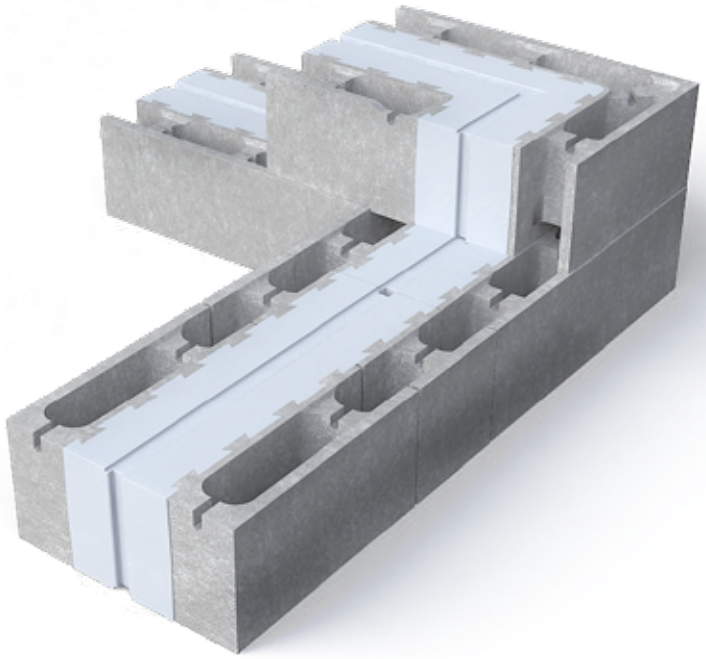
Lammi concrete blocks
WORK INSTRUCTIONS



Thermal blocks
LL500, LL400 & EMH350
and partition wall blocks
MH300, MH250, MH200,
KMH150, PH400, PH250, PPH300

LAMMI
harkko

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1 GENERAL

These work instructions apply to Lammin Betoni Oy's thermal blocks (LL500, LL400 and EMH350) and mould (MH300, MH250, MH200, MH150, KMH150). The manufacture, quality control and testing of the blocks comply with standards SFS-EN 15435 and SFS-EN 7018 issued by the Finnish Standards Association (SFS). Our quality control is certified by Inspecta Sertifiointi Oy. Lammin Betoni complies with the requirements of concrete standard BY 50 in the concreting of thermal blocks and partition wall blocks and supervision of concreting work.

2 PROPERTIES OF LAMMI THERMAL BLOCKS

The dimensions of Lammin Betoni's thermal blocks are 600x350x200 mm (length x width x height), 600x400x200 mm or 600x500x200 mm. The blocks weigh approximately 25–29 kg. A thermal block consists of a hollow concrete casing and heat insulation material (120, 170 or 270 mm). The concrete casing and heat insulation material are joined with a dowelled joint. The direction of a corner block can be changed by turning the block upside down, with the exception of LL500, which has symmetrical corner blocks (stack bond).

Lammi partition wall blocks are 150–300 mm wide. The product families include corner blocks (right- and left-handed) and end blocks. The end blocks are 400 mm or 600 mm long. The corner block length varies by product family (block width + 200 mm). Curved products (KMH150) are suitable for diameters of 3–7 m. Tables 1a and 1b list the product properties.

Table 1a. Structure properties

Block consumption	8.33 pcs/m^2
U value (EMH350/LL400/LL500)	0.25 / 0.17 / 0.11 W/m2K
Cast concrete	C30/37 (former K35)*
strength class	
load classes	
Outdoor areas	XF1 and XC3/4
Indoor areas	XC1
max. grain size	16 mm (8 mm)
plasticity	plasticised to S4
water/cement ratio	w/c ≤ 0.60
aggregate	rec. uncrushed natural round
share of aggregate	≥65% (paste ≤35%)
blend component	no fly ash
agents	plasticiser + air-entraining agent
Reinforcing bars	A 500 HW

*) The load classes and concrete strength class are determined according to the application and ambient conditions (BY 50, section 3.2). The cast blocks are made from frost-resisting dry mix. The thermal blocks' insulation material is graphite EPS.

Table 1b. Concrete consumption

Product	Concrete consumption
EMH350	125 l/m^2
LL400	133 l/m^2
LL500	133 l/m^2
MH300	210 l/m^2
MH250	150 l/m^2
MH200	115 l/m^2
MH150	80 l/m^2
KMH150	80 l/m^2
PH250	36 l/m
PH400	110 l/m
PPH300	45 l/m

3 MEASUREMENT SYSTEM

3.1 Modular coordination

Modular coordination is used in the design of thermal block walls. The module lines are always placed on the inner and external surface of the wall. (The distance between the module lines on both surfaces is 350 mm for EMH350, 400 mm for LL400 and 500 mm for LL500).

The walls are coordinated horizontally and vertically with a 2M (200 mm) module. The width and placement of openings also follow the 2M module. The opening width and placement from the inner corner is a multiple of the 2M module. 2M bonding is used in the laying of the blocks. To minimise the need to cut the blocks, it is recommended to use the 2M modular dimensions in the design of the building.

The door and window frames should have a horizontal measure of nx200-30 mm and vertical measure of nx200-40 mm. The greater vertical tolerance ensures a sufficient external sill angle.

When using mould blocks MH300-MH150, the placement of the openings must be checked on the site by using the end blocks.

3.2 Measurements

Before starting the stacking of the blocks, the foundation elevations, dimensions and angle are checked. The placements and dimensions of the walls and openings are checked from the plans. The height and floor height of the foundation/slab are checked to ensure that the target height is achieved by using complete blocks.

4 WORK PHASES

4.1 Foundation

The foundation of a Lammi Kivitalo building is usually a natural spread foundation or a pile spread foundation. In both cases, the foundation is created by using the Lammi Tassu foundation mould. Lammi Tassu is a quick, easy and affordable solution for laying the foundation.

https://www.lammi.fi/tassu

4.2 Delivery and storage on the site

We recommend bringing in the first block delivery after the casting of the foundation and the line guide measurements. In this way, the pallets do not get in the way of measuring work.

The blocks are delivered on pallets. The pallets are wrapped in stretch film.

The pallets must be placed horizontally on even ground. This prevents damage to the blocks.

The pallets should be placed so that there is no need to move the blocks around more than necessary, preventing damage to the blocks. To prevent damage to the blocks, we do not recommend stacking the pallets on the site.

In long-term storage, it is important to cover the pallets with e.g. a tarpaulin to prevent rainwater and snow from entering the product packages.

4.3 Preparation

Before laying the thermal blocks, the foundation dimensions and position must be checked. The lines of the walls' external surface are marked on the top of the foundation with e.g. a chalk line. Line guides are installed in the wall corners. The line guides are installed vertically along the walls by using a spirit level.

After the installation, a levelling instrument is used to determine the top elevation of the foundation. The top elevation of the foundation's top surface serves as the coordinating elevation of the bottom surface of the first block layer.

Depending on the bottom conditions and structures, a capillary break (e.g. bitumen sheet strip) is installed on top of the foundation, if necessary. Always follow the construction plans.

4.4 Building the first layer of blocks

If the foundation is made carefully (top surface dimensional accuracy <±2 mm), the first layer of blocks can be stacked directly on top of the foundation. If the dimensional accuracy is not sufficient, the first layer is built on wedges. When the first layer of blocks is built on wedges, plastic wedges are placed under each end. The wedges, chalk line and spirit level are used to place and align the blocks correctly.

It is mandatory that the first layer of blocks is at level elevation (<±2 mm)!

4.5 Dry-laying the blocks

After the first layer is built, the blocks are dry-laid by using the chalk line and spirit level.

The blocks are laid one layer at a time. The laying begins by pulling the chalk line between the line guides. Start from a corner and continue either clockwise or anti-clockwise. Partial and end blocks can be reduced by cutting the insulation with a saw.

The corner blocks of the same layer usually have the same handedness. The handedness of the corner blocks is changed by layer by turning the blocks upside down. In other words, the corner blocks are crossed in connecting layers. The LL500 corner block is a symmetrical, stack-bond block.

Please note that the corner blocks are slightly lower than the other blocks to prevent the building corners from rising above the other wall lines. If necessary, the corner blocks can be raised with wedges.

When laying up the blocks, it is important to monitor closely the rise of the wall lines with e.g. a levelling instrument (openings and corners in particular).

The blocks are laid from the inside of the structure. The chalk line runs along the structure, 1-2 mm from the exterior.

The chalk line indicates that the wall is straight lengthwise and vertically. The horizontal straightness of the blocks is checked from time to time with a spirit level. If the top surface of a block is not straight horizontally, it can be straightened with a plastic wedge.

Polyurethane foam is used in the horizontal and vertical seams, at the heat insulation. The purpose of the foam is to paste the blocks together for the duration of the work and ensure consistent heat insulation. The thin layer of foam is spread in the middle of the heat insulation of the last block layer and in the vertical seam grooves between the blocks. The correct dosage of foam is determined by testing. A layer that is as thick as a thumb is usually good. If the foam layer is too thick, it raises the block above it. In normal conditions, one polyurethane bottle (0.75 l) is enough for approximately 40-50 thermal blocks. In cold weather and in very dry conditions, more polyurethane is needed.

Do not use polyurethane foam between the block surfaces! It is not recommended to use polyurethane foam for caulking!

4.6 Window and door openings

Use end blocks to create the vertical sides of the openings. The end blocks make the process faster and easier, especially when the 2M modular coordination is used in the wall construction.

If ends blocks cannot be used, the jambs must be cast.

Steel lintel AT70 (70x40 mm U profile, L = 6,000 mm) is used on the top edge of the openings.

If necessary, the top edge can be supported with a wooden form. If a wooden form is used, the vertical sides and top edge of the opening must be supported carefully. The concrete casting pressure tries to bend the forms towards the opening.

4.7 Composite profile

The patented Lammi composite profile is designed for Lammi Kivitalo lintel blocks. Together with the block and cast concrete, the composite profile creates a steel-concrete composite structure. The composite profile replaces traditional wooden formwork. A composite lintel does not require a traditional tension, compression or shear reinforcement (supports). The following work instructions must be followed in the installation of composite profiles.

- Block the holes in the bottom of the profile with duct tape. The duct tape is placed on the profile surface, not inside the holes! Tape up the profile clearance (the tape must not reach the support). You can also use a board form instead of duct tape.
- Bring the profile to the support 120 mm; the profile's total length should be the opening width + 240 mm.
- Use an angle grinder and metal blade to cut the profile. Remember to use protective goggles and hearing protectors!
- If possible, use end blocks with the profiles!
- Install the profiles on top of the opening jambs (flanges up) and stack the first layer of blocks on top of the profiles.
- Support and straighten the lintel with props (e.g. "2x4") after stacking the first layer of blocks. See table 2 for the number of supports. Space the supports evenly.

Table 2. Temporary lintel support.

Opening width (mm)	Number of supports (pcs)
0–800	0
900–1 700	1
1 800–2 500	2
2 600–3 400	3
3 500–4 000	4

Table 3. Vertical reinforcing bars of lintels.

Lintel reinforcing bar ø (mm)	Bar clearance (mm)
10	100
12	150
16	250

- Stack the lintel.
- Install reinforcing bars according to table 3: 170 mm bar for 1-layer-tall lintels, 370 mm bars for 2-layer-tall lintels and 570 mm bars for 3-layer-tall lintels. The bars are installed before casting.
- Remove the duct tape.

4.8 Pediments

The top surface of a pediment is made with formwork. Use boards and form clamps to build a form suitable for the bevel in question. Any missing insulation pieces are cut from EPS board or broken blocks and fixed with urethane. The top surface of the pediment is formed with sheeting by screwing the sheets on top of the side forms. Leave spaces of approximately 3 metres between the pouring gates (depending on the bevel). Seal the pouring gates as the cast rises.

The pediment can also be made by cutting the blocks into the correct shape. Choose the work technique on a case-by-case basis.

When working on the joints between the pediments and roof structures, make sure the wall and roof insulations touch. This prevents a thermal bridge from developing at the joining points.

4.9 Thermal block processing

The best way to process the blocks is to use an angle grinder and a diamond head. Always use personal protective equipment, such as protective goggles, hearing protectors and a respirator, when you cut the blocks. Cut the blocks outdoors to limit dust nuisance. A normal hand saw suffices when cutting pre-cut blocks.

If the structure built with thermal blocks does not follow the modular coordination described in section 3.1, it is recommended to use broken blocks and cut them (e.g. blocks with damaged corners). This reduces the site's waste expenses.

4.10 Reinforcement

Thermal block walls are always reinforced according to the construction plans. The construction plans also indicate the placement of the reinforcing bars. The most common thicknesses are 8, 10 and 12 mm.

The horizontal reinforcing bars are installed during the dry-laying stage. The vertical reinforcing bars are slid inside the walls after laying. To ensure that the vertical reinforcing bars stay in place during casting, use the horizontal reinforcing bars as installation bars. See table 4 for the standard grip lengths.

Table 4. Reinforcement grip lengths with reinforcing bars A 500 HW. No more than half of the reinforcing bars are allowed to continue with the same cross section.

Reinforcing bar dimension	Horizontal bar	Vertical bar
Reinforcing bar ø 8 mm	1 000 mm	750 mm
Reinforcing bar ø10 mm	1 300 mm	950 mm
Reinforcing bar ø 12 mm	1 550 mm	1 100 mm

In thermal block walls, the vertical sides of door and window openings, up to the first full hole, are fitted with vertical reinforcing bars of ø 10 (1 bar/block casing), unless otherwise stated in the construction plans. It is recommended to slide the vertical reinforcing bars through the composite profile holes. The bar should continue at least 600 mm above and below the opening. The bar can be long enough to rest on top of the last cast layer, in which case no separate fastenings are needed.

At the structure corners, the external reinforcing bars are bent over the corner and the internal reinforcing bars are crossed, unless otherwise stated in the construction plans.

The lintel structures of the thermal block wall (tops of door and window openings) are reinforced according to the construction plans.

4.11 Sockets

Electrical installations are always made according to the electrical design plans. Only a qualified professional is allowed to carry out electrical installation work.

Conduits must always be used in laid block walls. As a rule, only vertical conduits are used inside thermal block walls. Horizontal conduits make concreting the wall more difficult. Horizontal conduits can be used in the base and intermediate floors and the roof.

Sockets should be placed so that they are either on the upper or lower edge of the blocks, not in the middle. Lengthwise, the boxes should be placed at the hollow part of the block.

In a laid block wall, the conduits are slid directly inside

the wall. Conduits running upwards are installed after the wall has been built to the casting height and **before concreting.**

The socket places are marked on the block wall. A diamond wheel is used to cut a rectangular hole for the box.

The box is fixed to the wall surface with a plywood panel. The box is nailed down to the cover panel from behind with zinc-coated nails. Finally, the cover panel with the box attached is fixed to the wall with e.g. a concrete screw or spring anchor.

When the socket has been installed, a conduit is slid inside from above and pressed into the stub on the socket. To ensure easy installation of the conduit, use a 12 mm raising circle with the socket.

If the conduit is slid in from below, use a flexible conduit. When using a flexible conduit, the electric wires, or at least the cable-pulling wires, should be pulled inside the conduits before casting.

4.12 Supports

See section 4.7 for the supporting of lintels.

If parts of the wall have been laid without bonding, the ends, openings and corners of the wall must be supported. A wall that goes through T junctions must be supported (the colliding wall casting pressure tries to push the wall outwards).

Partition wall block walls must be supported against the casting pressure.

4.13 Cast concrete

Cast concrete used	
Strength class	C30/37-2 (former K35-2)
Load classes	XC3, 4 and XF1
Max. grain size	16 mm (8 mm)
Plasticity	Plasticised to S4
Water/cement ratio	w/c ≤0.60
Share of aggregate	≥65% (paste ≤35%)
Blend components	no fly ash
Agents	plasticiser + air-entraining agent
Aggregate rec.	uncrushed natural round
Other requirements	Frost-resistant concrete (additional air-entrainment; spacing factor ≤0.27 mm), concrete pumped

4.14 Concrete pouring

4.14.1 Casting height

It is recommended to dry-lay and cast a thermal block wall at layers of approximately 1.5 metres. If a wall is taller than this, the stacking and casting takes places in two or more instalments.

In construction joints, the concrete surface should reach no higher than the middle of the top block. Ensure sufficient joint reinforcement.

4.14.2 Casting and compressing

The wall is cast by pump casting. When the maximum grain size is 16 mm, use a 2.5 inch hose (a 2 inch hose with a max. grain size of 8 mm). The wall is cast in layers of approximately 0.5 metres by circling the structure. The concrete is compressed carefully at every 200–400 mm by using a spud vibrator with a diameter of 20–25 mm. If the casting exceeds 10 m3, use 2 spud vibrators. The spud vibrator should sink approximately 10 cm in the last layer of concrete at every round. Do not move the concrete around sideways with the spud vibrator. While concreting, do not use the spud vibrator to compress the hollow with the conduits and sockets. The spud vibrator can detach the socket.

On the last page of these instructions is a checklist for casting, which includes steps to ensure good concreting results. The concrete supervisor fills in the concreting report (BY 401/2005) as applicable, which serves as the casting document and concreting plan.

If lintels are cast simultaneously with the thermal block wall, the concrete in the wall must be allowed to sink for one (1) hour before the concreting of the lintels. If, after 30 minutes, the top surface of the concrete level has fallen inside the wall, add more concrete and compress the top section.

4.14.3 Plasticity measurement on the site and other quality control

The suitability of the cast concrete must be checked on the site. The plasticity of the concrete is key to successful casting. It is easy to measure the plasticity of the concrete on the site with the following method.

To test the plasticity, you need an even, horizontal surface (e.g. board), which must be covered in film, a drainpipe with a diameter of 75 mm (the pipe must be 250 mm long), and a tape measure.

Place the pipe standing on the surface and fill it to the brim with the concrete intended for casting.

Then, remove the pipe by pulling it up slowly and allow the concrete to spread around the surface. Measure the diameter of the final form. If the diameter is at least 220 mm, the concrete is suitable for casting.

If the concrete is too stiff, plasticise it more before casting. The best way to do this is to pour more plasticiser in the transit mixer and mix it carefully. It is recommended to keep plasticiser on the site and use it when necessary but moderately according to expert instructions.

To ensure the quality of the casting of the thermal block wall, the concrete supervisor fills in the concreting report (BY 401/2005) as applicable and delivers it to the developer or the developer's representative. The casting checklist on the last page of these instructions is also a quality control tool.

4.14.4 Humidification

A dry (non-watered) concrete block absorbs the majority of the water in cast concrete, making the concrete stiffen quickly. This hinders the concreting process by leaving empty hollows in the structure and weakening the reinforcing bars' bond with the concrete. If the blocks are not watered before casting, the concrete strength can fall below the target level.

Therefore, it is essential to water the thermal block structure carefully before concreting. Please note that watering is prohibited in winter (sub-zero temperatures), unless the casting takes place in a covered and heated space.

4.14.5 Concreting in winter

When building thermal block walls in sub-zero temperatures, the blocks must not be wet, frozen or covered in snow. The reinforcing bars must also be free of ice and snow. The structures must be protected against snow and ice. Unless a heated weather-protected space is used, the blocks must not be watered before casting if the temperature is below zero. If a heated weather-protected space is used, the casting can be done by using the same concrete and method as in summer.

In winter, it is important to ensure that the concrete hardens to an adequate level. The development of the concrete properties must be monitored by carrying out regular temperature checks or in another reliable way. When the temperature falls below +5˚C, the cast must be covered and the structure must be kept warm enough. K35 concrete reaches the standard mould disassembly strength when normally hardening cement is used pursuant to table 5. In non-load-bearing structures, the freezing strength of 5 MPa is reached according to the last column of the same table. Freezing strength means the strength at which freezing no longer damages the concrete structure. However, the structure does not tolerate repeated freezing and melting or other unnecessary physical stress.

Table 5. Minimum hardening times of K35 concrete, load-bearing and non-load-bearing structures.

Concrete temperature	Mould disassembly strength in load-bearing structures.	Concrete's freezing strength in non-load-bearing structures
5°C	7,5 days	2 days
10°C	5,5 days	1,5 days
20°C	3,5 days	1 day

The hardening process can be accelerated by using frost concrete, quick-hardening concrete, accelerators or heated mass. When ordering frost concrete, it is important to make sure the concrete is frost-resistant (repeated freezing-melting stress). For more information about the use and properties of frost concrete, contact the frost concrete manufacturer.

The concrete report (BY 401/2005) is filled in as applicable also in winter. It also serves as a winter concreting plan.

4.14.6 Cleaning and aftercare

To reduce the time needed for smoothing the surfaces, the thermal block walls must be brushed clean of flashes immediately after casting. It is important to act quickly because concrete begins to bound within 2–3 hours of the preparation of the concrete. In construction joints, the concrete surface should reach no higher than the middle of the top block layer. The construction joints must be reinforced immediately after cleaning the surface, unless the joints were reinforced before casting. The construction joint reinforcement is indicated in the construction plans. After the concrete starts to set, the wall structure must not be stressed or moved. It is also prohibited to e.g. reinforce the construction joints at this point.

To reach the target strength and consistency, the same aftercare process used with normal concrete structures must also be followed here. Do not neglect aftercare!

The wall structure aftercare, watering, starts immediately after the surfaces have been cleaned up.

The first 24 hours are crucial to the hardening of the concrete. Therefore, the wall structure must be kept

evenly wet during the first 24 hours. After this, the wall structure is watered thoroughly three times a day for six (6) days. In windy and sunny weather, it must be decided on a case-by-case basis whether it is necessary to water the structure more often.

Neglected aftercare weakens the concrete's properties (e.g. weaker final strength, increased shrinkage and lower durability) significantly!

4.14.7 Aftercare in winter

When the temperature is below zero, it is prohibited to water the structure. In winter, the thermal block structure is covered tightly (e.g. tarpaulin) to prevent water from evaporating from the structure. In winter, the aftercare process lasts at least 14 days.

4.15 Fixing the intermediate floor to the exterior wall

The intermediate floor is created with a hollow-core slab or composite plate structure or casting a traditional reinforced concrete slab on the site.

The external skin is made from split thermal blocks, which serve as edge forms. The internal skin of the whole thermal block below supports the intermediate floor structure. The joint reinforcement has been indicated in the construction plans.

The insulation of a split thermal block is 60 mm thick. Therefore, additional EPS insulation of 50–70 mm is added to the structure.

4.16 Coating

4.16.1 Façades

The Lammi Kivitalo wall structure provides good strength and grip properties for coating.

It is recommended to coat (plaster) the external walls after one heating period. To ensure the wall structure is dry enough for coating, measure the concrete's relative humidity through a hole drilled into the concrete or by taking a concrete sample. Do not measure the humidity with a surface moisture meter. The manufacturer of the coating material determines the degree of dryness required.

The thermal block walls are always coated according to the instructions of the coating material manufacturer. The manufacturer provides specifications for each coating method on request.

We recommend using hydrophobic coating agents. Hydrophobic coating agents prevent the absorption of rainwater and keep the wall structure dry. The wall structure also stays clean better when it does not absorb water and impurities.

Before coating the wall structures and installing the water deflectors, cover the exposed separating surfaces (e.g. with a tarpaulin) to prevent rainwater from entering the structures.

We recommend using alkali-protected plastering mesh in the coating. The plastering mesh improves the coating's tensile strength and reduces the appearance of shrinkage cracks on the plaster surface.

When choosing the coating solution, make sure it is not too watertight and allows moisture to escape from inside the structure.

The damp-proofing of underground structures has been described in the construction plan.

4.16.2 Internal surfaces

The thermal block walls are always coated according to the instructions of the coating material manufacturer. The manufacturer provides specifications for each coating method on request.

Measure the wall's moisture content before coating according to section 4.16.1.

4.16.3 Priming of lintels

When a composite profile is used, the zinc-coated steel surface on the bottom of the lintels remains exposed. To ensure that the coating agent sticks to the surface, the steel surface must be primed before coating. The primer used is Emaco's Nanocrete Ap. Nanocrete Ap is a single-component, cement-based steel primer, which is spread on the clean steel surface with a soft paint brush.

Do not let the product freeze in storage. To purchase the primer, please contact our Deliveries or your local Lammin Betoni sales office or the manufacturer.

4.17 Shrinkage

As concrete dries and hardens, it also shrinks. This results in tensile stress in the wall structure. If the tensile strength exceeds the wall's tensile capacity, shrinkage cracks (hair cracks) appear in the wall. The risk of shrinkage can be reduced by using a correct concrete mix ratio and with careful casting and compression, good casting conditions and thorough aftercare. See sections 4.13...4.14.

4.18 Efflorescence

The external casing of the wall structure always dries from inside out. As the structure dries, it pulls minerals along with the water. These minerals react with carbon dioxide on the wall surface, leaving a crystalline growth on the surface. Efflorescence appears as white, fluffy spots on the wall surface. Efflorescence is characteristic to all cement-based materials. It dissolves slowly in water and disappears within 1-2 years on its own.

If efflorescence forms before the wall is coated, remove it with e.g. a wire brush.

4.19 Expansion joints

In addition to shrinkage, the wall structure is transformed by changes in air humidity and temperature. The scale of these transformations is influenced by the wall structure dimensions. The longer the wall, the greater the effect. To manage any transformations, expansion joints are used in the wall structure. See the construction plans for a description of expansion joints.

4.20 Fastening

4.20.1 Connected structures, temporary fastenings

Elements are fastened to block walls similar to other stone and concrete walls. Light loads can be fastened with a plastic plug and concrete screw. Various wedge or hammer anchors are used to fasten heavy loads.

4.20.2 Windows and doors

Windows and doors are fastened mechanically with frame screws. First, a rot-proof batten of 50 x 50 mm is glued inside the insulation, to which the windows and doors are fastened with screws. The gap between the frame and insulation is closed with polyurethane foam and/or insulating wool according to the window and door manufacturer's instructions.

5. WINTER WORK

In winter, the thermal blocks must not be covered in snow or ice. The reinforcing bars must also be free of ice and snow. The structures must be protected against snow and ice. The blocks must not be watered before casting if the temperature is below zero. The polyurethane foam used in the horizontal and vertical block joints must be suitable for use in winter.

See sections 4.14.5 Concreting in winter and 4.14.7 Aftercare in winter.

6. DRYING OF STRUCTURES

The concrete structure has a high moisture content as the hardening process begins. Some of this moisture is absorbed into the structure as the cement hardens, some of it evaporates.

The best solution is to combine various drying methods. Heating accelerates the evaporation process. However, heat is not enough to dry the structure, and effective ventilation is usually needed to remove moisture from the ambient air. This method works well in winter and spring, when the relative humidity of outdoor air is low.

Ventilation does not work in autumn, when the relative humidity level is higher. Instead, it is recommended to use condensing dryers alongside heating. It is important to note that different coating materials have different requirements for the dryness of the surface to be coated. Always check with the material supplier for the material requirements.

The structure drying time depends on the drying method. As a rule of thumb, a concrete structure dries approximately one centimetre a week (if the conditions are favourable). Thus, it is safe to start the coating of the inner surfaces ten (10) weeks after the start of heating and drying at the earliest. The start of drying is considered to be the point when the structure's temperature is increased to exceed 10°C and the ambient humidity rate is under 70% of relative humidity. During the drying process, the optimal indoor air temperature is at least 20°C and the optimal relative humidity is below 50%.

Before starting the coating of concrete structures, the structure's moisture level must be measured as instructed in section 4.16.1.

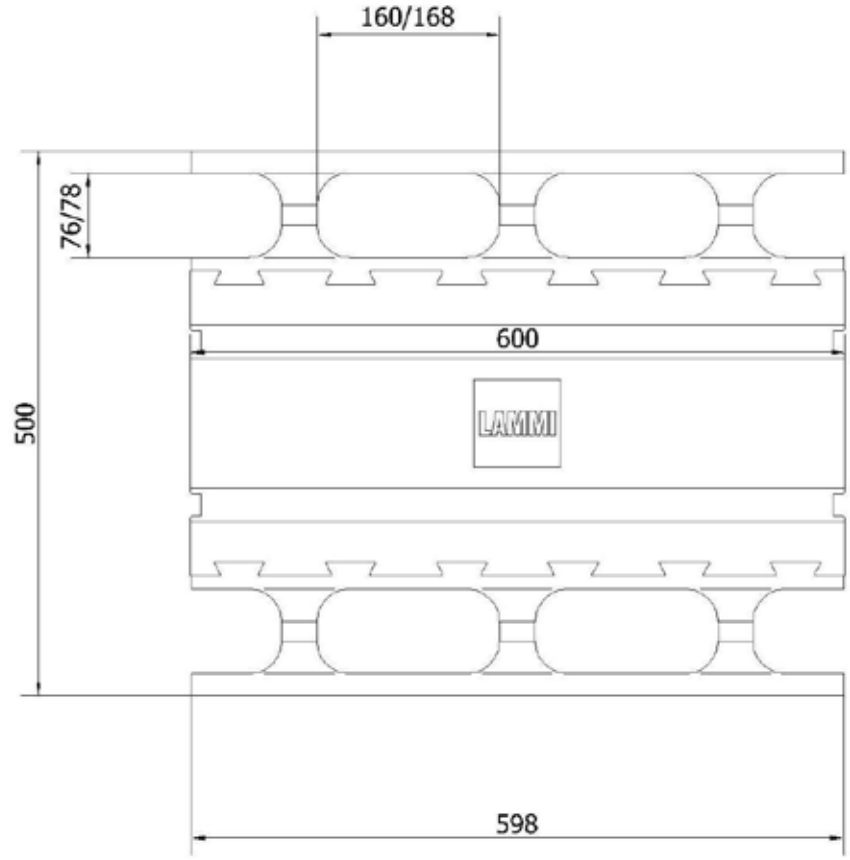
7. CONCLUSION

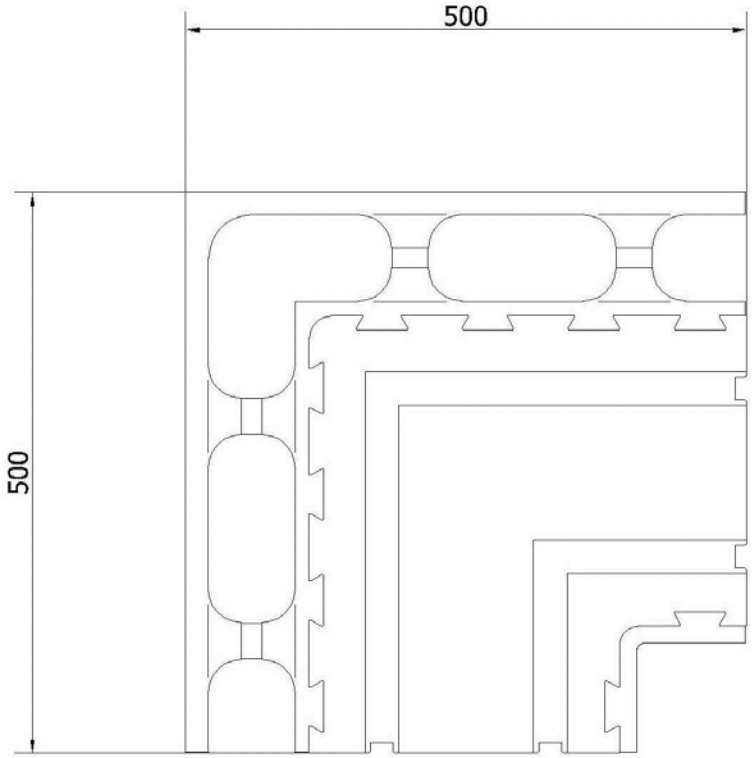
Building is easy when you know what you are doing. If you have any problems, always ask for advice and assistance. Lammin Betoni's technical advice team is happy to help you at 020 7530 400. Lammin Betoni Oy wishes you successful building!

APPENDICES

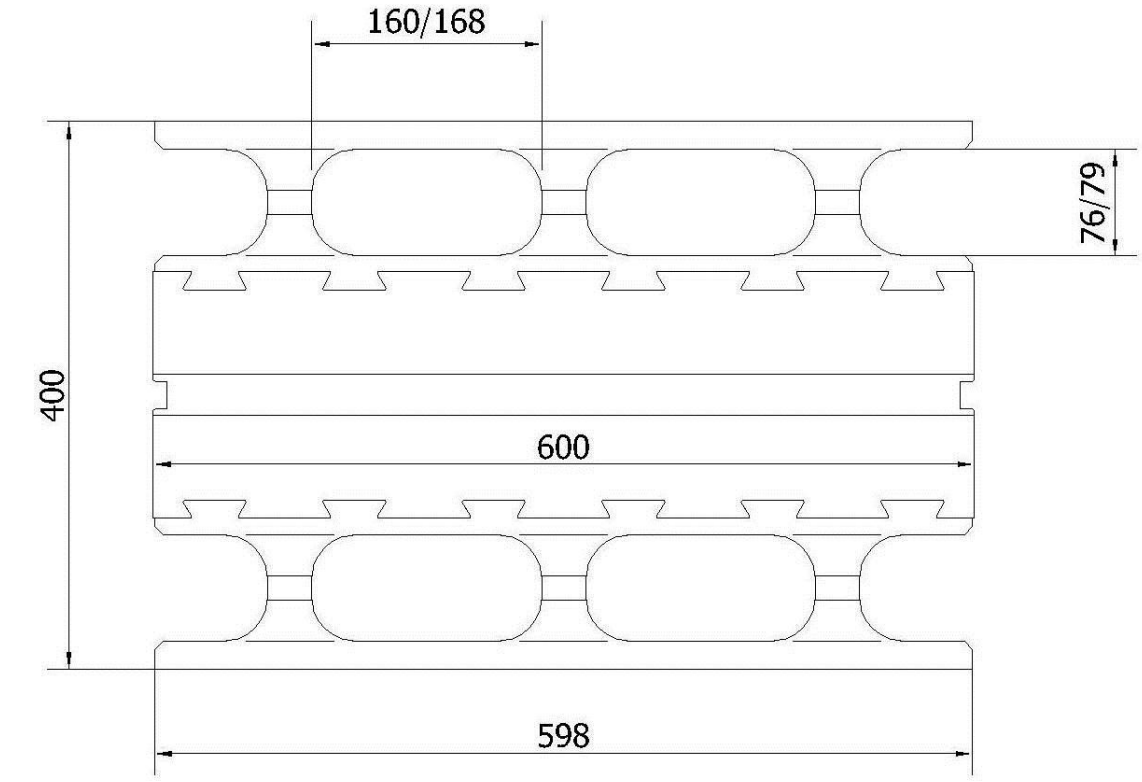
- PRINCIPAL DIMENSIONS OF THERMAL BLOCKS
- PLACEMENT OF REINFORCING RODS
- CHECKLIST FOR CASTING

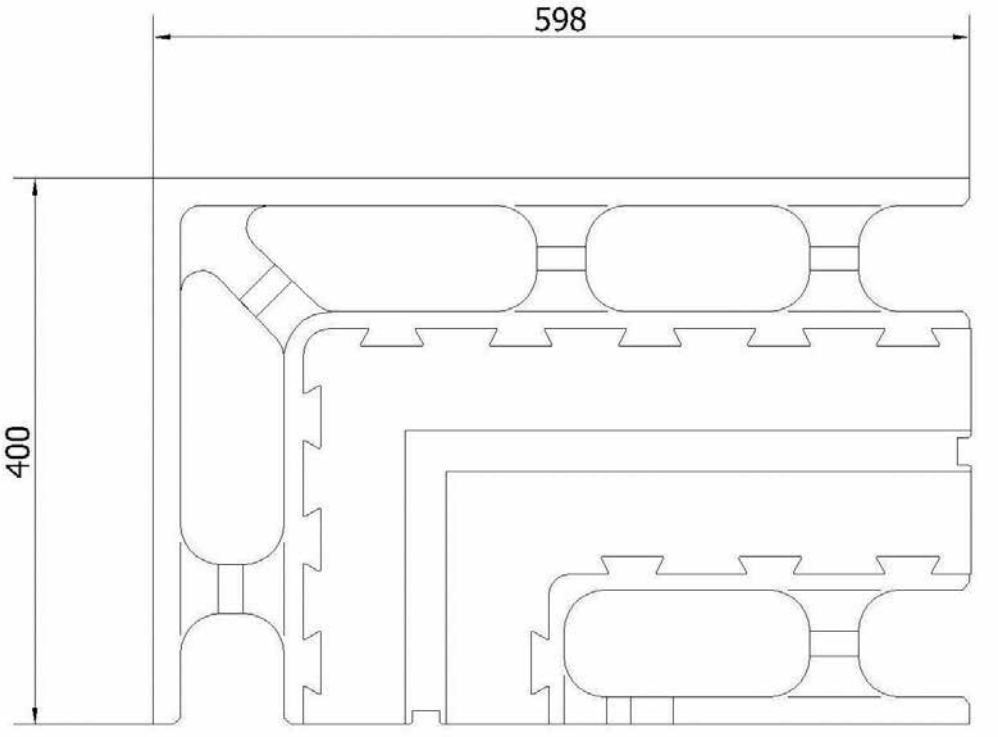
PRINCIPAL DIMENSIONS OF THERMAL BLOCK (LL500)





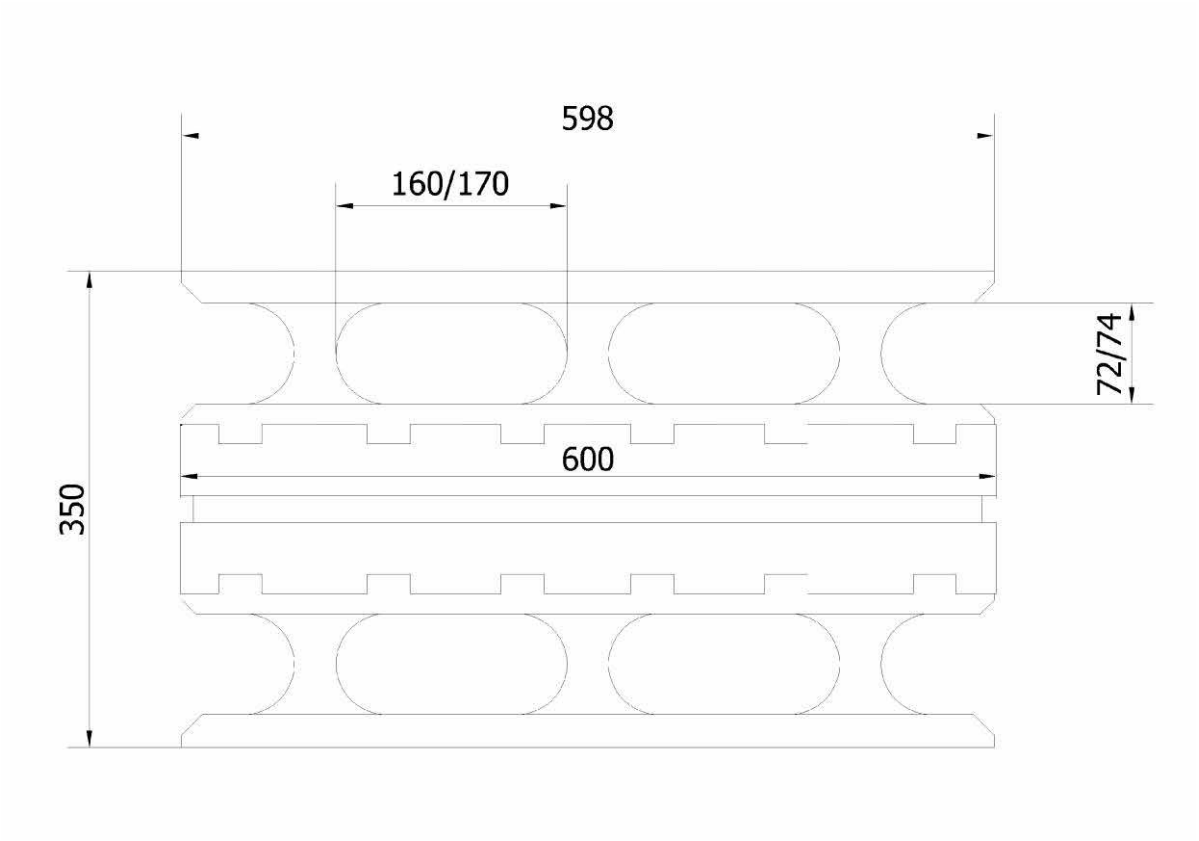
PRINCIPAL DIMENSIONS OF THERMAL BLOCK (LL400)

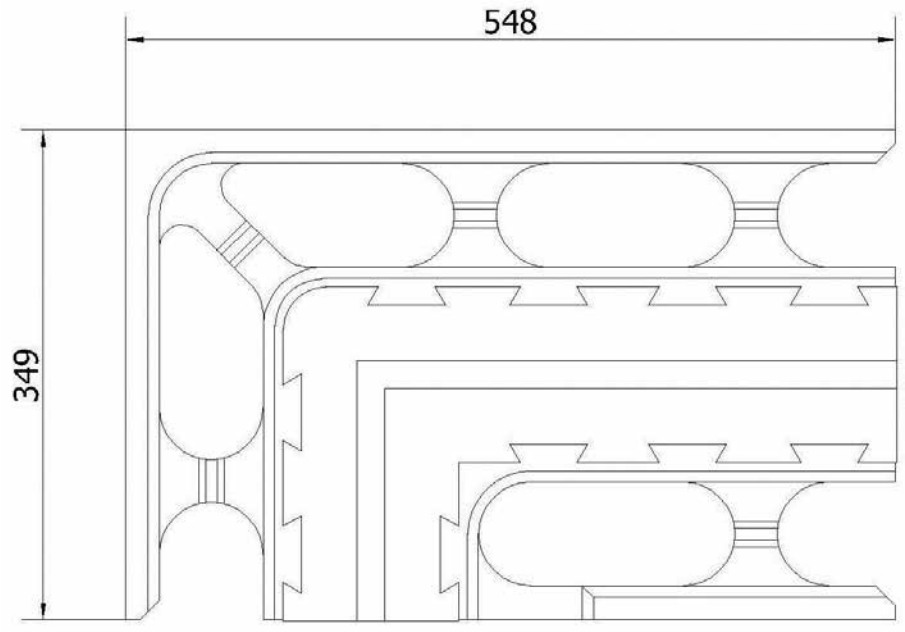




The handedness of the corner blocks is changed by turning the blocks upside down.

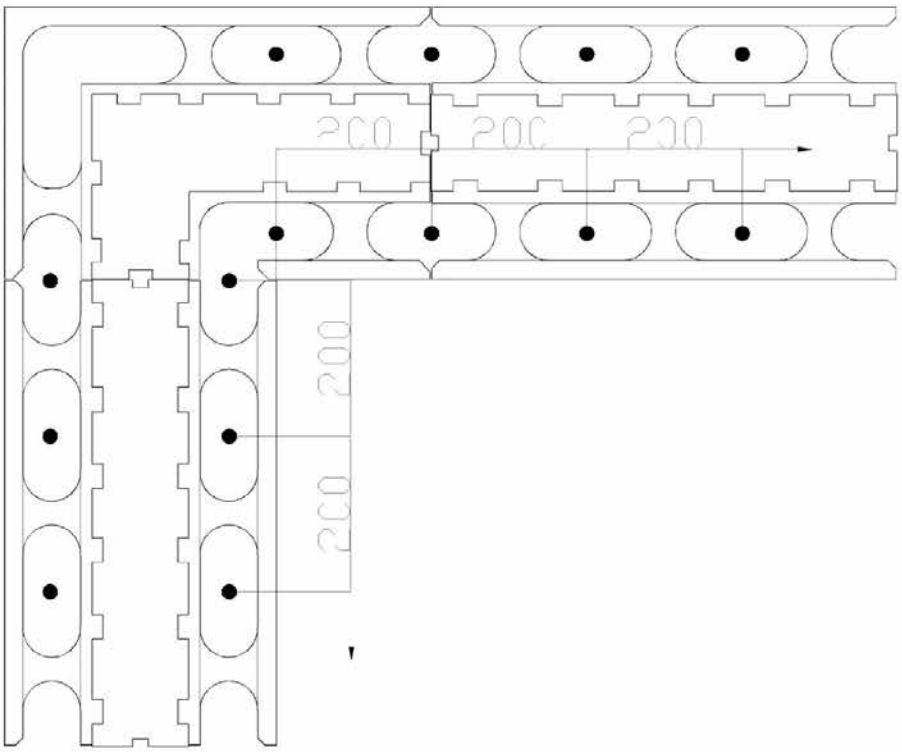
PRINCIPAL DIMENSIONS OF THERMAL BLOCK (EMH350)





The handedness of the corner blocks is changed by turning the blocks upside down.

PLACEMENT OF REINFORCING RODS



CHECKLIST FOR THERMAL BLOCK WALL CASTING

Important to note in the wall casting process.

BEFORE CASTING

· Correct concrete grade. Plasticity S4 (plasticised)

· Correct amount of concrete – 125 litres per square metre

· Ask the concrete supplier to bring plasticiser along in case the concrete has to be plasticised further

· The concrete pump has a 2.5 inch hose with a maximum grain size of 16 mm. (2 inch hose with a max. grain size of 8 mm)

· Spud vibrator 20–25 mm (2 pcs for castings of over 10 m3), water hose for watering the wall, shovel, brush for cleaning the wall, mineral wool for blocking flashes, timber for temporary mould supports, hammer, saw, power drill, nails/concrete screws/spring anchors

· Make sure the molds are supported and sealed carefully. Remember to create moulds for the bottom edges of openings.

· All reinforcing bars have been installed (also vertical)

· Construction joint reinforcements are ready

· Concrete rodding is ready

· Conduits and sockets have been installed

· Water pipes and sockets have been installed

· Central vacuum pipes and sockets have been installed

· Possible drainpipes and vent pipes have been installed

· The pipes have been blocked from above

· Lead-throughs have been installed

· The walls have been watered (not in sub-zero temperatures!)

· Reserve enough manpower, min. four people

DURING CASTING

· Plasticise the concrete further if necessary

· Cast the wall in layers of approximately 0.5 metres by circling the structure

· Vibrate each 0.5 m layer separately

· Do not vibrate next to conduits and sockets

· Do not vibrate too much next to the opening molds and the final (long) hole on the end block

· Keep an eye on the concrete level

· Keep an eye on the formwork of the opening jambs

· Monitor the filling of the opening bottoms (cast in the end if necessary)

· Keep an eye on the patched areas

· Keep an eye on the wall structure joints

· If supports are used, make sure they stay put. Add supports as necessary.

· Stop casting at the halfway point of the top block layer (excl. intermediate floor support and top of the wall, when the casing is cast full)

AFTER CASTING

· Brush the top surface of the wall. Clean the vertical surfaces with a brush or indirect (45 degrees) water spray (do not spray with water in sub-zero temperatures!).

· If necessary, reinforce the construction joints immediately after cleaning the top surface

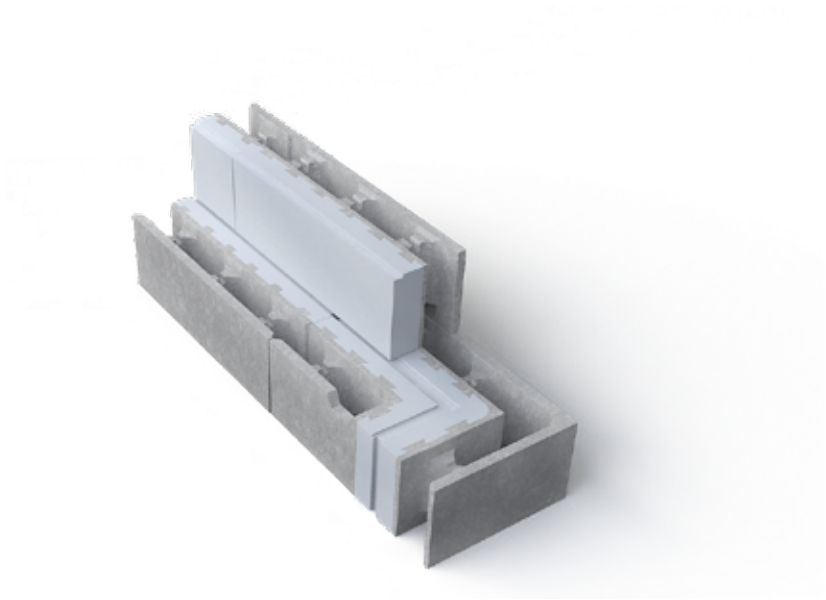
· Install other possible reinforcements, e.g. concrete rodding, immediately

· Clean the bottom parts of the walls from concrete

· Archive the concrete delivery notes and concreting report

· Keep the concrete structure wet for seven (7) days after casting by watering it on both sides three times a day

· Note the special winter work instructions!



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04-2024