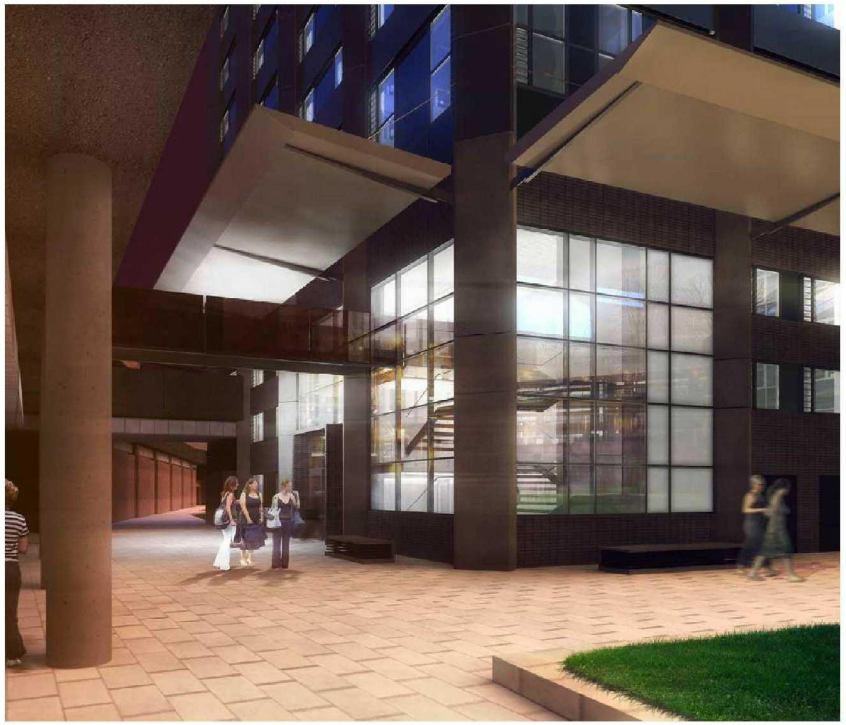
GRENFELL TOWER REGENERATION PROJECT

STAGE C REPORT
Oct. 2012



THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Kensington & Chelsea TMO

Churchman landscape architects

MAX FORDHAM

curtins consulting

CONTENTS

EXECUTIVE SUMMARY

The following report is a summary of Grenfell Tower design team activity up to and including RIBA stage C. The design proposals contained within the report are intended to provide a basis for further detailed design, risk and cost analysis of the design objectives in response to K&C Tenant Management Organisation (TMO) stated aims of:

- Respond to the Supplementary Planning Guidance for the site.
- Find a long term solution which is both efficient and economically viable for the Communal heating to the tower.
- Extend the life of the building and bring the standard of the external envelope in line with current standards.
- Optimise the use of space in the tower.
- Exploit any "hidden homes" opportunities to deliver additional affordably housing for the Borough.
- Improve the entrance and appearance of the block and the Lancaster West Estate generally.

The regeneration of Grenfell Tower is an extension of, and integral to the Kensington Academy and Leisure Centre project (KALC) and upgraded public realm. (Planning Application Reference PP/12/01833); The public realm works include new play areas, a shared surface connecting Grenfell Road and Silchseter Road, new pedestrian routes and a planting scheme. The three projects represent a significant investment and make-over for the area.

The close integration between the associated KALC projects is reflected in the design team for Grenfell Tower by the involvement of the same consultant organisations as Kensington Academy.

The project team (see section 1.0) through participation in project meetings, design workshops, public consultations and site investigations along with supplementary design guidance have been able to determine and refine a number of design objectives related to the refurbishment of Grenfell Tower:

- Improve access
- Enhance security
- Boost the external envelope performance & appearance
- Increase services performance and control
- Increasing building occupancy and efficiency of use (Podium levels)

1.0 CLIENT AND DESIGN TEAM

Client
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2.0 EXISTING SITE

Grenfell Tower sits at the Northern end of the Lancaster West 1 Estate, in the Notting Barns Ward of North Kensington. The Estate consists of the tower and three "finger blocks" – Testerton, Hurstway and Barandon Walks – 3 and 4 storey linear residential blocks which extend 150m south from the Tower enclosing two large green spaces.

The area to the immediate east of the tower is Lancaster Green and there are children's play areas to the immediate west. While these are retained and remodelled as part of the KALC project the open space to the north which is currently all-weather football pitches is the site of the proposed Kensington Academy. The London Underground viaduct is 70m to the west and Latimer Road Tube station is 200m walk from the entrance to the tower. The new Leisure Centre is situated beyond Lancaster Green.

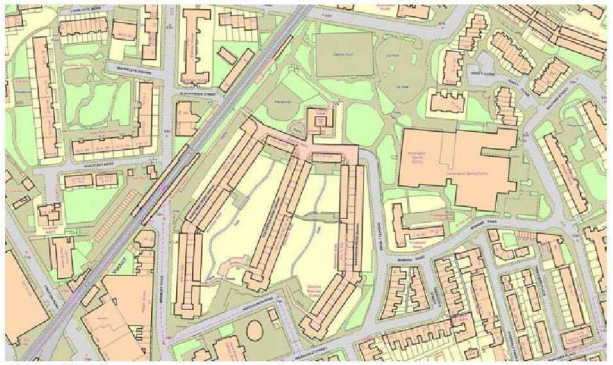

Fig. 1 Site Area

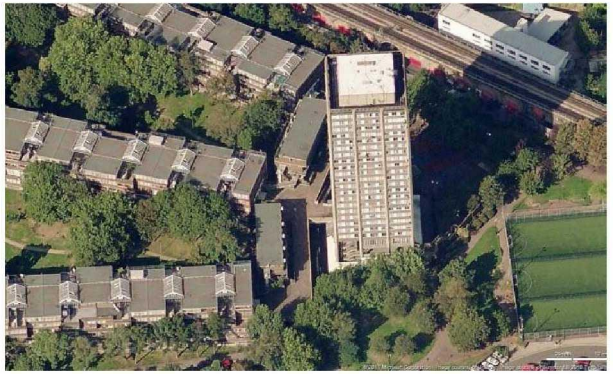

Fig. 2 Grenfell tower

2.1 History

Lancaster West was built in the early 1970's, completely erasing the previous street pattern and replacing properties without internal plumbing which had become to be regarded as slum housing. The estate was designed around a network of elevated pedestrian streets. Parking and service access are at a lower ground level and all pedestrian access is at first floor deck level. This was originally freely accessible: raised streets extended north to south down the centre of each finger block, with ramped access at either end. The deck originally extended right through the base of the tower. The streets – referred to as Walkways – are linked together into at the northern end with a direct connection to the south-west corner of Grenfell Tower via a bridge extension of the walkway deck.

In the early 1990's various improvements and changes were made across the estate, the most significant being access control. New glazed screens and doors with key-fob access now secure the blocks individually, restricting the use of the streets as thoroughfares. Whereas Grenfell Tower once had more than one point of access, including at Walkway level, it is currently only accessible via a small reception at ground level on the south side of the tower.

One of the changes made at the time was the closing off of the single public lift within Grenfell tower which serves Ground, Walkway and Walkway +1 levels. The latter was originally used as a Doctor's Surgery and more recently as offices for RBKC Social Services. There is currently no lift access between the ground floor parking level and the Walkway level anywhere across the estate. The original concept of the elevated street is unchanged for the residents of the finger blocks and it is still the level at which they gain access to their front doors. The service yard and lower ground parking was intended to be out of sight by artificially dropping the ground level by 2m from the surrounding grade level. All traffic accessing the under croft inc. residents vehicles, refuse trucks and maintenance vehicles are directed to the lowest point of the "site bowl" – directly opposite the Grenfell tower entrance. For the residents of Grenfell tower the yard is very much in view, not tidily concealed. It is a hostile environment for pedestrians and a dark unpleasant space to be in. While it is not possible to fundamentally alter the system of refuse collection or vehicle movement the TMO intend reducing the amount of traffic in this area and this application proposes transforming it into a pedestrian priority zone.

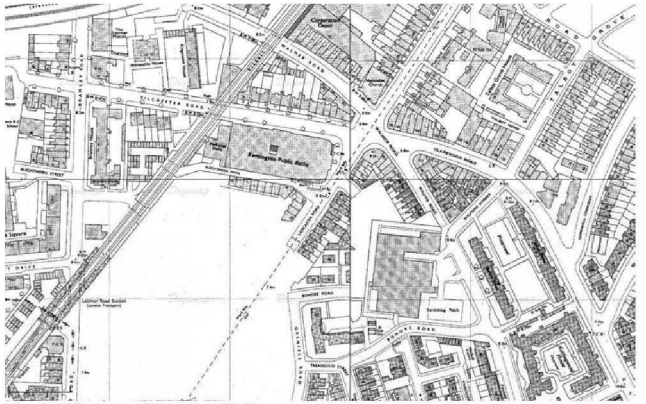

Fig. 3 OS map of the site 1970

Fig. 4 Lancaster Green

Fig. 5 Service Access to east side of tower

2.2 Supplementary Planning Document

The Special Planning Guidance (SPD) for this site deals primarily with the siting of the proposed Academy and Leisure Centre and the Public Realm. It is this last aspect which is most important because of the fractured nature of the KALC site, a consequence of its historic piecemeal development. The SPD seeks to improve the pedestrian (and visual) links across the site, beginning with a new north-south shared surface, starting at Grenfell Road at its southern end and connecting with Silchester Road on the north. The new north-south route is part of the KALC Planning Application and will be controlled by retractable bollards at both ends.

An improved east/west link is also indicated on the SPD on the south side of the tower because this is currently not a level direct pedestrian route. It is the shortest route from Station Walk and the tower entrance, and a natural desire line for anyone crossing the site by foot.

The area to the North & West of Grenfell Tower was originally a private walled garden for residents' use with no public thoroughfare.(figure 8). A youth club and Tenant's Association meeting areas (figure 9) at the base of the tower both opened directly onto the garden along with several means of access from Walkway level. One route down from the Walkway level is a stepped and curved ramp on the west side of the tower. This does not extend down to grade, perhaps because of the limited space available for the ramp. The ramp along with the intermediate ground level effectively block the direct east-west connection highlighted in the SPD by having to negotiate a flight of steps to the base of the ramp and a change of direction to pass.

Over the years the walled garden has been opened up to public access increasing routes through the site around the Tower. The Youth Club has been disbanded and the current tenants at the base of the tower include a nursery and amateur boxing club which both require better public access. The SPD sees the removal of the stepped ramp and a levelling of access around the Tower as key to re-establishing East – West movement through the site and improving public access generally taking into account the proposed development of a North - South route associated with the new academy. The loss of access to Ground level from the walkway is to be compensated with a new secure access route within the tower which includes re-establishing lift access to the walkway level.

East-West Connection

5.4.5 The map in Appendix 2 shows there is a popular east-west connection at ground level to the South of Grenfell Tower under Grenfell Walk. At present this route is poorly defined, dominated by the servicing yard for Lancaster West and Grenfell Tower and includes steps, limiting disabled access. Whilst not included as part of the site, an improved pedestrian environment should be provided as an integral part of the project.

Fig. 6 SPD - Extract

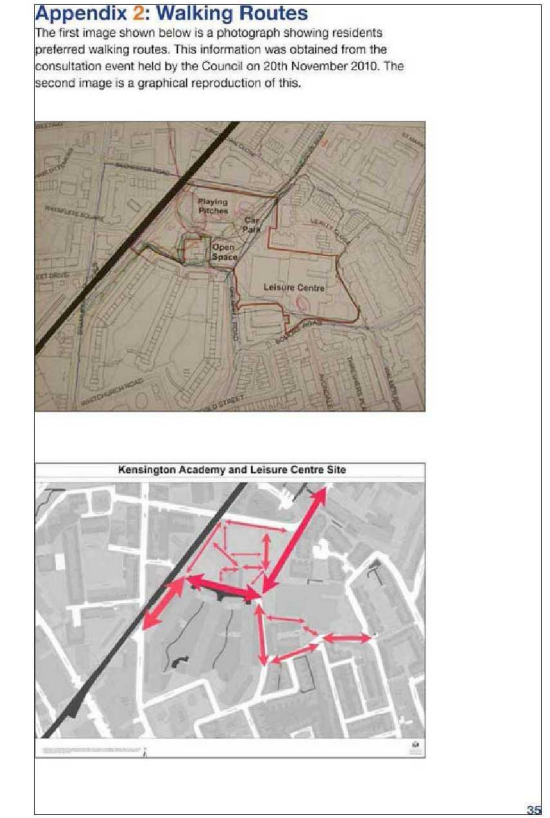

Fig. 7 SPD - Appendix 2

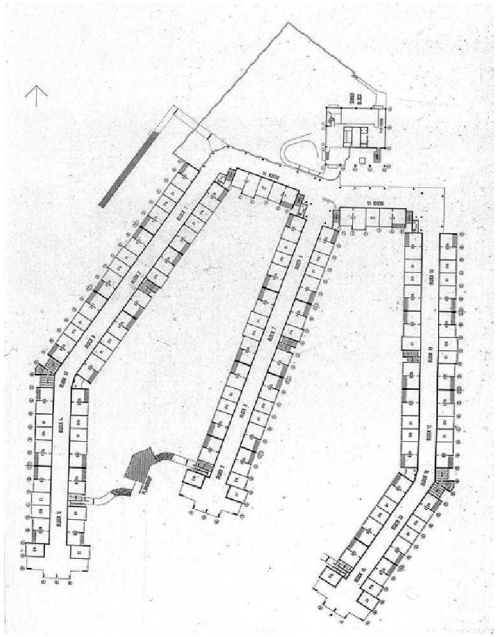

Fig. 8 Original drawing - Lower Ground Floor of Lancaster West

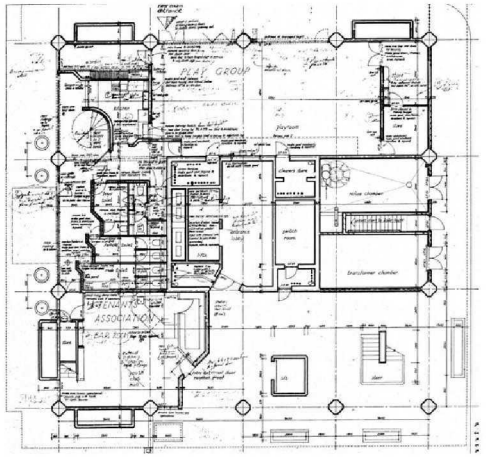

Fig. 9 Original drawing - Ground Floor

2.3 Summary of Public Consultations

Grenfell Tower Regeneration Project

Project Manager:
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292a Kensal Road, London W10 5BE

Date	Type of Consultation	Description	Feedback from residents
28/02/2012	Road Show	The first stage of the consultation process took place with Residents views/feedback sought via a KCTMO Road show and the issue of an initial questionnaire to Grenfell Tower residents.	Well attended meeting with plenty of feedback from residents requesting more details on the proposal.
15/05/2012	Estate meeting	second stage resident consultation took place with the Lancaster West EMB & RA representatives	
29/05/2012	Road Show	Further more detailed Residents consultation took place comprising of a presentation and the issue of a second Questionnaire seeking further comments and observations on the proposals for Grenfell Tower.	With regard to the second Questionnaire not all questions were completed but. 17 questionnaires in total were returned, 6 from Grenfell Tower Residents and 11 returned from either non-Grenfell Tower Residents or response was anonymous. Where the response to a question was left blank, this has not been recorded
12/07/2012	Evening consultation meeting and Newsletter	Discussion with design proposals	Majority of residents preferred an option where they can clean windows themselves. Also that they would like heating system which they can control the temperature within their flat. No concern from residents about cladding.
12/07/2012	meeting with nursery	Discussion about relocation	Positive feedback from group and accepted proposal. Only concern from group was where the club could be temporary housed during construction work
19/07/2012	Evening consultation meeting, day time drop-in sessions and Newsletter	Discussion with design proposals	From the window designs shown, tilt & turn reversible, sliding openers and finally pivot opening there was a preference from residents on the pivot. From the heating systems shown residents liked the heating system housed on the roof as it would provide additional storage space within their flat once existing system removed.
26/07/2012	Evening consultation meeting, day time drop-in sessions and Newsletter	Discussion with design proposals	External Canopy; Residents would like to see a new canopy which offers protection and shelter around the block. External Cladding proposal favourable to residents seem to be for profiled Zinc. Although we seem to have some feedback on type of cladding it's still undecided on their preferred colour for the cladding.
31/07/2012	meeting with Boxing club	Discussion about relocation	Generally good feedback from group and provisionally accepted proposal. Only minor concern with lease agreements which need to be reviewed by RBKC
02/08/2012	Evening consultation meeting, day time drop-in sessions and Newsletter	Discussion with design proposals	No attendees to Evening meeting or Drop-in session. Newsletter sent to Estate informing residents of preferred options for heating, windows, and cladding following previous meetings.
09/08/2012	Evening consultation meeting, day time drop-in sessions and Newsletter	Discussion with design proposals	Residents keen on idea with no objections to proposed designs.

Date	Type of Consultation	Description	Feedback from residents
16/08/2012	Evening Pre-Planning Presentation, day time drop-in sessions	Conclusion to consultation process and proposed planning application submission	There was a positive response from residents who attended presentation. Some residents wanted to know more about provision for new bike racks.
18/08/2012	Day time Pre-Planning Presentation	Conclusion to consultation process and proposed planning application submission	There was a positive response from residents who attended presentation.
Ongoing	Fortnightly day time drop-in sessions and Newsletters		

3.0 CDM CO-ORDINATOR REPORT

APPLEYARDS
GROUPE ARTELIA

CDM Report

The overall objectives of Health & Safety on this project are to ensure that, as far as is reasonably practicable, to avoid serious or life-threatening accidents to any person employed on or visiting the site or to any member of the general public. Minor accidents are reduced to a minimum and that lost working days caused through accident or ill-health are significantly reduced from the construction industry "norm". Which will also include post construction, use, during cleaning and maintenance and during future alteration/demolition.

As solutions to the various design parameters evolve an appropriate level of consideration will be given to health and safety matters thus helping to ensure that the principles of 'safety-in-design' have been followed, namely:-

Eliminate hazards wherever reasonably practicable to do so.

Introduce alternatives, where elimination has not been possible, that minimise the risk presented by the hazards.

Determine suitable controls to manage the potential for residual hazards to cause harm during the installation of the works and future use of the facility.

Project team meetings, design team workshops and meetings with specialist contractors are to be held to discuss specific key areas of the scheme and establish the main principles to be followed as the design proceeds through the planning and detail stages.

The principals of CDM, 2007 Regulations, have been adopted by the whole team and will continue to be employed throughout the design stages and during procurement processes and ultimately by the appointed Principal Contractor.

The Pre - construction Health & Safety information will provide information (obtained by the CDM Co-ordinator from the client, designers, consultants, reports and surveys and existing information specific to this project) and instruction to all persons engaged on the project.

The Principal Contractor will be made aware of any risks, (identified up to that time) that cannot be avoided or designed out of the project. These will be addressed in the Construction Phase Health & Safety Plan, which will be developed by the Principal Contractor.

The designs proposed have intrinsic construction and residual risks associated with both the temporary works requirements in construction and the management implications to the end-user. These elements have been identified as such and are to be the subject of particular workshops involving all affected parties.

General information on the site is now available and specific site investigations designed to provide the level of detail required by the designers have been requested. These surveys have been or are being instructed at the present time, or have been carried out with the resulting information being provided to the team.

APPLEYARDS
GROUPE ARTELIA

Construction sequencing and strategic project planning will need to be considered by the design team, the basis of which being that the existing building will be in use/occupation during works. A major element of this will be any requirement for the occupants to remain in-situ during the construction phase and how this is managed.

Security of the building and site accommodation will be of paramount importance to protect the public and occupants from site activities once construction works commence. A brief to ensure the necessary high level of protection will be developed as part of the tender requirements.

Access to the construction site will need to allow safe access and egress for site vehicles with a minimum of disruption or inconvenience to the adjacent buildings, infrastructure, motorist and pedestrians.

Detailed considerations will also be given to the needs of the future building management team in regard to the servicing of the building

In the next design stage there will be a move toward a more robust and detailed review of the Health & Safety risks associated with the proposed designs. The CDM Coordinator will open a 'Hazard Elimination Schedule' which works in the manner of a risk register and targets the major risk elements identified by the design, and later, the construction teams.

Facade

During the on-going development of the design, a number of specialist/experts are to be consulted including Façade treatments. Discussions will determine an architecturally desirable, structurally viable and cost effective solution and the ideas gathered being incorporated into a performance specification for a tendered procurement of this vital element of the project. An attractive, durable finish and ease of maintenance are among the top priorities in the choices that are being considered. The advice obtained from the specialist contractors will provide the design team with a choice of solutions from which they can ensure the chosen facade system will be practical and safe to construct and maintained using currently available standard products with normal industry techniques and access equipment. A balance is therefore needed between the aesthetic and the functional properties of the design.

Keith Bushell
Director of Project Safety

For and on behalf Appleyards

4.0 BRIEF

The primary driving force behind the brief to refurbish Grenfell Tower is the associated 'public realm' works as part of the Kensington Academy and neighbouring leisure centre developments.

Establishing a new accessible North South route through the site also affords the opportunity to re-establish a ground level East – West public route. Facilitating the proposed public routes requires the removal of the fire escape staircase to the North East corner, along with the removal of a public access ramp to the upper walkway level on the South West corner or Grenfell Tower.

The introduction of new permanent alternative means of access affords the opportunity to address existing design issues including a lack of inclusive access, security and more efficient and effective use of the podium levels (Ground, Mezzanine, Walkway and Walkway +1) through the following brief requirements that take account of planning restrictions, building regulations and BREEAM guidance:

- Introduction of an internal secure common staircase and lift for:
  - Combined fire escape to the existing residential and podium levels to ground level
  - Accessible lift access between ground level and walkway
  - The re-establishment of a direct link between walkway level and Grenfell Tower facilities
- Relocation of existing Nursery to ground level with direct access to external play facilities
- Relocation of existing Boxing Club within tower to walkway level
- Relocation of existing management offices inc. public waiting area to walkway level
- Introduction of 3No. three bed four person homes to a new residential level on the former mezzanine level
- Introduction of 4No. four bed, five person homes to a new residential level on the walkway +1 level.

The proposed reconfigurations of the podium levels have a number of knock effects which provide the opportunity to address further existing design issues. These include visibility into and out of the existing tower at ground level reinforcing the proposed 'public realm works' and maximising the use of passive surveillance for increased security extending the brief requirements to include:

- Removal of existing canopy and installation of a new canopy that:
  - Protects pedestrians from falling objects as a result of anti-social littering from the upper levels
  - Minimises the impact on internal day lighting for the reconfigured podium levels
  - Easily maintained from ground level
  - Reinforces the location of the reconfigured entrance
- New over-cladding / curtain walling to podium levels to better reflect the proposed layouts and connections to the external landscaping and the enclosure of previously under used external areas for useable internal floor area.

On the back of the above works K&C TMO have also decided to include works that address existing Grenfell Tower services design problems of overheating, poor energy efficiency, reliability and ongoing fire strategy issues notified by RBKC / LFB. The design team were instructed to investigate options for the renewal of services and the combined heating & hot water system in Grenfell Tower while minimising disruption of supply to the 'combined community heating & hot water system' serving the existing Grenfell Tower residents and the low rise finger blocks by:

- Removal & replacement of existing windows to the existing residential accommodation with new energy efficient glazing and insulated over-cladding which has the added benefits of addressing:
  - Ventilation requirements appropriate to the new energy strategy for trickle and purge ventilation
  - Permanent restrictors to improve resident Health and Safety both within the flats and at Ground level
  - Improved access for window cleaning from inside the flats through the new window design.
- New energy efficient heating source and central distribution throughout Grenfell Tower inc. metering and controls.
- New surface fixed LTHW heating system for existing residential accommodation including individual metering and controls (as per proposed residential accommodation)
- New separate DHW for existing residential accommodation inc. individual controls.
- Removal of existing hot water tank and associated pipe work within individual residences to create additional storage.
- Removal and replacement of existing fire dampers to common areas along with all necessary controls including links to fire alarm and building management systems.
- Removal and replacement of existing fire extract fans if necessary to bring fire extract system up to current statutory requirements for existing smoke extract systems (including additional capacity requirements for new residential accommodation on walkway +1).
- Removal and replacement of bathroom mechanical extract fans in rooftop plantroom

These works in turn have a further impact on the existing TV and Satellite systems requiring the removal existing dishes in favour of a communal system located on the roof. The renewal of the heating, domestic hot water systems and windows will also require making good works within the existing flats and common areas.

4.1 Area Schedule

FLOOR AREA	EXISTING	Area m² Nett	Area m² GIFA	PROPOSED	Area m² Nett	Area m² GIFA
Basement						
	Plant	609.4			609.4	
	Circulation	10.5			10.5	
	Total Basement	**619.9**	**696.5**		**619.9**	**696.5**
Ground Floor						
	Boxing	190.6		Community Use (Nursery)	218.5	
	Office	74.1		Reception	55.2	
	Circulation	65.4		Circulation	114.1	
	Plant	60.6		Plant	52.6	
	Total Ground Floor	**390.7**	**420.3**		**441.4**	**469.4**
Mezzanine Level						
	Nursery	266.2		3b5p Residential Unit 1	126.9	
				3b5p Residential Unit 2	102.3	
				3b5p Residential Unit 3	101.7	
				Circulation	87.3	
	Total Mezzanine Level	**266.2**	**270.8**		**418.3**	**435.2**
Walkway level						
	Office	118.2				
	Circulation	54.4		Circulation	112	
	Plant	12.6		Community Use (Boxing)	334.4	
	Total Walkway Level	**185.2**	**204.1**		**446.4**	**461.8**
Walkway +1 Level						
	Office	312.9		4b6p Residential Unit 4	101.5	
	Circulation	55.7		4b6p Residential Unit 5	101.5	
	Plant	12.5		4b6p Residential Unit 6	101.5	
				4b6p Residential Unit 7	101.5	
				Circulation	45	
	Total Walkway +1 Level	**381.1**	**394.4**		**451**	**471**

FLOOR AREA (contd.)	EXISTING	Area m² Nett	Area m² GIFA	PROPOSED	Area m² Nett	Area m² GIFA
Existing Residential (level 01 – 20)						
	1 Bed (type A)	51.4				
	1 Bed (type B)	51.4				
	2 Bed (type A)	75.5				
	2 Bed (type B)	75.5				
	2 Bed (type C)	75.5				
	2 Bed (type D)	75.5				
	Circulation	48.8				
	Total level 01 (typical)	**453.6**	**470.6**			
	Total existing residential (20)	**9072**	**9416**			
Roof Plant						
	Plant	2217				
	Circulation	16				
	Total Roof Plant	**237.7**	**247.2**			
FLOOR AREA TOTALS: GRENFELL TOWER		**11153**	**11649.3**		**11682**	**121167**
	Difference				**+529**	**+517.7**

WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Ground Floor						
South Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Glazed timber Screen			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	Window / Doors					
East Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Window / Doors			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
North Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Window / Doors			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
West Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Window / Doors Column			Curtain walling Column Cladding (Heavy Duty insulated render TBC)		
GROUND FLOOR TOTALS				Stack-bonded brick over-cladding		
				Curtain walling		
				Column Cladding (Heavy Duty insulated render TBC)		
	OVERALL	???			???	

WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Mezzanine Level						
South Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Windows			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	Canopy (linear m)					
East Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Windows			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	Canopy (linear m)					
North Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Windows / security grille			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
West Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Windows / security grille			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
MEZZANINE LEVEL TOTALS				Stack-bonded brick over-cladding		
				Curtain walling		
				Column Cladding (Heavy Duty insulated render TBC)		
	OVERALL	???			???	

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WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Walkway Level						
South Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Curtain walling			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	In-situ Concrete Balustrade / Upstand					
East Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Curtain walling			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	In-situ Concrete Balustrade / Upstand					
	Canopy (linear m)					
North Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Curtain walling			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	In-situ Concrete Balustrade / Upstand					
	Canopy (linear m)					
West Elev:						
	Brick Infill			Stack-bonded brick over-cladding		
	Curtain walling			Curtain walling		
	Column			Column Cladding (Heavy Duty insulated render TBC)		
	In-situ Concrete Balustrade / Upstand					
	Canopy (linear m)					
WALKWAY LEVEL TOTALS				Stack-bonded brick over-cladding		
				Curtain walling		
				Column Cladding (Heavy Duty insulated render TBC)		
	OVERALL	???			???	

WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Walkway +1 Level						
South Elev:						
	Curtain walling			Curtain walling		
	Column			Column Cladding		
East Elev:						
	Curtain walling			Curtain walling		
	Column			Column Cladding		
				Canopy (linear m)		
North Elev:						
	Curtain walling			Curtain walling		
	Column			Column Cladding		
				Canopy (linear m)		
West Elev:						
	Curtain walling			Curtain walling		
	Column			Column Cladding		
				Canopy (linear m)		
WALKWAY +1 LEVEL TOTALS						
				Curtain walling		
				Column Cladding		
				Canopy (linear m)		
	OVERALL	???			???	

SEA00006429/13

STUDIO E

WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Existing Residential (level 01 – 20)						
South Elev:						
	Horizontal Precast Spandrel			Insulated Zinc Rain-screen Over-cladding		
	Column			Column Cladding		
	Windows			Double Glazed Windows		
East Elev:						
	Horizontal Precast Spandrel			Insulated Zinc Rain-screen Over-cladding		
	Column			Column Cladding		
	Windows			Double Glazed Windows		
North Elev:						
	Horizontal Precast Spandrel			Insulated Zinc Rain-screen Over-cladding		
	Column			Column Cladding		
	Windows			Double Glazed Windows		
West Elev:						
	Horizontal Precast Spandrel			Insulated Zinc Rain-screen Over-cladding		
	Column			Column Cladding		
	Windows			Double Glazed Windows		
EXISTING RESIDENTIAL LEVEL TOTALS						
				Insulated Zinc Rain-screen Over-cladding		
				Column Cladding		
				Double Glazed Windows		
	TYPICAL	???			???	
	OVERALL (x20)					

WALL AREA						
	EXISTING	Area m²		PROPOSED	Area m²	
Plant Room Level						
South Elev:						
	Render			Insulated render system over-cladding		
	Doors					
East Elev:						
	Render			Insulated render system over-cladding		
	Doors					
North Elev:						
	Render			Insulated render system over-cladding		
	Doors					
West Elev:						
	Render			Insulated render system over-cladding		
	Doors					
EXISTING PLANT ROOM LEVEL TOTALS						
				Insulated render system over-cladding		
	OVERALL (x20)					

4.2 Outline Specification

SECTION HEADINGS:

C20 Demolition

E10 Mixing / casting / curing in situ concrete

F10 Brick / Block Walling

G10 Structural steel framing
G10 Isolated structural metal members
G30 Metal profiled sheet decking

H11 Curtain Walling
H42 Pre cast concrete panels cladding / features
H72 Aluminium strip / Sheet coverings / Flashings
H92 Rainscreen cladding

K10 Plasterboard dry linings/ partitions / ceilings
K11 Rigid Sheet sheathing / linings / casings
K12 Rigid sheet fine linings / panelling
K13 Timber board flooring / linings / casings
K21 Wood strip / fine board linings
K32 Panel Cubicles
K40 Demountable suspended ceilings

L10 Windows / Screens / Louvers'
L20 Doors / shutters/ hatches
L30 Handrails / Balustrades
L40 General Glazing

M21 Insulation with rendered finishes
M42 Wood block / composition block / mosaic parquet flooring
M50 Rubber / plastics / cork / lino/ carpet tiling / sheeting
M60 Painting / Clear Finishing
M61 In tumescent coatings for fire protection of steelwork

N11 Domestic Kitchen fittings, furnishings / equipment
N13 Sanitary appliances / fittings
N14 General signage systems
N15 Fire and Safety signage systems

P10 Sundry insulation / proofing work
P12 Fire stopping systems
P20 Unframed isolated trims / skirting's / sundry items
P21 Door / window ironmongery
P31 Holes, chases covers and supports for services

Q10 Kerbs / edgings / channels / paving accessories
Q20 granular sub bases to roads / pavings / bases
Q24 Interlocking brick / block roads / pavings
Q40 Fencing
Q50 Site / street furniture / equipment

R10 Rainwater drainage systems
R11 Above ground foul drainage systems

Z10 Purpose made joinery

5.0 ARCHITECTS REPORT

5.1 Design Approach: Layout (Podium Levels)

The key changes proposed to the internal organization of the tower are:

- Removal of the external concrete stair on the south east corner to make way for new floor space at ground, mezzanine, walkway and Walkway+1.
- Creation of a new stair and lift on the south west corner of the tower, connecting the lower three levels.
- Infill of voids and extension to the mezzanine floor slab to create extra space to become residential properties.
- A remodelled reception to be larger, more welcoming and provide surveillance to the doors, new lift and stairs.

The proposal is that the new stair would be generally accessible to residents, therefore replacing the external stepped ramp as a means of getting between ground and Walkway level. A new connection on the bridge is created to achieve this. This stair also provides the last two flights of stairs down to ground for residents in the floors above. The original fire escape strategy involves leaving the building at Walkway level and escaping via the bridge or one of the two external stairs.

Given the location of the Electrical switch room at Ground and the greater floor-to-floor heights it is not possible to extend the original escape stair directly down to ground level so the new stair has to become the necessary protected route out in the event of an emergency.
The location of the transformer Room, lifts and refuse chute are fixed and relocating them is beyond the scope of this project. Within the given footprint (roughly 22x22m square) and the concrete structure we are proposing the following at each level:

GRENFELL TOWER - GROUND FLOOR

- Enlarged entrance foyer, new stair and Part M compliant lift
- Concierge / reception desk with view of main entrance, new lift and stair and the entrance to the main lift core.
- New office for the EMB (Estates Management Board). This office is transferred from its existing location on the north-east corner of Barandon Walk.
- Relocated nursery in an L-shaped configuration.

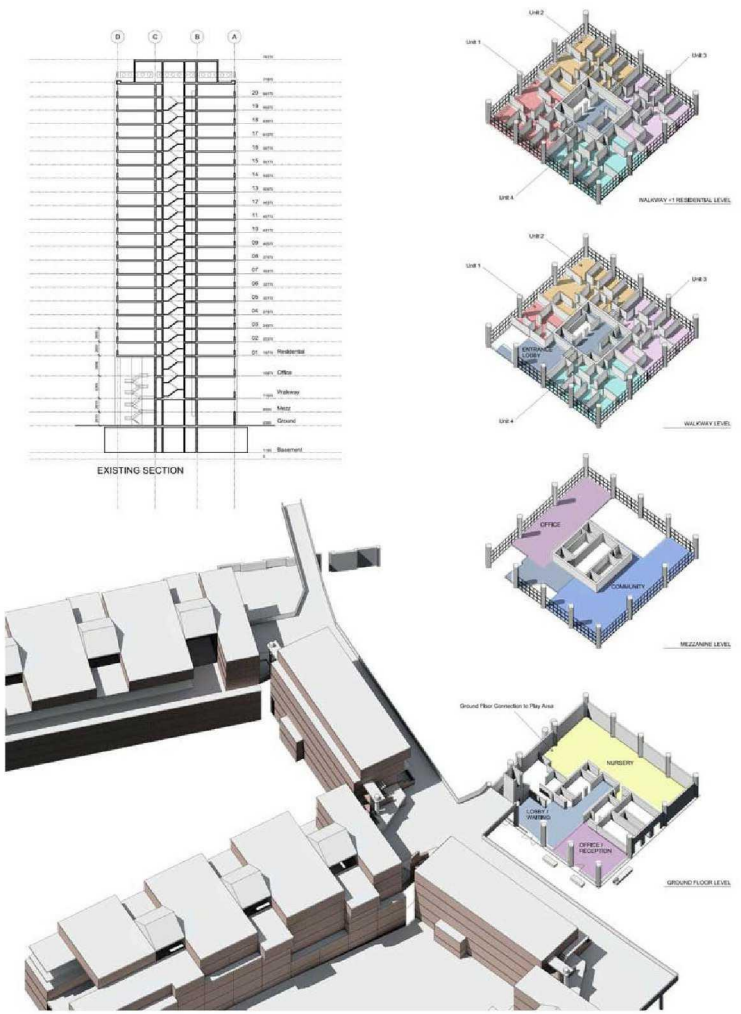


Fig. 10 Grenfell Tower upgrade – option study

The main entrance is retained on the South elevation with an increased presence. An additional proposed entrance to the Nursery on the West elevation gives direct connection to the play area, and to use the west leg of the "L" as a foyer and office spaces and keep the main space a simple rectangular shape for easier supervision and greater flexibility. The strip of paving to the immediate north of the tower is not part of the east-west route across the KALC site. By virtue of being at grade and not being a thoroughfare, and having a canopy lends itself to becoming a dedicated outdoor area for the nursery.

MEZZANINE

This level is not served by the two central lifts and it is proposed that only the new lift stops at mezzanine level. A new slab in what is a lift lobby on the floor above and below is nevertheless necessary to give access to three new residential units laid out in accordance with the London Housing Guide

WALKWAY LEVEL

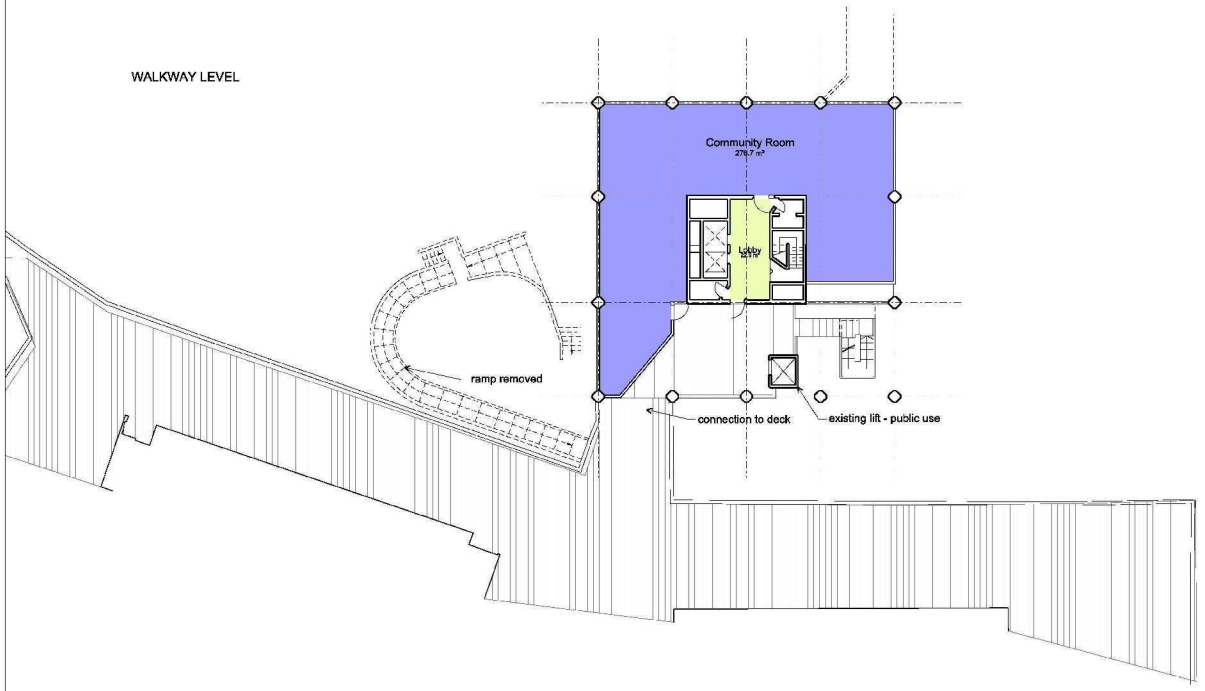
The boxing club occupies the available floor plate. Access is via the a new external access onto the existing walkway access. A new pedestrian bridge linking the walkway directly with the new stair core is proposed as both a secure access between ground and the walkway and an alternative means of escape

WALKWAY +1 LEVEL

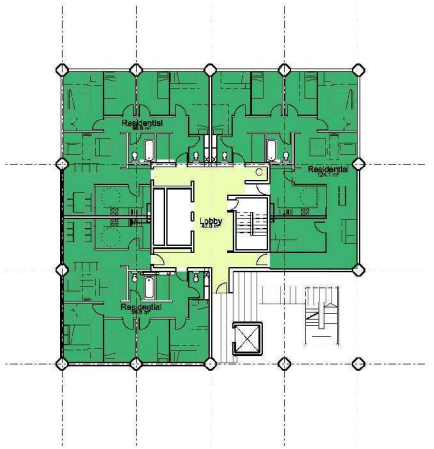
A new "shell and core" arrangement similar to the 20 floors above is proposed with some structural changes: new floor slab, new lift door openings, new connection to the refuse chute and a new connection to the escape stair. Four 4-bed units are arranged in each quadrant with the structural module having a strong influence on the layout: the bedrooms are situated on the north and south elevations and the living spaces face east and west where the structural module is wider. The kitchens are directly below the kitchens to the two-bed units above, which is important to maintain a vertical continuity of services such as gas and water.

5.2 Design Study Options: Layout (Podium Levels)

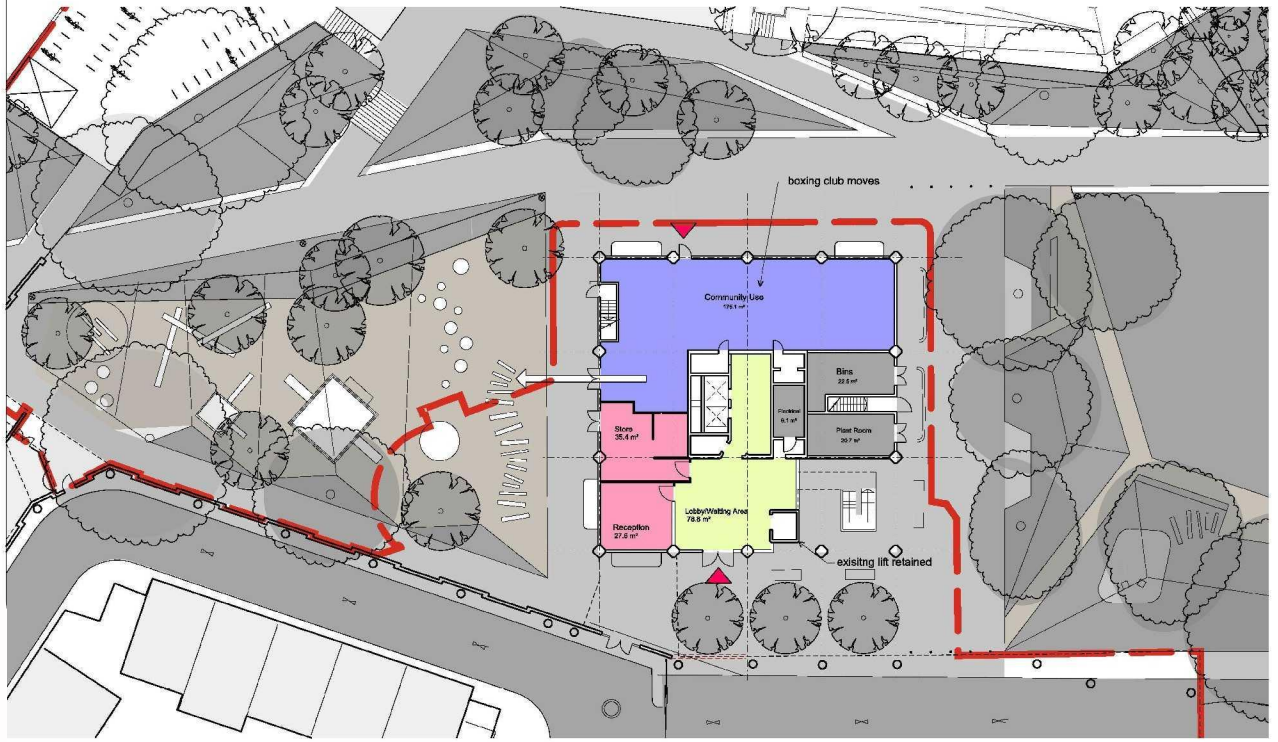
WALKWAY LEVEL



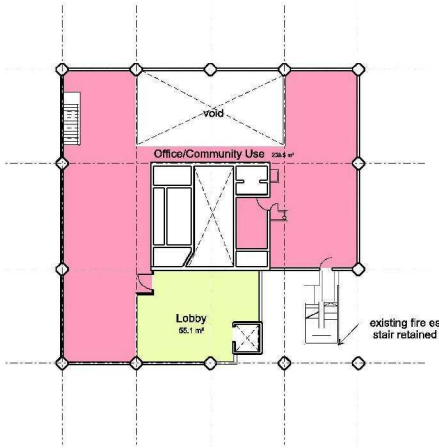
WALKWAY +1



GROUND FLOOR PLAN



MEZZANINE LEVEL



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GRENFELL TOWER UPGRADE

PROJECT

Podium Configuration
Option 1

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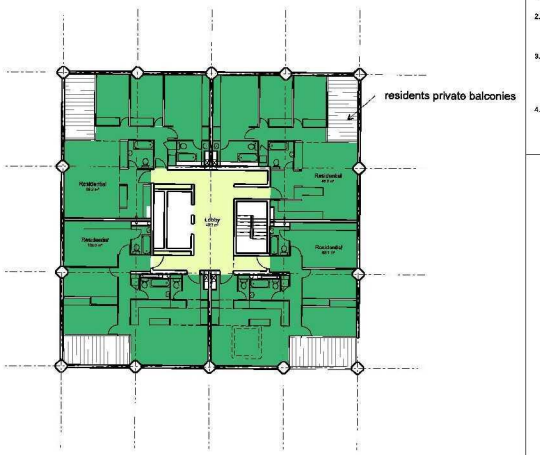
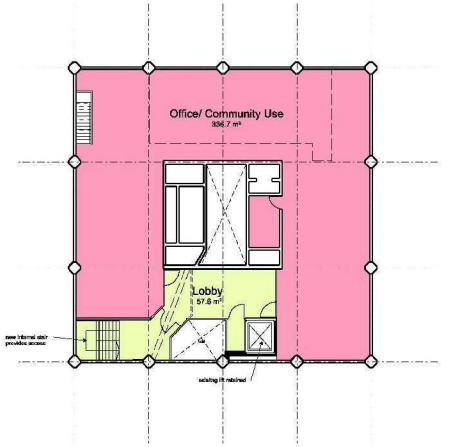
WALKWAY LEVEL

WALKWAY +1



GROUND FLOOR PLAN

MEZZANINE LEVEL



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GRENFELL TOWER UPGRADE

PROJECT

Podium Configuration Option 2

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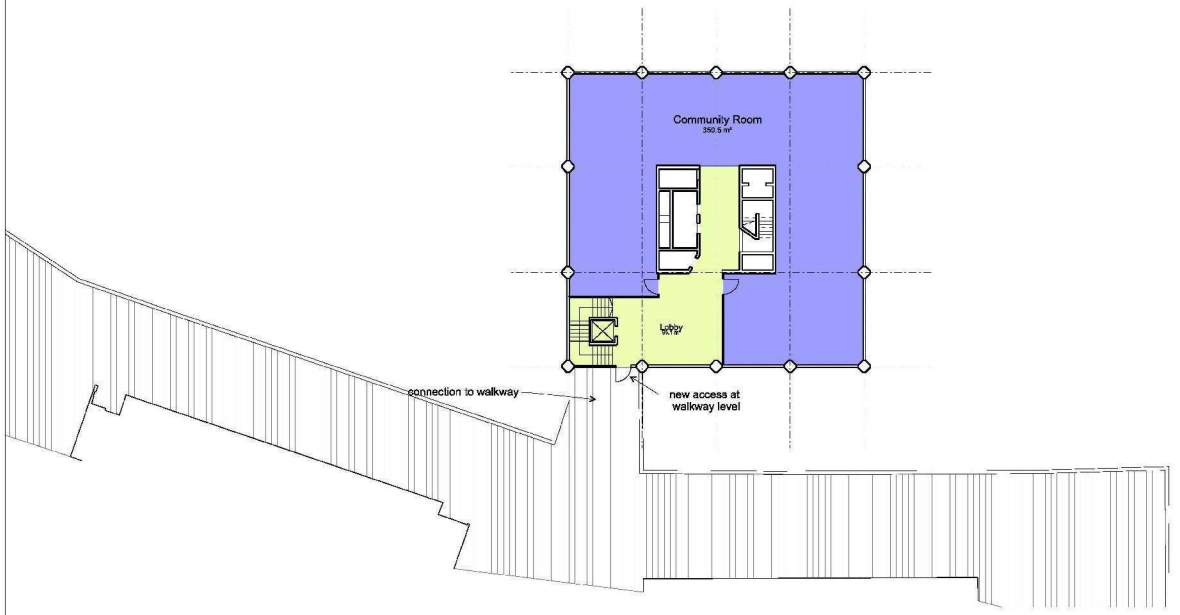
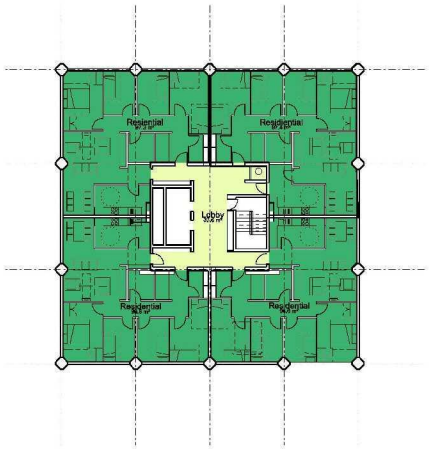
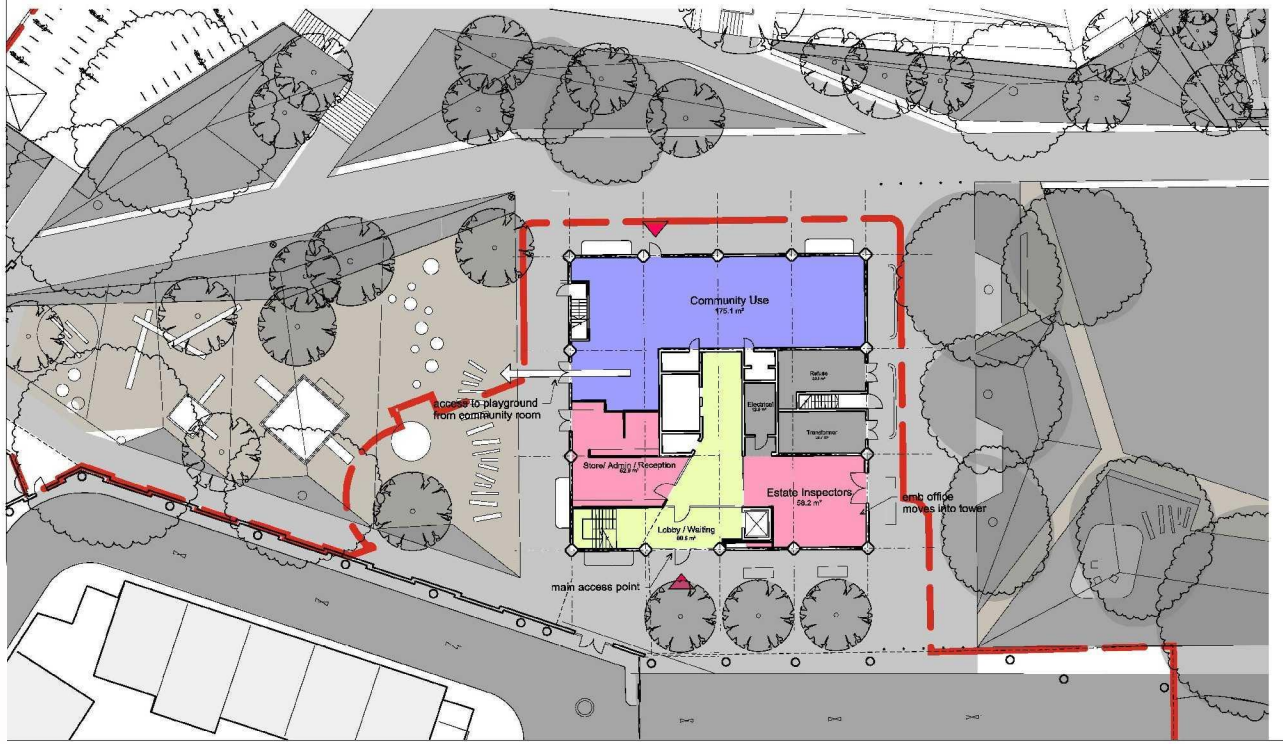
WALKWAY LEVEL



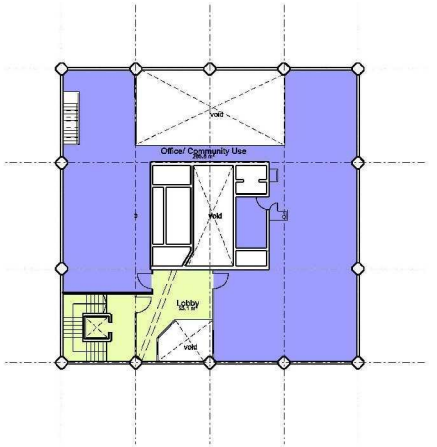
WALKWAY +1



GROUND FLOOR PLAN



MEZZANINE LEVEL



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Podium Configuration
Option 3
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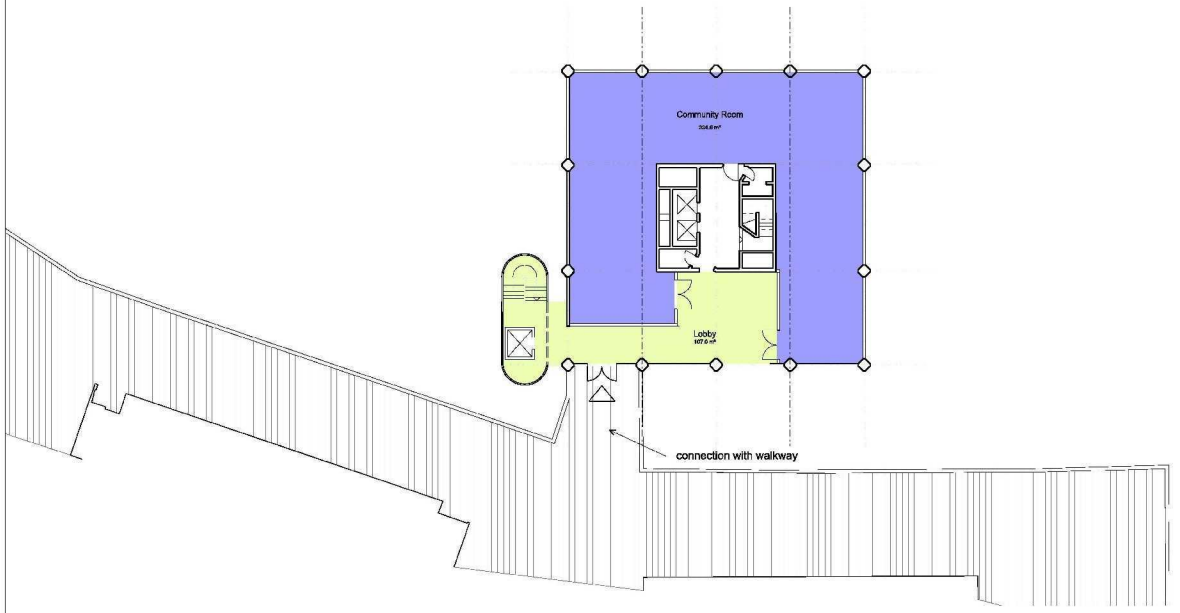
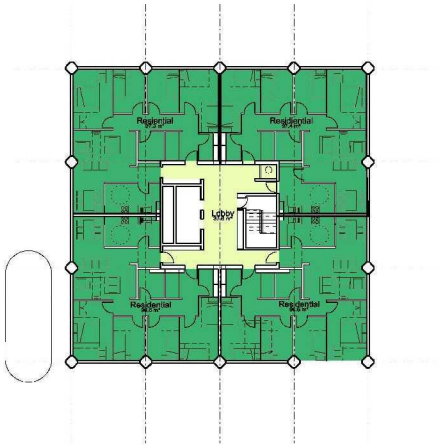
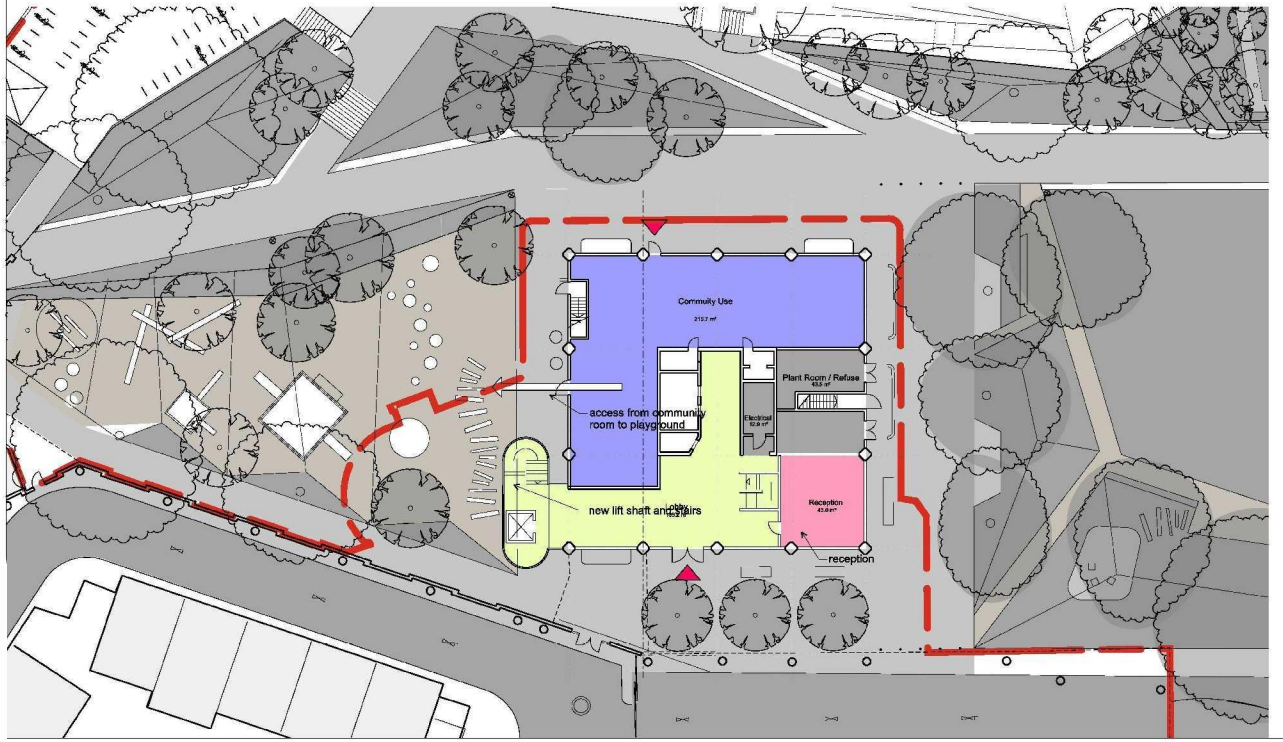
WALKWAY LEVEL



WALKWAY +1



GROUND FLOOR PLAN



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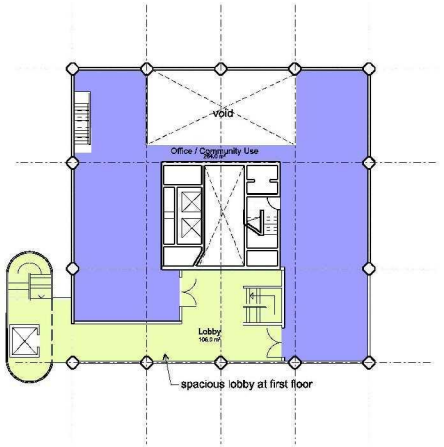

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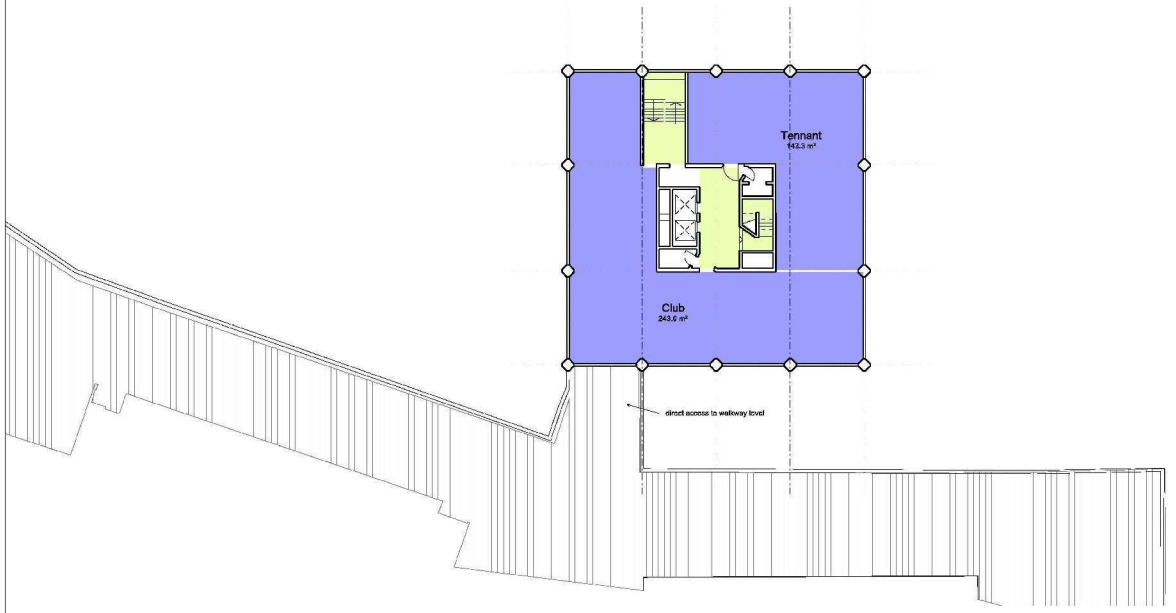
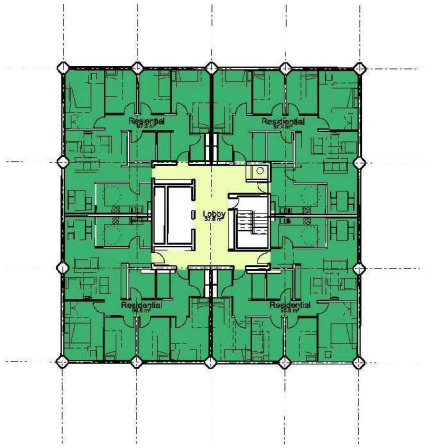


WALKWAY +1



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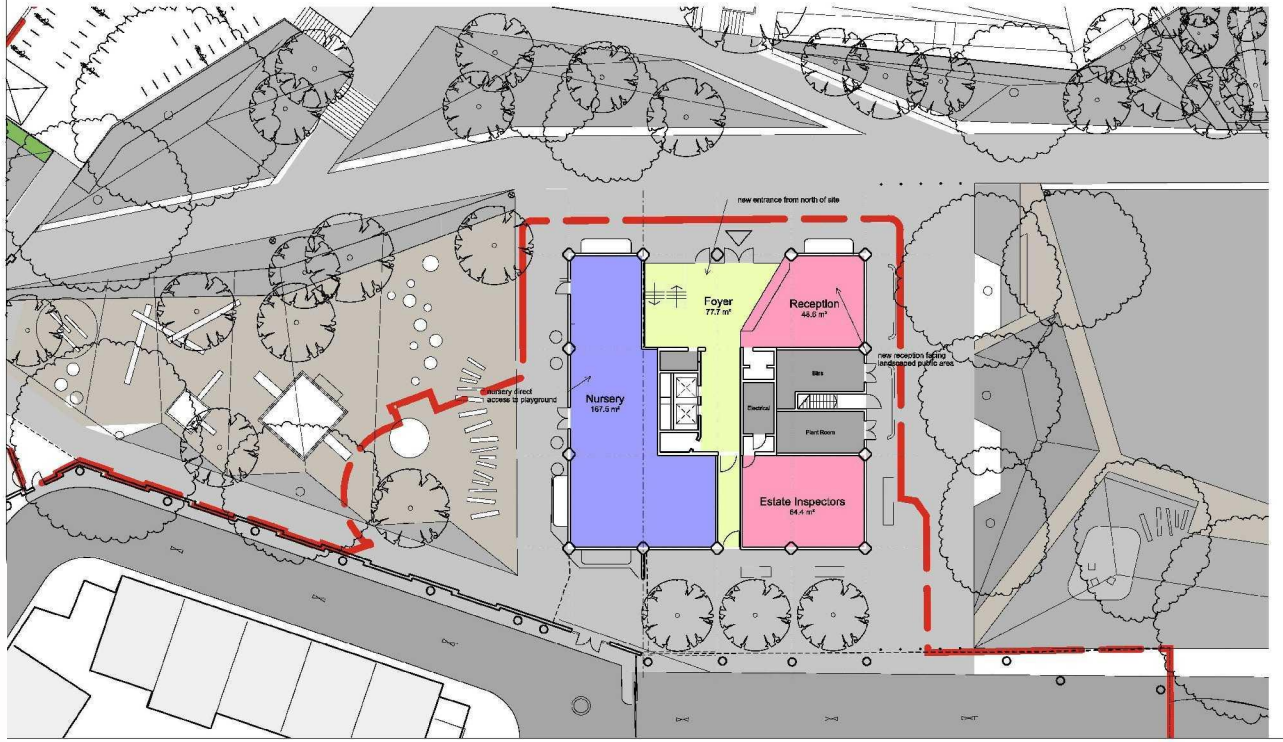

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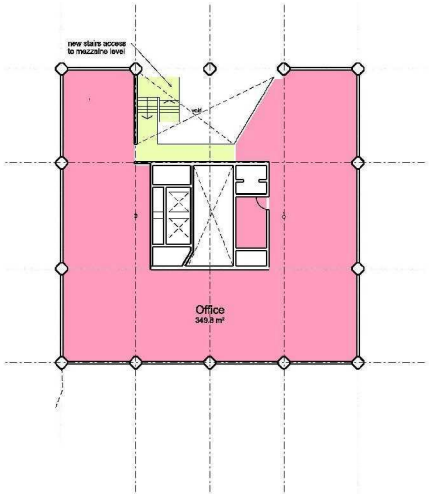

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Podium Configuration Option 5

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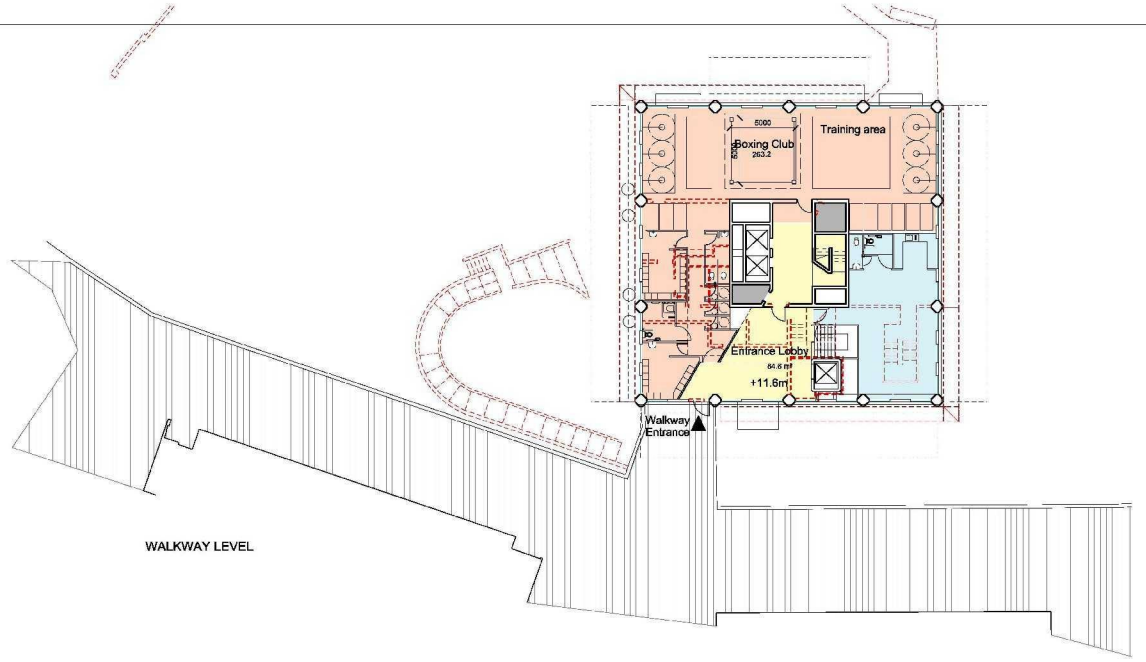

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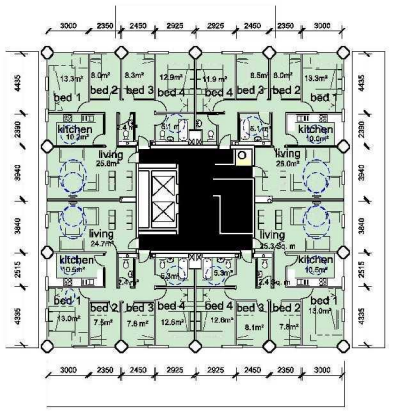
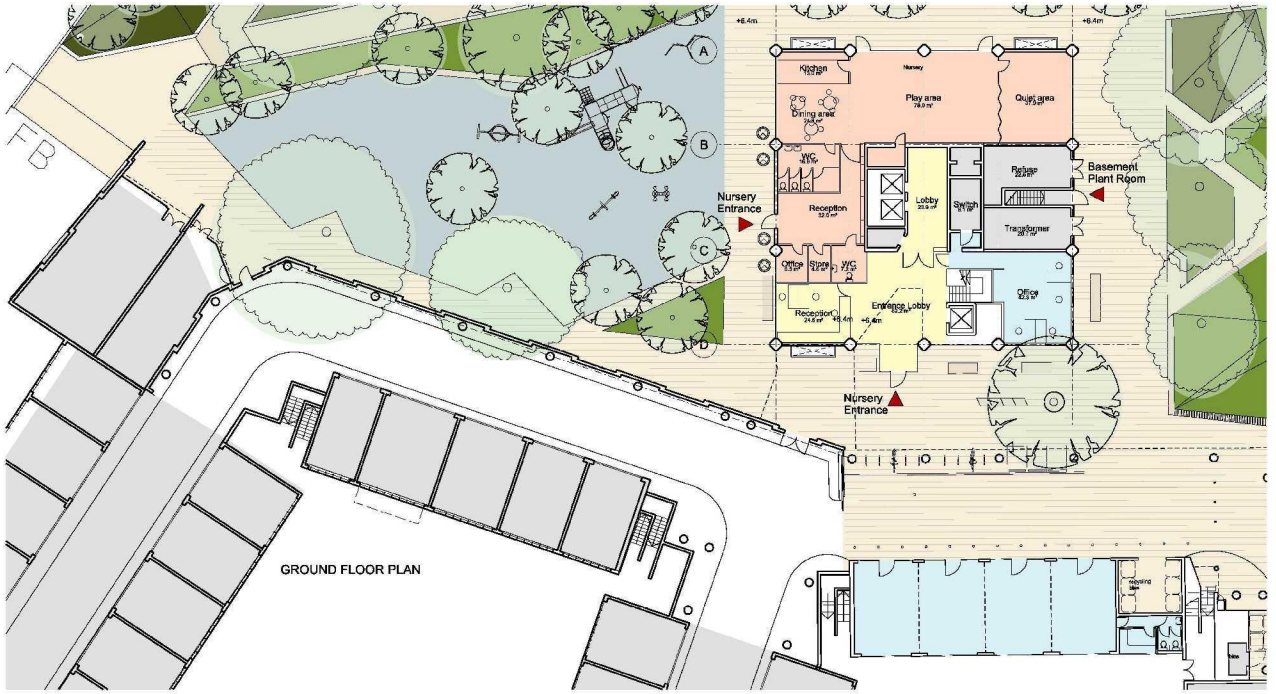
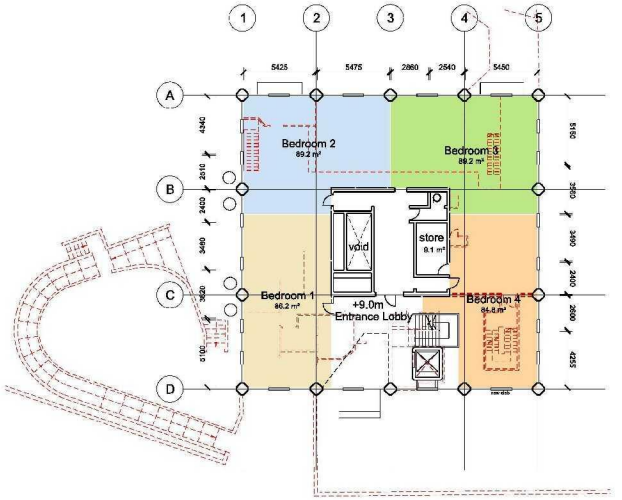


RESIDENTIAL LEVEL



GROUND FLOOR PLAN



MEZZANINE LEVEL

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GRENFELL TOWER REGENERATION PROJECT

PROJECT

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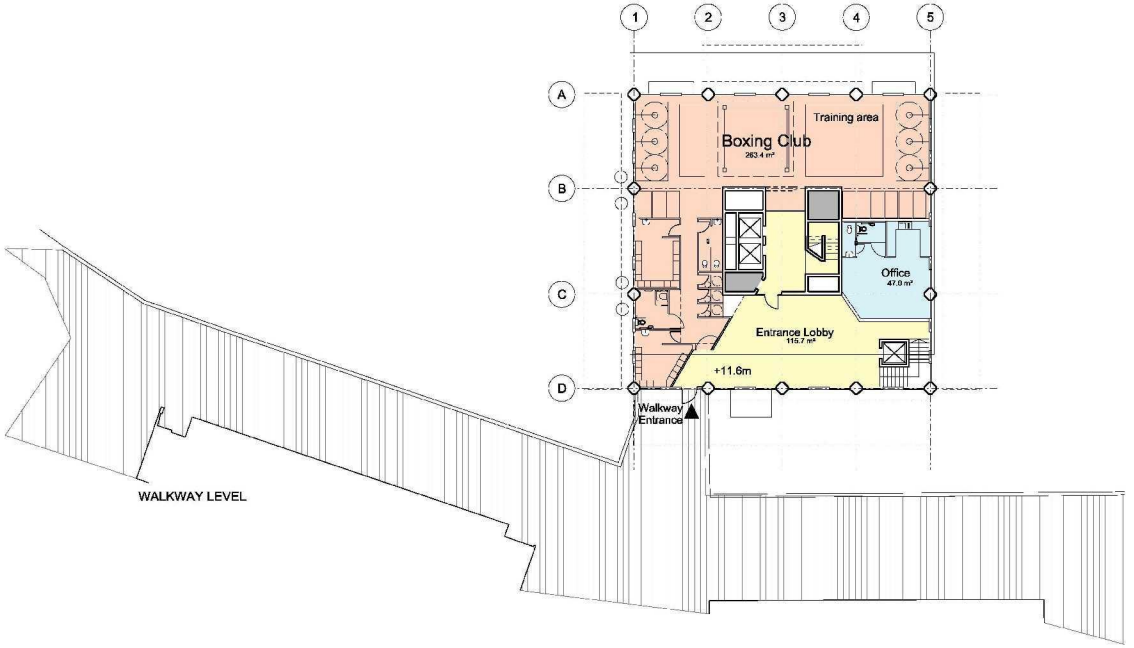

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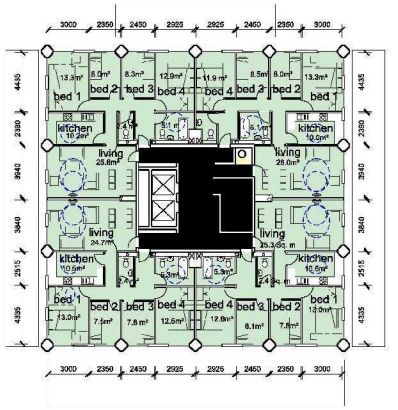

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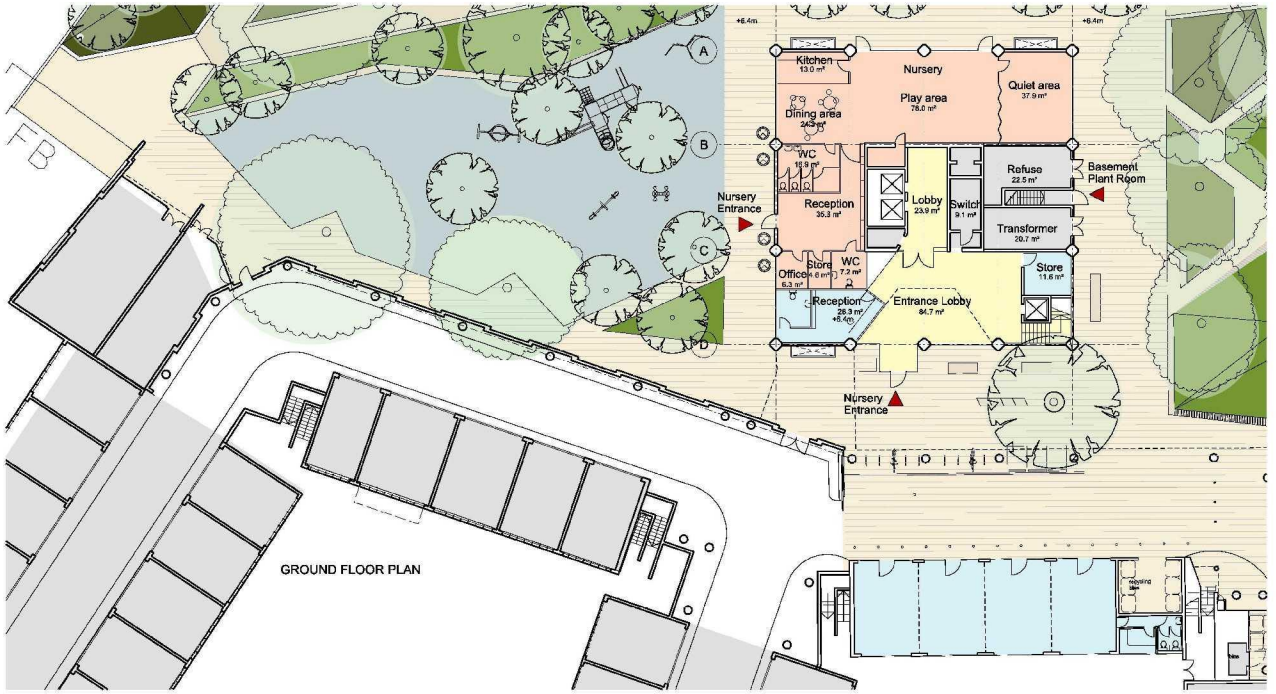
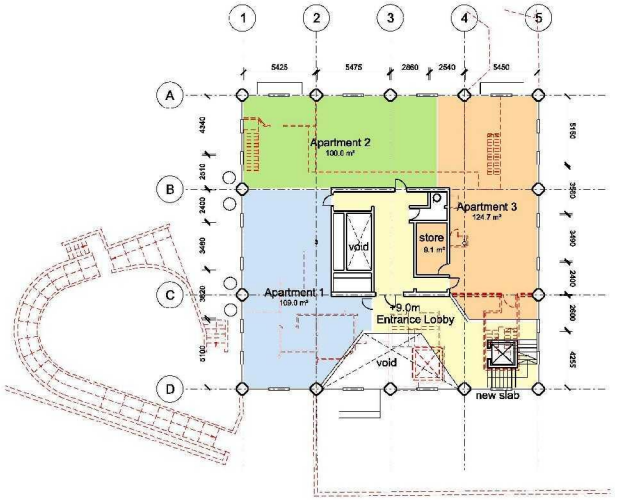


GROUND FLOOR PLAN



MEZZANINE LEVEL

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GRENFELL TOWER REGENERATION PROJECT
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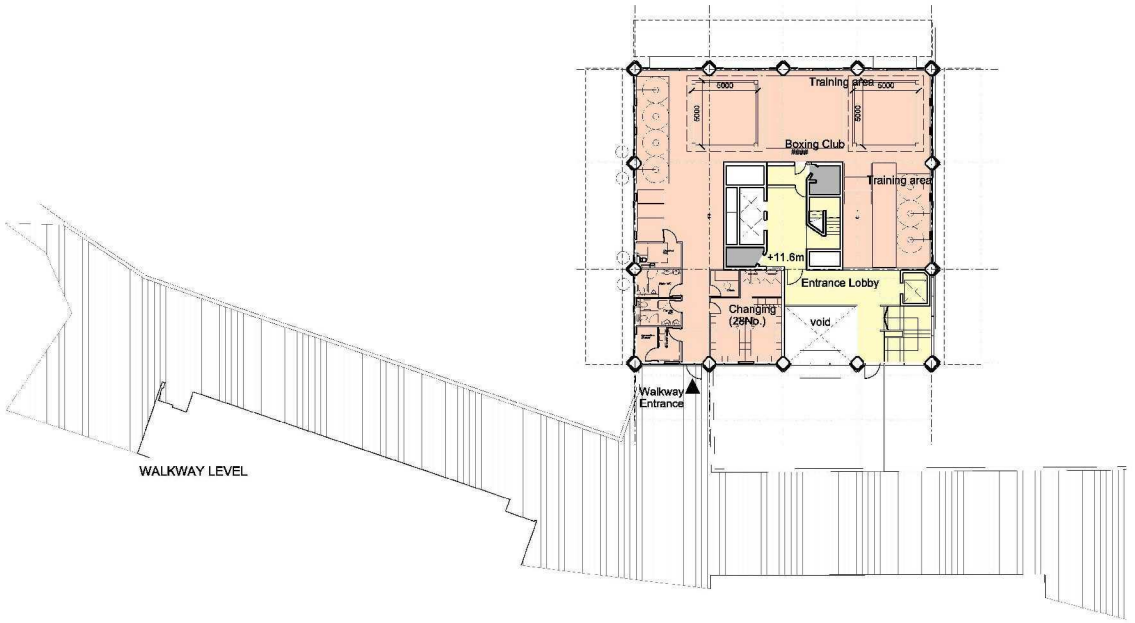

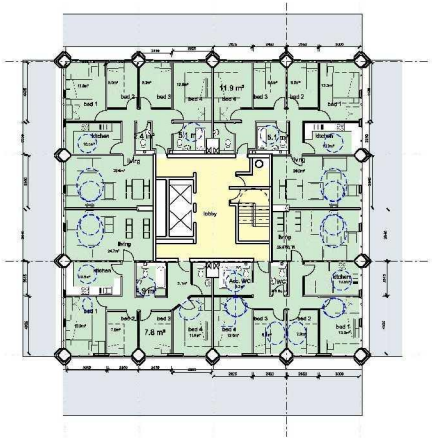

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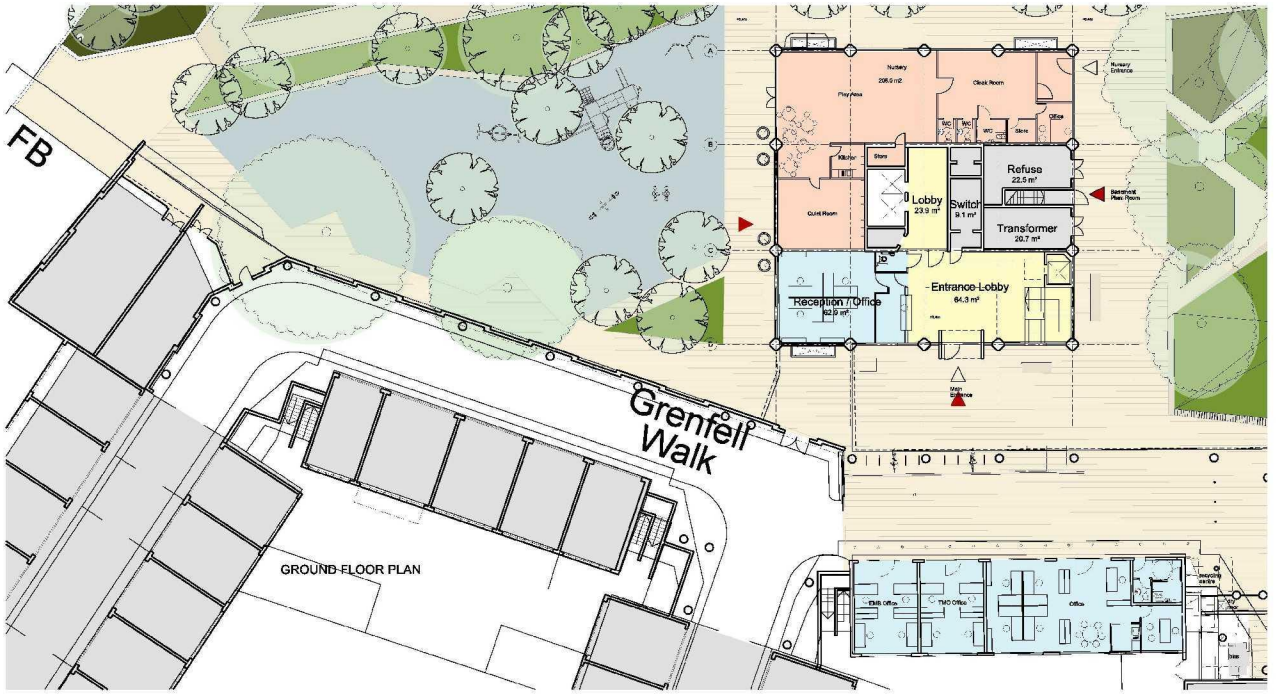
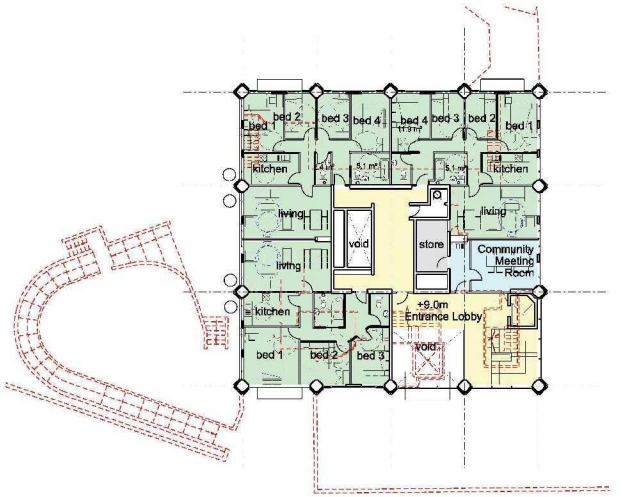




OPTION 8

Kensington & Chelsea TMO

FOR INFORMATION

STUDIO E LLP

Palace Wharf, Rainville Road, London, W6 9HN
Tel.
Fax

GRENFELL TOWER REGENERATION PROJECT

PROJECT

Podium Configuration OPTION 8

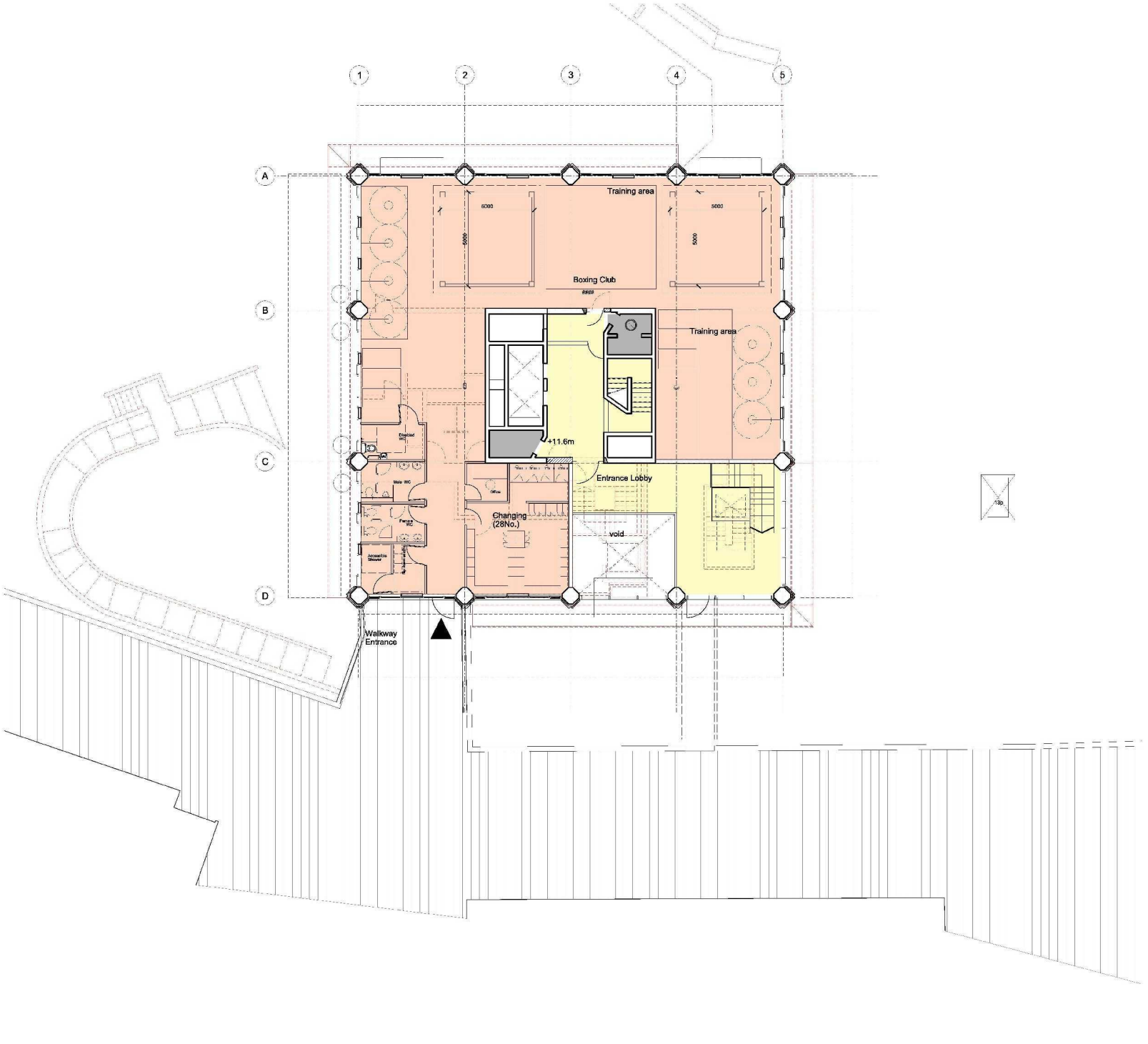
DRAWING

1:200@A1	20/10/2012
SCALE	DATE

1279 SK 055	00	
DWG. NO.	REVISION	CHECKED

SEA00006429/25

OPTION 9



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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space

N

0 5 10m @ 1:100

Kensington & Chelsea TMO

FOR INFORMATION

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Tel. [redacted]
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GRENFELL TOWER REGENERATION PROJECT

PROJECT

Reconfigured Podium OPTION 9

DRAWING

1:100@A1 SCALE | 15/08/12 DATE

1279 DWG. NO. | SK 058 00 REVISION | CHECKED

SEA00006429/26

5.3 Design Approach: Over Cladding

EXISTING BUILDING

Grenfell Tower is a concrete structure with mill finished (unfinished) aluminium windows. The external wall to the finger blocks are brick but there is relatively little used on Grenfell tower and only at the ground level. For the upper 20 storeys precast concrete cladding has been used: one panel type serves as a structural spandrel under the windows (horizontal) and the other is a decorative facing to the triangular pilasters, each a full storey height of 2.6m (vertical). This system sets up a simple visual language of modular elements: horizontal rough, washed aggregate for the spandrels, lighter and sharper detail on the vertical columns with cast-in vertical grooves, and aluminium framed "strip glazing" between. The infill panels between each window are a smooth white panel so that the assembly reads as a light weight infill in a concrete frame.

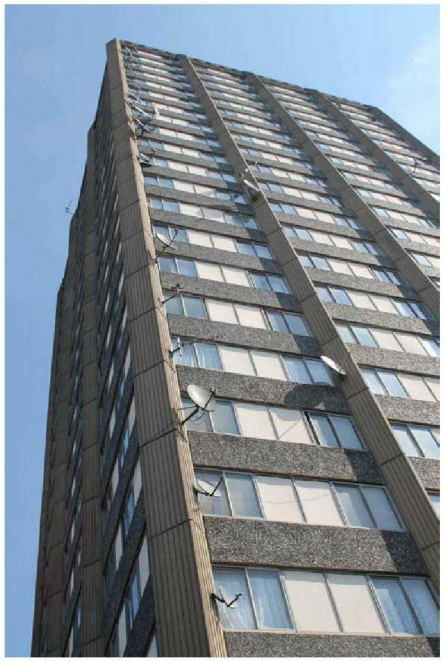


Fig. 11 Existing cladding

The original tower was divided compositionally into a base – the podium up to Walkway +1 level, a middle – the 20 residential floors, and a top – the plant room and pre-cast "crown" of tapered pilasters and ring of perforated freestanding beams. The perimeter columns have been rotated by 45° to read as diamonds in plan, and this generates the distinctive triangular pilasters running the full height of the building and grid across each elevation.

The existing windows are single glazed and sliding opening, each half sliding across the other so that it is in theory possible to clean the outside of outer half with the inner open and the outside of the inner half by moving it left and right of the outer window positioned mid-way in the opening. The low (980mm) internal cill height and need to reach up and out of an open window makes cleaning the windows potentially very dangerous. Retrofit restrictor devices have been fitted to all the windows which limit the opening to approximately 150mm. These can be disengaged but they do provide a measure of safety for residents, and in particular young children.

An Integrated Receiver System has recently been installed to Grenfell tower meaning all wall-mounted satellite dishes will be permanently removed as part of these proposals.

CONCEPT

Grenfell Tower was designed as a large rectilinear mass lifted high off the ground on stilt-like columns and nestled in an urban garden. We interpret the original intent behind this concept was to mitigate the density of the development by handing over of the lowest levels to outdoor and community use. The latter part of this vision has been completely lost. The lowest levels are now entirely defensive in character and the building is separated by a tarmac road from what little garden there is. The under-utilized outdoor deck and stairs to Grenfell Tower are prime locations for mischief rather than community use, and plagued by pigeons.

The original pre-cast concept is a simple and direct solution for the elevations, albeit very uniform and even monotonous. The tower offers only limited interest in the modelling and silhouette at roof level and the constraints of existing structure and plant mean there is no opportunity to add new habitable space at roof level.

Our response to the detail design of the over-cladding to the residential floors has been to respect the visual language of the original: light verticals, darker horizontals and "window strips" as used throughout Lancaster West, including the finger blocks. We have also sought to maintain the podium or lowest four levels as a distinct "base" zone with a more glassy appearance and different cladding material. The glazed screen is full height across the four levels on the two centre bays of the north and south elevations, and on the south-west corner where the new stair is situated. These proportions work for the size of the tower and the glassy openness responds to a desire to address the outdoor spaces: and expanded entrance forecourt on the south, and the scoop of the Academy to the north.

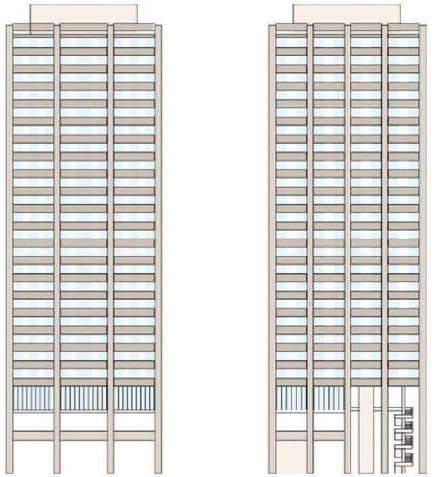


Fig. 12 Schematic - Elevations as designed circa 1970

Fig. 13 Schematic - Proposed West(L) and South(R) elevations

CLADDING DESIGN BRIEF ANALYSIS

The over-cladding works are an integral part of the upgrade to the heating of the building, while also being a complete overhaul to its appearance. New windows will deliver improved thermal performance and better functionality. The existing windows are 40 years old and at the end of their design life. More detail on the proposed energy efficiency of the complete building envelope and the parameters use in identifying the preferred window option can be found in the Sustainability Statement.

In consultation with the Design Team, the TMO and through several open workshops with residents we arrived at the following objectives for over-cladding:

- A dramatic improvement in heat loss with new insulation and air sealing which will generate significant energy savings.
- Windows which can be opened sufficiently to naturally vent the building throughout the year, without contributing to a risk of falling.
- Windows that can be safely cleaned from the inside.
- Windows that maintain the existing good levels of natural daylight internally.
- Improved acoustic performance which will bring the noise levels inside the flats to within Planning policy targets.
- To re-compose the tower with the reconfigured spaces at the lower floors into a coherent single entity and improve the overall appearance of the tower which is such a dominant presence in the public realm that will be upgraded as part of the KALC project.

WINDOWS

Powder coated aluminium windows are proposed as replacements for the existing. The proposed configuration is not dissimilar to that illustrated below (14): A narrow "purge panel" opens inward to allow rapid ventilation. It is screened by horizontal louvers to ensure large objects cannot fall out. The larger panel is a pivot window which is the default means of ventilation and it will be restricted to a narrow opening in normal use. Both window halves can be cleaned safely from inside: the pivot window can be disengaged from the safe position and rotated by 180 degrees. The casement is narrow enough not to disturb internal furniture arrangements when open 90 degrees inwards.

We feel the narrow module of the grille to the purge panel introduces a new and interesting rhythm to the otherwise very rigorous geometry of the original. The calculations prepared by Max Fordham demonstrate the need to for this amount of openable area to safeguard the thermal comfort of the occupants. The windows are slightly larger than existing to compensate for the heavier frames and to therefore to maintain the good levels of natural daylight.

MATERIALS

A zinc composite rainscreen cladding is proposed to the upper levels. Zinc has the advantage of being a self-finished natural material that will not corrode or weather as a coated finish eventually would. It offers a clean appearance, crisp detailing at joints and an attractive dull lustre. It is not sufficiently robust to use at low level so a combination of dark brick and new high quality concrete facings for the columns is proposed for the podium level. The colour of the brick is selected to match the pallet of the tower rather than the red multi brick used on the rest of the estate. Our view is that the tower always had a different treatment; the precast panels complemented the raw and rough brick used on the finger blocks and the neutral grey zinc will do the same in the overclad condition, albeit a lightweight and more refined material. Colour is proposed in a controlled way to the solid infil panels to the new areas of curtain wall and windows. This is proposed as coloured glass.

Fig. 14 Grille to purge vent

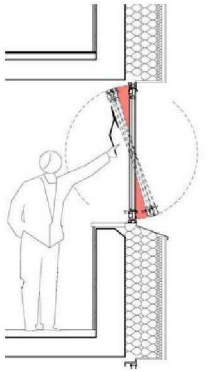


Fig. 15 Pivot window

Fig. 16 Corner Study - existing top corner

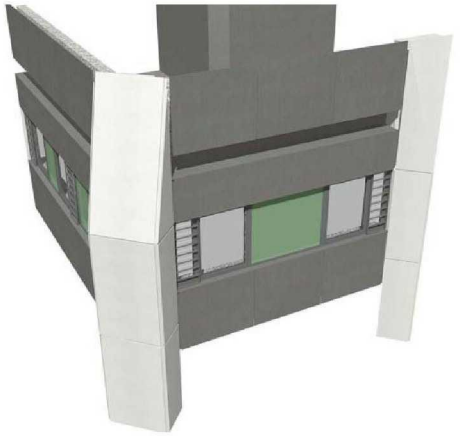


Fig. 17 Corner Study – proposed zinc cladding

Fig. 18 Corner Study - Bottom corner

Fig. 19 Corner study - Proposed cladding at low level

CANOPY

As part of the improvements to the entrances in the early 1990's a 2.5m wide steel and polycarbonate canopy was added to the perimeter of Grenfell Tower. Prior to that access at ground and walkway level were set well back from the edge of the building and therefore effectively sheltered from the rain. The 1990 canopy provides a protected route around the base of the tower but at the cost of the poor daylight to the mezzanine floor. This canopy has also suffered from frequent impact by objects being dropped from above.

Several options for replacing this canopy were explored and it was felt a continuous ribbon or "skirt" would conflict with the vertical articulation of the tower so it is proposed to to design the canopy as four independent lengths rather than a continuous strip. A small gap between the canopy and the building is introduced to allow the pilasters to run visually uninterrupted down to the ground – not that differently to the existing canopy.

To improve the day lighting to the new residential units at mezzanine level and to provide cover to the new entrance at Walkway level, the canopy is raised up a full storey height. Instead of pitching down it is pitched upward with a gutter and rainwater pipes against the building. This canopy is proposed to be a solid metal finish on the top side, on topo of a plywood deck to withstand the impact of falling objects. The underside will be a flush ceiling board, detailed so as to limit opportunities for pigeons to roost, a problem with the current canopy. Access to the gutters and hoppers will be critical and this is proposed via hydraulic "cherry picker" platforms.

GARAGES

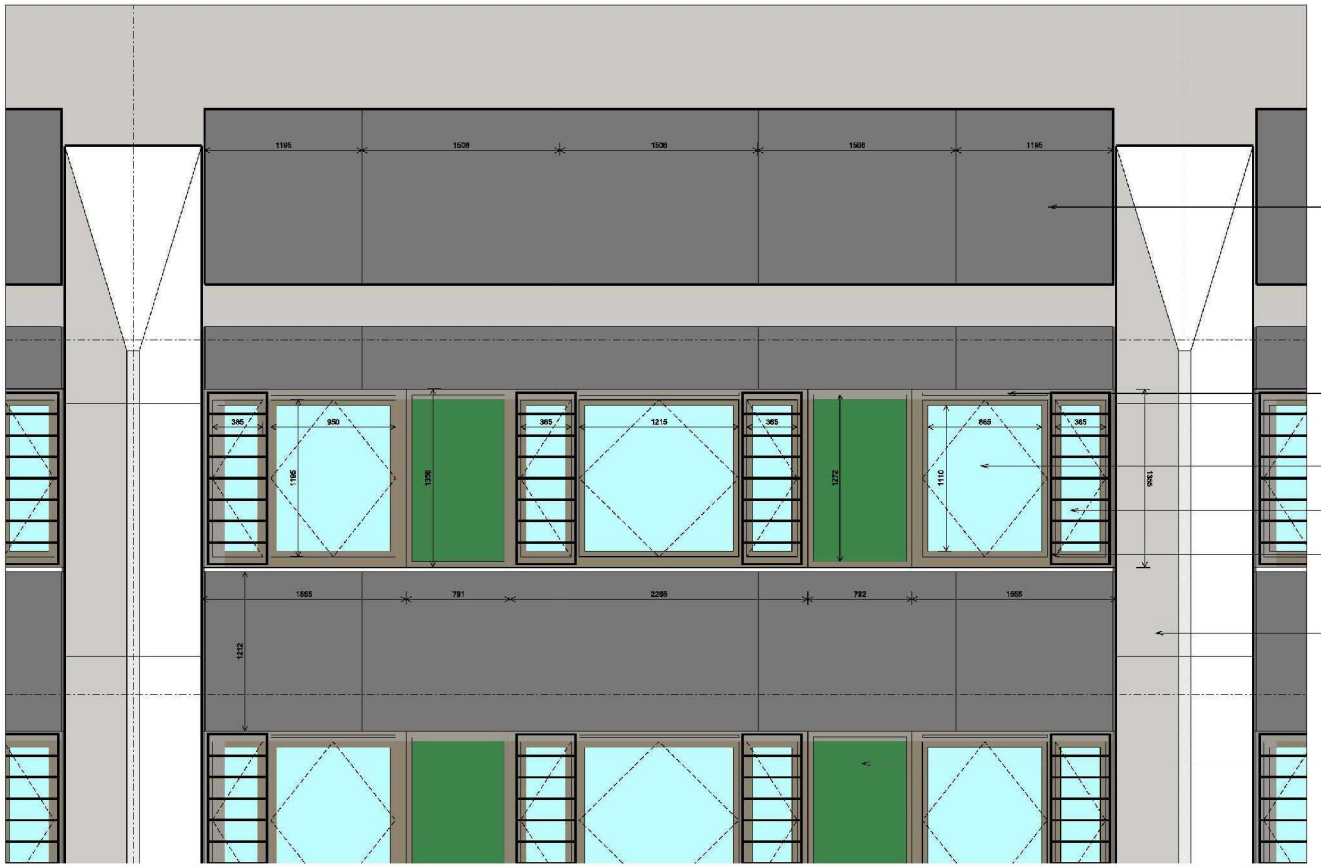
The public realm areas of the undercroft and service yard will be transformed as part of these proposals. A new ceiling will brighten the space and conceal the numerous pipes and cables mounted to the soffit. New lighting will be provided throughout. The garage doors will be replaced with glazed shopfronts for the new offices. The existing louvers in the opposite south facing wall (Figure 21) will be replaced with windows to match those to the Baseline Studios.

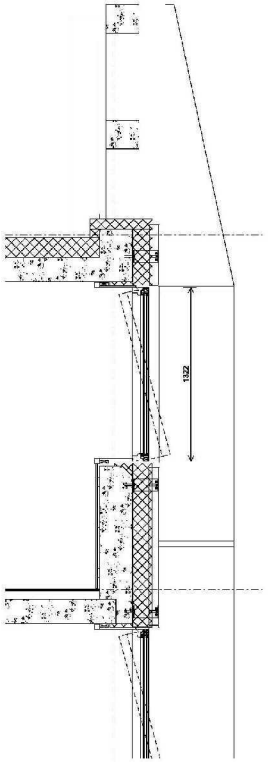
The Bins area will be screened and new paving to the shared surface will extend up to the entrance of Baseline, the new offices and the retractable gate to the rest of the garages.

Fig. 20 Proposed canopy

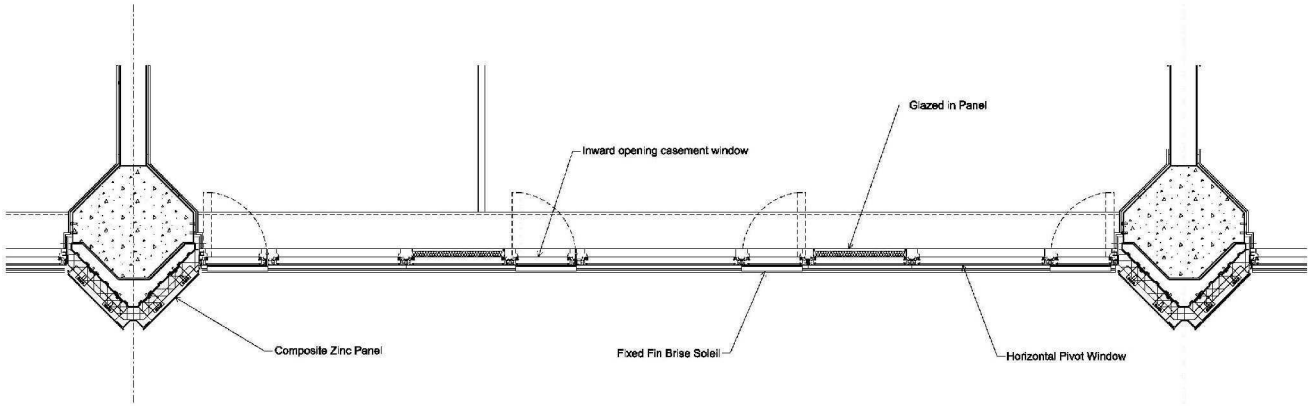
Fig. 21 Louvred vents to existing garages. Baseline windows can be seen to the right.

5.4 Design Study Options: Over Cladding





1 Detail: Elevation, Plan & Section
1:20



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Key

- Circulation
- Community Use
- New Residential
- Office Space

00	11/09/12	Issued for window samples Dimensions only

Kensington & Chelsea TMO

FOR INFORMATION

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GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
ELEVATION, PLAN
& SECTION DETAIL
DRAWING

1:20@A1	10/09/12
SCALE	DATE
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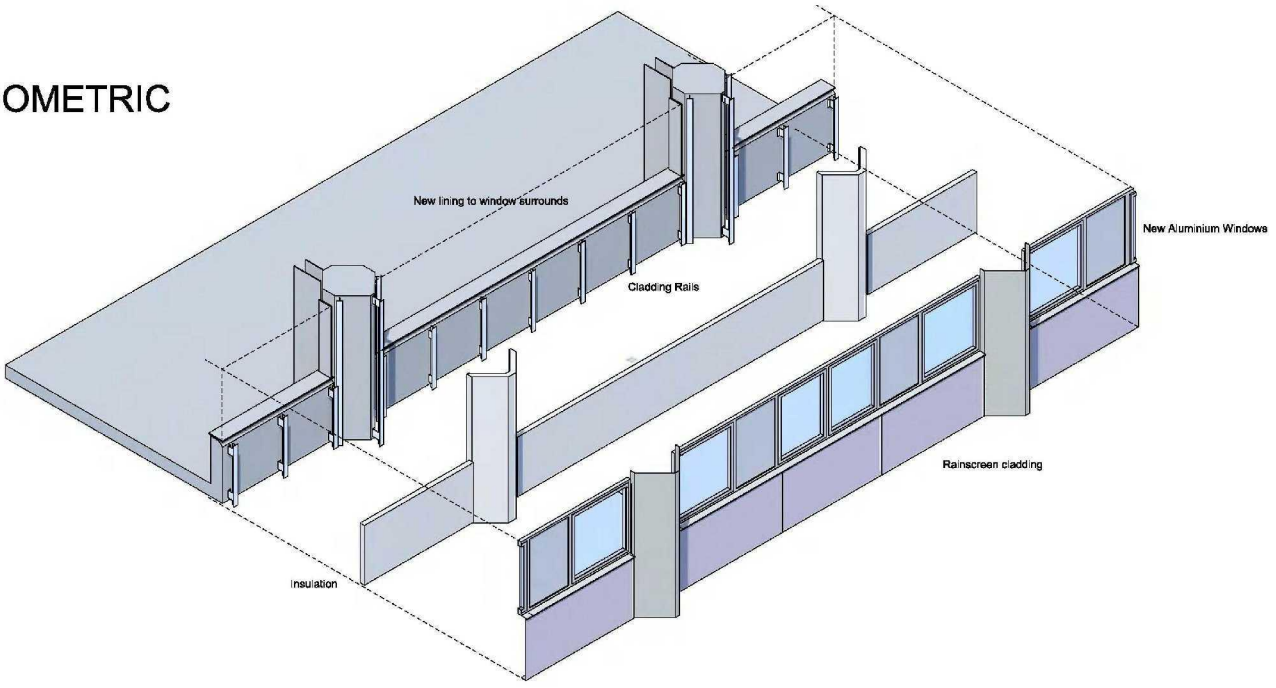


WINDOWS OPTIONS

Tilt Before Turn

Tilt before turn windows with slim sightlines - tilt for ventilation and turn for cleaning.
Application: Suitable for high rise applications, the tilt before turn window makes cleaning from the inside and gives secure ventilation.

Pivot Windows

Horizontal or vertical pivot windows and fixed lights.
Application: Offering slim sight lines and dual co-our functions ity, the pivot windows makes cleaning easy form the inside and gives flexible ventilation. The pivot window system features an optional locking restrictor to provide extra levels of safety where the application demands.

Reversible Window

Direct fix top-hung that fully reverses for ease of cleaning. Can be combined with fixed lights and mullions.
Application: Windows that can be safely and completely reversed for cleaning.

CLADDING IDEAS

Rainscreen - coloured panel

Rainscreen Cladding Systems
Application: This facade is a fibreglass reinforced polymer composite panel, with a smooth surface of electron beam cured acrylic. It has a documented durability period of 60 years, and offers one of the best guarantees on the market. It is a facade panel with many possible uses, and it is flexible through both form and format.

Rainscreen - Stone Chip

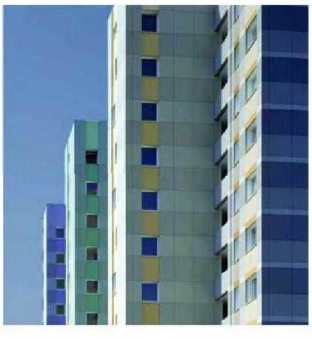
Rainscreen Cladding Systems
Application: This facade is a fibreglass reinforced polymer composite panel with surface of aggregated secure stones. Stone nature is available in 18 different natural stone colours, and up to 5 different grades. The facade panel is developed to give a natural appearance and is also very suitable in combination with other materials like wood and plaster.

Rainscreen - Render

Rainscreen Cladding Systems
Application: These types of facade are mounted on an adjustable sub-construction, protecting the wall and allowing it to breathe. By bringing thermal insulation and sound protection levels in line with modern requirements, it allows you to renovate and redesign with ease.

Rainscreen - Aluminium

Rainscreen Cladding Systems
Application: Due to its proven, consistently high quality and aesthetics appearance, Aluminium is a particularly economical material for facade claddings for residential buildings. Aluminium is a composite panel of two aluminium cover sheets and a plastic core.



Rainscreen - Zinc

Rainscreen Cladding Systems
Application: The special advantage of the reveal panel is the variety of panel widths available. The option of using different installation directions (vertical or diagonal) and combination with the horizontal panel.

BEFORE

AFTER

SEA00006429_0033

GRENFELL TOWER REGENERATION PROJECT

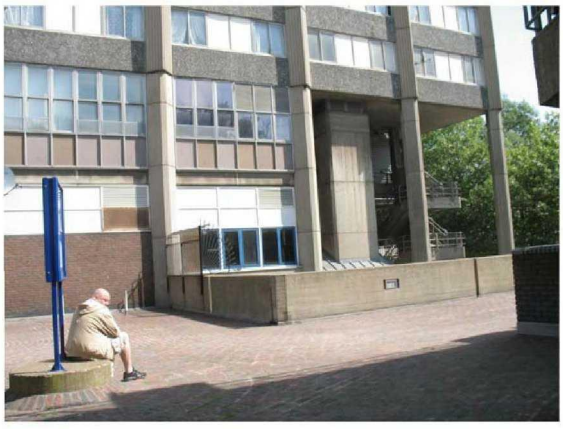
LOW LEVEL VIEWS

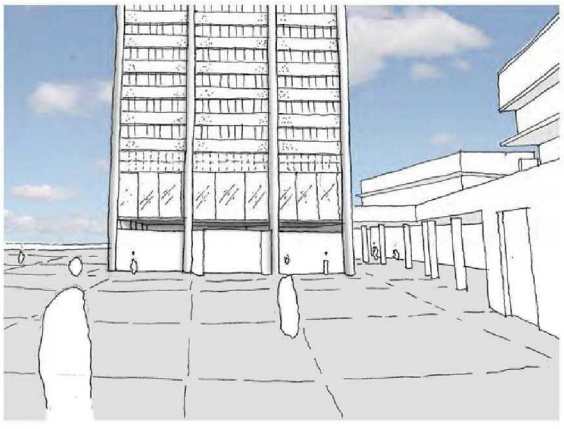
STUDIOE

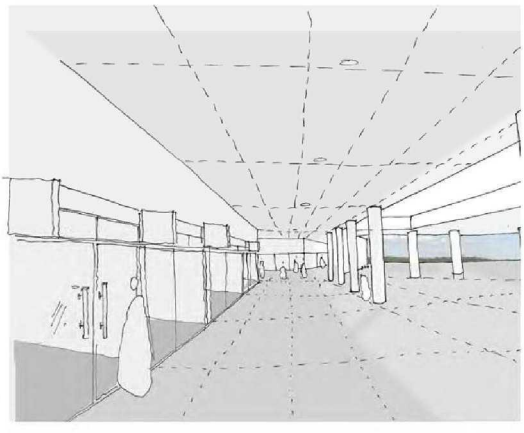
SEA00006429/33

BEFORE

AFTER







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GRENFELL TOWER UPGRADE

LOW LEVEL VIEWS

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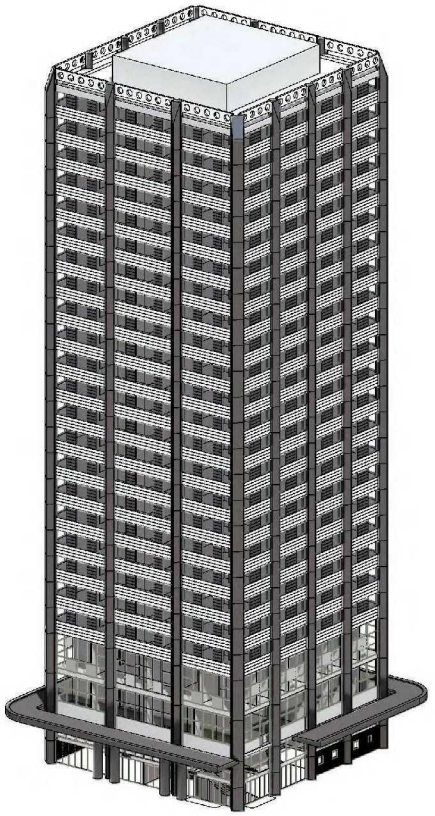
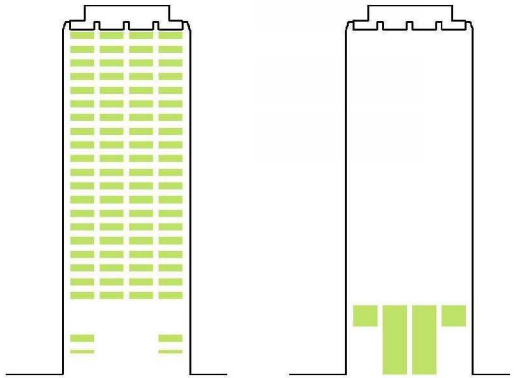
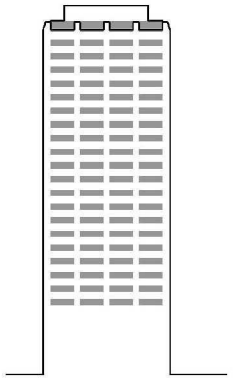


Proposed South West Axo

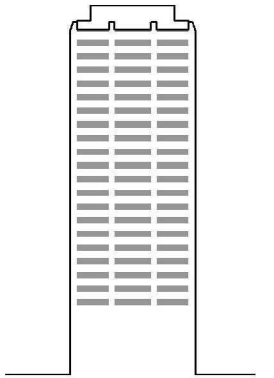


Total Window Area
North Elevation 511.24

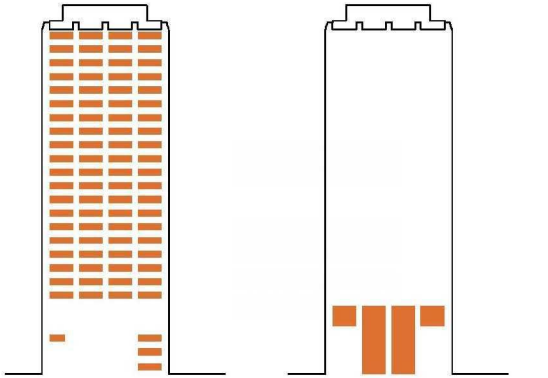
Total Curtain Wall Area
North Elevation 155.11 sqm



Horizontal Cladding Area
South Elevation 472.6 sqm
North Elevation 472.6 sqm
TOTAL 945.2 sqm

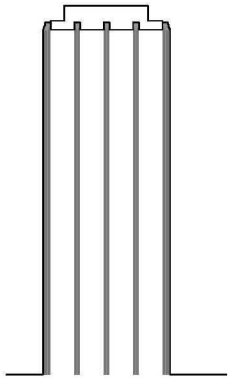


Horizontal Cladding Area
East Elevation 496.52 sqm
West Elevation 496.52 sqm
TOTAL 993.04 sqm

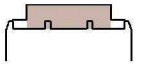


Total Window Area
South Elevation 514.69 sqm

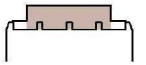
Total Curtain Wall Area
South Elevation 155.04 sqm



Total Column Cladding Area
Combined Elevations 1276.4 sqm



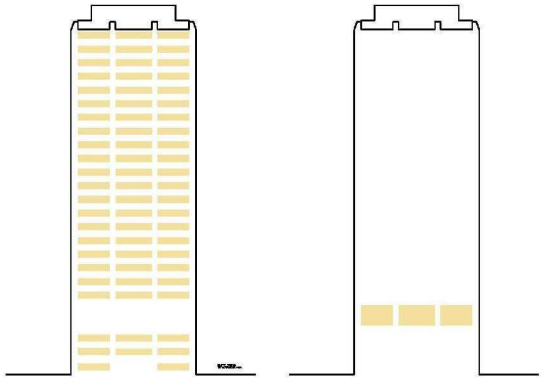
Rendered Plant Area
East Elevation 72.8 sqm
West Elevation 72.8 sqm



Rendered Plant Area
North Elevation 72.8 sqm
South Elevation 72.8 sqm

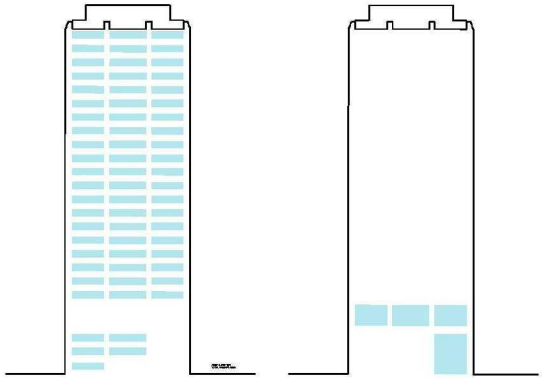
Total Brick Area
South Elevation 48.56 sqm

Total Brick Area
North Elevation 55.43 sqm



Total Window Area
East Elevation 585.06 sqm

Total Curtain Wall Area
East Elevation 74.33 sqm



Total Window Area
West Elevation 560.44 sqm

Total Curtain Wall Area
West Elevation 120.04 sqm

Total Brick Area
West Elevation 83.2 sqm

Total Brick Area
East Elevation 97.69 sqm

	North Area / m²	South Area / m²	East Area / m²	West Area / m²	Total Area / m²	Cost € / m²	Total Cost		Previous Area / m²	Previous Cost
Horizontal Cladding	472.6	472.6	496.52	496.52	1938.24	260	503942.4			
Column Cladding	319.1	319.1	319.1	319.1	1276.4	260	331864	total h & v cladding	3621	941460
Curtain Wall	155.11	155.04	74.33	120.04	504.52	430	229004		697	299650
Windows	511.26	514.69	585.06	560.44	2171.43	500	1085715		1968	982000
Brick	55.43	48.56	97.69	83.2	284.88	300	85464		105	31500
Render	72.8	72.8	72.8	72.8	291.2	300	58240		507	152400
						New Total (£)	2292259.4		Previous Total (£)	2433310

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DRAFT

03	12/09/12 FOR INFORMATION
02	05/07/12 FOR INFORMATION

Kensington & Chelsea TMO

FOR INFORMATION

STUDIO E LLP

Tel [redacted]

GRENFELL TOWER
REGENERATION PROJECT

PROJECT

Elevation Measure Sqm.

DRAWING

1:500@A1	12/09/12
SCALE	DATE
1279 SK 019	01
DWG NO.	REVISION

CHECKED

SEA00006429/35

SEA00006429_0035

Bay 8000
1 BED FLAT

Bay 7100
2 BED FLAT (CORNER)

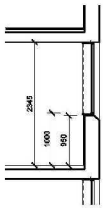
Bay 5600
2 BED FLAT

Bay 5600
2 BED FLAT

SLIDERS

Existing - Sliding Sash Frame

Existing Aluminium Single Glazed Window



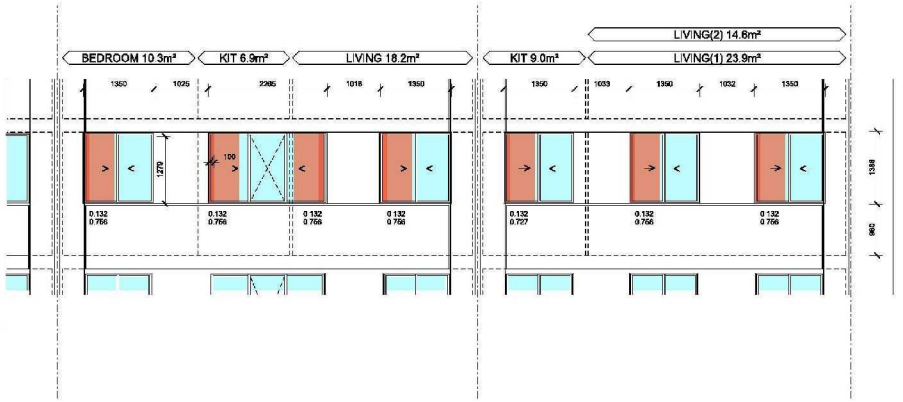
OPERATION

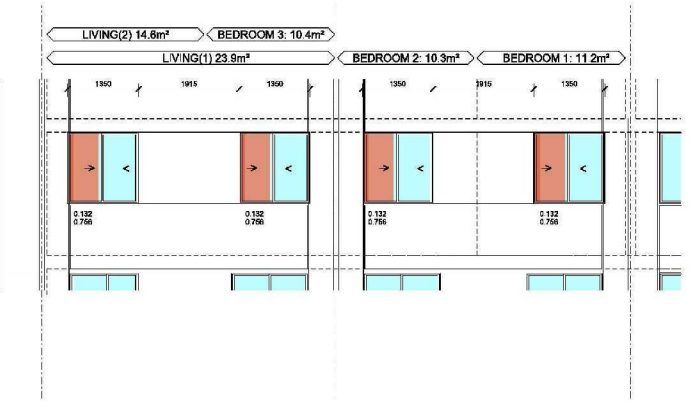
Currently many residents have disabled this restrictors as per the photo shown.

The frames are very fine and are a sliding panel with a spring buffer to stop them opening fully.

Most bays have windows which slide behind each other but on the larger bays there is a centre fixed panel.

When space is a premium, window does not project into the building when open.

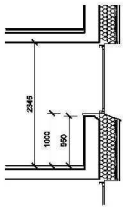




Option 1.0 - Sliding Sash Frame/ Recessed into Panel

AA63110 Horizontal Sliding Window

U-Value = 1.4w/m² K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2000 Pascals



OPERATION

Large single piece of glass slides across behind the solid panel

Cleaning of the windows are contracted out and done every 3/6 months

Option of restricting opening to 100mm

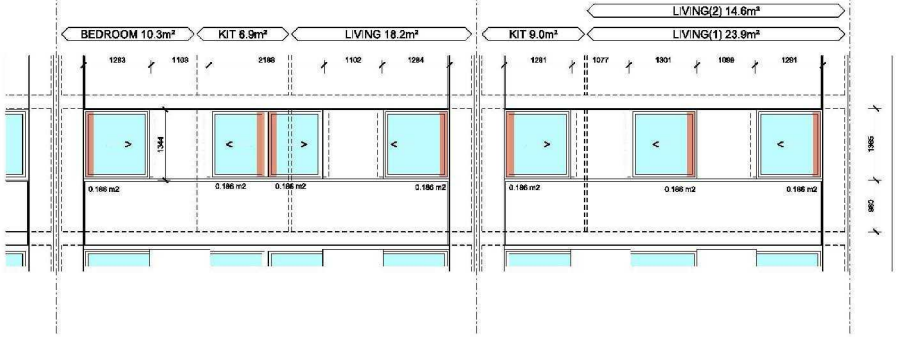
PRODUCT FEATURES

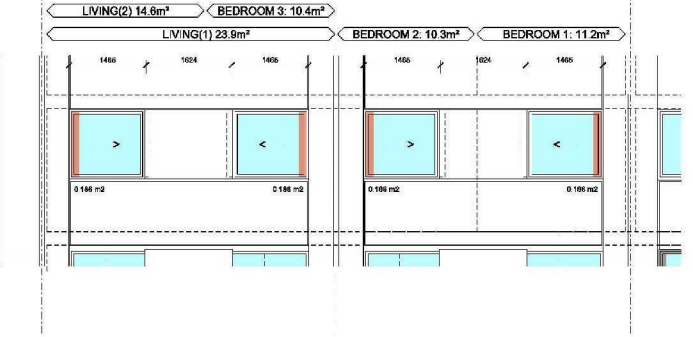
A product designed to be meet the needs of any project that requires maximum ventilation

Mounted on a stainless steel track with adjustable wheels

Double or single sliding options

When space is a premium, window does not project into the building when open

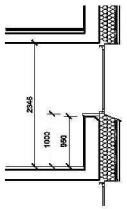




Option 1.1 - Sliding Sash Frame/ Recessed/ Perforated Mesh

AA63110 Horizontal Sliding Window

U-Value = 1.4w/m² K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2000 Pascals



OPERATION

User friendly sliding mechanism

Stainless steel track with adjustable wheels

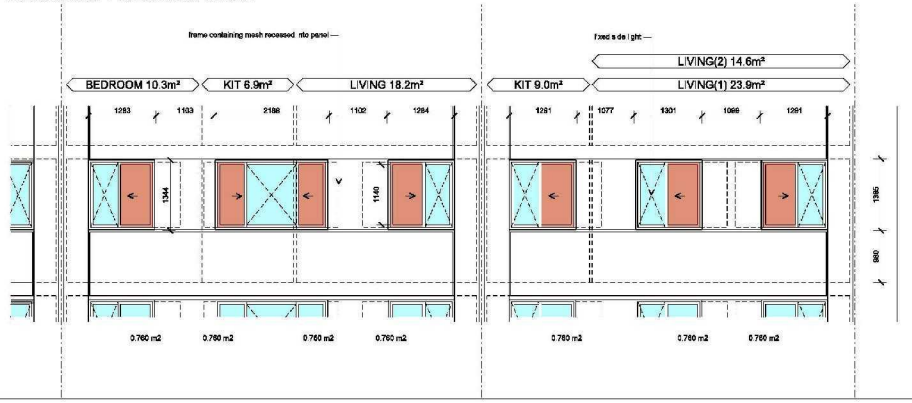
Window when open does not project into the building

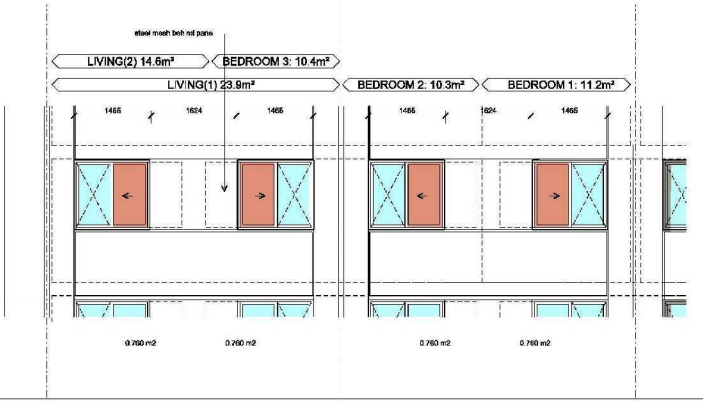
PRODUCT FEATURES

Product comes with a range of security features. One addition is extra, a bolt fit permanent perforated stainless steel mesh on the outside of the window.

This offers good visibility and ventilation while stopping the problem of items being thrown out the window.

Again the sliding sash offers excellent ventilation and a very user friendly system for the occupant





SEA00006429/36

GRENFELL TOWER REGENERATION PROJECT

WINDOW OPTIONS 1

1:50 @ A1

STUDIO E LLP

Kensington & Chelsea TMO

ALTERNATIVES

Bay 8000
1 BED FLAT

Bay 7100
2 BED FLAT (CORNER)

Bay 5600
2 BED FLAT

Bay 5600
2 BED FLAT

Option 2 - Reversible, Tilt Turn, Pivot

OPERATION

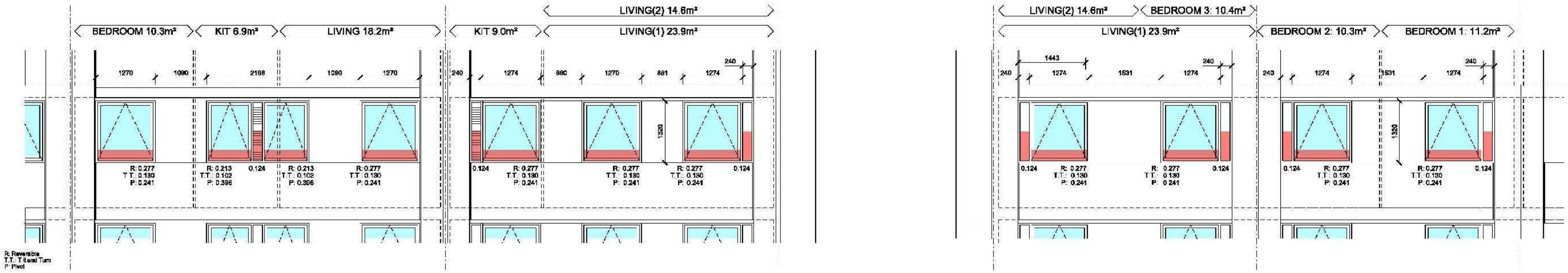
The 3 different window variations are shown in one model here because they do not divide the opening and are easy to clean from within the apartments

For everyday use the windows are restricted with ties or locks, which are unlocked when the occupant wishes to clean

There are strengths and weaknesses of each option. For example the pivot window gives a generous amount of ventilation area whilst the tilt and turn has varying opening methods meaning background ventilation is easier to maintain.

In addition to new windows small louvred panels also provide trickle ventilation whilst concealing the mechanical fan from the kitchen.

Window Size 1261mm x 1320mm	Opening Size	TOTAL Free Area (Plan plus two sides) m²
Reversible Window	240mm	0.497
Tilt Turn Window	115mm	0.200
Pivot Window	210mm	0.426



R: Reversible
T.T.: Tilt and Turn
P: Pivot

Reversible

Sapa Dualframe 75

U-Value – 1.4w/m² K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2000 Pascals

OPERATION

For everyday ventilation, the handle is turned and the sash is pushed outwards. The automatic restriction device engages when the window has opened 75-100mm. For cleaning purposes, the restrictor is released and the sash pivoted on the hinge until the restrictor re-engages just before the sash is fully reversed.

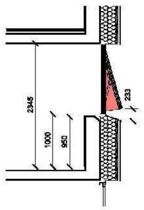
This enables safe cleaning of the external glass from inside. The restrictor is released to return the sash to its original position where it is securely closed using the handle.

IRONMONGERY

The top swing reversible: opus window has the external hinge mechanism semi concealed from the outside, giving a neat aesthetic appearance.

Suppliers onclude Nordan, Schuco, Sapa, Beaufort among others.

Windows fitted with cockspur handles that have a vent size of over 900mm in width, must be fitted with two handles.



Tilt Turn

Kawneer AA®603TE Tilturn Window
U-Value = 1.7W/m2K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2400 Pascals

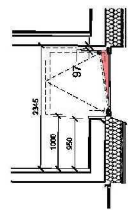
OPERATION

tilt in for ventilation - turn in for cleaning
Can be useful for multi-storey applications as the window can be cleaned safely from inside the building with the window in the turn mode.
Tilt before turn operation (tilt for ventilation and turn for cleaning), side hung open-in and bottom hung open in Optional Trickle ventilation
Multi-function handle
Option of concealed hinges

PRODUCT FEATURES

Offering locked, turn lock and open modes.

Draught free baffled ventilation and safety in operation and use. The full opening in the 'turn'.



Pivot

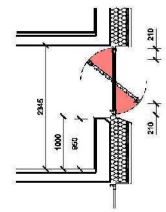
KAWNEER AA 541 (Top Hung) +
KAWNEER AA 542 (Pivot)

U-Value – 1.7 W/m2K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2400 Pascals

OPERATION
The top part of the windows are top hung and these provide excellent ventilation

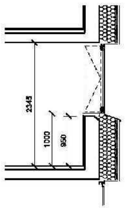
The pivot window (bottom part) may be opened to the ventilation position of 15° by operating the handle and pushing the sash forward until the pivot restrictor engages. To rotate the window further, the restrictor must be released.

In the fully rotated position the restrictoer is again automatically engaged, allowing safe cleaning of the exterior surfaces of the sash. This allows easy and safe cleaning in a high-rise situation. Option of concealed window locking at 125mm.



Option 3 - Casement (additional ventilation panel)

Kawneer AA541
Casement Window
U-Value = 1.7W/m2K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2400 Pascals



OPERATION

tilt in for ventilation - turn in for cleaning

coupled with a seperate ventilation panel. Possible louvred. This provides trickle ventilation and purge when the hatch is opened

This reduces the need for residents to use the 'turn' function on the tilt and turn window

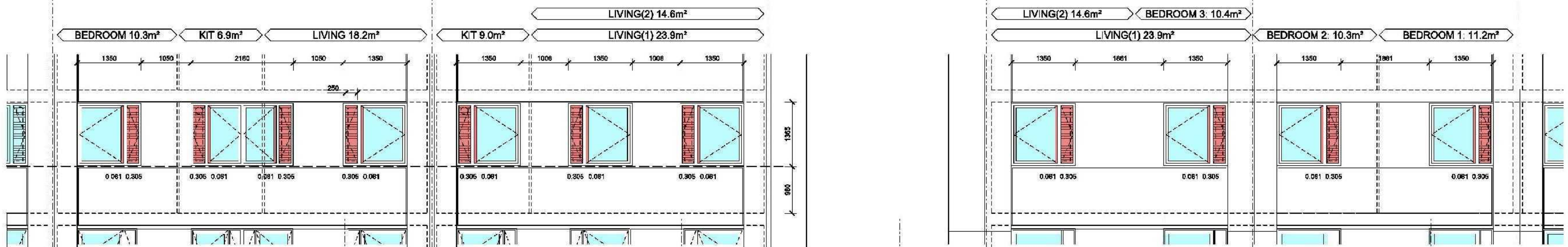
Tilt before turn operation (tilt for ventilation and turn for cleaning)

Multi-function handle

Option of concealed hinges

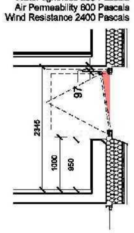
PRODUCT FEATURES

Offering locked, turn lock and open modes



Option 4 - Tilt Turn (Acoustic Vents in 1 Bed)

Kawneer AA®603TE Tilturn Window
U-Value = 1.7W/m2K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2400 Pascals



OPERATION

added louvred ventilation panel which is accessed via casement/sliding from within the apartment.

tilt in for ventilation - turn in for cleaning

Can be useful for multi-storey applications as the window can be cleaned safely from inside the building with the window in the turn mode.

Tilt before turn operation (tilt for ventilation and turn for cleaning), side hung open in and bottom hung open in Optional Trickle ventilation

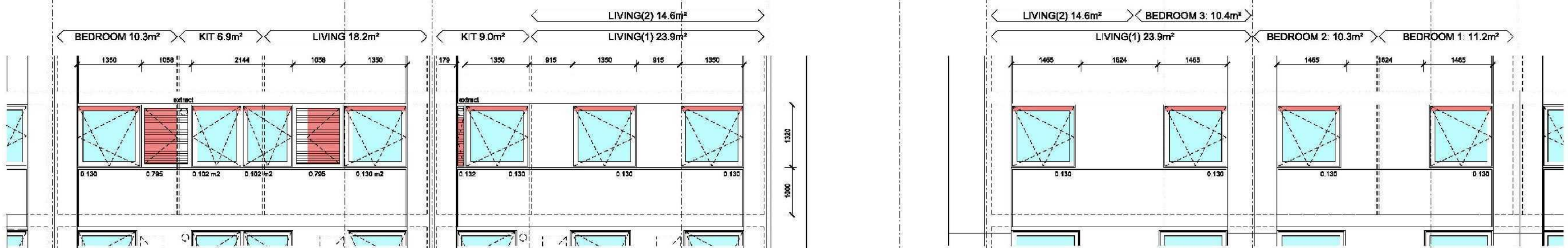
Multi function handle

Option of concealed hinges

PRODUCT FEATURES

Offering locked, turn lock and open modes.

Draught free baffled ventilation and safety in operation and use. The full opening in the 'turn'.



SEA00006429/37

GRENFELL TOWER REGENERATION PROJECT

WINDOW OPTIONS 2

1:50 @ A1

STUDIO E LLP

Kensington & Chelsea TMO

Option 1_Ribbon Canopy - North West view

Option 1_Ribbon Canopy - South East view

Option 4_Entrance Canopies - North West view

Option 2_Butterfly Canopy - North West view

Option 2_Butterfly Canopy - South East view

Option 4_Entrance Canopies - South East view

Option 3_Folded Canopy - North West view

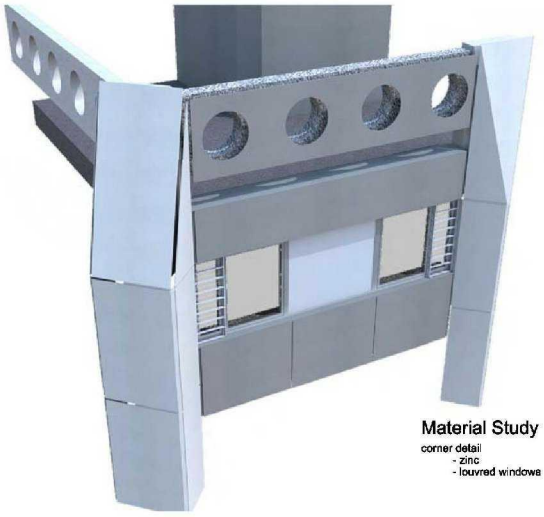
Option 3_Folded Canopy - South East view

GRENFELL TOWER REGENERATION PROJECT

STUDIOE LLP

Kensington & Chelsea TMO

SEA00006429/38



Material Study
corner detail
- zinc
- louvred windows

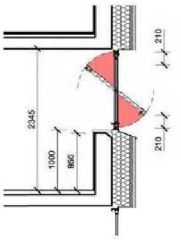
Pivot Window

U-Value = 1.2 W/m2K
Water tightness 600 Pascals
Air Permeability 600 Pascals
Wind Resistance 2400 Pascals

OPERATION
The top part of the windows are top hung and these provide excellent ventilation.

The pivot window (bottom part) may be opened to its ventilation position of 10° by opening the handleand pushing the sash forward until the pivot restrictor engages. To rotate the window further, the restrictor must be released.

In the fully rotated position the restrictor is again automatically engaged, allowing safe cleaning of the exterior surfaces of the sash. This allows easy and safe cleaning in a high rise situation. Option of concealed window stay locking 125mm



Proposed South Elevation
1:100

Proposed South Elevation
with new
- canopy
- entrance lobby

Scale: 1:100 @ A1 DWG. No.: 1279_SK 042 Revision: 00 Date: 09/08/2012 C Stage

GRENFELL TOWER REGENERATION PROJECT

STUDIO ELP

Kensington & Chelsea TMO

Existing South West View

Proposed South West View

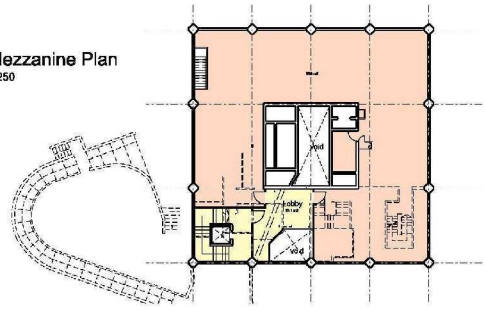
Existing North West View

Proposed North West View

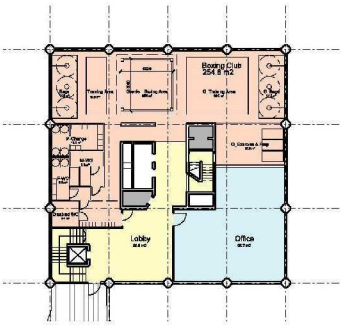
Ground Floor

Proposed Floor Plan
1:200

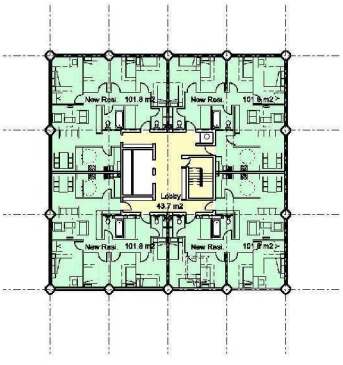
Mezzanine Plan
1:250



Walkway Plan
1:250



Walkway +1 Plan
1:250



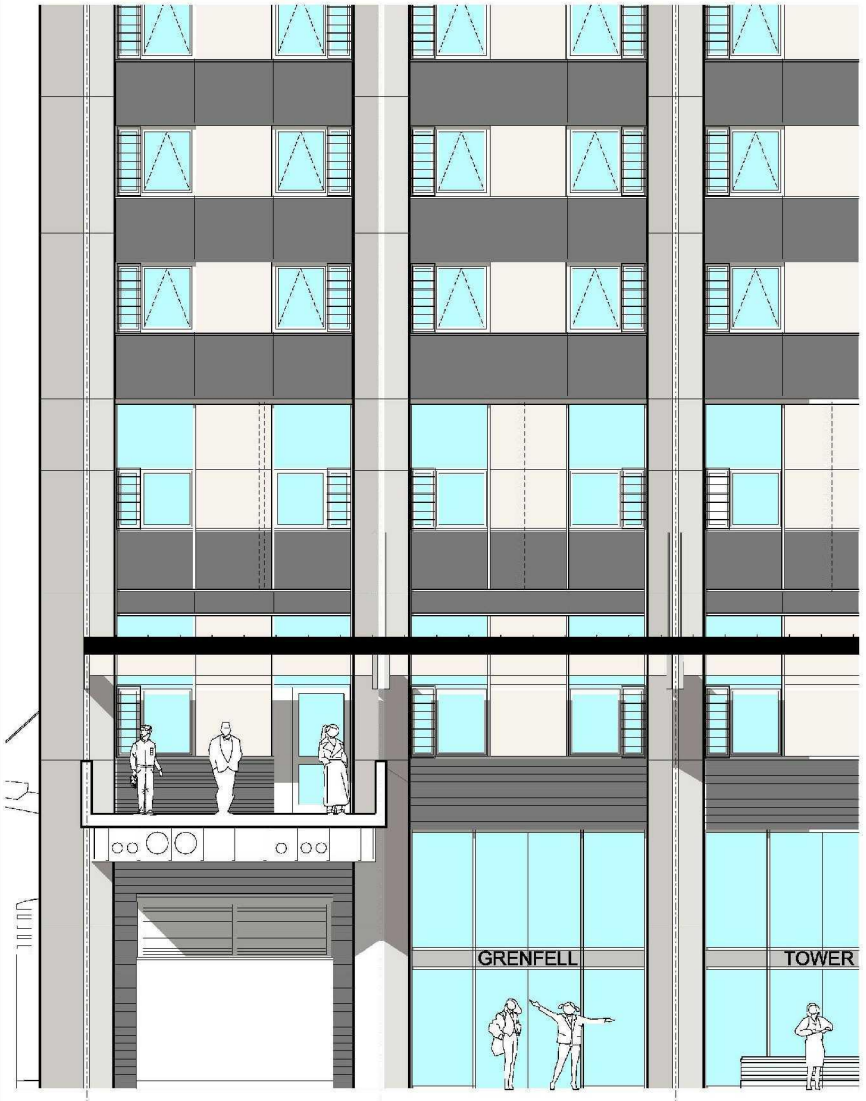
Scale: 1:100 @ A1 DWG. No.: 1279_SK 044 Revision: 00 Date: 09/08/2012 C Stage

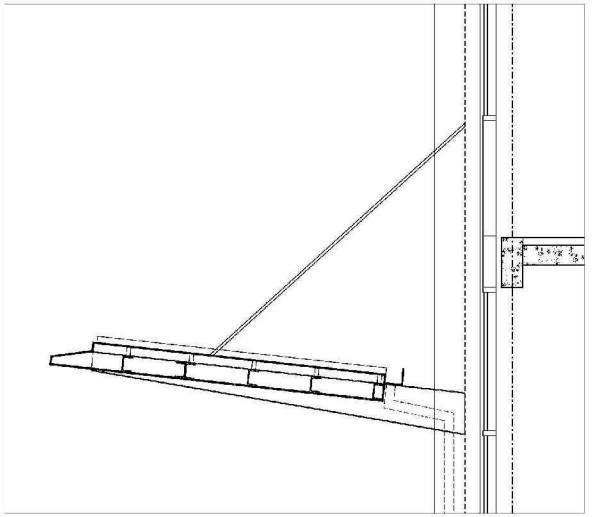
GRENFELL TOWER REGENERATION PROJECT
Proposed Floor Plans
Canopy Studies

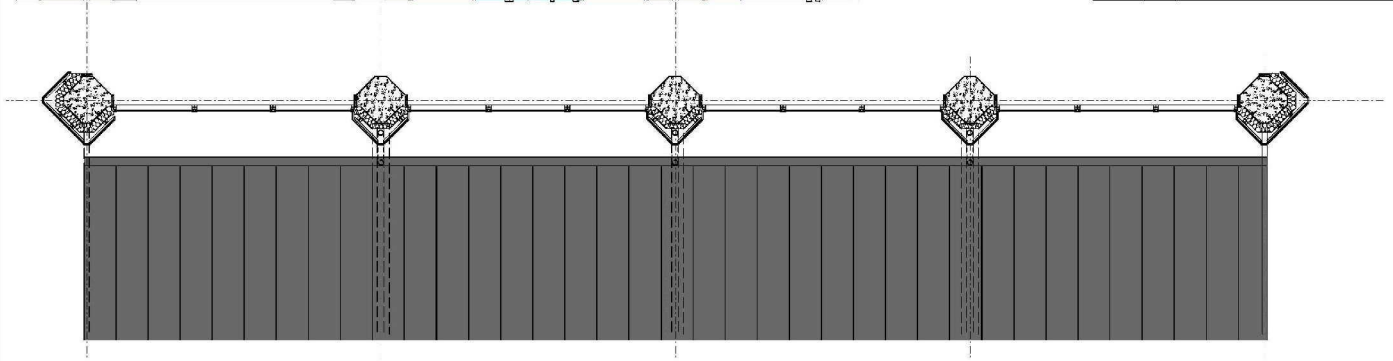
STUDIOE LLP

SEA00006429/40

SEA00006429_0040







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London, W6 9HH
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GRENFELL TOWER
REGENERATION PROJECT

PROJECT

DRAWING

SCALE DATE

1279

DWG NO. REVISION CHECKED

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SEA00006429_0041

5.5 Drawing Registers

DRAWING REGISTER & ISSUE FORM

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Palace Wharf, Rainville Road,
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Project:	Grenfell Tower Refurbishment		
Excel File	1279-A2-SE drg issue		
Sheet Name:	Sketch 1		
Drawing Reference Number	STUDIO E LLP	**Drawing CAD File Number**	**Scale**
	Drawing Title		

	Sketch Drawings			Revision											
D					12	19	15	21	31	01	06	07	12	10	11	12
M					04	04	05	05	05	06	06	06	06	07	07	07
Y					12	12	12	12	12	12	12	12	12	12	12	12
SK001	Existing Floor Plans		1:250@A1		00		01		01	01	01				
SK002	Deck 0 & Deck +1 layout proposals		1:200@A1	00											
SK003	Existing Sections and Elevations		1:250@A1	00	00		00		01	01					
SK004	Feasibility Option		1:200@A1	00	00	00	00		01	01	02				
SK005	SE-NW Aerial View		NTS@A3			00									
SK006	N Aerial, SE Deck View		NTS@A3			00									
SK007	S Aerial, W Ground View		NTS@A3			00									
SK008	Detail Build Up Study		1:10@A3												
SK009	Existing Plans		1:200@A1		00	00									
SK010	Ground Landscape		1:200@A1		00	00									
SK011	Existing: Plan, Elevation Detail.		1:20@A1												
SK012	Cladding Options, Isometric View		NTS					00							
SK013	Photos vs Perspective Sketches		NTS					00							
SK014	Podium Changes, Axonometric		NTS					00							
SK015	Plant Room and Roof Plan		1:200@A3												
SK016	Nursery Brief		1:200@A3										00		
SK017															
SK018															
SK019	Elevation Measure													00	
SK020															
SK021															
SK022															
SK023	Window Options 1	1:50@A1													00
SK024	Window Options 2	1:50@A1													00
SK025	Plan Measure													00	
SK026															
SK027															
SK028															
SK029															
SK030															
SK031															
SK032															
SK033	Ground Floor - Boxing Existing	1:100@A3													00
SK034	Deck Level - Boxing Proposed	1:100@A3													00
SK035	Mezzanine Level - Existing	1:100@A3													00
SK036	Deck Level - Proposed	1:100@A3													00
SK037															
SK038															
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CHURCHMAN	Chris Churchman	e												
TAYLOR YOUNG	Marc Watterson	e								e				
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Excel File	1279-A2-SE drg issue		
Sheet Name:	Planning 1 of 1		
Drawing Reference Number	STUDIO E LLP	**Drawing CAD File Number**	**Scale**
	Drawing Title		

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M				08	10	10	10								
Y				12	12	12	12								
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PL003	Proposed Site Plan	1:500@A1		00	00	00									
~~PL004~~	~~Existing Floor Plans~~	~~1:200@A1~~		00											
~~PL005~~	~~Proposed Floor Plans~~	~~1:200@A1~~		00											
PL006	Existing Sections	1:200@A1		00											
~~PL007~~	~~Proposed Sections~~	~~1:200@A1~~		00											
PL008	Existing Elevations	1:200@A1		00											
~~PL009~~	~~Proposed West Elevation~~	~~1:200@A1~~		00											
~~PL010~~	~~Proposed East Elevation~~	~~1:200@A1~~		00											
~~PL011~~	~~Proposed South Elevation~~	~~1:200@A1~~		00											
~~PL012~~	~~Proposed North Elevation~~	~~1:200@A1~~		00											
~~PL013~~	~~Undercroft Elevation~~	~~1:200@A1~~		00											
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PL020	Existing Sections	1:200@A1			00	00									
PL030	Existing Elevations	1:200@A1			00	00									
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PL111	Proposed Ground Floor Plan	1:100@A1			00	00	00								
PL112	Proposed Mezzanine Plan	1:100@A1			00	00	00								
PL113	Proposed Walkway Plan	1:100@A1			00	00	00								
PL114	Proposed Office Plan	1:100@A1			00	00	00								
PL115	Proposed Rosi Plan	1:100@A1			00	00									
PL116	Proposed Plant Room Plan	1:50@A1			00	00									
PL117	Proposed Roof Plan	1:50@A1			00	00									
PL118	Proposed 4 Bed Plan	1:50@A1			00	00									
PL125	Proposed Baseline Garage Refurbishment	1:100@A1			00	00									
PL126	Proposed Baseline (EMB) Office Refurbishment	1:100@A1			00	00									
PL200	Proposed Sections	1:200@A1			00	00									
PL301	Undercroft Elevation	1:200@A1			00	00									
PL302	Proposed West Elevation	1:200@A1			00	00									
PL303	Proposed East Elevation	1:200@A1			00	00									
PL304	Proposed South Elevation	1:200@A1			00	00									
PL305	Proposed North Elevation	1:200@A1			00	00									
PL400	Proposed Overcladding Detail	1:10@A1			00	00									

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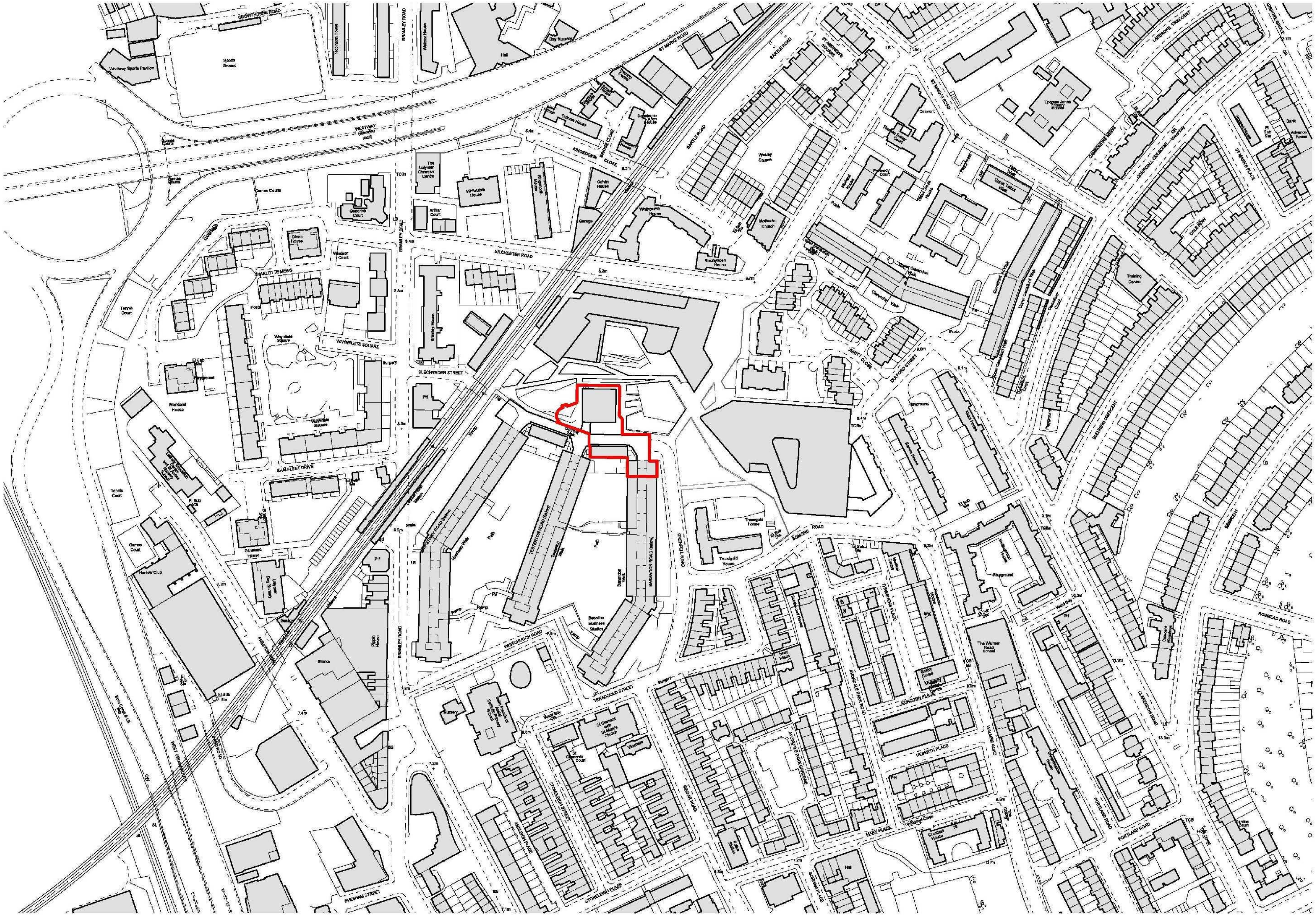
FC=for comment, **FI**=for information, **P**=planning, **C**=Construction, **T**=tender, **R**=record | | | | | | | | | | | | P | P | I

5.6 Current Drawings



Location Plan

NOTE

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Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

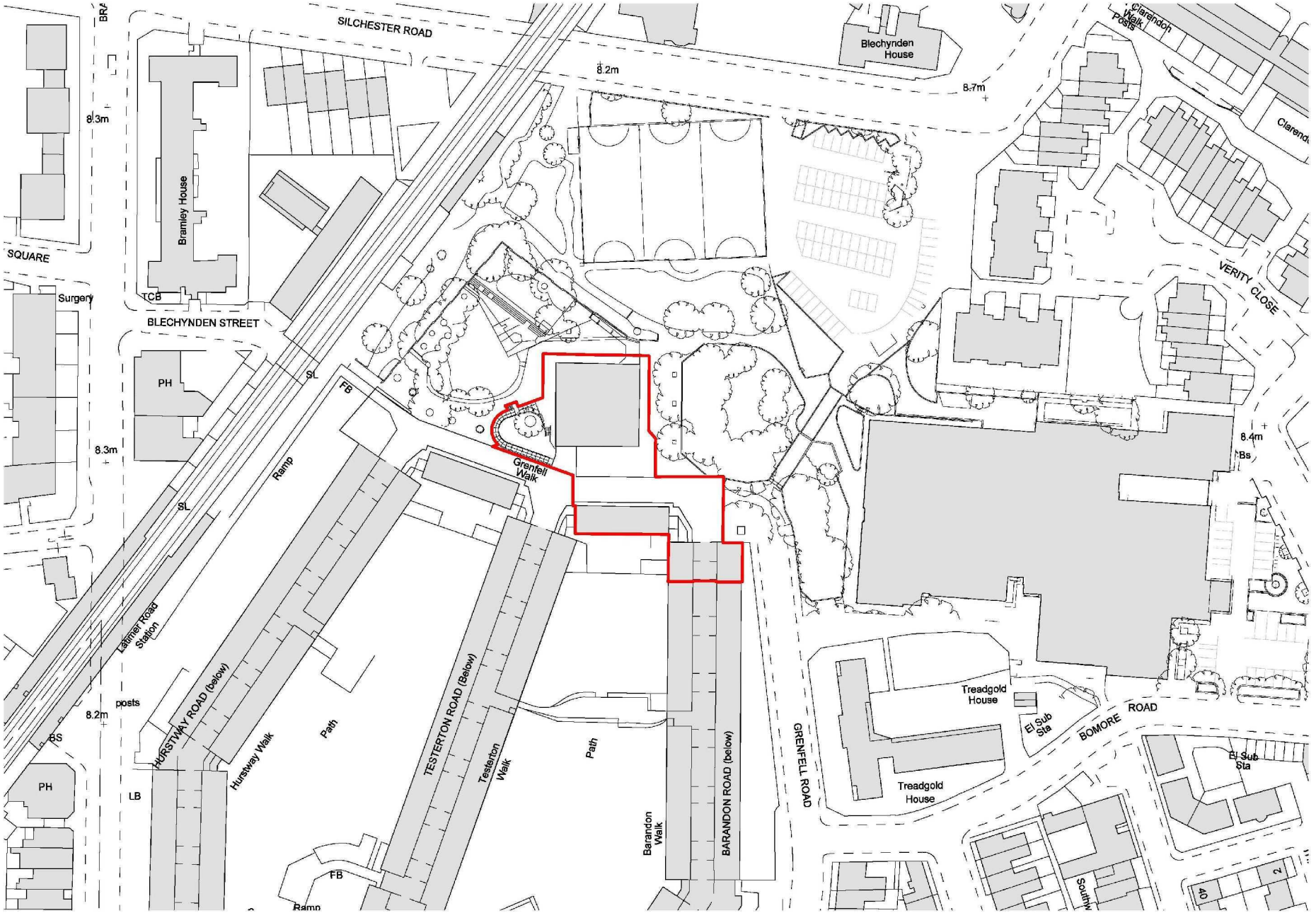
Pa ace Wharf, Rainville Road,
London, W6 9HN
Tel. [redacted]
Fax

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

Location Plan
DRAWING

1:1250@A1	15/08/12
SCALE	DATE

1279 PL 001	00	
DWG. NO.	REVISION	CHECKED



Site Plan

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GRENFELL TOWER REGENERATION PROJECT

PROJECT

Existing Site Plan

DRAWING

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DWG NO.	REVISION

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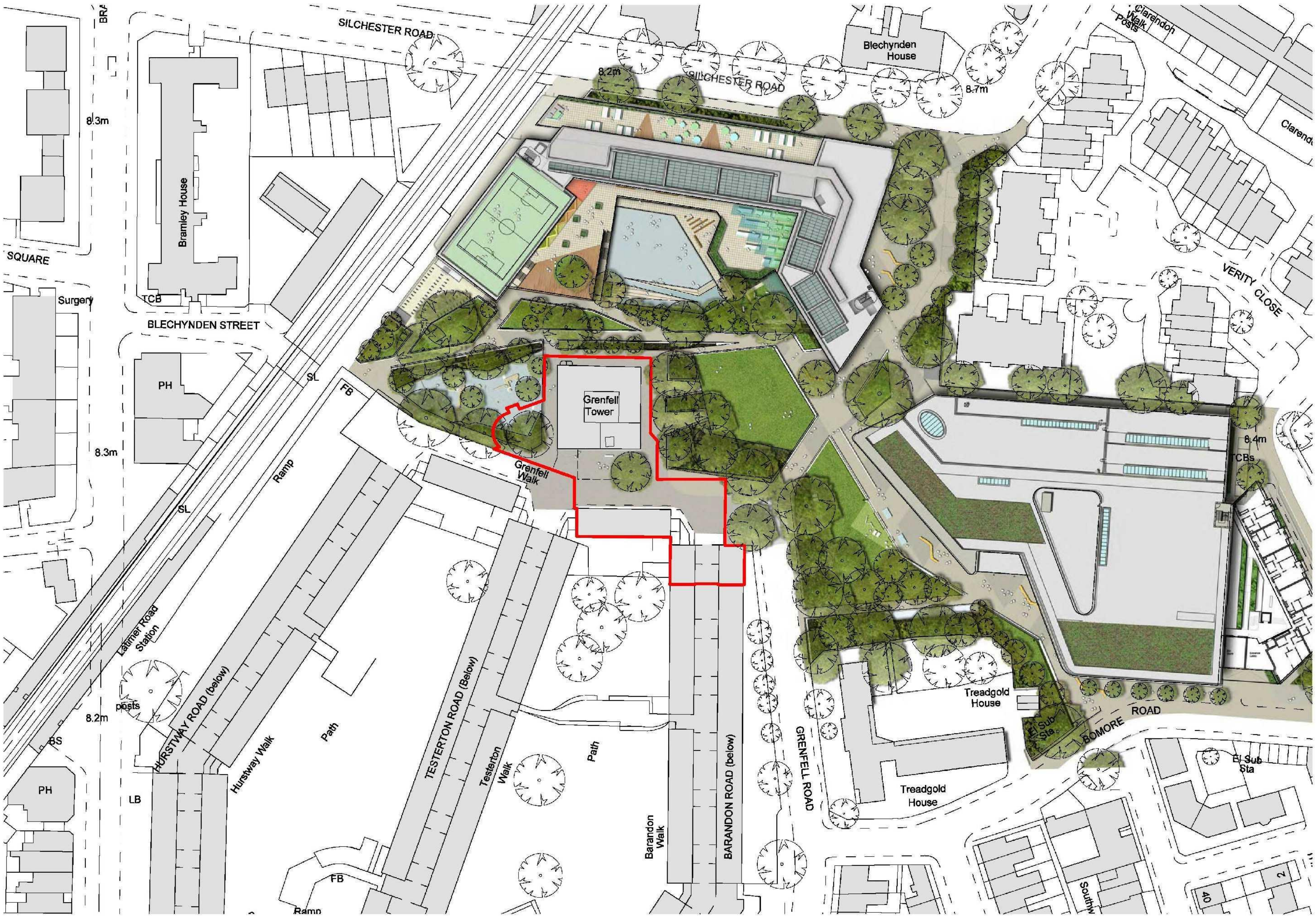
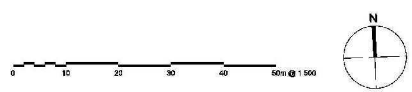


Site Plan



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STUDIO E LLP

Palace Wharf, Rainville Road,
London, W6 9HN
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Fax

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

Proposed
Site Plan
DRAWING

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15/08/12 — DATE

1279 PL 003 — DWG. NO.
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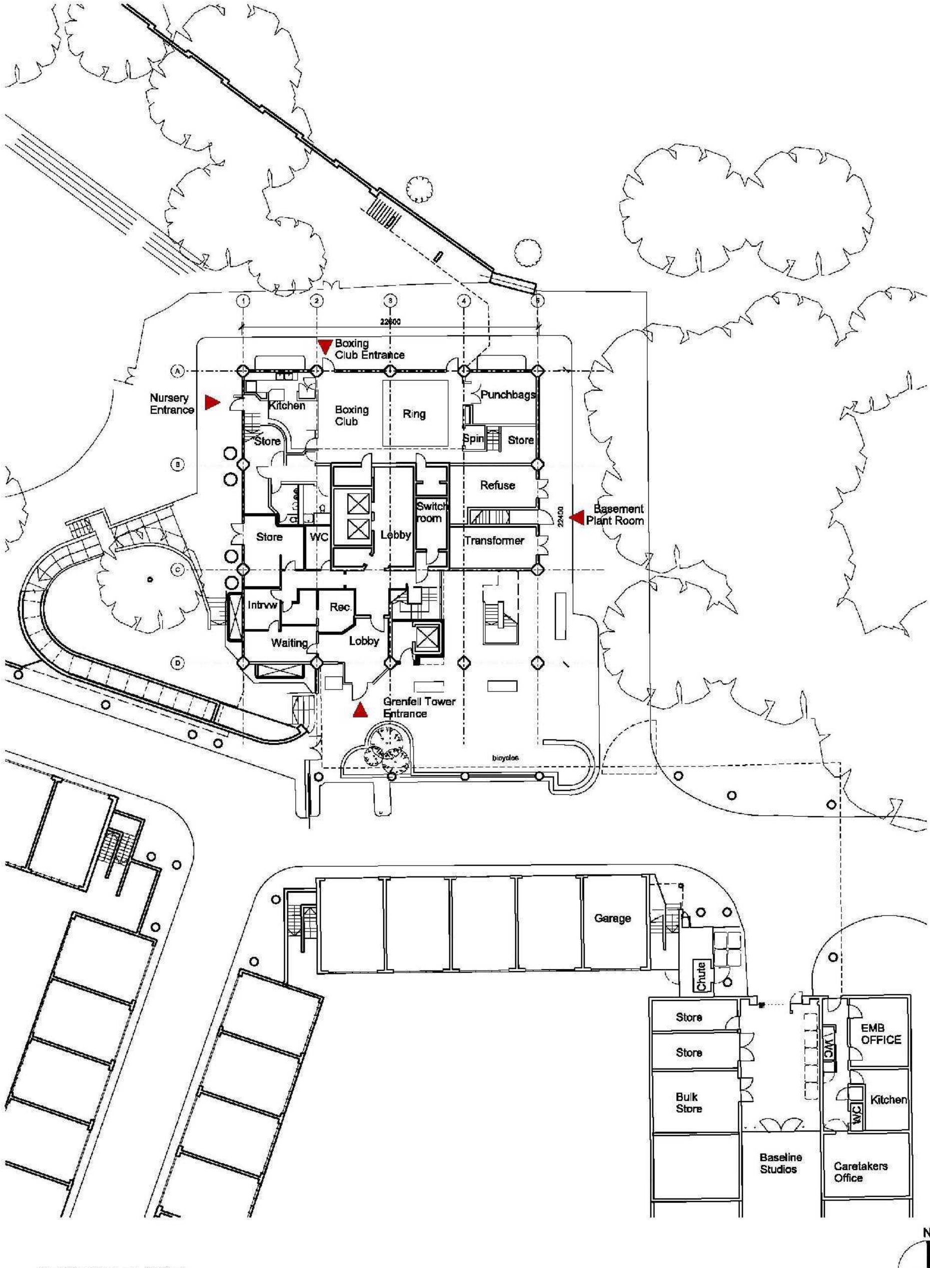
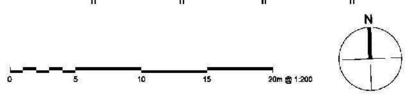
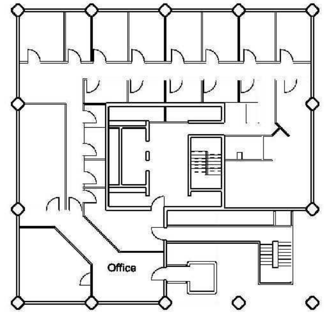
SEA00006429_0046

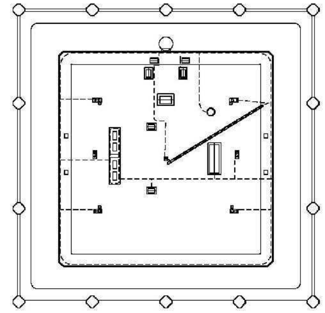




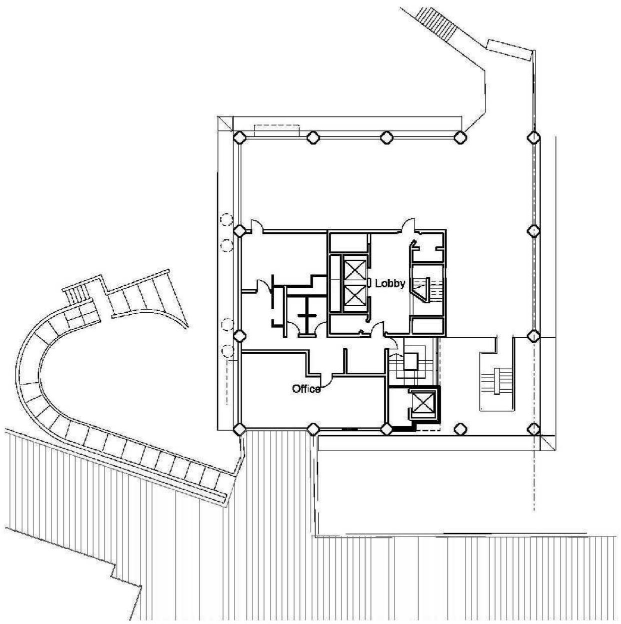
GROUND FLOOR



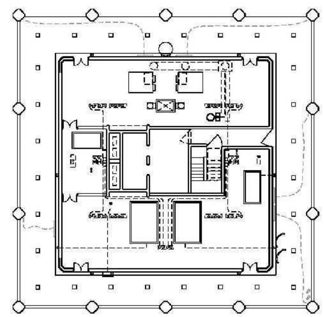
OFFICE LEVEL



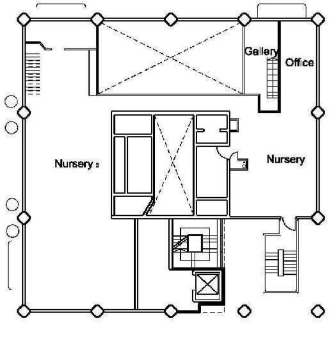
ROOF PLAN



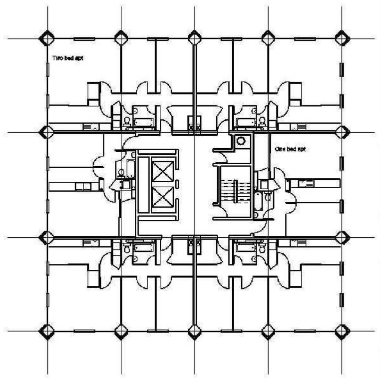
WALKWAY LEVEL



PLANT ROOM



MEZZANINE LEVEL



TYPICAL RESIDENTIAL FLOOR

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Key

Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

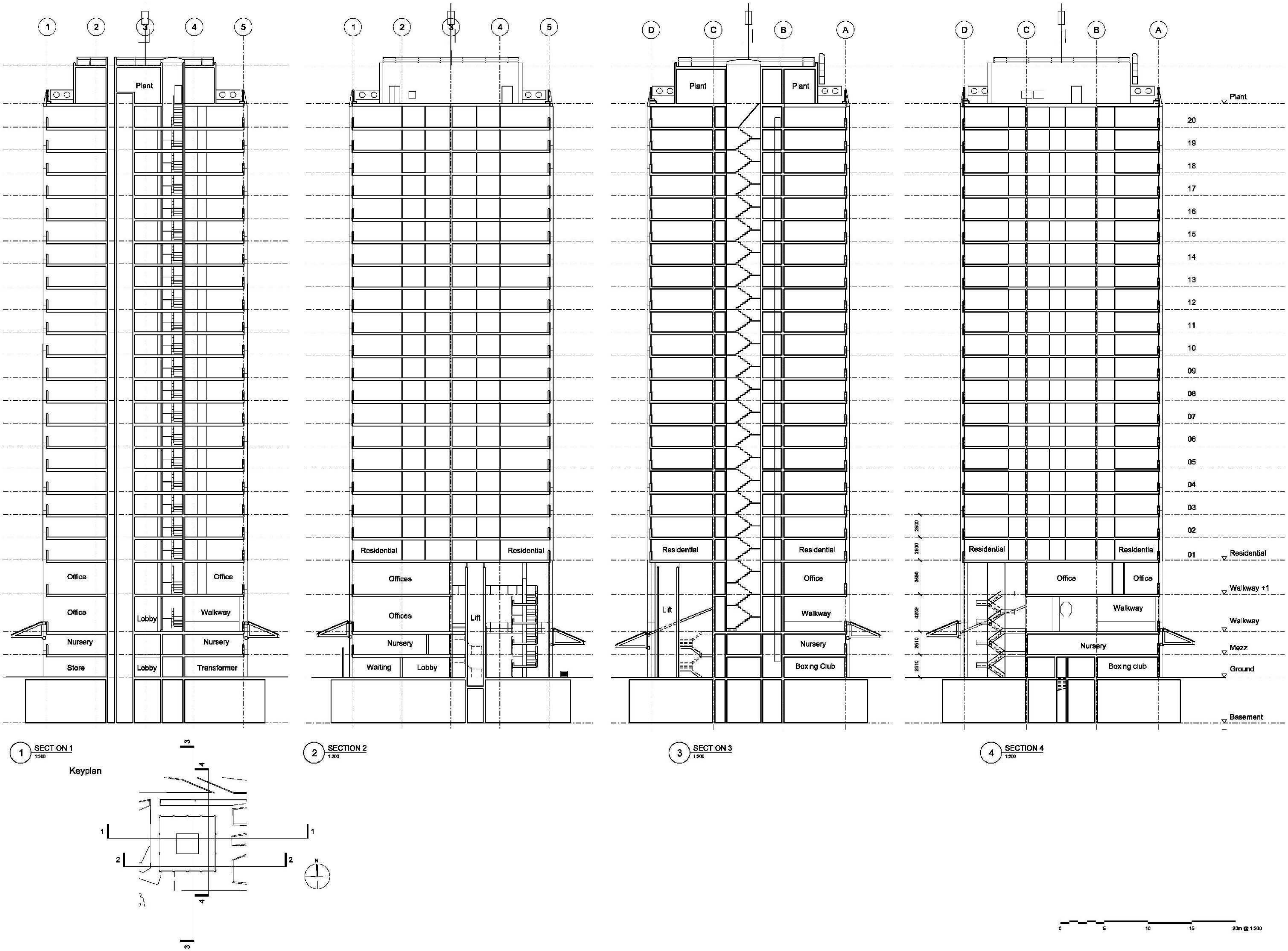
Palace Wharf, Rainville Road,
London, W6 9HN
Tel [redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

EXISTING
FLOOR PLANS
DRAWING

1:200@A1	15/08/12
SCALE	DATE

1279	PL010 00	
DWG. NO.	REVISION	CHECKED



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Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

Palace Wharf, Rainville Road,
London[redacted]
Tel.[redacted]
Fax[redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

EXISTING
SECTIONS
DRAWING

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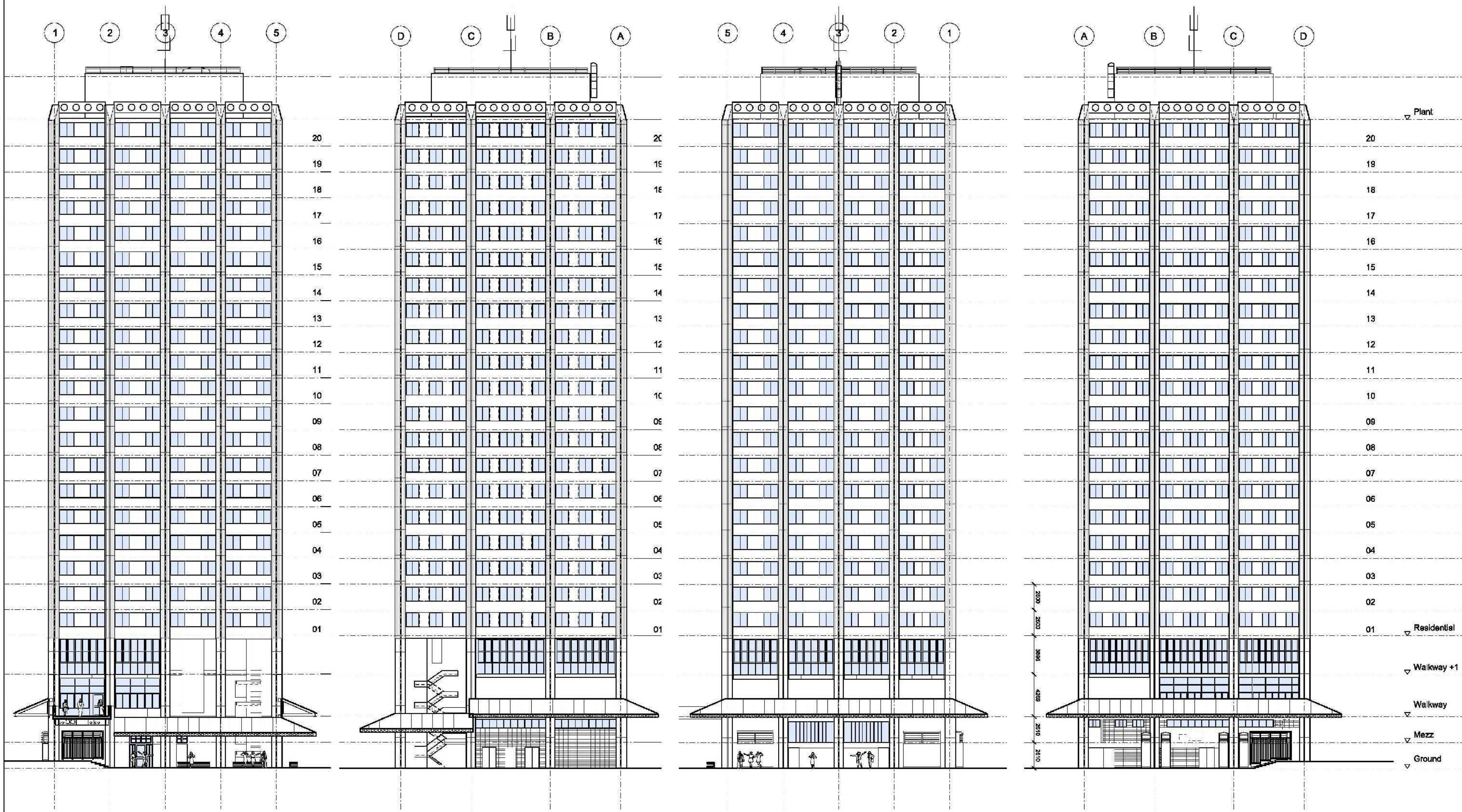
SCALE	DATE	
1279	PL020 00	
DWG. NO.	REVISION	CHECKED



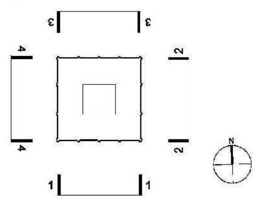
1 SOUTH ELEVATION
1:200

2 EAST ELEVATION
1:200

3 NORTH ELEVATION
1:200

4 WEST ELEVATION
1:200

Keyplan



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Key

Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

Pa ace Wharf, Rainville Road,
London, W6 9HN.
Tel. [redacted]
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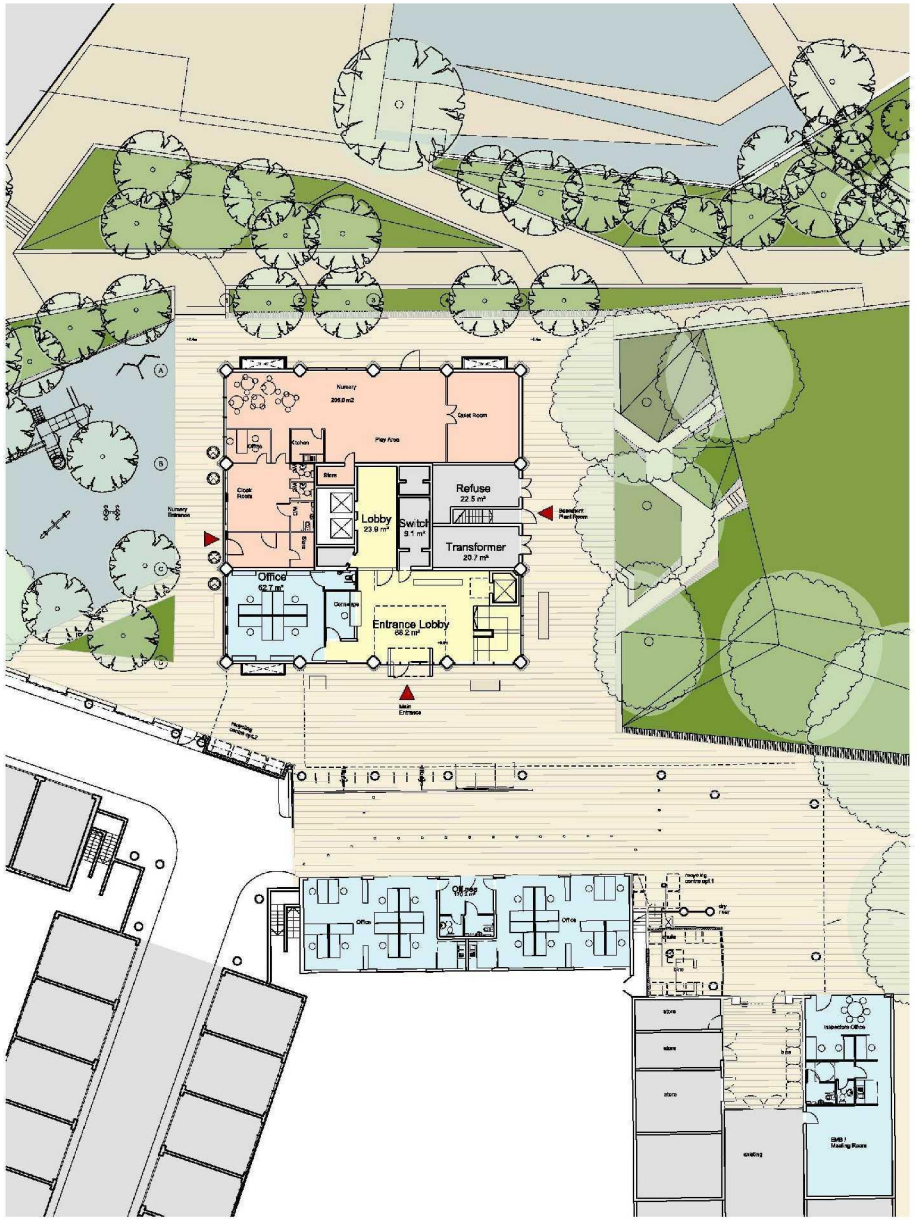
GRENFELL TOWER
REGENERATION PROJECT
PROJECT

EXISTING
ELEVATIONS
DRAWING

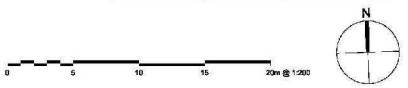
1:200@A1 16/08/12
SCALE DATE

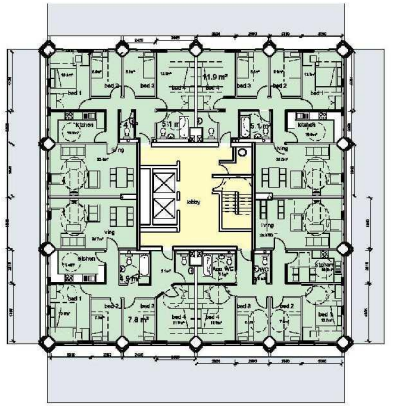
1279 PL030 00
DWG. NO. REVISION CHECKED

SEA00006429/49

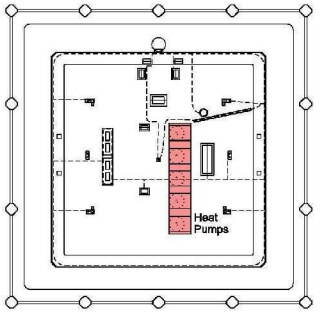


GROUND FLOOR

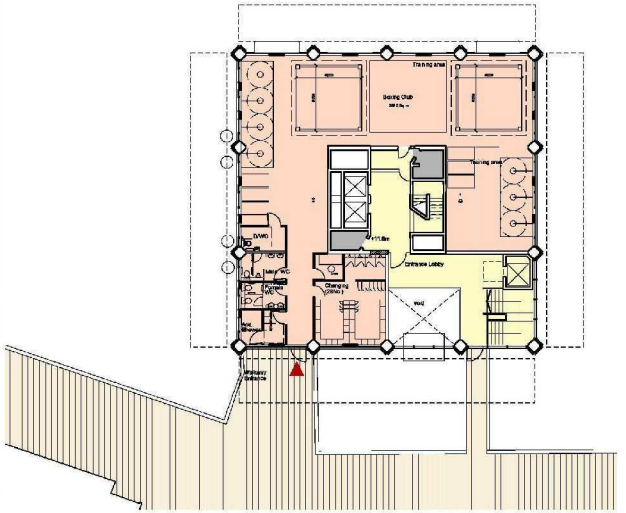




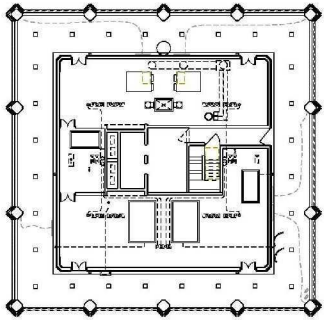
OFFICE LEVEL



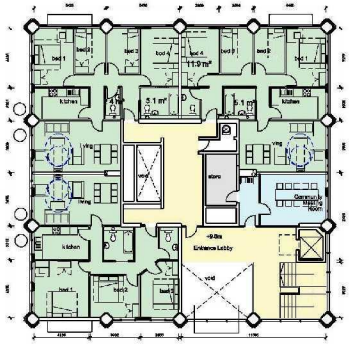
ROOF PLAN



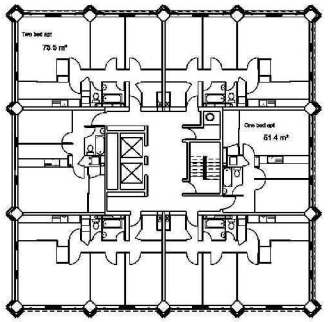
WALKWAY LEVEL



PLANT ROOM



MEZZANINE LEVEL



TYPICAL RESIDENTIAL FLOOR

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space

Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

Palace Wharf, Rainville Road, London, W6 9HA
Tel [redacted]
Fax

GRENFELL TOWER REGENERATION PROJECT

PROJECT

PROPOSED FLOOR PLANS

DRAWING

1:200@A1 15/08/12

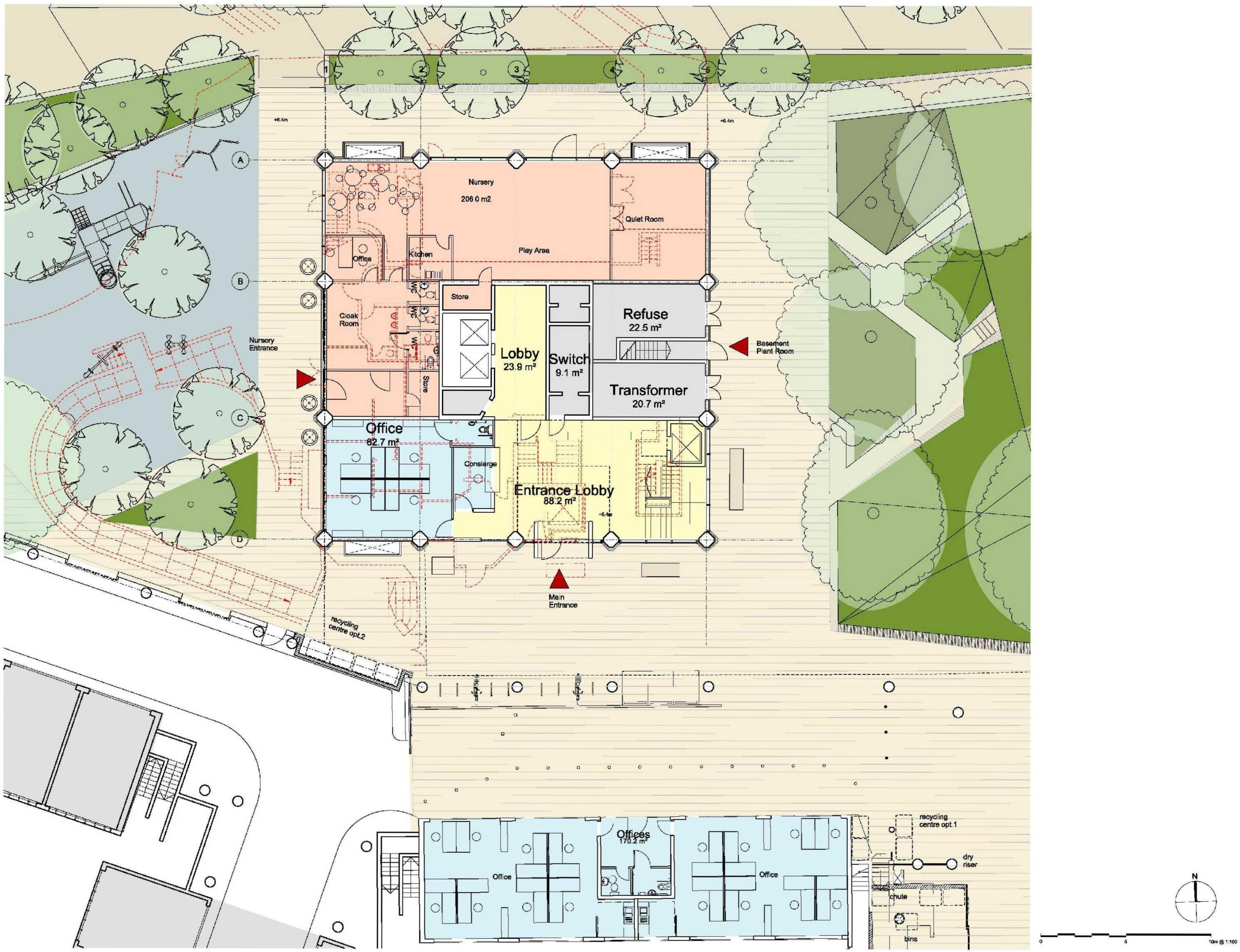
SCALE DATE

1279 PL110 00

DWG NO. REVISION CHECKED

SEA00006429/50

SEA00006429_0050



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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space
- Existing Removed

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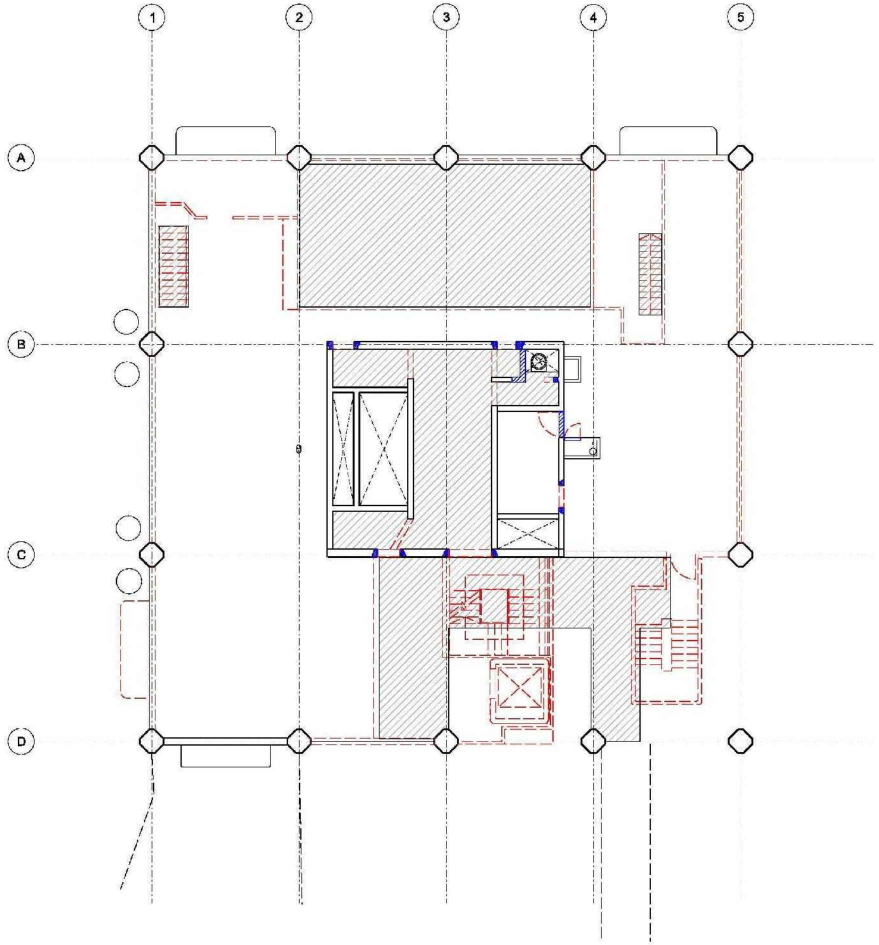
London, W6 9HN
Tel. [redacted]
Fax [redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
GROUND
FLOOR PLAN
DRAWING

SCALE	DATE
1:100@A1	15/08/12

DWG. NO.	REVISION	CHECKED
1279	PL111 00	



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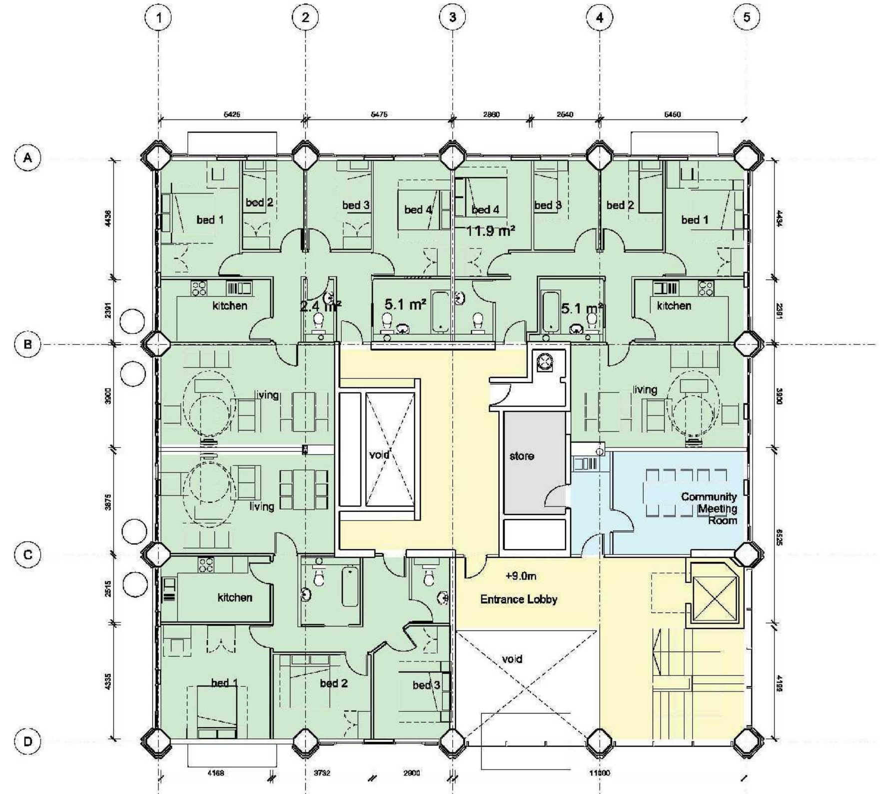

PROPOSED FLOOR PLAN

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Key

- Circulation
- Community Use
- New Residential
- Office Space Community Use
- Existing Removed

N

0 5 10m @ 1:100

Kensington & Chelsea TMO

PLANNING

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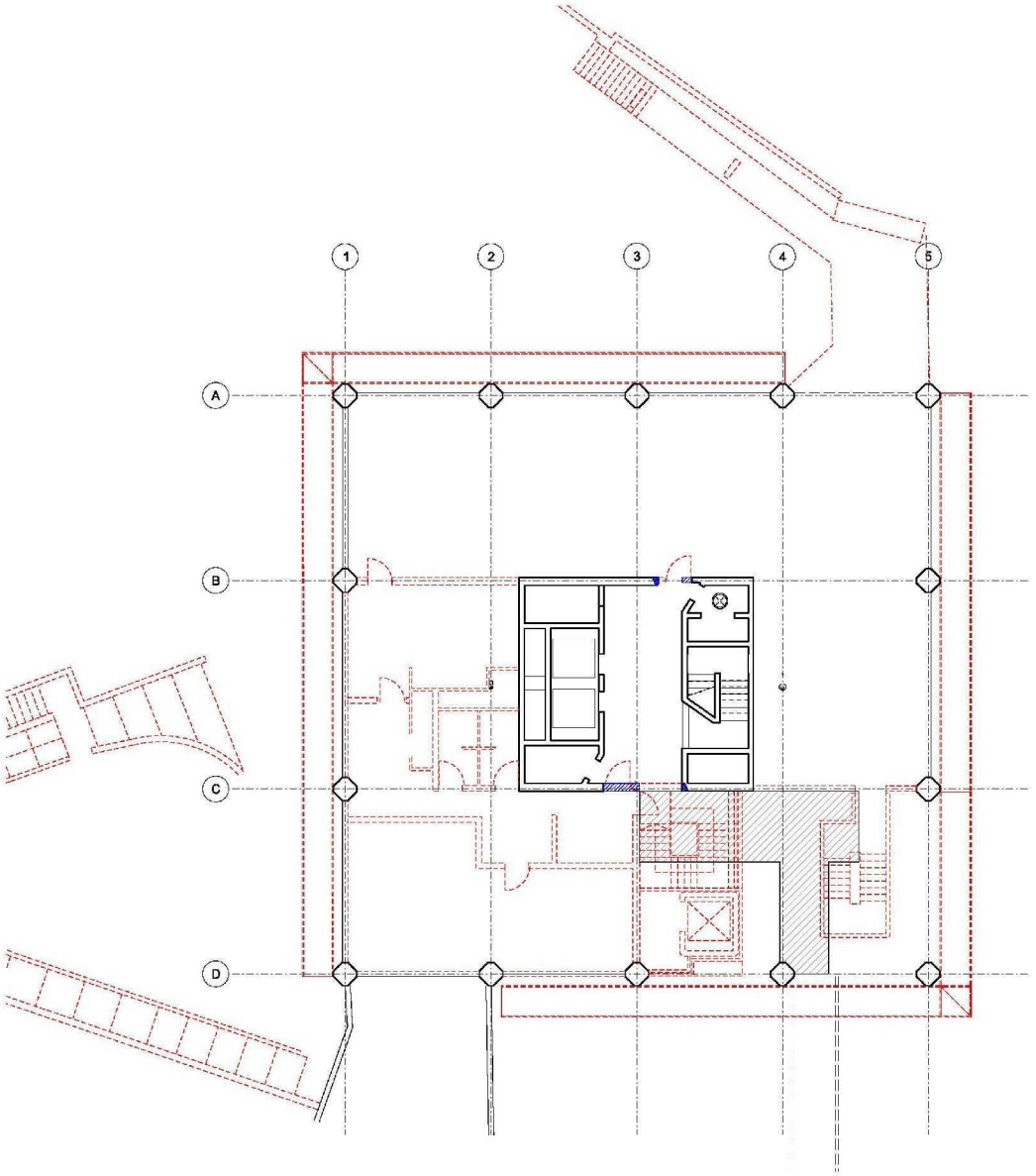
London, W6 9HN
Tel [redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
MEZZANINE
FLOOR PLANS
DRAWING

1:100@A1	15/08/12	
SCALE	DATE	
1279	PL112 00	
DWG. NO.	REVISION	CHECKED



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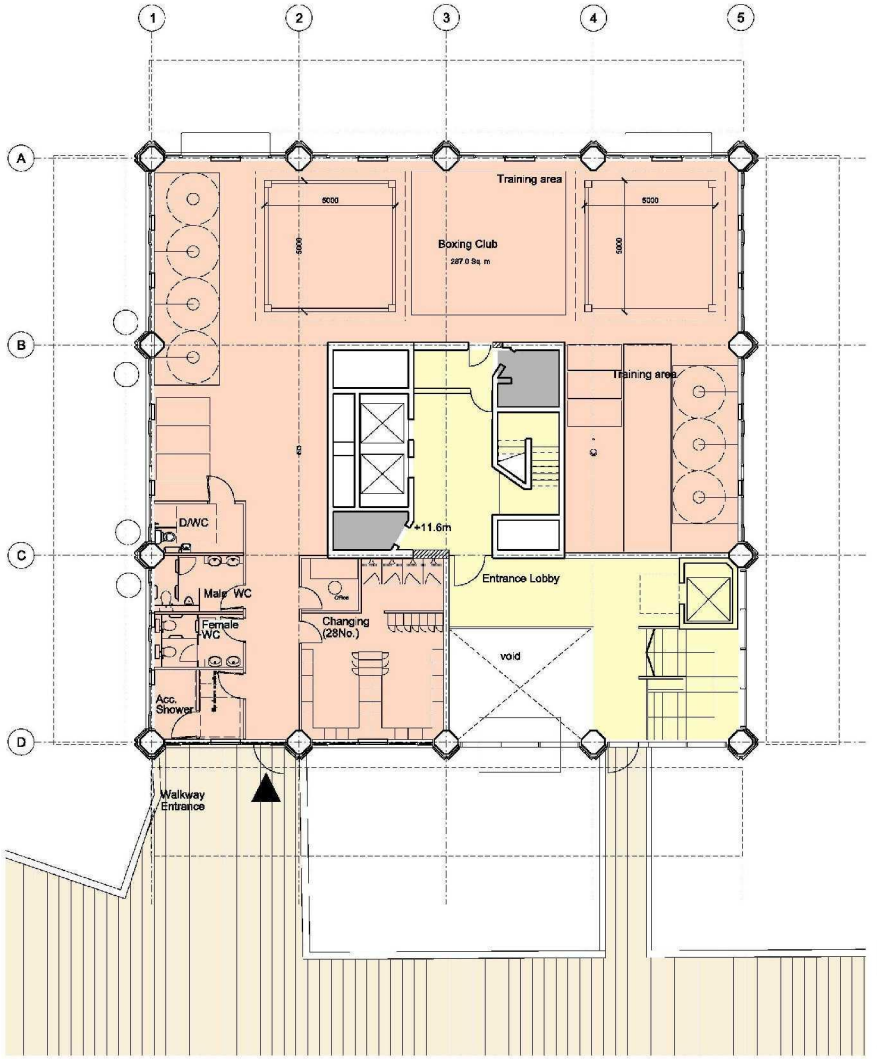

PROPOSED FLOOR PLAN

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space
- Existing Removed

Kensington & Chelsea TMO

PLANNING

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Palace Wharf, Rainville Road, London, W6 9HN
Tel: [redacted]
Fax:

GRENFELL TOWER REGENERATION PROJECT

PROJECT

PROPOSED WALKWAY PLAN

DRAWING

1:100@A1 12/09/12

SCALE DATE

1279 PL113 00

DWG NO. REVISION CHECKED

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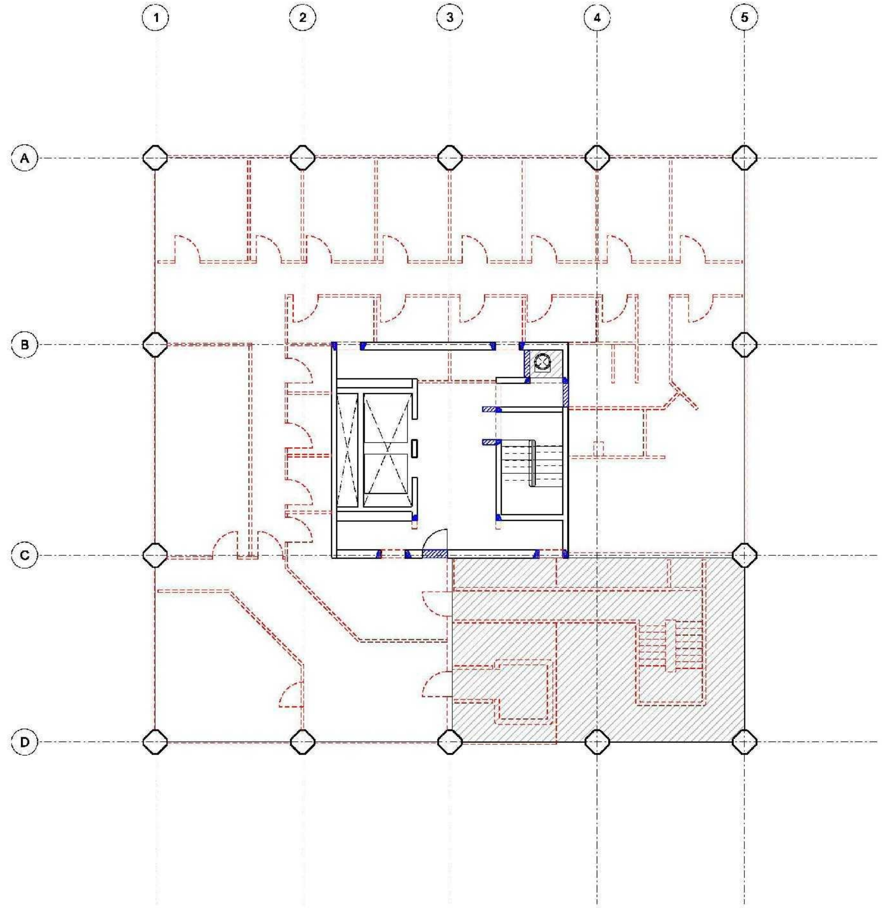
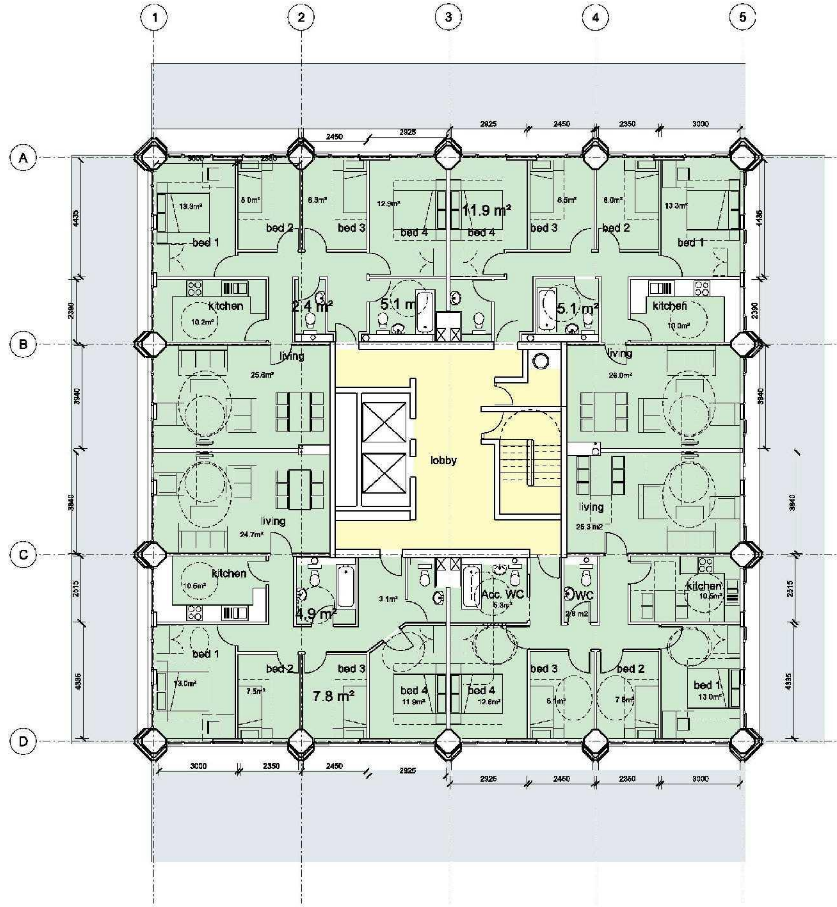


EXISTING FLOOR PLAN MODIFIED



PROPOSED FLOOR PLAN

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space
- Existing Removed

N

0 5 10m @ 1:100

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Pa ace Wharf, Rainville Road, London, W6 9HN.
Tel. [redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
WALKWAY +1 (OFFICE)
FLOOR PLAN
DRAWING

1:100@A1	10/09/12	
SCALE	DATE	
1279	PL114 00	
DWG. NO.	REVISION	CHECKED

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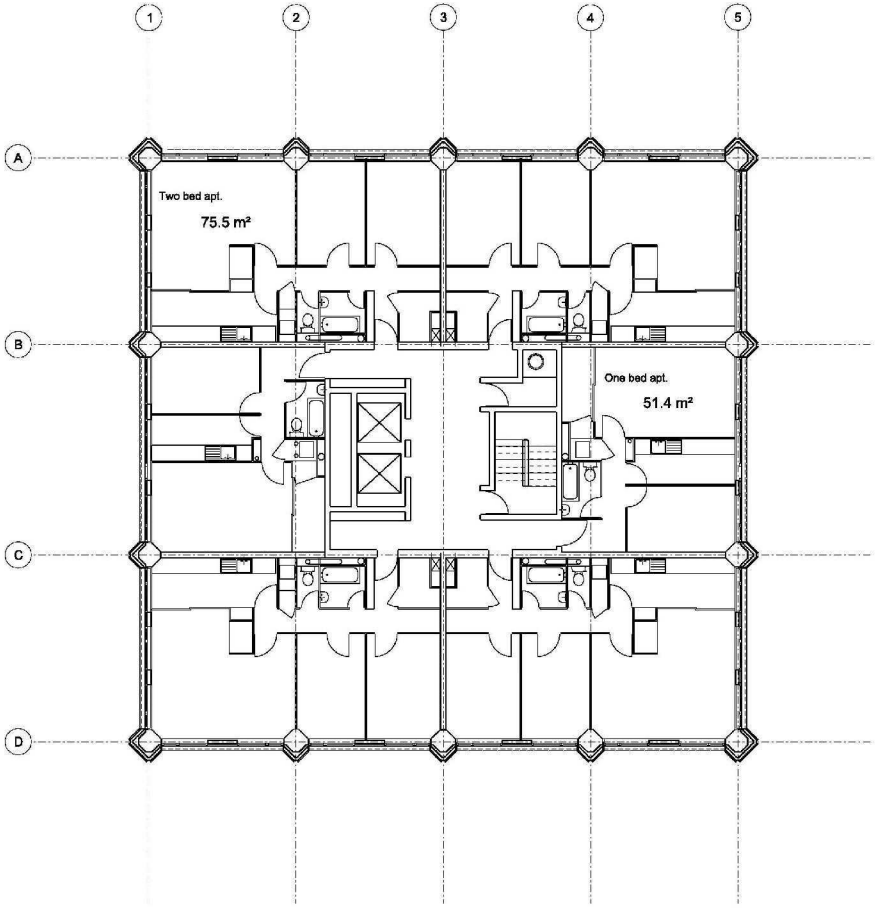
Key

- Circulation
- Community Use
- New Residential
- Office Space Community Use
- Existing Removed



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STUDIO E LLP

Palace Wharf, Rainville Road, London, W6 9HN
Tel [redacted]
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GRENFELL TOWER REGENERATION PROJECT
PROJECT

PROPOSED RESIDENTIAL FLOOR PLANS
DRAWING

1:100@A1	10/09/12
SCALE	DATE

1279	RE115 00	
DWG NO.	REVISION	CHECKED

SEA00006429/55

SEA00006429_0055

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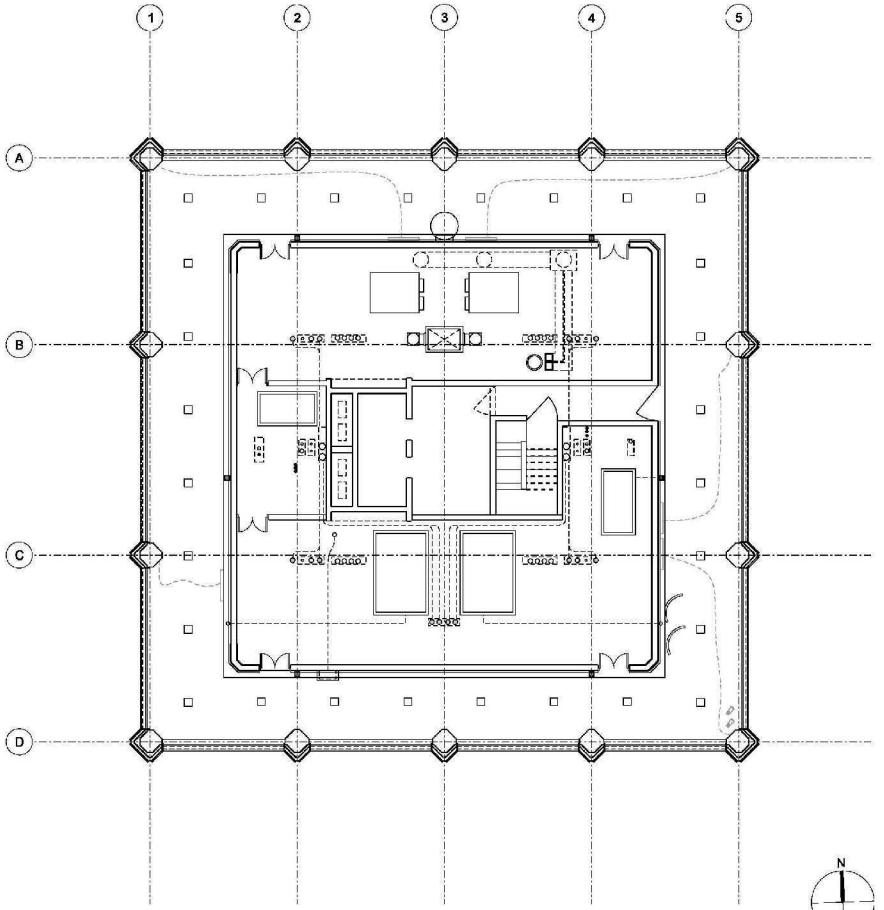
Key



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Palace Wharf, Rainville Road, London, W6 9HA
Tel: [redacted]
Fax

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
PLANT
FLOOR PLAN
DRAWING

1:100@A1 10/09/12
SCALE DATE

1279 PL116 00
DWG NO. REVISION CHECKED

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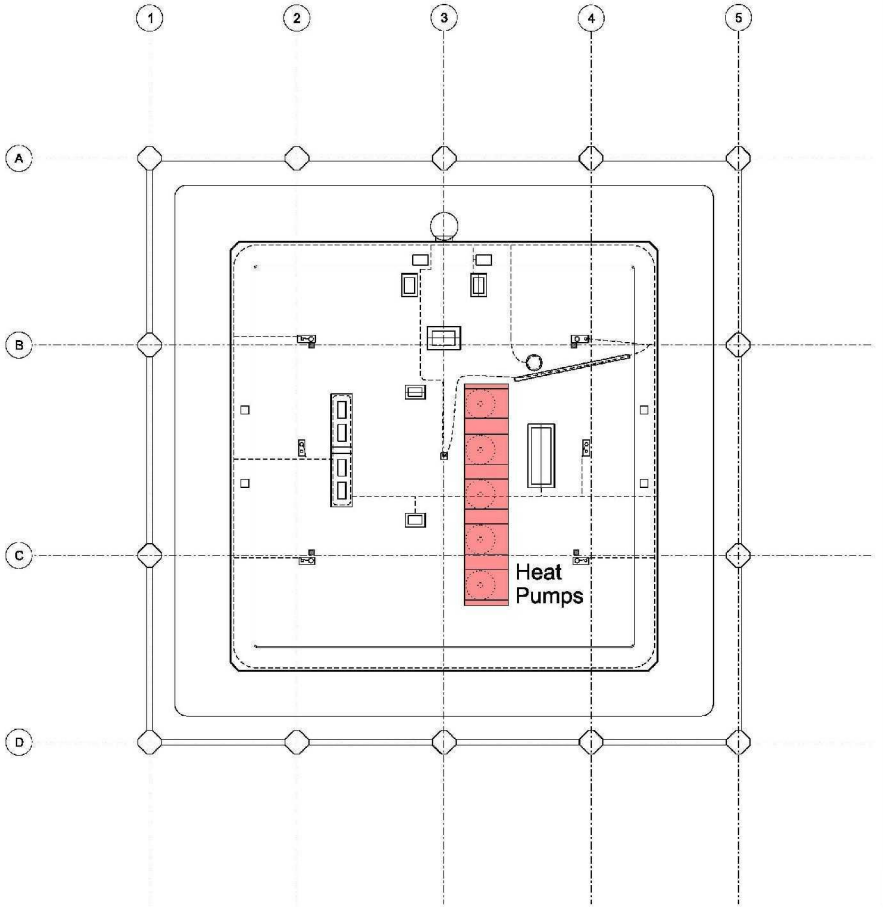
Key



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STUDIO E LLP
Palace Wharf, Rainville Road, London, W6 9HN
Tel:
Fax:

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
ROOF
FLOOR PLAN
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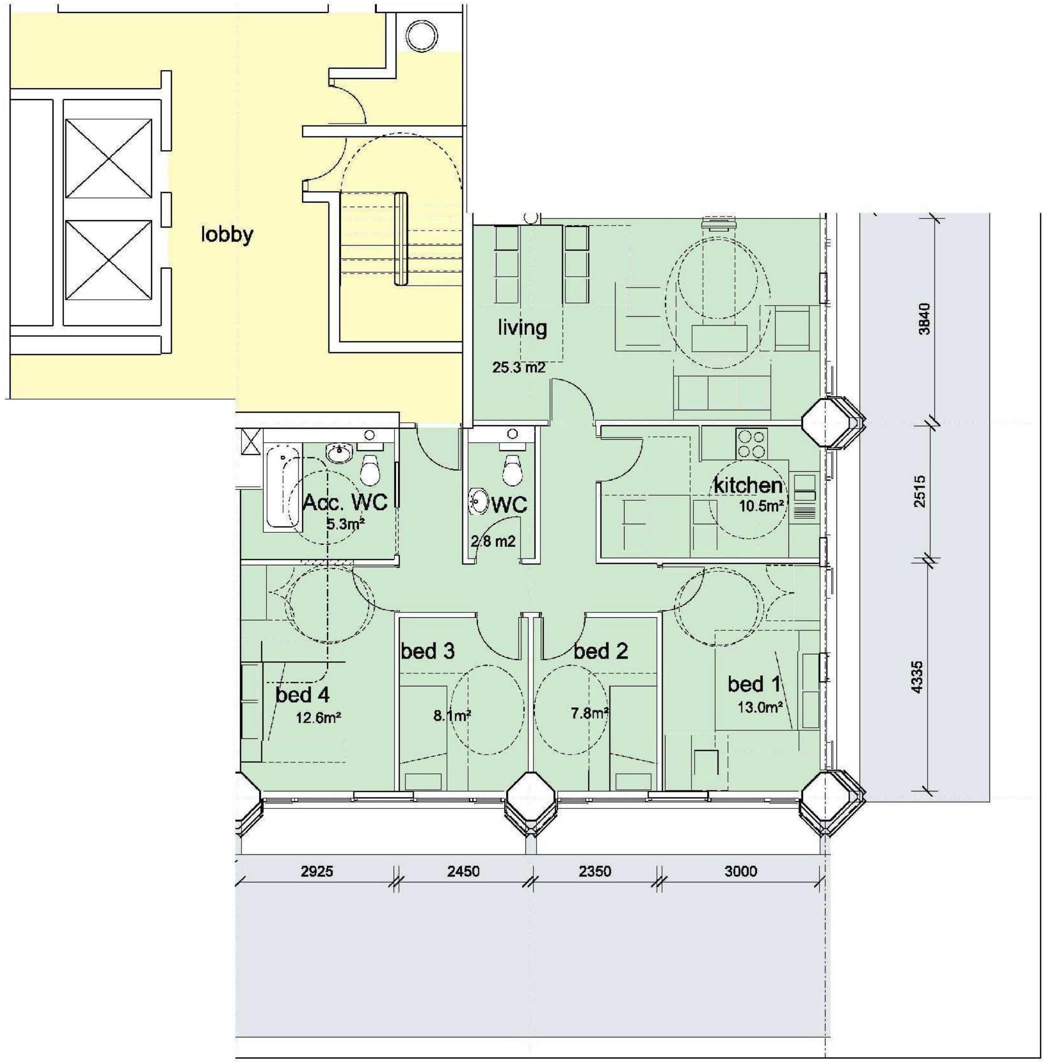

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Key

Circulation
Community Use
New Residential

Kensington & Chelsea TMO

PLANNING

STUDIO E LLP

Palace Wharf, Rainville Road,
Tel. [redacted]
Fax [redacted]

GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
4 BED
FLOOR PLAN
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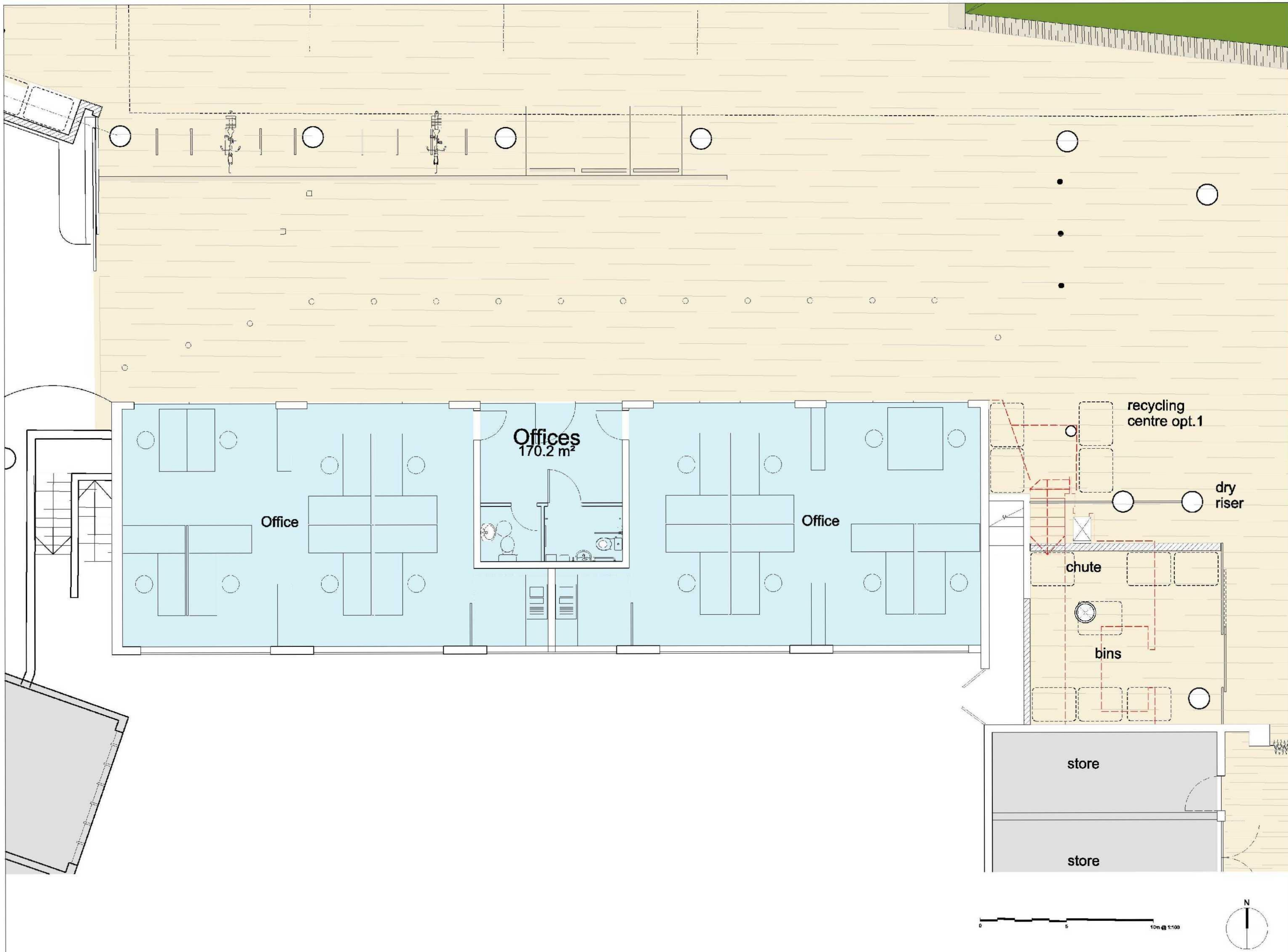

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space
- Existing Removed

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PROPOSED
BASELINE GARAGES
REFURB FLOOR PLAN
DRAWING

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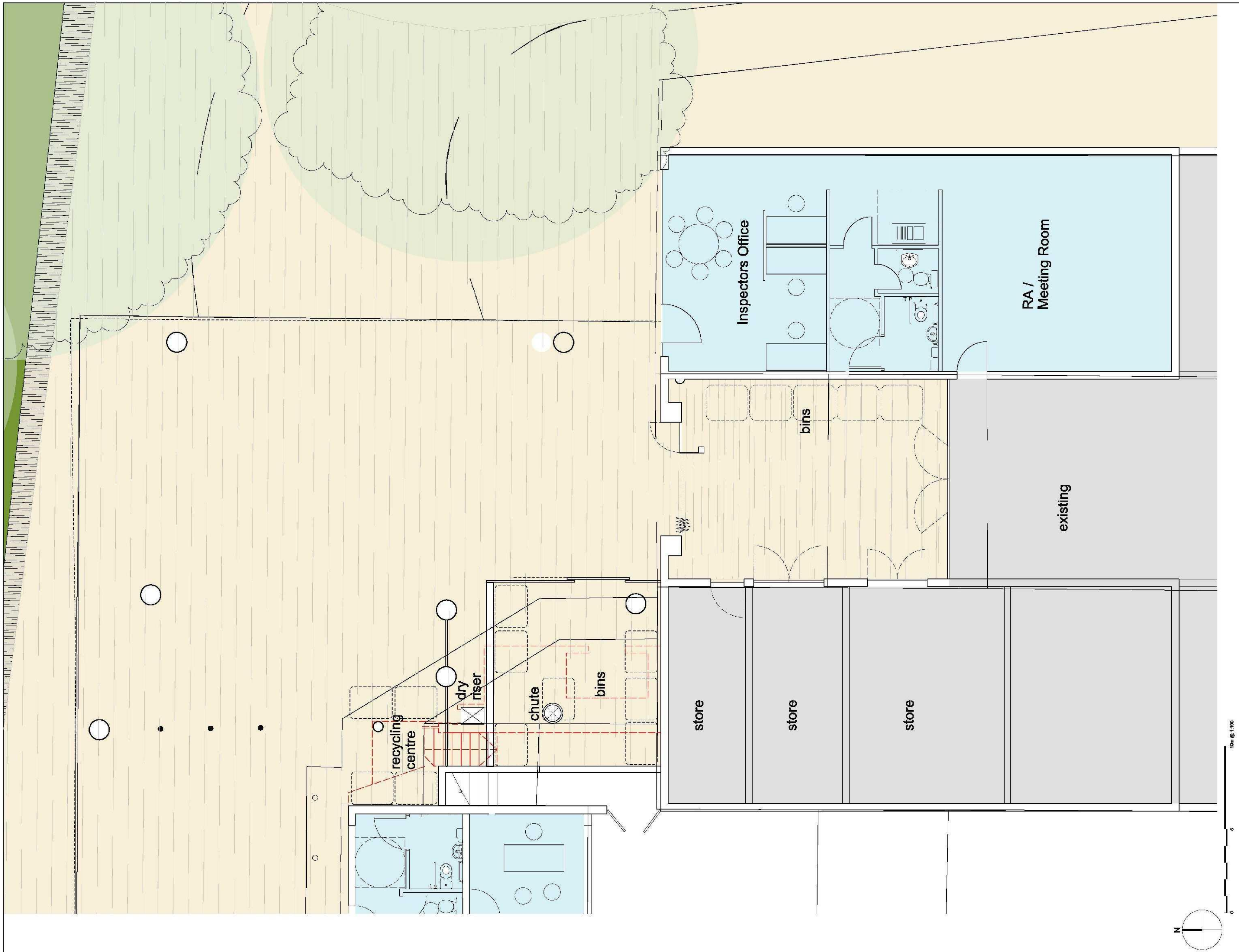

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space
- Existing Removed

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PROPOSED BASELINE (EMB) OFFICE REFURB FLOOR PLAN
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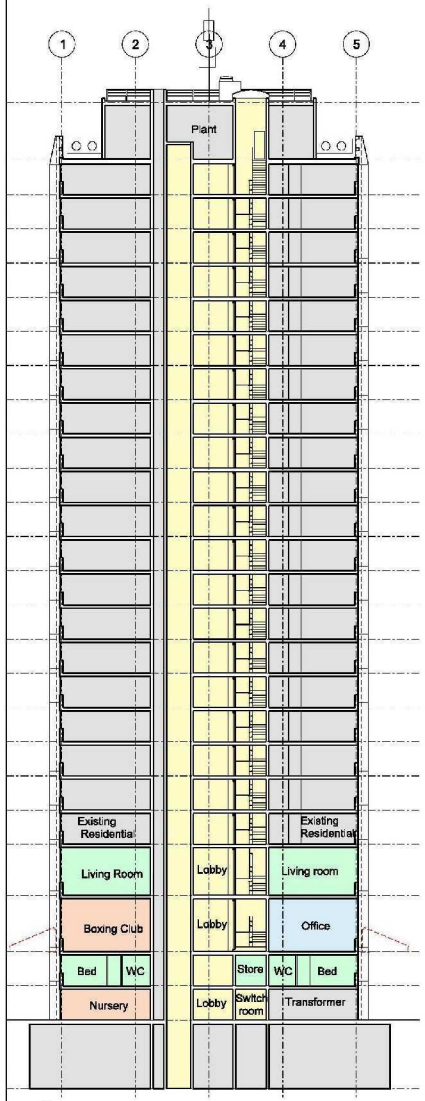

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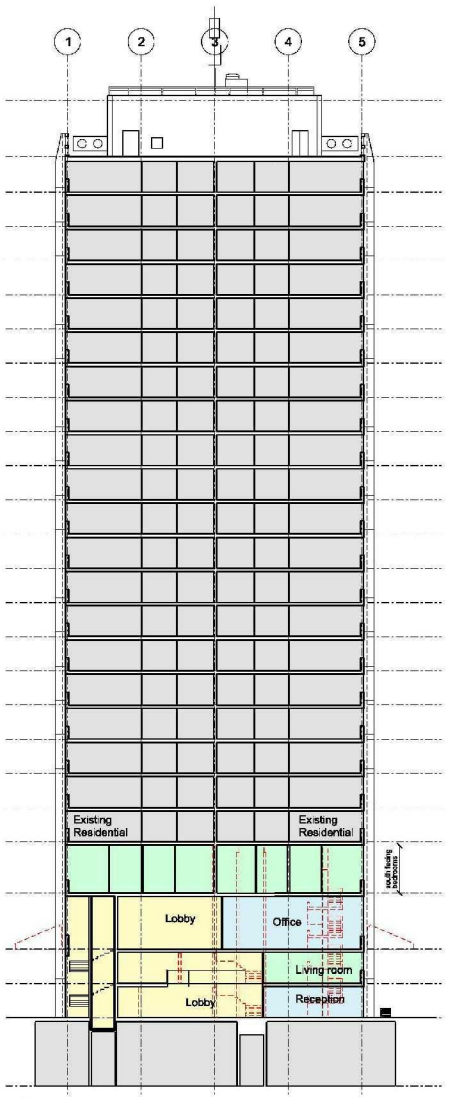

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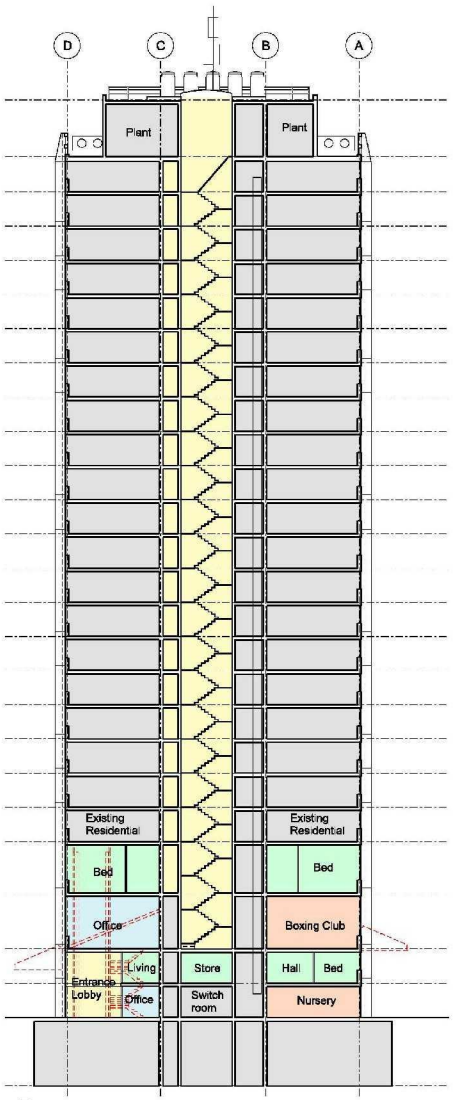

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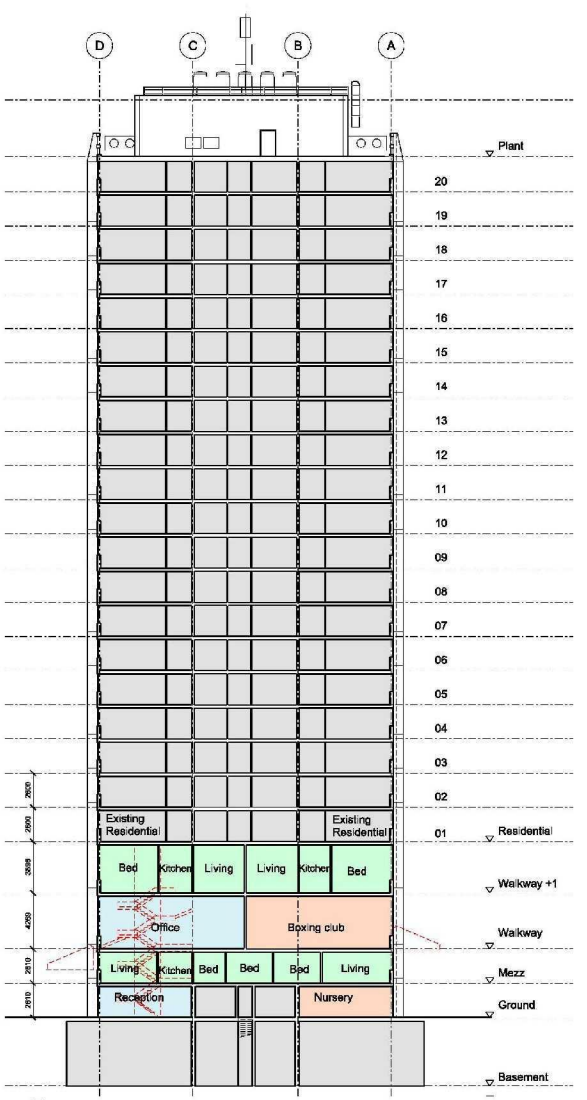

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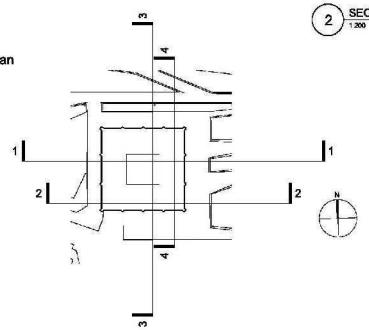

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Key

- Circulation
- Community Use
- New Residential
- Community Use Office Space

Kensington & Chelsea TMO

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GRENFELL TOWER REGENERATION PROJECT
PROJECT

PROPOSED SECTIONS
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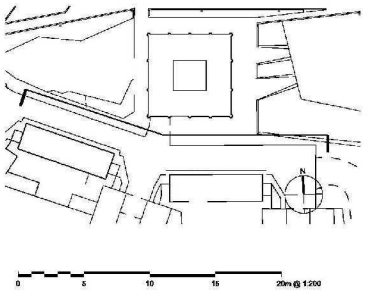
1 PROPOSED UNDRCROFT ELEVATION
1:200

Keyplan



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GRENFELL TOWER
REGENERATION PROJECT
PROJECT

PROPOSED
UNDERCROFT
ELEVATION
DRAWING

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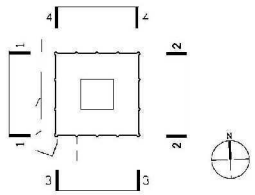
1 WEST ELEVATION
1:200

Keyplan



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London, W6 9HA
Tel: [redacted]
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PROJECT

PROPOSED
WEST ELEVATION
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2 EAST ELEVATION
1:200

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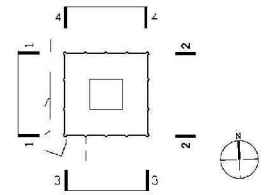

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REGENERATION PROJECT
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PROPOSED
EAST ELEVATION
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Key

3 SOUTH ELEVATION
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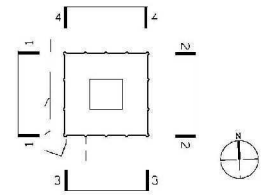

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PROPOSED
SOUTH ELEVATION
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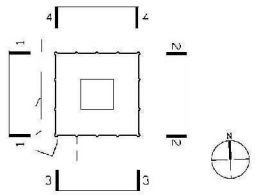
4 NORTH ELEVATION
1:200

Keyplan



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REGENERATION PROJECT
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5.7 Studio E Designers Risk Assessments

1279 - Grenfell Tower - Risk assessment schedule **STUDIO E LLP**

Key: Persons at risk: C = Contractor personnel, M = Maintenance staff, P = Public, R = Residents, V = Visitors (F = Environment)
Risk factor rating: L – Likelihood (1 – Low, 2 – Medium, 3 – High); S – Severity (1 – Low, 2 – Medium, 3 – High); R – Risk (Likelihood x Severity)

- Hazards scoring a **Risk Factor 3** attracts special notice, **Risk Factor of 4** or more require special management and an action plan to be agreed before proceeding.

Project CDM co-ordinator: **Appleyards** Latest review: 12/09/2012 Pages: 2

Element / Activity	No.	Potential hazard	Persons at risk*	Risk factor*			Action taken at design stage	Actioned		Possible control options (Contractor)
				L	S	R		By	Date	
General	00a	Fire risk during works	C/P/R	2	3	6				
	00b	Asbestos: removal or containment	C/R	2	2	4	Asbestos report commissioned			
	00c	Disruption of services, water, electricity, gas, etc.	R	2	2	4				
	00d	TV dishes, placement by residents	M/R	2	2	4				
	00e	Machinery – noise & vibration during the works	R	3	1	3				
	00f	Public safety, construction site activities, dirty streets	P/R	1	2	2				
	00g	Emergency vehicle access, strategy during works	P/R	1	2	2				
	00h	Injury to persons resident during the works	P/R	1	1	1				
	00i	Traffic disruption; access to parking and for services	R	1	1	1				
Site clearance	01a	Collapse of structure	C/P/R	1	3	3				Temp. works method statement required
Access / egress	02a	Machine movement / risk of collision due to lack of visibility	C/P/R	1	2	2				
	02b	Temporary closures of Grenfell Road to services	R	1	1	1				
Excavation, demolition	03a	Machinery – noise & vibration	C/F	3	1	3				Working hours to be agreed, out of hours working to be prohibited
	03b	Machine collision / vehicle stability	C	2	1	2				
	03c	Risk of collapse / falls	C	1	2	2				
Scaffolding	04a	Falls from height	C	1	3	3				Contractors method statement required
	04b	Falling objects	C/P/R	1	3	3				Contractors method statement required
	04c	Projections	C/R	1	1	1				
	04d	Tripping and slipping	C	1	1	1				
Stripping out, demolition	05a	Falls from openings	C/R	1	3	3				Contractors method statement required
	05b	Falling objects	C/P/R	1	2	2				
	05c	Moving objects / crushing	C/P/R	1	1	1				
Craneage	06a	Falling objects	C/P/R	1	2	2				
	06b	Moving objects / crushing	C	1	1	1				
Structural steel	07a	New lift shaft, SW corner: rises 5 levels	C/R	1	2	2				
	07b	Infill floor, SE corner, mezz & office levels	C/P/R	1	2	2				
	07c	New canopy, 4m above pedestrian traffic	P/R	1	2	2				
	07d	Handling	C	1	2	2				
Frame preparation	08a	Shot-firing or drilling injuries	C	1	2	2				
Installation of new cladding	09a	Falling / breaking glazed units	C/F	1	3	3				Contractors method statement required
	09b	Falls from height	C	1	3	3				Contractors method statement required
	09c	Handling	C	1	2	2				
Brick- & blockwork	10a	Handling	C	2	1	2				
Fastening	11a	Working at height	C	2	1	2				
Decoration	12a	Working at height	C	2	1	2				
Maintenance (future)	13a	Cleaning of new external cladding windows	R	2	3	6	Horizontal pivot units with restrictor			Carry forward to O&M manuals
	13b	Cleaning of new curtain wall elements	M	2	2	4				
	13c	Cleaning of new canopy	M	2	2	4				
	13d	Re-lamping in double-height volumes	M	1	2	3				
	13e	Lift maintenance	M/R	1	1	2				
Fire	14a	General means of escape: review	R/P/V	1	3	3				
	14b	Alarm system: review	R/F	1	3	3				
	14c	Escape strategy at mezz, ground & walkway levels - from lifts and commercial premises	R/P/V	1	3	3				
	14d	Fire-fighting strategy: review	R/P/V	1	3	3				
Rubbish removal	15a	Access for sanitary services: review	M/R	2	1	3				

6.0 FIRE STRATEGY

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Project No:	301922
Project:	**Grenfell Tower**
Doc Ref:	JW13703DN
Issue No:	01
Date:	12 September 2012

Grenfell Tower - Fire Safety Strategy

1 Introduction

This Design Note provides an outline fire safety strategy for the proposed refurbishment of the building, with particular emphasis on means of escape and access and facilities for the fire service

2 Statutory controls

The building alterations will be subject to the requirements of The Building Regulations 2010 and will have to be carried out:

- In accordance with the requirements of Schedule 1 of the Building Regulations 2010; and
- Such that the existing arrangements are no worse than they were before the alterations were carried out.

The alterations must also make the building no worse in terms of compliance with the Regulatory Reform (Fire Safety) Order 2005 and Section 20 of the London Building Acts (Amendment) Act 1939.

3 Compliance with The Building Regulations 2010

3.1 Compliance with B1 (means of warning and escape)

3.1.1. MEANS OF WARNING

Self contained fire detectors will need to be provided within all new apartments to an "LD3" standard as specified in BS 5839-6[1].

The boxing club and office accommodation at Walkway Level and the nursery and reception/office suite at ground level will need to be provided with a fire detection and alarm system to an "L3" standard as defined in BS 5839-1[2]

Smoke detectors will need to be provided in the common parts to:

- activate the smoke extract system serving them;
- to activate any fire/smoke curtains provided to safeguard the means of escape; and
- to cause an alarm of fire to be given to those parts of the building which are not residential apartments (this appears to be a feature of the existing fire safety arrangements for the building).

3.1.2. MEANS OF ESCAPE

To provide a satisfactory standard of means of escape from both the existing (unaltered) parts and to the altered parts of the building the measures outlined below will be necessary.

EXISTING PARTS

The existing smoke extract system serving the common lobbies will need to be refurbished and/or modified to reflect statutory requirements and any recommendations made by the statutory authorities regarding this system will need to be considered.

Any changes/improvements recommended in the Fire Risk Assessment for the building will need to be implemented.

ALTERED PARTS

OFFICE LEVEL

COMMON AREA

The new entrance doorways to the apartments will need to be self closing "FD30S" doors.

The vent shafts for smoke extract will need to be modified as necessary to reflect the strategy for the existing parts (see above).

WITHIN APARTMENTS

Each entrance hall will need to be enclosed by construction having a 30 minute standard of fire resistance with the doorways therein fitted with "FD20" doors which need not be self closing (this will not apply to the doors to bathrooms and wcs which need not be fire doors provided these rooms are separated from adjoining habitable rooms by walls having a 30 minute standard of fire resistance)

There need only be one exit from each apartment provided that the travel distance from the apartment entrance door to the door to the furthest habitable room does not exceed 9m.

WALKWAY LEVEL

COMMON AREA

The boxing club and office suite will need to be separated from the common lobby by construction having at least a 30 minute standard of fire resistance and approached from the common lobby by protected lobbies (lobbies enclosed by construction having at least a 30 minute standard of fire resistance incorporating inner and outer self closing "FD30S" doors).

These lobbies will need to be ventilated directly to the exterior by openings not less than 0.4m^2 in area.

The common area will need to be "fire sterile".

ACCOMMODATION AT THIS LEVEL

To meet travel distance requirements, an alternative escape from the boxing club will be needed. This will have to be to the common area via a ventilated, protected lobby as described above.

As stairs serving residential accommodation should not also serve other accommodation, it may be necessary to provide sprinkler (or water mist) systems to the boxing club and office suite.

(NOTE: some modification of the above requirements may be possible subject to negotiations with the statutory authorities)

MEZZANINE LEVEL

COMMON AREA

The new entrance doorways to the apartments will need to be self closing "FD30S" doors.

The vent shafts for smoke extract will need to be extended to serve this level.

WITHIN APARTMENTS

Each entrance hall will need to be enclosed by construction having a 30 minute standard of fire resistance with the doorways therein fitted with "FD20" doors which need not be self closing (this will not apply to the

doors to bathrooms and wcs which need not be fire doors provided these rooms are separated from adjoining habitable rooms by walls having a 30 minute standard of fire resistance)

There need only be one exit from each apartment provided that the travel distance from the apartment entrance door to the door to the furthest habitable room does not exceed 9m. In this connection, the secondary exit from the southern end of each of the E and W apartments can be omitted

GROUND LEVEL

COMMON AREA

The nursery and reception/office suite will need to be separated from the common lobby by construction having at least a 30 minute standard of fire resistance. In the case of the nursery, this separation should be imperforate. In the case of the reception/office suite, this should be approached from the common area by a protected lobby (a lobby enclosed by construction having at least a 30 minute standard of fire resistance incorporating inner and outer self closing "FD30S" doors).

This lobby will need to be ventilated directly to the exterior by an opening not less than 0.4m^2 in area.

The common area will need to be "fire sterile".

ACCOMMODATION AT THIS LEVEL

As stairs serving residential accommodation should not also serve other accommodation, it may be necessary to provide sprinkler (or water mist) systems to the reception/office suite.

(NOTE: some modification of the above requirements may be possible subject to negotiations with the statutory authorities).

3.2 Compliance with B5 (access and facilities for the fire service)

DRY RISING MAIN

It will be necessary to re-site the existing inlet to the dry rising main (which, it is understood, is located internally within the common area) to a suitable location on the external face of the building within 18m of (and in sight of) where a pumping appliance would pull up.

4 Compliance with The Regulatory Reform (Fire Safety) Order 2005

4.1 First aid fire-fighting equipment

It will be necessary to provide first aid fire-fighting equipment (portable fire extinguishers) in the non residentail areas of the building. These should be selected and located in accordance with the recommerndations of BS 5506-8[(3)].

4.2 Fire Risk Assessment

It will be necessary to update the Fire Risk Assessment in the light of the proposed changes to the building.

5 Compliance with Section 20

It might be necessary to provide openable windows for smoke ventilation to the new accommodation.

6 References

1. BS 5839-6: 1995. Fire detection and alarm systems for buildings – Part 6: Code of practice for the design and installation of fire detection and alarm systems in dwellings

2. BS 5839-1: 2002. Fire detection and alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance

3. BS 5306-8: 2000. Fire extinguishing installations and equipment on premises – Part 8: Selection and installation of portabl;e fire extinguishers – Code of practice

Prepared by:	T. Ashton **Terry Ashton** **Associate** **(for and on behalf of Exova Warringtonfire)**	**12/09/12**
Reviewed by:	Sean mc Eleney **Sean McEleney** **Graduate Engineer** **(for and on behalf of Exova Warringtonfire)**	**12/09/12**

7.0 SERVICES STRATEGY

Grenfell Tower Refurbishment

M&E Stage C Report (rev B)

September 2012

MAX FORDHAM

MAX FORDHAM

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ISSUE HISTORY

Issue	Date	Description
B	10/10/2012	Section 2.5 (kitchen extract ventilation) added and section 8.0 (water services proposal) added.
A	19/09/2012	Section 7 updated to include heating renewal option B
*	05/09/2012	Stage C issue to Client and Design Team

MAX FORDHAM LLP TEAM CONTRIBUTORS

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Andrew McQuatt	Lead Engineer / Partner
Matt Smith	Engineer
Arthur Lewis-Nunes	Lead Acoustician
Georgia Rogers	Acoustician

CONTENTS

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1.0 INTRODUCTION

1.1 Client and Design Team

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1.2 Key Points

The following issues need to be developed and resolved as early as possible during the next stage to allow the M&E design to progress beyond stage C deign.

- RBKC Planning accepting the proposals to use a gas fired air source heat pump.
- Survey of main risers needs to be completed to make sure enough spare capacity exists to be able to incorporate any new services.
- Heating replacement option A or B to be selected for the most appropriate sequencing.
- Podium level layouts frozen to allow detailed design work to begin.

1.3 Overview

The aim of this report is to identify how, as part of the Grenfell Tower refurbishment scheme, the current energy and environmental comfort problems can be addressed, and how the chosen solutions sit within the London Plan's aim to bring existing housing stock up to the Mayor's standards on sustainable design and construction.

The poor insulation levels and air tightness of both the walls and the windows at Grenfell Tower result in excessive heat loss during the winter months. Addressing this issue is the primary driver behind the refurbishment.

Due to valid safety concerns the windows at Grenfell Towers are restricted to open no more than 100 mm. This restriction causes chronic overheating in the summer months. It is essential that the renovation works do not make the overheating problems any worse and where possible we will strive to reduce overheating in line with current guidelines.

The heating system exacerbates the overheating problem due to its high uncontrolled heat losses throughout the year (including summer) and is also reaching the end of its design life. The client wishes to update the heating system at this point. Updating the heating system allows the disruptive works to 'piggy back' on the recladding works.

'The London Plan July 2011' aims to conserve energy. A defined energy hierarchy should be followed. This hierarchy is as follows:

1. Be lean: use less energy, in particular by adopting sustainable design and construction measures
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

This approach has been adopted to illustrate the environmental benefits achieved through the refurbishment of the tower.

1.4 Site & Flat Details

Grenfell Tower is a twenty three storey residential block built in the early 1970's and is located in the Lancaster West Estate in North Kensington.

The tower contains office space, a nursery and a boxing club which will be relocated within the tower as part of the refurbishment process. There is also a desire to convert two of the lower levels to new housing. The new housing design will following the same principles as the existing refurbished flats but will comply with the current building regulations.

Figure 1-1 Site Plan

1.5 Insulation and Energy

The wall construction of Grenfell tower is a solid concrete construction. Insulation is provided by a 12 mm layer of insulation bonded to the rear of the integral plaster board lining. The resulting U-value of the existing wall is 1.5 W/m^2.K. This is five times higher than current Building Regulations would allow on a new flat.

The existing windows are now coming to the end of their design life and require replacing. The existing window U-value is in the order of 5.5 W/m^2.K or about three times that above the level required by current Building Regulations. In addition to the poor thermal performance these windows also leak heavily which contributes to excessive heat loss, drafts and noise penetration.

Grenfell Tower has a communal bathroom extract system. This system extracts air at a rate of 1.8 m^3/s, 24 hours a day, 365 days a year. This warm air extracted from the bathrooms represents a significant wasted energy stream out of the building. Tenant feedback has indicated that this system is not reliable. Its failure results in the transfer of smells between flat units. Client to advise if the design team should investigate replacing the central extract plant as part of the refurbishment.

1.6 Overheating

Grenfell Tower reportedly suffers from chronic overheating in the summer. Presently the south facing flats experience the highest temperatures. The current climate change predictions for London over the next 30 to 50 years predict that peak summertime temperatures will rise. Doing nothing to improve the overheating now will result in further problems to all flat orientations in the future.

Ventilation to the flats is via single glazed horizontal sliding windows. These units are poorly sealed compared to modern standards. There is also a desire to restrict the opening of the windows for safety reasons: both to mitigate the risk of falls and to combat the problem of residents throwing objects from the windows.

By providing constant ventilation the existing poorly sealed windows are helping to reduce overheating. Increasing the air tightness and insulation levels alone without thinking about the flat cooling would result in a worse overheating problem than that currently being experienced.

1.7 Heating System

The residential units are heated by a single loop ladder arrangement, which also provides domestic hot water (DHW) via a hot water cylinder in each flat; this unit is referred to as the ELSON water storage tank in this report. The pipework serves the flats via six risers (1 per flat on each floor) and from there runs within the flats to radiators through pipework cast into the screed floors. The floor and ceiling slabs radiate heat due to the hot pipework cast within. This is contributing to the existing problem with summertime overheating of the flats. There is also currently no individual control of the heating system within each flat beyond the ability to turn off a radiator manually.

The heating system is now 30 years old and is coming to the end of its design life. Occurrences of leaks in this heating system are beginning to increase.

1.8 New Domestic and Non-Domestic Units

The first four floors at Grenfell Tower are currently used for mixture of uses. As part of the refurbishment the first four floors will be reorganised to incorporate offices, a boxing club and a nursery as well as providing two floors of new domestic flats.

2.0 BRIEF

2.1 Client Briefing

The following information was used to develop the client brief.

Documents
Feasibility Report – Lancaster West – Stage 1 – Issue 02
RBKC Estimated, Capital Property Services, Forward Maintenance Expenditure

Table 2-1 – Briefing Documents

Drawings (Studio E)
PL 001 00 Location Plan
PL002 00 Existing Site Plan
PL003 00 Proposed Site Plan
PL004 00 Existing Floor Plans
PL005 00 Proposed Floor Plans
PL006 00 Existing Sections
PL007 00 Proposed Sections
PL008 00 Existing Elevations
PL009 00 Proposed West Elevation
PL010 00 Proposed East Elevation
PL011 00 Proposed South Elevation
PL012 00 Proposed North Elevation
PL013 00 Undercroft Elevation
SK011b Proposed Plan, Elevation and Section Detail
RE015 00 Plant Room Roof Plan

Table 2-2 – Briefing Drawings

Meetings & Consultations
Design Team Meetings 01/05/2012, 13/06/2012, 18/07/2012, 19/07/2012, 26/07/2012, 09/08/2012.
Existing natural gas visit 13/06/2012
Design Session with Studio E 09/07/2012
Roof top plantroom visual survey 09/08/2012

Table 2-3 - Meeting and Consultations

2.2 Design Guidance and Parameters

General Design Guidance

Documents
Building Regulations 2011
CIBSE A Guide – Environmental design data
CIBSE guide G – Public health engineering
The Institute of Plumbing – Plumbing Engineering Services Design Guide
Site Layout Planning For Daylight and Sunlight, A guide to good practice, Paul Littlefair, BRE Press
The London Plan, Spatial developments strategy for greater London, Mayor of London
National Planning Policy Framework (NPPS)
RBKC Policy CE1

Table 2-4 - Design Guidance

External Design Conditions

The external conditions that will be taken for design calculations are as follows:

Weather data taken from the CIBSE A guide – Environmental design data for London, tables 2.4 and 2.6 and are therefore industry standard design temperature for London.

	Summer (°C)	Winter (°C)
Dry Bulb Temperature	28.0	-3.3
Wet Bulb Temperature	20.0	-4.0

Table 2-5 - Design Weather Data

The winter temperatures in Table 2-5 will be used to design the heat emitters for all areas of the building. The summer temperatures in Tabie 2-5 will be used to design the mechanical cooling for any other areas that require mechanical cooling that have yet to be identified.

Internal Heat Gains
The following data is used to calculate heat gains, occupancies and electrical loading for each space to determine the heating, cooling, ventilation and power requirements.

Room Type	Heat Gain (W/m^2)
Uncontrolled heating from LTHW heating pipework in existing flats	7.4
Existing residential lighting	1.3
Small power	5
Domestic occupancy (heating, cooling and ventilation)	17.5 m^2/person
Office occupancy (heating, cooling and ventilation)	12 m^2/person (as per BCO guidance)
Solar Heat Gains	To be calculated using a dynamic thermal model.

Table 2-6 - Room Heat Gains

Occupancy Hours
Assumed occupancy hours.

Domestic Living Room	09:00 to 22:00
Domestic Living Room	4745 hours per year
Domestic Bedroom	22:00 to 09:00
Domestic Bedroom	4015 hours per year
Office	09:00 to 17:00
Office	2080 h per year

Table 2-7 - Assumed Occupancy Hours

Internal Environmental Conditions
Heating
The heating system will be designed to achieve the following minimum temperatures when the external conditions are at those given in Table 2-5 - Design Weather Data.

Domestic Room Type	Min Occupied Heating Temperature (°C)
Living Room	24
Kitchen	21
Bedroom	21
Bathroom	Unheated internal room*
Hall	18*

Table 2-8 – Domestic design temperatures

*Only ground and top floor residential properties will have radiators in the corridors and bathrooms as these are the only floors with any heat loss from the circulation space.

Non-Domestic Room Type	Min Occupied Heating Temperature (°C)
Offices and Meeting Rooms	21
WCs	19
Changing/Shower Rooms	22
Reception/Waiting Area	22
Kitchen	18
Server Room	18
Storage	16

Table 2-9 - Minimum Internal Temperatures at External Design Conditions

A lower set back temperature of 14 °C will be maintained in all spaces (server rooms always maintained at 18 °C minimum) to protect against freezing and condensation when the building is unoccupied.

Cooling
Domestic
The following criteria are taken from the CIBSE A Guide and are also referenced in the Draft Climate Change Adaptation Strategy for London.

Living Room: 28°C shall not be exceeded for more than 1% of occupied hours (09:00 to 22:00, 41 h per year)

Bedroom: 26°C shall not be exceeded for more than 1% of occupied hours (22:00 to 09:00m, 47 h per year)

Non-Domestic
The natural ventilation will be designed to achieve the criteria set out in CIBSE/BCO for peak summertime temperatures - "No more than 5% of occupied hours over 25 °C and no more than 1% of occupied hours over 28 °C." These temperatures may seem high, but it is important to remember that a well-designed naturally ventilated building will feel more comfortable at higher temperatures than an air conditioned office. This is due to the high amount of air movement through the space. This air movement helps the body lose heat through evaporation (sweating).

Applying the assumed occupancy hours in Table 2-7 to the above overheating criteria means that 104 hours would be allowed to be above 25 °C and 21 hours will be permitted to be above 28 °C. These hours would occur over the summer and would be unlikely to occur consecutively.

The mechanical cooling in any server room will be designed to achieve a maximum internal temperature of 24°C based on an IT load of 1500 W/m^2.

Artificial Lighting

Existing Domestic

The artificial lighting to the existing residential is outwith the scope of this project.

New Domestic

Room Type	luminance (Lux) on Working Plane	Working Plane Height
Living Room	Pendant light fittings capable of 50 to 300 Lux	FFL
Kitchen General	Pendant light fittings capable of 150 to 300 Lux	FFL
Kitchen Worktop	Under cabinet lighting or overhead low energy spot lights capable of 500 lux	900 mm
WC	Pendant light fittings capable of 100 Lux	FFL
Corridor	Pendant light fittings capable of 100 Lux	FFL
Bedroom	Pendant light fittings capable of 100 Lux	FFL

Table 2-10 - New Domestic light levels

New Non-Domestic

Room Type	luminance (Lux) on Working Plane	Working Plane Height
Office (Background)	200	750 mm
Office (Task Lighting)	500	750 mm
Meeting Rooms	Normally 300 with ability to increase to 500	750 mm
Reception	200 (500 on reception desk by task lighting or fixed feature lighting)	750 mm
Lift Lobbies	200 (to be confirmed with selected lift manufacturer)	FFL
WCs	200	FFL
Corridors	100	FFL
Store Room	150	FFL
Kitchen	500	900
Canteen	200	750
Nursery General	300	FFL
Boxing Club General	300	FFL
Boxing Club Ring	Class 3 (500 Lux Horizontal, 250 Vertical)	At ring level

Table 2-11 - Artificial Light Levels on Working Planes

Lighting calculations will assume the following minimum surface reflectance:

Surface	Reflectance (%)
Walls (Plaster with Light grey paint)	50
Ceiling (Plaster painted white)	70
Floor (Carpet)	20

Table 2-12 - Lighting calculation design assumptions

Choosing internal finishes with lower light reflectance will result in more artificial lighting or higher power lamps being needed to achieve the design light level.

The external lighting will achieve the recommended minimum light levels as set out by CIBSE as shown in Table 2-13 - External Lighting Levels.

Area	luminance (Lux) on Working Plane
Bike Racks and Car Parking	>20
Walkways and Perimeter Zone	>20
Notice Boards	150

Table 2-13 - External Lighting Levels

Ventilation
The ventilation provision for the majority of the building will be provided by natural ventilation.

The natural ventilation design is based on the CIBSE application manual AM10:2005 Natural ventilation in non-domestic buildings.

The ventilation strategies will be designed to achieve the following ventilation rates as set out in the Building Regulations.

Non-Domestic

Room Type	Ventilation Rate
Office and Meeting Room (mechanical)	10 l/s/person
Office and Meeting Room (Natural Ventilation)	Designed to CIBSE AM 10
Shower Room	15 l/s (intermittent)
WC	6 l/s per WC/urinal
Reception	10 l/s/person

Table 2-14 – Non-domestic Room Ventilation Rates

Domestic

Flat	Background Ventilation Rate
Single Bed Trickle Vent Area	*35,000 mm^2
Two Bed Trickle Vent Area	*60,000 mm^2
Three Bed Trickle Vent Area	*65,000 mm^2
Four Bed Trickle Vent Area	*65,000 mm^2
WC	15 l/s
Kitchen	Canopy above hob capable of extracting at least 30 l/s* or 60 l/s if not located above hob.

Table 2-15 - Domestic ventilation rates

*The trickle ventilation requirements will be met using acoustic trickle ventilators built into the new window frames, see Appendix C – Acoustics Report for further details.

Acoustics
Max Fordham LLP has been appointed to undertake a noise assessment to support a Planning Application for a refurbishment of Grenfell Tower in the Royal Borough of Kensington and Chelsea (RBKC). The proposed scheme will make improvements to the external façade including replacing the windows and installing acoustic trickle vents. A number of items of mechanical plant will be installed on the roof to provide heating to the building.

An assessment of internal noise levels after the façade refurbishments are made, and the impact of noise emissions from the plant to nearby residential properties, has been made.

The full acoustic report can be found in Appendix C – Acoustics Report.

Adapting the acoustic separation between the party walls of the existing domestic flats is outwith the scope of this project.

All new flats and offices will comply with the acoustic separation requirements of the Building Regulations.

2.3 Utilities

Gas
The Gas requirements of Grenfell tower will be reduced as a result of the improved insulation that will be installed as part of the refurbishment. A new gas supply will be required to the roof level. As this will only involve an alteration to the client's side of the gas meter no application to the gas utility will be required.

Water
No significant change in the water requirement for Grenfell Tower will result from the refurbishment. Therefore no applications are required to the water utility.

Electricity
No significant change in the electrical requirement for Grenfell Tower will result from the refurbishment. New supplies will be applied for from UKPN to supply the new residential, boxing club and nursery at the start of the next stage.

2.4 Communal TV and Satellite System

Grenfell Tower is currently served by a community satellite system. This system will become the only source of satellite TV in the tower and all personal satellite dishes will be removed as part of the refurbishment works.

Figure 2-1 - External wiring for communal satellite system

The proposed cladding will cover the existing external coaxial cabling (Figure 2-1) for the communal satellite system. The following strategies show how the maintenance requirements of the cables can be met.

Option 1
Retain the existing external wiring as it is and provide trunking with access hatches in the new cladding at each entry point to accommodate future rewiring and maintenance.

Option 2
Re-install wiring to the surface of the new cladding. Either surface fixed or concealed within a new trunking system with knock out panels for future maintenance.

Option 3
Over clad the cables, which will eliminate all maintenance access (single cable from rooftop to flat which is unlikely to require maintenance). Install additional internal wiring routes within the flat risers with enough capacity to rewire the flats if /when the external cables fail. New cable routes could be installed in conjunction with the heating refurbishment.

Option 4
As option 3, but remove the existing external cable and carry out a full re-wire of the TV system as part of the main refurbishment works.

The above options have been discussed with a representative from KCTMO's IRS installation contractor SCCI (Tom

Chesterman). The above options were all confirmed as viable and SCCI are therefore happy to proceed with any of the proposed options. It was however reiterated that access will be required to the 15 flats that have not so far been connected to the central IRS system and that it would be prudent to carry out a full test of the system prior to overcladding commencement.

The potential for additional satellite coverage was also discussed and the results were as follows; additional coverage could be supplied with the addition of another dish. This would enable TurkSat to be included. In order to do this either the signal could be run down the secondary cable route currently installed for Sky+ (therefore losing this facility), or an additional cable run could be installed externally prior to cladding to enable the addition of TurkSat and Sky+.

It is proposed that Option 3 is followed with the necessary installation and testing work undertaken by SCCI prior to the cables being overclad.

2.5 Kitchen Ventilation

The facility for installation of mechanical kitchen extract ventilation was identified by Max Fordham as a desirable option early in the design phase. This is currently required for all new dwellings and therefore represents best practice. The addition of the over-cladding and installation of new double glazed window units will greatly increase the airtightness of the flats. If extract ventilation is not considered then moisture generated from cooking could build up, leading to potential problems with moisture leading to mould growth.

The brief from RBKC TMO was to provide the following:

1. Mechanical kitchen extract to those flats that do not already have it.
2. The ability to vent existing kitchen extract systems outside.
3. A spigot for venting tumble dryers and/or air conditioning units outside.

Due to the small area of high level external wall available within the kitchen area of the flats we propose to incorporate a panel that can be used to mount a mechanical extract fan or a connection point for existing extract above the purge window.

There is, however, an issue with providing additional capacity via spigots for tumble dryers and air conditioning units in that if a greater number of spigots are provided, the purge vent area becomes smaller. This would reduce the effectiveness of the designed system in combating summertime overheating. It is also the case that with the purge area provided, air-conditioning should not be necessary in order to cool the flats.

Therefore, our proposal is to house an extract vent within a panel above the purge vent that can be fitted with a mechanical extract fan or, alternatively, can be connected to an existing kitchen extract system via ducting. This will provide an extract rate of 60 l/s, in line with current Building Regulations Part F for new dwellings. The requirement for additional spigots cannot be met without compromising the existing window ventilation strategy or penetrating the new cladding.

An illustration of how this proposed method could be achieved is shown below in Figure 2-2.

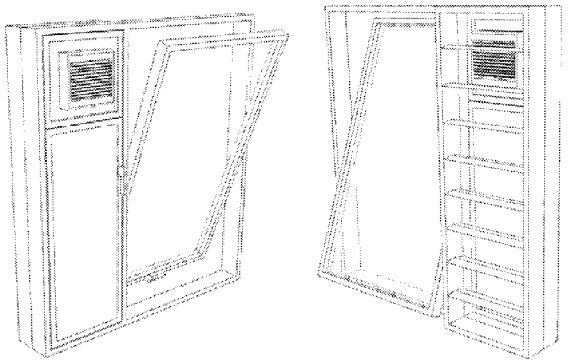


Figure 2-2 - Kitchen ventilation panel above purge vent panel

3.0 PART L BUILDING REGULATIONS

Under Part L of the Building Regulations the Grenfell Tower project is classified as a "mixed use development" as it contains both domestic and non-domestic elements. The domestic parts of the building will be covered by part L1B and the non-domestic parts will be governed by part L2B. The following section is a summary of the relevant requirements form the different regulations.

Relevant Part L - Compliance Documents

Level	Original Use	Proposed Use	Relevant Building Regulations
Ground	Reception, Boxing Club, & Storage	Reception & Nursery	Part L2B Existing non-domestic
Mezzanine	Nursery	Residential	Part L1B Existing Domestic
Walkway	RBKC TMO offices	Boxing Club and Offices	Part L2B Existing non-domestic
Walkway+1	Offices	Residential	Part L1B Existing Domestic
4th to 23rd	Residential (Dwelling)	No Change	Part L1B Existing Domestic

Table 3-1 - Part L Compliance Documents

U-value Targets

Part L1B (Existing domestic)

Element	Building Regulations Minimum Target U-Value ($W/m^2.K$)	Proposed U-Value ($W/m^2.K$)
Window	1.8	1.6
New Wall	0.28	0.15
Upgraded Wall	0.30	0.15
Upgraded Flat Roof	0.18	0.15
Curtain Wall (L2B)	1.8*	

Table 3-2 - Part L1B Minimum U-values

*1.8 is upper limit of curtain walling, Equation 1 should be used to calculate the limiting U-value for curtain walling which is bespoke to the individual project.

$$U_{Limit} = 0.8 + \{(1.2 + (FOL \times 0.5)) \times GF\}$$

Equation 1 - Upper limit of curtain walling U-value

Where FOl is the fraction of opening lights and GF is the glazed fraction.

SAP and SBEM Calculations

Level	SAP or SBEM Calculation required to show building regulations compliance
G	No
Mezzanine	No
Walkway	No
Walkway+1	No
4th to 23rd	No (SAP calculations will be performed to generate evidence for BREEAM Domestic Refurbishment 2012, these will be passed to Building Control to support the Building Warrant)

Table 3-3 - SAP and SBEM Requirements

No SAP or SBEM calculations will be required to show compliance with part L1B or L2B. Building control will require a document that states that the refurbishment will comply with the regulations set out in L1B and L2B.

Energy Performance Certificates (EPC)

The lowest possible EPC rating achievable within the constraints of the budget is the aspiration for the project.

Level	EPC Required
G	Yes
Mezzanine	Yes
Walkway	Yes
Walkway+1	Yes
4th to 23rd	No

Table 3-4 - EPC requirements

Energy performance certificates will be required for all areas except the existing domestic from floors 4 to 23. Max Fordham LLP offer an EPC service as an additional duty. Max Fordham would be happy to submit a price for these works in due course.

4.0 REFURBISHMENT RESPONSE TO EXISTING ENERGY & ENVIRONMENTAL ISSUES

4.1 Insulation

Improving the insulation levels of the walls, roof and windows is the top priority of this refurbishment.

Improving the insulation levels on a solid wall construction is always best done from the outside of the wall. This solves several issues with thermal bridging and interstitial condensation. Thermal bridging will be kept to a minimum by insulation window reveals and using thermal breaks on all fixings that link the new rain screen cladding to the existing concrete structure.

The chosen strategy is to wrap the building in a thick layer of insulation and then over-clad with a rain screen to protect the insulation from the weather and from physical damage.

Table 4-1 below shows the target levels of insulation for Grenfell Tower. The proposed insulation levels far exceed those required by Building Regulations. Insulation improvements may only happen once or twice in a building's lifetime due to the complexity and disruption caused. For this reason we are going over and above current Building Regulations to make sure the building continues to perform well into the future.

Column two of the Appendix A Heating Options Study shows the energy improvements that are made to Grenfell Tower by applying the improved insulation and new windows.

Element	Building Regulations[1] ($W/m^2.K$)	Grenfell Refurbishment ($W/m^2.K$)	Improvement over Building Regulations
External Walls	0.3	0.15	50 %
Roof	0.18	0.15	17 %
Windows	1.8	1.6	11 %

Table 4-1 Proposed U-values at Grenfell Tower

[1] Part L1 2010 Building Regulations 2010, maximum permissible values for each element in the notional building.

External Walls

An external wall target U-value of 0.15 $W/m^2.K$ was calculated using the areas shown in Figure 4-1 and the thickness build-ups illustrated in Figure 4-2 and detailed in Table 4-2, Table 4-3, Table 4-4 and Table 4-5.

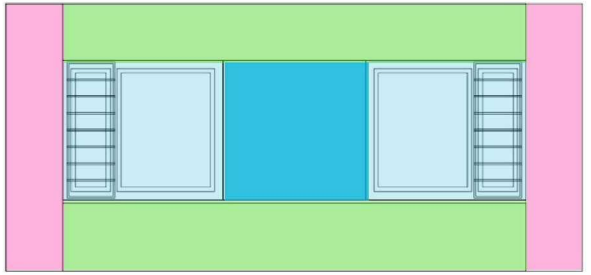


Figure 4-1 Area Weighted U-Value Calculation Areas

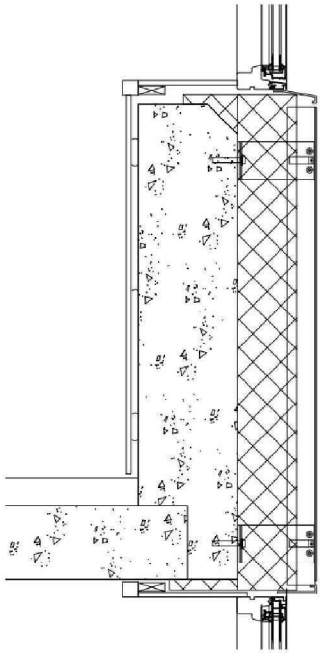


Figure 4-2 Section of Spandrel Wall Panel with New Insulation and Rain Screen Cladding

Spandrel Wall Panel (Green)

Element (Outside to Inside)	Conductivity W/(m.K)	Thickness mm
Zink Cladding (New Rain Screen)	160.0	3
Ventilated Cavity	n/a	50
Insulation (New, Celotex FR5000)	0.021	150
Cast Concrete (Existing)	1.400	250
Insulation (Existing)	0.035	10
Plasterboard (Existing)	0.160	12
Total		**475**
U-value (W/m2.K)		**0.1248**

Table 4-2 Spandrel Wall Panel Build-up

Column (Pink)

Element (Outside to Inside)	Conductivity W/(m.K)	Thickness mm
Zink Cladding (New Rain Screen)	160.0	3
Ventilated Cavity	n/a	50
Insulation (New, Celotex FR5000)	0.021	100
Cast Concrete (Existing)	1.400	100
Insulation (Existing)	0.035	10
Plasterboard (Existing)	0.160	12
Total		**275**
U-value (W/m2.K)		**0.1810**

Table 4-3 Column Build-up

Glazing Infill Panel (Blue)

Element (Outside to Inside)	Conductivity W/(m.K)	Thickness mm
Glass	1.1	6
Insulation (New, Celotex FR5000)	0.021	100
Insulation (New, Celotex FR5000)	0.021	25
Plasterboard	0.160	12
Total		143
U-value (W/m2.K)		0.16

Table 4-4 Glazing Infill Panel Build-up

Total Area Weighted Average

Building Element	U-Value W/m2.k	Area
Spandrel Wall Panel	0.1248	5.45
Column	0.1810	2.88
Glazing Infill Panel	0.1617	1.88
Total Area Weighted Average		0.15

Table 4-5 Area Weighted Average Calculation Results

4.2 Overheating in Existing Residential

Grenfell Tower suffers from summertime overheating due to the design and operation of the current heating system and the safety restrictors that restrict the window openings to 100 mm. To add additional insulation without improving the ventilation will make the existing overheating problem worse.

Ventilation to the flats is currently via single glazed horizontal sliding windows. These units are poorly sealed compared to modern standards. There is also a desire to restrict the opening of the windows for safety reasons; both to mitigate the risk of falls and to combat the problem of residents throwing objects from the windows. For this reason the re-cladding of the building will be carefully designed in conjunction with the ventilation systems in order to ensure adequate summertime cooling.

The design of ventilation and window options for Grenfell Tower was driven primarily by four key requirements;

1. Prevention of summertime overheating as a result of increased insulation incorporated within the cladding system.
2. Comply with Building Regulations
3. Ability for the windows to be cleaned from inside the dwellings by residents.
4. 100 mm restriction on window opening aperture desired by client for safety reasons and to address anti-social behaviour of residents throwing items from the windows.

Building Regulations
For refurbishment works to existing buildings Building Regulations Approved Document Part F, section 7.1 states that;

"When building work is carried out on an existing building, the work should comply with the applicable requirements of schedule 1 of the Building Regulations, and the rest of the building should not be made less satisfactory in relation to the requirements than before the work was carried out..."

Therefore there must not be an overheating issue created due to the restrictions placed on the window apertures and/or the design of the proposed ventilation solution.

Building Regulations (Part L1A 2010) describes how overheating to new apartments must be limited. Although the majority of the Grenfell Tower is a refurbishment project rather than a new development, Part L1A does provide a good framework for ensuring that no overheating issues are created as a result of the works undertaken. The method of demonstrating compliance is by SAP (Standard Assessment Procedure) calculation, which includes a component to calculate the risk of overheating.

Planning Policy - Regional (The London Plan)
The London Plan (July 2011) states *'Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible.'*

Building Regulations - New Build
The Building Regulations (Part L1A 2010) describe how overheating to apartments must be limited. The method of demonstrating compliance is by SAP (Standard Assessment Procedure) calculation, which includes a component to calculate the risk of overheating. SAP does this by assigning each flat a "likelihood of high internal temperatures" score of slight, medium or high. This assessment method was carried out in the early design phase and identified that the one bedroom flats had a high likelihood of overheating. SAP is a static calculation that does not take into account real world weather data, for this reason a dynamic computer simulation was also carried out as part of the design process.

The following criteria are taken from the CIBSE A Guide and are also referenced in the Draft Climate Change Adaptation Strategy for London.

Living Room:	28°C shall not be exceeded for more than 1% of occupied hours (09:00 to 22:00, 41 h per year)
Bedroom:	26°C shall not be exceeded for more than 1% of occupied hours (22:00 to 09:00m, 47 h per year)

Recommended Regulatory Approach for Grenfell Tower
To comply with the Part F requirement we need only to ensure that the existing overheating problem does not become any worse than it currently is. However we are aware that the summertime temperatures in Grenfell Tower cause many residents discomfort. These conditions do not provide a sensible target for overheating. As such the overheating of the flats at Grenfell Tower will be assessed against both the refurbishment criteria and the new build criteria using a dynamic thermal model predict the number of hours that rooms will be hotter than their target temperature, focusing on the temperatures in the living rooms and the bedrooms as this is what the legislation is concerned with.

A short list of three different types of window configuration for dealing with overheating and the criteria above have been investigated. The three window types that were looked at are central pivot, tilt and turn and horizontal sliding.

A series of computer simulations were run to assess the effects of the different window types and to help assess the requirements for solar control glass and areas of window that allows safe rapid purge ventilation in the summer. These simulations were each given a model name shown in Table 4-6.

Model Reference	Description	Insulation	Heating
A	Current Grenfell Tower	Existing	Existing
B	Improved Heating System	Existing	New
C1	Pivot windows with acoustic trickle ventilation	New	New
C2	Tilt and Turn windows with acoustic trickle vent	New	New
C3	Horizontal Sliding windows with acoustic trickle vent	New	New
D1	Pivot with Solar Control	New	New
D2	Tilt and Turn with Solar Control	New	New
D3	Horizontal Sliding with Solar Control	New	New
E1	Pivot with Purge ventilation	New	New
E2	Tilt and Turn with Purge ventilation	New	New
E3	Horizontal Sliding with Purge ventilation	New	New
E4	Pivot with Purge ventilation, No solar control glass	New	New

Table 4-6 Summary of Computer Simulations

Overheating Study Results

Reducing/eliminating the uncontrolled heat loss through the installation of the proposed new heating system is shown in model B. This has the effect of reducing but not solving the overheating issues at Grenfell Tower (Figure 4-3 and Figure 4-4).

Series C shows the effect on overheating of improving the insulation and airtightness of the dwelling while limiting the openings of the new windows to 100 mm (Figure 4-3 and Figure 4-4). The improved insulation means that the flats cannot lose heat during the night and the improved air tightness means the building cannot lose heat through being 'leaky'.

Introducing solar control to the D series models reduces the occurrences of overheating dramatically in D2 & D3 (Figure 4-3 and Figure 4-4). However, on its own solar control is not capable of reducing the overheating below the new build target for any window option. It was subsequently discovered that the use of solar control glass would not be acceptable as it reduces the daylight factor to an unacceptable level.

The E series introduces an area of fully openable windows that provides high ventilation rates (Figure 4-3 and Figure 4-4) without compromising safety. An illustration of the "safe purge" ventilation models E1 to E4 is shown in Figure 4-5.

The new build target is not achieved for the living room area in options E1, E2, E3 and E4 (Figure 4-3 and Figure 4-4). This is because the living room is assessed between 09:00 and 22:00 when the external air temperature is at its highest. Opening the windows when the external air temperature is above the target temperature of 28 °C can only heat the living room, not cool it. Therefore adding openable area will not improve the overheating any further. To further improve the situation we would need to include measures such as exposing thermal mass or active cooling which are beyond the scope of this refurbishment.

Grenfell Refurbishment Solution

The initial thermal simulations (A to E3) were performed before the daylight assessment was carried out for the new and existing flats. The daylight study showed that solar control glass was not a viable option on Grenfell Tower. Solar control glazing cuts out as much thermal energy as possible while allowing as much visible light to pass as possible. However using solar control glass will reduce the total visible light through the glass by a further 20% compared to normal double glazing. This 20% reduction of visible light transmittance made it impossible for the new or refurbished flats to pass the minimum daylight requirements of the Building Regulations.

As solar control glass is not an option simulation E4 was used to model the overheating of the flats with centre pivot windows, purge ventilation panels and normal double glazing. Removing the solar control glass increased the occurrences of overheating in the bedrooms and living rooms by an average of 20% and 14% respectively. However the resulting overheating for the bedrooms is still below the new build threshold as can be seen in Figure 4-3.

Option E4 has been selected as the proposed solution as this option achieves the lowest number of hours above 26/28 °C and is compatible with the minimum daylight standards in section 9.0 of this report.

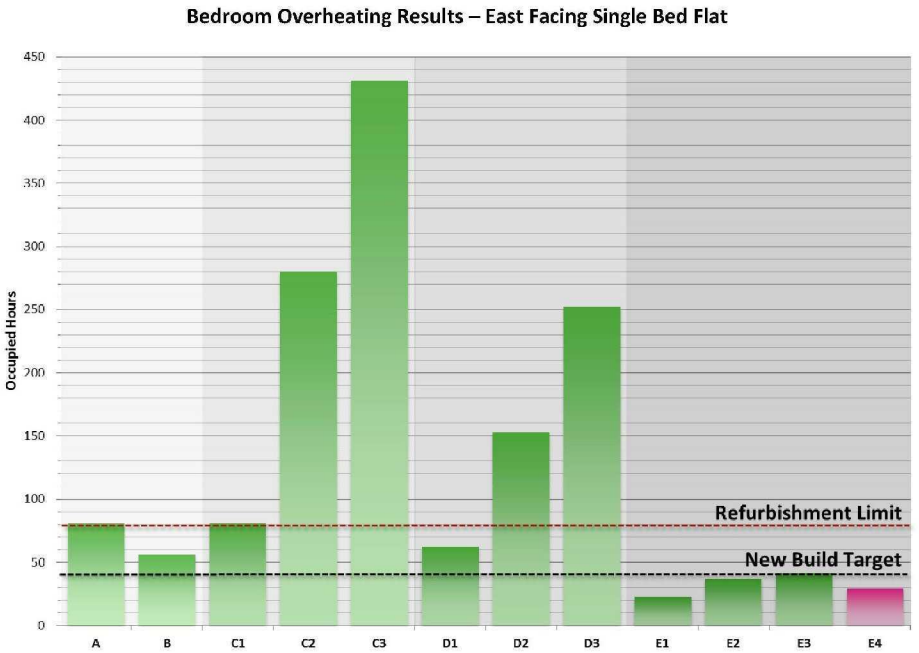


Figure 4-3 Overheating analysis in worst case bedroom

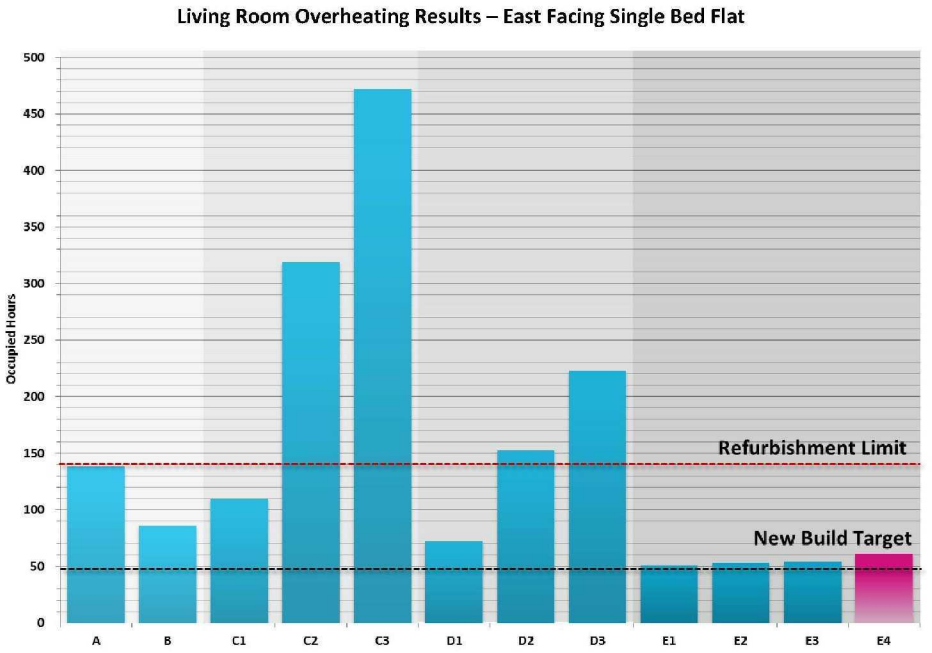


Figure 4-4 Overheating analysis in worst case living room

Figure 4-5 Safe purge ventilation

4.3 Heating System Renewal

Existing System
The residential units are heated by a single loop ladder arrangement which also provides domestic hot water (DHW) via a hot water cylinder in each flat. The pipework serves the flats via six risers (1 per flat on each floor) and from there runs within the flats to radiators through pipework cast into the screed floors. There is a pre-existing problem with summertime overheating of the flats caused by the floor and ceiling slabs radiating heat due to the hot pipework within. There is also no individual control of the heating system within each flat beyond the ability to turn off a radiator manually.

The summertime overheating is a symptom of the greater problem of heat loss and therefore energy waste due to the inefficient method of heat distribution throughout the building. When the age/construction of the building façade and likely efficiency of the heating plant is taken into consideration, it is clear that there are significant carbon reductions to be made by refurbishing the façade and heating in a cohesive manner.

The basement heating plant consists of 3x gas-fired boilers located in the basement. These boilers are old, inefficient and unreliable with an estimated efficiency of 60%. Hot water for both heating and DHW is pumped from the basement up the six risers to the flats on each floor. As these risers supply both the DHW and heating flow and return there is a requirement for them to be active both during and outside the heating season.

The heating system was comprehensively surveyed in 2008 and found to have a useful service life of approximately 10 years remaining. When this is taken into consideration along with the inefficiencies and issues mentioned previously it was decided that a complete new system would be required.

Design Brief for Refurbished Heating System
The initial client brief included the following primary issues to be solved with the new heating system as summarised below;

1. Prevent overheating due to DHW and LTHW distribution pipework.
2. Give tenants control over individual heating systems.
3. Reduce energy use and therefore operating cost.
4. Minimise disruption to tenants during and after installation.
5. Improve reliability

In addition to the above considerations the design team has also gathered further considerations from the weekly tenant consultations at Grenfell Tower. The tenants/long lease holders would also like the following to be incorporated into the refurbishment.

6. Provide mains pressure hot water to allow tenants to install showers in their properties.
7. Reduce amount of heating equipment (water storage etc.) within the flat to increase storage space.

Heating System Proposal
Several different heating options were considered. A full appraisal can be found in Appendix A. Option B2 (centralised gas absorption heat pump with central DHW storage and trace heating) was chosen as it could best address the client's and the tenants' requirements. What follows is a short summary of how the new heating system addresses the briefing points above.

1. **Reduce Overheating**
   a. Each flat will have individual heating control via a wall mounted thermostat. When the heating is off there will be no hot water flow in the flat pipework; eliminating the heating system's contribution to the summer time overheating.
   b. All pipework running through flats to be insulated to a high standard to reduce heat loss as much as possible.
   c. Replacing the radiators and insulating the external walls will allow the heating to run at a reduced temperature. This will facilitate the use of renewable heat sources and will reduce overheating.

2. **User Control**
   a. Each flat will have a thermostat that allows the user to set an air temperature for their flat and to turn the heating on/off.
   b. Thermostatic radiator valves on every radiator allow individual rooms to be controlled.

3. **Reduce Energy Consumption**
   a. The energy consumption of several heating options were analysed (see Appendix A for full appraisal). The Gas Absorption Heat pump (GAHP) (option B1 to B3) was selected due to its low carbon and running costs compared to the other options.
   b. The central extract system at Grenfell Tower currently rejects over 1.8 m^3/s of warm air from the tower. Placing the heat pumps in the path of this extract air stream allows energy to be recycled from the central extract system; turning a waste energy stream into a useful contributor to the heating and hot water demand of Grenfell Tower.

4. **Minimise Disruption to Tenants**
   a. Keeping the system renewal confined to spaces that are currently only used for heating and hot water means that the installation of the new system will minimise the disruption to the flats.

5. **Improved Reliability**
   a. The selected heat pump will be a cascaded system that combines the output of five individual units. If one of the individual units was to fail the remaining four can continue to operate independently of the failed unit.
   b. A top up/backup high efficiency gas boiler will also be provided to supplement the output of the heat pumps. This will only be necessary during periods of very cold weather and high domestic hot water use.

6. **Mains Pressure**
   a. The selected system will be a mains pressure system to allow the tenant to install showers if they wish to. The current system is open vented to the flats and does not provide enough pressure to shower.

7. **Space**
   a. Option B2 was selected in part due to its space saving within the flats. This option will remove the need for a local hot water storage unit in the flats. The space that was taken up by the water storage vessel can now become storage.

5.0 PLANNING POLICY

The following sections describe The London Plan planning policy, spatial development strategy for greater London July 2011. The policy is described in a national, regional and local context. We summarise the planning policies at these levels that have informed our approach to the Grenfell Tower energy strategy.

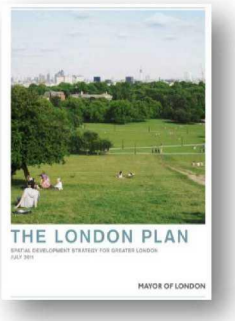


Table 5-1 The London Plan 2011 & National Planning Policy Framework

5.1 Policy Context – National

National Planning Policy Framework (NPPS) set out the Government's national policies for different aspects of land use planning in England. This policy outlines that the local planning authorities are empowered to include policies in their plans requiring a percentage of on-site renewable energy within both new and some existing developments.

5.2 Policy Context – Regional

The London Plan. Spatial Development Strategy for Greater London, July 2011

Policy 5.4: Retrofitting
A: The environmental impact of existing urban areas should be reduced through policies and programmes that bring existing buildings up to the Mayor's standards on sustainable design and construction. In particular, programmes should reduce carbon dioxide emissions, improve the efficiency of resource use (such as water) and minimise the generation of pollution and waste from existing building stock.

B: LDF's boroughs should develop policies and proposals regarding the sustainable retrofitting of existing buildings. In particular they should identify opportunities for reducing carbon dioxide emissions from the existing building stock by identifying potential synergies between new developments and existing buildings through the retrofitting of energy efficiency measures, decentralised energy and renewable energy opportunities (see Policies 5.5 and 5.7).

5.3 Policy Context – Local

The Royal Borough of Kensington and Chelsea's (RBKC's) Core Strategy outlines their environmental requirements for new and refurbished developments in the following policy:

Policy CE1: Climate Change
The Council recognises the Government's targets to reduce national carbon dioxide emissions by 26% against 1990 levels by 2020 in order to meet a 60% reduction by 2050 and will require development to make a significant contribution towards this target.

To deliver this the Council will:

a. Require an assessment to demonstrate that all new buildings and extensions of 800m^2 or more residential development or 1,000m^2 or more non-residential achieve the following Code for Sustainable Homes / BREEAM standards;
   i. **Residential Development:** Code for Sustainable Homes:
   Up to 2012: Level Four; and seek to achieve:
   2013 to 2015: Level Five;
   2016 onwards: Level Six.
   ii. **Non Residential Development:** Relevant BREEAM Assessment:
   Up to 2015: Excellent; and seek to achieve:
   2016 onwards: Outstanding;

b. Require an assessment to demonstrate that conversions and refurbishments of 800m^2 or more residential development or 1,000m^2 or more non-residential achieve the following relevant BREEAM standards;
   i. **Residential Development:** EcoHomes Very Good (at design and post construction) with 40% of credits achieved under the Energy, Water and Materials sections, or comparable when BREEAM for refurbishment is published;
   ii. **Non Residential Development:**
   Up to 2015: Very Good (with 40% of credits achieved under the Energy, Water and Materials sections);

c. Require an assessment to demonstrate that the entire dwelling where subterranean extensions are proposed meets EcoHomes Very Good (at design and post construction) with 40% of the credits achieved under the Energy, Water and Materials sections, or comparable when BREEAM for refurbishment is published;

d. Require that carbon dioxide and other greenhouse gases are reduced to meet the Code for Sustainable Homes, EcoHomes and BREEAM standards in accordance with the following hierarchy:
   i. Energy efficient building design, construction and materials, including the use of passive design, natural heating and natural ventilation;
   ii. Decentralised heating, cooling and energy supply, through Combined Cooling Heat and Power (CCHP) or similar, whilst ensuring that heat and energy production does not result in unacceptable levels of air pollution;
   iii. On-site renewable and low-carbon energy sources;

e. Require the provision of a Combined Cooling, Heat and Power plant, or similar, which is of a suitable size to service the planned development and contribute as part of a district heat and energy network for:
   i. Strategic site allocations at Kensal, Wornington Green, Kensington Leisure Centre and Earl's Court; and

ii. significant redevelopment and regeneration proposals at Notting Hill Gate and Latimer as set out in the places section of this document;

f. Require all CCHP plant or similar to connect to, or be able to connect to, other existing or planned CCHP plant or similar to form a district heat and energy network;

g. Require development to connect into any existing district heat and energy network, where the necessary service or utility infrastructure is accessible to that development;

h. Require development to incorporate measures that will contribute to on-site sustainable food production commensurate with the scale of development;

i. Require, in due course, development to further reduce carbon dioxide emissions and mitigate or adapt to climate change, especially from the existing building stock, through financial contributions, planning conditions and extending or raising the Code for Sustainable Homes and BREEAM standards for other types of development.

From the relevant national, regional and local policies outlined previously it can be seen that in order to comply with planning policies it is necessary to achieve a BREEAM Domestic Refurbishment assessment score of Very Good. The implications and methodology of this is described in more detail in the following section.

6.0 BREEAM DOMESTIC REFURBISHMENT 2012

6.1 BREEAM Domestic Refurbishment 2012

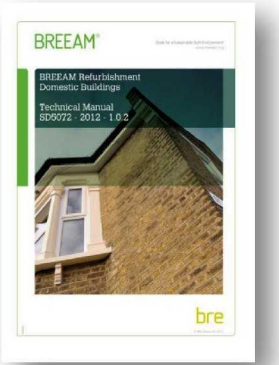


Figure 6-1 BREEAM Domestic Refurbishment Technical Manual

This section provides additional information regarding measures taken to comply with BREEAM Domestic Refurbishment requirements. For a full report and details of the scores achieved for each credit please refer to the "BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator".

RBKC's Policy CE1 states that a qualifying refurbishment should achieve a score of Very Good (at design and post construction) with 40% of credits achieved under the Energy, Water and Materials sections. After discussion with the RBKC planning department it has been decided that the strategy should be to demonstrate the score achieved *within the scope of the project*, with reasons/evidence given for any credits not gained.

The BREEAM Refurbishment section is laid out in the following manner; section title, excerpt from BREEAM Domestic Refurbishment Technical Manual describing the section, and Max Fordham LLP (MF) comments on the credits which fall within the scope of this project.

Management
The management section covers issues that aim to ensure the home owner is able to operate their home efficiently and effectively as well as being able to live in a home that is safe and secure. The category also covers issues relating to effective project management and sustainable site practices, to providing a framework that encourages refurbishment projects to be managed in an environmentally, socially considerate and accountable manner.

MF: We believe that the following credits are within the scope of the project;

- Provide a Home User's Guide to all new dwellings.
- Specify windows and doors to minimum security standards.
- Obtain ecology report from the Kensington Academy and Leisure Centre (KALC) project.
- Ensure the project manager has assigned individual and shared responsibilities across the team.
- Involve a BREEAM assessor prior to the refurbishment specification being produced.
- In addition to the above measures it was also assumed that the construction contractors (Leadbitters) will achieve the same high standards of responsible construction practises on Grenfell Tower as they are on the concurrent KALC project.

Health & Wellbeing
The Health and Wellbeing category aims to improve the quality of life in homes by recognising refurbishments that encourage a healthy and safe internal environment for occupants including the following aspects during refurbishment:

- Minimising impacts on daylighting and encouraging enhanced daylighting (see section 5 for further details).
- Improving sound insulation values for separating walls and floors to Part E standards and beyond.
- The specification of finishes which avoid the use of Volatile Organic Compounds
- Improving accessibility to the home and allowing for future adaptability
- Providing sufficient ventilation
- Providing fire and carbon monoxide detection

MF: The majority of the Health & Wellbeing credits are beyond the scope of the Grenfell Tower project. However, there are some credits that fall within the scope of the project, or that can be reasonably delivered during the refurbishment. These are;

- Architect to specify all paints etc. to have low VOC emissions.
- Supply minimum levels of background ventilation (NB this will necessitate the fitting of a mechanical extract to the kitchens).
- Install a compliant battery operated fire and carbon monoxide detector to each dwelling.

Energy
The energy category assesses measures to improve the energy efficiency of the home through refurbishment. 65% of the available score relates the energy targets, based upon SAP or the EPC. These targets bring a balanced assessment of the impact that the refurbishment has on improving the dwelling's energy performance including:

- How much the Energy Efficiency Rating has been improved as a result of refurbishment.
- The dwelling's energy demand post refurbishment.
- The % of the dwelling's demand that is met by renewable technologies.
- 35% of remaining credits relate to additional measures that save energy that are not covered under SAP or measures that provide occupants with opportunities to reduce their energy use or their impact on transport energy use, thus reducing CO2 emissions including:
- Providing energy efficient white goods.
- Providing a reduced energy means of drying clothes.
- Encouraging the provision of energy efficient lighting.
- Providing a device for occupants to monitor energy use.
- Encouraging occupants to cycle by providing adequate and secure cycle storage facilities.
- Reducing the need to commute to work by ensuring residents have the necessary space and services to be able to work from home.

MF: The proposed works to Grenfell Tower include the replacement of the outdated heating and hot water system and improvements to insulation through the replacement of windows and re-cladding of the building. The method of heating is to be gas absorption heat pumps (GAHPs). These are classed as a renewable source of energy within the BREEAM assessment criteria and as such are likely to achieve all available credits under the renewable technologies Ene 04 section.

There are a number of available credits that fall outside the scope of the project and as such have not been included due to the difficulty and additional cost required to achieve. These include; white goods, energy efficient lighting, drying space, home offices and compliant cycle storage.

Water
The water category is focused on identifying means of reducing water consumption in the home including internal water use and external water use. The assessment covers all sanitary fittings in the home and the targets provide recognition for both small changes in the home (e.g. installing a low flow shower) all the way up to a complete replacement of sanitary fittings. Where sanitary fittings are replaced (e.g. a new bathroom), credits can be gained through use of fittings that meet the appropriate fittings standards, or through use of the water calculator. The water calculator looks at the impact that a fitting has on reducing water use, indicating whether a target has been met and the number of credits that can be awarded (subject to the provision of appropriate evidence).

An additional credit is also available for reducing outdoor water use, through the specification of a water butt or a similar device to collect rainwater rather than use mains potable water. Whilst all these measures are designed to reduce water use, it is up to the occupants to use water appropriately therefore an additional credit is gained for providing a water meter, to let occupants monitor their water use. Overall, the following aspects are covered in the water category:

- Fitting low use water fittings for sanitary applications.
- Providing a water collection system for external water use.
- Providing water metering systems including smart water meters or AMRs.

MF: The water services are outside the scope of the Grenfell Tower project and as such the score predicted for this section of the assessment is low. The score achieved is due to the residents not having access to individual or communal garden space, therefore negating the need for rainwater collection for irrigation purposes. Providing a mains pressurised hot water system will allow the tenants to install showers. Washing using showers uses on average 60% less water than using a bath.

Materials
The materials category focuses on the procurement of materials that are sourced in a responsible way and have a low embodied impact over their life including how they have been extracted and manufactured. Overall it aims to encourage the retention of existing materials and where new materials are procured that they have they the lowest environmental impact and the greatest potential impact on reducing the dwelling's operational energy demand including the following aspects during refurbishment:

- Using thermal insulation which has a low embodied environmental impact relative to its thermal properties.
- Sourcing responsible sourced materials with appropriate certification e.g. FSC, ISO14001 etc.
- Sourcing materials with a high Green Guide rating.

MF: A high score can be achieved in the materials section of the BREEAM assessment. It should be possible to achieve a high score by selecting materials based on the following;

- All materials will have a Green Guide rating of at least A+ (3).
- Cladding materials chosen to achieve a U-value of 1.5 $W/m^2/K$.
- Windows specified to have a U-value of 1.6 $W/m^2/K$.

Waste
The waste category covers issues that aim to reduce the waste arising from refurbishment work and from the operation of the home, encouraging waste to be diverted from landfill including the following:

- Providing recycling storage facilities.
- Providing composting facilities.
- Implementing a site wide waste management plan (SWMP) to reduce refurbishment waste.

MF: The Household Waste part of this section was deemed outside the scope of the project. Credits gained have been from within the Refurbishment Site Waste Management allocation with the assumption being that the contractor will adhere to best practice methods during the construction phase as on the neighbouring KALC project.

Pollution
The pollution category covers issues that aim to reduce the home's impact on pollution as well as reducing risk from flooding. This includes the following aspects being considered during refurbishment:

- The use of low NOx space heating and hot water systems.
- Having a neutral impact on runoff or reducing or eliminating runoff from the dwelling as a result of refurbishment.
- Providing flood resistance and resilience strategies, where dwellings are in a medium or high flood risk zone.
- Rewarding dwellings which are located in a low flood risk zone.

MF: Credits can be achieved through the use of the GAHPs and gas-fired back up boilers. It is expected that the proposed works will have a neutral impact on surface water run-off. A Flood Risk Assessment (FRA) would need to be carried out by a qualified person but preliminary checks on the Environment Agency website indicate that two credits should be expected to be gained through classification of the site as having a low annual probability of flooding.

7.0 HEATING REFURBISHMENT SEQUENCING

7.1 AIM

Replace the central heat distribution pipework and remove the "ELSON" hot and cold water storage tank in each flat, while occupied, without disrupting services to other units and creating the minimum amount of disruption to each existing dwelling.

The following section outlines two options for renewing the heating system. Option A requires that a high number of shorter visits be carried out to replace the heating system and option B requires fewer longer visits. Option B is likely to require that one or two floors of tenants are rehomes for the duration of the works on their floor.

7.2 Undesirable Works

- Coring new holes within occupied dwellings
- Disassembling the Elson water storage tank within a dwelling to remove it. It should be removed as one piece to minimise the change of damage to the dwelling.

7.3 Restrictions

- A new "live" LTHW system needs to be installed before the existing LTHW pipework can be removed to ensure an uninterrupted DHW and heating service is maintained.
- Installing the new pipework in the flats will require new cores to be cut within the dwelling and installing new pipework would inhibit the ELSON tank being removed in a single piece.

Existing Installation

Heat for DHW and Heating is provided to each dwelling by LTHW (low temperature hot water pipework) located in a riser in each flat. Each vertical stack of flats is supplied by the same riser. The heating is controlled by a return temperature limiter "A" that restricts the flow to the heating system when the heating system return hot water temperature is high. This system allows a small amount of hot water to circulate around the flats when heating is not needed, resulting in a low level of unwanted heating. This unwanted heating contributes to the overheating problem.

The system operates in Heating and DHW mode (Figure 7-1) or DHW only (Figure 7-2) by reversing the flow in the pipework. This is a cleverly designed system but does not operate as anticipated. Many residents require their heating all year round while other residents suffer overheating problems from the all year heating. This leaves the TMO with complaints regardless of which mode they have selected for the heating system.

The following section illustrates the process that will be required to replace the heating and DHW system at Grenfell Towers with minimum disruption to the tenants.

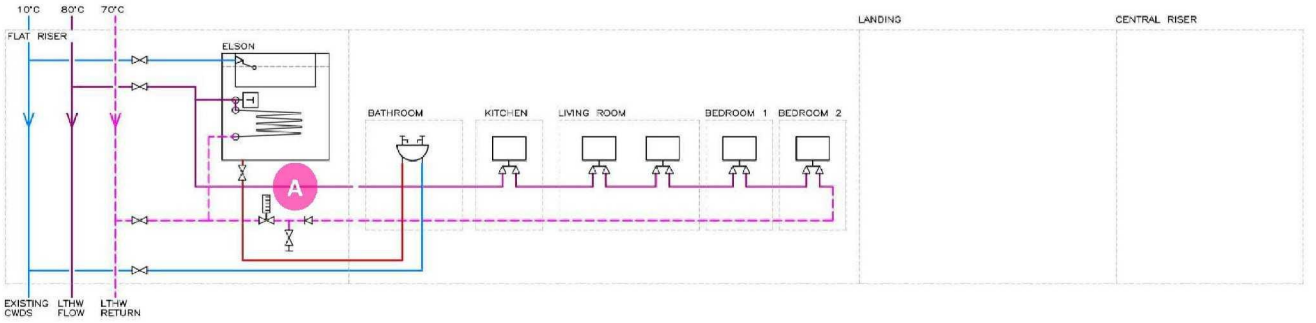


Figure 7-1- Existing Flat Heating and Hot Water Set-up, Winter Mode

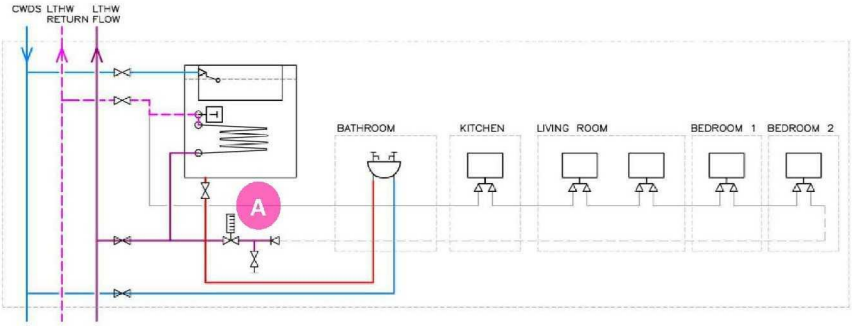


Figure 7-2 - Existing Flat Heating and Hot Water Set-up, summer mode

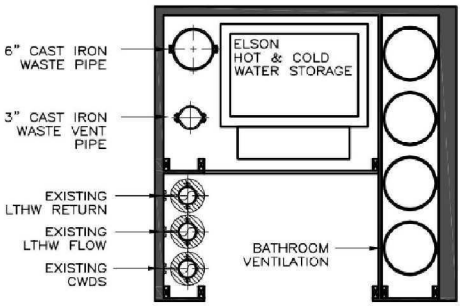


Figure 7-3 - Existing single bedroom flat riser layout

MAX FORDHAM

Works to Roof Top Plant Room

In order to provide an undisrupted DHW and heating service to the tenants the new heating and DHW water plant will need to be installed and commissioned before "phase 1" (see next page) is complete.

Figure 7-4 opposite shows where the new heating and DHW plant will be located within the existing roof top plant room. The green access routes show how access to existing plant is maintained to ensure that on-going maintenance and plant replacement will still be possible around the new plant.

KEY

1. 6 x 2000 litre domestic hot water storage vessels.
2. Heating System expansion vessels.
3. Back-up gas high efficiency gas boilers.
4. Area for new heating circulation pumps and balancing valves
5. Gas fired heat pumps located on plant room roof.
6. Maintenance and plant replacement walkway maintained to all items of plant.
7. Flat riser position
8. Main riser position
9. New potable water tanks

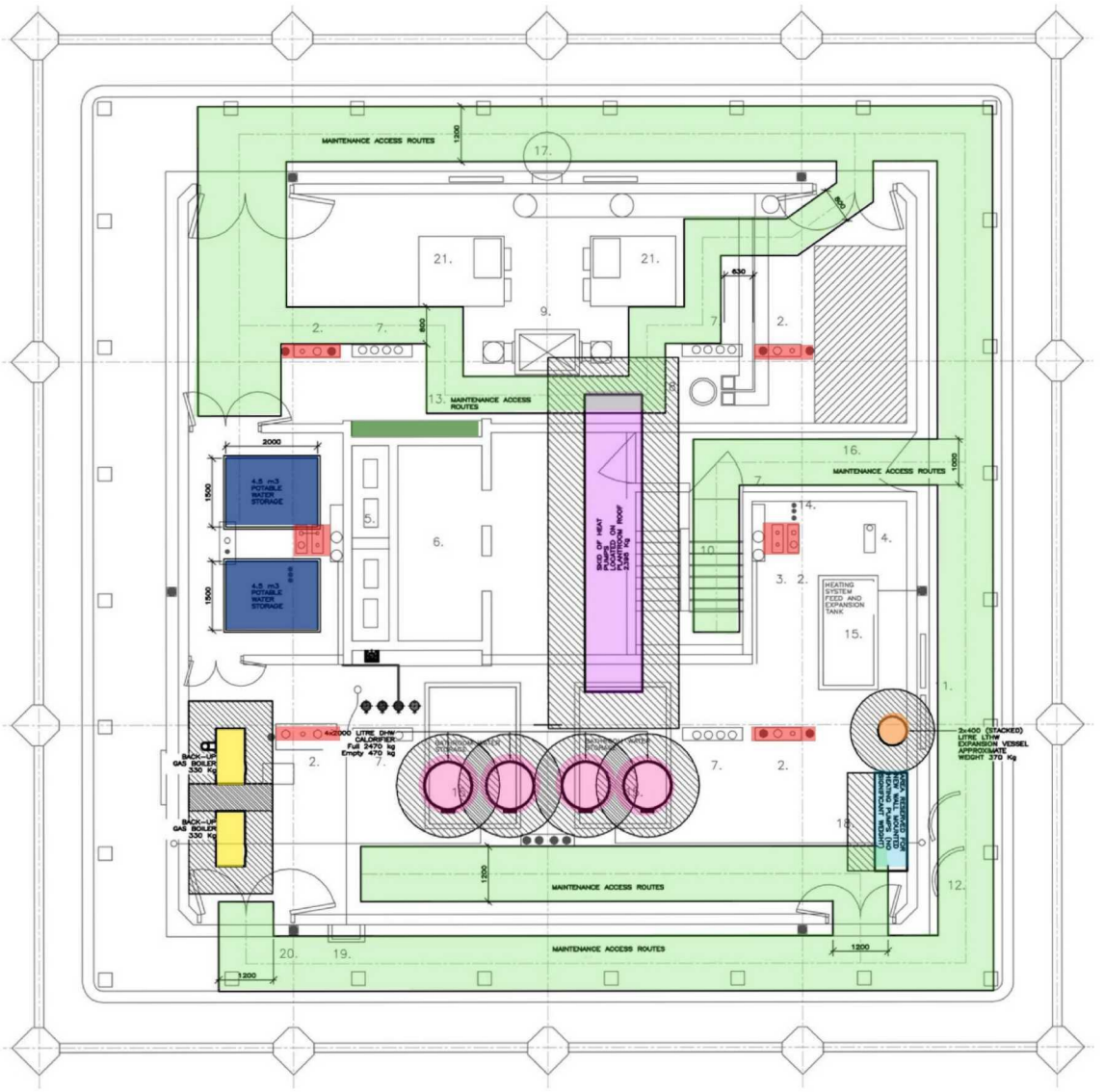


Figure 7-4 - Proposed layout of the roof top plant room

Option A - Phase 1

Installing new LTHW pipework within the existing flat risers before the old pipework is removed will result in new cores being cut into the concrete floors/ceilings and would block the route required to remove the ELSON water tank in a single piece. Drilling new cores will be loud and messy; it is unlikely that this would be acceptable in an occupied flat. Breaking the ELSON tank into smaller parts before removing it will be noisy, messy and may not be possible to do in a safe way within the tight constraints of the riser.

Installing the new LTHW pipework in the central main service riser does not have the above associated problems. Any mess caused will be contained to the central areas where it will be contained and cleaned up.

New LTHW heating pipework would run at high-level within the communal area and would be boxed in with a Pendock profile as shown in Figure 7-7. Providing this pipework in the communal areas has the following advantages;

- All heating system parts that require regular maintenance or are more likely to fail will be located in the corridor. This eliminates the need to gain entry to occupied flats when equipment needs replaced.
- If the flats are void the heating could be isolated from outside.
- If the heating system inside the flat was to be damaged and is leaking the flat could be isolated from the corridor.

The new LTHW pipework will have to be operated at the same temperatures as the existing system (80°C/70°C) until phase 7 (new heating system is installed in all flats).

By the end of phase 1 a fully commissioned central distribution system will have been installed by the "commercial" contractor and will be available for the "domestic" contactors to carry out in phase 2.

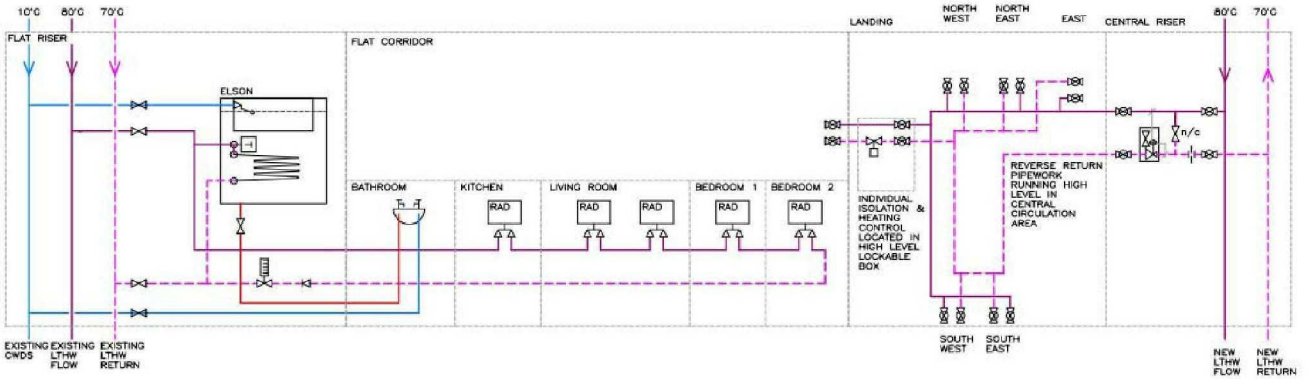


Figure 7-5 - Phase 1 Schematic, new LTHW pipework installed in communal corridor

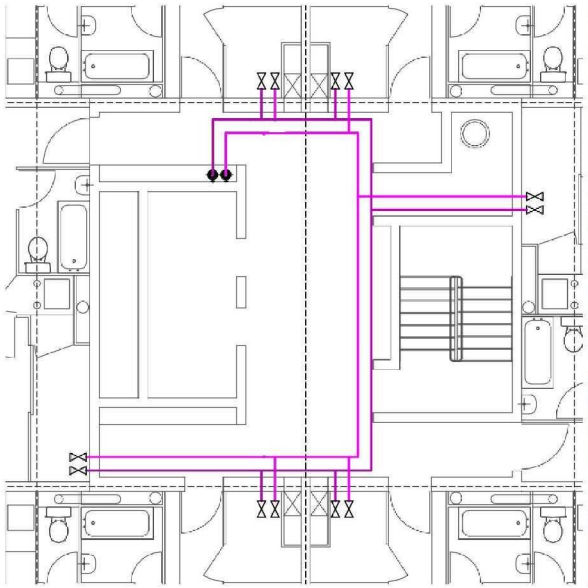


Figure 7-6 - New LTHW layout floors 4 to 23

Figure 7-7 - Pendock profile boxing in high level pipework

Option A - Phase 2

This phase involves setting up a temporary connection in each flat from the new LTHW pipework installed in phase 1 to the ELSON and heating system for DHW and heating respectively.

This work will involve running temporary pipework at high level within the dwelling as shown in Figure 7-8 and Figure 7-9.

All work carried out within occupied properties must be done in a sensitive manner without causing any permanent damage to the flats. All works that are going to be carried out on occupied flats will be fully tested out.

Once phase 2 is complete all the flats will receive heat from the new LTHW supply in the central riser supplied by the new roof top heat pumps and gas fired boilers.

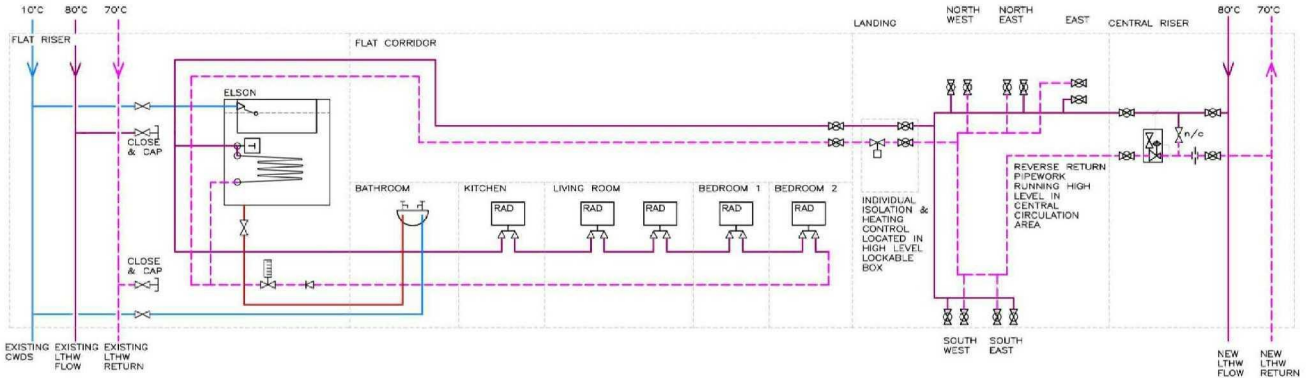


Figure 7-8 - Phase 2 schematic, Temporary link installed between new and old systems

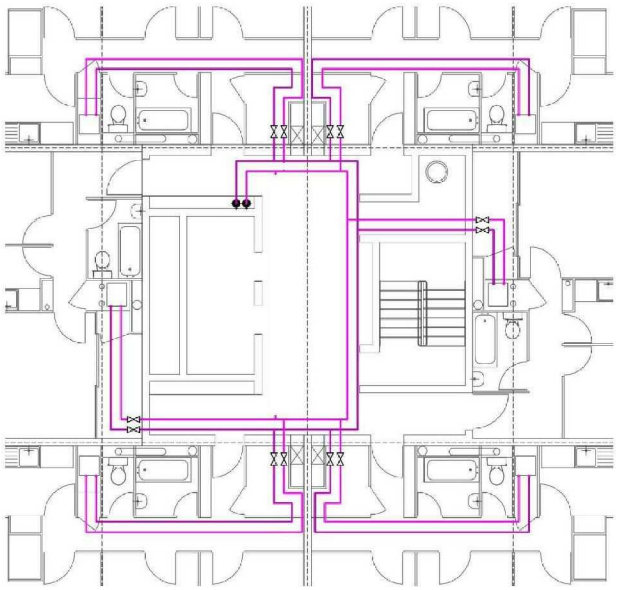


Figure 7-9 - Phase 2 Layout showing temporary pipe routes though flats

Option A - Phase 3

As all the heating and hot water is being supplied by an alternative supply the existing LTHW pipework can be drained down and removed from each flat.

Phase 3 and 4 may be best performed simultaneously to avoid the need to install temporary fire stopping to the existing pipework penetrations between flats.

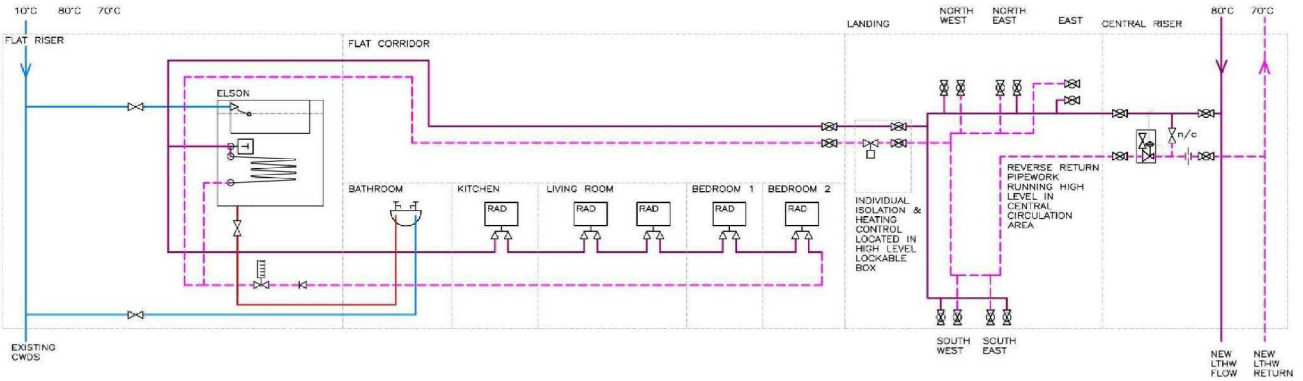


Figure 7-10 - Phase 3 Schematic, Removal of the existing LTHW pipework

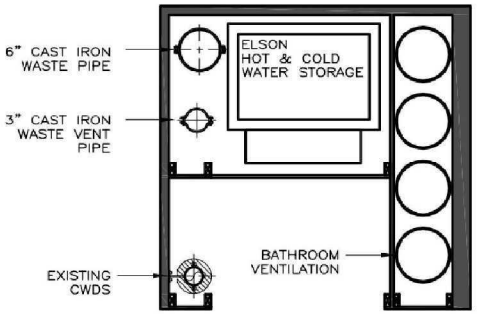


Figure 7-11 - Layout of single bedroom riser after existing LTHW pipework has been removed

Option A - Phase 4

Install new DHW and CWDS pipework in the location of the old LTHW pipework. The new pipework will be the same dimensions as the removed LTHW pipework therefore no new holes need to be cored in occupied flats as the new pipes can be installed through the existing penetrations.

The trace heating system to the DHW system will be installed with the new DHW pipework. The trace heating uses electricity to maintain the temperature of the DHW flow pipe at 65°C to eliminate the need for DHW circulation return pipework. **Figure 7-14** shows the trace heating cable that will be installed underneath the insulation in contact with the DHW pipework to maintain the DHW flow temperature at 60 °C.

This work could be carried out by the "commercial" heating contractor. At the end of Phase 4 each flat will have a capped off supply to the fully commissioned new DHW and CWDS pipework.

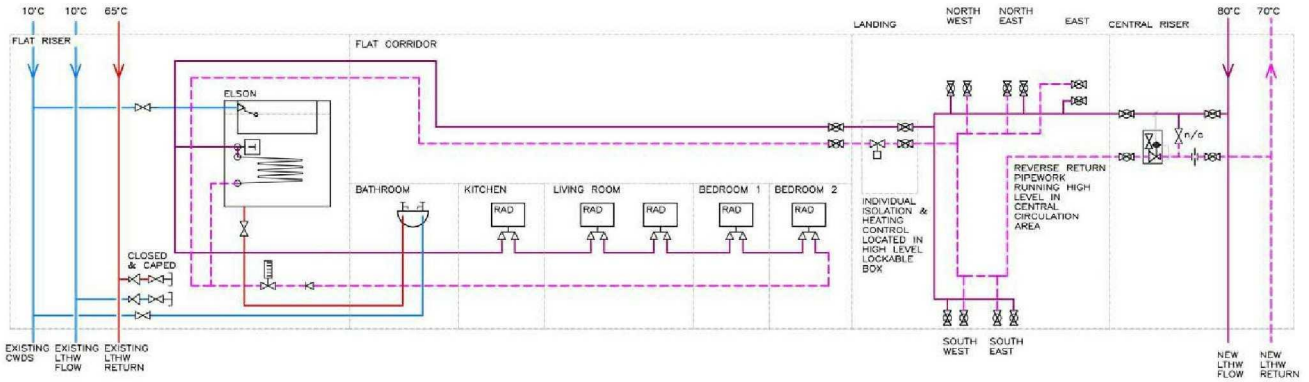


Figure 7-12 - Phase 4 Schematic, New CWDS and DHW pipework installed and capped off

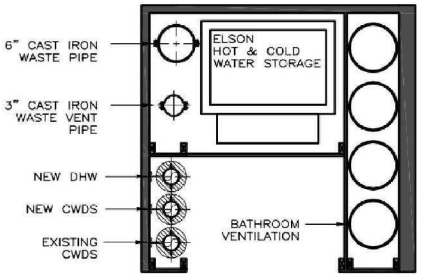


Figure 7-13 - Riser with new CWDS and DHW installed

Figure 7-14 - Trace heating cable used to maintain the temperature of the DHW pipework at 60 ° C

Option A - Phase 5

The "domestic contractor" can now connect the existing appliances and heating system pipework directly to the new DHW and CWDS distribution, which eliminates the need for the ELSON water storage tank.

The flats will not be running off mains pressure hot and cold water.

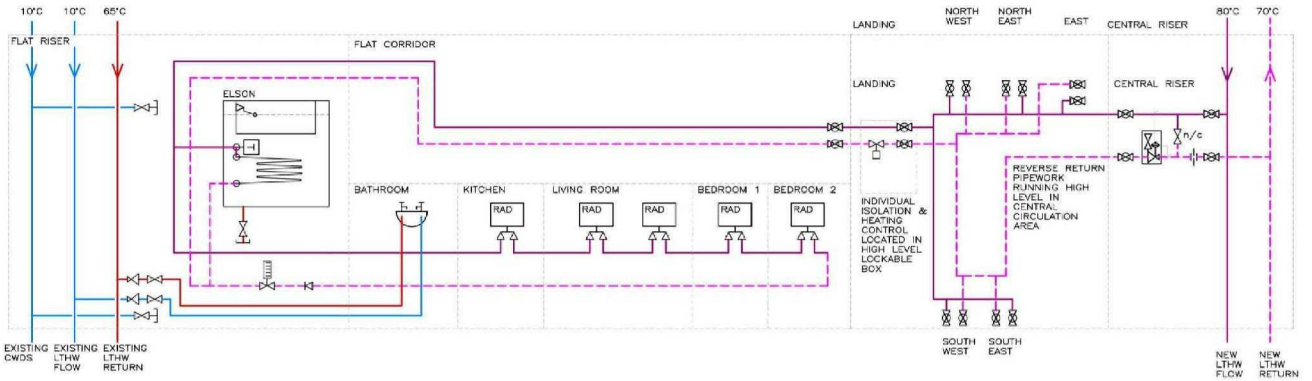


Figure 7-15 - Phase 5 Schematic, New CWDS and DHW connected to existing flat appliances and heating system

Option A - Phase 6

Remove the ELSON tank and the existing CWDS pipework from each flat. The hole created in the floor slab by removing the old CWDS will require fire stopping. Alternatively, this penetration may be used to install a distribution route for the communal satellite TV system, see section 2.4 for more information.

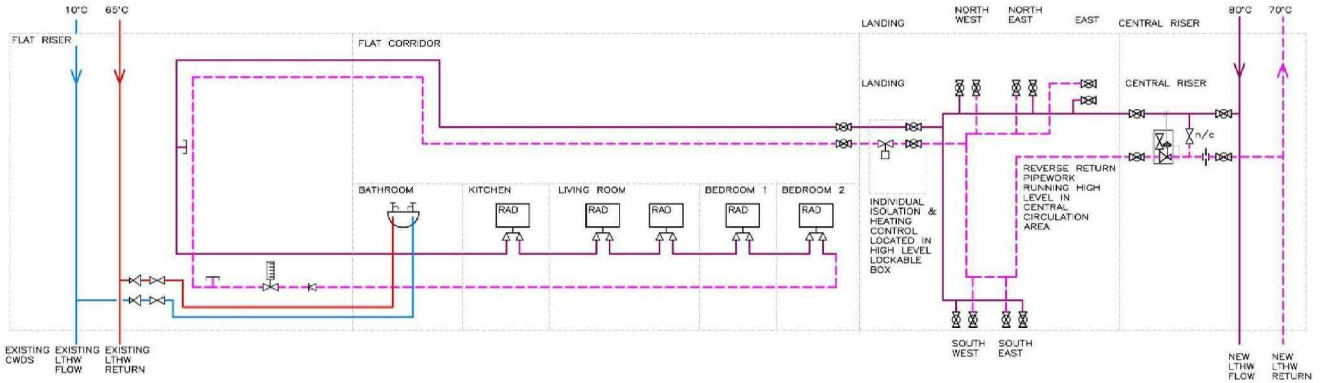


Figure 7-16 - Phase 6 Schematic, Existing CWDS and ELSON tank removed

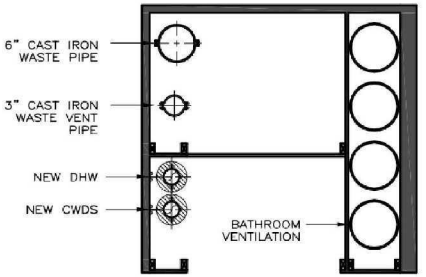


Figure 7-17 - Riser without ELSON tank or old CWDS

Option A - Phase 7

The final phase will be to install the replacement heating system into each flat.

The temporary connection pipework installed in phase 2 can be removed and reused as part of the new heating system.

The new heating system pipework will be run at low level behind a Pendock skirting profile as shown in Figure 7-22 and Figure 7-23. The existing heating pipework cannot be removed as it is cased into the floor screed. The existing pipework will be drained down and cut back to FFL. The existing pipe tails will be concealed by the Pendock profile.

New radiators will be installed as per Figure 7-21. The radiators will be deeper than the ones they replace, this is required to maintain a high output with the new lower temperature hot water that is produced by the heat pumps.

Once the new radiators have been installed in all the flats the flow temperature of the main heating distribution in the central risers can be reduced as per Figure 7-19. This will allow the new heating system to work efficiently with the new heat pump system.

Each flat will have a wireless thermostat installed in the living room. This will allow the users to turn off their heating during the summer months and will provide them with an enhanced level of control in the heating season.

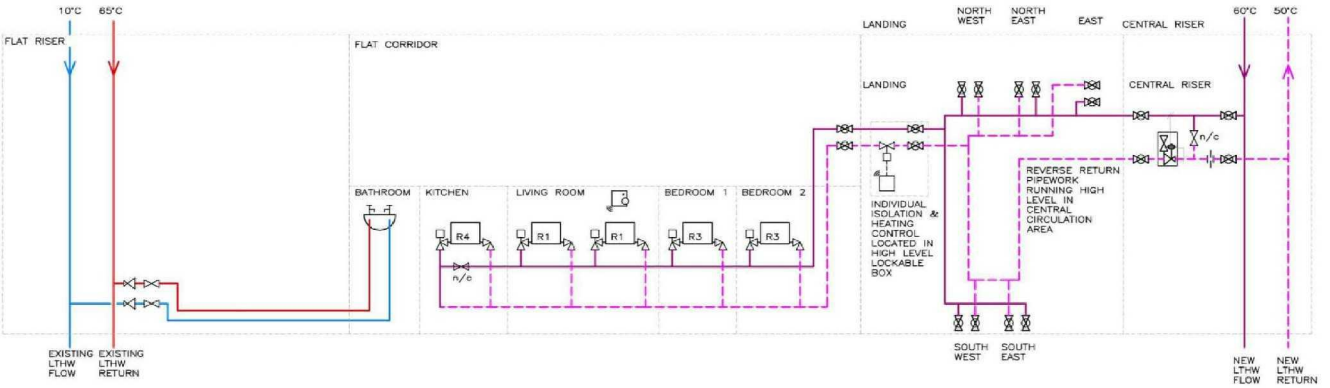


Figure 7-18 - Phase 7 Schematic, New heating system

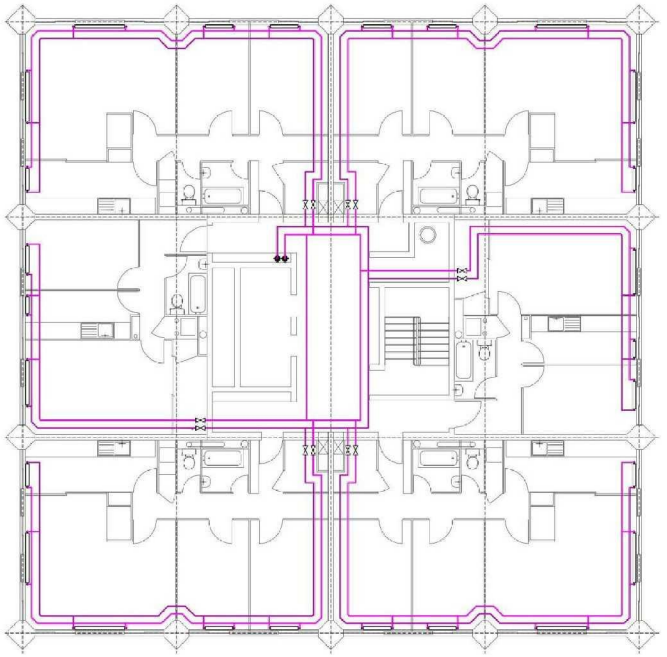


Figure 7-19 - Residential floor pipe layout showing new heating systems

Figure 7-20 - Wireless room thermostat to control heating set point

Figure 7-21 - Double panel radiator proposed for refurbishment

Figure 7-22 - Pendock skirting profile concealing low level heating pipework

Figure 7-23 - Typical Pendock profile and radiator arrangement

Option B – Phase 1

As per option A with the addition of a new domestic hot water and cold water down service being run win the common space along with the new LTHW pipework.

Commercial contractor can undertake all common space works on a floor by floor basis.

Phase one will leave a fully working and commissioned central distribution system for LTHW, DHW and CWS.

Pipe connections will be left isolated and capped off outside every flat waiting for phase two to begin.

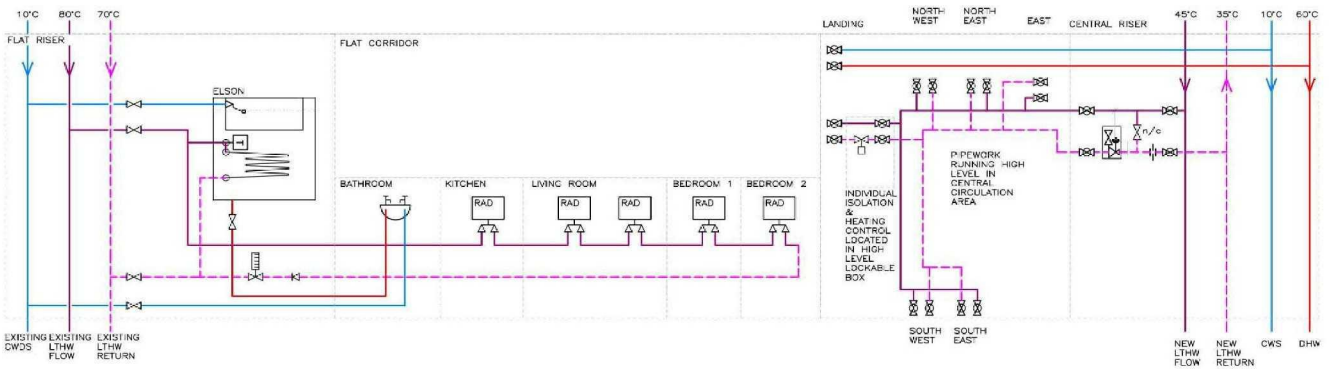


Figure 7-24 - Option B - Phase 1 ,Install new DHW, CWS and LTHW pipework in common areas

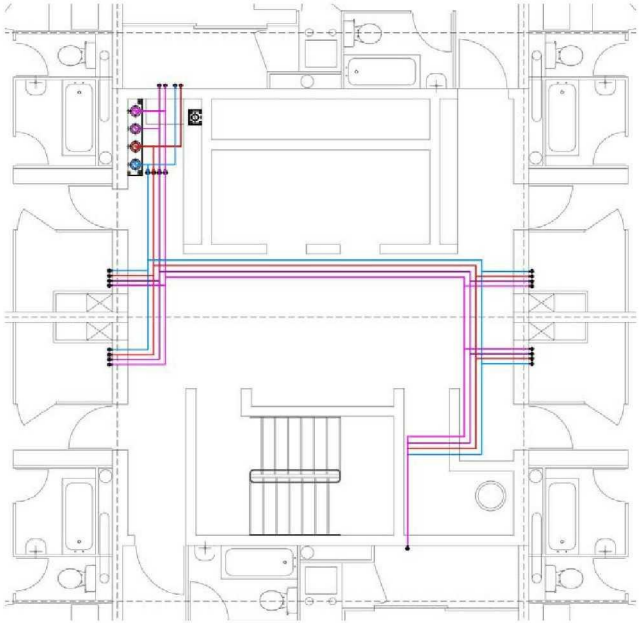


Figure 7-25 - Option B - Phase 1, New centralised DHW, CWS and LTHW pipework

Option B – Phase 2

Relocate tenant from flat and carry out the majority of the internal works in one visit spanning 3 to 5 days depending on conditions within the flats and experience level of contractor crew.

These works include;

a) Install new heating system
b) Remove Elson tank
c) Connect existing hot and cold water services to new central supplies.
d) Isolate and cap off existing risers, remove as much existing pipework possible.

Any flat on any floor could be attached to the new system in any order. However phase 2 for every flat serviced by the same vertical riser must be completed before phase 3 on that riser can begin.

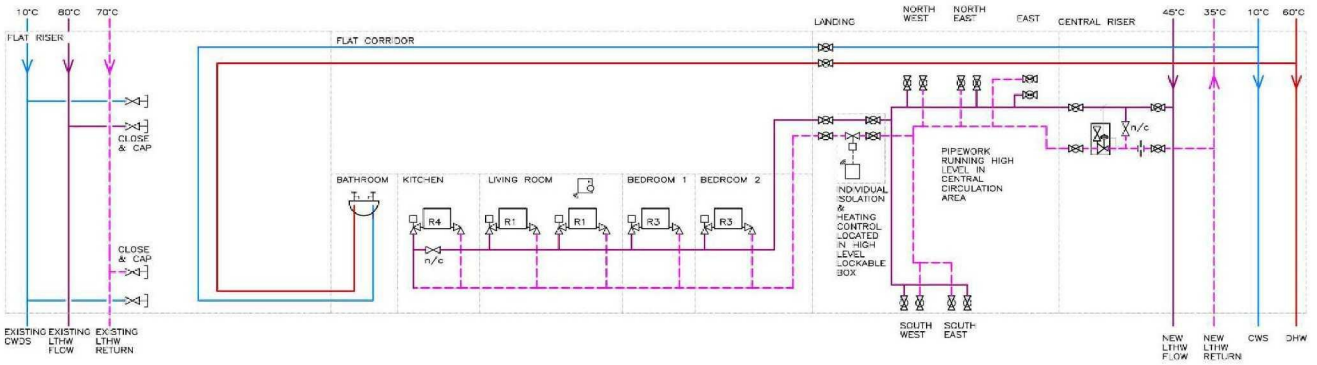


Figure 7-26 - Option B - Phase 2 - Install heating, connect to new central distribution and remove "ELSON"

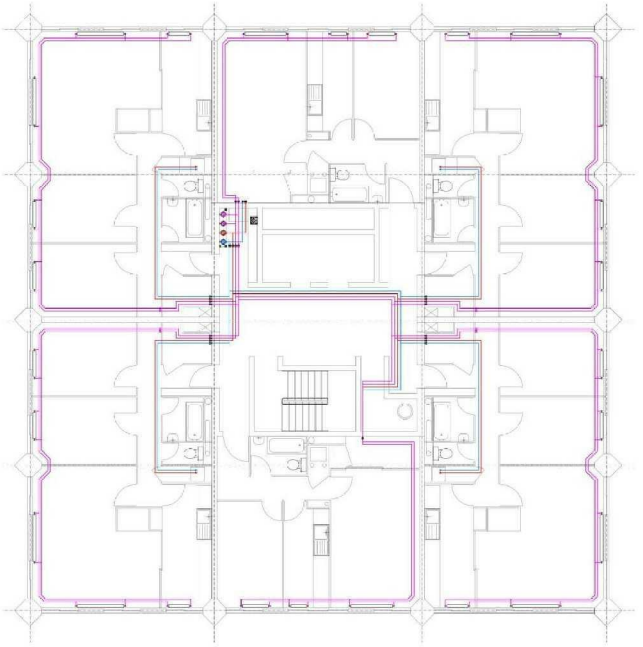


Figure 7-27 - Option B - phase 2, New heating system installed in each flat with DHW and CWS connections installed

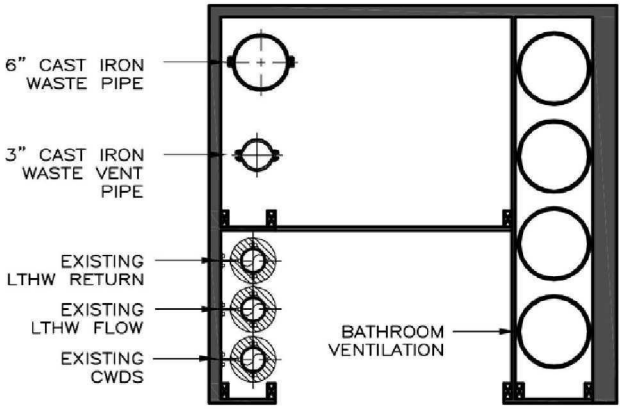


Figure 7-28 - Option B - Phase 2, Riser layout with ELSON removed but existing live LTHW and CWDS in place

Option B – Phase 3

Phase 3 can only begin once all vertically stacked flats have completed phase 2.

Remove the old LTHW and CWDS form the riser cupboard. Any joinery work required to make the cupboard good can also take place at this time.

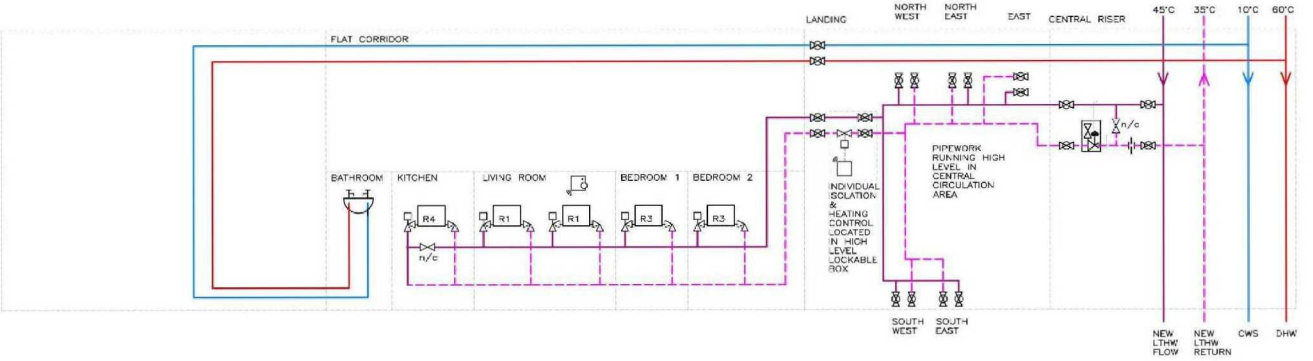


Figure 7-29 - Option B - Phase 3 - Once phase 2 is complete LTHW and CWDS pipework is removed

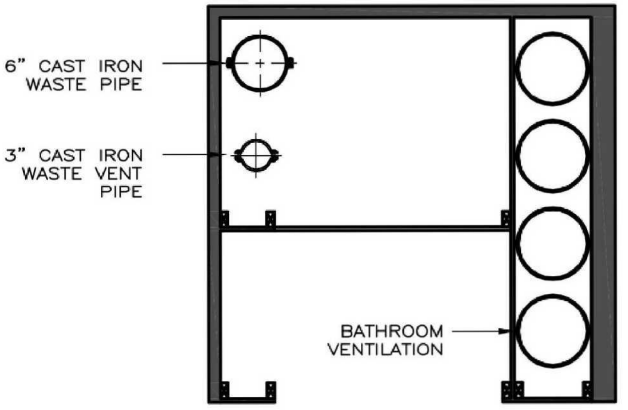


Figure 7-30 - Riser layout once Elson and existing pipework is removed.

8.0 WATER SERVICES

The water services proposal is to combine the existing potable and non-potable water storage tanks into a single new water storage tank. This will result in a lower storage volume than is currently being provided at Grenfell Tower.

Historically tower blocks tend to have excessively large volumes of water storage. This storage provides an uninterrupted water supply in the event of a mains water failure.

The calculations opposite show how much water back-up is provided by the current and proposed water storage volumes. The water usage rates were calculated using "The Water Efficiency Calculator for new dwellings" methodology and data form "BREEAM Domestic Refurbishment Manual 2012, Table 21 – Default Performance Data".

The calculations show that the existing system can provide a water back-up time of approximately 6 hours while the proposed system can provide a back-up time of approximately 4.9 hours in the event of a water failure. In the event of a power failure the back-up times are reduced in both cases as the water in the basement booster set break tank will be unavailable for use. Unplanned mains water failures over is 3 hours are rare, therefore the proposed system should be sufficient in all but the most catastrophic water mains failures.

It is no longer considered acceptable to design new systems with potable and non-potable water storage, all stored water should be potable (drinkable). The proposed system complies with this modern legislation.

Reducing the volume and combining the existing potable and non-potable water will increase the stored water turnover rate. This will help to improve the water quality of the stored water at Grenfell Tower.

Increasing the tank turnover rate will also reduce the average tank temperature of the stored water. This will in turn reduce the risk of bacteria growth such as Legionella bacteria.

Washing and bathing uses the majority of water. In the event of a planned water stoppage, the residents could be asked not to run any baths during the outage. As the proposed system has more potable water storage than the existing system the proposed system would provide drinking water for longer than the existing system.

Water Storage Calculation

Existing

Potable Water (Roof)	4000	Litres
Non-potable Water (Roof)	13500	Litres
Potable Water (Basement, booster break tank, not available during power cut)	4000	Litres
Total (roof only)	17500	Litres
Total (Inc booster break tank)	21500	Litres
Calculated litres per person	203	Litres/day
Average No of people per Dwelling	2.2	People
Number of Dwellings (Units added to account for offices and, nursery and boxing club)	144	No
Total Usage per Dwelling	447	Litres/day
On Average Water usage occurs between (06:00 and 24:00)	18	hours
Average water use per hour	25	Litres/hour
Average Total Tower Water use	3573	Litres/hour
Supply Times (Power Failure)		
Existing Storage Supply Time (assuming total water supply failure)	4.9	hours
Supply Time Days	0.27	days
Supply Times (Water Failure)		
Existing Storage Supply Time (assuming total water supply failure)	6.0	hours
Supply Time Days	0.33	days

Water Storage Calculation

Proposed

Potable Water	13500	Litres
Non-potable Water	0	Litres
Potable Water (Basement, booster break tank, not available during power cut)	4000	Litres
Total (roof only)	13500	Litres
Total (Inc booster break tank)	17500	Litres
Calculated litres per person	203	Litres/day
Average No of people per Dwelling	2.2	People
Number of Dwellings (Units added to account for offices and, nursery and boxing club)	144	No
Total Usage per Dwelling	447	Litres/day
Water usage occurs between (06:00 and 24:00)	18	hours
Average water use per hour	25	Litres/hour
Average Total Tower Water use	3573	Litres/hour
Supply Times (Power Failure)		
Proposed Storage Supply Time (assuming total water supply failure)	3.8	hours
Supply Time Days	0.2	days
Supply Times (Water Failure)		
Proposed Storage Supply Time (assuming total water supply failure)	4.9	hours
Supply Time Days	0.27	days

Existing

Non-potable water (non-drinking) is stored in two tanks each with a storage capacity of 6.75m^3, giving a total of 13.5m^3 non-potable water storage shown in Figure 8-2.

Potable water (drinking water) is stored in two tanks each with a storage capacity of 2 m^3, giving a total of 4m^3 of potable water storage shown in Figure 8-3.

All four water storage tanks are located in the roof top plant room.

The ground floor plant room contains four small break tanks feeding the booster sets that pump mains potable and non-portable water to the roof top plant room.

Decommission the non-potable water break tanks and booster set as they will no longer be necessary in the proposed solution.

Renew existing potable water booster set and breaks tanks in basement plant room as the RBKC maintenance expenditure schedule of equipment advises that the pumps and tanks are original. Given the age of the installation, we recommend replacing this equipment as part of these works.

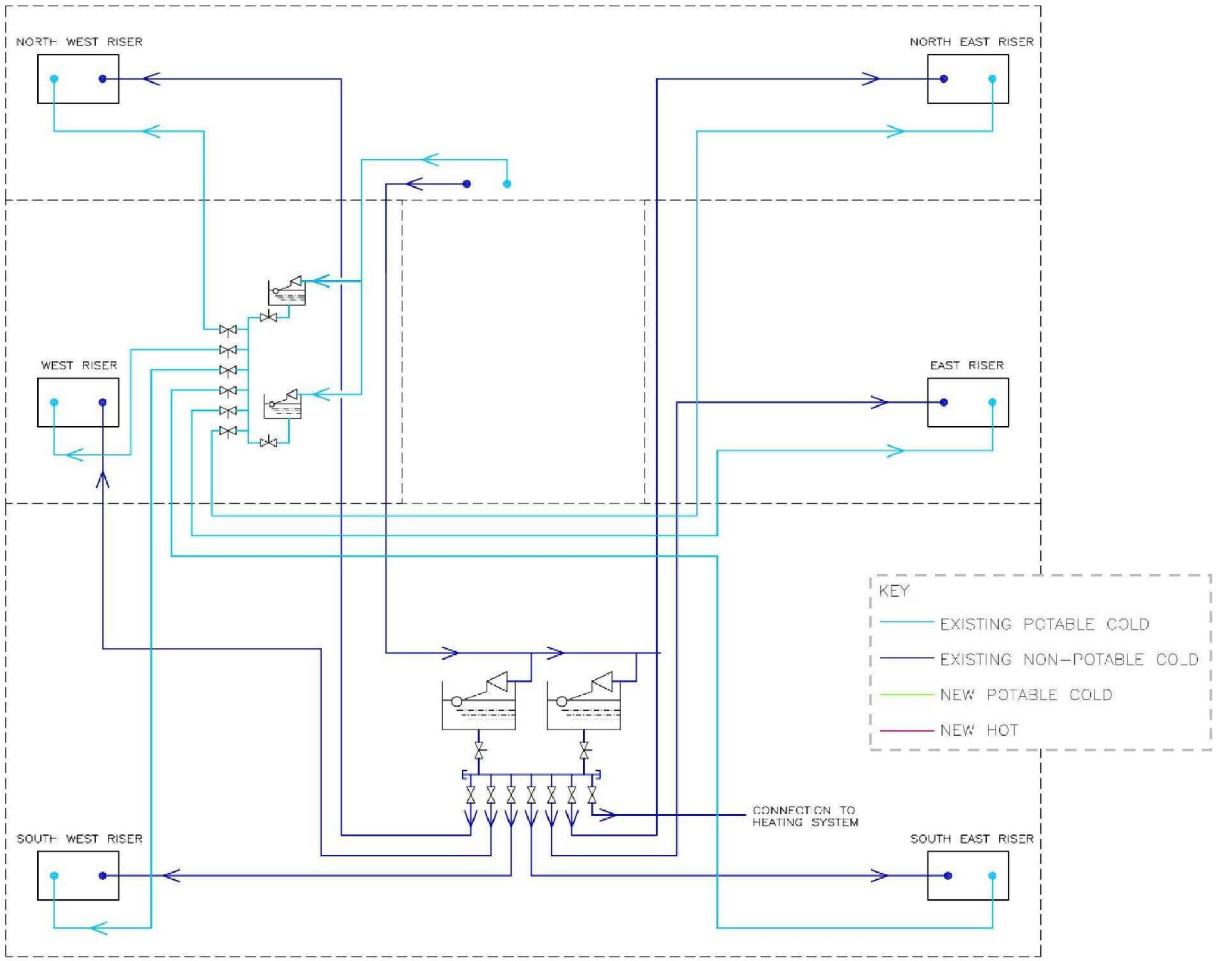


Figure 8-1 - Existing roof top plant room schematic

Figure 8-2 - Non-Potable Water Tanks

Figure 8-3 - Potable Water Tank

Phase 1

Connect existing non-potable cold water down services to the potable water supply at the top of each riser as per Figure 8-4 below.

Decommission and remove non-potable pipes and storage tanks once the flats are fed entirely from the potable water system.

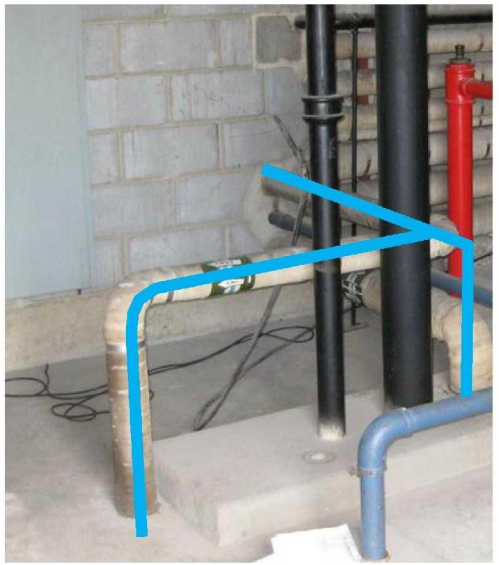
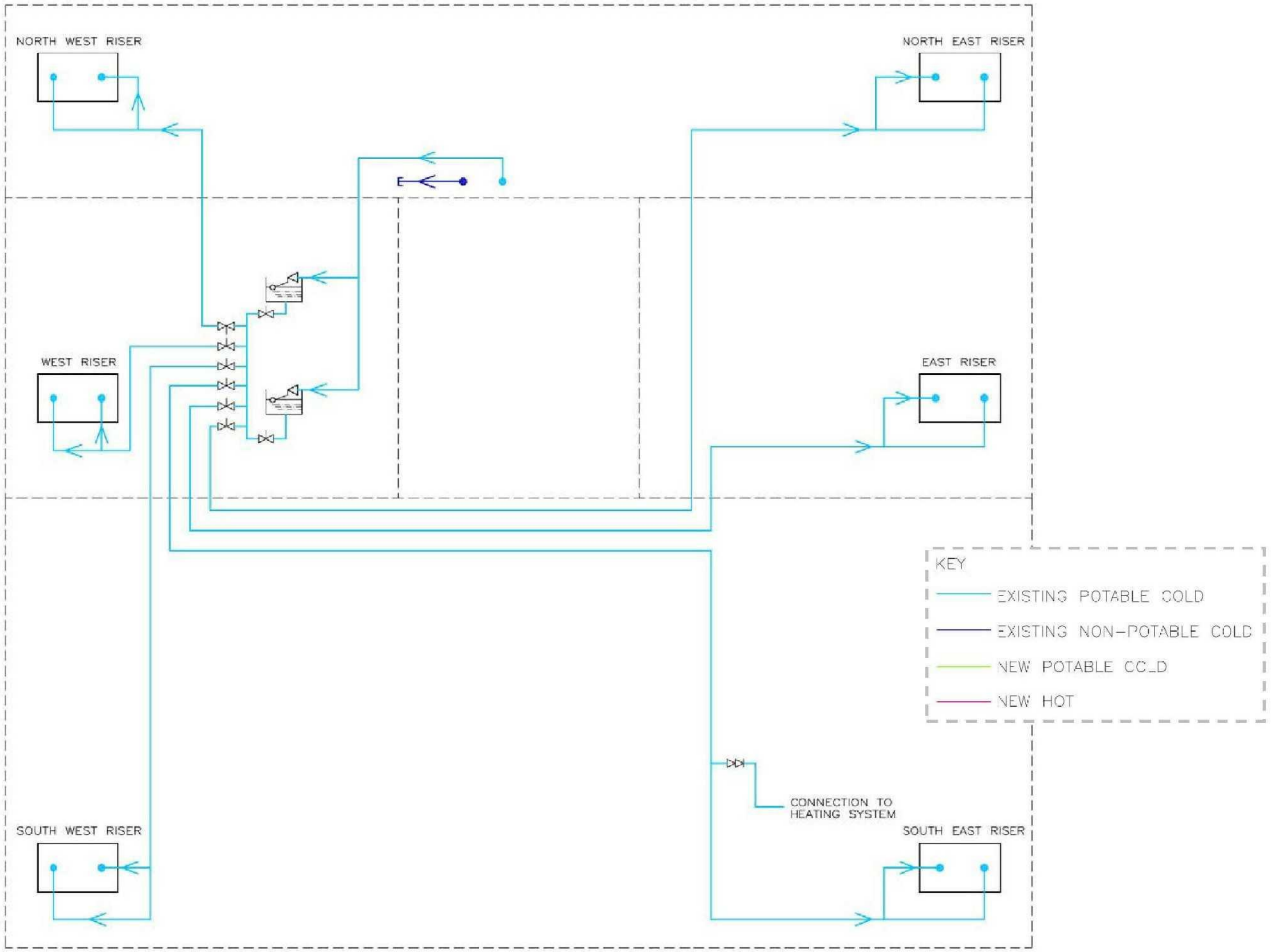


Figure 8-4 - Blue line shows potable water supply connected to existing non-potable supply



MAX FORDHAM

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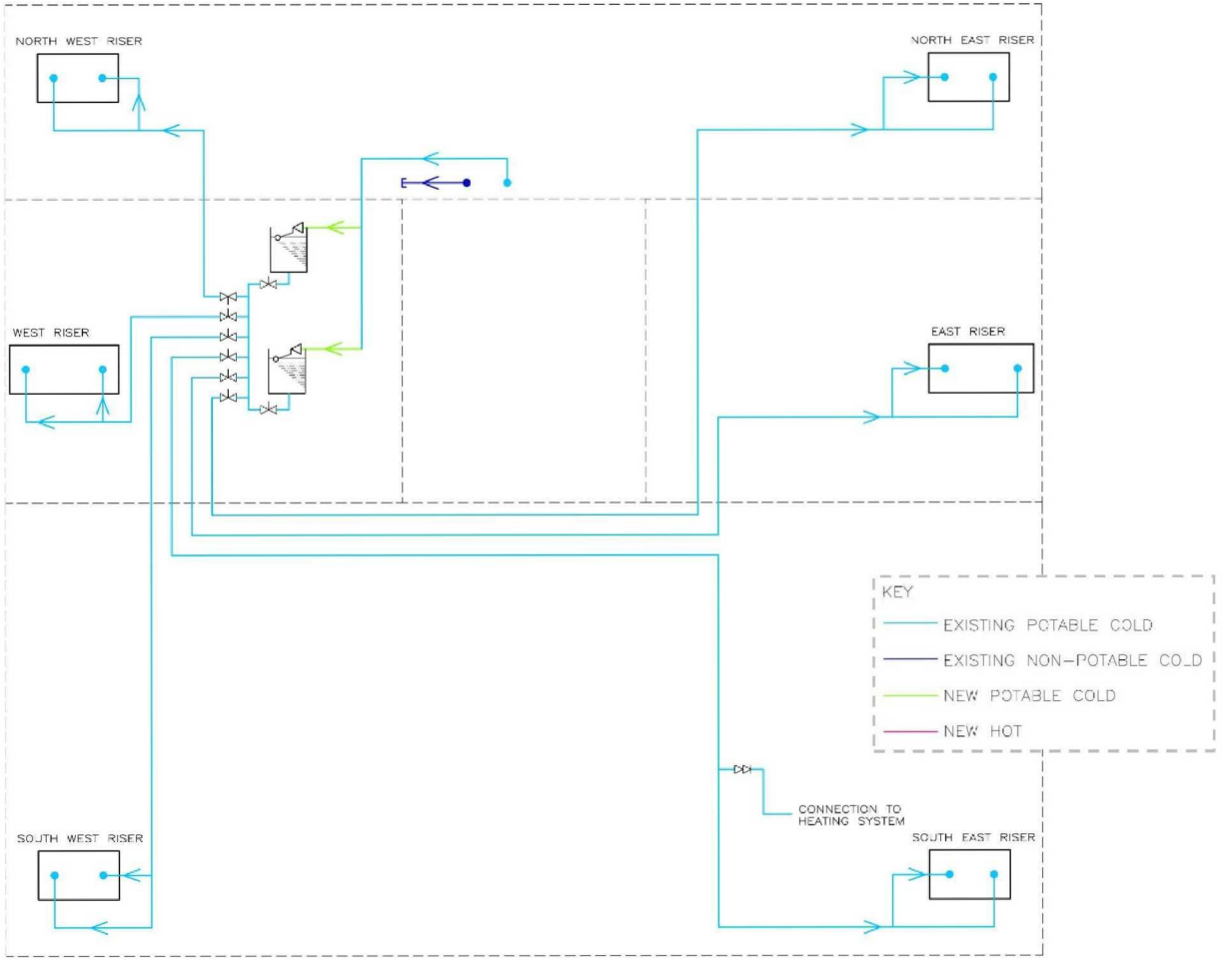
Phase 2

Replace the existing potable water storage tanks one at a time to maintain an uninterrupted potable water supply to the tenants.

New sectional water tanks to be assembled on new 500 mm high brick plinths. Reducing the height of the plinths will allow the storage capacity of the new tanks to be maximised.



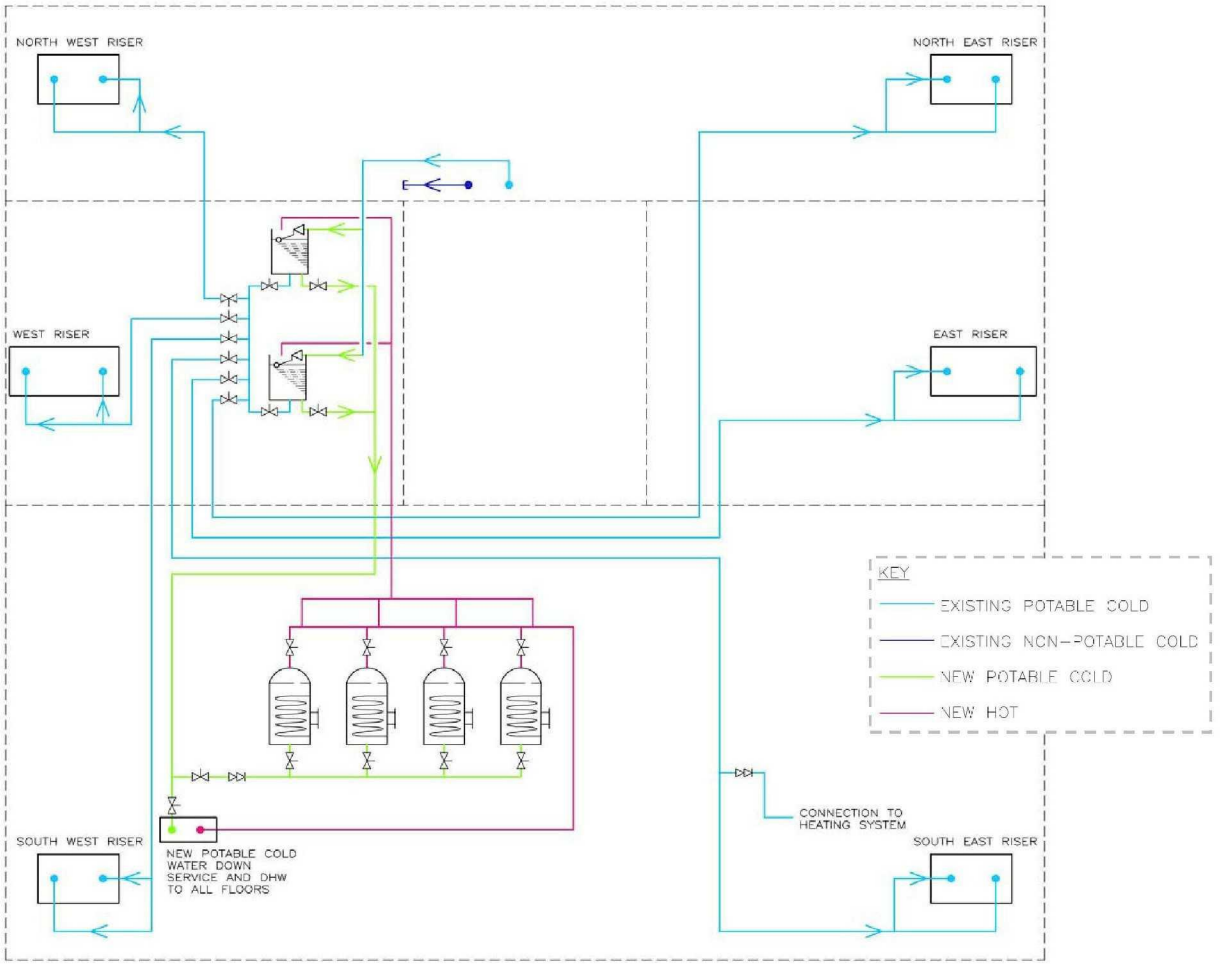
Phase 3

Install four new domestic hot water (DHW) cylinders in the location of the now removed non-potable water storage tanks providing a total capacity of 8000 litres.

Connect potable water supply to the DHW cylinders.

Connect the new DHW supply to the newly formed DHW down service to supply all floors.

Connect new potable cold-water service to the newly formed CWS down service to supply all floors.



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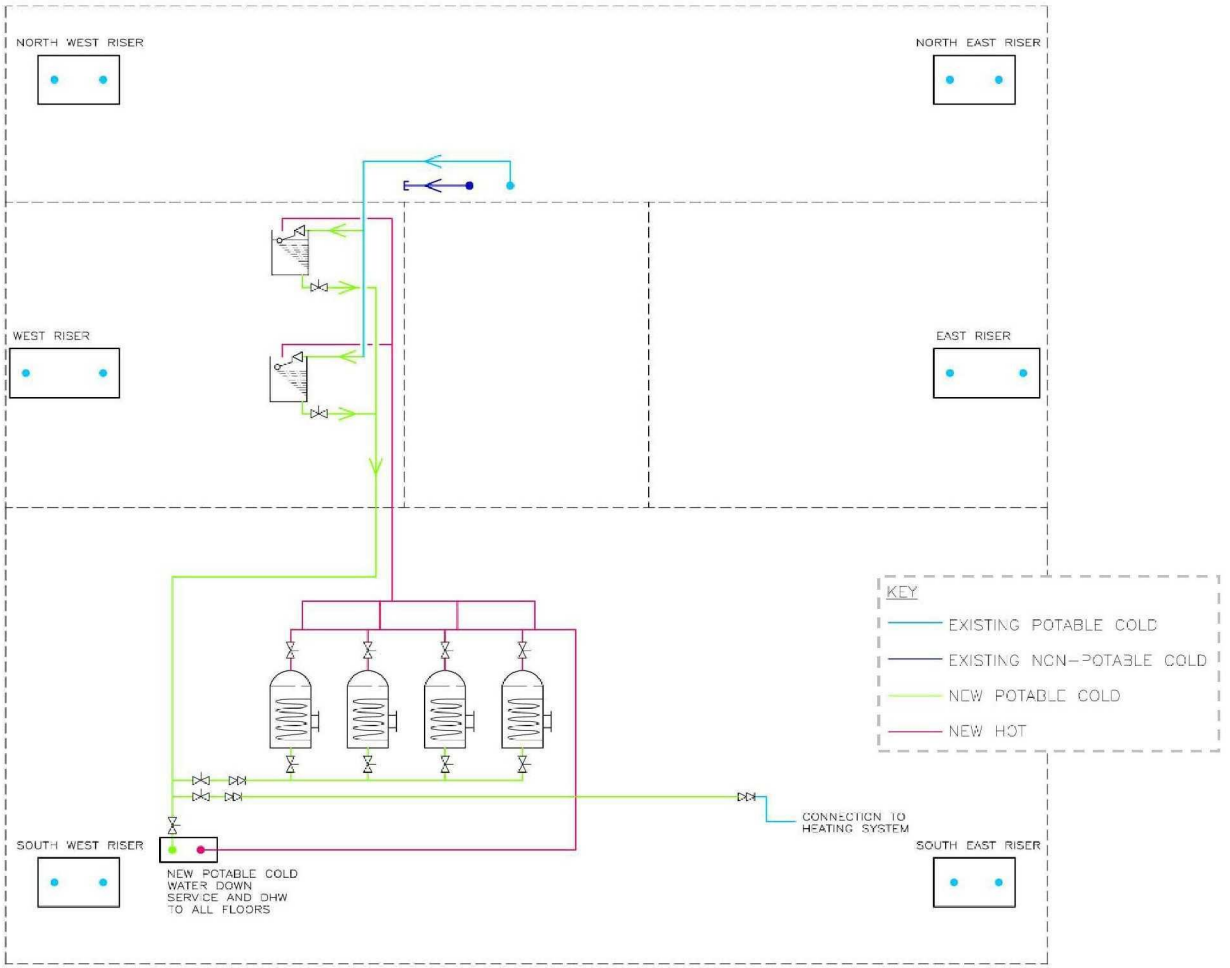
Phase 4

Decommission redundant potable water pipework to the top of each riser. The riser pipework removed as part of the heating system replacement works described in section 7.0.



9.0 DAYLIGHT ASSESSMENT

9.1 Introduction

As part of the refurbishment works at Grenfell Tower the fenestration dimensions and glazing type will be altered.

This report aims to compare the pre-refurbishment levels of daylight within the flats with those expected post-refurbishment.

Two new levels of residential flats are proposed for the Mezzanine level and Walkway+1 level. These flats will be assessed to confirm compliance with the minimum daylight levels as set out by the relevant standard.

9.2 Daylight Assessment Criteria

BS 8206 part 2 code of practice for daylighting sets out the minimum requirements for average daylight factors in new dwellings. These minimum standards are shown in Table 9-1 below.

Room	Minimum Average Daylight Factor (ADF)
Living Room	1.5 %
Bedroom	1.0 %
Kitchen	2.0 %

Table 9-1 Minimum ADF (BS 8206-2)

The assessment criteria of BS 8206 part 2 will be applied to both the existing refurbished and new flats at Grenfell Tower.

The existing flats will also be assessed against the pre-refurbishment average daylight factors to get a sense of the change in the available daylight due to the refurbishment.

9.3 Assessment Procedure

The daylight simulations are carried out using a modelling platform called IES (Integrated Environmental Solutions). The modelling engine within IES is 'Radiance' and the calculation algorithm used the CIE overcast sky for London.

A model of Grenfell Tower was created using the planning submission layouts and elevations. Proposed wall thicknesses were included to take into account the reduction in daylight caused by increased window reveal depths.

Figure 9-1 shows local shading objects such as the canopy (yellow), the finger blocks (orange), walkway and future academy (green) that were included in the model of Grenfell Tower.

The canopy was modelled as a solid element. Should the canopy be transparent to light the daylight factor to the floors below would be improved.

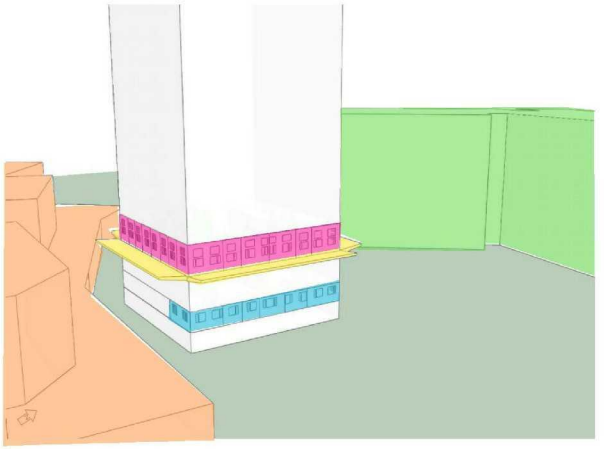


Figure 9-1 Daylight Model of New Residential Units

Every living room, kitchen and bedroom situated off of the mezzanine and walkway+1 level was modelled to show compliance.

A west facing single bedroom flat and a northwest facing two bedroom flat situated on the 1st residential floor were modelled. Because the 4th is the lowest refurbished residential floor the daylight levels on this floor will represent the 'worst case' within the refurbished flats.

9.4 Daylight Results

The IES daylight simulation results for Grenfell Tower are shown below. Figure 9-2 and Table 9-2 Mezzanine Level New Residential Average Daylight Factor Results show the layout and average daylight factor results for new residential flats on the mezzanine level. Figure 9-3 and Table 9-3 show the layout and average daylight factor results for new residential flats on the walkway+1 level. Table 9-4 shows the daylight factor results for existing flats situated on the first refurbished residential floor before and after the proposed refurbishment.

New Flats Mezzanine Level

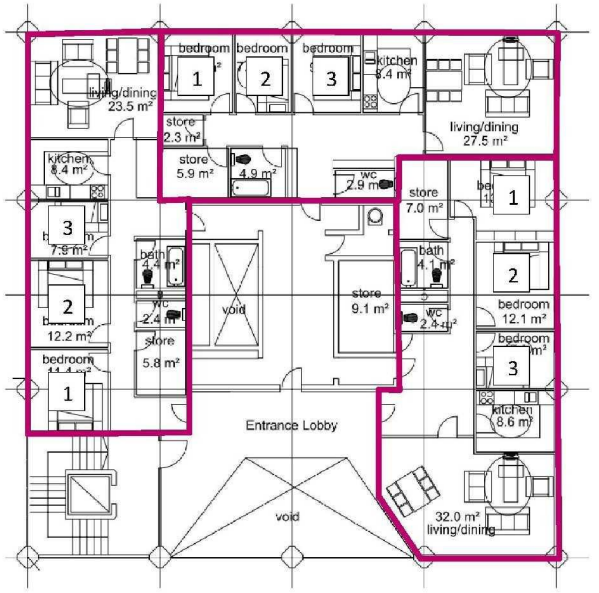


Figure 9-2 Mezzanine Level showing bedroom numbering

Flat	Room Type	ADF	Pass/Fail
Mezz_West	Living Room	2.37	Pass
	Kitchen	2.22	Pass
	Bedroom_1	1.82	Pass
	Bedroom_2	1.68	Pass
	Bedroom_3	1.33	Pass
Mezz_North	Living Room	2.16	Pass
	Kitchen	2.13	Pass
	Bedroom_1	1.52	Pass
	Bedroom_2	1.80	Pass
	Bedroom_3	1.92	Pass
Mezz_East	Living Room	1.59	Pass
	Kitchen	2.11	Pass
	Bedroom_1	2.00	Pass
	Bedroom_2	1.95	Pass
	Bedroom_3	1.79	Pass

Table 9-2 Mezzanine Level New Residential Average Daylight Factor Results

New Walkway+1 Level

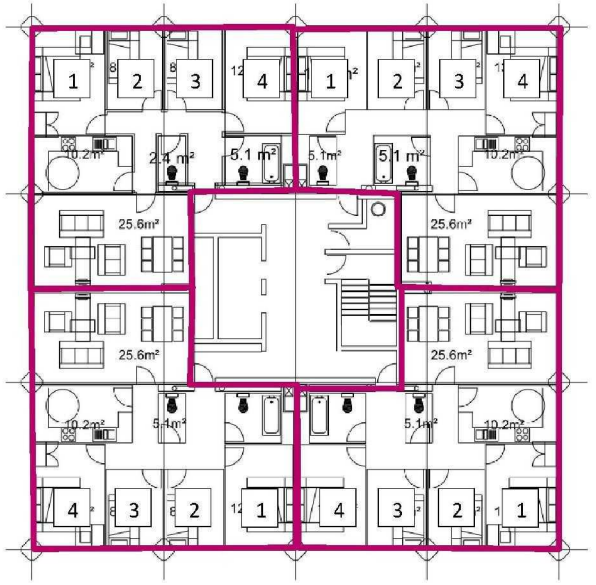


Figure 9-3 Walkway+1 Level showing bedroom numbering

Flat	Room Type	ADF	Pass/Fail
W+1_ North_West	Living Room	2.54	Pass
	Kitchen	2.86	Pass
	Bedroom_1	5.13	Pass
	Bedroom_2	2.31	Pass
	Bedroom_3	2.29	Pass
	Bedroom_4	1.69	Pass
W+1_ North_East	Living Room	2.05	Pass
	Kitchen	2.37	Pass
	Bedroom_1	1.62	Pass
	Bedroom_2	2.42	Pass
	Bedroom_3	2.45	Pass
	Bedroom_4	5.47	Pass
W+1_ South_West	Living Room	2.17	Pass
	Kitchen	2.31	Pass
	Bedroom_1	1.74	Pass
	Bedroom_2	2.48	Pass
	Bedroom_3	2.48	Pass
	Bedroom_4	5.32	Pass
W+1_ South_East	Living Room	2.12	Pass
	Kitchen	2.08	Pass
	Bedroom_1	1.74	Pass
	Bedroom_2	2.42	Pass
	Bedroom_3	2.50	Pass
	Bedroom_4	5.63	Pass

Table 9-3 Walkway+1 New Residential Average Daylight Factor Results

Existing Flats

Flat Type	Room Type	Existing	Refurbished With Solar Control		Refurbished Normal Double Glazing	
		ADF	ADF	% Reduction	ADF	% Reduction
Double	Living Room	4.41	2.12	52%	4.24	4%
Double	Bedroom	2.74	1.22	55%	2.35	14%
Double	Kitchen	2.81	1.50	47%	2.41	14%
Single	Living Room	2.00	1.22	39%	1.98	1%
Single	Bedroom	2.68	1.23	54%	2.37	12%
Single	Kitchen	3.93	1.63	59%	2.60	34%

Table 9-4 Existing Flats Example, Average Daylight Factor Pre and Post Refurbishment

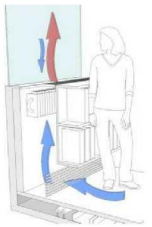
9.5 Summary

New flats on the mezzanine and walkway+1 levels comply with the minimum daylight levels as set out in BS8206 part 2.

Refurbished flats will all have reduced average daylight factors. In part this is necessary to reduce the current overheating problem. All rooms comply with the minimum standards set out by BS 8206 part 2.

The single bedroom flat kitchen has a noticeable reduction in daylight due to the high provision for glazing in the existing window arrangement. The average daylight factor has dropped by 34%, however the refurbished daylight factor is well above the minimum level of 2.0 for a kitchen and as such this is not deemed to be a problem.

10.0 SERVICING STRATEGY SUMMARY

Floor	Drainage	Piped Services	Heating and Cooling	Ventilation	Lighting & Emergency Lighting	CCTV	Access Control	Security and Alarm	Fire Detection and Alarm	BMS
General	Where possible drainage requirements of the new units should be designed around the existing drainage to limit the amount of new drainage that needs to be installed. However, new drainage to the lower floors should be relatively easy to accommodate due to the flexibility afforded by the basement plantroom.	New CWDS and DHW supply each area from the newly installed heat pump system on the roof. Services to run down the existing riser routes, these routes to be accessible from the new floors (ground to Walkway +1).	All levels to be fed with LTHW generated by the central heat pump plant installed at roof top level. Cooling to be via openable windows and secure purge ventilators.	Generally ventilation will be via openable windows and trickle ventilators.	New general and emergency lighting will be provided throughout with the exception of the existing residential.	Enhance or extend the existing CCTV system to provide additional coverage to the under croft and finger blocks. Entrances to the tower will be covered. Additional CCTV cameras should be kept to a minimum. No new CCTV will be installed within the Tower.	Stand-alone fob controlled access.	Stand-alone security system to different areas.	Fire strategy to be developed with Exova and Studio E at the start of the next stage. Existing stair core smoke extract system and fire alarm and detection to be renovated as per AECOM "upgrade to fire alarm and smoke extract system" and extended to the new levels as required by the fire strategy. It is likely that the fire alarm and detection systems for the Nursery, Boxing club and offices will be separate but will be linked to main central fire detection and alarm system to alert when another system is activated.	A simple BMS system will be provided to operate the main items of plant and to monitor any energy monitoring.
Offices			**Heating** Generally, active perimeter trench heating either flush to floor level or if built in wall storage is required a detail such as Figure 10-1can be used.  **Figure 10-1 - Perimeter storage and heating** **Cooling** Natural Ventilation automatic control, manual override provided to enhance user control.	Automatic opening windows controlled by a stand-alone CO_2 monitoring system.	New office lighting to BCO guidance.  **Figure 10-2 - Sample Office Lighting** Install new high level efficient lighting making use of LED or high frequency linear fluorescent lamps to create an industry standard lighting scheme.		Stand-alone fob controlled access	Stand-alone security system		Stand-alone control of services.
Nursery			**Heating** Low surface temperature radiators around the perimeter. Underfloor heating would be desirable in this area but it unlikely that the floor levels will permit this option. **Cooling** Natural Ventilation automatic control via a stand-alone system with manual override.	Automatic opening windows controlled by a stand-alone CO_2 monitoring system.	New nursery lighting. Nursery to be consulted on their lighting requirements.		Stand-alone fob controlled access	Stand-alone security system.		Stand-alone control of services.

Floor	Drainage	Piped Services	Heating and Cooling	Ventilation	Lighting & Emergency Lighting	CCTV	Access Control	Security and Alarm	Fire Detection and Alarm	BMS
Boxing Club			**Heating** Double panel wall hung radiators hung around the perimeter of the space. **Cooling** Natural Ventilation automatic control via a stand-alone system with manual override.	Automatic opening windows controlled by a stand-alone CO_2 monitoring system.	New boxing club lighting. Boxing club to be consulted on their lighting requirements.		Stand-alone fob controlled access	Stand-alone security system.		Stand-alone control of services.
New Domestic			**Heating** Double panel wall hung radiators. **Cooling** Natural ventilation via opening windows and secure purge ventilation panels.	Acoustic trickle ventilator built into the window frames, opening windows and secure purge vent panels.	New pendant fittings and downlights.		Incorporate the new residential floors into the existing fob access control system. The existing system will require a new buzzer faceplate to incorporate the new floors.	No security alarm.	New LD3 class fire detection and alarm system to be installed in all flats. These are not linked to the central fire detection and alarm system.	Stand-alone control of services.
Existing Domestic	As existing			Acoustic trickle ventilator built into the window frames, opening windows and secure purge vent panels.	Existing lighting.			No security alarm (As existing).	New LD3 class fire detection and alarm system to be installed in all flats. These are not linked to the central fire detection and alarm system.	Stand-alone control of services.

APPENDIX A – HEATING OPTIONS STUDY

	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
System Description	As existing, central district heating boiler plant, 24h LTHW circulation, limited control over heating system and overheating problems in summer. Ventilated domestic hot water storage in each flat served by the district heating central boilers in the basement plant room. The existing hot water storage is poorly insulated and is not recommended to be retained in any of the options.	Replace the existing central heat plant with a new boiler located in the basement plant room area. Replace existing ventilated hot water storage tanks in every flat with a new unventilated hot water storage tank in each flat.	Replace the existing central heat plant with a gas absorption heat pump located in the rooftop plant room area. Replace existing ventilated hot water storage tanks in every flat with a new unventilated hot water storage tank in each flat.	Replace the existing central heat plant with a gas absorption heat pump located in the rooftop plant room area. Install a new central domestic hot water (DHW) system at roof-level with DHW return pipework.	Replace the existing central heat plant with a gas absorption heat pump located in the roof top plant room area. Install a new central domestic hot water (DHW) system at roof-level with trace heating to the supply pipework.	Remove existing heat distribution pipework and hot water cylinders. Install individual gas combination (combi) boilers to each flat to supply instantaneous domestic hot water and individual heating systems.
Energy Carbon	400 kWh/m2.year 77.8 $kgCO_2/m^2$.year	99 kWh/m^2.year 19 $kgCO_2/m^2$.year	68 kWh/m^2.year 13 $kgCO_2/m^2$.year	69 kWh/m^2.year 14.7 $kgCO_2/m^2$.year	70 kWh/m^2.year 14 $kgCO_2/m^2$.year	81 kWh/m^2.year 16 $kgCO_2/m^2$.year

	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
User comfort and control	Users currently have on/off control of their radiators. Turning radiators off does not stop the hot water flow within the heating distribution pipes that are cast into the floor. These pipes are hot all year round. This is an uncontrolled heat source and is a major contributor to the high energy consumption and summertime overheating. Due to the type of existing radiators and the way in which the system is piped it is not possible to remove the uncontrolled heat loss from the pipes and provide heating control to each individual room.	Install a simple heating controller that allows users to set a central flat temperature and time clock. The controller would operate a control valve to control the temperature of the flat. The thermostat is usually placed within the principal habitable room, in this case the living room of the flats. Individual room control via thermostatic radiator valves (TR) would only be possible if a replacement radiator pipe system was installed, the current system cannot facilitate this. If individual TRVs were not installed overheating could occur in other rooms.	The user controls proposed would be the same as those in option 'A'. Centralised weather compensation will vary the temperature of the water being circulated around the building. The temperature would depend on the external air temperature. Only when it is very cold does water need to be circulated at the maximum flow temperature. When external temperatures are warmer the flow temperature can be reduced which improves the heat pump efficiency and reduces uncontrolled heat gains. The unventilated domestic hot water storage cylinder would be sized to provide 24 hours of hot water storage. This allows the storage cylinders to be re-charged once a day. We propose to recharge the DHW overnight between 01:00 and 04:00. During this time the main pipework flow temperature cannot be decreased as it can when supplying the heating. By only supplying hot water for DHW at night this strategy allows the distribution pipework to be run at lower temperatures during the day which reduces overheating problems. If a tenant runs out of hot water before the next recharge has started they could use an electric immersion heater to provide extra hot water.	As option 'B_1' As described previously, larger radiators can be run at cooler temperatures while supplying the same amount of heat to a room as a small radiator running at a higher temperature. Cooler radiators reduce the risk of elderly or very young tenants burning themselves. Each room would have temperature control via a thermostatic radiator valve (TRV) which gives the tenants individual temperature control of each room. A central time clock will also be provided to switch heating off at night and when on holiday etc. When radiators are controlled with TRVs low temperature radiators are less likely to overshoot the room temperature set point, this leads to a more comfortable environment. DHW to be provided via a central distribution system from roof level.		This option allows for the maximum amount of user control. As there is no central hot water flowing through each flat there are none of the associated unwanted heat gains. Hot water is always available and cannot run out as can happen with a DHW storage vessel. The user would be able to change the flow temperature of the heating to suit their individual needs.

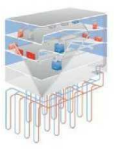
	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
Ease of installation		Due to the flat construction any new pipework feeding new radiators would need to be surface run within the flats and concealed to avoid damage. Pipework routes would need to be planned to minimise disruption and clashes with door thresholds etc. This applies to all options where the existing radiators and pipework is replaced. Full access into each riser would be required to replace the existing hot water storage tank. All new equipment would be sized to fit within the existing riser space. No further space will be taken up within the flats due to the new heating system. No impact on plant rooms as the new boiler would be installed in the available 'boiler no.4' area within the basement plant room.	As Option A with the exception of the following; The GAHPs are to be installed on the top of the rooftop plant room to take advantage of the bathroom extract fans. Back up boilers will be situated within the rooftop plant room.	As Option B_1 with the exception of the following; 4nr central domestic hot water tanks are to be situated within the rooftop plant room. Existing hot water storage cylinders in all flats are to be removed and cupboard space created.		A space roughly the size of a wall hung kitchen cabinet would need to be found in every flat to mount the combi boiler. Each combi boiler would require its own balanced flue which would be approximately 100 mm in diameter and would need to terminate on an external wall. If the combi position was away from an external wall the flue would need to be run at high level, boxed in and access hatches would need to be provided to allow for periodic inspections. The flats at Grenfell Tower are not large and do not have an abundance of storage space. A combi boiler is at minimum the same size as a wall hung kitchen cabinet. The kitchen was chosen as the ideal location as the gas service runs here and has access to an external wall. If a clear area of wall cannot be found an area of wall will need to be created, perhaps by removing an existing cupboard.

	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
Metering	A central gas meter measures gas used by the district heating system. Tenants are billed based on an estimated rate multiplied by their flat floor area. This billing strategy effectively charges each tenant a flat rate for their heat. It is difficult to encourage energy saving by the tenants using a strategy such as this.	Metering could be incorporated into this option by adding a heat meter (more accurate) or a water meter (less accurate) into the heating and hot water flow pipework into the flat. If tenant billing was required the more accurate heat meter would be required than if the metering was installed to monitor heat use. Metering with feedback, be that in the form of a bill or statement showing energy consumption against the neighbour's consumption, could encourage individuals to think more about the heat they use. The cost analysis to follow will set out estimated costs for installing heat metering to each flat.	Metering could be incorporated in the same way as option 'A'. The electric top-up element of the DHW system is intended to encourage responsible use of the hot water. If heat continues to be unmetered then there is a perception that the heat is free. This option proposes to give each flat a generous daily allowance of hot water (200 litres); if they run out of hot water then they must use the electric emersion heater to top it up. As the tenants pay their own electricity bills they will pay for any extra hot water used over and above what is being provided to their flats under the flat rate.	Metering for the heating system could be incorporated in the same way as Options A & B_1. DHW could be metered using a water flow meter at the point of entry to the flat as the temperature will be a known constant value.		Each flat is served by a 22 mm natural gas supply originating from the kitchen riser. The single void flat has a pay-as-you-go gas meter under the kitchen sink. It is unclear as yet if this is the standard arrangement in all flats. If this is the standard arrangement then it would be relatively simple to install new gas combi boilers off the existing natural gas supplies. Each flat is metered separately so the tenants will pay normal domestic gas rates, this could result in higher bills than they currently pay but is likely to be offset by the increased efficiency of the building fabric and heating system.

	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
Ease of maintenance	Very few components within the existing system required routine maintenance. It is good practice to carry out an annual inspection on any heating system, although there is no legal requirement to do so.	Replacing the existing open vented domestic hot water storage vessel with a modern equivalent will have the same low maintenance requirements as the existing system. However this system results in water pressure within the flats that is not capable of running showers. If the option to increase the pressure of the DHW to allow showers was a priority then an unvented DHW storage system similar to Option 'B' would be required. This system would have a slightly more onerous maintenance regime than the existing; see option 'B' for details.	There is no legal requirement for an annual inspection of an unvented hot water system. It is however strongly recommended that an annual inspection is carried out to check that the expansion vessel membrane and that all the safety devices are working correctly. This will require access to be maintained to the riser. This option is no more onerous than the current installation. If the gas inspection lapses to more than a year between inspections the landlord is in breach of the law and is liable to be prosecuted. This can result in the TMO having no choice but to force entry into a flat to carry out a gas inspection. This is not the case for the yearly heating system inspection as there is no legal requirement. If a property cannot be entered a different date can be scheduled. The advantage of an unventilated hot water system is that the tenants will be able to install showers in their flats. Showers use less hot water than baths so should help to reduce the energy consumption. All other maintenance can be carried out centrally with no disruption to the tenants.	All maintenance can be carried out centrally with no disruption to the tenants. The GAHPs require a check on a yearly basis with scheduled maintenance occurring every two years.		Gas appliances require yearly safety inspections. This is a legal requirement and must be carried out otherwise the landlord is in breach of the law. Installing gas boilers in each flat will impose an inspection burden on the TMO. It can be difficult to gain entry into tenanted flats to carry out these inspections on a yearly basis. Forced entry may be necessary if no other means of entry can be arranged. This option has the most onerous maintenance regime of any of the other options. Accessing the boilers from outside via a cleaning rig was tabled as an option for boiler maintenance access. This option would require the gas engineer to be specially trained in the use of a cleaning rig. This option is not currently being actively pursued but could be investigated further if required.

	Existing	Option A	Option B_1	Option B_2	Option B_3	Option C
Threats		Not getting permission to renew radiators in the long lease holders' flats would leave them with a lower level of user control. Not being able to access the service risers. If furniture obstructs access into the service riser it would have to be removed and reinstated. This will vary on a flat by flat basis.	The existing heating pipework may not be in an acceptable condition to be retained. New central pipework would need to be installed within all six service risers. This would involve partially removing the fire stopping between floors and replacing it after the new pipework was installed. A scope of works for an appropriate survey will be produced by Max Fordham LLP to gauge the condition of the existing pipework. Not being able to access the service risers. If furniture obstructs access into the service riser it would have to be removed and reinstated. This will vary on a flat by flat basis. The ability to replace radiators in all flats, if one flat did not agree to replace their radiators the hot water circulation temperature would not be able to be decreased. Therefore the efficiency improvements from the heat pump could not be realised.	As Option B_1.		Unknowns regarding the existing gas services. If all flats have gas metered installed then new combi boilers could be added without notifying the gas utility. If not all flats have utility meters then the utility company will need to be involved to add new meters. If new gas pipework is required to the flats it will have to be run externally and remain accessible for inspection.
Tenant Feedback from Consultation		Energy consumption was seen as being too high for this option when viewed relative to the GAHP options.	Method was seen as being acceptable – see Options B_2 and B_3 for more information.	Preferred option due to increased space available. No clear preference between Options B_2 and B_3 due to differences being seen as purely technical issues.		Safety concerns from all tenants spoken to regarding combi-boilers in each flat. Also space concerns were raised due to the likely loss of cupboard area within the kitchens.

APPENDIX B – RENEWABLE OPTIONS

Technology	 PV	 Wind	 Solar Thermal	 Biomass	 Ground Source Heat Pump	 Air Source Heat Pump	 Rainwater & Grey water harvesting
Location	Roof top and south façade.	Rooftop	Rooftop	Basement	Basement	Rooftop	Water storage/treatment in basement
Load	Generates electricity, supplying to the landlord's electricity supply	Generates electricity, supplying to the landlord's electricity supply	Generates domestic hot water (DHW)	Generates Low Temperature Hot Water (80 to 90 °C)	Generates Low Temperature Hot Water (35 to 65 °C)	Generates Low Temperature Hot Water (35 to 65 °C)	Recycles rain water or grey water to be used for flushing WCs or washing clothes
Advantages	• Easy to install • Easy to connect services • Light weight • Zero carbon electricity • Easy "bolt on" renewable technology • 20 years payback with government incentives	• Rooftop mounting location maximises wind speed and therefore energy generation • Zero carbon electricity produced • 15 years payback with government incentives	• Zero carbon domestic hot water produced • Current proposals place all the DHW storage at roof top level which is the ideal location to pick up energy from a rooftop solar thermal system. • 10 to 15 years payback with government incentives	• Near zero carbon heat • Versatile high grade heat produced • 10 to 15 years payback with government incentives	• Heat extracted from a renewable source • Low running costs. • Low plant space requirement. • Low maintenance • Suitable for low temperature heating	• Heat is extracted from the air to heat the building and the hot water • Additional heat can be recovered from the central extract system • No boreholes required • 10 to 15 years payback with government payback	• Reduces the amount of drinking quality water needlessly used to flush toilets and wash clothes.
Disadvantages	• Relatively low efficiency compared to solar thermal • High capital cost • Large area of panel required to generate a meaningful amount of electricity • Requires direct sunshine to function efficiently	• High capital cost • Acoustics, close proximity to upper floor flats may cause noise problems • Structural requirements for wind loading • Structural requirements for anti-vibration into dwellings	• Requires more maintenance than a PV system. • No way to sell surplus energy like a PV or wind system	• Hot water produced by a biomass boiler is ideally matched to old buildings with poor insulation levels. This is not the case with Grenfell Tower. • Additional space required on site for biomass fuel storage.	• Performance dependent on geological conditions • Large number of piles required to harvest required heat • Relatively expensive	• High capital cost when compared to standard gas boilers • Efficiency is low if the heating system is not weather compensated (Grenfell will be weather compensated) • Not as efficient as a ground source heat pump	• Large areas required to store captured rainwater and grey water treatment. • A second set of water distribution pipework would be required to deliver rainwater from storage tanks to WCs and washing machines
Project Suitability	Highly suitable due to ease of installation, low maintenance requirements and silent, vibration free operation	Assuming the structural requirements of wind turbines could be met the acoustic impact on the upper floor flats could not be easily solved. If an electricity generating renewable was required PV panels would be the first choice.	Solar thermal would be ideally matched to the Grenfell Towers project, as the hot water demand of a domestic property is high. However, due to the limited roof area compared to the net flat floor area, this technology can only have a limited impact on DHW energy use.	Biomass fuel deliveries in urban environments should not be encouraged as they add to traffic congestion. The particulates generated by burning biomass contributes to urban air pollution.	The large ground heat collector required to supply Grenfell Towers with heat will be large. As there is only a small amount of land available onsite for boreholes there would only be a small number of them. To achieve the required heat transfer each borehole would need to be very deep which would be prohibitively expensive.	Highly suitable due to roof top mounting location where energy can be recycled from the central extract system	Grey water treatment is troublesome to get working, we would not normally recommend its use. The small roof area compared to the large floor area means that the rain collected would only make a small contribution to the WC water demand. Additional pipework to WCs would require disruptive work inside the flats.
Further Consideration	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**	**No**

APPENDIX C – ACOUSTICS REPORT

1.0 INTRODUCTION

Max Fordham LLP has been appointed to undertake a noise assessment to support a Planning Application for a refurbishment of Grenfell Tower in the Royal Borough of Kensington and Chelsea (RBKC). The proposed scheme will make improvements to the external façade including replacing the windows and installing acoustic trickle vents. A number of items of mechanical plant will be installed on the roof to provide heating to the building.

This report sets out an assessment of internal noise levels after the façade refurbishments are made, and the impact of noise emissions from the plant to nearby residential properties.

2.0 NOISE ASSESSMENT CRITERIA

2.1 Core Strategy (2010)

The Royal Borough of Kensington and Chelsea Core Strategy sets out the Council's policies in relation to planning and noise. Policy CE6 states that the Council will:

"require that noise and vibration sensitive development is located in the most appropriate location and protected against existing sources of noise and vibration, through careful design, layout and use of materials, to ensure adequate insulation from sound and vibration", and

"resist all applications for noise and vibration generating development and plant that would have an unacceptable noise and vibration impact on surrounding amenity".

2.2 Plant Noise Emissions

The Supplementary Planning Document (SPD) released in 2009 provides further details of the Council's policies in relation to planning and noise. It is stated that all noise generating development such as building services plant and equipment will be subject to the imposition of a planning condition to protect residential amenity. The typical condition given in the SDP is that plant and equipment shall not increase the LA90 background noise level at 1m from the nearest residential window at any time when the plant is operation. This is normally interpreted as meaning that the plant noise level must be at least 10 dB lower than the lowest LA90 background noise level, or 15 dB lower if the noise is tonal or impulsive.

2.3 Internal Noise Levels

The SPD does not provide any specific guidance in relation to internal noise targets within refurbished residential buildings. However, RBKC have indicated that they would require an assessment to be made of the expected reduction in internal noise levels as a result of the refurbishment.

3.0 NOISE SURVEY

A 48-hour noise survey was undertaken from the 23rd – 25th July 2012 to establish existing background noise levels.

A measurement position was chosen to be representative of the lowest background noise level experienced by residents. This position would consequently be the most affected by any increase in noise level due to the installation of new plant.

The results from this measurement can be used to accurately calculate the noise levels on other facades.

Survey procedure
A sound level meter was set up to make consecutive 5-minute noise measurements over the 48-hour period.

The microphone of the sound level meter was mounted on a tripod and positioned 1m outside a window on the 9th floor of Grenfell Tower's eastern façade (see Figure 1). This position is considered to be free field and representative of noise levels experienced by residents in Grenfell Tower and nearby locations. A weather protection kit was used. The sound level meter was calibrated at the beginning and end of the survey period and no significant drift occurred.

The weather conditions throughout the survey period were warm with low winds and no precipitation. They are not considered to have affected the survey results.

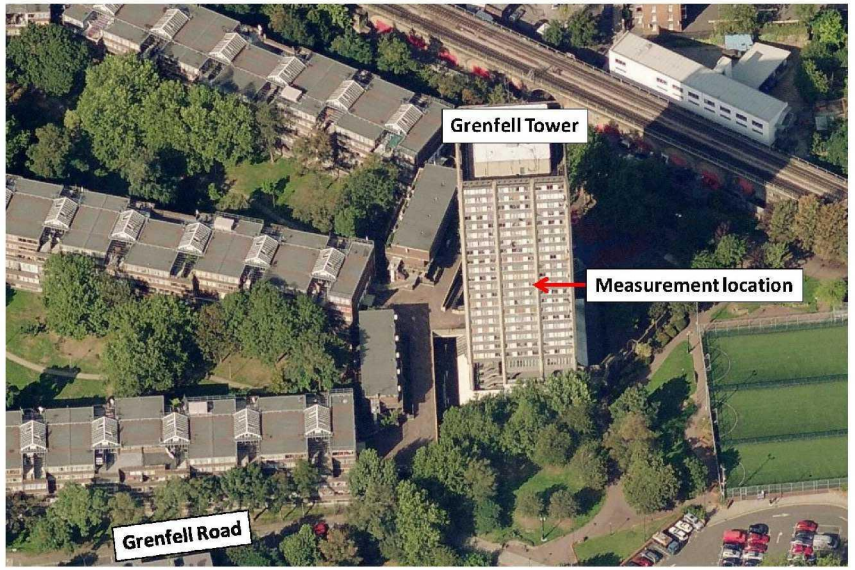


Figure 1 – Aerial image of site including measurement location

Survey equipment
NOR 118 (S/N 31419) sound level meter Cert no. U7288

NOR 1206 (S/N 30457) preamplifier (with SLM)

NOR 1225 (S/N 51319) microphone Cert no. 7298

NOR 1251 (S/N 30895) calibrator Cert no. U7299

Survey results
The results of the noise survey are presented graphically in Figure 2 below.

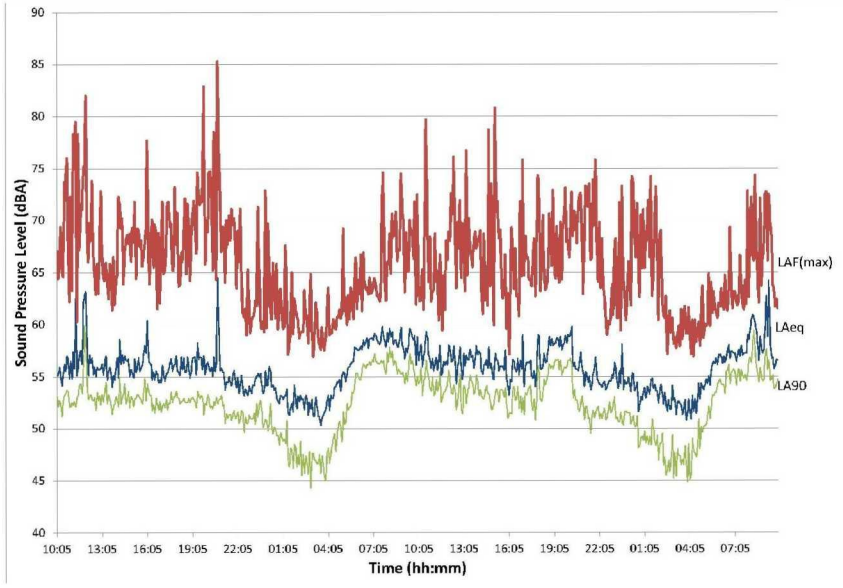


Figure 2 – Summary of Noise Survey Results

The logarithmic average values for the full day and night periods are as follows:

- LAeq,day(16hr, 07:00-23:00) = 57.0dB
- LAeq,night(8hr, 23:00-07:00) = 54.5dB

The lowest measured noise level in the survey was 44 dB LAF90.

Therefore in order to ensure that the RBKC requirement is met at all times, the combined plant noise level must be less than 34 dBA LAeq at a position 1m in front of the window of the most affected residence. A 5dB penalty is applied if the noise is tonal or impulsive in character.

The measurement was made on the eastern façade

4.0 PLANT NOISE ASSESSMENT

4.1 Proposed Plant Equipment

The main external mechanical plant equipment currently proposed is listed in Figure 3 below. This equipment would be installed on top of the plant enclosure on the roof of Grenfell Tower, in the location indicated in red in Figure 5. Also listed are the noise levels emitted by the units, as advised by the manufacturer (based on initial worst-case selections).

Noise data provided by the manufacturer is in the form of single figure A-weighted values. Octave band data from similar items of plant was used in the assessment, scaled appropriately.

Item	Quantity	Noise Level
Bosch Floor Standing Condensing Boiler GB312	2	Sound Power Level = 55dBA
Bosch Gas Absorption Heat Pump GWPL38 L5 (5x38kW)	1	Sound Pressure Level at 10m =49dBA

Figure 3 – Proposed external plant equipment

4.2 Tonal and Impulsive Noise

MFLLP have measured noise from similar installed heat pump units in third octave bands. A typical measurement is presented in Figure 4 below. The graph contains no significant third octave peaks, which indicates that noise emitted by this type of unit is not tonal in character. The operation of the unit is continuous and does not result in any impulsive noise. It is therefore not appropriate to apply the penalty for tonal or impulsive noise.

No spectral data is available for a unit similar to the condensing boiler. However, the units are much quieter operationally than the heat pump and will not contribute significantly to the overall plant noise level.

Thus the requirement for the combined plant equipment is a noise level less than 34 dBA LAeq at a position 1m in front of the window of the most affected residence.

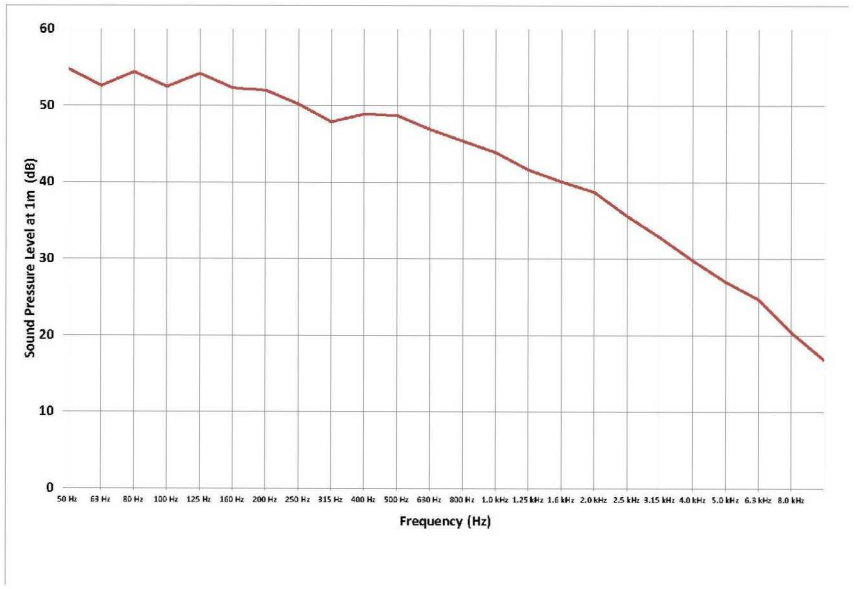


Figure 4 – Sound pressure level spectrum for typical heat pump.

4.3 Plant Noise Calculation

Plant noise levels are calculated in octave bands at a position 1m from the window of the most affected top floor residence of Grenfell Tower using noise data provided by the manufacturers and considering the attenuation over distance and screening effects of barriers. Noise levels were also calculated at nearby residences on Grenfell Road, which are further away from the plant but benefit less from screening (see Figure 5).

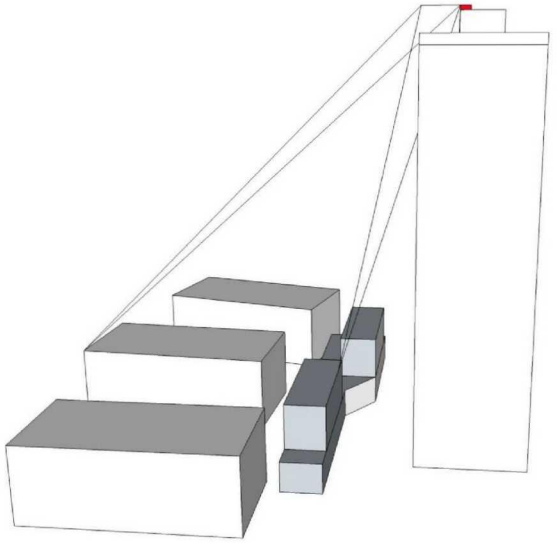


Figure 5 – Illustration of plant noise screening at nearby residences on Grenfell Road. The proposed location of the plant is shown in red.

The total plant sound power level is 55dB. The distance to a position 1m from the window of the most affected top floor residence in Grenfell Tower is 12m with a corresponding noise attenuation of 2dB. The screening effect of the corner of Grenfell Tower reduces noise levels by 21dB. The total sound pressure level from the proposed plant at the top floor position is 29dBA. The noise level at all other positions is less than 29dBA.

The calculated noise level falls below the target level of 34dBA. Therefore the RBKC plant noise requirement is met with no additional acoustic screening needed.

5.0 FAÇADE REFURBISHMENT

5.1 Façade Noise Exposure

Internal noise levels have been calculated for a residence on the north or west façade of Grenfell Tower, which are the façades with the highest noise exposure. The external noise level incident on these façades is approximately 62dBA which was calculated from the measurement on the eastern façade, corrected for screening.

5.2 Façade Sound Insulation Improvements

An assessment has been made of the sound insulation provided by the existing façade and the resulting internal noise level. The improvements in façade sound insulation have been predicted based on the proposed façade refurbishment works. The current single glazing will be replaced by insulated double glazing and an acoustic trickle ventilator will be installed. It is assumed that the ventilator will have a sound insulation performance of at least 38 dB Dne, w. This can be achieved with a Renson AK35 or similar product.

Façade condition	Period	Internal Noise Level (dBA)
Current	Day	48
	Night	46
Upgraded windows and new acoustic trickle vents	Day	38
	Night	36

Figure 6 – Internal noise levels before and after upgrade

The results show that upgraded windows and new acoustic trickle vents will reduce internal noise levels by approximately 10dB. The façade sound insulation performance is improved significantly.

It should be noted that external noise levels are predicted to rise during the construction of the proposed Kensington Academy and Leisure Centre. Therefore internal noise levels are indicative only.

6.0 SUMMARY

- This report assesses the noise impact of the refurbishment of Grenfell Tower in the Royal Borough of Kensington and Chelsea.
- The proposed scheme will make improvements to the external façade including replacing the windows and installing acoustic trickle vents.
- A number of items of mechanical plant will be installed on the roof of Grenfell Tower to provide heating to the building.
- A noise survey was undertaken to establish the average noise level incidence on the façade during the daytime and night time periods, and the minimum background noise level at local residential properties.
- Internal noise levels were calculated before and after the proposed façade refurbishment and are found to be reduced by 10dB. The façade sound insulation performance is improved significantly.
- The noise level generated by the proposed plant was calculated and found to meet RBKC requirements with no additional acoustic screening needed.

APPENDIX A

Glossary of acoustic terminology

Sound Pressure Level, SPL or LP (decibels, dB)

A measure of the instantaneous sound pressure at a point in space. The threshold of hearing occurs at approximately SPL=0 dB (which corresponds to a reference sound pressure of 20□Pa).

LP(dB)=20.log10(Measured RMS Sound Pressure (Pa)/20□Pa)

where RMS Sound Pressure is the Root-mean-square of the sound pressure at a point, relative to mean atmospheric pressure, over a time period defined by the sound level meter used.

A-Weighted Sound Pressure Level, LA (dBA)

SPL values are weighted in a way that approximates the frequency response of the human ear and allows sound levels to be expressed as a single figure value.

Equivalent Continuous A-Weighted SPL, LAeq,T (dBA)

Energy average of the A-weighted sound pressure level over a time period, T. The level of a notional continuous sound that would deliver the same A-weighted sound energy as the actual fluctuating sound over the course of the defined time period, T

Background Noise Level A-Weighted LA90,T (dBA)

A-weighted sound pressure level that is exceeded 90% of the time.

8.0 STRUCTURAL STRATEGY

Stage C Report
Grenfell Tower,
Royal Borough of Kensington and Chelsea

Client
Royal Borough of Kensington and Chelsea

By Curtins Consulting Ltd
August 2012

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1.0 Introduction

This stage C report has been prepared in conjunction with Studio E Architects for the proposed refurbishment of Grenfell Tower, Kensington. The proposal was to consider a comprehensive approach to the refurbishment of the building. This report has been prepared to provide an overview of the existing Grenfell tower building construction, appraisal of the existing structure as well as providing an assessment of the proposed building options.

Additionally the report outlines the structural works required for the proposed architectural layout changes including the introduction of additional floors and removal / addition of vertical circulation routes (staircases and lifts).

The site is part of the existing Lancaster Road West Estate. Grenfell Tower is at the eastern edge of the Estate fronting the proposed site for a new Academy and Leisure Centre.

This report provides:

- An overview of the existing building structure following site inspections and a review of the record drawings obtained from The Royal borough of Kensington and Chelsea.
- A summary of the proposed concrete testing to be undertaken.
- A summary of the structural alterations carried out to the building to date and the implications these may have on the currently proposed refurbishment as well as recommendations going forward.
- A description of the proposed architectural scheme and the structural considerations associated with the proposals.

2.1 Record Information on the Existing Building

The information available on the structure of the existing tower is limited to a set of general arrangement drawings showing the building as it was when completed in the early '70s (1972) and the alterations carried out at the lower levels in 1979. The drawings are included in Appendix A of this report.

2.2 Visual Inspection

- Grenfell Tower is a 25 storey 70 metres high building composed of 4 lower levels of varying height and mixed use, 20 storeys of residential accommodation and an enclosed rooftop plantroom, all over a 5m high basement.

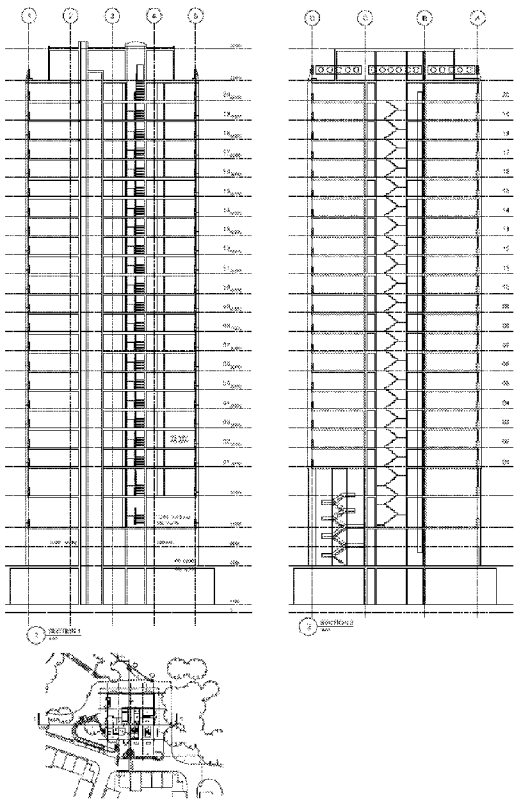

Figure 1 - Grenfell Tower sections

- The main block building stability is provided by the reinforced concrete core acting as vertical cantilever transferring the horizontal forces to the foundations.

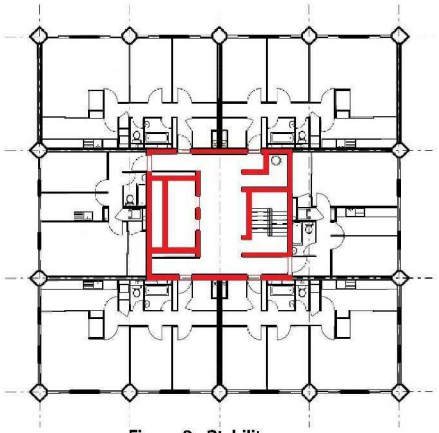

Figure 2 - Stability core

- There are no record drawings indicating the foundation system, however due to the height of the building this is likely to be piled.
- The construction of the floor slabs appears to be in-situ reinforced concrete supported by the core on the inside and perimeter columns on the outside. Beams are located at the edge of large cut-outs in the floor plate at lower levels.
- The perimeter reinforced concrete columns are square with large chamfers at each corner. These columns are rotated 45° in plan as an architectural feature and clad with precast concrete panels at the residential levels. In multiple locations holes have been cut through the columns to allow for pipes to go from one bay to the next.
- The external concrete structural elements to all elevations appear to be robust and are showing no signs of deterioration.
- The footprint of the basement is larger than that of the tower above. All the perimeter columns continue into the basement but are rotated by 45° from their orientation above ground floor.
- The existing lift pits were not inspected.
- The existing foundations could not be inspected.
- The underground drainage was not inspected.

- External elevation consisting of ribbon strips of concrete spandrels between columns. These are to be retained as used as support for the new insulation and cladding panels. Intrusive investigations to determine fixing types, their location and condition.
- The structural grid is on a 5.6m module in one direction and 7.1 – 8 - 7.1m in the other direction with 14 perimeter columns.

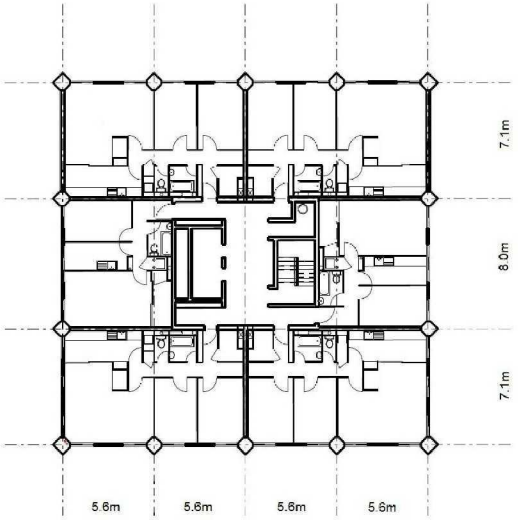

Figure 3 - Structural grid

- The building as far as could be ascertained during our visual inspections, did not reveal evidence of significant structural defects.

2.3 Information on the Existing Building by Others.

No additional information is available other than a limited number of record drawings, which are limited to general arrangements and included in Appendix A.

3.1 Concrete Testing

This appraisal, which has taken the form of a two stage process, commenced with Curtins undertaking a cursory visual inspection or 'impressionistic survey' of the building in order that an overview of its general condition could be obtained. Our findings were subsequently used to determine the extent of the intrusive investigative works that would be required in order to confirm our view regarding the condition and future durability of the structure.

The intrusive investigation work on site is on-going at the time this report is being prepared and no results are therefore available to inform the structural proposals at this stage.

The condition of the masonry infill, roof coverings and windows, together with any other materials and/or components which comprise the building's external envelope, are all excluded from consideration.

3.1.1 Scope of the Investigations

In order to properly determine the condition and future durability of the existing concrete frame, the following characteristics need to be assessed:

- Chloride ion content.
- Cement content.
- Carbonation depth.
- Cover to reinforcement.
- High Alumina Cement (HAC) content.

Concrete testing has been proposed in a number of sample locations carefully chosen to provide data on a variety of structural elements at various levels. These will not cover every level and structural member, but will be sufficient to provide an indication of the condition of the building.

The locations and structural elements chosen to carry out the testing are the following:

- Concrete core walls at basement and ground floor, dust samples at various heights and locations.
- Basement retaining walls, dust samples at various heights and locations.
- Concrete columns at ground and second floor, dust samples at various heights and locations.
- Concrete slabs, dust samples to the underside of the ground floor, Walkway and Office level slabs at various locations.
- Precast panels at second, tenth and twentieth floor, dust samples at various locations and determine the type, location and condition of the fixings of the panels to the primary structure.
- Precast cladding to columns at second, tenth and twentieth floor, dust samples at various locations and determine the type, location and condition of the fixings of the panels to the primary structure.

3.0 Concrete Testing

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At each location where a concrete dust sample will be taken the depth of carbonation and the concrete cover will also be established and tested for cement content carried out on samples taken from 50% of the areas.

Test locations are indicated in Appendix B of this Report.

3.1.2 Assessment of Potential Defects

Deterioration of the reinforced concrete elements is instigated by corrosion of the steel reinforcement which subsequently expands causing the exposed surface to crack and eventually spall. Concrete is inherently alkaline and it is this alkalinity which protects the encased steel from decay. However, the protection can be reduced by the action of acidic gases present in the air (such as carbon dioxide and sulphur dioxide). This process is called carbonation. If the carbonation depth coincides with or exceeds the depth of the reinforcement, the risk of corrosion increases, reducing the integrity of the concrete thereby leading to a reduction in its structural capacity.

Corrosion can increase or be more severe in the presence of high levels of chloride ion within the concrete. Chloride based admixtures were used during the construction process to speed-up curing times of concrete (normal practice up to the late 1960's).

In order to properly determine the condition and future durability of the concrete, the following characteristics will therefore need to be assessed:

- Chloride ion content.
- Cement content.
- Carbonation depth.
- Cover to reinforcement.

3.1.3 Chloride Ion Content

Chloride attack on reinforcement is aggressive and can occur despite the alkalinity of the surrounding concrete. It sets up an electrolytic cell, which encourages the migration of chloride ions from surrounding areas to the site of the attack. This results in localised deep pits in the reinforcement, which decreases its cross sectional area significantly before sufficient rust has formed to crack the concrete to the surface. As this form of reinforcement attack is hidden from view, it is potentially a serious cause of weakness to reinforced concrete and it can progress undetected. Consequently, it is important that the level of chloride in the concrete is established.

Concrete samples are taken, either by drilling holes and collecting the debris or by chipping pieces from the corners of components.

3.1.4 Cement Content

Cement content is determined under laboratory conditions in accordance with methods set out in BS1881: Part 124: 1988. Its analysis is required in order to properly assess the concrete's composition with respect to chloride ion content as well as confirm its strength.

3.0 Concrete Testing

3.1.5 Carbonation Depth

There are four basic factors that contribute towards the resistance of concrete to carbonation. These are as follows:

- The type and proportions of the materials used in the concrete mix.
- The compaction achieved during casting.
- The curing regime to which the concrete has been subjected.
- The environment in which the concrete is located.

The depth of carbonation is a good indicator of the quality of the concrete; the degree to which the concrete has suffered from weathering and the approximate time scale before the reinforcement is affected by the environment.

The depth of carbonation in concrete is determined by spraying the surface of the drilled hole with liquid Phenolphthalein indicator. This clear liquid turns un-carbonated concrete purple. The colourless zone can be measured as the carbonation depth.

3.1.6 Cover to Reinforcement

Measuring the depth of cover is necessary to establish the potential vulnerability of corrosion occurring in the reinforcement. It is of importance that reinforcement is afforded adequate protection from the carbonation process in order for it to remain effective within the concrete section; too little cover can lead to premature corrosion resulting in cracking and spalling of the concrete face and ultimately, failure of the component.

3.1.7 High Alumina Cement

High Alumina Cement (HAC) concrete was used extensively in the UK from the 1950s to the early 1970s in the manufacture of precast, prestressed concrete beams and some other building components because it had the benefit of early strength gains of the concrete when compared to ordinary Portland Cement, which enables the concrete components to be struck earlier from their moulds. Since the mid-1970s, HAC has not been recommended for use in structural concrete in the UK following a few cases of structural failure.

3.1.8 Findings and Conclusions (Concrete Test Results)

Concrete tests are being carried out at the time this report is being prepared and no results are available.

3.2 Intrusive Investigations

Intrusive investigations will be required to determine the size and setting out of structural elements. These will be scoped during the next design phase once the Architectural and M&E proposals are progressed further.

4.0 Structural Works

4.1 Proposed Alterations

The proposed upgrade works to the tower will involve structural works to the lower four levels (ground floor to "office" level).

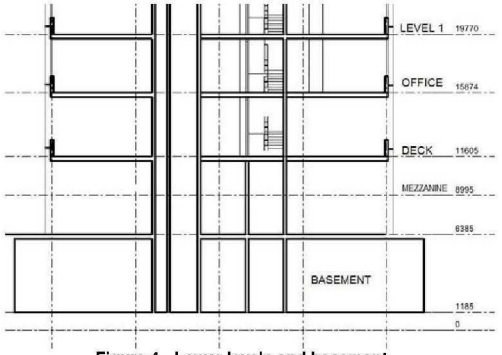

Figure 4 - Lower levels and basement

The structural alteration works to be carried out at each level based on the architectural and M&E proposals at this stage will include the following:

4.1.1 Relocation of stair and lift shaft at lower levels

The stairs and lift currently located at one corner of the tower and used to access the lower four levels are to be removed and new stairs and a lift introduced in the opposite corner of the south elevation. This will involve:

- Demolition of the two existing stairs and liftshaft
- Lift pit opening to the lift infilled. The lift shaft and feature concrete stair central column to the basement can be left in place.
- Introduce a new lift pit to underside of the ground floor slab and form an opening in the slab. Support for the new liftshaft and stair wrapping around it to be introduced between basement and underside of ground floor. Extent and construction of the supporting structure will depend on the construction of the liftshaft and more importantly of the stair. This will be developed in the following design stage.
- Form an opening in the slab at each of the lower levels (Mezzanine to Office) to allow the introduction of the new stair and liftshaft. This will require cutting the existing floor slabs and the introduction of beams to support the façade and the edge of the cut slab and the stairs spanning onto it.

4.1.2 Removal of nursery stair

The stair currently located in the nursery and connecting the ground floor to Mezzanine level is to be removed and the opening at mezzanine level infilled. According to the record drawings this area has been subject to structural alterations in the past when the original spiral stair connecting ground floor to deck level was replaced with a straight stair to the Mezzanine with no connection to the Deck level.
Further intrusive investigations will be required in this area to ensure that the proposed alterations are compatible with the previous structural works.

4.1.3 New slabs

In the area at the south west corner of the tower where the existing stair and liftshaft are to be removed new floor plates fill be introduced at each level (Mezzanine, Deck and Office). Due to the limitations of working below existing occupied residential levels it is not envisaged that the construction of the new floor slab will involve the use of precast concrete elements.

The new floors are likely to be built as:

- Concrete slab on metal deck spanning on steel beams supported by the existing stability core and perimeter RC columns with trimmer beams to frame any opening in the slab.
- Concrete flat slab stitched into the existing slabs (assumed in-situ concrete, to be confirmed by further intrusive investigations) and spanning onto the stability core and perimeter walls. The introduction of new downstand beams within the floor plate and upstand along the outer edge may be required depending on the findings of the intrusive investigations and the location and size of openings in the slab.

As the existing floors are likely to be in situ concrete and to limit the craneage requirements the in-situ concrete flat slab solution is our preferred option at this stage.

4.1.4 Openings in the core

The architectural proposals include openings to be introduced in the stability core. Each opening will have to be individually assessed as described in section 4.4. Small openings are unlikely to be a problem however larger openings, particularly around the perimeter of the core, will require careful structural consideration and may need strengthening of the core to restore stability.

4.1.5 Demolition of North Link

The link currently providing access to the north side of the Deck level is to be removed. As this is currently spanning onto the edge of the slab the removal of the link is unlikely to involve structural works, with the exception of the possible introduction of a concrete upstand to offer a support to the new cladding.

4.1.6 Upper Floors

No alteration to the structural frame is proposed at the residential levels.

4.1.7 Roof plant room

It is proposed that new water tanks are introduced in the plantroom at roof level. The existing roof plantroom is currently divided in two areas, one with plant and one with tanks. The new tanks will be introduced in the area currently occupied by plant therefore the loading on the slab is likely to increase. It is unlikely that the floor slab to the two plantrooms is different and therefore it is assumed that no structural strengthening of the floor will be required.

Further intrusive investigations will be required to confirm the initial assumptions.

4.1.8 Façade

It is proposed that new lightweight insulated cladding will be fixed to the existing precast concrete panels. Pull-out test will be required to determine the specification of the fixings prior to the installation of the new cladding. The fixings installation will need to be supervised on site with a stringent pull-out regime to ensure satisfactory anchorage is achieved.

4.1.9 Canopy

The existing canopy around the base of the building will be replaced with a new canopy. It is envisaged that the new canopy will be fixed to the concrete columns similarly to the current arrangement and that no vertical support will be provided to the outside edge.

The size, extent, level and construction of the canopy are still under discussion at this stage of the design.

4.2 Loads

The new superstructure elements will be designed for the following imposed loads based on the current architectural proposals:

- Boxing Club 5.0kN/m^2
- Residential and Offices 2.5kN/m^2
- Stairs and circulation 4.0kN/m^2
- Plant room 7.5kN/m^2 TBC by M&E subcontractor

The plant room loads could be substantially higher than 7.5kN/m^2 in the case of water tanks, the size of which will have to be confirmed to determine the loading requirements.

4.3 Existing Foundations

There are no record drawings showing the type and construction of the existing foundations. The proposed architectural scheme involves over-cladding of the façade with lightweight panels and some structural alterations at the lower levels. The additional load to the south-east corner is partially offset by the demolition of the existing lift core and staircases with a small net increase in load, to be fully assessed at the next stage of the design.

We consider the proposed change of use of the lower levels and the structural alterations and additions should only lead to a minor load increase on the existing columns or foundations. As the building has performed well over nearly 40 years, the existing foundations are considered satisfactory for this refurbishment scheme.

The increase in load will have to be fully assessed during the next design stage.

4.4 Builders Work and Risers

4.4.1 Vertical Service Penetrations

We consider it is feasible for local vertical service penetrations to be formed in the traditional reinforced concrete core areas. We consider it possible for these local service penetrations to be formed with minimum strengthening works.

It is considered reasonable that small core drilled penetrations (<100mm) can be located through the existing floors. In the absence of detailed proposals we are unable to comment in more detail at present.

All new penetration positions are to be agreed with Curtins Consulting.

4.4.2 Horizontal Service Penetrations

The shear walls forming the stability core are indicated on Figure 2. These reinforced concrete core walls transfer the horizontal forces to the foundations. If horizontal service penetrations are required through these elements then it is advised that the penetrations are located centrally in the wall (horizontally) and not in the wall 'end zones' as these are the areas of the shear wall that are effectively acting as columns transferring the lateral forces to the foundation.

For larger openings a steel 'box' frame may be required to frame out the proposed opening and evenly distribute the forces through the shear wall.

4.5 Hanging Services from Floors

The form of construction of the slabs is likely to be reinforced in-situ concrete, to be confirmed by further intrusive surveys; therefore hanging pipes and ducts to the underside of slabs will be possible, subject to assessing loads.

4.0 Structural Works

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An allowance should be made in the cost plan for making good existing penetrations to the concrete floor plates which are no longer required.

4.6 Head Restraint to New Walls

It is assumed that all new partition walls, stud and glass will need to be fully restrained at the base and at the head.

4.7 Underground Drainage

The existing drainage drop points to underground drainage are to be reused and at this stage no new underground drainage Is foreseen. It is assumed that the above ground drainage total discharges as calculated by the Services Engineer will not exceed the capacity of the existing outfalls as the proposed new floor area will only result in a small percentage increase to the occupancy of the tower, hence there is no issue with surcharging the individual outfalls.

In any case it would be prudent to carry out a CCTV survey of the existing underground drainage system to determine the condition and extent of the system for a future term of use. The CCTV report would be used to quantify any repairs that may be required.

4.8 Roof

If any plant is introduced at roof level above the plantroom the structure will have to be checked for the additional load and structural alterations may be required to the roof in case of heavy equipment.

4.9 Disproportionate Collapse

We are dealing with an existing building that is approximately 40 years old. The building appears to be sound and there are no signs of structural distress. It is not proposed to extend the building vertically or horizontally. The building will continue to be used as before generally, although some parts will have new uses. Under the circumstances, we believe that the critical issue is whether the changes of use adversely impact on the building for the purposes of disproportionate collapse. In our opinion this is not the case. The renovation under the current project will improve the building fabric and the services will be brought up to modem standards.

5.0 Recommendations

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Recommendations

- The concrete testing is currently being undertaken to the principal elements of the structural frame, notably internal slab soffits, columns, concrete stability core, basement walls and precast concrete façade panels. From an initial visual inspection the structure looked to be in sound condition however this will need to be confirmed by the concrete testing to make sure that it is fit for further term of use or that it is repaired appropriately if required.

- The results of the concrete testing will also be required to determine the specification for the over-cladding fixings into the existing precast concrete façade panels and the need for any repair.

- A full fabric condition survey is recommended to ensure no damp penetration Into the building.

- It is feasible to locate local vertical service penetrations in the traditionally reinforced concrete core areas and small core drilled penetrations (<100mm) through the existing floors. Avoid vertical penetrations through the outer perimeter of the central stability core.
  All new penetration positions are to be agreed with Curtins Consulting.

- Intrusive surveys will be required to determine the construction type, size, setting out and existing reinforcement provision to structural elements in areas where structural alterations have been proposed. The scope of the survey will be based on frozen architectural/ M&**E** proposals and will be carried out during the next design phase.

- Load testing of the roof plant slab may be required to prove the imposed load that will be generated by the proposed water tanks. Subject to confirmation of the size, setting out and load of the water tanks.

- Carry out a CCTV survey of the existing underground drainage system to determine the condition and extent of the system for a future term of use and to quantify any repairs that may be required.

- The alteration proposals at the lower levels of the tower will require the introduction of a number of connection points into the existing structure which will need to be investigated to determine the best possible location and configuration of fixings.

6.0 Appendix

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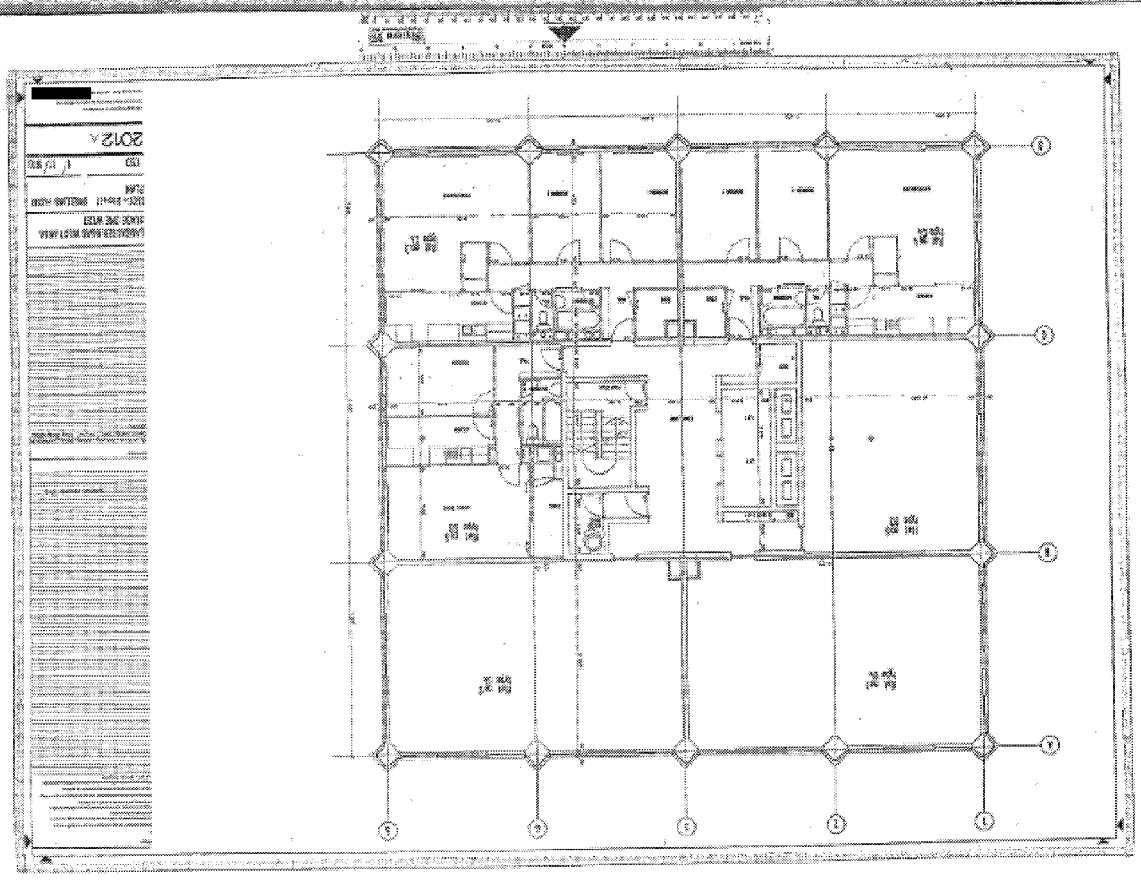
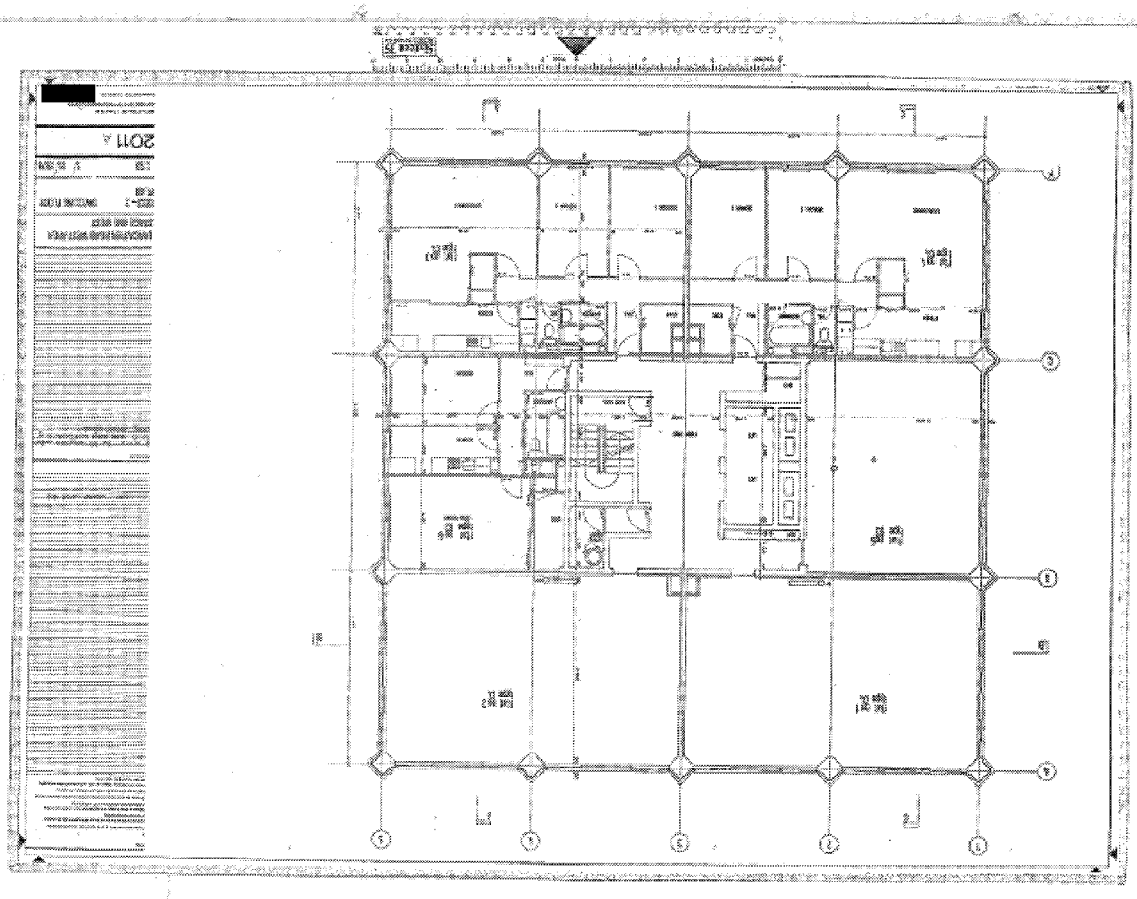
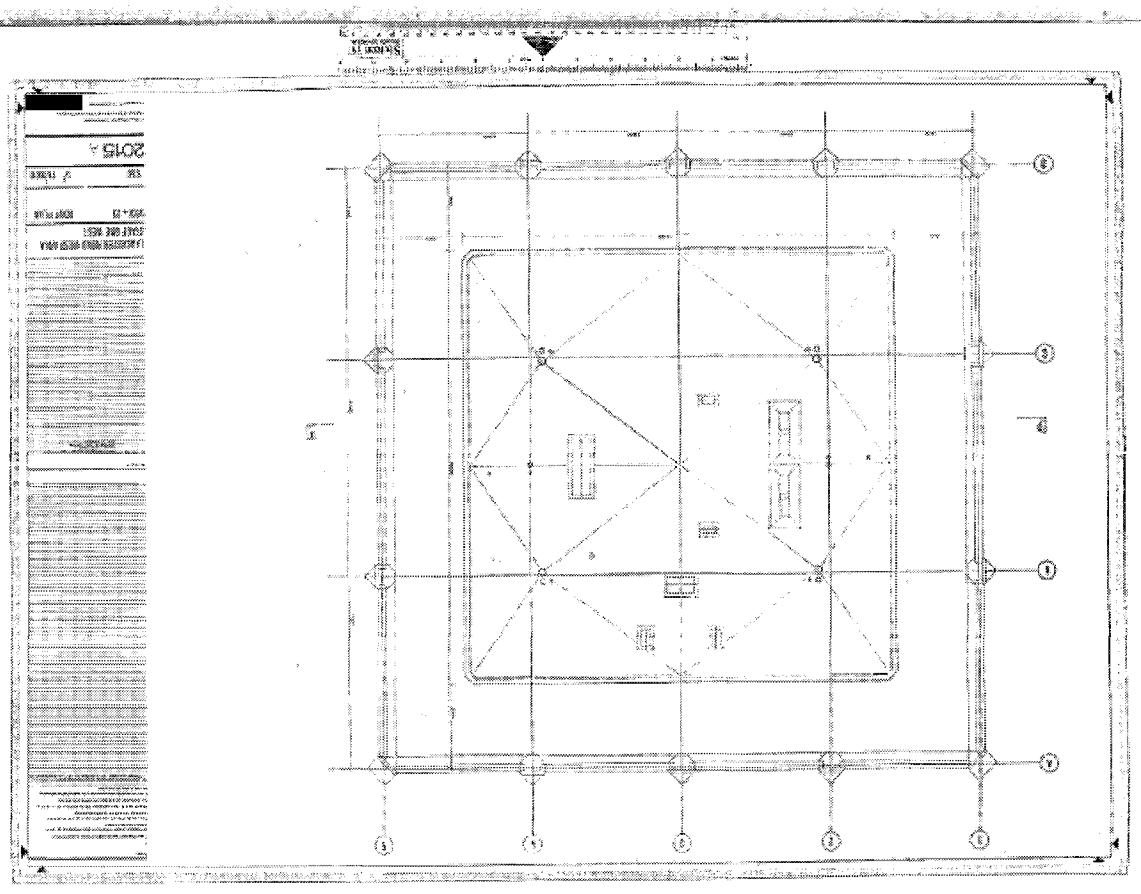
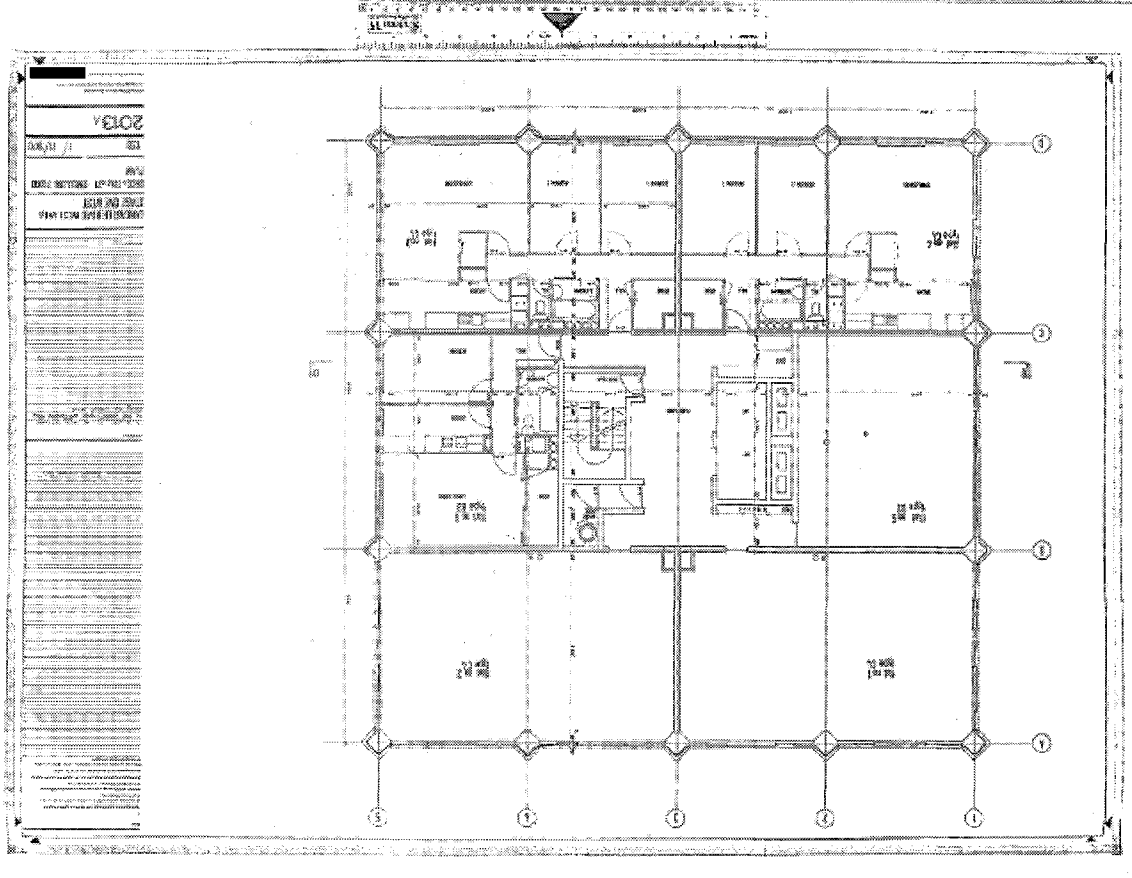
APPENDIX A

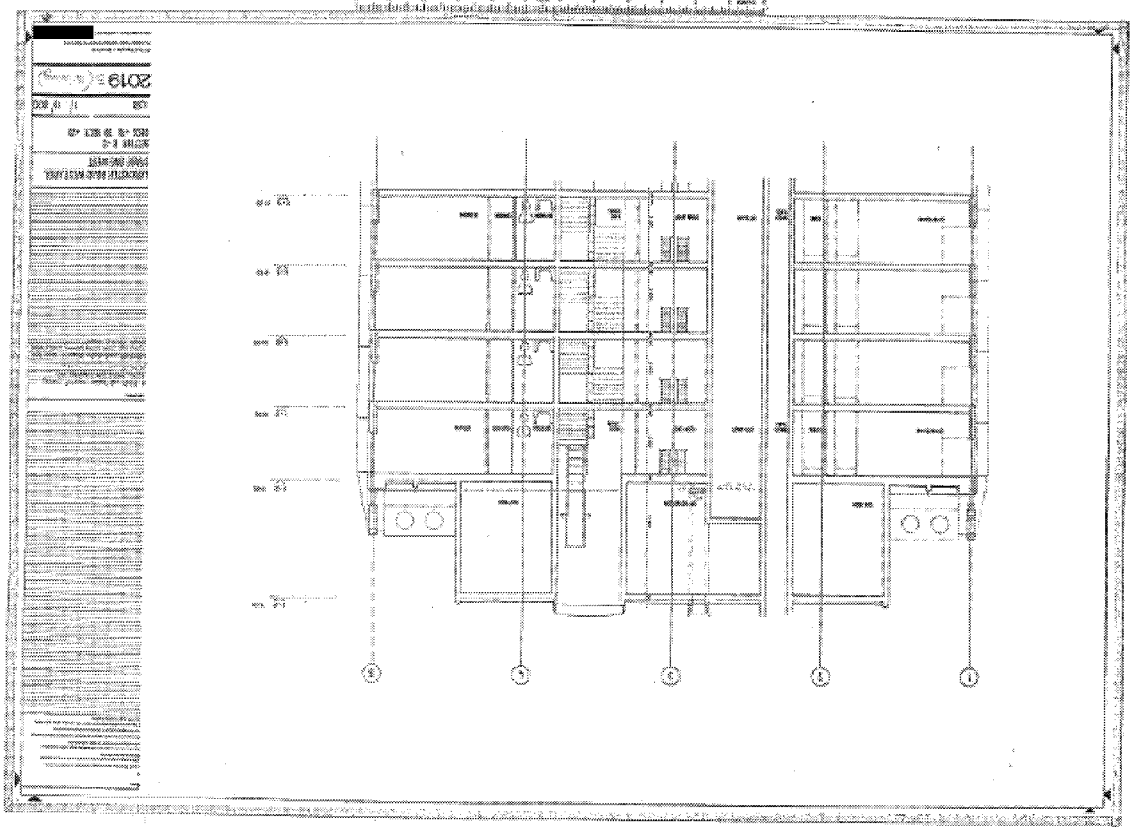
RECORD DRAWINGS

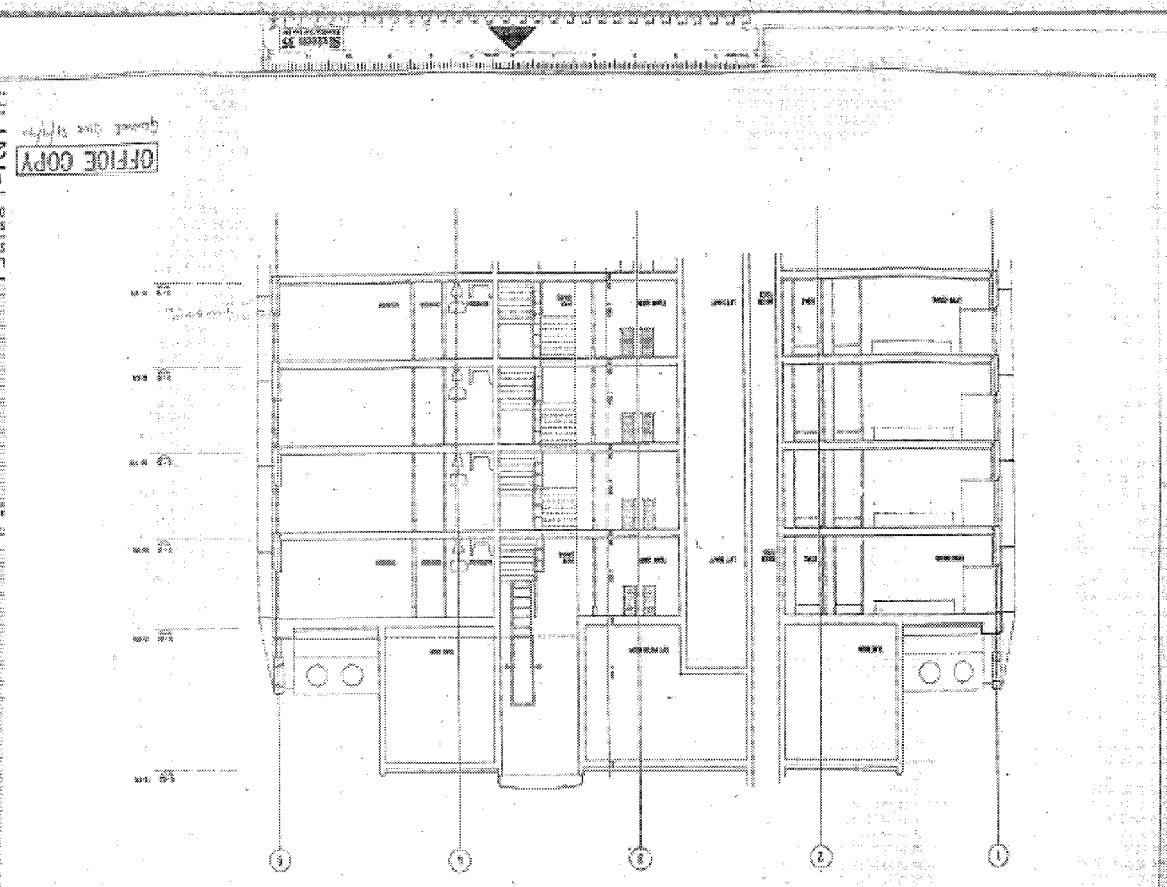


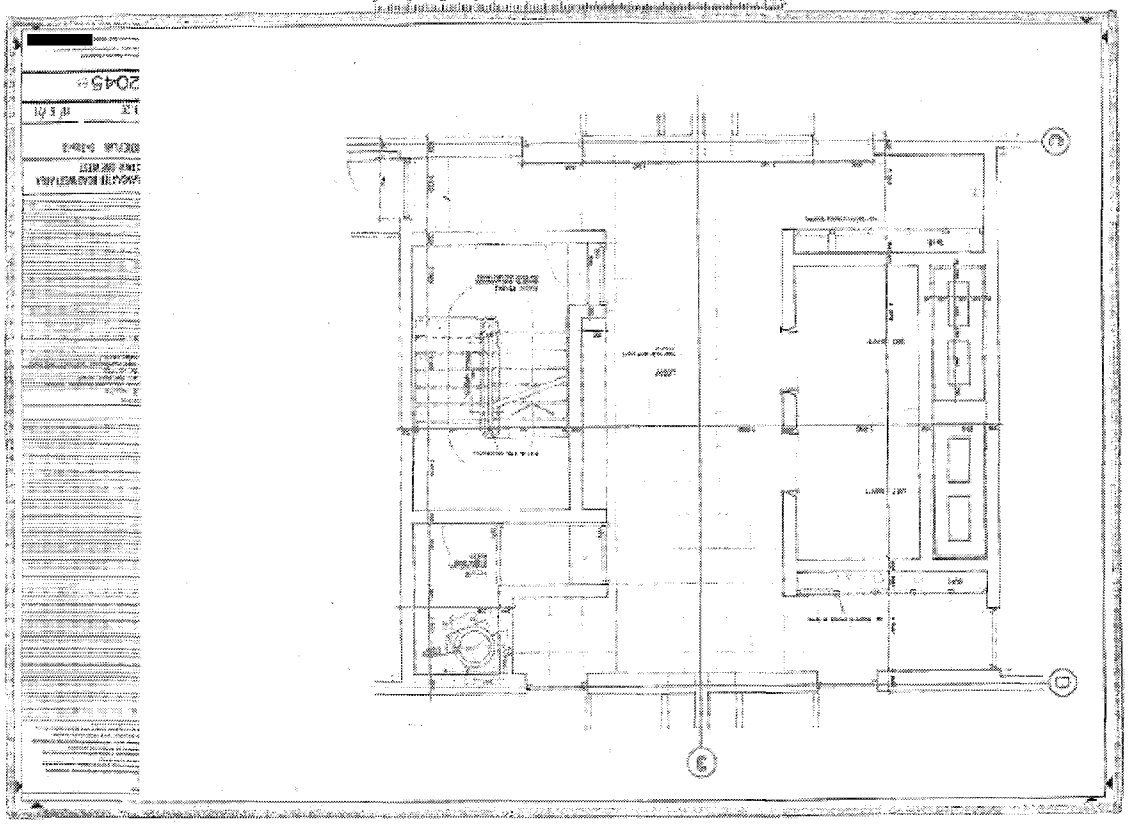


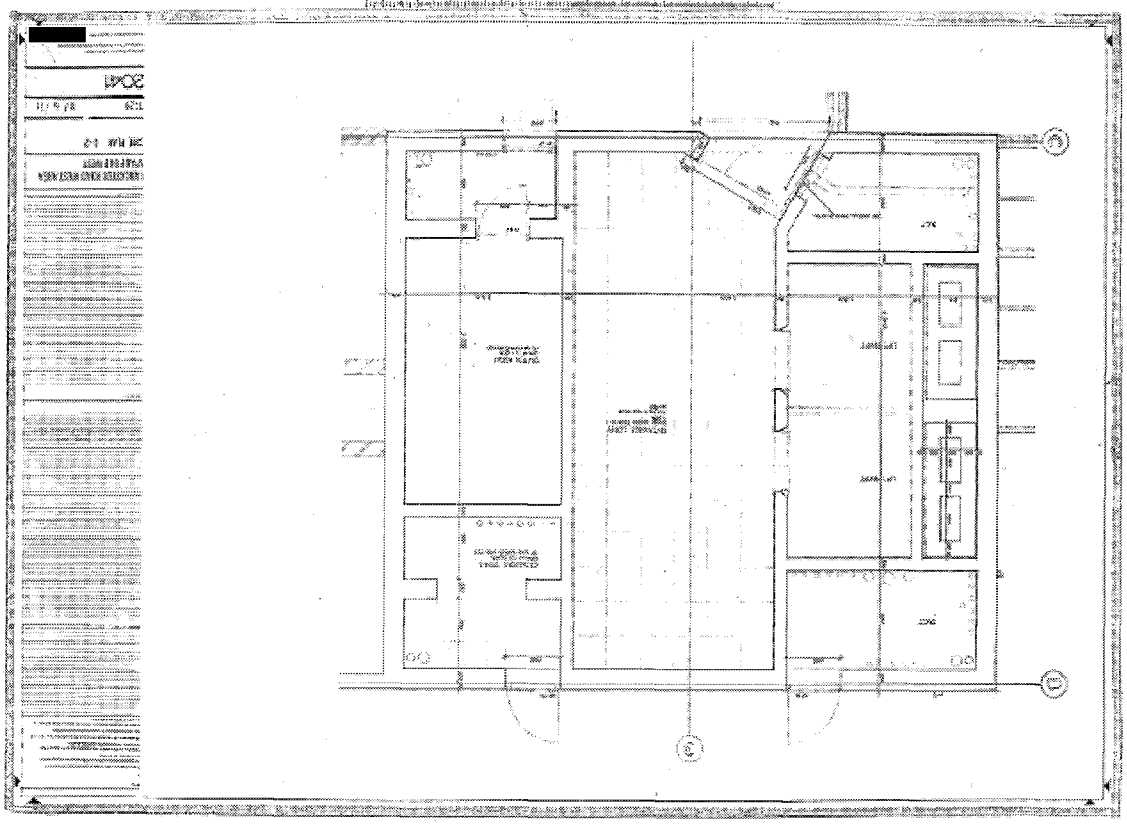


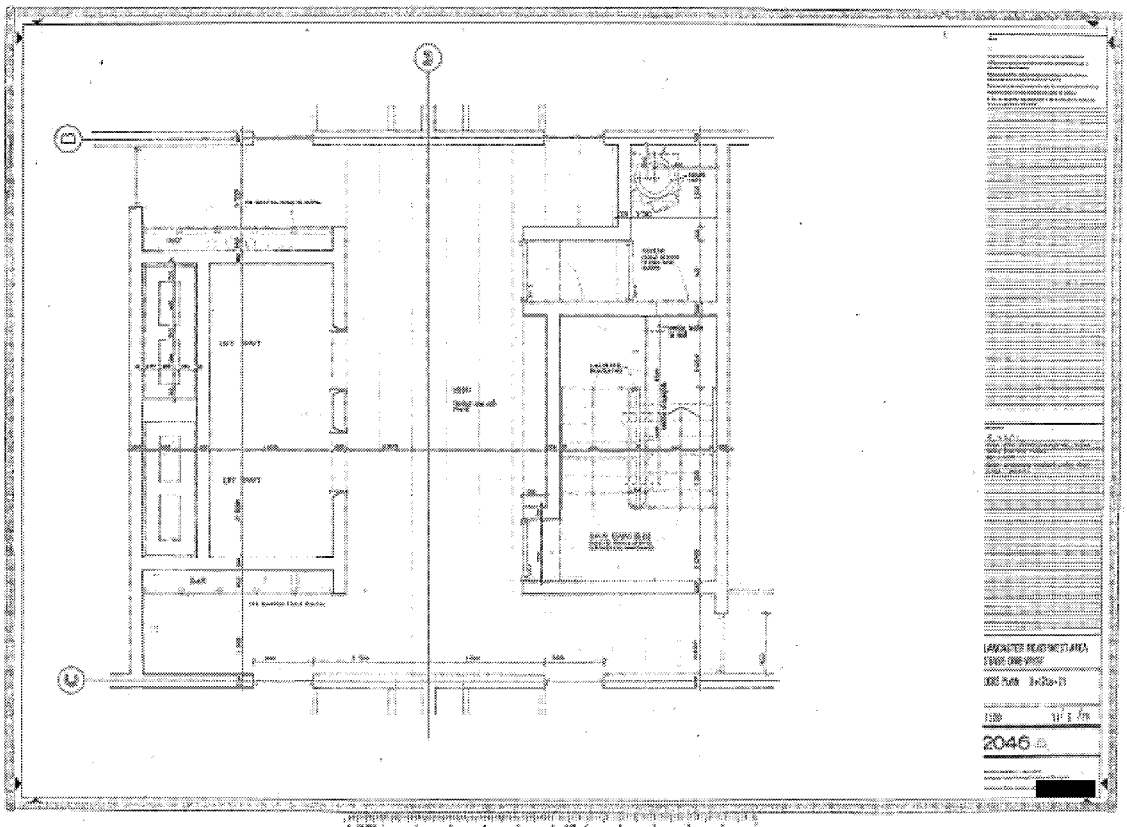


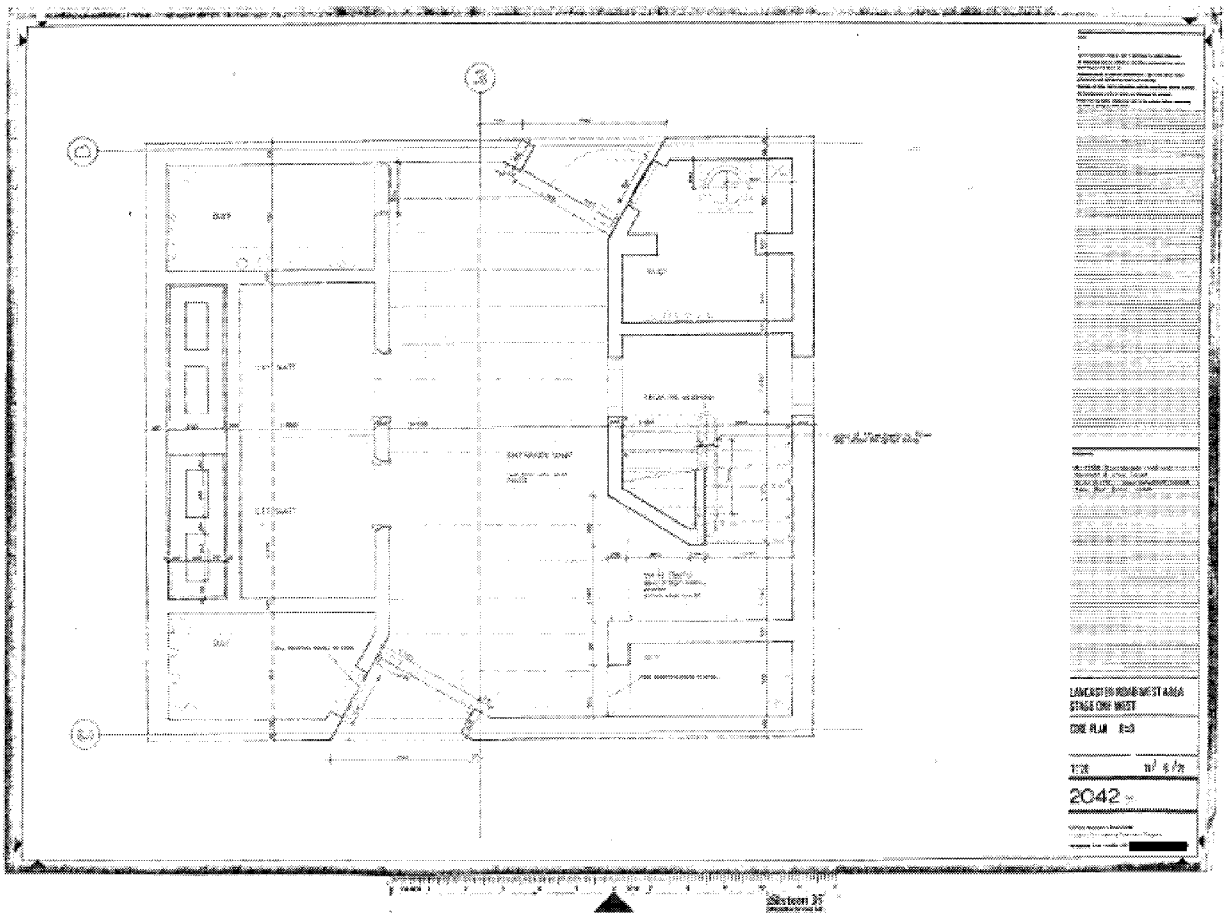


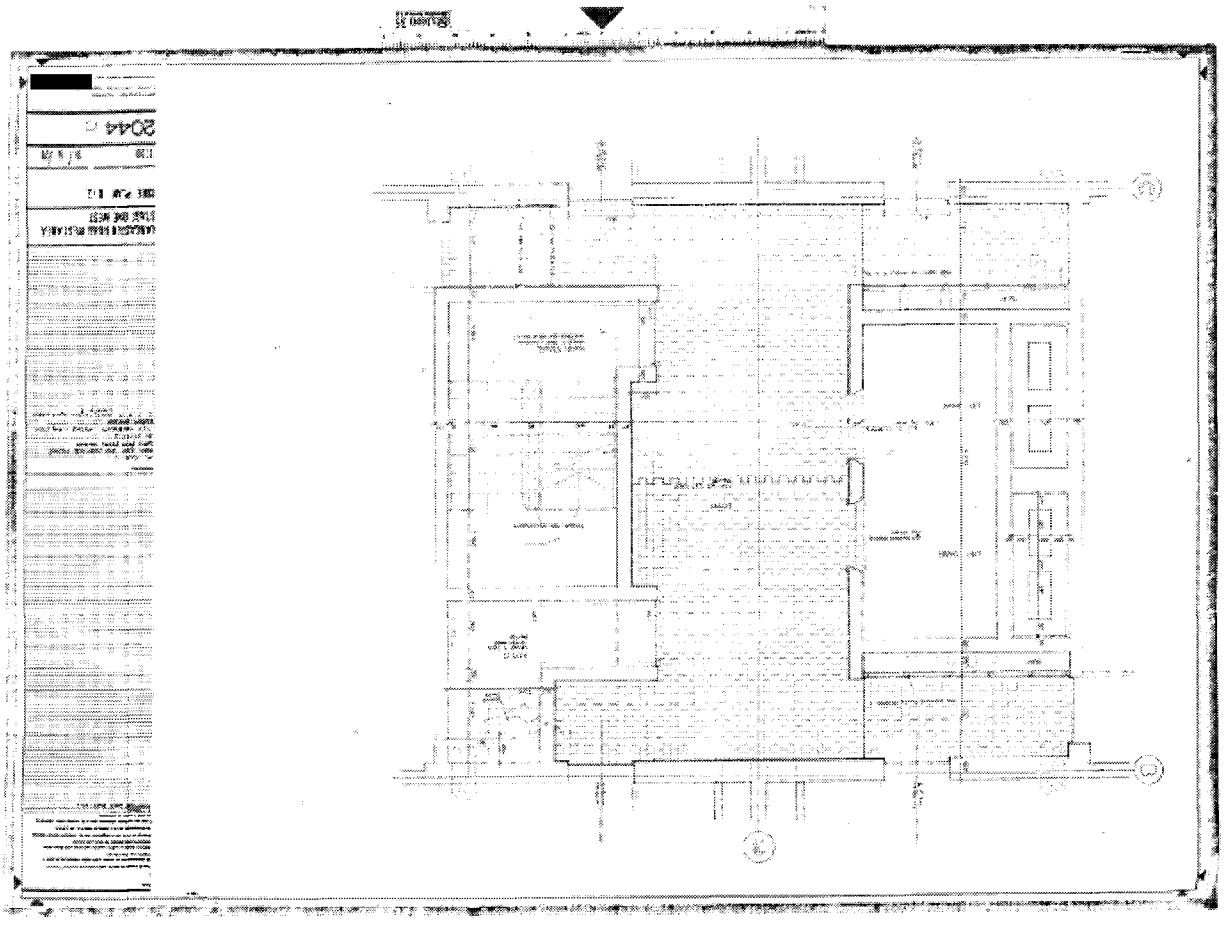


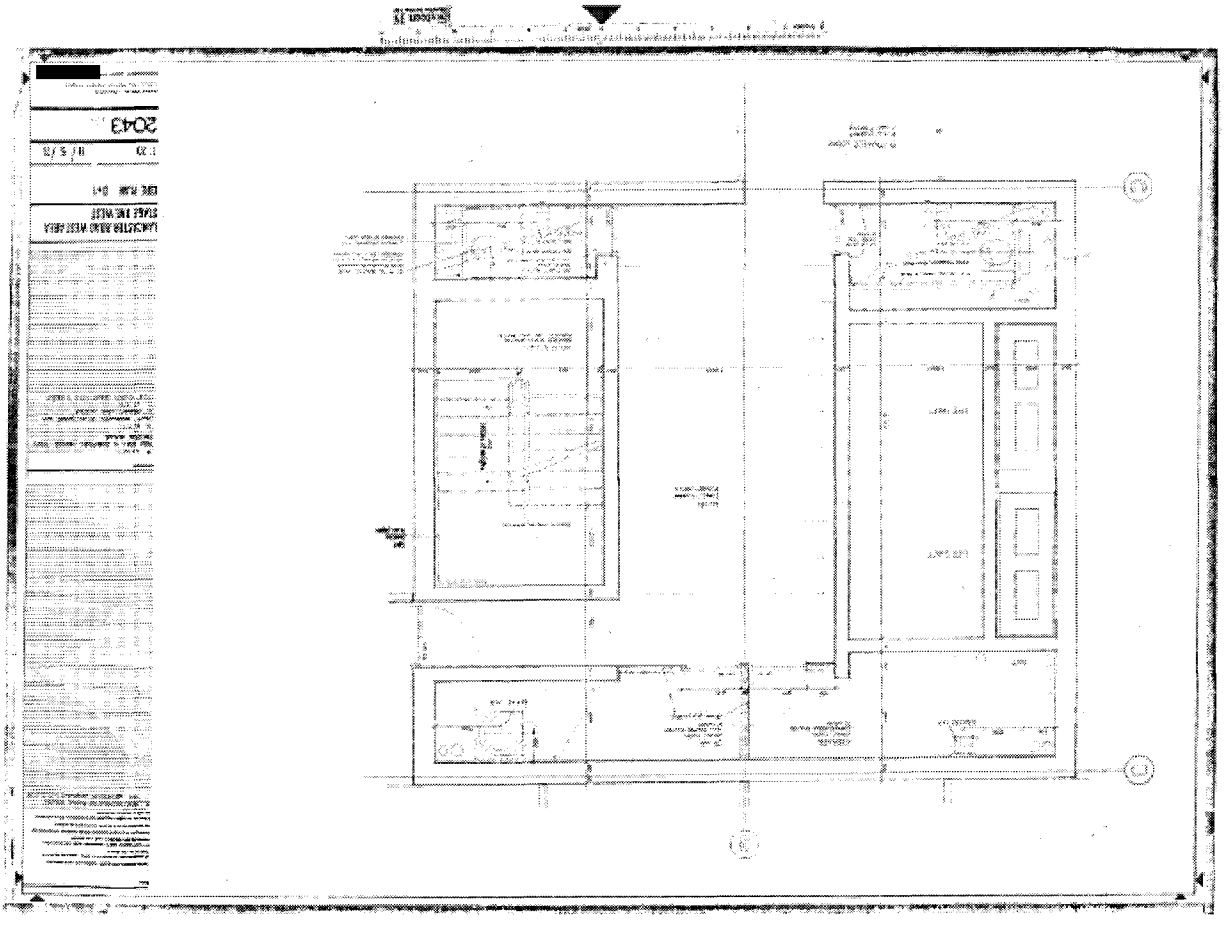


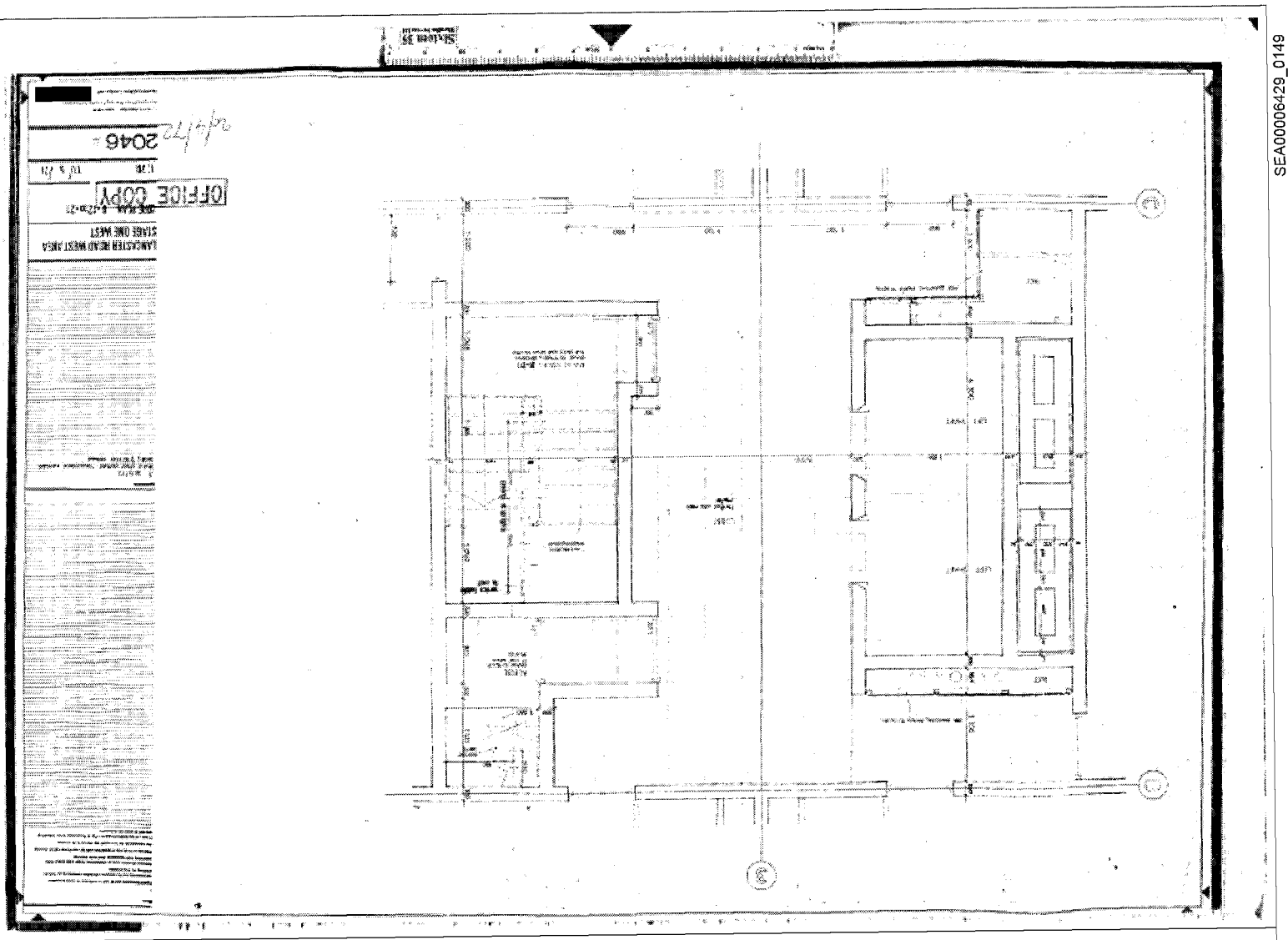


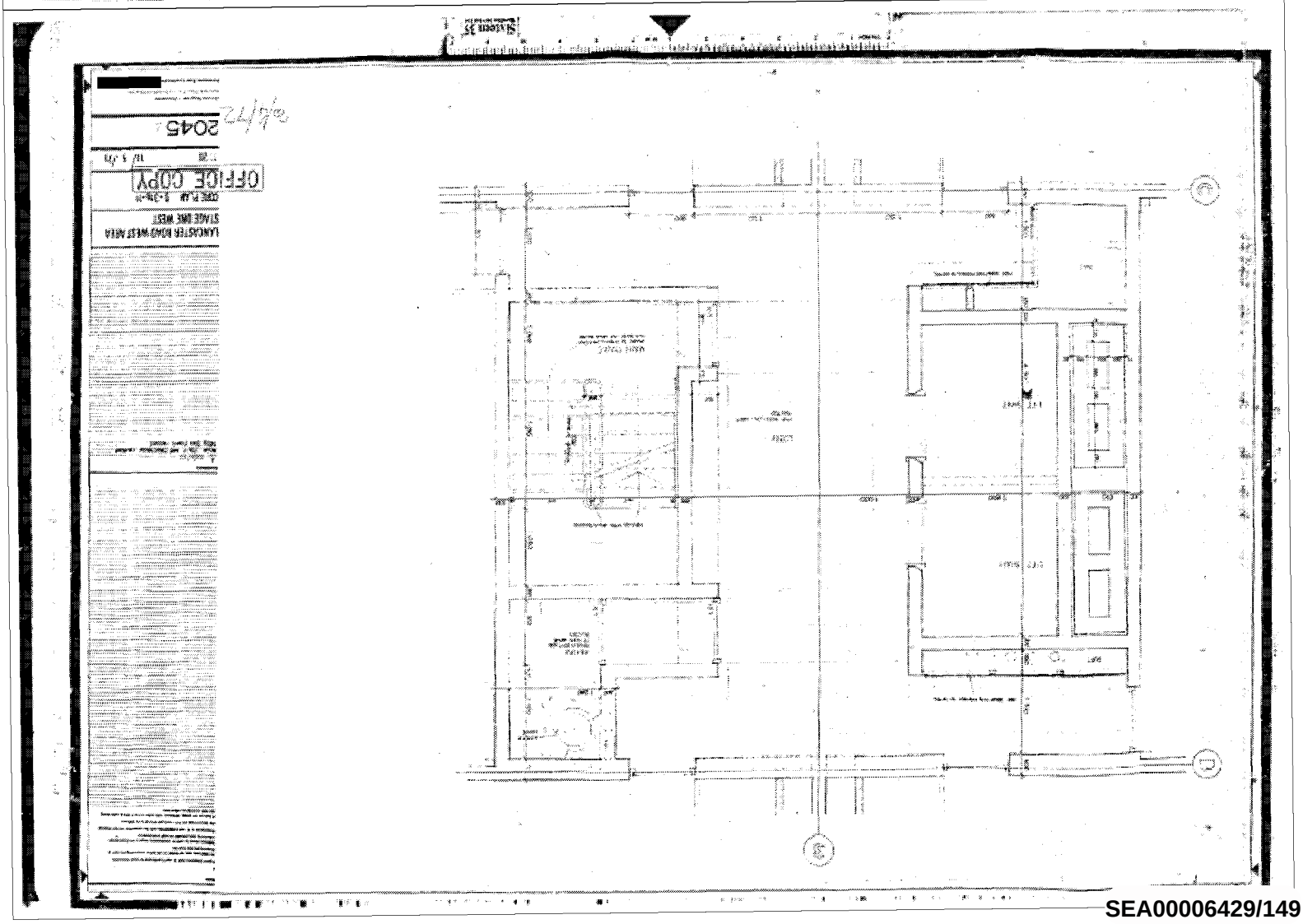


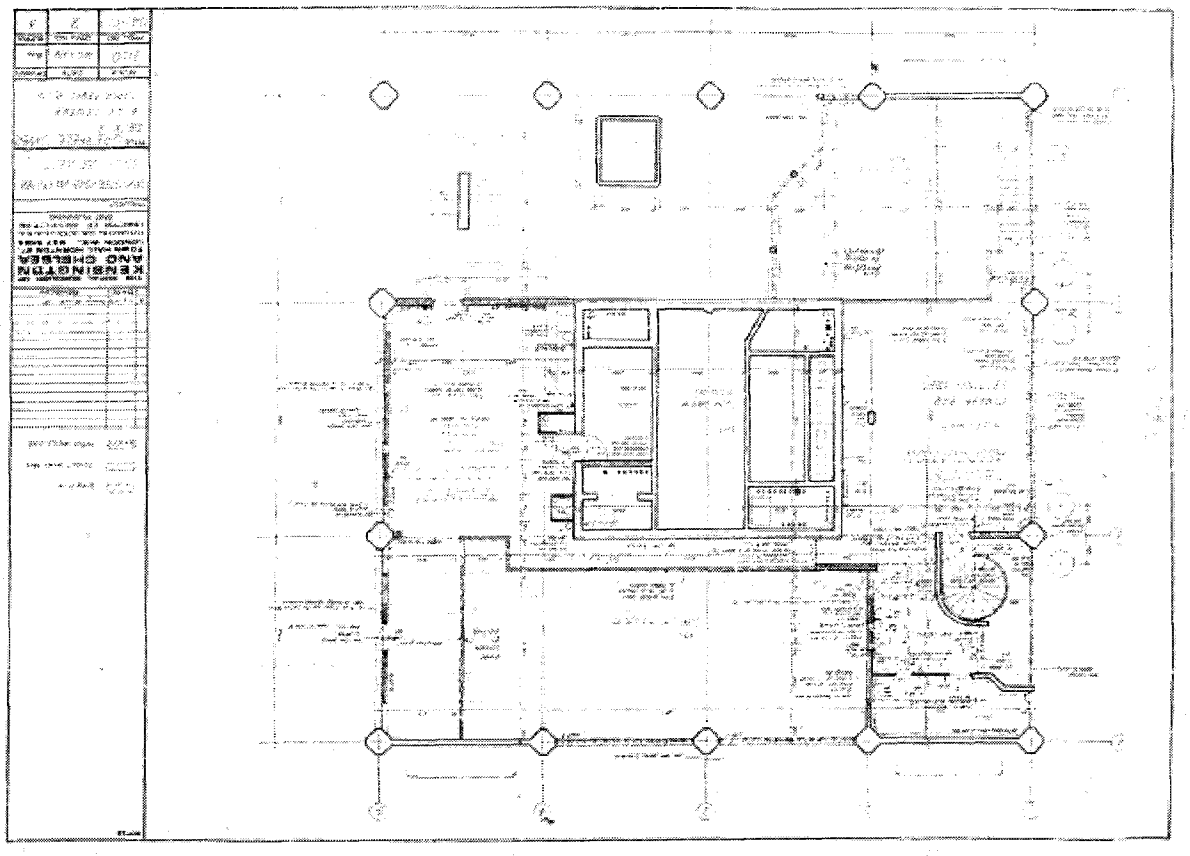


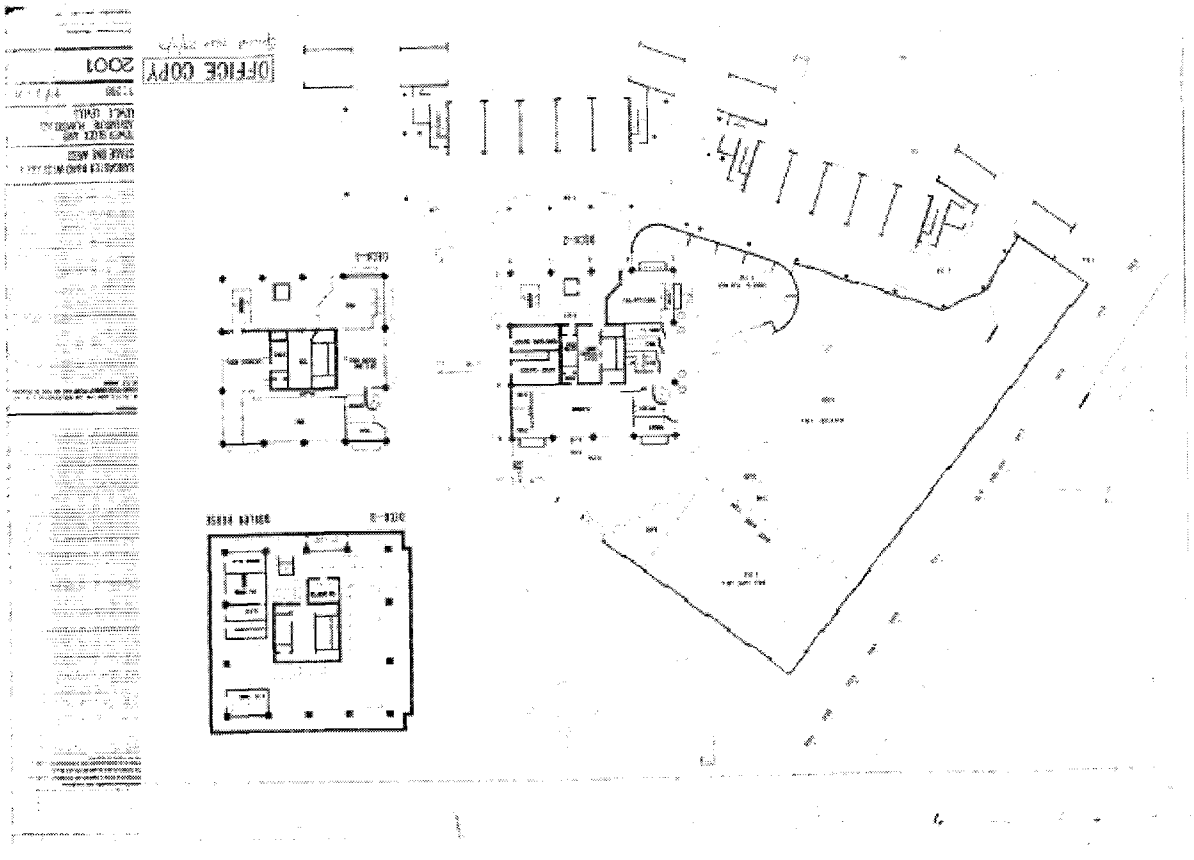


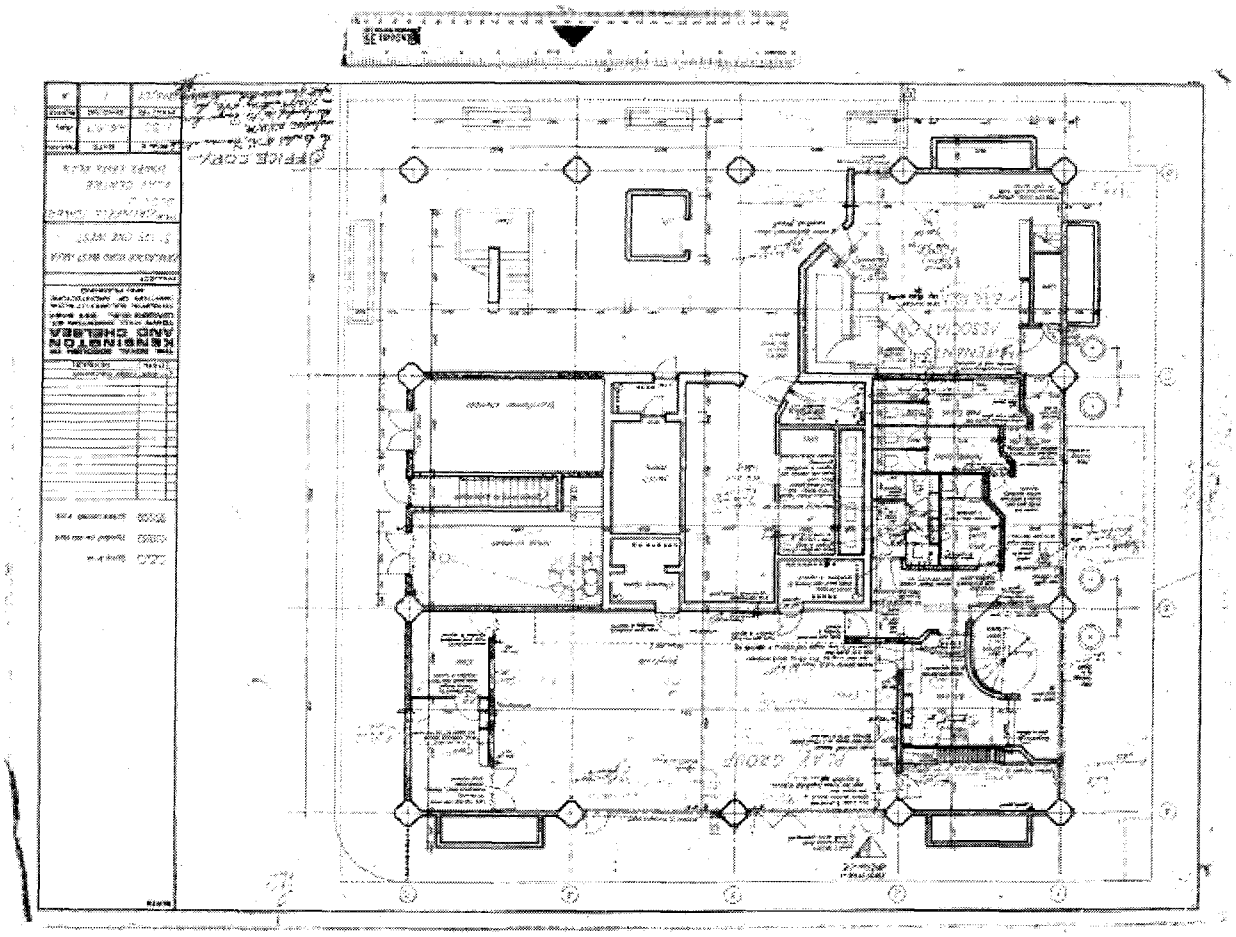


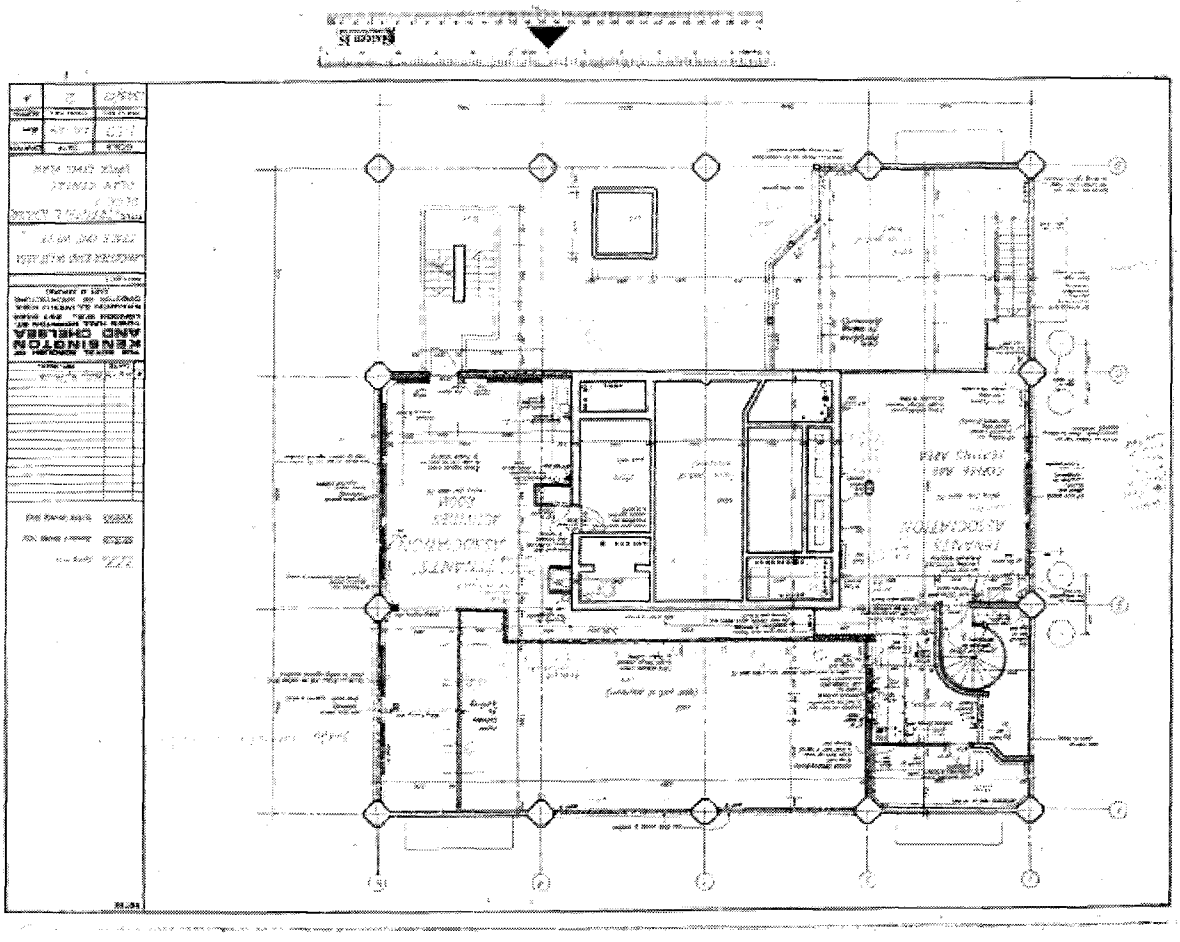


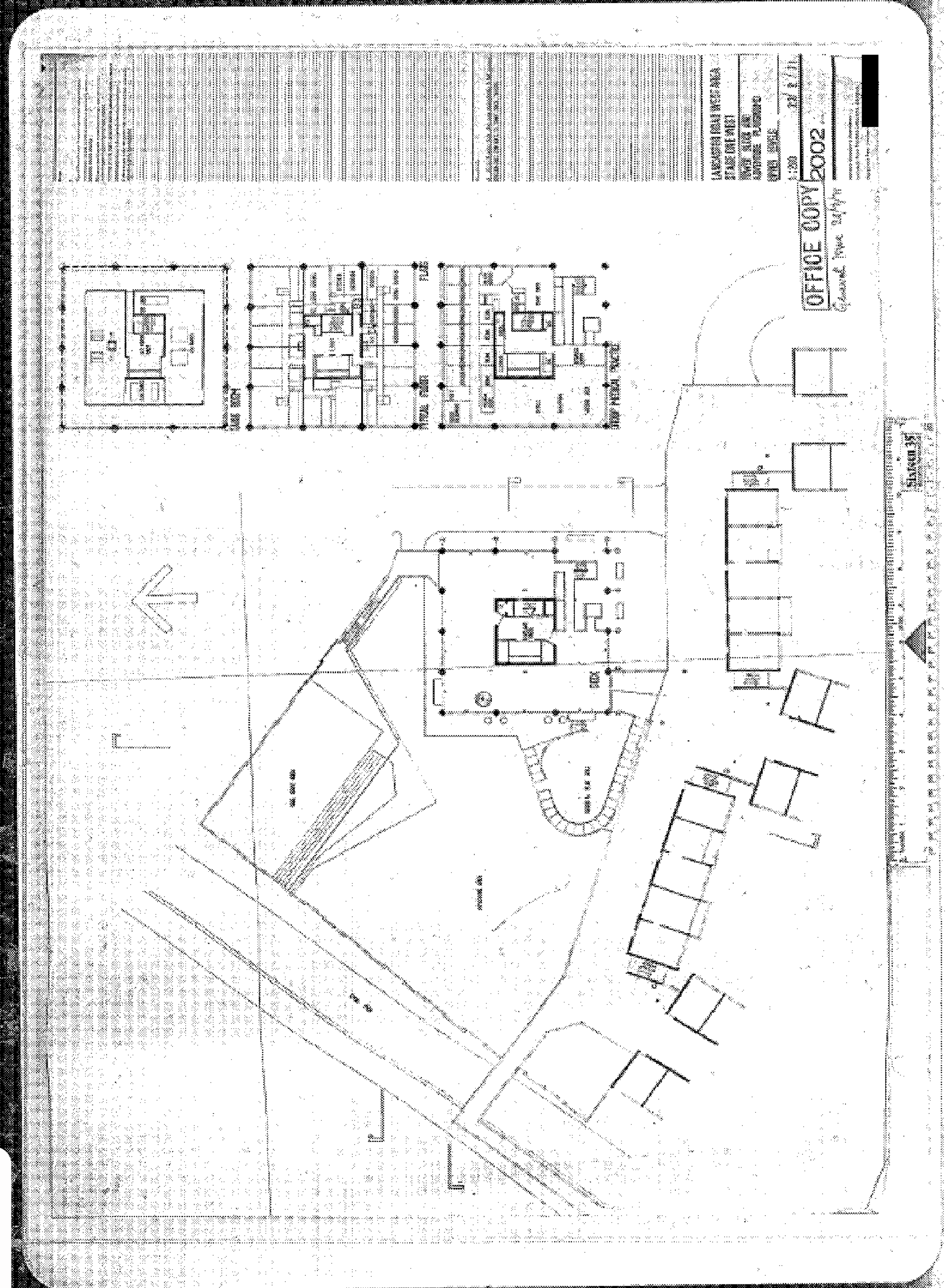


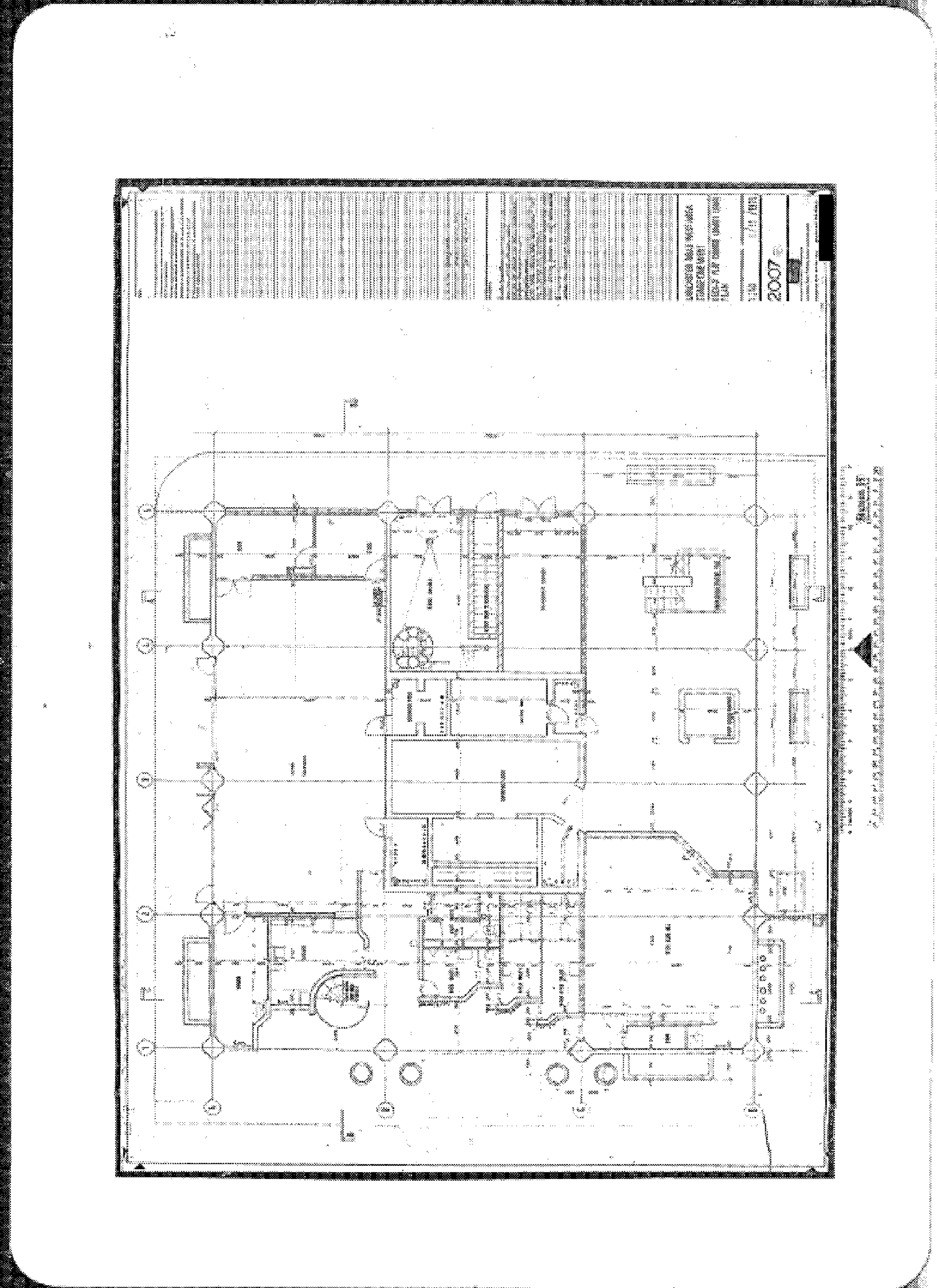


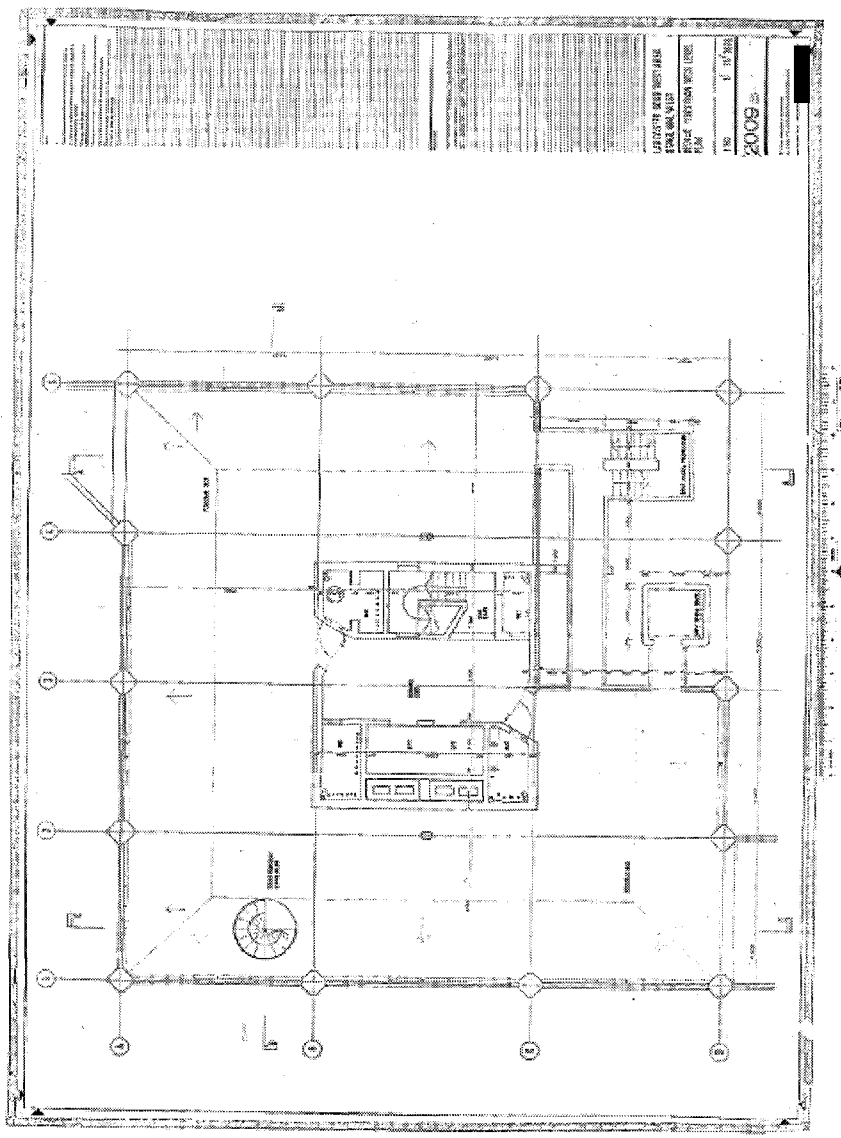


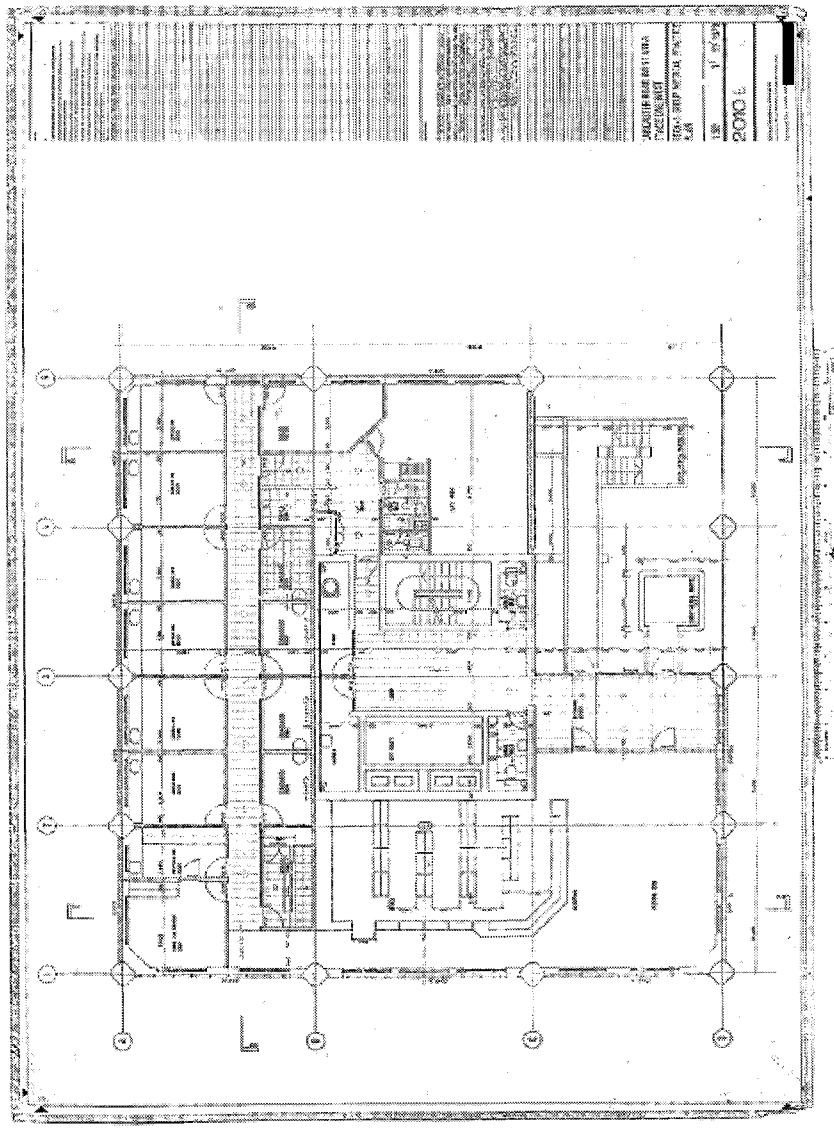












6.0 Appendix

APPENDIX B

CONCRETE SAMPLE LOCATIONS

Glenfell Tower – Scope of Testing Rev A 19.06.12

External

Ground Floor Level

1.0 Concrete wall to have four concrete dust samples taken at 0.6m and 1.5m height above ground floor level. Two samples at each level.

2.0 Concrete columns to have four dust samples taken at 1.2m above ground floor level.

3.0 Four concrete dust samples to be taken from concrete staircase elements.

Walkway Level

1.0 Using a quick stage scaffold take two dust samples from the underside of the floor slab above.

Office Level

1.0 Using a quick stage scaffold or a cherry picker take two dust samples from the underside of the floor slab above the external stair.

2nd Floor Level

1.0 Using a quick stage scaffold or a cherry picker take eight dust samples from two precast concrete panels that are located below the window and span between the concrete columns.

2.0 From quick stage scaffold or a cheery picker take four concrete dust samples from the precast concrete cladding panels that wraps around the external face of the insitu concrete column. The height is approx. 10m above ground floor level.

Core a 50mm Ø hole through the concrete panels to the face of the insitu concrete column.

Use cover meter to locate the fixings which fix the precast concrete panels to the insitu concrete columns.

10th Floor Level

1.0 Take four dust samples from two precast concrete panels that are located below the window and span between the concrete columns.

2.0 Take four concrete dust samples from the precast concrete cladding panels that wraps around the external face of the insitu concrete column. The height is approx. 47m above ground floor level.

20th Floor Level

1.0 Take four dust samples from two precast concrete panels that are located below the window and span between the concrete columns.

2.0 Take four concrete dust samples from the precast concrete cladding panels that wraps around the external face of the insitu concrete column. The height is approx. 65m above ground floor level.

Internal

Basement

1.0 Using a quick stage scaffold take twelve dust samples from the basement perimeter wall at 1, 3 and 5m above basement level, four samples at each level.

2.0 Concrete columns to have four dust samples taken at 1.2m above basement level.

3.0 Concrete core walls to have four dust samples taken 0.6m and 1.5m height above ground floor level. Two samples at each level.

4.0 Using a quick stage scaffold take four dust samples from the underside of the ground floor slab below both internal and external spaces.

Void Flat

1.0 Remove the inner skin framework to the inner skin of the eternal wall.

The inside face of the precast concrete panel needs to be fully exposed in order to locate the fixings of the panel back to the insitu concrete columns.

2.0 Take two concrete dust samples from the precast concrete panel.

Note

- At each location where a concrete dust sample will be taken we will also establish the depth of carbonation and the concrete cover. Total number of locations is 70.
- At 50% of the areas where a dust sample is taken we need to take sufficient size samples in order to test for cement content. Total cement contents is 35.

6.0 Appendix

APPENDIX C

PHOTOS

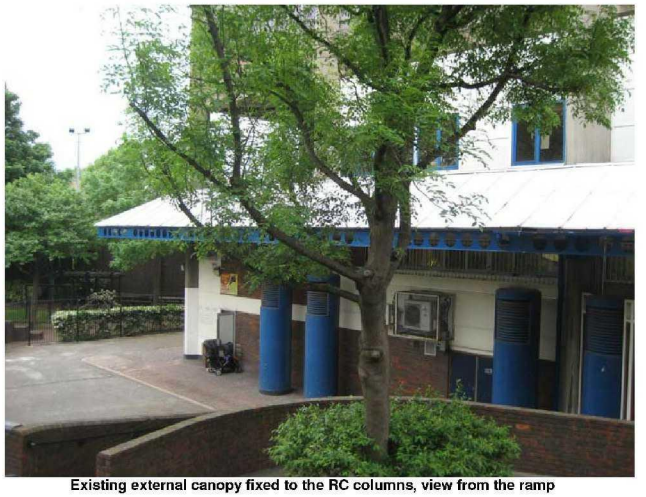
Grenfell Tower Facade

View of the existing external lift and stair, both to be demolished

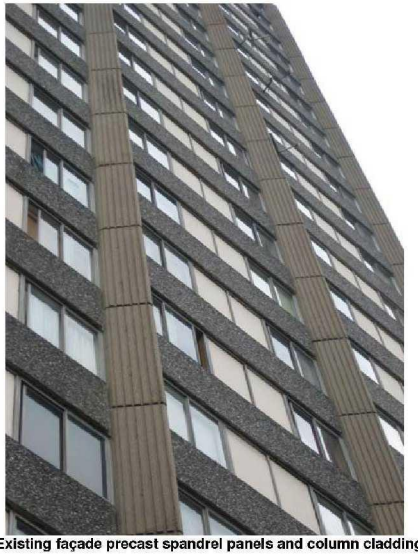
Existing external canopy fixed to the RC columns

Existing ramp from ground to deck level, to be demolished

6.0 Appendix



Existing external canopy fixed to the RC columns, view from the ramp

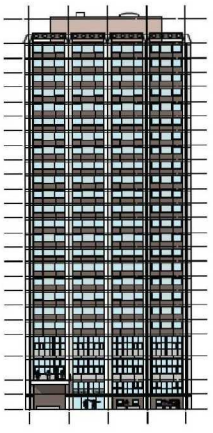


Existing façade precast spandrel panels and column cladding

9.0 BREEAM STRATEGY

SYNTEGRA CONSULTING
Intelligent & Green Building Solutions

BREEAM Domestic Refurbishment Pre-Assessment



Grenfell Tower, London.

August 201

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Registered Company No. 06408056 VAT Registration No. 980016044

SEA00006429/158

Revision:				
Date:	22/08/2012			
Prepared by:	CT			
Checked by: Authorised by:	AWK AWK			

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Registered Company No. 06408056 VAT Registration No. 980016044

1.0 Scope

This BREEAM Domestic Refurbishment Pre-Assessment Estimate for Grenfell Tower, a twenty three storey residential block in London, has been prepared to support the planning application for the Grenfell Tower refurbishment scheme, to be submitted to the Royal borough of Kensington & Chelsea. Also, the BREEAM pre assessment estimate aims to provide the outline sustainability strategy and act as a sustainable design guide for the refurbishment scheme.
The Pre-assessment is an estimate that sets out the method for which the proposed refurbishment could achieve a BREEAM rating of "Very Good".
This report and estimate has been based on information provided by:
Studio E architects
Appleyards (Project Management)
Max Fordham (Energy & M&E Consultant).

2.0 Executive Summary

The Pre-Assessment Estimate shows that at by achieving the minimum standard requirements together with assumptions of good sustainable design practice the proposed refurbishment project could achieve a BREEAM rating of "Very good".
The Mechanical and Electrical specification of the building and materials used in the refurbishment of the building will be essential to the sustainable performance of the building and need to be addressed at an early stage in the design process. This assessment together with the Sustainability and Energy statement prepared by Max Fordham are therefore the starting point for developing the overall strategy of the building's sustainable design.
The BREEAM "Very Good" rating is a planning policy requirement as it is set out in Core Strategy Policy CE1 of the Royal Borough of Kensington & Chelsea Local Development Framework. The reduction is achieved by energy efficient design measures incorporated into the building fabric coupled with low and zero carbon technologies for providing heating on site, such as Gas Apsorption Heat Pumps (GAHPs).

3.0 Project Details

PROJECT :	Grenfell Tower.
CLIENT:	KCTMO
ARCHITECT:	Studio E Architects
BUILDING SERVICES & LZC CONSULTANT:	Max Fordham
BREEAM CONSULTANT:	Syntegra Consulting.
Structural Engineer	Curtins Consulting.
PRINCIPAL CONTRACTOR:	Not appointed yet.

4. BREEAM Domestic Refurbishment

BREEAM Domestic Refurbishment is a performance based assessment method and certification scheme for refurbished buildings. The primary aim of BREEAM Domestic Refurbishment is to mitigate the life cycle impacts of refurbished buildings on the environment in a robust and cost effective manner. This is achieved through integration and use of the scheme by clients and their project teams at key stages in the design and procurement process.
BREEAM Domestic Refurbishment has been developed to meet the following principles:

- Ensure environmental quality through an accessible, holistic and balanced measure of environmental impacts.
- Use quantified measures for determining environmental quality.
- Adopt a flexible approach, avoiding prescriptive specification and design solutions.
- Use best available science and best practice as the basis for quantifying and calibrating a cost effective performance standard for defining environmental quality.
- Reflect the social and economic benefits of meeting the environmental objectives covered.

- Provide a common framework of assessment that is tailored to meet the 'local' context including regulation, climate and sector.
- Integrate construction professionals in the development and operational processes to ensure wide understanding and accessibility.
- Adopts existing industry tools, practices and other standards wherever possible to support developments in policy and technology, build on existing skills and understanding and minimize costs.
- Stakeholder consultation to inform ongoing development in accordance with the under-lying principles and the pace of change in performance standards.

4.1 BREEAM Domestic Refurbishment Environmental Issues

The environmental issues under which BREEAM assesses a building are divided up into the following seven categories:

- Management
- Health and well-being
- Energy
- Water
- Materials
- Waste
- Pollution

4.2 BREEAM Domestic Refurbishment Scoring & Rating

There elements that determine the overall performance of a refurbished project assessed using BREEAM Domestic Refurbishment, the following:

I. The BREEAM rating level benchmarks
II. The minimum BREEAM standards
III. The environmental section weightings
IV. The BREEAM assessment issues and credits

The BREEAM rating level benchmarks:

The BREEAM Domestic Refurbishment rating benchmarks are shown on the following table:

BREEAM RATING	%Score
Outstanding	85
Excellent	70
Very Good	55
Good	45
Pass	30
Unclassified	<30

An unclassified BREEAM rating represents performance that is non-compliant with BREEAM, in terms of failing to meet either the BREEAM minimum standards of performance for key environmental issues or the overall threshold score required for formal BREEAM certification.

The minimum BREEAM Domestic Refurbishment standards:

In order to ensure that performance against fundamental environmental issues is achieved in pursuit of a desired BREEAM rating, minimum standards of performance are set in key areas such as energy, water, waste etc. To achieve a particular BREEAM rating, the minimum overall percentage score must be achieved together with the minimum standards, detailed in the Table below.

BREEAM issue	Minimum standards by BREEAM rating level				
	Pass	Good	Very Good	Excellent	Outstanding
Ene 02: Energy Efficiency Rating Post Refurbishment	0.5 Credits	1.0 Credits	2 Credits	2.5 Credits	3.5 Credits
Wat 01: Internal Water use	-	-	1 Credit	2 Credits	3 Credits
Hea 05: Ventilation Hea 06: Safety	1 Credit 1 Credit	1 Credit 1 Credit	1 Credit 1 Credit	1 Credit 1 Credit	1 Credit 1 Credit
Pol 03: Flooding Mat 02: Responsible sourcing of materials	- Criterion 3 only	- Criterion 3 only	- Criterion 3 only	2 Credits Criterion 3 only	2 Credits Criterion 3 only

The environmental section weightings :

BREEAM uses an explicit weighting system derived from a combination of consensus based weightings and ranking by a panel of experts. Each of the environmental sections consists of a differing number of assessment issues and BREEAM credits. Hence, each individual assessment issue and credit varies in terms of its contribution to a building's overall score.

The Table below outlines the weightings for each of the nine environmental sections included in the BREEAM 2011 New Construction scheme

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Environmental section	Weighting
Management	12%
Health & Wellbeing	17%
Energy	43%
Water	11%
Materials	8%
Waste	3%
Pollution	6%
Total:	100%
Innovation (additional)	10%

The BREEAM assessment issues and credits:

BREEAM Domestic Refurbishment consists of thirty three individual assessment issues spanning the seven environmental categories, plus an eighth category called 'innovation'. Each issue addresses a specific building related environmental impact or issue and has a number of 'credits' assigned to it. 'BREEAM credits are awarded where a building demonstrates that it meets the best practice performance levels defined for that issue.

Innovation credits are available for the recognition of sustainability related benefits or performance levels which are currently not recognised by standard BREEAM assessment issues and criteria. In that way, buildings that go beyond best practice in terms of a particular aspect of sustainability may be awarded.

5. Grenfell Tower BREEAM Domestic Refurbishment Pre-assessment performance result

This project has achieved a Pre-Assessment target score of 66.32% against the BREEAM Domestic Refurbishment Pre-assessment criteria. This translates to a Pre-Assessment target rating of VERY GOOD.

BREEAM Environmental Category	Environmental Weighting	Credit Available	Credits Targeted	Section Score
Management	12%	11	11	12%
Health & Wellbeing	17%	12	7	9.92%
Energy	43%	29	17.5	25.95%
Water	11%	4	3.5	7.7%
Materials	8%	45	31	5.51%
Waste	3%	5	5	3.00%
Pollution	6%	8	3	2.25%
Innovation	10%	2	0	0.00%
Total Indicative BREEAM Score	66.32% VERY GOOD Rating			

Note: As the design is progressed, the pre-assessment may be subject to change and the score therefore is indicative only at this stage.

Specialist Reports, Calculations and other specialist items:

In order to achieve the VERY GOOD rating the below specialist reports need to be produced:

- Flood Risk Assessment.
- Ecology Report.
- Hydrologist Report (Surface Water Run-off calculations).
- Building User guide.
- Site Waste Management Plan.

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6. Grenfell Tower BREEAM Domestic Refurbishment Pre-Assessment Issue Scoring Report

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BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.4

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Building name	Grenfell Tower
Indicative building score (%)	66.32%
Indicative BREEAM rating	BREEAM Very Good
Indicative Minimum Standards level achieved	BREEAM Very Good

Management | Health & Wellbeing | Energy | Water | Materials | Waste | Pollution

INNOVATION

Section Weighting: 10% — Indicative Section Score 0.00%

Comments

MANAGEMENT

Section Weighting: 12% — Indicative Section Score 12.00%

Man 01 Home Users Guide

No. of BREEAM credits available	3	Available contribution to overall score	3.27%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where a Home Users Guide be provided to all dwellings, covering all issues set out in the 'Users Guide Contents list', three credits may be awarded

Indicative Credits Achieved
3

Comments

3No credits will be achieved since a Home User Guide will be produced and will cover all listed items in the User Guide Contents List outlined in the BREEAM Domestic Refurbishment Manual 2012.

Man 02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where a compliant considerate construction scheme will be used, credits are awarded depending the score achieved as outlined below:

Indicative Credits Achieved
2

Large Scale - project with more than 5 units

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 24 - 31.5	Score of 32 - 35.5
Alternative Compliant Scheme	Compliance	Beyond Compliance

Small Scale - project with 5 units or fewer

	One Credit	Two Credits
Considerate Constructors Scheme	24 - 31.5	32 - 35.5
Alternative Compliant Scheme	Compliance	Beyond Compliance

Exemplary Credit

Checklist A-4	50% of the optional items / 80% of the optional items

Considerate Constructors Scheme	Score of >36	Indicative Innovation Credits Achieved
Alternative Compliant Scheme	Exemplary Level Compliance	
Checklist A-4*	All Items (Optional & Mandatory)	* Small Scale Project Only

Comments

2No Credits since it is assumed that the principal contractor will use the Considerate Constructors Scheme (CCS) with a score of 32-35.5 .

Man 03 Construction Site Impacts

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where evidence demonstrate that site impacts will be monitored, as detailed below:

Indicative Credits Achieved: 1

Requirements

	One Credit
Large Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-5** are completed
Small Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-6** are completed

Sections of Checklist	
Large Scale - Checklist A-5	Small Scale - Checklist A-6
Monitor, report and set targets for CO2 production of energy use arising from site activities	Set objectives for reducing CO2 production from energy use arising from site activities
Monitor, report and set targets for water consumption arising from site activities	Set objectives for reducing water use arising from site activities
A main contractor with an environmental materials policy	Main contractor environmental materials statement
A main contractor that operates an Environmental Management System	80% of site timber is reclaimed, re-used or responsibly sourced
80% of site timber is reclaimed, re-used or responsibly sourced	

Same definition of small and large scale as in Man 02

Comments

1No Credits will be achieved since it is assumed that the main contractor will (i)monitor, report and set targets for CO2 production of energy use arising from site activities and (ii) operates an Environmental Management System.

Man 04 Security

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits Achieved: 2

Requirements

One Credit Secure windows and doors	External doors and accessible windows meet minimum standards and appropriately certified
Two Credits Secured by design	Principles and guidance of Secured by Design Section 2 are complied with A suitably qualified security consultant is consulted at the design stage and their recommendations are incorporated into the refurbishment

Comments

1No credit will be achieved since it is assumed that the External Door accessible windows meet the following criteria:
Doors are certified to:
PAS 24:2007 or LPS 1175 Issue 7 Security Rating 1 1 or equivalent
Windows are certified to:
BS 7950:1997 (36) and LPS 1175 Issue 7 Security Rating 1 or equivalent

Man 05 Protection and Enhancement of Ecological Features

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits Achieved: 1

Requirements

One Credit Protecting Ecological Features	Site survey carried out to determine presence of ecological features Statutory Nature Conservation Organisation notified of protected species Features of ecological value protected during refurbishment works

Requirements

		Indicative Innovation Credits Achieved
Exemplary Credit Ecological enhancement	A suitably qualified ecologist recommends features to enhance ecology of the site	0
	adopts all general ecological recommendations	
	adopts 30% of additional recommendations	

Comments

A site survey will be undertaken by a suitably qualified ecologist.

Man 06 Project Management

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	2	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits Achieved: 2

Requirements

One Credit Project Roles and Responsibilities	Where all of the project team are involved in the project decision making **Small Scale** - the project manager assigns individual and shared responsibilities amongst the project team including all trades on site **Large Scale** - the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: i. Planning and Building control notification ii. Design iii. Refurbishment iv. Commissioning and handover v. Occupation

Small Scale projects: five units or fewer or less than £100k
Large Scale projects: more than five units or more than £100k

Requirements

	Handover meeting arranged

One Credit Handover and Aftercare	2 or more of the following committed to: - A site inspection within 3 months of occupation - Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation - Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Exemplary Credits

	Requirements	Indicative Credits Achieved
		0
One Exemplary Credit Early Design Input	Where A BREEAM Accredited Professional has been appointed to oversee key stages within the project. OR Where a BREEAM Domestic Refurbishment Assessor has been appointed at an early stage of the project, prior to the production of a refurbishment specification	

	Requirements
One Exemplary Credit Thermographic Surveying and Airtightness Testing	Where Thermographic surveying and Airtightness testing have been carried out at both pre and post refurbishment stages Where an improved air tightness target has been set at design stage and testing demonstrates that this has been achieved post refurbishment

Comments

2No Credit will be achieved since the Project manager (Appleyards) has assigned individual and shared responsibilities across the following key design and refurbishment stages:
(i)Planning and Building control notification (ii)Design (iii)Refurbishment (iv)Commissioning and handover (v)Occupation. Also, a handover meeting will be arranged a)A site inspection within 3 months of occupation and b) post occupancy interviews will be conducted with building occupants or a survey via phone or post

HEALTH & WELLBEING — Section Weighting: 17% — Indicative Section Score 9.92%

Hea 01 Daylighting

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the refurbishment results in a neutral impact on daylighting or where minimum daylighting standards are met, up to two credits may be awarded as follows:

Indicative Credits Achieved: 1

For Existing Dwellings and Change of Use Projects

First Credit Maintaining Good Daylighting	The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study

Where the property is being extended

First Credit Maintaining Good Daylighting	New spaces achieve minimum daylighting levels
	The extension does not reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties

For All Properties

Second Credit Minimum Daylighting	The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study

Comments

If the existing flats are refurbished with double glazing, the minimum daylighting levels in the kitchens, living rooms, dining rooms and study will be achieved. MF's sustainability and energy statement present the results of the daylight calculations demonstrating compliance.

Hea 02 Sound Insulation

No. of BREEAM credits available	4	Available contribution to overall score	5.67%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

To ensure the provision of acceptable sound insulation standards and so minimise the likelihood of noise complaints.

Indicative Credits Achieved: 2

Properties where sound testing has been carried out:

Up to Four Credits	Four credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual

Properties where sound testing is not feasible and not required by the appointed Building Control body

Two Credits	Where existing separating walls and floors are designed to meet the requirements of Building Regulations with compliant construction details
Up to Four Credits	Where a Suitably Qualified Acoustician (SQA) provides recommendations for the specification of all existing separating walls and floors
	SQA confirms in their professional opinion that they have the potential to meet or exceed the sound insulation credit requirements
	Where these recommendations are implemented
	See table in additional information in Technical Manual

Historic Buildings

Up to Four Credits	Where the dwelling is a Historic Building and sound testing results demonstrate existing separating walls and floor meet the Historic Building credit requirements
	See table in additional information in Technical Manual

Detached Properties

Four Credits	By Default

Properties with separating walls or floors only between non habitable rooms OR Testing not required by building control body

Four Credits	By Default

Comments

An accoustics consultant has already been on board and has produced a noise assessment. In the detailed stages of the project an assessment will be made of the expected reduction in internal noise levels as a result of the refurbishment. RBKC has notified that it will be required

Hea 03 Volatile Organic Compounds

No. of BREEAM credits available	1	Available contribution to overall score	1.42%

No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the refurbishment avoids the use of VOCs with new products meeting the following requirements:

Indicative Credits Achieved
1

One Credit Avoiding the use of VOCs	Where all decorative paints and varnishes used in the refurbishment have met the requirement listed in table 5.4 in the Technical Manual
	Where at least five of the eight remaining product categories listed in table 5.4 have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within table 5.4 in the Technical Manual
	Where five or less products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.

Comments

It is assumed that at least five of the categories listed in table 5.4 of the BRREAM domestic Refurbishment manual will meet the testing requirements and emission levels for VOC emissions against the relevant standarts identified in table 5.4.

Hea 04 Inclusive Design

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where an access statement has been carried out using Checklist A-8 of the Technical Manual to optimise the accessibility of the home as follows:

Indicative Credits Achieved
1

	Checklist A-8 of the Technical Manual	
	Section 1	Section 2
One Credit Minimum Accessibility	Completed with Evidence	
Two Credits Advanced Accessibility	Completed with Evidence	Completed with Evidence

Exemplary Performance

Indicative Innovation Credits Achieved
0

One Credit	Where an access expert suitably qualified member of the design team has completed sections 1, 2 and 3 of Checklist A-8, access statement template with evidence provided of the measures implemented in the refurbishment

Comments

An Access statement will be produced and checklist A-8 of the BREEAM technical manual will be completed by a member of the design team.

Hea 05 Ventilation

No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwelling meets the following ventilation requirements:

Indicative Credits Achieved
1

	A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010
One Credit Minimum Ventilation Requirements	A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010.
	A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7, Building Regulations Approved Document Part F, 2010. It is an historic building and meets historic building requirements in CN4 of the technical manual
Two Credits Advanced Requirements	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full
	Where the building is a historic building and meets the requirements for Historic Buildings in compliance note 4 of the technical manual

Comments

1. A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010 2. A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010. 3. A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7,Part F, 2010.

Hea 06 Safety

No. of BREEAM credits available	1	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where a fire and carbon monoxide (CO) detection and alarm system is specified as follows:

Indicative Credits Achieved
1

One Credit Fire and Carbon Monoxide (CO) Detection and Alarm Systems	Carbon Monoxide detector installed if dwelling is supplied with mains gas or other fossil fuel
	Where a compliant fire detection and fire alarm system is provided
	Mains supplied fire detection and alarm system if project involves re-wiring
	Battery operated fire detection and alarm system if no re-wiring is to take place

Comments

Fire and carbon monoxide detectors will be installed in each flat.

ENERGY

Section Weighting: 43% | Indicative Section Score 25.95%

Ene 01 Improvement in Energy Efficiency Rating

No. of BREEAM credits available	6	Available contribution to overall score	8.90%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following targets are met for the improvement in Energy Efficiency Rating achieved as a result of refurbishment:

Indicative Credits Achieved
4

Improvement in EER	Credits
≥ 5	0.5
≥ 9	1
≥ 13	1.5
≥ 17	2

≥ 21	2.5
≥ 26	3
≥ 31	3.5
≥ 36	4
≥ 42	4.5
≥ 48	5
≥ 54	5.5
≥ 60	6

Comments

The M&E consultant MF have undertaken the pre refurbishment SAP calculations as designed post refurbishment SAP calculations. The energy averaging is applied for multiple dwellings. The average EER improvement is 38, and therefore 4No credits will be achieved.

Ene 02 Energy Efficiency Rating Post Refurbishment

No. of BREEAM credits available	4	Available contribution to overall score	5.93%
No. of BREEAM innovation credits	2	Minimum Standards applicable	Yes

Assessment Criteria

Where the following Energy Efficiency Rating benchmarks will be met as a result of refurbishment:

Indicative Credits Achieved
4

EER post refurbishment	Credits	Minimum requirements
≥50	0.5	'Pass' level EER of 50
≥55	1	'Good' level EER of 58
≥60	1.5	
≥65	2	'Very Good level' EER of 65
≥70	2.5	'Excellent' level EER of 70
≥75	3	
≥80	3.5	'Outstanding' level EER of 81
≥85	4	

Exemplary	Credits
≥90	1
≥100	2

Indicative Innovation Credits Achieved

Comments

The average EER for post refurbishment is 85. Therefore, 4No credits are achieved. As stated in Ene 01 the SAP calculations have been produced by the M&E consultant MF.

Ene 03 Primary energy demand

No. of BREEAM credits available	7	Available contribution to overall score	10.38%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following Primary Energy Demand benchmarks will be met as a result of refurbishment:

Indicative Credits Achieved
6.5

Primary Energy Demand Post Refurbishment (kWh/m^2/year)	Credits
≤ 400	0.5
≤ 370	1
≤ 340	1.5
≤ 320	2
≤ 300	2.5
≤ 280	3
≤ 260	3.5
≤ 240	4
≤ 220	4.5
≤ 200	5
≤ 180	5.5
≤ 160	6
≤ 140	6.5
≤ 120	7

Comments

As a result of the refurbishment the average area weighted primary energy demand will be 123 kWh/m2/year. Therefore, 6.5 No Credits will be achieved.

Ene 04 Renewable Technologies

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the dwelling will meet the following % contribution from renewables and primary energy demand targets as a result of refurbishment

Indicative Credits Achieved
2

Dwelling Type	Primary Energy Demand	Percentage from Renewables	
		1 Credit	2 Credits
Detached	≤ 250 kWh/m^2/year	≥10%	≥20%
Semi-Detached		≥10%	≥20%
Bungalow		≥10%	≥20%
End of Terrace		≥10%	≥20%
Mid Terrace	≤ 220 kWh/m^2/year	≥10%	≥20%
Low Rise Flat		≥10%	≥20%
Mid Rise Flat		≥10%	≥15%
High Rise Flat		≥10%	≥15%

Comments

The proposed heating system is GAHPs, which are considered a Low Zero Carbon technoloy by BREEAM according to DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. Based on area wighted average for the multiple dwellings, 78% of the primary energy demand is supplied by the LZC. Hence, 2No credits will be achieved.

Ene 05 Energy Labelled White Goods

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where Energy Efficiency White goods are to be provided as follows:

Indicative Credits Achieved
0

First Credit

Appliance	Appliance provided	Appliance not to be provided
Fridges, Freezers and Fridge-Freezers	Energy Saving Trust Recommended appliances specified	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Second Credit

Appliance	Appliance provided	Appliance not to be provided
Washing Machines and Dishwashers	Energy Saving Trust Recommended appliances specified	Second credit not achieved
Washer-Dryers and Tumble Dryers	Appliances specified with B Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Comments

N/A. This is not in the scope of the refurbishment.

Ene 06 Drying Space			
No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where adequate, secure internal or external space with posts and footings or fixings is provided with the following:

Indicative Credits Achieved
0

1 Credit

Number of bedrooms	Drying line required
1-2	4m+
3+	6m+

Comments

N/A

Ene 07 Lighting			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where energy efficient internal and external lighting is provided as follows:

Indicative Credits Achieved
1

External Lighting - 1 Credit

Energy Efficient Space Lighting and Energy Efficient Security Lighting OR
Where Energy Efficient Space Lighting is provided ONLY

Internal Lighting - 1 Credit

Maximum average wattage across the total floor area of the dwelling of 9 watts/m2

Comments

It is assumed that all comunal areas will be fitted with energy efficient lighting. Therefore, 1No credit will be achieved under this issue.

Ene 08 Display Energy Devices			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where consumption data is displayed to occupants by a compliant energy display device

Indicative Credits Achieved
0

Electricity usage data displayed	Primary Heating Fuel	
	Electricity	Other
Electricity usage data displayed	2 credits awarded	1 credit awarded
Primary Heating Fuel usage data displayed	N/A	1 credit awarded
Electricity & Primary Heating Fuel usage displayed	N/A	2 credits awarded

Exemplary Credits

One credit		Indicative Innovation Credits Achieved
Recording consumption data	Where any compliant Energy Display Device is capable of recording consumption data	

Comments

N/A

Ene 09 Cycle Storage			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where individual or communal compliant cycle storage is provided as follows:

Indicative Credits Achieved
0

Dwelling Size	One Credit	Two Credits
Studios/ 1 bedroom	1 per two dwellings	1 per dwelling
2-3 bedrooms	1 per dwelling	2 per dwelling
4 bedrooms	2 per dwelling	4 per dwelling

Comments

N/A

Ene 10 Home Office			
No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation

Indicative Credits Achieved
0

Comments

N/A

WATER

Section Weighting: 11% | Indicative Section Score 7.70%

Wat 01 Internal Water Use			
No. of BREEAM credits available	3	Available contribution to overall score	6.60%
No. of BREEAM innovation credits	1	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwellings water consumption meets the following consumption benchmarks, or where terminal fittings meet the following water consumption standards:

Indicative Credits Achieved
1.5

Calculated Water Consumption (litres/person/day)	Equivalent terminal fitting standards	Minimum Standard	Credits
>150	Typical baseline performance	N/A	0
140-150	All showers specified to 'Good' **OR** All taps and WC's to 'Good' **OR** Kitchen fittings specified to 'Excellent'	N/A	0.5
129-139	All showers specified to 'Excellent' **OR** All showers and bathroom taps to 'Good'	BREEAM Very Good	1
118-128	All bathroom and WC room fittings specified to 'Good'	N/A	1.5

	OR All bathroom fittings specified to 'Excellent'		
107-117	All Bathroom and WC room fittings specified to 'Excellent' **OR** All Bathroom fittings Specified to 'Excellent' and WC room fitting specified to 'Good' **OR** All Bathroom fittings, kitchen and utility sittings specified to 'Good'	BREEAM Excellent	2
96-106	All kitchen, bathroom, utility room and WC room fittings specified to 'Good' **OR** All bathrooms, kitchens and utility rooms specified to 'Excellent'	N/A	2.5
<95	All bathroom fittings specified to 'Excellent' and WC room, kitchen and utility room fittings specified to 'Good'	BREEAM Outstanding	3

NOTE: 'Good' fittings are equivalent to good practice fittings with "Excellent" fittings equivalent to best practice fittings (see the technical manual for full details.

Exemplary Credit	If the water consumption is less than 80l/person/day	Indicative Innovation Credits Achieved

Comments

It is assumed that post refurbishment the water consumption will lie in between 118-128 lt/person/day. In addition, all bathroom and WC room fittings will be specified to 'Good' OR all bathroom fittings will be specified to 'Excellent'.

Wat 02 External Water Use

No. of BREEAM credits available	1	Available contribution to overall score	2.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits Achieved
1

Requirements:

One Credit	Where a compliant rainwater collection system for external/internal irrigation use has been provided to dwellings. **OR** Where dwellings have no individual or communal garden space.

Comments

The flats have no individual garden space and the residents have no access to a communal garden space.

Wat 03 Water Meter

No. of BREEAM credits available	1	Available contribution to overall score	2.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where an appropriate water meter for measuring usage of mains potable water meter has been provided to dwelling(s), one credit may be awarded

Indicative Credits Achieved
1

Comments

A water meter already exists.

MATERIALS Section Weighting: 8% Indicative Section Score 5.51%

Mat 01 Environmental Impact of Materials

No. of BREEAM credits available	25	Available contribution to overall score	4.44%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Up to 25 credits can be awarded, with credits calculated using the Mat 01 calculator tool. The table below shows the maximum number of credits available for each element:

Indicative Credits Achieved
19

Elements	Green Guide Rating credits available	Thermal performance credits available*
Roof	5	3
External walls	5	3.8
Internal walls (including separating walls)	5	-
Upper and Ground Floor	5	1.2
Windows	5	2

The full 25 credits represents all of the elements containing refurbished or existing materials that meet the Green Guide Rating of A+(6)

GG Rating	Points for existing / refurbished elements	Points for new elements
A+ (6)	5	
A+ (5)	4.6	
A+ (4)	4.2	
A+ (3)	3.8	
A+ (2)	3.4	
A+	3	3
A	2	2
B	1	1
C	0.5	0.5
D	0.25	0.25
E	0	0

Where the full 25 credits cannot be achieved the score can be 'topped up' with thermal performance credits. The full number of thermal performance credits for each element can be achieved when achieving the minimum U-values shown below.

Elements	Minimum U-Value (W/m2K)
Roof	0.11
External walls	0.15
Internal walls (including separating walls)	-
Upper and Ground Floor	0.15
Windows	1.4

Comments

19No credits will be achieved since all materials will have a green guide rating of at least A+(3) as it is stated in the Sustainability and Energy statement prepared by the M&E Consultant.

Mat 02 Responsible Sourcing of Materials			
No. of BREEAM credits available	12	Available contribution to overall score	2.13%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where new materials are responsibly sourced, up to 12 credits may be awarded where 80% of new materials for an element are responsibly sourced. The credits achieved are dependent on % of point achieved which is based upon the responsible sourcing tier level of each material sourced as detailed below:

Indicative Credits Achieved
4

Table 1

Tier level	Points
1	4
2	3.5
3	3
4	2.5
5	2
6	1.5
7	1
8	0

Table 2

BREEAM credits	% of available points achieved
12	≥54%
10	≥45%
8	≥36%
6	≥ 27%
4	≥ 18%
2	≥ 9%

Will all new timber used in the project be sourced in accordance with the UK Government's Timber Procurement Policy
Yes

Comments

At least 18% of the materials used will be responsibly sourced.

Mat 03 Insulation			
No. of BREEAM credits available	8	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where any new insulation specified for use within external walls, ground floor, roof and buildings services meet the following requirements:

Indicative Credits Achieved
8

	Requirements
4 Credits	Where the Insulation Index for new insulation used in the buildings is ≥2
	Where Green Guide ratings are determined using the Green Guide to specification tool

	Requirements
4 Credits	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.

Comments

WASTE	Section Weighting: 3%	Indicative Section Score	3.00%

Was 01 Household Waste			
No. of BREEAM credits available	2	Available contribution to overall score	1.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where compliant recycling and composting facilities are provided, up to two credits may be awarded as follows

Indicative Credits Achieved
2

First Credit - Recycling Facilities	
Scenario	**Internal recycling storage requirements**
Compliant collection scheme in place	3 internal recycling containers provided where recycling is not sorted post collection
	1 internal recycling container provided where recycling is sorted post collection
	Minimum 30 litre total capacity, no single container less than 7 litre capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place No adequate external storage	3 internal recycling containers provided
	Minimum 60 litre total capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place Adequate external storage provided	3 internal recycling containers provided
	Minimum 30 litre total capacity, no single container smaller than 7 litre capacity
	Dedicated position in accordance with compliance note 1

Second credit - Composting facilities	
With external space	**Without external space**
Where a composting service or facility is provided for green/garden waste	Where a composting service or facility is provided for kitchen waste
Where a composting service or facility is provided for kitchen waste	Where an interior container is provided for kitchen composting waste of at least
Where an interior container is provided for kitchen composting waste of at least 7 litres	

Comments

Was 02 Refurbishment Site Waste Management			
No. of BREEAM credits available	3	Available contribution to overall score	1.80%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Up to three credits are available depending on the site waste management plan to be implemented as follows

Indicative Credits Achieved
3

Projects up to £100k

Three Credits	Where waste generated through the refurbishment process is managed in accordance with Checklist A-9	Indicative Innovation Credits Achieved
Exemplary Credit	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place	0

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	The percentage of non-hazardous construction waste and demolition waste generated by the project has been diverted from landfill and meets or exceeds the refurbishment & demolition waste diversion benchmarks

Projects over £300k

First Credit Management Plan	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Second Credit Good Practice Waste Benchmarks	First credit achieved
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	Amount of waste generated against £100,000 of project value is recorded in the SWMP
	Pre-refurbishment audit of the existing building is completed
	If demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials
Third Credit Best Practice Waste Benchmarks	Where the first two credits have been achieved achieved
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion benchmarks
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency benchmark*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

The principal contractor will have in place a BREEAM compliant SWMP, where best practice waste benchmarks will be achieved.

POLLUTION

Section Weighting: 6% | Indicative Section Score 2.25%

Pol 01 NOx Emissions

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows:

Indicative Credits Achieved
0

	Dry NOx Emissions
One Credit	≤100 mg/kWh (NOx class 4 boiler)
Two Credits	≤70 mg/kWh (NOx class 5 boiler)
Three Credits	≤40 mg/kWh

Comments

Pol 02 Surface Water Runoff

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where impacts of the refurbishment on surface water runoff are neutralised or where runoff is reduced as a result of refurbishment, up to three credits can be awarded as follows:

Indicative Credits Achieved
1

	Requirements
First Credit Neutral Impact on Surface Water	New hard standing areas must be permeable
	If building on to previously permeable area additional run-off must be managed on site
	Calculations should be carried out by an appropriately qualified professional
Second Credit Reducing Run-Off From Site: Basic	Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods
	Include runoff from all existing and new parts of the roof.
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site
Third Credit Reducing Run-Off From Site: Advanced	Where run-off as a result of the refurbishment is managed on site using source control
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
	The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).
Exemplary Credit	Where all run-off from the developed site is managed on site using source control
	The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
	There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Comments

Pol 03 Flooding			
No. of BREEAM credits available	2	Available contribution to overall score	1.50%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria	Indicative Credits Achieved
Where the dwelling is located in a low flood risk zone, or where in a medium to high flood risk zone and a flood resilience/resistance strategy has been implemented, up to two credits can be awarded as follows:	2

Minimum Standards	A minimum of two credits must be achieved for this issue at the Excellent and Outstanding levels

Option 1 - Low Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.

Option 2 - Medium / High Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.
	Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding by following Checklist A-10; Decision Strategy Flow Chart.
	Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional

Comments

A Flood Risk Assessment will be undertaken for the Grenfell Tower by a qualified Hydrologist. Also, to the Environment agency the site is expected to be of low flooding risk. Therefore, two No credits will be achieved.

10.0 ACCESS STRATEGY

Grenfell Tower
Access Statement

Reference Documents
The design has been formulated using best practice guidance:

- Approved Documents Part M and B of the Building Regulations
- BS9999:2008 Code of Practice for means of escape for disabled people
- BS 8300:2009 Design of buildings and their approaches to meet the needs of disabled people - Code of Practice
- Department of Transport – Inclusive Mobility
- Dulux – Colour and Contrast: A design guide for the use of colour and contrast to improve the built environment for visually impaired people
- Accessible London: achieving an inclusive environment, Lifetime Homes
- LDF Access Design Guide: Supplementary Planning Document – Adopted December 2010
- Lifetime Homes 21st Century Living - Habinteg

These documents will continue to be used through the design process as more information and detail comes to light.

External Environment

The proposed scheme has removed steps providing level entry to the whole of the ground floor and walkway level, ensuring ease of access for all to the facilities. The surrounding landscape provides gentle slopes to access the site and other buildings within it.

There is currently no car parking within the curtiledge of Grenfell Tower and this situation will remain. . etc as per previous statement

Wayfinding
The development has two level entry points. Clear routes are provided between buildings and wayfinding tools will include the use of signage which meets the Sign Design Guide.

Internal
Residential Arrangements
There is only one new floor of residential accommodation being provided, which contains four apartments. Whilst the internal walls are being gutted, there is a core of vertical circulation and services remaining; these impact on the final solution.

The following points identify the standards achieved for various elements and any deviations from them.

Corridors
The corridors within the residential zone exceed the 1050mm minimum width required, other than, one short section of corridor which is purely for means of escape.

Doors
All new doors will meet the clear opening width of 750mm applicable to the corridor widths and have the required clear leading edge to facilitate independent access.

Toilets and Bathrooms
The existing services are located within the central core of the building and the location of the sanitary facilities has been dictated by this. A bathroom and separate WC are being provided.

The bathroom is located adjacent to a large double bedroom, which could allow future direct linkage to the bedroom. Baths are being installed; however, a shower replacement tray could facilitate disabled access, when required.

All walls to the bathrooms will be of sufficient strength to allow the installation of grab rails.

Windows
The fenestration of the block remains and whilst windows are being replaced, there will not be any alteration to their size and shape. The windows will be chosen to allow ease of opening with the relevant safety features.

Finishes
Throughout the building materials and finishes will be chosen to ensure tonal contrast. This will include fixed furniture, decorations, carpets, all electrical and mechanical fittings, etc.

Switches and Sockets

All new sockets and switches will be located within the 450 – 1200mm off FFL range as recommended by Lifetime Homes.

Commercial Areas

There are a number of building users including a nursery, boxing club and office areas. The following outlines the approach taken to ensure the scheme meets the anticipated requirements of the Equality Act.

Entrance/ Exit Doors

Entry to the main lobby, nursery and walkway foyer will be fully visible within the facade. All public entry doors will be 1000mm clear width; automation will be provided where required. Manifestation will be provided to meet the requirements of BS8300 and any door entry system will be positioned to suit all users.

Circulation

Horizontal

Internal circulation will provide a sense of location and direction to assist people with sight impairments and learning difficulties in particular. Colour will be used to assist this provision.

All new lobbies throughout the building meet with Part M requirements to ensure access for wheelchair users to all parts of the building.

All new circulation routes will meet the requirements of ADM. No obstructions will be present in the corridors other than any existing structure which will be protected and fire equipment, yet to be confirmed.

All new internal doors will meet current building regulation requirements, for an existing building, including clear opening widths, having a 300mm leading edge, vision panels, manifestation and tonal contrast. Accessible toilet doors will be a 1026mm leaf to ensure the correct opening width, with wide grab rails attached to the back of the door.

Suitable lever handle door furniture or pull handles will be used for doors; they will operate without having to fully grip the handle, for instance, by using a closed fist. Care will be taken in the selection of security and fire exit fittings, such as release latches or locks to ensure that they will be manageable by all users.

Vertical

There is full passenger lift as part of this scheme and will be in accordance with Part M of the Building Regulations and the detailed requirements of BS 8300:2009. The lifts will provide adequate space for motorised wheelchairs and will be large enough to accommodate standing disabled people, allowing more to travel and reducing 'travel time'.

A clear manoeuvring space of 1500 mm x 1500 mm has been provided in front of the entrance to all the lifts, as BS 8300 Para. 8.4.2.

All new stairs will meet the requirements in Part M 2004. The detail design of stairs will be developed in accordance with the Part M requirements for internal stepped access and BS8300.

Tonal contrast will be provided to the riser and going of all the internal stairs.

Sanitary Facilities

A number of accessible toilets are being installed; these will be distributed to reflect the security arrangements and the requirements cf ADM.

Care will be taken to ensure that accessible changing facilities are provided within the boxing club.

Summary

Accessibility legislation as well as Building Regulations makes it clear that reasonableness is a key ingredient in determining what is to be done in each circumstance and for the function of the particular building. The statement therefore embodies what it is considered reasonable to provide and what mixture of built provision and support mechanisms is most practical.

As the design develops, we will ensure that inclusion is continued to be monitored and that the proposals provide a flexible, accessible, affordable environment for all within the context of the brief, building constraints and budget.

11.0 LANDSCAPE STRATEGY

Grenfell Tower is located at the southern edge of the 2 hectare site which is the subject of development proposals associated with the Kensington and Chelsea Academy and Leisure Centre. The following text needs to be considered alongside the current proposals for the KALC project which are currently the subject of a planning application.

EXISTING CONDITION

The external areas to the four sides of the tower lack any real sense of place or arrival. The building sits within a zone of low quality pavings which allow pedestrians to move around its base on all sides.

The south side of the building provides the principal means of access. However this is also the principal route for vehicles approaching from the south via Grenfell Road. The area has a utilitarian quality dominated by low walls, tarmac and paving slabs giving access onto a narrow paved forecourt accommodating bicycle and motorbike stands. A low wall separates the space immediately adjacent to the tower from a service road which provides access to the baseline offices and the parking areas under the Testerton and Hurstway residences. The area is dark and overshadowed sitting in part under the first floor access deck to the adjacent residential blocks.

To the west is the existing children's playground which wraps around the north-west corner of the building. This playground will be need to be relocated as a result of the incursion into this area by the Academy. In the south west corner is a brick stepped ramp which provides the means of access onto the raised deck. The ramp lands on a low raised platform which means that all pedestrians passing around this corner of the building have to go up and then down a small flight of steps, making access around the south side of the tower more difficult than it needs to be. It is understood that the existing playground is very successful with children of all ages, including those attending the crèche who regularly use the facility, particularly during the summer months. The playground is currently divorced from the wider public realm by a high brick walls. The playground is sub divided into the main play space and a more secluded private garden space. It is understood that this second enclosure has only recently seen the addition of paly equipment, previously this was a quitter more contemplative space. The playground is secured by 1.8 metre high railings. The area contains a number of existing trees, those along the southern edge being of slightly higher quality with 2 mature London Plane providing visual screening from the elevated Metropolitan Line. A high graffiti clad wall defines the southern edge of the space.

To the north of the tower is a narrow service road set behind a dense belt of shrubs and trees. The existing fire escape stairs on this side of the tower jut out into the space.

On the east side the tower overlooks a wide access road which then becomes a concrete slab path containing 4 large London Plane, the roots of which have lifted the paving. Lancaster Green is then to the immediate east providing a green aspect to this side of the building. The present mounded form of Grenfell Tower establishes a degree of visual separation between the base of the building and the wider public realm.

Despite the presence of the playground which is clearly a valuable asset for the residents it would appear that the spaces immediately adjacent to the tower provide little significant benefit for the residents in terms of areas for active use, the majority of green space accommodates only informal relaxation and dog exercising. Given the space available, this is a missed opportunity.

PROPOSALS

The proposals need to be read in association with the plans for the Kensington Academy and Leisure Centre. While it is essential that the spaces are integrated with the wider KALC project, it would be beneficial if the areas immediately adjacent to the tower were seen to have some sense of belonging to the occupants of the housing.

The removal of the existing stepped ramp will go a considerable way to delivering a more meaningful sense of space on the west side of the tower, providing level access from Station Walk around the south side of the playground and then along the south side of the tower onto Grenfell Road. While the east – west link remains the primary route for those crossing the site or accessing the Academy or the Leisure Centre, the removal of these steps will encourage short cutting by some local users which will encourage heavier use of the route and, in so doing, enhance passive surveillance.

The playground is re-provided slightly further to the south, the quantity and quality of the play equipment maintaining or improving what is currently provided. Every effort will be made to re- use any of the existing equipment but it is likely that the cost difference between re-use and re-provision will be negligible. The northern edge of the play area will now define the east – west cross site route and the secondary public entrance to the academy. The levels are used to create a subtle sense of division between the heavily used pathway and the spaces adjacent to the tower base. By elevating the east – west path by circa 500mm it is possible to achieve a sense of separation without creating a narrow corridor space alongside the tower. A ramp leads down to the north east corner of the tower from Lancaster Green achieving fully inclusive access. It is envisaged that the space alongside the tower will be separated by a low fence with access via pairs of gates at both corners of the building.

On the east side Lancaster Green is drawn much closer to the tower absorbing the existing strip of broken paving slabs under the London Plane and part of the adjacent road. The shallow embankment which rises onto the green will be populated with small seating areas set amongst low shrubs providing quieter spaces for reading and for other passive recreation.

The southern side of the tower will experience the greatest level of transformation. The existing low brick wall will be removed and the bike stands re-provided under the elevated walkway. An expanse of open paving will then extend down to the existing garage doors providing a simple uncluttered hard landscape space as a more appropriate threshold to Grenfell Tower.

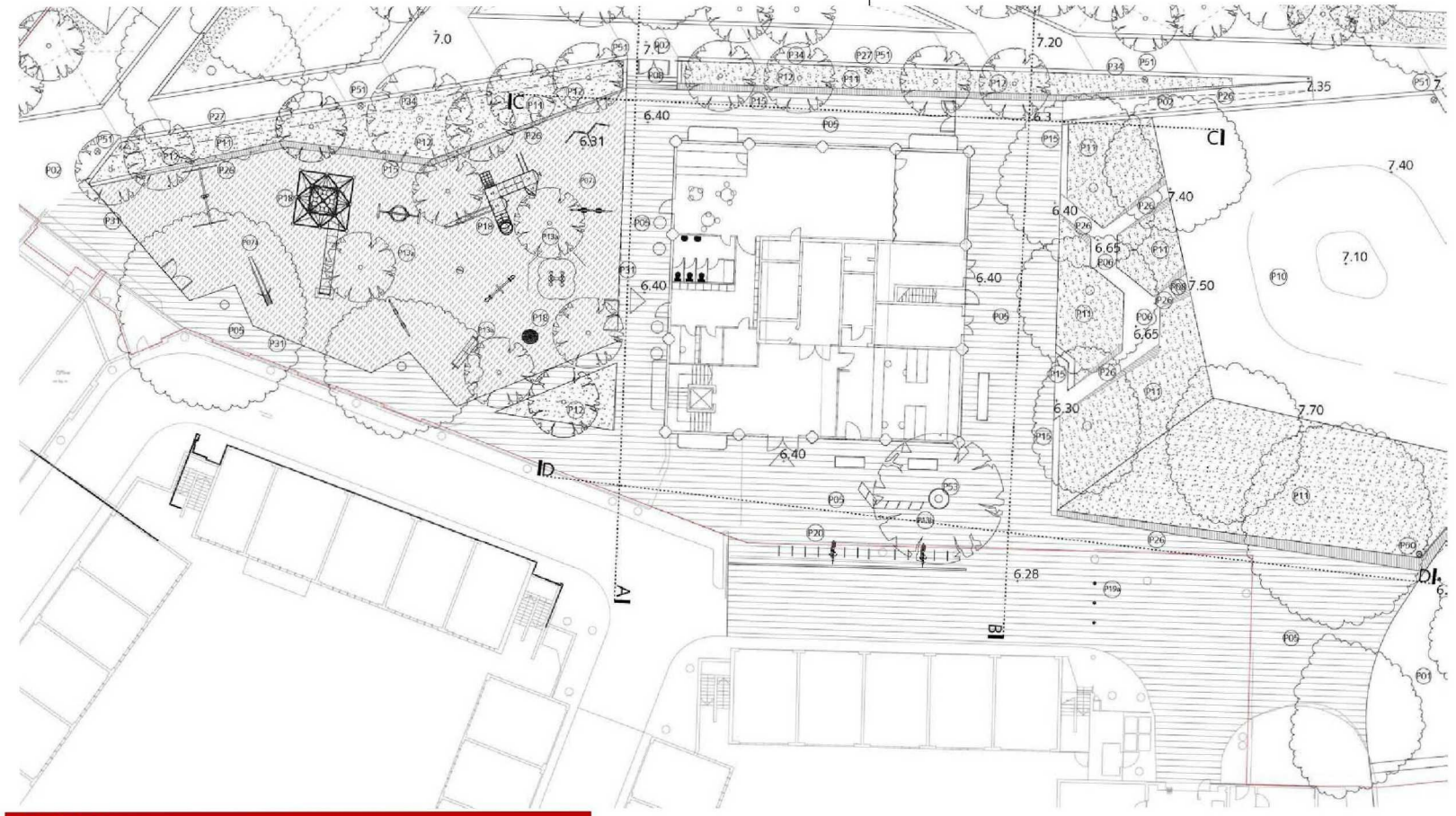
CHANGES TO ACCESS AND PARKING

Parking, particularly by contractors has been a major detractor from the quality and the use of this space. There is a desire to make those areas around the tower more usable by pedestrians and by residents transforming them from their current highway like character, the objective being to establish an environment which looks like a plaza rather than a road. However, there are still traffic related issues which do need to be carefully considered and adequately addressed.

Free access by vehicles must be prevented, vehicle movements into this area need to be controlled and managed. Changes of the floorscape will reinforce the message that the vehicle user has only permissive rights of access, pedestrian use being the primary focus. It is likely that motorists entering this area will do so at low speed, 10-15 mph is likely to be the norm given the restricted nature of the space. However, it will also be necessary to prevent free access by the installation of retractable bollards to the south east corner

of the tower so that there is a discernible boundary between this area and Grenfell Road and between this area and the north –south link. It will also be necessary to establish a line across the southern edge of the space beyond which vehicles should clearly not progress, ideally this should be established through the use of furniture, trees, bike stands. It may also be necessary to place a retractable bollard at the south west corner of the tower following removal of the existing stepped ramp. This will prevent vehicles trying to circumnavigate the base of the tower.

The proposals therefore offer a significant level of enhancement to the tower environs, both in terms of the quality of the materials and the nature of activities that can be supported. They provide a space where the pedestrian is the primary user while vehicular movements are controlled through passive measures. They achieve consistency with the wider KALC proposals while strengthening the sense of ownership for the Grenfell residents.



Public Realm Materials Key

- P01 Adoptable Paving - Exposed Aggregate Concrete/Granite (Shared Surface)
- P02 Pedestrian Paving Exposed Aggregate Concrete/Granite
- P05 Exposed Aggregate Concrete/Granite Pavers to Grenfell Tower Apron (to match P01)
- P06 Small Unit Paving to Lancaster Green
- P07a Permeable Rubber Crumb Safety Surface
- P08 Precast Concrete Steps Including handrail and Tactile Paving
- P10 Grass
- P11 Herbaceous/Shrub Planting
- P12 Tree Planting in Soft Landscape - min. 25cm girth
- P13a Tree Planting in Paving - Semi Mature 30-50cm girth
- P13b Tree Planting in Paving Semi Mature min 70cm girth
- P15 Timber Clad Concrete Seating Walls
- P16 Concrete Seating Plinths
- P18 Play Equipment
- P19a Bollards - Retractable
- P20 Cycle Stands - Positioned under upper terrace
- P26 Battered Retaining Wall Clad in Timber
- P27 Flush Wide Precast Concrete Edge
- P31 1800mm high Vertical Steel Bar Railings
- P33 Hedge
- P34 1500mm high Perforated Steel Fence (to match Academy Boundary detail

- P50 Primary Lighting Masts
- P51 Secondary Lighting Masts
- P52 Litter Bins (Locations to be confirmed)
- P53 Tree Grille to Trees in Hard Paving

Note: Refer to outline specification for reference details

12.0 BUDGET COST PLAN

RIBA STAGE C REPORT

FOR GRENFELL TOWER REGENERATION PROJECT

Kensington and Chelsea Tenant Management Organisation

APPROVAL SHEET

Document Status; FINAL		Date of Issue: 02/10/12
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October 2012	Stage C Report	Studio E	1

FOREWORD

1. This document has been prepared by Appleyards with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it by agreement with the Client.
2. This document is confidential to the Client and Appleyards accepts no responsibility whatsoever to third parties to whom this document, or any part thereof, is made known. Any such party relies upon the document at their own risk.
3. This document shall not be used for project or contractual purposes unless signed above by the author and the approver for and on behalf of Appleyards, and unless the document status is 'Final'.

October 2012

CONTENTS

1 Cost

The estimated Total Project Costs that are based on the Stage C design information are as follows:

Grenfell Tower - £8,663,600 including fees
External Works - £257,400
Total Budget Costs - £8,921,000 including fees (£421,000 over budget)

Following review in line with BREEAM requirements a series of Value Engineering exercises are being undertaken to realise savings against the key elements of works. Possible savings can be made against the specification of windows, a detailed specification of the refurbished offices and a reduced contingency on elements of works where a more accurate specification may reduce rates.

The Stage C Value Engineering savings as discussed stand to achieve savings in the region of:

- Tilt and turn windows in lieu of central pivot - £119,405 *(subject to confirmation of fixed price costs from Leadbitter – awaited)*

Value Engineering will be continued throughout the design and procurement stages.

The estimated Total Project Costs include approximately £730,972 of Project Contingency to cover design development risks, construction risks, employers change and other risks. This contingency represents 10% of the budget costs for the refurbishment (excluding fees), although it is feasible that once costs are closer to a fixed price for key elements of the design that the contingency could be reduced on said elements.

Triple Glazing

Further to resident liaison regarding the treatment of window solutions, it was suggested that triple glazing would be beneficial to aid with acoustic separation from KALC. This option was reviewed by the design team, and considered to not be of sufficient value for money when measured against the acoustic performance.

When compared to double glazed alternatives, the triple glazing was budgeted to cost a further £170/ m². Over the entire scheme of 2,171 m² this would mean an extra over of potentially £369,070. Given the budget of circa £1m on the replacement windows this would reflect percentage increase in the region of 37%.

The acoustic assessment carried out by Max Fordham on 16th July 2012 concludes that the specification of triple glazing would yield negligible results as the acoustic performance of the windows is dictated by the ventitlation allowance.

RIBA Stage C Report for Grenfell Tower

2 Programme

Overview

The objective of the project has always been to conduct the refurbishment works in line with the completion deadline of KALC, Septmeber 2014. This requires a completion of no later than September 2014. The table of key dates below reflects the current overall plan.

The project is generally proceeding to plan, with the key milestone during RIBA C (submission of Planning application) having been achieved broadly on time.

Given that Planning submission and committee for Grenfell Tower was to follow KALC, we submitted planning on 25th August and hope to meet the planning committee date of 30th October 2012.

The key overall project dates are as follows:

	Start	Finish
RIBA C	July 2012	October 2012
Procurement of Contractor (pre-construction phase)	Dec 2012	Jan 2013
RIBA D	October 2012	October 2012
Planning application Allowance for possible Judicial Review	August 2012 October 2012	End October 2012 December 2012
Design Team Novation	October 2012	November 2012
RIBA E/F1	November 2012	January 2013
Pre Contract award / Enabling works	October 2012	January 2013
Grenfell Construction Period	January 2013	May 2014
External Works	February 2014	May 2014

Appended to this report is an initial GANTT chart completed to give an overview of RIBA phases, planning submission and construction period.

Planning

The detailed planning application was submitted on the 25th August and is expected to be considered at the RBKC Planning committee on 30th October. Following the Planning Committee meeting, a further 12 weeks has been allowed for any potential judicial review of the planning decision. The construction contract cannot therefore be entered into without commercial risk until after the 22nd January 2013.

Vacant Possession

Following trial drilling conducted by Leadbitter to ascertain noise levels for mechanical fixing into existing structure we are currently reviewing whether or not vacant possession will be required along with consideration of the mechanical service solution to be adopted.

3 Key Governance / TMO Approvals

A project governance and gateway review meeting is scheduled for 8th October and a summary of key deadlines and activities will be issued as an addendum to this report.

4 Risk Register

An end of RIBA Stage C risk workshop will be held on 18th October where the project risks compared with the project objectives are to be reviewed. The revised risk register is being prepared and will be issued as an addendum to this report.

5 CDM-C

Please see separate CDM-C Report contained within this document.

6 Contractor Selection

The procurement of the construction contractor has been undertaken using the iESE framework in line with KALC. A Pre-construction Agreement will need to be entered into with Leadbitter for work during RIBA stage D until construction contract award at the end of RIBA stage H.

TMO has expressed a wish to novate the design team to Leadbitter, from RIBA Stage D (under a single umbrella appointment through Studio E). Both the consultant appointments (with novation agreement appended) and the pre-construction agreement with Leadbitter need to be progressed and entered into in parallel prior to the end of RIBA Stage D – it is intended to use the same forms for both documents as have recently been agreed on KALC.

List of Appendices

- Stage C Cost Plan
- Risk register (to be issued as an addendum report)
- CDM register /report
- Gantt chart for overview of RIBA stages and indicitve Construction

APPLEYARDS
GROUPE ARTELIA

Budget Cost Estimate nr. 4

prepared for

Kensington and Chelsea Tenant Management Organisation (KCTMO)

relating to

Grenfell Tower Regeneration Project, Kensington, London

October 2012

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Notes :-

1 The estimate is based on prices at 3rd Quarter 2012. Please note that if the project is deferred to next year then the BCIS tender price index forecast is currently indicating an increase in tender price levels of 1.3%, from 3rd Quarter 2012 (220) to 3rd Quarter 2013 (224).

2 The estimate assumes that the works will be procured on a two stage tender basis, keeping IESE contractor (currently contracted under KALC) and Design Team will be novated at Stage E (after stage D).

3 Allowances for the scope of the works have been based on the information from Studio E LLP received on 1st October and 29st September (Proposed floor plan 1279 RE110, Planning Drawing nr. 1279 PL 001 to PL 013), landscaping information from Churchman Landscape Architects received on 2nd October (Drawing nr. 341/105) and M&E Information from Max Fordham received on 27th September and Design Team Meeting on 20th September 2012, structural stage C report received on 1st October 2012

4 Floor areas stated are largely derived from areas indicated on the drawings (1:200 at A1), but are indicative at this stage and subject to verification as more accurate details become available.

5 Costs assume a construction period of approximately 64 weeks (15 months) and works being carried out during normal working hours.

6 All Mechanical and Electrical services are compliant with current regulations and standard. No replacement is allowed for unless specifically stated.

Exclusions :-

No allowance has been made within the Construction Cost for the following:

A Tender price increases beyond 3rd Quarter 2012

B Removal of any contaminated substances, e.g. Asbestos

C Public Realm, Drainage, internal redecoration/refurbishment works to existing 20-storey flats, external lighting

D Statutory fees including Planning and Building Control.

E Site investigation, survey works for checking existing structural framework, drainage, existing services installations, etc., asbestos survey, contamination survey, topographical surveys, fire strategy

F Decants, removals and relocation costs of existing nursery, boxing club and residents

G Finance and legal costs

H Out-of-hours working; requirement for 'noisy working restriction' is included in the preliminaries allowance.

I Full VAT liability.

J Loose furniture, fixtures and equipment, other than where indicated.

K New enclosure, realignment of existing external wall and wall extension to gate

GROSS INTERNAL FLOOR AREA (m^2)

Easement	697.00	
Ground (convertion from existing garage to offices)	275.00	
Ground (nursery, office)	490.00	
Mezzanine (new residential)	466.00	
Walkway/Deck Level (boxing club, office)	466.00	
Office Level/Walkway + 1 (new residential)	494.00	
20-storey Residential Level (+19770 and above); GFA of 9,416m2	Excluded	
Roof Plant 247.20m2	Excluded	
		2,883.00
		2,886.00 m2

Stage C Budget Cost Estimate Breakdown:

Item	Descriptions	Qty	Unit	Rate £	Total £		Total £
	Scope of Works						
1A	**Demolition Works to Existing Garage/Undercroft**						
A	Demolition of existing stud wall partition/brick walls and doors to Existing Garage	312	m²	55	17,160		
B	Strip out of existing floor and ceiling finishes in existing garage and EMB office, Kitchen and Caretakers office	275	m²	20	5,500		
C	Strip out of existing wall finishes in existing garage	510	m²	10	5,100		
1B	**Refurbishment Works to Existing Garage**						
D	To convert existing garage to new offices including new curtain wall, roller shutters, new raised floor deck, wall, floor and ceiling finishes, M&E services as per Studio E draft outline specification dated 26.9.12	275	m²	1,410	387,750		
2A	**Demolition Works to Main Tower**						
A	Demolition of existing stairs and lift enclosure (SE corner) from Ground (6385) to Office level (15874)	200	m²	150	30,000		
B	Removal of existing steps (Ground to Mezzanine in proposed dining area and quiet area)	10	m²	180	1,800		
C	Demolition of existing stud wall partition and doors to Existing Store, Lobby, Offices, etc.	1,010	m²	55	55,550		
D	Demolition of existing masonry walls	344	m²	230	79,120		
E	Remove existing doors and dispose off site	44	nr	100	4,400		
F	Remove existing sanitary appliances including basins, wc, etc	10	nr	150	1,500		
G	Demolition of the link currently providing access to north side of the Deck level (area to be confirmed)	60	m²	110	6,600		
2B	**Refurbishment Works to Main Tower**						
H	Infill flooring/new floor plates (permanent shuttering) to existing void for new Reception (ground), Residential (mezzanine), Office (walkway), Residential (Walkway +1)	354	m²	350	123,900		
J	New enclosure to cover areas at Office level/Walkway +1 to create new residential units	427	m²	500	213,500		
K	Forming floor opening (4.2m x 5.5m) to entrance lobby on Mezzanine and Walkway level	1	Item	10,000	10,000		
L	New staircase at entrance lobby (9.5m high) and forming new lift core including building into existing structure	1	Item	30,000	30,000		
M	New lift; ground to Walkway level (assumed for 8 person; 4 stops)	1	nr	45,000	45,000		
N	New footbridge (deck with balustrade) to provide access from lift to the walkway level	1	Item	10,000	10,000		
O	New reception/offices, play area, office, boxing club, office, WC, etc at Ground and Walkway level including new partition and folding partition, new floor, wall and ceiling finishes, upgrade/modification of M&E services as per Studio E draft specification dated 26.9.12	955	m²	750	716,250		

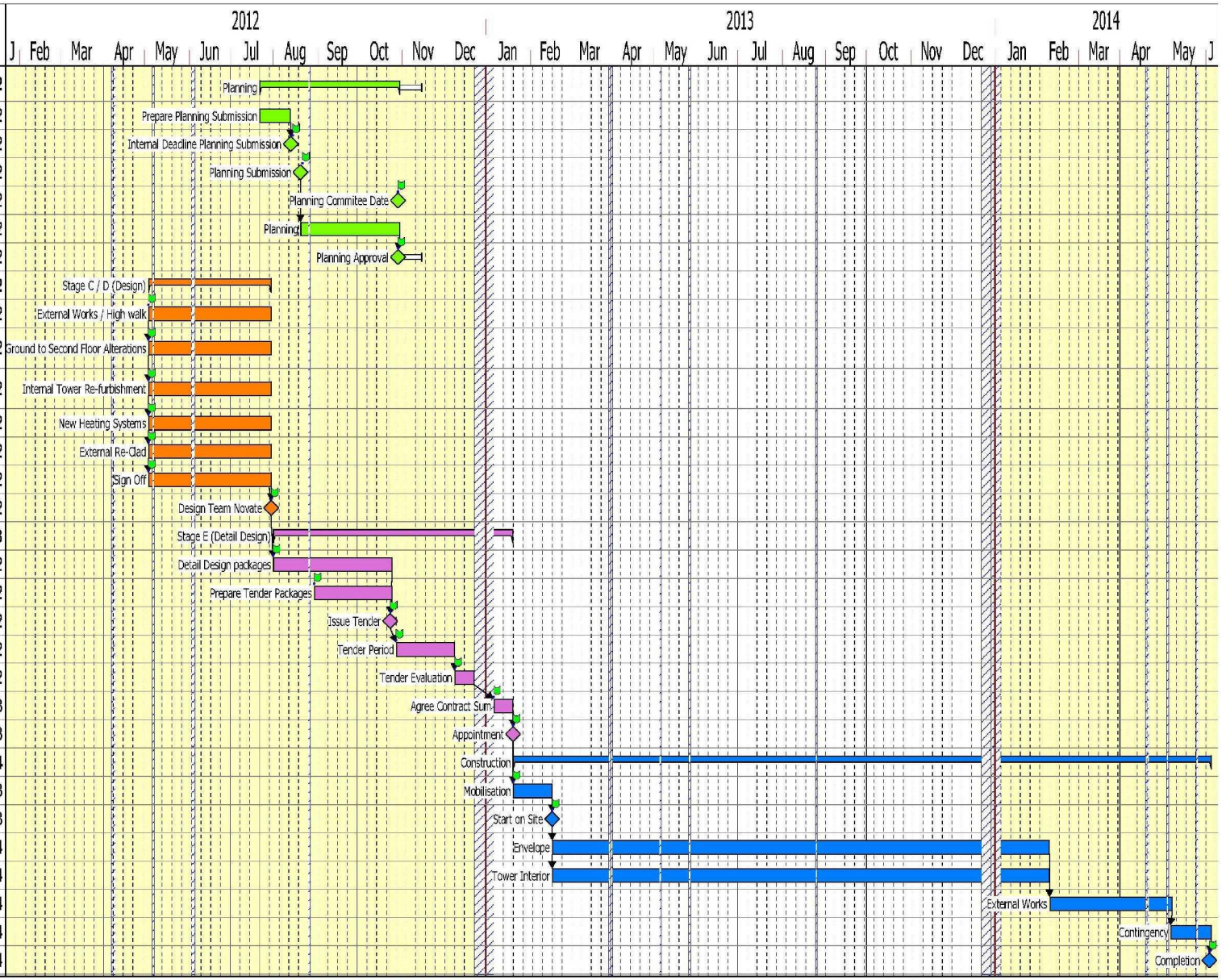
Item	Descriptions	Qty	Unit	Rate £	Total £			Total £
2B	Refurbishment Works to Main Tower (Cont'd)							
A	New residential units at Mezzanine and Walkway +1 Level including new partition, new doors, new floor, wall and ceiling finishes, kitchen fittings and cupboards, sanitary appliances, upgrade/modification of M&E services as per Studio E draft outline specification dated 26.9.12	960	m²	780	748,800			
B	Remove existing windows and New double-glazed central pivot windows with manual purge ventilators (to deal with over heating issue) to whole tower	2,171	m²	470	1,020,370			
C	New cladding including insulation (allow say VMZinc Rain screen Cladding) to tower	3,215	m²	260	835,900			
D	New curtain wall to tower	505	m²	450	227,250			
E	New Render including insulation and inner leaf at £200/m2 (Assumed existing strips of concrete spandrels between column are sound and to be retained and can be used as support for new insulation and cladding without any replacement required as per Curtins Consulting Stage C report)	291	m²	200	58,200			
F	New brickwork to tower	285	m²	300	85,500			
G	Remove existing canopy and install new metal cantilever canopy	300	m²	600	160,000			
H	Remove existing covering, install new insulation and covering/finish on roof and around plant room (lower roof)	500	m²	150	75,000			
J	Cap-off and modification/adaption of existing communal heating system	1	item	10,000	10,000			
K	Cap-off incoming heating and hot water services to apartments; connect new hot water cylinder to pipework	127	nr	500	63,500			
L	Removal of redundant central plant and pipe works	1	item	25,000	25,000			
M	Gas fired heat pump including new hot water cylinder and new larger radiator in each units with central DHW system/ storage on roof (assumed there's sufficient space on the roof and the existing structure able to receive the load of the water storage)	1	item	434,139	434,139			
N	New 100mm diameter mild steel gas pipe from basement to roof top plant room (assumed new pipe attach to outside of building)	90	m	100	9,000			
O	Concrete stand to support central domestic hot water storage (assumed no structural strengthening required as per Curtins Consulting report dated Sep 12)				Exclusion			

Item	Descriptions	Qty	Unit	Rate £	Total £			Total £
2B	Refurbishment Works to Main Tower (Cont'd)							
A	New Heating system and Pipe works for Office, Nursery, Boxing Club, common area at Ground floor and Walkway/Deck level	956	m²	50	47,800			
B	BMS point and Heat meters for billing (as advised by Max Fordham)	86	nr	450	38,700			
C	Sharky 775 M-bus Ultrasonic Compact Heat meters (20mm diameter) to lease holders flat and new residemial flats on podium level	19	nr	800	15,200			
D	Sharky 775 M-bus Ultrasonic Compact Heat meters (40mm diameter) to nursery, boxing club, reception office and office	4	nr	1,600	6,400			
E	B-meters 20 M-bus Screwed hot water meter for measuring DHW (for billing)	19	nr	800	15,200			
F	B-meters 40 M-bus Screwed hot water meter for measuring DHW (for billing)	4	nr	1,600	6,400			
G	Renewing main LTHW distribution pipework (6 risers, flow and return)	780	nr	35	27,300			
H	Upgrading smoke extract system (subject to confirmation of scope of work by Fire Engineer); allow say	12,029	m²	10	120,290			
J	Domestic Smoke detectors with power supply to existing flats to comply with BREEAM	50	nr	75	3,750			
K	Domestic Carbon Monoxide (CO) detectors with power supply to existing flats to comply with BREEAM	50	nr	75	3,750			
L	Allowance for kitchen extract ventilation (assumed local extract going out of façade of building)	127	nr	500	63,500			
M	Allowance for WC and bathrcom extract fans replacement (to retain existing ducts etc)	254	nr	250	63,500			
N	Allowance for extra over to existing communal satellite	1	item	15,000	15,000			
O	Allowance for 10 New CCTV camera	1	item	50,000	50,000			
P	Allow 10% for Builder's Work in Connection with Services	1	item	106,300	106,300			
Q	Removal of asbestos/contaminated substances (further investigation require to allow for costing)				Exclusion			
3	Landscaping Works							
A	Removal of stepped ramp (external)	80	m²	200	16,000			
B	Altaration to existing levels and New permeable rubber crumb safety surface to where stepped ramp removed	380	m²	130	49,400			
C	Remove existing floor finishes and new exposed aggregate concrete pavers including new road base around the tower	1,085	m²	150	162,750			
D	Trees grille to trees in hard paving	1	Nr	600	600			
E	Tree planting in paving - semi-mature min 70cm girth	1	Nr	5,000	5,000			
F	Covered cycle stands (assumed 13 nr stainless steel cycle stand with galvanised steel frame with corrugated roof	1	item	8,650	8,650			

Stage C Budget Cost Estimate Breakdown:

Itsm	Descriptions	Qty	Unit	Rate £	Total £		Total £
3	**Landscaping Works (Cont'd)**						
A	Retractable bollards	3	Nr	5,000	15,000		
B	New enclosure, realignment of existing external wall and wall extension to gate				Exclusion		
	Sub-total						6,356,279
4	**Preliminaries costs (Construction period of 64 weeks), say 15% of Construction Cost:**						953,442
5	**Sub-total:**						7,309,721
6	**Contingency allowance @ 10%, say**	10.0%					730,972
7	**Total Estimated Construction Cost at current prices at 3rd Quarter 2012 (excluding VAT):**					Say	8,041,000
8	**Total Professional Fees**						832,843
9	**Total Survey Fees (site and level, concrete testing, pipework, access for disable) and othor cost (BREEAM)**						30,330
10	**Total Planning and Building Control Fees**						16,701
11	**Overall Project Cost (excluding VAT):**					Say	8,921,000

Line	Name	Duration	Start	Finish
1	**Planning**	**14w 1d**	**23/07/2012**	**30/10/2012**
2	Prepare Planning Submission	3w 1d	23/07/2012	13/08/2012
3	Internal Deadline Planning Submission		14/08/2012	14/08/2012
4	Planning Submission		21/08/2012	21/08/2012
5	Planning Commitee Date		30/10/2012	30/10/2012
6	Planning	10w	21/08/2012	30/10/2012
7	Planning Approval		30/10/2012	30/10/2012
8	**Stage C / D (Design)**	**12w**	**03/05/2012**	**30/07/2012**
9	External Works / High walk	12w	03/05/2012	30/07/2012
10	Ground to Second Floor Alterations	12w	03/05/2012	30/07/2012
11	Internal Tower Re-furbishment	12w	03/05/2012	30/07/2012
12	New Heating Systems	12w	03/05/2012	30/07/2012
13	External Re-Clad	12w	03/05/2012	30/07/2012
14	Sign Off	12w	03/05/2012	30/07/2012
15	Design Team Novate		31/07/2012	31/07/2012
16	**Stage E (Detail Design)**	**22w 2d**	**01/08/2012**	**21/01/2013**
17	Detail Design packages	12w	01/08/2012	24/10/2012
18	Prepare Tender Packages	8w	30/08/2012	24/10/2012
19	Issue Tender		24/10/2012	24/10/2012
20	Tender Period	6w	29/10/2012	07/12/2012
21	Tender Evaluation	2w	10/12/2012	21/12/2012
22	Agree Contract Sum	2w	07/01/2013	18/01/2013
23	Appointment		21/01/2013	21/01/2013
24	**Construction**	**67w 4d**	**21/01/2013**	**04/06/2014**
25	Mobilisation	4w	21/01/2013	15/02/2013
26	Start on Site		18/02/2013	18/02/2013
27	Envelope	48w	18/02/2013	07/02/2014
28	Tower Interior	48w	18/02/2013	07/02/2014
29	External Works	12w	10/02/2014	07/05/2014
30	Contingency	4w	07/05/2014	04/06/2014
31	Completion		04/06/2014	04/06/2014



Grenfell

Planning | Stage D | Stage E | Construction

APPLEYARDS GROUPE ARTELIA	Project: Grenfell Tower Refurbishment	Project No: 11833	Revision No: A	Grenfell Tower, London W11
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		Author: DH	Revised By: DH	

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