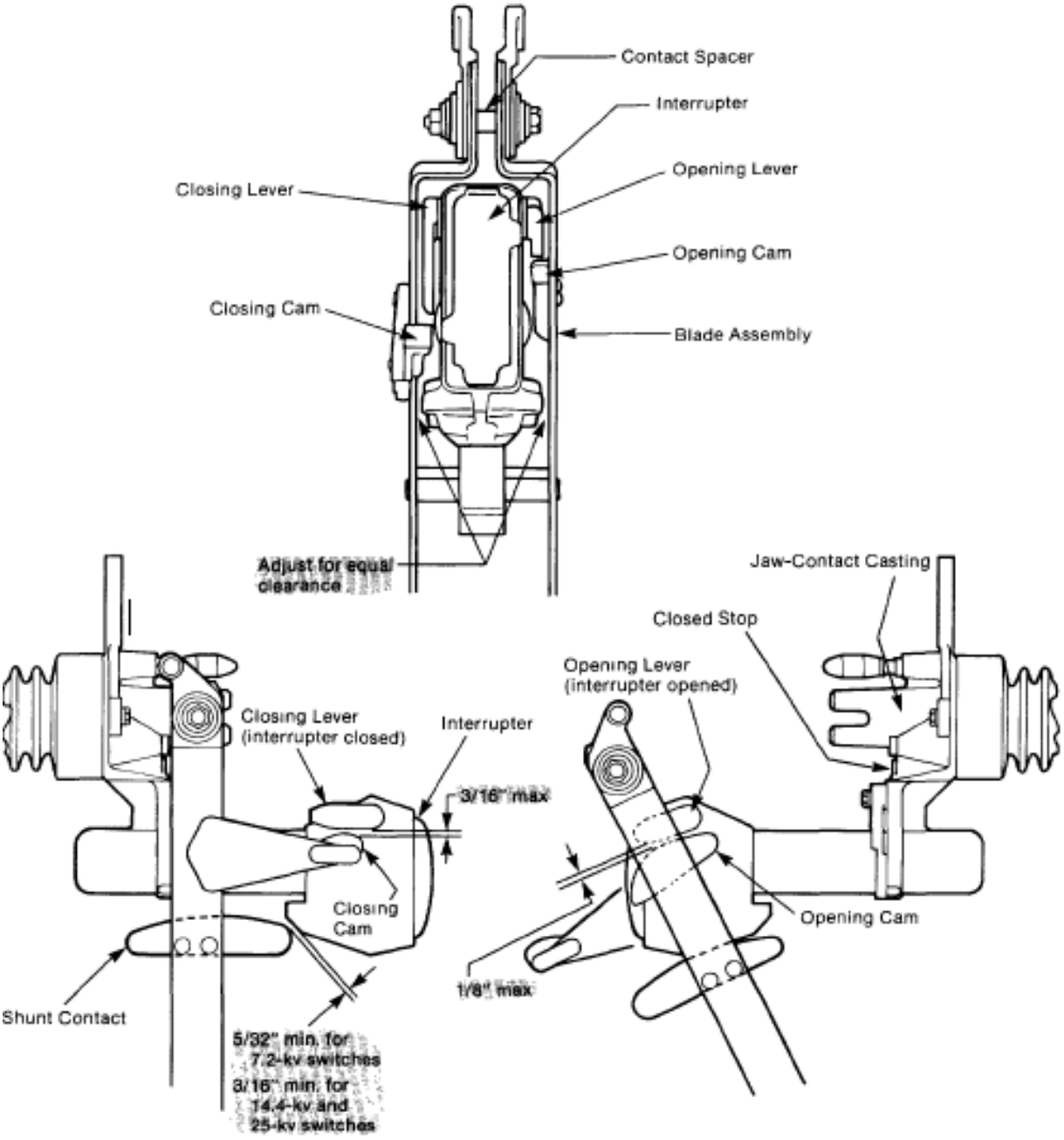
# Incident Summary #II-882604-2019 (#14507) (FINAL)

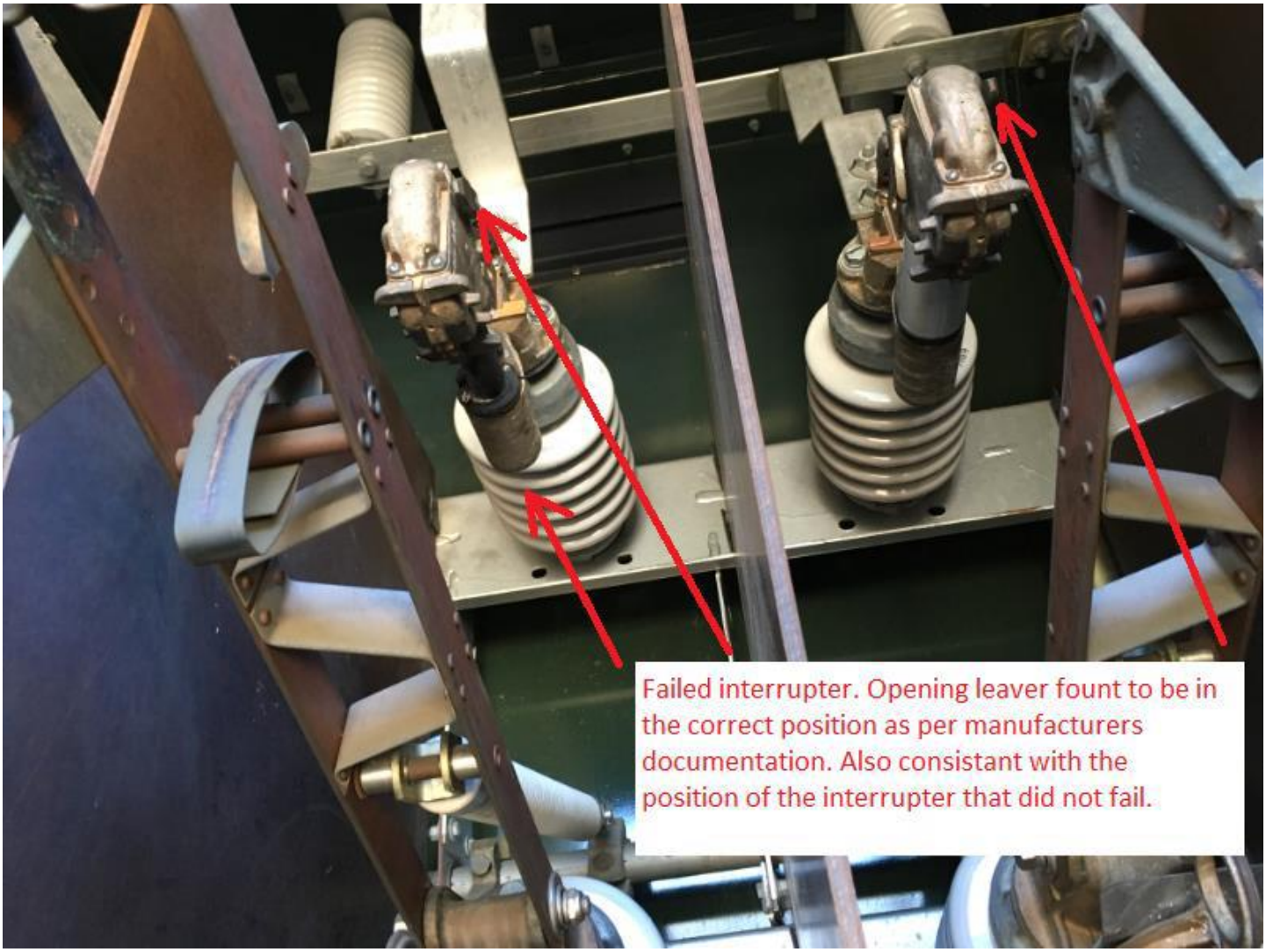
| | | | |
|---|---|---|---|
| SUPPORTING INFORMATION | Incident Date | | June 30, 2019 |
| | Location | | Nanaimo |
| | Regulated industry sector | | Electrical - High voltage electrical system (greater than 750V) |
| | Impact – Injury | Qty injuries | 0 |
| | | Injury description | None |
| | | Injury rating | None |
| | Impact – Damage | Damage description | Main high voltage interrupting switch for a transformer failed when opening. Two of the phase interrupters failed catastrophically erupting the outer porcelain housings. |
| | | Damage rating | Major |
| | Incident rating | | Major |
| | Incident overview | | **The following fields of information are taken from an independent engineering report. The report is attached to the incident file listed above and referenced here within.*<br><br>During a routine isolation process to install equipment and record measurements to facilitate future retrofit installations of breakers, A main high voltage interrupting switch for a transformer failed when opening resulting in an arc flash and damage to the equipment. |
| INVESTIGATION CONCLUSIONS | Site, system and components | | The 25kV switch was an S&C Alduti-Rupter type which is designed to interrupt the circuit without external arc or flame. The arc is supposed to be contained and extinguished within the air-filled interrupter.<br><br>The operation is intended to be such that when the arc is established, components of the interrupter yield deionizing gases which are supposed to quickly quench the arc.<br><br>The small clearance between the components is meant to ensure efficient deionizing action even when interrupting low currents. |
| | Failure scenario(s) | | During the switching operation, one of the following scenarios were believed to be present or developed.<br><br>1. The opening lever on the interrupters were not in the correct position prior to operation potentially as a result of one of the following reasons: a. The closing cams on the blade assemblies were out of adjust and did not actuate the interrupter mechanism the last time the switch was closed.<br>2. During previous maintenance and inspections, the interrupters were inadvertently actuated and not reset to the proper position or were mistakenly placed in a position that was thought to be correct.<br>3. Thru vibration either during the last close operation or as a result of the interrupter mechanism latch failing, the opening lever sprung to the wrong position. |

## Incident Summary #II-882604-2019 (#14507) (FINAL)

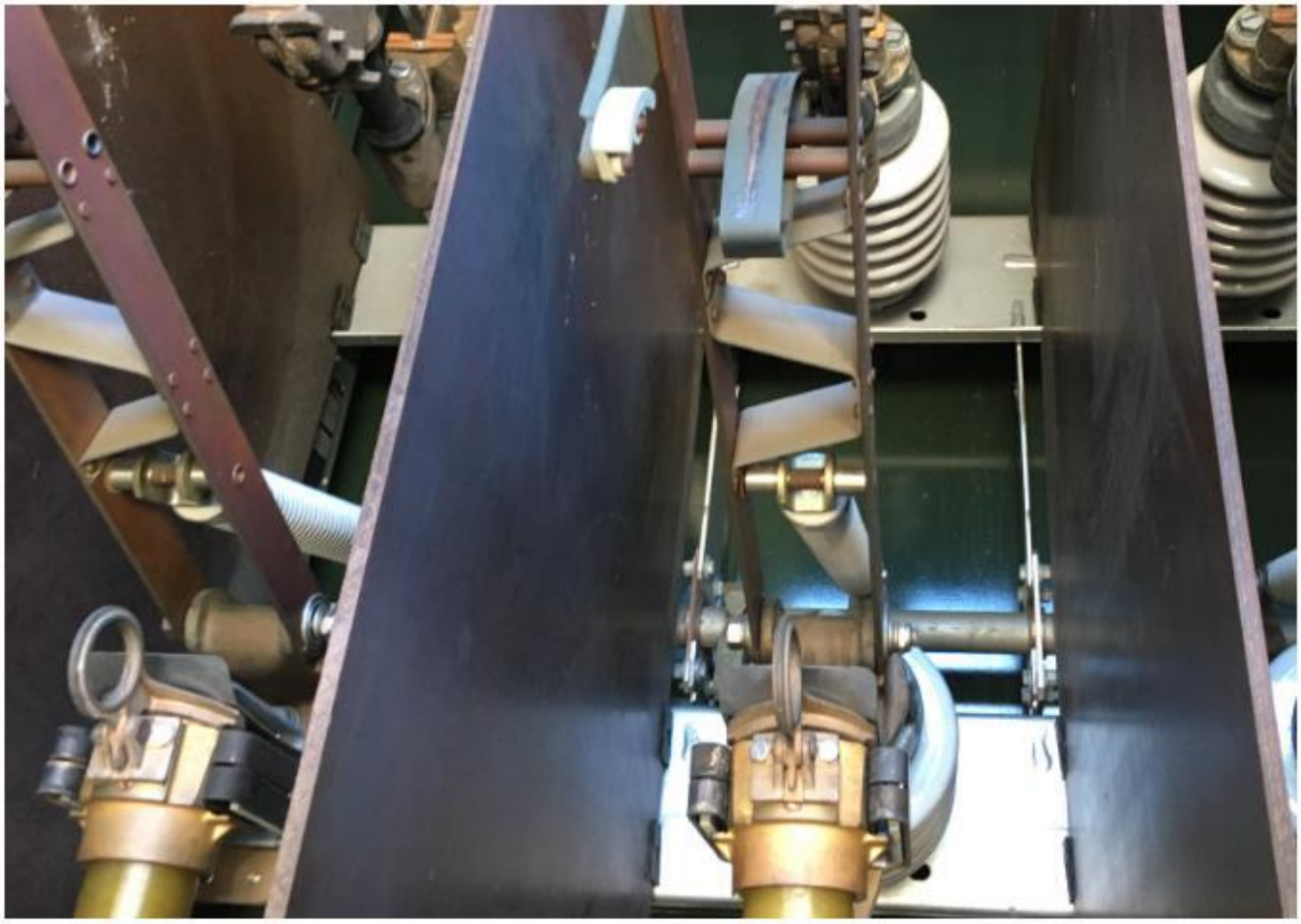
| | |
|---|---|
| | 4. The interrupter mechanism simply failed on two of the three phases. The pull in plunger may have moved away from the stationary contact, however the trailer mechanism did not engage properly, and the deionizing gas did not blow out the arc. |
| Facts and evidence | Upon inspection immediately following the incident, the opening and closing levers on all three interrupter chambers did appear to be in the correct positions.<br><br>When personnel operated the switch there was a noticeable lag between the sound of the switch mechanism completing its travel and the fault that occurred soon thereafter. The flash over marks indicate that for one of the reasons noted above the interrupter did not sufficiently extinguish the arc within the interrupter as designed.<br><br>As the switch travelled to the open position the arc was maintained creating a phase to phase fault which was cleared by the upstream pole mounted recloser.<br><br>From discussions with the manufacturer, these interrupters have a 20-25-year life span before correct operation of the interrupter could become unreliable. The majority of the major electrical distribution system is approximately 40 years in age. |
| Causes and contributing factors | It is likely that the switch and internal components exceeding the manufactures recommended life span caused the failure of the switch to interrupt the electrical circuit without an arc and caused the interrupter to fail to extinguish the arc as designed. |




Detail of switch components




Failed Interrupter



Burning on insulating material suggests that eventually the arc drawn resulted in a phase to phase fault. No tracking across this barrier to any grounded metal was evident. Would also explain the complete destruction of two interrupter mechanisms.