Incident Summary (Reference #II-684399-2018) (FINAL)

SUPPORTING INFORMATION	Incident Date		*May 4, 2018*
	Location		*Burnaby*
	Regulated industry sector		*Construction/ personnel hoists/man lifts*
	Impact – Injury	Qty injuries	*0*
		Injury description	*NA*
		Injury rating	*None*
	Impact – Damage	Damage description	*Governor safety device welded component failure.*
		Damage rating	*Major*
	Incident rating		*Major*
	Incident overview		*While performing a test of the over-speed safety brake, a component of the over-speed safety system broke allowing the hoist have an uncontrolled descent.*
INVESTIGATION CONCLUSIONS	Site, system and components		*This model of personnel hoist uses a rack and pinion gears for its propulsion in both up and down direction. The hoist also has an over-speed safety brake to prevent the hoist from moving in the down direction over a rated speed. The over-speed safety brake also uses pinion gears on the same rack as the drive system to slow and stop the hoist. The teeth on the over-speed safety brake pinion gears are kept mated with the rack by two metal retaining tabs welded to the same mounting plate that the pinion gears and over-speed safety brake are attached to. To test the operation of the over-speed safety brake, weights are added to the hoist car, then the hoist is put into a test mode. The test mode releases the motor brakes allowing the hoist to descend freely so the over-speed safety brake will activate and stop the hoist.*
	Failure scenario(s)		*While performing the over-speed brake test, the hoist was put into test mode and the motor brakes were opened. The hoist car began to descend. When the over-speed brake device actuating speed was reached the device engaged the over-speed pinion brake. The force of the pinion brake actuating caused the pinion to shift away from the rack which engaged the welded retaining lugs. The retaining lug weld, which was already compromised, broke allowing the pinion gear to fully separate from the rack preventing the pinion brake from arresting the hoists decent. The mechanic then manually stopped the decent by activating the motor brakes.*
	Facts and evidence		A physical inspection of the over-speed brake on-site showed that it had only partially engaged. An inspection of the over-speed pinion gears and retaining tabs revealed that the welds on the two retaining tabs had been partially broken off, one of which the welds were rusted through indicating the welds were broken prior to the incident, the second retaining tab had freshly broken welds that measured 3/16” thick. The retaining tabs, which are installed from the factory within 1/4” of the rack were 7/8” from the rack and had over 90% of their welds broken.
	Causes and contributing factors		*It is highly probable that previous impact forces on the pinion gear retaining tabs compromised the integrity if the retaining tab welds. The force of the over-speed brake engaging and shifting the rack into the tabs contributed to the retaining tab weld failure. It is probable that the broken tab welds allowed for enough clearance for the pinion gear to disengage from the rack allowing the uncontrolled descent of the*

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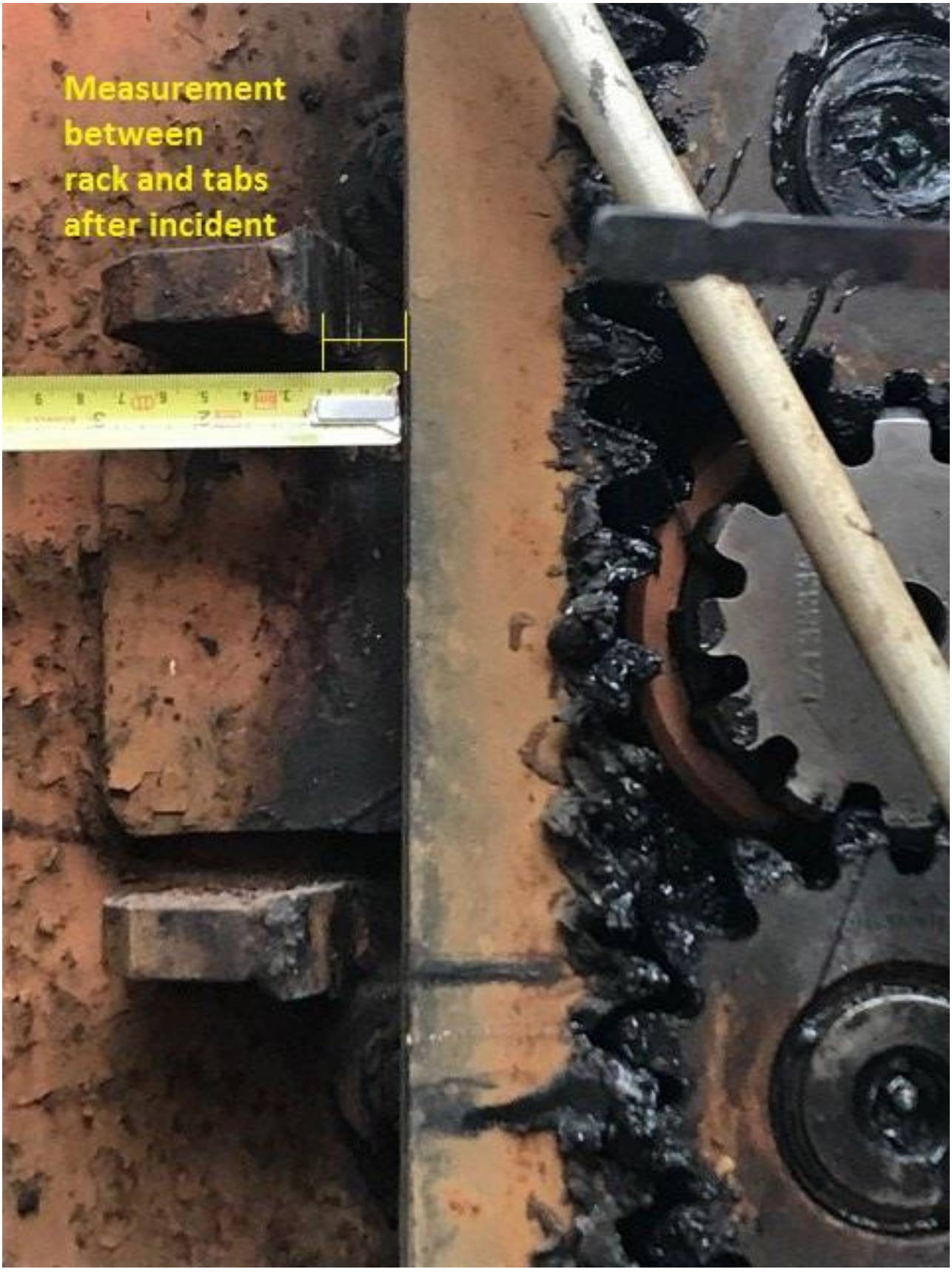
	hoist. It is probable that the broken welds went undetected during regular maintenance.

Photos or diagrams (if necessary)

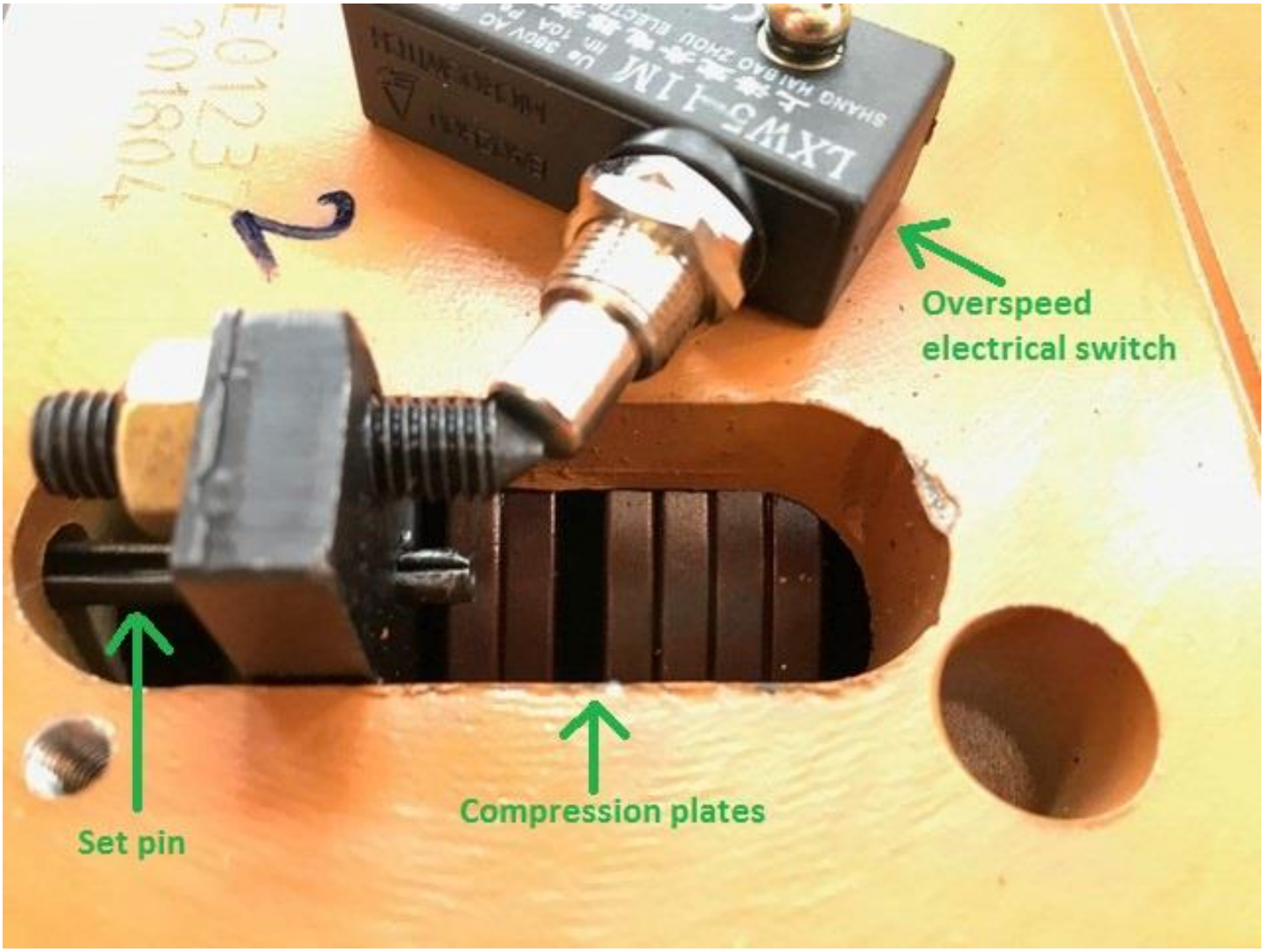

Measurement
between
rack and tabs
after incident

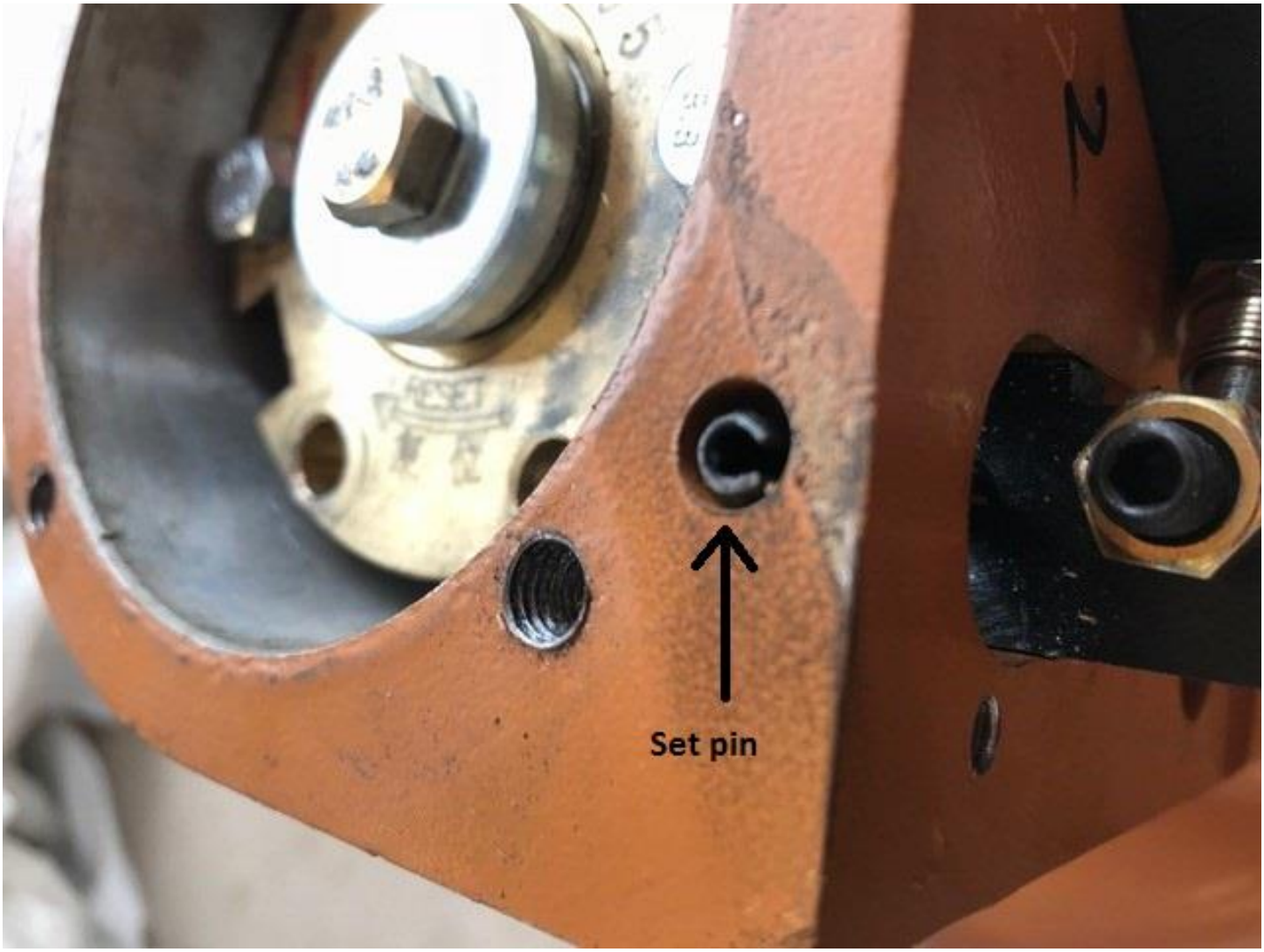

Top down view of
broken retaining tabs


Grooves worn into
retaining tabs from
contact with rack


Welds rusted through


Freshly broken weld
~3mm thick


Overspeed
electrical switch
Compression plates
Set pin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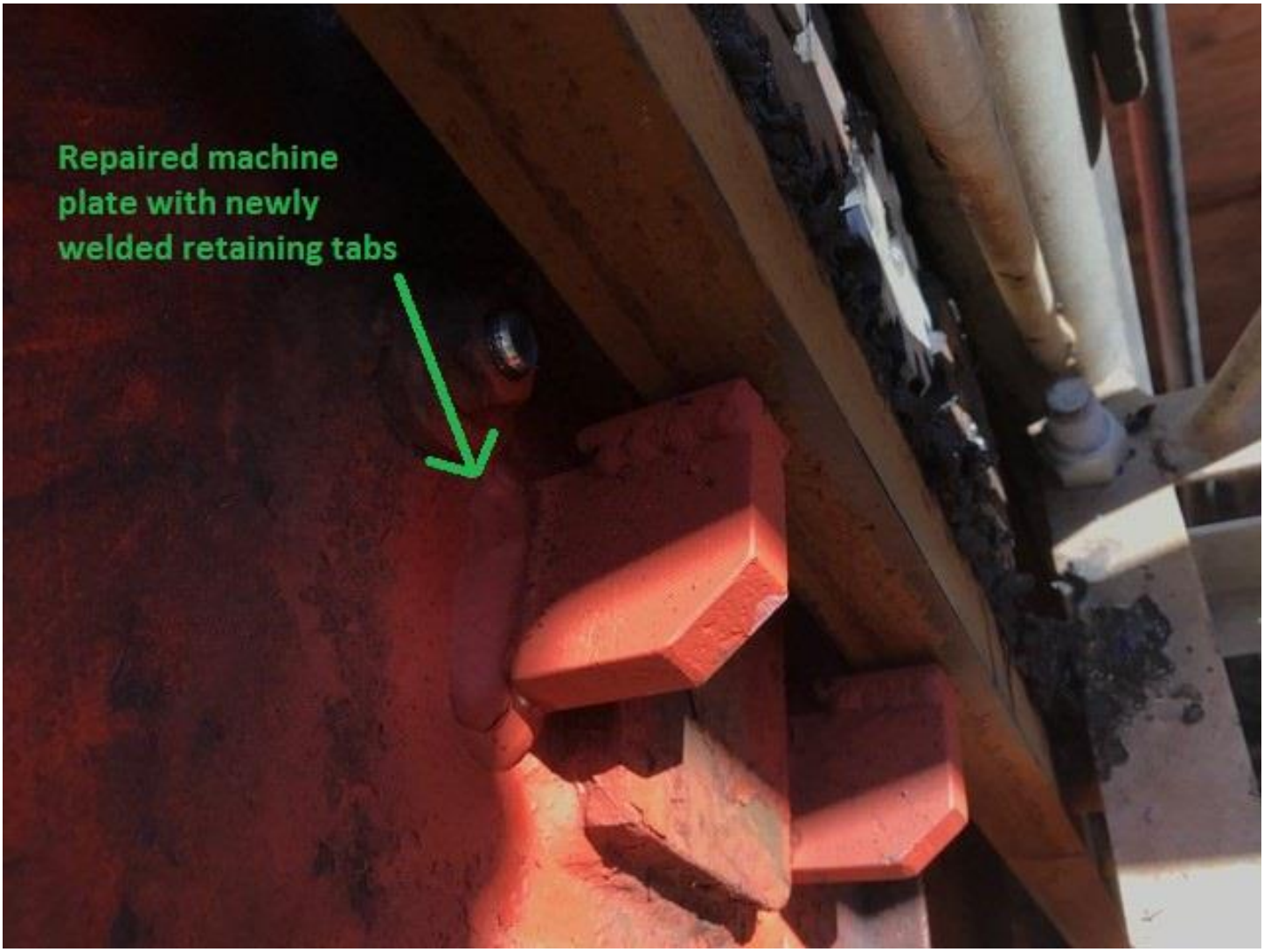
Repaired machine
plate with newly
welded retaining tabs