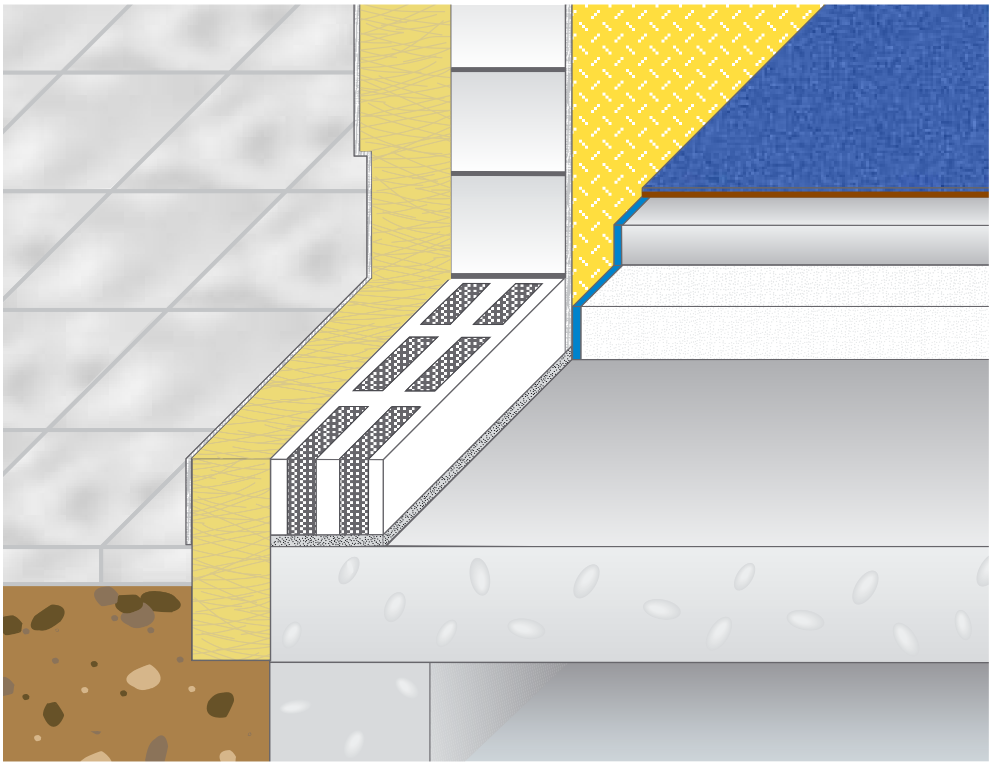
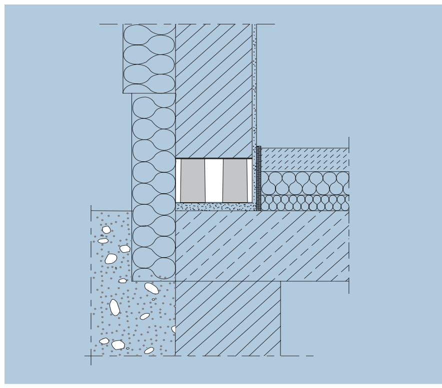
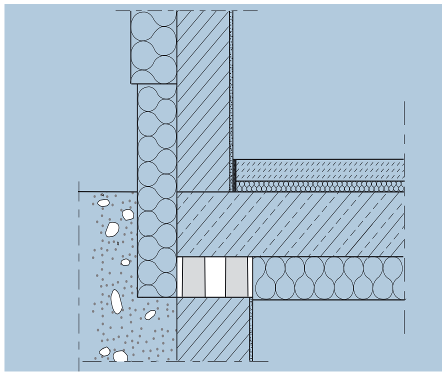
TECHNICAL INFORMATION SCHÖCK NOVOMUR®/NOVOMUR® LIGHT







Schöck
build simply better

PLANNING & ADVICE SERVICE

The engineers in the Schöck application Technology Department are ready to help you with your design and construction questions. Our answers come complete with plans, project solutions and detailed equations.

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Construction physics

Thermal bridges

General information

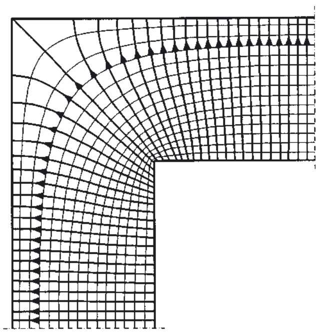
The thermal bridge effect is a phenomena which occurs due either to material or construction methods and which allows thermal outflow through the adjoining areas. The result of this thermal outflow is a drastic reduction of surface temperature in the inside of the building.

Most people normally differentiate between geometric and material caused thermal bridges, although these two causes most commonly combine; acting together to produce a thermal bridge. Typical examples of thermal bridges caused geometricaly, are wall ends and corners; a purely material based cause is, for instance, when the moisture conductivity factor of a wall construction is worsened by an achilles heel being allowed to form, through which thermal energy can freely flow.

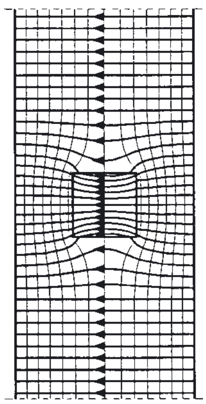
Balcony slab connective points can enable these effects to combine when a geometric weak point (e.g. the cooling fin effect) and a material thermal bridge (brickwork/reinforced concrete) are allowed to exist at the same point in time.

In the same way, at the damp course level a thermal bridge can be caused by a combination of the previously mentioned effects.

The thermal outflow increases in direct proportion to the difference in enterior/exterior temperatures. i.e. the colder the external temperature, the more thermal energy is sucked outwards.



diag. 1



diag. 2

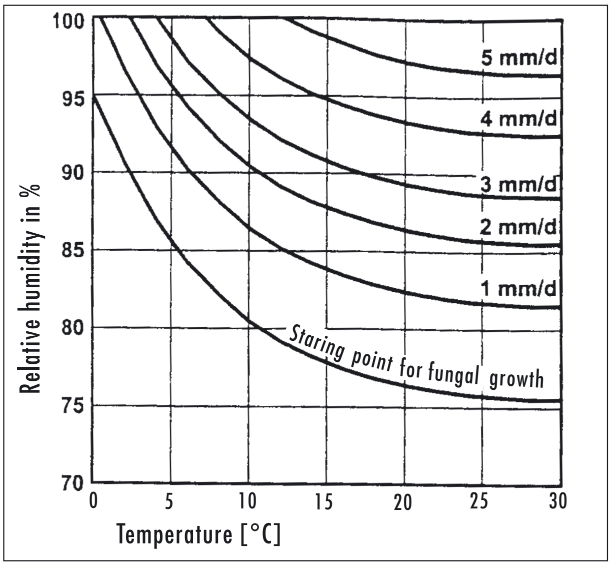
Thermal flux lines (arrows) and isothermic reaction at a buildings external angle (diag. 1; purely geometric thermal bridge) and where a, normally preventive, wall construction has been compromised (diag.2 purely material thermal bridge causation). Thermal flux lines and isotherms are seen on top of one another.

When a thermal energy outflow occurs due to the existence of a thermal bridge, it results in the following thermo-technic effects.

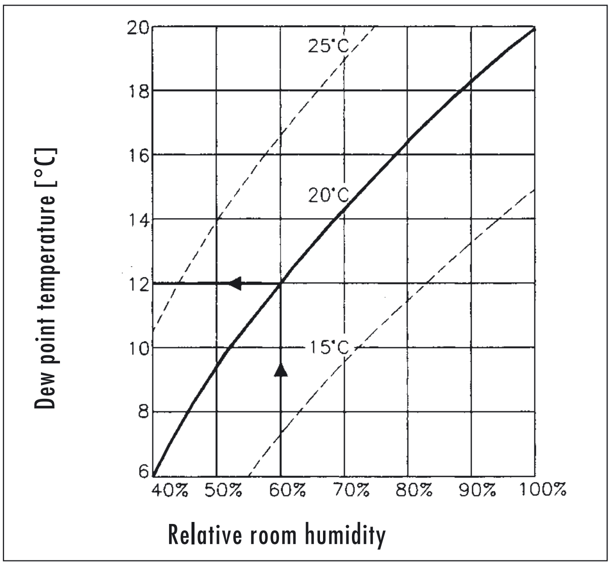
- **Increased energy consumption.**
  In order to combat the loss of thermal energy caused by thermal bridges extra heating must be used, thereby necessitating taking into consideration higher than needful energy costs. These costs are substantial when one realises that approximately half of domestic energy costs are due to heating[1] and that thermal bridges lead to the loss of up to one third of central heating energy.

- **Danger of fungus growth and condensation formation.**
  Due to the dramatic fall in living area surface temperature, the relative humidity factor increases in areas adjoining the thermal bridge. This causes a much higher risk of fungal growth (see diag. 1 page 4). Ensures the dew point temperature is never reached, thus allowing moisture to form as condensation (see diag. 2 page 4) leading to serious building damage in almost every case.

[1] source: Association of Electrical energy suppliers (VDEW), dpa- statement: 14.09.1993



diag. 1: Curves show the growth of fungus (mould) on wallpaper in relation to the lowering of surface temperature and damp created (factors show growth in mm per day) Source: Frauenhofer Institute for construction physics, Stuttgart.



diag. 2: Dependancy of dew point temperature as relating to room humidity with different temperature bases.
From the picture one can see clearly that in a normal living-room climate (room air temperature 20 °C, relative humidity factor of < 60 %) when surface temperature is allowed to fall below 12 °C moisture in the form of condensation appears (arrows).

Formation of moisture, i.e. condensation is a natural phenomenon: Warm air can absorb much more humidity than cold air. For instance, warm air with a temperature of 20 °C can absorb up to 17.3 g/m^3. However air with a temperature of 10 °C can only absorb 9.4 g/m^3. Therefore when warm air cool down below a certain point water condenses to form moisture (dew) at the rooms coolest points. Should then the wall surface temperature fall below the so-called dew point, moisture, in the form of condensation forms: The ideal breeding ground for fungicidal growth. The air-borne spores from this type of growth are particularly harmful, causing lung infections. Mould fungus cannot root on dry surfaces, it needs damp and conditions described above. In the front line of this battle are, of course, domestic dwellings. These are places where the conditions necessary for fungus/mould formation rule. When a thermal bridge is allowed to form the thermal integrity of a building is severely compromised, in this case a thermal partition between the exterior and the interior of the building is of critical necessity.

Energy Conservation regulations and the thermal bridging effect

Due to the new energy conservation regulations in Europe, the low-energy house standard has been legally introduced. This higher attainment level of thermal insulation necessitates special consideration to thermal bridges, while the thermal integrity of a building carcass can only be maintained when the insulation level is well designed. Something that cannot be achieved when thermal bridges are formed. Legislation now requires special consideration to thermal bridges when planning the energy conservation goals of a construction project.

The specific thermal transmission loss factor H_T is reached by the following equation:

$$H_T = \Sigma\, F_i \cdot U_i \cdot A_i + H_{WB}$$

$\Sigma\, F_i \cdot U_i \cdot A_i$ describes a thermal loss by outflow through the large-area construction components (walls, ceilings, floor slabs etc.) with U_i as thermal conductor co-efficient of the wall i with the outer-based area A_i and the temperature reduction factor $F_i \cdot H_{WB}$ is the share of conductive thermal loss, caused by the formation of a thermal bridge.

Case 1: Without thermal bridge analysis

Without further calculation of thermal bridging the following applies:

$$H_{WB} = \Delta U_{WB} \cdot A_{ges} \text{ with: } \Delta U_{WB} = 0{,}1\ W/(Km^2),\ A_{ges} = \Sigma\, A_i \text{ (total of outer surface of building).}$$

i.e. a flat-rate value ΔU_{WB} is added to the average U value of the building carcass (worst-case value when not taking thermal bridges into consideration) This add-on to the average U-value can be calculated as upwards of 30%

Case 2: Analysis of the thermal bridge effect as per appendix 2 of DIN 4108

Appendix 2 of DIN4108 gives examples of minimum insulation measures necessary to combat thermal bridges. Relative to the conjunction details of these application examples, the flat-rate add-on value of ΔU_{WB} to 0,05 $W/(Km^2)$ is then reduced by an approximate value which can be taken as plus 15 % of the average U-value.

Case 3: More exact analysis of the thermal bridge effect

When effective counter-measures to thermal bridges are taken(e.g. Schöck Isokorb® and Schöck Novomur®) this leads to a pro-active reduction in the outflow values for H_{WB} In these cases a more exact form of calculation of thermal bridges lends itself for use through the thermic outflow loss co-efficient Ψ. Thus:

$$H_{WB} = \Sigma\, F_i \cdot \Psi_i \cdot l_i + \Sigma\, F_k \cdot \chi_k$$

The large Ψ_i stands for the (outer based) value of the length-wise co-efficient Ψ_i (also thermical loss co-efficient). The linear formed thermal bridge i with the length l_i while χ_k is the thermical loss co-efficient of the point-formed thermal bridge k.

Investigation processes	1. Without actual investigation of thermal bridgess	2. Added extra fixed value as per app. 2 of DIN 4108	3. Exact investigation process
Description	The thermal bridging risks are not actually calculated, i.e the investigation does not meet the standards calculable (and cannot use) the examples given in app.2 of DIN 4108	The thermal insulation measures used are as laid down in app.2 DIN 4108	The individual thermal bridge details are documented and can therefore be calculated with the assistance of the FE programme.
Applicable calculations	$H_{TB} = 0{,}1\ W/(Km^2)\ A_{tot}$	$H_{TB} = 0{,}05\ W/(Km^2)\ A_{tot}$	$H_{TB} = \Sigma\ F_i \cdot \psi_i \cdot l_i + \Sigma\ F_k \cdot \chi_k$
Depreciation of the average U-value of the building	approx. 30 %	approx. 15 %	approx. 5 % (whith adequate insulation at thermal bridge points.

table 1: Investigation process as per EnEV

As shown in table 1, the thermal insulation level decreases from aprox. 95 % to approx. 85 % and 70 % respectively in cases where the exact thermal bridge investigations are not properly carried out. This must then be rectified by costly counter measures (e.g. extra thick insulation on external walls) in any attempt to compensate.

The thermal insulation value of Schöck Novomur® when used in various forms of construction ψ are shown in the tables on pages 14 and 20. The calculation necessary as described in process 3 is then relatively easy to work out and thereby the thermal outflux factor drastically reduced.

Contribution of transmissions and ventilated thermal loss to the year's primary energy needs in kWh/m² annum

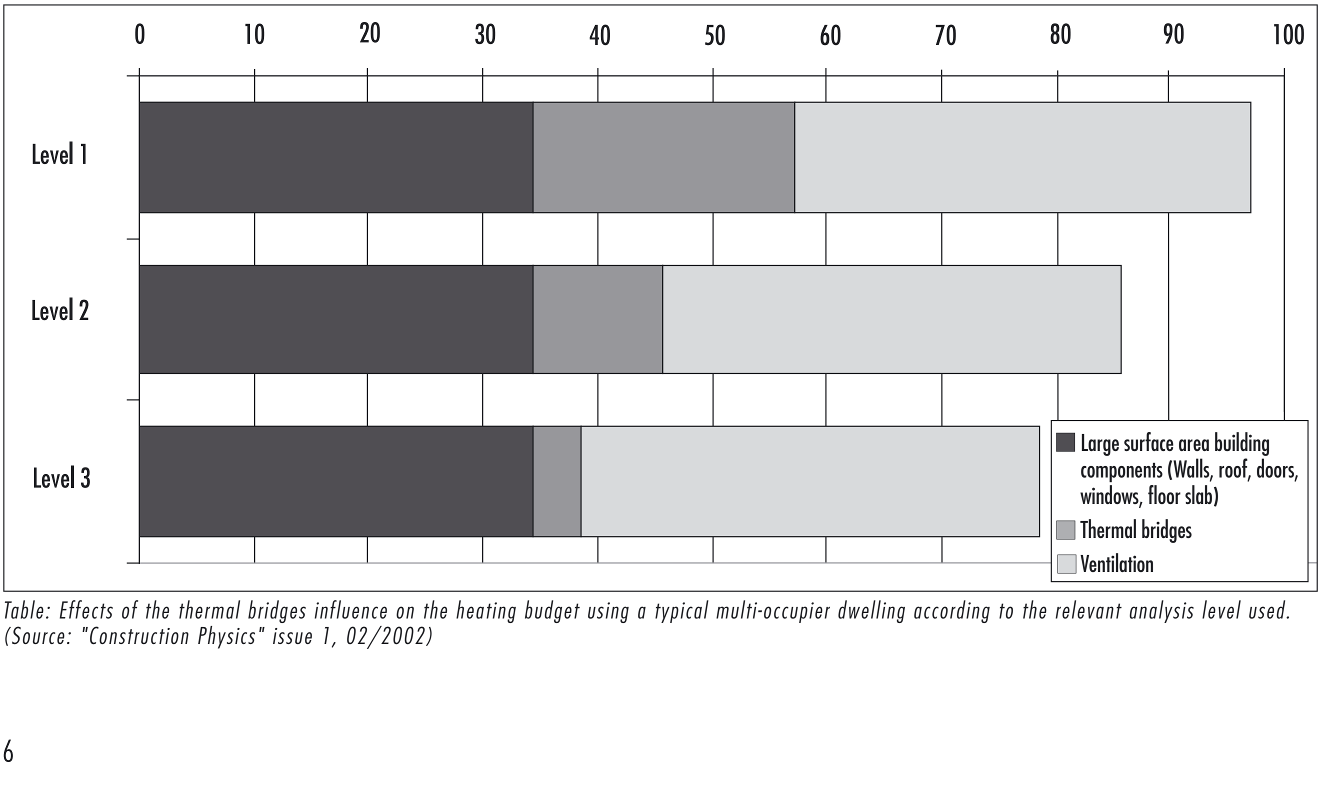


Table: Effects of the thermal bridges influence on the heating budget using a typical multi-occupier dwelling according to the relevant analysis level used. (Source: "Construction Physics" issue 1, 02/2002)

Damage to buildings as a result of increased humidity in living rooms.

- **Damp patches on inner wall surfaces**
  lead to damage to wallpaper and coverings, plaster and wood surfaces; also to a tendency to dust accumulation. Accumulation of dust particles creates a breeding ground for fungicidal growth.

- **Fungus attack**
  Moist/damp areas are susceptible to fungicidial attack. Mould fungi adversely affects the hygiene quality of living rooms by releasing spores into the air (raising the risk of lung based allergic reaction) Fungus mould encroachment does not necessarily start when the dew point is not reached, but rather as soon as a high enough humidity factor exists, the capillary condensation effect then creates the necessary conditions for fungus to entrench itself firmly: even at temperatures above the dew point. Once a fungus type mould has taken a firm hold on the wall, its natural physiognomy ensures rapid growth even when the room temperature is kept at stasis point.

- **Effects on living standard comfort**
  When the above conditions take place only constant higher-than-normal levels of heating can enable a comfortable living climate to be achieved.

- **Affects on quality of living**
  In cases of high moisture content of brick/blockwork only through constant high rate of heating can a comfortable living standard be reached.

Examples of physical manifestation of fungus attack at thermal bridge areas.

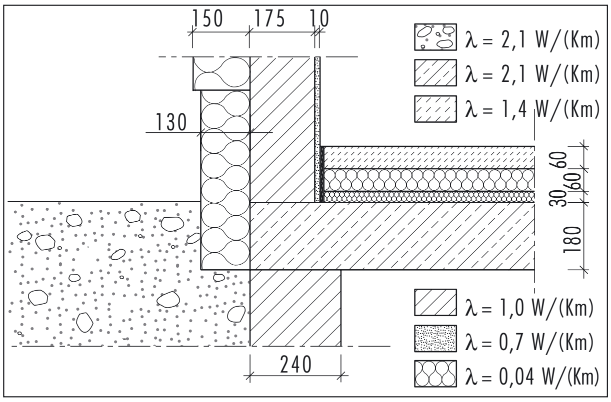
Thermal bridges at damp course level

Insulation measures in comparison

Un-insulated damp course

Where the damp/first course building level is not insulated, the brick/blockwork creates a weak link in the natural thermic defences of the building allowing thermal energy to flow between the above-basement insulation and the external insulation (see diag. 1a). Thus, owing to the high thermal conductivity factor of brick/blockwork ($\lambda \approx$ 1,0 W/(Km)) a large thermal bridge is created. This means:

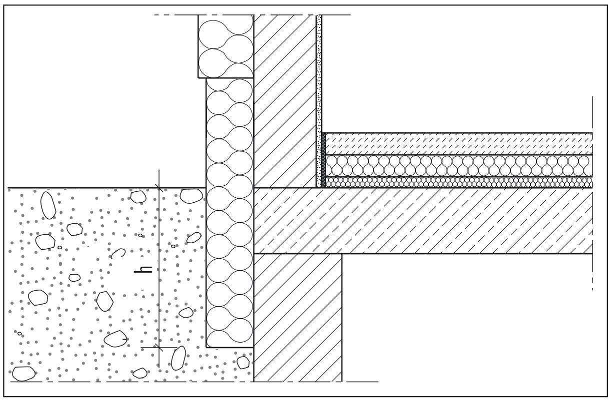
- Increased thermal energy loss and therefore higher heating costs
- Decrease of interior wall surface temperature, leading to condensation formation which in turn causes fungicidal growth (Building Damage !)



diag.1a: Construction cross-section with non-insulated damp course

Alternative insulation measures

When attempting to combat this problem the external insulation is often driven deeper into the earth in order to create a sub-level insulation perimeter (see diag. 2a). Apart from the prohibitive extra costs which ensue from such measures, another drawback is that it allows more energy to escape than it prevents; making it non-cost effective (see diag.2b). Tests show that at after a depth of approx. 0.5 m there is no noticeable increase in effectiveness of the perimeter insulation defence (see diag. 5).

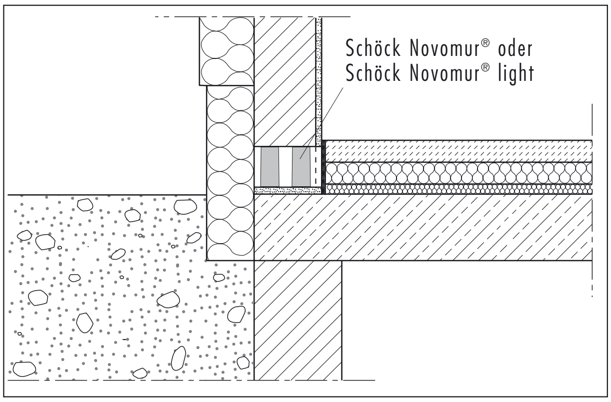


diag. 2a: Alternative insulation measures

Insulation with Schöck Novomur® and Schöck Novomur light®

The load-bearing insulation elements Schöck Novomur® and Schöck Novomur® light work by blocking thermal energy escape attempts between the basement insulation and the external insulation (see diag. 3a). By creating a continuous ultra-efficient barrier, keeping thermal energy in and cold out (see diag. 3b).
This means:

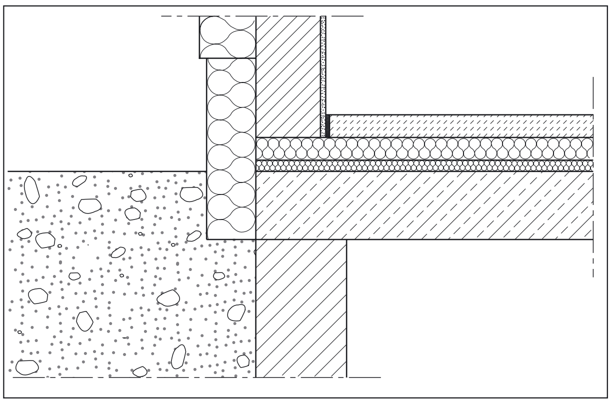
- Minimisation of thermal energy loss and thereby preventing heating costs from soaring.
- Increase of interior wall surface area temperature: thus not allowing „dew Point" crises to damage the building.
- No danger of fungicidal attack.
- Healthier living environment.



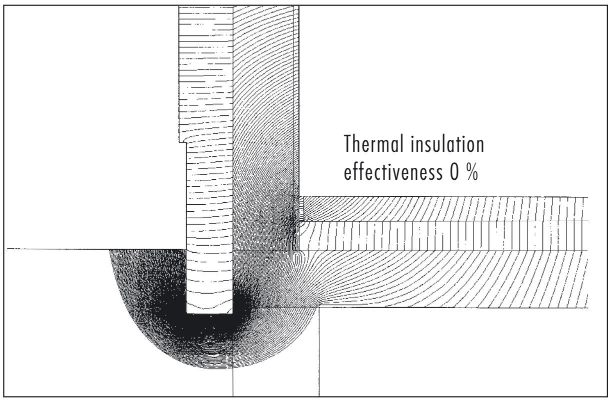
diag. 3a: Cross-section showing building constructed with Schöck Novomur® or Schöck Novomur light® insulation technology

The best possible scenario insulated building base

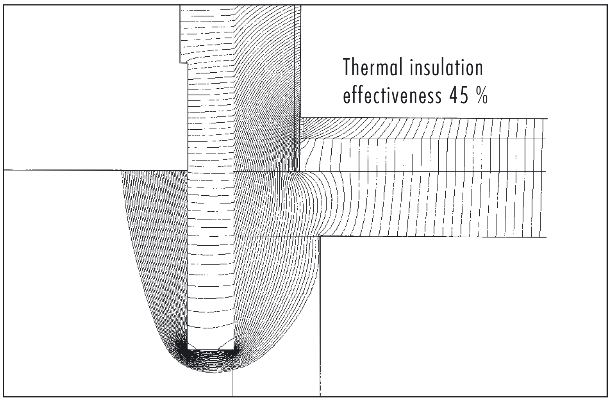
In contrast to the previously described alternative attempts at insulation the theoretical best case scenario is a complete thermic seal (see diags. 4a and 4b).
As you can see, in practice this measure can't be beaten.



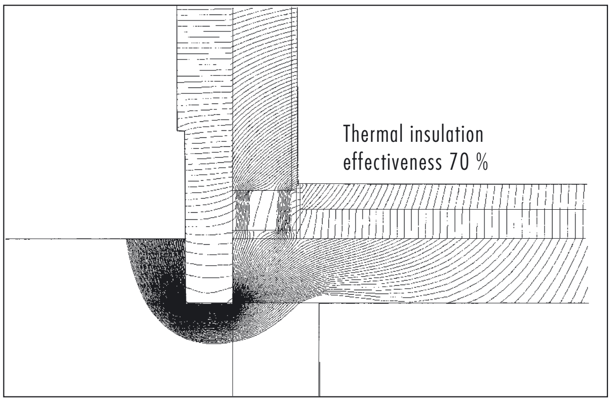
diag. 4a: Cross-section of a building base with the best possible scenario insulation



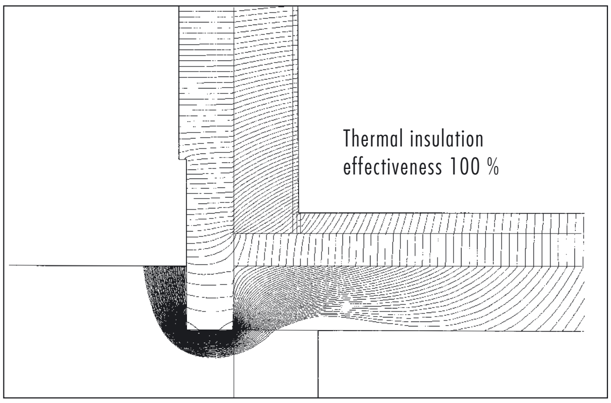
diag. 1b: Thermal flux lines shown on a non-insulated building base



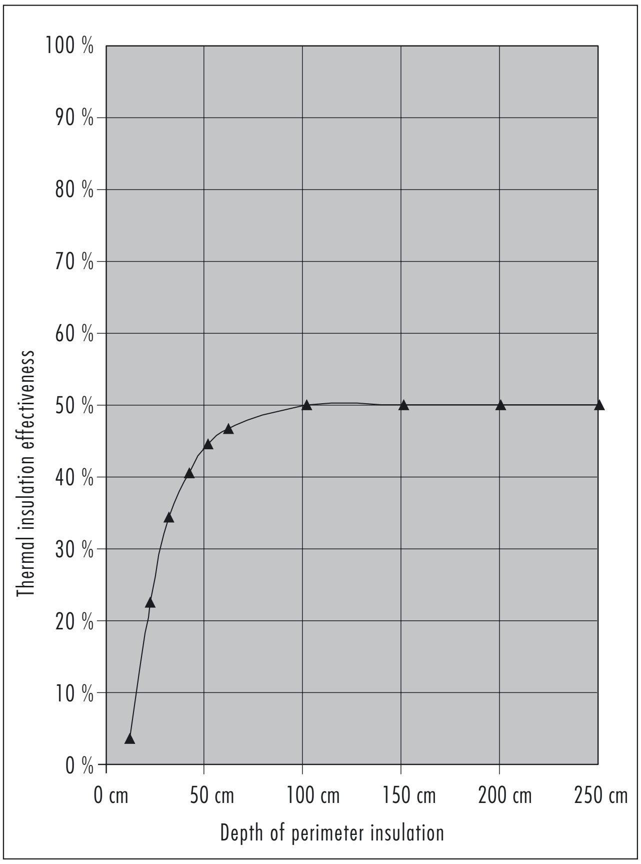
diag. 2b: Thermal flux lines shown on an alternative insulation method



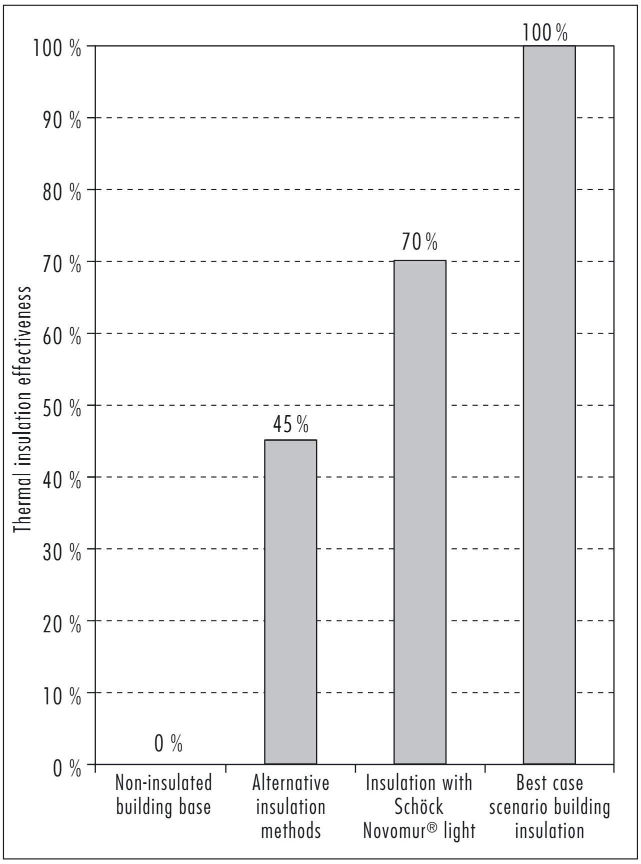
diag. 3b: Thermal flux lines shown on a building base insulated with Schöck Novomur® light



diag. 4b: Thermal flux lines shown on a best case scenario insulated building base.



diag. 5: Thermal insulation effectiveness of alternative insulation method



diag. 6: Thermal insulation effectiveness of previously described alternative methods in comparison with Schöck products

Thermal bridges which take place at the buildings base

Construction material moisture and thermal insulation effectiveness

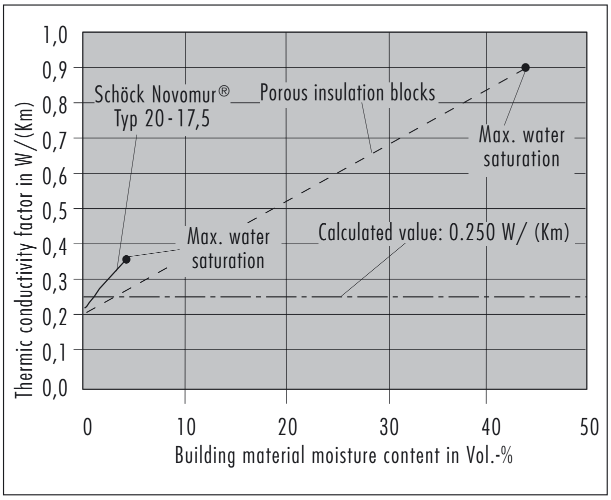
The actual thermal conductivity factor – and therefore the thermal insulation effectiveness – of construction material is totally dependant upon its moisture absorbence behaviour: the higher the moisture content, the higher the inherent thermic conductivity and the lower its thermal insulation capabilities. Thermal conductivity rises when using porous insulation blocks: e.g to approx. 8 % absorption of moisture content per 1 Vol-% (see diag. 7). In the construction phase of any building a large amount of water collects in the brick/blockwork. Especially vulnerable is the first course above the basement as moisture from below (rain and damp in the basement) and above (rain, snow etc.) is absorbed.

Capillary absorbent blocks, when used as a first or damp course, are often soaked to saturation point, rendering them useless as thermal insulation elements. These thoroughly soaked blocks naturally, have a much higher thermal conductivity value: when calculating this the higher value of λ_R taken from technical research data (λ_R symbol-expresses the thermal conductivity factor as relative to the moisture absorbence qualities of the material) A porous block can be expected to absorb between 45 Vol.-% and 80 Vol.-%. Therefore when using such blocks a much higher rate of thermal energy conductivity than necessary λ = 0.9 W/(Km) must be reckoned with.

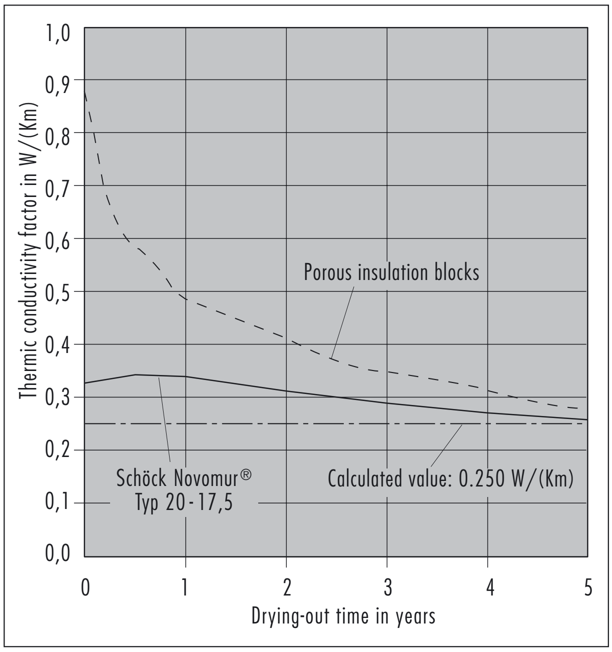
Water absorbed during the construction phase takes much longer to dry out due to the fact that blockwork is sandwiched between beds of non-porous mortar, effectively creating a water storage tank. FEM simulations carried out by the Fraunhofer Institute for Construction Physics* shows that the actual thermal conductivity factor of porous insulation blocks during the circa 5 years necessary drying-out time is much higher than was previously thought and also much higher than the values normally used in standard practice calculation. In comparison here with Schöck Novomur® and Schöck Novomur® light show only a slight increase occurring during the construction phase which then falls steadily. The first few years of any construction project are critical to its later lifespan as dwellings are extremely susceptible to encroachment of possible adverse influences; in other words, at this vital stage damp and fungus must not be allowed to get a foot over the doorstep. Once fungus/mould has managed to get a grip on the structure it is almost impossible to get rid of. The higher humidity which occurs at these times is greatly affected by the type of thermal insulation at first/damp course level.

The load bearing Schöck Novomur® and Schöck Novomur® light are practically non-absorbent and take on only a tiny amount of water (approx. 3.5 Vol.-%).

Therefore eliminating the dangers outlined above. Schöck Novomur® and Schöck Novomur® light start working for you from the moment they are laid.



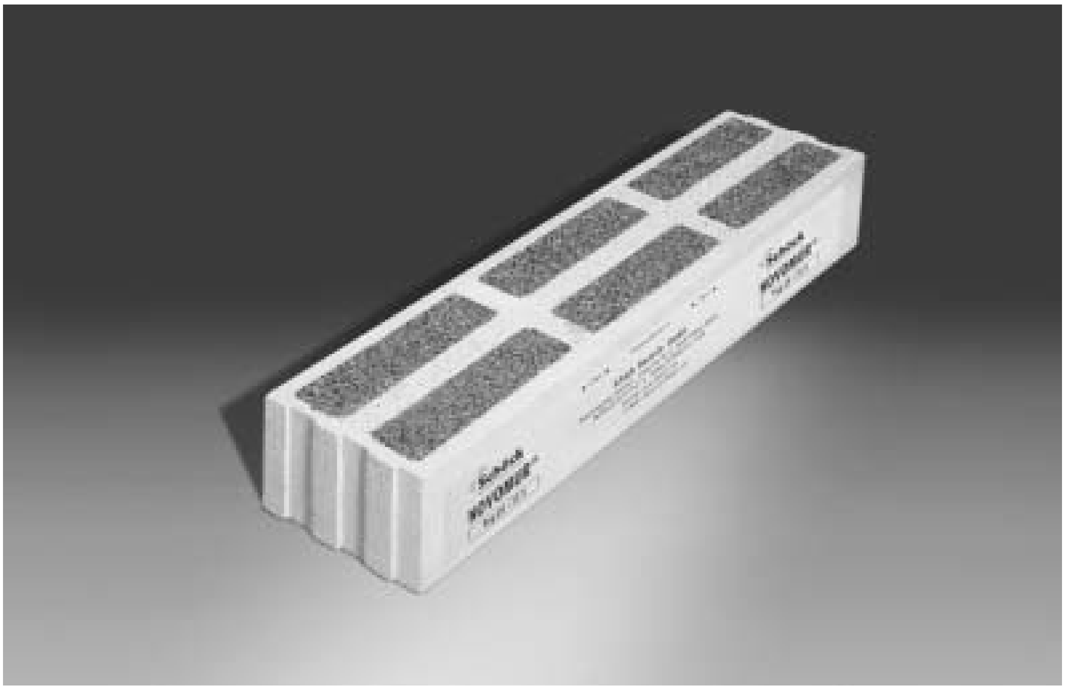
diag. 7: Dependancy of the thermic conductivity factor of construction materials, example given: porous insulation block and Schöck Novomur®



diag. 8: Thermic conductivity factor behaviour during typical drying-out time using porous insulation blocks and Schöck Novomur® as examples.

* IBP report HTP-5/200, Fraunhofer Institute for Construction Physics, Stuttgart, Germany.

Load-bearing, water repellent thermal insulation element for avoidance of thermal bridges occuring at the first/damp course of multi occupier dwellings



Schöck Novomur® Typ 20 - 17,5

Application area:
First and/or last course in brick/blockwork walls at the building base of multi-occupier dwellings

- Block density class 20
- Takes up to 4 full storeys with no need for extra thrust force calculation
- Can be used with thin-bed or normal mortar
- High level of planning security: Approved and accredited for use in construction, thermal technology tested, fire protection tested, moisture absorbence tested
- Almost no capillary water absorbtion

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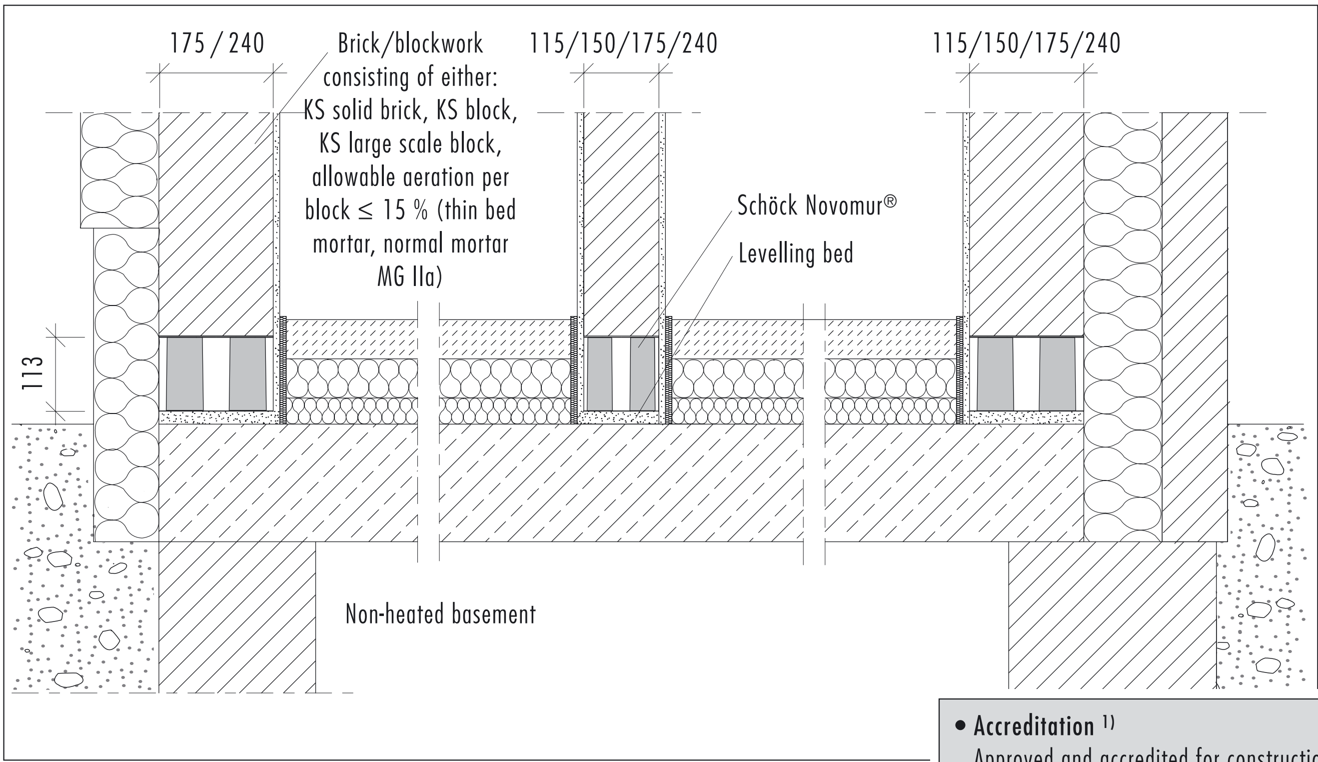
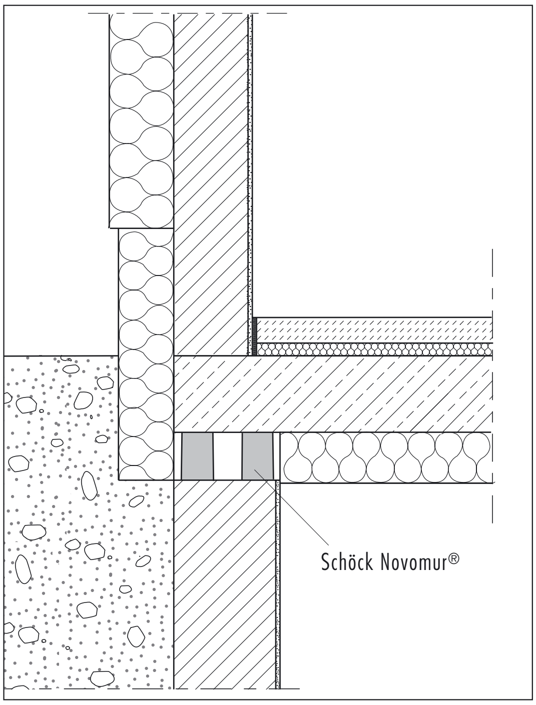
Schöck Novomur®

Actual fitted state

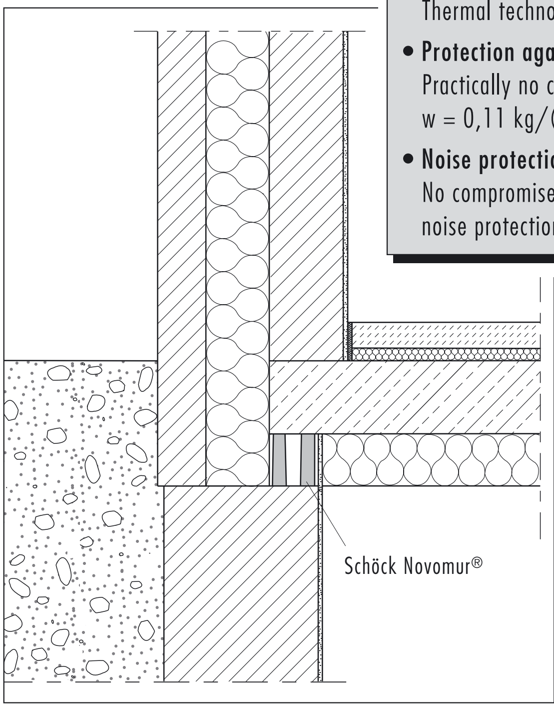


Actual fitted state of Schöck Novomur® used with a bonded thermal insulation system, inner wall and double skin wall

- **Accreditation** [1)]
  Approved and accredited for construction use
- **Fire protection** [1)]
  Fire resistance class F 90
- **Thermal protection** [2)]
  Thermal technology value tested
- **Protection against damp** [3)]
  Practically no capillary water absorbtion,
  w = 0,11 kg/(m² $h^{0,5}$) ➔ water resistant
- **Noise protection** [4)]
  No compromise of wall sonic integrity and noise protection ability



Actual fitted state of Schöck Novomur® below the basement ceiling slab used in conjunction with a bonded thermal insulation system



Actual fitted state of Schöck Novomur® below the basement ceiling slab used in conjunction with double skin thermal insulation system

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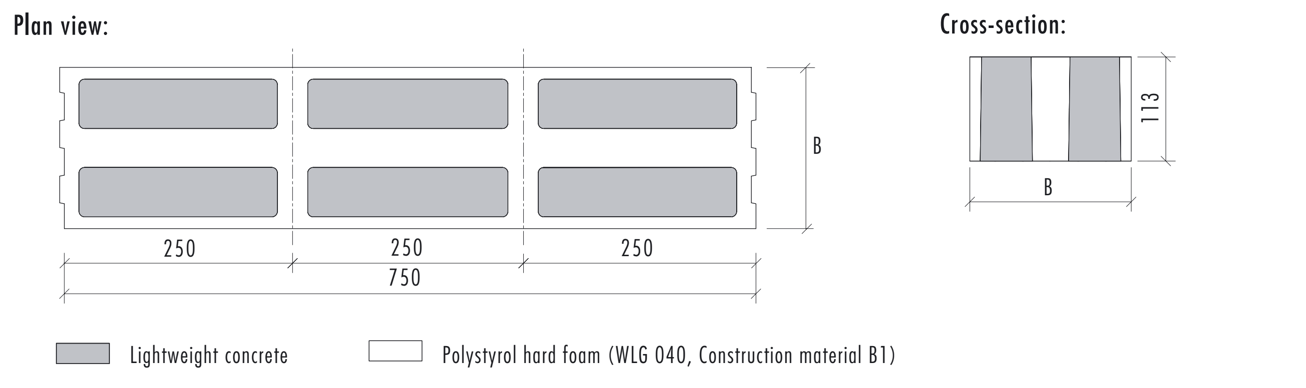
1) General construction accreditation nr. Z-17.1-709, DIBT- German institute for building technology, Berlin
2) Prof. Dr. Hauser GMBH consultant engineers
3) Test report nr. 02 10 60 06 94, Institute for Large Scale Construction and construction technology, Karlsruhe University, Germany
4) Impact sound test report, nr L 97.94-p 18 and extension paragraphs, ITA - Institute for technical Accoustics, Wiesbaden (further details see page 15), Germany

Schöck Novomur®

Table of measurements/dimensions/material consistence

Schöck Novomur® type	Dimensions			Brick/block density class	Weight	Standard value σ_0 of the permissable thrust tension for			
						Brick/blockwork[1)] density class 12		Brick/blockwork[1)] with min. density class 20	
						Mortar		Mortar	
	Width (B)	Height	Length			MG IIa	DM	MG IIa	DM
	[mm]	[mm]	[mm]		[kg]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
20 - 11,5	115	113	750	20	9,6	1,6	1,8	1,9	2,4
20 - 15	150				12,5				
20 - 17,5	175				14,6				
20 - 24	240				19,5				

[1)] Brick/blockwork consisting of either: KS solid brick, KS block, KS large scale block, allowable aeration per block ≤ 15 %



Dimensions Schöck Novomur®

Reference points

– Schöck Novomur® can be assessed by the simplified calculations found in DIN 1053/1, A.6.

– Schöck Novomur® is only intended for use as the first/last course of brick/blockwork

– With buildings with up to three full storeys and extra basement or attic (either fitted-out or not fitted out) as set out in the simplified assessment process, no specific extra calculation of thrust forces is necessary. In any case the above mentioned low susceptibility to thrust forces must be taken into consideration.

– When a thrust force evaluation is carried out as per DIN 1053/1, A.6.9.5, then to find perm. τ that is determined by the equation of 6 a – with σ_{oHs} for non-mortared perp joints – of the given standard values of blockwork used and for only 50 % of the max. τ input value of the blockwork used, that is, a maximum of 0.1 N/mm² may be used.

– In the case of buildings in earthquake risk 3 and 4 zones walls with Schöck Novomur® and Schöck Novomur light® may not be counted as structure stabilisers.

– To work out the corner bonding length, only a two sided toothed-indent bond may be used as a calculating base.

– In the case of brick/blockwork where load is to be borne at right angles to its level, bending-drag tension cannot be accounted for. When this must be calculated then only a load-bearing effect using as its starting point a position upright to the bed to takes into account this effect.

Schöck Novomur®

Thermal technological values

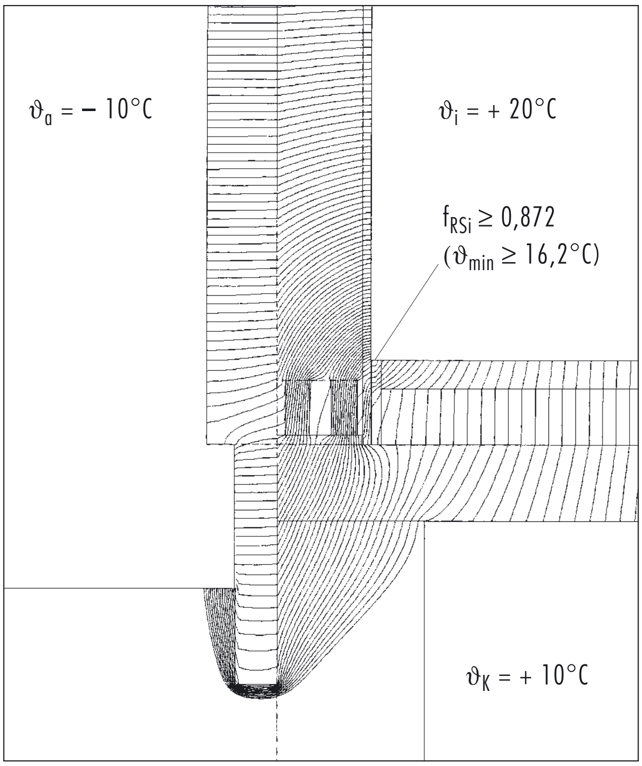
Schöck Novomur® type	Average thermal conductivity		Thermal bridge loss co-efficient ψ[1] (external surface area-based)			Temperature factor f_{RSi}[2] (minimum surface temperature ϑ_{min})[3]		
	Vertical axis [W/(Km)]	Horizontal axis [W/(Km)]	Thermal insulation system[3] [W/(Km)]	Double skinned outer wall [3] [W/(Km)]	Internal wall [W/(Km)]	Thermal insulation system[3]	Double skinned outer wall	Internal wall
20 - 11,5	$\lambda_v = 0{,}286$	$\lambda_h = 0{,}088$	–	$\Psi \leq 0{,}056$	$\Psi = 0{,}190$	–	$f_{RSi} \geq 0{,}866$ ($\vartheta_{min} \geq 16{,}0°C$)	$f_{RSi} = 0{,}855$ ($\vartheta_{min} = 18{,}6°C$)
20 - 15			$\Psi \leq 0{,}039$		$\Psi = 0{,}224$	$f_{RSi} \geq 0{,}872$ ($\vartheta_{min} \geq 16{,}2°C$)		$f_{RSi} = 0{,}845$ ($\vartheta_{min} = 18{,}5°C$)
20 - 17,5					$\Psi = 0{,}246$			$f_{RSi} = 0{,}836$ ($\vartheta_{min} = 18{,}4°C$)
20 - 24					$\Psi = 0{,}298$			$f_{RSi} = 0{,}821$ ($\vartheta_{min} = 18{,}2°C$)

Thermal technlogical values contributed by Prof. Dr. Hauser GmbH, Germany consultant engineers as per page 8 with wall thickness of 240 mm, basement insulation 115 mm, temperature reductions factor F= 0.5

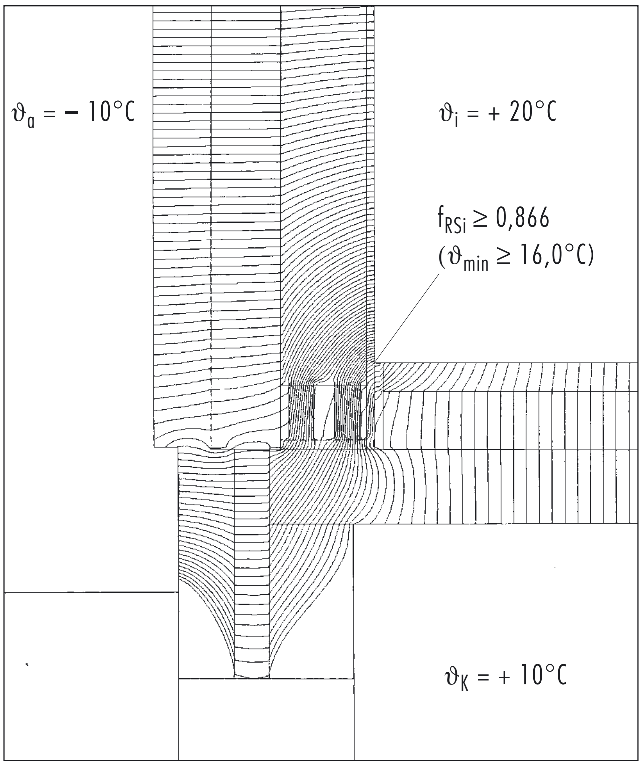
1) where thermal escape resistance factor outside $R_{se} = 0{,}04\ (m^2K)/W$ and inside $R_{si} = 0{,}13\ (m^2K)/W$

2) $f_{RSi} = (\vartheta_{min} - \vartheta_a)/(\vartheta_i - \vartheta_a)$; where thermal escape resistance factor outside $R_{se} = 0{,}04\ (m^2K)/W$ and inside $R_{si} = 0{,}25\ (m^2K)/W$

3) Where external temperature is $\vartheta_a = -10°C$, inside temperature $\vartheta_i = +20°C$, basement temperature $\vartheta_K = +10°C$



Thermal outflux, temperature factors and minimum surface temperature with bonded thermal insulation system



Thermal outflux, temperature factors and minimum surface temperature with double skinned external wall

Fire protection requirements for multi-occupier dwellings

The fire protection requirements regarding building walls may differ from state to state.

The fire protection requirements regarding load bearing brick/blockwork walls of dwellings which are not of what is classified as low height, (i.e. the uppermost floor level is on one or more points more than 7 m above ground level) must be at least fire resistant, more exactly of at least F 90 clasification to comply with regulations. When dealing with concrete building projects the applicable regulations state and country wide must be taken into consideration in every case.

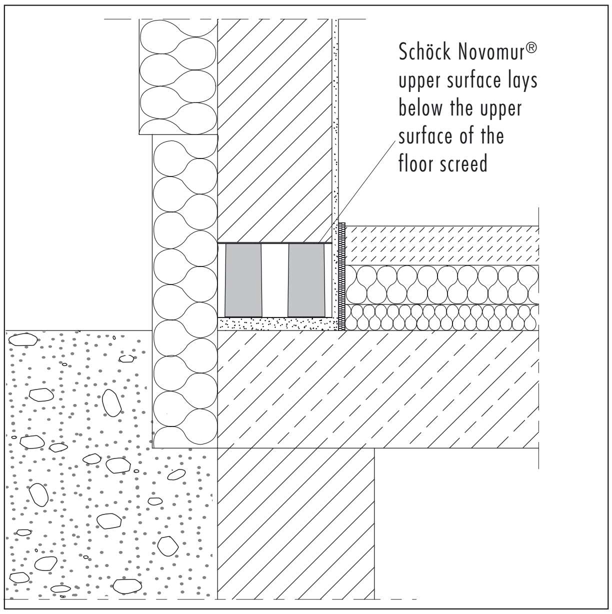
Fire resistance class F 30 and F 90

In order to achieve fire protection classification F 30 and F 90 in cases of enclosure walls as per DIN 4102, part 2 and part 4 Schöck Novomur® may be used providing the following steps are complied with.

Schöck Novomur® must be laid inside the slab construction so that its upper edge of lays below the surface of the floor screed.

The inclusion in fire protection classification F 30 and F 90 in non-enclosure walls as per DIN 4102, part 2 and part 4 is nevertheless valid when Schöck Novomur® is used correctly. Extra fire protection measures are not necessary.

The exact classification of brick/blockwork walls that use Schöck Novomur® is F 30-AB , more exactly F 30-AB as per DIN 4102 part 2.



F30 and also F90 according to fire protection technology in enclosure walls

Fire walls

Schöck Novomur® and Schöck Novomur® light may not, in general, be used in fire walls.

When Schöck Novomur® is contained on both sides within an approved floor screed, then in individual cases a fire protection evaluation and classification as fire wall may be obtained.

Noise protection.

According to the results of accoustic measurement in tests, Schöck Novomur® has no adverse effect on the accoustic insulation properties of said walls (see test report nr. L 97.94 and continuation from P 225/02 dated 29.07.02, ITA - Institute of Accoustic technology, Wiesbaden, Germany).

To be taken into consideration hereby is that, for example, by complete plaster covering of a wall (at least one side) no „Reverberative“ sonic bridges may be allowed to form (e.g. empty joints or butt joints not properly fitted).

Schöck Novomur®

Actual fitted advice

General advice and points of reference

- The Schöck Novomur® load bearing insulation element must be laid as according to the markings there on with the upper face placed upwards.
- Schöck Novomur® can be cut to length with normal construction tools. The cut to size part must comply with minimum bond length, i.e that of at least 25 cm. Cuts may not be used adjacently.
- Wall recesses and openings which weaken the load bearing capabilities of the cross section are not permissable.
- Schöck Novomur® is not to be laid in consecutive courses, i.e. on top of one another.

Laying above the basement ceiling

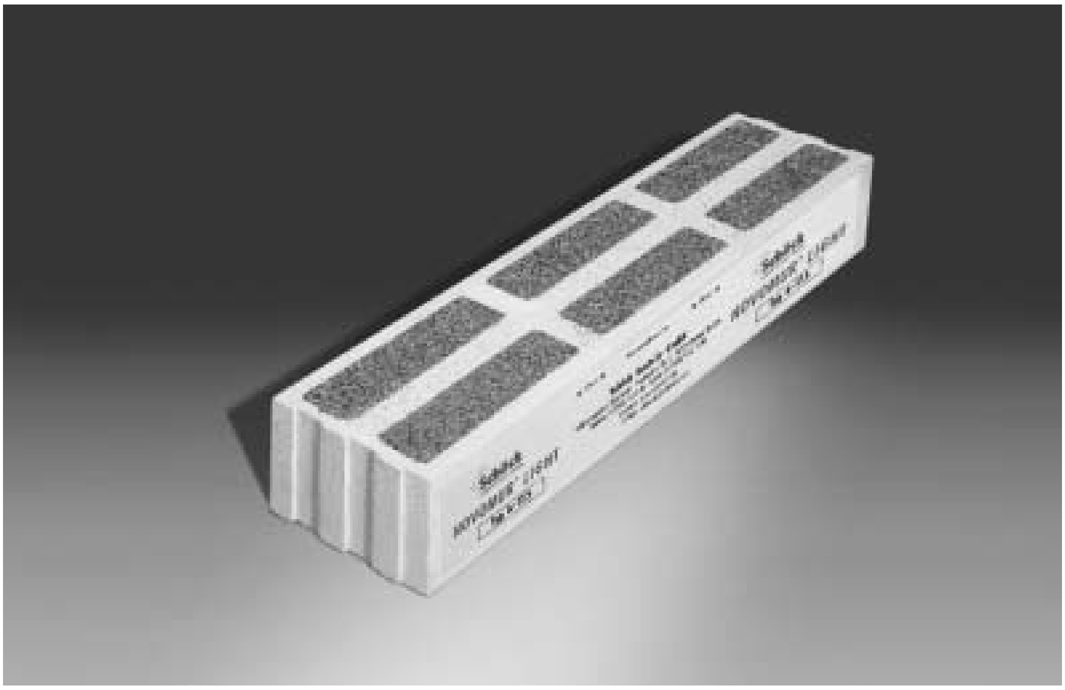
- Schöck Novomur® is to be laid on a mortar bed of normal MG III consistency and tightly butted to each other.
- After laying the element a curing time must be observed whereby the mortar is hard bonded, ensuring no danger of movement when the next course is laid.
- When using in a wall which will consist of KS glued massive blocks with thin bed mortar then proper care and attention must be given to ensure that the elements are laid in a level and correct fashion.

Laying below the basement ceiling

- A full joint must be laid as bed for the basement ceiling slab when seating on Schöck Novomur®.

Schöck Novomur® light

Load-bearing, water repellent thermal insulation element for avoidance of thermal bridges occuring at building base in single family dwellings



Schöck Novomur® light Typ 6 - 17,5

Application area:
First and/or last course in brick/blockwork walls at the building base of single family dwellings

- Block density class 6
- Can be used with thin-bed and normal bed mortar
- High level of planning security: Approved and accredited for use in construction, thermal technology tested, fire protection tested, moisture absorbence tested
- Almost no capillary water absorbtion

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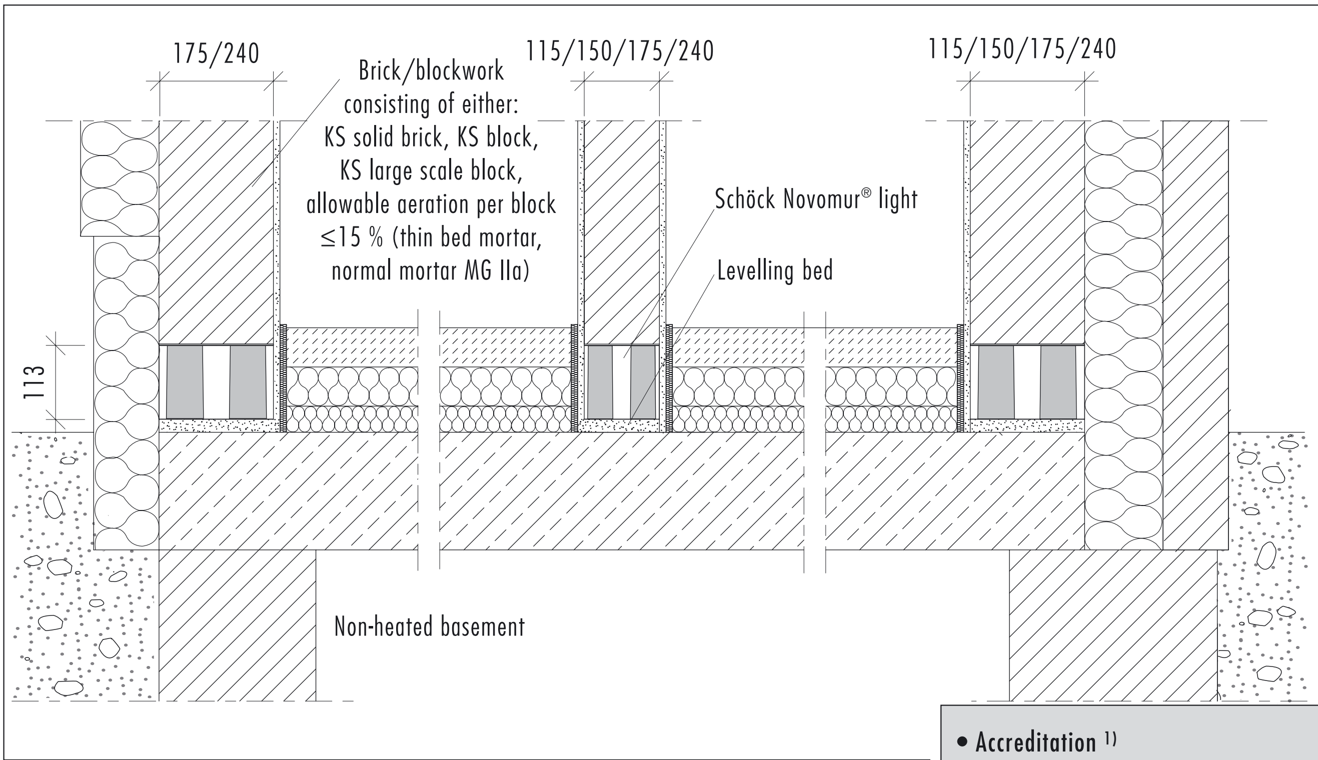
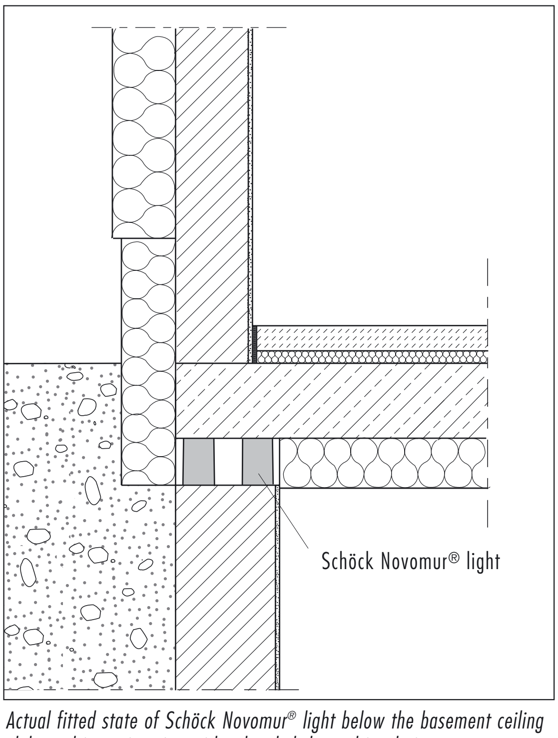
Schöck Novomur® light

Actual fitted state

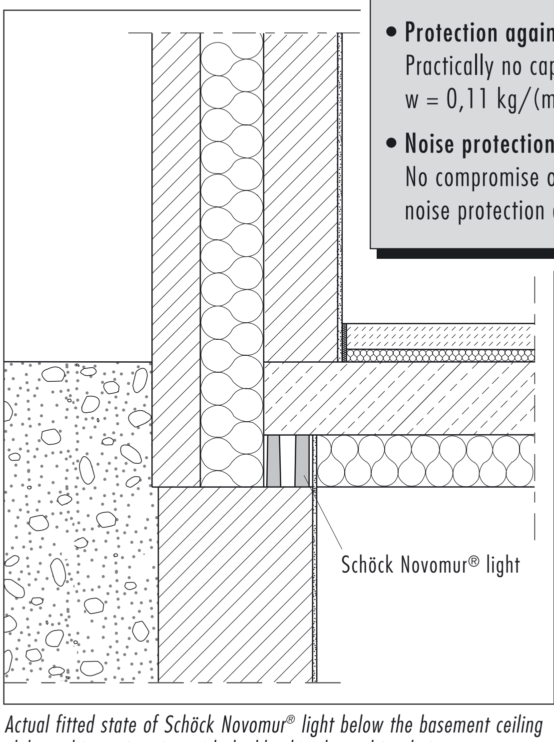


Actual fitted state of Schöck Novomur® light used with a bonded thermal insulation system, inner wall and double skin wall

- **Accreditation** [1]
  Approved and accredited for construction use
- **Fire protection** [1]
  Fire resistance class F 90
- **Thermal protection** [2]
  Thermal technology value tested
- **Protection against damp** [3]
  Practically no capillary water absorbtion,
  w = 0,11 kg/(m² $h^{0,5}$) ➔ water resistant
- **Noise protection** [4]
  No compromise of wall sonic integrity and noise protection ability



Actual fitted state of Schöck Novomur® light below the basement ceiling slab used in conjunction with a bonded thermal insulation system



Actual fitted state of Schöck Novomur® light below the basement ceiling slab used in conjunction with double skin thermal insulation system

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[1] General construction accreditation nr. Z-17.1-709, DIBT- German institute for building technology, Berlin

[2] Prof. Dr. Hauser GMBH consultant engineers, Germany

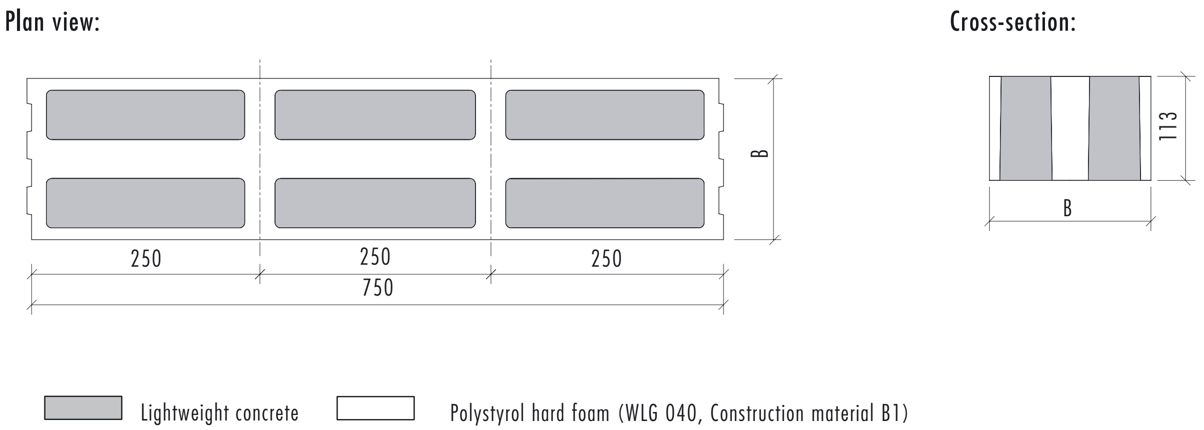
[3] Impact sound test report, nr L 97.94-p 18 and extension paragraphs, ITA - Institute for technical Accoustics, Wiesbaden (further details see page 15), Germany

Schöck Novomur® light

Table of measurements/dimensions/material consistence

Schöck Novomur® light type	Dimensions Width (B) [mm]	Height [mm]	Length [mm]	Brick/ block density class	Weight [kg]	Standard value σ_0 of the permissable thrust[1)] tension for MG IIa [N/mm²]	DM [N/mm²]
6 - 11,5	115	113	750	6	7,3	1,0	1,2
6 - 15	150				9,6		
6 - 17,5	175				11,0		
6 - 24	240				14,9		

[1)] Brick/blockwork consisting of either: KS solid brick, KS block, KS large scale block, allowable aeration per block ≤ 15 %



Dimensions Schöck Novomur® light

Reference points

- Schöck Novomur® light can be assessed by the simplified calculations found in DIN 1053/1, A.6.
- Schöck Novomur® light is only intended for use as the first/last course of brick/blockwork.
- With buildings with up to two full storeys and extra basement or attic (either fitted-out or not fitted out) as set out in the simplified assessment process, no specific extra calculation of thrust forces which affect room stability. In any case the above mentioned low susceptibility to thrust forces must be taken into consideration.
- Should a thrust calculation be necessary, as per DIN 1053/1, A 6.9.5; then for perm. τ 0.03 MN/m² is to be included to complete the equation.
- In the case of buildings in earthquake risk 3 and 4 zones walls with Schöck Novomur® light may not be counted as structure stabilisers.
- To work out the corner bonding length, only a two sided toothed-indent bond may be used as a calculating base.
- In the case of brick/blockwork where load is to be borne at right angles to its level, bending-drag tension cannot be accounted for. When this must be calculated then only a load-bearing effect using as its starting point a position upright to the bed to take into account this effect.

Schöck Novomur® light

Thermal technological values

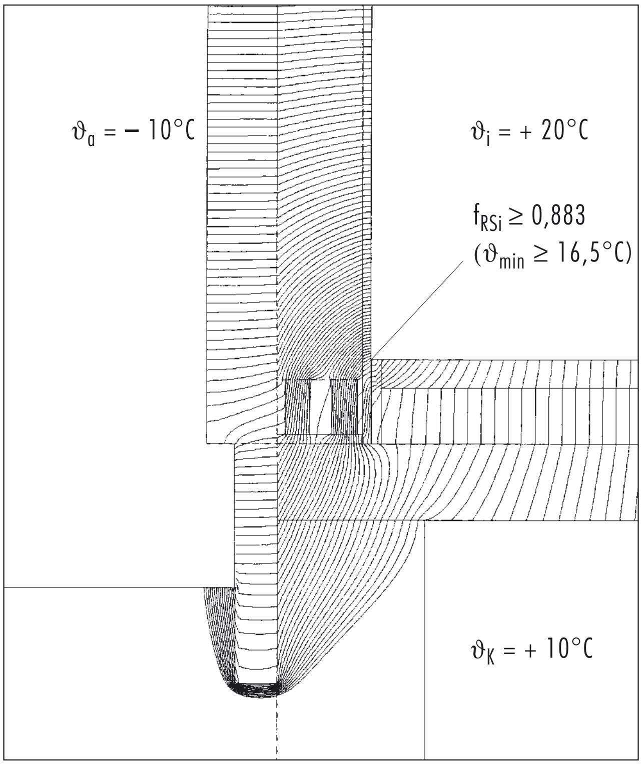
Schöck Novomur light® type	Average thermal conductivity[1]		Thermal bridge loss co-efficient ψ[2] (external surface area-based)			Temperature factor f_{RSi}[4] (minimum surface temperature ϑ_{min})[5]		
	Vertical axis [W/(Km)]	Horizontal axis [W/(Km)]	Thermal insulation system[3] [W/(Km)]	Double skinned outer wall [3] [W/(Km)]	Internal wall W/(Km)]	Thermal insulation system[3]	Double skinned outer wall	Internal wall
6 - 11,5			–		$\Psi = 0{,}148$	–		$f_{RSi} = 0{,}880$ (ϑ_{min}=18,8°C)
6 - 15	$\lambda_v = 0{,}189$	$\lambda_h = 0{,}083$	$\Psi \leq 0{,}016$	$\Psi \leq 0{,}030$	$\Psi = 0{,}172$		$f_{RSi} \geq 0{,}879$ ($\vartheta_{min} \geq 16{,}4$°C)	$f_{RSi} = 0{,}873$ (ϑ_{min}=18,7°C)
6 - 17,5					$\Psi = 0{,}188$	$f_{RSi} \geq 0{,}883$ ($\vartheta_{min} \geq 16{,}5$°C)		$f_{RSi} = 0{,}865$ (ϑ_{min}=18,6°C)
6 - 24					$\Psi = 0{,}227$			$f_{RSi} = 0{,}853$ (ϑ_{min}=18,5°C)

Thermal technlogical values contributed by Prof. Dr Hauser GMBH consultant engineers as per page 8 with wall thickness of 240 mm, basement insulation 115 mm, temperature reductions factor F = 0.5

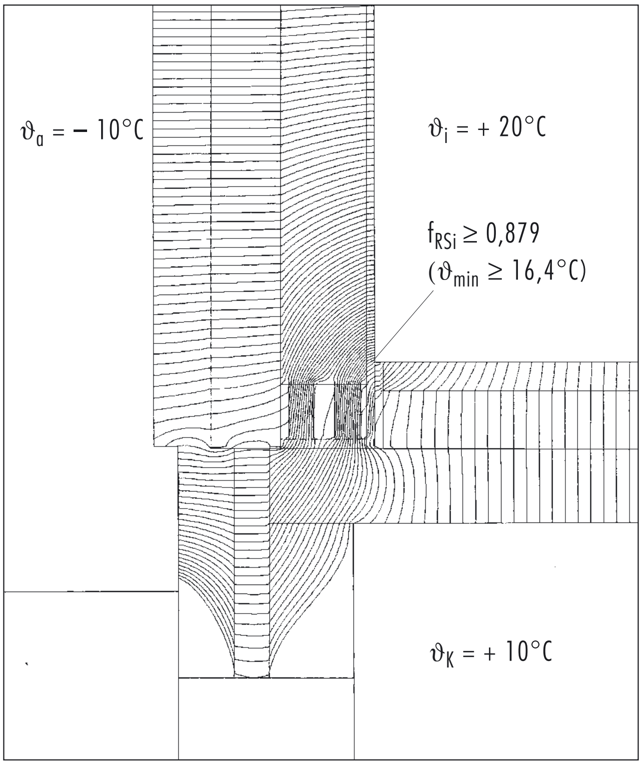
1) where thermal escape resistance factor outside R_{se} = 0,04 (m²K)/W and inside R_{si} = 0,13 (m²K)/W

2) $f_{RSi} = (\vartheta_{min} - \vartheta_a)/(\vartheta_i - \vartheta_a)$; where thermal escape resistance factor outside R_{se} = 0,04 (m²K)/W and inside R_{si} = 0,25 (m²K)/W

3) where external temperature is ϑ_a = –10°C, inside temperature ϑ_i = +20°C, basement temperature ϑ_K = +10°C



Thermal outflux, temperature factors and minimum surface temperature with bonded thermal insulation system



Thermal outflux, temperature factors and minimum surface temperature with double skinned external wall

Fire protection requirements for single family dwellings

The fire protection requirements regarding building walls may differ from state to state.

The fire protection requirements regarding load bearing brick/blockwork walls of dwellings which are not of what is classified as low height, (i.e. the uppermost floor level is on one or more points more than 7 m above ground level) must be at least fire resistant, more exactly of at least F 90 clasification to comply with regulations. When dealing with concrete building projects the applicable regulations state and country wide must be taken into consideration in every case.

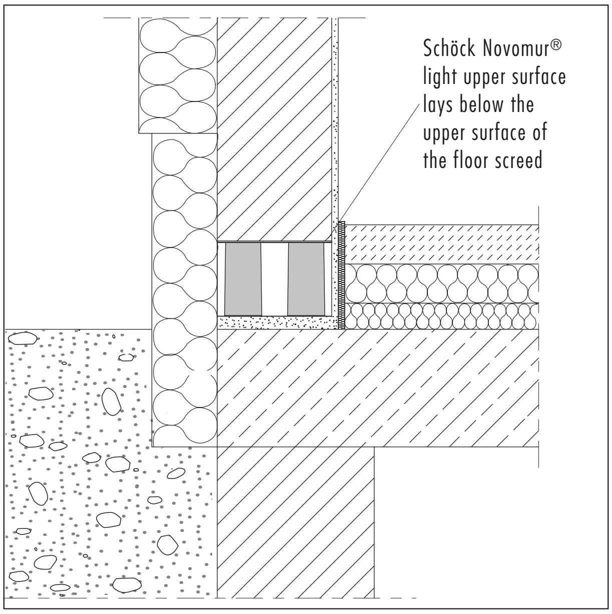
Fire resistance class F 30 and F 90

In order to achieve fire protection classification F 30 and F 90 in cases of enclosure walls as per DIN 4102, part 2 and part 4 Schöck Novomur® light may be used providing the following steps are complied with.

Schöck Novomur® light must be laid inside the slab construction so that its upper edge of lays below the surface of the floor screed.

The inclusion in fire protection classification F 30 and F90 in non-enclosure walls as per DIN 4102, part 2 and part 4 is nevertheless valid when Schöck Novomur® light is used correctly. Extra fire protection measures are not necessary.

The exact classification of brick/blockwork walls that use Schöck Novomur® light is F 30-AB , more exactly F 30-AB as per DIN 4102 part 2.



F 30 and also F 90 according to fire protection technology in enclosure walls

Fire walls

Schöck Novomur® light may not, in general, be used in fire walls.

When Schöck Novomur® light is contained on both sides within an approved floor screed, then in individual cases a fire protection evaluation and classification as fire wall may be obtained.

Noise protection

According to the results of accoustic measurement in tests, Schöck Novomur® light has no adverse effect on the accoustic insulation properties of said walls (see test report nr. L 97.94 and continuation from P 225/02 dated 29.07.02, ITA - Institute of Accoustic technology, Wiesbaden, Germany).

To be taken into consideration hereby is that, for example, by complete plaster covering of a wall (at least one side) no "Reverberative sonic bridges" may be allowed to form (e.g. empty joints or butt joints not properly fitted).

Schöck Novomur® light

Actual fitted state advices

General advice and points of reference

- The Schöck Novomur® light insulation element must be laid as according to the markings there on with the upper face placed upwards.
- Schöck Novomur® light can be cut to length with normal construction tools. The cut to size part must comply with minimum bond length, i.e that of at least 25 cm. Cuts may not be used adjacently.
- Wall recesses and openings which weaken the load bearing capabilities of the cross section are not permissable.
- Schöck Novomur® light is not to laid in consecutive courses, i.e. on on top of one another.

Laying above the basement ceiling

- Schöck Novomur® light is to be laid on a mortar bed of normal MG III consistency and tightly butted to each other.
- After laying the element a curing time must be observed whereby the mortar is hard bonded, ensuring no danger of movement when the next course is laid.
- When using in a wall which will consist of KS glued massive blocks with thin bed mortar then proper care and attention must be given to ensure that the elements are laid in a level and correct fashion.

Laying below the basement ceiling

- A full joint must be laid as bed for the basement ceiling slab when seating on Schöck Novomur® light.

Schöck Novomur®

POSITION	AMOUNT	UNIT		UNIT PRICE	TOTAL PRICE
1.1.			**Blockwork as per DIN 18330**		
1.1.1			Delivery and supply of the load bearing, water repellent (w = 0,11 kg/(m² h 0,5)) Schöck Novomur® thermal insulation element, for the first or last course of upwardly built blockwork. The element consists of lightweight concrete and polystyrol hard foam. General construction accreditation (DIBt Berlin) nr. Z-17-1-709; blockwork density class 20 , horizontal thermal conductivity factor: 0.88 W/(Km); vertical thermal conductivity factor: 0.286 W/(Km); the instructions given in Architect and/or design engineers plans must be complied with in all cases.		
1.1.2		piece	Schöck Novomur® type 20 - 11,5 Height/width/length: 11,3/11,5/75,0 cm		
1.1.3		piece	Schöck Novomur® type 20 - 15 Height/width/length: 11,3/15,0/75,0 cm		
1.1.4		piece	Schöck Novomur® type 20 - 17,5 Height/width/length: 11,3/17,5/75,0 cm		
1.1.5		piece	Schöck Novomur® type 20 - 24 Height/width/length: 11,3/24,0/75,0 cm		

Schöck Novomur® light

POSITION	AMOUNT	UNIT		UNIT PRICE	TOTAL PRICE
1.2			**Blockwork as per DIN 18330**		
1.2.1			Delivery and supply of the load bearing, water repellent (w = 0,11 kg/(m² h 0,5)) Schöck Novomur® light thermal insulation element, for the first or last course of upwardly built blockwork. The element consists of lightweight concrete and polystyrol hard foam. General construction accreditation (DIBt Berlin) nr. Z-17-1-749; blockwork density class 6 , horizontal thermal conductivity factor: 0.83 W/(Km); vertical thermal conductivity factor: 0.189 W/(Km); the instructions given in Architect and/or design engineers plans must be complied with in all cases.		
1.2.2		piece	Schöck Novomur® light type 6 - 11,5 Height/width/length: 11,3/11,5/75,0 cm		
1.2.3		piece	Schöck Novomur® light type 6 - 15 Height/width/length: 11,3/15,0/75,0 cm		
1.2.4		piece	Schöck Novomur® light type 6 - 17,5 Height/width/length: 11,3/17,5/75,0 cm		
1.2.5		piece	Schöck Novomur® light type 6 - 24 Height/width/length: 11,3/24,0/75,0 cm		

Subject to technical alterations

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