

## Incident Summary #II-899008-2019 (#14988) (FINAL)

SUPPORTING INFORMATION	Incident Date	August 25, 2019	
	Location	Trail, BC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Damage	Damage description	A fault occurred in a rectifier unit resulting in catastrophic damage to the complete unit and associated, adjacent electrical features.
		Damage rating	Moderate
Incident rating	Moderate		
Incident overview	An AC/DC rectification unit experienced an electrical fault on the 488VAC supply to the unit. The electrical fault condition resulted in an internal fire which destroyed the rectification unit. The fire propagated to the connected cables and electric buss resulting in damage to all connected and adjacent equipment in the vicinity of the rectifier. AC overcurrent protection initiated and operated effectively when the fault occurred.		
INVESTIGATION CONCLUSIONS	Site, system and components	The ore smelting facility employs four AC/DC rectification units to provide DC current to respective lead and zinc electrolytic cellhouses. The rectification unit involved in the incident is supplied with a 488 volt, 28,600 ampere alternating current and outputs a 66,000 ampere direct current to the zinc electrolytic cellhouse at +/- 100VDC (the DC voltage is variable to accommodate the electrolytic process).	
	Failure scenario(s)	The fire resulting from the rectifier failure destroyed the majority of physical evidence available preventing the investigation to reach a definitive conclusion, however, all indications point to a fault originating at the top of the rectifier unit which contains the busswork that is connected to the 488 volt supply. The high incident energy resulting from the electrical fault initiated and operated the unit overcurrent protection and de-energized the electrical supply to the rectifier in coordinated fashion but the fault arc-blast and resulting fire migrated to the output section of the unit creating a short circuit on the rectifier output busswork and direct current supply to the electrolytic cellhouse. The electrolytic cellhouse can be considered a very large 'battery' when not operating as designed and with the output busswork protection compromised the short circuit at the rectifier output resulted in extremely high levels - estimated at greater than 70,000 amperes for approximately five seconds - of direct current flow in the opposite direction. The short circuit on the output section of the system resulted in a second fire and further damage to the unit and associated components.	
	Facts and evidence	Though the majority of unit was destroyed, the evidence obtained from the remaining components and sections available for examination indicate that, though inconclusive, a likely root cause was a metallic object contacted the 488 volt supply busswork and created a phase-to-phase short circuit or fault-to-ground condition, resulting arc-blast and fires.	
	Causes and contributing factors	Examinations of preventive maintenance records and physical examination of other rectification units on site identified that carbon accumulations on the inside of the	

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units contribute to carbon tracking and minor hot spots; busswork supports show signs of loose connections which may have contributed to the incident. The rectification units undergo annual maintenance, thermal scanning and oil sampling, however, no internal physical examination of the unit involved in the incident has been performed over the past ten years. More frequent examinations may have identified potential risks and additional required maintenance.