

# Harton Quays, South Shields, Tyne and Wear.

## Historic Wall Survey

Curtins Ref: 076755-CUR-XX-XX-RP-S-00101

Revision: V01

Issue Date: 15 December 2020

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## Historic Wall Survey

Rev	Description	Issued by	Checked	Date
V01	Initial Issue	NW	TA	15/12/2019

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## 1.0 Introduction

### 1.1 Brief

The Harton Quays office development in South Shields has an existing boundary wall around South East boundary of the site. This wall is approximately 100 years old and was built as part of the Mill Dam Complex of buildings. Mill Dam building opposite the Harton Quays site still remains and is understood to be grade II listed. The Harton Quays boundary wall was built at a similar time and part of this wall formed the façade to Staiths House which has now been demolished with façade remaining. This wall has been identified by the conservation officer for the area as historically Significant and any alterations to it need to be approved by them. Along the western boundary of the site there are the remains of a chimney from the previous glassworks use on the site. The

The condition of the wall is unknown and there is therefore a concern and risk that this wall may accordingly be damaged during storms, construction traffic impact or vehicle impact from the adjacent public highway. The purpose of this commission is to undertake a visual inspection of the wall to assess its condition. Photographs of the wall will be taken as a record of its condition. The chimney to the western boundary will also be surveyed as part of this commission.



**Figure 1:** *Façade to the former Staiths House now forms part of the boundary wall.*

## 1.2 Site Description and background

Harton Quay is a derelict site was previously used as a glassworks production facility. The site historic wall forms the south and eastern boundaries of the site with west facing elevation overlooking the River Tyne. This western side of the site has the remains of an historic chimney associated with the previous glassworks. Below is a site plan indicating the extent of the historic wall and Chimney.



**Figure 2:** Site Plan Indicating Historic Wall extent and chimney position.

## 2.0 Observations

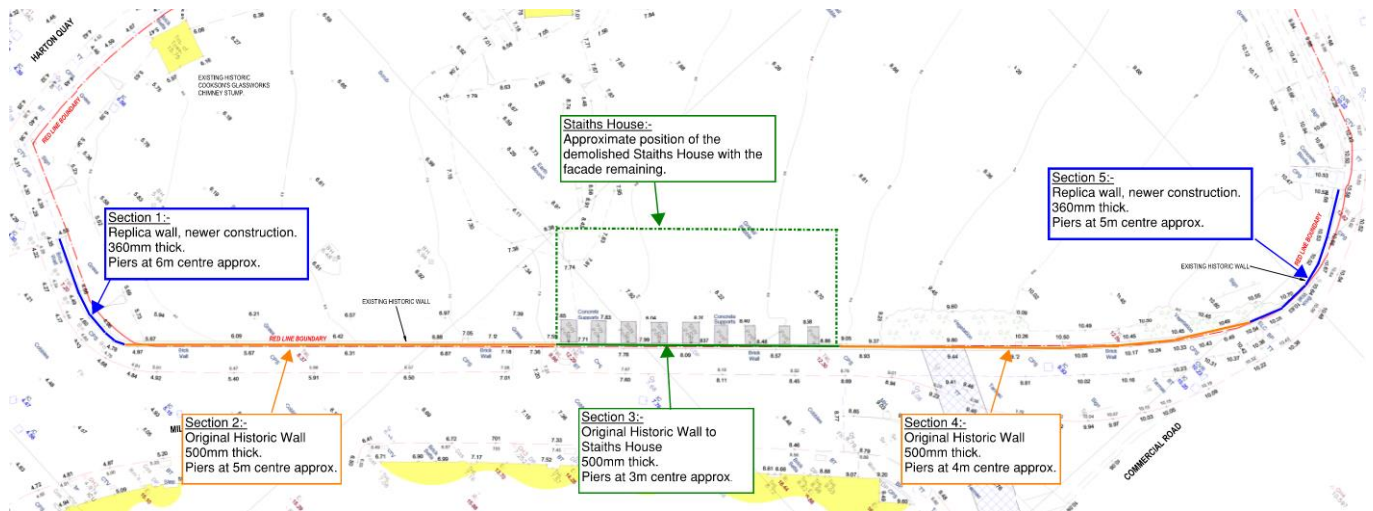
### Description of Wall Construction: -

- There are five distinct sections to the existing historic wall. Sections 2, 3 and 4 are the central area of the wall and are the original wall construction. Section 3 is the remaining façade of the now demolished Staiths House, whilst section 2 and 4 extend out from this remaining building façade. The remaining façade of Staiths House (Section 3) typically has 950mm long by 500mm thick masonry piers at approximately 3m centres. Between the piers are masonry set back 100mm from the face of the piers, these panels have old window opening with flat masonry arches that have now been infilled with new brickwork infill. Section 2 and 4 of the wall either side of the remaining Staiths House have a similar construction with 830mm long by 500mm deep masonry piers at approximately 4-5m centres. These walls also have a masonry panel set back 100mm from the main piers and contain some decorative masonry detailing along the top of the wall. These sections of wall also have concrete copings that are unlikely to be the original construction. Header bricks were observed in all sections of the historic wall (Piers and infill panels), these were typically every fourth course of masonry.

Section 1 and 5 occur at opposite ends of the wall. These sections are of new construction built to replicate the appearance of the Historic wall they connect onto. These relatively new extensions to the Historic wall could be 30-40 years old.

- Below is plan marked up with the wall section locations used for descriptive purposes within this report.

## Historic Wall Survey



**Figure 3:** Site Plan Indicating Wall Types

### Wall Section 1 Observations: -

- This section of wall incorporated a 900 x 900mm square pier at the end of the wall and the masonry panel spanning between masonry piers appeared to be 360mm thick. This masonry panel incorporated a header course every fourth course, this header course is effectively tying the wall leaves of masonry together. The head of the wall has decorative masonry and a concrete coping.
- This wall appeared in good condition with obvious signs of defects. (Refer to Photograph 1 in Appendix A)
- A spirit level was put against the wall and this appeared vertical with indication that wall was leaning.

### Wall Section 2 Observations: -

- A diagonal crack in masonry pier was observed near the head of the pier, some mortar loss and local repointing was also evident. This pier was located towards the western end of this section of wall. (Refer to Photograph 2 in Appendix A)

## Historic Wall Survey

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- As second pier further along the wall also had evidence of a diagonal crack that had been repointed. Some repointing generally had occurred to this pier. (Refer to Photograph 4 in Appendix A)
- The head of the masonry wall has decorative dental work masonry and a concrete coping above. Some repointing to has area had occurred however there were still some areas requiring repointing. (Refer to Photograph 3 in Appendix A)
- The second pier away from the retained Staithes Façade has evidence of damaged bricks being replaced with new brickwork.
- Inspection the rear of this sections revealed missing mortar to a large coping above a masonry pier. The masonry to the rear of this pier also had evidence of a diagonal crack that had been repointed. Effervescence was also observed. (Refer to Photographs 27 & 28 in Appendix A)
- A section of masonry panel between piers did not appear to have been bonded / coursed through into the adjacent pier. (Refer to Photograph 29 in Appendix A)
- Generally, the rear of the wall was flush and had no piers to the rear face, however section 2 of the wall did incorporate single masonry pier to the rear. This pier had vegetation growing from the top. (Refer to Photograph 26 in Appendix A)
- The rear of the wall shows evidence of numerous repairs and re-building of sections. There is a short section near to the Staithes House façade that has been rendered. There are a couple of sections of masonry that look to be lot newer than the original Historic Wall condition suggesting parts of the rear leaf of masonry have been re-built. (refer to Photographs 25 & 26 in Appendix A)
- A spirit level was put against the wall and this appeared vertical with a nominal lean. This lean might be in the order of 30mm over its full height. The centroid of the wall would therefore still be within the middle third of the wall.



Wall Section 3 Observations: -

- This section of the wall is the remaining façade of Staithes House and comprises of 950mm long x 500mm deep masonry piers at approximately 3m centres. Between these piers are masonry panels set back 100mm former the face of the pier. These masonry panels then have old window openings in filled with relatively new masonry. These window openings have flat arch above them instead of a lintel. This wall also has decorative dental work masonry to window sills and head of the wall. (Refer to Photograph 7 in Appendix A)
- The head of the wall now includes concrete coping where the eaves gutter would have been. The end coping has missing mortar and missing brickwork below it. (Refer to photograph 8 in Appendix A)
- Vegetation was observed growing out of some areas of dental work masonry at the head of this wall. (Refer to Photograph 9 in Appendix A)
- Some missing mortar was observed to the piers. This was not extensively but just some small localised areas. (Refer to Photograph 10 in Appendix A)
- The increased height of the historic wall along this section where it is the means of the Staithes House façade is higher than the other sections of the historic wall. Consequently, the rear elevation has steelwork restraint posts fixed to the masonry wall and supported on concrete foundation behind. (Refer to Photographs 23 and 24 in Appendix A)
- A spirit level was put against the wall and this appeared vertical with a nominal lean. This lean might be in the order of 30mm over its full height. The centroid of the wall would therefore still be within the middle third of the wall.

Wall Section 4 Observations: -

- There appeared to be a couple of masonry panels that had been re-built with new masonry slightly darker in colour than the original brickwork to the historic wall. (Refer to Photographs 11 & 12 in Appendix A). When viewing this length of the wall from the rear it also showed a

different colour of brickwork at higher level suggesting the upper section of the wall may have been re-built / repaired at some stage. (Refer to Photographs 21 & 22 in Appendix A)

- A section of the wall appeared to be misaligned at the head and curve inwards towards the site. At this location the masonry pier appears to incorporate a large stone padstone halfway up. inspection from the rear also shows a large stone padstone with corroded steel hinge connected to it. The photographs taken to the rear of this area also indicated that masonry wall panel coursing is discontinuous with the masonry pier and does not appear to tooth into the pier. (Refer to Photographs 13 & 19 in Appendix A)

A spirit level was placed against the wall and there was a nominal lean outward that would be in the order 75-80mm over its full height. The centroid of the wall would however stay within the middle third of the wall.

The coping along this length of wall had missing mortar to the underside.

- Vegetation was observed growing out of the rear face of this section of wall. (Refer to Photograph 19 in Appendix A)
- Other sections to the rear of this section wall appeared to have mixed masonry panels suggesting that over the year's sections of the rear leaf of masonry have been repaired and rebuilt. (Refer to Photograph 18 in Appendix A)
- There was some evidence of diagonal cracking to the rear wall section 4. (Refer to Photograph 20 in Appendix A)

#### Wall Section 5 Observations: -

- The junction between wall section 4 and 5 appears to have the masonry but jointed to the pier and one stone course through. There was also evidence of repointing to some brickwork within the pier. (Refer to Photograph 14 in Appendix A)

- This section of wall is similar to section 1 in that it is a new build extension to the original historic wall built to replicate the existing. This wall appeared in good condition with obvious signs of defects.
- Vegetation growth was observed growing up the rear face of the wall. (Refer to Photographs 15, 16 & 17 in Appendix A)

Chimney Observations: -

- The chimney was of brickwork construction with a Flemish bond arrangement. The lower section of the chimney had been rendered. The chimney had a dating stone built within it conforming that it was built in 1865
- The upper section of the North elevation had vegetation growing for cracks within the brickwork joints. There was also a stone feature band halfway up the chimney, this stone feature band also had vegetation growing from it.

There was some evidence of a vertical crack in the chimney and this looked to have been pointed at some stage. (refer to Photographs 31 & 32 for North Elevation in Appendix A).

- The upper section of the west elevation appeared in reasonable condition for its age although it was heavily weathered with some mortar loss to joints. The lower section of wall has been rendered however most of this render had now been weathered and fallen off with 20% remaining on the wall. The render that remained was loose in several areas and could be dislodged with little effort. The brickwork now exposed by the loss of render appeared in reasonable condition given its age. (Refer to Photographs 33, 34, 35 & 36 for West Elevation in Appendix A)
- The south elevation had a horizontal crack in the render that appeared to emanate from the brickwork below. (Refer to Photograph 38 in Appendix A)

- The south and east elevation both had vegetation growth growing out of some masonry joints. The brickwork at high level was weathered but appeared in reasonable condition given its age. Some mortar loss was evident to some joints.

### 3.0 Recommendations and Conclusions

- Generally, the historic wall was in reasonable condition given its age. The wall appeared stable and there was little evidence of cracking associated with foundation failure or lateral movement from high wind loads. There was some evidence that the front facing part of the wall had been mated by local re-pointing and replacement of damaged bricks. However, inspection from the rear suggested that more remedial work had been undertaken over its life as there were a number of instances in the rear face where brickwork did not appear to match the original brickwork construction. These repairs appeared to have been carried out satisfactorily and the wall appeared stable.
- There was a length of wall along section 4 that appeared mis-aligned and leaned out approximately 75-80mm at the top. There did not appear to be any cracking to this wall suggesting that it was in distress. It may be that the wall had previous been damaged and had been re-built locally, however the building tolerance may not have been maintained which is why the wall appears mis-aligned at this point. Given the wall is 500mm thick and the wall lean is only 75-80mm the centre of gravity of the wall still remains within its middle third suggesting that it is stable in its current condition.
- Similarly, there is a length of the wall along section 2 that leans out wards by approximately 30mm at the top. Again, there did not appear to be any cracking to this wall suggesting it was in distress. Given the wall thickness of 500m and the wall lean of 30mm the centre of gravity of the wall remains within its middle third suggesting that it is stable.
- The cracks that were observed within the wall are likely to have been caused by a lack of movement joints within the wall. The lime-based mortar used in the construction offers some

flexibility for movement in the wall, but the wall is approximately 150m long and should have movement joints within.

Cracks in masonry and areas of mortar loss are weak points in the wall where water can penetrate, once water is in the wall freeze/thaw action can take place which causes more mortar to crack and become dislodged. We recommend that all cracks and areas of mortar loss are repointed with lime-based mortar to help protect it from the elements and extend its design life. Repointing elements of the wall will likely require consent from the local conservation officer. We anticipate re-pointing works to be minimal and not the full elevation of the walls. See Appendix C for the Conservation Officer's repair specifications.



- There were several masonry panels with butt joints to piers giving the impression they were not tied into the piers. We suspect that the inner leaves of masonry hidden from view would be tied back into the masonry pier, but this could not be confirmed without undertaking intrusive investigations.
- There were several coping stones with mortar missing, we recommend that that the coping stones have any loose mortar raked out and replaced with new mortar to match the existing. This mortar should be a lime-based mortar and will likely require consent from the local conservation officer. See Appendix C for the Conservation Officer's repair specifications.
- There was one very large coping stone to a pier along section 2 of the wall. Mortar loss to this pier should be replaced.
- The coping stone to the high-level section of the remaining façade to Staiths house should be cut back or removed and replaced so that does not overhang the missing dental masonry directly below. (See Photograph 8 in Appendix A).
- We recommend that the cracks in the front facing façade of the wall are re-pointed with a lime-based mortar. Similarly, areas of missing mortar to joints should be repointed with a lime-based mortar. Repairs to the front facing façade of the wall will likely require consent from the local conservation officer. See Appendix C for the Conservation Officer's repair specifications.

- Cracks and mortar loss from joints along the rear of the wall should be re-pointed with a lime based mortar. This again is likely to require consent from the local conservation officer. See Appendix C for the Conservation Officer's repair specifications.
- Vegetation growing along the back of the wall should be removed. If these were left in place the roots would expand and cause more mortar to be dislodged. Similarly, vegetation should be removed from the pier along wall section 2 and from the façade of wall section 3 (Staiths House Façade).
- The existing chimney appeared in reasonable condition given its age appeared structurally stable. The masonry was weathered, and mortar loss was observed to some joints. Vegetation growth was also observed in several masonry cracks and to the stone feature band. If the vegetation is left to grow, then the roots will expand and force more mortar to become dislodged from the joints. We therefore recommend that the vegetation is removed, and the joints re-pointed with a suitable lime based mortar that matches the existing. Some other joints will require re-pointing where mortar has also been lost. These remedial works to the chimney will require consent from the local conservation officer. See Appendix C for the Conservation Officer's repair specifications.
- The loose render to the west elevation of the chimney should be removed and the exposed masonry repointed where necessary as described above.
- The horizontal crack in the south elevation should have the render removed locally and mortar joint raked out and repaired. This should then be re-rendered to match the existing. This will also have to be agreed with the local conservation officer. See Appendix C for the Conservation Officer's repair specifications.

## 4.0 Appendices

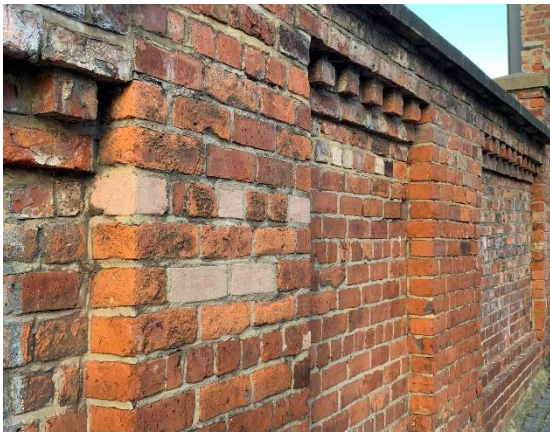
### Appendix A Photographs

**Appendix A Photographs**

	
<p><b>Photograph 1:</b> <i>Wall Section 1, Replica of historic wall.</i></p>	<p><b>Photograph 2:</b> <i>Wall Section 2 diagonal crack to masonry pier</i></p>
	
<p><b>Photograph 3:</b> <i>Wall Section 2 loose mortar to copings</i></p>	<p><b>Photograph 4:</b> <i>Wall Section 2 diagonal crack to masonry pier and some re-pointing</i></p>



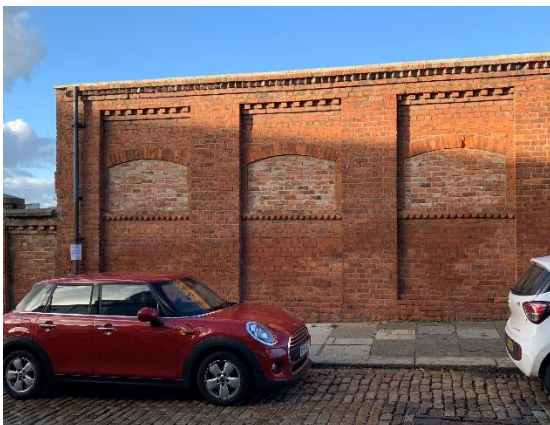
Historic Wall Survey



**Photograph 5:** *Wall section 2 replacement bricks*



**Photograph 6:** *Wall Section 3*



**Photograph 7:** *Wall Section 3*



**Photograph 8:** *Wall Section 3, loose / missing mortar to coping.*

Historic Wall Survey



**Photograph 9:** *Wall Section 3, vegetation growing for the old gutter position at the wall head.*



**Photograph 10:** *Wall Section 3, mortar loss to joint.*

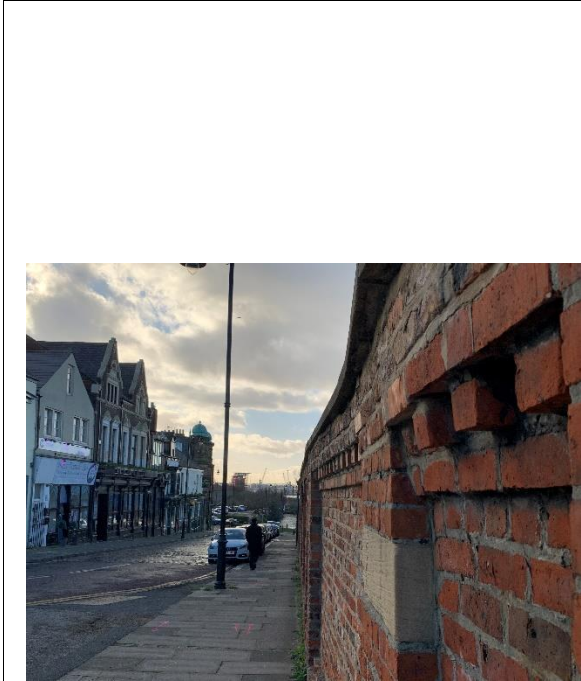


**Photograph 11:** *Wall Section 4, top section of wall has been re-built with brickwork to try and match original brick.*

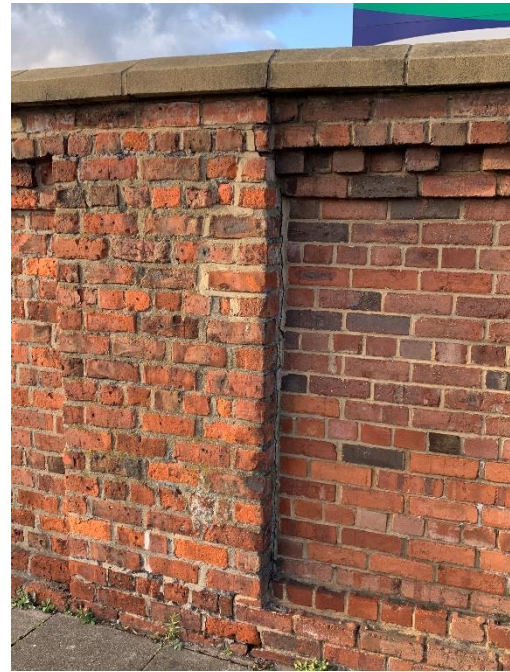


**Photograph 12:** *Wall Section 4, top section of wall has been re-built with brickwork to try and match the original brick.*

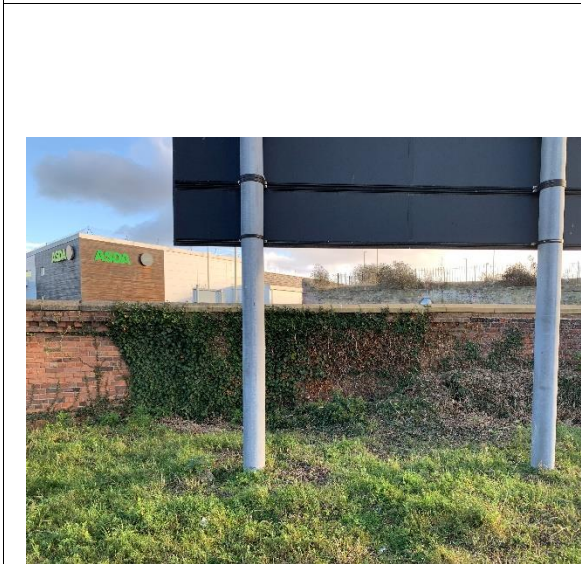
Historic Wall Survey



**Photograph 13:** *Wall Section 4, mis-alignment the wall at the head..*



**Photograph 14:** *Wall Section 4&5, mortar repair to joint and butt joint between masonry types.*



**Photograph 15:** *Wall Section 4 & 5, vegetation growth to rear of wall.*



**Photograph 16:** *Wall Section 4 & 5, vegetation growth to rear of wall.*

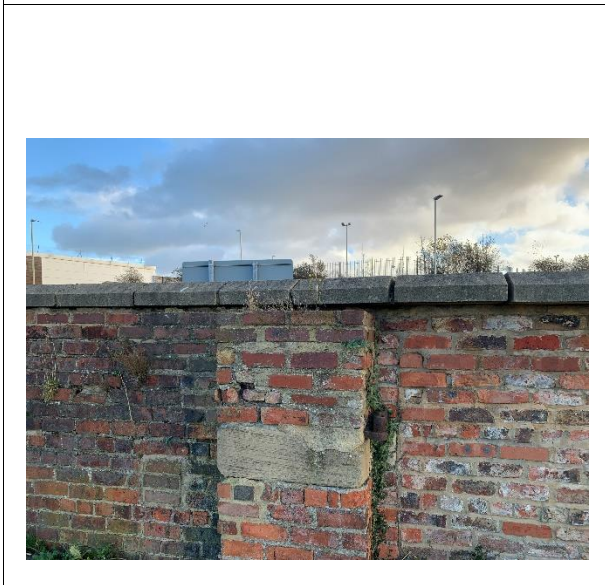
Historic Wall Survey



**Photograph 17:** *Wall Section 4&5 junction with, vegetation growing up the rear face.*



**Photograph 18:** *Wall Section 4, Repair to rear of wall with different brickwork.*



**Photograph 19:** *Wall Section 4, missing mortar to underside of copings..*



**Photograph 20:** *Wall Section 4 rear.*

Historic Wall Survey



**Photograph 21:** *Wall Section 4, Rebuilt at high level to the rear.*



**Photograph 22:** *Wall Section 3, restraint post to rear.*



**Photograph 23:** *Wall Section 4, restraint posts and infill masonry to windows.*



**Photograph 24:** *Wall Section 4, restraint posts.*

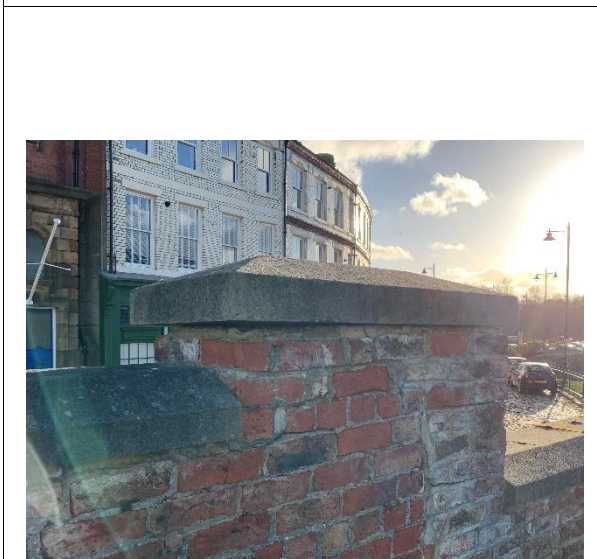
Historic Wall Survey



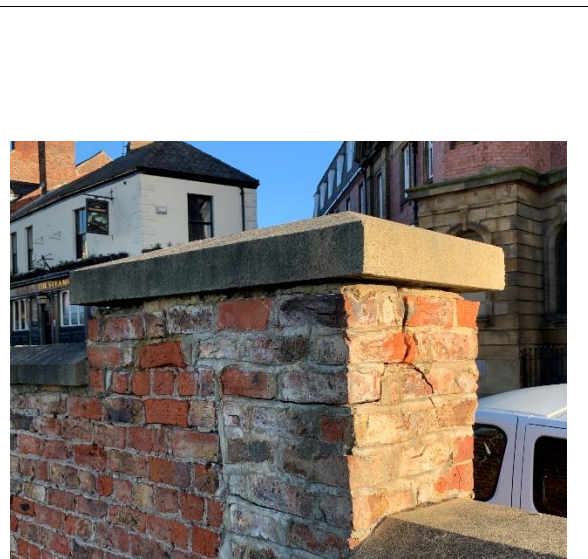
**Photograph 25:** *Wall Section 2, rear face has been repaired and rebuilt in local sections. Joint not bonding through*



**Photograph 26:** *Wall Section 2, vegetation growth and local rebuild.*

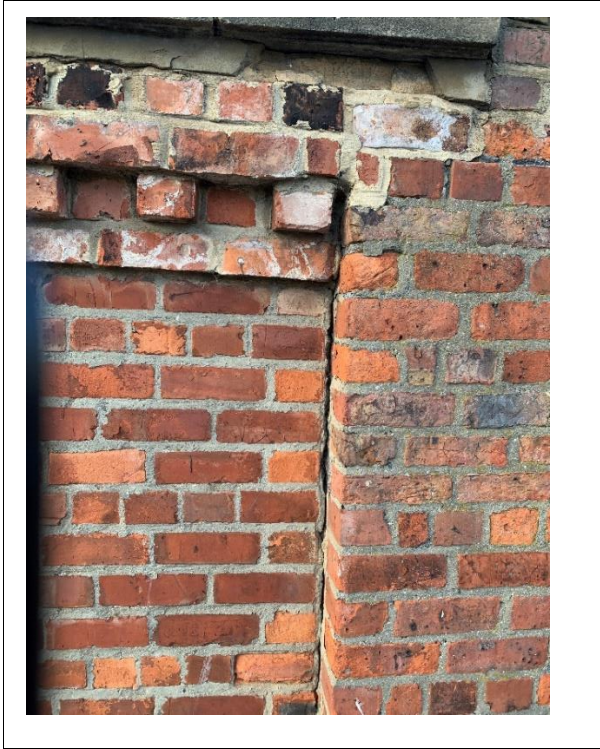


**Photograph 27:** *Wall Section 2, missing mortar to coping and brick repair to pier.*



**Photograph 28:** *Wall Section 2, missing mortar to coping and brick repair to pier.*

Historic Wall Survey



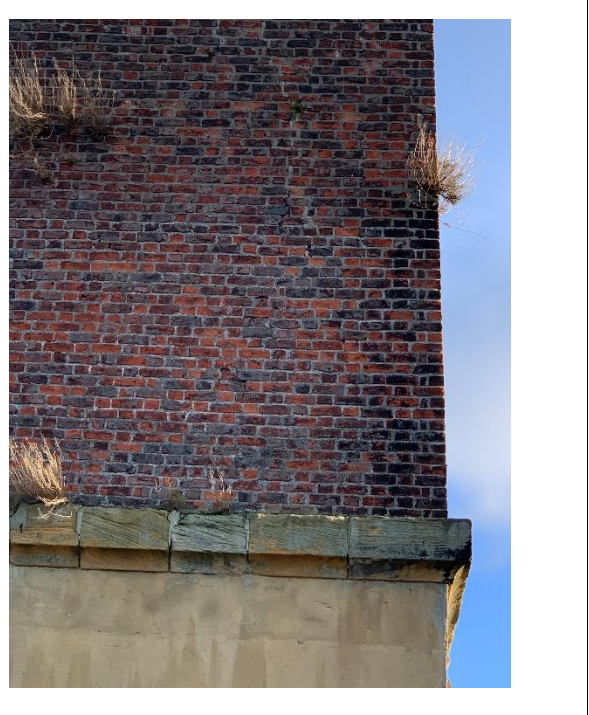
**Photograph 29:** Wall Section 2, No bond between infill panel and pier.



**Photograph 30:** Wall Section 3, spirit level used to check verticality.



**Photograph 31:** Chimney North Elevation



**Photograph 32:** Chimney North Elevation

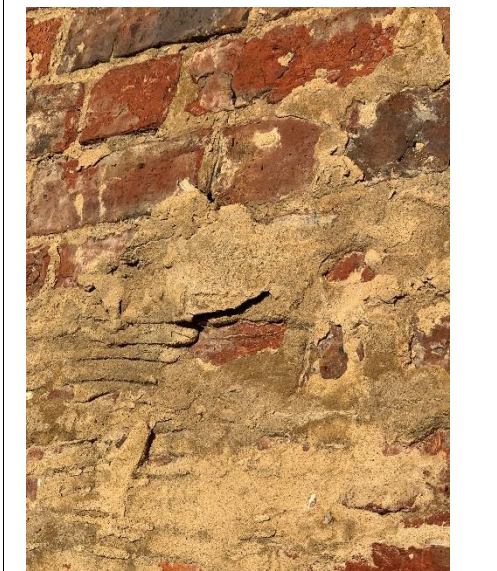
Historic Wall Survey



**Photograph 33:** *Chimney West Elevation*



**Photograph 34:** *Chimney West Elevation*







**Photograph 35:** *Chimney West Elevation*



**Photograph 36:** *Chimney West Elevation*



Historic Wall Survey

	
<p><b>Photograph 37:</b> <i>Chimney South Elevation</i></p>	<p><b>Photograph 38:</b> <i>Chimney South Elevation</i></p>
	
<p><b>Photograph 39:</b> <i>Chimney East Elevation</i></p>	<p><b>Photograph 40:</b> <i>Chimney East Elevation</i></p>

**Appendix B Site Survey Notes**

GENERAL NOTES:  
 1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.  
 2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.  
 3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.  
 4. FOR GENERAL NOTES REFER TO DRAWING 076755-CUR-ZZ-DR-S-0001.

**Legend:**

Buildings	Overhead Cable	IC	Inspection chamber	Bo	Bollard
Wall	Concrete edge	Plw	Pipe invert	IB	Illuminated bollard
Kerb line	Tarmac edge	Gy	Gully	Bn	Rubbish bin
Line marking	Grass verge	Bg	Back gully	Vp	Vent pipe
Drop kerb	Canopy/Overhang	Dp	Down pipe	Gr	Ground light
Centre line	Verge	Pipe	Pipe above ground	Lbox	Letter box
Station and Name	Station Level	MH	Manhole	Ldr	Ladder
Tree / Bush / Sapling	Area of Undergrowth	WL	Water level	Sty	Stile
Woodland	Ridge Level	F	Flood light	IFL	Internal floor level
Eaves Level	Flat Roof Level	Lp	Lamp post	THL	Threshold level
Top of Wall Level	Gate	Tp	Telegraph post	Sp	Sign post
Fence types:	Gas	Ep	Electricity post	TH	Trials hole
Interwoven	Air valve	TI	Traffic light	BH	Borehole
Iron Railings	Wash out	Bus	Bus stop	ELC	Electric
Wire Mesh	Rodding eye	Sv	Stop valve	BT	British Telecom
Post & Rail	Beltsha beacon	St	Stop top	Chx	Control box
Post & Wire	Gas marker post	CL	Earth rod	TT	Tackle
Chain Link	So	Wm	Water meter	BP	Brick paved
Wooden Panels	So	Gas	Gas valve	CPS	Concrete paving slabs
Concrete Panels	So	Av	Air valve	CVR	Cover
Steel Palisade	So	ICU	Undertiled inspection	IC	Inspection chamber
	So	Wo	Wash out	RWall	Retaining wall
	So	Re	Rodding eye	UTL	Unable to lift
	So	BB	Beltsha beacon	TCL	Tree canopy level
	So	Mkr	Marker post	MG	Multi girth
	So	Gmkr	Gas marker post	Stmp	Tree Stump
	So	CL	Cover level	IL	Invert level

1. Masonry crack at high level.  
 2. Vegetation growing from masonry at high level and from stone feature band.

Loose render falling off masonry.

Horizontal Crack in render.

Foundations:-  
 1960mm x 1500 x 750mm deep foundation.  
 203 x 203 UC with 152 UC diagonal at 45 degrees 800mm high.

Foundations:-  
 1700mm x 1000 x 350mm deep foundation.  
 203 x 203 UC with 152 UC diagonal at 45 degrees 800mm high.

Section 1:-  
 900 x 900 masonry pier.

Section 1:-  
 360mm thick wall with header bricks ever 4 courses.

Section 2:-  
 Substantial mortar loss to the coping stone to pier in this location.

Section 2:-  
 1 No pier to rear of this section of wall

Section 2:-  
 Newer brick to rear suggest repair.

Section 4:-  
 Some masonry panels are not keyed / bonded into the adjacent piers. Internal leaves could not be seen but likely to tie into the pier.

Section 5:-  
 500mm deep and 680mm wide at 5m centre approx.

Section 4:-  
 Missing mortar to coping along this section.

Section 2:-  
 Pointing to coping required.

Section 2:-  
 Piers 500mm deep and 1180mm long at 5m cts.

Section 2:-  
 Horizontal crack within pier.

Section 2:-  
 Crack within pier.

Section 3:-  
 Piers 500mm deep and 950mm long at 3m centres approx.

Section 4:-  
 Top section of wall has been built with new brickwork suggesting it has been repaired.

Section 4:-  
 Nominal 40mm lean out of the wall.

Section 2:-  
 Piers 500mm deep and 830mm long at 5m cts.

Section 3:-  
 Minor cracks and some mortar loss to joints.

Section 2:-  
 Piers 500mm deep and 830mm long at 4m cts.

001	PRELIMINARY STAGE 3 ISSUE	10/11/20	KE	TA
002	PRELIMINARY SURVEY	22/10/20	KE	TA
Rev	Description	Date	By	Chkd

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PRELIMINARY STAGE 3  
 HARTON QUAYS, SOUTH SHIELDS

**Historic Wall Survey Notes.**

Size	Date	Drawn By	Designed By	Checked By
A0	OCT 20	KE	TA	NW

Project No: 076755-CUR-00-ZZ-DR-S-90001- P02  
 Volume: 1  
 Type: DR  
 Rate: S  
 Category: 90001  
 Number: P02

**Appendix C Conservation Officer Specifications**

## BRICKWORK REPAIR & REPOINTING SPECIFICATION

Pointing in the sections below covers. a. re-pointing of existing walls where required under the Contract b. pointing to mortar in newly constructed masonry

The Contractor should provide sample panels of pointing to allow inspection of re-pointing of existing brickwork. Trial panels to remain on site for the duration of the Contract until the completion and approval of the works.

The typical specification below may be altered if agreement is gained in advance to meet the site requirements.

In preparation cut out all loose and defective mortar in existing masonry to a depth equal to one and half times the width of the joint and never less than 35mm. in areas of particularly defective brickwork identified on site. This may involve cutting out less existing mortar and insertion of extra mortar to meet the specification below. Care may be needed to only cut out very small areas to prevent collapse of the masonry.

For removal of existing mortar equipment should be used that will minimise damage to the masonry and which will be more precise than use of hand held hammers and suitable (less than width of mortar) pointing chisels. Sound mortar should remain undisturbed. a. Angle grinders with circular saw blades and similar chasing tools will not be permitted. b. Mortar picks and scotch hammers will not be permitted c. Where necessary use specially made tools for extra fine joints i.e. hacksaw blades, spikes and fine plugs to avoid friction contact with edges of the brick. d. While the general specification for funded projects does not allow use of any power tools it is acknowledged that precision drills and files and purpose made tools provide the ability to remove mortar in a much more diligent and precise manner than manual techniques. The Contractor will need to discuss any proposals for tools in advance and obtain agreement from the conservation team.

All dust must be removed prior to repointing. Raked out joints should be thoroughly cleaned from top to bottom using brushes, low pressure compressed air or washed out with a hose.

Joints to be thoroughly wetted before mortar inserted.

Pointing shall generally be using an NHL 3.5 mortar. The pointing should be flush finished then brushed back with a stiff bristle brush until slightly recessed behind the face of the masonry. Wire brushes must not be used. The face of the masonry should be kept clean at all times. Where the existing masonry is generally eroded, the face of the mortar should be kept back to the point at which the joint remains the original width (unless agreed otherwise) so that re-pointing should not increase the width of the original joints.

Where cavities of loose material of depth greater than 50mm are found replacement mortar must be built up by tamping in layers not exceeding 75mm in thickness with setting time allowed between layers using the structural mortar mix. New reclaimed matching brickwork may be inserted where appropriate.

Curing: the mortar once placed in the joints must be protected from drying out quickly from wind, rain and frost. The setting time is very slow. The area is to be covered with damp hessian or canvas sheeting for an average period of two weeks. The length of this period will depend upon the prevailing conditions and may be longer (although is unlikely to be shorter). In warm or windy weather the sheeting must be sealed to prevent evaporation. In frosty weather additional insulation in the form of straw filled sacking (or other equivalent) will be necessary to prevent freezing of

mortar. The amount of insulation depends upon the level of temperature. Ideally no pointing should be carried out where a risk of frost is present. Rain must never be allowed to strike the mortar and brickwork until the setting process is complete. Exposed wall tops and flat or sloping surfaces are very susceptible to frost damage and may have to be protected for extended periods by tarpaulin weighted down with straw bales.

## MORTARS

Where no investigation or testing has been carried out on the existing walls:

Two natural hydraulic lime mortars may be required on site. Natural hydraulic lime mortar category NHL 3.5 or 5 is to be used as specified, delivered as a hydrated hydraulic lime powder in sealed bags unless lime putty mortar is agreed. Hydrated lime (bag lime) and both ordinary and white Portland cement should only be brought on site with prior approval (e.g. for foundations)

It is essential that the material be kept dry.

The brickwork is generally to be consolidated and repointed using NHL 3.5. However the Contractor may choose to use NHL 5 as a structural mix where there are problems over the short term stability of the works and a harder and quicker set is required.

Requirements for NHL 3.5 re-pointing and consolidation mix: a. The outer 40 to 25mm of mortar should be re-pointing mix. b. The mortar should be weaker than the original mortar using NHL 3.5 c. The requirement for pointing mortar is that it starts to set within two to four days unless otherwise agreed. d. A mortar mix (3 to 1) may be prepared with discussion and prior approval i) 1 soft sand ii) 2 grit sand iii) 1 hydraulic lime putty e. Where joints are very wide add ½ grit aggregate (5mm down) may be added.

For mixing:

- a. A conventional cement mixer may be used, although the lime tends to roll around rather than mix with the aggregate. A roll pan or paddle mixer is therefore preferable.
- b. If mixed in a drum precautions should be taken to prevent balling. It is recommended that a small quantity of water is put into the mixer while not rotating and then the appropriate quantity of lime added. When the mixer is switched on the lime should be turned into a wet slurry. The sand is added to the slurry with more water and mixed for approximately 15-20 minutes. Do not overfill mixer as this will prevent proper mixing. The mix to begin with should appear rather dry but as mixing time increases the render will become much 'fatter' At the end of 20 minutes the final water can be added to obtain the correct workability – if required. If too much water is added the risk of shrinkage will increase and the final strength reduced.
- c. Mix ingredients thoroughly to a consistence suitable for the work and free from lumps. Mortars containing air entraining admixtures must be mixed by machine do not over mix
- d. Do not use any Plasticisers unless otherwise agreed.
- e. Measure materials accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand allow for bulking if sand is damp. A shovel is not acceptable since quantities are too inconsistent.
- f. Use mortar within about two hours of mixing at normal temperature. Use retarded mortar within the time and site temperatures recommended by the manufacturer. Mortar may be re-tempered to restore workability but only within these time limited.

Requirements for structural mix:

- a. If considered necessary a NHL 5 mix may be used for reconstruction of areas of masonry where there are concerns over stability and a rapid set is required for safety reasons. However NHL 3.5 is preferred to allow for subsequent movement of the walls.
- b. The mortar shall have properties as above except that the setting period may be reduced to 24 hours. 2.8 Sand for mortar. a. To BS EN 13139:2002 unless otherwise specified b. Sand for face work mortar to be from one source different loads to mixed if necessary to ensure consistency of colour and texture.
- c. When a range is specified (e.g. 1:1:5:6) use lower proportion of sand for grade G sands and higher proportion for grade S.
- d. Ground stone or coarse dark grit and to be generally used to reduce shrinkage and allow for insertion of lime putty in place of some of the fine sand.
- e. Where very fine joints preclude the use of aggregate sand/crushed stone, a fine building sand will be permitted or a lime putty may be applicable – to be subject to discussion.

## **Natural Hydraulic Lime (NHL) Render Specification**

The correct specification for any render should consider the nature and condition of the background, site exposure, time of the year (weather maps / rainfall and wind driven rain indices are available from the BRE) and type of finish required. The success of a render depends on ensuring good background preparation and suction control, the correct choice of a mortar and its application.

Sample panels should always be carried out.

The durability of a render depends on mortars that will adhere to the background, are able to breathe and resist harsh climatic conditions that can and do occur even in relatively benign climate zones. A good bond to the substrate and between all coats is essential to the soundness of the render structure. Bonding is both physical and mechanical: a. A physical bond is achieved by controlling the suction correctly, such that a suction bond develops. The natural surface condition can also offer a good key. b. Mechanical bonding is induced by the method of application. Ensuring good keying between layers, and especially the first coat, by casting/harling or spraying is by far the most successful method.

To avoid potential de-bonding and cracking each coat should be not be richer in binder or thicker than the preceding one (thicker base coats are applicable on thin stipple/scratch coats).

### Sands for renders:

In dubbing out, stipple coats and base coats the sands should be well graded, washed and free of clay/silt (particles below 0.075). Use sharp sands from 3 or 4mm, down to 0.075mm, with the bulk of the sand in the 1.18mm/0.6/0.3/0.15 range. Fine sands or monogranular sands (bulk in 1 or 2 grades only) are to be avoided.

In finishing coats, finer sands, still well graded, can be used for smooth finishes (avoid over trowling).

Particular attention will have to be paid to finishing coats with fine sands to avoid high shrinkage due to the high amount of water that fine sands absorb. The use of a wooden float, energetically applied in small circular motions, will help. Floating with plastic floats is not suitable. Sponge floats can be used after the wooden float work is completed to achieve a particular texture in the finish. Curing will also be important.

Small hairline shrinkage cracks can be healed if treated in time with a light water mist.

Check that any movement cracks are stable and where necessary ensure they are properly tied and if needed, grouted/pinned/pointed.

Careful removal of existing renders will result in less remedial repairs prior to re-rendering. Removal of failed or inappropriate existing render or finishes, including many types of paint, may require the walls to be left to dry out properly before re-rendering and time should be allowed for this. Ensure all repairs to the background are completed and that loose pinning stones or defective bricks are repaired or replaced prior to commencement of any rendering.

Partial or complete re-pointing / consolidation may be required. Remove all loose and friable materials, remove and treat all organic growth, use biocides where applicable, ensuring that they will not affect the mortar.

Newly built walls should be allowed to dry properly, usually 1 month. This will not take place readily in winter conditions.



Repointing before rendering: if this is necessary it should be done with a compatible mortar.

Detailing: inspect all details, i.e. copings etc. Check gutters and down pipes and all forms of roof drainage, ground drainage and general ground conditions. Make sure all the above items are functioning properly and where remedial action is required, ensure it is completed before proceeding with render work.

Rendering should never come into contact with soil. Renders should be kept clear of the ground or finish at the base of a wall into free draining gravel.

Dubbing out: on defaced surfaces or in areas with a large amount of damaged joints it will be necessary to apply a dubbing out coat to provide a level surface. In most cases this will be sufficient with mortar, however very deep joints or hollows should be pinned to reduce the mass of mortar. When a dubbing out coat is used, let it set sufficiently (8-10 hours) before scraping it and keying it. Apply the first coat after approx. 2 days (more if very deep recesses have been filled) and depending on weather conditions.

Dubbing out should leave a relatively flat surface, keyed as necessary, on which to render.

Suction control: if needed, apply sufficient water to reduce excessive suction, especially on bricks and porous stone. Old bricks often require more water than new ones. On many occasions this is done the day before, if necessary several times with the last dampening just before application starts. Apply water starting at the top of the structure. Over saturation of the background will result in loss of bond. Never render backgrounds that have standing water on the surface. Always dampen preceding coats before applying next coat.

It should be noted that in the presence of different suction levels the degree of dampening will vary accordingly.

Keying: provide adequate keying between background and base coat and between each coat. Crisscross patterns are preferred to combing. Make sure that keying does not cut too deeply. Sometimes joints in brickwork are raked back (normally 10mm), this is not necessary with NHL renders if a stipple coat is applied cast on, harled or sprayed on. Two coat work

Two coat work is suitable for renders with an overall thickness of approx. 15 mm. on surfaces that provide adequate suction and a good key. On surfaces offering poor suction and keying, it is recommended to use a stipple coat (3-4mm thick) applied by casting on, harling or spraying. The main coat can be applied after sufficient hardening and finished as required. Alternatively use 3 coat work by applying a finishing coat. 3.2 On two coat work the base coat will be the thickest (up to 10mm, more if applied in 2 passes) and with a binder: sand ratio of 1:1.5 or 1:2. Use mainly NHL 5 or NHL 3.5.

This can be laid on or preferably cast/sprayed on. Scour back and key after initial setting.

To ensure a flat and uniform surface see "Ensuring a level surface" under Undercoat in 3 coat work section.

Curing: check for initial shrinkage. If found, dampen surface lightly with water and tighten back and re-key. Repeated shrinkage is usually a function of poor quality sands, poor suction control or rapid drying.

Finishing coat: use NHL 3.5 or NHL 2. 5mm max. for smooth or light textured finishes, 7-8mm for coarse finishes (tyrolean, roughcast etc).

Smooth and light textured finishes: use finer well graded sands, 1-2mm down to 0.075mm. Add just enough water to obtain required workability. The more water is added the higher the risk of shrinkage.

When the mortar is firm enough, proceed to float up with a cross-grained wood float. This is the most important phase of the finishing work and should be done diligently together with good curing and protection it is vital in obtaining a good finish.

Coarse finishes: use coarser sands if thick (rustic) granular finishes are required. The thickness of the coat depends on the final finish required. Some of these finishes, especially the ones requiring special skills such as cottage, scraped and travertine effects, could also be done by using the same type of sand as smooth and light textured (floated) finishes. In these and tooled renderings (patterned), if initial shrinkage takes place, lightly dampen the surface and re-float the area during the first day or two. Tooling is normally applied when the render is 5-7 days old.

Curing: curing by water mist over 3 to 4 days, if necessary more than once a day, is essential when weather conditions would cause quick drying. See "Protecting Lime Mortar".

Ensuring a level surface: to achieve a uniform and level surface fix vertical timber battens or dab's on the wall at 2-2.5m intervals. If the wall is uneven use spacers and check that battens are straight with a plumb level. Fill out to screeds, if necessary in layers. Screed off excess mortar between battens with a wooden straightedge spanning between the battens. When battens are taken down, fill in strips with the same mortar.

Scour back and key as usual after initial setting. Check for shrinkage during the first 2 days and, if necessary, lightly dampen the relevant area, tighten back and re-key. In case of intermediate coats this would apply to each coat. Do not apply finishing coat until undercoat is adequately hardened.  
Protecting NHL mortars and renders

The setting properties of NHL mortars require protection against adverse weather conditions.

Precautions are necessary.

Early exposure to rain will cause some moisture absorption in the first few millimetres of a fresh render. If frost occurs, there might be damage.

The preferred form of protection is hessian covers that, with re-dampening, will also contribute to curing the mortar. Hessian covers are essential to protect against frost. Plastic sheeting is effective against rain but should be kept clear of fresh work. If too tight it will generate condensation leading to unsightly staining. It will not protect against frost. Frost protection should be provided even if frost is not occurring at the moment of finishing the day's work but is forecast during the early days of a mortar. Work should not start in frost conditions or when frost is forecast or with temperatures below 5°C. In working with NHL 2 or in rendering with fine finishing coats, this should be 8°C. Protection from the quick drying effects of wind or direct strong sun should be provided by using shading sheets on scaffolding. Good working practices

Where scaffolding is being used make sure that the scaffolding has adequate clearance from the face of the wall to allow application, avoiding unsightly lift lines. Scaffolding should project past all areas to be rendered to allow for protection of the new work against direct rainfall. Generally scaffolding should be capable of carrying the protective screens necessary to shade the work and prevent rapid uncontrolled drying and any covers needed to protect against frost.

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