TRAIN & KEMP
CONSULTING ENGINEERS

HERITAGE STRUCTURAL ASSESSMENT

on

UCL INSTITUTE OF EDUCATION

PHASE 2

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INTRODUCTION

1.1 UCL intend to refurbish and upgrade the Institute of Education facilities. This will include rationalisation and upgrading of the services, and replacement of mezzanine floors.

1.2 The Institute of Education is a Lasdun 1970's concrete building along Bedford Way which is Grade II* listed. The proposals require planning and listed building consent for internal alterations. The application is supported by a heritage assessment which has been prepared by Alan Baxter Associates.

1.3 The redevelopment will require some structural interventions and adaptions, and these are presented in Appendix 1

1.4 For the purposes of this report the orientation is taken with Bedford Way to the east and Tavistock and Russell Squares to the north and south respectively.

2.0 BRIEF DESCRIPTON OF INSTITUTE OF EDUCATION BLOCK

2.1 The block was built in the 1970's to a design by Denys Lasdun with Arup as the structural engineer. It is a massive block over 200m long with 3 basement and 6 upper storeys and 3 storey overruns to the 3 cores. Internally there are high quality exposed concrete finishes.

2.2 The building is piled and there are no signs of significant movement. The structural arrangement is sensible, and the detailing is of a high standard. Structurally it is a robust building with substantial concrete cores. In the teaching areas remote from the cores, the ribbed floors span east west across the width of the building.

2.3 Inevitably in the intervening 40 years there have been some structural alterations and adaptions; again, these are sensible. Infills and alterations in an occupied building have inevitably been framed in steel with appropriate fire protection. The maintenance has also been of a high standard.

3.0 PROPOSED SCHEME

3.1 The Phase 2 proposed alterations relate only to work to Cores A, B and C and are outlined in information from Architon LLP.

3.2 The proposals are to improve the quality of the services within the building and to rationalise some of the infill spaces to give a better use of the building. There are no proposed extensions.

3.3 The principles for forming builders works holes for new service penetrations through floor slabs and core walls which were established in Phase 1 will also be used for Phase 2.

4.0 STRUCTURAL INTERVENTIONS

4.1 The majority of the alterations relate to service penetrations in the cores. These are through slabs and walls and generally are localised in scale. The challenge is assessing how these aggregate with the current penetrations, particularly on the lower floors where the loads are the greatest. As set out in Appendix 1, there are three classes of penetrations that are considered.

4.2 The required structural interventions are at specific locations and the structural works have been developed to ensure that the stability and well-being of the structure is maintained.

4.3 The infills and alterations in an occupied building have inevitably been framed in steel with appropriate fire protection.

4.4 Seven key interventions are given in Appendix 1. These use established engineering and building techniques.

5.0 DISCUSSIONS

5.1 The Institute of Education was well built and has been adequately maintained. The structure has the necessary robustness to accommodate the proposed alterations which are both sensible and achievable and will not compromise the integrity of the building.

5.2 There is asbestos within what is an occupied building and its removal is being completed in a safe and methodical manner. Once this has been undertaken, the details of the steel framed infills and their connections to the concrete core walls can be established and the possibility of salvaging and reusing the steels will be explored. It is not envisaged that these subsequent additions impact on the integrity of the original structure.

6.0 CONCLUSIONS

6.1 The proposed alterations do not comprise the integrity of the structure.

6.2 The alterations are not extensive in magnitude or density. Where framing is required, established engineering techniques are adopted and this will ensure that the integrity of the structure is maintained.

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Appendix 1

List of Structural Alterations

Revision 01 21 November 2019

1. Existing Service Riser Modifications
2. Existing Standalone Riser Enlargement
3. New penetrations
4. Existing Level 5 mezzanine removed in Cores B & C and reformed
5. Lowering of Archive Store at Level 3 in Core C
6. Core C smoke vents at Level 3
7. Core A roof chiller ventilation

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Structural Alteration 01

Existing Service Riser Modification

Revision 03 04 December 2019

1. Current Arrangement
   - 1.1 The existing risers are located in the three cores. The primary riser is to the east side of the corridor on Grid B as a series of shafts and a large central riser surrounded by concrete walls.

2. Alterations and Challenges
   - 2.1 It is proposed to cut further holes in the central riser slab with slots in the corridor wall on Grid B to allow ventilation of the corridors.
   - 2.2 Where there are teaching spaces at the lower levels to the east side of the riser there will be further slots to provide air handling to these areas. There will also need to be access provision with existing doors re-used where feasible.
   - 2.3 The largest slab holes are Core B at Level 1 with 2/1750m x 1250mm to the back eastern wall of the riser.
   - 2.4 The largest wall slots are 2/1750mm wide to the Grid B corridor wall.
   - 2.5 The challenge will be in ensuring that these new holes and slots do not combine with the existing ones to generate significant weaknesses.

3. Solution
   - 3.1 The new holes and slots are being mapped on the existing holes as a drawing exercise in the first instance and will be marked out on site when the areas are declared free of asbestos.
   - 3.2 The riser slab is framed on all sides and is inherently strong; it is only any free edges that will need local support. This will be with steels spanning the width of the riser
   - 3.3 The corridor wall on Grid B, only has to support the 2m corridor and is hence a strong point in the structure. Where the slots are for pipework distribution, discrete holes will be spaced for individual larger diameter pipes as far as possible.
   - 3.4 Floor structure to teaching spaces on the east side of the riser will span north/south and therefore limit the vertical load transferred to the riser wall. Slots will be installed vertically where feasible to limit the width dimension and doors re-used.
   - 3.5 As a rule of thumb, the wall sections remaining between the slots should be longer than the slot opening. Where the piers between the slots are less a full analysis of the load paths will be completed.

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Structural Alteration 02

Existing Standalone Riser Enlargement

Revision 0 20 November 2019

1. Current Arrangement
   - 1.1 Inevitably over the last 40 years it has been found that service distribution has also had to be positioned remote from the core risers.
   - 1.2 These standalone risers are mostly orientated to be parallel with the ribs in the floors.

2. Alterations and Challenges
   - 2.1 Any increase in the holes will be parallel to the ribs to minimise their impact on the ribs.
   - 2.2 It is the risers that are located in the beam strips that have had the greatest impact on the structure. Again, the same principle applies with any opening being extended across the width of the building, so the beam strip is not weakened further.

3. Solution
   - 3.1 Openings in slab to be in the direction of the ribs, i.e. across the width of the building.
   - 3.2 Enlarging any openings in the beam strips will be resisted as far as possible with duct routes altered to suit.
   - 3.3 If necessary, trimming can be introduced to any ribs that need to be cut as SK01 Appendix 02.

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Structural Alteration 03

New Penetrations

Revision 03 04 December 2019

1. Current Arrangement
   1.1 Existing slabs

2. Alterations and Challenges
   2.1 New 350mm wide slots are required in Cores A and B on Grids 33 and 26 respectively; these are alongside concrete walls as strong points in the structure. At the upper levels (4+) the location of these slots will shift to avoid concrete beam strips and run through the beam and pot floors with trimming as 02.

3. Solution
   3.1 Such openings will be resisted as far as possible, with enlarging of existing holes being the preferred solution.
   3.2 Any openings in slab to be at strong points in the structure and avoid solid concrete beam strips.

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Structural Alteration 04

Existing Level 5 mezzanines removed in Cores B & C and reformed

Revision 0 20 November 2019

1. Current Arrangement
   - 1.1 There are mezzanine infills that are at approximately Level 5 in both Cores B and C; these only have staircase access from Level 4. In order to maximise the teaching space at Level 4, the staircases are to be removed. Unfortunately, the mezzanines are not exactly at Level 5 and need to be removed and reformed.

2. Alterations and Challenges
   - 2.1 With the asbestos, the current construction of the mezzanines has not been established.
   - 2.2 Consequently, the assumption is that the existing mezzanine will need to be demolished and cannot be salvaged. A new mezzanine will be constructed with access from Level 5 using steel beams and composite concrete floors. The steels will be supported on the existing concrete walls.

3. Solution
   - 3.1 The current installation will be investigated to see if it is possible to salvage and reuse any of the elements. The existing fixing assemblies will also be investigated so the principles can be readopted with the revised floor.
   - 3.2 Depending on the ability to salvage any items, a dismantling plan will be developed.
   - 3.3 The loadings will be similar to previous and the structure can support the new mezzanines

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Structural Alteration 05

Lowering of Archive Store at Level 3 in Core C

Revision 0 20 November 2019

1. Current Arrangement
   1.1 The existing archive store in Core C is to become teaching space at Level 3 and consequently needs to be lowered by 0.4m.

2. Alterations and Challenges
   2.1 The existing steel beams to the archive have deflected, although this is due to the high archive loads.
   2.2 It is hoped that the beams can be salvaged and reused in the formation of the teaching space, but with headroom constraints the deflection may be too great
   2.3 As previous, the walls on Grids 13 and 16 will be used for support.

3. Solution
   3.1 The deflected profile of the existing steels will be surveyed to see if the beams will fit. Consideration will also be given to turning the beams upside down and use the deflection as a precamber.
   3.2 The existing fixing assemblies will also be investigated so the principles can be readopted with the salvaged/new beams.
   3.3 Depending on the ability to salvage any items, the dismantling plan will be developed.

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Structural Alteration 06

Smoke Vents Core C Level 3

Revision 0 20 November 2019

1. Current Arrangement
   1.1 The new teaching space to Level 3 only has one means of escape and smoke ventilation will be required at Level 3 high level.

2. Alterations and Challenges
   2.1 The precise size of the smoke vent slots has still to be established but will be located in the core wall beside Grids 13 and 16.

3. Solution
   3.1 Currently the core walls are imperforate, so it will be possible to insert smoke vent slots without compromising the structure.

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Structural Alteration 07

Core A Roof Chiller Ventilation

Revision 0 20 November 2019

1. Current Arrangement
   - 1.1 The new chiller unit to Level 9 in Core A needs greater ventilation than previous and will require the roof slab to be removed.

2. Alterations and Challenges
   - 2.1 The stability of the current roof support walls will need to be checked since the restraint to their head will be removed. As concrete walls that buttress each other, their stability is not anticipated to be a problem.
   - 2.2 The main challenge is waterproofing and weather sealing rather than structure.

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Appendix 2

Rib trimming detail for Structural Alteration 02

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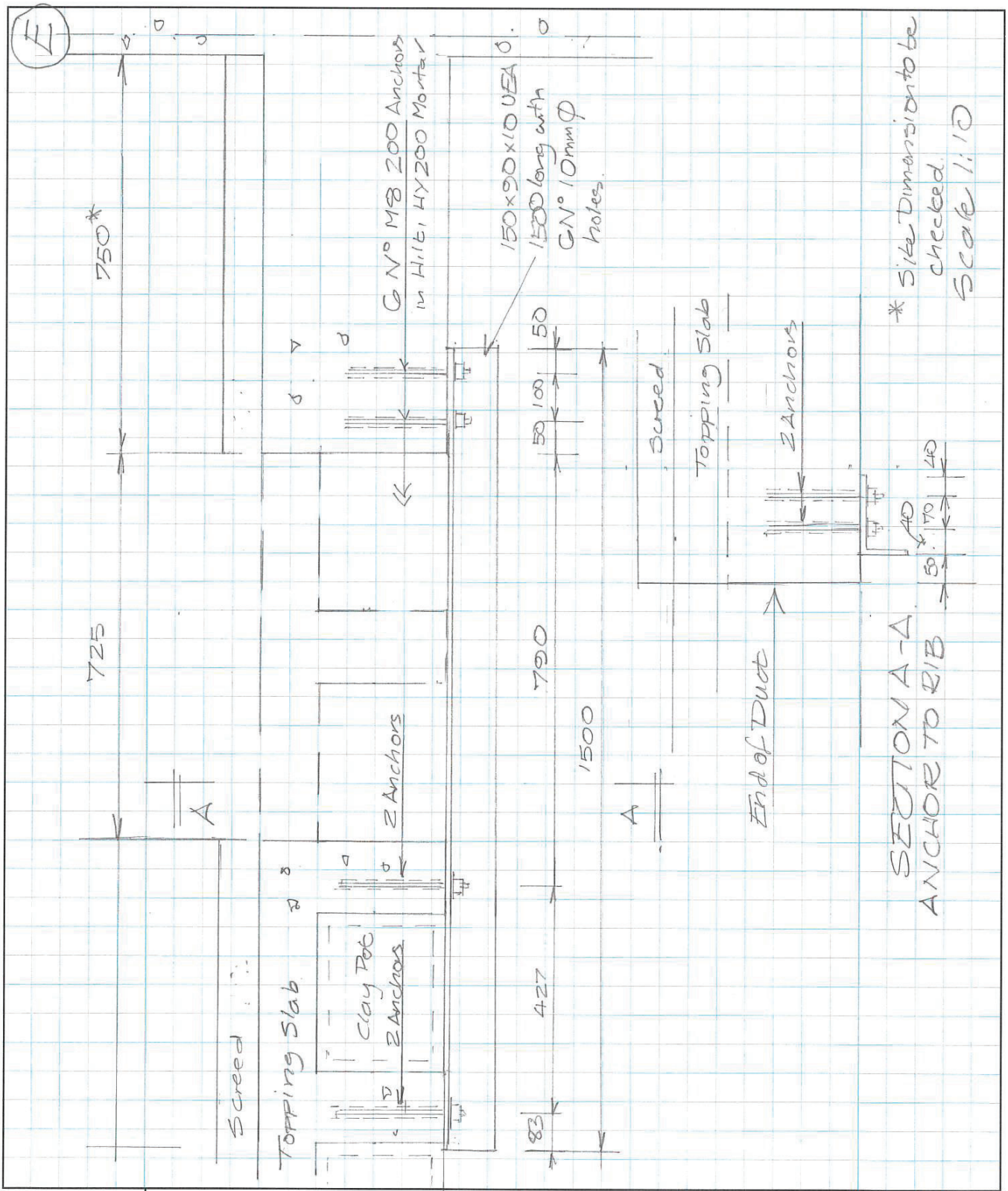

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