Multipor ceiling insulation systems
5.0 Multipor ceiling insulation systems

5.1 General introduction and planning

- Quick, cost-effective adhesive installation
- Bright, welcoming surface finish
- Non-combustible, A1 construction material, improves fire resistance rating (subject to building design)
- Purely mineral-based, free from fibers and harmful substances
- Simple adhesive installation prevents backflow of air
- Various surface finishes
- Insulation and sound absorption in one

Whether in large-scale underground car parks or domestic basements in existing buildings or new ones, the Multipor ceiling insulation system has satisfied energy efficiency standards and fire protection requirements safely and reliably for over 20 years. Furthermore, it is a certified non-toxic, environmentally safe insulating material – with seals of approval from the German Institute for Construction and Environment (IBU), natureplus and the independent eco-INSTITUT, which awarded the product its highest A+ rating based on indoor air analysis.

Nowadays it would be virtually unthinkable to design a new building or an inner-city development of offices and commercial buildings without an (insulated) underground garage. Multipor ceiling insulation systems reduce construction times and costs in this area because they can be installed quickly and safely, and without anchor fixings. The open-pored surface of the mineral insulation boards also absorbs sound in underground garages. They provide superior fire protection for refurbished buildings, and in addition the bright, white boards create a welcoming atmosphere in underground car parks.

Basement and underground car park ceilings
National technical approval Z-23.11-1501 stipulates the area of application for the Multipor mineral-based ceiling insulation system.

Ceiling insulation for basements

Many basement ceilings in existing buildings are inadequately insulated – if at all – and often fail to comply with current fire protection requirements. Refurbishment with a Multipor ceiling insulation system can remedy this situation. The versatile and cost-effective insulation system can be adapted to any circumstances to improve safety and reduce heating costs.

Home occupants frequently complain about cold floors, which can drastically reduce their sense of comfort. At the same time, a great deal of space heating is lost to the basement, leading to elevated heating costs. Multipor ceiling insulation board is the ideal solution for improving thermal comfort and cutting heating costs, and may be eligible for grant funding [e.g. KfW in Germany]. Even at a low thickness, Multipor ceiling insulation boards – simply bonded to the underside of the existing ceiling – can significantly reduce heating costs. Multipor ceiling insulation boards are quick, straightforward and economical to fit by specialist installers and competent DIY homeowners alike. They are a simple and effective means of insulating and finishing the underside of ceilings of various styles and shapes. Multipor ceiling insulation boards come in a handy 600 x 390 mm format designed for speedy installation – in conjunction with easy-to-process, high-yielding Multipor lightweight mortar.

Uneven surfaces can be sanded smooth with the Multipor sanding board. The insulated ceiling can be left untreated, primed and painted, skimmed with Multipor lightweight mortar or plastered to protect the surface of the boards from mechanical damage.
Fire protection requirements
Non-combustible Multipor ceiling insulation used with Multipor lightweight mortar creates total peace of mind in underground garage and basement ceilings and passageways. Even when exposed to extremely high temperatures during fire, the Multipor ceiling insulation system does not generate toxic fumes or smoke. Neither does it produce dangerous droplets of burning material. Since Multipor ceiling insulation boards are non-combustible, they do not constitute an additional fire load in the event of fire – making them ideal for insulating escape routes.

Multipor ceiling insulation boards have an A1 fire rating in accordance with DIN EN 13501-1. In combination with Multipor lightweight mortar, which is an A2-rated building material, the system as a whole satisfies all building regulation requirements for non-combustible building materials (class A).

Fire protection of garages
In Germany, the requirements for the fire protection of garages are governed by the ‘Garage Ordinances’ of the respective federal states. Some individual states, e.g. North Rhine Westphalia, have also produced successor regulations. In addition, the German Building Control Commission (Fachkommission Bauaufsicht) has produced the Model Garage Ordinance (Muster-Garagenverordnung). Virtually all these regulations include the following section (extract from the Model Garage Ordinance M-GarVO § 6 (6)):

1. in large garages (over 1000 m²) must consist of non-combustible materials and
2. in medium-sized garages (100–1000 m²) of flame-retardant materials at the very least.

Since the Multipor ceiling insulation system comprises non-combustible materials, it satisfies all requirements in this area, whichever regulation takes precedence.

Optimizing fire protection in refurbishments
Multipor ceiling insulation boards are ideal for upgrading the fire protection of ‘old’ concrete ceilings and improving fire protection in old and new buildings alike. If existing load-bearing ceiling structures have inadequate fire protection, e.g. due to insufficient concrete cover of the embedded steel reinforcement bars, Multipor has the answer.

Ceiling insulation made from Multipor mineral insulation boards may be used to upgrade the concrete cover to comply with current fire protection requirements in accordance with DIN EN 13501. Our sales representatives will gladly provide the corresponding certificates on request. A higher fire resistance rating that complies with current requirements can be achieved by combining the existing concrete cover with the additional protection provided by the Multipor ceiling insulation system.

Moisture control
Exposure to moisture during construction due to site-related conditions does not have a lasting adverse effect on the Multipor ceiling insulation system. Underground garages in risk-prone areas may be subject to even greater environmental influences (e.g. flooding).
We conducted a field test to analyze the moisture loads in these types of extreme situation:

We bonded Multipor ceiling insulation boards to a concrete ceiling element and left them fully immersed in water for several days.
The results were persuasive: The boards remained dimensionally stable and mechanically undamaged, the adhesive bond remained fully intact and the insulating performance was fully restored just a few days after subsequent air-drying due to the vapor-permeable characteristics of the Multipor mineral insulation boards.

**Energy requirements**

Ceilings adjoining heated habitable spaces must be insulated for reasons of energy efficiency and to comply with statutory requirements (EnEV). Furthermore, the insulation must comply with the U-values defined in the latest EnEV and the requirements of DIN 4108-2 “Reducing thermal bridges in open garages”. The Multipor ceiling insulation system is a completely homogenous material with a consistently low U-value; thermal transmittance throughout the entire thickness of the mineral insulation board is $\lambda = 0.042 \text{ W/(mK)}$.

The full-surface bond and homogenous structure of the boards eliminates thermal bridging that typically occurs with rail or anchor systems and multilayer boards.

Bonding the insulation boards directly to the ceiling in a full bed of adhesive mortar has the additional advantage of preventing air flowing behind the layer of insulation, thereby avoiding system-related heat losses such as those associated with ‘loose’ layers of insulation (i.e. with air gaps).

**Working around joists and walls**

In conjunction with Multipor ceiling insulation boards, the Multipor insulating wedge is ideal for connecting to joists and intersecting elements. Joint profiles are not normally required due to the dimensional stability of the insulation board. Multipor ceiling insulation boards can be precision-cut to accommodate round or rectangular penetrations, thus avoiding thermal bridges.

**Bright and welcoming atmosphere**

Lighting is essential in underground garages, but energy-efficiency considerations also have to be taken into account. Multipor ceiling insulation boards have a bright, welcoming surface appearance, which is retained even when boards have been sanded down thanks to the material’s homogenous structure. And they can of course be painted with silicate paints.

The surface can be further enhanced with a colorless silicate primer, Multipor interior silicate paint, a thin skim of plaster or a mechanically anchored reinforcement layer, followed by a final finishing plaster. Thus the insulation system not only makes economic sense, it can also be tailored to suit the building’s style and function.
Reference building

Underground garage insulation in Limbecker Platz Shopping Centre, Essen

- Insulating the ceiling of an underground visitor car park
- Quick adaptation to existing geometry
- Quick and easy installation
- Outstanding fire protection, visual appearance and acoustics

Project data

<table>
<thead>
<tr>
<th>Building type</th>
<th>Underground garage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Essen</td>
</tr>
<tr>
<td>Application</td>
<td>Ceiling insulation</td>
</tr>
<tr>
<td>Products used</td>
<td>Multipor ceiling insulation board, t = 80 mm</td>
</tr>
<tr>
<td></td>
<td>Multipor lightweight mortar</td>
</tr>
</tbody>
</table>
Reference building

Underground garage insulation,
Parkend residential complex, Frankfurt am Main

- Insulating the ceiling of an underground car park
- Quick adaptation to existing geometry
- Visually appealing solution
- Sound-absorbing properties ensure peace and calm in habitable areas above the underground garage

Project data

<table>
<thead>
<tr>
<th>Building type</th>
<th>Underground garage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Frankfurt am Main</td>
</tr>
<tr>
<td>Application</td>
<td>Ceiling insulation</td>
</tr>
<tr>
<td>Products used</td>
<td>Multipor ceiling insulation board, t = 160 mm</td>
</tr>
<tr>
<td></td>
<td>Multipor lightweight mortar</td>
</tr>
</tbody>
</table>
5.2 Detail drawings for ceiling insulation

Detail drawings for ceiling insulation: Basement and underground car park ceilings

### Joist cladding

- **007** Reinforced concrete ceiling
- **044** Butt joint (unmortared)
- **130** Flexible joint

* Leave 2-3 mm wide joint between wall and ceiling insulation. Fill open joints with flexible sealant.

### Ceiling step

- **007** Reinforced concrete ceiling
- **044** Butt joint (unmortared)
- **173** Multipor lightweight mortar
- **196** Joint profile
- **251** Multipor ceiling insulation

* Leave 2-3 mm wide joint between wall and ceiling insulation. Fill open joints with flexible sealant.

### Ceiling step with edge profile

- **007** Reinforced concrete ceiling
- **044** Butt joint (unmortared)
- **130** Flexible joint

* Leave 2-3 mm wide joint between wall and ceiling insulation. Fill open joints with flexible sealant.

### Ceiling step with joint profile

- **007** Reinforced concrete ceiling
- **044** Butt joint (unmortared)
- **173** Multipor lightweight mortar
- **196** Joint profile
- **251** Multipor ceiling insulation

* Leave 2-3 mm wide joint between wall and ceiling insulation. Fill open joints with flexible sealant.
Detail drawings for ceiling insulation: Basement and underground car park ceilings

Ceiling cladding

* Leave 2-3 mm wide joint between wall and ceiling insulation
fill open joints with flexible sealant

Example installation (without anchors)

Example installation (with anchors)

Fastener connection

Ceiling insulation 17-005

Ceiling insulation 17-010

Ceiling insulation 17-011

Ceiling insulation 17-012

007 Reinforced concrete ceiling
130 Flexible joint
155 Drop-in anchor/compact anchor
156 Threaded rod
157 Nut with washer Ø 30 mm
158 Pipe clamp
168 Existing masonry
173 Multipor lightweight mortar
251 Multipor ceiling insulation
326 Multipor screw-in anchor

Download these and other detail drawings at www.multipor.com/detaildrawings.php
5.0 Multipor ceiling insulation systems

5.2 Detail drawings for ceiling insulation

Detail drawings for ceiling insulation: Basement and underground car park ceilings

Sidewall insulation

Sidewall insulation with joint profile

Sidewall insulation with ceiling fastener

Sidewall insulation with insulating wedge

Screw-in anchor

* Leave 2-3 mm wide joint between wall and ceiling insulation
fill open joints with flexible sealant

Ceiling insulation 17-006

Ceiling insulation 17-008

Ceiling insulation 17-007

Ceiling insulation 17-009

007 Reinforced concrete ceiling
130 Flexible joint
168 Existing masonry
173 Multipor lightweight mortar
196 Joint profile
251 Multipor ceiling insulation
254 Multipor insulating wedge
327 Multipor ceiling fastener (depending on requirements)

Download these and other detail drawings at www.multipor.com/detaildrawings.php
Installing Multipor ceiling insulation systems

Typical areas of application:
- Ceilings of underground garages and basements
- Insulation of adjacent sidewalls to minimize thermal bridging
- Air duct insulation (see Chapter 4.6)

Benefits:
- Quick, straightforward overhead installation
- Low board weight
- Easy to work round columns and walls
- Easy adhesive installation
- Bright, attractive appearance
- High coverage rate of Multipor lightweight mortar; one bag yields approx. 30 l of fresh mortar

Substrate inspection and preparation
When insulating the ceilings of both new and existing buildings, it is important to check the suitability and load-bearing capacity of the substrate beforehand (see Table 1). Make sure it is clean, dry and free from residues that may impair adhesion, such as mold oil. Pay particular attention to strength development, stripping times and concrete drying. Multipor lightweight mortar has a very high water retention capacity, so additional priming is not normally necessary, provided that substrates are otherwise load-bearing. Sandy and highly absorbent substrates, which often occur in existing buildings, must be primed or treated, e.g. with a Multipor lightweight mortar skim coat.

Careful consideration must be given to stripping times and strength development, especially with cast-in-place concrete.

Remove paint, soiling and unsound plaster and make good any defective areas with standard lime-cement plaster. Remove any concrete burrs; this can usually be done by simply scraping them off with a trowel [1] and then brushing the surface [2]. Concrete surfaces that have been treated with release agents must be suitably pretreated and cleaned. Allow sufficient time for freshly plastered substrates to dry.


5.3 Installing Multipor ceiling insulation systems

<table>
<thead>
<tr>
<th>Existing substrate</th>
<th>Measure</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease, mold oil or other release agents</td>
<td>Remove</td>
<td>Pressure wash with suitable detergent, rinse with clean water, allow to dry</td>
</tr>
<tr>
<td>Dust, dirt, diesel soot</td>
<td>Remove</td>
<td>Brush down, wash off</td>
</tr>
<tr>
<td>Unsound, sandy plaster</td>
<td>Remove</td>
<td>Remove mechanically, secure mineral insulation boards with anchors if necessary</td>
</tr>
<tr>
<td>Old/unidentified paint</td>
<td>Remove</td>
<td>Remove all traces of paint (e.g. stripping/sanding)</td>
</tr>
<tr>
<td>Wallpaper</td>
<td>Remove</td>
<td>Remove all traces of wallpaper (e.g. stripping/sanding)</td>
</tr>
<tr>
<td>Unidentified substrates</td>
<td>Check suitability for adhesion</td>
<td>Remove coating, prepare substrate for adhesion and additionally secure mineral insulation boards with anchors</td>
</tr>
</tbody>
</table>

**Mixing lightweight mortar**

Mix Multipor lightweight mortar with the quantity of water indicated on the mortar bag according to the directions and the safety precautions. Do not use if the air or component temperature is below 5°C. See Table 2 for technical data. The graduated Multipor bucket makes it easy to mix Multipor lightweight mortar (20 kg/bag) for skimming, bonding and reinforcing Multipor ceiling insulation boards. To obtain the desired consistency, we recommend using a low-speed mixer with a long, sturdy paddle [3]. Depending on the weather, leave the mortar to cure for five minutes, then mix again before use. Clean paddle mixers thoroughly after use for optimal mixing results.

- Approx. 8 l of water per 20-kg bag of lightweight mortar for mixing with the paddle mixer
- Processing time: approx. 1.5 hours, depending on the weather
- Multipor lightweight mortar has a high coverage rate; one bag yields 30 l of fresh mortar, which is enough to cover approx. 5 m² for bonding or approx. 6 m² for reinforcement, depending on the condition of the substrate.
- Multipor lightweight mortar can also be applied with conventional plastering machines.
Multipor ceiling insulation systems

Installing Multipor ceiling insulation systems

<table>
<thead>
<tr>
<th>Table 2: Technical data for Multipor lightweight mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightweight mortar</td>
</tr>
<tr>
<td>Compressive strength class</td>
</tr>
<tr>
<td>Diffusion resistance factor</td>
</tr>
<tr>
<td>Water absorption</td>
</tr>
<tr>
<td>Thermal conductivity</td>
</tr>
<tr>
<td>Building material class</td>
</tr>
<tr>
<td>Weight per bag</td>
</tr>
<tr>
<td>Pallet content</td>
</tr>
</tbody>
</table>

Practical tip: The graduated Multipor bucket makes it easy to add the correct quantity of water to the Multipor lightweight mortar.

Multipor lightweight mortar can be stored on a pallet in a dry place for up to 12 months from the date of manufacture. As with any other product, please follow the directions and safety precautions on the pack.

Applying lightweight mortar to Multipor ceiling insulation boards

Apply a full bed of lightweight mortar to the back of the insulation boards with a notched trowel and comb into ridges to create an optimal adhesive bond between the lightweight mortar and the insulation board [4].

Use different trowel sizes to obtain the right ridge height to suit the thickness of insulation:

- 12-mm notched trowel for insulation thickness up to 140 mm
- 15-mm notch trowel for insulation thickness of 160 mm or above
  (up to 200-mm single-layer thickness)

Slight unevenness in the substrate can also be levelled out in this way. If necessary, Multipor ceiling insulation boards can be laid wet-on-wet (buttering-and-floating method) to level out larger uneven areas.

Bonding Multipor ceiling insulation boards

Bond Multipor ceiling insulation boards with a joint offset ≥ 15 cm using a full bed of Multipor lightweight mortar [5]. Use a mounting board to simplify overhead installation and apply pressure more evenly. Butt the head joints in the insulation boards up tightly, but do not fill them. To ensure full-surface adhesion, check that the board faces are square before installation and mark reference lines with a chalk line or laser.

Bond, slide into position and press either manually or with the aid of a mounting board. For optimum adhesion, always slide the insulation boards into position at right angles to the mortar ridges [6–7].
5.0 Multipor ceiling insulation systems

5.3 Installing Multipor ceiling insulation systems

Slide and press into position at right angles to the mortar ridges

Table 3: Mechanical fastening

<table>
<thead>
<tr>
<th>Insulation thickness</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 160 mm, one or two layers</td>
<td>full bed of Multipor lightweight mortar</td>
</tr>
<tr>
<td>180 mm or above, single layer</td>
<td>full bed of mortar and mechanical anchoring*</td>
</tr>
<tr>
<td>180 mm or above, two layers</td>
<td>full bed of mortar and mechanical anchoring*</td>
</tr>
<tr>
<td>– for unidentified substrates</td>
<td>general: full bed of mortar and mechanical fastening* required</td>
</tr>
<tr>
<td>– for mesh-reinforced plaster layer (regardless of board thickness)</td>
<td></td>
</tr>
</tbody>
</table>

* at least one fastener per board

For insulation thicknesses > 200 mm bond two layers of Multipor ceiling insulation boards to the ceiling (Table 3). Fit the first layer as described above, then bond a second layer – thinner or the same thickness – to the first layer in a full bed of Multipor lightweight mortar with staggered head and bed joints. An 8-mm or 10-mm notched trowel is usually sufficient for applying the intermediate layer of adhesive mortar. Regardless of whether one or two layers are applied, if the total thickness of insulation exceeds 160 mm or if the underside of the Multipor ceiling insulation boards is fully plastered, the insulation boards must be anchored to the substrate.

The two-layer method automatically optimizes thermal bridging due to the offset joints in the layers of insulation. Furthermore, any unevenness in the substrate which has transferred to the first layer can easily be rectified by sanding smooth before applying the second layer. Always brush down sanded surfaces.

**Dealing with movement and expansion joints/connected elements**

Large underground garages and connected large structural elements are particularly susceptible to static and thermal effects which can produce stresses strong enough to cause cracking in the structural elements. To prevent this, the structural elements are separated from one another with movement joints – often referred to as expansion joints. These joints must be carried through into the insulation layer in both new and existing buildings.

Under no circumstances should existing expansion joints be covered with insulation, since this may result in movements in the structural element causing damage to the insulation.

Even in smaller buildings with no existing expansion joints, always install the Multipor ceiling insulation boards such that any movements within the building or between the insulation and building cannot cause any damage. For instance, when completely cladding the underside of a ceiling with insulation boards [8], leave a gap all the way round the perimeter by cutting saw grooves.

Newer underground garages are often constructed from precast concrete elements. Movements can occur in these statically determinate structures – especially in joists with plain bearings. The joists expand and contract due to temperature loads and time-dependent material behavior.
Furthermore, their self-weight and vertical loads may cause them to deflect. When a uniform load is applied, this deflection is greatest in the middle of the joist. In turn, the deflection produces torsion which is greatest on the bearing surface. Sufficient provision must be made to accommodate these movements to prevent coercive stresses between the Multipor ceiling insulation boards and the existing structure.

Connections between the joist and the existing wall in particular must be constructed in such a way that they are able to absorb these movements. It is clear from the reasons outlined above that connections between the wall and ceiling must also allow for movement. Open joints can be sealed on the room side with flexible sealing materials. Chapter 5.2 ‘Detail drawings for ceiling insulation’ provides further guidance on this subject.

**Cutting and reshaping Multipor ceiling insulation boards**

Boards and closers are easy to cut to any size using a fine-toothed Multipor handsaw [9].

Multipor ceiling insulation boards can also be quickly adjusted to accommodate existing electrical wiring or recesses in the wall or ceiling and so ensure a uniform layer of insulation [10] [11].

It is very easy to round or square off the edges of the board using a Multipor sanding board [12] [13].

**Multipor ceiling insulation board with anchor fixings**

From a thickness > 160 mm each insulation board must be additionally secured with one anchor fastening in accordance with the Construction Products List Part C. It is often difficult to assess whether the substrate of solid existing ceilings is able to support a bonded insulation system.
If the insulation thickness exceeds 160 mm or the substrate can only be assessed to a limited extent, insert an anchor fixing in the middle of each Multipor ceiling insulation board for additional security [14] [15]. Use suitable ceiling fasteners approved for this purpose. Suitable anchor fixings can be found in the download section of our website at www.multipor.com.

**Practical tip:** When installing two layers of insulation board, only the first layer requires anchor fixings in addition to bonding. The second layer – maximum 160 mm thick – is simply bonded to the first layer. This approach cuts costs by using shorter anchors and at the same time, creates an attractive appearance.

**Loads suspended from the ceiling**
Wiring and cable trays are often retrofitted beneath the ceiling. This does not require the insulation to be removed; instead loads can be fastened through the Multipor ceiling insulation boards into the substrate with a threaded rod and washer (see Page 157, Example 17-012). Please refer to Chapter 5.4 for more information on fasteners.

**Easy to sand**
The insulation boards can easily be sanded with a Multipor sanding board to smooth out any uneven surfaces [16].

**Practical tip:** It's easy to smooth down uneven surfaces with the Multipor sanding board. Because the material is homogenous, the structure and color of the sanded surface of Multipor ceiling insulation boards is exactly the same as the unsanded surface.

Applying insulation to the ceiling is a quick, clean process. The bright Multipor mineral insulation boards basically require no further treatment. If large areas of the underside of the ceiling have been sanded down, a colorless silicate primer can be applied to give a uniform visual appearance. Remove any loose material and dust from the surface before priming.

**Optional surface finishes**
The chosen finish depends on the requirements. Boards can be painted, skimmed or plastered: The range of options is enormous.
Optional painted finishes
We recommend using Multipor interior silicate paint in accordance with DIN 18363 to introduce some color to the insulation boards. Apply with a brush, roller or sprayer to the dust-free surface.

Optional skim finish
For a skim finish, apply Multipor lightweight mortar thinly to grain thickness – maximum 3.0 mm – to the surface of the Multipor ceiling insulation boards and smooth with a felted float before it sets [17]. This method is recommended mainly for rooms with less stringent requirements for surface quality since hairline cracking may occur around the board joints. 2 to 2.5 kg/m² Multipor lightweight mortar is enough for a 2 to 3 mm coating thickness (10 to 12 m²/bag).

Optional plastered finish
For a plastered finish, first apply a reinforcing layer of Multipor lightweight mortar to the Multipor ceiling insulation boards – with an average layer thickness of 5mm including reinforcement mesh [18] [19]. Then screw anchor fixings through the fresh plaster and the reinforcement mesh into the load-bearing substrate [wet-on-wet]. Carefully slit the reinforcement mesh with a sharp knife before drilling a hole and inserting the Multipor screw-in anchor [20]. This enables the anchor to be screwed in without dragging the embedded mesh out of place [21] [22]. The area around the anchor may need patching after screwing in the anchor. Allow four anchors/m². You can find an overview of other fasteners in the download section of our website at www.multipor.com.

Note the following instructions, depending on the chosen finish:

Thin-film plaster and skim plaster:
- Apply a 2 to 3-mm thick finishing coat of Multipor lightweight mortar and smooth with a felted float before it sets.
- Apply Multipor fine lime plaster or Multipor smooth lime plaster as a skimming coat or for a smooth plaster finish on top of the reinforcement layer.

The total thickness of plaster (reinforcement layer and finishing plaster) should not exceed 8 mm. The finishing coat should be around 3-mm thick, or slightly thinner for Multipor fine lime plaster and Multipor smooth lime plaster (see directions for use).
Insulating joists and structural elements
The various connection details shown below illustrate the ease of installation of Multipor ceiling insulation boards. Connections to curved or rectangular shapes can easily be formed without the need for additional tools or profiles. The insulation boards do not need edging with metal profiles to prevent chipping or damage [23 – 25].

When insulating joists, it is important to insulate the underside of the joist first, and then the sides [26 – 28].

Apply the adhesive mortar for the underside of the joist to the mineral insulation board so that the overhanging areas remain free of adhesive. This prevents the horizontal and perpendicular faces of Multipor ceiling insulation boards bonding together and the insulation board breaking off due to deflection of the beam. The insulation on the ceiling runs up to the insulation on the side of the joists [29]. The connection in this area must also be unrestrained and, depending on the fire protection requirements, flexible. When connecting the joist insulation to the walls, follow the instructions for expansion and movement joints.
Rigid connections between walls and ceilings must be avoided. Form a flexible connection instead, for example using flexible sealing tape [30].

**Fixtures**

Mount light fittings to the load-bearing substrate, which provides a stable bearing surface in conjunction with the mineral insulation board and plaster. Always check the fire protection regulations first.

**Expansion joints subject to fire protection requirements**

Existing expansion joints must always be carried through into the insulating layer. Unprotected openings in structural elements do not comply with fire protection requirements and are not permitted. This includes movement joints. We recommend sealing joints ≤ 30 mm wide between solid ceilings and walls with a flexible fire-protection mastic with an F90 fire resistance rating in compliance with DIN 4102-2. This will prevent fire and smoke transmission for 90 minutes and absorb joint movements up to +/- 15% of the joint width. [30 – 32].

**Calculation guide**

Table 3 gives guideline material quantities and time allowances for the various stages.

<table>
<thead>
<tr>
<th>Material</th>
<th>Coverage</th>
<th>Time allowance</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grundpositionen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multipor ceiling insulation board</td>
<td>4.3 boards/m²</td>
<td>approx. 15 min/m²</td>
<td>for bonding</td>
</tr>
<tr>
<td>Multipor lightweight mortar</td>
<td>approx. 3.5 kg/m²</td>
<td>approx. 15 min/m²</td>
<td>for bonding</td>
</tr>
<tr>
<td><strong>Alternative components</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multipor lightweight mortar</td>
<td>approx. 3.5 kg/m²</td>
<td>approx. 10 min/m²</td>
<td>for reinforcement</td>
</tr>
<tr>
<td>Multipor screw-in anchor without fire protection requirement</td>
<td>4.3 units/m²</td>
<td>approx. 8 – 10 min/m²</td>
<td>place the anchors in the middle of the board or arrange evenly over the plastered surface</td>
</tr>
<tr>
<td>Multipor lightweight mortar</td>
<td>approx. 2.5 kg/m²</td>
<td>approx. 10 min/m²</td>
<td>as the finishing plaster (final coat)</td>
</tr>
<tr>
<td>Multipor screw-in anchor with fire protection requirements</td>
<td>4.3 units/m²</td>
<td>approx. 8 – 10 min/m²</td>
<td>place the anchors in the middle of the board or arrange evenly over the plastered surface</td>
</tr>
<tr>
<td>Multipor insulating wedge</td>
<td>5.2 units/m²</td>
<td>approx. 15 min/m²</td>
<td>for bonding</td>
</tr>
</tbody>
</table>

The specimen calculations are based on the following assumptions:
- There are no major openings, level changes, reveals or similar in the surface to be insulated.
- No provision has been made for levelling plaster and other preparatory work.
- Allowance must be made for other tasks (e.g. plaster profiles) if necessary – see the latest tender texts.
- Multipor screw-in anchor with or without fire protection requirements
- Direct transport to the site and setup times must also be included.
A selection of suitable fasteners can be found under ‘technical information’ on the download section of our website at www.multipor.com.

**Attaching light loads**

Light, static loads with a pull-out load up to 6 kg and 600-mm hole spacing can be mounted directly to the Multipor ceiling insulation board using the Multipor spiral anchor [1]. Make a cross-shaped slit in the plaster layer with a Stanley knife before carefully screwing in the spiral anchor (50 mm, 85 mm, 120 mm) with a T 40 Torx bit [2].

**Practical tip:** All loads in underground car parks with public access should be fastened to the load-bearing substrate to prevent vandalism.

**Multipor telescopic device mount**

This mount can be used for installing lights, motion sensors and other devices without using anchor fixings.
With a minimum center distance of 120 mm, it can be combined and extended as required. It must be installed before fitting the insulation. Electric wiring can be safely connected with ease thanks to integrated cable routing. The Multipor telescopic mount is suitable for loads up to 5 kg [3] [4].

**Attaching heavy loads**
We recommend attaching loads over 6 kg and all dynamic loads to the load-bearing substrate rather than the Multipor ceiling insulation board.

**Attaching single loads**
Fasten brackets for cable trays through the Multipor ceiling insulation board into the load-bearing substrate. Use a washer to distribute point loads [5].
Multipor roof insulation systems

- Optimum stability
- Pressure-resistant
- Non-combustible
- Free from fibers
- Purely mineral-based
- Vapor-permeable
- Resistant to ageing
- Dimensionally stable
- Easy to install
- Volumetrically stable
- Cost-effective
- Sustainable execution
- Reliability

- Pitched roofs 100% recyclable
- Economical performance reliability
- Free from fibers
- Volumetrically stable flat roof vapor-permeable performance reliability purely mineral-based cost-effective execution reliability pitched roofs non-combustible