

Topic 2C: Vertical Transport, Automation & Technology Infrastructure

Buildings need more than structural systems and mechanical equipment. They also need systems that move people, manage operations, and connect to the digital world. Topic 2C covers three areas that are central to how modern facilities function: vertical transportation, building automation, and technology infrastructure. Each involves specialized equipment, dedicated service contractors, and a growing body of code requirements. The facility manager must understand and oversee all three.

2.6 Vertical Transportation

Elevators, escalators, and moving walks are among the most regulated systems in any commercial building. They carry thousands of people every day, and their safe operation depends on well-maintained equipment, code-compliant inspections, and active contract management. Vertical transportation requires less hands-on technical work than HVAC or electrical systems, but it demands just as much attention to scheduling, documentation, and vendor accountability.

Elevator Types and Operation

Elevators in commercial buildings fall into two main categories — traction and hydraulic — each using a different drive mechanism and suited to different building types and heights.

Elevator Type	Drive Mechanism	Typical Building Height	Key Characteristics
Traction (Standard)	Steel cables or belts run over a motor-driven sheave; a counterweight offsets cab weight for energy efficiency	Mid-rise and high-rise buildings (typically 5 stories and above)	Fast, energy-efficient, and long-lived; requires a dedicated machine room above the shaft in traditional designs
Machine Room-Less (MRL) Traction	Same cable-and-sheave mechanism; drive machinery is compact and located inside the hoistway itself	Low- to mid-rise; increasingly common in new construction and retrofits across all building types	Saves space and reduces construction cost; service access is more complex and requires technicians familiar with the specific MRL design

Elevator Type	Drive Mechanism	Typical Building Height	Key Characteristics
Hydraulic	A fluid-driven piston raises the cab; a pump unit and fluid reservoir are located in an adjacent machine room	Low-rise buildings, typically 2–5 stories	Lower installation cost than traction; slower speed and less energy-efficient; hydraulic fluid leaks are an environmental concern requiring prompt response

TABLE 2.8 | ELEVATOR TYPES AND KEY CHARACTERISTICS

All elevators include safety devices that stop the cab if cables fail, speed exceeds set limits, or doors fail to close properly. These safeties are tested during every periodic inspection. The facility manager should never disable or bypass a safety device. Any report of unusual behavior — jerky movement, door hesitation, or unexpected stops between floors — should be treated as a service priority.

Door systems deserve special attention. Elevator doors are the single most common source of service calls and passenger complaints. Door edges must be checked for wear, and safety sensors must be tested regularly. A door that fails to reopen when contacted is a serious injury hazard.

The facility manager should know the type, age, capacity, and service history of every elevator in the building. This information supports maintenance planning, budget forecasting, and informed response when a unit goes out of service.

Escalators and Moving Walks

Escalators and **moving walks** serve high-traffic areas such as lobbies, retail concourses, and transit stations. They move large numbers of people continuously and, like elevators, require regular inspection and maintenance under applicable codes.

Common maintenance tasks include chain and bearing lubrication, step or pallet alignment inspection, handrail tension checks, and safety device testing. Worn or misaligned steps are a tripping hazard and must be addressed promptly. Handrails must move at the same speed as the steps — a mismatch is a fall hazard and must be corrected immediately.

The **comb plate** is the toothed metal piece at the top and bottom of an escalator where passengers step on and off. It must mesh cleanly with the steps at all times. A damaged or misaligned comb plate can trap shoes or clothing and cause a fall. Comb plate condition should be part of every routine inspection.

Any unit taken out of service must be clearly barricaded and occupants must be notified. A stopped escalator in a busy building creates immediate congestion, so response time matters.

Regulatory Requirements and ASME A17.1

Vertical transportation equipment is governed by **ASME A17.1**, the Safety Code for Elevators and Escalators. Most jurisdictions adopt ASME A17.1 into local law and require periodic inspections by a licensed elevator inspector. Most require an annual inspection and a full load test every five years. Certificates of inspection must be current and posted in the elevator cab.

An expired inspection certificate is a code violation and an insurance liability.

The facility manager schedules inspections and ensures the contractor prepares the equipment beforehand. Deficiencies noted by the inspector must be corrected within the timeframe set by the AHJ. Failure to act promptly can result in mandatory shutdown of the unit.

Many jurisdictions are also adopting **modernization requirements** that require older traction elevators to upgrade controls, door systems, or safety devices on a set timeline. The facility manager should track the compliance status of each unit and factor modernization costs into long-range capital plans.

Service Contracts and Maintenance Logs

Elevator maintenance is almost always done under a service contract with a licensed elevator contractor. These contracts vary widely in scope, and the facility manager must understand what is and is not included before signing.

Contract Type	What Is Covered	What Is Excluded	Best-Fit Scenario
Full Maintenance	All parts, labor, lubrication, adjustments, callbacks, and entrapment response at no additional charge	Typically excludes vandalism, misuse damage, and major cab interior renovation	High-use elevators in occupied buildings where any unplanned downtime is disruptive and costly
Examination Only	Scheduled inspections, lubrication, and minor adjustments to keep the unit in current condition	All parts and major repairs; these are billed separately at time and materials rates	Newer elevators still under manufacturer warranty, or buildings with dedicated in-house maintenance capacity for minor repairs

Contract Type	What Is Covered	What Is Excluded	Best-Fit Scenario
Oil and Grease	Basic lubrication service only; the contractor visits on a set schedule to apply lubricants	All labor beyond lubrication, all parts, all inspections, and all adjustments — billed separately	Low-use freight elevators, seldom-used service elevators, or facilities with strong in-house elevator service capability

TABLE 2.9 | ELEVATOR SERVICE CONTRACT TYPES

When evaluating bids, look beyond the monthly fee. Response time guarantees, parts availability, and technician qualifications all affect real-world service quality. A low-cost contract with slow callbacks and deferred repairs is not a good value.

The facility manager should require the contractor to keep a detailed **maintenance log** for each unit. The log records every service visit, work performed, parts replaced, and the condition of key components. At contract renewal, the maintenance log is the primary tool for evaluating contractor performance.

REFLECTION QUESTION

Think about the elevators in a building you know. What type do you think they are — traction or hydraulic — and what clues led you to that conclusion? If one unit went out of service during peak morning hours, what steps would you take and in what order?

2.7 Building Automation Systems

A modern commercial building generates enormous amounts of data every hour. Temperatures, pressures, energy consumption, occupancy patterns, equipment alarms — all of it flows continuously through dozens of systems. The building automation system, commonly called the BAS, is the platform that collects, monitors, and acts on that data. For the facility manager, the BAS is one of the most powerful tools available. Understanding how it works and how to use it effectively is a core competency in modern facility management.

BAS Architecture and Components

A **building automation system** is a network of hardware and software that monitors and controls a building's mechanical, electrical, and life safety systems from a central platform. The BAS connects field devices — sensors, actuators, and controllers — to a central server and operator interface, allowing the facility manager to monitor conditions, adjust setpoints, respond to alarms, and review historical data from a single location.

The BAS operates across three functional levels. Each level has a distinct role, and together they give the facility manager real-time visibility and control over every connected building system.

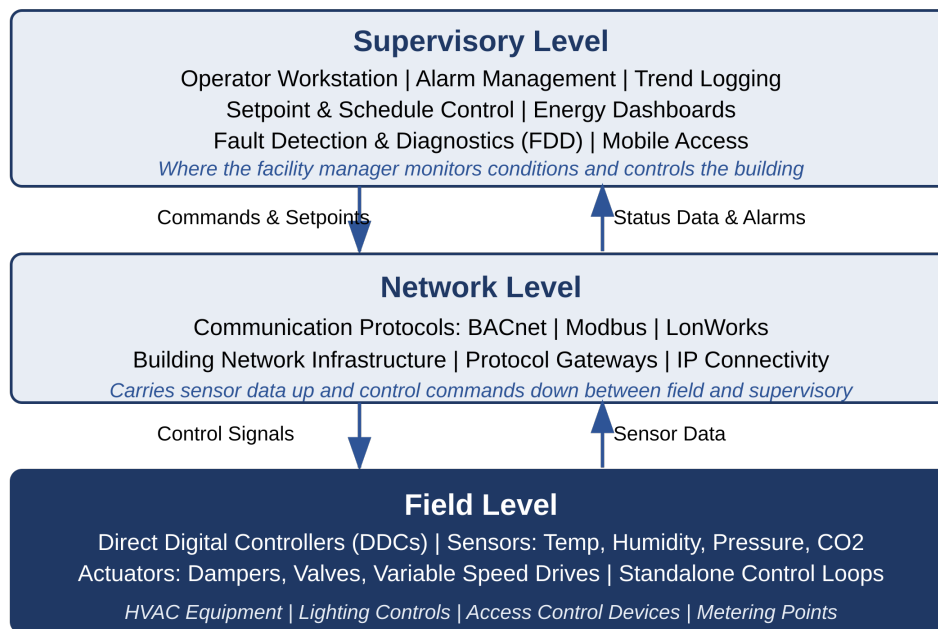


FIGURE 2.10 | BAS THREE-LEVEL ARCHITECTURE: FIELD, NETWORK, AND SUPERVISORY

At the **field level**, sensors measure temperature, humidity, pressure, CO₂, and occupancy. Actuators physically move dampers, valves, and variable speed drives in response to control commands. **Direct digital controllers**, called **DDCs**, process sensor data and issue control commands. DDCs maintain independent local control and do not require a live connection to the central server to keep equipment operating.

The **network level** connects field devices to each other and to the building network. **BACnet** is the most widely used open protocol in commercial buildings, allowing equipment from different manufacturers to communicate on the same network. Proprietary protocols limit interoperability and can create vendor lock-in over time.

The **supervisory level** is where the facility manager interacts with the system. The operator workstation displays real-time data, alarms, trends, and schedules. Setpoints are adjusted here, control sequences are modified, and reports are generated. A well-configured supervisory interface makes routine monitoring efficient. A poorly configured one obscures problems and slows response.

Technology is advancing what a BAS can do. Mobile interfaces let facility managers monitor and adjust from anywhere in the building or off-site. Artificial intelligence is entering the BAS space, with AI-driven analytics capable of detecting anomalies and predicting equipment failures faster than manual review allows.

HVAC Control and Integration

The BAS controls HVAC equipment through programmed **sequences of operation** that define how equipment responds to changing conditions — ramping up air handler supply

air temperature as outdoor temperature drops, staging chillers on and off based on cooling demand, and modulating VAV boxes to match zone-level load.

Scheduling tells the BAS when to run equipment. **Optimum start algorithms** calculate the earliest time to begin conditioning a space so it reaches setpoint exactly at occupancy start — not hours before. These algorithms learn from daily patterns and reduce energy waste without sacrificing comfort.

Economizer control uses outdoor air for free cooling when outdoor conditions are favorable. A stuck or poorly calibrated economizer is one of the most common sources of HVAC energy waste in commercial buildings.

Alarm management — setting appropriate thresholds, prioritizing alerts, and suppressing false triggers — is ongoing maintenance work. A well-configured alarm system is a powerful early-warning tool. A poorly configured one generates hundreds of nuisance alarms that get ignored while real problems hide behind the noise.

Energy Management Through BAS

Trend logging records data from sensors and equipment over time. Reviewing trend data reveals patterns invisible in real-time monitoring — a chiller running at full load in mild weather, a zone that constantly calls for heat while adjacent zones call for cooling, or an air handler that never reaches its supply air temperature setpoint. Each one points to a correctable problem.

Fault detection and diagnostics, called **FDD**, uses algorithms to identify equipment operating outside expected parameters — stuck dampers, failed sensors, simultaneous heating and cooling, and economizer faults that can go unnoticed for months. They waste significant energy and accelerate equipment wear.

Continuous commissioning runs software on top of the BAS on an ongoing basis. It analyzes live data streams against engineered benchmarks and flags deviations with prioritized findings and estimated savings. Buildings using continuous commissioning achieve deeper and more sustained energy savings than those relying on periodic audits alone.

Demand limiting uses the BAS to shed non-critical loads when electrical demand approaches a billing threshold. Shedding load for even a few minutes during a demand peak can meaningfully reduce utility costs for the entire billing period.

Lighting and Access Control Integration

Lighting integration connects the BAS to the building's lighting management system. When the BAS puts the building into unoccupied mode, lighting follows the same schedule without a separate programming step. **Access control integration** allows the BAS to respond to real occupancy signals from the security system — beginning setback operations the moment the last person badges out of a space.

Integration also supports emergency response. When the fire alarm activates, the BAS can execute a preprogrammed smoke control sequence — pressurizing stairwells, exhausting smoke from affected floors, and shutting down return air systems. This integration must be commissioned and tested carefully as part of the building's annual fire protection program.

BAS Maintenance and Troubleshooting

Sensor calibration is one of the most important maintenance tasks. A temperature sensor reading two degrees high causes the system to overcool. A pressure sensor that drifts causes a fan to run faster than needed. Sensors should be calibrated on a regular schedule and recalibrated whenever control problems suggest inaccurate readings.

Controller firmware and BAS software should be kept current. An outdated BAS platform may be vulnerable to cyberattack and may not support integration with newer systems. BAS networks should be segmented from the corporate IT network and protected by firewalls and access controls.

When BAS problems occur, the facility manager should review current alarms and recent trends before calling a contractor. Many issues can be traced to a failed sensor, a stuck actuator, or a control override left in place after a service visit. Checking for active **overrides** is always an early troubleshooting step.

KEY POINTS

- The BAS operates across three levels: field (DDCs, sensors, actuators), network (BACnet/Modbus protocols), and supervisory (operator interface, dashboards, alarm management).
- Sequences of operation define how equipment responds to changing conditions and must be reviewed and updated when building use changes.
- FDD and continuous commissioning detect energy waste and equipment faults that routine visual monitoring routinely misses.
- BAS networks must be segmented from corporate IT infrastructure and protected by firewalls — cybersecurity is a facility management responsibility.
- Active control overrides left in place after service visits are one of the most common causes of unexplained equipment behavior.

REFLECTION QUESTION

Think about a building you know. If the BAS reported that a rooftop unit was running continuously during unoccupied hours, what are three possible causes you would investigate, and how would you use BAS trend data to narrow down the problem?

2.8 Telecommunications & IT Infrastructure

Commercial buildings today run on data as much as they run on electricity. Voice communications, wireless networks, security systems, audio-visual equipment, and the building automation system all depend on a reliable telecommunications and IT infrastructure. For the facility manager, this is a building system that requires the same attention to installation standards, maintenance, and capacity planning as any other system in the building.

Structured Cabling Systems

Structured cabling is the physical foundation of the building's telecommunications infrastructure — the network of cables, connectors, and distribution hardware that carries

voice, data, and low-voltage signals throughout the building. A well-designed structured cabling system supports all current applications and has capacity to grow as technology needs change.

Category 6 and **Category 6A** cables are the current standard for most commercial applications. Maximum horizontal run length is 90 meters. Cables must be routed away from electrical equipment to avoid signal interference.

The telecommunications room — also called the **IDF**, or intermediate distribution frame — houses patch panels, switches, and distribution hardware for each floor. These rooms must be climate-controlled and secure. An overheated telecommunications room is a common and preventable cause of network outages.

The **main distribution frame**, called the **MDF**, is the central hub of the cabling system. The MDF room requires dedicated cooling, uninterruptible power, and physical security. All cabling must be clearly labeled and documented — good documentation cuts troubleshooting time and is essential during renovations or tenant changes.

Network Infrastructure and Data Rooms

The facility manager is not responsible for managing the network itself, but maintaining the physical environment the network depends on is a core obligation. Network switches and routers are typically rack-mounted in telecommunications rooms. Good cable management within racks keeps airflow clear and makes troubleshooting faster.

Data rooms and server rooms require precise environmental control. Most equipment operates best between 64 and 80 degrees Fahrenheit, with humidity between 40 and 60 percent. The facility manager should monitor conditions continuously. Physical access must be limited to authorized personnel and logged electronically.

Wireless Infrastructure

Wireless access points, called **WAPs**, must be distributed based on a coverage plan developed by a qualified network engineer. The facility manager's role is to ensure WAPs are securely mounted, connected to the structured cabling system, and powered through the network switches using power over Ethernet (**PoE**). WAPs should not be relocated without consulting the network team.

Distributed antenna systems, called **DAS**, extend cellular coverage inside buildings where exterior signals cannot penetrate. The facility manager should know whether the building has a DAS and who is contractually responsible for its maintenance.

Audiovisual and Communications Systems

Most buildings have shifted from traditional analog telephone lines to **VoIP** — voice over internet protocol. VoIP phones use the data network, which means a network outage takes down voice communications as well. Emergency phones and elevator phones must have dedicated backup power independent of the main data network.

Public address and **intercom systems** support daily building communications and emergency notification. They must be tested regularly. A failed PA system during an emergency can significantly impede occupant response and evacuation.

Low-Voltage Systems Coordination

Telecommunications and IT infrastructure belongs to a broader category known as **low-voltage systems** — which also includes security and access control, fire alarm, audio-visual, and nurse call systems. These systems share pathways, conduit, and sometimes power sources. Clear lines of responsibility are essential.

The facility manager should maintain a complete inventory of all low-voltage systems in the building. Each should have a designated service contractor, a current service agreement, and a maintenance log. During renovations, low-voltage systems are frequently damaged or disconnected. Requiring contractors to identify and protect all low-voltage infrastructure before demolition begins should be a standard scope requirement on every project.

REFLECTION QUESTION

Think about the telecommunications infrastructure in a building you know. Where is the main distribution frame located, and do you know who is responsible for maintaining the cabling system? What would happen to building operations if the main network switch in the MDF failed?