Influence of finishing materials on indoor humidity

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Experimental investigations

Test facilities

Testhall

South
Experimental investigations

Test facilities

Two identical testrooms

View from the South
Experimental investigations

Test facilities

Ground plan

Two identical testrooms
Experimental investigations

U-value: 0.4 W/Km²
Total solar energy transmittance: 0.57

U-value: 1.1 W/Km²

Volume: 50 m³
Surface: 65 m² (without floor)

Ground plan
Experimental investigations

foil faced test room

reference room
Experimental investigations
Experimental investigations

Ventilation

Moisture production

Indoor temperature: min. 20°C
Experimental investigations

Moisture generation

Moisture produced by ultra sonic vapor generators

![Image of moisture generator]

Production rate: 5.63 [g/min]

Graph showing mass of evaporated water over time with a linear increase and a production rate of 5.63 [g/min].
Experimental investigations

Moisture generation

Moisture produced by ultra sonic vapor generators

Advantages:
- Steady vapor production rate
- No additional heat source through humidification process
- Reliability
- Easily to handle
Experimental investigations
Moisture generation

- Two vapor generators in each room
- Controlled by a time switch

Ultra sonic vapor generators
Experimental investigations

Moisture generation

- Moisture production rate [kg/h]
  - 2.4 kg per day
- Status of circuit
- Relative humidity [%]

Hours of the day
Experimental investigations
Air tightness of the rooms

- Avoiding of uncontrolled energy transfers

Results

- Reference Room:
  - $n_{50} = 0.57 \Rightarrow n = 0.04 \ [1/h]$

- Wood Focus Testroom:
  - $n_{50} = 0.43 \Rightarrow n = 0.03 \ [1/h]$
Experimental investigations

Ventilation strategy

Used device:

Airflow controlling unit by BELIMO

Advantages:

- Easily to control:  
  signal form 0 to 10 V  
  \(\rightarrow\) airflow rate 25 to 75 m\(^3\)/h
- Non-sensitive to pressure differences  
  caused e.g by wind
- Very reliable performance
Results

Temperature > 5 °C

Relative humidity [%]

Outdoor temperature [°C]

Time [month]

Legend:
- Wooddines
- Tongue and groove shingles
- Tongue and groove shingles and wooddines
- Asbestos
- Calcium sulfate
- Asbestos tiles
- Calcium sulfate, less than 1 mm
- Calcium sulfate, 3 mm grain
- Calcium sulfate, 6 mm grain
- Asbestos, less than 1 mm
- Asbestos, 3 mm grain
- Asbestos, 6 mm grain
- Wood finished
- Plaster painted

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Results

![Graph showing indoor relative humidity (RH) over time for Plaster coated and Tongue and groove shelves.]

- **Indoor RH [%]**
  - Y-axis values range from 0 to 100%
- **Time [days]**
  - X-axis values range from 16 Jan to 9 Feb

The graph compares the indoor relative humidity over time for two different types of shelves: Plaster coated and Tongue and groove shelves.
Results

![Graph 1: Indoor RH (%) vs. time [h] for different materials: Plaster without paint, Aluminium, Plaster coated, Blankets, Plaster coated, Acoustic panel, Tongue and groove shelves.](image1)

![Graph 2: Indoor RH (%) vs. time [h] for different materials: Plaster coated, Blankets, Plaster coated, Tongue and groove shelves.](image2)
Preliminary tests
Preliminary tests
Preliminary tests
Preliminary tests

![Diagram](image)

- The diagram on the left illustrates the relationship between air temperature and relative humidity, categorizing the comfort zone based on temperature and humidity levels.
- The right panel shows the indoor climate classification for different materials:
  - Aluminium: 61% Too humid, 19% Optimum zone, 11% Too dry
  - Plaster painted: 71% Too humid, 11% Optimum zone, 18% Too dry
Moisture buffering effects of wood-based linings
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Moisture buffering effects of wood-based linings

[Chart showing RH amplitude ratio and indoor climate classification]
Moisture buffering effects of wood-based linings

![Image of a moisture buffering effect]

![Bar chart showing RH amplitude ratio for Plaster painted and Wood fibreboard during 6-8 am and 4-10 pm]
Moisture buffering effects of wood-based linings
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![Graphs showing moisture buffering effects for different materials]

- **Wood fibreboard**: 91% Too humid, 66% Optimum zone, 28% Too dry
- **Plaster painted**: 9% Too humid, 6% Optimum zone
- **Spruce panels**: 1% Too humid, 21% Optimum zone, 73% Too dry
- **Plaster painted**: 2% Too humid, 6% Optimum zone
Moisture buffering effects of wood-based linings

![Graph showing RH amplitude ratio for different materials and conditions]

- aluminium
- cellulose insulation elements
- acoustic elements
- spruce panels
- log walls, end grain sealed
- log walls, end grain unsealed
- wood fibreboard

Decade-temperature-averaged > 5 °C

Left 6:00 - 8:00 am / right 4:00 - 10:00 pm
Field Tests

Location of test houses

- Wooden house
  - Built in 2002
  - No treated wood surfaces
  - 5 Persons
  - Logger installed in living room
Field Tests

Representative test houses

![Graph showing water vapour vs. temperature for inhabited stone house (red) and inhabited wooden house (green).]
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