

Incident Summary #II-974332-2020 (#16492) (FINAL)

SUPPORTING INFORMATION	Incident Date	January 29, 2020	
	Location	Coquitlam, BC	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 750V)	
	Impact	Qty injuries	1
		Injury description	Thermal burns sustained to the crane operator's face, hands and body.
		Injury rating	Moderate
	Damage	Damage description	The tower cranes control panel was damaged to the point complete replacement was required and other damages requiring repairs.
		Damage rating	Moderate
	Incident rating	Moderate	
Incident overview	A tower crane operator working on an energized control panel, caused an unintended release of electrical energy, injuring themselves and causing damage to the equipment.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>A tower crane is a fixed crane used on building sites to lift, lower and move materials. The crane is a manufactured piece of equipment that is electrically powered and controlled by an operator who sits in the operator's cab in the case located at the top of the tower crane, this provides the operator with a good overall view of the site. The tower cranes height can be extended with a climbing frame used to add or removed sections altering the towers height.</p> <p>The electrically powered tower crane involved in the incident was provided with a disconnect switch located at the bottom of the crane (ground level) as well as a disconnect switch located on the slewing ring level which is one level below the operators cab, these disconnect switches are provided to turn the tower cranes power off and on. Behind the operators chair there is an electrical control panel for controlling the electrical components of the crane. The slewing ring level disconnect switch, which is part of the manufactured tower crane, turns the cranes power off and on and feeds power to the control panel behind the operators chair.</p> <p>The BC Electrical code rule 2-304 (1) states "No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible". And is interpreted as meaning that electrical work may only be carried out in a de-energized state, unless it can be demonstrated that the task to be performed is not possible in a de-energized state.</p>	
	Failure scenario(s)	The crane operator near the end of their shift, turned the control panel disconnect switch off and opened the control panel door so they could see what tools would be required to connect the climbers electrical equipment into the control panel the following day. The control panel disconnect switch is located within the control panel enclosure, it has an external operating handle located on the exterior of the control panel door but does not de-energize all electrical components within the panel when turned off, the electrical feed on the line side of the control panel disconnect remains energized and accessible without barriers. Proper electrical lock out procedure was	

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	<p>not followed resulting in a worker entering into an energized control panel. The worker then touched an insulated energized conductor on the line side of the disconnect switch, due to crane movement the conductor connection may have already been loose and only exacerbated by the worker touching it. When the conductor was contacted it caused an arc fault either phase to ground, and or phase to phase rapidly releasing energy resulting in an arc flash.</p>
<p>Facts and evidence</p>	<p>Evidence from interview with Crane Operator:</p> <p>The crane operator was aware they should have disconnected power to the control panel by turning off the disconnect switch located on the slewing ring level below but did not prior to opening the enclosure door to investigate what tools they would need to connect the climber the next day, they stated they did turn off the control panel disconnect switch. While investigating what tools would be required they noticed a wire in the lower left hand side of the control panel enclosure that looked bent, twisted and sticking out. After conversation with the crane operator it appears the conductor / wire they were describing was one of the feeder conductors terminating on the line side of the control panel disconnect switch, more specifically the conductor on the far right side. The crane operator stated that the crane had been running fine that day and the wire they touched did not look damaged but they wanted to check it for heat but did not touch it with force. They stated once the control panel enclosure door was open they went down two or three steps on the ladder to get a better look inside and when reaching into the enclosure to check the conductor for heat the unintended release of energy occurred, they stated it was like a furnace went off with a ball of energy coming out, they stated they did not get electrically shocked. When this occurred they intentionally removed their feet to drop to the slewing ring level below. They noticed their jacket and pants were on fire. They quickly removed their jacket and underneath hoodie and threw them to the slewing ring levels floor as they patted out the fire on their pants. They started to yell down for help and to turn the power off. The electrical sizzling noise did not stop for approximately 10 seconds. The crane operator was able to climb down the tower crane under their own power.</p> <p>Physical Evidence:</p> <p>Electrical Safety Officer on-site for incident investigation Friday January 31st 2020 two days after the incident. Fused disconnect switch feeding the crane and providing the crane with overcurrent protection was approximately 600ft away from the base of the crane located in the temporary construction power sea-can. The overcurrent devices protecting the crane did not appear to open at time of the cranes electrical fault. This might have led to a prolonged fire at the top of the crane.</p> <p>After review of photos, the physical evidence appears to align with the location the crane operator stated the unintended release of electrical energy occurred.</p> <p>Documentary Evidence:</p> <p>Crane engineering report.</p>
<p>Causes and contributing factors</p>	

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It is likely that the unintended release of electrical energy that caused injury to the crane operator and damage to the equipment was due to a person working on live electrical equipment. Due to the fact that the control panel enclosure door was open at the time of the fault the electric energy was not contained within the enclosure expelling out causing injury to the worker and subsequent damage to the crane.



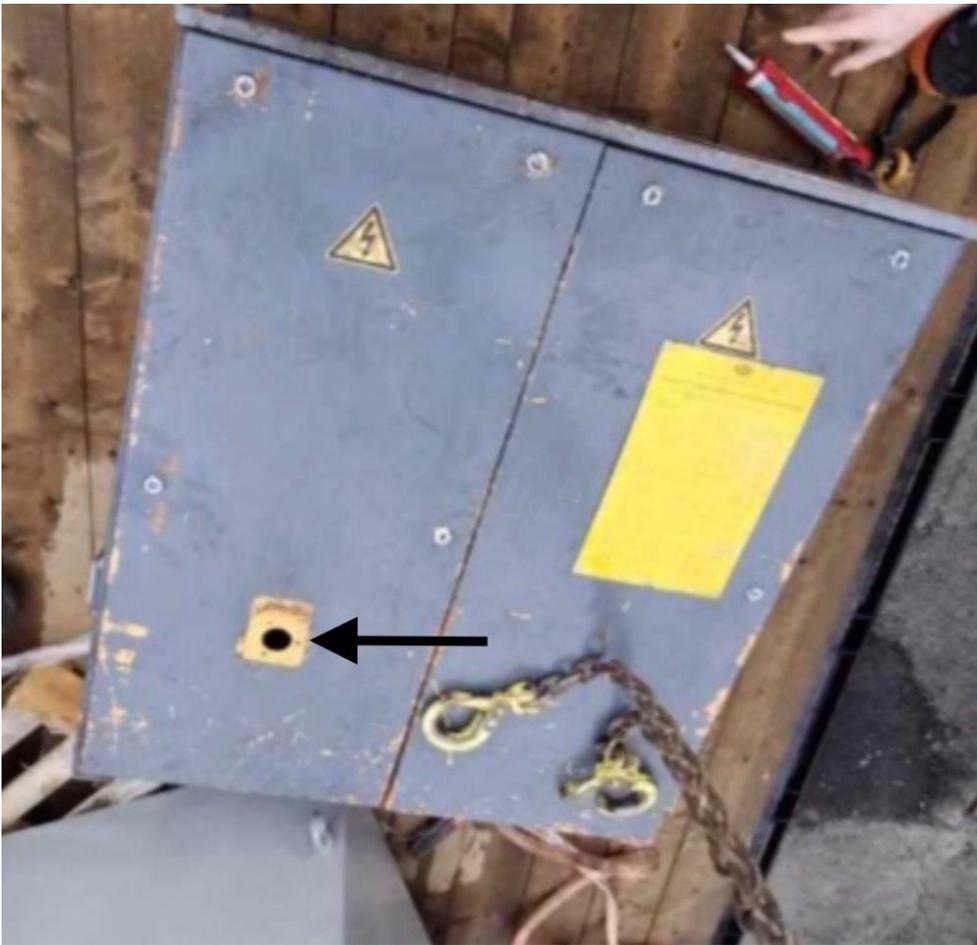
Overall photo of the crane after the incident occurred; fire being extinguished by the fire department.



Overall photo of the crane during the fire which resulted from the incident. The black arrow indicates the tower crane operators cab where the control panel is located and where the incident occurred. The blue arrow indicates the slewing ring deck where the manufacturers disconnect is located which turns the control panels power on and off. The fire in the photo is from the operators jacket which was on fire and thrown to the ground when they dropped from the operators cab to the slewing ring deck below. The green arrow indicates the tower cranes climbing unit, the crane operator at the time of the incident was investigating the tools required to connect the electrical equipment for the climber.



This photo is of the inside of the control panel located inside the operators cab after the incident. The red arrow indicates the location where the operator touched right before the unintended release of electrical energy occurred and resulting fire. The location appears to be on the line side of the control panel disconnect.



This photo is of the damaged control panel after it was removed from the tower crane with the control panel doors installed. The black arrow indicates the location of the control panels disconnect operating handle.



This photo is of the tower cranes manufactures disconnect switch located on the slewing ring level that turns power to the control panel where the incident occurred on and off.