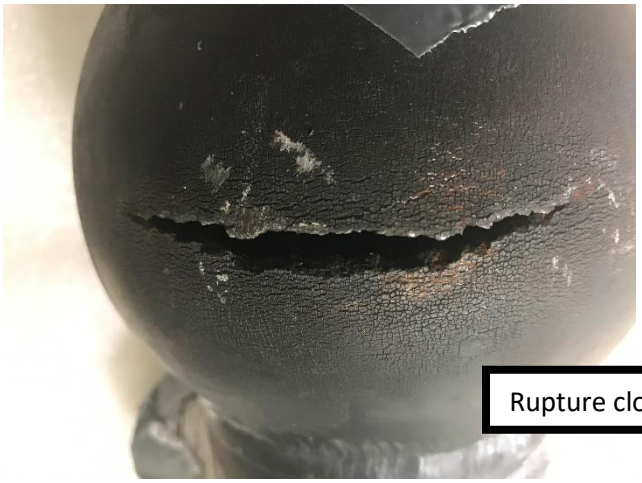
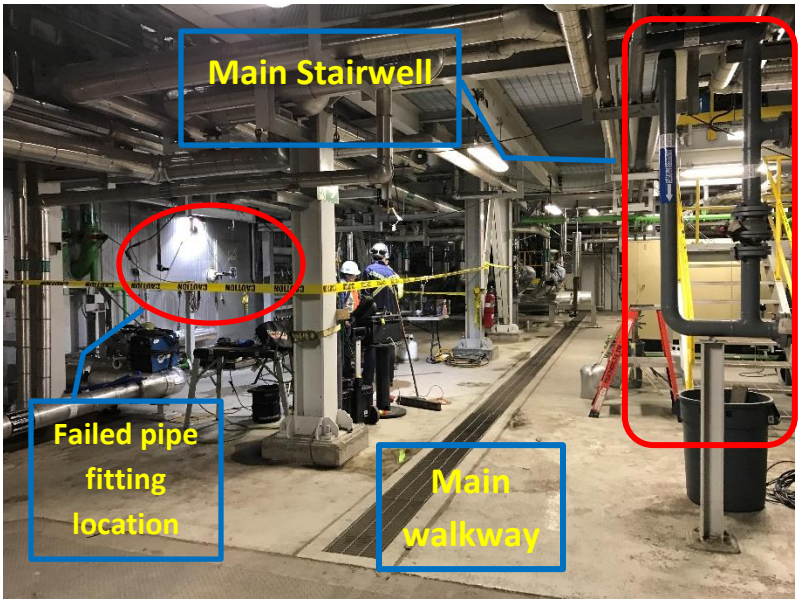
Incident Summary #II-941214-2019 (#15927) (FINAL)

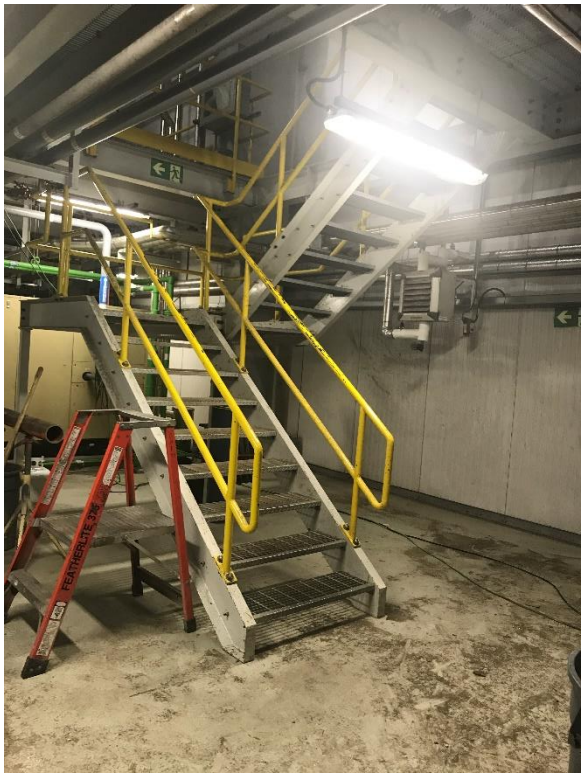
SUPPORTING INFORMATION	Incident Date		November 12, 2019
	Location		Fort St. James, BC
	Regulated industry sector		Boilers, PV & Refrigeration - Boiler and Pressure Vessel System
	Impact – Injury	Qty injuries	0
		Injury description	None
		Injury rating	None
	Impact – Damage	Damage description	Ruptured pressure fitting, burned and damaged insulation/cladding.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		Pressure piping fitting ruptured while in service shooting high pressure (1840 psig), high temperature (1000°F) steam across a frequently used walkway and stairwell, filling the building with steam.
INVESTIGATION CONCLUSIONS	Site, system and components		The piping and fittings in the system normally supply high pressure, high temperature steam to measuring equipment prior to entering a large steam turbine which generates power.
	Failure scenario(s)		During initial construction of the site in 2015, both the owner and contractor played roles in material management. After site commissioning there was approximately one year of run time on the piping system. Under normal operating conditions, the 4” x 1 ½” eccentric reducer pipe fitting ruptured in service. Operations staff reported a loud pop and safely shutdown the boiler to investigate what happened.
	Facts and evidence		A third party failure analysis, which determines probable cause of failure, was performed determining that both the ruptured fitting and the opposite reducer fitting were the incorrect material (plain carbon steel) from the specified material on the construction drawings (chrome-molybdenum alloy). Although material tracking paperwork provided by the owner and contractor identified the correct pressure fittings were in place, the incorrect material was installed in the system.
	Causes and contributing factors		It’s likely that poor material handling and traceability practices were the contributing cause of the failure of the ruptured fitting. It’s very likely this fitting failed due to a creep failure, (which is where metal components continuously deform under load which may eventually lead to a rupture). Carbon steel materials have significantly lower creep resistance than the specified material and are not suitable for use under pressure in moderate to high temperature service.



Overview of failed pressure piping section removed. Arrow indicates ruptured fitting.



Overview of frequently used walkway and stairwell.



Main stairway is the only egress down from upper floors (directly across from failure area).

Area overview of failed fitting and associated piping location. (Removed from service)