6.6 Floating floors of CETRIS® floor elements

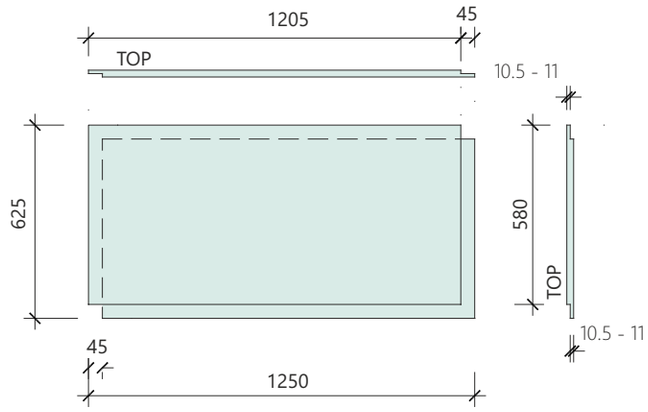
The IZOCET and POLYCET lightweight floating floor systems have been offered for over 20 years. During this time, thousands of m² of floor area have been installed, mainly in residential, office and school buildings.

The whole system uses the favourable effect of fully supported insulation boards (softboard, polystyrene...), which prevent noise from spreading into the rooms below the floor and ceiling. The load-spreading layer in this case is always two layers of CETRIS® cement bonded particleboards 12 or 10 mm thick, which are laid staggered and screwed together. The same synergistic effect can be achieved with floor elements – an element made of two layers of CETRIS® boards bonded with a rebate, or of one CETRIS® board milled with a rebate.

The existing POLYCET, IZOCET floor systems remain available, as does the option of forming the load-spreading layer of a floating floor from various sizes of CETRIS® BASIC boards (1250x625 mm up to the basic size 1250x3350 mm). The new floor elements simplify laying; the rebate system reduces board cutting during laying. Joining the elements in the rebate is also faster, and the combination of mechanical fixing and bonding ensures that the whole load-spreading layer is compact.

The floor element is intended to form a load-spreading layer laid on insulation boards designed for lightweight floating floor systems. The CETRIS® floor element is a cement bonded particleboard panel with a rebated edge, offered in the following variants:

Technical specification of floor elements with rebated edges:

Trade name	**CETRIS® PDP 22 mm**
Description:	Panel made by milling a cement bonded particleboard th. 22 mm, rebate 45 mm wide
Drawing:	
Size incl. rebate:	1250 x 625 mm
Size after laying:	1205 x 580 mm
Element thickness:	22 mm

Packaging					
Floor element type (mm)	Approx. weight (kg/m²)	Approx. weight (kg/pc)	Number of elements per pallet (pcs)	Element area (incl. tongue) per pallet (m²)	Total approx. weight incl. pallet (kg)
CETRIS® 10 mm +10 mm	29.0	22.6	40	31.25	954
CETRIS® 12 mm +12 mm	34.8	27.2	35	27.34	1002
CETRIS® 22 mm – rebated edge	31.9	24.9	30	34.51	798

CETRIS® floor elements are stacked on wooden transport pallets that allow handling by forklift. They are secured by strapping the elements to the pallet crosswise. CETRIS® floor elements are protected against the weather by PE foil wrapping. However, packing CETRIS® floor elements in PE foil does not meet the conditions for long-term exposure to the weather when stored in the open. CETRIS® floor elements should be stored in covered, dry areas so that the boards do not get damp before laying. In storage, pallets with CETRIS® floor elements may be stacked in max. two layers. During handling, CETRIS® floor elements should be placed on a pallet. Otherwise the elements are handled in a vertical position. Manual carrying is also done in a vertical position.

Preparing the substrate before laying the floor:

Load-bearing substrate, requirements and preparation

To ensure the final surface quality of the floating floor for laying the wearing layers, the preparation of the load-bearing substrate is important. The load-bearing substrate may be a solid floor structure (reinforced concrete slab, ceramic floors, HURDIS floors, etc.) or a timber joist floor with plank boarding, a timber log floor or a concrete ground slab. The load-bearing substrate is assumed to be able to carry at least the load = standard (imposed) load + floor weight, with the maximum deflection of the floor structure according to the given requirements. The substrate must be dry and load-bearing with a flatness of max. 4 mm per 2 m. If the permissible flatness deviations of the load-bearing substrate are not met, the permissible flatness deviations under the wearing layer cannot subsequently be guaranteed. Local unevenness may be up to 5 mm (e.g. individual protruding aggregate, concrete burrs or knots in a timber substrate) with regard to subsequent creep of the insulation layer. If the substrate is not flat enough, it must be levelled.

Levelling the load-bearing substrate

The substrate can be levelled in two ways:

1. wet method – using cement-sand mortar or a layer of self-levelling compound according to the manufacturers' instructions

2. with a dry fill – dry levelling mixtures based on crushed aerated concrete or perlite can be used for the fill. The minimum fill height is 10 mm; the maximum height for use categories A and B is 60 mm, for categories C1-3, C5 and D1 20-30 mm (see Tab. 2 – Permissible heights of insulation boards (fills) depending on the imposed load). Suitable fills: FERMACELL, Cemwood CW 1000, Cemwood CW 2000.

When levelling the surface of a timber joist floor, the quality of the load-bearing structure is assessed first; worn, warped (unevenness over 5 mm) or otherwise damaged boards are replaced. Building paper is laid on the boarding as protection against the dry fill falling through knot holes and gaps between the boards. Levelling fills are applied according to the manufacturers' instructions. We recommend laying one layer of wood-fibre insulation th. min. 10 mm on the fill (prevents creaking at the contact between the fill and the CETRIS® floor element).

Damp-proofing

To prevent moisture transport into the thermal and sound insulation layer, this layer must be separated from the floor structure by a protective foil. This barrier applies above all to load-bearing floor structures containing residual moisture or where increased moisture penetration through the floor structure is expected. For this purpose, a damp-proof foil, e.g. PE foil th. 0.2 mm, is spread over the cleaned surface with overlaps between the strips of min. 200 mm (the joints may also be taped), turned up the vertical structures above the level of the planned floor.

When levelling with a self-levelling compound, the damp-proofing is laid on the finished compound; when levelling with a fill, it is placed between the load-bearing structure and the fill.

When laying the floor on a load-bearing timber structure or on an original floor structure, the use of PE foil is not recommended, so that the floor structure can "breathe". If there are rooms with increased air humidity (bathroom, kitchen) below the floor, moisture transport into the structure must be prevented or its free evaporation ensured. Damp-proofing must be addressed for the entire floor and ceiling structure. For possible ventilation of damp structures, a micro-ventilation layer or a studded membrane can be used.

Laying floors of CETRIS® floor elements:

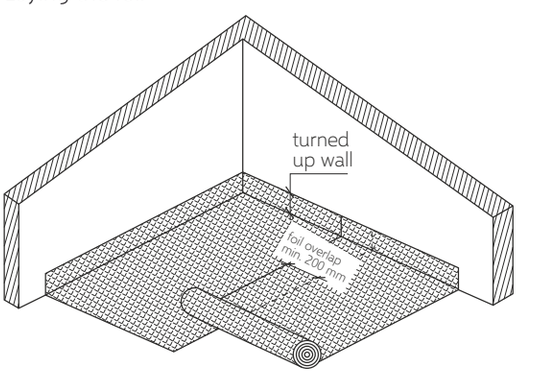
1. Floating floors of CETRIS® PDP elements are laid as the final structure after all "wet" construction work has been completed (after partitions have been built, plastering done, etc.).

2. Floating floors of CETRIS® PDP floor elements are laid on a dry and clean substrate.

3. Before laying the floor structure, the floor elements must be acclimatised for min. 48 hours at min. 18°C and a relative air humidity of max. 70%. This brings the production moisture of the board closer to the equilibrium moisture in use and reduces later changes in shape.

4. In cases where the substrate contains a high level of residual moisture, or there is a risk of increased moisture penetration through the floor structure, PE foil is laid on the substrate with an overlap of 200 mm between the strips and turned up the vertical structures at least to the height of the floor structure.

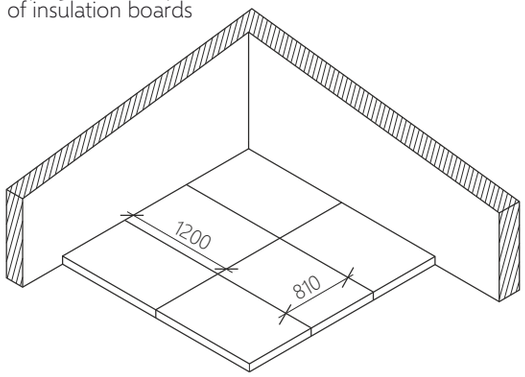
Laying the foil



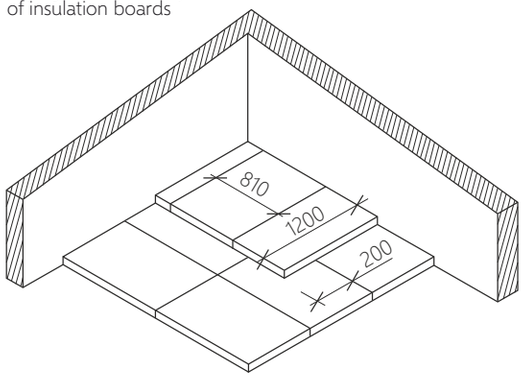
5. If the substrate needs to be levelled with a dry fill, the fill is always spread over only part of the area at a time. We recommend laying one layer of wood-fibre insulation th. min. 10 mm, max. 30 mm on the fill (prevents creaking at the contact between the fill and the CETRIS® PDP floor element).

6. Before laying the CETRIS® PDP floor elements, the laying direction of the insulation boards must be determined. When laying the individual layers, the principle is that they are laid crosswise over each other. At the same time, care must be taken that the joints of the insulation boards and of the CETRIS® PDP floor elements do not lie above each other. The maximum insulation height depends on the insulation type and the area of use – see the table Permissible heights of insulation boards (fills) depending on the imposed load.

Laying the first layer of insulation boards



Laying the second layer of insulation boards



7. The insulation boards are laid tight against the vertical structures. The insulation boards are laid without expansion joints in the floor area.

Where the dry floor structure passes through a door threshold, the fitting of the door frame must be resolved. The frame must be aligned and packed to the exact height along its entire length under the bottom central rail. When fixing the door threshold, longer screws must be used so that the frame is connected to the base profile.

If insulation higher than 60 mm or a fill higher than 40 mm is used, we recommend fitting support battens under the CETRIS® PDP elements on both sides at the door threshold. The recommended size of the support batten is 80x40 (60) mm; they can be made up to the total insulation height with a cut piece of EPS board of adequate thickness (see detail).

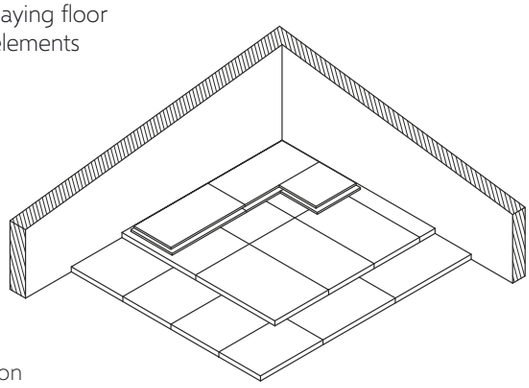
The effect of the reduced impact sound attenuation due to the local use is negligible. We also recommend the support batten solution for an expansion joint in the floor area (area larger than 6x6 m), at floor transitions, etc. We recommend laying a separating foil (Mirelon, max. 2 mm thick) on EPS (polystyrene) insulation boards to prevent creaking.

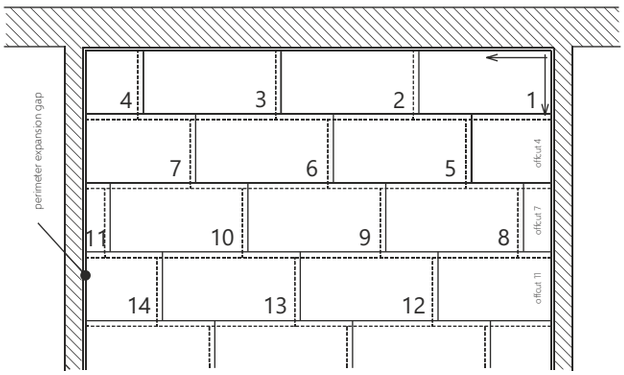
8. Around vertical structures (walls, columns, etc.) an expansion joint 15 mm wide is formed. It is recommended to insert a strip of mineral wool or polystyrene th. 15 mm into the expansion joint around vertical structures, which prevents the joint from becoming clogged during subsequent work. This strip is cut off at the required height after the final surface finish of the floating floor has been completed, before the floor covering is laid.

9. Laying of CETRIS®PDP floor elements starts with a whole element opposite the door. The elements are laid with a stagger – an offset of min. 200 mm; no cross joints may occur during laying. On the first element in the first row, the protruding rebate must be cut off on both the long (longitudinal) and short (transverse) sides. On the remaining elements in the first row, the rebate must be cut off on the longer (longitudinal) side. For the last floor element in the first row, first cut the element to the required width, then cut off the rebate on its longitudinal side. The offcut (width min. 200 mm) can be used to start the second row.



Laying floor elements

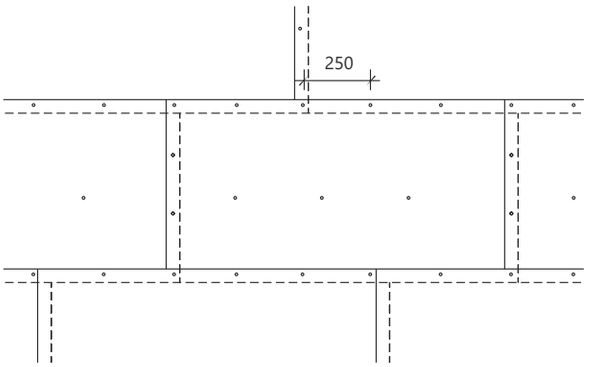


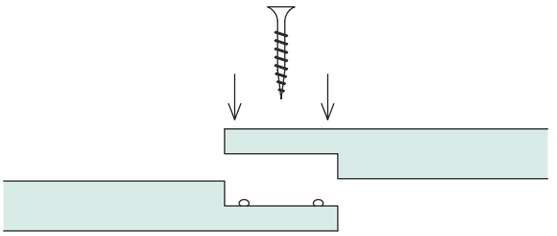


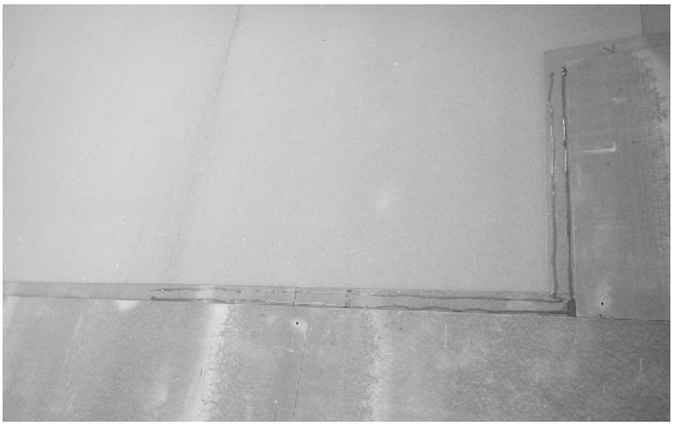
10. After laying the floor element, the rebates must be bonded – apply two beads of adhesive about 25 mm apart on the upper side of the rebate. Suitable adhesive types:

    - polyurethane wood adhesives (e.g. Den Braven D4 polyurethane wood adhesive, Soudal PRO 45P, etc.).
    - assembly adhesives Uzin Fondur High Tack, Sikaflex 552, Innotec Adheseal.

    Approximate consumption is 40 g of adhesive per m² of laid area. Bonding of the floor panels must be carried out at a relative air humidity of max. 80% and a minimum room temperature of 5°C. CETRIS® floor elements must be laid tight against each other.







11. Within 10 minutes of bonding, the floor elements must also be joined mechanically so that the adhesive does not foam up and lift the elements in the rebate. For screwing CETRIS® PDP 10 mm + 10 mm elements, 4.2x25 mm screws are sufficient; for CETRIS® PDP 12 mm + 12 mm elements, or CETRIS® PDP 22 mm rebated edge, screws with a length of min. 30 mm. Screws with cutting ribs under the head are recommended, allowing the head to be countersunk during screwing. The maximum screw spacing is 250 mm (rebate joint). For a panel of two bonded boards (CETRIS® PDP 10 mm + 10 mm), the elements must at the same time also be anchored in the field (3 screws according to the diagram).

    When stapling, the maximum staple spacing is 200 mm around the perimeter (at the bonded rebate); a suitable staple type is KG 718 CDNK geh (staples for "board to board" joints) + min. 3 staples in the field. To ensure the initial pressure, load the floor element with your own weight and then screw the elements together.

12. After laying the CETRIS® PDP floor elements, the edge strip and insulation foil are cut off with a knife at the required height. Full loading of the floor is possible only after the adhesive has cured (approx. 24 h at a temperature of 15°C and relative air humidity of max. 65%), when excess adhesive is also removed (e.g. with a spatula). If the floor covering is not laid within 48 hours after the adhesive has cured, it is recommended to give the surface of the floor elements a protective coat – preferably the primer recommended for the subsequent floor covering – or to cover it with foil (to ensure uniform acclimatisation of the installed floor elements).

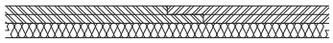
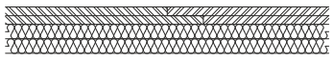
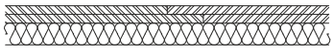
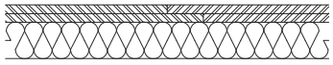
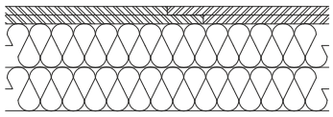
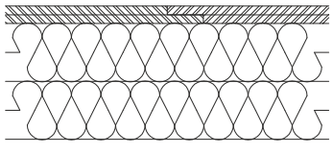
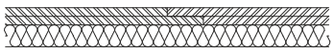
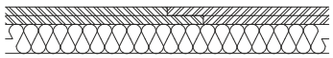
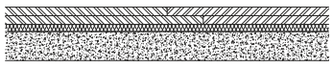
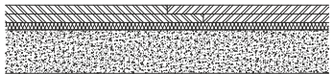
13. When installing a large floor area, we recommend laying the insulation and boards gradually, section by section of the expansion bay. This reduces the risk of damage to the insulation boards by workers moving about.

    ~~Note: due to~~ drying and gradual acclimatisation of CETRIS® PDP floor elements, slight lifting of the free edges (at walls, in corners) may occur after laying, especially in the winter months. This can be eliminated by locally anchoring the CETRIS® PDP floor elements to the substrate (boarding, floor structure).

Sound insulation and thermal insulation properties:

The acoustic properties of floors of CETRIS® cement bonded particleboards were determined by the laboratory method according to ČSN EN ISO 10140-1, ČSN EN ISO 10140-2 and ČSN EN ISO 10140-3 on a standard floor slab (reinforced concrete floor slab th. 140 mm). The thermal properties of the floating floor are characterised mainly by the properties of the insulation boards; the values of improved thermal resistance were determined by calculation.

Acoustic and thermal parameters of lightweight floating floors on a reinforced concrete floor slab

	Construction diagram	Floor build-up	Airborne sound insulation index R_w	Normalised impact sound level L_{nw}	Reduction of normalised impact sound level ΔL_w	Improvement of thermal resistance R ($Wm^{-2}K^{-1}$)
1		CETRIS® 12+12 mm wood-fibre insulation 20 mm	58 dB	54 dB	26 dB	0.49
2		CETRIS® 12+12 mm wood-fibre insulation 2x20 mm	59dB	52 dB	28 dB	0.89
3		CETRIS® 10+10 mm EPS T 4000 30 mm	54 dB	57 dB	23 dB	0.84
4		CETRIS® 12+12 mm EPS T 4000 50 mm	57 dB	54 dB	22 dB	1.19
5		CETRIS® 12+12 mm EPS 100 S 60+60 mm	60 dB	52 dB	25 dB	3.24
6		CETRIS® 10+10 mm EPS 100 S 80+80 mm	58 dB	53 dB	26 dB	3.65
7		CETRIS® 12+12 mm EPS 200 S 30 mm	55 dB	58 dB	22 dB	0.97
8		CETRIS® 10+10 mm Rockwool Steprock 40 mm	59 dB	46 dB	33 dB	1.23
9		CETRIS® 10+10 mm Wood-fibre insulation 12 mm Fermacell fill 40 mm	60 dB	53 dB	26 dB	0.92
10		CETRIS® 10+10 mm Wood-fibre insulation 12 mm Cemwood fill 60 mm	61 dB	52 dB	28 dB	1.28

Thermal parameters, diffusion resistance

Material	Cement bonded particleboard CETRIS®	Wood-fibre insulation	EPS	Stone wool	Fill Cemwood	Fill Fermacell
Thermal conductivity W/mK	0.251	0.05	0.038	0.035	0.07	0.09
Diffusion resistance factor dry/wet	50	5 / 2	70 / 30	1 / 1	2 / 1	2 / 1

Areas of use

Lightweight floating floors generally consist of an insulation layer and a load-spreading layer. The overall load capacity of the composite floor is therefore determined by several factors – above all the type and height of the insulation and the height of the load-spreading layer.

To allow high variability in the use of the floor elements for different floor build-ups, extensive mechanical tests with concentrated and uniformly distributed loads were carried out to determine the load capacity. The resulting values of permissible characteristic (standard) loads include a safety factor that ensures proper function in combination with the subsequent floor covering.

In the concentrated load tests, the load was applied by a hydraulic cylinder; the loaded area was formed by a circular indenter 50 mm in diameter. A floor specimen measuring 1.2x1.6 metres was loaded at 3 points:
- in the board field
- at the linear joint of two boards
- at the T-joint of three boards

The load was increased by a constant force increment until the limit deformation (3 mm) was reached.

Imposed loads on floors according to EN 1991-1-1

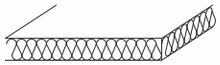
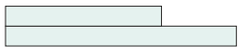
Categories of loaded areas according to EN 1991-1-1		Distributed load q_k (kN/m^2) b	Concentrated load acting on an area 50x50 mm Q_k (kN)
A. Residential areas and areas for domestic activities	Rooms in residential buildings and houses, bedrooms and wards in hospitals, bedrooms in hotels and hostels, kitchens and toilets	2	2
B. Office areas		3	2
C. Areas where people may congregate (except areas in categories A, B, D)	C1: areas with tables, etc. – e.g. areas in schools, cafés, restaurants, dining halls, reading rooms, receptions.	3	4
	C2: areas with fixed seats, e.g. areas in churches, theatres or cinemas, conference rooms, lecture halls, assembly halls, railway waiting rooms	4	4
	C3: areas without obstacles for moving people, e.g. areas in museums, exhibition rooms and access areas in public and administrative buildings and hotels	5	4
	C4: areas with possible physical activities, e.g. dance halls, gymnastic rooms, stages	5	7
	C5: areas susceptible to large crowds, e.g. buildings for public events like concert halls, sports halls including stands, terraces and access areas	5	4
D. Shopping areas	D1: areas in small shops	5	4
	D2: areas in department stores, e.g. areas in stores for goods, paper and office supplies.	5	7

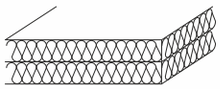
~~Note: the v~~alues of uniformly distributed and concentrated loads given in the table are based on EN 1991-1-1. The loads to be used may differ in specific cases and must be specified by the designer. A dry lightweight floor of CETRIS® floor elements is not suitable for rooms with a higher standard load than prescribed for this floor type or for permanently damp rooms such as saunas, laundries, showers, etc.

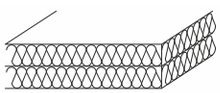
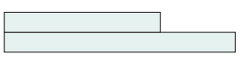
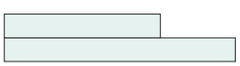
Plasterboard partitions with a line load lower than the permissible concentrated load of the boards can be built on dry floors of CETRIS® boards at any point of the floor without further measures. Plasterboard partitions with a line load higher than the concentrated load value must be founded on the load-bearing structure (floor structure, boarding) before the floor is laid.

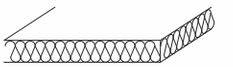
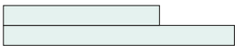
Tests of various floating floor build-ups with a load-spreading layer of CETRIS® boards show that the concentrated load is decisive for floor design. The permissible values of point (concentrated) load are imposed loads and apply to all floor coverings. The load capacity of floors of CETRIS® boards for area (uniformly distributed) loads safely meets the requirements of EN 1991-1-1.

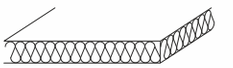
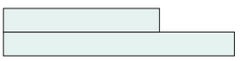
Permissible heights of insulation boards (fills)

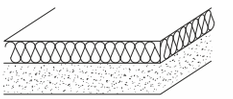
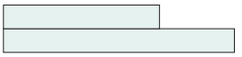
Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Expanded polystyrene – acoustic EPS T4000 											
				Insulation height (mm)											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												

Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Expanded polystyrene – EPS 100S 											
				Insulation height (mm)											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												

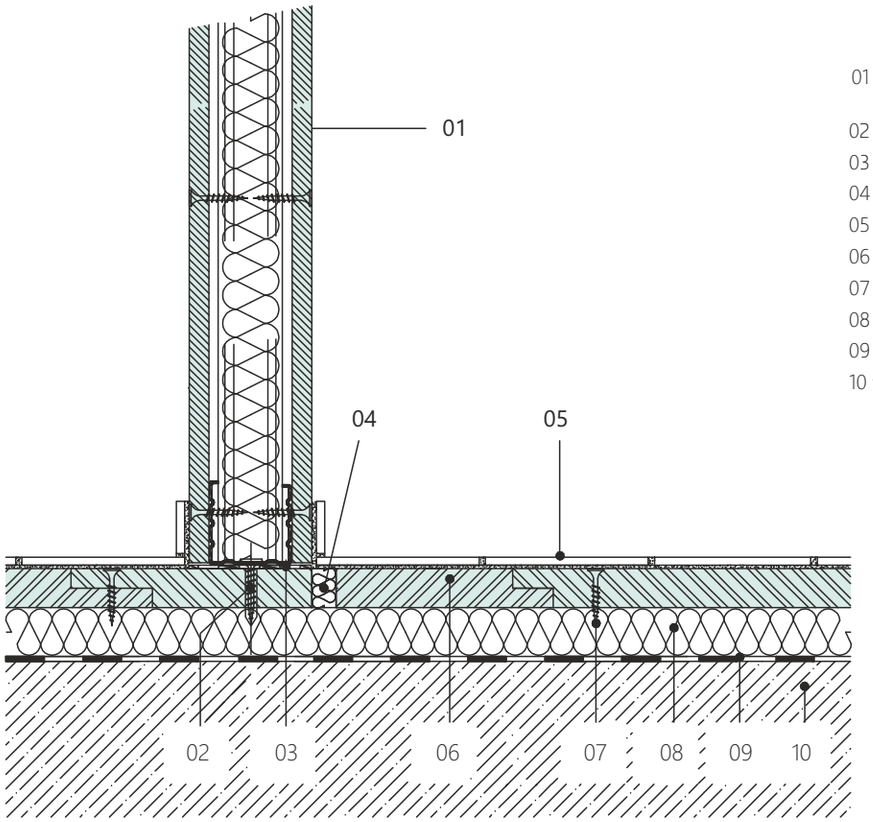
Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Expanded polystyrene – EPS 200S 											
				Insulation height (mm)											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												

Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Wood-fibre board /softboard/ 											
				Insulation height (mm)											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
	C4,D2	7	5												

Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Stone wool (Rockwool Steprock) 											
				Insulation height (mm)											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												

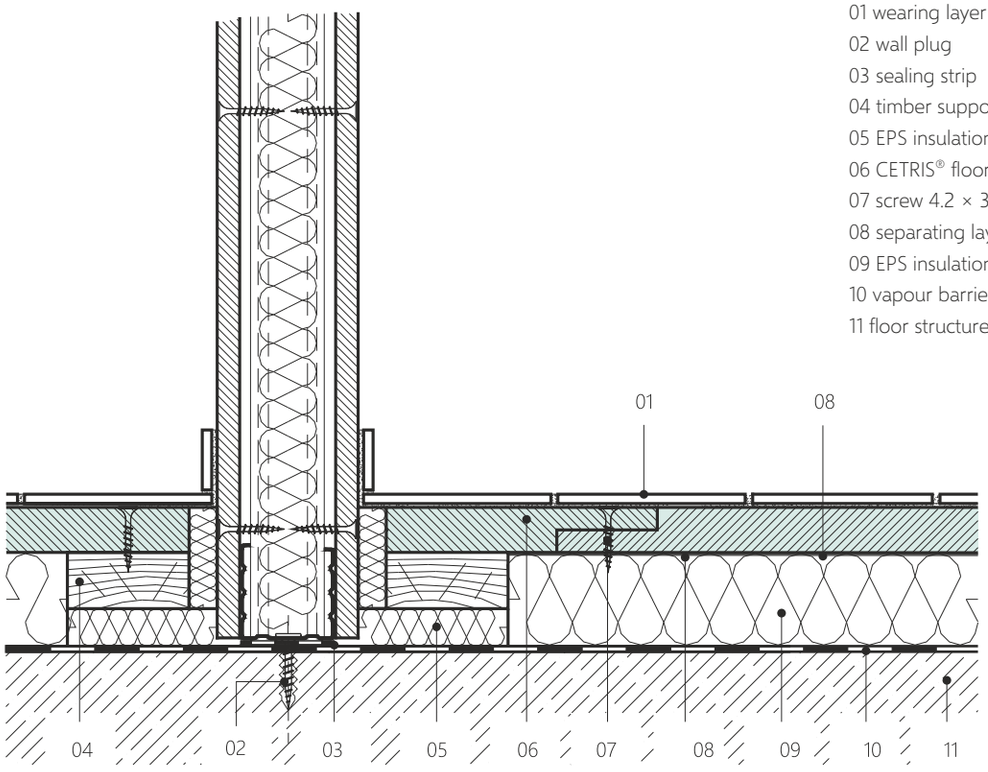
Floor panel	Category of loaded areas	Concentrated load (kN)	Uniformly distributed load (kN/m²)	Wood-fibre board Hobra Standart 12 mm 											
				Fill height Cemwood CW 2000, Fermacell											
				20	30	40	50	60	70	80	90	100	120	140	160
CETRIS® 10 mm + 10 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
CETRIS® 12 mm + 12 mm 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												
CETRIS® PDP 22 mm – rebated edge 	A,B	2	1.5 - 2.5												
	C1-3.5,D1	4	3 - 5												

Founding a lightweight partition



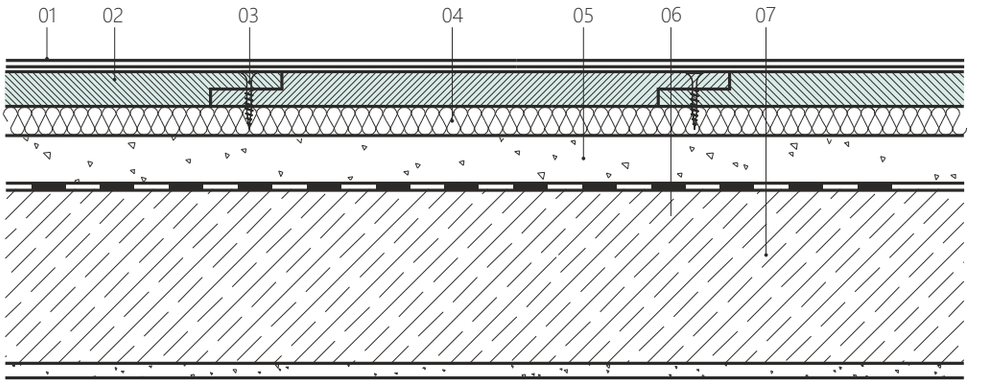
01 plasterboard partition (line load lower than the permissible concentrated load of the floor)
02 sealing strip
03 wall plug
04 expansion joint
05 wearing layer
06 CETRIS® floor element
07 screw 4.2 × 25 (35) mm
08 insulation board
09 vapour barrier
10 floor structure

Floor-to-partition junction – vertical section



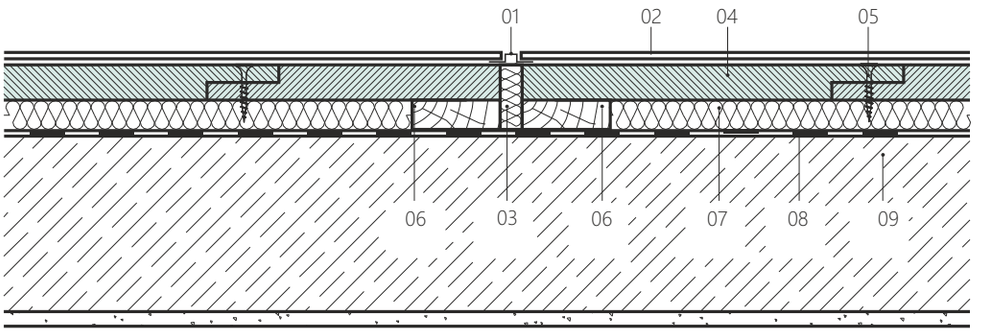
01 wearing layer
02 wall plug
03 sealing strip
04 timber support batten 80 × 30 mm
05 EPS insulation
06 CETRIS® floor element
07 screw 4.2 × 35 mm
08 separating layer – foam sheet th. 2 mm
09 EPS insulation
10 vapour barrier
11 floor structure

Levelling an uneven substrate, increasing the build-up height – vertical section



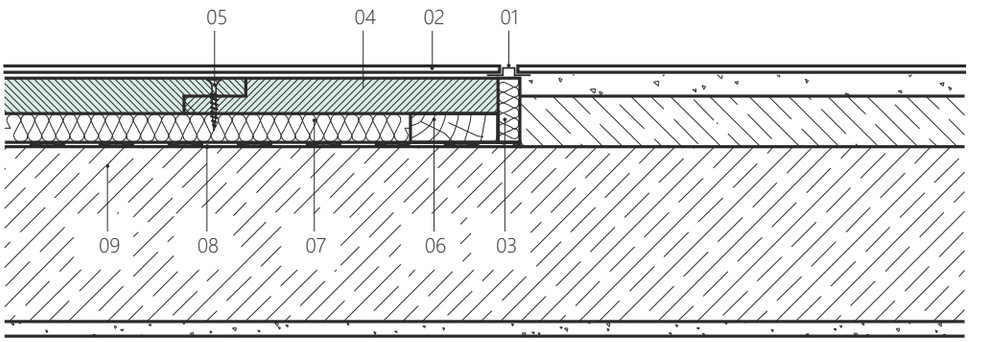
01 wearing layer
02 CETRIS® floor panel
03 screw 4.2 × 25 (35) mm
04 insulation board
05 dry fill (Fermacell, Cemwood 2000)
06 vapour barrier
07 floor structure

Expansion joint in the floor area – vertical section



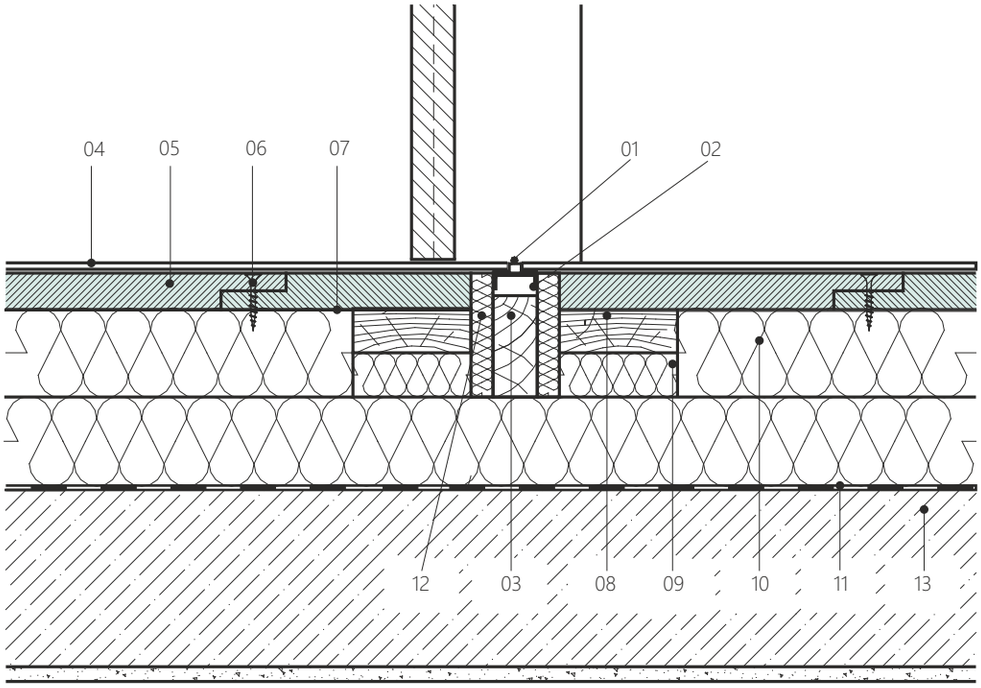
01 Schlüter DILEX expansion profile
02 wearing layer
03 expansion gap (15 mm)
04 CETRIS® floor panel
05 screw 4.2 × 25 (35) mm
06 timber support batten
07 insulation board
08 vapour barrier
09 floor structure

Transition to another floor – vertical section



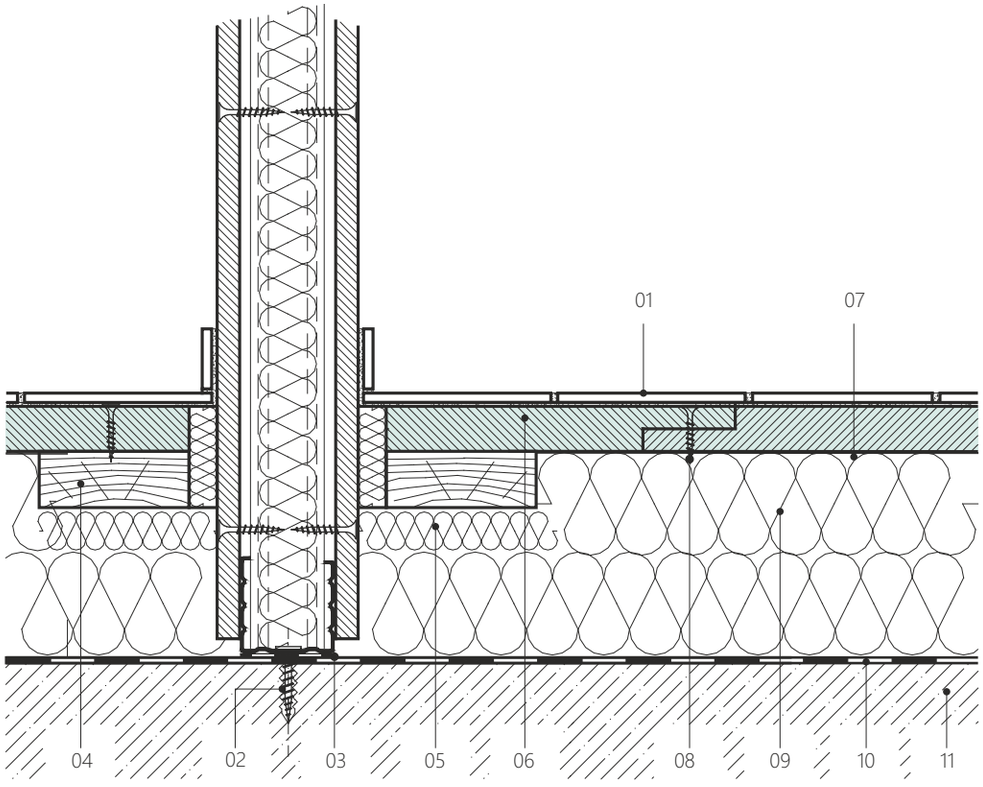
01 Schlüter DILEX expansion profile
02 wearing layer
03 expansion gap (15 mm)
04 CETRIS® floor panel
05 screw 4.2 × 25 (35) mm
06 timber support batten
07 insulation board
08 vapour barrier
09 floor structure

Threshold-free floor transition – vertical section



01 Schlüter DILEX expansion profile
02 threshold connector
03 timber threshold base profile
04 wearing layer
05 CETRIS® floor panel
06 screw 4.2 × 25 (35) mm
07 separating layer – foam sheet th. 2 mm
08 timber support batten 80 × 30 mm
09 EPS insulation
10 EPS insulation boards
11 vapour barrier
12 expansion gap (15 mm)
13 floor structure

Floor-to-partition junction – vertical section



01 wearing layer
02 wall plug
03 sealing strip
04 timber support batten 80 × 30 mm
05 EPS insulation
06 CETRIS® floor panel
07 separating layer – foam sheet th. 2 mm
08 screw 4.2 × 25 (35) mm
09 EPS insulation board
10 vapour barrier
11 floor structure