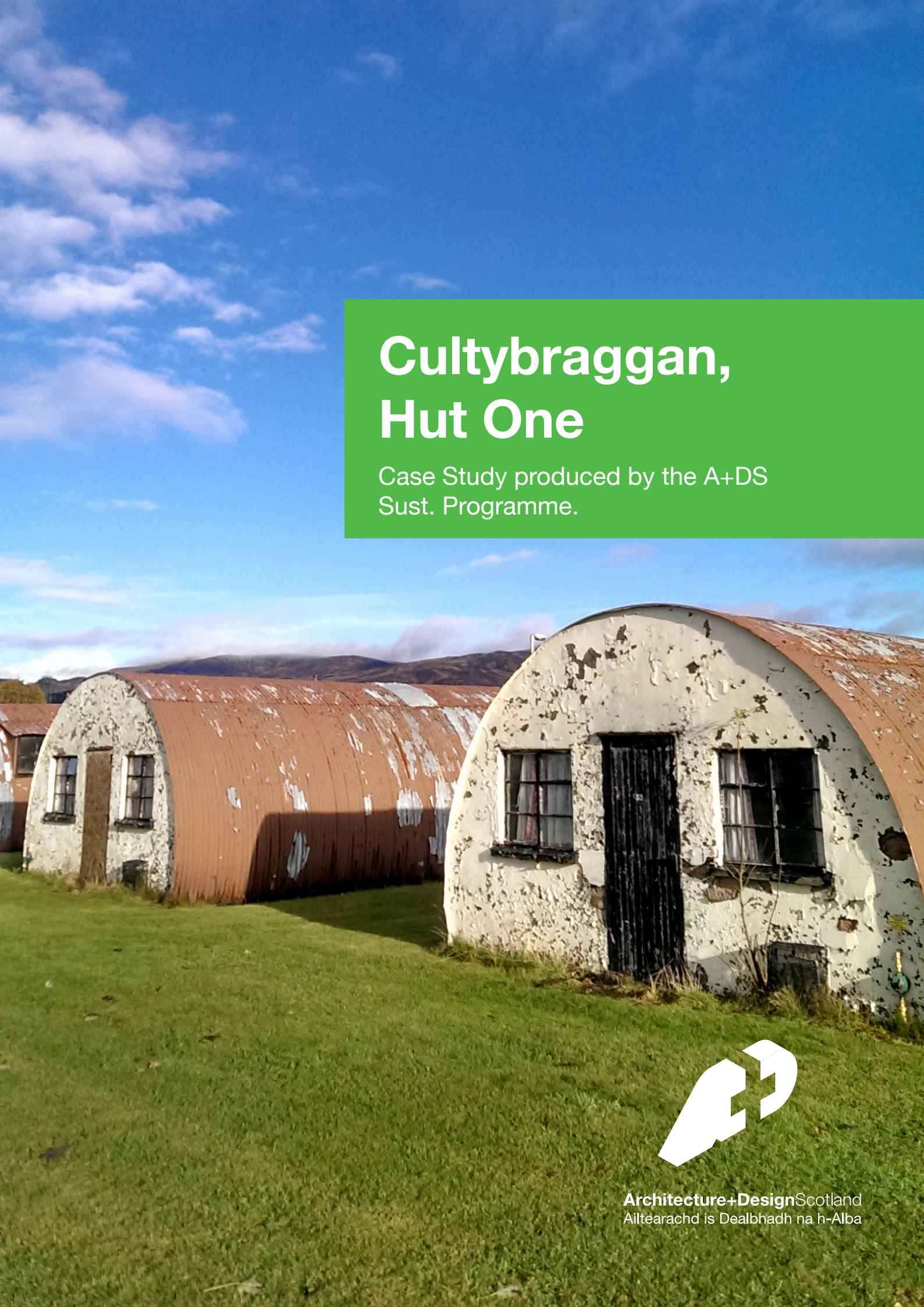
Cultybraggan, Hut One

Case Study produced by the A+DS Sust. Programme.



Architecture+DesignScotland
Ailtearachd is Dealbhadh na h-Alba

Cultybraggan Hut One, Comrie

One of eighty huts in a former Prisoner of War camp in Perthshire, Hut One has been refurbished as a visitors centre. Originally conceived as a temporary building, this 70 year old structure has been secured for another generation using innovative construction materials.

BACKGROUND

Built in 1941 as a purpose built prisoner of war camp, Cultybraggan Camp was built simply and economically, laid out in military orderliness on a functional grid and organised to achieve effective security from the central Guard's Block. Other remnant structures, apart from some eighty 'Nissen' huts, include a firing range, an assault course, a nuclear bunker, telecommunications mast, and a Royal Observer Corps listening post. The site is unique as it is one of the best preserved Prisoner of War (POW) camps in Britain, and also the only POW Camp to house the SS.

The site was chosen for its remote location that was also well served by a local railway station which allowed for the prisoners to be easily transported to the camp. There are around eighty huts in total, of which about thirty are either A or B listed.

Comrie Development Trust acquired Cultybraggan Camp in 2007 as a result of a community buy-out. The Development trust have developed a 10 year plan for the Camp's development based the themes of food production; sport and recreation; business; and technology/ eco-hub.

Hut One, is a Nissen hut occupying a prominent site at the entrance to the camp. Comrie Development Trust have worked with the Architecture and Design Scotland (A+DS) Sust programme, with funding from Greener Scotland, on a pilot project to refurbish this Category B Listed Nissen hut. It will serve as a reception and interpretation centre as the camp develops. In time it is envisaged that a permanent visitors centre will be built in the centre of the camp and hut one will become an office for the Development Trust. This refurbishment secures this B listed building and creates a warm, useable space.

"This is a unique Refurbishment Project. We're effectively refurbishing a temporary structure- a very efficient structure"
Matt Bridgestock, Project Architect

The Nissen hut is essentially a metal tent with a brick wall on either end which was designed to fit on a single 10 ton truck and be erected quickly. Originally intended to be temporary structures , around 70 years after the war, the huts on this site are still wind and watertight.

APPROACH

The aim of the project was to demonstrate how recycled and natural materials could be used to insulate existing buildings, and provide a temporary small visitor centre exhibiting both the heritage and low carbon future of the site. Through funding support from Greener Scotland A+DS provided some funding for the project which enabled

<< Existing huts at Cultybraggan Camp

Cultybraggan Camp location was chosen due to its remote location with good rail links

John Gilbert Architects to work on the project, and secure many of the innovative materials that have been used.

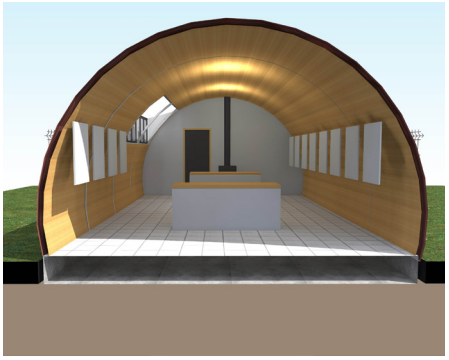
PROCESS

The first priority for John Gilbert Architects was to ensure the conservation and extension of the life of Hut One. This included replacing rotten timber and insulation, replacing windows, fixing external fabric, carrying out work to the front and back walls and replacing the electrics.

The second priority was to improve the building to create a warm and functional space by insulating the structure for the third time. The Nissen huts were originally insulated using straw. Following the War when Cultybraggan became an Army Camp this was replaced with spray foam insulation.

The inner skin was removed and the shell re-insulated, the floor was insulated using wood fibre boards and the end walls were insulated externally. A significant part of the strategy was to improve the airtightness of the building, which was originally very leaky, so an airtightness barrier was introduced into the build-up of the shell and sealed at both ends. The new windows and doors are double glazed and well insulated.

Natural materials with low embodied energy have been selected and work in harmony with the existing materials of the hut. Use of timber has been prioritised through new, high performance doors and windows, new timber linings and wood fibre board for insulation.



visualisations of Hut One produced by John Gilbert Architects

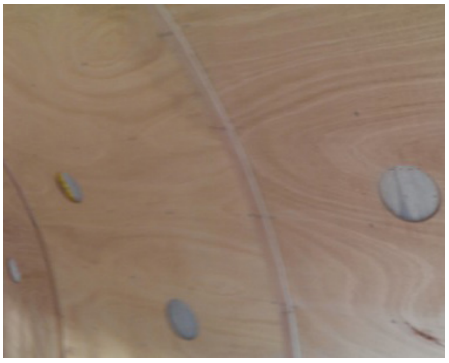
Hut One at the Camp entrance ^

Existing interior view of Hut One v

Cultybraggan Hut One, Comrie

The innovative materials used are listed below:

Timber >
The internal metal lining of the hut was replaced with flexible plywood – providing some of the structure and a beautiful internal finish. The plywood is from sustainably managed sources and coated in an organic flame retardant.
Plywood supplier: Winwood Products
Manufactured: Italy
Flame retardant supplier: Russwood / HR Prof
Manufactured: Finland



Paints >
Many paints are based on petrochemical products and often emit volatile organic compounds (VOCs) into the atmosphere throughout their life. The products used in hut one contain 99% natural raw materials and do not use petrochemicals. The materials come from environmentally managed sources and are produced in a sustainable ecological cycle. Much of the linseed oil used in the paint is grown close to the factory and certified as organic.
Paint supplier: Auro Paints
Manufactured: UK

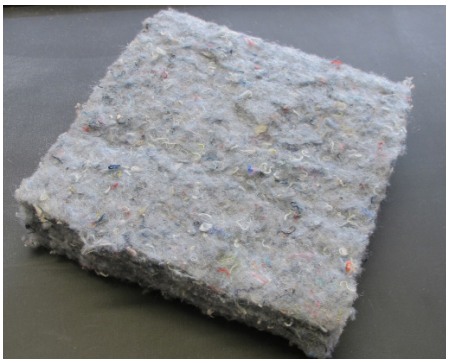
Internal finishes >
Clay plaster helps to moderate the internal environment and absorbs humidity.
The floor finish is a non-slip vinyl which contains PVC produced with the aim of meeting higher environmental standards. For example, 45% of the product is from recycled materials and is manufactured using renewable energy.
Plaster supplier: Natural Building Technology
Manufactured: UK
Flooring supplier: Forbo
Manufactured: Europe

Sheep's wool >
Sheep's wool has been used for insulation, a natural insulation made in the UK from waste wool. A 130mm thick layer of sheep's wool has been applied between the external metal sheet and the internal plywood skin.
Supplier: Thermafleece
Thermal conductivity: 0.038 W/mK
Manufactured: UK

Cultybraggan, Hut One

Recycled Plastic <
Recycled plastic insulation was selected as it is composed of 80% recycled material. A 130mm thick layer has been used between the external metal sheet and internal plywood.
Supplier: YBS insulation
Thermal conductivity: 0.0425W/mK
Manufactured: UK

Hemp Batts <
Hemp fibres are robust and resistant to corrosion and have been used throughout history for durable applications such as ropes and clothing. Hemp batts are an ideal insulator with a guaranteed longevity often exceeding the life of the building. Hemp fibres will also lock away up to two tones of CO2 for every tonne of hemp harvested.
Supplier: Black Mountain Insulation
Thermal conductivity: 0.039W/mK
Manufactured: UK



Recycled Cotton Insulation <
This innovative cotton insulation is made from cotton textiles diverted from landfill. It contains no chemical irritants and requires less energy to manufacture than conventional insulation. 130mm of insulation has been used between the outer metal sheet and inner plywood boards.
Supplier: Inno Therm
Thermal conductivity: 0.039W/mK
Manufactured: France

Wood fibre insulation <
Wood fibre insulation is manufactured in thick boards. 60mm has been used to insulate the floor with a further 60mm to insulate the front and back walls. External walls have render applied directly to the wood fibre board to make a new, warm waterproof skin.
Supplier: Natural Building Technology
Thermal conductivity: 0.043W/mK
Manufactured: Switzerland

District Heating System
Cultybraggan Camp has a district heating system (in hut 16) powered by woodchips from the local area. The aim is for the visitors centre to be connected to this network. In the meantime, an electric heater has been installed. Because the insulation has been increased and draughts reduced, only a small 2kW heater is required.

Airtightness >
The huts are very draughty, meaning they lose heat. In hut one the windows, doors, walls and floor were draught-sealed. Hut one has been fitted with airtight membranes to the walls and floor, which prevent damp and provide an airtight layer. The building is now warmer and uses less energy.
Airtightness membrane supplier: SIGA
Manufactured: Switzerland
Floor membrane supplier: Visqueen Ecomembrane
Manufactured: UK

Windows and Doors >
Rotting single-glazed windows were replaced with modern, double-glazed timber windows. The windows, made from sustainably-sourced timber, are draught sealed and secure. The front window, dormer windows and external door have also been replaced.
Window and door supplier: CCG Windows and Doors
U-Value: 0.9 W/m2K
Manufactured: Scotland

Lighting >
Previously the huts were very poorly lit. This has been improved with high efficiency flourescent lamps along the ceiling and low energy LED strip lighting along the floors.
LED lighting supplier: iGuzzini

RESULT
The project has transformed a cold and uncomfortable building into a warm, attractive, useable space. Previously the space could not be heated sufficiently to make it comfortable, it can now be heated throughout the year with just a 2kW electric panel heater.

IN USE
Hut One opened to the public as a visitors centre on 28 March 2014.

KEY LESSONS

The lessons learned from Hut One will be translated into action on the other huts in Cultybraggan Camp. The process of refurbishing Hut One has served to provide information on the construction of the Nissen huts and the priorities for retrofit work. Through undertaking this project the Architects have examined how that work can be easily undertaken to allow for more economical refurbishment in the future, allowing them to evaluate which interventions make the most significant differences.

"We're aiming to promote materials that could be made in Scotland but currently aren't. There could be an industry and market for these types of products in Scotland so by having them in this high profile project hopefully it might generate interest"
Matt Bridgestock, Project Architect

Cultybraggan, Hut One

Anecdotal feedback from the work offers the following insights:

- Improving airtightness seems to offer a huge improvement on the energy efficiency.
- Insulating the floor and replacing the windows have made a significant impact on comfort in the building.
- Re-insulating the shell with a variety of materials was possible and seems to lead to improved thermal performance in all cases.
- Careful design of the narrow doors is required to make the buildings accessible.
- Removing the internal lining meant that a new lining is required with appropriate support and fixing, which can be costly.
- The cost of undertaking these works on a listed building should not be underestimated (see back cover page for cost details).
- Listed building consent and building warrant approval were needed for all of the works undertaken on this hut. Perth and Kinross Council have been supportive of these new approaches to retaining and improving these temporary structures.

Hut one opening event

Interior view of Hut One

Hut One at the entrance to Cultybraggan Camp


Comrie through the Ages
Prison life at Cultybraggan
Comrie in the Second World War

Project Information

Location:	Cultybraggan Camp, Comrie, Perthshire
Client:	Comrie Development Trust
Date Completed:	March 2014
Project Value:	£43,700
Gross floor area:	53m^2
Architect:	John Gilbert Architects
Civil Engineer:	David Narro Associates
Quantity Surveyor:	William Lang Construction Consultants
Energy Consultants:	John Gilbert Architects
Main Contractor:	Guthrie and Robertson Builders
Funders:	Greener Scotland, Heritage Lottery Fund LEADER Climate Challenge Fund Perth and Kinross Heritage Trust The Robertson Trust Local Fundraising
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Architecture and Design Scotland

Bakehouse Close, 146 Canongate
Edinburgh EH8 8DD

Level 2, The Lighthouse, 11 Mitchell Lane,
Glasgow, G1 3NU

T: +44 (0) 845 1 800 642
F: +44 (0) 845 1 800 643
E: info@ads.org.uk

www.ads.org.uk/sust

Architecture+Design Scotland
Ailtearachd is Dealbhadh na h-Alba