Dublin City Council

Housing SPC

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DCC Housing Developments (Apartments & Flat Blocks)

New-build and Retrofit Case Studies

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CONSTRUCTION STANDARDS & TARGETS

Policy Context

Energy Performance Buildings Directive

- Main EU law covering building energy performance is 2010 EPBD and 2012 EED. These require minimum building standards with all new buildings NZEB by 2020. The EPBD envisages that buildings undergoing major refurbishment should meet the same minimum requirements for energy efficiency as new buildings.
- EPBD amended (2018): Required National Energy Renovation Strategies towards achieving a "highly efficient and decarbonized building stock by 2050 (and) cost-effective transformation of the existing buildings into NZEB".
- EPBD being amended to include mandatory requirement for **Whole Life Carbon** assessments.

Irish Building Regulations (TGD Part L)

- All **new** buildings occupied after the 31 December 2020 (31 December 2018 for Public Bodies) to be NZEB.
- **Existing dwelling 'Major Renovation' requirement.** When 25% or more of a building's envelope surface is renovated, TGD Part L 2022 regulations require the building's energy performance be upgraded to the cost-optimal level. This is as far as it is technically, functionally and economically possible.

Climate Action Plan 2023 and National Residential Retrofit Plan (Dwellings):

- **By 2025**. All new to NZEB standard with 170K using heat pumps. 120K existing retrofitted to B2 with 45K using heat pumps.
- **By 2030**. All new to Zero Emission Building (ZEB) standard. 500K existing retrofitted to B2 with 400K using heat pumps
- NRP envisages 36,500 social housing homes retrofitted to a B2 BER standard by 2030, (with remainder by 2050).

Climate Action Plan 2023

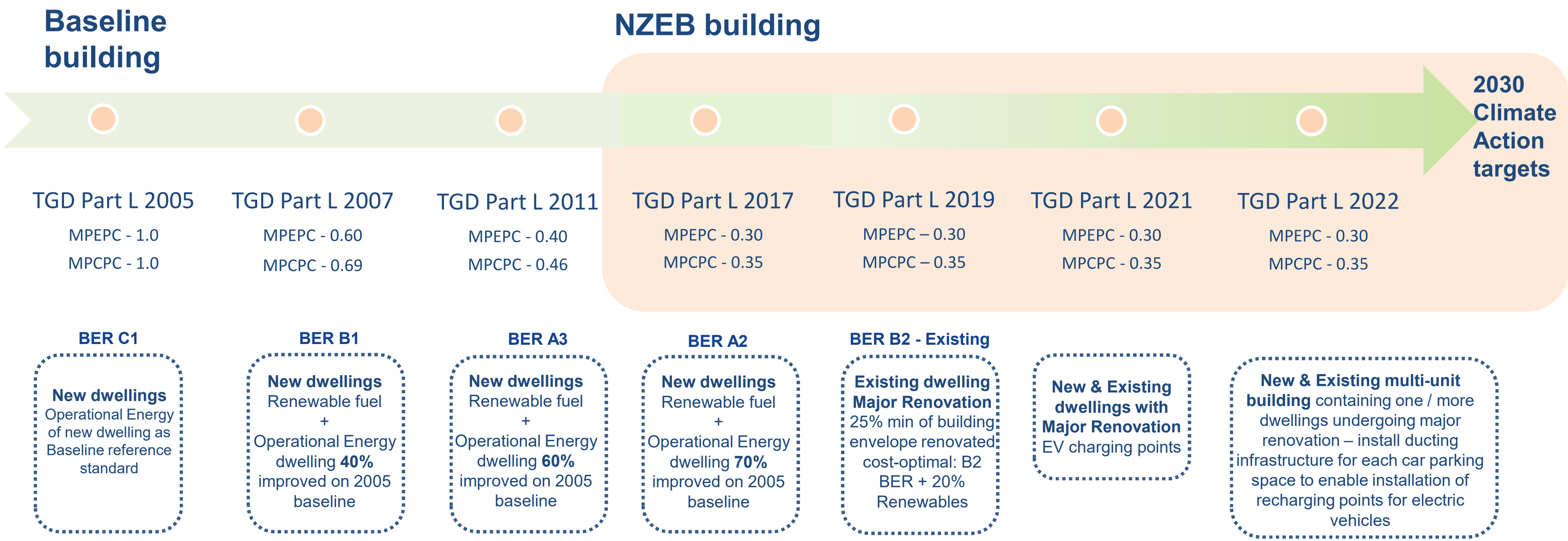
We will continue to see the effects of high regulatory standards as new building construction gains momentum towards delivering the targets set out in Housing for All. ***As technology and construction are constantly evolving, policy and regulation will continue to change, setting high standards and targets in relation to construction and materials, to ensure that we can achieve a climate neutral built environment by 2050.***

The recast of the EU Energy Performance of Buildings Directive (EPBD), expected to be finalised by mid-2023, plans to include:

- *A new ZEB standard which does not cause any on-site carbon emissions from fossil fuels;*
- *The inclusion of a Declaration of Global Warming Potential on Building Energy Rating Certificates;*
- *Mandatory Whole Life Carbon Assessment at building design stage;*
- *The introduction of Building Renovation Passports;*
- *The introduction in legislation of Minimum Energy Performance Standards for all buildings;*
- *Mandatory installation of rooftop solar panels on all buildings, with earlier dates for public buildings;*
- *A rescaling of the existing Building Energy Rating (BER) scale, information on which will need to be shared with the general public, construction professionals and other stakeholders.*

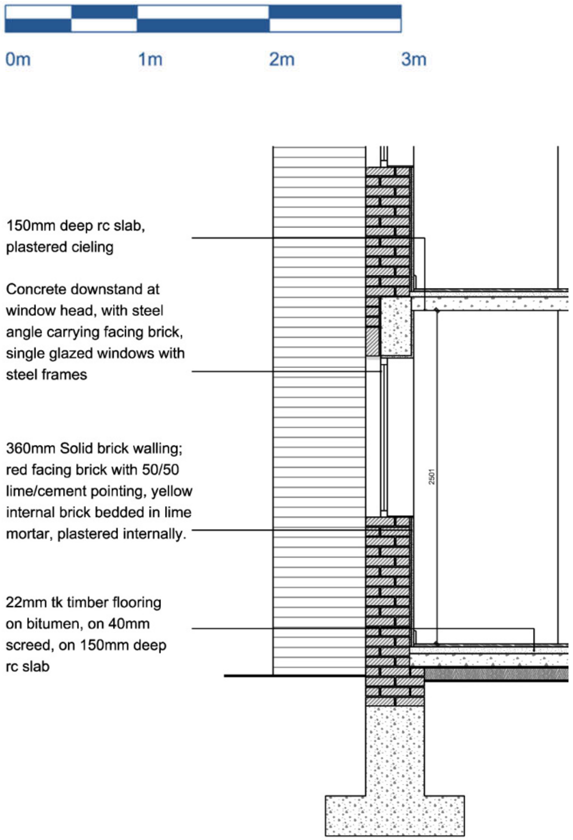
TGD Part L Energy in Use for Dwellings and NZEB

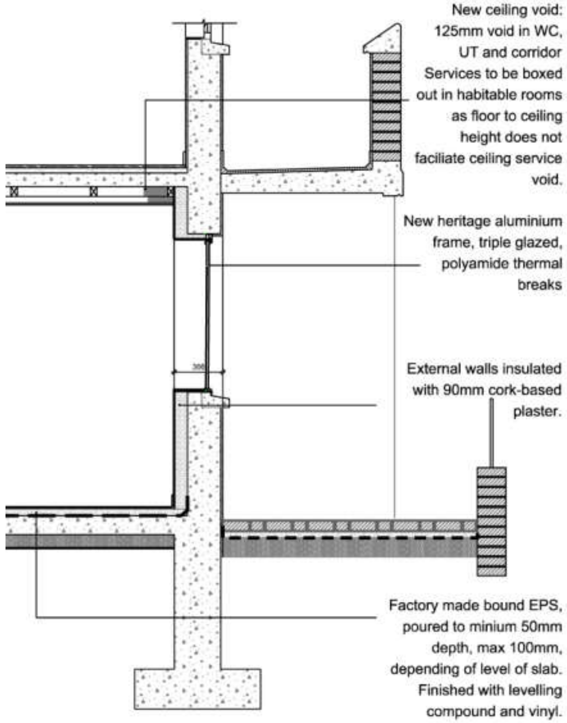
Building Regulations apply to the construction of new buildings and to extensions and material alterations to buildings

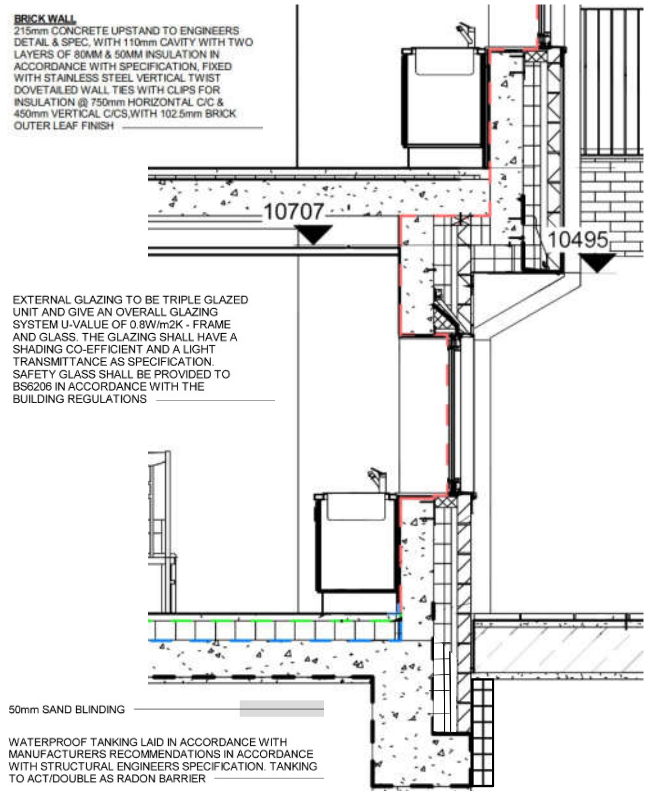


*MPEPC - Max Permitted Energy Performance Coefficient
*MPCPC - Max Permitted Carbon Performance Coefficient

Construction Complexity! Comparing Flat Blocks 1939 v 2022







Ballybough House 1939
as existing (section through front elevation)

Ballybough House Retrofit 2021 (B2 BER)
pilot retrofit of two flats (section through courtyard elevation with access deck)

Sean Foster Place Nth King St 2022 (A1)
new development (section through courtyard elevation)

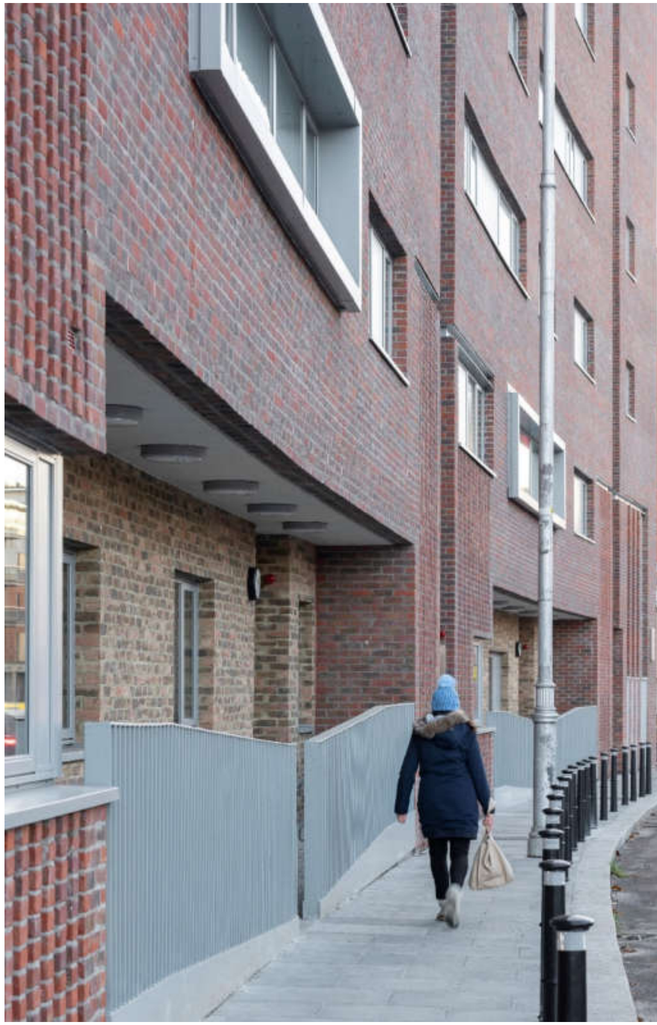
NEW BUILD CASE STUDIES

Case Study 1 – North King Street Housing

Designing North King Street housing as a regeneration project involved considering urban design, streetscape, density, creating a sustainable community for living in the Markets Area of Dublin.

- Brownfield site
- 30 apartments on six storeys.
- Completed 2022

Sustainable design solutions were prepared by a highly skilled professional team at each project stage including low embodied carbon and low operational carbon.
The scheme was designed as a Near Zero Energy Building (NZEB) along with embodied carbon studies carried out using Oneclick LCA and water use efficiencies.
The project exceeded design targets by achieving A1 BERs.

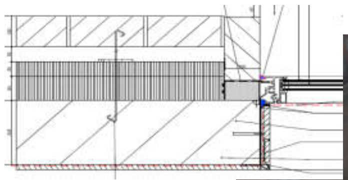


Case Study 1 – North King Street Housing – NZEB Strategies

sustainable solutions
GREEN ROOFS mitigate against URBAN HEAT ISLAND EFFECT by increasing the building's solar reflectance index and delaying surface water run-off

renewable fuels
PV PANELS provide energy efficient fuel for apartments achieving renewable energy compliance with Part L requirements for DEAP analysis

air tightness
INSULATED cavity wall construction of 0.15 W/m²K with efficient AIR TIGHTNESS 2m³/hr/m²



solar heat gain
SOLAR shading to south facing balconies and solar gain to apartments with g-value of 0.42

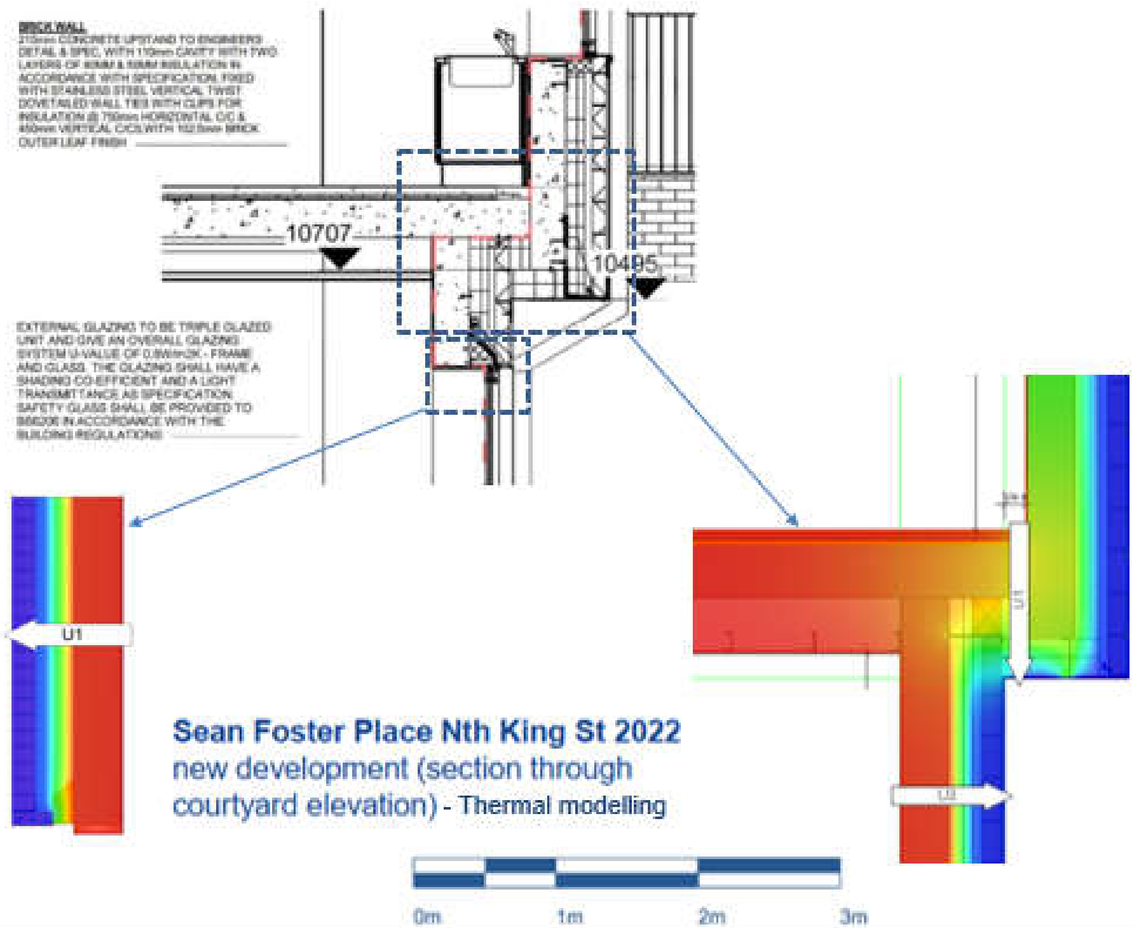
building fabric
TRIPLE GLAZED WINDOWS provide reduced heat loss of 0.8 W/m²K with sound reduction

heating / ventilation method
HIGH EFFICIENCY exhaust air heat pump to each unit

Case Study 1 – North King Street Housing – NZEB Strategies

In developing NZEB strategies for North King Street the building envelope was reviewed to optimise the design. The optimisation process included:

- Increased levels of insulation were installed to provided energy wall build-up construction
- Each junction detail underwent a process of thermal modelling to mitigate air leakage – see wall section w. details
- Air leakage test were carried out within each unit upon completion



Sean Foster Place Nth King St 2022 new development (section through courtyard elevation) - Thermal modelling

Case Study 2 – O’Devaney Gardens Phase 1

Phase 1 is the first step in the regeneration of the former O’Devaney Gardens site. The project is an exemplar **low-rise high density scheme**. Density is 77 homes per hectare or 227 bed-spaces per hectare.

- Brownfield site
- 56 homes; from 3-bed and 2-bed town-houses to apartments and duplex units.
- Completed 2022

Design objectives included:

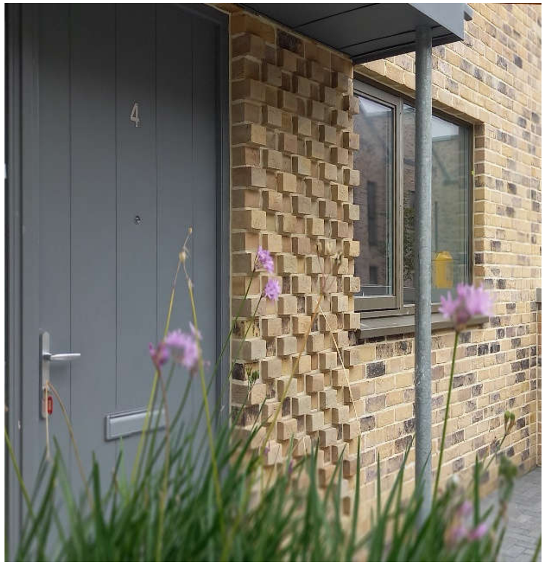
- Connecting the development with surrounding neighbourhoods, amenities and public transport hubs
- Creating a varied streetscape with a rich mix of dwelling types providing high quality accommodation
- Creating a high quality, accessible public realm.

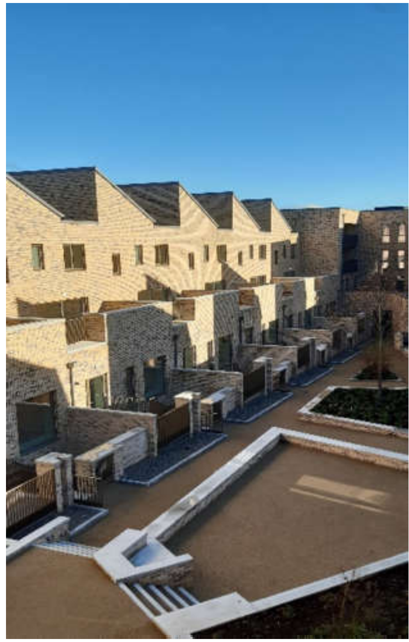
Case Study 2 – O'Devaney Gardens Phase 1

Project achieves Near Zero Energy (NZEB). All homes have A2 BER with annual operational energy requirements producing average, 8kg of CO_2 emissions per m2. Note, the annual operational energy requirements of a typical home constructed in the 1980s (C BER) produces in excess of 50kg of CO_2 per m2.
This went beyond B2 requirement tied to its date of planning permission

Project trialled IGBC's Home Performance Index (HPI) certification process. This required rigorous analysis of the design using the following metrics:

- Residential density
- Surface water run-off
- External water use
- Waste management during construction,
- Responsible procurement of timber
- Embodied impact of materials
- Transport impact,
- Daylighting and indoor comfort





Case Study 2 – O'Devaney Gardens Phase 1

How were the Home Performance Index metrics addressed in Phase 1?

- Wide range of dwelling types ranging from 1 Bed Apartments to 3 Bed Houses catering to differing living requirements
- Scheme espouses best principles of universal access and life time adaptability e.g. three storey houses designed to facilitate future modifications allowing for an additional habitable room at ground level
- All dwellings are dual aspect to promote well being, natural cross-ventilation and less reliance on artificial lighting
- Construction details thermally modelled at design stage and inspected at construction stage to ensure the comfort of occupants and to reduce needless heat loss
- On-site biodiversity carefully considered through the planting in the communal courtyard and private gardens
- Swift and Bat 'boxes' were incorporated into parts of the building fabric
- All timber certified by the Forest Stewardship Council
- All concrete has high content of GGBS (cementitious material derived from waste products of the steel industry)
- All materials used carefully considered in terms of longevity and potential end of life re-use e.g. Zinc metal roofs have a useful life in excess of 100 years at the end of which, the Zinc can be readily recycled and re-purposed
- During construction, the Contractor's Site Waste Management Plan was monitored by the Project Team. All waste products were segregated on site before being removed to suitable facilities
- Permeable paving, green roofs and tree pits used to reduce rainwater run-off thus reducing burden on the City's drainage infrastructure

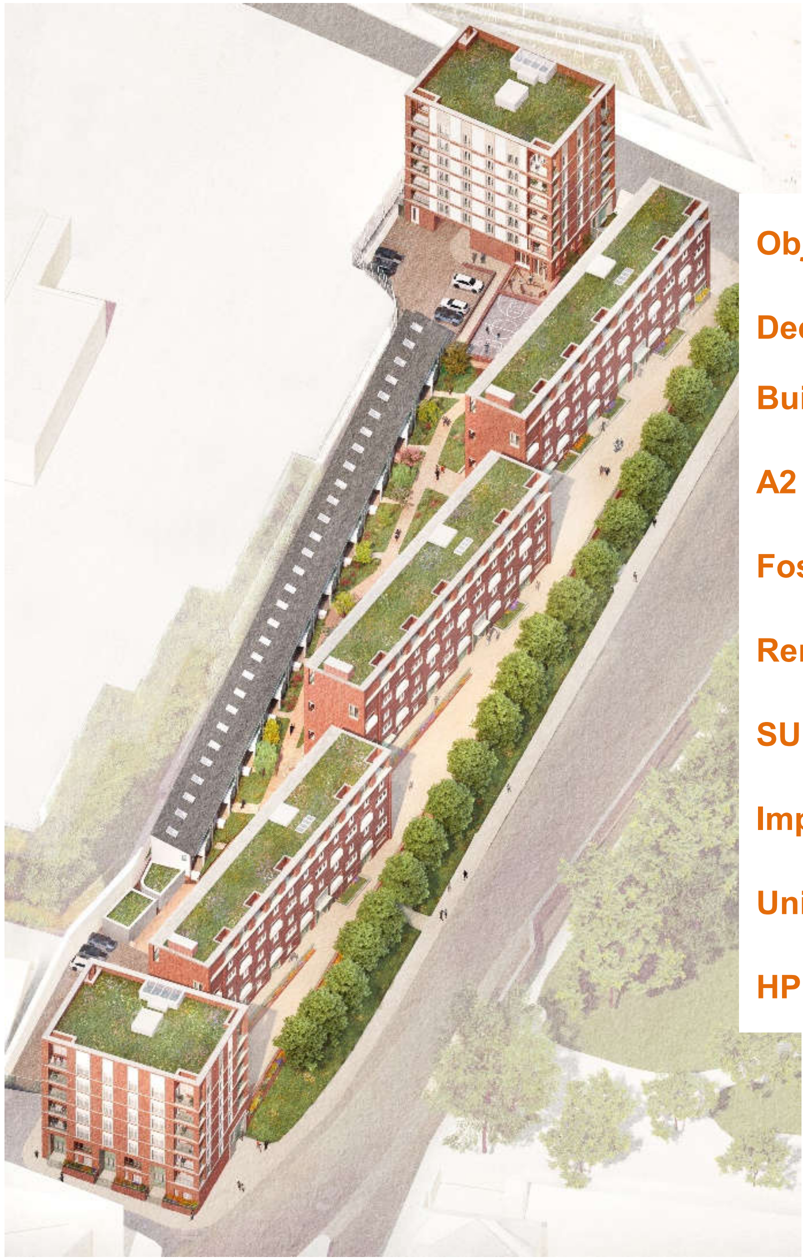
RETROFIT CASE STUDIES

Case Study 3 – Constitution Hill

Constitution Hill is the first deep retrofit of an existing 5-storey block. The 5-storey buildings are a type within Dublin City Council and this project can inform deep-retrofits and amalgamations on potentially 2000 homes.

- Project received planning Q2 2023
- Existing three 5-storey flat blocks comprising 60 duplexes and 30 bedsits
- Proposed 124 homes comprising retrofitted blocks, amalgamated bedsits, additional floors, new blocks north and south and mews development to rear.

Existing blocks are well located and orientated on the site. Retrofit reduces the number of homes in each block, new build elements compensate. Overall, the project achieves an increased number of higher quality homes with high environmental sustainability.



Objectives:

Deep Retrofit & New Build

A2 BER

Fossil Fuel Free

Renewables

SUDS & Green Roofs

Improve Bio-diversity

Universal Design

HPI Certification

Case Study 3 – Constitution Hill

Key aspects

- First Deep Retrofit at this scale within Dublin City Council
- Improved Urban Design and street activation with own door access and new street facing entrances.
- Improved space standards All homes comply with the New Development Plan Standards.
- Green roofs provided to new apartment blocks and renovated blocks
- Improved bio-diversity with private inner courtyard for residents

Key Learnings

- Life Cycle Analysis Reporting is underway to inform the design development and post occupancy analysis.
- Embodied Carbon and embodied energy is being measured and tracked to inform future Retrofit and New Build projects.
- Sequence of Building Investigations being carried out as well as unique thermal modelling of building performance to inform understandings of this building type within DCC.

Case Study 4 – Dominick Street Lower

Dominick Street East (Dominick Hall)

Phase 1 (Dominick Hall) completed in 2022. The project provides improved housing for residents in the three flat blocks on the west side.

Dominick Street West

Case Study 4 - Dominick Street West

The vacated blocks provide an opportunity to determine the optimum approach to retrofitting.

- Blocks are well located on site. Redevelopment unlikely to deliver significant additionality. Retrofit therefore a viable option.
- Alterations and amalgamation of existing flats can be minimised. Project can proceed without need for phasing.
- Project can focus on retrofit technical options with emphasis on **Measurement, Learning & Upskilling, and Public Dissemination of Findings.**
- Project can explore best practice in **Water Management, SUDs, Greening, Circular Economy** and **Positive Energy.**

Case Study 4 – Dominick Street West

The core objective of the Dominick Street West project is to develop an exemplar Climate Resilient Housing Solution to renovating DCC flat blocks, which addresses current questions about retrofit and informs other renovation programmes (public and private).

NEXT STEPS

- Map stakeholders and develop a collaborative design strategy.
- Finalise vision document.
- Apply for Stage 1 DHLGH approval
- Procure consultants
- Develop meanwhile uses and secure / visually animate the blocks
- Start on site Q2 2025

THANK YOU!

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