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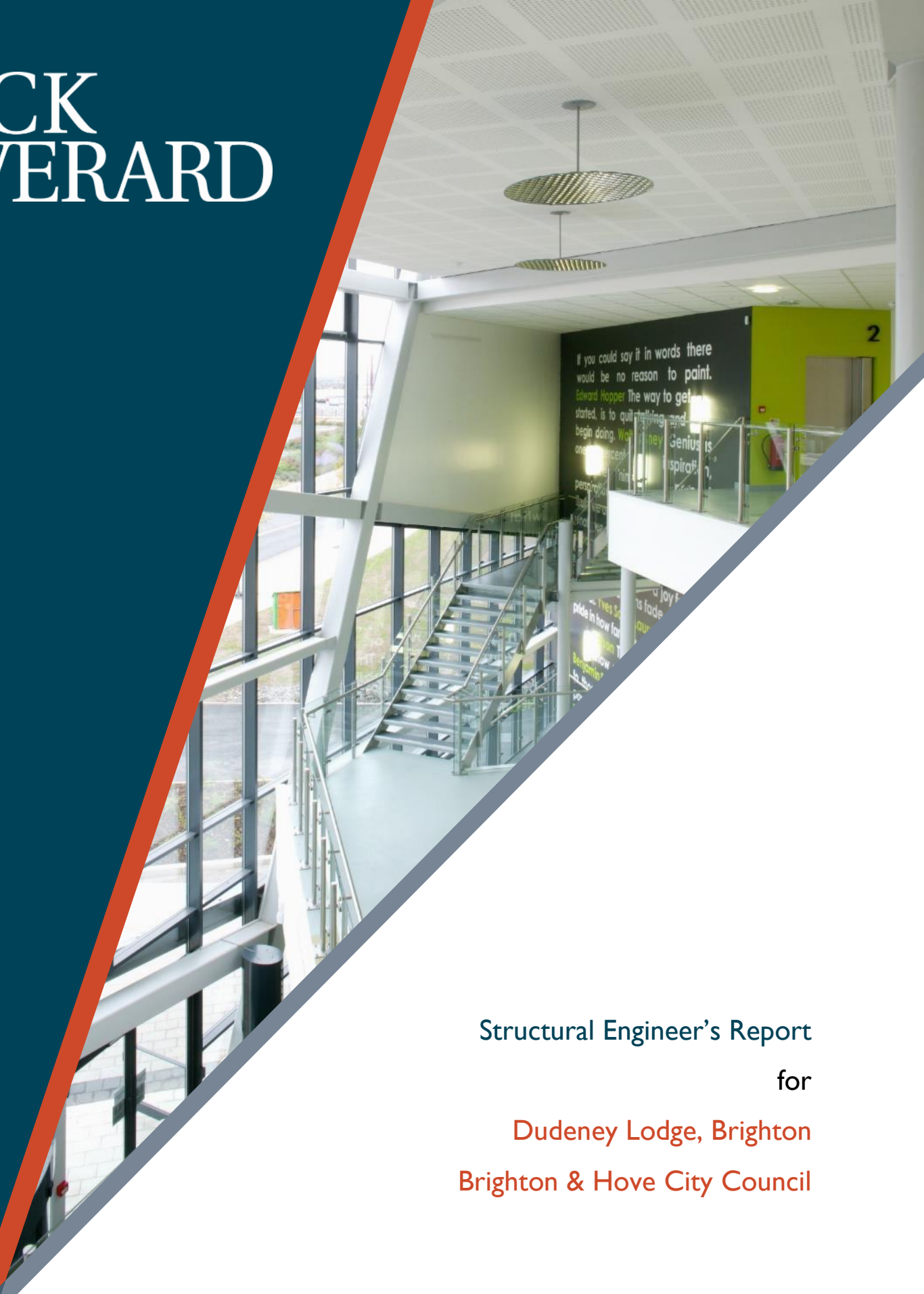


Structural Engineer's Report

for

Dudeney Lodge, Brighton

Brighton & Hove City Council

Issue Number 01
1 July 2019

Document History

Issue	Date	Comment	Author	Chk'd
01	01.07.19	First Issue	IPG	IPR

Contents

1.0 Reference and Instruction

1.1	PE Report Reference	:	STR/IPR/IPG/190215/17-2/R007 – Issue 01
1.2	Client	:	Brighton & Hove City Council
1.2.1	Address	:	Housing Centre Unit 1 Fairway Trading Estate Eastergate Road Moulsecoomb Brighton BN2 4QL
1.2.2	Telephone Number	:	[redacted]
1.3	Inspected Property	:	Dudeney Lodge Upper Hollingdean Road Brighton BN1 7GT
1.4	Occupier	:	Various tenants and leaseholders
1.5	Inspecting Engineer/Surveyor	:	[redacted]
1.6	Instruction		
1.6.1	Mode	:	Purchase Order
1.6.2	Reference	:	BHC0608879/0
1.6.3	Instructed by	:	Geof Gage
1.6.4	On behalf of	:	Brighton & Hove City Council

1.7 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. 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 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 and 15 May 2019 and detailed notes are retained on file. The weather was generally overcast but dry on all days.

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 [redacted] – 25 April 2019. This was reported by the client as a void (empty) flat. However, a resident was in occupation but agreed to provide access.
- Flat [redacted] – 15 May 2019. The resident requested an inspection via the Council due to concerns regarding a previous patch repair to the Living Room ceiling. The resident would only permit inspection of the Living Room. Access to the rest of the Flat was not permitted, except to walk through the Hallway into the Living Room.
- Flat [redacted] – 15 May 2019. The resident saw us carrying out our inspections on site and requested for us to inspect inside their flat.
- Flat [redacted] – 25 April 2019. This was reported by the client as a void (empty) flat and access was gained with the void key provided.
- Flat [redacted] – 24 April 2019. The resident requested an inspection via the Council due to them observing cracking in their Bathroom ceiling. The resident would only permit

inspection of the Bathroom and adjacent Hallway. Access to the rest of the Flat was not permitted.

Flats [redacted], [redacted], [redacted], [redacted], [redacted], [redacted], [redacted] and [redacted] 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 Caretaker Room adjacent to the West elevation.
- Ground floor Residents' Communal Room at the South West corner of the building.
- Ground floor Accessible WC near the North end of the building.
- Lift Shafts

In addition, although keys were provided to access garages at Lower Ground Floor levels, 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.

Dudeney 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 grills 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 North and West of the building, all typically more than 10m away from the building.

A brick outhouse building has been constructed approximately 7m away from the South 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 Dudeney 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 Engineer, for the adjacent Nettleton Lodge building.

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 report provided for Dudeney Lodge. We understand that the lift shaft for Dudeney Lodge has not therefore been inspected and reported on previously to our knowledge.

However, there was no reference to any obvious visible defects observed in the lift shaft structure of Nettleton Lodge.

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 five 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 6th 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
Flat [redacted] Bathroom	Internal Ceiling	Artex on Precast Reinforced Concrete Slab	Very slight crack in ceiling finish 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. The tenant reported that the crack had been present for approximately 7 or 8 years and never repaired during that time.	Rake out crack and re-artex flush with the existing and redecorate.	INT-5/6	**2020**
Hallway and Stairs Various Floors	Internal face of wall	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-36	**2024**
Electricity Intake Room	Internal face of wall	Precast Concrete Wall	Slight vertical crack at joints of precast concrete wall panels in South East corner of room and along the West wall and 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-38 / INT-39 / INT-40	**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
Electricity Intake Room	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-41	**2024**
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-47	**2024**
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
Stairs, 6th floor level	Walls	Precast Concrete Wall	Patch repair observed at the level of the 6th 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, these should be visually monitored as part of future routine inspections.	INT-62	**2020**
Stairs, 14th floor level	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-69	**2024**
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-82	**2024**
Roof Lift Plant Room	Internal Ceiling	Precast Reinforced Concrete Slab	Very slight crack in ceiling at joint in roof 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-83	**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
Flat [redacted] Living Room	Internal Ceiling	Artex on Precast Reinforced Concrete Slab	The tenant was concerned that there may be damage to the concrete floor slabs beneath a previous artex repair. He reported that at the time of the artex repair some years ago, there was a visible crack in the slab, the full width of the room. It could be that this was a joint in the slab, although there is a visible joint between the slabs just to the East of the artex repair, so it may be unlikely to be this. However, if there was structurally significant movement that caused cracking to the slab, we would expect to be able to observe this through the artex finish. There was no current structurally significant cracking within the artex finish, only a hairline crack at the adjacent slab joint. However, this damage is considered to be due to slight thermal expansions and contractions between the slab sections and is not considered to be of structural significance.	Visually monitor as part of future routine inspections.	INT-86/87	**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
Flat [redacted] Bedroom	Walls	Precast Concrete Wall	Slight vertical crack/gap 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. The tenant reports that the gap was observed when wallpaper was removed. It has since been painted over without being filled.	Visually monitor as part of future routine inspections.	INT-90/91	**2024**
Flat [redacted] Bedroom and Bathroom	Internal Ceiling	Precast Reinforced Concrete Slab	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-93/95	**2024**
Flat [redacted] Bathroom	Walls	Precast Concrete Wall	Hairline vertical crack at joints of precast concrete wall panels bottom left of window in the 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-93/94	**2024**
Flat [redacted]	-	-	No significant damage noted	-	-	-
Flat [redacted]	-	-	No significant damage noted	-	-	-

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 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-9	**2024**
External East Elevation [redacted]	Walls	Pre-cast concrete non-loadbearing external panel below window	Appears to be a slight localised vertical crack, approximately 100mm long at left hand end of panel.	Rake out crack and inject with epoxy resin with flush finish to the external face. Visually monitor as part of future routine inspections.	EXT-10	**2020**
External East Elevation, Roof Level	Walls	Joints between pre-cast concrete wall panels between bays J/K/L/M/N and left of bay J	Sealant at joints appears to have come out.	Rake out any defective joints and re-seal with a polyurethane sealant, to ensure continued weather tightness of the structure.	EXT-11	**2020**
External East Elevation, [redacted]	Walls	Pre-cast concrete non-loadbearing external panel below window	Possible slight localised corrosion of reinforcement bar below recess.	Visually monitor as part of future routine inspections.	EXT-13	**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
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-14	**2024**
External West Elevation, [redacted]	Walls	Pre-cast concrete loadbearing wall end projecting at elevation	Localised corrosion staining spot, possibly due to localised corroding reinforcement at shallow depth.	Visually monitor as part of future routine inspections.	EXT-24	**2024**
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-25	**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
External South Elevation, Ground Floor Level at South East corner of building	Walls	Pre-cast concrete loadbearing wall panels	Localised spalling visible to bottom of ground floor panel.	Visually monitor as part of future routine inspections.	EXT-32	**2024**
External South Elevation, Lower Ground Floor Level	Walls	Brickwork infill to opening at lower ground floor level	Corroding steel element within brickwork infill within pre-cast concrete panel.	Arrange for access into the lower ground floor garage at this location, to inspect the wall internally. Confirm function of steel to allow appropriate remedial repairs to be specified.	EXT-34	**2020**

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 10mm to the samples taken from the North, East and South elevations, but virtually no carbonation to the samples taken from the West 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 only one sample of pre-cast concrete could be tested.

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. 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 five 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 which are clad, 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 to the North and South elevations.
4. Testing of the below ground structures for chlorides/sulphates, given the possibility that sea-dredged aggregates may have been used in the in-situ concrete 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 Dweling 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

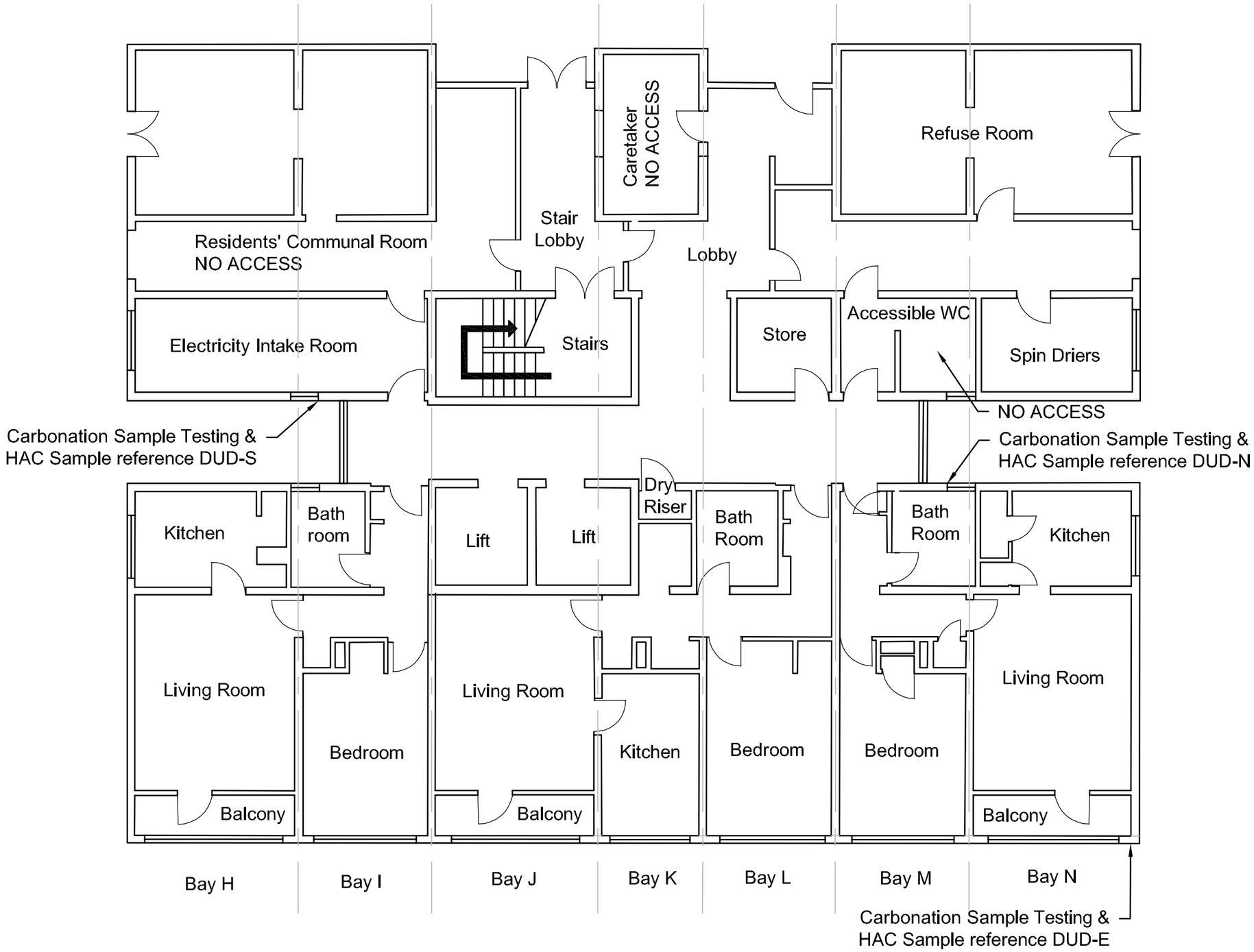
Drawing No. 190215-PEV-07-00-DR-S-0701	-	Ground Floor Layout Plan
Drawing No. 190215-PEV-07-01-DR-S-0702	-	Floors 1-14 Typical Floor Layout Plan

NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

Note:

To be read in conjunction with Pick Everard Report reference STR/IPR/IAA/190215/17-2/R007

Plan based on archive plans provided by the client



Revision		Date	Drn	Chk
P01	Report Issue	28.06.19	IAA	IPG

Client
Brighton and Hove City Council

Project
Large Panel System Tower Block Inspection

Drawing Title
Dudeney Lodge
Ground Floor Layout

Suitability Status
S2 - Suitable for Information

Job No.	Scale	Size	Rev
190215	NTS	@ A3	P01

Drawing Number
190215-PEV-07-00-DR-S-0701
Project Code - Originator - Zone - Level - Type - Role - Number

PICK EVERARD

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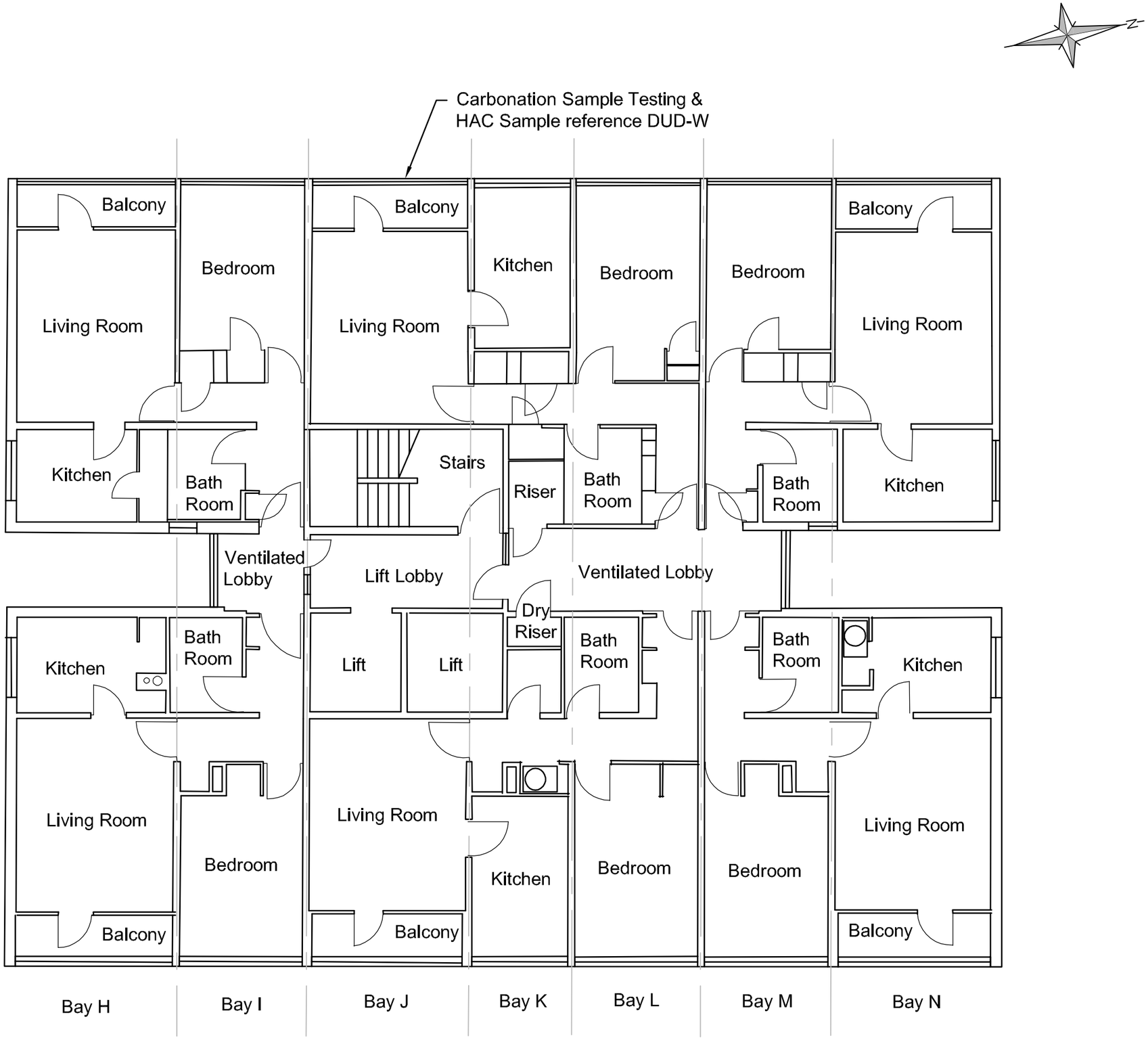
NO DIMENSIONS TO BE SCALED FROM THIS DRAWING



Note:

To be read in conjunction with Pick Everard Report reference STR/IPR/IAA/190215/17-2/R007

Plan based on archive plans provided by the client

Revision		Date	Drn	Chk
P01	Report Issue	28.06.19	IAA	IPG

Client
Brighton and Hove City Council

Project
Large Panel System Tower Block Inspection

Drawing Title
Dudeney Lodge
Floors 1 - 14 Typical Floor Layout

Suitability Status
S2 - Suitable for Information

Job No.	Scale	Size	Rev
190215	NTS	@ A3	P01

Drawing Number
190215-PEV-07-01-DR-S-0702
Project Code - Originator - Zone - Level - Type - Role - Number

PICK EVERARD

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Appendix B

Photographs

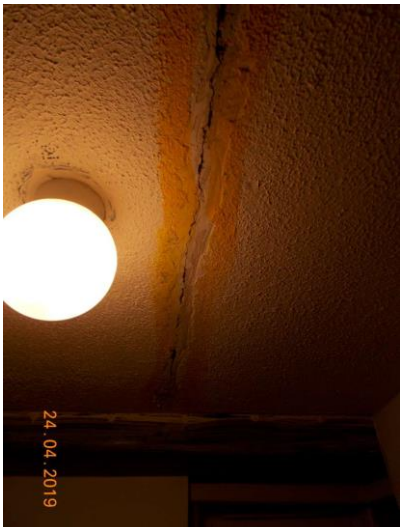

Photo No. INT-5

Photo No. INT-6

Photo No. INT-36

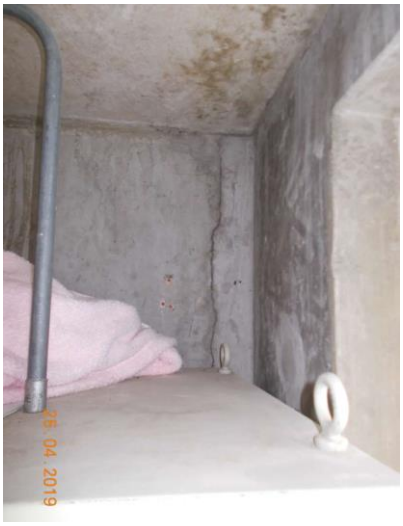

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Photo No. INT-39

Photo No. INT-40

Photo No. INT-41

Photo No. INT-47

Photo No. INT-53

Photo No. INT-61

Photo No. INT-62

Photo No. INT-69

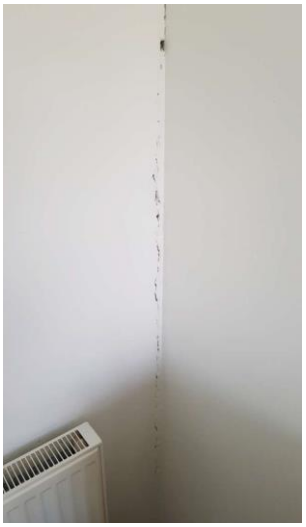
Photo No. INT-82

Photo No. INT-83

Photo No. INT-86

Photo No. INT-87

Photo No. INT-90



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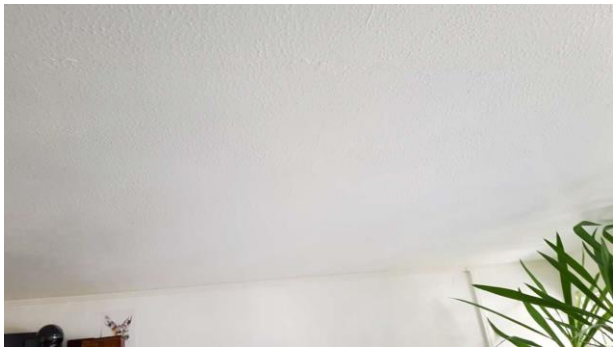

Photo No. INT-93

Photo No. INT-94

Photo No. INT-95

Photo No. EXT-9

Photo No. EXT-10

Photo No. EXT-11

Photo No. EXT-13

Photo No. EXT-14

Photo No. EXT-24

Photo No. EXT-25

Photo No. EXT-32

Photo No. EXT-34

Appendix C

HAC Testing Results

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

Pick Everard
Halford House
Charles Street
Leicester
LE1 1HA

Analytical Test Report: L19/1274/PIC/001

Your Project Reference:	**Brighton & Hove Tower Blocks**	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		37519	37520	37521	37522
Client Sample Reference		DU/N	DU/E	DU/S	DU/W
Location		Dudeney Tower	Dudeney Tower	Dudeney Tower	Dudeney Tower
Location		Dudeney North Elevation	Dudeney East Elevation	Dudeney South Elevation	Dudeney West Elevation
Sample Description		Concrete dust and lumps	Concrete dust and lumps	Concrete dust and lumps	Concrete dust and lumps
BRE DETECTION OF HIGH ALUMINA CEMENT	**Accreditation**				
Presence Of High-Alumina Cement (HAC)	UKAS	No	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	1. Testing was in accordance with BRE Information Sheet IS 15/74. 2. Contaminated samples may give a false result. 3. Samples taken from extensively carbonated concrete containing Portland Cement may give a false positive result. 4. If conclusive identification of the presence of High Alumina Cement is required this result should be confirmed by a more definitive test.