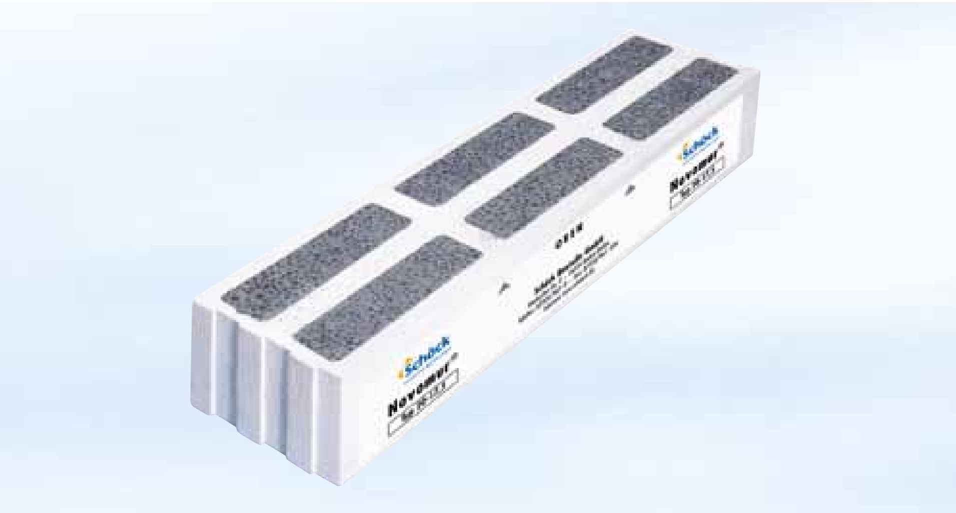
Schöck Novomur®



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Schöck Novomur®
Planning & Advice

Our advisory team is ready to help you with your design and construction issues. We provide detailed consulting, engineering and design services.

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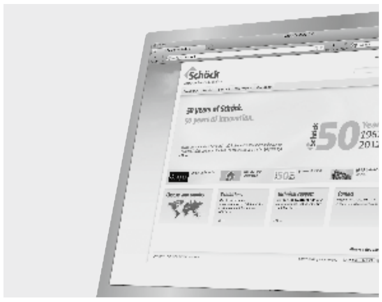

Schöck Novomur®
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Building physics
Thermal bridges

Definition of thermal bridges

Thermal bridges are localised regions in building envelope details which display increased thermal losses. The increased thermal losses can be caused by the component geometry ("geometric thermal bridge") or by the localised inclusion of materials with a higher thermal conductivity in the affected component ("material-based thermal bridge").

Effects of thermal bridges

In the area of a thermal bridge, the local increase in thermal losses causes the temperature of inside surfaces to drop. Mould will form as soon as the surface temperature drops below the so-called "mould temperature" θ_S. If the surface temperature drops even further – to below the dewpoint temperature θ_τ – the moisture present in the room air will condense on the cold surfaces in the form of droplets.

Once mould has formed in the area of a thermal bridge, the spores released by it into the room can represent a serious health hazard to anybody living in the room. Mould spores are allergens which can cause severe allergic reactions in humans, such as sinusitis, rhinitis and asthma. As exposure inside the house or apartment is usually prolonged, there is a high risk that these allergic reactions can develop into chronic conditions.

In summary, the effects of thermal bridges are therefore:

- Risk of mould formation
- Risk of health damage (allergies etc.)
- Risk of condensation
- Increased wastage of heating energy

Dewpoint temperature

The dewpoint temperature θ_τ of a room is the temperature at which the moisture present in the air in the room can no longer be supported by the air and condenses in the form of water droplets. At this point the relative humidity is then 100 %.

Room air which is in direct contact with the surfaces of colder areas take the temperature of the cold surface as a result of this direct contact. If the minimum surface temperature of a thermal bridge is below the dewpoint temperature, then the temperature of the air directly adjacent to this surface will also be below the dewpoint temperature. As a consequence, the moisture contained in this layer of room air condenses on the cold surface.

The dewpoint temperature only depends on the temperature and the humidity of the air in the room (see figure 1, page 5). The higher the humidity and temperature of the air in the room, the higher the dewpoint temperature – i.e. the sooner condensation forms on colder surfaces.

On average, standard climatic conditions in a room are around 20 °C with a relative humidity of approximately 50 %. This results in a dewpoint temperature of 9.3 °C. In rooms where the humidity is higher, e.g. in a bathroom, the humidity may also reach a value of 60 % or higher. The dewpoint temperature is correspondingly higher, and the risk of condensation forming increases. For example, if the humidity of the room air is 60 % the dewpoint temperature is already 12.0 °C (see figure 1, page 5). The steeply ascending curve in figure 1 gives a very clear indication of how closely the dewpoint temperature depends on the humidity of the room air: even slight increases in the humidity of the room air lead to a significant increase in the dewpoint temperature of the room air. This results in a significant increase in the risk of condensation forming on the cold component surfaces.

Mould temperature

At room air relative humidity values of 80 % or higher the surface moisture on components is sufficient for mould to grow, i.e. mould will grow on the surface of cold components if the component surface is cold enough to generate a humidity of 80 % in the layer of air directly adjacent to the component. The temperature at which this occurs is referred to as the socalled “mould temperature” θ_S.

This means that mould growth already takes place at temperatures above the dewpoint temperature. At a room climate of 20 °C/50 % the mould temperature is 12.6 °C, i.e. 3.3 °C higher than the dewpoint temperature. As a result, from the point of view of avoiding building damage (i.e. mould formation), the mould temperature is therefore more important than the dewpoint temperature. It is not sufficient for the inside surfaces to be warmer than the dewpoint temperature of the room air – the surface temperatures must also be above the mould temperature.

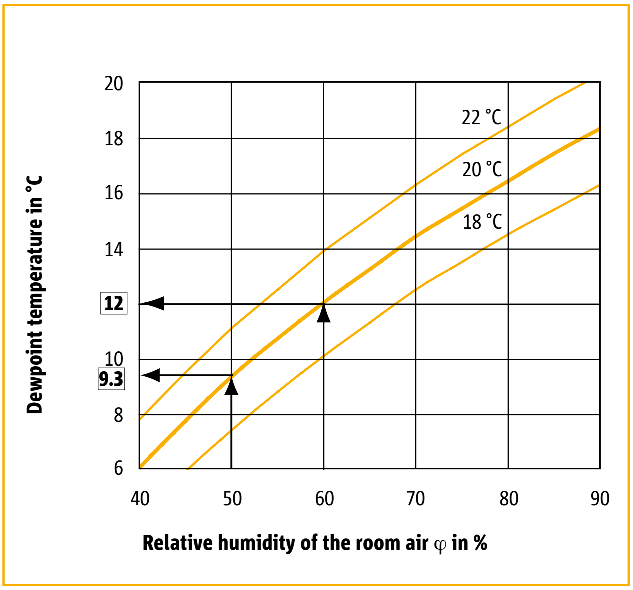


Figure 1: Dependency of the dewpoint temperature on the room air humidity and temperature

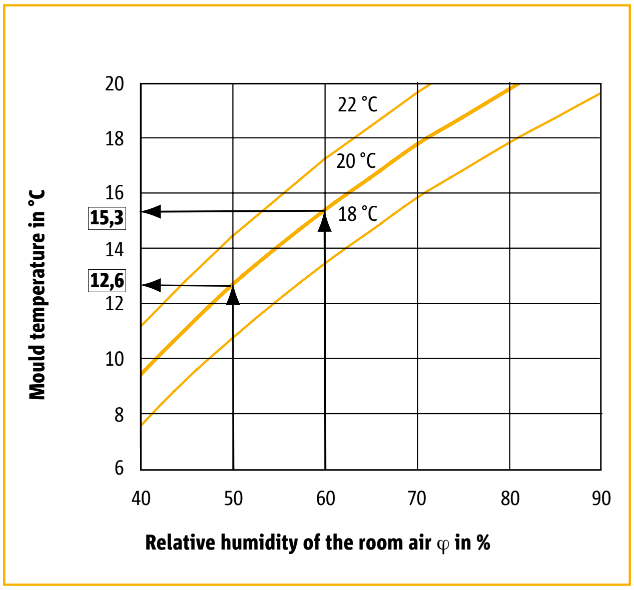


Figure 2: Dependency of the mould temperature on the room air humidity and temperature

Thermal characteristics of thermal bridges

The thermal effects of thermal bridges are described by the following thermal characteristics:

Thermal effects	Characteristic values	
	Qualitative representation	Quantitative single value representation
▸ Formation of mould ▸ Formation of condensation	▸ Isothermals	▸ Minimum surface temperature θ_{min} ▸ Temperature factor f_{Rsi}
▸ Thermal loss	▸ Heat flow lines	▸ ψ value ▸ χ value

These characteristic values can only be determined by means of a thermal FE calculation of the thermal bridge. To do this, the geometric layout of the structure in the area of the thermal bridge is modelled on a computer together with the thermal conductivity values of the materials used. The boundary conditions which should be applied to the calculations and to the models are governed by BS EN ISO 10211-1:1996 and BS EN ISO 10211-2:2001.

In addition to the quantitative characteristic values, the FE calculation also yields a representation of the temperature distribution within the structure (representation of "isothermals") and the layout of the heat flow lines. The heat flow line representation shows the paths on which heat is lost through the structure and offers good insight into the weak spots of the thermal bridge. The "isothermals" are lines or areas of the same temperature. They show the temperature distribution within the analysed component. Isothermals are often graded with a temperature increment of 1 °C. Heat flow lines and isothermals are always perpendicular to each other (see Figures 3 and 4).

The thermal transmission coefficients ψ and χ

The linear thermal transmission coefficient ψ ("psi value") describes the additional thermal losses per meter of a linear thermal bridge. Correspondingly, the thermal transmission coefficient χ ("chi value") describes the additional thermal losses through a point-shaped thermal bridge.

Depending on whether the surfaces used to determine the ψ value relate to external or internal dimensions, a distinction is made between ψ values which relate to external and internal dimensions. The thermal insulation calculations in accordance with the Energy Saving directive must be based on ψ values which relate to external dimensions. Unless specified otherwise, all of the ψ values in this technical information document relate to external dimensions.

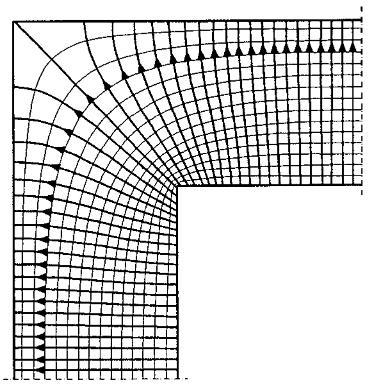


Figure 3: Example of a thermal bridge which is caused purely by the geometry of the component ("geometric thermal bridge"). Representation of the isothermals and heat flow lines (arrows).

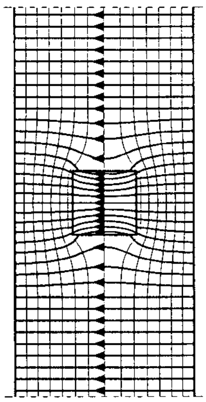


Figure 4: Example of a thermal bridge which is caused purely by the choice of materials ("material-based thermal bridge"). Representation of the isothermals and heat flow lines (arrows).

The minimum surface temperature θ_{min} and the temperature factor f_{Rsi}

The minimum surface temperature θ_{min} is the lowest inside surface temperature occurring in the region of a thermal bridge. The value of the minimum surface temperature is the deciding factor which determines whether condensation forms at a thermal bridge or whether mould starts to grow there. Accordingly, the minimum surface temperature is an indicator of the effects of a thermal bridge in terms of dampness.

The characteristic values θ_{min} and the ψ value depend on the layout and structure of the thermal bridge (geometry and thermal conductivity of the materials which form the thermal bridge). In addition, the minimum surface temperature also depends on the prevailing outside temperature. The lower the outside air temperature, the lower the minimum surface temperature (see Figure 5).

As an alternative to the minimum surface temperature, the temperature factor f_{Rsi} can also be used as a dampness indicator. The temperature factor f_{Rsi} is the temperature difference between the minimum surface temperature and the outside air temperature ($\theta_{min} - \theta_e$) divided by the temperature difference between the inside temperature and outside temperature ($\theta_i - \theta_e$):

$$f_{Rsi} = \frac{\theta_{min} - \theta_e}{\theta_i - \theta_e}$$

As the f_{Rsi} value is a relative value, it offers the advantage that it only depends on the construction of the thermal bridge, and not on the prevailing inside and outside temperatures like θ_{min}. If the f_{Rsi} value of a thermal bridge is known, the minimum surface temperature can be calculated for specific inside and outside air temperatures:

$$\theta_{min} = \theta_e + f_{Rsi} \times (\theta_i - \theta_e)$$

Figure 5 shows the dependency of the minimum surface temperature on the adjacent outside temperature as a function of different f_{Rsi} values with a constant inside temperature of 20 °C.

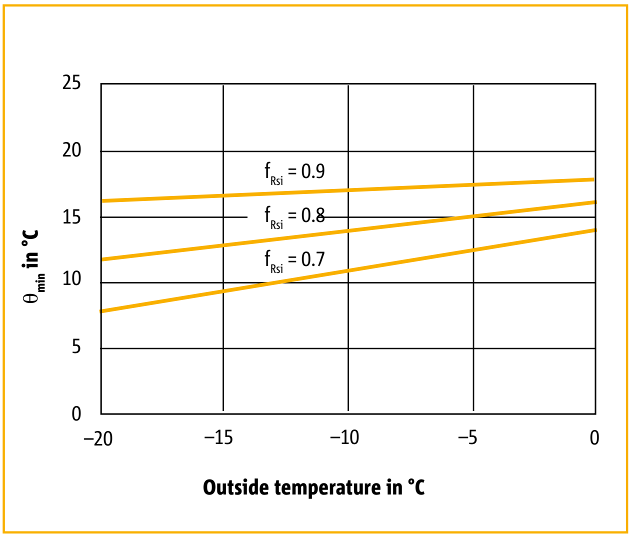


Figure 5: Dependency of the minimum surface temperature on the adjacent outside temperature (Inside temperature at a constant value of 20 °C).

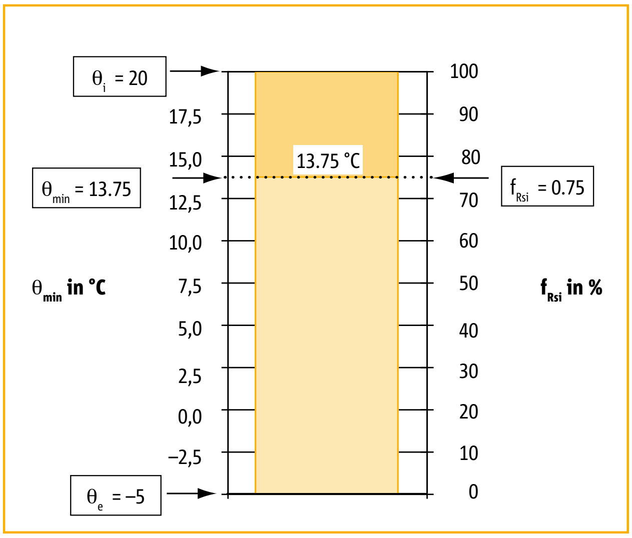


Figure 6: Definition of the f_{Rsi} value

Building physics
Thermal bridges

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
Building materials: moisture risk and thermal insulation effectiveness

The actual thermal conductivity value – and therefore the thermal insulation effectiveness – of construction material is totally dependent on its moisture absorbence behaviour: the higher the moisture content, the higher the inherent thermic conductivity and the lower its thermal insulation properties. Thermal conductivity rises when using porous insulation blocks: e.g by approx. 8 % for each 1 Vol.-% increase in moisture content (see figure 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 have a much higher thermal conductivity value than the calculated value λ_R quoted in technical data sheets. (λ_R symbol expresses the thermal conductivity factor as relative to the moisture absorbency qualities of the material). A porous block can be expected to absorb between 45 Vol.-% and 80 Vol.-%. Therefore when using such blocks a very high rate of thermal energy conductivity of λ = 0,9 W/(m • K) must be reckoned with.

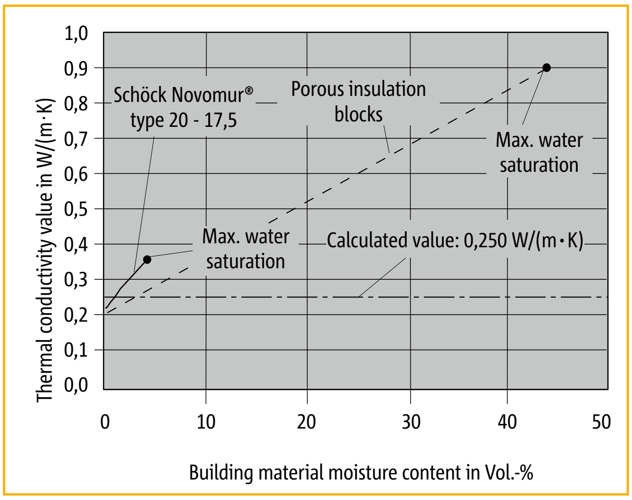


Figure 7: Dependency of the thermic conductivity factor of construction materials, example given: porous insulation block and Schöck Novomur®

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 Building Physics* shows that the actual thermal conductivity value of porous insulation blocks during the about 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, 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 level of humidity which occurs at this stage is greatly affected by the type of thermal insulation at first/damp course level.

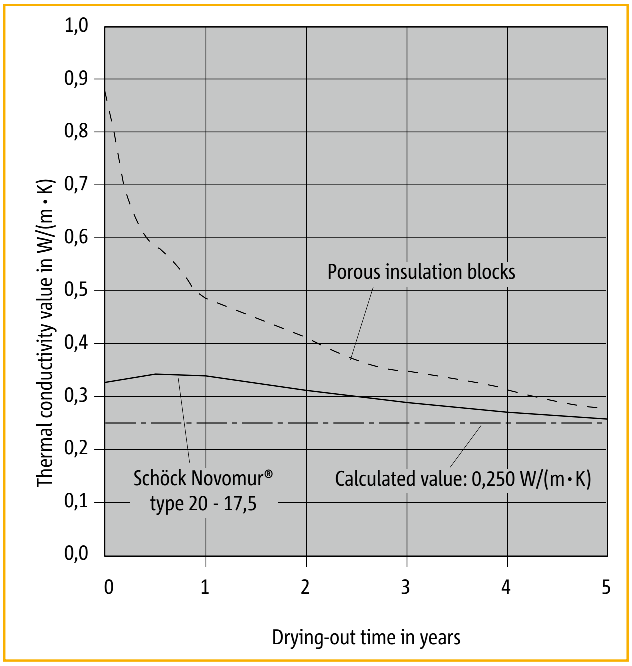


Figure 8: Behaviour of the thermal conductivity value during typical drying-out time using porous insulation blocks and Schöck Novomur® as examples

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.-%), thus preventing the risk of soaking the damp course. Schöck Novomur® and Schöck Novomur® light start working for you from the moment they are laid.

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

Thermal bridges at damp course level

Insulation measures in comparison

Non-insulated damp course

Where the damp/first course of the building 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 insulation above the basement and the external insulation (see figure 1a). Thus, owing to the high thermal conductivity value of brick/blockwork (λ ≈ 1,0 W/(m·K)) 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!)

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 figure 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 figure 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 figure 5).

Insulation with Schöck Novomur® and Novomur® light

The load-bearing insulation elements Schöck Novomur® and Schöck Novomur® light fill the gap between the basement insulation and the external insulation (see figure 3a), by creating a continuous ultraefficient barrier, keeping thermal energy in and cold out (see figure 3b).
This means:

- Minimisation of thermal energy loss thus preventing heating costs from soaring.
- Increase of the internal wall surface temperature significantly above the dewpoint temperature.
- No danger of fungicidal attack.
- Healthier living environment.

The best possible scenario for an insulated building base

The theoretical best case scenario is a complete thermal seal (see figures 4a and 4b). This solution, however, can not be implemented in practice.

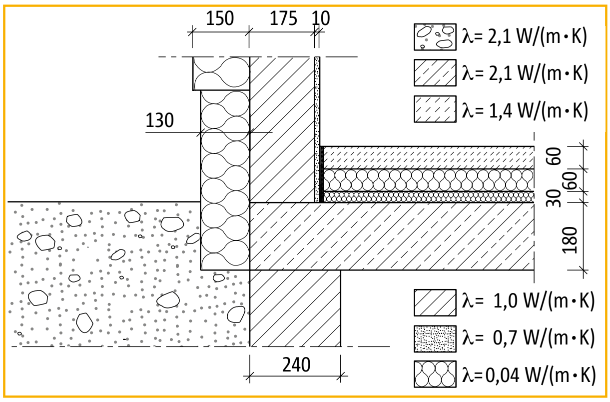


Figure 1a: Construction with a non-insulated damp course

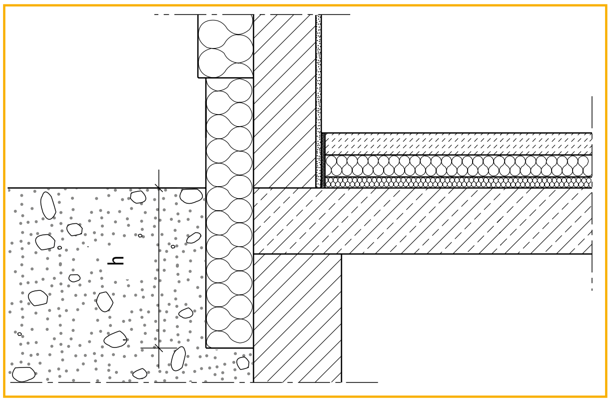


Figure 2a: Alternative insulation measures

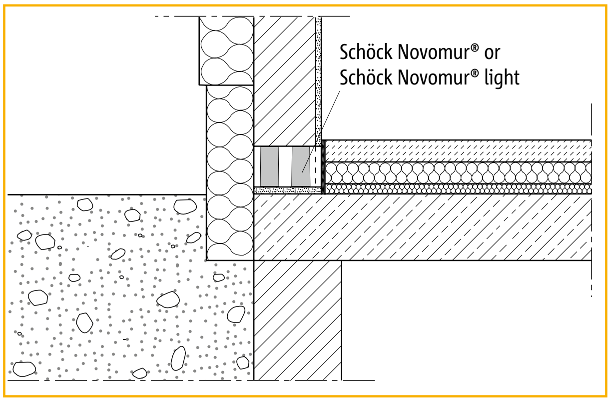


Figure 3a: Cross-section showing building with Schöck Novomur® or Schöck Novomur light® insulation technology

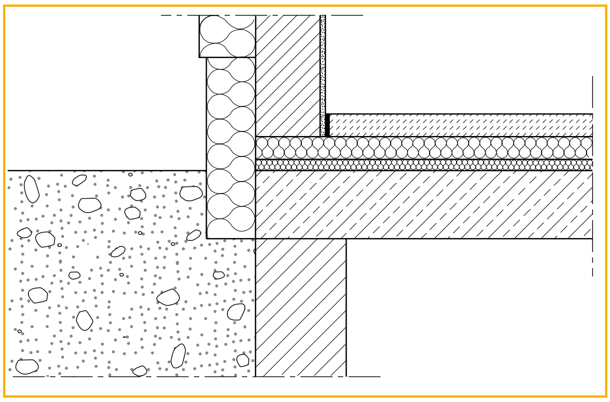


Figure 4a: Cross-section of a building base with the best possible scenario insulation

Thermal bridges at damp course level

Insulation measures in comparison

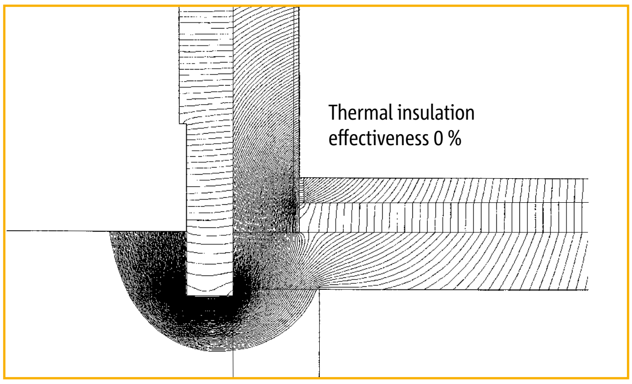


Figure 1b: Heat flow lines shown on a non-insulated building base

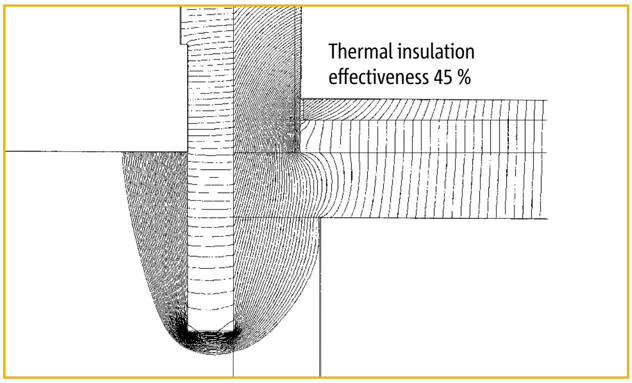


Figure 2b: Heat flow lines shown on an alternative insulation method

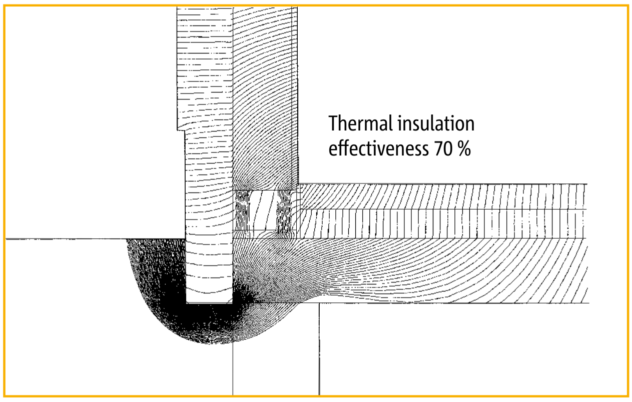


Figure 3b: Heat flow lines shown on a building base insulated with Schöck Novomur® light

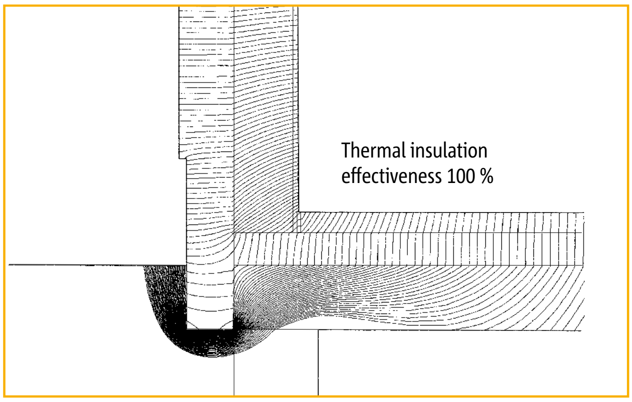


Figure 4b: Heat flow lines shown on a best case scenario insulated building base.

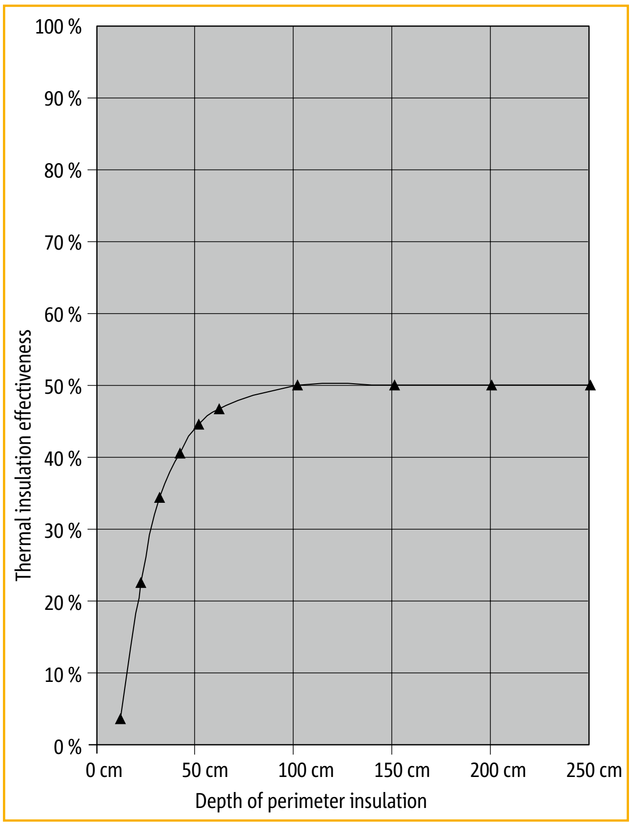


Figure 5: Thermal insulation effectiveness of an alternative insulation method

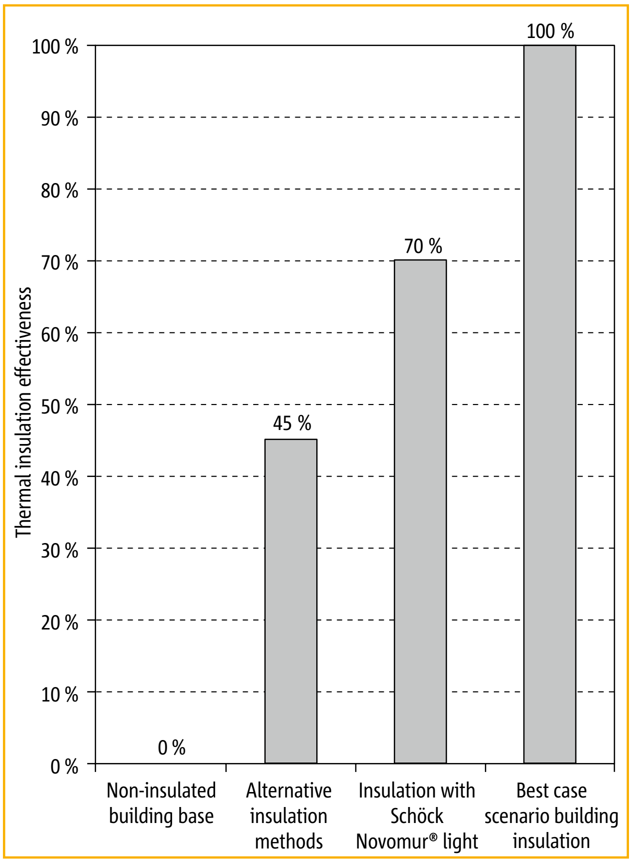
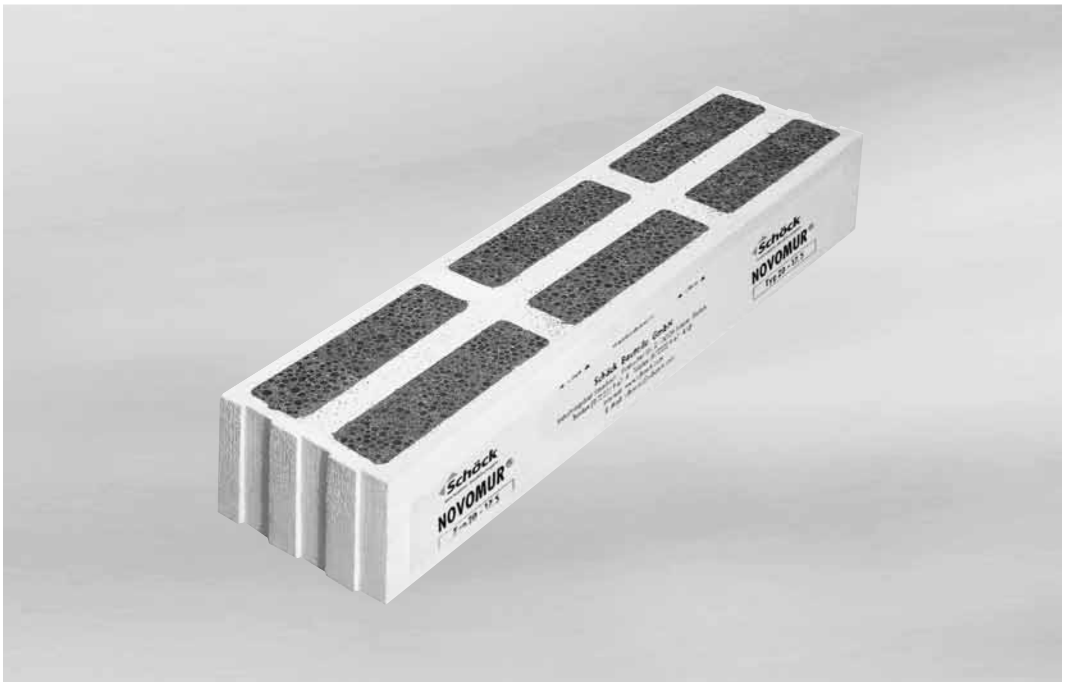


Figure 6: Thermal insulation effectiveness of previously described alternative methods in comparison with Schöck products

Schöck Novomur®

Load-bearing, water repellent thermal insulation element to prevent thermal bridges at the first/damp course of multi dwelling units



Schöck Novomur® type 20 - 17,5

Application area: First and/or last course in brick/blockwork walls at the building base of multi dwelling units
▸ 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 absorbency tested ▸ Almost no capillary water absorption

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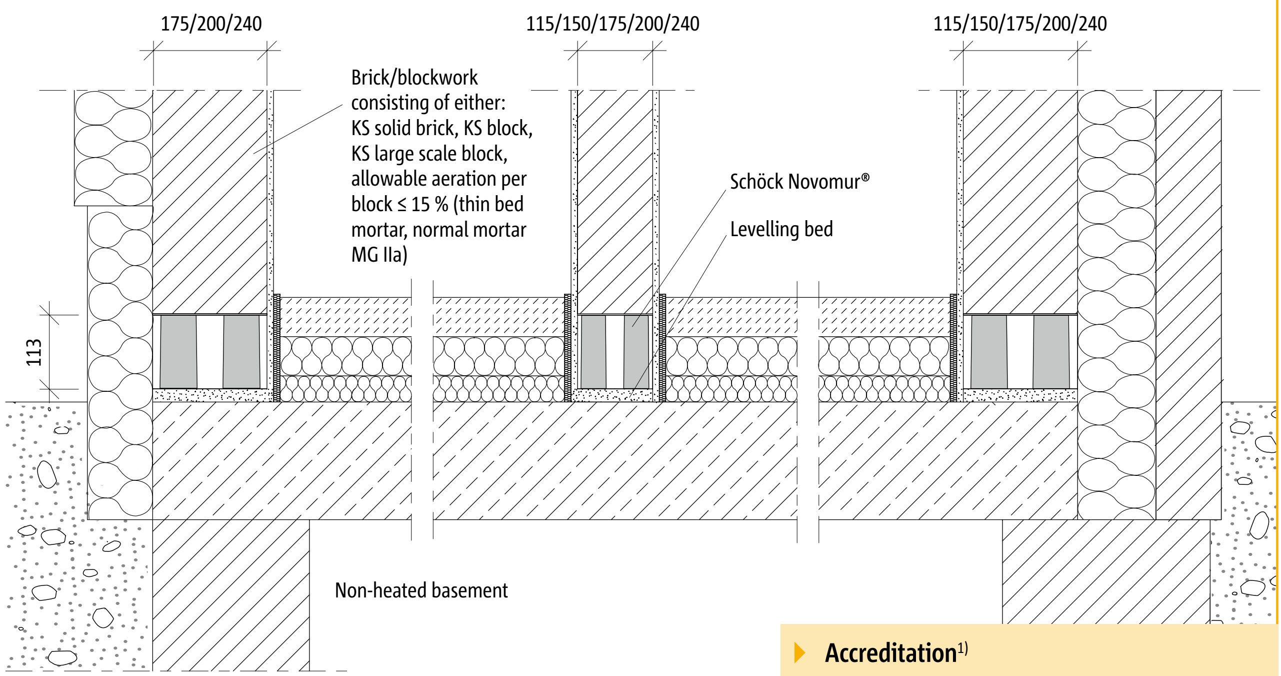
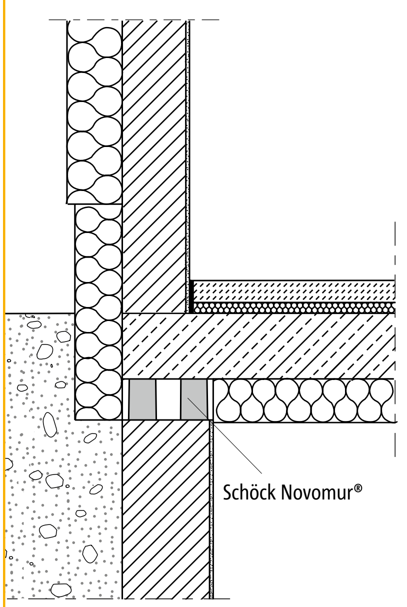
Cross-sections of installation

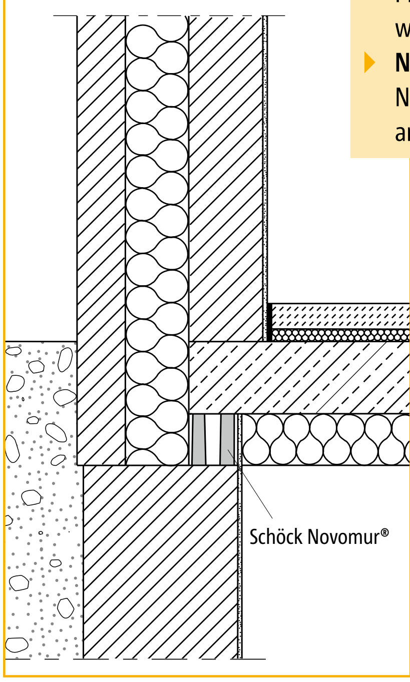


Cross-section of Schöck Novomur® used with a bonded thermal insulation system, inner wall and double skin wall

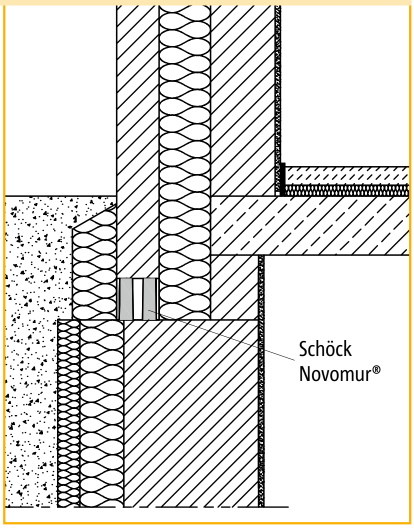
- **Accreditation**[1]
  Approved and accredited for construction use
- **Fire protection**[1]
  Fire resistance class F 90
- **Thermal protection**[2]
  Thermal characteristic value tested
- **Protection against damp**[3]
  Practically no capillary water absorption, w = 0,11 kg/(m² h^{0,5}) → water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



Cross-section of Schöck Novomur® below the basement ceiling slab used in conjunction with a bonded thermal insulation system



Cross-section of Schöck Novomur® below the basement ceiling slab used in conjunction with double skin thermal insulation system



Installation situation of Schöck Novomur® with a cavity wall (e.g. engineering brick)

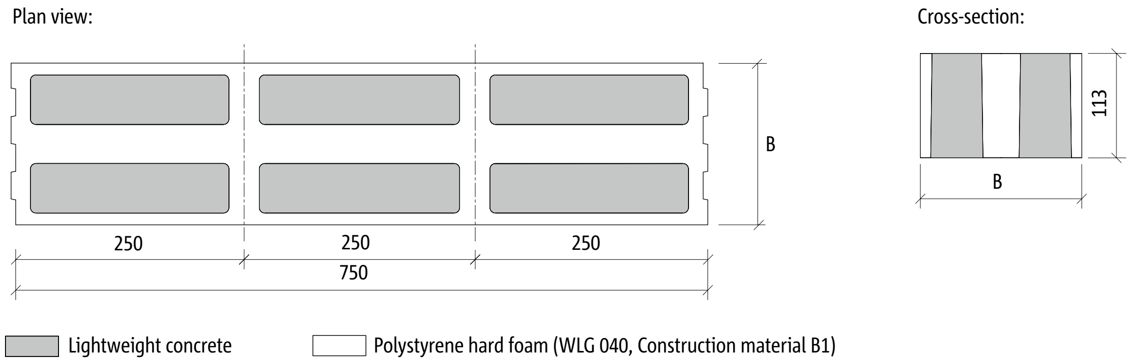
[1] General construction accreditation nr. Z-17.1-709, DIBT- German institute for building technology, Berlin
[2] Prof. Dr. Hauser GMBH consultant engineers
[3] Test report nr. 02 10 60 06 94, Institute for Large Scale Construction and construction technology, Karlsruhe University, Germany
[4] Impact sound test report, nr L 97.94-p 18 and extension paragraphs, ITA - Institute for technical Accoustics, Wiesbaden (further details see page 17), Germany

Schöck Novomur®

Table of measurements/Dimensions/Materials

Schöck Novomur® type	Dimensions			Brick/block density class	Weight	Standard value σ_0 of the permissible thrust tension for			
						Brick/blockwork[1)] density class 12		Brick/blockwork[1)] with min. density class 20	
						Mortar		Mortar	
	Width (B)	Height	Length		Weight	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	9,3	1,6	1,8	1,9	2,4
20 - 15	150				12,1				
20 - 17,5	175				14,1				
20 - 20	200				16,1				
20 - 24	240				19,3				

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



Dimensions Schöck Novomur®

Notes

- 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 zones 3 and 4 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 characteristic values

Schöck Novomur® type	Average thermal conductivity (Novomur®)		Thermal bridge loss coefficient ψ[1] (in relation to external dimensions)			Temperature factor f_{RSi}[2][4] (minimum surface temperature ϑ_{min})[3]		
	Vertical axis [W/(m·K)]	Horizontal axis [W/(m·K)]	Thermal insulation system[3] [W/(m·K)]	Double skinned outer wall[3] [W/(m·K)]	Internal wall [W/(m·K)]	Thermal insulation system[3]	Double skinned outer wall[3]	Internal wall
20 - 11,5			–			–		
20 - 15								
20 - 17,5	λ_v = 0,266	λ_h = 0,088	$\psi \leq$ 0,144	$\psi \leq$ 0,106	–	$f_{RSi} \geq$ 0,817 ($\vartheta_{min} \geq$ 15,4°C)	$f_{RSi} \geq$ 0,835 ($\vartheta_{min} \geq$ 15,9°C)	–
20 - 20								
20 - 24					ψ = 0,185			f_{RSi} = 0,919 (ϑ_{min} = 18,0°C)

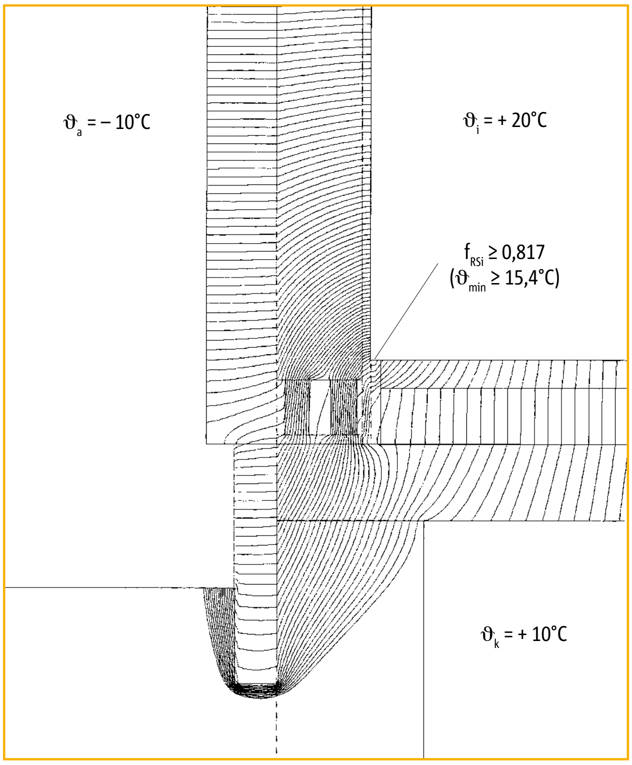
Thermal characteristic values contributed by Prof. Dr. Hauser GmbH, Germany consultant engineers with a wall thickness of 240 mm, basement insulation 115 mm, temperature reduction factor F = 0.5

[1] where heat transfer resistance outside is R_{se} = 0,04 (m²K)/W and inside is R_{si} = 0,13 (m²K)/W

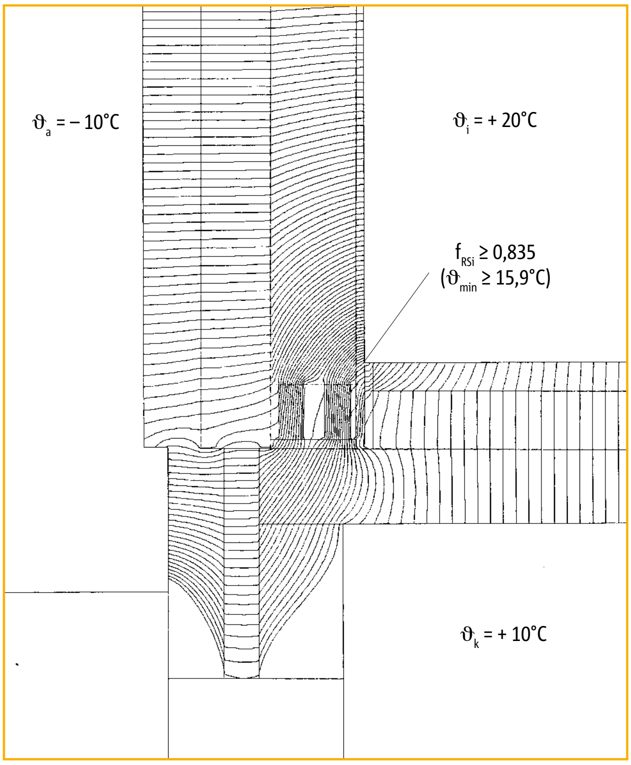
[2] $f_{RSi} = (\vartheta_{min} - \vartheta_a)/(\vartheta_i - \vartheta_a)$; where heat transfer resistance outside is R_{se} = 0,04 (m²K)/W and inside is R_{si} = 0,25 (m²K)/W

[3] where external temperature is ϑ_a = –5°C, inside temperature ϑ_i = +20°C, basement temperature ϑ_k = +10°C

[4] thermal bridges catalog, Büro für Bauphysik, Hannover



Heat flow lines, temperature factors and minimum surface temperature with bonded thermal insulation system



Heat flow lines, temperature factors and minimum surface temperature with double skinned external wall

Schöck Novomur®

Fire protection/Noise protection

Fire protection requirements for multi-occupier dwellings

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.

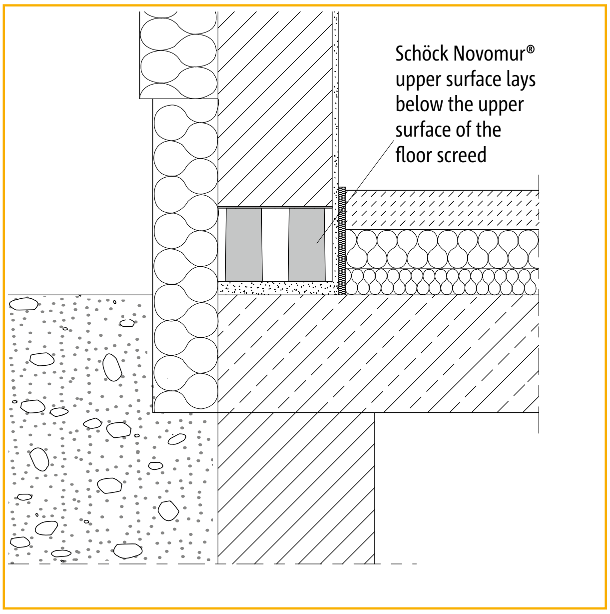
Fire resistance class F 30 and F 90

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 lays below the surface of the floor screed.

The inclusion in fire protection classification F 30 and F 90 in nonenclosure 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.



F 30 and also F 90 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®
Installation instructions

General notes

- The Schöck Novomur® load bearing insulation element must be laid as according to the markings on it with the upper face placed upwards.
- Schöck Novomur® can be cut to length with normal construction tools. The cut to size parts must comply with the minimum bond length of at least 250 mm. Cuts may not be used adjacently.
- Wall recesses and openings which weaken the load bearing capacities of the cross section are not permissable (see DIN 1053).
- Schöck Novomur® is not to be laid in consecutive courses, i.e. on top of one another.
- According to DIN 18195 part 4 a sealing measure (e.g.plastic sheet) is required.
- In case of non-load-bearing external walls at double skin thermal insulation systems: Differing from DIN 1053 1:1996- 11, article 8.4.3.1 the overlap of the outer brick shell over the thermal insulation panel may not exceed 10 mm.

Laying above the basement ceiling

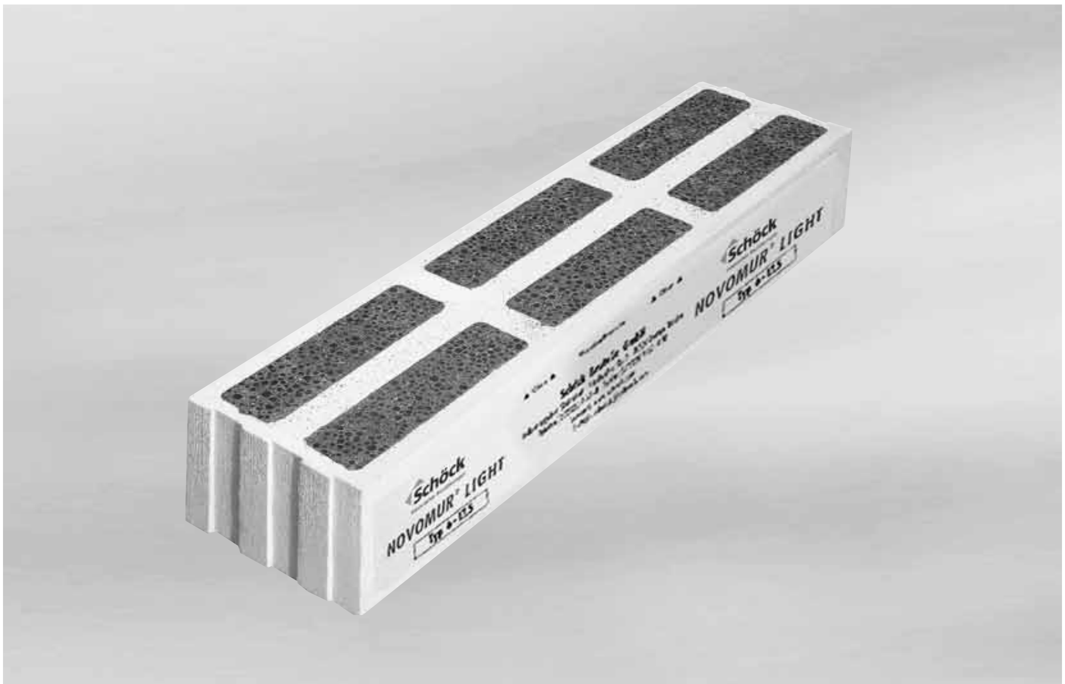
- Schöck Novomur® is to be laid on a mortar bed of normal MG III consistency and tightly butted to each other.
- After laying the element a curing time must be observed whereby the mortar is hard bonded, ensuring no danger of movement when the next course is laid.
- When using in a wall which will consist 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®.
- Pay attention to building waterproofing, DIN 18195.

Schöck Novomur® light

Load-bearing, water repellent thermal insulation element to prevent thermal bridges
at building base in single family dwellings



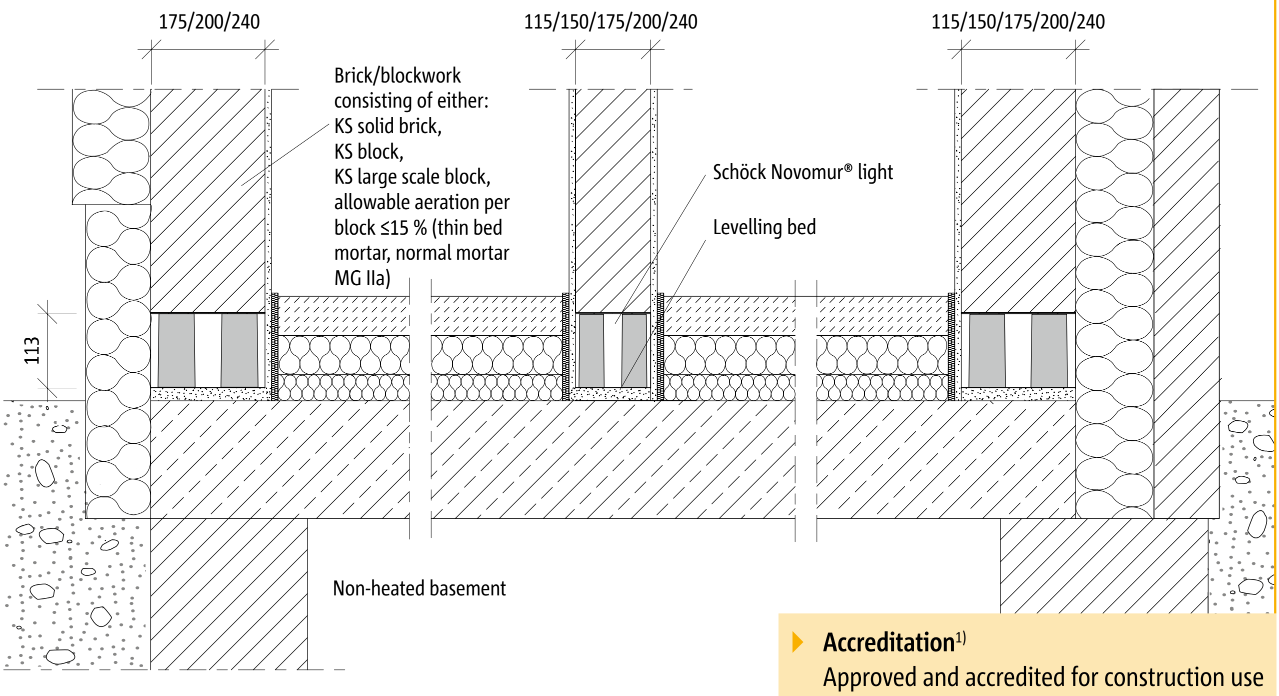
Schöck Novomur® light type 6 - 17,5

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 absorbency tested
- Almost no capillary water absorption

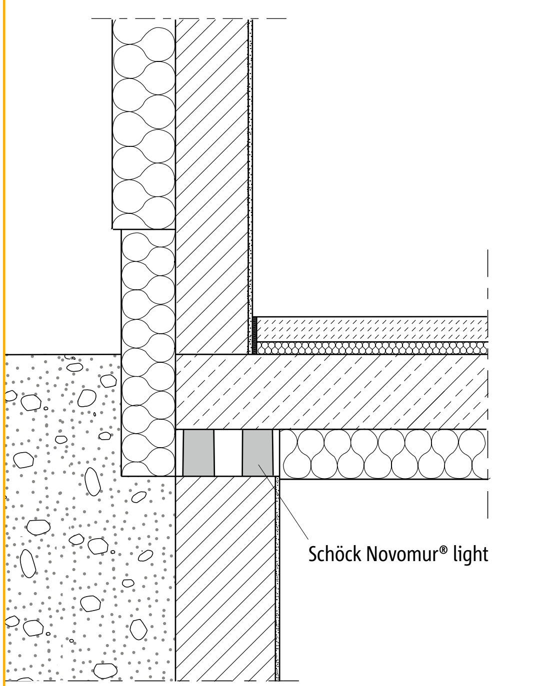
Contents **Page**

Schöck Novomur® light
Cross-sections of installation

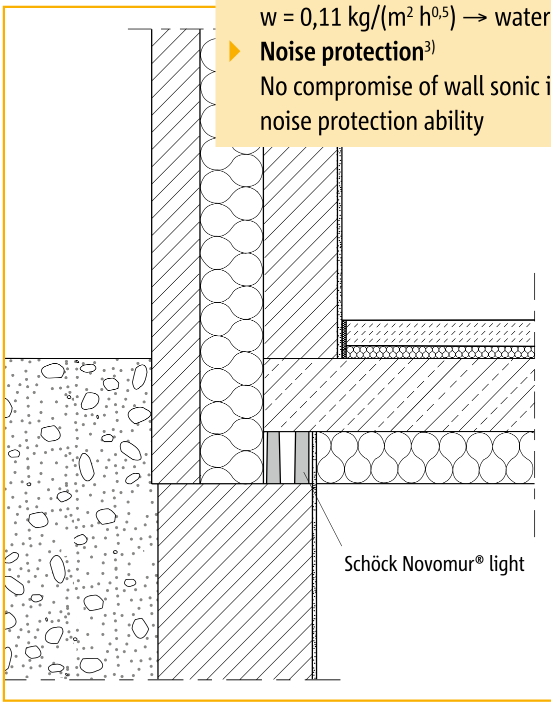


Cross-section of Schöck Novomur® light used with a bonded thermal insulation system, inner wall and double skin wall

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



Cross-section of Schöck Novomur® light below the basement ceiling slab used in conjunction with a bonded thermal insulation system



Cross-section of Schöck Novomur® light below the basement ceiling slab used in conjunction with double skin thermal insulation system

Novomur® Light

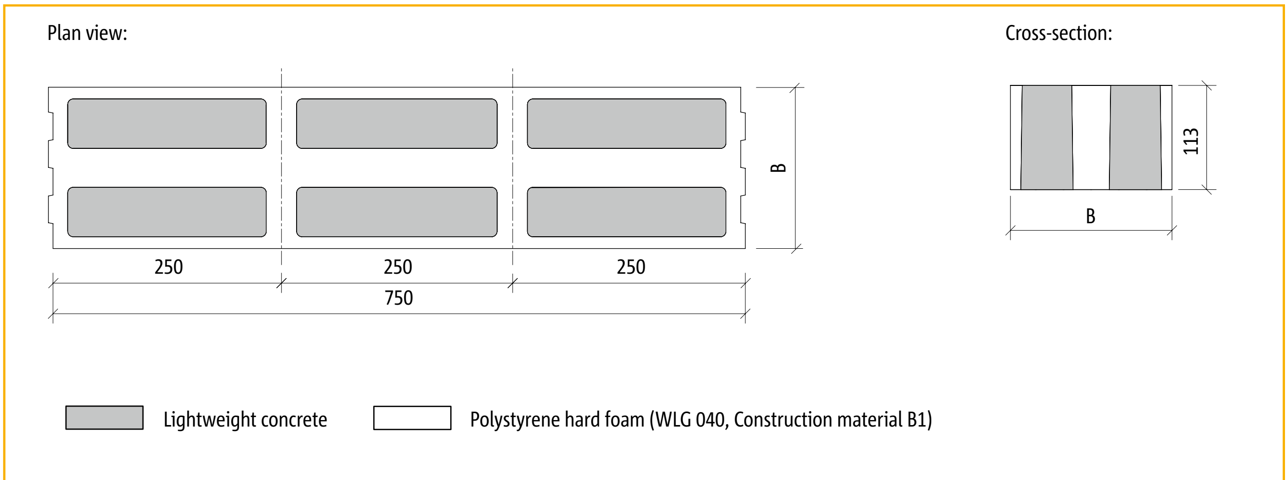
[1] General construction accreditation nr. Z-17.1-709, DIBT- German institute for building technology, Berlin
[2] Prof. Dr. Hauser GMBH consultant engineers, Germany
[3] Impact sound test report, nr L 97.94-p 18 and extension paragraphs, ITA - Institute for technical Accoustics, Wiesbaden (further details see page 23), Germany

Schöck Novomur® light

Table of measurements/Dimensions/Materials

Schöck Novomur® light type	Dimensions			Brick/block density class	Weight	Standard value σ_0 of the permissible thrust[1] tension for	
	Width [mm]	Height [mm]	Length [mm]		[kg]	MG IIa [N/mm²]	DM [N/mm²]
6 - 11,5	115	113	750	6	6,8	1,0	1,2
6 - 15	150				8,9		
6 - 17,5	175				10,4		
6 - 20	200				11,9		
6 - 24	240				14,2		

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



Dimensions Schöck Novomur® light

Notes

- 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 zones 3 and 4 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 characteristic values

Schöck Novomur® light type	Average thermal conductivity[1] (Novomur®)		Thermal bridge loss coefficient ψ[2)4)] in relation to external dimensions			Temperature factor f_{RSi}[4)] (minimum surface temperature ϑ_{min})		
	Vertical axis [W/(m·K)]	Horizontal axis [W/(m·K)]	Thermal insulation system[3)] [W/(m·K)]	Double skinned outer wall[3)] [W/(m·K)]	Internal wall [W/(m·K)]	Thermal insulation system[3)]	Double skinned outer wall[3)]	Internal wall
6 - 11,5			–			–		
6 - 15								
6 - 17,5	λ_v = 0,193	λ_h = 0,083	$\psi \leq$ 0,101[4)]	$\psi \leq$ 0,079	–	$f_{RSi} \geq$ 0,840 ($\vartheta_{min} \geq$ 16,0°C)	$f_{RSi} \geq$ 0,847 ($\vartheta_{min} \geq$ 16,2°C)	–
6 - 20								
6 - 24					ψ = ≤ 0,185			f_{RSi} = 0,919 (ϑ_{min} = 18,0°C)

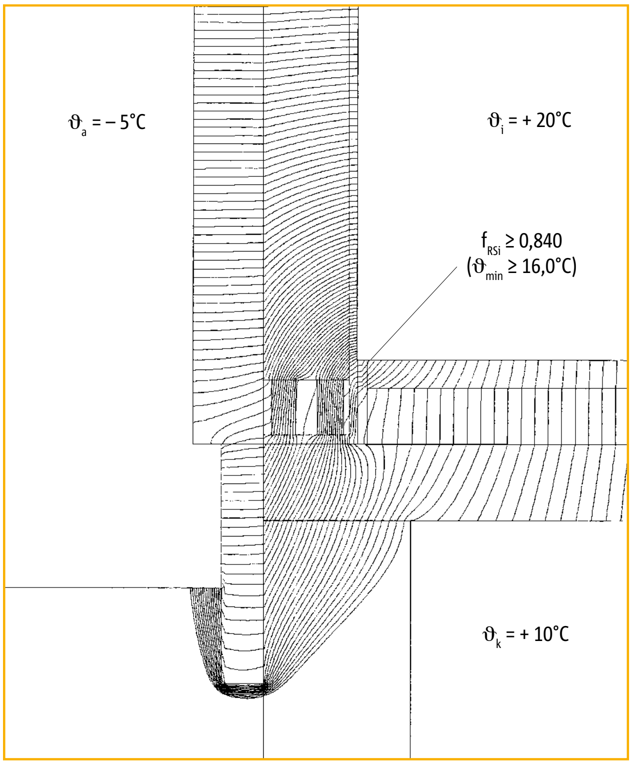
Thermal characteristic values contributed by Prof. Dr. Hauser GMBH consultant engineers with a wall thickness of 240 mm, external wall insulation 140 mm, basement insulation 115 mm, temperature reductions factor F = 0.5

[1)] where heat transfer resistance outside is R_{se} = 0,04 (m²K)/W and inside is R_{si} = 0,13 (m²K)/W

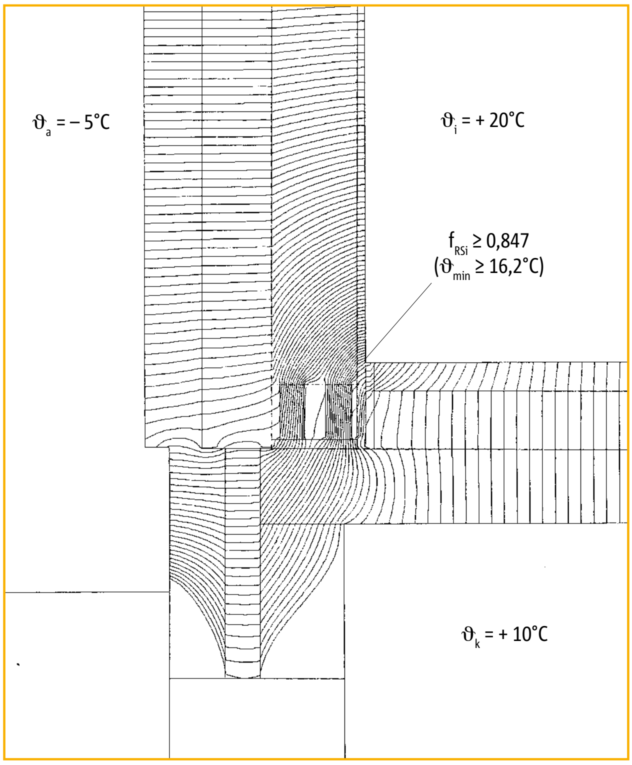
[2)] $f_{RSi} = (\vartheta_{min} - \vartheta_a)/(\vartheta_i - \vartheta_a)$; where heat transfer resistance outside is R_{se} = 0,04 (m²K)/W and inside is R_{si} = 0,25 (m²K)/W

[3)] where external temperature is ϑ_a = –5°C, inside temperature ϑ_i = +20°C, basement temperature ϑ_k = +10°C

[4)] thermal bridges catalog, Büro für Bauphysik, Hannover



Heat flow lines, temperature factors and minimum surface temperature with bonded thermal insulation system



Heat flow lines, temperature factors and minimum surface temperature with double skinned external wall

Schöck Novomur® light
Fire protection/Noise protection

Fire protection requirements for single family dwellings

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.

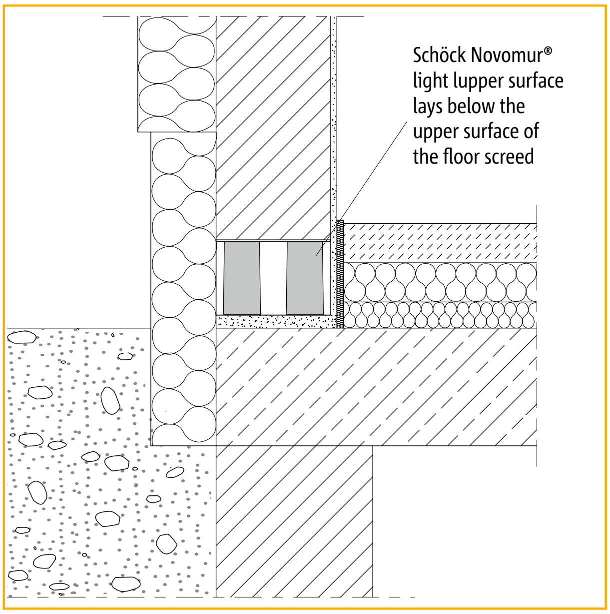
Fire resistance class F 30 and F 90

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 followin steps are complied with:

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

The inclusion in fire protection classification F 30 and F 90 in nonenclosure walls as per DIN 4102, part 2 and part 4 i 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

Installation instructions

General notes

- The Schöck Novomur® light insulation element must be laid as according to the markings on it with the upper face placed upwards.
- Schöck Novomur® light can be cut to length with normal construction tools. The cut to size parts must comply with the minimum bond length of at least 250 mm. Cuts may not be used adjacently.
- Wall recesses and openings which weaken the load bearing capacities 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.
- According to DIN 18195 part 4 a sealing measure (e.g.plastic sheet) is required.
- In case of non-load-bearing external walls at double skin thermal insulation systems: Differing from DIN 1053 1:1996- 11, article 8.4.3.1 the overlap of the outer brick shell over the thermal insulation panel may not exceed 10 mm.

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.
- Pay attention to building waterproofing, DIN 18195.

Schöck Novomur®/Schöck Novomur® light
Recommended tender specifications

Tender specifications 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/($m^2 h^{0,5}$) Schöck Novomur® thermal insulation element, for the first or last course of upwardly built blockwork. The element consists of lightweight concrete and polystyrene hard foam. General construction accreditation (DIBt Berlin) nr. Z-17-1-709; blockwork density class 20 , horizontal thermal conductivity value: 0,088 W/(m·K), vertical thermal conductivity value: 0,266 W/(m·K); the instructions given in the 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 - 20 Height/width/length: 11,3/20,0/75,0 cm		
1.1.6		piece	Schöck Novomur® type 20 - 24 Height/width/length: 11,3/24,0/75,0 cm		

Tender specifications 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/($m^2 h^{0,5}$) Schöck Novomur® light thermal insulation element, for the first or last course of upwardly built blockwork. The element consists of lightweight concrete and polystyrene hard foam. General construction accreditation (DIBt Berlin) nr. Z-17-1-749; blockwork density class 6 , horizontal thermal conductivity value: 0,083 W/(m · K), vertical thermal conductivity value: 0,193 W/(m·K); the instructions given in the 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 - 20 Height/width/length: 11,3/20,0/75,0 cm		
1.2.6		piece	Schöck Novomur® light type 6 - 24 Height/width/length: 11,3/24,0/75,0 cm		

Imprint

Published by: Schöck Ltd
The Clock Tower
2 - 4 High Street
Kidlington
Oxford
OX5 DH

Date of publication: May 2013

Subject to technical changes
Date of publication: May 2013

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800058/05.2013/GB/120568