Incident Summary #II-950447-2019 (#16070) (FINAL)

SUPPORTING INFORMATION	Incident Date		December 4, 2019
	Location		Surrey
	Regulated industry sector		Gas - Natural gas system
	Impact – Injury	Qty injuries	0
		Injury description	None
		Injury rating	None
	Impact – Damage	Damage description	Damage to combustible materials surrounding the boiler
		Damage rating	Minor
	Incident rating		Minor
	Incident overview		A boiler heating system located in a residential house started to overheat causing combustible materials surrounding the appliance to start to smoke and burn and produced small amounts of carbon monoxide in the residence.
INVESTIGATION CONCLUSIONS	Site, system and components		Natural Gas is supplied to the residence by a gas utility which is then sent through a series of piping or tubing to the boiler intended to be used as a source of heat. When there is a call for heat the gas valve opens and the gas is ignited by the standing pilot as it exits the burner. Once the burner has been ignited, it heats up the water in the heat exchanger as an external water pump circulates the hot water to the intended space. The flue products produced from the combustion pass through a finned heat exchanger, then exit the boiler to the outdoors through the installed atmospheric vent, while fresh air for the proper combustion of the appliance is supplied through combustion air pipe installed adjacent to the boiler. The boiler is protected by various devices installed from the manufacture called “safeties”. A safety is intended to stop the operation of the gas appliances if there is an undesired effect such as excessive heat, flue gas spillage or flames rolling out in the opposite direction of the burner.
	Failure scenario(s)		The heat exchanger inside the boiler was significantly plugged with excessive soot which restricted the ability of the products of combustion to pass through the coils and exit through the venting system. The boiler started to overheat and tripped at least one of the boilers safety devices designed to shut the boiler down in the event of excessive heat or flame roll out. (see photo # 2+3) The safety devices were then bypassed by an unqualified person hired by the homeowner, and the boiler was put back into operation with the heat exchanger still restricted.

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	The boiler then started to overheat, and with no safety devices to shut the boiler down as they were bypassed earlier, the heat reached a point where combustible materials surrounding the boilers started to burn and spill carbon monoxide into the residence. (see photo #1)
Facts and evidence	<u>Homeowner Interview</u> • One morning when they woke up, the house was cold and they had no heat • They hired a plumbing and heating company who put the boiler back into operation and advised for them to replace it in the near future • Shortly after the boiler was put back into operation, they started smelling something burning and described it as a rotten egg smell • Fire Department and Fortis were called who detected elevated levels of carbon monoxide in the residence and shut off the gas to the boiler. • They could not remember the last time the boiler was serviced. <u>Interview with Plumbing and Heating Company owner</u> • He was hired to repair the boiler • He altered the wiring to get the boiler back into operation as a temporary measure • The company consists of 2 employees (him and his brother) and neither of them hold any gas qualifications. <u>Observations</u> • Boiler showed signs of excessive heat and it appears the flooring around the boiler became very close to igniting • Flame roll out safety installed by the burners was disconnected with the wires jumped together • When the control wiring cover was removed, it appeared that the wiring had been altered and the operating control and high limit control were bypassed. • Temperature and Pressure Relief Valve was closed but had failed in the open positon and was bypassing water from the boiler straight to the drain on the floor.
Causes and contributing factors	It is probable that the lack of servicing led to the heat exchanger becoming restricted. This caused the flames to roll out the front on the boiler, causing the roll out safety switch to trip and shut down the boiler. It is highly probable that multiple safeties being bypassed by an unqualified individual and the boiler being put back into operation led to carbon monoxide being present in the residence and the combustible materials to start burning.

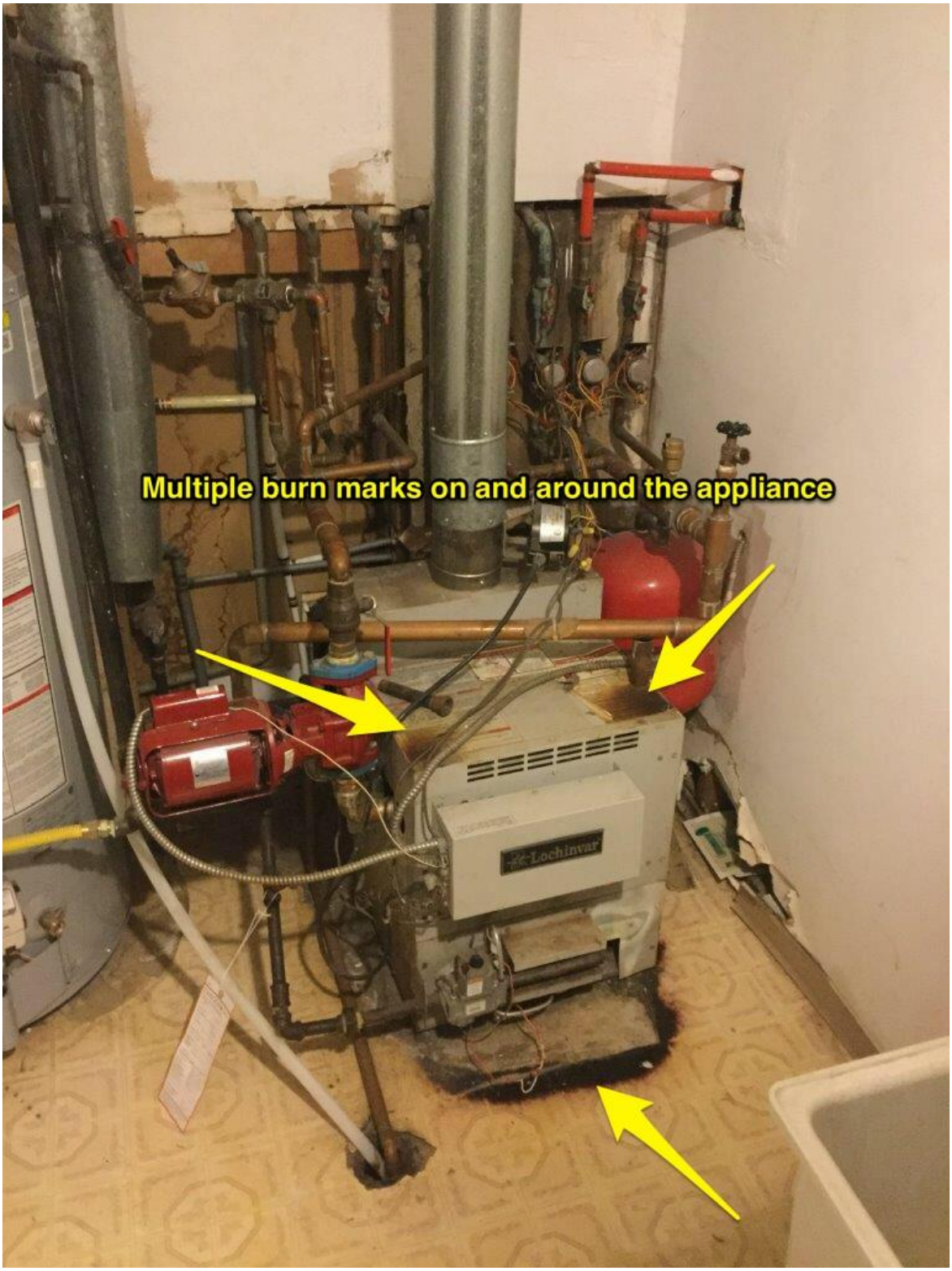

Photo #1

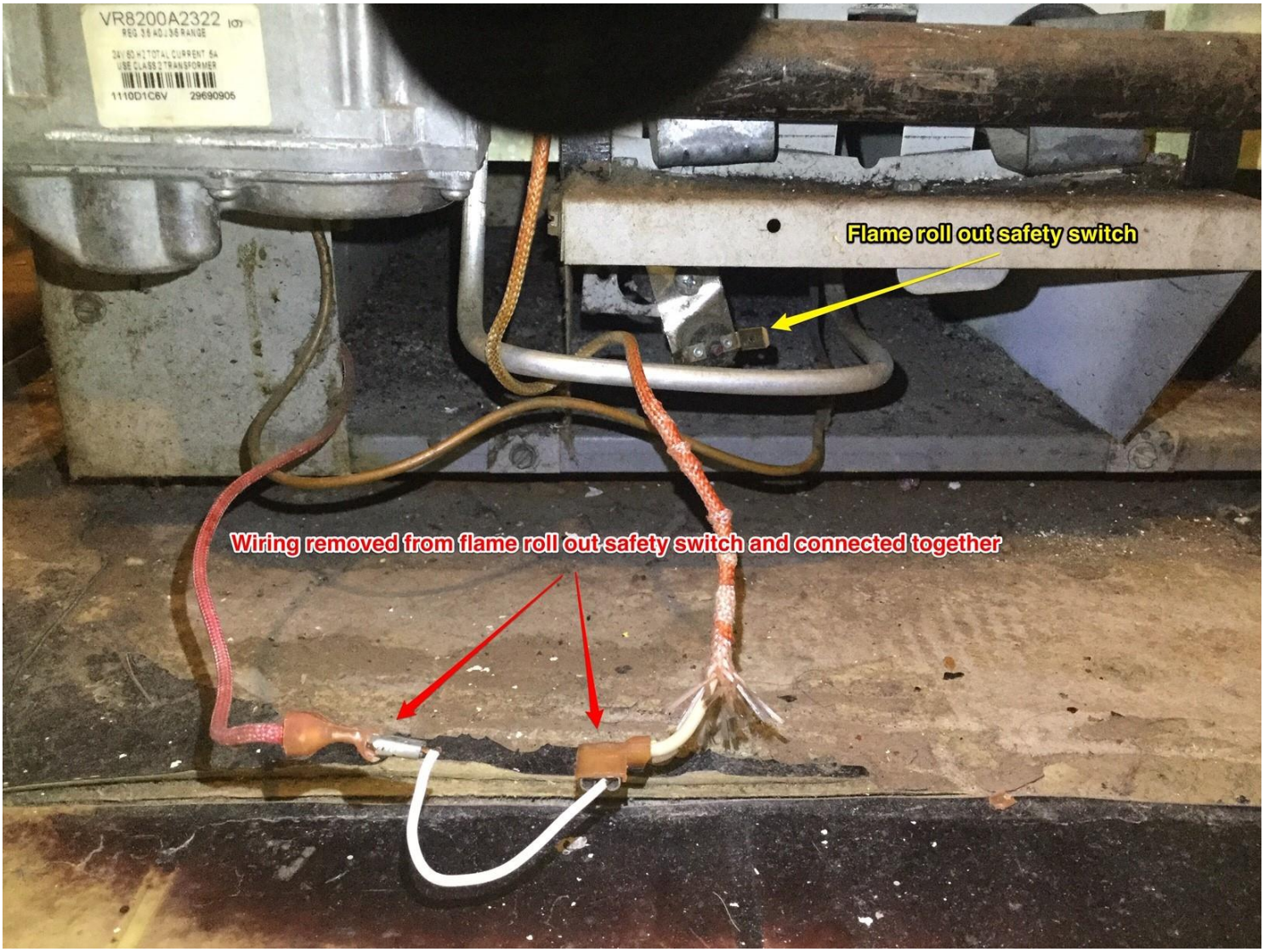
VR8200A2322
Flame roll out safety switch
Wiring removed from flame roll out safety switch and connected together

Photo #2


Operating temperature control
High Limit Control
Screws missing and wiring of controls have been altered

Photo #3