RIDGE

DUDENEY LODGE
STRUCTURAL ROBUSTNESS
PRELIMINARY EXECUTIVE SUMMARY
REPORT
BRIGHTON AND HOVE CITY COUNCIL

August 2024

Brighton & Hove City Council

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Prepared for

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1. INTRODUCTION

1.1. Site Address

Dudeney Lodge
Upper Hollingdean Road
Brighton and Hove
BN1 7GT

1.2. Structural Engineering Brief

Ridge and Partners LLP (Ridge) were appointed by Brighton and Hove City Council to carry out structural investigations to determine the robustness of the Residential block, Dudeney Lodge, Upper Hillingdon Road Brighton. The appointment came following owners of LPS dwelling blocks, which includes Brighton and Hove City Council, being required to seek professional advice regarding the safety of their assets by the Ministry of Housing, Communities & Local Government (MHCLG).

The brief was therefore to carry out an audit on the construction of the block, based on available historic information, followed by detailed intrusive investigations into selected areas of the block. The construction details of the block obtained from this audit then form the basis of the structural assessment to determine whether the construction of the block was sufficient to resist progressive collapse in the event of accidental loading from an internal gas explosion.

1.3. Report Contents

The contents of this report relate exclusively to the construction of Dudeney Lodge and its structural condition at the time of inspection. The report has been compiled following the visual inspection and a series of intrusive and non-intrusive tests conducted on a limited number of pre-selected areas of the structure.

This preliminary summary report documents the findings of the investigation work undertaken to date, which is currently in progress, the full findings will follow the issue of the full structural assessment into the robustness of the building against disproportionate collapse.

1.4. Limitations

Throughout the duration of the intrusive investigations the block remained inhabited by residents. This presented challenges to the investigation team in terms of availability of vacant flats within which intrusive investigations could be undertaken. Three suitable flats were identified, although none were available at top floor level and as such no information was obtained at that level.

Whilst the investigative works were detailed, with multiple tests carried out in each of the three flats, it should be noted that many areas of the block were not tested and thus the assessment of the block can only be based on what was uncovered in the sample investigation. The investigations were also only carried out from within the flats. No works were carried out externally or in the communal areas due to H&S concerns for the residents.

All flats within the block are single level dwellings (no duplex apartments). It was therefore not possible to obtain core samples from floor slabs during this investigative phase. Ridge advised the client that core sampling could be undertaken within a cupboard off the communal area which would reduce the impact on residents from this intrusive works. Core samples have not been completed and lab test results have not been received at the time of completing the calculations which inform this report. The calculation for the key element checks have therefore calculated the required compressive strength to pass the assessment, which will be confirmed following the receipt of the lab test results.

The client provided access to a limited selection of archive drawings, which contained mostly Architectural general arrangements. None of the documents provided any information regarding the structural elements and typical construction of the block.

However, a previous report from 2019 by Pick Everard 'Structural Engineers Report' has been reviewed which completed visual inspections of the block in addition to carbonation testing and High Alumina Cement (HAC) testing from ground floor level only. The report found no structural defects and stated that the structure appeared to be in 'good' condition – recommending only localised repairs and further investigations.

1.5. Exclusions

The report provided herein does not assess any aspects of fire safety of the structure. Any measurements taken on cover is solely for the assessment of corrosion protection and carbonation and are not intended to be used in a detailed fire assessment. Advise on performance of the building against fire and it's compliance against the current legislation should be carried out by a specialist fire consultant.

1.6. Statement

The purpose of the Report is to advise on the construction of the LPS structure and its susceptibility to disproportionate collapse, together with those related matters specifically referred to therein and it is not intended to be used for any other purposes. The Report is for the sole benefit and may only be relied upon by the addressee, to whom we will owe a duty of care. The Report or any part of it is confidential to the addressee and should not be disclosed to any third party for any purpose, without our prior written consent of Ridge and Partners LLP as to the form and context of such disclosure. The granting of such consent shall not entitle the third party to place reliance on the Report, nor shall it confer any third-party rights pursuant to the Contracts (Rights of Third Parties) Act. The Report may not be assigned to any third party.

2. BACKGROUND INFORMATION ON DUDENEY LODGE

2.1. General Building Information

Dudeney Lodge is a 15-storey, with lower ground floor, residential block on a site located on Upper Hollingdean Road, Brighton which contains two identical blocks, the subject block and Nettleton Court. The lower ground floor is occupied by garages which occupy less than half of the buildings total footprint at the lower ground level. For the purpose of this report the building will therefore be considered as a 15-storey structure. The structure will be considered as a class 3 structure for the purpose of this assessment.

The ground and lower ground floor construction is believed to be constructed of in-situ reinforced concrete, forming a reinforced concrete podium deck at first floor. It is also believed that the lift and stair core, located in the centre of the building is also constructed of in-situ concrete for the full height of the structure.

Above the reinforced concrete podium, the construction of the remaining 14 upper storeys comprises of LPS (Large Panel System) design, consisting of precast wall and floor panels. It is understood that the blocks are of Bison Wall Frame system and are believed to have been constructed circa 1965.

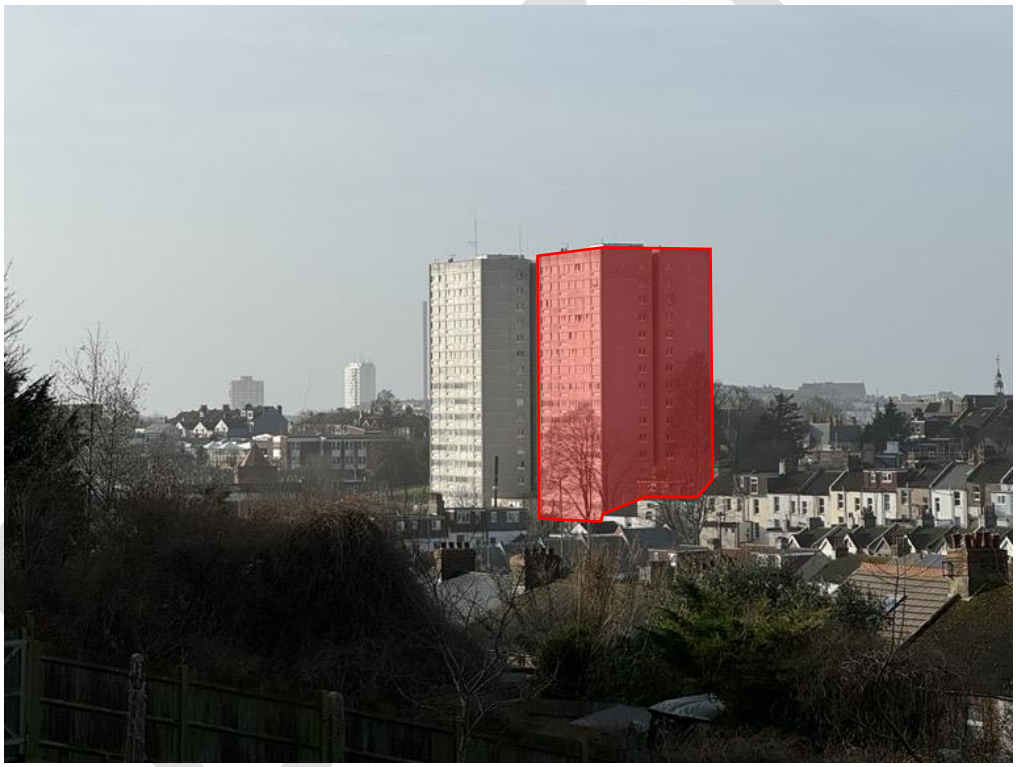

Figure 1: Image of Upper Hollingdean Road Site indicating Dudeney Lodge

The ground floor contains three residential units to the east side, in addition to an entrance lobby, caretakers store, communal residents room, refuse store and services cupboards.

Each upper floor level comprises six residential dwellings, with three units either side of a communal corridor from which all the dwellings are accessed. The corner units are all similar 1-bed layouts, while the two middle units are handed versions of a different 1-bed layout - the building contains a total of 87 dwellings.

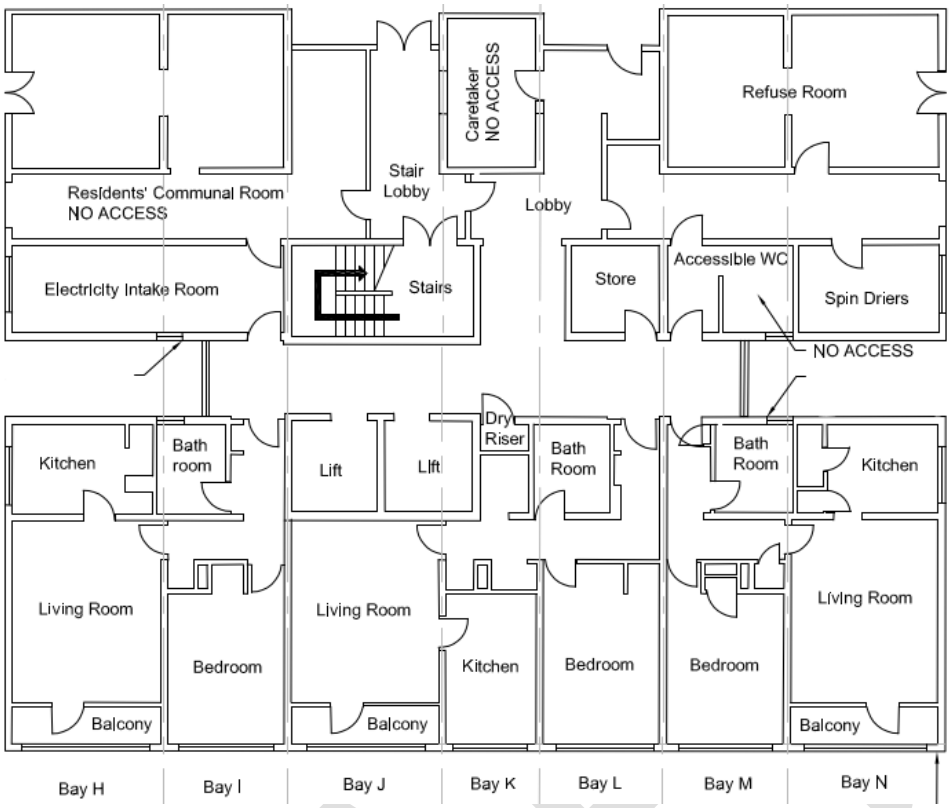

Figure 2: Dudeney Lodge Ground Floor Layout

Figure 3: Dudeney Lodge (Google Earth, 2024)

The site is steeply sloped from west to east, with approximately 1 storey (3m) difference in external levels each side of the building. To the east side, the lower ground floor level comprises private garages.

By review of British Geological Society mapping data, it is understood that the site is underlain by Seaford Chalk Formation, comprising of Chalk.

3. LPS ROBUSTNESS ASSESSMENT

The Large Panel System (LPS) dwelling block, Dudeney Lodge, Brighton has been assessed for its robustness to resist accidental loading and its susceptibility to progressive collapse.

A select number of flats were subjected to intrusive and non-intrusive investigative investigations, including visual inspection, concrete testing and intrusive opening-up works. The results of the investigations were documented and used as the basis of the structural assessment.

The assessment was carried out in accordance with BRE Report 511. The document states that LPS blocks can be assessed under three criteria, of which a block needs only pass one. The criteria and results relating to Dudeney Lodge are as follows:

3.1. LPS Criterion 1 – Adequate Ties (Reinforcement) within Joints

As Dudeney Lodge is considered as a 15-storey with lower ground floor structure, it has been considered to fall within Consequence Class 3, as defined in Building Regulations Approved Document A. This requires that the block possess effective horizontal and vertical ties. The findings of the intrusive opening up works were assessed against the tie force requirements given in BS 8110-1:1997. The results of the assessment for each joint type are presented in the table below:

ADEQUATE TIES	
JOINT	ASSESSMENT
Flank Wall	PARTIAL [1]
Cross Wall	PARTIAL [1]
Spine Wall	INADEQUATE [2]
Walls to Wall Joints	INADEQUATE [3]

[1] Wall to floor joints were found to have effective horizontal ties, however the detail for the vertical tie does not provide a continuous tie and is therefore considered to be ineffective.
[2] The anticipated tie detail between floors over cross wall panels was not identified in during investigations – it is therefore anticipated that ties have not been properly installed in these locations and the tie is therefore non-existent and considered ineffective. No effective vertical tie as note 1 above.
[3] No ties were observed between wall panels – therefore no effective tie exists in this location. No effective vertical tie as note 1 above.

Further to the assessment results it should also be noted that in several locations, improperly installed reinforcement was observed, whereby the loop of the u-bars had been bent up and were not interacting with the dowel pins extending from panels. In these instances, the tie would provide no resistive force and be considered ineffective. The above assessments rely on the ties having been consistently installed throughout the block, construction defects will reduce the overall resistance of the building against disproportionate collapse.

The dowel bar extending from the top of one wall panel was located within a levelling plate in the panel above. This detail does not provide a continuous vertical tie between elements – subsequently the detail does not satisfy the requirements of an effective vertical tie.

3.2. LPS Criterion 2 – Adequate Strength to Resist Accidental Loads

To satisfy LPS Criterion 2 each of the main structural members are subjected to checks to determine whether they have sufficient strength to withstand the loading from accidental overpressures caused by an internal gas explosion. The magnitude of the overpressure to be tested is determined on the three criteria below:

A. An LPS dwelling block with a piped gas supply within or to any part of the building: an assessment overpressure of 34 kN/m^2 should be used generally throughout the building.
B. An LPS dwelling block with a basement: an assessment overpressure of 34 kN/m^2 should be used in the basement and in any other zone where an explosive mixture of gas might accumulate (potentially from an external source).
C. An LPS dwelling block without a basement and without a piped gas supply to any part of the building: an assessment overpressure of 17 kN/m^2 should be used [to allow for explosions from sources such as bottled gas, large aerosols and cannisters- brought into the block by residents / others]

Dudeney Lodge has a communal heating system served by a gas boiler within a detached single storey structure separate to the block. There is no gas supply to block, specifically the upper floors, which are constructed from the LPS form of construction. We would therefore consider that the LPS sections of Dudeney Lodge be assessed against the lower 17kN/m^2 overpressure.

Each of the LPS structural elements forming the block have been subjected to key element checks, with the results presented in the following table:

ELEMENT CHECKS (WITHOUT PIPED-GAS SUPPLY – 17KN/M^2)	
JOINT	PASS / FAIL
Flank Wall	PASS
Cross Wall & Spine Wall	INADEQUATE [4]
Floor Slabs	INADEQUATE [5]

[4] Cross walls and Spine walls are typically unreinforced, and both fail in flexure against accidental loading at all levels.
[5] In the absence of test data floors were assessed using a concrete compressive strength value of 18N/mm². Using this value the floor slab failed in flexure for all slabs, except in the reduced span slab, typically occurring in kitchens. The 18 N/mm² value has been taken from previous testing results completed on other similar construction blocks. This value could be reevaluated by further testing on the floor slab and may provide a more favourable value. The final version of the report will provide the compressive strength value required to ensure the slab passes in all cases.

3.3. LPS Criterion 3 – Ability to Mobilise Alternative Load Paths

Due to the failure of a number of structural elements (cross walls and larger span slabs) in the event of accidental loading as a result of a non-piped gas explosion, it is unlikely the block would be able to develop alternative load paths to prevent disproportionate collapse in its current state. Removal of a key element is likely to cause progressive collapse. This is due to the fact that all joints between wall to wall and wall to slab panels are treated as pinned jointed elements with horizontal resistance only provided via friction between the elements themselves. With no redundancy in the overall system, all load bearing elements are treated as key components. Removal of any of these components is likely to lead into a disproportionate collapse.

ALTERNATIVE LOAD PATHS
Unable to mobilise alternative load paths

3.4. Conclusion

The conclusion is therefore that the blocks in their current state are inadequately robust to resist disproportionate collapse.

3.5. Recommendations

To address the failings of the disproportionate collapse requirements, works would be required to the block. We would therefore recommend that the required remaining life of the block should be discussed. It is likely that, if the blocks are to be retained long-term, that this will include strengthening works.

A risk analysis should be carried out to determine:

- Whether the risk can be reduced to an acceptable level through risk-reduction measures for the duration of the remaining life of the blocks.
- Whether risk-reduction measures are not alone sufficient, and strengthening works are required.

If the risk analysis shows it to be required, a suitably qualified structural engineer should carry out strengthening proposals for the blocks.

A cost-benefit analysis should then be carried out, accounting for the short remaining life of the blocks, to understand whether the strengthening works are suitable.

Based on the above results, an option is that demolition may need to be considered following the cost-benefit analysis.

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