

# What Is Vertical Circulation Design?

## Worksheet

Vertical circulation design is the placement and sizing of stairs, elevators, escalators, and ramps so occupants can move safely and efficiently between floors, meeting both everyday circulation needs and emergency egress requirements.

## Questions

1. Which vertical circulation element is required for fire egress in most multi-story buildings?
  - A) Elevators
  - B) Escalators
  - C) Exit stairs
  - D) Ramps only
2. What is the maximum slope allowed for an ADA-compliant ramp?
  - A) 1:8
  - B) 1:12
  - C) 1:20
  - D) 1:2
3. Why are elevators generally unusable during a fire evacuation?
  - A) They're too slow
  - B) They can lose power or open onto a fire floor
  - C) They require a ticket
  - D) They're reserved for staff only
4. What mainly determines how many elevators a tall building needs?
  - A) The color of the lobby
  - B) Population, height, and peak traffic demand
  - C) The number of stairs already provided
  - D) The architect's personal preference
5. A 5-story office building has 300 occupants per floor. How many exit stairs does code likely require?
6. A 12-story residential tower with about 4 units per floor (48 units total) needs elevator service. How many elevators are typically needed?
7. A ramp needs to rise 3 ft (36 in.) to reach a building entrance. How long must an ADA-compliant ramp be?
8. Define: What is vertical circulation?
9. Define: Why do code-mandated exit stairs matter?
10. Define: What is the maximum slope for an ADA-compliant ramp?

## Answer Key

1. C) Exit stairs - Exit stairs are the code-required emergency egress path; standard elevators are excluded from fire evacuation.
2. B) 1:12 - ADA requires a maximum ramp slope of 1:12, meaning 12 inches of run for every 1 inch of rise.
3. B) They can lose power or open onto a fire floor - Fire can disable elevator power or cause doors to open onto a burning floor, so occupants use stairs instead.
4. B) Population, height, and peak traffic demand - Elevator sizing is based on how many people need to move, how far, and how fast during peak demand periods.
5. Most building codes require at least two remote exit stairs once occupant load or building height passes a threshold. With 300 occupants per floor, this building needs at least two separate, remote exit stairs. Stair width is then sized using an occupant-load factor (commonly around 0.3 in. per person) to ensure enough egress capacity. The architect verifies exact numbers against the applicable building code for the specific occupancy type.
6. Elevator sizing considers population, travel distance, and target handling capacity during peak periods. A rough guideline for residential towers is roughly one elevator per 100-150 units, adjusted for building height and speed. For 48 units in a slim 12-story tower, 1-2 elevators is common practice. A vertical transportation consultant runs detailed traffic calculations for anything beyond a small building.
7. ADA requires a maximum slope of 1:12 for accessible ramps. Run length = rise  $\times$  12 = 36 in.  $\times$  12 = 432 in. = 36 ft. The 36-ft ramp also needs level landings at least every 30 ft of horizontal run and at the top and bottom. If 36 ft doesn't fit the site, the design may need switchbacks or a different accessible route, like an elevator.
8. The system of stairs, elevators, escalators, and ramps that lets people move between floors of a building.
9. They provide a safe, fire-rated emergency egress path; most multi-story buildings need at least two remote exit stairs.
10. 1:12 - for every 1 inch of rise, the ramp must run 12 inches horizontally.

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