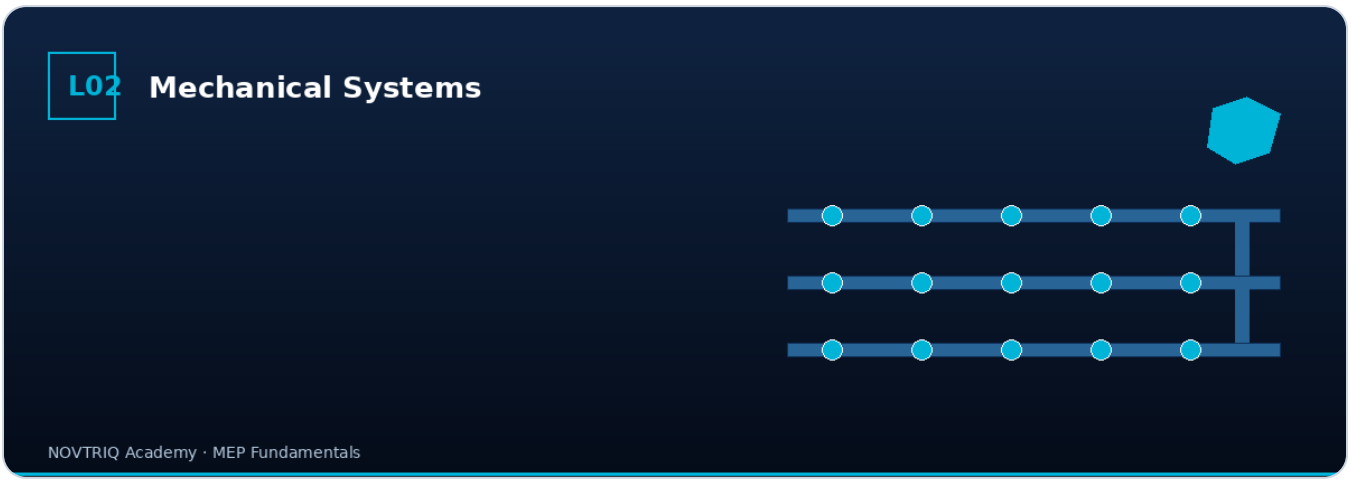
FREE

MEP FUNDAMENTALS

Mechanical Systems — HVAC Fundamentals

HVAC fundamentals — load calculation, distribution and equipment basics.



· **MEP Fundamentals** Lesson 2 of 15

HVAC delivers thermal comfort and indoor air quality. The four operations: heat (when cold), cool (when hot), ventilate (always), and dehumidify (often).

This lesson covers load calculation principles, the major system archetypes, and the language an HVAC engineer uses every day.

Learning objectives

Remember	Core concepts of this lesson.
Understand	Selection logic between alternatives.
Understand	Standards landscape.
Apply	Match a system type to a project brief.

1 · Sensible vs latent loads

Heating/cooling load splits into **sensible** (changing air temperature) and **latent** (changing moisture content). Both matter for comfort. Calculation methodologies: CIBSE TM37 (UK heating loss), ASHRAE Handbook Fundamentals (cooling load), EN 12831 (heating design loads).

2 · System archetypes

All-air systems (VAV, CAV, dual duct) — flexibility but space-hungry. **Air-water** (fan coil, chilled beam, induction) — compact but maintenance-intensive. **All-water** (radiator, fan coil with separate ventilation) — common in residential. Choice driven by load profile, plenum depth, control granularity needed.

3 · Plant rooms and risers

Plant footprint typically 5–10% of GIA on commercial. Vertical risers for distribution. Acoustic design matters — chillers, generators, AHUs all need attenuation. CIBSE Guide B has the canonical sizing approach.

4 · Controls fundamentals

Sensors (temperature, humidity, CO_2, occupancy), actuators (valves, dampers, VSDs), controller (DDC) and supervisory layer (BMS). Strategy categories: setpoint control, scheduling, optimisation. Lesson 12 dives deeper.

5 · What this looks like on a real project

UK London office HVAC selection

Standard 1990s office grade A: VAV all-air system. Modern Class A: chilled beams (active or passive) for sensible cooling, separate DOAS for ventilation/latent. Decision driven by ceiling depth and cycle of refurb.

EU · DE KfW Class B retrofit

Existing 1970s office achieving KfW B grant requires fabric upgrade plus heat pump conversion. HVAC selection follows: low-temperature emitters (radiators or underfloor) sized for 35–45°C flow.

UAE Dubai tower district cooling

Most Dubai high-rises connect to district cooling (Empower or Emicool). Building-side: BTU meter for billing, secondary distribution to FCUs/AHUs. Saves plant room footprint and maintenance.

6 · Why this matters

Heating, cooling, ventilation, air movement — the four levers behind every climate decision in a building. You can now read an HVAC schematic, name the components, and trace the airflow without bluffing. That fluency is the foundation for every other mechanical conversation, from energy strategy to commissioning to retrofit.

Quiz

Your score 0 / 5

1. What does sensible cooling load cover?

a) Removing moisture

b) Changing air temperature

c) Filtering particulates

d) Pressurising plant

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2. CIBSE Guide B covers:

a) Fire engineering

b) Heating, ventilation and AC

c) Drainage

d) Lighting

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3. A VAV system distributes:

a) Hot water at variable flow

b) Air at constant temperature, varying volume

c) Refrigerant

d) Steam

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4. A DOAS unit:

a) Recirculates indoor air only

b) Provides 100% outdoor air for ventilation/latent control

c) Heats domestic hot water

d) Filters smoke

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5. District cooling primarily benefits:

a) Single-family homes

b) Dense urban developments with shared chilled water

c) Rural farms

d) Single warehouses

Answers (for print): 1b · 2b · 3b · 4b · 5b

Resources

PRIMARY SOURCES

- CIBSE Guide B — Heating, Ventilation, Air Conditioning and Refrigeration.
- ASHRAE Handbook — Fundamentals (current edition).
- EN 12831 — Heating design loads.

STANDARDS AND GUIDANCE

- CIBSE TM37 — Design for improved solar shading control.
- EN 16798 — IEQ design parameters.

INDEPENDENT COMMENTARY

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