



Structural Survey Report

Client

Fairbank Investments

Project 3810


Coal Drops Penistone

Castree Limited

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CONTROLLED DOCUMENT

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For the avoidance of doubt, the parties confirm that these conditions of engagement shall not, and the parties do not intend that these conditions of engagement shall confer on any party any rights to enforce any term of this Agreement pursuant of the Contracts (Rights of third Parties) Act 1999.

The appointment of Castree Ltd shall be governed by and construed in all respects in accordance with the laws of England & Wales and each party submits to the exclusive jurisdiction of the Courts of England & Wales.

CONTENTS

CONTENTS.....	i
1. INTRODUCTION.....	1
2. NATURE OF THE INSPECTION.....	1
3. SITE AND GENERAL BACKGROUND.....	1
4. OBSERVATIONS.....	4
4.1 Coal Drops.....	4
4.1.1 <i>Timber beams over coal drops:</i>	4
4.1.2 <i>Bay 1:</i>	5
4.1.3 <i>Bays 2-5:</i>	7
4.1.4 <i>Bays 6:</i>	7
4.2 Adjacent structures.....	10
4.2.1 <i>Existing retaining wall:</i>	10
4.2.2 <i>Regency House:</i>	12
5. CONVERSION OF STRUCTURE.....	13
5.1 Slabs over coal drops.....	13
5.2 Rear basement access to coal drops.....	14

1. INTRODUCTION

- 1.1 Castree have been asked by Fairbank Investments Ltd to inspect and carry out a structural appraisal of the historic coal drops railway structure, located near Stottercliffe Road, Penistone.
- 1.2 Paul Harrison of Castree attend site on 05 September 2024 to carry out the inspection. Weather conditions were light rain and overcast.
- 1.3 Photographs were taken and are included in the body of the report.

2. NATURE OF THE INSPECTION

This Report details a partial structural inspection as defined by the Institution of Structural Engineers and should not be considered as a comprehensive appraisal of structural condition or stability; it deals solely with the matter referred to within it. It is prepared specifically for yourselves as our Client for your confidential use; and we bear no liability to any third party for its content. If necessary, it may be reproduced for the purposes of obtaining quotations for remedial works or issuing to advisors. All comments made are with reference to the structure and are not intended to indicate or imply any financial valuations. Only areas which were safely accessible were inspected.

You will appreciate that it was not possible to inspect those parts of the structure that were covered or inaccessible and thus we are unable to report that any such part was free from defect; neither have we inspected any part of the structure that is not mentioned in this report. Our survey consisted of a visual examination carried out from ground level and from the top of the arches. Where distress has been described in detail it is to indicate the nature and extent and should not be considered exhaustive.

3. SITE AND GENERAL BACKGROUND

- 3.1 The structure is located on Stottercliffe Road adjacent to the roundabout where Market Lane and St Mary's Street meet in Penistone.
- 3.2 The coal drops were constructed in 1845 and the structure is grade II listed.
- 3.3 A signal house is located to the west of the coal drops structure, referred to as Regency House on the survey drawings provided.
- 3.4 The drops and signal house are constructed in sandstone masonry.
- 3.5 The structure is close to but not within a coal mining development high risk area.
- 3.6 British Geological Survey GeoIndex Onshore records show the existing ground to be Pennine Lower Coal Measures Formation - Mudstone and siltstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period. It is likely a layer of clay will be present over the bedrock.

- 3.15 The western retaining wall of the structure continues to the south in front of the arches and curves around the corner to the west. It appears to support the east and south walls of the signal building.
- 3.16 The signal building (Regency House) is of traditional sandstone and brick masonry construction, with timber floors and roof.
- 3.17 To the east of bay 6 is a buttressing masonry pier measuring approximately 1250mm x 2000mm. The wall behind the pier is curved on plan and of substantial thickness, and connects to a disused railway bridge over the B6462. A masonry retaining wall extends in front of the pier, retaining the hardstanding in front of the coal drops.

4. OBSERVATIONS

4.1 Coal Drops

4.1.1 *Timber beams over coal drops:*

- a) The timber beams are dilapidated, having undergone significant timber decay caused by wet rot. The southern beam has been completely removed exposing the bare earth topping the arches. See Photo 1.



Photo 1

- b) The beams and particularly the buffers are at risk of further collapsing into the coal drops. The remains of the buffers can be seen in Photo 2.



Photo 2

4.1.2 Bay 1:

- a) The west wall of bay 1 retains the earth behind the wall. Within the coal drops the wall has undergone some displacement. The displaced masonry can be seen in Photo 3. It is likely the timber beams were restraining the head of the retaining wall, and the removal of some of the beams has resulted in the partial failure of the masonry.
- b) The failure of the masonry appears to have only partially affected the wall, with a section between the remaining timber beams at high level having displaced forward at the bed joints.
- c) It may be the upper section of the wall can be rebuilt, without having to rebuild the lower section. The masonry units could be dowelled together during rebuilding, using stainless steel dowels, to prevent a repeat of the same type of failure occurring. If the wall is to be extended in height as part of the proposed scheme, a trial pit should be excavated to the rear to determine the existing construction and determine whether additional strengthening works are required (see section 5 on the conversion of the structure).
- d) It is proposed to introduce a suspended slab over the open coal drops. This would permanently prop the head of the wall and help prevent a recurrence of this type of failure.
- e) The arch structures are in an overall sound condition with no signs of displacement, but require repointing with a suitable lime mortar, as do the walls.
- f) The inner walls supported by the front barrel vault retaining the fill on top of the vaults requires rebuilding, see Photo 4. It is likely some of the masonry here was originally retained by the timber beam which has been removed.
- g) The wall supported by the rear barrel vault retaining the fill requires partial rebuilding, see Photo 5.

- h) The wall between Bay 1 and Bay 2 is plumb. The top of the wall is weathered, but could be consolidated with new mortar and relaying of loose bricks to support a suspended slab. See the right hand side of Photo 5.



Photo 3



Photo 4



Photo 5

4.1.3 Bays 2-5:

- a) Bays 2 to 5 are all of a similar condition.
- b) Typically the masonry subdividing walls between the bays are plumb. The tops of the walls are weathered and will need to be consolidated with new mortar and relaying of some masonry.
- c) The walls between the bays will be suitable for supporting the proposed suspended slab (see Section 5).
- d) The walls and arches require repointing.
- e) Some of the masonry walls built on the internal face of the barrel vaults to retain the soil fill on top of the arches require rebuilding or partial rebuilding.

4.1.4 Bays 6:

- a) The front arch of bay 6 has partially failed with a significant vertical displacement present. The buttressing pier to the east side of the arch is leaning at a gradient of approximately 25mm lateral displacement per 1000mm height. See Photo 6. The displacement has caused some of the masonry above the arch to crack.



Photo 6

- b) The cause of the vertical deformation of the arch and the lateral displacement of the pier is likely due to one or a combination of the following causes:
- The pier may have insufficient mass to resist the lateral thrust from the arch, which is relatively flat, so is likely to generate a significant thrust even for a relatively short span such as this.
 - The pier may have been pushed over by the repeated impact force of the coal wagons striking the buffers.
 - The pier may have inadequate foundations or be supported on ground which is too soft to adequately support the bearing pressures applied.
- c) The rear vault also appears to be slightly distorted toward the front of the arch, which is likely to have a similar cause as the displacement of the arch above, but to a lesser extent, as the wall below appears to be relatively plumb. See Photo 7.
- d) The east wall of the bay has a large diagonal crack at an articulation or yield line where the wall to the south of the crack has moved laterally eastward relative to the section to the north. The crack is clearly visible in Photo 8. The crack does not appear at the other side of the wall, but this could perhaps be expected, as the far face of the wall would be in compression due to the movement of the attached pier, rather than tension at the inner face where the crack has appeared, as the wall has little capacity to resist tension. Alternatively, the wall may be soil filled, and only the inner face has moved.



Photo 7



Photo 8

- e) We do not consider any special works other than repointing are required for the rear arch.
- f) There are options for the remediation of the front arch. These are listed as follows:
 - If the arch and buttressing pier can be justified as stable by calculation, the pier can be retained in its current leaning form, and the arch be rebuilt to its original height. New arch stones would be required as the opening will be slightly wider than it was originally. The temporary stability of the adjacent arch would need to be considered and the supporting wall would probably need to be propped during construction.

- If the arch and buttressing pier can be justified by calculation, they could both be taken down and rebuilt to their original position, using the same construction as the existing. A new foundation will likely be required for the pier, and part of the adjacent wall may also need to be rebuilt.
 - If the existing pier has insufficient mass, and cannot be justified by calculation to resist the thrust from the arch, it would need to be taken down and rebuilt with a new foundation of sufficient size and mass to resist the overturning moment generated, with a reinforced concrete column constructed within the core of the wall, in place of the existing rubble fill. The cantilevering concrete column within the pier would resist the thrust from the rebuilt arch.
- g) To determine the suitability of any of the above options, some intrusive site investigation works would be required to determine the size of the existing pier foundation, as well as the competency of the supporting ground, and the size of pier required to prevent a similar failure recurring. This would probably involve a trial pit within the public highway, and possibly a window sample. Permission from the council would be required to carry out the works. For the options where the existing pier is retained, underpinning may be required.

4.2 Adjacent structures

4.2.1 Existing retaining wall:

- a) The existing retaining wall between coal drop bay 1 and regency house is deformed, with a prominent bulge, increasing toward the top of the wall. See **Error! Reference source not found..**
- b) The cause of the failure of the wall isn't clear, but it could be related to the rusting pipe built into the wall. Volumetric expansion of the corroding iron/steel may have pushed the joints apart and weakened the wall, contributing to the failure. See Photo 10.



Photo 9



Photo 10

- c) The wall appears to have failed to a significant height, and should locally be taken down and rebuilt between the coal drops and Regency House.
- d) The masonry wall may need to be increased in thickness, or backed with a reinforced concrete retaining wall to comply with modern design standards, and prevent a similar failure happening in future.
- e) The adjacent regency house may need to be locally underpinned to maintain stability of the north wall whilst the wall is taken down and rebuilt, depending on the depth of the existing foundations.

4.2.2 *Regency House:*

- a) A small crack is visible to the lower east corner of the north wall, where the building appears to be constructed on top of the retaining wall. The crack may have been caused by the partial failure and associated deformation of the adjacent section of retaining wall. The crack is not currently of concern from a structural point of view, but may worsen over time if the adjacent retaining wall failure is not addressed. Movement also appears to have occurred between a coping stone and the corner stone of the building wall. See Photo 11.



Photo 11

- b) Inside the building the inner brick facing of a stone mullion at the ground floor to the rear of the building has poor pointing and it is not clear whether or not the brickwork is tied to the stone mullion. It was probably originally bonded to the stone with mortar, but the bond has since failed. The brickwork does not appear to be particularly secure, and it should be tied to the stone mullion. This could be achieved by repointing the masonry, filling the gap between the stone mullion and the bricks with new mortar, and securing the brickwork to the stone with some side fixed cut down galvanised steel restraint straps. See Photo 12.



Photo 12

5. CONVERSION OF STRUCTURE

5.1 Slabs over coal drops

- 5.1.1 It is proposed to install new suspended slabs over the coal drops to form a terrace. As mentioned earlier in the report, the main walls separating the bays are of substantial thickness, show little sign of settlement and clearly have sufficient capacity to support a new suspended slab.
- 5.1.2 The walls may need to be extended in height slightly to achieve the required level for the new slab.
- 5.1.3 Where the new terrace extends over the existing arches, the walls retaining the soil fill will need to be repaired/rebuilt.

5.1.4 It may be a sensible approach to continue the suspended slab over the arches so that a consistent imposed load allowance can be made across the entire area of the terrace. This way loading from emergency vehicles or construction loads can be catered for, without the need for undertaking a more detailed analysis of the capacities of the arches, which are of relatively shallow construction.

5.1.5 A terrace balustrade could be fixed to the new RC slab, or the front parapet stones could be secured into the slab such that they have the capacity to restrain the balustrade, which would likely need to be designed to resist a significant 3kN/m (300kg per linear m) lateral load.

5.2 Rear basement access to coal drops

5.2.1 It has been suggested as part of the redevelopment it is likely to be necessary to construct a basement to the new building to the north of the coal drops, giving access to the rear of the coal drops.

5.2.2 The rear wall of the coal drops could likely be excavated to the required depth without compromising the overall structural integrity of the structure. A masonry or in-situ reinforced concrete wall could then be constructed behind the existing stone walls, forming a foundation for the walls of the new building and consolidating the existing.

5.2.3 Alternatively, it may be possible to construct the new walls directly on top of the existing rear wall of the coal drops, depending on the size and bearing strata of the foundation. Underpinning could be carried out if necessary. If this is to be explored further it would be worthwhile excavating a trial pit to the rear of the wall so its construction can be confirmed, and any strengthening works detailed at an early stage.

5.2.4 Openings could be made within the rear wall of the coal drops with the walls propped and lintels installed to form the permanent structural openings.

5.2.5 It would be possible to construct walls forming parts of the new building over the coal drops as part of the scheme. The new suspended slab over the coal drops openings could be designed to carry the weight of the new masonry and steel construction to be supported, see Figure 2, with the supported load locations identified in red. The coal drop bay stone dividing walls are substantial and would have sufficient load bearing capacity to support point loads from walls supported above. Again the existing foundations would need to be investigated to determine the size and bearing strata. Localised underpinning could be carried out if necessary, but it seems likely this will not be required.



Figure 2

We hope our above comments are clear. Should you have any question or require any further information or clarification, please do not hesitate to contact us.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Paul Harrison'.

Paul Harrison

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