TECHNICAL SAFETY BC

Incident Summary #II-1052002-2020 (#ID:19022) (FINAL)

SUPPORTING INFORMATION	Incident Date		August 14, 2020
	Location		Penticton, British Columbia
	Regulated industry sector		Electrical - Low voltage electrical system (30V to 750V)
	Impact – Injury	Qty injuries	0
		Injury description	No Injuries
		Injury rating	None
	Impact – Damage	Damage description	A complete loss of a residential distribution load center and all associated wiring including consumer service conductors. A Utility Cut Out switch was also lost at the time of incident when it was activated
		Damage rating	Major
	Incident rating		Major
	Incident overview		An electrical fault was created within a residential load center, without proper system protection the fault caused a large power draw on the utility system until the Utility Cut Out switch was activated. As a result of this activation, a power loss for the surrounding downtown area was created.
INVESTIGATION CONCLUSIONS	Site, system and components		In a modern day electrical distribution system safety redundancies are placed within the system to create a tiered safety system should a fault occur within a residential home. **(See Figure 1)** A utility supplies electrical energy to its consumers via a utility power grid. The grid that is installed is protected on the downstream side by device called a Utility Cut Out switch. The electrical power is then transformed by a utility transformer to a much safer consumer voltage. From there it is ran to a utility meter where the power consumption is monitored for billing purposes before being connected to a consumer service electrical panel . Once the power is inside a residential electrical panel it is connected to a main overcurrent device (breaker) where the power can safely be disconnected should a large draw or fault occur within the system. Within the residential electrical panel and after the main breaker there are individual branch circuit overcurrent protection devices installed to safely supply power to all electrical devices within a home and safely disconnect those individual devices should a fault occur. An example of this is a 30 amp 2 pole breaker installed within a residential electrical panel to supply power to a clothes dryer. Should that clothes dryer create a fault condition or draw a larger amount of current than it is designed for the 30 amp breaker will trip and disconnect any and all power to that dryer. Should that 30 amp breaker not disconnect the electrical system safely the main breaker is designed to disconnect and clear the fault should the electrical energy draw increase beyond a safe amount. In this particular instance an older legacy system was observed within the home that did not incorporate the use of a main overcurrent device (main breaker) and only utilized individual branch circuit protection. If a fault occurs within the system in one's home and is unable to be cleared by the individual branch circuit protection the Utility Cutout Switch is the only other line of protection. It is imperative to understand

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	that the Cutout switch is meant to protect entire neighbourhoods electrical energy and not just individual homes. It requires a large release of electrical energy before sensing a fault and activating. **(See Figure 2)**
Failure scenario(s)	The home in this incident was undergoing a service change to incorporate a new panel with a main breaker for modern protection. This new system was installed in parallel to the existing system as the original was on overhead system and the new system was underground Without having the hydro disconnected for safety the electrical contractor began moving circuits from the existing load center to the new panel for later energization of the new system Contact was made while moving these circuits within the existing panel between energized components and a fault occurred. The release of large amounts of energy caused extensive damage to the existing electrical load center and surrounding area within the home After an unknown length of time the Utility Cutout switch was activated (tripped) notifying the utility as the grid had now lost power and clearing the fault at the same time.
Facts and evidence	It is known that older homes in this area were originally installed with electrical service load centers that did not incorporate a main breakers Electrical Safety Officer received a phone call that the utility cutout fuse had tripped and they were aware of the occurrence and what the cause was as they were able to provide the specific address. The fire department had also been contacted and was able to provide similar information Electrical Safety Officer interviewed electrical contractor involved who stated that the utility had delayed their disconnect appointment At this time the contractor made the decision to proceed moving wires in advance of the disconnect with the existing load center still energized.
Causes and contributing factors	Although the exact cause of the electrical fault is undetermined outside of the wires being removed, it is likely that working on energized equipment that did not incorporate a main overcurrent device created a more hazardous situation should a fault occur. When the fault occurred it is highly probable that the energy release continued without ceasing until the utility cut out fuse was tripped.

Photos or diagrams (please see next page)

Figure 1. Site Systems and Components - Scenerio One - WITH Main Overcurrent Device

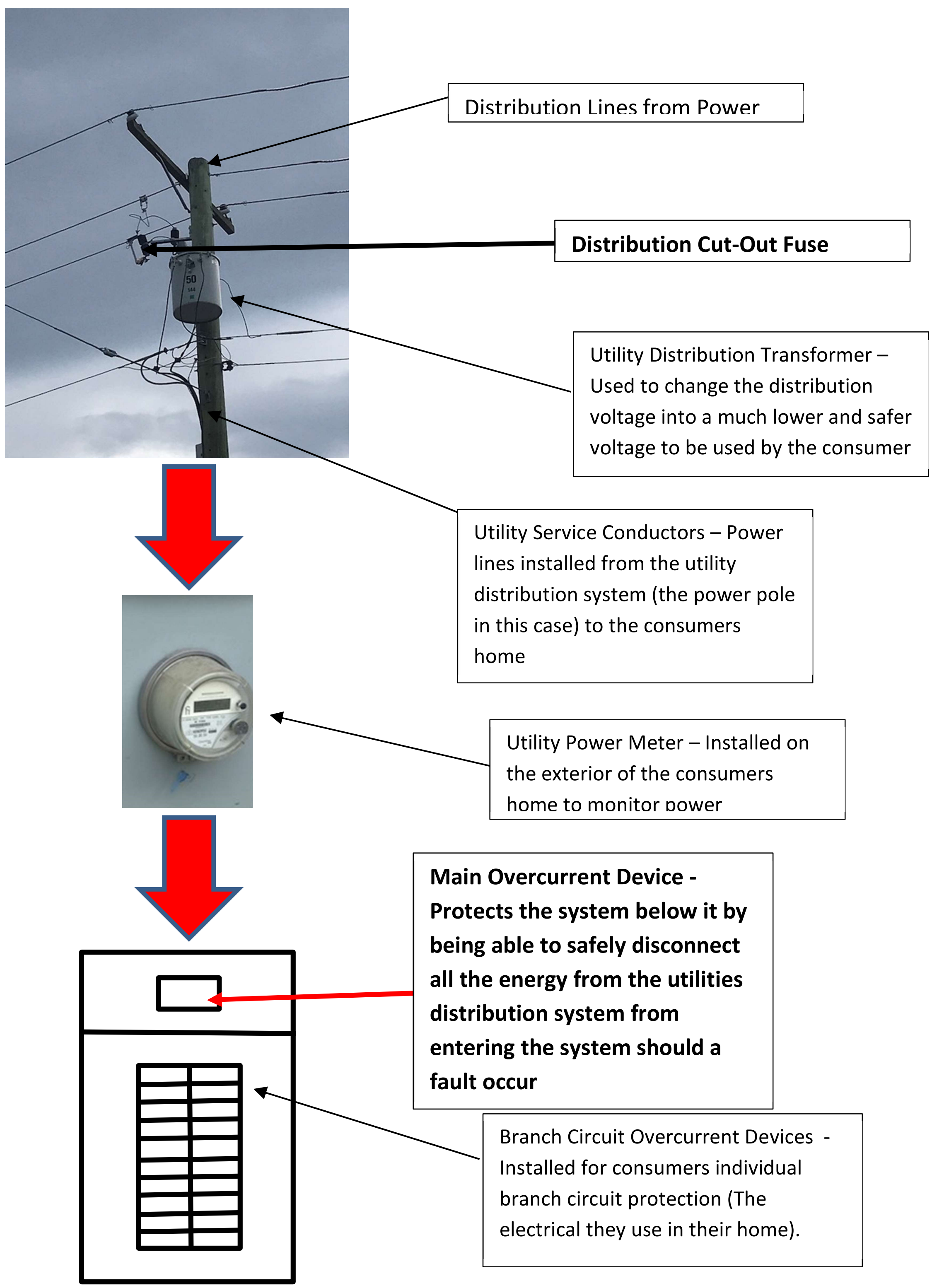
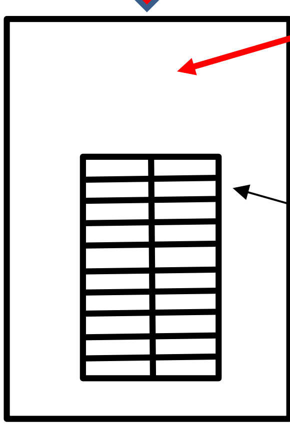


Figure 2. Site Systems and Components - Scenerio Two - WITHOUT Main Overcurrent Device

Distribution Cut-Out Fuse – The only point of protection between it and the much smaller branch circuit overcurrent devices (below) in this scenario. A large amount of energy is required to cause this fuse to disconnect

Important!

No Main Overcurrent Device. There is NO ability to safely disconnect a consumers system should a fault occur. This system is relying on the Distribution Cut-Out Fuse (above)for protection which is installed for the protection of multiple homes and businesses with their power consumption not just one individual consumer system.



Branch Circuit Overcurrent Devices - Installed for consumers individual branch circuit protection (The electrical they use in their home).

A photo taken previous to the incident with the original equipment installed

A photo taken post incident after rapid release of electrical energy and the cut out fuse activating

Photo of the damaged breakers that were installed within the load center

Photo taken of the inside of the panel after the incident. Observe within the red - the area of the large fault occurrence and rapid energy release.