

Incident Summary #II-969209-2020 (#16379) (FINAL)

SUPPORTING INFORMATION	Incident Date	January 18, 2020	
	Location	Peace River Region	
	Regulated industry sector	Boilers, PV & refrigeration - Boiler and pressure vessel system	
	Impact	Qty injuries	0
		Injury description	None
		Injury rating	None
	Damage	Damage description	Fire damage to firetube, gas burners, building exterior and structural walkway.
		Damage rating	Major
	Incident rating	Major	
	Incident overview	It was reported that the emulsion treater had caught on fire.	
INVESTIGATION CONCLUSIONS	Site, system and components	During process operations, oil with other fluids from the geological well formation combine and develop what is known as emulsion. This emulsion must be separated in order to recover the oil and to process the other recoverable fluids. As part of the separation process to break down the emulsion, the emulsion is heated in a treater which is a horizontal separator containing a fire tube in it where natural gas is burned to provide heat. The fire tube is in contact with the emulsion and once heated, gravity then separates the emulsion into useable products.	
	Failure scenario(s)	<ul style="list-style-type: none"> - An emulsion “Pad” may have build-up around the firetube causing an insulating effect reducing heat transfer efficiency from the firetube to the emulsion; this may have caused excessive heating stress cycles on the firetube. - Corrosion (Brittle) Fatigue may have resulted from a high caustic environment from operations use of demulsifying chemical to reduce the emulsion pad build-up on the firetube. - Fatigue cracking in the firetube may have been caused by cyclic expansion and contraction during the heating process. 	
	Facts and evidence	<ul style="list-style-type: none"> - Operations Engineer reported emulsion “pad” build-up on the outside of the firetube from the process fluids in the treater vessel - Operations Engineer reported that field operations had increased the use of demulsifying chemical to reduce the emulsion pad build up on the firetube - Metallurgical analysis by third party investigators reported that stress corrosion cracking (brittle) fatigue of steels can occur in several different environments, with the most common being caustic solutions 	

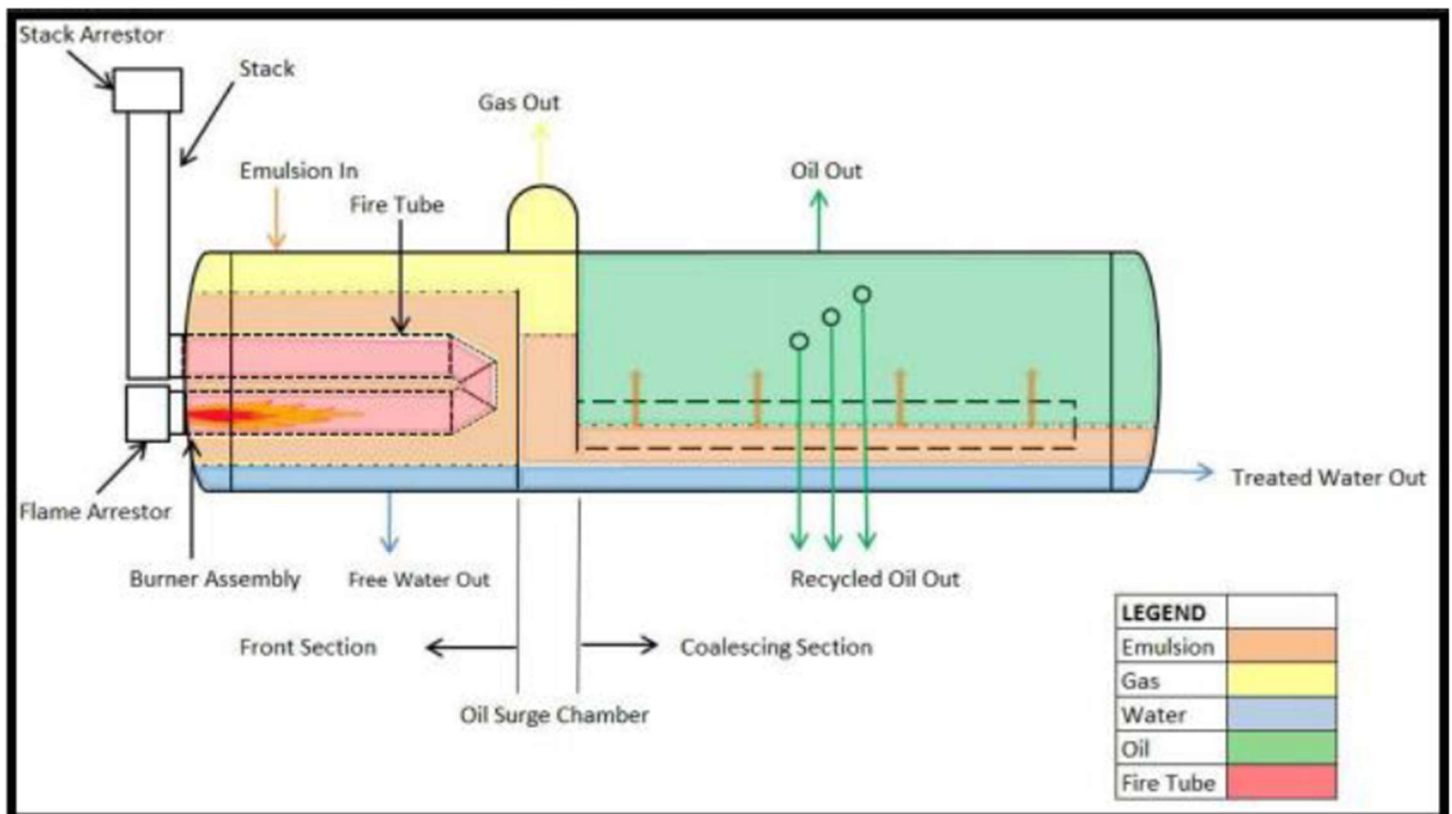
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- Metallurgical analysis reported that fatigue cracking had propagated from the top of a weld, joining sections of firetube, throughout 25 percent of the firetube wall thickness.
- The Metallurgical Engineer reported that from the point of the fatigue crack, there appeared to have been brittle overload fracture through-out the remaining wall thickness of the firetube.
- The Metallurgical Engineer explained that fatigue cracking is caused by the application of cyclic tensile (pulling) stress, of which, may have been related to the expansion and contraction associated with fluctuating temperatures within the firetube during heating cycles.

Causes and contributing factors

It is possible that fatigue cracking combined with brittle corrosion may have contributed to this failure.

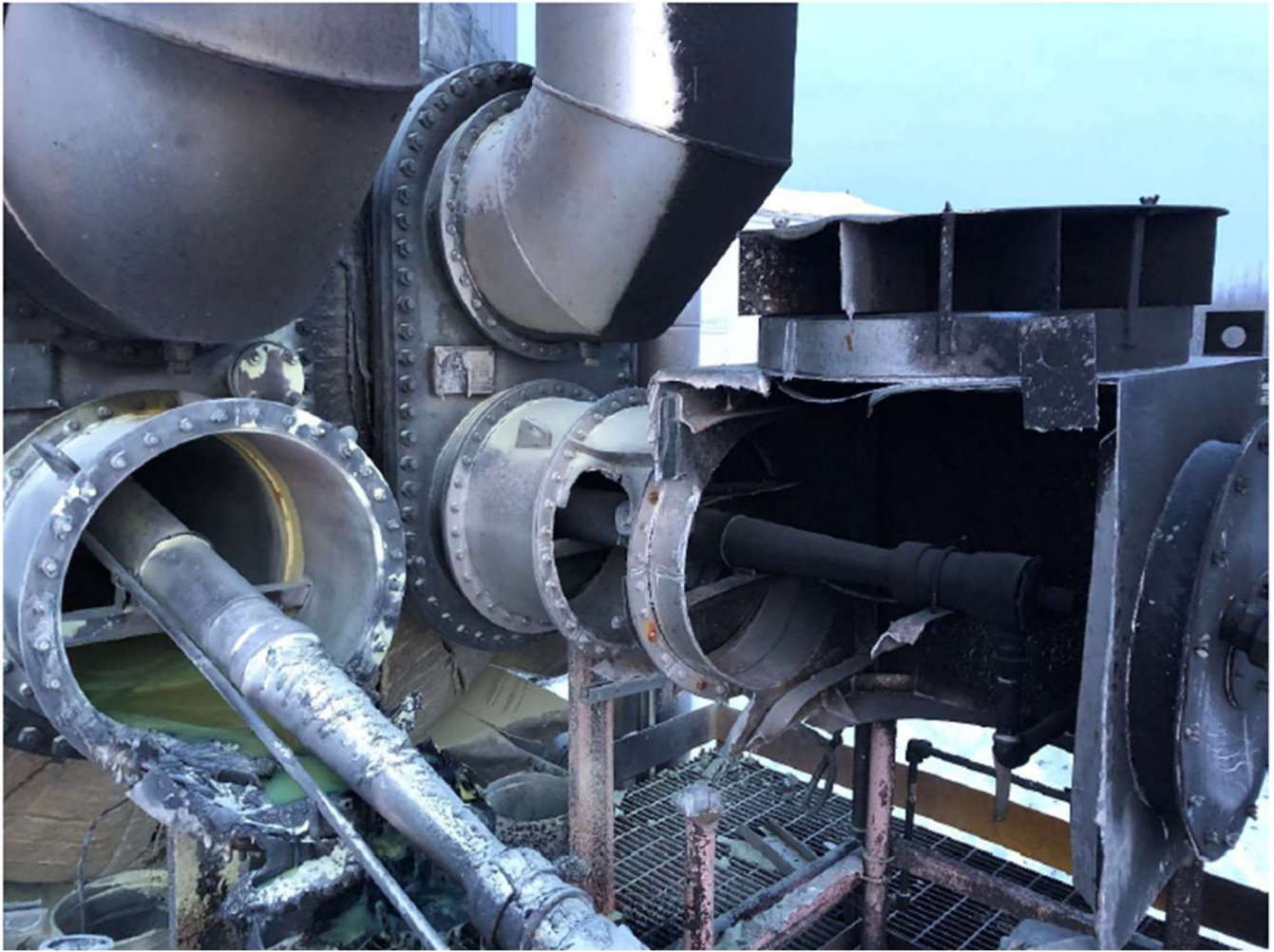
Photographs and Images (provided by third party investigators)



Treater Overview



End View of Treater Firetube Burner Section



Firetube Burners and Stack

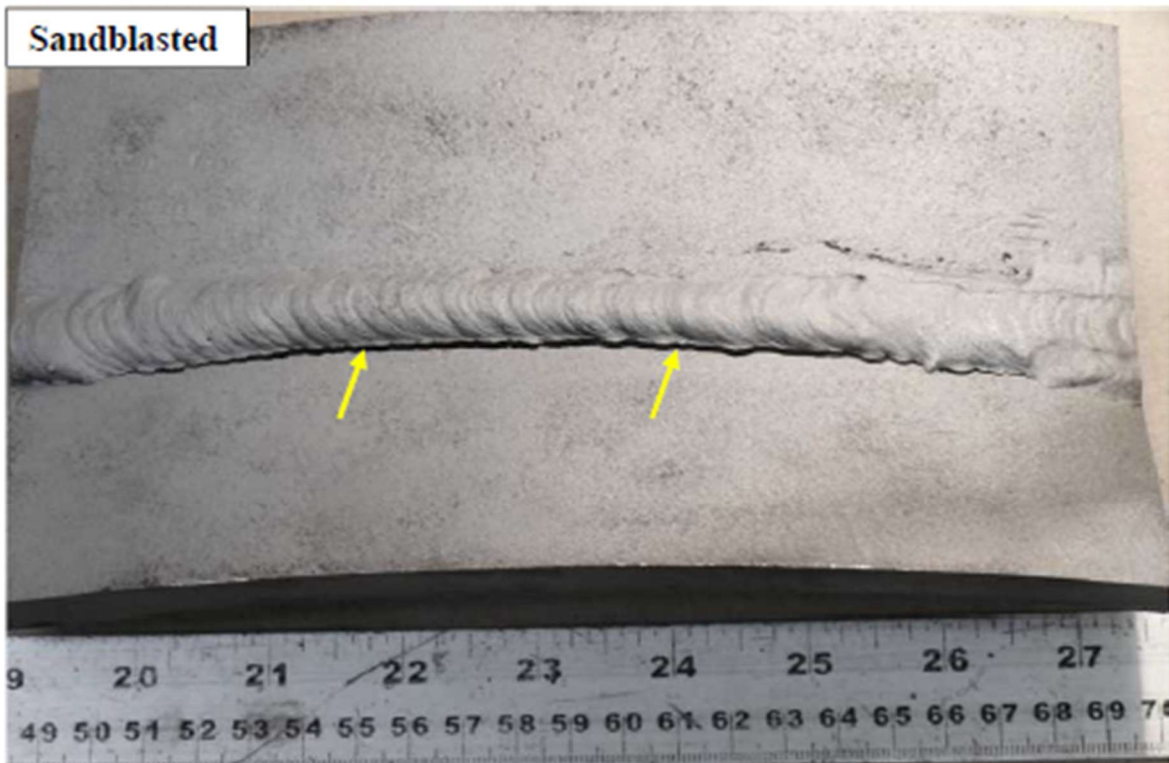
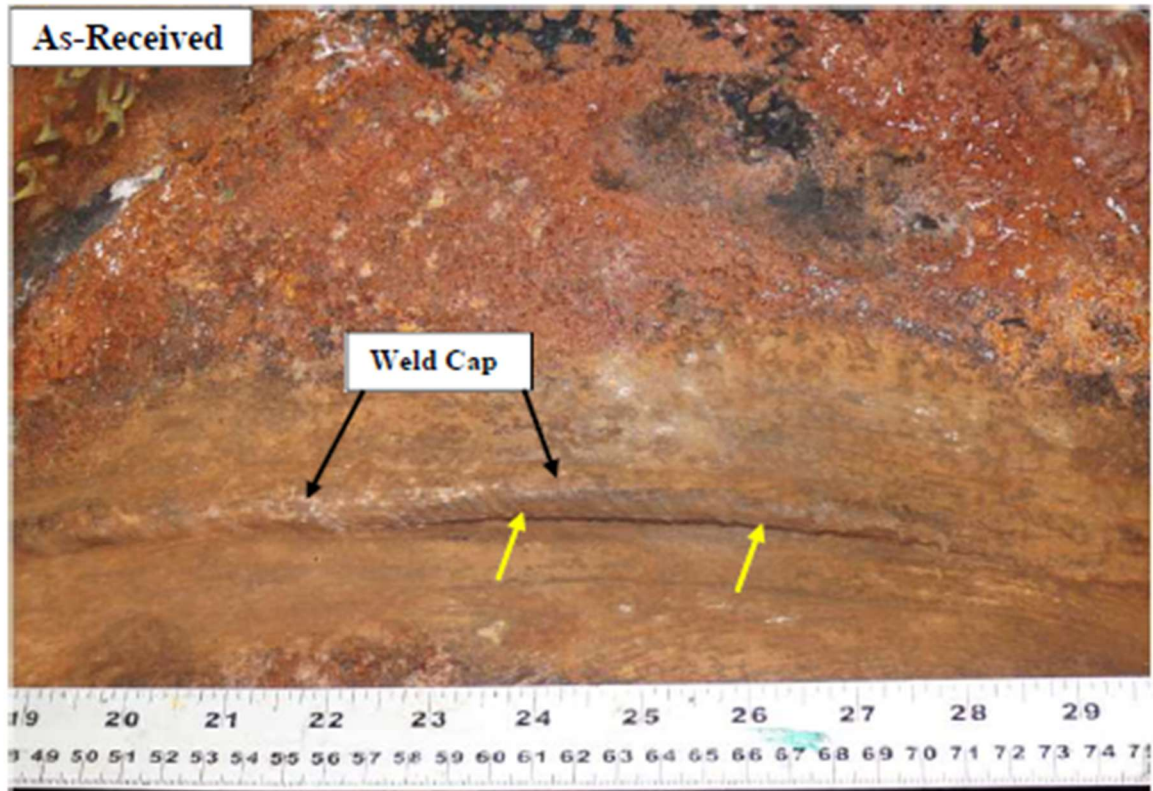


FIGURE 2 CRACK ON EXTERNAL SURFACE

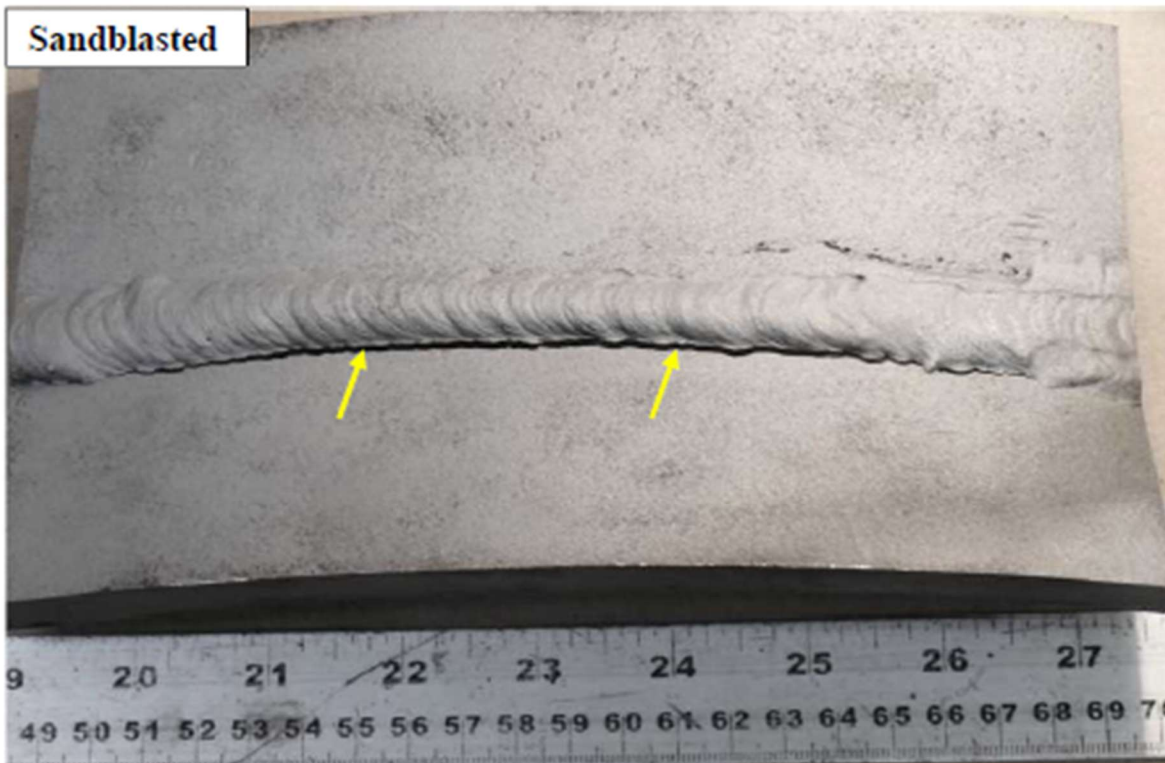
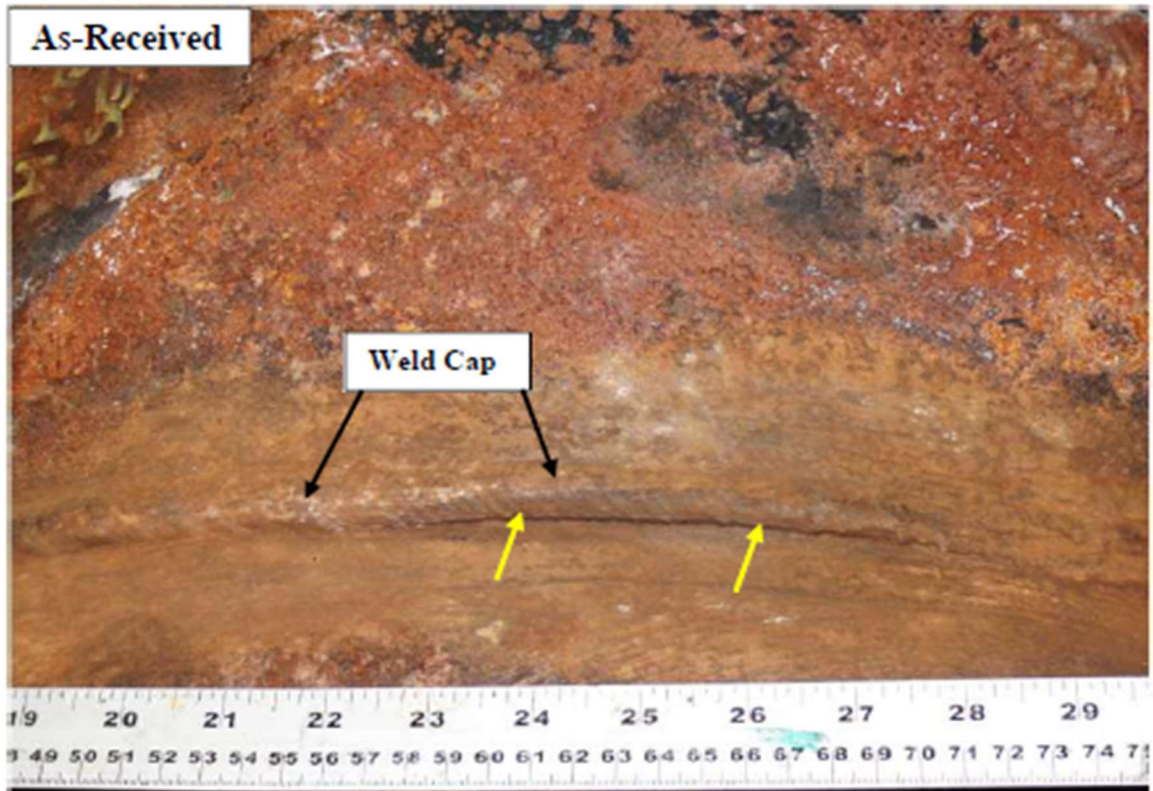


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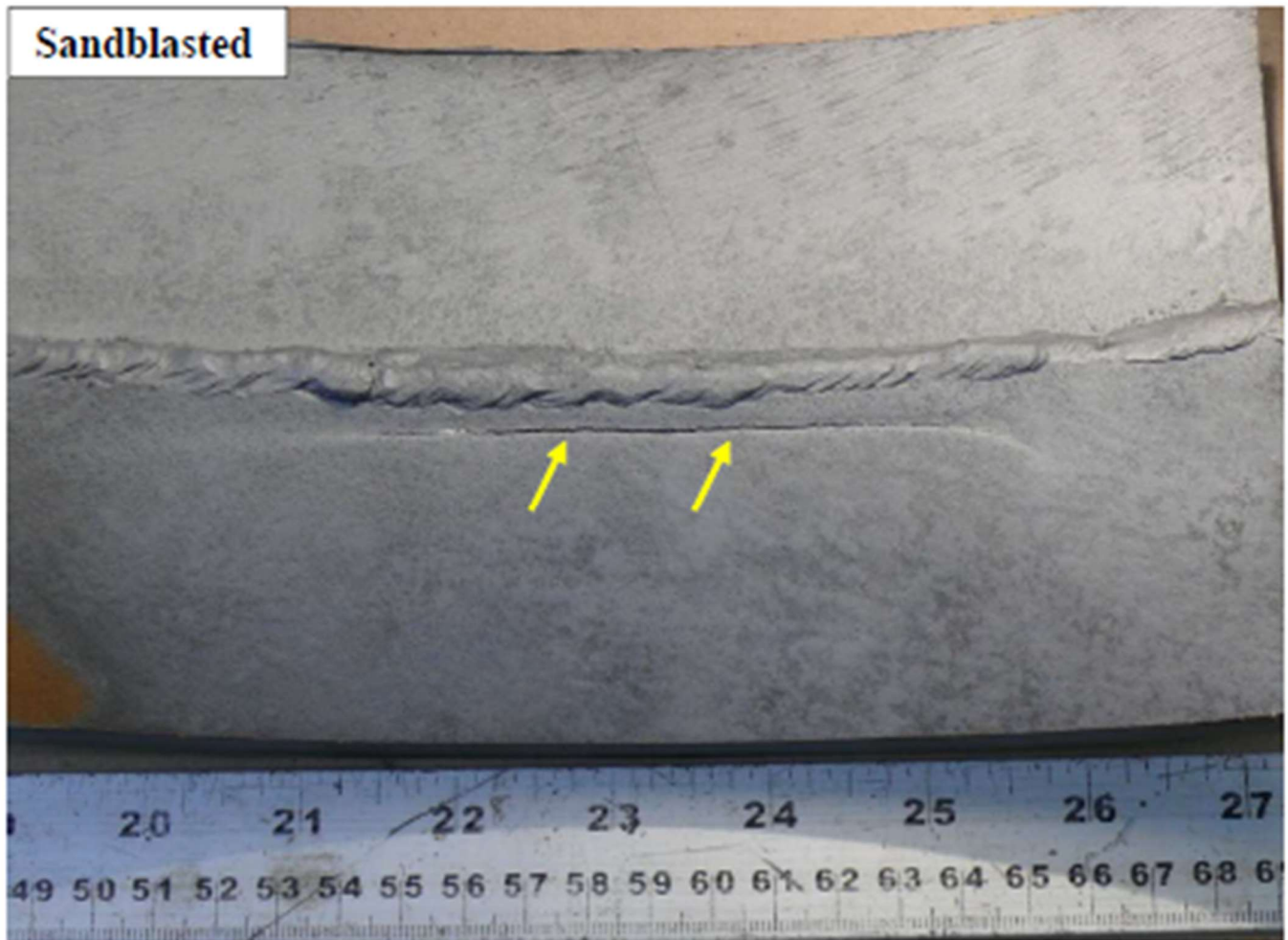


FIGURE 3 **CRACK ON INTERNAL SURFACE**

Internal side of crack (through wall) of firetube.