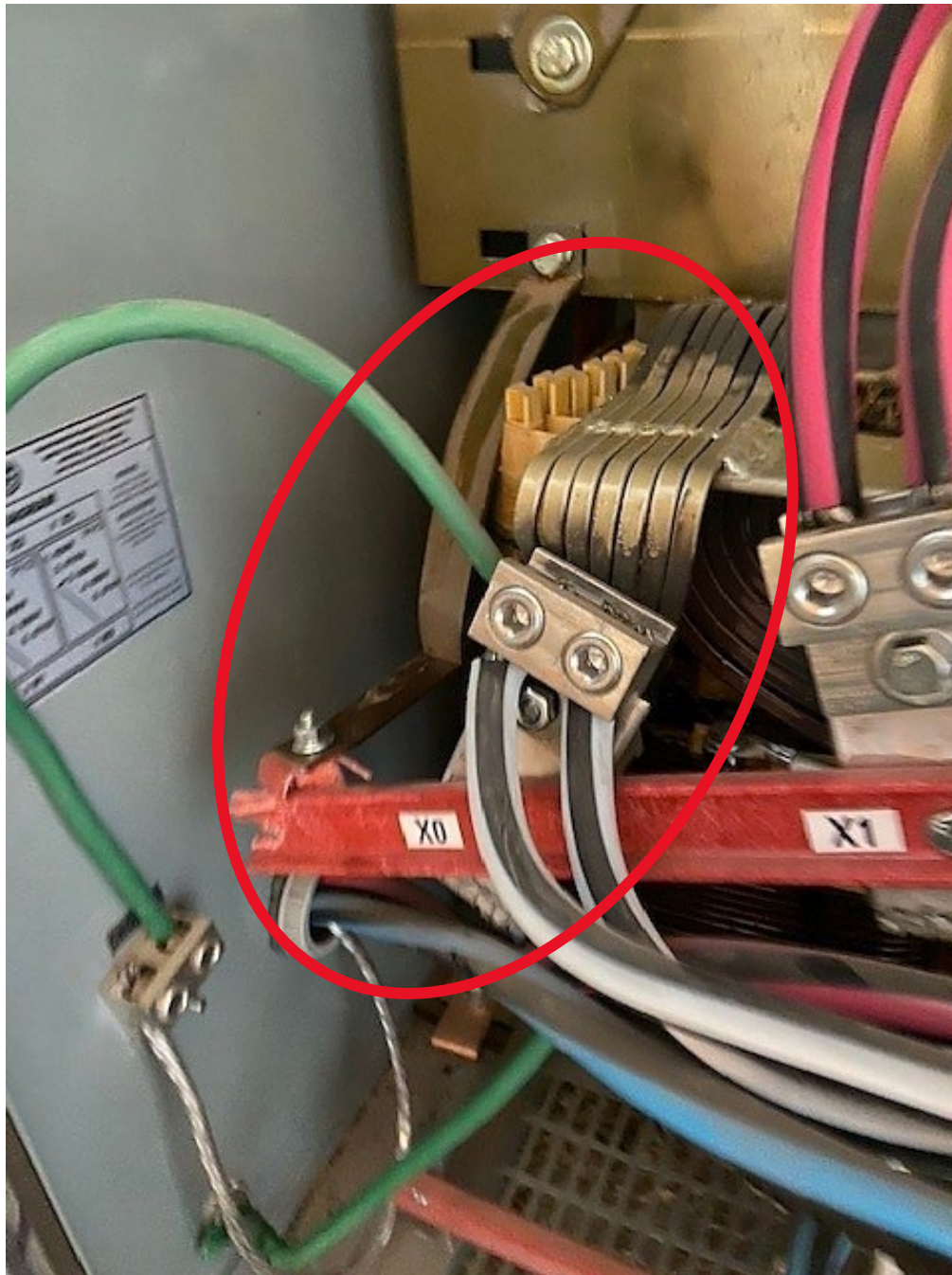


Photo 6 - Where grounding conductor enters transformer, bottom left and is terminated on X0 point pulling the entire bar down.

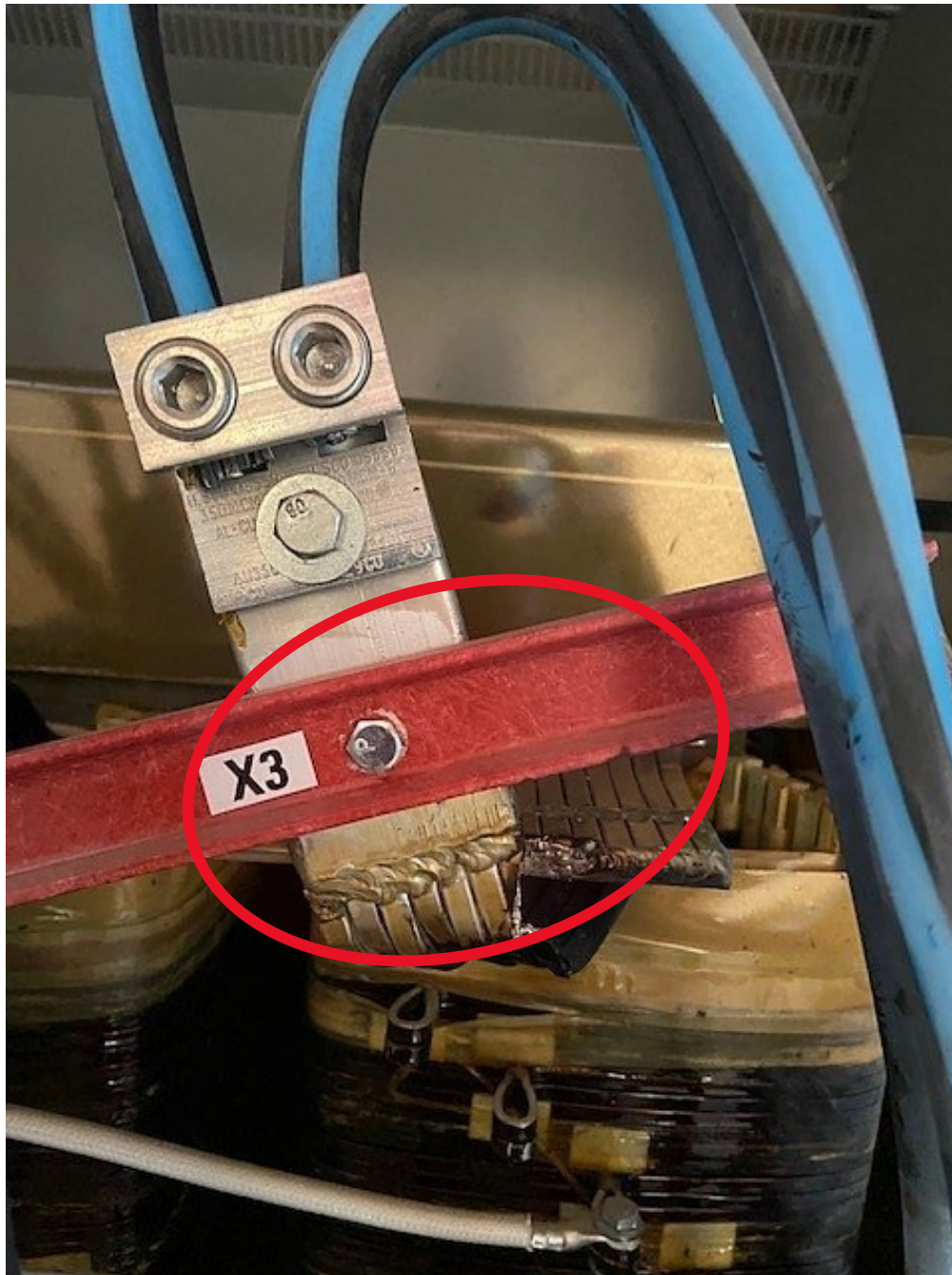


Photo 7 - X3 point where it shorted out.