The Grenfell Curriculum

Engineering Ethics

When buildings fail

Learning objectives

01

DESCRIBE

the key facts and timelines of the Grenfell Tower and Wang Fuk Court fires.

02

EXPLAIN

how material choices and structural decisions contributed to the rapid spread of fire in both cases.

03

COMPARE

the common factors: flammable exterior materials, cost-cutting, ignored warnings, and regulatory failures.

04

EVALUATE

the ethical responsibilities of engineers, designers, manufacturers, and regulators when safety is compromised.

Grenfell Tower: the facts

KEY FACTS

- 24-storey social housing tower in North Kensington
- Fire reached the roof in under 30 minutes
- 72 people killed
- Refurbishment added ACM cladding with a combustible PE core

HOW THE FIRE SPREAD

- ACM cladding panels (aluminium + PE core) ignited and acted as fuel
- Air cavity between cladding and insulation created a 'chimney effect', drawing flames upward
- Fire entered flats through flammable window surrounds
- Compartmentation failed – fire spread between flats

Wang Fuk Court: the facts

KEY FACTS

- Eight 31-storey towers undergoing façade renovation
- 168 people killed across seven towers
- Buildings wrapped in scaffolding and non-compliant netting for façade renovation
- EPS foam boards sealed over windows as part of renovation

HOW THE FIRE SPREAD

- Non-compliant netting ignited and spread to EPS foam boards
- Foam boards blew out windows, allowing fire into flats
- Scaffolding and foam created a vertical fuel path (chimney effect)
- Residents had warned about foam flammability months before

Comparing the two disasters

	GRENFELL TOWER (2017)	WANG FUK COURT (2025)
Location	North Kensington, London, UK	Tai Po, Hong Kong, China
Building type	24-storey social housing tower (built 1974)	Eight 31-storey residential towers (built 1983)
Fatalities	72 killed	168 killed (incl. 1 firefighter)
Exterior fire fuel	ACM cladding (PE core) + foam insulation	Non-compliant netting + EPS foam boards
Fire spread mechanism	Chimney effect via air cavity; fire entered through windows	Chimney effect via scaffolding; foam boards blew out windows
Cost-cutting	PE-core panels saved £293,368 over fire-resistant option	Substandard netting saved ~HK$115,000
Ignored warnings	Residents warned repeatedly; 40 safety issues flagged	Residents demonstrated flammability; 16 failed inspections
Regulatory failure	Manufacturers falsified test data; self-regulation failed	Inspections missed non-compliant materials; falsified certificates

The pattern of failure

Five structural similarities between the two disasters

1 Flammable Exterior Materials

Cheaper, flammable materials replaced fire-resistant alternatives on both buildings.

2 The Chimney Effect

Vertical air gaps on the exterior drew flames upward at extreme speed.

3 Fire Entry Through Windows

Exterior fire breached flats through windows in both cases.

4 Cost-Cutting Over Safety

Cheaper materials were chosen deliberately: £293,368 saved at Grenfell; ~HK$115,000 at Wang Fuk Court.

5 Ignored Warnings & Failed Regulation

Residents raised concerns that were dismissed. Inspections failed. Safety data was falsified.

Engineering ethics

What responsibilities do engineers and designers have?

CORE ETHICAL PRINCIPLES

- **Duty of care** – professionals must prioritise the safety of building occupants above all other considerations
- **Honesty and transparency** – test results, material properties, and safety data must never be falsified or concealed
- **Accountability** – every person in the design and construction chain bears responsibility for the safety of the final product
- **Professional competence** – engineers must ensure they fully understand the fire performance of the materials they specify
- **Whistleblowing** – professionals have a moral obligation to raise concerns when they identify safety risks, even if it is commercially inconvenient

DISCUSSION QUESTIONS

- Should an engineer refuse to use a material they believe is unsafe, even if their employer insists?
- Who bears the most responsibility: the manufacturer who sold the product, the designer who specified it, or the regulator who approved it?
- If a cheaper material passes the minimum legal standard but a safer alternative exists, which should be used?
- How can building regulations be improved to prevent similar disasters?
- What lessons should D&T students take from these cases into their own design practice?

Group activity

Comparative Analysis – 15 minutes

1

READ & ANALYSE

Use the Activity Sheet to read the case study summaries for both fires. Highlight the key facts in each column.

2

COMPARE & CONNECT

Complete the Venn diagram on the Activity Sheet. Identify what is unique to each fire and what is shared by both.

3

EVALUATE & WRITE

Write a 6–8 sentence evaluative paragraph answering the key question on the Activity Sheet about engineering ethics and responsibility.

⏱️ 5 min reading | 5 min Venn diagram | 5 min evaluative writing

Plenary: what have we learned?

KEY TAKEAWAYS

- Engineers and designers have a duty of care that extends beyond meeting minimum legal requirements.
- Material selection has life-or-death consequences – understanding fire performance is essential.
- Cost-cutting is not just a financial decision; it is an ethical one.
- Systemic failures (not single mistakes) cause disasters – responsibility is shared across a chain.
- Regulations only protect people if they are properly enforced and honestly applied.

EXIT TICKET

On a sticky note or scrap of paper, write your answer to this question:

"If you were an engineer asked to use a material you believed was unsafe, what would you do and why?"