

King's Cross Station: Clock Tower Repairs



Listed Building Consent Application
Rev A 19/03/2015

JOHN MCASLAN + PARTNERS

the 1970s, the 1980s and the 1990s, and the 21st century. The first two phases are characterised by the 'old' and 'new' paradigms, and the last three phases are characterised by the 'old', 'new' and 'emerging' paradigms.

The 'old' paradigm is characterised by a focus on the user's information needs, and the 'new' paradigm is characterised by a focus on the user's information-seeking behaviour. The 'emerging' paradigm is characterised by a focus on the user's information-seeking behaviour, and the 'old' paradigm is characterised by a focus on the user's information needs.

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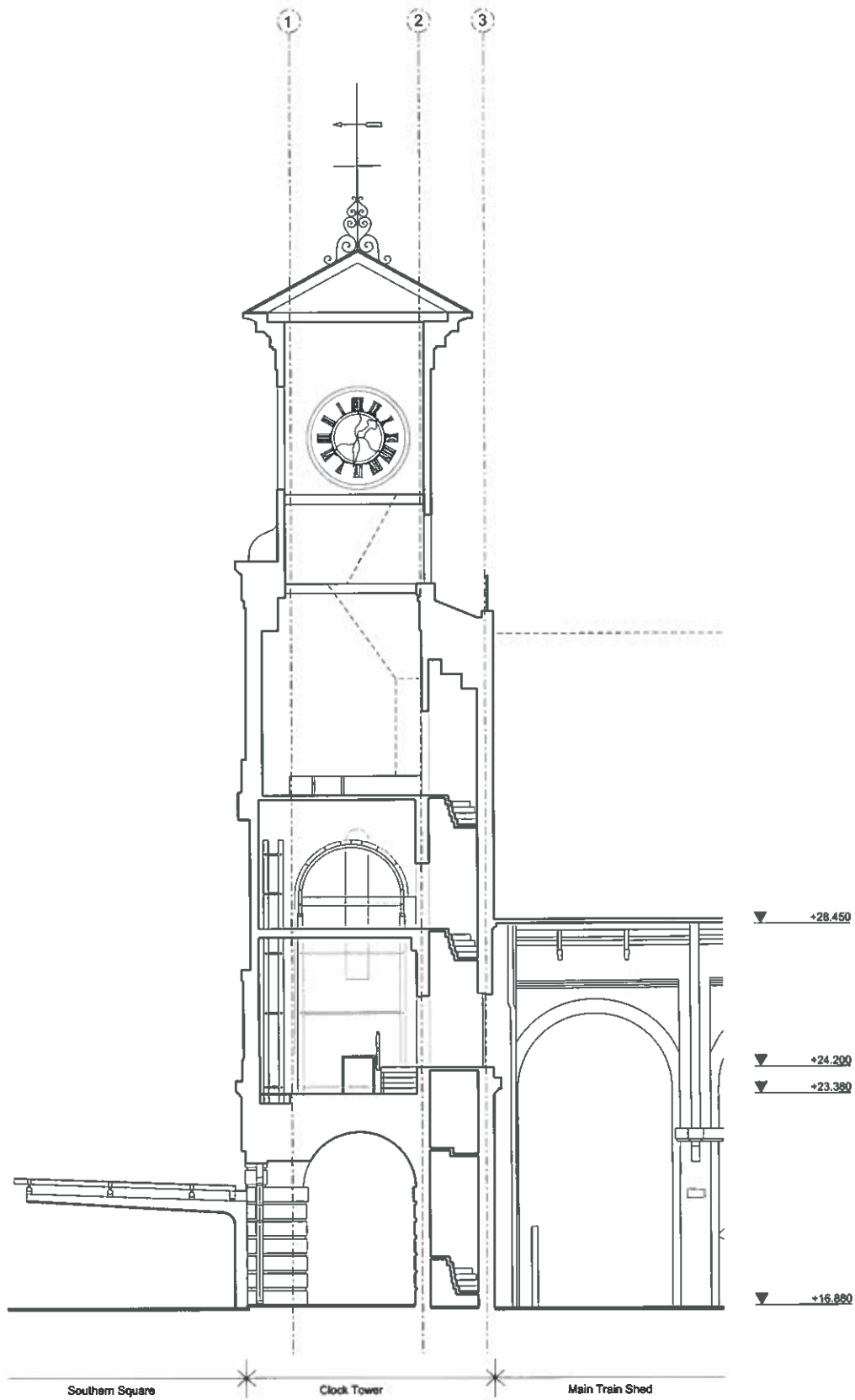
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Section through the Clock Tower stairs

1 Introduction

1.1 Purpose of the Submission

This document has been prepared for an application for listed building consent for the repairs to the Clock Tower stair.

1.2 Contents of the Report

Section 2.0 of the report contains historical information about the station.

Section 3.0 of this report describes the relevant works with regard to the Clock Tower.

Appendix A contains the location map

Appendix B contains the contractor's method statement for the works.

Appendix C contains data sheets for the stone replacement.

1.3 Justification

The proposal involves repairing a broken, dangerous step and removing the delaminated material on the underside of the rest of the staircase so that the condition of the other treads can be assessed for damage. The works are needed to ensure the stair is not damaged further and can continue to be used for maintenance access to the tower and roof.

2 Understanding the Asset

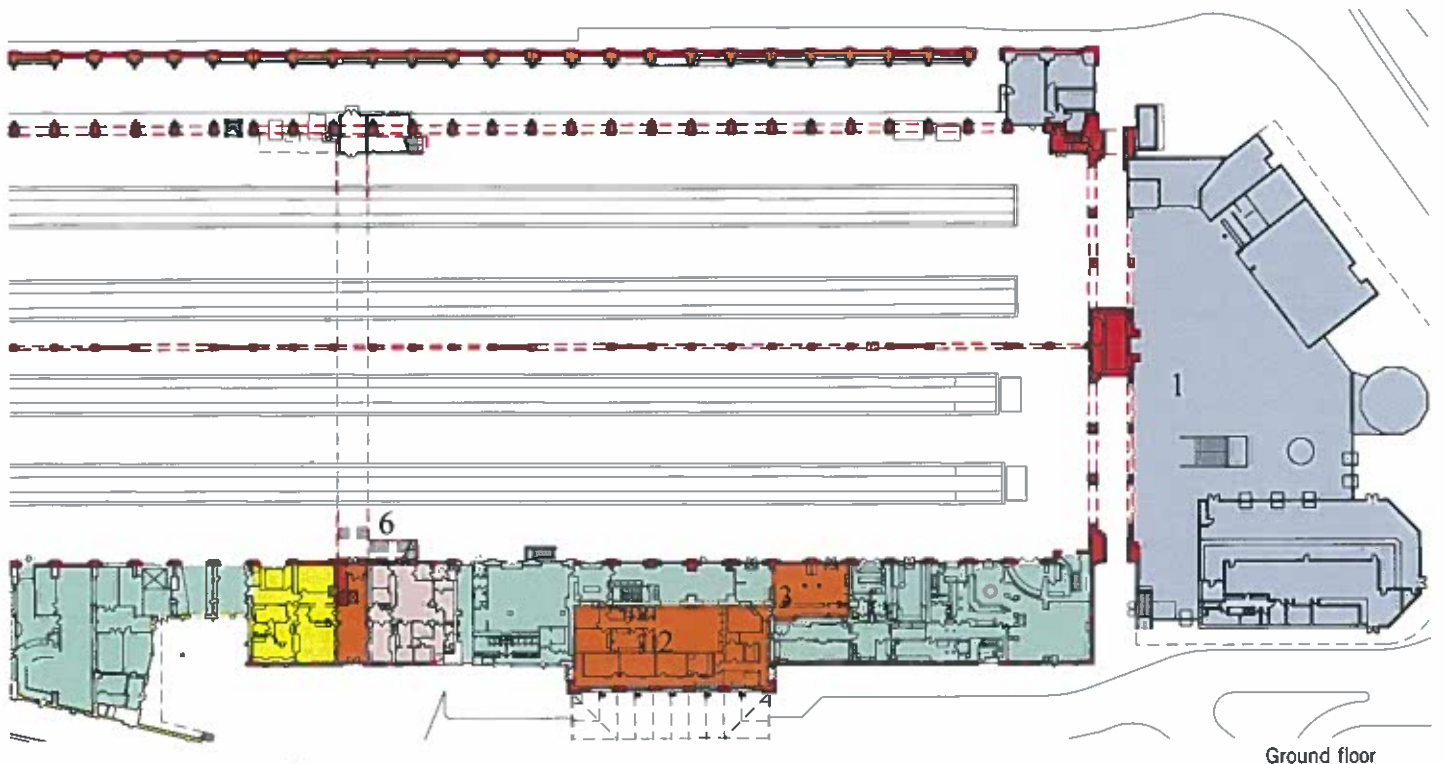
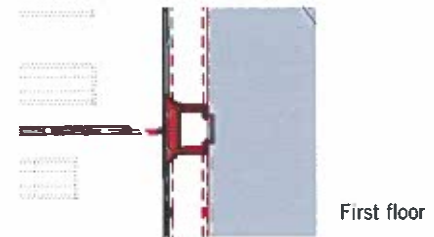
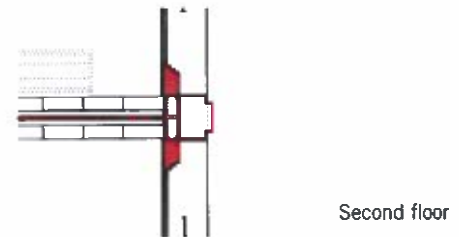
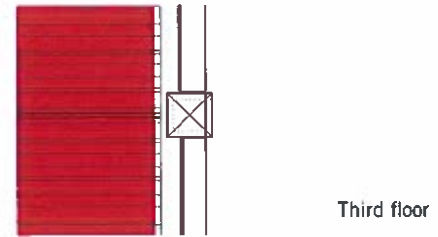
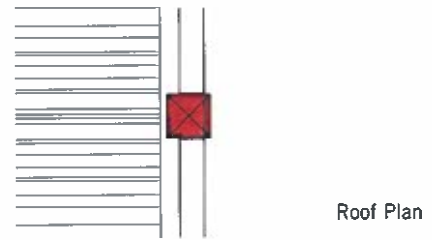
2.1 Significance

King's Cross Station was designed by Lewis Cubitt and built in 1852. The station is one of the earliest major termini, built at a time of considerable expansion of the railways and employing innovative construction technology. The building is Grade I listed and, as well as being one of London's most important historical buildings, it also functions as one of its busiest transport hubs.

The Clock Tower is of high significance. It is part of the original fabric of the building and is in a highly prominent location at the front of the station. The stair itself has always been a 'back of house' space used for maintenance access to the tower and roof. The stone stair is one of two of the same unusual design, the other being located in the East Tower.

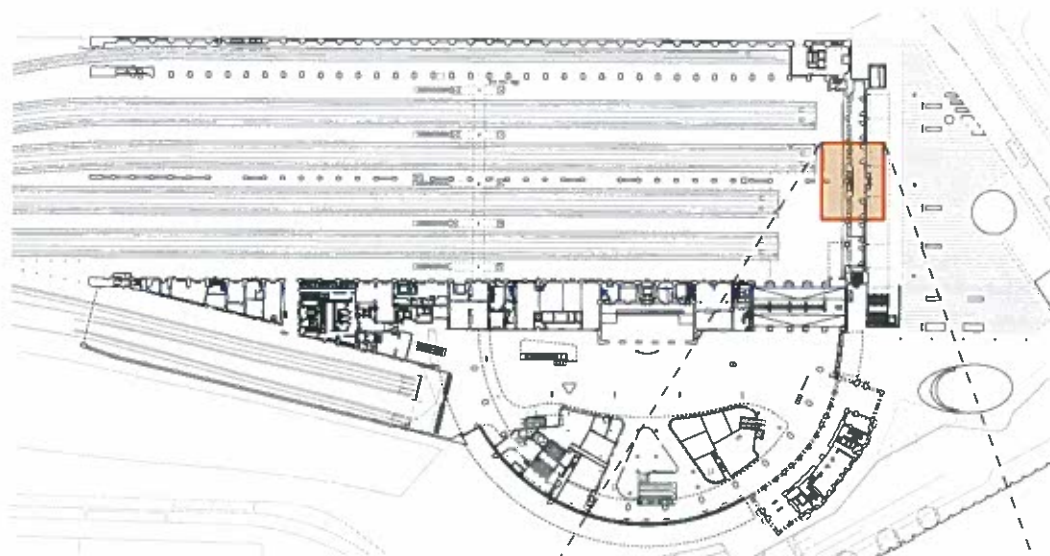
KEY TO CULTURAL & HERITAGE SIGNIFICANCE

- or **HIGH SIGNIFICANCE:** Primary elevations, important historical or architectural features and/or historic association
- or **SIGNIFICANT:** Architectural character or quality and/ or notable features, including potential for major enhancement
- or **SOME SIGNIFICANCE:** Some surviving decorative finishes or historic interest
- LOW SIGNIFICANCE:** Little or no historic or architectural significance, including areas of lost significance through major alteration or loss of finishes
- DETRIMENTAL ELEMENTS:** Elements that detract from the architectural and / or heritage significance
- No access available at time of assessment**



Plan extract from the conservation plan showing the agreed significance of the building

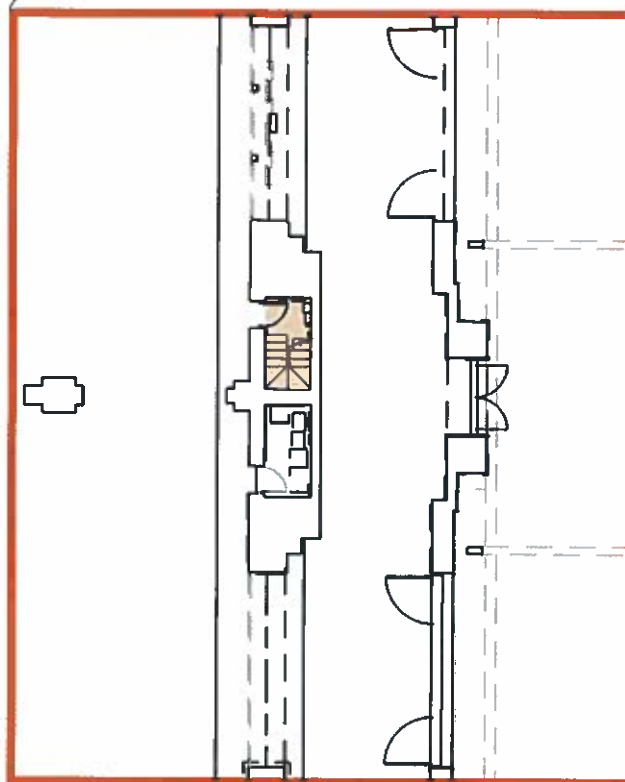
3 Description of Relevent Works



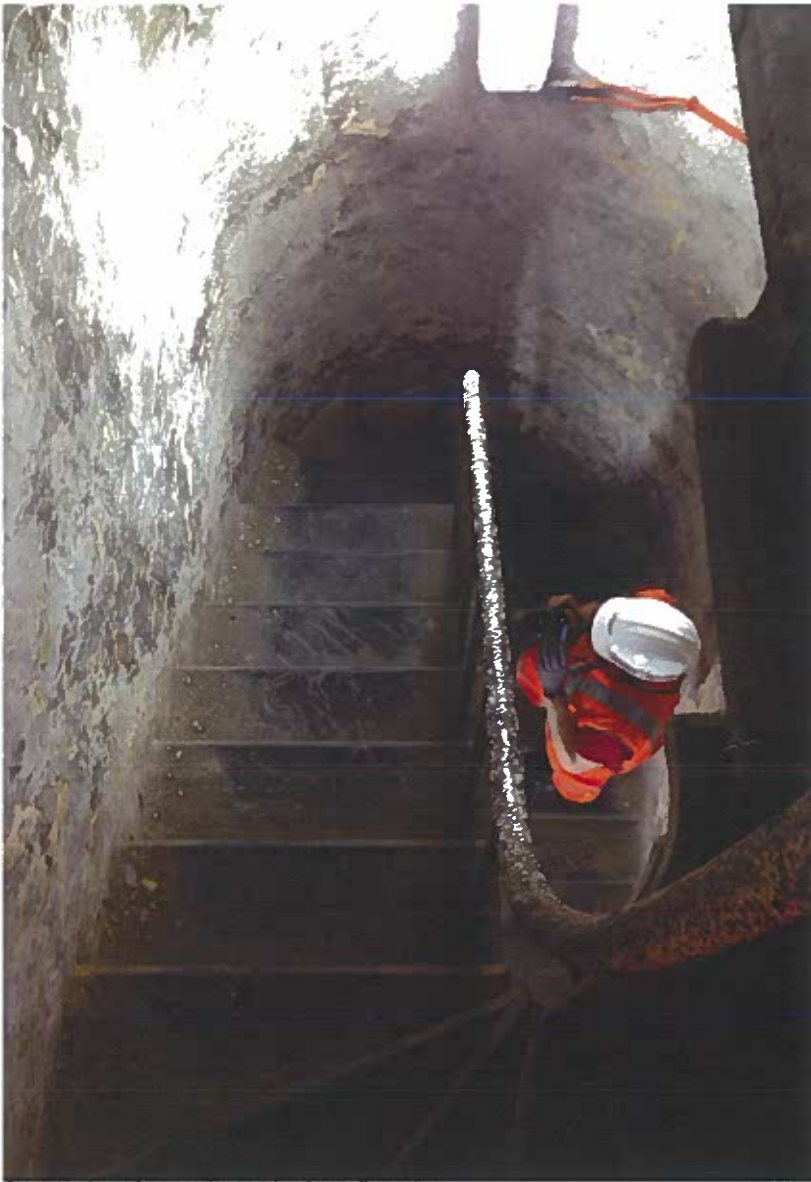
Key plan of the station

3.1 Work Area Covered in the Proposals

The area covered by this application is the Clock Tower stairs.



Plan extract showing the location of the Clock Tower stairs



General view of the stair showing its configuration



Photo showing delamination of a stone riser



Photo showing damaged tread and riser to be replaced



Photograph of the underside of the damaged tread showing extensive delamination and damage. It also shows the surface coating of the stone.

3.2 Description of the Proposal

The Clock Tower stair is very narrow and was originally intended for occasional maintenance access onto the roof. During the major refurbishment works over the last few years it has been heavily used by contractors for access to this part of the station and has become damaged.

One of the stone treads has failed mainly because its bearing into the wall has been compromised by an area which was cut out to allow some electrical cables to pass through. The adjacent riser has also been damaged, possibly due to a combination of the extra movement and the increased foot traffic on the stair.

This broken tread and riser will be repaired using new sandstone to match the existing.

The underside of the stone stair is delaminating. In most areas this is superficial but in some places, particularly under the broken tread, the delamination is extensive. In the past the stone has been painted with a cementitious coating which may have trapped moisture within the stone and is possibly the cause of the delamination of the stone.

3.2.2 Low Pressure Abrasive Clean

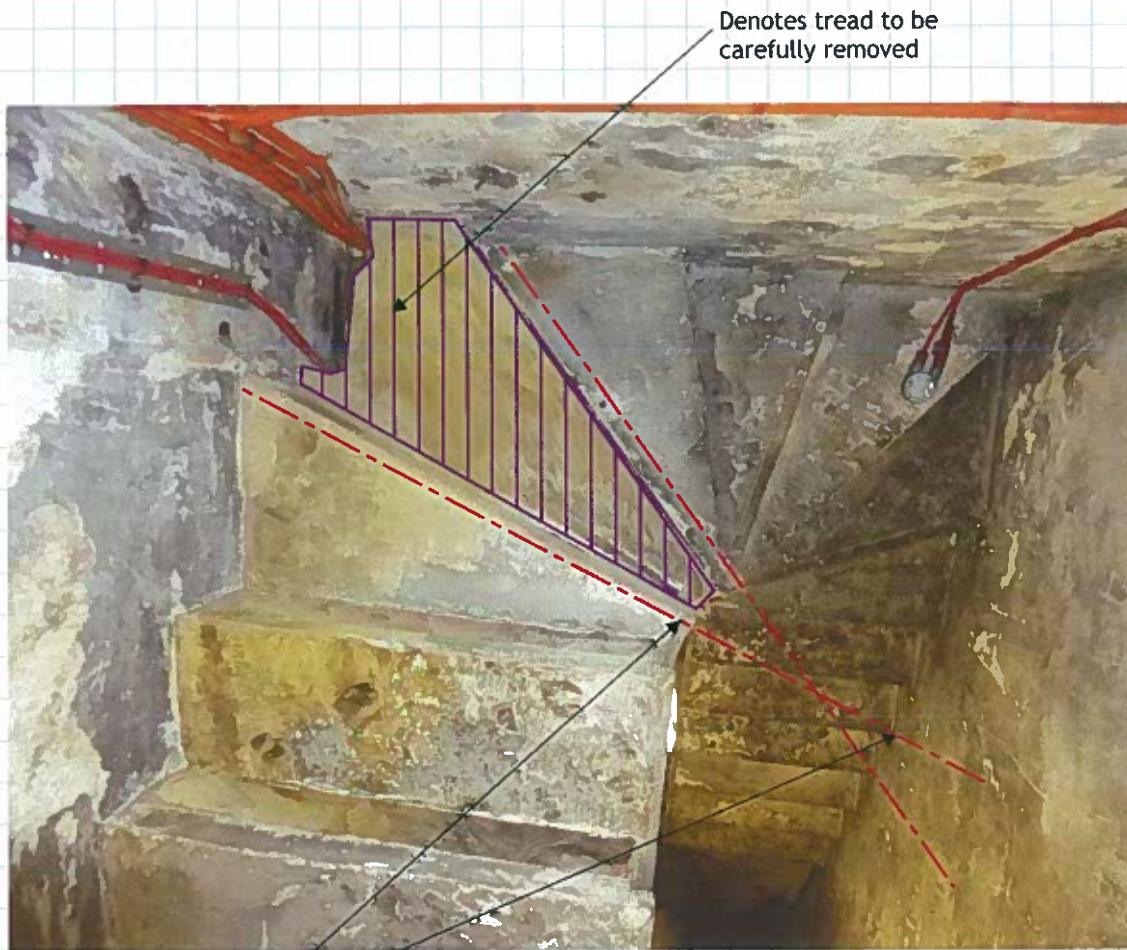
The proposal is for a low pressure abrasive clean using a fine aggregate which will remove the delaminated and powdery stone as well as the rest of the cementitious coating. It will allow the stone to be inspected for damage so that any additional treads or risers which are revealed to have failed are identified.

A trial panel of stone cleaning will be carried out for inspection by the conservation officer before proceeding with the rest of the work.

The existing door to the clock tower stairs is a modern door, put in as part of the recent project. As a part of the cleaning works this door will be temporarily removed and replaced with a temporary door which will allow the extract of the dust through a duct whilst keeping the area secure. The door will be reinstated on completion of the cleaning works.



Photo showing the door to the Clock Tower behind the war memorial



2No. 152x89x16 UB temporary beams to support stairs above and below tread to be removed. Connection detail into wall shown to the right.

100x100x8 EA, 300mm long, bolted to existing wall using 2No. M16 resin anchors with Hilti HIT-HY 70 resin, 150mm embedment to manufacturers details

Temporary Beam Support Details
N.T.S.

Bolt beam to angle using Lindapter F9 flange clamps (2No. per angle)

Structural engineer's sketch (SK01) illustrating the method of repairing the stone

3.2.2 Stonework Repair

In order to replace the step, the stair will first be temporarily supported from below using two steel beams. Also, mansafe anchors will be fixed to the wall to provide fall restraint for the operatives carrying out the work.

The temporary support beams will allow the damaged stone to be carefully cut out and replaced with a new stone tread and riser. Following the works the temporary support and mansafe anchors will be removed and the wall will be made good.

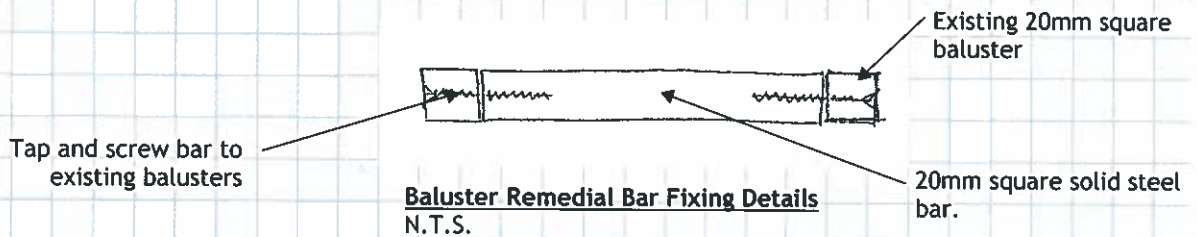
See above extract sketch and Appendix B for further details.

Any further stone repairs revealed as necessary during the cleaning work will be carried out using the same method.



New 20mm square solid steel bar fixed to top of handrail and bottom of return to stiffen up lower handrail. Refer to fixing detail below.

Existing remedial steel strapping can be removed following installation of steel brace.

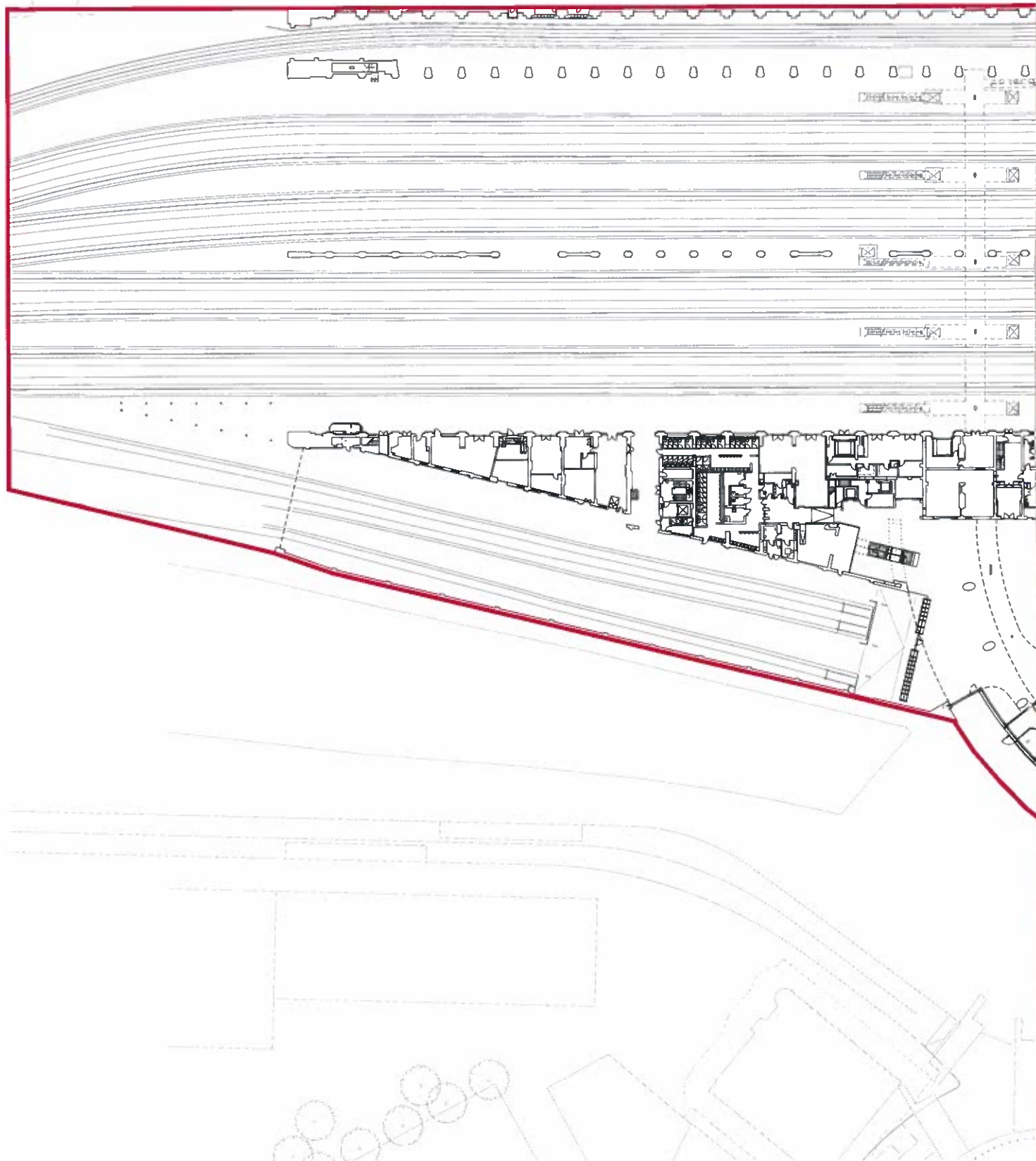


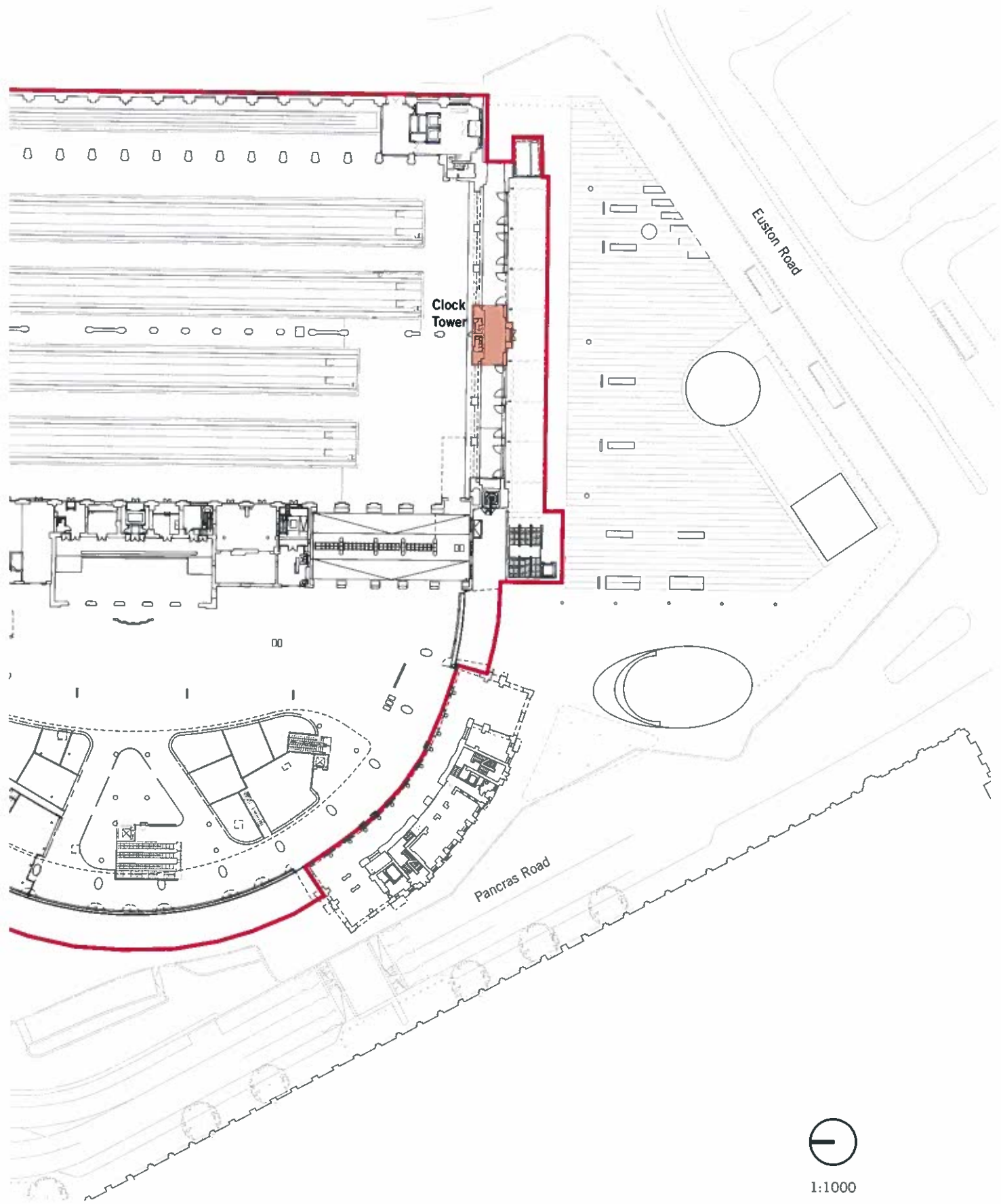
Structural engineer's sketch (SK02) illustrating the proposal to strengthen the balustrade

3.2.3 Balustrade Strengthening

Remedial work is also required to strengthen the existing iron balustrade. Existing steel straps will be removed and new steel struts will be screwed in place through the steel balusters. This repair method will be used at the top landing as shown in the photograph above and elsewhere where the balustrade has been weakened. The number of locations where this repair method will be used will be confirmed once the stair has been fully assessed for damage

A: Location Plan





Clock Tower

Elston Road

Pancras Road



1:1000

B: Contractor's Method Statement

(Extract from the Work Package Plan, pages 1-6)

Principal Contractor: Sisk Rail
Responsible Subcontractor(s): Anglian Brickwork

Work Package Plan

Project Title:

Kings Cross Clock Tower Staircase Repair & Refurbishment

Work Package Title:

Site Set-Up, Cleaning of Stonework and Stair Repair to Clock Tower Staircase

Reference No: KXS WPP01

Contract No:

Location: Kings Cross Station

Programme Dates: 16.03.15 – 13.04.15

Estimated Duration: 2 weeks

					Acceptance on behalf of Network Rail of Sections A1, A2 and B3		
Version	Prepared by	Date	Approved by (CRE)	Date	Required Y/N	Accepted by	Date
01	T Sykes	10.02.15					
02	A Taylor	05.03.15					

Issue No:	Comments	Date
02	Stonework Repairs added & NR comments addressed	05.03.15



Sisk Rail

QP09-1
WWP 01

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Sisk Rail Work Package Plan

WPP 01

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Sisk Rail Work Package Plan

WPP 01

A WORK PACKAGE DETAILS

This Plan identifies the significant hazards and risks associated with the works, as well as the safe systems of work to be implemented to reduce or eliminate those risks.

Site operatives shall be inducted and be expected to understand the arrangements detailed within the Plan, which shall be freely available for reference purposes.

Site operatives shall work under the safe systems of work detailed within the Task Briefing Sheets produced under this Plan.

No work shall be carried out until all Permits are in place.

A1 Description of work

The planned scope of works is to undertake the Cleaning of the Clock Tower Stairs removing failed detrimental previously applied protective coatings. Following the cleaning of the existing stonework a single tread and riser is to be replaced as identified in the Engineers report.

Cleaning

The Cleaning method is a LOW pressure air abrasive clean using fine abrasive medium discharge at low pressure to clean the surface.

The works involve the careful cleaning of the stone staircase to remove the coatings and deposits of loose and flaking detritus. The existing coating is cementitious applied as a slurry so this does not in itself create any enhanced risks with regard to removal or disposal.

Operatives are to complete an inspection before the work is to commence to identify any potential overspray and take particular care when working around the identified areas and provide temporary protection with secured polythene.

Areas that have been identified and require additional protection:

- Windows frames and Glass are to be covered with Polythene and Masking tape to prevent accidental damage and be secured to prevent opening.
- Cable and any wiring are to be covered and protected by Polythene and Corex.
- Cleaning near painted areas to be covered with Polythene or Hardboard to prevent any accidental damage, or the potential for the release of lead into the atmosphere and the associated exposure.

With this particular method of cleaning the Airborne drift of the spent medium is suppressed by the introduction of water within the cleaning mix and usually forms a porridge like substance for easy cleaning and bagging for removal.

The control of waste water is by A.S.C.A.R and will be by the use of Sawdust and polythene and bagged for disposal.

All waste material will be removed off site at the end of each shift.

Stair Tread and Riser Replacement

Man-safe anchors will be installed and tested to provide fall restraint for harness wearing operatives whilst carrying out the tread and riser replacement.

The tread and riser replacement will then be carried out as follows:



Sisk Rail Work Package Plan

WPP 01

1. Install angel supports for proposed temporary beams into wall using 2No. M16 resin anchors with Hilti HIT-HY 70 resin.
2. Allow for resin to cure for 24 hours.
3. Install both temporary 152x89x16 UB steel beams, as MNP sketch SK/01, as tight to the existing treads as possible.
4. Shim up between the steel beams and the underside of the existing treads using neoprene shims.
5. Carefully remove existing loose riser.
6. Carefully remove existing tread. Allow to saw cut along existing bearing to free stone from wall.
7. Carefully reform the original bearing of existing tread and riser.
8. Remove cables to allow for installation of new stonework (by specialist).
9. Carefully install new riser, using lime mortar to bed onto existing stone tread below.
10. Carefully install new tread, using lime mortar to bed onto new riser.
11. Re-route cables through new core through stone tread if necessary.
12. Allow mortar to cure for 7 days.
13. Remove temporary steel beams and angle supports.
14. Make good holes in masonry wall where angle supports were installed.

Proposed Stone Replacement Temporary Works Details

This sketch should be read in conjunction with MHP outline method statement.

Denotes tread to be carefully removed



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Temporary Beam Support Details
N.T.S.

Bolt beam to angle using Lindapter F9 flange clamps (2No. per angle)

Note: All details subject to listed building consent



Sisk Rail Work Package Plan

WPP 01

Planned Sequence of the Tasks:

1. Establish worksite
2. Erect barriers to secure cable and hose routes and provide public exclusion.
3. Brief All Staff
4. Cover all Windows & Electrical Equipment
5. Set Up for Blasting
6. Clean all Required Areas
7. Inspect for any other repairs required
8. Install man-safe anchors
9. Repair Stonework (single tread and riser)
10. Remove all spent waste
11. Clear work-site and de-mobilise (subject to no further repairs being required)

Temporary Works:

Prior to commencement of cleaning, the following tasks are to be completed.

1. Temporary barriers erected from compressor location to clock tower door, securing cable and hose routes from public access.
2. Erection of a timber and roof felt housing to the data cable equipment in the ground floor of the clock tower stair.
3. Clock tower stair door to be left ajar and temporarily sealed if no other effective method of allowing hose and cable access into the stairwell can be agreed. This is to control both security and maintain debris control.
4. Black and yellow tape to be secured to damaged tread and a temp. sign erected to indicate that stair is not to be loaded.
5. Excalibur eyebolts to be installed above and below the damaged tread, and at the top of the stair where loose to provide a clip on point for fall arrest harnesses.
6. The existing steel handrail is deemed to act as fall prevention but where it is identified as being inadequate for that purpose i.e. where the balusters are loose in their sockets, temporary fixing enhancement is required – this needs to be confirmed at commencement of the work.

Technical or Quality Requirements

The effectiveness of the cleaning method is to be confirmed by inspection as soon as a representative area has been treated.

The completed stair and tread is to be inspected upon completion.

Authorising the start of work

Authorisation to start work will be confirmed by the Sisk Rail Site Manager/Supervisor who will ensure that all site control measures are in place.

Prior to works starting all staff must ensure that they have received a task briefing and have signed to confirm their understanding and acceptance of the briefing.

All staff must sign the Site register.

Changes to planned methodology

Where the defined process cannot be followed, work will be suspended until a change to the Work Package Plan can be made and re-approved by the project CRE. The changes will be referenced in the Task Brief.

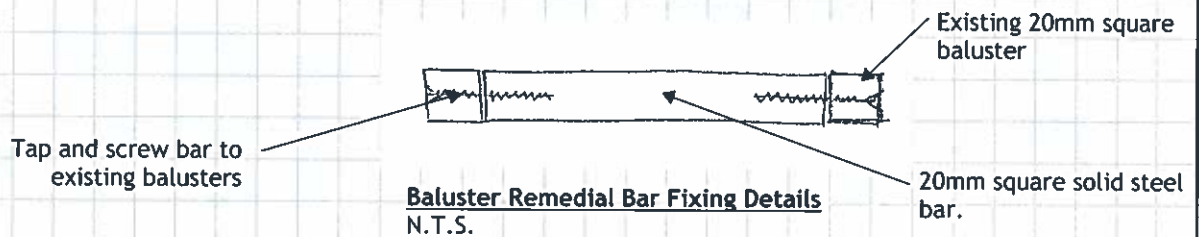
Project				Job Ref	
Clock Tower, Kings Cross Station				214274	
Sketch				Sketch no	
Title				SK/02	
Proposed Staircase Remedial Works					
Sketch By	Date	Checked by	Date	Revision	Date
JL	11.14				

Proposed Remedial Works Details for Top Landing Balustrade



New 20mm square solid steel bar fixed to top of handrail and bottom of return to stiffen up lower handrail. Refer to fixing detail below.

Existing remedial steel strapping can be removed following installation of steel brace.



Note: All details subject to listed building consent

C: Product Data Sheets

Lime Mortar and Sandstone

Pure and Natural Hydraulic Lime (NHL 3.5) Product Data

St Astier Natural Hydraulic Limes (NHL)

Conforms to European Norms EN 459 and BS 459
 Strength factor: 3.5 (Moderately hydraulic)
 Residue @ 0.09 mm: 6.5%
 Density (volumetric weight) : typical 650gr / litre
 Available (free) lime after slaking Ca(OH)₂: 25% +
 Packing: 25kg. Bags

Contains no additives.
 Whiteness index: 72
 Surface cover (cm²pergram): 9000
 Expansion : < 1mm
 Residue of quick lime after slaking: < 1%
 Shelf life: 8-12 months kept sealed and dry

MORTARS MIX RATIO	Compressive strengthN/mm ²				Elasticity Moduli (Mpa)		
	EN459*	1 : 2	1 : 2.5	1 : 3	1 : 2	1:2.5	1 : 3
7 DAYS		0.75	0.57	0.53			
28 DAYS	3.5*	1.88	1.47	1.34	9010	9000	8070
6 MONTHS		7.1	5.34	3.94	15260	13501	13150
12 MONTHS		7.5	5.90	3.90	15280	13620	13150
24 MONTHS		8.63	6.00	3.97	17480	13785	13670
Consumption for 1m ³ of mortar Kg. +/- 10%		305	244	216			
EN 459/BS 459 (mortar ratio 1:1 by volume, with ISO 679 Sand)							

Mixing: can be mixed in cement mixers.

Application by spray gun: possible. Please consult us.

Working temperatures: not below 5°C or above 30°C. Make sure that high suction materials are thoroughly dampened before application. Avoid rapid drying due to high temperatures or strong winds by curing with a light water mist several times a day if necessary. See "*Protecting Lime Mortar*".

SUITABLE FOR LATH WORK / LIME CONCRETE/INJECTION/GROUTING See relevant sheets

Reworking: possible within 12 hours

Mortar composition: MASONRY/POINTING/ CAPPING/ BEDDING/ ASHLAR

Binder: sand ratio: from 1:1.5 to 1:3 depending on the support/background conditions, the size of the joint and the fineness of the sand. Always use well graded sands (3 - 4mm down to 75 microns).

See also "*Applications & Good Working Practices Sands for Lime Mortars*".

RENDERING

A. Scratch coat (3-5mm) 1 VOLUME OF NHL 3.5 : 1.5 VOLUMES OF SAND - Cast on

B. Undercoat (15-20mm) 1 VOLUME OF NHL 3.5 : 2 VOLUMES OF SAND*

C. Finishing (5-10mm) 1 VOLUME OF NHL 3.5 : 2.5 VOLUMES OF SAND

With very fine sands possibly containing clays the binder content may have to be reduced.

*At this dosage the consumption is approx. 0.35kg. of NHL 3.5 per m² for each mm thickness.

Please also refer to "*Applications & Good Working Practices - NHL Renders.*"

For further Guidance, contact your St Astier Distributor.

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Peak Minor

Specifying the stone

Quarry details

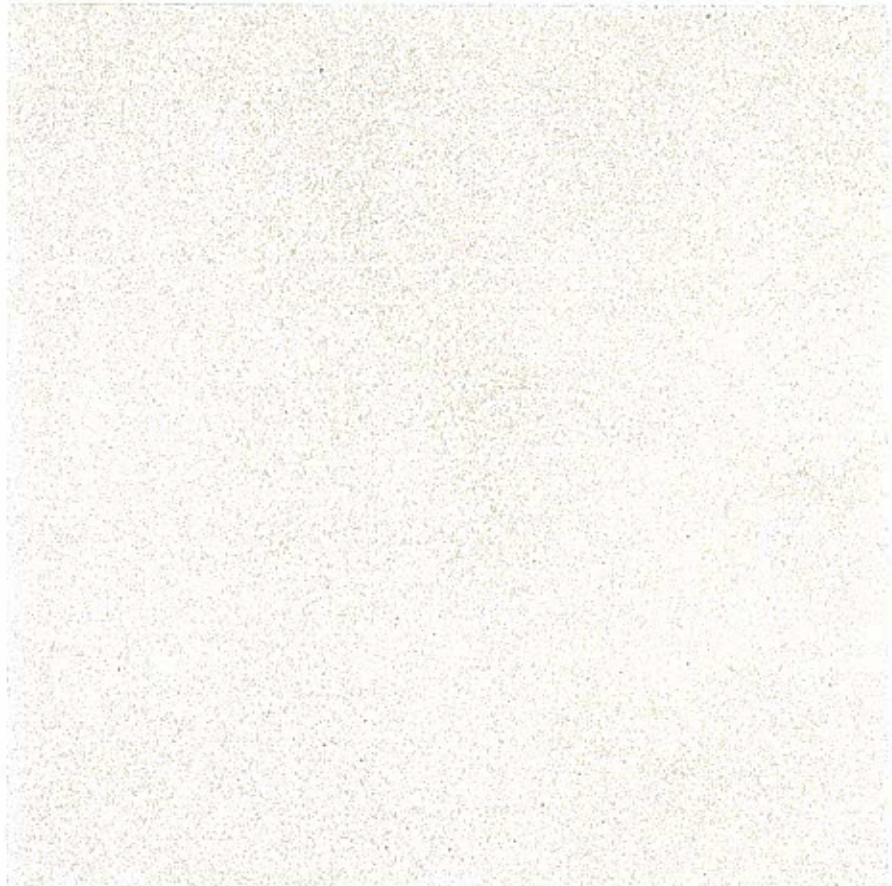
New Pillhough, Stanton in Peak,
Derbyshire, UK

Supplier

Block Stone Limited,
Wingerworth,
Derbyshire, S42 6RG

Contact

blockstone@realstone.co.uk



Small image

Technical results

Description	Medium-grained sandstone. Durable with good weathering qualities.	
Country of origin	UK	
Geological type	Carboniferous / Millstone grit	
Colour	Buff / Yellow some faint Pink / Brown iron intrusions	
Water absorption	4.69 %	BS EN 13755
Porosity	10.49	BS EN 1936
Density	2240 kg/m ³	
Abrasion resistance	26.8	BS EN 1341 (2000)
	Moderate (oilicos etc)	
Compressive strength	71 MPa	BS EN 1026 (1999)
Slip resistance	Dry 94 Wet 79	BS EN 1341 (2000)
Flexural strength	7.64 MPa	BS EN 13161 (2001)
Durability	Pass Change in flexural strength 0.80 %	BS EN 1341 (2001)
Acid immersion	Pass	BRE 141

Please note that stone is a natural product and all results are subject to variation

Block sales

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Bolehill Quarry,
Wingerworth, Chesterfield,
Derbyshire, S42 6RG,
England, UK

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BLOCK



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LIMITED

www.blockstone.co.uk

King's Cross Station: Clock Tower Repairs

