□ RAMPS, STAIRS, LADDERS

Level differences ==> connection need

1. GEOMETRY

- **Ramp – 0-15° (27%)**
  - Wheel chair, handicapped access (!!!) 5-8 % depending on - the level difference of the ramp
    - the length of the ramp
  - Physical work (trolley), baby car 10-15%
  - Car ≤ 15% (20 just personal car – **!!! to round off the ends**)
  - Pedestrian: 8 %
  - Width – depending on the function ≥1,20-1,50 m
  - Hand rail (Wheel chair, handicapped access): double hand rail 70 and 95 cm height, ∅5 cm
  - sliding / skidding risk (open air, snow, ice, sliding free finishing, and/or heating)!!!!

- **Stair 15 - 45/60°**

  Practically: **R(ise) [cm]**

  - STEP → OTÉK 65.§
  - **Rule: 2×R + G = 60-65 cm** (ergonomics – average step legth)
  - The more people use it, the more comfortable the stair must be.
  - Inside a flat: max 45° (100%) ≤ 20
  - Residential housing, Housing estate staircase ≤ 17
  - Public buildings ≤ 15
  - Gala = 13
  - Garden ≤ 13

- **Ladder 60-90°**
  - Vertical ladder – fall protection → grating
  - Just for only maintenance reason: above 45°

2. SPECIAL REQUIREMENTS ABOUT STAIRCASE:

- Flight width (free – nothing in it) ≥ 1,10 m
- ≥ 0,6 m maintenance,
- ≥ 0,8 m inside a flat,
- ≥ 1,65 m public

- LANDING → OTÉK 67.§

- Landing width: ≥ 1,20 m (flight + 10 cm, flight + 20 cm, if door, other …)
- Handrail: Not to be climbed!
  Not to stuck in! (children's head – 12 cm)
  1,0 m height (if the top cover width ...)
- Earlier not to be sliding on it.

3. FIRE PROTECTION:

- Escape routes --> **not spiral (or helical) stair**
  --> not combustible materials
- Smoke-free staircase (anteroom as a smoke-gap, ventilation)
- Escape time calculation (depending on No of people, height, No of floors, width of flight, ...)

4. STAIR CLASSIFICATION, GROUPING

- ACCORDING TO LOCATION - stairs independent of the building
  - stairs connected to the building
  - internal stairs

- ACCORDING TO NUMBER FLIGHTS – (1, 2, 3, …)
  - **RULE → OTÉK 64.§**
  - In one flight max. 20 rises
  - maximum vertical span of flight 180cm in public building
  - Straight flight (with landing) - a lot of walking (slow)
  - Half turn stair with open well (or without - doglegged)
  - Quarter turn stair
  - Three flights with well (double quarter turn)
  - *asymmetrical steps (split, Vienna, Leipzig...)

- ACCORDING TO FLIGHT SHAPES – (straight, curved, special)
  - *Curved single flight stair - position of the walking line (step dimension)
  - *spiral stair - position of the walking line (step dimension)
  - *Helical stair - position of the walking line (step dimension)

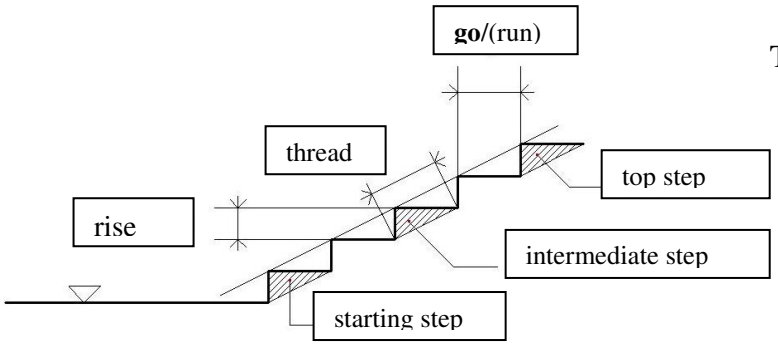
  *** Never forget to check the headroom above the flight!!! (Min. 2,20 m)**

- ACCORDING TO MATERIALS – rc., stone, artificial stone, timber, steel, mixed
- ACCORDING TO STATICS SYSTEM - hanging
  - supported

5. REQUIREMENTS FOR STAIRS

1.1 ARCHITECTURAL → detail definition, materials selection, …etc. - **AESTHETIC**
1.2 TRAFFIC→ geometry (escape time calculation), abrasion resistance, non skidding, noise insulation, …
1.3 LOAD BEARING STRUCTURE
1.4 BUILDING CONSTRUCTION ASPECT → harmony of selected materials
1.5 FABRICATION → cost effective construction

6. STAIR CONSTRUCTION TERMINOLOGY



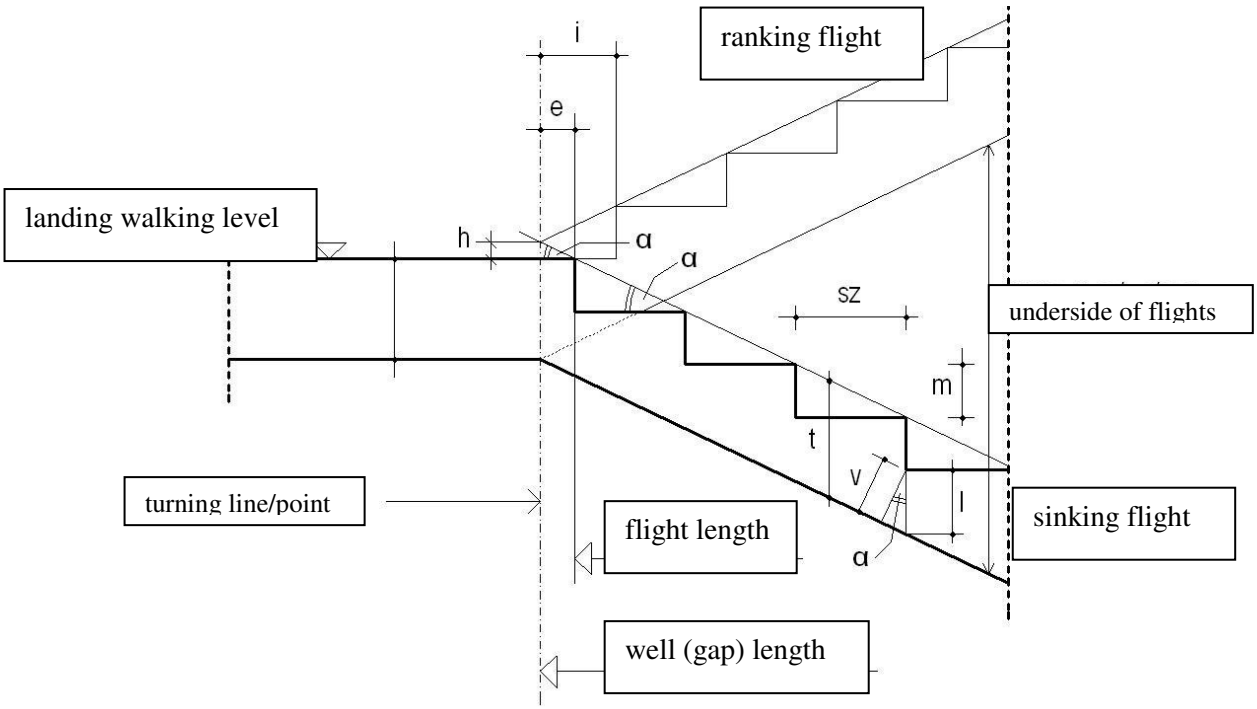
Terminology:

- step
- flight
- landing
- well (flight gap)

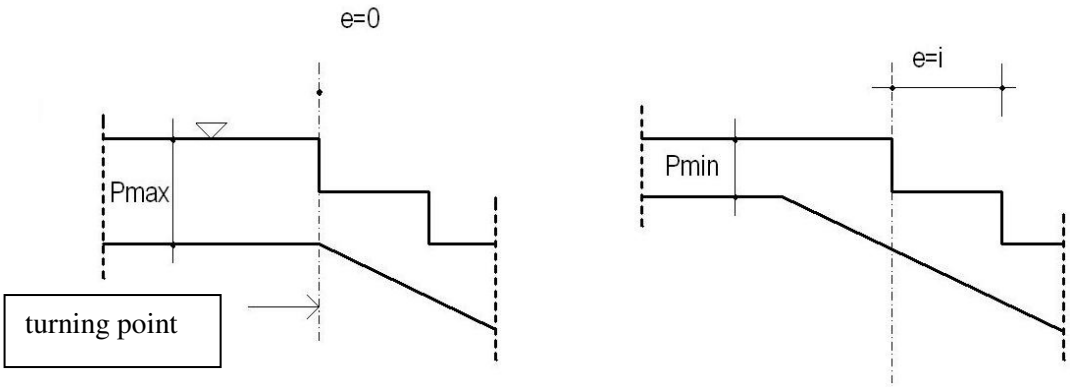
7. SUPPORT AND LOAD BEARING SCHEME of steps

- HANGING STAIRS→ steps weighing onto each other and otherwise on one end rigidly affixed into the wall, the other end is free hanging
- SUPPORTED STAIRS → steps weighing onto each other and otherwise directly on the ground or onto beams, arches etc.

□ RC STAIRS
1. DETAILS, TURNING POINT



MARGINAL ISSUES:



RELATIONSHIPS:

$tg\alpha = \frac{h}{e}$, $tg\alpha = \frac{m}{sz}$, $\cos\alpha = \frac{v}{l}$

Pv = t - h = t - e * tgα

t = m + l = m + (v/cosα)

2. CALCULATION AND DECISIONS (SAMPLE)

- (Arrangement – where to situate the room for the stair within the building?)
- Floor height? (3,05 m)
- Function of the building? → Rise → Go (Residential, 17 cm, 30 cm)
- Step dimensions → No. of steps (18×17= 306 cm, to modify floor height)
- Function → Length / height of one flight (as you wish – architectural tool)
- No. of flights (as you wish – architectural tool)
- Landing dimensions (+10, +20, +40 cm: doors, measures)
- Material of the stair? (Monolithic RC)
- Method of load-bearing? (Between landings)
- Finishing? Thickness of the finishing? (Stone)
  (linoleum, PVC, rubber, cork, carpet, tile, steel artificial stone)
- Load-bearing cross-section (span /20, but minimum 12 cm)
- Special requirements? (Thermal ins., airtight, …)

3. CONSTRUCTION AT THE TURNING POINT:
- Pitch / soffit lines of the ranking / sinking flight,
- turning edge line
- Go=s+r
- The turning edge line can move, and at the same time the landing thickness is changing.
- Final solution by attempting repeatedly

4. THE MATERIAL (today RC.) CONSTRUCTION
From prefabricated elements
- step
- part of the flight (1/4, 1/3, 1/2)
- one flight

in-situ-made construction (monolithic)

5. FIXING OF BALUSTRADE
- on the side
- on the top (free room!!!)
- **Position of balustrade vs. turning edge line!!**