

WUFI®

Guideline for the Calculation of Flat Roofs

Date: March 2026

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Introduction

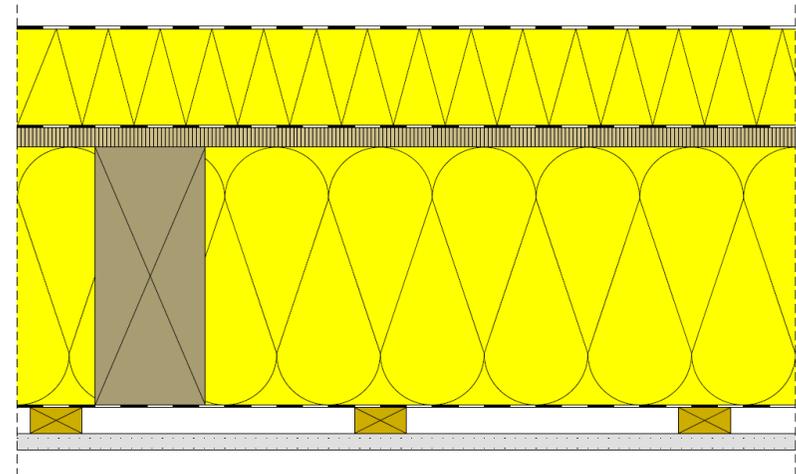
This guideline explains the procedure of the calculation and evaluation of flat roofs in wooden constructions without ballast.

For the assessment of green or gravel flat roof constructions the following guidelines are available:

- [Guideline for the calculation of extensive green roofs](#)
- [Guideline for the calculation of gravel roofs](#)

In the first step all necessary input data and the evaluation criteria are described.

The procedure from input to evaluation is then explained using an example case.



Component – Assembly

Roofing Membrane

The roofing membrane is not included in the calculation as a component layer but is considered as an s_d -value in the surface transfer parameters.

This leads to identical results but may speed up the calculation considerably compared to considering the roofing membrane in the component assembly.

Underlying Roof Assembly

The underlying layers are to be entered according to the assembly in the cavity axis.

Component – Assembly

Moisture Source – Infiltration (only needed for structures with wooden parts)

According to DIN 68800 [1], the amount of moisture that convectively enters the construction as a function of the air tightness always needs to be assessed for wooden structures and is considered in the simulation using the IBP infiltration model.

The moisture source must be placed at the position in the component assembly where the condensation water will form in practice – usually this is below the second airtight layer on the cold side of the component.

For roofs we recommend the following settings:

- with wooden sheathing: moisture source in the interior 5 mm of the wooden sheathing
- without wooden sheathing: moisture source in the exterior 5 mm of the insulation layer

Component – Assembly

Moisture Source – Infiltration (only needed for structures with wooden parts)

The amount of moisture entered in winter is automatically determined in the program depending on the overpressure due to the building's thermal buoyancy (temperature difference between outside and inside as well as specified air space height), the indoor air humidity and the specified airtightness of the building envelope [2].

For more information on using the infiltration source in WUFI[®], click here: [Guideline for Using the Air Infiltration Source in WUFI[®]](#)

Component – Initial Conditions

Initial Temperature and Moisture:

A constant initial relative humidity of 80 % and an initial temperature of 20 °C should be used as a default setting.

If increased built-in moisture contents are known, these can be specified separately for the corresponding layer.

Boundary Conditions (exterior) – Climate

Outdoor Climate:

A climate appropriate for the location of the building should be used.

For Germany:

The hygrothermal reference years (HRY), which were created for 11 locations in Germany as part of a research project [4], are useful here. These locations are representative for the respective climate region. For more information, please refer to the *WUFI® Help (F1) → Topic: Hygrothermal Reference Years*

The Holzkirchen location, with 20% reduced radiation, is considered critically representative of German locations up to altitudes of 700 m. This can be set in the simulation by reducing the absorption coefficient from a to $a \cdot 0.8$. This climate was also used for the exemption of deemed-to-satisfy constructions in DIN 4108-3 [8].

Boundary Conditions (exterior) – Orientation

Orientation

The relevant orientation is usually North with the lowest radiation gains. However, the orientation is only of minor importance for pitched roofs with an inclination close to zero degrees.

Roof Inclination

The inclination of the roof must be specified according to the planned roof inclination.

Boundary Conditions (exterior) – Surface

Heat Transfer

The heat transfer coefficient at the exterior surface is assumed to be 19 W/m²K for flat roofs according to experience values of IBP from numerous field and object investigations.

The 25 W/m²K proposed in some standards corresponds to an average wind speed of higher than 6 m/s, which is well above the average value for Germany with about 3.5 m/s and thus too far on the safe side. (If the short-term behavior of the surface temperatures is also to be evaluated, the setting "wind-dependent" may be used).

Vapor Transfer (additional diffusion resistance)

The roofing membrane is not considered as a component layer but is specified as an additional diffusion resistance (s_d -value) in the surface transfer parameters.

Note: This value has no influence on rain absorption!

Input: Surface Transfer Coefficients (exterior)

Boundary Conditions (exterior) – Surface

Radiation: Short-Wave Absorptivity

The short-wave radiation absorptivity should be selected depending on the colour of the roofing membrane.

Radiation: Long-Wave Emissivity

For roofing membranes, the long-wave radiation emissivity is usually 0.9.

To consider the (night-time) overcooling, the explicit radiation balance always must be used for roofs due to its large field of view to the sky.

Rain

As the roofing membrane is assumed to be rain tight, but is not included in the component in WUFI[®], rainwater absorption is switched off.

Boundary Conditions (interior) – Climate / Surface

Indoor Climate:

By default, we recommend using the indoor climate with medium moisture load + 5% for design purposes (according to DIN 4108-3 [3] and EN 15026 [6]).

Alternatively, depending on the use of the building, the indoor climate with low moisture load (according to EN 15026 [6]) or with medium or high moisture load (according to DIN 4108-3 [3] and EN 15026 [6]) can be applied. For example, constant or measured conditions can also be applied.

Heat Transfer:

The heat transfer coefficient at the interior surface is assumed to be 8 W/m²K according to DIN 4108-3 [3].

Control

Period of Calculation:

It is recommended to start the calculation on October 1st, because the component usually moistens up further in the following winter months before drying out possibly starts in spring. This start date is therefore usually an extra stressing of the component.

The calculation time depends on the time the construction needs to reach steady state conditions. Usually, a calculation time of 5 years is sufficient. It can be assumed that calculation times will tend to be shorter for diffusion-open components and longer for diffusion-tight components.

Ventilated flat roofs

Requirements for a ventilated cross-section and the openings according to German regulations depending on inclination of the roof

INCLINATION OF THE ROOF	DIN 68800-2		DIN 4108-3	
	Air-gap height	Openings	Air-gap height	Openings for inclination < 5° up to max. 10 m
< 3°	For roof inclinations below 3°, ventilation is generally not recommended.			
≥ 3° and < 5°	≥ 80 mm resp. ≥ 150 mm ¹⁾	≥ 40%	≥ 50 mm	eaves and monopitch roof connection for inclination < 5°: 2 ‰ of the roof area, min. 200 cm ² /m
≥ 5° and < 15°	≥ 80 mm	≥ 40 %	(≥ 20 mm)	ridge and hip for inclination ≥ 5°:
≥ 15°	≥ 80 mm	≥ 40 %	(≥ 20 mm)	0.5 ‰ of the roof area, min. 50 cm ² /m

1) Specification valid for greened, flat pitched and pitched roofs according to DIN 68800-2, Annex A, Figure A.

Recommendation: The ventilation air-gap height should be larger than the specified minimum dimension.

Source: [Informationsdienst Holz - Flachdächer in Holzbauweise, 01-2019](#)

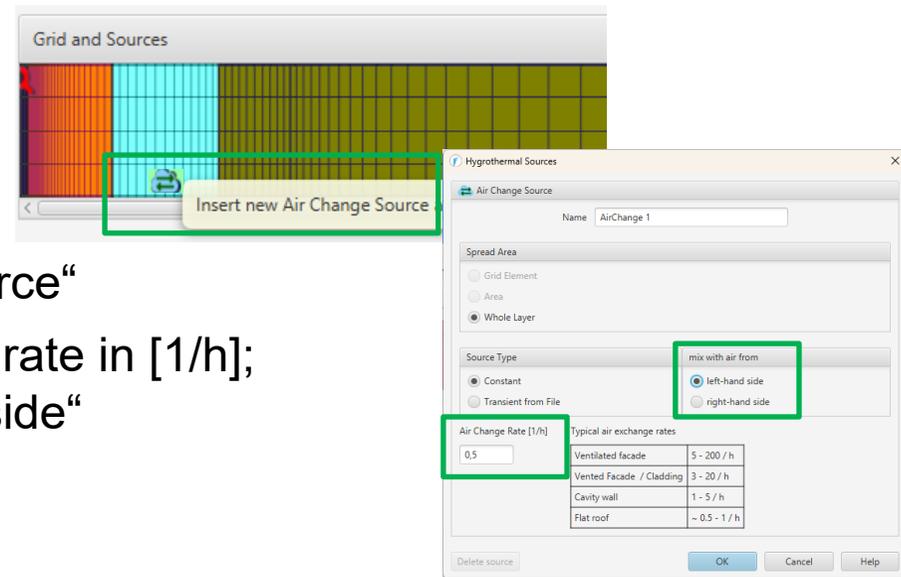
Ventilated flat roofs

Air Change Source in WUFI®

Guided by set air change rate, an air change source exchanges a certain amount of air at the source's location in the component with outdoor air. Depending on the temperature and humidity conditions in the component and in the outdoor air, this process leads to a transport of heat and humidity into or out of the component.

Procedure:

- Left-click on the bottom line of the air layer to be ventilated
- Insert „New Air Change Source“
- Specify constant air change rate in [1/h]; mix with air from „left-hand side“



Ventilated flat roofs

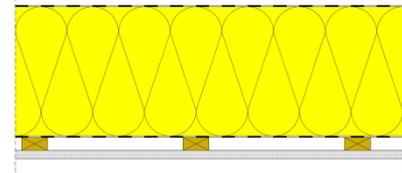
Air change rate in [1/h]

Depending on the design of the ventilated cavity and the inclination of the roof, there may only be a low air change rate.

We recommend varying the air change rate (0/h; 0.5/h; 2/h; 5/h) to check how sensitively the construction reacts to ventilation.

If the construction only works with a high air change rate, pay attention to a very exact design and compliance with the required height of the air gap as well as the ventilation openings given in the standards!

Roofs with mineral wool insulation without wooden sheathing



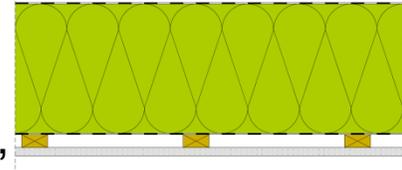
These assemblies do not have any moisture-sensitive materials in the standard cross-section (in the cavity).

Only at the roofing felt, due to the higher diffusion resistance compared to the insulation, temporarily increased moisture or condensation may occur.

The amount of condensation occurring below the roofing felt is used to evaluate the results. For this purpose, the maximum water content in [kg/m³] in the outer area of the mineral wool insulation is evaluated. The guideline “[Assessing the risk of interstitial condensation runoff](#)” presents the condensation water retention capacity (RC) as a practical limit value and describes how to assess the risk of condensation water runoff using hygrothermal simulation.

The assessing method recommended until 2023 for hydrophobic mineral fiber insulation materials has been replaced by new findings and extended to other fiber insulation materials.

Roofs with wood fibre insulation without wooden sheathing

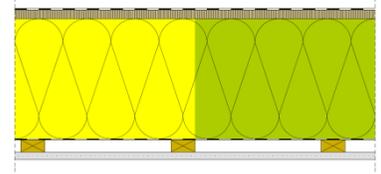


For assemblies with wood fibre insulation between the rafters, an evaluation of the wood moisture in the wood fibre insulation is performed.

For this purpose, the wood moisture content is evaluated in [% by mass] in the outer centimeter of the wood-fiber insulation in the settled state. The settled stage has been reached if the course of the water content does not change between the years any longer.

For evaluation purposes, the general limit value of 18 % by mass from DIN 68800 [1] can be used, which may be exceeded by a maximum of 20 % by mass for up to three months a year. Alternatively, the manufacturer can guarantee the maximum moisture content for which his product can be used.

Roofs with insulation and wooden sheathing



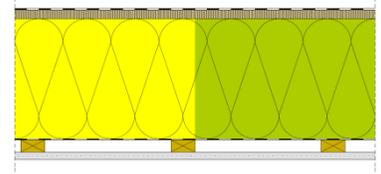
For assemblies with exterior wooden sheathing, the insulation between the rafters (mineral wool or wood fibre) is evaluated according to [slide 17+18](#).

For the evaluation of the wooden sheathing, the course of the wood moisture content in [% by mass] in the wooden sheathing in the settled state is used. The value of 20 % by mass for wood and 18 % by mass for wood-based materials specified in DIN 68800 [1] is recommended as the limit value. If this limit moisture content is not exceeded, no further evaluation is necessary.

If the wood moisture exceeds the limit value according to DIN 68800 [1], an evaluation according to the WTA Guideline 6-8 [8] can also be carried out for solid wood. This allows a more precise evaluation considering the temperature and humidity conditions.

Roofs with insulation and wooden sheathing

Evaluation according to DIN 68800 [1]



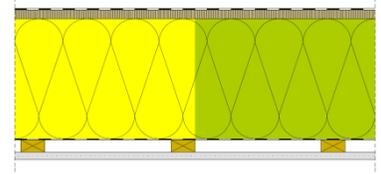
Critical moisture conditions regarding damage to the wood can occur if the moisture content limits of 20 % by mass for wood and 18 % by mass for wood-based materials specified in DIN 68800 [1] are exceeded over a long period.

However, this limit value includes high safety margins and, in contrast to the WTA guideline, no specifications are made for the evaluation range. In the case of thin wooden sheathings, the entire section of the sheathing shall be evaluated, otherwise the most critical 1 cm thick section should be used in accordance with the WTA evaluation.

If the wood moisture remains below the limit values (see above), no further evaluation is necessary.

Roofs with insulation and wooden sheathing

Evaluation according to WTA Guideline 6-8 [8]



If the limit value for wood of 20 % by mass according to DIN 68800 [1] is exceeded, also an evaluation according to the WTA 6-8 [8] can be carried out. Here, the evaluation of wood structures is carried out based on temperature-dependent limit values for the relative pore air humidity in a 1 cm thick layer at the relevant position of the wood. This allows a more accurate and realistic evaluation.

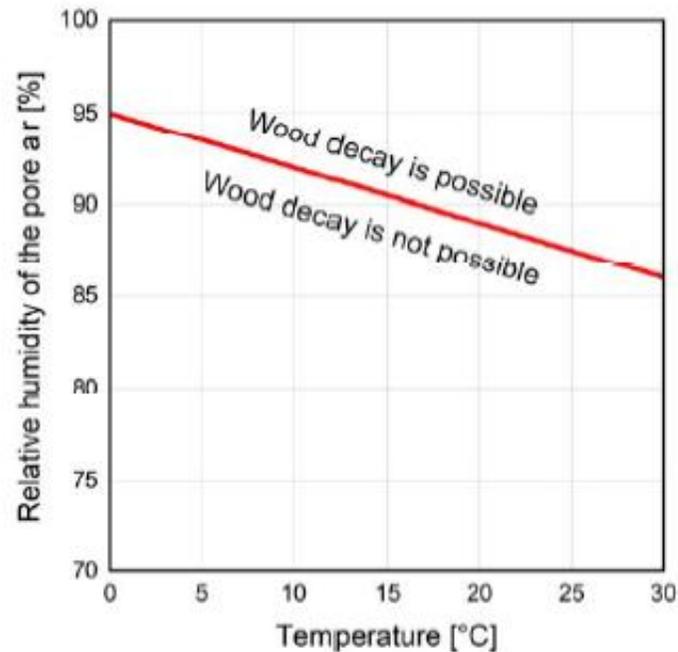
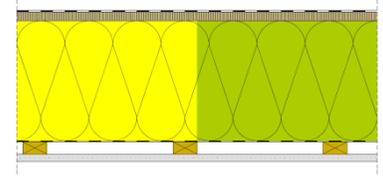
This evaluation is not permissible for wood-based materials, as other limit values for rotting processes may apply here.

Notes on the Evaluation: Wooden Sheathing

Roofs with insulation and wooden sheathing

Limit curve for wood decay depending on temperature (x-axis) and relative humidity (y-axis) according to WTA 6-8 [8].

Below the red limit line, wood decay is not possible in solid wood.

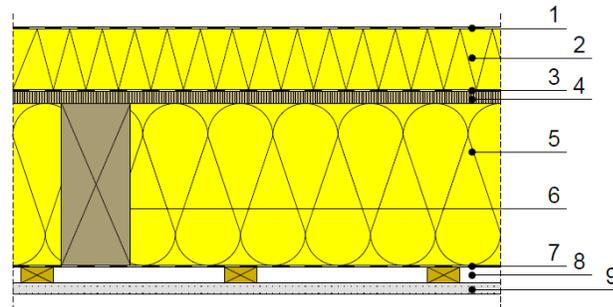


- [1] DIN 68800-2: Holzschutz - Teil 2: Vorbeugende bauliche Maßnahmen im Hochbau. Beuth Verlag, February 2022.
- [2] Zirkelbach, D.; Künzel, H.M.; Schafaczek, B. und Borsch-Laaks, R.: Dampfkonnektion wird berechenbar – Instationäres Modell zur Berücksichtigung von konvektivem Feuchteeintrag bei der Simulation von Leichtbaukonstruktionen. Proceedings 30. AIVC Conference, Berlin 2009.
- [3] DIN 4108-3: Wärmeschutz und Energie-Einsparung in Gebäuden - Teil 3: Klimabedingter Feuchteschutz - Anforderungen, Berechnungsverfahren und Hinweise für Planung und Ausführung. Beuth Verlag, March 2024.
- [4] Research Report: Energieoptimiertes Bauen: Klima- und Oberflächenübergangsbedingungen für die hygrothermische Bauteilsimulation. IBP-Bericht HTB-021/2016. Carried out on behalf of Project Management Jülich (PTJ UMW). July 2016.
- [5] WTA Guideline 6-2/E: Simulation of heat and moisture transfer. October 2025.
- [6] EN 15026: Hygrothermal performance of building components and building elements – Assessment of moisture transfer by numerical simulation. December 2023.
- [7] EN ISO 13788: Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods. May 2013.
- [8] WTA Guideline 6-8: Feuchtetechnische Bewertung von Holzbauteilen - Vereinfachte Nachweise und Simulation. August 2016.

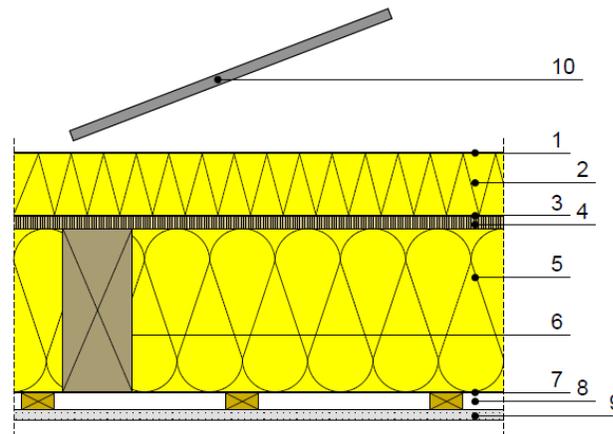
Examples: Flat Roof without and with Shading by PV Modules

Based on the example of a flat roof in timber construction without and with shading by rack-mounted PV modules, the procedure for the input and the evaluation of flat roofs is described.

Example A:



Example B:



- 1 Roofing Felt
- 2 EPS Insulation
- 3 PE Foil
- 4 Wooden Sheathing
- 5 Insulation
- 6 Rafter
- 7 Vapour Retarder
- 8 Installation Layer
- 9 Gypsum Board
- 10 PV Modules (rack-mounted)

Examples: Assembly

Assembly (from outside to inside):

- Roofing Felt ($s_d = 300$ m)
- EPS (heat cond.: 0.04 W/mK – density: 30 kg/m³) 0.1 m
- PE Foil (vapour retarder, $s_d = 100$ m)
- Wooden Sheathing (Softwood) 0.025 m
- Mineral Wool (heat cond.: 0.04 W/mK) 0.24 m
- Moisture-Variable Vapour Retarder (PA-Membrane) 0.001 m
- Air Layer 0.02 m
- Gypsum Board 0.0125 m

Examples: Boundary Conditions

Boundary Conditions:

- Flat roof (3° to the North)
- Dark roofing felt ($a = 0.8$; $\varepsilon = 0.9$)
- Example A: no shading
Example B: shading by rack-mounted PV modules (WTA 6-8)
- Outdoor Climate: Holzkirchen
- Indoor Climate: Medium Moisture Load + 5 %
according to DIN 4108-3
- Air Tightness of the Envelope: $q_{50} = 3 \text{ m}^3/\text{m}^3\text{h}$
- Stack Height: 5 m

Examples: Evaluation Matrix

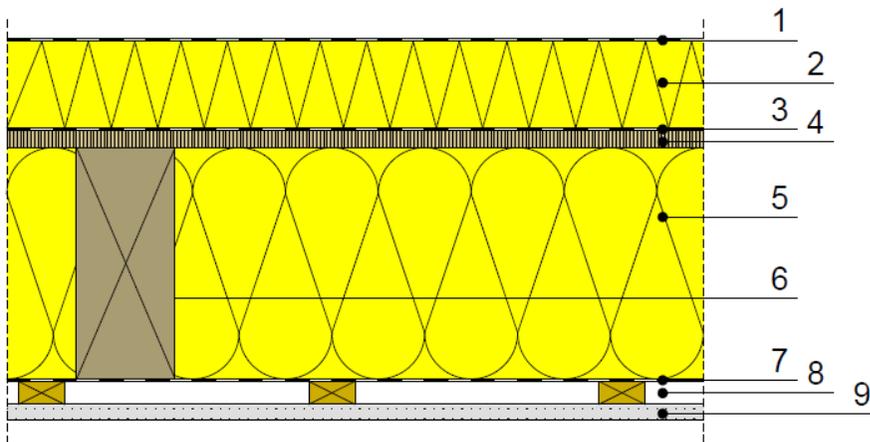
Evaluation Matrix:

The following evaluation matrix shows the evaluation criteria relevant to this design.

	Criteria
1) Numerics	No or only low balance differences (especially in the case of convergence failures)?
	Consistent, periodic course of the total water content?
2) Evaluation parameters	Total water content reaches dynamic equilibrium or decreases?
	Water content in the wooden sheathing below the limit values according to DIN 68800 or WTA 6-8?

Example A: Flat Roof without Shading

Example A:
Flat roof in timber construction without shading



- 1 Roofing Felt
- 2 EPS Insulation
- 3 PE Foil
- 4 Wooden Sheathing
- 5 Insulation
- 6 Rafter
- 7 Vapour Retarder
- 8 Installation Layer
- 9 Gypsum Board

Example A: Input – Component Assembly

Input: Component – Assembly

The screenshot displays the WUFI Pro 7.1 software interface for configuring a roof assembly. The main window shows a diagram of the assembly with the following layers and properties:

- EPS (heat cond.: 0.04 W/mK - density...): 0.1 m
- Softwo...: 0.025 m
- Mineral Wool (heat cond.: 0,04 W/mK): 0.24 m
- Air L...: 0.02 m

The Gypsum Board layer thickness is set to 0.0125 m. The interface also shows a grid and sources view, and a table of geometry properties and total thermal performance.

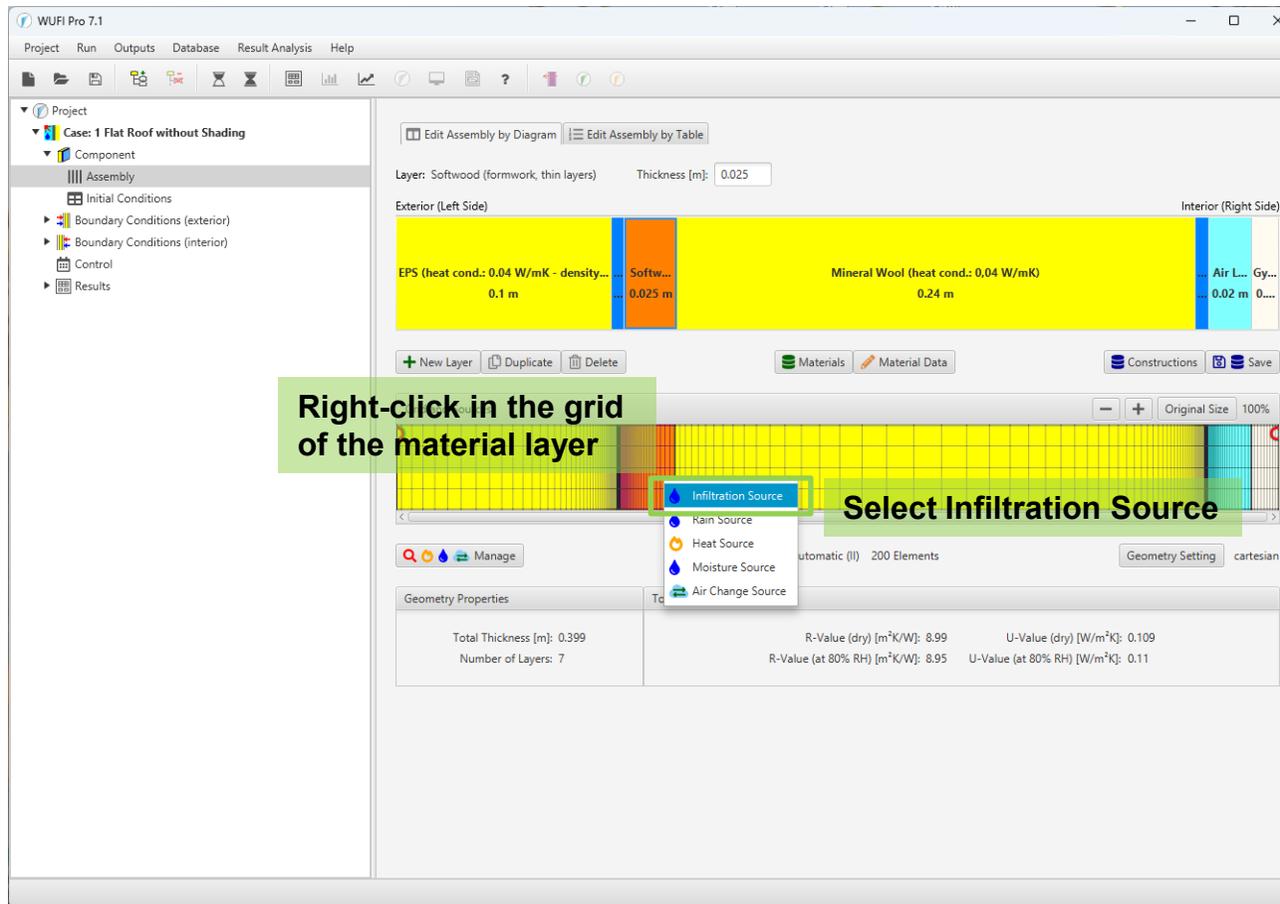
Geometry Properties		Total Thermal Performance	
Total Thickness [m]: 0.399	Number of Layers: 7	R-Value (dry) [m ² K/W]: 8.99	U-Value (dry) [W/m ² K]: 0.109
		R-Value (at 80% RH) [m ² K/W]: 8.95	U-Value (at 80% RH) [W/m ² K]: 0.11

Enter roof assembly without roofing felt
Adjust layer thicknesses if necessary

Example A: Input – Infiltration Source

Input: Component – Assembly

Infiltration source according to DIN 68800 in the wooden sheathing



Example A: Input – Infiltration Source

Input: Component – Assembly

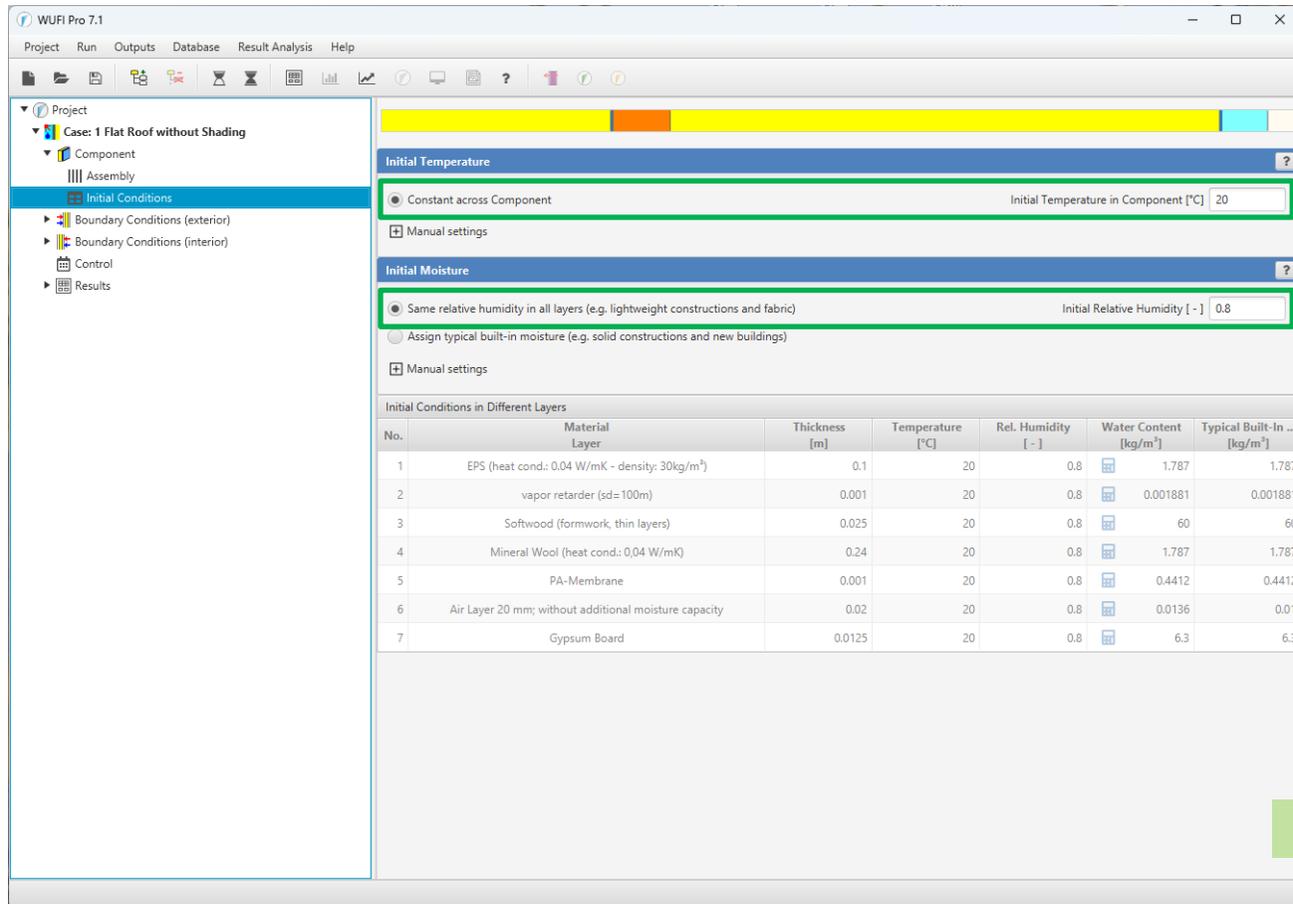
Moisture Source in the interior 5 mm of the wooden sheathing.

The screenshot shows the 'Hygrothermal Sources' dialog box with the 'Infiltration Source' tab selected. The 'Name' field is 'Infiltration 1'. Under 'Spread Area', the 'Area' radio button is selected with a dropdown menu set to 'right-fixed'. The 'Thickness [m]' field is set to '0.005'. In the 'Source Type' section, 'Air Infiltration model IBP' is selected. The 'Source Term Cut-Off [kg/m³]' section has 'Cut-Off at Free Water Saturation' selected. The 'Envelope Infiltration q50 [m³/m²h]' section has a value of '3' and a dropdown menu set to 'Air Tightness Class B (DIN 4108, tested <= 3 m³/m²h)'. The 'Stack Height [m]' field is '5' and the 'Mechanical Ventilation Overpressure [Pa]' field is '0'. At the bottom, there are buttons for 'Delete source', 'OK', 'Cancel', and 'Help'.

Adjust Infiltration Source

Example A: Input – Initial Conditions

Input: Assembly – Initial Conditions



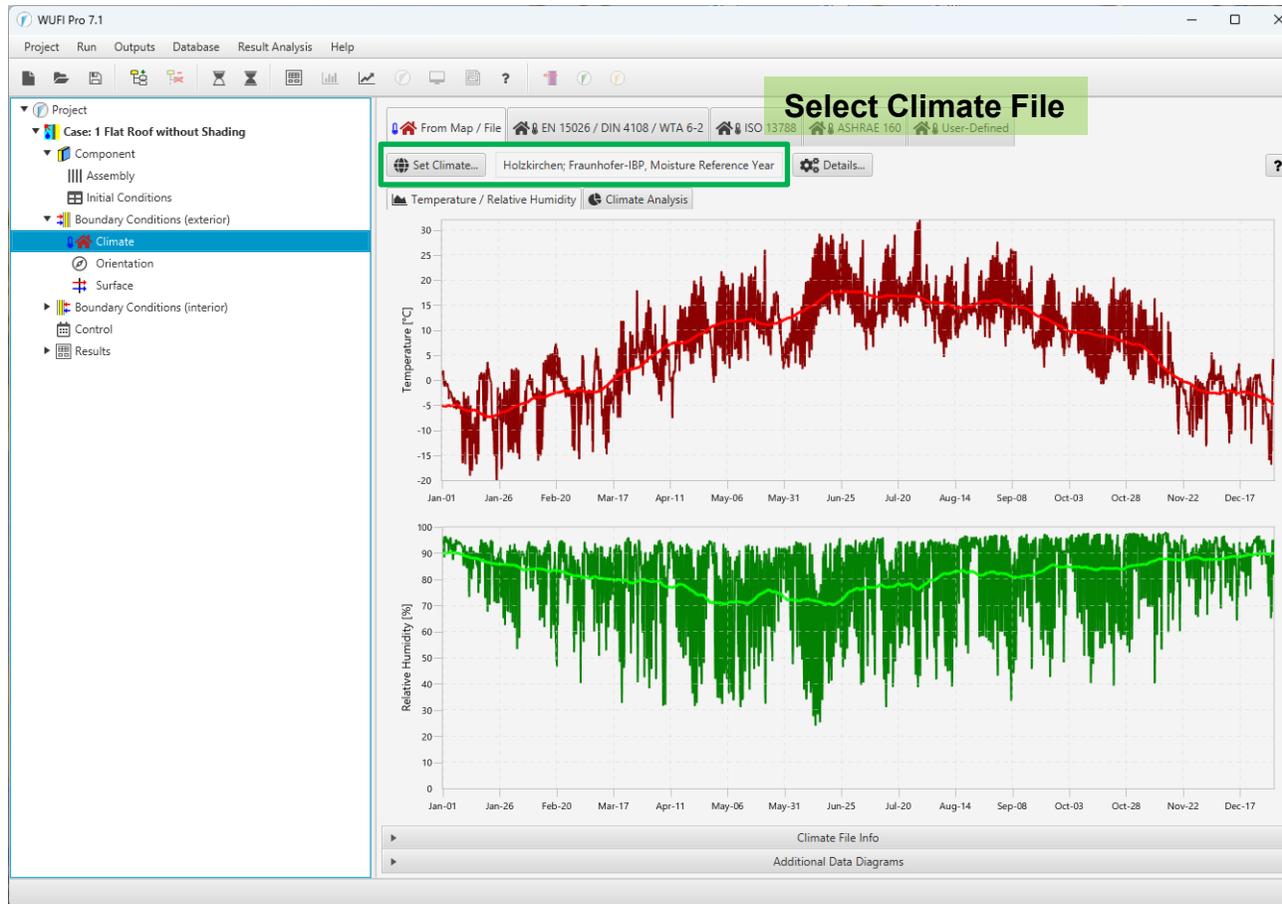
The screenshot shows the WUFI Pro 7.1 software interface. The left sidebar displays the project structure for 'Case: 1 Flat Roof without Shading', with 'Initial Conditions' selected. The main window shows the 'Initial Conditions' settings for the assembly. The 'Initial Temperature' section is set to 'Constant across Component' with a value of 20 °C. The 'Initial Moisture' section is set to 'Same relative humidity in all layers (e.g. lightweight constructions and fabric)' with a value of 0.8. Below these settings is a table titled 'Initial Conditions in Different Layers'.

No.	Material Layer	Thickness [m]	Temperature [°C]	Rel. Humidity [-]	Water Content [kg/m³]	Typical Built-In ... [kg/m³]
1	EPS (heat cond.: 0,04 W/mK - density: 30kg/m³)	0.1	20	0.8	1.787	1.787
2	vapor retarder (sd=100m)	0.001	20	0.8	0.001881	0.001881
3	Softwood (formwork; thin layers)	0.025	20	0.8	60	60
4	Mineral Wool (heat cond.: 0,04 W/mK)	0.24	20	0.8	1.787	1.787
5	PA-Membrane	0.001	20	0.8	0.4412	0.4412
6	Air Layer 20 mm; without additional moisture capacity	0.02	20	0.8	0.0136	0.01
7	Gypsum Board	0.0125	20	0.8	6.3	6.3

No changes required

Example A: Input – Outdoor Climate

Input: Boundary Conditions (exterior) – Climate



Example A: Input – Orientation / Inclination

Input: Boundary Conditions (exterior) – Orientation

The screenshot displays the WUFI Pro 7.1 software interface. The left sidebar shows a project tree with the following structure:

- Project
 - Case: 1 Flat Roof without Shading
 - Component
 - Assembly
 - Initial Conditions
 - Boundary Conditions (exterior)
 - Climate
 - Orientation**
 - Surface
 - Boundary Conditions (interior)
 - Control
 - Results

The main workspace contains three panels:

- Orientation:** Features a compass rose with cardinal directions (N, S, E, W) and intercardinal directions (NE, SE, SW, NW). A red arrow points towards North. Below the compass is a dropdown menu currently set to "North".
- Inclination:** Shows a 3D diagram of a roof surface tilted at an angle. A sun icon is present in the top left. The angle is displayed as **3°**. Below the diagram are two input fields: "Inclination [°]" with a value of 3, and "[%]" with a value of 5.24.
- Building Height / Driving Rain Coefficients:** Contains two radio buttons: "Rain load calculation according to WUFI model" (selected) and "Rain load calculation according to ASHRAE Standard 160". Below are two input fields: "R1 [-]" with a value of 1, and "R2 [s/m]" with a value of 0. A note below reads: "Note: Rain Load = Rain * (R1 + R2 * Wind Velocity)".

A green callout box at the bottom right of the interface contains the text: **Adjust orientation and inclination**

Example A: Input – Surface Transfer Coefficients (exterior)

Input: Boundary Conditions (exterior) – Surface

WUFI Pro 7.1

Project Run Outputs Database Result Analysis Help

Project

- Case: 1 Flat Roof without Shading
 - Component
 - Assembly
 - Initial Conditions
 - Boundary Conditions (exterior)
 - Climate
 - Orientation
 - Surface
 - Boundary Conditions (interior)
 - Control
 - Results

Heat Transfer

Heat Transfer Coefficient [W/m²K] 19 Roof

long-wave radiation parts Heat Transfer Coefficient [W/m²K] 6.5

Wind-dependent

Wind-dependence formula

Vapor Transfer

Additional diffusion resistance (e.g. coating), sd-Value [m] 300 User-Defined

Note: This setting does not affect rain absorption.

Radiation

Short-wave absorptivity, e.g. solar radiation [-] 0.8 ■ DIN 4108-3: black, dark hue

Radiative overcooling Note: Explicit Radiation Balance, includes radiative cooling due to long-wave emission.

Long-wave emissivity, e.g. nighttime radiative cooling [-] 0.9

Additional radiation parameters

Reduction factors

Rain

Simulation takes rain into account

Rain parameters

Adjust surface transfer coefficients

Heat Transfer Coefficient
(from list: roof)

s_d -value of the roofing felt
= 300 m

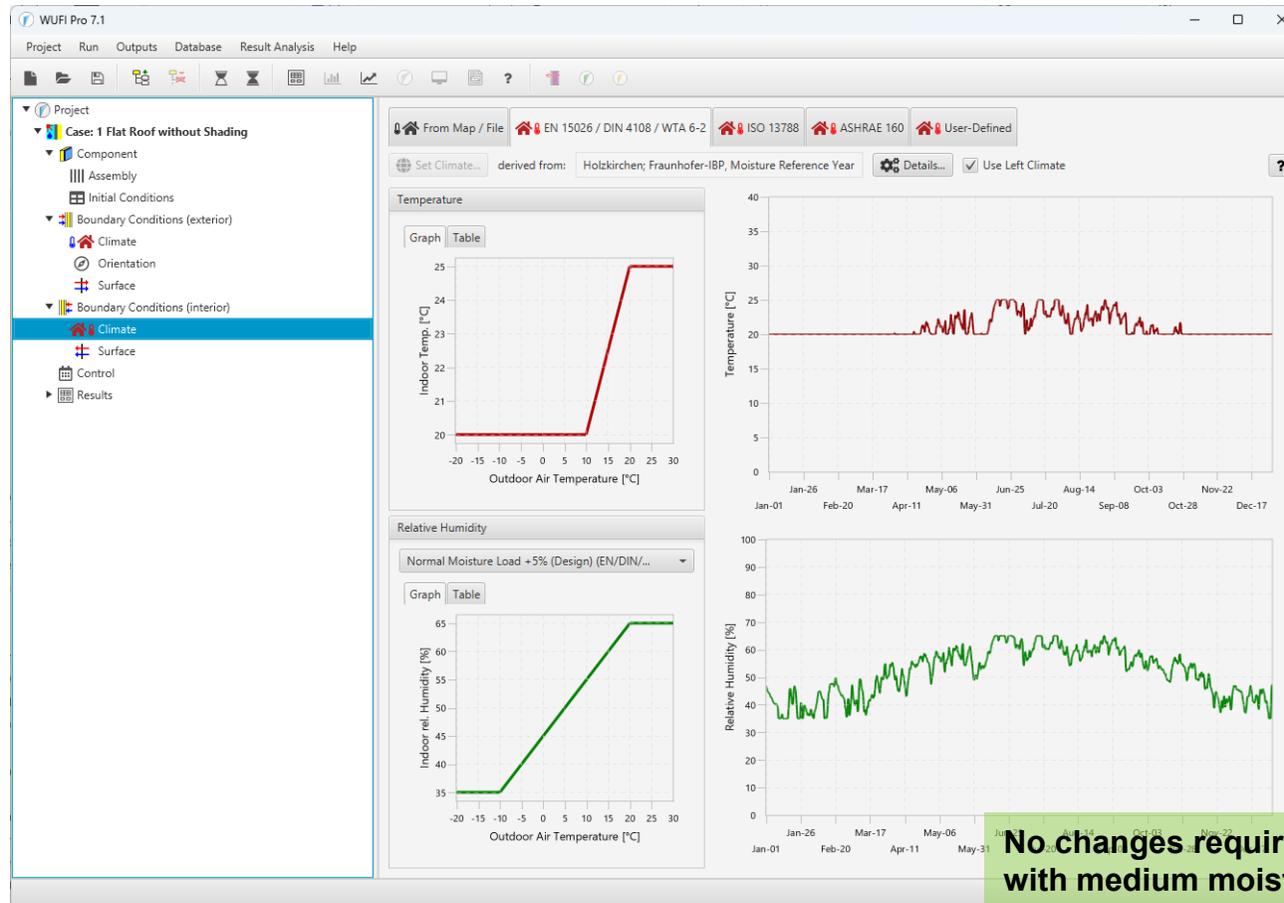
Absorptivity (black, dark hue)

Use radiative overcooling

No rain water absorption

Example A: Input – Indoor Climate

Input: Boundary Conditions (interior) – Climate



Example A: Input – Surface Transfer Coefficients (interior)

Input: Boundary Conditions (interior) – Surface

The screenshot displays the WUFI Pro 7.1 software interface. The left sidebar shows a project tree with the following structure:

- Project
 - Case: 1 Flat Roof without Shading
 - Component
 - Assembly
 - Initial Conditions
 - Boundary Conditions (exterior)
 - Climate
 - Orientation
 - Surface
 - Boundary Conditions (interior)
 - Climate
 - Surface (highlighted)
 - Control
 - Results

The main window shows the configuration for the selected 'Surface' boundary condition. The 'Heat Transfer' section is active, with the following settings:

- Apply list selection from exterior surface
- Heat Transfer Coefficient [W/m²K]: 8
- Roof (Interior Surface)

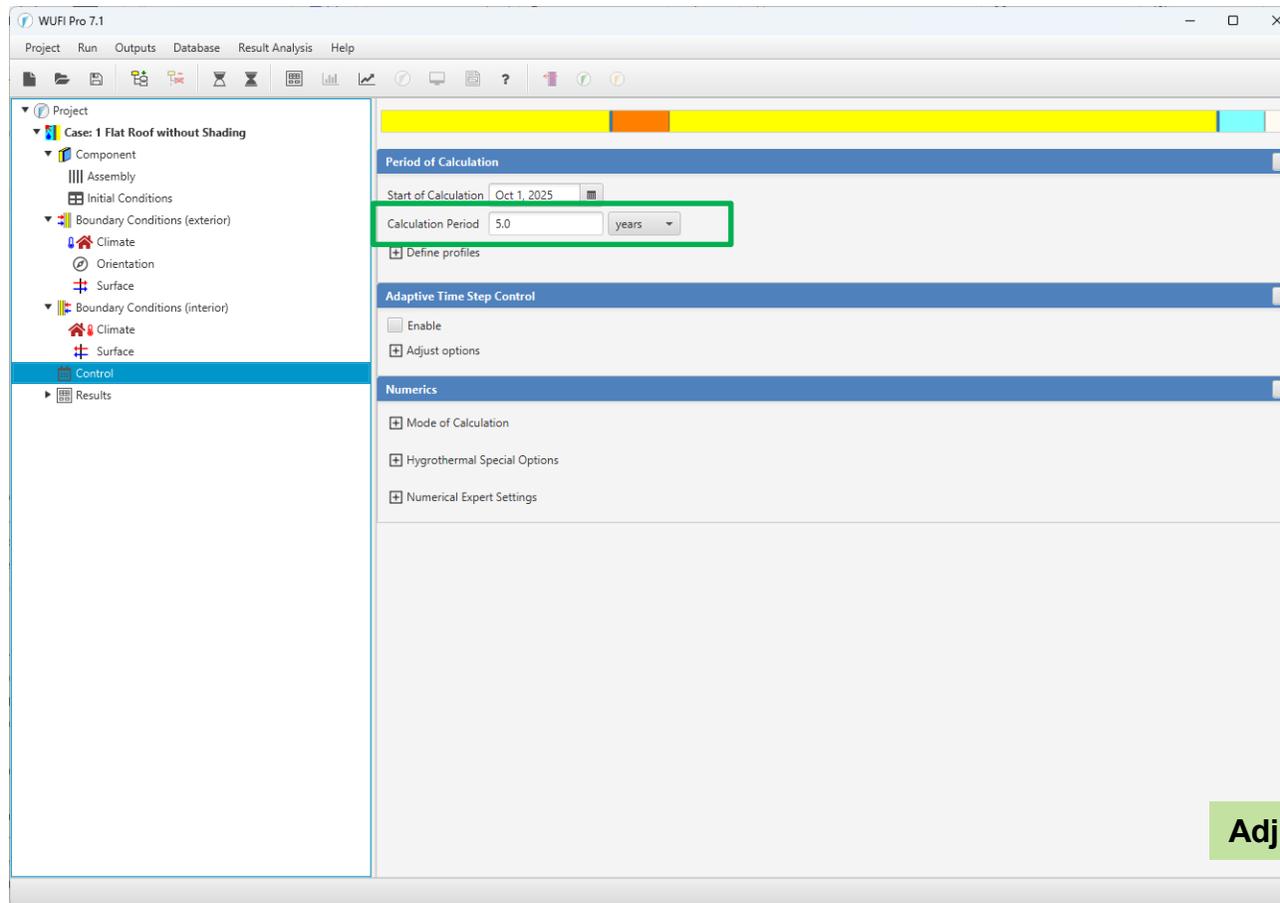
The 'Vapor Transfer' section is also visible, with the following settings:

- Additional diffusion resistance (e.g. coating), sd-Value [m]: ----
- No coating (selected in dropdown)

No changes required

Example A: Input – Period of Calculation and Numerics

Input: Control



The screenshot displays the WUFI Pro 7.1 software interface. The left sidebar shows a project tree with 'Control' selected. The main window is divided into three sections: 'Period of Calculation', 'Adaptive Time Step Control', and 'Numerics'. The 'Period of Calculation' section is highlighted with a green box around the 'Calculation Period' input field, which is set to '5.0 years'. A green callout box at the bottom right of the screenshot contains the text 'Adjust calculation period'.

WUFI Pro 7.1

Project Run Outputs Database Result Analysis Help

Project

- Case: 1 Flat Roof without Shading
 - Component
 - Assembly
 - Initial Conditions
 - Boundary Conditions (exterior)
 - Climate
 - Orientation
 - Surface
 - Boundary Conditions (interior)
 - Climate
 - Surface
 - Control
 - Results

Period of Calculation ?

Start of Calculation Oct 1, 2025

Calculation Period 5.0 years

Define profiles

Adaptive Time Step Control ?

Enable

Adjust options

Numerics ?

Mode of Calculation

Hygrothermal Special Options

Numerical Expert Settings

Adjust calculation period

Example A: Evaluation – Check for numerical quality

Results:

Status of Calculation

Calculation: Time and Date	Dec 18, 2025, 12:52 PM
Begin / End of calculation	Oct 1, 2025 / Oct 1, 2030
Computing Time	0:00:37.096
Current Date/Time	Oct 1, 2030, 12:00 AM

Check for numerical quality

No. of Convergence Failures		0	
Sum of diffusive fluxes (left/right)	[kg/m ²]	-0.049	0.797
Sum of capillary fluxes (left/right)	[kg/m ²]	0.000	1.2E-7
Balance (mass vs. sum of surface-fluxes)	[kg/m ²]	-0.743	-0.745

Water Content [kg/m³]

	Start	End	Min.	Max.
Total Water Content	2.187	1.441	1.406	2.266

Water Content [kg/m³]

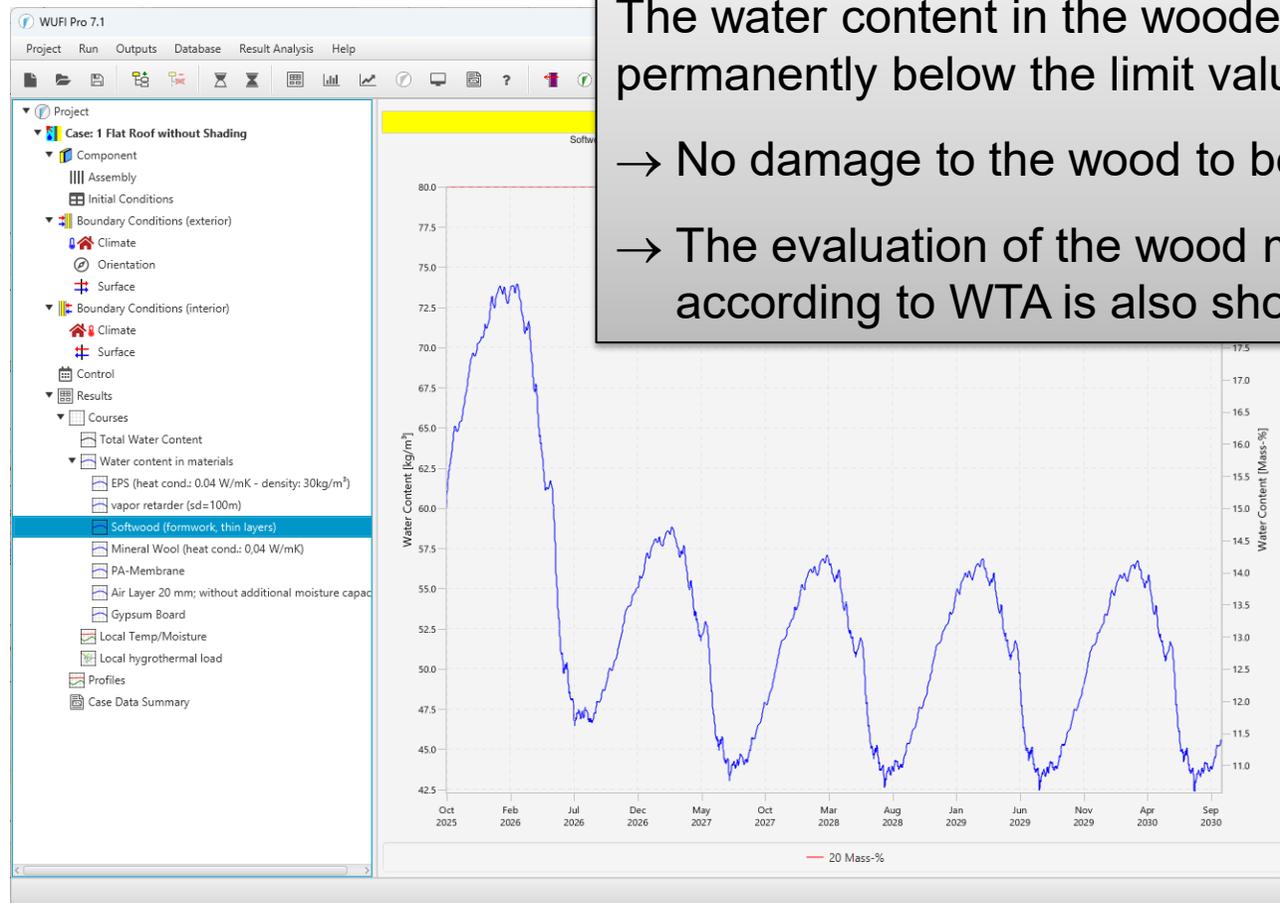
Layer/Material	Start	End	Min.	Max.
EPS (heat cond.: 0.04 W/mK - density: 30kg/m ³)	1.787	0.938	0.921	1.822
vapor retarder (sd=100m)	1.9E-3	8.9E-4	8.3E-4	3.0E-3
Softwood (formwork, thin layers)	60.000	45.569	42.304	74.026
Mineral Wool (heat cond.: 0.04 W/mK)	1.787	0.659	0.414	1.787
PA-Membrane	0.441	0.200	0.101	0.441
Air Layer 20 mm; without additional moisture cap	0.014	9.1E-3	6.2E-3	0.014
Gypsum Board	6.300	3.964	2.584	6.300



Example A: Evaluation – Wooden Sheathing

Evaluation:

Moisture Content in the Wooden Sheathing



The water content in the wooden sheathing is permanently below the limit value of 20 % by mass.

→ No damage to the wood to be expected

→ The evaluation of the wood moisture content according to WTA is also shown as an example

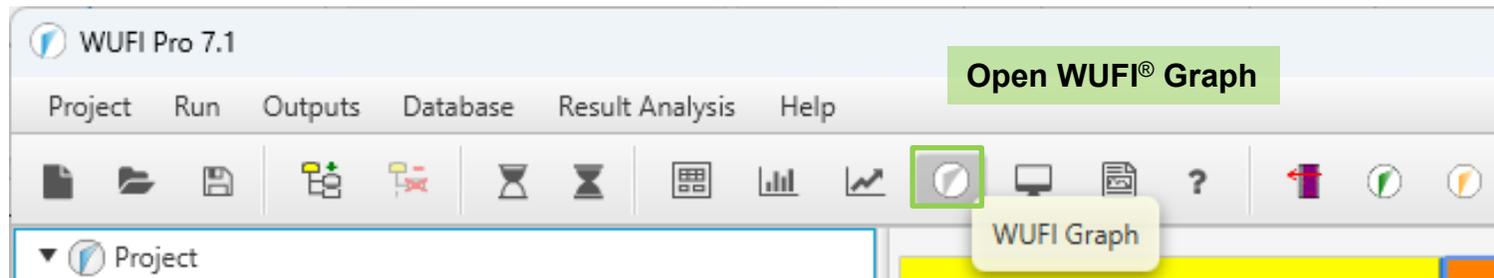
Example A: Evaluation – Wooden Sheathing

Evaluation with WUFI® Graph:

Moisture Content in the Wooden Sheathing according to WTA 6-8

Note:

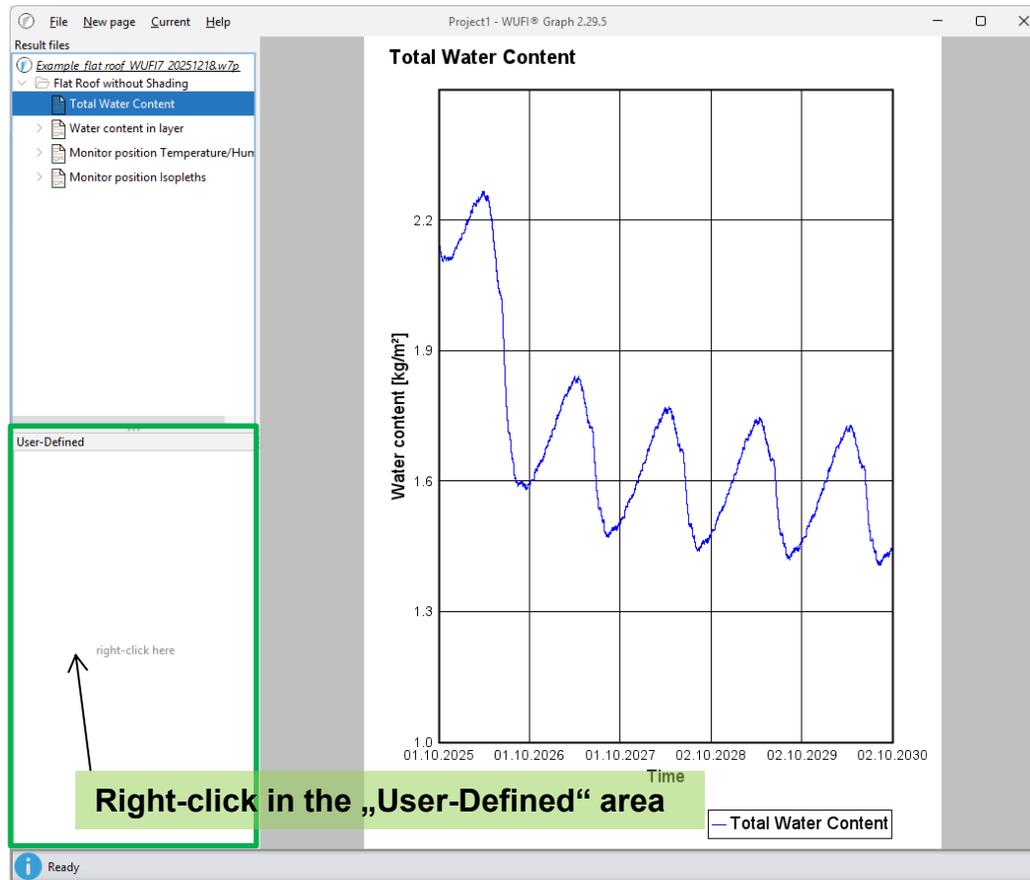
To open WUFI® Graph, the WUFI® project must be saved first!



Example A: Evaluation – Wooden Sheathing

Evaluation with WUFI® Graph:

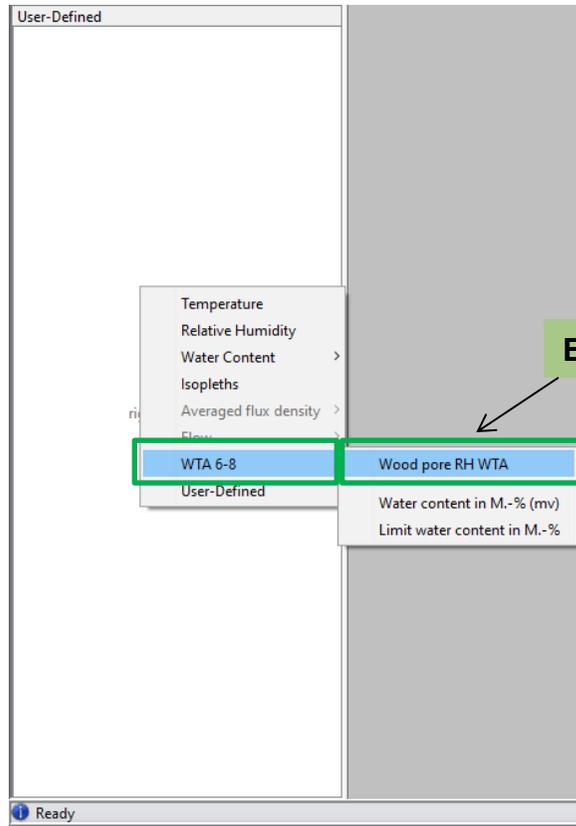
Moisture Content in the Wooden Sheathing according to WTA 6-8



Example A: Evaluation – Wooden Sheathing

Evaluation with WUFI® Graph:

Moisture Content in the Wooden Sheathing according to WTA 6-8



Evaluation of the wood pore RH according to WTA

Example A: Evaluation – Wooden Sheathing

Evaluation with WUFI® Graph:

Moisture Content in the Wooden Sheathing according to WTA 6-8

Area Selection / Settings

Current selection:
Grid Element $n_1 = 83 \rightarrow n_2 = 87$ | Width 10.01 mm

Selection range of 1 cm according to WTA is preset

Select critical centimetre of the wooden sheathing (here: interior)

File: 0251218.w7p | Type: Wood pore RH WTA | Module: X-Y-Plot for selection | Collective selection 10 mm

Options	Values
Result quantity X	Temperature
Result quantity Y	Relative Humidity
Title	Wood pore RH WTA 6-8
Series name	Wood pore RH
Start color	
Middle color	
End color	

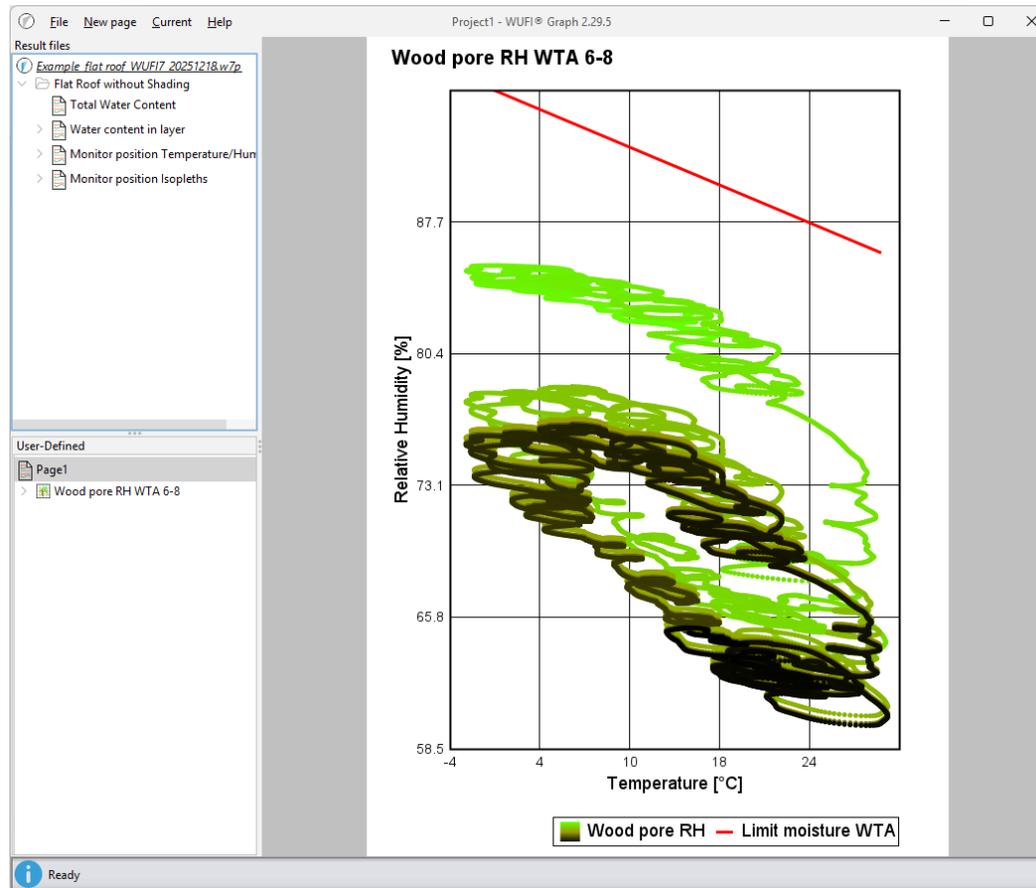
Grid Element 86 | Position 122.62 mm | Material Softwood (formwork, thin layers)

Enter „OK“

Example A: Evaluation – Wooden Sheathing

Evaluation with WUFI® Graph:

Moisture Content in the Wooden Sheathing according to WTA 6-8



The relative pore air moisture in the interior centimetre of the sheathing does not exceed the limits according to WTA.

→ no damage from wood decay



Example A: Evaluation – Final Evaluation

Final Evaluation:

	Criteria	Evaluation
1) Numerical quality	No or only low balance differences (especially in the case of convergence failures)?	✓
	Consistent, periodic course of the total water content?	✓
2) Evaluation parameters	Total water content reaches dynamic equilibrium or decreases?	✓
	Water content in the wooden sheathing below the limit values according to DIN 68800 or WTA 6-8?	✓

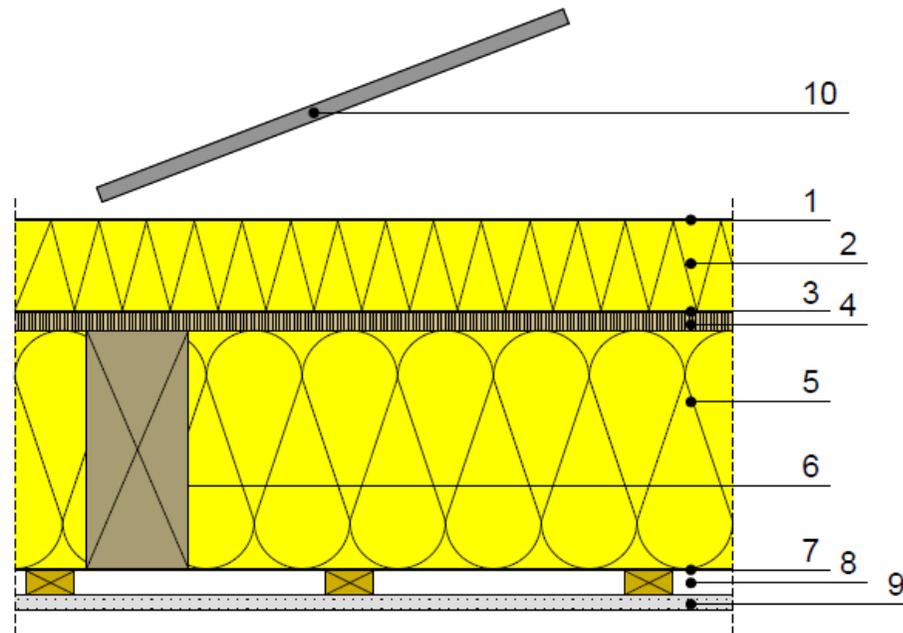


Construction unproblematic from a moisture point of view!

Example B: Flat Roof with Shading by PV modules

Example B:

Flat roof in timber construction with shading by rack-mounted PV modules



- 1 Roofing Felt
- 2 EPS Insulation
- 3 PE Foil
- 4 Wooden Sheathing
- 5 Insulation
- 6 Rafter
- 7 Vapour Retarder
- 8 Installation Layer
- 9 Gypsum Board
- 10 PV modules (rack-mounted)

The assembly is identical to example A. The additional shading affects the radiation absorption and emission. Therefore, the reduction factors due to shading are adjusted accordingly!

Example B: Input – Surface Transfer Coefficients (exterior)

Input: Boundary Conditions (exterior) – Surface

Heat Transfer ?

Heat Transfer Coefficient [W/m²K] 19 Roof

long-wave radiation parts Heat Transfer Coefficient [W/... 6.5

wind-dependent

+ Wind-dependence formula

Vapor Transfer ?

Additional diffusion resistance (e.g. coating), sd-Value [m] 300 User-Defined

Note: This setting does not affect rain absorption.

Radiation ?

Short-wave absorptivity, e.g. solar radiation [-] 0.8 ■ DIN 4108-3: black, dark hue

Radiative overcooling Note: Explicit Radiation Balance, includes radiative cooling due to long-wave emission.

Long-wave emissivity, e.g. nighttime radiative cooling [-] 0.9

+ Additional radiation parameters

- Reduction factors

for absorptivity [-] 0.3 Rack-mounted PV modules (WTA 6-8)

for emissivity [-] 0.5

Rain ?

Simulation takes rain into account

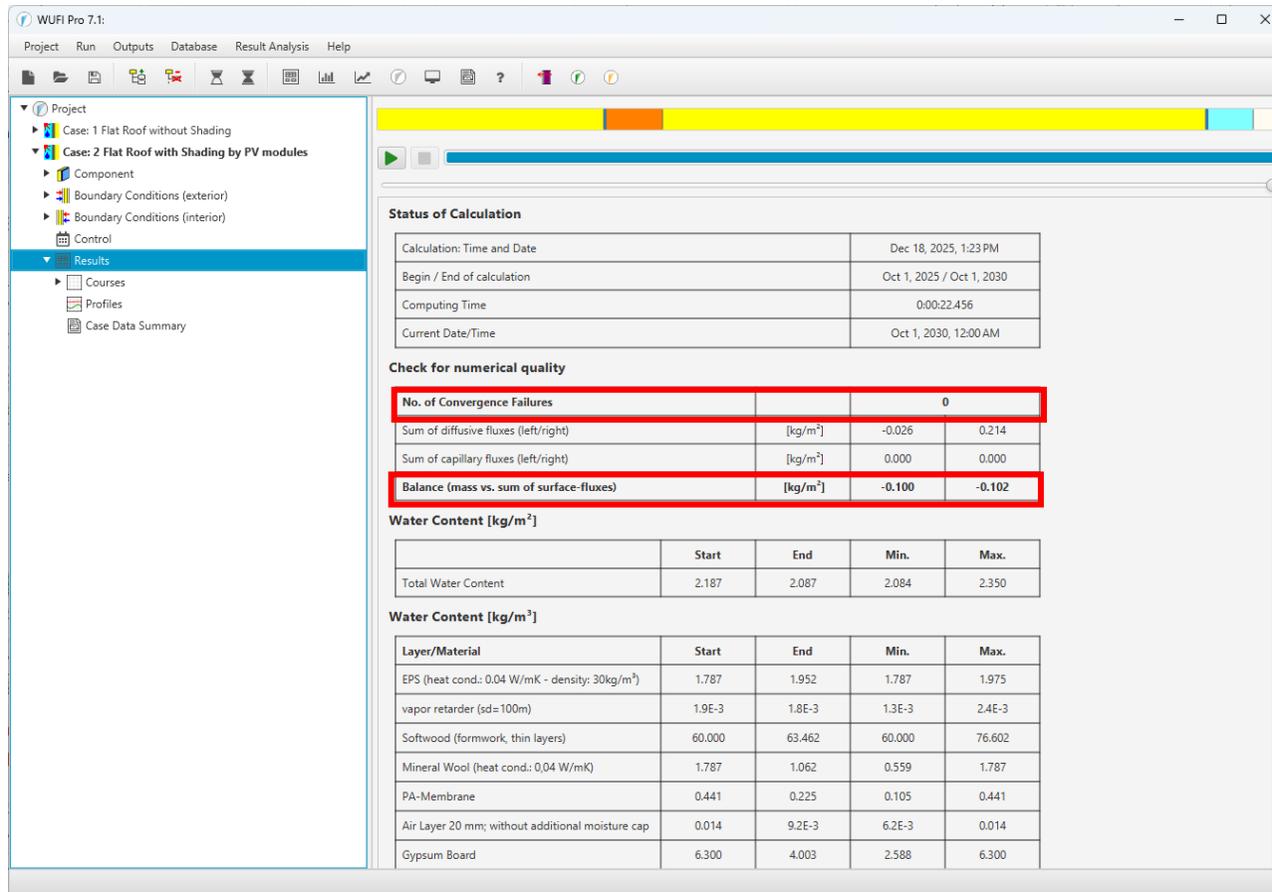
+ Rain parameters

**Reduction factors:
Shading by rack-mounted PV modules (WTA 6-8)**

Adjust surface transfer coefficients!

Example B: Evaluation – Check for numerical quality

Results:



The screenshot displays the WUFI Pro 7.1 software interface. The left sidebar shows a project tree with 'Case: 2 Flat Roof with Shading by PV modules' selected. The main window shows the 'Status of Calculation' and 'Check for numerical quality' sections. The 'Check for numerical quality' table highlights 'No. of Convergence Failures' as 0 and 'Balance (mass vs. sum of surface-fluxes)' as -0.100 and -0.102. A green checkmark is visible to the right of the table.

Status of Calculation

Calculation: Time and Date	Dec 18, 2025, 1:23 PM
Begin / End of calculation	Oct 1, 2025 / Oct 1, 2030
Computing Time	0:00:22.456
Current Date/Time	Oct 1, 2030, 12:00 AM

Check for numerical quality

No. of Convergence Failures			0
Sum of diffusive fluxes (left/right)	[kg/m ²]	-0.026	0.214
Sum of capillary fluxes (left/right)	[kg/m ²]	0.000	0.000
Balance (mass vs. sum of surface-fluxes)	[kg/m²]	-0.100	-0.102

Water Content [kg/m³]

	Start	End	Min.	Max.
Total Water Content	2.187	2.087	2.084	2.350

Water Content [kg/m³]

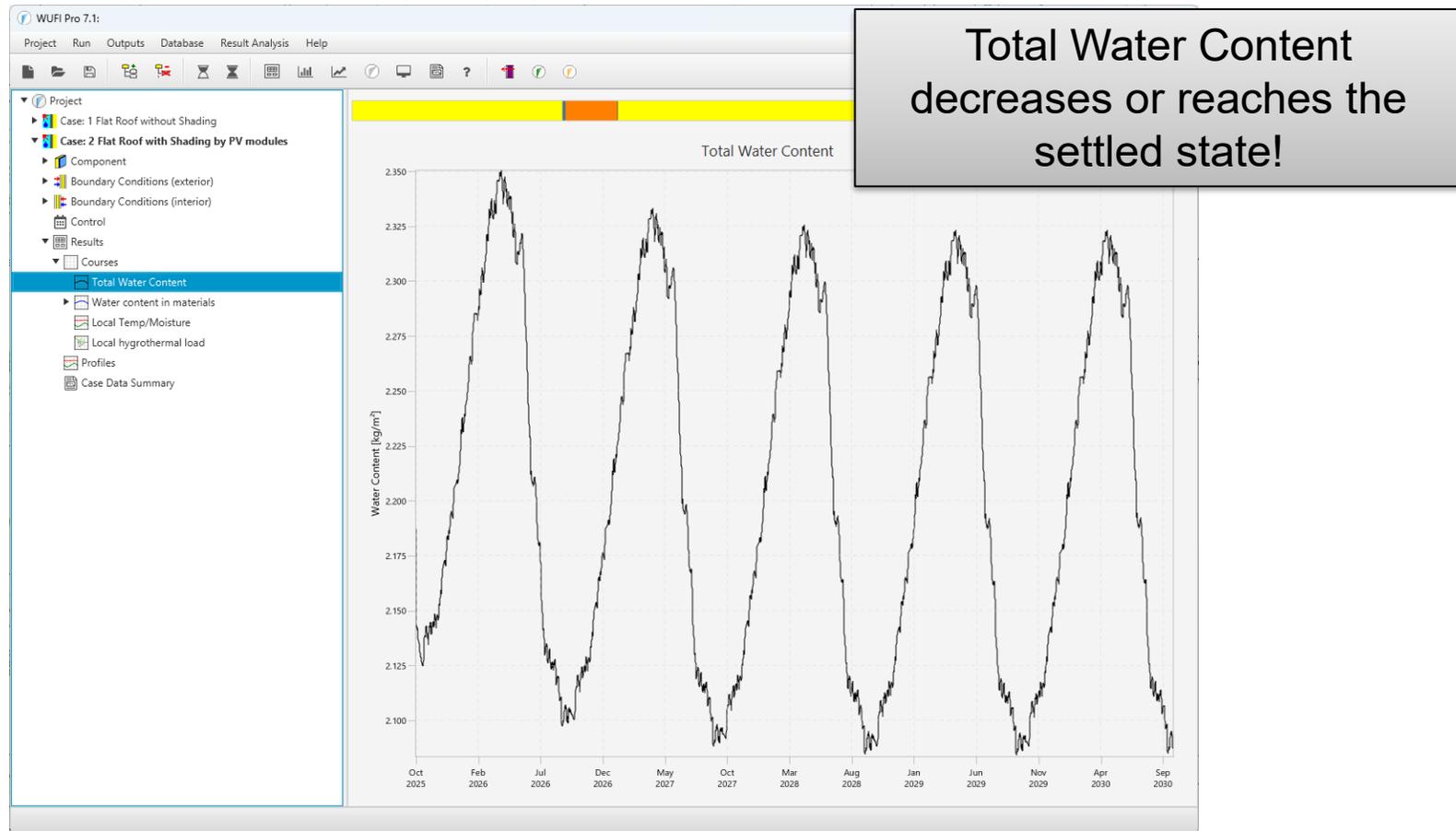
Layer/Material	Start	End	Min.	Max.
EPS (heat cond.: 0.04 W/mK - density: 30kg/m ³)	1.787	1.952	1.787	1.975
vapor retarder (sd=100m)	1.9E-3	1.8E-3	1.3E-3	2.4E-3
Softwood (formwork, thin layers)	60.000	63.462	60.000	76.602
Mineral Wool (heat cond.: 0,04 W/mK)	1.787	1.062	0.559	1.787
PA-Membrane	0.441	0.225	0.105	0.441
Air Layer 20 mm; without additional moisture cap	0.014	9.2E-3	6.2E-3	0.014
Gypsum Board	6.300	4.003	2.588	6.300



Example B: Evaluation – Total Water Content

Evaluation:

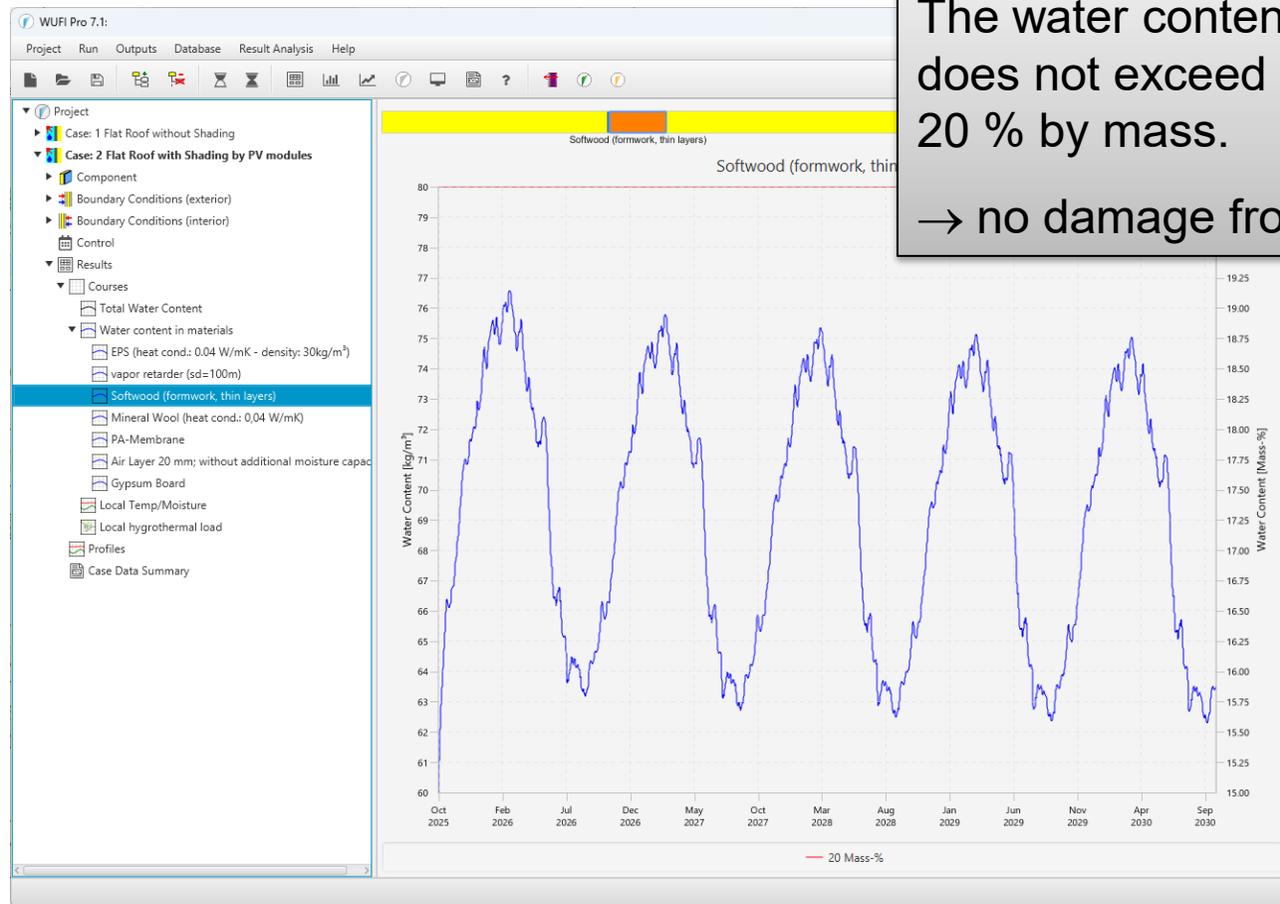
Total Water Content



Example B: Evaluation – Wooden Sheathing

Evaluation:

Moisture Content in the Wooden Sheathing



The water content in the sheathing does not exceed the limit value of 20 % by mass.
→ no damage from wood decay

Example B: Evaluation – final Evaluation

Final Evaluation:

	Criteria	Evaluation
1) Numerical quality	No or only low balance differences (especially in the case of convergence failures)?	✓
	Consistent, periodic course of the total water content?	✓
2) Evaluation parameters	Total water content reaches dynamic equilibrium or decreases?	✓
	Water content in the wooden sheathing below the limit values according to DIN 68800 or WTA 6-8?	✓



Construction unproblematic
from a moisture point of view!