

## The Strengthening Works on the funicular railway.

### Description

This post has been informed by comments made on my series of six posts on "Will the repairs to the funicular work" and discussion with people with a far greater knowledge of construction and civil engineering than me.



When I commented on this picture in my second post on the funicular court cases ([see here](#)) I had not realised that there are two different types of brackets holding the beams together. The second type can just be seen at the very edge of the left hand side, but, is better seen in this picture of pier 60 which appeared on social media last Saturday:-



The outer and inner brackets

The four outer brackets which are clamping the insitu blocks to the  $\hat{??}l\hat{?}$  beams are more complex than the two inner brackets around the insitu block. This indicates that there is a major problem at those joints, something that I have suggested and commented on before ([see here](#)) and ([here](#)), including the following screenshot which shows the  $\hat{??}l\hat{?}$  beams and in-situ joints:-



**Plate 24 - General view of surface markings to Pier 53 Right Beam, left support up.**

Green =  $\hat{??}l\hat{?}$  beam; Red = insitu block; Black = cross head.

Apart from showing us exactly what the brackets look like, four other things immediately stand out from the photo with the brackets.

(1) The maintenance walkway.

This was missing from much of the funicular (see photo from the Funimag below) but was in place at others (eg Pier 53 in photo above). Its removal was reported to the Health and Safety Executive and it appears thanks to their intervention a walkway has now been put in place to ensure the safety of CM(S)L inspection/ maintenance crew working on the structure.



Photo courtesy of Michel Azema author of the magazine FUNIMAG.

The absence of large sections of the walkway was a point made several times by ADAC Structures in previous reports into the funicular. It should make the annual inspection by ADAC Structures easier, more comprehensive and therefore more accurate.



The new walkway and lots of metal brackets. Incidentally, note the state of the ground below! Photo from FB

As far as I can tell this is a completely new walkway, which begs the question if it is, â??What happened to the previous steel walkway sections of which were left lying on the ground for yearsâ?? Who got the scrap money for that? Another charity?!

(2) The protruding steel-work.

In my opinion there is now a new safety risk for inspectors and people working by the funicular which also shows poor work practices and that is the length of studding/ threaded bar, holding the brackets together, protruding from (a) the sides and (b) up into the air.

(a) The excess steel-work protruding outwards from the brackets will hinder staff clearing snow away from the track and could cause injury, and,

(b) The extra lengths especially in the middle of the walkway, are a tripping hazard for staff working on it, from which someone could be seriously injured or even worse!

Why were the excess lengths not removed to make the work more presentable and safer?

Where are the safety markers that should be placed near those brackets? Even a coat of red paint would make them more obvious!

(3) The state of the rails.

This is easier to see from another photo taken from the same social media page showing the right hand track as it leaves the base station:-



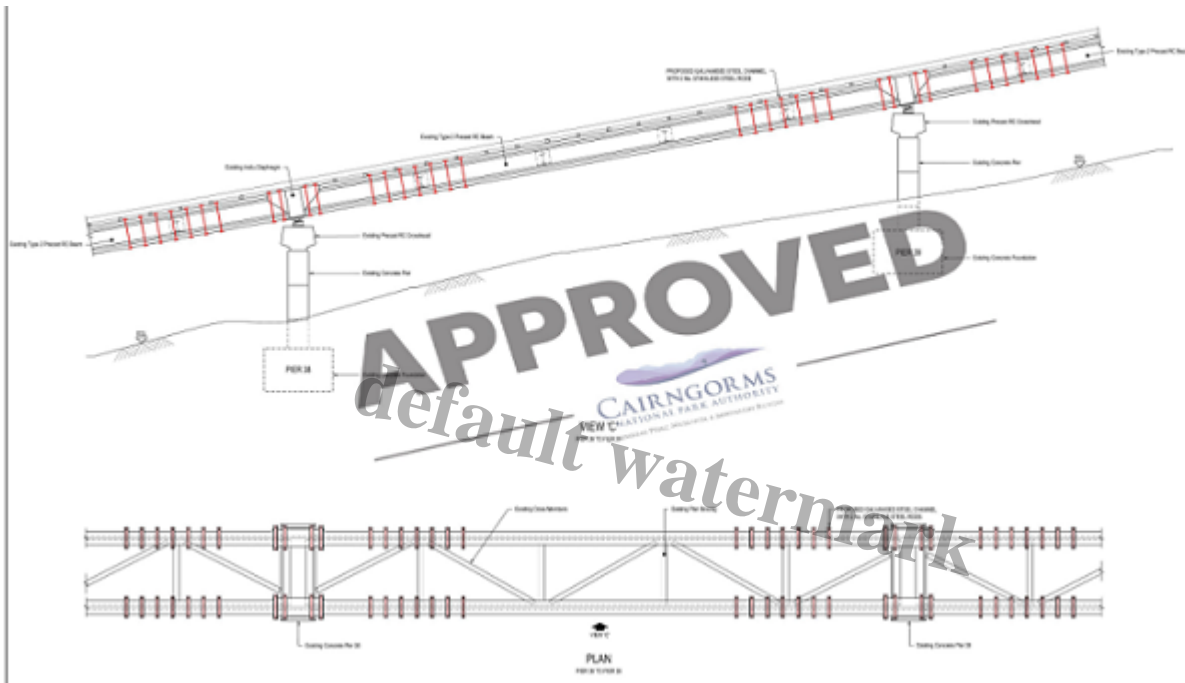
The photo shows that the track did not have a surface grind before rail operations recommenced. The shiny mid- section is where the bogie wheels are touching the centre of the rail with lateral shiny bits where the wheels touch now and again. These are high spots on the rails known in the rail world as 'corrugations' and are a major cause of vibration which damages the concrete structure of the system ([see here](#) for my fuller explanation of the importance of grinding and the impact of vibration).

After **FOUR** years of inactivity and the track rusting a rail grind was one of those jobs that should have been a major part of the repair/ strengthening works and shows how both CM(S)L and HIE have a lackadaisical approach to health and safety. Nothing appears to have changed since the COWI report

in 2018 (page 311) stated:

“Poor workmanship appears to have been consistent throughout the build and subsequent maintenance”

(4) The work is different to what was shown in the planning application



Note that the two brackets on the insitu blocks are not shown! A later addition?

After my post on the court cases (link above) I had a phone conversation with a concrete specialist who had worked on the funicular build, amongst other projects on the hill and had posted this on social media:

areas of all structures on the mountain.during this time I personally walked the hill with a structural engineer who showed me what had to be broken out and replaced This guy missed nothing?? We walked the full length of the railway and i can guarantee he spotted every hairline cracks in the structure and he recommended that the train should be shut down and resin to be pumped into said cracks which would have stopped any water getting into the rebar This is a normal on almost every bridge on the road system/rail system This was completely ignored by Natural retreats and after three years of non maintenance the cracks had opened up and water penetrated to the rebar?and the rest is history???

Resin injection is apparently an industry standard response to cracking in concrete structures

Appendix A to the report issued by ADAC Structures in November 2015 (obtain by FOI but no longer on HIE's website) lists the problems that existed but did not explicitly recommend a shut down until repairs were initiated. Some of those repairs were however classified as **Immediate Repair** or **Repair Priority**.

Location:	Problem:	Repair priority:
Above pier number Left or right side Plinth numbered from lower end		
3/L4	Vertical crack on inner face	Watching brief
3/R4	Vertical crack on inner face	Watching brief
4/L19	Vertical crack on inner face	Watching brief
<b>5/L20</b>	<b>Total disintegration</b>	<b>Immediate repair</b>

<b>In the tunnel, counting from the top down:</b>		
261/L	Chipped corner	Note
268/R	Grout block split	Repair
281/L	Grout block split	Repair
284/R	Grout block split	Repair
290/L	Grout block split	Repair
<b>291/R</b>	<b>Disintegrated</b>	<b>Repair priority</b>
<b>293/L</b>	<b>Disintegrated</b>	<b>Repair priority</b>

Are these the faults that should have triggered an immediate shutdown? Was the structural engineer told not to mention a shutdown in the report or is it implicit in "immediate repair"?

Several FOI requests have now been submitted about the repairs/ strengthening and for paperwork relating to the re-opening of the funicular which, when made available, will no doubt raise even more questions including the sense of repairing the funicular rather than demolishing it.

Watch this space.

### Category

1. Cairngorms

### Tags

1. Cairn Gorm
2. CMSL
3. funicular
4. HIE
5. planning

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