

Building Design & Construction Systems

Overview

STAIR DESIGN VIGNETTE

Knowledge/
Skills

Sample Multiple-
Choice Questions

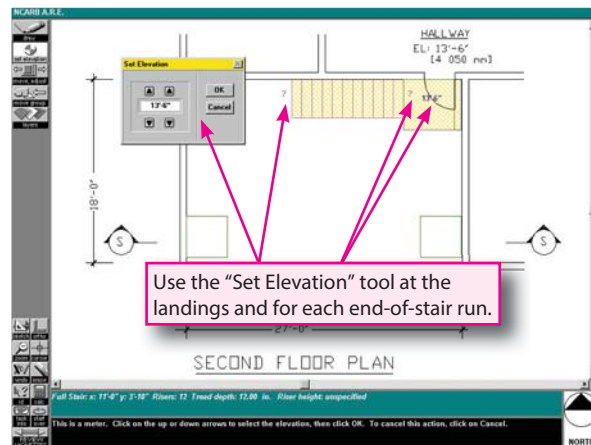
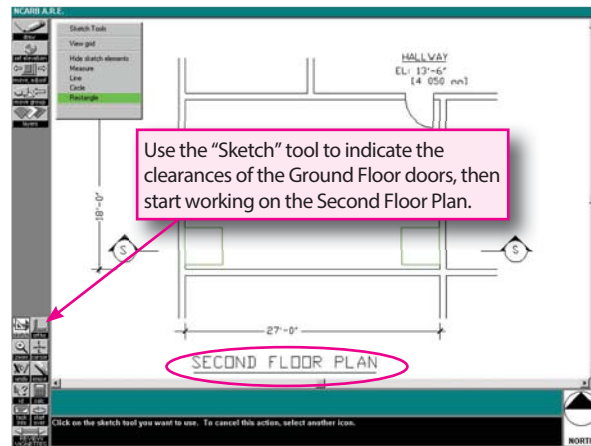
Accessibility/Ramp
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References

General Tips for Taking Stair Design



Directions

Using the tools provided, develop a design for an exit stairway within the existing two-story stairwell shown on the work screen. Draw the necessary components of the stairway on the two floor plans provided, and:

- ▶ Indicate the elevations of all landings.
- ▶ Indicate the elevations of all stair flights – at the top of the highest riser and at the bottom of the lowest riser – to match adjacent landing elevations.
- ▶ Include railings, i.e., guardrails and handrails.
- ▶ Connect stair flights to landings or the ground floor only.
- ▶ When using the cut stair tool, the flight of stairs should be drawn from landing to landing or from ground floor to landing.

You should develop a design that meets the given code and program requirements. Before starting to work on your stair design, you should familiarize yourself with the floor plans on the work screen as well as the program, the code, and the action that can be accessed through the Vignette Index screen.

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Program

In order to meet new accessibility standards and increased occupant loads, schematic plans are being developed for a new exit located within an existing stairwell in a two story bank building. Second floor to have area of refuge. The design for the other building exits – a second stairway and the building's main entrance – has been completed.

- Design the stairway to serve as a means of egress from all three building levels leading into the stairwell and through the exit discharge door to the sidewalk at grade (a public way).
 - The stairway must provide a continuous path from Second floor to Ground floor exit that includes a landing at the Intermediate level.
- The total occupant loads and number of exits for each level of the building are as follows:

Building Level	Total Occupant Load	Number of Exits
Ground Floor	360	3
Janitor	9	1
Second Floor	180	2

- The stairs will be constructed from pre-cast concrete components with the following dimensions:
 - Landings: 12 inches deep between the landing soffit and the surface.
 - Stair flights/stringers: 12 inches deep between the stair nosings and the stringer soffit measured along a line perpendicular to the soffit.

Code

Comply with the following code requirements. These are the ONLY code-related criteria you are required to use.

Definitions

- Means of Egress:** A continuous and unobstructed path of travel from any point in a building to a public way. A means of egress comprises the vertical and horizontal means of travel and shall include exit stairways, passage-ways, and exit doors.
- Exit Stairways:** That portion of a means of egress which is separated from all other spaces of a building by fire resistance rated construction to provide a protected way of travel to an exit door at grade. A stairway shall consist of one or more flights of stairs and the landings connecting them.

Capacity of Exit Components

- Occupant Load:** The occupant load for each exit shall be determined by dividing the total occupant load for an individual floor by the number of exits serving that floor.
 - Where stairways serve more than one level, the capacity of the exit components shall be based on the individual floor with the largest occupant load, provided that the exit capacity shall not decrease in the direction of means of egress travel.
- Minimum Width:** The width of each exit component in inches shall not be less than the occupant load served by an exit multiplied by 0.3 nor less than the minimum width specified by this code for each component.

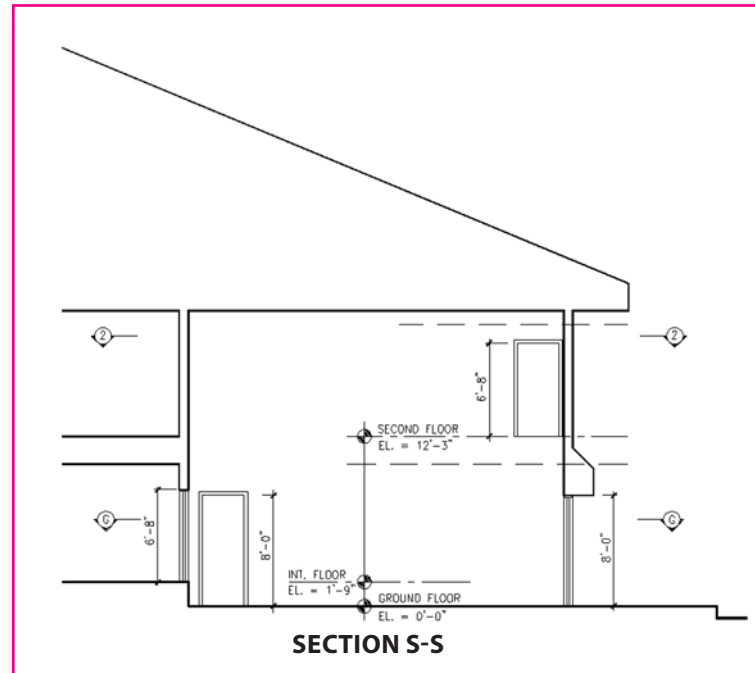
Stairways

1. **Width:** The minimum width shall be computed in accordance with Capacity of Exit Components, above, but shall not be less than 44 inches.
 - ▶ Stairways shall not reduce in width in the direction of egress travel.
 - ▶ Projections into a required stairway width are prohibited, except for handrail projections.

2. **Landings:** Stairs shall have a level landing or floor at the top and bottom of each stair run.
 - ▶ The width of a landing shall not be less than the width of the stair.
 - ▶ The least dimension in the direction of travel shall be 44 inches.
 - ▶ If the path of travel changes direction between stair runs, the least dimension shall be the width of the stairs.

3. **Headroom:** The minimum headroom of all parts of a stairway shall not be less than 80 inches measured vertically from the tread nosing or from any floor surface including landings.

4. **Treads and Risers:**
 - ▶ Maximum riser height shall be 7 inches and minimum riser height shall be 4 inches.
 - ▶ Minimum tread depth shall be 11 inches.
 - ▶ Treads shall be of uniform depth and risers of uniform height in any flight of stairs.



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Doors

1. When opening, doors shall not reduce the width of landings to less than one-half of the required width.
2. There shall be a floor or landing on each side of a door and the floor surface on both sides of the door shall be at the same elevation.
3. Minimum maneuvering clearances at doors shall be as shown in Figure 1.

Guardrails

1. Open sides of landings shall be protected by a continuous guardrail.

Handrails

1. Stairways shall have continuous handrails on both sides.
 - ▶ At locations where handrails are not continuous between stairway flights, including the top and bottom of a stairway, at least one handrail shall extend horizontally at least 12 inches beyond the top riser and the bottom riser.
2. Handrails shall not project more than 4 inches into the required passageway and stairway width.

Area of Refuge

1. An accessible area of refuge serving the second floor shall be provided within the stair enclosure.
2. The area of refuge shall be sized to accommodate one wheelchair space of 30 inches by 48 inches.
 - ▶ Such wheelchair spaces shall not reduce the required stair or landing width.
3. When areas of refuge are required, stairway width shall have a minimum clear width of 48 inches between handrails.

FIGURE 1: MANEUVERING CLEARANCES AT DOORS

