Rapid Build Volumetric, Low Embodied Carbon and Certified Passive House

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Celebrated 30 Years in June 2023

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Presentation Overview

- 1) Passive House Principles
- 2) Passive House projects underway in Ireland
- 3) Volumetric Case Study
- 4) Embodied Carbon Counting
- 5) Economics
- 6) NetZeroBAU Learning Platform

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The 5 Principles of Passive House!

Passive House: (since 19	91)	
Energy efficient	Comfort	Healthy
Resilient	Quality standard	Science-based
No-performance	Net-Zero	All building
gap	ready	types

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Project Form Factor

Form Factor = Envelope Area divided by Floor Area

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#2: Air-Tightness and Vapour Control











#4: High Performance Windows





#5: Mechanical Ventilation with Heat Recovery





Last but not least: Heating (and cooling?)



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Performance Gap for Homes Modelled in DEAP



- Total sample of 9,923 homes
- A and B-rated houses were found to use 39% more energy than predicted by the BER.

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>1,000* Certified Passive House residential units under construction in Ireland

* Conservative calculation of only multi-res units completed and in-progress, not including non-res buildings

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ABK () mosart walls



World's Largest Passive House 'Premium' Project, Erne Campus, Enniskillen



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High Rise Passive House in London



48 story student dormitory 1,720 beds

Apt 🚥

Broke ground late 2022

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Traditional Cavity Wall Construction



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2013: Volumetric Modular Passive House in Philadelphia, US





Affordable Passive House, designed and built by Onion Flats Certified by MosArt

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2013: Volumetric Modular Passive House in Philly





Speed, Quality, Efficiency, Affordability

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Setanta Homes, Maherafelt, Northern Ireland



• Volumetric:

- assembled in 90 minutes! Achieved Passive House airtightness Low embodied
- carbon: timber frame and cellulose insulation SoLow research project

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Sealing up the Joints Between the Six Volumes



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MVHR Ducts Pre-installed



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The Blowerdoor Test: Ultimate Indication of Build Quality



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And the result is....



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Passive House Envelope and Ventilation Specification

Thermal Envelope Element	
Roof	0.059(!)
Walls	0.104
Floor	0.119
Window Glazing	0.53
Window Frames	0.73

Mechanical Ventilation with Heat Recovery (MVHR):

Nilan 'Compact P' (77% heat recovery efficiency)
 Provides heat recovery ventilation, DHW, about two-thirds of heating and some degree of cooling

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Thermal Bridge Analysis

Heat loss coefficient calculated for all junctions and interfaces

	Thermal bridge inputs										
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Embodied Carbon Counting

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The A, B, C & D of Net Zero Carbon



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Setanta SoLow Total Carbon Assessment	1
Operational Carbon: • All energy uses over 60 years, including contribution of PV	= 218 kg CO ₂ e/m ² GIA <mark>36%</mark>
Embodied Carbon "Cradle to Grave": • Manufacture, transport, construction, use, maintenance, repair, refurbishment and replacement and end of life (includes allowance of 153 kg for	= 389 kg CO ₂ e/m ² GIA
sequestration) Total Life-Cycle Carbon:	= 607 kg CO ₂ e/m ² GIA
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Meets the 'London Energy Transformation Index' (LETI) 2030 Design Target



Economics

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"The overall capital cost uplift was only 0.9% a relatively small cost can yield huge energy demand and carbon savings".



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Passive House Can be Cost-Neutral



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Thank You!

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