

WUFI®

Modelling a Water-Repellent Façade Treatment by Adjusting the A-value

Date: July 2026

Requirements for a water-repellent treatment

German recommendation according to WTA-Merkblatt 3-17 ("Hydrophobierende Imprägnierung von mineralischen Baustoffen")

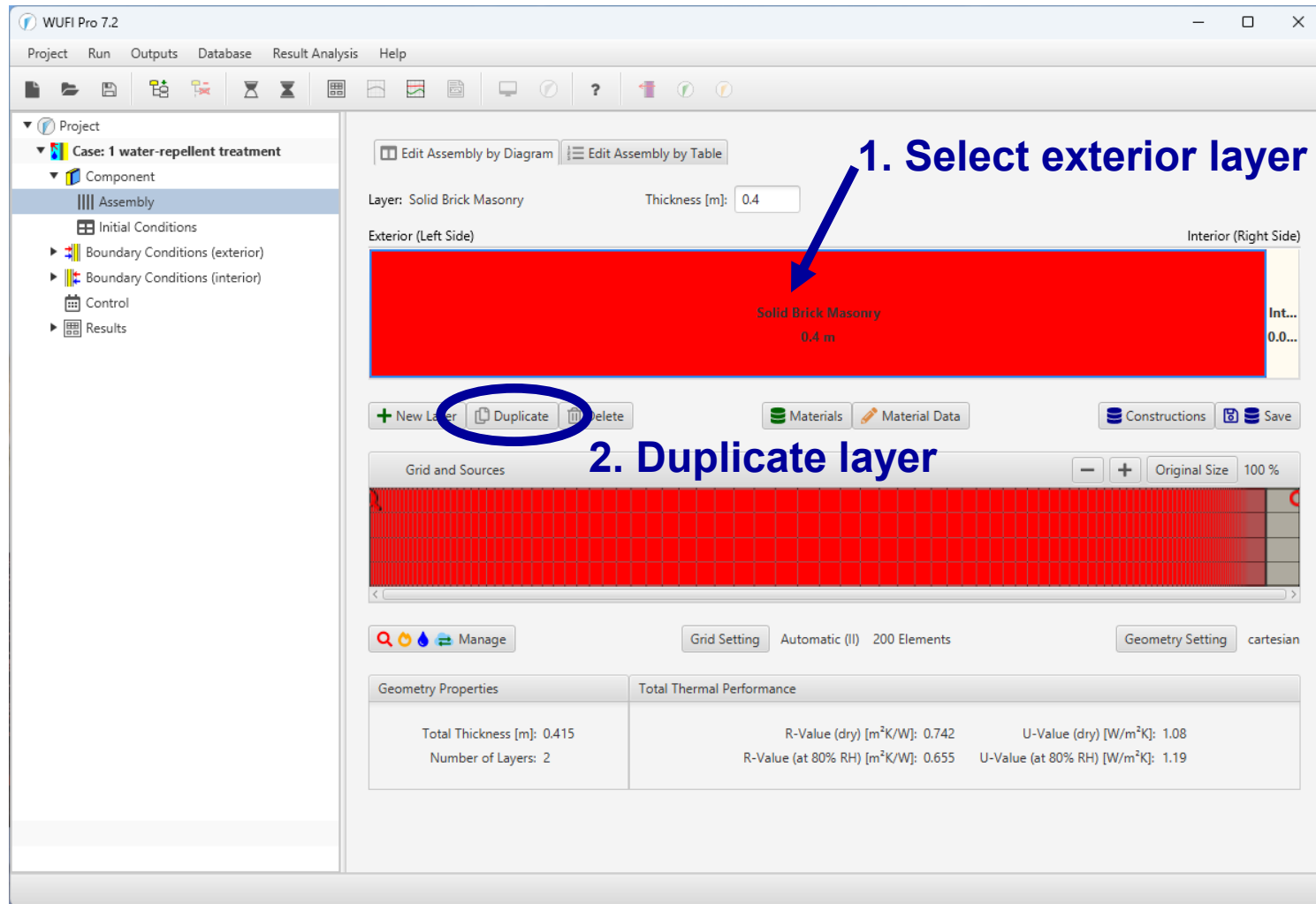
- Water-repellent treatments of façades reduce the capillary water absorption. When properly applied, the treatment should result in **A-values** **< 0.1 kg/m²√h**.
 - In WUFI[®], this can be modelled by modifying the liquid transport properties of a thin surface layer of the façade material, corresponding to the penetration depth of the water-repellent agent.
- Sufficient water vapour permeability must be maintained to allow any moisture entering through imperfections to dry out. Due to the water-repellent treatment the **diffusion resistance** of the treated layer **must not be increased by more than 50 %**.
 - μ -value of the surface layer must be adapted separately!

Consideration by adjusting the A-value and the μ -value:

Proceeding:

- 1) Separate a thin surface layer (0.5 – 1 cm, depending on penetration depth of treatment) from the original wall assembly. To do this, duplicate the original layer and then adjust the two thicknesses as needed.
- 2) Edit the material properties of the new exterior layer:
 - Unlock the material.
 - Check the “Generate” boxes at “Liquid Transport Coefficients” for suction and redistribution.
 - Adjust “Water Absorption Coefficient”.
Note the units: the value in $[\text{kg}/\text{m}^2\sqrt{\text{s}}]$ is obtained by dividing the A-value in $[\text{kg}/\text{m}^2\sqrt{\text{h}}]$ by 60.
 - Adjust the “Water Vapour Diffusion Resistance Factor” of the new surface layer.

Proceeding in WUFI®



Proceeding in WUFI®

3. Reduce thickness (e.g. minus 1 cm)

4. Select exterior layer

Layer: Solid Brick Masonry

Exterior (Left Side) Interior (Right Side)

Solid Brick Masonry 0.4 m

Solid Brick Masonry 0.39 m

Grid and Sources

Geometry Properties

Total Thermal Performance	
Total Thickness [m]: 0.805	R-Value (dry) [m ² K/W]: 1.39
Number of Layers: 3	U-Value (dry) [W/m ² K]: 0.635
	R-Value (at 80% RH) [m ² K/W]: 1.22
	U-Value (at 80% RH) [W/m ² K]: 0.711

5. Change thickness (e.g. 1 cm)

Layer: Solid Brick Masonry Thickness [m]: 0.01

6. Double click on layer

Exterior (Left Side) Interior (Right Side)

Solid Brick Masonry 0.39 m

Int... 0.0...

+ New Layer Duplicate Delete Materials Material Data Constructions Save

Grid and Sources

Grid Setting Automatic (II) 200 Elements Geometry Setting cartesian

Geometry Properties	Total Thermal Performance	
Total Thickness [m]: 0.415	R-Value (dry) [m ² K/W]: 0.742	U-Value (dry) [W/m ² K]: 1.08
Number of Layers: 3	R-Value (at 80% RH) [m ² K/W]: 0.655	U-Value (at 80% RH) [W/m ² K]: 1.19

Layer/Material Data

Layer/Material Name: Solid Brick Masonry - unlocked

Bulk density [kg/m³]: 1900

Porosity [m³/m³]: 0.24

Spec. Heat Capacity [J/kgK]: 850

Thermal Conductivity [W/mK]: 0.6

Water Vapour Diffusion Resistance Factor [-]: 10

Typical Built-In Moisture [kg/m³]: 100

Layer Thickness [m]: 0.01

Thermal Conductivity, Design Value [W/mK]:

Colour: Rot

Hygrothermal Functions | Material Information

Moisture Storage Function

Liquid Transport Coefficient, Suction

Liquid Transport Coefficient, Redistribution

Water Vapour Diffusion Resistance Factor, moisture-de...

Thermal Conductivity, moisture-dependent

Thermal Conductivity, temperature-dependent

☐ Generate

No.	Water Content [kg/m³]	Dws [m²/s]
1	0	0
2	10	1.5E-10
3	190	1.7E-6

Paste into Database | Import | Export

OK | Cancel | Help

Normalized Water Content [-]

Liquid Transport Coefficient [m²/s]

Water Content [kg/m³]

u_{80}

u_f

7. Unlock material

8. Select "Liquid Transport Coefficient, Suction"

9. Check
“Generate”

Layer/Material Data

Layer/Material Name: Solid Brick Masonry - unlocked

Bulk density [kg/m³]: 1900

Porosity [m³/m³]: 0.24

Spec. Heat Capacity [J/kgK]: 850

Thermal Conductivity [W/mK]: 0.6

Water Vapour Diffusion Resistance Factor [-]: 10

Typical Built-In Moisture [kg/m³]: 100

Layer Thickness [m]: 0.01

Thermal Conductivity, Design Value [W/mK]:

Colour: Rot

Hygrothermal Functions | Material Information

Moisture Storage Function

Liquid Transport Coefficient, Suction

Liquid Transport Coefficient, Redistribution

Water Vapour Diffusion Resistance Factor, moisture-de...

Thermal Conductivity, moisture-dependent

Thermal Conductivity, temperature-dependent

☒ Generate

Approximation Parameters:

Reference Water Content [kg/m³]: 18

Free Water Saturation [kg/m³]: 190

Water Absorption Coefficient [kg/m²√s]: 0.001667

No.	Water Content [kg/m³]	Dws [m²/s]
1	0	0
2	18	5.63E-13
3	190	2.93E-10

Normalized Water Content [-]

Liquid Transport Coefficient [m²/s]

Water Content [kg/m³]

OK Cancel Help

10. Enter A-value in [kg/m²√s]
in this case: $0.1 \text{ kg/m}^2\sqrt{\text{h}} / 60 = 0.001667 \text{ kg/m}^2\sqrt{\text{s}}$

Layer/Material Data

Layer/Material Name: Solid Brick Masonry - unlocked

Bulk density [kg/m³]: 1900

Porosity [m³/m³]: 0.24

Spec. Heat Capacity [J/kgK]: 850

Thermal Conductivity [W/mK]: 0.6

Water Vapour Diffusion Resistance Factor [-]: 10

Typical Built-In Moisture [kg/m³]: 100

Layer Thickness [m]: 0.01

Thermal Conductivity, Design Value [W/mK]:

Colour: Rot

Hygrothermal Functions | Material Information

Moisture Storage Function

Liquid Transport Coefficient, Suction

Liquid Transport Coefficient, Redistribution

Water Vapour Diffusion Resistance Factor, moisture-de...

Thermal Conductivity, moisture-dependent

Thermal Conductivity, temperature-dependent

☒ Generate

Approximation Parameters:

Reference Water Content [kg/m³]: 18

Free Water Saturation [kg/m³]: 190

Water Absorption Coefficient [kg/m²√s]: 0.001667

No.	Water Content [kg/m³]	Dww [m²/s]
1	0	0
2	18	5.63E-13
3	190	2.93E-11

Normalized Water Content [-]

Liquid Transport Coefficient [m²/s]

Water Content [kg/m³]

OK Cancel Help

12. Check
"Generate"

11. Select "Liquid Transport Coefficient, Redistribution"

Layer/Material Name: Solid Brick Masonry - unlocked

Bulk density [kg/m³]: 1900

Porosity [m³/m³]: 0.24

Spec. Heat Capacity [J/kgK]: 850

Thermal Conductivity [W/mK]: 0.6

Water Vapour Diffusion Resistance Factor [-]: 15

Typical Built-In Moisture [kg/m³]: 100

Layer Thickness [m]: 0.01

Thermal Conductivity, Design Value [W/mK]:

Colour: Rot

Hygrothermal Functions

- Moisture Storage Function
- Liquid Transport Coefficient, Suction
- Liquid Transport Coefficient, Redistribution
- Water Vapour Diffusion Resistance Factor, moisture-de...
- Thermal Conductivity, moisture-dependent
- Thermal Conductivity, temperature-dependent

☒ Generate

Approximation Parameters:

Reference Water Content [kg/m³]: 18

Free Water Saturation [kg/m³]: 190

Water Absorption Coefficient [kg/m²√s]: 0.001667

No.	Water Content [kg/m³]	Dww [m²/s]
1	0	0
2	18	5.63E-13
3	190	2.93E-11

Normalized Water Content [-]

Liquid Transport Coefficient [m²/s]

Water Content [kg/m³]

OK Cancel Help

**13. Increase “Water Vapour Diffusion Resistance Factor” by 50 % (on the safe side!)
in this case: from $\mu = 10$ to $\mu = 15$**