STAGE
02

CROYDON COLLEGE

FECTF APPLICATION REPORT

OCTOBER 2021

NORR

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CONTENTS

1.0 INTRODUCTION

1.1 Site Details

College Road, Croydon CR9 1DX

1.2 Background Information

NORR Architects have been appointed by Croydon College to assist with the preparation of documentation and design information to assist with the FECTF (Further Educational Capital Transformation Fund) Application for various works to the College's main campus building.

Croydon College, a Further Education College based in South London, was established in 1895. In 2011 the College was accredited as a university centre, enabling the College with the ability to provide higher education programmes. In July 2020, Croydon College and the University of Roehampton formed a partnership which aims to develop opportunities for people to participate in higher education programmes within Croydon. The partnership will introduce a range of University of Roehampton degrees which will be delivered at the Croydon College Campus as of September 2021.

NORR is an employee-owned, fully integrated architectural and engineering firm. Our professional team of 700 architects, engineers, planners and interior designers work collaboratively across 14 market sectors from offices located in Canada, the US, UK and UAE.

Our mission is to create socially aware, environmentally responsible, and financially viable architecture and engineering design solutions to ensure our clients achieve their business goals while contributing to healthier and sustainable spaces and places across the globe.

Founded in 1938 by Canadian Architect John B. Parkin, we've been building on our reputation for inspired design for more than 80 years. We continue to advance design through sustainable stewardship, diversity of people, the power of technology and the pursuit of excellence for the built environment.

2.0 THE BRIEF

2.1 Overview

The brief for the FECTF Application is to provide various external and internal works to the College's main campus building.

The College building was built from 1953. It has become increasingly apparent that some elements of the building now require significant major maintenance works to extend the building's life expectancy and allow it to operate in a safe and more robust condition.

Important to note, this is over and above regular routine maintenance works typically expected to such a building.

'Section 3 - Building Facade and Envelop Works (incl. scaffolding)' provides details of the external elements of the building requiring major maintenance works, as follows:

3.1 Facade Renewal
3.2 Roofing & Guttering Renovations
3.3 Window Replacement

As noted above, this includes the requirement for a significant amount of scaffolding. The scaffolding will allow for each of the above works to be carried out in the same period of time. Thereby, becoming much more cost effective compared to splitting the works into separate phases and having to erect and dismantle the scaffolding multiple times.

In addition, various rooms on the second floor have been identified as urgently requiring refurbishment. 'Section 4 - Internal Refurbishment Works' provides details of the proposals.

The replacement of windows (ref: Section 3.3) will have a direct impact on the associated internal rooms. Therefore, the proposed 'building facade and envelop works' and 'internal refurbishment works' are interconnected and the funding application should be considered holistically as such.

2.2 Project Benefits

The project will upgrade and improve areas in the West Wing of the existing Croydon campus, assessed as falling within condition categories B-D by the College's property advisor and the FECDC survey and also supported by additional independent survey reports from 3BM and Martech, commissioned for the development of the adopted Estates Strategy. FECDC and the independent survey identified areas of necessary building condition works to improve the condition of failing external fabric as:

- Exterior stonework repair, localised replacement and cleaning
- Roofing and guttering renovations
- Significant window replacement of all remaining single glazed, 1950's metal framed windows with double glazing,

These conclusions are supported by the FECDC Report.

In addition to the building facade and envelop works, localised substantial improvements to the internal fabric for classrooms, Science labs, and some corridor spaces will be completed including investment in sustainable features such as LED lighting which will create high quality, inclusive learning environments. The Scope and location of internal refurbishment has also been informed by the FECDC report and the adopted College Estates Strategy.

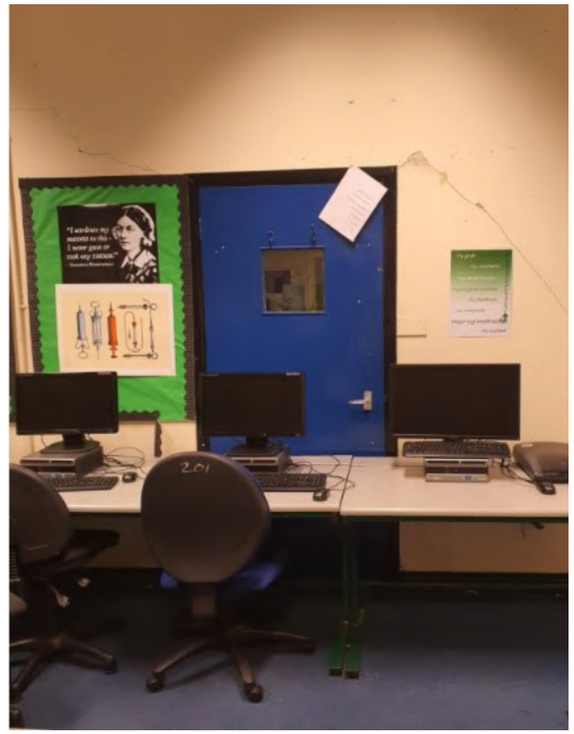
The objectives of the project are:

- Building Condition, Health & Safety - Address urgent condition related investment identified by FECDC
- Protect the College Operation - Ensure the buildings become wind and weather tight, protecting the Colleges operation
- Efficiency - Reducing energy consumption and running / maintenance costs by replacement of single glazed windows which are now over 60 years old
- Skills Needs - Improve learner experience and ability to adapt to future skills requirement by creating functional and flexible spaces

Exterior Photo - an example of an area of exterior stonework that has broken and fallen off

Window Photo - a single glazed, 1950's metal framed window

Interior Photo 1 - poor finishes, include ceilings



Interior Photo 2 - poor building conditions (note, significant crack across the wall) and lighting conditions create low quality learning environments for the students

3.0 BUILDING FACADE AND ENVELOP WORKS (incl. SCAFFOLDING)

3.1 Facade Renewal - Concrete & Brickwork

In May 2019, Martech Technical Services undertook a condition survey of the external façade of the building (Façade Concrete and Brickwork).

The survey identified a range of condition related issues. The structure was found to be suffering from low cover in areas with the advancing carbonation having reached the reinforcement in places, and hence a reinforcement corrosion problem – most notable to the basement level window headers and cills but also in other areas. The cast-in chloride levels found presented a generally low but up to moderate risk of chloride attack on the reinforcement. There is one dislodged cladding panel at roof level on the east wing, north elevation. There are areas of brickwork deterioration, missing mortar joints notably adjacent window surrounds and eroded brick faces in places. The report advised that works to address façade and brickwork deterioration should be undertaken as soon as practicable. The conclusions of the Martech Report are consistent with those of the FECDC Survey.

An extract of the Survey's 'Summation' has been included opposite.

Refer to Martechs 'External Facade Brickwork and Concrete Conditional Survey' for further details.

summation

Key words:	concrete, brick, reinforcement corrosion, wall ties, assessment, testing, cover, carbonation, chlorides, samples, laboratory testing, alkalinity, cracking, spalling, European Standard EN 1504, concrete repair, corrosion control.
Objectives:	Croydon College was assessed and tested in order to gain knowledge on the exact cause and true extent of any concrete and brickwork deterioration and reinforcement corrosion present.
Findings:	The structure was found to be suffering from low cover in areas with the advancing carbonation having reached the reinforcement in places, and hence a reinforcement corrosion problem – most notable to the basement level window headers and cills but also in other areas. The cast-in chloride levels found presented a generally *low but up to moderate* risk of chloride attack on the reinforcement. There is one dislodged cladding panel at roof level on the east wing, north elevation. There are areas of brickwork deterioration, missing mortar joints notably adjacent window surrounds and eroded brick faces in places.
Repairs:	Proper concrete remedial works and effective corrosion control measures must be designed, in accordance with EN 1504, European standard for concrete repair, to deal with visible and latent damage, together with consideration of specific client requirements and expectations. Procurement of remediation services should, in our opinion, be in accordance with the Egan Report. We have recommended the use of traditional patch repairs utilising proprietary repair materials for all of the visible concrete defects. The selective use of corrosion inihibitors for latent damage should also be considered. The dislodged cladding panel at roof level should be accessed, removed and reinstated or replaced as necessary. The failed joints to brickwork and around window openings should be reinstated.
Time scale:	Remedial works should be undertaken as soon as practicable. In the first instance the dislodged panel should be addressed. It is assumed concrete repairs would be undertaken over holiday periods to minimise disruption to building users.
Dateline:	It is clear that the deterioration observed has been caused by a combination of factors. This has resulted in the readily visible effects seen on the structure, plus the latent, or hidden, damage identified. The information contained within the report is only valid as presented in its entirety. The advice and interpretation given are representative of the state of the structure as found at the time of survey. As deterioration is clearly ongoing in the structure, the advice and contents of the report are only valid for a period of 12 months from the date of issue.

Summation extract - Martechs 'External Facade Brickwork and Concrete Conditional Survey'

3.2 Roofing & Guttering Renovations

The proposed roofing and guttering renovations works are highlighted in the image opposite and summarised below.

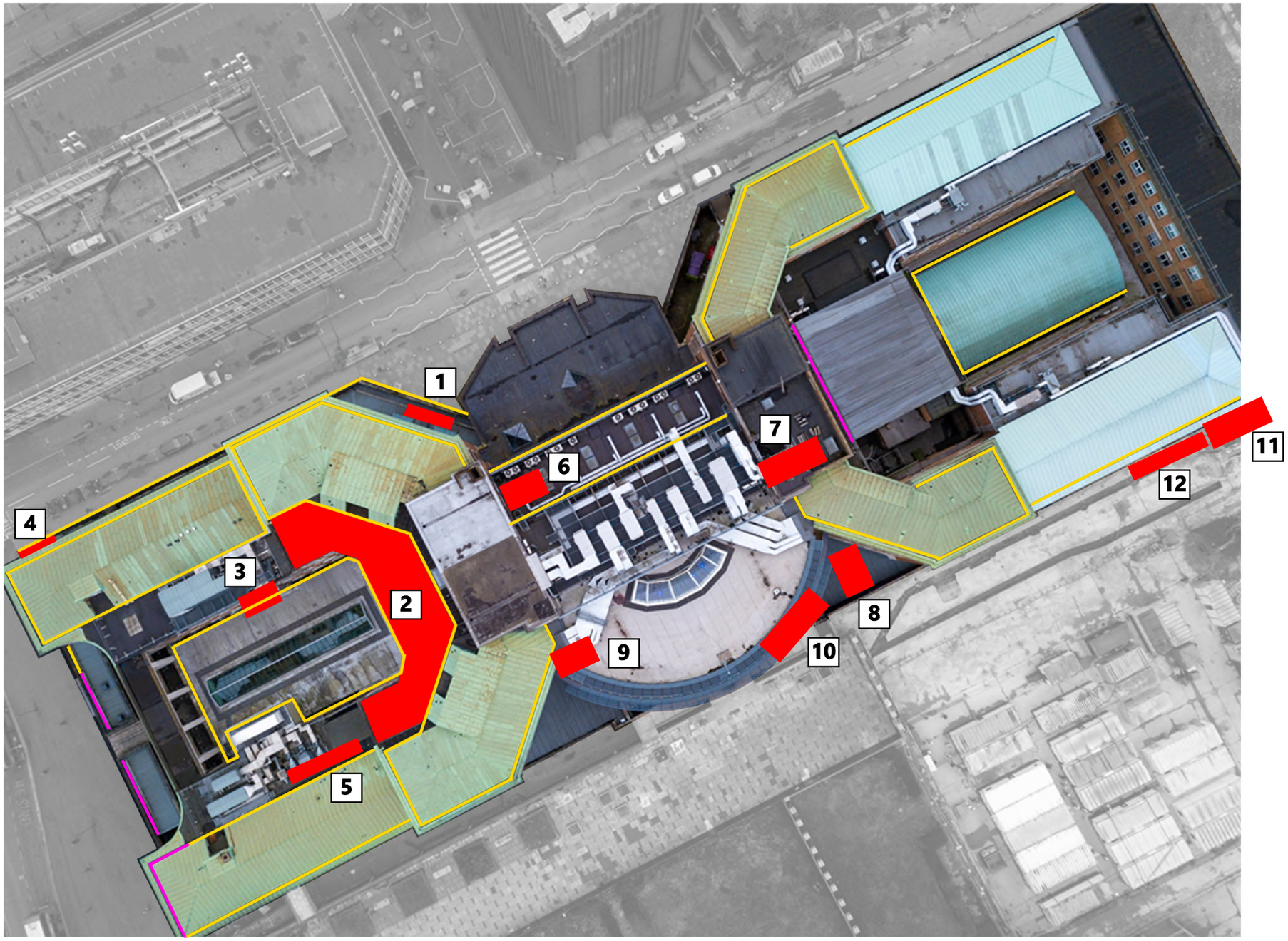
All of the roofing works are small, localised repairs with exception of Item 2 below which will require a complete waterproof liquid roofing overlay.

Roofing & Guttering:

Roof in need of repair
1. Wielding roof
2. 4th floor West roof
3. IT plant
4. Paint workshop
5. MIS guttering
6. Plant roof (archive exit)
7. Flat guttering
8. Ground floor rotunda roof
9. Room 426 leak
10. Principal balcony
11. Room 280
12. Ground floor East end gutter

Existing guttering

Guttering & gulleys fixed within last roofing works



Additionally, the College are proposing to install new Mansafe guardrail systems to the roofs. Refer to the image opposite and summary below.

Mansafe Guardrail:

- Guardrail required
- Guardrail replacement required
- Leak

3.3 Window Replacement

The proposed window replacement applies to the windows highlighted in the opposite photographs in the West End of the College's main campus building. All of the windows to be replaced are Crittal windows.

The image below illustrates the location of where each of the photographs referenced 1-5 were taken.

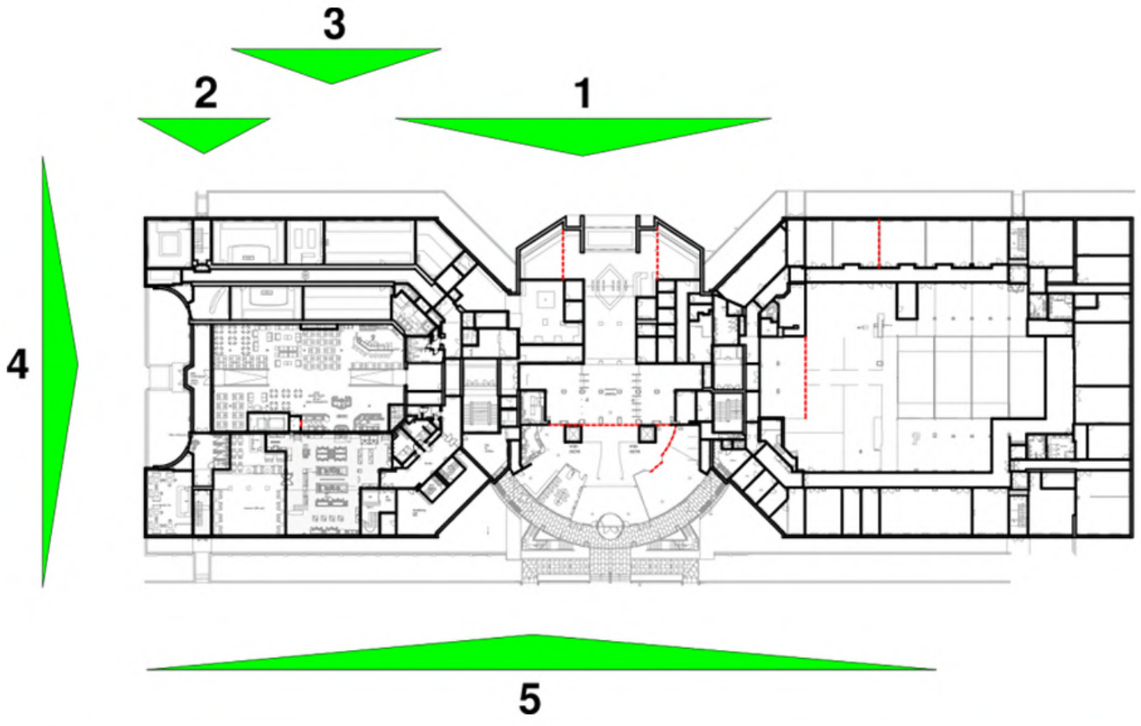


Photo 1 - Northern Elevation, Main Entrance & West Wing

Photo 2 - Northern Elevation, West Wing

Photo 3- Northern Elevation, West Wing

Photo 5 - Southern Elevation, West Wing

Photo 4 - Western Aerial Elevation, West Wing

4.0 INTERNAL REFURBISHMENT WORKS

4.1 Summary

The proposed internal refurbishment works applies to various rooms and circulation areas on the second floor of the College's main campus building.

These works include a number of poor quality classrooms, workshops, IT rooms, Science labs and staff offices requiring urgent refurbishment.

The proposed second floor refurbishment drawings are included in the following sections:

The rooms to be refurbished are listed in Section 4.3: Room Details.

Classroom Photo 1 - 2nd floor classroom with single glazed, 1950's metal framed windows

Classroom Photo 2 - 2nd floor classroom with exposed soffit - lacking a fitted ceiling - and surface mounted services and poor lighting provides a unwelcoming, poor and uninspiring learning environment

4.2 Refurbishment Levels - Definitions

As part of the funding application and associated cost estimates, three different levels of refurbishment have been identified within the proposals. These are defined as follows:

'Full' Refurbishment
This includes:

- Carpet replacement
- Skirting replacement
- Walls made good and decorated
- Door leafs and hinges to be replaced
- Door frames to be made good and decorated
- Internal glazed screen frames decorated
- Window replacement - refer to Section 5.0 above
- Window cills made good and repainted
- Radiators to be decorated
- Suspended ceilings added/ replaced
- Lighting to be replaced with LED's
- New power and data and trunking replaced
- Redundant wiring to be removed and areas made good for decoration

'Part' Refurbishment
This includes:

- Door leafs and hinges to be replaced
- Door frames to be made good and decorated
- Lighting to be replaced with LED's
- Window replacement - refer to Section 5.0 above
- Window cills made good and repainted
- New power and data and trunking replaced

'Lighting Only'
This includes:

- Internal lighting to be replaced

Refer to 'Appendix A: Mechanical & Electrical Stage 2 Report' for further services details.

4.3 Room Details

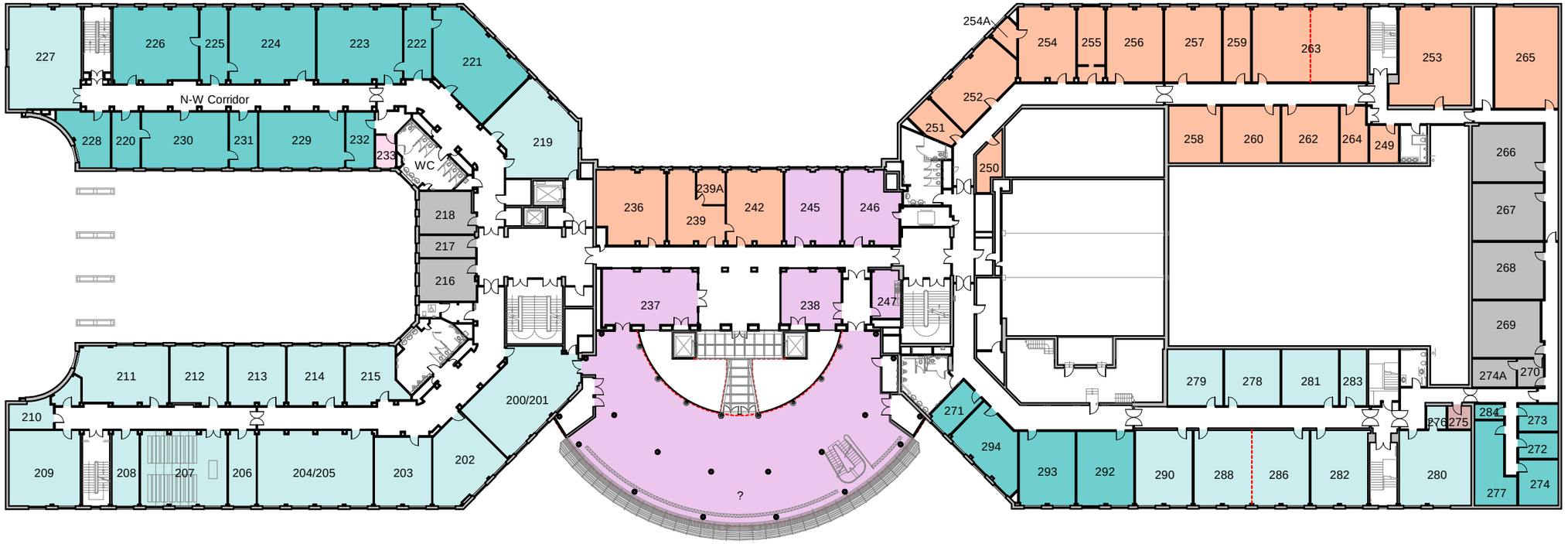
The following table is a list of rooms included as part of the refurbishment works. The references numbers are included within the associated plans for further clarity.

Refer to '4.6: Proposed Refurbishment Plan' for further details.

NUMBER	NAME	DEPARTMENT
LEVEL 02		
	N-W Corridor	
	WC	
209	Childcare Room	BUSINESS, COMMUNITY & ACCESS
211	Classroom	BUSINESS, COMMUNITY & ACCESS
212	Classroom	BUSINESS, COMMUNITY & ACCESS
218	Vacant Room	VACANT ROOM
219	H+S Staff Office	BUSINESS, COMMUNITY & ACCESS
220	Technician's Store	BUILDING, ENGINEERING & TECHNICAL
221	Biology Lab	BUILDING, ENGINEERING & TECHNICAL
222	Store	BUILDING, ENGINEERING & TECHNICAL
223	Biology Lab	BUILDING, ENGINEERING & TECHNICAL
224	Chemistry Lab	BUILDING, ENGINEERING & TECHNICAL
225	Store	BUILDING, ENGINEERING & TECHNICAL
226	Chemistry Lab	BUILDING, ENGINEERING & TECHNICAL
227	IT Lab	BUSINESS, COMMUNITY & ACCESS
228	Technician's Store	BUILDING, ENGINEERING & TECHNICAL
229	Classroom	BUILDING, ENGINEERING & TECHNICAL
230	Staff Office	BUILDING, ENGINEERING & TECHNICAL
231	Technician's Store	BUILDING, ENGINEERING & TECHNICAL
232	Technician's Store	BUILDING, ENGINEERING & TECHNICAL
233	Staff Office	APPRENTICESHIPS
236	Classroom	ENGLISH, MATHS & SKILLS FOR LIFE
239	Classroom	ENGLISH, MATHS & SKILLS FOR LIFE
242	Classroom	ENGLISH, MATHS & SKILLS FOR LIFE
245	Supported Learning - Independent Living Flat	STUDENT SERVICES
246	Supported Learning - Kitchen for Students	STUDENT SERVICES
254	Classroom	ENGLISH, MATHS & SKILLS FOR LIFE

Table - Rooms included as part of the refurbishment proposals

4.4 Existing Floor Plan



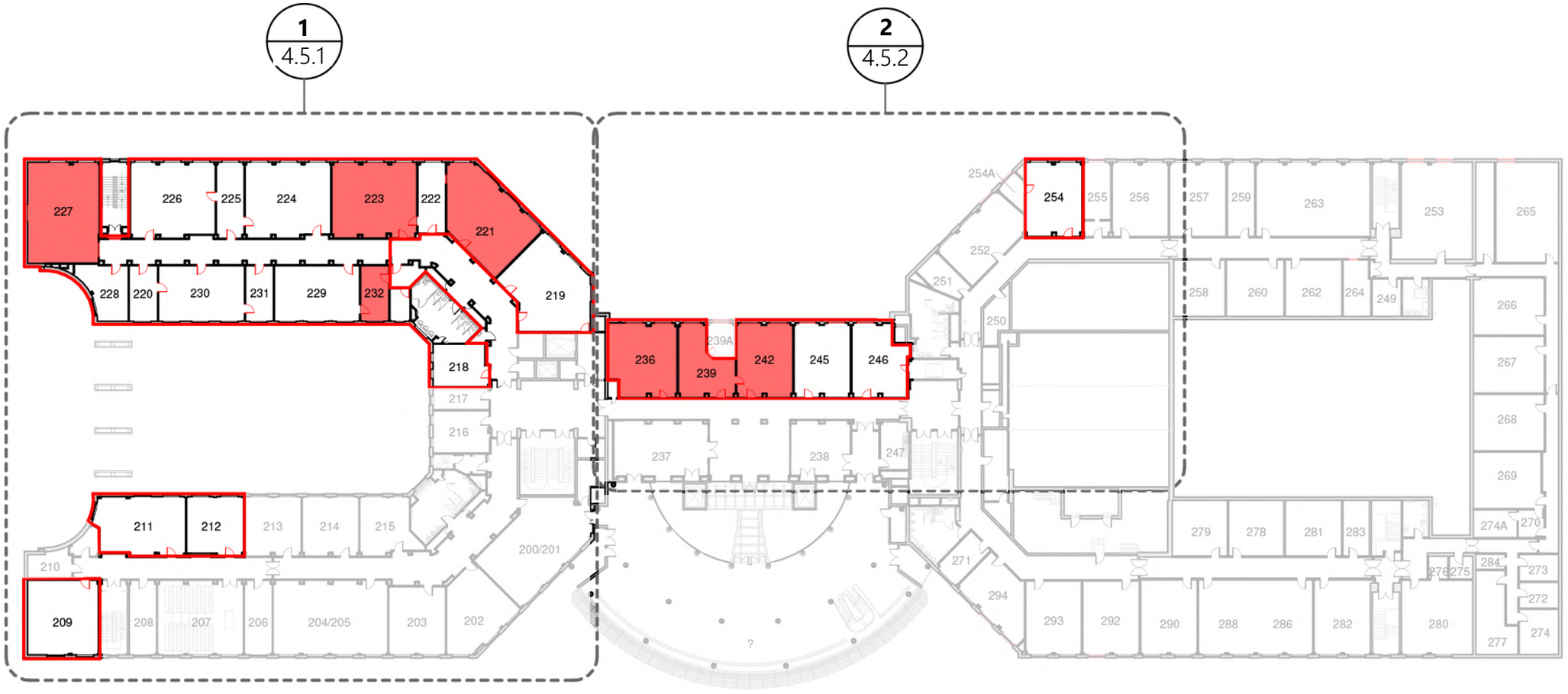
Departments

- Apprenticeships
- Back of House Staff Areas
- Building, Engineering & Technical
- Business, Community & Access
- Creative Arts
- English, Maths & Skills for Life
- Higher Education
- Plant
- Staff Breakout Spaces
- Student Services
- Vacant Room

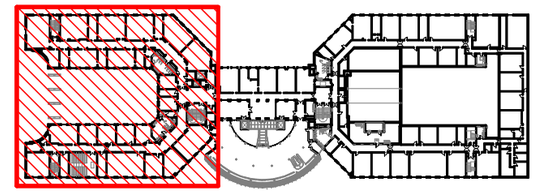
Croydon College

NORR

4.5 Strip Out Plan



4.5.1 Strip Out - Detail Plan 01



Strip Out Levels

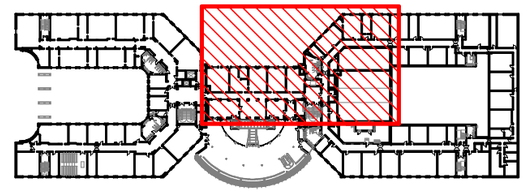
A

B

C

Notes:
Refer to 'Section 3.3 - Window Replacement' for further details..

4.5.2 Strip Out - Detail Plan 02



Strip Out Levels

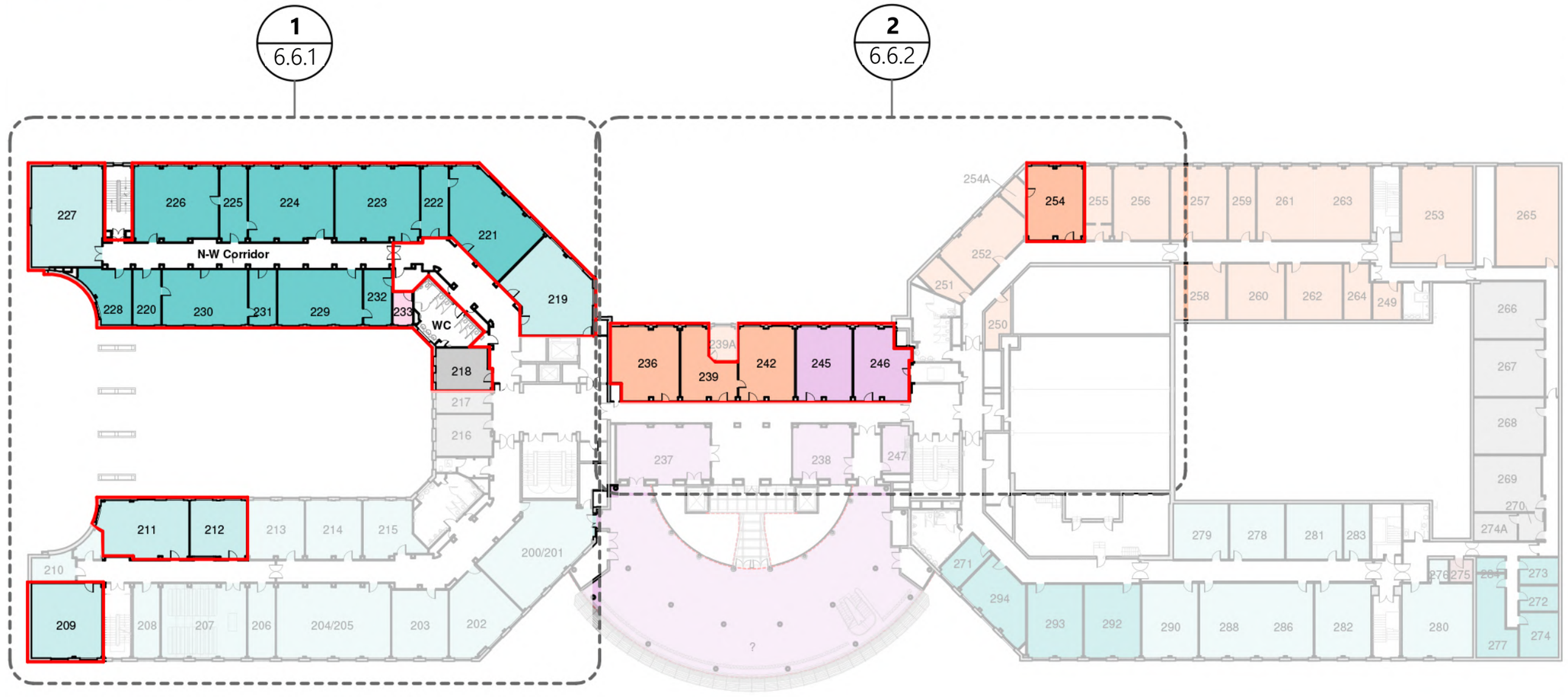
A

B

C

Notes:
Refer to 'Section 3.3 - Window Replacement' for further details.

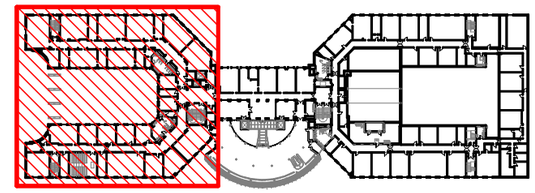
4.6 Proposed Refurbishment Plan



Department

- Apprenticeships
- Back of House Staff Areas
- Building, Engineering & Technical
- Business, Community & Access
- Creative Arts
- English, Maths & Skills for Life
- Higher Education
- Plant
- Staff Breakout Spaces
- Student Services
- Vacant Room

4.6.1 Refurbishment - Detail Plan 01

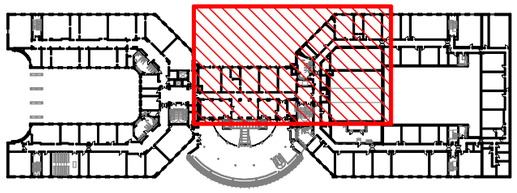


Refurbishment Levels

- ‘Full’
- ‘Partial’
- Lighting only

Notes:
Refer to Section 4.2 for refurbishment level definitions.

4.6.2 Refurbishment - Detail Plan 02



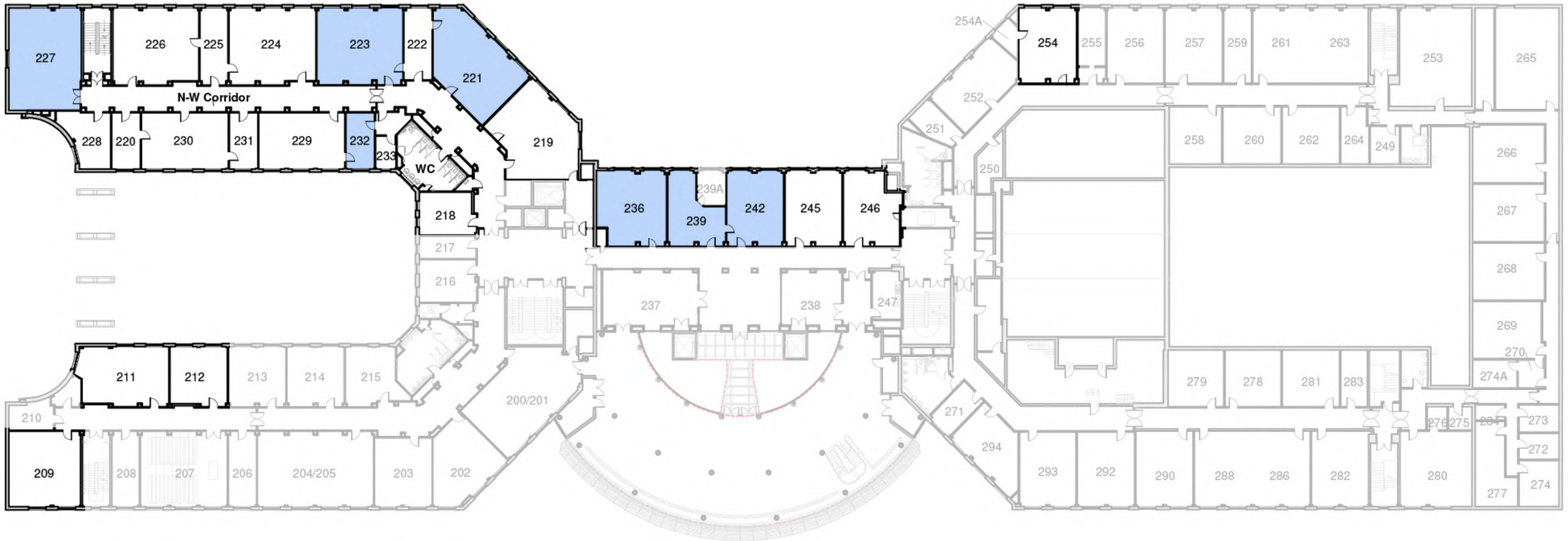
Refurbishment Levels

- ‘Full’
- ‘Partial’
- Lighting only

Notes:
Refer to Section 4.2 for refurbishment level definitions.

Croydon College

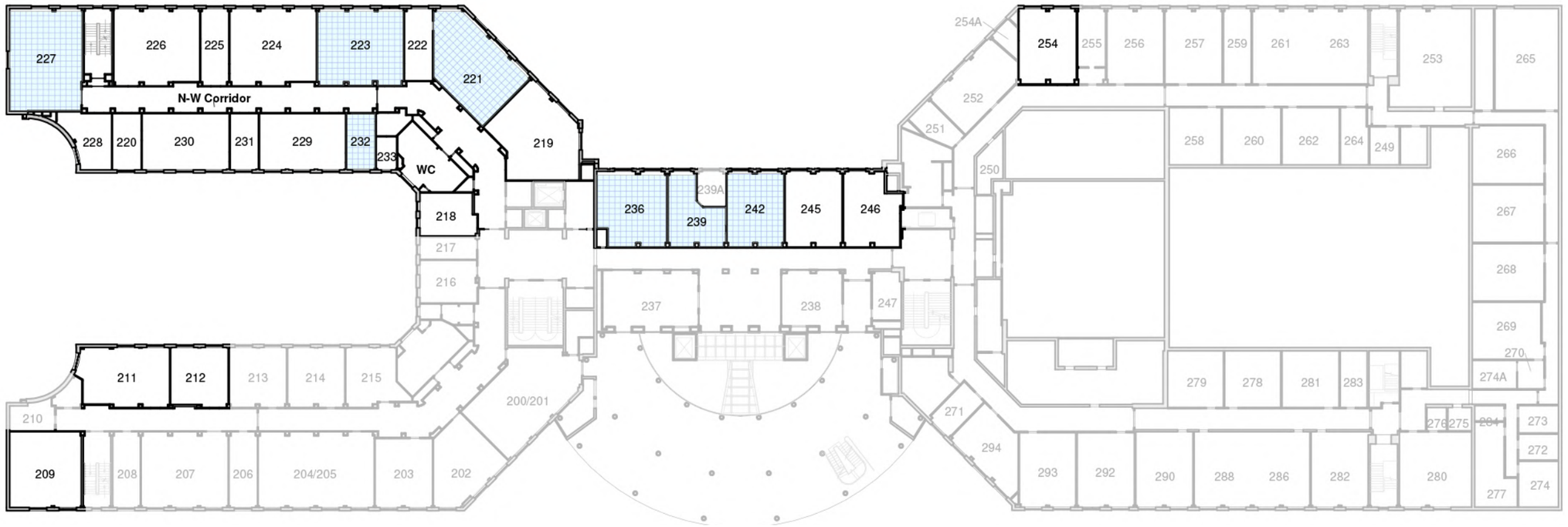
4.7 Proposed Floor Finishes Plan



Floor Finishes

Carpet tiles

4.8 Proposed Reflected Ceiling Plan



Ceiling Finishes

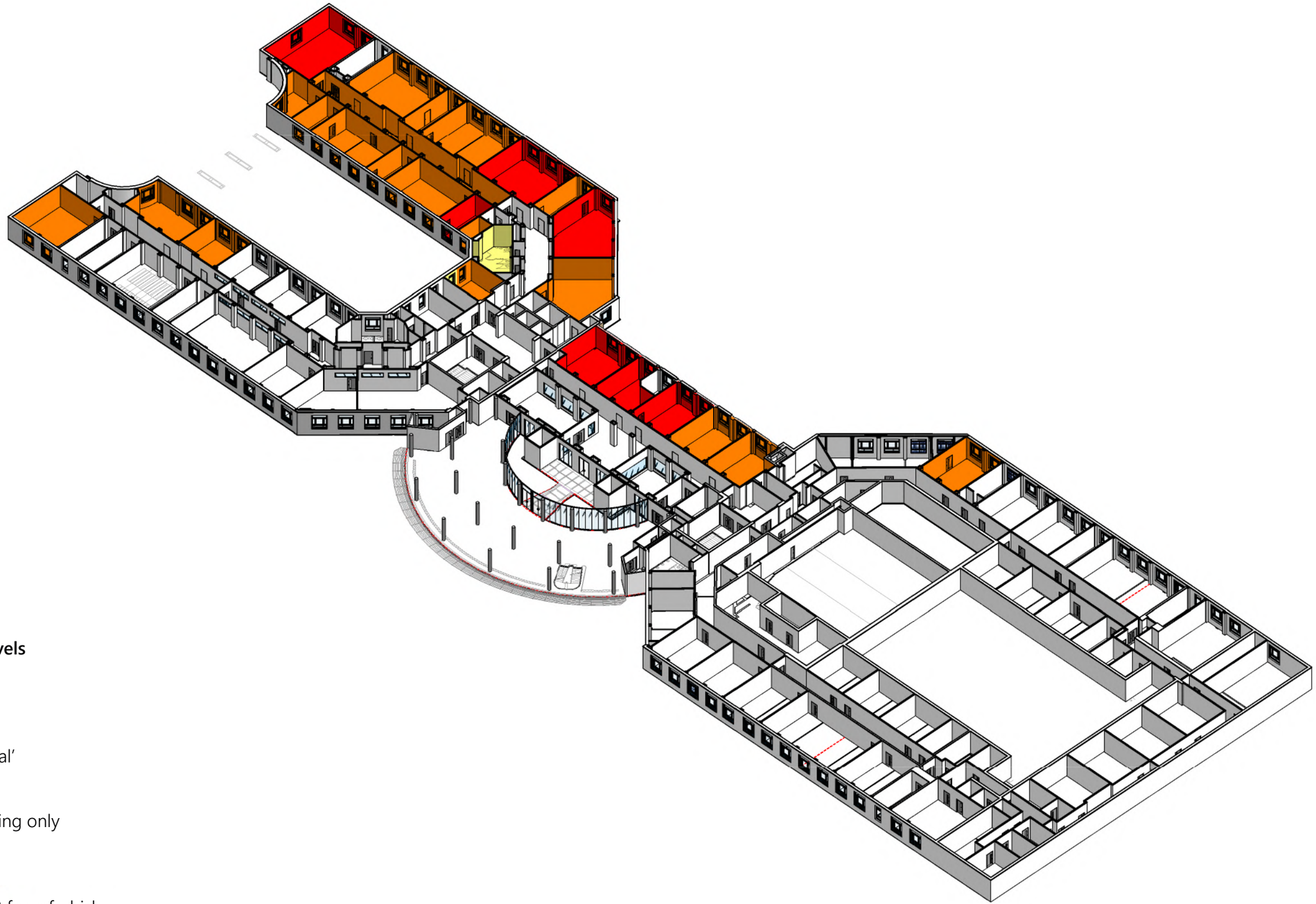
Modular Ceiling
Grid 600 x 600mm

Notes:

1. Suspended ceiling levels lower that the top of the windows.
2. Proposed ceiling finishes to match existing.
3. All service penetrations through cavity barriers (proprietary or partition) to incorporate fire dampers/ collars, as required.
4. Any ceiling mounted services to be advised by the M&E consultant.

All services penetrations through cavity barrier to be suitably fire stopped including fire dampers, as required

4.9 Proposed Axonometric



Refurbishment Levels

- 'Full'
- 'Partial'
- Lighting only

Notes:
Refer to Section 4.2 for refurbishment level definitions.

APPENDICES

A **Mechanical & Electrical Stage 2 Report** by Michael Jones & Associates LLP

Making Life Better Through Intelligent Architecture

CROYDON COLLEGE

FECTF APPLICATION

ELECTRICAL & MECHANICAL SERVICES

RIBA STAGE 02 REPORT

Croydon College
College Road
Croydon
CR9 1DX

Michael Jones & Associates LLP

File No: D6196

Report Prepared By:

- **Henry Chambers (Principal):** Electrical Services
- **Paul Packham (Partner):** Mechanical Services

Report Ref: D6196/MEPH/Rep.07/10/21/2

Prepared For: CROYDON COLLEGE

c/o Fusion Project Management Ltd

Signed:

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7th October 2021

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PAGE NO.

1.0 INTRODUCTION

Michael Jones & Associates LLP (MJA) have been appointed by Croydon College to assist with the preparation of documentation and design information to assist with the FECTF Application for various proposed works to the College's main campus building, specifically in connection with the Mechanical & Electrical Services that will be affected by the proposed works.

The brief for the FECTF (Further Educational Capital Transfer Fund), Application is to provide various internal and external works to the College's main campus building, which includes: -

3.0 Façade Renewal – Concrete & Brickwork (NO M&E Services involvement)
4.0 Roofing & Gutters Replacement (NO M&E Services Involvement)
5.0 Window Replacement to the West End (MECHANICAL Heating Services affected by these works)
6.0 Internal Refurbishment (MECHANICAL & ELECTRICAL Services affected by these works)

Items 3.0 and 4.0 as noted above do not affect the Mechanical & Electrical Building Services Installations, and this report does not include any further reference to these works.

Item 5.0 refers to Window Replacement, and this comprises significant window replacement of all remaining single glazes, 1950's metal framed windows with double-glazed units. This exercise will thermally improve the current window 'U' values and will have a direct effect on the heating load to the areas/rooms where windows are replaced, and this will in turn reduce heating demand into these spaces and reduce energy consumption pro-rata.

Item 6.0 refers to Internal Refurbishment works, and this will include refurbishment and substantial improvements to the internal fabric for Classrooms, Science Labs, WC Accommodation, Circulation and Offices, alongside adaptions specifically related to M&E Services, including replacing lighting with LED fittings, improving lighting control and zoning, and adapting existing heat emitter radiators to include individual thermostatic control (TRV) valves. Other affected existing M&E Services will be locally altered, adapted, upgraded and refurbished in coordination with the overall works, as suits and as appropriate for each area of refurbishment works.

The further sections of this report address the above, for items 5.0 and 6.0.

2.0 Item 6.0 : Refurbishment Works : Existing Lighting

Specifically in connection with the Internal Refurbishment Works, (6.0), and furthermore specifically the Lighting Services Installations and the need to replace the existing lighting with new LED lamped fittings, this report includes an overview of the current lighting installations, and a proposal for the replacement of same, including an assessment of the potential energy savings that could result over the lifetime of the building.

The report sets out the impact of the existing lighting installation and compares this with the proposed refurbishment lighting and controls, highlighting energy and annual cost savings.

To prepare this report, MJA have attended the College (Friday 1st October 2021), and conducted a survey of the existing lighting installation within a series of typical 2nd floor classrooms, to determine the luminaire types, quantities, and load details.

The luminaire for the future refurbishment and load details is based upon a similar classroom refurbishment which took place on the 1st floor of Croydon College, completed in April 2021, and the technical data for the fittings used during these recent works has been adopted for the calculations within this report.

The Gross internal areas (GIA) on the load schedules have been sourced from the FECTF Refurbishment Schedule, prepared by Woodley Coles LLP.

For the purposes of this report, the energy billing for the College is taken as being on a maximum demand based, 2-part tariff, consisting of an availability charge in kVA and a maximum demand charge per kWh. For this report, we have used a typical maximum demand charge per kWh to make the comparison between the existing and the new lighting energy usage.

The existing lighting installation generally consists of recessed and surface mounted linear fluorescent luminaires within a suspended ceiling grid or, alternatively, mounted directly on the underside of the structural soffit or suspended from same.

Lighting controls in all instances consists of manual multi gang switches in each room.

See below for examples of some of the EXISTING lighting fittings

600 x 600 2 x 55-Watt PL Watt Gull Wing fluorescent Luminaire

Surface Mounted 2 x 36-Watt Cross blade fluorescent Luminaire

Note: Single lamp version also used in some rooms

Recessed 1200 x 600 4 x 36 Watt Cross blade fluorescent Luminaire

3.0 Item 6.0 : Refurbishment Works : Proposed Lighting

The proposed lighting scheme to the areas of internal refurbishment will consist of 600 x 600 recessed modular flat panel LED luminaires within a new suspended ceiling grid or, alternatively, surface mounted versions of the same fitting fixed to the soffit.

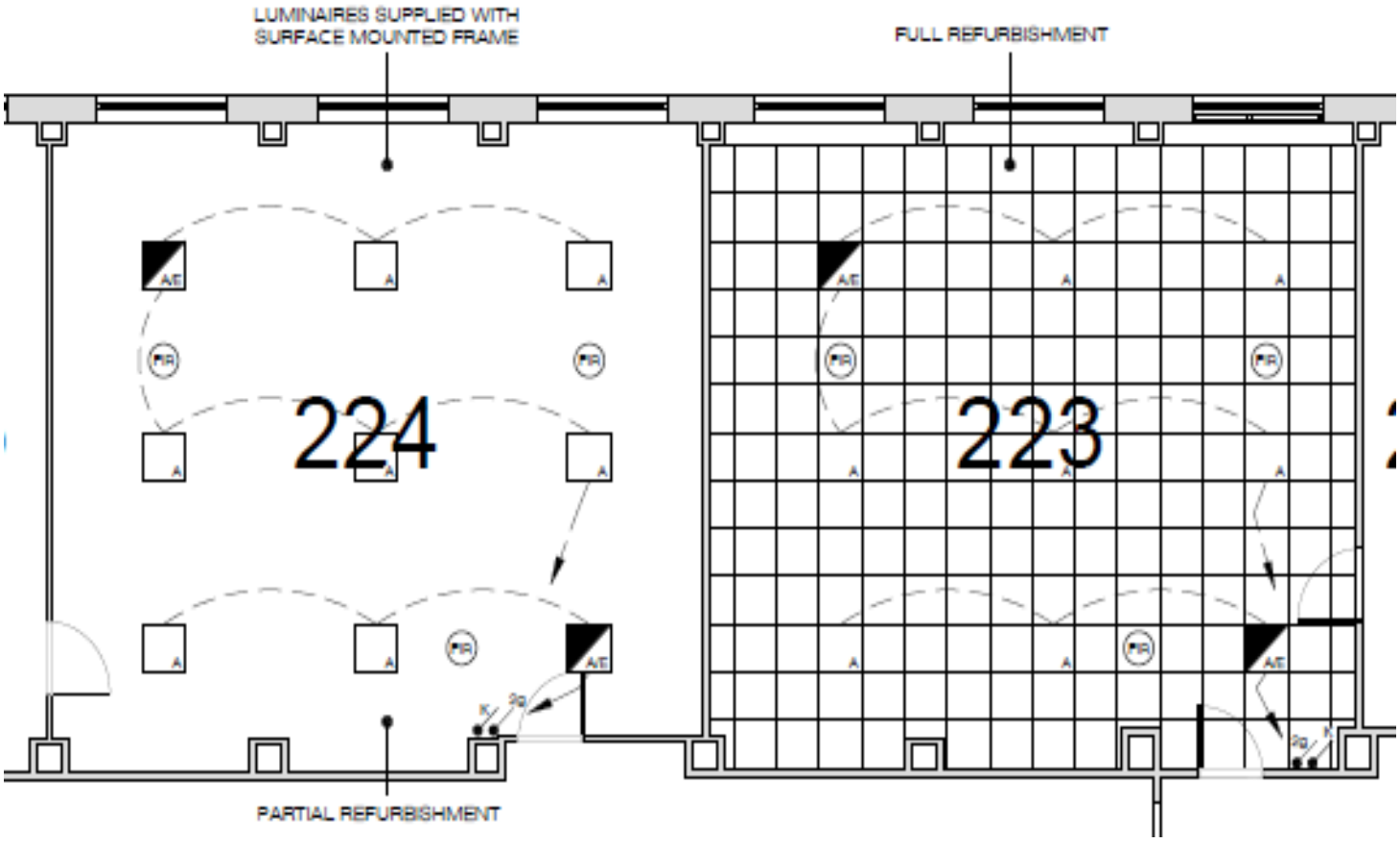
Lighting controls will consist of absence detection which means lights will be switched on manually and after a pre-defined period of no movement they will switch off.

See below for an example of the PROPOSED lighting fitting and PIR motion sensor.

Typical 33-Watt Flat Panel LED

PIR Motion Sensor

Typical Partially and Fully Refurbished Classroom Lighting



4.0 Item 6.0 : Refurbishment : Energy/Cost Analysis

Each College year is made up of 39 weeks, or 195 days. These weeks are split over three main terms, which are then split again into half-terms.

The following schedules demonstrate the load difference in Watts and the overall costs and energy savings between the existing and proposed lighting installation over a College year. This analysis does not take into consideration any out of core hours evening classes.

This comparison is limited to the energy and associated cost savings and no allowance has been made for the following: -

- Labour and material maintenance cost savings due to lamps not having to be replaced
- Replacement of old or burned-out control gear / ballasts.
- The costs for replacement of old luminaires with new luminaires as part of the refurbishment works.

Existing Lighting Load Schedule

Room Number	Name	Area m2	Existing Lighting Load - Watts	W/m2
Level 02				
209	Childcare Room	59	540	9.15
211	Classroom	58	540	9.31
212	Classroom	37	648	17.51
219	H+S Staff Office	64	792	12.38
220	Tecnicians Store - Included within 219			
221	Biology Lab	73	720	9.86
222	Store	22	216	9.82
223	Biology Lab	72	648	9.00
224	Chemistry lab	70	1320	18.86
225	Store	23	432	18.78
226	Chemistry lab	71	1320	18.59
227	IT Lab	78	1296	16.62
228	Tecnicians Store	26	216	8.31
229	Classroom	54	432	8.00
230	Staff office	55	432	7.85
231	Tecnicians Store	18	144	8.00
332	Tecnicians Store	18	66	3.67
233	Staff office	18	144	8.00
236	Classroom	55	864	15.71
239	Classroom	47	864	18.38
242	Classroom	47	288	6.13
245	Supported Learning - Independent Living	47	432	9.19
246	Supported Learning - Kitchen for Studenets	43	432	10.05
254	Classroom	53	432	8.15
TOTAL		**1108**	**13218**	

Calculated kWh = 195 x 8 x 13,218W = 20,620kWh (Annual)

Calculated Energy Costs = 20,620 x 13.43p + 5% VAT per kWh = £2,907.72 (Annual)

Proposed Lighting Load Schedule

Room Number	Name	Area m2	New Lighting Load - watts	W/m2
Level 02				
209	Childcare Room	59	132	2.24
211	Classroom	58	198	3.41
212	Classroom	37	132	3.57
219	H+S Staff Office	64	267	4.17
220	Tecnicians Store - Included within 219			
221	Biology Lab	73	297	4.07
222	Store	22	66	3.00
223	Biology Lab	72	297	4.13
224	Chemistry lab	70	297	4.24
225	Store	23	66	2.87
226	Chemistry lab	71	297	4.18
227	IT Lab	78	396	5.08
228	Tecnicians Store	26	99	3.81
229	Classroom	54	198	3.67
230	Staff office	55	198	3.60
231	Tecnicians Store	18	66	3.67
332	Tecnicians Store	18	66	3.67
233	Staff office	18	33	1.83
236	Classroom	55	297	5.40
239	Classroom	47	198	4.21
242	Classroom	47	198	4.21
245	Supported Learning - Independent Living	47	198	4.21
246	Supported Learning - Kitchen for Studenets	43	198	4.60
254	Classroom	53	198	3.74
TOTAL		**1108**	**4392**	

The proposed lighting energy consumptions makes no allowance for savings associated with daylight harvesting or absence detection and is purely based on a like for like replacement, however past research has shown the use of motion sensors for the control of lighting can save up to a further 30% energy if lights are automatically switched off when rooms are not occupied, and this saving is included within the following calculations.

Calculated kWh = 195 x 8 x 4392W x 0.7 = 4,796kWh (Annual)

Calculated Energy Costs = 4,796 x 13.43p + 5% VAT per kWh = £676.30 (Annual)

1. ***Existing installation energy cost = £2,907.72 (Annual)***

   Minus, proposed installation energy cost £676.30 (Annual)

   Calculated Cost Reduction = £2,231.42 (Annual) = 77% Reduction

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2. ***Carbon Saving 20,620kWh – 4,796kWh (0.233kg) = 3,686kg Carbon (Annual)***

5.0 Item 5.0 : Window Replacement

Item 5.0 refers to Window Replacement, and this comprises significant window replacement (404m2) of all remaining single glazed, 1950's metal framed windows with double-glazed units.

This exercise will thermally improve the current window 'U' values and will have a direct effect on the heating load to the areas/rooms where windows are replaced, and this will in turn reduce heating demand into these spaces and reduce energy consumption pro-rata.

The replacement glazing (Total = 404m2) is proposed to the following elevations: -

- Northern Elevation: Main Entrance
- Northern Elevation: West Wing
- Southern Elevation: West Wing

Single-glazed crittall windows can often have a typical 'U' Value figure as high as : 5.6Wm2K.

Replacement double glazing with low emissivity glass (with air cavity) of equivalent size, can have a typical 'U' Value of: 1.8Wm2k.

Criteria Adopted for the Calculated Energy Savings:-

- Heating Season = 01 October – 31 March = 182 days
- Less unoccupied periods/weekends/term breaks) = 120 days (average)
- Heating period per day (average) = 15 hours x 120 days = 1,800 Hours
- Heating 'ON' @ 06.00Hrs
- Heating 'OFF' @ 21.00Hrs
- Existing Glazing = 5.6Wm2K;
- New Glazing = 1.8Wm2K;
- Glazing Improvement = 3.8Wm2K
- Area of windows being replaced = 404m2
- Average temperature difference inside/outside during the heating season = 16degC
- Natural Air Infiltration Rate – Existing Windows @ 2.0
- Natural Air Infiltration Rate – New Windows @ 0.5
- Gas Tariff = 1.324p/KWh + 5% VAT

Existing Glazing:-

Heatloss = 5.6 x 404 x 16 x 2 = 72,396Wm2K

Calculated kWh = 1,800 hours x 72,396Wm2K= 130,312kWh (Annual)

Calculated Energy Costs = 130,312kWh x 1.324p + 5% per kWh = £1,811.59 (Annual)

Proposed Glazing:-

Heatloss = 1.8 x 404 x 16 x 0.5 = 5,817Wm2K

Calculated kWh = 1,800 hours x 5,817Wm2K = 10,470kWh (Annual)

Calculated Energy Costs = 10,470kWh x 1.324p +5% VAT per kWh = £145.55 (Annual)

Energy Saving Calculation (Annual)

1. ***Existing installation energy cost = £1,811.59 (Annual)***

   Minus, proposed installation energy cost £145.55 (Annual)

   Calculated Cost Reduction = £1,666.04 (Annual) = 91% Reduction

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2. ***Carbon Saving 130,312kWh –10,470kWh (0.233kg) = 27,923kg Carbon (Annual)***

Across the life of the building, the natural reduction in heat loss, and heat demand will have a net reduction on the energy consumption within the served rooms, and this has been assessed based upon the above criteria and calculations.

6.0 CONCLUSION

LED luminaires and lamps now account for around two-thirds of sales in the UK. The sale of halogen lamps was banned in the UK from September 2021 as part of ministerial efforts to cut carbon emissions. A ban on fluorescent lighting, which is mostly used in offices, will follow in September 2023, therefore every effort should be made to make the required change from old to new luminaires as early as possible.

Consideration should also be given to the aesthetic and visual comfort of the College environment which will have an impact on the wellbeing of the students.

Replacement of existing single-glazed windows with modern equivalent double-glazed units, with improved 'U' values and lower natural air-leakage will reduce heat losses, reduce heating demand, improve efficiencies of the installed heating system, and in turn have a net effect of reducing the overall energy consumption on the campus.