

## Incident Summary #II-1665021-2024 (#43737) (FINAL)

SUPPORTING INFORMATION	Incident Date	January 10, 2024	
	Location	North Eastern, BC	
	Regulated industry sector	Boilers, PV & refrigeration - Boiler and pressure vessel system	
	Impact	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Damage	Damage description	Fire inside boiler cabinet from boiler combustion chamber melted the boiler fan, gas valve and pressure switch assembly.
		Damage rating	Moderate
Incident rating	Moderate		
Incident overview	Hospital staff called facility maintenance indicating a smell of smoke. Maintenance personnel traced the smell of smoke to one of the heating boilers. Initial indication was that the fan inside the No.5 boiler housing caught fire. The smoke was contained to the inside of the boiler cabinet and there was no external damage beyond the boiler.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>One of the institutions' boilers which provides heat to the facility exchangers (combustion chamber) refractory became dislodged. This allowed hot combustion gases to escape around the refractory and through the fan motor/lid gasket and melted the boiler fan and exposed the gas valve assembly to heat and smoke.</p> <p>The purpose of the boilers (five in a row) connected provide heat for the hospital.</p> <p>During normal operations, each boiler, internally has what is called combustion chamber, (where natural gas is burned to generate heat), the combustion chamber is made from stainless steel and in the shape of a vertical cylinder, with a lid. This lid has refractory just inside the cylinder (combustion chamber) to prevent the heat and flames of combustion from contacting the silicone gaskets which prevent gases from escaping from the boiler. Just above the lid of the combustion chamber is a fan motor which forces supply air heated by combustion gasses out of the boiler to where this heat is needed throughout the hospital building.</p>	

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<p>Failure scenario(s)</p>	<ul style="list-style-type: none"> <li>• During operation, the refractory moved out of its designed position exposing the silicone combustion chamber gaskets to heat from the combustion gases. Eventually, the gaskets degraded resulting in combustion heat escaping out of the combustion cylinder lid melting the fan motor housing and associated gas control switch.</li> <li>• History: Boiler No.5 manufactured in 2021, along with the rest of the boilers (1 to 5) were originally installed in November 2021 by a licensed Class A contractor.</li> <li>• The Manufacturer released a public product upgrade notice on October 21, 2022, indicating that this boiler model EX850 had a new exchanger lid design revising the refractory and lid assembly so that the refractory is bolted to the combustion chamber lid instead of the previous design where the refractory was set within recessed grooves located just below the lid.</li> <li>• The newly updated lids and refractory kits were made available and recommended by the manufacture to be installed at the next boiler service interval.</li> <li>• Communication of the updated lids and refractory kits appeared to only be communicated on the manufacturer's website under product upgrades and not identified as a recall notice.</li> <li>• According to the Owner's site representative no annual service has been conducted since installation prior to the event.</li> </ul>
<p>Facts and evidence</p>	<ul style="list-style-type: none"> <li>• The boiler was originally installed in October 2021, and according to the owner's representative, the first service for the boiler was to be arranged in 2024.</li> <li>• The boiler manufacturer refers to scheduled maintenance in section 7.0 of the owner's manual under the service and maintenance section. Specifically, "Inspection of the boiler is to be performed annually by a qualified service technician".</li> <li>• The owner's representative stated via an email, that these boilers were installed in 2021 and as 2024 was the boilers third year in operation, the first service had not yet been scheduled.</li> <li>• Boiler No.5 had not been upgraded with the new lid/refractory design. Therefore, the refractory was not anchored to the lid as in the new design.</li> <li>• The manufacturer's agent stated in an email that it was not aware of any other cases of this model having an issue; and recommended that the refractory be checked under the combustion chamber lid as well as the igniter and fan gaskets to ensure no leakage of products of combustion.</li> </ul>

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### Causes and contributing factors

The cause of the fire in the boiler was a displaced refractory which resulted in damage to the silicone gaskets, and leaking combustion gases.

The design of the EX850 boiler refractory assembly and delay in servicing the boiler likely contributed to this event.

In addition, the minimal communication or requirements regarding the “product upgrade” issued by the manufacturer to address a significant safety concern may have contributed to the upgrade not being completed.

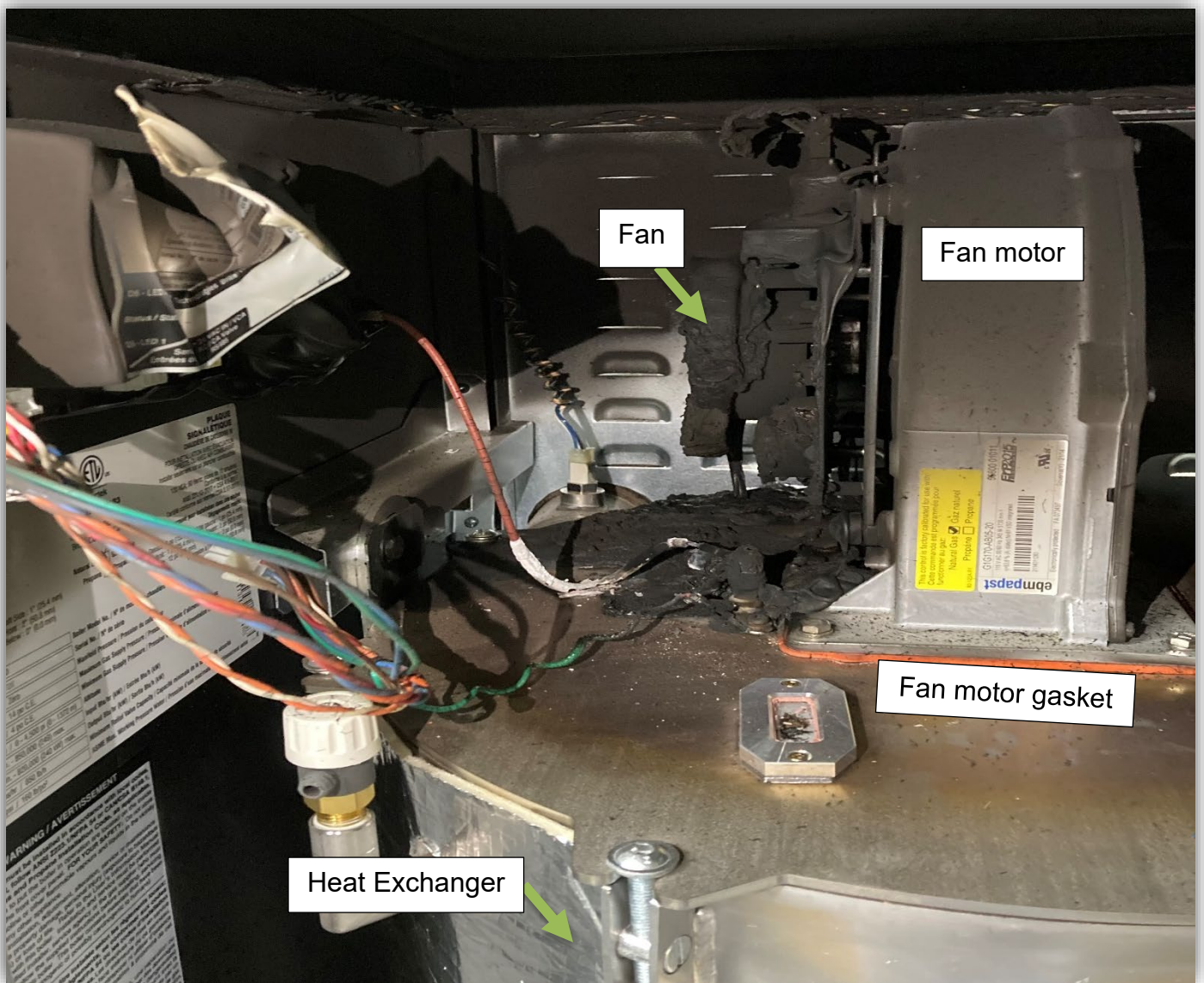


Image 1 - Heat Exchanger and fan motor assembly melted.

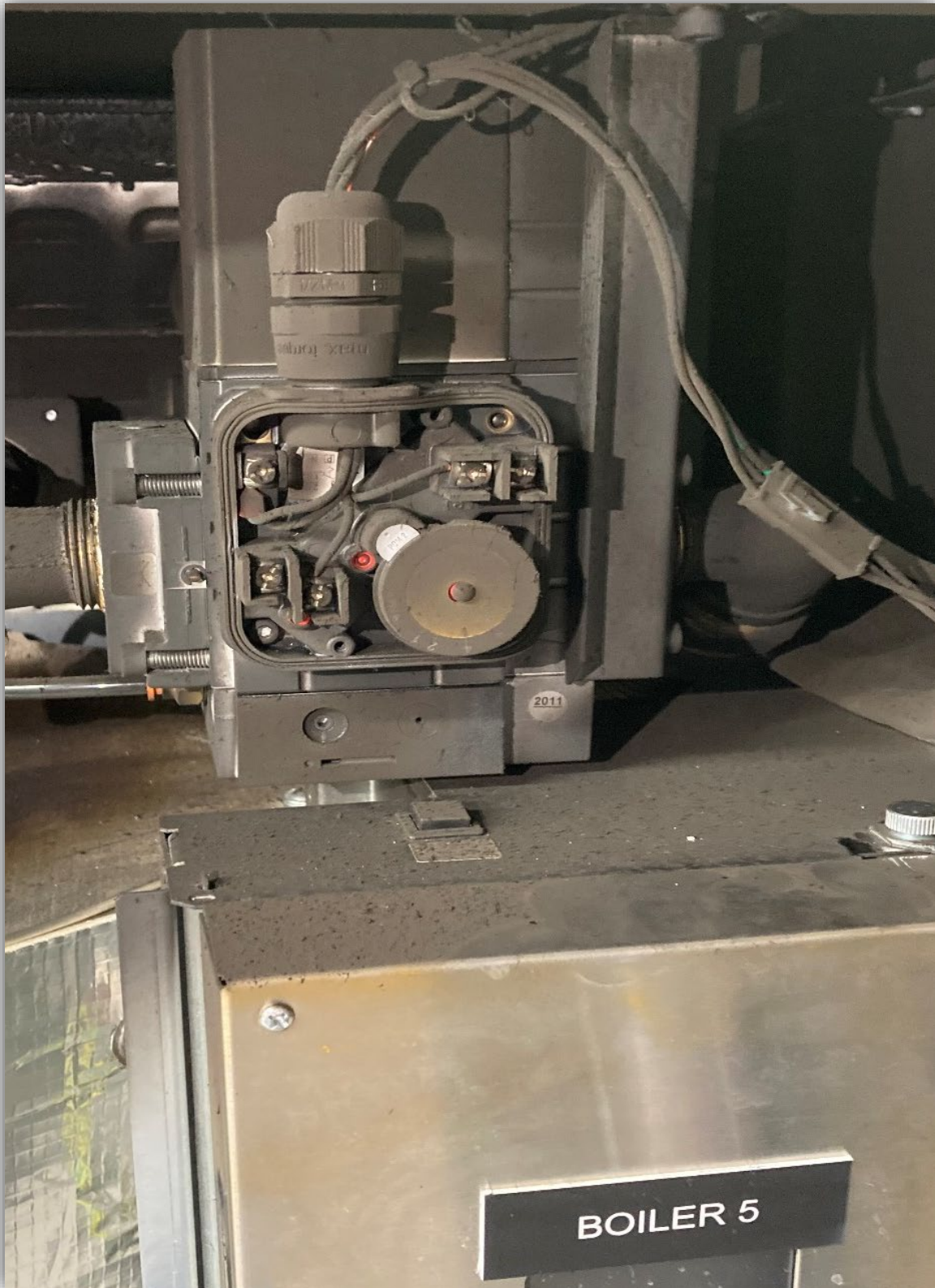


Image 2 - Gas valve and pressure switch assembly (right of fan motor).

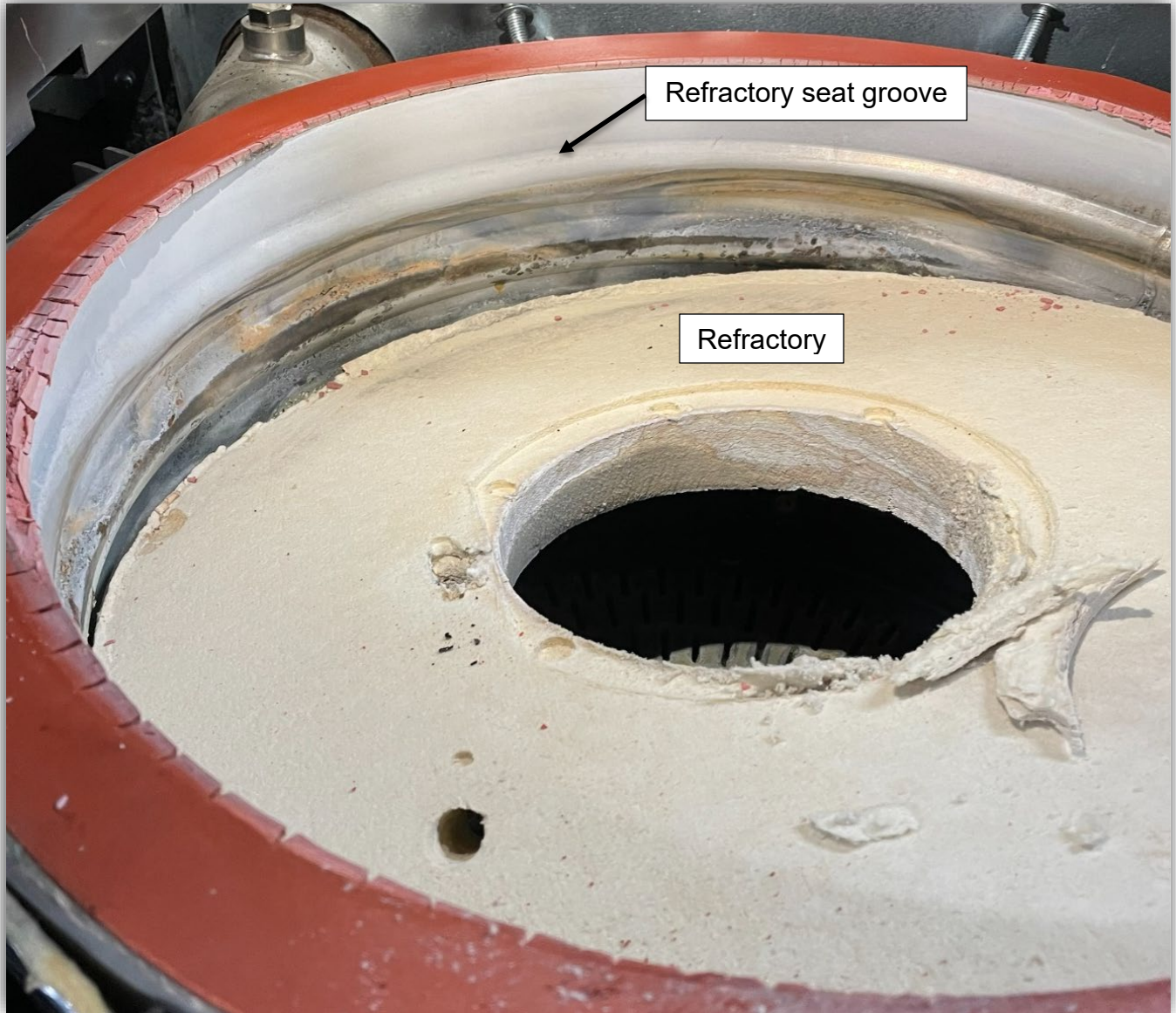


Image 3 - Refractory dislodged inside heat exchanger.



Image 4 - Fan motor gasket (orange) where combustion flame contacted the heat exchanger lid. Hot combustion gases escaped through the heat exchanger lid gasket melting the fan motor and exposing heat and smoke to the gas assembly.

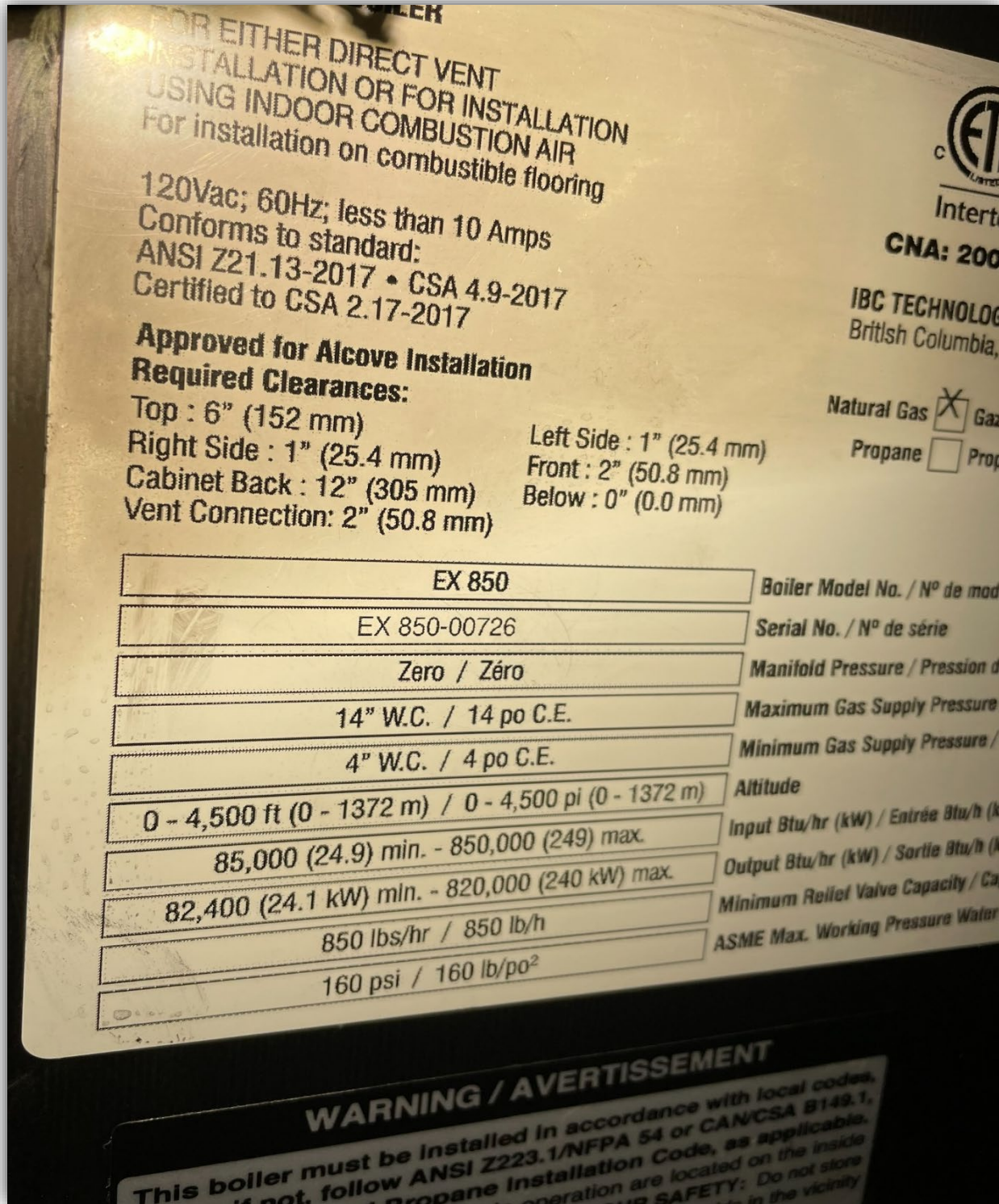


Image 5 - Boiler nameplate sticker.