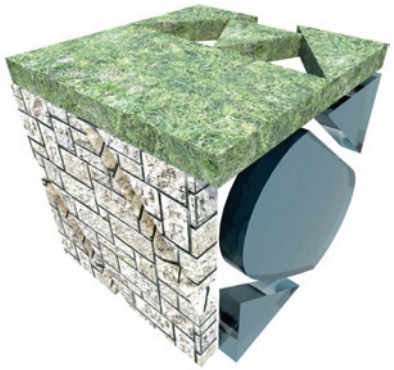
Northern Periphery Programme 2007-2013

NEES Project
Draft Final Content Report



Project Name	NEES PROJECT
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Social Housing Project using Hempcrete & Timber, Antrim N.Ireland

1. Introduction

The Natural Energy Efficiency and Sustainability (NEES) Project is a trans-national partnership comprising 8 agencies from 5 regions in the Northern Periphery of Europe. The Project began in 2011 and was completed in April 2014. The main motivation was an interest in the development of sustainable architecture, and in particular, the potential use of renewable and recycled materials in achieving this.

Having been initiated in Ireland, most of the NEES Project 8 partners were drawn from this region:

- **Cork Centre for Architectural Education (CCAE)**, University College Cork who had an interest in low-impact sustainable design;
- **South Kerry Development Partnership**, a regional partnership promoting a range of social, economic and environmental community initiatives in county Kerry with a keen interest in sustainable development;
- **Northside Community Enterprise**, a community based employment project that was implementing the Government's 'Warmer Homes Scheme' for energy retrofit of low income housing;
- **Claremorris Irish Centre for Housing (Clár ICH)** a community housing association based in County Mayo aiming to develop more sustainable housing;
- **The Ulster Business School**, at the University of Ulster who provided support in the area of business feasibility;
- **The Centre for Energy and the Built Environment**, Glasgow Caledonian University (GCU) brought in expertise in energy and carbon measurement and sustainability;
- **The School of Architecture at the University of Umeå, Sweden** who brought in the Scandinavian experience and
- **The Arctic Technology Centre (ARTEK)** Sisimuit, Greenland who provided the Arctic expertise.

Over a dozen Associate Partners, including several local authorities, public bodies, housing associations and private producers and service providers also contributed to the NEES Project.

During the course of the 3 year project, the NEES Project delivered 28 products and services related to this objective, including:

- Defined new criteria for selecting and selected 15 best practices in products and services that use renewable and recycled materials;
- Implemented 6 Pilot Projects to demonstrate these best practices in different partner regions;
- Developed a Vocational Training Course in the application of NEES products and services, including Training Modules and a Training Manual course aimed at stakeholders and the public;
- Provided a Project Results web site, www.neesonline.org where complete information and a short film on project activities and results can be accessed and
- Other products and services detailed below.

NEES Partners have also hosted over 12 public events, and provided input into regional and European policies regarding energy efficiency and sustainable construction.

Hedluna School, SWECO Pilot Project

2. Project Story

The NEES Project was initiated by the Cork Centre for Architectural Education (CCAE) at University College Cork, Ireland in 2010. The main motivation was an interest in the development of sustainable architecture, and in particular, the potential use of renewable and recycled materials in achieving this. The interest arose from the practical experience and previous research of CCAE staff, including their participation in a number of social housing developments involving the use of low-impact timber frame construction, cellulose insulation and green roofs in the UK as well as more recent research projects in Ireland that explored a similar approach.

One of the key tasks of the NEES Project Partners was defining Criteria to identify and promote Best Practices in the region, a Work Programme that was led by Glasgow Caledonian University. Partners were aware of a large number of different types of accreditations in existence (around 600). These ranged from Energy Ratings, based on the Energy Performance in Buildings Directive, to Energy Label and Eco-Labels, to more specialised procedures for accrediting entire buildings as well as materials. The Partners decided that all these systems served very specific functions that did not necessarily reflect the particular aims of NEES so they developed a generic system for selection and accreditation of Best Practices, based on specific criteria defined by the NEES Project.

Cob House, Hollies Centre for Sustainability, Cork

The Evaluation Criteria were grouped into five broad and equally weighted categories, summarised below:

- **Resource Efficiency:** This covers the energy efficiency improvement made by using the product / service, lifespan and maintenance, and life cycle issues such as the use of recycled materials, processing and disposal at end of life.
- **Environment and health:** This covers the use of 'natural' materials sourced from environments in the NPP, the impact on climate change of their production (their embodied energy – i.e. their cradle-to-gate / site carbon footprint), and any other environmental or human health impacts from production, installation and use – such as pollution and the use of hazardous materials.
- **Sustainability:** This category covers the longer term sustainability of supply and distribution networks, 'bioregionalism', how the use of the product / service reflects regional architecture, and compliance with conservation legislation. This will allow experts to reward products or services that meet the broader NEES objectives but could be made more sustainable in the long term (for example by improving the efficiency of the supply chain) if demand were to increase as a result of involvement with the project.
- **Enterprise:** This category covers the current status of the product /service (and, if applicable, the range of products/services) on the market, including costs of installation and maintenance, current turnover of the company/organisation, and the status of any existing competitors.
- **Scalability:** This covers the future market potential of products and services in light of current opportunities or barriers to achieving a greater market share, and allowing for the assessment of the likely benefits of promoting the product or service through NEES. It serves as a counter-balance to 'Enterprise' by rewarding products or services with a high potential to grow their market share through involvement with the project.

Evaluation Procedure and Role of the Expert Panel

In order to apply this Criteria and select Best Practices from the entire region, the Partners opted to hold a series of public Calls (totalling 3) asking for submission of a completed questionnaire by any producer or service provider who felt they might qualify as a Best Practice.

The evaluation of these submissions was carried out by a Panel of seven independent Experts nominated from each region:

- **Professor Kevin McCarthy**, Cork Centre for Architectural Education: Professor at University College Cork, the Founding Director of the joint UCC-CIT Cork Centre for Architectural Education;
- **Dr Paul Baker**, Glasgow Caledonian University: Senior Lecturer and Researcher at Glasgow-Caledonian University;
- **Geza Fischl**, University of Umeå: Part-time Project Assistant at Umeå School of Architecture, visiting Professor (ranked) and Visiting Researcher at Mapua Institute of Technology;
- **Tom Woolley**, Architect and Environmental Researcher, freelance educator and environmental consultant for Rachel Bevan Architects, Northern Ireland;
- **Peter Barfoed**, ARTEK, Principal Architect, Tegnestuen Nuuk AS, Greenland;
- **Dr. Colm Cryan**, Course Director for Construction Management and Engineering at the University of Limerick and Director of the Building Physics Research Centre;
- **John Scahill**, Chartered Engineer and Programme Co-ordinator of the BSc (Hons.) in Sustainable Building Technology Programme at GMIT, Galway.

These Experts were nominated by NEES Partners and have recognized experience in their field (architecture, engineering, energy, etc.). Their role has been to evaluate the products or services submitted on the basis of the NEES Criteria. Each expert was required to declare any financial or commercial interests with the applicants at the outset of the meeting and excuse themselves from the relevant discussion(s) where necessary.

Best Practices

The 3 Calls produced over 100 submissions that were first screened for eligibility (e.g. being in the NPP region, using renewable or recycled materials, etc.). The short lists were then evaluated by the Expert Panel, first remotely, then by 3 meetings to secure agreement on the results. This process concluded at the end of December 2013, with the selection of a total of 15 Best Practices. These selected Best Practices were highlighted on the original NEES Web Site, promoted through various press releases, at public and brokerage events and exhibitions taking place throughout the duration of the NEES Project.

The 15 Best Practices selected were:

Ecocel - *Cork, Ireland*

Ecocel is a wholly owned Irish company that manufactures Ecocel Cellulose Insulation for the Irish home market. Ecocel is made from Recycled newspapers to generate a non-toxic, fire retardant insulation product.

Green (Anú) Roofs Ireland - *Cork, Ireland*

Green Roofs Ireland is a full service green roof firm, providing services to design and create unique, performance driven green roof. They provide consultation, design assistance, project management, installation, and maintenance services.

FH Wetland Systems Ltd. - *Ennis, Ireland*

FH Wetland Systems Ltd. is an environmental consultancy based in County Clare which specialises in the design and planting of constructed wetlands, reed beds and zero discharge willow facilities. Other services include wetland habitat creation and edible landscaping.

Mud and Wood - *Sligo, Ireland*

Mud and Wood was founded by husband and wife Colin Ritchie and Féile Butler. Colin is a carpenter and Féile is an architect and together they started earth construction or 'cob' building in 2005. In 2011 they completed their cob and timber frame home in Sligo, Ireland.

Mud and Wood offers courses in environmentally friendly, sustainable, natural building and design.

Advanced Timbercraft - *Newtownabbey, Northern Ireland*

Advanced Timbercraft is an innovative family business specialising in the design and manufacture of bespoke low energy homes. Using timber frames as the base of each home, Advanced Timbercraft also uses recyclable and biodegradable products for insulation and external lining.

Locate Architects - *Dunblane, Scotland*

Locate Architects was founded in 2004 by Chris Morgan, who is one of only five RIAS advanced accredited Architects in Sustainable Design in Scotland, and he is a Past-Chair of the Scottish Ecological Design Association. Chris has over 20 years experience in sustainability in design, and is recognised as one of the leading Ecological Architects in the UK.

Ecological Architecture - *Tombreck & Wemyss Bay, Scotland*

Ecological Architecture was founded in 2008 by Sue Manning and Mary Roslin, who have been researching, teaching and practicing ecological architecture since the mid 1980's. The partnership is based between Mary's home in Weymss Bay and Sue's farm at Tombreck, near Aberfeldy.

Enviroglass - *Shetland, Scotland*
Enviroglass is a stand-alone trading unit within the Shetland Amenity Trust. It exists to provide a local, financially viable, recycling route for Shetland's waste glass, which it turns into a range of value-added products.

Inzievar Woods - *Oakley, Dunfermline, Scotland*
Inzievar Woods is a managed woodland where the environment, local community and economy are all taken into consideration in deciding how best to manage each part of the woodland. Inzievar and its sawmill are suppliers of Scottish hardwoods including oak, elm, beech, sycamore, ash and larch which can be used as naturally durable beams, flooring, and decking.

Martinsons Glulam - *Bygdsiljum, Sweden*
Martinsons is at the forefront of glulam technology and is Sweden's largest manufacturer of glulam products today. Glulam consists of finger-jointed slats of wood that are glued together to form beams which are particularly well suited for construction.

Martinsons Xlam - *Bygdsiljum, Sweden*
Martinsons is one of the largest producers of cross laminated timber (Xlam) which is forested from the northern Swedish woods. Xlam timber is glued across the grain for extra strength and increased dimensional stability.

Masonite Beams - *Rundvik, Sweden*
Masonite Beams, part of the Byggma Group, manufactures Masonite I-Joists and I-Beams which are used as structural components in engineered timber floor, wall and roof systems. Masonite has a comprehensive environmental policy which covers both the manufacture of its products and the sourcing of its raw materials.

SWECO - *Stockholm, Sweden*
SWECO provides sustainable engineering and design solutions and services for urban and regional development. One of the largest companies in Europe, SWECO carries out about 37,000 projects in over 80 countries world-wide.

Hollies Centre for Sustainability - *West Cork, Ireland*
The Hollies Centre for Sustainability has been providing training in Practical Sustainability since 1999. The Centre aims to create working examples of what a sustainable society might look like and is particularly renowned for leading the revival of cob building in Ireland.

MAKAR - *Inverness, Scotland*
MAKAR manufactures natural Structural Insulated Panels (nSIPs) and provides a comprehensive Design and Build service for all building needs. They specialise in the use of local Scottish timber and natural materials to make energy efficient buildings that are as appropriate to client needs as they are to the surrounding landscape

These selected NEES Best Practices were promoted on the original NEES Project Web Site, in press releases, mail shots via email, at public and brokerage events and in exhibitions for the duration of the NEES Project. Details are also available on the new NEES Project Results website - ***www.neesonline.org***

Evaluation of Best Practices

One sample evaluation of a best practice was carried out, A Carbon Footprint of Best Practice Enviroglass, was undertaken by Partner GCU. The conclusion of this carbon Footprint were as follows: (please contact GCU directly for this – NOT COMPLETED)

Pilot Projects

In parallel to the selection of Best Practices, the NEES Partnership undertook the development of 6 Pilot Projects that would reflect the use of NEES Best Practice products and services, or similar products and services that for whatever reason had not been specifically selected but generally fit the NEES Criteria.

These Pilot Projects were mostly funded from external resources, and were very much dependant on the specific circumstances of the Partners who prepared and implemented them. Given the limited funding available, it was not always possible to scientifically evaluate the results obtained.

The Pilot Projects developed were:

The Blue House - *Sisimiut, Greenland*
This was the deep retrofit of a post and beam timber house owned by the Municipality of Qeqqatta. The retrofit in the external cladding of the house consisted of cellulose insulation, with an aluminium envelope. The results of this retrofit are being monitored during the life-time of the house.

The Wooden House - *Skibbereen, Ireland*
This was a passive solar extension and conservatory plus external cladding of a kit-built log cabin in West Cork, Ireland. The works included the construction of a timber extension and solar conservatory, insulated with cellulose, and with a solid and sedum roof.

The Mayfield Community Centre - *Claremorris, Ireland*
Clár ICH designed and built Mayfield Community Centre as part of its' social housing project The centre has very high levels of energy efficiency and the NEES input is specifically in the ceiling insulation, which used recycled paper.

Parnell Cottage - *County Cork, Ireland*
Parnell Cottage is both a comprehensive pilot project, incorporating more than 7 examples of NEES Best Practises, as well as documenting the basis for training in their application. The impact of this Pilot Project was also measured by a comprehensive Life Cycle Assessment (see "Parnell Cottage Life Cycle Analysis" below).

The Passive House - *Umeå, Sweden*
This Pilot Project involved the design and construction of a Passive House incorporating renewable and recycled materials by Swedish Best Practise architects, SWECO. The building is a school, and constructed to BREEAM standards, as well as being a certified Passive House.

Reed Bed System - *Valencia Island, Ireland*
This Pilot Project involves a reed bed system to treat the waste water from the Valencia Lighthouse in County Kerry, a popular tourist attraction on the Western Coast of Ireland. The waste water treatment consists of a series of ponds where waste water is filtered through a selection of plants that effectively remove all pollutants from the water, allowing it to flow clearly into the sea.

Evaluation of Pilot Projects

One sample evaluation of a Pilot Project was undertaken: a Life Cycle Assessment of the Parnell Cottage Pilot project in Cloyne, County Cork. This was carried out by Sustaineo Consultants for South Kerry Development Partnership.

Vocational Training

The NEES vocational training package consists of a set of training modules that address the various aspects of Natural, Energy Efficient and Sustainable (NEES) building practices. The package is made up of six modules:

- **Module 1** General Principles
- **Module 2** Construction Methods
- **Module 3** Envelope 1 Roofs and Earth Construction
- **Module 4** Envelope 2 Windows and Insulation
- **Module 5** Accreditation and Certification and
- **Module 6** Energy and Water Usage

The modules are designed to be stand alone and each module can be delivered individually or as part of the series. Each module consists of a PowerPoint slide presentation which contains notes and images. Module 6 is designed as a support module and covers some of the fundamental building energy principles.

A complimentary Training Manual contains additional training support material that can be used to aid delivery of the modules and a list of the headings from each module and the intended learning outcomes.

Hard Woods from Inzievar Woodlands, Scotland

Impact on Regional and European Policies

The NEES Project has also made representations to both Regional and European Policies relating to sustainable construction and energy efficiency. A notable example is the verbal submission made to the All Party Parliamentary Group on Sustainable Construction in the UK in which the NEES UK Partners made the case for more support for the use of renewable and recycled materials as part of a green construction approach.

In Ireland the NEES Best Practise, Mud and Wood, Sligo made a detailed submission to the Sustainable Energy Authority of Ireland (SEAI) in September 2013, recommending the incorporation of life-cycle thinking into the BER Assessment. Further presentations were also made to the Scottish Parliament.

NEES also participated in the consultation held by the Northern Periphery Programme regarding the proposed objectives of the 2014-2020 Programme. Here we emphasised the regional importance of energy efficiency in the region, to go side by side with the current focus on renewable energy sources. This issue has now been given prominence in the Programme. In addition to this, the NEES public events and presentations have strongly highlighted key issues at regional and European levels.

Newly planted constructed wetland system in North County Dublin, FH Wetlands Ltd.

Follow-on Activities

Activity has been intense during the 3 years of the Project, aiming at achieving its key objectives. During this period, Partners have been surprised at the low level of official support currently given to the use of renewable and recycled materials by public and industry bodies in most regions, and by the difficulties involved in securing accreditation and recognition for natural products and services. However, we have also been impressed at the committed and consistent work carried out by producers and service providers, and some grass roots organisations and lobby groups, to promote this important alternative.

Partners are satisfied that we have achieved what we set out to do in the NEES Project in terms of demonstrating the viability of products and services of this type in the NPP region, and of the kind of mechanisms that could be put in place to support these. However, much work is still needed to make this sector economically sustainable and technically advanced. We believe that both these factors are necessary for the mainstreaming of a more sustainable approach to construction, based on organic architecture and circular economy principles. Partners share the conviction that the best way to ensure this continued development is by the resourcing and continuation of the work carried out in NEES, on the basis of future related initiatives.

In terms of follow-on activities, the NEES Partners have been active in identifying sources of support for continuing the work of the Partnership.

Horizon 2020 Programme (Energy efficiency in Buildings)

A comprehensive proposal was submitted to the Horizon 2020 Programme, under 'Call EeB1 – 2014 Materials for the Building Envelope'. The Proposal titled 'NATLOW CO2' (Achieving Naturally Low Embodied Carbon and Energy over the Life-cycle of Buildings), was submitted in March of 2014.

This new Project aimed to continue and consolidate the work of NEES by identifying a further 15 renewable and recycled materials that contribute to energy efficiency in buildings (this time from the whole of Europe) and which can achieve targeted reductions in energy use and carbon emissions during their life-cycle, as well as superior energy efficiency in use and other sustainability benefits. The NATLOW CO2 Partnership comprises 14 organisations, including 4 current NEES Partners.

Unfortunately, the proposal was not selected for the Programme. A further bid to Horizon 2020 under another Call is currently under development.

Northern Periphery and Arctic Programme 2014-2020

NEES Partners are currently considering the submission of a further NEES bid to the NPA 2014-2020 Programme, involving additional countries, and aimed at consolidating and expanding the principles and processes pioneered in the NEES Project. NEES Partners are currently inviting expressions of interest from other relevant bodies in the NPA Region, including the Canada and Russian regions that might want to join this new proposal.

3. Project Outcomes: Products and Services

1. **NEES Best Practice Accreditation Framework** (NEES Partnership c/o CCAE)
2. **Ecocel**, Cork, Ireland (Eco-Cel)
3. **Green Roofs**, Cork, Ireland (Green Roofs Ireland)
4. **FH Wetland Systems Ltd.**, Ennis, County Clare, Ireland (FH Wetland Systems)
5. **Mud and Wood**, Sligo, Ireland (Mud and Wood)
6. **Advanced Timbercraft**, Newtownabbey, Northern Ireland (AT, NI)
7. **Locate Architects**, Dunblane, Scotland (Locate Architects, Scotland)
8. **Ecological Architecture**, Tombreck & Wemyss Bay, Scotland (EA, Scotland)
9. **Enviroglass**, Shetland, Scotland (Enviroglass, Scotland)
10. **Carbon Footprint Enviroglass** (GCU, Scotland)
11. **Inzievar Woods**, Oakley, Dunfermline, Scotland (IW, Scotland)
12. **Martinsons Glulam**, Bygdsiljum, Sweden (Martinsons Sweden)
13. **Martinsons Xlam**, Bygdsiljum Sweden (Martinsons Sweden)
14. **Masonite Beams**, Rundvik, Sweden (Masonite, Sweden)
15. **SWECO**, Stockholm, Sweden (SWECO, Sweden)
16. **Hollies Centre for Sustainability**, West Cork, Ireland (The Hollies, Cork)
17. **Makar**, Inverness, Scotland (Makar, Scotland)
18. **The Blue House**, Sisimiut, Greenland (ARTEK, Greenland)
19. **The Wooden House**, Skibbereen, County Cork, Ireland (CCAE, Cork)
20. **The Mayfield Community Centre**, Claremorris, County Mayo Ireland (Clár ICH, County Mayo)
21. **Parnell Cottage**, Cloyne, County Cork, Ireland (CCAE, Cork)
22. **Life Cycle Assessment of Parnell Cottage** (SKDP, County Kerry)
23. **The Passive House**, Umeå, Sweden (SWECO, Sweden)
24. **Reed Bed System**, Valencia Island, County Kerry (SKDP, County Kerry)
25. **Vocational Training Modules and Training Manual** (ARTEK, Greenland)
26. **Business Feasibilities Best Practices** (University of Ulster)
27. **The Collection** - Umeå Final Seminar presented papers (ed. U of Ulster)
28. **NEES Results Web Site and Summary Film** (ARTEK, Greenland)

4. Project Outcomes: Producers and Providers

Organisation name	City	Country	Outcome
Cork Centre for Architectural Education University College Cork	Cork	Ireland	*1,19,21*
South Kerry Development Partnership	Kerry	Ireland	*22, 24*
Clár ICH	Mayo	Ireland	*20*
Artic Technology Centre, Technical University Denmark (ARTEK)	Sisimuit	Greenland	*18, 25, 28*
Glasgow Caledonian University	Glasgow	Scotland	*10*
Umeå School of Architecture	Umeå	Sweden	
University of Ulster	Coleraine	N. Ireland	*26, 27*
Ecocel	Cork	Ireland	*2*
Green Roofs Ireland	Cork	Ireland	*3*
FH Wetland Systems Ltd	Clare	Ireland	*4*
Mud and Wood	Sligo	Ireland	*5*
Advanced Timbercraft	Newtownabbey	N. Ireland	*6*
Locate Architects	Dunblane	Scotland	*7*
Ecological Architecture	Tombreck & Wemyss Bay	Scotland	*8*
Enviroglass	Shetland	Scotland	*9*
Inzievar Woods	Dunfermline	Scotland	*11*
Martinsons	Bygdsiljum	Sweden	*12, 13*
Masonite Beams	Rundvik	Sweden	*14*
SWECO	Stockholm	Sweden	*15*
Hollies Centre for Sustainability	West Cork	Ireland	*16, 23*
Makar	Inverness	Scotland	*17*

5. Testimonials

NEES Project Testimonial 1

In Scotland, the NEES Project has accredited six products and services, produced or delivered by five businesses based or operating in the EU's Northern Periphery Programme (NPP) Region, as examples of best practice in sustainable natural and recycled building materials.

The project has been able to support these businesses, all of which are micro-SMEs, in a number of ways: marketing and awareness-raising through publications and events; lobbying; enabling access to expert guidance and networks; and in one case the funding of free physical testing and a Carbon Trust certified carbon footprint (to be confirmed).

Although NEES was designed explicitly as a market-enablement rather than a research project, it has clarified the current status and future potential for sustainable building materials, and several academic papers are now under preparation. In Scotland this has provided strong evidence for an urgent need to rejuvenate the sustainable building market, with some traditional skills and industries being now almost completely extinct. NEES has also provided evidence of the potential environmental, social and economic benefits that could be achieved from supporting these producers and service providers.

A key lesson from the project has been the need for a very active approach to engaging with producers and service providers, who often lack time and information and can be sceptical of engaging with top-down projects. It has been possible to reach out to many, if not most, of the relevant Scottish producers through working with appropriate local partners. However the sheer number of service providers (especially architects) necessitated greater focus on producers who are more in need. The geographical restrictions on funding also created a limitation, since many more potentially qualifying businesses are based in the south and east of Scotland. Although in some ways this geographic distinction is justified as it reflects the relative socio-economic deprivation of the NPP region it has also acted as a barrier by limiting engagement with customers and mutually supportive businesses based outside of the region.

To date the key successes of the project in Scotland have been either procedural or political. In particular these include the successful development and implementation of the 'NEES Process' for accrediting best practice and the invitation of the project team to give evidence at both Holyrood and Westminster parliaments. Work is now underway to build on those successes and ultimately gain political backing for measures to support producers and users of locally sourced sustainable building materials, and to form new partnerships to better communicate their benefits and encourage their stipulation in procurement policies.

What is clear is that governments have failed to take a sufficiently holistic view of sustainability to fully understand and value the contributions NEES industries could make to achieving sustainable economic growth. However the project team have found a willingness to engage on the part of politicians and professionals, and the consumer popularity of goods and services that emphasise their regional identity strongly suggests that continued pressure and support should yield tangible and measurable results.

Dr Emmanuel Rohinton, *Professor in Sustainable Design & Construction Glasgow Caledonian University (GCU), NEES Project Leader GCU*

NEES Project Testimonial 2

Sustineo specialises in managing low carbon projects and in quantifying sustainability measures through numbers. We evaluated a NEES demonstration project involving a cottage refurbishment and extension in County Cork, Ireland, against a given set of criteria, including mass, energy, carbon and cost. The evaluation considered a design incorporating six NEES Best Practices against conventional construction practices.

The project achieved reductions in mass, embodied energy and carbon and in cost The savings might have been greater, however, had the evaluation been integrated into the design process from the outset and not after the design was chosen.

It would also have been preferable to design and construct the demonstration project with complete independence from a client. In this case the client made some design decisions that may have conflicted with the NEES partners' objectives.

NEES should consider having a 'control' for its demonstration projects. We were asked to compare the NEES design against conventional practices and define what 'conventional' was. We suggest that for future demonstration projects tenders are issued for both the NEES and conventional design so that contractors must price both designs separately. This would give a more accurate comparison of costs.

Chain of custody for timber products should have been specified in the architect's schedule of works. This would have improved the carbon footprint result. Similarly Iroko was specified in the timber frame which has questionable green credentials.

BER analysis should have been integrated into the design process to ensure a stronger degree of energy efficiency was attained. The BER analysis considers the U-values of the building fabric materials. It does not consider other thermal properties such as thermal mass and thermal inertia (diffusivity) which may have portrayed hempcrete in a more positive light.

Broadly, the materials in the specification for the NEES building envelope, as compared against conventional practice, represent the following 'cradle-to-gate' savings: 64% in mass, 8% in embodied energy and 1.4% in embodied carbon emissions. If chain of custody certificates had been specified and provided, carbon savings were calculated to be 19%. There was a 20% labour saving due to the greater ease and speed of construction using timber frame over concrete slab and blockwork .

Unfortunately the NEES design did not achieve a high Building Energy Rating (BER), and this was principally due to the architectural form and lack of heating controls. So while the building can be considered natural, low carbon and more sustainable, it is not considered to be energy efficient.

Hopefully NEES findings will have a broader impact. Indeed, Sustineo is talking to Kevin Gartland Architects about a possible joint publication on this demonstration project to further promote the findings.

For the future, we would recommend more lead-in time for the evaluation process.

However, it was a pleasure to work with all the people involved: we corresponded and met with the NEES project manager, architect, builder and client who were all helpful. We also met with the other NEES partners at a conference in Umeå, Sweden.

Raoul Empey, *CEng MIEI, MSc, BA BAI*
Sustineo - *www.sustineo.ie*

NEES Project Testimonial 3

Having being chosen as one of the Best Practises by the NEES Project I feel we as a company have benefitted. NEES has helped us bring Ecocel cellulose fibre to the attention of a wider audience.

We spent 2 days in Kerry insulating and meeting groups to answer their questions on our product. It would seem from the reception we got that most people understand the benefits of a sustainably produced insulation when compared to what has previously been available. There was a little resistance from builders who like to be able to control all aspects of a build. However, they were very positive when they were informed of the "Euro cost to U-value" results for cellulose and that the lifespan is the same as the building – this compares to imported synthetic fibres which only have a life span of 20 years maximum.

We are also doing a project in Cloynes insulating floors, walls and sloping ceiling with cellulose while the stone walls are being insulated with hemp-crete. This should make for a very healthy building with all the walls and the ceiling able to breathe and thus contributing to good indoor air quality as long as surface finishes are kept natural as well with no petrochemicals off-gasing. The house in Cloyne is a very good example of what NEES can achieve with its Best Practise products. We need to see NEES getting the opportunity to do similar projects so we can start to really gather empirical data to show that these Best Practise products and services are better performing than the non-sustainable products they are replacing.

It will be interesting to go back to the Cloyne project after the house has been lived in for a year to confirm that all the Best Practise products used have contributed positively to the well being of the inhabitants as well as the building itself.

We need more of these 'live' projects that we can go back to year after year to enable NEES to prove that sustainable building products are the way forward and they don't need to be high tech. Low tech products like cellulose and hemp-crete really do offer a sustainable solution to building good healthy houses.

John Egan, *Managing Director, Ecocel*
www.ecocel.ie

Mud and Wood, Sligo

6. Where to get the solutions

Contact Details

Contact Person: Jose Ospina

Organisation name: Cork Centre for Architectural Education

Address:
University College Cork
Cork
Ireland

E-mail:jose.ospina@neesonline.org

Telephone:+353 28 21890

Work mobile: +353 86 8224429

Website: ***www.neesonline.org***

Instructions: Contact details for Partner and best practices are on NEES Results Web Site. Further information and introduction may be provided by the Project Manager as above.

7. Visualisation

The NEES Project Video can be accessed via the **NEES Project You Tube Channel** - ***https://www.youtube.com/watch?v=asa4T8SPau4***

8. Supporting Documents

Product Fact Sheets: 19
Service Fact Sheets: 9
Pictures: 15 Best Practice posters and 6 Pilot Project sheets
Graph: one graph for all
Video: 1
Others:

- Vocational Training Summary,
- EnviroGlass Carbon Footprint summary
- Parnell Cottage LCA summary
- Best Practices Business Feasibilities Summary
- The Collection – Presentations at Umeå Conference

9. Signature

Place and date:

Authorized signature for the Lead partner organisation:

Factsheet 1

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: NEES Best Practice Accreditation Framework

Key words

Benchmarking, Quality, Criteria, Sustainability, Energy

Purpose

One of the key tasks of the NEES Project Partners was defining Criteria to identify and promote Best Practices in the region, a Work Programme that was led by Glasgow Caledonian University.

Partners were aware of a large number (hundreds) of sustainability assessment tools for the construction industry in existence. These ranged from Europe-wide 'eco-labels' such as NaturePlusTM, national certification schemes such as those run by the UK's Carbon Trust, to bottom-up bespoke emissions and lifecycle accounting tools.

None of these approaches was found to sufficiently reflect the aims and scope of the project, particularly as most were weighted towards one aspect of sustainability (usually environmental), whilst others were insufficiently sensitive to capture the lifecycle benefits of natural and recycled materials. The 'NEES Process' was designed to overcome these limitations, particularly the assessment of wider aspects of sustainability (social, economic, cultural) and the regional focus of the project.

Target groups

- Professionals in construction (architects, surveyors, builders)
- Local Authorities, Housing Associations, Private Property Developers and Managers
- Residents
- Community and Research Agencies concerned with environment, energy and sustainability.

Attributes

The NEES Best Practice evaluation is based on specific criteria defined by the NEES Project.

The Evaluation Criteria was grouped into five broad and equally weighted categories, summarised below:

Resource Efficiency

This covers the energy efficiency improvement made by using the product / service, lifespan and maintenance, and life cycle issues such as the use of recycled materials, processing and disposal at end of life.

Environment and health

This covers the use of 'natural' materials sourced from environments in the NPP, the impact on climate change of their production (their embodied energy – i.e. their cradle-to-gate / site carbon footprint), and any other environmental or human health impacts from production, installation and use – such as pollution and the use of hazardous materials.

Sustainability

This category covers the longer term sustainability of supply and distribution networks, 'bioregionalism', how the use of the product / service reflects regional architecture, and compliance with conservation legislation. This will allow experts to reward products or services that meet the broader NEES objectives but could be made more sustainable in the long term (for example by improving the efficiency of the supply chain) if demand were to increase as a result of involvement with the project.

Enterprise

This category covers the 'current' status of the product / service (and, if applicable, the range of products / services) on the market, including costs of installation and maintenance, current turnover of the company / organisation, and the status of any existing competitors.

Scalability

This covers the 'future' market potential of products and services in light of current opportunities or barriers to achieving a greater market share, and allowing for the assessment of the likely benefits of promoting the product or service through NEES. It serves as a counter-balance to 'Enterprise' by rewarding products or services with a high potential to grow their market share through involvement with the project.

Evaluation Procedure and Role of the Expert Panel

In order to apply these Criteria and select Best Practices from the entire region, the Partners held a series of public Calls (totalling 3) asking for submission of a completed questionnaire by any producer or service provider who felt they might qualify as a Best Practice.

The evaluation of these submissions was carried out by a Panel of seven independent Experts nominated from each region. These Experts had recognized experience in their field (architecture, engineering, energy, etc.) and evaluated the products or services submitted on the basis of the NEES Criteria. Experts were required to declare any financial or commercial interests with the applicants at the outset of the meeting and excuse themselves from the relevant discussion(s).

The experts were:

- **Professor Kevin McCarthy**, Founding Director Cork Centre for Architectural Education, University College Cork, Ireland;
- **Dr Paul Baker**, Senior Lecturer and Researcher , Glasgow Caledonian University, Scotland;
- **Professor Geza Fischl**, Project Assistant Umeå School of Architecture, Denmark;
- **Tom Woolley**, Architect & Environmental Researcher, previously Professor of Architecture, Queens University Belfast, Northern Ireland;
- **Peter Barfoed**, Architect, co-owner Tegnestuen Nuuk AS;
- **Dr Colm Cryan**, Course Director, Construction Management and Engineering, University of Limerick, Ireland;
- **John Scahill**, Chartered Engineer and Programme Co-ordinator, BSc (Hons.) in Sustainable Building Technology Programme at Galway Mayo Institute of Technology, Galway, Ireland.

Further information about the NEES Expert Panel can be viewed on the NEES Project Results Website: ***http://www.neesonline.org/evaluation-criteria-process/expert-panel/***

Selection of Best Practices

The 3 Calls produced over 100 submissions that were first screened for eligibility (e.g. being in the NPP region, using renewable or recycled materials, etc.). The short lists were then evaluated by the Expert Panel, first remotely (with the 'Delphi Process' used to produce overall scores), then by 3 meetings to secure agreement on the results.

This process concluded at the end of December 2013, with the selection of a total of 16 Best Practices:

1. Ecocel, Ireland
2. Green Roofs Ireland, Ireland
3. FH Wetlands Systems, Ireland
4. Mud and Wood, Ireland
5. Advanced Timbercraft, Northern Ireland
6. Locate Architects, Scotland
7. Ecological Architecture, Scotland
8. Enviroglass, Scotland
9. Inzievar Woodlands, Scotland
10. Martinsons Gluelam, Sweden
11. Martinsons Xlam, Sweden
12. Masonite Beams, Sweden
13. SWECO, Sweden
14. The Hollies Centre for Sustainability, Ireland
15. MAKAR Design and Build, Scotland
16. MAKAR natural Structurally Insulated Panels (nSIPs), Scotland

These selected Best Practices were highlighted in the original NEES Web Site, promoted through various press releases, at public and brokerage events and exhibitions for the duration of the NEES Project.

The 16 Best Practices can also be viewed on the NEES Project Results Website: ***http://www.neesonline.org/best-practices/***

References

Organisation name	City	Country
SWECO	Umeå	Sweden
CCAE	Cork	Ireland
Jose Ospina Development Consultant	Skibbereen	Ireland
Clár ICH	Claremorris	Ireland
South Kerry Development Partnership	Cahersiveen	Ireland
Qeqqatta Municipality	Sisimuit	Greenland

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Instructions

The NEES criteria may be applied for the selection of Best Practices in products and services based on natural and recycled materials and providing energy reduction and environmental benefits.

Visualisation

1. NEES Project film
   - ***www.neesonline.org***
2. NEES Graph

Factsheet 2

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Ecocel**, Cork, Ireland

Key words

Ecocel Cellulose Insulation, Recycled Newspapers

Purpose

Ecocel is a wholly owned Irish company that manufactures Ecocel Cellulose Insulation for the Irish home market. Ecocel is made from Recycled newspapers to generate a non-toxic, fire retardant insulation product.

Ecocel Cellulose acts as an effective protective shield to reduce the transmission of heat or sound and is suitable for insulation of Timber Frame Walls, sloping roofs and attics

Ecocel is fire retardant and approved by the Irish Agrement Board.

EcoCel cellulose insulation

Target group(s)

- Irish Home Market: Insulation Installers, Timber Frame Manufacturers, Developers building timber frame homes.
- Architects and Engineers.
- Local Authority Housing.
- Anyone building a house.

Attributes

Ecocel cellulose is an insulation product manufactured entirely from recycled newspaper – a natural product designed to minimise energy loss more effectively than mineral fibres.

Ecocel is one of the most sustainable insulations. Its' main features are:

- Ecocel is made from natural fibres derived from recycled newspapers which might otherwise end up in a landfill;
- Ecocel contains some 50% carbon dioxide. As a result, a timber framed house, insulated with Ecocel, acts as a carbon sink, sequestering many tons of CO2;
- A house insulated with Ecocel can be as much as 40% more energy efficient than current building regulations require;
- Ecocel has a very low embodied energy.
- Ecocel is Airtight. When cellulose is installed to a density of 60-65 Kg/M3 or more, it acquires a unique air-sealing ability, eliminating both conductive and convective heat loss.
- Ecocel is Fire Safe. The borate-based fire retardants in cellulose are non-toxic and provide a high level of fire resistance, meeting all protection standards and in effect providing a fire stop.

Key Benefits of Ecocel

Cellulose has the lifespan of the building whereas synthetic fibres like fibreglass and rock wool has a lifespan of 20 years only. So all the work being done by local councils for the better energy schemes will have to be redone in 20 years, i.e. by the time the councils have finished it will be time to start again.

- **Cost Effective** - Ecocel provides a sustainable solution to energy efficiency without increased costs.
- **Sustainable** - Cellulose has a very low embodied energy, the energy used in manufacturing the product.
- **Energy Efficient** - A U-Value is a means of measuring heat loss. A lower value means less loss. A timber framed wall with 300mm of dense packed cellulose can achieve a U-Value of 0.12 or lower.
- **Hygroscopic** - It can absorb and release moisture, allowing the building to 'breathe', thus promoting a healthy living environment.

Homeowners

For homeowners, Ecocel makes it possible to achieve greater comfort and lower energy bills at the same time, through tighter construction and better insulation.

Whether using Ecocel for insulating attics, adding insulation over existing insulation for additional R-Value, or a professionally installed insulation for protecting your entire home, Ecocel insulation provides a durable, safe, cost effective solution to your insulation needs.

Given that 20% of Ireland's energy consumption goes towards heating Irish homes, it is clear that considerable savings could be made by improving the energy performance of those buildings.

The passive house standard is a cost efficient way of reducing energy consumption and improving comfort levels; simply by improving the quality of the building envelope (the walls and the windows) to minimize losses and maximize gains it would be possible to meet the energy demands of new buildings completely from renewable sources.

300mm of Ecocel cellulose super insulation is a sustainable way to help achieve this.

Builders and Developers

The demand for more comfortable and energy efficient residential and commercial buildings is on the increase, and Ecocel cellulose insulation can help builders and developers to stay ahead of the competition.

Ecocel's application methods ensure that insulation systems will be free of the voids and gaps that drastically reduce the performance of conventional insulation systems, often leading to discomfort, mould, durability and noise issues. Their cellulose insulation has been used in some of the most energy efficient buildings constructed in Ireland.

Ecocel cellulose insulation offers builders and developers the opportunity to increase the value of new buildings by providing superior thermal performance, fire resistance, sound dampening and environmental benefits that are unmatched by any other insulating materials.

The upgrade to cellulose insulation often pays for itself through smaller HVAC equipment and distribution requirements.

New home owners enjoy lower fuel costs and exceptional comfort, while builders and developers will benefit from reduced callbacks, enhanced building durability, and improved customer satisfaction.

Architects

For Architects designing homes and buildings for a living, it is vital to have knowledge of the best techniques and materials available, so they know what kind of stress and pressures your designs can bear.

Cellulose not only provides the greatest thermal and sound insulation per inch, but it also gives greater flexibility in designing structures. The fire-resistance in the cellulose insulation gives architects the option of designing simpler and less costly firewalls. It allows for less space between electrical outlets, which opens up more aesthetic possibilities for a designer.

This is in contrast to man-made, mineral fibre insulations, which consume huge amounts of energy.

Installation

Ecocel provides cellulose insulation and technical support to an ever-expanding installer base across Ireland. All Ecocel installers are fully trained and certified.

All Ecocel installers undergo specialist training to get approved certification. Training takes place in-house at the Ecocel Headquarters in Cork, Ireland.

The policy of Ecocel is to ensure that all installations are carried out in accordance with current standards. Ecocel is committed to compliance with all standards outlined by the Irish Agrement Board (IAB) with particular emphasis on the methods used by installers of Ecocel.

References

Organisation name	City	Country
MBC Timber Frame	Tipperary	Ireland
Ecowise	Galway	Ireland
Coughlan Insulation	Cork	Ireland
McHugh Insulation	Cork	Ireland
Keating Insulation	Wexford	Ireland
GreenTec Ecological Homes	Galway	Ireland
McGee Insulation	Donegal	Ireland
Scandinavian Homes	Galway	Ireland
Joseph Little Architects	Dublin	Ireland
Devana Insulation England	Cambridge	England
John Payne Insulation	Norwich	England
Makar Timber Frame	Inverness	Scotland
Belfast Insulation Company	Belfast	N. Ireland

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Instructions

Contact product producer directly for further information and costs.

Visualisation

1. Ecocel Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-Ecocel.pdf***
2. NEES Graph

Factsheet 3

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Green Roofs**, Cork, Ireland (Green Roofs Ireland)

Key words

Green Roof, Anú Green

Purpose

Anú Green is a full service green roof firm, providing everything you need to design and create a spectacular, unique, performance driven green roof.

Anú Green design, supply and install green roofs that maximise the ecological benefits and take both the built environment and the uniqueness of the site location into consideration. The company provides a complete green roof system supplied with each green roof's unique characteristics.

The company provides consultation, design assistance, project management, installation, and maintenance services. These can be contracted as a complete project or separately to promote sound green roofing practices.

Anú Green also supplies individual components for those looking to install their own green roofs.

Target group(s)

Residential Homes, Commercial Buildings, Home owners, Businesses, Builders, Developers, Architects.

Attributes

Product Description

Green Roofs Ireland (Anú Green) was established by husband and wife team Paul Quirke and Rita Higgins and combines their love of practical design with a reverence for nature in their work. They specialise in creating beautiful, useable outdoor spaces.

Key features of a typical green roof

- **'Natural' and/or 'Recycled' Content**
  Protection Fleece: 100% post consumer recyclables.
  Drainage: 50-100% recycled materials.
  Growing Medium: 60-100% recycled materials.
- **Percentage of the product processed and/or manufactured in the NPP region**
  - 60-90% based on volume.
- **Recyclability / biodegradability**
  All recyclable or biodegradable at end of life.
- **Contribution to Energy Effciency in buildings**
  Green roof systems can improve heating and cooling by 30-90% depending on the type of building and type of green roof.
- **Lifespan**
  30+ years (up to 80 or more).

Costs

The cost of a green roof is entirely dependent on the size and type of green roof required.

The company's guiding principles are:

- **Improving the everyday with good design**

Every day we step out our door more often than not we are facing concrete sidewalks, grey block walls, buildings, building sites, paved surfaces. We don't think it has to be this way and we truly believe by greening these hard surfaces we can improve every day.

Sometimes it is a roof, sometimes it is an old building site, and sometimes it might just be a scrappy lawn. All are opportunities to create beautiful and practical spaces that make both urban living and the rural life a little bit better. We bring our passion for nature and our experience in design, research, engineering and horticulture to every project.

- **Finding a balance between beauty and function**

Sometimes it has to be functional and sometimes just beautiful and as often as possible we design for both.

We truly believe that we can't ignore our role in the landscape around us and every project we take on should consider the long lasting and far reaching effects. Each step of our project is considered in the bigger picture and educated choices are then made.

Every project we take on we hope to improve the relationship of people with their environment, people with nature, bringing people outside into places they would have otherwise completely passed by. Our plan is to find ways to re-connect with the natural world even in the greyest, concrete jungles through landscape design that looks at the integration of buildings and the environment.

Green Roofs Ireland also specialise in landscape design and living walls.

References

Organisation name	City	Country
Jose Ospina Development Consultant	Skibbereen	Ireland

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Instructions

Contact product producer directly for further information and costs.

Visualisation

1. Green Roofs Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-GreenRoof.pdf***
2. NEES Graph

Factsheet 4

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **FH Wetland Systems Ltd.**, Ennis, Co. Clare, Ireland (FH Wetland Systems)

Key words

Waste water Treatment, Constructed Wetlands, Zero discharge Willow facilities

Purpose

FH Wetland Systems Ltd. is an environmental consultancy which specialises in the design and planting of constructed wetlands, reed beds and zero discharge willow facilities.

Constructed wetland systems and reed beds are a natural sewage treatment option, able to provide high quality effuent treatment for septic tanks, industry and municipal applications without the use of pumps, blowers or chemical additives. They can also fit in well around existing systems to achieve a high quality effuent discharge. Zero discharge willow facilities are 100% evapotranspiration systems that rely upon quick growing biomass willow varieties and a carefully designed basin layout to ensure that no discharge to ground water or surface water is necessary.

Since starting the business in 1996 FH Wetlands Ltd have also been involved in a wide range of other environmental consultancy work, wetland habitat creation and restoration projects and edible landscaping projects.

Target group(s)

Local Authorities, Home Owners, Developers, Engineers, Architects and Industry.

Attributes

Constructed wetland systems, reed beds and zero discharge willow facilities all rely upon the action of plants to treat, or evaporate 100% of the effuent entering the system. In this way they are a very natural system that typically have lower energy requirements than conventional effuent treatment. In fact, willow facilities can be net carbon negative in that they will produce more energy in terms of a biomass crop over their lifetime than is consumed by initial embedded energy in construction and pumping (required for the willow facilities to get an even spread of effuent) requirements.

Constructed wetlands use indigenous soils as the growing medium, as do willow facilities. Reed bed systems use locally available gravel. The plastic liner (unless indigenous clay is suffcient) is imported. Wetland plants provided by FH Wetland Systems are native wetland species, sourced within Ireland as much as possible. The willow cultivars used in the zero discharge willow facilities are Scandinavian bred cultivars specifically for biomass production.

The plants used are all natural biodegradable, and the willow facilities can recycle sewage nutrients into firewood.

Both constructed wetland systems and reed beds can be a major contribution to energy saving in any home by providing high quality, zero energy sewage treatment. Willow facilities go a step further and provide a biomass crop to offset fossil energy requirements in your home. For these systems, FH Wetland Systems Ltd. have been working a lot with a Danish company, Centre for Recycling. This design uses a pumped distribution system for evenly spreading the effuent and providing consistent growth rates of the willow trees. Although this uses electricity, this is more than offset by the energy provided by the trees in the form of firewood.

All of these systems have a long lifespan, and where appropriate maintenance is adhered to, can last for many decades without trouble.

Constructed wetland systems have been used throughout Ireland and elsewhere in the NEES project region. Zero discharge willow facilities are commonplace in Denmark, and have in recent years been used in sites in Ireland as a solution for sites of poor percolation.

Constructed Wetland Systems and Reed beds are similar in cost to standard domestic scale sewerage treatment systems. Where self construction is possible this can greatly reduce the costs to the home owner. Where high quality effluent standards are needed, the costs will rise accordingly on account of the additional area requirements. Costs can vary from €1000 - €4000 for standard secondary treatment scale systems, in addition to the septic tank, pump sump and pump.

Maintenance is also needed to cut back the willows on a three-year phased rotation (but the firewood you get out is then free!)

Second year growth in a County Limerick zero discharge willow facility

References

Organisation name	City	Country
Limerick County Council: Domestic Scale Willow Facility for Zero Discharge.	Co. Limerick	Ireland
Coonagh Wetland: Habitat Creation Project	Co. Limerick	Ireland
Ballymaloe Cookery School: Constructed Wetland System	Co. Cork	Ireland

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Instructions

Contact product producer directly for further information and costs.

Visualisation

1. FH Wetlands Systems Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-Wetland.pdf***
2. NEES Graph

Factsheet 5

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Mud and Wood**, Sligo, Ireland (Mud and Wood)

Key words

Natural Building, Cob, Cob Workshops, Mud-wall Conservation

Purpose

Mud and Wood offers a range of services to natural builders including design, planning and building control applications, training, on-site mentoring and certification of construction.

We run public and private workshops using natural materials to make cob ovens, benches, sculptures, etc. We provide conservation advice for and carry out repairs to historic mud-wall buildings.

We design and craft bespoke native hardwood furniture. We design and build garden structures (walls, fireplaces, raised beds, gazebos) using natural materials such as stone, tree trunks and earth.

Target group(s)

- Home Builders, Self-builders, Home Owners of Historic Mud-Wall.
- Buildings, Building Professionals, Gardeners and Landscapers.
- Community Groups, Community Garden Groups, Housing Associations.
- Students, Schools, Environmentalists, Artists and Dreamers, Farmers.

Attributes

Mud and Wood was founded by husband and wife team, Colin Ritchie and Féile Butler in 2011. Colin finished his carpentry apprenticeship under his father in 1987. Féile is an accredited conservation architect and a director of Earth Building UK.

Mud and Wood provides consultancy, training, architectural services, conservation services and building services for Natural Building Projects. The company specialises in and promotes the use of earth building, timber frame/straw-bale construction, windfall (storm-blown) timber, stone and reclaimed construction materials.

Cob, timber, straw bales and stone bedded in lime are all 100% natural and 100% recyclable. Cob, timber and straw bales are 100% biodegradable. All are (naturally) beautiful.

There is an abundance of anecdotal evidence which shows that cob buildings are warm, dry and healthy. Straw bales in timber-frame are a cheap and natural way to super-insulate a building. Around the globe, more and more scientific research is being carried out and more standards are being developed to assist natural builders in achieving compliance with building regulations. From an embodied energy perspective, both cob and straw bale construction can be carbon neutral and even carbon negative.

When detailed correctly, cob buildings will last for centuries. Timber frame homes are classified as permanent construction.

Maintenance is very low-tech. External lime washing is usually required every 3-5 years, but can be extended with the application of potassium silicate.

From an environmentally friendly point of view, it does not get much better than cob-building. You source your raw material yourself, right where you want to build. No tree is cut down, no rock is quarried, no metal is mined and no oil is extracted. Your raw material does not require any melting or heating at high temperatures or the addition of any chemicals or massive quantities of water to turn it into a building material. There is no need for transport from the forest/quarry/mine/rig to the factory and on to the builders' providers, and from there to your site.

From an aesthetic point of view, natural buildings and structures can be sculpted, crafted and moulded to reflect the personality of their owner. They possess soul.

References

Organisation name	City	Country
CLÁR ICH	Claremorris	Ireland
Creative Spark, Louth Craftmark	Dundalk	Ireland
Heritage Walled Garden	Dublin	Ireland
Doras Bui	Dublin	Ireland
Ballina Community Garden Group	Ballina	Ireland
Sligo Grammar School	Sligo	Ireland
Permaculture Gathering	Strokestown	Ireland
Secret Village Festival	Ballaghaderreen	Ireland
Good Life Festival	Oxford Island	Northern Ireland
Private Client – Historic Cob House Survey and Report	Leitrim	Ireland
Private Client – Historic Cob House Consultancy on Repairs	Athy	Ireland
Private Client – Historic Cob House Survey	Dublin	Ireland

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Instructions

Contact service provider directly for further information and costs.

Visualisation

1. Mud and Wood Poster - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-MudWood.pdf***
2. NEES Graph

Factsheet 6

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Advanced Timbercraft**, Newtownabbey, Northern Ireland(AT, NI)

Key words

Low Energy Homes, Timber Frames, Green Building

Purpose

Advanced Timbercraft is an innovative family business specialising in the design and manufacture of bespoke low energy homes. Using air tightened, breathable and ventilated timber frames as the base of each home, Advanced Timbercraft also uses recyclable and biodegradable products for insulation and external lining including cellulose, hemp, sheep's wool, wood wool and wood fibre.

Advanced Timbercraft uses the most advanced engineering, the best craftsmanship and high specification materials to craft each energy saving home.

Target group(s)

Home owners, Social Housing Providers, Local Authorities, Private Developers, Tourism Developers.

Attributes

Advanced Timbercraft (ATC) are a small family business with a big mission to design, manufacture and erect high insulated, air tightened, breathable and ventilated timber frame buildings.

They are focused upon using timber as their base material which is insulated using Cellulose and/or Hemp and/or Sheepwool with external liners made from wood wool or wood fibre.

The complete building is designed and manufactured in the NPP region and virtually all materials used in ATC's process are recycled and biodegradable.

ATC's buildings are seen as being some of the most energy efficient buildings in the NPP region and if ATC's buildings are properly lived in and ventilated they will have centuries of use.

This product is flexible in terms of choice and therefore the cost varies upon decisions made by the potential end user. In the use of a Heat Recovery Ventilation Unit it is necessary to change filters and clean around outlets and inlets of the system. Other than that no maintenance is required to the remainder of the product as it is covered with the remainder of the construction.

Advanced Timbercraft, Northern Ireland

References

Organisation name	City	Country
Robin Herron Property Developer	Holywood	Northern Ireland

Contact Details

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Website: ***www.advancedtimbercraft.com***

Instructions

Contact company directly for estimates and availability.

Visualisation

1. Advanced Timbercraft Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-LocateArchitects.pdf***
2. NEES Graph

Factsheet 7

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Locate Architects**, Dunblane, Scotland (Locate Architects, Scotland)

Key words

Sustainable Architects, Passivhaus Designer

Purpose

Locate Architects was founded in 2004 by Chris Morgan, who is one of only five RIAS advanced accredited Architects in Sustainable design in Scotland, and a Past-Chair of the Scottish Ecological Design Association.

Chris has over 20 years experience in sustainability in design, and is recognised as one of the leading Ecological Architects in the UK. Recently he became one of the first two Architects in Scotland to be certified as a European Passivhaus Designer.

Locate's approach reflects a desire to locate buildings more fully into their surroundings, environment, and local culture so that they 'belong' as few modern buildings now seem to do.

Target group(s)

Community Organisations, County Councils, Hotels, Home Owners, Universities, Environmental Organisations, Sustainable Organisations.

Attributes

Locate Architects is an innovative young practice specialising in contemporary ecological design, tailored to circumstance and budget.

The company uses locally sourced, Scottish Timber which is 100% natural. There are no chemical additives, 0% recycled normally, but reclaimed timber can, and has been used. 100% of the product is sourced in the NPP region where supported by the client.

Re-usability is more relevant than recyclability, we also specify re-used timber, but this is more down to Client taste with finishes, floors etc. Biodegradability is 100%, but the main issue is that we use the timber without preservatives or insecticides so it can be safely composted.

Timber frames are certainly better thermally than frames using metal or concrete, but otherwise there is no major contribution to operational energy use (which is achieved using thermal insulation and airtightness, passive solar design etc). Timber does provide a very large contribution to carbon sequestration which is part of an overall energy efficient design and another reason why we routinely use timber in preference to other materials.

The lifespan of a timber frame home is indefinite, assuming it is designed and specified properly.

Costs vary hugely due to the large number of variables involved.

References

Organisation name	City	Country
Aberdeenshire Council	Aberdeen	Scotland
Aviemore Hilton Hotel	Inverness-shire	Scotland
Community Woodland Association	Kilmartin	Scotland
Crichton Carbon Centre	Dumfries	Scotland
Down To Earth' Housing	Moray	Scotland
Dundee University	Dundee	Scotland
The E3 Partnership (Ecological Consultants)	Hexham	England
Edinburgh University	Edinburgh	Scotland
Energy Agency	Ayr	Scotland
Forestry Commission Scotland	Edinburgh	Scotland
Royal Institute of Chartered Surveyors	Edinburgh	Scotland
Private Clients	Various	Various

A full list of clients is available on the company website:
www.locatearchitects.co.uk/clients.htm

Contact Details

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Instructions

Contact practice for prices and availability.

Visualisation

1. Locate Architects Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-LocateArchitects.pdf***
2. NEES Graph

Factsheet 8

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Ecological Architecture**, Tombreck & Wemyss Bay, Scotland (EA, Scotland)

Key words

Ecological Architecture, Sustainable Building

Purpose

Ecological Architecture was founded in 2008 by Sue Manning and Mary Roslin, who have been researching, teaching and practicing ecological architecture since the mid-1980s and are recognised as experts in the field. The partnership is based between Mary's home in Weymss Bay and Sue's farm at Tombreck, near Aberfeldy.

The farm is also home to a variety of innovative and sustainable buildings designed and built by Sue and Mary, including the Big Shed, which won the Carbon Trust's Low Carbon Building Award for 2013.

Target group(s)

Self-builders, Housing Associations, Community Organisations, Local Authorities, Private Developers.

Hemcrete House, Ecological Architecture, Scotland

Attributes

Ecological Architecture provides a complete range of architectural services for individuals, businesses, organisations and community groups. We offer a flexible consultation process from discussion of preliminary ideas and project initiation to design and development and construction management. They can provide a complete or partial service, according to individual needs.

The choice of building materials is central to the design and approach of Ecological Architecture. We work as much as possible with local and/or renewable and natural materials, such as timber, stone, lime, clay, sheep's wool, straw bales and hempcrete.

When choosing materials other than these we consider:

- Energy required during manufacture or processing.
- Energy required during transport to the building site.
- Planetary resources.
- Robustness and fitness for purpose.
- Maintenance Issues.

We practice an ecological approach to architecture and building considerations from a technical point of view:

- Sun, Energy and all Renewable Energy Sources.
- Finite Global Construction Materials Resources.
- Local Resources and Processes.
- Water.
- Biodiversity.
- Soils.
- Decay and Wastes.

Before considering an energy supply we aim to reduce energy demands by careful building design. Using Passive Solar Design principles, high levels of insulation and natural cooling techniques, the reduced amount of energy required is efficiently supplied by the appropriate choice of Renewable Technologies for particular situations.

These include:

- Solar Panels
- Photovoltaic Cells
- Biomass Boilers and Stoves
- Wind Generation
- Hydro Generation
- Geothermal (Heat Pumps)
- Lifespan

References

Organisation name	City	Country
The Big Shed	Perthshire	Scotland
Holmlea Gardens	Glasgow	Scotland
The Grahams	Perthshire	Scotland
The Manse	Lochtayside	Scotland
Careston House	Brechin	Scotland

Contact Details

Contact Person: Mary Roslin

Organisation name: Ecological Architecture

Address:
Castle Wemyss Drive
Wemyss Bay
Renfrewshire
PA18 6BU
Scotland

E-mail: mary@ecological-architecture.co.uk

Telephone: +353 (0) 1475 529003 **Work mobile:** +353 (0) 79 71397022

Website: ***www.ecological-architecture.co.uk***

Instructions

Contact practice for prices and availability.

Visualisation

1. Ecological Architecture Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-EcologicalA.pdf***
2. NEES Graph

Factsheet 9

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Enviroglass**, Shetland, Scotland (Enviroglass, Scotland)

Key words

Glass Recycling, Recycled Paving, Glasscast

Purpose

Enviroglass is a stand-alone trading unit within the Shetland Amenity Trust. It exists to provide a local, financially viable, recycling route for Shetland's waste glass, which it turns into a range of value-added products.

By processing the glass in Shetland, Enviroglass makes the Shetland Isles a more self sufficient community and adds value to the local economy.

Profits are reinvested into projects which protect and enhance Shetland's unique environment. There is also an active education programme.

Target group(s)

Architects, Local Authorities, Homeowners, Housing Associations, Private Developers.

Scalloway Museum: Enviroglass, Shetland, Scotland

Attributes

Suitable for indoor and outdoor use, Enviroglass Glasscast paving products contain 80% recycled glass. A range of sizes, colours and finishes are available. Our glasscast paving has been used extensively in a range of building and renovation projects, from kitchen floors to large scale public spaces.

Tiles can be treated to expose the glass aggregate or left unexposed, to naturally weather/wear. Whether treated or naturally exposed, the small glass particles give an attractive and distinctive finish.

100% of the product is manufactured in the NPP area. All products are produced in the Shetland Islands, Scotland, utilising Shetland's waste glass. The products are 100% recyclable as an aggregate.

Glasscrete is thought to have better heat retaining properties than traditional paving alternatives and, if laid correctly, product lifespan is estimated at 50+ years.

Enviroglass also provide a range of aggregate products made from 100% recycled glass: Garden Glass, Shotblast and All In Aggregate.

As a social enterprise, any profits generated by Enviroglass are reinvested into environmental projects.

Prices start from £3.00 per paver or £24 per square metre. As with any paving product, minimal maintenance is required.

Contact Details

Contact Person: Chris Massie

Organisation name: Enviroglass

Address:
Cunningsburgh
Shetland
ZE2 9HB
Scotland

E-mail: info@enviroglass.co.uk

Telephone: +44 (0) 1950 477666 **Work mobile:** 07899 890 504

Website: ***www.enviroglass.co.uk***

Instructions

Contact supplier for further details, prices and shipping.

Visualisation

1. Enviroglass Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-Enviroglass.pdf***
2. NEES Graph

Factsheet 10

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: Carbon Footprint Enviroglass (GCU Scotland)

Key words

Recycled glass paving, flooring, aggregate

Purpose

Enviroglass takes Shetland's waste glass (~99%) and recycles it into attractive pre-cast paving and flooring products (80% recycled content), as well as aggregates and bespoke castings. This innovative product has been used extensively in a range of building and renovation projects, from kitchen floors to large scale public spaces, and eliminates a waste stream that would otherwise need to be shipped off the islands.

Target group(s)

- Developers and owners of residential, public and commercial buildings (for new build and retrofit)
- Homeowners
- Landscape gardeners
- The construction industry
- Other users of decorative and ornamental stone and glass (e.g. makers of plaques / awards)

Attributes

Enviroglass is a not for profit company established in 2003, and is managed by the Shetland Amenity Trust. Enviroglass products are available in a range of standard colours, finishes and sizes, as well as bespoke products such as plaques and memorials.

Tests conducted on Enviroglass paving by Dr Paul Baker of Glasgow Caledonian University have found that it is superior in thermal conductivity to comparable products, particularly in comparison with medium and high density concrete (see below). It also has potential for applications where better insulating performance is required, e.g. as a screed material or as a sub-floor material to replace concrete. Further mechanical testing is being planned.

Four samples were tested with test conditions used were as follows:

Cold plate temperature = 2o°C

Warm plate temperature = 22o°C

Temperature difference = 20K

Mean sample temperature = 12.5o°C

Measured thermal conductivities of the Enviroglass paving samples

	Thermal Conductivity W/mK
Sample 1	0.27
Sample 2	0.26
Sample 3	0.24
Sample 4	0.27

The average result is **0.26 ±0.1 W/mK**.

For comparison, the thermal conductivities of other cement based materials are given in below.

Thermal Conductivity of other cement based materials

	Thermal Conductivity W/mK
Lightweight aggregate concrete block	0.57
Concrete (medium density)	1.13-1.59
Concrete (high density)	1.93

Source: Scottish Government 2011 Technical Handbooks - Domestic Section 6 Energy, Table 6.A.18 (www.scotland.gov.uk/Resource/0041/00412257.pdf)

Enviroglass products also have a lower carbon footprint than comparable products (see separate NEES report) and lower Shetland's carbon footprint by eliminating the need to transport waste glass to the mainland for processing.

References

Organisation name	City	Country
Shetland Museum and Archives	Lerwick, Shetland	Scotland
Mareel Cinema and Music Venue	Lerwick, Shetland	Scotland

Contact Details

Contact Person: Sita Goudie

Organisation name: Enviroglass

Address:
Shetland Amenity Trust
Garthspool
Lerwick
ZE1 0NY
Shetland
Scotland

E-mail: info@enviroglass.co.uk

Telephone: +44 (0) 1950 477666

Website: ***www.enviroglass.co.uk***

Instructions

Contact by telephone or email for further information.

Visualisation

1. Carbon Footprint Report
2. NEES Graph

Factsheet 11

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Inzievar Woods**, Oakley, Dunfermline, Scotland (IW, Scotland)

Key words

Hardwoods, Durable Beams, Flooring, Decking

Purpose

Inzievar Woods is a managed woodland where the environment, local community and economy are all taken into consideration in deciding how best to manage each part of the woodland. This ensures that there is enough in the woodlands for everyone to enjoy whatever their priorities.

Inzievar and its' sawmill are suppliers of quality home grown Scottish hardwoods – oak, elm, beech, sycamore, ash and larch – which can be used as naturally durable beams, flooring, and decking.

All our timber comes from environmentally sustainable sources in Scotland, ensuring the future of our local woodlands. A not for profit organisation, all funds raised through the sale of timber are used for local environmental and community projects.

Target group(s)

Home Owners, Builders, Architects, Furniture Makers, Craft Makers, Developers.

Attributes

Scottish Wood is an innovative project born from extensive and ongoing research into the woodland culture in Fife. It is the trading arm of Dynamic Woods, a Scottish Charity that brings together local communities, environmentalists, landowners and local businesses to promote the sustainable development of our woodland resources. Its aim is to regenerate a thriving woodland culture, maximising the potential from our existing broadleaf woodlands. This in turn will secure the future of our woodlands; it will help to improve our local environment, boost our local economy and create genuine local employment and training opportunities.

Timber is a renewable resource. However, the vast majority of our local hardwood resources are wasted or underused. The hardwood industry is left mainly to a few large continental or English firms who send their sales men to scour the land searching for the very best trees to export and process outside Scotland. Some of these products are then re-imported as prime grade timber or veneers. The rest of our timber is deemed "waste" or value-less, trees that have graced our land for hundreds of years are even dumped in landfill sites.

Each species of timber has its own unique character and properties from being clean and non-tainting (an ideal surface for food preparation) to being naturally durable without the need for environmentally damaging chemical treatments. All timbers can be used to make furniture, craft or used as building materials.

Different timber species have different degrees of natural durability and resistance to insect and fungal decay.

Scottish Wood recommends the use of naturally durable timbers as opposed to chemical treatment where possible. This is not only environmentally desirable but also has cost saving implications in initial staining/preservative treatments, subsequent maintenance and longevity.

100% of our product is sourced in the NPP area and it is 100% recyclable.

Costs M^3 vary according to the type of hard-wood:

- Ash £1120-£1341
- Beech £1120-£1341
- Birch £1120-£1341
- Elm £1260-£1765
- Larch £565-£700
- Lime £1120-£1341
- Scyamore £998-£1341+
- Oak £1260-£1765

Contact Details

Contact Person: Chris Morgan
Organisation name: Inzievar Woodlands (Scotland)

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Fife
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Scotland

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Telephone: +353 (0) 1383 851328

Website: ***www.scottishwood.co.uk***

Instructions

Contact product producer directly for further information and costs.

Visualisation

1. Inzievar Woodlands Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-InzievarWoodlands.pdf***
2. NEES Graph

Factsheet 12

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Martinsons Glulam**, Bygdsiljum, Sweden (Martinsons Sweden)

Key words

Glulam, Glulam Beams, Glulam Panels

Purpose

Martinsons is one of Sweden's largest family-owned wood processing companies with around 400 employees and sales of one billion kronor annually.

Martinsons has been at the forefront of glulam technology and is Sweden's largest manufacturer of glulam products today.

Glulam consists of finger-jointed slats of wood that are glued together to form beams in the required dimension. It is particularly well suited to construction and with its' better weighing capacity it is an ideal material for constructing buildings with large bearing distances and open spaces.

It has become an increasingly common choice for building domestically and internationally.

Target group(s)

- **Glulam Panels:** Construction companies, single family homes tenements buildings, business premises.
- **Comwood Poles:** Roadside and park lampposts, 3G Masts and as bearing pillars in bridges and buildings: local Authorities, Building Companies, Engineering Companies.
- **Glulam Beams:** Commercial Premises, Sports halls, Agricultural Buildings. Businesses, Community Organisations, Sports Associations.

Attributes

The Martinson product range offers everything from Glulam beams and cross beams, cross-laminated timber and glulam panels, to construction timber, finger-jointed timber and impregnated wood.

Martinsons offer a wide range of posts and beams in pine or pressure treated glulam in varying sizes. They also provide custom-made glulam post and beam products for a range of customers within the housing and other industries.

Glulam panels are used for properties whose facade is required to be maintained over a long period of time. The panel is manufactured by splitting a glulam beam resulting in a panel with vertical grained wood. As a result, glulam panels maintain their form with only a minimum risk of buckling and splitting.

Comwood is Martinsons' unique proprietary glulam post with a high stability and bearing capacity which makes it suitable for use in place of steel and concrete. Because it is hollow, it is easy to hide cables and pipes from view. Posts can be manufactured with both straight and conical longitudinal sections.

100% Natural and 100% manufactured in the NPP Region, Martinson's Glulam products are also 100% recyclable and have all the energy efficient properties of a wooden structure. With a lifespan of 50 years, Glulam is easy to work with, maintains its shape and is easy to manipulate using traditional hand tools when cutting holes and notches. It is a cost effective solution as the costs related to transportation and the laying of foundations can be kept low thanks to glulam's light weight.

Glulam is a safe material in case of fire, as it burns at a constant rate - Martinsons can deliver glulam in fire ratings R30 and R60.

An important factor in the consistently high quality of Martinsons glulam products is access to the slow-growth spruce and pine forests of Västerbotten, located in northern Europe's coniferous belt. They use the highest quality wood from the forests of northern Sweden that is well suited for construction and joinery purposes.

Costs per M³: 5000 - 8500 SEK

References

Organisation name	City	Country
Berggren & Bergman AB	Luleå	Sweden
Umeå Kommun	Umeå	Sweden
Skelleftea Kommun	Skellefta	Sweden
DAB Domiflex	Frölunda	Sweden
Banverket	Stockholm	Sweden

A full listing of Martinsons Glulam clients are available on the Martinsons website: ***www.martinsons.se***

Contact Details

Contact Person: Linda Nyström

Organisation name: Martinssons

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Burträskvägen 53 S-937 80
BYGDSILJUM
Sweden

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Telephone: +46 914 207 00

Website: ***www.martinssons.se***

Instructions

Contact supplier for prices and shipping.

Visualisation

1. Martinsons Glulam Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-InzievarWoodlands.pdf***
2. NEES Graph

Factsheet 13

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Martinsons Xlam**, Bygdsiljum, Sweden (Martinsons Sweden)

Key words

Cross Laminated Timber, Xlam Timber

Purpose

Martinsons is one of the largest producers of cross laminated timber (Xlam) which is forested from the northern Swedish woods.

Xlam timber is glued across the grain for extra strength and increased dimensional stability. It is environmentally friendly since it is produced from renewable raw materials that are manufactured very energy efficiently with minimal environmental impact.

Target group(s)

- Construction Companies, single family homes tenements buildings, business premises.
- Local authorities, building companies, engineering companies.
- Commercial premises, sports halls, agricultural buildings.
- Businesses, community organisations, sports associations.

Attributes

Martinsons' Xlam (Cross Laminated) wood is a multi-leveled wooden panel with every other layer cross added, creating a dimensionally stable building component with a high load capacity in relation to its own weight.

By using large, stable element in Xlam wood facilitates rational, effcient installation and reduced construction period. Xlam wood can also be combined with other materials to create interesting design solutions.

Xlam is 100% produced in the NPP region and is 100% recyclable. It has all the properties of a wooden structure in terms of energy efficiency and a lifespan of 50 years.

Contribution to Energy Efficiency in Buildings

Properties of a wooden structure.

Costs per M³: 6000-9000 SEK

References

Organisation name	City	Country
Copenhagen Business School	Copenhagen	Denmark

Contact Details

Contact Person: Linda Nyström

Organisation name: Martinssons

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Telephone: +46 914 207 00

Website: ***www.martinssons.se***

Instructions

Contact supplier for prices and shipping.

Visualisation

1. Martinsons Xlam Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-MartisonsCrossBeam.pdf***
2. NEES Graph

Factsheet 14

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Masonite Beams**, Rundvik, Sweden (Masonite, Sweden)

Key words

I-Joists, I-Beams, Construction, Timber, Renewable

Purpose

Masonite Beams is part of the Byggma Group which comprises 12 companies manufacturing building related products with a turnover in excess of £250m. Masonite Beams AB manufactures Masonite I-Joists and I-Beams which are used as structural components in engineered timber floor, wall and roof systems.

Masonite has a comprehensive environmental policy which covers both the manufacture of its products and the sourcing of its raw materials. Manufactured in accordance with the environmental management system ISO 4001, Masonite utilise wood fibre certified by the Forest Stewardship Council. Keeping wastage to a minimum, the maximum use of the whole tree is achieved through efficiency in the manufacturing process.

Masonite is the first company in Sweden to be approved as a manufacturer of non-allergenic building products.

Target group(s)

House Manufacturers, Industrial Builders, Local Authorities, Housing Associations, Private Developers.

Attributes

Masonite Beams manufactures, distributes and sells custom wood beams, joists and sole plates. The flanges for beams and joists are machine sorted and consist of structural timber. The middle section consists of OSB. The adhesive used in Masonite Beams products is a white construction adhesive. 75% of the beams are recyclable and all manufacturing is carried out at Masonite Beams production plant in Rundvik, Sweden. OSB is imported.

Masonite Beams have clear environmental and energy benefits and is best known for being light, strong and straight. Masonite Beams use PEFC certified raw material. The main part of the I-beam material is taken from local, northern sawmills that sort out a specific timber quality to meet our high quality standards. It takes approximately 65% less wood to make our I-beam, compared to the solid construction timber.

Masonite Beams have one of the most modern production facilities providing a very energy efficient manufacturing process. The company has ISO 14001 which certifies that Masonite Beams is actively working on environmental issues and to reduce their environmental impact.

Masonite use environmentally friendly and efficient transport. Through a new and effective packaging process, the company can supply more volume at a lower weight compared to solid alternatives.

Masonite Beams holds an EPD (Environmental Product Declaration) which represent a low CO2 load. The I-beam low weight also gives less need for large cranes on the construction site, while their building systems solutions provide a fast and cost-effective construction process that reduces wastage at all stages.

Masonite beams and joists have the smallest possible environmental and resource-load through the use of flimsy wood dimensions. They are fully degradable, provide superior heat economy through minimal thermal bridges and have a lifespan of 50 years.

Costs: €300-350 m^3.

References

Organisation name	City	Country
Parnell Cottage, Cloyne, Cork Centre for Architectural Education	Cork	Ireland
Greenwich Self Build Charlton, Co-operative Housing in South East London (CHISEL)	London	UK

Contact Details

Contact Person: Stefan Bylund

Organisation name: Masonite Beams

Address:
Box 5 914 29
Rundvik
Sweden

E-mail: kundcenter@byggmagroup.se

Telephone: +46 930-399 00

Website: ***www.byggmagroup.se***

Instructions

Contact company for prices and shipping.

Visualisation

1. Masonite Beams Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-MasoniteBeams.pdf***
2. NEES Graph

Factsheet 15

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **SWECO**, Stockholm, Sweden (SWECO, Sweden)

Key words

Sustainable Engineering and Design

Purpose

SWECO provides sustainable engineering and design solutions and services for both urban and regional development. One of the largest companies in Europe, with over 9000 employees, SWECO carries out about 37,000 projects in over 80 countries world-wide.

Listed on the OMX Nordic Exchange Stockholm, SWECO is one of the largest companies of its type in Europe and a market leader in several areas.

Recent examples of SWECO's work include low energy and 'Passive Houses', a pre-school with a low-energy technology design and they are in the process of building a new ECO-city in China which will be climate-neutral.

Target group(s)

- Urban and Regional Development Projects for Local Authorities and Government Organisations.
- Hospitals, Education Providers, Airports, Train Stations.
- Buildings of Cultural and Historical importance.

Attributes

SWECO delivers high quality consulting services with high knowledge content throughout the client's project chain from feasibility studies, analyses and strategic planning to engineering, design and project management. SWECO is among the largest players in Europe and a leader in several market segments in the Nordic region and Central and Eastern Europe.

SWECO provides sustainable engineering and design solutions that contribute to the creation of a sustainable society. Services include:

- Project program focused sustainable solutions,
- Environmental and quality planning,
- LCA energy based estimates,
- Resource-efficient and maintenance friendly design solutions,
- Passive house concept and
- Environmental certifications.

With a commitment to sustainability, the results of this work is cleaner air, purer water, more efficient usage, better living and working environments, smarter transport solutions and industries that are profitable and environmentally sound.

We make it possible for our clients to carry out projects not only with high quality and good economy bit also with the best possible conditions for sustainable long-term development.

SWECO's use of the concept of sustainability, or sustainable development derives from the UN Report "Our Common Future" from 1987, also known as the "Brundtland Report". It defines sustainable development as development that meets the need of the present without compromising the ability of future generations to meet their own needs.

An example of SWECO's recent work involved the design and construction of a Passive House at Hedluna incorporating renewable and recycled materials. The building is a school, and constructed to BREEAM standards, as well as being a certified Passive House. The Passive House was also shortlisted as a NEES Pilot Project.

Heat energy is reduced by about 80%.

U-values that apply to the school:

- walls: 0.09 W / (m2 K)
- window: 0.68 W / (m2 K)
- glass facades: 0.8 W / (m2 K)
- ceiling: 0.07 W / (m2 K)
- the Ground: 0.07 W / (m2 K) depends on future energy price development

The lifespan of the Hedlunda school is 50-50+ years. Further information about the Passive Hourse can also be viewed on the NEES Project Results Website ***http://www.neesonline.org/pilot-projects/the-passive-house/***

Other SWECO projects include the sustainable Development of a Station area in Oslo, Effective storage of surplus energy in a new Hospital; Passive Houses for residential and educational use, Preserving properties with cultural and historical value and Energy saving at Arlanda Airport.

Costs: Project dependent.

References

Organisation name	City	Country
Svenska Bostäder: Passive Building	Bromstein	Sweden
Maldivan Ministry of Environment	Maldives	Maldives
PEAB: Friends Arena	Solina	Sweden
Holtet Station	Oslo	Norway
Swedish Civil Aviation Authority: Arlanda Airport	Norrköping	Sweden

A full list of SWECO projects is available on their website:
http://www.swecogroup.com/en/Sweco-group/Projects/

Contact Details

Contact Person: Thomas Greindl

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Website: ***www.sweco.se***

Instructions

Contact company for prices and availability.

Visualisation

1. SWECO Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-Sweco.pdf***
2. NEES Graph

Factsheet 16

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Hollies Centre for Sustainability**, West Cork, Ireland (The Hollies, Cork)

Key words

Natural Building Training, Sustainable Building, Cob Building

Purpose

The Hollies Centre, West Cork, Ireland, has been providing training in Practical Sustainability since 1999.

Owned by An Baile Dulra Teoranta, a company with charitable status, the Hollies Centre aims to create working examples of what a sustainable society might look like in the areas of housing, energy, gardening, economics and community development.

The Hollies Centre is particularly renowned for leading the revival of cob building in Ireland.

Target group(s)

Anyone interested in building a cob home, oven, stove or chimney.

The Hollies Centre for Sustainability, Cork

Attributes

The Hollies Centre provides training courses in Natural Building Techniques. It aims to create working examples of what a sustainable society might look like in the areas of housing energy, gardening, economics and community development. Since 1999, the Hollies Centre has been developing educational programmes and examples of natural building techniques.

The approach for our buildings and training courses is to use natural and local materials only, particularly cob -building. The Hollies Centre can teach you how to build your cob cottage, select a site, build the foundations, windows and doors, attachment of wood and other materials, detail work and finishing.

Cob building uses hands and feet to form lumps of earth mixed with sand and straw. It is very easy to learn and inexpensive to build. It lends itself to curved walls, arches and niches. Cob homes are cool in summer and warm in winter. Cob walls are usually one to two feet thick providing immense thermal mass and insulation which is ideal for passive solar construction. A cob building requires little additional heating in winter. With its porous nature cob is resistant to rain and the cold making it suitable for all climates. As it is fireproof it can also be used for building ovens, stoves and chimneys.

With increasing interest in environmentally safe building practices, cob building is enjoying a renaissance. It is non toxic and completely recyclable. It doesn't contribute to deforestation, pollution or mining.

Cob is one of the cheapest building materials available and often the soil removed during the site work is sufficient to build the walls. The lifespan of a cob building is hundreds of years.

Cob building is very simple to learn and in a week long workshop you will learn how to select materials, prepare a mix and build a wall.

Training Costs:

- €60 for one day Introductory Course;
- €250 for 5 day Essential Natural Building;
- €750 for 9-day Complete Natural Building Training Course;
- €3000 for 2 month Apprenticeship.

Contact Details

Contact Person: Thomas Riedmuller

Organisation name: The Hollies Centre for Sustainability

Address:
Enniskeane
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Ireland

E-mail: info@thehollies.ie

Telephone: +353 (0)23 8847001

Website: ***www.thehollies.ie***

Instructions

Contact the Centre via email or phone.

Visualisation

1. Hollies Centre Poster
   - ***http://www.neesonline.org/best-practices/the-hollies-centre-for-sustainability/***
2. NEES Graph

Factsheet 17

Project Name: NEES Project

Type of project outcome: Product/Service

Product/Service name: **MAKAR**, Inverness, Scotland (Makar, Scotland)

Key words

Structural Insulated Panels, Construction, Sustainable, Timber, Builders

Purpose

MAKAR manufactures natural Structural Insulated Panels (nSIPs) as well as providing a comprehensive Design and Build service for all building needs.

MAKAR specialise in the use of local Scottish timber and use natural materials to make energy efficient buildings that are as appropriate to client needs as they are to the surrounding landscape. To date MAKAR have completed more than 60 buildings throughout Scotland.

A MAKAR house can arrive on site and be constructed to wind and watertight within an average of 3 days.

Target group(s)

New Build Residential Homes, Self-builders, Housing Associations, Local Authorities, Private Developers, Community Organisations.

Attributes

MAKAR have established a reputation for delivering high quality energy efficient new build homes for their customers with residential projects making up the majority of their work across Scotland.

MAKAR is led by local architect Neil Sutherland and incorporates Neil Sutherland Architects LLP. The company integrates architectural design, specialist off-site manufacturing and on-site construction to deliver a complete design and build service to clients. Integrated design and build services mean greater control over building projects from start to finish, resulting in greater certainty that projects will be delivered on time and within budget.

MAKAR believe in delivering healthier and more inspiring homes to live in that are sensitive to the environment. Produced by a local workforce, MAKAR supports the regional Highland economy by sourcing high quality materials from their network of the best local suppliers. MAKAR's commitment to using home-grown timber has kept the company at the forefront of pioneering work to further the application of this resource, which is apparent in the bespoke architecture they produce.

MAKAR buildings are designed to have a negligible impact upon the environment. Using natural materials is integral to this approach for several environmental reasons:

- The natural materials we use are mostly from renewable resources and their contribution to carbon emissions will be minimal. Natural materials represent an alternative to synthetic materials which can be harmful to your health.
- Aesthetic qualities: Natural materials from the local area will weather and blend in better with their surrounding environment.
- Afterlife: Buildings made from natural materials can biodegrade into the soil after the lifetime of the building.

MAKAR takes a holistic view to construction by considering the whole life of a building including the legacy this building will leave after its lifespan. We believe in a cradle to cradle approach to manufacturing buildings which avoids the mixing of synthetic and natural materials which creates products that are difficult to dispose of after the building has outlived its purpose.

MAKAR aims to design and build robust, comfortable, healthy, and long lasting houses that are sensitively sited and make a positive contribution to the environment.

The company takes a long term and holistic view of its buildings and works to use resources in a careful and responsible way. This includes the consideration of carbon emissions related to construction processes as well as those related to the day-to-day operation of the finished building.

The use of renewable resources such as timber wherever possible is one of MAKAR's main operational objectives. Another key aim is to construct low energy buildings that are environmentally sustainable and financially economic for their occupiers to heat and power.

MAKAR has a strategy of building and maintaining relationships with suppliers which share our environmental and quality ethos. Our aim is to fully understand the provenance of all the materials and components we use.

Building our network of suppliers, which includes timber suppliers (e.g. Gordon Timber), manufacturers of doors and windows (Treecraft Woodwork), and manufacturers of flooring and timber finishes (Russwood Ltd), provides us with confidence in the quality of both suppliers' products and their services.

The company has always sought to maximise the Scottish content and value of the buildings it manufactures and erects. The company seeks to maximise the local and regional economic impact of its operation wherever possible.

MAKAR's commitment to innovation and research into the use of home-grown timber has positioned the company at the forefront of this expertise in Scotland. In the last 20 years MAKAR (and Neil Sutherland Architects) have been progressive in their approach to modern methods of construction and have invested heavily in off-site manufacturing facilities which have significantly improved the quality and performance of finished buildings. This has resulted in the production of MAKAR's own structural closed panel system that utilises Scottish timber and natural materials to make healthy buildings that are quick to build.

MAKAR continues to push perceived boundaries in this field by prototyping and testing new uses for local timber including Brettstaple/Dowellam, Acetylated timber ground beams, and most recently a timber ridge beam truss. Much of MAKAR's recent research has been conducted in partnership with structural timber experts at Edinburgh Napier University's Centre for Offsite Construction and Innovative Structures [COSIS].

Costs: Vary

References

Organisation name	City	Country
Di Rollo House	Ullapool	Scotland
Woodland Trust Centre	Perth	Scotland
Natural Power Offices	Castle Douglas	Scotland
Fernaig Visitor Centre	Fernaig	Scotland
Royal Dornoch Half-way House	Royal Dornoch	Scotland
Forestry Office Extension	Dingwall	Scotland

A full list of clients is available on the MAKAR website:
http://makar.co.uk/design-build/projects

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Website: ***www.makar.co.uk***

Instructions

Contact company for prices and availability.

Visualisation

1. MAKAR Poster
   - ***http://www.neesonline.org/wp-content/uploads/PDF/BPs/BP-MAKAR.pdf***
2. NEES Graph

Factsheet 18

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **The Blue House**, Sisimiut, Greenland (ARTEK, Greenland)

Key words

Retrofit, Cellulose Insulation, Social Housing, Arctic

Purpose

This was the deep retrofit of a post and beam timber house owned by the Municipality of Qeqqatta. It is a typical wooden building standing on concrete foundations, with minimal internal insulation.

The Pilot retrofit consisted of the external cladding of the house with cellulose insulation, with an aluminium envelope. The results of this retrofit are being monitored during the life of the house.

Target group(s)

Local Authorities, Housing Associations, Private Developers, Home Owners, Builders, Self-builders, Building Professionals.

The Blue House, Sisimuit, Greenland

Attributes

The Blue House is a 28 year old wooden family detached house located in Sisimiut, Greenland. The NEES Best Practice product used in the house was cellulose insulation.

It is estimated that the lifespan of the product used in the property is more than 30 years:

- Boards at outer cladding can be replaced anywhere on the house.
- From window sills, insulation can be checked and refilled in case of breakage.
- Replacement of windows can be done as usual. Windows can be moved further out to more commend depth.
- Extensions are possible as at common constructions.

Maintenance issues:

- Outer cladding can be repainted if wanted – not expected to be necessary the first 10-20 years.

The insulation used for this building is EPS granules 100% recycled material from the dump and paper insulation which is 88% recycled paper. EPS granules can be collected and reused or burned. Paper insulation can be burned or will perish in nature without doing any harm. Wooden boards can be recycled. Fiber boards can be recycled.

Since the Blue House is located in Greenland it was not possible for any of the applied materials to have origin in the country. The Carbon footprint of the building before and after the works is estimated to be Co2 : 7,8t pr year before rebuilding and is expected to be reduced to 4,4t pr year thereafter.

All building regulations according to Greenland building regulations were complied with and there are no human or environmental hazards in installation, use or disposal (end of life).

In terms of better health, the Blue House provides a better indoor climate and the carbon capture potential of building expected (theoretically) is 3,4t CO2 per year.

Sustainability

The Blue House relates to its natural environment and the traditional built environment of its location, although it has used different materials. Most of the products used on the construction and works originated in Denmark but the EPS insulation granule is produced locally from local waste goods. Paper insulation could have been produced if there was machinery present.

The volume of materials needed for this method to add insulation on the building outside and renewing a climate shield is less than traditional methods. In terms of transportation and importation, again this is less than for those of traditional methods.

Materials must always be shipped to Greenland, but all materials are available in Denmark. It would only require a short training programme for local craftsmen to become skilled to perform this method of insulation.

In terms of enterprise and job creation it is possible to replicate the method all over Greenland. There are about 100 companies who would potentially have the skills and material to replicate the model of construction in the region (and outside Greenland) and it can be used in new builds, rebuildings and any building that requires insulation. Promotion, Marketing, Teaching in technical schools, promotion in architects magazines etc would be required to promote the method.

Cost of works: In Denmark the cost is about 1.200 Dkk per M^2 for standard buildings. This is about the same as other methods used so far but there are no other methods that include both walls and basement insulation without thermal bridges.

When annual savings in oil consumption, a further lifespan for the building and improvement of living standard is compared to the cost of building a new house it is a reasonable investment to carry out this method of reconstruction/additional insulation.

The particular elements in the Blue House Pilot Project that are unique and worth developing are the insulation on the building without thermal bridges, coherent insulation of recycled material, the ventilated climate shield and insulation on the basement underground level. The Blue House highlights that too many buildings produce too much CO2 which could be remedied if more buildings used this method of cellulose insulation.

References

Organisation name	City	Country
Quaqatta Municipality	Sisimuit	Greenland

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Instructions

Call Jing to arrange viewings in advance.

Visualisation

1. The Blue House Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/ProjectBriefs/BlueHousePilotProjectBrief.pdf***
2. NEES Graph

Factsheet 19

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **The Wooden House**, Skibbereen, County Cork, Ireland (CCAE, Cork)

Key words

Cellulose Insulation Sedum Roofs, Hempcrete, Solar Conservatory, Triple-glazing

Purpose

This was a passive solar extension and conservatory plus external cladding of a kit-built log cabin in West Cork, Ireland.

The works included the construction of a timber extension and solar conservatory, insulated with cellulose, and with a solid and sedum roof. Also triple glazed windows, skylights and a ceramic tiled floor for thermal mass. Two of the walls were also clad externally with hempcrete.

Target group(s)

Architects, Builders, Home-Owners, Self-builders, Housing Associations, Local Authorities, Building Professionals.

The Wooden House, West Cork

Attributes

The Wooden House is a prefabricated log cabin, made of interlocking sewn logs of cedar timber, 8" thickness prefabricated kit house, designed by Sylvan Homes in Scotland, and standing on a strip concrete foundation, with a floor cavity. It has a ground floor with a bedroom, bathroom, open living room/dining room and kitchen, and a second floor in the roof with 2 further bedrooms and a bathroom. It has a concrete tiled roof. Before works the property had no insulation on the ground floor and only metal sheet insulation in the roof and under the floor.

The house was built in 1991 by the then owner, on a self-build basis with some skilled input from the manufacturers and local builders. There are few wooden houses in Ireland, as they are considered "inappropriate" for the climate. Older houses are made of stone or concrete and very damp. The Wooden House is situated in the countryside in Aughadown Townland, 3 miles outside the town of Skibbereen.

The nature of works was the construction of an extension to the West of the house, to house a new separate living room, and of solar conservatory to the South West, to house a new kitchen. The extension is timber frame; cellulose filled, has a soil roof and stands on block strip foundations. The solar conservatory is also timber built, cellulose filled and stand on wooden piers, with sedum roof and skylights. There is also external hempcrete cladding on the North and East walls.

Contribution to Energy Efficiency

No detailed calculation was made of carbon and energy savings, although both are likely from the additional insulation added. This includes 12"of cellulose on the West and South West walls and 8" of hempcrete on the North and East walls. The construction work and the external cladding are timber frame and hempcrete, which is easy to maintain and repair. There are no added mechanical or synthetic installations. The life span of the property is estimated at 100 years. There are no major maintenance issues. The cellulose insulation is recycled paper, the hempcrete and sedum and soil roofs are natural or renewable materials. Most materials used a biodegradable or easily recycled. There are no chemical/ mechanical processes required in construction. The environmental impact of construction and retrofit is minimal and most materials used, e.g. timber, cellulose, plants for the roof, lime, are carbon capturing.

Environment and Health

90%of the materials used are natural renewable or recycled materials. Very few materials used are synthetic and none are hazardous. Timber and lime is purchased locally, plants used on the roof are found locally. Cellulose insulation is made from recycled paper in Cork City. The carbon footprint of the extension and solar conservatory is unknown, as no calculations have been made. Construction is in compliance with building regulations for extensions. There are no hazardous waste issues involved in construction or end-of-life disposal. The building involved minimal disruption to land and biodiversity. No hazardous or polluting substances were used. Only hand tools were used for construction with the exception of a small digger and a motorised lift for putting solid and sedum on roof. There will be health benefits arising from better insulation, better air tightness, and extra light and air from the solar conservatory. The extensive use of natural materials and lime means that the building is highly carbon capturing.

Sustainability

The property is embedded in the natural environment and reflects this environment in the materials used. It is not traditional of the location, as wooden building is very unusual, but growing, in Ireland. The materials are of local origin as far as possible, but there is no local availability of materials like construction quality timber and hemp. Lime, soil, and plants used however are locally sourced. There will be some impact in the import of materials, but this is not high and unavoidable at the moment. The cellulose insulation used is certified through a NSAI Agréments. The hempcrete is not certified, and there is no certification used for green roofs to our knowledge. There are no evident impact issues

involved in design and there is no conservation legislation applying. Materials for timber framing are readily available, cellulose is available from Cork City at competitive pricing, and sedum roofs and hempcrete installation require specialist services that are available in the region. However, the number of craft persons providing these services with the required skills are very few.

Enterprise Aspects

The retrofit and construction undertaken is low carbon and carbon capturing, and around 80% of materials used are renewable. No social enterprises were involved in the retrofit, but a number of SMEs carried out most of the works involved. These included:

- Eco Cel (Cellulose Insulation) Cork – NEES Best Practice
- Anú Green (Green Roofs Ireland) Cork - NEES Best Practice
- Steve Allin Hempcrete, Kenmare, Kerry – NEES Best Practice candidate
- David Simmonds, Sustainable Builder, Skibbereen, Cork – NEES Best Practice candidate
- Tony Cohu, Architect, Coomhola, Borlin, Bantry – NEES Best Practice candidate
- John O'Sullivan, Surveyor, Planning Consultant, Glengarriff, Bantry

All of these are typical of the small companies and consultancies that work in this field. In addition, up to 4 other local workmen were employed. These SMEs work on a localised small-scale basis, due to scares resources for expansion and marketing.

Scalability

The approach taken to this retrofit and extension could be replicated easily on a one-off basis in this and other regions, subject to the availability of similar tradesperson in other areas. It is not likely that the SMEs involved could carry out more that one of these jobs at a time given current capacity. If a significant scaling up was considered, it would have to be on the basis of a guaranteed new-build or retrofit programme.

As this type of approach is not currently supported by Government retrofit schemes, this is not likely to happen. For this to be taken on board as an alternative approach to retrofit, a major change in approach on the part of bodies like Sustainable Energy Authority of Ireland and the National Standards Authority of Ireland would have to take place. Companies such as Ecocel and Anú Green would have to receive support from bodies like Enterprise Ireland in terms of scaling up their operations, something that is unlikely to happen at present due to the limited demonstrated market (especially public market).

A significant social housing development programme aimed at low-carbon, low energy housing could be a basis for promoting these products and services. A similar example would be the self-build programme that was supported in England in the late 80's and early 90's. (see http://www.zoominfo.com/p/Anthony)> However, this is unlikely at present due to the lack of tangible evidence for and recognition and promotion of this approach.

Conclusion

The Wooden House project demonstrates in a small way that a more sustainable approach to low-carbon retrofit in Ireland is possible and viable. However, the possibility of scaling up this approach at present is limited, due to the lack of official recognition of the potential of renewable or recycled materials in Ireland, and the lack of any retrofit or new development programmes that aim at low-carbon solutions.

This Pilot represents a starting point and a sampling of some of the approaches and technologies that could be applied in a more significant pilot or programme, and one that should involve access to funding for testing and measurement of results. This will to a certain extent be achieved in the Cloyne Pilot project, developed by Cork Cente for Architectural Education. It is also recommended that further Pilot Projects be undertaken along these lines, to continue scaling up and documenting the viability of this approach.

References

Organisation name	City	Country
Jose Ospina, Development Consultant	Skibbereen	Ireland

Contact Details

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Instructions

Please call to arrange visits.

Visualisation

1. The Wooden House Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/ProjectBriefs/TheWoodenHousePilotProjectBrief.pdf***

2. NEES Graph

Factsheet 20

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **The Mayfield Community Centre**, Claremorris, county Mayo, Ireland (Clár ICH, Co. Mayo)

Key words

Ecocel Insulation, Sustainable Insulation, Community Centre

Purpose

Clár ICH designed and built a Community Centre as part of its' social housing project at Mayfield in Claremorris, County Mayo.

This Centre incorporates renewable energies via a district heating system, and is designed to very high levels of energy efficiency. The NEES input is specifically in the Ecocel ceiling insulation, which uses recycled paper.

Target group(s)

Community Organisations, Local Authorities, Housing Associations, Public Bodies, Architects

Attributes

The Mayfield Communal Building is a newly constructed (2013) recreational and social services centre for residents of the Mayfield Sheltered Housing Scheme and organisations catering specifically for older persons and people with disabilities. The floor area of the communal building is 281 m sq encompassing a HSE approved kitchen with dining facilities, office and storage space, laundry facility, meeting room and rehabilitation rooms.

The communal building is nominated as Clár ICH's NEES pilot project and aims to showcase the principles of sustainable building practices by using natural materials as a domestic insulation product. The building will promote the principles of sustainable development demonstrating to the public various heating options such as bio mass and oil. By installing the latest technology to monitor and verify natural heating and insulation products, it is envisaged that the building will become a community training and demonstration hub. The development is located at the starting point of Claremorris's Green Mile, as the town begins its promotional campaign as an eco town.

The communal building is located on a 4.5 acre circa development with an adjacent 36 sheltered houses being built in Mayfield, Claremorris. The development is located in an area of community significance nestled on the shores of Mayfield and Clare Lake, opposite Claremorris Playground and overlooking a community based horticultural project called 'Growing Locally'. The project was funded by the Department of the Environment and National Lottery. The project architect was Waldron and Associates, County Mayo and the Builder was P. McHugh & Sons Ltd, Building & Civil Engineering Contractor, also based in Mayo.

The Building is insulated with ecocel cellulose insulation which shows a 30% to 40% reduction in energy demand when compared to those with man- made mineral fibers. Cellulose is suitable on all retro fit houses and extensions and causes minimum interruption in installation as it is pumped into the cavity filling the vacuole. No maintenance is required as it is pumped into the walls and ceilings and since the product is made entirely from recycled newspapers 100% of its content is completely recyclable in the form of compost. A Wood Gasification System was also installed.

Carbon Emissions

Ecocel contains some 50% carbon dioxide, and, as a result, a timber framed house insulated with Ecocel, acts as a carbon sink sequestering many tons of CO2. The ability to fully compost Ecocel means that Ecocel is an eco-friendly home insulation product made from recycled newspapers, which compares favourably with all imported alternatives.

Energy Efficiency

Ecocel is a sustainable and energy efficient product. It is suitable not just for new homes but also for retrofitting older homes, apartments and commercial buildings. Ecocel is a natural, warm, air tight and fire safe product Ecocel is Hygroscopic (is the ability of a substance to attract and hold water molecules from the surrounding environment.) Ecocel provides a sustainable solution of energy efficiency without increased costs.

Environment and Health

100% of the materials are sourced from recycled paper and the carbon footprint of the building is zero since the Ecocel is pumped into the Cavity and creates a carbon sink. 100% of the materials are compostable and there is no danger to the environment. Ecocel is made from natural fibres derived from recycled news papers which might otherwise end up in land fill.

Ecocel components are non toxic, non irritant and environmentally benign. It also requires relatively little energy in production and does not pollute water, air or soil. It can be easily removed and reused, and can ultimately be returned to the earth (composted).

Sustainability

Ecocel Cellulose is a loose material, it has the benefit of filling voids and eliminating air pockets common with other insulation materials, it performs better by reducing air conditioning or heating costs from 30% to 50%.

Enterprise aspects

Ecocel insulation would be of huge benefit to commercial buildings, apartment buildings, sound and recording studios as well as residential housing. Ecocel has proven itself to be one of the most efficient low-cost solutions to reduce sound propagation from one space to another. Its' application encloses the noise generating source and acts like a sound barrier or absorber keeping noise levels down.

References

Organisation name	City	Country
Mayfield Sheltered Housing Scheme	Claremorris	Ireland

Contact Details

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Instructions

Please contact for access.

Visualisation

1. Clár ICH Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/ProjectBriefs/MayfieldPilotProjectBrief.pdf***
2. NEES Graph

Factsheet 21

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **Parnell Cottage**, Cloyne, County Cork, Ireland (CCAE, Cork)

Key words

Sustainable retrofit , Building Extensions, Natural Materials

Purpose

This project is described in the article "Education, Research, Practice: A Case Study" by Kevin Gartland and Orla McKeever, and is both a comprehensive pilot project incorporating more than 7 examples of NEES Best Practises, as well as providing the basis for training in their application.

The project entails the refurbishment of an old cottage scheduled for demolition, and a timber framed extension providing services. (see The Collection).

The impact of this Pilot Project will also be measured by a comprehensive 'Life Cycle Assessment' commissioned by SKDP, county Kerry.

Target group(s)

Private Home Owners, Local Authorities, Housing Associations, Builders, Building Professionals.

Attributes

The existing single storey cottage of approximately 45m² had three small bedrooms and one main living space. The external walls are of rubble stone, and approximately 450mm thick. The house had no insulation to floor, walls or roof before this project, had single glazed windows and an open fire.

The project entailed demolition of existing partitions to make one large Kitchen, Living and Dining Room. The volume of the attic was opened up into the main room, and lean to extensions and stores added over the years which blocked light were removed. The sills of the windows were dropped and two windows were combined to one large door on the south facing side. The inside of the room was lined with hemp lime plaster, and the external face of the stone walls were lined with 225mm of hempcrete and lime render. The ceiling was insulated with 400mm of cellulose insulation, and a new suspended timber floor was inserted with 200mm cellulose insulation.

The new extension was constructed using plywood web joists to floor, walls and ceiling, and lined with SmartPly 3 formaldehyde free OSB board. The spaces in between the studs were insulated with cellulose insulation. The exterior was clad with cedar shingles. Inside the extension provides an entrance porch, a bathroom and a bedroom. The arrangement of the extension with the cottage allows for a series of well sheltered and sunny spaces around the house, with good access from internal rooms to the outdoors.

The Architect for the Parnell Cottage was Kevin Gartland, Gartland Architects, Cork and the builder was Declan Devoy based in Midleton, County Cork. The NEES Products used in the Pilot project were:

- EcoCel (cellulose)
- Steve Allin (Hempcrete)
- Timber Frame Building using plywood web joists (Declan Devoy & Cork Roof Truss Company)
- Triple glazed windows (Munster Joinery),
- Smart Ply 3 from Coillte.

NEES Best Practice Services were provided by Kevin Gartland, Gartland Architects Blackrock, county Cork.

Other relevant natural products or services:

- Domestic hot water and space heating by wood burning stove.
- Reed bed, solar panel and Sedum roof planned for.
- Detailed calculations to carbon and energy savings are made in an extensive report prepared by Raoul Empy of Sustineo consultants commissioned by NEES which concludes that the building is more natural, and arguably more ‘sustainable’ as it attempts to generate jobs locally, it has lower carbon emissions and the cost analysis indicates that the NEES costs are lower than the conventional.

The Parnell building is designed and constructed to minimise maintenance. External finishes are lime plaster on hempcrete and cedar shingles, both of which are easy to maintain and repair. The life span of the property is estimated at 100 years. The cellulose insulation is recycled paper, the hempcrete is made with natural or renewable materials. There are few toxic materials used in the house due to the client’s allergic reactions to frequently used chemicals.

Environment and Health

Due to allergic reactions of the client, almost all materials used on the project are natural and renewable materials, with a minimum of toxic chemicals used. Other than fibreglass which is used as a roof membrane, very few materials used are synthetic and none are hazardous. Most materials are sourced locally, however some material had to be imported such as lime and hemp used for hempcrete which came from France, and plywood web joists which were manufactured in the UK.

Many of the products used sequester carbon from the atmosphere. The extensive report prepared by Sustineo goes into considerable detail about the carbon footprint and health benefits of the house. The main health benefits can be attributed to better insulation, better air tightness, and ample natural light from appropriate orientation to suit the room. The cellulose insulation and hempcrete both regulate humidity levels and absorb toxins from the internal atmosphere.

There are no hazardous waste issues involved in construction or end-of-life disposal. The building involved minimal disruption to land and biodiversity.

Sustainability

The house and extension work together to integrate with the landscape. The extension is situated so as to maximise natural light and shelter. The materials and labour used in the construction of the project were local where possible, with a minimum of material being exported. Lime and hemp used in hempcrete had to be imported as no local source is available, and plywood web joists are not widely manufactured in Ireland. Cellulose insulation is NSAI back and has and agrement certificate. Hempcrete however, does not and this would be an impediment to its use in other projects.

The most sustainable action in the design process was to keep the existing house rather than demolish, which was the original intent of the owner. Thus, costs have been kept low, a historically significant structure has been retained and upgraded, and the site disruption has been kept to a minimum.

There are no evident impact issues involved in design and there is no conservation legislation applying. Materials for timber framing are readily available, cellulose is available from Cork City at competitive pricing, and sedum roofs and hempcrete installation require specialist services that are available in the region. However, the craft persons providing these services, e.g. with the required skills, are few.

Enterprise aspects

The retrofit and construction undertaken is low carbon and carbon capturing, and around 90% of materials used are renewable. A number of SMEs carried out most of the works involved. These included:

- Ecocel (cellulose insulation) Cork – NEES Best Practice.
- Steve Allin Hempcrete, Kenmare, Kerry – NEES Best Practice candidate.
- Declan Devoy, Builder, Midleton, County Cork.
- Kevin Gartland, Gartland Architects, Cork.

Most of the sub-contractors who worked on the project were local and small scale enterprises.

Scalability

The significance of the Parnell Cottages when they were built was that 40,000 similar houses were built within a five year period. Each house was a 'one off', however collectively they had a large scale impact on the built heritage and quality of life of the population.

There are similarities between that original scheme and this project. Given the number of houses that are demolished, it is feasible through positive and skilful design to refurbish and extend a house with natural and renewable materials. The challenge is supply of competent crafts people in the construction industry and the willingness of building owners to engage them, and the considerable design works necessary to enable them. Cellulose insulation offered the most positive carbon footprint or any material used on this project, and lends itself to up scaling the most.

Conclusions

In this project the most impressive carbon savings were to be found in use of cellulose insulation, while use of hempcrete led to significant use of energy in manufacture and transportation. This project demonstrates, in conjunction with the report prepared by Sustineo, that using natural and renewable materials is not in and of itself a means to delivering reduced carbon footprint for buildings.

Further study into a range of natural materials would provide those involved in design and construction of buildings with emphasis on use of natural materials with a better range of guidance on what would deliver in terms of reducing carbon use.

References

Organisation name	City	Country
Cork Centre for Architectural Education	Cork	Ireland

Contact Details

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Instructions

Please contact to arrange access.

Visualisation

1. Parnell Cottage Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/ParnellCottageNEESFiche.pdf***
2. NEES Graph

Factsheet 22

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Life Cycle Assessment of Parnell Cottage** (SKDP, Co. Kerry)

Key words

Life Cycle Assessment, Energy Consumption, CO2 Emissions, Sustainability

Purpose

As part of the NEES Project, a demonstration project was selected to test six of the 'NEES Best Practices'. The Parnell Cottage project involves the refurbishing and extension of an existing cottage at a rural location outside Cloyne, County Cork, Ireland.

The six Best Practices are:

1. Timber Frame Construction
2. Hempcrete External Insulation
3. Cellulose Insulation
4. Triple glazed Wooden Windows
5. Green (sedum) Roofs
6. Gravel Reed Bed for Wastewater Treatment.

The Life Cycle Assessment carried out by Raul Empey, of Dublin based consultants Sustineo, evaluates the building as a whole and the above Best Practices.

An analysis of the NEES specification, and a comparable conventional design, together with a building energy rating (BER) assessment form the basis of the evaluation. The evaluation metrics are mass, energy, carbon and cost over the life cycle of building, but the report also considers biodiversity, human health, ease of construction and maintenance.

Target group(s)

Building Professionals, Home Owners, Housing Associations, Local Authorities, Private landlords, Policy makers.

Attributes

This report is an evaluation of the demonstration project and the above best practices. The architect provided a set of general arrangement tender drawings and some annotated details for the NEES demonstration project.

The evaluation involved comparing the NEES design with a 'conventional' design; and, as no drawings or details were provided for a conventional design, the evaluation team devised a comparable specification by matching the architectural form and U-values of the building envelope (i.e. the thermal performance of the floors, walls, roofs).

The evaluation metrics included mass, energy, carbon and cost. Energy consumption and carbon emission arise from:

i) making, transporting, installing and disposing of a material – termed 'embodied' energy or carbon emissions;
ii) people living in a house using electricity and fossil or renewable fuels – termed 'operational' energy or carbon emissions.

With regard to the building envelope, three types of carbon have been calculated separately, namely: those arising from the combustion of fossil fuels; those arising from the combustion of biomass; and the amount of carbon that can be stored in timber and cellulose based materials.

The Cloyne demonstration project has been evaluated on a life cycle basis (tender requirement) and with a second technique called carbon profiling (not a tender requirement, but provided as it is perhaps a better method for illustrating the relative merits of carbon assets against the typical lifespans of different building elements).

Building Results

The results take consideration of the NEES design against the conventional design with regard to materials and a 100 year life cycle assessment. The 'cradle-to-gate' impact of materials includes extraction or harvesting of raw materials, transportation of raw materials to a factory, and processing these materials into a building material or product. While the 100 year life cycle assessment (LCA) adds the remaining life cycle phases to this including: transportation from factory gate to site; construction; operation (house being lived in); and end of life (final disposal of building elements).

Based on the assumptions detailed in this report, the materials in the NEES specification are a third of the mass of the conventional specification, save 8% embodied energy (cradle-to-gate), save 1.4% carbon emissions (including biomass emissions as it is not clear that timber is from sustainable sources, and excluding positive effect of carbon sequestration), and making a 20% labour saving which is principally due to the greater ease of construction resulting from use of timber frame construction (i.e. less use of teleporter to carry heavy blockwork materials, less excavation for larger foundations, quicker erection of timber frame as against conventional blockwork construction).

The transport impact of the NEES specification is 185% greater than that of the conventional, largely because niche products must be sourced further afield (particularly green roof substrate and hempcrete materials). In this respect, the NEES specification needs more careful consideration.

BER

A Building Energy Rating (BER) assessment was integral to the analysis of the building in use.

Although the NEES design cannot be considered energy efficient as it received a D1 rating, it does however represent a significant improvement before the works commenced. Principal reasons for the poor D1 rating include having larger than normal ratios of window to floor areas, and external surface area to floor areas, as well as not specifying heating controls. Although the heating system can be considered low-carbon, DEAP bases its energy value calculations on primary energy consumed, regardless of the fuel type being biomass or fossil fuels.

Biodiversity & Human Health

Impacts to biodiversity and human health are considered, and while the NEES best practices generally perform well, it is notable that the NEES specification pays no attention to securing chain of custody certificates for timber products, rather, it specifies tropical hardwoods with very questionable green credentials (i.e. Iroko). With regard to human health, ventilation is considered a disimprovement to conventional practice (which would typically have mechanical extract fans), as moisture build up will increase the likelihood of mould.

Wastewater Treatment Results

The gravel reed bed has double the mass burden of conventional wastewater treatment systems but compares favourably in terms of cost by presenting a possible 11% cost saving against a comparable biofilter system. Embodied energy and carbon emissions are broadly similar between all options considered. It should also be pointed out the gravel reed bed, constructed wetland and willow facility options all require significantly more space than comparable conventional systems, and the cost of land is not factored into the calculations contained in the report.

NEES Best Practice Results - NEES Best Practice Evaluation:

1. **Timber frame construction:**
   lower mass, higher EE, lower EC, especially allowing for sequestration.
2. **Hempcrete external insulation:**
   Higher mass, higher energy, higher emissions even if allowing for sequestration.
3. **Cellulose insulation:**
   Higher mass, lower energy, lower emissions.
4. **Triple glazed wooden windows:**
   Lower energy, lower emissions.
5. **Green (sedum) roofs:**
   Higher mass, energy & emissions as it is an add on.
6. **Gravel reed bed (wastewater treatment):**
   Higher mass, slightly higher energy, slightly lower emissions.

Broad Conclusion

In considering the title of the project – Natural Energy Efficient and Sustainable – the broad conclusion to the demonstrator project as against a conventional build is that:

- Yes, the building is more natural
- No, the building is not energy efficient, as it has a low BER rating (although energy is reduced by over 50% from what it was before retrofit)
- Yes, the building is arguably more 'sustainable' as:
  - People: it attempts to generate jobs locally.
  - Planet: it has lower carbon emissions.
  - Profit: the cost analysis seems to indicate that the NEES costs are lower than the conventional. In terms of contributing more to the local economy, further consideration is needed to source materials that are required by the NEES best practices more locally.

References

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Instructions

A copy of the Report can be downloaded from the NEES Project 'Results' Website:
http://www.neesonline.org/wp-content/uploads/PDF/CloyneEvaluationReport.pdf

Contact service provider for quotes and conditions.

Visualisation

1. Parnell Cottage, Cloyne Summary Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/NEESDemonstrationProjectoverview.pdf***
2. NEES Graph

Factsheet 23

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **The Passive House**, Umeå (SWECO, Sweden)

Key words

Passive House Umeå, SWECO Architects

Purpose

This involved the design and construction of a Passive House incorporating renewable and recycled materials by Best Practise SWECO architects.

The building is a school, and constructed to BREEAM standards, as well as being a certified Passive House.

Target group(s)

Residential Housing, Architects, Builders, Developers, Schools, Community Organisations. Local Authorities, Housing Associations,

The Passive House, Pilot Project, Sweden

Attributes

The challenge facing this project was to come up with a building design process that would allow first through third-year students at a trade school to build high-quality Passive House buildings in the far north of Sweden with environmentally friendly, renewable construction materials.

From the very beginning, the single-family homes were designed to implement local environmental goals. The vocational school aims to train its students to a very high level, which of course includes construction projects that already strive to meet future construction standards.

The challenge of designing a Passive House building 300 km south of the Arctic Circle required a verified calculation tool; we chose the PHPP. Even at the beginning of the process, it was clear that the homes could not achieve the heating demand of < 15 kWh(m2a) called for in the international Passive House definition while also using renewable, zero-emission construction materials. The client, therefore, decided to plan for FEBY, a national Passive House certificate.

Quality is defined based on a project-specific quality and environmental plan and on adaptation of other certification systems – in this case, the national Passive House certificate FEBY and the highest class (gold) of the national sustainability certificate MiljöByggnad. At a later point in the project, the international Passive House certificate for pilot projects also became a factor.

Contribution to Resource Efficiency

The project's environmental and quality plan includes the following topics:

- Non-toxic indoor climate with low thresholds for formaldehyde, VOCs, TVOCs, CO2, and radon – we need to build for people; otherwise, it doesn't make sense = strict limits on emissions in indoor air.
- Highest possible resource and energy efficiency with maximum comfort and quality while also reducing CO2 emissions = international Passive House certification.
- Renewable energy for residual energy demand = Nearly Zero-Energy Building.
- Renewable, zero-emission construction materials with low embodied energy levels.
- (LCA) External quality assurance (not typical in the Swedish construction process) on the construction site plus quality assurance based on Passive House and sustainability certification.
- Materials and structures with long service lives, low maintenance expenses, easy to update and dismantle (LCC).
- Flexible floor plans, flexible and easily accessible building services equipment, nonload bearing walls inside, accessible ventilation system.
- Possibility of prefabricating building components for higher construction quality.
- Good location, well connected to local transportation and commercial and public facilities – Use of existing infrastructure.

Environment and Health

Non-toxic indoor climate with low thresholds for formaldehyde, VOCs, TVOCs, CO2, and radon – we need to build for people; otherwise, it doesn't make sense = strict limits on emissions in indoor air.

Sustainability

In 2012, FEBY1 certified the first three buildings according to the Swedish Passive House Standard. Because the heating demand is 18, international Passive House certification is not possible. The Passive House Institute's suggestion of using insulation with a much lower lambda value was considered based on a simple calculation of cumulative primary energy consumption. Because the buildings strive for all Passive House quality criteria, were planned with the PHPP, and use only certified PH components of the highest quality, the project was nevertheless designated a "pilot project" in October 2013.

LCAs were conducted early on envelope structures common in Sweden. We decided on a Passive House quality building envelope with Icalculations and the city council's environmental resolutions approved of the decision to use Igoals. Thermal benefits and the factory's location only 50 km away were also viewed positively.

Because each group of students, based on the year they began vocational school, should have "their own construction site," single family homes had to be built instead of duplexes, which would have had a heating demand of 15kWh / (m2a). Much of the focus on potential thermal improvements was therefore placed on comparing the environmental effects of different kinds of insulation. Because CPEC is based on how much primary energy is used, it is an ideal indicator of energy resource consumption. It also means that all different kinds of energy use included in cumulative consumption must be considered in relation to primary energy use.

Using PUR/PIR insulation meant that insulation thickness in the building envelope could be reduced to 10 cm and a maximum heating demand of 15 kWh / (m2a) could be achieved. PIR/PUR insulation, which has a much lower thermal conductivity (**λ**), meant the project could earn standard Passive House certification, but it also entails much higher primary energy consumption for production, uses crude oil, and has a significantly higher GWP.

A simplified lifecycle assessment showed that a Passive House building insulated with recycled natural fibers would have a lower CPEC and GWP and, therefore, significant environmental benefits. PIR/PUR insulation would reduce the environmental footprint on the site into account when comparing ecological aspects of the various insulation materials.

Enterprise Aspects

Constructing energy-efficient buildings was not the only project goal. City council resolutions stipulate that renewable construction materials must always be given preference over non-renewable materials and that, starting in 2012, all educational facilities must be free of toxic substances.

Because the construction sites for this project serve as "classrooms" for the trade students, these guidelines were kept in mind when drawing up the building concept and choosing construction materials. Maximum emissions in indoor air are therefore also defined in the project's quality and sustainability plan.

For all of the buildings' lifecycle stages, there was a consistent effort to reduce the consumption of energy and resources and minimize effects on the ecosystem.

Scalability

In Sweden, vocational training is mostly provided at trade schools. The country does not yet offer any specific training for tradespeople to reliably construct the Nearly Zero-Energy Buildings (NZEB) to be implemented throughout the European Union in the future – nor has a definition specific to Sweden even been drawn up for the standard.

At the moment, 145 students are learning about their trades while working on six buildings in various stages of construction. After 2.5 years of construction, the first houses are due to be completed in April 2014.

The EU directive on Nearly Zero-Energy Buildings was passed in 2010. In 2011, we worked with the vocational school's president and project director to develop this training concept in order to ensure that there would be enough qualified tradespeople in the Umeå labor market in 2019 to be able to construct this kind of forward-looking building.

We also hope that the buildings will serve as an example for other trade schools throughout the country and contribute to the discussion on which energy standard Nearly Zero-Energy Buildings in Sweden can and should strive for.

Conclusions

Even vocational students new to the trades can construct high-quality Passive House buildings if plans on the construction site are comprehensive and detailed enough. The number of detailed sketches needed was underestimated.

We also realized that regular site visits were necessary, although they are not the norm in Sweden, where building owners tend to trust the construction companies' own quality assurance processes. A significant benefit is that the planning architect is involved in theoretical lessons for the students and therefore has the opportunity to explain the sustainability concept and, in particular, the airtightness concept, including all important quality assurance measures.

Freestanding single-family homes are far from the most efficient residential solution in terms of resources, but they are possible even close to the Arctic Circle. The unfavourable compactness of this kind of house explains the high transmission losses through the building envelope. If it were a duplex, this construction concept would certainly earn standard Passive House certification, but the vocational school's training concept requires single-family homes to be built.

We don't see a way for the current construction concept to be improved for this site, based on PH components available on the market today, except by using insulation with a lower thermal conductivity. As previously discussed, however, we rejected this solution based on a calculation of the cumulative energy consumption.

References

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SWECO	Umeå	Sweden

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Instructions

Contact practice for terms and conditions, and costs.

Visualisation

1. Passive House Report
   - ***http://www.neesonline.org/wp-content/uploads/PDF/ProjectBriefs/PassiveHousePilotProjectBrief.pdf***
2. NEES Graph

Factsheet 24

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: Reed Bed System, Valencia Island, County Kerry (SKDP, County Kerry)

Key words

Sustainable upgrade, Natural materials, Reed bed system

Purpose

This project is for an upgrade to the old sewage treatment system serving the lighthouse keepers' house at Valentia Lighthouse in County Kerry. The lighthouse keeper's house was originally used for the keeper and his family, but since automation of the light in 1947, a part-time attendant was appointed and the house has been empty.

This project was carried out to accompany the renovation of the building as a visitor centre in order to ensure that the sewage is treated in a sustainable manner before percolation.

Target group(s)

Private Home Owners, Local Authorities, Housing Associations, Builders, Building Professionals.

Visitors to Valentia Island, both domestic and overseas.

Reed Bed System,
Valencia Island, county Kerry

Attributes

An existing septic tank and glass cullet reed bed were in place on the site, but the reed bed hadn't yet been connected or put into use. FH Wetland Systems was commissioned to assess the capacity of the existing system and it was determined that a significantly larger area was needed in order to properly address the greater anticipated loading from the new visitor centre.

The new treatment system comprises the existing septic tank, a new vertical flow gravel reed bed system, a new horizontal flow gravel reed bed system and a new distribution area for the final tertiary polished effluent. In tandem with this treatment process, a urine diversion toilet has been installed that will remove urine at source for recycling to agriculture. The environmental benefits of urine diversion include a reduction in pollution potential on-site and a reduction in the need for purchased artificial fertiliser on the farm where it will be used. The removal of urine also helps to keep the overall reed bed sizes lower, which was important in this small site area.

The system was designed by FH Wetland Systems and installed by South Kerry Development Partnership. The system has been fully planted with selected native Irish wetland plant species by both FHWS and SKDP.

Environment

Most conventional sewage treatment systems use pumps and blowers to oxygenate the effluent in order to remove the main contaminants. Reed beds and constructed wetland systems can achieve the same degree of treatment without that constant energy requirement. In this case a pumped feed is needed initially because of the topography of the site, but the overall energy usage is significantly lower than would be the case for a standard mechanical treatment system.

Sustainability

Flush toilets, for all their convenience, have the undesirable drawbacks in that they waste a considerable amount of fresh water, biomass and nutrients. In this instance, it was decided to keep with the flush toilet for the benefits of familiarity and ease of maintenance that they offer, but to use a urine diversion toilet so that at least this high-nitrate element of the waste stream could be routed to agricultural reuse rather than simply adding to the size requirements of the reed beds.

On a wider scale, the use of urine diversion will provide an excellent public example of source separation technology and will help others to embrace these methods of sustainable nutrient cycling.

The urine diversion toilet used at Valentia was imported from Sweden. Even though this contributed to the overall carbon footprint of the project to some extent, the environmental benefits of recouped local nutrients far outweigh the initial carbon inputs.

Enterprise Aspects

Constructed wetlands and reed beds offer a way for small rural enterprises to deal with sewage in a very thorough and cost-effective manner. By demonstrating the use of reed beds in a high-profile location such as the Valentia Lighthouse, it will assist others in adopting similar methods and help to facilitate planning procurement for SMEs in rural Kerry.

Scalability

Although the lighthouse site is unique, with unique topography, geology, scale and location, the technologies adopted here for sewage treatment are easily transferred to other developments throughout Ireland and Europe. The Irish EPA Code of Practice on Wastewater Treatment and Disposal Systems Serving Single Houses includes constructed wetlands and reed beds as a treatment option and similar guidelines exist in other EU countries.

Source separation is most advanced as a technology and focus of academic study in Scandinavia, and there are plenty of opportunities for an emerging green economy to examine locally appropriate solutions throughout Europe.

Conclusions

The most interesting aspect of this project was the dedication to the use of environmentally sustainable solutions for sewage treatment. Source separation of sewage inputs such as faecal biomass and urine are at the forefront of sanitation research and development in Europe as we look towards a future with genuine joined up thinking. There is great potential for broad-scale use of this resource in agriculture instead of limited artificial fertiliser sources.

The vertical and horizontal flow gravel reed beds following the septic tank are another eco-friendly technology to provide further treatment to the septic tank effluent before percolation.

The inclusion of this project at the Lighthouse site will enhance the overall visitor experience and will also tie in an environmental education element to the overall visit.

References

Organisation name	City	Country
Cork County Council: A storm-water reed bed used for a recycling centre.	Castletownbere	Ireland
Ollan Herr's Reed Bed: A domestic reed bed system for septic tank effluent treatment designed by Herr Ltd.	Dundalk	Ireland

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Instructions

Contact SKDP for further information.

Visualisation

1. Reed Bed System Report
   http://www.neesonline.org/wp-content/uploads/2014/04/Valentia-Lighthouse-Reed-Bed-System.pdf
2. NEES Graph

Factsheet 25

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: Vocational Training Modules and Training Manual

Key words

Vocational Training, Construction, Green Building

Purpose

The NEES Partners have designed and commissioned a series of vocational Training Modules, based on the selected NEES Best Practices and NEES Pilot Projects.

These vocational training modules document the use and benefits of the NEES approach and the various materials and services identified throughout the NEES Project.

Target group(s)

Builders, Self-builders, Architects, Construction Companies, Vocational Training Institutions, Colleges, Design and Construction Students.

Attributes

The NEES vocational training package consists of a set of training modules that address the various aspects of Natural, Energy Efficient and Sustainable (NEES) building practices. The package is made up of six modules:

- **Module 1** General Principles
- **Module 2** Construction Methods
- **Module 3** Envelope 1 Roofs and Earth Construction
- **Module 4** Envelope 2 Windows and Insulation
- **Module 5** Accreditation and Certification
- **Module 6** Energy and Water Usage

Module 1: General Principles of Holistic Building and Construction Design

This is an introduction to the NEES principles and criteria, sustainable materials principles embodied energy, carbon footprint, natural materials, health issues and lifecycle disposal and durability.

After completion of this module the learner will be able to list and describe the principles of holistic building design; appreciate the role and importance of embodied energy and carbon in relation to the specification of building products and materials; be familiar with the characteristics of natural and renewable material and their role in construction.

Module 2: Housing Construction Methods and Principles

This module is an introduction to conventional construction, thermal performance principles, air-tightness, foundations, timber frame construction, hemp-lime hempcrete.

After completion of this module the learner will be aware of the importance of thermal performance of materials and detailing in relation to low energy buildings; be familiar with a range of low impact construction principles and knowledgeable of a range of natural and renewable construction materials and their application in the built environment.

Module 3: House
Envelope 1 - Roofs and Earth Construction

This module includes Green Roofs, Earth Construction, Retrofit Methods and Material.

The learning outcomes from module 3 will include knowledge of the principles and application of green roofs, low impact construction techniques and materials including cob and earth, straw bale and timber frame building techniques. They will also be aware of the principle of retrofit techniques and the technical challenges associated with low energy retrofitting. The learner will also have an understanding of the concept of breathability in relation to building materials.

Module 4: House
Envelope 2 - Windows and Natural Insulation

This module outlines windows and the various types of natural insulation including passive solar design, insulation methods such as cellulose, sheep's wool, hemp-wood fibre insulation. It also explores IBO Catalogue Data, a comparative case study and insulation products.

After completion of this module the learner will be familiar with the concept of passive solar design; list and describe the properties of a range of natural insulation materials and be aware of a range of innovative low impact insulation materials.

Module 5: Certification and Accreditation.

This modules looks at CE marking, Construction Products Directive (CPD), Agrément Certification, Carbon Offsetting, Natureplus Certification, REACH COSHH, Environmental Product Declarations (EPDs), Life Cycle Assessment LCA, ASBP LEED, Living Building Challenge and a Cellulose case study.

After completion of this module the learner will be familiar with certification and accreditation as it applies to construction products. He/she will understand the role and importance of certification and accreditation in relation to the specification of low impact products and materials for construction projects.

Module 6: Energy and Water Usage

This module looks at energy usage and definitions, building heat loss, low energy lighting, renewable energy options, energy efficient appliance, water usage and treatment.

After completion of this module the learner will be familiar with the principles of power and energy measurement; understand the basic principles of building heat loss and be aware of a range of building energy usage reduction strategies and ways to reduce water usage in buildings.

The 6 modules are designed to be stand alone and each module can be delivered individually or as part of the series. Each module consists of a PowerPoint slide presentation which contains notes and images. Module 6 is designed as a support module and covers some of the fundamental building energy principles.

A Training manual contains additional training support material that can be used to aid delivery of the modules and a list of the headings from each module and the intended learning

The NEES Certificate Course and the accompanying Training Manual will be made available to interested Partners, Colleges and Universities for future delivery as ether a FETAC Vocational or a CPD Professional Course.

References

Organisation name	City	Country
NEES Partners	Various	Various

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Instructions

The Training Modules and Training Manual can be downloaded from the NEES Project 'Results' Website:
http://www.neesonline.org/resources/vocational-training/

Please contact for permission to use.

Visualisation

1. Training Summary
2. NEES Graph

Factsheet 26

Project Name: NEES Project

Type of project outcome: Service

Product/Service name: **Business Feasibilities Best Practices** (University of Ulster)

Key words

NEES Best Practices Business Feasibility

Purpose

The NEES Project is investigating the potential and feasibility of popularising the application of renewable and recycled natural materials for the production and installation of products to improve the energy efficiency of new and existing buildings. Also, identifying and promoting local design and installation services available for the application of these products or based on sustainable natural processes.

There has been considerable commercial development of high-tech solutions for energy efficiency, including chemical and industrially manufactured products and processes, nanotechnology, the use of IT in smart buildings and smart grids. In contrast, there has been a notable lack of research and development of products and services based on natural products and processes.

In Ireland, grants for retrofitting existing homes (under the Warmer Homes and Greener Homes Schemes for example), is limited to energy-intensive industrial and petrochemical products, and no single technology for retrofit of existing walls based on the use of natural materials has been approved for subsidy.

This limitation has consequences for sustainability, including the fact that such products are usually manufactured outside of the region, though energy-intensive industrial processes, with a considerable environmental impact. They have then to be transported from other regions. Little use is made of local products, especially agricultural products and by-products that could achieve a similar effect. The production or installation of these materials rarely promotes new skills locally, or the development of the local economy, other than in a limited sales or installation role. The building and refurbishment sector has become dependent on these imports, when there are potentially viable products available locally that could be developed and delivered locally.

This report also looks at the business feasibility of 5 example NEES Products and Services.

Target group(s)

Sustainable Producers, Sustainable Service Providers, Policy Makers, Government Agencies.

Attributes

The skills required in the production of sustainable products and services are usually found locally, and their installation is often based on traditional skills and local resources. If properly identified and developed these products and services could provide much needed jobs and training opportunities, and new green enterprises.

Product examples include:

- Timber from renewable forests
- Hemp and lime
- Straw
- Recycled Newspaper.

Examples of services that could help reduce energy use are:

- Timber frame design;
- Bioclimatic design;
- Energy and sustainability assessments and
- Local behaviour change training.

These products and services are:

- Less capital intensive;
- More locally based;
- Consume less rare and finite materials in production;
- More reusable;
- Less polluting waste;
- Require less transport.

These products are by their nature linked to diversification of agricultural production, so they could have a positive effect on agricultural diversification and on biodiversity on the one hand, and on new and on diversification of rural economies on the other.

Energy efficiency and sustainable development are two of the European Union's main priorities, as reflected in the Energy Performance of Buildings Directive (EPBD), the Energy Services Directive (ESD) and the Eco Design of Energy Using Products Directive (Up), and the requirement for all Member States to National Energy Efficiency Action Plans.

The availability of naturally based products and services is also an important consideration in the development of a sustainable economy and green procurement policy. Procurement by public bodies constitutes 16% of all purchases, even more in some countries (e.g. 30% in UK).

An excellent example of the NEES approach in practice is the recent Drumalla House project in Carnlough, County Antrim, Northern Ireland, developed by the Oaklee Home Group. The aim of this project was to design and build a new social housing development of 11 homes, to achieve Level 4 of The Code for Sustainable Homes (CSH) using renewable materials as an alternative to traditional forms of construction. This project was a pilot project under Northern Ireland's Department of Energy and Climate Change's Renewable Construction Demonstrator Programme.

The project will also assess the validity of this alternative building type in terms of feasibility for future developments, along with examining energy consumption and also considering tenant attitudes. The fabric of the scheme uses timber frame construction with a hempcrete (formed from the hemp plant in combination with hydraulic lime) outer skin in place of concrete. The CO2 absorbed in the growing of hemp more than offsets the CO2 produced in the manufacture of the binder, and use of the product will have reduced the embodied carbon dioxide in the construction of the houses by almost 40%.

In order to establish a viable business from natural, sustainable, energy efficient materials the initial steps are crucial. The preliminary planning and research can have an enormous impact upon the future success of any business and none more so than in an emerging market such as this. In general natural, energy efficient products and services tend to be more expensive than traditional materials at present. Rather than allowing this to hinder the development of the market it should be used to the seller's advantage. For example a timber frame construction business may not be able to compete with traditional construction methods on price, but they could focus more upon on differentiating themselves and emphasising some of the other qualities which their products possess.

References

Organisation name	City	Country
NEES Project Partners	Various	Various
NEES Best Practices	Various	Various

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Instructions

A copy of the Report together with the example feasibility studies can be downloaded from the NEES Project website.

Visualisation

1. Summary Report
   - ***http://www.neesonline.org/resources/business-feasibility/***
2. NEES Graph

Factsheet 27

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **The Collection - Umeå Final Seminar Presented Papers** (ed. U of Ulster)

Key words

NEES Collection, NEES Umeå Seminar

Purpose

A collection of papers presented at the final NEES Conference which took place in Umeå, Sweden in March 2014.

Target group(s)

NEES Partners, Architects, Sustainable Builders and Developers, Student Architects, Community Organisations.

Attributes

The final NEES Conference Papers includes contributions from:

"The NEES (Natural Energy Efficiency and Sustainability) Project"
Background, Achievements and Repercussions
Jose Ospina, Project Manager, CCAE, Cork Centre for Architectural Education

This paper gives an overview of the NEES Project highlighting the Background, Partnership, Work Programme and Activities, Criteria for Selecting the Business Practices, Evaluation Procedure and the role of the Expert Panel, Selection of the 15 Best Practices, Pilot Projects, Vocational Training Modules and Training Manual, the NEES Results website. The impact of the NEES Project on Regional and European Policy and Prospects for the future.

"Scoping of 'Best Practices' in Natural Energy Efficient and Sustainable Building Products and Services"
R. Emmanuel, C. Thomson, K.J. Baker
School of Engineering & the Built Environment
Glasgow Caledonian University, Glasgow, UK

This paper presents the authors' experiences in developing and operationalising a set of assessment criteria for the selection of 'Best Practices' that promote natural and sustainable building products and services for enhanced energy efficiency in retrofitting existing dwellings in the Northern Periphery Programme Region.

"A Sustainability Performance Assessment Tool for SMEs"
G. Fischlå, Umeå School of Architecture, University of Umeå and T. Olofsson, Applied Physics and Electronics, University of Umeå

Small and medium-sized enterprises (SMEs) within the construction and design domain are already been provided with several sustainability assessment techniques. This paper presents an easy to use assessment technique for 20 building projects in terms of a sustainability performance assessment tool. Originally, this assessment tool was conceived within the NEES project supported by the Nordic Periphery Programme.

"Education, Research, Practice"
Kevin Gartland and Orla McKeever
CCAE, Cork Centre for Architectural Education

This paper looks at the link between architecture education, research and practice, using a current project as a vehicle to cover aspects of building pilot and live projects. The building project was the refurbishment and extension of a Parnell Cottage for a private client located near Cloyne in East Cork, Ireland. The pilot project falls within the NEES Project investigating the use of materials and services based on natural or recycled materials to improve the energy performance of new and existing buildings. The live project aims to hold a series of onsite workshops and seminars for students of Architecture, Architects and interested parties demonstrating the integration of NEES best practice materials and techniques within the built project.

"Evaluation of a NEES Demonstration Project at Cloyne, County Cork, Ireland"
Raoul Empey, Sustineo, Fergal McGirl, Fergal McGirl Architects and J. Little, Building Life Consultancy

A demonstration project involving a cottage refurbishment and extension in county Cork, Ireland was evaluated against a given set of criteria, including mass, energy, carbon and cost. The evaluation considered a design incorporating six NEES 'Best Practices' against conventional construction practices:

1. Timber frame construction
2. Hempcrete external insulation
3. Cellulose insulation
4. Triple glazed wooden windows
5. Green (sedum) roofs
6. Gravel reed bed for wastewater treatment.

The objective was to evaluate the building project as a whole against current conventional practice in rural Ireland and to draw conclusions about the sustainability of the project and above NEES Best Practices.

"Vocational Training Based on Natural and Sustainable Criteria"
Jing Qu, Arctic Technology Center, Department of Civil Engineering,
Technical University of Denmark

In 1987 the UN World Commission on Environment and Development (WCED) defined the term 'Sustainable Development' (WCED, 1987), and nowadays climate change is a great and worldwide challenge. The building industry accounts for 40% of the total energy demand globally (Dixit et al.2010). Improving building energy efficiency is one of the most discussed topics, but natural materials which have a lower embodied energy have not gained adequate attention. This paper presents work on exploring a training package based on natural and sustainable renewable products and services selected from the NPP regions.

"The Role of Voluntary Housing Associations in Promoting Natural Sustainable Materials in Ireland"
Alma Gallagher Clár ICH

With a housing stock of over seventy units, Clár ICH is in a unique position to pilot many of the Best Practices identified by NEES. Clár ICH not only builds houses but seeks to build sustainable communities. By showcasing NEES Best practices Clár ICH incentivises local communities to experience at first hand the benefits of using natural materials in construction methods and energy conservation. As a delivery agent for labour activation schemes Clár ICH created opportunities for participants to increase their knowledge in using natural materials in construction.

"Challenges of Building in the Arctic"
Peter Barfoed, Tegnestuen Nuuk as, Architects and Planners, Nuuk, Greenland

This paper deals with the challenges of building in the Arctic. These challenges are primarily caused by severe climate conditions in the form of heavy winds, snow and ice and a cold climate. In addition, there is the very low sun and little solar radiation in the middle of the winter and midnight sun in the summertime. It is also challenging to design your settlements and towns, so that they establish protection against wind. For example, high-rise buildings of course don't protect against the wind, and have long shadows. In addition to the natural challenges there is also a weak and expensive infrastructure, a small market with long distances to other markets and small populations.

"Best Practice in The Northern Periphery"
Derek Bond, Elaine Ramsey and Norry McBride
Ulster Business School, University of Ulster, Coleraine

The submission was based on the experiences of a transnational team of experts working in the Northern periphery of Europe. The triple helix NEES project team were based in the Republic of Ireland, Northern Ireland, Scotland, Sweden and Greenland. The team were supported by a transnational panel of experts.

The aim of the NEES project was to explore the challenges and opportunities that adopting sustainable building techniques offers to the various regions of the NPP area. To achieve this NEES was involved in identifying 'Best Practices' and using pilot projects to demonstrate the viability and benefits of the techniques. The transferability of the 'Best Practice' was also evaluated. Given the importance attached to knowledge transfer by the NPP, NEES was also involved in developing dissemination and training modules.

References

Organisation name	City	Country
NEES Partners	Various	Various

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Instructions

The Umeå Collection can be downloaded from the NEES Project 'Results' website: ***www.neesonline.org/reports***

Visualisation

1. The Umeå Collection Summary - ***www.neesonline.org/reports***

Factsheet 28

Project Name: NEES Project

Type of project outcome: Product

Product/Service name: **NEES Results Web Site and summary film** (ARTEK, Greenland)

Key words

NEES, Energy Efficiency, Sustainability, NPP Programme

Purpose

The NEES Project Partners wanted to design and implement a NEES Project Web Site to highlight the activities, information and final results of the 3 year project. This new website also includes a link to the original NEES website and includes a new Project video.

The new project video documents the many successes of the NEES Project, promotes the use of sustainable and natural materials and generates interest in the NEES Project for the future.

Target group(s)

Sustainable Builders & Developers, Architects, Engineering & Architectural Students, Environmental Organisations, Housing Associations, Community Organisations, Government Bodies.

Attributes

The requirements for the new NEES Project Results website included:

- A Home Page providing an overview and introduction to the Project.
- The Project Evaluation Criteria and Process – a page describing the NEES evaluation criteria and process and providing short biographies of the Expert panel members.
- Best Practices – the core area of the site, highlighting each of the 15 best practices.
- Pilot Projects – pages for each of the pilot projects showing the location of each project, photos and diagrams . Each page contains a downloadable summary describing the calculated benefits of the project and any evaluations carried out, and also what Best Practice materials or services it uses.
- Partners pages, describing and linking to each Partner in the Project and staff involved in the project.
- Vocational Training Modules – 6 Vocational training modules were produced by the end of the project and these are described in detail on this part of the website, where modules are available for download. In addition, a Training Manual is also available for download, along with an introduction and overview document.
- Partner Meetings – a short description of the 6 partner meetings is included along with other project activities.
- Local Activities – a record of local activities is provided in summary, including local focus, group meetings, promotional events and other activities, with links to relevant documents.
- Associates and Collaborators – description and links to other associate collaborators and partners, specifically those that had a role in the project, such as consultants and contractors.

The Project video documents the successes of the NEES project and investigates the potential and feasibility of popularising the application of renewable and recycled natural materials for the production and installation of products to improve the energy efficiency of new and existing buildings.

The video is a mix of animation with a presenter providing key facts and information about the NEES Project and its aims.

References

Organisation name	City	Country
NEES Partners	Various	Various
Stakeholders	Various	Various
General Public	Various	Various

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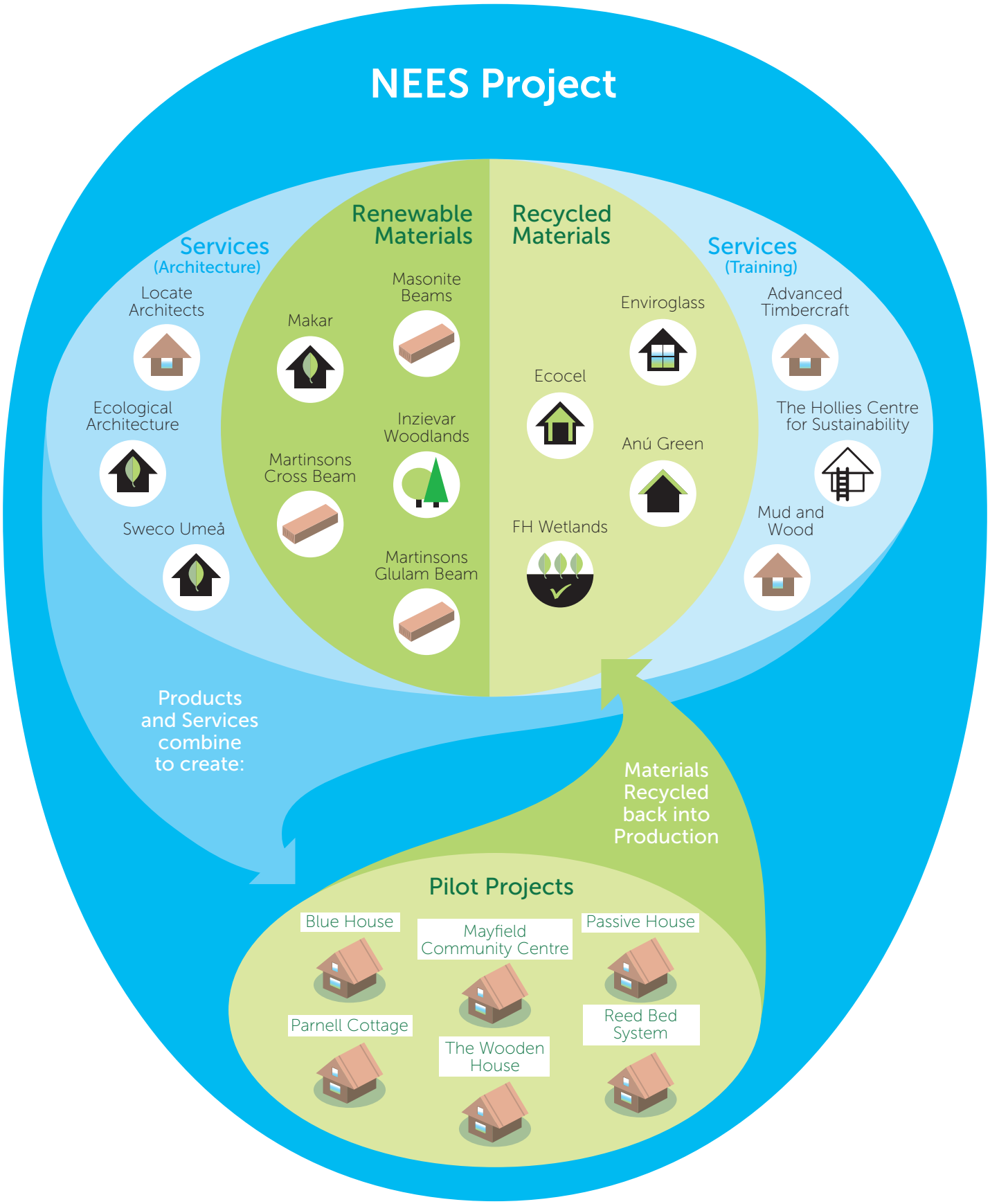
Instructions

The NEES Project 'Results' Website is available at ***www.neesonline.org***

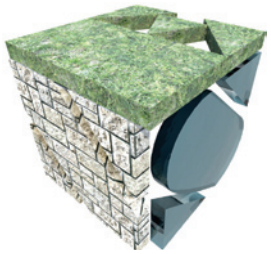
The NEES Project video can be viewed on the website Home Page at ***www.neesonline.org/home*** or on the NEES Project YouTube channel: ***https://www.youtube.com/watch?v=asa4T8SPau4***

Visualisation

1. NEES Project Results Website
   - ***www.neesonline.org***
2. NEES Project Video
   - ***https://www.youtube.com/watch?v=asa4T8SPau4***


NEES Project
Services (Architecture)
Locate Architects
Ecological Architecture
Sweco Umeå
Renewable Materials
Masonite Beams
Makar
Inzievar Woodlands
Martinsons Cross Beam
Martinsons Glulam Beam
Recycled Materials
Enviroglass
Ecocel
Anú Green
FH Wetlands
Services (Training)
Advanced Timbercraft
The Hollies Centre for Sustainability
Mud and Wood
Products and Services combine to create:
Materials Recycled back into Production
Pilot Projects
Blue House
Mayfield Community Centre
Passive House
Parnell Cottage
The Wooden House
Reed Bed System

Northern Periphery Programme 2007-2013



NEES Project

Partners:

SOUTH KERRY DEVELOPMENT PARTNERSHIP LTD.

ARCTIC TECHNOLOGY CENTRE

University of ULSTER

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

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