

Dr. Becker Gábor

Introduction to Building Constructions

**Standards**

[www.epszerk.bme.hu](http://www.epszerk.bme.hu)



Budapest University of Technology and Economics  
Faculty of Architecture  Department of Building Constructions

## slabs:

bending → resulting force → requirement →

**structure**

load → bending → load bearing → bent, plane

**slabs**

water insulation performance categories:

- watertight (heightened watertightness)
- waterproof

measurement, controll, design, performance, drafting, replacement options,  
comparability → a need for regulation

the first standart: **1 meter** (units from classical ages on – body parts etc.)

at the end of the 19th. century: screws, voltages, connectors, water pressure etc.

the aim of **standadisation**:

ability for intended use, safety, , environment protection, economics,  
performance, international trade, consumer rights, communications





### standard:

a commonly accepted technical documentation that regulates a process and/or the result of a process and contains general and repetitive rules, guidelines or parameters.

typically **voluntary** – responsibility, protection (german motorway speed etc.)

→ „the engineer’s crutch”

(at disagreements, law cases; decisions)

may be **mandatory**

- safety of life and property
- when defined in a contract

we **mostly** use

• graphical • geometrical (dimensioning, load bearing structural, thermo-dynamical, acoustical, fire protection ) • performance-requirement standards



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Roofs – flat roofs, pitched roofs

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relation between roof **incline** and **covering material**:

- \* • **minimal pitch** roof: 1-8% - **waterproof** cover (=flat roof)
- **low pitch** roof: 4,5-16° (8-28%)- **heightened watertight** cover
- **medium pitch** roof : 16-45° - **watertight** cover
- **high pitch** roof : >45°

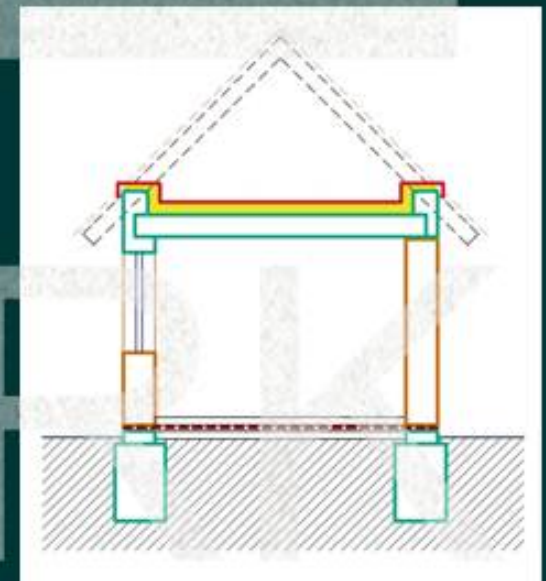
## flat roofs

**task** (function): external horizontal separation

effect → requirement → **structure**

rain, snow → impregnation → flat roof: water and  
heat load → thermal insulation → thermal insulation

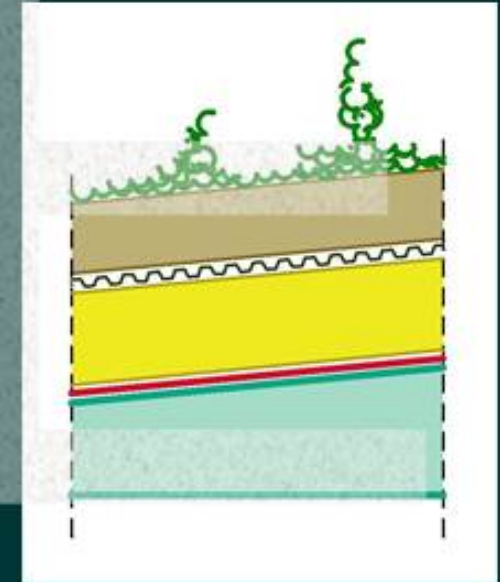
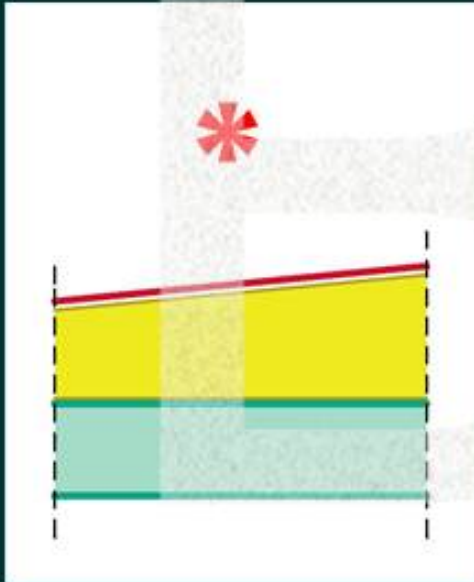
secondary:  
loads, use → load bearing → built onto the load bearing slab  
noise → noise insulation → insulating structures  
other: sunlight (heat, UV), wind effect, dust, other soiling sources  
chemical effects (corrosion) mechanical effects, fire



**function, requirements, materials,**  
roofs –roof incline and covering materials, **flat roof** functions, materials

## typical layer structure of standard flat roof variations

(warm roofs with internal water collection)



### direct

layer order:

- waterproofing
- thermal insulation
- slab structure

### reverse

layer order:

- weighdown
- waterproofing
- thermal insulation
- slab structure

## typical layer structures

roofs – flat roofs – standard flat roof types (warm roofs)





seal



**direct** layer structure:

- the outside is waterproof – outer skin
- inside is the insulation – fatty tissue

polar bear



**reversed** layer structure:

- the outside is the insulation – fur
- underneath is the insulation against water
- outer skin

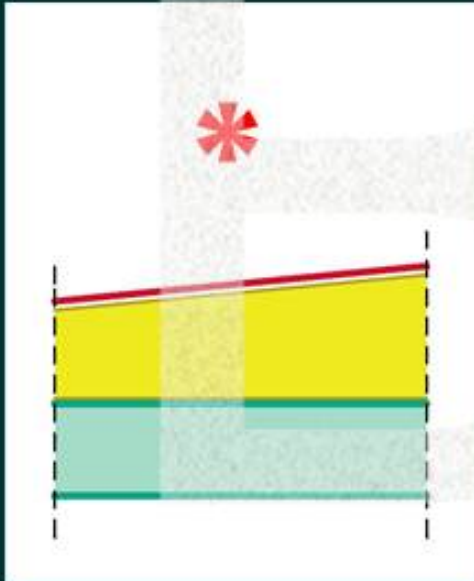


**typical layer structures – examples in nature**

roofs – flat roofs – standard flat roof types (warm roofs)

## typical layer structure of standard flat roof variations

(warm roofs with internal water collection)



### direct

layer order:

- waterproofing
- thermal insulation
- slab structure



### reverse

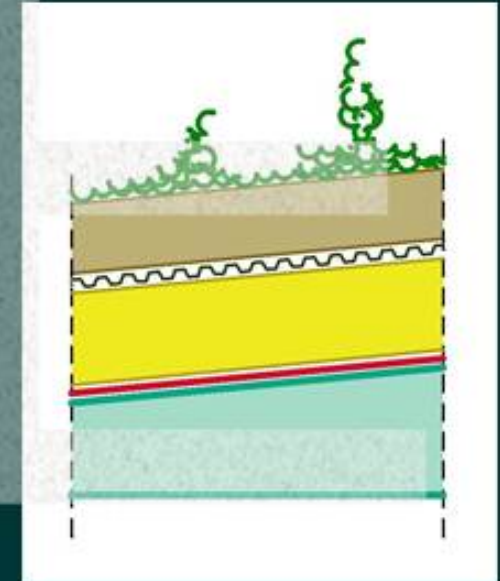
layer order:

- weighdown
- waterproofing
- thermal insulation
- slab structure



### accessible roof:

- covering
- foundation
- water throughfare
- thermal insulation
- waterproofing
- slab structure



### greenroof:

- vegetation
- soil mixture
- water throughfare
- thermal insulation
- waterproofing
- slab structure

t



## typical layer structures

roofs – flat roofs – standard flat roof types (warm roofs)





flame melting of the thick bitumen  
waterproofing sheets

**waterproofing** materials:



- **bitumen** sheets in several layers
  - thick sheets (>4 mm) – 2 layers
  - thin sheets – 3 layers
- **plastic** sheets – 1 layer

**thermal insulation** materials:



- **artificial** foams
- **fibrous** natural materials
  - mineral fibres
  - glass fibres

mineral fibre thermal insulation on  
a bituemnous vapour barrier



**waterproofing, thermal insulation**  
roofs – flat roofs – flat roof main types (warm roofs)



plastic sheet waterproofing



bitumen sheet waterproofing



gravel as a weigh-down



green roof, terrace roof



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**roof surfaces**

roofs – flat roofs – flat roof main types (warm roofs)



**task** (function): external **inclined** separation

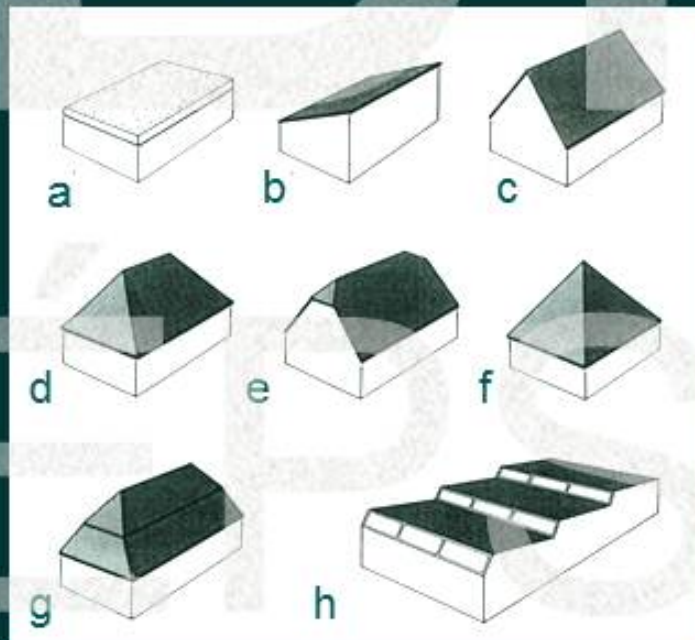
effect → requirement → **structure**

rain, snow, cold, heat → waterproofing (thermal insulation) → **pitched roof**: covering and its supporting structure

secondary:  
loads, use  
noise

load bearing → load bearing slab structure  
noise insulation → noise insulation structures

other: sunshine (heat, UV), wind, dust, soiling, chemical effects (corrosion), mechanical effects, fire



- a) flat roof
- b) semi-pitched roof (lean-to)
- c) pitched roof (gabled)
- d) hipped roof
- e) half-hip roof
- f) pyramid roof
- g) masarde roof
- h) shed roof



**function, requirements, shapes**

roofs – **pitched roof** functions, requirements, roof shapes





ring beam with fixation screws



base purlin with rafter



rafters with collar ties



rafter roof construction – a few rules:

- the **base purlin** is tied down to the ring beam  
- horizontal forces, technological conn.
- **rafters** at appr. every meter
- **rod structure**, supports are needed at every 3-4,5 meters



**defining the structure**

roofs – pitched roof functions, materials – defining the roof structure





defining the roof structure of open attics  
roofs – pitched roofs – defining the roof structure



## outer cover – scale like layer



tile



concrete tile



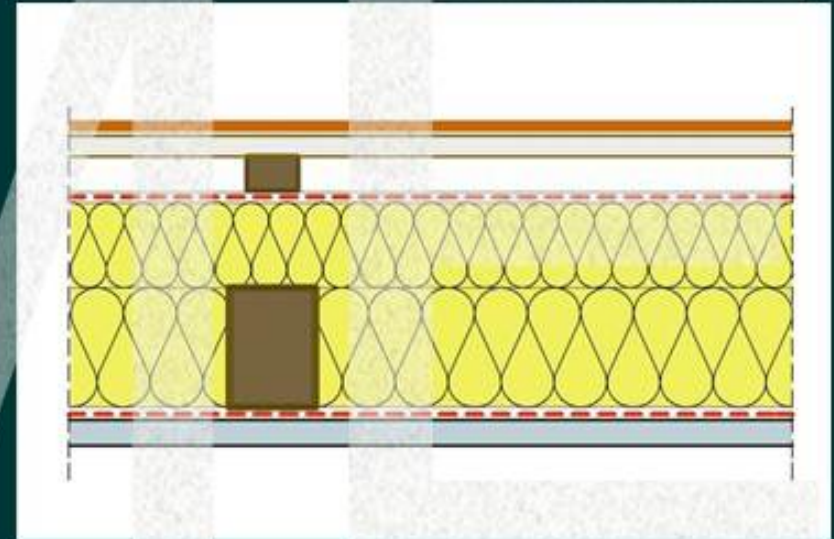
slate



natural slate



## habitable attics



layers:

- outer cover (eg. tiles)
- tile battens
- counter battens
- secondary (water) insulation
- thermal insulation (fibrous – fire!)
- vapour barrier
- inner cover (eg. wood, gypsum p.)



**covering, habitable attics**  
roofs – pitched roof materials – defining the layer structure



boarding, vapour barrier



thermal insulation



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secondary (water) insulation



battens, sheeting cover: tiles



**covering, habitable attics**  
roofs – pitched roof materials – defining the layer structure

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Partition walls

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**task** (function): internal separation

space separation: visual, **acoustic**

+ mechanical loads (eg. load on the wall)

special: **in between apartments** (20 cm r.c., 30 cm sandmortar, or ceramics)

**self supporting** (not load bearing) walls

main types (material, technology)

req. plastering



not req. plastering

brick, **ceramics**, concrete  
(formed)

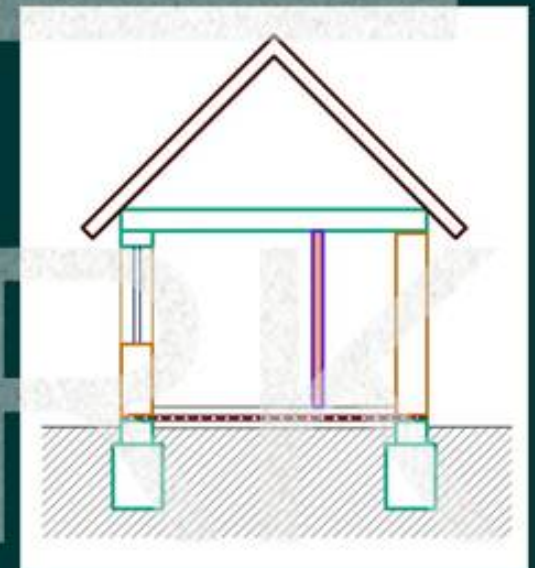
laid from **elements**

(steel) **frame** (gypsum) sheets  
**assembled**

gypsum, site- or pre-fabricated

**may be built**

- onto the slab (calculations!)
- onto soil supported base  
(foundation or base reinforcement)



**function, ,materials , technology**

internal separation: **partition walls**



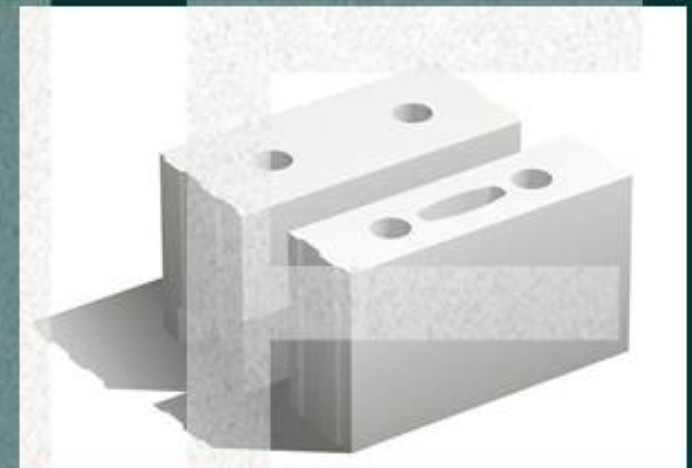




ceramic  
partition block



concrete form  
partition block



gypsum block  
- no need for plastering



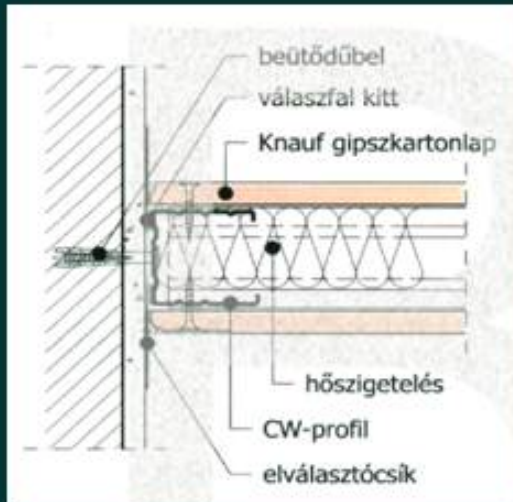
traditional ceramic partition walls



**laid partitions**  
internal separation: **partition walls**



wall connection



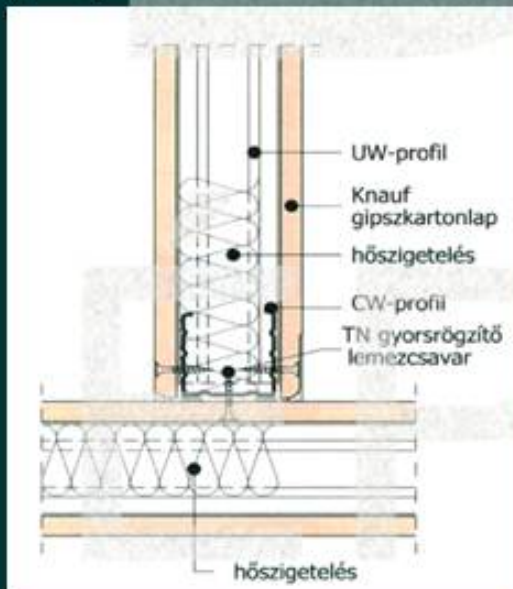
steel frame



„thermal insulation”



„T” joint



gypsum boarding



finishing



frame base (non-plastered) assembled partition  
internal separation: partition walls





## roofs

relationships between cover material and incline

### flat roofs (warm roofs)

- direct and, reverse layer structures, terrace and green roofs
- water insulation: bitumen or plastic sheets
- thermal insulation: plastic foams, fibrous materials

### pitched roofs

- some roof structure construction rules
- elemental coverings
- habitable attics – layer structure

## partitions

- plastered, laid partitions (traditional),
- non-plastered (assembled, gypsum, r.c. ) partitions

## summary

roofs – flat and pitched roofs; partitions







extra

roofs – flat and pitched roofs; partitions