RIBuild

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Designing guidelines for robust internal insulation

Associate professor Søren Peter Bjarløv
Technical University of Denmark

What to expect?

RIBuild will in 2020 result in guidelines, which will help practitioners to determine, whether a building is suitable for internal insulation and which solution to choose.

The guidelines will be applicable to buildings in EU

Limitations

Geographical limit

- EU

Limits of buildings

- Only buildings before 1945
- Only heavy external walls made of stone, brick and timber framing (half timber)
- Only walls exposed to outdoor climate

User interface

The following slides is an example on how the user interface could be for such guidelines.

Building information will be put into the data base through a user interface by going through various steps regarding location, building type, facade condition and surface, materials etc.

User interface

- First the user have to fill in data about the existing building
- Secondly the user have to choose the interior insulation by clicking on the actual bottom:

User interface

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Country

Because of climate conditions and national building differences you must choose the country of your building

→ Click on one of the EU countries

Country

Denmark

Climate zone

Many countries have different climate zones.

→ Click on the actual climate zone

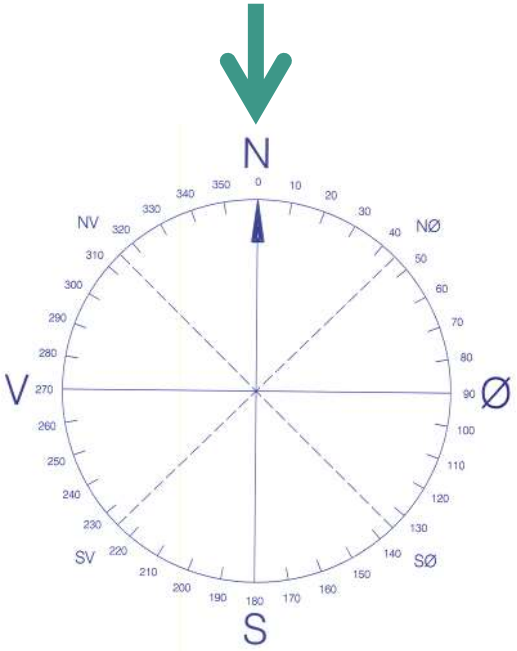
Climate zone

Climate zone 1

Orientation

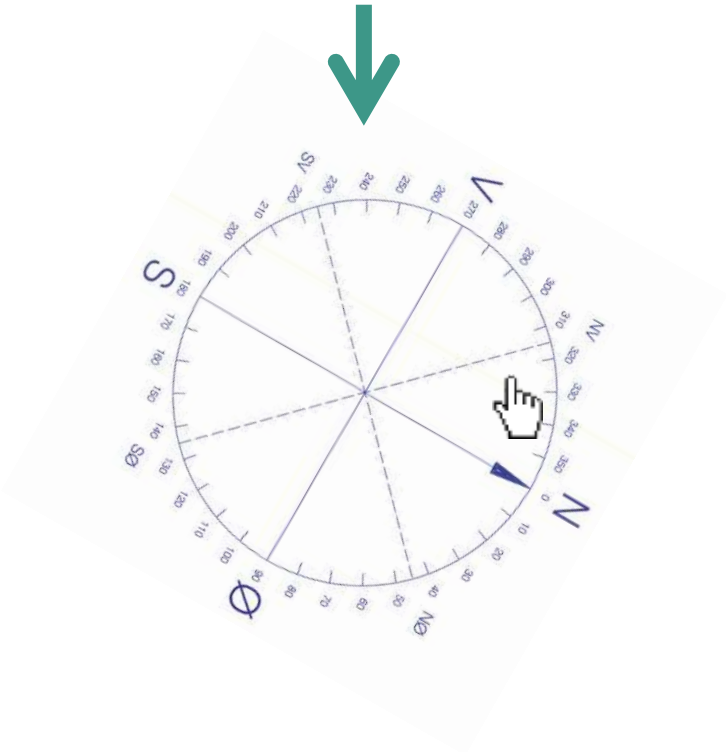
Wall orientation can have an impact on hygrothermal conditions. Every orientation is added/calculated individually.

→ Turn the compass to orientation of the wall in question



Orientation

The surface of the wall is facing 240° SW



Type of external walls

There are different external wall types dated before 1945. Ribuild deals with 3 main types

→ Click on type of wall

External walls made of bricks

External walls made of stone

External walls made of half timber

Type of building

External wall made of Brick

External walls made of bricks

External walls made of stone

External walls made of half timber

Floor slabs with wooden beams

Embedded wood in the construction can increases risks associated with of internal insulation, and must be considered.

→ State if the construction has a deck with wooden beams

Wooden beams

No wooden beams

Floor slabs with wooden beams

Wooden beams

Wooden beams

No wooden beams

Year of construction

The time period of construction can help classify the building and materials

→ Click on the period of construction

- Prior to 1856
- 1856-1889
- 1889-1945

Year of construction

1889-1945

- Prior to 1856
- 1856-1889
- 1889-1945

Façade condition

Condition of façade can be vital in regards to internal insulation. Make sure your façade is intact. If not, proper repairs must be made.

→ Click on relevant button. If you choose façade is damaged you will get repair tips before continuing process.

Façade is intact

Façade is damaged

Façade condition

Façade is intact

Façade is intact

Façade is damaged

Interior wall

Prior to internal insulation, interior walls must be stripped clean. Are your walls ready for internal insulation?

→ Click on relevant button. If your walls are not ready, you will get information on preperation before continuing.

Interior wall is ready for insulation

Interior wall is not ready

Interior wall

The wall is ready for insulation

Interior wall is ready for insulation

Interior wall is not ready

Exterior surface

The exterior surface of the building has influence on the hygrothermal properties of the wall

→ Click on type of surface


Exposed


Impregnated

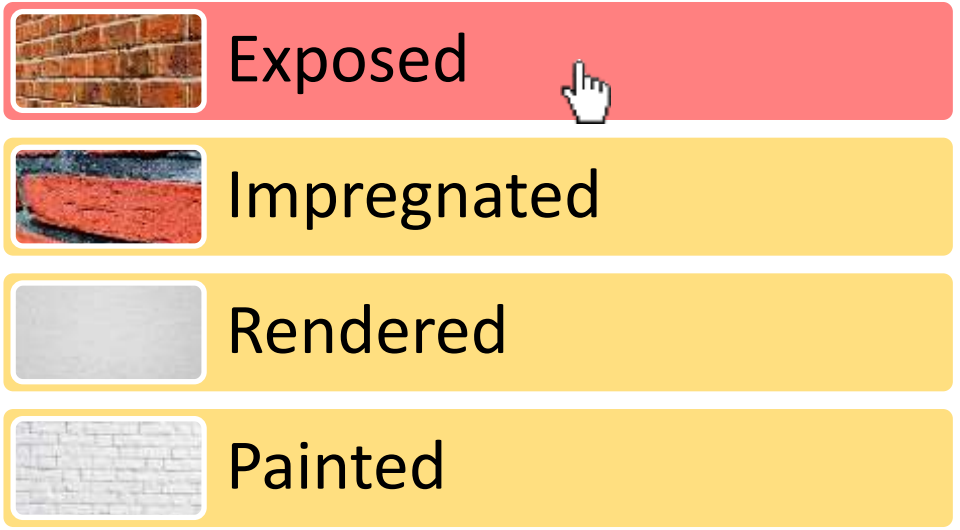

Painted


Render


Render with paint

Exterior surface

Exposed brick

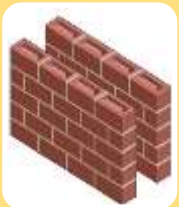


Wall construction

The type of wall construction is essential for insulation solution

→ Click on type of wall construction

Solid masonry



Cavity wall

Wall construction

Solid masonry

Solid masonry

Cavity wall

Thickness of wall

The thickness of the wall has e.g. influence on the moisture balance and the U-value of the final wall system.

→Press the bottom with the thickness closest to the wall you want to examine.

*If the wall has more than one thickness you have to go through each thickness of the wall separately

108mm	Thickness of wall is the length of ½ brick
228mm	Thickness of wall is the length of 1 brick
348mm	Thickness of wall is the length of 1½ bricks
480mm	Thickness of wall is the length of 2 bricks
588mm	Thickness of wall is the length of 2½ bricks
720mm	Thickness of wall is the length of 3 bricks
828mm	Thickness of wall is the length of 3½ bricks
912mm	Thickness of wall is the length of 4 bricks

Thickness of wall

The thickness of the wall is 1½ brick

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Surface, capillary suction

The capillary suction of the exterior surface determines the impact of external water sources, e.g. wind-driven rain. The capillary suction can be determined by Karsten tube (method can be found here: link)

→Type absorbed amount of water and wetted diameter obtained in 15 minutes for brick and joint

Bricks

Absorbed water [ml] 0.00

Wetted diameter [mm] 0.00

Joints

Absorbed water [ml] 0.00

Wetted diameter [mm] 0.00

OK SKIP

Surface, capillary suction

Bricks

Absorbed water [ml]	8
Wetted diameter [mm]	66

Joints

Absorbed water [ml]	10.5
Wetted diameter [mm]	67

OK SKIP

Materials

If more complete information about materials is given, more detailed calculations can be made. Otherwise the safety factor increases in the underlying calculation and the result could be a less optimal solution than necessary.

→If material information is available, click on detailed calculation

Solution with higher safety factor

Detailed calculation

Materials

Material information is available

Solution with higher safety factor

Detailed calculation

Materials

Material properties for either brick or mortar

→Select material for which information is available

Brick

Mortar

Materials

More information about brick is known

Brick

Mortar

Materials

Bricks

Density (method)	0.00	$\frac{kg}{m^3}$
Specific heat capacity (method)	0.00	$\frac{J}{kg \cdot K}$
Open porosity (method)	0.00	$\frac{m^3}{m^3}$
Thermal conductivity (method)	0.00	$\frac{W}{m \cdot K}$
Capillary suction (method)	0.00	$\frac{kg}{m^2 \cdot s^{½}}$
Water vapour diffusion resistance factor (method)	0.00	

OK

Materials

Bricks

Density (method)	:	1885	$\frac{kg}{m^3}$
Specific heat capacity (method)	:	850	$\frac{J}{kg \cdot K}$
Open porosity (method)	:	0.28	$\frac{m^3}{m^3}$
Thermal conductivity (method)	:	0.80	$\frac{W}{m \cdot K}$
Capillary suction (method)	:	0.20	$\frac{kg}{m^2 \cdot s^{½}}$
Water vapour diffusion resistance factor (method)	:	24	

OK

Wall conditions

Existing moisture conditions in the wall effect the hygrothermal response of internal insulation

→ Type in the moisture content in the three measuring areas

Method for determination found here: link

Under ground floor window	Between windows (height~1.5-2m)	Under roof
		
0.00 %	0.00 %	0.00 %

OK

Wall conditions

Moisture content in the walls can be determined by drillings out core samples and sending samples to laboratory for testing of moisture content (weighing-drying method is sufficient).

- Use a Ø10mm and 10cm long drill
- Collect as much powder as possible in sealed test tube
- Send sample to laboratory

Back

Wall conditions

Insert values

7.11 % under window
5.68 % between windows
2.16 % under roof

Summary of input for existing wall

You have entered the following information:

Country	:	Denmark
Climate zone	:	1
Orientation	:	240° SW
Building	:	Brick
Solid/cavity	:	Solid
Surface	:	Exposed
Thickness	:	348 mm
Exterior surface	:	OK
Interior surface	:	OK

Material parameters	Brick	Mortar
Density[$\frac{kg}{m^3}$]	1885	1570
Specific heat capacity [$\frac{J}{kg \cdot K}$]	850	1000
Open porosity [$\frac{m^3}{m^3}$]	0.28	0.40
Thermal conductivity [$\frac{W}{m \cdot K}$]	0.8	0.70
Capillary suction [$\frac{kg}{m^2 \cdot s^{½}}$]	0.2	0.18
Water vapour diffusion resistance [-]	24	11

Location	Moisture content [%]
Under window	7.11
Between windows	5.68
Under roof	2.16

Back

Continue to choice of interior insulation

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Location	Moisture content [%]
Under window	7.11
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Under roof	2.16

Back

Continue to choice of interior insulation

Choice of interior insulation

All solutions should be fully adhered to the wall according to manufacturers specifications

→ Select insulation material

Material	Manufacturer	Product	Thermal conductivity [W/mK]	Max insulation thickness [mm]	U-value for wall system [W/m²K]
Calcium silicate	Skamol	SkamoPlus+	0.062	75	0.551
	Introflex	SLP CS	0.0727	90	0.542
	MicroTherm	Indeklimaplader	0.067	80	0.547
AAC	Nuh	Eko-blok G2 +.35	0.10	130	0.519
	Vuong Hai Corporation	Vuong Hai AAC Block	0.12	165	0.500
	Xella	Ytong Multipor	0.042	50	0.566
PUR/PIR	Introflex	IQ-therm	0.031	35	0.574
	Kingpan	Kooltherm K17	0.024	25	0.579
	Recitel	Powerwall	0.024	25	0.579
VIP	Kingspan	Optim-R	0.007	8	0.591
	Porextherm	Vacupor	0.0048	5	0.593
	MicroTherm	SlimVac	0.0042	4	0.593

Choice of interior insulation

Introflex Calcium silicate boards

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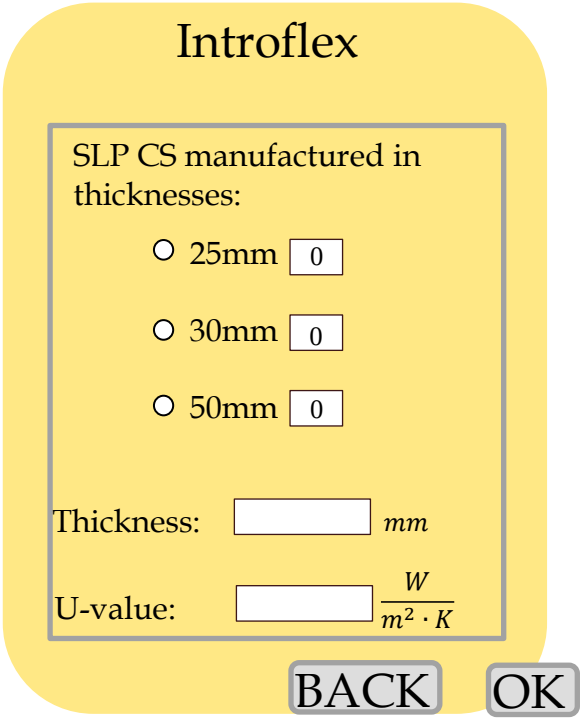
Results: Interior insulation

Introflex Calcium silicate boards

Enter number of each board

The total thickness should not exceed the max thickness specified on previous page.



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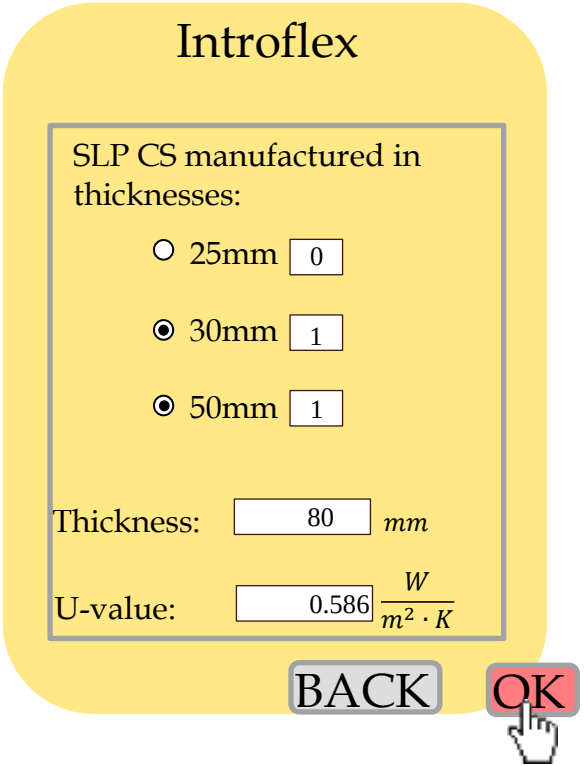

Results: Interior insulation

→Name the wall

You can add more walls by altering typed information accordingly while running though the interface again.

Internally insulated wall(s)

Wall	Area [m^2]	Existing wall thickness [mm]	U-value before insulation [W/m^2K]	Product	Insulation thickness [mm]	U-value after insulation [W/m^2K]	Heat loss reduction [kWh/yr]	Annual CO_2 reduction [kg]	CO_2 From produc-tion of added materials [kg]
SW1	84	350	1.646	SLP CS	80	0.586	267	46	168
						Total	267	46	168

BACK ADD WALL

Results: Interior insulation

→Name the wall

You can add more walls by altering typed information accordingly while running though the interface again.

Internally insulated wall(s)

Wall	Area [m²]	Existing wall thickness [mm]	U-value before insulation [W/m²K]	Product	Insulation thickness [mm]	U-value after insulation [W/m²K]	Heat loss reduction [kWh/yr]	Annual CO_2 reduction [kg]	CO_2 From production of added materials [kg]
SW1	84	350	1.646	SLP CS	80	0.586	267	46	168
SW2	20	108	3.279	SLP CS	25	1.541	104	18	40
NE1	84	350	1.646	SLP CS	80	0.586	267	46	168
NE2	20	108	3.279	SLP CS	25	1.541	104	18	40
						Total	**742**	**128**	**416**

BACK ADD WALL