

Incident Summary #II-1042078-2020 (#18835) (FINAL)

SUPPORTING INFORMATION	Incident Date	July 17, 2020	
	Location	Vancouver / UBC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	0
		Injury description	No injuries
		Injury rating	None
	Damage	Damage description	Damage to a single family dwellings consumer service raceway and conductors between the meterbase and panelboard.
		Damage rating	Minor
	Incident rating	Minor	
Incident overview	Failure of the consumer service bonding path leading to equipment damage.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>Ungrounded conductors are protected by overcurrent and short circuit protection at the point where the circuit receives its supply of current. Usually consumer service conductors do not have overcurrent protection between the supply utilities service conductors and the line side of the consumer services main overcurrent device.</p> <p>The overcurrent protection for consumer service conductors is usually provided on the primary side of the supply utilities transformer feeding the service. As a result when a fault occurs on the line side (upstream) of the services main overcurrent device a large amount of current can flow through the bonding path for a considerable amount of time before the supply utilities overcurrent protection can clear the fault.</p> <p>This is why the requirements for bonding at service equipment is more stringent than that of equipment downstream; after the main overcurrent and short circuit protection.</p>	
	Failure scenario(s)	Possible damage to the insulation of an ungrounded consumer service conductor led to a fault between the metal consumer service raceway and the damaged conductor. Due to an inadequate bonding path the fault was not cleared by the supply utilities overcurrent device before the bonding path was melted due to the high heat caused by the fault; resulting in the service remaining energized after the bonding path failed.	
	Facts and evidence	<p>Physical facts and evidence:</p> <p>After examination of the equipment, there was damage to a insulated consumer service ungrounded conductor and the insulated grounded neutral conductor at the location of the consumer service raceways connector entering into the service entrance section of the combination panelboard. Visible heat and arcing damaged observed on the electrical metallic tubing raceway connector and the interior of the panelboard enclosure.</p>	

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	<ul style="list-style-type: none"> -An ungrounded conductor's insulation was damaged exposing the bare copper conductor, visible in the area of the connector. -The knockout used to enter the consumer service raceways connector into the panelboard was larger than the required size. -When the conductors were removed from the raceway it was found there was damage to the conductors that extended beyond the point of failure. -The Field Safety Representative (FSR) on-site who's services were obtained to correct the issue stated that the metal locknut used to secure the connector to the panelboard enclosure was loose and the plastic bushing was off the connector hanging loose, creating an unreliable bonding path. -The service remained energized after the bonding path failed as the service was still energized and had to be disconnected to correct the issue. -An insulating substance used to seal around the connector entering into the meterbase may have affected the bonding connection to the meterbase enclosure, adding impedance to the bonding path. -The panelboard was only secured to the structure with one screw, making the equipment more susceptible to movement and vibration. -The panelboard appeared to be retrofitted into the wall; indicating this was not the original panelboard when the house was built and had been upgraded at some point. -The electrical metallic tubing consumer service raceway was installed loosely and at an angle with modifications made to the side of the meterbase enclosure also indicating the panelboard may have been changed.
<p>Causes and contributing factors</p>	<p>It is likely that a break or damage to the consumer service conductor insulation exposed the bare copper conductor which made contact or came in close contact with the electrical metallic tubing raceway connector causing a fault.</p> <p>Due to the poor bonding connection made by the loose locknut and oversized knockout for the connector, the bare conductor and metal connector arced until the bonding path failed. This failure occurred before and without the supply utilities overcurrent protection clearing the fault.</p> <p>The conductors were possibly damaged during installation or when the panelboard may have been replaced. Movement or vibration due to the panelboard only being secured by one screw may have caused damage to the conductors.</p>



Picture #1 – Picture of when the service entrance section barrier was removed. Red arrow indicates where the damaged was to the ungrounded consumer service conductor shown in Picture #2 with a red arrow.



Picture #2 – Picture of the conductors after they were removed for the installation. Red arrow indicates the damage to the insulation of the ungrounded conductor where the fault occurred and the blue arrow is indicating other damage to the conductor's insulation.



Picture #3 – Picture of the damage to the electrical metallic tubing connector after the conductors and lock nut were removed.



Picture #4 – Picture showing the knock out in the panelboard is oversized for the installed connector.



Picture #5 – Picture showing the alterations to the single meterbase.



Picture #6 – Picture of the electrical metallic tubing raceway once it was removed showing the black sealant around the connector on the side that was entering into the meterbase.