Reflection

Physical Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- Modern multi-story glass-fronted building with metal frame and horizontal mullions (window divisions)
- Older brick/stone building visible in reflection, showing contrast between architectural styles
- Repetitive grid pattern of window frames and panes across multiple floors
- Metal horizontal support beams running the full width of the facade
- Clear sky visible through transparent glass panels

Reasonable Inferences

- From glass facade + metal frame: The building is designed to allow light into interior spaces while maintaining structural support; engineers had to balance transparency with strength.
- From repetitive grid pattern: Modern buildings use modular, repeated units for efficient construction and cost-effectiveness.
- From reflection of older building: Different building materials (glass vs. brick) serve different purposes—older structures prioritize insulation and durability; modern ones prioritize light and aesthetics.

Engineering Task

K-2 Challenge:

Make a tall building that lets lots of light in. Use clear materials (like plastic wrap or cellophane) and straws or sticks to make a frame. Your building should stand up on its own and not fall over when you gently push it. How can you make the frame strong enough to hold the see-through walls?

3-5 Challenge:

Design a 30 cm tall building facade using a grid framework (straws, dowels, or craft sticks) and transparent panels (plastic sheets, cellophane, or acetate). Your structure must (1) support a lightweight load (100g weight) placed on a simulated floor, (2) allow light to pass through at least 60% of the surface, and (3) use no more than 12 vertical supports. Test which frame spacing (5cm, 10cm, or 15cm apart) provides the best balance between strength and transparency.

EDP Phase Targeted

Imagine / Plan — The photo shows a successful real-world solution (glass-and-steel facade). Students can observe how engineers solved the light/strength trade-off, then apply those design principles to their own structure. This phase works best because students have a visible model to analyze before building.

Suggested Materials

- Plastic straws, wooden dowels, or craft sticks (for frame)
- Clear plastic sheeting, cellophane, or transparency film (for panels)
- Tape (masking or clear packing tape)
- Small weights or washers (for load testing)
- Ruler or measuring tape

- Optional: sand/weights to simulate load

Estimated Time

Two 30-minute sessions (first session: observe photo, plan design, build frame; second session: attach panels, test load, measure light transmission)

Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (Define a problem, identify constraints and criteria) by having students analyze a real building's trade-offs between structural strength and light transmission, then apply those constraints to their own prototype.