Incident Summary #II-1173964-2021 (#21532) (FINAL)

SUPPORTING INFORMATION	Incident Date		December 5, 2020
	Location		Vancouver, BC
	Regulated industry sector		Elevating devices - Escalator or moving walkway
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	Four broken escalator steps
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		The escalator steps 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		An escalator's 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, which guide their way up or down at a set motor speed via electronic panel. An escalator's steps have four wheels attached to the underside, which are constructed to flatten out before arriving at the top and bottom landings: the two top wheels on either side of the steps each connect to the chains that loop around the gears, and two bottom 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 designed to keep the steps aligned with each other, for rider stability and for the step surface to mesh with the landing plates (comb plates), preventing passengers from being pinched between the steps and the comb plates. The tolerance of the space between the steps and the stationary landing plates of the device are critical to proper operation.
	Failure scenario(s)		A loose nut was found in the interior of the escalator, which may have raised the escalator step above the comb plate. This resulted in an escalator step pileup.
	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 service personnel on-site

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	• Upon arrival on site, the escalator was partially disassembled by removing the damaged steps and opening the access floor plates • Damaged escalator step observed (Image 1) • During observation of the damage, a nut was discovered (Image 1 & 2) • During observation, damage on the leading step roller was found (Image 3) • The point of contact between nut and roller coincided with the location of the step being lifted, and the resulting pileup • Upon opening the unit, it was found that all other components of the escalator were within manufacturer's specifications, and that the only abnormality was the nut • All safety devices functioned within manufacturer's specifications
Causes and contributing factors	It is probable that a loose nut caused the escalator step to be lifted. It is probable that the raised step was lifted high enough to cause the step to come in contact with the comb plate, causing a pileup.

Image 1 - Location of nut

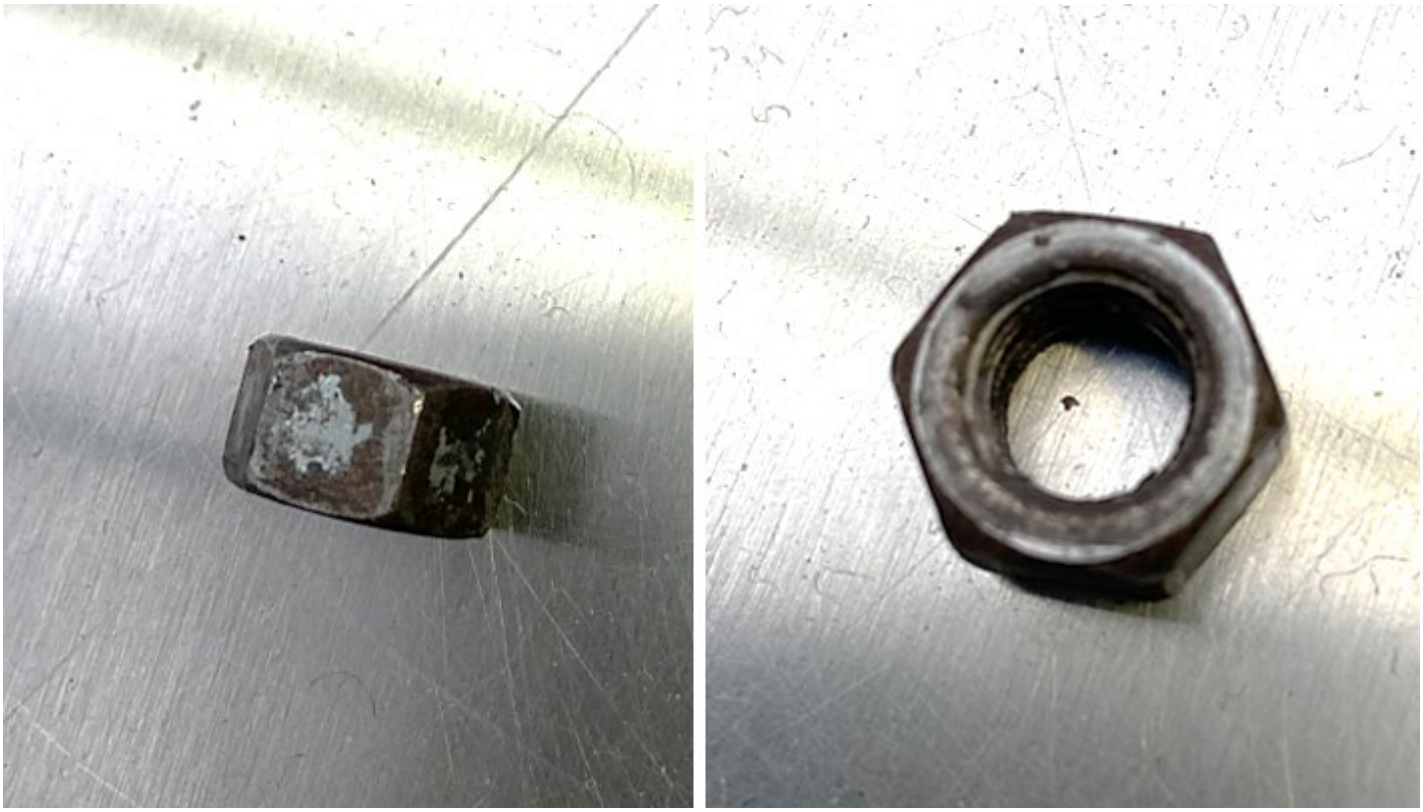

Image 2 - The nut

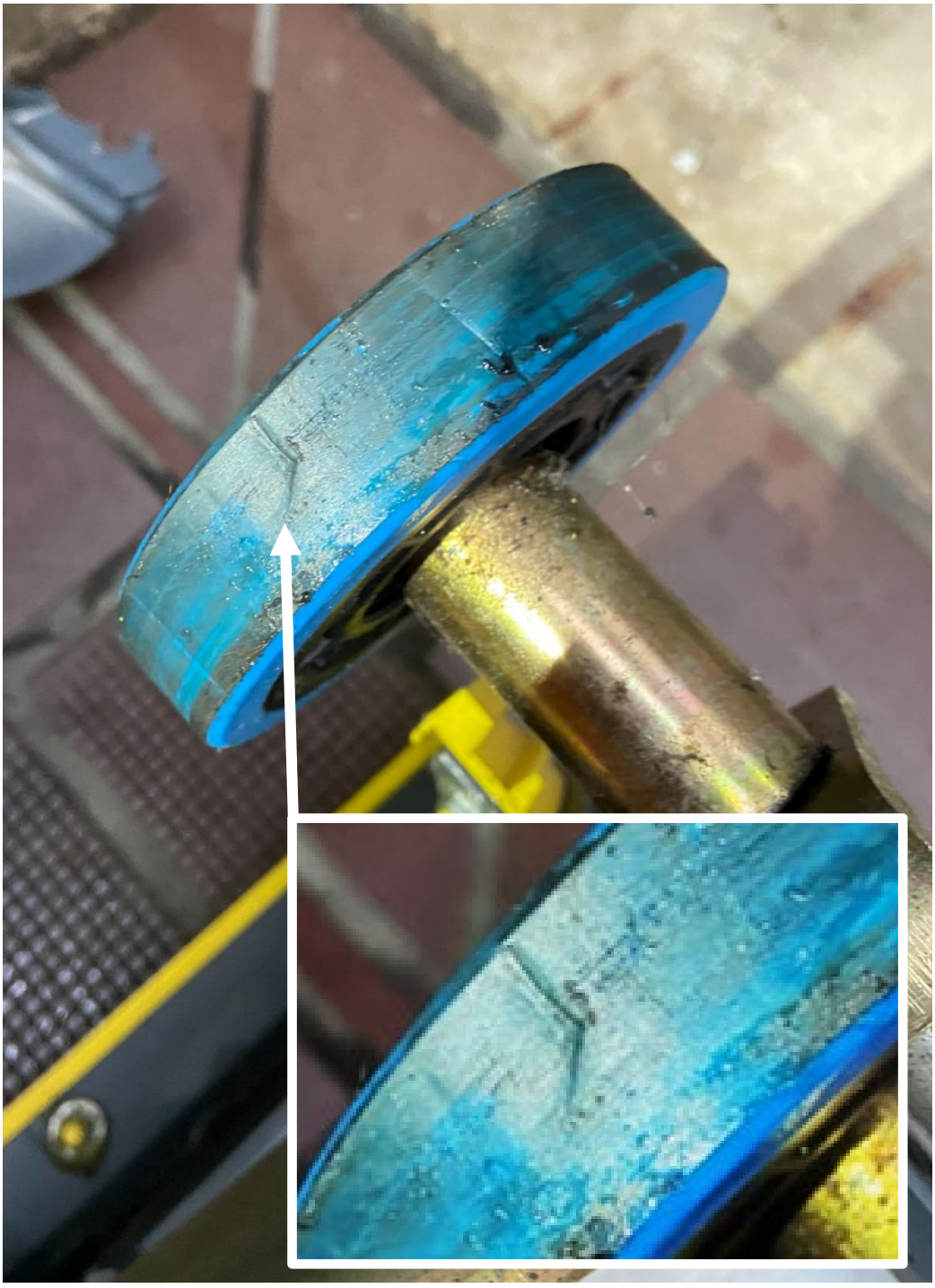

Image 3 - Damage observed on step roller