

Teadmistepõhine ehitus 2017

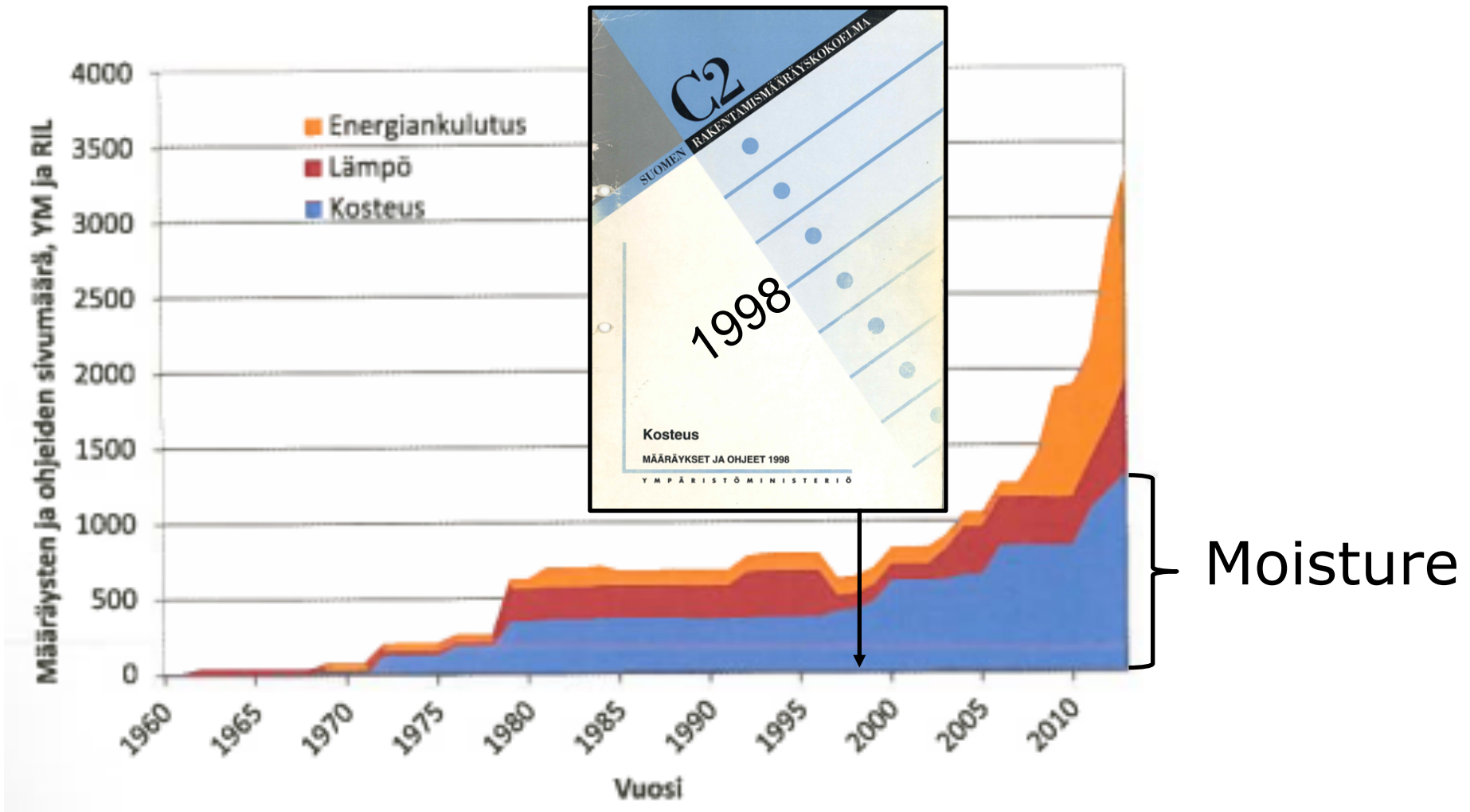
SAMI NIEMI

Vahanen Rakennusfysiikka Oy

Niiskuse väljakuivamise hindamise metoodika ja niiskuse mõõtmine

- Moisture control of construction sites
- Moisture measurements and covering
of concrete structures
- In **Finland**

Regulations and instructions VAHANEN (number of pages)



Recent 10 years

VAHANEN



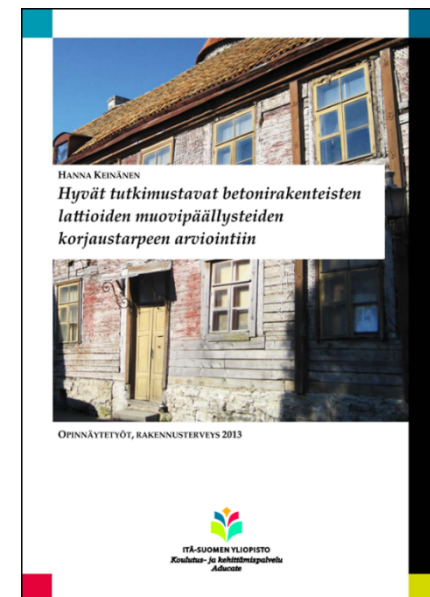
2007



2010



2011



2013

**WWW.
kosteuden-
hallinta.fi**

2015



Ympäristöministeriö
Miljöministeriet
Ministry of the Environment



2016



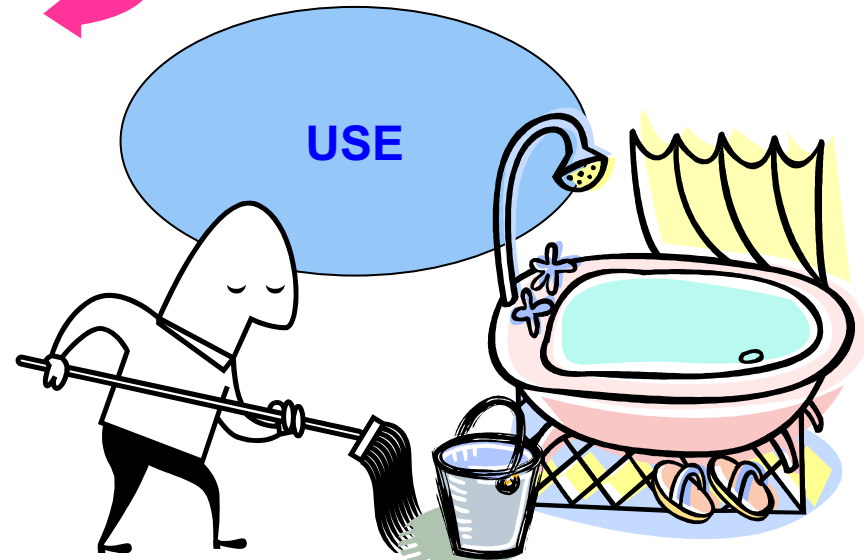
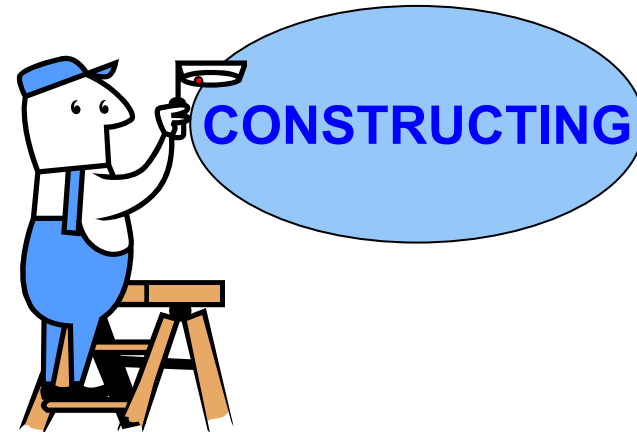
Future

27.4.2017

20 years ago

Life-cycle moisture management of the building

VAHANEN



BUILDING MOISTURE MANAGEMENT SHOULD START ALREADY AT THE DESIGN STAGE

MATERIAL ANALYSIS

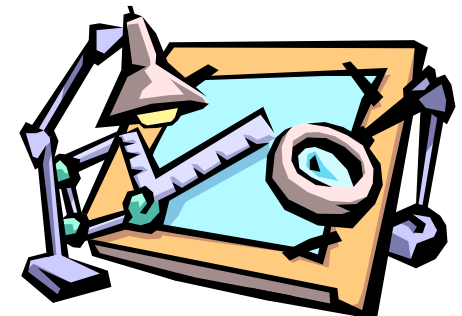
- Moisture resistance
(Wood-plasterboard-brick-concrete)
- Long-term durability
(Waterproof)
- Compatibility
(Leveling-mortar-waterproofing)
- Drying

CONSTRUCTION SOLUTIONS

- Building physical design
- Preventing watering
- Controlled humidity diminishing

HVAC SOLUTIONS

- Dehumidifying
(Water, water vapor)



Responsibilities of moisture management

- **Developer** demands good management and understands the impact on the timetable and costs - REQUIREMENTS FOR COMMERCIAL DOCUMENTS!
- **Designer** lists the challenges for the contractor to consider the most important things
- **Contractor** draws up a moisture management plan that is refined at all times and is responsible for not activating the risks - the main contractor requires the same from other contractors
- **Building supervision** requires from start to finish and involves if needed
- **Supervisor** follows the realization and documents the right things
- **Consultant** is able to observe the right things and makes accurate quality assurance measurements
- **Material supplier** even guide the whole picture



RIL 250/ Normal procedure for moisture management

- Clear developer requirements and goals
- Humidity risks and critical quality factors are detected
- Structural engineer involved in the start-meetings of critical phases
- The Moisture Management Plan will commence on time, will be supplemented and the various parties will be guided to do so
- Appropriate designers and executives
- The compatibility of the designs, the building physics functionality and the adequate coverage are checked
- In the design of document processing, the review procedure and procedure have also been agreed with building supervision
- Contractors and product manufacturers have their own quality assurance procedures
- Instructions for use and maintenance are given

RIL 250/ Enhanced procedure for moisture management

In addition to the normal procedure

- Ensuring the qualifications of operators
- Deeper planning and implementation of technical solutions
- External checking of designs
- External quality control of components
- Enhanced monitoring and maintenance during use

External checking of designs on buiding physics



Very good weather protection





Concrete is moisture proof

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Moisture management plan of the construction site

- Moisture risk mapping
- Drying time estimate
- Comparison to schedule
- Condition management
- Select the actions
- Measuring plan
- Organization, monitoring and control



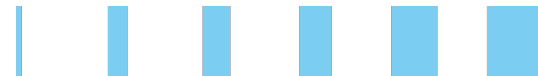
Prepared before start of construction and to be refined

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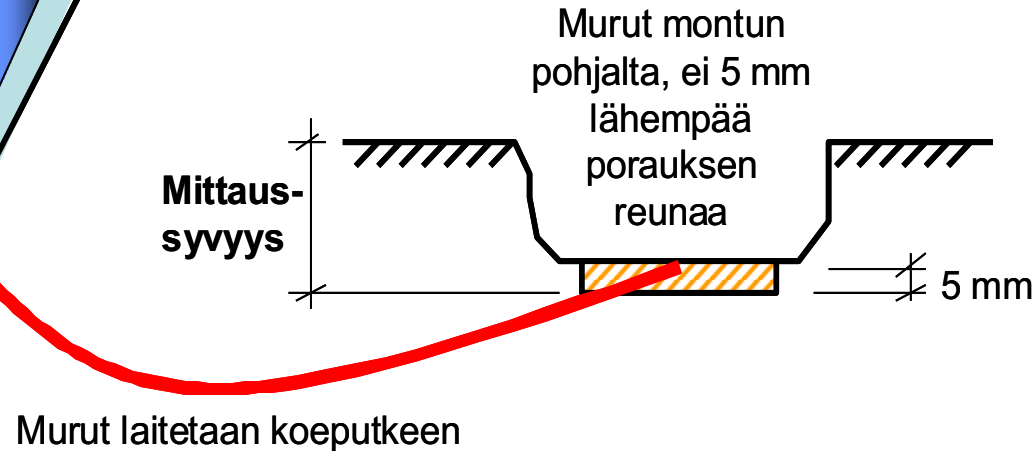
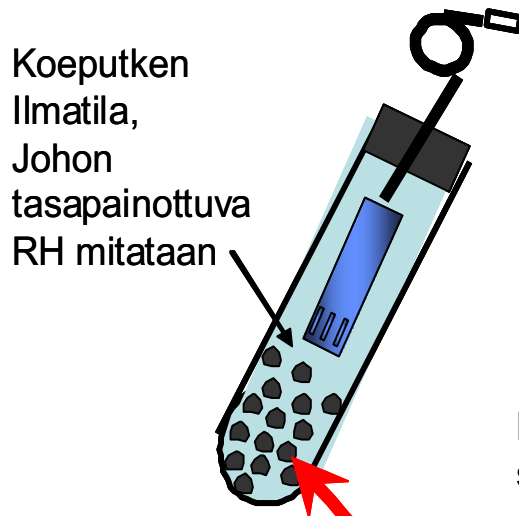
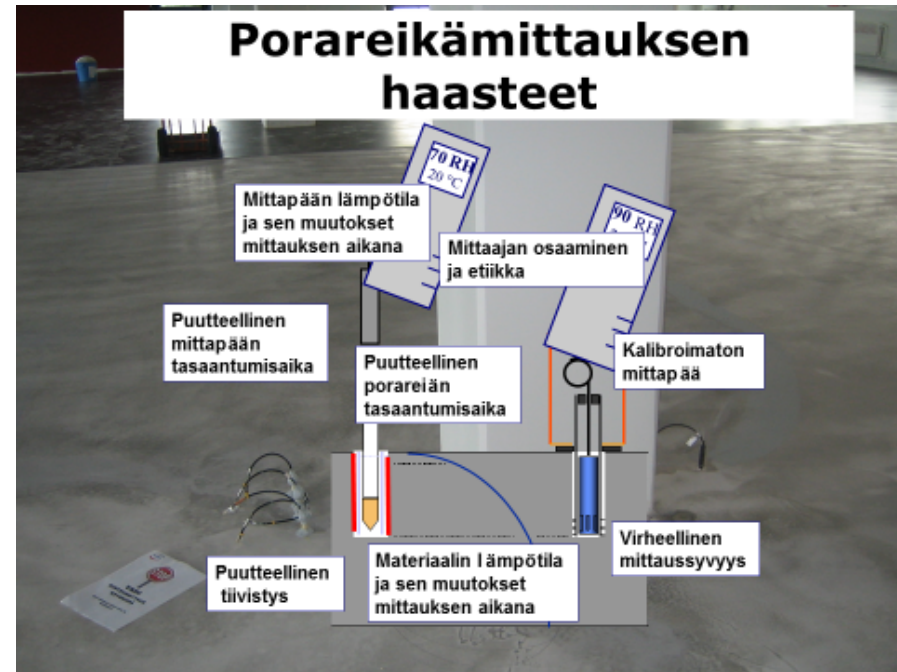


Certified meters

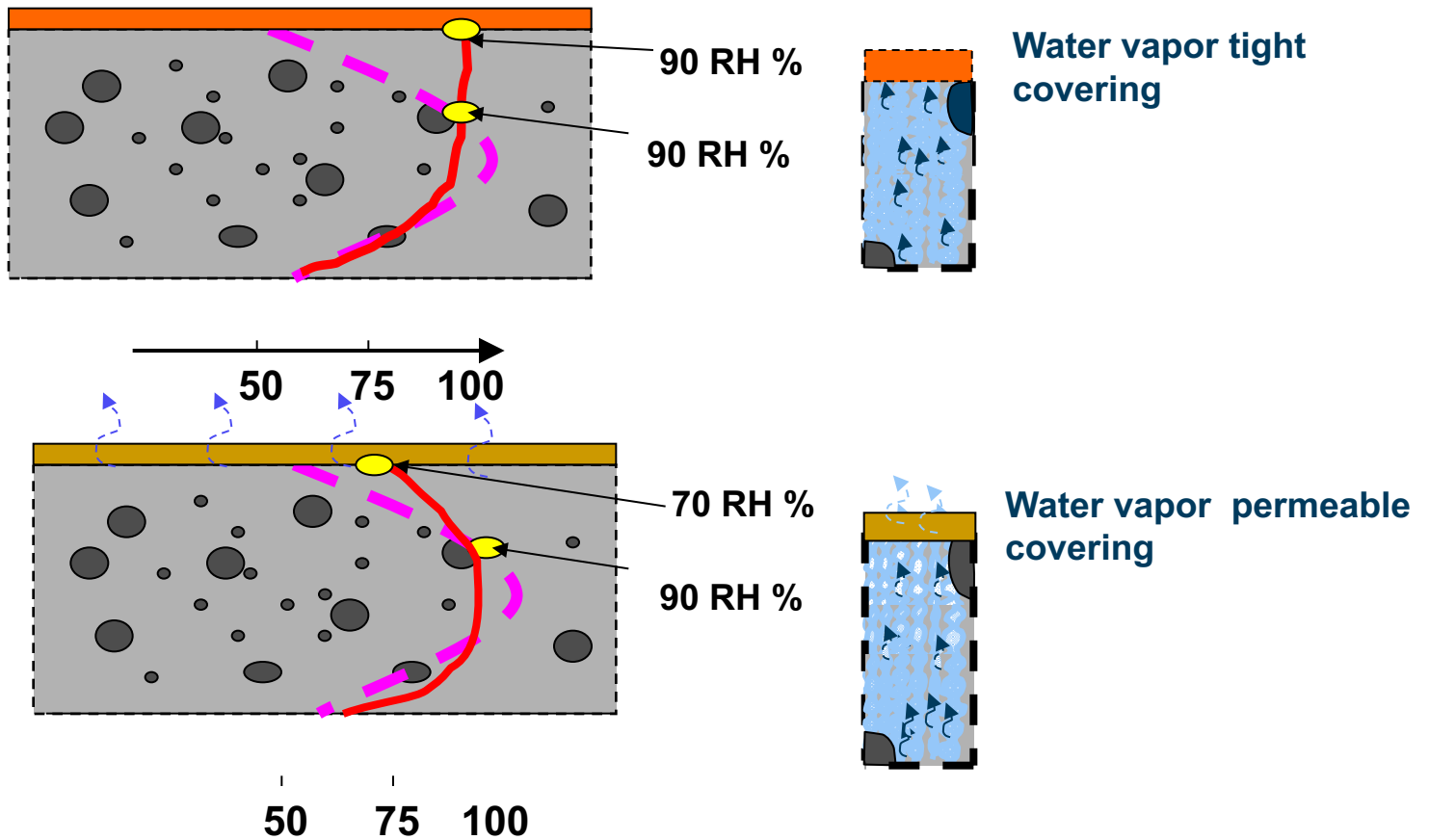
- 27.4.2017



The quality of measurement has improved

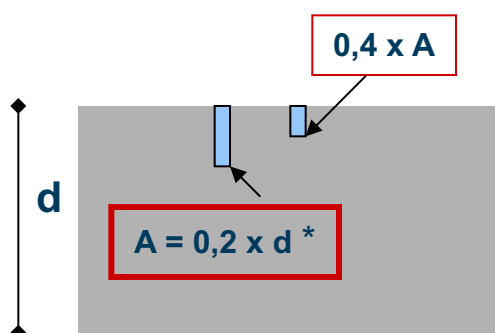


Redistribution of moisture profile

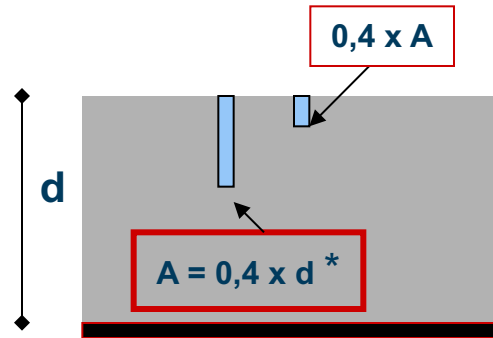


Betonirakenteiden
päällystämisen
ohjeet

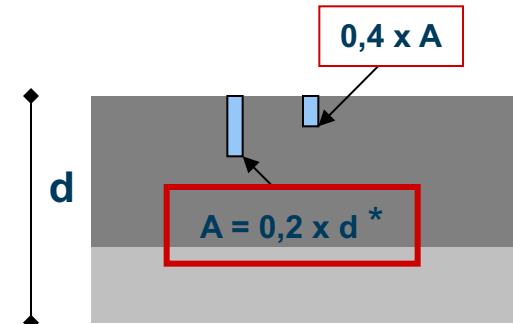
Measuring depths



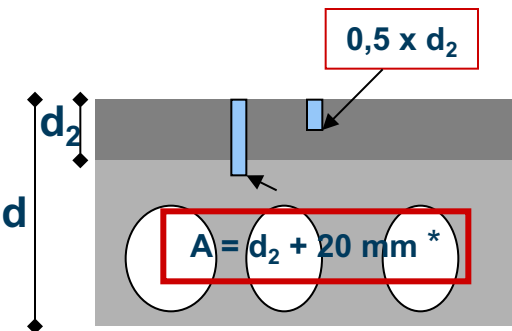
Intermediate floor
(drying both sides)



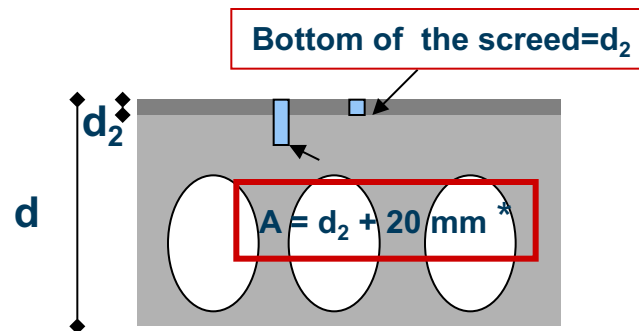
Joint slab or slab on ground
(drying one sided)



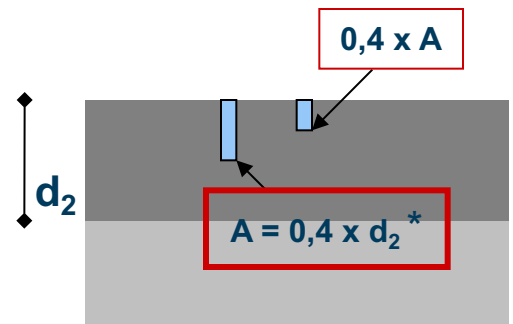
Partly pre-cast intermediate floor



Hollow Core slab + upper concrete (d_2)



Hollow Core slab + screed (d_2)



Dumped Hollow core + bathroom floor

Always at least two depths
Maximum measuring depth 70 mm

PVC carpets

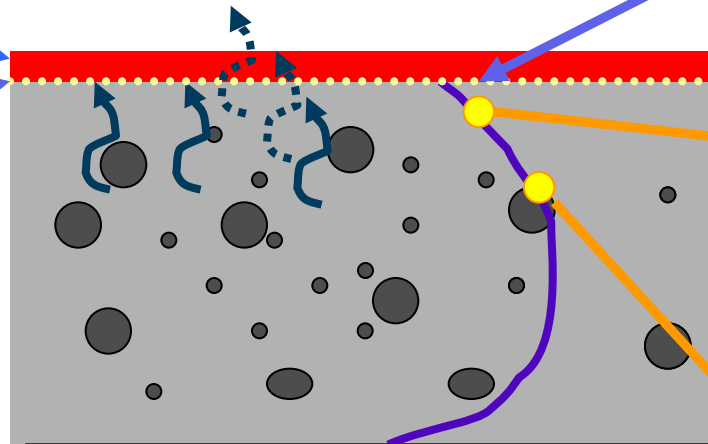
The moisture permeability affects remarkably to the rate the moisture can diminish from the structure without causing any damage.

Moisture content just under the covering may not rise above 85 %RH

Floor covering

Adhesive

Concrete



At the depth $0.4 \times A$ the moisture content has to be under 75 %RH to allow the moisture from adhesives to absorb into the concrete

Moisture measurement at the depth (A) at which the moisture content has to be under the covering limit. The limit can be exceeded if the depth $0,4 \times A$ and the surface is very dry.

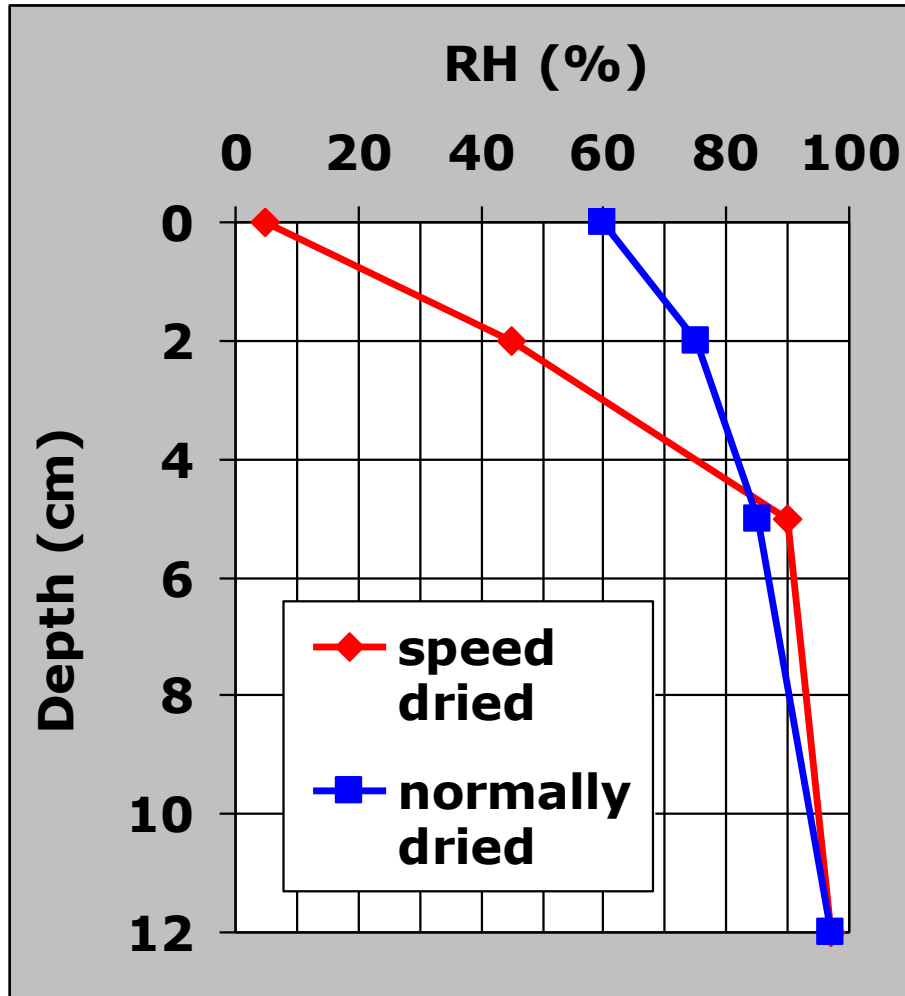
**To avoid
VOC-emissions**

Principle covering limits with carpets

Floor covering	Concrete RH (%) at the depth <u>A</u>	Concrete and/or screed RH (%) at the surface and at the depth <u>0,4 x A</u>
PVC carpets	85	75
Linoleum carpets	85	
Rubber carpets	85	
PVC-, rubber- and linoleum tiles	90	

- Contributors can have their own limits
- Limits can be changed according to more accurate analysis

Special covering limits



Depth (mm)	Principle RH-limit (%)	Special RH-limit (%)
5	75	50
15	75	80
30	75	90
70	85	95

- Building supervision may require moisture management to be considered at the licensing stage
- Moisture management involves a variety of "special people" on the sites
- Many designers learn moisture management basics
- Moisture behavior of structures is modeled with newest calculation programs
- Material manufacturers are developing their products
- Building supervising makes surprising checks at the construction sites after rainy days and gives "red-cards"
- New and effective equipment for protection, heating and drying is available and is being developed and tested
- Development projects are being promoted



Avoid this

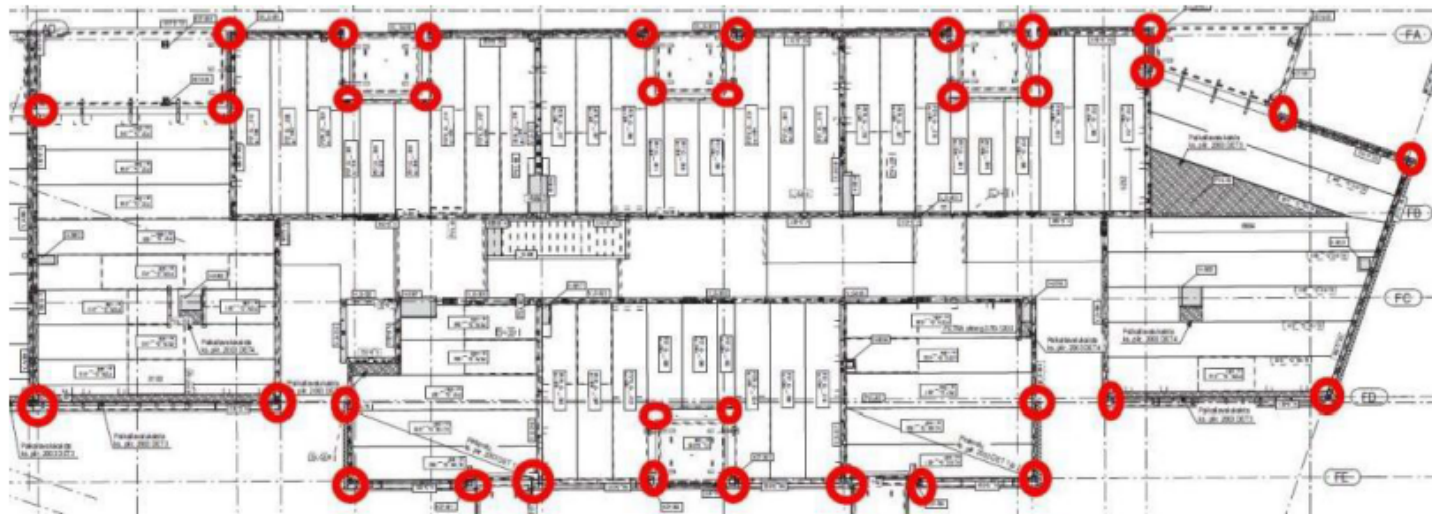


To avoid this



Kokemuksia (5/5)

- Arkkitehtuuri ja suunnittelu ei aina tue kosteudenhallintaa
 - 8 asuntoa/kras, 6 krs:ta, 122 sivua US- ja runkodetaljeja, 35 kpl ulkoseinänurkkaa/materiaaliliitosta/kras
 - Epäjatkuvuuskohdat erityisen riskialttiita
 - Tuottaa työmaalle toteutukseen runsaasti lisää vaativuutta



To manage, remember at least...

- Attitude counts.
- It is successful with the cooperation of all the parties, when everyone understands from the very beginning what good moisture management requires.
- Moisture management is much more than just the moisture content of the concrete.
- Not too short timetables.
- Accurately measure the correct points.
- Consider coating properties.