



Horatia and Leamington

Report upon required structural works and future life.

Job No. 5305

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1. Introduction

Horatia and Leamington Houses are Large Panel System buildings which were constructed in the 1960's.

Following the removal of the over-cladding panels on the outside of the building, Portsmouth City Council requested that an appraisal of the buildings be carried out prior to replacing the cladding. Detailed intrusive investigations were therefore undertaken and samples of the concrete were taken to determine the current condition and the likely future life of the structure of the building.

It was determined that strengthening works would be necessary in order to extend the future life and make the building compliant with current recommendations for the strength of LPS buildings.

Documents which set out the structural works required to Horatia House and Leamington House were issued in the last week of November and at the beginning of December.

The documents were provided in order to obtain a sensible estimate of the cost of the structural works necessary in repair, protection and strengthening of the buildings to meet with the recommendations set out in the Building Research Establishment for the Assessment of Large Panel System Building which was published in 2012.

2. Summary of the proposed strengthening works

Horatia House

The works proposed for Horatia House are primarily limited to the flats which adjoin the flank walls and to the flank walls. There is some strengthening of certain walls at the top stories of the building.

The work to the slabs in these flank wall flats involves removing the existing concrete screed, which is on top of the precast structural slab, and replacing it with a new bonded reinforced concrete topping. This will increase the strength of the floor slab.

On the outside of the flank walls, the existing outer concrete cladding panels will be removed to expose the inner concrete wall which is the structural load-bearing element. This flank wall is then strengthened and also tied to the slabs at each level by means of a steel framework which is erected against the outer face of the wall. This steel framework can then also be used to provide support for the new insulation and cladding on the flank wall elevations.

At upper levels, certain internal walls also need strengthening. This will be carried out by fixing metal plates to each face of the wall. These are then covered by a sheet of lining board.

Upon completion, the structural works will all be concealed.

The works proposed will strengthen the building so that it complies, by calculation, to the requirements set out in the Appraisal of LPS Buildings 2012 by the BRE. It will not however comply with the requirements of current Building Regulations.

Piped gas is not permitted in the building and future residents should be restricted from using bottled LPG or similar volatile bottled gases which could cause an explosion if released.

Leamington House

Leamington House has been found to have weaker concrete and therefore the structural strengthening works required are much more extensive.

All slabs within the building have to be extensively strengthened by removing, not only the existing screed, but also part of the precast slab. The existing slab is effectively used as a shutter for a new slab and beam construction and the concrete strength is provided by the new construction. Every one of the main slabs would be effectively re-cast so that adequate strength is assured.

The flank walls are strengthened by a steel frame in the same manner as Horatia House.

All the internal cross walls at every level are strengthened using plates bonded to each face which is then concealed by a lining sheet.

The new slab construction increases the weight of the building but it is considered that the foundations should be adequate to carry the increased load.

The works will strengthen the building so that it complies, by calculation, to the requirements set out in the Appraisal of LPS Buildings 2012 by the BRE. It will not however comply with the requirements of current Building Regulations.

Piped gas is not permitted and future residents should be restricted from using LPG or similar volatile gases.

3. Building Control

The proposed works will be subject to Building Control approval and it is proposed that, following the budget costing exercise, a meeting is held with Building Control to ensure that they are fully aware and in agreement with the proposals.

4. Pre-construction trials

Detailed on site testing of the proposed strengthening works needs to be carried out prior to completion of the final design in order to confirm the assumptions made in the scheme design. This will allow refinement and confirmation of the construction method and therefore cost of the work which will be repeated at each floor level up the building.

The work will include testing the bond between the new and existing concrete and techniques for removing the existing screed without damaging the structure.

5. Tests and inspection

Other investigations to be carried out prior to commencement include further concrete testing (the current testing was restricted by the availability of empty properties) and a structural inspection of every part of the building to ensure that there are no defects or other modifications which may inhibit or change the works. These checks will also confirm that all existing screeds are de-bonded as removal would be virtually impossible without significant damage to the existing slab if the insulation layer beneath the screed had been omitted.

6. Future Repairs

The tests on the concrete which form the structural elements of the building indicated some elevated levels of chlorides within the concrete.

Chlorides in concrete can speed the rate of corrosion of the steel reinforcement which then causes damage to the concrete. This corrosion requires there to be regular repairs carried out as eventually the reinforcement could corrode so badly that it will be weakened.

Coatings and other techniques can be used to reduce the rate at which corrosion occurs and if the concrete is kept dry the process of corrosion is very slow.

It is considered, based on the test information obtained, that corrosion will only occur in very local areas over the next 20 years and will not be detrimental to the structural integrity of the building. However, it is much harder to be certain of the behaviour over a 40 year time period and repairs may be necessary in order to maintain the structure.

7. Programme

It is not considered that the works can be carried out with any residents in occupation of any flats within the building.

The structural work specified requires a strict programme and sequence of operations in order to safely carry out the works. The works involve significant cutting into or close to structurally critical elements.

The sequence will be to strengthen each level working from the bottom storey upwards so that temporary propping required to support each floor has adequate support from the slab below. The works must ensure that no loss of support or restraint is allowed at any level as this may cause disproportionate collapse of the un-strengthened structure above.

The works will be carried out by hand using light percussive tools and continuous clearance will be required to ensure that there is no build-up of spoil which could overload the slabs. No machines or heavy mechanical plant will be allowed in the building.

The bonding of the new elements to the existing construction requires clean surfaces and therefore conditions not usually found on a construction site. There will need to be extensive vacuuming and sheeting of areas to ensure that these clean surfaces can be achieved.

No LPG or solvents will be permitted in the building during demolition and strip out works or during the new construction.

8. Risk

The construction and financial risk of carrying out complex strengthening work to a 50-year-old LPS building is significantly greater than that involved in new build construction or normal building refurbishment. The work will be difficult and slow as it is all carried out by hand.

Physical risks include:

Unidentified defects in the building.

Difficulty in removing the existing screeds especially if any are bonded to the slab

Damage to the existing slab during screed removal

Structural cracking or movement uncovered or created during the works.

Difficulty in removing the Reema flank wall cladding panels

Failure of the new topping to adequately bond with the existing slab

Construction vibration causing damage to building elements or dry-pack packing under walls

Financial and programme risks include:

Work sequencing extending the programme

Difficulty in finding a contractor or specialist sub-contractors

Risk of delay/project cancellation due to construction difficulty or further building defects

Future risk

Building is only strengthened to Appraisal of LPS buildings Handbook BRE 2012 and not compliant with current Building Regulations.

Continuing risk and gas management to prevent an explosive or similar event which is higher than the special, reduced level permitted by design to Appraisal of LPS buildings Handbook BRE 2012 which may therefore cause disproportionate collapse.

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The report is based upon limited testing of the structure in empty flats and communal areas. Further testing and investigation may find other or further defects which may alter the conclusions reached or make execution of the works impractical. Extensive investigation of the buildings is recommended before any contract works are instructed.