Incident Summary #II-795000-2019 (#10451) (FINAL)

SUPPORTING INFORMATION	Incident Date		November 7, 2018
	Location		Whistler
	Regulated industry sector		Passenger ropeways - Above surface ropeway
	Impact – Injury	Qty injuries	1
		Injury description	The worker noticed discomfort grow over the next 48 hours and went to first aid. The worker suffered a rotator cuff injury.
		Injury rating	Moderate
	Impact – Damage	Damage description	NA
		Damage rating	None
	Incident rating		Moderate
	Incident overview		Employee was installing a communication line and was in the process of tensioning the line, when the cable grip slipped along the line. This caused the cable tension to release. The tower dramatically swayed several feet and threw the worker off balance. The worker caught himself by grabbing the rail with his left arm during the movement of the tower. The worker felt slightly sore in the left shoulder at the time of incident and reported it to his supervisor.
INVESTIGATION CONCLUSIONS	Site, system and components		Incident occurred on the top of a ropeway tower of an under construction detachable grip gondola. • Based on the profile drawings, the communication cable was being installed within a 117 m span with a 32.2 m rise. The lower tower had a height of 15.5 m (measured from the top of the foundation). • The communication cable runs the entire length of the ropeway lift line over multiple tower locations. The communication cable is utilized in transmitting control signals and data. • Cable gripping device is described as: ➢ Chicago Grip for PVC Covered Conductors 0.5-Inch, (see photo) 1659-30, manufactured by Klein Tools. ➢ Specified for copper cable, specified for cable diameters of 7.87-12.70 mm, SWL 2041 kg force. • Communication cable description: ➢ Telecom Cable (see figure 1) -ALFOUR-83, 50PR X 19AWG 3/8” PE-38 -Figure 8 configuration, height 46 mm, width 30.4 mm, -Jacketed messenger 3/8”, steel cable. Jacket material is LLDPE (Linear Low-Density Polyethylene). -Diameter of jacketed messenger 12.5 mm. -1518 kg per 1000 m.

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Failure scenario(s)	A worker was in the process of tensioning a messenger line when the cable grip slipped on the cable that was being tensioned. The resulting dynamics of the cable grip slipping (tower swaying) caused the worker to lose their balance.
Facts and evidence	• The injured worker (electrician) was employed by the ropeway operator (employee of the resort) not the installer/manufacturer. • Based on the profile drawings, the communication cable was being installed within a 117 m span with a 32.2 m rise. The lower tower had a height of 15.5 m (measured from the top of the foundation). • Based on reports provided by the operating contractor and in discussion with the injured worker: ➢ The worker was tensioning the communication cable from the top of the downhill tower (pulling cable downhill from the upper tower). ➢ Cable was being tensioned with the use of 3 ton cumalong (lever chain hoist) and a cable gripping device (Klein, Chicago Grip 1659-30). • The employer (operating contractor/resort owner) did conduct an incident review in which the following factors where identified: ➢ Institutional Practices. -Work task procedures are passed along from the person with the most experience to the worker leaning the task. -The new worker will mentor with the experienced worker (injured worker was new to this type of work). -Review of work procedures and hazards was not completed in the valley or at the job site. (valley is the main shop location) ➢ Conflicting values. -Trying to help out and keep project on time. (it was known that the install work was falling behind schedule) ➢ Policies and Procedures. -Current procedure for selecting cable grab was incomplete. -Procedures reference to manufactures recommendations for size and type of grip to use. -Worker was not aware of potential for grip to slip. -Worker was not aware of different grip options. ➢ Tools, Knowledge and Skills. -Worker was not aware that twists in cable could lead to grip slipping off during tensioning phase. (implies that the cable was twisting during the tensioning process) ➢ Tactical Choices.

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-Worker not sure of which cable grip to use. After the slip the worker changed to a different style of cable grip and added and another as back up in case of another slip.

- Environment.

-Worker was on a high tower. This contributed to extra sway when the tension came off the cable
-The length of the com line was long which added twist in the cable.

- The review also included a statement indicating that the root cause factor was.

  Procedures were not complete in how to connect a Klein grip (cable grip) on communication cable as per manufacturer's recommendations. A secondary factor was that the worker was new to the task and was not aware that the extra length of com line would have extra twists which could add torque to the cable and cause the grip to slip.

- Cable gripping device is described as:

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  - Specified for copper cable, specified for cable diameters of 7.87-12.70 mm, SWL 2041 kg force.

- Communication cable description:

  - Telecom Cable

-ALFOUR-83, 50PR X 19AWG 3/8" PE-38
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-1518 kg per 1000 m.

- Ropeway manufacturer's/ Installer's representative indicated that:
  - The communication cables are normally tensioned to a point in which the sag is approximately equivalent to half the height of the tower head lifting frames (based on the manufacturer' s drawings, the lifting frames are approximately 1.7 m in height this would result in an approximate sag of .85 m once fully tensioned).
  - Normally a 1.5 ton Cumalong (lever chain hoist) is utilized in tensioning the communication line.

- Technical Safety BC conducted a review of tension values associated with the related span. Highlighted values indicated:

  - At approximately .84 m sag the estimated tension at the lower tower would be approximately be 32202.7 N (3284 kg force).
  - At approximately 2 m sag the estimated tension at the lower tower would be approximately be 13688.04 N (1395.8 kg force).
  - The review also makes a recommendation that sag should not be used as a method of determining cable tension and that rather a tension meter should be utilized in determining tension forces (the author of the review points out

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	that visually referencing sag is not deemed a reliable indicator of tension, as small changes in sag can indicate significant change in tension). • In determining the work norms related to the install of overhead electrical lines, a discussion was had with an electrical utility service provider worker (line crew supervisor) working in the province of BC: ➢ Electrical utility provider service work includes the install and tensioning of steel, aluminium and poly coated conductor lines. ➢ Transmission lines (line that transmit power over long distances with low losses) are tensioned by referencing a dynamometer (tension meter). ➢ Distribution lines (the final stage of the lines, transmit power to the consumer) to are tensioned by visually referencing line sag. ➢ In regards to the use of cable grips: -Cable twist will increase the risk of the cable grip releasing. It is utility company policy to use a swivel device to reduce the twisting effect on the cable. -It is utility company policy that, once seated onto the cable, the cable grip is to have 1/2" of travel remaining (measured on the slider of the grip) to provide a safety factor to account for the reduction of the cable diameter as the cable is tensioned. -In the discussion, it was emphasized, that it is important to ensure that the cable grip is fully seated onto the cable and that a not fully seated grip will cause the grip to slip. • Multiple communications and attempts at communicating (phone and email) with the grip manufacturer were made (from January 31, 2019 to the last email sent to the manufacturer March 5, 2020). The manufacturer, although provided with the cable specifications and grip type, provided no opinion or information as to the suitability of the cable grip as it relates to the job in which the incident occurred.
Causes and contributing factors	• It is likely that the cable grip slipped as the communication line was being tensioned and the resulting dynamic of the sudden release of tension caused the worker to lose their balance. In the effort of the worker attempting to catch themselves they injured their shoulder. • Multiple reasons can be speculated as to what may have caused the cable grip to slip: ➢ It cannot be confirmed that the cable grip was fully seated on the cable when the tension was applied. Industry common knowledge indicates that a grip not correctly seated on to the cable is likely prone to slipping. ➢ The employer's incident review indicates that the cable was twisting as tension was being applied. There is no evidence that the worker was using a swivel device when tensioning the cable. Industry common knowledge indicates that a twisting cable may cause the cable grip to slip. ➢ A 3 ton Cumalong was being utilized as the tensioning device. The cable grip has a rated SWL of 2041 kg force. The Cumalong rated force significantly exceeded that of the cable grip. This making it possible for the cable grip rated SWL to be likely easily exceeded. ➢ It cannot be confirmed as to what the approximate cable sag was when the grip slipped . With that said, the ropeway manufactures common practice

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would have been to tension the cable to a sag of .84 m. This would have resulted in a tension force of approximately 3284 kg. This value significantly exceeds the 2041 SWL rating of the cable grip (note: this also exceeds the SWL rating of the 3 ton Cumalong).

- The cable grip manufacturer specifications:

  -Specification for the cable grip indicate the cable type as copper. The cable that was being pulled was a jacketed steel messenger. It is therefore not certain that this cable grip was suitable for a steel cable.

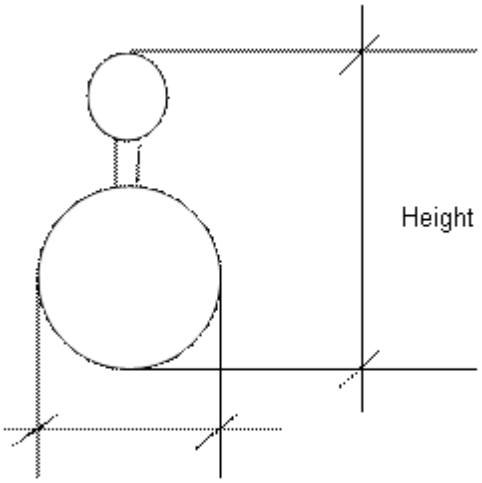
  -The manufacturer's specifications indicate cable grip is intended for use on PVC covered conductors. The cable that was being tensioned is LLDPE covered conductor/messenger. It is therefore not certain that this cable grip was suitable for the cable.

  -The cable specification indicated that the jacketed messenger has a diameter of 12.5 mm. The working range of the cable grip is specified as 7.87 mm - 12.70 mm. It is likely that the cable diameter was within the working range to the cable grip (the cable grip was correctly sized for the cable diameter).

- Based on the employer's incident review:
  - Institutional practices are that typically a new worker will mentor with the experienced worker. Policies and procedures related to the selection of the appropriate equipment were deemed not fully developed. It is possible that the worker was not provided complete information regarding the selection and use of the appropriate equipment.
  - The worker was possibly not aware of the hazards associated with the job, specifically; the worker was not aware that the grip has a potential to slip and that the cable twist could contribute to the likely hood of the cable grip slipping.
  - Conflicting values, related to work falling behind schedule, may have contributed to work being performed without full knowledge of the required equipment, procedures and the related risks.

Figure 1, Cross Section of Communication Cable

The smaller upper diameter circle represents the messenger cable 12.5 mm



Cable Grip