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Location map for various sites

Job name: Condition report into foundations of various tows at Cairngorm Mountain.
 Job number: 16011
 Client: Cairngorm Mountain Ltd
 Engineer: Mr Angus Armstrong
 Date: December 2016

Revision	Date	Comments
A	22/12/16	Issue

1 Introduction:

- 1.1 At the request of Cairngorm Mountain Ltd, the Client, the writer carried out a visual inspection of the concrete support structures to all in use ski tow bases at the Cairngorm Mountain resort. The writers brief was as follows: "To carry out a non-disruptive visual inspection of those areas that are fully exposed and to report findings along with any recommendations for maintenance or repair". This report follows a similar report issued in 2015.
- 1.2 This report may not be relied upon by a third party for any purpose without the written consent of this practice. Furthermore, this report has been prepared and issued specifically for the benefit of the addressee and no responsibility will be extended to any third party for the whole or any part of its contents.
- 1.3 The structural inspection was carried out by means of visual inspection and measurements, generally from ground level. No disruptive investigations, geotechnical investigations or materials testing were carried out, nor were any calculations carried out.
- 1.4 The purpose of this report was to comment on the integrity of the concrete components of those parts inspected, within the limitations of the brief and inspection techniques.
- 1.5 This report does not address any part above the various concrete bases.
- 1.6 Items requiring attention in the short term are **highlighted in red**.

2 Executive summary:

- 2.1 In broad terms the tow bases are acceptable.
- 2.2 There are a number of maintenance issues and items that should be monitored.
- 2.3 Many items recommended in the previous year's report have not been implemented.

3 Scope and references:

- 3.1 This report refers to the concrete bases and holding down bolts at the base of all stations and towers on the following systems:
 - 3.1.1 Car Park T-bar
 - 3.1.2 Fiacaill Ridge Poma
 - 3.1.3 Coire Cass T-bar
 - 3.1.4 M1 Poma
 - 3.1.5 Coire na Ciste T-bar
 - 3.1.6 Polar Express Poma
 - 3.1.7 Ptarmigan T-bar
 - 3.1.8 West Wall Poma
 - 3.1.9 Day Lodge Poma
- 3.2 No other infrastructure on the mountain was inspected as part of this report. Refer to separate 2016 reports into the redundant Ciste chairlifts and the Funicular railway
- 3.3 The referencing system is as follows:
 - 3.3.1 Upper refers to the part highest up the mountain
 - 3.3.2 Lower refers to the part lowest down the mountain
 - 3.3.3 Left refers to the left hand side as viewed looking up the mountain
 - 3.3.4 Right refers to the right hand side as viewed looking up the mountain

4 Tow bases:

- 4.1 The writer inspected the items listed in the schedule at item 3.1 of this report. The inspection was limited to the concrete base and the general condition of the holding down bolts.
- 4.2 A revised bolt condition system has been derived for this year's report. It is thought that this better reflects the bolts in question. The grading is similar to the previous system and a comparison table is presented below:

New condition reference number	New description of condition	Old equivalent condition grading number	Old description of condition
1	Mostly still galvanized coating	0	As new.
2	Surface rusting only	1	Bolts in used condition but no stud corrosion
3	Rust starting to compromise ability to remove nut	2	Nut and stud showing significant corrosion. Nuts probably can be removed but are in danger of seizing. No significant weakening of the stud yet
4	Significant corrosion. Unlikely to be able to remove nut. Not thought to be any significant loss of strength	3	Nut and stud showing serious corrosion. Nuts probably seized and likely to shear during removal. Some weakening of stud
5	As above but significant loss of strength	4	Nut and stud corroded and seized. A loss of section and consequent weakening
6	At risk of failure	5	Stud necked to unusable condition. Unreliable connection

4.3 General:

4.3.1 Many of the pylon bases were covered or partially covered in soils and rocks. **These should be uncovered and the surrounding ground arranged to be say 100mm below the concrete plinth level** to allow free drainage and prevent a continual damp environment around the bolts.

4.3.2 Most pylon base plates were not grouted up. In some cases, the base plates were seen to be deformed – this could be due to ice buildup. **It is recommended that all base plates be grouted up.**

4.4 2 - Car Park Tee:

4.4.1 Bottom station – extensive surface degradation of concrete. This is not thought to be structurally significant at this stage

4.4.2 Top station – Painted frame, paint system has failed and surface corrosion is extensive, **the corrosion system should be renewed if this steelwork is expected to last for much longer.** There are buried mild steel parts, **these should be exposed and inspected.**

4.4.3 Bolts generally grade 2 / 3, however pylon 1 bolts are grade 3 / 4.

4.4.4 Pylon 4 base is at risk of being undermined. **Care should be exercised when operating machinery in this area to ensure this situation does not become any worse.**

4.5 3 - Fiacaill Ridge:

4.5.1 Bottom station – no comment.

- 4.5.2 Top station – There is a suspended counter balance block of concrete. The steel U-bar cast in to make the connection is rusting and the rod is “necking”. **It is recommended that this suspension connection U-bar is replaced.**
- 4.5.3 Bolts generally grade 2 / 3.
- 4.5.4 Pylon 2 lower corner is fractures. It is regarded as stable at this time.
- 4.5.5 General note. The holding down bolt detail here and elsewhere is poorly detailed as it holds water which is a corrosion risk.

4.6 4 - Shieling Platter Poma (Sun Kid):

- 4.6.1 Bottom station, top surface showing dry shrinkage cracking on top surface. **It is recommended that these cracks be sealed.**
- 4.6.2 Top station - OK.
- 4.6.3 Bolts generally grade 1.

4.7 5 - Corrie Cas Tee:

- 4.7.1 Bottom station concrete rough but appears to be adequate.
- 4.7.2 The access platforms and walkways at an elevated level have been replaced since the 2015 report.
- 4.7.3 Top station this was buried in snow at the time of the inspection. This station was seen to be generally acceptable during the 2015 inspection.
- 4.7.4 Some pylon bases were covered in snow at the time of the inspection.
- 4.7.5 Bolts generally grade 1 / 2.

4.8 6 - M1 Poma:

- 4.8.1 Bottom and top station OK.
- 4.8.2 Bolts generally grade 2.
- 4.8.3 Pylon 2, SW corner bolt only partially supported, **grout up.**
- 4.8.4 Pylon 9 is in poor condition and crumbling. Regarded as stable at this time.

4.9 8 - Corrie na Ciste Tee:

- 4.9.1 Bottom station:
- On one post one nut and washer were seen to be too small of hole. **Replace with appropriate nut and washer.**
 - On the main base the last steel beam was poorly bolted down (only half threaded nut and missing bolt) and the rest was buried. **Expose all steelwork, check bolts and check for corrosion.**
 - The lower part most bolts buried. **Expose bolts and check for corrosion.**
 - The timber platform was seen to be broken - possibly due to vehicle access – **this needs to be replaced before the coming season.** This was discussed with CML staff at the time and assurances that this would be done were received.
- 4.9.2 Top station anchorages are buried to varying extents. **All steelwork should be exposed and inspected for corrosion.** Ground levels should be maintained to give free drainage and air circulation. Paint system is failing – **clean and re paint.**
- 4.9.3 Bolts generally grade 2 / 3. Pylon 6 grade 3.
- 4.9.4 Base 3 is in a poor condition. It is regarded as stable at this time.

4.10 9 - Polar express:

- 4.10.1 Bottom station tie back arrangement induces some bending stress in the steel. This is unnecessary but it is not showing any signs of distress. No action recommended at this time.

4.10.2 Top station tie back arrangement induces some bending stress in the steel. This is unnecessary but it is not showing any signs of distress. No action recommended at this time.

4.10.3 Bolts generally grade 2 / 3.

4.11 10 - Ptarmigan Tee:

4.11.1 Bottom station concrete surfaces spalling but serviceable. Bolts grade 3.

4.11.2 Top station tie back arrangement induces some bending stress in the steel. This is unnecessary but it is not showing any signs of distress. No action recommended at this time.

4.11.3 Pylon 1, bolts grade 4 plus failed washer. **Monitor.**

4.11.4 Pylon 4 is close to being undermined. **Monitor.**

4.11.5 Pylon 5 uses wedge shaped washers, this is likely to stress the bolts. The original base appears to have been encased in 300mm of new concrete.

4.12 11 - West wall Poma:

4.12.1 Bottom station concrete OK.

4.12.2 The lower platform should be inspected and assessed for its suitability as a public access platform.

4.12.3 Top station new in 2016.

4.12.4 Bolts generally grade 2.

4.12.5 Pylon base 4 poor in lower half, possibly fractured. **Monitor.**

4.12.6 Pylon base 6 lower left concrete fractured. **Monitor.**

4.13 12 – Day Lodge poma:

4.13.1 Bottom and top station OK.

4.13.2 Bolts generally 1 / 2.