A load-bearing thermal insulation system for raft foundations
1. **Concrete blinding**  
   (beneath this, a layer of compacted fill - hardcore - according to the designer’s specifications)
2. **Horizontal waterproofing** (on top of the blinding concrete)
3. **Vertical waterproofing**
4. **Lower and upper layer floor elements** (with a compressive strength of 300 or 400 kPa)
5. **Buttons for secure connection of the lower and upper layer floor elements together**  
   (in the case of seismic loads)
6. **Reinforced-concrete foundation slab**
7. **Edge element** (its height can be adjusted to take into account different thicknesses of the RC slab, and its width according to different thicknesses of the exterior walls regardless of the type of superstructure selected)
8. **Exterior corner element** (its angle can also be selected outside the usual 90 degrees)
9. **Ground insulation along the perimeter of the building** (to be used in the case of buildings without basements, where the level of the foundations is above the expected frost depth)
10. **Studded foil** (for protection of the waterproofing)
Increased care for the environment, higher fuel prices, and ever more demanding technical regulations affecting the field of building construction mean that, at every stage of building works, energy-efficient solutions need to be found. Since, after the year 2020, all new buildings will have to be of the nearly zero energy type, it will be necessary to surround them with a thermal insulation envelope with no thermal bridges. In the case of foundation works, this can be done by means of a thermally insulated foundation slab. In comparison with strip footings, the construction of a thermally insulated raft foundation by means of the JUBHome BASE system is simpler, quicker, and provides higher quality.

As well as helping to reduce heat losses from the building, the continuous waterproofed thermal insulation envelope provides complete protection from ground moisture and ground water under pressure. The JUBHome BASE system is suitable for the foundation of three-storey buildings according to any energy-saving standard. The method of constructing the foundation slab inside a thermally-insulating tub, and the carefully designed order of the following construction stages, guarantee high-quality execution, which, in the case of foundation works, where the later elimination of mistakes can be expensive and difficult to perform, is a big advantage.

The thermally-insulating envelope of the foundation slab using the JUBHome BASE system consists of lower and upper layer floor elements, edge and corner elements, sealing strips, and ground insulation if the foundations of the building are to be constructed above the expected frost depth. Buildings constructed using the JUB-Home BASE system can be adjusted to any kind of shape.

There is no need to provide special support of the edge and corner elements of the thermally-insulating tub which represent the “lost shuttering” of the foundation slab, since they are firmly fixed into the tub. The thermally insulating elements fulfil all the requirements of the standard SIST EN 13163, and the proposed waterproofing methods for protection against ground moisture and ground water under pressure fulfil those of the standard SIST EN 13969. These elements are made from BASF Peripor® 300 E, which means that, apart from having good load-bearing characteristics, they also have a high resistance to the ingress of moisture.
Why choose JUBHome BASE?

- no need for 2-stage concreting, as in the case of strip footings;
- the total excavation volume is reduced;
- pouring of concrete without shuttering;
- simpler reinforcing with less steel-fixing, performed mostly by placing reinforcing meshes;
- a thermally-insulating tub without thermal bridges, simple and high-quality execution of continuous waterproofing;
- due to a more uniform stress distribution, foundation slabs can be built on ground of lower bearing capacity, and on less homogeneous ground;
- rapid construction using a free of charge design plan for the thermally-insulating tub;
- no in situ cutting of elements, and a zero waste site;
- the foundation slab can have any thickness from 16 to 30 cm, with intermediate steps of 2 cm, taking into account the desired level of energy efficiency of the building;
- moisture absorption of less than 2%;
- guidelines for earthquake-resistant construction were developed at IKPIR, the Institute of Structural Engineering, Earthquake Engineering and Computer Science of the Faculty of Civil and Geodetic Engineering, University of Ljubljana.
- technical advice available free of charge during both the design and the construction stages.

View of the shear test of the behaviour of a JUBHome BASE assembly during cyclic horizontal loading - simulation of an earthquake loading

1. Concrete blinding (beneath this, a layer of compacted fill - hardcore - according to the designer’s specifications)
2. Ground insulation along the perimeter of the building (to be used in the case of buildings without basements, where the level of the foundations is above the expected frost depth)
3. Lower and upper layer JUBHome BASE floor elements (with a compressive strength of 300 or 400 kPa)
4. The reinforced-concrete foundation slab
5. The exterior wall (i.e. part of the superstructure), as selected
6. Suitable also for the foundation of buildings with basements reaching below the expected frost depth
7. A JUBHome BASE edge element (with a compressive strength of 400 kPa)
Schematic view of the method of assembly of JUBHome BASE elements

The individual JUBHome BASE elements

1. Lower layer floor element
2. Upper layer floor element
3. Edge element
4. Exterior corner element
5. Interior corner element

The assembled JUBHome BASE system
JUBHome BASE
for a variety of construction systems

1. JUBHome WALL
This is a system for the construction of walls out of thermally-insulating ICF elements made of EPS (ICF - insulated concrete form). The edge elements of the thermal insulation of the JUBHome BASE foundation slab fit directly, without any thermal bridges, into the facade wall which is made of JUBHome WALL wall elements. The ground waterproofing consists of welded bitumen sheets, whereas the vertical waterproofing of the plinth is located directly beneath the render finish.

2. MASONRY SUPERSTRUCTURES
The exterior plane of the masonry wall is aligned with the face of the JUBHome BASE raft foundation, whereas the thickness of the linear edge element depends on the design thickness of the façade’s thermal insulation. Waterproofing and ground insulation is implemented in the same way as in the case of a JUBHome WALL superstructure.

3. TIMBER FRAME CONSTRUCTION ACCORDING TO A LOW-ENERGY STANDARD
The JUBHome BASE edge elements are geometrically adjusted to the vertical plane of the plinth waterproofing, thus providing a continuous waterproofing barrier when joined to the ground waterproofing layer. In order to ensure less severe waterproofing transitions, the top surface of the edge elements has a lateral slope. The space between the vertical plinth waterproofing and the facade plane is filled with EUROTHERM EPS F STRONG S0 boards. Vertical waterproofing is either self-adhesive or else consists of bituminous waterproofing which is welded onto a base layer of reinforced JUBIZOL adhesive mortar.

4. TIMBER FRAME CONSTRUCTION ACCORDING TO A PASSIVE ENERGY STANDARD
The load-bearing structure of the timber frame wall is shifted a certain distance outwards with respect to the vertical edge of the raft foundation. In this case, too, the top surface of the JUBHome BASE edge elements has a lateral slope in order to ensure continuity of the waterproofing and the thermal insulation.
Thickneses and fields of application

JUBHome BASE is a system for the thermal insulation of the foundation slabs of buildings up to three storeys high, with or without a basement. In the case of light-weight building materials for walls (i.e. for prefabricated and timber-framed buildings, and for buildings with walls made of aerated concrete blocks) JUBHome BASE floor elements with a compressive strength of 300 kPa can be used, whereas in the case of buildings with walls made of brick-masonry or concrete these elements have to have a compressive strength of 400 kPa. The standard total thicknesses of the assembled lower and upper layer floor elements are 16, 24 in 30 cm, and intermediate thicknesses of the upper layer floor elements are available in steps of 2 cm. The thickness of the RC foundation slab, as well as the compressive strength of the JUBHome BASE elements, is defined by the designer of the building.

<table>
<thead>
<tr>
<th>Thicknesses of JUBHome BASE system</th>
<th>Thicknesses of the layers (cm)</th>
<th>Total thickness (cm)</th>
<th>λ Peripor (W/mK)</th>
<th>U (W/m²K)</th>
<th>Compressive strength (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 cm</td>
<td>8 + 8</td>
<td>16</td>
<td>0,033</td>
<td>0,206</td>
<td>300 / 400</td>
</tr>
<tr>
<td>24 cm</td>
<td>8 + 16</td>
<td>24</td>
<td>0,033</td>
<td>0,138</td>
<td>300 / 400</td>
</tr>
<tr>
<td>30 cm</td>
<td>8 + 22</td>
<td>30</td>
<td>0,033</td>
<td>0,110</td>
<td>300 / 400</td>
</tr>
<tr>
<td>any selected 16 - 30 cm, with 2 cm steps</td>
<td>8 + (8 do 22)</td>
<td>16 - 30</td>
<td>0,033</td>
<td>0,206 - 0,110</td>
<td>300 / 400</td>
</tr>
</tbody>
</table>

1. Lower layer floor element, with a thickness of 8 cm
2. Upper layer floor element, with a thickness of 8 cm
3. Upper layer floor element, with a thickness of 16 cm
4. Upper layer floor element, with a thickness of 22 cm
Ground insulation around the perimeter of buildings

In the case of foundations whose bottom edges are located above the expected frost depth, the soil around the perimeters of the thermally insulated foundation slabs has to be thermally insulated. In this way, the occurrence of ice lenses beneath the perimeter can be avoided, including any damage to the waterproofing and the leaching of fine soil particles during freezing/thawing periods. This protection is provided by means of simply-supported EUROTERM EPS F Strong S0 thermal insulation boards. The latter’s width and thickness depend on the annual average external air temperature at the site.

The width and thickness of the ground insulation in the case of a foundation depth of 40 cm:

<table>
<thead>
<tr>
<th>Annual average external air temperature (°C)</th>
<th>Width of the strip of EUROTERM EPS F Strong-S0 elements</th>
<th>Thickness of the EUROTERM EPS F Strong-S0 elements (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8-12</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>6-8</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>4-6</td>
<td>100</td>
<td>125</td>
</tr>
<tr>
<td>&lt;4</td>
<td>In this zone, foundations of buildings above the expected frost depth must not be implemented without detailed calculations.</td>
<td></td>
</tr>
</tbody>
</table>
Instructions for the installation of the JUBHome BASE system

The layer of blinding concrete must be suitably levelled and trowelled for the welding of the layer of bituminous waterproofing on top of it. The permissible surface unevenness amounts to 20 mm / 4.0 m, except in the case of an ICF superstructure (i.e. JUBHome WALL), where it amounts to just 10 mm / 4.0 m. Horizontal plane alignment, i.e. the inclination of the blinding concrete must not exceed 16 mm / 15.0 m.

The bituminous welding membrane must be fully welded to the surface of the layer of blinding concrete in order to achieve sufficient friction and stability of the structure in the case of seismic loads. Before placing the floor elements of the thermally insulated tub, the PE foil on this part of the waterproofing is removed.

The waterproofing sheets on top of the layer of blinding concrete are welded to a distance of 20 cm outside the perimeter of the JUBHome BASE elements, according to the assembly plan. The vertical waterproofing can then, with the help of an arris rail made of EPS, be welded onto the horizontal waterproofing. In order to maintain a clean connection surface (i.e. during construction of the foundation slab), this surface should be protected by placing felt strips and EPS boards.

The locations of the corner points of the thermal insulation tub’s external perimeter are transferred from markers at the edges of the excavated construction pit onto the waterproofing, and are properly marked. Using laser gauges, marking strings, and other aids, the tub’s perimeter is then set out. Assembly of the floor elements begins along the longest edge of the outline, which, in the assembly plan, runs parallel to the longer side of the thermal insulation tub.

The edge elements and the first row of lower layer floor elements are first placed along the marked edges of the tub. The elements are aligned and connected together by laying the first course of the upper layer floor elements. Following the instructions, the assembly is continued in this way by laying floor elements from one of the corners in a fanned pattern simultaneously in both directions towards the diagonally opposite corner. Uniform joints between the upper layer and lower layer floor elements are achieved by applying appropriate pressure to the upper layer elements.

In order to prevent the ingress of cement laitance into the joints between the upper layer elements of the thermally insulating tub, before the reinforcement is placed these elements are sealed using single-sided adhesive waterproof tape.

Reinforcement is placed in the thermally insulating tub in accordance with the reinforcement plans. Wide PE or cement bar spacers, as well as straight or curved chairs, may be used. After this the concrete is poured.

In the case of superstructures built using the JUBHome WALL system, the same permissible unevenness of the foundation slab should be taken into account as in the case of the blinding concrete, i.e. 10 mm / 4.0 m.

When applying vertical waterproofing to the plinth, it is necessary to follow the instructions which apply to individual materials. Whenever welded waterproofing sheets are used the surface of the EPS elements must be first protected against the effect of any burner flame. The transition from the horizontal to the vertical plane of the plinth should always be made less severe by the use of an arris rail with a triangular cross-section, made of EPS.
What your **JUBHome BASE** offer contains

**Preparation of our offer:**

JUBHome will, at your request, prepare an offer for the delivery and construction of a JUBHome BASE thermally insulated foundation slab for individual buildings. For this please:

1) supply your architectural plan and contact details,
2) state which compressive strength the JUBHome BASE elements should have.

Please send these details to info@jubhome.eu, and we will send you an offer within 5 days.

**Prices from the JUBHome BASE offer will include:**

- the elements of the JUBHome BASE system, fitted to the dimensions of your building;
- an assembly plan for the JUBHome BASE elements;

(The prices of JUBHome BASE products are stated in the currently valid Price List. The general sales terms of JUBHome d.o.o. apply.)

- technical support, at no charge:
  - to investors and independent house builders:
    - advice; instructions for the performance of works.
  - to designers:
    - design guidelines;
    - typical lists of building and craftsmen’s works; JUBHome technical documentation (details);
    - training and advice.
  - to builders:
    - instructions for building;
    - JUBHome technical documentation (details); training for installation works;
    - training and advice.

**JUBHome also offers design services:**

You can also order the design and structural proportioning of a foundation slab, based on your choice of the compressive strength of JUBHome BASE floor elements, as well as the redesign of foundations from strip footings to a foundation slab.
### JUBHome BASE 300

<table>
<thead>
<tr>
<th>Dimensions and geometric characteristics</th>
<th>Standard</th>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>EN 822</td>
<td>L</td>
<td>1200 mm ± 3 mm</td>
</tr>
<tr>
<td>Width</td>
<td>EN 822</td>
<td>W</td>
<td>900 mm ± 2 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>EN 823</td>
<td>T</td>
<td>80-220 mm ± 2 mm</td>
</tr>
<tr>
<td>Perpendicularity</td>
<td>EN 824</td>
<td>S</td>
<td>1200/900 mm ± 1 mm/m</td>
</tr>
<tr>
<td>Flatness</td>
<td>EN 825</td>
<td>P</td>
<td>1200/900 mm ± 5 mm</td>
</tr>
</tbody>
</table>

**Pending the results of measurements, this value has been adopted from Point 2 of Annex F of the standard SIST EN 13163. Other mechanical characteristics are given in the technical sheets and design guidelines.**

<table>
<thead>
<tr>
<th>Strength and other building-technical characteristics</th>
<th>Standard</th>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength at 10% deformation</td>
<td>EN 826</td>
<td>CS</td>
<td>≥300 kPa</td>
</tr>
<tr>
<td>Shear strength</td>
<td>EN 12090</td>
<td>SS</td>
<td>≥225 kPa</td>
</tr>
<tr>
<td>Shear modulus</td>
<td>EN 12090</td>
<td>G</td>
<td>≥6500 kPa</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>EN 826</td>
<td>E</td>
<td>≥15000 kPa</td>
</tr>
<tr>
<td>Bending strength</td>
<td>EN 12089</td>
<td>BS</td>
<td>≥450 kPa</td>
</tr>
<tr>
<td>Long-term water absorption – by immersion</td>
<td>EN 12087</td>
<td>WL(T)</td>
<td>2%</td>
</tr>
<tr>
<td>Long-term water absorption – by diffusion</td>
<td>EN 12088</td>
<td>WD(V)</td>
<td>1%</td>
</tr>
<tr>
<td>Freeze / thaw resistance with diffusion</td>
<td>EN 12091</td>
<td>FTCD</td>
<td>5%</td>
</tr>
<tr>
<td>Compressive creep*</td>
<td>EN 1606</td>
<td>CC</td>
<td>90 kPa</td>
</tr>
<tr>
<td>Declared thermal conductivity</td>
<td>EN 12667</td>
<td>XD</td>
<td>0,033 W/mK</td>
</tr>
<tr>
<td>Reaction to fire</td>
<td>EN 13501-1</td>
<td>-</td>
<td>Euroclass E</td>
</tr>
</tbody>
</table>

### JUBHome BASE 400

<table>
<thead>
<tr>
<th>Dimensions and geometric characteristics</th>
<th>Standard</th>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>EN 822</td>
<td>L</td>
<td>1200 mm ± 3 mm</td>
</tr>
<tr>
<td>Width</td>
<td>EN 822</td>
<td>W</td>
<td>900 mm ± 2 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>EN 823</td>
<td>T</td>
<td>80-220 mm ± 2 mm</td>
</tr>
<tr>
<td>Perpendicularity</td>
<td>EN 824</td>
<td>S</td>
<td>1200/900 mm ± 1 mm/m</td>
</tr>
<tr>
<td>Flatness</td>
<td>EN 825</td>
<td>P</td>
<td>1200/900 mm ± 5 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strength and other building-technical characteristics</th>
<th>Standard</th>
<th>Mark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength at 10% deformation</td>
<td>EN 826</td>
<td>CS</td>
<td>≥400 kPa</td>
</tr>
<tr>
<td>Shear strength</td>
<td>EN 12090</td>
<td>SS</td>
<td>≥300 kPa</td>
</tr>
<tr>
<td>Shear modulus</td>
<td>EN 12090</td>
<td>G</td>
<td>≥8600 kPa</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>EN 826</td>
<td>E</td>
<td>≥20000 kPa</td>
</tr>
<tr>
<td>Bending strength</td>
<td>EN 12089</td>
<td>BS</td>
<td>≥600 kPa</td>
</tr>
<tr>
<td>Long-term water absorption – by immersion</td>
<td>EN 12087</td>
<td>WL(T)</td>
<td>2%</td>
</tr>
<tr>
<td>Long-term water absorption – by diffusion</td>
<td>EN 12088</td>
<td>WD(V)</td>
<td>1%</td>
</tr>
<tr>
<td>Freeze / thaw resistance with diffusion</td>
<td>EN 12091</td>
<td>FTCD</td>
<td>5%</td>
</tr>
<tr>
<td>Compressive creep*</td>
<td>EN 1606</td>
<td>CC</td>
<td>120 kPa</td>
</tr>
<tr>
<td>Declared thermal conductivity</td>
<td>EN 12667</td>
<td>XD</td>
<td>0,033 W/mK</td>
</tr>
<tr>
<td>Reaction to fire</td>
<td>EN 13501-1</td>
<td>-</td>
<td>Euroclass E</td>
</tr>
</tbody>
</table>
JUBHome Systems:

**JUBHome BASE** – Load-bearing thermal insulation for foundation slabs
- Thermal losses through the ground are reduced, $U = 0.2 - 0.11 \text{ W/m}^2\text{K}$, thermal bridges are prevented.
- By choosing elements of suitable thickness, suitable for low-energy and passive or nearly zero-energy houses.
- For all types of structural systems - ICF, masonry, prefabricated, timber framed.
- No shuttering is needed for the construction of the concrete foundation slab.
- External waterproofing provides complete protection from ground moisture and ground water under pressure.
- Buildings can be founded not only in seismically active regions but also on ground with lower bearing capacity.

**JUBHome WALL** - Load-bearing walls made from thermally insulating ICF elements
- Reduced heat losses through exterior walls, $U = 0.2 - 0.084 \text{ W/m}^2\text{K}$.
- High level of airtightness and the absence of thermal bridges.
- Reduced costs of the render finishes of exterior and interior walls, since the final layer is applied directly to the wall elements.
- The reinforced-concrete core of the walls provides durability, strength and seismic resistance.
- Minimal physical effort is required for their installation, with no heavy site equipment, and a zero-waste building-site.

**JUBHome FLOOR** – Thermally insulating formwork for flat and sloping RC slabs
- Simple execution of an unheated basement beneath a heated ground floor.
- Rapid and precise placing of concrete in the ribbed inter-storey slabs, without formwork.
- Lost shuttering and at the same time additional thermal insulation of flat and sloping RC roofs.
- A less complex support system is needed for the execution of thermally-insulating ribbed inter-storey slabs.

**JUBHome ROOF** – Thermal insulation for roofs
- Simple installation using groove/tongue interlocking, on top of a ready-prepared timber roof structure.
- Walk-on system elements suitable for new buildings, renewal works, and the energy-retrofitting of roofs.
- For all kinds of roofing materials, and for all wind loading conditions.

**JUBHome** – Energy-saving solidly-built family homes
- Any energy saving class can be selected: low-energy, passive, nearly zero energy, self-sufficient.
- Different packets are available: from do-it-yourself to turn-key projects.
- A solidly built house, which is ready for occupation in half a year.
- Individually designed houses can be planned and built; typical houses can also be built, and put on the market.