04.04_PH-SUMMER SCHOOL

SOLID CONSTRUCTIONS

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CONTENT OF THIS PRESENTATION:

What are massive / solid constructions?

Types

Types of solid construction systems

- Single layer wall (+ plaster)
- Multi layer wall (+ plaster)

  - Exterior thermal insulation, interior structure
  - Exterior structure, interior thermal insulation
  - Exterior structure, core thermal insulation, interior structure
  - Exterior thermal insulation, core structure, interior thermal insulation

Source:

PH-details

Passive House construction details for massive/solid constructions.

Much of them are from “Details for Passive House, A catalogue of Ecologically Rated Constructions” from IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007, a „Building of Tomorrow“- project supported by the Austrian Federal Ministry for Transport, Innovation and Technology.

Source:

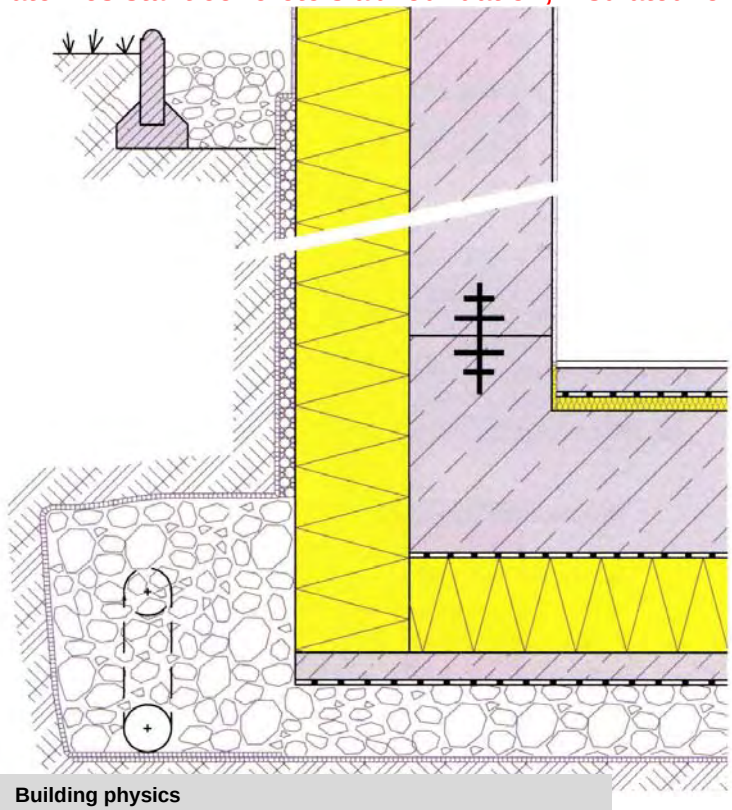
PH-details: Foundation / Outside wall

Foundation / Outside wall

Source:

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS (External thermal insulation compound system) / Water resistant concrete slab foundation, insulated lower side



Building physics

linear thermal bridge coefficient ψ	-0.040 W/mK

Technical description

Suitability
- For heated rooms with floors below ground level.
- If the floor slab is at least 1 m below ground level (deeper-reaching vertical thermal insulation along strip foundation is necessary otherwise).
- For floors with adequate load-bearing capabilities that make strip foundations unnecessary.
- For building loads that can be transferred via a thermal insulation layer.
- For any type of ground (also rock and binding loamy grounds).

Construction process
- The drainage pipes should be laid below the lower edge of the floor slab, but above the upper edge of the natural ground.
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.

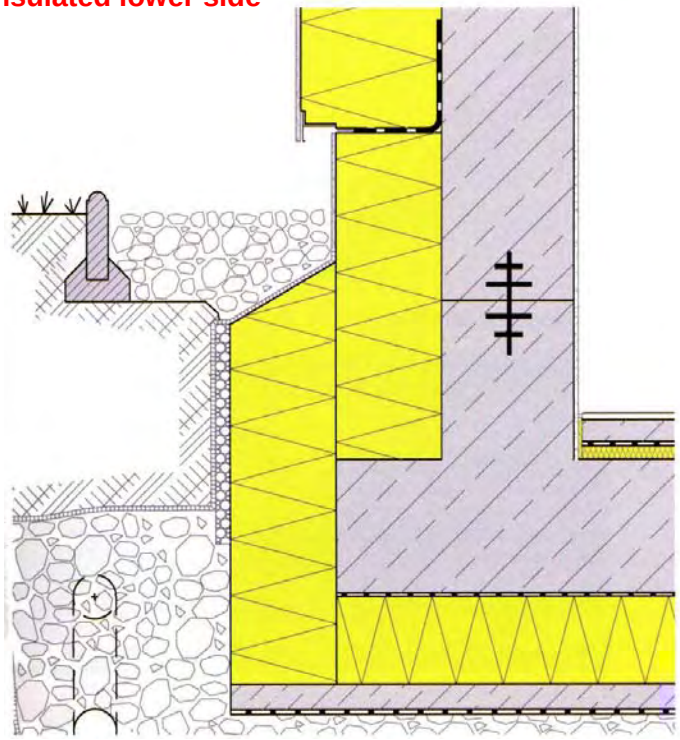
Maintenance
- Clean the drainage system regularly (if one exists)

Structural discussion
- The combination of a water resistant concrete floor slab and a rising wall with a bituminous seal is technically possible, but not recom-mendable: the connection of the bitumen layer with the water resist-ant concrete is a weak spot
- Impervious to damage where water resistant concrete and seal be-tween slab and external wall in contact with ground are made carefully. It is generally easy to find and repair leaks.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS / Water resistant concrete slab foundation, insulated lower side



Building physics

linear thermal bridge coefficient ψ	0.013 W/mK

Technical description

Suitability
- For heated rooms with floors below ground level.
- Where the floor slab is at least 1 m below ground level (deeper-reaching vertical thermal insulation along strip foundations is necessary otherwise).
- For grounds with lower load-bearing capabilities that do not require strip foundations, but require load distribution over a larger surface.
- For building loads that can be transferred via a thermal insulation layer.
- For any type of ground (also rock and binding loamy grounds).

Construction process
- The drainage pipes should be laid below the lower edge of the floor slab, but above the upper edge of the natural ground.
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insu-lation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.
- The combination of a water resistant concrete floor slab and a rising wall with a bituminous seal is technically possible, but not recom-mendable: the connection of the Bitumen layer with the water resist-ant concrete is a weak spot.

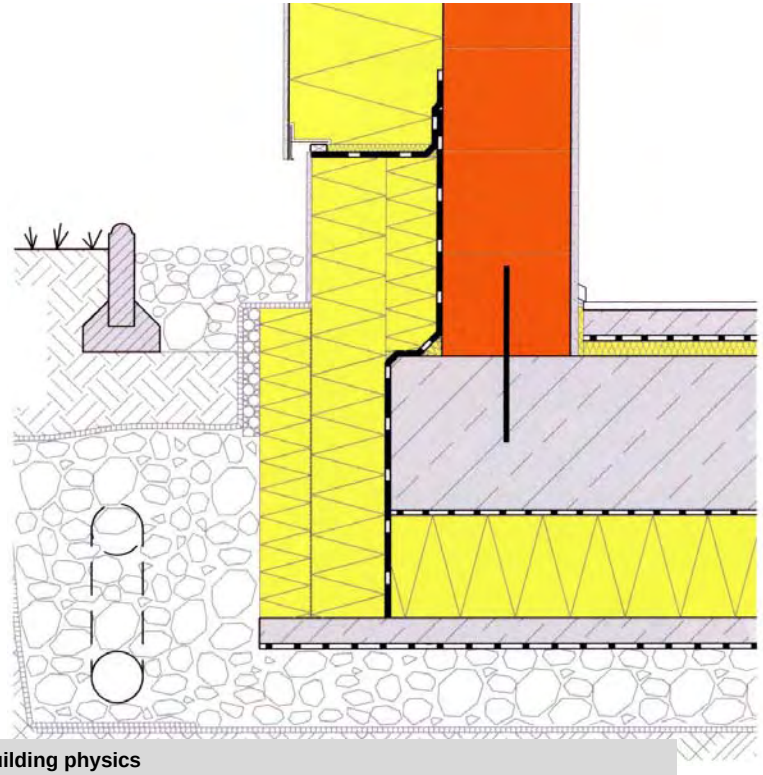
Maintenance
- Clean the drainage system regularly (if one exists)

Structural discussion
- Impervious to damage where water resistant concrete and seal be-tween slab and external wall in contact with ground are male careful-ly. It is generally easy to find and repair leaks.
- The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising Walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS /
Water resistant concrete slab foundation, insulated lower side



Building physics

linear thermal bridge coefficient ψ
- wall in contact with the ground: 26 cm XPS -0.033 W/mK

Technical description

Suitability
- For heated rooms with floors below ground level.
- Where the floor slab is at least 1 m below ground level (deeper-reaching vertical thermal insulation along strip foundations is necessary otherwise).
- For high point loads that do not allow for thermal insulation above the floor slab and directly below the floor surface structure.
- For buildings without strip foundations
- For any type of ground (also rock and binding loamy grounds).
- Only for floors with open-diffusion flooring materials.

Construction process
- The drainage pipes should be laid below the lower edge of the floor slab, but above the upper edge of the natura) ground
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insu-lation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal

Maintenance
- Clean the drainage system regularly.

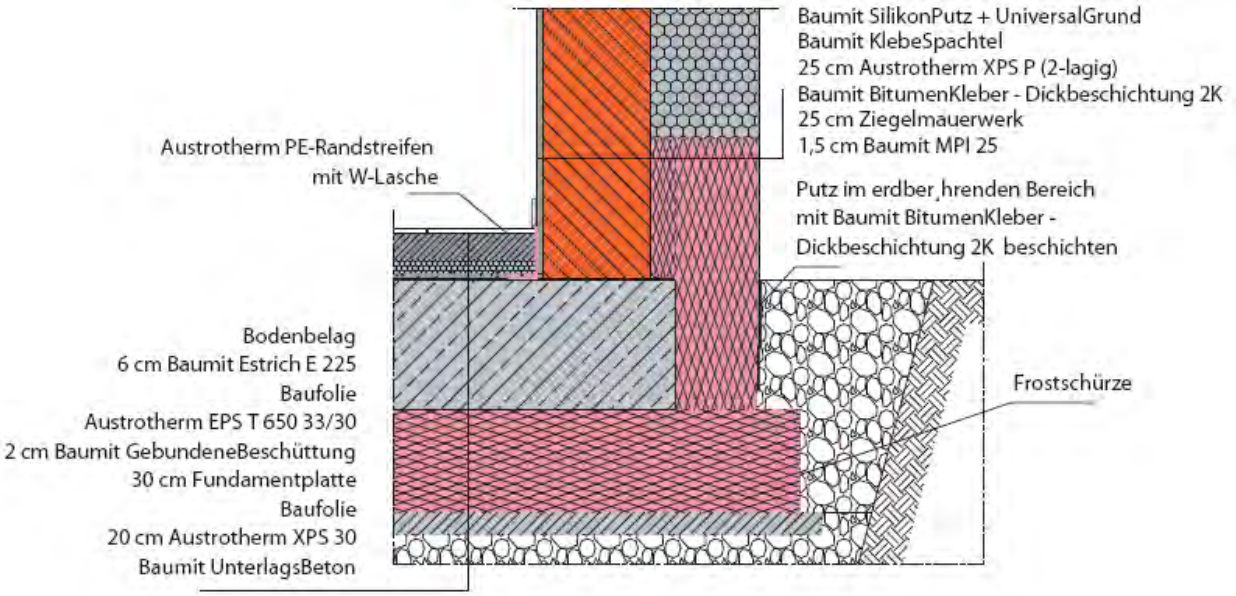
Structural discussion
- The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS /

Water resistant concrete slab foundation, insulated lower side

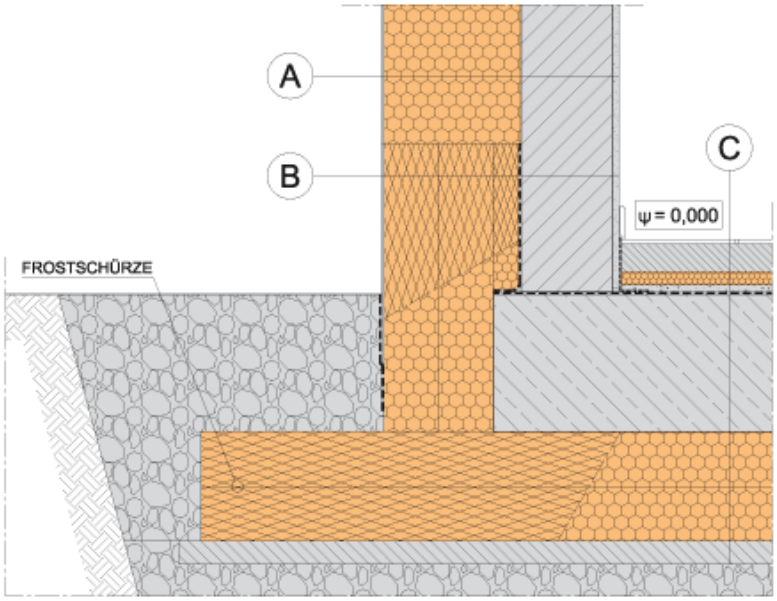


Source: http://www.austrotherm.com/imperia/md/content/baumitat2/deutsch/ratundtatgeber/neh_folder.pdf

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS /
Concrete slab foundation, insulated lower side

Ground floor without basement



*) Bei CO2 geschäumten XPS ist der Lambda-Nennwert gemäss Herstellerangaben zu beachten

Systemdetails für Passivhäuser M = 1:10 Ausgabe 2004

A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,017
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,121**

B	Wall base

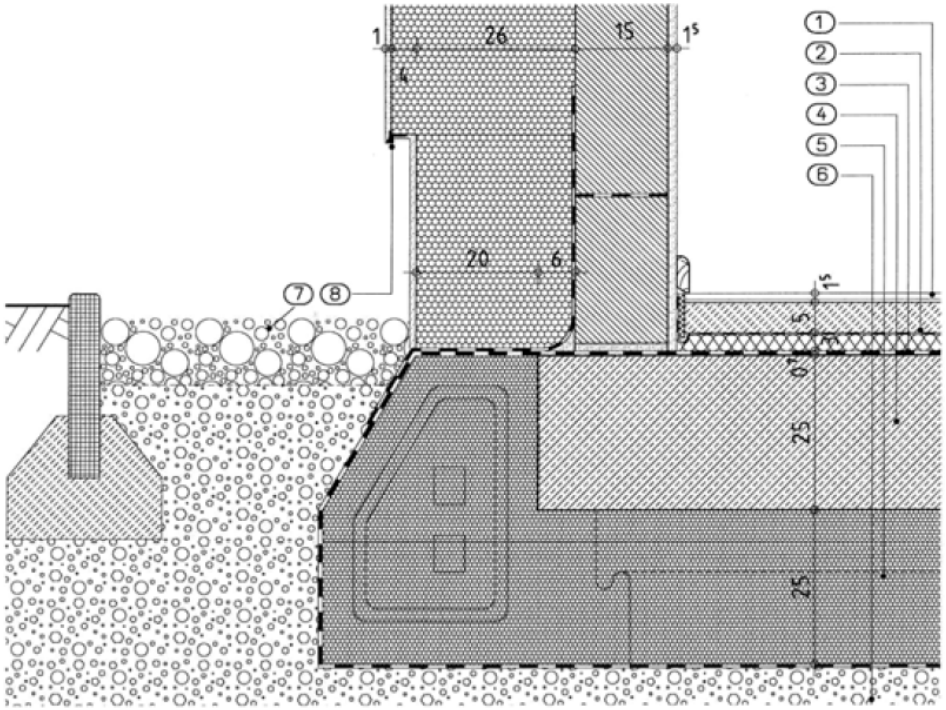
C	Floor construction		Lambda	Rt-value
1	1,0	Flooring		
2	6,0	Floating screed	1,400	0,043
3		Interlyer (vapour barrier)		
4	3,0	Sound insulation EPS-T 650 33/30	0,044	0,682
5	2,0	Equalising filling	0,700	0,029
6	30,0	Foundation slab	2,100	0,143
7		Construction foil as interlayer		
8	24,0	Heat insulation XPS-G or EPS-P	0,035	6,857
9		Granular subbase		
		sum thermal resistances		**7,754**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,126**

Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS /

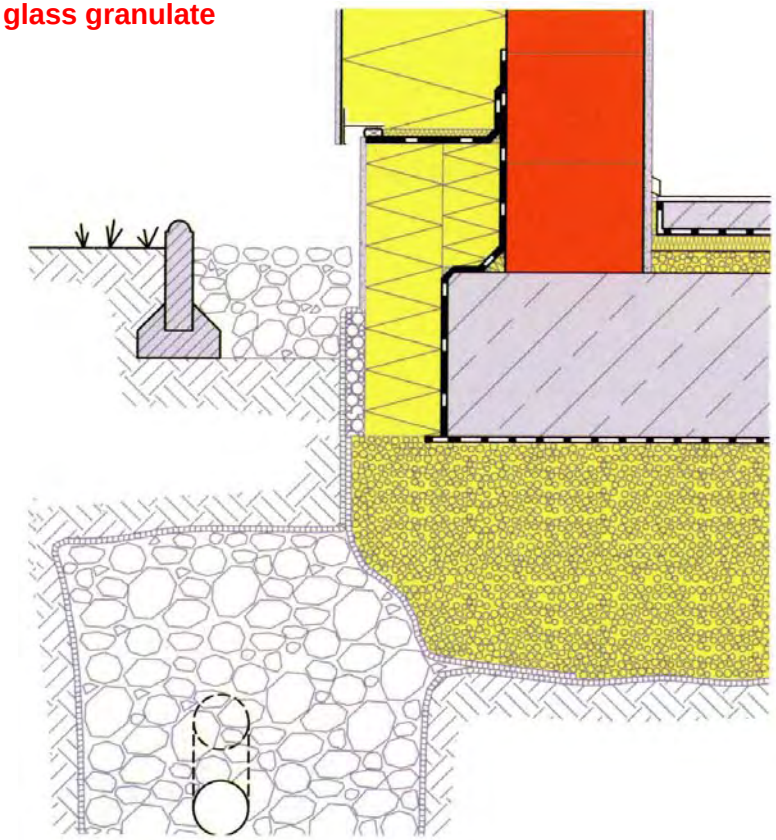
Concrete slab foundation, insulated lower side



Source: www.wolf-thermomodule.de/media/files/Download/Flyer.pdf

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS / Water resistant concrete slab foundation on foamed glass granulate



Technical description

Suitability
- For heated rooms without basements, with floors above ground level.

Construction process
- The drainage pipes (if necessary) should be laid above the foundation level.
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.
- The insulating apron in the perimeter area should extend approx. 1 meter below the ground surface.

Maintenance
- Clean drainage System regularly (if included in the structure).

Structural discussion
- The moisture resistant structure of the floor slab prevents capillary moisture build up.
- Impervious to damage where water resistant concrete is made carefully. It is generally easy to find and repair leaks.
- The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!).

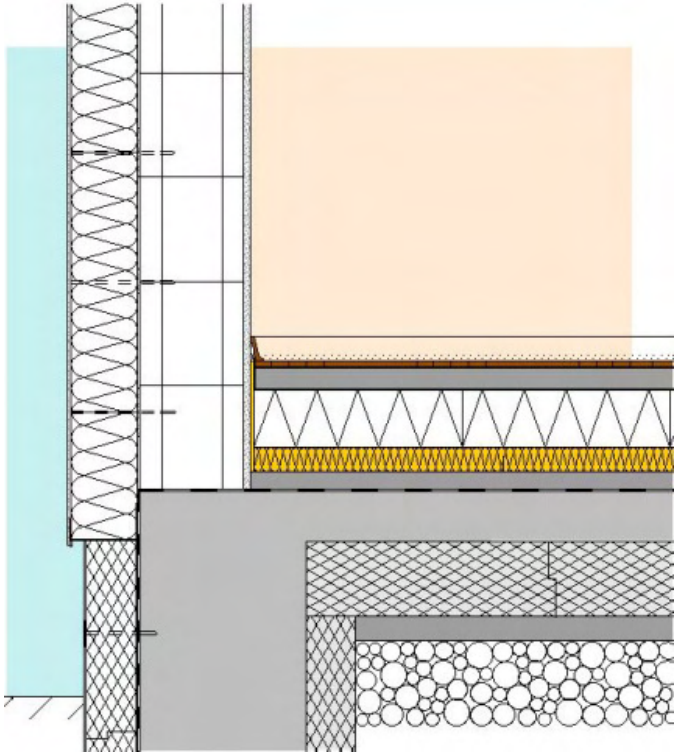
Building physics

linear thermal bridge coefficient ψ	-0.017 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS /
Foundation slab, insulated lower and upper side, wet floating screed



Floating screed above ground

cm	Composition
1,5	Parquet
-	Floating layer
5,0	Cement screed
-	Vapour barrier
14,0	EPS-W 20 (expanded polystyrene)
5,5	Impact sound insulation board 55
4,0	Protective concrete separation layer
0,5	Non-porous membrane
12,0	Sub-concrete
-	Separating layer
18,0	Extruded Polystyrene
	Protective concrete
	Round gravel

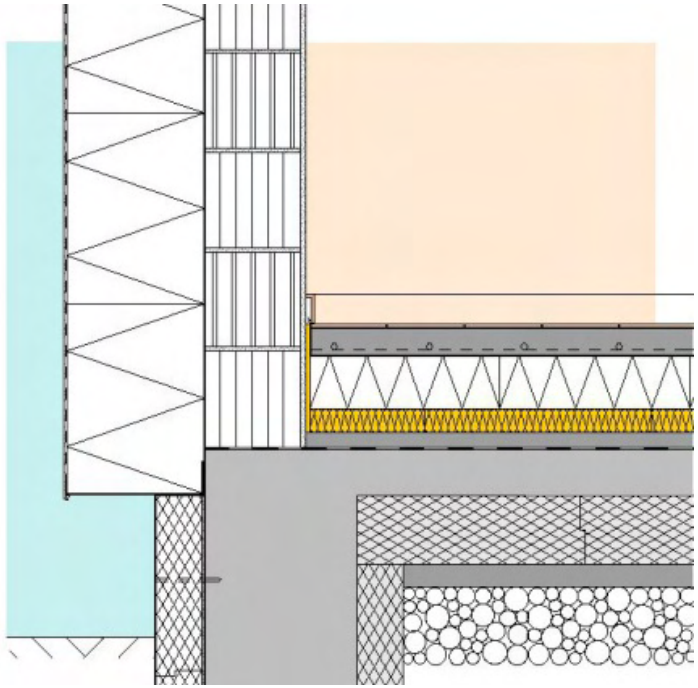
U = 0,10 W/m²K
Rw ≥ 63 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 11:30)

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS /
Foundation slab, insulated lower and upper side, wet floating heating screed



Floating heating screed above ground

cm	Composition
0,8	Tiles
0,3	Tiles cement
-	Stopper sealing
7,0	Cement screed with heating elements
-	Vapour barrier
14,0	EPS-W 20 (expanded polystyrene)
6,0	Impact sound insulation board 60
-	Separating layer
4,0	Protective concrete separation layer
0,5	Non-porous membrane
12,0	Sub-concrete
-	Separating layer
18,0	Extruded Polystyrene
-	Protective concrete
-	Round gravel

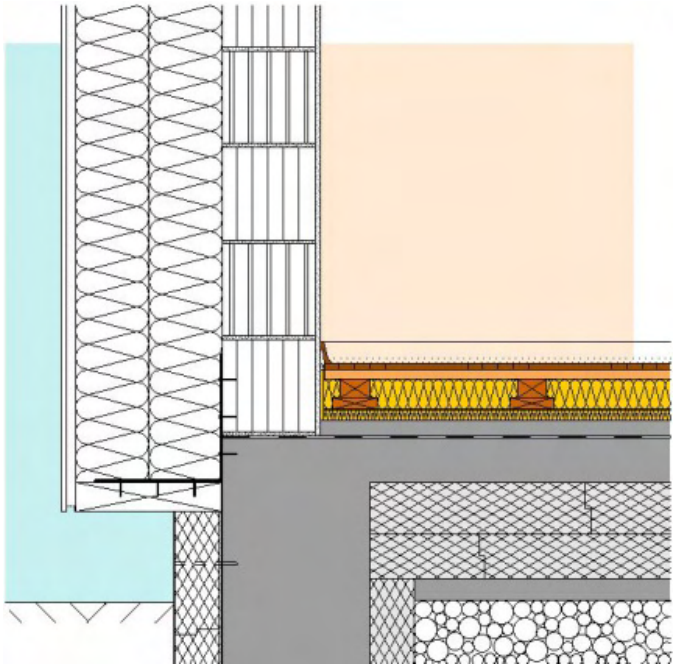
U = 0,10 W/m²K
Rw ≥ 63 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 11:30)

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS /
Foundation slab, insulated lower and upper side, dry floating screed



Wood floor above ground

cm	Composition
1,5	Parquet
2,5	Timber floor
-	Vapour barrier
8,0	Lightweight glass wool between wooden rafters 5/8 cm
-	Separation layer
3,0	Impact sound insulation board 30
4,0	Protective concrete
-	Separating layer
0,5	Non-porous membrane
12,0	Sub-concrete
-	Separating layer
14,0	Extruded Polystyrene
12,0	Extruded Polystyrene
-	Protective concrete
-	Round gravel

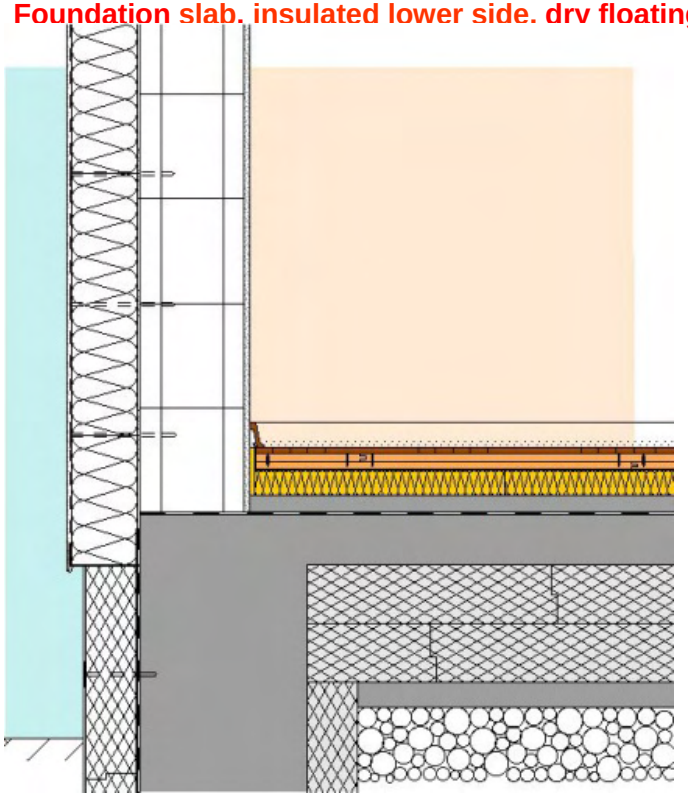
U = 0,10 W/m²K
Rw ≥ 56 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 11:30)

PH-details: Foundation / Outside wall

Honeycomb brick outside wall, ETICS /
Foundation slab, insulated lower side, dry floating screed



Chipboard and dry screed, above ground

cm	Composition
1,5	Parquet floating layer
3,8	Chipboard (V 100) layer (2 x 19 mm)
-	Vapour barrier
6,0	Impact sound insulation board 60
-	Separating layer
4,0	Protective concrete
-	Separation layer
0,5	Non-porous membrane
12,0	Sub-concrete
-	Separation layer
14,0	Extruded Polystyrene
14,0	Extruded Polystyrene
	Protective concrete
	Round gravel

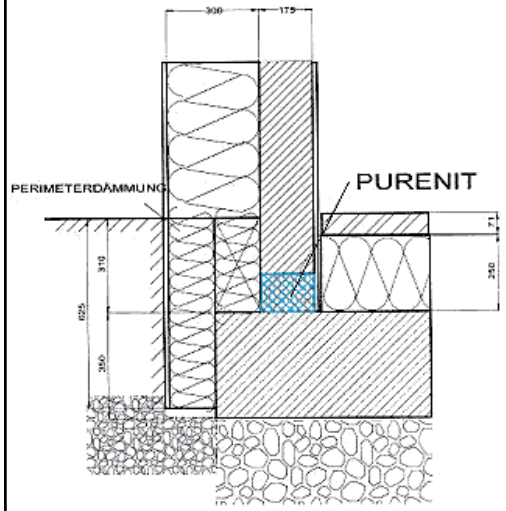
U = 0,10 W/m²K
Rw ≥ 60 dB

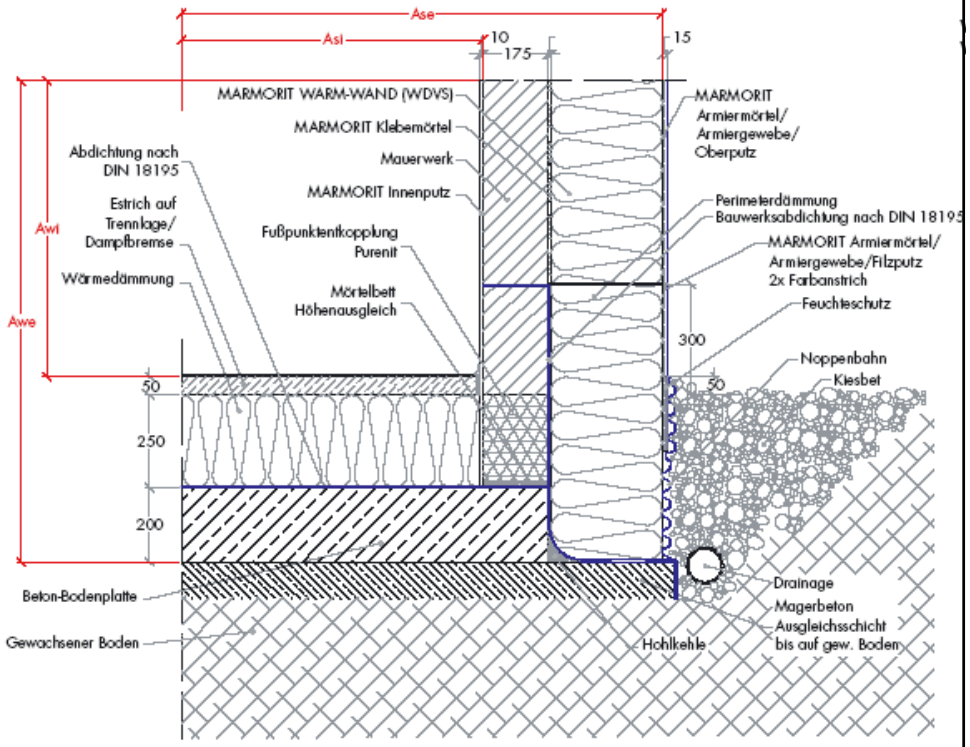
Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 11:30)

PH-details: Foundation / Outside wall

Outside Brick wall on „Thermo foot“, ETICS /
Slab foundation, insulated upper side, wet screed

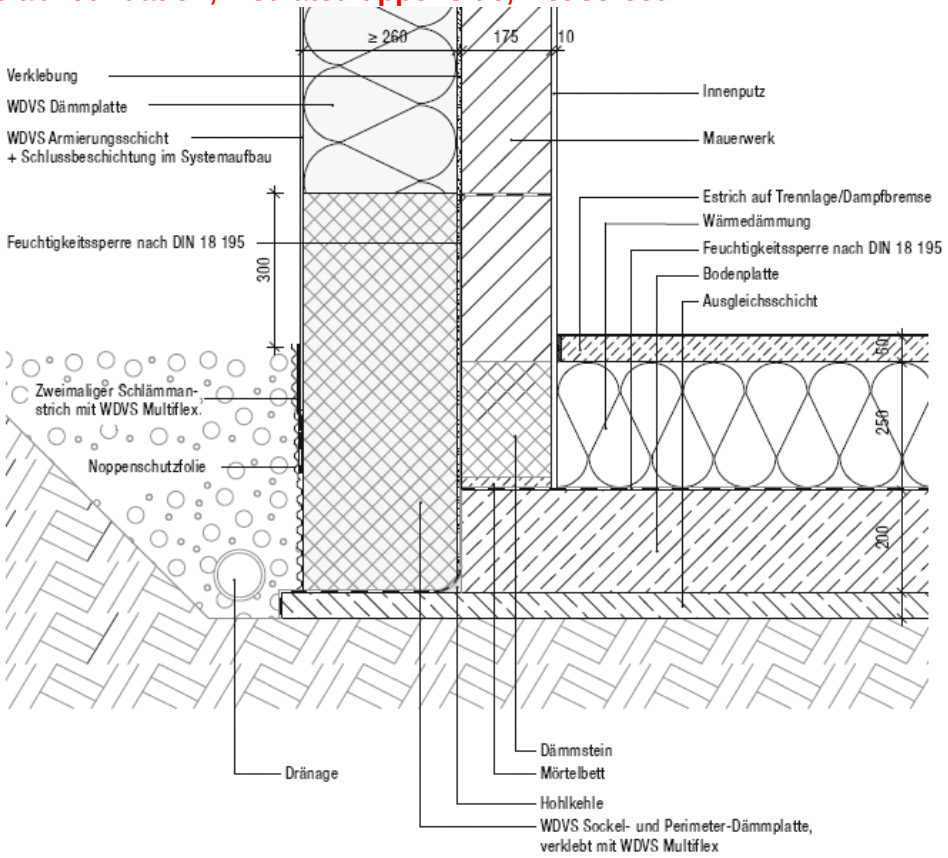




Source: www.baunetz.de/sixcms_4/sixcms/detail.php?id=57181&area_id=1170

PH-details: Foundation / Outside wall

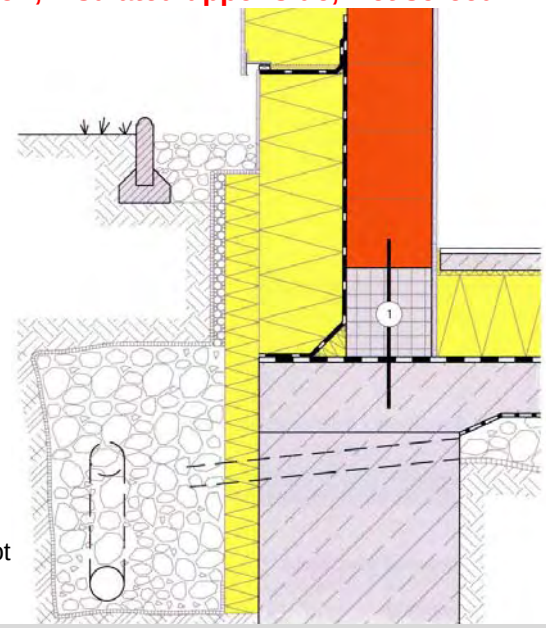
Outside brick wall on „Thermo foot“, ETICS /
Slab foundation, insulated upper side, wet screed



Source: Brillux Passivhausdetail 0.1.3

PH-details: Foundation / Outside wall

Outside brick wall on „Thermo foot“, ETICS / Slab foundation, insulated upper side, wet screed



1 worm foot

Building physics	linear thermal bridge coefficient ψ	
	Lime cement plaster λ=0.8 W/mK	**Insulating plaster λ=0.14 W/mK**
Warm foot		
λ=0.10 W/mK	-0.032 W/mK	-0.046 W/mK
λ=0.14 W/mK	-0.021 W/mK	-0.034 W/mK
λ=0.20 W/mK	-0.008 W/mK	-0.019 W/mK
λ=0.30 W/mK	0.010 W/mK	0.000 W/mK

Technical description

Suitability
- For heated rooms with floors below ground level.
- For buildings with strip foundations.
- If interior thermal insulation is asked for.
- Only in the case of ground with low thermal conductivity (e.g. gravel).

Construction process
- The drainage pipes should laid below the moisture seal, but above the foundation level in all areas
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.

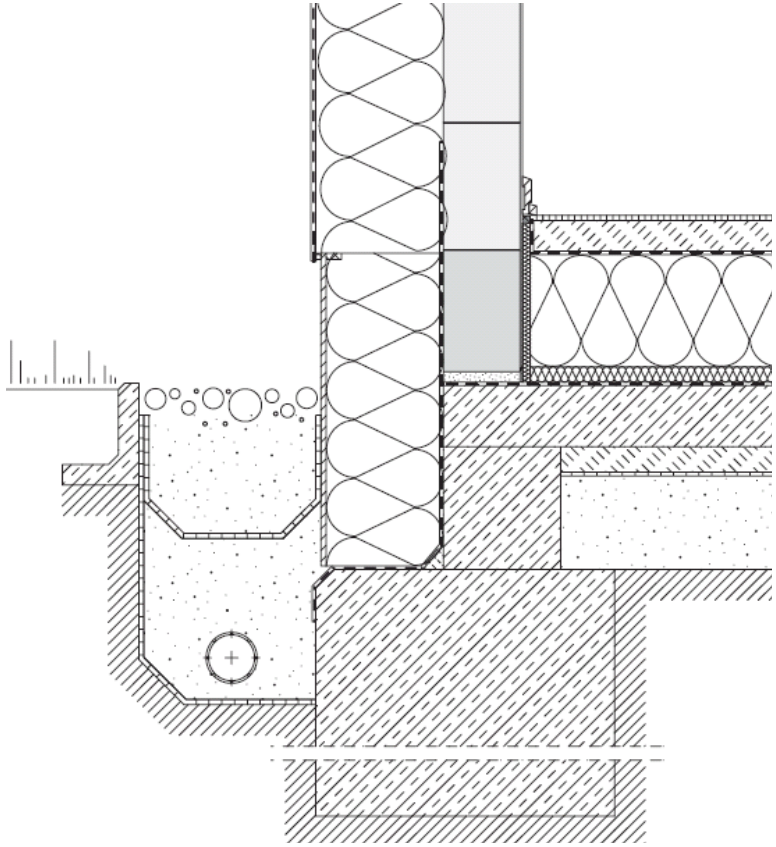
Maintenance
- Clean drainage System regularly.

Structural discussion
- Requires especially careful work an the moisture seals. Locating and repairing moisture seal damage is generally difficult and complex.
- The real between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)
- Placing Parts of the thermal insulation beneath the foundation slab increases moisture safety considerably.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

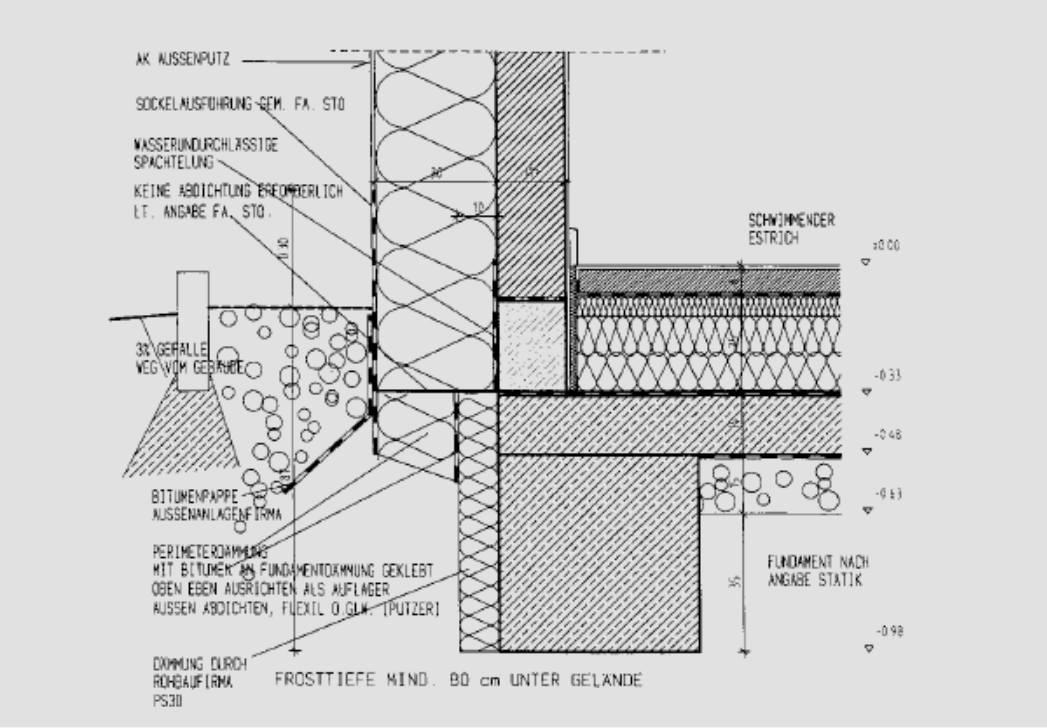
Outside brick wall on „Thermo foot“, ETICS /
Slab foundation, insulated upper side, wet screed



Source: Kalksandsteindetailsammlung, Detail 2.7.2.21, www.xella.de

PH-details: Foundation / Outside wall

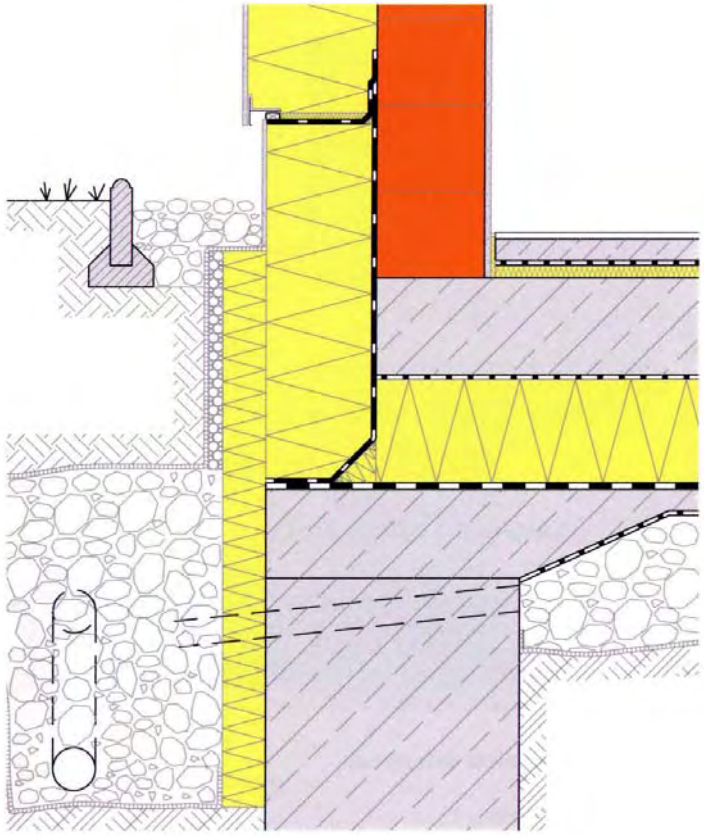
Outside brick wall on „Thermo foot“, ETICS /
Slab foundation, insulated upper side, wet screed



Source: www.xella.de/downloads/deu/broschures/Passivhaus_SILKA.pdf

PH-details: Foundation / Outside wall

Outside brick wall, ETICS /
Slab foundation, insulated lower side, wet screed



Technical description

Suitability
•For heated rooms with floors below ground level.
•For buildings with strip foundations.
•For building loads that can be transferred via a thermal insulation layer
•For any type of ground (also rock and binding loamy grounds).

Construction process
•The drainage pipes should laid below the moisture seal, but above the foundation level in all areas
•Use washed drainage gravel (without fines).
•Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
•Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.

Maintenance
•Clean drainage System regularly.

Structural discussion
• Advantage: completely free of thermal bridges.
• Disadvantage: requires especially careful moisture seal application. Locating and repairing moisture seal damage is generally difficult and complicated.
• The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

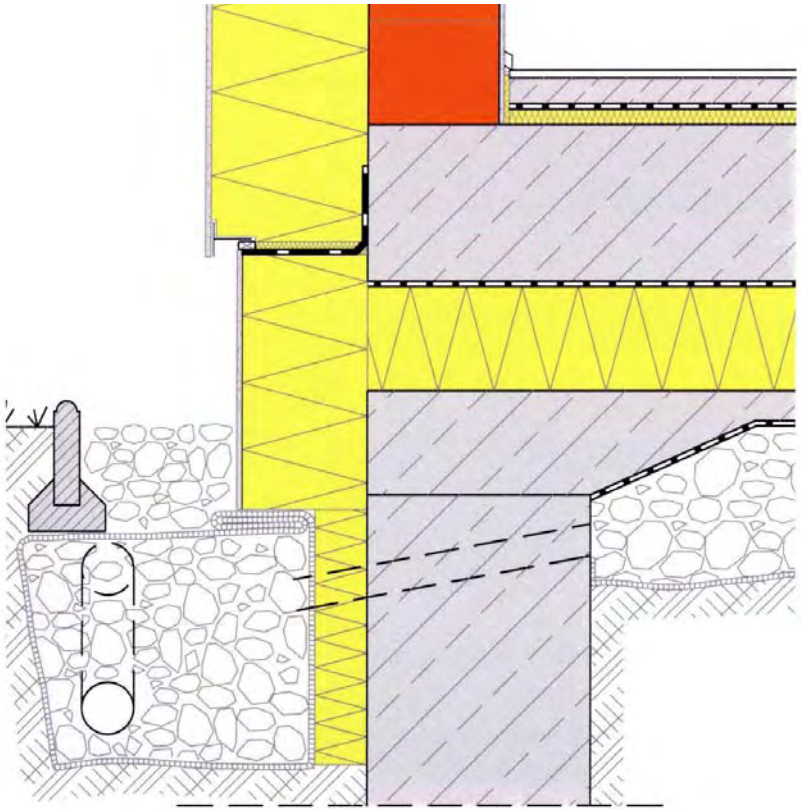
Building physics

linear thermal bridge coefficient ψ
- wall in contact with the ground> 24 cm XPS -0.028 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Outside brick wall, ETICS /
Water resistant concrete slab foundation, insulated lower side (*strip foundation)



Technical description

Suitability
•For heated rooms with floors below ground level.
•For any type of ground (also rock and binding loamy grounds).
•Only for floors with open-diffusion flooring materials.

Construction process
•The drainage pipes should laid below the moisture seal, but above the foundation level in all areas
•Use washed drainage gravel (without fines).
•Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
•Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.
•Strip foundations are required for load-bearing purposes and for the in-sulation layers that reach down approx. 1.5 meters.

Maintenance
•Clean drainage System regularly (if included in the structure).

Structural discussion
• The moisture resistant structure of the floor slab prevents capillary moisture build up.
• Impervious to damage where water resistant concrete is made carefully. It is generally easy to find and repair leaks.
• The seal between the upper edge of the Base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

Building physics

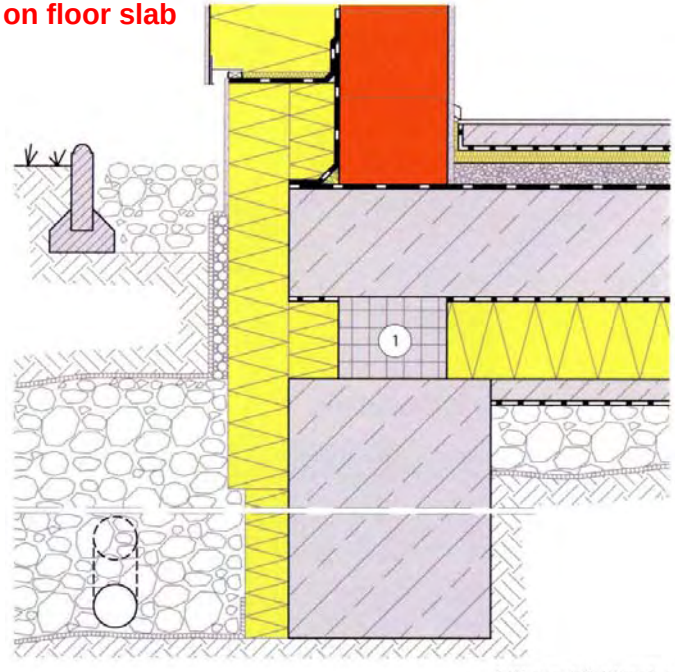
linear thermal bridge coefficient ψ	-0.053 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Outside brick wall, ETICS /

Slab foundation on „Thermo foot“, insulated lower side, sealed on floor slab



Building physics	linear thermal bridge coefficient ψ
Warm foot	
λ=0.10 W/mK	0.003 W/mK
λ=0.14 W/mK	0.012 W/mK
λ=0.20 W/mK	0.024 W/mK
λ=0.30 W/mK	0.038 W/mK

Technical description

Suitability

•For floors/floor slabs that are above or slightly below the level of the adjoining ground.
•For ground conditions that require strip foundations.
•For on-site production.
•For any type of ground (also rock and binding loamy grounds).

Construction process

•Drainage pipes should be laid higher than the foundation level.
•Use washed drainage gravel (without fines).
•Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
•Cover the joint an the front edge of the horizontal seal between the perimeter insulation and the exterior insulation of the rising wall with a long-lasting elastic seal
•Be careful to avoid ruptures and other leaks in the sealing layer since post-construction repairs are difficult and complex.
•The diffusion characteristics of ground layer, seals and foils should be adapted to one another in a way that ensures that moisture accumulation in the thermal insulation will be as low as possible
•The lightweight expandable clay concrete blocks inserted between the strip foundations and floor slab to minimize thermal bridges should be di-mensioned to provide the respective compression-resistance and thermal bridge-prevention requirements
•The decrease in insulating effect over time due to diffusion moisture accumulation and possible condensation should be taken into consider-ation when determining the thickness of the thermal insulation layer.
•A solid "massive" bed joint should be laid under the first brick layer to be able to connect the flow-sealed interior plaster layer to the moisture seal.

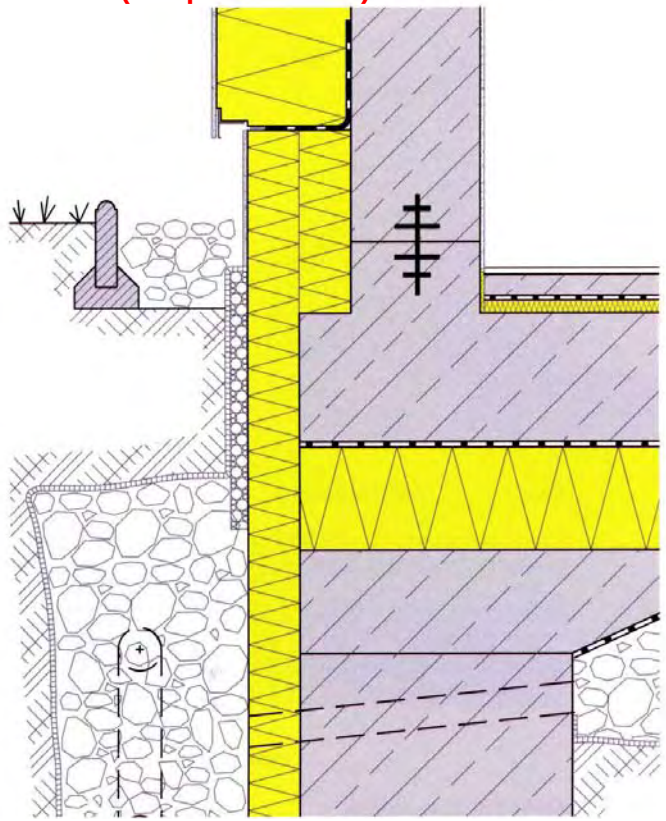
Maintenance

•Clean drainage System regularly.
•The joint between the Base and perimeter thermal insulation and the ther-mal insulation of the outer wall should be inspected for seal damage, any open areas should be closed.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS / Water resistant concrete slab foundation, insulation lower side (*strip foundation)



Technical description

Suitability
- For heated rooms with floors below ground level.
- For buildings with strip foundations.
- For any type of ground (also rock and binding loamy grounds).

Construction process
- The drainage pipes should be laid below the lower edge of the thermal insulation, but above the foundation level in all areas.
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic sea
- The combination of a water resistant concrete floor slab and a rising wall with a bituminous seal is technically possible, but not recom-mendable: the connection of the bitumen layer with the water resist-ant concrete is a weak spot.

Maintenance
- Clean drainage System regularly.

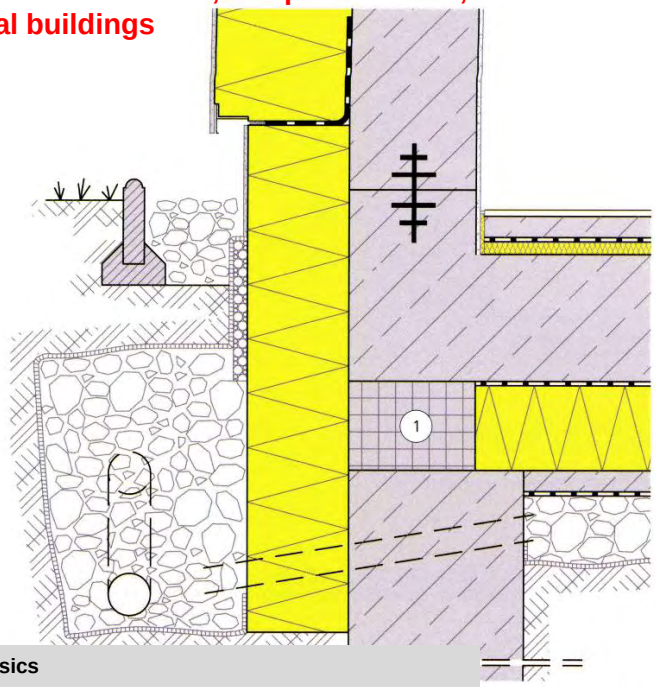
Structural discussion
- Impervious to damage where water resistant concrete and seal between slab and external wall in contact with ground are made carefully. It is generally easy to find and repair leaks.
- The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising Walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

Building physics	
linear thermal bridge coefficient ψ	-0.007 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Reinforced concrete outside wall, ETICS / Water resistant concrete, *strip foundation, for multi-storey residential buildings



Warmer Fuß / Warm foot

Building physics

linear thermal bridge coefficient ψ

Warm foot

λ=0.10 W/mK	-0.007 W/mK
λ=0.14 W/mK	0.010 W/mK
λ=0.20 W/mK	0.033 W/mK
λ=0.30 W/mK	0.063 W/mK

Technical description

Suitability

- For heated rooms with floors below ground level.
- For buildings with strip foundations.
- For building loads that cannot be transferred via an intermediate ther-mal insulation layer into the foundation.
- For any type of ground (also rock and binding loamy grounds).

Construction process

- The drainage pipes should be laid below the lower edge of the thermal insulation, but above the foundation level in all areas.
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.
- The combination of a water resistant concrete floor slab and a rising wall with a bituminous seal is technically possible, but not recom-mendable: the connection of the bitumen layer with the water resist-ant concrete is a weak spot.

Maintenance

- Clean drainage System regularly.

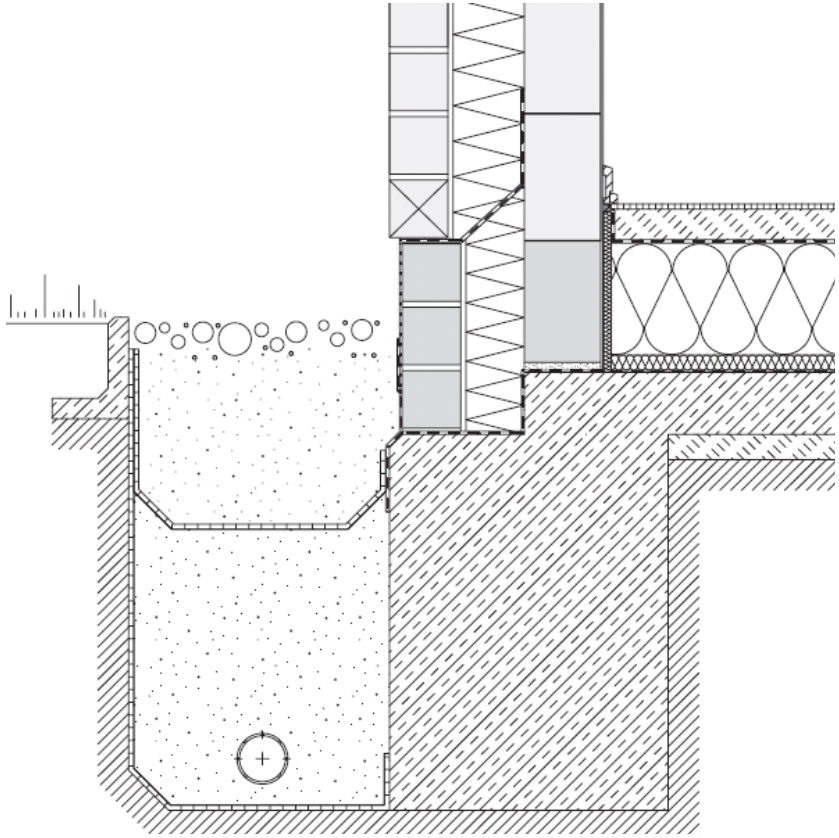
Structural discussion

- Impervious to damage where water resistant concrete and seal between slab and external wall in contact with ground are made carefully. It is generally easy to find and repair leaks.
- The seal between the upper edge of the base insulation and the adjoin-ing thermal insulation of the rising walls prevents vertical capillary moisture movement and the resulting damage (often forgotten!)

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Foundation / Outside wall

Brick double-leaf cavity wall with ventilation area /
Concrete slab foundation, insulated upper side



Source: Kalksandsteindetailsammlung, Detail 2.7.3.21, www.xella.de

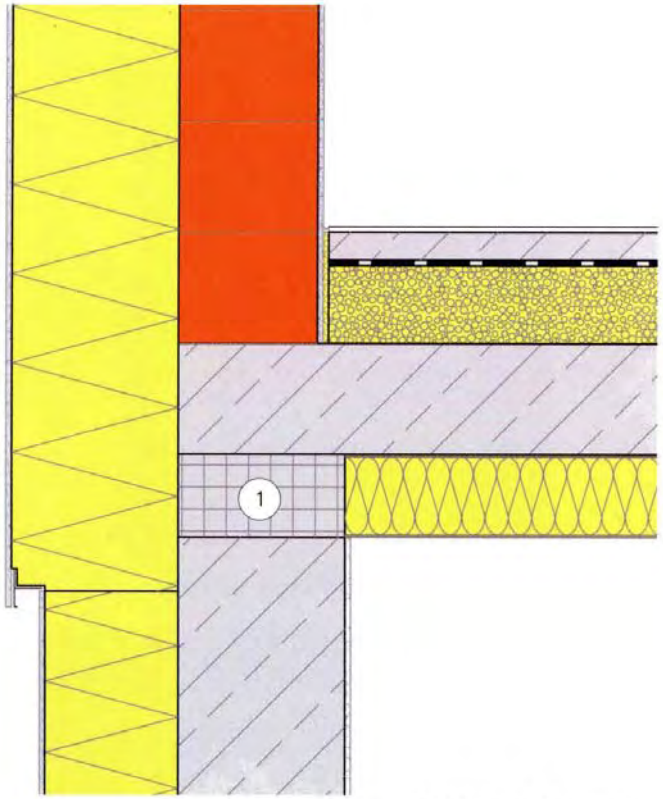
PH-details: Outside wall and ceiling / Cold cellar

Outside wall and ceiling / Cold cellar

Source:

PH-details: Outside wall and ceiling / Cold cellar

Outside brick wall, ETICS /
Basement ceiling slab with insulation on both sides, wet screed



1 Warmer Fuß / Warm foot

Technical description

Suitability
- For heated rooms with floors above unheated or ventilated rooms (garage, basement ...).

Construction process
- The lower concrete slab of the sandwich construction can - depending on the building load and compression-resistance of the insulation material - be finished as a widening of the load-bearing walls.
- No generally used grating insulation is required an the outer wall

Building physics

linear thermal bridge coefficient ψ

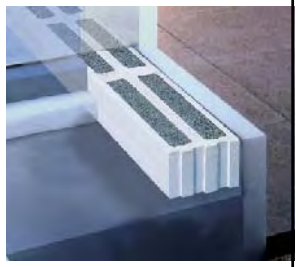
	Outside air	Basement
Warm foot		
λ=0.10 W/mK	-0.030 W/mK	0,012 W/mK
λ=0.14 W/mK	-0.031 W/mK	0,030 W/mK
λ=0.20 W/mK	-0.032 W/mK	0,053 W/mK
λ=0.30 W/mK	-0.034 W/mK	0,080 W/mK

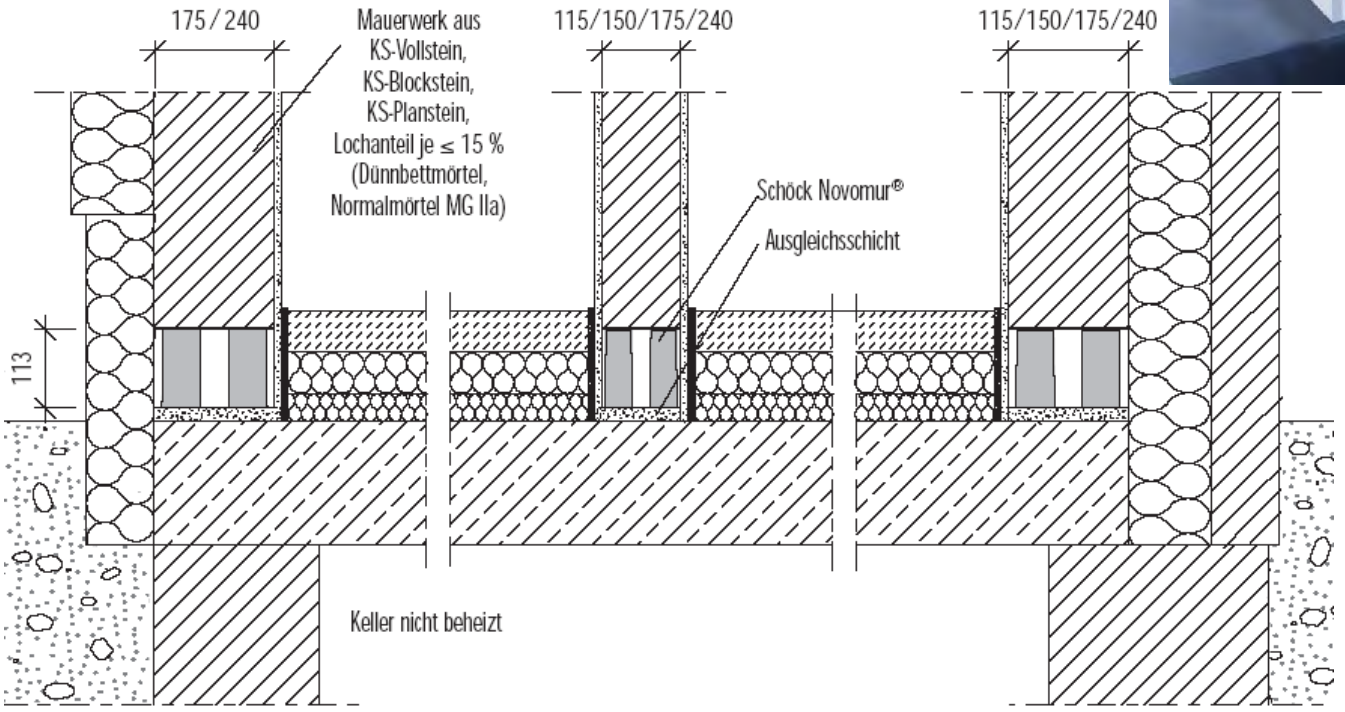
Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall with ETICS / inside wall / core insulation, all on "Thermo foot" or "warm foot" /

Basement ceiling, cold cellar, insulated upper side, wet screed

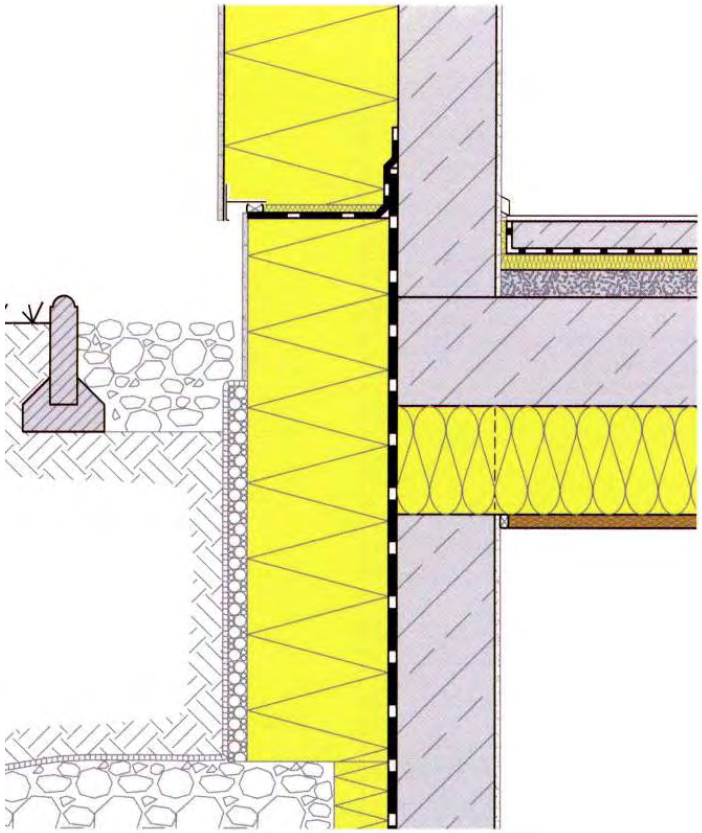




Source: www.schoeck.de/upload/Files/Documents/1127283803.pdf

PH-details: Outside wall and ceiling / Cold cellar

Reinforced concrete outside wall, ETICS / Solid basement ceiling slab, insulated lower side



Technical description

Suitability
- For floor surfaces that are slightly above or below the level of the ad-joining ground and that lie above a basement or underground garage.
- For buildings that allow for basement walls with a saw tooth upper edge.

Construction process
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Seal the polymer bitumen sheet stripe visible between the base insulation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic sea
- During planning check for potential damage that can be caused by thermal bridges resulting from basement wall penetration in certain areas.

Maintenance
- Clean drainage System regularly.

Structural discussion
- The construction contains thermal bridges, which become stronger depending an the load-bearing requirements of the basement walls. Therefore a compromise is needed between static and thermal requirements. Hence, in terms of thermal quality, fewer, but larger penetrations are preferable to a large number of smaller penetrations. Suitability in terms of condensation resistance should be examined in any case.

Building physics

linear thermal bridge coefficient ψ

	Outside air	Basement
	-0.025 W/mK	-0.033 W/mK

3-dimensional thermal bridge coefficient χ

cross section of the support:		
18 x 18 cm	-0.001 W/mK	0,116 W/mK
18 x 25 cm	-0.001 W/mK	0,148 W/mK
18 x 50 cm	-0.001 W/mK	0,251 W/mK
18 x 100 cm	-0.002 W/mK	0,442 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall and ceiling / Cold cellar

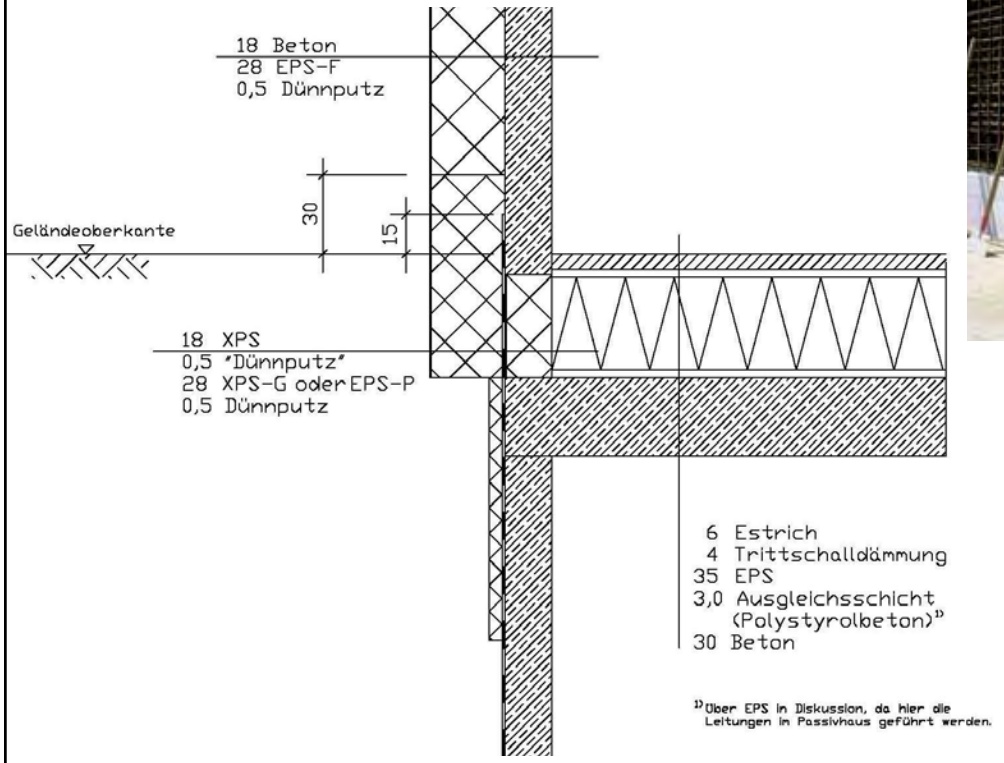
Reinforced concrete outside wall on “Thermo strips” and “Thermo foot”, ETICS /
Basement ceiling, cold cellar, insulated upper side, wet screed

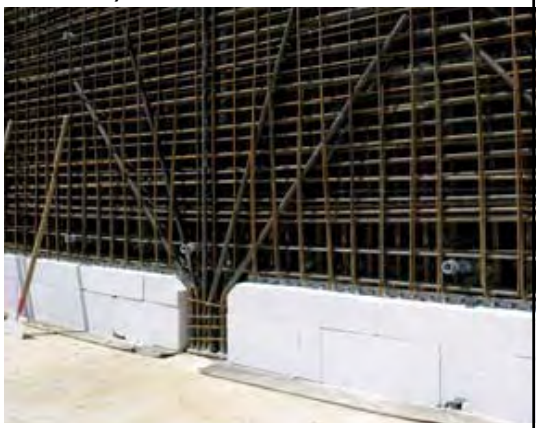
Source: IBO

Foto: Josef Seidl

PH-details: Outside wall and ceiling / Cold cellar

Reinforced concrete outside wall on “Thermo columns” and “Thermo foot”, ETICS /
Basement ceiling, cold cellar, insulated upper side, wet screed

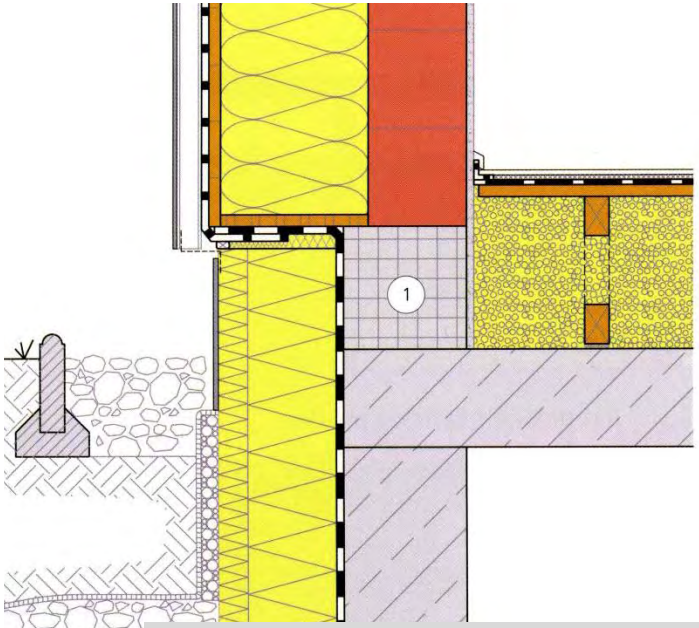




Source: Schöberl & Pöll, BV Utendorfg, www.wdvsfachbetrieb.at/news/docs/4869_Vortrag_Schoeberl.pps

PH-details: Outside wall and ceiling / Cold cellar

Brick chipping concrete outside wall /
Basement ceiling slab, insulated upper side between wood construction, dry screed



Building physics

linear thermal bridge coefficient ψ

Warm foot	Outside air	Basement
λ=0.10 W/mK	-0.039 W/mK	0,009 W/mK
λ=0.14 W/mK	-0.040 W/mK	0,023 W/mK
λ=0.20 W/mK	-0.041 W/mK	0,041 W/mK
λ=0.30 W/mK	-0.043 W/mK	0,065 W/mK

Technical description

Suitability

- For floors/basement ceiling slabs that are above the bordering ground level.
- For low-rise buildings with low loads an the porous concrete wall bases.
- For ceiling slabs over spaces ranging from moderately cold basement rooms to colder ventilated basement rooms (e.g. underground garages), depending an the quality of the porous concrete bare.

Construction process

- Drainage pipes should be laid higher than the foundation level (basement floor).
- Use washed drainage gravel (without fines).
- Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
- Adjust the load-bearing and insulation properties of the porous concrete base carefully as required.
- Cover the joint an the front edge of the horizontal seal between the floor slab and the exterior insulation of the rising wall with a long-lasting elastic seal.
- Carefully avoid tears in the sealing sheets, especially in the vertical and horizontal transition areas leading to the surface.
- Cover the ventilation opening with a fine-mesh insect screen (200 cm^2/m minimum open cross-section with regard to ÖNORM B 8110-2).

Maintenance

- Clean drainage System regularly.
- Keep rear ventilation afflux openings free.
- Ensure regular care and maintenance of the wood facade cladding along the Base area. The lowest two boards of the facade should be mounted to allow easy exchange.
- Longer periods of wood cladding moisture penetration or rear ventilation opening blocking should be avoided (e.g. remove accumulated snow).

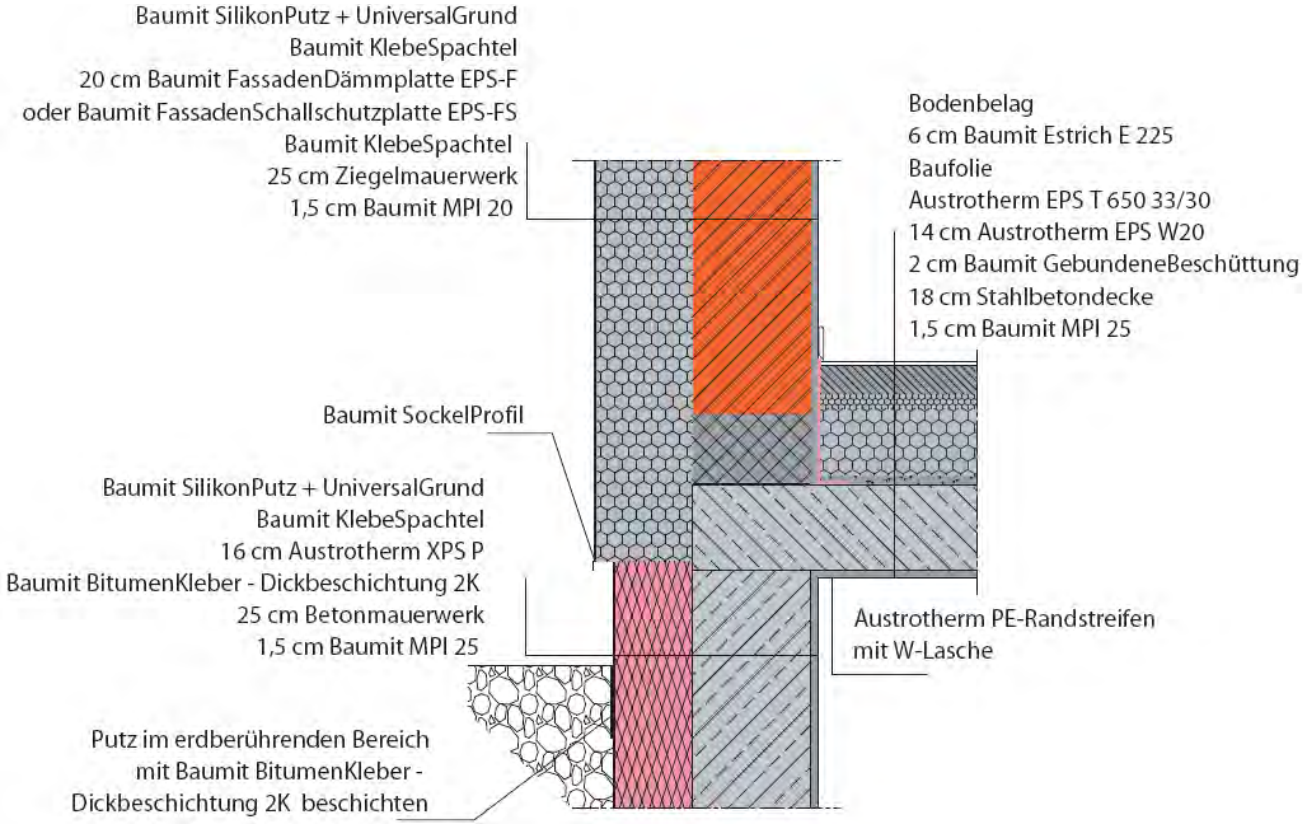
Structural discussion

- The construction contains weak thermal bridges along the base, which make a compromise between load-bearing capabilities and insulation effectiveness necessary.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall on "Thermo foot", ETICS /
Basement ceiling slab, insulated upper side, wet screed

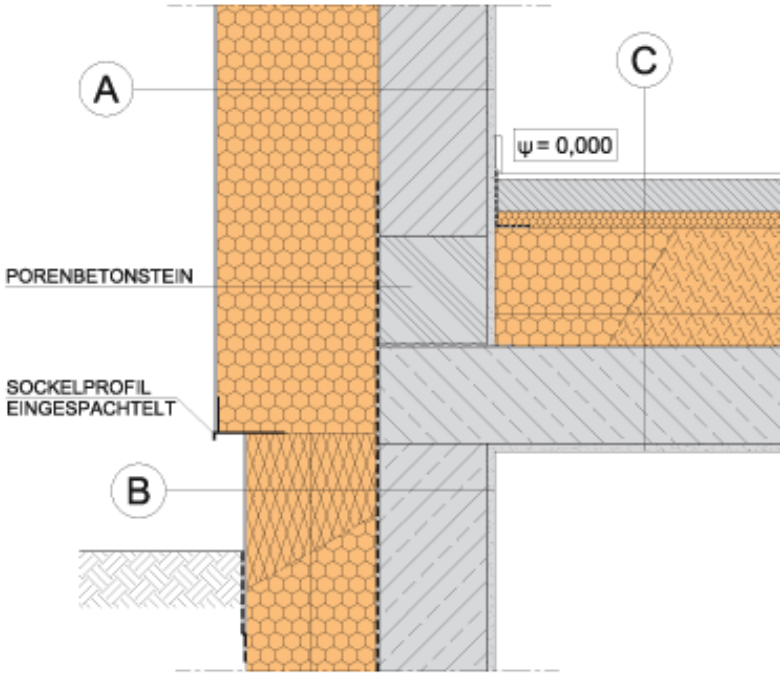


Source:

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall on "Thermo foot", ETICS (EPS foam) / Basement ceiling slab, insulated upper side, wet screed

Ground floor with basement



A	Exterior wall			
C	**Wall base**		**Lambda**	**Rt-value**
1		Covering layer		
2	24,0	Base insulation XPS-R or EPS-P	0,035	6,857
3		Moisture sealing		
4	20,0	Wall constuction	2,100	0,095
5	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**6,969**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,140**

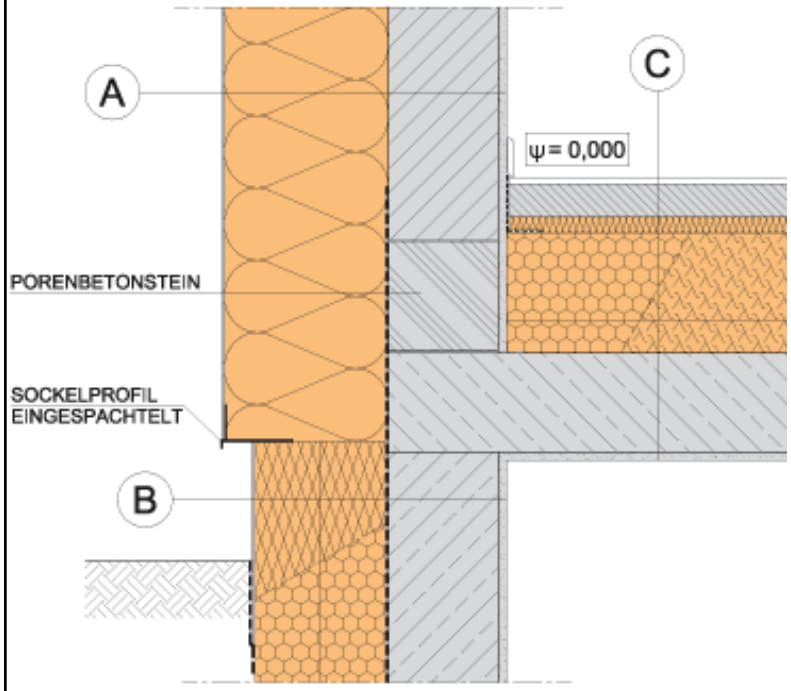
C	Ceiling		Lambda	Rt-value
1	1,0	Flooring		
2	6,0	Floating screed	1,400	0,043
3		Interlayer (vapour barrier)		
4	3,0	Sound insulation EPS-T 650 33/30	0,044	0,682
5	16,0	Heat insulation EPS-W 20	0,038	4,211
or	*11,0*	*Heat insulation PUR-DD*	*0,025*	
6	6,0	Heat insulation EPS-W 20	0,038	1,579
or	*4,0*	*Heat insulation PUR-DD*	*0,025*	
7	18,0	Reinforced concrete ceiling	2,100	0,086
8	1,5	Interior plaster	0,870	0,017
		sum thermal resistances		**6,618**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,147**

Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall on "Thermo foot", ETICS (Mineral wool) / Basement ceiling slab, insulated upper side, wet screed

Ground floor with basement



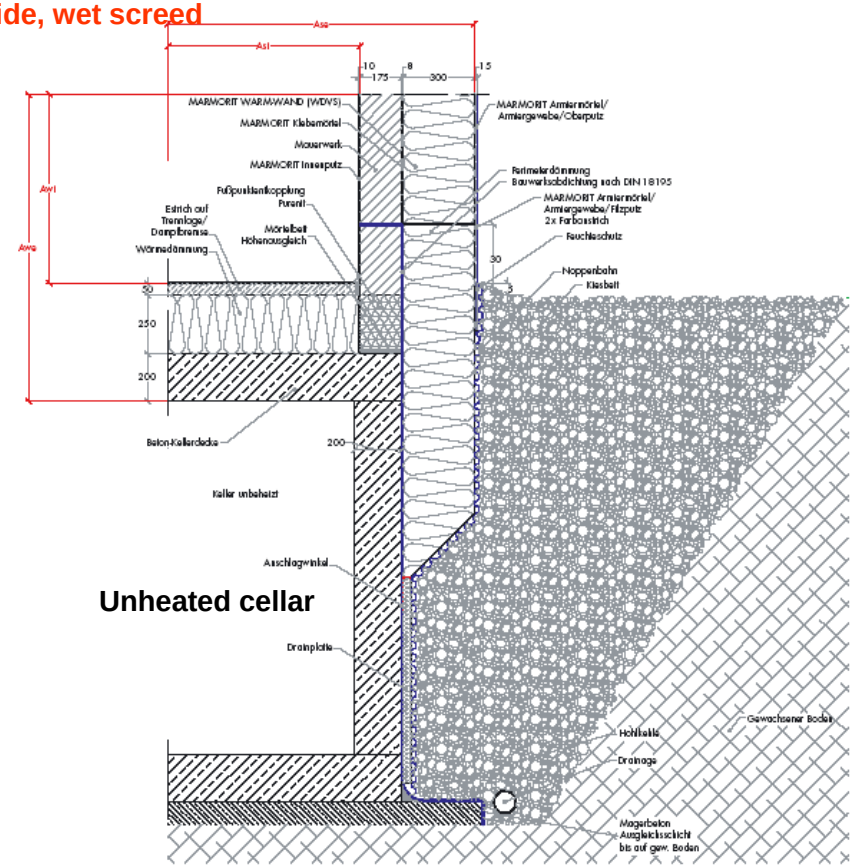
A	Exterior wall			
C	**Wall base**		**Lambda**	**Rt-value**
1		Covering layer		
2	24,0	Base insulation XPS-R or EPS-P	0,035	6,857
3		Moisture sealing		
4	20,0	Wall constuction	2,100	0,095
5	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**6,969**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,140**

C	Ceiling		Lambda	Rt-value
1	1,0	Flooring		
2	6,0	Floating screed	1,400	0,043
3		Interlayer (vapour barrier)		
4	3,0	Sound insulation MW-T	0,035	0,857
5	16,0	Heat insulation EPS-W 20	0,038	4,211
or	*11,0*	*Heat insulation PUR-DD*	*0,025*	
6	6,0	Heat insulation EPS-W 20	0,038	1,579
or	*4,0*	*Heat insulation PUR-DD*	*0,025*	
7	18,0	Reinforced concrete ceiling	2,100	0,086
8	1,5	Interior plaster	0,870	0,017
		sum thermal resistances		**6,793**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,144**

Source: www.gdi.at/gdi_passivhaus_details.pdf

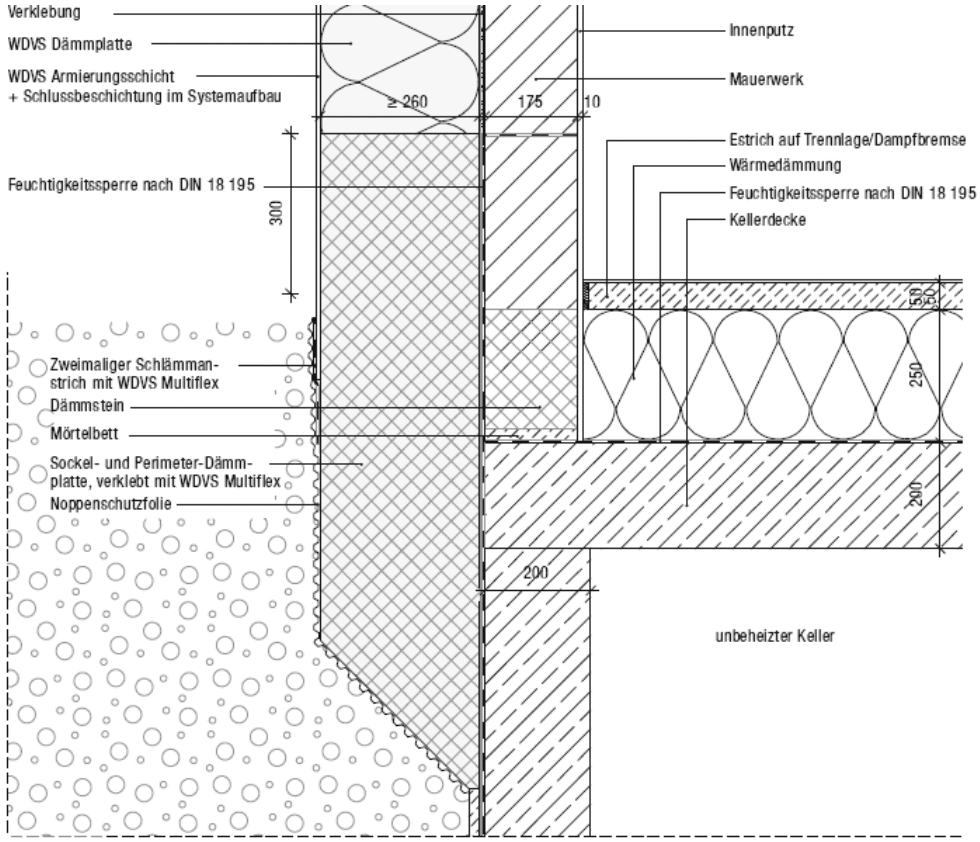
PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall on "Thermo foot", ETICS (EPS and XPS foam) /
Basement ceiling slab, insulated upper side, wet screed



Source:

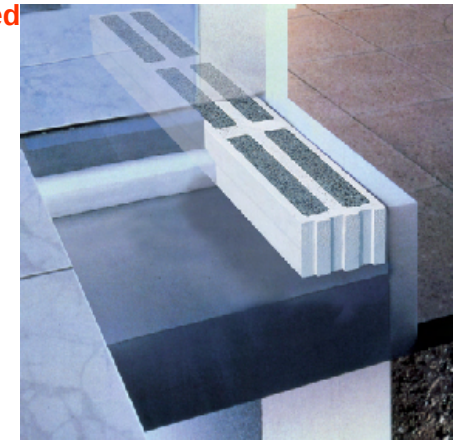
Brick or concrete outside wall on "Thermo foot", ETICS (Mineral wool and XPS foam) / Basement ceiling slab, insulated upper side, wet screed

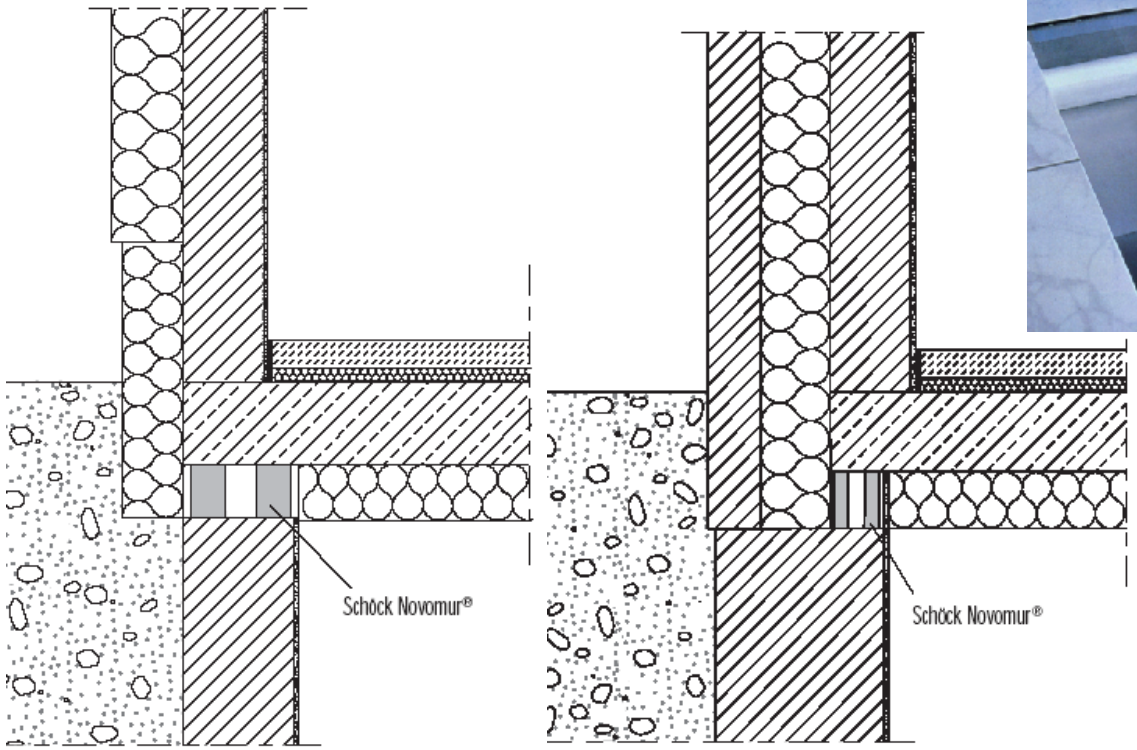


Source: Brillux Passivhausdetail 0.1.2

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall with ETICS (Mineral wool and XPS foam) / core insulation /
Basement ceiling slab on "Thermo foot", insulated lower side, wet screed

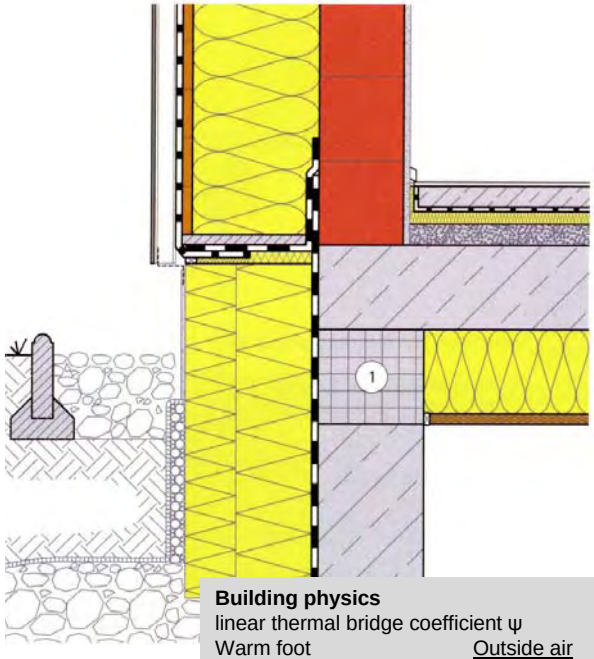




Source: www.schoeck.de/upload/Files/Documents/1127283803.pdf

PH-details: Outside wall and ceiling / Cold cellar

Brick or concrete outside wall, rear ventilation (Mineral wool and XPS foam) / Basement ceiling slab on "Thermo foot", insulated lower side, wet screed



Building physics

linear thermal bridge coefficient ψ

Warm foot	Outside air	Basement
λ=0.10 W/mK	-0.013 W/mK	-0,013 W/mK
λ=0.14 W/mK	-0.015 W/mK	0,007 W/mK
λ=0.20 W/mK	-0.016 W/mK	0,033 W/mK
λ=0.30 W/mK	-0.018 W/mK	0,069 W/mK

Technical description

Suitability

•For floor surfaces that are slightly above or below the adjoining ground level and which lie above a basement or underground garage.
•For low-rise buildings (low vertical loads) that allow for a basement wall crown made of less compression-resistant materials (lightweight expanded clay, porous concrete).

Construction process

•Drainage pipes should be laid higher than the foundation level (base-ment floor)
•Use washed drainage gravel (without fines).
•Line drainage gravel bed with PP filter fleece on all sides, be careful to avoid mixing the gravel with soil during construction.
•Seal the polymer bitumen sheet stripe visible between the Base insu-lation and insulation of the rising wall tightly (e.g. torch applying) an the wall surface, cover the joint with a long-lasting elastic seal.
•Cover the ventilation opening with a fine-mesh insect screen (200 cm^2/m minimum open cross-section with regard to ÖNORM B 8110-2).

Maintenance

•Clean drainage System regularly.
•No chemical wood protection is required if the guidelines for structural wood protection (-> wood protection) are followed
•Keep rear ventilation afflux openings free
•Ensure regular care and maintenance of the wood facade cladding along the base area. The lowest two boards of the facade should be mounted to allow easy exchange.
•Avoid longer periods of moisture penetration of the wood cladding or blockage of the back ventilation (e.g. remove accumulated snow).

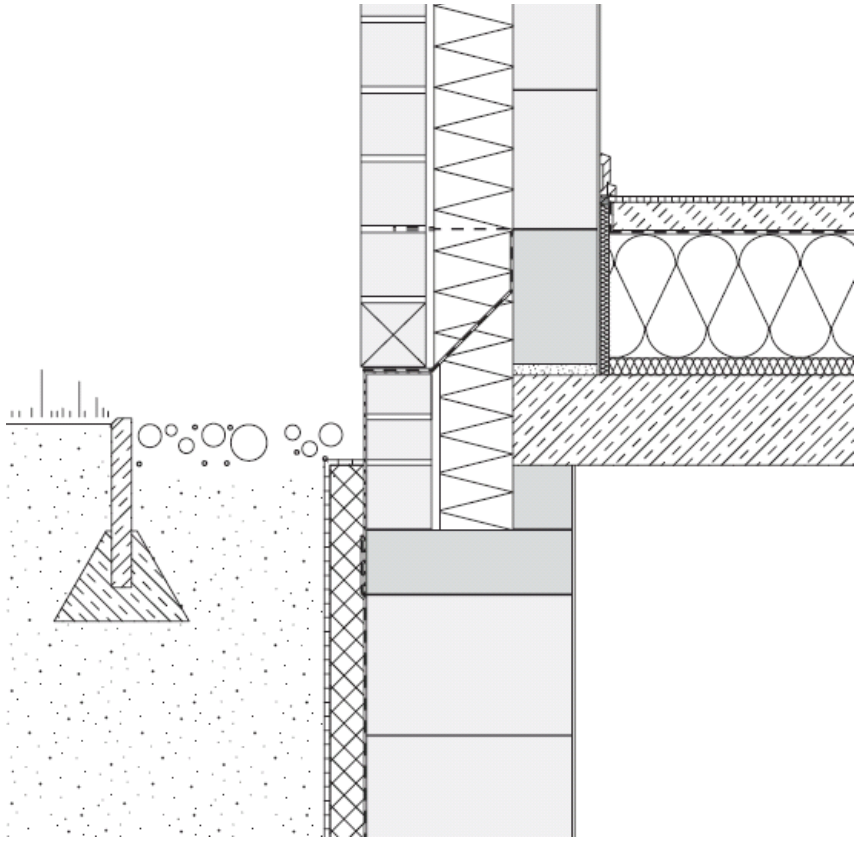
Structural discussion

•The construction contains thermal bridges that become stronger with increased load-bearing requirements of the basement masonry. Hence a compromise between static and thermal requirements is necessary.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall and ceiling / Cold cellar

Brick double-leaf cavity wall with ventilation area (Mineral wool) /
Basement ceiling slab on "Thermo foot", insulated upper side, wet screed



Source: Kalksandsteindetailsammlung, Detail 2.1.3.21, www.xella.de

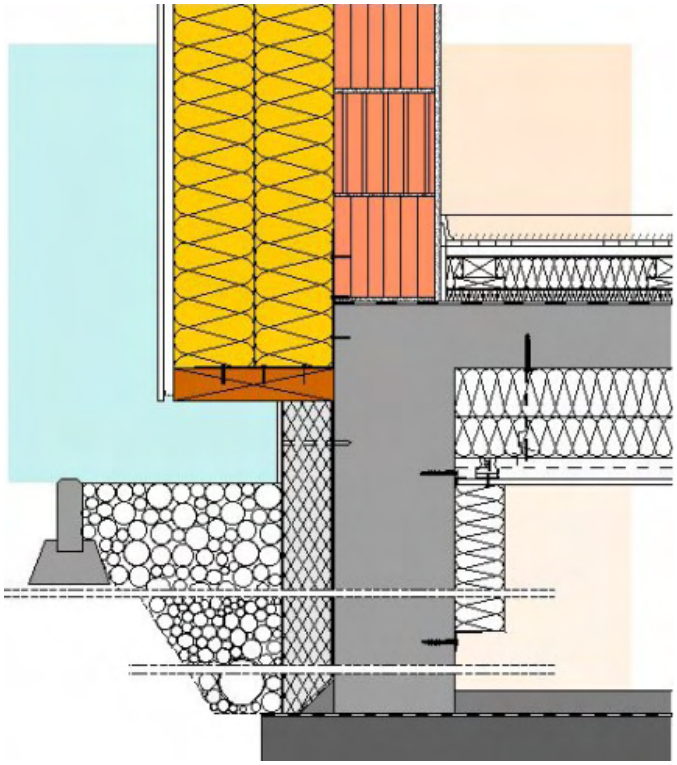
PH-details: Perimeter insulation

Perimeter insulation

Source:

PH-details: Perimeter insulation

Insulation below ground with concrete wall /
Basement ceiling slab, insulated lower side, dry screed



Perimeter Insulation

cm	Composition
30,0	Reinforced concrete wall
0,1	Bitumen priming coat
0,5	Separating layer (water barrier)
12,5	XPS-Extruded Polystyrene
	Ventilation with drainage pipe

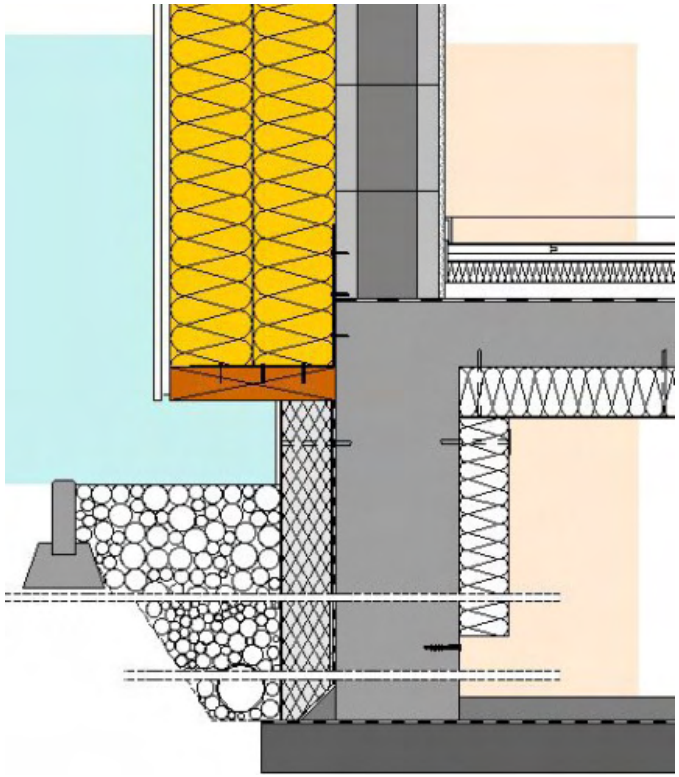
U = 0,29 W/m²K
Rw ≥ 66 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Perimeter insulation

Insulation below ground with concrete wall /
Basement ceiling slab, insulated lower side, dry screed



Perimeter insulation

cm	Composition
30,0	Reinforced concrete wall
0,1	Bitumen priming coat
0,5	Separating layer (water barrier)
12,5	XPS-Extruded Polystyrene glued and plugged
0,2	Levelling layer
0,3	Textile reinforced compound layer with undercoat
0,4	Thin layer of external rendering

U = 0,29 W/m²K
Rw ≥ 66 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

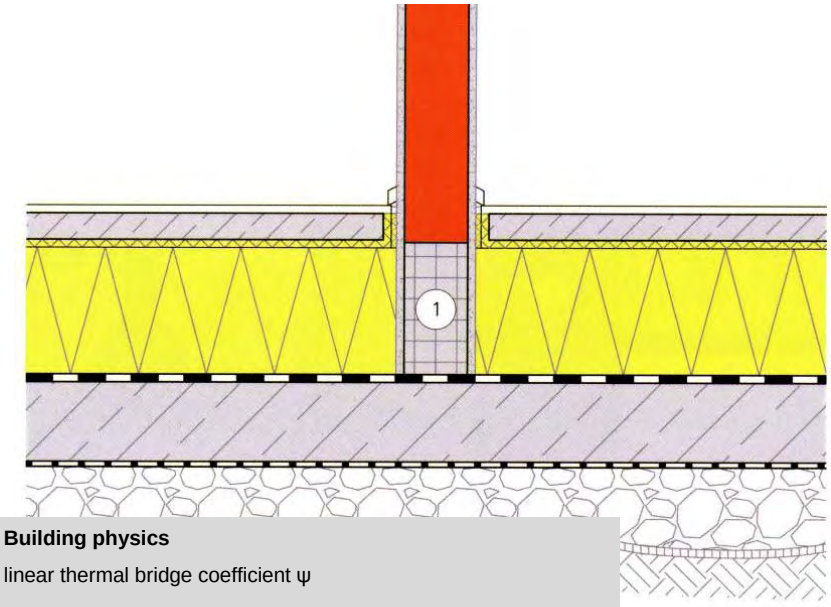
PH-details: Slab-on-grade / Inside wall

Slab-on-grade / Inside wall

Source:

PH-details: Slab-on-grade / Inside wall

Honeycomb brick separating wall, non-load bearing / Slab foundation, insulated upper side, wet screed



Warmer Fuß / Warm foot

Building physics

linear thermal bridge coefficient ψ

	Lime cement plaster **λ = 0.8 W/mK**	Insulating plaster **λ = 0.8 W/mK**
Warm foot		
λ=0.10 W/mK	0.071 W/mK	0,027 W/mK
λ=0.14 W/mK	0.080 W/mK	0,038 W/mK
λ=0.20 W/mK	0.093 W/mK	0,053 W/mK
λ=0.30 W/mK	0.112 W/mK	0,074 W/mK

Technical description

Suitability

•For non-load-bearing , solid, heavy interior walls with poor thermal insulation an floor slabs with upper-side insulation.
•Only in the case of ground with low thermal conductivity (e.g. gravel).

Construction process

•Check whether the entire wall can be built using the same well-insulating material as the wall base (porous concrete, lightweight expanded concrete, etc.), in such cases no separate base made of another material is required.
•Elastic edging strips should be inserted between the screed and the interior wall to minimize body impact sound transmission.

Maintenance

•No special measures.

Structural discussion

•The base made of mineral materials (porous concrete, lightweight expanded clay) is advantageous for walls made of materials with poor insulation qualities (e.g. materials with high storage effectiveness to improve summer properties).
•If there are no special requirements in terms of interior wall storage mass efficiency, or sound insulation, the entire wall can be made of the same material as the base.
•Placing parts of the thermal insulation beneath the foundation slab increases moisture safety considerably.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

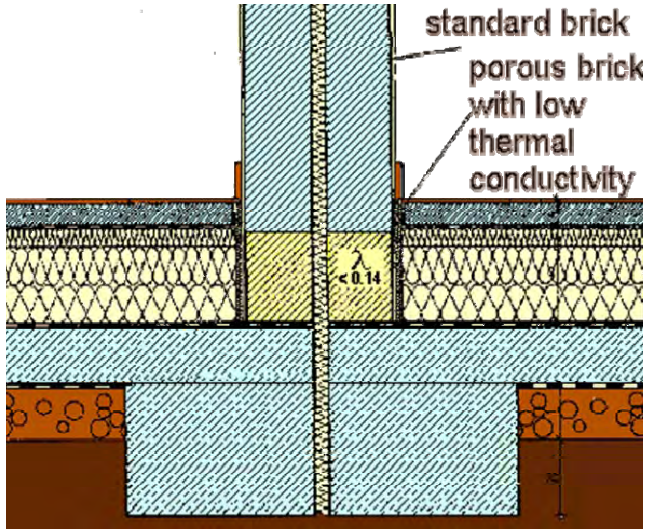
PH-details: Slab-on-grade / Separating wall for row houses

Slab-on-grade /
Separating wall for row houses

Source:

PH-details: Slab-on-grade / Separating wall for row houses

Standard brick separating wall for row houses /
Slab-on-grade, foundation, insulated upper side, wet screed



The thermal bridge at the joint of the interior masonry wall with the slab-on-grade can be avoided almost completely if a porous concrete block (yellow) is used for the first row of bricks.

Source: www.passivhaustagung.de/Passive_House_E/passive_house_avoiding_thermal_brigdes.html

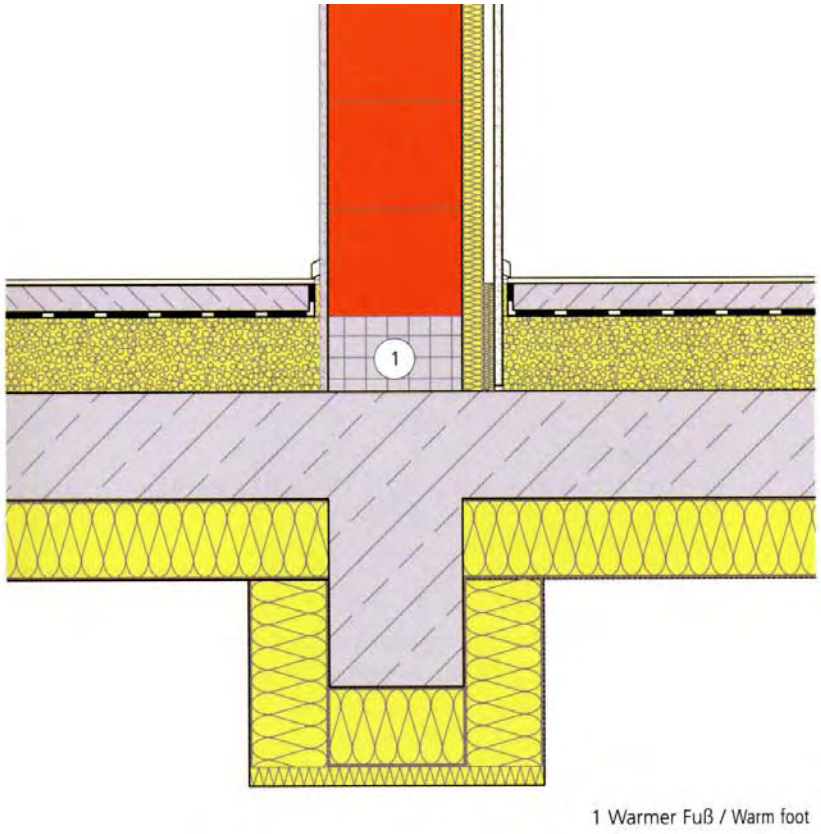
PH-details: Basement ceiling slab / Party wall

Basement ceiling / Party wall

Source:

PH-details: Basement ceiling / Party wall

Filler brick apartment party wall facing layer / Basement ceiling slab with insulation on both sides



Technical description

Suitability

- For load-bearing, solid, heavy, heat and sound insulating walls and floor slabs with upper and lower side insulation.
- For building heights that allow the use of bares with less load-bearing capability and better insulating properties

Construction process

- Elastic edging strips should be inserted between the screed and the interior wall to minimize body impact sound transmission.
- The thermal insulation an the lower side and the insulation around the main beam should be sized to eliminate the possibility of condensation build up in the insulating wall base.

Maintenance

- No special measures.

Structural discussion

- Perlite-filled honeycomb bricks have a proportionally better sound in-sulation level at higher heat conduction levels than the porous concrete blocks normally used.

Building physics

linear thermal bridge coefficient ψ

	Room w/o facing layer	Room with facing layer
Warm foot		
λ=0.10 W/mK	0.053 W/mK	-0,005 W/mK
λ=0.20 W/mK	0.074 W/mK	-0,008 W/mK
λ=0.10 W/mK, w. insulating plaster (λ=0.14 W/mK)	0.043 W/mK	-0,003 W/mK
w/o thermal decoupling	0.137 W/mK	-0,019 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

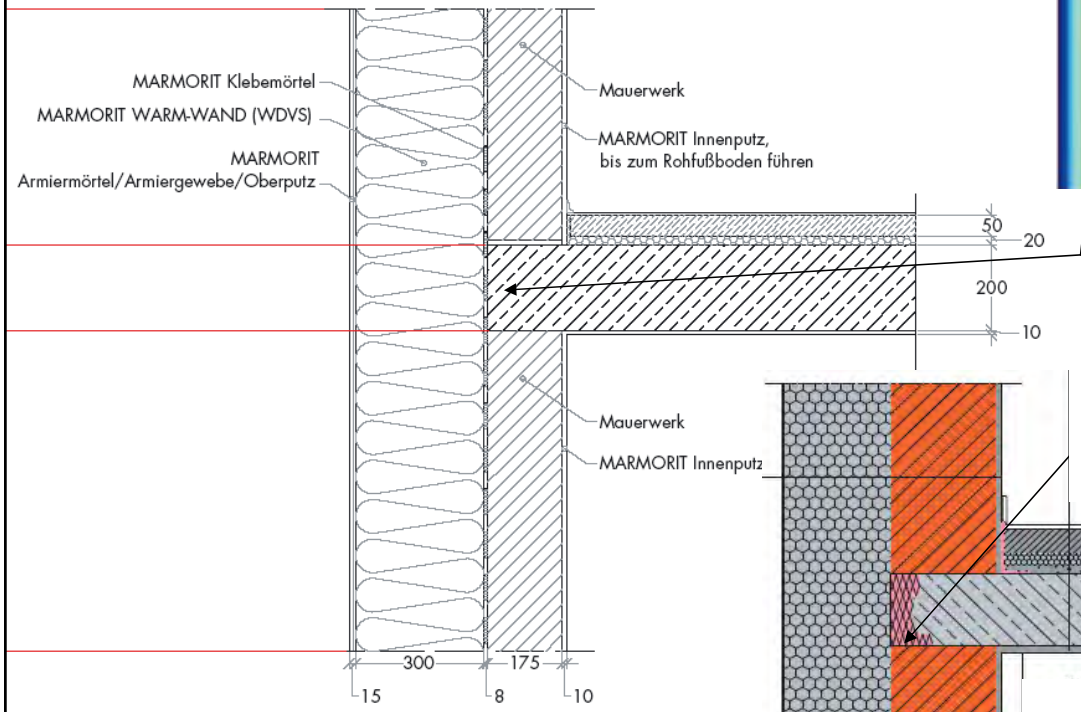
PH-details: Outside wall / Ceiling

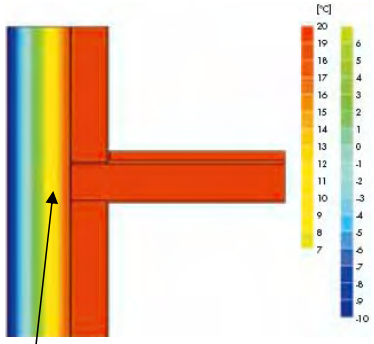
Outside wall / Ceiling

Source:

PH-details: Outside wall / Ceiling

Outside wall, ETICS /
Floor ceiling, wet screed





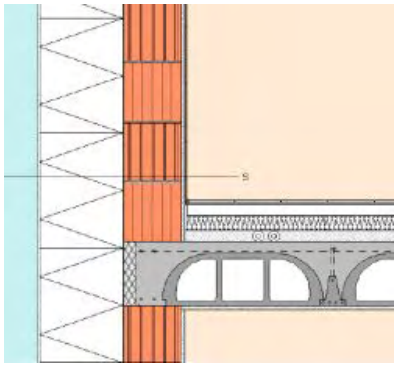
Free of thermal bridge

No …. necessary for outside heat insulation in the Passive house-Standard

Source: www.marmorit.de/pages/passhaus www.austrotherm.com/imperia/md/content/baumitat2/deutsch/ratundtatgeber/neh_folder.pdf

PH-details: Outside wall / Ceiling

Outside brick wall, ETICS /
Floor ceiling, wet screed



External thermal insulation compound system (ETICS) with EPS foam

cm	Composition
1,2	Ceramic tiles
2,0	Cement-lime rendering
25,0	Perforated brick
0,5	Glue layer
36,0	EPS foam insulation
0,2	levelling layer
0,3	Textile reinforced compound layer with undercoat
0,4	Thin layer of external rendering

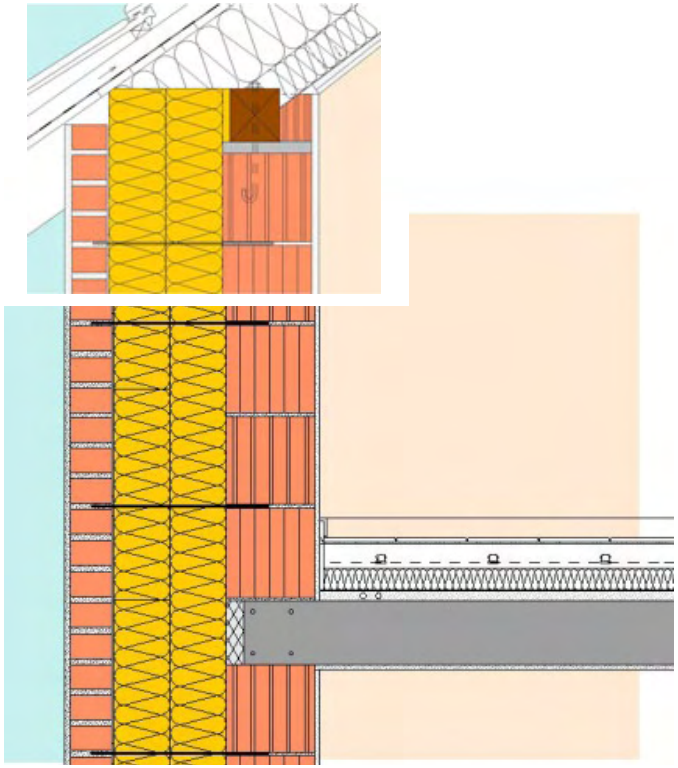
U = 0,10 W/m²K
Rw ≥ 53 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Double-leaf cavity wall with full-cavity insulation (Mineral wool) /
Floor ceiling, wet screed



Double-leaf cavity wall with full-cavity insulation

cm	Composition
1,5	Cement-lime rendering
25,0	Perforated brick
16,0	Facade insulation board
16,0	Facade insulation board fixed with special steel cavity anchors
12,0	Outer brick wall
1,5	Thin layer of external rendering

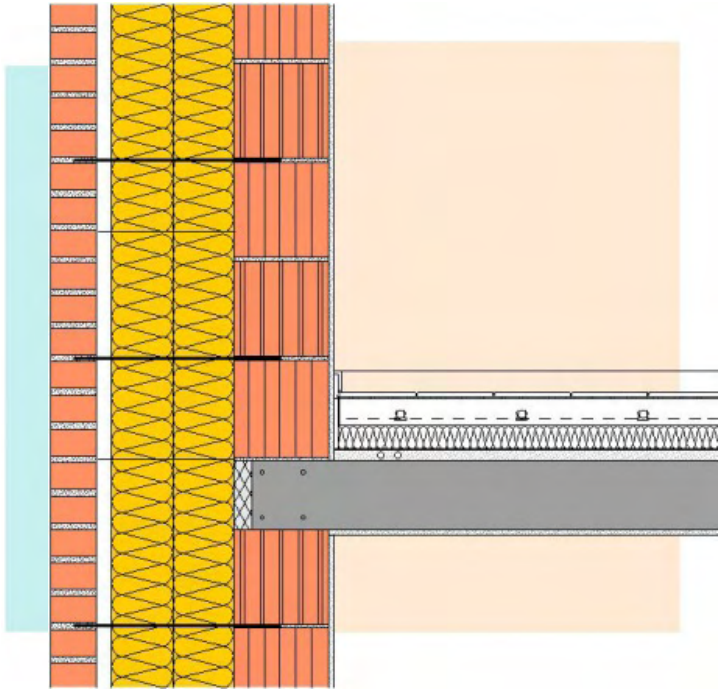
U = 0,10 W/m²K
Rw ≥ 59 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Brick double-leaf cavity wall with ventilation area, core insulation /
Floor ceiling, wet screed



Double-leaf cavity wall with ventilation area

cm	Composition
1,5	Cement-lime rendering
25,0	Perforated brick
16,0	Facade insulation board
16,0	Facade insulation board fixed with special steel cavity anchors
4,0	Ventilation area
12,0	Outer brick wall

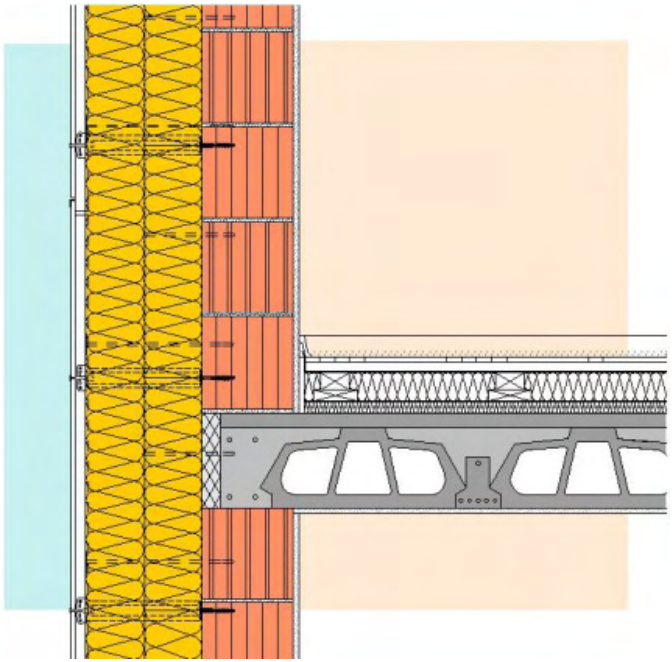
U = 0,10 W/m²K
Rw ≥ 64 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Ventilated outer wall with reinforced cement facade-cladding (Mineral wool) /
Floor ceiling, dry screed



Ventilated outer wall with reinforced cement façade-cladding

cm	Composition
1,5	Cement-lime rendering
25,0	Perforated brick
16,0	Facade insulation board
16,0	Facade insulation board fixed with special steel cavity anchors Ventilation area
3,0	Reinforced cement facade-cladding on
1,0	aluminium construction

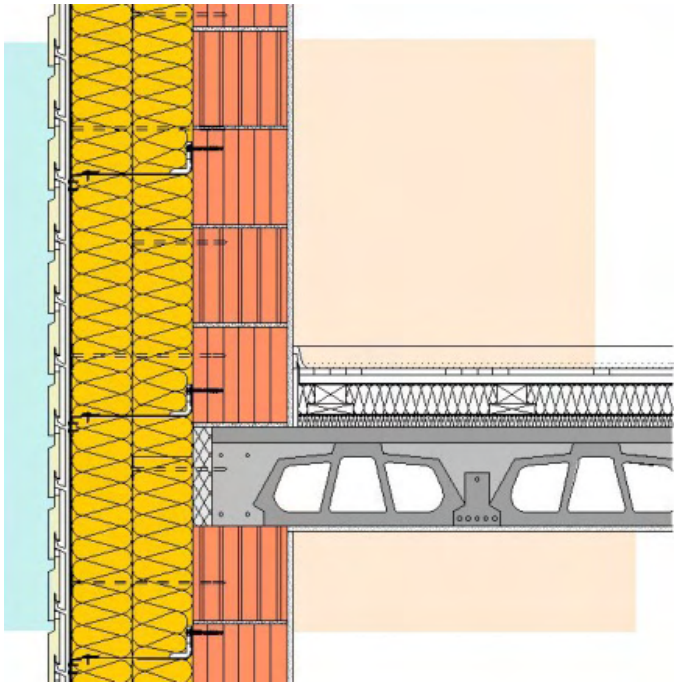
U = 0,10 W/m²K
Rw ≥ 60 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Ventilated outer wall with precast concrete blocks (Mineral wool) /
Floor ceiling, dry screed



Ventilated outer wall with precast concrete blocks

cm	Composition
1,5	Cement-lime rendering
25,0	Perforated brick
16,0	Facade insulation board Plug anchor
16,0	Facade insulation board plug anchor Water vapour permeable wind protection layer
3,0	Ventilation area
3,0	Cladding with precast concrete blocks

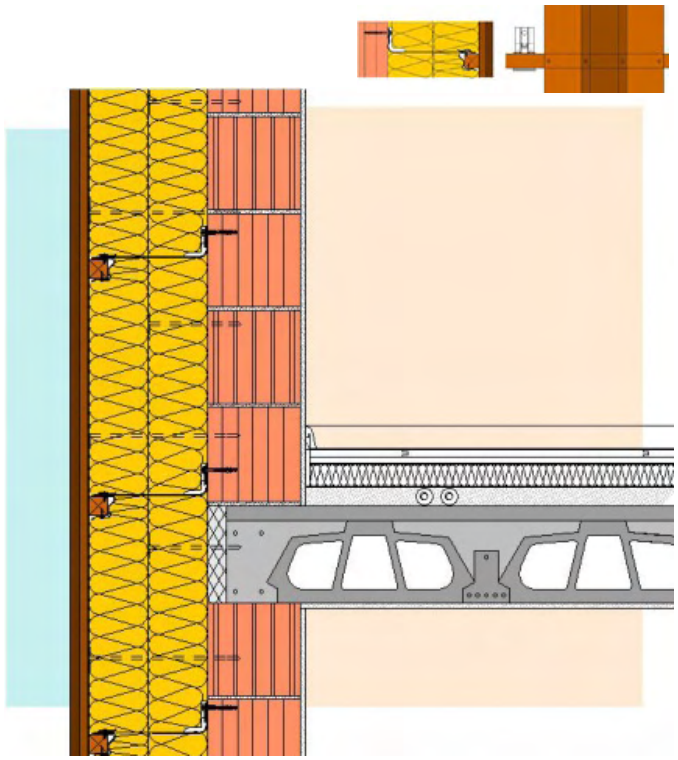
U = 0,10 W/m²K
Rw ≥ 60 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Brick outer wall with framework boarding (Mineral wool) /
Floor ceiling, dry screed



Outer wall with framework boarding

cm	Composition
1,5	Cement-lime rendering
25,0	Perforated brick
16,0	Lightweight glass wool (anchor)
16,0	Lightweight glass wool (anchor)
-	Layer of water vapour diffusion - permeable spun bonded web
-	Ventilation area
2,4	Framework boarding
2,4	Framework boarding

The framework boarding should not be painted or chemically treated, otherwise ventilation must be provided between the heat insulation and the timber frame work.

U = 0,10 W/m²K
Rw ≥ 60 dB

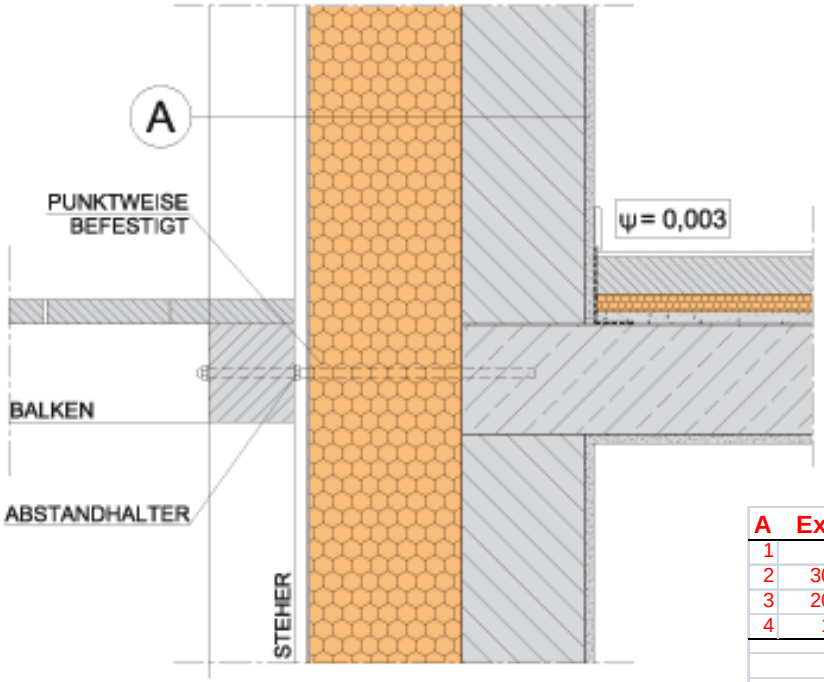
Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=20

PH-details: Outside wall / Ceiling

Outside wall, ETICS /

Outside wooden stand-alone balcony (with stainless-steel anchor), floor ceiling, wet screed



The balcony is distanced from the building
pointwise fixed with bolts
Bolts are glued into the ceiling (e.g. HILTI HIT-HY

Thermal separated balcony

A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,121**

Source: www.gdi.at/gdi_passivhaus_details.pdf

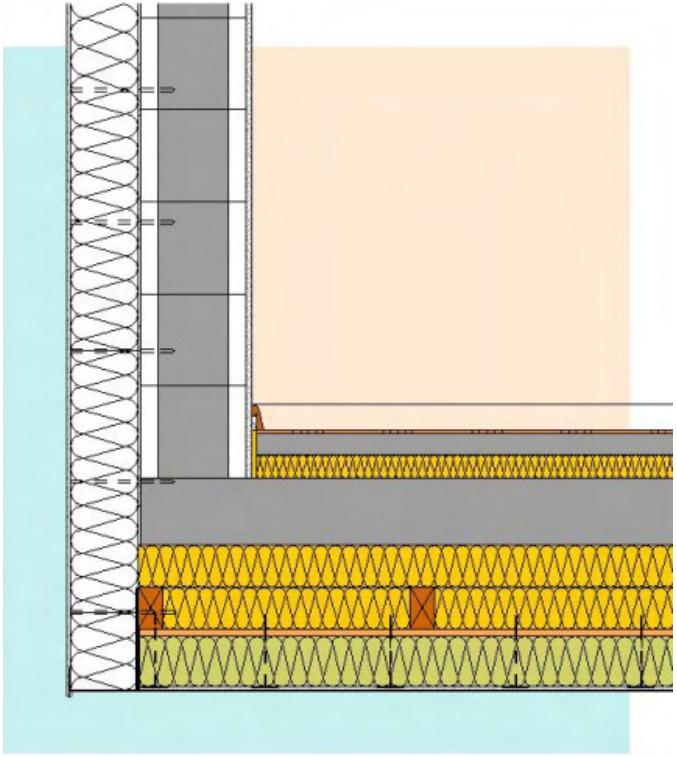
PH-details: Outside wall / Cantilever ceiling

Outside wall / Cantilever ceiling

Source:

PH-details: Outside wall / Cantilever ceiling

Concrete brick outside wall, ETICS (Mineral wool) /
Floor ceiling, wet screed, insulation on lower side,



Insulation for a cantilever ceiling

cm	Composition
0,7	Parquet glued
5,0	Cement screed
-	Vapour barrier
5,5	Impact sound insulation board 55
16,0	Reinforced concrete slab
10,0	Glass wool slab between rafters
10,0	Glass wool slab between rafters
1,9	Chipboard V 100
12,0	Rigid mineral wool board for thermal insulation system under stucco glued and plugged
1,2	0,7 cm reinforced basic layer of stucco and 0,5 finishing layer of stucco

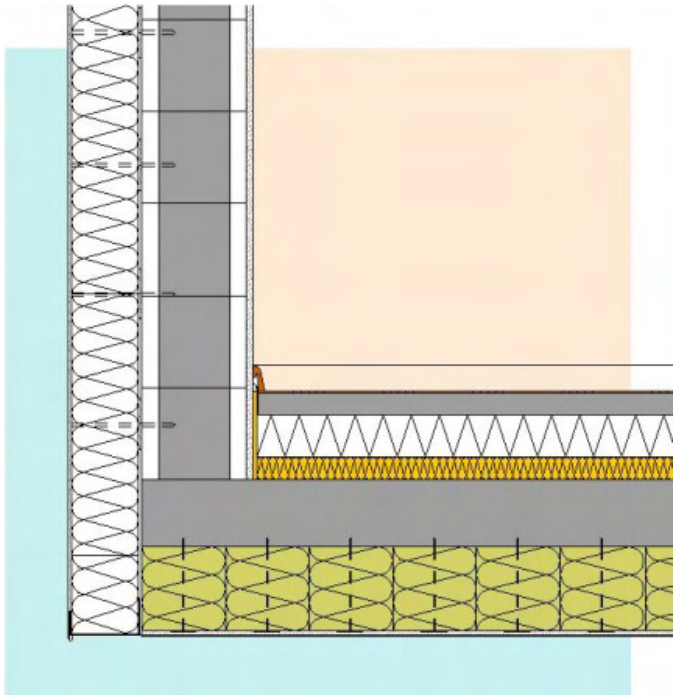
U = 0,10 W/m²K
Rw ≥ 63 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 13:00)

PH-details: Outside wall / Cantilever ceiling

Concrete brick outside wall, ETICS (Mineral wool) /
Floor ceiling, wet screed, insulation on lower side,



Insulation for a cantilever ceiling with mineral wool insulation and exterior rendering

cm	Composition
0,7	Parquet glued
5,0	Cement screed
-	Vapour barrier
10	EPS-W 20 (expanded polystyrene)
5,5	Impact sound insulation board 55
16,0	Reinforced concrete slab
20,0	Rigid mineral wool board lamella for thermal insulation system under stucco glued and plugged
1,2	0,7 cm reinforced basic layer of stucco and 0,5 finishing layer of stucco

U = 0,10 W/m²K
Rw ≥ 63 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 13:00)

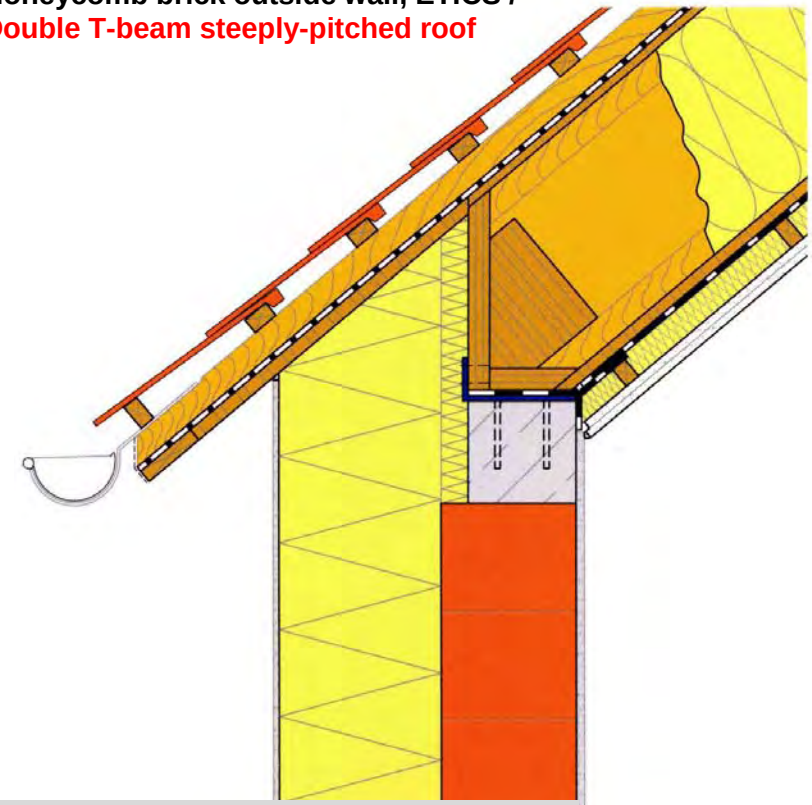
PH-details: Outside wall / Pitched roof / Warm attic

Outside wall / Pitched roof / Warm attic

Source:

PH-details: Outside wall / Pitched roof / Warm attic

Honeycomb brick outside wall, ETICS / Double T-beam steeply-pitched roof



Building physics

linear thermal bridge coefficient ψ	0.002 W/mK

Technical description

Suitability

• For heated rooms an the uppermost level that do not require a horizontal roof.
•For attic rooms that do not require any special protection against over-heating in summer.
•For solid construction method building roofs that do not require reinforced concrete roofs due to local building code guidelines.
•Especially suitable for prefabricated roof elements.

Construction process

•Handle roof elements very carefully during assembly (risk of damage to prefabricated vapor barrier).
•Concrete steel angles into the grating.
•Fasten the three-layer panel to the cross battens for the soffit and the mounting of an insect screen.
•Fasten the plaster-bearing adhesive tape to the concrete grating with an air-tight real and apply plaster. Perform the blower door test before mounting the facing shell in the roof area to check for existing leaks and dose them.
•Cover the ventilation of the lower roof side opening with a fine-mesh insect screen (200 cm²/m minimum open cross-section with regard to ÖNORM B 8110-2).
•Connect the gypsum plasterboard tightly to the outside wall, in accordance with the appropriate fire protection regulations since a gap could lead to fire spreading from the room to the attic space.

Maintenance

•Check the roof cladding regularly.
•No chemical wood protection is required if the guidelines for structural wood protection (->4 wood protection) are followed

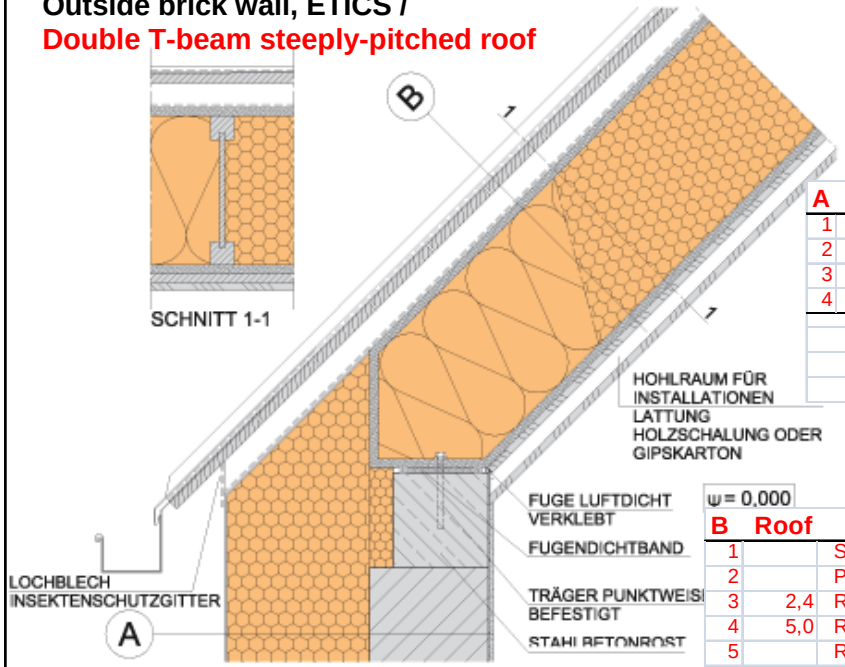
Structural discussion

•Special training and increased care are required for this construction.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /
Double T-beam steeply-pitched roof



Steep roof TJI-construction

A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,121**

ψ = 0,000

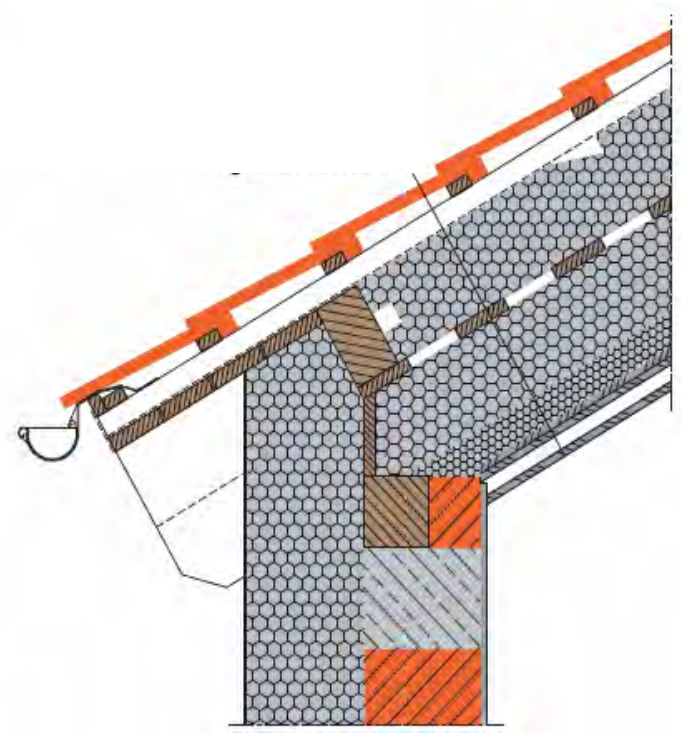
B	Roof		Lambda	Rt-value
1		Sheet roofing		
2		Pre-roofing		
3	2,4	Roof boarding		
4	5,0	Rear ventilation, counter batten		
5		Rainproof, vapour permeable roof sheeting		
6	2,4	Planking or OSB-panel	0,170	0,141
7		TJI-beam; 3%	0,170	0,000
8	35,0	Blow-in-insulation EPS, MW, cellulose; 97%	0,045	7,544
9	1,8	OSB-panel	0,170	0,106
10		Vapour barrier		
11	1,5	Gypsum plaster board	0,210	0,071
		sum thermal resistances		**7,862**
		heat transmission resistances		**0,260**
		heat transmission coefficient (U-value)		**0,123**

Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /

Double beam steeply-pitched roof

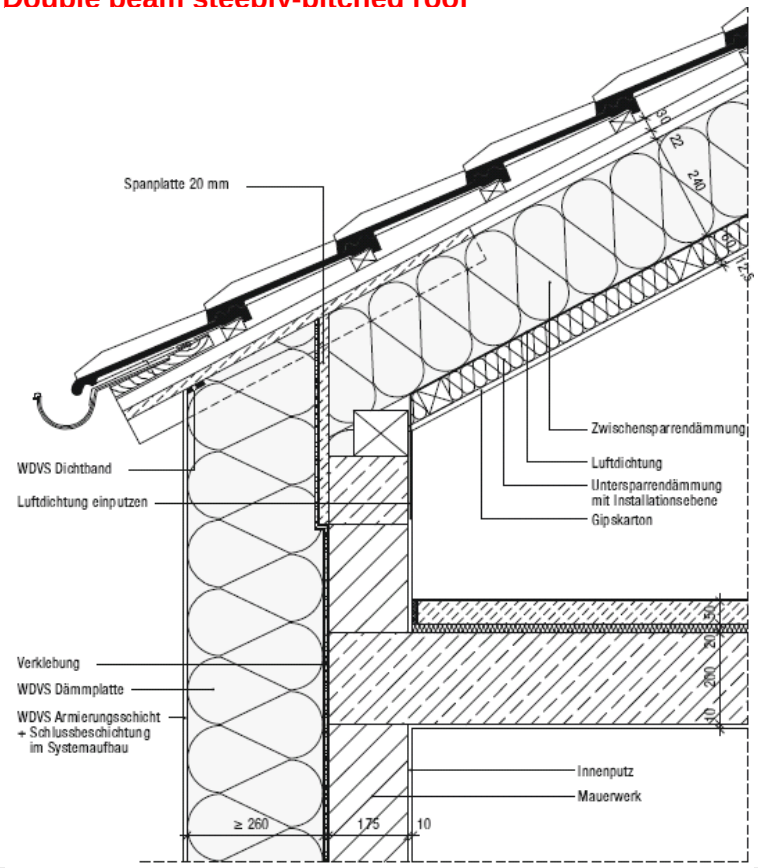


-	roof covering
3,0 cm	battens
5,0 cm	ventilation,
18,0 cm	insulation
2,5 cm	cladding
16,0 cm	rafter / insulation
8,0 cm	substructure / insulation
1,5 cm	gypsum plaster board
-	free space for electricity

Source: www.austrotherm.com/imperia/md/content/baumitat2/deutsch/ratundtatgeber/neh_folder.pdf

PH-details: Outside wall / Pitched roof / Warm attic

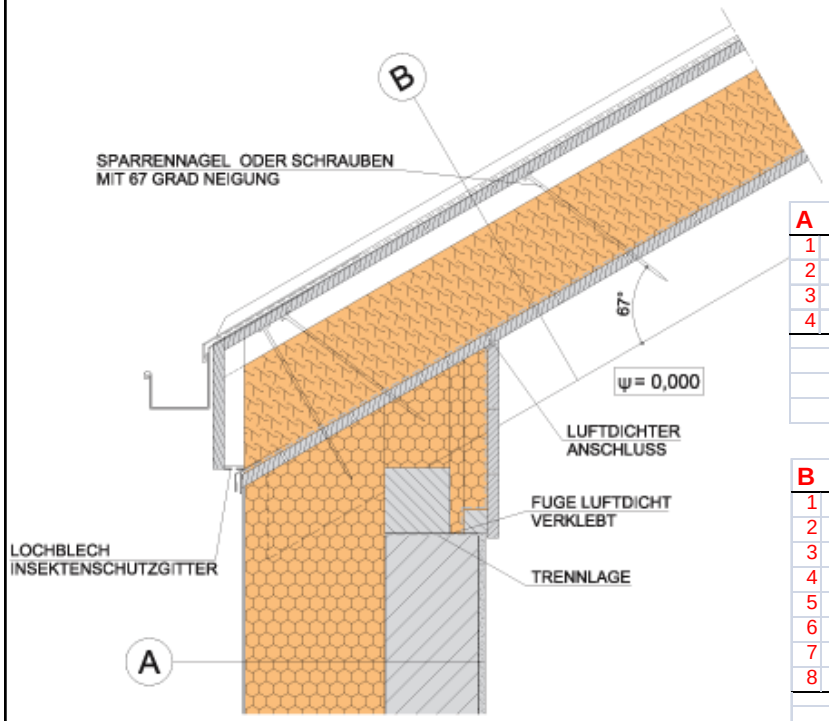
Outside brick wall, ETICS /
Double beam steeply-pitched roof



Source: Brillux Passivhausdetail 0.7.2

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /
Double beam steeply-pitched roof



Steep roof Over rafter insulation

A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,121**

B	Roof		Lambda	Rt-value
1		Sheet roofing		
2		Pre-roofing (slottet before sheet roofing)		
3	2,4	Roof boarding		
4	5,0	Rear ventilation, counter battens screwed through rafters		
5	20,0	Over rafter insulation PUR-DD	0,025	8,000
6		Roof sheeting		
7	2,2	Exposed boarding (dep. on fire prot.)	0,130	0,169
8		Rafter		
		sum thermal resistances		**8,169**
		heat transmission resistances		**0,260**
		heat transmission coefficient (U-value)		**0,119**

Source: www.gdi.at/gdi_passivhaus_details.pdf

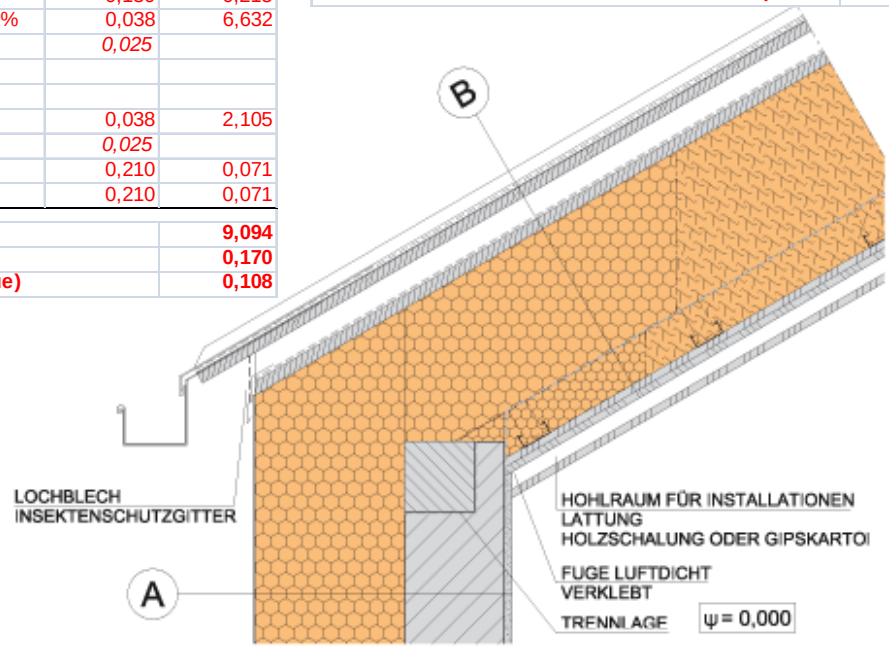
PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /
Rafter steeply-pitched roof

Steep roof Rafter construction

B		Roof	Lambda	Rt-value
1		Sheet roofing		
2		Pre-roofing (slottet before sheet roofing)		
3	2,4	Roof boarding		
4	5,0	Rear ventilation, counter battens		
5		Rainproo , vapour permeable roof sheeting		
6	2,4	Roof boarding		
7	28,0	Rafter system ca. 28x8 cm, e=80cm, 10%	0,130	0,215
8	28,0	Heat insulation EPS-W 20 betw. rafters, 90%	0,038	6,632
or	*18,0*	*Heat insulation PUR-DD, 90%*	*0,025*	
9		Vapour barrier		
10		Aluminium-substructure		
11	8,0	Heat insulation EPS-W 20 cross laid	0,038	2,105
or	*5,5*	*Heat insulation PUR-DD*	*0,025*	
12	1,5	Gypsum plaster board	0,210	0,071
13	1,5	Gypsum plaster board	0,210	0,071
		sum thermal resistances		**9,094**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,108**

A		Exterior wall	Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value		**0,121**



Source: www.gdi.at/gdi_passivhaus_details.pdf

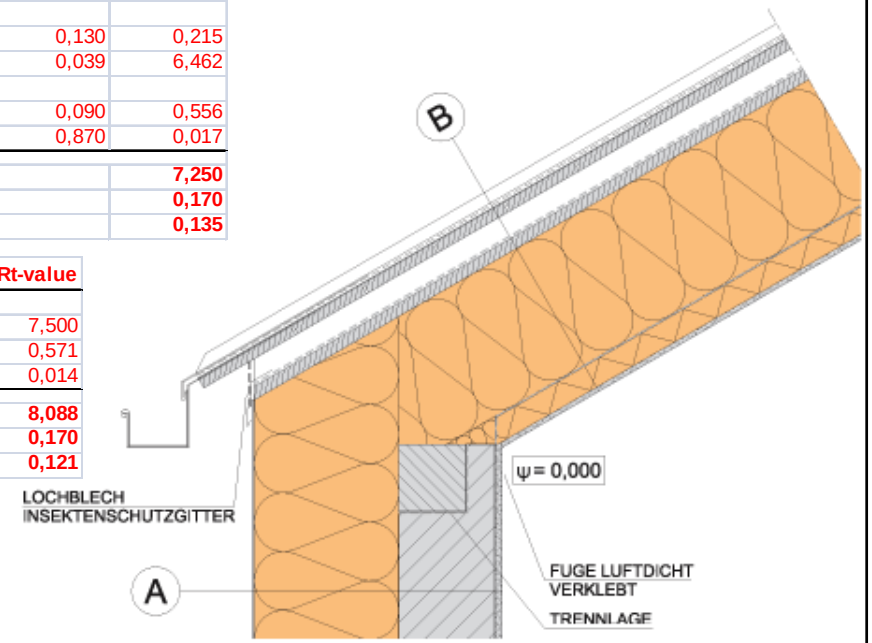
PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /
Rafter steeply-pitched roof

Steep roof Rafter construction

B	Roof		Lambda	Rt-value
1		Sheet roofing		
2		Pre-roofing (slottet before sheet roofing)		
3	2,4	Roof boarding		
4	5,0	Rear ventilation, counter battens		
5		Rainproof, vapour permeable roof sheeting		
6	2,4	Boarding		
7	28,0	Rafter system, rafters ca. 28x8 cm, e=80 cm, 10%	0,130	0,215
8	28,0	Heat insulation MW-W between the rafters, 90%	0,039	6,462
9		Vapor barrier		
10	5,0	Wood wool slab as insulated installation layer	0,090	0,556
11	1,5	Interior plaster	0,870	0,017
		sum thermal resistances		**7,250**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,135**

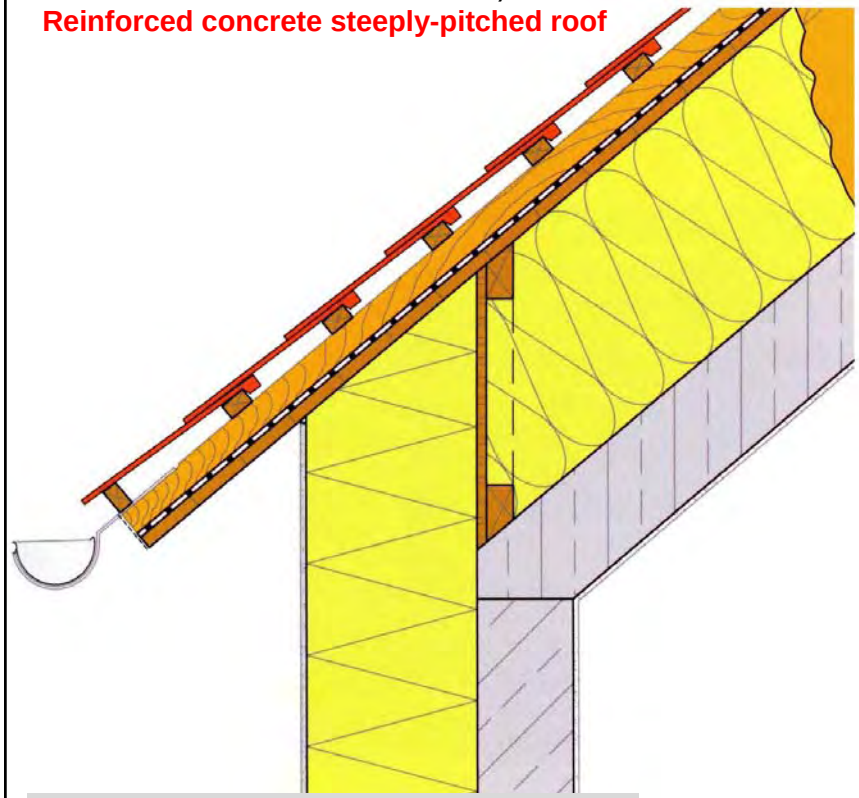
A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	0,350	0,571
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**8,088**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,121**



Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Outside wall / Pitched roof / Warm attic

Reinforced concrete outside wall, ETICS / Reinforced concrete steeply-pitched roof



Building physics

linear thermal bridge coefficient ψ	-0.012 W/mK

Technical description

Suitability

• For heated rooms an the uppermost floor that do not require a horizontal ceiling.
•For rooms an the uppermost floor that require a high amount of protection against overheating in summer.
•For roofs in solid construction method buildings which require reinforced concrete roofs in accordance with local building code (fire protection).
•For the construction of a nearly thermal bridge-free structure.

Construction process

•Cover the afflux opening of the lower roof ventilation with a fine-mesh insect screen (200 cm^2/m minimum open cross-section with regard to ÖNORM B 8110-2)
•Choose the thickness of the cross batten to suit the projection of the canopy.
•Services (empty piping) should be inserted in the formwork before pouring concrete.

Maintenance

•Check the roof cladding and battens regularly.

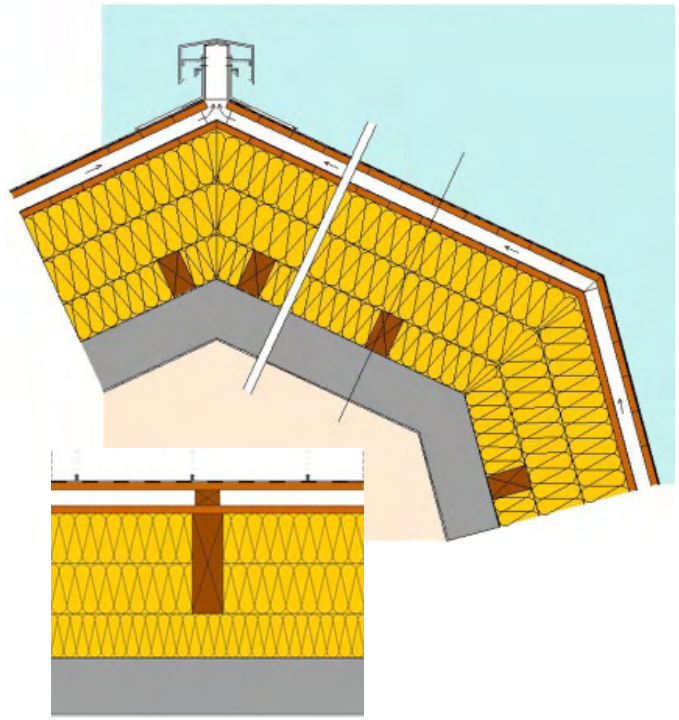
Structural discussion

•The construction allows for an almost completely thermal bridge-free structure.
•The high storage mass effectiveness leads to increased thermal comfort.
•The long concrete roof drying period is a disadvantage (not in the case of prefabricated components), that may delay interior construction.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Pitched roof / Warm attic

Reinforced concrete ("coffin-type") roof



Flat ("coffin-type") roof structure (sharking)

cm	Composition
	Tin roof covering
0,3	Layer roof skin (e.g. polymer bitumen roll roofing)
2,4	Under roof - rough formwork
5,0	Counter battens 5/8
	Layer of vapour diffusion-permeable span-bonded web
2,4	Rough formwork
16,0	Lightweight glass wool between battens
16,0	Lightweight glass wool between battens
14,0	Lightweight glass wool between battens
	Water vapour barrier
18,0	Reinforced concrete structure
0,5	Plaster

U = 0,10 W/m²K
Rw ≥ 59 dB
REI 30

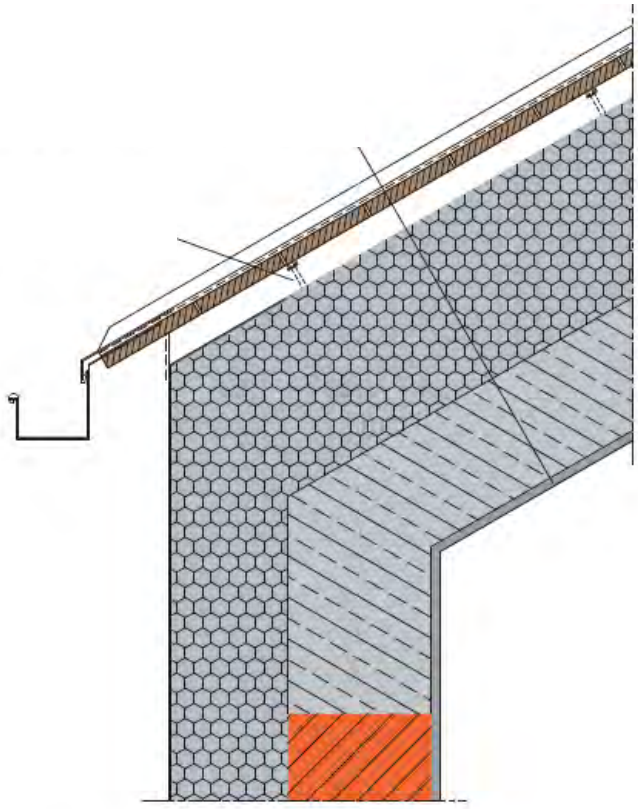
Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=19 (05.09.2008 15:30)

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /

Reinforced concrete steeply-pitched roof

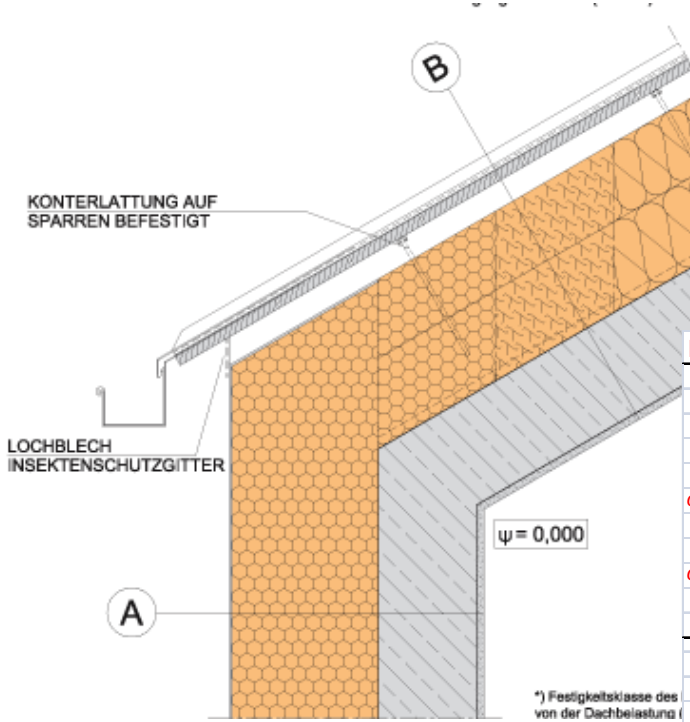


-	roof covering
2,4 cm	cladding
5,0 cm	ventilation, ….
14,0 cm	EPS-insulation
16,0 cm	rafter / insulation
20,0 cm	reinforced concrete
1,5 cm	inside plaster

Source: www.austrotherm.com/imperia/md/content/baumitat2/deutsch/ratundtatgeber/neh_folder.pdf

PH-details: Outside wall / Pitched roof / Warm attic

Reinforced concrete outside wall, ETICS /
Reinforced concrete steeply-pitched roof



Steep roof Massive

A	Exterior wall		Lambda	Rt-value
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Wall construction	2,100	0,095
4	1,5	Interior plaster	0,870	0,014
		sum thermal resistances		**7,612**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value		**0,129**

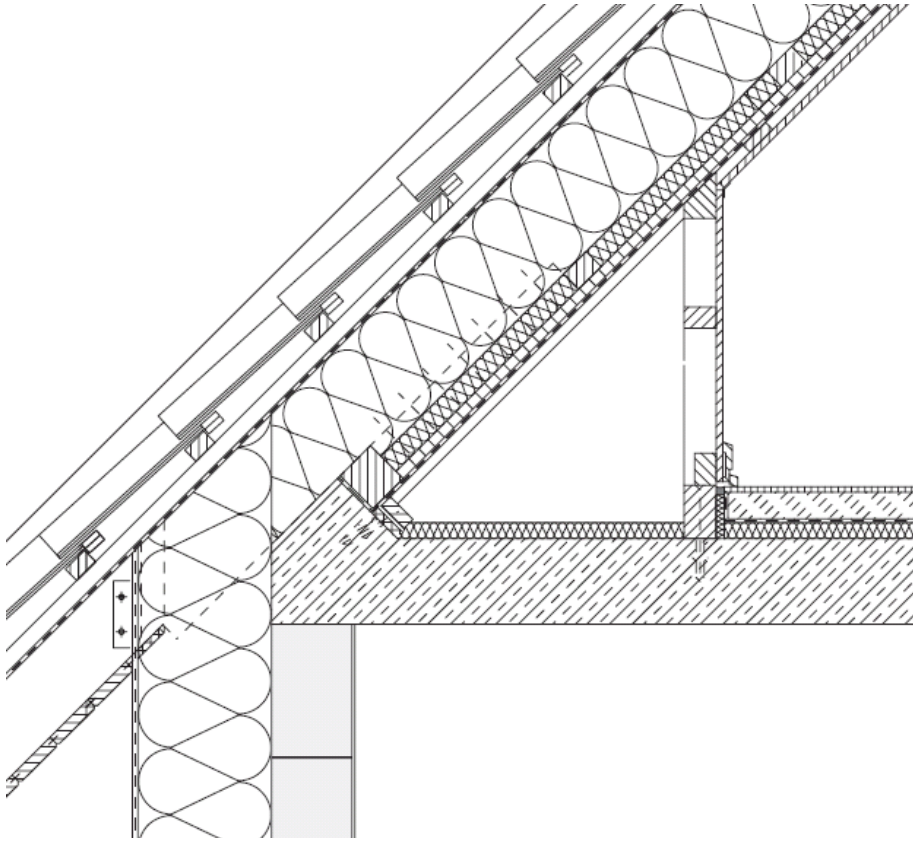
B	Roof		Lambda	Rt-value
1		Sheet roofing		
2		Pre-roofing (slotted before sheet roofing)		
3	2,4	Roof boarding		
4	5,0	Rear ventilation, counter battens fixed to the rafters		
5	14,0	Heat insulation EPS-W 20 on rafters	0,038	3,684
or	*9,0*	*Heat insulation PUR-DD*	*0,025*	
6	16,0	Lower rafter, rafter ca. 14x6 cm, e=80cm, 7,5%	0,130	0,092
7	16,0	Heat insulation EPS-W 20 between rafters	0,038	3,895
or	*10,0*	*Heat insulation PUR-DD*	*0,025*	
8	20,0	Reinforced concrete	2,100	0,095
9	1,0	Interior plaster	0,870	0,011
		sum thermal resistances		**7,777**
		heat transmission resistances		**0,260**
		heat transmission coefficient (U-value)		**0,124**

Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick wall, ETICS /

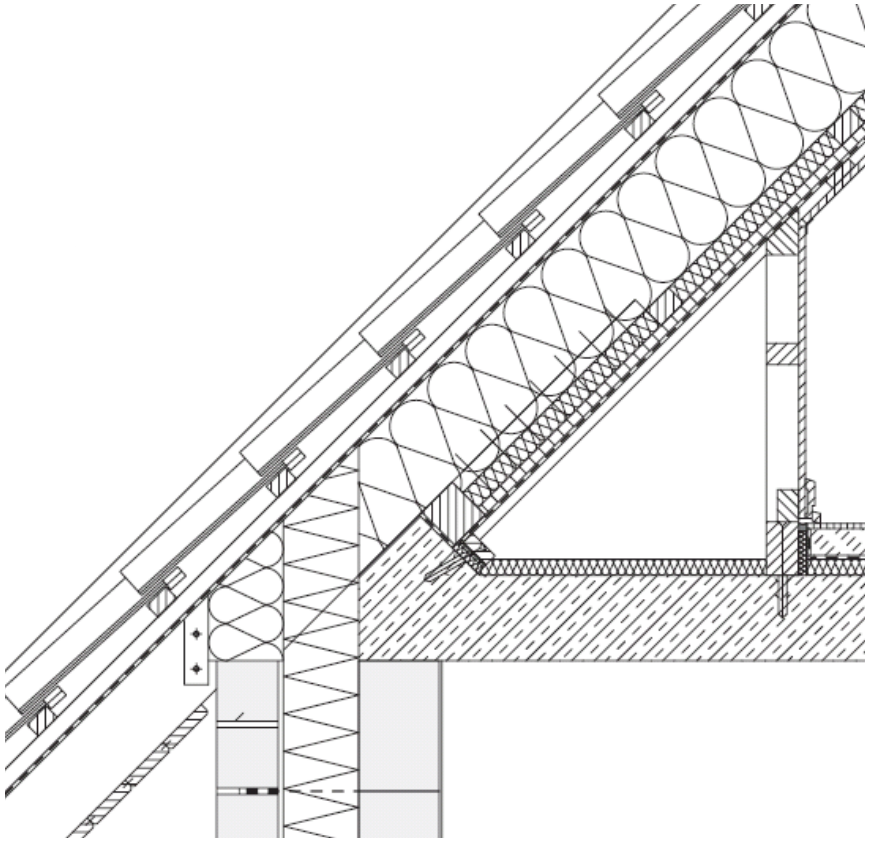
Reinforced concrete ceiling, steeply-pitched roof rafters, in-between insulation



Source: Kalksandsteindetailsammlung, Detail 4.2.2.21, www.xella.de

PH-details: Outside wall / Pitched roof / Warm attic

Brick double-leaf cavity wall with ventilation area, core insulation /
Reinforced concrete ceiling, steeply-pitched roof rafters, in-between insulation

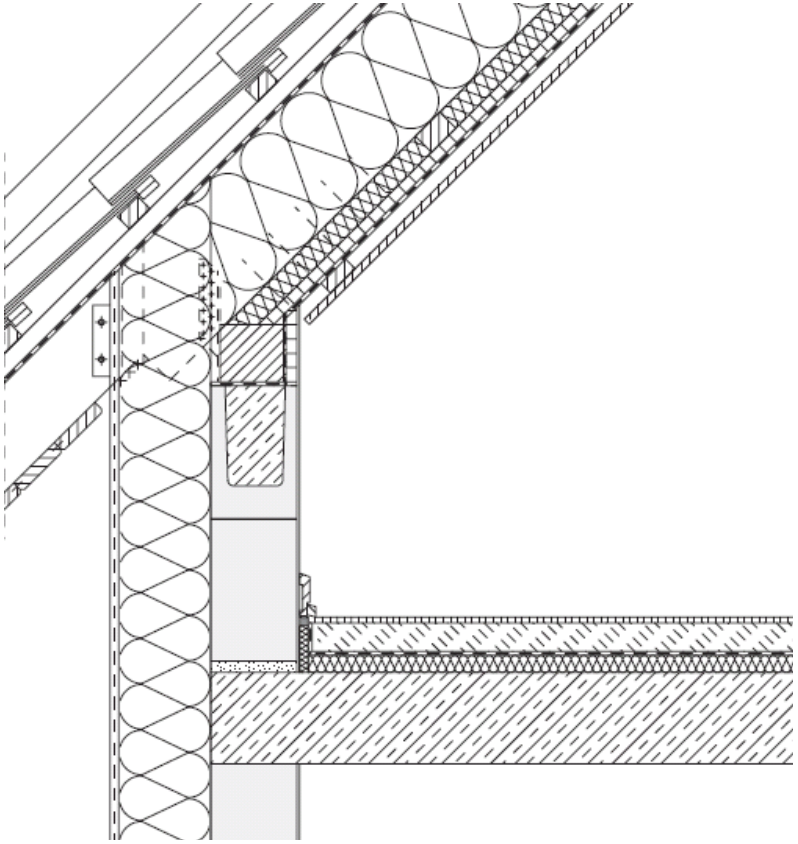


Source: Kalksandsteindetailsammlung, Detail 4.2.3.21, www.xella.de

PH-details: Outside wall / Pitched roof / Warm attic

Outside brick jump wall, ETICS /

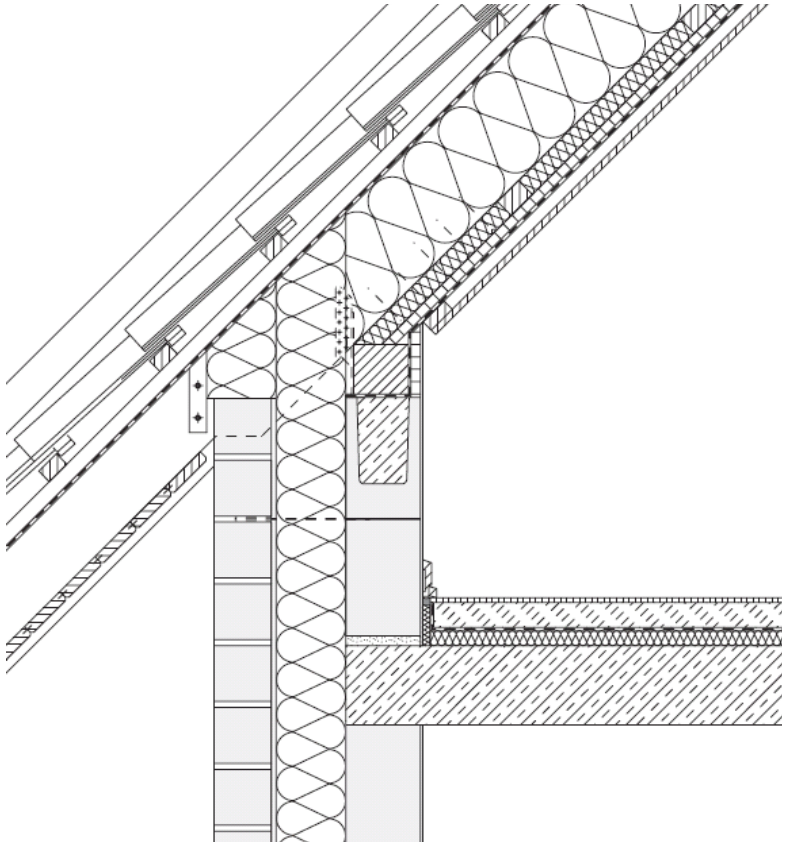
Reinforced concrete ceiling, steeply-pitched roof rafters, in-between insulation



Source: Kalksandsteindetailsammlung, Detail 4.3.2.11, www.xella.de

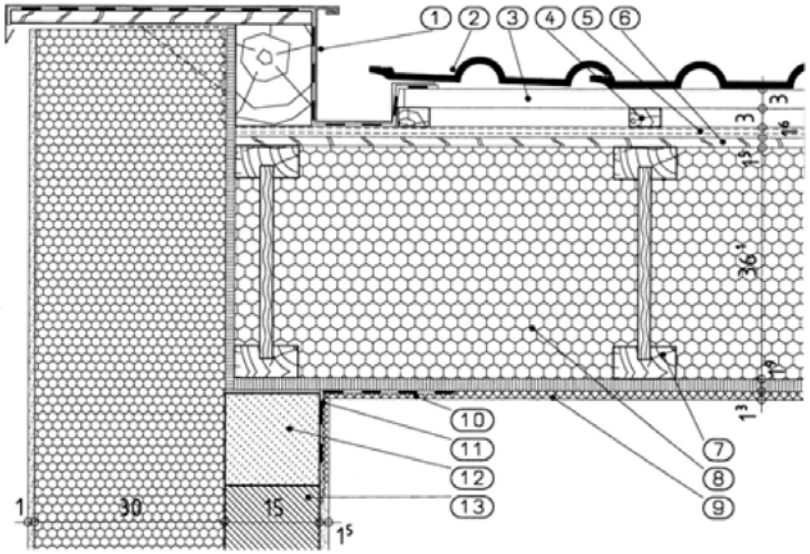
PH-details: Outside wall / Pitched roof / Warm attic

Brick double-leaf cavity jump wall with ventilation area, core insulation /
Reinforced concrete ceiling, steeply-pitched roof rafters, in-between insulation



Source: Kalksandsteindetailsammlung, Detail 4.3.3.11, www.xella.de

PH-details: Outside wall / Pitched roof / Warm attic



Source: Wolfgang Winter, Vorlesung - Besonderheiten des mehrgeschossigen Holzbaus in Europa

PH-details: Outside wall / Pitched roof / Cold attic

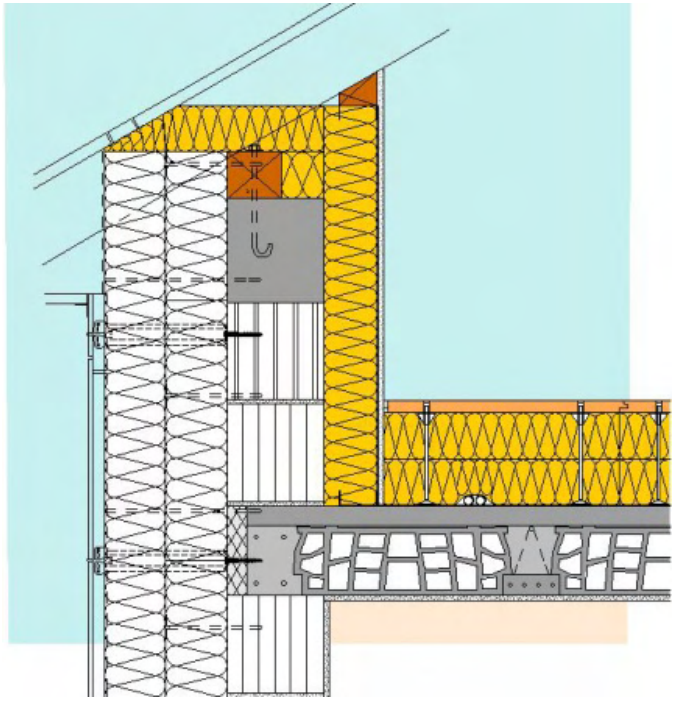
Outside wall / Pitched roof / Cold attic

Source:

PH-details: Outside wall / Pitched roof / Cold attic

Outside brick wall, ETICS /

Hollow brick ceiling, insulation between distance feet of "Distansol" chipboard panel , ventilation



Raised floor on top floor ceiling

cm	Composition
3,2	"Distansol" chipboard panel with distance feet
12,0	Glass wool panel
12,0	Glass wool panel
-	Vapour barrier
22,0	Hollow brick ceiling with concrete layer on top
1,5	Interior plaster

U = 0,14 W/m²K
Rw ≥ 66 dB

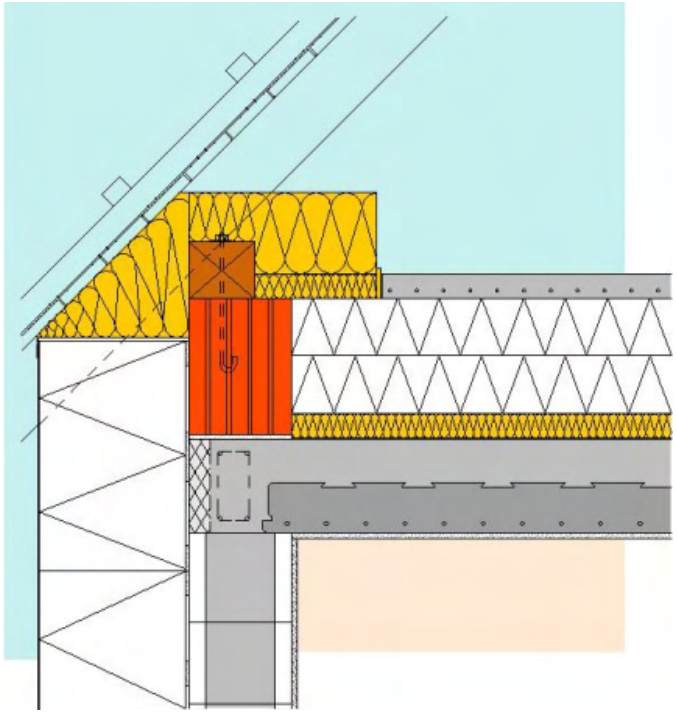
Ψ = 0,0 W/mK

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 15:30)

PH-details: Outside wall / Pitched roof / Cold attic

Outside brick wall, ETICS /
Hollow brick ceiling, insulated upper side, dry screed, ventilation



cm	Composition
6,0	Cement screed reinforced
14,0	EPS-W 20 (expanded polystyrene)
14,0	EPS-W 20 (expanded polystyrene)
6,0	Impact sound insulation board 60
-	Vapour barrier
23,0	Hollow brick ceiling with concrete layer on top
1,5	Interior plaster

U = 0,10 W/m²K
Rw ≥ 66 dB

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

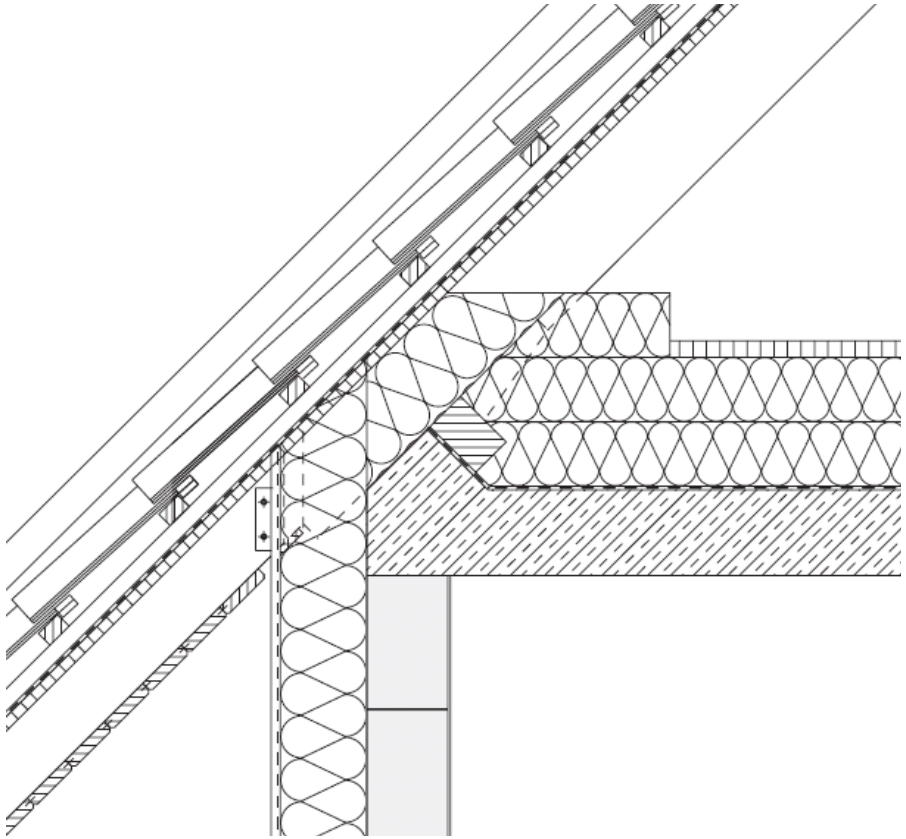
Ψ = 0,0 W/mK

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 15:30)

PH-details: Outside wall / Pitched roof / Cold attic

Outside brick wall, ETICS /

Reinforced concrete ceiling, insulation on upper side, steeply-pitched roof



TOP CEILING

Rafter roof support

Ceiling insulated outwards

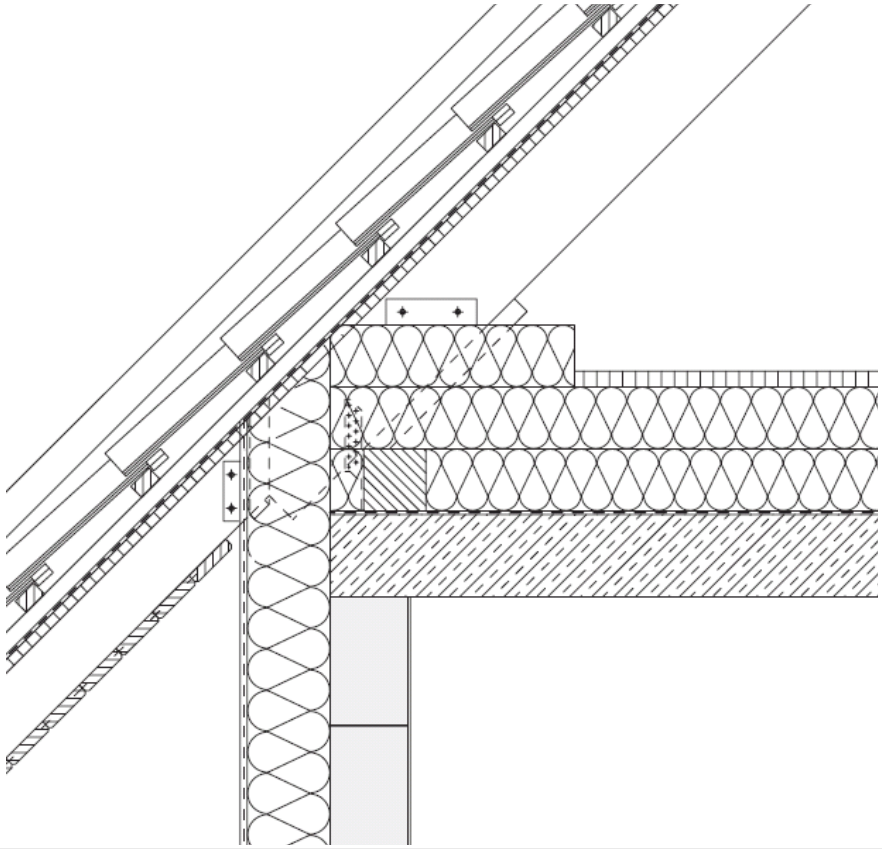
KS- Thermohaut

Source: Kalksandsteindetailsammlung, Detail 3.7.2.11, www.xella.de

PH-details: Outside wall / Pitched roof / Cold attic

Outside brick wall, ETICS /

Reinforced concrete ceiling, insulation on upper side, steeply-pitched roof



TOP CEILING

Purlin roof support

Ceiling insulated outwards

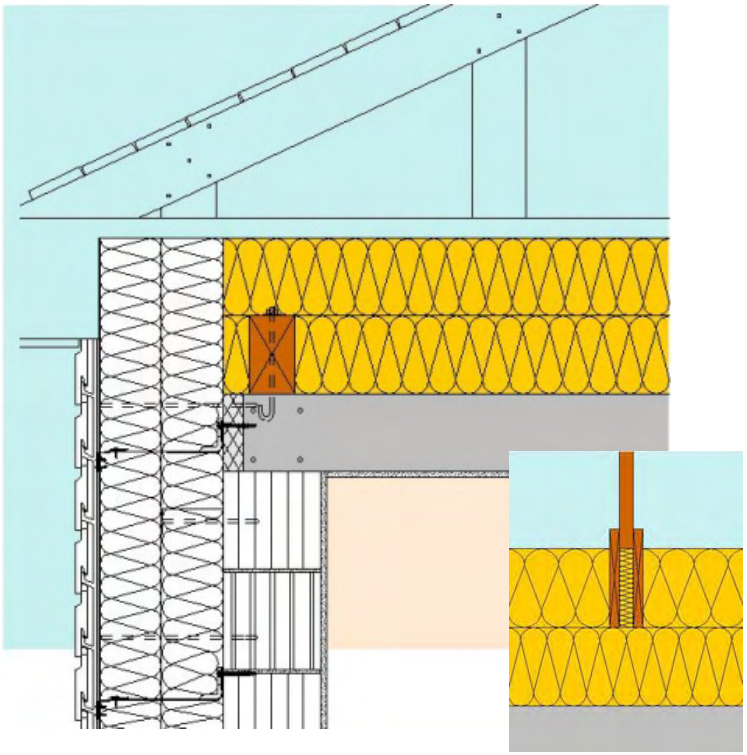
KS- Thermohaut

Source: Kalksandsteindetailsammlung, Detail 3.6.2.11, www.xella.de

PH-details: Outside wall / Pitched roof / Cold attic

Outside brick wall, ETICS /

Concrete ceiling, nailed frame roof, in-between insulation, ventilation



cm	Composition
-	*Wind-tight layer*
20,0	Lightweight glass wool between the nailed wood construction
20,0	Lightweight glass wool between timber beams
20,0	Reinforced concrete ceiling
1,5	Interior plaster

U = 0,10 W/m²K

Rw ≥ 61 dB

Link for different values: Architektenordner online

http://www.isover.at/index.php?id=aotech&no_cache=1

Ψ = 0,0 W/mK

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 15:30)

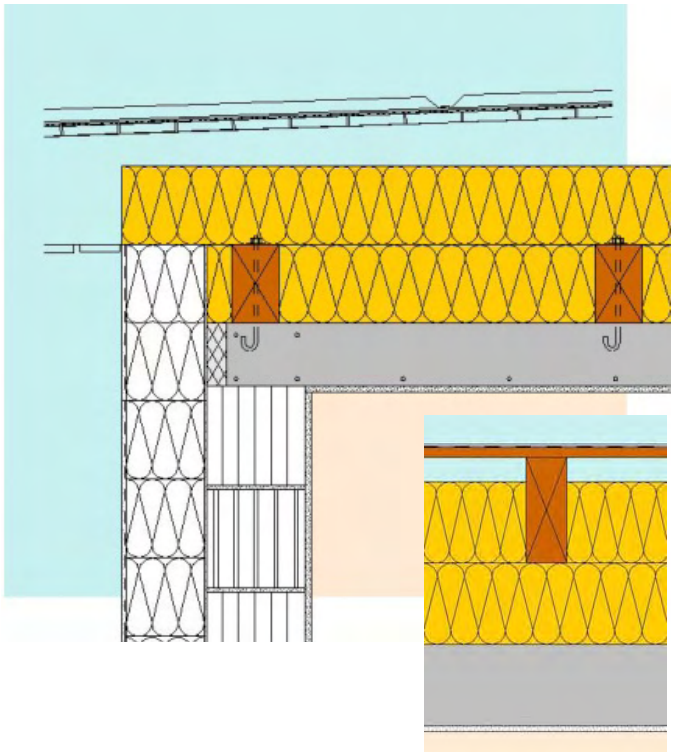
PH-details: Outside wall / Flat roof

Outside wall / Flat roof

Source:

PH-details: Outside wall / Flat roof

Outside brick wall, ETICS /
Concrete ceiling, tapered rafter roof, in-between insulation, rear ventilation



cm	Composition
-	Tin roof covering
2,7	Wood cladding with bitumen layer and ventilation area
20,0	Lightweight glass wool between tapered rafters
20,0	Lightweight glass wool between timber beams
16,0	Reinforced concrete ceiling
1,5	Interior plaster

U = 0,10 W/m²K
Rw ≥ 58 dB

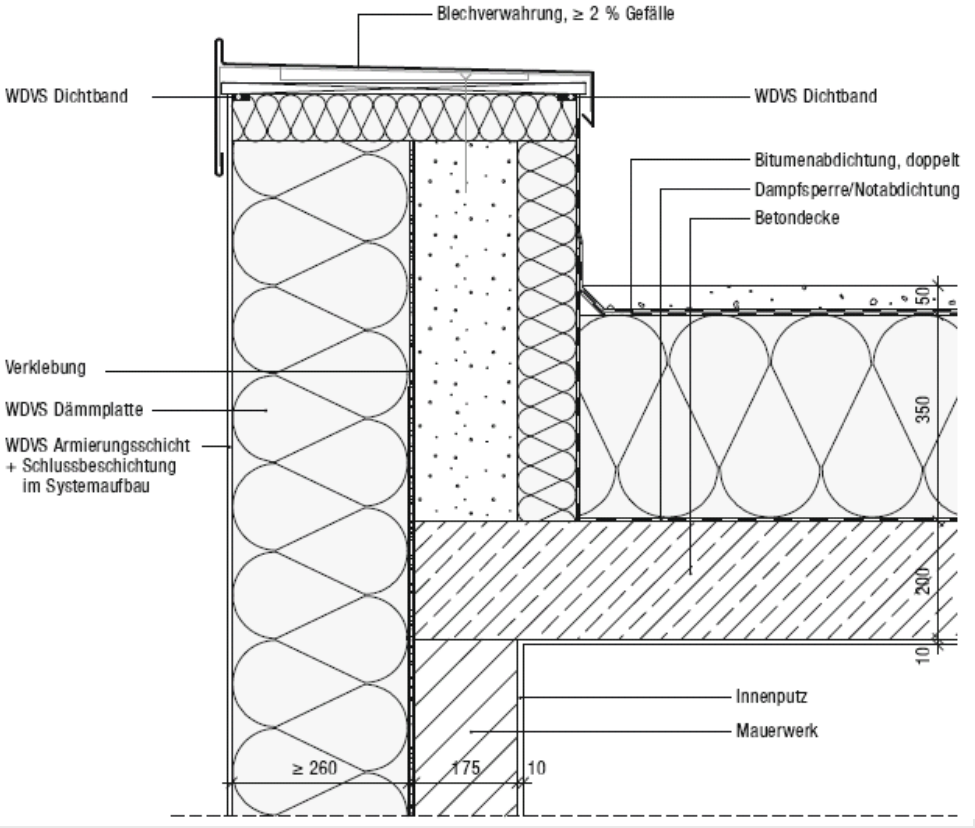
Ψ = 0,0 W/mK

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=21 (05.09.2008 15:30)

PH-details: Outside wall / Flat roof

Outside brick wall, ETICS, porous concrete attic /
Reinforced concrete flat roof, insulated upper side, non-ventilated

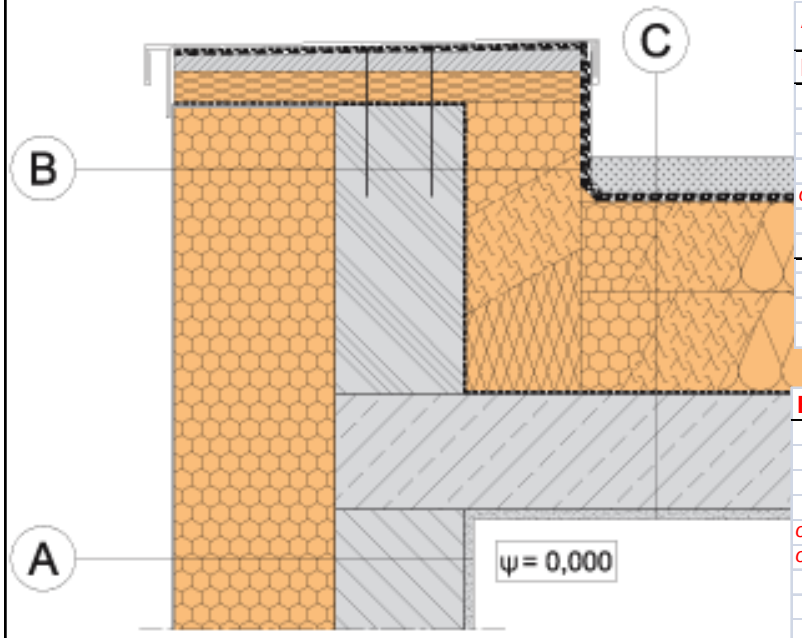


Source: Brillux Passivhausdetail 0.7.1

PH-details: Outside wall / Flat roof

Outside brick wall, ETICS, porous concrete attic /
Reinforced concrete flat roof, insulated upper side, non-ventilated

Non-ventilated roof with attic



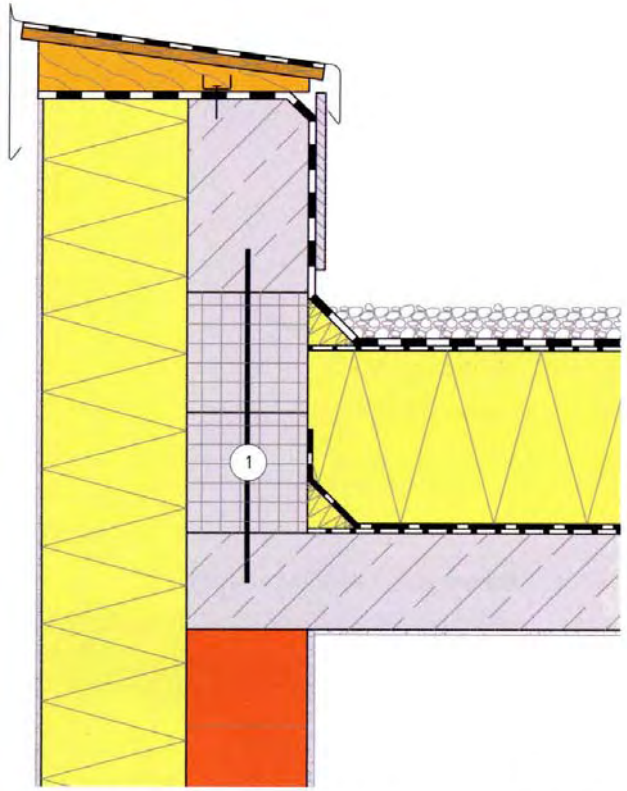
A	Exterior wall			
B	**Attic**		**Lambda**	**Rt-value**
1		Covering layer of the ETICS		
2	30,0	ETICS with EPS-F	0,040	7,500
3	20,0	Gas concrete wall	0,240	6,833
4	18,0	Heat insulation XPS-G or EPS-W 20	0,035	5,413
or	*13,0*	*Heat insulation PUR-DD*	*0,025*	
5		Vapour barrier, roof sealing		
6		Protective plate		
		sum thermal resistances		**13,476**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,073**

B	Non-ventilated roof		Lambda	Rt-value
1		Gravel		
2		Fleece		
4		Roof sealing, 2-layer		
5	30,0	Heat insulation EPS-W 20	0,036	7,895
or	*32,0*	*Heat insulation MW-WD*	*0,040*	
or	*20,0*	*Heat insulation PUR-DD*	*0,025*	
6		Vapour barrier		
7		Vapour pressure equalising layer		
8	18,0	Reinforced concrete ceiling	2,100	0,086
9	1,5	Interior plaster	0,870	0,017
		sum thermal resistances		**7,998**
		heat transmission resistances		**0,170**
		heat transmission coefficient (U-value)		**0,122**

Source: www.gdi.at/gdi_passivhaus_details.pdf

PH-details: Outside wall / Flat roof

Honeycomb brick outside wall, ETICS, concrete attic on “Thermo foot” / Reinforced concrete flat roof, insulated upper side, non-ventilated



1 Porenbetonstein λ = 0,1 W/mK / Porous concrete stone λ = 0.1 W/mK

Technical description

Suitability
- For rooms an the uppermost level with high comfort standards (low summertime overheating).
- For accessible flat roofs, roof terraces and green roofs

Construction process
- Secure parapet with splice bars.
- Vapor barriers, moisture seals and their connections to parapet should be made with great care and be protected from damage during construction.

Maintenance
- Check the roof skin regularly.

Structural discussion
- Vapor barrier and moisture seal (upper roof skin) are susceptible to damage. Damaged areas are often hard to find, repairs and the removal of moisture damage that has already developed can be difficult.

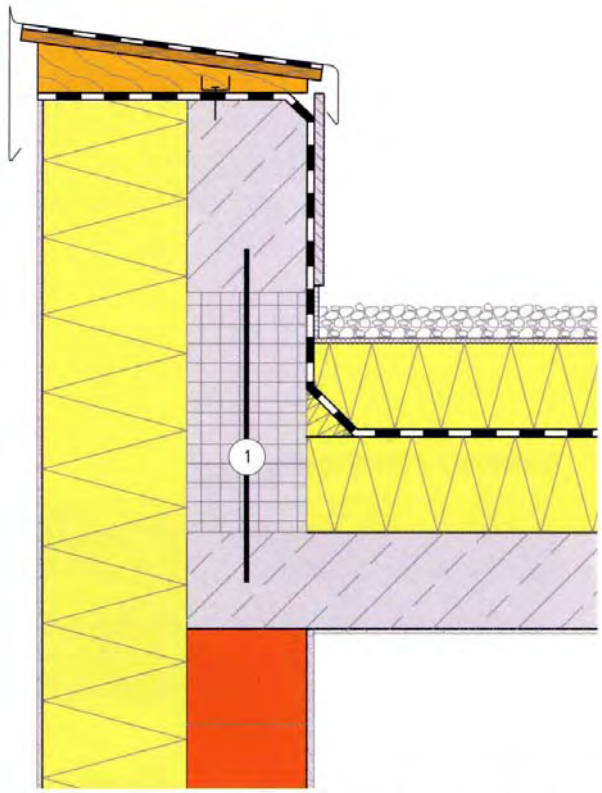
Building physics

linear thermal bridge coefficient ψ	-0.041 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Flat roof

Honeycomb brick outside wall, ETICS, concrete attic on “Thermo foot” / Reinforced concrete flat roof, insulated upper side, duo roof, non-ventilated



1 Porenbetonstein λ = 0,1 W/mK / Porous concrete stone λ = 0.1 W/mK

Technical description

Suitability
- For rooms an the uppermost level with great summer comfort (low summertime overheating)
- For both flat roofs not accessed constantly and roof terraces as well as green roofs.

Construction process
- Secure parapet with splice bars.
- Vapor barriers, moisture seals and their connections to parapet should be made with great care and be protected from damage during construction.

Maintenance
- No special measures.

Structural discussion
- The creation of the moisture seal and its connections requires meticu-lous, careful work and special protection before adding the upper in-sulation layer. This layer gives the roof skin effective protection.

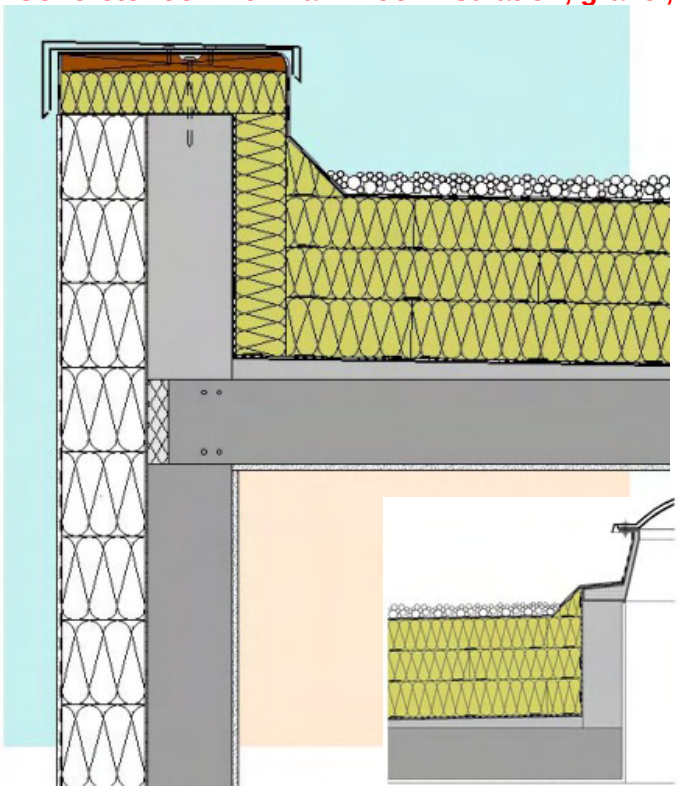
Building physics	
linear thermal bridge coefficient ψ	-0.043 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Flat roof

Concrete wall, ETICS /

Concrete roof with warm roof insulation, gravel, non-ventilated



Warm roof with gravel filling

cm	Composition
5,0	round gravel 16/32
0,8	Double-layer roof skin (e.g. polymer bitumen roll roofing, glued)
12,0	Stone wool with mechanical strength
12,0	Stone wool with mechanical strength
14,0	Stone wool with mechanical strength
-	Vapour barrier
-	Equalizing layer, perforated glass fibre roofing
-	Priming coat
≥ 4,0	Sloping concrete, 2° gradient
20,0	Reinforced concrete slap
1,5	Internal rendering

U = 0,10 W/m²K

Rw ≥ 60 dB

Ψ = 0,0026 W/mK

Link for different values: Architektenordner online

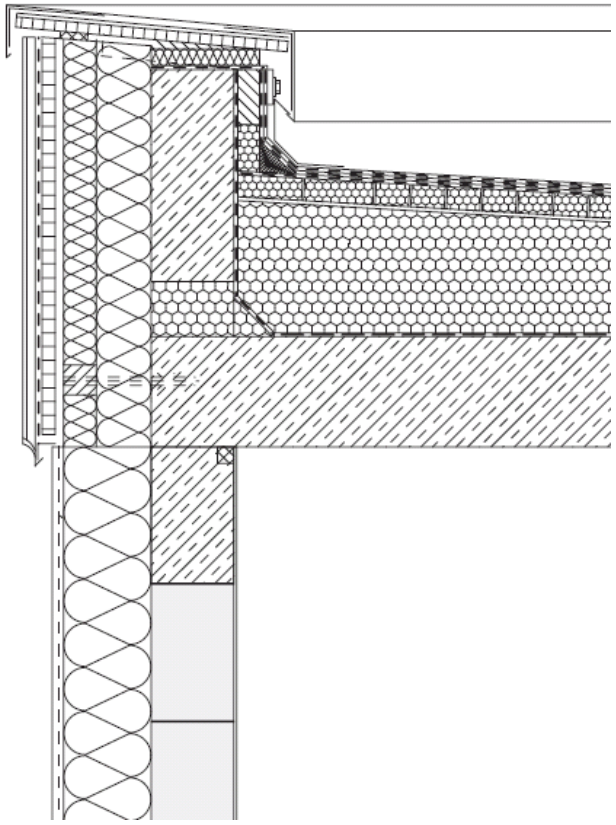
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=19 (05.09,2008 14:00)

PH-details: Outside wall / Flat roof

Outside brick wall, attic with “Isokorb”, ETICS, /

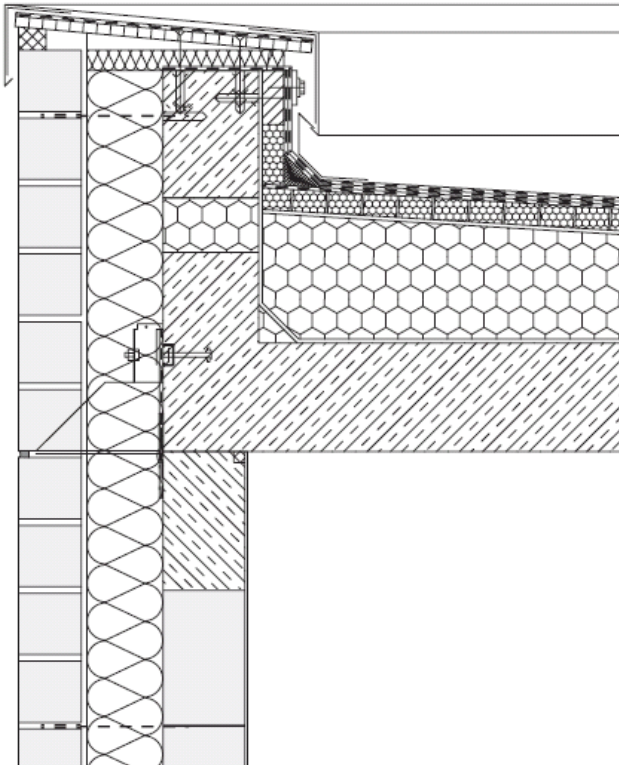
Concrete roof with warm roof insulation, gravel, non-ventilated



Source: Kalksandsteindetailsammlung, Detail 5.1.3.11, www.xella.de

PH-details: Outside wall / Flat roof

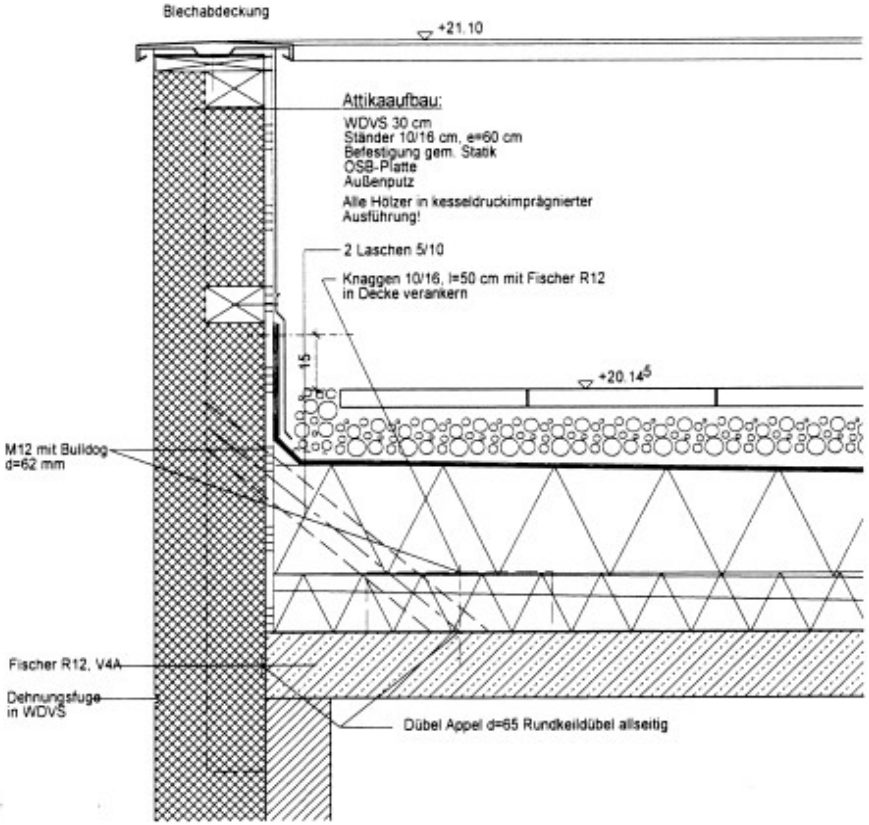
Double-leaf cavity wall with full-cavity insulation, attic with “Isokorb” /
Concrete roof with warm roof insulation, gravel, non-ventilated



Source: Kalksandsteindetailsammlung, Detail 5.1.3.11, www.xella.de

PH-details: Outside wall / Flat roof

Brick work outside wall, ETICS with timber sub-structure for attic /
Reinforced concrete flat roof, insulated upper side, non-ventilated



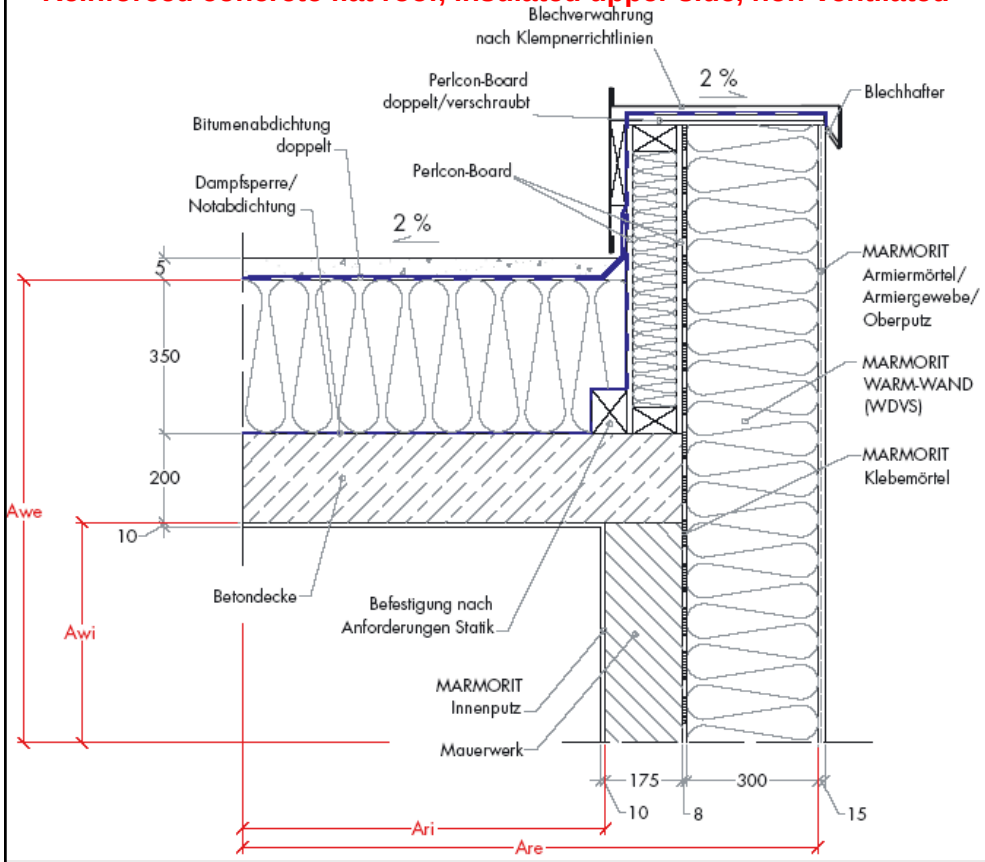
Construction of attic wall

- The attic wall is built with a light timber construction (ETICS outside).
- To achieve this an exemption from the Hamburg Building Code was given (REI 90 for supporting structures).

Source: Mehrgeschoss-Passivhaus Hamburg Pinnasberg, PHI Darmstadt

PH-details: Outside wall / Flat roof

Outside brick wall, ETICS with timber sub-structure for attic /
Reinforced concrete flat roof, insulated upper side, non-ventilated



Source: www.marmorit.de/pages/passhaus

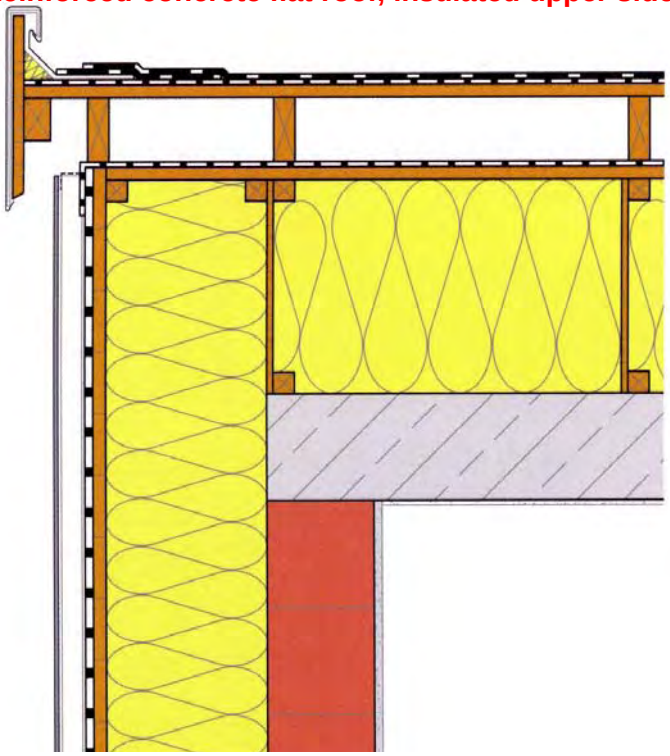
PH-details: Outside wall / Flat roof

Reinforced concrete outside wall, ETICS, with timber sub-structure for attic /
Reinforced concrete flat roof, insulated upper side, non-ventilated

Source: Architect Carsten Grobe, www.passivhaus.de

PH-details: Outside wall / Flat roof

Brick chipping concrete outside wall, rear ventilation /
Reinforced concrete flat roof, insulated upper side, rear ventilation



Building physics

linear thermal bridge coefficient ψ	-0.054 W/mK

Technical description

Suitability
• For rooms an the uppermost level with high summer comfort (low summertime overheating)
•For both flat roofs not accessed constantly and roof terraces as well as green roofs.

Construction process
•The height of the ventilated space and the afflux/exhaust ventilation openings should be checked carefully to ensure adequate vapor trans-portation and to avoid moisture damage to the ceiling.
•Both the upper opening of the rear ventilation of the outside wall and all the roof ventilation openings should be covered with fine-mesh insect screens. The screen surface should be larger than the ventilation cross-sections.
•UV-resistant foils should be used for roof sealing purposes.

Maintenance
•No special measures.

Structural discussion
•The construction can be completed with negligible thermal bridges
•High thermal comfort can be achieved.
•The construction requires caution during planning to avoid condensation build-up damage.
•The construction of the roof sealing connection requires particular care.
•The roof sealing has be resistant to thermal influences and UV irradiation.
•Checks for leaks in the roof skin are simple.
•With proper dimensioning of rear-ventilation space the construction of-fers a high degree of safety in comparison to other flat roofs thanks to two water-transport levels and its high drying potential.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

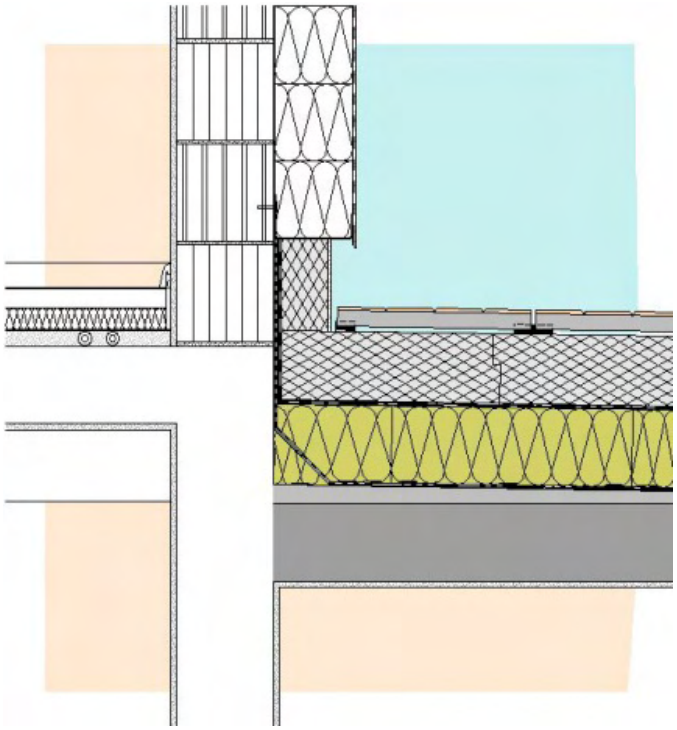
PH-details: Outside wall / Terrace

Outside wall / Terrace

Source:

PH-details: Outside wall / Terrace

Brick wall, ETICS /
Concrete roof with duo roof insulation, terrace



Duo roof - terrace roof

cm	Composition
5,0	Concrete panel with ceramics (50x50 cm)
2,5	Stalking bed
18,0	XPS-extruded polystyrene foam board
0,8	Double-layer roof skin (e.g. polymer bitumen roll roofing, glued)
18,0	Stone wool with mechanical strength, glued
-	Vapour barrier
-	Equalizing layer, perforated glass fibre roofing
-	Priming coat
≥ 4,0	Sloping concrete, 2° gradient
20,0	Reinforced concrete slap with XPS extruded polystyrene as thermal bridge insulation
1,5	Internal rendering

U = 0,10 W/m²K
Rw ≥ 60 dB

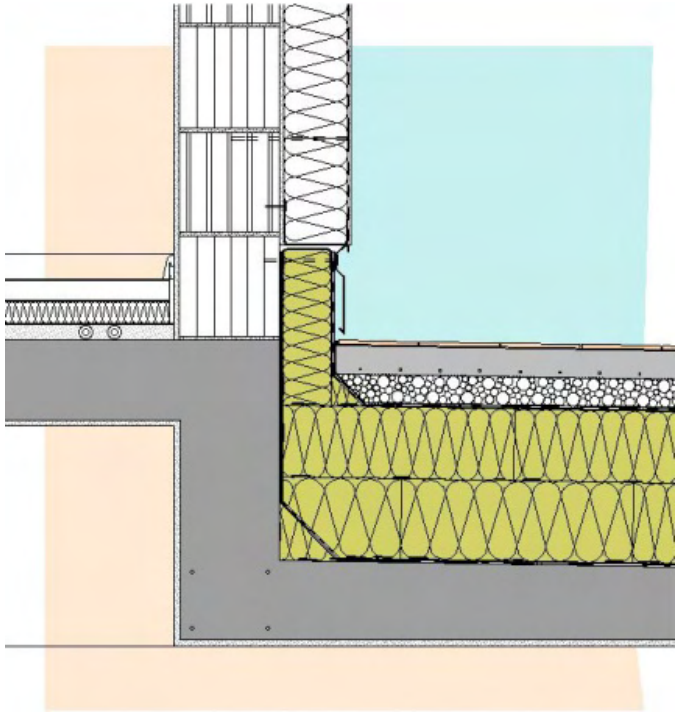
Ψ = 0,0 W/mK

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

Source: www.isover.com/SiteContent/view.do?navId=19 (05.09,2008 14:00)

PH-details: Outside wall / Terrace

Brick wall, ETICS /
Concrete roof with warm roof insulation, terrace



Warm roof, roofed-over terrace

cm	Composition
1,0	Clinker on flexible epoxy glue
7,0	Reinforced concrete screed
-	Separating layer
7,0	Drainage layer
-	Double separating layer
0,8	Double-layer roof skin (e.g. polymer bitumen roll roofing)
18,0	Stone wool with mechanical strength, glued
20,0	Stone wool with mechanical strength, glued
-	Vapour barrier
-	Equalizing layer, perforated glass fibre roofing
-	Priming coat
20,0	Reinforced concrete slap (sloping 2° gradient)
1,5	Internal rendering

Link for different values: Architektenordner online
http://www.isover.at/index.php?id=aotech&no_cache=1

U = 0,10 W/m²K
Rw ≥ 60 dB
Ψ = 0,0 W/mK

Source: www.isover.com/SiteContent/view.do?navId=19 (05.09,2008 14:00)

PH-details: Outside wall / Window

Wall / Windows

Source:

PH-details: Outside wall / Window

Outside brick wall, ETICS /
Wooden frame window, mounted on a subframe

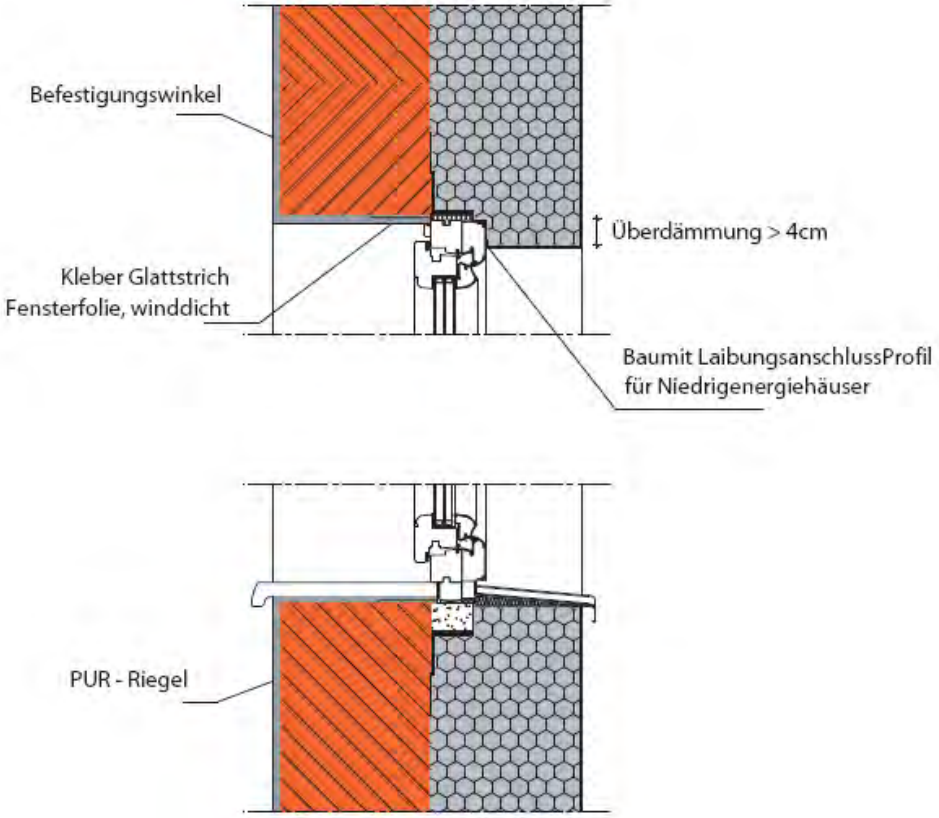
Wall built of polystyrene blocks and bricks inside

Cork is used as insulation material. The carrying construction is bricks.

Source: http://www.folkecenter.net/default.asp?id=33339

PH-details: Outside wall / Window

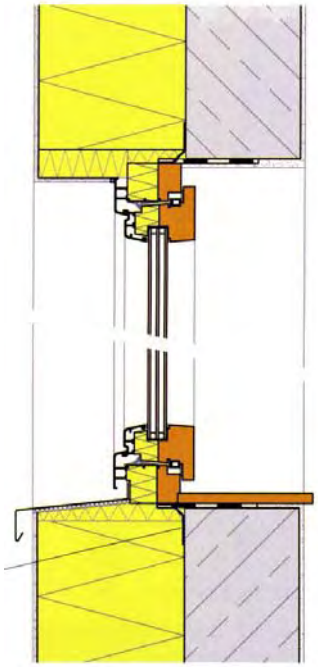
Outside brick wall, ETICS /
Wooden frame window, mounted on a subframe



Source: www.austrotherm.com/imperia/md/content/baumitat2/deutsch/ratundtatgeber/neh_folder.pdf

PH-details: Outside wall / Window

Reinforced concrete outside wall, ETICS / Wood-aluminium frame window



Technical description

Suitability
• Also suitable for the installation of windows in masonry and solid wood walls.
•Also suitable for wood passive house windows.

Construction process
•The construction steps are also valid for window-reveal connections.
•Fasten windows via lateral flat irons or via steel angles.
•Mount angles on the parapet for the installation and assembly of larger windows.
•Bond a fleece-laminated butyl rubber strip to seal the (cleaned) concrete an all sides.
•An interior plaster layer or gypsum fiberboard panel is necessary to cover the uneven surfaces caused by the flat irons and butyl rubber strips.
•Foaming the joint between the masonry and window frame increases the stability of the installed window.
•Ensure driving rain protection and wind tightness by the appropriate construction (e.g. insert compression strips between the insulation and window frame, connect exterior plaster layer with a rail to the frame).

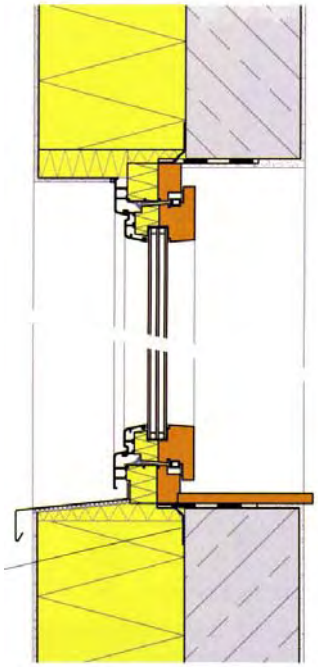
Maintenance
•If mounted with flat irons, the windows are easy to dismantle and exchange after removing the interior plaster, the gypsum plasterboard or gypsum fiberboard panel or removing the window sill.
•The aluminum cladding makes maintenance of the covering rail unnecessary.

Structural discussion
•Construction is also possible with other solid slabs, such as masonry, solid wood slabs and prefabricated cement components.
•Use a smooth screed layer an the entire surface for masonry.
•If a construction with interior plaster an the reveal is not desired, it is possible to fasten the window along the front using angles, but dismantling is difficult due to the screws an the outside
•Slightly angled reveal to increase solar radiation leads only to a minor increase in the thermal bridge coefficient.
•Aluminum cladding is definitely advisable along the parapet area due to the high water loads.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Window

Reinforced concrete outside wall, ETICS / Wood-aluminium frame window



Building physics

linear thermal bridge coefficient ψ

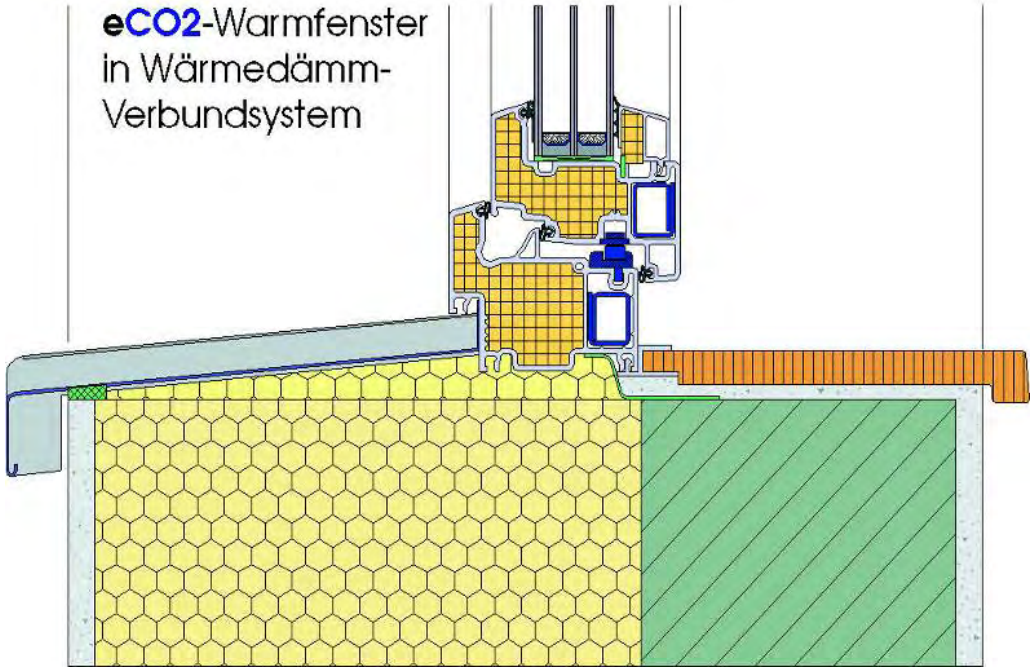
	Walls made of Concrete		Brick	Wood
Wood aluminium Windows				
Header/reveal w. add. insulation	0.011 W/mK		0.009 W/mK	0,007 W/mK
Parapet	0.023 W/mK		0.018 W/mK	0,016 W/mK
$U_{W,eff}$-value	0.842 W/m²K	0.834 W/m²K	0,828 W/m²K	
Wood-PUR windows				
Header/reveal w. add. insulation	0.003 W/mK		0.000 W/mK	-0,002 W/mK
Parapet	0.025 W/mK	0.020 W/mK	0,018 W/mK	
$U_{W,eff}$-value	0.842 W/m²K	0.816 W/m²K	0,810 W/m²K	
Header/reveal with 2 cm add. insulation				
Wood aluminium windows	0.016 W/mK		0.013 W/mK	0,011 W/mK
Wood-PUR windows	0.021 W/mK		0.018 W/mK	0,015 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Window

Reinforced concrete outside wall, ETICS /
Plastic frame window

Thermal bridge reduced connection – wall / window

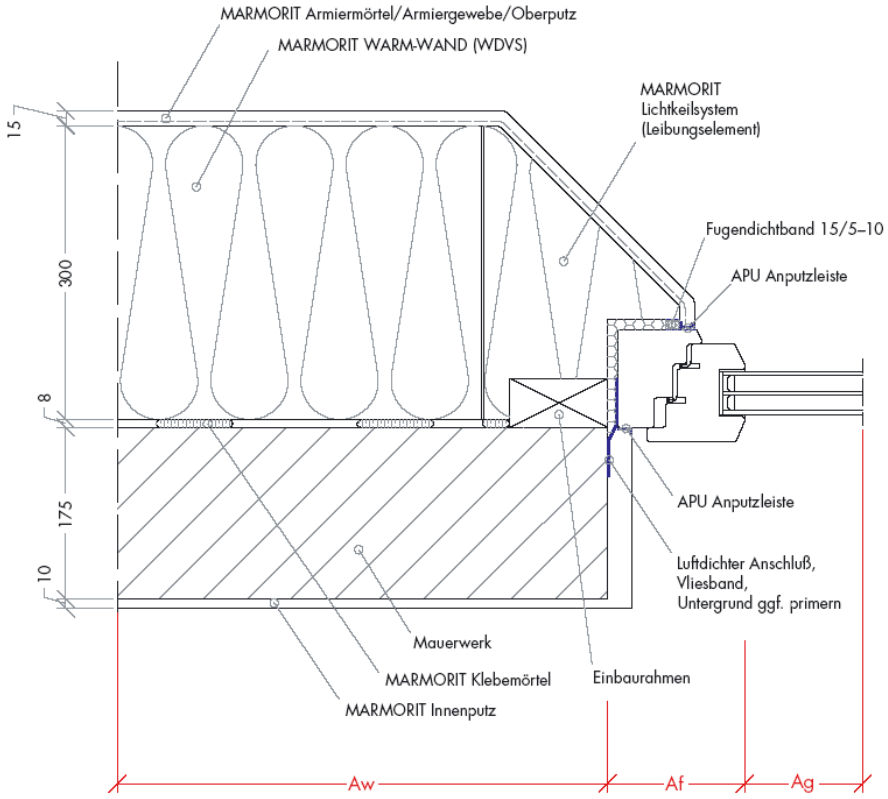


Source:

PH-details: Outside wall / Window

Outside brick wall, ETICS /
Wooden frame window mounted on a subframe

Thermal bridge reduced connection – wall / window

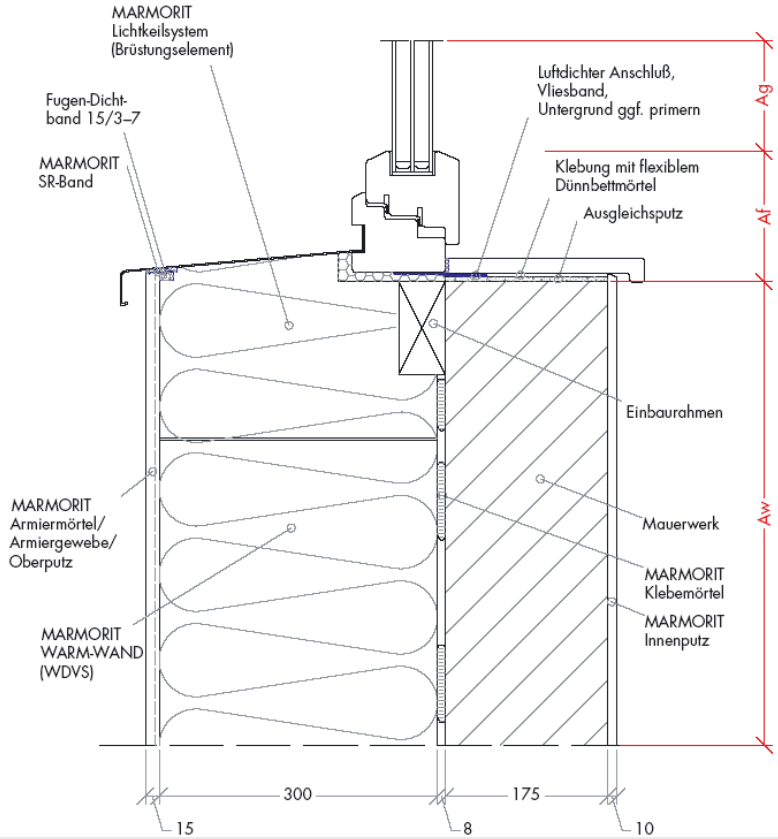


Source:

PH-details: Outside wall / Window

Outside brick wall, ETICS /

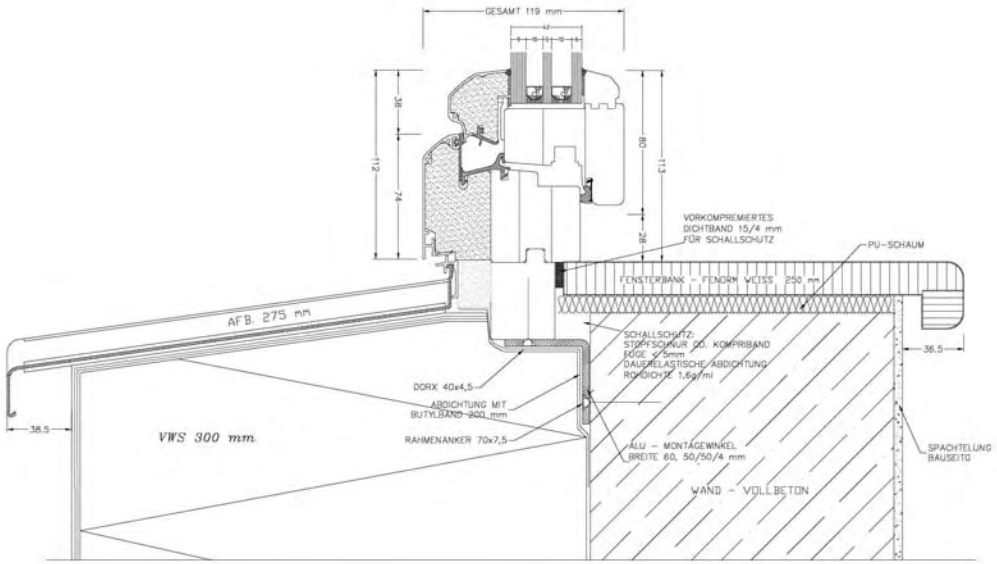
Wooden frame window mounted on a subframe

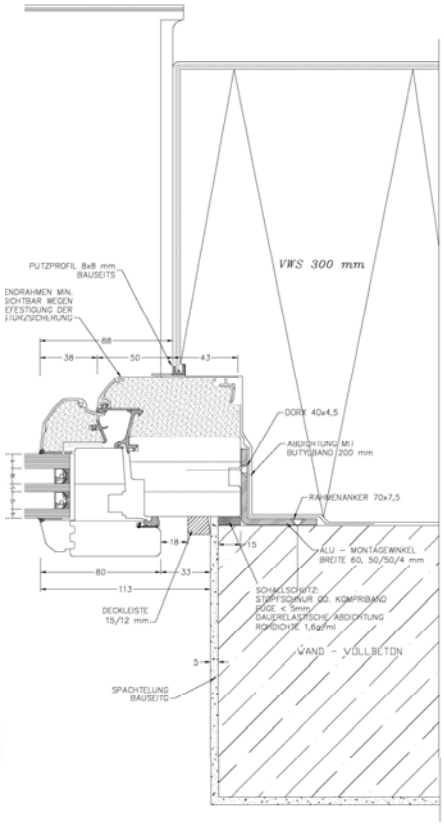


Source: www.marmorit.de/pages/passhaus

PH-details: Outside wall / Window

Concrete outside wall, ETICS /
Wooden (+insulation) frame window mounted on a sub-frame and console

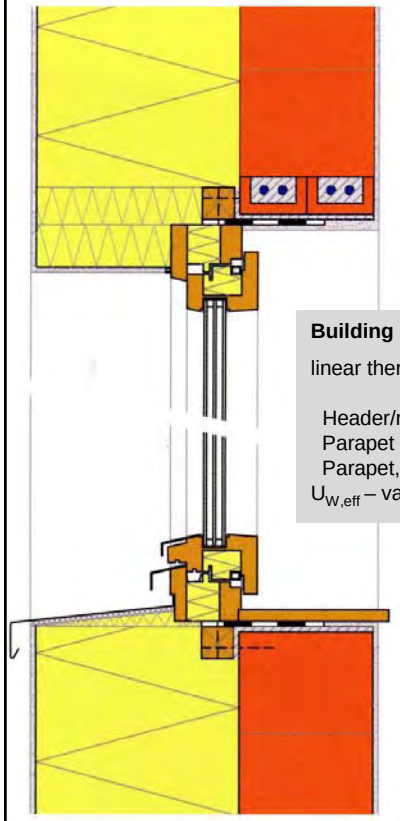




Source: Internorm, Schöberl & Pöll (Vortrag: Passivhausdetails in der Praxis)

PH-details: Outside wall / Window

Honeycomb brick outside wall, ETICS / Wooden frame window mounted on a subframe



Building physics

linear thermal bridge coefficient ψ

Header/reveal	0.005 W/mK
Parapet w/o add. insulation	0.027 W/mK
Parapet, 2 cm add. insulation	0.024 W/mK
$U_{W,eff}$ – value	0.831 W/m²K

Technical description

Suitability
- Only of limited use for wood-aluminum passive house windows.
- Only of limited use for reinforced concrete constructions.

Construction process
- The construction steps are also valid for window-reveal connections.
- Screw the window frame to the subframe and fasten it to the masonry.
- Spread smooth screed an all sides of the reveal.
- Fasten fleece-laminated butyl rubber strips and seal all sides of the smooth screed.
- Connect the interior plaster with the window frame plastering bead if needed.
- Ensure driving rain and wind tightness with the corresponding con-struction (e.g. insert compression strips between the insulation and window frame, connect exterior plaster layer with a bead to the frame).

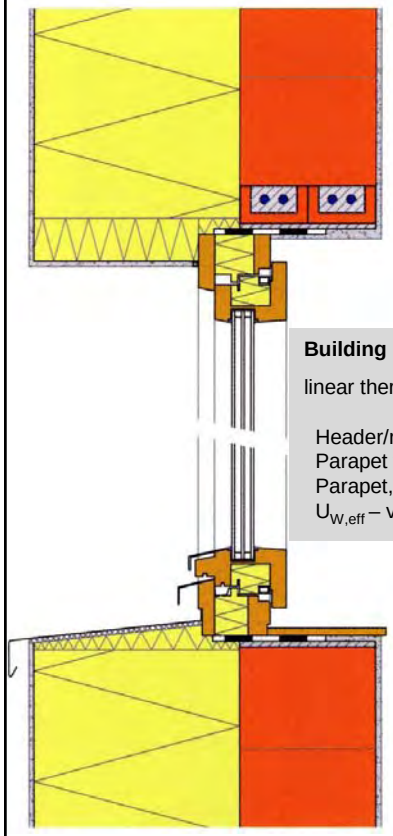
Maintenance
- The windows are easy to dismantle and exchange after removing the interior plaster.
- Observe the maintenance cycles for the finishing coating or the glazings (acrylic finishing lacquers approx. every ten years, coatings approx. every four years, longer in protected areas).

Structural discussion
- Wood-aluminum windows are only suitable if the U_w value is significantly lower than 0.8 W/m²K due to the high heat conductivity of aluminum and despite the use of an insulation layer an the window frame. Passive house limit value: $U_{w,mounted}$ = 0.85 W/m²K.
- Passive house windows used for reinforced concrete wall construc-tions have to have a Uw value significantly lower than 0.80 W/m²K.
- Construction with an exterior wall with solid slabs that offer less heat conduction than hollow brick walls is possible (e.g. solid Wood walls).
- Slightly angled reveal to increase solar radiation leads to only a minor increase in the thermal bridge coefficient.
- Parapet: aluminum cladding is definitely advisable along the parapet area due to the high water loads.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Window

Honeycomb brick outside wall, ETICS / Wooden frame window mounted on masonry



Building physics

linear thermal bridge coefficient ψ

Header/reveal	0.008 W/mK
Parapet w/o add. insulation	0.028 W/mK
Parapet, 2 cm add. insulation	0.030 W/mK
$U_{W,eff}$ – value	0.840 W/m²K

Technical description

Suitability
- Only of limited use for wood-aluminum passive house windows.
- Only of limited use for reinforced concrete constructions.

Construction process
- The construction steps are also valid for window-reveal connections •
- Half of the window frame is an the solid wall, this side is screwed to the masonry.
- Use a smooth screed layer an all sides.
- Bond a fleece-laminated butyl rubber strip to seal the smooth screed on all sides.
- Connect the interior plaster with the window frame plastering bead if needed.
- Ensure driving rain sealing and wind-tightness by meeans of suitable completion (e.g. insert compression strips between the insulation material and window frame, connect exterior plaster layer with a bead to the frame).

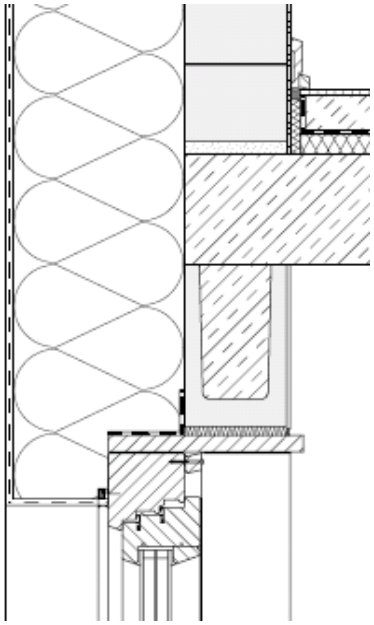
Maintenance
- The windows are easy to dismantle and exchange after removing the interior plaster.
- Observe the maintenance cycles for the finishing coating or the glazings (acrylic finishing lacquers approx. every ten years, coatings approx. every four years, longer in protected areas).

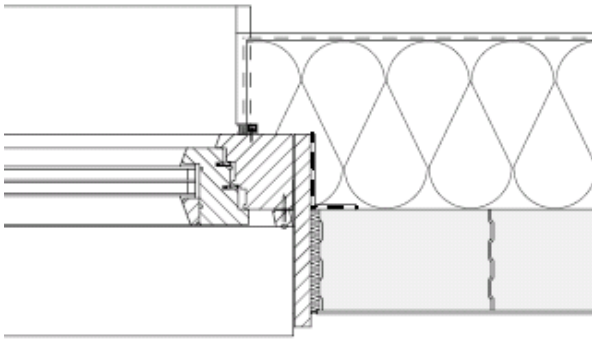
Structural discussion
- Wood-aluminum windows are only suitable if the Uw value is signifi-cantly lower than 0.8 W/m²K due to the high heat conductivity of alu-minum and despite the use of an insulation layer an the window frame. Passive house limit value: Uw mounted = 0.85 W/m²K.
- Passive house windows used for reinforced concrete wall construc-tions have to have a U_w value significantly lower than 0.80 W/m²K
- Construction with an exterior wall with solid slabs that offer less heat conduction than hollow brick walls is possible (e.g. solid wood walls)
- Slightly angled reveal to increase solar radiation leads only to a minor increase in the thermal bridge coefficient.
- The use of sealing tape and wet sealing between the window frame and smooth screed can also be a suitable replacement for the inserted butyl rubber strip in the airtight layer between window and wall

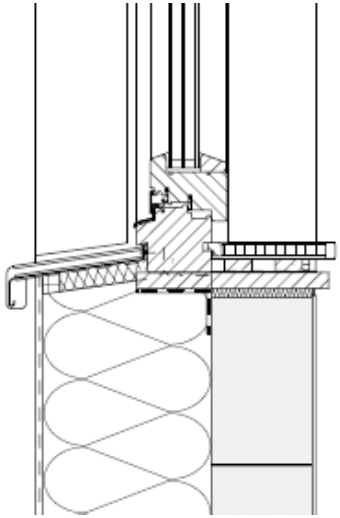
Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Outside wall / Window

Outside brick wall, ETICS /
Wooden frame window mounted on a frame



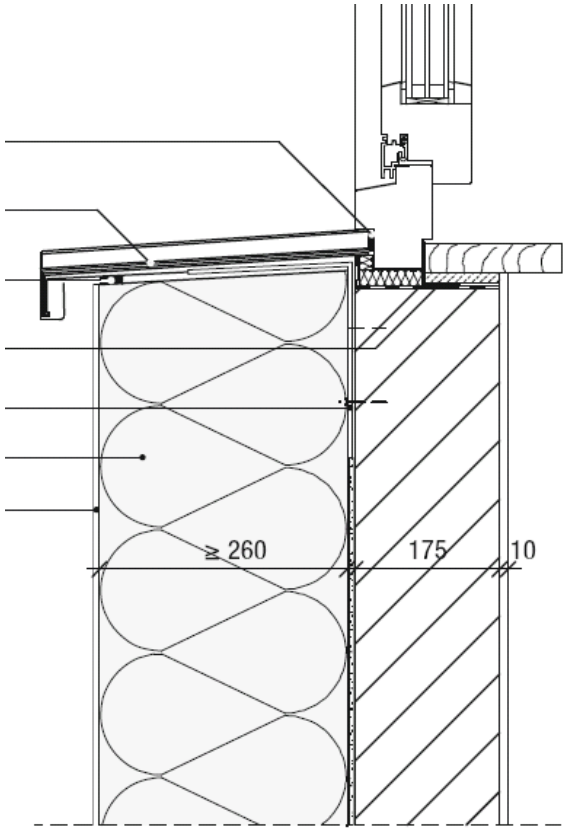




Source: Kalksandsteindetailsammlung, Detail 7.6.2.21, Detail 7.5.2.21, Detail 7.1.2.21, www.xella.de

PH-details: Outside wall / Window

Outside wall, ETICS /
Window frame mounted on masonry



WDVS Dichtband

WDVS Fensterbank

WDVS Dichtband

Luftdichte Fensteranschlussfolie

WDVS Maueranker

WDVS Dämmplatte

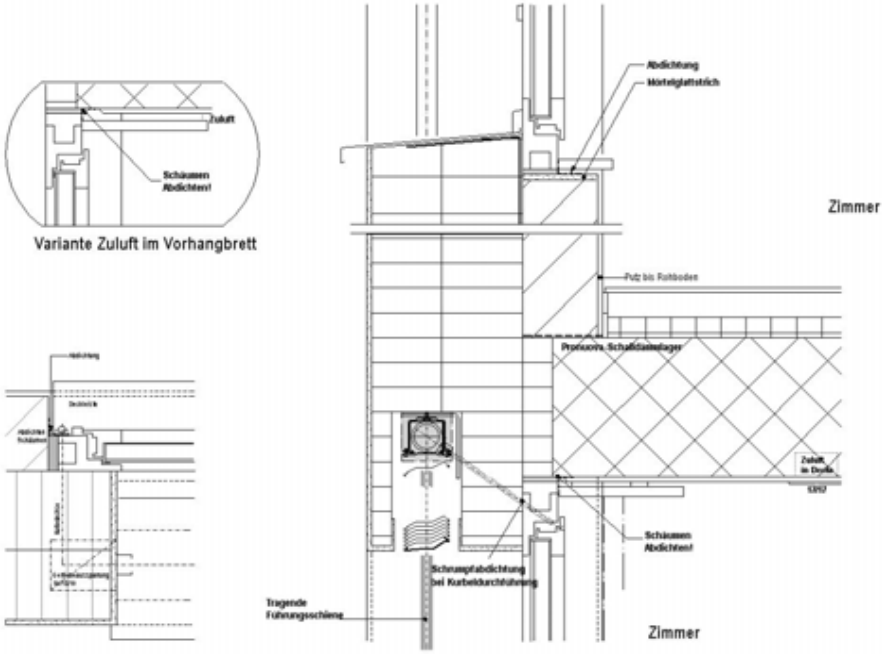
WDVS Armierungsschicht
+ Schlussbeschichtung im Systemaufbau

Source: Brillux Passivhausdetail 0.4.1

PH-details: Outside wall / Window

Outside brick wall, ETICS /

Plastic frame window mounted on masonry, lamella curtain box



Architect Arthur Sigg

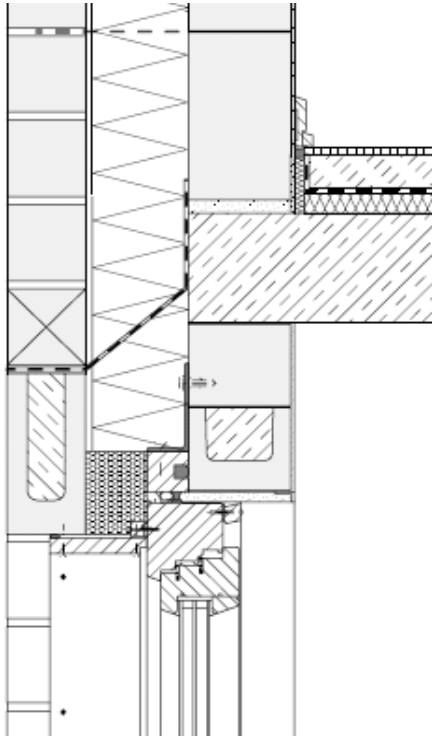
Outside wall: U = 0.104 W/m2K

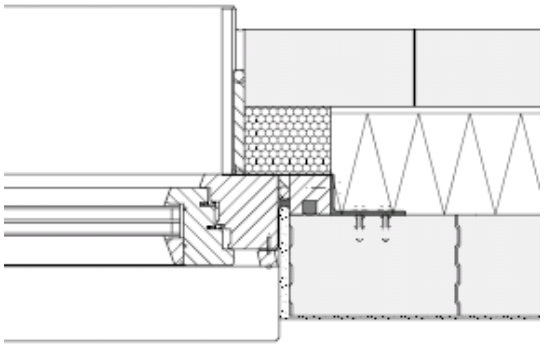
2 layers “Neopor” (λ-value 0.031 W/mK)

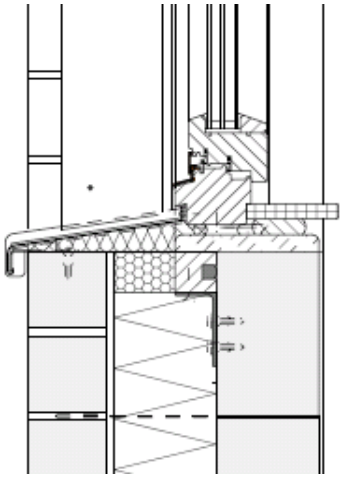
Source: Überbauung Konstanz in Rothenburg, Architect Arthur Sigg www.empa-ren.ch/Internet-Files/Programm/Aktuelles/aktualitaeten/Status-Seminar/pdf-files2004/Sigg%20Konstanz.pdf

PH-details: Outside wall / Window

Double-leaf cavity wall with full-cavity insulation /
Wooden frame window mounted on a subframe





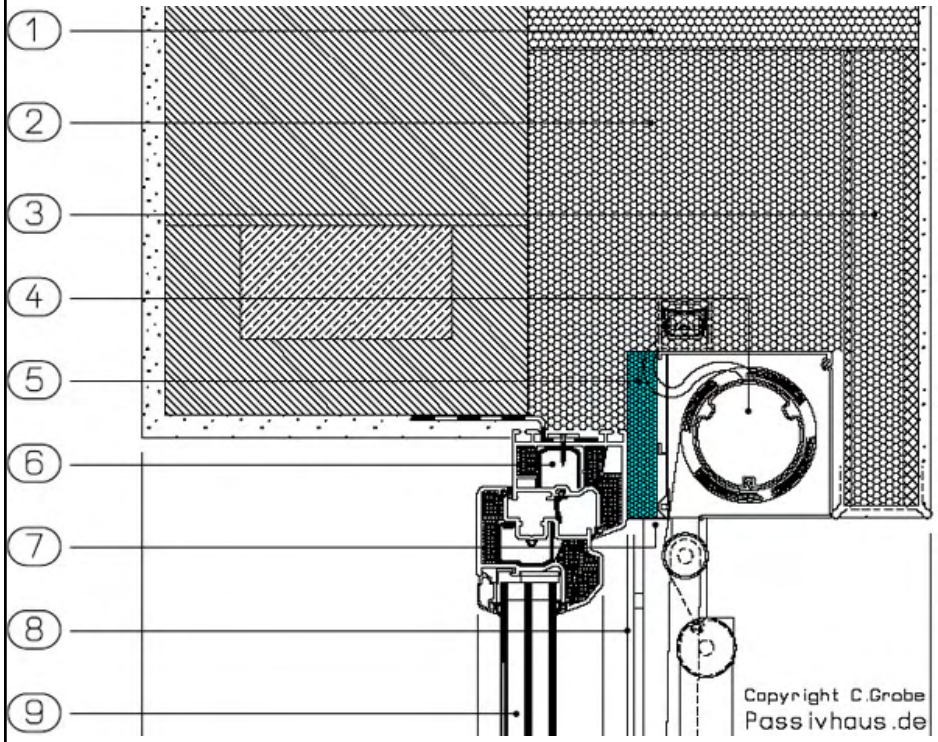


Source: Kalksandsteindetailsammlung, Detail 7.6.3.21, Detail 7.5.3.21, Detail 7.1.3.21, www.xella.de

PH-details: Outside wall / Window

Outside brick wall, ETICS /

Plastic frame window mounted on masonry, curtain box with VIP

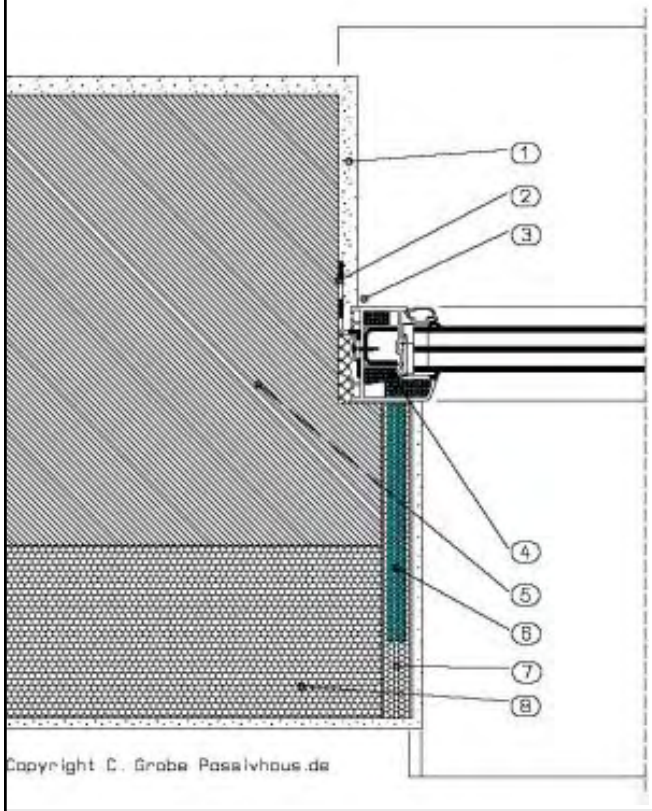


1. Heat insulation / PS15
2. Heat insulation mineral wool
3. Plaster board
4. Sun blind (electrical)
5. Vacuum insulation 2,5cm
6. Window system “Thyssen Polymer”
7. Metal sheet cover of vacuum panel
8. Plaster lath of the ETICS

Source: Architect Carsten Grobe, www.passivhaus.de

PH-details: Outside wall / Window

Outside brick wall, ETICS for renovation /
Plastic frame window mounted in masonry on "old" position, VIP for reveal



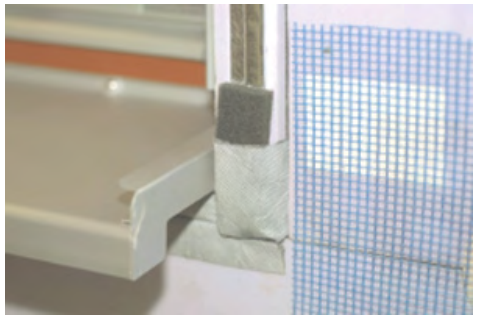
Very often the weak point of a thermal renovation is the reveal. This VIP – element only has a thickness of 3 cm. This offers the possibility to connect some good heat insulation to the existing window.

Source: Architect Carsten Grobe, www.passivhaus.de

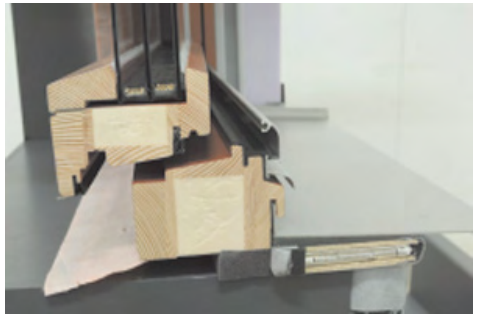
PH-details: Outside wall / Window

Outside wall /
VIP for reveal

Detail junction of the window"Soffit"



Insulation for sun blind boxes



French door: flush roof exit

No thermal bridge through the window sill

Source: http://sandwichelemente.net/hp620/Rollokastendaemmung.htm

PH-details: Doors / Terrace

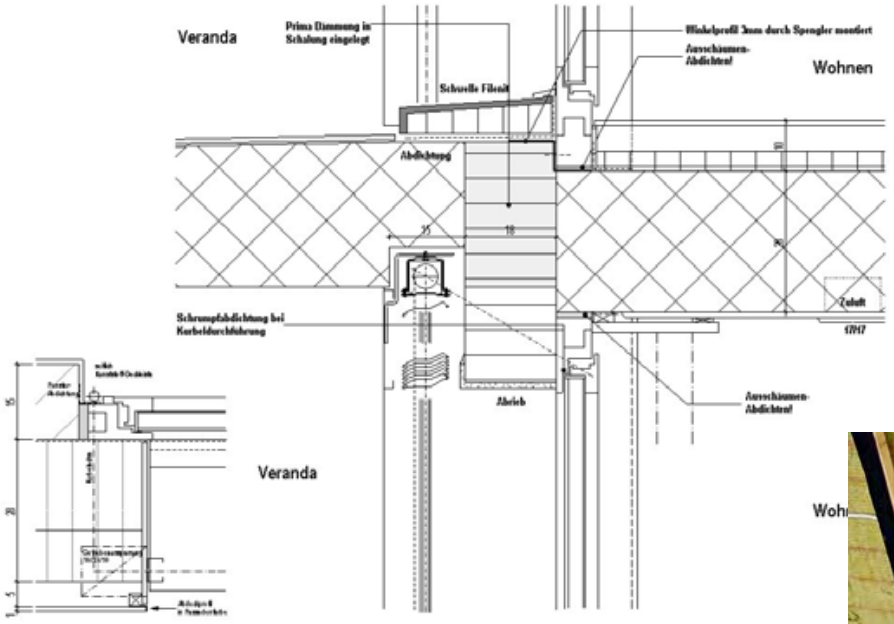
Doors / Terrace

Source:

PH-details: Doors / Terrace

Terrace door, Outside brick wall, ETICS /

Plastic frame terrace door mounted on concrete ceiling



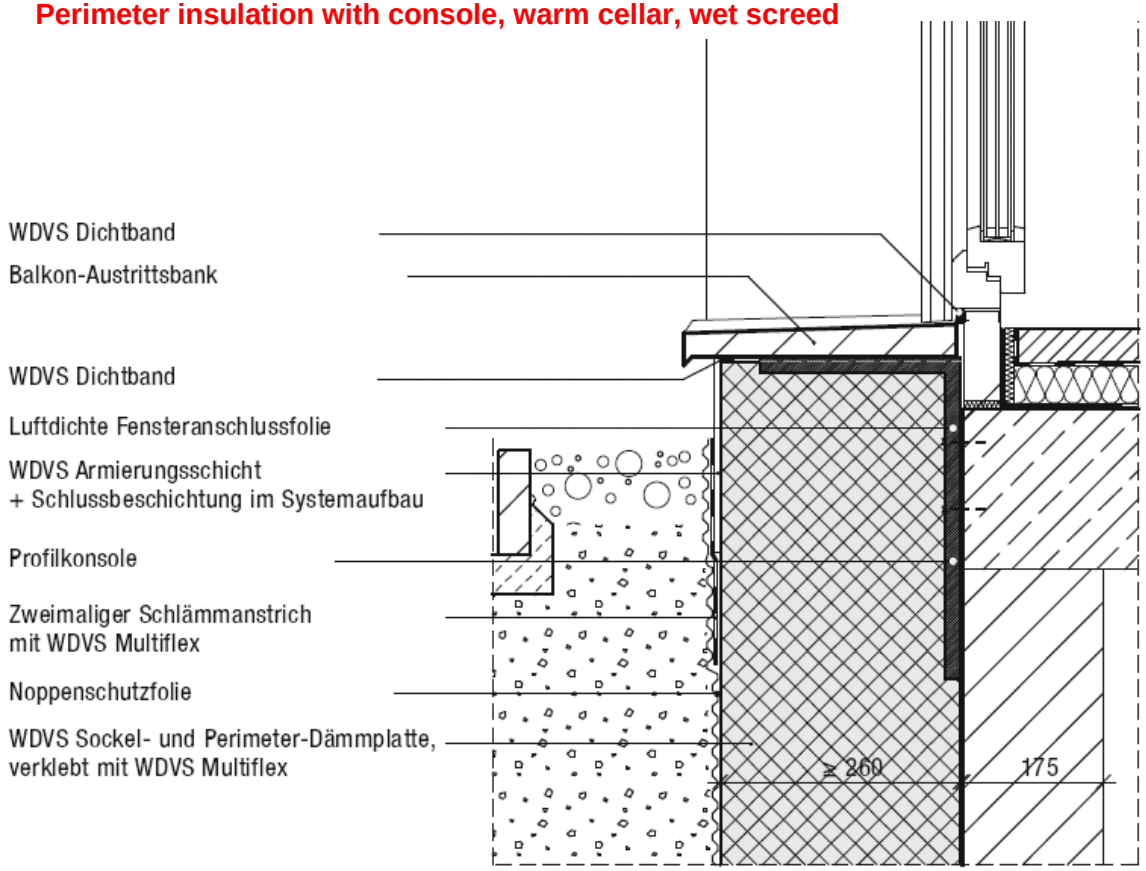
Architect Arthur Sigg

Thermal separated terrace
– built on its own steel columns

Source: Überbauung Konstanz in Rothenburg, Architect Arthur Sigg www.empa-ren.ch/Internet-Files/Programm/Aktuelles/aktualitaeten/Status-Seminar/pdf-files2004/Sigg%20Konstanz.pdf

PH-details: Doors / Terrace

Terrace door, Outside brick wall, ETICS /
Perimeter insulation with console, warm cellar, wet screed

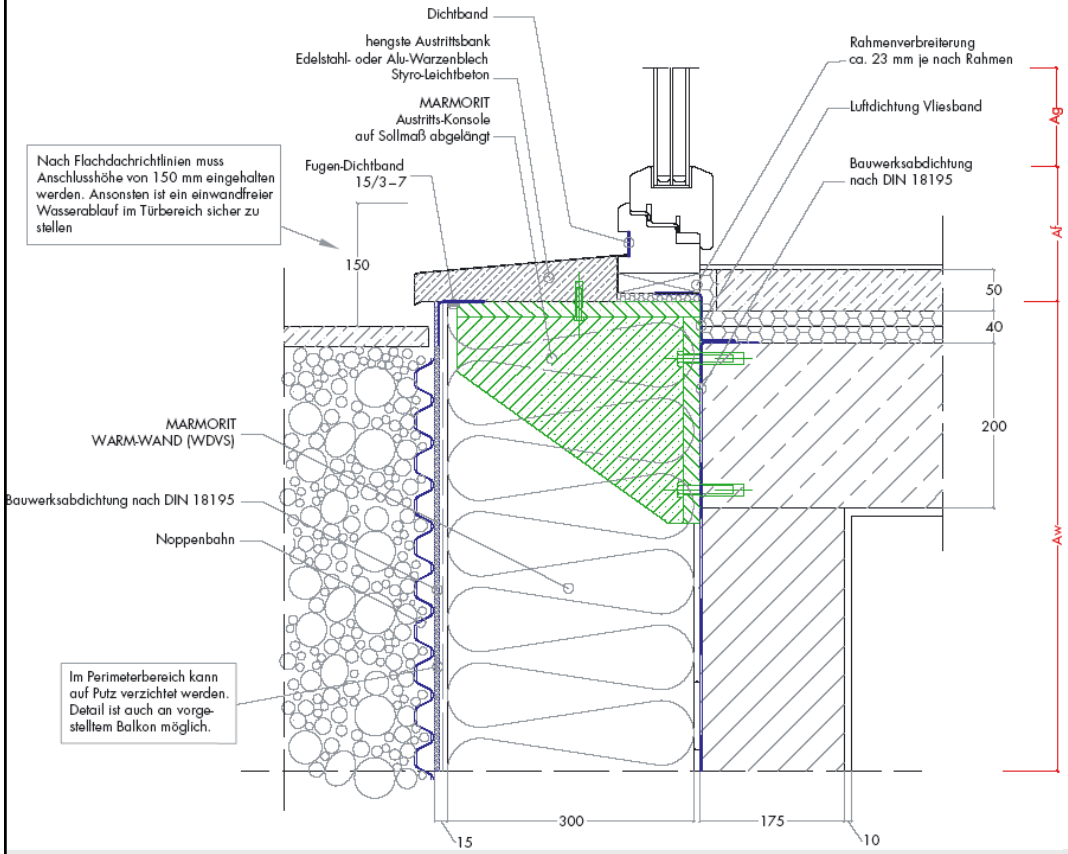


Source: Brillux Passivhausdetail 0.2

PH-details: Doors / Terrace

Terrace door /

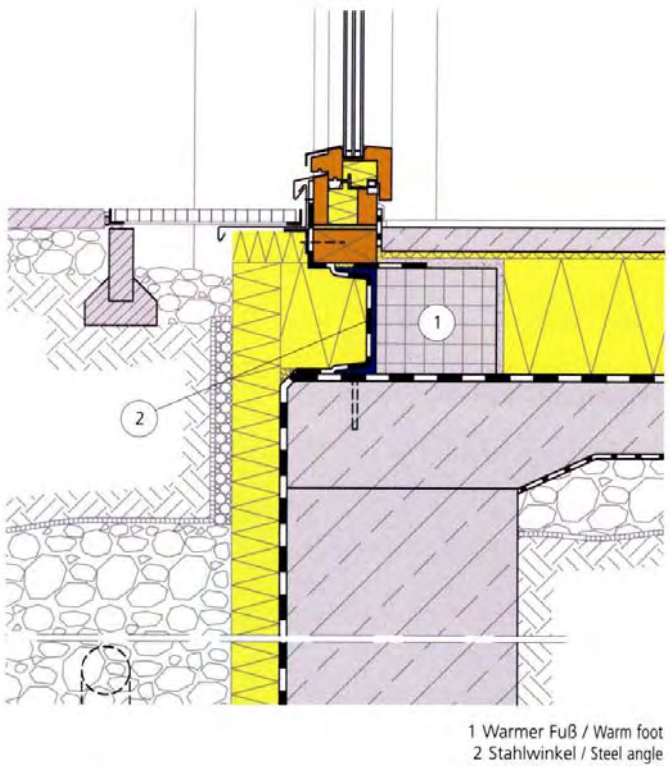
Perimeter insulation with console, warm cellar, wet screed



Source: www.marmorit.de/pages/passhaus

PH-details: Doors / Terrace

Terrace door /
Slab foundation, insulated upper side, wet screed



1 Warmer Fuß / Warm foot
2 Stahlwinkel / Steel angle

Technical description

Suitability
- For installation in solid walls.

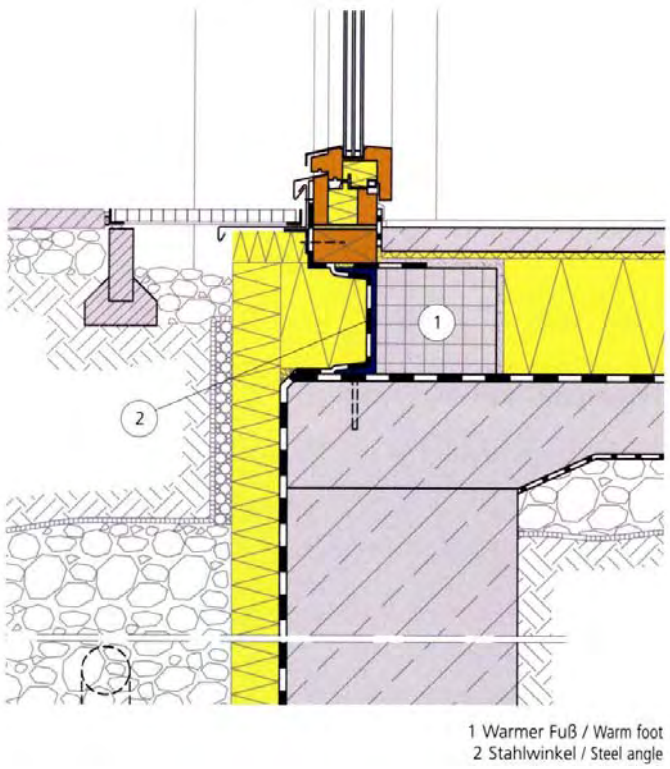
Construction process
- Screw the window frame to the subframe, reinforce this frame with steel angles where needed.
- Adjust and screw the angles to the concrete foundation.
- Add a layer of smooth screed to the porous concrete; insulating plaster recommended.
- Fill or foam joints.
- Bond a fleece-laminated butyl rubber with the smooth screed layer with an airtight seal.
- Plaster the porous concrete blocks to make them airtight.
- Ensure driving rain protection by applying an ECB sheet, do not bond it in the corner areas. The ECB sheet should be bonded to the sealing of the floor slab for a width of at least 5 m.
- Protective sheet should be mechanically fastened with a sheet metal.
- The concrete edge stones should be laid in their own concrete foundation.
- The steel angles used to fasten the grating can be fixed to the subframe, or if the statics allow, to the window frame.

Maintenance
- The Windows are easy to dismantle and exchange after removing the flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be re-movable to check the insulating connection.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door /
Slab foundation, insulated upper side, wet screed



1 Warmer Fuß / Warm foot
2 Stahlwinkel / Steel angle

Technical description

Structural discussion

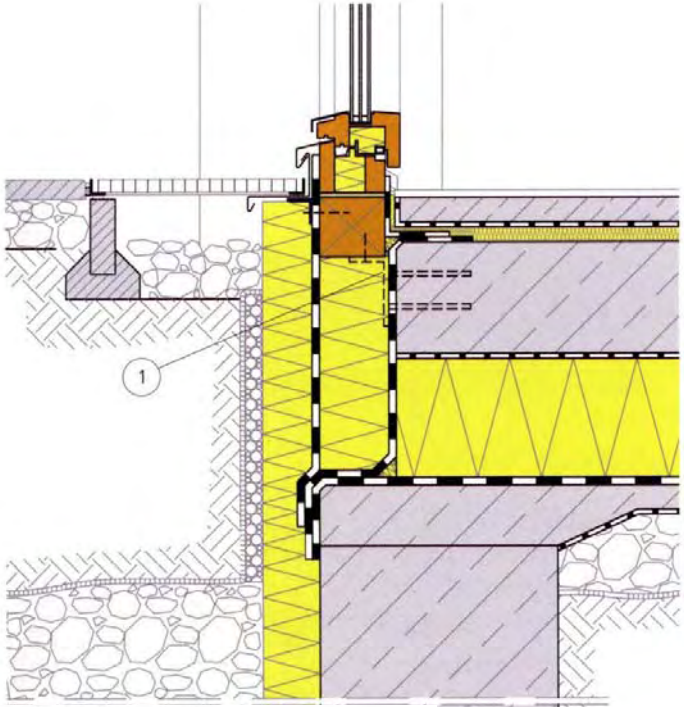
- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The subframe can be replaced with a purenit plank or a battered subframe with an XPS exterior shell for improved heat protection.
- The connection can be built without barriers.
- The minimum height of the vertical upstand element should be deter-mined according to local conditions such as, orientation, main wind di-rection, canopy and national standards.
- When using terrace doors which meet ÖNORM B 7220 standards with reduced vertical upstand of the moisture seal, an additional mechanical fastening to the window frame is required. If the frame is not suitable according to the manufacturer, the moisture seal must be fastened to the exterior wall or to a subframe.

Building physics	
linear thermal bridge coefficient ψ	-0.008 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door /
Slab foundation, insulated lower side, wet screed



1 Stahlwinkel / Steel angle

Bauphysik / Building physics

	Einheit / Unit	
Linearer Wärmebrückenkoeffizient Ψ • Linear thermal bridge coefficient Ψ	W/mK	- 0,008

Technical description

Suitability
- For installation in solid and lightweight walls.

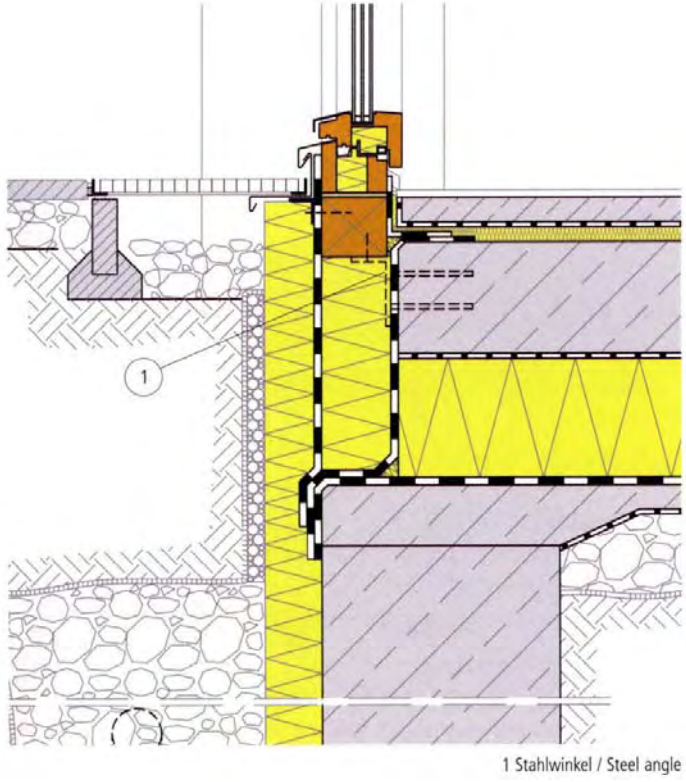
Construction process
- Screw the window frame to the subframe, reinforce this frame with steel angles where needed.
- Screw the angles to the floor slab.
- Insert a pre-compressed sealing ribbon between the window frame and subframe and between subframe and floor slab an all sides for high quality sound insulation.
- Fill or foam the joint between the window frame and subframe.
- Bond the vapor barrier to the window frame and floor slab with an air-tight seal.
- Ensure driving rain protection by applying an ECB sheet, do not bond it in the corner areas. The ECB sheet should be bonded to the floor slab at least 5 cm wide.
- Protective sheet should be mechanically fastened with a metal sheet.
- The concrete edge stones should be laid in their own concrete foundation.
- The angles used to fasten the grating can be fixed to the subframe, or if the statics allow, along the window frame.

Maintenance
- The windows are easy to dismantle and exchange after removing the flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be re-movable to check the insulating connection.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door /
Slab foundation, insulated lower side, wet screed



1 Stahlwinkel / Steel angle

Technical description

Structural discussion

- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The subframe can be replaced with a purenit plank or a battered sub-frame with an XPS exterior shell (improved heat protection).
- The connection can be built without barriers.
- The connection requires sophisticated adaptation for lightweight walls due to its greater assembly height (e.g. exterior wall an concrete base).
- The minimum height of the vertical upstand element should be determined according to local conditions such as orientation, main wind direction, canopy and national standards.
- When using terrace doors which meet ÖNORM B 7220 standards with reduced vertical upstand of the moisture seal, an additional mechanical fastening to the window frame is required. If the frame is not suit-able according to the manufacturer, the moisture seal must be fastened to the exterior wall or to a subframe.

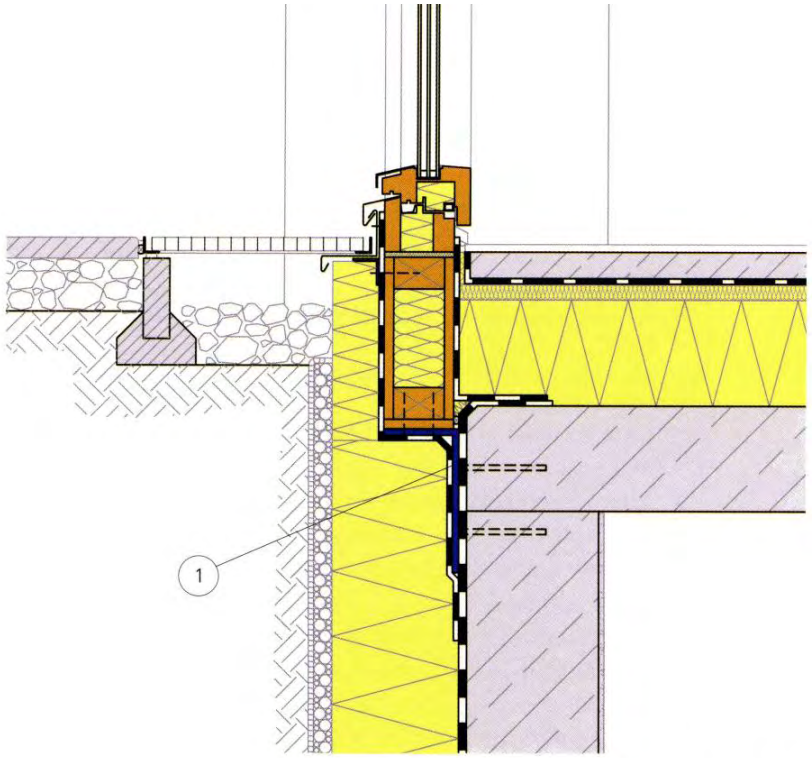
Building physics

linear thermal bridge coefficient ψ	-0.008 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door on steel console mounted on sealed reinforced concrete outside wall / Basement ceiling slab, insulated upper side, wet screed



1 Stahlwinkel / Steel angle

Technical description

Suitability
- For installation in lightweight and solid walls.
- For window installations with high-quality sound insulation.

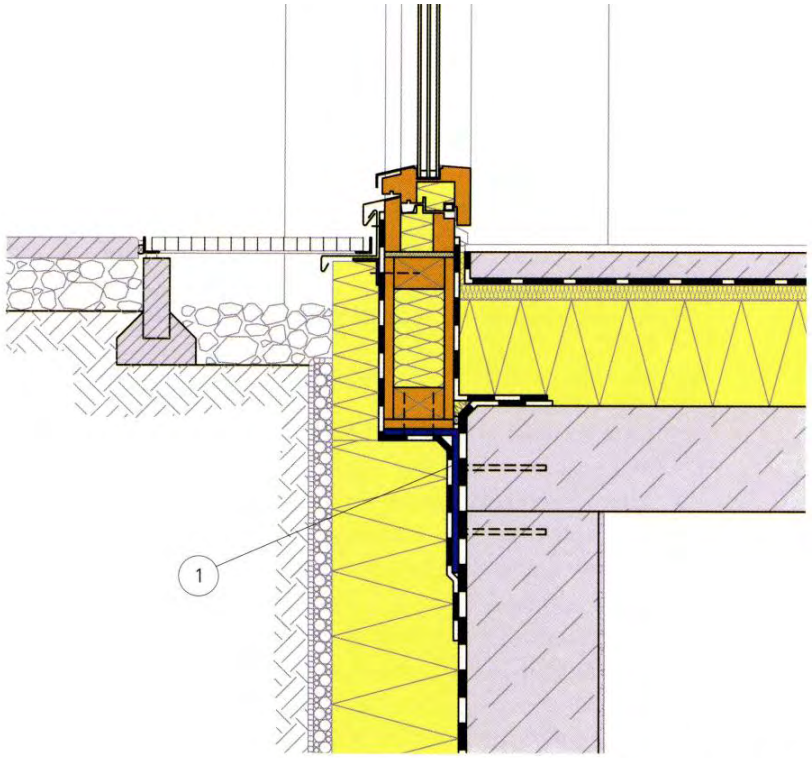
Construction process
- Screw the window frame to the prefabricated base element, reinforce this frame with steel angles were needed.
- Screw the angles to the floor slab and the prefabricated base element.
- Fasten the wood chipboard panel to the angles.
- Fill or foam the joint between the window frame and subframe.
- Fasten the vapor barrier to the window frame and floor slab with an airtight real and connect it to the flow-sealed layer along the sides (plaster, vapor barrier, OSB, depending an the exterior wall).
- Ensure driving rain protection by applying an ECB sheet, do not bond it in the corner areas. Bond the ECB sheet with the floor slab seal.
- Protective sheet should be mechanically fastened with a sheet metal.
- The concrete edge stones should be laid in their own concrete foundation.
- The angles used to fasten the grating can be fixed to the prefabricated base element or if the statics allow, to the window frame.

Maintenance
- The windows are easy to dismantle and exchange after removal of the flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be removable to check the insulating connection.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door on steel console mounted on sealed reinforced concrete outside wall /
Basement ceiling slab, insulated upper side, wet screed



1 Stahlwinkel / Steel angle

Technical description

Structural discussion

- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The connection can be built without barriers.
- The minimum height of the vertical upstand element should be determined according to local conditions such as orientation, main wind direction, canopy and national standards.
- When using terrace doors which meet ÖNORM B 7220 standards with reduced vertical upstand of the moisture seal, an additional mechanical fastening an the window frame is required. If the frame is not suit-able according to the manufacturer, the moisture seal must be fastened to the exterior wall or to a subframe.

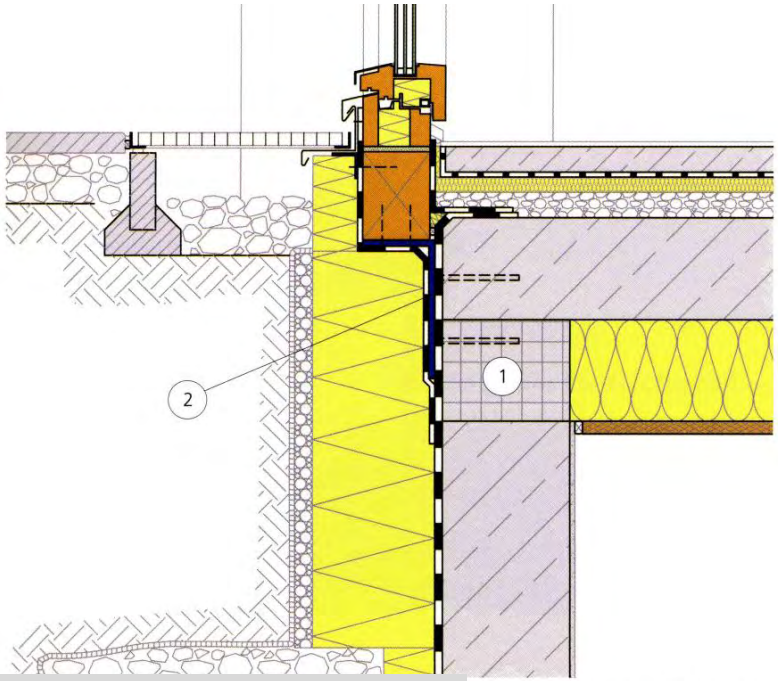
Building physics

linear thermal bridge coefficient ψ	
Outside air	0.001 W/mK
Basement	-0.025 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door on steel console mounted on sealed reinforced concrete outside wall /
Basement ceiling slab, insulated upper side, wet screed



1 Warmer Fuß / Warm foot
2 Stahlwinkel / Steel angle

Building physics

linear thermal bridge coefficient ψ

Outside air	0.027 W/mK
Basement	0.006 W/mK

Technical description

Suitability
- For window installation ins solid walls.
- For window installations with high-quality sound insulation.

Construction process
- Screw the window frame to the subframe, reinforce this frame with steel angles where needed.
- Screw the angles to the floor slab.
- Insert a precompressed sealing ribbon between the window frame and subframe and between subframe and floor slab an all sides for high quality sound insulation.
- Fill or foam the joint between the window frame and subframe.
- Bond the vapor barrier to the window frame and floor slab with an air-tight seal.
- Ensure driving rain protection by applying an ECB sheet, do not bond it in the corner areas. Bond the ECB sheet with the floor slab seal.
- Protective sheet should be mechanically fastened with a sheet metal.
- The concrete edge stones should be laid in their own concrete foundation.
- The angles used to fasten the grating can be fixed to the subframe, or if the statics allow, along the window frame.

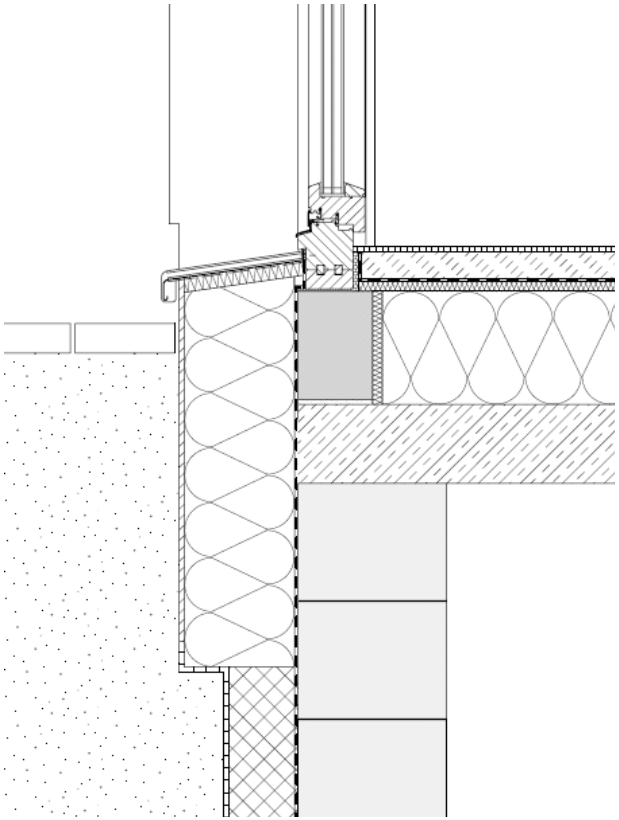
Maintenance
- The Windows are easy to dismantle and exchange after removing the flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be removable to check the insulating connection.

Structural discussion
- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The subframe can be replaced with a purenit plank or a battered subframe with an XPS exterior shell for improved heat protection.
- The connection can be built without barriers.
- The connection requires sophisticated adaptation for lightweight walls due to its high external level (e.g. exterior wall and concrete base).

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

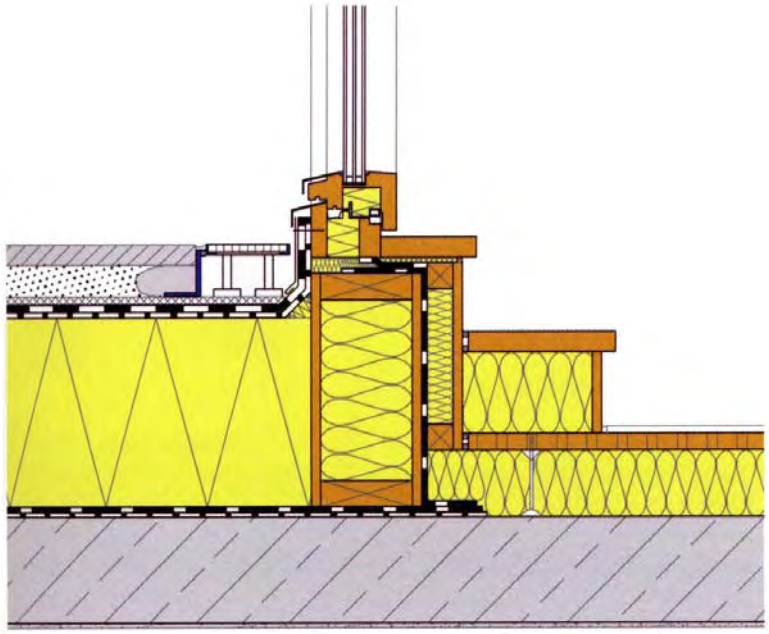
Terrace door mounted on “Thermo foot” on reinforced concrete ceiling, outside brick wall /
Basement ceiling slab, insulated upper side, wet screed



Source: Kalksandsteindetailsammlung, Detail 8.5.2.21, www.xella.de

PH-details: Doors / Terrace

Terrace door mounted on subframe / Reinforced concrete terrace structure, Reinforced concrete intermediate floor



Technical description

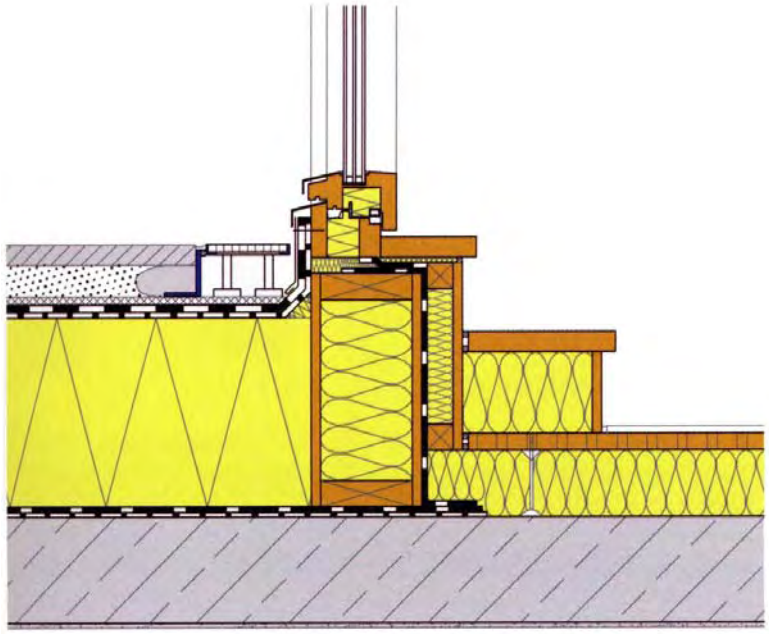
Suitability
- For installation in solid or lightweight exterior walls.

Construction process
- Screw the window frame to the prefabricated base element
- Fasten the prefabricated base element to the reinforced concrete ceiling with steel angles.
- The butyl rubber strip should be bonded to the vapor barrier with a tight seal along all sides.
- Joints should be filled with fiber insulation material or foamed with sound insulation foam.
- Bond the Base vapor barrier to the reinforced concrete ceiling with an air-tight seal.
- Ensure protection against driving rain by bonding a sealing layer along the window frame and mount a folded metal sheet using mechanical fastening or clamp joints.
- Place the grating an adjustable feet using compensating panels underneath. Insert a sound insulation layer under these panels if needed (e.g. neoprene).

Maintenance
- The windows are easy to dismantle and exchange after removing the flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be removable to check the insulating connection.

PH-details: Doors / Terrace

Terrace door mounted on subframe / Reinforced concrete terrace structure, Reinforced concrete intermediate floor



Technical description

Structural discussion

- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The connection is also suitable for walls with wood-derivative panels as vapor barrier; joints should be finished with bonded, air-tight seals.
- Even surface inside and terrace levels can be achieved using spacers or bonded filler and wood-derivative panel, no cladding is required then.
- The minimum height of the vertical upstand should be determined according to local conditions such as orientation, main wind direction, canopy and national standards.
- When using terrace doors which meet ÖNORM B 7220 standards with reduced vertical upstand of the moisture seal, an additional mechanical fastening to the window frame is required. If the frame is not suitable according to the manufacturer, the moisture seal has to be fastened to the exterior wall or to a subframe.

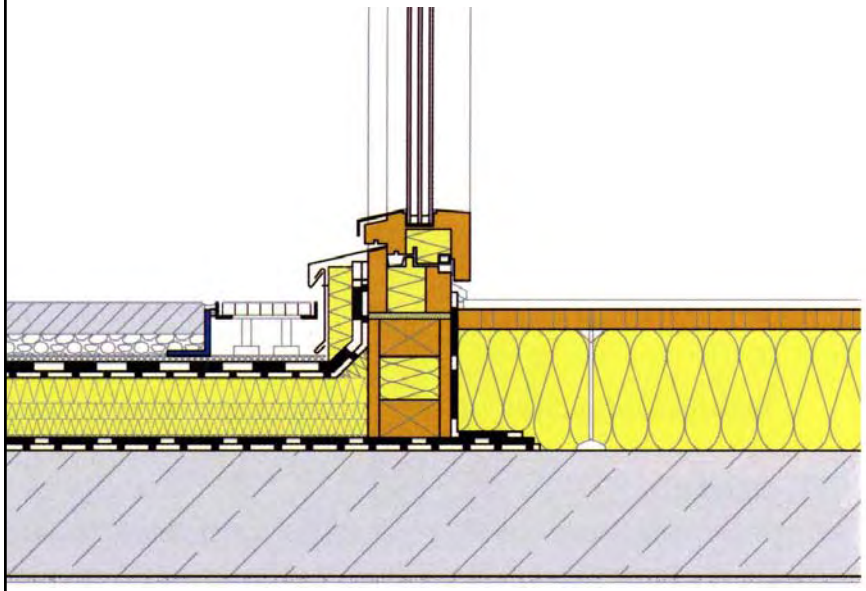
Building physics

linear thermal bridge coefficient ψ	
Base	0.001 W/mK
Header/reveal w. add. insulation	0.025 W/mK
$U_{W,eff}$-value	0.846 W/m^{2}K

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door mounted on subframe /
Reinforced concrete flat roof terrace structure,
Reinforced concrete intermediate floor



Building physics

linear thermal bridge coefficient ψ	
Base	0.068 W/mK
Header/reveal w. add. insulation	0.008 W/mK
$U_{W,eff}$-value (1.1-2.2m)	0.847 W/m²K

Technical description

Suitability
- For installation in solid and lightweight exterior walls.

Construction process
- Screw the window frame to the prefabricated base element.
- Joints should be filled with fiber insulation material or foamed with sound insulation foam.
- Bond the window frame vapor barrier to the reinforced concrete ceiling with an air-tight seal.
- Ensure protection against driving rain by bonding a sealing layer along the window frame and mount a folded metal sheet using mechanical fastening or clamp joints
- Set the grating an adjustable feet using compensating panels underneath. Insert a sound insulation layer under these panels if needed (e.g. neoprene).

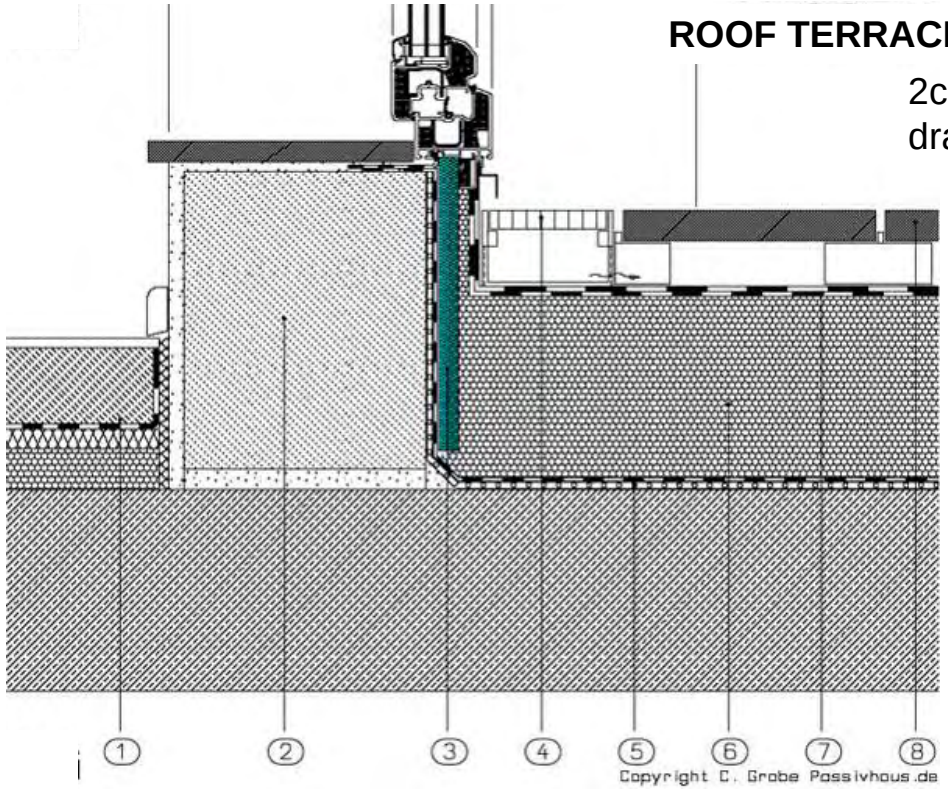
Maintenance
- The windows should be easy to dismantle and exchange after remov-ing the flooring
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be re-movable to check the insulating connection.

Structural discussion
- The prefabricated wood element can be replaced with a purenit or a timber plank. (Consider the expansion properties and higher thermal bridge effect).
- The advantage of the prefabricated wood element is its high stability combined with relatively good thermal properties.
- Protect vacuum insulation against mechanical damage.
- A XPS wedge protected with a thick sheet metal can be inserted in front of the vertical upstand element to optimize its thermal properties.
- Aluminum cladding is definitely advisable along the parapet area due to the high water loads.
- The connection is also suitable for outside walls with a wood-derivative panel as vapor barrier; joints should be finished with bonded, air-tight seals.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Terrace door mounted on foam brick /
Reinforced concrete intermediate floor, foam brick, vacuum insulation, stilted terrace surface



ROOF TERRACE

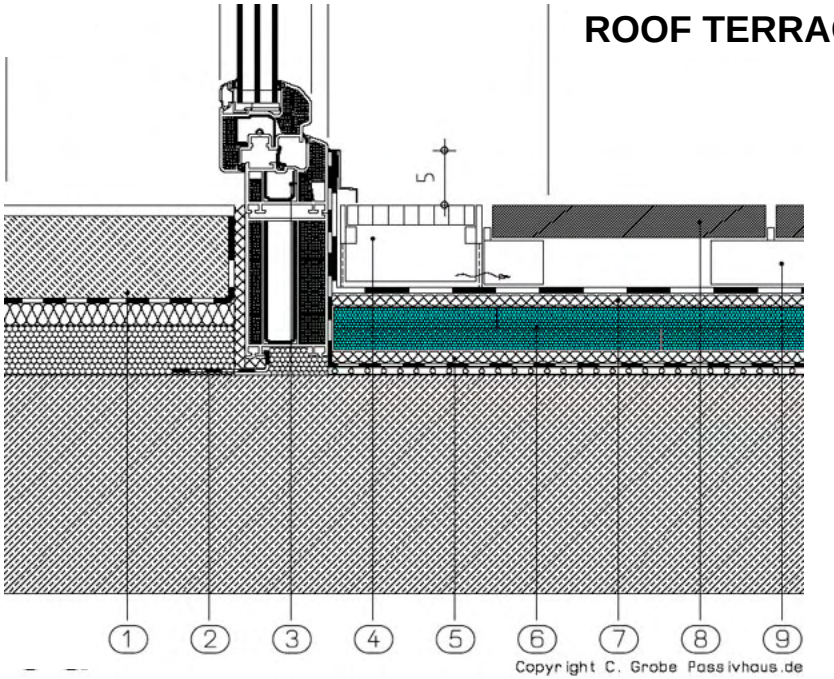
2cm Vacuum insulation between drain and foam concrete brick

1. screed
2. foam concrete brick
3. vacuum insulation
4. drain
5. vapour diffusion barrier
6. heat insulation (pressure resistance)
7. sealing layer
8. stilted terrace surface

Source: Architect Carsten Grobe, www.passivhaus.de

PH-details: Doors / Terrace

Terrace door mounted on concrete ceiling /
Reinforced concrete intermediate floor, vacuum insulation, stilted terrace surface



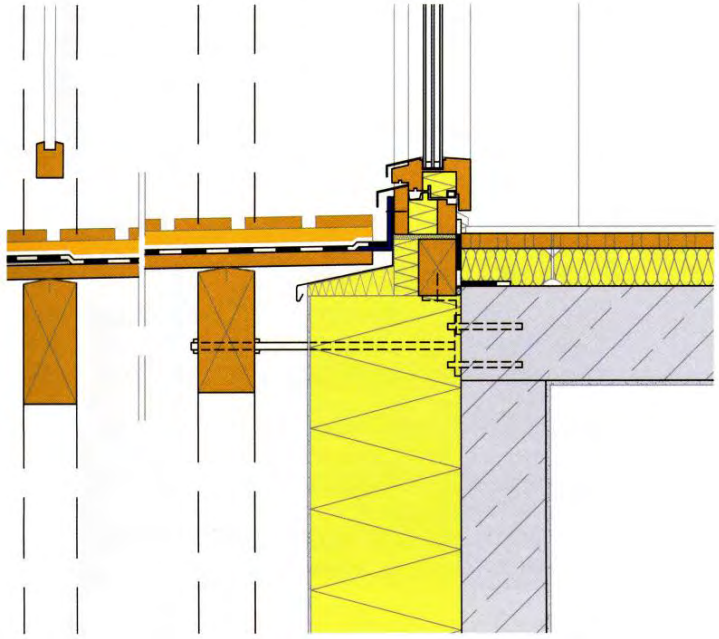
ROOF TERRACE

1. screed
2. air-tight sealing of window
3. PH-window (Thyssen Polymer)
4. drain
5. vapour diffusion barrier
6. 3 cm vacuum insulation
7. protection layer with sealing layer
8. stilted terrace surface
9. stilting support

Source: Architect Carsten Grobe, www.passivhaus.de

PH-details: Doors / Terrace

Balcony door on subframe mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, freestanding balcony



Technical description

Suitability
- For the installation of windows in solid walls or solid wood walls with ETIC systems or mechanically fastened insulation systems.

Construction process
- Screw the window frame to the subframe, which is screwed to the steel angles an all sides.
- Ensure air tightness between the window frame and reinforced concrete ceiling with air-tight foil.
- Fill joints or foam them with sound insulation foam.
- Use a mechanically fixed sheet metal protector an the base to ensure driving rain protection.
- Use stainless steel mounting (minimum spacing according to manufacturer) for freestanding balcony structure, fasten it to the ceiling grating.
- Wood lathes and rafters should be structurally protected against moisture.

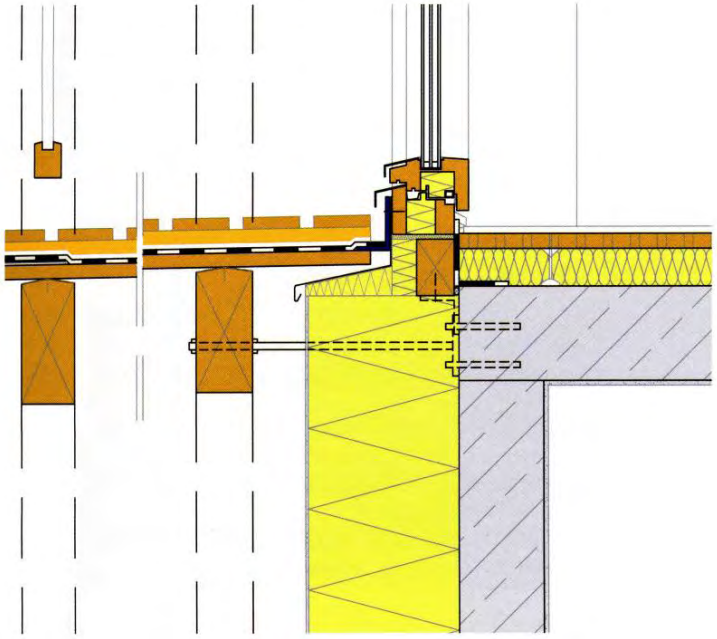
Maintenance
- The windows should be easy to dismantle and exchange after remov-ing the ready-to-use parquet flooring layer.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be removable to check the insulating connection.
- Regular cleaning of the joints increases the balcony grating service life.

Structural discussion
- Also suitable for wet screed intermediate floors.
- The aluminum cladding an the window frame and doors in the parapet area is advisable due to the high water loads.
- The balcony structure is watertight. Water should not seep into the ends of the balcony planks.
- Observe local fire protection guidelines, size the wood uprights accordingly and plan for the use of steel uprights (fire protected) if needed. Also plan for the use of a fire protection panel below the balcony slab.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Balcony door on subframe mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, freestanding balcony



Building physics

linear thermal bridge coefficient ψ

Base	0.068 W/mK
Header/reveal w. add. insulation	0.008 W/mK
$U_{W,eff}$-value (1.1-2.2m)	0.847 W/m²K

3-dimensional thermal bridge coefficient χ

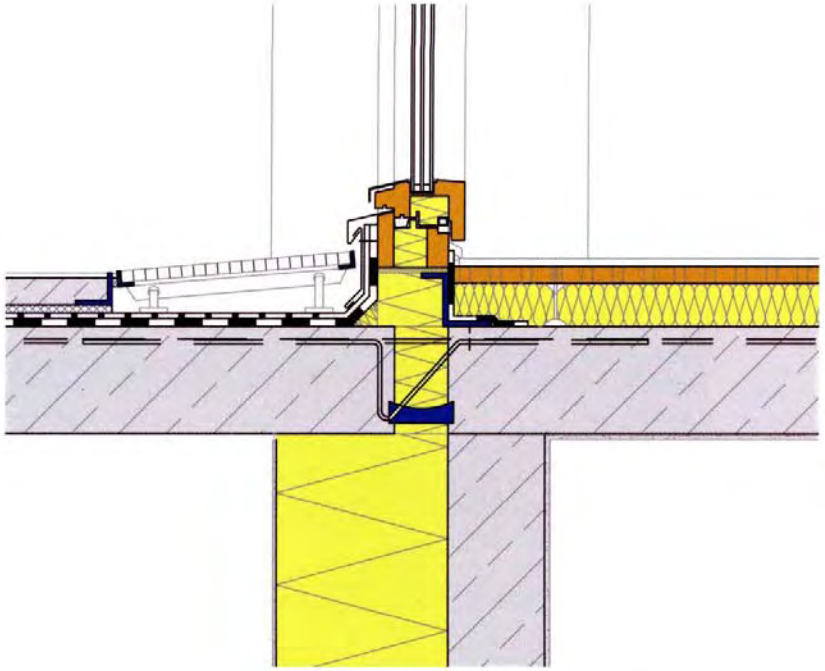
Steel anchor per piece:

Stainless steel Ø 5 mm	0.001 W/mK
Stainless steel Ø 10 mm	0.004 W/mK
Steel Ø 5 mm	0.003 W/mK
Steel Ø 10 mm	0.011 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Balcony door on steel console mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, centilevered balcony (Isokorb)



Technical description

Suitability
- For window installations with average sound insulation if airtight steel angles are used an all sides. Size the thickness and sealing of the steel angles according to statics and Sound insulation requirements.
- Window installations in solid walls or solid wood walls with a ETIC system.
- High thermal bridge losses due to Isokorb (a load bearing connecting element for cantilevered balconies), can only be completed in passive houses with the corresponding reserves.

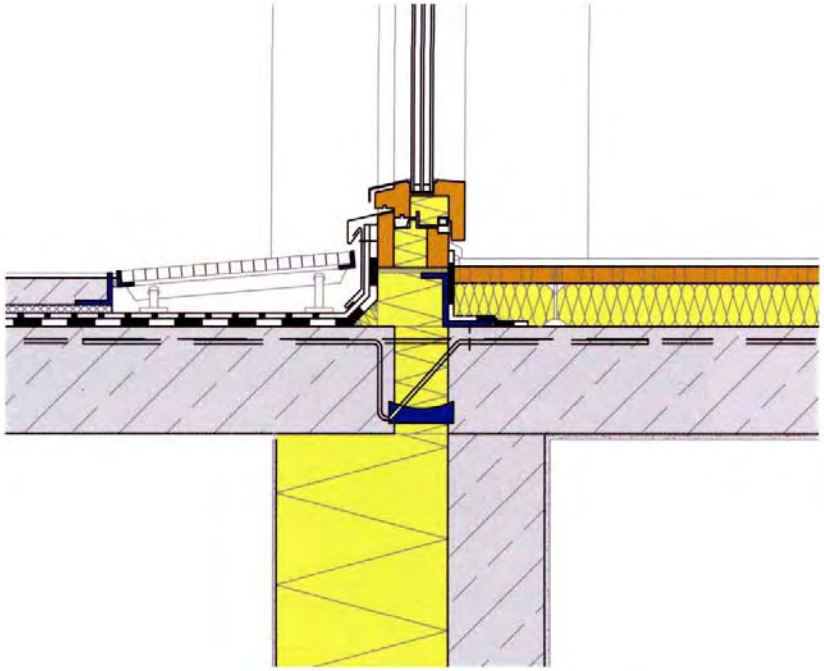
Construction process
- Screw the window frame to the steel angles an all sides.
- Ensure air tightness between the window frame and reinforced concrete floor with air-tight foil.
- Cut and bond the XPS wedge exactly within the free space between the window frame and Isokorb element. Fill joints along the outside or foam with sound insulation foam.
- Use a mechanically fixed sheet metal protector an the base to ensure driving rain protection.

Maintenance
- Exchanging the windows can be either easy or complicated depending an the type of screw fastening.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be re-movable to check the insulating connection.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Balcony door on steel console mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, centilevered balcony (Isokorb)



Technical description

Structural discussion

- A separate balcony construction is much better in terms of thermal properties.
- The aluminum cladding an the window frame and doors in the parapet area is advisable due to the high water loads.
- The balcony structure is watertight.
- Isokorb elements cause an high thermal bridge coefficient depending an the projection. Replacement of steel with fiberglass is probable in the future.
- With projections up to 1.5 m thermal bridges can be reduced by using Isokorb elements at selected points only.
- The use of lightweight prefabricated concrete components for the projecting balcony slab can reduce thermal bridges.

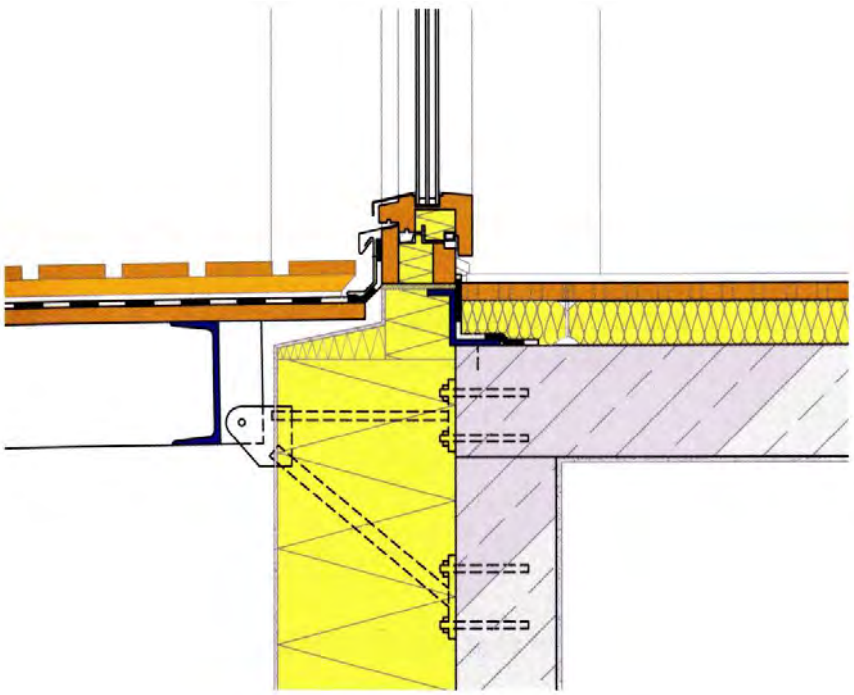
Building physics

linear thermal bridge coefficient ψ	
Base	0.319 W/mK
Header/reveal w. add. insulation	0.003 W/mK
Opaque wall to Isokorb:	
Reinforced concrete wall	0.282 W/mK
Brick wall	0.252 W/mK
Lightweight wall	0.332 W/mK
$U_{W,eff}$-value (1.1-2.2m)	0.949 W/m²K

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Balcony door on steel console mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, balcony on tripods



Technical description

Suitability
- Window installations in solid walls or solid wood walls with an ETIC system.
- For window installations with average sound insulation if airtight steel angles is completed air tightly an all sides. Size the thickness and sealing of the steel angle according to statics and Sound insulation requirements.

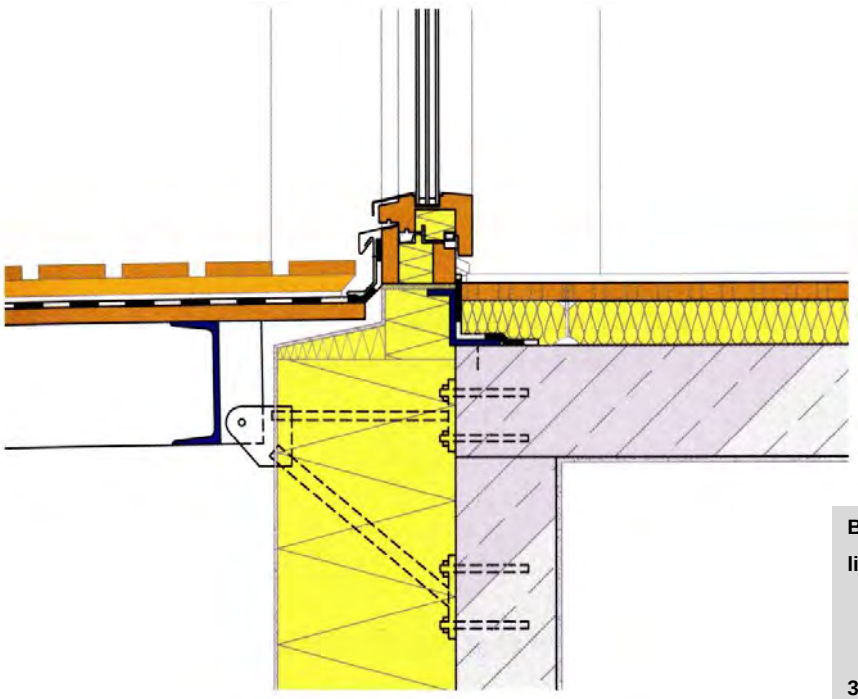
Construction process
- The tripod can be insulated with local application of 2-layer thermal insulation and by foaming of hollow spaces.
- The exterior plaster layer should reach the lower edge of the window frame. The joint should be wet-sealed after installing the window.
- Screw the window frame to the steel angles an all sides.
- Ensure air tightness between the window frame and reinforced concrete with air-tight foil.
- Create an air gap between the wood planks and the exterior plaster, no water should penetrate the end-grain wood!
- Size the space between the U-iron and tripod for screw fastening.
- Ensure protection against driving rain by bonding a sealing layer along the window frame and mount a folded metal sheet using mechanical fastening or clamp joints, if needed.
- Connect the handrails outside the watertight structure.

Maintenance
- Exchanging the windows can be either easy or complicated depending an the type of screw fastening.
- The aluminum cladding makes maintenance of the surface unnecessary. The lower horizontal covering rail of the window frame should be removable to check the insulating connection.

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007

PH-details: Doors / Terrace

Balcony door on steel console mounted on concrete ceiling / Reinforced concrete intermediate floor, spacer floor, balcony on tripods



Technical description

Structural discussion

- Also suitable for wet screed intermediate floors.
- The aluminum cladding an the window frame and doors in the parapet area is advisable due to the high water loads.
- The balcony structure is watertight.
- Respect local fire protection guidelines, size the steel structure accordingly. Plan for the use of a fire protection panel below the balcony slab, if needed.
- The balcony support structure can also be built using wood, respect local fire protection guidelines.
- Average sound insulation only requires steel angles at certain points instead of continuous metal angle.
- A bracket or a double T iron on an EPDM layer can be used instead of a "tripod" depending an the projection.
- The connection can be built without barriers.

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Building physics

linear thermal bridge coefficient ψ	
Base	0.063 W/mK
Header/reveal w. add. insulation	0.003 W/mK
$U_{W,eff}$-value (1.1-2.2m)	0.832 W/m^{2}K
3-dimensional thermal bridge coefficient χ	
Tripod per piece:	0.021 W/mK

Source: Details for Passive House, A catalogue of Ecologically Rated Constructions; IBO – Austrian Institute for Healthy and Ecological Building (Ed.); 2007