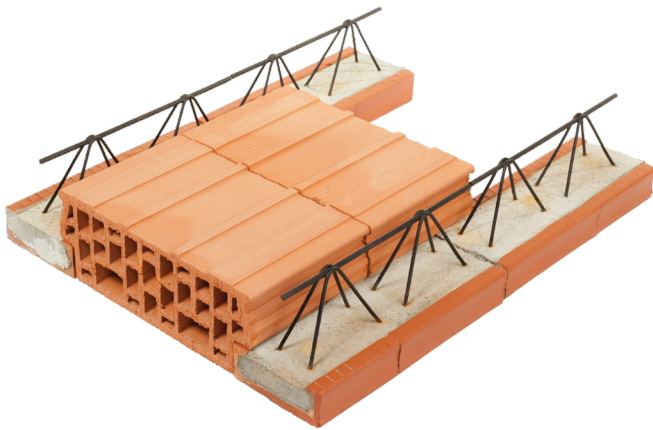




CERAMIC CEILINGS HELUZ MIAKO

HELUZ MIAKO ceramic ceilings consist of ceramic-concrete ceiling girders and MIAKO ceiling panels, which are solidified in the construction by applying a 40 or 60 mm concrete layer on the ceiling panels, which results in a 210 to 290 mm ceiling structure.



The ceiling girders are reinforced with 3D reinforcement and are made of 250 mm length modules. They are 175 mm for lengths from 1.5 m to 6.25 m and 230 mm for lengths from 6.5 m to 8.25 m. The MIAKO ceiling panels are made for a ceiling girder axial distance of 500 and 625 mm in three basic heights of 150, 190 and 230 mm. "Low" auxiliary ceiling panels with a height of 80 mm are also produced.

The approximate weight of a standard girder metre is 20 to 26 kg. Shorter ceiling girders can be handled manually. Girders with a length of 4.5 m and longer already exceed 100 kg so handling using lifting equipment (truck crane, truck with hydraulic arm, etc.) is recommended. The weight of the ceiling panels ranges between 6 and 15 kg depending on the type.

CEILING CONSTRUCTION WORK PROCEDURE

In brief. For more detailed information, please see the HELUZ implementation or technical manual.

1. PREPARATION BEFORE CONSTRUCTION

Read the MIAKO ceiling documentation and assembly plan carefully.

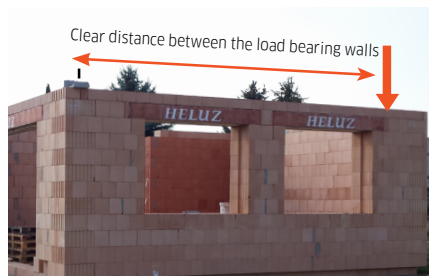
Check the clearance (distance) of the load bearing walls. The tolerance can be max. +20 mm. If the clearance is larger, it is necessary to consult the designer in time (whether the girders can be supported on a distance shorter than 125 mm or whether longer ceiling girders should be ordered).

Inspect the ordered and delivered material according to the drawing of the ceiling composition – assembly plan (length and number of the ceiling girders, type and number of ceiling panels, capping course height).

It is necessary to prepare line supports and props. When applying concrete during winter or hot summer, read up on the principles of concreting carefully.



Check the material delivered according to the assembly drawing – type, dimensions and number of ceiling girders, panels and capping course blocks.



Before the installation itself, it is advisable to verify the clear distance between the load bearing walls (girder length) – tolerance max. +20 mm.



A bitumen band of at least 3.5 mm is applied only in the ceiling support area and the future reinforced concrete ring beam!

2. MASONRY LEVELLING

Inspect the evenness of the support structure for applying the girders. When the walls are made of ground brickwork, the wall crown is even. It is sufficient to only cover the lintels with a thin layer of mortar as required. However, if there is any unevenness (i.e. a deviation exceeding 5 mm within a length of 2.0 m, or a difference between the highest and lowest points exceeding 10 mm) or for masonry made of rough brickwork, then it is necessary to level with mortar with a thickness of at least 10 mm.



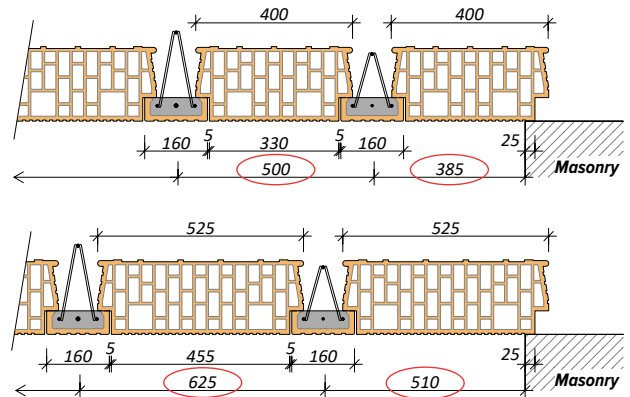
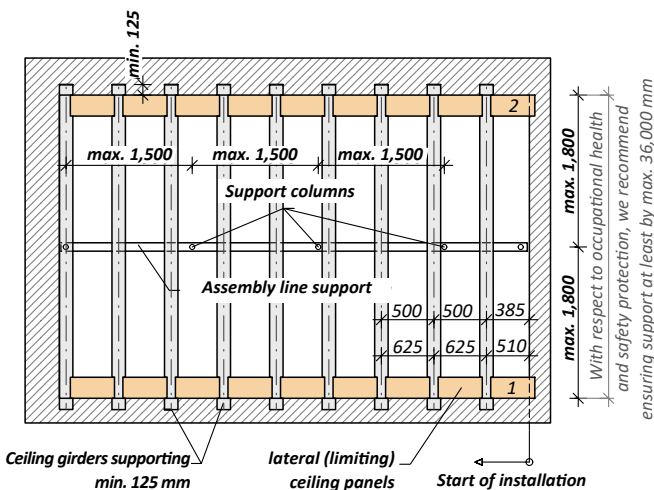
3. HEAVY BITUMEN BAND

It is recommended to apply a heavy bitumen band with a thickness of at least 3.5 mm or a HELUZ flexible separation band on the levelled masonry, i.e. in the width under the future reinforcing ring beam. In this way, the risk of the formation of horizontal cracks where the ceiling joins the walls is minimised and this solution is also advantageous in order to minimise noise propagation. For this reason, it is also advisable to apply these bands to the top surface of the ceiling under the future load bearing walls and partitions of the higher storey.

4. INSTALLATION OF THE CEILING GIRDERS

The length of the ceiling girder support is at least 125 mm. For safety reasons, when handling the ceiling girders, it is recommended to already have the line assembly supports (see step 5) fitted before installing the ceiling girders on the masonry. If not specified in the assembly plan otherwise, installation of the girders starts at a point with any other structural component (such as a staircase, chimney, etc.). If the ceiling panels are laid on the load bearing wall first, installation of the first girder always starts from this wall. For an axial distance between girders of 500 mm, this is max. 385 mm, while for a girder axial distance of 625 mm, this is max. 510 mm. An axial distance of 500 mm and 625 mm, respectively, between the ceiling beams is to be limited by fitting the edge ceiling panels. The gap created from the bottom between the beam ceramic edge and the panel is from approximately 2 mm to max. 5 mm.

ASSEMBLING CEILING GIRDER SUPPORTS



5. INSTALLING SUPPORTS INCLUDING CANTILEVERING

It is necessary to support the ceiling girders with all line supports and columns as soon as possible after distributing them. E.g. wooden beams with a min. size of 120/140 mm or boarding system components can be used as line supports. When carrying out girder support, also perform the specified assembly cantilevering so as to achieve the required value in the middle of the girder length.

However, if there is no cantilevering specified in the assembly plan, then cantilever all the ceiling girders longer than 5,250 mm by a value of $L/600$ where L represents the girder length. When carrying out cantilevering, it is necessary to ensure the ceiling girders remain firmly on the masonry (i.e. it is necessary to avoid lifting the ends of the ceiling girders in the supporting areas).



The distance **between the line supports** between each other or between a support and the masonry is **max. 1,800 mm**.

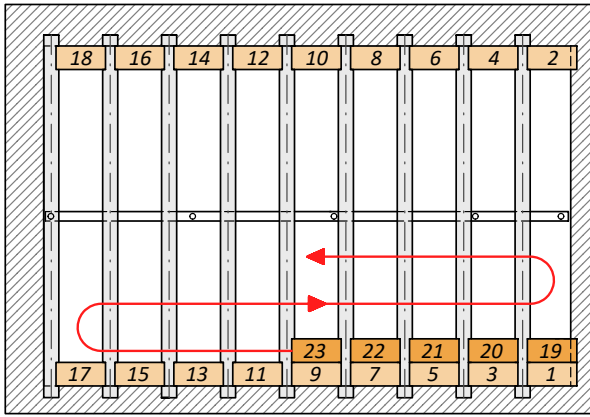
The line supports are supported with **columns** in a distance of **max. 1,500 mm**. The columns can be extendable or made of wood, which should be aligned with wedges and braced.

When constructing the MIAKO ceilings for more storeys above each other, the columns should also be positioned vertically above each other. The columns in higher storeys are to be fitted on "slippers" (wooden beams of at least 100/120 mm and 0.5 m long). When removing the supports, always proceed from the top storey to the lower ones. **The installation supports should only be removed after the standard concrete strength is achieved (after approximately 4 weeks).**

6. INSTALLATION OF MIAKO CEILING PANELS ▼

The ceiling panels have been applied in one row on both ends of the girders in order to limit the axial distance between the ceiling girders (see step 4). After assembling the supports and the elevation of the ceiling beams, it is possible to progressively lay other rows of MIAKO ceiling panels, which are laid on the girders successively in individual rows perpendicularly with respect to the girder axis from one wall to the other – see the diagram.

CEILING PANEL LAYING PROCEDURE



▲ Openings wider than 450 mm (e.g. for a chimney, dormer, staircase landing, etc.) positioned between the girders are constructed using "ceiling trimmers". A hidden joist will be created from the low ceiling panels, which is to be reinforced so that it can "bear" 1 or 2 shortened girders. In order to allow construction, it is recommended to strengthen the reinforced concrete rib with 2+2 Ø 10 reinforcement from low ceiling panels in the middle of the girders longer than 6.25 m. Low ceiling panels or several ceiling girders laid side by side are designed in the areas of hidden joists. It is necessary to lay auxiliary boards on the ceiling structure with a thickness of at least 24 mm.

7. APPLYING THE CAPPING COURSE BLOCKS AND THERMAL INSULATION

Capping course blocks with a thickness of 80 mm of the same height as the completed ceiling are to be applied along the periphery of the ceiling structure from its external side. When making a construction on ground brickwork, it is ideal to use HELUZ building foam or SID1 mortar, taking into consideration the mortar curing rate. The capping course blocks are fitted tightly by pushing into each other (tongue and groove).

Thermal insulation in the thickness in accordance with the project (most frequently EPS 70 F or EPS GreyWall polystyrene) is to be applied on the peripheral walls on the capping course internal side. It is also advisable to fix each third capping course block using a tying wire attached to the reinforcement of the ceiling girder (as a protection against the capping course bulging when applying concrete on the ceiling).



8. REINFORCEMENT APPLICATION

If not specified otherwise by the designer, welded wire mesh with a Ø 4/150–Ø 4/150 wire is inserted within the complete ceiling area. The reinforcement should be strengthened for longer ceiling girders (from a length of approximately 5.0 m) – see the structural strength tables, because of a partial fixation of the ceiling in the masonry, which is created by loading with the wall of the higher storey (i.e. excluding the top storey). L-shaped above-support strap pieces are added or the mesh is strengthened to a Ø 5/100–Ø 5/100 wire in the girder mounting area in the band of approximately 1.0 m along the peripheral wall or 2.0 m above the internal load bearing walls. Contact of individual parts of the mesh with the Ø 4 wire is made with overlapping of 210 mm (or 50 Ø), in both directions (alternatively, strap pieces can be used for the mesh contact area). Ideally, the contact of individual mesh parts should be made so that 3 individual parts of mesh are overlapping in a point (not 4) and individual mesh parts should not be above the internal load bearing walls at the same time. The mesh should be put on already prepared pads, called distance pieces, which ensure the minimum reinforcement covering with concrete, i.e. 15 mm from the top – for a top concrete layer with a thickness of 40 mm, the height of the distance pieces is 15 mm (Ø 4 mesh). For a top concrete layer with a thickness of 60 mm, the height of the distance pieces is 30 mm (for Ø 4 and 5 mm mesh) or 25 mm (Ø 6 mm mesh), min. covering of mesh in the point of contact is 10 mm from the top. **Reinforcement for rings and ribs, ceiling trimmers or hidden joists, connection of the staircase, etc. should be applied in accordance with the project documentation.** It is necessary to insert corner strap pieces with pulling towards the external face in the points of crossing and ring connection – see the figure on the next page.



Welded wire mesh has to be applied within the complete area of the ceiling with mutual overlapping in the places of contact of individual parts.

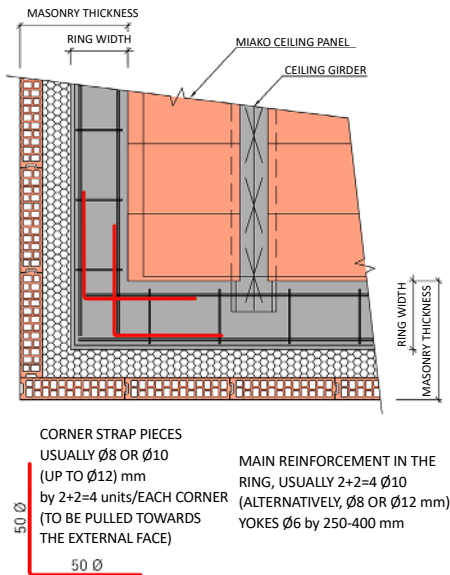


The mesh is to be applied on the ceiling panels and pads (distance pieces), which will ensure a minimum covering of 15 mm.

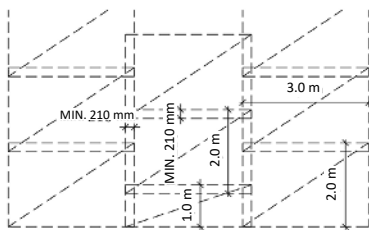


The mesh along the periphery must be pulled behind the external face of the masonry, reinforcement covering in the ring at least 20 mm.

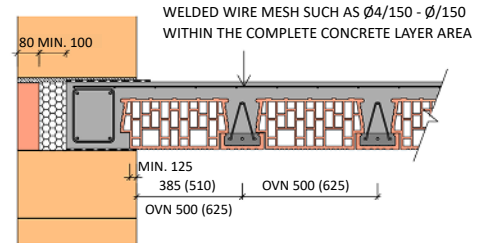
REINFORCEMENT APPLICATION TYPE DETAILS – TOP VIEW



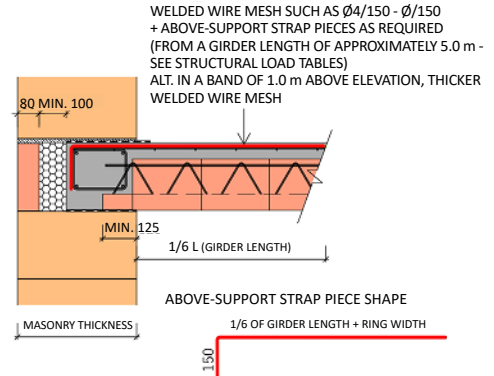
TOP VIEW DIAGRAM – CONTACT JOINT OF WELDED WIRE MESHES ($\varnothing 4.0$ mm)



CROSS SECTION – in the ceiling panel mounting area



CROSS SECTION – in the ceiling girder mounting area



DETAIL – SIDE VIEW OF THE CONTACT JOINT OF INDIVIDUAL MESH PARTS



AS FAR AS POSSIBLE, WELDED WIRE MESHES ARE TO BE LAID "INTO EACH OTHER" RATHER THAN "ON EACH OTHER" SO AS ONLY 3 MESHES (NOT 4) OVERLAP EACH OTHER AT ANY POINT, E.G., HALF THE WIDTH OF THE MESH SHOULD BE USED IN ODD ROWS AT THE BEGINNING

9. CEILING CONCRETE APPLICATION

Applying concrete on the ceiling can begin after all ceiling panels have been mounted and reinforced. In accordance with the design documentation, it is necessary to fit the boarding for openings (add at least 20 mm for dilatation), anchoring for the adjoining structures, preparation for staircase mounting, etc., before applying concrete. The load bearing ribs above the ceiling girders, the concrete layer ("extra concrete") above the ceiling panels and the reinforcing rings are constructed simultaneously when applying the concrete. Use concrete of a soft consistency in the strength class **C20/25- $XC1-D_{max16}$ mm-S3**. Each stage of concreting is very important and is critical for MIKO ceiling load bearing capacity.

Before applying the concrete:

It is necessary to inspect the cleanliness of the concrete area and check whether there are any gaps which concrete could leak through during application. Eliminate potential gaps by boarding. Spray water on the ceiling panels before concreting in order to improve the adhesion of the concrete and ceramic material.

Concreting itself:

It is necessary to take the ambient temperature and climatic effects into consideration when concreting (optimum temperature for concreting ranges between +15 and 25 °C). **When concreting during winter, it is necessary to observe the principles of winter concreting; the same applies to concreting during hot summer, when the principles for concreting at high temperatures have to be considered.** Concrete should be applied uniformly in bands in the direction of the ceiling girders. The band concreting should not be broken; an operational joint can be made midway between two girders (in the middle of the MIKO ceiling panels). Concrete may not accumulate in one place, and it may not be sprayed from a pump from excessive height or in close proximity to the capping course. It is necessary to ensure a uniform height of the layer of extra concrete above the panels (40 mm or 60 mm), i.e. in the girder elevation area during concreting. When applying the concrete, it is necessary to carry out compaction using immersion vibrators and vibration bars; increased care should be paid close to the peripheral reinforcing rings and thermal insulation material and capping course blocks) and compaction should be performed carefully (by puncturing, tamping). The low ceiling panels can only be loaded with the concrete mixture. For safety reasons, it is forbidden to step on them and to avoid breaks and consequent leakage of fresh concrete.

Concrete should be applied uniformly in bands in the direction of the girders and may not accumulate in one place during concreting. Concrete should be compacted properly (e.g. using an immersion vibrator) and the concrete surface should be smoothed using a levelling or vibration bar.



! The correct treatment of fresh concrete is important to prevent the occurrence of shrinkage cracks.

After concreting:

It is critical use the correct treatment to keep fresh concrete sufficiently moist, especially during the first 7 days. The most frequent mistakes include spraying the concrete surface with water with a considerably different temperature than that of the concrete surface (thermal shock), directly spraying (watering) a concrete surface which is not cured sufficiently or, on the other hand, starting the concrete treatment late. The recommended instructions from the concrete supplier or the general principles for the correct treatment of fresh concrete should be followed – e.g. <https://www.ebeton.cz/pojmy/osetrovani-betonu>.

Pallets with bricks or other building materials may only be stored on the ceiling 7 days after concrete application. The pallets should be stored as close to the load bearing walls as possible and only in one layer. The installation supports can only be removed after the standard concrete strength is achieved (after approximately 4 weeks) – see step 5.