Elevator Traffic Analysis

How Many Elevators Does Your Building Really Need?

Understanding how traffic studies improve building performance, reduce waiting times, and guide capital investment.

A technical guide for building owners, developers, architects, and facility managers.

Executive Summary

The number, size, speed, and arrangement of elevators should be determined by how people actually move through a building—not by floor count alone. Elevator traffic analysis evaluates passenger demand, handling capacity, waiting and journey times, and the performance of proposed or existing systems. For new buildings, it helps establish the right design before hoistways are finalized. For existing properties, it helps identify whether poor service results from inadequate capacity, dispatching, equipment performance, or changes in occupancy.

1 | What Is Elevator Traffic Analysis?

An elevator traffic analysis is an engineering study of how effectively an elevator system transports passengers. It considers building population, occupancy, arrival and destination patterns, car capacities, speeds, door operation, travel distances, and group dispatching.

Two common applications are new-building design, where the study establishes elevator quantity and specifications, and existing-building performance evaluation, where it identifies service deficiencies and improvement options.

2 | Why the Study Matters

Poor elevator service can create long queues, crowded cars, delayed trips, and dissatisfied tenants. Installing too many elevators, however, consumes rentable space and adds equipment and maintenance expense. A traffic study helps balance service quality with capital and operating cost.

Office towers, residences, hotels, hospitals, universities, and mixed-use developments have different traffic patterns. Similar floor counts do not imply similar elevator requirements.

3 | How Many Elevators Does a Building Need?

There is no universal elevator-per-floor formula. A 12-story office building with concentrated morning arrivals may need a different system from a 12-story residence with more distributed travel or a hospital with bed, staff, and visitor movements.

Key inputs: building population and use; number of floors and travel distance; peak passenger demand; rated car capacity and speed; acceptable waiting and journey times; hoistway and lobby constraints; and future occupancy assumptions.

4 | Handling Capacity

Handling capacity is commonly expressed as the percentage of a building population transported in a five-minute period. For example, a 1,000-person building with an illustrative five-minute design demand of 12% would require capacity for approximately 120 passengers in that period. This percentage is an example—not a universal target.

The study tests whether the proposed elevator group can meet project-specific demand under realistic operating assumptions.

5 | Performance Measures

- Elevator interval: in conventional calculations, the average time between successive departures from the main terminal during the modeled condition.
- Average waiting time: the average time between requesting service and an elevator becoming available for boarding.
- Journey time: the passenger's in-car travel, including stops and door operations.
- Time to destination: the combined waiting and in-car journey time, a useful measure of overall passenger experience.

6 | Why Faster Is Not Always Better

Elevator speed is only one contributor to total trip time. Passenger transfer, door cycles, acceleration, intermediate stops, dispatching, and available capacity can dominate performance—particularly in lower-rise buildings. Before purchasing higher-speed equipment, determine whether speed is the actual bottleneck.

7 | Computer Simulation and Scenario Testing

Traditional calculations are useful for preliminary assessment, while computer simulation can model complex up-peak, down-peak, interfloor, and mixed traffic. Simulations can compare four versus five elevators, alternative car sizes and speeds, and different dispatching approaches.

Results depend on accurate population assumptions, arrival patterns, and control models. For existing buildings, observed traffic and operating records should inform and, where possible, validate the model.

8 | Performance Studies for Existing Buildings

Persistent queues, overcrowding, long journeys, or inconsistent service do not automatically mean an owner needs new elevators. Problems may stem from inadequate capacity, slow doors, dispatching, poor maintenance, or units frequently out of service.

A performance evaluation may combine site observations, passenger counts, waiting-time measurements, elevator operating records, equipment tests, and traffic modeling to identify the underlying cause before recommending modernization.

9 | When to Commission a Study

- During early new-building planning—before hoistway quantity and dimensions are fixed.

- Before major modernization, expansion, or a significant occupancy or use change.
- When recurring waiting-time complaints or peak-hour congestion occur.
- During property acquisition and due diligence to identify capacity limitations and future capital exposure.

10 | Risks of Skipping Traffic Analysis

Too few elevators can lock a building into years of inadequate service; too many can increase installation cost and consume valuable space. Incorrect capacities, speeds, or zoning arrangements may fail to solve congestion. Once structural layouts are fixed, adding elevators can be prohibitively costly or impractical.

11 | The Value of Independent Analysis

Manufacturers can provide useful studies, but these may reflect their own equipment and controls. An independent consultant can establish performance objectives first, compare alternatives against consistent criteria, evaluate technical proposals, and help owners avoid unnecessary expenditures.

12 | The Right Decision Starts With the Right Analysis

New construction requires an elevator system sized for anticipated traffic before building design decisions become difficult to change. Existing properties require a diagnosis of the actual cause of poor service before committing to upgrades. In both cases, sound traffic analysis supports reliable performance and responsible investment.

How Senawi Group Consulting LLC Can Help

Senawi Group Consulting LLC provides independent elevator traffic analysis, performance evaluations, new elevator planning and design, modernization assessments, technical specifications, competitive bid evaluations, and project oversight. Our focus is helping owners select solutions that support performance, reliability, and long-term value.

The right elevator system begins with the right analysis.

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senawik@senawigroupconsulting.com | www.senawigroupconsulting.com