

Protection against humidity

▶ Moisture penetration

- bulk moisture
- capillary action
- air leakage
- vapor diffusion

Protection against humidity

► Condensation from humid air infiltration

■ sources of water vapor and typical humidity production [g/h]:

- Resting person	30 to 50		
- Active person	200 to 300		
- Cooking water	100 to 200		
- Bath	2000		
- Shower	2400		
- Apartment plant	10		
- Washing machine (laundry)	50 to 200		
- Dryer (laundry)	500		
Total for apartment	400 to 1600	i.e.	7 to 11 kg/day

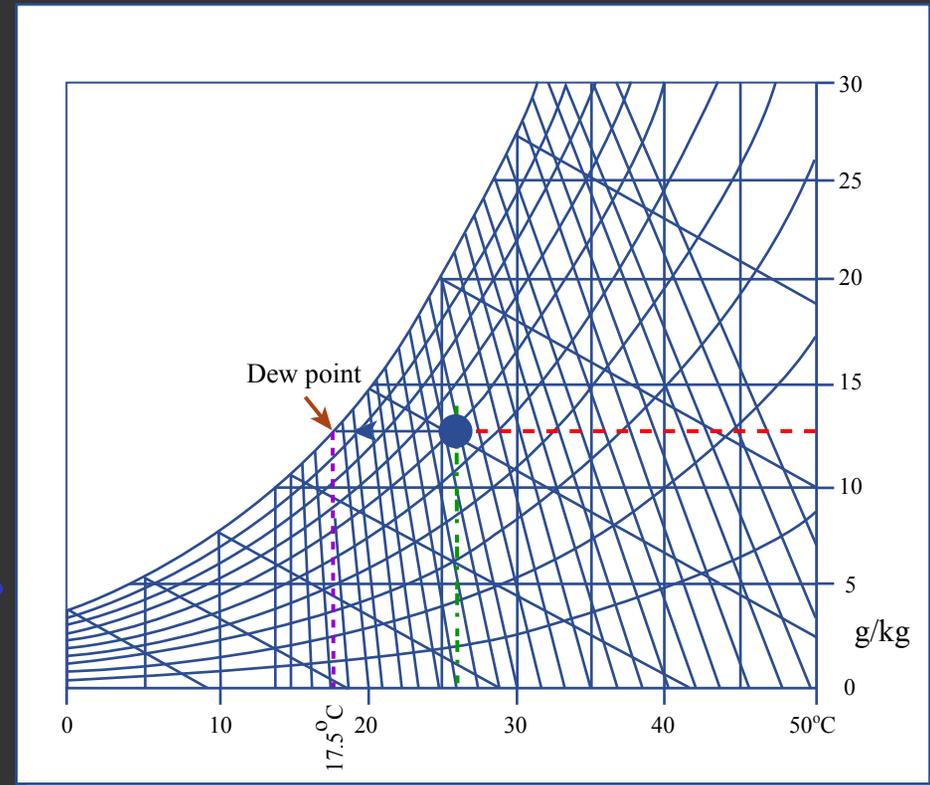
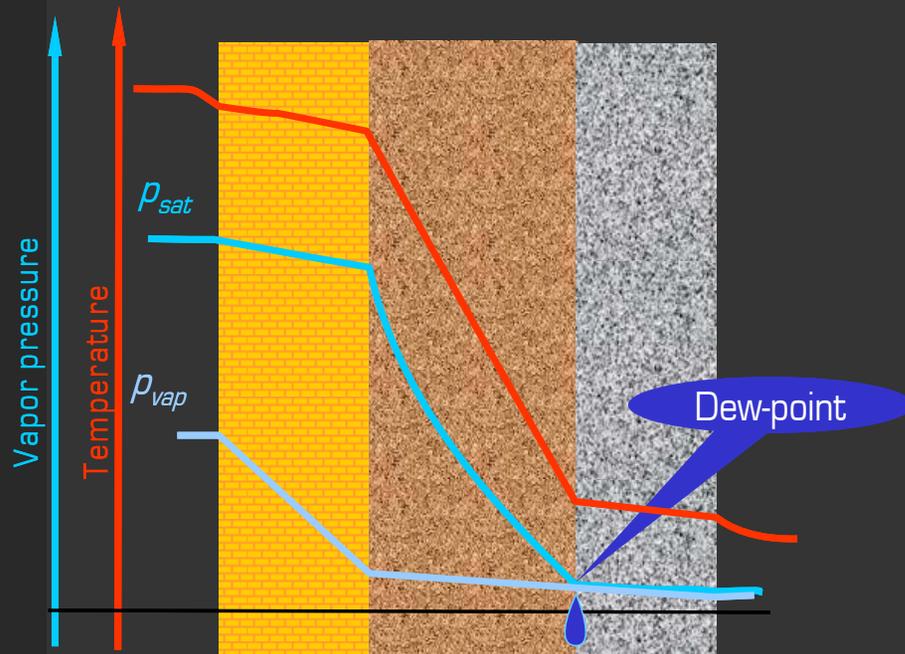
Protection against humidity

► Condensation from humid air infiltration

- reaching of dew-point °T

- assess condensation risk

higher if thermal bridges
or poor ventilation

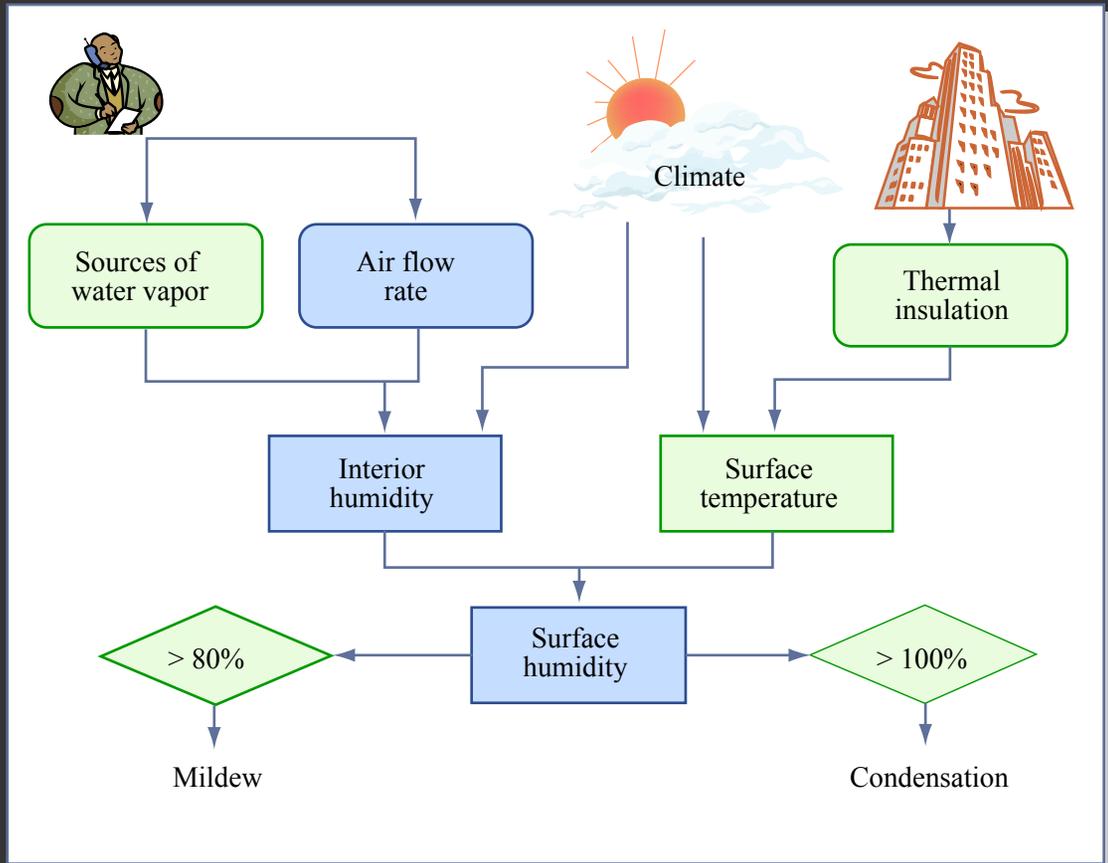


Protection against humidity

► Condensation from humid air infiltration

■ reaching of dew-point °T

- assess condensation risk
- calculate amount of condensed water
- account for evaporation (summer)



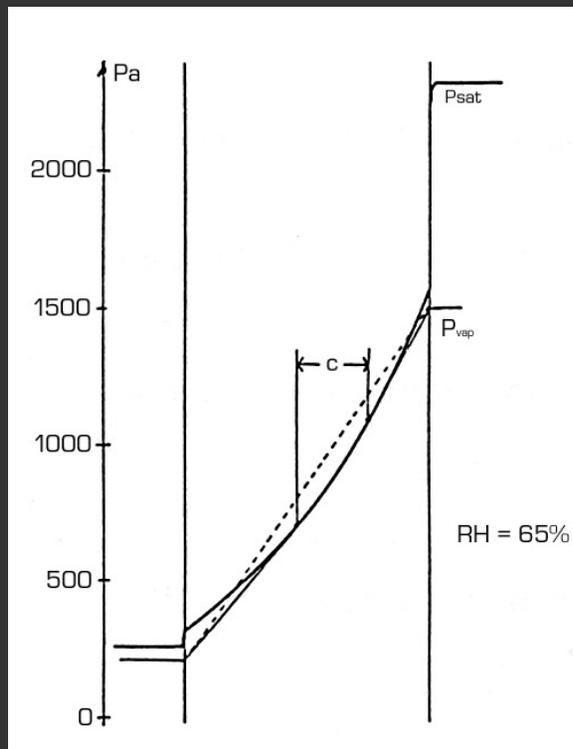
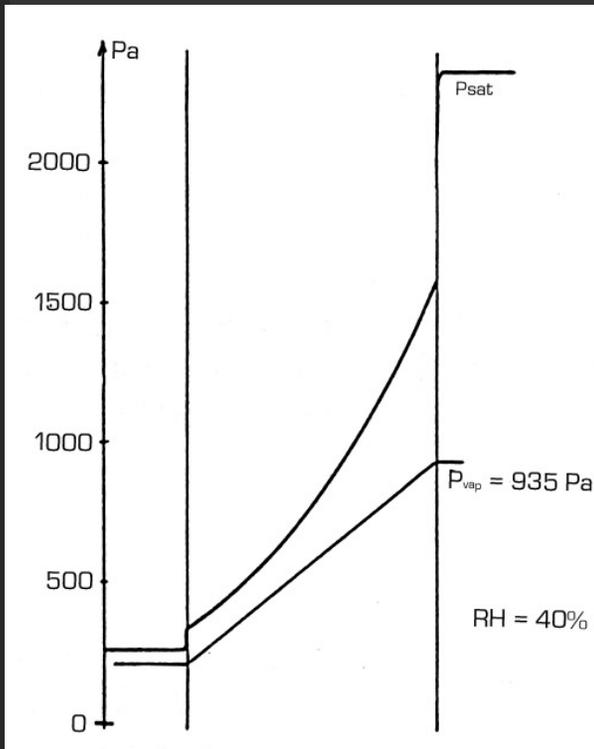
Protection against humidity

► Condensation from humid air infiltration

- reaching of dew-point °T
 - assessing the condensation risk

Material	λ_{vap} [mg / m h Pa]
Air	0.64
Concrete	0.004 – 0.010
Brick	0.10 – 0.175
Mineral wool	0.32 – 0.64

Image by MIT OCW.



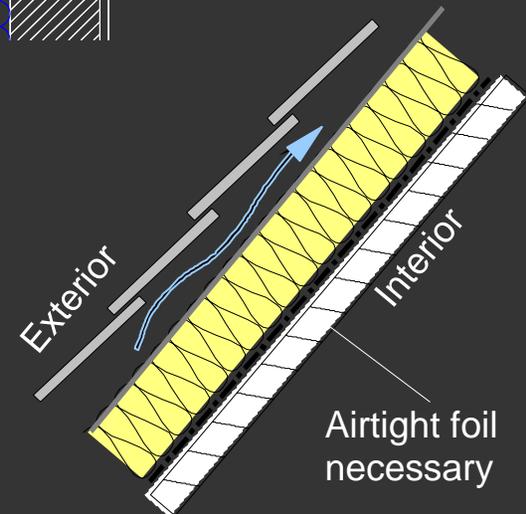
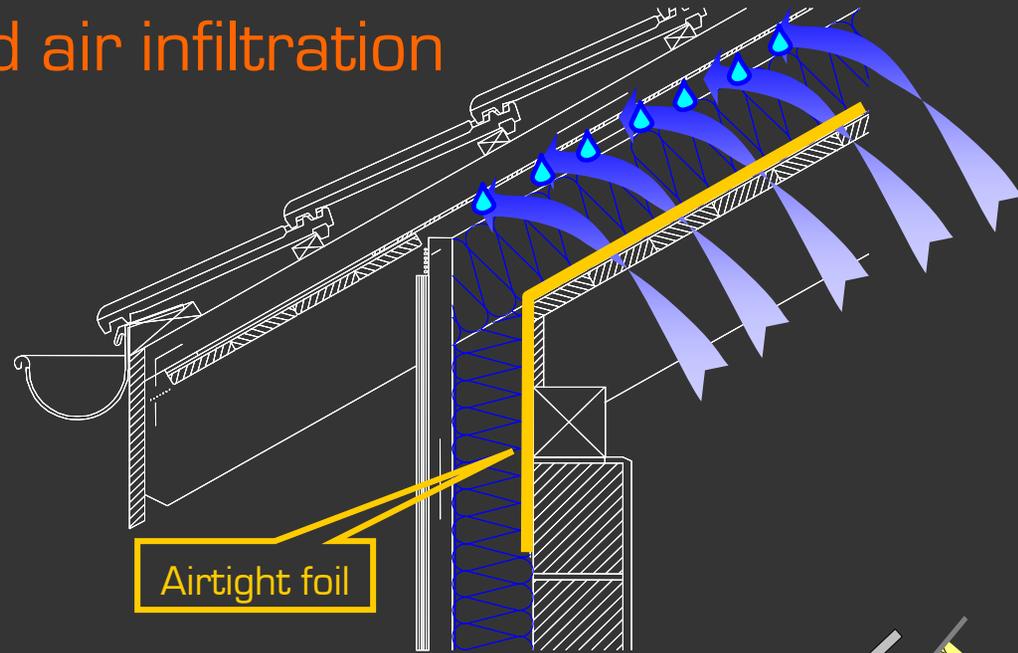
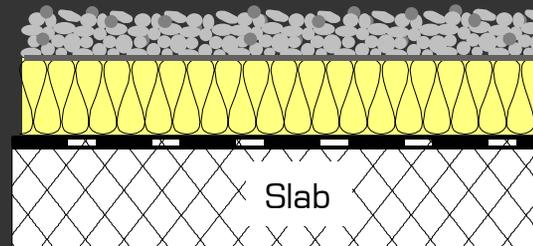
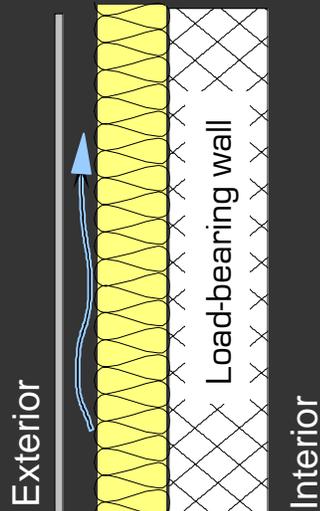
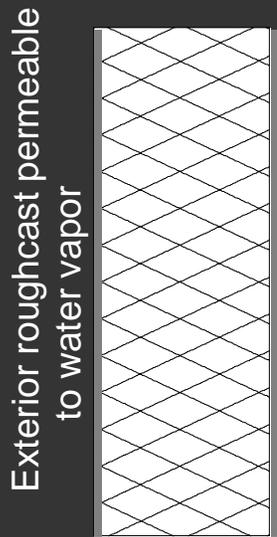
$$J_{\text{vap}} = S \Delta p / R_{\text{vap}}$$

$$R_{\text{vap}} = \sum R_{\text{vap } i} = \sum d_i / \lambda_{\text{vap } i}$$

Protection against humidity

► Condensation from humid air infiltration

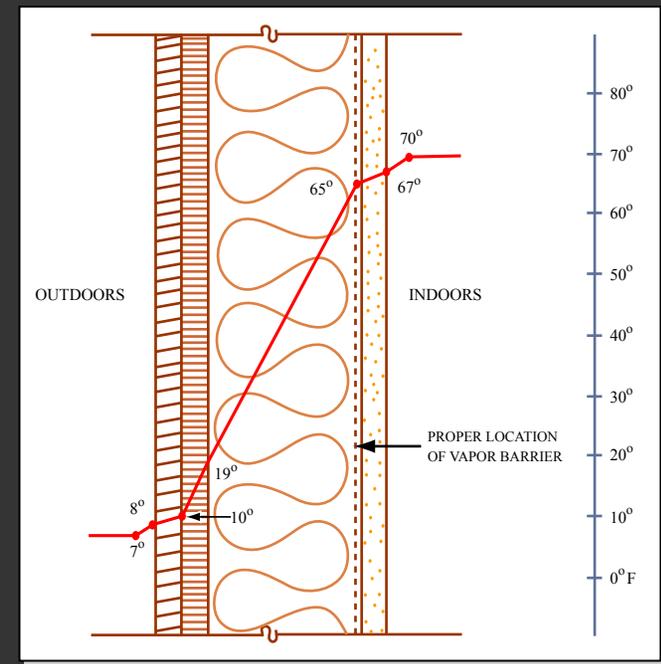
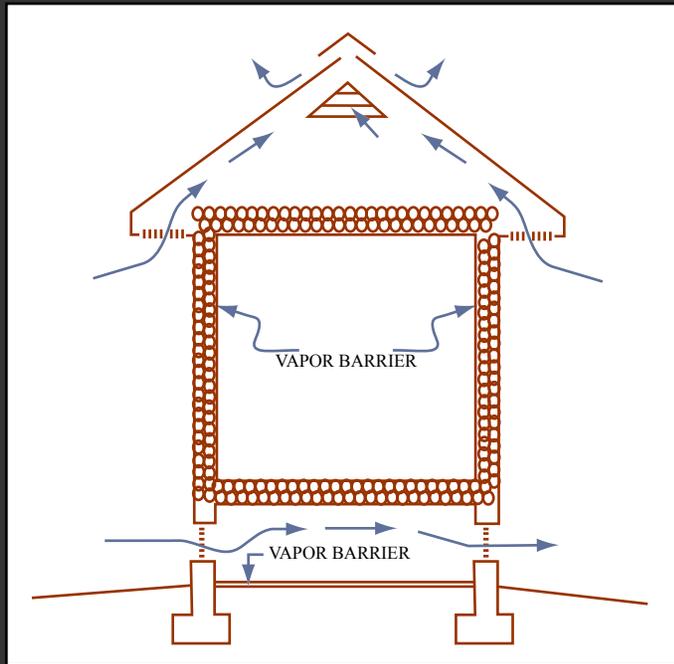
- reaching of dew-point °T
- prevention measures



Protection against humidity

► Condensation from humid air infiltration

- reaching of dew-point °T
- prevention measures
 - vapor retarder on warm side (before insulation) (vapor barrier)



Thermal Insulation, Condensation/moisture

- ▶ Reading assignment from Textbook:
 - "Introduction to Architectural Science" by Szokolay: § 1.4.3 - 1.4.4 + § 1.5.4
- ▶ Additional readings relevant to lecture topics:
 - "How Buildings Work" by Allen: Chap 8, Chap 12
 - "Heating Cooling Lighting" by Lechner: Chap 15