Reuse, Recycle and Retrofit Project Pack

Made by the Learning team at RIBA

With special thanks to RIBApix, Mint Cake, Lionheart, Scott Abercrombie and John Gilbert Architects

RIBA Architecture.com

About this pack

In this pack, you will find:

a) some key information for teachers to help deliver learning activities focusing on recycling, reusing and retrofitting existing buildings so that they become environmentally-friendly, sustainable homes.

b) activities for young people to complete that will help them to learn about retrofitting and sustainable architecture.

Each project is broken down into 4 parts:

- Explore
- Design based on a design brief
- Make
- Evaluate

This fits with the Secondary National Curriculum format for Design Technology (DT), Science and Geography learning.

We have included Design Technology, Geography and Science curriculum aims in this project. We have listed the curriculum aims that this particular project covers at each stage.

Key information and aims

Key words – make sure you know what these words mean. Use a dictionary, the internet or an adult to help you.	Architect – someone who designs buildings. Conservation Architect – an architect who specialises in conserving (protecting), restoring and repairing historic buildings and sites; they care deeply about preserving the character and heritage of a building or site. Climate change - a change in climate patterns caused by the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels. Sustainability – providing goods or services that cause little or no damage to the environment and therefore are able to last for a longer time. Retrofit – the act of making existing buildings more energy efficient or a project which involves retrofitting. Tenement – the most prevalent type of housing in Scotland, a tenement is a type of building typically with flats on each floor and a shared entrance and stairway for its residents.
Materials – what you will need to collect to do this project.	Thick card or foamboard, tape and/or glue, scissors, paper, pencils and pens
Skills - what you should know how to do by the end of the project. Can you show someone else how to?	I can design with the environment in mind I can communicate my ideas by drawing them I can build a 3D model based on my drawing I can compare my work to the work of professional architects
Knowledge – what you should know by the end of the project. Can you tell someone else about it?	I know what architects are doing to tackle the climate crisis I know about the process of working to an architectural brief I know different ways of making buildings environmentally friendly and sustainable
Extension activities – other things you can do to build on your learning	Find other examples of sustainable, retrofitted architecture – in books or on the internet Write a factfile or create a moodboard showcasing different materials, technologies and designs that turn existing buildings into environmentally friendly buildings.

What the National Curriculum says young people should learn:

Explore

Geography Key Stage 3 and 4

- understand how human and physical processes interact to influence and change landscapes, environments and the climate
- research the causes, consequences of and responses to extreme weather conditions
- learn about the spatial and temporal characteristics of climatic change and evidence for different causes, including human activity, from the beginning of the quaternary period (2.6 million years ago) to the present day
- discover how humans use, modify and change ecosystems and environments in order to obtain food, energy, water and other resources

Science Key Stage 3 and 4

- understand how carbon is used in obtaining metals from metal oxides, the carbon cycle, how carbon dioxide is produced by human activity and the impact on climate
- evaluate the evidence for additional anthropogenic causes of climate change, including the correlation between change in atmospheric carbon dioxide and the concentration and consumption of fossil fuels
- describe the potential effects of increased levels of carbon dioxide and methane on the Earth's climate and how these effects may be mitigated, including the consideration of scale, risk and environmental implications
- Learn how changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction

Design

Design and Technology Key stage 3 and 4

- build and apply a repertoire of knowledge, understanding and skills in order to design and make high-quality prototypes and products for a wide range of users
- critique, evaluate and test their ideas and products and the work of others
- identify and solve their own design problems and understand how to reformulate problems given to them
- develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
- develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools

Make

Design and Technology Key stage 3 and 4

- select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture
- select from and use a wider, more complex range of materials and components, taking into account their properties
- understand that all design practices takes place within contexts which inform outcomes
- identify and understand client and user needs through the collection of primary and secondary data
- demonstrate an ability to write a design brief and specifications from their own and others' considerations of human needs, wants and interests
- investigate factors, such as environmental, social and economic challenges, in order to identify opportunities and constraints that influence the processes of designing and making
- use different design strategies, such as collaboration, user-centred design and systems thinking, to generate initial ideas and avoid design fixation

Evaluate

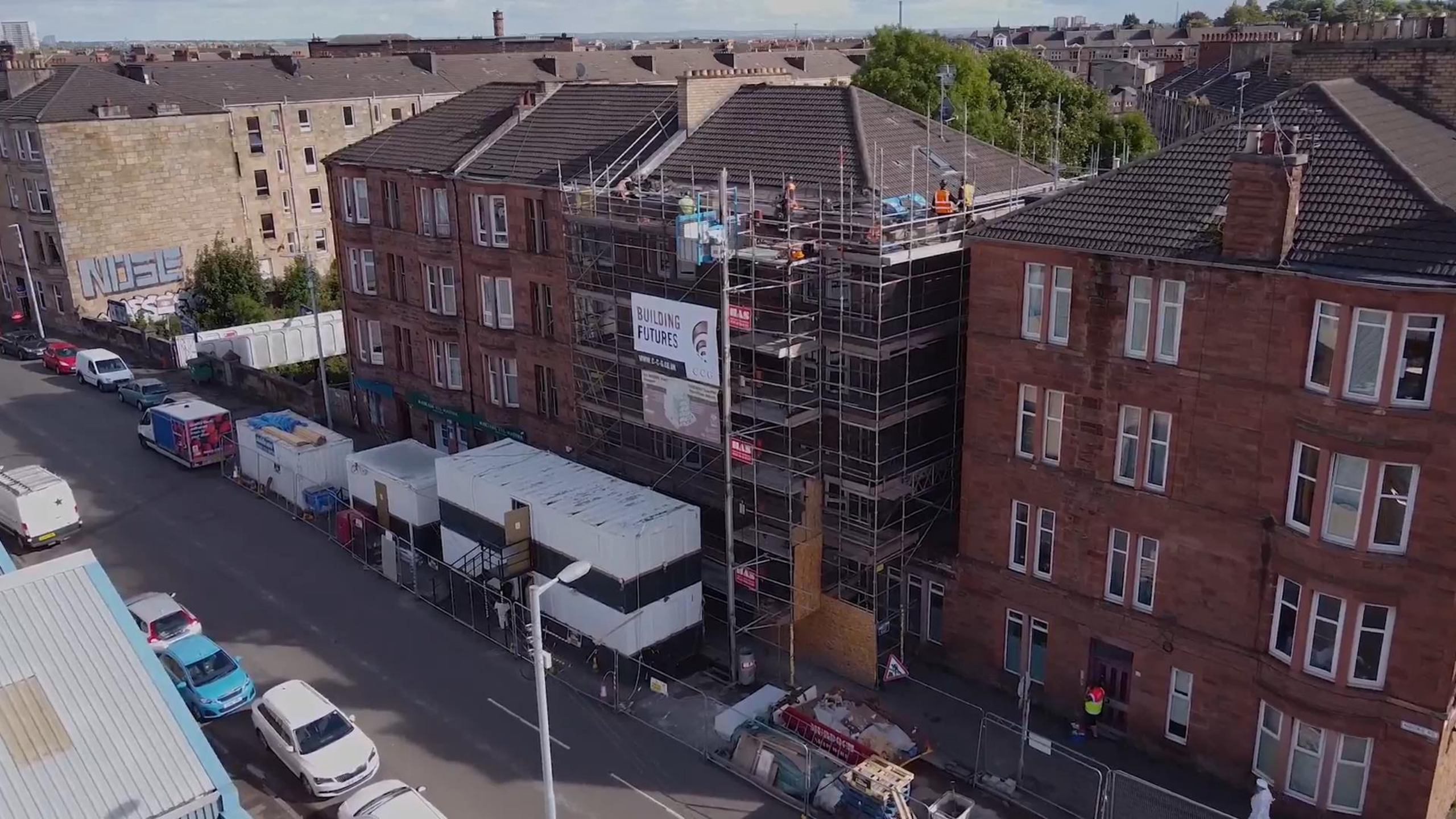
Design and Technology Key stage 3 and 4

- analyse the work of past and present professionals and others to develop and broaden their understanding
- investigate new and emerging technologies
- test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups
- understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists
- understand how the critical evaluation of new and emerging technologies informs design decisions; considering contemporary and potential future scenarios from different perspectives, such as ethics and the environment

Technical Knowledge

Design and Technology Key stage 3 and 4

- understand and use the properties of materials and the performance of structural elements to achieve functioning solutions
- understand the impact of new and emerging technologies on industry, enterprise, sustainability, people, culture, society and the environment, production techniques and systems
- understand the way in which the selection of materials or components is influenced by a range of factors, such as functional, aesthetic, environmental, availability, cost, social, cultural and ethical


BUILDING
FUTURES
CCG

Explore

This is a project about reusing, recycling and retrofitting. Eventually you will be working as an architect to retrofit an existing building into an environmentally-friendly, liveable home. An architect is someone who designs buildings and places.

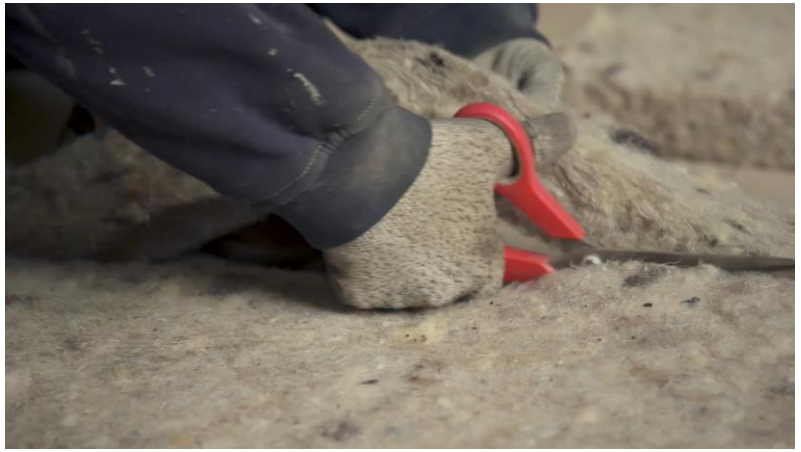
John Gilbert Architects in Glasgow, Scotland were asked to test out a sustainable and environmentally-friendly way to retrofit a tenement building. Watch section three of RIBA's Building the Future film to explore how they achieved this.

What factors did the architects have to consider when they created their design to ensure their building did not negatively contribute to climate change?

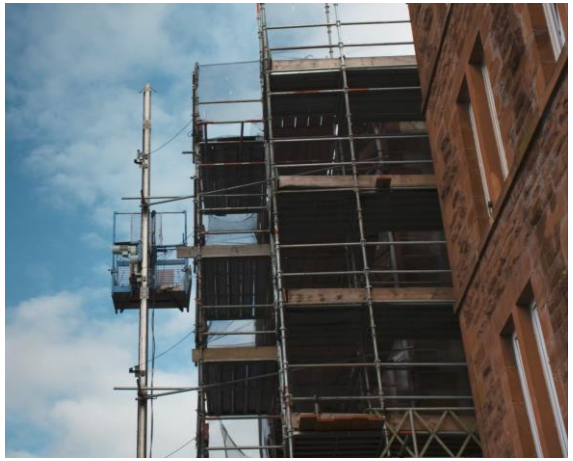
Illustrations by Dovilė Čiapaitė

Explore

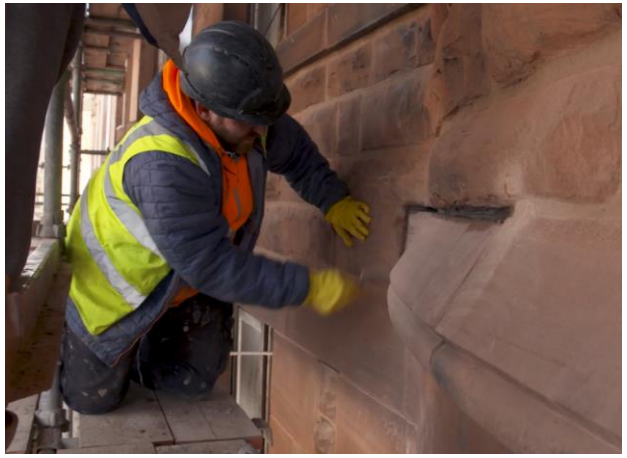
Watch section three of RIBA's Building the Future film about climate change and the built environment. Find the answers to the following questions.



Older, existing buildings
Why does knocking down older, existing buildings and starting from scratch have a negative impact on the environment?



Conservation
What is another reason we retrofit iconic buildings as opposed to replacing them with new energy-efficient buildings?



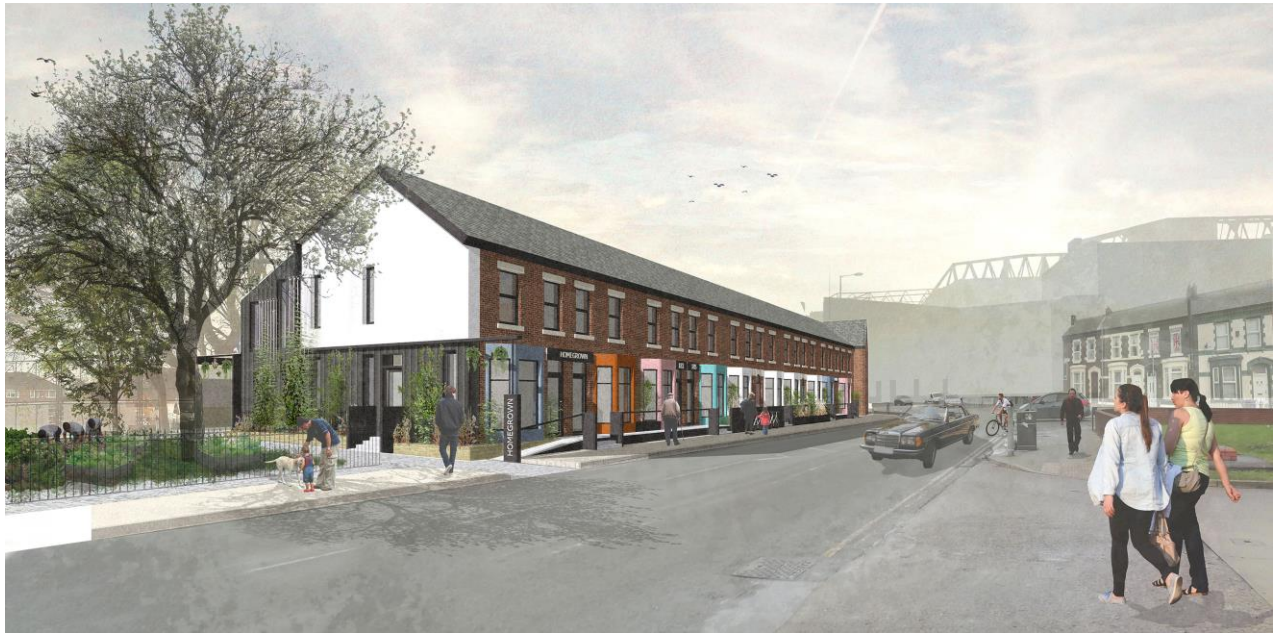
Tenants
In what ways will the architects' choices positively impact the lives of the tenants? How have they made this a nicer place for people to live?

Temperature of our homes
How can we keep the heat in? Why is it good for the environment to keep the heat in during colder months?

Materials
Which materials are the architects using to insulate the tenement flat? What factors did they consider when choosing their materials for the flat in general? Are there any factors worth considering that they didn't mention?

Insulation and airtightness
Why is ventilation important?

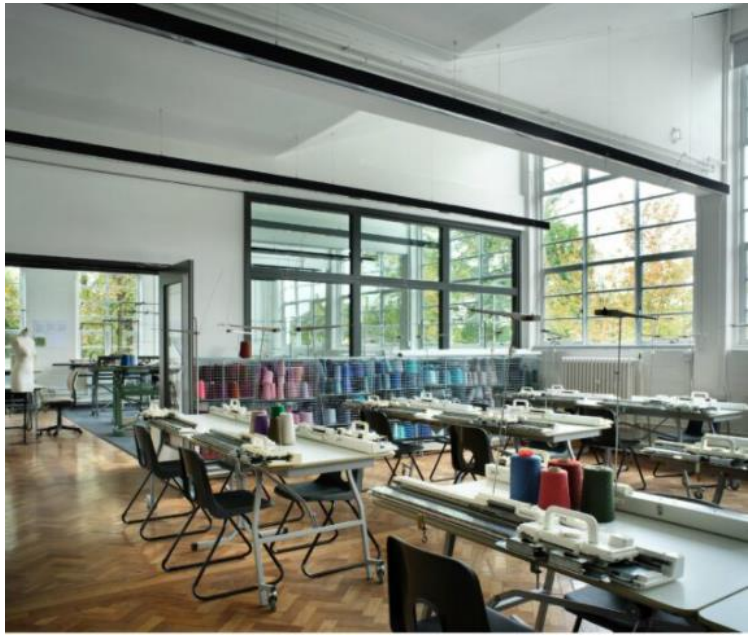
Explore



Homebaked by Homebaked Community Land Trust (CLT), Your Housing Group and URBED, Oakfield Road in Liverpool

Homebaked is an ongoing project co-owned by people who live and work locally. It started with the refurbishment and reopening of a cherished local landmark, Mitchell's Bakery (now Homebaked Bakery), which sits opposite Liverpool Football Club and was due to be demolished. The next stage of the plan is to retrofit 9 currently derelict, 100 year old terraced houses to create 8 affordable and energy-efficient homes – a mixture of houses and flats – as well as community space, a micro-brewery, and training space for the bakers. The locals want to keep some of the history and memory of the place, whilst showing that things have also moved on. For this reason, the redesigns make limited changes to the brink front of the terraced houses other than cleaning and repairs. More dramatic changes are being made to the rear of the houses, with external wall insulation and a rendered finish which covers the existing brick but gives the building a new overcoat, like a 'tea cosy', keeping it warm and insulated. Roof extensions introduce a modern look but also create more living space within the attics. They have also included a communal outdoors seating area. Read more here.

Explore



Kingston School of Art's Mill Street building, London by Haworth Tompkins

One option was to demolish and replace the building, which was inefficient and illogical in places. Some of the art studios would overheat in summer, whilst others didn't get enough natural light. Haworth Tompkins gave the building a new lease of life with a major retrofit. The glazing was replaced with a new high performance glazing system, a new, highly insulated roof put in and the architects used strips of Cor-ten steel to form horizontal 'fins' on the windows for shade in the summer. They used Cor-ten because it matched the existing brickwork, whilst having the appearance of having been made in one of the art school's metalwork workshops. The iconic brickwork has simply been cleaned for the most part, and where it needed to be removed, the bricks were reused elsewhere. A new lift extension has been put in that now makes all floors fully accessible and usable. And over 1,000m² of flat roof has been put in to provide space for outdoor teaching spaces, wildlife habitats and green roofs. Read more here.

Explore

Explore some more examples of reusing, recycling and retrofitting on the internet:

Architype

BDP.

Gbolade Design Studio

RAFT (Retrofit Action For Tomorrow)

Rotor

Now take a walk round your local neighbourhood and make notes on:

Buildings, building materials and styles that are iconic or typical of the area

Buildings you like and why

Buildings you would like to improve or change, or buildings that appear disused or derelict

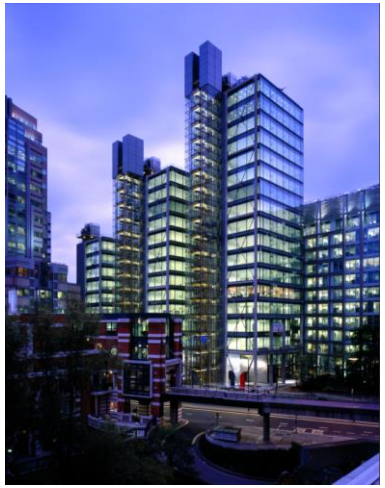
Methods used to heat or cool buildings

Design

You will be working as an architect to retrofit an existing building into an environmentally-friendly, enjoyable and comfortable home. Choose one of the options from below. You can work in groups or individually.

Office

During the pandemic, offices have been left empty with many people now working from home. Repurpose a disused office building into affordable and sustainable homes. Choose an office from your neighbourhood or one from the internet.



Church

There are many magnificent churches in ruins or abandoned. Redesign a church into an environmentally-friendly place for people to live. Choose a place of worship from your neighbourhood or one from the internet.

School

Retrofit a school into energy-efficient and comfortable homes. Choose your own school or one from the internet.

Warehouse

In NYC and Brooklyn, many people live in apartments in warehouses. Turn a warehouse from your neighbourhood or one from the internet into several energy-efficient homes.

Image references (clockwise from top left):
88 Wood Street, City of London by Richard Rogers Partnership. Credit: Morley von Sternberg / RIBA Collections; Melrose Abbey, Scotland. Credit: RIBA Collections; Warehouse Conversion, Thames Tunnel Mills, London by Hunt Thompson Associates. Credit: Martin Charles / RIBA Collections on RIBApix; Bluecoat Chambers, School Lane, Liverpool. Credit: Architectural Press Archive/RIBA Collections. Explore more images on RIBApix.

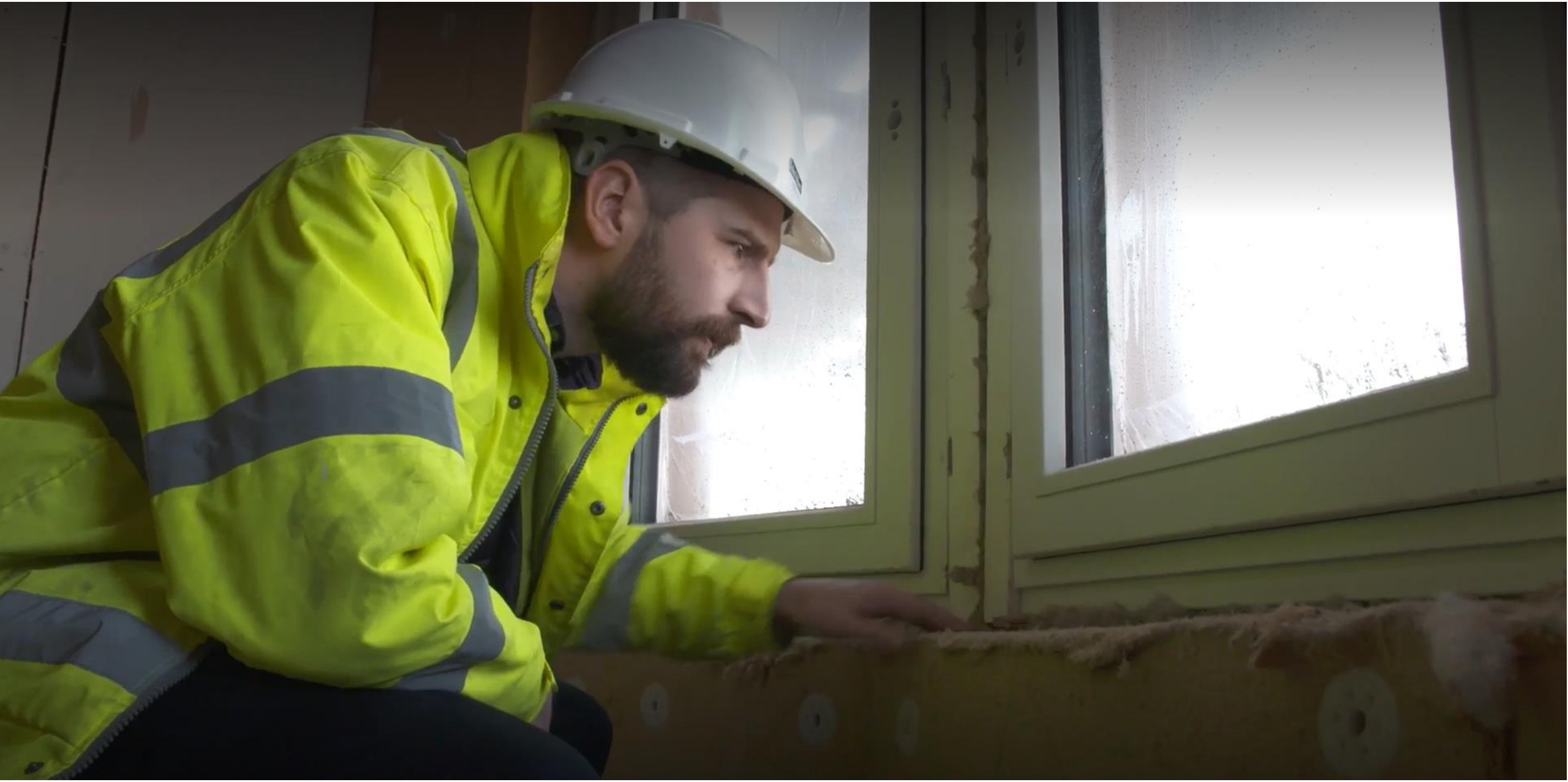
Design

Look back on your notes from the film and the observations you made during your walk round your neighbourhood.

What building have you chosen to retrofit and why?

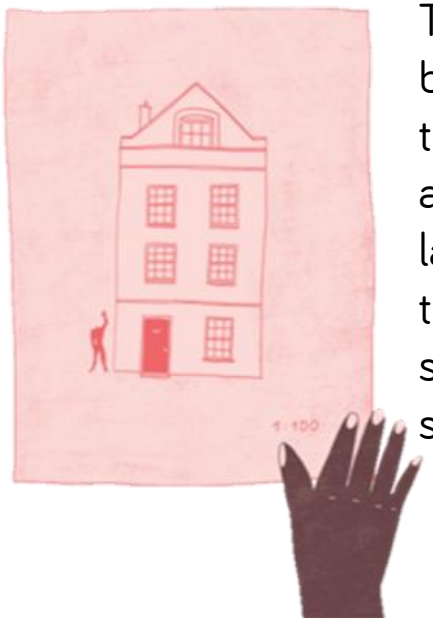
Think about:

- How will you conserve the character or history of your building? Will you keep everything as it was?
- What recycled materials will you use to insulate your building?
- How will you heat your building?
- How will you introduce ventilation without losing too much heat?
- What building materials and techniques will you use in your design and why?
- Where will you source your materials from?
- How will you ensure your building does not contribute negatively towards climate change?
- What special sustainable features will you include in your design?
- Are there any local environmental factors linked to climate change that you will need to consider when making your building more sustainable?



Design

Draw your design for your building in elevation.



This drawing will need to be a front elevation like the drawing on the left and it will need to be labelled. Use the box to the right or a separate sheet if you need more space.

Extension: Draw your design for your building in plan and section.

Extension: Draw a mini masterplan of your building's area to showcase how it links to local infrastructure in a sustainable way.

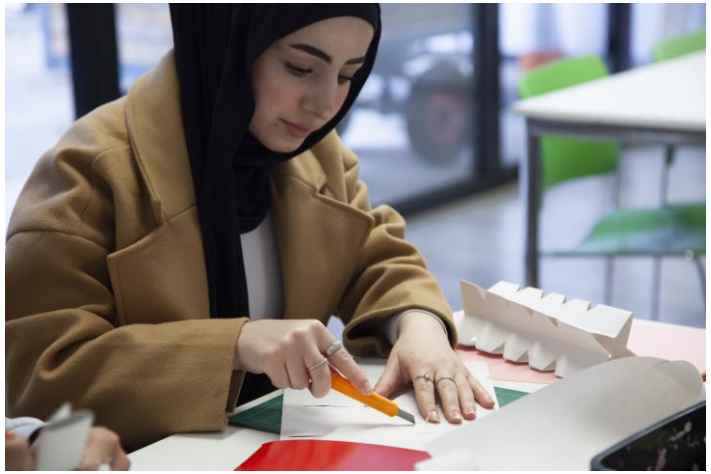
Draw and label your building here:

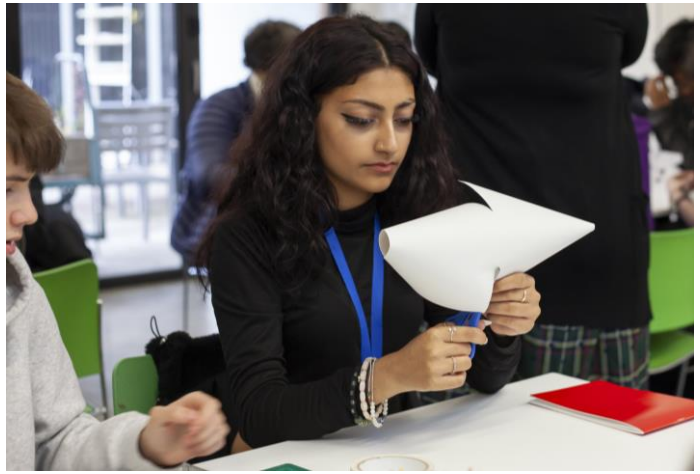
Make

Look at your drawings of your building and consider how you can transform your drawings into three dimensional architectural models.

Think about the materials you can use – strong card or foamboard is really good for a base and paper and masking tape is great for experimenting with construction techniques.

How can you cut or join your materials to make the shapes you will need to make a 3D version of your building? This short film will give you some great ideas for creating three dimensional building shapes.





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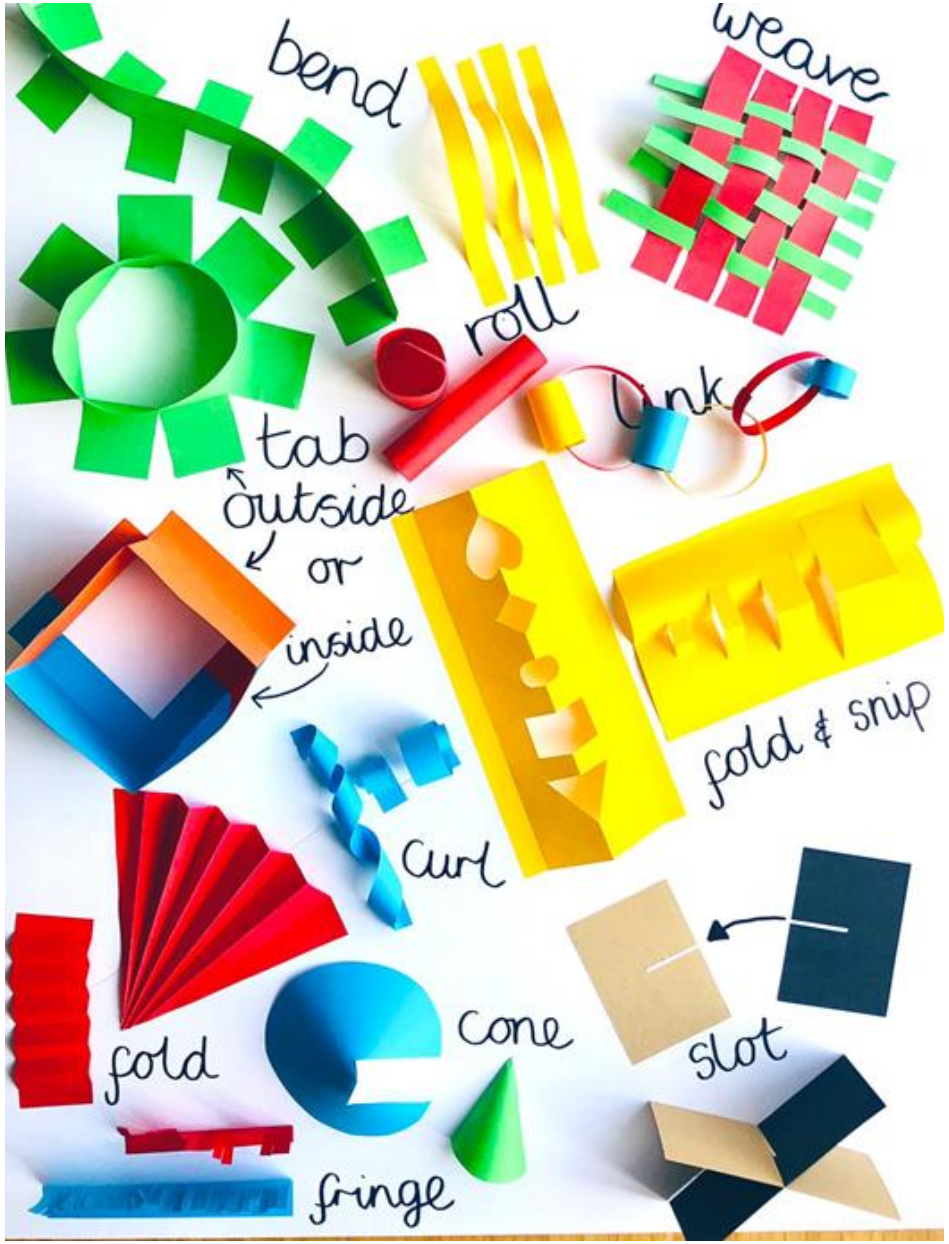

3D building ideas by RIBA Learning

Evaluate

Look at your designs and your 3D model.

Explain what you did in the project (think about what you were asked to do and how you did it):

Can you see any similarities or differences to any of the architecture you looked at whilst you were at the Explore stage of the project?

Does your design fit the brief: does your building provide environmentally-friendly and enjoyable homes? How?

Would you change or improve anything?

Extension:
Ask other people to give you feedback! Is there anything they can suggest to improve your design? Make the changes to improve your design.