INVESTIGATION INTO THE DOWNTOWN VANCOUVER POWER OUTAGE OF 14 JULY 2008

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ABSTRACT
This paper presents the results of an investigation into the power outage on 14 July 2008 in downtown Vancouver, caused by a fire and explosion in one of the downtown manholes. This resulted in 14 underground, 12 kV distribution circuits being left without power for several days. The investigation found the root cause of the explosive fire to be an overheating connector on a 600A elbow of a T connection. The results of the investigation are discussed in terms of test protocols and condition assessment test programs used to identify such problems.

KEYWORDS
Cable Faults, Distribution, Connectors, Explosion, Condition Assessment

INTRODUCTION
On 14 July 2008 there was a major power outage in downtown Vancouver, British Columbia. Fire was reported in Manhole 2445 and ten feeders were tripped by their protective relays, two feeders were switched out manually, and two feeders tripped automatically without any relay targets. According to the records the first fault occurred on CSQ12F215 at 8:54 AM, followed by a cascade of faults on the other feeders in the manhole with the last fault occurring at 10:41:42 AM. All the protective relays were functioning correctly and cleared the faults within the specified limits. Table 1 gives information on the circuits, cable types, and splices in the manhole.

As part of the condition assessment test program of the BC Hydro underground distribution network a routine inspection was carried out in MH2445 by the BC Hydro Cable Department on 3 January 06. No problems were reported other than a splice leak on MUR4F52. On 22 January 2008 a detailed condition assessment was carried out by Powertech Labs on MH2445 [1]. During that inspection the following were the main findings in MH2445:

- Elevated temperature on a T connection of CSQ12F215. The temperature of the connector was 5.3 °C above the temperature of the connecting cable. This connection was installed in 2005.
- An oil leak on CSQ12F223.
- Partial discharge was detected on CSQ12F223 and CSQ12F211.

At the time these results were not considered sufficiently high to warrant immediate action. The normal practice has been to discuss the results of the draft report after the testing and analysis has been completed. At a team meeting attended by all of the stakeholders final recommendations on the course of action on all of the circuits tested are made. The rationale for this approach is...