Incident Summary (II-773843-2018) (Incident ID: 9705)

SUPPORTING INFORMATION	Incident Date		November 9, 2018
	Location		Abbotsford, BC
	Regulated industry sector		Low Voltage Electrical System (30V to 750V)
	Impact – Injury	Qty injuries	0
		Injury description	No injuries
		Injury rating	None
	Impact – Damage	Damage description	Fire damage to an electric exhaust fan and its associated wiring in addition to dwelling branch circuit wiring within the attic space. Smoke, fire and water damage to main floor of house. Water damage to basement area.
		Damage rating	Major
	Incident rating		Major
	Incident overview		A bathroom exhaust fan motor and its assembly caught on fire when power was restored to the de-energized home by the utility provider with the supply service conductors incorrectly terminated at the overhead electrical service conduit during service upgrade work by a licensed electrical contractor. The resulting fire started at the fan and spread through the dwelling attic space.
INVESTIGATION CONCLUSIONS	Site, system and components		The bathroom exhaust fan motor is operated by a general purpose wall switch and the motor turning the exhaust fan is rated to operate at 120v AC. In a dwelling of combustible construction it is typically directly wired with non-metallic sheathed cable (NMSC) that includes an ungrounded conductor, a grounded (common) conductor and a bare bonding conductor. The dwelling had a typical 120/240v single phase service provided by a utility transformer at the road, that consisted of two ungrounded conductors and one grounded (neutral) conductor, providing either 240 volts or 120 volts to the dwelling.
	Failure scenario(s)		Power was disconnected to the dwelling by the utility provider due to a private service pole on the property that was identified a safety hazard and needing replacement. The pole was replaced, the service raceway was re-installed onto the new pole, but the service conductors from the dwelling protruding from the overhead electrical service conduit were miss-identified at the time of installation and were terminated to the overhead lines from the utility transformer with one of the overhead ungrounded conductors from the transformer terminated to the dwellings grounded (neutral) conductor and the utilities common conductor terminated to one of the dwellings ungrounded conductors. Power was restored to the dwelling by the utility. At the same time inside the house the master bathroom fan switch was in the ‘ON’ position. The fan motor received 240 volts across the motor windings which generated excess heat due to the motor

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	drawing too much current at 240 volts, causing the motor winding insulation to break down and the motor to short out and spark.
Facts and evidence	It was identified by the fire investigator working on behalf of the home insurer that at the overhead electrical service conduit the contracted installer had miss-identified and terminated the dwelling conductors to the overhead service conductors incorrectly. This was proven by doing a 'continuity' test of all dwelling conductors as connected. It was identified by the fire prevention officer that the fire started in the location of the bathroom exhaust fan. No other ignition sources were identified in the origin location. As declared by the fire investigator, the source of the fire was the failure of the exhaust fan motor when 240 volts was applied to it over a short duration of time.
Causes and contributing factors	It is very likely the exhaust fan failed due to the incorrect service conductor connections, resulting in excess voltage being applied to the motor for a long enough duration that the excess current generated excess heat which compromised the motor winding insulation, causing it to short out and spark, igniting the subsequent fire.

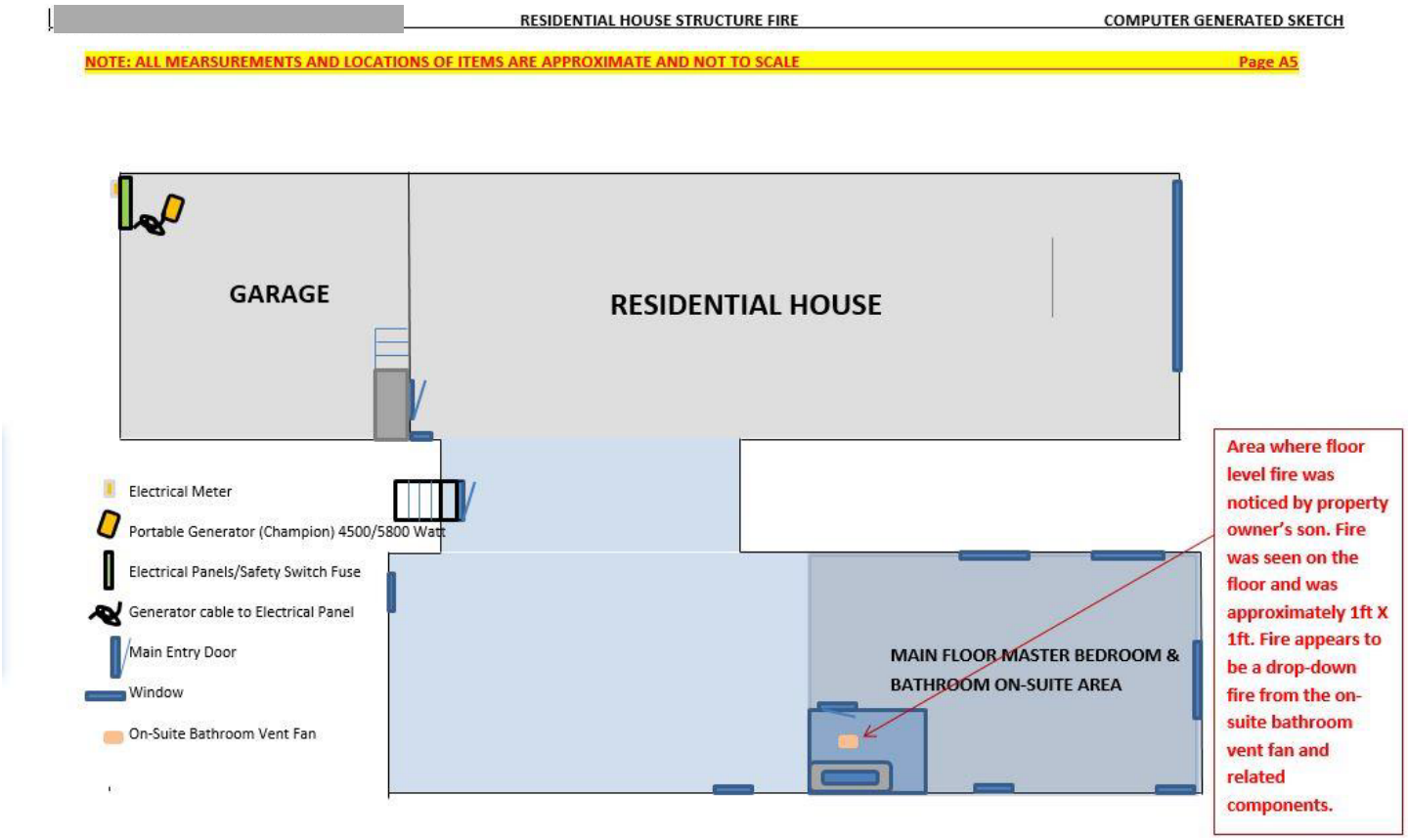

Figure 1 –Layout of residential dwelling where incident took place. Sketch provided by local fire department fire prevention officer.

Figure 2 –Location where dwelling service conductors were incorrectly terminated to the overhead line conductors from the utility transformer. The red arrow shows the service neutral conductor that was incorrectly identified with white tape by the installer. This caused the utility to re-energize an ungrounded line conductor that was terminated to the dwelling's service neutral conductor which caused the over voltage condition at the bathroom exhaust fan within the dwelling.

Figure 3 –Origin of the dwelling fire. Bathroom exhaust fan is suspended from a non-metallic sheathed cable branch circuit. Picture provided by local fire department fire prevention officer.