STAIRS
Design & Construction
“A Stair is a system of steps by which people and objects may pass from one level of a building to another.”

A stair is to be designed to span a large vertical distance by dividing it into smaller vertical distances, called steps.

Some of the functional requirements of staircases are:

- Stability
- Protection from fire
- Suitable dimensions (for normal, elderly, disabled people & children)
- Appearance
COMPONENTS & TERMINOLOGY

**flight**: A series of steps between different levels or storeys of a building.

**landing**: An area of floor at the top of or between flights of stairs for changing direction in the stairs & providing a resting place between long flights of stairs.

**tread** - The part of the step that is stepped on.

**riser** - The vertical portion of the step between steps.

**nosing** - An edge part of the tread that extends from the riser beneath.
winders - Winders are steps that are narrower on one side than the other. They are used to change the direction of the stairs without landings. A series of winders form a circular or spiral stairway.

stringer or string - The structural member that supports the treads. There are typically two stringers, one on either side of the stairs; though the treads may be supported many other ways. The stringers are notched so that the risers and treads fit into them.

handrail: A rail fixed parallel above the pitch line at the sides of a stair.

balusters: Vertical members which support a handrail.

Newel: A vertical post which might provide support for either the handrail, or support for the upper end of an outer string.
bullnose – when one or both sides of the stairs are open, the first step above the lower floor may be wider than the other steps. The rounded portion of the step is called a "bullnose".
SUITABLE DIMENSIONS FOR STAIRCASES

- **Riser and tread**: in a flight of stairs all steps should have the same riser and same tread.
- Relationship between riser and tread can be shown as $2R + T = 63\text{cm}$
- Convention centers, cinema, Theaters: $R = 16\text{cm}$
- Schools, hospitals, Office buildings: $R = 17\text{cm}$
- Residential Buildings: $R = 18\text{cm}$

- **Steepness** of stairs; Regular pitch: 25-36 °
Tread dimensions

Min. Tread width (no side walls) = 60cm
One side wall = 70cm
Two side walls = 80cm
Handrals may project a max. of 9cm into the required width.

Handrals height should be between 86.5-96.5 cm.

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Minimum Headroom – 200 cm.
Headroom calculation

\[ H = 140 + \frac{70}{\cos \alpha} \]

Pitch : 20°  \( H = 215 \text{cm} \)
Pitch : 30°  \( H = 220 \text{cm} \)
Pitch : 45°  \( H = 240 \text{cm} \)
Types of Staircases (Plan types)

- Straight run
- 180 degree return
- L shaped
- Spiral
Straight Run Stairs

• Simplest form of stair arrangement
• Consists of one straight flight of stairs linking two levels.
• The width and the length of the landings should be equal (max. 120cm).
STRAIGHT RUN STAIRCASES – steel staircase
180 Degree Return Stair

- Open well with two flights; Space between the lower and upper flights causes half space landing to be longer.

- Dog leg: Two short flights with a half space landing between them.
- Outer strings of two flights lie in the same vertical plane.
180 DEGREE RETURN STAIRCASES – steel staircase
L Shaped Stair

• L shaped stair may have either equal or unequal flights
L-SHAPED STAIRS
“Winder" or "curved" stairs refer to stairways that make a turn without including an intermediate landing or platform to provide a flat rectangular turning space.
Landing Types

($\S$.8). Sahanlık türleri
Landing Dimensions

(§.9). Ara sahanıkların uzunluğu

(§.10). Köşe sahanlık
Spiral Stairs

have treads which turn and rise around a central column.

Diameter : 1900mm

(The opening left for spiral staircases is 15 cm more than the diameter.)
(Ş.12). Tam dönel merdivenlerde baş yüksekliği
SPIRAL STAIRCASES

[Image of a spiral staircase]

[Diagram showing parts of a spiral staircase: Individual tread, Individual Rise, Total Rise, Landing platform flush with first floor, Drawing shows a 14 rise flight (13 treads plus landing platform)]
SPIRAL STAIRS
Vatican Museum Staircase
CONCRETE STAIRS
CONSTRUCTION TYPES
WOODEN STAIR
CONSTRUCTION TYPES
How to draw a detailed stair plan:
1. Number each of the steps starting from the lowest
2. Indicate all the dimensions like tread widths & depths, total length & width of the stair, balustrade details etc.
3. Specify all the different types of materials.
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PLAN DRAWING OF A STAIRCASE

BODRUM KAT PLANI.

ZEMİN KAT PLANI.

1. KAT (SON KAT) PLANI.

(§.290). 1/100 ölçekli merdiven çizimi
BALUSTRADES

(§.250). Payandalı üstten bağlantı

(§.251). Çift ankrajlı yandan bağlantı

(§.252). Çift ankrajlı bağlantı

(§.247). Üstten bağlantı

(§.248). Yandan bağlantı

(§.249). Alttan bağlantı
BALUSTRADE
CONNECTION
DETAILS
Open riser treads
Cable rails- Cable railing requires very rigid frames compared to many other types of railings due to the forces applied to the end posts by tensioning the cables. Cables must be tensioned to provide a rigid as possible condition to satisfy building code requirements. Common frame types are constructed of steel, stainless steel, extruded aluminum or wood.
REFERENCES
3. Sari, Abdullah, Merdivenler, 1994, Turkey
4. www.mustknowhow.com
5. www.gharexpert.com