The HRE Group

North Yorkshire Council: Planning
(by email: planningcomments.sel@northyorks.gov.uk)

2 April 2024

Dear Sir/Madam

**Ref ZG2024/0183/FUL: Infilling of Rudgate bridge, nr Newton Kyme**

We are writing to object to the above planning application which seeks permission to retain infill at the bridge carrying Rudgate over the dismantled Church Fenton-Harrogate railway near Newton Kyme, North Yorkshire.

On 23 April 2020, Jacobs, consultants acting on behalf of Highways England (renamed National Highways (NH) in August 2021), notified Selby District Council (the Local Planning Authority (LPA)) of "planned" infill works to "prevent further deterioration [of the bridge] and remove the risk of future collapse". Neither the LPA nor Newton Kyme cum Toulston Parish Council expressed any objection to the proposal.

On 6 October 2020, Jacobs wrote again to SDC, informing them that "A BD21 assessment undertaken in 2018 found [Rudgate bridge] suitable only for 32 tonnes GVW." Although no defects were specified, the letter states that "the structure represents an ongoing and increasing risk to public safety" and would be infilled under Schedule 2 Part 19 Class Q of the Town & Country Planning (General Permitted Development) (England) Order 2015, known hereafter as 'Class Q'. The letter went on to make clear that "Specifically, and for the avoidance of any ambiguity, the works are being undertaken in order to prevent an emergency arising", although the word "arising" does not appear in Class Q.

Invoking these rights established a specific statutory framework for the infill scheme under which it had not previously been considered by the LPA. It should be noted that Class Q defines "emergency" as "an event or situation which threatens [present tense] serious damage to human welfare…, the environment…or the security of the United Kingdom."

By default, Class Q applies only to *temporary works* remaining in situ for no more than 12 months. If NH intended to retain the infill beyond this period, written consent was required from the LPA. According to government guidance on Class Q (appended), such consent should be sought by submitting a retrospective planning application "as soon as possible".

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Class Q is intended for unilateral implementation by the Crown/developer, if the relevant conditions are met. There is no formal mechanism for LPA approval. It was therefore entirely legitimate for the LPA to regard the letter of 6 October 2020 as a notification and not respond.

Even if the previous expression of no objection to the infill scheme remained valid in the context of Class Q, it could not legitimately be regarded as written consent to retain the infill beyond the maximum period of 12 months as this requirement did not exist at the time no objection was expressed.

The Rudgate scheme was one of six infills carried out by NH under Class Q between autumn 2019 and summer 2021. In all cases, the company failed to seek consent for retention, resulting in the works becoming unauthorised and, in the case of Rudgate bridge, the LPA's request for a retrospective planning application.

The infill at Great Musgrave bridge, Cumbria was removed between July-October 2023 following the refusal of a retrospective planning application and subsequent issuing of an Enforcement Notice by Eden District Council. A retrospective planning application to retain the infill at Congham bridge, Norfolk was refused by the Borough Council of King's Lynn & West Norfolk in October 2023. National Highways has appealed against the subsequent issuing of an Enforcement Notice for the infill's removal.

At least 29 other infill schemes were the subject of Class Q notification letters dated 10 September 2020. However, despite the supposed development of multiple emergencies, no infill works have yet taken place at any of the affected structures. It is clear that NH was systematically attempting to misapply Class Q to progress routine, permanent works.

Infilling started at Rudgate bridge on 8 March 2021 - five months after the notification letter was sent - and was completed on 14 April 2021. The project cost £133K. In our view, the length of the delay demonstrates that there was no emergency that required prevention and these works were therefore carried out unlawfully.

## The bridge's load-bearing capacity

In January 2018, Jacobs carried out a BD21 assessment on behalf of National Highways (extract appended), calculating that Rudgate bridge had a live load capacity of 32 tonnes, using factors described as "conservative". The assessment was undertaken using the modified MEXE method which, under the replacement standard CS454, is no longer permitted in relation to masonry arch bridges with a skew of more than 35 degrees. Rudgate bridge has a skew of 50 degrees.

It is the view of a specialist bridge engineer consulted by The HRE Group that a more precise method of assessment would likely have shown greater capacity.

Rudgate is a narrow lane with overhanging trees and a bend at the southern end of the bridge. The area is rural and traffic levels on Rudgate are light, although wagons and agricultural machinery do use local roads to travel to/from nearby farms and a quarry.

National Highways has provided no evidence of having undertaken a traffic survey which would have been useful to inform decision-making around the risks presented by the bridge.

At the junction with the A659, 100m from the structure, a sign indicates that Rudgate is prohibited to motor vehicles of "over 3 tons unladen". There is doubt as to the legal status of this restriction; however, the sign is the means of communicating it, upon which the driver acts. It is unlikely that a driver would choose to disregard the sign on the basis that, in their opinion, the restriction was non-compliant and/or unenforceable.


*The sign at Rudgate's junction with the A659 and (right) an aerial view of the bend at the bridge's south end.*

Any vehicle of 32 tonnes or less would be within the assessed capacity of Rudgate bridge. Given the prevailing circumstances, the likelihood of a vehicle exceeding 32 tonnes in weight (i.e. five or six axle HGV) using the bridge was extremely low due to the posted weight restriction and physical constraints.

In its Planning Statement (PS), National Highways asserts that "vehicles of any weight in excess of 3T could use Rudgate, if they require access to property off Rudgate, and therefore could exceed the weight limit." Unless supplemented by barriers etc, this is true of all weight, height, width and speed restrictions - the law is only effective if complied with by the driver, which is mostly a matter of culture. National Highways appears to be suggesting that weight limits have little value - a peculiar position for the state-owned roads company to take.

When news of NH's infilling and demolition programme emerged in January 2021, the company's spokesperson asserted that "Local highway authorities have responsibility for applying weight restrictions, closing the roads, or restricting traffic. Around 200 of the public road bridges managed by HE/HRE have failed their most recent structural assessment (BD21) but haven't had any restrictions implemented. Therefore, our planned infilling is the safest and most appropriate option and will maintain access across the structure."

In other words, NH was bemoaning the lack of weight restrictions at bridges across the country and was seeking to undertake infill schemes as mitigation. At Rudgate, where there *was* a weight restriction (albeit of questionable legality), NH deems this to be inadequate.

**The bridge's condition**

Contrary to its obligations under the company's Protocol Agreement with the Department for Transport for management of the Historical Railways Estate (HRE), National Highways did not inspect Rudgate bridge in either 2019 or 2020. Therefore, no recent evidence of the bridge's condition was available to NH immediately prior to the Class Q notification letter being sent to the LPA in October 2020.

An inspection report produced by Balfour Beatty Rail (BBR) in October 2018 (appended) - the most-recent available prior to infilling - describes the overall condition of the structure as "Fair", as does both BBR's 2017 inspection (extract appended) and the inspection carried out to inform Jacobs' 2018 capacity assessment. However, in the PS, NH asserts that "A bridge inspection to assess the condition of the bridge was undertaken in late 2017 and identified that the bridge structure was in poor condition." This statement is therefore a misrepresentation of NH's formal engineering evidence.

In relation to existing defects, the examiner who conducted the 2018 inspection stated that there is "*Possible* further deterioration to the spalling brickwork areas, *possible* further deterioration to the eroded stonework areas also the vegetation is progressively getting worse. P2 to P4."[1]

These defects are typical of those recorded on many 19th Century masonry arch bridges and are likely to be a function of water ingress, freeze/thaw or weathering, rather than overloading.

The examiner's only recommendation was to spend £1K repairing or renewing approach fencing to the south-east. No requirement for structural works was identified. However, on the appended risk matrix, National Highways' engineer asserts "infilling preferable to repairs" and, under Action/Notes, states "Case to be made for infilling".

On the risk matrix appended to the 2017 inspection report, the engineer states "possible infill candidate depending on assessment result". This suggests that infilling was under consideration more than three years prior to the work being carried out under emergency permitted development rights.

Masonry arch bridges are very resilient and have large reserves of strength. For the bridge to present any meaningful threat of failure/collapse, a significant deterioration in its condition would have had to occur, probably taking decades.

In the PS, addressing issues around development in the Green Belt, NH claims there was a need to "safeguard an existing road bridge, *with no viable alternative*, with long-term benefits which outweigh any possible harm to the Green Belt."

[1] P2 indicates that action is required within five years; P4 indicates that no action is required.

This statement is preposterous. Simple, cheap and more sympathetic methods of maintaining the bridge in a safe condition - without infilling - were available, including spot/patch brick/stone replacement/recasing. Such work is routinely carried out on masonry arch bridges and indeed features in National Highways' own video promoting its work on the HRE:

https://youtu.be/Y-9I21JAgng

Infilling was an asset management choice, based on NH's imperative of liability reduction and perceived long-term cost savings, rather than safety. Prior to infilling, any *proportionate* risk assessment - taking into consideration the *likelihood* of occurrence - would have determined that the risks presented by the bridge were low. The fact that National Highways did not inspect the structure in 2019 or 2020 demonstrates that it had no particular concerns about it.

It should be noted that infilling has created a collection of hidden critical elements which can no longer be inspected. This is undesirable from an asset management perspective, increasing the possibility of undiscovered deterioration of structural elements that still support the road.

**Heritage value**

Section 2.1 of Historic England's (HE) *Infrastructure: Transport - Listing Selection Guide* (extracts appended) states that "Most pre-1850 bridges, where substantially intact, will warrant serious consideration for listing". Rudgate bridge, dating from 1847, falls within this statement's scope.

HE divides the construction of Britain's railway network into four phases. It states that "The second phase runs from 1841 to 1850, and marks the heroic age of railway building and the period of 'railway mania' in which commercial speculation and the competition for routes led to the frantic construction of lines, including the Great North Railway and the laying of many of the main trunk lines that form the basis of today's inter-city network."

HE goes on to state that "When it comes to purpose-built railway structures, most pre-1850 buildings will often be of international significance as being among the earliest railway structures in the world, and even partial survivals need to be assessed carefully. The 1840s saw a massive expansion in the network and while the Italianate style was initially favoured, many designs were eclectic and realised in a variety of styles. Great care should be taken in seeking out work of this date because it is often hidden by later alterations and extensions."

Whilst not designated, it is clear from HE's comments that decision-making about the future of Rudgate bridge should have reflected its historical value as an 1840s structure. Its highly-skewed construction elevates it above most other masonry arch bridges and demonstrates the remarkable skill of the Victorian stonemasons who erected it.

The Church Fenton-Harrogate line, passing beneath the bridge, was constructed by the York & North Midland Railway under the chairmanship of George Hudson, known as 'The Railway King'. It was built by John Cass Birkinshaw, thought to be the first articled pupil of Robert Stephenson, with whom he worked on several of Yorkshire's railways.

Records from the Parliamentary Archives (catalogue reference HL/PO/PB/3/plan1845/Y1) (search entry appended) identify Robert Stephenson as the railway's engineer, with Birkinshaw as his assistant. It is not clear why NH's Heritage Statement (HS) fails to highlight this apparent link between Rudgate bridge and one of Britain's greatest railway engineers.

Birkinshaw played roles in the construction of the Leicester & Swannington, Liverpool & Manchester and London & Birmingham railways, and can therefore be regarded as an important figure during the railway's pioneering period.

With the exception of its parapets, infilling has eliminated any opportunity to appreciate the bridge's form which would, to some extent, require access beneath the span. In the PS, National Highways suggests that the bridge is "preserved in-situ within the infilling". However, conservation specialists/engineers consulted by The HRE Group reject the proposition that burial in stone and concrete is a legitimate form of preservation. The long-term impacts of concrete on the masonry are not clear and the trapping of water within the structure could accelerate its deterioration. Given that the scheme has been progressed for liability reduction purposes - without safety justification - infilling is widely regarded as vandalism.

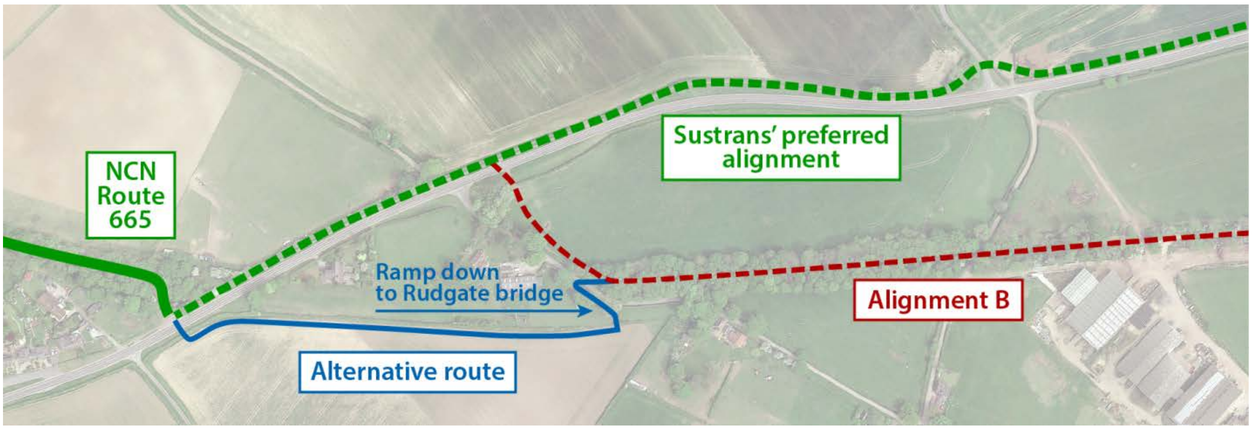
Also in the PS, National Highways asserts that "There are no other remaining physical elements of the former Church Fenton to Harrogate Railway Line near the bridge itself…". This statement fails to recognise the cutting on its east side, the underbridge at Watson's Lane, 320m to the south-east (albeit with a replacement concrete span) and Newton Kyme's former station house, 200m north-west.

*Watson's Lane bridge (Bill Boaden) and a view of Newton Kyme's former station house, with Rudgate bridge in the background (Tadcaster Historical Society).*

Paragraph 2.10 of the National Planning Policy Framework (NPPF) sets out a presumption in favour of sustainable development, with a key element of 'sustainability' being "protecting and enhancing our…historic environment" (2.8.c). It cannot be demonstrated that infilling has "protected" Rudgate bridge as it is no longer possible to inspect it. There is no suggestion that the work has "enhanced" the structure; on the contrary, as acknowledged in the HS, it has clearly caused harm to an attractive non-designated heritage asset of moderate historic, aesthetic and evidential value, designed by an engineer of significance during the 'heroic' second phase (1840s) of railway construction.

**Repurposing potential**

It is accepted that Sustrans' feasibility study into the development of an active travel link between Route 665 of the National Cycle Network near Newton Kyme and Route 66/665 at Tadcaster (March 2020) puts forward a preferred alignment mostly alongside the A659 and south bank of the River Wharfe. However, it is noted that an alternative alignment through the railway corridor south-east of the bridge was identified (Alignment B).




*An aerial view of the alignments considered by Sustrans and an alternative (blue) via the field adjacent to the infilled cutting.*

National Highways notes that the cutting to the north-west of the bridge has been infilled and seems to regard this as an absolute impediment to any possible repurposing. However, in statements relating to its bridge infilling programme, NH has repeatedly stated that infilling is "fully reversible". This also applies to the cutting in which the fill material is likely to be much looser than the compacted stone/concrete placed beneath the bridge.

Sustrans states that Alignment B would offer "a tranquil, mainly off-road route" but, amongst other issues, requires two crossings of the A659 and "affects three landowners significantly". There is no evidence to indicate that Sustrans considered a fully off-road route via the field alongside the infilled cutting, then ramping down (parallel to the SW wing wall) under Rudgate bridge onto the former trackbed. It is recognised that this would impact additional landowners and, for the purposes of clarity, The HRE Group is *not* suggesting this route.

However, as a general principle, it is our view that viable legacy structures should be retained for possible future repurposing as we transition to more sustainable forms of transport. Given its Fair condition and close proximity (340m) to an active travel route intended for extension, Rudgate bridge would fall within this category. The infilling of the bridge ensures that any repurposing would be significantly more costly and difficult than if it was still open.

**Environmental and landscape impacts**

Rudgate bridge is located within the Green Belt. At paragraph 152 of the NPPF, it is stated that "Inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances."

It is clearly the case that there was no emergency at Rudgate bridge and the infill scheme was progressed for liability reduction purposes, not for meaningful engineering or safety reasons. Simple, cheap and more sympathetic methods of maintaining the bridge in a safe condition - without infilling and therefore without the associated harm - were available, contrary to NH's unsustainable claim that there was "no viable alternative".

It also emerged during the LPA's enforcement investigation that, to access the site, NH's contractor felled or damaged trees within areas protected by Tree Preservation Orders, without the council's authority. From the PS, it is clear that this work was carried out with little regard for the damage being caused and with no records being kept. The cluster of four felled elm trees growing close to the bottom part of the southern embankment were "*unlikely* to be included in G2 of the TPO", but this cannot be confirmed; one of the felled trees on the northern embankment is "*understood* to have been an ash tree"; some pruning/stem removal took place within G1 of the TPO "which all *appear* to be below 75mm in diameter. Without exact records, it is *assumed* that the trees removed were ash or elm…"

Four sycamore trees that were partially buried within the newly-created infill embankment now require removal due to the compromising nature of the soil level changes experienced around them.

These were not the actions of a responsible public body, undertaking its work with due care.

Infilling typically involves the quarrying, processing and transportation of more than 1,500 tonnes of stone and concrete which are then used to bury the relevant structure within the landscape, although it is noted that NH has not released the weight of material used for the Rudgate bridge infilling. Such schemes inevitably result in habitat loss and a greater level of carbon emissions than sympathetic repair techniques. Infilling does not represent a sustainable approach to the management of historic structures.

It is noted that the bridge is located within an area designated as a Locally Important Landscape Area, with two Scheduled Monuments in close proximity.

As stated in the PS, the disused railway occupies private land and is therefore not accessible for public use. As a result, the bridge's east elevation could not legitimately be enjoyed, apart from an oblique view from the south end of the east parapet and adjacent bushes, and from the field on the former railway's north side. The west elevation was already substantially buried. It is therefore accepted that the landscape impacts from the infill scheme are modest.

**Planning**

Policies relevant to this application from Selby District Council's Local Plan 2013 include:

- *SP2 Spatial Development Strategy* which states that "Development in the countryside will be limited to the replacement or extension of existing buildings, the re-use of buildings preferably for employment purposes, and well-designed new buildings of an appropriate scale..."
- *SP3 Green Belt* which states that "within the defined Green Belt, planning permission will not be granted for inappropriate development unless the applicant has demonstrated that very special circumstances exist to justify why permission should be granted."
- *SP12 Access to Services, Community Facilities and Infrastructure* which states that "In all circumstances opportunities to protect, enhance and better join up existing Green Infrastructure, as well as creating new Green Infrastructure will be strongly encouraged…"
- *SP13 Scale and Distribution of Economic Growth* which states that "In all cases, development should be sustainable and be appropriate in scale and type to its location, not harm the character of the area..."
- *SP18 Protecting and Enhancing the Environment* which states that "The high quality and local distinctiveness of the natural and manmade environment will be sustained by:
    - Safeguarding and, where possible, enhancing the historic and natural environment including the landscape character and setting of areas of acknowledged importance.
    - Conserving those historic assets which contribute most to the distinct character of the District and realising the potential contribution that they can make towards economic regeneration, tourism, education and quality of life."
- *SP19 Design Quality* which states that "Proposals for all new development will be expected to contribute to enhancing community cohesion by achieving high quality design and have regard to the local character, identity and context of its surroundings…" and "Positively contribute to an area's identity and heritage in terms of scale, density and layout..."

Provisions relevant to this application from the NPPF include:

- *Paragraph 135(c)* which states that "Planning policies and decisions should ensure that developments …are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities)."
- *Paragraph 152* which states that "Inappropriate development is, by definition, harmful to the Green Belt and should not be approved except in very special circumstances."

- *Paragraph 180* which states that "Planning policies and decisions should contribute to and enhance the natural and local environment by…protecting and enhancing valued landscapes, sites of biodiversity or geological value…recognising the intrinsic character and beauty of the countryside…minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures."
- *Paragraph 196* which states that "Plans should set out a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. This strategy should take into account…the desirability of sustaining and enhancing the significance of heritage assets, and putting them to viable uses consistent with their conservation…the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring…the desirability of new development making a positive contribution to local character and distinctiveness…and opportunities to draw on the contribution made by the historic environment to the character of a place."
- *Paragraph 203* which states that "In determining applications, local planning authorities should take account of:
  a. the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
  b. the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
  c. the desirability of new development making a positive contribution to local character and distinctiveness.
- *Paragraph 209* which states that "The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset."

**Summary**

Rudgate bridge was infilled for liability reduction purposes; no meaningful engineering or safety concerns have been demonstrated. National Highways claims there was "no viable alternative" to infilling, but this disregards the cheap, simple and sympathetic option of brick and stonework repairs which are routinely carried out by NH on other HRE masonry bridges. This approach would have delivered the same benefits of safeguarding the bridge and increasing capacity, but without the associated harm. No account was taken in decision-making of the Council's policy objective of protecting and enhancing heritage assets.

National Highways claims that long-term cost savings will accrue from the infilling, but offers no evidence to support this or provide alternative costings for comparison purposes. In any event, cost is not a valid planning consideration.

The work was carried out under emergency permitted development rights, resulting in members of the public having no opportunity to view and comment on the plans. The possibility of infilling emerged in 2017, with months of design and project development work subsequently being undertaken, thus demonstrating that there was no emergency or any prospect of one. There was no intention to remove the infill within 12 months, as required under Class Q. These rights were being systematically misapplied as part of a nationwide programme of infilling works, undermining trust and confidence in public bodies.

The bridge stands in the Green Belt where development should not be approved except in very special circumstances, which National Highways has not come close to demonstrating. The unauthorised felling and damaging of trees within an area protected by a Tree Preservation Order is indicative of a developer concerned only with its own narrow interests.

Policies adopted by the Council (particularly SP3, SP13 and SP18), as well as provisions within the National Planning Policy Framework, provide clear grounds to reject the planning application and we trust the Council will do so.

Yours faithfully

[redacted]

**Graeme Bickerdike**
on behalf of The HRE Group

The HRE Group is an alliance of walking, cycling and heritage campaigners, engineers and greenway developers who regard the Historical Railways Estate's 3,000+ structures to be strategically valuable in the context of future rail and active travel provision.

*Appended*

Newspaper advertisement identifying J C Birkinshaw as the Engineer
Search record for the Parliamentary Archives identifying Robert Stephenson as the Engineer
(Extract) Government's guidance relating to Class Q
(Extract) Jacob's capacity assessment and associated inspection
2018 Balfour Beatty Rail inspection
(Extract) 2017 Balfour Beatty Rail inspection
(Extracts) Historic England's Infrastructure: Transport (Listing Selection Guide)

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YORK & NORTH MIDLAND RAILWAY.

HARROGATE BRANCH.

CONTRACTS FOR WORKS.

THE DIRECTORS of the YORK and NORTH MIDLAND RAILWAY COMPANY will meet at the RAILWAY STATION, YORK, on WEDNESDAY, the Fifth Day of November next, to receive Tenders for the Execution of the Works between Church Fenton and Harrogate, being a distance of 18 Miles, or thereabouts.

The Works include a Tunnel and Viaduct. Drawings and Specifications may be seen, after the 20th instant, on Application to Mr. J. C. BIRKINSHAW, Engineer, 29, Micklegate, York, where Printed Forms of Tender may be obtained.

All Tenders must be delivered to the Secretary at the Railway Station, York, before TEN o'Clock on WEDNESDAY, the 5th Day of November next, when Parties tendering are requested to be in Attendance.

(Signed) GEORGE HUDSON, Chairman.

York, October 2, 1845.

*Newspaper advertisement identifying J C Birkinshaw as the Engineer (Yorkshire Gazette, 11 October 1845)*

# York and North Midland and Harrogate Railway.

« Back

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|---|---|
| **Held At:** | Parliamentary Archives: GB-061 |
| **Catalogue Reference:** | HL/PO/PB/3/plan1845/Y1 |
| **Date:** | 1845 |
| **Level:** | File |
| **Category:** | Plans of railways, roads, canals and other public works |
| **Description:** | Plan & Section of an Intended Railway to commence by a Junction with the York & North Midland Railway, near Church Fenton, and to terminate at or near Harrogate, in the West-Riding of the County of York. Robert Stephenson, Engineer. John C. Birkinshaw, Assistant Engineer. November 30th 1844. |
| **Access Status:** | Open |
| **Physical Description:** | Plan, Section, Book of Reference, List of owners, lessees and occupiers, Subscription Contract, Estimate |

*Search record for the Parliamentary Archives identifying Robert Stephenson as the Engineer, with J C Birkinshaw as his Assistant.*

**What additional permitted development rights does the Crown have in an emergency and when do these apply?**

Part 19, Class Q, of Schedule 2 to the Town and Country Planning (General Permitted Development) (England) Order 2015 (http://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/19/made) relates to development by the Crown for the purposes of preventing an emergency or in response to an emergency. The permitted development rights apply to all Crown land, mainly to ensure that all the residences of the Sovereign and Her heirs are covered. It is also possible that the Crown Estate, for example as owners of the foreshore, may have to deal with an environmental emergency. An 'emergency' is defined as an event or situation which threatens serious damage to human welfare (in a place), the environment (of a place) or the security of the United Kingdom.

When using these additional rights the developer must notify the local planning authority as soon as practicable after starting the development, and the development must cease and the land be restored to its original or an agreed condition within 6 months. If the Crown wishes the development to be permanent, it should submit a retrospective planning application as soon as possible.

Paragraph: 008 Reference ID: 44-008-20140306

Revision date: 06 03 2014

**What are the additional permitted development rights for national security purposes?**

Part 19, Classes R-T, of Schedule 2 to the Town and Country Planning (General Permitted Development) (England) Order 2015 (http://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/19/made) permits certain types of development on any Crown land for national security purposes. These rights are available to all Crown bodies in order to cover the physical protection of the Sovereign and Her heirs (which is a matter of

# HRE Assessment Programme

Highways England - Historical Railways Estate

## CFH1/12, Rudgate Road, North Yorkshire

## BD21 Assessment and Inspection Report

0450380| Form AA/BA

January 2018

VAR9/5266

JACOBS

# Document control sheet

Rail (EHR F17.1)
June 2016

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| Project: | HRE Assessment Programme | | |
| Client: | HE-HRE | Project Number: | B28280BT |
| Document Title: | CFH1/12 BD21 Assessment and Inspection Report | | |
| Doc. No: | 0450380 | | |

| | | Originated by | Checked by | Reviewed by |
|---|---|---|---|---|
| ORIGINAL | ISSUE | [redacted] | | |
| Approved by | | | | |
| DATE | January | | | |

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# Executive Summary

**Structure Type:** Single Span Overbridge

**Superstructure Form:** Segmental profiled, brickwork arch with stone voussoirs

**Substructure Form:** Gravity type, stone abutments, spandrels and wingwalls

**Span:** Clear skew span 11.93m (39' – 1 ½"), Clear square span 7.58m (24' – 10 ½"), skew angle of 50°

**Assessment Code:** BD21

**Live load capacity:** 32 tonnes GVW Loading

**Modified Axle Load:** 10 tonnes

**Restriction:** 32 tonnes

**Condition:** Fair

**Local Authority:** North Yorkshire

**OS Reference:** SE 455 446

This report presents the load carrying capacity for the bridge and identifies the data used to derive the assessment. It has been prepared by Jacobs for the exclusive use by HRE and should not be relied on by third parties. It has been based on site measurements and investigation by Jacobs or historical information provided by HRE, as appropriate.

The description of condition does not represent a principal inspection; nor should it be relied on for the development of maintenance works. Close inspection of members was limited by the constraints of safe access possible within a single site visit.

Identification of defects is principally based on ground level observation of visible members. The structural arrangement of the bridge meant that the following elements were not examined as part of the inspection for assessment:

- The arch barrel extrados and the soil faces of the spandrel walls were considered to be built-in parts not amenable to inspection. Assessment followed standard methods based on appraisal of the visible parts of the bridge.

# 1. General Description and Structural Details

## 1.1 Introduction

Jacobs was appointed by Highways England – Historical Railways Estate (HRE) to undertake a BD21 MEXE assessment of overbridge CFH1/12.

Structural Soils Ltd. excavated a trial pit adjacent to the east parapet to expose the arch crown extrados. Data on the trial pit is included in Appendix E

## 1.2 Location and General Description

Structure CFH1/12, 'Rudgate Road', carries an unclassified road over the track bed of the former Church Fenton to Harrogate railway line, 3km north west of Tadcaster, North Yorkshire. The bridge has been partially infilled up to the western face by third parties with fill sloping down under the span to formation level at the eastern face.

The road is a single carriageway, 3.11m wide at the centre of the span. Verges line both sides of the roadway, 2.29m and 1.65m wide on the east and west sides respectively. The overall width between the parapets is 7.05m. Refer to the plan at road level in Appendix G for carriageway dimensions.

The road has low traffic flow with no HGV use observed during the inspection. The national speed limit applies over the bridge.

The OS grid reference is SE 455 446.

The line opened on 10th August 1847, it is likely that the bridge dates from around this time.

## 1.3 Construction type

The bridge is a partially infilled, highly skewed, single span brick arch overbridge. It has a clear skew span of 11.93m (39' – 1 ½") and a clear square span of 7.58m (24' – 10 ½") giving an angle of skew of 50°.

The segmental profiled arch barrel is constructed of five rings of brick with stone voussoirs. The rise of the arch is 2.09m at the crown. The thickness of the arch barrel was taken from level readings within the trial pit as 583mm (1' – 11"). The stone voussoirs were measured to be 630mm (2' 1") thick.

The arch is supported on gravity type abutments constructed of regularly coursed stone. The parapets, wingwalls and spandrels are also constructed of stone.

Sketches of the plan at road level and the elevation are included in Appendix G.

# 2. Information Search

## 2.1 Services Search

A services search was carried out by Jacobs. Information is supplied in Appendix D

## 2.2 Site Investigation Description and Results

Data on the trial pit is included in Appendix E.

## 2.3 Existing Drawings

A British Rail Eastern Region Overbridge Assessment drawing, dated June 1981, contains a plan, elevation and cross-sectional sketch of the structure; refer to Appendix F for details.

# 3. Structure Condition

## 3.1 General

The survey and inspection for BD21 assessment was undertaken on Friday 10th October 2017. Weather conditions were mixed with intermittent sun and overcast conditions with a temperature of 16°C.

Parking was available within the east verge and Structural Soil Ltd. traffic management system provided for the survey.

Access to the formation was gained by walking down the cutting slope adjacent to the south east pilaster.

## 3.2 Structure Condition

### 3.2.1 Arch barrel

The arch is constructed from five rings of common red brick with stone voussoirs. The bricks are in poor condition (Photographs 5-10). The exposed areas of brickwork show spalling up to a depth of 20mm with heavy damp staining throughout and algal staining concentrated towards the eastern face. Brickwork throughout the arch is soft and hollow sounding under tactile inspection indicating saturated brickwork. A barrel factor of 0.7 is considered appropriate (BA 16/97 Table 3/1).

The carriageway construction above the arch is in fair condition and shows no significant settlement or tracking. The intrusive investigation revealed the backfill is well compacted granular fill up to an approximate depth of 342mm; a fill factor of 0.7 is therefore recommended (BA 16/97 Table 3/2).

The joints are generally well filled throughout the brickwork area though open joints are visible at the interface with the east voussoir, a joint depth factor of 1.0 (Table 3/5 BA16/97) is recommended. Damp staining is visible throughout the barrel indicating friable mortar; a mortar factor of 0.9 is considered appropriate (Table 3/4 of BA16/97). Joints widths are between 6mm and 12.5mm wide giving a joint width factor of 0.9 (Table 3/3 of BA16/97).

Slight movement to a small section of brickwork adjacent to the south east voussoir is visible. The widespread saturated brickwork and hollow sounding nature of the arch barrel presents a concern over potential debonding between the arch rings. A condition factor of 0.85 is considered appropriate based on the current survey findings (BA16/97 Clause 3.17 – 3.21).

### 3.2.2 Abutments

The abutments are in fair condition.

The south abutment has localised hollow sounding blocks to the supporting course of stonework beneath the springers. A small fracture is evident through the south east springer block. Water seepage and corresponding leachate and algal staining are visible throughout (Photograph 11).

The majority of the north abutment has been buried within the infill material and is therefore not amenable to inspection. The remaining exposed stonework and springers are saturated and hollow sounding and soft to the touch (Photograph 12).

### 3.2.3 Spandrels

The south east, north east and south west spandrels are in fair condition. The north west spandrel is buried within the existing fill material and therefore not amendable for inspection.

The south east spandrel has visible spalling to the upper two courses to an approximate depth of 20mm (Photograph 15).

The north east spandrel exhibits mortar loss at the interface with the voussoir and the buttress. Damp blocks are visible throughout with localised spalling up to 50mm deep and algal staining across the face (Photograph 16).

The south west spandrel is heavily spalled with water seepage and hollow blockwork throughout (Photograph 17).

#### 3.2.4 Wingwalls & Buttresses

The eastern wingwalls and buttresses are in fair condition. The buttresses and wingwalls have damp and algal staining towards the bases. The western wingwalls and buttresses are buried.

The south east wingwall has localised open joints with sapling growth visible within the stringcourse (Photograph 13).

The north east wingwall and buttress have isolated hollow sounding blocks with localised fracturing to stonework evident (Photograph 14). Open joints and displacement of stonework up to 20mm is visible.

#### 3.2.5 Parapets

The parapets are in fair condition with localised spalling and fractured blocks across the external faces (Photographs 18 & 19). The internal faces have intermittent vegetation growth (Photograph 20 & 21).

#### 3.2.6 Formation

The formation to the east of the bridge is flanked with cutting slopes and heavily vegetated (Photographs 23). The formation to the west has been infilled up to the face of the structure with the land used for agricultural grazing (Photograph 24).

#### 3.2.7 Road Surface

The carriageway surface is in good condition with no signs of settlement, cracking or tracking. The geometry over the structure makes axle lift-off effects unlikely (Photographs 3 and 4).

# 4. Assessment to BD21/01

## 4.1 Methodology

The following table summarises the condition/modifying factors used in the modified MEXE method of assessment as outlined in Chapter 3 of BA16/97. The factors represent general condition of the elements of the structure, as taken from justifications in section 3.2.1 of this report.

Axle lift off was not considered as part of these calculations.

For the purpose of these calculations the arch ring thickness has been taken as 583mm (1' – 11") at the east crown. This is based on historical drawings contained within Appendix D.

The following factors were used indicating the condition of the arch for the MEXE assessment:

| Description | Modifying Factor |
|---|---|
| Barrel Factor, $F_b$ | 0.7 |
| Fill Factor, $F_f$ | 0.7 |
| Width of Joint factor, $F_w$ | 0.9 |
| Depth Factor, $F_d$ | 1.0 |
| Mortar Factor, $F_{mo}$ | 0.9 |
| General condition factor of bridge, $F_{cm}$ | 0.85 |

**Table 1: Factors used for MEXE analysis**

## 4.2 Results

### 4.2.1 Arch barrel (MEXE assessment)

| Arch span | Modified axle load | BD21 assessment result |
|---|---|---|
| 11.93m | 10.0 tonnes | **32 tonnes** |

**Table 2: MEXE analysis results**

| Axle Factor | | Permitted Axle load |
|---|---|---|
| Single | 1.62 | 17.3 |
| Two axle bogie | 1.00 | 10.3 |
| Three axle bogie | 0.80 | 7.8 |

**Table 3: Axle factors and resulting modified axle loads**

The modified axle load obtained from the MEXE analysis was 8 tonnes. After applying the axle factors, a rating did not satisfy all allowable axle loads of 11.5, 10 and 8 for single, double and triple axles respectively. This means, according to this MEXE assessment, the bridge can carry a max gross vehicle weight of 32 tonnes and therefore requires a weight restriction of 32 tonnes complying with Road Vehicles (Authorised Weight) Regulations (BD 21 (DMRB 3.4.3)).

### 4.2.2 Substructure

The substructure shows signs damp and saturated blocks though no signs of fractures or significant failures are evident. By qualitative assessment the substructure appears to be satisfactory for vehicles conforming to the Road Vehicles (Authorised Weight) Regulations (BD 21 (DMRB 3.4.3)).

# 5. Conclusions and Recommendations

For the BD21 MEXE assessment the rating for triple axle effects is below 8 tonnes required to obtain a GVW rating of 40/44 tonnes. A weight restriction of 32 tonnes is necessary on the bridge as determined by the BD21 MEXE assessment.

Assignment of the general condition factors for the assessment is somewhat subjective and has a significant influence on the result. The factors used have been based conservatively on the hollow sounding nature of the arch and suspected arch ring separation within the arch barrel. The marginal 32t GVW capacity indicated by the BD21 assessment indicates the bridge could require further restrictions if the condition deteriorates or is found to be poorer than suspected resulting in a reduction of these factors.

The condition of the substructure is deemed to be sufficient for full BD21 loading by qualitative assessment though the condition should be closely monitored with blockwork strength reducing under heavy saturation.

It is recommended that further investigations, such as coring, be undertaken through the arch barrel to determine the internal condition of the arch and provide clarity on the true capacity of the structure.

scoring matrix

# Historical Railways Estate

| | | |
|---|---|---|
| Structure Reference | CFH1/12 | |
| **Public Risk** | | |
| Severity | Medium | 2 |
| Likelihood | Medium | 2 |
| Based On | Recent assessment failure. possible overloading. | |
| Listed? | Yes ○ No ◉ | 0 |
| Maintenance Reqd? | Short-term (1 to 3 years) | 2 |
| Based On | Infilling preferable to repairs. | |
| Future Plans | No plans or proposals | 0 |
| **Public Access** | Subtotal | 6 |
| Vandalism | Unlikely problem site | 1 |
| Flytipping | No evidence | 1 |
| Right of Way | No sign of use | 1 |
| Fencing | Poor | 3 |
| **Action/Notes** | Total | 3 |

Case to be made for infilling.

[redacted]

[redacted]

Signature

| ELR: CFH1 | Structure No: 12 | Mileage: 0m 000ch | Examination date: 03/10/2018 |
|---|---|---|---|
| Route: CHURCH FENTON - HARROGATE | | | OS ref: SE: 455 446 |
| Name: RUDGATE ROAD | | | Type: OVERBRIDGE |

*General view of structure:*

**Examiner comments:**

**SERVICES**

There is no evidence in the HE (HRE) 2015 Health and Safety File, previous examination reports or as noted on site to confirm the presence of any statutory services affecting the structure.

A **Visual Examination** of this structure has been carried out and any deterioration in condition or development of defects or other factors, which might place at risk the public at large, is recorded in the Examiner's Comments section of this document.

**Examined by:**

[redacted]
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**Access Hazards:**

Public access route to the top, fenced & partially in filled to the underneath, bend to road, vegetation may be an impediment at future examinations, consider tree removal, consider rubbish removal, evidence of previous vehicular impact damage to parapet stonework, animal burrows underneath the structure, livestock within the vicinity of the structure, traffic management would be required for any roadside parapet work.

**Recommendations:**

Repair/renew approach fencing to SE - PS £1k.

**Signed by Examining Engineer:** [redacted]

| ELR: CFH1 | Structure No: 12 | Mileage: 0m 000ch | Examination date: 03/10/2018 |
|---|---|---|---|
| Route: CHURCH FENTON - HARROGATE | | | OS ref: SE: 455 446 |
| Name: RUDGATE ROAD | | | Type: OVERBRIDGE |

***Examiner Comments on Structure Condition:***

**General Comments -** Overall condition of the structure is fair.

**Severe Defects -** Mature tree growth within the proximity of the structure. P1.

**New Defects -** N/A.

**Changes to Existing Defects since Last Examination -** Possible further deterioration to the spalling brickwork areas, possible further deterioration to the eroded stonework areas also the vegetation is progressively getting worse. P2 to P4.

**Changes to the Use of the Structure and/or the Surrounding Area since Last Examination -** N/A.

**Evidence of Repair/Maintenance/Investigation Work that appears to have been carried out since Last Examination -** N/A.

**Condition of Approach Fencing/Walling and Risk to the Public -** Overall condition of the approach road fencing/walling is poor, sections in disrepair, missing at the S/E end, close proximity to buildings. *{Uncertain of demarcation}* P5.

**Existence and Condition of Weight Restriction Signs including Advanced Signs -** N/A.

**Existence and Condition of Height Restriction Signs including Advanced Signs -** N/A.

**Existence and Condition of Non - Dedication plates -** N/A.

**New Mortar Tabs, Avongards, Plumbing Points, Pins, etc. Fitted during this Examination -** None installed.

**New Padlock(s) Fitted to Access Gates/Doors during this Examination -** None installed.

**Use of Solum/Track Bed -** Area under the structure is fenced off to the east elevation and partially in filled to the west elevation.

| | | | | | |
|---|---|---|---|---|---|
| **ELR:** | **CFH1** | **Structure No:** | **12** | **Mileage:** | **0m 000ch** | **Examination date:** | **03/10/2018** |
| **Route:** | **CHURCH FENTON - HARROGATE** | | | | | **OS ref:** | **SE: 455 446** |
| **Name:** | **RUDGATE ROAD** | | | | | **Type:** | **OVERBRIDGE** |

***Photographs of structure***

**Photo No: 1 – Mature tree growth: Within of the proximity of the structure.**

**Photo No: 2 – Possible further deterioration: To the spalling brickwork areas.**

| ELR: CFH1 | Structure No: 12 | Mileage: 0m 000ch | Examination date: 03/10/2018 |
|---|---|---|---|
| Route: CHURCH FENTON - HARROGATE | | | OS ref: SE: 455 446 |
| Name: RUDGATE ROAD | | | Type: OVERBRIDGE |

***Photographs of structure***

**Photo No: 3 – Possible further deterioration: To the eroded stonework areas.**

**Photo No: 4 –Vegetation: Progressively getting worse.**

| | | | | | | |
|---|---|---|---|---|---|---|
| **ELR:** | **CFH1** | **Structure No:** | **12** | **Mileage:** | **0m 000ch** | **Examination date: 03/10/2018** |
| **Route:** | **CHURCH FENTON - HARROGATE** | | | | | **OS ref: SE: 455 446** |
| **Name:** | **RUDGATE ROAD** | | | | | **Type: OVERBRIDGE** |

***SPhotographs of structure***

**Photo No: 5 – Approach road fencing: Typical example of the condition at S/E end.**

**Photo No: 6 – Area under the structure: Typical example.**

| ELR: CFH1 | Structure No: 12 | Mileage: 0m 000ch | Examination date: 03/10/2018 |
|---|---|---|---|
| Route: CHURCH FENTON - HARROGATE | | | OS ref: SE: 455 446 |
| Name: RUDGATE ROAD | | | Type: OVERBRIDGE |

***Photographs of structure***

**Photo No: 7 – Arch ring soffit: View.**

**Photo No: 8 – View: Across Structure.**

scoring matrix

# Historical Railways Estate

| | | |
|---|---|---|
| Structure Reference | CFH1/12 | |
| **Public Risk** | | |
| Severity | No significant risk | 0 |
| Likelihood | Low | 1 |
| Based On | Assumption recorded assessment result (1996) remains valid. New assessment in progress. | |
| Listed? | Yes ○ No ◉ | 0 |
| Maintenance Reqd? | Short-term (1 to 3 years) | 2 |
| Based On | Possible infill candidate depending on assessment result. | |
| Future Plans | No plans or proposals | 0 |
| **Public Access** | Subtotal | 2 |
| Vandalism | Unlikely problem site | 1 |
| Flytipping | No evidence | 1 |
| Right of Way | No sign of use | 1 |
| Fencing | Poor | 3 |
| **Action/Notes** | Total | 3 |

No action required pending result of current assessment.

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V 1.009 5/11/2009

Signature

# Historical Railways Estate
# Visual Examination Report

| ELR: **CFH1** | ROUTE: **CHURCH FENTON - HARROGATE** | **Sheet 1 of 7** |
|---|---|---|

| Identification of Structure | Examination Date | Preliminaries |
|---|---|---|
| **OVERBRIDGE**<br>Structure No: **OB 12**<br>Mileage: **000.0000**<br>O. S. Ref: **SE: 455 446** | **20/08/2017**<br>No. of Spans<br>**1** | **Risk Assessment** – The examination was carried out in accordance with the risk assessments in Appendix L of the Generic Method Statement for the Examination of Structures.<br>**Access Route to Structure** – B659, onto unclassified road to Rudgate, park at N/E, descend embankment at S/E parapet end.<br>**Site Issues and Impediments to carrying out repairs, DE's or other works** – Public access route to the top, fenced & partially in filled to the underneath, bend to road, vegetation may be an impediment at future examinations, consider tree removal, evidence of previous vehicular impact damage to parapet stonework, animal burrows underneath the structure, livestock within the vicinity of the structure, traffic management would be required for any roadside parapet work.<br>**Date of Last Examination** – 20/08/2016.<br>**Structure Examined within 12 months?** – Yes.<br>**Reason for Exceeding 12 months interval** – N/A. |
| I certify that I have carried out a Visual Examination of this structure, which appears to be in a satisfactory condition except where recorded in this report.<br><br>Examined by: [redacted] | | |

**GENERAL VIEW**

**Historical Railways Estate**
**Visual Examination Report**
**(Continuation Sheet)**

carillion

| Line: **CHURCH FENTON - HARROGATE** | **Sheet 2 of 7** |
|---|---|

| Recommendations (By the Examining Engineer) | **Examination Elements of:** |
|---|---|
| Repair/renew approach fencing. £1K - P1<br>General masonry repairs and re-point deep open joints. £5K - P2 | **CFH1/12 - 0m 00ch** |
| | **Examination Date** |
| | **20/08/2017** |
| | **Examination Type** |
| | **VISUAL** |
| | **Sundries** |
| | Date Tabs Fitted (**T**/N.) |
| | Fitting & setting combination locks (**C**/No) |
| | Non-Dedication Plates Fitted (**N**/No) |

Signed: [redacted]

STE2/STE6 Examining Engineer [redacted] BEng (Hons) MBA CEng MICE MIAM

**Historical Railways Estate**
**Visual Examination Report**
**(Continuation Sheet)**

| Line: CHURCH FENTON HARROGATE | Structure Identifier: **CFH1/12** |
|---|---|
| | **OB: 12 – Brick arch, stone voussoirs, stone abutments, wing walls, buttress, parapets & pilasters. SE: 455 446.** |

| **Remarks (Refer to parts by name)** | **Sheet 3 of 7** |
|---|---|

**General Comments -** Overall condition of the structure is fair.

**Severe Defects -** Mature tree growth within the proximity of the structure. P1.

**New Defects -** N/A.

**Changes to Existing Defects since Last Examination -** Possible further deterioration to the spalling brickwork areas, possible further deterioration to the eroded stonework areas. P2 to P3.

**Changes to the Use of the Structure and/or the Surrounding Area since Last Examination -** N/A.

**Evidence of Repair/Maintenance/Investigation Work that appears to have been carried out since Last Examination -** N/A.

**Use of Solum/Track Bed -** Fenced off to the east elevation and partially in filled to the west elevation under the structure. P4.

**Condition of Approach Fencing/Walling and Risk to the Public -** Overall condition of the approach road fencing/walling is poor, sections in disrepair, missing at the S/E end, close proximity to buildings. *{Uncertain of demarcation}* P5.

**Existence and Condition of Weight Restriction Signs including Advanced Signs -** N/A.

**Existence and Condition of Height Restriction Signs including Advanced Signs -** N/A.

**New Mortar Tabs, Avongards, Plumbing Points, Pins, etc. Fitted during this Examination -** None installed.

**New Padlock(s) Fitted to Access Gates/Doors during this Examination -** None installed.

Historic England

# Infrastructure: Transport

Listing Selection Guide

# 1 Historical Summary

## 1.1 Up to 1714

The infrastructure for internal communication by land and water remained almost totally undeveloped until the mid-seventeenth century and widespread improvements did not occur until the eighteenth. Road transport in the medieval and early modern periods was slow and cumbersome – it was considered fast in the fifteenth century for information to travel by land from Devon to East Anglia in five days; St Albans was a day's travelling distance from London. Road improvement depended upon the initiative of the church, charitable individuals or institutions, and usually took the form of bridges and causeways; some municipalities paved portions of their principal streets. Early improvements in the internal waterways network include the building in 1564-6 of the five-mile long Exeter ship canal; most investment went into drainage rather than navigation.

## 1.2 Georgian

The period saw the beginning of a transport revolution. Turnpike roads, which levied tolls from travellers to finance road improvements, were a pre-condition of industrialisation and economic development. They were established in the 1660s, but the main period of growth took place in the next century: the principal arterial roads out of London were turnpiked by 1750 and the greater part of the network of main roads by 1780. By 1800, 4,000 turnpike trusts controlled 22,000 out of 105,000 miles of highway, and toll houses were common. By 1835 there were 14,000 regular wagon services nationally and the stagecoach service between London and Birmingham rose from one a week in 1740 to 34 a day by 1829. All of this was further facilitated by improvements in bridges and surfacing, notably the graded and cambered stone surfaces pioneered by John McAdam. Many completely new stretches of road were constructed in the early nineteenth century and these are often of considerable engineering interest. From 1862 turnpikes came to be administered by Highways Boards and entered the public domain. Tram or wagonways – early railways, for the local carriage of coal and the like from mines and quarries – which had begun in the early seventeenth century, expanded especially in industrial areas, as did packhorse routes, which received many new bridges between 1660 and 1740. Engineer James Brindley's Bridgewater Canal (1759-61), whilst not the first canal in England, sparked off the *canal age* that saw 4,000 miles of canals in place by 1850 (Fig 1). Building activity reached its height in the 1790s – canals continued to operate well into the railway era – but the network was mostly complete by the 1830s and underwent little expansion thereafter.

## 1.3 Victorian and Edwardian

The key development in land communication in this period was the railway, followed by the tram, both forms of transport taking over from vehicles – carts, carriages, gigs, and so forth – previously pulled by the horse, which was gradually eclipsed during the period. The railway was the culmination of the transport revolution, and was to have major consequences in economic, social and cultural terms. Its origins lay in the Georgian period, but the railway system's development was one of the greatest achievements of the Victorians. Its history falls into four distinct phases. The pioneering first phase extends from the opening of the Stockton to Darlington (1825) and Liverpool and Manchester (1830) Railways (both George Stephenson) to the completion of

Figure 1
Bridgekeeper's House, Fretherne Bridge, Fretherne, Gloucestershire. One of a series of classically-inspired houses along the Gloucester-Sharpness canal of the early nineteenth century. Probably designed by Robert Mylne who had acted as Surveyor to the company in 1793. A high degree of architectural interest and individuality is given to what is more usually an unremarkable building type. Listed Grade II.

the Great Western Railway from London to Bristol in 1841. The second phase runs from 1841 to 1850, and marks the heroic age of railway building and the period of 'railway mania' in which commercial speculation and the competition for routes led to the frantic construction of lines, including the Great North Railway and the laying of many of the main trunk lines that form the basis of today's inter-city network. The third phase, from the 1850s to the 1870s, saw the consolidation of the network including the opening of the dramatic Settle to Carlisle line, carrying the Midland Railway into Scotland.

The fourth period runs up to 1914, and saw the completion of the network. Railway stations developed alongside the network as a distinct building category, and combined engineering audacity with architectural sophistication to produce monuments to a new age.

London was the first city in the world to have an underground railway: the Metropolitan Railway (opened 1863, Sir John Fowler, engineer) was of cut and cover construction. The first underground electric 'tube' train service (now part of the Northern Line) opened in 1890 but a variant of the technology that made this possible – the tunnelling shield – had previously been used by Marc and I K Brunel when constructing a foot tunnel under the Thames at Rotherhithe in 1825-43. Tunnels were an essential component of the railway network from the beginning: the Severn Tunnel (1873-86, T A Walker) remains one of the outstanding feats of railway engineering. Some, for instance on the Great Western and the London and Birmingham lines had elaborate portals, creating architectural statements of great power.

Horse-drawn omnibuses appeared in the 1820s, horse-drawn trams in the 1860s and electrified trams from 1880s. Taking over from the horse-tram, the electric tram was introduced from 1883 and its operations brought about large-scale changes to city centres through the need for road widening and exceptionally, as on London's Kingsway, underground tunnels. Local Improvement Acts allowed the expansion of this new form of urban transport which in its wake created tram shelters (for both passengers and staff), generating stations, sub-stations, and bridges, together with large maintenance depots and tramsheds.

## 1.4 Twentieth century

The twentieth century saw revolutionary strides in road and air transport. Motor cars appeared in the 1880s though more significantly, the first petrol-powered cars were imported in 1895. Then in 1896, the four miles an hour a speed limit (determined by the maximum speed of the it will be the overall complex: on other occasions, it will only be elements which possess special interest. This should be made as clear as possible in all List entries.

Individual buildings must be assessed on their own merits. However, it is important to consider the wider context and where a building forms part of a functional group with one or more listed (or listable) structures this is likely to add to its own interest. Key considerations are the relative dates of the structures, and the degree to which they were functionally inter-dependent when in their original uses.

## 2.1 Bridges

Most pre-1850 bridges, where substantially intact, will warrant serious consideration for listing (Fig 2). Where they have been subsequently altered or modified they may still merit serious consideration where the modifications reflect the evolution and development of a particular route, but the extent of alteration and intrinsic interest will require careful analysis. Monumental bridges, or bridges that display significant technological innovation, may warrant listing in a higher grade. The rapid increase of transport projects for turnpikes, canals and railways created the need for standardised and less spectacular bridges: for these, greater selection will be required.

Regarding bridge technology, it is worth remembering that the eighteenth century marked the high point in the theory and practice of masonry bridge construction: Robert Mylne's Blackfriars Bridge of 1760-9 (demolished) represented its acme. But increasing demand required quicker solutions. Timber bridges and viaducts, once quite common but subject to unavoidable deterioration, are now extremely rare. Arched iron bridges (the first – now a Scheduled Monument and Grade-I listed building – being constructed at Ironbridge, Shropshire, 1777-81, by the ironmaster Abraham Darby) were widely adopted in the early nineteenth century but a series of failures rendered cast iron risky for

**Figure 2**
Grosvenor Bridge, Grosvenor Road, Chester. When designed in 1824 by Thomas Harrison the 200-foot single span of the Grosvenor Bridge was one of the longest in the world. The architect took care to provide separate passage for pedestrians and coaches at riverbank level. Listed Grade I.

Figure 3
A slender concrete footbridge to unite town and gown in the ancient cathedral city of Durham. Designed by Sir Ove Arup in 1963, its dramatic silhouette is complemented by the careful detail on a human scale. Listed Grade I.

major spans after 1847 (although many smaller and ornamental bridges continued to be built). Engineers turned more to metal truss bridges from the 1820s (combining small interconnecting members, some in compression, others in tension) and suspension bridges (Telford's over the Menai Straits of 1826 was among the earliest). Age, degree of survival and design interest will be the main determinants for listing, and some bridges will clearly warrant designation in an upper grade. Many bridges were major projects of civic improvement, and were often conceived on a grand scale: architectural treatment can thus be a key consideration, alongside engineering interest. Concrete for bridges was used from the late nineteenth century (mass concrete first used in 1877, reinforced in 1901); design quality as well as earliness of date and influence will be the key determinants of designation-worthiness (Fig 3). The first major use of steel (as opposed to wrought iron) in British bridges is the Forth Bridge (1890) and it came to predominate in the twentieth century in the form of box girder and suspension bridges. The general availability of pre-stressed steel and arc welding allowed for more elegant and slender bridges from the 1950s – some of the best are small footbridges in sensitive settings, such as the Garret Hostel bridge (listed Grade II) at Cambridge of 1960 by Guy and Timothy Morgan – and some post-war bridges are of note in their use of high-quality detailed concrete finishes and refined engineering. Structural and aesthetic considerations will determine their listability.

## 2.2 Specialised canal structures

The canal network was largely in place by the 1830s and most canal buildings surviving in anything like their original form from before that date deserve serious consideration. Because of the lack of modernization along the canal network, the survival rate is remarkably high for some types of structure although bridges and locks, the ones most frequently found, have often been subject to radical repair or rebuilding. There are two essential divisions which characterise canal bridges: one is whether they are fixed or movable – the latter can be swing bridges, as seen in the series of listed late nineteenth-century bridges over the Manchester Ship Canal, or bascule bridges (drawbridges) – the second is whether they carry public roads or provide access between private estates divided by a canal (in which case they are known as accommodation bridges). The latter were quite often movable. Aqueducts are the most spectacular of all canal structures, displaying both high architectural quality, engineering boldness and technological innovation in the form of cast-iron troughs: Longdon Aqueduct (Shropshire) (by Thomas Telford, 1795-6; listed Grade I) is among the earliest use in England of such features. Almost all surviving examples are already protected; later examples which have avoided listing will be assessed on the basis of age, degree of survival, design interest and group value. Locks, usually of the pound type (the first in England was on the Exeter Canal, 1564-6), are listable if appreciable parts of the original stone pound walls (and associated surfaces) survive; lock gates will rarely be early as they require regular renewal, and appropriate allowance must be made. The same emphasis on authenticity of fabric applies to tunnels: the first, near Preston, was opened in 1775. Age, degree of survival and the design interest of the portals will determine eligibility. Inclined planes to lift vessels out of the water, usually by means of caissons (also associated with early railways), were introduced on the canal system in the 1780s but most extant examples are late nineteenth century and tended to be short-lived; intactness (or otherwise) will be a key determinant. Boat lifts (that at Anderton, Greater Manchester, completed 1872-5, being the first) proved similarly uneconomic and accordingly are rare. Some of the more monumental structures – including the Anderton Boat Lift - and some lengths of relict canals are Scheduled Monuments.

Canal warehouses range from massive complexes like Ellesmere Port (Cheshire) to small individual warehouses such as those along the Grand Union Canal via the early specialised warehouses serving the Bridgewater Canal in Manchester. These can possess group value with other canal elements, and are eloquent reminders of transport's role in the Industrial Revolution. Settlements like Stourport (Worcestershire) grew up in the later eighteenth century, with new sorts of canal-related buildings creating a new form of settlement. Repair and maintenance yards, often linked to canal company offices, seem more susceptible than other canal structures to unsympathetic development: intact examples should be carefully assessed as to whether any of their boathouses or workshops are of particular interest. Stables were a necessary adjunct to these yards and warehouse complexes. Lock keeper and bridgeman's cottages range from unremarkable structures which could as readily be considered as typical houses of the period to distinctive, sometimes quite sophisticated pieces of 'polite' architecture (as with tollhouses) which sometimes share a company style such as the Neo-classical cottages on the Gloucester-Sharpness canal. Mileposts and toll offices are normally eligible for listing, particularly when they have a clear visual relationship with the canal.

## 2.3 Specialised railway structures

Railway buildings and structures fall into three broad categories. First, there are the new building types, invented specifically for the railways. Second, there are engineering works such as tunnels with their portals, cuttings and their retaining walls, bridges and viaducts. Third, there are building types that were adapted for railway use: these include warehouses, offices, engine and goods sheds, carriage works, stables and railway workers' housing.

When it comes to purpose-built railway structures, most pre-1850 buildings will often be of international significance as being among the earliest railway structures in the world, and even partial survivals need to be assessed carefully. The 1840s saw a massive expansion in the network and while the Italianate style was initially favoured, many designs were eclectic and realised in a variety of styles. Great care should be taken in seeking out work of this date because it is often hidden by later alterations and extensions.

Increasingly rigorous selection is required for buildings after about 1860: this reflects both the quantity of what remains, and the standardisation of design which was applied to buildings and structures erected along different railway lines. A number of factors should be taken into account when assessing buildings of the second half of the nineteenth century, which have often undergone considerable replacement (greater significance having been attached to the first-generation railway buildings). Railway companies had different approaches to construction and different house styles and, where possible, a representative sample of structures from each company should be listed if the architecture is distinctive. Some are rarer than others, such as the later Victorian 'Domestic Revival' stations designed for the Great Eastern Railway in East Anglia from the 1880s. Other regional factors may be relevant too – surviving smaller station buildings in urban areas such as Lancashire, Yorkshire, and Tyneside are very thin on the ground due to the de-staffing of stations and subsequent demolition in the 1970s. As with industrial buildings generally, group value can be a key determinant. Some stations and goods yards need to be assessed as a whole, especially where they demonstrate the phased evolution of the railway system, through alteration and extension. Rarity will always be a factor in listing assessments: for instance, attrition rates for some later Victorian railway buildings have been high, and it is not simply a question of 'the older, the better'.

### Railway stations

These are among the icons of the modern industrial age (Fig 4). The first surviving example in the world is the former Liverpool Road railway station (and station master's house), Manchester, of 1830 (listed Grade I), designed by George Stephenson and resembling a terrace of smart town houses. The great termini and city stations were elaborate structures with massive train sheds that spanned several platforms and were fronted by prestigious hotels (see the Commerce and Exchange Buildings selection guide). Most are listed, sometimes at a high grade. By contrast, minor stations and other wayside buildings built pre-1850 were often quite plain and modest in their design. Multi-

**Figure 4**
The former Monkwearmouth railway station, Sunderland, designed for the York, Newcastle and Berwick Railway Co. in 1848. A building of considerable dignity now used as a museum following closure of the line. It retains much of its interior and the listing includes a later cast-iron footbridge attached to the rear of the station. Listed Grade II*.

phased stations can be of special interest as well, but judgment will be needed as to the coherence of the ensemble, and the claims of the component elements. Architecture and design quality, technical or construction interest, date, and extent of alteration will be key issues. Twentieth century stations can sometimes possess considerable architectural presence: of two stations designed for Southern Railways, Ramsgate, Kent (1926, designed by Maxwell Fry; listed Grade II; Fig 5) represents the classical approach, while Surbiton, Surrey (1937; also listed Grade II) the streamlined inter-war style. Oxford Road, Manchester (1959-60; listed Grade II) demonstrates that the structural boldness of Victorian stations continued to be an aspiration in the post-war period after rail nationalisation: here, British Railways commissioned the Timber Development Association to come up with a dramatic laminated timber roof of three conoid shells. Smaller stations comprising the main station building sometimes with staff accommodation, canopies, waiting shelters, footbridge, signal box and goods shed, survived in vast numbers at the beginning of the twentieth century but have suffered grievously from attrition and clearance. Timber buildings, especially waiting shelters, are maintenance-heavy and easily vandalised, and have consequently been very susceptible to replacement in recent years and are becoming increasingly rare. Reasonably complete ensembles, such as Ockley & Capel (Surrey; listed Grade II), a station of 1867 for the London, Brighton and South Coast Railway, may merit overall listing since they are now so rare: extra care needs to be taken to ensure that less obvious ancillary structures are fairly considered, alongside principal station buildings.

### Engine sheds

These came in two principal forms – the circular, or roundhouse, and the through shed. Most have had their roofs completely renewed in the twentieth century; any shed with an original roof will be particularly rare.

### Railway bridges and viaducts

The English railway system was constructed across a busy and often undulating landscape, necessitating the construction of many bridges


Figure 5

Ramsgate Railway Station, Kent. An unusual foray for railway station architecture into the neo-Georgian style and designed to resemble an enormous orangery or garden building. A notable early work (1924-6) by one of the later proponents of the Modern Movement in England, E Maxwell Fry, acting as chief assistant to J R Scott, the Southern's Chief Architect. Listed Grade II.

and viaducts. Up to the 1880s, many of these bridges were executed in masonry or brick. Early examples shared a lot in common with canal and road bridges, and often sport careful masonry in their detailing: date, degree of survival and design will be the principal considerations, while for later bridges it will be engineering interest which is a key determinant. In terms of iron bridges, wrought iron replaced cast iron for larger structures following the collapse of the Dee Bridge, Chester, in 1847. Iron in general was superseded very rapidly by steel in the late nineteenth century for bridges (the Forth Bridge of 1890 was the first use of steel for a major bridge) and indeed, following the collapse of a cast iron bridge at Norwood (London Borough of Croydon) in 1892, there was a major programme of replacing cast iron bridges of all kinds. So iron is very much a mid-nineteenth century material, and as there are now so few survivors, probably any substantial wrought iron bridges would be of interest.

The best listed viaducts are notable feats of engineering, striking in the landscape. A significant number are listed, 33 at Grade ll* and four at Grade l. As with other railway buildings, those erected before 1850 will be serious candidates for listing, but increasing selectivity is necessary for later periods. Modest standard designs, replicated by the various railway companies, are unlikely to be of special interest. Degree of survival is important, but such structures are regularly repaired and allowance for a reasonable level of replacement fabric should be made. Where viaducts are early in date, on one of the pioneering lines such as the Liverpool and Manchester, and designed by one of the great railway engineers such as the Stephensons, Brunel or Locke, listing at a higher grade should be considered. Maidenhead viaduct (listed at Grade ll*) in Berkshire, for example, was constructed in 1837-8 and was designed by I K Brunel. The Sankey viaduct (listed Grade l), in St Helens, Merseyside, by George Stephenson, erected in 1830, is the earliest such structure in the world. The aesthetic quality of the structure as a whole and the detail of the design are also a consideration. The 1841 Twemlow viaduct (listed Grade II) in Cheshire is relatively plain with a dentilled cornice beneath the parapet and vermiculated stone bands to the piers. However this, together with its stately 23 arch span, gives it special interest. The 1858 Hownes Gill viaduct (listed Grade ll*), in Durham, has 12 elegant brick and ashlar arches on slender tapering piers, and is an imposing 150 feet high at the mid point. The 1839-40 Stockport viaduct (listed Grade ll*) in Cheshire extends for a magnificent 27 arches, all in red brick. Hawthorne Dene viaduct (listed Grade ll) in Durham is a relatively short six-arch structure of 1905, in brick and concrete, but has an elegant design with a giant central span and blind roundels in the spandrels. Iron viaducts are likely to be of interest. Early examples are decidedly rare – the best, such as Belah (Cumbria), have been lost. Even later examples, such as the 1877 iron and concrete Bennerley viaduct (listed Grade II*) in Derbyshire, may be of interest if innovative.

**Figure 6**
Birmingham New Street Signal Box, Navigation Street, Birmingham. A dramatic tour-de-force of the Brutalist style, opened in 1964, which gave the railway signal box typology a new lease of life in post-war England. Making clever use of a difficult site the architects Bicknell and Hamilton (with R L Moorcroft) created a building at once functional and iconic. Listed Grade II.