

10 Carbon Analysis & Sustainability

10.6 Embodied Carbon

10.6.1 Assessment methodology

Methodology and assumptions

The calculation of the embodied carbon was based on the stage 3 design.

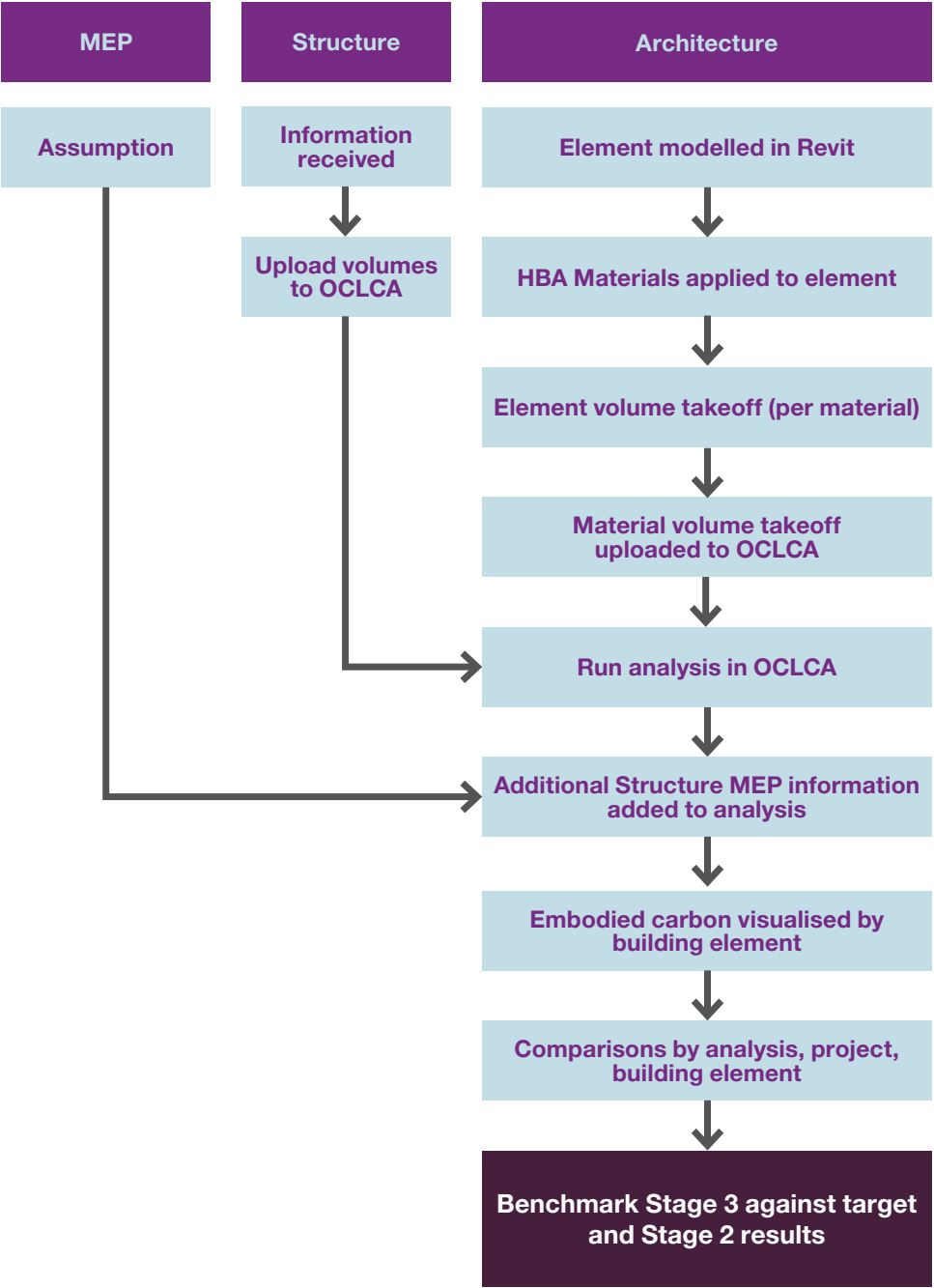
The data was then input into “One Click LCA” tool.

For MEP, the GLA breakdown (21%) for the business as usual benchmark (1400kgCO2/m2) was used, resulting in A-C exc B6/B7 of 292kgCO2/m2.

Information regarding the retained building components were added into the calculation, considering its impact in stages B & C.

The embodied carbon of the materials was calculated in OneClick LCA, in accordance to the RICS PS.

Considering that this is a Stage 3 and the materials specifications are yet to be defined, it was considered an extra contingency of 5%. This is to reflect possible carbon factor disparities due to the use of different EPD’s in later stages.



Main materials & components input

Structure

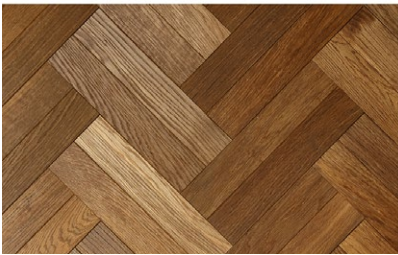
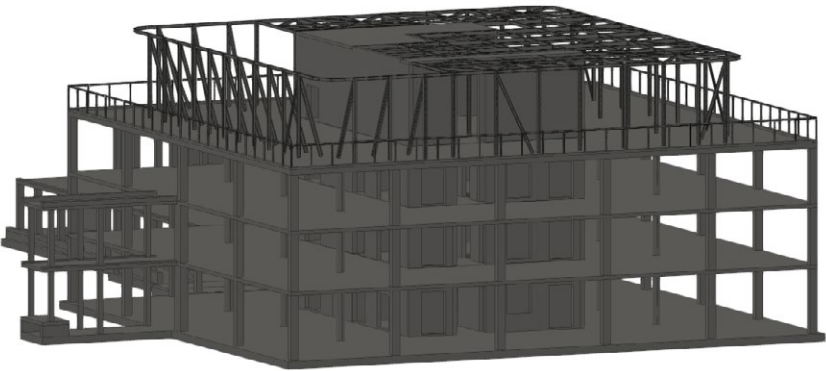
- Cement replacement is specified at 50% for all concrete elements
- PT slab (thinner slab than traditional RC flat slab)
- Optimised column grid
- Raft foundation
- Removal of the basement

Facade

- GRC facade with optimised modules to avoid excessive fixings points

Finishes

- Material efficiency: self-finishing and natural materials with long lifespan, robustness and low maintenance



10 Carbon Analysis & Sustainability

10.6 Embodied Carbon

10.6.2 Results

Embodied carbon comparison between stages

Analysis was undertaken using One Click LCA software and based on the Stage 3 design freeze for both the refurbishment and new build parts of the project to track the current design against the targets proposed.

The results of the embodied carbon for the Trinity and Civic Centre buildings are shown opposite alongside with the comparison between previous stage 2 and the benchmarks.

The Stage 3 design results show that the embodied carbon of both buildings remained similar to the Stage 2 design results Both Trinity building and Civic Centre are achieving the best practice embodied carbon ‘minimum’ target.

This shows the importance of the embodied carbon monitoring throughout design stages. To continue the aim to be an exemplary net zero carbon building, it would be important to continue this work of embodied carbon analysis in the next stage.

Life cycle embodied carbon (A-C exc B6&B7) (kgCO2/m2)				
	Targets		Results	
	Minimum	Aspirational	Stage 2	Stage 3
Civic Centre	500	350	453	446
Trinity Building	970	750	986	967
Campus Wide	428*	864*	710	712

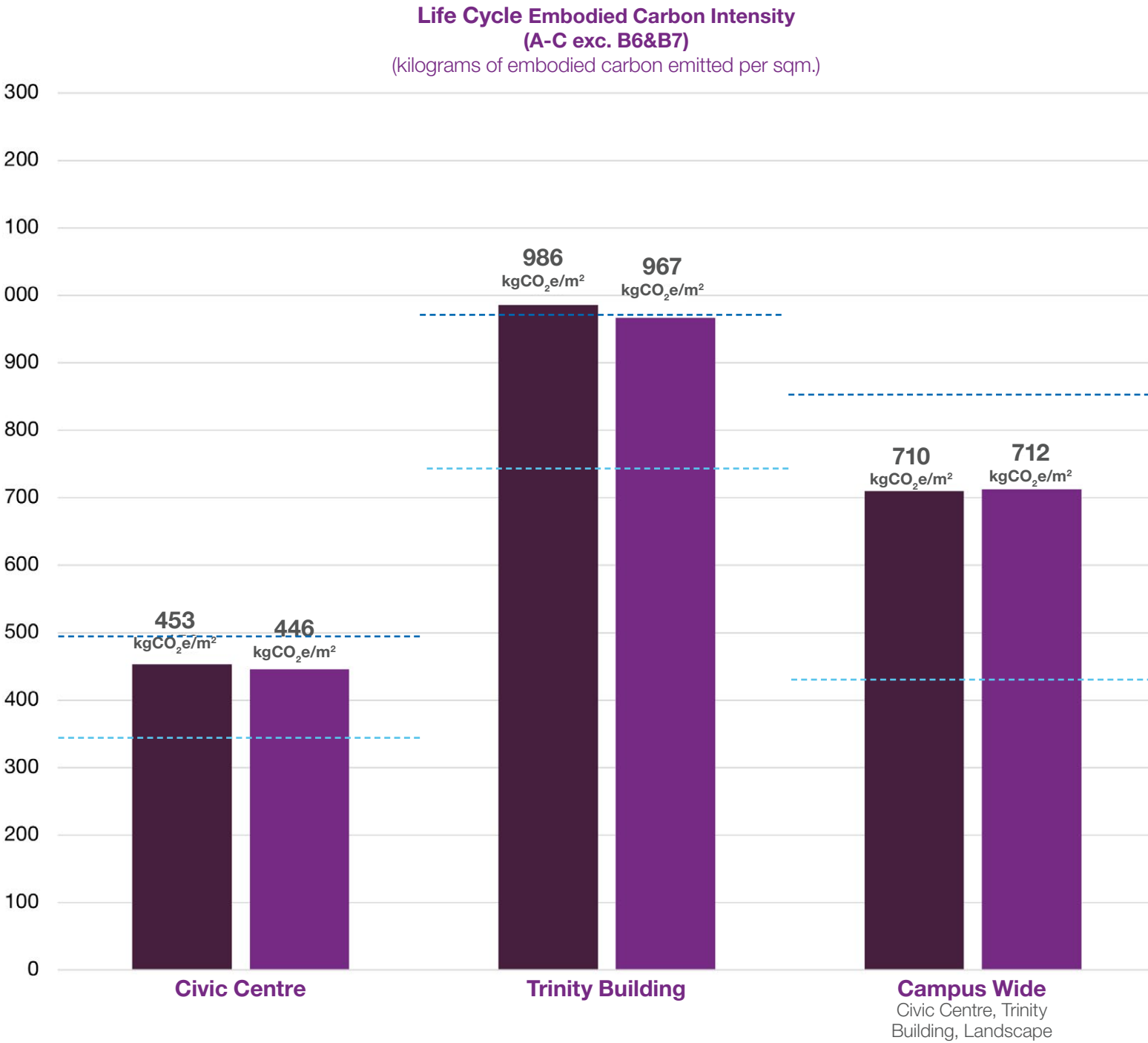
Key

Stage 2

Stage 3

Minimum target

Exemplary Target



10 Carbon Analysis & Sustainability

10.6 Embodied Carbon

10.6.2 Results

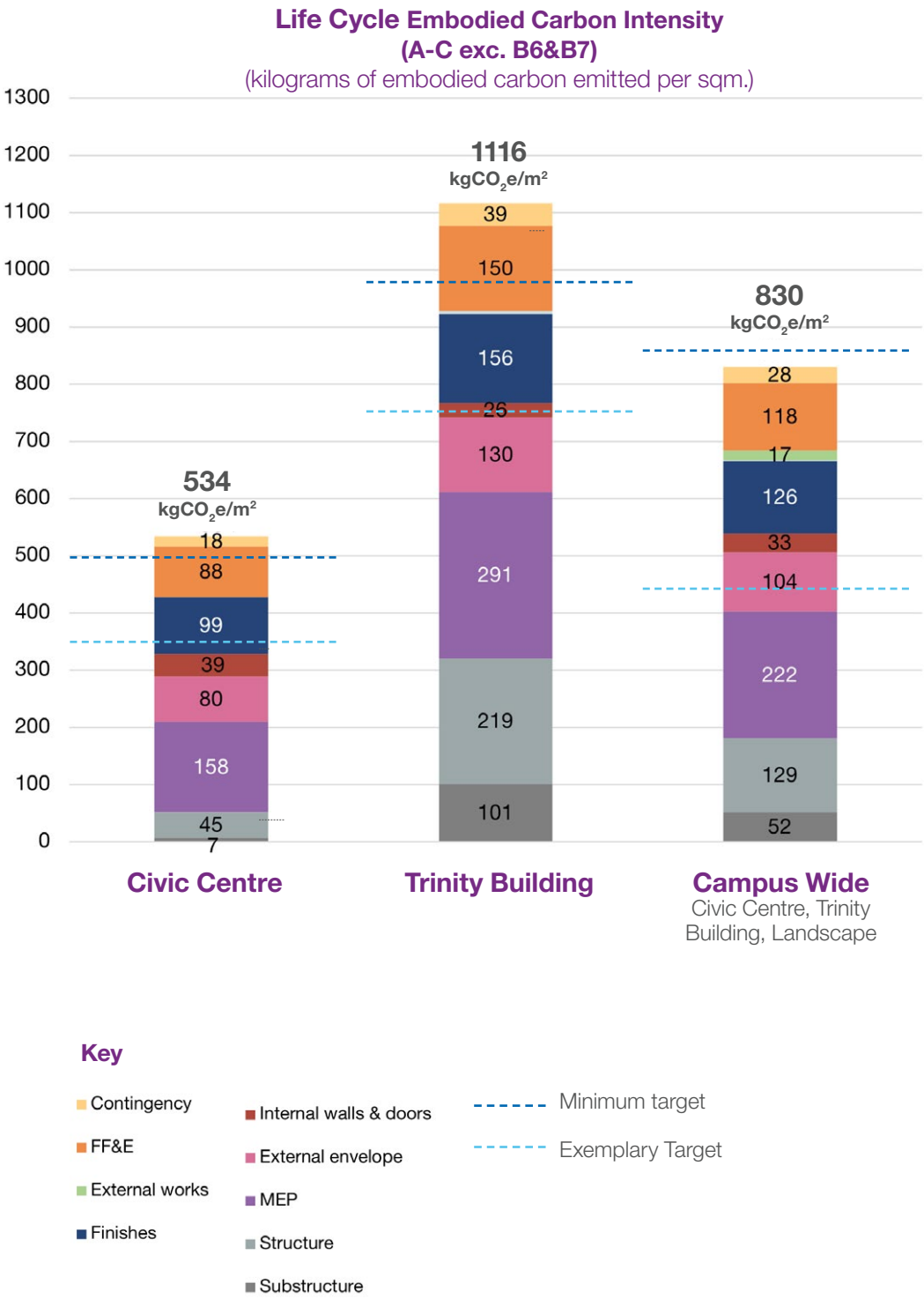
Embodied carbon results by building categories

The graph on this page shows the results of embodied carbon per building categories. It must be noted that in this analysis it was included the ‘FF&E’ (furniture, fixtures and equipment) carbon emissions, which was not included in the previous Stage 2 embodied carbon analysis. This element is reponsible for a considerable amount of the life cycle emissions because it was considered the RICS default replacement rate of 10 years.

The RICS with the indicative component lifespan considered in this study can be seen in this page.

Similar to the FF&E, the finishes embodied carbon have significant impact due to the replacement rate, which was considered the RICS default rates. As the client will be occupying the building, this mean there will be a higher level of control over the finishes replacement and maintenance. Assumptions can be updated in future embodied carbon analysis to reflect this, and should be liaised with the client.

In both buildings, the biggest contributor is MEP. As mentioned previously, this is an assumption based on GLA guidance breakdown for a business as usual office building. This assumption should be revised with the service engineer in the next design stage, and a TM65 analysis should be considered.



Building part	Building elements/components	Expected lifespan
Roof	Roof coverings	30 years
Superstructure	Internal partitioning and dry lining	30 years
Finishes	Wall finishes: Render/Paint	30/10 years respectively
	Floor finishes Raised Access Floor [RAF]/Finish layers	30/10 years respectively
	Ceiling finishes Substrate/Paint	20/10 years respectively
FF&E	Loose furniture and fittings	10 years
Services/MEP	Heat source, e.g. boilers, calorifiers	20 years
	Space heating and air treatment	20 years
	Ductwork	20 years
	Electrical installations	30 years
	Lighting fittings	15 years
	Communications installations and controls	15 years
	Water and disposal installations	25 years
	Sanitaryware	20 years
	Lift and conveyor installations	20 years
Facade	Opaque modular cladding e.g. rain screens, timber panels	30 years
	Glazed cladding/Curtain walling	35 years
	Windows and external doors	30 years

Table 9: Indicative component lifespans

Table 9 contains conservative generic assumptions for the lifespan of items based on information from BCIS Life expectancy of building components (2006); CIBSE Guide M; Scheuer, Keoleian, and Reppe (2003). Life cycle energy and environmental performance of a new university building: modelling challenges and design implications. Energy and Buildings, 35, pp.1049–1064.

10 Carbon Analysis & Sustainability

10.6 Embodied Carbon

10.6.2 Results

Upfront embodied carbon emissions

The graph on this page shows the results of upfront embodied carbon total emissions per building categories.

If the development does aim to be Net Zero Carbon in Construction, then the upfront carbon should be responsibly offset at practical completion through recognised offsetting framework.

Key

- Contingency

FF&E

External works

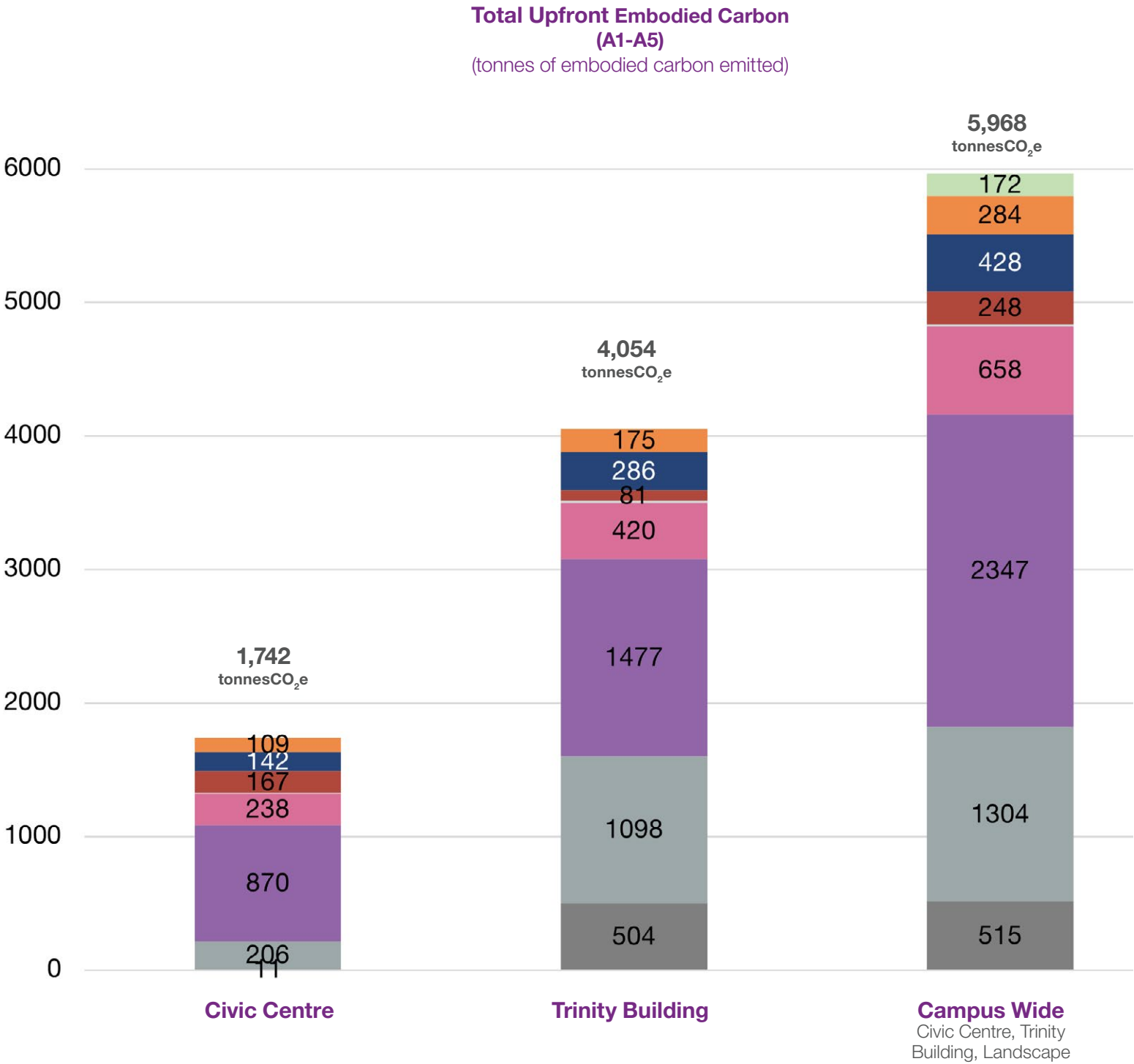
Finishes
- Internal walls & doors

External envelope

MEP

Structure

Substructure



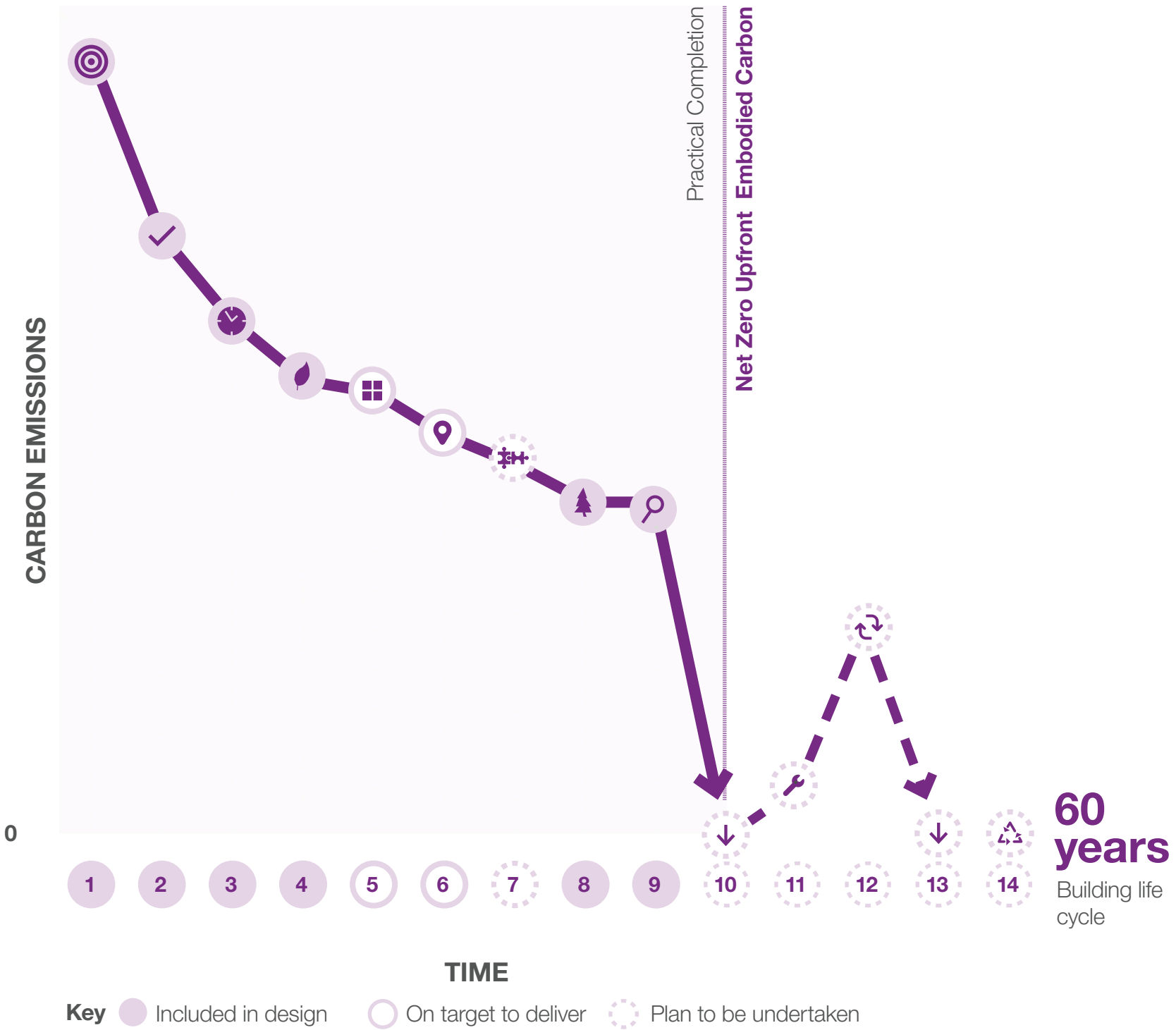
10 Carbon Analysis & Sustainability

10.6 Embodied Carbon

10.6.3 Roadmap to net zero embodied carbon

This graph is an illustrative roadmap showcasing the key steps needed for the project to reach Net Zero Embodied Carbon. This extrapolates for a 60 years period as per LCA guidance.

Steps towards Net Zero Embodied Carbon	
	1. Define targets based on benchmarks
	2. Design efficiency
	3. Design for robustness and longevity
	4. Specify low-embodied carbon materials
	5. Specify self-finish materials
	6. Specify local materials
	7. Design for disassembly
	8. Maximise biogenic carbon storage
	9. Embodied carbon monitoring and optimisation throughout design stages
	10. Responsible off-setting of upfront carbon
	11. Maintenance to promote longevity
	12. Replacement of materials
	13. Responsible off-setting of carbon from replacement / refurb
	14. End of life: disassemble, reuse, recycle



10

Carbon Analysis & Sustainability

10.7

Whole Life Carbon

10.7.1

Results

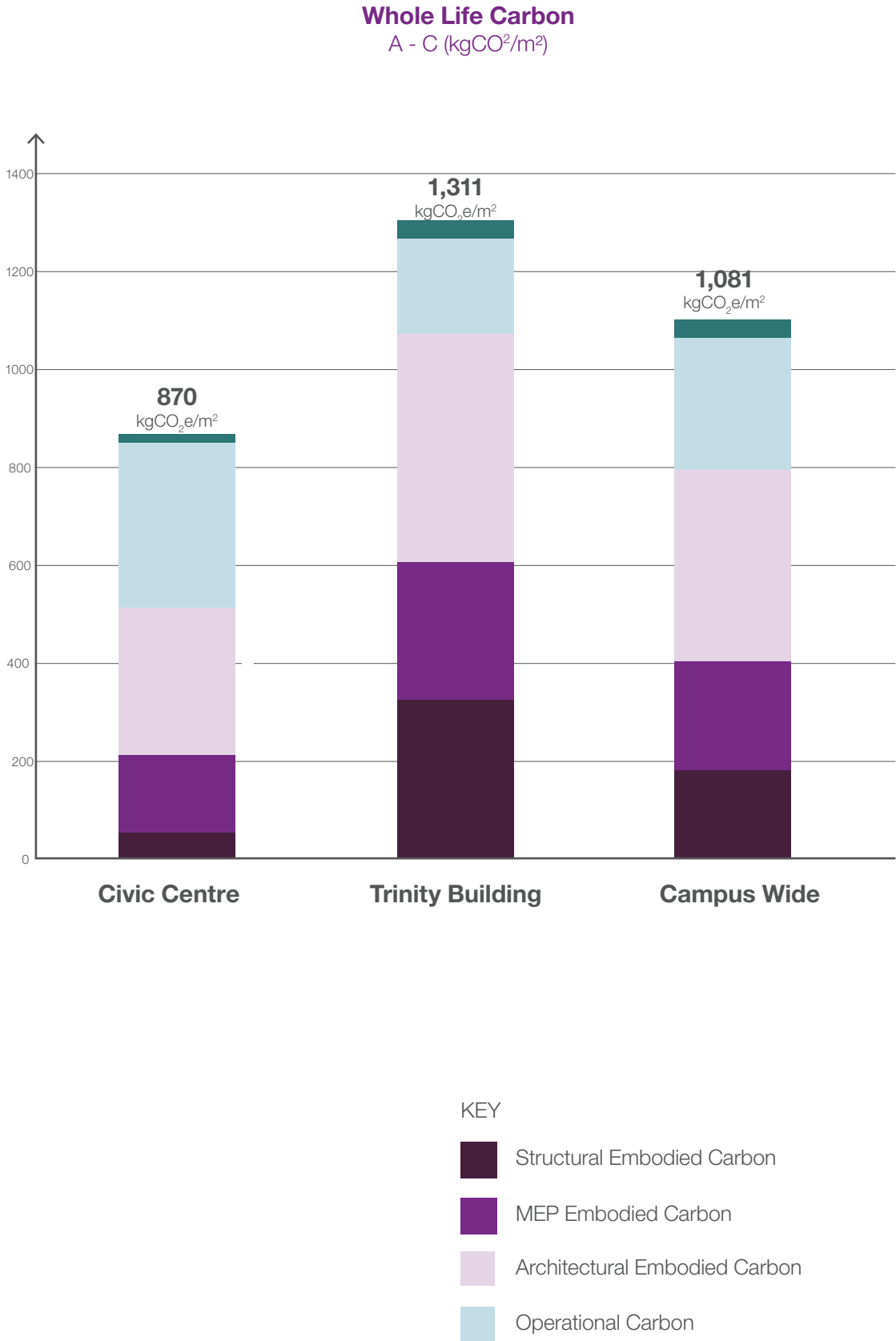
Whole Life Carbon

The results of the Whole Life Carbon analysis for the project are shown here, using the same conversion strategy of operational energy to carbon as earlier studies.

Civic Centre		
Area: 5,505m ²	Overall Carbon (tonnesCO ₂ eq)	Carbon per m2 GIA (kgCO ₂ eq/m ²)
Upfront Carbon (A1-A5)	1,742	316
Embodied Carbon (A-C exc. B6&B7)	2,840	516
Contingency (5%)	99	18
Operational Energy (B6)	1,807	328
Operational Water (B7)	44	8
WLC Carbon A-C	4,790	870

Trinity Building		
Area: 5,075m ²	Overall Carbon (tonnesCO ₂ eq)	Carbon per m2 GIA (kgCO ₂ eq/m ²)
Upfront Carbon (A1-A5)	4,054	799
Embodied Carbon (A-C exc. B6&B7)	5,465	1077
Contingency (5%)	199	39
Operational Energy (B6)	922	182
Operational Water (B7)	66	13
WLC Carbon A-C	6,653	1,311

Campus wide (Civic Centre, Trinity Building, Landscape)		
Area: 10,580m ²	Overall Carbon (tonnesCO ₂ eq)	Carbon per m2 GIA (kgCO ₂ eq/m ²)
Upfront Carbon (A1-A5)	5,796	548
Embodied Carbon (A-C exc. B6&B7)	8,305	785
Contingency (10%)	298	28
Operational Energy (B6)	2,729	258
Operational Water (B7)	110	10
WLC Carbon A-C	11,442	1,081



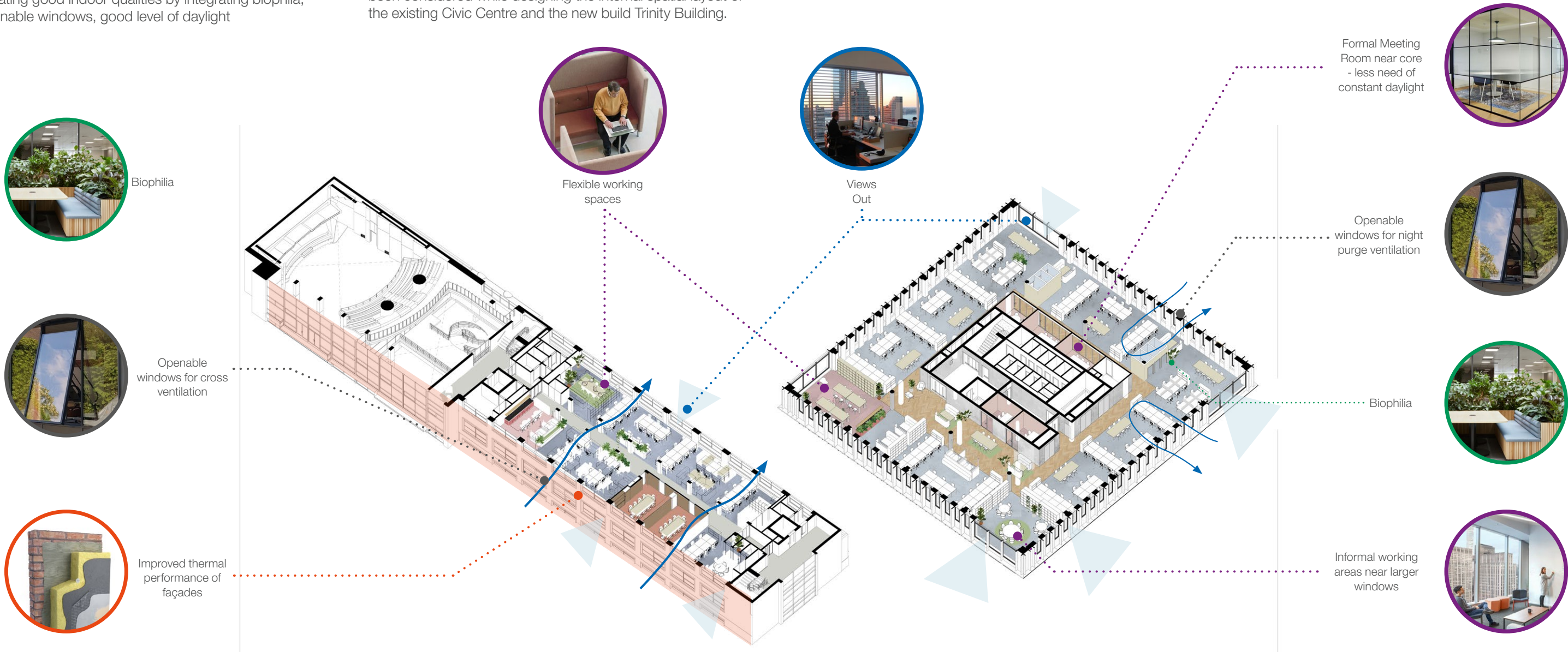
10 Carbon Analysis & Sustainability

10.8 Health & Wellbeing

Higher productivity, efficiency and running costs have always been the key focus in workplace design. However, the current biggest challenge being faced by the industry is firstly attracting and then retaining best in class people/global talent. This is where environmental design/sustainable design can make a big difference. Human beings by nature enjoy spending time in the outdoors with nature, daylight and sunlight. Recent studies show that people currently spend up to 80-90% of time indoors. This has huge impact on circadian rhythm, mental and physical health and well-being. Poor health increases absence due to sickness, further affecting productivity. To address these issues we believe it is essential to embed the following environmental design principles:

- Creating good indoor qualities by integrating biophilia, openable windows, good level of daylight

- Embedding climate resilience into the spatial layouts, MEP and external fabric design
 - Ensuring workspaces can adjust longer term with minimal disruption (and embodied carbon) as their requirements change with time
 - Creating environmental and spatial choices to enable people to control their immediate environment
- To address wellbeing in buildings, one must understand the relationship between key factors that influence health and well-being and design strategies that shapes those healthy environments. We have listed the key factors below that have been considered while designing the internal spatial layout of the existing Civic Centre and the new build Trinity Building.



10 Carbon Analysis & Sustainability

10.8 Health & Wellbeing

Daylight analysis

During the design development, daylight analyses were conducted to assess if the design is providing sufficient daylight levels. This was mainly tested in the Trinity Building, as there is more control over the openings.

The assessment was conducted using Honeybee from Ladybug Tools, a software that run daylighting analysis using Radiance.

Reflectances for the surfaces follows the British standard Daylight in buildings - BS EN 17037:2018+A1:2021 (October 2021).

The annual illuminance analysis used the weather file from London Heathrow Intl AP ISD-TMYx.

Daylight metrics

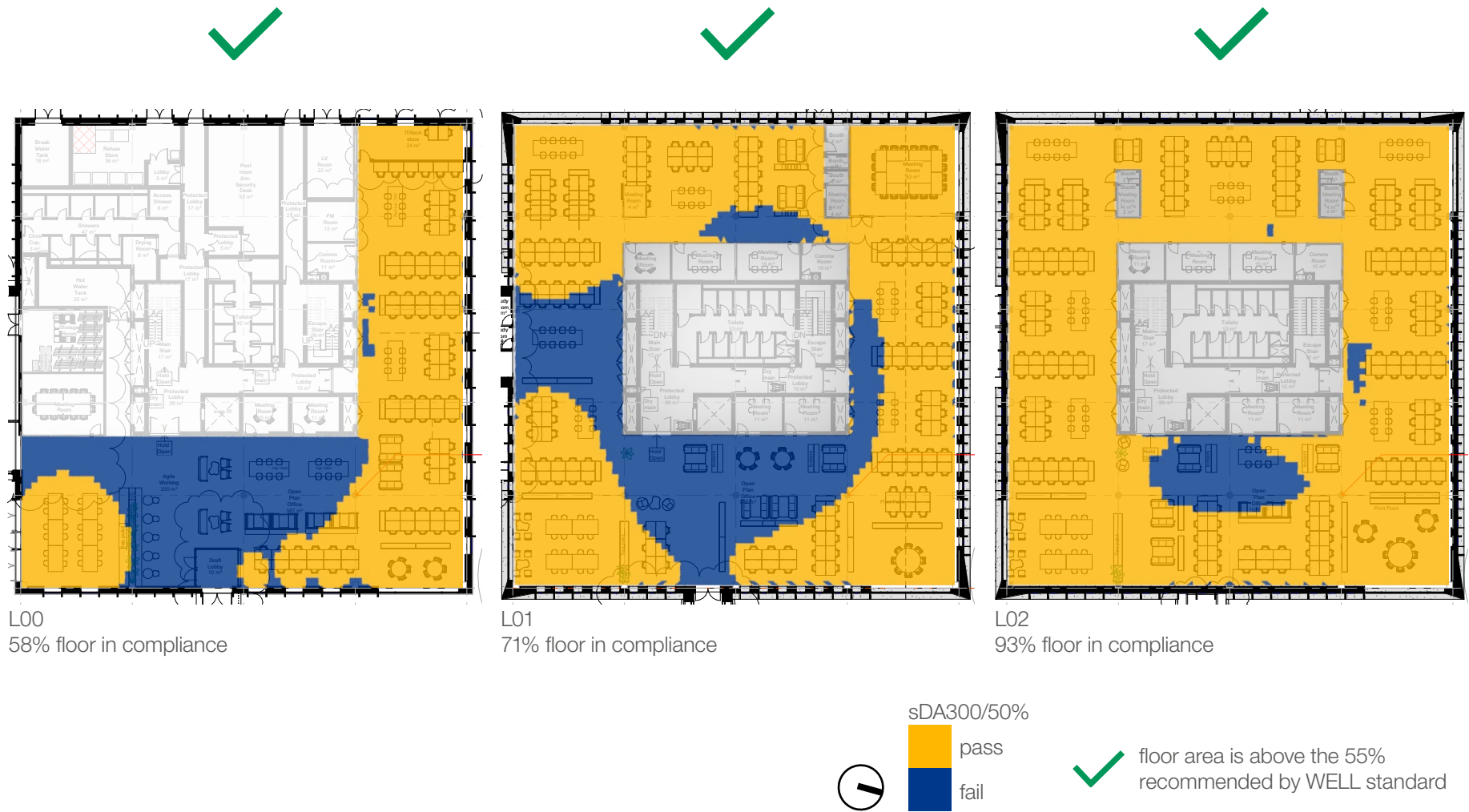
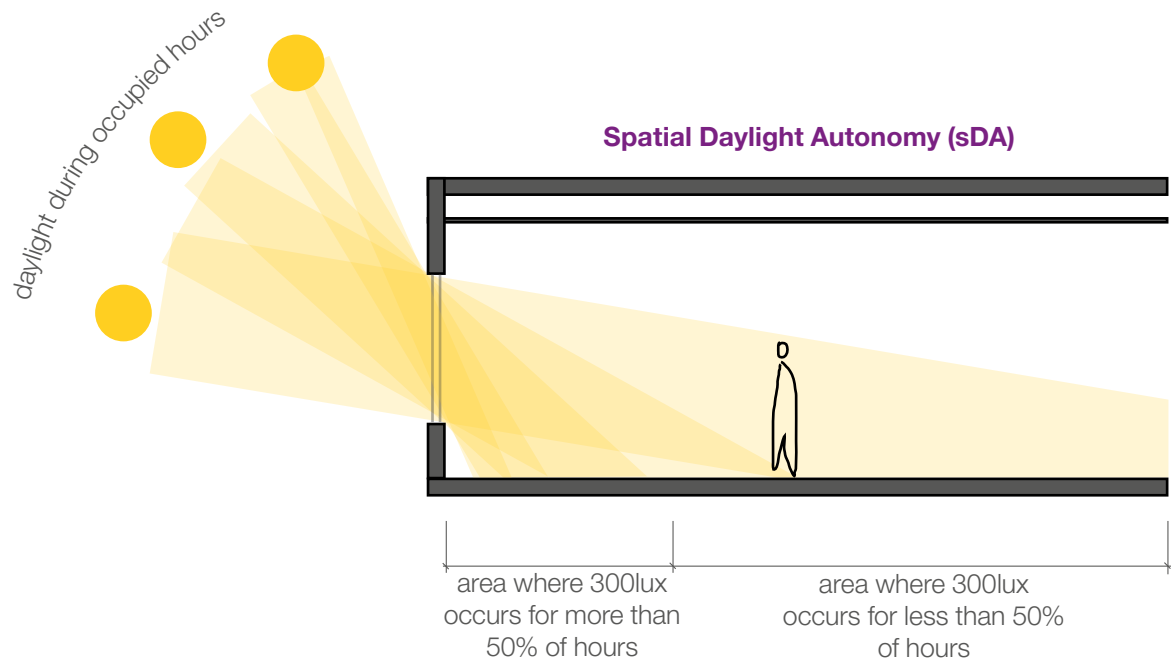
Daylight Autonomy (DA) is a climate based daylight metric that calculates the percentage of occupied hours (usually 8am - 6pm) which the testing point receives a minimum daylight level - usually 300lux (minimum for a office task).

Spatial Daylight Autonomy (sDA) measures the percentage of floor space where DA can be met completely for some proportion of time (for example 50%).

For WELL standard, it is expected sDA300lux/50% for at least 55% of the floor plan.

Daylight analysis results

All the floors in the Trinity building are in compliance with the WELL Criteria.



11

Drawing Schedule

Planning Drawing List

Project name:

Project number:

Document reference:

Reason for issue:

Revision:

Date:

Haringey Civic Centre

HB190149

HCC-HBA-XX-XX-SH-A-08001

For Information

P1

05/04/2023

Architectural drawings					
Document reference	Document title	Size	Scale	Date	Revision
00 Site Information					
HCC-HBA-ZZ-RF-DR-A-008001	Site Location Plan	A2	1:1250	05/03/2023	P1
HCC-HBA-ZZ-RF-DR-A-008002	Site Block Plan	A1	1:500	05/03/2023	P1
00 Existing					
HCC-HBA-CC-B1-DR-A-008100	Level B1 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-008101	Level 00 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-008102	Level 01 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-008103	Level 02 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-008104	Level 03 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-04-DR-A-008105	Level 04 - Existing GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008200	Existing East Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008201	Existing North Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008202	Existing West Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008203	Existing South Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008300	Existing Sections	A0	1:100	05/03/2023	P1
00 Stripout					
HCC-HBA-CC-B1-DR-A-008150	Level B1 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-008151	Level 00 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-008152	Level 01 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-008153	Level 02 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-008154	Level 03 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-04-DR-A-008155	Level 04 - Proposed Strip Out Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008250	East Elevation - Proposed Strip Out	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008251	North Elevation - Proposed Strip Out	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008252	West Elevation - Proposed Strip Out	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008253	South Elevation - Proposed Strip Out	A0	1:100	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-008350	Sections / Internal Elevations - Proposed Strip Out	A0	1:100	05/03/2023	P1
20 General arrangement					
HCC-HBA-ZZ-B1-DR-A-208100	Level B1 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-00-DR-A-208101	Level 00 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-01-DR-A-208102	Level 01 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-02-DR-A-208103	Level 02 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-03-DR-A-208104	Level 03 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-04-DR-A-208105	Level 04 - Proposed GA Plan	A1	1:200	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208200	Proposed East Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208201	Proposed North Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208202	Proposed West Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208203	Proposed South Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208204	Proposed East Courtyard Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208205	Proposed North Courtyard Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208206	Proposed West Courtyard Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208207	Proposed South Courtyard Elevation	A0	1:100	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208208	Proposed Context Elevations	A0	1:200	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208209	Proposed Context Elevations	A0	1:200	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208210	Proposed Courtyard Context Elevations	A0	1:200	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208211	Proposed Courtyard Context Elevations	A0	1:200	05/03/2023	P1
HCC-HBA-ZZ-ZZ-DR-A-208300	Proposed Section AA	A0	1:100	05/03/2023	P1

21 External walls					
Trinity Building					
HCC-HBA-AB-ZZ-DR-A-218300	External Wall Assembly Section -AB - North Elevation	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218301	External Wall Assembly Section -AB - East Elevation	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218302	External Wall Assembly Section -AB - West Elevation	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218303	External Wall Assembly Section -AB - South Elevation	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218304	External Wall Assembly Section -AB - Picture Window	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218310	External Wall Assembly Section -AB - East Linkblock	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218311	External Wall Assembly Section -AB - West Linkblock	A1	1:50	05/03/2023	P1
HCC-HBA-AB-ZZ-DR-A-218401	External Wall Details - AB - Typical Facade Detail - Plant Screen	A1	1:50	05/03/2023	P1
Civic Centre					
HCC-HBA-CC-ZZ-DR-A-218050	External Wall Types - CC - Brickwork Enhancement	A1	1:10	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218051	External Wall Types - CC - Precast Concrete Enhancement / Replacement	A1	1:10	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218052	External Wall Types - CC - Miscellaneous Enhancement	A1	1:10	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218210	External Wall Scoping Elevations - CC - Brickwork - Sheet 01	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218211	External Wall Scoping Elevations - CC - Brickwork - Sheet 02	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218212	External Wall Scoping Elevations - CC - Concrete & Render - Sheet 01	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218213	External Wall Scoping Elevations - CC - Concrete & Render - Sheet 02	A1	1:200	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218350	External Wall Bay Studies - CC - North Wing - East Elevation	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218351	External Wall Bay Studies - CC - North Wing - West Elevation	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218352	External Wall Bay Studies - CC - South Elevation	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218353	External Wall Bay Studies - CC - West Wing - South Elevations	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-ZZ-DR-A-218354	External Wall Bay Studies - CC - 03 - East & West Elevations	A1	As indicated	05/03/2023	P1
24 Stair & Ramps					
Civic Centre					
HCC-HBA-CC-00-DR-A-248100	Level 00 - Stairs & Ramps Civic Centre repair plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-248101	Level 01 - Stairs & Ramps Civic Centre repair plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-248102	Level 02 - Stairs & Ramps Civic Centre repair plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-248103	Level 03 - Stairs & Ramps Civic Centre repair plan	A1	1:200	05/03/2023	P1
27 Roofs					
Civic Centre					
HCC-HBA-ZZ-RF-DR-A-278106	RF Level - Civic Centre Roof Scoping Plan	A1	1:200	05/03/2023	P1
34 Balustrading					
Civic Centre					
HCC-HBA-CC-00-DR-A-348100	Level 00 - Balustrading Civic Centre repair plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-348101	Level 01 - Balustrading Civic Centre repair Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-348102	Level 02 - Balustrading Civic Centre repair Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-348103	Level 03 - Balustrading Civic Centre repair Plan	A1	1:200	05/03/2023	P1
35 Ceilings					
Civic Centre					
HCC-HBA-CC-B1-DR-A-358099	Level B1 - Basement Ceiling Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-358100	Level 00 - Ground Floor Ceiling Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-358101	Level 01 - Ground Floor Ceiling Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-358102	Level 02 - Ground Floor Ceiling Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-358103	Level 03 - Ground Floor Ceiling Finishes Plan	A1	1:100	05/03/2023	P1
42 Internal wall finishes					
Civic Centre					
HCC-HBA-CC-B1-DR-A-428099	Level B1 - Basement Floor Internal Wall Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-428100	Level 00 - Ground Floor Internal Wall Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-428101	Level 01 - First Floor Internal Wall Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-428102	Level 02 - Second Floor Internal Wall Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-428103	Level 03 - Third Floor Internal Wall Finishes Plan	A1	1:200	05/03/2023	P1
43 Floor Finishes					
Civic Centre					
HCC-HBA-CC-B1-DR-A-438099	Level B1 - Basement Floor Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-00-DR-A-438100	Level 00 - Ground Floor Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-01-DR-A-438101	Level 01 - First Floor Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-02-DR-A-438102	Level 02 - Second Floor Finishes Plan	A1	1:200	05/03/2023	P1
HCC-HBA-CC-03-DR-A-438103	Level 03 - Third Floor Finishes Plan	A1	1:200	05/03/2023	P1
77 Room Data Sheets					
Civic Centre					
HCC-HBA-CC-00-DR-A-778506	Room Data Sheet - Typical North Wing Meeting Room	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-01-DR-A-778507	Room Data Sheet - Committee Room 1&2	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-00-DR-A-778508	Room Data Sheet - Large Room of the Registrars	A1	As indicated	05/03/2023	P1
HCC-HBA-CC-00-DR-A-778509	Room Data Sheet - Lobby / Reception Area	A0	As indicated	05/03/2023	P1
HCC-HBA-CC-01-DR-A-778510	Room Data Sheet - Council Chamber	A0	As indicated	05/03/2023	P1
DAS					
HCC-HBA-XX-XX-RP-A-081000	Design and Access Statement	A3	-	05/03/2023	P1

