David Sparrow
Architects

Repairs to external brickwork
42 Kingsway

Prepared for: 42 Kingsway Residential Limited

Prepared by: David Sparrow

Report number: 16003-1

On: Condition of external brickwork to rear elevation

On: Condition of external brickwork to light-wells

24 January 2018

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Section 1- Initial brief and visual survey of rear elevation

Client Brief

The initial client brief was to carry out a visual inspection of the brickwork to the rear elevation of 42 Kingsway, London WC2 in response to the emergence of damp to the inner face of the rear wall and in the stairwell. A technical report was commissioned on the condition of brickwork in relation to evidence of dampness to the internal face of the external brick wall.

The results of this initial visual inspection are laid out in this section of the report (Section 1- Initial brief and visual survey).

The building works to be carried out to resolve the damp penetration to the rear of the building are dealt with in section 2 of the report (Section 2- Repairs rear elevation).

Subsequently the brief was extended to include the 2 glazed brick light-wells and other sundry areas of damp penetration.The works arising from the visual inspection of the light-wells and in relation to the other areas of damp are dealt with in section 3 of this report (Section 3- Brickwork Repairs to light-wells).

Access

Access for the inspection of the external brickwork elevation was from the adjoining building backing on to 42 Kingsway, the Royal College of Radiologists, 63 Lincoln's Inn Fields, London WC2A 3JW, some 6.5m from the elevation in question. Internal inspection of the external wall was from the common access areas and stair-well of 42 Kingsway.

Brief Background

The building is a Grade II Listed building designed by Sir Edwin Lutyens. Building works commenced in 1906 and were complete by 1910. The building is 8 storeys tall including one basement level. The structure is load-bearing masonry with 'filler joist' floors. The external walls are constructed from load bearing masonry and contain embedded steel lintels with the ends of filler joists projecting into the wall zone.

The building was remodelled/refurbished during the years of 2010-12.

Assessment

All brickwork walls are designed to shed the majority of rainwater hitting the face of the wall. Some water is inevitably absorbed and is subsequently lost, as water vapour, from both the outer and inner face of the wall. The glazed surface of glazed brickwork limits the amount of water absorbed and the thin mortar joints, approximately 1/4 of an inch, further reduce the potential for moisture absorption. With the reduced breathable area of glazed brickwork more of the water vapour will exit from the inner unglazed wall surface.

The majority of the damage to the brickwork is due to the corrosion and subsequent expansion of of the embedded steelwork, from both the steel lintels over the windows and the filler joist ends contained in the floor construction.

Other potential sources of moisture ingress:-

1.Concrete cills weathered and some cracking.

2.Existent cracked brick; large or missing mortar joints; both historic and recent. There are areas where jointing has been repaired but the brickwork and jointing shows more cracking and opening up of joints.

Moisture to the Interior face of the Wall

A series of moisture readings (as set out in the table above) were taken to try and establish the extent of moisture penetration through the brickwork. It is clear from the readings in some areas, the condition of the wallpaper and the extent of mould growth behind the wallpaper that there has been significant moisture penetration of the glazed brickwork on the rear (East) and flank wall (North). There are areas of peeling wallpaper and mould growth from the 2nd to the 5th floor. A moisture heater reading of 15 or higher is generally deemed to be significant in terms of the level of moisture in the material to potentially cause a problem.This correlates with the moisture readings of 15 or higher on these floors where the wallpaper has peeled away from the wall and there is mould growth and discolouration of the wall far under the wallpaper. Areas where there were high moisture readings are :-

1) the window and the flank wall to the left in the stairwell to the landing between the 5th and 4th levels (window reference 5.14) ;

2) the 4th floor window in the stairwell (reference 4.13), particularly below dado level;

3) the window and the flank wall to the left in the stairwell to the landing between the 4th and 3rd levels (window reference 4.14);

4) 3rd floor window in the stairwell (reference 3.13);

5) the window and the flank wall to the left of the landing between the 3rd and 2nd levels (window reference 3.14);

6) the flank wall at the first set of winders down from the 2nd floor. Otherwise the reading were not out of the ordinary for solid brick construction.

It should be noted that where the wallpaper has been previously peeled back allowing the moisture trapped to "breathe" out of the wall the moisture readings were not of a significant level.

Moisture readings

Floor Level	Right of window	Under window	Left of Window	Flank Wall upper level (winder)	Flank Wall lower landing
5th above	13	15-21	13	N/A	N/A
5th/4th landing above dado	22		15	15	14-18
5th/4th landing below dado	18	17.5-20	8	12	10-22
4th- above dado	8-15		14	N/A	N/A
4th-below dado	18-20	19.5-22	17	N/A	N/A
4th/3rd landing - above dado	46-56		18-47	20	22-30
4th/3rd landing below dado	18	19	18-21	30-20	20
3rd- above dado	15	19	10	N/A	N/A
3rd- below dado	19	19	14	N/A	N/A
3rd/2nd landing - above dado	11	13	6	13	10-20
3rd/2nd landing below dado	15	12	10	20	20
2nd above dado	12	12	0	N/A	N/A
2nd below dado	15	14	9	N/A	N/A
2nd/1st landing above dado	5	11.5	4	7-20	2-6
2nd/1st landing below dado	11	11	11	14	10-11
1st- above dado	6	13	2	N/A	N/A
1st- below dado	12		3	N/A	N/A

Description of readings

The meter, whilst providing a true quantitative moisture content for wood, does not do so on masonry substrates. The readings obtained from masonry surfaces should be read as 'per cent full scale deflection' of the meter needle or 'per cent wood moisture equivalent' depending on the type of scale provided. A figure above 15% full scale deflection (fsd) or 20% wood moisture equivalent (wme) is considered by the manufacturers to be of significance. The fact the meter does not record a quantitative measurement is of little consequence. The diagnosis is based on the overall distribution of meter readings and not so much the actual reading itself.

Most building materials (brick, mortar plasters, render) are free from materials which affect electrical resistance. Therefore, it must be appreciated that in over 99.5% of cases changes in electrical resistance is reflecting either water and/or soluble salts! Thus, it is quite valid to use electrical moisture meters to look at damp/salt problems.

An electrical moisture meter should be used to plot a 'profile' of readings: this involves recording the pattern and distribution of surface readings, for example, in a vertical series up a wall. It is the pattern and distribution that gives an indication as to the problem.[1]

[1] Graham Coleman Remedial Technical Services 'The use of electrical moisture meters' Building Engineer, June 1997

Recommendations

1. Have a suitable scaffolding erected over the East (rear) elevation and at least part of the North elevation to verify the condition of the brickwork, windows, cills and lead flashings.
2. Establish a schedule of works to expose, treat the embedded steels and repair the brickwork where continued degradation of the wall is apparent.
3. Schedule the areas of brickwork to be repointed.
4. Decide treatment to the existing external cills.
5. The existing vinyl wallpaper finish to the interior face of the external walls will be removed and a micro porous paint or wallpaper finish be applied.
6. Install a humidity meter to record the air temperature and moisture content to rule out buildings internal environment contributing via condensation to the dampness observed in the walls.

General Description of the works

40 & 42 Kingsway is a Sir Edwin Lutyens designed building, circa 1906 and completed around 1910 for Mr William Robinson, the proprietor of '*The Garden*' magazine. The building is Grade II Listed and **any new work must match in every respect the existing in appearance materials and workmanship**.

The Residences will continue to operate throughout the construction contract. There is a code compliant smoke evacuation system and fire detection and alarm system existent in the building and the functioning of these Life Safety systems will be maintained throughout the course of the construction.

The building structure is load bearing brickwork with clinker concrete floors and steel filler joists. The rear and flank elevation are faced in a white glazed brick. The bricks used in the two elevations do not match. All new brickwork is to match the respective elevation. The brickwork repairs consist of areas of repointing where the existing pointing has failed; cutting out and replacing cracked bricks, singly and areas of more extensive cracking; replacement and repairs to chipped bricks; filling holes in the brickwork; the cleaning down and repair of existing stone window cills and their treatment with a clear waterproofing. Refer to drawing GA-200.

There is evidence in the glazed brick of the original steel lintel over the windows becoming corroded, expanding and casing damage to the brickwork. Additional repair work to the existing building fabric consists of removing the existing 3 course brick arch over the windows in order to expose the first of a pair of steel lintels supporting the brick work. There are 3 different regimes of repair depending on the level of the corrosion and the existent structural condition (see drawings attached in Appendix A).

With the height of the building the thickness of the brickwork decreases. Externally, on the north facing flank wall elevation this is expressed with a change in plane and a canted glazed brick. A lead flashing covers this detail but is missing at high level level 5 and needs to be installed.

Repointing

As a general rule, if the mortar will not cut out readily using hand tools it does not need replacing. The existing weathered and friable or otherwise failed joints or pointing are to be carefully raked out by hand to a depth of between 10mm and 20mm - or at least to twice the width of the joint.

Only lime putty based mortars are to be used. All mortar for laying or pointing should only be lime and sand mortar without the addition of Portland cement.

All pointing to match the existing flush pointing.

Cutting in new bricks

Single bricks and larger areas of damaged/cracked bricks as indicated on the drawing GA-200 will be cut out use hand tools as described above. New bricks will match as closely as possible in appearance and dimensions the existing glazed brick. Bricks will be laid in lime mortar and repointed. Temporary propping will be installed to repair the long vertical cracking between windows 5.13 & 4.13 and windows 4.13 & 3.13.

Repair/fill holes in bricks

Lime mortar with the addition of 2 parts white Portland cement will only be allowed for the purpose of filling holes in bricks and the repair of chipped bricks.

Repair of Cills

The stone cills will be treated with an algicide and cleaned down with water and soft brushes. Copper wire brushes are allowable but not steel wire brushes. Any salts or mortar droppings will be removed. Cracks, chips, holes and depressions will be filled with matching mortar. The underside of the cill will be left clean and with the drip effective over the full width of the cill. The under-side of the cill will be repointed in lime mortar. Once the cill is clean and dry it will be treated with a breathable clear waterproofing.

Typical Lintel Repairs

There are 3 different repair regimes depending on the level of the corrosion and the existent structural condition. The windows that require works are noted on drawing GA-200, Appendix A.

One

Repair of existing inner lintel where the outer lintel has been replaced with a new concrete lintel but the inner lintel has not been repaired. This applies only to some of the 5th floor windows as noted on drawing GA-200.

The timber sash window will, temporarily, be removed and protected and placed in a store on site. The 3 course brick arch above the window will be completely removed and the brickwork above fully propped. Sufficient brickwork either side of the arch will be removed to fully expose the outer ends of the window lintel. The 5.13 window has had a historic repair and the first steel lintel has been removed and a new concrete lintel added. In this instance the the clinker concrete slab encasing the remaining inner lintel will be removed to expose the underside of the top flange, outer facing web and underside of the of the bottom flange. The steel will be descaled. The beam is cleaned of dirt, dust and rust and two Coats of RIW 'Heaviseal' will be applied to the exposed faces. The brickwork will be rebuilt in matching bricks and matching bond laid in lime mortar and flush pointed.

Two

Repair of existing outer lintel that has minor corrosion.

The timber sash window will, temporarily, be removed and protected and placed in a store on site. The 3 course brick arch above the window will be completely removed and the brickwork above fully propped. Sufficient brickwork either side of the arch will be removed to fully expose the outer ends of the window lintel. (In the instance of the 2.13 window part of the lower course of arched brickwork has already been removed). The beam is cleaned of dirt, dust and rust and two Coats of RIW 'Heaviseal' will be applied to the exposed faces. New RC40 concrete encasement is cast with D49 wrapping mesh fixed to the top bottom and side of the existing beam, with dry pack over beam to the drawing attached in Appendix A. The brickwork will be rebuilt in matching bricks and matching bond laid in lime mortar and flush pointed.

Three

Replacement of existing lintel for corroded existing outer lintels.

The timber sash window will, temporarily, be removed and protected and placed in a store on site. The 3 course brick arch above the window will be completely removed and the brickwork above fully propped. (In the instance of the 4.13 window the lower two courses of arched brickwork has already been removed). Sufficient brickwork either side of the arch will be removed to fully expose the outer ends of the window lintel. The clincker concrete is removed to expose the underside of the top flange, outer facing web and underside of the of the bottom flange of the inner lintel. The inner lintel is retained and cleaned of rust, dirt and dust and two Coats of RIW 'Heaviseal' applied to the exposed faces. The bottom of beam is encased in new concrete fixed to the beam

with stainless steel EML. New RC40 concrete encasement is cast with D49 wrapping mesh fixed to the top, bottom and side of the existing beam, with dry pack over beam to the drawing attached in Appendix A. The brickwork will be rebuilt in matching bricks and matching bond laid in lime mortar and flush pointed.

Below is a schedule of the work specific to the individual windows to the rear elevation.

Schedule

Item	Description	Rate/ Price
Repointing	Carefully raked out by hand to a depth of between 10mm and 20mm - or at least to twice the width of the joint. Thoroughly brush the open joint clean of dust and flush out with clean water. Repoint in lime mortar with a flush joint.	
Replace single brick	Cut out a single damaged/cracked brick as indicated on the drawing GA-200. New bricks are to match as closely as possible in appearance and dimensions the existing glazed brick. Lay brick in lime mortar and repoint.	
Replace area of Brickwork	Cut out areas of damaged/cracked bricks as indicated on the drawing GA-200. New bricks are to match as closely as possible in appearance and dimensions the existing glazed brick. Lay bricks in lime mortar and repoint.	
Clean /Repair cill	Treat the stone cills with an algicide. Clean down with water and soft brushes. Copper wire brushes are allowable but not steel wire brushes. Remove any salts or mortar droppings. Fill cracks, chips, holes and depressions with matching mortar. Ensure the underside of the cill is clean and the drip is effective over the full width of the cill. Repoint under the cill in lime mortar. Once clean and dry treat with a breathable clear waterproofing.	
Window ‘stack’ -.13		
5.13 Window	Repair of existing inner lintel where the outer lintel has been replaced with a new concrete lintel. Two lower courses of arched brickwork has been removed.	
4.13 Window	Replacement of corroded existing outer lintel. Two lower courses of arched brickwork has been removed.	
3.13 Window	Replacement of corroded existing outer lintel. Two lower courses of arched brickwork has been removed.	
2.13 Window	Repair of existing outer lintel that has minor corrosion. Two lower courses of arched brickwork has been removed.	

Item	Description	Rate/ Price
Opening up works to reveal lintels	Remove lower 2 courses of arched brickwork to window and prop brickwork over.	
	Possible additional work *	
5.12 Window	Repair of existing inner lintel where the outer lintel has been replaced with a new concrete lintel.	
4.12 Window	Replacement of corroded existing outer lintel.	
3.12 Window	Replacement of corroded existing outer lintel.	
2.12 Window	Repair of existing outer lintel that has minor corrosion.	
5.14 Window	Replacement of corroded existing outer lintel.	
4.14 Window	Replacement of corroded existing outer lintel.	
3.14 Window	Repair of existing outer lintel that has minor corrosion.	

***** As shown on drawing GA-200 the windows listed above under 'Possible additional work' are to have further investigation works to establish whether there are any repairs necessary to the embedded steels over the window.

Assessment

A visual inspection of the light-wells was undertaken on the 5th of January 2018. Access was only available from the roof level and from within the 5th floor flat. There was no sign of dampness and no damp issues have been reported in relation to the glazed brickwork of the light-wells other than a small patch of damp plaster between the windows 5.6 and 5.7. There are some areas of distress to the brickwork which were visible. This is primarily at the interface between the parapet up stand walls to the roof that have been rebuilt in new glazed brickwork and the existing glazed brickwork below. The stones cills are in need of some attention and should be cleaned and treated with a breathable clear waterproofing.

At the time of the survey there are 4 locations (other than the rear wall) where moisture ingress is apparent within the building and affecting the finishes. All of these are at Level 5. In only one instance is it likely that the ingress of moisture is due to the glazed brickwork.

The other 3 instances are-

1. at high level located in the Northeast corner of the plant room to Level 5. The leak from the ceiling is most likely to be associated with the roof level drainage gully located in the area and further investigation is required;
2. there is a leak evident in the kitchen area close to the line of the western walls of the 2 light-wells, further investigation is required but a likely source is the pedestal foot for the fence dividing the roof terrace;
3. there is a leak evident to ceiling at level 5 in the northwest corner of the building and it is likely that this is due to a visible crack in the stone parapet wall above the height of the roof slab.

There are isolated areas within the light wells that we believe require repointing. These are mostly confined to levels 5 and 4 with some minor raking out and repointing at level 3. The extent of repointing will be confirmed by the contractor as the works progress.

Recommendations

42 Kingsway is an old building and to ensure that it remains free from damp the following should occur:-

A. A regular schedule of visual surveys should be initiated.

B. A maintenance programme should be developed from the results of the survey.

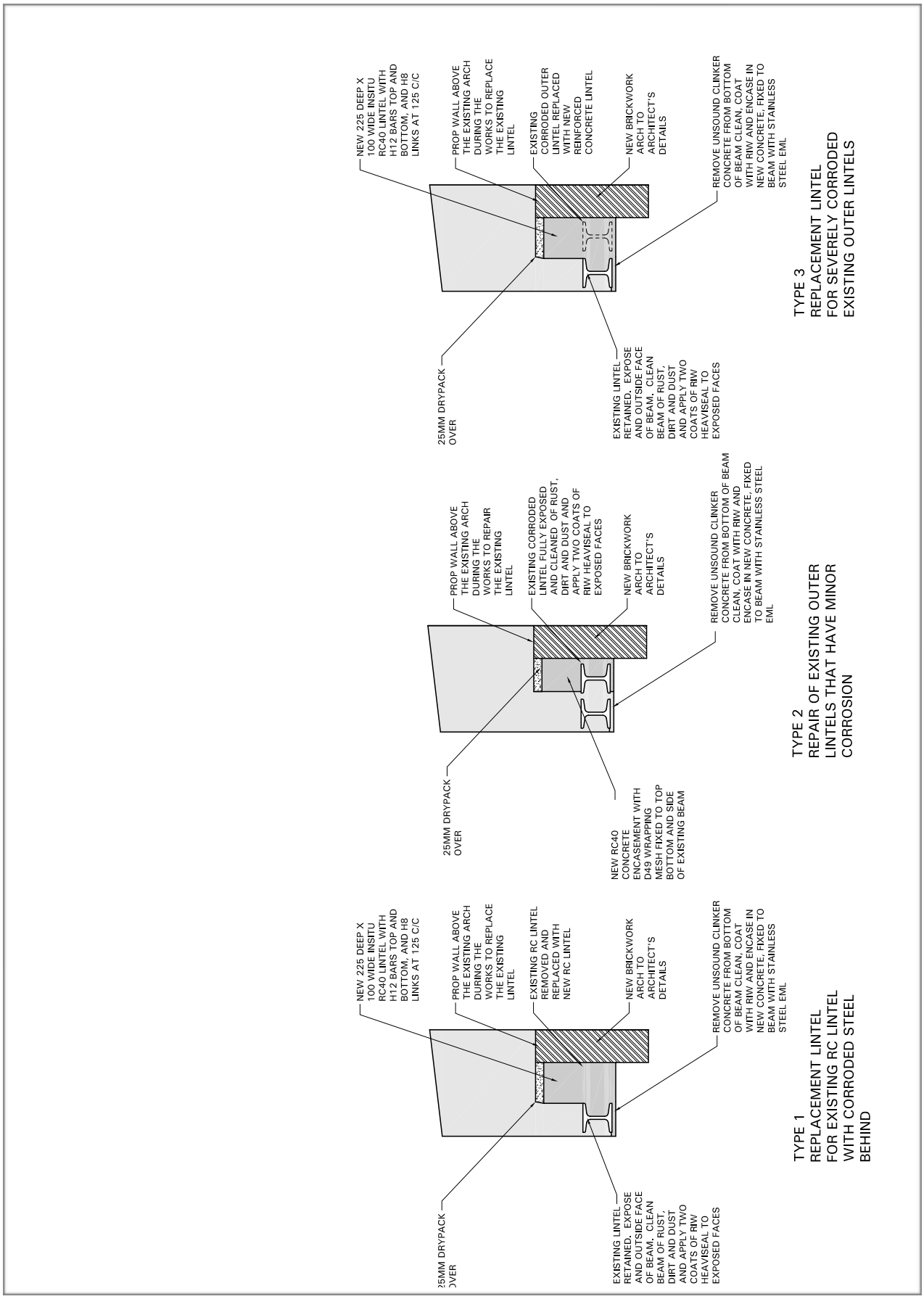
C. Carry out the works described in Section 2 - Repairs rear elevation.

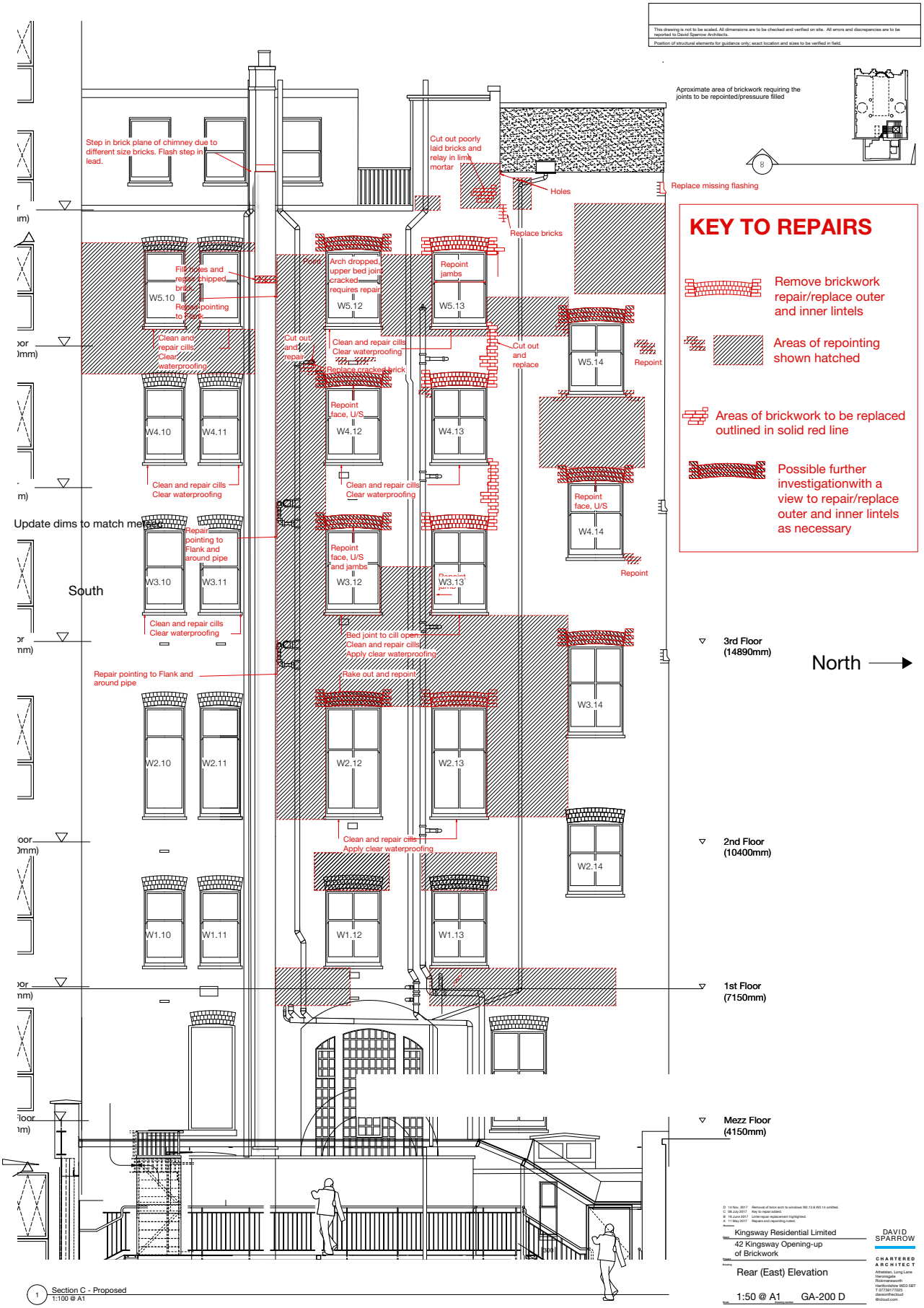
D. Carry out the repointing work to the light-wells as described in Section 3 - Brickwork Repairs to Light-wells.

E. Investigate the leak at high level located in the Northeast corner of the plant room to Level 5 and repair as necessary.

F. Investigate the damp patch in the ceiling to the kitchen area in flat 5 and carry out the necessary repairs.

G. Repoint crack in stone above roof level in Northwest corner.


NEW 225 DEEP X 100 WIDE INSITU RC40 LINTEL WITH H12 BARS TOP AND BOTTOM, AND H8 LINKS AT 125 C/C
PROP WALL ABOVE THE EXISTING ARCH DURING THE WORKS TO REPLACE THE EXISTING LINTEL
EXISTING CORRODED OUTER LINTEL REPLACED WITH NEW REINFORCED CONCRETE LINTEL
NEW BRICKWORK ARCH TO ARCHITECT'S DETAILS
REMOVE UNSOUND CLINKER CONCRETE FROM BOTTOM OF BEAM CLEAN, COAT WITH RIW AND ENCASE IN NEW CONCRETE, FIXED TO BEAM WITH STAINLESS STEEL EML
25MM DRYPACK OVER
EXISTING LINTEL RETAINED. EXPOSE AND OUTSIDE FACE OF BEAM. CLEAN BEAM OF RUST, DIRT AND DUST AND APPLY TWO COATS OF RIW HEAVISEAL TO EXPOSED FACES
TYPE 3
REPLACEMENT LINTEL
FOR SEVERELY CORRODED
EXISTING OUTER LINTELS
PROP WALL ABOVE THE EXISTING ARCH DURING THE WORKS TO REPAIR THE EXISTING LINTEL
EXISTING CORRODED LINTEL FULLY EXPOSED AND CLEANED OF RUST, DIRT AND DUST AND APPLY TWO COATS OF RIW HEAVISEAL TO EXPOSED FACES
NEW BRICKWORK ARCH TO ARCHITECT'S DETAILS
REMOVE UNSOUND CLINKER CONCRETE FROM BOTTOM OF BEAM CLEAN, COAT WITH RIW AND ENCASE IN NEW CONCRETE, FIXED TO BEAM WITH STAINLESS STEEL EML
25MM DRYPACK OVER
NEW RC40 CONCRETE ENCASEMENT WITH D49 WRAPPING MESH FIXED TO TOP BOTTOM AND SIDE OF EXISTING BEAM
TYPE 2
REPAIR OF EXISTING OUTER
LINTELS THAT HAVE MINOR
CORROSION
NEW 225 DEEP X 100 WIDE INSITU RC40 LINTEL WITH H12 BARS TOP AND BOTTOM, AND H8 LINKS AT 125 C/C
PROP WALL ABOVE THE EXISTING ARCH DURING THE WORKS TO REPLACE THE EXISTING LINTEL
EXISTING RC LINTEL REMOVED AND REPLACED WITH NEW RC LINTEL
NEW BRICKWORK ARCH TO ARCHITECT'S DETAILS
REMOVE UNSOUND CLINKER CONCRETE FROM BOTTOM OF BEAM CLEAN, COAT WITH RIW AND ENCASE IN NEW CONCRETE, FIXED TO BEAM WITH STAINLESS STEEL EML
25MM DRYPACK OVER
EXISTING LINTEL RETAINED. EXPOSE AND OUTSIDE FACE OF BEAM. CLEAN BEAM OF RUST, DIRT AND DUST AND APPLY TWO COATS OF RIW HEAVISEAL TO EXPOSED FACES
TYPE 1
REPLACEMENT LINTEL
FOR EXISTING RC LINTEL
WITH CORRODED STEEL
BEHIND


This drawing is not to be scaled. All dimensions are to be checked and verified on site. All errors and discrepencies are to be reported to David Sparrow Architects.
Position of structural elements for guidance only; exact location and sizes to be verified in field.
Aproximate area of brickwork requiring the joints to be repointed/pressuure filled
Step in brick plane of chimney due to different size bricks. Flash step in lead.
Cut out poorly laid bricks and relay in lime mortar
Holes
Replace missing flashing
Replace bricks
Point
Arch dropped, upper bed joint cracked requires repair
Repoint jambs
Fill holes and repair chipped brick
Repoint pointing to flank
Clean and repair cills Clear waterproofing
Cut out and repair
Clean and repair cills Clear waterproofing
Replace cracked brick
Cut out and replace
Repoint
Repoint face, U/S
Clean and repair cills Clear waterproofing
Repoint face, U/S
Repoint face, U/S and jambs
Repoint
Update dims to match metres
Repair pointing to Flank and around pipe
South
Bed joint to cill open
Clean and repair cills Apply clear waterproofing
Rake out and repoint
Repair pointing to Flank and around pipe
Clean and repair cills Apply clear waterproofing
W5.10
W5.12
W5.13
W5.14
W4.10
W4.11
W4.12
W4.13
W4.14
W3.10
W3.11
W3.12
W3.13
W3.14
W2.10
W2.11
W2.12
W2.13
W2.14
W1.10
W1.11
W1.12
W1.13
3rd Floor (14890mm)
2nd Floor (10400mm)
1st Floor (7150mm)
Mezz Floor (4150mm)
North
KEY TO REPAIRS
Remove brickwork repair/replace outer and inner lintels
Areas of repointing shown hatched
Areas of brickwork to be replaced outlined in solid red line
Possible further investigationwith a view to repair/replace outer and inner lintels as necessary
Kingsway Residential Limited
42 Kingsway Opening-up of Brickwork
Rear (East) Elevation
1:50 @ A1
GA-200 D
DAVID SPARROW
CHARTERED ARCHITECT
Section C - Proposed
1:100 @ A1