Glenveagh Homes Limited

Glenveagh & Nua Innovation & Manufacturing Overview

Glenveagh
Home of the new.

Contents:

Glenveagh Homes Limited

About Glenveagh

Glenveagh
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Glenveagh is a leading Irish homebuilder:

At Glenveagh:

- We believe we have an obligation to identify **solutions that will contribute to resolving the current housing crisis**
- We pride ourselves on our ability to react and **utilize innovation to help find new ways of solving future challenges**
- We have successfully demonstrated this in the past and will continue to do so in the future.

Our Vision:

- Glenveagh is committed to opening sustainable, high-quality homes to as many people as possible, in flourishing communities across Ireland.

We at Glenveagh, are constantly striving to set a new benchmark in our sector, by delivering the maximum possible social benefit at the lowest possible environmental cost.

My experience & role within Glenveagh:

Exposure to the Global Residential Sector has shaped a mindset on how things can be done differently…

My Journey to Date:

- I have over 25 years of experience within the design and construction sectors, with exposure right across the Goble, from:
  - working in my home country of New Zealand,
  - Working in the Middle East
  - And eventually settling in Ireland.

Wanaka Residence, New Zealand

My Role:

- Director of Design & Innovation at Glenveagh Properties PLC:
  - I started my journey with Glenveagh 7 years ago
  - My department is the innovation hub of Glenveagh

Qasr Al Hosn, Abu Dhabi

Housing Estate, Ireland

Glenveagh Homes Limited

Nua Manufacturing

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Key Innovation & MMC Priorities

Nua Manufacturing:

Our Sustainable Manufacturing Arm:

Introducing Nua; our manufacturing & technology arm of the business…

Why we did we invest in Off-Site Construction?

- To become vertically integrated.
- Guarantee long-term supply: align with growth targets
- To control critical path items
- Reduce delivery to market

About Nua; How do we deliver our product?

- Invested in three strategically located facilities
- Secured a supply chain of over 4,000 units
- We optimise value through ongoing:
  - Enhancement of our Pre-Manufacturing Value (PMV)
  - Relentless Innovation and R&D
  - Implementation of best-practise Standardisation principals

Key Innovation & MMC Priorities

Nua Manufacturing:

Dundalk Factory (Timber Frame):

- Existing **partnership** with Keenan Timber Frame (since 2019)
- A highly-capable management team with **significant manufacturing** experience and track record.
- We continue to **make investments** in the factory when suitable to **maximise** production capabilities.
- Flexibility to **scale up** production when needed.
- **Production Capacity**: **900 to 1000 units**

Key Innovation & MMC Priorities

Nua Manufacturing:

Arklow Factory (Timber Frame):

- We **acquired** Harmony Timber Solutions and **integrated** into the Glenveagh Group in 2022.
- **Rebranded** as NUA Manufacturing Ltd.
- Custom built **timber frame production** facility capable of delivering **450 units** per year.
- Strategically located to serve the **Southeast**
- **50** full time staff

Key Innovation & MMC Priorities

Nua Manufacturing:

Carlow Factory (Timber Frame and LGS):

- Located at the Former Braun Factory.
- Converted into a state-of-art TF and LGS manufacturing facility
- The factory was officially opened in **June 2023**.
- Currently over **100 staff** in the factory across both TF & LGS, with plans to **expand the team** as we increase production
- Ample capacity for the Business to **explore** automation, technology and PMV advancements (our innovation hub)
- Future Unit **Capacity**:
  - Timber Frame Capacity: **750 units**
  - Light Gauge Steel Capacity: **500 units**

Key Innovation & MMC Priorities

Nua Manufacturing:

Nua Manufacturing – Building Capacity :

Nua Carlow, Arklow and Dundalk

2024 Summary

2,030
Units
Manufactured

1741
Timberframe

289 Light-Gauge Steel (LGS)

72% more units manufactured in 2024 vs. 2023

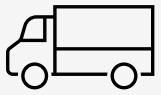
2,038
Units
Delivered

1728
Timberframe

310 Light-Gauge Steel (LGS)

Units delivered across **23** sites

86 % more units delivered in 2024 vs. 2023.



Timber Frame

Preferred delivery method for our single occupancy housing

Apply maximised DFMA principals (up to **30%** efficiency gains)

NSAI certification achieved for Carlow TF (IS440)

Light Gauge Steel

Delivery method for our multi-occupancy units (maisonette, duplex and in-fill panels to modest apartment blocks.

NSAI certification achieved for LGS

EN1090 Certification achieved for LGS

Nua Manufacturing – Carlow Factory:

Transition from the Braun Factory to a State-of-Art TF & LGS Manufacturing Facility:

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Proposed Construction Methodology Transition Plan

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Key Innovation & MMC Priorities

Glenveagh / Nua MMC Blueprint:

Glenveagh MMC Transition Blueprint:

Proposed PMV Journey (houses):

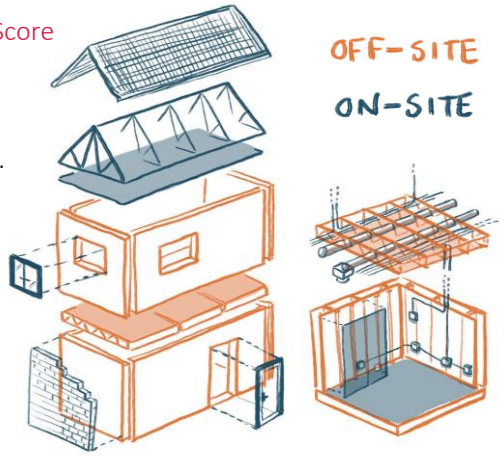
PMV Rational: The formula is a simple equation; it translates the Pre-Manufactured Value of a project into a percentage of the overall Gross Construction Cost.

Phase 1

Estimated PMV Score

45%

Current approach.

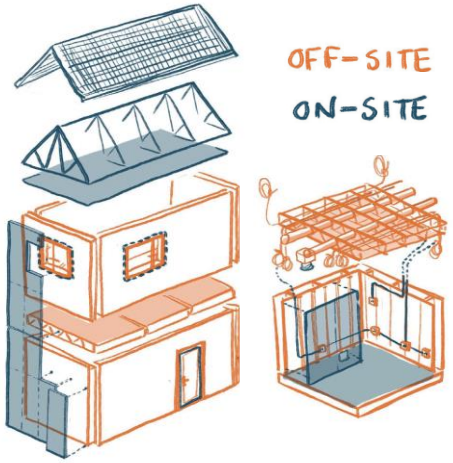


Phase 2a

Estimated PMV Score

55%

Substitute traditional heavy cladding with Lightweight cladding. Pre-serviced cassette.

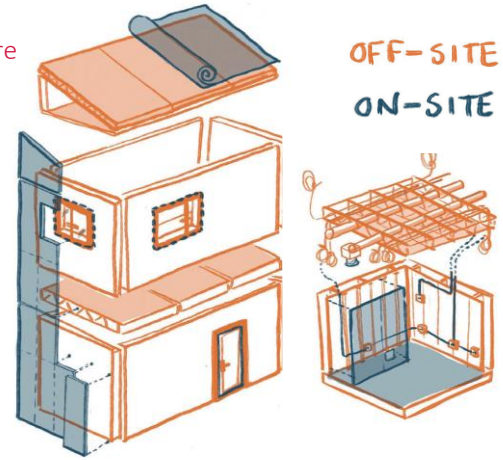


Phase 2b

Estimated PMV Score

60%

Substitute traditional heavy roof tiles with Lightweight cladding. Potential low-pitch pre-manufactured roof.

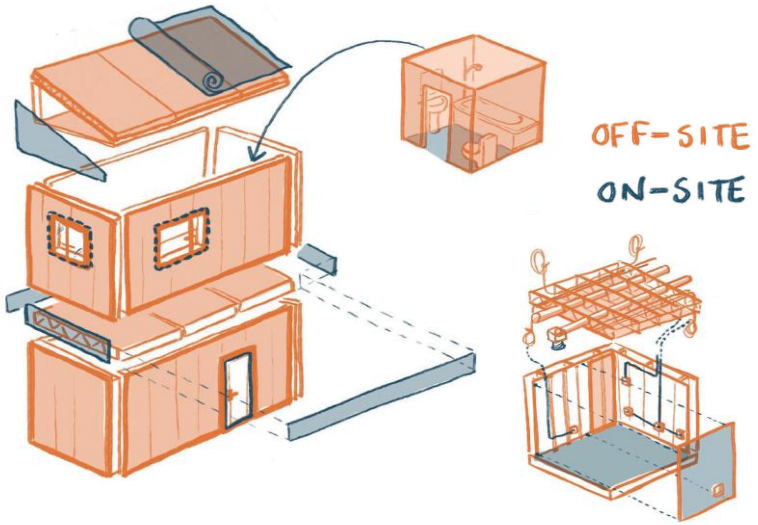


Phase 3

Estimated PMV Score

65%

Factory-fitted facades and sub-assemblies/pods. Alternative internal finishes.

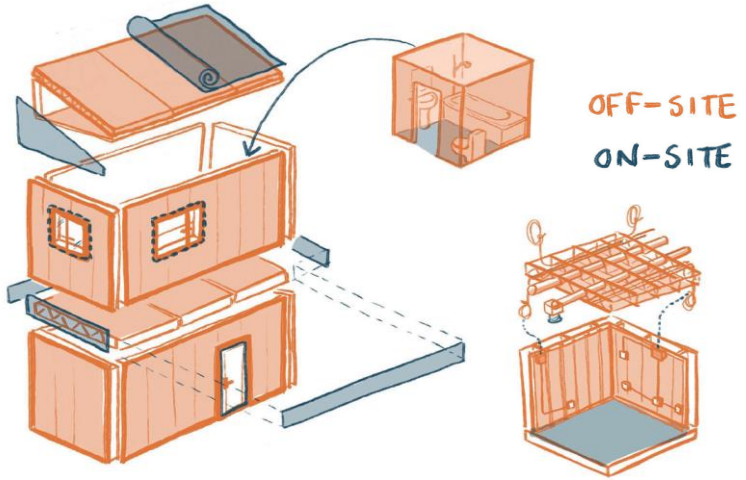


Phase 4

Estimated PMV Score

70%

Pre-wired walls. Lightweight Floor Cassette and Rapid Foundation solutions



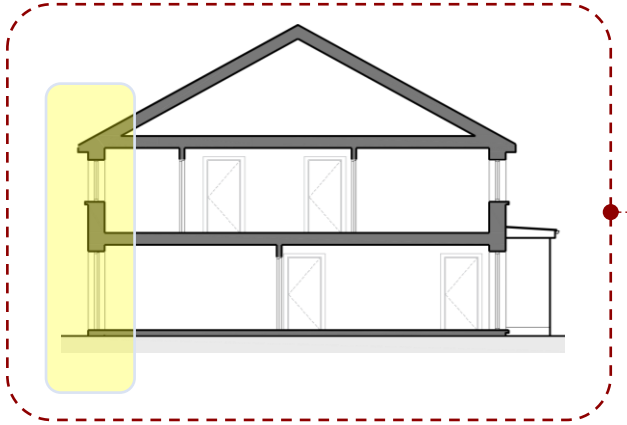
Key Innovation & MMC Priorities

Proposed MMC & PMV Transition Plan:

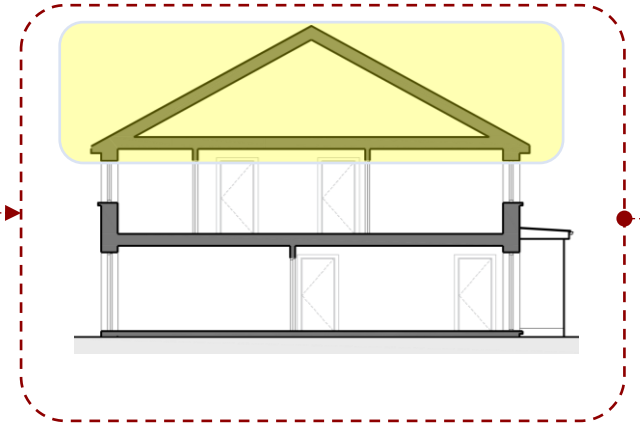
Proposed Construction Methodology Transition Plan:

Substitute Traditional Building Materials with Innovative Light Weight Alternatives:

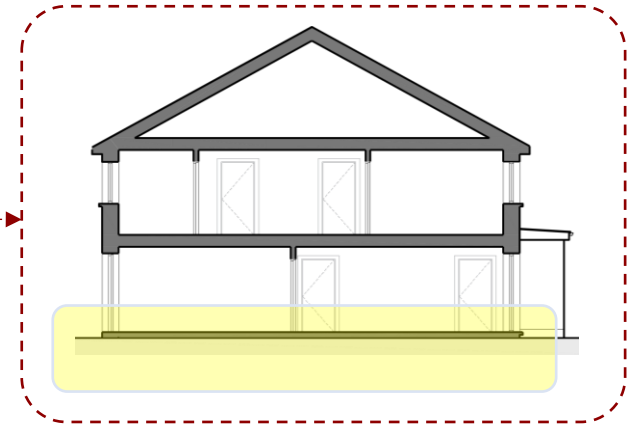
Phase 01 Transition



Phase 02 Transition



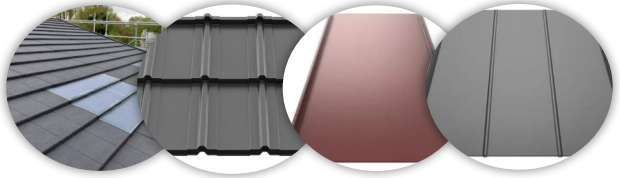
Phase 03 Transition



Light Weight Wall Cladding:
Substitute traditional heavy masonry external cladding with light weight external sheathing boards, fixed to timber battens

Light Weight Roof Cladding:
Substitute traditional heavy concrete roof tiles with light weight metal tiles & panels. This will also unlock more efficient roof structures (reduced pitch etc.)

Light Weight Floor Cassette & Piles:
Substitute in-situ concrete foundations, concrete block rising walls & in-situ concrete ground floor slabs with innovative floor cassette & piling solutions



Key Innovation & MMC Priorities

Proposed MMC & PMV Transition Plan:

Proposed MMC & PMV Transition Plan:

Manufacturing & MMC Transition Plan:

Phase 01:
To set up a manufacturing facility in Carlow with the capability of producing both Timber Frame & LGS kits for the residential market

Phase 02:
Ramp up production of both Timber Frame & LGS kits to deliver / satisfy unit demand

Phase 03:
Once the factory is running to potential, seek opportunities to further enhance our PMV. Research light weight solutions that are versatile & facilitate offsite installation

50

No. of lightweight claddings reviewed

Due Diligence

4

No. of lightweight claddings shortlisted
(least risk adverse)

R&D Product Shortlisting:

Fire, Acoustic and Weather Testing (c. 40 tests)

Compliance Review by Two Independent Technical Advisers

Review of Labour Requirements and Install Times

Material Embodied Carbon Assessments

Review of Technical Detailing and Offsite Benefits

Review of Installation and Material Supply Costs

Key Innovation & MMC Priorities

Proposed MMC & PMV Transition Plan:

Proposed Construction Methodology Transition:

WHY: Light Weight Claddings verses Traditional Heavy Weight Claddings

Significant reduction in embodied carbon

High

Low

Pros & Cons: Traditional Masonry Facades

Metric`	Score	Commentary
Scalability		Limited potential to accommodate growth. Does lend itself to meeting ambitious growth demand. Limited versatility, diminishing labour workforce etc.
Cost (material only)		In isolation, generally lower costs in comparison to innovative materials
Cost Saving Potential		Limited cost reduction potential as higher loads require more traditional structure / supporting foundations etc.
Compliance		All materials utilised to date are compliant with the Irish Building Regulations
Durability / Performance		Very durable and resistant to physical damage, weathering, and wear (existing precedents)
Installation Time		More labour-intensive and time-consuming, requiring skilled labour & specialized equipment
Pre-Manufacture Value		Limited versatility in terms of design & installation opportunities (installed on-site)
Logistics		Transportation of Heavy materials requires more loads, resulting in increased trips (higher GHG emissions)
Waste		Limited waste reduction opportunities when compared to innovative lightweight materials
Carbon		Production of heavy cladding materials result in a high carbon footprint

Pros & Cons: Light Weight Facades

Metric	Score	Commentary
Scalability		Superior potential to accommodate growth. Offers unique aesthetic qualities that enhances appeal to a wider audience. De-risks the delivery model.
Cost (material only)		In isolation, generally higher costs in comparison to traditional materials
Cost Saving Potential		High all-encompassing cost reduction potential as unlocks cost-efficient solutions / processes, as well as reduced install times
Compliance		All materials short listed are compliant with the Irish Building Regulations
Durability / Performance		Limited precedents in the market when compared to traditional. Is compliant, just an education piece required
Installation Time		Lighter materials; easier & quicker to install. MMC Mitigates against a diminishing labour workforce
Pre-Manufacture Value		Lightweight materials are the biggest facilitator of offsite MMC (versatility of offsite application)
Logistics		Transportation of lighter materials consumes less fuel & reduces the number of trips (reduced GHG emissions)
Waste		Significant waste reduction opportunities when compared to innovative lightweight materials
Carbon		Less raw material & more recyclable, reducing environmental footprint

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Proposed Light Weight Façade Studies

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Key Innovation & MMC Priorities

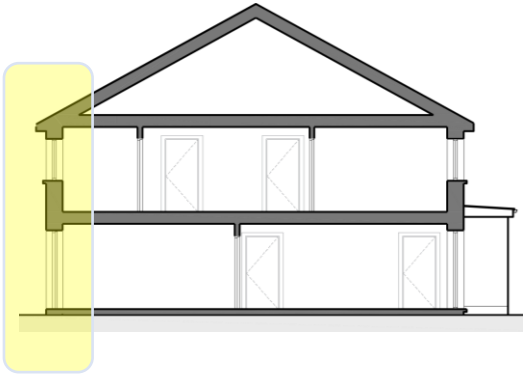
Lightweight Building Fabric Study:

Proposed Construction Methodology Transition:

Light Weight Façade Study:

Strategy: Substitute traditional heavy masonry external cladding with light weight external sheathing boards, fixed to timber battens. These will consist of a combination of Acrylic Render, Acrylic Brick Slip Finish & Pre-Finished textured boards

Phase 01 Transition:



Proposed Material Change:

Current Cladding:

- External cladding consisting of traditional brickwork & rendered blockwork

Proposed Cladding:

- Light Weight Cladding solutions consisting of sheathing board & plank systems

Versatility & Performance:

Product & Process:

- Limited flexibility; Cannot facilitate offsite installation
- Labour Intensive
- High in Carbon
- Slow install

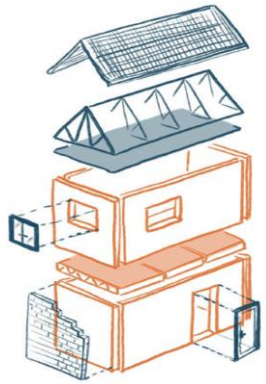
Product & Process:

- Greater Flexibility; Can facilitate offsite installation.
- Sustainable low-carbon solution.
- Quicker install times.

Proposed PMV Enhancement:

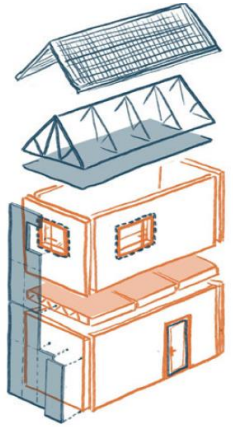
Current PMV Score: 45%

- Current PMV baseline aligned with timber frame manufactured offsite and brick/block installed onsite



Estimated PMV Score: 55%

- Increase from the current PMV baseline due to potential options to install light weight fabric offsite



Key Innovation & MMC Priorities

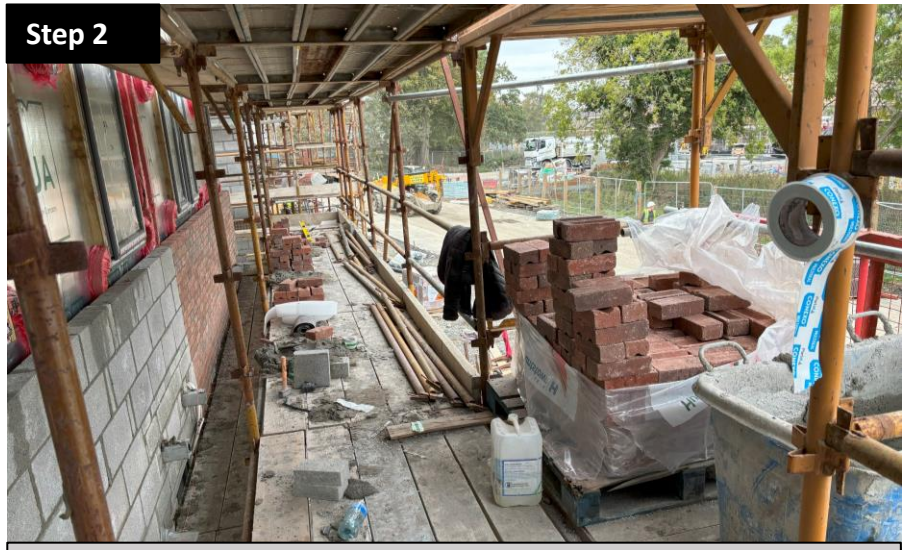
Lightweight Building Fabric Study:

Current Heavyweight Façade Construction Methodology:

Step 1

Setout façade location, prepare base, distribute materials

Step 2



Commence brick laying. Multiple material loads & platform lifts

Step 3

Finishing of final detailing and pointing of brick (render blocks)

Step 4

Completed brick and rendered block facade

Key Innovation & MMC Priorities

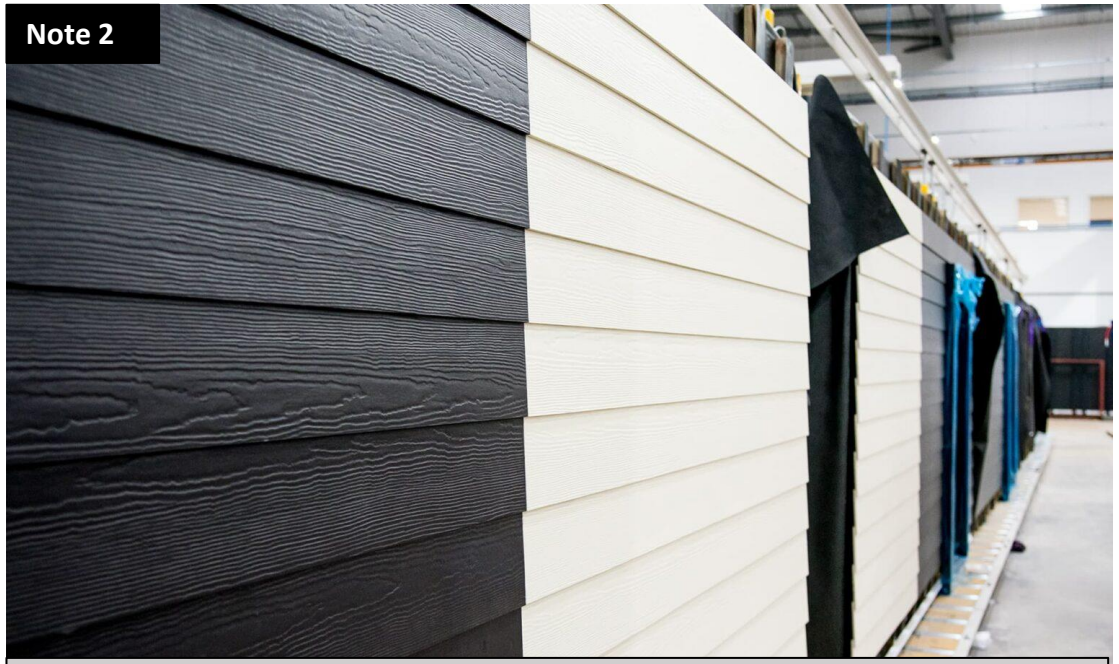
Lightweight Building Fabric Study:

Proposed Lightweight Façade Construction Methodology:

Note 1

We can adapt the factory to facilitate the application of light weight facades

Note 2

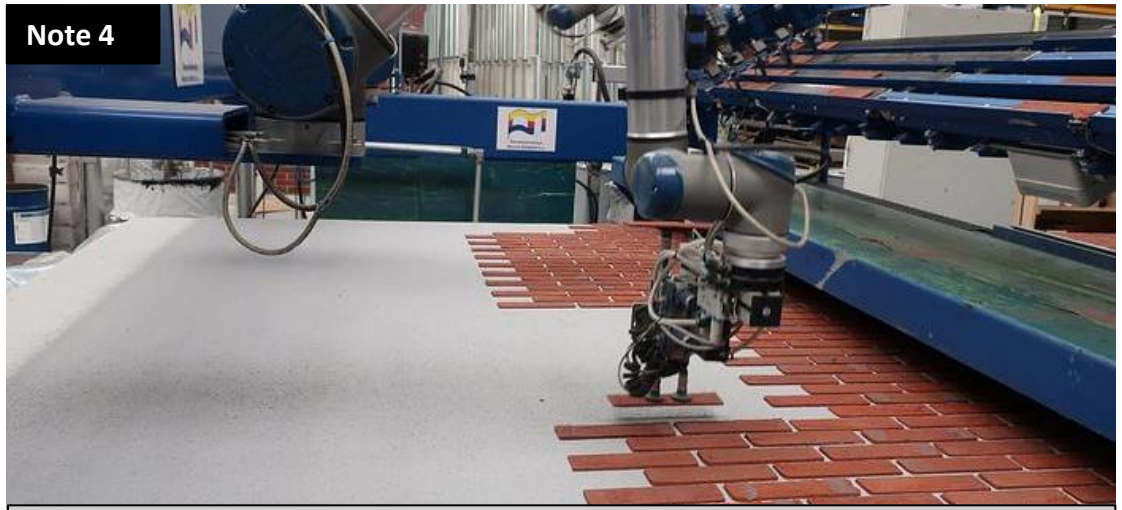


We can install either brick & render solutions or pre-finished panels

Note 3

The Mauer automated proposal will mimic the above, applied to full panels

Note 4



Future possibilities aligned with industry automation & robotic advancements

Lightweight Building Fabric Study:

2-Storey Front Façade Prototypes (Nua Factory):

Prototype 1: Mauer

Prototype 2: Webber

Key Innovation & MMC Priorities

Lightweight Building Fabric Study:

Lightweight Building Fabric Study:

Prototype 3: Swiss Pearl & James Hardie

2-Storey Front Façade Prototypes (Nua Factory):

Prefinished Panels: Elevational Treatments:
(Mark 2 Houses)

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Proposed Light Weight Roof Covering Studies

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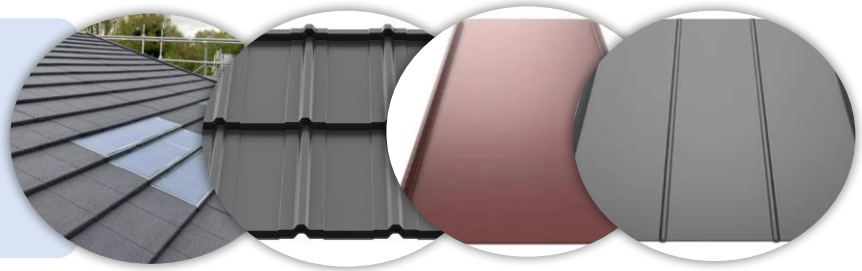
Key Innovation & MMC Priorities

Lightweight Building Fabric Study:

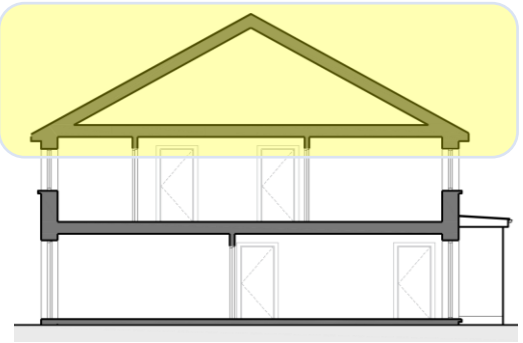
Proposed Construction Methodology Transition:

Light Weight Roof Material Study:

Strategy: Substitute traditional heavy concrete tile roofing with light weight metal roofing solutions. Various profiles such as metal tile and standing seem sheets



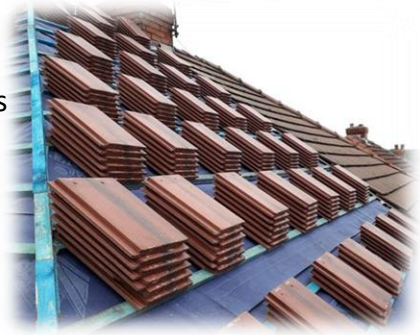
Phase 02 Transition:



Proposed Material Change:

Current Cladding:

- Concrete Roof Tiles fitted on site, fixed to typical timber roof trusses (traditional roof pitch of >35°)



Proposed Cladding:

- Light Weight Roof Cladding solutions consisting of a range of metal roof tiles that mimic traditional, to lager metal sheet profiles

Versatility & Performance:

Product & Process:

- Limited flexibility; Cannot facilitate offsite installation
- Labour Intensive
- High in Carbon
- Slow install

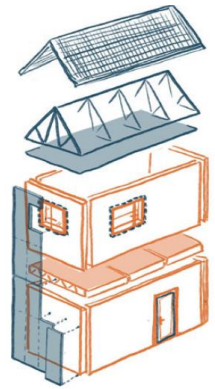
Product & Process:

- Greater Flexibility; Can facilitate offsite (prefab cassettes)
- Can be installed to a reduce roof pitch
- Sustainable low-carbon solution.
- Quicker install times.

Proposed PMV Enhancement:

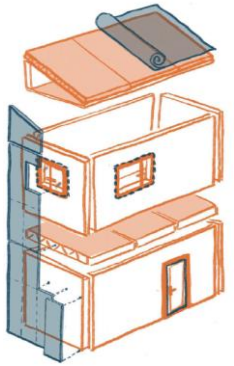
Previous PMV Score: 55%

- PMV score includes benefits from substituting traditional brick & block with innovative light weight external wall claddings (installed offsite)



Estimated PMV Score: 60%

- Increase from the previous PMV baseline due to potential options to install light weight roof materials offsite. Potential to un-lock prefabricated roof cassettes



Key Innovation & MMC Priorities

Lightweight Building Fabric Study:

Current Heavyweight Roof Covering & Roof Structure Construction Methodology:

Install prefabricated roof trusses, fit cross bracing

Membrane applied on site, then timber roof battens fitted

Multiple loads of con roof tiles distributed across the roof, prior to installation

Roof tiles installed and ancillary trims & flashing applied. Gutter and facia installed

Key Innovation & MMC Priorities

Lightweight Building Fabric Study:

Proposed Lightweight Roof Covering & Roof Structure Construction Methodology:

Option 1: Metal Roof Tiles

Option 2: Metal Roof Sheeting

Metal Roof Tiles mimic existing. Efficiency benefits: lighter & reduced logistics

Contemporary solution. Efficiency benefits: reduced pitch & prefab cassettes

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Proposed Light Weight Floor Cassette & Rapid Foundation System

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Key Innovation & MMC Priorities

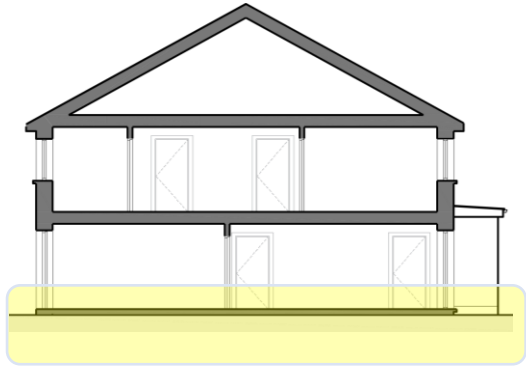
Light Weight Floor Cassette & Rapid Foundation System:

Proposed Construction Methodology Transition:

Rapid Foundation & Light Weight Floor Cassette Solutions:

Strategy: Substitute traditional in-situ concrete foundations, concrete block rising walls and in-situ concrete ground floor slabs with metal screw piles and a lightweight floor cassette, pre-manufactured offsite.

Phase 03 Transition:



Proposed Material Change:

Current System:

- In-situ concrete foundations, concrete block rising walls and in-situ concrete ground floor slabs

Proposed System:

- Ongoing research project where we are exploring the appropriateness of utilising steel screw piles & a lightweight pre-manufactured floor cassette

Versatility & Performance:

Product & Process:

- Limited flexibility; Cannot facilitate offsite installation
- Labour Intensive
- High in Carbon
- Slow install

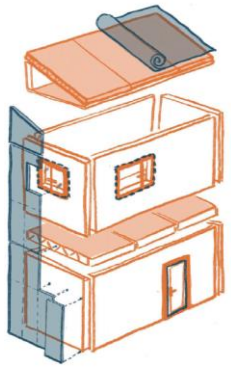
Product & Process:

- Greater Flexibility; Can facilitate offsite (prefab cassettes)
- Pile installation offers program benefits.
- Reduction in soil relocation
- low-carbon solution.
- Quicker install times.

Proposed PMV Enhancement:

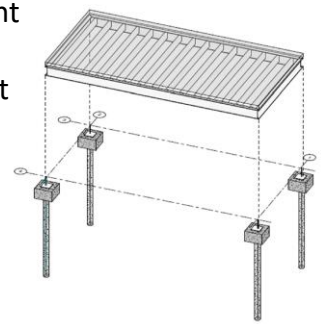
Previous PMV Score: 60%

- PMV score incorporates the benefits from utilising innovative light weight external wall claddings & light weight roof materials (installed offsite)



Estimated PMV Score: 70%

- Increase from the current PMV baseline based on utilising both lightweight wall and roof claddings, which allows us to explore innovative, lightweight, rapid foundation & ground floor cassette systems



Key Innovation & MMC Priorities

Light Weight Floor Cassette & Rapid Foundation System:

Current Foundation & Ground Floor Slab Construction Methodology:

Step 1

Reduce soil level (soil removal & relocation), dig & pour concrete foundations

Step 2

Construct concrete block rising walls. Height various re soil condition (circa >1m)

Step 3

Bring up ground level with use of lean mix, gravel, sand blinding etc.

Step 4

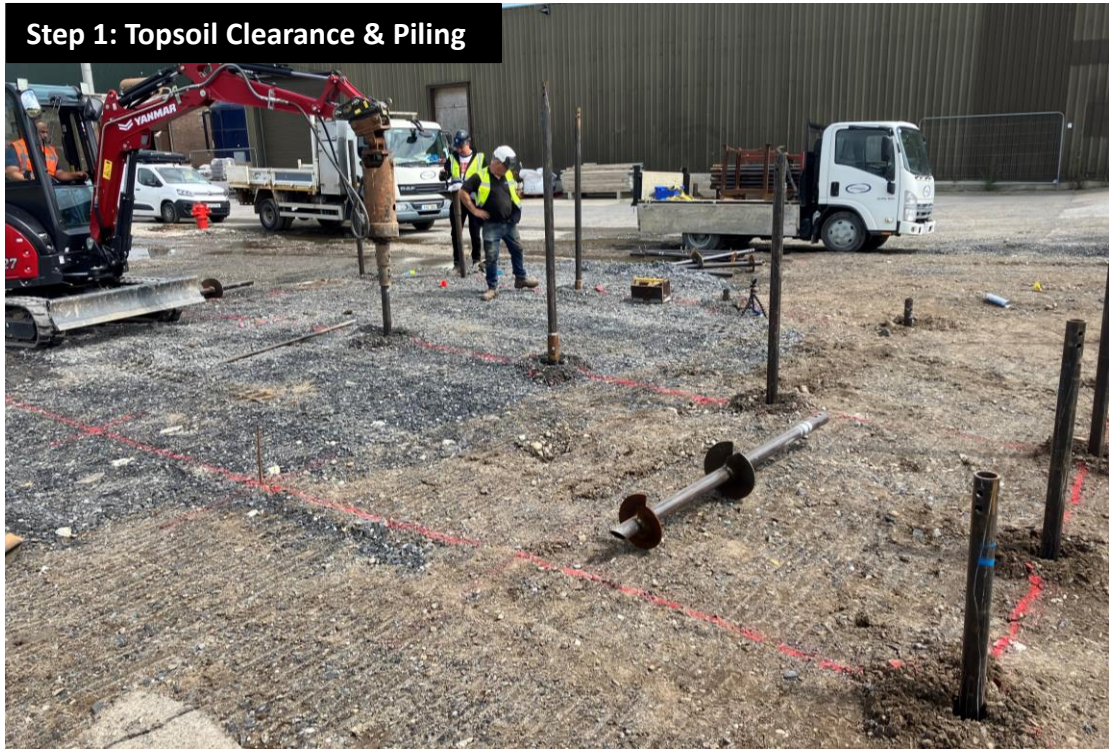
Prepare ground floor pad (formwork, insulation etc.), then pour concrete slab

Key Innovation & MMC Priorities

Light Weight Floor Cassette & Rapid Foundation System:

Proposed Rapid Foundation & Lightweight Floor Construction Methodology:

Step 1: Topsoil Clearance & Piling



Step 2: Placement of Prefabricated Cassette

Removal of topsoil (no foundation trenches required), install screw piles

Install pile caps (either steel or concrete), and fit prefabricated cassette

Key Innovation & MMC Priorities

Light Weight Floor Cassette & Rapid Foundation System:

Rapid Foundation & Light Weight Floor Cassette Prototype:

WIP Prototype: Light Weight LGS Floor Cassette on Steel Screw Piles

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Mauer Façade System

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Key Innovation & MMC Priorities

Mauer Façade System:

Lightweight Building Fabric Study: Mauer Light Weight Brick Façade Panel

What Is It:

- Comprises of a Lightweight Composite Façade Panel, that is prefabricated and has a brick slip effect finish which can match any brick type.

License Agreement:

- An agreement between Nua & Mauer which grants Nua exclusive supply of the Licensed Façade Product, for manufacture & installation in the Republic of Ireland.

Current Certified System
(manual installation of prefabricated panels)

Certified façade panel, fixed to an aluminium subframe system, fixed back to the Structural Timber Frame wall

Proposed Certified System
(automated application within the factory)

Centred around enhanced automation, where the finishing material is applied to the entire timber frame panel within the factory. The panel will also be fixed to timber batten supports as opposed to an aluminium cleats

Key Considerations:

- **Compliance Check**
- **Suitability for Irish Climate Conditions**
- **Performance 'Through Wall' Testing with Substrate**

Implication Phase:

- **Phase 1:** Initial installation of prefabricated panels; installed & assembled either onsite or offsite
- **Phase 2:** Automated application applied within the factory

Key Innovation & MMC Priorities

New Co. Façade Solution:

Compliance Due Diligence - Lightweight Building Fabric Study:

Light Weight Brick Façade Panel: Technical Due Diligence:

Certification:

Undertook a detailed audit of all certification and testing to ensure the system is compliant with the Irish Building Regulations

Climate:

Undertook a detailed audit of all testing data to ensure the system is compliant with the Irish Climate Conditions

Performance:

Commissioned multiple performance tests (fire, acoustic etc.), to ensure compliance with the Irish building regulations, from a through wall perceptive.

Prototype:

Commissioned prototyping within Nua Carlow, which allowed us to familiarised ourselves with the detailing and interface element of the system.

Key Innovation & MMC Priorities

Compliance Due Diligence:

Glenveagh Due Diligence Summary - Kiwa Certification & Test Data:

Catalyst Compliance Audit:

- Below is a summary of the technical audit conclusion, which catalyst carried out on the Mauer Façade Panel.
- Based on the below summary, the system is deemed complaint with the Irish Building Regulations.

Building Reg Part	Subject	Compliance Status
Building Reg Part A	Structure	Compliant
Building Reg Part B	Fire Safety	Compliant
Building Reg Part B	Fire Safety - Volume 2 Dwelling Houses	Compliant
Building Reg Part C	Site Preparation & Resistance to Moisture	Compliant
Building Reg Part D	Materials & Workmanship	Compliant
Building Reg Part E	Sound	Not Applicable
Building Reg Part F	Ventilation	Compliant
Building Reg Part G	Hygiene	Compliant
Building Reg Part H	Drainage & Wastewater Disposal	Compliant
Building Reg Part J	Heat Producing Appliances	Compliant
Building Reg Part K	Stairways, Ladders, Ramps & Guards	Not Applicable
Building Reg Part L	Conservation of Fuel & Energy - Dwellings	Compliant
Building Reg Part L	Conservation of Fuel & Energy - Buildings other than Dwellings	Compliant
Building Reg Part M	Access and Use	Not Applicable

Durability:

- Testing and Certification demonstrates the expected service life durability will be in excess of 60years.
- The 60-year durability assessment included reviewing test evidence carried out by an EA accredited test body under UKAS)

CATALYST

Catalyst (Irish Technical Adviser) and our wider design team reviewed all Lucideon test data and have confirmed that all tests were conducted in accordance with European test methods; while also ensuring all testing / results conforms with Irish climates.

LUCIDEON

TEST REPORT

60-Year Durability Assessment of Mauer Composite Façade Panel and Façade Cladding System