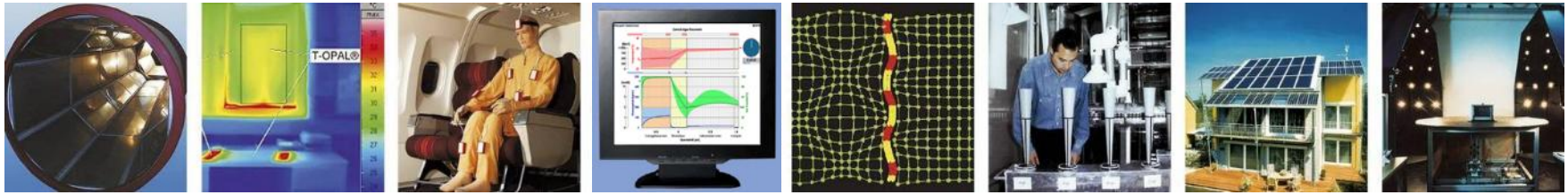

WUFI®

Guideline for the Calculation of extensive Green Roofs (generic)

Date: July 2026

Fraunhofer IBP

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Development of Green Roof Models

Within the research project

> *„Ermittlung von Materialeigenschaften und effektiven Übergangsparametern von Dachbegrünungen zur zuverlässigen Simulation der hygrothermischen Verhältnisse in und unter Gründächern bei beliebigen Nutzungen und unterschiedlichen Standorten“ [1]*
>
> (Funded by the research programme "Zukunft Bau" of the Bundesinstitut für Bau-, Stadt- und Raumforschung (German Federal Ministry of Transport, Building and Urban development); file number: SF-10.08.18.7-11.18 / II 3-F20-10-1-100)

one generic and different product-specific models were developed in order to simulate and design green roofs – especially on wooden constructions – reliably by the help of hygrothermal simulations.

Development of Green Roof Models

Generic Approach:

The generic green roof model was developed based on field studies in Holzkirchen, Leipzig [2], Vienna [3] and Kassel [4]. The climate data available for the test period didn't contain any data for the atmospheric counter radiation, so it was necessary to consider their influence in a simplified way by the available climate elements and appropriate surface transfer coefficients. Therefore this model is suitable especially for locations in Central Europe respectively locations with a comparable climate. They can be used if no measured data for the atmospheric counter radiation or no detailed information about the applied substrate type are available.

Product-Specific Approach:

On the basis of the generic model, product-specific approaches for five green roof systems of the company Optigreen (partly with solid drainage) were developed by means of additional laboratory and field tests in Holzkirchen. Hereby the influence of the measured atmospheric counter radiation was considered explicitly, so these approaches are in principle also suitable for other climate regions. Validations have been performed for Holzkirchen and Milan [5].

See also "Guideline for the Calculation of extensive Green Roofs (Optigreen)"

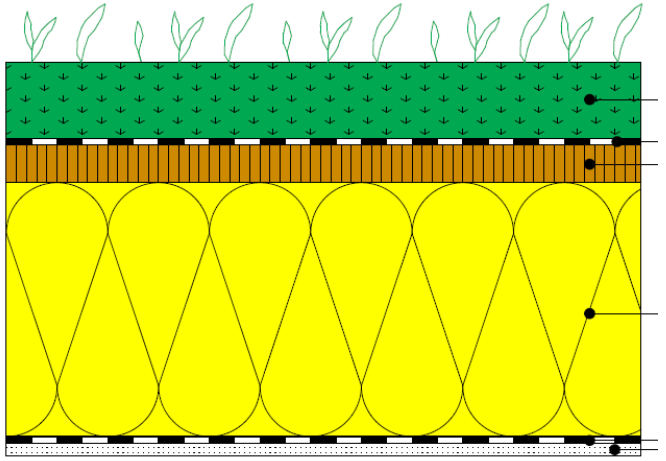
Application of the Generic Green Roof Model

The **generic green roof model** should be used if **no detailed information about the substrate type** or **no measured data for the atmospheric counter radiation** are available.

In this model **the long-wave radiation is considered in a simplified way by the reduced short-wave radiation absorptivity**.

This is acceptable if the radiation conditions are comparable to the one at the examined locations.

Other radiation conditions
(especially due to clearly different clouding)
should be considered by a detailed
calculation of the long-wave radiation losses.



Input: Component Assembly and Grid Setting

Component – Assembly

Generic Substrate

The generic substrate is to be applied in the required thickness (up to a maximum of about 15 cm substrate layer thickness).
The material is directly available in the WUFI® - Material Database under *Fraunhofer-IBP→ Green and Gravel Roofs*.

Underlying Roof Assembly

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

Grid Setting

Recommended grid setting:
Automatic (II) with 200 elements (default setting)

Input: Moisture Source in the Substrate

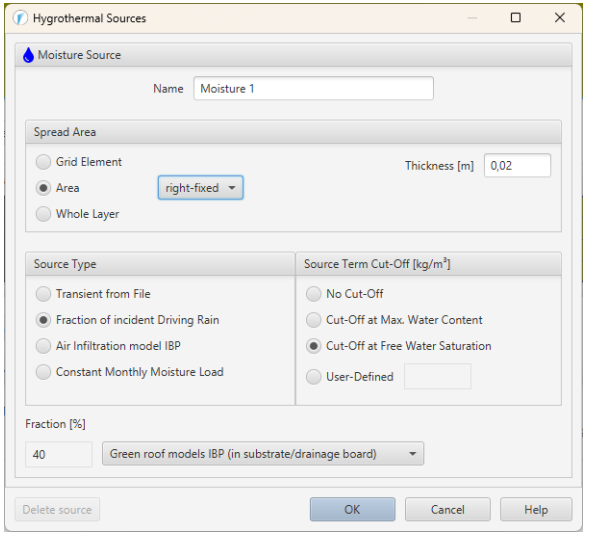
Component - Assembly

Moisture Source in the Substrate Layer

In order to take the precipitation flowing through the substrate layer into account in the calculation, a moisture source is to be considered in the lower 2 cm of the substrate layer. This should introduce 40 % of the precipitation, limited to the free water saturation, into the substrate layer during a rain event.

Settings:

- Spread Area:
  Area – right fixed; thickness: 0.02 m
- Source Type:
  Fraction of incident driving rain
- Source Term Cut-Off:
  Cut-Off at Free Water Saturation
- Fraction: 40 % (Green roof models IBP)



Input: Infiltration Source

Component - Assembly

Moisture Source - Infiltration (only for wooden structures)

According to DIN 68800 [6], the amount of moisture that convectively enters the construction as a function of the air tightness must always be assessed for wooden structures and is taken into account in the simulation using the infiltration model of the IBP.

The moisture source must be located in the component assembly at the position where the condensation water will precipitate in practice – usually this is in front of 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

Input: Infiltration Source

Component - Assembly

Moisture Source - Infiltration (only for wooden structures)

The amount of moisture entered in winter is automatically determined in the WUFI® from the overpressure due to the thermal buoyancy in the building (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 [7].

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

Input: Initial Conditions

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 construction moisture contents are known, these can be specified separately for each individual layer.

Boundary Conditions (exterior) – Climate

Outdoor Climate:

An outdoor climate appropriate for the building location must 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*0.8. This climate was also used for the exemption of deemed-to-satisfy constructions in DIN 4108-3 [8].

Input: Orientation / Inclination

Boundary Conditions (exterior) - Orientation

Orientation

The relevant orientation is usually North, as this is where the lowest radiation gains occur. However, the orientation is only of minor importance for very flat sloping roofs.

Roof Inclination

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

Input: Surface Transfer Coefficients (exterior)

Boundary Conditions (exterior) – Surface

Heat Transfer

The heat transfer coefficient at the exterior surface of generic green roofs is assumed to be 19 W/m²K.

Radiation

Selection (drop-down menu): Roof → Green roof, generic model

According to the generic green roof model in [1], the long-wave radiation is taken into account in a simplified way by using a reduced short-wave radiation absorptivity. This is assumed to be a rather low value of 0.3. The long-wave radiation emissivity is not applied for generic green roofs. The radiative overcooling is also not used.

Rain

Rain must be taken into account when simulating green roofs.

Boundary Conditions (interior) – Climate / Surface

Indoor Climate:

For design purposes, an indoor climate with medium moisture load + 5% (according to DIN 4108-3 [3] and EN 15026 [6]) is recommended.

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 [8].

Control

Period of Calculation:

It is recommended to start the calculation on October 1, because the component usually becomes even more humid during the following winter months before the drying period starts in spring. This start date is therefore usually an unfavourable case.

The calculation time depends on when the construction reaches the steady state condition. Green roofs usually require a calculation time of about 10-15 years.

Control

Adaptive Time Step Control:

Due to the difficult moisture balance in the substrate layer, the calculation of green roofs should be performed with "Adaptive Time Step Control".

The following setting is recommended:

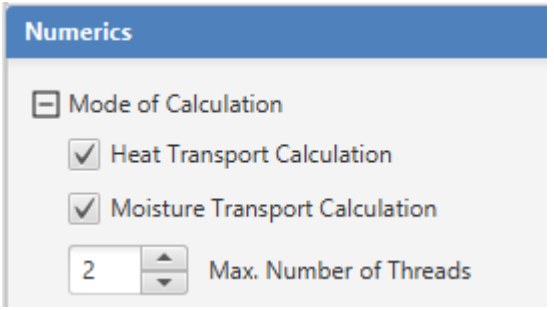
- Steps: 3
- Max. Stages: 10

Numerics:

It is recommended to use 2 CPU cores when simulating green roofs.

→ Mode of Calculation

→ Max. Number of Threads: 2



Notes on the Evaluation of Green Roofs

Calculation Quality

- Long calculation times are not unusual for green roofs.

- The balance differences should remain as small as possible.

Status of Calculation

Calculation: Time and Date	May 11, 2026, 10:15 AM
Start / end of the computed time period	Oct 1, 2026 / Oct 1, 2034
Calculation Period	0:01:28.302
Currently simulated time step	Oct 1, 2034, 12:00 AM

Check for numerical quality

No. of Convergence Failures		**104**	
Sum of diffusive fluxes (left/right)	[kg/m²]	-362.132	-0.245
Sum of capillary fluxes (left/right)	[kg/m²]	-726.990	0.000
Balance (mass vs. sum of surface-fluxes)	**[kg/m²]**	**15.292**	**15.371**

- The number of convergence failures is not a decisive factor, but a high number indicates that convergence is difficult. It is important that the balances do not differ too greatly. In the case of green roofs, however, larger balance differences can occur due to the large amounts of moisture in the green roof structure (driving rain source). These usually occur in the green roof layers and often have no or only a marginal effect on the underlying structure.

- If the water content curves in the layers of the underlying structure do not show any abnormalities (e.g. abrupt jumps, peaks...), the result is usually acceptable.

Notes on the Evaluation of Green Roofs

Greened lightweight constructions

The evaluation procedure and the evaluation criteria are almost identical to those for normal flat roofs and can be found in the Guideline for the calculation of flat roofs.

The evaluation of the moisture conditions in a possibly existing additional insulation of the outer sheathing is explained on the following slides.

Additional evaluation in the case of an additional insulation

A slow accumulation of moisture is often observed in the additional insulation of the exterior sheathing, therefore moisture-insensitive materials should preferably be used in this area.

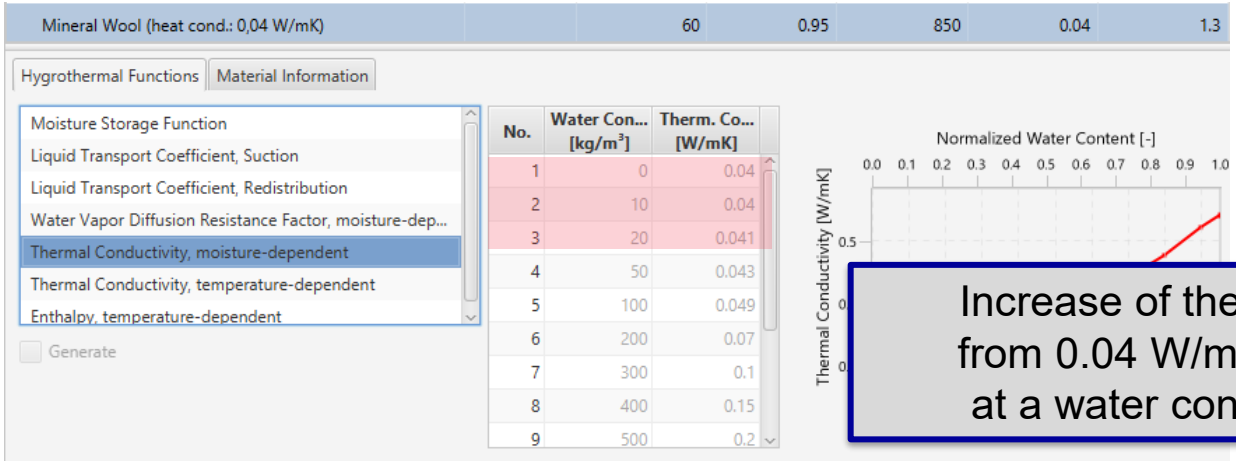
- Moisture leads to an increase in thermal conductivity - but this increase usually remains so small (see next slide) that it appears negligible even for typical service lives of 25 years.
- In rigid-foam insulation, moisture remains in the pore structure of the material - i.e. usually without any further consequences for the material or construction.
- In fibre insulation, liquid condensation can possibly penetrate into other component layers and damage them - this effect must be considered separately!

Notes on the Evaluation of Green Roofs

Additional evaluation in the case of an additional insulation

The example shows the water content of a mineral wool insulation, which increases to about 20 kg/m³ over the service life of the roof (converted to a thickness of 6 cm, this corresponds to about 1.2 kg/m²).

The effect on the thermal conductivity can be taken from the material data. In this case, it increases by about 2.5 % from 0.04 to 0.041 W/mK. If the additional insulation is relevant for the U-value of the component, the effect could be compensated by using insulation that is about 1.5 mm thicker.



Increase of thermal conductivity from 0.04 W/mK to 0.041 W/mK at a water content of 20 kg/m³.

Important Notes / Rules for Construction Practice

- **Additional insulation** of the exterior sheathing **is useful** and recommended for insulation thicknesses above about 15 - 20 cm.
- **Moisture-variable vapour retarders** in combination with diffusion-open interior sheathing improve drying and moisture balance and should therefore be **preferred**.
- **Caution** should be exercised **in shaded areas** and locations with low radiation, as the low drying potential is further reduced.
- **Install** materials **as dry as possible** – drying out after installation is only possible very slowly.
- Aim at and check for **good airtightness.**
- **No drying possible upwards** through the greening layer – but moisture entry from above is possible. Therefore, **diffusion-resistant roofing membranes** perform more favourably (**s_d-values ≥ 300 m** recommended)!
- Insulation over the rafters is always uncritical!!

Literature

[1] Schafaczek B., Zirkelbach D.: Ermittlung von Materialeigenschaften und effektiven Übergangsparametern von Dachbegrünungen zur zuverlässigen Simulation der hygrothermischen Verhältnisse in und unter Gründächern bei beliebigen Nutzungen und unterschiedlichen Standorten. Forschungsinitiative Zukunft Bau, Band F 2863, Fraunhofer IRB Verlag 2013.

[2] Winter, S.; Fülle, C.; Werther, N.: Forschungsprojekt MFPA Leipzig und TU München (Z 6 – 10.08.18.7-07.18). „Flachdächer in Holzbauweise“. 2007-2010.

[3] Teibinger, M.; Nusser, B.: Ergebnisse experimenteller Untersuchungen an flachgeneigten Hölzernen Dachkonstruktionen. Herausgegeben von Holzforschung Austria, Wien. (Forschungsbericht, HFA-Nr.: P412), 2010.

[4] Minke, G.; Otto, F.; Gross, R.: Ermittlung des Wärmedämmverhaltens von Gründächern. Abschlussbericht, AZ 24242-25. ZUB Kassel. Juli 2009.

[5] Fiori, M.; Paolini, R.: Politecnico di Milano, Dipartimento di Architettura, Ingegneria delle costruzioni e Ambiente costruito. The green roof monitoring is funded by the Italian Ministry of Research, project PRIN SENSE „Smart Building Envelope for Sustainable Urban Environment“.

[6] DIN 68800-2: Wood preservation - Part 2: Preventive constructional measures in buildings. Beuth Verlag, February 2022.

[7] Zirkelbach, D.; Künzel, H.M.; Schafaczek, B. und Borsch-Laaks, R.: Dampfkonvektion wird berechenbar – Instationäres Modell zur Berücksichtigung von konvektivem Feuchteeintrag bei der Simulation von Leichtbaukonstruktionen. Proceedings 30. AIVC Conference, Berlin 2009.

[8] DIN 4108-3: Thermal protection and energy economy in buildings – Part 3: Protection against moisture subject to climate conditions – Requirements, calculation methods and directions for planning and construction. Beuth Verlag, March 2024.

[9] Research Report: Energieoptimiertes Bauen: Klima- und Oberflächenübergangsbedingungen für die hygrothermische Bauteilsimulation. IBP-Bericht HTB-021/2016. Durchgeführt im Auftrag vom Projektträger Jülich (PTJ UMW). Juli 2016.

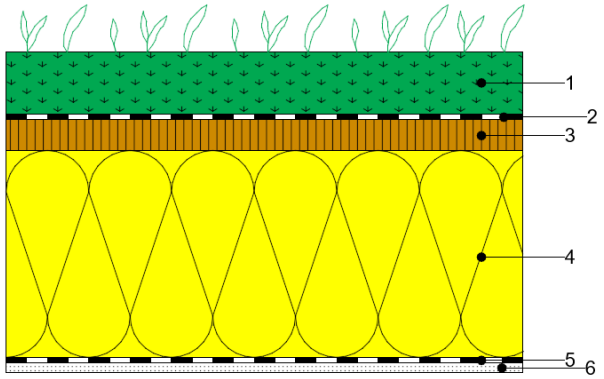
[10] WTA Guideline 6-2: Simulation of heat and moisture transfer. October 2025.

[11] EN 15026: Hygrothermal performance of building components and building elements – Assessment of moisture transfer by numerical simulation. Beuth Verlag, December 2023.

Examples: Extensive green roof on lightweight construction

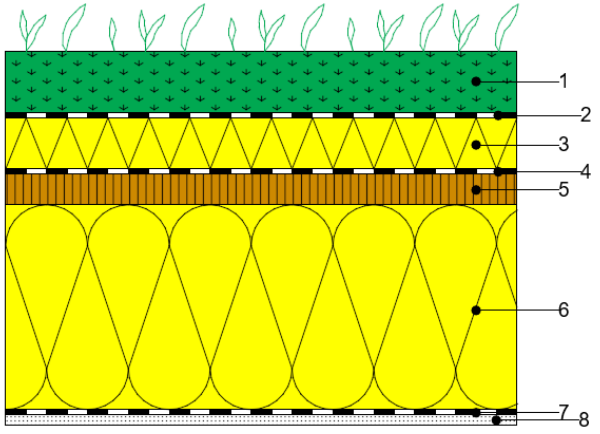
The following section describes the evaluation procedure for green roofs on lightweight constructions using two example cases. It presents the required material data, moisture sources, boundary conditions, and the evaluation procedure for the roof assembly.

Example A:
Extensive green roof on
a lightweight construction
without additional insulation



1 Substrate incl. Planting
2 Roofing Membrane (s_d = 300 m)
3 Wooden Sheathing
4 Mineral Wool Insulation
5 Moisture-variable Vapour Retarder
6 Gypsum Board

Example B:
Extensive green roof on
a lightweight construction
with additional insulation



1 Substrate incl. Planting
2 Roofing Membrane (s_d = 300 m)
3 EPS-Insulation
4 Vapour Retarder (s_d = 20 m)
5 Wooden Sheathing
6 Mineral Wool Insulation
7 Moisture-variable Vapour Retarder
8 Gypsum Board

Example A: Assembly

Assembly (from outside to inside):

• Generic Substrate	0.06	m
• Roofing Membrane (s_d = 300m)	0.001	m
• Wooden sheathing (Softwood)	0.025	m
• Mineral Wool (heat cond.: 0,04 W/mK)	0.24	m
• Moisture-variable vapour retarder (Vario KM Duplex)	0.001	m
• Gypsum Board	0.0125	m

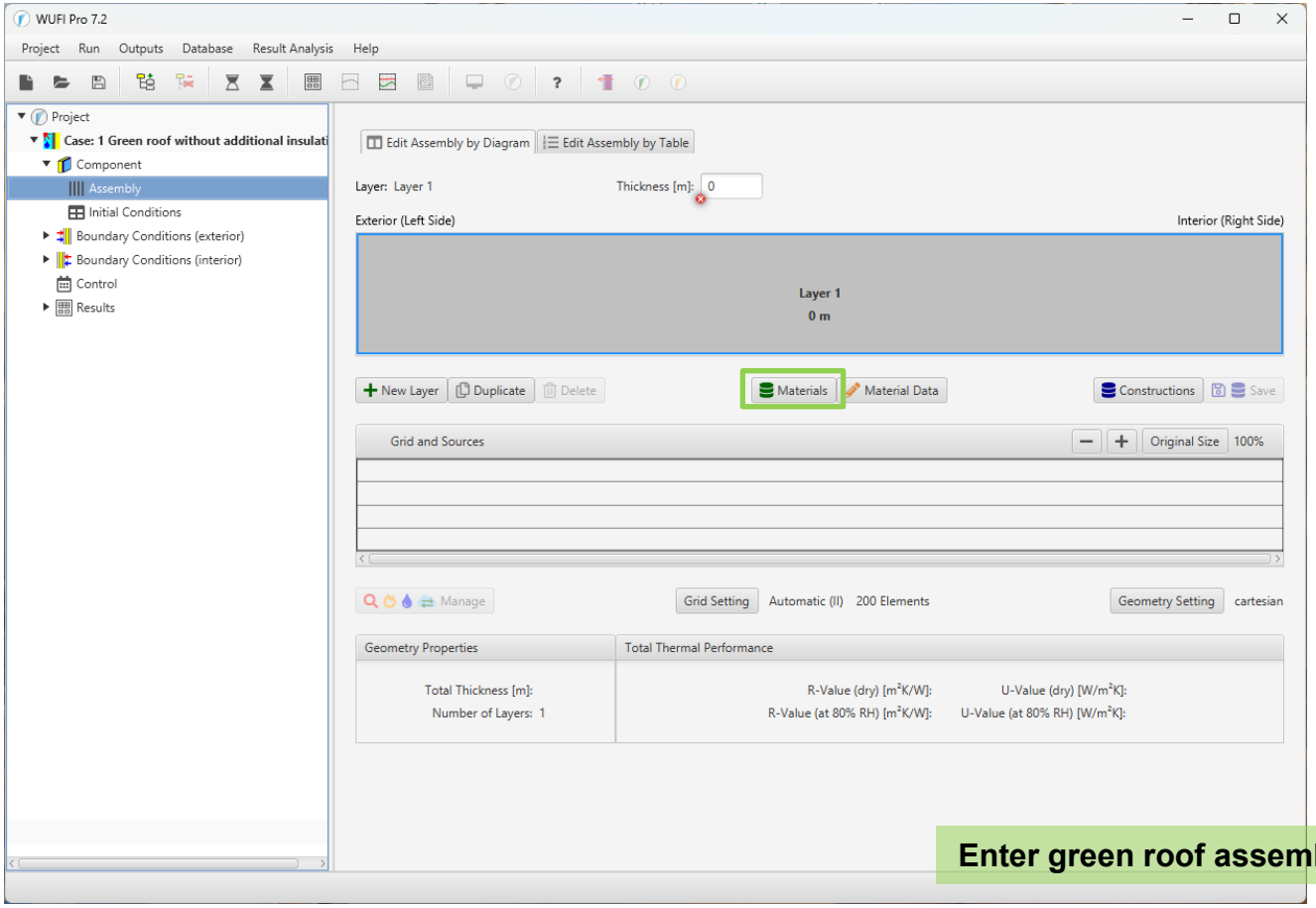
Example A: Boundary Conditions

Boundary Conditions:

- Flat roof (3° to the North)
- Radiation according to “Green roof: generic model”
  Short-wave absorptivity: 0.3
  Long-wave emissivity: ---
  No use of radiative overcooling!
- Outdoor Climate: Holzkirchen
- Indoor Climate: Medium Moisture Load + 5 %
  according to DIN 4108-3
- Air Tightness of the Envelope: q_{50} = 3 m³/m³h
- Stack Height: 5 m

Example A: Component Assembly

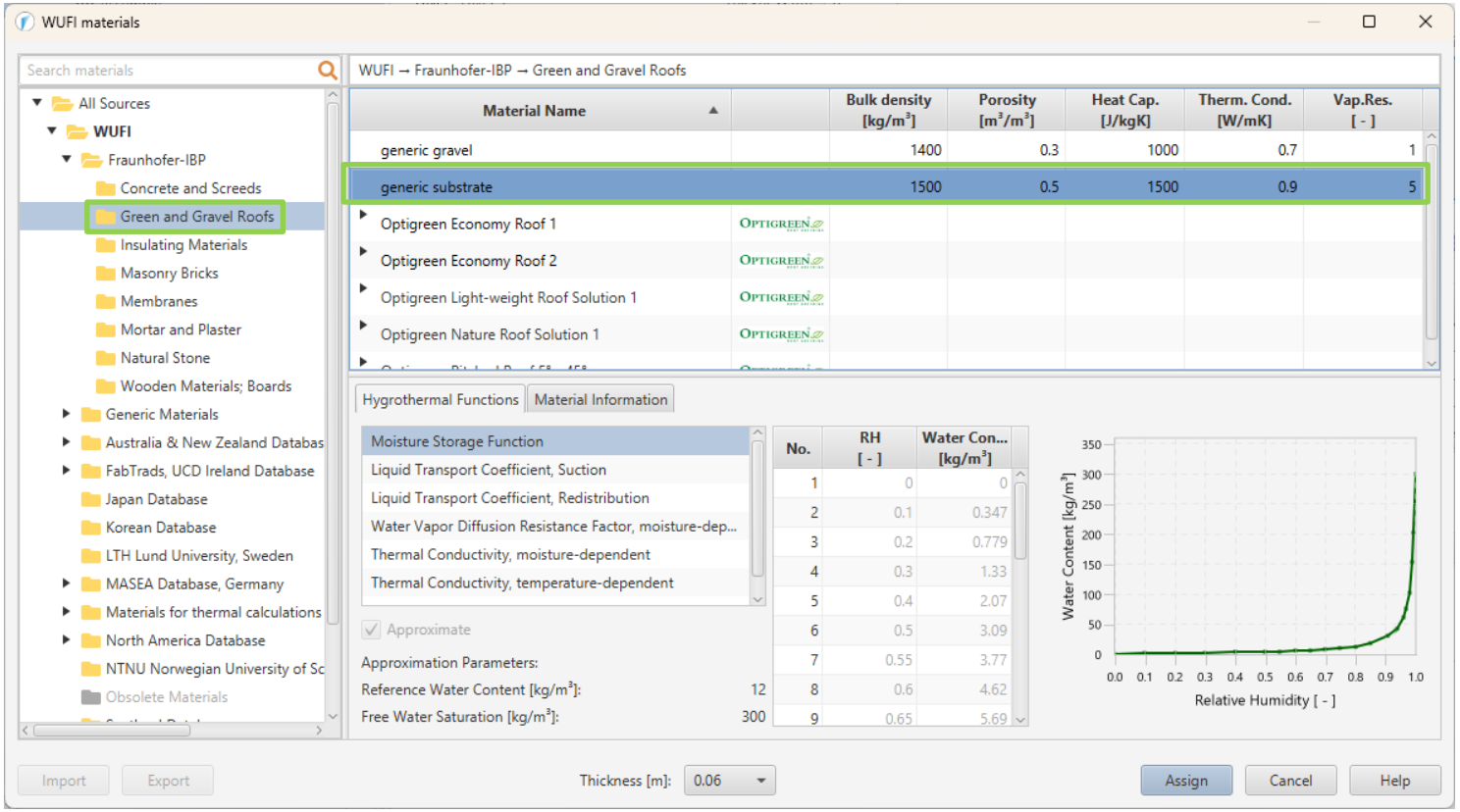
Input: Component – Assembly



Enter green roof assembly in single layers

Example A: Component Assembly

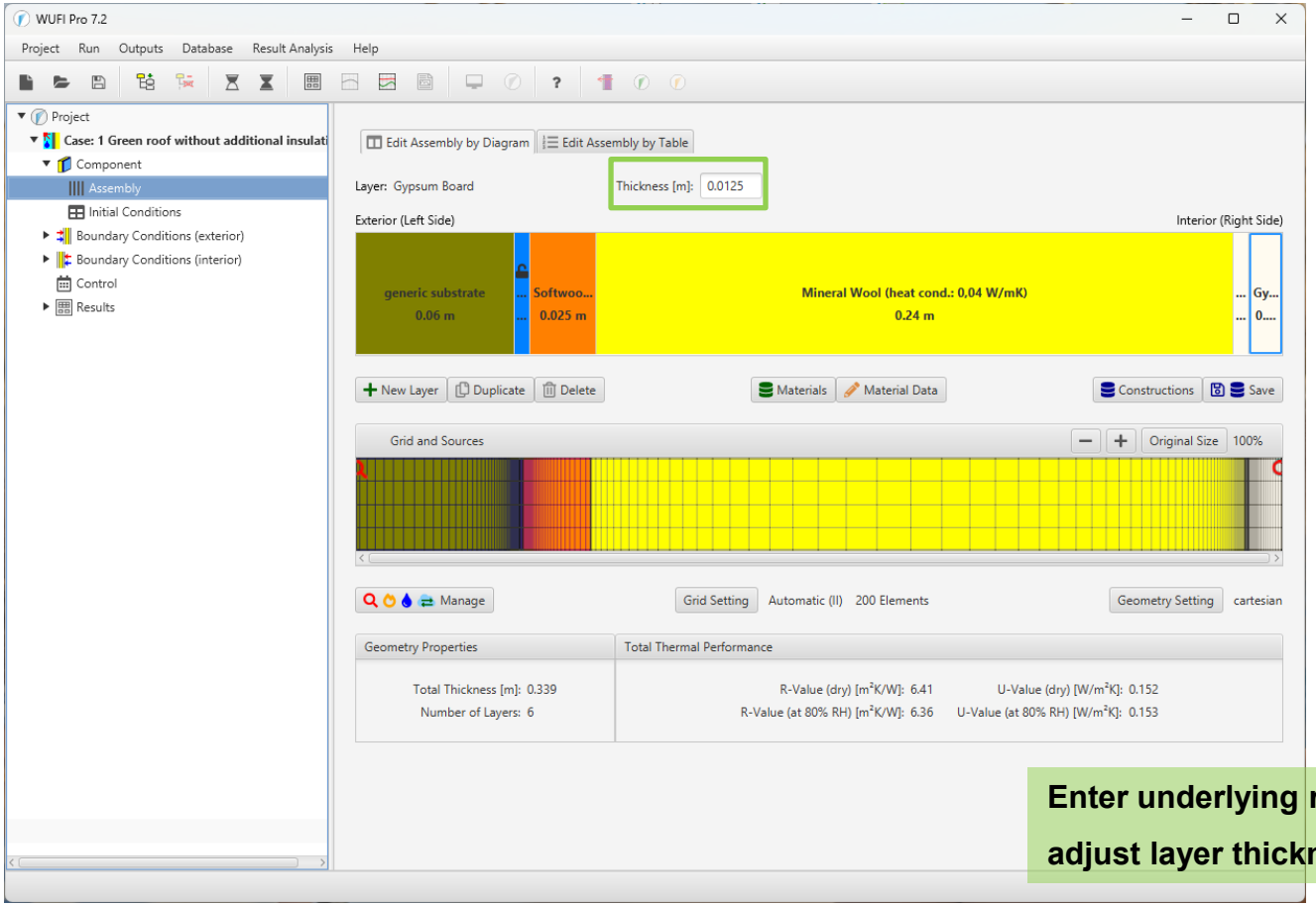
Input: Component – Assembly



Green and Gravel Roofs → Generic substrate

Example A: Component Assembly

Input: Component – Assembly

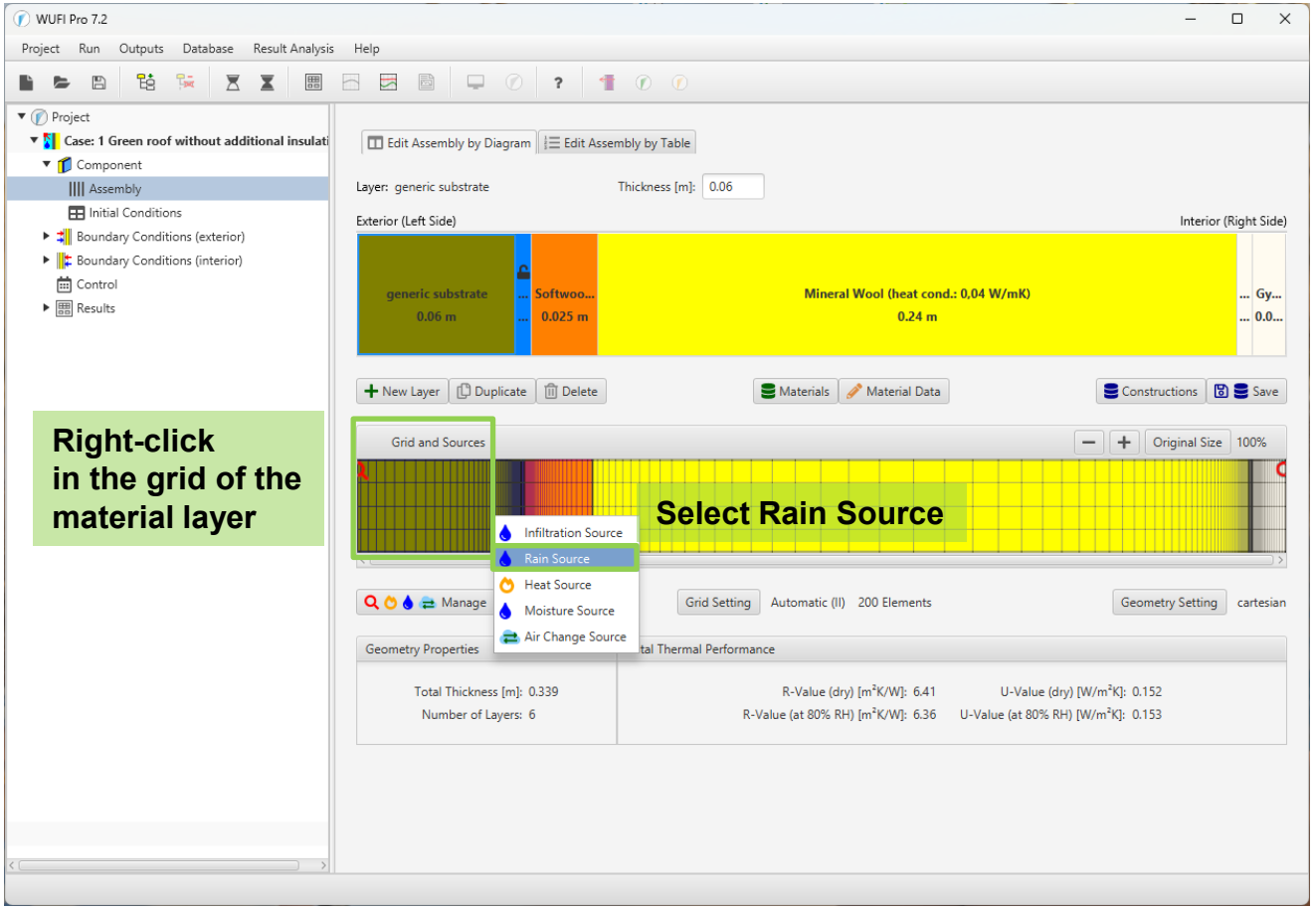


Enter underlying roof construction; adjust layer thicknesses if necessary

Example A: Moisture Source in the Substrate Layer

Input: Component – Assembly

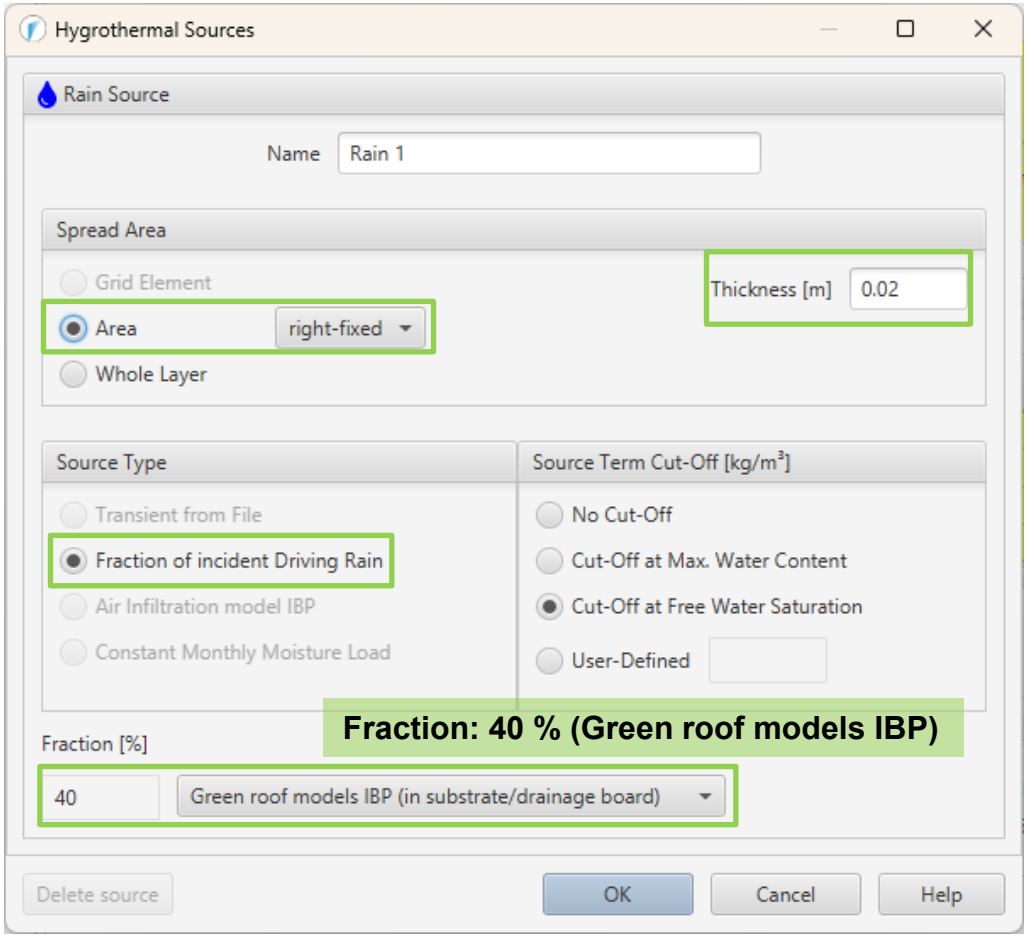
Insert moisture source in the layer “Generic Substrate“



Example A: Moisture Source in the Substrate Layer

Input: Component – Assembly

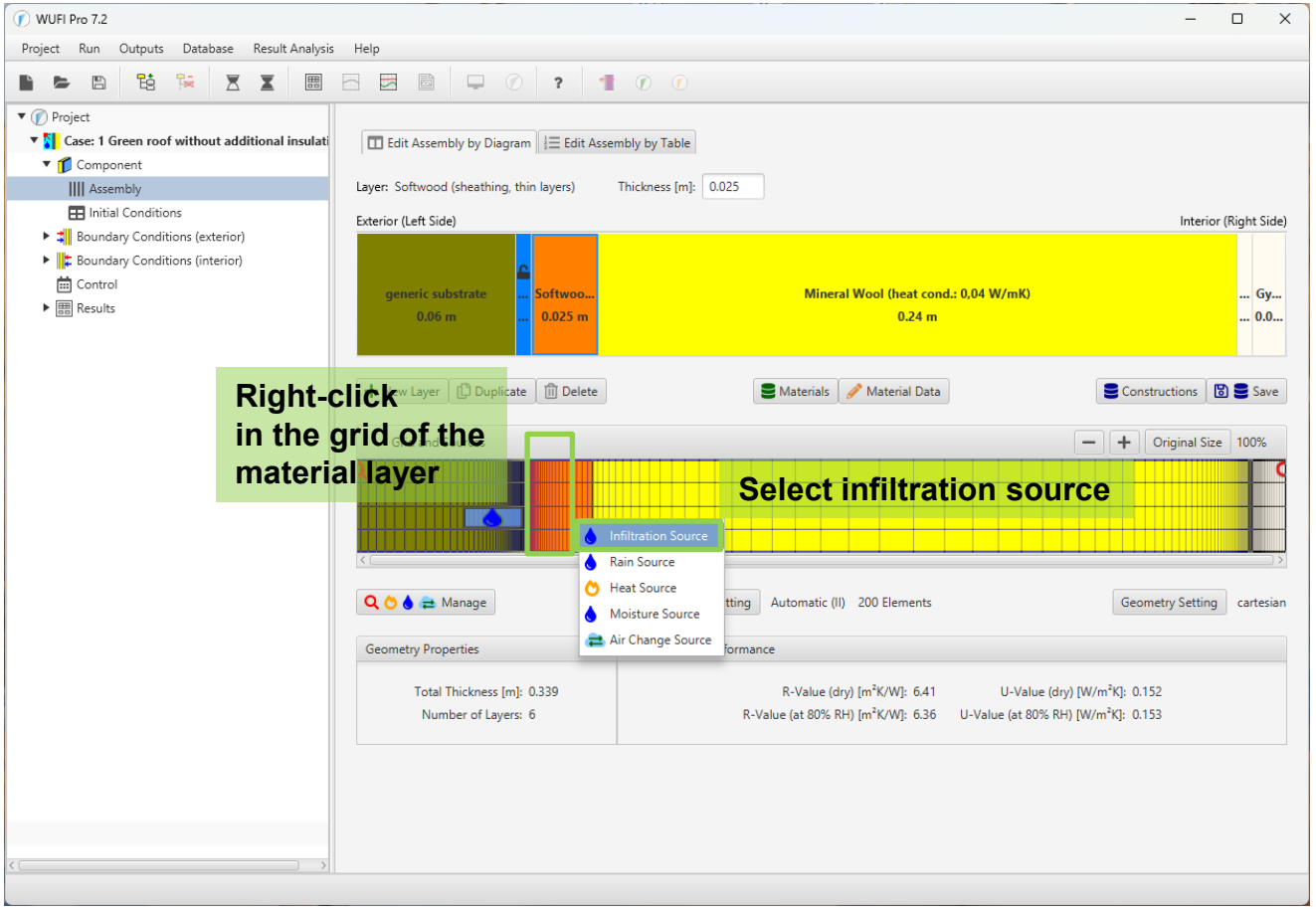
Moisture source in the lowest 2 cm of the substrate layer.



Example A: Infiltration Source

Input: Component – Assembly

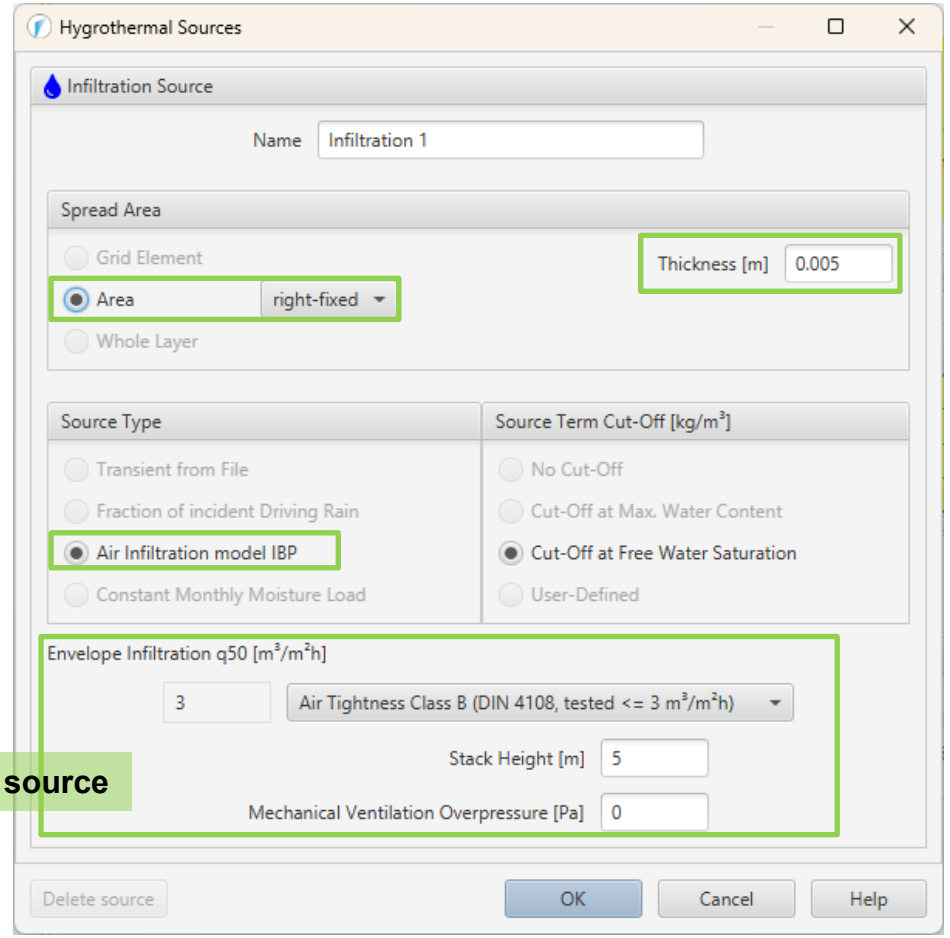
Infiltration source according to DIN 68800 in the wooden sheathing



Example A: Infiltration Source

Input: Component – Assembly

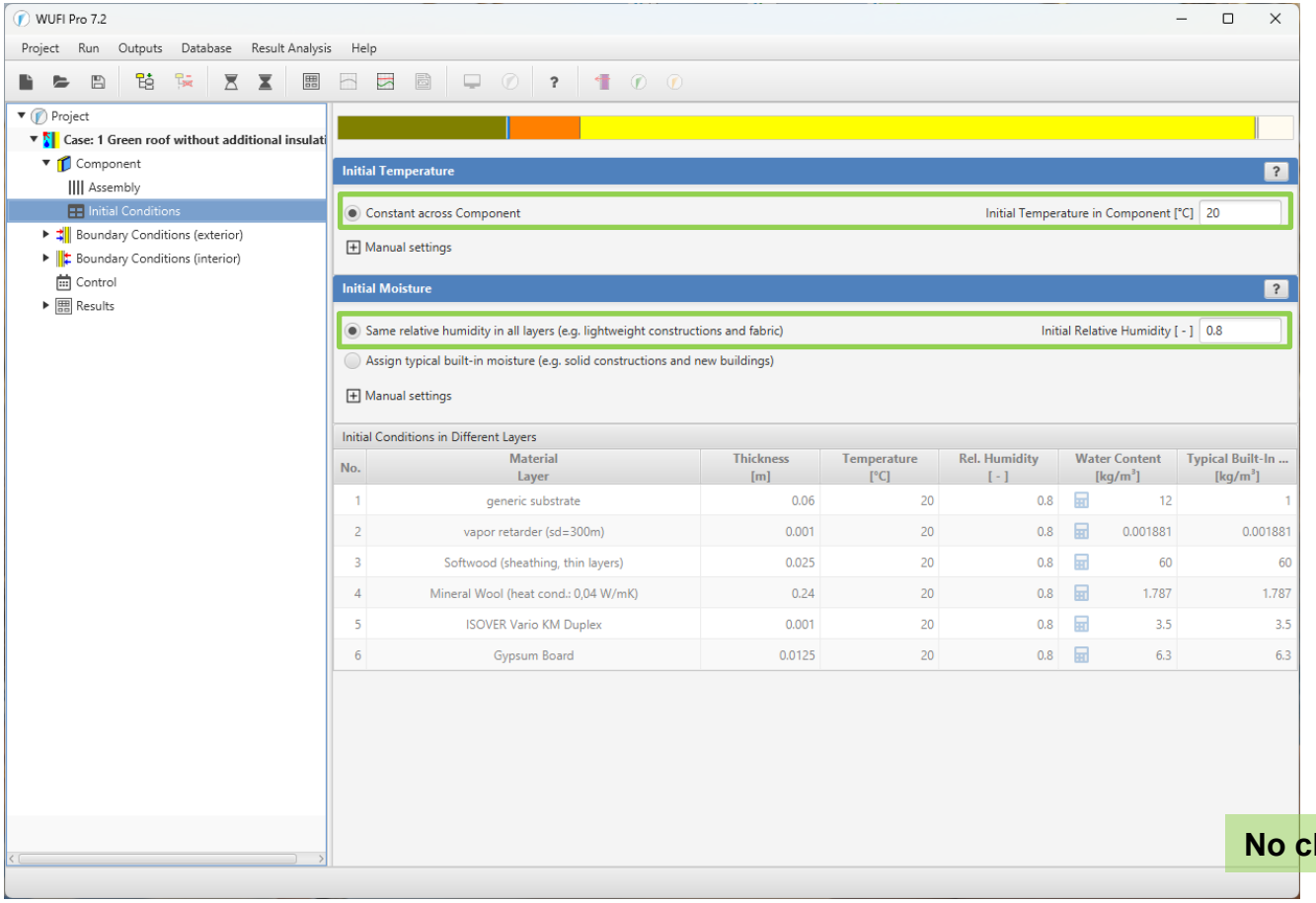
Moisture Source in the interior 5 mm of the wooden sheathing.



Adjust infiltration source

Example A: Initial Conditions

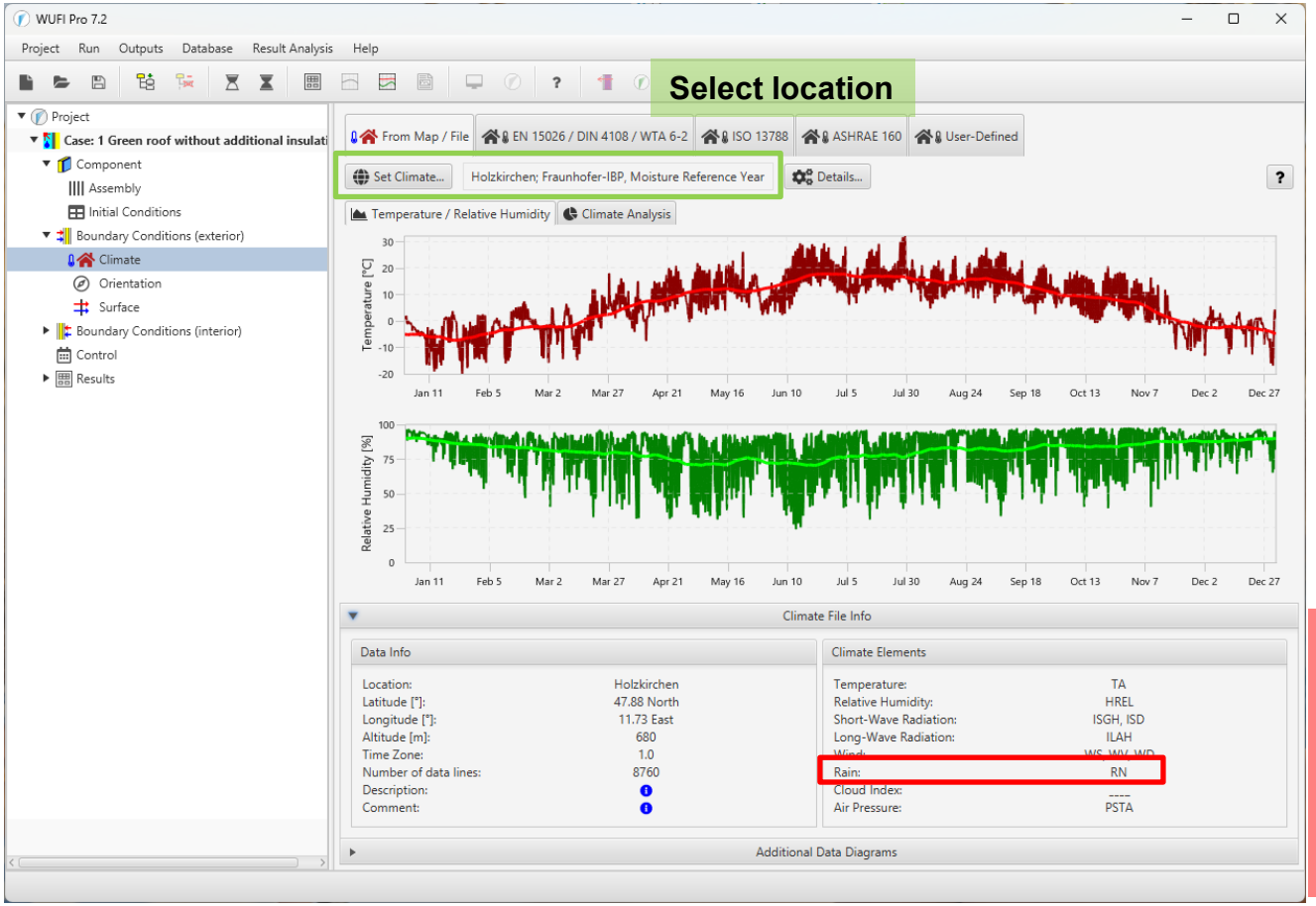
Input: Component – Initial Conditions



No changes required

Example A: Outdoor Climate

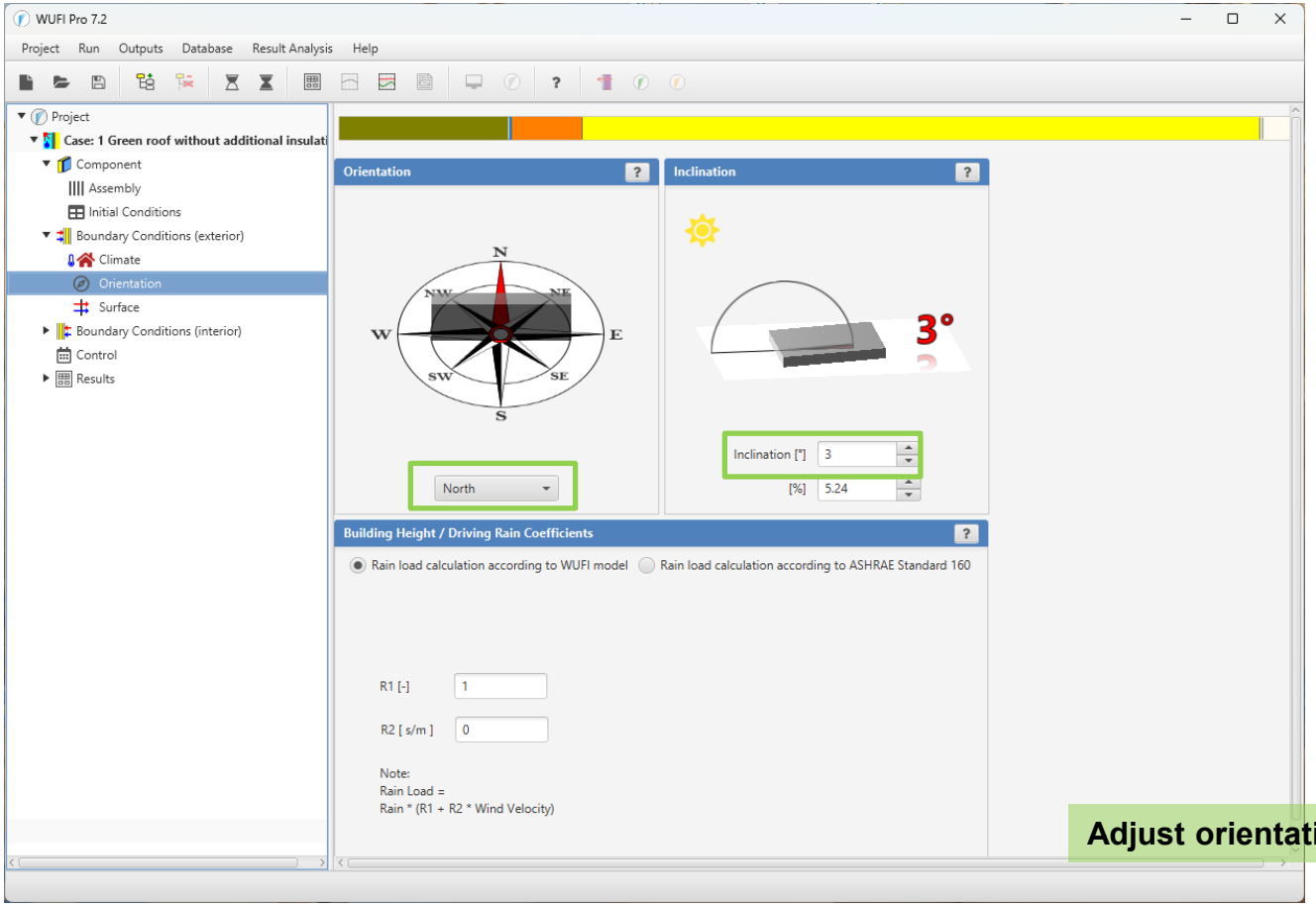
Input: Boundary Conditions (exterior) – Climate



Note:
The generic green roof model is also suitable for climate data without long-wave radiation. But rain data are necessary!

Example A: Orientation / Inclination

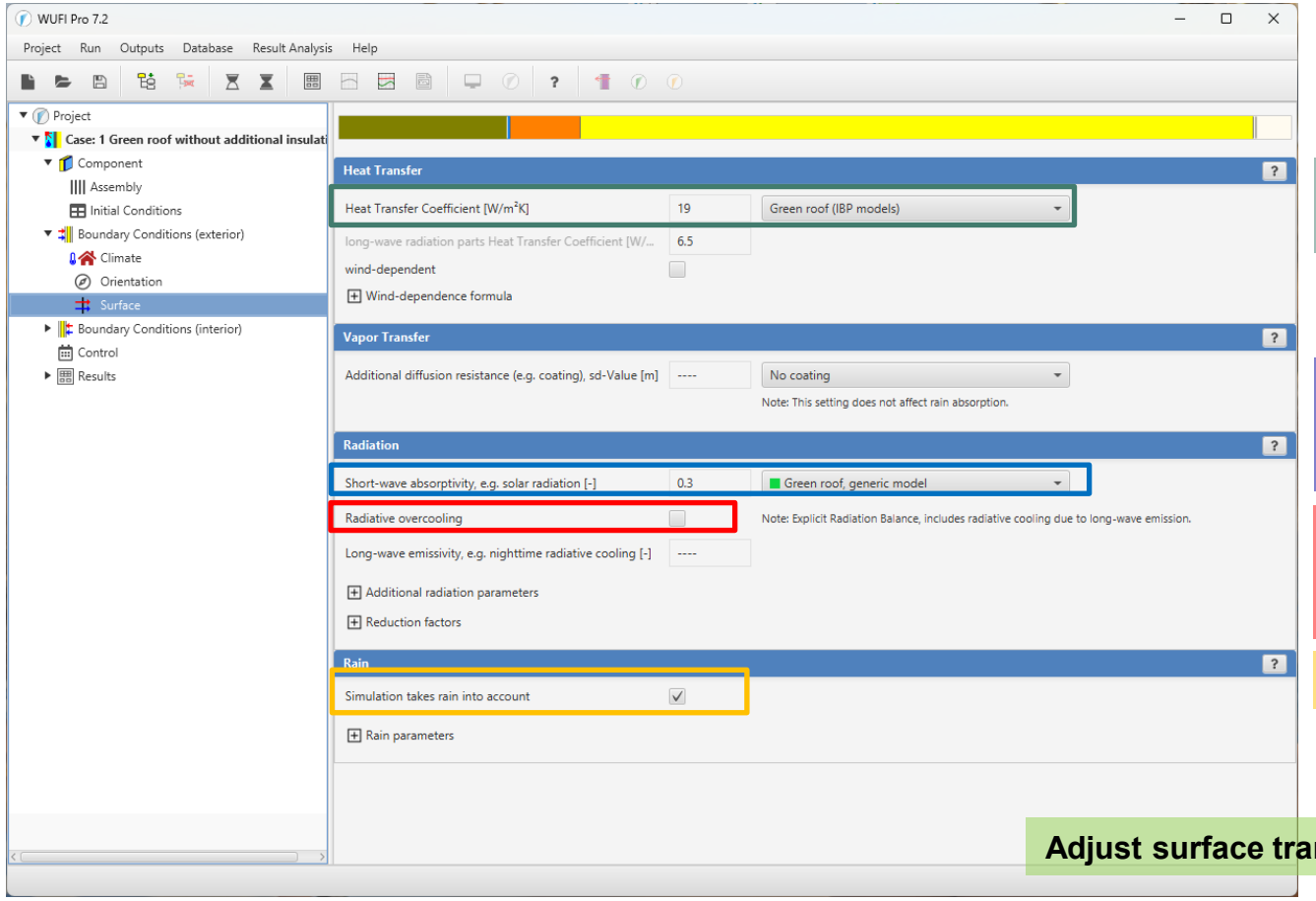
Input: Boundary Conditions (exterior) – Orientation



Adjust orientation and inclination

Example A: Surface Transfer Coefficients (exterior)

Input: Boundary Conditions (exterior) – Surface



Heat transfer coefficient (from list: green roof)

Absorption (from list: green roof, generic model)

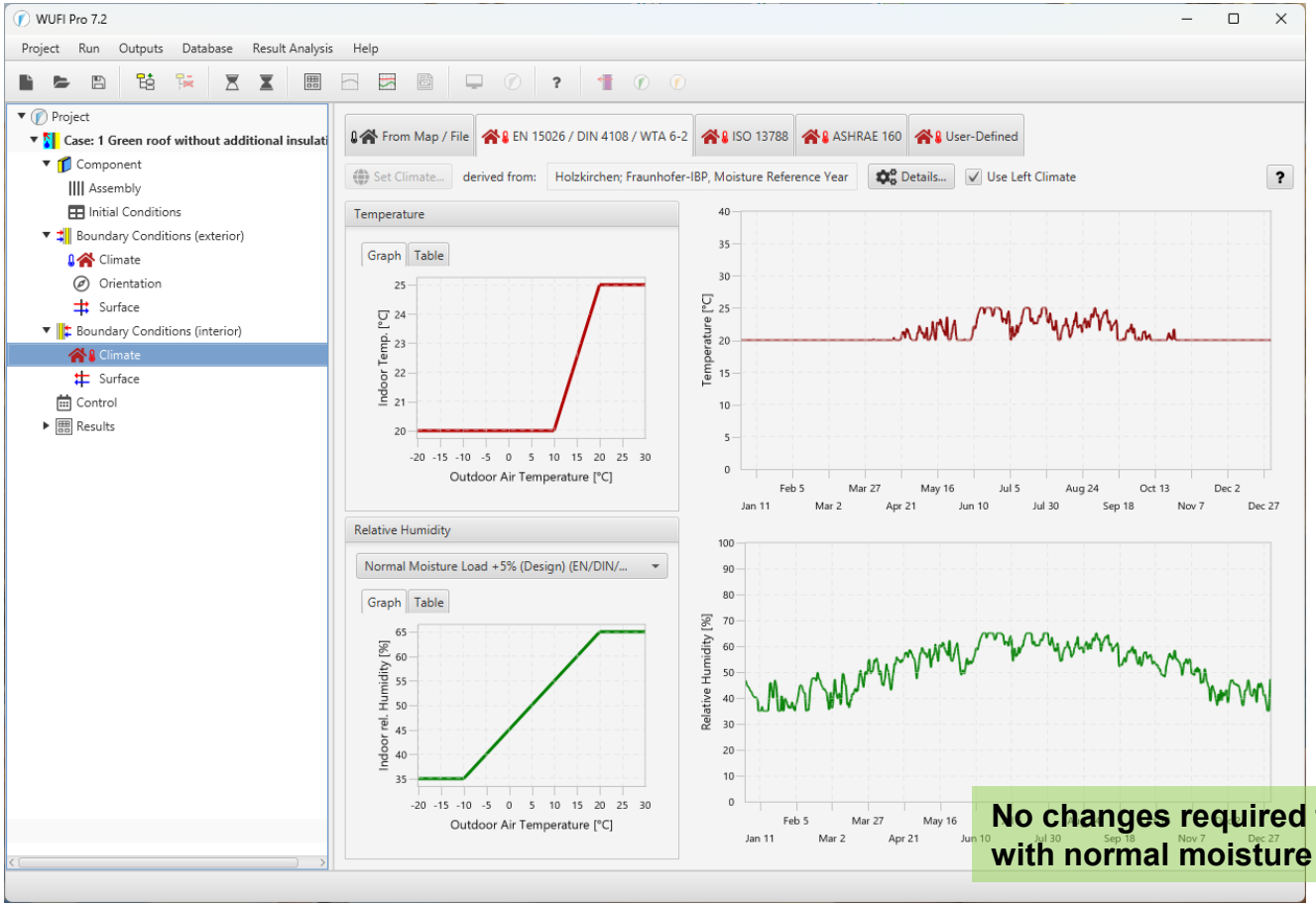
NO USE of the radiative overcooling in the generic approach

Rain is taken into account

Adjust surface transfer coefficients!

Example A: Indoor Climate

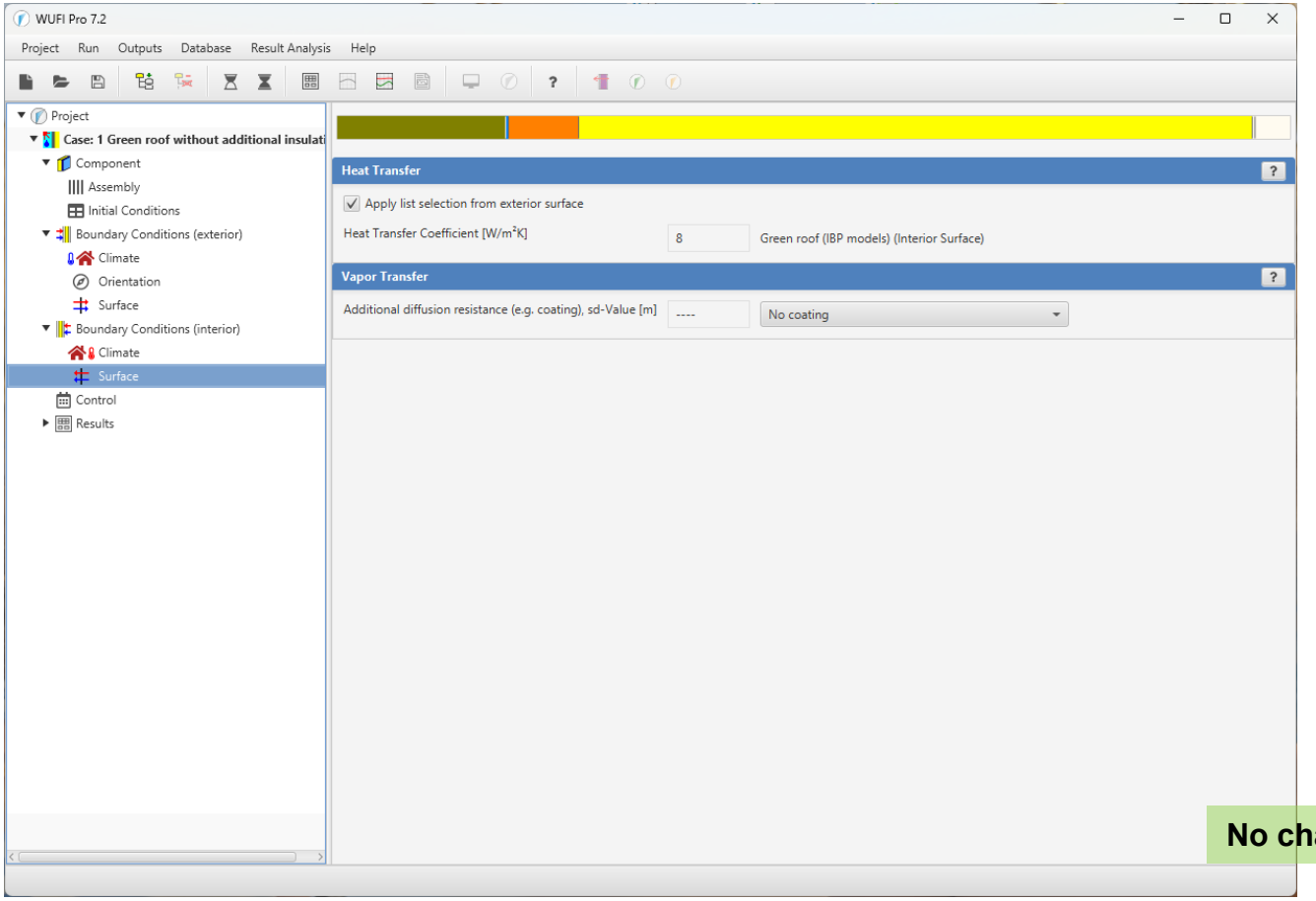
Input: Boundary Conditions (interior) – Climate



No changes required for indoor climate with normal moisture load + 5%

Example A: Surface Transfer Coefficients (interior)

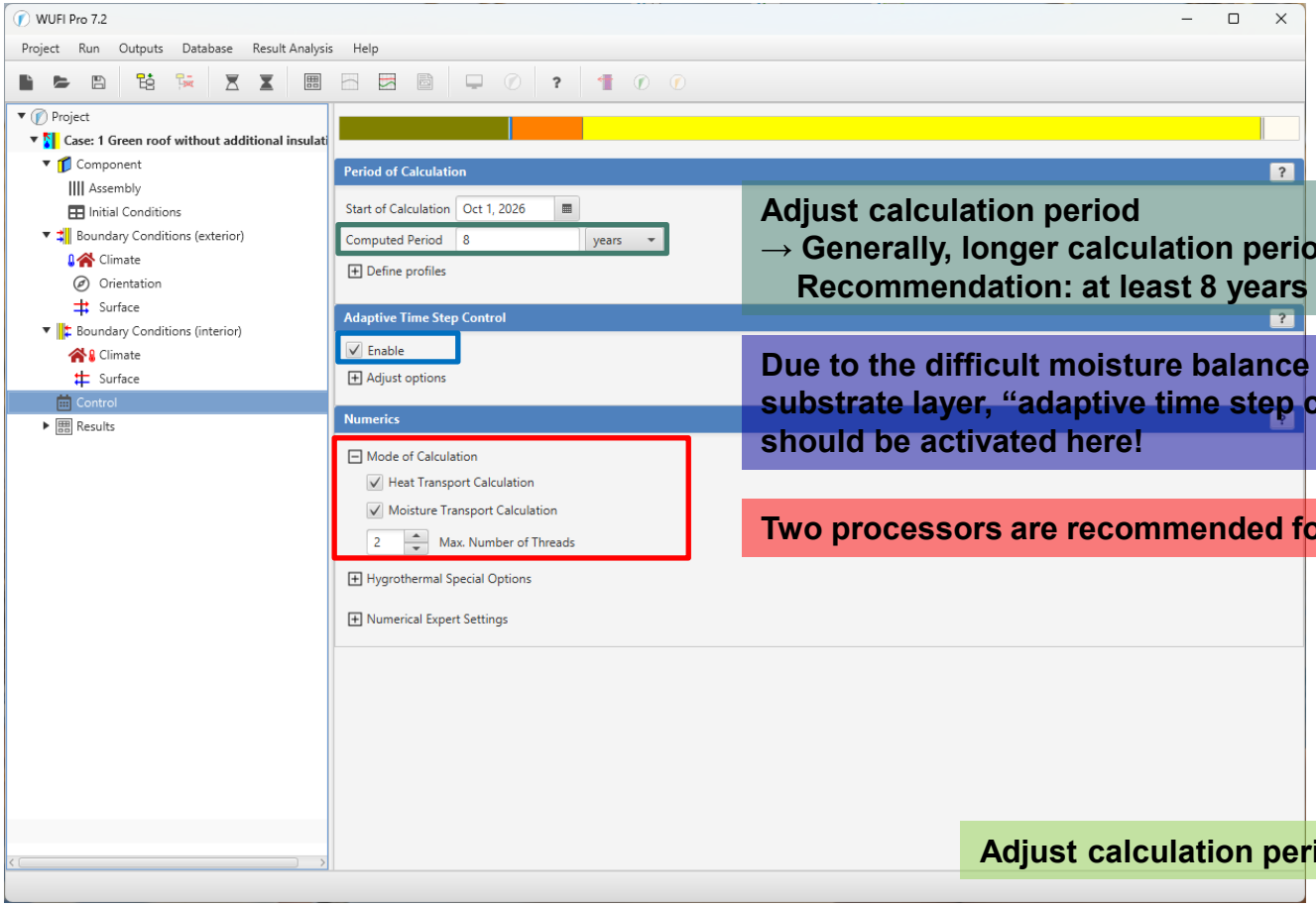
Input: Boundary Conditions (interior) – Surface



No changes required

Example A: Period of Calculation and Numerics

Input: Control



Adjust calculation period
→ Generally, longer calculation periods are required
Recommendation: at least 8 years

Due to the difficult moisture balance in the substrate layer, "adaptive time step control" should be activated here!

Two processors are recommended for this calculation!

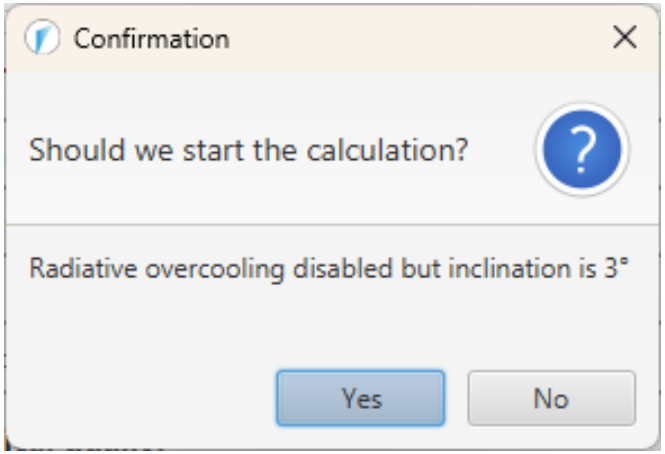
Adjust calculation period and numerical settings

Example A: Note at Calculation Start

Calculation start:

Note:

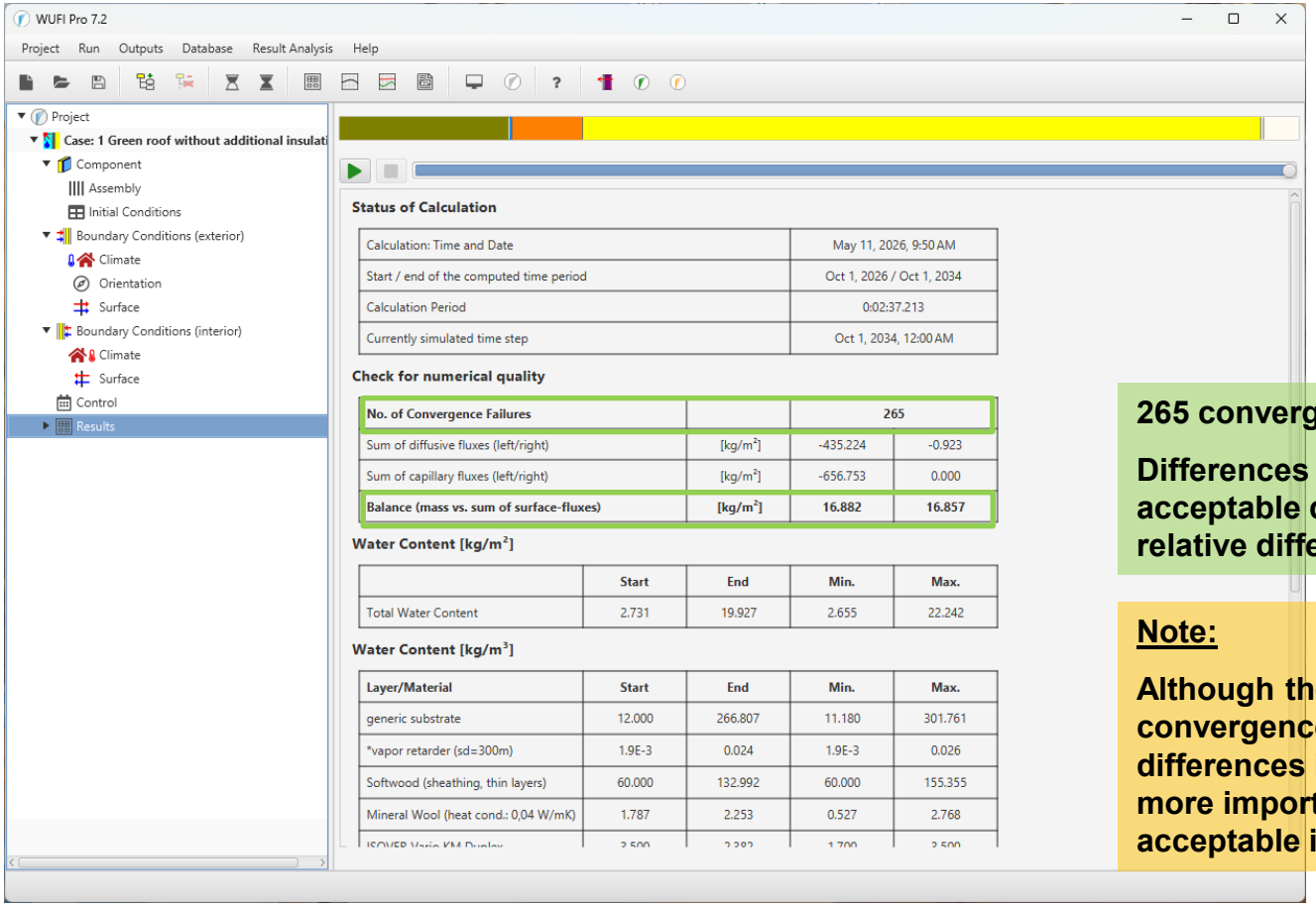
After calculation start this warning appears:



→ this warning can be ignored for the calculation of a green roof with the generic model!

Example A: Check for Numerical Quality

Results:



265 convergence failures

Differences in balance acceptable due to small relative differences!

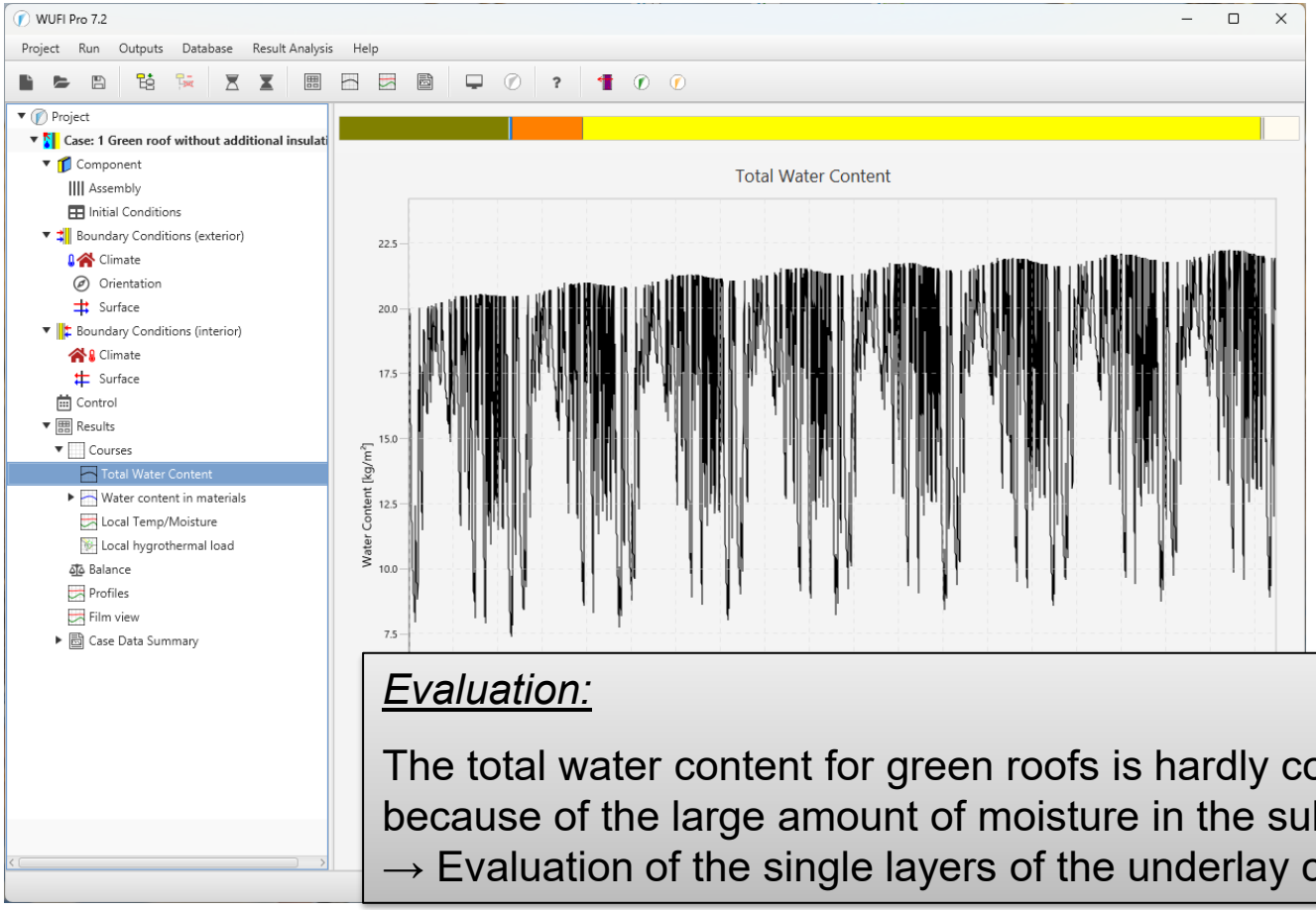
Note:

Although there are many convergence failures, the differences in balance are more important and are acceptable in this case.

Example A: Evaluation of Total Water Content

Evaluation:

Total water content



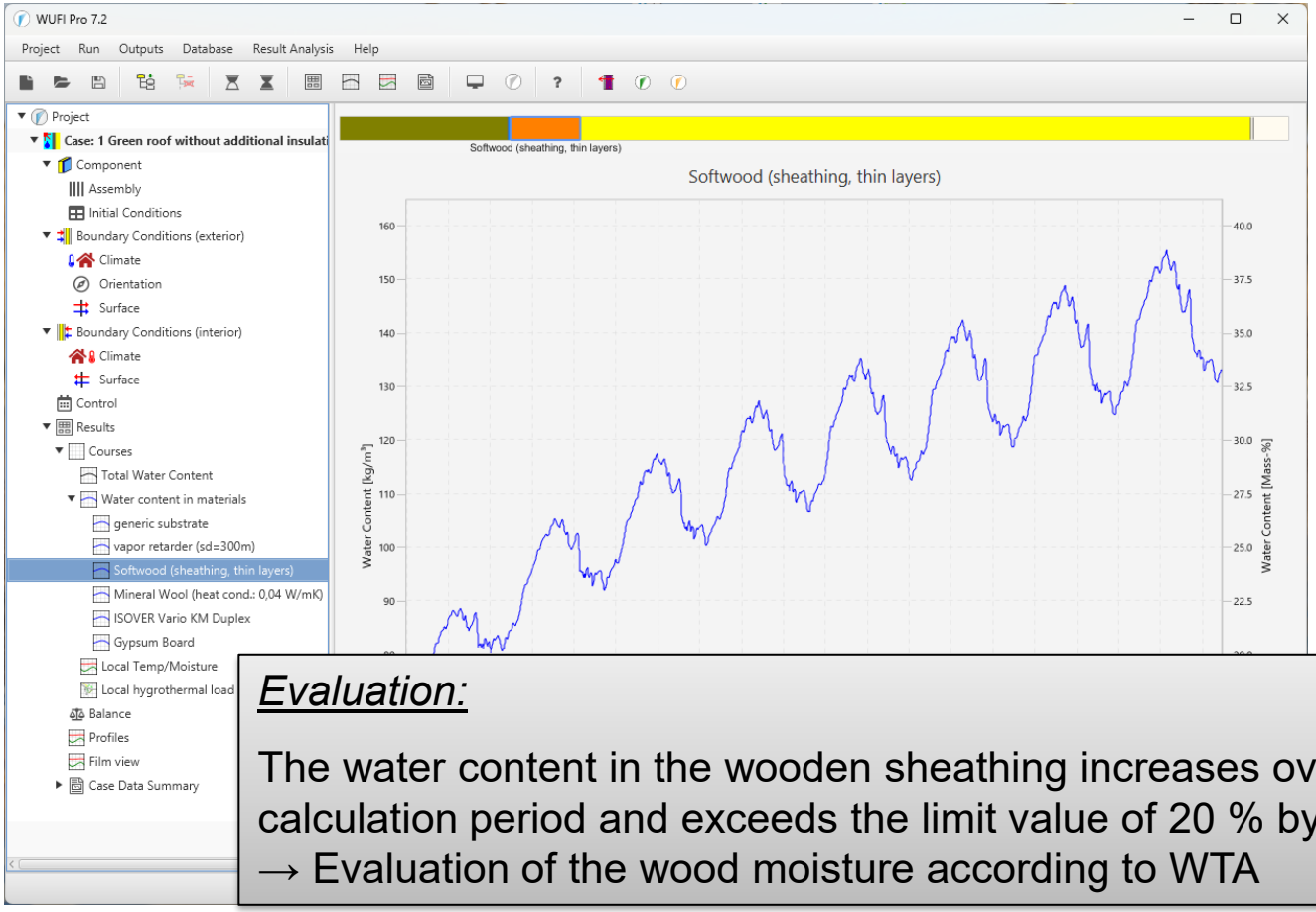
Evaluation:

The total water content for green roofs is hardly conclusive because of the large amount of moisture in the substrate layer.
→ Evaluation of the single layers of the underlay construction

Example A: Evaluation of Wood Moisture

Evaluation:

Water content in the wooden sheathing



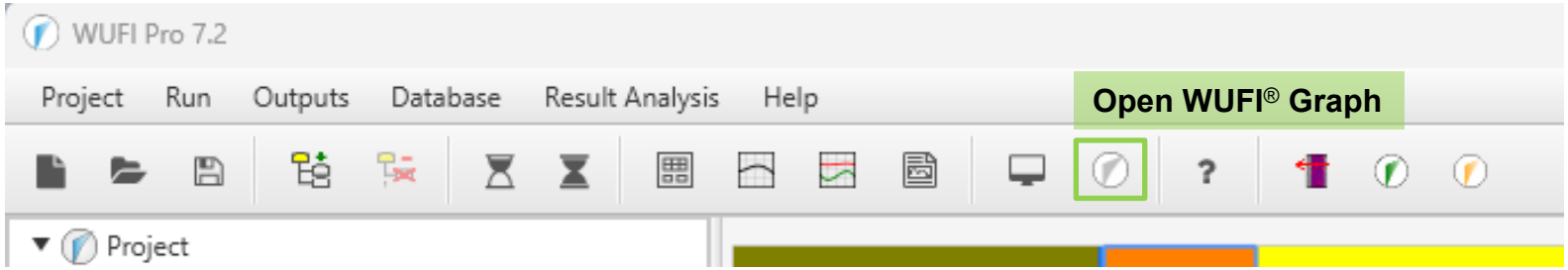
Evaluation:

The water content in the wooden sheathing increases over the calculation period and exceeds the limit value of 20 % by mass clearly.
→ Evaluation of the wood moisture according to WTA

Example A: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:
Wood moisture in the wooden sheathing according to WTA 6-8

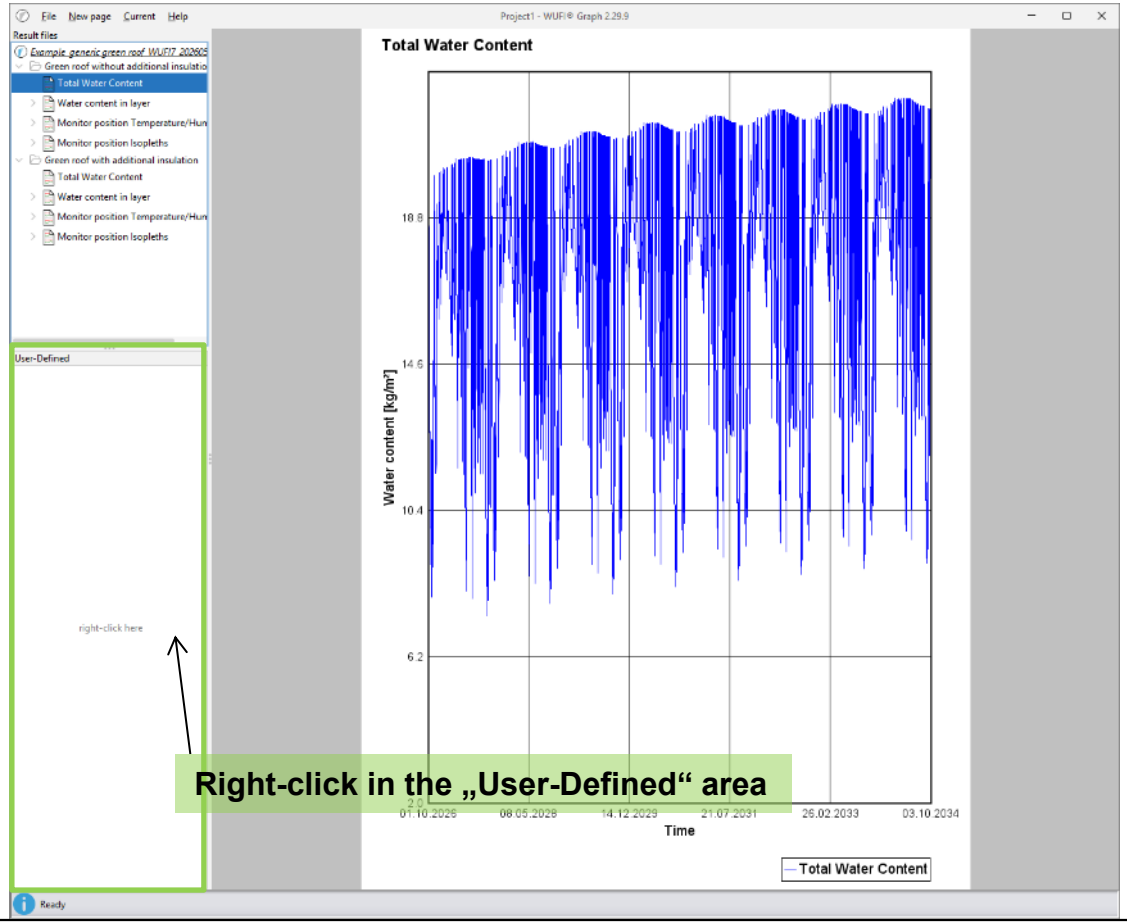
Note:
To open WUFI® Graph, the WUFI® project must first be saved!



Example A: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

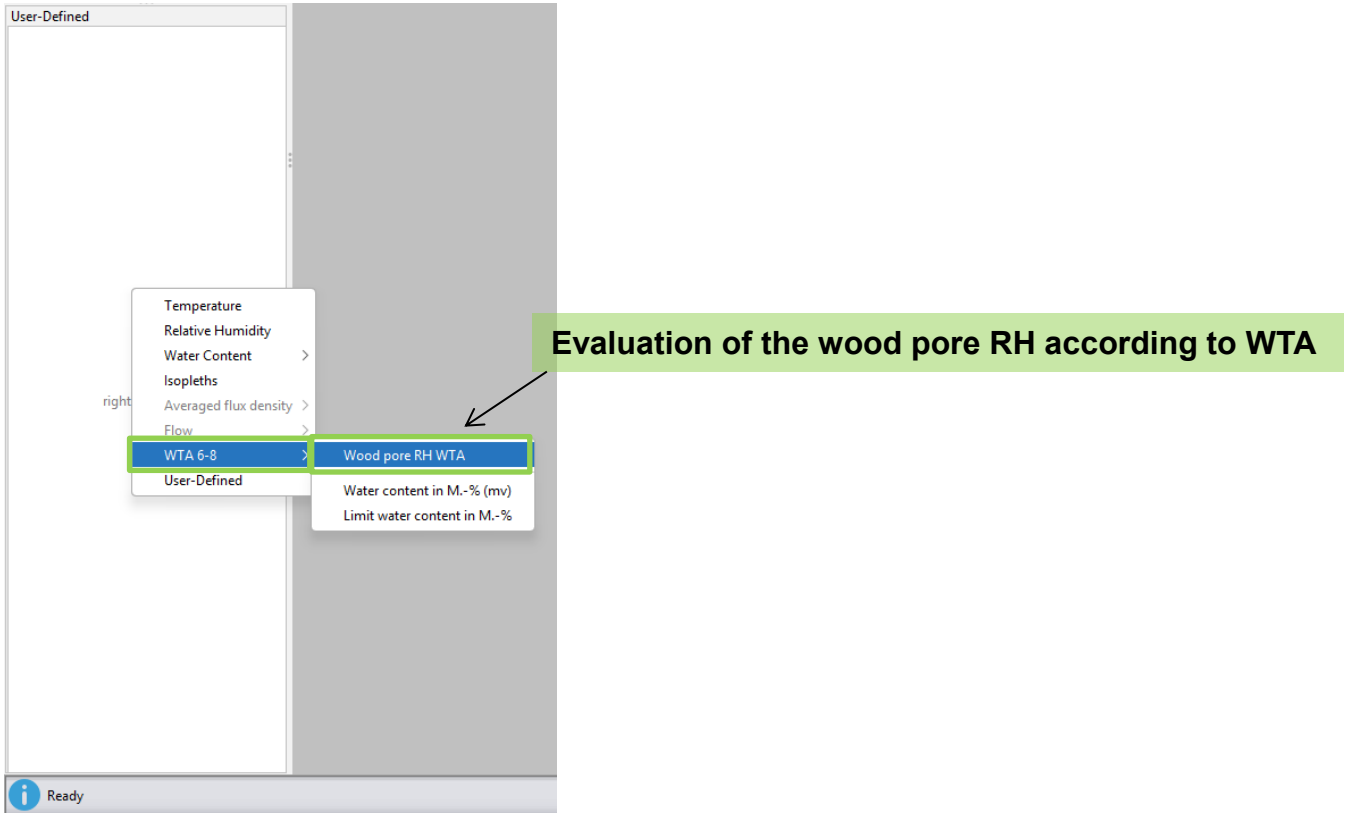
Wood moisture in the wooden sheathing according to WTA 6-8



Example A: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8

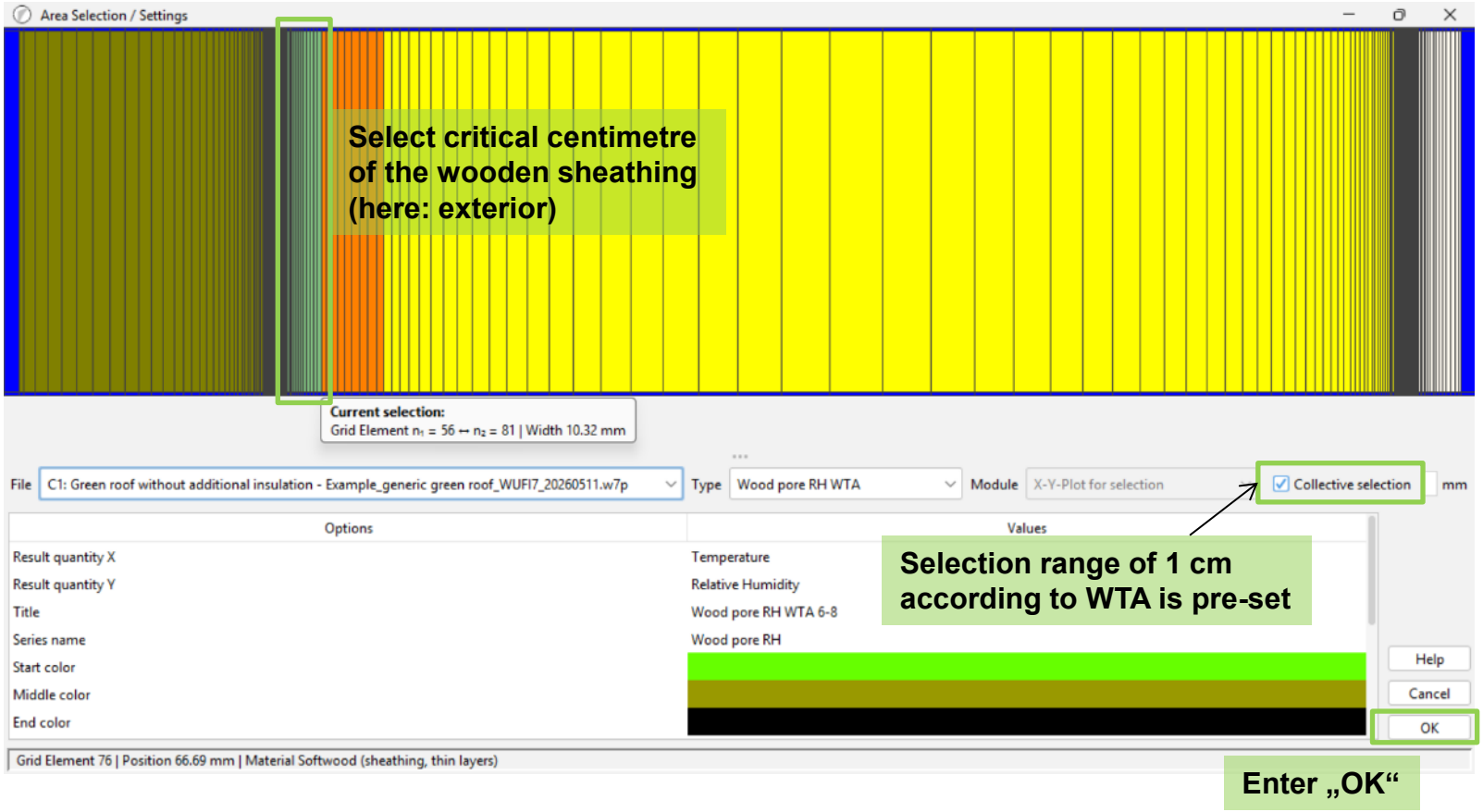


Example A: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8

Evaluation in the most critical centimetre (in case of doubt, consider both sides)

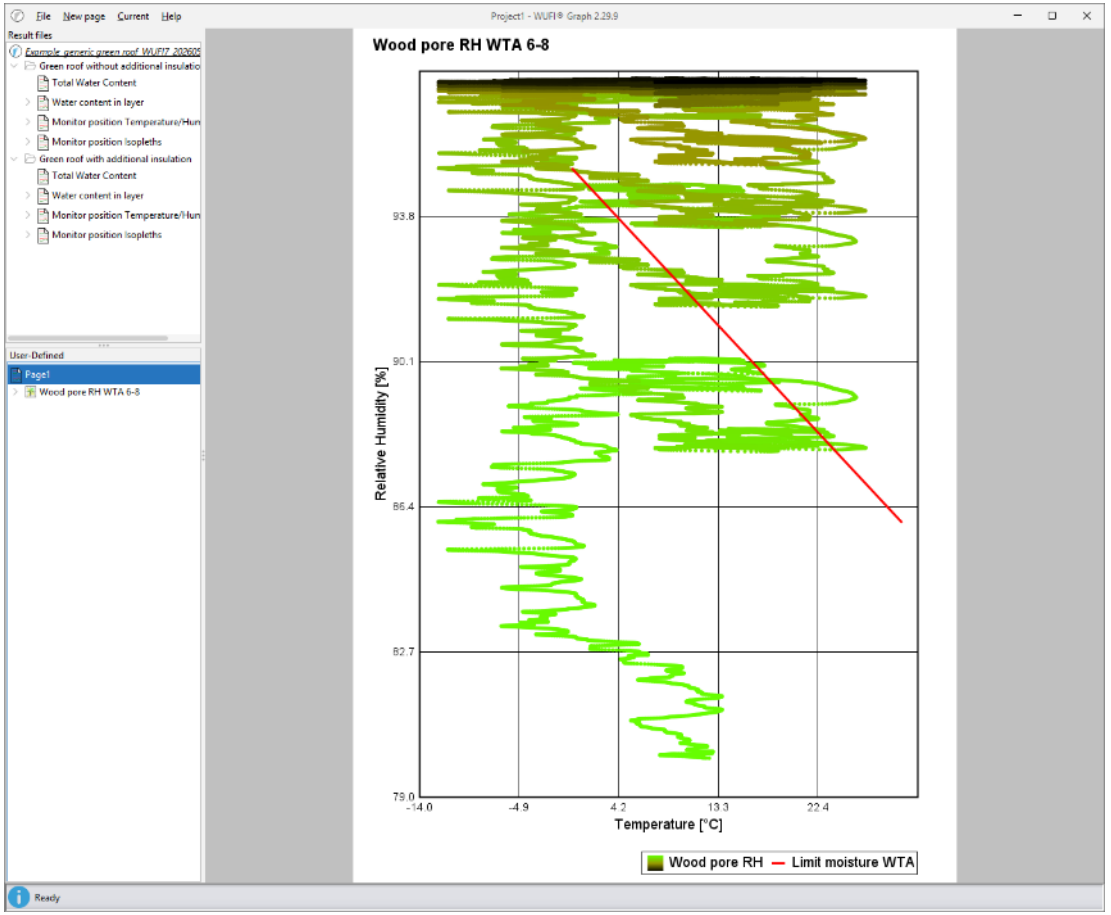


Example A: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8

Evaluation in the most critical centimetre (in case of doubt, consider both sides)



Evaluation:

The relative pore air moisture in the exterior centimetre of the sheathing exceeds the limit moisture according to WTA also clearly.

→ High risk regarding damage of the wood

Example B: Assembly

Assembly (from outside to inside):

• Generic Substrate	0.06	m
• Roofing Membrane (s_d = 300m)	0.001	m
• EPS (heat cond.: 0,04 W/mK – density: 30 kg/m³)	0,1	m
• Vapour retarder (s_d = 20m)	0,001	m
• Wooden sheathing (Softwood)	0.025	m
• Mineral Wool (heat cond.: 0,04 W/mK)	0.24	m
• Moisture-variable vapour retarder (Vario KM Duplex)	0.001	m
• Gypsum Board	0.0125	m

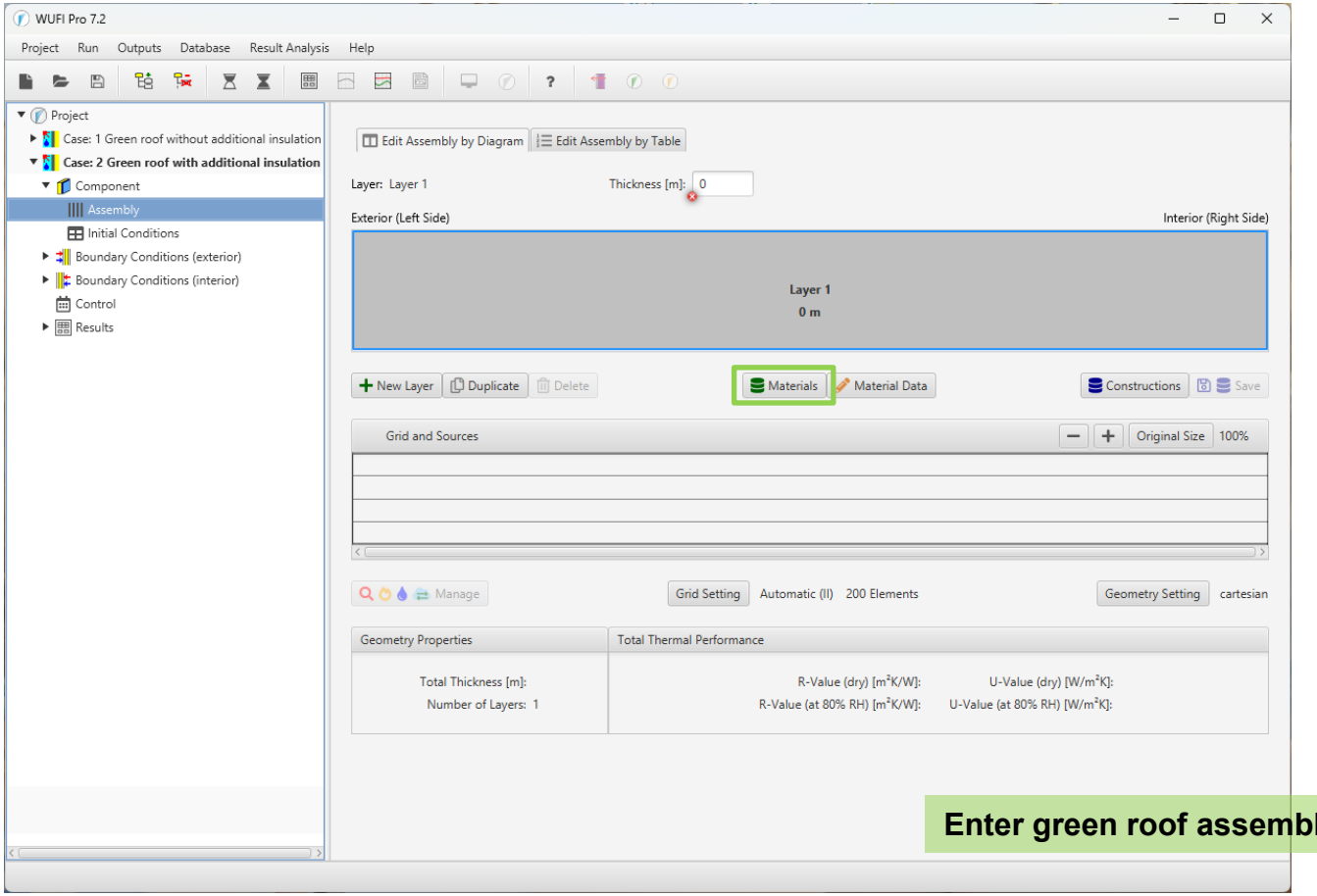
Example B: Boundary Conditions

Boundary Conditions:

- Flat roof (3° to the North)
- Radiation according to “Green roof: generic model”
  Short-wave absorptivity: 0.3
  Long-wave emissivity: ---
  No use of radiative overcooling!
- Outdoor Climate: Holzkirchen
- Indoor Climate: Medium Moisture Load + 5 %
  according to DIN 4108-3
- Air Tightness of the Envelope: q_{50} = 3 m³/m³h
- Stack Height: 5 m

Example B: Component Assembly

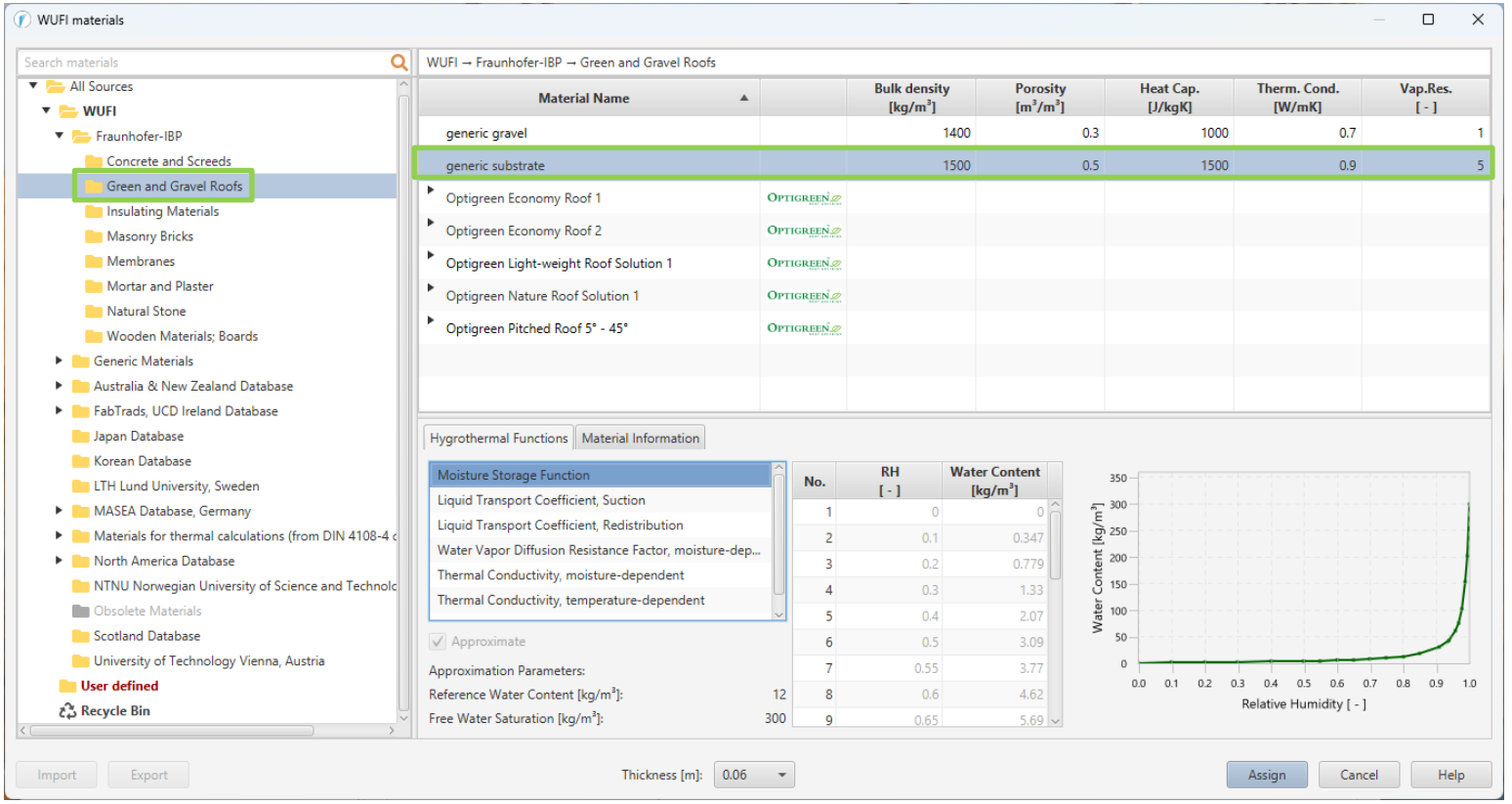
Input: Component – Assembly



Enter green roof assembly in single layers

Example B: Component Assembly

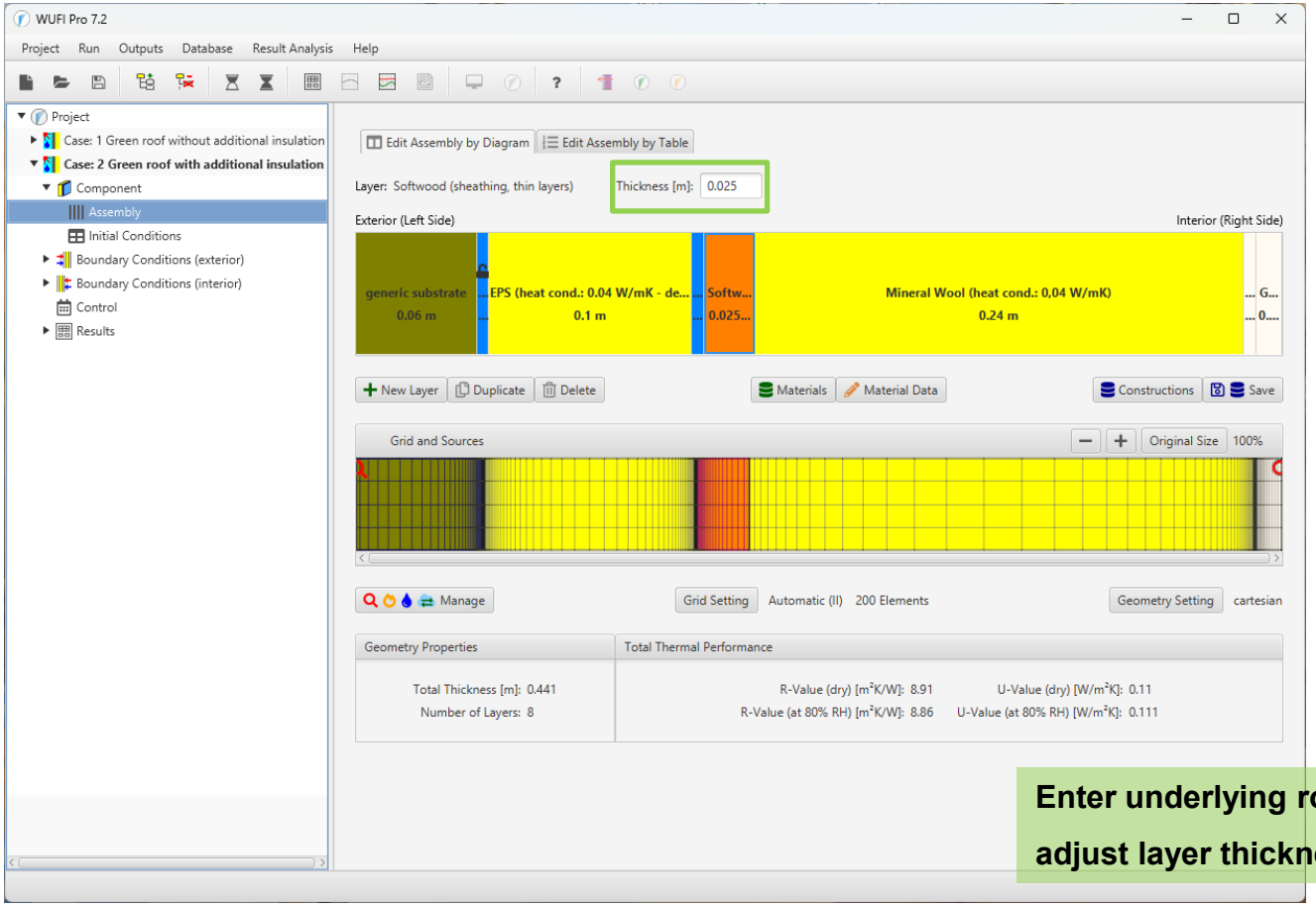
Input: Component – Assembly



Green and Gravel Roofs → Generic substrate

Example B: Component Assembly

Input: Component – Assembly

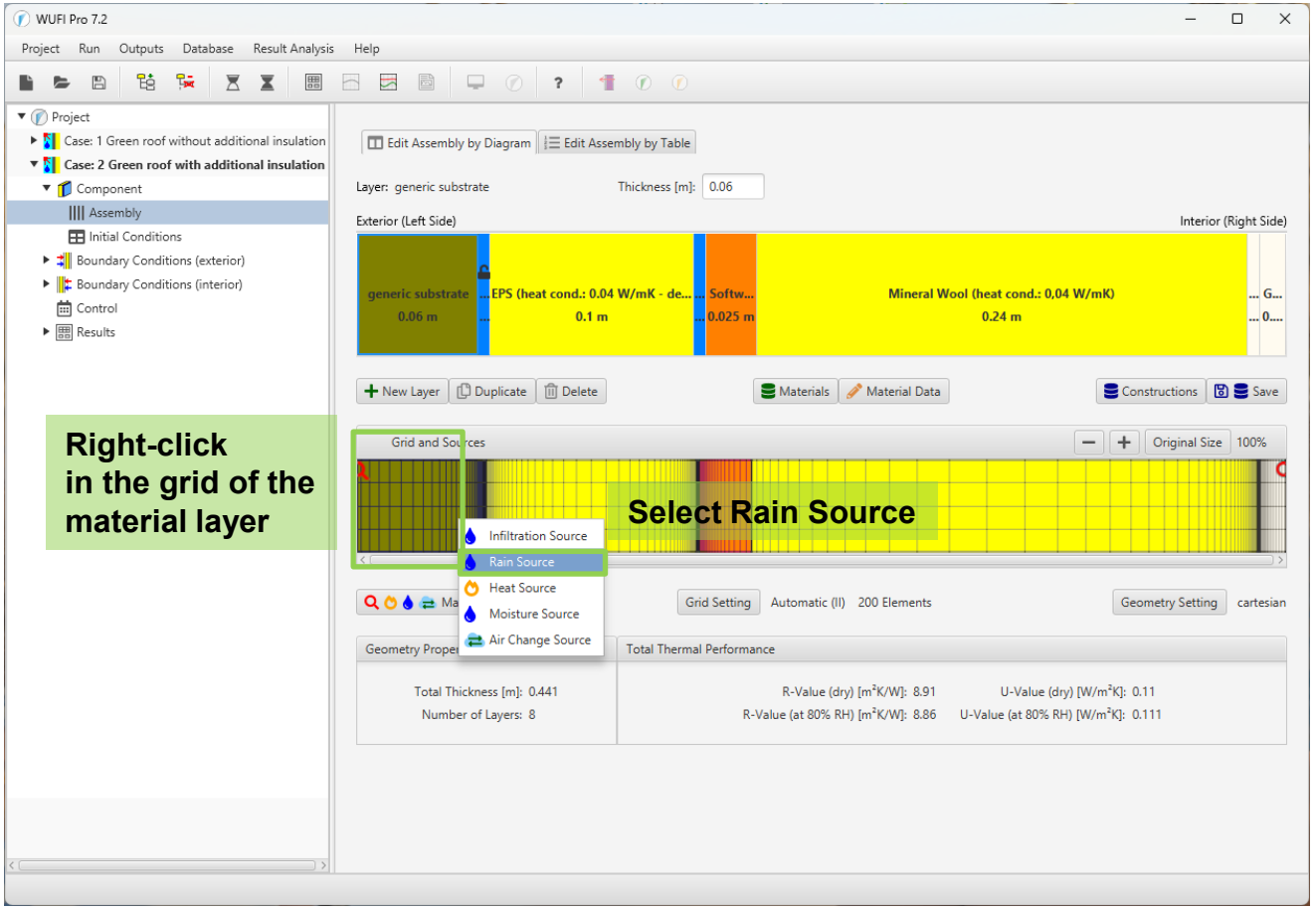


Enter underlying roof construction; adjust layer thicknesses if necessary

Example B: Moisture Source in the Substrate Layer

Input: Component – Assembly

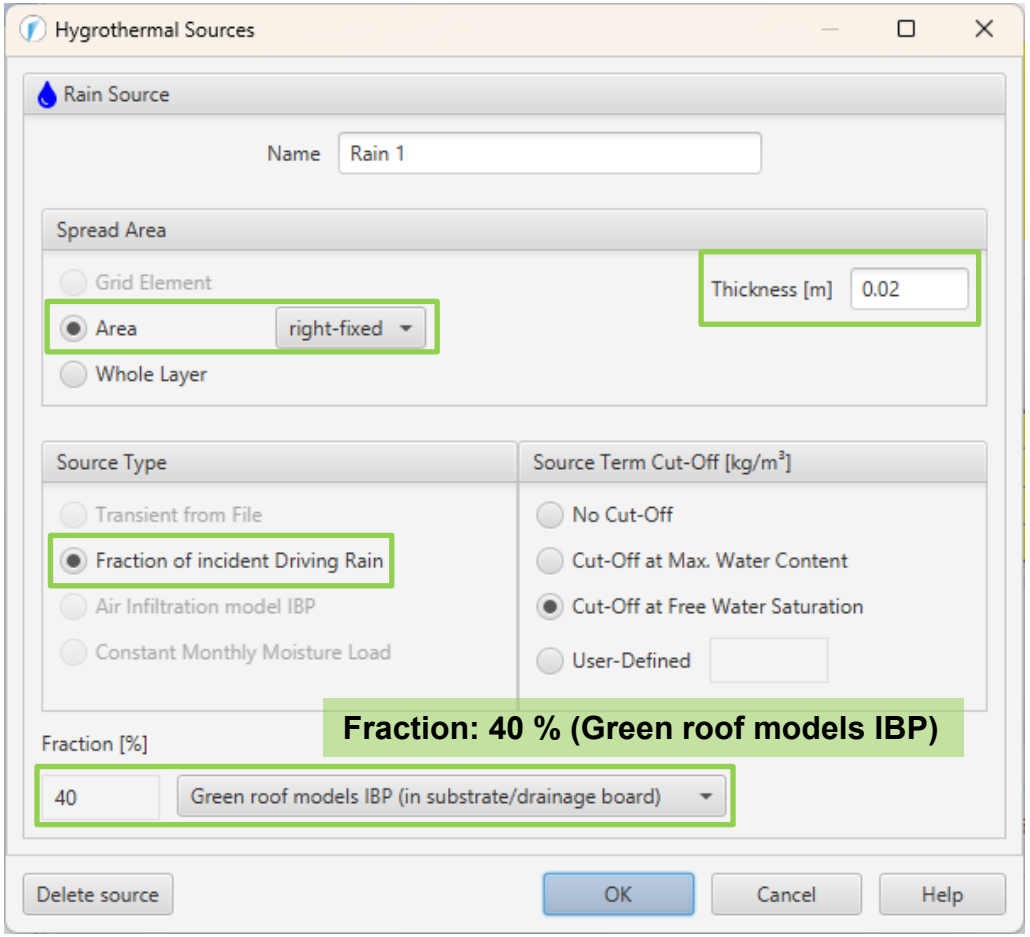
Insert moisture source in the layer “Generic Substrate“.



Example B: Moisture Source in the Substrate Layer

Input: Component – Assembly

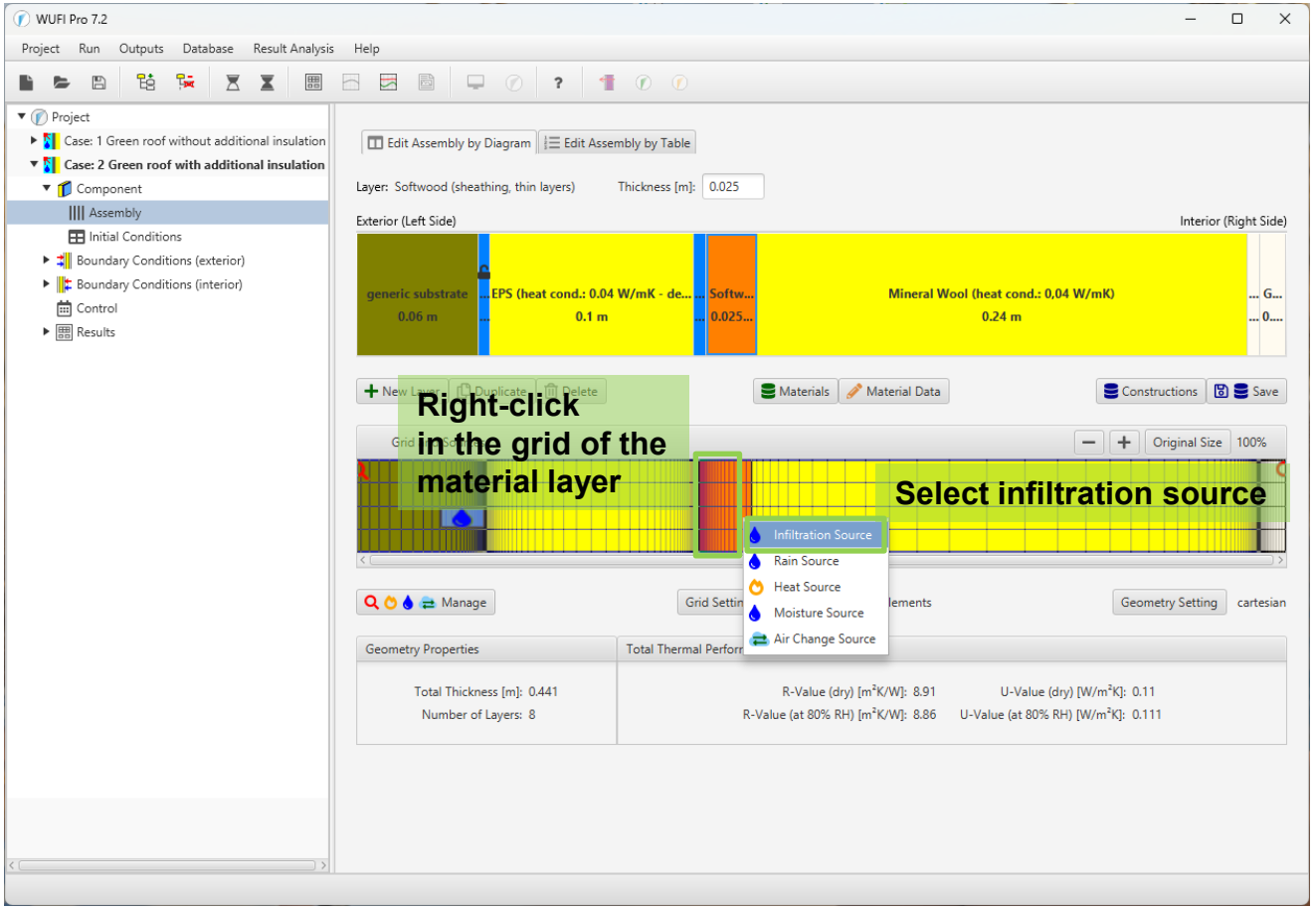
Moisture source in the lowest 2 cm of the substrate layer.



Example B: Infiltration Source

Input: Component – Assembly

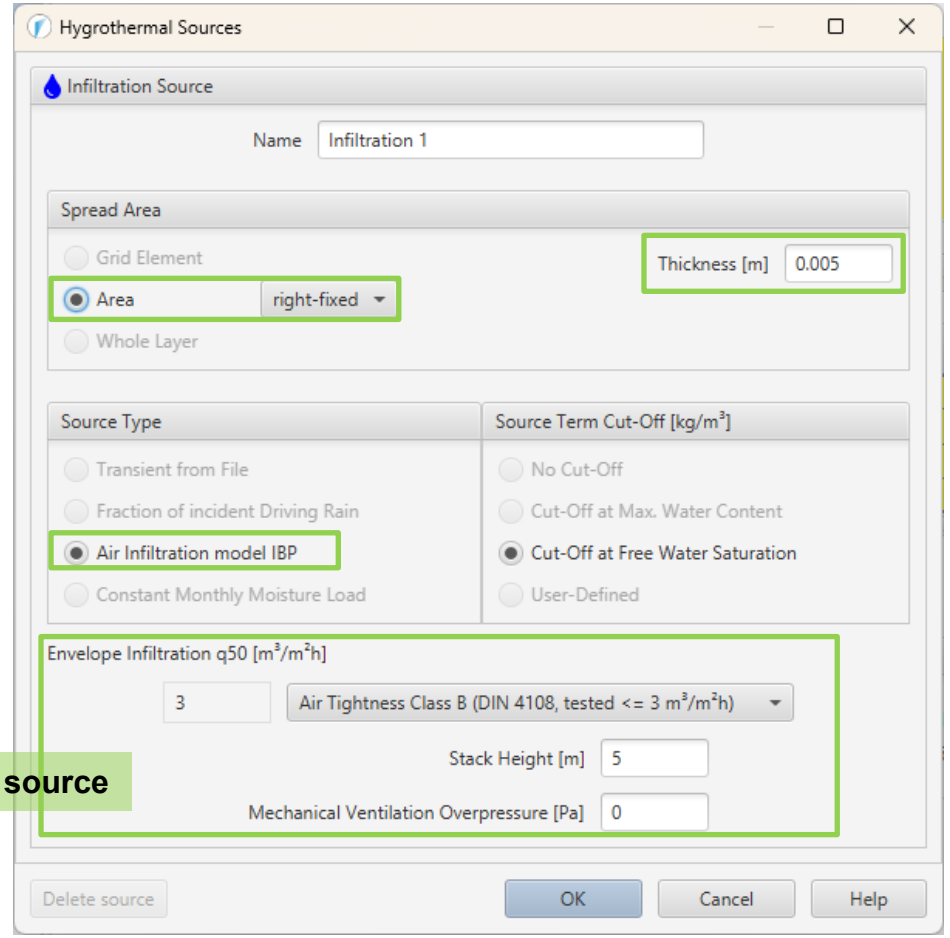
Infiltration source according to DIN 68800 in the wooden sheathing



Example B: Infiltration Source

Input: Component – Assembly

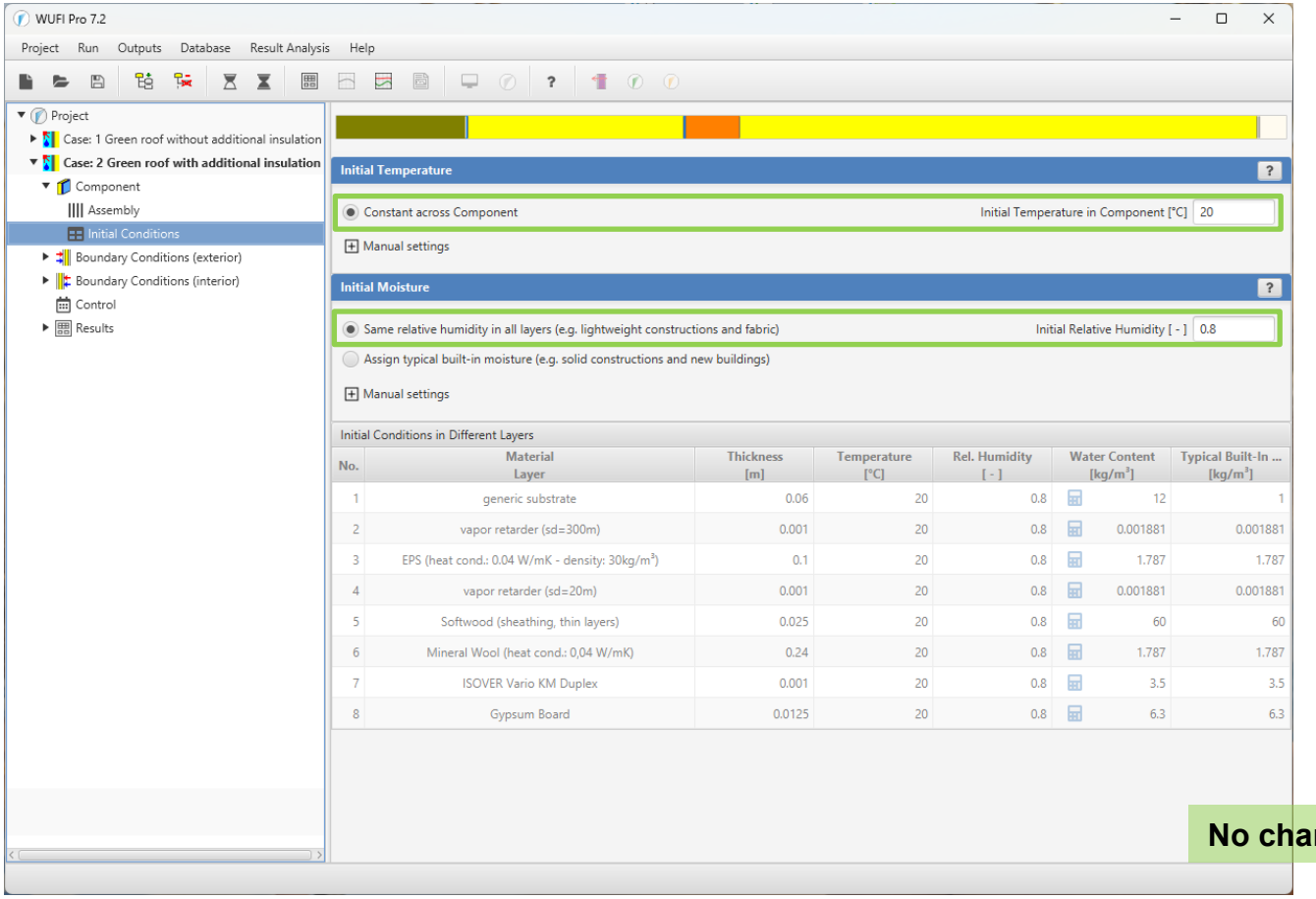
Moisture Source in the interior 5 mm of the wooden sheathing.



Adjust infiltration source

Example B: Initial Conditions

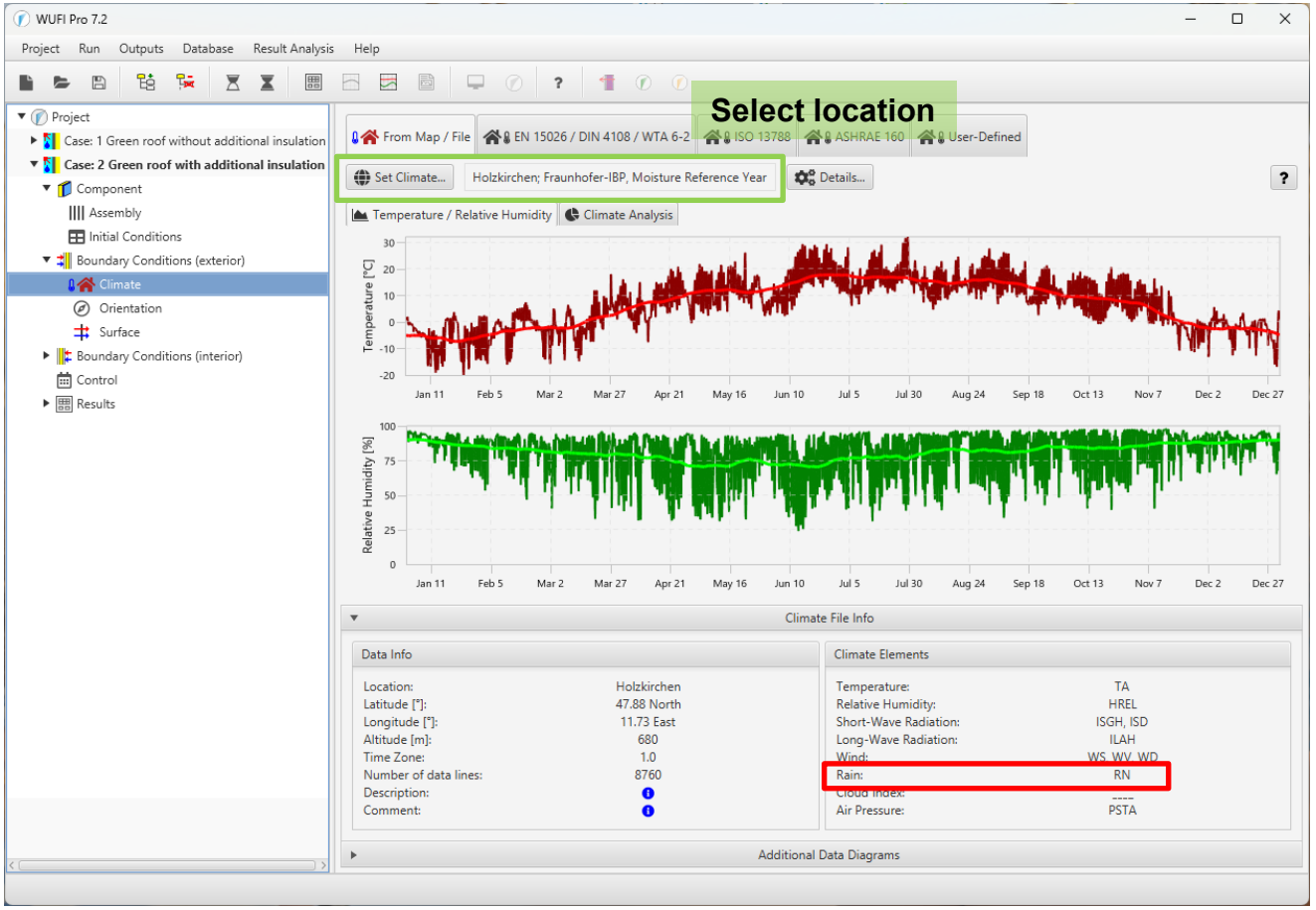
Input: Component – Initial Conditions



No changes required

Example B: Outdoor Climate

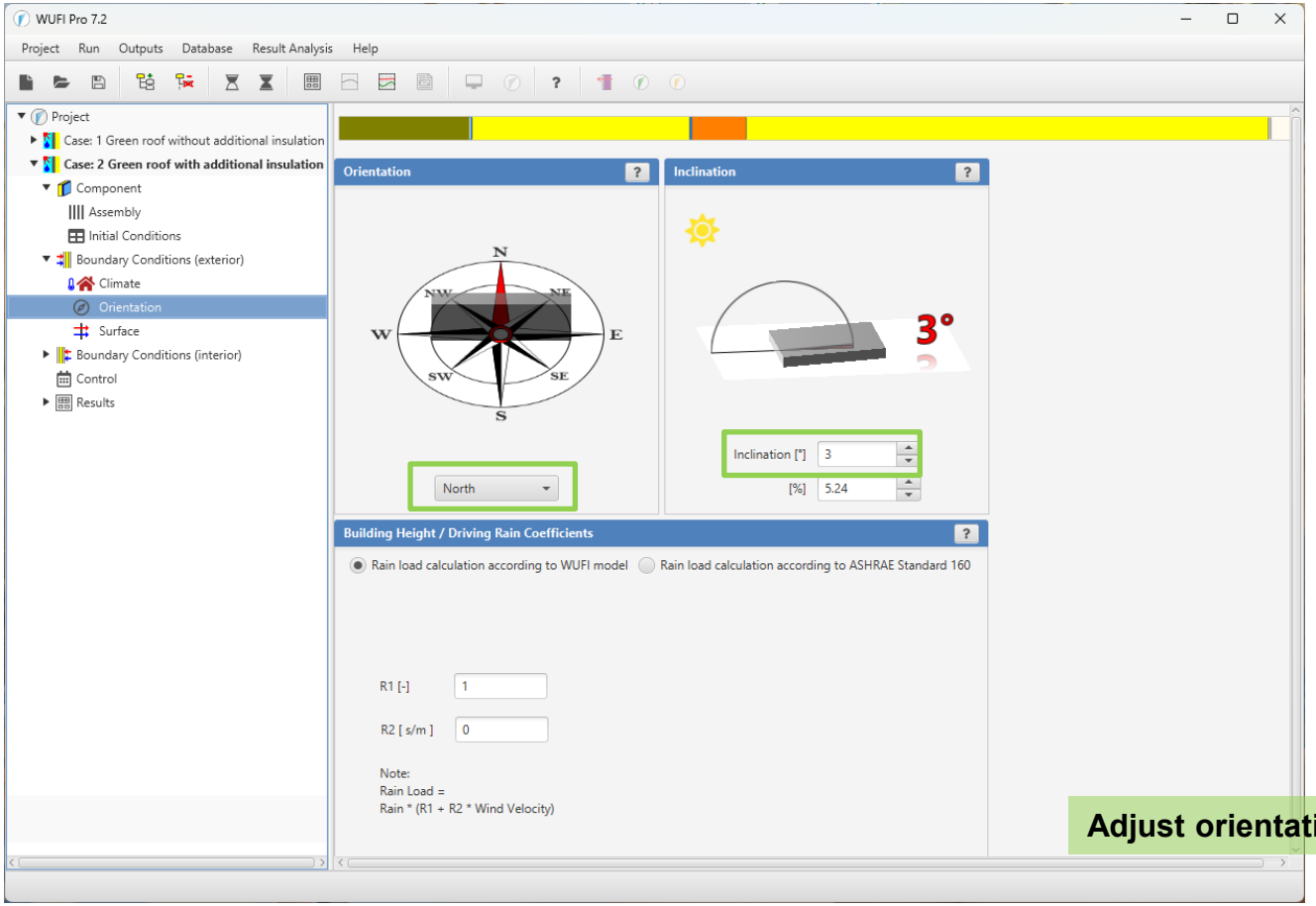
Input: Boundary Conditions (exterior) – Climate



Note:
The generic green roof model is also suitable for climate data without long-wave radiation. But rain data are necessary!

Example B: Orientation / Inclination

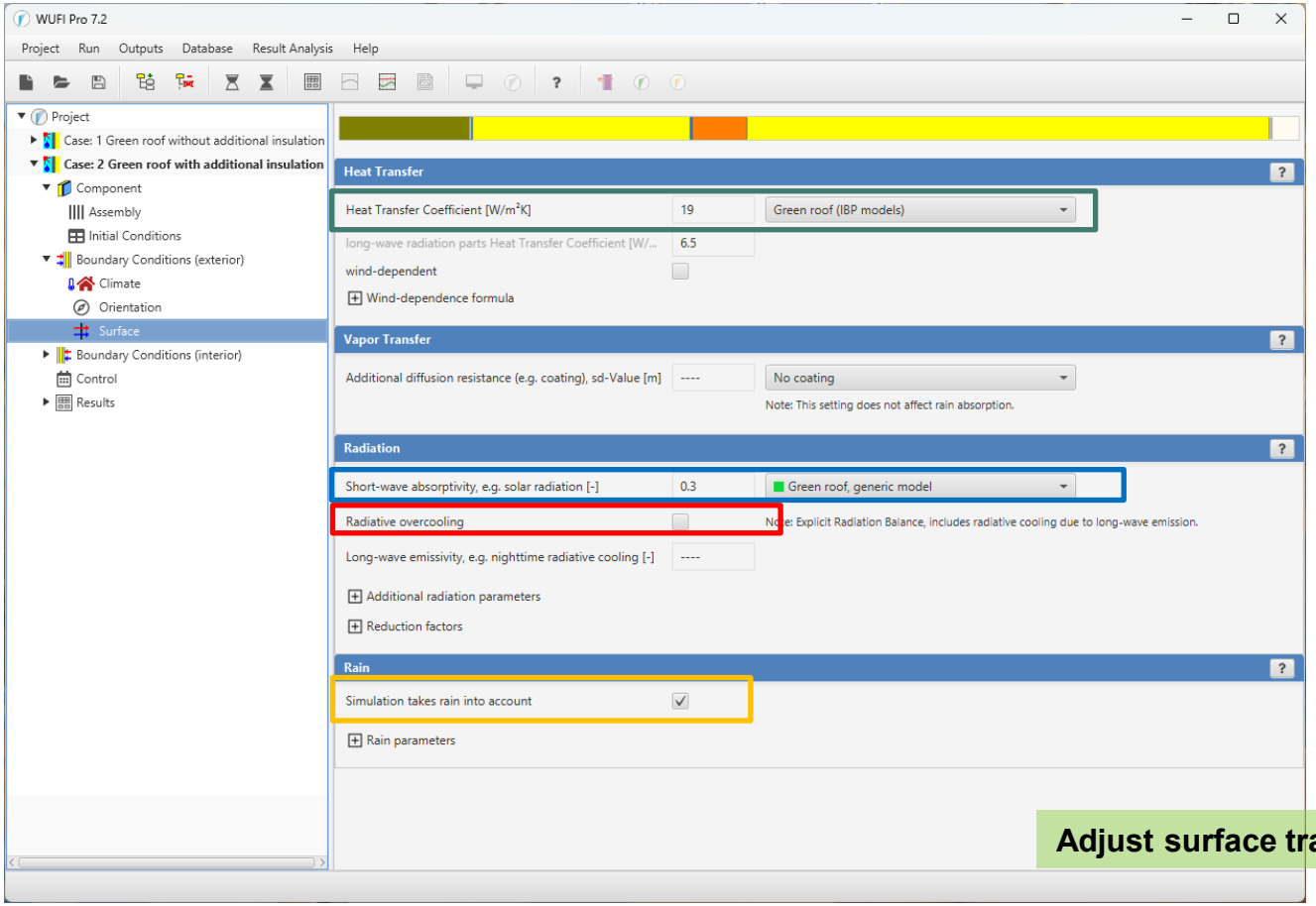
Input: Boundary Conditions (exterior) – Orientation



Adjust orientation and inclination

Example B: Surface Transfer Coefficients (exterior)

Input: Boundary Conditions (exterior) – Surface



Heat transfer coefficient (from list: green roof)

Absorption (from list: green roof, generic model)

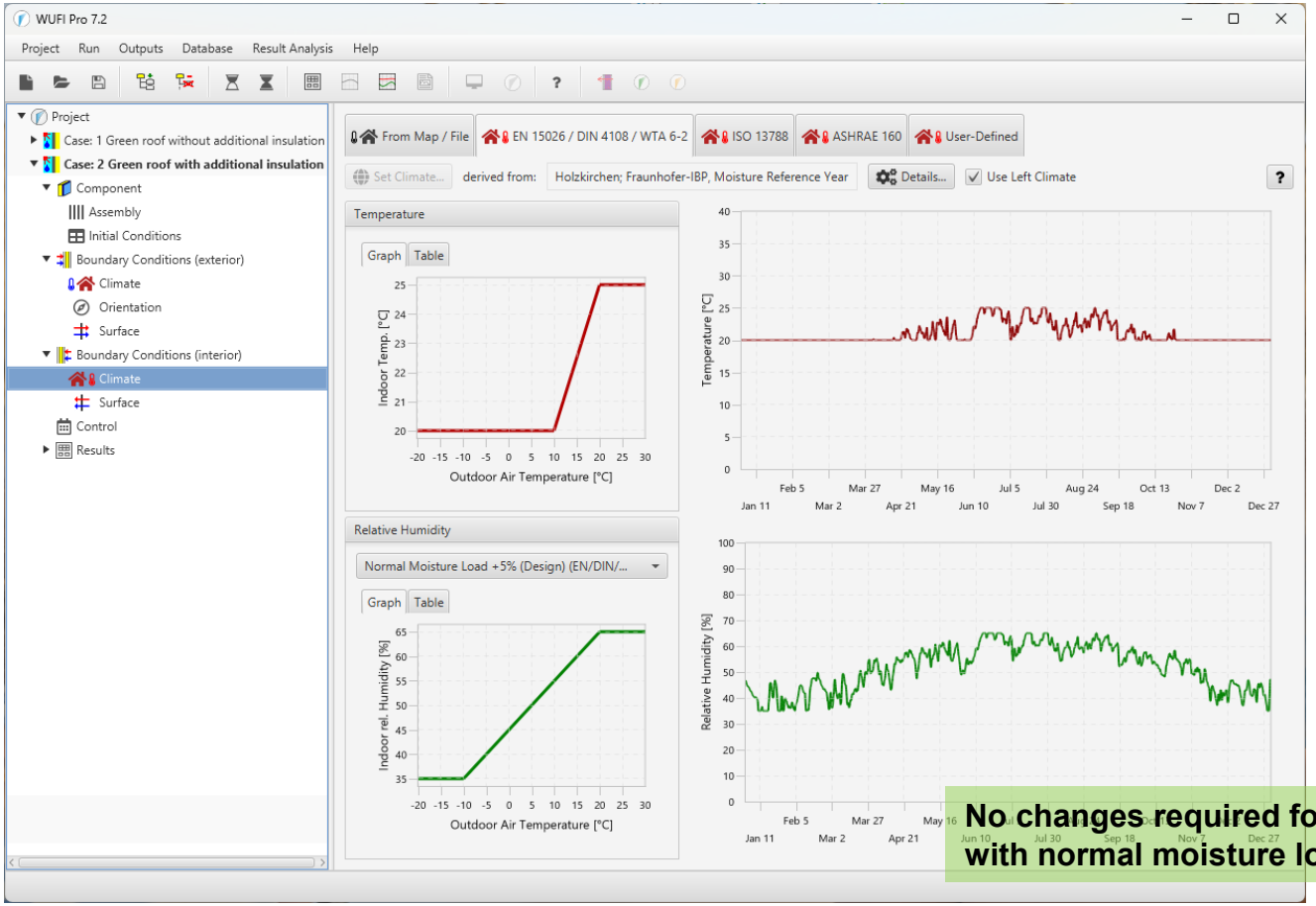
NO USE of the radiative overcooling in the generic approach

Rain is taken into account

Adjust surface transfer coefficients!

Example B: Indoor Climate

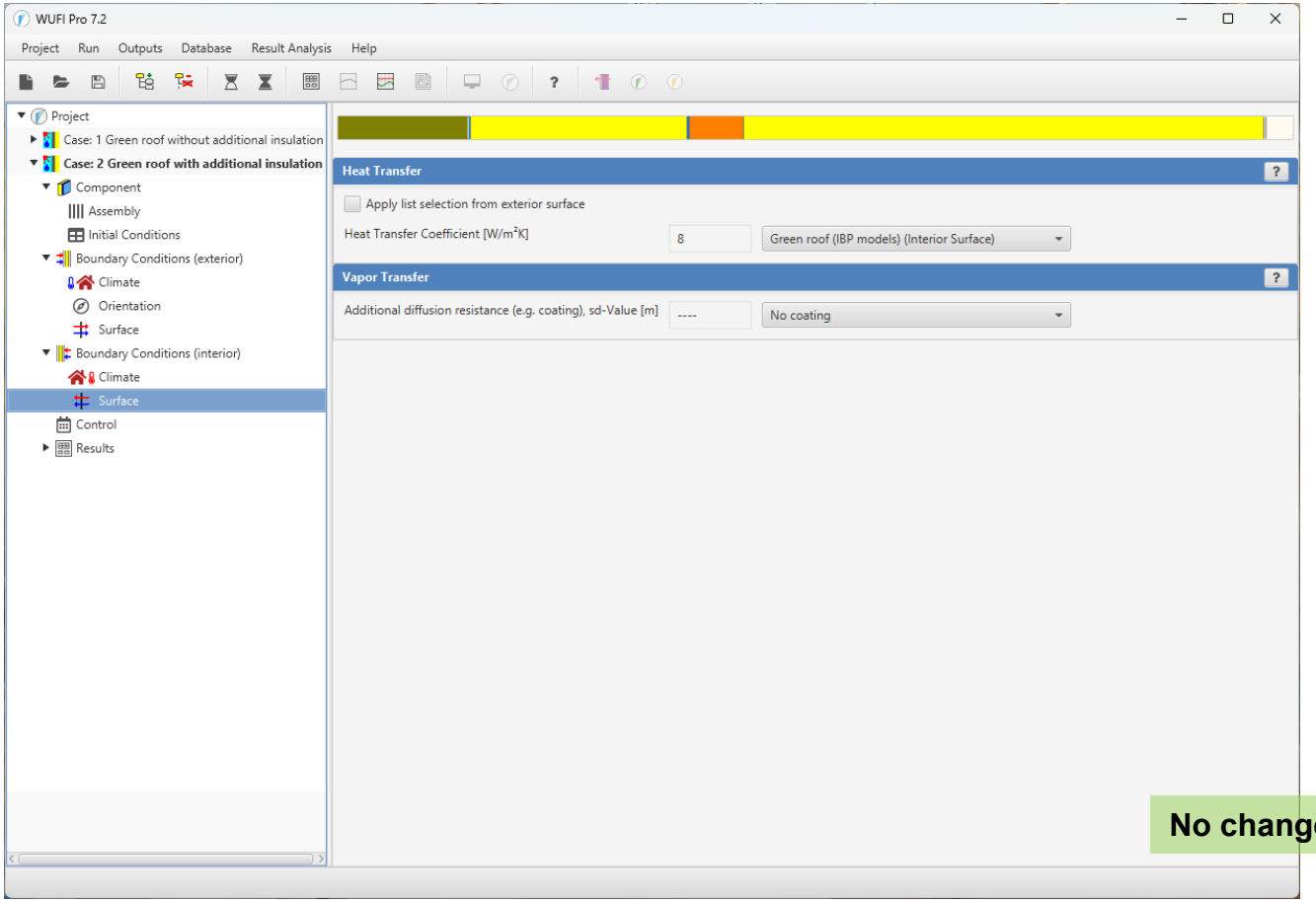
Input: Boundary Conditions (interior) – Climate



No changes required for indoor climate with normal moisture load + 5%

Example B: Surface Transfer Coefficients (interior)

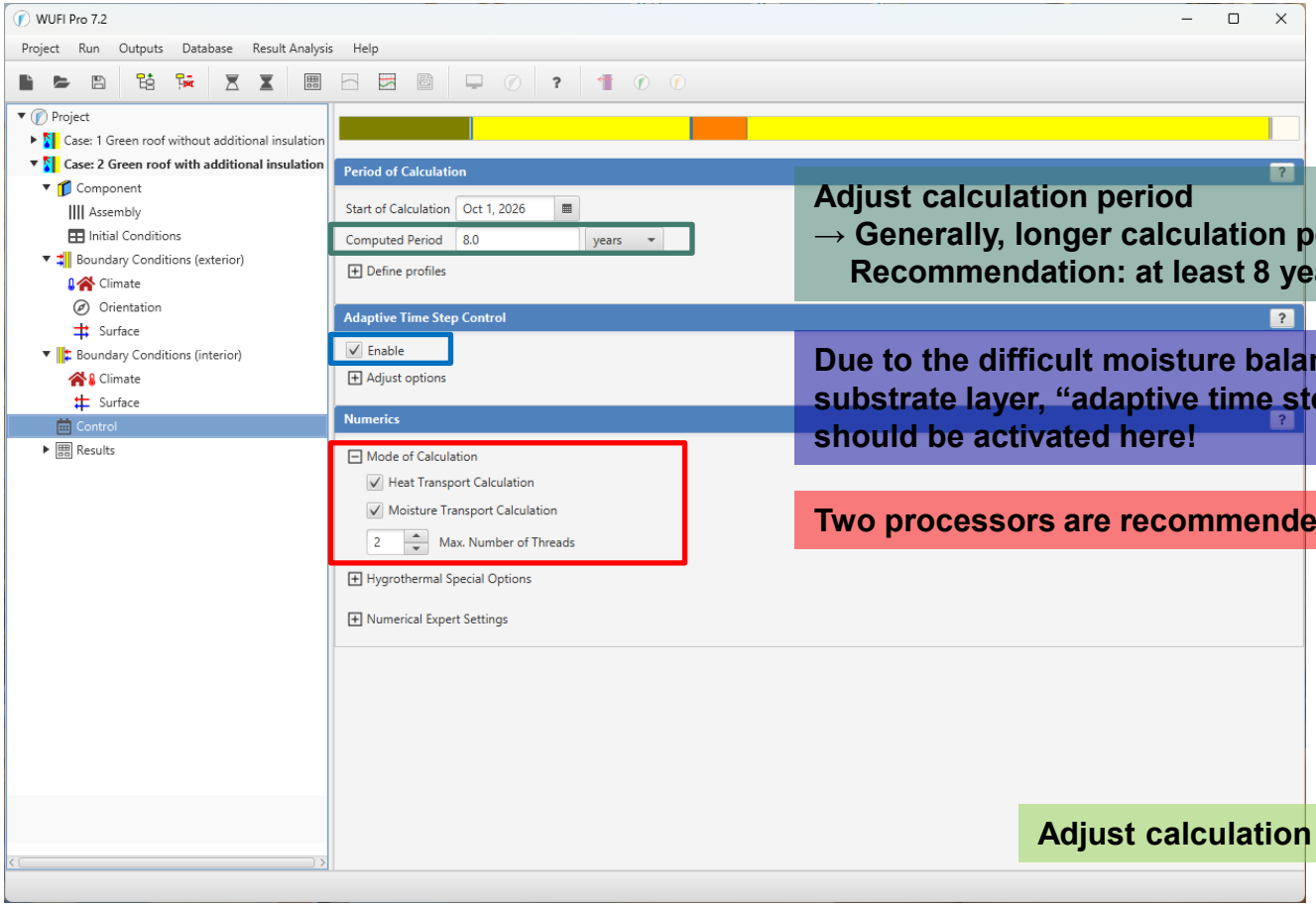
Input: Boundary Conditions (interior) – Surface



No changes required

Example B: Period of Calculation and Numerics

Input: Control



Adjust calculation period
→ Generally, longer calculation periods are required
Recommendation: at least 8 years

Due to the difficult moisture balance in the substrate layer, "adaptive time step control" should be activated here!

Two processors are recommended for this calculation!

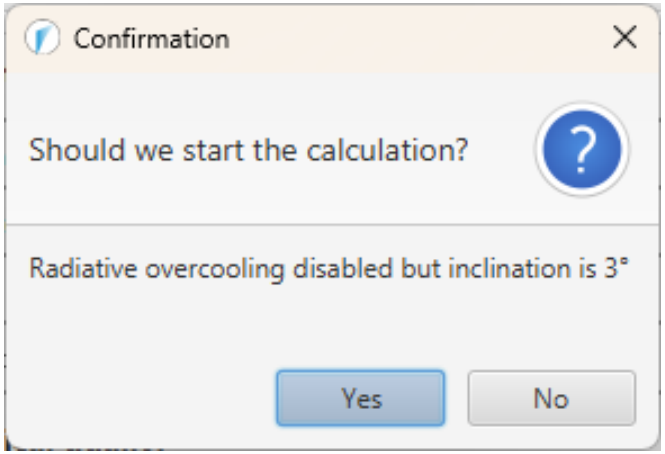
Adjust calculation period and numerics

Example B: Note at Calculation Start

Calculation start:

Note:

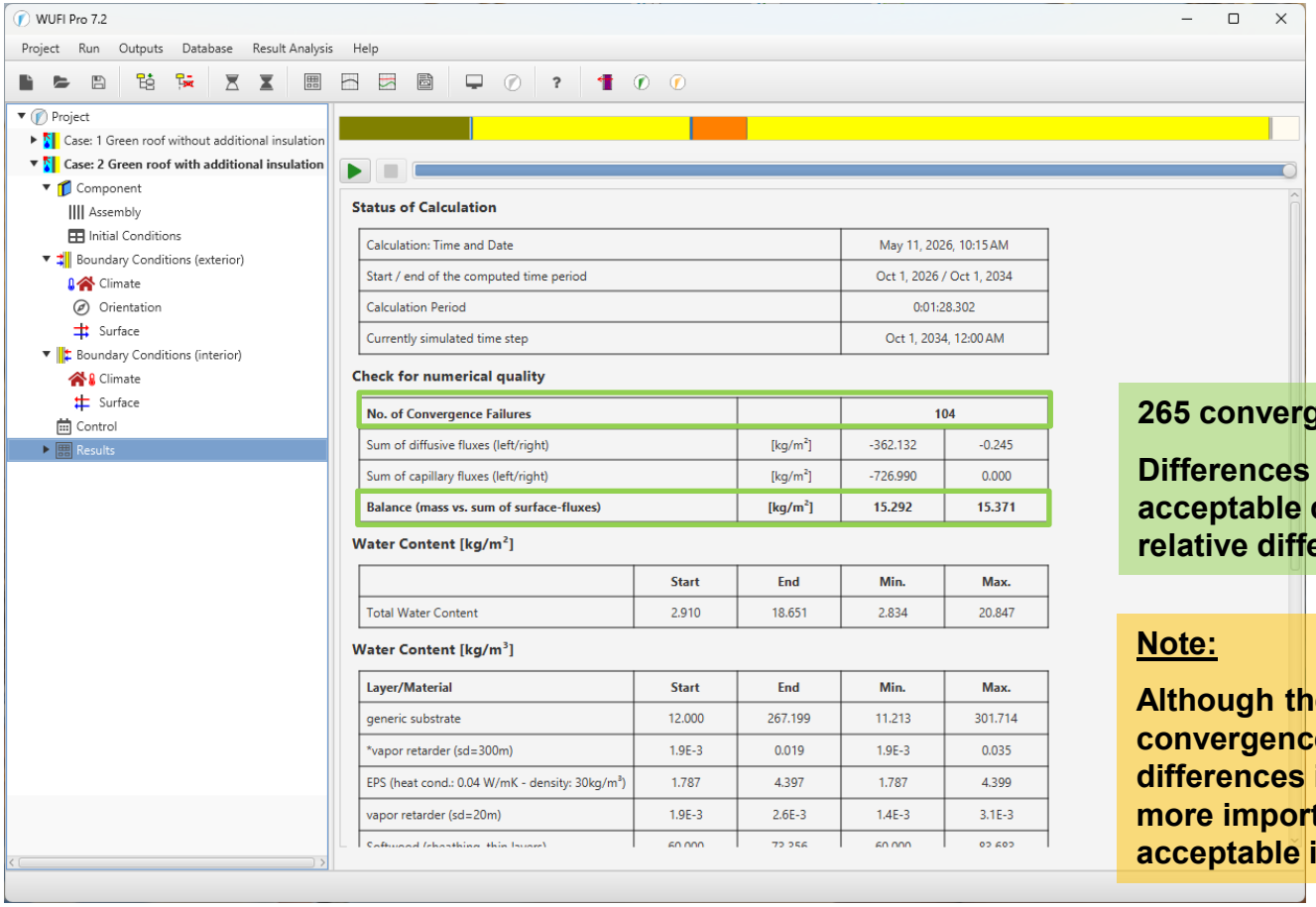
After calculation start this warning appears:



→ this warning can be ignored for the calculation of a green roof with the generic model!

Example B: Check for Numerical Quality

Results:



265 convergence failures

Differences in balance acceptable due to small relative differences!

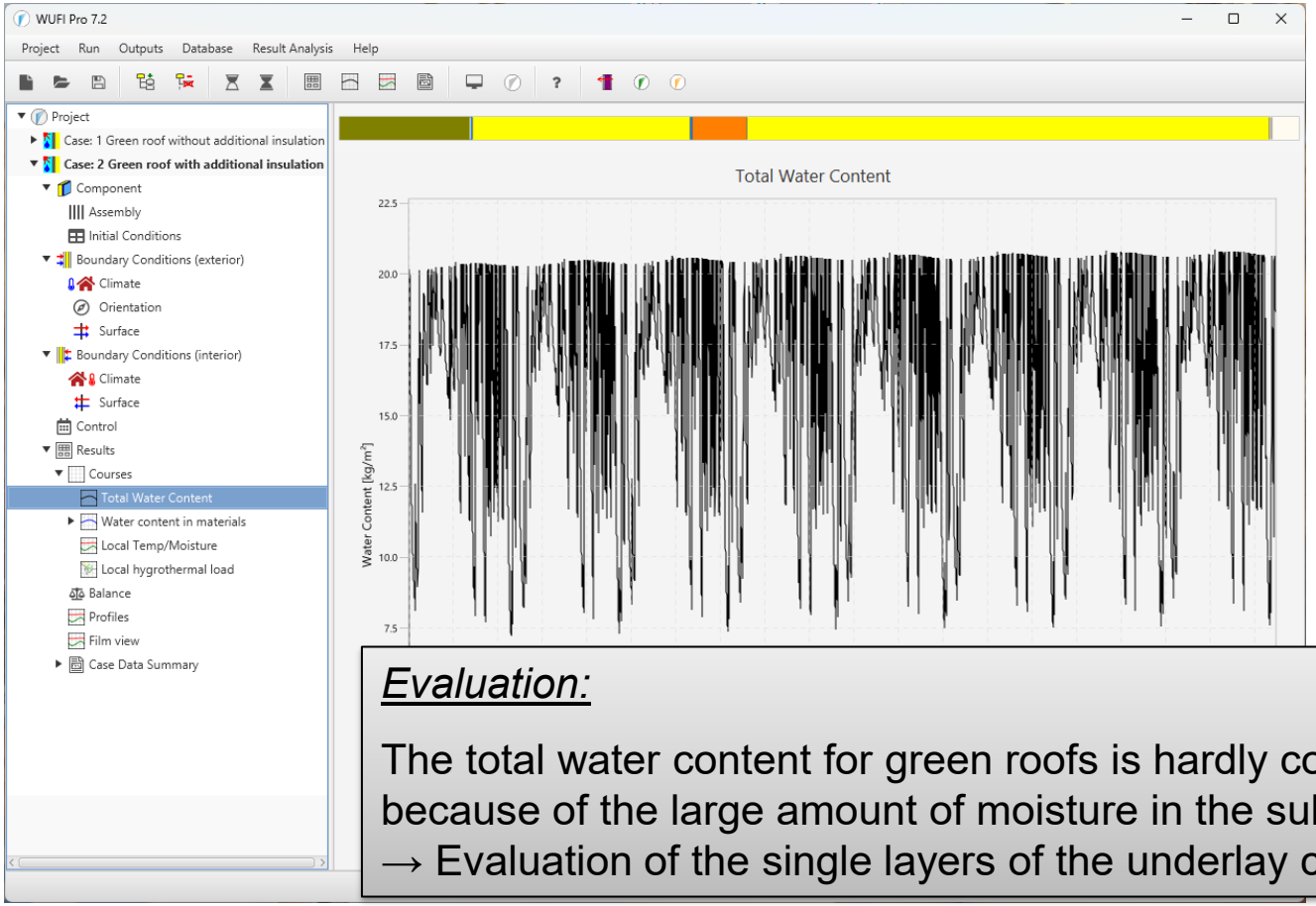
Note:

Although there are many convergence failures, the differences in balance are more important and are acceptable in this case.

Example B: Evaluation of Total Water Content

Evaluation:

Total water content



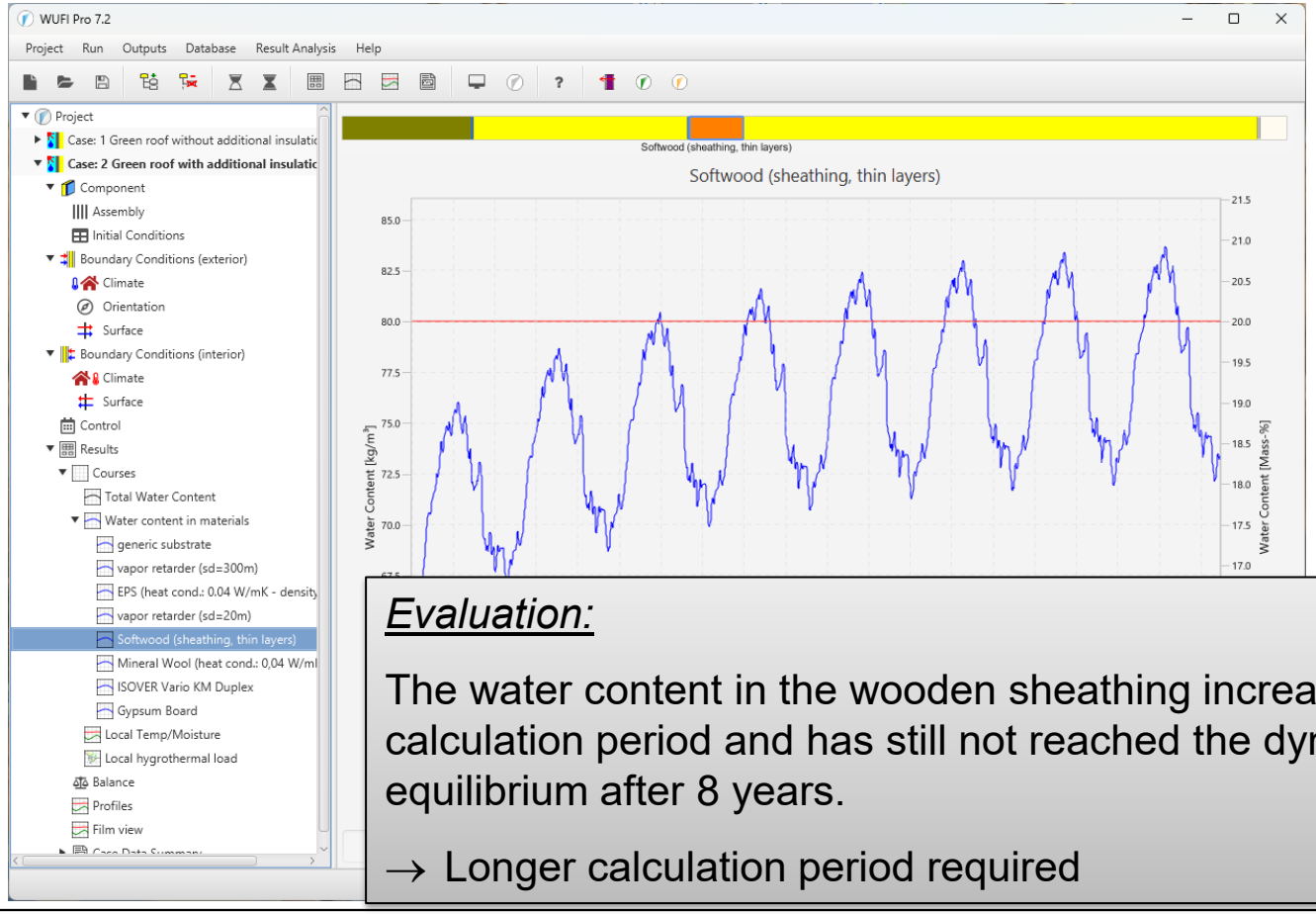
Evaluation:

The total water content for green roofs is hardly conclusive because of the large amount of moisture in the substrate layer.
→ Evaluation of the single layers of the underlay construction

Example B: Evaluation of Wood Moisture

Evaluation:

Water content in the wooden sheathing



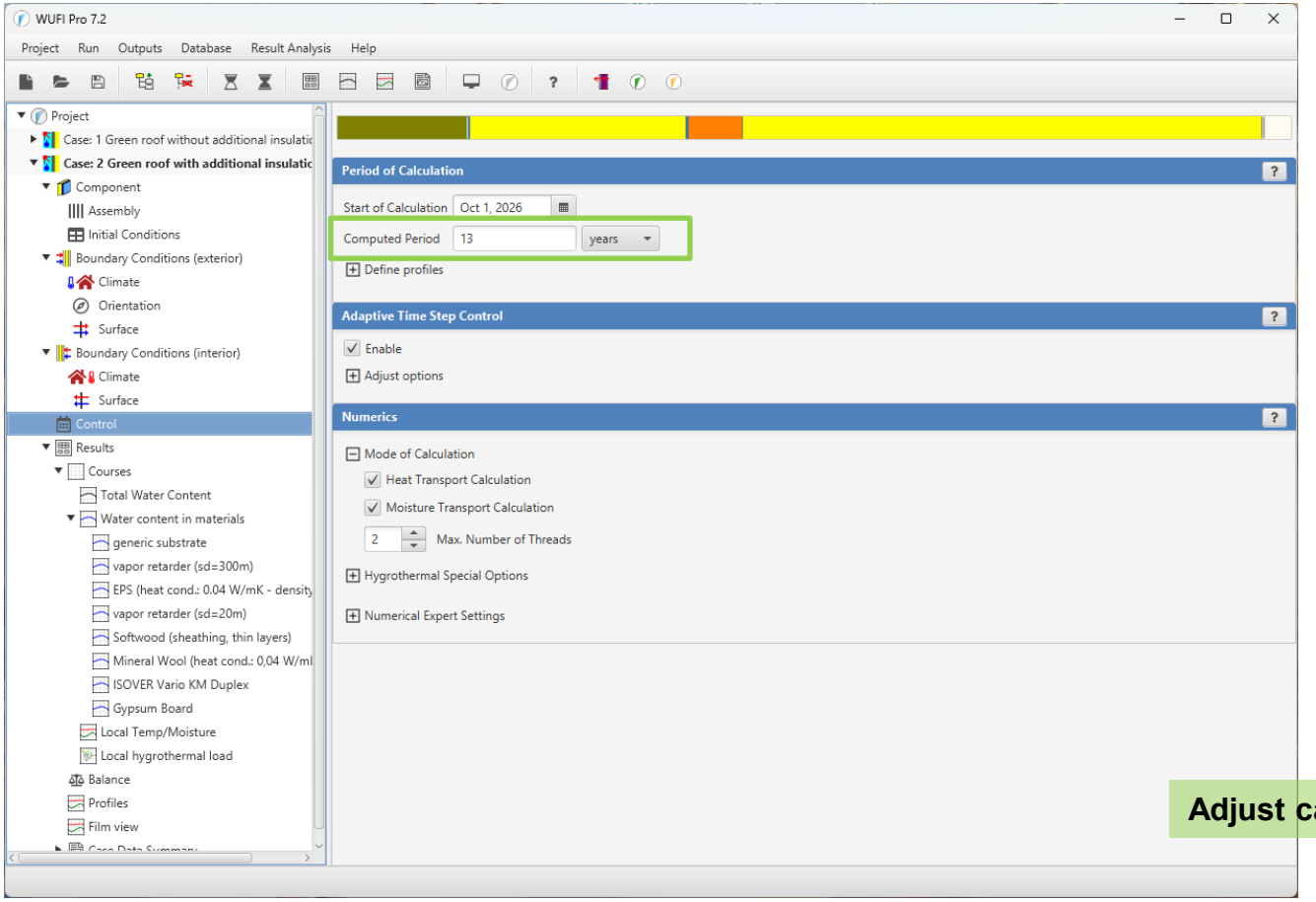
Evaluation:

The water content in the wooden sheathing increases over the calculation period and has still not reached the dynamic equilibrium after 8 years.

→ Longer calculation period required

Example B: Evaluation of Wood Moisture

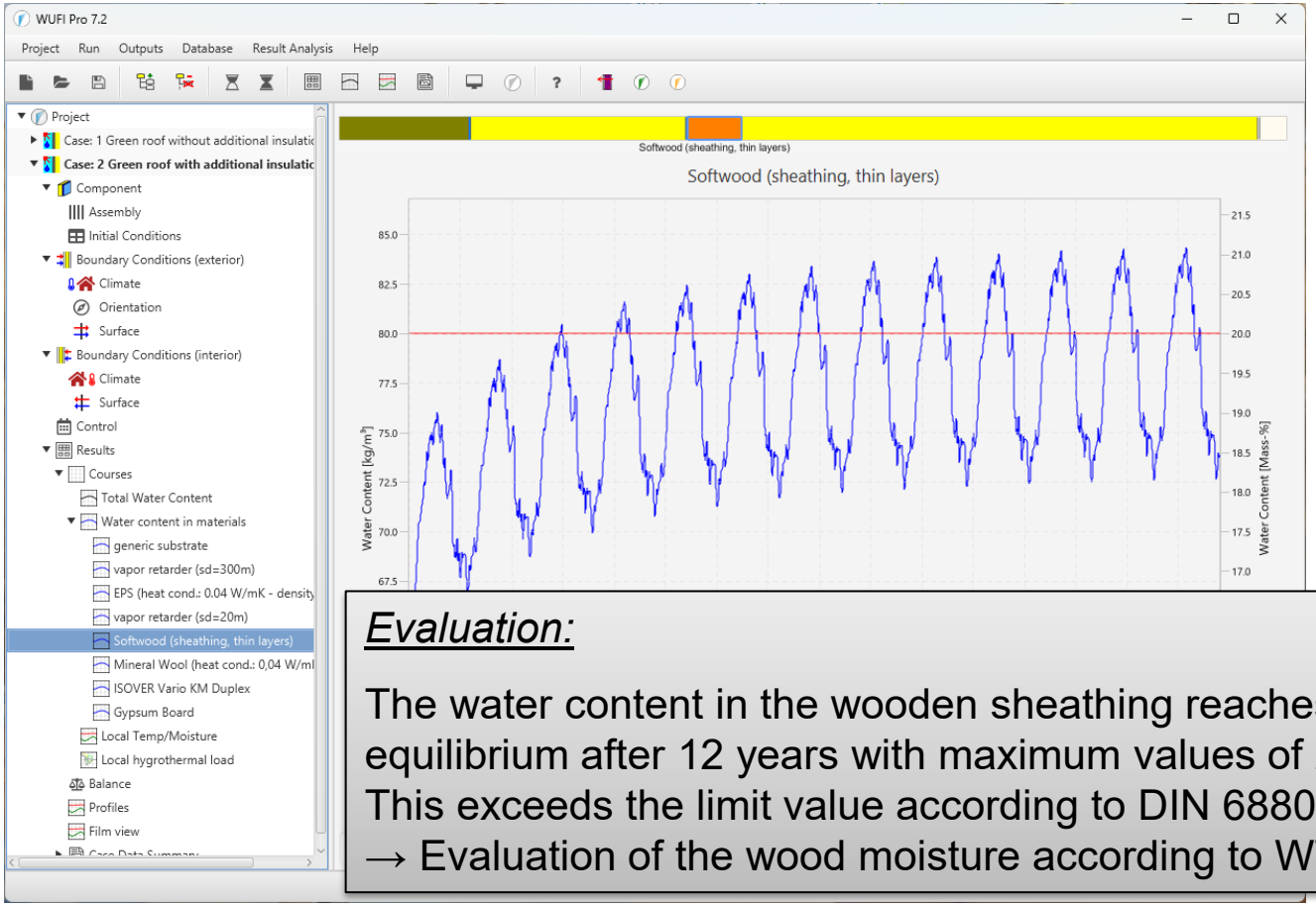
Input: Control



Example B: Evaluation of Wood Moisture

Evaluation:

Water content in the wooden sheathing



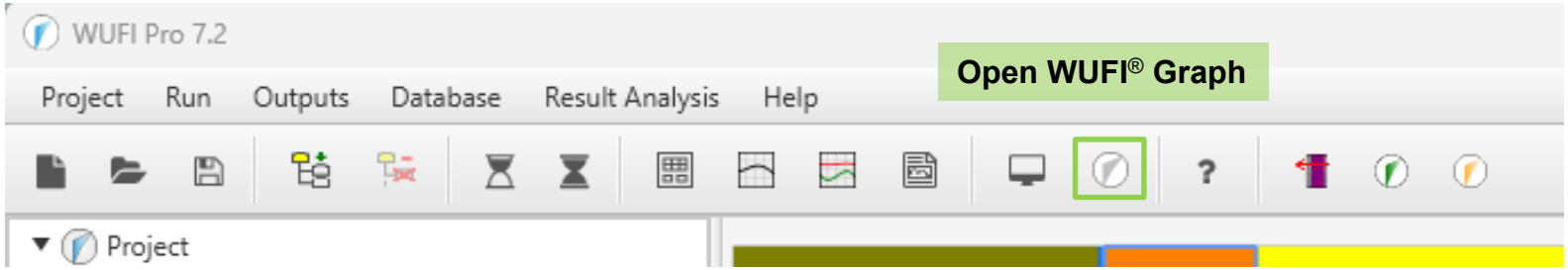
Evaluation:

The water content in the wooden sheathing reaches the dynamic equilibrium after 12 years with maximum values of 21 % by mass. This exceeds the limit value according to DIN 68800.
→ Evaluation of the wood moisture according to WTA

Example B: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:
Wood moisture in the wooden sheathing according to WTA 6-8

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



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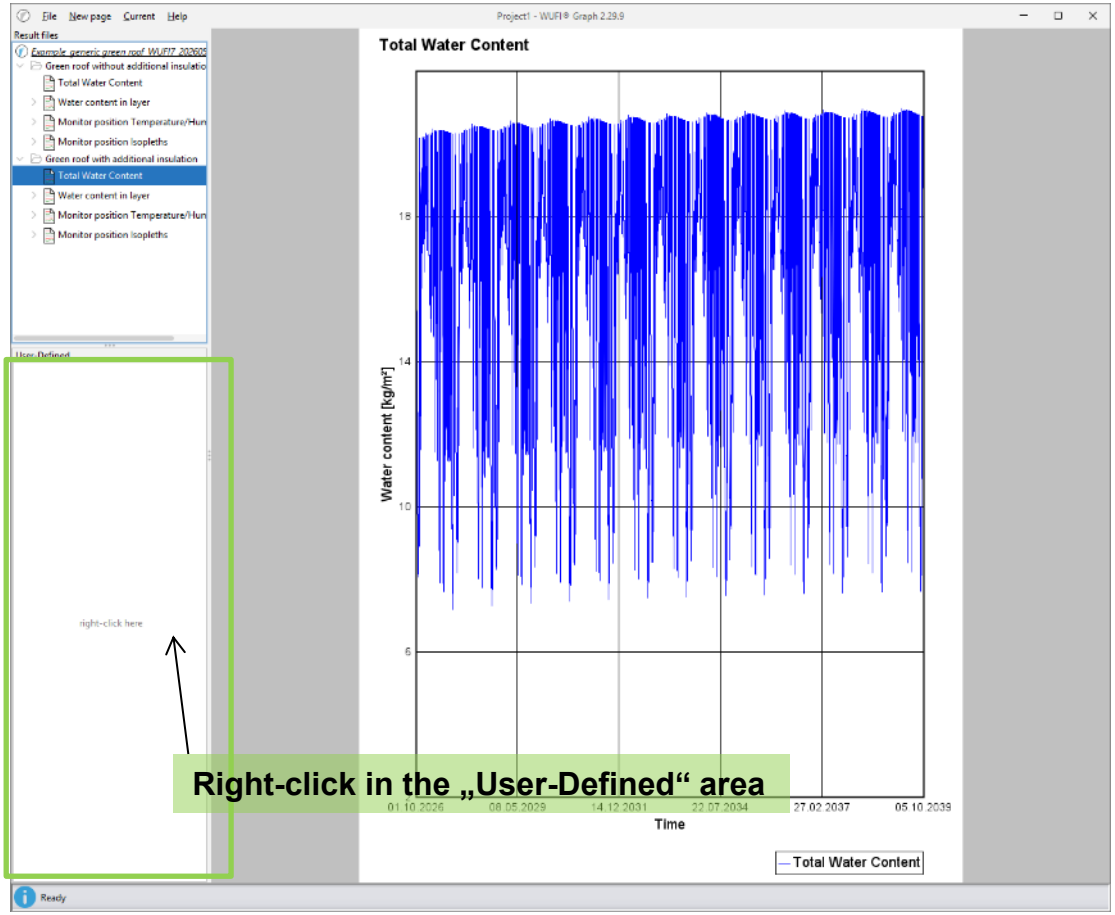
Evaluation with WUFI® Graph:

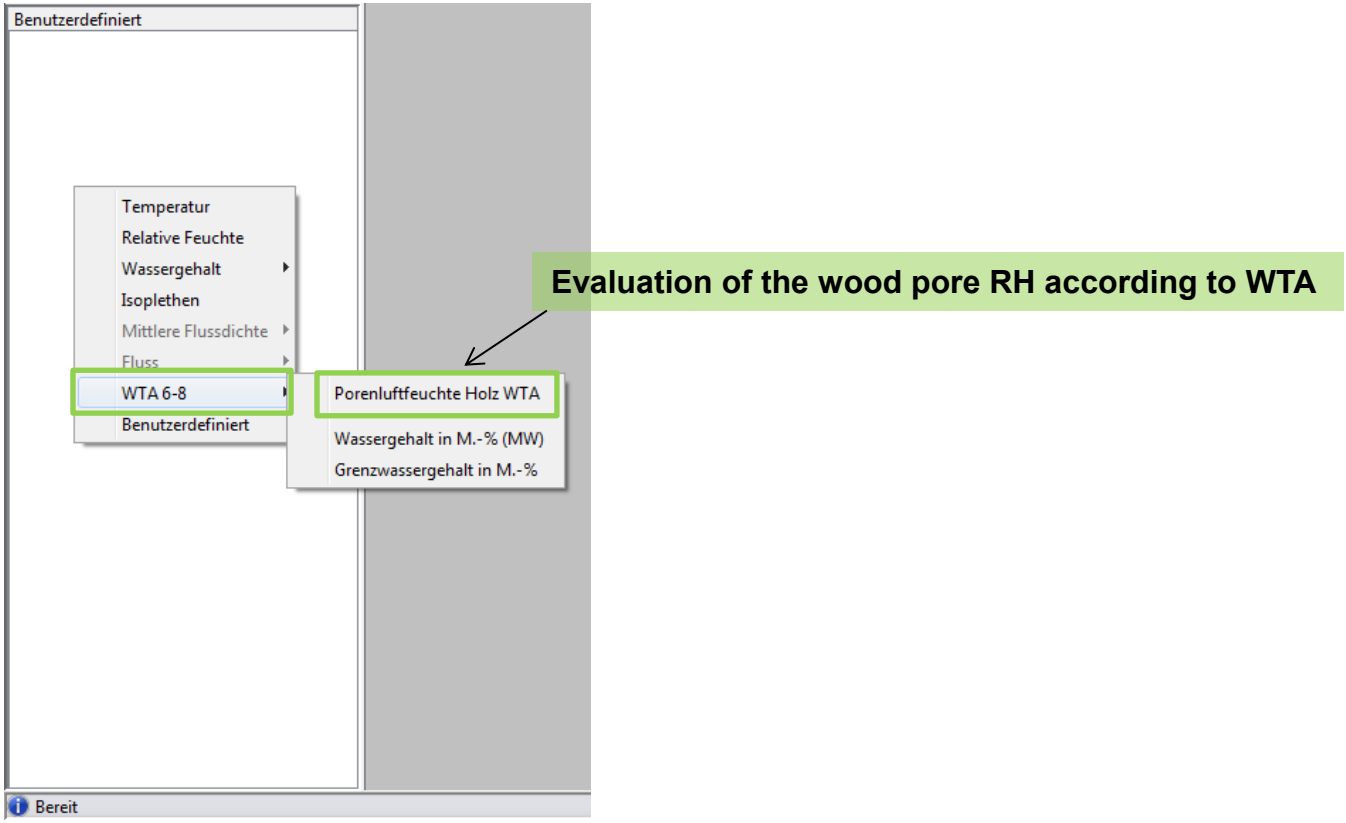
Wood moisture in the wooden sheathing according to WTA 6-8



Example B: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8



Example B: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8

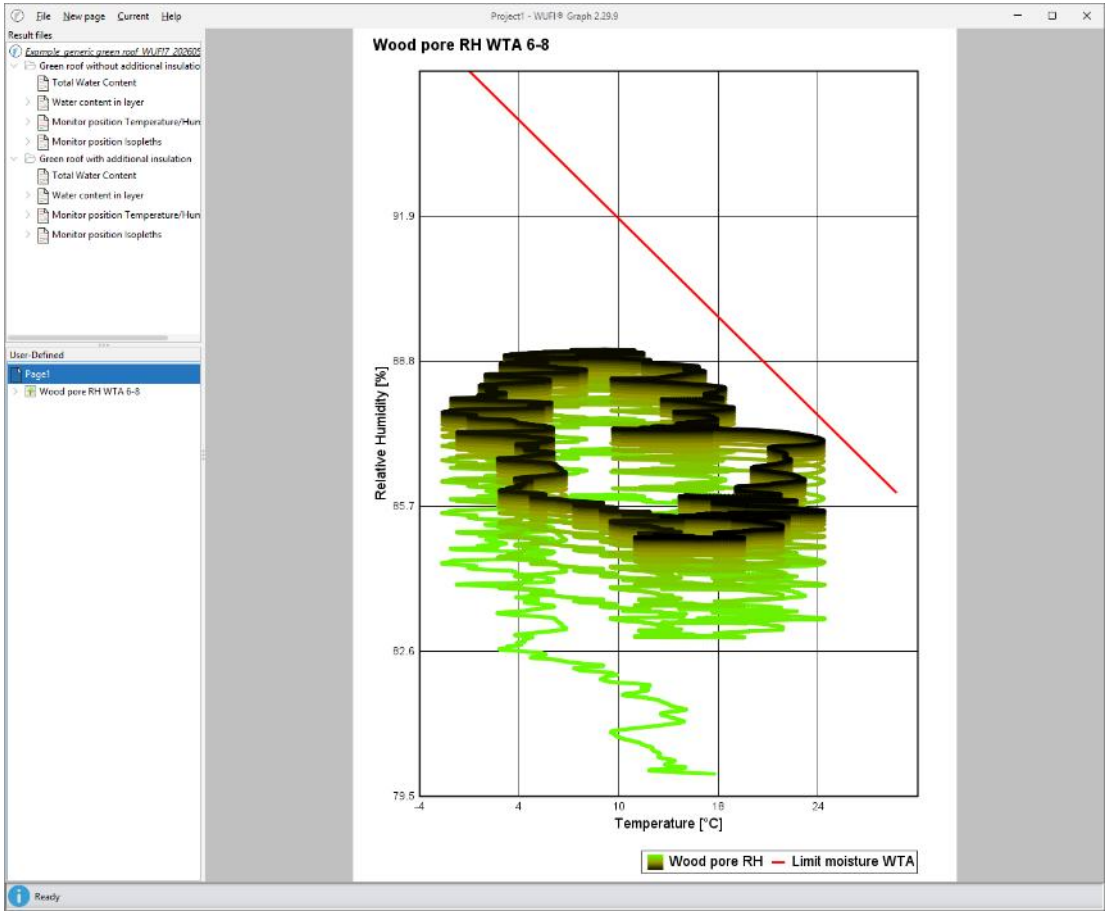
Evaluation in the most critical centimetre (in case of doubt, consider both sides)

Example B: Evaluation of Wood Moisture with WUFI® Graph

Evaluation with WUFI® Graph:

Wood moisture in the wooden sheathing according to WTA 6-8

Evaluation in the most critical centimetre (in case of doubt, consider both sides)



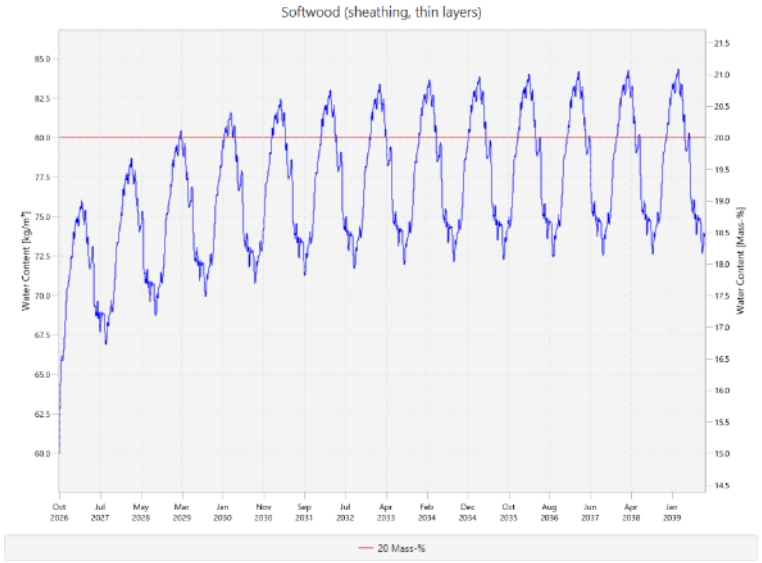
Evaluation:

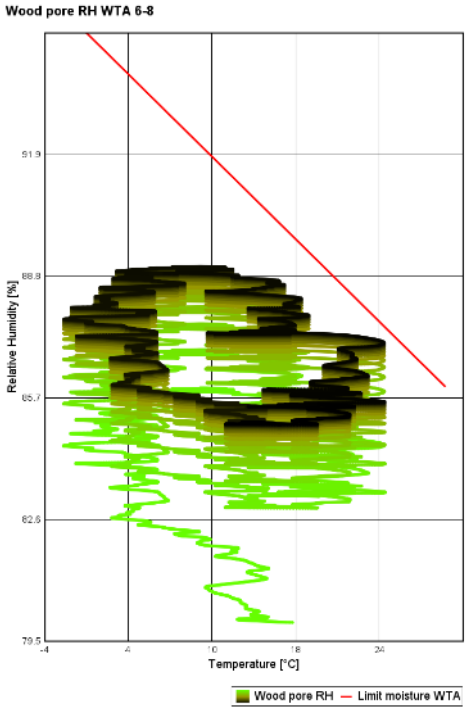
The relative pore air moisture in the exterior centimetre of the sheathing remains below the limit moisture according to WTA.

→ No risk regarding wood decay

Example B: Evaluation of Wood Moisture

Evaluation Wood Moisture:





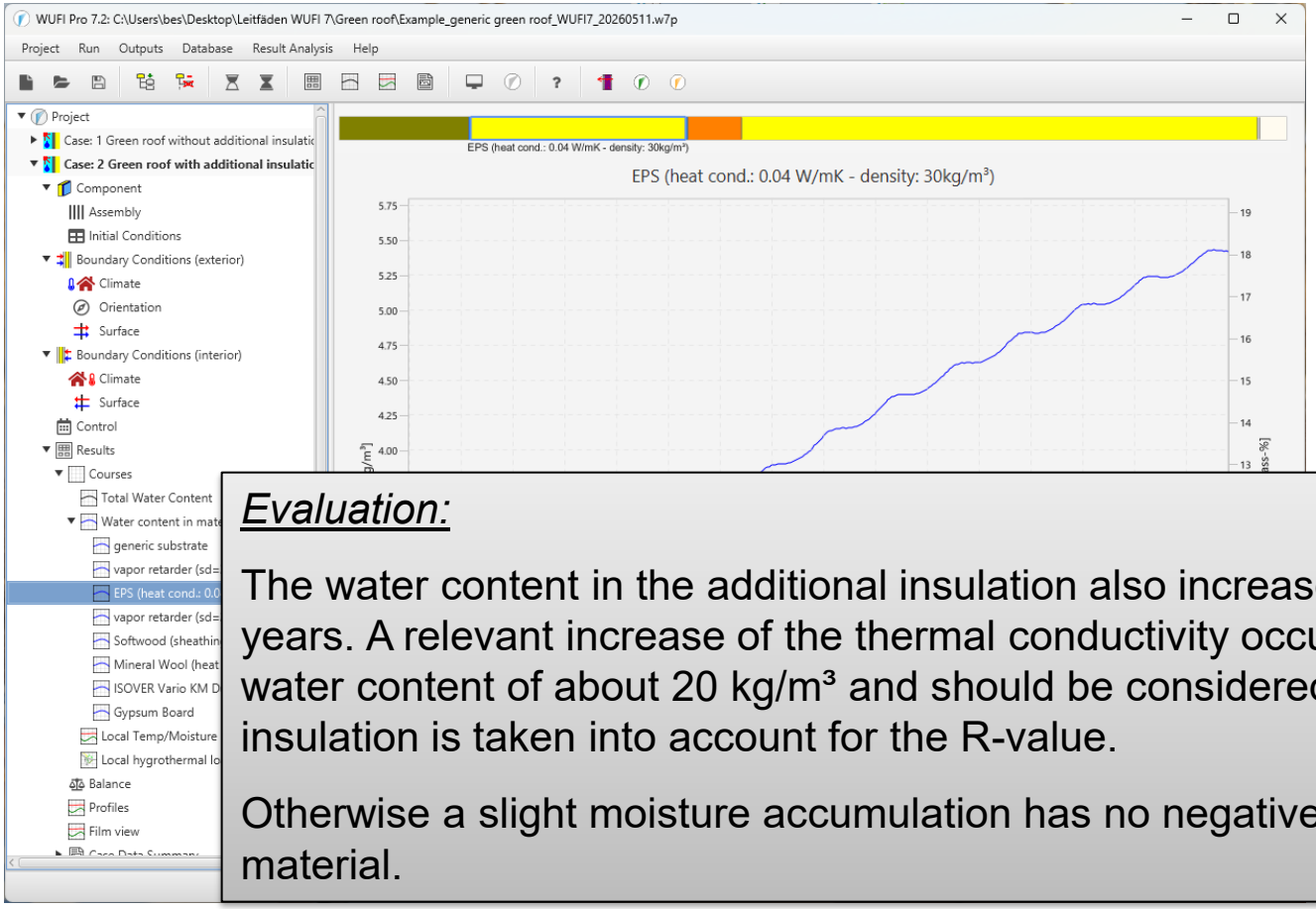
According to DIN 4108-3 the evaluation can be done in accordance with the WTA-Guideline 6-8, whereby this roof assembly is permitted.

For a higher safety, also the limit value of 20 % by mass can be observed. This can be ensured with a thicker additional insulation.

Example B: Evaluation Water Content Additional Insulation

Evaluation:

Water Content in the additional insulation



Evaluation:

The water content in the additional insulation also increases after 13 years. A relevant increase of the thermal conductivity occurs only from a water content of about 20 kg/m³ and should be considered if the insulation is taken into account for the R-value.

Otherwise a slight moisture accumulation has no negative effect on this material.