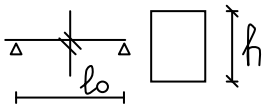
□ FLOORS

- function: - horizontal separation, covering spaces (above top floors)
  [the structure weighs / stands on walls and pillars (wall or frame type structural systems)]
  [plane, curved, stepped-type, horizontal or tilted separation]
- classification :
  - plane floors, types:
    - beam row type (wood, steel, r.c.)
    - beam type (wood, steel, r.c.)
    - ribbed (wood, steel, r.c.)
    - block insert (reinforced concrete)
    - poured / monolithic solid slab (reinforced concrete)
    - panel type (reinforced concrete)
  - vaults (horizontal pressures!)
- primary requirements:
  - load bearing capacity, stability, rigidity, limited deformation
  - should fix walls in place, take and distribute horizontal forces
  - enduring (for the lifespan of the building)
  - fulfill heat, noise and water insulation requirements
  - fulfill fire resistance requirements
  - fulfill use related requirements
  - fulfill aesthetics requirements
  - fulfill construction and cost factor requirements
- components:
  - load bearing section (wood, steel, r.c. slab, glass, brick, stone etc.)
  - finishing layer (cold, warm, semi-cold, hard, elastic, soft, floating)
  - fill (in older floor construction)
  - heat or water insulation (as required)
  - bottom surface finishing (possibly)
  - suspended ceiling (possibly)
  - raised floor (possibly)
- the finishing layer from an acoustic standpoint may be:
  - hard
  - floating
  - elastic
  - soft
- specific requirements:
  - stability req.:
    - load bearing capacity must be calibrated!
    - pre fabricated floors
      $M_M < M_H$
      $q_m < q_H$
    - poured floors (slabs) → „rule of thumb” estimations during calibration

beams



$h = \frac{l_0}{20}$ (dual support) $h = \frac{l_0}{25}$ (multiple support)

slabs

$v = \frac{l_0}{30}$ (dual support) $v = \frac{l_0}{40}$ (multiple support)

deformation specifications

maximum allowed deflection:

- high aesthetics $\frac{l}{200}$
- family houses $\frac{l}{150}$
- pre fabricated r.c. $\frac{l}{300}$

- Loads
  - Load bearing: useful load 150-1500 kg/m2 [flat, office, public, industrial, archives (paper store), data in BOOK]
  - + building parts, elements – partition wall, floor finishing,
  - special local loads (safe, water tank),
  - dynamic load, vibration (machinery room e.g. ventilator)
- Load bearing **during the construction**
  - self supporting
  - not self supporting - needs temporary support

o load distribution (cooperation of structural elements)
- the goal is to distribute concentrated loads amongst load bearing elements
- to avoid cracks, economy issues
- load distribution reference value should be around 50%

o endurance
- brick, concrete, reinforced concrete slabs → when properly constructed, endurance is high
- steel floor → when proper anti-corrosion layer is applied, endurance is high
- wood floor → water must not reach it (rotting, fungi, mould)

o fire resistance
- BM. 2002/2 (I.23) regulation specifies calibration rules
- medium buildings (above 13,65m) the rules become strict
- requirement is fire resistance in hours as defined by T_H category
- ***higher*** *requirements to divide* ***fire compartments***
- r.c. beams
  - increasing with and the concrete coating on steel under tension will increase in the T_H value
  - statically unstable solution will increase T_H value by 50%
  - pre-tensioning of beams reduces T_H by about 30%
  - fire resistance of the construction will be increased by plastering or applying fireproof coatings
- similar requirements for r.c. slabs
- the structure must not emit toxic fumes during burning
- ***noncombustible*** *materials on* ***escape routes*** *(finishes)*

- HEAT INSULATION req.
  - heat insulation between similar functional spaces is not required
  - at top floors (roof slabs or slabs below roofs) the specified U values for heat transmission capacities muts be adhered to
  - unwanted heat bridge effects (ring beams, beams, lintels) should be reduced with additional insulation
  - balconies, overhanging roofs and other structures in direct contact with slabs should be separated with heat bridge gap solutions
  - thermal capacity!!!

- WATER INSULATION requirements
  - DPC (mass shower room, kitchen for restaurant)

- ACQOUSTIC INSULATION requirements
  - air noise transmission (radiated) *resistance* value R'w (definition as for walls, rule of thumb: mass of floors should exceed 350 kg/m^2)
  - from an acqoustic point an even weight distribution is advantageous (solid r.c. slab is better than a hollow or ribbed solution)
  - transmitted noise (stepping, knocking noises) *transmission* values: L_nw (weighed noise transmission level) in dB

    $\Delta L_{nw} = L_{nw,a} - L_{nw,b}$ —— reduction for finishing layers

    change raw slab transmission level
  - the less the L_{nW} value, the better the transmission resistance

    Noise transfer reduction effect of various floor finishes:

		increase in air noise reistance	reduction in knocking noise transmission
		ΔR' dB	ΔLw'
hard finish		1	0
soft finish	PVC with foam	0	21
	carpeting	0	24
elastic finish	hardwood floor	0	16
floating	20/15 ISOLIT	3	30

  - ***special situations***: inside a flat, offices, between different functions, factory, movie rooms!!!

- MULTIPLE SUPPORT requirements (for beam type floors – M distribution) advantage

- CONSTRUCTION requirements
  - construction principles: over elevation support in relation to span
  - pouring, reinforcement placement instructions, after treatment, centering removal

- ESTHETICAL requirements (special shape)
- FINISHING requirements
  - Esthetical requirements
  - Abrasion resistance
  - Soft, warm, …etc.
  - Antistatic
  - Spark free
  - Conductive
  - where to situate the HVAC engineering equipments, pipes

- BUILDING METHOD (supplier's, contructor's requirements)
- required TIME OF BUILDING PROCESS
- **ECONOMY** of the building during the whole lifecycle
  - investment (construction costs),
  - running cost,
  - maintenance costs,
  - cost of renewal,

- demolishing cost - environment protection!!

- SPECIAL requirements
  - transperency (translucency) (glass, glass insert floors)
  - resistance against aggressive materials (acids, bases, fats etc.)
  - dynamic load bearing (garage slabs, vibrations)
  - removable floors or roofs (sport facilities)
  - incorporate lighting units)
  - protection from radioactive / magnetic radiation, or taking part in lightning protection, or earthquake, etc.

CLASSIFICATION OF FLOORS (CONT.)

- according to statics scheme (dual- or multiple-support)
- single- or or multi-directional load bearing (lateral, unilateral)
- according to location: top floor, bottom floor, intermediate floor
- according to material: wood, steel, r.c., brick, stone, glass, etc.
- according to reinforcement: soft steel, pre- or post-tension steel
- according to fabrication: pre-fabricated, in-situ-made, partial pre-fabrication