

Define and Plan the Build

Lesson at a glance

Open by asking each group who their user is and the one small problem to solve — hold them on the need, not a solution. Groups agree three or four checkable success criteria, then draw side and top views on the printed DesignBrief page with real centimetre measurements taken from the shared materials table. They gather materials against their own list, revising the plan if something's missing. Close with a display-only talk on why engineers plan and measure before they build.

Learning objectives

- Confirm the user need and agree clear success criteria for the build
- Produce a labelled, measured Design Brief with chosen materials
- Choose and gather the materials the group will need to build

Before the bell – prep

Set up the shared materials table before the bell — tubes, boxes, card and joining bits laid out so groups can measure real objects. Print one DesignBrief page per group. Have tape measures/ rulers to lend so measuring is real, not guessed. Sort labelled trays or bags so each group can store their Design Brief and gathered kit together for the build.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
DesignBrief page (Investigation Journal)	1	group	school kit	a plain A4 sheet ruled into a sketch box and a materials list
30 cm rulers	2	group	classroom	the edge of the Investigation Journal marked in centimetres
tape measures	1	group	school kit	a length of string measured against a ruler afterwards
sketch paper and pencils	1	pupil	classroom	the back of scrap paper
assorted junk-modelling materials to choose from (cardboard tubes, boxes, paper strips, split pins, string, lolly sticks)	1	class	brought from home	recycling collected over the previous week
labelled trays or bags to store each group's plan and materials	1	group	classroom	a large envelope or a stacked box per group

Safety watch-point

Supervise scissors and any cutting when groups measure and handle tubes, boxes and card at the shared materials table.



Teaching moves

- **Ask: Whose Problem Are We Solving?:** Ask each group to say aloud in one sentence who their user is and the small problem they're solving. If they name a solution ('we'll build a box'), stop them and re-ask 'but what does your user NEED?' — hold them on the need.
- **How Engineers Plan Before They Make:** Read the concept table one row at a time, pausing on the pencil-holder example before revealing the next row. Point at a real pencil and the corner of a desk. For success criteria, anchor hard: 'three or four things we'll actually check when we test.'
- **Imagine: Agree the User Need and Success Criteria:** Circulate and press every group to make criteria checkable — swap 'it must be strong' for 'it must hold three heavy books'. Ask 'How will you know it worked? What would tell you it failed?' Cap at three or four criteria.
- **Plan: Draw a Labelled, Measured Design Brief:** Model both views at the board first — a pencil holder from the side (a tall open box) and from the top (a rectangle with the opening inside). Top view is the hard one, so make it visible before groups start. Insist on real centimetre numbers, not 'about big' — lend tape measures so groups measure the actual space their build must fit.
- **Gather and Check the Materials:** Groups collect against their own list and lay items beside the Design Brief so gaps show. If a group planned something you don't have, have them revise the plan now — frame it positively: engineers change plans when materials run out, that's normal. Store kit and brief together in a labelled tray.
- **Make Sense: How Engineers Plan:** Keep this display-only — nothing typed. Revoice good thinking: 'You changed your plan when the tube ran out — that's exactly what engineers do.' Tell the Waterford Greenway and Samuel Beckett Bridge story: both were measured and planned in detail before any building began.

What it should show

A successful group leaves with a stored DesignBrief showing side and top views, at least three centimetre measurements, and a materials list with quantities — and their gathered kit beside it. Criteria are checkable (a number, a size, a yes/no job), not 'it must be nice'. A group whose numbers are 'about big' hasn't measured yet — send them back to the table with a tape measure.

Misconceptions & interventions

- **Pupils write vague success criteria like 'it must be good' or 'it must be nice'.** — Ask 'How would you check that with a ruler or a count?' Push each one to a number, a size, or a yes/no job — 'it must hold six pencils', 'it must fit in a 20 cm space'.
- **Pupils treat the Design Brief as a pretty picture and guess sizes.** — Remind them an engineer must be able to build from it. Send them to the materials table to measure the real tube or the real desk corner, and write the true centimetre numbers on the plan.
- **Pupils jump straight to a solution before naming the user's need.** — At the Ask step, if a group says 'we'll build a box', hold them: 'but what does your user actually need?' Get the need in one sentence before any building idea.

**Differentiation**

Emerging	Developing	Proficient
• Give a sentence stem for criteria — 'It must hold ____', 'It must fit ____', 'It must not ____'. • Start a stuck group by measuring the space their build must sit in, then work outwards.	• Add a second measurement to check, e.g. 'the handle must be at least 8 cm so a hand fits'. • Ask 'what would tell you your build failed?' and add that as a fourth criterion.	• Have the group critique another group's brief: is every criterion actually checkable? Is a measurement missing? • Ask them to justify each material choice against a named success criterion.

**Cross-curricular hook**

Tie to the Maths Measures strand — pupils use length in centimetres and read a ruler or tape measure to record true sizes on the brief.