# Monte Rosa Mountain Hut

**Resources:** Teacher Notes; PowerPoint slide; Activity Sheet

A Hut Haven - a story by Alberto Venzago (youtube.com)

## Introduction

This activity looks at the challenge in terms of building design for a structure to be located in a cold mountainous region and yet needs to be well insulated and energy efficient. It needs to be warm inside and not use large amounts of energy in so doing. There is significant sunlight in the area and this needs to be factored in the design.

| Learning Objectives | Learning Outcomes |
|---|---|
| • To understand and apply ideas about energy transfer to explain how a building can be made energy efficient. | • A clear explanation of the key features of a design using ideas about energy transfer. |

## Why this technology is important:

Understanding energy transfer in building design has long been important and some structures are good at either capturing energy from the sun if they need or reflecting it if it is unwanted. The structure of the walls is crucial and if this is done well energy can be retained effectively, reducing heating bills and energy demand.

Being energy efficient is becoming ever more important as costs rise, availability becomes more variable and the need to avoid releasing greenhouse gas emissions becomes more widely recognised.

The Monta Rosa Mountain Hut has a high degree of energy self-sufficiency and the process of improving this continues. The hut is fitted with storage batteries so that energy is available at times when demand is greater and supply less so. The lead batteries have now been replaced with lithium with advanced battery solution.

## Answers to support Pupil Activity Sheet

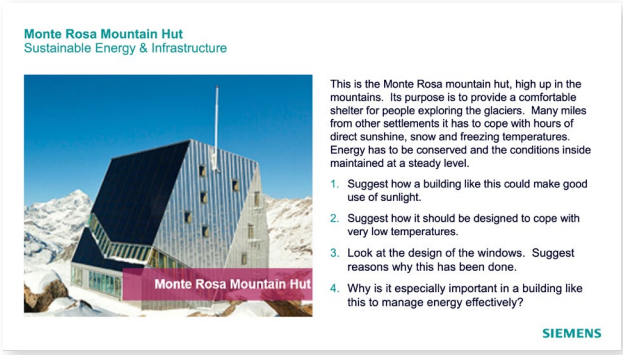
**Activity sheet:**

This set of activities is focused upon house insulation and deciding how energy can best be managed effectively. It does this by looking at both a conventional house and a very different type of building in a different location. The purpose of this is to highlight what the factors and constraints are. The activity sheet and the PowerPoint slide can be used as standalone assets to be incorporated in an existing teaching sequence on heat transfer or use can be made of the full teaching sequence provided on the Siemens Education site which has materials explaining conduction, convection and radiation.

The activity sheet looks at a conventional house and then a diagrammatical representation of a house, prompting questions around how energy is travelling out of the house and then how this can be reduced. It would therefore work as an activity to be done after students had learned about conduction, convection and radiation and were then ready to apply that to another context.

| **Route heat might escape from a house** | **How heat escapes this way** (use the words conduction, convection, or radiation) | **How to stop heat escaping this way** |
|---|---|---|
| Walls | Houses have cavity walls – two layers with a gap between. If the gap is filled with air, heat reaching it will rise by convection and escape. | Fill the cavity with solid insulation. This will not be a conducting material and it will stop convection currents rising. |
| Windows | When warm air reaches glass some of the energy is transferred by conduction through the glass and then carried away on the outside by convection currents in the air. | Having a second layer of glass (double glazing) means there is a layer of air in between. Air is a poor conductor. |
| Doors | Warm air may escape around the edge of the door or heat may travel by conduction through the material of the door. | Make sure the door fits well to stop air flow. Door material should be a good insulator and any window in it should be double glazed. |
| Roof | Warm air rises to the ceiling by convection and then through the ceiling by conduction. | Loft insulation makes the ceiling a poorer conductor. |
| Ground | Heat travels through the ground by conduction. | Insulation in the floors stops heat travelling through it. |

## Answers to support Powerpoint Slides:




**Powerpoint Slide Answers:**

The powerpoint slide looks at the same ideas but in a very different context. The idea is to use this to challenge students to apply their ideas to a different situation. In this there is an even greater need to capture energy from sunlight, to make sure energy is conserved and reduce any losses. This would be suited to a point in the learning sequence after students have studied energy management in a conventional building.

**Q1:**

The building makes good use of sunlight by having a large surface area facing the sun and coloured matt black to absorb the energy.

**Q2:**

It copes with very low temperatures by having effective insulation and relatively little window area so that energy loss is minimised.

**Q3:**

The windows are designed to be small in area to reduce energy loss but also to be predominantly on the south facing side to allow light in.

**Q4:**

The low temperatures mean that energy demands for heating could be high and supplying energy from elsewhere is likely to be difficult and expensive.

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Engage your students in the world of sustainable energy with the Energy Farm Game. Designed for pupils aged 11-14, this game challenges them to apply different energy technologies to run a farm efficiently.

**Decarbonsiation Game**

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