Welcome to A Level Engineering!

Whether you have previously studied Engineering or are joining the course from a different school, we are delighted that you have chosen to study Engineering with us.

This transition work has been designed to help you prepare for the course by introducing you to one of the fundamental areas of engineering – **engineering materials**. A good understanding of the properties and applications of different materials is essential, as engineers must make informed decisions about which materials are best suited to specific products and environments.

Please complete the following preparatory task

OCR H404 Engineering: Transition Task Sheet

Lightweight Emergency Shelter Frame Design

Duration: 2–3 hours | **Individual work** | **Self-marking checklist provided**

Design Brief

You are a junior design engineer for an international disaster relief organization. Your task is to design a lightweight, portable frame structure for an emergency shelter that can be rapidly deployed in remote locations after natural disasters.

The shelter frame must:

- Support a distributed load of 500 kg (roof covering + internal equipment + wind load)
- Weigh less than 8 kg
- Be assembled by two untrained people in under 5 minutes
- Use materials available globally and cost less than £40 to manufacture
- Withstand environmental conditions: temperature range −10 °C to +50 °C, wind speeds up to 40 mph (17.9 m/s)

Your deliverables

Annotated design sketch with dimensions and material specification

Manufacturing process proposal (2–3 methods considered)

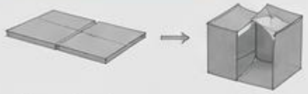
EMERGENCY SHELTER IDEAS

CONCEPTS FOR SAFE, QUICK, AND SUSTAINABLE SHELTER

1. INFLATABLE SHELTER

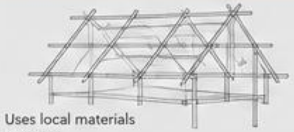
- Quick to set up
- Lightweight and easy to transport
- Weather resistant
- Suitable for temporary use

2. FOLDING PANEL SHELTER



- Flat-pack design
- Fast assembly
- Durable panels
- Good insulation
- Reusable

3. BAMBOO FRAME SHELTER



- Uses local materials
- Low cost
- Strong and flexible
- Good ventilation
- Environmentally friendly

4. CONTAINER SHELTER

- Very durable
- Weather and fire resistant
- Secure
- Can be modified and reused

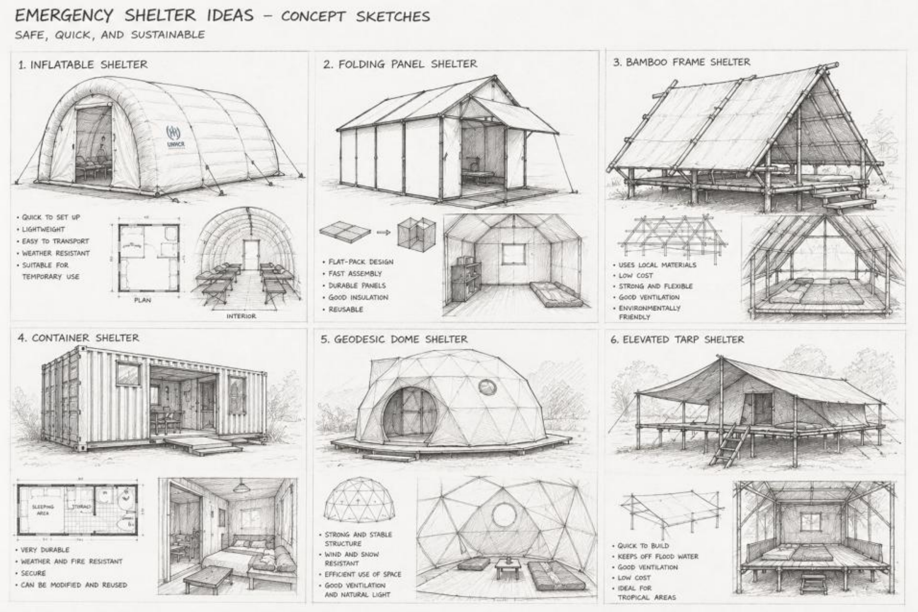
5. GEODESIC DOME SHELTER

- Strong and stable structure
- Wind and snow resistant
- Efficient use of space
- Good ventilation and natural light

6. ELEVATED TARP SHELTER

- Quick to build
- Keeps off flood water
- Good ventilation
- Low cost
- Ideal for tropical areas

Design Concept & Sketch



Task: Sketch a frame structure suitable for an emergency shelter. Consider:

- Frame geometry (A-frame, dome, rectangular portal frame, or other)
- How the 500 kg load is distributed through the structure
- Where joints and connections occur
- How it folds or packs for transport

Your sketch must show:

- Plan view (top-down) with all dimensions labeled in mm
- Side elevation with height, depth, and cross-bracing visible
- Material type and cross-section size for each member (e.g., "20 mm aluminum tube," "16 mm steel rod")
- Assembly method at joints (bolted, welded, pinned)

Guidance: A simple A-frame or rectangular portal frame is acceptable. Focus on clarity and labeling, not artistic quality. Hand-drawn sketches are fine.

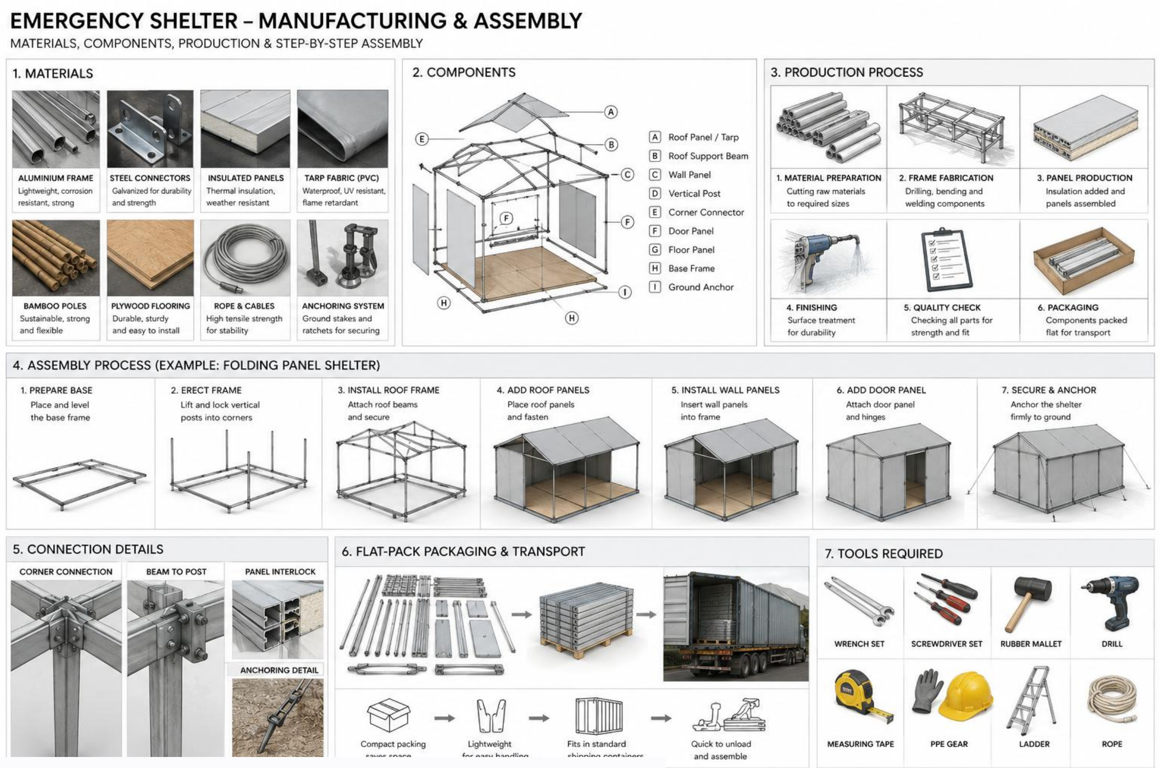
Manufacturing & Assembly

Task: Describe how your frame would be manufactured and assembled in the field.

Manufacturing: State the primary manufacturing process for your frame members (e.g., tube drawing, extrusion, pultrusion, hand-lashing). Why is this method suitable? (Consider cost, precision, skill required, speed of production.)

Assembly in the field: Describe the step-by-step assembly procedure for an untrained person. Include:

1. How many parts?
2. What tools are needed? (hammer, screwdriver, wrench, none?)
3. Estimated assembly time
4. Failure points where assembly could go wrong



Write 200 words maximum. Include a simple numbered list of assembly steps.

Self-Marking Checklist

Tick each box as you complete it. Your teacher will use this to guide feedback.

Design Sketch (✓ if complete)

- ☐ Sketch includes plan view and side elevation with all dimensions labeled
- ☐ Material type and cross-section size clearly stated for each member
- ☐ Assembly method at joints identified (bolted/welded/pinned)

Manufacturing & Assembly (✓ if practical)

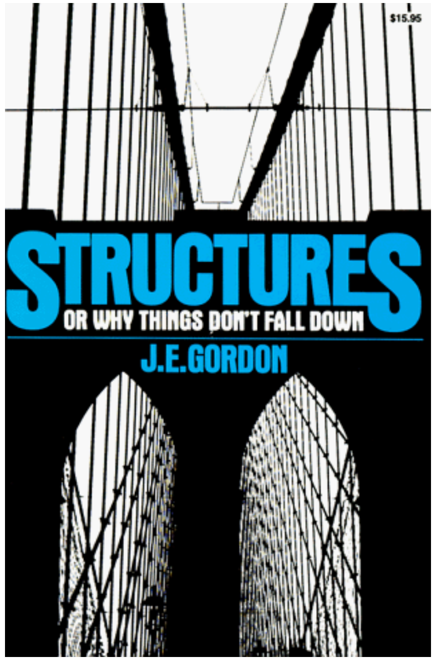
- ☐ Manufacturing process named and justified
- ☐ Step-by-step assembly procedure listed (minimum 5 steps)
- ☐ Assembly time estimated and tools identified
- ☐ Accessible to untrained users (no specialist skills required)

Reading List

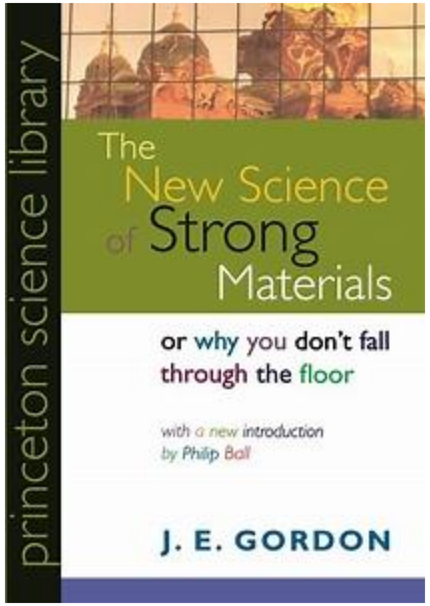
To help you prepare for A Level Engineering, we recommend reading some of the books and articles below over the summer. You do not need to read everything – choose one or two books and a selection of articles that interest you. The aim is to develop your understanding of engineering, current technologies and the role engineers play in solving real-world problems.

OCR Design and Technology for AS/A Level (Chris Walker, John Grundy, Sharon McCarthy & Jacki Piroddi)

OCR H404 Specification



Structures: Or Why Things Don't Fall Down – J. E. Gordon



The New Science of Strong Materials – J. E. Gordon

The Perfectionists: How Precision Engineers Created the Modern World – Simon Winchester