BUROHAPPOLD ENGINEERING

UCL Institute of Education - Phase 1

Stage 4 Fire Strategy

035833

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Revision 02

Revision	Description	Issued by	Date	Checked
00	Stage 2 Phase 1 – Addition of Level 4/5 of wing	BD	02.03.2018	JLM
01	Stage 3 Phase 1	BD	25.04.2018	JLM
02	Stage 4 Phase 1	BD	18.06.2018	JLM

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Contents

1 Introduction

1.1 Aim

BuroHappold has been appointed by UCL Estates to produce a Stage 4 fire strategy for the redevelopment of the existing building of UCL Institute of Education (IoE). This fire strategy report focuses on the Phase 1 alteration works which are intended to provide additional teaching spaces in the building.

Please note that this report is an update of the previously agreed Phase 1 report to include within the scope of Phase 1, the levels 4 and 5 of the wing. While level 02 and 03 of the Wing, and level 03 of ISD are presented again for completeness, these have been previously agreed and remain as is.

This report is intended to inform the design team of the fire strategy proposals, while being used as the basis for submission to the Approved Inspectors, and the London Fire Brigade. It has been developed to demonstrate how the functional life safety requirements of the Building Regulations 2010 will be met, at a RIBA Stage 2 level of information of the Phase 1 alteration works for level 4 and 5 of the wing. Level 02 and 03 of the Wing, and level 03 of ISD are approved and under construction.

It is the objective of this strategy to provide a risk proportionate approach that balances occupant needs with an uplift in fire precautions. The strategy is based upon information supplied and is determined on the basis of there being one fire seat in the building at any one time. Asset and property protection are not explicitly stated as design objectives and as such have not been considered within this fire strategy.

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1.1 Approving Bodies

Approval of this fire strategy will need to be agreed with the following stakeholders:

- MLM - Approved Inspectors
- London Fire Brigade (LFB)
- UCL Fire Officer
- The Building Insurers

1.2 Description

1.2.1 Building Description

The 1970's Grade II* listed, UCL building has five levels above ground, a lower ground level and two levels of basements. The levels above ground (level 05 to level 09) are served by three main protected stairs A, B and C and an external stair D. The building accommodates teaching facilities/rooms; large lecture rooms, offices, laboratories, library and break out spaces.

The "wing" is the section of the building located between stair core A and D, which is partially detached from the main building from block A to C, referred to as ISD.

While several future alteration phases are proposed to UCL Institute of Education, this report only focuses on Phase 1, as described in the following section (Section 1.2.2).

Figure 1-1: UCL IoE building (Hawkins Brown image)

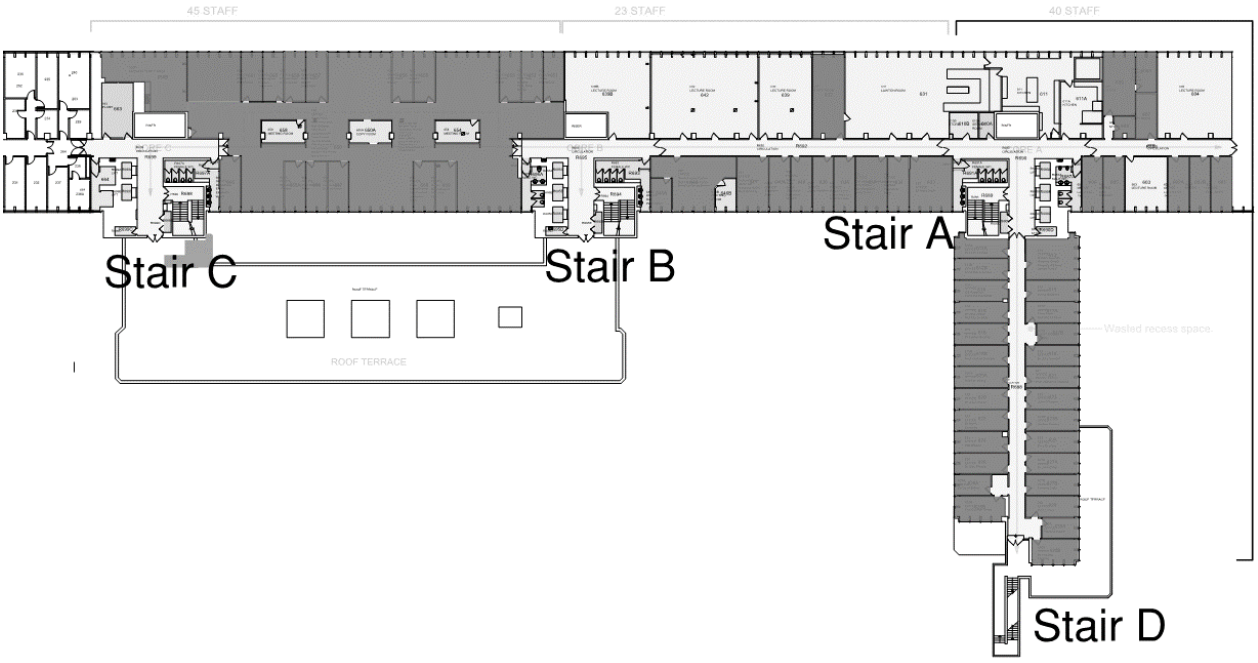

Figure 1-2: UCL IoE typical level and stair locations

1.2.2 Phase 1 Works

The proposed renovation of IoE building will be divided in design Phases. Phase 1 alteration works include the areas listed below. Please note that Level 02 and 03 of the Wing, and level 03 of ISD between core B and C are only referred in this report for completeness, as these were previously agreed and are under construction.

- Level 02 of the Wing between cores A and D, where additional teaching spaces will be located, estate offices and an existing plant room; this level of the Wing was previously used as plant, workshop spaces and facilities for management.
- Level 3 of the Wing between cores A and D, where will be located teaching spaces and break out space; this level of the Wing was previously used as a bar/kitchen for the Student Union.
- Level 4 of the Wing between Cores A and D, where additional teaching spaces will be located, and a new Student Union bar is proposed; this level of the Wing was previously used as offices.
- Level 5 of the Wing between cores A and D, where will be located new office spaces. This level of the Wing was previously used as offices.
- Level 3 between cores B and C; where will be located temporary decant office spaces with workstations and finally be converted to teaching spaces. This is understood to be currently used as offices.

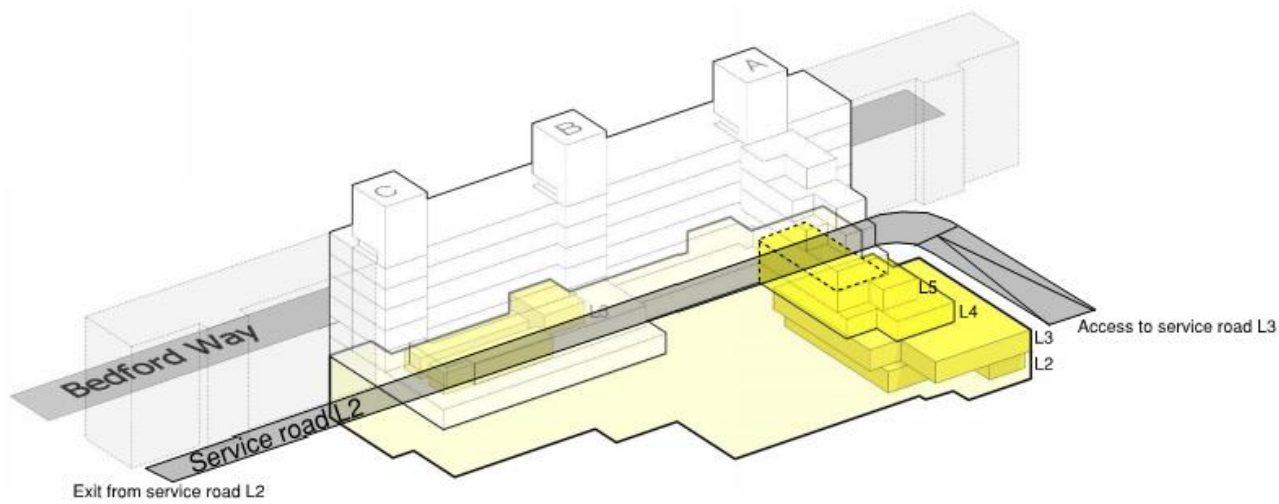

Figure 1-3: IoE building with highlighted areas of Phase 1

It is understood that these works may happen when the building is occupied/partially occupied. Therefore, as a key principle, the contractor will need to ensure that the areas under construction are fire separated from live occupied areas with 60 minute fire separation and that escape routes serving all occupied areas should remain clear and safe to use at all times.

1.3 Legislative Requirements

In order to comply with the statutory functional life safety requirements of the Building Regulations 2010, it is proposed to design these areas in accordance with BS 9999:2017 *Code of practice for fire safety in the design, management and use of buildings*.

In addition, it should be ensured that all works comply with the relevant UCL technical guidance documents.

1.4 List of Drawings

In this document have been used the drawings listed in Table 1-1.

Table 1-1: List of drawings used for Stage 3 report

Drawing Title	Drawing Number	Revision Date
Proposed GA Level 2 Wing	UCL-IOE-0100-WA-02-DR-A-72-0001 P03	18.12.2017
Proposed GA Level 3 Wing	UCL-IOE-0100-WA-03-DR-A-72-0001 P04	08.02.2018
Proposed GA Level 4 Wing	UCL-IOE-0100-WA-04-DR-A-72-0001 P01	23.05.2018
Proposed GA Level 5 Wing	UCL-IOE-0100-WA-05-DR-A-72-0001 P01	23.05.2018
Level 3 (Core B & C- ISD Area) Proposed GA	1655_DWG_00_205	21.03.2017

2 Executive Summary

2.1 Summary of Maximum Occupancies For Each Area of Phase 1

Please see below and executive summary of the maximum occupancies that can be accommodated in each of the Phase 1 areas, takin into account means of escape from the remainder of the building where stairs/exits are shared:

Level 2 Wing Section

Total maximum occupancy of 372 people, limited by exit capacity.

Level 3 Wing Section

Total maximum occupancy of 514 people, limited by exit capacity.

Levels 4 and 5 Wing Section

Total maximum occupancy of 625 people for the Wing areas from level 4 to 9, limited by stair capacity. Based on even floor occupancy factor across all levels, and the additional exit at level 04, this equates to a maximum of 245 people at level 04, and 96 people at level 05, and 284 people total from level 06 to 09 (currently outside Phase 1 scope).

Level 3 between Cores B and C:

The total maximum occupancy of upper levels served by cores A to D i.e. Level 3, and 5 to 9, inclusive, should not exceed 1938 people at any one time due to limited total stair capacity.

For example, assuming an even distribution of occupants per floor this equates to 323 occupants in total per floor for each of floors 3 and 5 to 9. For example, assuming an even distribution of occupants on either side of Core B at level 03 this equates to a maximum of 161 occupants in Phase 1 at level 3.

If there is not an even distribution per floor, i.e. more of this total maximum 1938 occupancy is located at Level 03 when compared with other levels., then the occupancy of L03 can increase to a total of up to 372 occupants on either side of Core B, but this subject to an overall total maximum occupancy throughout floors 3, and 5 to 9, inclusive, of 1938 occupants not being exceeded.

In order to confirm what the maximum expected occupancy in the Phase 1 area at Level 3, confirmation is required from UCL Estates of the total maximum occupancy per floor, and on either side of Core B at each level, and also taking into account future increases in occupancy in other areas. This should take into account occupancy waiting outside lectures.

Please note, in future if all stairs are provided with a protected lobbies (not currently achieved) then the total overall occupancy upper levels served by cores A to D i.e. Level 3, and 5 to 9, inclusive, could increase from 1938 to 2601 at any one time.

2.2 Risks and Opportunities – Alternative Fire Engineered Solutions

Where the design of the building does not meet the requirements of the prescriptive code guidance, fire engineering designs will be used to develop an alternative approach. This allows the design team to deliver the building they desire whilst ensuring that the fire safety design of the building is as safe as, or safer, than it would be if designed using the prescriptive code approach. Any engineered proposals are agreed on a case-by-case basis with the Approved Inspectors (MLM) and, where appropriate, the London Fire Brigade and therefore carry an approvals risk until such agreements are reached.

These fire engineered solutions are summarised below, and have discussed and agreed in principle with MLM and the London Fire Brigade, as part of the original Phase 1 scope for level 02 and 03 of the Wing.

2.2.1 Level 02 Wing- Basement Smoke Clearance

Following code recommendations, any basement greater than 200m^2, is required to be provided with natural smoke venting equivalent to 1/40th (2.5%) of floor area on opposite sides to allow cross ventilation. This therefore applies to level 02 of the "wing".

While as much smoke venting is aimed to be achieved via opening doors to external, it is not be possible to achieve fully current recommendations, such as cross venting due to existing constraints– i.e. the building is a Grade II* listed building. However, the proposal significantly improves the existing firefighting conditions (i.e. this level was used as workshops areas with no venting or firefighting facilities), this is therefore considered reasonable.

Please refer to Section 6.4 for further information.

2.2.2 Inner Rooms

BS 9999 recommends wherever escape from a room is only available through another room (inner room), it should be ensured that the access room is provided with detection or there are vision panels between the access room and inner room. The occupancy of these rooms should also be limited to 60 people.

It is currently proposed for some rooms accessed only from the breakout space to accommodate a potential occupancy greater than 60 people (potentially up to 100 occupants). This is considered reasonable based on at least two escape routes as remote as possible from each other with doors opening in the direction of escape, as well as, increased visual awareness with automatic fire detection. Currently, it is proposed for these rooms to be provided with full glazed frontage, and L1 detection throughout, providing the highest level of awareness possible, and greater than just a small vision panel in a door required for an inner room with 60 occupants. While furniture is proposed in the breakout space (access rooms), its main purpose remains as circulation and access to these rooms, therefore escape routes are unlikely to be impeded.

3 Means of Escape

3.1 BS 9999 Risk Profile

3.1.1 Occupancy Classification

The occupants of Phase 1 will mainly comprise students and teaching staff. These areas will be addressed with risk profile B, since occupants are awake and potentially unfamiliar with their surroundings, as would be available for all students in UCL campus.

Level 03 between core B and C will be temporally used as decant office space. However, in the final condition it will be permanently converted to teaching facilities, therefore, to provide flexibility in the design from the beginning these areas will also be addressed as risk profile B.

The back of the house areas in Level 2 Wing will accommodate offices for UCL Estates staff and the plant room with access only to maintenance personnel. These areas will be addressed with an A risk profile, since occupants are awake and familiar with their surroundings.

3.1.2 Fire Growth

The building is not provided with sprinkler system therefore the growth rate is treated as medium and in high-risk areas such as plant rooms, as fast. Table 3-1 below presents in summary the fire growth rate and risk profile for each area of Phase1.

Table 3-1: Risk Profile Phase 1

Phase 1 Area		BS 9999 Risk profile
Level 02 of the Wing	Break out space Teaching Facilities	B2
	UCL Estates Offices	A2
	Existing Plant room	A3
Level 03 of the Wing (teaching)		B2
Level 04 of the Wing (teaching and Bar)		B2 with alcohol consumption
Level 05 of the Wing (offices)		B2
Level 03- Cores B to C		B2

3.2 Evacuation Strategy

A simultaneous evacuation strategy on single knock is to be implemented, whereby in the event of a fire detected anywhere, the whole UCL IoE building will evacuate with a signal being sent to main fire alarm panel.

3.3 Travel Distances

Travel distances for the different uses are summarised below:

Table 3-2 Summary of Travel Distance Recommendations

Risk Profile (including 15% increase for Automatic Fire Detection)	Maximum Distance for Single Direction of Travel (m)	Maximum Distance when at least Two Directions of Travel Exist (m)
A2	24	63.2
A3	20.7	51.7
B2	23	57.5
B2 (with potential alcohol consumption)	17.2	43

According to BS9999, for risk profile A3, the maximum travel distance shall be within 20.7m in single direction, and 51.7m when two directions of travel are available, and including for enhanced detection provided (L1 to BS 5839-1), The travel distance in single direction within the plant room servicing zone is extended (42.3m in single direction), however, this is reasonable given this is as per existing situation, and provided the access is limited to maintenance personnel under permit to work, see left corner of Figure 3-1.

Please also refer to Figure 3-2 and Figure 3-5 for other areas. Please note travel distances to other areas or Phase 1 are currently within BS 9999 recommendations.

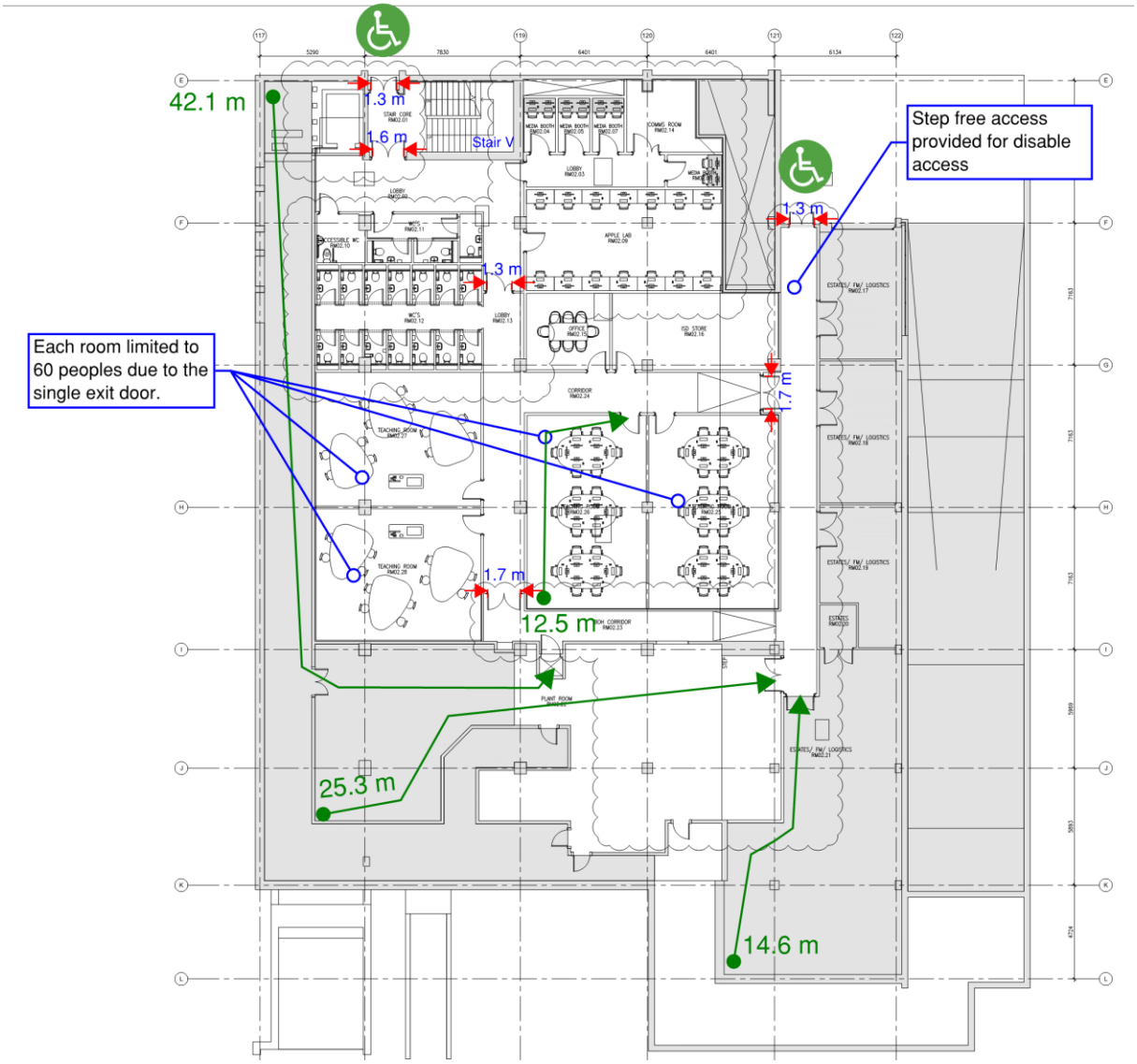

Figure 3-1: Level 02 Wing escape routes

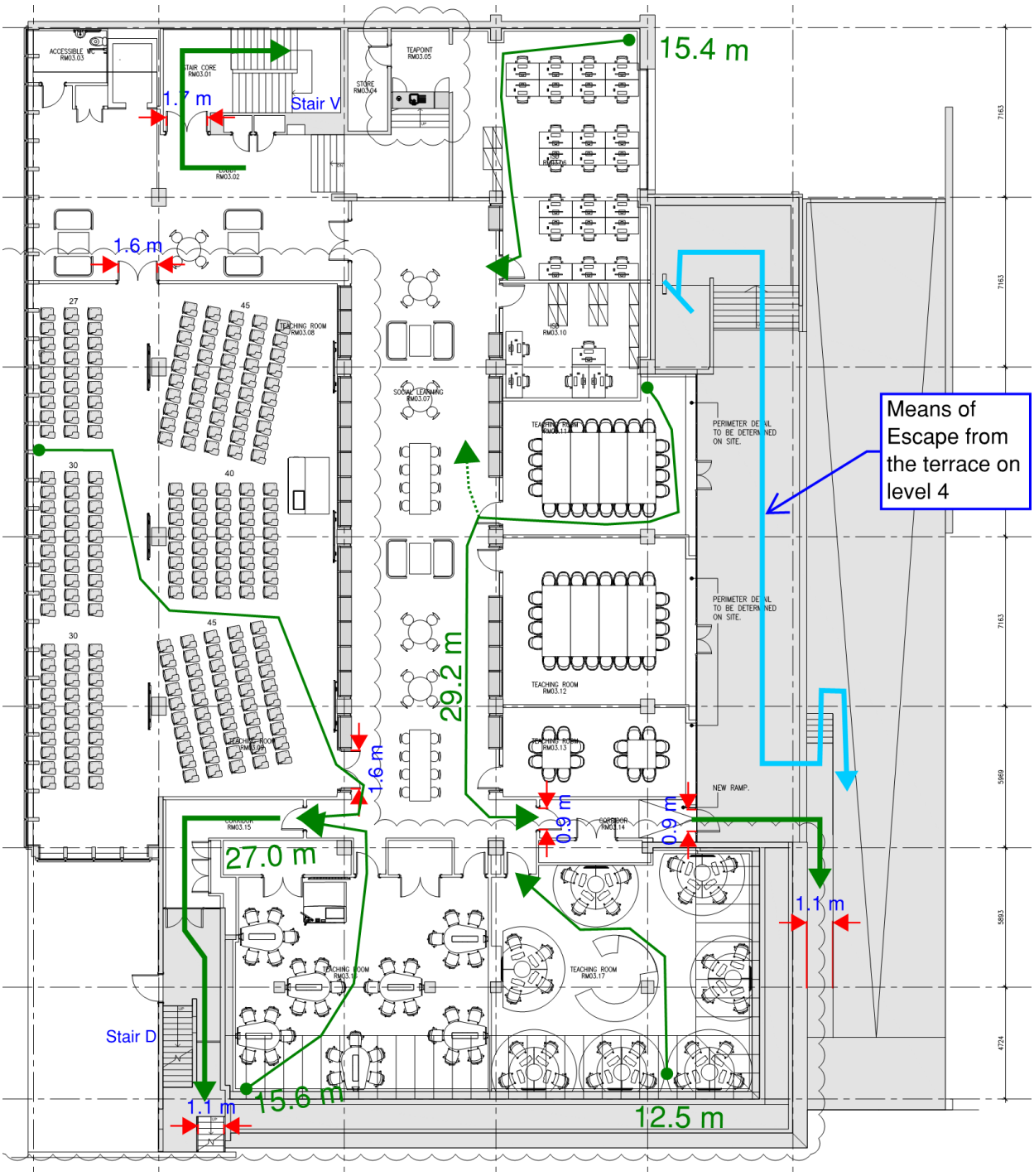

Figure 3-2: Level 03 Wing escape routes

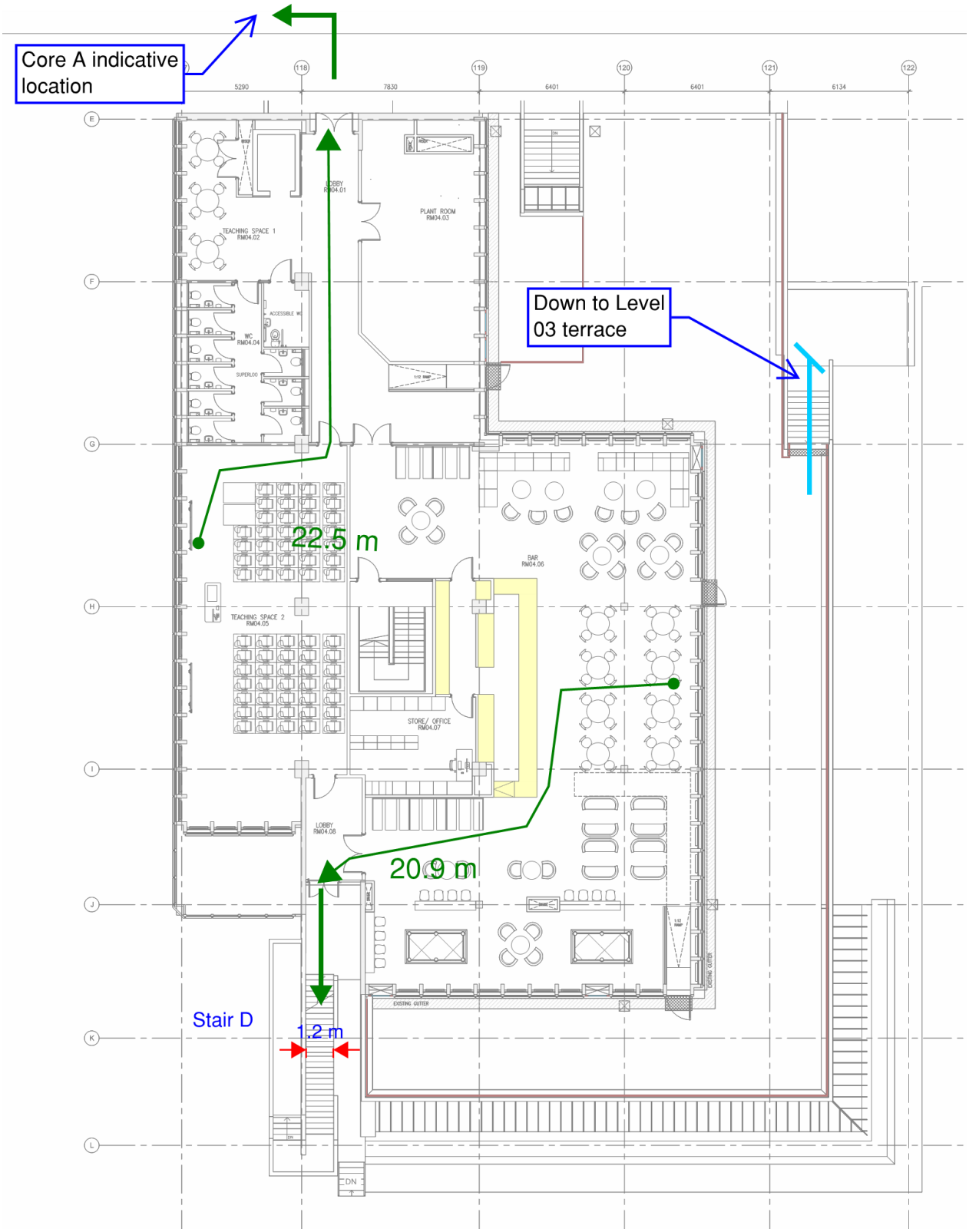

Figure 3-3: Level 04 Wing escape routes

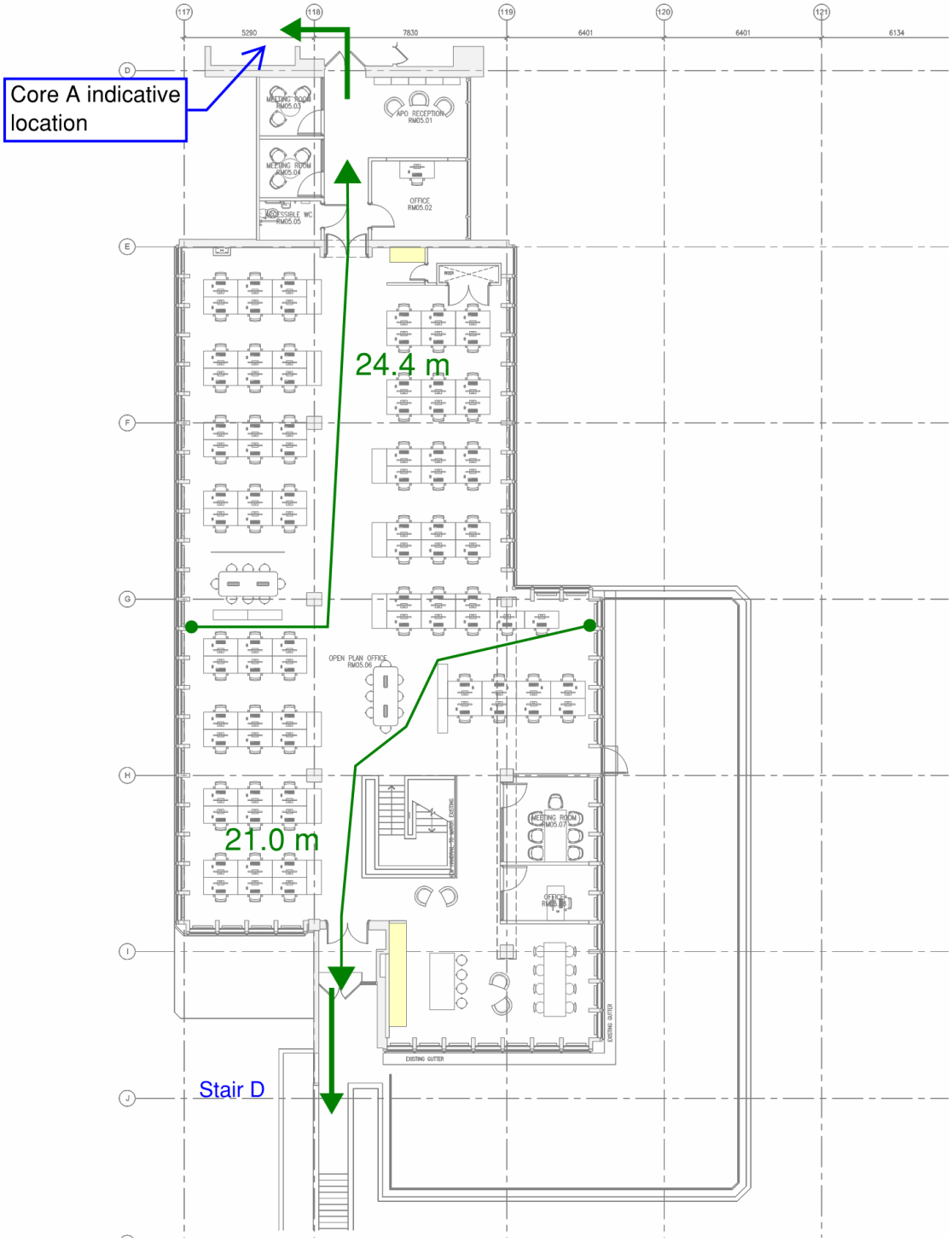

Figure 3-4: Level 05 Wing escape routes

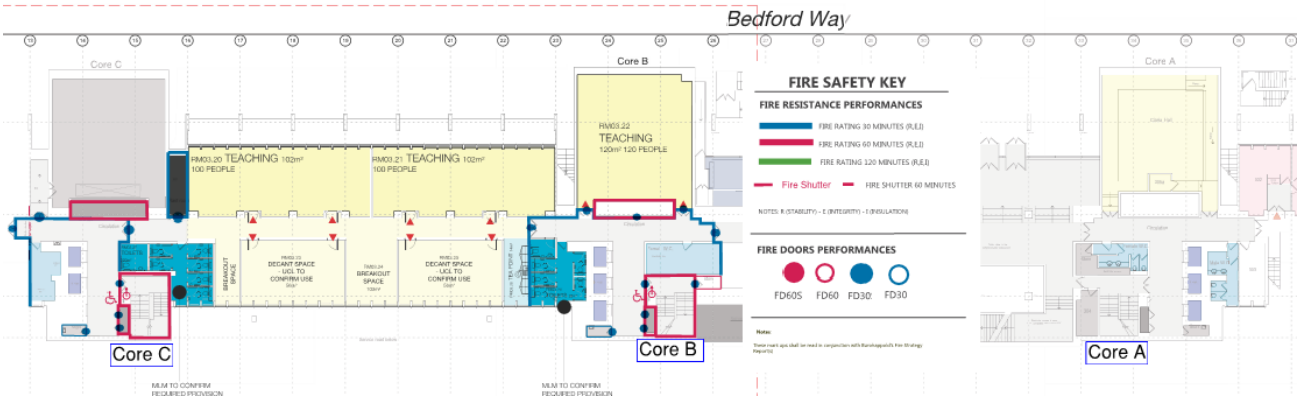

Figure 3-5: Level 03 between cores B and C escape routes

3.4 Occupancy

The maximum capacity of each level is calculated based on the available exits as detailed below for each level in Phase 1. At least two escape routes, remote from one another, should be provided to all rooms, or areas, that may accommodate more than 60 occupants.

Level 2 Wing Section

Two horizontal exits are provided, one through Stair V of 1300mm wide and one door of 1300mm leading to outside. Assuming the largest exit is discounted due to a fire, the exit capacity is 372 people (including 15% increase due to the L1 alarm and detection system provided, 3.5mm/pp). It should be noted that there is no merging through this stair for this fire scenario, since occupants at level 03 are sized for the largest exit to be discounted and is only fully utilised for a fire at level 03 blocking an exit direct to outside.

Level 3 Wing Section

Three horizontal exits are provided, the 1300mm door leading to Stair V, a 900mm wide door leading to exit route near Stair D, and a 900mm wide door leading to the outside. Please note Stair V only serves Levels 01, 20 and 03, and discharges at level 02.

By discounting the wider exit, the two available exits capacity is 257 people through the 900mm door directly to outside (including 15% increase due to L1 alarm and detection system provided, 3.5mm/pp) and 257 people through the 900mm wide door leading to exit route near Stair D (including 15% increase due to L1 alarm and detection system provided, 3.5mm/pp). Thus, the total exit capacity is 514 people.

Levels 4 & 5 of the Wing Section

The wing is served from level 04 to 09, by the external stair D, and the existing core A. Core A is currently not lobbied at all levels, and existing fire resistance of the few lobbies is not considered suitable.

- Stair D (existing external stair), is 1200mm wide, and serves level 04 to 09 (6 levels).
- Core A is 1300mm wide (actually 1600mm wide but final door at level 2 is 1300mm wide), and serves level 03, and 05 to 09 (6 levels).

Assuming Core A is discounted, based on a B2 occupancy, the current capacity for the level 04 to 09 wing is 612 occupants (@1.96mm/pers with enhanced detection). The combined wing area (from level 4 to level 09) is approximately 2500m^2 (Level 04 is 680m^2, level 05 is 560m^2, etc. to level 09 which is approximately 160m^2). The occupancy equates to approximately 4.1m^2/pers.

Level 04 is also served by an additional external stair from level 04 terrace to level 03 terrace (1000mm wide route) which allows an additional 104 occupants (500mm / 4.8mm/pers). Please note 500mm was used as the dimension as the escape route is less than 1050mm, as per BS 9999.

Therefore, the total occupancy for level 04 is 269 occupants 680m^2@4.1m^2/pers = 165 pers + 104 pers = 269 pers.

Level 05 occupancy is 112 occupants (560m^2 @ 4.1m^2/pers).

As level 05, level 06 to 09 occupancy is to remain at an average occupancy factor of 4.1m^2/pers (335 combined occupants). Level 06 to 09 are understood to currently accommodate significantly less occupants than permitted, however, this average occupancy factor of 4.1m^2/pers should also apply to future work.

Please note that the current intent of the masterplan, is for Core A, Core B, and Core C to be lobbied at all levels, as such, no stair cores would be discounted. If achieved, occupancy of level 04 would be 418 people. Level 05 occupancy would be 214 people. Level 06 to 09 occupancy would be 635 people.

<u>Level 3 between Cores B and C:</u>

The occupancy on Level 03 between cores B and C depends on the stairs capacity in the existing building. This has been determined and included within the *Stage 1 Feasibility Fire Safety Strategy Report* (UCL IOE Masterplan report) and is repeated here for clarity.

The total capacity of Cores A to D for Levels 03 to 09, excluding level 04 with protected lobbies at every level, is 1938 people, see Figure 1-2 for stairs location on typical level. Level 01 (mainly lecture halls) is served by separated protected stairs. Level 02 is mainly including plant and store rooms, and has a very limited occupancy. Level 04 is provided with escape routes direct to external, however their capacity should be assessed at a later stage for the future phases including renovation of Level 04 (and additional/larger doors may be investigated if necessary).

The above is based on BS9999, L1 detection, and no protected lobbies being provided to the stair cases. It has been confirmed by UCL IoE Fire Officer that the compartmentation forming the stair lobbies cannot be depended upon to perform as required due to previous works performed in the building. During Phase 1 protected lobbies will only be provided in Level 03 stairs B and C, where works are to be taken place. Protected stair lobbies in all levels will be provided as part of later planned phases of works whenever the occupancy for these floors would exceed the 1938 occupancy, to increase the limit to 2601 people, see Table 3-3.

Based on an even distribution of occupants across levels using the staircases, a maximum occupancy of 323 people can accommodate at Level 03. The maximum existing occupancy for level 5-9 should not exceed 1615 occupants (or 323 occupants per floor), and is acknowledged by UCL.

The horizontal escape capacity of the entire Level 03 is greater than the stair capacity because by discounting one exit, two are available of 1300mm, providing capacity for 372 people each (L1 alarm and detection system provided, 3.5mm/pp).

Table 3-3: Cores A to D maximum capacity with and without protected lobbies

Stairs	Effective Stair width at pitch point (mm)[Note 1]	No of upper levels serving (excluding Level 02)[Note 2]	Occupancy Capacity per stair	
			All Stairs Lobbied	No Lobbies provided
A	1300	6	663	Discounted
B	1300	6	663	663
C	1300	6	663	663
D-External stair	1200	6	612	612
Total stair capacity			2601	1938
Total capacity per storey for each Level 05-09 and 03[Note 3]			433	323

Note 1: Based on minimum stair width or final exit width, whichever is smaller.

Note 2: For the purposes of this analysis, stairs not counted for capacity at level 4 as this level has exits direct to outside independent to the stairs A, B C and D. Based on BS 9999 as stair serving 6 storeys of a B2 occupancy is assess at having a capacity of 1.96mm/person 15% decrease due to Automatic Fire Detection being provided.

Note 3: Please note that this is an indicative maximum occupancy per level assuming an even distribution of occupants per level. It is possible to have a larger occupancy on some levels provided the total occupancy of the upper levels 3, and 5 to 9 does not exceed the total stair capacity. Assuming an average floor occupancy, it should therefore be confirmed by UCL that the maximum existing occupancy for level 5-9 does not exceed 1615 occupants (or 323 occupants per floor).

To summarise the maximum capacity of upper levels served by cores A to D:

<u>The total maximum occupancy of upper levels served by cores A to D i.e. Level 3, and 5 to 9, inclusive, should not exceed 1938 at any one time due to limited total stair capacity.</u>

For example, assuming an even distribution of occupants per floor this equates to 323 occupants in total per floor for each of floors 3 and 5 to 9. For example, assuming an even distribution of occupants on either side of Core B at level 03 this equates to a maximum of 161 occupants in Phase 1 at level 3.

If there is not an even distribution per floor, i.e. more of this total maximum 1938 occupancy is located at Level 03 when compared with other levels., then the occupancy of L03 can increase to a total of up to 372 occupants on either side of Core B, but this subject to an overall total maximum occupancy throughout floors 3, and 5 to 9, inclusive, of 1938 occupants not being exceeded.

In order to tie down exactly what the maximum occupancy permitted in the Phase 1 area at Level 3, confirmation would be required from UCL Estates of the total maximum occupancy per floor, and on either side of Core B at each level, and also taking into account future increases in occupancy in other areas. This should take into account occupancy waiting outside lectures.

Please note that in future if all stairs are provided with a protected lobbies (not currently achieved) then the total overall occupancy upper levels served by cores A to D i.e. Level 3, and 5 to 9, inclusive, could increase from 1938 to 2601 at any one time.

3.5 Inner Rooms

BS 9999 recommends wherever escape from a room is only available through another room (inner room), it should be ensured that the access room is provided with detection or there are vision panels between the access room and inner room. The occupancy of these rooms should also be limited to 60 people.

It is currently proposed for some rooms accessed only from the breakout space to accommodate a potential occupancy greater than 60 people (potentially up to 100 occupants). This is considered reasonable based on at least two escape routes as remote as possible from each other with doors opening in the direction of escape, as well as increased visual awareness with automatic fire detection. Currently, it is proposed for these rooms to be provided with full glazed frontage, and L1 detection throughout, providing the highest level of awareness possible, and greater than just a small vision panel in a door required for an inner room with 60 occupants, see Figure 3-1, Figure 3-2, and Figure 3-5.

While furniture is proposed in the breakout space (access rooms), its main purpose remains as circulation and access to these rooms, therefore escape routes are unlikely to be impeded.

This has been discussed and agreed in principle with UCL Fire officer and MLM Approved Inspectors, and the London Fire Brigade.

3.6 Exit Doors

The following will apply to doors where applicable:

- All doors used for means of escape should be design in accordance with UCL Fire Technical Note TN001;
- All escape doors serving more than 60 occupants should open in the direction of escape;
- Door fastenings: All doors will be capable of being readily opened in direction of escape in the event of an emergency without the use of a key;
- Panic hardware will be used along escape routes from areas with more than 60 occupants (e.g. from the teaching faculties rooms; break out spaces);
- Electronically locked doors on escape routes will failsafe open on fire alarm and power failure. This will also be provided with Green Break Glass Units (BGUs).

3.7 Final Exits

Final exits should be provided at least as wide as the stairs they serve. If this is not met as per existing building constrains, the stair width will be assumed to be the final door width.

3.8 Mobility Impaired Persons

It should be noted that under the Regulatory Reform (Fire Safety) Order 2005, it is the duty of the responsible person along with their appointed safety assistants to assist everyone to a place of ultimate safety outside the building in the event of an emergency.

In order to meet Building Regulations, Any disabled member of staff should have a Personal Emergency Evacuation Plan (PEEP) and the procedures should be practiced. A Generic Emergency Evacuation Plan (GEEP) will need to be written for members of the public who would need assistance to escape.

Refuge spaces will be provided in all the protected stairs serving the Levels of Phase 1, including one external refuge at level 03.

To comply with BS9999 each refuge should be:

- Provided with clear space of at least 900 mm x 1400 mm for the refuge space, which should not impede evacuation of other occupants.
- Provided with a two way communication device in compliance with BS 9999 and UCL Technical Note TN054, which communicates with a central monitoring station(off site main security room) and to reception at ground floor.

4 Structure and Compartmentation

4.1 Structure Fire Resistance

UCL Institute of Education has a basement less than 10m deep (approximately 9.15m), and has the topmost occupied floor level less than 18m without sprinkler protection, therefore, loadbearing structural elements should be protected for at least 60 minutes in accordance with BS 9999.

As such, any new loadbearing elements of the structure for Phase 1, will have 60 minute fire resistance.

The existing structural frame is concrete. For the phase 1 works it is not considered necessary from a Building Regulations point of view to upgrade or confirm 60 minutes is achieved to the existing concrete structure, as the use remains the same. However, it is strongly recommended that the fire resistance period achieved by the actual existing concrete frame be confirmed in order to inform design of future phases of work.

4.2 Compartmentation

The compartmentation requirements given in Table 4-1 are for Phase 1 works. The below is for integrity and insulation unless otherwise stated:

Table 4-1: Compartmentation

Part of Building	Fire resistance (minutes)
Compartment Walls	60 (FD 60s fire doors)
Compartment Floors (all floors)	60
Service Road Wall	120 (FD 60s fire doors)
Service Risers	60
Stair	60 (FD 30s fire doors)
Lift	60 (FD 30 fire doors)
Protected lobbies	30 (FD 30s doors)
Plant and refuse rooms	60 (FD 30s doors)
Store rooms/kitchen areas (excluding tea points)	30 (FD 30s fire doors)

If existing construction elements are being used to achieve these fire resistance ratings noted it is recommended that this be confirmed by survey that these fire resistance periods are achieved and where necessary that the fire resistance period is increased accordingly by upgrading or replacing the element. Any new or existing penetrations through fire rated walls and floors should be fire stopped as part of these works, in the areas subject to these works.

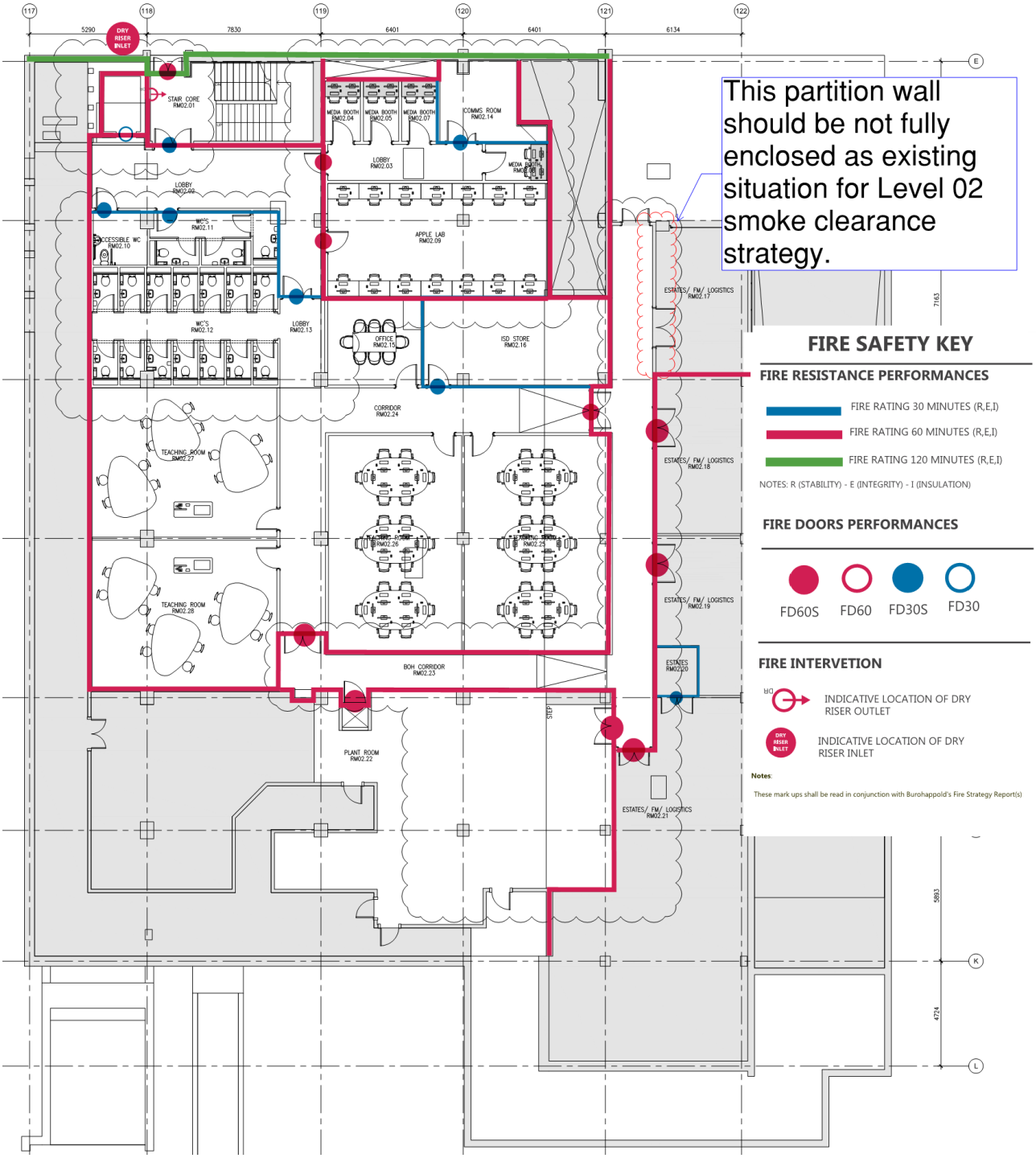

Figure 4-1: Level 02 Wing compartmentation (also see Appendix A)

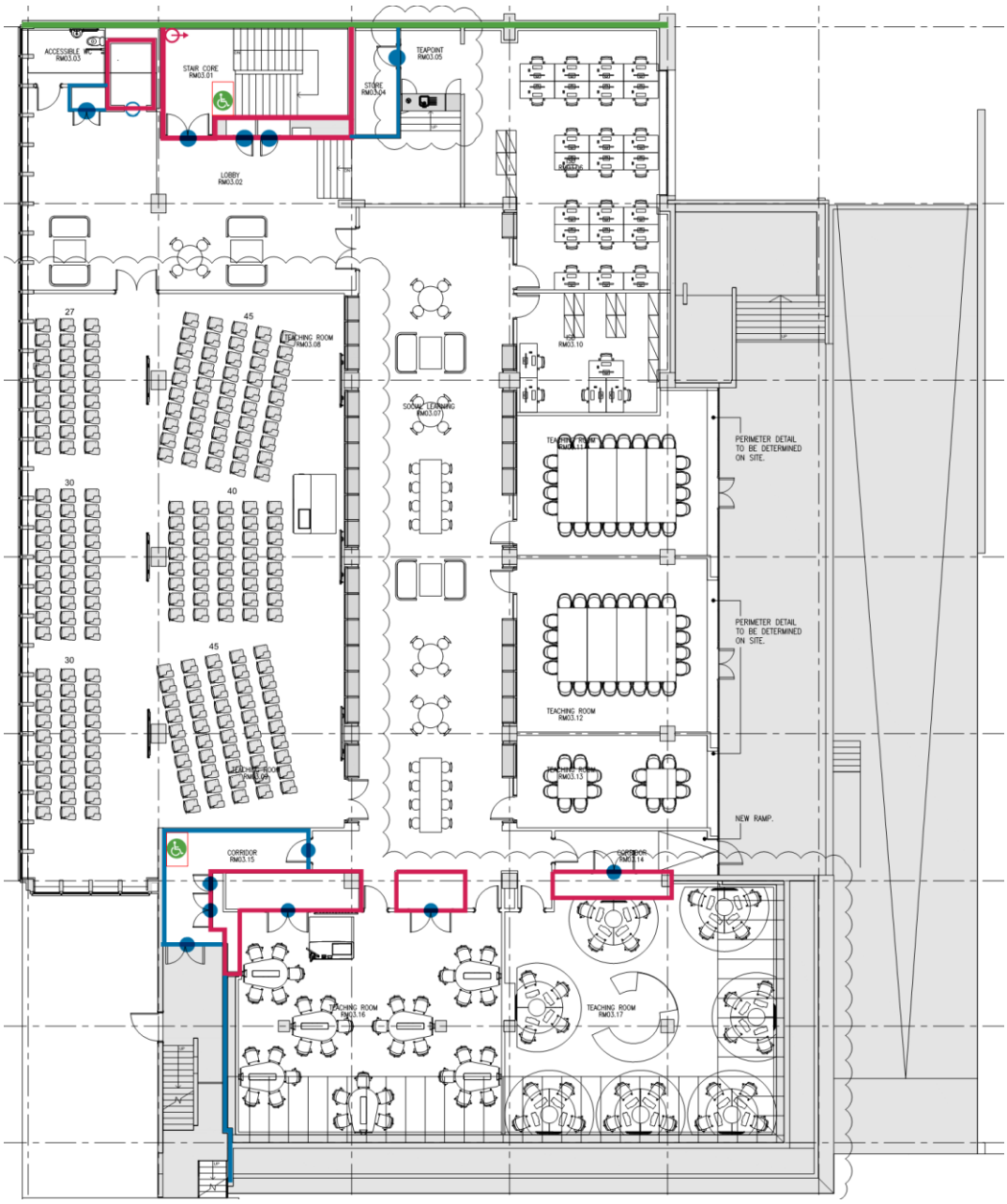

Figure 4-2: Level 03 Wing compartmentation (also see Appendix A)

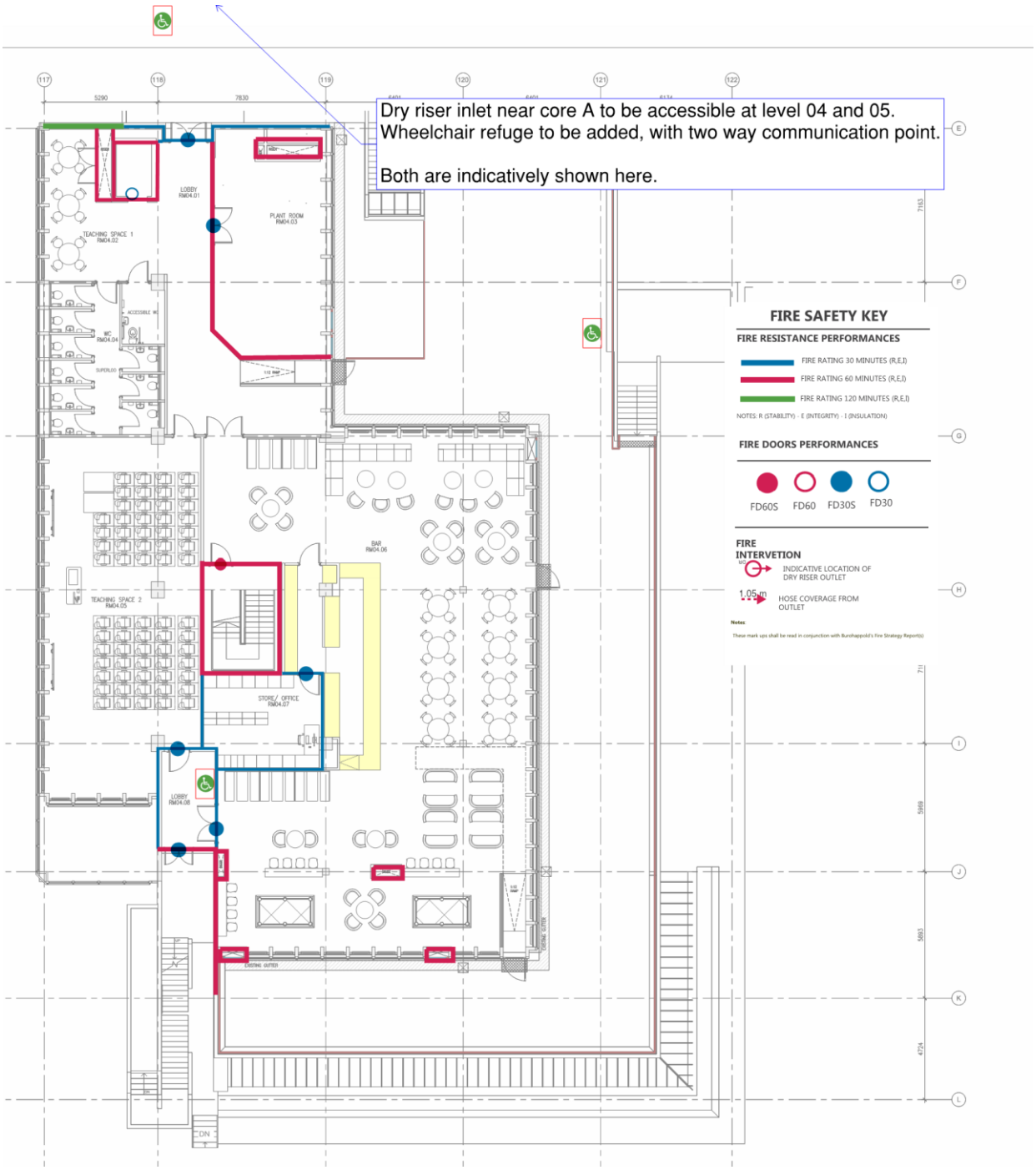

Figure 4-3: Level 04 Wing compartmentation (also see Appendix A)

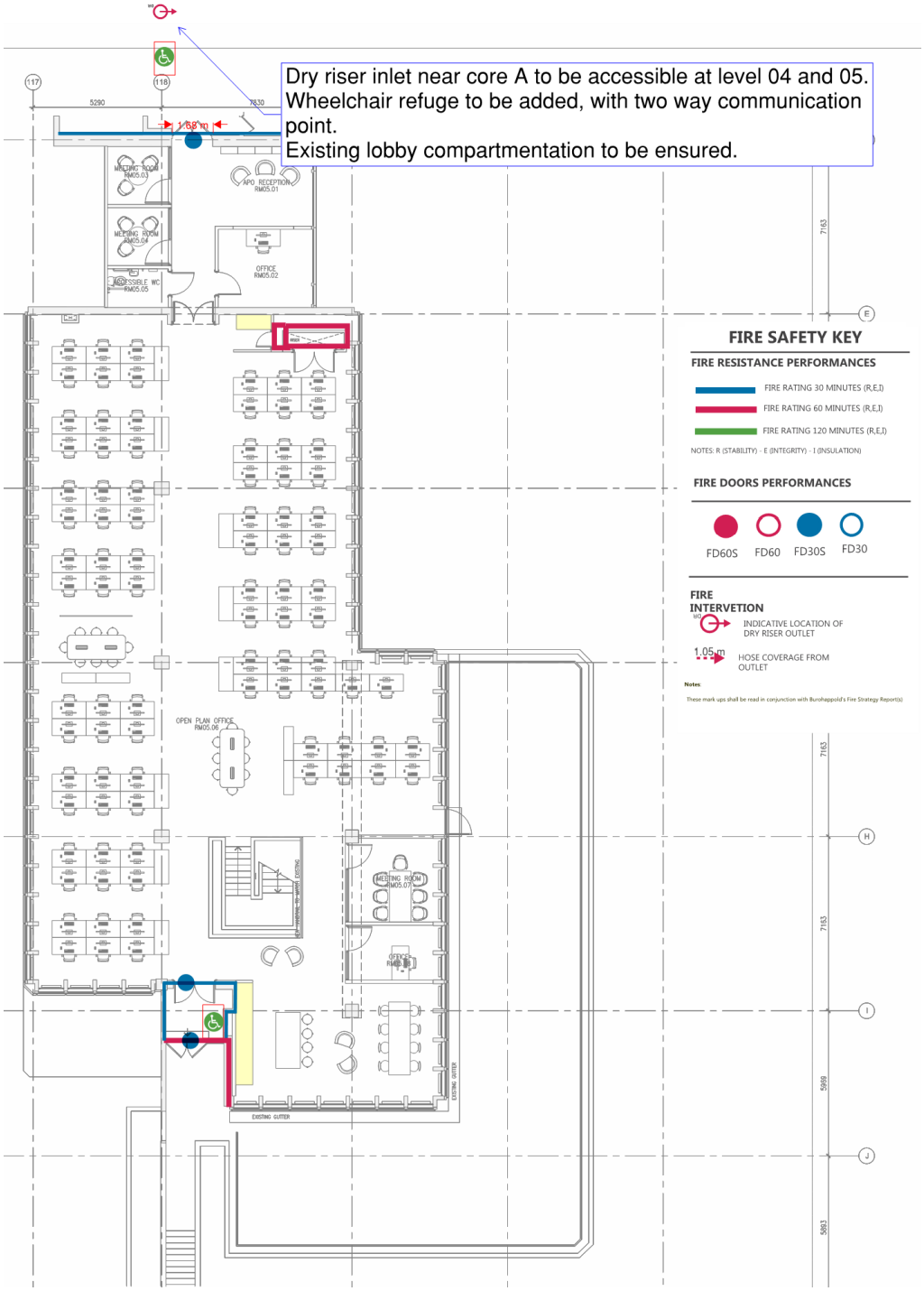

Figure 4-4: Level 05 Wing compartmentation (also see Appendix A)

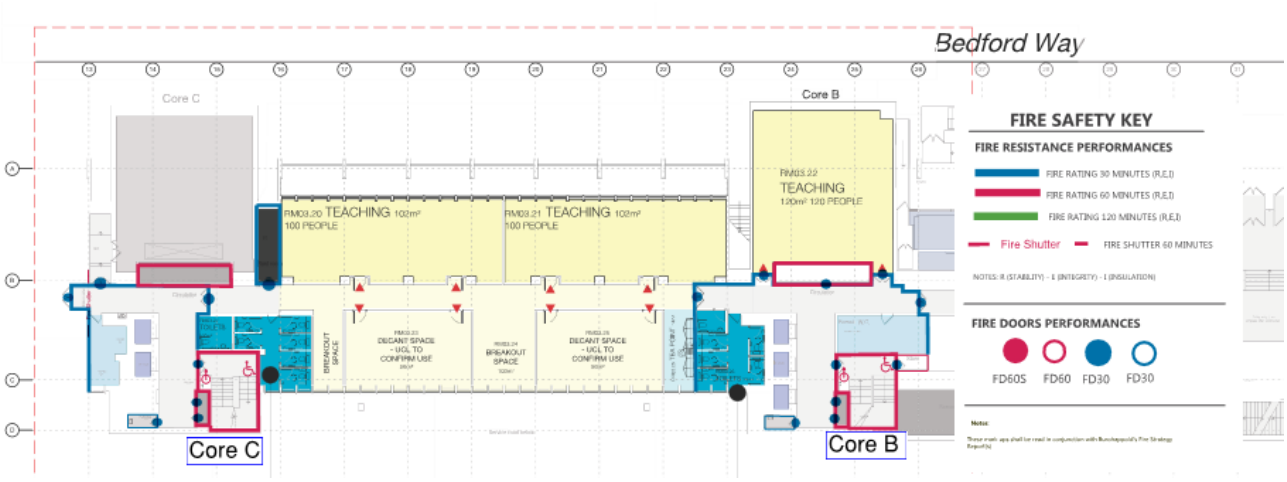

Figure 4-5: Level 03 between cores B to C compartmentation (also see Appendix A)

4.3 Tea Points

Tea points should be provided for tea making and heat up only, without cooking, and will be designed in accordance with UCL Fire Technical Note TN105. Therefore, are considered reasonable without the provision of fire resistant construction.

4.4 Fire Stopping

Within the areas subject to these works, Fire stopping should be provided on the line of compartment walls and floors where gaps exist that could allow smoke and flames to breach the compartment wall or floor. Joints between elements that serve as a barrier to the passage of fire should be fire stopped and all openings for pipes, ducts, conduits or cables to pass through any part of an element that serves as a barrier to the passage of fire should be:

- Kept as few as possible;
- Kept as small as practicable; And,
- Fire stopped (which in the case of a flue or duct should allow thermal movement).

Fire stopping should be provided in accordance with BS9999 and UCL Technical Note TN066.

As a general note, fire and smoke dampers should be provided in duct that passes through compartment walls forming protection to an escape route (e.g. discharge routes from stairs). Fire dampers should be provided in ducts passing through other fire compartment walls.

4.5 Surface Linings

Any new internal linings for all walls and ceiling surfaces will achieve the following:

Table 4-2: Internal fire spread (linings) classifications

Location	National class	European Class
Circulation routes in common areas	Class 0	B-s3, d2
Rooms (excluding small rooms), and circulation spaces	Class 1	C-s3, d2
Rooms less than 30m^2 in area.	Class 3	D-s3, d2

For the purposes of surface spread of flame, wall surfaces facing onto the central main breakout space should be Class 0- i.e. main space treated as a circulation route/common area.

The National classifications do not automatically equate with the equivalent classifications in the European column, therefore, products cannot typically assume European class, unless they have been tested accordingly, When a classification includes "s3, d2", this means that there is no limit set for smoke production and/or flaming droplets/particles.

Parts of walls in rooms may be of poorer performance than specified in Table 4-2 above, but not lower than Class 3 or D-s3, d2. This variation is limited to a total area not exceeding one half of the room floor area, subject to a maximum of 60m.

4.6 Roof Coverings

Roof coverings should comply with BS 9999 recommendations, and should have a National Classification AA, AB, or AC when tested to BS 476-3, or European Class B roof (t4) when tested to BS EN 13501-5.

4.7 Cavity Barriers

Cavity barriers should be provided internally in extensive cavities (i.e. ceiling voids or floor voids) in accordance with BS 9999 recommendations.

5 External Fire Spread

5.1 Unprotected Areas

Given that the risk associated with the proposed changes is reduced or equivalent (from offices or plant/workshop areas to teaching spaces), and that compartmentation between floors will not be reduced, the existing conditions will be improved from an external fire spread point of view. In fact by providing confirmed compartmentation in areas subject to these phase 1 works, the existing situation for compartmentation and hence external fire spread will be improved.

It is therefore not necessary to assess external fire spread – unprotected areas in line with current code guidance.

5.2 External Faces of Buildings

It is currently understood that there is no external façade works being carried out as part of the proposed refurbishment works for Phase 1.

Any openings formed (for new services or others) should be provided with cavity barriers (30 minutes integrity, 15 minutes insulations) in accordance with ADB.

6 Fire-Fighting Access and Facilities

6.1 Fire-fighting Access Overview

The existing strategy for Fire Brigade Access is via Bedford Way where the dry riser inlets in Cores A to C are located. It should be noted that the dry risers do not serve all levels of staircases and do not serve the "Wing". It is proposed to provide Fire Brigade access to Level 02 and Level 03 of the Wing via the service road. This service road is 6.2m wide and should be managed to be kept clear at all times to comply with the access road criteria as Table 6-1 below. This was agreed with LFB as part of the original Phase 1 work.

Table 6-1: Fire Brigade access road as per London Fire Brigade Fire Safety Guidance Note 29

Appliance Type	Min width of road between kerbs (m)	Min width of gateways (m)	Min turning circle between kerbs (m)	Min turning circle between walls (m)	Min clearance height (m)	Min carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	14.0

As per BS 9999 recommendations, hose coverage should be provided such that every part of each level is within 45m from the fire main outlets measured on a route suitable for laying hose from either a fire appliance parking location or a dry main outlet. The indicative location of dry riser outlets of Phase 1 as well as hose coverage are shown in Figure 6-1, Figure 6-2 and Figure 6-5.

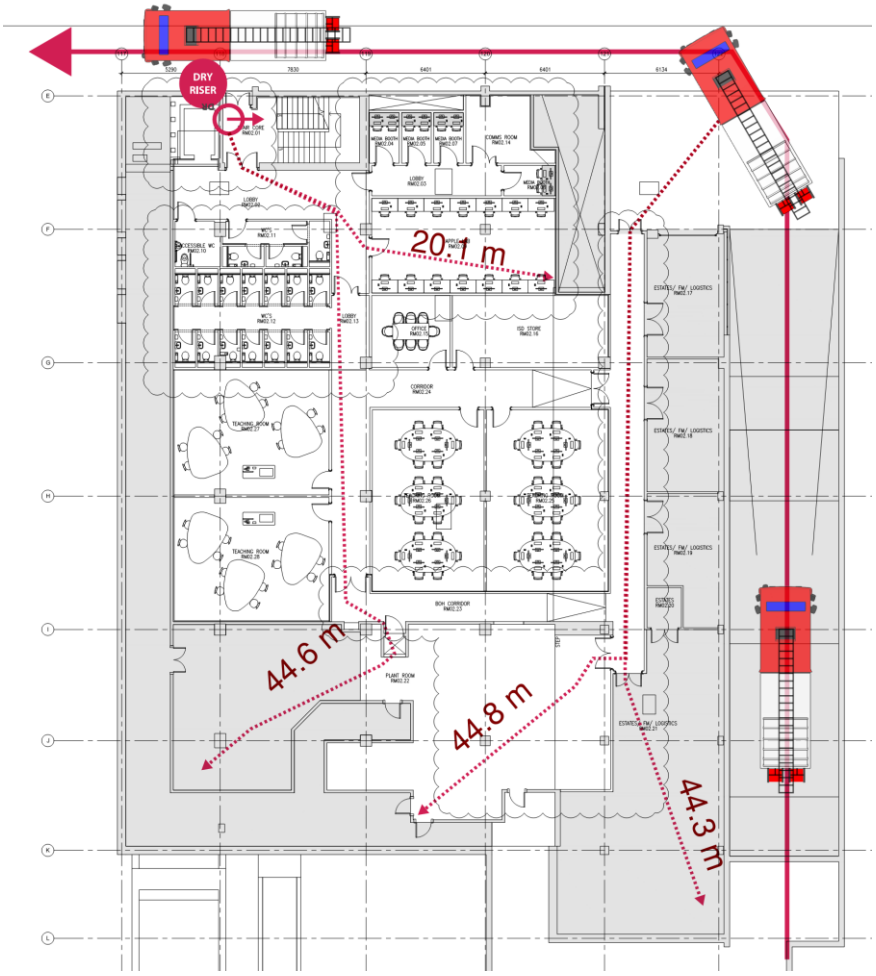

Figure 6-1: Level 02 Wing Fire brigade access and hose coverage

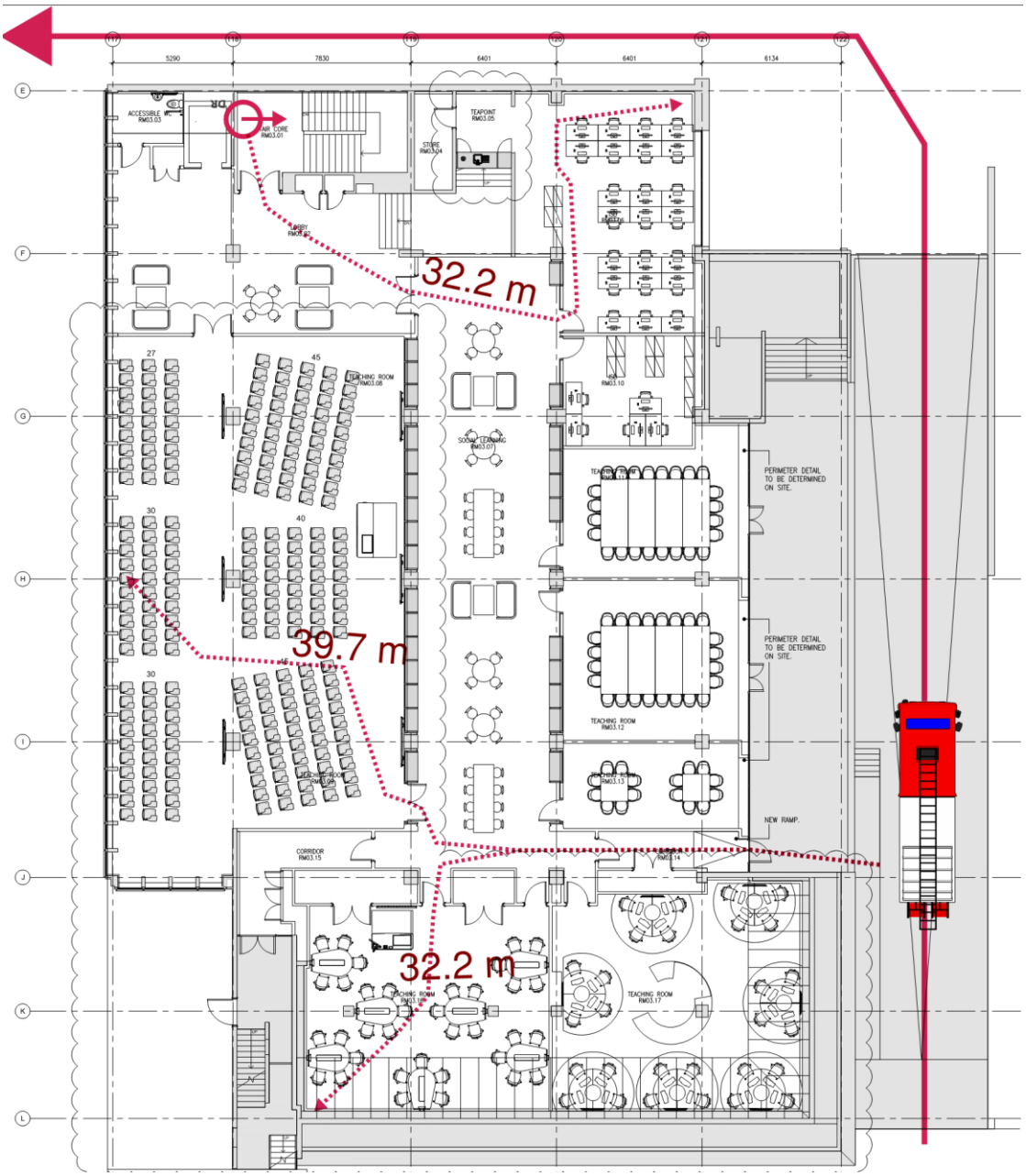

Figure 6-2: Level 03 Fire Brigade access and hose coverage

On level 04 and 05 of the Wing, it is proposed to improve existing firefighting facilities in Core A to ensure hose coverage can be achieved within 45m of a dry riser outlet. The existing dry riser will need to be modified to serve level 04 and 05.

It should be noted that the hose coverage is slightly above the 45m as recommended by the code guidance on level 04 (51m after fitout). However, since the proposed arrangement is significantly improving the hose coverage on this floor (no dry riser outlet at this level currently from Core A), and that the shortfall can be achieved externally through the terraces, this is considered reasonable. This is to be discussed and agreed with MLM and LFB.