Incident Summary Report II-705921-2018 (7470) Final

SUPPORTING INFORMATION	Incident Date		May 31,2018
	Location		Vancouver
	Regulated industry sector		Elevating Devices - Escalator
	Impact – Injury	Qty injuries	None
		Injury description	None
		Injury rating	None
	Impact – Damage	Damage description	It was observed that the escalator steps, step treads, comb plates, step chain pins, bottom of skirt panels all showed signs of damage. Most of these were bent metal and 5 step chain pins were sheared completely
		Damage rating	Major
	Incident rating		Major
	Incident overview		The escalator piled up into the upper landing. This is a malfunction that occurs when the moving components come into contact with the stationary components
INVESTIGATION CONCLUSIONS	Site, system and components		Escalators core parts are hidden beneath the steps, called a truss. At the top of the unit is an electric motor that runs the four primary gears, two drive gears on either side at the top, and two return gears on either side at the bottom. Chains loop around the gears and run down each side. The chains are connected to each step and help make their way up or down at a speed set by the motor, via electronic panel. The steps which are basically metal with 4 wheels attached to the underside, are constructed to flatten out at the tops and bottoms by two wheels that are closest to the top of the step connecting to the two chains that loop around the gears, the bottom two wheels keep the steps level. The horizontal positioning of the chain at the top and bottom causes the steps, in turn to, flatten out. The grooves in the steps are to help alignment and improve balance and stability for riders. The tolerance of the steps to the stationary end components of the device are critical to proper operation.
	Failure scenario(s)		The escalator usage, constant weight & the amount of people, contributed to wear on components, leading to the tolerances (measurements) for the steps, which are very critical, becoming misaligned and resulting in a bend in the track. This misalignment, which was not captured during a regular maintenance inspection lead to steps striking stationary components of the escalator causing the pile up.
	Facts and evidence		On Site investigations: • Escalator located at a high foot traffic area, and subject to weather conditions (rain, snow, salt). • Escalator operates at extended usage hours • Escalator shut down and barricaded upon arrival

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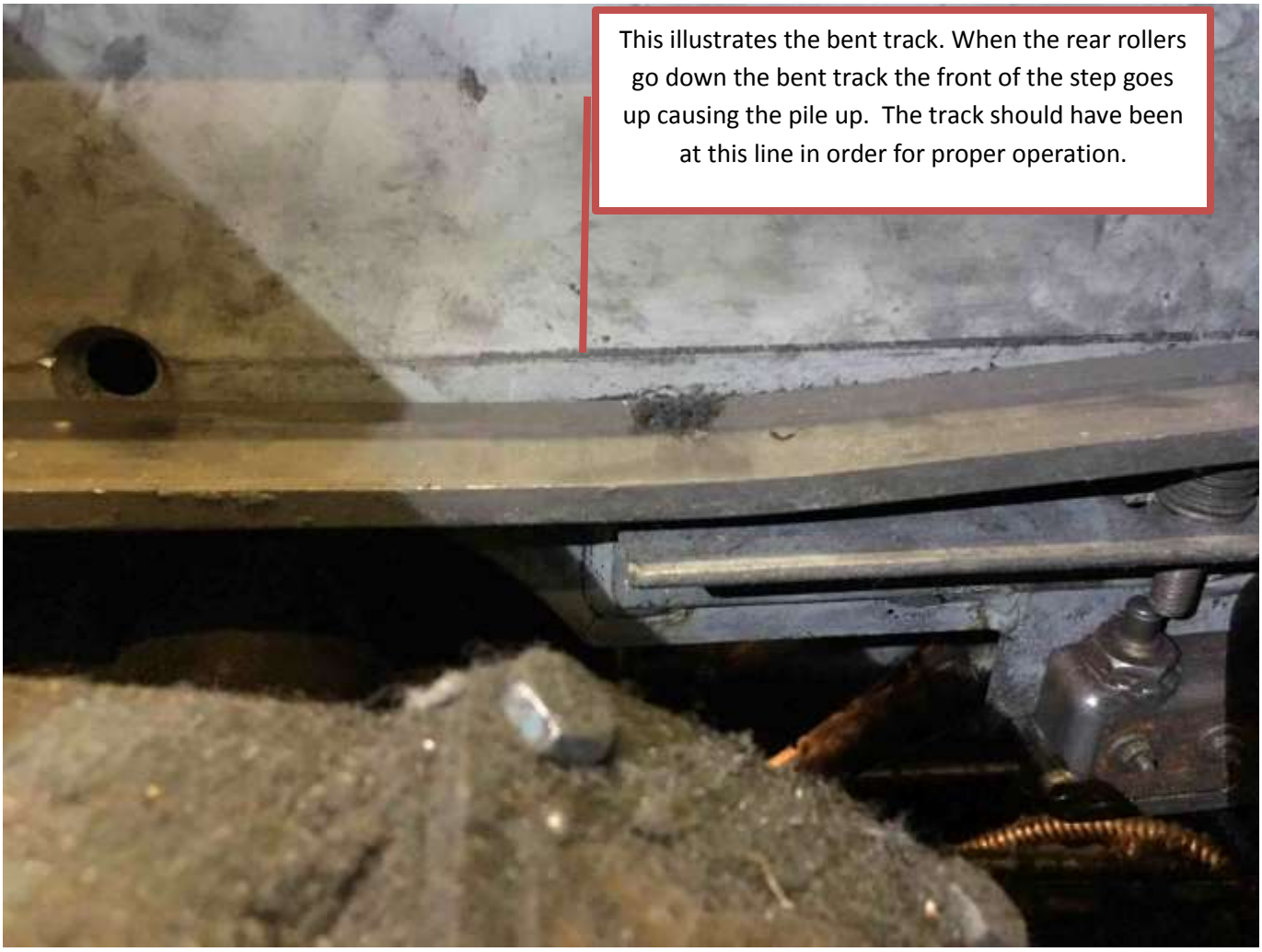
	• Escalator service personnel on-site • Log books were not available for reviewing at the time of visit. • The escalator was partially disassembled by removing the damaged steps and opening the access floor plates. • Damaged escalator step observed (see attached photos) • During observation of the damage, a bent track was discovered. It was identified that the original position of the track, and the position of the track after the pile up, indicated a difference in the measurements and tolerances. (see bent track picture below) • Differences in tolerances were verified on site during the investigation of the pile up, after unit was opened up. It was visibly noticeable that the tolerances were out. See picture below.
Causes and contributing factors	On opening the unit it was found that the tolerances(measurements) were out. It is probable that the proper measurements of the steps were not maintained due to the infrequency of the maintenance visits. A contributing factor could possibly be the lack of proper examination of the tracks and their tolerances on a more frequent maintenance schedule. However, the frequent usage of the escalator is a contributing factor to this type of degradation of equipment (slight measurement changes and bent track) and it wasn't detected by normal maintenance. The amount of track bend and gap would indicate that frequency, environmental contributors and location of unit were contributing factors to the misalignment.


This illustrates the bent track. When the rear rollers go down the bent track the front of the step goes up causing the pile up. The track should have been at this line in order for proper operation.


The left Center of this roller should have a pin, but it has been sheared off due to the impact.


The left side of this step shows the bent metal due to impact