

Introduction to Building Systems

Introduction to Building Systems

Designed as a quick-reference guide for students, new engineers, and facility managers.

1. What Is a Building System?

Definition	Key Idea
Integrated collection of components that work together to provide a functional environment inside a structure.	Combines mechanical, electrical, structural, and control elements to meet comfort, safety, and performance goals.
Scope	HVAC, lighting, power distribution, fire protection, plumbing, security, vertical transportation (elevators/escalators), building automation, and structural support.

2. Core Categories of Building Systems

Category	Primary Functions	Typical Sub-systems
Mechanical	Condition indoor air temperature, humidity, and quality.	• Heating, Ventilation & Air Conditioning (HVAC) • Boilers, chillers, pumps, fans • Ductwork & piping
Electrical	Deliver safe, reliable power; enable communication.	• Power distribution (transformers, switchgear, panels) • Lighting (interior & exterior) • Emergency power (generators, UPS) • Data & telecom cabling

Introduction to Building Systems

Category	Primary Functions	Typical Subsystems
Plumbing & Sanitary	Provide water supply, waste removal, and fire suppression water.	• Domestic water distribution • Storm drainage • Sewage & waste water • Sprinkler & standpipe systems
Fire Protection	Detect, contain, and suppress fire; protect occupants.	• Detection (smoke, heat, flame sensors) • Alarm & notification (horns, strobes) • Suppression (sprinklers, gaseous agents) • Smoke control & pressurization
Vertical Transportation	Move people & goods between floors efficiently.	• Elevators, escalators, lifts • Control & safety devices (door operators, brakes) • Card readers, biometric
Security & Access Control	Restrict unauthorized entry & monitor activity.	• Scanners • CCTV, intrusion detection • Perimeter barriers • Sensors (temperature, occupancy, CO₂)
Building Automation & Controls (BAS)	Coordinate operation of all other systems for efficiency & comfort.	• Controllers (PLC, DDC) • User interfaces (touch panels, web dashboards) • Integration protocols (BACnet, Modbus, LonWorks)

3. Design Drivers & Performance Criteria

Driver	How It Influences System Choice
Occupant Comfort	Temperature set points, humidity control, lighting quality, acoustic levels.

Introduction to Building Systems

Driver

How It Influences System Choice

Energy Efficiency	High-efficiency equipment, variable-speed drives, heat recovery, daylight harvesting.
Indoor Air Quality (IAQ)	Filtration, fresh-air ventilation rates, CO ₂ monitoring, contaminant control.
Codes & Standards	International Building Code (IBC), ASHRAE 90.1 (energy), NFPA 70 (electrical), local fire & accessibility regulations.
Sustainability Goals	LEED, BREEAM, WELL certifications; renewable integration (solar PV, geothermal).
Reliability & Redundancy	Backup generators, dual-pump loops, N+1 sizing, fail-safe control logic.
Life-Cycle Cost	Initial capital, operation & maintenance (O&M) expenses, replacement cycles.
