

Incident Summary (Reference #5622240) (Final)

SUPPORTING INFORMATION	Incident Date		July 18, 2017	
	Location		Vancouver	
	Regulated industry sector		Elevating- Elevator	
	Impact	Injury	Qty injuries	0
			Injury description	None
			Injury rating	None
	Damage	Damage description	Significant damage to all major elevator components: Car/ counterweight/ compensating ropes/ sheaves/ buffers/ associated structural members.	
		Damage rating	Major	
Incident rating		Major		
Incident overview		It was reported to BCSA that during maintenance troubleshooting an elevator accelerated in an uncontrolled manner into the elevator shaft overhead.		
INVESTIGATION CONCLUSIONS	Site, system and components		<p>Elevators controllers are designed to control the normal operation of the elevator. Elevator controllers can control speed, braking, acceleration and other functions.. Elevator controllers have circuit boards that control certain functions of the elevator. Each circuit board has a designated slot in the controller. The elevator is designed to operate only with all of the circuit boards in their designated slots.</p> <p>Elevator “motion control devices” are devices meant to shut down and arrest any uncontrolled motion of an elevator. Elevator “motion control devices” engage the elevator braking system. Elevator brakes are designed to hold 125% of the designed rated load. Elevator brakes are designed to stop an elevator that has gone into a uncontrolled motion state (run-away/ over speed).</p> <p>Service and maintenance of elevator brakes are performed with the elevator cab at the top of the elevator shaft and the elevator counterweight on the buffers (springs/ hydraulic pistons) at the bottom of the elevator shaft (ground). The elevator in this position will not move with the brakes released as the elevator counterweight is heavier than the elevator cab.</p>	
	Failure scenario(s)		<p>Possible failure scenario 1.- The maintenance personnel removed the controller circuit boards to perform a visual inspection. The maintenance personnel replaced the circuit boards into the incorrect slots (positions) in the controller. The elevator was energized and a command to run was made. The circuit board in the incorrect position caused the elevator to run at high speed into the elevator shaft overhead causing the reported mechanical and structural damage.</p> <p>Possible failure scenario 2.- Adjustments made to the elevator brake while the elevator car was at the bottom portion of the elevator shaft allowed the elevator to move in an uncontrolled manner up the elevator shaft. The counterweight being heavier than the elevator car allowed the elevator develop significant velocity. The motion control devices may have actuated, but a reduction or lack of braking force allowed the elevator car to impact the upper structural members (overhead) of the elevator shaft causing the reported mechanical and structural damage.</p>	
	Facts and evidence		Maintenance Personnel Statements-.	

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		<ul style="list-style-type: none"> • The maintenance assistant stated that: They had removed the controller circuit boards (A3 speed supervision and A4 speed regulator) for cleaning. • Maintenance personnel stated that they were troubleshooting reported elevator speed issues. • Maintenance personnel stated that the elevator car was at the bottom landing. • The maintenance assistant and mechanic stated that: They had inadvertently placed the circuit boards into the incorrect positions in the controller. • The maintenance assistant and mechanic stated that: After the elevator was energized and a run command had been made the elevator ran uncontrolled up, crashing into the elevator shaft overhead causing substantial damage. • Maintenance personnel stated that- Elevator brake coil component had been removed to be used on a different elevator in the building after the incident had occurred. • Maintenance personnel stated that the elevator drive powered through the applied brakes. • Maintenance personnel stated that the entire incident event occurred within a 15 second time frame. <p><i>On-Site Investigation Observations:</i></p> <ul style="list-style-type: none"> • Brake pads and drum were observed not to exhibit signs of hard braking or being driven through (discoloration of brake drum/ brake shoe wear dust/ burnt brake pad odor). • Counterweight buffers completely compressed and damaged. Signs of high speed impact. • Machine room structural members damaged and displaced. Signs of high speed impact. • Hoist ropes dislocated from hoist rope sheaves. • Elevator car observed to be twisted in the elevator shaft. • Uncontrolled motion device was observed to be tripped in “ up direction” indicating that the car had over sped in the up direction. • Damage as shown in attached investigation photos. <p><i>Original Equipment Manufacturer- Field Engineer- Test results and remarks:</i></p> <ul style="list-style-type: none"> • Field Engineer performed controller simulation test- Statement of result:” If the A3 (speed supervision) and A4 (speed regulator) are placed in the locations shown in the attachment the car is not allowed to start (not on automatic nor on inspection).”
	<p>Causes and contributing factors</p>	<p>Based on test result performed by the field engineer it is highly unlikely that the inadvertent misplacement of the controller circuit boards (A3 and A4) into the wrong controller slots caused the uncontrolled movement of the elevator.</p> <p>It is plausible that the elevator brake system was inoperable or not providing designed braking power allowing the uncontrolled movement of the elevator.</p> <p>Human error likely contributed to the incident.</p> <p>The cause of this incident is unknown.</p>

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Photos or diagrams (if necessary)



Figure 1- Elevator car above 17 floor landing. Arrow pointing at gap between car door and car door frame- Illustrates that amount of twist (racking) sustained by elevator car due to impact.



Figure #2- Mono –mass (compensation rope tension device) mounting bracket torn from floor due to impact.
Note slack ropes in the center rear of the photo tangled and damaged.



Figure 3- Counterweight buffer- fully compressed and bent due to impact of the counterweight. Counterweight frame bent.



Figure 4- Machine beam in machine room. Machine beam dis-lodged due to impact.



Figure 5- Secondary sheave with ropes displaced from sheave groove.

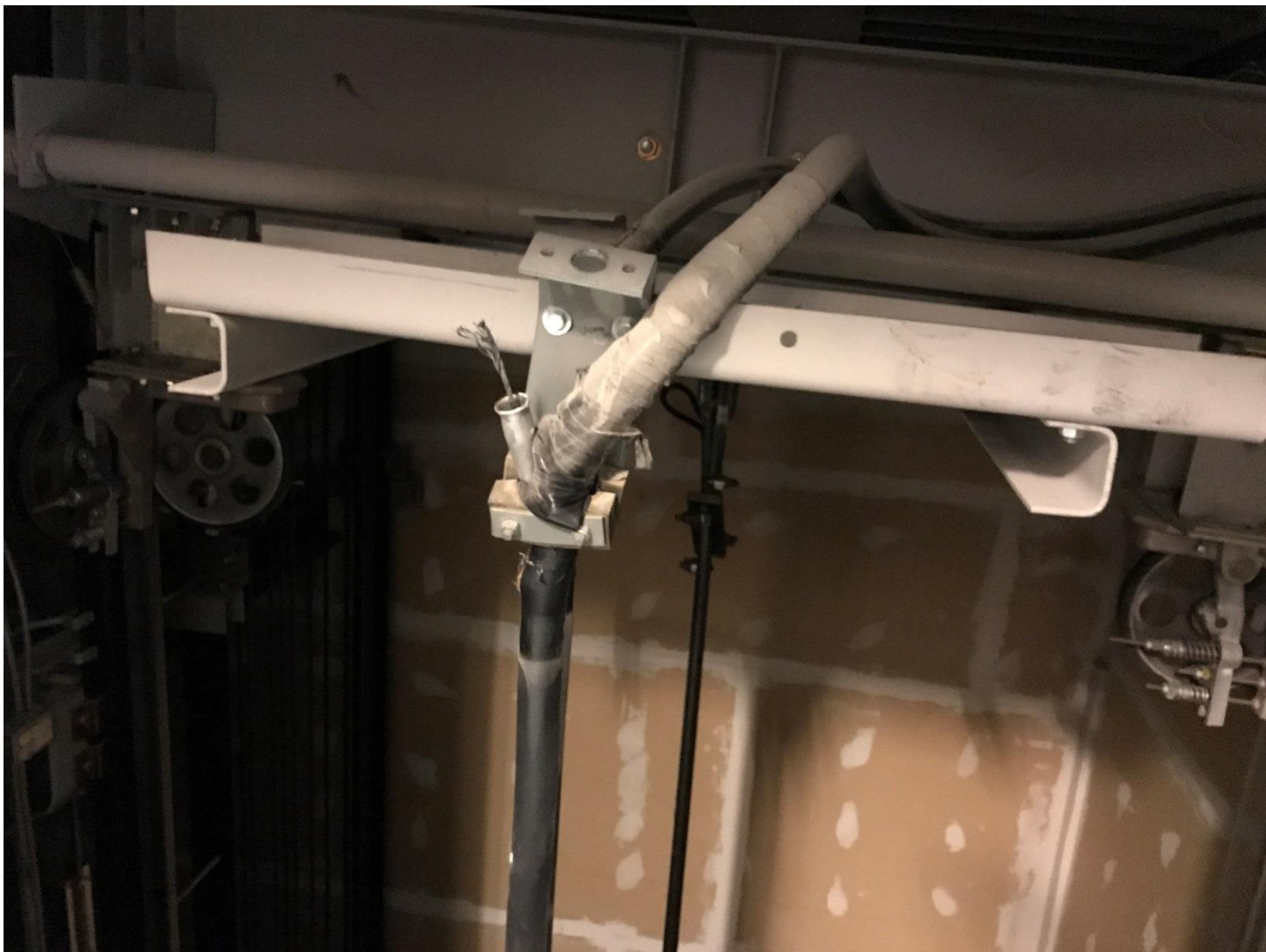


Figure #6- Damaged travelling cable due to impact.

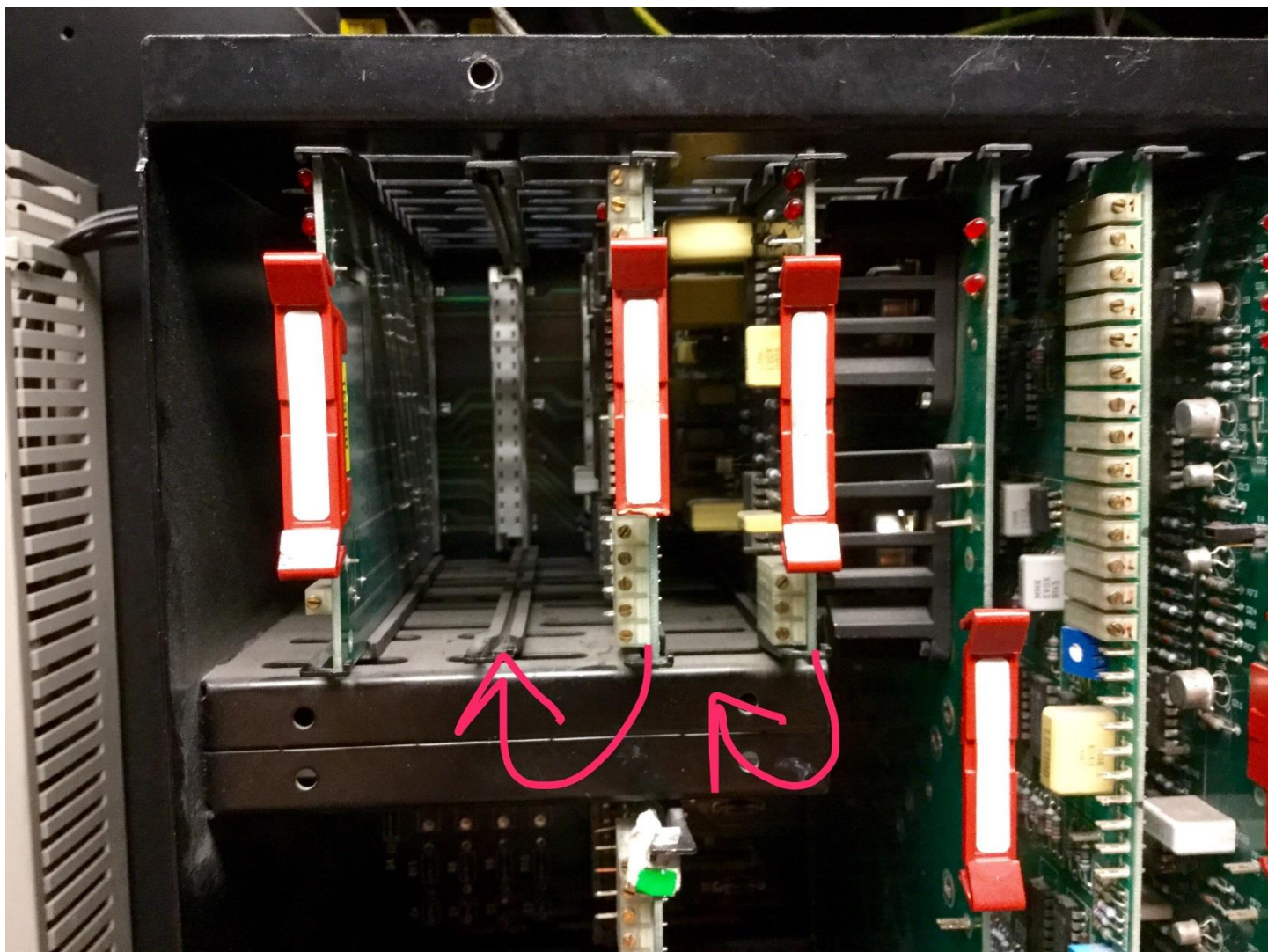


Figure 7. Controller circuit boards in correct slots. Arrows indicate where boards were reported to have been placed prior to the incident.