

Incident Summary #II-1765674-2024 (#52211) (FINAL)

SUPPORTING INFORMATION	Incident Date	September 24, 2024	
	Location	Prince George	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 1000V)	
	Impact	Qty injuries	0
		Injury description	No injuries
		Injury rating	None
	Damage	Damage description	A Motor Control Center (MCC) bucket arc-flashed causing damage to the breaker, wiring and small dust fire occurred causing charring and soot on the door.
		Damage rating	Moderate
Incident rating	Moderate		
Incident overview	At a sawmill, a pull-out pump motor control bucket in the 27-inch barker (powering machinery used for de-barking logs) Motor Control Center (MCC) had an arc-flash. The phase "A" TEW 600volt conductor that ran from the breaker to the starter contactor arced to the metal enclosure of the MCC bucket.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>The incident happened at an "L" shaped Sawmill where logs come in one side, are processed, sorted and travel through the facility and continue out the other side before travelling to the kiln and planer mill areas. This is an automated Mill where production starts at 0700 with 2 electricians onsite for facilities comparable in size to football fields. Incident occurred at 10:20 am. Most employees work inside the mill. The majority of employees can be seen operating and monitoring issues further down the processing as the lumber gets cut. The employees present where the Motor Control Center is located inside booths and have direct line of sight, but their function is not to motor for fault 24/7.</p> <p>The incident occurred at one of the facility's MCC's bucket which is a modular element or component that houses the protection and control mechanisms for a single motor and was in the sawmill supplied by one of the 480volt three phase, three wire, delta system, Power Distribution Centers (PDC).</p> <p>Three-phase systems can be configured in two different ways to maintain equal loads; the one is known as Delta system which is common in sawmills.</p> <p>The MCC that contains numerous sections and buckets is located on the sawmill floor area. The bucket that arced was supplying the pull-out hydraulic pump motor, the "A" phase, TEW 600volt conductor from the bucket's 15amp circuit breaker to the motor starter contactor was partially worn in the area of the fault.</p> <p>The wear mark on the conductor aligned with the edge of the bucket's starter mounting plate. The 15amp three phase breaker in the bucket was found tripped and wouldn't reset, it had to be replaced after the incident.</p>	

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<p>Failure scenario(s)</p>	<p>At the time of the incident there was a ground fault on another piece of sawmill equipment the #2 merchandiser, saw #1. This ground fault was discovered when the sawmill was being brought back online after being shut down right after the arc-flash incident occurred about 100 feet away (Sawmill map).</p> <p>The MCC that supplies the #2 merchandiser saw motors is supplied by the same Power Distribution Centre that supplies the 27-Inch Barker (de-barker) MCC. When troubleshooting the ground fault, the voltage readings taken from the three phases A/B/C to ground were 700/500/250volts. The voltage rating of the arc faulted conductor was 600volts.</p> <p>The voltage to ground on phases A/B/C were not the normal 480/480/480volts but were measured after the incident at 700/500/250volts to ground. The TEW 600volt rated conductor inside the pull-out pump MCC bucket had been wearing on the edge of the motor starter mounting bracket (Image #2).</p> <p>The combination of the worn 600volt insulation and the higher voltage caused the TEW 600volt conductor to fail resulting in an arc flash and a dust fire from the small amount of wood dust that had accumulated on the 27-inch barker MCC (Image #3).</p> <p>This unbalance caused the voltage on phase “A” to exceed its normal level of 480 volts, as under the fault condition it was 700 volts.</p>
<p>Facts and evidence</p>	<p>Site Evidence:</p> <ul style="list-style-type: none"> • Image 1 – Shows the location of the incident. The front of Motor Control Centre Bucket is shown. This bucket runs the 27 Inch hydraulic pump (HPU) that is used for stripping bark from trees. • Image 2 - Inside Motor Control Centre Bucket. The phase “A” TEW conductor has been removed. If the picture is enlarged, you can see the starter is sitting on the edge of the mounting plate and was wearing over time likely due to the vibration. • Image 3 - Door of Motor Control Centre Bucket showing some charring and soot from the arc-flash incident and subsequent dust fire. • Image 4 - Rear of Motor Control Centre with cover removed to inspect for any damage from the arc-flash incident. - Image supplied by Mill Manager. • Image 5 - TEW 600volt rated wire from phase “A” that arced. Worn to copper where it arced due to friction on mounting bracket components in the MCC. <p>Mill was observed to be well maintained as far as following their safety management plan and was adhering to cleaning standards which likely prevented fire from spreading.</p> <p>Employee Statements:</p> <p>Due to the distance and the rarity of ground faults on a daily basis operators are not paying attention to these lights on a regular basis but are aware of the meaning of these lights. This leaves checking for lights being out to the electricians.</p> <p>Operators are stationed at every major machine center. Each machine center is around the length of a football field with numerous cameras to watch. The MCCs are distances away from operators and as they are not in charge of these do not pay attention to MCCs during a normal production run. Every MCC has a dedicated ground fault lights box that indicates if there is a ground fault presents per mill</p>

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	<p>employees the mill had no audible system for the ground fault and in the past have relied on the ground fault lights (which are on all MCCS and PDCs and were added afterwards as none of the MCCs or PDCs had these lights in the past). Decisions have been made to add electronic systems to send a message to our PLC display in the near future to alarm production boards which are read by everyone of a ground fault going forward. This will allow employees to catch these faults at an even faster pace and troubleshoot any faults right away vs relying on someone to see individual lights being dim on the MCCs.</p> <p>Operators have been trained on electrical safety and due to the sawmill incidents are aware of arc flashes and explosions to minimize risks.</p> <p>Canadian Electrical Code (CEC)</p> <p>10-400, 2) On the occurrence of a ground fault, the ground fault detection shall activate a visual <u>or</u> audible alarm to indicate the presence of the ground fault.</p> <p>Rule 10-400 Ungrounded systems have traditionally been used for an added degree of service continuity and reliability. However, a fault on one phase of a three-phase ungrounded system places a sustained increased voltage on the insulation of the ungrounded phases, which tends to reduce the life of the insulation. Although ungrounded systems are still permitted by the Code, they are increasingly being replaced by impedance grounded systems, which provide better voltage-to-ground stability.</p>
<p>Causes and contributing factors</p>	<p>It is likely that the arc flash was caused by higher than normal voltages due to an existing ground fault conditions which exceeded the insulating capacity of a 600v TEW conductor.</p> <p>It is likely the location of the arc flash was due to the insulation of the conductor in that location being degraded over time due to abrasion against the MCC bucket wall.</p> <p>One of the contributing factors was likely that the sawmill was operating with a visual only monitoring system. An audible monitoring system was not required by the CEC. The ground fault alert lights mounted on the MCC needed to be specifically looked at directly to alert employees of a fault when they may not have been able to view the fault lights for periods of time and there is no dedicated person monitoring this. When the original fault happened, it was not immediately discovered, as the foreman had been somewhere else on the floor.</p>



Image 1 - Front of Motor Control Centre (MCC) Bucket.

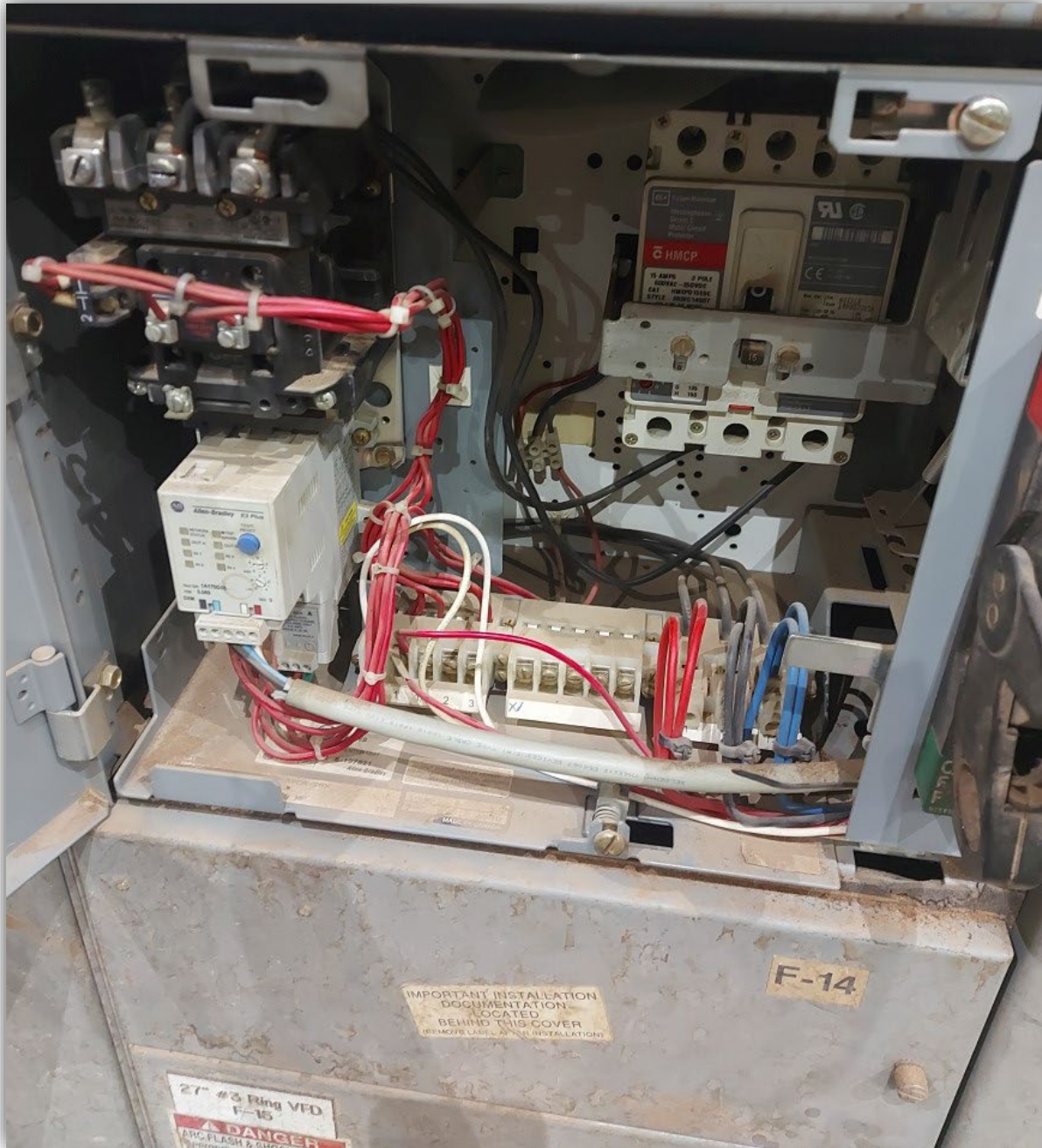


Image 2 - Inside Motor Control Centre (MCC) Bucket the phase "A" TEW conductor has been removed. If the picture is enlarged, you can see the starter mounting plate.



Image 3 - Door of Motor Control Centre (MCC) Bucket showing some charring and soot from the arc-flash incident.



Image 4 - Rear of Motor Control Centre (MCC) with cover removed to inspect for any damage from the arc-flash incident (Image supplied by Mill Manager).



Image 5 - TEW 600volt wire from phase "A" that arced. Worn to copper where it arced due to friction on mounting bracket components in the MCC.



Image 6 – Screenshots of arc incident from the surveillance camera.

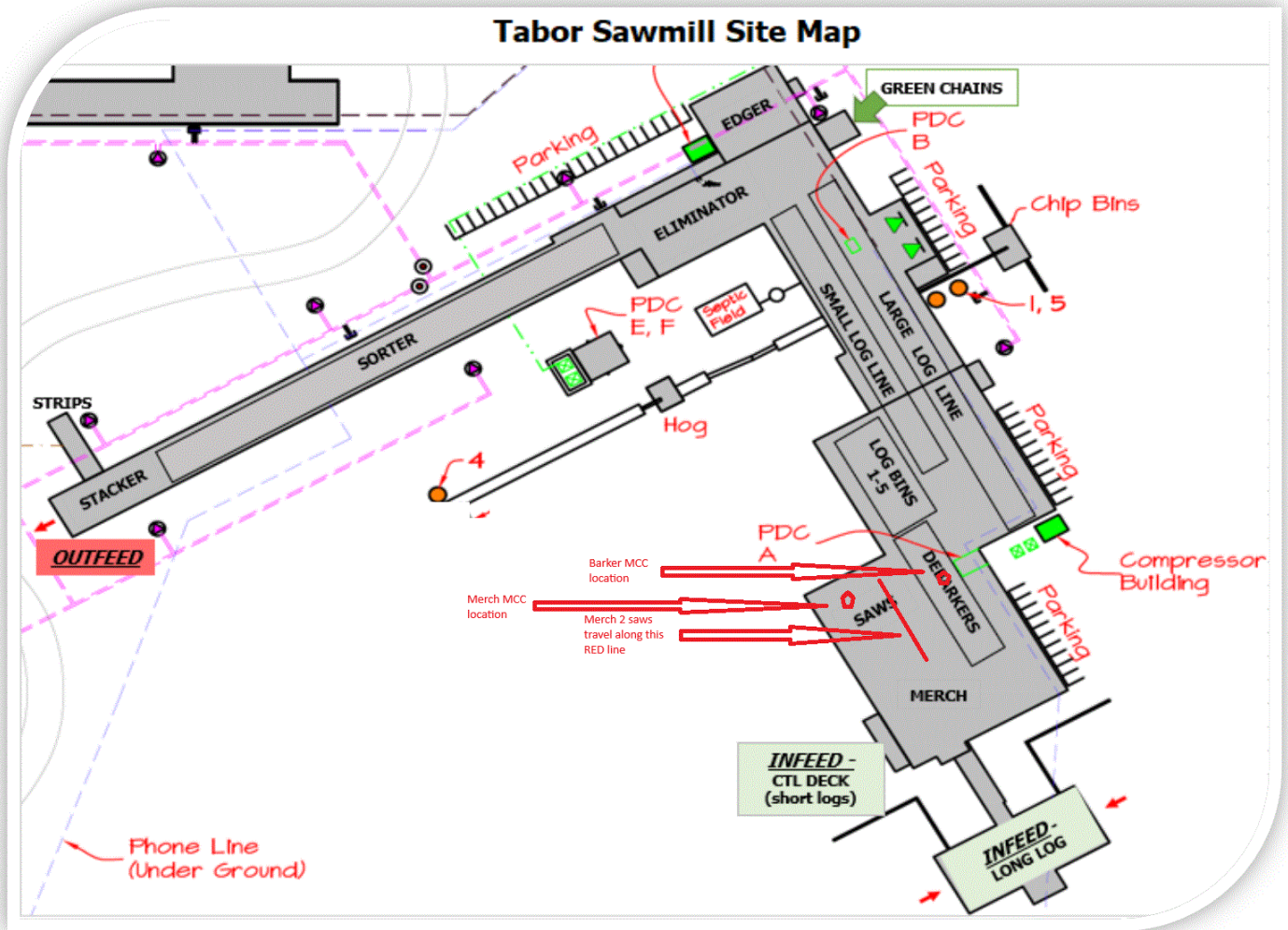


Image 7 - Sawmill map provided by Sawmill Manager.