Interreg North Sea Region ProCirc
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Pilot Case Study

Aberdeenshire New Build & Refurb projects

Aberdeenshire Council

Keywords: Circular construction, Office Space, Resources and Circular Economy, New build, Net Zero, Design, Sustainable Procurement Tools, Circular Economy Appraisal Framework, Operational carbon, Embodied carbon, Education

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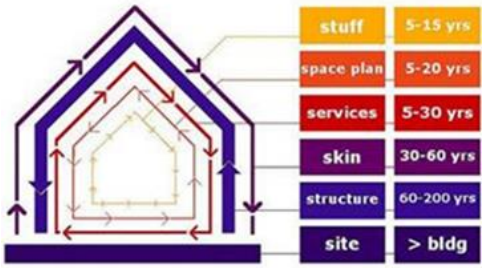
More information: Please note the case study of this project was presented by Craig Matheson at the Circular Construction Webinar on 7th September 2021. The case study can be viewed as part of the recording. Peter Ramsay from Business in the Community peter.ramsey@bitc.org.uk can be contacted to access the recording.

New build office
163 FTE staff

82 desks (5:10)

Family Resource Centre

Library
- Service point
- Registrar



Introduction

The Aberdeenshire Council implemented an Office Space Strategy project designed to optimise office space and develop a space plan fit for the future. This strategy has been under review as the Council defines what will be required of office space in the post-Covid environment. The strategy for the Ellon Office has continued, however. This was due, in part, to office use being only part of the multi-occupancy proposal for the building.

As part of its Environmental and Climate Change Policy and Resources and Circular Economy Commitment the Council is looking to ensure the developments are as energy efficient as possible and built in line with circular economy principles. Circular Economy is becoming increasingly considered in Council decision making supported by two key policy commitments.

The Resources and Circular Economy Commitment (2019) commits the Council to promote, effect and support circular economy principles and practice internally and in external areas of influence, such as events, contractors, partners, community and government. In 2020 a Climate Change Declaration was signed, which included the commitment to work with others across the region to ensure that Aberdeenshire reaches Net Zero by 2045, by promoting energy transition and a circular economy.

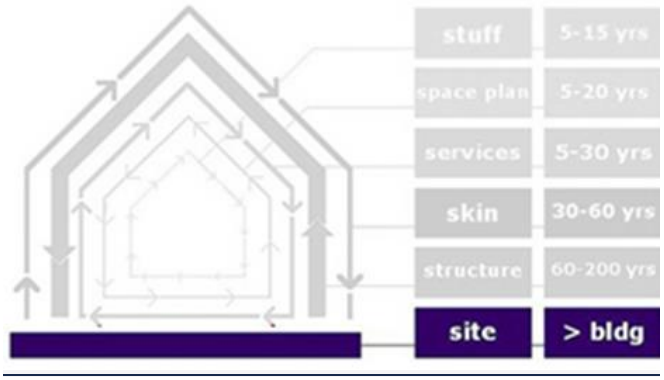
Ellon New Build

Planning permission was granted for the development of a 2 storey council office, public library and family centre at the former academy site at Schoolhill in Ellon in March 2022.

The building aims to achieve 'net zero' operation standards and will feature a number of carbon reduction measures.

An overview of the approach to the Ellon New Build Project through the life cycle is given below. This approach illustrates the layering concept in constructing a building using circular principles to enable repurposing and ease of disassembly for reuse. Building work is projected to be completed by Summer 2023.

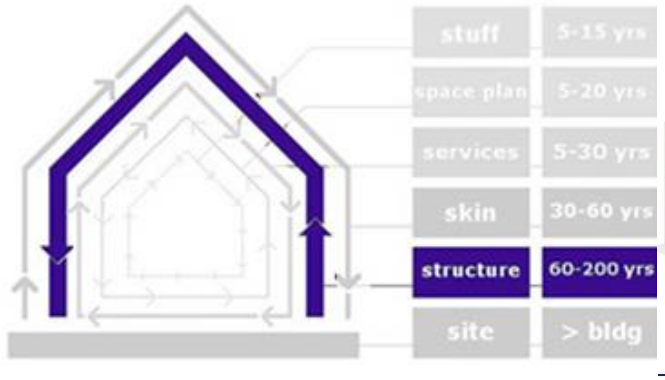
Site



The layering concept (How Buildings Learn: What Happens After They're Built, Stewart Brand, 1994) is a common sustainable design approach. This model of the 6 S's (Site, Structure, Skin, Services, Space Plan and Stuff) is instructive in designing for longevity through easy adaptation.

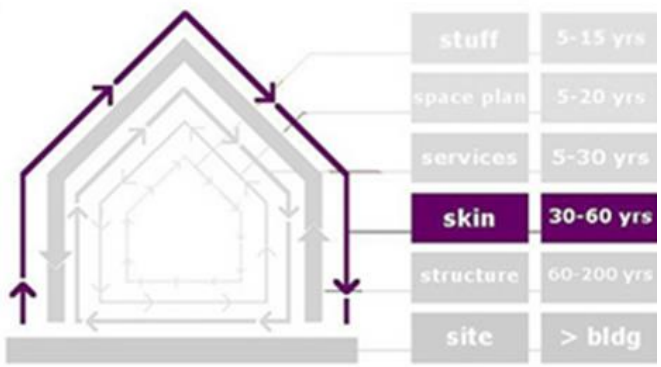
- Issues: More thorough review of retention of existing structures could have been carried out (in hindsight). If the organisation had adopted a more circular approach 7 or 8 years ago could have planned how to retain structures on the site.
- Made sure proposals worked with existing site material so we 'work with what we have'.

Structure (60-200 years)



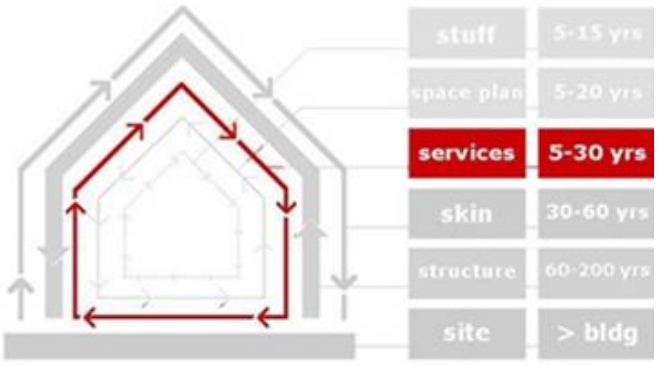
- Utilised Cross Laminated Timber/Gulam, which also offers carbon impact benefits
- Modular to increase flexibility with internal space planning
- Prefabrication of components
- Ease of adaptability
- Ease of disassembly & reuse – bolted connections and timber a good material for future reuse

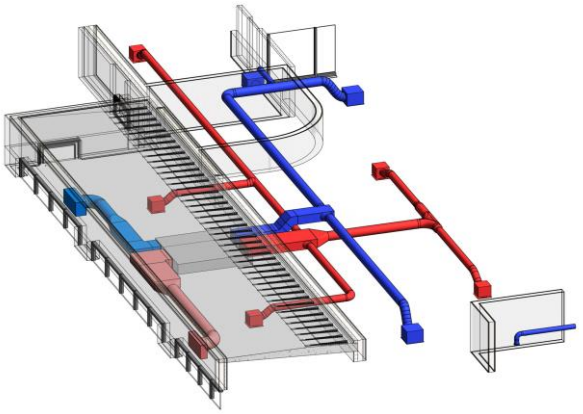
Skin (30-60 years)



- Designed for longevity – ability to maintain, repair and replace e.g. such as windows to be replaced through their life without disrupting the fabric.
- Only applying finishes with functional benefit – don't just base decision making on aesthetics.
- Modularisation & standardisation – built in a set of repeating modules, consistency in sizing e.g. windows.
- Specification with circularity in mind – reuse bricks from existing sites where feasible, looking at the opportunity to use recycled materials (such as Kenoteq - these bricks make use of construction waste). Trying to use local materials wherever possible, e.g. locally sourced timber, granite. Storage is an issue with reused materials. The market engagement phase required a lot of engagement with industry and local partners to identify potential solutions.

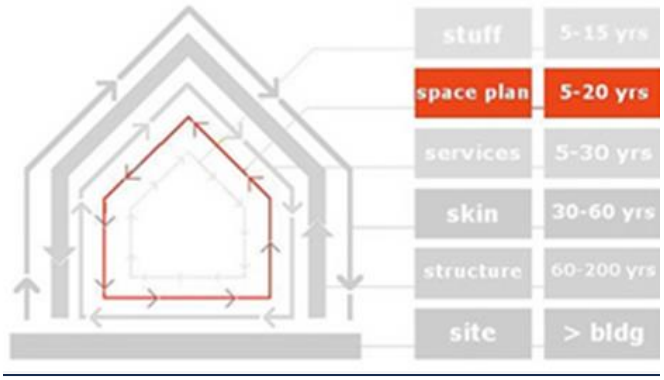
Services (5-30 years)





- Designed for longevity – ability to maintain, repair and replace.
- Potential for more building services on show and not covered up by linings.
- Building Information Modelling (BIM) is allowing early interrogation of building coordination – designing out waste through abortive work during the construction phase. Resolving issues before work on site, streamlined process. Investigating the possibility to integrate Buildings Material Passport into BIM model and for future Facilities Management.

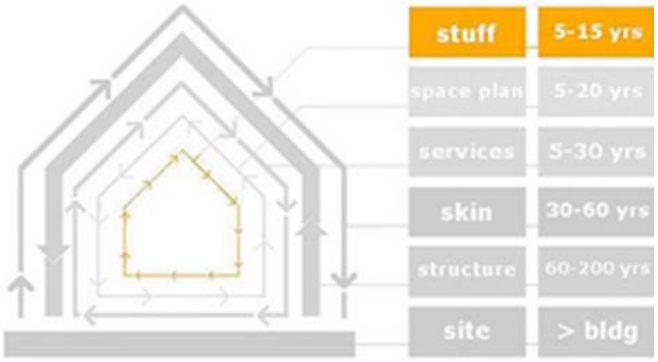
Space Plan (5-20 years)



- Designing to a grid pattern – Gulam & cross laminated timber.
- Evolving requirements through Covid-19 to adapt space requirements according to anticipated demand.
- We anticipate change in the short-medium term as we come through the pandemic.
- Flexibility with internal spaces can maximise the buildings use.

The Covid pandemic required consideration regarding future proofing, including ensuring the office elements was capable of internal reconfiguration so the key has been ensuring the structural solution doesn't preclude space planning options. The building has been designed to be multifunctional – library, family centre, registration service and office space so a range of Council Services are contained within a single building.

Stuff (5-15 years)



- Assessment of what we already have.
- Reuse, repair and / or repurpose where possible.
- Engagement has already commenced with possible furniture re-purposing.
- 'Warp It' for items not required.
- Circular conscious specification of new items.

Procurement process

Pre-procurement

A series of pre-procurement strategy workshops were held with the architectural design and procurement teams, facilitated by Zero Waste Scotland and co-ordinated by Circular North-East. These workshops were designed to raise awareness of the circular economy, and the benefits that it could bring to the project. The project adopted the principle of designing in layers, integrating a circular approach within each lifecycle element of the building. Throughout the project, opportunities to reduce impact of operational energy and embodied carbon were considered, aiming for net zero for operational emissions.

Market Engagement workshops were held in partnership with Circular North-east and Zero Waste Scotland. A

number of workshops were held with the supply chain, including framework contractors and furniture and interior suppliers. The aim of these workshops has been to articulate the council's aspirations to the market place and explore what might be possible to deliver the development in line with circular economy principles.

The procurement process followed the stages of the Scottish Government's Procurement Journey. Sustainable Procurement Tools such as Life Cycle Impact Mapping and the Sustainability Test were used to capture and assess risks and opportunities in terms of environmental impact.

Sharing tools and lessons

Tools were also shared between Local Authorities to enable circularity assessment. Zero Waste Scotland had previously supported East Ayrshire Council to carry out a circular economy appraisal of materials to be used in the renovation of a small primary school. The output of that support was a circular economy appraisal framework (figure below) to assess the resources, components and future value of each layer of the building (site, structure, skin, services, space and stuff), using a simple traffic light system. East Ayrshire Council shared the tool with Aberdeenshire Council to facilitate use.

Circular Economy Appraisal Framework
Key design approaches for each theme

A. Resources	Retain in Use	*Retrofit existing asset (Retain building or other infrastructure largely intact)*
		Salvage materials for reuse (based on demolition appraisal, going to material bank)
	Source Responsibly	*Use salvaged materials (whether on-site or from material bank)*
		Use materials with recycled/secondary content (meaningful part of new item)
		Use other low impact materials (natural materials, renewable energy input)
	Design out Waste	*Manage wastage of materials (use full width panels, cutting patterns full sheet)*
		Manage construction site waste (construction debris, packaging, temp. works)
B. Components	Standardise Manufacture	*Standardisation of components (industry standard items v bespoke manufacture)*
		Modularisation of components (MMC including all forms of prefabrication)
	Extend Producer Responsibility	*Servitisation of components (providing a service in lieu of installing components)*
		Performance procurement (ongoing repair/replace/return components)
C. Future Value	Design to Preserve Value	*Design for longevity (durability, ability to maintain, repair and replace)*
		Design for flexibility (loose fit, accommodate changes in use without major works)
		Design for adaptability (adapt structural/spatial items to uses with different needs)
		Design for deconstruction (assembly/disassembly/materials are salvageable)

St Sophia's Circular Refurbishment 33

A. Resources

		Site	Structure	Skin	Services	Space	Stuff	Commentary
Retain in Use	Retrofit existing asset (Retain building or other infrastructure largely intact)							*The proposals allow for significant reuse of the existing building with only a small portion to be demolished and rebuilt (site, structure), and the exterior will be overclad (skin). The exceptions are services where a new MEP installation has been planned (services) and interiors (space). Unclear whether existing furniture and equipment will be repurposed or new items purchased (stuff).*
	Salvage materials for reuse (based on demolition appraisal, going to material bank)							
Source Responsibly	Use salvaged materials (whether on-site or from material bank)							*Assumed that insulation (skin) and interior finishes (space) will mostly use natural/low impact materials as detailed in other sections of this review, this score would be downgraded with more standard material choices (e.g. plastic insulation). There will be less opportunity for this with other parts of the new fabric (structure, services). Procurement requirements can be embedded in specification.*
	Use materials with recycled/secondary content (meaningful part of new item)							
	Use other low impact materials (such as natural materials or renewable energy input)							
Design out Waste	Manage wastage of materials (use of full width panels, cutting patterns to use full sheets etc.)							*Contractor not yet appointed so assume base level compliance but could be included with tender (e.g. in accordance with WRAP targets) Highlights where design choices will have impact e.g. temporary wall bracing (skin).*
	Manage construction site waste (construction debris, packaging, temp. works, excavation)							

Hard FM

Support from Sustainable Procurement Limited (SPL) on behalf of Zero Waste Scotland under the ProCirc programme included training and presentations on circular approaches, to build internal capability in support of the Council's Circular Economy Commitment.

This also included initial input into a draft specification for the Council's Hard FM contract in 2021, which was subject to significant delays due to the Covid-19 pandemic, with a particular focus on delivering circular outcomes.

This contract provides Planned Preventative and Reactive Maintenance service across Aberdeenshire Council's entire portfolio of operations and non-operational building and land assets. It is estimated at £30m over 5 years. The contract was awarded to FES FM, which states that it is the first Building Services and Facilities Management company in the world to achieve both the UN Climate Neutral Now Initiative participation and the Carbon Neutral International Standard.

Results and lessons learned

Operational Carbon Impact

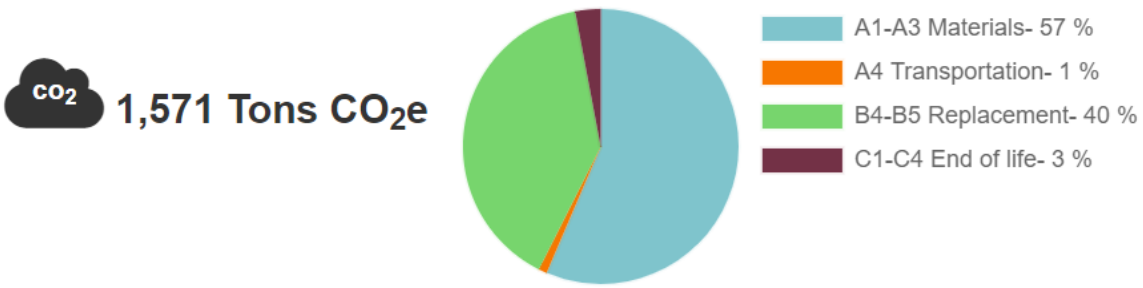
The Council's focus has been on reviewing a carbon neutral building in terms of operational use. This has been achieved but there has been a grid constraint preventing this being fully implemented; relating to the amount of photovoltaics on the roof.

As soon as the infrastructure is resolved (or the use of battery storage is more economical) the roof has been designed to allow for future expansion of PV.

Embodied Carbon Life Cycle Analysis (LCA)

There is no set Council target to achieve on a project by project case on embodied carbon. However, a Life Cycle Analysis has been carried out to assess how the project stands against industry and try to lock that in so the Council has some conscience to its approach to design/specification. The project meets the London Energy Transformation Initiative (LETI) benchmark criteria.

The LCA identified the embodied carbon as being as follows and broken down into life cycle stages (source: Pick Everard on behalf of Aberdeenshire Council):



Key Considerations for Construction Phase

- Making sure contractors / suppliers have awareness of the Council's Circular ambitions. Early dialogue with supply chains / industry is essential, particularly in relation to challenges in being able to achieve a circular specification.
- Ensuring circular specification cannot be challenged and eroded, through the commercial exercise.
- Planning from the beginning to design for disassembly and reuse of material at the end of the building's life is essential.

Education is key to success

Craig Matheson, Principal Architect at Aberdeenshire Council attended an online course, *Circular Economy for a Sustainable Built Environment* run by *Delft University of Technology (DelftX)*. This is a great example of transnational peer to peer learning and the principles of circularity taught in the course were applied to a live project.