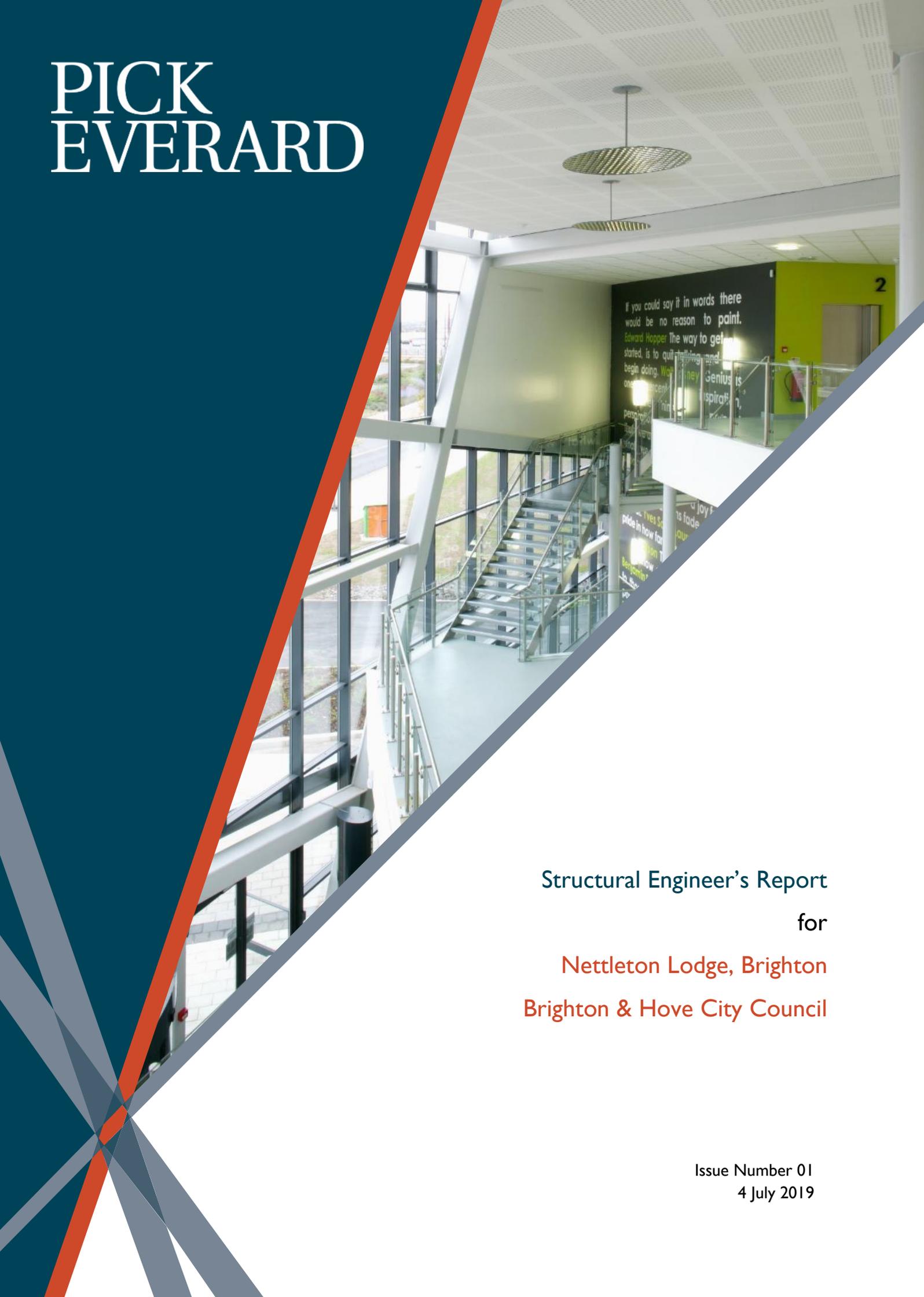


# PICK EVERARD

The background image shows a modern interior space, likely a library or community center. It features a prominent staircase with a glass railing, large windows on the left side, and a wall with a large quote by Edward Hopper. The ceiling has a grid pattern with circular pendant lights. The overall design is clean and contemporary.

Structural Engineer's Report  
for  
Nettleton Lodge, Brighton  
Brighton & Hove City Council

Issue Number 01  
4 July 2019

### Document History

Issue	Date	Comment	Author	Chk'd
01	04.07.19	First Issue	IAA	IPR



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**Appendix A**  
Typical Floor Layout Plans

**Appendix B**  
Photographs

**Appendix C**  
HAC Testing Results



## I.0 Reference and Instruction

- I.1 PE Report Reference : STR/IPR/IPG/190215/17-2/R008 – Issue 01
- I.2 Client : Brighton & Hove City Council
- I.2.1 Address : Housing Centre  
Unit 1 Fairway Trading Estate  
Eastergate Road  
Moulsecoomb  
Brighton  
BN2 4QL
- I.2.2 Telephone Number : [REDACTED]
- I.3 Inspected Property : Nettleton Lodge  
Upper Hollingdean Road  
Brighton  
BN1 7GS
- I.4 Occupier : Various tenants and leaseholders
- I.5 Inspecting Engineer/Surveyor : [REDACTED]
- I.6 Instruction
- I.6.1 Mode : Purchase Order
- I.6.2 Reference : BHC0608879/0
- I.6.3 Instructed by : Geof Gage
- I.6.4 On behalf of : Brighton & Hove City Council
- I.7 Brief

### Site Inspection and Investigation Works

- To carry out a visual, non-intrusive inspection of the tower block superstructure, externally from ground level with the use of binoculars, and internally to accessible communal areas and to void flats or flats where residents had requested or agreed an internal inspection.
- To particularly focus on inspection of exposed surfaces at panel connection locations, to inform decisions regarding any further investigations, to establish hidden connection details and condition, not included in this brief (the brief did not require opening up and inspection at typical connection details at this time).
- To carry out carbonation testing and High Alumina Cement (HAC) testing to a sample of concrete from each elevation of the block at ground floor level only.
- To identify any obvious Fire or H&S risks associated with the structural observations (not a full Fire or H&S assessment of the building)

### Reporting

- Following the site inspection and investigation works, to provide a report with comment on findings, the nature and cause of any damage; and recommendations on such further investigations as might be necessary to ascertain the cause of the damage and/or the type and scope of possible remedial measures.

## 2.0 Scope of Investigations and Report

In accordance with the aforesaid instructions, the following investigations have been undertaken:-

- (a) A visual inspection of the superstructure
- (b) On site carbonation testing of concrete samples from each elevation at ground floor level, using Phenolphthalein Solution on freshly broken concrete samples.
- (c) Laboratory HAC testing of concrete samples taken from site.
- (d) In addition, a desktop review of the following documents was undertaken:
  - a. Feasibility Report for Additional Lift Shaft door openings from 2013, by Frankham Structural Engineers, provided by the Council.
  - b. Online Geological maps

The investigations and this report are confined to technical assessment of the load bearing elements of the structure, the identification of damage in these elements at the time of our inspection, the cause of damage and the type and scope of measures necessary to repair that damage. Whilst every endeavour will be made to provide a positive and helpful report we are unable to predict the future behaviour of the structure or its components. Guarantee cannot therefore be given that the property will be free from future damage or that existing defects will not suffer from further deterioration or lead to damage.

This report is not to be used for any other purpose or by any third party and is not to be taken as a specification for remedial action or works. However, if the recommendations included within this report are to be subsequently taken forward to detailed design / scheduling and / or construction; before any work can commence, there is a duty on designers, within the definition of the Construction (Design and Management) Regulations 2015, to ensure that Clients are aware of the specific duties they are required to carry out under the provisions set out in the CDM Regulations. HSE's Client Guidance document INDG 411 which can be found on [www.hse.gov.uk](http://www.hse.gov.uk) sets out clear and concise guidance as to the role the Client plays in a project, and also what is expected of other disciplines involved in the project.

The visual inspection of the superstructure was made on 24 & 25 April 2019 and detailed notes are retained on file. The weather was generally overcast and dry, although with showers on 24 April.

Other than samples taken for carbonation and HAC testing, no breaking out or opening up of the building fabric was undertaken at the time of our inspection and no part of the property which was not readily accessible, or which was covered or otherwise concealed, was inspected.

Internally, communal areas and the following Flats were able to be accessed and inspected:

- Flat ■ – 25 April 2019. This was reported by the client as a void (empty) flat and access was gained with the void key provided.

Flats ■ ■ ■, ■, ■ and ■ were also reported by the client to be void Flats. However, the void key did not open the doors, and there was no response from residents when we knocked on the doors.

Access was not possible to the following internal communal areas:

- Ground floor Store adjacent to the Caretaker's Room.
- Ground floor Library.
- Lift Shafts

In addition, although keys were provided to access garages at the Lower Ground Floor level, none of these keys worked. Therefore no access was gained to these garages.

Absence of report on areas not accessed is not to be taken that it is free from defect. Such areas and unexposed parts of the building may contain problems and special arrangements would need to be made for these areas to be investigated (where practicably possible) if confirmation were to be required about their condition.

Drains were not inspected or tested. Foundations were not uncovered. Woodwork was not inspected other than for present functional structural adequacy.

Enquiries with local or statutory authorities have not been carried out. Whilst attention may be drawn to any apparent breaches of statutory requirements relative to the buildings or site, the absence of any such comment does not imply compliance with such requirements. The building and associated structures have not therefore been assessed for compliance with the Building Regulations, for example, Approved Document B – Fire Safety.

Whilst attention may be drawn to the suspected presence of asbestos in the building, this report is to be taken specifically to exclude any advice or recommendation in respect of the identification, handling, management or disposal of asbestos. Advice should be sought from other specialists, as and where appropriate.

We have not carried out any inspections to external structures that are not part of the tower blocks, such as the Gas Boiler Outhouses and Retaining and Boundary Walls around the site.

We have not carried out any inspections for invasive plant species such as Japanese Knotweed. Whilst attention may be drawn to the suspected presence of invasive plant species this report is to be taken specifically to exclude any advice or recommendation in respect of the identification, handling, management or disposal of such plants. If required advice should be sought from a qualified ecological or landscape consultant as and where appropriate.

## 2.1 Classification of Visible Damage to Walls and Ceilings

For the purposes of this report, the width of cracks is used as a basis for the classification of visible damage, broadly in compliance with the damage classifications defined by Building Research Establishment Digest 251, revision of 1991 (although updated in 1995 to provide greater description) :-

Description	Approximate crack width	BRE Category of Damage
Hairline cracks	Barely visible, less than 0.1mm wide	0
Very slight cracks	Up to 1mm wide	1
Slight cracks	1mm to 5mm wide	2
Moderate cracks	5mm to 15mm wide	3
Severe cracks	15mm to 25mm wide	4
Very severe cracks	Greater than 25mm wide	5

## 2.2 Orientation

Compass point orientation has been used to describe the location of various elements of the building. RIGHT-HAND and LEFT-HAND in relation to individual walls or components are taken when facing that wall or component.

## 3.0 The Property – General Details & History

### 3.1 Construction Details Observed

There are 2 no. tower blocks at the Upper Hollingdean Road site, which appear to be of the same construction detail. The blocks are named Nettleton Lodge and Dudeney Lodge.

The archive general arrangement floor plans provided by the client of these blocks, which includes a typical lower ground floor plan, typical ground floor plan, typical upper floor plan, and typical roof plan; appear to be the original design drawings and are dated late 1965, which suggests that the buildings were likely constructed c1966 and are of a Bison 'Large Panel System' (LPS) design.

Nettleton Lodge has a ground floor level and fourteen upper floor levels. The building is built within a hillside which slopes down from West to East. There is a lower ground floor level on the East side of the building. It appears from the Lower Ground Floor Plan provided by the client that the ground floor concrete slab and lower ground floor level slab are of in-situ reinforced concrete construction, with an in-situ concrete wall running along the line of the East side of the Lift Lobby connecting these 2 slabs. The same plan indicates that foundations may be strip footings, stepped as the ground levels change across the site.

The foundations then appear to support the main pre-cast concrete walls and pre-cast reinforced concrete floor panel construction continuing upwards. The internal dividing walls at ground floor level and the lift shafts also appear to be pre-cast concrete units. The main loadbearing walls at the East and West sides of the building appear to run East/West, with the floor slabs spanning North/South between them; but within the central part of the building the loadbearing walls appear to run North/South; with the floor slabs spanning East/West between them.

The original external pre-cast concrete wall panels to the North and South elevations, and within most of the 'alcoves' at the North and South ends of the building have been clad externally with an insulated rainscreen cladding system. Original windows have been replaced with UPVC framed double glazed windows. Ventilation grilles were noted at the bottom of the new cladding. Given the presence of the cladding installation, only the underside edge at the bottom of the original pre-cast concrete panels at ground floor level is visible in some locations. The remaining parts of the original external concrete panels are generally not visible, with the exception of the short length of external walls to Bathrooms within the 'alcoves' at the North and South ends of the building.

Internally, the pre-cast concrete panels in the communal areas are partly visible, with a painted finish in many areas, although some walls have been wallpapered locally in the corridors.

Online geological maps suggest that the building is founded on the Seaford Chalk Formation. The Lower Ground Floor Plan provided by the client indicates that foundations may be strip footings, stepped as the ground levels change across the site, although these may be piled ground beams. This would need to be confirmed by further investigations if confirmation was required.

There are various mature trees within the site, to the South and West of the building, all typically more than 10m away from the building.

A brick outhouse building has been constructed approximately 3m away from the North East corner of the building. This houses the gas boilers, which heat water that is fed to the tower block.

### 3.2 Brief Background and History of Large Panel System Buildings

The majority of high rise tower blocks utilising ‘Large Panel Systems’ were designed and constructed in the 1950/1960s. They typically comprise pre-cast reinforced concrete floor and roof components spanning onto storey-height structural precast concrete wall panels. The pre-cast components are connected by various forms of joint made on site; typically dowels and hoops cast into the walls and floors are connected, with the gaps then infilled with a dry pack mortar on site to complete the structural construction. There are however differences in the individual forms of LPS, which were propriety products produced by the various manufacturers of the day.

As noted above, the system used for Nettleton Lodge is understood to be a Bison System.

Concerns regarding the general structural form of LPS construction for high rise buildings were brought into focus in 1968 at the time of the Ronan Point disaster where a gas explosion in a flat caused a progressive collapse to one side of the building. The Ronan Point building was a Taylor Woodrow-Anglian (TWA) LPS dwelling block.

In subsequent years to the Ronan Point disaster, various structural investigations and appraisals have been undertaken on various manufacturers’ systems, by the Building Research Establishment (BRE) and others, with reports readily available. These reports have led to recommendations on requirements for appraisals and assessment of these buildings from the BRE and the Ministry of Housing and Local Governments (MHLG) (as once was).

Particularly after the Ronan Point disaster there were immediate recommendations, amongst others, for strengthening works to the joints between the pre-cast panels.

Various localised defects have been found to different types of LPS system buildings over the years during previous BRE and other investigations, which although raise concern about potential build quality of the systems, does not necessarily mean that all LPS buildings were constructed poorly.

However, the BRE Report in 1987 (The Structural Adequacy and Durability of LPS dwellings) made recommendations that a full structural assessment of a complete LPS dwelling block should be undertaken every 20 years; with supporting visual inspections of the external envelope of the building at intervals of about 5 years, together with intrusive investigations every 10 years to check upon the condition of the reinforcement within in-situ joints which might experience rain penetration.

The most recent guidance document regarding LPS buildings is the BRE Handbook for the Structural Assessment of LPS Dwelling Blocks for Accidental Loading of 2012, which reiterates the above inspection regime of the 1987 report and provides 3 criteria against which LPS dwelling blocks should be evaluated.

### 3.3 Review of Previous Reports on the Building

The client was largely unable to readily locate any historic records for structural appraisals or remedial works undertaken to the building since its construction, although did report that the Council’s archiving system was in the progress of being digitised, which means that there may be historic records available which are not currently readily accessible.

Apart from the typical archive general arrangement floor plans provided, the client was not able to locate any other previous reports which refers to the building structure, although

did provide a 2013 Feasibility Report on Additional Lift Shaft Door Openings by Frankham Structural Engineers.

This report indicates that the lift shafts within Nettleton Lodge were inspected as part of this feasibility study to form new door openings in the shafts (to allow new lifts to stop at every floor rather than every other floor).

However, there was no reference to any obvious visible defects observed in the lift shaft structures.

It was also reported by the client that the piped gas supply had been removed from the tower block, presumably at some point following the Ronan Point disaster. The gas supply is now only to the Outhouse building feeding the gas boilers, which heat water that is fed to the tower block.

From the limited records currently available, there is no documentary evidence at present to suggest that BRE or MHLG recommended inspection or remedial works have been carried out over the years since the Ronan Point disaster.

## 4.0 Visual Inspection – Observations and Principal Present Damage

Generally, there was no obvious significant structural damage observed to the areas of the tower block that we were able to inspect and the building generally appeared to be in good structural condition.

However, as noted above, external inspection of the original concrete panels was largely not possible and the internal inspection was limited to communal areas and one out of approximately 87 flats. There were no obvious significant deformations in the external cladding panels which might otherwise give cause for immediate structural concern.

There was evidence of 1 no. internal patch repair to floor/wall junction at the 3<sup>rd</sup> floor level in the Stairs, which might suggest that investigation and possibly strengthening works may have been carried out at the joint, possibly following the Ronan Point disaster. However, as this location was localised to 1 no. area, this might suggest that only investigation works were undertaken rather than strengthening works, which might otherwise be evident with patch repairs at all floor levels. However, evidence of other areas of investigations or strengthening works may now be hidden behind decorative finishes.

Regarding specific areas of damage observed during our on-site inspections, we have itemised these into the table in Section 4.1, with a recommendation for further investigation or repair, and a recommendation for when such works should be carried out. Photographs can be found in Appendix B. Although most of these are not of structural concern at present, they have been recorded to allow for future visual monitoring.

The localised repairs recommended for the year 2020 and beyond (amber and green highlights) are subject to the findings of the wider further recommendations provided in Section 6.0 of this report, such that, if further investigations yield any significant further concerns, the necessity for localised repairs may be superseded. However, if further investigations are not undertaken as recommended in Section 6.0, then localised repairs should be undertaken as recommended.

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Ground Floor Level Caretakers Room	Floor	Precast reinforced concrete slab panels.	Joint between panels filled with mortar. Appears that this may be coming loose.	Rake out and refill the joint with a proprietary concrete repair in accordance with manufacturer's specification.	INT-24	2020
Electricity Intake Room	Walls	Precast Concrete Wall	Slight vertical crack at joints of precast concrete wall panels in South East corner of room. The damage is considered to be due to slight thermal expansions and contractions between the wall sections. This damage is not considered structurally significant.	Visually monitor as part of future routine inspections.	INT-26	2024
Ground Floor Level WC	Internal Ceiling	Precast Reinforced Concrete Slab	Very slight crack in ceiling at joint in floor slab. The damage is considered to be due to slight thermal expansions and contractions between the slab sections. This is not considered to be of structural significance.	Visually monitor as part of future routine inspections.	INT-28	2024
Ground Floor Level WC	Walls	Precast reinforced concrete panels	Very slight vertical crack at joints of precast concrete wall panels to East wall. The damage is considered to be due to slight thermal expansions and contractions between the wall sections. This damage is not considered structurally significant.	Visually monitor as part of future routine inspections.	INT-29	2024

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Refuse Room	Internal Ceiling	Precast Reinforced Concrete Slab	Various very slight cracks in ceiling at joints between floor slabs. The damage is considered to be due to slight thermal expansions and contractions between the slab sections. This is not considered to be of structural significance.	Visually monitor as part of future routine inspections.	INT-34	2024
Refuse Room	Services	Water Waste Pipe	Although not of direct structural concern, it was observed that a plastic water overflow pipe that runs around the Eastern walls of the room has been fractured following impact from the bins and is missing near its outlet end. Water is therefore leaking onto the floor.	It would be prudent to replace the damaged pipe either with a more robust steel pipe, or to protect a new plastic pipe from impact damage with a metal grill or similar. Constant leaking of water could eventually damage the building structure.	INT-37 / INT-38	2019
Dry Risers and Risers	Internal Ceiling and Walls	Precast Concrete Walls and Slab	It was observed that within all upper floor Risers and Dry Risers either side of the central Hallways, that steel angle plates had been bolted to the walls between the corridor and risers and the adjacent floor slabs, presumably to act as additional bracing or support for the slab edges at these particular locations.	There did not appear to be any sign of distress in the original construction in these locations or defects with the new steel angles. It would be prudent to review if there are any additional archive records available to ascertain the purpose of these steel angles. In addition, these should be visually monitored as part of future routine inspections.	INT-53/61	2024

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Hallways and Stairs Various Floors	Walls	Precast Concrete Wall	Typical hairline to very slight vertical cracks at joints of precast concrete wall panels at various floor levels. The damage is considered to be due to slight thermal expansions and contractions between the wall sections. This damage is not considered structurally significant.	Visually monitor as part of future routine inspections.	INT-81	2024
Hallways to Various Floor Levels adjacent to North and South windows	Walls	Appears to be stud walling	Crazed cracking to plaster finish and hairline cracks at joint between timber window trims and plastic window trims and the wall. The damage is considered to be due to slight thermal expansions and contractions between the different materials. This damage is not considered structurally significant.	Visually monitor as part of future routine inspections.	INT-83	2024
Floor 2 Hallway East wall near North end	Walls	Precast Concrete Wall	Appears to be historic water staining.	It would be prudent to carry out localised repair to the plaster and decorations and then monitor this area as part of future routine inspections.	INT-84	2024
Stairs, 3 <sup>rd</sup> floor level	Walls	Precast Concrete Wall	Patch repair observed at the level of the 3 <sup>rd</sup> floor slab. This could be a location of previous investigations or remedial strengthening repairs.	There did not appear to be any sign of distress in the repair. It would be prudent to review if there are any additional archive records available to ascertain the details of the repair and any possible investigation works undertaken. In addition, this should be visually monitored as part of future routine inspections.	INT-86	2020

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Floor 9 Hallway West Wall near North end	Walls	Precast Concrete Wall	Peeling paint and very slight localised cracking observed to end of wall between Flat doors. This may be due to cracking caused by insertion of fixings for the service ducting fixed to the wall.	It would be prudent to carry out further intrusive investigations of this detail as part of the general investigation work recommended within section 6.0 of this report, to establish if there is any significant structural cracking within the concrete structure.	INT-95	2020
Floor 12 Hallway West Wall near South End.	Walls	Precast Reinforced Concrete	A service pipe has been leaking and caused historic staining to the wall.	It would be prudent to investigate whether this leak is ongoing and to remedy if necessary to prevent further water damage to the building. It would then be prudent to carry out localised repair to the plaster and decorations and then monitor this area as part of future routine inspections.	INT-100	2019
Flat ■	-	-	No significant damage noted	-	-	-
Roof Lift Plant Room	Internal Ceiling	Precast Reinforced Concrete Slab	Very slight crack in ceiling at joint in roof slab and in floor at joint in slab. The damage is considered to be due to slight thermal expansions and contractions between the slab sections. This is not considered to be of structural significance.	Visually monitor as part of future routine inspections.	INT-136	2024

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Roof Lift Plant Room	Walls	Precast Concrete Wall	Hairline horizontal crack at joint between floor slab and wall panels. The damage is considered to be due to slight thermal expansions and contractions between the slab sections. This is not considered to be of structural significance.	Visually monitor as part of future routine inspections.	INT-137	2024
External North Elevation, Ground Floor Level at North East corner of building	Walls	Pre-cast concrete loadbearing wall panels	3 no. areas of localised spalling visible to bottom of ground floor panel and exposed reinforcement bars in places.	Locally break out damage surrounding concrete. Clean any corroded steel reinforcement back to bright metal and apply zinc rich paint followed by proprietary concrete repair in accordance with manufacturer's specification.	EXT-51 / EXT-52 / EXT-53	2020
External East Elevation, [REDACTED]	Beam	In-situ Concrete Frame Over Garage Doors	Localised corrosion staining spot, possibly due to localised corroding reinforcement at shallow depth.	Visually monitor as part of future routine inspections.	EXT-54 / EXT-57	2024
External South Elevation, Ground Floor Level at South East corner	Walls	Pre-cast concrete loadbearing wall panels	Various areas of localised spalling visible to bottom of ground floor panel and exposed reinforcement bars in places.	Locally break out damage surrounding concrete. Clean any corroded steel reinforcement back to bright metal and apply zinc rich paint followed by proprietary concrete repair in accordance with manufacturer's specification.	EXT-60 / EXT-61	2020

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
External South Elevation, Ground Floor Level at South East corner of building	Walls	Pre-cast concrete loadbearing wall panels	It was observed that exposed painted reinforcement connections between the lower ground floor walls and the ground floor walls appeared to have shallow concrete cover where they are embedded into the base of the ground floor wall panels. Adjacent to 1 no. of these connections, spot corrosion staining was observed to the bottom of the panel.	It would be prudent to carry out further closer inspection and possible intrusive investigations of this detail as part of the general investigation work recommended within section 6.0 of this report.	EXT-66 / EXT-68	2019
External West Elevation	Walls	Pre-cast concrete non-loadbearing external panels below windows and perpendicular loadbearing walls	Various localised concrete patch repairs to panels across the elevation and to ends of perpendicular loadbearing walls. These repairs all appear to be in satisfactory condition at present.	Visually monitor as part of future routine inspections.	EXT-101 / EXT-105	2024
West External Elevation ██████████ █	Walls	Pre-cast concrete non-loadbearing external panels below windows	Localised spot corrosion to wall panel	Visually monitor as part of future routine inspections.	EXT-106	2024

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
North and South External Elevation	Walls	Rainscreen Cladding	Small diameter holes in wall cladding panels to all levels up the external elevation to the East and West half of the building, presumably left following removal of service pipes.	It would be prudent to carry out further closer inspection and possible intrusive investigations of these areas as part of the general investigation work recommended within section 6.0 of this report, to determine if any damage may have occurred to the walls behind if water has penetrated through the holes. We recommend that holes should be sealed so that rain water cannot penetrate behind the cladding.	EXT-108	2019
South External Elevation, Western half of building	Walls	Rainscreen Cladding	Timber panel fixed over presumed hole in rainscreen cladding at ground floor level.	It would be prudent to complete a more permanent repair to this area, as the untreated timber board will likely deteriorate more rapidly than the surrounding cladding material.	EXT-111	2019
External East Elevation	Walls	Pre-cast concrete non-loadbearing external panels below windows and perpendicular loadbearing walls	Various localised concrete patch repairs to panels across the elevation and to ends of perpendicular loadbearing walls. These repairs all appear to be in satisfactory condition at present.	Visually monitor as part of future routine inspections.	EXT-118 / EXT-119	2024

#### 4.1 Visual Inspection – Observations and Principal Present Damage

Location	Building Element	Element Description	Condition / Defect	Recommended Works	Photo Number	Rec Year Of Work
Roof Lift Plant Room	Walls	External Cladding	Impact damage to plastic wall cladding.	Replace or make good damaged cladding to prevent water ingress into the building structure.	EXT-135	2019
Roof Lift Plant Room	Door	Lock	Door to lift plant room was unlocked. Yale key provided does not work to be able to lock after access.	Recommend to replace lock if there is no key, to help prevent unauthorised access, although there are 2 other doors up to roof level that are locked to prevent access to the roof, before the Plant Room is reached.	N/A	2019

## 5.0 Carbonation and HAC Testing of Concrete

5.1 Samples were taken for on-site carbonation testing and laboratory HAC testing at the following locations as shown in the Floor Layout Plans in Appendix A:

North Elevation:	Bottom of pre-cast concrete wall panel at ground floor level.
East Elevation:	Side of in-situ concrete column at lower ground floor level.
South Elevation:	Bottom of pre-cast concrete wall panel at ground floor level.
West Elevation:	Bottom of pre-cast concrete wall panel at first floor level.

5.2 Carbonation testing was carried out on site using phenolphthalein solution sprayed onto the freshly broken off samples of concrete. The concrete surface turns pink in the presence of a high pH value above 9.0, indicating that the concrete has not been subject to the carbonation process whereby its pH has been reduced and thus its potential passive protection to the reinforcement steel may be less effective.

Testing and measurements taken on site indicated that there was carbonation occurring to a depth of approximately 7mm to the samples taken from the East, South and West elevations, and to approximately 10mm depth to the sample taken from the North elevation.

5.3 HAC testing results, which are shown in Appendix C, returned negative results for all samples, although it should be noted that on this block, one sample was to an in-situ concrete element.

## 6.0 Assessment of Findings & Recommendations

- 6.1 Generally, there was no obvious significant structural damage observed to the areas of the tower block that were able to be inspected and the building generally appeared to be in good structural condition. The hairline to very slight cracking at joints in the concrete panels is considered to be due to slight thermal expansions and contractions between the panels.
- 6.2 If carbonation depths to all concrete elements are similar to the areas tested during our inspections, then it appears that the concrete will still be providing good protection to steel reinforcement, assuming that the concrete cover is at typical depths of say 30-40mm, although it was observed that exposed painted reinforcement connections between the lower ground floor walls and the largely hidden ground floor walls appeared to have shallow concrete cover where they are embedded into the base of the ground floor wall panels. Areas where localised corrosion staining have been observed are likely to be localised areas where reinforcement cover is relatively shallow.
- 6.3 However, as noted above, external inspection of the original concrete walls was not possible and the internal inspection was limited to communal areas and one out of approximately 87 flats. There were no obvious significant deformations in the external cladding panels which might otherwise give cause for immediate structural concern.
- 6.4 Depending on the design and installation of the ventilation detail behind the new cladding to allow air flow, there may be potential for condensation to build up behind the cladding panels.
- 6.5 As noted above, we are not aware of any records that structural strengthening has been carried out, and there was only very limited evidence from our observations on site, that such work has been undertaken following the Ronan Point collapse.
- 6.6 However, one of the main hazard sources to the building; internal gas explosion, has been removed from the block, although there remains the risk of an external gas explosion from the boilers in the Outhouse, albeit that this is a single source where the risk should be reduced assuming a routine boiler servicing and maintenance regime is in place.
- 6.7 Although there was no indication of structurally significant movement in the building at present; given the apparent lack of records and the age and construction type of the building, we consider that it would be prudent to follow the BRE guidance in relation to undertaking a full structural assessment of the block, which will require intrusive investigations to check the condition of the reinforcement within typical in-situ external and internal joints and confirm the condition of typical external walls which are currently hidden by the newer cladding.
- 6.8 However, in the first instance, we consider that it would be prudent to review the feasibility of carrying out a thermal imaging survey of the exterior façades, as this may be a cost effective way to provide an initial indication of any damp patches or structural anomalies (cracking/spalling) that may be occurring behind the external cladding. This may allow targeted intrusive investigations to be undertaken of the structure behind the cladding.

- 6.9 At the time of intrusive investigations, it would also be prudent to carry out the following further testing:
1. Compressive strength testing of pre-cast concrete wall and floor samples and of some typical in-situ concrete samples.
  2. Further carbonation testing of pre-cast concrete wall panels
  3. Chloride testing, given the proximity of the building to the sea and that the concrete was exposed to the elements before the current cladding system was installed.
  4. Testing of the below ground foundations for chlorides/sulphates, given the possibility that sea-dredged aggregates may have been used in the in-situ concrete foundation construction.
- 6.10 It would also be prudent as part of intrusive investigations, to assess whether the newer over cladding design and installation has taken into account the conclusions within the BRE Report of 1986 'Overcladding external walls of large panel system dwellings'.
- 6.11 Following the findings of the intrusive investigations, it would be prudent to carry out a full structural assessment of the original concrete structure of the block in line with the guidance in the BRE Handbook for the Structural Assessment of LPS Dwelling Blocks for Accidental Loading, including assessment against the 3 criteria which LPS dwelling blocks should be evaluated.
- 6.12 Localised repairs recommended in Section 4.0 should be undertaken, but those recommended in the year 2020 and beyond (amber and green highlights) will be subject to the findings of the wider further investigations recommendations above and should be reviewed again following the further investigations and appraisal. For example, if further investigations yield any significant further concerns, the necessity for localised repairs may be superseded by larger scale remedial works. However, if further investigations are not undertaken as recommended above, localised repairs should be undertaken as recommended.
- 6.13 In regards to future long term inspections, appraisals and investigations, the BRE recommendations from their 1987 report (The Structural Adequacy and Durability of LPS dwellings) should be followed:
- A full structural assessment of a complete LPS dwelling block should be undertaken every 20 years
  - Supporting visual inspections of the external envelope of the building at intervals of 5 years
  - Intrusive investigations every 10 years to check upon the condition of the reinforcement within in-situ joints which might experience rain penetration.

## 7.0 Status of Report

This report does not provide a warranty or guarantee as regards the structural adequacy and condition of the building. It provides a considered professional opinion based on a limited visual inspection and no liability shall attach to us except to the extent that we have failed to exercise reasonable skill, care and diligence in the provision of our services.

*Pick Everard*

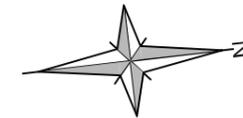
Pick Everard  
Consulting Civil and Structural Engineers  
Halford House  
Charles Street  
Leicester  
LE1 1HA

## Appendix A

### Typical Floor Layout Plans

Drawing No. I90215-PEV-08-00-DR-S-0801	-	Ground Floor Layout Plan
Drawing No. I90215-PEV-08-01-DR-S-0802	-	Floors 1-14 Typical Floor Layout Plan

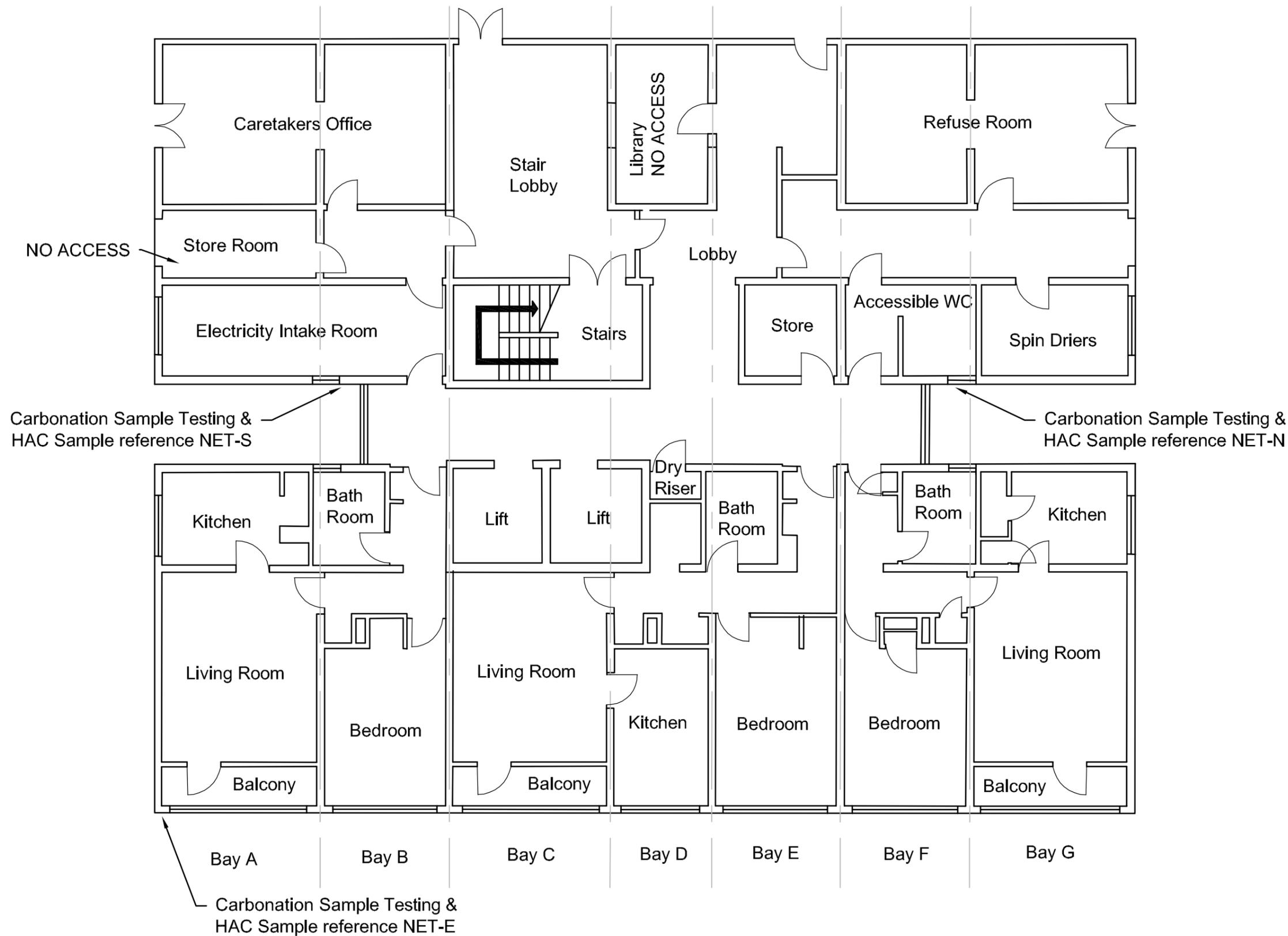




**Note:**

To be read in conjunction with Pick Everard Report reference STR/IPR/IPG/190215/17-2/R008

Plan based on archive plans provided by the client



Revision	Date	Drn	Chk
P01	Report Issue	27.06.19	IAA IPG

Client: Brighton and Hove City Council

Project: Large Panel System Tower Block Inspection

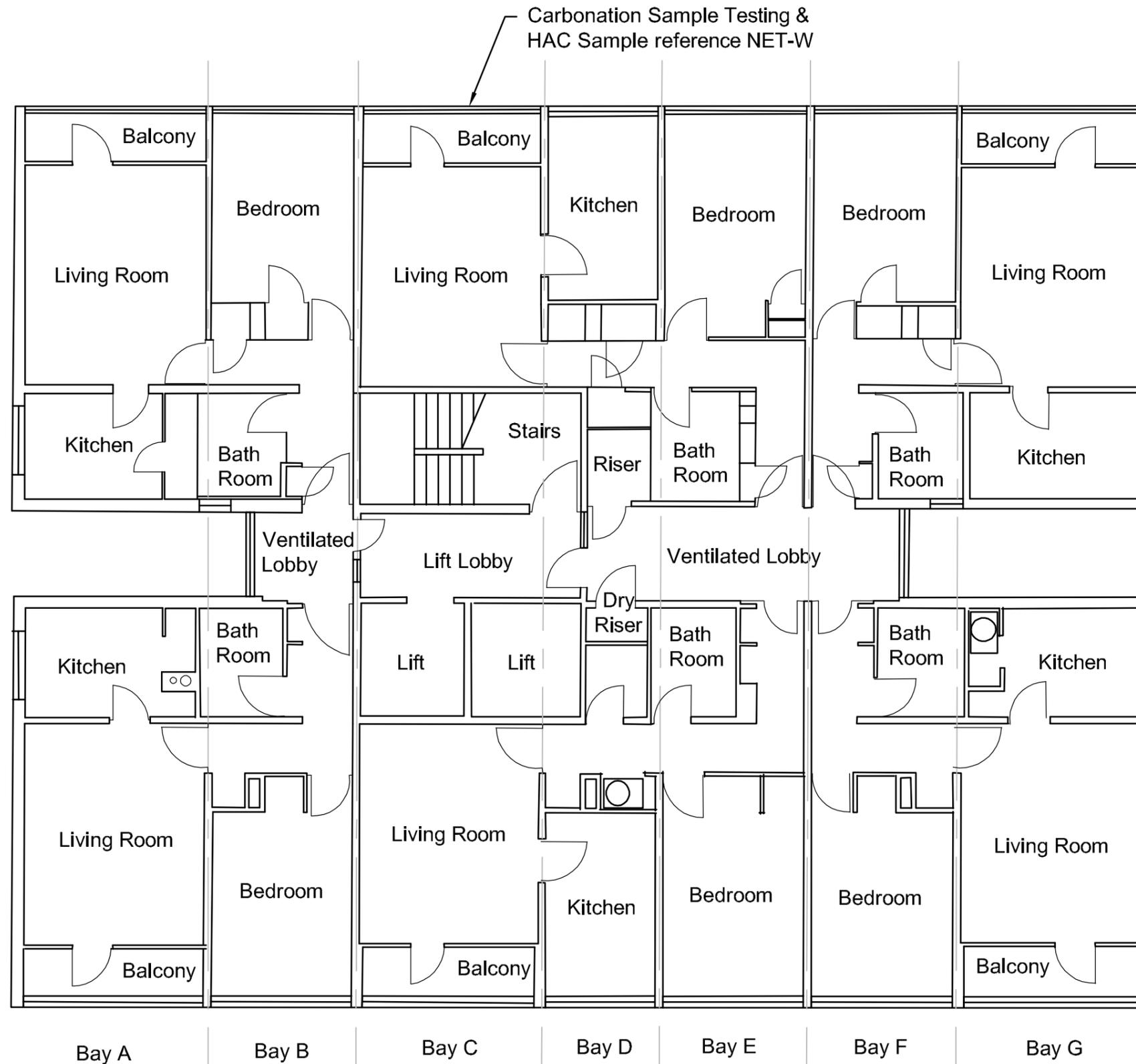
Drawing Title: Nettleton Lodge Ground Floor Layout

Suitability Status: S2 - Suitable for Information

Job No. 190215 Scale NTS Size @ A3 Rev P01

Drawing Number: 190215-PEV-08-00-DR-S-0801  
Project Code - Originator - Zone - Level - Type - Role - Number





**Note:**

To be read in conjunction with Pick Everard Report reference STR/IPR/IPG/190215/17-2/R008

Plan based on archive plans provided by the client

P01	Report Issue	28.06.19	IAA	IPG
Revision	Date	Drn	Chk	
Client				

**Brighton and Hove City Council**

Project  
**Large Panel System Tower Block Inspection**

Drawing Title  
**Nettleton Lodge  
Floors 1 - 14 Typical Floor Layout**

Suitability Status  
**S2 - Suitable for Information**

Job No.	Scale	Size	Rev
<b>190215</b>	<b>NTS</b>	<b>@ A3</b>	<b>P01</b>

Drawing Number  
**190215-PEV-08-01-DR-S-0802**  
Project Code - Originator - Zone - Level - Type - Role - Number



## Appendix B

### Photographs





**Photo No. INT-24**



**Photo No. INT-26**



**Photo No. INT-28**



**Photo No. INT-29**



**Photo No. INT-34**



**Photo No. INT-37**



**Photo No. INT-38**



**Photo No. INT-53**



**Photo No. INT-61**



**Photo No. INT-83**



**Photo No. INT-84**



**Photo No. INT-86**



**Photo No. INT-95**



**Photo No. INT-100**



**Photo No. INT-136**



**Photo No. INT-137**



**Photo No. EXT-51**



**Photo No. EXT-52**



**Photo No. EXT-53**



**Photo No. EXT-54**



**Photo No. EXT-57**



**Photo No. EXT-60**



**Photo No. EXT-61**



**Photo No. EXT-66**



**Photo No. EXT-68**



**Photo No. EXT-101**



**Photo No. EXT-105**



**Photo No. EXT-106**



**Photo No. EXT-108**



**Photo No. EXT-111**



**Photo No. EXT-118**



**Photo No. EXT-119**



**Photo No. EXT-135**



## Appendix C

### HAC Testing Results





**Pick Everard**  
Halford House  
Charles Street  
Leicester  
LE1 1HA

**Analytical Test Report: L19/1274/PIC/001**

Your Project Reference:	<b>Brighton &amp; Hove Tower Blocks</b>	Samples Received on:	20/05/2019
Your Order Number:	71569	Testing Instruction Received:	20/05/2019
Report Issue Number:	1	Sample Tested:	20/05 to 30/05/2019
Samples Analysed:	32 concrete samples	Report issued:	30/05/2019

Signed

**James Gane**  
Group Data Manager  
Nicholls Colton Group

Notes:

**General**

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Samples were supplied by customer, results are representative of the material provided

**Accreditation Key**

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue 24.01.2017

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

J:\Public\Projects\2019\L19\PIC - Pick Everard\L19-1274-PIC\L19-1274-PIC-001.xlsx\Cover Sheet



Nicholls Colton Group  
 7 - 11 Harding Street  
 Leicester  
 LE1 4DH

L19/1274/PIC/001

Project Reference - Brighton & Hove Tower Blocks

Analytical Test Results - Concrete

NC Reference	37523	37524	37525	37526
Client Sample Reference	NE/N	NE/E	NE/S	NE/W
Location	Nettleton Tower	Nettleton Tower	Nettleton Tower	Nettleton Tower
Location	Nettleton North Elevation	Nettleton East Elevation	Nettleton South Elevation	Nettleton West Elevation
Sample Description	Concrete dust and lumps	Concrete dust and lumps	Concrete dust and lumps	Concrete dust and lumps
<b>BRE DETECTION OF HIGH ALUMINA CEMENT</b>	<b>Accreditation</b>			
Presence Of High-Alumina Cement (HAC)	UKAS	No	No	No



Nicholls Colton Group  
7 - 11 Harding Street  
Leicester  
LE1 4DH

L19/1274/PIC/001

Project Reference - Brighton & Hove Tower Blocks

Analysis Methodologies and Notes

Determinant	Test method and notes
BRE Detection of High Alumina Cement	<ol style="list-style-type: none"><li>1. Testing was in accordance with BRE Information Sheet IS 15/74.</li><li>2. Contaminated samples may give a false result.</li><li>3. Samples taken from extensively carbonated concrete containing Portland Cement may give a false positive result.</li><li>4. If conclusive identification of the presence of High Alumina Cement is required this result should be confirmed by a more definitive test.</li></ol>