Insulation

- **With (external) insulation heat losses through a construction element can be reduced up to 90%**
- **There are appropriate insulation materials and systems for every application: from natural materials to high-tech systems like Vaccuum Insulation Panels**
- **Insulation systems are fully developed with a useful lifetime of at least 40 years**
- **Even very thick insulations will amortise financially and environmentally**
- **An insulation measure will only succeed, if it is free from thermal bridges + air-tight !**
  - Careful planning: drawings of crucial details (connections, penetrations)
    „What is difficult to draw, is even more difficult to be built!"
  - Accurate realisation: - giving instructions to the craftsmen
  - Quality Assurance: - continious presence and supervision of expert
    - accompanying checks with Blower-Door & Thermography
    - immediate correction of faults

Thermal Bridges

- **Thermal Bridges** = areas with higher heat drain than in standard component
  → **cooling-down of inner surface**
    → below critical value: interior air humidity condenses in place
      → humid, cool surface → MOULD !

- Consequences:
  - needless higher energy-losses
  - risk of constructional damages caused by condensate
  - risk of health damages caused by mould
  - receivables of tenants, vacancy

- **Remedy: thermal protection raises inner surface temperature**
  « Insulating mantle has to wrap the heated volume without interruption »

- Building without thermal bridges begins in the planning-office
  - Intense consideration and drawings of crucial details
    are more helpful than exact calculated thermal bridge effects !

Air-Tightness

- **Leakages**

  → **airstream pervades construction**

  → airstream carries interior air humidity into construction

  → *amount of condensate due to convection is more than 100 times higher than by vapour-diffusion !*

- Consequences:
  - Leaky insulation largely ineffective
    (U-value declined up to factor 5 even by narrow gaps of 1mm width !)
  - risk of severe construction damages
  - dissatisfaction of dwellers because of cold draught
  - balanced air ventilation with heat recovery will work inefficiently

- **Remedy: determined air-tight envelope (« mantle without interruption »)**
  + defined air inlets (or ventilation system) for hygienic fresh air supply

- Air-tightness also requires careful planning (→ Concept of air-tightness)
  - No craftsman can compensate a lacking concept ! …
  - … but he can even override an existing one ! → Instructions + supervision are essential