

# The S&C's wonderful star attraction

The Ribbleshead Viaduct is special, for all sorts of reasons. By train you can experience it, but in the very nature of things it is below you - largely unseen. If you want to see it, you need to be out there in the Yorkshire Dales - ideally on foot.

Three roads lead to Ribbleshead - those from Ingleton, Settle and Hawes. Whichever one you take there comes a point when you round a bend or come over a brow... and there it is. That first view of the Ribbleshead Viaduct in its massive expanse of landscape and sky just takes your breath away, no matter how often you have seen it before. This man-made structure in the middle of nowhere commands your full attention.

Like the very railway of which it is so spectacular a part (the Settle-Carlisle Line),

The first in our series of in-depth features on *RAIL's* Seven Wonders of the Railway focuses on the Ribbleshead Viaduct. MARK RAND tells the story of this imposing and iconic structure, and explores why it holds such a special place in the hearts and minds of railway enthusiasts

it came close to being knocked down when it was deemed by some to have been 'life-expired'. What an absurdly lazy term to use about an inanimate object. It's an experts' term, sadly still sometimes used in the railway industry to describe something that is redundant, no longer needed, or just too easy to replace rather than repair.

Indeed, replacement was on the agenda for

a while. Perhaps good for the long-term future of the line, but what a crying shame that would have been both for the viaduct and for the Yorkshire Dales, of which the viaduct is such an iconic feature.

Unlike most bridges or viaducts, Ribbleshead does not cross a river, stream or watercourse of any sort, although who knows in detail what may be far below ground? This limestone area

is criss-crossed by potholes and underground water courses, as well as sink-holes, as a glance at any aerial view readily shows.

It would therefore have been possible (and simplest) to build an embankment, although it would have needed to be windscaped if trains were not to be at risk of being blown over. That was among the serious options, but what an affront to the senses that would have been. A box girder bridge was another idea.

Had a replacement been built, the idea was for the worn-out viaduct to be left standing, although not without ongoing costs. That could have been a good idea - it would have given passengers a view of the 'old' viaduct. My ears still ring from the cries of an Australian visitor complaining that he had come halfway round this expletive world to see this expletive viaduct, and now he was expletive here he couldn't expletive see it!

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It is perhaps idle to speculate how well the idea of a replacement would have been received, either by National Park planners or the public as a whole. Time heals wounds, and I am not aware of adverse comments about the viaduct when first built.

Of course, the 1870s were a different age. Perhaps few would have cared what the structure looked like when being planned or built. Sheep would have been the main onlookers, and the Environment (capital E) was less to the fore, if at all.

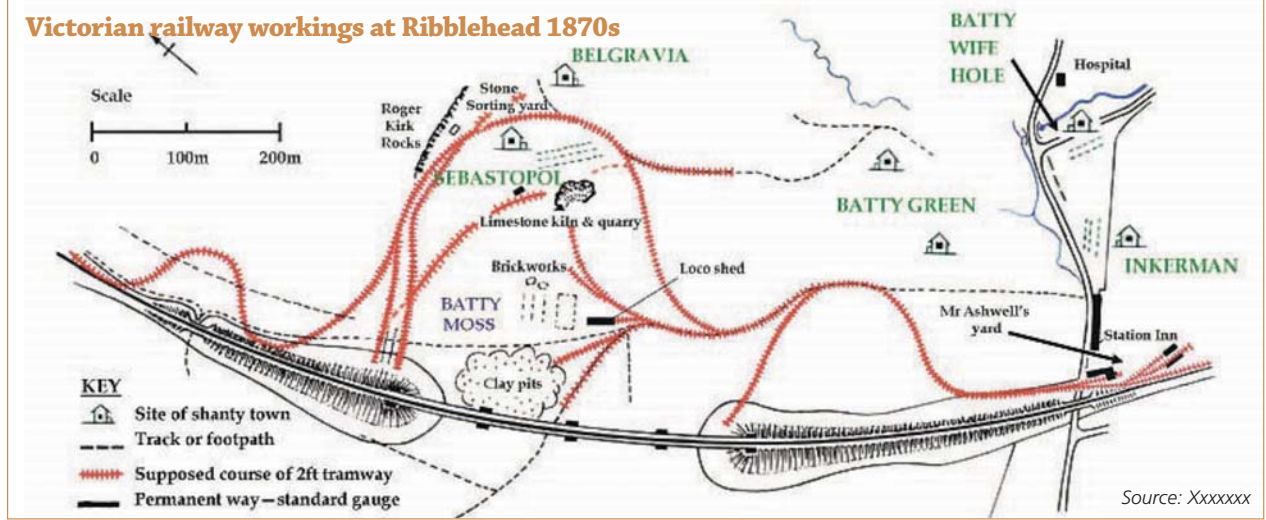
Still, I have often wondered: had the Settle-Carlisle Line (S&C) not existed and somebody proposed it today, would the Ribbleshead Viaduct in its present form be regarded as an environmental and visual outrage? Maybe so.

Yet as one views it today, I (for one) am forced to conclude that mankind can

60163 *Tornado* roars over Ribbleshead Viaduct on February 15 2017, during the 'Plandamp' event which featured scheduled steam-hauled passenger services returning to the network for the first time since 1968. BILL LOWIS.







➔ sometimes intervene boldly in Nature's landscape and actually enhance it, add to it and dignify it.

Perhaps nowhere else is this more apparent than at Ribbleshead, simply because there is almost nothing else around to compete with it. Viewed from afar, the massiveness of the Three Peaks - Whernside to the north, Ingleborough to the south west and Pen-y-ghent to the south east, dwarf even the viaduct. Close-up, the viaduct dominates and eclipses the mountains. Its symmetry defies the surrounding rounded randomness. The result is stunning.

Ribbleshead is a photographer's dream. Its remote location means that there is little or no light pollution. Combined with recent advances in photography and imaging, this has resulted in many spectacular new pictures of the viaduct as a whole or of its individual arches set against the stars, especially the Milky Way.

From the comfort of indoors, the best direct views of the viaduct are from the Ribbleshead Stationmaster's House and from the gents'

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toilet window of the Station Inn - quaintly known as the 'loo with a view'. Better still, there are four web cameras along the Settle-Carlisle Line, one of which points at the viaduct to reveal a magnificent ever-changing panorama... with trains (<http://sandctrust.org.uk/>), although that view can sometimes be obscured - Ribbleshead weather can be 'entertaining'.

Nowadays you can also go online and see what is happening at <http://www.mylocalweather.org.uk/ribbleshead/>. The sensors are at Ribbleshead station, to the south of the viaduct and in a less exposed situation. On or under the viaduct, things are altogether bleaker.

From the middle of the viaduct there is line of sight to the west coast at Morecambe Bay. The prevailing westerly winds gather speed along the wide valley between Ingleborough and Whernside, meeting little resistance until they reach the viaduct itself. The massive piers and arches funnel the already strong winds, acting like huge Venturi tubes. Oddly, it can be almost calm on the deck as westerlies whistle over the top, lifted (and sped up) by the parapet walls. The danger areas are therefore beneath the arches and above the parapets. Work on the viaduct must cease in winds exceeding 50mph.

Winds from the north can also be troublesome. The parapet walls that give shelter from the east and west now serve to channel and concentrate the wind. It has been known for track workers to cross the viaduct on hands and knees in severe northerlies, and slow-moving trains going north have been blown to a standstill on the 1-in-100 gradient.

Snow and ice can also make for problems. Massive icicles can (and do) form below the air shafts in nearby Blea Moor tunnel, and drifting

### RIBBLESHEAD VIADUCT

- It was built between 1870 and 1875.
- It is 440 yards long (402m or ¼ of a mile), and is the longest of 20 viaducts on the line.
- It is 104 feet (31.7m) tall at its highest point.
- Foundation depths vary between 10 and 15 feet below current ground level.
- There are 24 arches, 23 intermediate piers and four abutments.
- There is a 1-in-100 gradient on the viaduct, whose north end is 13 feet higher than its south.
- Every sixth pier is a double thickness King Pier, creating four independently stable sections.
- It is bridge number 66 of 363 numbered bridges along the line.
- It is a Grade 2\* Listed building.
- The surrounding navvy camp and prehistoric areas are a Scheduled Ancient Monument.
- Its co-ordinates are 54.210436°N 2.370231°W.
- It has a lateral curve, convex on the west, of radius 0.85 miles (1.37 km).



### The Ribbleshead Viaduct: fact, fiction and folklore

**FACT:** It was originally called Batty Moss viaduct after the broad expanse of ground to the east.

**FACT:** Wind speeds at arch level can be 15mph higher than at ground level.

**FACT:** In steam days engine crews sometimes crouched low down in the cab, behind the cab side sheets, to shelter from the wind when crossing the viaduct.

**FACT:** High winds have been known to blow slow-moving steam trains to a halt on the viaduct.

**FACT:** Wagon tarpaulins were regularly blown off when crossing the viaduct.

**FACT:** In 1964, a number of Humber cars were blown off a train on the viaduct and onto the adjoining track.

**FACT:** In howling westerly or easterly gales the calmest place is on the bridge deck, as the wind is forced upwards over the parapet walls.

**FACT:** Mr W Davidson was for 13 years a member of the Blea Moor Tunnel maintenance gang and a Methodist lay preacher. He would walk and cycle across the viaduct and through Blea Moor tunnel on Sundays, to preach at Dent.

**FACT:** Plans were drawn up in the 1970s to replace the then-deteriorating viaduct. Options included an embankment and a box girder bridge.

**FACT:** Between 1989 and 1992 the viaduct underwent major restoration and strengthening. It is now stronger than when first built.

**FICTION:** The ganger whose hat blew off, flew under an arch, and landed back on his head.

**FICTION:** That the holes in the ground near the viaduct are Second World War bomb craters. They are sink holes.

**FICTION:** That there was a plan to box in the arches and convert the viaduct into a prison. It was April 1.

snow can soon cover the walls and windows at Ribbleshead station and Blea Moor signal box, surely England's loneliest.

That said, the north west of England and south west Scotland have a slightly warmer (if wetter) climate than elsewhere. Winters can be almost snow-free, although when it snows and blows at Ribbleshead the snow ploughs are kept busy. Occasionally, the Midland Route is the only open Anglo-Scottish route. Every winter, the Pennine tops are snow-covered, and on those crystal-clear winter days the S&C is at its very best.

Having been declared life-expired, the viaduct underwent invasive examination in 1988, with the belief that its dire condition had been exaggerated.

It became apparent that far from being

beyond repair, it could be repaired for a fraction of previous estimates. It was also clear that the state of the inner parts of the piers and arches varied - partly through differential wear, tear and water ingress, but also through inconsistent Victorian construction.

Also, in 1988, the viaduct was Grade 2\*-listed. The timing was exquisite. The overall Ribbleshead construction and prehistoric site had been declared a Scheduled Ancient Monument in 1976, so the 1988 Listing corrected the odd situation that the ground on which the structure stood was protected, but the viaduct itself was not.

The findings and cost estimates were massively influential in the April 1989 decision to reprieve the line from closure. A number of powerful TV documentaries at the time had

flagged up the closure threat. One in particular was narrated by local resident Alan Bennett with music by Sir Edward Elgar - a formidable pairing.

The viaduct underwent major overhaul during 1990-91. It was waterproofed, stone blocks were replaced or repaired, voussoirs and brick arches were repaired and stitched, and voids were filled and strengthened internally, enabling unsightly (but necessary) outer strengthening braces of steel railway lines and concrete to be removed. Reinforced concrete haunches were also installed to bulk up the parapet walls over the entire length of the structure. It can be declared with confidence that the Ribbleshead Viaduct was now stronger than ever - and to outward appearances it was as newly built. ➔





An enormous crack between the brick arches and stone voussoirs gave rise to concern about the viaduct's state of repair and its possible need for complete replacement in 1989. It contributed to BR's decision to replace the double tracks with a single line in the centre of the formation above, to more evenly distribute heavy loads on the structure. Despite appearances, it was capable of repair. BRITISH RAIL.

whose churchyard has so many graves of construction workers and their families.

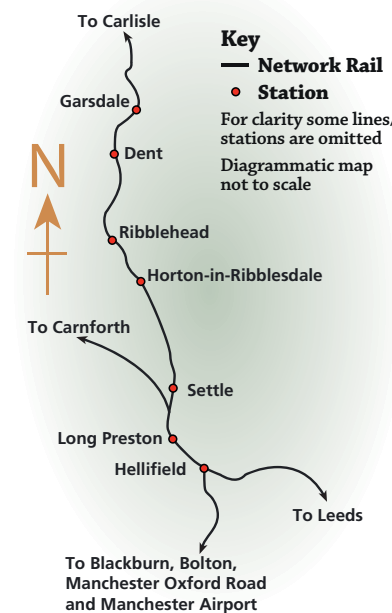
The viaduct itself has 24 arches, which somehow seems just right. The original plan was to create 18, a severe limiting factor being the availability of sufficient numbers of skilled workers (especially stonemasons) in such a remote and hostile place.

The first piers to be sunk were the middle ones. Working outwards enabled a decision to be made on the eventual numbers of piers in the light of what was found. Then the superstructure could be built from the north end southwards, with the benefit of the massive abutments for heavy access.

The building was done six arches at a time, with double-thickness king piers between each set of six. This was meant to confine any domino-style collapse to (at most) six arches. Happily, this theory has never been put to the test, although extreme care had to be taken when so many key components were being replaced during the major refurbishment. Engineer Tony Freschini is proud to have been

➔ In an effort to reduce and even out the loading on the viaduct, its twin tracks had been replaced by a single track in the centre in 1985. The strengthened viaduct was well capable of being redoubled, but given recent history and the need to keep costs down the decision was made to retain the single track. Apart from a stretch of single line on the approach to Carlisle station, the viaduct is the

### S&C route



only section of single line on the S&C.

Some maintain that the central single track is actually harmful to a viaduct designed to be loaded at its sides, and the notion of doubling the track is currently under review. This could ease the present 30mph speed limit over the viaduct, although a higher speed would give less time for people to take in the grandeur.

But you don't just visit a viaduct in isolation when you experience Ribblehead, you immerse yourself in so much more.

The best option is to come by train and get off at Ribblehead station, which houses the Ribblehead Visitor Centre and cafe, where the whole vast site is superbly explained. You can even 'fly' up the line all the way to Carlisle, courtesy of Network Rail's aerial imaging.

Pick up a map telling you what to see on a circular route of the area around and under the viaduct, including the sites of the smallpox hospital, the various named navvy encampments, quarries, brick works and the industrial railway lines. You could even press on northwards past Blea Moor signal box and over the top of Blea Moor tunnel. Not far away is the hamlet of Chapel-le-Dale,

Tarmac's Arcow and Dry Rigg quarries at Helwith Bridge were reconnected to the rail network in 2015, having been disconnected in the 1960s. Typically, two train loads a day of high-grade aggregate now depart the Arcow siding, relieving the Yorkshire Dales' roads of a great deal of heavy lorry traffic. Trains must travel north over the Ribblehead Viaduct to Blea Moor for reversal, before returning south. An Arcow northbound train crosses the viaduct with Ingleborough in the background. MICHAEL CARDUS.

in charge of restoring Ribblehead Viaduct, and he did not want to be responsible for inadvertently demolishing it!

Like all railway structures, bridges (especially the Ribblehead Viaduct) undergo a rigorous regime of inspection. The frequency of inspection varies from structure to structure, dependent on all manner of variables.

In Ribblehead's case its location, materials of construction and the weather are areas for concern, as is the weight and speed of traffic that passes over it. There is an annual visual inspection, and a much more detailed tactile inspection every six years. Every 18 years there is a detailed structural assessment to calculate the structural capacity of the viaduct. The (presently single) track over the viaduct has been re-sleepered gradually over the past two years, with hardwood sleepers to keep the weight down and achieve optimum ballast depth.

Spalling of the limestone with which the viaduct is faced inevitably occurs, and is dealt with as quickly as possible when it does. Network Rail prefers to deal with it rather than install safety fences for an undue period, given

Ribblehead's iconic status.

The brick arches were originally constructed from bricks made on site from locally dug clay, but these started to fail very early in the viaduct's history. Over time, outer/lower layers of brick have been replaced with Midlands blue engineering bricks or Accrington reds, although many of the inner layers are of the poorer local bricks.

The tapered profile of the stone piers, combined with the better-quality bricks now under the arches, gives comfort from falling masonry. However, the freeze/thaw cycles that are inevitable at Ribblehead means that vigilance is maintained on what amounts to an almost living mass subject to immense and variable stresses.

During Control Period 6 (2019-24), hoppers and drain pipes will be cleared, and there will be targeted masonry repairs including small defects in spans 1, 2, 4, 11 and 12 and within the pattress plates. Conscious of the area's importance, some spoil heaps from earlier works will also be cleared.

Comfortingly, NR can (and does) liaise with the one man who literally knows the viaduct

“ The biggest draw for many is the journey itself - and the Ribblehead Viaduct in particular. ‘Shall we be going over the viaduct?’ is by far the most common query. ”



### The other Ribblehead Viaduct

Railway modellers will know of DCC Concepts. The company makes and sells everything to do with the hobby, and is at the forefront of the electronics - the unseen wizardry that has transformed model railways.

DCC Concepts was based in Australia, but has recently established itself in magnificent premises alongside Settle station. Unsurprisingly, the daddy of all model railways runs around its premises - indeed, through the walls.

The layout is there to test and demonstrate its products, but its most striking feature is an enormous replica of the Ribblehead Viaduct. It was built in Australia, is 18 feet long, and arrived in the UK by container.

It is still a work in progress, but is all the more fascinating for that. And it is ahead of the real thing, in that it has double tracks!

inside out - Tony Freschini.

As to the viaduct's future, this is much dependent on the future of the railway that runs over it.

I am constantly amazed at how many people think this is simply a railway which connects Settle and Carlisle. That, after all, is 'what it says on the tin', yet who in their right corporate mind would build such a thing at such colossal expense in money and lives?

Nobody, of course. It was built as the middle and final one of three routes from London (St Pancras no less) and Scotland. A glance at a UK relief map explains it: the rivers Ribble ➔





Live images and sounds from the viaduct are captured by a web camera mounted on the north gable of Ribbleshead Stationmasters House. The house itself is available all year as a holiday let, via the S&C Trust's website, while the footage can be accessed online at railcam.co.uk. RAILCAM LTD/FOSCL.



➔ at the south and Eden at the north are both approximately north-south in orientation. Settle just happened to be the obvious place for the line (at first just called the Midland Extension) to strike out northwards along those two valleys from existing major railway lines at both ends.

The catchy (but rather odd) title 'Settle and Carlisle' was the accurate description of the closure-threatened portion of the far greater whole. We are trying hard to re-brand it as Leeds-Settle-Carlisle for realistic present-day purposes, Leeds and Carlisle being where most of the trains start and finish.

So, 'Settle and Carlisle' it has been for many a year now. That served well as a rallying call when closure threatened, and the name has stuck. The industry uses SAC for short or sometimes 'The Midland'. S&C tends to get confusing, as it is also shorthand for Signals and Communications (US) or Switches and Crossings (UK).

So, who uses the viaduct and the line?

### That shadow

Train passengers often miss it unless Friends of the Settle-Carlisle Line volunteer on-train-guides or trolley staff point it out.

At some elevations, the sun shines right through the carriage windows to create a detailed train shadow atop the viaduct. You can wave at your own shadow when things are just right.

The viaduct's shadow can stretch for well over a mile when the sun is sinking below the western horizon, which is way below the viaduct's elevation. Therefore, the sun and sometimes the moon can illuminate the undersides of the arches and project the shadow onto the rising ground to the east almost limitlessly, although the edges become less well-defined the longer it gets.

An aerial view of the viaduct as the sun sets over Morecambe Bay shows the remains of Batty Moss construction site. The indentations are sink holes, while the trackways of former industrial railways and tramways can be clearly seen. LES LIDDLE.

There are nine passenger trains each way on most days. Leeds and Carlisle are important commuter destinations, but many passengers are visitors, travelling the line for its own sake.

The biggest draw for many is the journey itself - and the Ribbleshead Viaduct in particular. "Shall we be going over the viaduct?" is by far the most common query.

In fact, Ribbleshead is just one of 20 viaducts along the line, 21 if you add what amounts to a virtual underground viaduct recently built at Eden Brows to remedy the huge landslide there. There are also 14 tunnels.

Thirty years on from its reprieve from closure, the line is as popular as ever and the Settle-Carlisle effect seems to be as big a pull as it has ever been. Besides the daily diesel services there is a steady stream of special trains, which tend to be packed with people prepared to pay high fares for the particular experience of travelling in style.

There has also been a big increase in cross-border passenger business to and from Scotland. Both Carlisle and Leeds have the easiest of cross-platform changes, and canny fare-aware people have recognised a bargain.

## It has been known for track workers to cross the viaduct on hands and knees in severe northerlies, and slow-moving trains going north have been blown to a standstill on the 1-in-100 gradient. 77

A resumption of Leeds-Glasgow fast trains is overdue, so too connections to Lancashire via Hellifield.

The line was built for long-distance fast and luxurious trains. It was built for 90mph in the days when trains could barely achieve such

speed. Today's line speed is 60mph - fine for admiring the scenery, but that's all.

The line underwent near total renewal and extra signalling some years ago, potentially doubling its capacity. It is not electrified - an increasingly serious limitation. The 'E-word' is

guaranteed to enrage.

Who knows how traction will evolve? I take the view that this railway line is first and foremost a working railway, not just a photographer's plaything.

However, it is also the UK's longest Conservation Area, so heritage remains a big factor in its appeal - especially at Ribbleshead. It has perhaps the most complete and now cherished set of railway buildings and structures anywhere. Wayside stations look as they should. Those that survived have flourished, thanks to an army of volunteers and dedicated private owners.

Freight is a tricky one, but vital. The line is a major freight route with gauge limitations (category W8, if that floats your boat). Coal traffic has almost ended, to be replaced in part by bulk construction materials - timber, gypsum, cement and aggregates.

Major quarries in Ribblesdale disconnected from the rail network in the 1960s are now being reconnected to rail, with hugely beneficial results for the businesses and for the local road environments. Ribbleshead Viaduct, once a weak link in a magnificent chain, is ready for all the freight and weight that can be thrown at it.

There are three aspects of the line where opportunities are being lost: diversions, through passenger trains, and line speed. Work is in hand on each of those.

Thank you, RAIL readers, for voting for the Ribbleshead Viaduct. You have impeccably good taste. **R**

### About the author

Mark Rand, Contributing Writer

Retired police officer Mark Rand was for five years Chairman of the Friends of the Settle-Carlisle Line. He is a volunteer On-train-guide who lives in Settle station water tower, restored and converted during 2011-12. His grandsons James and Ben could recite the names of S&C stations, forwards and backwards, from the ages of four.

