Incident Summary #II-984561-2020 (#16727) (FINAL)

SUPPORTING INFORMATION	Incident Date		February 24, 2020
	Location		Vancouver, BC
	Regulated industry sector		Elevating devices – Elevator
	Impact – Injury	Qty injuries	0
		Injury description	None
		Injury rating	None
	Impact – Damage	Damage description	Damaged overhead deflector sheave. Damaged elevator ropes.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		An entrapment involving one person occurred after 3 of the 4 elevator ropes came dislodged from the deflector sheave. Elevator came to an abrupt stop and was found suspended by one rope.
T INVESTIGATION CONCLUSIONS	Site, system and components		Traction elevator is raised and lowered by four steel ropes attached to the top of the car that are then looped over to 3 deflector sheaves (pulleys) mounted at the top of the hoistway by an electric motor. These deflector sheaves, are designed with sealed non-serviceable bearings, which reduce friction allowing for smooth rotation of the sheave and providing a path for the ropes to line up with the drive sheave located at the bottom of the hoistway. Deflector sheaves and drive sheave are designed with a grooved rim surface. Each rope sits in its own groove. The ropes loop under the drive sheave and back up to the third deflector sheave at the top of the hoistway. The third deflector sheave is aligned with the counterweight sling, which provides a path for the ropes to drop directly down to the counterweight where the ropes are tied off. Under normal operation all sheaves work together like a network of pulleys. As the motor turns the drive sheave, the elevator is raised or lowered by its steel ropes. The counterweight replicates the car's movement but in the opposite direction. All four sheaves turn as the elevator is in motion and all ropes move freely within their grooves.
	Failure scenario(s)		• A fault in the bearings of the counterweight sheave developed as the elevator was descending with a passenger on board. • The collapse of the bearings resulted in the deflector sheave tilting over to one of its sides. • With the sheave collapsed toward one of its sides, and no rope retainers in place, 3 of the 4 ropes came out of their grooves. • The elevator came to an abrupt stop and was found suspended by one rope that remained on the deflector sheave.
	Facts and evidence		Safety Officers site observations, interviews with Maintenance Contractor Foreman, Maintenance Contractor Mechanic, Building Manager, Property Manager and report by Maintenance Contractor Foreman.

Evidence observed during on-site investigation:

1st Visit:

- Met with the Maintenance Contractor Foreman and Building Manager. The Mechanic who attended the initial trouble call was not there.
- Incident occurred two days prior, unit was shut down until Safety Officer site visit to investigate.
- Day of the incident mechanic was not able to access the machine room because the Building Manager had changed the keys within the last 6 months and did not provide the maintenance contractor with a copy.
- No safe access to the top of the car for pictures.
- Used a rope gauge to confirm that the correct size of the steel ropes were installed for the unit. Rope gauge confirmed correct size of ropes and that they were still in good condition.
- Maintenance Log books onsite indicated that no maintenance had been done since May of 2019 prior to incident.
- Safety Officer questioned the incomplete maintenance log book. Maintenance contractor responded that the door locks to the Machine Room had been changed, and they had no keys to get inside to fill in the log book.
- 2019 Maintenance log was on site but only completed for early 2019. (See Photo # 6 below)
- 2020 Maintenance log was on site, with no entries. (See Photo # 7 Below)
- Safety Officer requested electronic copy of maintenance log. (See Photo #8)

2nd Visit:

- Arranged a site visit with Maintenance Contractor Foreman, upon arrival no mechanic was present.
- Car had been secured and a ladder had been set up on top of the car to access the deflector sheave that the mechanic suspected might have had its bearings damaged.
- Found the suspected damaged sheave out of plumb and slightly tilted to one of its sides. (See photos #1 and #2)
- Found three of the four ropes missing from the Sheave's grooves. (See photo #4)
- Found the three loose ropes between the sheave holding bracket and back wall. (See photos #3 and #9)
- Ropes were hanging loosely in the hoistway (see photos #5 and #9)
- Called foreman for information on maintenance contract for last 6 months and asked him about new findings on the incident.
- Foreman stated mechanic had secured the car after the first site visit and set up a ladder to access the deflector sheave. The mechanic confirmed that the sheave had damaged bearings. Because of the damaged bearings the deflector sheave collapsed towards the wall which caused 3 of the 4 ropes to come out of their grooves.
- Requested more pictures from maintenance contractor of deflector sheave to be forwarded to Safety Officers prior to beginning repairs.

Communication with Maintenance Contractor

- They had asked multiple times for keys but never got keys from the managers.
- Questioned Supervisor if he could get the Mechanic who does maintenance at the property to call Safety Officer and was told Mechanic would call later that day.

Evidence or Events from mechanic (43 days after incident):

		• Upon onsite visit found the root cause of the incident was a failed bearing inside the deflector sheave between the counterweight and motor. • This is a non-serviceable sealed bearing, with no grease nipples. (see photo #1 and #2 showing a collapsed bearing). • Found elevator and counterweight suspended by one rope. (See photo #5) • Mechanic indicated that he was aware that the door lock to machine room had been changed and had requested keys multiple times from office and had never received them. • Mechanic indicated no one was performing maintenance in the hoistway during this time, maintenance did not get done for most of the year. • Mechanic attended call for the initial entrapment and incident. Mechanic stated that the fire department had been called to get the passenger out. • Mechanic reported that suspected noises from the elevator were heard a few days prior to the incident. **Events based on interview with tenants/Building Manager/Property Manager:** • Property Manager stated they were unaware of requests from maintenance contractor for keys to new machine room door lock. Property Manager stated a new owner bought property recently and they weren't aware of machine room door lock being changed. • Property Manager stated that Building Manager is new as well, and may not have been aware that machine room door lock was changed. • Building Manager indicated previous Building Manager would not communicate with them and the new Building Manager was not made aware of outstanding work or work that needed attention. The new Building Manager stated they had started working at the property in December, 2019 and had no idea about the machine room door lock issue. • Building Manager stated he does not recall being approached by maintenance contractor for keys to machine room door. • Passenger that was in elevator at the time stated he heard loud "clanking noises" in the elevator while he was riding the elevator down. The elevator suddenly stopped. Passenger indicated it was not a hard stop but a sudden stop.
	Causes and contributing factors	It is very likely that the ropes coming out of their grooves was caused from a failed/damaged bearing in the deflector sheave. The maintenance logs indicated that no maintenance had taken place a few months prior to the incident. It is possible that the missed mandatory maintenance visits prevented the maintenance mechanic from hearing audible noises coming from the deflector sheave prior to the failure.

Photo 1: Damaged Bearings

Photo 2 - Photo shows the sheave out of plumb and tilted towards one of its sides.

Photo 3 – 3 loose ropes on the side of the Deflector Sheave

Picture 4 – Deflector Sheave with 3 missing ropes

Photo 5 – showing the Overhead Deflector Sheave with only 1 rope in place, others hanging loosely.

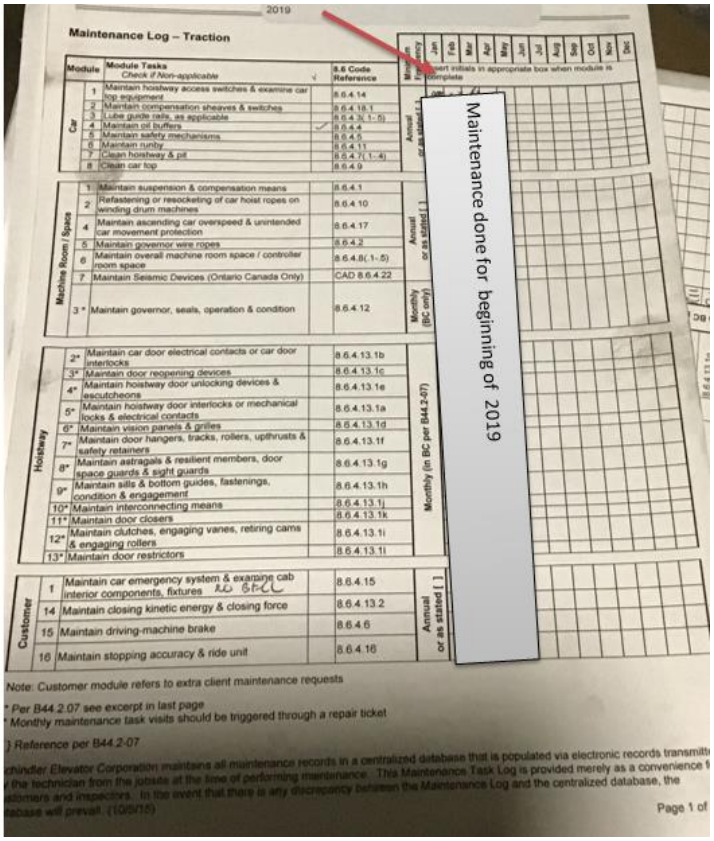

Photo 6- 2019 Maintenance Log Book – records indicate unit had maintenance earlier in 2019, and no entries since.

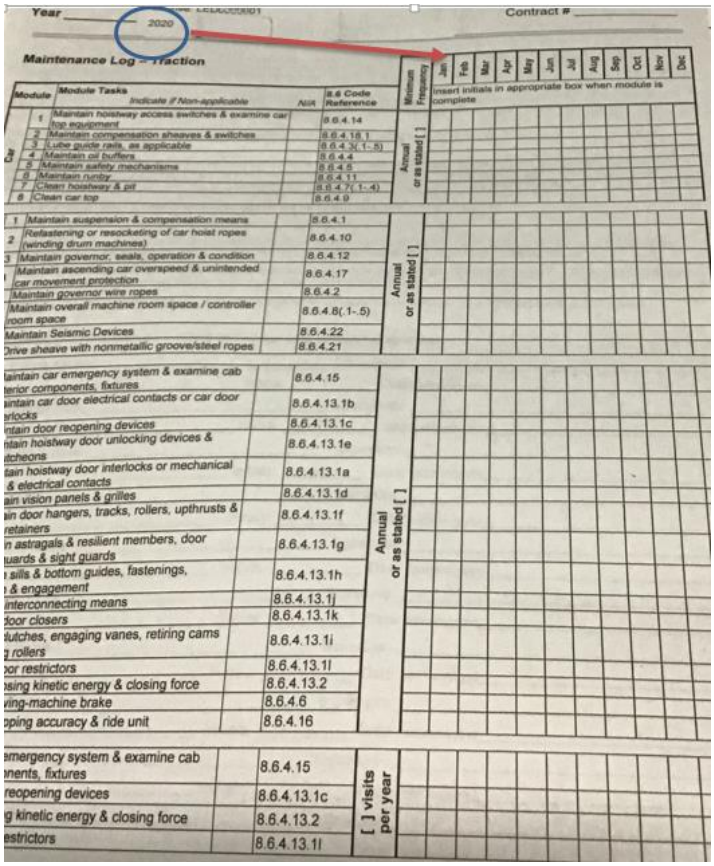

Photo 7- 2020 Maintenance Log onsite – The Log Book indicates that no maintenance since early 2019.

Electronic Records
03/2016 – 02/2020

Date	Contract	SD Doc.	Notif #	Description 1	Description 2
02/24/2020	4300000250		67502595	ENTRAPMENT. ELEVATOR 1FT ABOVE 2ND FLOOR WITH ELDERLY MAN INSIDE. ROPES	HAVE JUMPED OFF DRIVE SHEAVE AND OVERHEAD DEFLECTOR SHEAVE. LEFT
12/19/2019	4300000250		PX010017003002	PERFORMED PREVENTIVE MAINTENANCE, INCLUDING ROUTINE VISUAL INSPECTION OF	EQUIPMENT. UNABLE TO ACCESS MACHINE ROOM.
10/08/2019	4300000250		PX010016954001	PERFORMED PREVENTIVE MAINTENANCE, INCLUDING ROUTINE VISUAL INSPECTION OF	EQUIPMENT. CLOSED
04/03/2019	5300035532		RP5300035532	BRAKE DISMANTLE AND TESTING.	
	5330187785		RP5330187785	CPSL TRACE ALARM BELL WIRING. MORE TIME NEEDED OR ADJUSTER. ALARM BELL	NOT WORKING. TRACED WIRING. MORE TIME NEEDED OR ADJUSTER.
01/04/2019	4300000250		PX010015153063	PERFORMED PREVENTIVE MAINTENANCE, INCLUDING ROUTINE VISUAL INSPECTION OF	EQUIPMENT. CUSTOMER. ADJUST DOOR OP CHAIN TENSION AND BELT TENSION.
11/01/2018	5330181152		RP5330181152	DROPPED ESCALOMETER OFF AT SHOP. PICKED UP WORK VAN FROM FORD, DROPPED	OFF AT SPEEDY GLASS. PICKED UP KEYS FROM ROUTE TEC IN NEW WEST. REPLACED
10/25/2018	4300000250	5350359003	62058379	CHECK FOR NOT RUNNING AFTER OTHER COMPANY (ELTEC) INSPECTED	1N CONTACTOR FAULTY
08/31/2018	4300000250		61452147	REPLACE UA AND AUX CONTACTOR	
08/07/2018	4300000250		PX010014619889	PERFORMED PREVENTIVE MAINTENANCE, INCLUDING ROUTINE VISUAL INSPECTION OF	EQUIPMENT. CUSTOMER. CHECK COP

Photo 8- Electronic Records (Maintenance Log) – records indicated Maintenance done Jan, April, Oct 2019, Dec 2019 – machine room not accessed and Feb 24, 2020 is date of incident.

Photo 9- The three deflector sheaves mounted at the top of the hoistway. The sheave mounted furthest to the back wall is the sheave with the damaged bearings. Three ropes hang loosely to the side of the sheave while one remains in the groove.

Photo 10- The traction elevator machine located in the basement. The drive sheave is positioned inside the hoistway while the motor end sits in the machine room. The ropes can be seen hanging loosely.