

## Incident Summary #II-1660419-2024 (#43399) (FINAL)

SUPPORTING INFORMATION	Incident Date	January 14, 2024	
	Location	Interior	
	Regulated industry sector	Passenger ropeways - Above surface ropeway	
	Impact Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Damage	Damage description	Components suspending ski lift chairs such as the haul-rope and sheave received abrasions. Deropement occurred.
		Damage rating	Moderate
	Incident rating	Moderate	
Incident overview	Haul rope deropement at unload station guide sheave, uphill (passenger) side.		
INVESTIGATION CONCLUSIONS	Site, system and components	<p>The passenger ropeway is an above surface double chairlift.</p> <p>The carriers (chairs) are suspended from a haul rope, which transports ski and snowboard passengers uphill. The passengers unload carriers at the top, unload station, by sliding away from their chair at a specific point on an inclined snow ramp.</p> <p>The unload (top) station of the ropeway consists of an attendant, safety system controls, passenger unload ramp, return sheave (bullwheel) and guide sheaves.</p> <p>The guide sheaves are a two-wheel sheave assembly, used to prevent misalignment of a haul rope entering and leaving the bullwheel. A mechanism is mounted on the guide sheave center axle to retain the haul rope on the outside if the haul rope leaves its normal running position. This is called a rope catcher equipped with a safety monitoring switch.</p> <p>Another safety switch is mounted at a sheave axle as the guide sheave assembly is expected to pivot in the absence of the haul rope as the two sheaves are weighted differently. The bullwheel is a large diameter sheave that redirects the haul rope 180 degrees, from uphill to downhill travel.</p> <p>A guide ring on the bullwheel maintains the steadiness of the carriers as they travel around the bullwheel. The carrier consists of a grip attached to the haul rope, a chair, and a hanger arm connecting the grip and chair. On top of the hanger arm is a bumper that contacts the bullwheel guide ring.</p>	
	Failure scenario(s)	A passenger mis-unload of the carrier at the unload station resulted in carrier side swing, which led to the haul rope leaving its normal running position on the uphill side guide sheaves and deropement.	

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### Facts and evidence

#### Chairlift:

- Installed in 1978.
- 84 total double carriers.
- Main drive controls and safety system annunciation upgraded in 2022.
- Maximum ropeway speed of 2.0 m/s.
- Guide sheaves assemblies positioned on the uphill and downhill sides of the unload station bullwheel.
- Operating contractor identified the load distribution on the uphill station guide sheaves is very minimal, about 30 lbs. Manufacturer ideally likes to have about 500 lbs.

#### Unload Attendant Statement:

- Passenger fell on unload ramp, while attempting to unload.
- Haul rope had de-roped at the uphill unload station guide sheave.
- Guide Sheave safety monitoring device stopped ropeway.
- Unloading passenger not injured.
- Temperature extremely cold, -28 C.
- Ski Patrol began manual rope evacuation initially.

#### Maintenance Personnel Statement:

- Responded within 5 minutes to incident.
- Requested Ski Patrol start manual rope evacuation immediately.
- Determined deropement occurred to a passenger failing to unload.
- The snow unload ramp was poorly maintained.
- Once the haul rope was repositioned and safety switches were reset, began ropeway operation, 45 minutes later, to unloading the remaining passengers.
- All passengers unloaded within 1-hour.

#### Historical (similar) Incidents of Ropeway:

- The last 5 years, ropeway has de-roped at the same location 7 times during operation, alongside passengers falling on unload ramp.
- Two of the deropements did not automatically stop ropeway – safety monitoring switches not activated. Top station attendant stopped ropeway.
- Occasionally, passengers were injured (minor) while mis-unloading.
- Incident reporting data not as comprehensive prior to 2018.
- Personnel indicated that the second monitoring switch on the guide sheave was requested to be added 20-plus years ago.
- Spring 2019 – Owner/operator directed to review/discuss deropements with manufacturer.
- January 2022 – Owner/operator directed to review/discuss deropements with manufacturer and/or Professional Engineer.

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	<p><b>Manufacturer and Operation Contractor Findings:</b></p> <ul style="list-style-type: none"> <li>• Discovered the hanger head bumper could catch the carrier guide ring and force haul rope from guide sheaves if carrier swung sideways.</li> <li>• The carrier guide ring on the bullwheel required modification to prevent hanger head bumpers from catching and prying haul rope from guide sheaves.</li> <li>• Similar vintage ropeways have measures to prevent the hanger head bumper from getting caught by a swinging carrier on the bullwheel guide ring.</li> </ul> <p><b>Industry Standards:</b></p> <ul style="list-style-type: none"> <li>• Haul rope deropement is not common or routinely expected/tolerated during passenger unloading of carriers.</li> </ul>
<p>Causes and contributing factors</p>	<p>The cause of the deropement incident was the carrier bumper getting caught in the bullwheel when unloading passengers caused the carrier to swing from side to side. Other passenger ropeways of a similar vintage have a mechanism in place to prevent the bumpers from getting caught in the bullwheel, whereas this chairlift did not.</p> <p>This was not an isolated incident and had occurred several times over the past 6 years.</p> <p>Contributing factors to the incident included:</p> <ol style="list-style-type: none"> <li>1. A poorly maintained passenger unload ramp increased falls/collisions, and therefore carrier swinging, during unloading, which likely increased the frequency of deropements.</li> <li>2. Repeated delays by the operator in working with the manufacturer and/or an engineer to improve the design following previous deropements allowed continued operation in a state where deropements were likely to occur.</li> </ol>

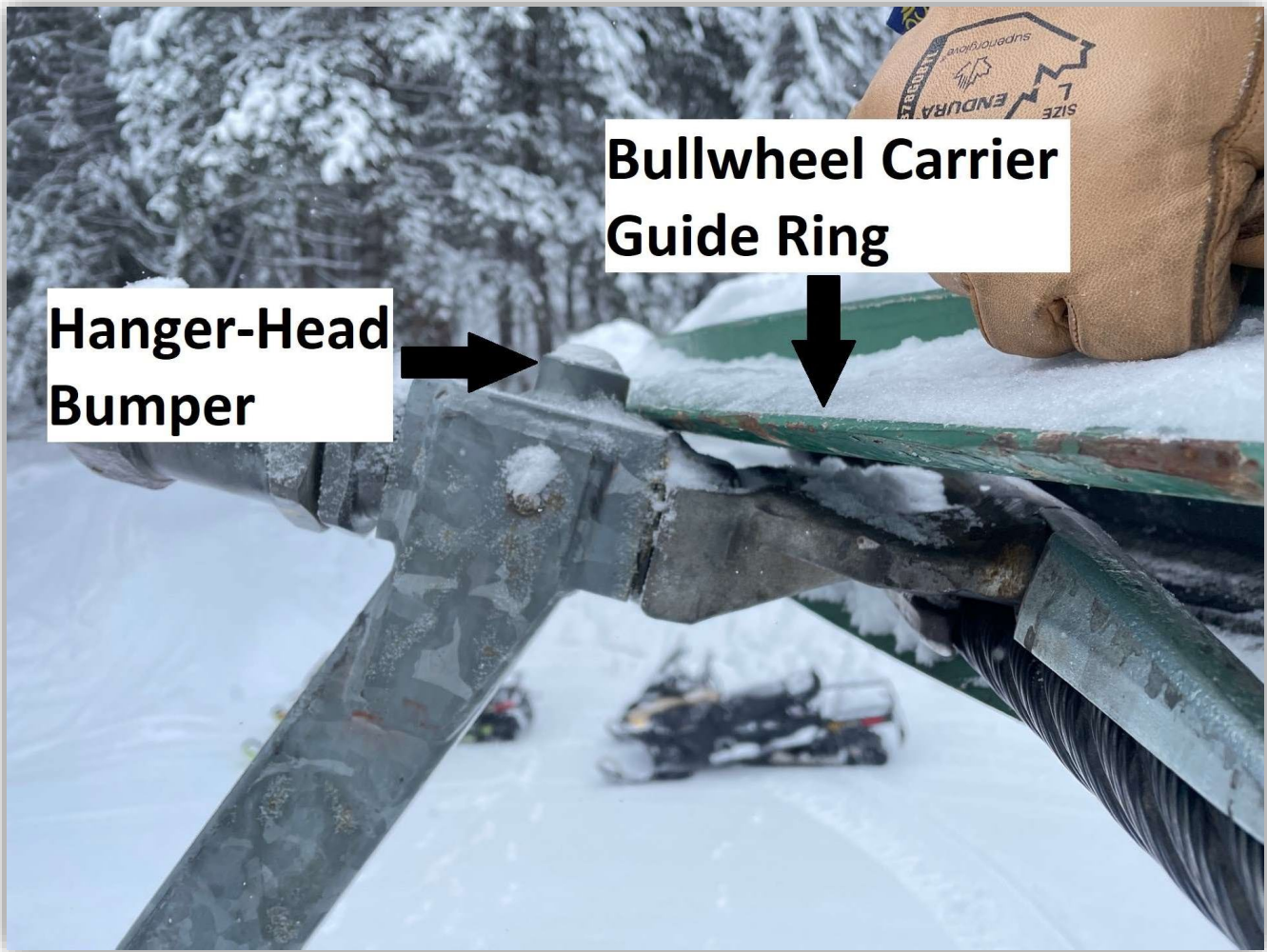


Image 1 – Original Bullwheel Guide Ring configuration.



Image 2 – Modified Bullwheel Carrier Guide Ring.