

Introduction to Building Systems and Services

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Key concepts, typical components, and how they interrelate in modern structures.

1. What Are Building Systems & Services?

Term	Definition	Why It Matters
Building Systems	Integrated groups of mechanical, electrical, and plumbing (MEP) components that deliver essential functions (e.g., heating, ventilation, lighting).	Provide the backbone for occupant comfort, safety, and productivity.
Building Services	The operational aspects of those systems—maintenance, monitoring, control, and support functions (e.g., fire protection, security).	Ensure reliability, efficiency, and regulatory compliance over the building’s life?cycle.

Together they transform a static shell into a functional, habitable environment.

2. Core System Categories

Category	Main Sub? systems	Typical Equipment	Primary Objectives
HVAC (Heating, Ventilation, Air? Conditioning)	- Heating - Cooling - Ventilation - Air?distribution - Utility service	Boilers, chillers, heat pumps, air handling units (AHU), ductwork, fans, thermostats	Maintain indoor temperature, air quality, and humidity within design limits.
Electrical Power & Distribution	- Transformers - Switchgear - Lighting - Emergency power	Transformers, panelboards, circuit breakers, UPS, generators, LED fixtures	Deliver safe, reliable electricity for all building loads and critical backup.

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Category	Main Sub? systems	Typical Equipment	Primary Objectives
Plumbing & Water Management	- Domestic water supply - Sanitary drainage - Stormwater management - Water heating	Pumps, water heaters, pressure?boost systems, pipe networks, fixtures	Provide clean water, remove waste, and manage runoff efficiently.
Fire Protection & Life Safety	- Detection - Suppression - Egress - Alarm & notification - Perimeter security - Intrusion detection	Smoke detectors, sprinklers, fire pumps, fire alarm panels, emergency exit signs	Detect, contain, and evacuate safely during fire events.
Security & Access Control	- Video surveillance - Credential management	CCTV cameras, motion sensors, card readers, intercoms, control software	Protect occupants, assets, and information.
Building Automation & Controls (BMS/EMS)	- Monitoring - Scheduling - Optimization - Fault detection	Sensors, programmable logic controllers (PLC), SCADA, dashboards	Integrate all subsystems for energy efficiency, comfort, and proactive maintenance.
Specialty Systems <i>(depending on building type)</i>	- Elevators & lifts - Medical gas (hospitals) - Data?center cooling - Acoustic & vibration control	Traction elevators, pneumatic tubes, chilled water loops, acoustic panels	Support unique functional requirements of specific occupancies.

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3. Design Process Overview Services

1. Program & Requirements Gathering

- Occupancy type, density, operating hours, comfort criteria, sustainability goals.

2. Pre-design Feasibility

- Site constraints, utility availability, climate data, code envelope.

3. Conceptual Design

- Select system types (e.g., VAV vs. CAV, chilled water vs. DX cooling).
- Rough sizing using rule-of-thumb calculations (e.g., 1kW per 10m² for cooling).

4. Detailed Design & Coordination

- Load