CETRIS®
www.cetris.cz

Non-combustible board for
# WALLS, FLOORS, FACADES, CEILINGS...

## Technical manual for architects, designers and manufacturers

CETRIS®
www.cetris.cz

The biggest manufacturer
of cement bonded particleboards
in Europe

CETRIS®
www.cetris.cz

## List of CETRIS products including their application

0 Wall systems
1 Facade systems
2 Floor systems
3 Roof systems
4 Fireproof systems
5 Ceilings & plinth walls
6 Profile sheeting
7 Balcony systems
8 Road constructions
9 Hobby





| Board type | max. board size (mm) | supplied thicknesses (mm) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CETRIS **BASIC** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CETRIS **PD** | 1250 x 625 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | | ● | ● | ● | ● | | | | |
| CETRIS **PDB** | 1250 x 625 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | | ● | ● | ● | ● | | | | |
| CETRIS **PDI** NEW | 1220 x 610 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | | ● | | | | | | | |
| CETRIS **PLUS** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | ● | ● | | ● | ● | ● | | ● | | |
| CETRIS **FINISH** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | ● | ● | | ● | | |
| CETRIS **LASUR** NEW | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | ● | ● | | ● | | |
| CETRIS **PROFIL** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | ● | ● | | | | |
| CETRIS **PROFIL PLUS** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | ● | ● | | | | |
| CETRIS **PROFIL FINISH** | 3350 x 1250 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | ● | ● | | | | |
| CETRIS **AKUSTIC** | 1250 x 625 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | ● | | | | | ● | | | | |
| CETRIS **AKUSTIC FINISH** | 1250 x 625 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | ● | | | | | ● | | | | |
| CETRIS **DEKOR** NEW | 1250 x 625 | 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 | | ● | | | | ● | | ● | | |

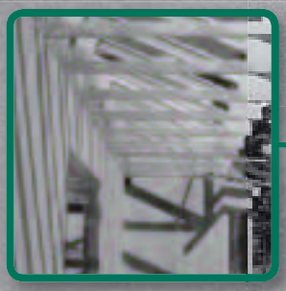
Ceilings and plinths

Roofs

Balconies

Fire protection

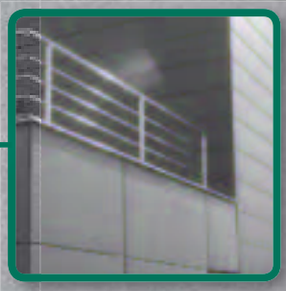
Walls



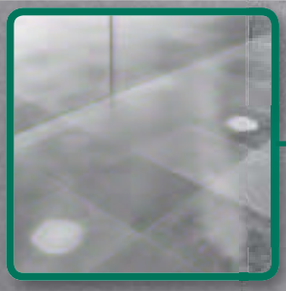
Permanent shuttering

Road constructions

Facades



Floors



Hobby

CETRIS®

# Content

# Content

# 1 Introduction

„Even the best materials used in a perfect system do not by themselves guarantee absolute perfection of the construction. That is why it is very important for the site managers, assembly companies and especially the craftsmen themselves to take proper care to duly and consistently work in compliance with the prescribed technological procedures and contact us, the manufacturer of the CETRIS® cement bonded particleboards, with trust in the case of any doubt. All our colleagues are ready to provide any information that might help you resolve any particular problem.

We believe that mutual exchange of experience between the manufacturer of CETRIS® cement bonded particleboards and the customer will contribute to the successful implementation of the customer's construction work."

# Introduction 1



CETRIS®

# 1.1 Introduction of Company

The company CIDEM Hranice, a.s., division CETRIS®, is currently the biggest manufacturer of cement bonded particleboards in Europe.

Construction of the factory for manufacture of cement bonded particleboard in the Czech Republic was commenced in 1987. The plant was commissioned in 1991.

In the first years of production the product range was limited only on a motherboard CETRIS® BASIC without surface treatment. The product range was gradually extended, and more services were addad, such as cutting, milling, grinding, drilling, application of surface coatings, and more. At present we offer a total of eleven kinds of cement bonded particleboards, and we are continuously developing new types of products in order to satisfy the needs and desires of our customers.

The growing popularity and versatility of CETRIS® boards proved by the fact that they are currently being exported to almost all over Europe, and also to Africa, Asia and South America.

The cement bonded particleboards CETRIS® are manufactured on technological equipment provided by a German company BISON. In 2010, the production line underwent extensive overall renovations with the aim of improving and increasing of production capacity, which is currently 55,000 $m^3$ per year. The production line is newly fitted with cleaning and polishing equipment that perfectly clean production areas and thus improves the quality of board surface. The drying chamber was renovated and extended, and new formatting saw was purchased. When formatting the manufactured boards, we are now able to declare lower values of permitted tolerances in dimensions and shapes, which are significantly below the standard values. The surface-coating line also underwent many changes. A fully automated line with spraying machine KRONOS from Italian manufacturer MAKOR was purchased. It perfectly coats not only the visible face side of the board, but also its edges.

At the beginning of the whole process of expanded and enhanced surface coatings procedure we can find cleaning and sanding equipment for the preparation of the face side area, and also efficient drying and cooling equipment. Furthermore, the compressor station was modernized, the dispatch hall was enlarged, and in the future we plan to invest in further modernization and expansion of our plant.

Permanent attention has been paid to the quality of our products. In 1996 our company was certified pursuant to ISO 9002 issued by the accredited international certifier Lloyd's Register Quality Assurance. After the release of the new standard, the system was re-certified in 2003 pursuant to ISO 9001. The manufacturing of cement bonded particleboards CETRIS® is also authorized and supervised by Notified Bodies. Since the company exports its products throughout Europe, the cement bonded particleboards are certified not only according to the European harmonized standards, but also according to national standards.

CE

A2 CETRIS® BOARDS IN CLASS A2

15 YEARS GUARANTEE

LLOYD'S REGISTER · LRQA ISO 9001

PEFC PEFC/08-35-0021

## 1.2 Quality Policy of CETRIS® Division

CETRIS®

### Quality Policy of CETRIS® Division

Through this quality policy the management of the joint-stock company defined the decisive principles of assurance of compliance with the requirements and expectations of customers of our CETRIS division as well as shareholders of the company in harmony with the formulated quality management system and with the liability to continuously improve the system.

**La division CETRIS a adopté la politique qualité suivante:**

- Nous travaillons avec enthousiasme pour répondre à l'attente justifiée de nos clients.
- Nous travaillons pour dégager un bénéfice de nos activités et pour développer et consolider notre firme.
- Nous travaillons en toute sécurité.
- Nous respectons notre environnement.
- Nous considérons nos fournisseurs comme des partenaires.

**Division CETRIS® adopted following philosophy:**

- We work with enthusiasm to satisfy the right expectations of our customers
- We work to bring profit to our business in order to develop and consolidate our Company
- We work safely
- We have respect for the external environment
- We have respect for our suppliers

**Division CETRIS® nahm folgende prinzipien an:**

- Wir arbeiten mit Begeisterung, um berechtigte Erwartungen unserer Kunden zu erfüllen
- Wir arbeiten, um den Gewinn in unserem Unternehmen zu erreichen und damit unsere Firma weiterzuentwickeln und zu festigen
- Wir arbeiten mit Sicherheit
- Wir schätzen unsere Umwelt
- Wir schätzen unsere Lieferanten

**Dywizja CETRIS® podłeja następującą politikę jakości:**

- Pracujemy z entuzjazmem, by zaspokoić uzasadnione oczekiwania naszych klientów
- Pracujemy, by osiągnąć korzyść w naszej działalności i by rozwijała się i umacniała nasza firma
- Pracujemy bezpiecznie
- Szanujemy środowisko
- Szanujemy naszych dostawców

**Отдел «CETRIS®» принял следующую политику качества:**

- Работаем с энтузиазмом для того, чтобы удовлетворить справедливые ожидания наших клиентов
- Работаем так, чтобы достигнуть прибыли от нашей предпринимательской деятельности и, тем самым, способствовать развитию и укреплению престижа нашей фирмы
- Работаем безопасно
- Ценим окружающую среду
- Уважаем наших поставщиков

generální ředitel

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## 1.3 References

For more references see our new colour catalogue “CETRIS® – referenční stavby a aplikace” (CETRIS® – Reference Constructions and Applications) or visit www.cetris.cz, section “References”.


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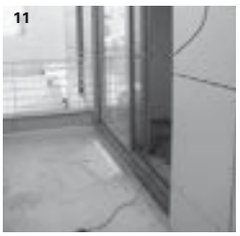
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**Fig. 1, 23, 33** LUXOR theatre, Rotterdam, the Netherlands
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**Fig. 2, 3** Family house, Czech Republic
CETRIS® BASIC, construction panels

**Photo 4** Flooring, Olomouc, Czech Republic
Floating floor IZOCET

**Fig. 5, 27** Tennis hall, Prague – Trója, Czech Republic
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**Photo 6** Administrative building SPORTEN, Nové Město, Czech Republic
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**Photo 7** Administrative building J&T, Bratislava, Slovak Republic
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**Photo 13** Entrance gate to a manufacturing plant, Brno, Czech Republic
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**Photo 14** Family housing, the Netherlands
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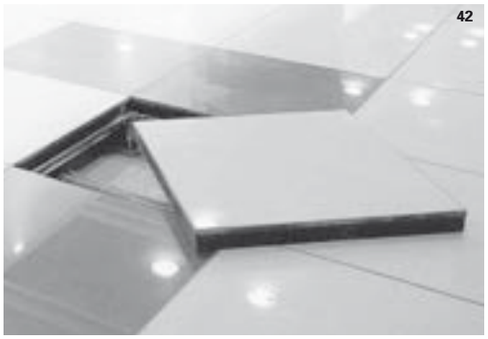


**Photos 19, 28, 30, 41** Residential complex, Nový Prosek, Czech Republic
CETRIS® FINISH, CETRIS® BASIC, façade cladding, ceiling panels, VARIO system

**Photo 20** Family house, Hranice, Czech Republic
CETRIS® DOLOMIT, soffits, ceiling panels

**Photo 21** Family housing, the Netherlands
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CETRIS® PROFIL FINISH, slate relief type, façade cladding, VARIO system

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**Photo 32** Brewery, Přerov, Czech Republic
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**Photo 34** Family house, Říčany, Czech Republic
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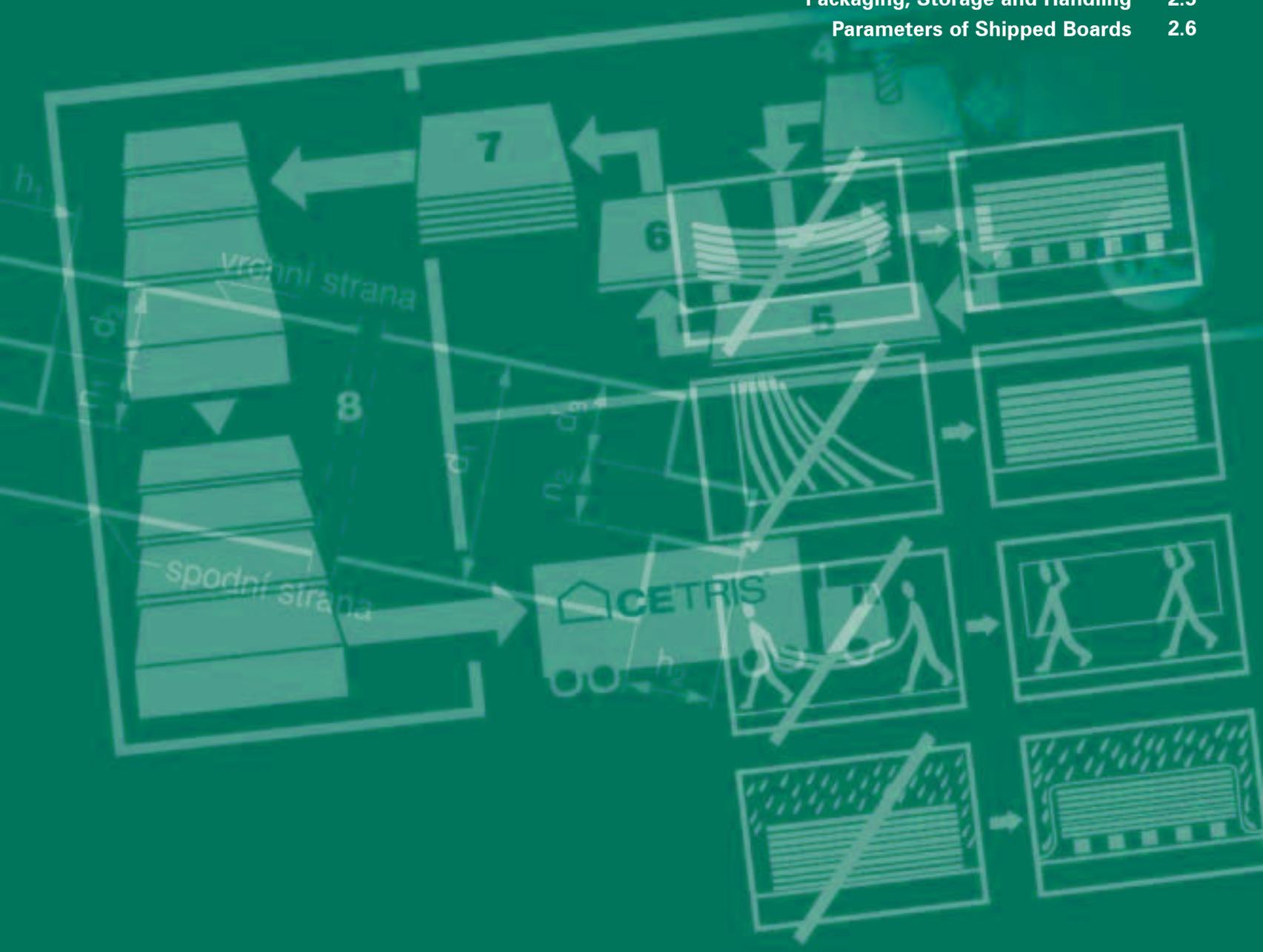
# Manufacturing Programme








CETRIS®

CETRIS® cement bonded particleboard is a high-standard board material of exceptional properties for flooring systems, attics, roofing, vented façades, fire protection applications, ceiling panels, walls and partitions and garden accessories.

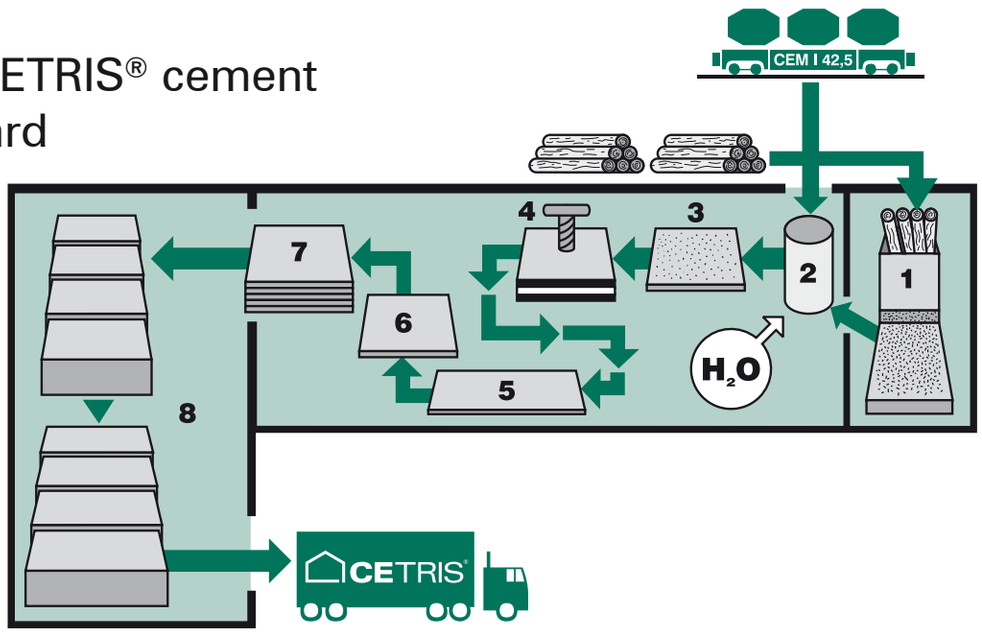






CETRIS® cement bonded particleboard application areas include assembled constructions of all kinds. They are ideal for dry construction applications, for constructions under demanding climatic conditions and wherever other favourable features of this construction material may fully manifest themselves.

## 2.1 Manufacturing of CETRIS® cement bonded particleboard




CETRIS® cement bonded particleboards are manufactured by a technology supplied by the German company BISON. In 2010 the manufacturing line underwent an overall reconstruction including modernisation of the machinery and the increase of manufacturing capacity to 55,000 m³ a year.

**Simplified manufacturing procedure:**

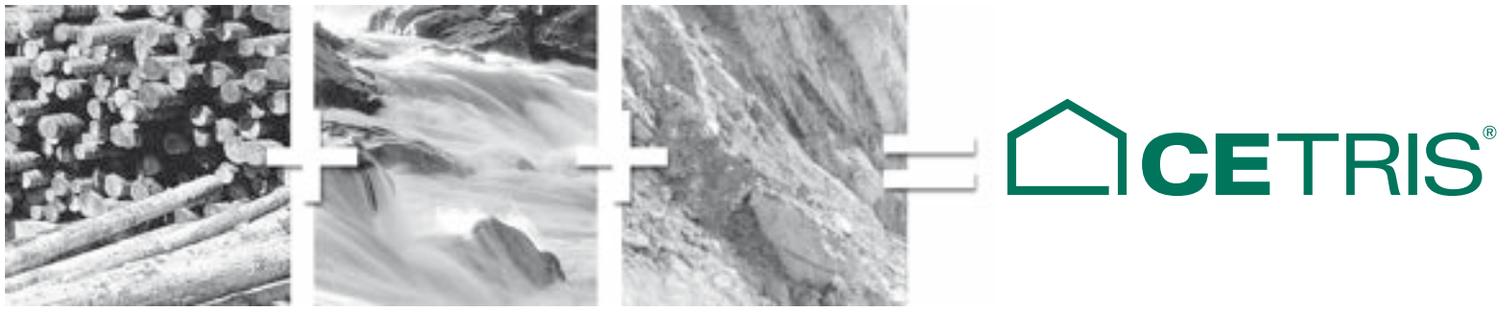
1 Chipping
2 Mixture mixing
3 Board layering
4 Pressing and hardening under pressure
5 Maturation and drying
6 Trimming
7 Storage
8 Shipment

CETRIS® cement bonded particleboards are made in compliance with EN 633, 634-1 and 634-2.

Debarked spruce and fir timber is stored for three to four months and then chipped to needle-shaped chips and transported to silos. The prepared wooden mass is dosed in the mixing device to be mixed with quality Portland cement. Further ingredients added pursuant to the recipe include mineralising substances and water whose quantity is adapted to the measured timber humidity. In the layering device the mixed material is spread over flat, pre-treated steel trays. The device works with four separated layering machines in a row. The first and the fourth chamber create the cover layers of the boards with the help of wind sorting. The second and the third chamber are mechanical and are used for creation of the middle layer by even application. The middle layer is bonded. The trays with the bonded material are stacked and pressed under high pressure to the nominal board thickness (about one third of the spreading thickness). Following an accelerated hydration process of hardening, the boards are de-stacked and transferred to an air-conditioned warehouse where they mature for at least seven days. After that the CETRIS® boards are dried to the humidity of 9% (±4 weight %). Then the boards are trimmed to basic dimensions. Further services are performed on customer request, including board cutting to smaller sizes, edge milling, edge chamfering, drilling, grinding, priming and other surface finishes.

## 2.2 Merits of CETRIS® cement bonded particleboards

CETRIS® cement bonded particleboards combine positive properties of cement and wood. They are lighter than the traditional cement fibreboards, and their compactness and weather resistance, frost and mould resistance place them above cement bonded chipboards or plasterboards.




### Principal benefits of CETRIS® boards

#### Environment Friendliness

Cement bonded particleboards are environment friendly. They do not contain hazardous substances such as asbestos or formaldehyde and are resistant to petrol and oils.

#### Fire Resistance

CETRIS® cement bonded particleboards are fire resistant and classified pursuant to the reaction to fire class pursuant to the European standard EN 13 501-1 as A2-s1, d0 – non flammable.

#### Moisture Resistance

CETRIS® cement bonded particleboards are ideal for humid environments including exteriors thanks to their moisture resistance.Thickness swelling, after immersing CETRIS® boards in water for 24 hours, is only max. 1.5 %.

#### Perfect Sound Barrier

CETRIS® boards absorb sound (airborne sound transmission loss 30 – 35 dB).

#### Frost Resistance

CETRIS® cement bonded particleboards have been tested using the 100 freezing cycle test pursuant to EN 1328.

#### No Hygienic Risks

CETRIS® boards cause no hygienic risk, do not stink and do not contain any hazardous substances.

#### Mould Resistance

Thanks to the resistance of CETRIS® boards against humidity no mould develops on their surface.

#### Insect Resistance

Due to their cement content the CETRIS® cement bonded particleboards are absolutely insect resistant.

#### Low Weight

CETRIS® boards are light (10 mm thick boards weigh only 14.0 kg/m$^2$).

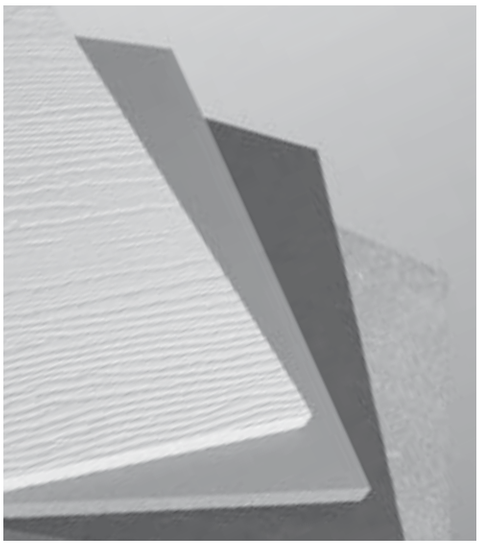
#### Flexibility

Elasticity module of a CETRIS® board is <4,500 N/mm$^2$.

#### Easy Processing

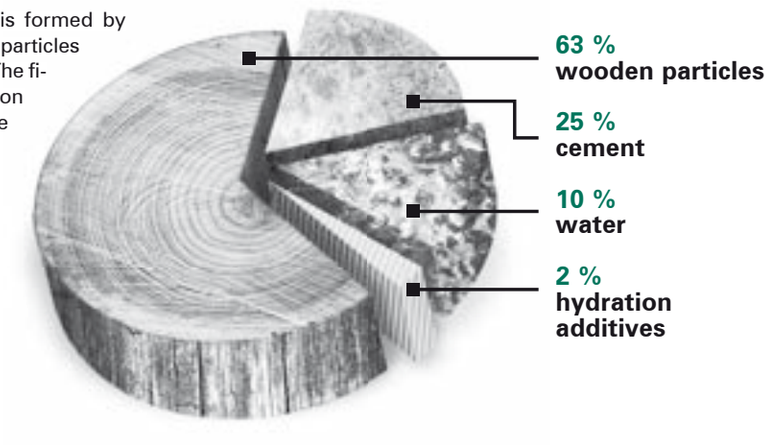
CETRIS® cement bonded particleboards may be processed by any wood processing machinery. The boards may be drilled, cut, milled and sanded.

## 2.3 Composition of CETRIS® cement bonded particleboards



CETRIS® boards are composed of wooden mass, cement, water and hydration admixtures in the following proportions:

The board structure is formed by pressing the wooden particles coated with cement. The finer fraction is applied on both sides of the middle coarse fraction. That is why the board surface is smooth.




## 2.4 Types of CETRIS® cement bonded particleboards

### Boards without surface finish

#### 2.4.1 CETRIS® BASIC

Cement bonded particleboard with smooth cement grey surface. Standard thicknesses of 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 mm, or 34, 36, 38 and 40 mm on request. The basic board size is 3,350 by 1,250 mm. The boards are supplied to the customer cut to the required dimensions, with rounded or chamfered edges (45 degrees chamfer), milled from 12 mm thickness up with semi-groove or from 16 mm up with groove and tongue. Holes may also be pre-drilled in the boards on request.

| CETRIS® BASIC | cement bonded particleboard with smooth natural cement grey surface |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 mm (on request 34, 36, 38, 40 mm) |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Services | on customer request – cutting, milling, hole drilling, edge chamfering |
| Relief type | smooth |
| Surface finish | none |

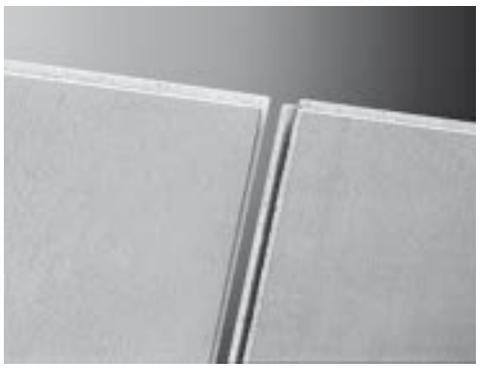
**Size tolerances** (all data in mm):

| CETRIS® BOARD THICKNESS | Limit tolerances for 1st class quality | | |
|---|---|---|---|
| | Thickness | Width | Length |
| 8. 10 | ± 0.7 | ± 5 | ± 5 |
| 12, 14 | ± 1.0 | ± 5 | ± 5 |
| 16, 18 | ± 1.2 | ± 5 | ± 5 |
| 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40 | ± 1.5 | ± 5 | ± 5 |

**The tolerances of width and length ±5 mm are according to the standard. The actual tolerances of finished products range around ±2 mm.**

## 2.4.2 CETRIS® PD

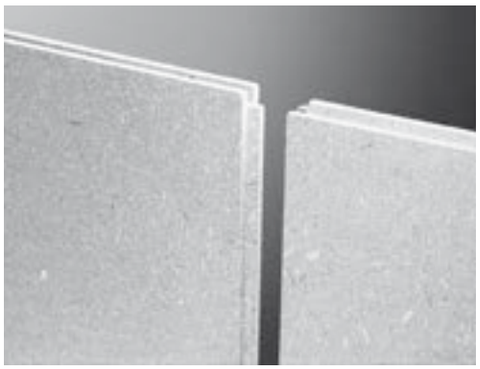
Cement bonded particleboard, size 1,250 by 625 mm (including tongue) for dry flooring technologies. Standard thicknesses of 16, 18, 20, 22, 24, 26, 28 mm, or other thicknesses and sizes on request. The boards are provided with groove and tongue on the perimeter and are designed for laying over beams or for renovation of old floors.



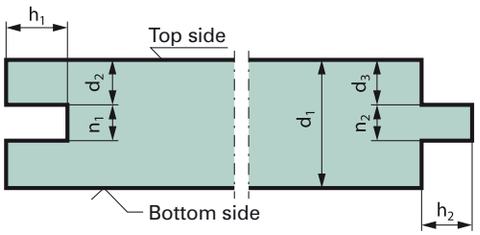
| CETRIS® PD | cement bonded particleboard with groove and tongue with smooth surface |
|---|---|
| Basic size | 625 × 1,250 mm (including tongue) |
| Board thickness | 16, 18, 20, 22, 24, 26, 28 mm (on request 30, 32 mm) |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Services | milled edges – groove and tongue |
| Thickness tolerances | ±1,2 mm (for thickness of 16 and 18 mm), ±1,5 mm (for the other) |
| Surface finish | none |

## 2.4.3 CETRIS® PDB

Cement bonded particleboard, calibrated by sanding, size 1,250 by 625 mm for dry flooring technologies. The calibration reduces thickness tolerance to ±0.3 mm. Standard thicknesses of 16, 18, 20, 22, 24, 26, 28 mm, or other thicknesses and sizes on request. The boards are provided with groove and tongue on the perimeter and are designed for laying over beams or for renovation of old floors.



| CETRIS® PDB | ground cement bonded particleboard with groove and tongue with smooth surface |
|---|---|
| Basic size | 625 × 1,250 mm (including tongue) |
| Board thickness | 16, 18, 20, 22, 24, 26, 28 mm (on request 30, 32 mm) |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Services | milled edges – groove and tongue, sanding |
| Thickness tolerances | ±0.3 mm |
| Surface finish | none |

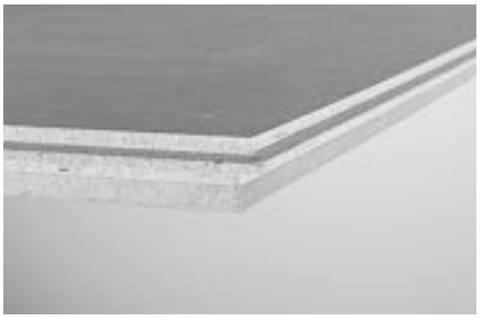



**Dimensions of CETRIS® PD and CETRIS® PDB boards groove and tongue** (all data in mm)

| $d_1$ | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|
| $n_2$ | 5.5 | 5.5 | 5.5 | 5.5 | 7.0 | 7.0 | 7.0 |
| $n_1$ | 6.0 | 6.0 | 6.0 | 6.0 | 8.0 | 8.0 | 8.0 |
| $d_2$ | 5.0 | 6.0 | 7.0 | 8.0 | 8.0 | 9.0 | 10.0 |
| $d_3$ | 5.25 | 6.25 | 7.25 | 8.25 | 8.5 | 9.5 | 10.5 |
| $h_1$ | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| $h_2$ | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |

## 2.4.4 CETRIS® PDI

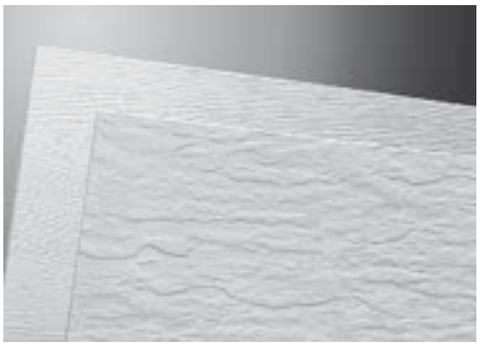
CETRIS® PDI is a two-ply panel used in dry floor technology. It consists of a 22 mm thick cement bonded CETRIS® particleboard glued to 12 mm insulating fibreboard (hardboard). The size is 1,220 × 610 mm (including the tongue) and it is 34 mm thick; it has a tongue and groove along the perimeter, the surface is smooth. The panels should be laid on a level surface area (ceiling structures, cladding). They are great for a quick and exact installation. They also spread spot-load stress over a larger area.



| **CETRIS® PDI** | Two ply panel of cement bonded particleboard CETRIS® glued together with insulating wood-fibre board. |
|---|---|
| Basic size | 1,220 × 610 mm (with tongue), 1,203 × 593 mm (without tongue). Panel size after laying: 0.713 m² |
| Rough dimensional tolerance | ±1.5 mm |
| Thickness | 34 mm |
| Weight | ca 33.5 kg/m² |
| Features | Tongue & groove shaped edges |
| Surface finish | Without surface finish |

## 2.4.5 CETRIS® PROFIL

Cement bonded particleboard, thickness 10 or 12 mm, with relief surface imitating wood or slate structures. The basic board size is 3,350 by 1,250 mm. The services provided are the same as in the case of CETRIS® BASIC boards. For their decorative appearance these boards are mainly used as façade cladding, interior as well as exterior.

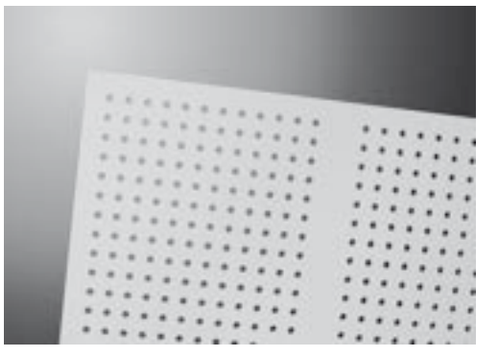


| **CETRIS® PROFIL** | cement bonded particleboard with relief and cement grey surface |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 10, 12 mm |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Services | on customer request – cutting, hole drilling, edge chamfering |
| Relief type | slate, wood |
| Surface finish | none |

## 2.4.6 CETRIS® AKUSTIC

CETRIS® AKUSTIC cement bonded particleboard is made by processing (drilling of regularly spaced holes with the diameter of 12 mm) in the CETRIS® BASIC board type. The standard board size is 1,250 by 625 mm and the thickness is 8 and 10 mm. The board surface is smooth, cement grey (without surface finish).

Drilling of regularly spaced holes achieves, in addition to the existing high mechanical strength values, improved acoustic properties. CETRIS® AKUSTIC



| CETRIS® AKUSTIC | cement bonded particleboard with predrilled holes and smooth cement surface |
|---|---|
| Basic size | 1,250 × 625 mm with drilled holes – diameter 12 mm, spacing 30 – 32 mm (see figure) |
| Board thickness | 8, 10 mm (on request 12, 14, 16 and 18 mm) |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Area density | Thickness 8 mm – 10 kg/m², thickness 10 mm – 12.5 kg/m² |
| Surface finish | none |

is a board used for acoustic cladding especially in sporting facilities, spaces with varying temperature and humidity and special demand buildings.

Installing the CETRIS® AKUSTIC cement bonded particleboard in a wall cladding system or ceiling panel system (under ceiling or roof construction) together with the load-bearing structure, acoustically effective textile and mineral wool inserts results in an aesthetically attractive as well as functional cladding, improving the space acoustics and contributing to noise absorption in the interiors.

For details of use of CETRIS® AKUSTIC board see Chapter 10.4.

### Boards with surface finish

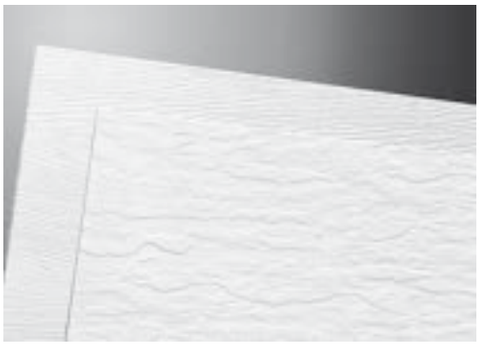
## 2.4.7 CETRIS® PLUS

Cement bonded particleboard, size 8 – 32 mm, with smooth surface. On request thicknesses of 34, 36, 38 and 40 mm may be supplied. Both sides and all edges are primed with a white primer. The paint on the face side is applied in two layers. The basic board size is 3,350 by 1,250 mm. The services provided are the same as in the case of CETRIS® BASIC boards. The primer improves adhesion between the board and the final surface finish, reduces the board absorption rate and consumption of the top coat material.

| CETRIS® PLUS | cement bonded particleboard with smooth surface and primer |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 mm |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Services | on customer request – cutting, hole drilling, edge chamfering |
| Surface finish | primer |
| Colour Shade | colour shade – white or RAL on request |

## 2.4.8 CETRIS® PROFIL PLUS

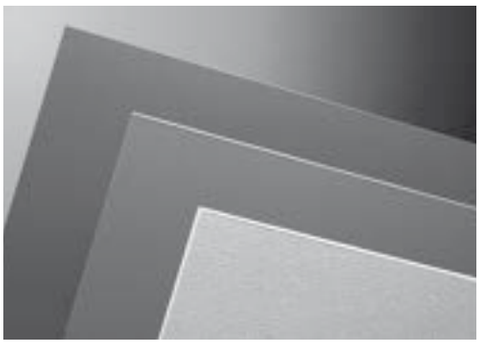
Cement bonded particleboard, thickness 10 or 12 mm, with relief surface imitating wood or slate structures. Both sides and all edges are primed with a white primer, which improves adhesion between the board and the final surface finish, reduces the board absorption rate and consumption of the top coat material. The basic board size is 3,350 by 1,250 mm. The services provided are the same as in the case of CETRIS® BASIC boards.



| CETRIS® PROFIL PLUS | cement bonded particleboard with relief and primer |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 10, 12 mm |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Relief type | slate, wood |
| Services | on customer request – cutting, hole drilling, edge chamfering |
| Surface finish | primer (one or two layers) |
| Colour Shade | colour shade – white or RAL on request |

## 2.4.9 CETRIS® FINISH

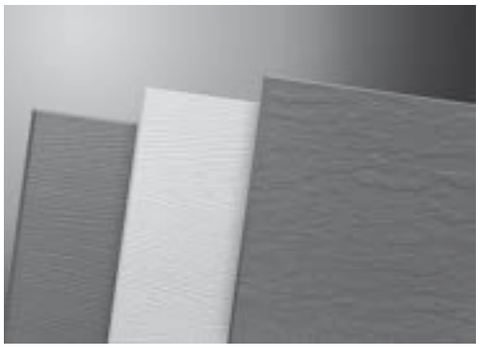
Cement bonded particleboard, thickness 10 – 32 mm, with smooth surface, primer and top coat in RAL or NCS shades. On request thicknesses of 34, 36, 38 and 40 mm may be supplied. The basic board size is 3,350 by 1,250 mm. The services provided are the same as in the case of CETRIS® BASIC boards. The CETRIS® FINISH boards are mainly used as exterior façade cladding.



| CETRIS® FINISH | cement bonded particleboard with smooth surface, primer and top coat pursuant to pattern book |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 mm |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Relief type | smooth |
| Services | on customer request – cutting, milling, hole drilling, edge chamfering |
| Surface finish | primer, top coat |
| Colour Shade | pursuant to RAL or NCS colour tables<br>(consult the manufacturer for a suitable shade) |

## 2.4.10 CETRIS® PROFIL FINISH

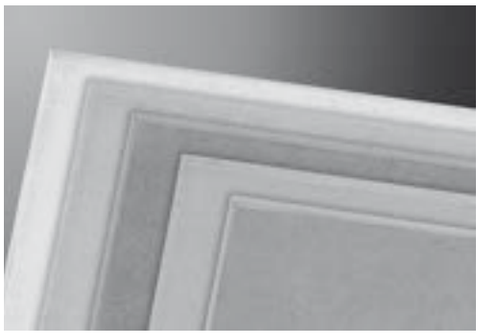
Cement bonded particleboard, thickness 10 or 12 mm, with relief surface imitating slate or wood structures. The board is covered with a primer and top coat in RAL or NCS shades. The basic board size is 3,350 by 1,250 mm. The services provided are the same as in the case of CETRIS® BASIC boards. The CETRIS® PROFIL FINISH boards are mainly used as exterior and interior façade cladding.



| CETRIS® PROFIL FINISH | cement bonded particleboard with relief surface, primer and top coat pursuant to colour chart |
|---|---|
| Basic size | 1,250 × 3,350 mm |
| Board thickness | 10, 12 mm |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Relief type | slate, wood |
| Services | on customer request – cutting, hole drilling, edge chamfering |
| Surface finish | primer, top coat |
| Colour Shade | pursuant to RAL or NCS colour charts<br>(consult the manufacturer for a suitable shade) |

## 2.4.11 CETRIS® LASUR

Cement bonded particleboard in thickness ranging from 10 – 32 mm with smooth surface, treated with primer paint and acrylic varnish glazing as the top coat in colours as per the colour chart. The glazing top coat provides a solid but non-uniform appearance. Upon prior agreement it is also possible to deliver the following thicknesses: 34, 36, 38 and 40 mm. The basic size of the board is 3 350 × 1250 mm. We provide the same services as for the CETRIS® BASIC boards. The CETRIS® LASUR boards are primarily used as exterior facade sheathing boards.



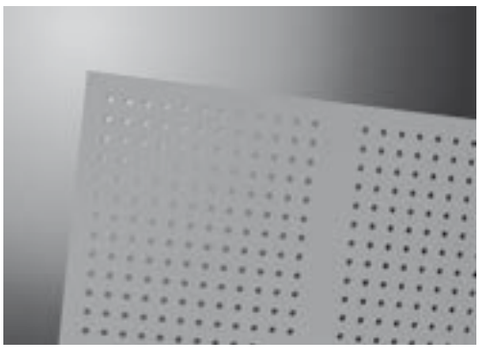
| CETRIS® LASUR | Cement bonded particleboard in thickness ranging from 10 – 32 mm with smooth surface, treated with primer paint and acrylic varnish glazing as the top coat in colours as per the colour chart. |
|---|---|
| Basic size | 3,350 × 1,250 mm |
| Board thickness | 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30 a 32 mm<br>(upon prior agreement 34, 36, 38, 40 mm) |
| Bulk density | 1,150 – 1,450 kg/m³ |
| Relief type | smooth |
| Services | on customer request – cutting, hole drilling, edge chamfering |
| Surface finish* | pigmented primer, varnish glazing top coat |
| Colour Shade | as per the colour chart* for CETRIS® LASUR boards (7 shades) |

* Note: The back side of CETRIS® LASUR cement bonded particleboards is treated with primer coat without a regular texture, look and sufficient covering power. The colour shade of the coat is not specific, therefore the requirement for a white or transparent shade needs to be specified in the order in advance.

## 2.4.12 CETRIS® AKUSTIC FINISH

The cement-bonded particleboard CETRIS® AKUSTIC FINISH is the result of treatment (drilling of evenly spaced 12-mm diameter holes) of the CETRIS® BASIC basic board type. The basic dimension of the particleboard is 1,250 × 625 mm, the product is 8 or 10 mm thick. The particleboard surface is treated with a primer coat and then a final surface coat according to RAL or NCS colour charts is applied.

Present high mechanical parameters are broadened with excellent accoustic parametres by drilling holes in regular patterns.



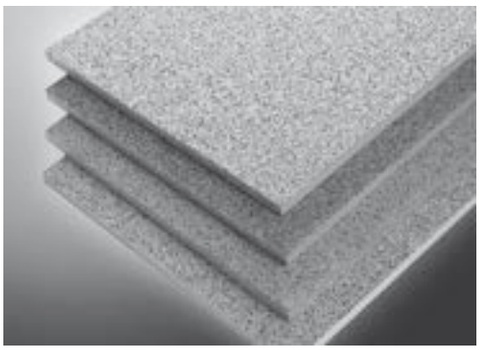
| CETRIS® AKUSTIC FINISH | cement bonded particleboard with pre-drilled holes, smooth surface, treated with a primer coat and a surface finish |
|---|---|
| Basic size | 1,250 × 625 mm with drilled holes – diameter 12 mm, spacing 30 – 32 mm (see figure) |
| Board thickness | 8, 10 mm (on request 12, 14, 16 and 18 mm) |
| Bulk density | 1,150 – 1,450 kg/m$^3$ |
| Area density | 8 mm – 10 kg/m$^2$, 10 mm – 12.5 kg/m$^2$ |
| Surface finish | primer coat, finish coat |
| Colour Shade | pursuant to RAL or NCS colour charts (consult the manufacturer for a suitable shade) |

The CETRIS® AKUSTIC FINISH represents a sound absorbing cover panel with applications especially in sports facilities, areas with variable temperature and moisture levels, and in buildings with special requirements.

* Note: The coating the back side does not have a regular structure.

## 2.4.13 CETRIS® DEKOR

Cement bonded particleboard CETRIS® DEKOR is cement bonded particleboard in thickness 12 and 14 mm with smooth surface, treated with primer paint and decorative acrylic mosaic plaster in colours according to a colour chart. The board is used predominantly as exterior facade board.



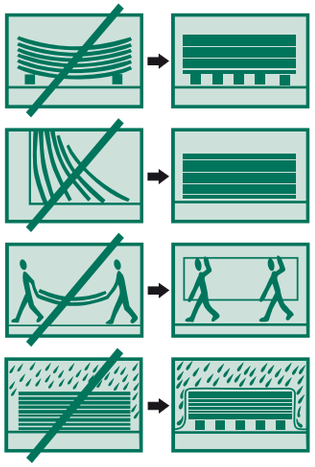
| CETRIS® DEKOR | Cement bonded particleboard with smooth surface, treated with surface finish – decorative acrylic mosaic plaster in colours according to a colour chart |
|---|---|
| Basic size | 1,250 × 625 mm (upon agreement also other) |
| Board thickness | 12 and 14 mm (upon agreement also other) |
| Bulk density | 1,150 – 1,450 kg/m$^3$ |
| Area density | th. 12 mm – cca 20 kg/m$^2$, th. 14 mm – cca 23 kg/m$^2$ |
| Relief type | Smooth |
| Surface finish* | Primer paint and decorative acrylic mosaic plaster |
| Shades | As per the colour chart for CETRIS® DEKOR boards |

* Note: The back side of cement bonded particleboards CETRIS® DEKOR is coated with a protective white primer, which does not have a regular structure, appearance and sufficient coverage.

# 2.5 Packaging, Storage and Handling

CETRIS® cement bonded particleboards are stored on wooden pallets allowing for forklift handling. The boards are fixed to the pallet by crosswise tying of the boards to the pallet. Lengthwise tying on customer request only.

CETRIS® boards are protected against the weather with PE foil wrap. Wrapping the CETRIS® boards into PE foil does not meet requirements for long-term weather protection in the case of open air storage. Storage may cause bending of the upper board as a result of quicker drying of the upper surface. This effect may be eliminated by turning the board upside down.



CETRIS® boards should be stored in a roofed dry space to prevent moistening of the boards before installation. The stored pallets with boards of the same size may be stacked up to a max. five layers.

CETRIS® boards should only be handled on the pallets, or in the vertical position. Manual transfers should also be performed in a vertical position.

| Board thickness (mm) | Approximate weight (kg/m²) | Approximate board weight (kg/pc) | Number of boards on pallet (pc) | Board surface size on pallet (m²) | Total approximate weight of boards including pallet (kg) |
|---|---|---|---|---|---|
| **CETRIS® cement bonded particleboard in basic format** (size 3,350 by 1,250 mm) | | | | | |
| 8 | 11.36 | 47.6 | 60 | 251.25 | 2,894 |
| 10 | 14.2 | 59.5 | 45 | 188.44 | 2,716 |
| 12 | 17.0 | 71.4 | 40 | 167.50 | 2,894 |
| 14 | 19.9 | 83.3 | 35 | 146.56 | 2,954 |
| 16 | 22.7 | 95.1 | 30 | 125.63 | 2,894 |
| 18 | 25.6 | 107.0 | 25 | 104.69 | 2,716 |
| 20 | 28.4 | 118.9 | 25 | 104.69 | 3,013 |
| 22 | 31.5 | 130.8 | 20 | 83.75 | 2,656 |
| 24 | 34.3 | 142.7 | 20 | 83.75 | 2,894 |
| 26 | 36.9 | 154.6 | 20 | 83.75 | 3,132 |
| 28 | 39.8 | 166.5 | 15 | 62.81 | 2,537 |
| 30 | 42.6 | 178.4 | 15 | 62.81 | 2,716 |
| 32 | 45.4 | 190.3 | 15 | 62.81 | 2,894 |
| 34 | 48.3 | 202.2 | 15 | 62.81 | 3,073 |
| 36 | 51.1 | 214.1 | 10 | 41.88 | 2,181 |
| 38 | 54.0 | 226.0 | 10 | 41.88 | 2,300 |
| 40 | 56.8 | 237.9 | 10 | 41.88 | 2,419 |
| **CETRIS® PD, PDB** (size 1,250 by 625 mm) | | | | | |
| 16 | 22.7 | 17.8 | 50 | 39.0 | 895 |
| 18 | 25.6 | 20.0 | 45 | 35.1 | 906 |
| 20 | 28.4 | 22.2 | 40 | 31.2 | 895 |
| 22 | 31.5 | 24.6 | 35 | 31.2 | 868 |
| 24 | 34.3 | 26.8 | 35 | 31.2 | 946 |
| 26 | 36.9 | 28.8 | 30 | 23.4 | 865 |
| 28 | 39.8 | 31.1 | 30 | 23.4 | 932 |
| **CETRIS® cement bonded particleboard IZOCET and POLYCET** (size 1,250 by 625 mm) | | | | | |
| 12 upper board | 17.0 | 13.3 | 70 | 54.7 | 950 |
| 12 lower board | 17.0 | 13.3 | 70 | 54.7 | 950 |
| **CETRIS® cement bonded particleboard AKUSTIC and AKUSTIC FINISH** (size 1,250 by 625 mm) | | | | | |
| 8 | 10.0 | 7.80 | 100 | 78.13 | 810 |
| 10 | 12.5 | 9.75 | 80 | 62.50 | 805 |
| **Insulation fibreboard for IZOCET flooring system** (size 1,200 by 810 mm) | | | | | |
| 20 | 5.0 | 5.0 | 50 | 48.6 | 260 |
| 20 | 5.0 | 5.0 | 150 | 145.8 | 745 |
| **CETRIS® PDI floorboards** (size 1,220 × 610 mm) | | | | | |
| 34 | 33.5 | 24 | 30 | 22.32 | 750 |

**Note**: The format and the packaging may change in relation to the supplied assortment of the insulation board manufacturer.

# 2.6 Parameters of Shipped Boards

## 2.6.1 Size Tolerances

**Note:** The tolerances are specified pursuant to EN 634-1.

| FEATURE | BOARD THICKNESS | TOLERANCE |
|---|---|---|
| Thickness of unsanded board | 8, 10 mm | ±0.7 mm |
| | 12, 14 mm | ±1.0 mm |
| | 16, 18 mm | ±1.2 mm |
| | 20 – 40 mm | ±1.5 mm |
| Thickness of sanded board | | ±0.3 mm |
| Length and width of basic format | | ±5.0 mm |
| Accuracy of division for length and width | | ±3.0 mm |
| Edge straightness | | 1.5 mm/m |
| Rectangularity | | 2.0 mm/m |

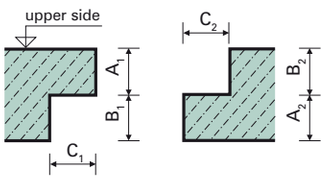
## 2.6.2 Appearance

| PARAMETER | 1ST CLASS QUALITY | 2ND CLASS QUALITY |
|---|---|---|
| Deflection from the right angle | max. 2 mm/1 m of length | max. 4 mm/1 m of length |
| Permitted edge damage | max depth 3 mm | max. depth 30 mm |
| Plane projections | max. 1 mm, size 10 mm | max. 1 mm |
| Hollows | max. 1 mm, size 10 mm | max. 2 mm |
| Other | | Thin edges, bark in surface, cement inclusions, peeled off edge, surface damage from pallet, edge and corner damage by saw blades. |

## 2.6.3 Services

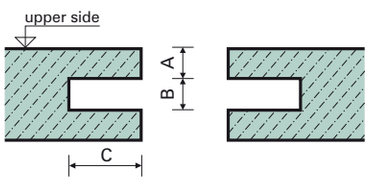
Milling, chamfering, tongue and groove forming tolerances are specified to assure correct function on assembly.

### Semi-groove



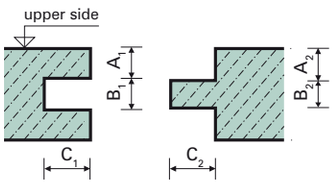

| Dimensions | Tolerance | Size | Tolerance |
|---|---|---|---|
| $A_1$ | −1 / 0 | $A_2$ | −1 / 0 |
| $B_1$ | 0 / +1.5 | $B_2$ | 0 / +1.5 |
| $C_1$ | 0 / +2 | $C_2$ | −2 / 0 |

### Groove




| Dimensions | Tolerance |
|---|---|
| A | −0.5 / +0.5 |
| B | 0 / +1.5 |
| C | 0 / +2 |

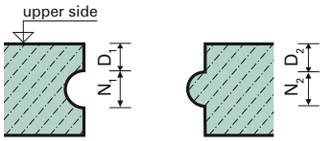
### Tongue and groove




| Dimensions | Tolerance | Size | Tolerance |
|---|---|---|---|
| $A_1$ | ±0.5 | $A_2$ | ±0.5 |
| $B_1$ | 0 / +0.5 | $B_2$ | −0.5 / 0 |
| $C_1$ | 0 / +2 | $C_2$ | −2 / 0 |

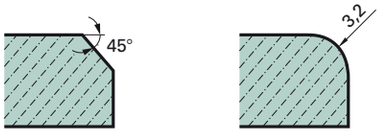
All dimensions in mm

### Semi-circular groove and tongue



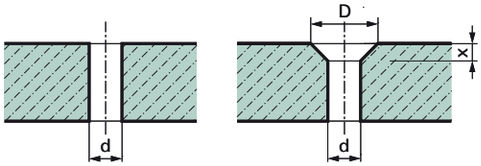

| Dimensions | Tolerance | Size | Tolerance |
|---|---|---|---|
| $D_1$ | ±0.5 | $D_2$ | ±0.5 |
| $N_1$ | 0 / +0.5 | $N_2$ | −0.5 / 0 |

### Rounded and chamfered edges




| Tolerance |
|---|
| Accuracy of processing ±0.5 mm |

### Drilling




Spacing tolerance of individual drilled holes in the board max. ±5 mm.

| DRILLING TYPE | HOLE DIAMETER | | SINK DEPTH X (mm) | BOARD THICKNESS (mm) |
|---|---|---|---|---|
| | d (mm) | D (mm) | | |
| No sink | 4.5 – 8.0 ±0.5 | - | - | 8 – 40 |
| No sink | 10.0 – 12.0 ±1.0 | - | - | 8 – 40 |
| With sink | 4.5 ±0.5 | 9.5 ±0.5 | 2.5 ±0.5 | 12 – 40 |
| With sink | 5.5 ±0.5 | 10.0 ±0.5 | 2.5 ±0.5 | 12 – 40 |
| With sink | 6.5 ±0.5 | 17.0 ±1.0 | 5.0 ±1.0 | 12 – 40 |

### Surface Finishes

The warranty period for colour stability (by colour manufacturer) is 3 years minimum.

Colour shades of CETRIS® FINISH (FINISH PROFIL) boards may be selected from the RAL or NCS colour table. It is recommended to consult the fitness of the selected colour shade with the manufacturer.

The reverse side of CETRIS® boards with a surface finish is covered with one layer of primer (lacquer) – in standard white or a transparent shade. The protective paint does not cover the identification inscriptions of the boards on the reverse side. The surface of the reverse side of the boards may be slightly damaged by manufacture-related handling of CETRIS® boards.

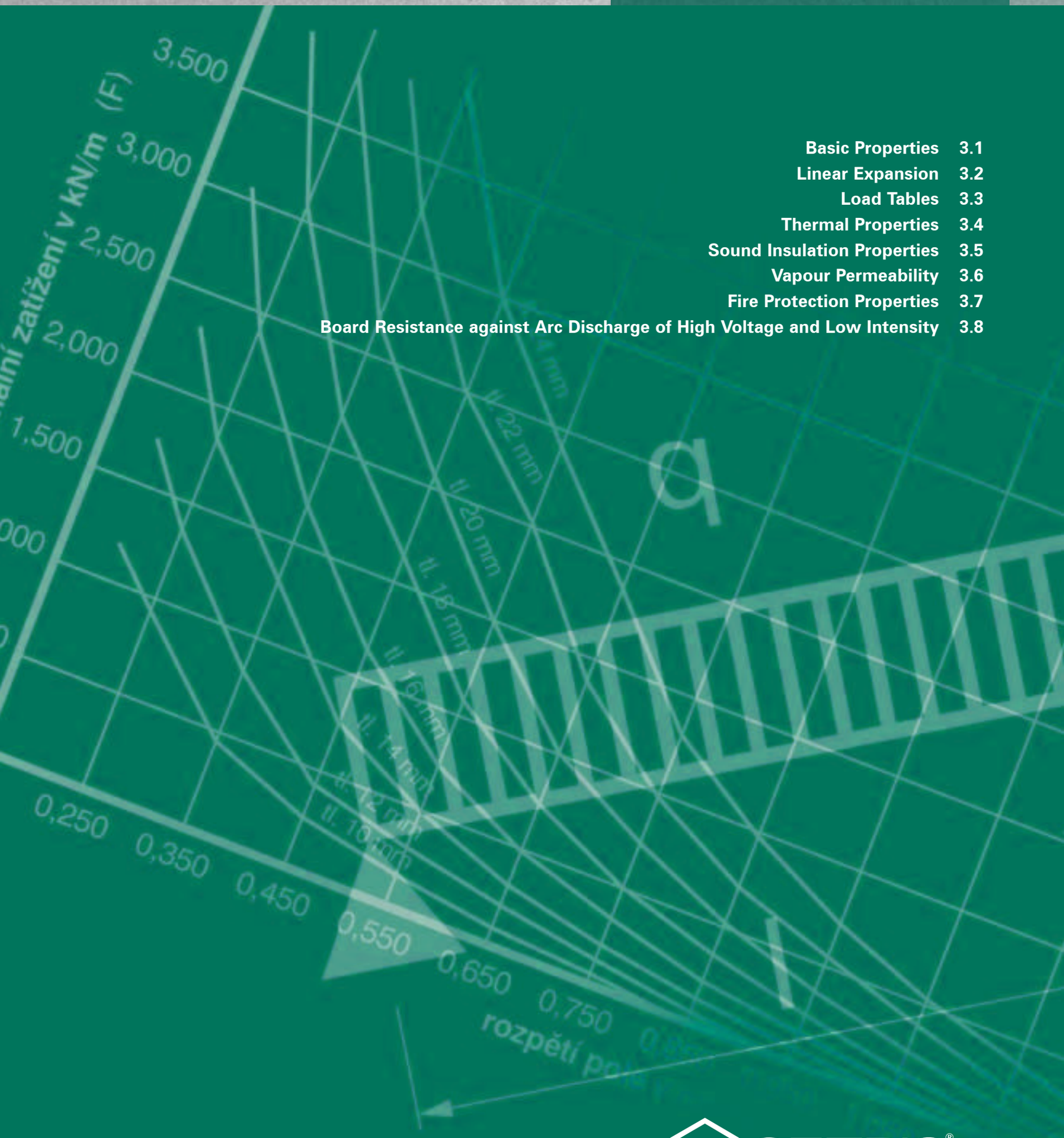
If on customer request a sample with the required colour shade is produced then this is for colour shade and coverage information only (there is a difference between manual paint application and machine painting of the mass manufactured boards).

**Notes**

# Basic Properties
## of CETRIS® Cement Bonded Particleboard

3






CETRIS®

# 3.1 Basic Properties

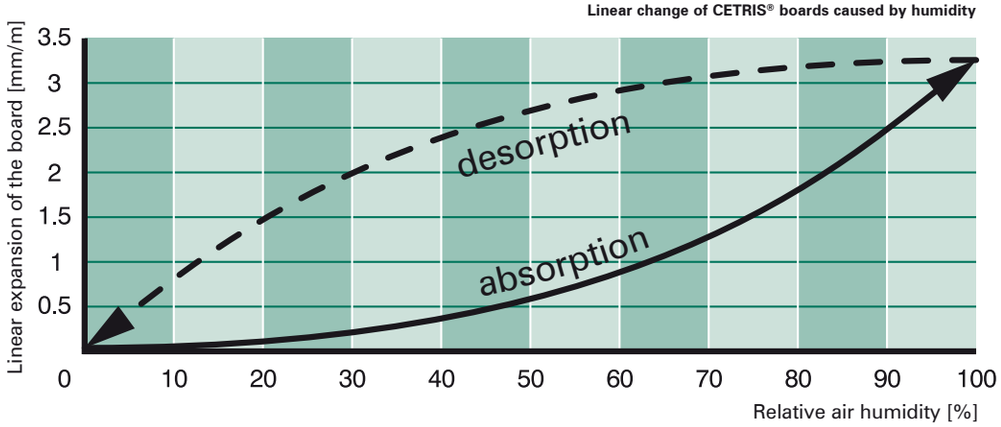
| TABLE OF BASIC PHYSICAL AND MECHANICAL PROPERTIES OF CETRIS® CEMENT BONDED PARTICLEBOARD | STANDARD VALUES | MEAN VALUES ACTUALLY ACHIEVED |
|---|---|---|
| Bulk density pursuant to EN 323 | min. 1,000 kg/m³ | 1,350 kg/m³ |
| Tensile bending strength pursuant to EN 310 | min. 9.0 N/mm² | min. 11.5 N/mm² |
| Elasticity module pursuant to EN 310 | min. 4,500 N/mm² | min. 6,800 N/mm² |
| Tensile strength applied perpendicularly to the board plane pursuant to EN 319 | min. 0.5 N/mm² | min. 0.63 N/mm² |
| Mass balanced moisture at 20° C and relative humidity 50 % pursuant to EN 634-1 | 9 ±3 % | 9.5 % |
| Linear expansion by air humidity change from 35 to 85 % at 23° C pursuant to EN 13 009 | | max. 0.122 % |
| Thermal expansion coefficient pursuant to EN 13 471 | | $10 \times 10^{-6}$ K$^{-1}$ |
| Board absorption rate after immersion into water for 24 hours | | max. 16 % |
| Thickness swelling after immersion into water for 24 hours | max. 1.5 % | max. 0.28 % |
| Thermal conductivity coefficient pursuant to EN 12 664 | | th. 8 mm – 0.200 W/mK<br>th. 22 mm – 0.251 W/mK<br>th. 40 mm – 0.287 W/mK |
| Airbone sound transmission loss pursuant to ČSN 73 0513 | | th. 8 mm – 30 dB<br>th. 24 mm – 33 dB<br>th. 40 mm – 35 dB |
| Diffusion resistance factor pursuant to EN ISO 12 572 | | th. 8 mm – 52.8<br>th. 40 mm – 69.2 |
| Weight activity Ra $^{226}$ | 150 Bq/kg | 22 Bq/kg |
| Weight activity index | I = 0.5 | I = 0.21 |
| Tensile strength after cycling in humid environment pursuant to EN 321 | min. 0.3 N/mm² | min. 0.41 N/mm² |
| Thickness swelling after cycling in humid environment pursuant to EN 321 | max. 1.5 % | max. 0.31 % |
| Frost resistance in 100 cycle test pursuant to EN 1328 | $R_L > 0.7$ | $R_L = 0.97$ |
| Surface resistance to water and chemical defrosting agents (ČSN 73 1326) | Waste after 100 cycles max. 800 g/m² (method A) | Waste after 100 cycles max. 20.4 g/m² (method A) |
| | Waste after 75 cycles max. 800 g/m² (method C) | Waste after 75 cycles max. 47.8 g/m² (method C) |
| Resistance to arc discharge of high voltage and low intensity pursuant to EN 61 621 | | th. 10 mm – min. 143 sec |
| Board pH value | | 12.5 |
| Sliding friction coefficient ČSN 74 4507 | | static $\mu_s = 0{,}73$<br>dynamic $\mu_d = 0{,}76$ |

| TABLE OF BASIC FIRE RESISTANCE PROPERTIES | ACHIEVED VALUE |
|---|---|
| Reaction to fire pursuant to EN 13 501-1 | A2-s1,d0 |
| Surface spread of flame index pursuant to ČSN 73 0863 | I = 0 mm/min |

# 3.2 Linear Expansion

One of the properties of products containing wooden mass is linear expansion and shrinkage caused by air humidity changes. This also applies to CETRIS® boards and must be taken into account by allowing the boards to sufficiently dilate. In the case of vertical cladding constructions a dilation of 4 – 5 mm is provided every 1,250 mm, or a dilation of 12 mm every 3,350 mm.
In the case of horizontal load-bearing constructions (such as floors), CETRIS® boards are set butted and the dilation joints are created along the walls in the minimum thickness of 15 mm. Size changes do not affect the quality or durability of CETRIS® boards.

**Linear change of CETRIS® boards caused by humidity**



# 3.3 Load Tables

Structural analysis of the load-bearing capacity of CETRIS® boards has been made for board laying on beams (with the boards acting as a continuous beam). Joint action of the individual CETRIS® boards in the case of beams with two or more fields is assured by groove and tongue joint gluing, or edge gluing in the case of smaller board thicknesses.

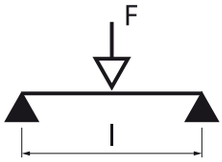
The calculation was made for flexibly behaving material and with respect for the following mechanical and physical properties:

- Tensile bending strength min. 9 $Nmm^{-2}$
- Elasticity module min. 4,500 $Nmm^{-2}$
- Bulk density 1,400 $kg/m^3$

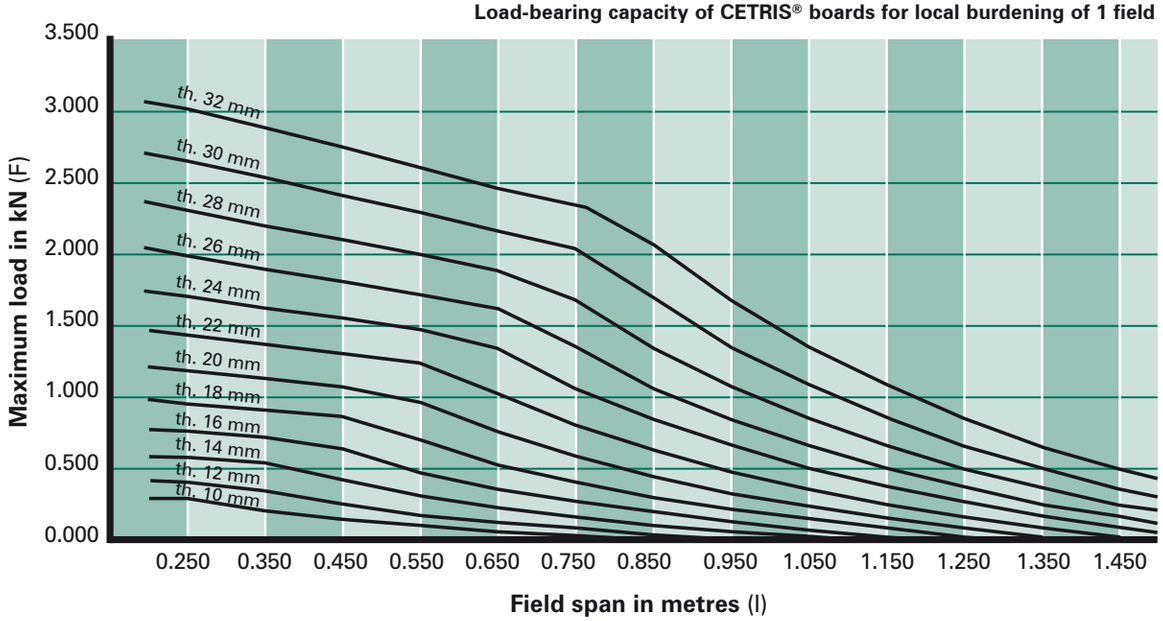
When the load-bearing capacity was calculated, the effect of the boards own weight was also taken into account. The maximum normal strain in the marginal fibres under load does not exceed 3.60 $Nmm^{-2}$ (this means 2.5 multiple safety). Maximum deflection sag by traffic load including the boards own weight does not exceed 1/300 of the span. →→

**Load Table for CETRIS® – concentrated load – 1 field beam**
(applies for example for specification of thickness of a board – ceiling panel loaded with a solitary burden)

| Beam span **l** (mm) | Maximum load **F** (kN) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | th. 10 | th. 12 | th. 14 | th. 16 | th. 18 | th. 20 | th. 22 | th. 24 | th. 26 | th. 28 | th. 30 | th. 32 |
| 200 | 0.298 | 0.431 | 0.587 | 0.767 | 0.972 | 1.201 | 1.454 | 1.731 | 2.032 | 2.357 | 2.707 | 3.080 |
| 250 | 0.291 | 0.420 | 0.573 | 0.750 | 0.951 | 1.175 | 1.423 | 1.694 | 1.990 | 2.309 | 2.651 | 3.018 |
| 300 | 0.250 | 0.410 | 0.559 | 0.732 | 0.929 | 1.148 | 1.391 | 1.657 | 1.946 | 2.259 | 2.595 | 2.954 |
| 350 | 0.205 | 0.361 | 0.545 | 0.714 | 0.906 | 1.121 | 1.359 | 1.619 | 1.903 | 2.209 | 2.538 | 2.889 |
| 400 | 0.170 | 0.302 | 0.489 | 0.695 | 0.883 | 1.093 | 1.326 | 1.581 | 1.858 | 2.157 | 2.479 | 2.824 |
| 450 | 0.141 | 0.255 | 0.417 | 0.632 | 0.860 | 1.065 | 1.292 | 1.541 | 1.812 | 2.105 | 2.420 | 2.757 |
| 500 | 0.117 | 0.216 | 0.357 | 0.546 | 0.789 | 1.036 | 1.258 | 1.501 | 1.766 | 2.053 | 2.360 | 2.690 |
| 550 | 0.097 | 0.183 | 0.307 | 0.473 | 0.688 | 0.958 | 1.223 | 1.461 | 1.719 | 1.999 | 2.300 | 2.622 |
| 600 | 0.078 | 0.154 | 0.263 | 0.410 | 0.601 | 0.842 | 1.137 | 1.420 | 1.672 | 1.945 | 2.239 | 2.553 |
| 650 | 0.062 | 0.128 | 0.225 | 0.356 | 0.526 | 0.741 | 1.006 | 1.325 | 1.624 | 1.891 | 2.177 | 2.483 |
| 700 | 0.047 | 0.105 | 0.191 | 0.308 | 0.461 | 0.654 | 0.892 | 1.179 | 1.520 | 1.836 | 2.115 | 2.414 |
| 750 | 0.033 | 0.084 | 0.160 | 0.265 | 0.402 | 0.576 | 0.790 | 1.050 | 1.359 | 1.720 | 2.052 | 2.343 |
| 800 | 0.020 | 0.065 | 0.132 | 0.226 | 0.349 | 0.506 | 0.700 | 0.935 | 1.216 | 1.544 | 1.925 | 2.273 |
| 850 | 0.007 | 0.047 | 0.106 | 0.190 | 0.301 | 0.443 | 0.619 | 0.832 | 1.087 | 1.387 | 1.734 | 2.132 |
| 900 | | 0.030 | 0.082 | 0.157 | 0.257 | 0.385 | 0.545 | 0.739 | 0.971 | 1.245 | 1.562 | 1.926 |
| 950 | | 0.014 | 0.060 | 0.127 | 0.217 | 0.333 | 0.478 | 0.654 | 0.866 | 1.116 | 1.406 | 1.739 |
| 1000 | | | 0.039 | 0.980 | 0.179 | 0.284 | 0.416 | 0.577 | 0.770 | 0.998 | 1.264 | 1.570 |
| 1050 | | | 0.020 | 0.072 | 0.144 | 0.239 | 0.358 | 0.505 | 0.682 | 0.890 | 1.134 | 1.415 |
| 1100 | | | 0.001 | 0.047 | 0.112 | 0.197 | 0.306 | 0.439 | 0.600 | 0.791 | 1.014 | 1.272 |
| 1150 | | | | 0.024 | 0.082 | 0.158 | 0.256 | 0.378 | 0.525 | 0.700 | 0.904 | 1.141 |
| 1200 | | | | 0.003 | 0.053 | 0.122 | 0.211 | 0.321 | 0.321 | 0.455 | 0.615 | 0.802 |




**Load-bearing capacity of CETRIS® boards for local burdening of 1 field**



# Basic Properties
## of CETRIS® Cement Bonded Particleboard

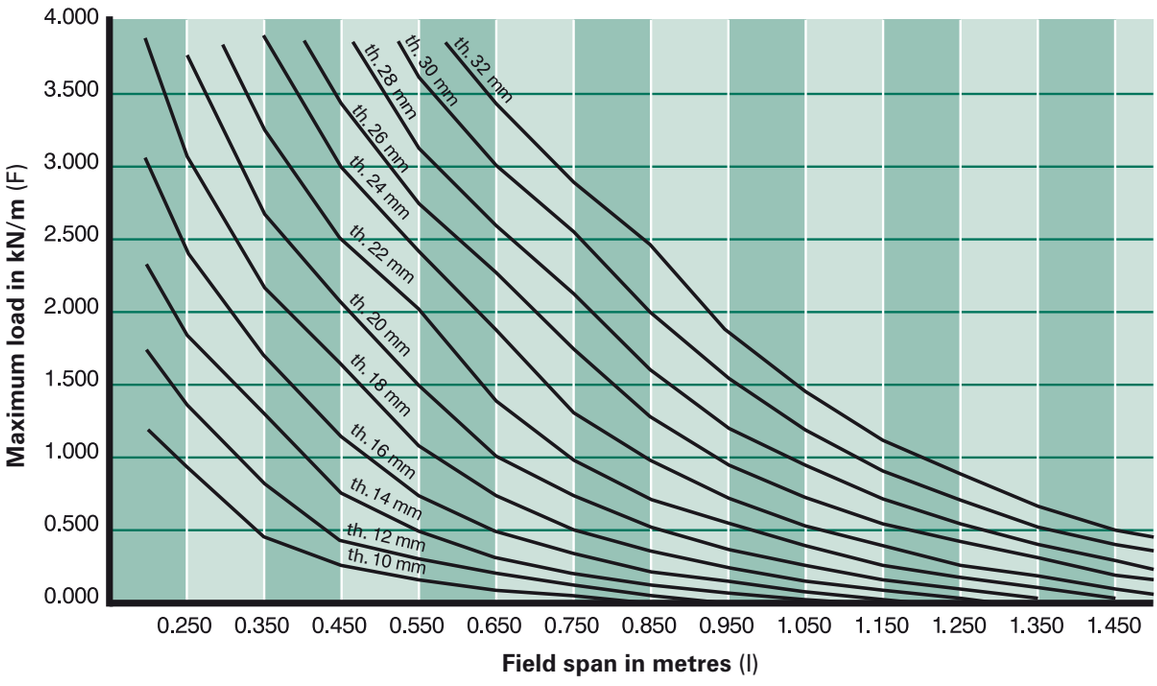
The calculation has verified that concentrated load is decisive for the CETRIS® board load-bearing capacity. The following tables and diagrams consider loading of the surface of 50 by 50 mm in the middle of a board of min. width of 1 m (pursuant to EN). The static calculation further assumes that the forces act directly on the board surface.

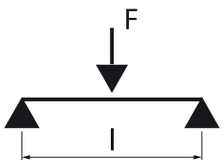
**The below data cannot be used for floor construction designing. For model designs of CETRIS® board floors and their load tables see Chapter 7 CETRIS® Floor Systems.**

**Load Table for CETRIS® – line load – 1 field beam**
(applies for example for specification of thickness of a board loaded with a line burden)

| Beam span l (mm) | Maximum load F (kN/m) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | th. 10 | th. 12 | th. 14 | th. 16 | th. 18 | th. 20 | th. 22 | th. 24 | th. 26 | th. 28 | th. 30 | th. 32 |
| 200 | 1.186 | 1.711 | 2.332 | 3.050 | 3.863 | 4.772 | 5.777 | 6.878 | 8.076 | 9.369 | 10.758 | 12.243 |
| 250 | 0.938 | 1.361 | 1.857 | 2.430 | 3.079 | 3.805 | 4.608 | 5.488 | 6.444 | 7.477 | 8.588 | 9.774 |
| 300 | 0.640 | 1.121 | 1.539 | 2.014 | 2.554 | 3.158 | 3.826 | 4.558 | 5.353 | 6.213 | 7.137 | 8.125 |
| 350 | 0.459 | 0.810 | 1.301 | 1.716 | 2.178 | 2.694 | 3.265 | 3.891 | 4.572 | 5.307 | 6.098 | 6.943 |
| 400 | 0.340 | 0.606 | 0.980 | 1.480 | 1.894 | 2.344 | 2.842 | 3.389 | 3.983 | 4.626 | 5.316 | 6.054 |
| 450 | 0.257 | 0.456 | 0.758 | 1.151 | 1.657 | 2.070 | 2.512 | 2.996 | 3.523 | 4.093 | 4.706 | 5.361 |
| 500 | 0.196 | 0.362 | 0.597 | 0.913 | 1.321 | 1.833 | 2.246 | 2.681 | 3.154 | 3.665 | 4.215 | 4.803 |
| 550 | 0.150 | 0.285 | 0.477 | 0.735 | 1.070 | 1.491 | 2.006 | 2.421 | 2.850 | 3.313 | 3.812 | 4.345 |
| 600 | 0.114 | 0.225 | 0.384 | 0.599 | 0.878 | 1.228 | 1.659 | 2.178 | 2.595 | 3.018 | 3.474 | 3.962 |
| 650 | 0.085 | 0.177 | 0.310 | 0.491 | 0.726 | 1.022 | 1.387 | 1.827 | 2.348 | 2.767 | 3.187 | 3.635 |
| 700 | 0.061 | 0.138 | 0.250 | 0.404 | 0.604 | 0.857 | 1.169 | 1.546 | 1.993 | 2.517 | 2.939 | 3.354 |
| 750 | 0.041 | 0.106 | 0.201 | 0.332 | 0.504 | 0.722 | 0.991 | 1.317 | 1.704 | 2.158 | 2.683 | 3.109 |
| 800 | 0.024 | 0.078 | 0.159 | 0.272 | 0.421 | 0.610 | 0.844 | 1.128 | 1.466 | 1.862 | 2.321 | 2.848 |
| 850 | 0.009 | 0.054 | 0.124 | 0.221 | 0.350 | 0.516 | 0.721 | 0.970 | 1.266 | 1.615 | 2.019 | 2.483 |
| 900 | | 0.034 | 0.093 | 0.177 | 0.290 | 0.435 | 0.615 | 0.835 | 1.097 | 1.406 | 1.764 | 2.175 |
| 950 | | 0.015 | 0.066 | 0.139 | 0.238 | 0.366 | 0.525 | 0.720 | 0.952 | 1.227 | 1.546 | 1.912 |
| 1,000 | | | 0.042 | 0.106 | 0.192 | 0.305 | 0.444 | 0.619 | 0.827 | 1.072 | 1.358 | 1.686 |
| 1,050 | | | 0.021 | 0.076 | 0.152 | 0.525 | 0.377 | 0.532 | 0.718 | 0.937 | 1.194 | 1.489 |
| 1,100 | | | 0.001 | 0.049 | 0.116 | 0.204 | 0.316 | 0.454 | 0.621 | 0.819 | 1.050 | 1.317 |
| 1,150 | | | | 0.025 | 0.083 | 0.162 | 0.262 | 0.386 | 0.536 | 0.714 | 0.923 | 1.165 |
| 1,200 | | | | 0.003 | 0.054 | 0.123 | 0.213 | 0.324 | 0.459 | 0.621 | 0.810 | 1.029 |

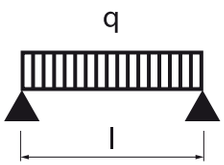
**Load-bearing capacity of CETRIS® boards for line burdening of 1 field**



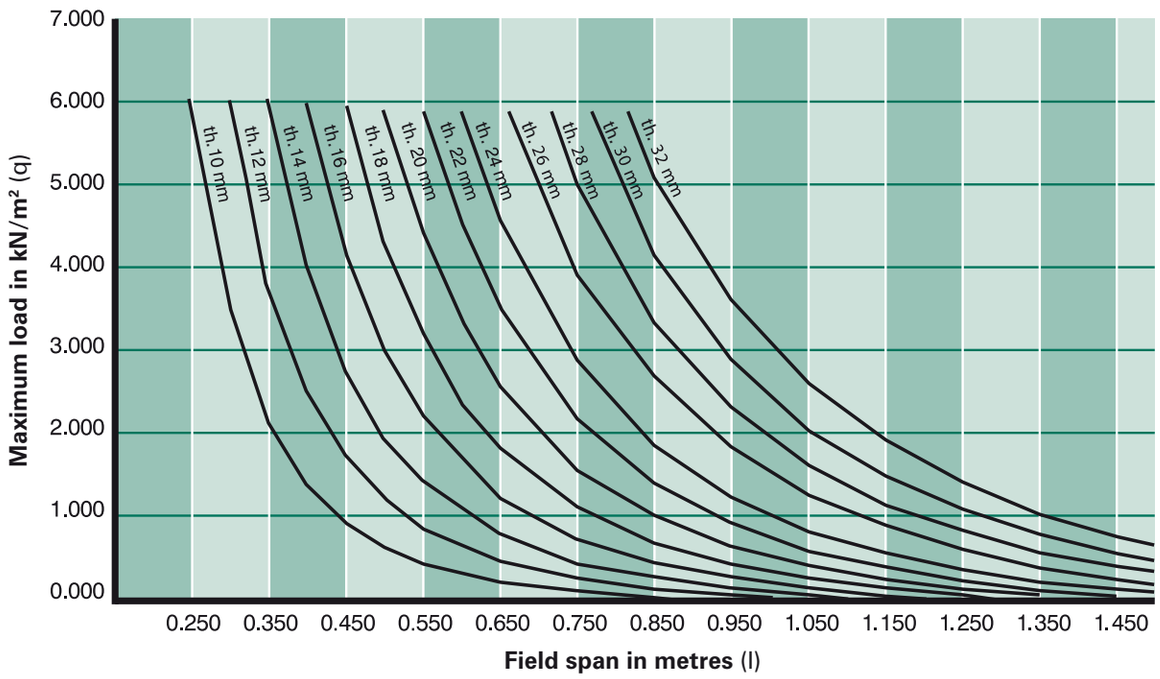



**Load Table for CETRIS® – continuous load – 1 field beam**
(applies for example for specification of thickness of a board used as permanent formwork)

| Beam span l (mm) | Maximum load q (kN/m²) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | th. 10 | th. 12 | th. 14 | th. 16 | th. 18 | th. 20 | th. 22 | th. 24 | th. 26 | th. 28 | th. 30 | th. 32 |
| 200 | 11.860 | 17.112 | 32.324 | 30.496 | 38.628 | | | | | | | |
| 250 | 6.004 | 10.449 | 14.857 | 19.437 | 24.631 | 30.440 | | | | | | |
| 300 | 3.416 | 5.976 | 9.560 | 13.429 | 17.028 | 21.053 | 25.505 | 30.384 | | | | |
| 350 | 2.099 | 3.701 | 5.948 | 8.947 | 12.444 | 15.393 | 18.657 | 22.234 | 26.124 | 30.328 | | |
| 400 | 1.360 | 2.424 | 3.920 | 5.920 | 8.496 | 11.720 | 14.212 | 16.944 | 19.916 | 23.128 | 26.580 | 30.272 |
| 450 | 0.913 | 1.653 | 2.695 | 4.091 | 5.892 | 8.148 | 10.910 | 13.317 | 15.660 | 18.192 | 20.913 | 23.825 |
| 500 | 0.628 | 1.159 | 1.911 | 2.922 | 4.227 | 5.864 | 7.870 | 10.281 | 12.615 | 14.661 | 16.860 | 19.213 |
| 550 | 0.437 | 0.829 | 1.387 | 2.139 | 3.113 | 4.336 | 5.836 | 7.641 | 9.778 | 12.048 | 13.861 | 15.801 |
| 600 | 0.304 | 0.600 | 1.024 | 1.596 | 2.340 | 3.276 | 4.424 | 5.808 | 7.448 | 9.364 | 11.580 | 13.205 |
| 650 | 0.210 | 0.436 | 0.763 | 1.208 | 1.787 | 2.517 | 3.414 | 4.496 | 5.780 | 7.282 | 9.018 | 11.007 |
| 700 | 0.140 | 0.316 | 0.572 | 0.922 | 1.380 | 1.959 | 2.672 | 3.533 | 4.555 | 5.752 | 7.137 | 8.723 |
| 750 | 0.088 | 0.225 | 0.428 | 0.708 | 1.075 | 1.540 | 2.115 | 2.810 | 3.636 | 4.603 | 5.724 | 7.009 |
| 800 | 0.048 | 0.156 | 0.319 | 0.544 | 0.842 | 1.220 | 1.689 | 2.256 | 2.932 | 3.724 | 4.643 | 5.696 |
| 850 | 0.016 | 0.102 | 0.233 | 0.416 | 0.660 | 0.971 | 1.356 | 1.825 | 2.383 | 3.040 | 3.801 | 4.674 |
| 900 | | 0.060 | 0.165 | 0.315 | 0.516 | 0.773 | 1.094 | 1.484 | 1.951 | 2.499 | 3.136 | 3.867 |
| 950 | | 0.025 | 0.111 | 0.235 | 0.401 | 0.616 | 0.884 | 1.212 | 1.604 | 2.066 | 2.603 | 3.221 |
| 1,000 | | | 0.067 | 0.169 | 0.308 | 0.488 | 0.714 | 0.991 | 1.323 | 1.715 | 2.172 | 2.698 |
| 1,050 | | | 0.032 | 0.116 | 0.232 | 0.383 | 0.575 | 0.810 | 1.094 | 1.428 | 1.819 | 2.269 |
| 1,100 | | | 0.002 | 0.071 | 0.169 | 0.297 | 0.460 | 0.661 | 0.904 | 1.191 | 1.527 | 1.915 |
| 1,150 | | | | 0.035 | 0.116 | 0.225 | 0.364 | 0.537 | 0.745 | 0.994 | 1.284 | 1.620 |
| 1,200 | | | | 0.004 | 0.072 | 0.164 | 0.284 | 0.432 | 0.612 | 0.828 | 1.080 | 1.372 |

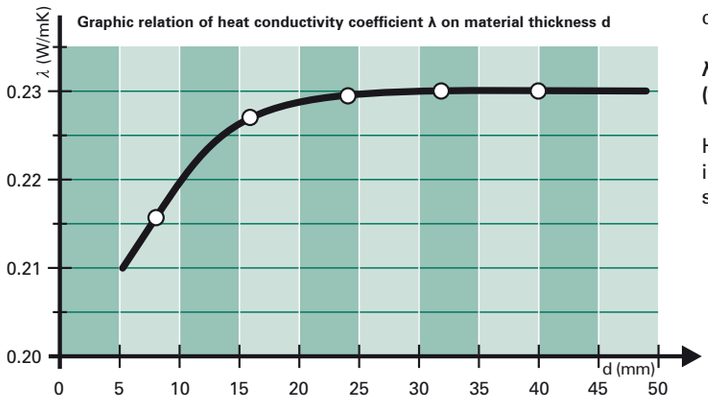



**Load-bearing capacity of CETRIS® boards for continuous burdening of 1 field**



## 3.4 Thermal Properties

The heat conductivity or the heat conductivity coefficient represents the most important indicator of building materials with regard to thermal performance. The CETRIS® cement bonded particleboard, thanks to its ideal connection of wood and cement, is a good heat conductor. For that reason their application area includes all applications requiring compact materials with the lowest thermal resistance possible to minimise heat loss. This is for example the case of floor heating applications. Floor heating is dealt with in more detail in a separate chapter, 7.10 Floor Heating.




**λ = max. 0.287 W/mK**
**(for mass humidity 9 ±3 %)**

Higher humidity causes proportional increase of heat conductivity which should not exceed 0.35 W/mK.

Heat conductivity of CETRIS® boards in relation to thickness:

| CETRIS® BOARD THICKNESS (mm) | HEAT CONDUCTIVITY λ (W/mK) | THERMAL RESISTANCE R ($m^2K/W$) |
|---|---|---|
| 8 | 0.200 | 0.040 |
| 24 | 0.251 | 0.096 |
| 40 | 0.287 | 0.139 |

The above values of heat conductivity are measured in dry conditions. The effect of moisture on heat conductivity is not negligible, though. Higher humidity causes a proportional increase of heat conductivity. That is why the heat conductivity values should be related to a stabilised CETRIS® board moisture level.

## 3.5 Sound Insulation Properties

On the basis of evaluation of tests of acoustic properties by the Construction Research Institute in Prague the acoustic properties of CETRIS® boards are excellent and therefore the boards are ideal for cladding of light partitions, walls and ceilings and may also be used as sound absorbing ceiling panels. CETRIS® cement bonded particleboards show low sound absorption, therefore are classified as reflexive sound barriers.
For increased sound absorption it is recommended to use CETRIS® boards with sound absorbing material.

**Following values have been tested for the purpose of application of the boards in sound protection systems:**

| | |
|---|---|
| Sound transmission loss coefficient | 0.013 |
| Lengthwise wave spread rate | 2,128 m/s |
| Material constant | 22.7 |
| Index $R_w$: th. 8, 10 mm | 30 dB |
| th. 12, 14 mm | 31 dB |
| th. 16, 20 mm | 32 dB |
| th. 24 mm | 33 dB |
| th. 32 mm | 34 dB |
| th. 40 mm | 35 dB |

**Sound transmission loss of wall constructions clad with CETRIS® cement bonded particleboard**
One of the possibilities to reduce noise transmission from the source to the recipient is an effective noise barrier. The ability of building structures to transfer and reduce acoustic output spreading through the air is provided by acoustic materials (insulation etc.). Sound transmission loss is a feature of building construction to provide noise insulation of two neighbouring rooms and protect the rooms from airborne noise. The basic rule is: the higher the sound transmission loss the better!

**Weighed laboratory sound transmission loss Rw (dB)** of selected wall constructions clad with CETRIS® cement bonded particleboard was measured in laboratory on specimen of prescribed size pursuant to EN ISO 140-3 Acoustics – Measurements of noise barriers represented by building constructions and noise barriers in buildings – Part 3: Laboratory measurements of sound transmission loss in building constructions. For the other structures of walls and partitions the values of sound transmission loss are shown in the table on page 134 (chapter CETRIS® Board Application in Fire Protection, Survey of Fire Walls) and specified by calculation.

**Weighed construction sound transmission loss R`w (dB)** – is STL measured in a particular building structure on site. For the reason of different conditions of measurement (effects bypasses) the results on site are always worse than in the laboratory. The following equation applies to building sound transmission loss R`w (dB):

**R`w = Rw – k (dB)**

Where "k" is the correction depending on the bypass direction of air flow (usually k = 2 – 3 dB, in the case of composite constructions the value is recommended to be specified individually on the basis of knowledge of the surroundings and the bypass direction).

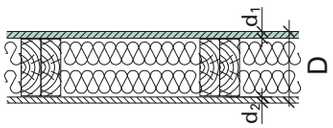
**Informative compositions – requirements for noise insulation between rooms in buildings pursuant to ČSN 73 0532 Acoustics – Assessment of noise insulation of building constructions and in buildings**

| SPACE | REQUIREMENTS FOR NOISE ABSORPTION BY PARTITIONS $R'_w$ | PROPOSED COMPOSITION |
|---|---|---|
| **Residential houses – one living room in a multi-room apartment** | | |
| All other rooms of the same apartment unless functional parts of the protected space | 42 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| **Residential houses – apartment** | | |
| All rooms of other apartments | 52 dB | CETRIS® 2 × 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 2 × 12 mm |
| Common spaces (staircases, corridors etc.) | 52 dB | CETRIS® 2 × 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 2 × 12 mm |
| Common unused spaces (such as lofts) | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| Passages, subways | 52 dB | CETRIS® 2 × 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 2 × 12 mm |
| **Hotels and accommodation facilities – bedroom space, guest rooms** | | |
| Rooms of other guests | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| Common spaces (staircases, corridors etc.) | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| **Hospitals, sanatoria – wards, doctors' offices** | | |
| Wards, surgeries | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| auxiliary spaces | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| **Schools and educational institutions** | | |
| Classrooms | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| Common spaces | 42 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| Noisy rooms (gyms, workshops, dining halls) $L_a$ max. <85 dB | 52 dB | CETRIS® 2 × 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 2 × 12 mm |
| **Offices and studies** | | |
| Offices and studies | 37 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |
| Studies with increased demand for noise protection | 47 dB | CETRIS® 12 mm, CW profile 75 + 60 mm mineral wool, CETRIS® 12 mm |

# Basic Properties
## of CETRIS® Cement Bonded Particleboard

**Laboratory measurements of sound transmission loss pursuant to EN ISO 140-3**

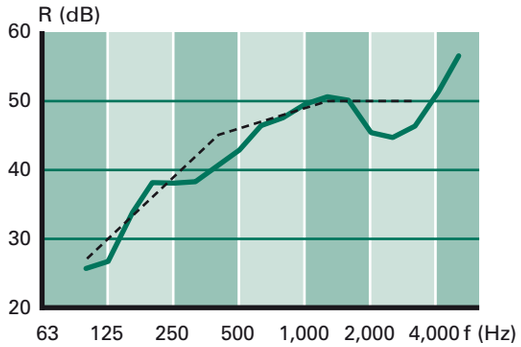
### Wall 1




Composition:
- CETRIS® board 14 mm
- Wooden frame 120 mm
- ORSIL Uni 2 × 60 mm
- Plasterboard KNAUF GKB thickness 12.5 mm

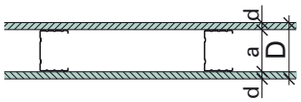
Assessment pursuant to EN ISO 717-1

$R_w$ (C; $C_{tr}$) = 46 (-2; -6) dB




| FREQUENCY | Hz | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1,000 | 1,250 | 1,600 | 2,000 | 2,500 | 3,150 | 4,000 | 5,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **R** 1/3 oct | dB | 25.6 | 26.7 | 33.2 | 38.1 | 38.0 | 38.2 | 40.8 | 42.9 | 46.5 | 47.6 | 49.5 | 50.6 | 50.1 | 45.5 | 44.7 | 46.4 | 51.1 | 56.6 |

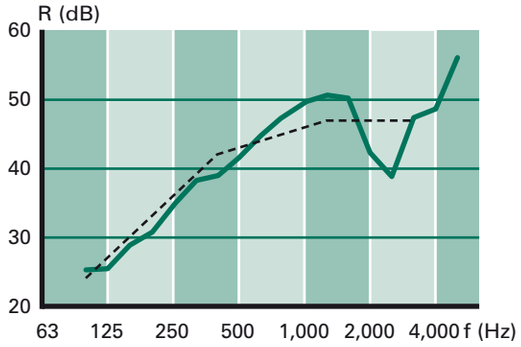
### Wall 2




Composition:
- CETRIS® board 12 mm
- CW profile 75 mm
- CETRIS® board 12 mm

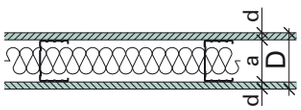
Assessment pursuant to EN ISO 717-1

$R_w$ (C; $C_{tr}$) = 43 (-2; -5) dB




| FREQUENCY | Hz | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1,000 | 1,250 | 1,600 | 2,000 | 2,500 | 3,150 | 4,000 | 5,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **R** 1/3 oct | dB | 25.2 | 25.4 | 28.8 | 30.7 | 34.8 | 38.3 | 38.9 | 41.7 | 45.0 | 47.7 | 49.7 | 50.7 | 50.3 | 42.3 | 38.7 | 47.5 | 48.6 | 56.2 |

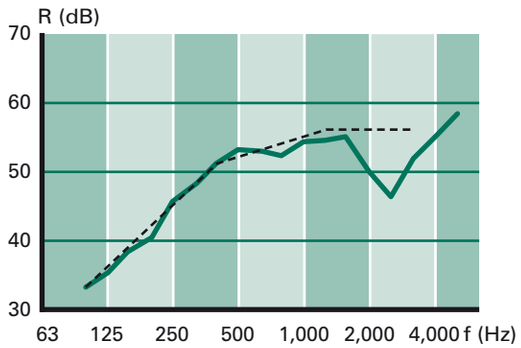
### Wall 3




Composition:
- CETRIS® board 12 mm
- CW profile 75 mm
- ORSIL Hardsil 60 mm
- CETRIS® board 12 mm

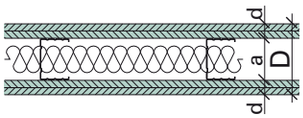
Assessment pursuant to EN ISO 717-1

$R_w$ (C; $C_{tr}$) = 52 (-2; -5) dB




| FREQUENCY | Hz | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1,000 | 1,250 | 1,600 | 2,000 | 2,500 | 3,150 | 4,000 | 5,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **R** 1/3 oct | dB | 33.2 | 35.3 | 38.5 | 40.3 | 45.7 | 48.0 | 51.2 | 53.2 | 53.0 | 52.3 | 54.3 | 54.5 | 55.1 | 50.2 | 46.2 | 51.8 | 55.1 | 58.4 |

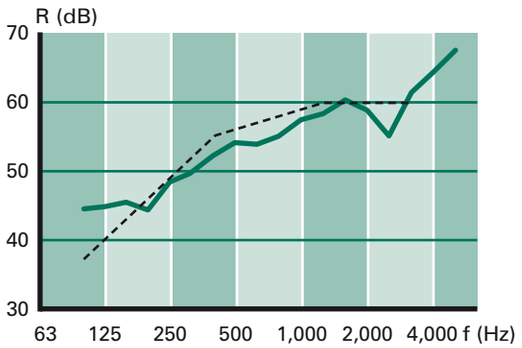
**Wall 4**




Composition:
- 2 CETRIS® boards 12 mm
- CW profile 75 mm
- ORSIL Hardsil 60 mm
- 2 CETRIS® boards 12 mm

Assessment pursuant to EN ISO 717-1

$R_w$ (C; $C_{tr}$) = 56 (-1; -3) dB




| FREQUENCY | Hz | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1,000 | 1,250 | 1,600 | 2,000 | 2,500 | 3,150 | 4,000 | 5,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **R** 1/3 oct | dB | 44.5 | 44.8 | 45.5 | 44.3 | 48.4 | 49.8 | 52.4 | 54.2 | 54.0 | 55.2 | 57.5 | 58.4 | 60.4 | 59.0 | 55.2 | 61.4 | 64.4 | 67.6 |

**Note: Board measurements were performed by Centrum stavebního inženýrství, a.s., Prague, Zlín office, in October 2006 under the following conditions:**
**Test sample surface area 10.3 m², transmission chamber volume 90.3 m³, receiving chamber volume 70 m³, temperature 18 – 19° C, relative humidity 44 – 47%**

# 3.6 Vapour Permeability

Diffusion is the ability of molecules of gas, vapour or liquid to permeate through molecules of a porous material. When the porous material separates two spaces with a difference between partial pressures of vapour, vapour diffusion occurs. Vapour diffuses from the space where the partial vapour pressure is higher in macro-capillaries with the diameter $d > 10^{-7}$ m, because no capillary condensation happens in these capillaries.

Diffusion (diffusion resistance factor) is measured pursuant to *EN ISO 12572 Thermal behaviour of construction materials and products in relation to humidity – Specification of vapour permeation.*

Diffusion is tested on an exactly defined sample tightly closing the space of the test bowl containing either a drying agent (Silicagel) or a saturated solution (wet bowl). The set is placed in a test chamber with controlled temperature and air humidity. For the reason of different partial vapour pressure between the space of the test bowl and the chamber, vapour begins to flow through the permeable samples. Regular weighing of the set serves for specification of vapour permeation in the stable condition.

Ability of building materials to let vapour pass through by diffusion can be expressed by:

- Diffusion conductivity coefficient (vapour diffusion) **δ**
- Diffusion resistance factor **μ**
- Equivalent diffusion thickness $\mathbf{s_d}$

There are exactly defined relations between these values.

**Diffusion conductivity coefficient (vapour diffusion) δ** (s) is product of vapour permeability and thickness of a homogeneous sample. The coefficient was specified for CETRIS® cement bonded particleboard in 1991 (pursuant to ČSN 72 7031, tested thickness 12 mm) with the resulting value of $0.00239 \times 10^{-9}$ s, or $8.604 \times 10^{-6}$ g/mhPa.

**The value of diffusion resistance factor μ (dimensionless) is used more often.** It is the quotient of diffusion conductivity coefficient of vapour and building material. The factor expresses how many times higher the diffusion resistance of the building material is in comparison to a layer of air of the same thickness and temperature. Therefore the higher the value of the resistance the less permeable the material (the value achieved by mineral wool is 1 – 2, polystyrene and concrete values are 120 – 150, hydro insulation values equal to thousands). The diffusion resistance factor was specified by testing pursuant to EN ISO 12 572 for CETRIS® boards with the following results:

- For thickness 8 mm (the thinnest) **μ = 52.8**
- For thickness 40 mm (the thickest) **μ = 69.2**

**Equivalent diffusion thickness sd** (m) – thickness of the equivalent air gap is the thickness of a layer of calm air with the same diffusion resistance as the test sample.
For CETRIS® cement bonded particleboards the equivalent diffusion thickness generally equals to $\mathbf{s_d = \mu \times d}$, where **d** is the material thickness, i.e.:

- For thickness 8 mm (the thinnest)
  $s_d = 52.8 \times 0.008 = 0.43$ m
- For thickness 40 mm (the thickest)
  $s_d = 69.2 \times 0.040 = 2.78$ m
- for other thicknesses (generally)
  $s_d = \mu \times d$

*d ..... thickness of the CETRIS® board in m*
*μ ..... interpolated value from the table (for thickness range 10 – 38 mm)*

| | THICKNESS OF CETRIS® BOARD (mm) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | th. 8 | th. 10 | th. 12 | th. 14 | th. 16 | th. 18 | th. 20 | th. 22 | th. 24 | th. 26 | th. 28 | th. 30 | th. 32 | th. 34 | th. 36 | th. 38 | th. 40 |
| **μ** | 52.8 | 53.7 | 54.6 | 55.5 | 56.4 | 57.3 | 58.2 | 59.1 | 60.0 | 60.9 | 61.8 | 62.7 | 63.6 | 65.0 | 66.4 | 67.8 | 69.2 |
| **$s_d$ (m)** | 0.43 | 0.54 | 0.66 | 0.78 | 0.90 | 1.03 | 1.16 | 1.30 | 1.44 | 1.58 | 1.73 | 1.88 | 2.04 | 2.21 | 2.39 | 2.58 | 2.78 |

## 3.7 Fire Protection Properties

**Classification of cement bonded particleboard by reaction to fire class pursuant to European standard**
For the purpose of unified classification of building materials a new system has been introduced, completed and implemented as standard EN 13 501-1 Fire Classification of Building Products and Building Constructions – Part 1: Classification Based on Results of Tests of Reaction to Fire.

This new system eliminates, in the given area, the principal differences between the national systems of EU countries representing a serious obstacle to common trade. Another advantage of the system is the more accurate evaluation of building products. The new test standards are closer to the results of large dimension tests, i.e. behaviour in the care of actual fire.

**Classification of CETRIS® cement bonded particleboard based on its reaction to fire was performed on the basis of results of tests carried out pursuant to the following European standards:**
- EN ISO 1182:2002 – Non-Flammability Test
- EN ISO 1716:2002 – Specification of Burning Heat
- EN 13823:2002 – Test by Single Burning Item (SBI)
- EN ISO 11925-2:2002 – Test of Ignitability by single Flame Source (Inflammability Test)

On the basis of these tests performed by the IBS – Institut für Brandschutztechnik und Sicherheitsforschung Linz (Austria), CETRIS® cement bonded particleboards are classified as **A2**. Its complementary classification of smoke generation is **s1**, its classification of flaming drops (particles) is **d0**, which means the resulting classification of **A2-s1,d0**. This result applies to classification of the board behaviour in fire conditions, except for flooring.

The cement bonded particleboard is also classified pursuant to other national standards:
- Pursuant to **PN-B-02874:1996** (Protocol NP-595/02/JF, implemented) – **classification niezapalny** (non-flammable).

## 3.8 Board Resistance against Arc Discharge of High Voltage and Low Intensity

ELEKTROTECHNICKÝ ZKUŠEBNÍ ÚSTAV
Počet stran 2
Počet příloh/Počet stran příloh 0
Zn. Lidka

Číslo protokolu: 301508-01/01
Datum vydání: 12. 5. 2003

PROTOKOL O ZKOUŠCE

| | |
|---|---|
| Výrobek: | Cementotřísková deska |
| Typ: | CETRIS |
| Jmenovité hodnoty: | tloušťka 10mm |
| Výrobní číslo: | - |
| Výrobce: | CIDEM Hranice, a.s., divize CETRIS, Skalní 1088, 753 40 Hranice I - Město, Česko |
| Výrobní místo: | CIDEM Hranice, a.s., divize CETRIS Skalní 1088, 753 40 Hranice I - Město, Česko |
| Číselník výrobků EZÚ: | 100001 - ostatní služby |
| Objednavatel: | CIDEM Hranice, a.s., divize CETRIS, Skalní 1088, 753 40 Hranice I - Město, Česko |
| Počet zkoušených vzorků: | 10 |
| Vzorky předloženy dne: | 7.4.2003 |
| Místo provedení zkoušek: | Elektrotechnický zkušební ústav, s.p. |
| Zkoušky prováděny v době od: | 28. 4. 2003 do: 2. 5. 2003 |
| Jiné údaje: | |
| Výrobek zkoušen podle: | ČSN EN 61 621 98 |

Zpracoval: M. Beran

**New application of CETRIS® cement bonded particleboard**
CETRIS® cement bonded particleboard is a universal board material for interior and exterior use. It is distinguished from other board materials by its high resistance to weather effects, fire, mechanical damage and demanding technological space conditions.
On the basis of requirements coming from electricity distribution companies, the cement bonded particleboard CETRIS® has been tested for resistance against arc discharge of high voltage and low intensity pursuant to EN 61 621:1998 (IEC 61621:1997).

The testing was performed in May 2003 in the Electro-technical Test Institute in Prague – Trója with the testing apparatus MICAFIL ART 68 with the following result for CETRIS® board, thickness 10 mm:

- Minimum time to conductive path 143 s
- Mean time to conductive path 180.25 s

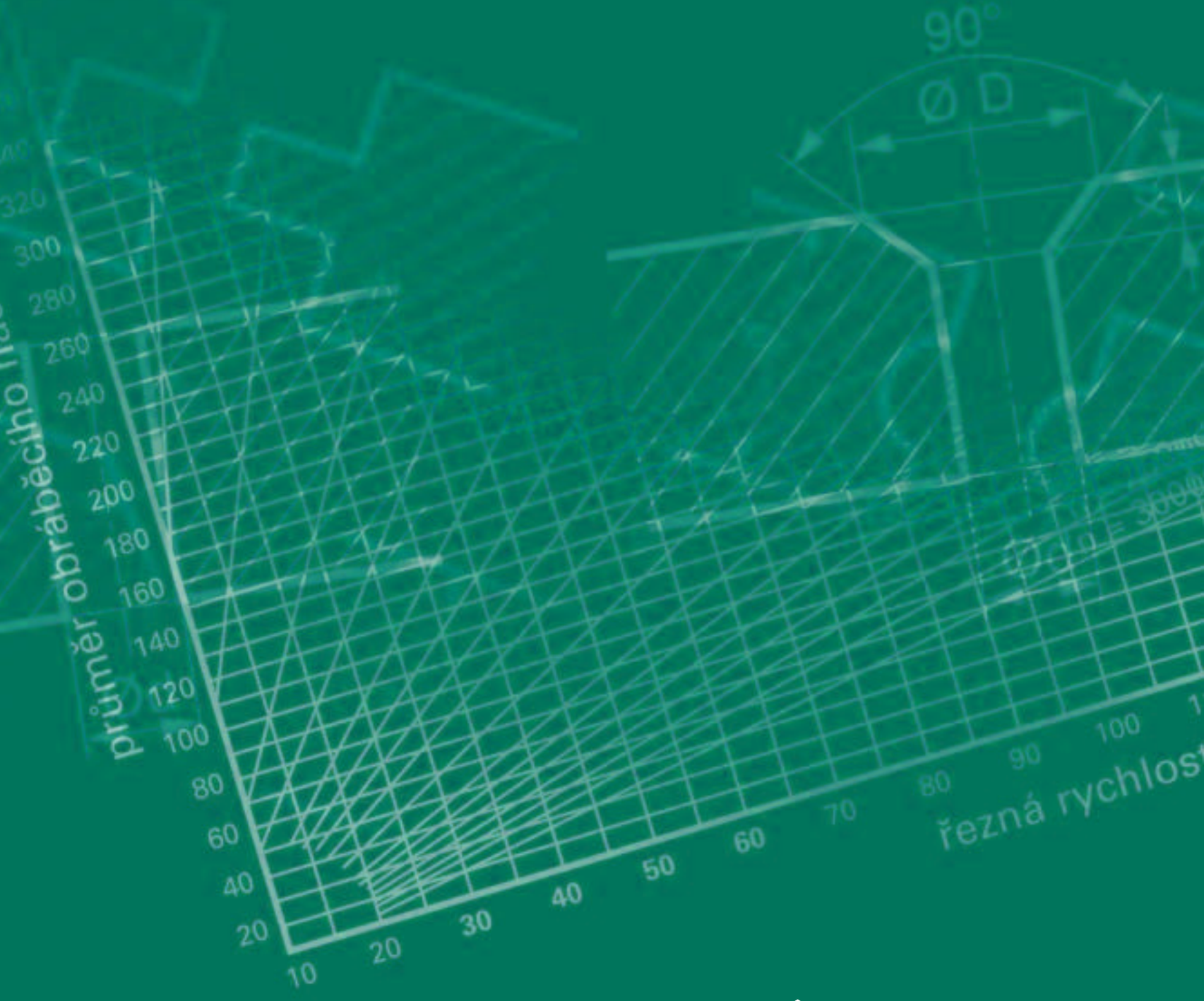
CETRIS® cement bonded particleboard complies with its resistance to electrical arc in spaces with high voltage wiring (collectors).

**Justification**: The mean and the minimum value of the measured times to the conductive path is lower than the protection switch off times of distribution network HV and LV wiring.

# Processing
## of CETRIS® Cement Bonded Particleboard

4





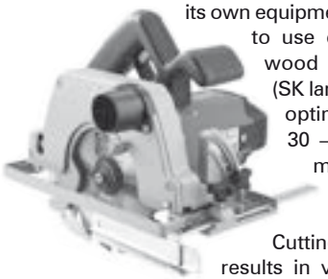

CETRIS®

# Processing
## of CETRIS® Cement Bonded Particleboard

A great advantage of CETRIS® cement bonded particleboards is that they can be processed by all common wood processing machines. For professional processing of CETRIS® boards, only hard metal instruments should be used. CETRIS® boards can be cut, drilled, milled and ground.

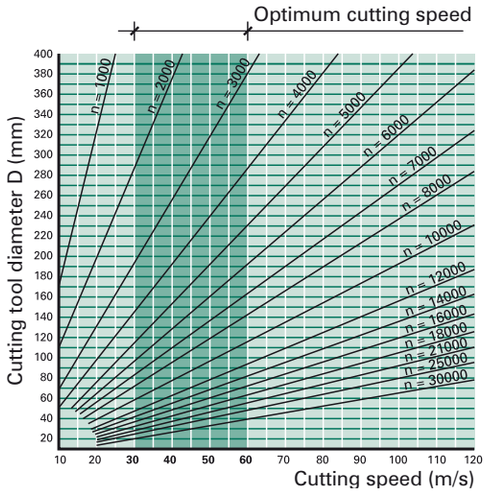
## 4.1 Cutting

The boards can be cut in the manufacturing plant on the basis of customer requirements with a specialised device. If a customer wants to cut the boards with its own equipment it is recommended to use common hard metal wood cutting instruments (SK lamellas). To achieve the optimum cutting speed of 30 – 60 m/s it is recommended to use machines with electronic revolution control.



Cutting of CETRIS® boards results in very fine dust waste.

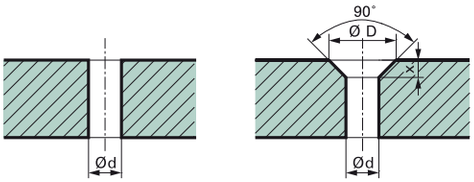
Surface finished boards (CETRIS® FINISH, and PROFIL FINISH) must be cut on the reverse (not treated) side to prevent damage to the front face with the surface finish. Even though the dust does not contain any harmful substances its exhausting is recommended for the reason of working environment protection.




**Relation of progress of processing tool on cutting speed (n = tool revolutions)**

## 4.2 Drilling

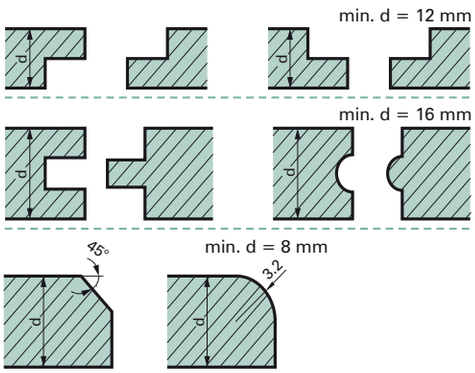
On the basis of a customer submitted drilling plan, the boards may be drilled (including countersinking) directly in the manufacturing plant.




Drill bits for drilling metal may be used. In the case of manual drilling it is recommended to use electrical drills with electronic revolution control. Surface finished boards (CETRIS® FINISH and PROFIL FINISH) are drilled from the face side (with surface finish). Drilling from the reverse side might damage the face.

## 4.3 Milling

CETRIS® cement bonded particleboards can be milled if required by the customer (for example semi-tongue, tongue and groove, edge chamfering etc.). If the customer wants to use its own mills




for milling the same principles as in the case of the previous processing methods apply. When milling, it is necessary to observe the mechanical properties of the boards (minimum thickness). The recommended cutting speed ranges within the interval 25 – 35 m/s.

## 4.4 Sanding

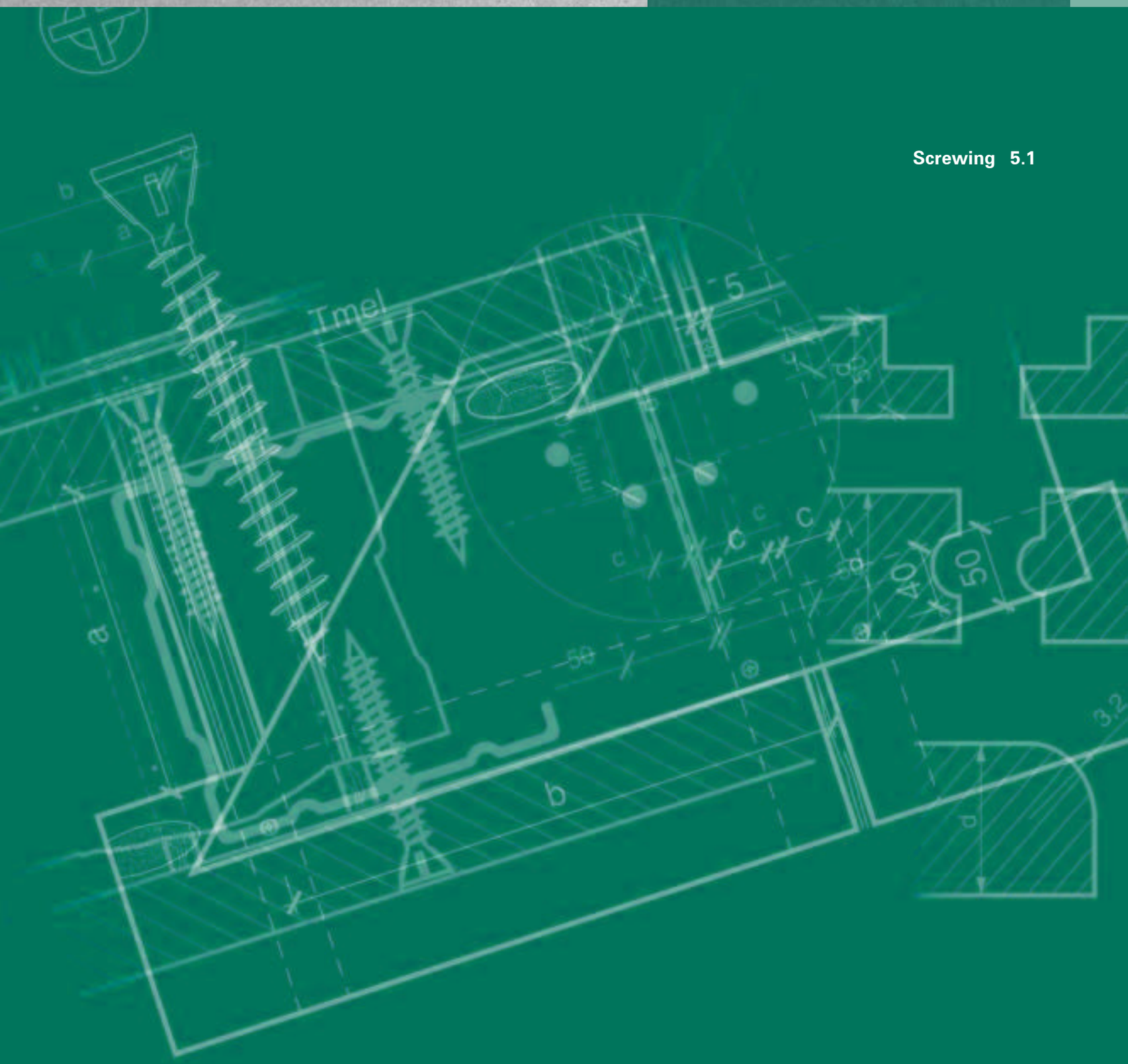
Full area machine sanding of CETRIS® cement bonded particleboards in the manufacturing plant is performed for the purpose of production of sanded flooring CETRIS® PDB for the reason of reduction of thickness tolerance to ±0.3 mm.

Manual sanding can be performed in the points of contact of the boards where uneven surface must be levelled or the board surface needs roughing. The instruments used include electrical manual sanders with abrasion paper of 40 – 80 granularity value. In this case exhausting of the resulting dust is also recommended.

# Fastening
## of CETRIS® Cement Bonded Particleboard

5






CETRIS®

CETRIS® boards can be fastened to constructions by screwing or riveting. Use of nails and bolts used for plasterboard is not recommended. All types of fastening elements must be treated with an anti-corrosion agent. Alternatively CETRIS® boards may be fixed to the load-bearing construction by gluing or clamping. Both methods are mainly used for fixation of the boards in the system of suspended vented façades.

# 5.1 Screwing

## 5.1.1 Interior Anchoring

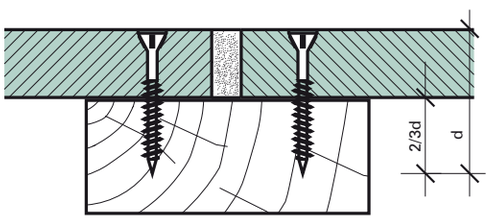
### 5.1.1.1 Screwing to Timber

For correct fixation of CETRIS® boards to constructions it is necessary to observe the maximum spacing of the load-bearing construction and the fixation elements.

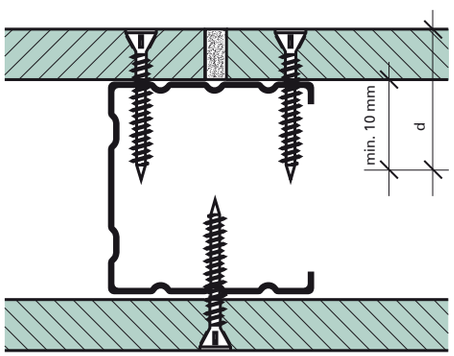
The best fastening element for fixation of CETRIS® boards is a self-cutting screw with double thread, hardened tip and sunken head with blades for countersinking. This type of screw may be supplied as an auxiliary material with CETRIS label, diameter 4.2 mm, lengths 35, 45, 55 mm for connecting of two CETRIS® boards in the floating floor system or for board fixation to horizontal and vertical timber constructions (floors, partitions, ceiling panels, etc.). For anchoring purposes the screw should penetrate to the wooden construction with at least 2/3 of its length. For fixation of floor boards, a screw of the length exceeding the board thickness by 20 mm will suffice.

### 5.1.1.2 Screwing to Sheet Metal

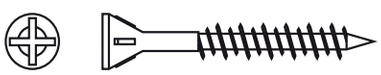
For fixation of CETRIS® boards to sheet metal profiles there is the self-cutting screw, CETRIS 4.2 × 25 mm (this screw is threaded up to the head), or screws 4.2 × 35, 45, 55 mm (thread up to about 2/3 of the shank length). The most often used load-bearing constructions include zinc-coated profiles CW and UW. Horizontal UW profiles are anchored via sound absorbing inserts to the ceiling (floor) construction. Vertical CW profiles are inserted in the UW profiles, about 15 mm shorter than the room height. The CETRIS® board for wall cladding is only fixed to the vertical profiles (stands – CW). When anchoring to sheet metal profiles the screw should protrude by at least 10 mm through the thickness of the board. It is recommended to pre-drill the CETRIS® board.
In the point of contact – of the vertical joint and the vertical CW profile – first anchor the CETRIS® board closer to the stand of the CW profile. In the case of the opposite procedure (anchoring to the soft part of the CW profile) there is the risk of deformation of the profile and subsequently the cladding too!




CETRIS self-cutting screw to timber




CETRIS self-cutting screw to sheet metal



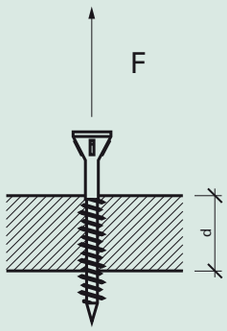
When using regular screws the screw holes should be pre-drilled to 1.2 multiple of the screw used. It is also recommended to prepare the countersinking for the sunken screw heads. For professional screwing it is recommended to use pneumatic or electrical screwdrivers with regulated revolutions. This method also applies to exterior applications when the CETRIS® board is used as the base under a contact thermal insulation system and in the overlapping façade system PLANK.

**Resistance to the screw pulling out of CETRIS® cement bonded particleboard**

**A) Specification of resistance to the screw pulling out perpendicularly to the board plane:**

**Test method:**
EN 320

**Screw type:**
CETRIS 4.2 × 35 mm (pre-drilled hole in the board with a diameter of 3.5 mm)

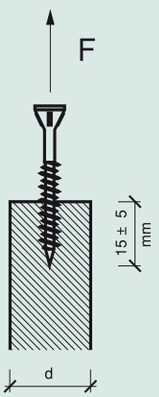



| Board thickness d | Resistance |
|---|---|
| 8 mm | 597 N |
| 10 mm | 788 N |
| 12 mm | 1,305 N |

**B) Specification of resistance to the screw pulling out parallel to the board plane:**

**Test method:**
EN 320

**Screw type:**
CETRIS 4.2 × 35 mm (pre-drilled hole in the board with a diameter of 3.5 mm)



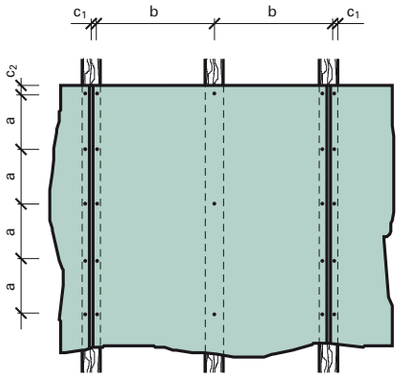

| Board thickness d | Resistance |
|---|---|
| 22 mm | 1,039 N |

**Note:** Informative values.

## 5.1.2 Exterior Anchoring

CETRIS® boards are fixed in the VARIO system (visible joints) with stainless or galvanized screws with semi-circular or hexagonal heads and compressive water-tight washers. These washers are treated on the bottom side with vulcanized elastomer EPDM for water-tight and flexible material connection. The screw type also depends on the base type – the load-bearing grid applied. Rivets may be used for anchoring to zinc-coated (aluminium) constructions. The types of screws and rivets are described in Chapter 8.7.7 Auxiliary Materials. In that chapter you will also find information about board gluing to the load-bearing construction with the SikaTack® Panel gluing system.

## 5.1.3 Support Span, Screw (Bolt) Spacing




**Interior wall – no fire resistance requirement**
(or exterior cladding under contact thermal insulation systems)

| BOARD THICKNESS (mm) | a (mm) | b (mm) | $c_1$ (mm) | $c_2$ (mm) |
|---|---|---|---|---|
| 8 | < 200 | < 420 | > 25 < 50 | > 50 < 100 |
| 10 | < 250 | < 500 | | |
| 12, 14 | < 250 | < 625 | | |
| 16, 18, 20 | < 300 | < 670 | | |
| 22, 24, 26, 28, 30 | < 350 | < 670 | | |
| 32, 34, 36, 38, 40 | < 400 | < 670 | | |

**Interior wall with fire resistance requirement** (or exterior cladding under thermal insulation systems)
For details see Chapter 9.2

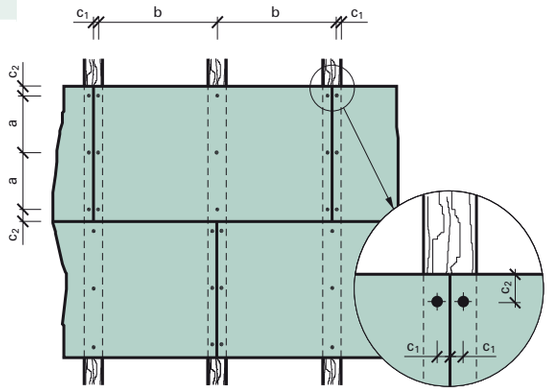
| BOARD THICKNESS (mm) | a (mm) | b (mm) | $c_1$ (mm) | $c_2$ (mm) |
|---|---|---|---|---|
| 10, 12, 14, 16, 18 | < 200 | < 625 | > 25 < 50 | > 50 < 100 |

**Interior + exterior ceiling panel with fire resistance requirement**
For details see Chapter 9.3

| BOARD THICKNESS (mm) | a (mm) | b (mm) | $c_1$ (mm) | $c_2$ (mm) |
|---|---|---|---|---|
| 12 | < 200 | < 420 | > 25 < 50 | > 50 < 100 |

**Interior + exterior ceiling panel without fire resistance requirement**
For details see Chapter 8.1

| BOARD THICKNESS (mm) | a (mm) | b (mm) | $c_1$ (mm) | $c_2$ (mm) |
|---|---|---|---|---|
| 8 | < 200 | < 420 | > 25 < 50 | > 50 < 100 |
| 10 | < 250 | < 500 | | |
| 12, 14 | < 300 | < 625 | | |




**Flooring constructions**
For details see chapters 7.5 and 7.6

| BOARD THICKNESS (mm) | a (mm) | b (mm) | $c_1$ (mm) | $c_2$ (mm) |
|---|---|---|---|---|
| CETRIS® boards th. 12 mm in floating floor systems | Upper layer predrilled, max. 300 mm | | > 25 < 50 | 50 |
| CETRIS® PD (PDB) 16,18, 20, 22, 24 mm | ≤ 300 | Pursuant to load tables max. 621 mm | | |
| CETRIS® PD (PDB) 16,18, 20, 22, 24 mm | ≤ 400 | | | |

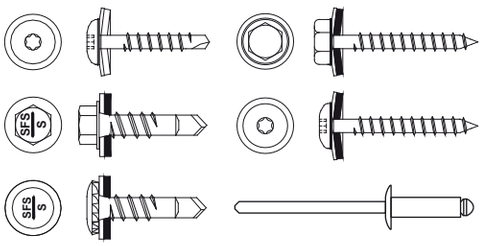
**Fixation of CETRIS® cement bonded particleboards in exteriors**
**Façade cladding with visible horizontal and vertical joints – VARIO system** – for details see Chapter 8.3

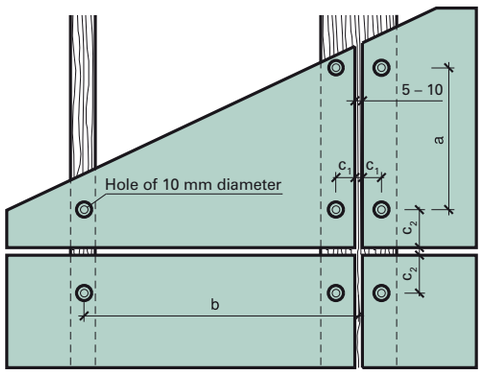
CETRIS® boards are fixed in the VARIO system (visible joints) with stainless or galvanized screws with semi-circular or hexagonal heads and compressive water-tight washers. These washers are treated on the bottom side with vulcanized elastomer EPDM for water-tight and flexible material connection. The screw type also depends on the base type – the load-bearing grid applied.*

**Board pre-drilling**
CETRIS® boards must be pre-drilled:
- Diameter 8 mm for board lengths up to 1,600 mm
- Diameter 10 mm for board lengths over 1,600 mm (applies to screw/rivet diameter up to 5 mm)

For position stabilisation at least one fixed point (with the diameter of 5 mm) is needed. Dilations between boards 5 – 10 mm.

**Types of screws/rivets**
For details see Chapter 8.7.7. Auxiliary Materials.






| BOARD THICKNESS (mm) | SCREW/RIVET SPACING **a** (mm) | SUPPORT SPAN **b** (mm) | SCREW DISTANCE FROM VERTICAL EDGE $C_1$ (mm) | | | SCREW DISTANCE FROM HORIZONTAL EDGE $c_2$ (mm) |
|---|---|---|---|---|---|---|
| | | | Timber | Zinc coat | Aluminium | |
| 8 | <400 | <420 | >25 <50 | >30 <50<br>>50 <70* | >50 <70 | >70 <100 |
| 10 | <550 | <500 | | | | |
| 12 | <500 | <625 | | | | |
| 14 | <550 | <625 | | | | |
| 16 | <550 | <700 | | | | |

*** Applies to lengthwise laying of CETRIS® boards (width >1,875 mm)**

**Fixation of CETRIS® cement bonded particleboards in exteriors**
**Façade cladding with overlapped joints – PLANK system** – for details see Chapter 8.4

CETRIS® boards in the PLANK system (overlapped) are fixed with galvanized screws or stainless screws with sunken heads.
**The board must be predrilled:**
- outer – diameter of 8 mm
- inner – 1.2 times of the screw diameter

Recommended screws for CETRIS® board thickness 10 (12) mm, timber load-bearing grid:
- Screw 4.2 × 35 mm

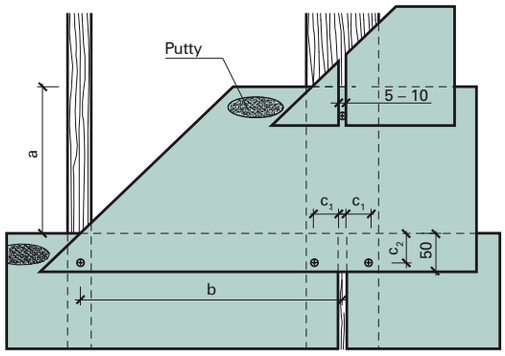
Recommended screws for CETRIS® board thickness 10 (12) mm, EuroFox load-bearing grid:
- EJOT screw Climadur-Dabo TKR – 4.8 × 35 mm

**Broad pre-drilling:**
- 1.2 multiple of screw diameter (mostly 6 mm) – applies to screw diameter up to 5 mm

Dilations between boards 5 – 10 mm.

**Note:** Recommended maximum length of CETRIS® board for PLANK system equals triple the span of the auxiliary vertical profiles (laths) – i.e. for board thickness 10 mm is max. 1,500 mm and for board thickness 12 mm is 1,875 mm.

**Screw type:**




| BOARD THICKNESS (mm) | SCREW/RIVET SPACING **a** (mm) | SUPPORT SPAN **b** (mm) | SCREW DISTANCE FROM VERTICAL EDGE $C_1$ (mm) | | | SCREW DISTANCE FROM HORIZONTAL EDGE $c_2$ (mm) | MAXIMUM LENGTH OF BOARD (mm) |
|---|---|---|---|---|---|---|---|
| | | | Timber | Zinc coat | Aluminium | | |
| 8 | <400 | <420 | >35 <50 | | | 40 | 1,260 |
| 10 | <450 | <500 | | | | | 1,500 |
| 12 | <350 | <625 | | | | | 1,875 |
| 14 | <500 | <625 | | | | | 1,875 |
| 16 | <500 | <700 | | | | | 2,100 |

# Surface Finishes

## of CETRIS® Cement Bonded Particleboard

6




CETRIS®

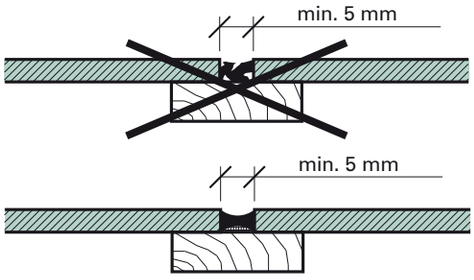
When applying surface finishes to CETRIS® cement bonded particleboard the following principles must be observed:

- All applied materials must be stable in an alkali environment
- Before application of paints, glues or plasters on CETRIS® boards the boards must be covered with a primer for absorptive surface
- The materials must be applied to a dry board surface in compliance with the technological procedures required by the material manufacturers
- It is not recommended to apply hard materials but rather permanently elastic materials
- Dilation joints between boards may be covered laths or filled with elastic filler (acrylic, polyurethane)
- Coating and sealing can be done after acclimatization of boards in installed condition

## 6.1 Joint filling with permanently elastic filler

When using CETRIS® boards for wall, partition and ceiling cladding, the boards must be dilated – visible joints must be left with the minimum width of 5 mm. The joints may be covered with laths, an inserted wooden, plastic or sheet metal profile, or filled with permanently elastic filler. The recommended fillers are the ones based on acrylic resins or polyurethanes. Silicon fillers may be applied to compact materials with acid pH, which is not the case of CETRIS® board. Where silicon filler must be used the contact surfaces must be treated with a primer.

The main principle for correct function of the dilation joints is elimination of three-sided adhesion in the joint, which causes uneven stress on the elastic filling and subsequently its tearing off the joint sides. This may be prevented by insertion of a slide insert – a polyethylene tape or string. The result is adhesion of the elastic matter on the opposite sides (edges of CETRIS® boards) only and even stress on the fill – the "chewing gum effect".




### Fillers recommended for joint filling

| DESCRIPTION | PROPERTIES | APPLICATION | PROCEDURE | MANUFACTURER |
|---|---|---|---|---|
| **Acrylic elastic filler S-T 5** Single-component sealing joint filler creating permanent firm elastic joint. | High adhesion, coverable with acrylic and dispersion paints. After hardening resistant to weather effects including UV radiation. Maximum permitted deformation 20 %. | Filling joints in peripheral coats of cement bonded particleboards CETRIS® with joint widths 5 – 40 mm. | The surface must be clean, dry, firm, without grease and oil. It is recommended to treat the base with a primer – diluted filler S-T 5 (diluted in water in the ratio 1:3). | DEN BRAVEN |
| **Soudaflex 14 LM** Single-component elastic low-module filler on polyurethane basis. | Permanently elastic after maturation, maximum permitted deformation 25 %. When covered with regular oxidisation paints the paint drying process may be delayed. | Joint filling with high contact movement. Joint width 5 – 30 mm. | The surface must be clean, dry, firm, without grease and oil. It is recommended to treat the base with a primer – Primer 100. | SOUDAL |
| **MAPEFLEX AC4** Single-component joint filling materials on acrylic resin basis. | Water- and air-tight permanently elastic joint filler. | Joint fill with maximum movement possible 15 – 20 %. Joint width 5 – 30 mm. | The surface must be clean, dry, firm, without grease and oil. | MAPEI |
| **BOTACT A4** Single-component acrylic filler. | Weather resistant, high ductility, can be covered with paint. | For joint sealing and construction board connection. | The surface must be clean, firm, without dust, grease and oil. | BOTAMENT |
| **SCHÖNOX S 20** Permanently elastic single-component joint filler on MS polymer basis. | High adhesion, resistant to water, weather and UV radiation, coverable with acrylic and dispersion paints. Maximum permitted deformation 25 %. | Filling joints in peripheral coats, balconies, dilation joints between construction slabs and in ceramic paving. For joint widths 5 – 20 mm. | The surface must be firm, dry, without dust, grease and other impurities. It is recommended to treat the base with a primer – Casco Primer 12. | SCHÖNOX |

| DESCRIPTION | PROPERTIES | APPLICATION | PROCEDURE | MANUFACTURER |
|---|---|---|---|---|
| **Henkel – Building acrylic** Dispersion sealing filler. | Does not contain solvents, coverable with paint, odourless, resistant to UV radiation. | Joint closing, joint width 5 – 30 mm. | The surface must be clean, dry, firm, without dust, grease and oil. It is recommended to moisten the base before application. | HENKEL |
| **Dexaflamm – R** Single-component elastic filler. FIRE PROTECTION APPLICATION. | After maturing permanently elastic, maximum permitted deformation 15 %. | Joint filling between boards, fire resistance. Joint width 5 – 20 mm. | The surface must be clean, dry, firm, without grease and oil. It is recommended to treat the surface with a primer – diluted filler Dexaflamm – R. | TORA |
| **Den Braven Pyrocryl** Single-component sealing filler on acrylic dispersion basis. FIRE PROTECTION APPLICATION. | High adhesion, deformation 12.5 %, retards flame (foams at temperatures above 200° C) coverable with paint after hardening. | Joint filling between interior boards. Joint width 4 – 25 mm. | The surface must be clean, firm, without dust, grease and oil. | DEN BRAVEN |
| **SIKA Firesil** Permanently elastic 1-component sealing filler on silicon basis. FIRE PROTECTION APPLICATION. | High adhesion, fire and water resistant. | Joint filling between boards, maximum joint width 15 mm. | The surface must be clean, firm, without dust, grease and oil. | SIKA |
| **SIKAFLEX 11 FC** Permanently elastic single-component joint filler on polyurethane basis. | High adhesion, water, weather and UV radiation resistant, coverable with paint, bridges deformations 15 %. | Filling joints in peripheral coats, balconies, ceramic paving, dilation joints. | The surface must be clean, firm, without dust and grease. For increased adhesion priming with primer Sika Primer 3N is recommended. | SIKA |

## 6.2 Paints

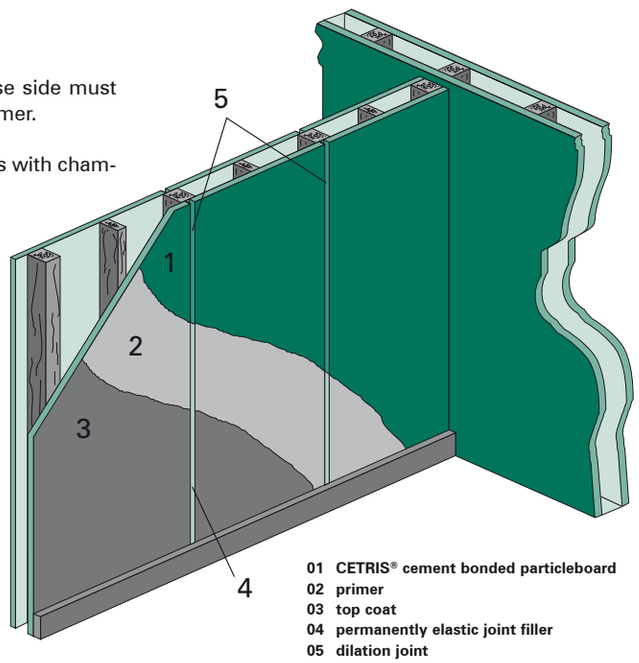
Painting a CETRIS® board is the simplest surface finish. When applying surface finishes to CETRIS® cement bonded particleboards the following principles must be observed:

- CETRIS® board must be primed (for surface stabilisation, reduction of absorption, base unification)
- Top coat colours recommended by their manufacturers for a cement base must be used
- The product composition must be unified and the prescribed technological procedure must be followed (application method, technological breaks)
- The paints must contain pigments stable in an alkali environment. Unstable pigments may lead to discoloration.
- CETRIS® board surfaces must be dry, clean, without grease and oils
- Lime paints are not recommended
- In the case of visible CETRIS® board joints, the board edge must be treated with the same paint system.

For an even surface finish, the reverse side must also be provided with a protective primer.

For aesthetic reasons, CETRIS® boards with chamfered edges may be used.
If the customer wishes invisible joints under the surface finish, see Chapters 6.3, 6.4.

**Note:** In the case of old paint renewals on CBPB CETRIS® it is necessary to consider the existing paint condition and the type of the paint used (composition). The surface needs to be roughened and cleaned before application and the covering colour should be of the same composition as the original paint.




**01 CETRIS® cement bonded particleboard**
**02 primer**
**03 top coat**
**04 permanently elastic joint filler**
**05 dilation joint**

## Recommended paints for colour surface finish of CETRIS® boards

| PRIMER | TOP COAT | MANUFACTURER |
|---|---|---|
| **FORTE Penetral**<br>Molecular primer. | **ETERNAL**<br>Universal dispersion paint. | **AUSTIS** |
| **ACRYL EMULZE**<br>Water soluble primer. | **ACRYL COLOR**<br>Water soluble acrylic top coat. | **JUB** |
| **HC-4**<br>Water soluble primer. | **GAMADEKOR (F, FS, FS1, SIL, SA)**<br>Water soluble top coats. | **STOMIX** |
| **EkoPEN**<br>Deep penetrating agent. | **EkoFAS (EkoFAS Extra)**<br>Smooth acrylic façade paint. | **EKOLAK** |
| **Quarzgrund**<br>Resin-based filled primer. | **TEX Egalisationsfarbe**<br>Water resistant highly permeable façade paint. | **TEX COLOR** |
| **Sto Prim Concentrat**<br>Primer concentrate. | **Sto Color Royal**<br>Matt acrylic based façade paint. | **STO** |
| **Mistral Primer** | **Mistral Univerzal**<br>Water soluble enamel paint. | **MISTRAL** |
| **FANO**<br>Façade penetration. | **RENOFAS J**<br>Fine façade paint. | **CHEMOLAK** |
| **KEIM Silangrund**<br>Hydrophobic primer on silan basis. | **KEIM Granital**<br>Homogenised silicate based paint. | **KEIM FARBEN** |
| **BILEP P**<br>Dispersion acrylic penetration | **ETERFIX BI**<br>Dispersion acrylic matt top coat. | **BIOPOL PAINTS** |
| **Funcosil Hydro-Tiefengrund**<br>Water soluble deep penetration. | **Funcosil Betonacryl**<br>Anti-carbon acrylic paint for concrete. | **REMMERS** |
| **PEN-FIX**<br>Water soluble off-white penetration. | **ELASTACRYL SATIN**<br>Water soluble matt façade paint. | **TOLLENS** |
| **REMCOLOR Impregnation**<br>Primer. | **REMCOLOR Roof paint**<br>Water soluble dispersion paint for external use. | **deREM** |
| **Ceresit CT 17**<br>Deep primer without solvents. | **Ceresit CT 44**<br>Acrylate paint. | **HENKEL** |
| **Baumit universal primer**<br>Primer for surface absorption levelling. | **Baumit Nanopor paint**<br>Highly resistant vapour resistant paint on silicate basis for exteriors, dirt resistant. | **BAUMIT** |
| **Penad (H, BC-650)**<br>Primer concentrate. | **Actin (F, SDF, DF, THERMO, H, I, L)**<br>Water soluble surface finish. | **POLYTEX** |

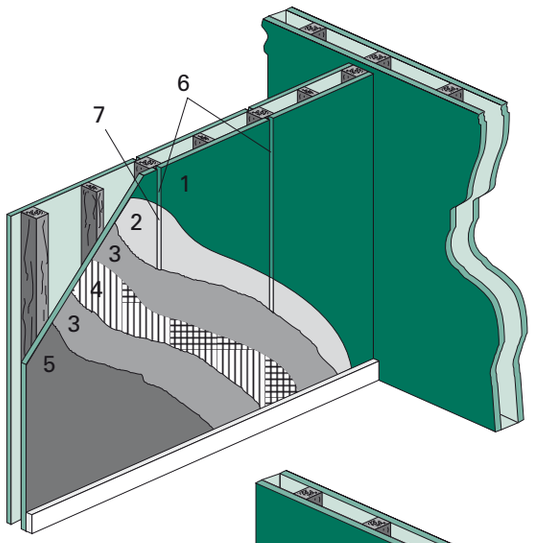
## Recommended paints for transparent surface finish of CETRIS® boards

| PAINT | MANUFACTURER |
|---|---|
| **IMESTA IN 290**<br>Preparation resistant to water on silicon oil basis. | **IMESTA** |
| **TOLLENS Hydrofuge Incolore**<br>Hydrophobic solution for stone, masonry, concrete and plaster protection. | **TOLLENS** |
| **SIKAGARD 700S**<br>Hydrophobic single-component solution on siloxan resin basis. | **SIKA** |
| **Herbol-Fassaden-Imprägnierung Hydrophob**<br>Colorless, solvent impregnation agent for water resistant paints over all mineral bases. | **Herbol Akzo Nobel Deco** |
| **ACTIN LI**<br>Water soluble clear varnish for inner walls. | **POLYTEX** |

## 6.3 Interior Plasters

Plastering is surface finish hiding joints. CETRIS® boards must first be treated with a primer, the joints must be filled with permanently elastic filler, and then filling compoud is to be applied across the surface in which bandage fabric with glass fibre is pressed. After application of the levelling layer again consisting of filling compoud the final top coat is applied. It is recommended to always use a unified system by a single manufacturer of surface finishes and observe the technological procedures of the respective manufacturer throughout the application.

The reverse side of the CETRIS® board must be treated with at least one layer of paint (for example – primer or paint with a higher diffusion resistance) for prevention of board bending after application of the surface finish on the board face.




**01 CETRIS® cement bonded particleboard**
**02 primer**
**03 filling compoud**
**04 bandage fabric**
**05 plaster**
**06 dilation joint**
**07 permanently elastic gap filler**

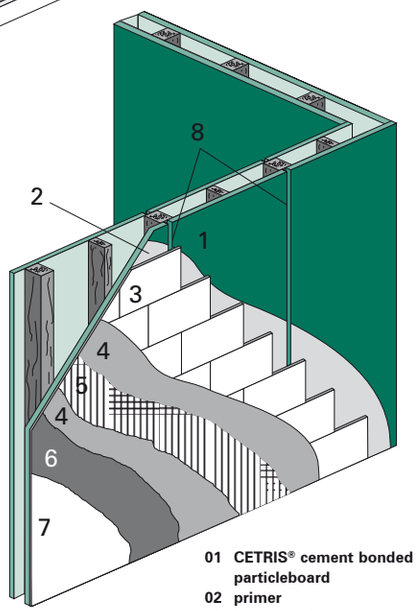
## 6.4 Exterior Plasters

Plastering is surface finish hiding joints. CETRIS® boards expand and shrink as a result of humidity dilation movements. To prevent damage of the façade plaster by hair-thin cracks caused by these movements, it is necessary to cover the CETRIS® board with an insulation board (polystyrene, mineral wool) with the minimum thickness of 30 mm. Mechanical anchoring may be needed in some cases. When using CETRIS® cement bonded particleboard 1,250 by 1,250 mm, the sufficient thickness of the insulation board is 20 mm. The insulation will create a separation layer to which other layers are applied, like in the case of the contact thermal insulating systems – spackle, bandage, noble plaster.

The CETRIS® boards must be treated with a penetration agent. Joint filling is not necessary in these cases. Polystyrene and mineral wool are glued with cement glue or low-expansion foam to cover the joints between the CETRIS® cement bonded particleboards. Then the spackle is to be applied across the surface in which bandage fabric with glass fibre is pressed. After application of the levelling layer, again consisting of spackle, the final top coat is applied.

Mechanical anchoring of insulation boards to CETRIS® boards is implemented with disc dowels (self-cutting screw with disc head of high-quality polyethylene). The numbers of anchoring elements are specified by the manufacturers of the insulation boards, or the manufacturer of the discs. The minimum number is 4 pieces/m².

**Recommended products:**
EJOT SBH-T 65/25, screw diameter 4.8 mm, anchoring length 20 – 40 mm.
Used in combination with self-cutting screws EJOT® Climadur-Dabo SW 8 R.

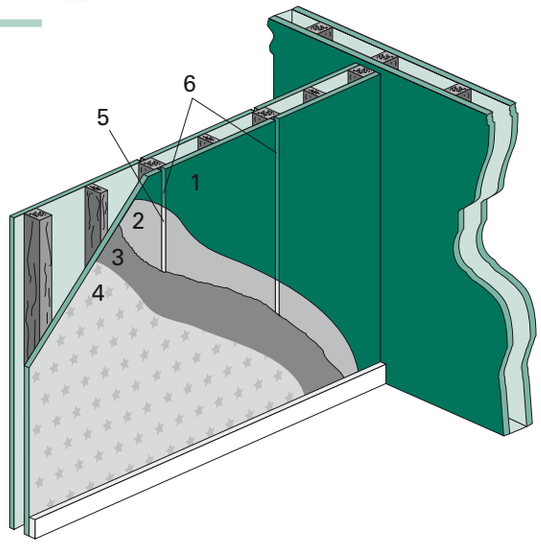



**01 CETRIS® cement bonded particleboard**
**02 primer**
**03 insulation board**
**04 filling compound**
**05 bandage fabric**
**06 penetration agent**
**07 plaster**
**08 dilation joint**

## 6.5 Wallpapers

In interiors, a surface finish with invisible joints may also be created by putting up vinyl wallpaper or glass fibre wallpaper. Paper wallpaper cannot be used. In these cases the CETRIS® cement bonded particleboards are primed, the joints are filled with permanently elastic filler and the wallpaper is glued with wallpaper glue. Further paints may be applied over glass fibre wallpaper. Vinyl wallpaper is designed for a surface finish with high aesthetic demand, washability and abrasion resistance.

When gluing vinyl wallpaper and wallpaper with glass fibre it is necessary to accurately follow the technological procedures recommended by the respective manufacturers.

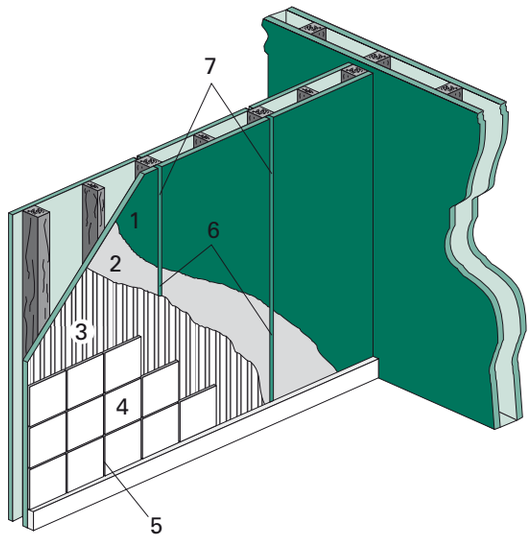



**01 CETRIS® cement bonded particleboard**
**02 primer**
**03 wallpaper glue**
**04 wallpaper**
**05 joint filler – permanently elastic**
**06 dilation joint**

# 6.6 Ceramic Tiles for Interiors

When tiling, it is recommended to use permanently elastic fillers for joint filling between CETRIS® cement bonded particleboards, as well as for the tiling itself. The gluing filler must be spread across the whole surface not only in points. It is recommended either to place the dilation joints between the boards under the ones between tiles, or glue the tile just to one of the boards under it and leave it without glue in the part covering the joint. This solution is designed for spaces commonly exposed to water. Maximum tile size 200 by 200 mm.

**01** CETRIS® cement bonded particleboard
**02** penetration
**03** gluing filler
**04** ceramic tiles
**05** joint filler
**06** permanently elastic joint filler
**07** dilation joint

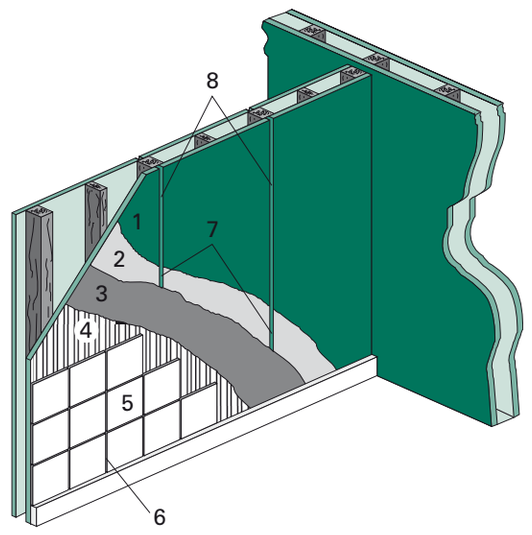



**Spaces with standard environment burden**

| SYSTEM COMPOSITION | MAPEI SYSTEM | SCHÖNOX SYSTEM | BOTAMENT SYSTEM | BASF SYSTEM | CERESIT SYSTEM | SIKA SYSTEM |
|---|---|---|---|---|---|---|
| Primer | Not required | Schönox KH | Botact D 11 | PCI-Gisogrund | Ceresit CT 17 | Not required |
| Gluing filler | ULTRAMASTIC III | Schönox PFK (Schönox PFK plus) | Botact M 21 | PCI-Nanolight | Ceresit CM 16 – lower load<br>Ceresit CM 17 – higher load | Sika Ceram 203 |
| Joint filler (dilation joint filling) | ULTRACOLOR (MAPESIL AC) | Schönox WD FLEX (Schönox ES) | Botact M 32 / Botact S5 | PCI-Flexfug | Ceresit CE 40 (Ceresit CS 25) | Sik Fuga |

In non-ventilated sanitary spaces, showers and spaces with increased humidity exposure, CETRIS® cement bonded particleboards must be treated with hydro insulating paint:

**01** CETRIS® cement bonded particleboard
**02** penetration
**03** hydro insulating plaster
**04** gluing filler
**05** ceramic tiles
**06** joint filler
**07** permanently elastic joint filler
**08** dilation joint




**Spaces with excessive exposure to moisture**

| SYSTEM COMPOSITION | MAPEI SYSTEM | SCHÖNOX SYSTEM | BOTAMENT SYSTEM | BASF SYSTEM | CERESIT SYSTEM | SIKA SYSTEM |
|---|---|---|---|---|---|---|
| Primer | Not required | Schönox KH | Botact D 11 | PCI-Gisogrund | Ceresit CT 17 | Not required |
| Hydro insulation (bandage of corners, dilations) | KERALASTIC (th. 1 mm) (MAPEBAND) | Schönox HA (Schönox Fugendichtband + bandage, coins) | Botact DF 9/ AB 78 - bande | PCI-Lastogum PCI-Dichtband Objekt | Ceresit CL 51 (Ceresit CL 52) | Sika Top 109 Elastocem, Sika Tape Seal S |
| Gluing filler | KERALASTIC | Schönox PFK plus | Botact M 21 | PCI-Nanolight | Ceresit CM 16 – lower load<br>Ceresit CM 17 – higher load | Sika Ceram 203 |
| Joint filler (dilation joint filling) | ULTRACOLOR (MAPESIL AC) | Schönox WD FLEX (Schönox SU) | Botact M 32 / Botact S 5 | PCI-Flexfug | Ceresit CE 40 (Ceresit CS 25) | Sika Fuga |

# CETRIS®
# Floor Systems

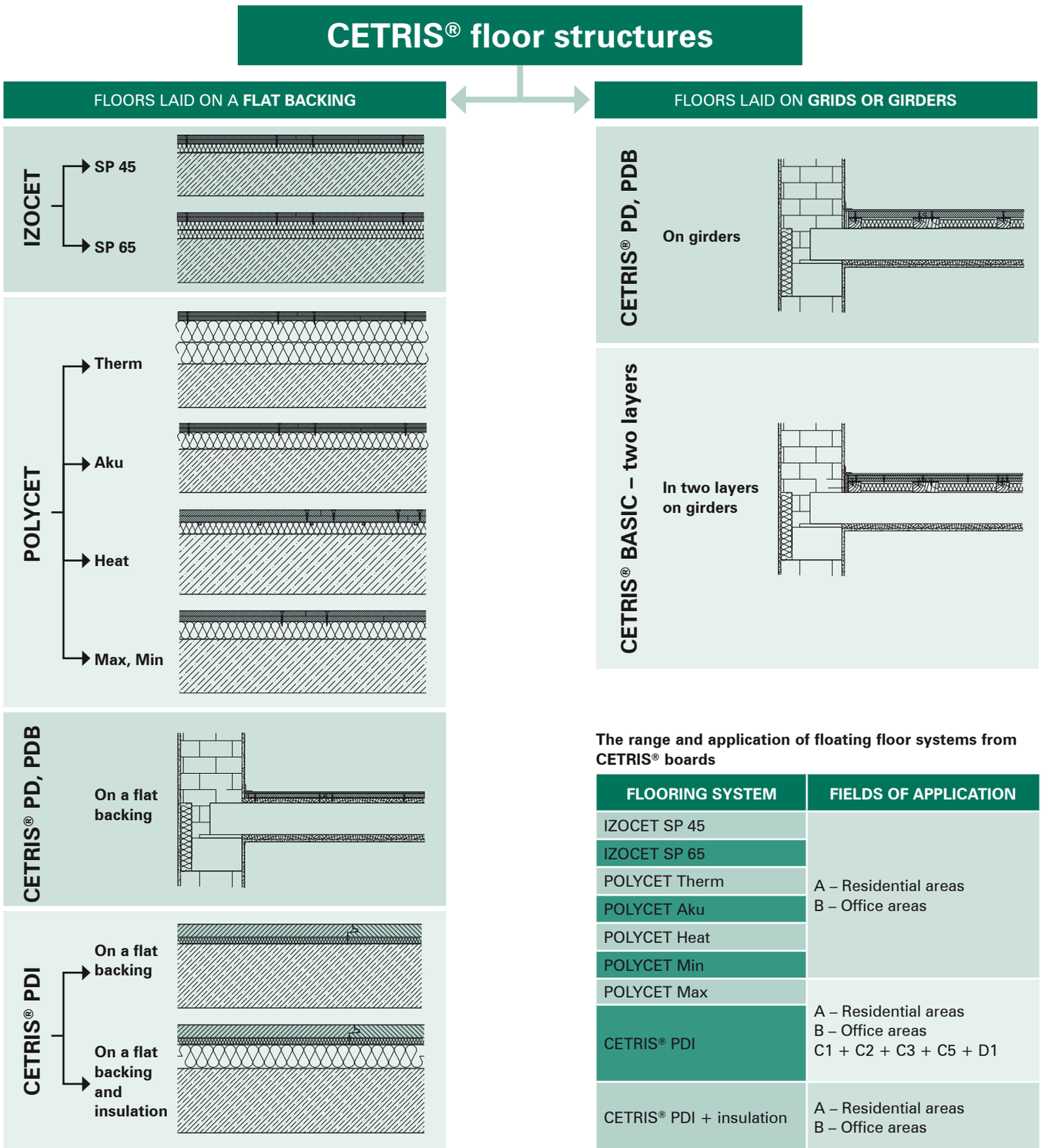
7




CETRIS®

## 7.1 Types of CETRIS® Flooring Systems

Floor constructions of CETRIS® cement bonded particleboards may be designed in several basic variants pursuant to the following scheme:




**The range and application of floating floor systems from CETRIS® boards**

| FLOORING SYSTEM | FIELDS OF APPLICATION |
|---|---|
| IZOCET SP 45 | A – Residential areas<br>B – Office areas |
| IZOCET SP 65 | |
| POLYCET Therm | |
| POLYCET Aku | |
| POLYCET Heat | |
| POLYCET Min | |
| POLYCET Max | A – Residential areas<br>B – Office areas<br>C1 + C2 + C3 + C5 + D1 |
| CETRIS® PDI | |
| CETRIS® PDI + insulation | A – Residential areas<br>B – Office areas |

**The range and application of floating floor systems from CETRIS® boards**

| FLOORING SYSTEM | FIELDS OF APPLICATION |
|---|---|
| **A. Residential areas and areas for domestic activities** | Rooms of residential buildings and houses, bed rooms and rooms in hospitals , hotels and hostels bedrooms and toilets |
| **B. Office areas** | |
| **C. Areas where there may be a gathering of people (except areas listed in categories A, B, C)** | C1: Areas with tables, etc., e.g. areas in schools, cafes, restaurants, dining halls, reading rooms, receptions. |
| | C2: Areas with built-in seating, e.g. areas in churches, theaters and cinemas, meeting rooms, lecture or conference rooms, railway waiting rooms. |
| | C3: Areas without obstacles for the movement of persons, e.g. areas in museums, exhibition halls and in access public areas and office buildings and hotels. |
| | C4: Areas designed for motional activities such as dance halls, gymnasiums, stages. |
| | C5: Areas where there may be a high concentration of people, such as buildings for public events like concert halls, sports halls including stands, terraces or access areas. |
| **D. Shopping areas** | D1: Areas in small shops. |
| | D2: Areas in supermarkets, such as areas in warehouses. |

CETRIS® Cement bonded particleboards are successfully used as floor boards for refurbishing of old wooden floors, as the load-bearing layer laid over beams or in the light floating floor systems. For their thermal conductivity ($\lambda = 0.35$ W/mK) the boards are applied in combination with various systems of floor heating. In combination with heat insulating materials they form floor constructions with the required insulation properties and fire protection.

Use of CETRIS® boards can improve acoustic and heat insulating parameters of existing floor constructions or create a new floor construction very quickly and cheaply without the need for wet processes. For assurance of quality floor construction it is necessary to observe the manufacturer recommended technological procedures respecting the properties of cement bonded particleboards CETRIS®.

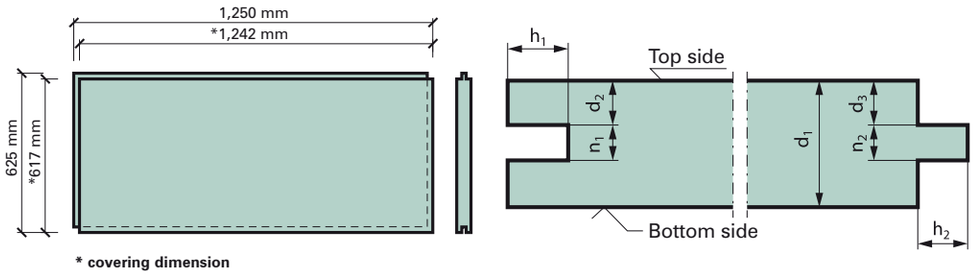
## 7.2 Applications of CETRIS® Floor Boards

**Examples of use of floor systems of CETRIS® cement bonded particleboard:**
- New residential and commercial developments
- Building reconstructions and renovations
- Floors in extensions and inserts in lofts
- Buildings
- Offices, classrooms
- Special flooring solutions
- Creating a strong and flexible floor
- Slide protection device of the room
- etc

**Advantages of floor systems of CETRIS® cement bonded particleboard:**
- Ability to level different elevations
- Possibility of combinations of different floor systems as needed (with different usable load bearing capacities)
- Quick and easy assembly without wet processes
- Excellent acoustic and heat insulation properties
- Low area weight of floor construction
- Floor ready for walking immediately after laying
- Applicability of a wide range of floorings
- High level of fire resistance
- High level of noise reduction

# 7.3 Types of CETRIS® Floor Boards

## 7.3.1 CETRIS® PD Floor Boards

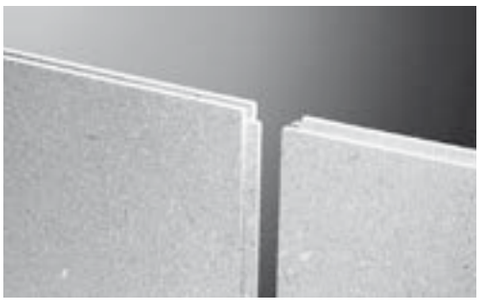



The standard manufacturing dimensions of CETRIS® PD floor boards are 625 × 1,250 mm (0.78 m²) including the tongue.
The cover size of the board is 617 × 1,242 mm (0.77 m²). The standard manufactured thicknesses are 16, 18, 20, 22, 24, 26 and 28 mm. The floor boards are provided with a groove and tongue along the perimeter with the groove depth 10 mm. On request other thicknesses may also be supplied. The bottom side of CETRIS® PD boards are marked with a stamp for laying reasons.

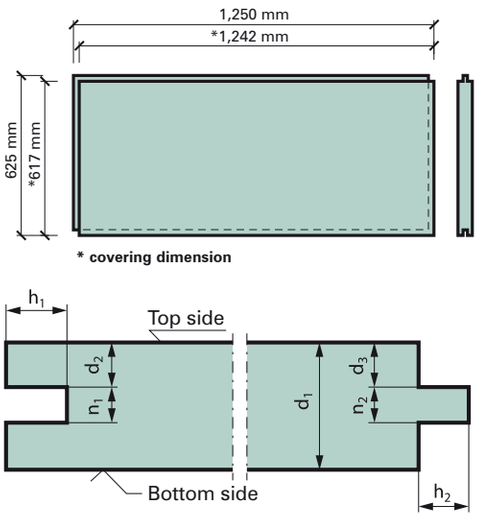
**Sizes of groove and tongue of CETRIS® PD boards** (all data in mm)

| $d_1$ | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|
| $n_2$ | 5.5 | 5.5 | 5.5 | 5.5 | 7.0 | 7.0 | 7.0 |
| $n_1$ | 6.0 | 6.0 | 6.0 | 6.0 | 8.0 | 8.0 | 8.0 |
| $d_2$ | 5.0 | 6.0 | 7.0 | 8.0 | 8.0 | 9.0 | 10.0 |
| $d_3$ | 5.25 | 6.25 | 7.25 | 8.25 | 8.5 | 9.5 | 10.5 |
| $h_1$ | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| $h_2$ | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |

## 7.3.2 CETRIS® PDB Floor Boards



The standard manufacturing dimensions of CETRIS® PDB floor boards are 625 × 1,250 mm (0.78 m²) including the tongue. The cover size of the board is 617 × 1,242 mm (0.77 m²). The standard manufactured thicknesses are 16, 18, 20, 22, 24, 26 and 28 mm. The floor board is full-area sanded to achieve minimum thickness tolerances (max. ±0.3 mm). The boards are provided with a groove and tongue along the perimeter with the groove depth of 10 mm. Other thicknesses may also be supplied on order. The bottom side of CETRIS® PDB boards is marked with a stamp for laying reasons. CETRIS® PDB floor boards resemble of chipboard with their sanded look, which may tempt using the boards as the walking surface of the floors. It needs to be considered, though, that the CETRIS® PD and CETRIS® PDB boards are designed as construction layers of the floor with the relevant permitted tolerances (length, width) and not as decorative flooring. Therefore complaints concerning board appearance cannot be accepted.




**Dimensiones of groove and tongue of CETRIS® PD boards** (all data in mm)

| $d_1$ | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|
| $n_2$ | 5.5 | 5.5 | 5.5 | 5.5 | 7.0 | 7.0 | 7.0 |
| $n_1$ | 6.0 | 6.0 | 6.0 | 6.0 | 8.0 | 8.0 | 8.0 |
| $d_2$ | 5.0 | 6.0 | 7.0 | 8.0 | 8.0 | 9.0 | 10.0 |
| $d_3$ | 5.25 | 6.25 | 7.25 | 8.25 | 8.5 | 9.5 | 10.5 |
| $h_1$ | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| $h_2$ | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |

**Basic data on packaging of CETRIS® PD and CETRIS® PDB floor boards** (size 1,250 × 625 mm)

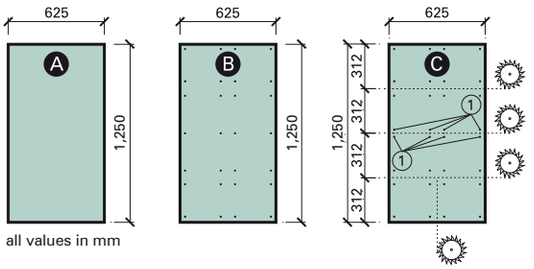
| Board thickness mm | Approximate weight kg/m² | Approximate board weight kg/pc | Number of boards per pallet pcs | Board area on pallet m² | Approximate gross weight of the package kg |
|---|---|---|---|---|---|
| **16** | 22.7 | 17.8 | 50 | 39.0 | 895 |
| **18** | 25.6 | 20.0 | 45 | 35.1 | 906 |
| **20** | 28.4 | 22.2 | 40 | 31.2 | 895 |
| **22** | 31.5 | 24.6 | 35 | 31.2 | 868 |
| **24** | 34.3 | 26.8 | 35 | 31.2 | 946 |
| **26** | 36.9 | 28.8 | 30 | 23.4 | 865 |
| **28** | 39.8 | 31.1 | 30 | 23.4 | 932 |

## 7.3.3 CETRIS® Floor Boards for Floating (Two-Layer) Floors

IZOCET and POLYCET floor systems are made of CETRIS® boards, thickness 12 mm, standard size 625 × 1,250 mm (0.78 m²), without edge chamfering. The boards are laid in two layers with an overlap of 312 mm, both layers connected with self-cutting screws with sunken heads with blades for counter-sinking and double thread 4.2 × 35 mm. For easier assembly the upper layer of the boards is pre-drilled with holes with a diameter of 4 mm. The screw spacing is specified by static tests of dry floor constructions. The mean number of connecting screws is 30 pc/m².

**CETRIS® floor boards, thickness 12 mm, for floating floors**

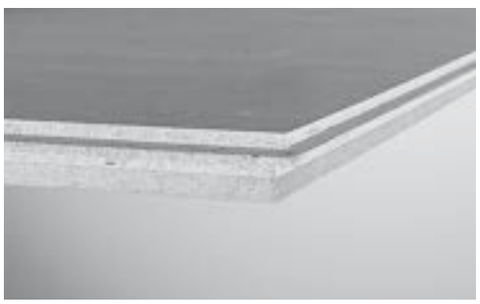
**A – Standard size of CETRIS® floor board for bottom layer**
**B – Standard size of CETRIS® floor board for top layer with predrilled 4 mm holes**
**C – Adaptation of standard size of CETRIS® floor board for module size**
**1 – holes made on site**




**Basic data on packaging of CETRIS® floor boards for IZOCET and POLYCET floor systems**
(size 1,250 × 625 mm)

| Board thickness mm | Approximate weight kg/m² | Approximate board weight kg/pc | Number of boards per pallet pcs | Board area on pallet m² | Approximate gross weight of the package kg |
|---|---|---|---|---|---|
| **12 bottom** | 22.7 | 17.8 | 50 | 39.0 | 895 |
| **12 top** | 25.6 | 20.0 | 45 | 35.1 | 906 |

## 7.3.4 CETRIS® PDI two-ply panel for dry floor technology

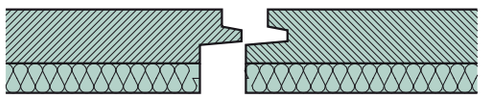


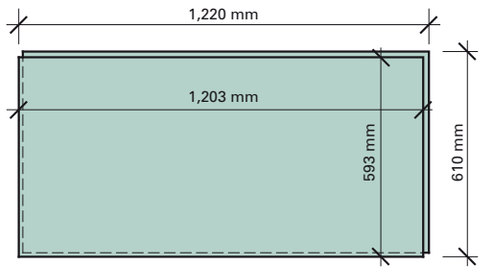
**CETRIS® PDI is a two-ply panel used in dry floor technology.** It consists of a 22 mm thick cement bonded CETRIS® particleboard glued to 12 mm insulating fibreboard (hardboard). The size is 1,220 × 610 mm (including the tongue) and it is 34 mm thick; it has a tongue and groove along the perimeter, the surface is smooth. The panels should be laid on a level surface area (ceiling structures, cladding). They are great for a quick and exact installation. They also spread spot-load stress over a larger area.

CETRIS® PDI panels can be laid directly on the base – a ceiling structure or cladding. The base must be level, supporting and dry. In this way, a new load spreading and insulating layer only 34 mm thick can be made with a high load capacity and resistance against spot stress.

**Technical specification**

| | |
|---|---|
| Basic size | 1,220 × 610 mm (with tongue), 1,203 × 593 mm (without tongue). Panel size after laying: 0.713 m² |
| Rough dimensional tolerance | ±1.5 mm |
| Thickness | 34 mm |
| Weight | ca 33.5 kg/m² |
| Features | Tongue & groove shaped edges |
| Surface finish | Without surface finish |






**Packing**

| Panel thickness | Weight approx. | Approx. weight of the panel | Number of panels on the pad | Size of the panels on the pad | Total approximate weight of panels including the pad |
|---|---|---|---|---|---|
| 34 mm | 33.5 kg/m² | 24 kg/pc | 30 pcs | 22.32 m² | 750 kg |

# 7.4 General Principles of Assembly of CETRIS® Floors

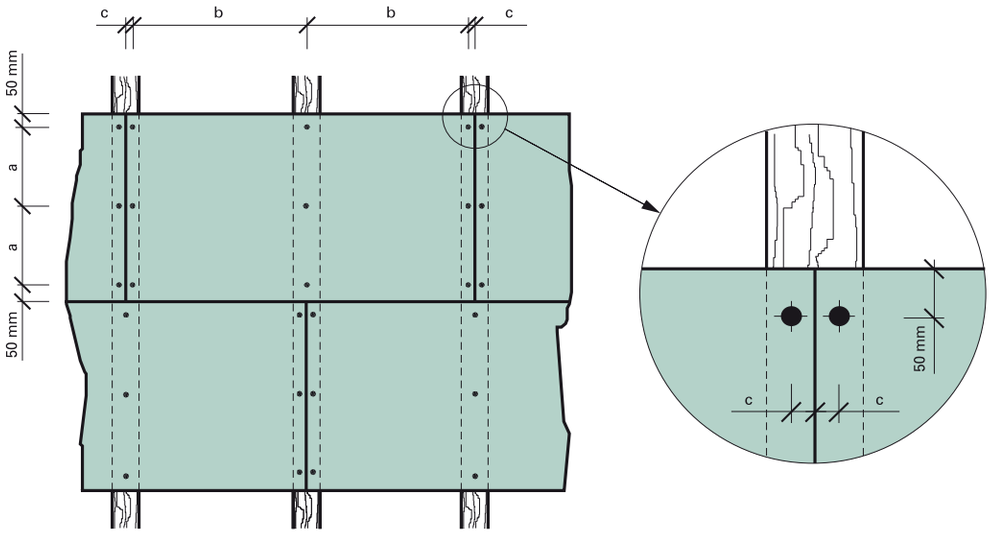
## 7.4.1 Fixing of CETRIS® Floor Boards

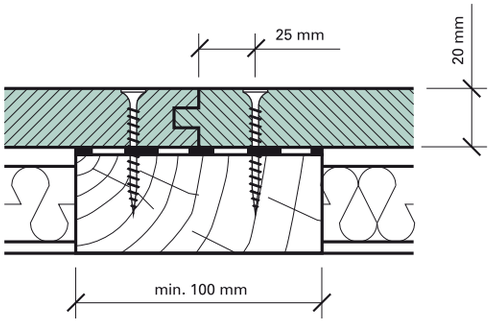
CETRIS® PD and CETRIS® PBD floor boards are fixed to the base by screwing. This is how the individual layers of the floor can be interconnected (IZOCET, POLYCET system). Stapling or manual nailing is not recommended. For screw connections self-cutting screws with sunken heads with blades for countersinking and double thread are recommended (such as VISIMPEX or BÜHNEN). Specification of the screw length is governed by the principle that the length of the screw to reach inside the base should be at least 20 mm (in the case of solid wood) or 10 mm (in the case of steel profiles).

For screwing with other types of screws and in the case of use of screws for anchoring to the steel construction, the holes in the board must be predrilled by 1.2 multiple of the diameter of the screw used. The head countersinking must also be prepared in advance.

The maximum axial distances of the connecting elements are shows in the table. The axial distances of the holes from the board edges are at least 25 mm and maximum 50 mm. The support (beam) must be at least 50 mm wide or at least 80 mm wide under the joint of two CETRIS® boards.

- Self-cutting screws used for plasterboard assembly purposes and nails are not suitable for CETRIS® board connection.
- In the case of floor parts laid over joists, the joints must be supported in at least one direction. In the case of single-direction beams, CETRIS® PD and PDB boards are laid with the longer side perpendicular to the beams.
- In the case of floor parts laid over a plank floor, the boards are laid crosswise to the direction of the original wooden floor.




| Type of product<br>Board thickness (mm) | a<br>mm | b<br>mm | c<br>mm |
|---|---|---|---|
| CETRIS® boards for floating floor systems, thickness 12 mm | The upper layer of the board is predrilled by the manufacturer | | |
| CETRIS® PD (PDB) thickness 16, 18, 20, 22, 24 mm | ≤ 300 | max. 621 | 25 ≥ c ≥ 50 |
| CETRIS® PD (PDB) thickness 26, 28 mm | ≤ 400 | max. 621 | 25 ≥ c ≥ 50 |

## 7.4.2 Dilation Joints and CETRIS® Floor Board Laying

One of the properties of products containing wood mass is represented by size changes caused by changed air humidity – expansion and shrinkage. This also applies to CETRIS® boards and must be considered when applying the boards. Floor boards are laid tightly and the dilation is allowed along the walls where a gap of 15 mm is left.

Dilation joints divide the floor area to smaller fields. The dilation joints pass through the floor construction from the surface to the insulation or the load-bearing construction.

**The dilation joints must be implemented:**
- In the case of large floors exceeding 6 by 6 m
- At the points of change of thickness and type of the floor or a sudden change of the ground plan etc.
- At vertical constructions – walls, pillars
- by door thresholds.

**Treatment of dilation joints (floor to wall connections) as part of floor laying:**
- By corner pieces of PVC, or carpet
- By wooden edge laths (in the case of wooden flooring)
- By Schlüter® system profiles

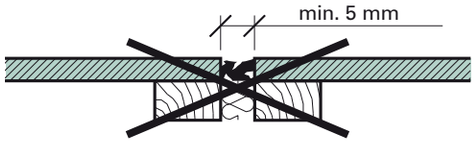
When laying the floor around the threshold always make the dilation joint as well. In the points of contact of the dry floor construction and another floor system (such as a traditional floor) it is recommended to apply the transfer system dilation profile by Schlüter® by every threshold (DILEX-EX, EKE, EDP, BWB, BWS, KS, etc.).

## Dilation Joints

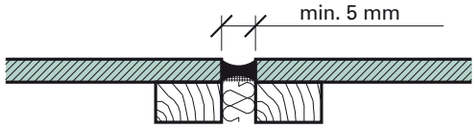
The joint width to depth ratio is 1 : 1, or 2 : 3 in the case of wider joints. The dilation joint must be dry before filling and dust must be removed. Adhesion may be improved by priming of the joint sides with the prescribed primer (or diluted filler). The primer must be absolutely dry before further steps can be taken. The main principle to be observed for correct function of the dilation joint is exclusion of three-side adhesion to the joint which may cause uneven stress of the elastic fill and tearing off the joint sides. This may be prevented by insertion of a slide insert in the joint bottom – polyethylene tape, or rope in the case of deeper joints. The result is adhesion of the elastic matter only to the opposite sides and thus even stress on the fill – the "chewing gum effect".

Dilation joint filling

**1) Incorrect: Three-sided adhesion of the filler in the dilation joint**

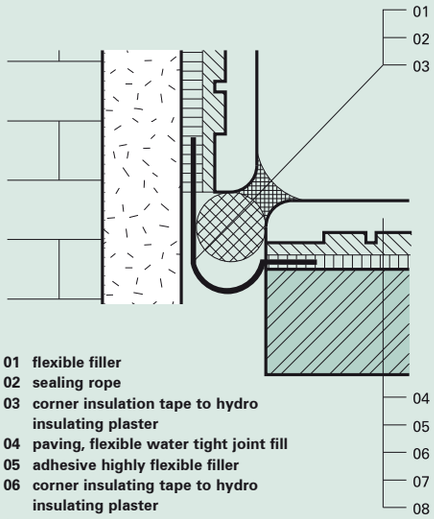



**2) Correct: Separation of the filler form the joint bottom with a slide insert**



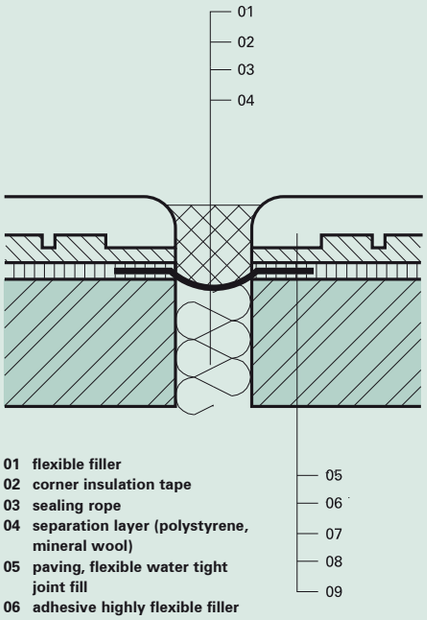

**A) Joints filled with elastic mass**

### $A_1$ Floor to wall joint




**01** flexible filler
**02** sealing rope
**03** corner insulation tape to hydro insulating plaster
**04** paving, flexible water tight joint fill
**05** adhesive highly flexible filler
**06** corner insulating tape to hydro insulating plaster
**07** priming
**08** CETRIS® board

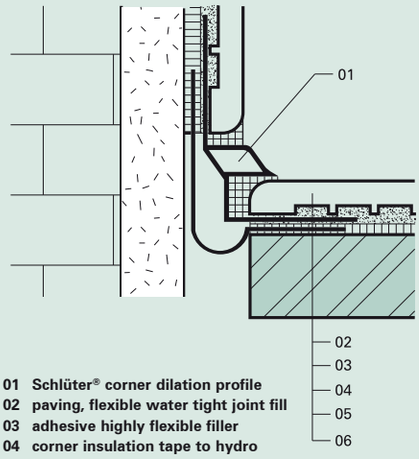
### $A_2$ Floor detail




**01** flexible filler
**02** corner insulation tape
**03** sealing rope
**04** separation layer (polystyrene, mineral wool)
**05** paving, flexible water tight joint fill
**06** adhesive highly flexible filler
**07** hydro insulating plaster
**08** priming
**09** CETRIS® board

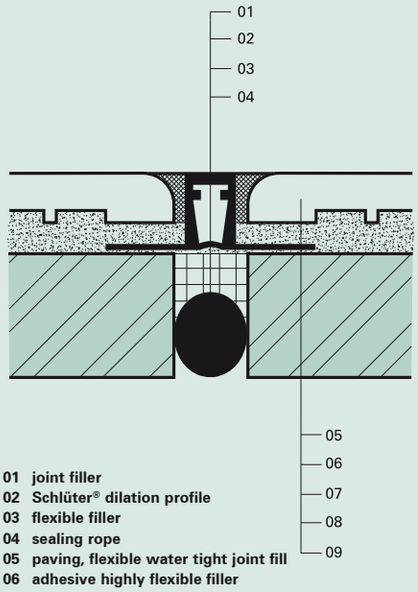
**B) Joints filled with special dilation profiles**

### $B_1$ Floor to wall joint




**01** Schlüter® corner dilation profile
**02** paving, flexible water tight joint fill
**03** adhesive highly flexible filler
**04** corner insulation tape to hydro insulating plaster
**05** priming
**06** CETRIS® board

### $B_2$ Floor detail




**01** joint filler
**02** Schlüter® dilation profile
**03** flexible filler
**04** sealing rope
**05** paving, flexible water tight joint fill
**06** adhesive highly flexible filler
**07** hydro insulating plaster
**08** priming
**09** CETRIS® board

# 7.5 Floating Floors of CETRIS® Boards

Floating floor is a floor separated from the other constructions, the ceiling and the walls with an elastic material – the floor is laid in a basin of this material and "floats" in it.
The purpose of the dry floor construction is to create a new floor construction very quickly and cheaply without use of the wet process, at the same time improving acoustic and heat insulating properties of the ceiling construction. Floating floors, unlike other floor types, act favourably on the joint mechanism of the human body.

When designing dry floating constructions the increased elasticity must be considered. That is why these systems are not recommended for spaces with increased humidity (showers, bathrooms, laundries, saunas etc.) where the permitted sag might endanger the function of the hydro insulating layer.

If the floor composition includes materials other than fibreboard insulation boards their properties must be comparable to fibreboard (especially stiffness). Use of insulation boards designed for a heavy floating floor is not permitted.

## 7.5.1 IZOCET Floating Floor

The IZOCET dry floor construction is classified as a light floating floor (weight of the floating floor up to 75 kg/m$^2$). The mechanical parameters of the floor have been tested pursuant to EN 13 810-1 Wood-based panels – Floating Floors – Part 1: Performance specifications and Requirements.

**Composition of IZOCET floating floor**
A – walking surface – carpet, parquet, PVC, paving
B – load-distribution layer – consists of two CETRIS® boards, thickness 12 mm, screwed together with self-cutting screws 4.2 × 35 mm with sunken heads
C – heat insulating layer – the most important part of the floating floor, assuring increased impact sound transmission loss and airborne sound transmission loss and improved heat insulation. This function is fulfilled by pressed fibreboards
D – edge strips – CETRIS® cement bonded particleboard must be separated from the walls with a material with similar sound insulation properties as the insulation itself

#### 7.5.1.1 Description of IZOCET floor composition

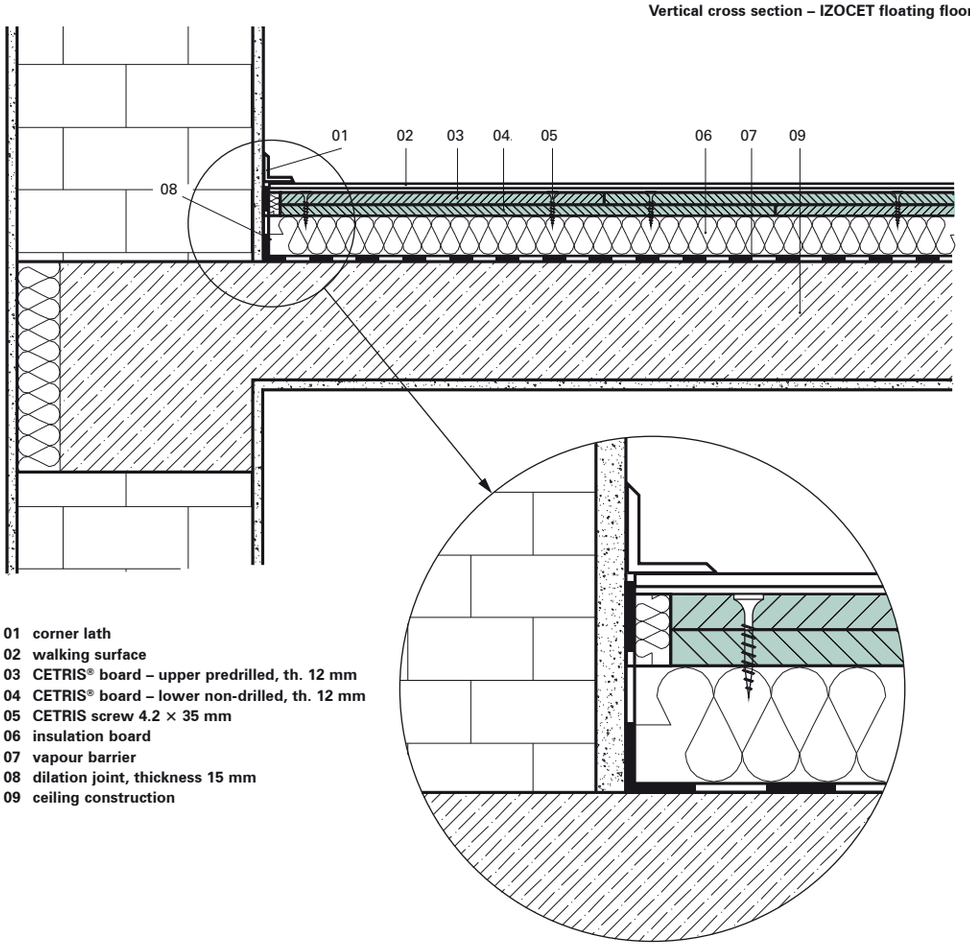
**Brand Name**

IZOCET SP 45: CETRIS® thickness 12 mm, two layers, insulation board, thickness 19 mm
IZOCET SP 65: CETRIS® thickness 12 mm, two layers, insulation board, thickness 19 mm, two layers

**Material specification**

- The insulation boards are soft fibreboards (hardboards), thickness 19 mm ±1.0 mm, bulk density 250 kg/m$^3$ ±30 kg/m$^3$, supplied size 810 × 1,200 mm,
- The CETRIS® board thickness 12 mm ±1.0 mm, with tensile bending strength min. 9 Nmm$^{-2}$, size 625 × 1,250 mm. The boards for the upper layer are supplied predrilled (hole diameter 4 mm),
- Self-cutting screws CETRIS 4.2 × 35 mm with double thread and sunken head with blades for countersinking.

**Vertical cross section – IZOCET floating floor**




**01 corner lath**
**02 walking surface**
**03 CETRIS® board – upper predrilled, th. 12 mm**
**04 CETRIS® board – lower non-drilled, th. 12 mm**
**05 CETRIS screw 4.2 × 35 mm**
**06 insulation board**
**07 vapour barrier**
**08 dilation joint, thickness 15 mm**
**09 ceiling construction**

### 7.5.1.2 Properties of IZOCET Floor

**Load-bearing capacity**

The load-bearing capacity of IZOCET flooring has been specified by tests designed for light floor constructions by EN 13 810-1. The individual tests were performed in the acoustic chamber of the testing laboratory of CSI Praha a.s., Zlín office, on a sample size 3.6 × 3.0 m. The floor was always laid over a reinforced concrete ceiling construction.

Loading methods for test purposes:

- **Concentrated load** – object of 130 kg weight acting locally on a circular area with the diameter of 25 mm. The value of limit sag under the load is max. 3 mm.
- **Impact load** – object with the weight of 40 kg falling on the floor from the height of 350 mm. After 10 hits the limit sag value is max. 1.0 mm. The load simulated falling objects, falling persons, dancing, jumping etc.
- **Uniform load**

The achieved results show that all variants of IZOCET flooring are suitable for loads of categories A (residential areas and areas for domestic activities) and B (office space) pursuant to EN 1991-1-1 Euro code 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings. When designing dry floor constructions the permitted sags must be considered and the base load-bearing capacity must be taken into account. The IZOCET dry floor construction is not recommended for spaces with higher standard load demand than prescribed for this type of floor and for permanently wet rooms such as saunas, laundries, showers etc.

**Evaluation of tests for category A (residential spaces) and B (office spaces)**

| PARAMETER NAME AND TEST METHOD | PARAMETER VALUE AND NTD IDENTIFICATION | IZOCET SP45 | IZOCET SP 65 |
|---|---|---|---|
| Resistance to concentrated load EN 13 810-1 | At $F_k$=1.3 kN sag $d_F \leq$3.0 mm EN 13 810-1 | $d_F$ = 2.7 mm | $d_F$ = 2.0 mm |
| Resistance to dynamic impact load EN 1195 | sag increment $\partial d_F \leq$ 1.0 mm | $\partial d_F$= −0.7* mm | $\partial d_F$= 0.0 mm |
| Resistance to even load EN 12 431 | At qK 3,0 kN/m² compression $d_q \leq$2.0 mm EN 1991-1-1 | $d_q$ = 0.26 mm | $d_q$ = 0.43 mm |

*** Note: Impact of test object caused compacting of the insulation pad.**

**Sound insulation properties**

Acoustic properties of IZOCET dry flooring were specified by laboratory methods pursuant to EN ISO 140-3, EN ISO 140-6 over standardised ceiling slab (reinforced concrete ceiling construction, thickness 120 mm).
With regard to quality of impact sound transmission loss the IZOCET floor may be used over load-bearing constructions with area weight of 300 kg/m² or over ceiling constructions without acoustic requirements.

| FLOOR COMPOSITION | SOUND TRANSMISSION LOSS INDEX $R_W$ | STANDARDISED NOISE LEVEL INDEX $L_{nv}$ |
|---|---|---|
| IZOCET SP 45 | 58 dB | 54 dB |
| IZOCET SP 65 | 59 dB | 52 dB |

Calculated informative sound insulation parameters of IZOCET flooring over wooden ceiling construction:
Airborne sound transmission loss index ..... $R_w$ = 58 dB
Standardised impact sound level index ..... $L_{nw}$ = 62 dB
Reduction of standardised impact sound level ..... $\Delta L_w$ = 8 dB

**Heat insulating properties**

Heat insulating properties of an IZOCET floating floor are characterised by the properties of the fibreboards.

| BOARD | HEAT CONDUCTIVITY COEFFICIENT U |
|---|---|
| Insulation fibreboards | 0.05 W/mK |
| CETRIS® | 0.277 W/mK |

| FLOOR | HEAT RESISTANCE R |
|---|---|
| IZOCET SP 45 | 0.49 m²K/W |
| IZOCET SP 65 | 0.89 m²K/W |

### 7.5.1.3 Preparation of Base before Floor Laying

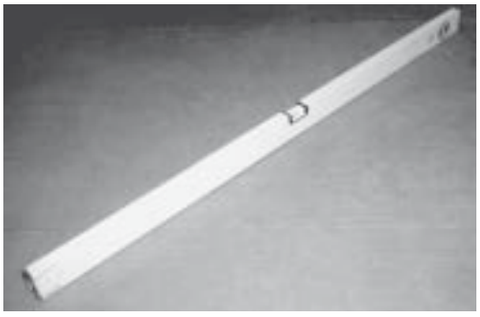
**Load-Bearing Base, Requirements and Preparation**

To assure the final quality of the floating floor surface for the walking layer laying it is necessary to prepare the load-bearing base well. The load-bearing base may be a massive ceiling construction (reinforced concrete ceiling slab, ceramic ceiling, HURDIS ceiling etc.) or a wooden slab and girder ceiling with plank cover, a joist ceiling, a log ceiling or a concrete foundation slab.

The load-bearing base is expected to be able to transfer the minimum load = the standardised (usable) load + the floor weight in compliance with the requirement for the maximum ceiling construction sag.

The IZOCET floating floor requires a dry load-bearing base with the max. planarity tolerance of 4 mm per 2 m. If the maximum permitted planarity tolerances – of the load-bearing base are not met then it is not possible to subsequently guarantee the maximum permitted sag under the walking surface of the floor. Local tolerances may reach up to 5 mm (for example individual protruding fills, concrete burrs or knags in the wooden base) as there is the possibility of a subsequent levelling of these local irregularities with the insulation layer shaping.

If the sufficient planarity of the base is not present then the base surface must be levelled.



**Load-Bearing Surface Levelling**

Surface levelling may be done two ways:

**1. Wet method** – with the help of cement mortar with sand or with a layer of self-levelling plaster pursuant to the instructions of the individual manufacturers

**2. Dry sub-base** – it is possible to use dry levelling mixes based on crushed porous concrete, pearlite. The minimum height of the sub-base must be 10 mm and maximum 40 mm. The recommended mixes include FERMACELL, BACHL BS Perlit, Liapor, SILIPERL.




Before levelling the surface of wooden log ceiling the quality of load bearing construction should be assessed. Beaten, bent (deviations over 5 mm) or otherwise damaged planks should be replaced first. Cardboard should be laid over the ceiling as protection against drops of the dry sub-base mix through openings after knags and gaps between the planks.

The levelling sub-base is spread according to instructions by the individual manufacturers.

Recommended procedure:

- Specify the required final height of the constructed floor and mark it on the adjacent walls (1 m above the final floor level)
- Pour the sub-base mix along one wall in a strip of about 20 cm width up to the required sub-base height (it is necessary to respect the construction height of the floor system). In the distance equal to the length of the smoothing lath create a parallel sub-base strip.
- Place the levelling laths on the strips and level with a spirit level. For this activity you need a set of smoothing laths (such as wooden prisms). The smoothing lath must be provided with side dents corresponding to the height of the levelling laths.
- Fill the space between the strips with the sub-base mix and use the smoothing lath to level the surface of the sub-base to the required elevation level.

**Base Humidity**

Maximum permitted mass humidity of the base:

- Wooden base – 12 %
- Silicate base – 6 %

**Humidity Insulation**

To prevent humidity transport to the heat insulation and acoustic insulation layer, this layer must be separated from the ceiling construction with a hydro-insulating layer. This barrier mainly applies to the load-bearing ceiling construction, which contains residual humidity, or where increased pass of humidity through the ceiling construction is expected. For this purpose clean the surface and cover it with a hydro-insulating foil such as PE foil, thickness 0.2 mm with overlaps between the individual strips at least 200 mm (or glue the foil joints with an adhesive tape). The foil should be drawn up the adjacent vertical constructions above the assumed floor surface level.

When levelling the surface with the self-levelling plaster the humidity insulation is placed over the plaster. In the case of levelling with the sub-base mix the humidity insulation is placed between the load-bearing construction and the sub-base.

When laying the floor over a wooden load-bearing construction, use of PE foil is not recommended to preserve “breathing” of the ceiling. If there are rooms under the ceiling where increased humidity is expected (a bathroom, a kitchen) then it is necessary to prevent humidity transport to the construction or its free evaporation must be assured.

The humidity insulation must be part of the whole ceiling and floor construction.

For the purpose of potential venting of wet constructions, a microventilating layer may be used (such as OLDROYD, TECHNODREN).

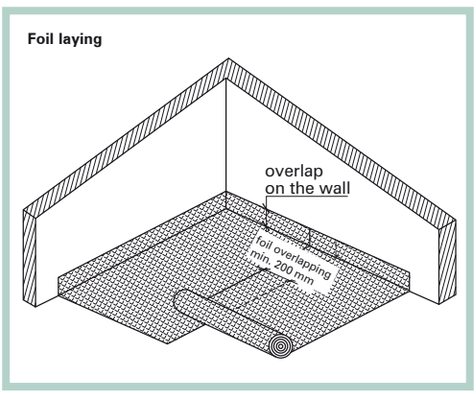
### 7.5.1.4 IZOCET Floating Floor Laying

**1** The IZOCET floating floor is laid as the final construction after completion of the "wet" construction works (partition building, plastering etc.)

**2** The IZOCET floating floor is laid over a clean and dry surface.

**3** Before the floor construction laying, the floor parts should be acclimatised for the minimum period of 48 hours at the minimum temperature of 18°C and relative air humidity max. 70 %. The acclimatisation approximates the manufacturing humidity of the board to the balanced humidity of the application and reduces the problem of later shape changes.

**4** Cover the load-bearing ceiling construction with PE foil, or paper cardboard in the case of a wooden ceiling, or a microventilating layer, with 200 mm overlaps between the strips and overlap up the vertical constructions at least to the height of the floor construction.

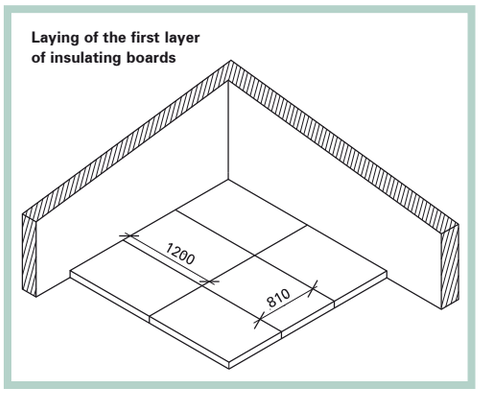


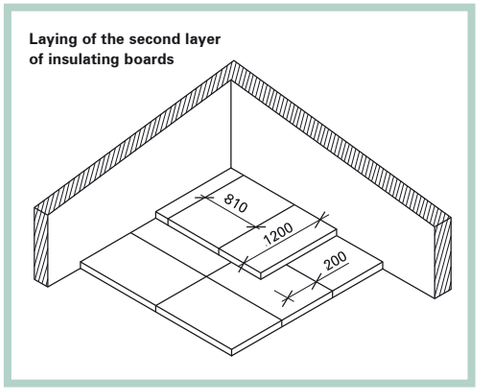

**5** If necessary, level the base with a dry sub-base, which is only spread along part of the area.

**6** If the floor construction does not comply with the criteria of load-bearing capacity under local load, it is recommended to eliminate the effects of unfavourable distortions by application of base load-distribution elements. These load distributing elements – 100 mm wide planks – are placed between rooms, between individual floor types and where load with concentrated objects higher than the load-bearing capacity of the given floor type is expected.
Where the dry floor construction passes a door threshold the issue of installation of the door frame must be resolved. The floor must be levelled and padded up to the exact height along the door frame length under the central bottom partition. When fixing the door threshold it is necessary to use longer screws to connect the door frame with the base profile. In the case of door threshold it is recommended to always install the base laths on both sides of the threshold under the CETRIS® boards (see the solution of details of the IZOCET floating floor). To assure quality settlement of the door threshold especially over the walking surface of ceramic tiles it is recommended to cover the threshold with silicone filler before the threshold laying.

**7** Specify the direction of the upper CETRIS® board layer on which the direction of the bottom boards depends. The individual layers must cross each other. The joints of the insulation boards and the CETRIS® floor boards must not be one above the other.

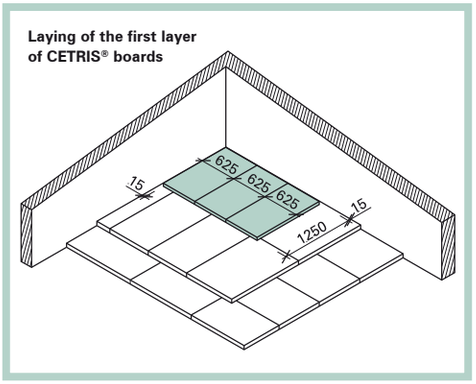
**8** The insulation boards are laid tightly along the vertical constructions. The insulation boards are laid without dilation gaps in the surface. When using two layers of insulation boards the upper layer is laid with an overlap of at least 200 mm over the bottom layer.



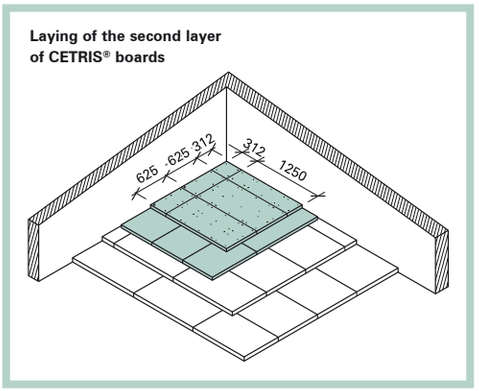




**9** Start CETRIS® board laying with a whole board opposite the door. The boards are laid tightly with a cross gap.

**10** Create 15 mm wide dilation joints around vertical constructions (walls, pillars etc.).




**11** The second layer of CETRIS® boards is laid crosswise in relation to the bottom layer with the overlap by 1/3 of the board, i.e. 312 mm. For easier assembly the upper layer of the CETRIS® boards is predrilled with holes with a diameter of 4 mm.




**12** Insert a 5 mm wide strip of mineral wool (such as ORSIL) along the vertical constructions to prevent undesirable filling of the dilation joint by the subsequent works. The strip is cut to the required height after completion of the final surface finish of the floating floor before the flooring laying.

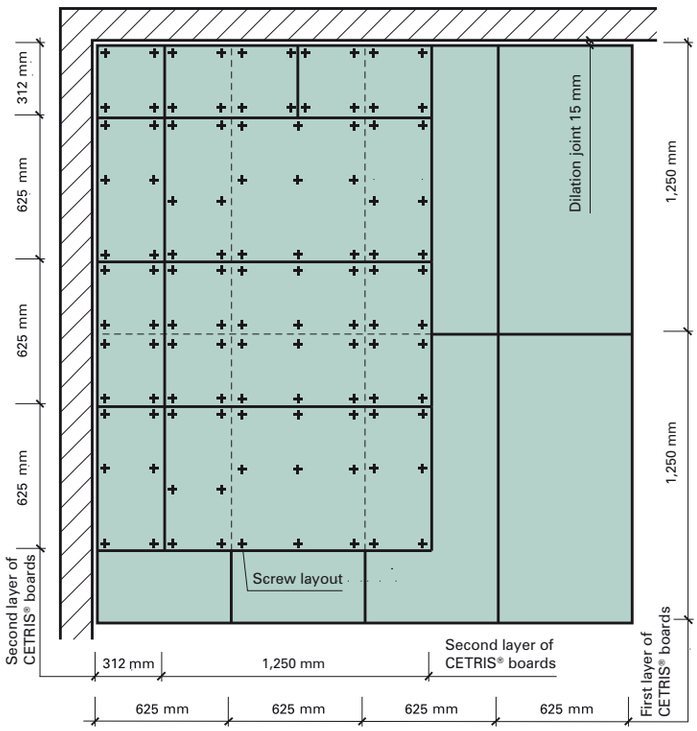
**13** The CETRIS® boards must be joined with self-cutting screws with a diameter of 4.2 mm and length 35 mm with sunken heads immediately after laying. The screws are placed in the predrilled holes. In case of additional cutting of the boards, the screws must be placed 25 – 50 mm from the board edge with a maximum spacing between the individual joints of 300 mm. The screws must not pass through the joints of the bottom layer of the CETRIS® boards. The average number of connecting screws per 1 $m^2$ is 28 pieces.

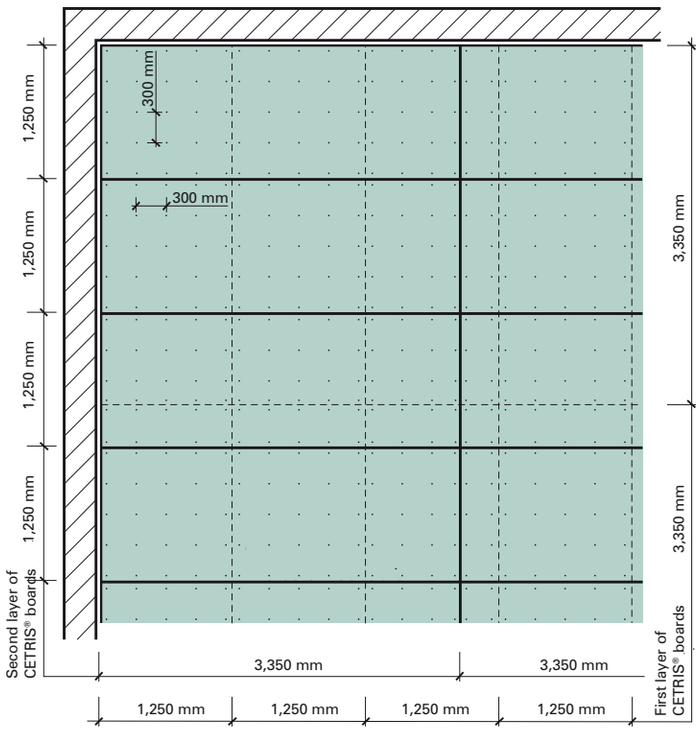
When laying basic formats of CETRIS® board (1,250 × 3,350 mm) about 20 screws per square

meter will be sufficient for screwing the boards together if the following conditions are met:

- min. distance of the screw from the board edge 25 mm
- max. distance of the screws on the board surface 300 mm
- in the point of contact of the bottom board layer double screwing is needed – to both boards of the bottom layer
- the upper board must be predrilled with the hole diameter of 4 mm

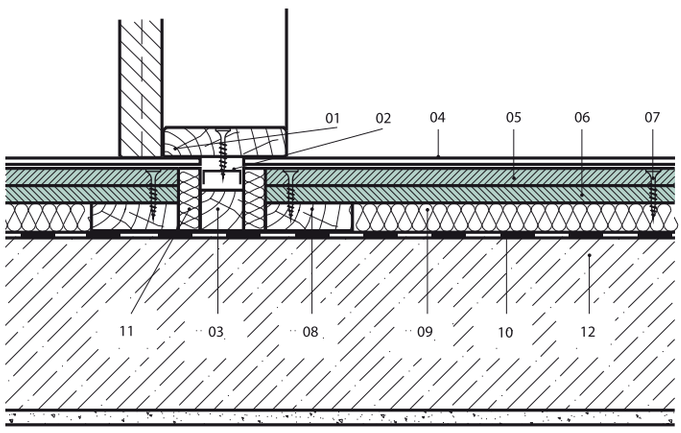
**14** It is recommended to use electric screwdrivers for the screwing. When joining CETRIS® boards it is necessary to locally press the boards, ideally with the weight of the worker. This will prevent lifting of the upper board layer and potential deposits of the sawdust from drilling between the joints. Start screwing individual boards from the centre of the board.




### 7.5.1.5 Details of IZOCET Floating Floor

**Threshold crossing**
Vertical cross-section




**01** wooden door threshold
**02** threshold joint
**03** wooden base profile
**04** walking surface
**05** CETRIS® floor board, th. 12 mm, upper layer, predrilled
**06** CETRIS® floor board, th. 12 mm, bottom layer
**07** screw 4.2 × 35 mm
**08** wooden base lath
**09** insulation board
**10** vapour barrier
**11** dilation joint 15 mm
**12** ceiling construction

**15** After joining both layers of CETRIS® boards cut the edge strip and the insulation foil in the required height with a knife.

**16** The screwed together floor can be walked on immediately. The walking layer of the flooring may be laid immediately, too.

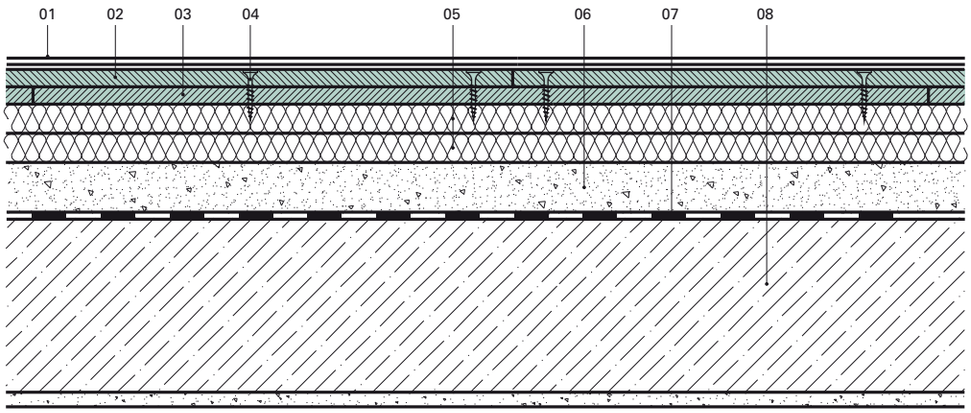
**17** When laying large floors it is recommended to lay the insulation and the boards by dilation field. This will reduce the possibility of damage to the insulation by worker traffic.

**Note:** Drying and continuous acclimatisation of the CETRIS® boards after the floor laying may lead, especially in winter months, to moderate lifting of the free edges (by the walls, in the corners). This effect may be eliminated by local anchoring of the CETRIS® boards to the base (subfloor, ceiling).

All dimensions in mm.

### Levelling of uneven base surface, increase of construction height

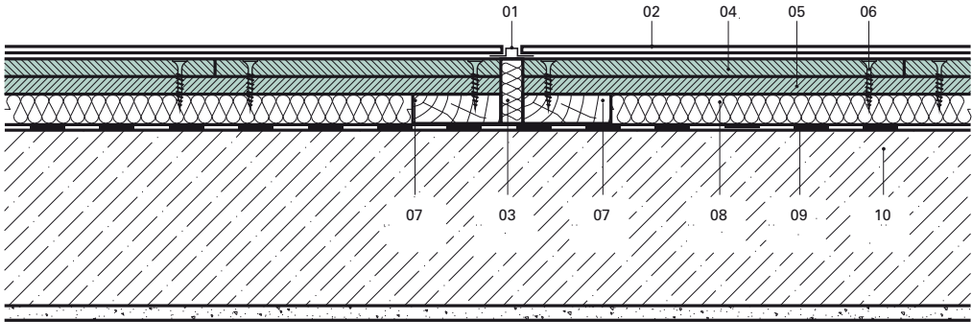
Vertical cross-section




**01** walking surface
**02** floor board CETRIS®, thickness 12 mm, upper layer, predrilled
**03** floor board CETRIS®, thickness 12 mm, bottom layer
**04** screw 4.2 × 35 mm
**05** insulation board 2 × 19 mm
**06** sub-base (Fermacel, BACHL Perlit BS, Silipert) – max. thickness 40 mm
**07** vapour barrier
**08** ceiling construction

### Dilation joint in the middle of the surface

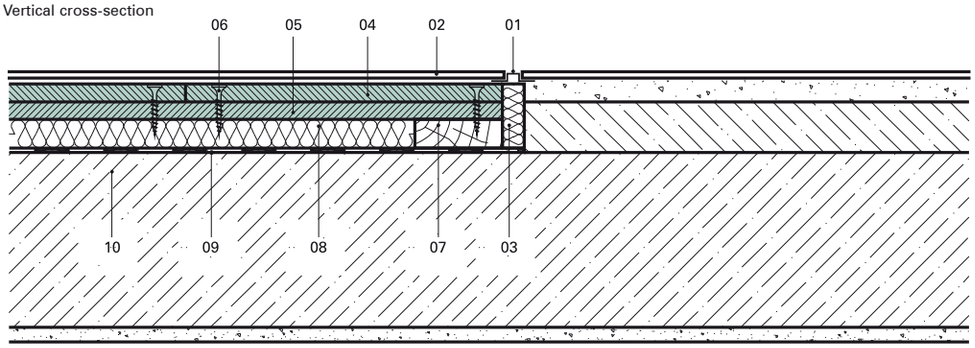
Vertical cross-section




**01** dilation profile Schlüter DILEX – BWB
**02** walking surface
**03** dilation joint thickness 15 mm
**04** floor board CETRIS®, th. 12 mm, upper layer, predrilled
**05** floor board CETRIS®, th. 12 mm, bottom layer
**06** screw 4.2 × 35 mm
**07** wooden lath
**08** insulation board
**09** vapour barrier
**10** ceiling construction

### Transfer to another floor type

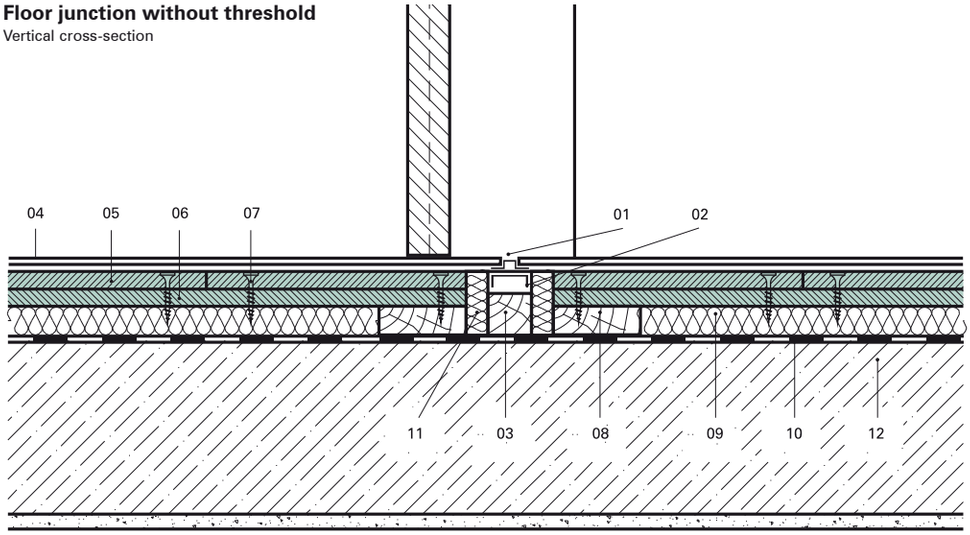
Vertical cross-section




**01** dilation profile Schlüter DILEX – BWB
**02** walking surface
**03** dilation joint thickness 15 mm
**04** floor board CETRIS®, th. 12 mm, upper layer, predrilled
**05** floor board CETRIS®, th. 12 mm, bottom layer
**06** screw 4.2 × 35 mm
**07** wooden lath
**08** insulation board
**09** vapour barrier
**10** ceiling construction

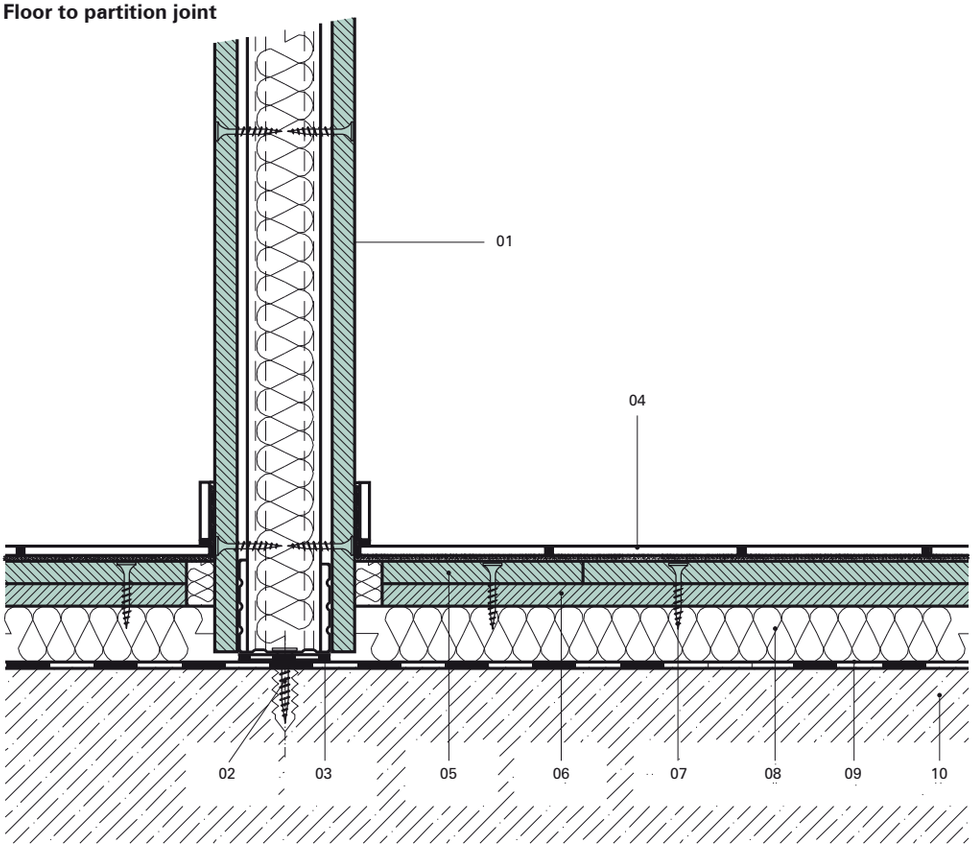
# CETRIS®
# Floor Systems

**Floor junction without threshold**
Vertical cross-section




**01** dilation profile Schlüter DILEX
**02** threshold joint
**03** wooden base profile
**04** walking surface
**05** floor board CETRIS®, th. 12 mm, upper layer, predrilled
**06** floor board CETRIS®, th. 12 mm, bottom layer
**07** screw 4.2 × 35 mm
**08** wooden lath
**09** insulation board
**10** vapour barrier
**11** dilation joint 15 mm
**12** ceiling construction

**Floor to partition joint**




**01** partition
**02** dowel
**03** sealing washer
**04** walking surface
**05** floor board CETRIS®, th. 12 mm, upper layer, predrilled
**06** floor board CETRIS®, th. 12 mm, bottom layer
**07** screw 4.2 x 35 mm
**08** insulation board
**09** vapour barrier
**10** ceiling construction

## 7.5.2 POLYCET Floating Floors

The POLYCET floating floor extends the CETRIS® cement bonded particleboard offer of light floating floors. The composition of the dry floating floor includes insulation boards of elasticised foam polystyrene – in various combinations of types and thicknesses pursuant to the application. The load distributing layer consists of two layers of CETRIS® cement-bonded particleboards. These floors are designed for residential and office spaces. Like in the case of the IZOCET system, POLYCET floor layers must count on increased elasticity. That is why these systems are not recommended in rooms with increased humidity (showers, bathrooms, laundries, saunas etc.) where the permitted sags might threaten the functionality of the hydro insulating layer.
Designs of the composition and implementation of the POLYCET floor must comply with the principles defined in the instruction for assembly. In the case of replacement of the insulation boards based on EPS insulation, boards of a lower class cannot be used.

The POLYCET dry floor construction is a representative of the category of light floating floors (floating floor weights up to 75 kg/m$^2$). All tests and assessments have been performed by the accredited testing laboratory of the Centrum stavebního inženýrství Praha a.s., [Centre of Civil Engineering, joint-stock company, Prague, Zlín office], on the basis of the requirements of the following standards:

- ČSN 74 45 05 Floors, General Provisions
- EN 13 810-1 Wood-based panels – Floating floors – Part 1: Performance specifications and requirements
- EN ISO 140-3 Acoustics. Measurement of sound insulation in buildings and of building elements. Part 3: Laboratory measurement of airborne sound insulation of building elements (ISO 140-3:1995)
- EN ISO 140-6 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 6: Laboratory measurement of impact sound insulation of floors.
- EN ISO 717-1 Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation
- EN 717-2 Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation.

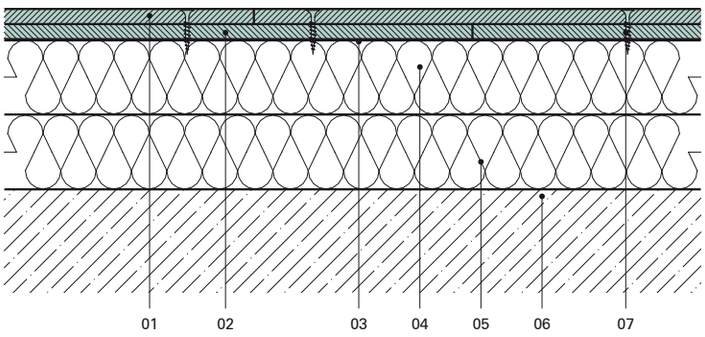
**Composition of POLYCET floating floor**

- **Walking surface** – may consist of carpet, parquet, PVC, pavement (recommended maximum tile size 200 × 200 mm).
- **Load-distributing layer** – two layers of CETRIS® boards, thickness 12 mm, screwed together with self-cutting screws with sunken heads (or glued with a glue spread across the whole surface).
- **Separation layer** – softened foil of foam polyethylene (elimination of creaking between CETRIS® and EPS). In the case of use of insulation boards with aluminium foil the separation is not necessary.
- **Heat insulating layer** – the most important part of the floating floor, increases impact sound transmission loss, at the same time improving heat insulation. The POLYCET floor includes one or a maximum two layers of insulation of elasticised foam polystyrene EPS, maximum thickness 60 mm
- **Perimeter tapes** – the floating floor must be separated from the walls with a material of similar sound insulation properties as the insulation itself.

### 7.5.2.1 Description and Variants of POLYCET Floors

**POLYCET Therm – light floor with high thermal resistance**

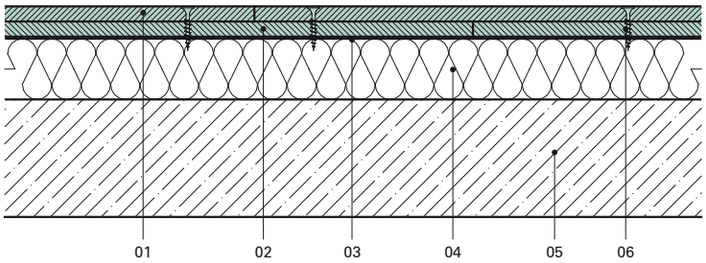
POLYCET Therm flooring is the ideal solution especially for basement floors (laid on the natural ground). Use of two layers of polystyrene insulation boards of EPS 100Z class with the total height of 120 mm results in a high value of thermal resistance, significantly exceeding the minimum required values and corresponding to the recommended values of the heat transfer coefficient pursuant to ČSN 73 0540-2.




**01** CETRIS® cement bonded particleboard 12 mm, upper drilled
**02** CETRIS® cement bonded particleboard 12 mm, bottom
**03** separation layer
**04** foam polystyrene EPS 100 Z, thickness 60 mm
**05** foam polystyrene EPS 100 Z, thickness 60 mm
**06** ceiling construction
**07** screw 4.2 × 35 mm

**POLYCET Aku – light floor for ceiling constructions between residential units**

Even with the low total height of POLYCET Aku flooring, the requirements for impact sound transmission loss pursuant to EN ISO 717-1,2 and ČSN 73 0532 for ceiling constructions in residential houses are met. The function of the acoustic layer is fulfilled by foam polystyrene insulation of EPS T3500 class, which meets the requirements or insulation against structural noise and impact sound.

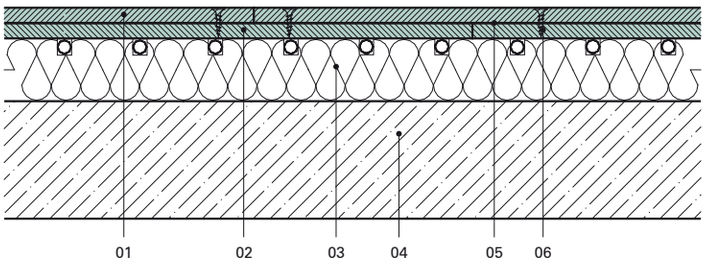



**01** CETRIS® cement bonded particleboard 12 mm, upper drilled
**02** CETRIS® cement bonded particleboard 12 mm, bottom
**03** separation layer
**04** foam polystyrene EPS T 3500, thickness 50 mm
**05** ceiling construction
**06** screw 4.2 × 35 mm

# CETRIS®
# Floor Systems

### POLYCET Heat – light floor with inbuilt floor heating

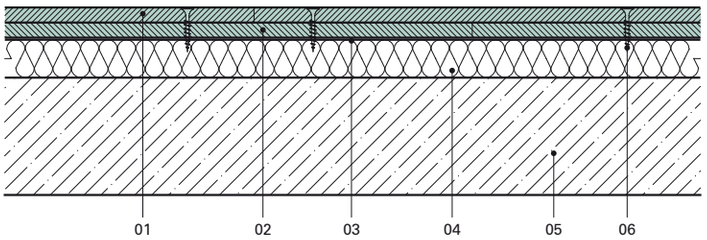
The insulation boards of the POLYCET Heat floor are adapted elements of foam polystyrene of EPS 100S class. These parts are provided with self-closing grooves for pipeline laying and covered across the whole surface with aluminium foil th. 0.09 mm (for ideal heat transfer). On the bottom side of the board there are air grooves. The self-sticking overlaps of the aluminium foil are used for attachment of the adjacent insulation boards. Stiffness of the load-distribution layer of two CETRIS® boards, thickness 12 mm, is reinforced by gluing across the whole surface (Uzin MK-73 glue) and screwing with screws of max. length 25 mm (6 screws per board size 1,250 × 625 mm).




**01** CETRIS® cement bonded particleboard 12 mm, upper drilled
**02** CETRIS® cement bonded particleboard 12 mm, bottom
**03** foam polystyrene EPS 100 S, th. 50 mm with aluminium foil and underfloor heating pipe
**04** ceiling construction
**05** UZIN MK-73 adhesive (800 – 1,000 g/m²)
**06** screw 4.2 × 35 mm

### POLYCET Max – light floor with higher imposed load

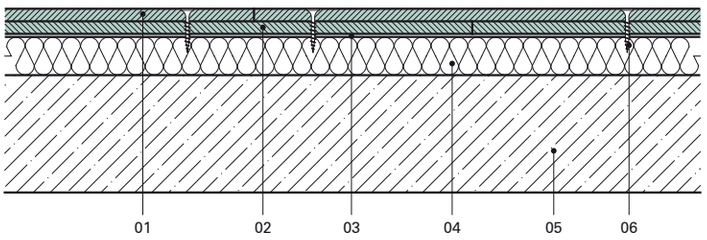
Most of light floating floor is designed for rooms with load category A or B pursuant to EN 1991 - 1-1 Eurocode 1: loads of structures - Part 1-1: General loads - Densities, self-weight and imposed loads for building constructions. The floor POLYCET has been tested pursuant to EN 13810 Wood-based panels - Floating floors - Part 1: Specification utility qualities and requirements for higher load classes - C1-C3, C5 (areas in schools, theaters, office buildings). High mechanical strength is achieved by using the insulation of expanded polystyrene for high pressure loaded floor and roof structures. New for light systems floors with a distribution layer made from two layers of cement bonded particleboards CETRIS® is also a system of mutual connection - nailing modern technology with significantly less time assembly. CETRIS® boards are stapled ("board to board" system) with Haubold staples, or optionally screwed with screws (predrilled upper board).




**01** CETRIS® cement bonded particleboard 12 mm, upper drilled
**02** CETRIS® cement bonded particleboard 12 mm, bottom
**03** separation layer
**04** foam polystyrene EPS 200S, thickness 30 mm
**05** ceiling construction
**06** screw 4,2 × 35 mm, eventually clip Haubold KG 700 CNK

### POLYCET Min – lightweight floating low cost floor

The floating floor POLYCET Min is designed for rooms with load category A or B pursuant to EN 1991 - 1-1 Eurocode 1: loads of structures - Part 1-1: General loads - Densities, self-weight and imposed loads for building constructions. The whole composition excels primarily in low cost while maintaining favorable mechanical and acoustic parameters. Two layers of cement bonded particleboards CETRIS® thickness 10 mm, mutually overlapped and screwed together with countersunk head screws (upper board predrilled) are put on polystyrene foam insulation for noise reduction.




**01** CETRIS® cement bonded particleboard 10 mm, upper drilled
**02** CETRIS® cement bonded particleboard 10 mm, bottom
**03** separation layer – foam foil 2 mm thickness
**04** foam polystyrene EPS T4000, thickness 30 mm
**05** ceiling construction
**06** screw 4,2 × 35 mm

**Material Specification**

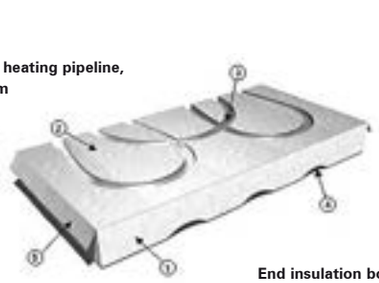
- CETRIS® boards are cement bonded particleboards, thickness 12 ±1 mm, with tensile bend strength min. 9 MPa, size 1,250 × 625 mm. Variants POLYCET Therm and Aku are supplied with predrilled upper layer boards (hole diameter 4 mm). Alternatively the POLYCET Therm and Aku may also use the basic board size 1,250 × 3,350 mm.
- Self-cutting screws 4.2 × 35 mm with double thread and sunken heads with blades for countersinking (for screwing together CETRIS® boards in the POLYCET Therm and Aku variants).
- Self-cutting screws 4.2 × 25 mm with double thread and sunken heads with blades for countersinking (for screwing together CETRIS® boards in the POLYCET Heat variant).
- Insulation foil of expanded foam polyethylene with closed cellular structure, made without use of freon. A separation layer for elimination of creaking and increased impact sound transmission loss.
- Glue UZIN MK 73 for gluing together CETRIS® boards across the whole surface in the POLYCET Heat variant. A solvent type glue based on artificial resin for particleboard, cement, magnesium, heated plasters, cast bitumen and insulation layers UZIN. Very easy to spread and fill, quickly binding, with hard elasticity and high shear strength.
- Insulation boards EPS of elasticised foam polystyrene, type and thickness specified individually for each composition. Insulation layers of lower class or thicker than 60 mm cannot be used. A maximum two layers of insulation boards are permitted.

**Survey of used types of EPS in POLYCET floor composition and classification of their properties pursuant to EN 13163**

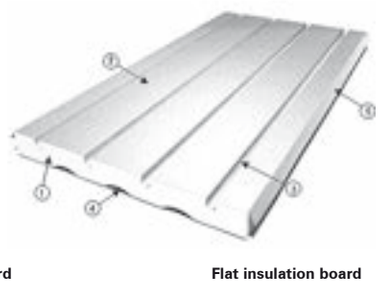
| VARIANT OF POLYCET FLOOR SYSTEM | THERM | AKU | HEAT | MAX |
|---|---|---|---|---|
| Insulation agent type – EPS | EPS 100 Z | EPS T3500 | EPS 100 S Stabil for floor heating | EPS 200 S Stabil |
| Heat conductivity coefficient | 0.038 W/m.K | 0.045 W/m.K | 0.038 W/m.K | 0,034 W/m.K |
| Size | 1,000 × 500 mm | | 2,000 × 1,000 (Bachl)<br>480 × 960 (Fana) | 1 000 × 500 mm |
| Thickness (for POLYCET system) | 10 – 60 mm | 15 – 50 mm | 20 – 50 mm | 10 – 30 mm |
| Thickness tolerance T | ±2 mm | | | |
| Length tolerance L for widths <500 mm | ±3 mm | | | |
| Width tolerance W for widths <500 mm | ±3 mm | | | |
| Rectangularity S | ±5 mm/m | | | |
| Planarity P4 | ±10 mm/m | | | |
| Pressure tension CS(10) | 100 kPa | • | 100 kPa | 200 kPa |
| Stability DS (N) | ±0.5 % | | ±0.2 % | |
| Dimensional stability DS (70,-) | 1 % | • | 1 % | |
| Dimensional stability DLT (1) | 5 % | • | 5 % | |
| Dynamic solidity SD | • | 10 – 30 MN/m³ | • | |
| Compression factor CP3 | • | CP3 – 3 mm | • | |
| Reaction to fire class pursuant to EN 13 501-1 | E | | | |

**Insulation boards for floor heating** are provided with self-closing grooves for pipeline laying and are covered with aluminium foil across the whole surface. There are air grooves on the bottom side of the board. Self-sticking overlaps are used for attachment of the adjacent insulation boards. The end insulation board allows for turning the direction of the heating pipeline.

**01** EPS board
**02** aluminium foil
**03** self-closing grooves for heating pipeline, diameters 16 and 17 mm
**04** air grooves
**05** aluminium foil overlaps



End insulation board



Flat insulation board

### 7.5.2.2 Properties of POLYCET Flooring

**Load-bearing capacity**

When designing dry floor structures, with permitted deflections should be reckoned, and load ratings of the substrate should be considered. The POLYCET dry floor construction is not recommended for spaces with higher standard load demand than prescribed for this type of floor and for permanently wet rooms such as saunas, laundries, showers etc.

The load-bearing capacity of POLYCET flooring has been specified by tests designed for light floor constructions by EN 13 810-1. The individual tests were performed in the acoustic chamber of the testing laboratory of CSI Praha a.s., Zlín office, on sample size 3.6 × 3.0 m. The floor was always laid over a reinforced concrete ceiling construction.

Loading methods for test purposes:

- **Concentrated load** – object of 130 kg weight acting locally on a circular area with the diameter of 25 mm. The value of limit sag under the load is max. 3 mm.
- **Impact load** – object with the weight of 40 kg falling on the floor from the height of 350 mm. After 10 hits the limit sag value is max. 1.0 mm. The load simulated falling objects, falling persons, dancing, jumping etc.

The achieved results show that all variants of POLYCET flooring are suitable for loads of **category A** (residential areas and areas for domestic activities) and **category B** (office space) pursuant to EN 1991-1-1 Euro code 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings. When designing dry floor constructions, the permitted sags must be considered and the base load-bearing capacity must be taken into account.

**Evaluation of tests for category A (residential spaces) and category B (office spaces)**

| PARAMETER NAME AND TEST METHOD | PARAMETER VALUE AND NTD IDENTIFICATION | POLYCET THERM | POLYCET AKU | POLYCET HEAT | POLYCET MIN |
|---|---|---|---|---|---|
| Resistance to concentrated load EN 13 810-1 | At $F_k$ =1.3 kN sag $d_F$ ≤3.0 mm EN 13 810-1 | $d_F$ = 1.7 mm | $d_F$ = 1.9 mm | $d_F$ = 1.9 mm | $d_F$ = 2.58 mm |
| Resistance to dynamic impact load EN 1195 | Sag increment $\partial d_F$ ≤1.0 mm | $d_F$ = 0.1 mm | $d_F$ = 0.0 mm | $d_F$ = 0.2 mm | $\partial d_F$ = 0.15 mm |
| Resistance to uniform load EN 12 431 | At qK 3.0 kN/m² compression $d_q$ ≤2.0 mm EN 1991-1-1 | $d_F$ = 0.9 mm | $d_F$ = 0.8 mm | $d_F$ = 1.0 mm | $d_F$ = 0.48 mm |

Variant of the **POLYCET Max** floor is designed for higher category load pursuant to EN 1991-1-1:
**C1 – areas with tables** - eg. in schools, cafés, restaurants, canteens, etc.
**C2 – areas with integrated seats** – eg. areas in churches, theaters, cinemas, meeting rooms, waiting rooms, etc.
**C5 – areas, can be overcrowded**, eg. buildings for public events like concert halls.

**Evaluation of the utility category C1 to C3 and C5**

| PARAMETER NAME AND TEST METHOD | THE VALUE OF THE PARAMETER AND IDENTIFICATION OF NTD | POLYCET MAX |
|---|---|---|
| Resistance to the concentrated load EN 13 810-1 | When $F_k$ = 2.6 kN deflection $d_F$ ≤3.0 mm EN 13 810-1 | $d_F$ = 2.96 mm |
| Resistance to dynamic load EN 1195 | Increase od deflection $\partial d_F$ ≤ 1.0 mm | $\partial d_F$ = −0.35 mm |
| Resistance to evenly load EN 12 431 | When qK 5.0 kN/m² compression $d_q$ ≤2.0 mm EN 1991-1-1 | $d_F$ = 0.38 mm |

**Sound insulation properties**

The acoustic properties of POLYCET dry flooring were specified by laboratory methods pursuant to EN ISO 140-3, EN ISO 140-6 over a standardised ceiling slab (reinforced concrete ceiling construction, thickness 140 mm). Values were also calculated for the variant with a light log ceiling.

Horizontal constructions are assessed with regard to sound transmission through the air (airborne sound transmission loss) and with regard to impact noise resulting from dynamic load by mechanical impacts (impact sound transmission loss).

Airborne sound transmission loss is the ability of a construction to acoustically insulate two spaces from noise spread through the air. The evaluation parameter is weighed airborne sound transmission loss $\mathbf{R'_w}$ or laboratory airborne sound transmission loss $\mathbf{R_w}$. An increasing value of sound transmission loss means better acoustic insulation.

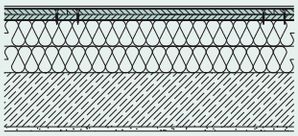
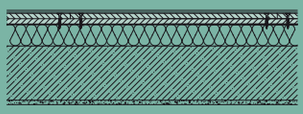
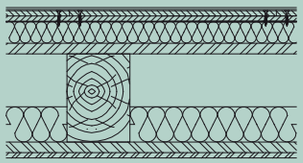
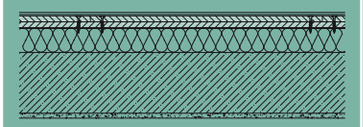
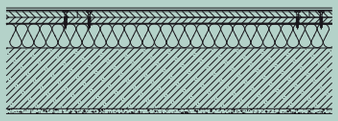
**The following equation applies:**

$R'_w = R_w - C$ (dB)
Where C…. is the correction depending on sound transfer by side constructions.

Impact sound transmission loss expresses the ability of a construction to absorb sound energy resulting from mechanical impact on the construction. The evaluation parameter is the weighed impact sound level $\mathbf{L'_{nw}}$ or laboratory impact sound level $\mathbf{L_{nw}}$. The higher the value the lower the impact sound transmission loss between two spaces.

The impact sound level reduction – $\mathbf{\Delta L_w}$ – represents improved sound transmission loss, expressed as the difference between the level of impact sound of just the ceiling construction (without acoustic insulation) and the level of impact sound of the ceiling with acoustic insulation, with application of the correction factor (depends on the ceiling construction type).

Regarding the quality of impact sound transmission loss, the POLYCET floor may be used on load-bearing constructions with area weights higher than 300 kg/m² or on ceiling constructions without acoustic requirements. For these reasons it is recommended to improve acoustic properties of the floor laid over a wooden log ceiling by additional loading of the ceiling construction – for example with concrete tiles of minimum thickness 40 mm.

| CONSTRUCTION SCHEME | FLOOR COMPOSITION | AIRBORNE SOUND TRANSMISSION LOSS INDEX $R_W$ | STANDARDIZED IMPACT SOUND LEVEL INDEX $L_W$ | REDUCTION OF STANDARDIZED IMPACT SOUND LEVEL $\Delta L_W$ |
|---|---|---|---|---|
|  | **POLYCET Therm**<br>• 2× CETRIS® 12 mm<br>• foam polystyrene EPS 100Z th. 2 × 60 mm<br>• reinforced concrete ceiling slab 140 mm | 58 dB | 54 dB | 25 dB |
|  | **POLYCET Aku**<br>• 2× CETRIS® 12 mm<br>• foam polystyrene EPS T3500 thickness 50 mm<br>• reinforced concrete ceiling slab 140 mm | 59 dB | 52 dB | 22 dB |
|  | **POLYCET Aku**<br>• 2× CETRIS® 12 mm<br>• foam polystyrene EPS T3500 thickness 50 mm<br>• timber ceiling | 58 dB<br>calculated value | 63 dB<br>calculated value | 7 dB<br>calculated value |
|  | **POLYCET Min**<br>• top board CETRIS® 10 mm<br>• bottom board CETRIS® 10 mm<br>• foam polystyrene EPS T4000 thickness 30 mm<br>• reinforced concrete ceiling slab 140 mm | 54 dB | 57 dB | 23 dB |
|  | **POLYCET Max**<br>• top board CETRIS® 12 mm<br>• bottom board: CETRIS® 12 mm<br>• foam polystyrene EPS 200S thickness 30 mm<br>• reinforced concrete ceiling slab 140 mm | 55 dB | 58 dB | 22 dB |

In terms of quality of impact sound reduction POLYCET floor can be applied on bearing structures of areal weitght more than 300 kg/m$^2$ or on ceiling constructions without acoustic requirements.

For these reasons, it is recommended to improve the acoustic properties of the floor placed on wooden beam ceiling by additional loading of deck ceiling – for example, with concrete tiles thickness min. 40 mm.

**Required values of sound insulation of ceiling construction pursuant to ČSN 73 0532 and EN ISO 717-1.2**

| | SOUND INSULATION REQUIREMENTS | |
|---|---|---|
| | $R'_W$ | $L'_{BW}$ |
| **Residential houses – one living room in a multi-room apartment** | | |
| All other rooms of the same apartment unless functional parts of the protected space | 47 dB | 63 dB |
| **Residential houses – apartment** | | |
| All rooms of other apartments | 53 (52) dB | 55 (58) dB |
| Common spaces (staircases, corridors etc.) | 52 dB | 55 dB |
| Common unused spaces (such as lofts) | 47 dB | 63 dB |
| Passages, subways | 57 dB | 53 dB |
| Passages, subways for car traffic, garages | 57 dB | 48 dB |
| Workplaces with La, max. < 85 dB with operation till 10 pm | 57 dB | 53 dB |
| **Semi-detached and terraced family houses** | | |
| Rooms in neighbouring house | 57 dB | 48 dB |
| **Hotels and accommodation facilities – bedroom space, guest rooms** | | |
| Rooms of other guests | 52 dB | 58 dB |
| Common spaces (staircases, corridors etc.) | 52 dB | 58 dB |
| Restaurants, special spaces and services with operation till 10 pm | 57 dB | 53 dB |
| **Hospitals, sanatoria – wards, doctors' offices** | | |
| Wards, surgeries | 52 dB | 58 dB |
| Auxiliary spaces | 52 dB | 58 dB |
| **Schools and educational institutions – classrooms** | | |
| Classrooms | 52 dB | 58 dB |
| Common spaces | 52 dB | 58 dB |
| **Offices and studies** | | |
| Offices and studies | 47 dB | 63 dB |
| Studies with increased demand for noise protection | 52 dB | 58 dB |

**Heat insulation properties**
The heat insulation properties of POLYCET flooring are mainly determined by properties of the EPS insulation boards.

| TYPE OF INSULATING AGENT – EPS | EPS 100 Z | EPS T3500 | EPS 100 S STABILE FOR FLOOR HEATING |
|---|---|---|---|
| Heat conductivity coefficient (W/m.K) | 0.038 | 0.045 | 0.038 |

**Improvement of thermal resistance of ceiling construction by POLYCET flooring**

| FLOOR | LOAD-DISTRIBUTING LAYER | INSULATION | | THERMAL RESISTANCE IMPROVEMENT R ($Wm^{-2}K^{-1}$) |
|---|---|---|---|---|
| | | **Type** (class) | **Thickness** (mm) | |
| **POLYCET Therm** | CETRIS® board 2 × 12 mm | EPS 100Z | 60+60 mm | 3.24 |
| **POLYCET Therm** | | | 60 mm | 1.62 |
| **POLYCET Aku** | | EPS T3500 | 30 mm | 0.75 |
| **POLYCET Aku** | | | 50 mm | 1.19 |
| **POLYCET Heat** | | EPS 100S | 50 mm | 1.40 |
| **POLYCET Heat** | | | 60+60 mm | 3.24 |
| **POLYCET Max** | | EPS 200S | 30 mm | 0.97 |
| **POLYCET Min** | CETRIS® board 2 × 10 mm | EPS T4000 | 30 mm | 0.84 |

**Required and recommended values of heat transfer coefficient and heat insulation thickness pursuant to ČSN 73 0540-2**

| CONSTRUCTION TYPE | HEAT TRANSFER COEFFICIENT U ($W/m^2K$) | | CORRESPONDING THICKNESS OF HEAT INSULATION (mm) | |
|---|---|---|---|---|
| | Required value | Recommended value | Required value | Recommended value |
| Ceiling under unheated loft | 0.30 | 0.20 | 120 | 180 |
| Ceiling from heated to unheated room | 0.60 | 0.40 | 60 | 90 |
| Ceiling above unheated room | 0.30 | 0.20 | 120 | 180 |
| Floor on natural ground (foundation slab) within 1 m from soil and ambient air interface | 0.38 | 0.25 | 100 | 150 |
| Floor on natural ground (foundation slab) in a distance exceeding 1 m | 0.60 | 0.40 | 60 | 90 |
| Floor with floor heating | 0.30 | 0.20 | 120 | 180 |
| Ceiling between spaces with temperature difference up to 10° C inclusive | 1.05 | 0.70 | 40 | 50 |
| Ceiling between spaces with temperature difference up to 5° C inclusive | 2.20 | 1.45 | 20 | 30 |

### 7.5.2.3 Base Preparation for Floor Laying

**Load-bearing base, requirements and preparation**
For assurance of the final quality of the surface of the floating floor for the walking surface it is necessary to prepare the load-bearing base well. The load-bearing base may be a massive ceiling construction (a reinforced concrete slab, ceramic ceiling etc.) or a timber ceiling with planks, a wooden log ceiling or a concrete foundation slab.
The load-bearing base is expected to be able to transfer the minimum load equal to the standard (usable) load plus the weight of the floor with the requirement of the maximum sag of the ceiling construction in compliance with the given requirements.
The POLYCET floating floor requires a dry load-bearing base with a planarity tolerance of 4 mm per 2 m. If the acceptable values of planarity tolerance are not complied with, the acceptable tolerances of planarity under the walking surface of the floor cannot be guaranteed either. Local irregularities may reach up to 5 mm (such as individually protruding fills, concrete burrs or knags in the wooden base) thanks to the possibility of additional levelling by the insulation layer. Insufficiently flat surfaces must be levelled.

**Load-bearing base levelling**
Surface levelling may be done by two ways:
1. **Wet method** – with the help of cement mortar with sand or with a layer of self-levelling plaster pursuant to the instructions of the individual manufacturers
2. **Dry sub-base** – it is possible to use dry levelling mixes based on crushed porous concrete, pearlite. The minimum height of the sub-base must be 10 mm and maximum 40 mm. The recommended mixes include FERMACELL, BACHL BS Perlit, SILIPERL.

Before levelling the surface of wooden log ceiling the quality of load bearing construction should be assessed. Beaten, bent (deviations over 5 mm) or otherwise damaged planks should be replaced first. Cardboard should be laid over the ceiling as protection against drops of the dry sub-base mix through openings after knags and gaps between the planks.
The levelling sub-base is spread according to instructions by the individual manufacturers.

**Recommended procedure**
Specify the required final height of the constructed floor and mark it on the adjacent walls (1 m above the final floor level).
Pour the sub-base mix along one wall in a strip of about 20 cm width up to the required sub-base height (it is necessary to respect the construction height of the floor system). In the distance equal to the length of the smoothing lath create a parallel sub-base strip.
Place the levelling laths on the strips and level with a spirit level. For this activity you need a set of smoothing laths (such as wooden prisms). The smoothing lath must be provided with side dents corresponding to the height of the levelling laths.
Fill the space between the strips with the sub-base mix and use the smoothing lath to level the surface of the sub-base to the required elevation level.

**Base Humidity**
Maximum permitted mass humidity of the base:
- Wooden base – 12 %
- Silicate base – 6%

**Humidity Insulation**
To prevent humidity transport to the heat insulation and acoustic insulation layer, the layer must be separated from the ceiling construction with a hydro-insulating layer. This barrier mainly applies to the load-bearing ceiling construction, which contains residual humidity, or where increased pass of humidity through the ceiling construction is expected. For this purpose, clean the surface and cover it with a hydro-insulating foil such as PE foil, thickness 0.2 mm with overlaps between the individual strips at least 200 mm (or glue the foil joints with an adhesive tape). The foil should be drawn up the adjacent vertical constructions above the assumed floor surface level.
When levelling the surface with the self-levelling plaster the humidity insulation is placed over the plaster. In the case of levelling with the sub-base mix the humidity insulation is placed between the load-bearing construction and the sub-base.
When laying the floor over a wooden load-bearing construction, use of PE foil is not recommended to preserve "breathing" of the ceiling. If there are rooms under the ceiling where increased humidity is expected (a bathroom, a kitchen) then it is necessary to prevent humidity transport to the construction or its free evaporation must be assured.
The humidity insulation must be part of the whole ceiling and floor construction.
For the purpose of potential venting of wet constructions a microventilating layer may be used (such as OLDROYD, TECHNODREN) or a PE foil.

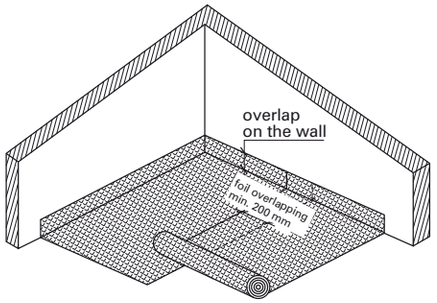
### 7.5.2.4 POLYCET Floating Floor Laying

**1** The POLYCET floating floor is laid as the final construction after completion of the "wet" construction works (partition building, plastering etc.)

**2** The POLYCET floating floor is laid over a clean and dry surface.

**3** Before laying the floor construction the floor parts should be acclimatised for a minimum period of 48 hours at the minimum temperature of 18° C and relative air humidity max. 70 %. The acclimatisation approximates the manufacturing humidity of the board to the balanced humidity of the application and reduces the problem of later shape changes.

**Foil stretching**



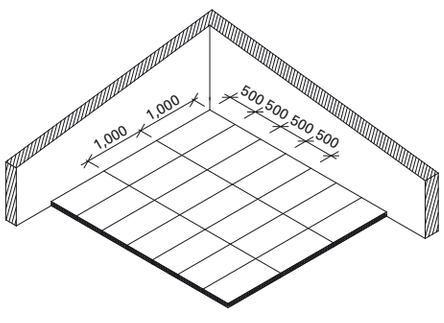

**4** If the sub-base contains high residual humidity, or in the case of risk of increased infiltration of humidity through the ceiling construction, cover the load-bearing ceiling construction with PE foil with 200 mm overlaps between the strips and overlapping the vertical constructions at least to the height of the floor construction.

**5** If necessary, level the base with a dry sub-base, which is only spread along part of the area.

**6** Specify the direction of the upper CETRIS® board layer on which the direction of the bottom boards depends. The individual layers must cross each other. The joints of the insulation boards and the CETRIS® floor boards must not be one above the other.

**7** The insulation boards of elastified foam polystyrene (EPS) are laid tightly along the vertical constructions. The insulation boards are laid without dilation gaps in the surface. When using two layers of insulation boards, the upper layer is laid with an overlap of at least 200 mm over the bottom layer. Where the dry floor construction passes a door threshold the issue of installation of the door frame must be resolved. The floor must be levelled and padded up to the exact height along the door frame length under the central bottom partition. When fixing the door threshold it is necessary to use longer screws to connect the door frame with the base profile. In the case of a door threshold it is recommended to always install the base laths on both sides of the threshold under the CETRIS® boards. The recommended size of the base boards is 80 by 30 mm and completion up to the total insulation height with cut EPS boards of adequate thickness (see detail drawing). The effect of reduction of impact sound absorption is negligible due to local use. The solution with the base lath is also recommended in the case of the floor dilation across the surface (area larger than 6 by 6 m), floor transfers etc.

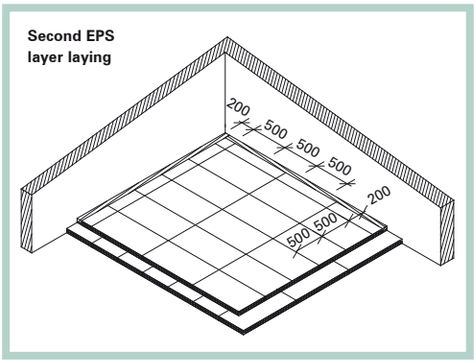
**First EPS layer laying**




To assure quality settlement of the door threshold, especially over the walking surface of ceramic tiles, it is recommended to cover the threshold with silicone filler before the threshold laying.

**8** When using two layers of EPS boards the second layer is laid with a min. overlap of 200 mm. Regarding the height of the insulation, it is recommended to eliminate the effect of the unfavourable deformations by using load-distributing elements as the base.

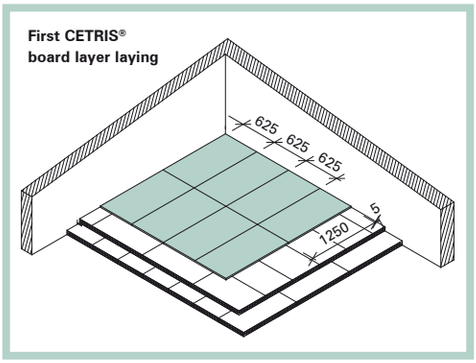
The best floor reinforcement are planks 80 by 30 mm with the thickness completed with EPS boards up to the total height of the insulation base. These "reinforcements" are placed between rooms, between individual floor types, along the room perimeter and




where load with concentrated objects larger than permitted for the given floor type is expected. In the case of the POLYCET Heat, insulation boards are used with grooves for floor heating insertion. A straight insulation board is used across the floor area – with longitudinal grooves. An end piece is placed along the walls where heating pipeline direction change is expected.
Thanks to the new technology the end piece is covered with aluminium foil all over, for heat loss minimisation. The universal groove layout allows for combinations of spans of the heating pipelines – both 125 and 250 mm. Assembly is identical with standard technological procedures for floor heating.
The new technology allows for overlaps of lengthwise joints between the pieces with self-sticking aluminium overlaps.
The floor heating pipeline laying follows the laying of the insulation boards.

**Before laying of the load-distributing layer, functionality and tightness of the floor heating pipeline must be checked!**

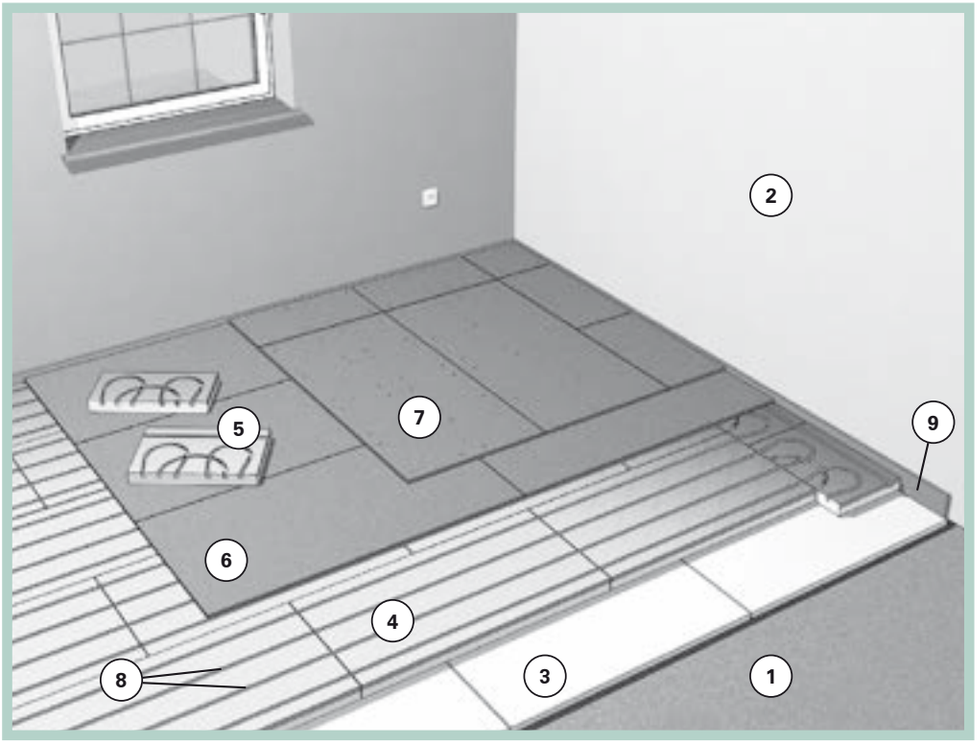
Before the load-distribution layer of CETRIS® boards is laid it is recommended to lay separation foil to prevent the floor creaking – a softened PE foil (such as Mirelon), thickness 2 mm. In the case of the POLYCET HEAT floor where insulation boards with aluminium foil are used, the separation is not needed.




**9** Start CETRIS® board laying with a whole board opposite the door. The boards are laid tightly with a cross gap.

**10** Create dilation joints around vertical constructions (walls, pillars etc.) with the width of 15 mm. Place a 15 mm wide mineral wool or polystyrene strip in the dilation joints along vertical constructions to prevent clogging of the dilation joint in the course of subsequent works.
Cut the strip to the needed height after completion of the final surface finish of the floating floor before flooring laying.

**Structure of POLYCET HEAT floor system**




**01 ceiling**
**02 wall**
**03 base insulation**
**04 straight insulation board**
**05 end insulation board**
**06 bottom layer – CETRIS® board th. 12 mm**
**07 upper layer – CETRIS® board th. 12 mm**
**08 heating pipeline**
**09 dilation**

## Further procedures of floor laying depend on the variant of POLYCET floor!

**Variants of POLYCET THERM, AKU, MAX and MIN**

**11** The second layer of CETRIS® boards is laid crosswise in relation to the bottom layer with the overlap by 1/3 of the board, i.e. 312 mm. For easier assembly the upper layer of the CETRIS® boards is predrilled with holes with a diameter of 4 mm.

**12** The CETRIS® boards must be joined with self-cutting screws with a diameter of 4.2 mm and length 35 mm with sunken heads immediately after laying. The screws are placed in the predrilled holes. In case of additional cutting of the boards, the screws must be placed 25 – 50 mm from the board edge with the maximum spacing between the individual joints 300 mm. The screws must not pass through the joints of the bottom layer of the CETRIS® boards. The average number of connecting screws per 1 m² is 30 pieces.

**13** It is recommended to use electric screwdrivers for the screwing. When joining CETRIS® boards it is necessary to locally press the boards down, ideally with the weight of the worker. This will prevent lifting of the upper board layer and potential deposits of the sawdust from drilling between the joints. Start screwing individual boards from the centre of the board.

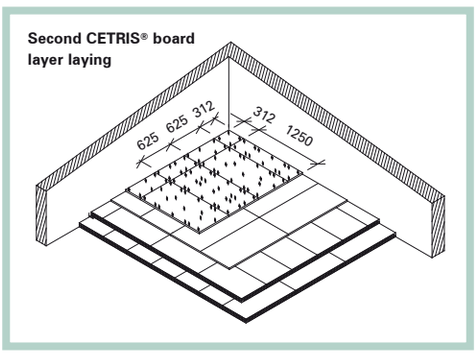
When laying standard sizes of CETRIS® board (3,350 by 1,250 mm) about 20 screws per 1 m2 is sufficient for screwing the boards together if the following conditions are met:

- Minimum distance of each screw from the board edge is 25 mm
- Maximum spacing of the screws in the board surface is 300 mm
- In the points of contact of the bottom boards double screwing is necessary – the upper board must be screwed to both bottom boards
- The upper boards must be predrilled with 4 mm holes

**14** After joining both layers of CETRIS® boards cut the edge strip and the insulation foil in the required height with a knife.

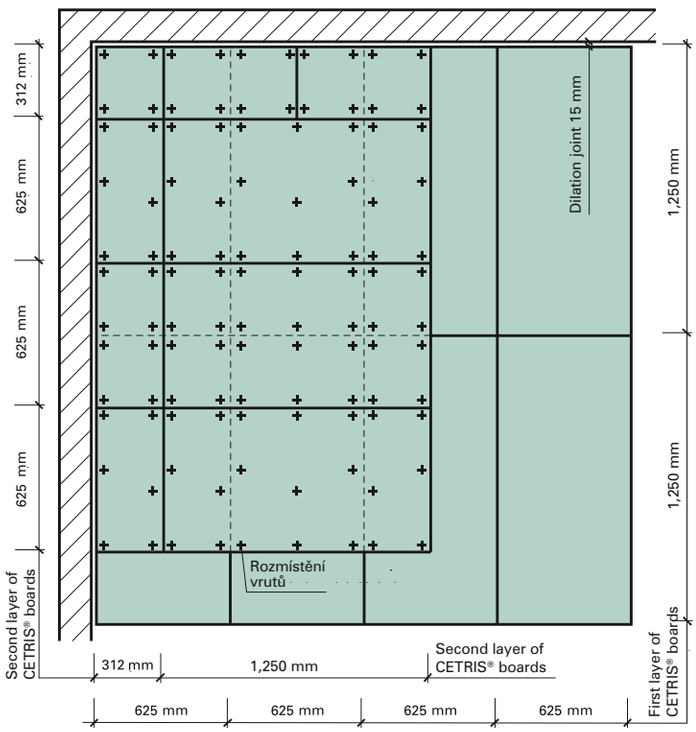
**15** The screwed together floor can be walked on immediately. The walking layer of the flooring may be laid immediately, too.

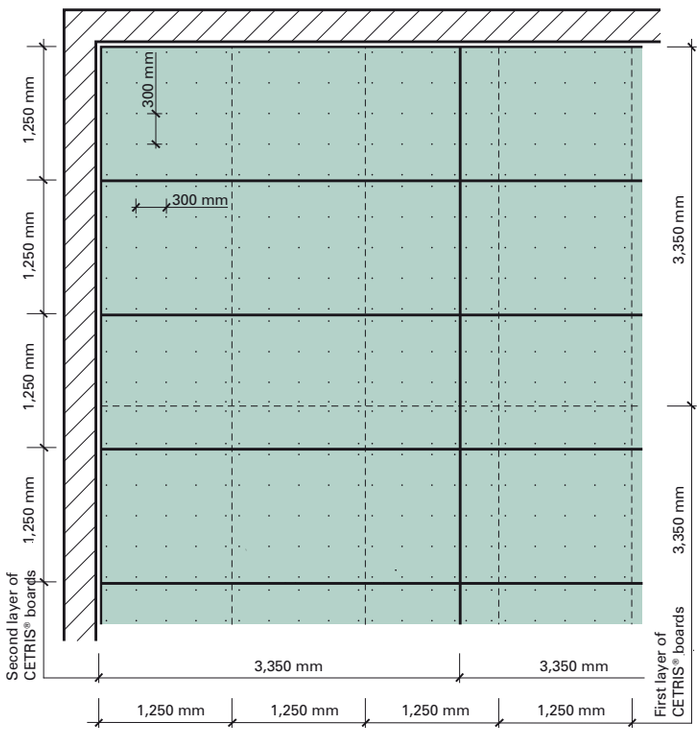
**16** When laying large floors it is recommended to lay the insulation and the boards by dilation field. This will reduce the possibility of damage to the insulation by worker traffic.




**Note:** Drying and continuous acclimatisation of the CETRIS® boards after floor laying may lead, especially in winter months, to moderate lifting of the free edges (by the walls, in the corners). This effect may be eliminated by local anchoring of the CETRIS® boards to the base (subfloor, ceiling).

**CETRIS® board laying in POLYCET THERM, POLYCET AKU, MAX and MIN**



**Variant of POLYCET HEAT**

Before laying the second layer of CETRIS® boards apply the glue UZIN MK 73 to the upper side of the bottom layer of the CETRIS® boards. The face of the bottom layer of CETRIS® boards must be dry and clean – without substances reducing adhesion. The glue must be applied evenly across the layer surface with a notched spatula with the notch height of B3. The recommended glue dose is 0.8 – 1.0 kg/m².

**UZIN MK 73 floor glue**


**11** Lay the second layer of CETRIS® boards to the glue. The second layer of CETRIS® boards is laid crosswise in relation to the bottom layer with the overlap by 1/3 of the board, i.e. 312 mm.

**12** Immediately after laying, the upper board layer must be locally screwed together with the bottom layer of CETRIS® boards. In the case of the CETRIS® board size 1,250 × 625 mm it is necessary to place the screws in the corners and in the middle of the longer edge – i.e. 6 screws per board. It is recommended to pre-drill the upper boards with a drilled hole diameter of 4 mm and use self-cutting screws with the diameter of 4.2 mm and length 25 mm with sunken heads. Place the screws in the predrilled holes. The screws are to be placed 25 – 50 mm from the board edge. The screws must not pass through the joints of the bottom layer of CETRIS® boards. It is not recommended to lay the standard size CETRIS® boards in the case of POLYCET Heat variant because of fast drying of the glue.

**13** It is recommended to use electric screwdrivers for the screwing. When joining CETRIS® boards it is necessary to locally press the boards down, ideally with the weight of the worker. This will prevent lifting of the upper board layer and potential deposits of the sawdust from drilling between the joints.

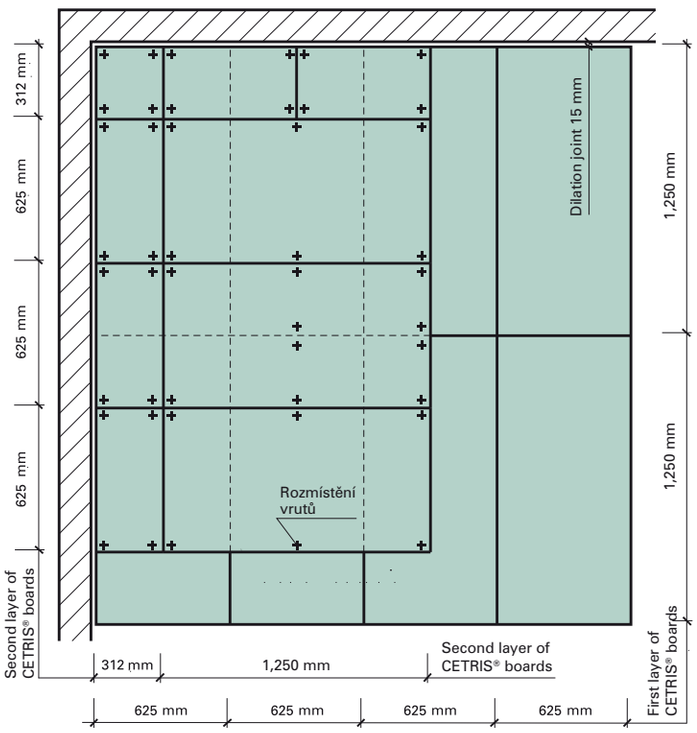
**14** After joining both layers of CETRIS® boards cut the edge strip and the insulation foil in the required height with a knife.

**15** As the CETRIS® board layers are glued together, the POLYCET Heat floor is not ready for foot traffic immediately after laying. You can walk along this floor type and apply the walking surface no sooner than after 48 hours from assembly.

**16** When laying large floors it is recommended to lay the insulation and the boards by dilation field. This will reduce the possibility of damage to the insulation by worker traffic.

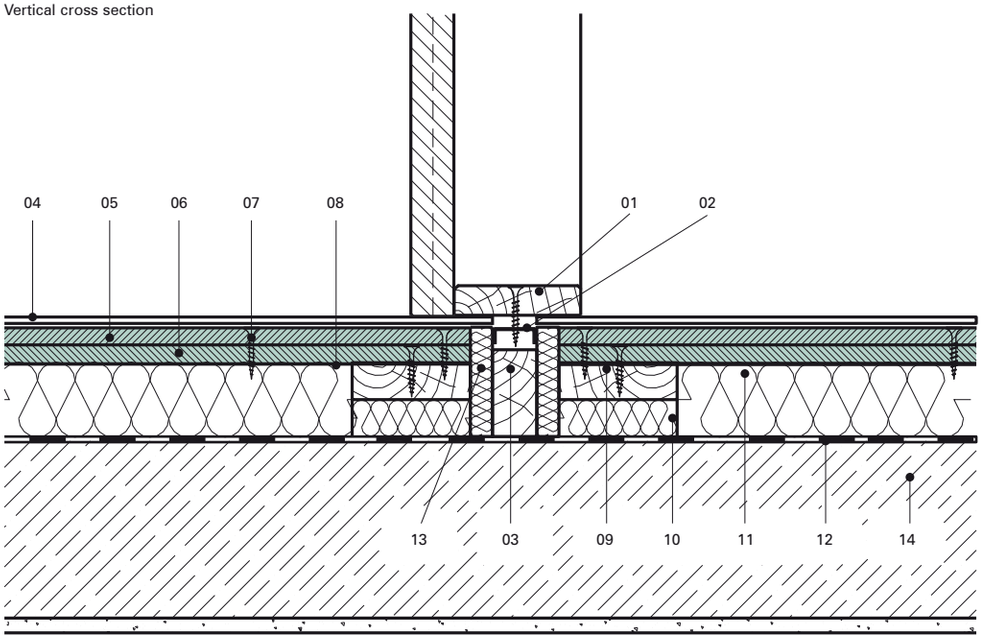
**Note:** Drying and continuous acclimatisation of the CETRIS® boards after the floor laying may lead, especially in winter months, to moderate lifting of the free edges (by the walls, in the corners). This effect may be eliminated by local anchoring of the CETRIS® boards to the base (subfloor, ceiling).

**CETRIS® board laying in POLYCET Heat system**



### Threshold transfer of POLYCET floor

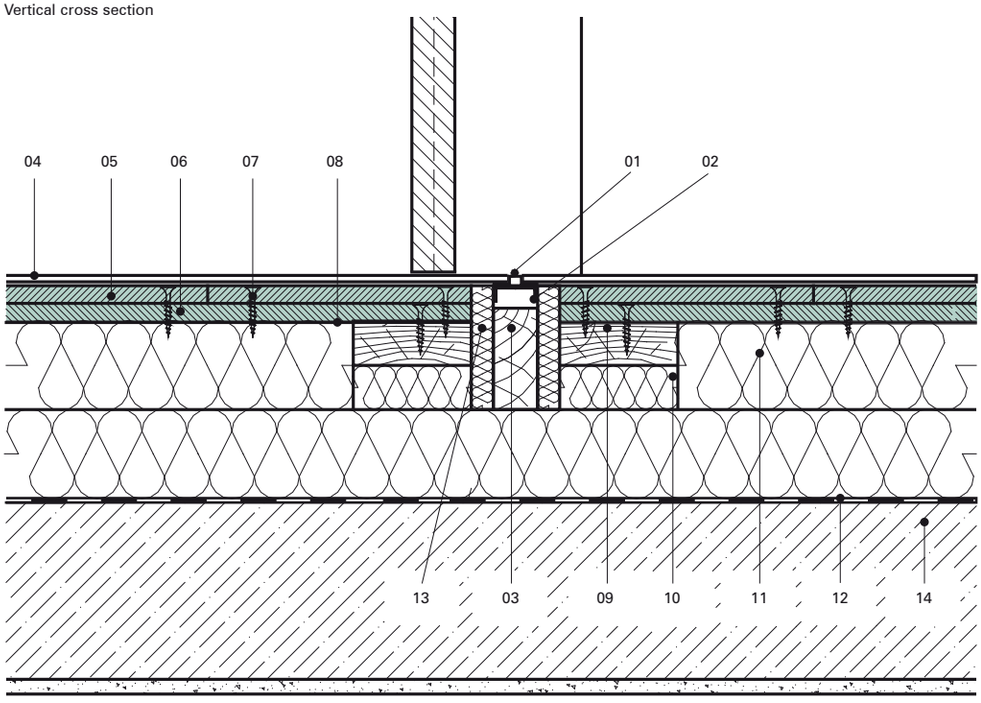
Vertical cross section




**01** wooden door threshold
**02** threshold joint
**03** wooden base threshold profile
**04** walking surface
**05** CETRIS® 12 mm, upper layer
**06** CETRIS® 12 mm, bottom layer
**07** screw 4.2 × 35 mm
**08** separation layer – foam foil, thickness 2 mm
**09** wooden base lath 80 × 30 mm
**10** EPS insulation
**11** EPS insulation board (type 100Z or 100 S or T3500)
**12** vapour barrier
**13** dilation (15 mm)
**14** ceiling

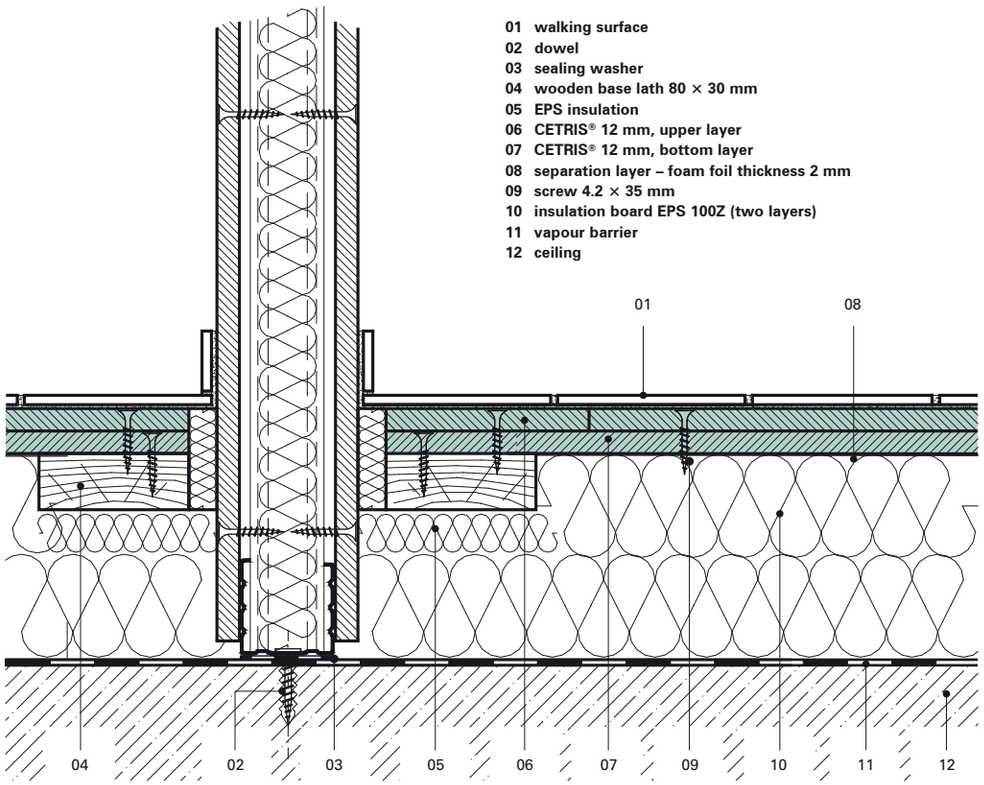
### Transfer of POLYCET floor without threshold

Vertical cross section



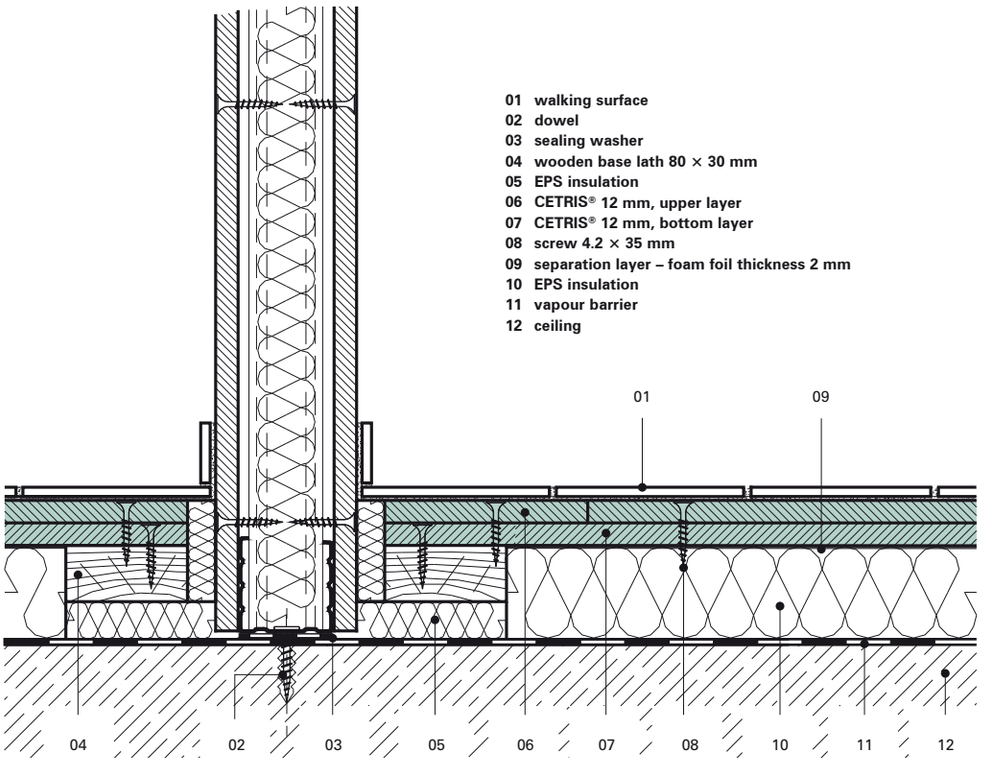

**01** dilation profile Schlűter DILEX
**02** threshold joint
**03** wooden base threshold profile
**04** walking surface
**05** CETRIS® 12 mm, upper layer
**06** CETRIS® 12 mm, bottom layer
**07** screw 4.2 × 35 mm
**08** separation layer – foam foil, thickness 2 mm
**09** wooden base lath 80 × 30 mm
**10** EPS insulation
**11** EPS insulation board type 100Z or 100 S (two layers)
**12** vapour barrier
**13** dilation (15 mm)
**14** ceiling

**Connection of POLYCET Therm floor to partition**
Vertical cross section



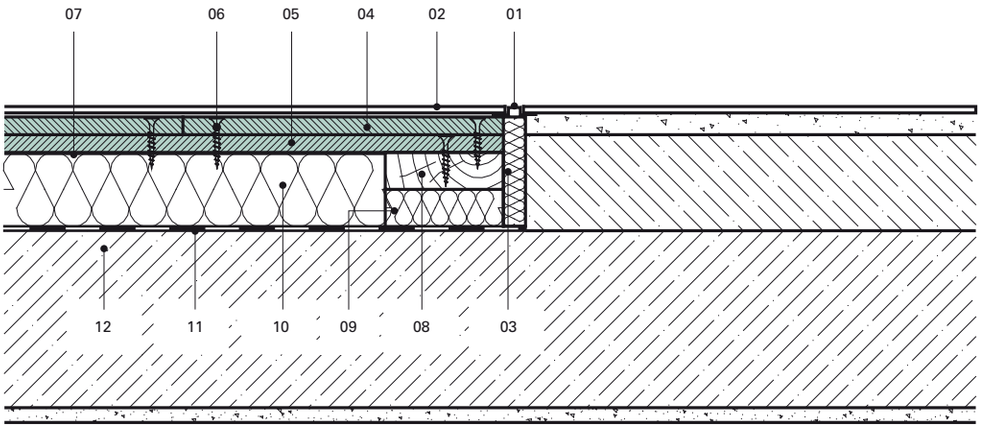

**01** walking surface
**02** dowel
**03** sealing washer
**04** wooden base lath 80 × 30 mm
**05** EPS insulation
**06** CETRIS® 12 mm, upper layer
**07** CETRIS® 12 mm, bottom layer
**08** separation layer – foam foil thickness 2 mm
**09** screw 4.2 × 35 mm
**10** insulation board EPS 100Z (two layers)
**11** vapour barrier
**12** ceiling

**Connection of POLYCET Aku floor to partition**
Vertical cross section



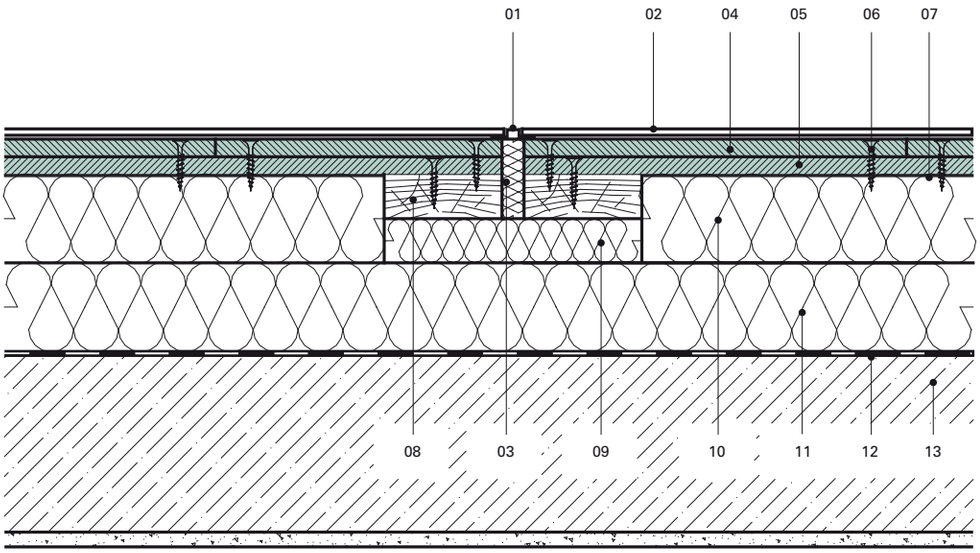

**01** walking surface
**02** dowel
**03** sealing washer
**04** wooden base lath 80 × 30 mm
**05** EPS insulation
**06** CETRIS® 12 mm, upper layer
**07** CETRIS® 12 mm, bottom layer
**08** screw 4.2 × 35 mm
**09** separation layer – foam foil thickness 2 mm
**10** EPS insulation
**11** vapour barrier
**12** ceiling

### Transfer to another floor type
Vertical cross section




**01** dilation profile Schlűter DILEX
**02** walking surface
**03** dilation (15 mm)
**04** CETRIS® 12 mm, upper layer
**05** CETRIS® 12 mm, bottom layer
**06** screw 4.2 × 35 mm
**07** separation layer – foam foil thickness 2 mm
**08** wooden base lath 80 × 30 mm
**09** EPS insulation
**10** insulation board EPS T3500
**11** vapour barrier
**12** ceiling

### Dilation joint in the surface
Vertical cross section

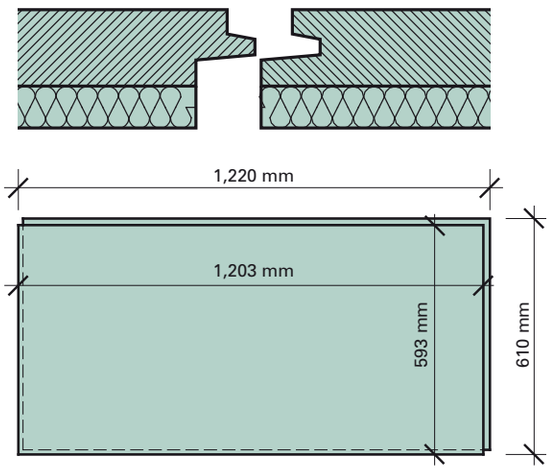



**01** dilation profile Schlűter DILEX
**02** walking surface
**03** dilation (15 mm)
**04** CETRIS® 12 mm, upper layer
**05** CETRIS® 12 mm, bottom layer
**06** screw 4.2 × 35 mm
**07** separation layer – foam foil thickness 2 mm
**08** wooden base lath 80 × 30 mm
**09** EPS insulation
**10** insulation board EPS 100Z
**11** insulation board EPS 100Z
**12** vapour barrier
**13** ceiling

### 7.5.3 Floor panel CETRIS® PDI

**CETRIS® PDI is a two-ply panel used in dry floor technology.** It consists of a 22 mm thick cement bonded CETRIS® particleboard glued to 12 mm insulating fibreboard (hardboard). The size is 1,220 × 610 mm (including the tongue) and it is 34 mm thick; it has a tongue and groove along the perimeter, the surface is smooth. The panels should be laid on a level surface area (ceiling structures, cladding). They are great for a quick and exact installation. They also spread spot-load stress over a larger area.

| | |
|---|---|
| Basic size | 1,220 × 610 mm (with tongue), 1,203 × 593 mm (without tongue). Panel size after laying: 0.713 m² |
| Rough dimensional tolerance | ±1.5 mm |
| Thickness | 34 mm |
| Weight | ca 33.5 kg/m² |
| Features | Tongue & groove shaped edges |
| Surface finish | Without surface finish |



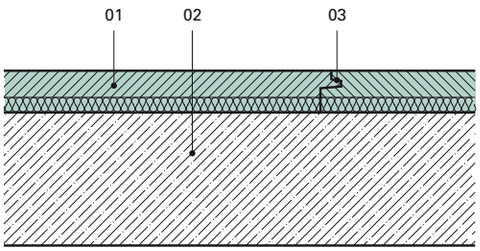

| Panel thickness | Weight approx. | Approx. weight of the panel | Number of panels on the pad | Size of the panels on the pad | Total approximate weight of panels including the pad |
|---|---|---|---|---|---|
| 34 mm | 33.5 kg/m² | 24 kg/pc | 30 pcs | 22.32 m² | 750 kg |

CETRIS® PDI floor panels are laid on wooden transport pallets, which enable forklift manipulation. The boards are secured with straps. CETRIS® PDI panels are protected against atmospheric influences by PE foil. Wrapping in PE foil, however, does not satisfy conditions for long-lasting exposure to atmospheric influences when stored in an open area.

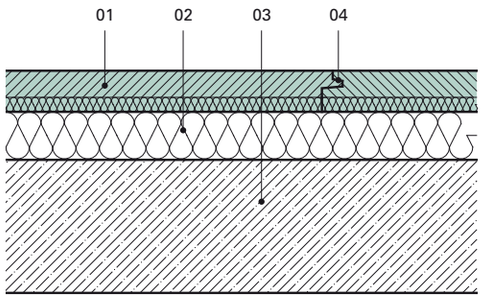
CETRIS® PDI panels must be stored in a sheltered dry area so that they do not get wet before laying (especially the fibreboard). When storing, CETRIS® PDI panels on the pallets can be stacked two layers high. The boards should be placed on the pallets when handled. They should be hand-carried in a vertical position.

**Floor structures with CETRIS® PDI panels**
CETRIS® PDI panels can be laid directly on the base – a ceiling structure or cladding. The base must be level, supporting and dry. In this way, a new load spreading and insulating layer only 34 mm thick can be made with a high load capacity and resistance against spot stress.

If a higher structural height has to be achieved, or if the floor structure must reach a higher thermal resistance value, we recommend laying insulation boards under the CETRIS® PDI panels. Polystyrene based insulation boards (min. class EPS S 70), or boards with stone or mineral wool or fibreboards are suitable. However, they must always be designed for light floating floors. The maximum recommended thickness of the insulation board is 50 mm.




**01 CETRIS® PDI floor panel**
**02 ceiling structure**
**03 glued joint (polyurethane glue)**




**01 CETRIS® PDI floor panel**
**02 insulation board, max. 50 mm**
**03 ceiling structure**
**04 glued joint (polyurethane glue)**

### 7.5.3.1 Properties of floors with CETRIS® PDI panels

**Floor loading capacity**
The loading capacity of CETRIS® PDI panels was determined by tests specified for light floor structures as per EN 13 810-1. The testing was performed in an acoustic chamber of the SCI (Zlín branch) on 3.6 × 3.0 m samples. The floor was always laid on a 140 mm thick reinforced concrete ceiling structure.

The test loading methods were as follows:
- **Concentrated load** – action of a spot load 130 kg (260 kg) in a circular area 25 mm in diameter. The critical sag value under the loading arm is 3 mm.
- **Impact load** – a 40 kg load was dropped from the height of 350 mm; the critical sag after ten drops is 1.0 mm. This load simulates a falling object, a tripping person, jumping and dancing.

The obtained results show that a floor made with CETRIS® PDI panels laid directly on the base (without inserted insulation) is suitable for all load categories:
- **C1** – areas with tables, e.g. schools, cafés, restaurants, dining halls, etc.
- **C2** – areas with fixed seats, e.g. churches, theatres, cinemas, meeting rooms, waiting rooms, etc.
- **C5** – areas with gathering people, e.g. buildings for public events such as concert halls.

The floor composition with an inserted insulation board (max. 50 mm) under the CETRIS® PDI panel is suitable for the following load categories:

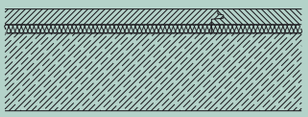
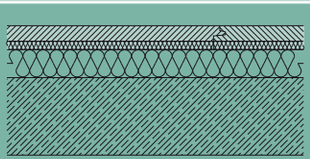
- **A** – dwelling areas and areas for household activities
- **B** – office areas

The loading method was performed as per EN 1991-1-1 Eurocode 1: Actions on structures - Part 1-1: General actions – Densities, self-weight, imposed loads for buildings.

When designing dry floor structures, it is necessary to take into account the maximum allowed sags and load capacity of the base.
**The dry lightweight CETRIS® PDI floor is not suitable for areas with greater nominal load than specified for this type of floor and for wet areas such as saunas, laundries, showers, etc.**

**Sound-insulating properties**
Acoustic properties of a dry floor made with CETRIS® PDI were determined by a laboratory method as per EN ISO 10140-2, EN ISO 10140-3 on a standardised ceiling board (reinforced 140 mm concrete ceiling structure). The thermal-technical properties of a floating floor made with CETRIS® PDI panels are determined mainly by the insulation board properties; values of increased thermal resistance were found by calculation.

**Sound and thermal insulating properties**

| STRUCTURE PATTERN | FLOOR COMPOSITION | AIRBORNE-TRANSMISSION LOSS INDEX $R_W$ | INDEX OF STANDARDIZED IMPACT NOISE $L_{nw}$ | REDUCTION OF STANDARDIZED IMPACT NOISE LEVEL $\Delta L_W$ | IMPROVEMENT OF THERMAL RESISTANCE R ($Wm^{-2}K^{-1}$) |
|---|---|---|---|---|---|
|  | • CETRIS® PDI Floor panel, 34 mm<br>• Reinforced concrete slab, 140 mm | 57 dB | 60 dB | 21 dB | 0.33 |
|  | • CETRIS® PDI Floor panel, 34 mm<br>• Polystyrene EPS S 70, max. thickness 50 mm<br>• Reinforced concrete slab, 140 mm | 58 dB | 55 dB | 26 dB | 1.65 |

### 7.5.3.2 Preparation of the base before laying the floor

**Load bearing base, requirements and preparation**
It is important to prepare the supporting surface to ensure the final quality of the floating floor for laying down the wear layer. The load bearing base can be either massive ceiling structures (reinforced concrete slabs, ceramic ceilings, HURDIS ceilings, etc.) or wooden beam ceilings with plank cladding, wooden timber ceilings or a concrete foundation slabs.
The load bearing base should be able to transfer load at a minimum load stress = normative (utility) load + floor weight, while observing the maximum sag of the ceiling structure according to the given specifications.

The base must be dry and supporting with a maximum surface unevenness of 4 mm per 2 metres. Unless the allowable tolerances of the base are observed, the allowable unevenness tolerances under the final wear surface and reduction of the impact noise cannot be guaranteed. The local unevenness can reach 5 mm (e.g. protruding filler, concrete joints, knots in a wooden base), because the insulation layer can reshape. If the base is not sufficiently flat, it must be levelled.

**Levelling of the supporting base**
The base can be levelled by application of two methods:

1. **Wet method** – application of cement mortar with sand or a layer of self-levelling compound according to the producer's instructions.
2. **Dry sub-base** – it is possible to use dry self-levelling compounds based on crushed aero-concrete or perlite. The minimum height of the sub-base is 10 mm, the maximum is 40 mm. We recommend FERMACELL or BACHL BS Perlit or Siliperl as the sub-base.

When levelling the surface of a wooden beam ceiling, first inspect the quality of the bearing structure for warps and wears (unevenness above 5 mm) and replace damaged boards. Put paper cardboard on the cladding as a protection against sub-base dropping through knot-holes and gaps between the planks.

Make the sub-base according to the producer's instructions.

**Moisture of the base**
The maximum allowable specific moisture of the base:

- wooden base . . . . . 12 %
- silicate base . . . . . 6 %

**Insulation against moisture**
To eliminate transport of moisture into the thermal and sound insulation layer, this layer must be separated from the floor structure by a protective foil. This protection concerns mainly a support ceiling structure, which contains residual moisture or areas where increased penetration of moisture through the ceiling structure is anticipated. Spread a hydro-insulating foil (e.g. 0.2 mm PE foil) with overlaps of at least 200 mm (or plaster the joints with adhesive tape) over a cleaned surface and pull it up to vertical structures above the intended floor level.

When using a self-levelling compound, lay the moisture insulation film on the finished compound; if using a sub-base, lay it between the bearing structure and the sub-base.

When laying the floor on a wooden structure or an original ceiling structure, application of PE film is not recommended to ensure the breathing of the ceiling. If a room with higher air humidity (bathroom, kitchen) is located below the ceiling, it is necessary to prevent the transport of humidity into the structure or ensure its free evaporation.

Moisture insulation must be addressed within the complete structure of the ceiling or the floor.

A micro-ventilating layer (e.g. OLDROYD, TECHNODREN) or a studded foil can be used for venting wet structures.

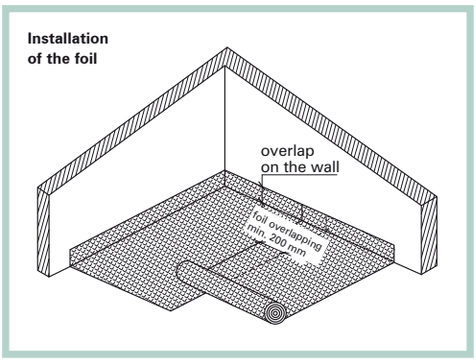
### 7.5.3.3 Laying CETRIS® PDI floor panels

**1** Floating floors made with CETRIS® PDI are laid as a final layer after finishing «wet» building works (after finishing walls, plastering, etc.).

**2** Floating floors made with CETRIS® PDI are laid on a dry, clean base.

**3** Before laying, the floor panels must be allowed to acclimatise for at least 48 hours at a minimum temperature of 18° C and relative humidity of 70 % max. The acclimatisation adapts the production moisture in the board to the balanced moisture during application, thus reducing problems with future dimensional and shape changes.

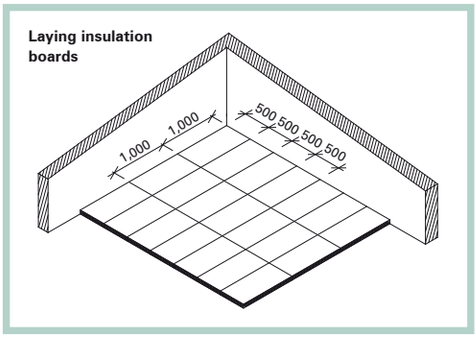
**4** If the base contains a high level or residual moisture or if penetration of moisture through the ceiling structure is anticipated, a PE foil should be laid on the base with a 200 mm overlap of the strips and pulled up along vertical structures to the anticipated level of the floor.




**5** If necessary, the base can be levelled with dry sub-base – spread it always only over a part of the surface.

**6** If insulation boards are used together with CETRIS® PDI panels, the laying direction of the boards must be determined before their application. When laying individual layers, make sure they are laid crosswise over each other. Joints between insulation boards and the CETRIS® PDI sections must not mate.

**7** The insulation boards should be set to the vertical structures so that they touch a dilatation insert, without dilatation gaps in the surface.

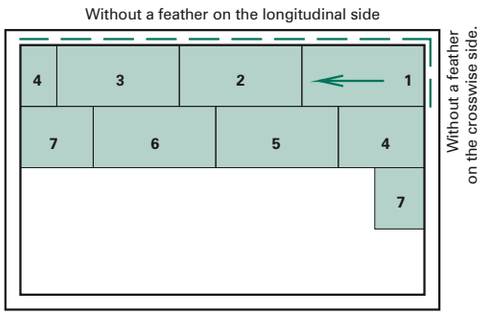



When a dry floor structure passes across a doorsill, take care of installation of the doorframe. It must be levelled and propped into a precise height by the central cross-beam. When fixing the threshold, use longer screws to connect the frame to the base section.

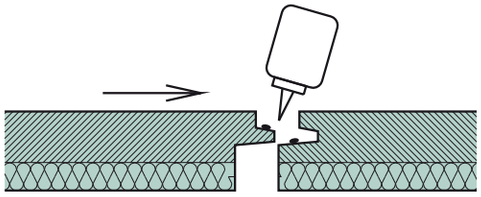
If an insulating board is used, we recommend installation of an underlaying batten under the CETRIS® PDI panel along both sides of the doorsill. The recommended size of an underlaying batten is 80 × 30 mm; it can be supplemented with an EPS board of an appropriate thickness (see the detail). The loss of impact noise reduction of the entire floor is negligible because of a local application. We also recommend using an underlaying batten for dilatation of the floor in the surface (area larger than 6 × 6 m), floor transitions, etc.

**8** Make a 15 mm wide dilatation gap along vertical structures (walls, columns, etc.). We recommend inserting a 15 mm strip of mineral wool or polystyrene in the dilatation gaps to eliminate clogging during the subsequent operations. Cut this strip to the required height after finishing the surface of the floating floor before laying the flooring material.

**9** Start the laying with a full CETRIS® PDI panel opposite the door. The panels are laid on the butt.




**10** CETRIS® PDI panels are usually laid from the right to the left; no cross-joints may appear; the minimum overlap between joints is 200 mm. The protruding tongue on the first panel in the first row must be cut both on the long (longitudinal) and short (transverse) side. The tongue on the longer side must be cut on the remaining panels in the first row.
Apply glue to the top side of the tongue of the inserted panel and in the groove (bottom part) of the already laid panel.
Use polyurethane glue for wood (e.g. Den Braven D4, Soudal PRO 45, etc.). The approximate glue consumption is 40 g/m² of a laid area (500 ml packaging = ca. 12 m² of floor).



The floor panels must be glued at a maximum relative air humidity of 80 % and a minimum room temperature of 5° C. The CETRIS® PDI panels must be in full contact with each other.

**11** When laying down the final panel, first cut it to the required length, then cut the tongue on the longitudinal side. You can use the cut-off piece (minimum length 200 mm) for starting the second row.

**12** After laying a floor with CETRIS® PDI panels, cut an edge strip and the insulation foil to the required height with a knife.

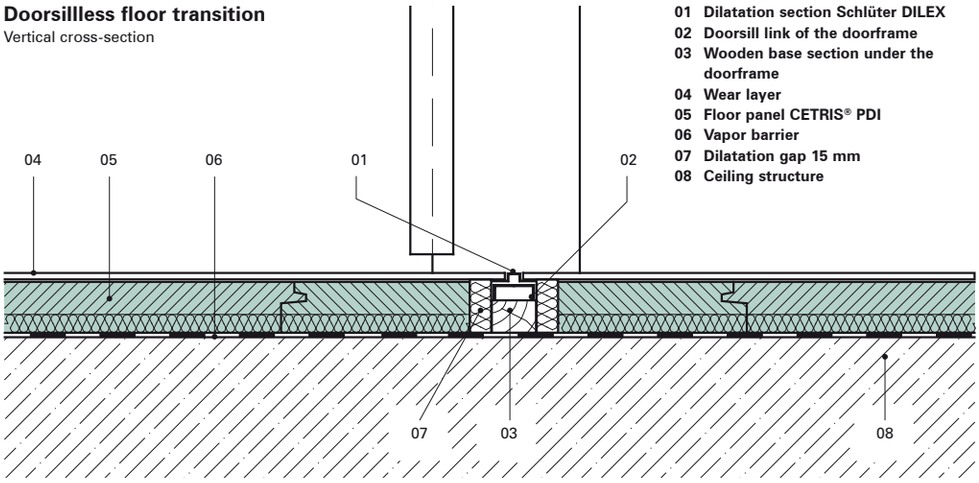
**13** When laying a large floor area, we recommend a sequential installation of insulation and panels in individual areas of the dilatation zone. This will reduce damage to the insulation boards by worker activity.

**14** The floor can be fully loaded and other operations can be performed (laying floor covering) after complete setting of the polyurethane glue (min. 24 hours). Remove the excessive glue with a spatula after the setting.

**15** For laying the final flooring, we recommend the principles described in Chapter 7.9 Flooring (Materials for designing and implementation of CETRIS® boards).

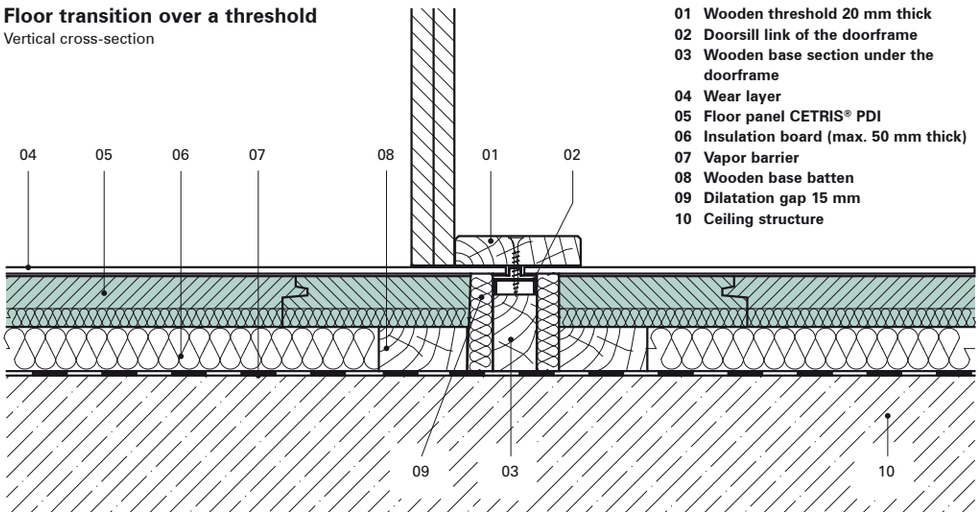
**Note:** As a result of drying and gradual adaptation of CETRIS® PDI panels, free edges may rise (along walls, in corners) after laying a floor especially during winter months. This effect can be eliminated by local fastening of CETRIS® PDI panels to the base (cladding, ceiling).

**Doorsillless floor transition**
Vertical cross-section



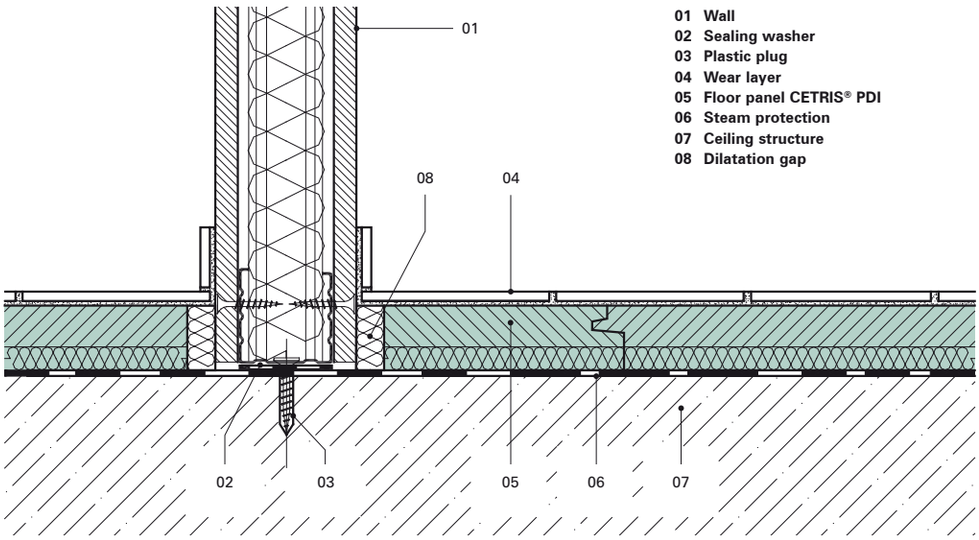

**01** Dilatation section Schlüter DILEX
**02** Doorsill link of the doorframe
**03** Wooden base section under the doorframe
**04** Wear layer
**05** Floor panel CETRIS® PDI
**06** Vapor barrier
**07** Dilatation gap 15 mm
**08** Ceiling structure

**Floor transition over a threshold**
Vertical cross-section




**01** Wooden threshold 20 mm thick
**02** Doorsill link of the doorframe
**03** Wooden base section under the doorframe
**04** Wear layer
**05** Floor panel CETRIS® PDI
**06** Insulation board (max. 50 mm thick)
**07** Vapor barrier
**08** Wooden base batten
**09** Dilatation gap 15 mm
**10** Ceiling structure

**Joint of the floor with the wall**
Vertical cross-section



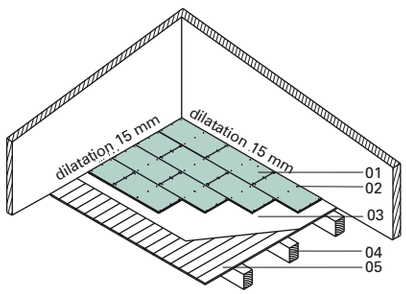

**01** Wall
**02** Sealing washer
**03** Plastic plug
**04** Wear layer
**05** Floor panel CETRIS® PDI
**06** Steam protection
**07** Ceiling structure
**08** Dilatation gap

# 7.6 CETRIS® PD and CETRIS® PDB Floors Systems on Load-Bearing Flat Base

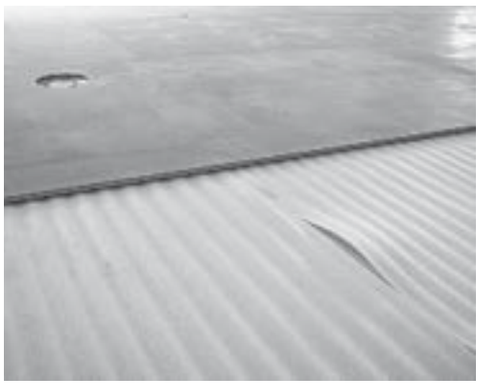
CETRIS® PD and CETRIS® PDB cement-bonded particleboards laid over a load-bearing base are used for rehabilitation of flooring without defects of the load-bearing construction itself but with flooring damaged by long use and physical wear or inappropriate maintenance. These boards are mainly used for rehabilitation of old wooden floors.

The floor boards CETRIS® PD (CETRIS® PDB) are then fully supported across their area and perform no load-bearing function, only providing a good plane for laying the final flooring. This solution requires CETRIS® PD (CETRIS® PDB) board thickness 16 mm is sufficient here.

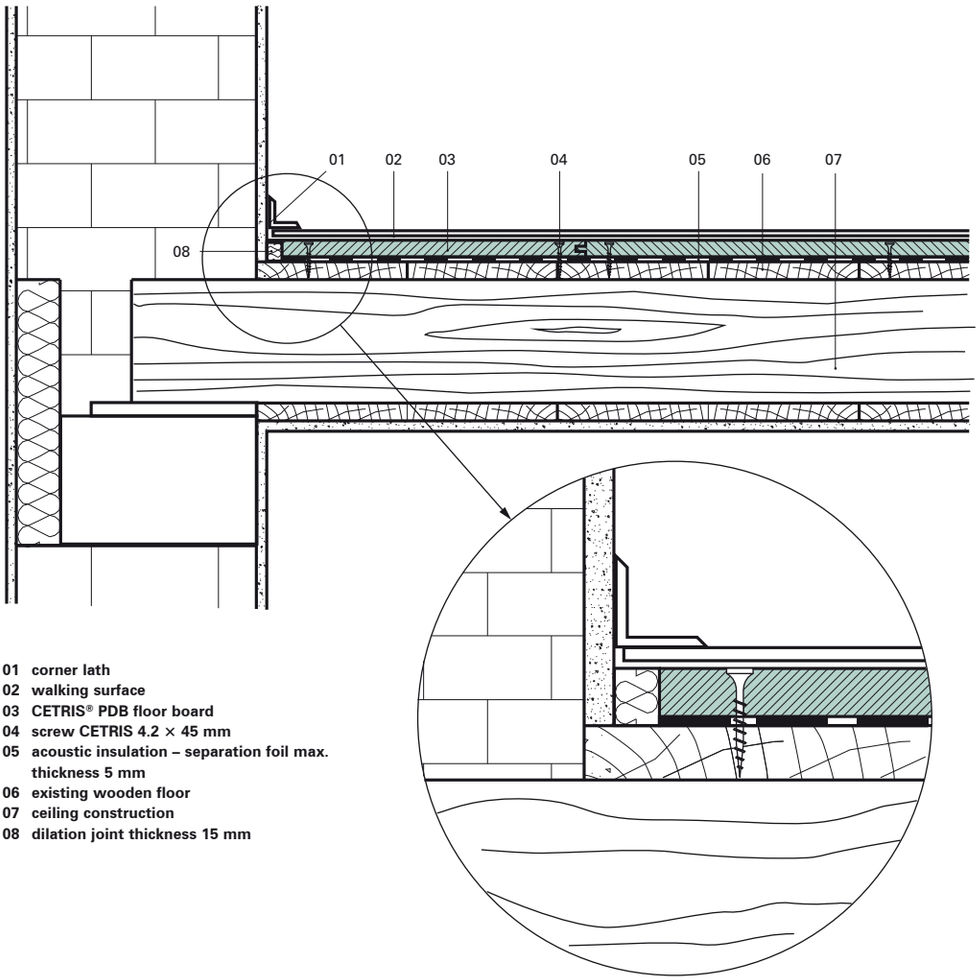
**CETRIS® PD and CETRIS® PDB floor boards on load-bearing base**




**01 CETRIS® PDB floor board**
**02 screw CETRIS 4.2 × 45 mm**
**03 acoustic insulation – separation foil max. thickness 5 mm**
**04 ceiling construction**
**05 existing wooden floor**



**Model cross section – CETRIS® PD and CETRIS® PDB floor boards on load-bearing base**
Vertical cross section




**01 corner lath**
**02 walking surface**
**03 CETRIS® PDB floor board**
**04 screw CETRIS 4.2 × 45 mm**
**05 acoustic insulation – separation foil max. thickness 5 mm**
**06 existing wooden floor**
**07 ceiling construction**
**08 dilation joint thickness 15 mm**

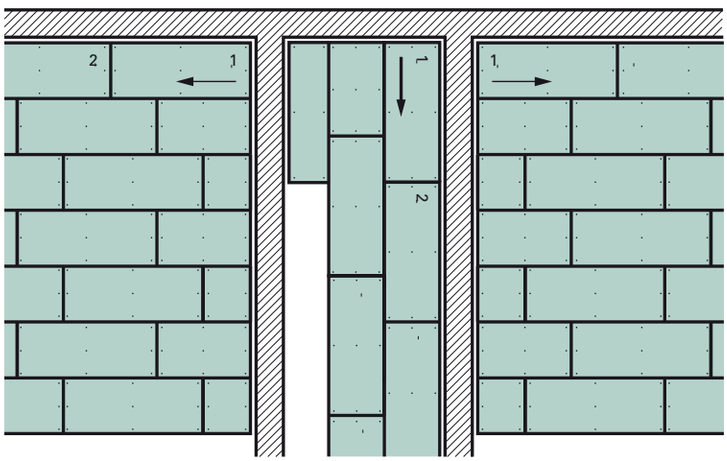
## 7.6.1 Load-Bearing Base, Requirements, Laying

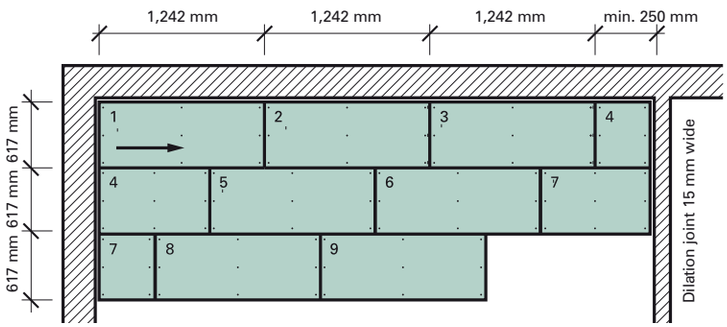
An important precondition for application of this floor type is the ability of the base (such as the original wooden floor) and the load-bearing ceiling construction (such as ceiling joists, steel girders) to transfer the needed load.

**Recommended technological procedure of rehabilitation of original wooden floor:**

- In the case of local irregularities exceeding 2 mm potential protrusions – knags, elevated growth rings etc. – must be sanded (attention must be paid to the reduced load-bearing capacity of the wooden base in the case of grinding large stretches of the surface!) and depressions must be filled with a suitable filler.
- In the case of a healthy, not too damaged wooden floor with local irregularities up to 2 mm, the existing floor is covered with a separation layer (unwoven fabric, cardboard etc.) and the CETRIS® PD (CETRIS® PDB) floor boards, thickness 16 mm, are laid directly over the separation layer.
- Laying CETRIS® PD (CETRIS® PDB) floor boards begins with a whole board in the corner opposite the door. CETRIS® PD (CETRIS® PDB) boards are laid tightly without gaps and the joints are fixed with a glue. The following dispersion glues resistant to alkali are recommended: UZIN MK33, MAPEI – ADESIVIL D3, SCHÖNOX HL, CONIBOMD PRO 1005, HENKEL PONAL SUPER 3 (PATEX SUPER 3).
- The boards must be laid within 15 minutes (which is the time of the glue plasticity). Excess (pushed out) glue must be removed after pressing the boards together for the joint to be filled with the glue up to the edge. After that the boards are screwed to the old wooden floor.
- When laying CETRIS® PD (CETRIS® PDB) cement-bonded particleboards cross joints are prohibited. The individual rows of the boards are laid with overlaps of a min. 1/3 of the board length, perpendicularly to the direction of the original wooden floor. The length of the first boards in a row must be selected for the minimum size of the cut board to be 250 mm. Min. 15 mm wide dilation joints must be made along the vertical constructions (walls, pillars etc.)
- Around the doors the CETRIS® PD (CETRIS® PDB) boards should not create a joint perpendicular to the door.
- In the case of floors attacked by fungi or rotten floors, the old boards should be replaced or removed and new CETRIS® PD (CETRIS® PDB) boards should replace them. The new boards must then be laid on joists, see Chapter 7.7 CETRIS® PD and CETRIS® PDB Floor Systems on joists.
- If the floor is wet it is necessary to provide for the moisture absorption for example by application of a separation foil.
- If the old wooden floor shows insufficient load-bearing capacity (is too flexible) it is necessary to assess the thickness of the CETRIS® PD (CETRIS® PDB) boards against the load tables or strengthen the original wooden floor by inserting reinforcing planks. Another option is installation of a load-bearing grid over the original floor.

**CETRIS® PD and CETRIS® PDB board floor laying over load-bearing flat base**



# 7.7 CETRIS® PD and CETRIS® PDB Floor Systems on Joists

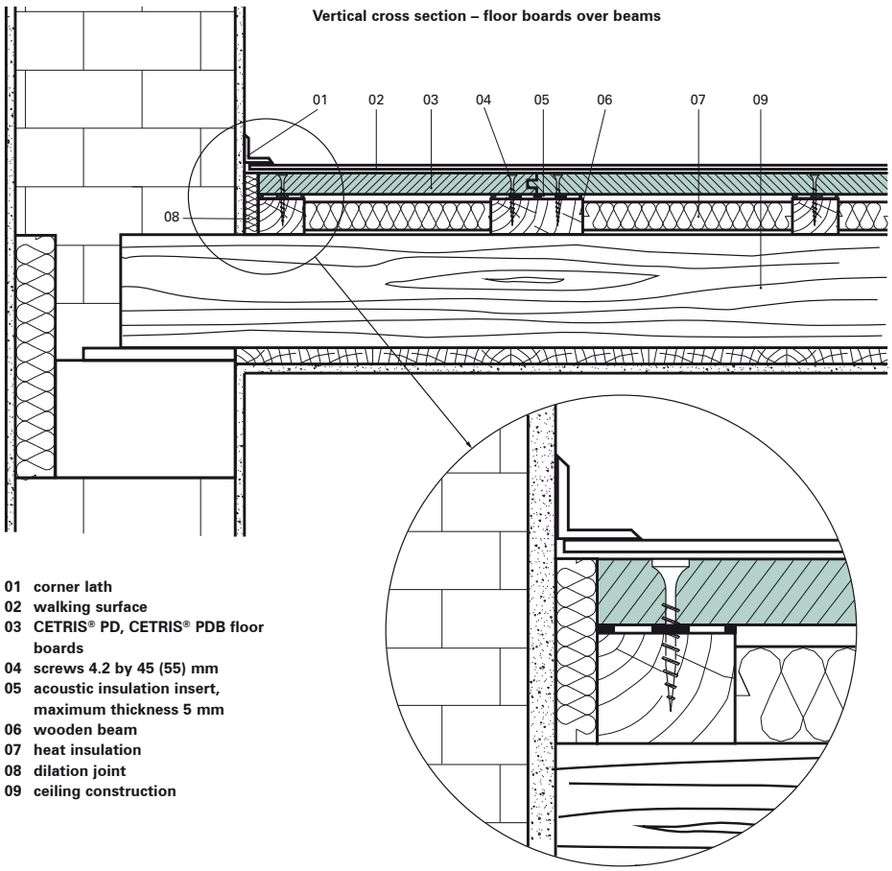
CETRIS® PD and CETRIS® PDB cement-bonded particleboards on joists are used both for floors in new houses and for reconstructions of old floors.

## 7.7.1 Description of Construction

The classical solid floor construction consists of beams (wooden joists, steel girders etc.). The beams are covered with CETRIS® PD and CETRIS® PDB cement-bonded particleboards in one layer screwed to the beams. The CETRIS® PD and CETRIS® PDB floor boards are laid tightly without gaps and the joints are secured with dispersion glue for assurance of joint action of the boards. Heat and sound insulation is placed between the beams as required. To prevent formation of sound bridges acoustic insulation is also laid over the beams in the maximum thickness of 5 mm. The floor is finished around the walls with a 15 mm wide dilation joint. It is recommended to place a mineral wool strip in the dilation joints around the vertical constructions (such as ORSIL, thickness 15 mm), to prevent the dilation joint from clogging by subsequent works. The strip is cut to the required height after completion of the surface finish of the floor before laying the flooring.

The beams must display sufficient load-bearing capacity and must be laid on a load-bearing construction of a sufficient capacity too. Their sag must be checked. In the case of a flat load-bearing construction, the beams should lie on the construction along their full length.

**Vertical cross section – floor boards over beams**




**01 corner lath**
**02 walking surface**
**03 CETRIS® PD, CETRIS® PDB floor boards**
**04 screws 4.2 by 45 (55) mm**
**05 acoustic insulation insert, maximum thickness 5 mm**
**06 wooden beam**
**07 heat insulation**
**08 dilation joint**
**09 ceiling construction**

## 7.7.2 Load Tables

The static calculation of the load-bearing capacity of CETRIS® PD and CETRIS® PDB floor boards was made for the board laying on beams (single-direction support) or grid (two-direction support). The grid beam spacing must be the same in both directions (the beams form square fields). Joint action of CETRIS® PD (CETRIS® PDB) boards is provided by a glued a tongue and groove joint.
The calculation assumes elastic material behaviour and respects the following mechanical and physical properties:

| | |
|---|---|
| **Tensile bend strength** | $\sigma$ = min. 9 Nmm$^{-2}$ |
| **Elasticity module** | E = min. 4,500 Nmm$^{-2}$ |
| **Bulk density** | $\rho$ = 1,400 kgm$^{-3}$ |

The load-bearing capacity calculation also considered the effect of the board's own weight. The maximum normal tensions in the marginal fibres will not exceed 3.6 N/mm$^2$ (which means 2.5 multiple of the safe value). The maximum elastic sag of the board by operational traffic including the board's own weight will not exceed 1/300 of the board span.

The calculation has verified that the load-bearing capacity of the CETRIS® cement-bonded particleboard concentrated load pursuant to ČSN 73 00 35 (Loads of Building Constructions) is decisive. Specification of the maximum usable load of the board respects Article 6 of ČSN 73 00 35 standard, stipulating that in the case of ceilings, staircases, flat roofs and terraces concentrated standard vertical load must be considered in the kN value equal to the value of the standard usable uniform load per 1 m$^2$ of the ceiling.

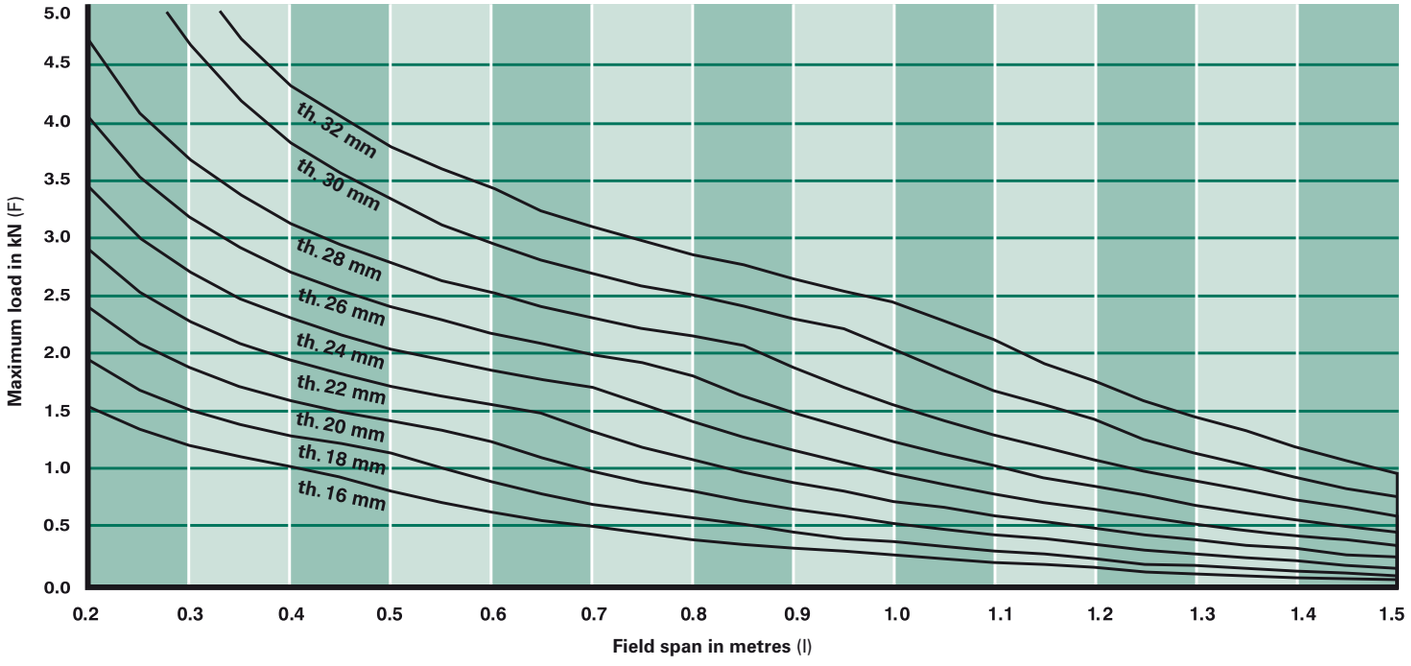
This concentrated load is assumed to act on a square area with 100 mm sides.

The calculation further assumes that the load acts directly on the board surface. In the case of use of load-distributing layers, the load-bearing capacity of CETRIS® floor boards will be higher, but must be proven by calculation for each individual case. The results of static calculations are shown in the following tables and diagrams.

**Load-bearing capacity of CETRIS® PD and CETRIS® PDB floor boards in the case of one-direction beams**

**Max. sag L/300, max. tensile bend strength 3.6 N/mm², loaded area 100 x 100 mm**

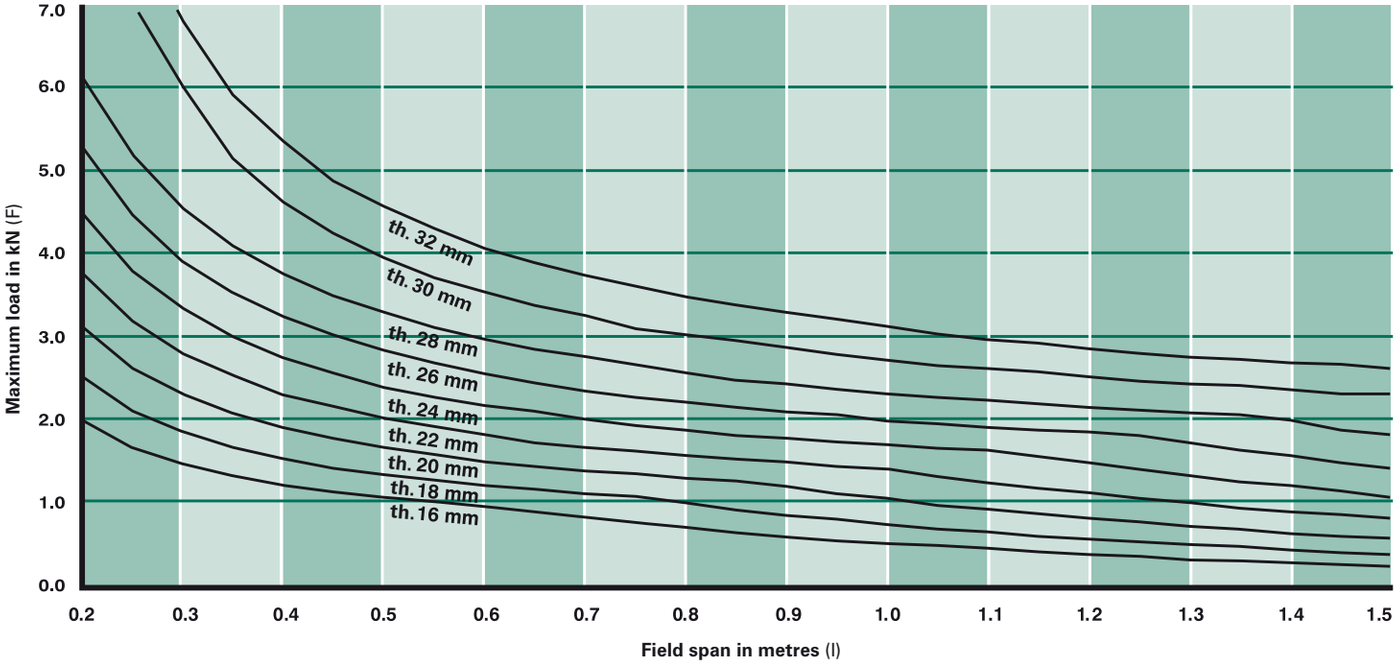
| SPAN (m) | MAXIMUM LOAD F (kN) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | th. 16 mm | th. 18 mm | th. 20 mm | th. 22 mm | th. 24 mm | th. 26 mm | th. 28 mm | th. 30 mm | th. 32 mm |
| 0.200 | 1.532 | 1.940 | 2.396 | 2.899 | 3.451 | 4.052 | 4.700 | 5.396 | 6.140 |
| 0.250 | 1.335 | 1.691 | 2.089 | 2.529 | 3.010 | 3.534 | 4.100 | 4.708 | 5.357 |
| 0.300 | 1.200 | 1.520 | 1.878 | 2.274 | 2.707 | 3.179 | 3.688 | 4.235 | 4.820 |
| 0.350 | 1.099 | 1.393 | 1.721 | 2.085 | 2.483 | 2.916 | 3.384 | 3.886 | 4.423 |
| 0.400 | 1.020 | 1.293 | 1.599 | 1.937 | 2.308 | 2.711 | 3.146 | 3.614 | 4.114 |
| 0.450 | 0.922 | 1.212 | 1.499 | 1.817 | 2.165 | 2.544 | 2.953 | 3.392 | 3.862 |
| 0.500 | 0.802 | 1.144 | 1.415 | 1.716 | 2.045 | 2.403 | 2.790 | 3.207 | 3.651 |
| 0.550 | 0.703 | 1.010 | 1.343 | 1.628 | 1.942 | 2.282 | 2.651 | 3.047 | 3.470 |
| 0.600 | 0.620 | 0.893 | 1.235 | 1.551 | 1.851 | 2.176 | 2.528 | 2.906 | 3.311 |
| 0.650 | 0.550 | 0.794 | 1.101 | 1.476 | 1.769 | 2.081 | 2.418 | 2.781 | 3.168 |
| 0.700 | 0.488 | 0.708 | 0.985 | 1.323 | 1.695 | 1.994 | 2.318 | 2.667 | 3.039 |
| 0.750 | 0.435 | 0.635 | 0.884 | 1.190 | 1.559 | 1.915 | 2.227 | 2.562 | 2.920 |
| 0.800 | 0.387 | 0.568 | 0.795 | 1.073 | 1.409 | 1.807 | 2.141 | 2.465 | 2.810 |
| 0.850 | 0.345 | 0.509 | 0.715 | 0.970 | 1.276 | 1.639 | 2.068 | 2.373 | 2.707 |
| 0.900 | 0.307 | 0.456 | 0.644 | 0.877 | 1.157 | 1.489 | 1.878 | 2.288 | 2.610 |
| 0.950 | 0.272 | 0.408 | 0.580 | 0.793 | 1.049 | 1.354 | 1.711 | 2.124 | 2.518 |
| 1.000 | 0.240 | 0.364 | 0.522 | 0.717 | 0.952 | 1.232 | 1.560 | 1.940 | 2.375 |
| 1.050 | 0.211 | 0.325 | 0.469 | 0.648 | 0.864 | 1.121 | 1.423 | 1.773 | 2.174 |
| 1.100 | 0.184 | 0.288 | 0.420 | 0.584 | 0.783 | 1.020 | 1.298 | 1.621 | 1.991 |
| 1.150 | 0.159 | 0.254 | 0.375 | 0.526 | 0.709 | 0.927 | 1.184 | 1.482 | 1.823 |
| 1.200 | 0.136 | 0.223 | 0.334 | 0.472 | 0.641 | 0.842 | 1.079 | 1.354 | 1.669 |
| 1.250 | 0.115 | 0.194 | 0.296 | 0.423 | 0.578 | 0.763 | 0.982 | 1.235 | 1.527 |
| 1.300 | 0.095 | 0.168 | 0.259 | 0.375 | 0.517 | 0.687 | 0.888 | 1.121 | 1.390 |
| 1.350 | 0.076 | 0.141 | 0.225 | 0.332 | 0.462 | 0.618 | 0.803 | 1.018 | 1.265 |
| 1.400 | 0.059 | 0.118 | 0.195 | 0.295 | 0.412 | 0.556 | 0.726 | 0.924 | 1.153 |
| 1.450 | 0.043 | 0.097 | 0.167 | 0.256 | 0.366 | 0.499 | 0.656 | 0.840 | 1.051 |
| 1.500 | 0.029 | 0.077 | 0.141 | 0.223 | 0.325 | 0.447 | 0.592 | 0.762 | 0.959 |



**Load-bearing capacity of CETRIS® PD and CETRIS® PDB floor boards in the case of two-direction beams (grids)**

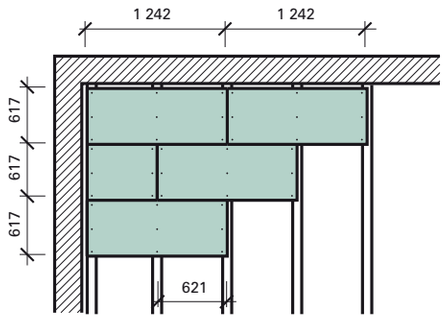
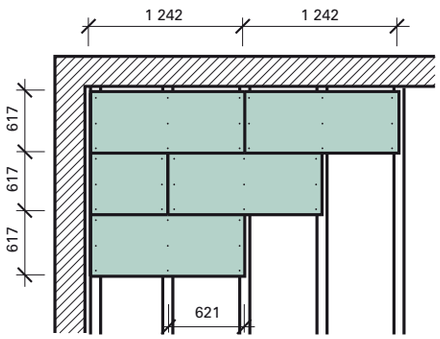
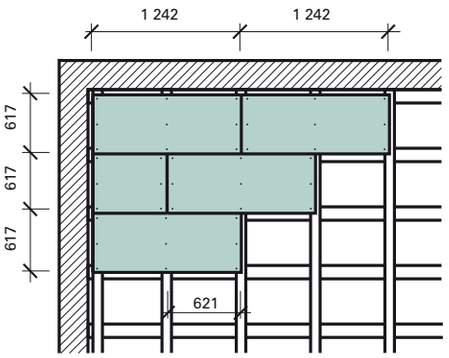
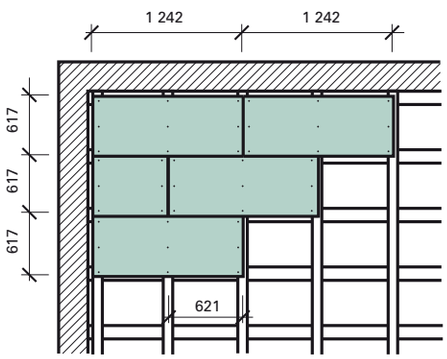
**Max. sag L/300, max. tensile bend strength 3.6 N/mm², loaded area 100 x 100 mm**

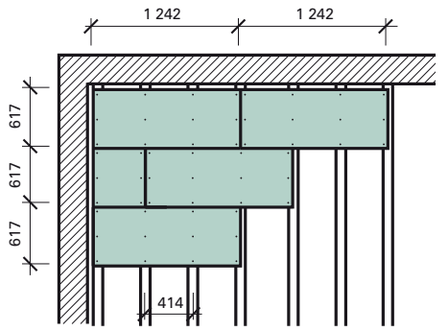
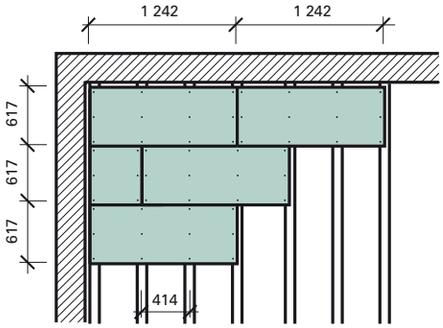
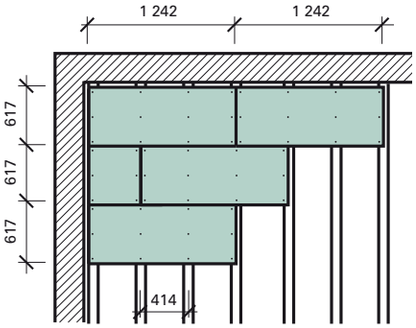
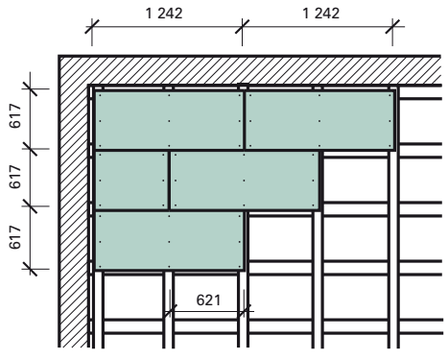
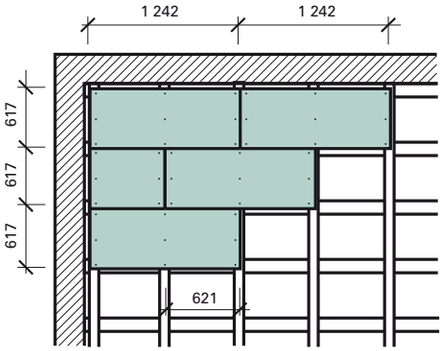
| SPAN (m) | MAXIMUM LOAD F (kN) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | th. 16 mm | th. 18 mm | th. 20 mm | th. 22 mm | th. 24 mm | th. 26 mm | th. 28 mm | th. 30 mm | th. 32 mm |
| 0.200 | 1.999 | 2.530 | 3.124 | 3.781 | 4.500 | 5.282 | 6.126 | 7.033 | 8.002 |
| 0.250 | 1.692 | 2.142 | 2.645 | 3.201 | 3.810 | 4.472 | 5.187 | 5.955 | 6.776 |
| 0.300 | 1.487 | 1.882 | 2.325 | 2.814 | 3.349 | 3.932 | 4.560 | 5.236 | 5.958 |
| 0.350 | 1.340 | 1.697 | 2.097 | 2.537 | 3.020 | 3.545 | 4.113 | 4.722 | 5.374 |
| 0.400 | 1.229 | 1.557 | 1.924 | 2.329 | 2.773 | 3.255 | 3.776 | 4.336 | 4.935 |
| 0.450 | 1.143 | 1.448 | 1.789 | 2.167 | 2.580 | 3.029 | 3.514 | 4.036 | 4.593 |
| 0.500 | 1.074 | 1.361 | 1.682 | 2.036 | 2.425 | 2.848 | 3.304 | 3.795 | 4.319 |
| 0.550 | 1.017 | 1.289 | 1.593 | 1.930 | 2.298 | 2.699 | 3.132 | 3.597 | 4.095 |
| 0.600 | 0.969 | 1.229 | 1.519 | 1.840 | 2.192 | 2.575 | 2.988 | 3.432 | 3.907 |
| 0.650 | 0.913 | 1.177 | 1.456 | 1.764 | 2.102 | 2.469 | 2.866 | 3.292 | 3.748 |
| 0.700 | 0.836 | 1.133 | 1.401 | 1.698 | 2.024 | 2.378 | 2.760 | 3.171 | 3.611 |
| 0.750 | 0.768 | 1.094 | 1.354 | 1.641 | 1.956 | 2.299 | 2.669 | 3.066 | 3.492 |
| 0.800 | 0.708 | 1.019 | 1.312 | 1.591 | 1.896 | 2.229 | 2.588 | 2.974 | 3.387 |
| 0.850 | 0.655 | 0.945 | 1.274 | 1.546 | 1.843 | 2.167 | 2.516 | 2.892 | 3.294 |
| 0.900 | 0.608 | 0.879 | 1.219 | 1.505 | 1.795 | 2.111 | 2.452 | 2.818 | 3.211 |
| 0.950 | 0.566 | 0.820 | 1.140 | 1.469 | 1.752 | 2.060 | 2.394 | 2.752 | 3.136 |
| 1.000 | 0.527 | 0.766 | 1.067 | 1.435 | 1.713 | 2.015 | 2.341 | 2.692 | 3.068 |
| 1.050 | 0.491 | 0.717 | 1.002 | 1.351 | 1.677 | 1.973 | 2.293 | 2.637 | 3.005 |
| 1.100 | 0.459 | 0.673 | 0.942 | 1.273 | 1.644 | 1.934 | 2.249 | 2.587 | 2.948 |
| 1.150 | 0.428 | 0.631 | 0.887 | 1.201 | 1.580 | 1.899 | 2.208 | 2.540 | 2.896 |
| 1.200 | 0.400 | 0.593 | 0.836 | 1.135 | 1.496 | 1.866 | 2.170 | 2.497 | 2.847 |
| 1.250 | 0.374 | 0.557 | 0.789 | 1.074 | 1.419 | 1.828 | 2.134 | 2.456 | 2.801 |
| 1.300 | 0.349 | 0.524 | 0.745 | 1.018 | 1.347 | 1.739 | 2.101 | 2.419 | 2.759 |
| 1.350 | 0.325 | 0.492 | 0.704 | 0.965 | 1.281 | 1.656 | 2.069 | 2.383 | 2.719 |
| 1.400 | 0.302 | 0.462 | 0.665 | 0.915 | 1.219 | 1.579 | 2.002 | 2.350 | 2.681 |
| 1.450 | 0.281 | 0.434 | 0.628 | 0.869 | 1.160 | 1.507 | 1.914 | 2.318 | 2.646 |
| 1.500 | 0.260 | 0.406 | 0.593 | 0.825 | 1.105 | 1.439 | 1.832 | 2.287 | 2.612 |



# CETRIS®
# Floor Systems

**The results of the static calculation point to the following options of use of CETRIS® floor boards:**

| | | |
|---|---|---|
| **Nature of the room** | **Lofts, inaccessible terraces and flat roofs with roofing element span up to 9 m.** | **Residential apartments including antechambers and corridors, rooms in dormitories, hotels, rooms in crèches and nurseries, bedrooms of school dormitories and sanatoria, hospital wards, policlinics, other healthcare facilities, surgeries and waiting rooms.** |
| **Standard load** (kNm$^{-2}$) | **0,75** | **1,50** |
| **Recommended load-bearing floor construction** | CETRIS® PD (PDB) floor boards thickness 18 mm over beams with the span of 0.621 m | CETRIS® PD (PDB) floor boards thickness 22 mm over beams with the span of 0.621 m |
| |  |  |
| | CETRIS® PD (PDB) floor boards thickness 16 mm over beams in both directions with the span of 0.621 m | CETRIS® PD (PDB) floor boards thickness 20 mm over beams in both directions with the span of 0.621 m |
| |  |  |

| | | |
|---|---|---|
| **Rooms and offices of research institutions, office buildings, reading rooms, classrooms without heavy equipment or material storage, agricultural rooms and areas.** | **Halls and corridors in the mentioned above objects with exception of schools, lecture halls, mess halls, coffee and restaurant rooms.** | **Halls and corridors of messes, cafés, restaurants, schools, railway stations (areas open to public), theaters, cinemas, concerthall clubs, sports halls, department stores, museums, exhibition halls and pavilions, libraries and archives.** |
| **2,00** | **3,00** | **4,00** |
| CETRIS® PD (PDB) floor boards thickness 22 mm over beams with the span of 0.414 m | CETRIS® PD (PDB) floor boards thickness 28 mm over beams with the span of 0.414 m | CETRIS® PD (PDB) floor boards thickness 32 mm over beams with the span of 0.414 m |
|  |  |  |
| | | **Or individual solutions with thicker boards** |
| CETRIS® PD (PDB) floor boards thickness 24 mm over beams in both directions with the span of 0.621 m | CETRIS® PD (PDB) floor boards thickness 30 mm over beams in both directions with the span of 0.621 m | |
|  |  | |

**Note:** Cases of higher usable load or large solitary objects must be addressed individually.

All values in mm

## 7.7.3 Laying of CETRIS® PD and CETRIS® PDB Floors

**1** CETRIS® PD and CETRIS® PDB Floor boards are laid as final constructions after completion of the "wet" construction works (partition erection, plastering etc.). Where a light partition (plasterboard, CETRIS® on grid) is to be installed its weight must be considered by the design of dimensions and layout of the floor beams. In this case the possibility of sound transfer through the floor from one room to the other must be considered.

**2** The width of the beam is based not only on the load-bearing capacity requirement but also on the requirement for sufficient anchoring of the floor sections CETRIS® PD (CETRIS® PDB) in the load-bearing construction. The width of wooden beams in the point of contact of two CETRIS® PD (CETRIS® PDB) boards must be at least 100 mm. It is recommended to place a flexible insert between the beams and the load-bearing construction (rubber, solid felt, PE foil layer of minimum thickness 5 mm) for sound transmission reduction. The inserts or wedges will at the same time level the beams. Anchor the levelled beams in the base. Use screws for anchoring to the wooden base and hammered dowels for anchoring to concrete. The floor beams are laid in axial distances required by the designed load.

**3** It is recommended to separate CETRIS® PD (CETRIS® PDB) boards from the beams with a separation layer (unwoven fabric, felt, rubber, cardboard) to prevent potential knocking of the floor. It is sufficient to lay a strip of the same width as the beam along the full length of the beam.

**4** The tongue edge by the wall is to be cut off.

**5** CETRIS® PD (CETRIS® PDB) boards are laid tightly without gaps and the joints are fixed with glue. The following dispersion glues resistant to alkali are recommended: UZIN MK33, MAPEI – ADESIVIL D3, SCHÖNOX HL, HENKEL PONAL SUPER 3 (PATEX SUPER 3), CONIBOMD PRO 1005 etc. After glue application and board settlement the floor boards must be screwed immediately. Excess (pushed out) glue must be removed after pressing the boards together for the joint to be filled with the glue up to the edge. The maximum screw spacing is 600 mm in the lengthwise direction and 300 mm in the crosswise direction. The screws must be a min. 25 mm and max. 50 mm away from the board edges.

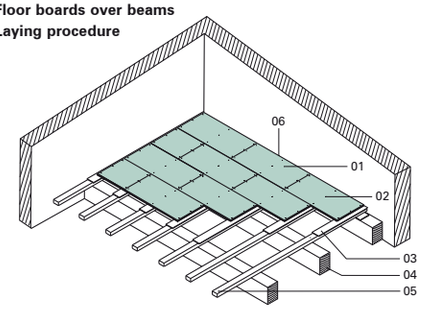
**6** When laying CETRIS® PD (CETRIS® PDB) floor boards, cross joints should be avoided. Butt joints should be supported in at least one direction. The individual rows of the boards are laid with overlaps of a min. 1/3 of the board length, perpendicularly to the direction of the original wooden floor. The length of the first boards in a row must be selected for the minimum size of the cut board to be 250 mm. Min. 15 mm wide dilation joints must be made along the vertical constructions (walls, pillars etc.).

**7** In the case of single-direction beams, CETRIS® PD (CETRIS® PDB) boards are laid with **the longer side perpendicular to the beams**.

**8** CETRIS® PD (CETRIS® PDB) boards laid around the doors must avoid cross joints.

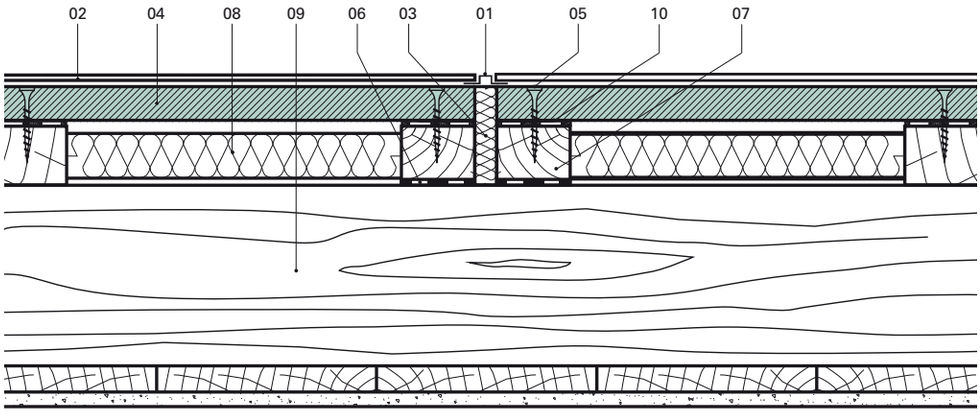
**9** In the case of additional heat insulation between the beams by backfill (such as LIAPOR) up to the beam top, it is recommended to overfill the space between the beams to allow for additional compaction. The backfill is recommended to be covered with end-to-end cardboard for prevention of grain penetration to the joints of the floor boards in the course of the floor assembly and for elimination of the floor creaking.

**Floor boards over beams**
**Laying procedure**




**01 CETRIS® PD (CETRIS® PDB) floor boards**
**02 CETRIS screw**
**03 base and levelling inserts**
**04 existing log**
**05 beams**
**06 dilation joint**

**Floor boards over beams – Dilation design**




**01 dilation profile**
**02 walking surface**
**03 dilation joint**
**04 CETRIS® PD (CETRIS® PDB) floor boards**
**05 CETRIS screw**
**06 underlay and leveling strip**
**07 beams**
**08 heat and sound insulation**
**09 ceiling construction**
**10 separation strip**

# 7.8 Two-Layer CETRIS® Floors on Beams

Recent solutions and implementations of CETRIS® board floors are increasingly based on two or more layers of basic CETRIS® boards laid over beams. This solution is used for the better availability of the basic boards in comparison to the special floor boards. This method is also beneficial in the case of varied (changing) axial distances between the beams (in the case of reconstructions of old wooden floors).
The maximum permitted axial distance of the beams is 625 mm. In comparison to floor board laying this method is more laborious – more steps, a thick network of screws for perfect joining of the layers, the necessity to cut the basic board size.

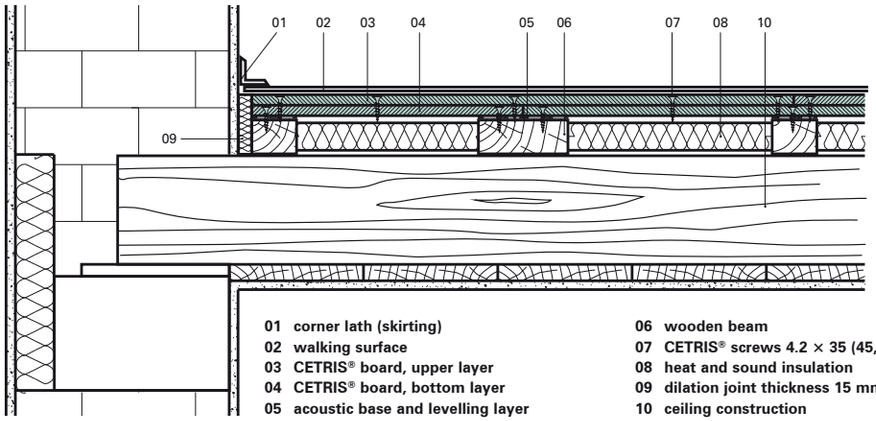
**Attention!**
**Only one layer of CETRIS® boards on beams is not fully walkable. During the assembly the workers are allowed to walk only on the beams (supports). The total load capacity of the floor is achieved after screwing of the two layers of CETRIS® boards together! For this method to be effective both CETRIS® board layers must be perfectly joined together (by screwing, or riveting) for ideal transfer of shear and tensile tensions. If the layers are not perfectly bound together each of them behaves as a separate layer, which results in the risk of significant sags.**

This solution is used both for floors in new buildings and for ceiling reconstructions in old buildings.

## 7.8.1 Description of Construction

The classical solid floor construction consists of one-way or two-way beams (wooden joists, steel girders etc.). The beams are covered with CETRIS® PD and CETRIS® PDB cement-bonded particleboards in two layers. Due to the static effects the largest possible sizes of the CETRIS® boards are recommended. The first layer of CETRIS® boards is laid tightly without gaps and screwed to the beams. The shorter sides of the boards are laid over the beams. The second CETRIS® board layer is laid with an overlap on both sides **for the shorter sides again to be laid over the beams (the overlap in the direction perpendicular to the beams equal one field length and in the beam direction a half board width)**. The second layer boards are again laid tightly and screwed for joint action of both board layers. Heat and sound insulation is placed between the beams as required. To prevent formation of sound bridges acoustic insulation is also laid under the beams in the maximum thickness of 5 mm. The floor is finished around the walls with a dilation joint with the width of 15 mm. The beams must display sufficient load-bearing capacity and must be laid on a load-bearing construction of a sufficient capacity too. Their sag must be checked. In the case of a flat load-bearing construction the beams should lie on the construction along their full length.

**Two-layer CETRIS® floors over beams**




**01** corner lath (skirting)
**02** walking surface
**03** CETRIS® board, upper layer
**04** CETRIS® board, bottom layer
**05** acoustic base and levelling layer
**06** wooden beam
**07** CETRIS® screws 4.2 × 35 (45, 55) mm
**08** heat and sound insulation
**09** dilation joint thickness 15 mm
**10** ceiling construction

## 7.8.2 Load Tables

In the case of compliance with the technological procedure of laying (and especially joining of the two layers) the design of this floor type may be based in the static calculation of load-bearing capacity for CETRIS® floor boards.
**However, joint action of the two CETRIS® board layers must be assured by their screwing, or riveting (maximum distance of the joining elements in the lengthwise and the cross wise direction is 300 mm).**
In the case of perfectly assured joint action of both layers the load-bearing capacity of the two-layer floor equals the load-bearing capacity of the one-layer CETRIS® PD (CETRIS® PDB) floor glued in the tongue and groove connections of the same total thickness, reduced for safety reasons by 25%. The other assumption of the calculation and the load tables can be found in Chapter 7.7 CETRIS® PD and CETRIS® PDB Floor Systems on Beams.

**Maximum usable load in kN for most frequent application (floors of two screwed together layers of CETRIS® boards laid over one-direction grid)**

| SPAN (m) | CONSTRUCTION COMPOSITION (thickness + thickness in mm) | | | | |
|---|---|---|---|---|---|
| | 10 + 10 | 10 + 12 | 12 + 12 | 12 + 14 | 14 + 14 |
| 0.35 | 1.29 | 1.56 | 1.86 | 2.19 | 2.54 |
| 0.40 | 1.20 | 1.45 | 1.73 | 2.03 | 2.36 |
| 0.45 | 1.12 | 1.36 | 1.62 | 1.91 | 2.21 |
| 0.50 | 1.06 | 1.29 | 1.53 | 1.80 | 2.09 |
| 0.55 | 1.01 | 1.22 | 1.46 | 1.71 | 1.99 |
| 0.60 | 0.93 | 1.16 | 1.39 | 1.63 | 1.90 |
| 0.625 | 0.88 | 1.14 | 1.36 | 1.60 | 1.85 |

## 7.8.3 Laying of CETRIS® Boards

**1** Floors of CETRIS® boards are laid as final constructions after completion of the "wet" construction works (partition erection, plastering etc.). Where a light partition (plasterboard, CETRIS® on grid) is to be installed its weight must be considered by the design of dimensions and layout of the floor beams. In this case the possibility of sound transfer through the floor from one room to the other must be considered.

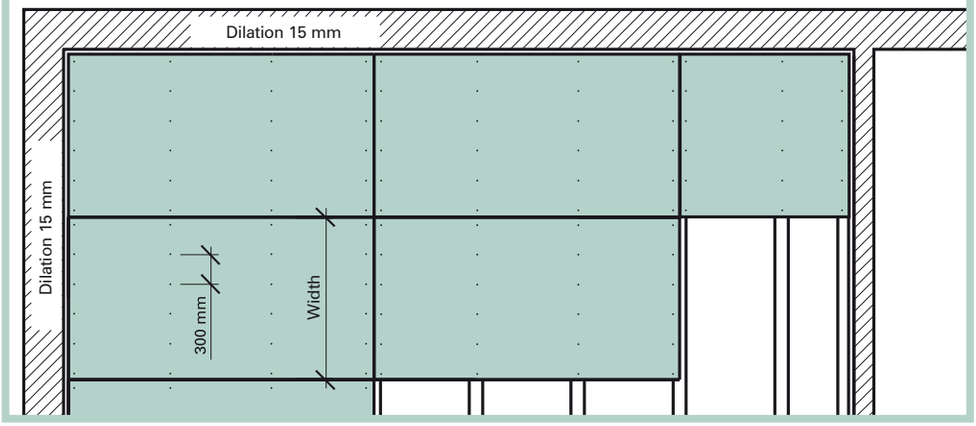
**2** The width of the beam is based not only on the load-bearing capacity requirement but also on the requirement for sufficient anchoring of the CETRIS® boards in the load-bearing construction. The width of wooden beams in the point of contact of two CETRIS® boards must be at least 100 mm. It is recommended to place a flexible insert between the beams and the load-bearing construction (rubber, solid felt, PE foil layer of maximum thickness 5 mm) for sound transmission reduction. The inserts or wedges will at the same time level the beams. Anchor the levelled beams in the base. Use screws for anchoring to the wooden base and hammered dowels for anchoring to concrete.

**3** It is recommended to separate CETRIS® boards from the beams with a separation layer (unwoven fabric, felt, rubber, cardboard) to prevent the potential knocking of the floor. It is sufficient to lay a strip of the same width as the beam along the full length of the beam.

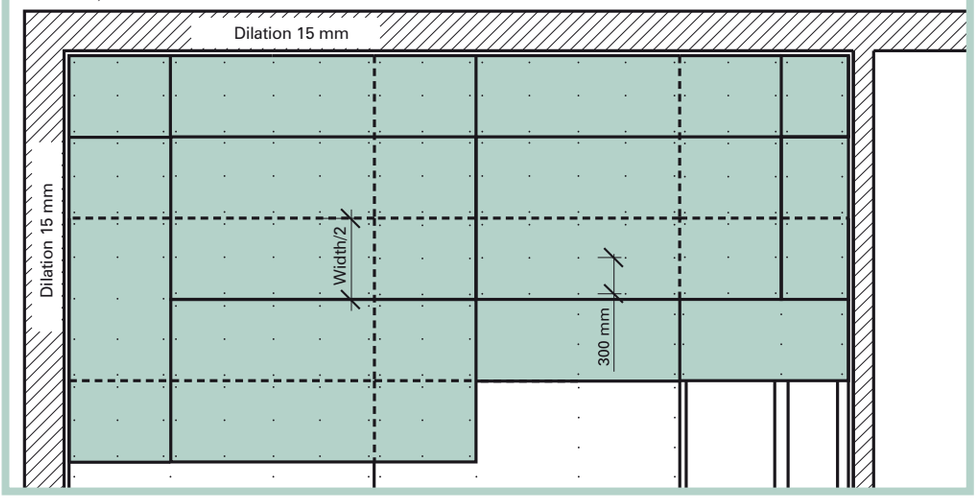
**4** The first layer of CETRIS® boards is laid tightly with cross joints. The board is settled and immediately screwed. In the case of single-direction beams the first CETRIS® board layer is laid with the longer side perpendicular to the beams and the shorted side supported by the beam. The screw spacing in the beam direction must not exceed 300 mm. The screw distance from the board edge must range between 25 and 50 mm. The dilation joint of minimum width of 15 mm must be kept around the vertical constructions (walls, pillars).

**5** The second layer of CETRIS® boards is laid with an overlap with the shorted sides again lying on the beams (the overlap equals the length of one field). The boards are again laid tightly with cross joints. The board is settled and immediately screwed to the bottom layer. The screw spacing in the lengthwise and crosswise direction must not exceed 300 mm. The screw distance from the board edge must range between 25 and 50 mm. The dilation joint of minimum width of 15 mm must be kept around the vertical constructions (walls, pillars).

**Laying two-layer CETRIS® board floor on beams**
Bottom layer




**Laying two-layer CETRIS® board floor on beams**
Bottom layer




**Note:** In the case of softened PE foil inserted between the two CETRIS® board layers for increased impact sound transmission loss, it is necessary to use milled floor boards CETRIS® PD (CETRIS® PDB) for the second layer. If non-milled boards are used, different local compression may occur with resulting irregularities of the cross joints of the CETRIS® boards. The CETRIS® PD or CETRIS® PDB floor board is glued in the tongue and groove joints and screwed to the bottom CETRIS® board layer.

**6** The CETRIS® board laid around the doors must avoid joints.

**7** In the case of additional heat insulation between the beams by backfill (such as LIAPOR) up to the beam top it is recommended to overfill the space between the beams to allow for additional compaction. The backfill is recommended to be covered with end-to-end cardboard for prevention of grain penetration to the joints of the floor boards in the course of the floor assembly and for elimination of the floor creaking.

# 7.9 Floor covering

## 7.9.1 Preparation of Surface of CETRIS® Floor Boards for Laying of Floor Finish

After completion of a CETRIS® PD (CETRIS® PDB) cement bonded particleboard floor, the surface must be checked for planarity deviations with a focus on elimination of the deviations between the individual boards and preparation of a perfectly flat surface for the Laying of Floor Finish. The method of elimination of potential irregularities is different for each flooring finish type.

The surface is levelled by sanding or application of levelling plaster.

- The joints of the CETRIS® board need not be processed under glued wooden parquet or pavement.

- If the parquet is to be floating and potential irregularities do not prevent laying priming is not necessary. However, it is recommended to place a separation foil of unwoven textile or foam polystyrene (MIRELON) between the parquet and the CETRIS® boards for creaking minimisation.

- In the case of full area filler or glue applications, the CETRIS® boards need priming. Priming is recommended to be applied immediately after the board laying on the dry and clean board surface. Priming means painting the CETRIS® board surface, which penetrates to the sub-surface layers to simultaneously fulfil the following three functions – reduction of the effects of various forms of humidity on the linear expansion of the boards, assurance of reliable adherence of the subsequently laid layers and reduction of absorption by the board (water absorption from the plaster). Well applied priming significantly affects the final effect of the subsequently performed works.

- In the case of use of thin layer floor covering (such as PVC or carpet) elastic filler should be spread over the CETRIS® board floor with an emphasis on the joints of the boards, the unused predrilled holes, and eventually also individual connecting screws. Larger irregularities should be sanded before the filler application.

- Because of diversity of the floor finishes used it is recommended to consult with the glue manufacturers.

- Priming and gluing of floor covering is recommended to be implemented with unified systems with all components of the system produced by the same manufacturer and tested for use over cement bonded particleboard (MAPEI, SCHÖNOX, DEGUSSA, BOTAMENT). It is not recommended to use a combination of materials by different manufacturers within a single floor system.

- If the CETRIS® floors are to be covered with mosaic, stone or ceramic floor finish, the maximum paving stone size should not exceed 200 × 200 mm. The paving stones must not be laid in the oblique orientation. Because of the nature of the CETRIS® boards, the pavement must not be glued with standard fillers which are not able to compensate shape alterations of the base. Ceramic tile gluing over CETRIS® boards is only reliable if elastic glues are used. The glue must be applied with a teethed spatula with the tooth size at least 8 mm. The pavement is glued in the floating and buttering manner. When laying pavement the issue of dilation joints must be carefully considered. The pavement dilations should correspond to the base dilations and should be designed with regard to the size and shape of the room.

- Elastic joint filling materials must be used for pavement joint filling.

- Pavements may also be glued with special glues not requiring priming (two-in-one). Use of these products must be consulted with their respective manufacturers.

- Spaces stressed with water (sanitary rooms of residential houses) must be provided with sufficient hydro-insulation (elastic hydro-insulating plaster or hydro-insulating foil) for reliable protection of the CETRIS® boards against water infiltration.

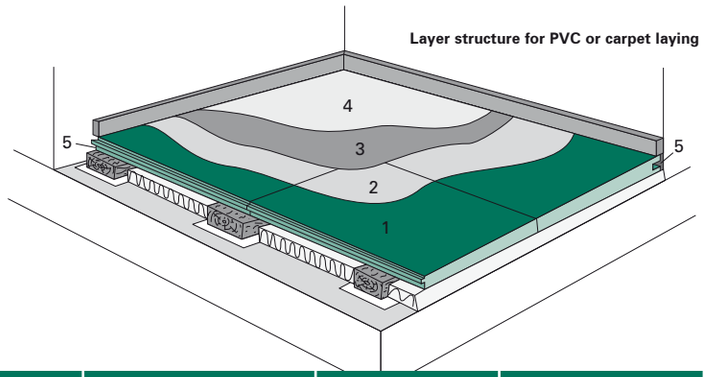
- If the flooring is not to be laid within 48 hours after the CETRIS® board floor laying it is recommended to treat the boards with a protective paint, ideally priming (type pursuant to the floor covering – such as MAPEI Primer S, Schönox KH, Botact 11 etc.).

- Particular cases occurring in the course of laying the floor covering should be consulted with representatives or technicians of the building chemical manufacturer. Applications of individual materials should comply with the principles stated on the product packages, or in the product data sheets.

## 7.9.2 PVC, Carpets

In the case of use of thin layer floor covering (such as PVC or carpet) elastic filler should be spread over the CETRIS® board floor with an emphasis on the joints of the boards, the unused predrilled holes, and eventually also individual connecting screws. Larger irregularities should be sanded before the filler application.

**01** CETRIS® cement-bonded particleboard
**02** priming
**03** levelling plaster
**04** PVC, carpet
**05** dilation joint

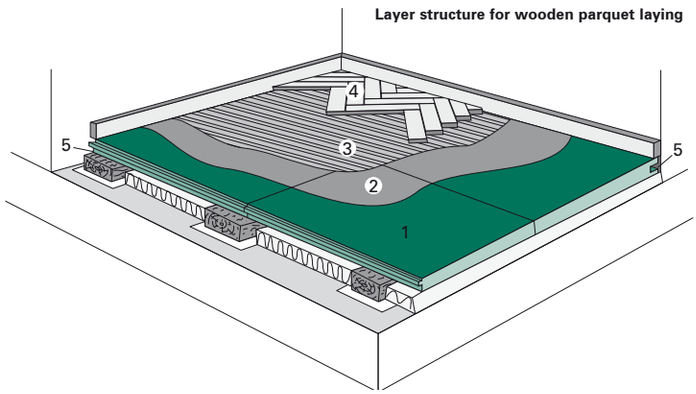



| SYSTEM COMPOSITION | MAPEI system | SCHÖNOX system | BASF system | THOMSIT system | UZIN system | MUREXIN system |
|---|---|---|---|---|---|---|
| Primer | MAPEPRIM SP | Schönox KH | Penetration PGM | Thomsit R 777, R 766 | UZIN PE 360 | Murexin D7 |
| Levelling plaster | FIBERPLAN v tl. min. 3 mm | Schönox SP, AM | Mastertop 515 | Thomsit FA 97 | UZIN NC 170 LevelStar | Murexin NH 75 |
| Glue | ROLLCOLL | Schönox Unitech, Floorplastic, Tex-object | --- | Thomsit K 188, T 440 | UZIN UZ 57, LE 44, KE 66 | Murexin D 321 |

## 7.9.3 Wooden Parquet

Dry floor must be primed before gluing wooden parquet. If the parquet is to be floating priming is not necessary. However, it is recommended to place a separation foil of unwoven fabric or foam polystyrene between the parquet and the CETRIS® boards (for creaking minimisation).

**01** CETRIS® cement-bonded particleboard
**02** priming
**03** gluing filler
**04** wooden parquet
**05** dilation joint

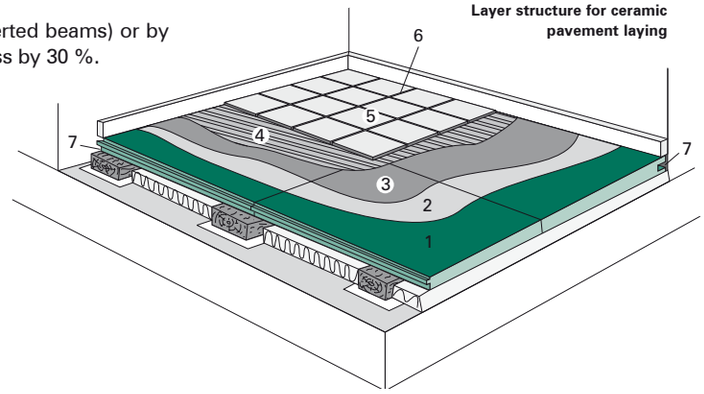



| SYSTEM COMPOSITION | MAPEI system | | SCHÖNOX system | THOMSIT system | SIKA system | LEAR system | UZIN system | MUREXIN system |
|---|---|---|---|---|---|---|---|---|
| Primer | PRIMER PA | not required | not required | Thomsit R 777 | not required | Unixin A170 | UZIN PE 414 TURBO | not required |
| Gluing filler | ADESILEX PA | LIGNOBOND | Schönox MS-elastic | Thomsit P 600, P 685 | Sika Bond T 52, T 54, T 55 | Unixin P230 | UZIN MK 100 | Objekt X-Bond MS-K 509 |

## 7.9.4 Ceramic Pavement

If the CETRIS® floors are to be covered with mosaic, stone or ceramic floor finish, the maximum paving stone size should not exceed 200 × 200 mm. The mentioned compositions are also suitable for anchoring of a heating (resistance) mat with subsequent ceramic tile gluing. The pavement must be glued in compliance with the instructions of the respective manufacturers of the gluing fillers (the recommended consumption, size of the teethed spatula with the tooth size at least 8 – 10 mm, two-sided gluing). In water-unstrained rooms hydro insulation is not needed. When using a larger tile format than 200 by 200 mm it is recommended to increase the compactness of the floor – ideally by reduction of the axial distance of the supports to a half (by inserted beams) or by an increase of the board thickness by 30 %.

**Layer structure for ceramic pavement laying**




**01 CETRIS® cement-bonded particleboard**
**02 priming**
**03 hydro insulating plaster**
**04 gluing filler**
**05 ceramic pavement**
**06 joint filler**
**07 dilation joint**

| SYSTEM COMPOSITION | MAPEI system | SCHÖNOX system | BASF SH system | BOTAMENT system | CERESIT system | SIKA system | Systém UZIN |
|---|---|---|---|---|---|---|---|
| Primer | not required | Schönox KH diluted with water 1 : 3 | PCI-Gisogrund | Botact D 11 | Ceresit CT 17 | not required | codex Fliesengrund |
| Hydro insulation (bandage of corners, dilations) | KERALASTIC min. 1 mm (MAPEBAND) | Schönux HA in combination with a sealing tape Schönux ST and accessories Schönux ST-IC - inner corner, Schönux EA - outer corner including an insulating collar Schönux ST-D. Corresponds to ETAG 022 standard. | PCI-Lastogun | Botact MD 28 Botact SB 78 | Ceresit CL 51 (Ceresit CL 52) | Sika Bond T 8 | codex Power Flex Turbo (Multimoll TOP 4) |
| Gluing filler | KERALASTIC | Schönox PFK plus | PCI-Nanolight | Botact M 21 (lower loads) Botact M 29 (higher loads) | Ceresit CM 16 (lower loads) Ceresit CM 17 (higher loads) | Sika Bond T 8 | codex Power CX 3 |
| Joint filler | ULTRACOLOR (MAPESIL AC) | Schönox WD FLEX Schönox SU | PCI-Flexfuge | Botact M 30 Botact S 5 | Ceresit CE 43 (Ceresit CS 25) | Sikaflex 11 FC | codex Brillant Flex Basic (codex quadrosil) |

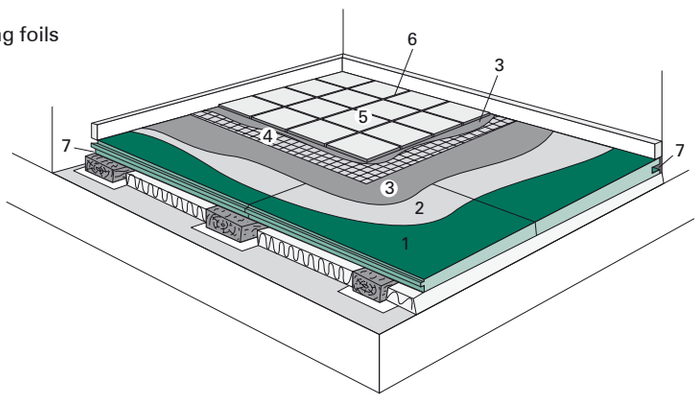
**Note: When using DEGUSSA products it is recommended to cover CETRIS® board joints with an reinforcing fabric 300 mm wide and anchor to the base by shot staples.**

## 7.9.5 Ceramic Pavement with Hydro Insulating Foil

Floors with ceramic pavement for spaces stressed with water may be designed with a hydro-insulation foil application. The load-bearing layer of these foils is represented by polyethylene strips with one-sided (bottom) or two-sided textile (fleece) for effective anchoring in the gluing filler. The foil is used not only for insulation but also as the layer for levelling vapour overpressure and the separation layer compensating horizontal stresses in the base and able to bridge cracks.
The foil is laid over the gluing filler bed. The joints and the corners are treated with accessory elements. Immediately after the foil (mat) gluing the pavement may be laid in a thin glue bed.
The gluing filler must be elastic, hydraulically hardening.

Suitable types:
- Schlüter DITRA
- Botact insulating and separating foils

**Hydro-insulating layer of Schlüter® DITRA foil**




**01 CETRIS® cement-bonded particleboard**
**02 priming**
**03 gluing filler**
**04 hydro insulating mat**
**05 ceramic pavement**
**06 joint filler**
**07 dilation joint**

## 7.9.6 System Solution under Ceramic Pavement

**System solution for impact noise absorption under ceramic pavement**
This composition includes pressed boards of polymer fibre bonded with latex. Insertion of these boards in the floor composition, even in low thicknesses (6 mm) may reduce impact noise by up to 13 dB (tested pursuant to EN ISO 140-8) and separate the base from the upper layers with preservation of the very low construction height of the floor. The boards are laid in a layer of gluing filler and pressed in – ideally with a hard roller. To prevent formation of acoustic bridges it is necessary to glue the contact joints with self-sticking cover tape.

**Note:** For the purpose of uniform distribution of the load the minimum floor tile format is 150 × 150 mm, or 240 × 115 mm.

| SYSTEM TYPE | SYSTEM SOLUTION FOR IMPACT SOUND ABSORPTION UNDER CERAMIC PAVEMENT | SYSTEM SOLUTION FOR BASE STABILITY INCREASE |
|---|---|---|
| System supplier | BOTAMENT | |
| Primer | BOTACT D 11 | |
| Board/mat gluing | Special quick-drying filler BOTACT M 26 | BOTACT M 21<br>Quick-drying filler BOTACT M 24<br>(in wet spaces BOTACT MD 1) |
| Board/mat | BOTACT – separation board for impact sound absorption | BOTACT – light separating mat |
| Gluing filler | BOTACT M 26 or BOTACT M 29 | |
| Joint filler | Flexible joint filling material BOTACT M 30 or MULTIFUGE | |
| Elastic fill | BOTACT S 5 or BOTACT S 3 | |

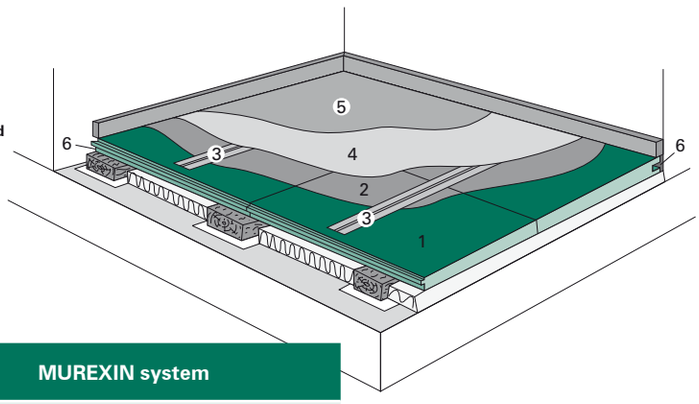
**System solution for increased base stability**
This solution is ideal for reduction of the risk of cracks in critical bases with preservation of the very low construction height of the floor. The floor composition includes a sandwich separating mat BOTACT, under the walking surface of the floor covering with reinforcing fabric inside. Especially in the case of floor rehabilitation in old houses the undisputed advantages include the minimum height (0.7 mm) and weight of the geo textile fleece. The mat is laid in a layer of gluing filler with 40 mm overlap, and pressed in – best made with a hard roller.

**Note:** The minimum thickness of the ceramic pavement must be 8 mm, the sizes need to be chosen from the range 150 × 150 mm to 300 × 300 mm and the tiles may not be laid "over joints". **This mat is not designed for dilation joint bridging!**

## 7.9.7 Self-Levelling Cast Floor, Electrostatically Conductive

The self-levelling cast floor, electrostatically conductive, the "antistatic" floor, is mainly used for spaces with high concentration of computer technology – computer rooms, offices etc. This floor may also be used in rooms where castor chairs are used. The board joints must be covered with an reinforcing fabric, width 300 mm, anchored to the base by short staples. This floor must be laid by a professional company and consulted with the manufacturer.

**01 CETRIS® cement-bonded particleboard**
**02 priming**
**03 conductive tapes**
**04 conductive paint**
**05 cast upper abrasive layer**
**06 dilation joint**

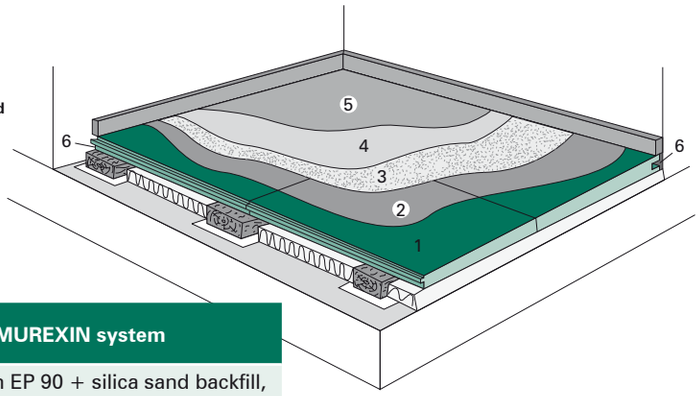



| SYSTEM COMPOSITION | BASF SH system | MUREXIN system |
|---|---|---|
| Primer | MASTERTOP P 678 (Conipur 78) | Epoxy antistatic primer Aquapox ASG 170 |
| Conductive tapes | PCI-Kupferband | Copper strip KB 20 |
| Conductive paint | MASTERTOP CP 687 W AS (Conipur 287 W-AS) | not required |
| Cast upper abrasive layer | MASTERTOP BC 375 AS (Conipur 275 AS) | Epoxy antistatic coating ASD 130 |

### 7.9.8 Comfort Cast Decorative Elastic Floor

The cast comfort decorative elastic floor is designed for spaces where an elastic surface with easy maintenance is required (nurseries, old people's homes, sports grounds with light burdens). The board joints must be covered with an reinforcing fabric, width 300 mm, anchored to the base by short staples. This floor must be laid by a professional company and consulted with the manufacturer.

**01 CETRIS® cement-bonded particleboard**
**02 priming**
**03 silica sand backfill**
**04 abrasion layer**
**05 protective UV paint**
**06 dilation joint**




| SYSTEM COMPOSITION | BASF Building Materials system | MUREXIN system |
|---|---|---|
| Primer | MASTERTOP P 678 (Conipur 78) + silica sand backfill, fraction size 0.4 – 0.8 mm | Epoxy resin EP 90 + silica sand backfill, fraction size 0,3 – 0,9 mm |
| Abrasion layer | MASTERTOP BC 375 A (Conipur 225 A) | Polyurethane coating HIRES PU 300 |
| Protective UV paint | MASTERTOP TC 467 or P (Conipur 67) | Closing polyurethane paint PU 40 |

# 7.10 Floor Heating

Floor heating may be applied with CETRIS® board floor systems.

At present two types of floor heating are most frequently used:

- Floor heating under load-distribution floor boards (medium hot water circulating in PE or copper pipelines, or electrical heating cables)
- Floor heating laid over the load-distributing layer of the floor – the "warm pavement" system – electrical heating cables (mats) in the filler under the pavement.

When designing floor heating it is necessary to observe the recommendation of the floor covering supplier about the maximum permitted temperature of the floor surface for prevention of damage to the walking surface of the floor. The floor heating implementation must be performed in strict compliance with the instructions and procedures of its manufacturer (supplier).

The heating media (cables, pipelines, mats) are not recommended to be installed under furniture with closed pedestal (living room furniture, kitchen furniture) and with storage space underneath (beds, sofas) for in these places there is the risk of overheating of the thermo cables as a consequences of poor heat transfer from the covered floor surface.

### 7.10.1 Floor Heating under CETRIS® boards

For light floor construction with hot water heating see Chapter 7.5.2.1 Description and Variants of POLYCET Floors, POLYCET Heat Floor.

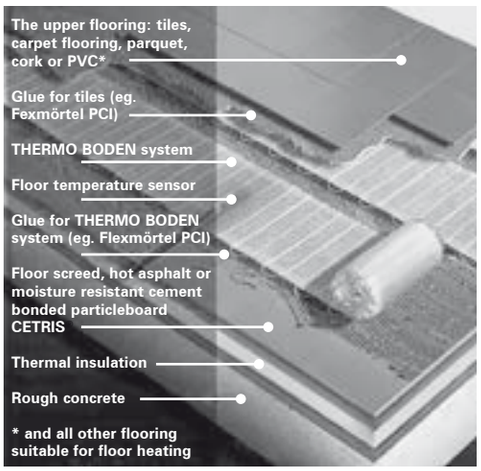
### 7.10.2 Floor Heating over CETRIS® boards

**System description**
The heating medium is represented by electrical heating cables, or heating mats, laid over the load-distributing and load-bearing layer of CETRIS® boards. The heating cables (mats) are covered with a layer of cement gluing filler and the final floor covering. This method, sometimes called "warm pavement", may be applied on both floating floors and CETRIS® PD (CETRIS® PDB) board floors.

**When implementing this method it is necessary to comply with the technological principles of the floor heating supplier.**

As this is a wet process, the CETRIS® boards must be primed before the heating media installation. For coverage of heating cables (mats) and gluing of the floor covering, gluing elastic fillers must be used which are suitable for floor heating systems (permanently increased temperature environment). The products recommended in Chapter 7.9 Floor covering comply with this requirement.

**Note:** The first commissioning of the system or renewal of operation after an outage must be very slow with the maximum permitted surface temperature of 28° C.



Product certificate:
**The IZOCET light floating floor**

AUTORIZOVANÁ OSOBA 212
CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. Praha

CERTIFIKÁT VÝROBKU

č. 0087/Z/212/2009

Lehká plovoucí podlaha IZOCET

Product certificate:
**The POLYCET Therm, Aku and Heat floating floor**

AUTORIZOVANÁ OSOBA 212
CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. Praha

CERTIFIKÁT VÝROBKU

č. 156T/Z/212/2008

Lehká plovoucí podlaha POLYCET – typ Therm, Aku a Heat

Product certificate:
**The POLYCET Max and Min light floating floor**

AUTORIZOVANÁ OSOBA 212
CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. Praha

CERTIFIKÁT VÝROBKU

č. 0050/Z/212/2011

Product certificate:
**The CETRIS PDI light floating floor**

AUTORIZOVANÁ OSOBA 212
CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. Praha

CERTIFIKÁT VÝROBKU

č. 039/Z/212/2012

# CETRIS® Façade Systems

8




CETRIS®

In addition to improvement of the heat insulation properties of buildings, increased emphasis has been laid on protection of walls against ground moisture and noise absorption and there is also a visible effort to improve the aesthetic appearance of buildings. The relative humidity of heated interiors of residential and office buildings, where we spend up to 90 % of our time, ranges around 60 %. The humidity is pushed to the external surface of the walls where vapours condense. If the walls resist vapour escape for example by ceramic tiling then the vapours accumulate inside the wall. Heat conductivity of the walls is thus increased, while water freezes inside, expands and damages the plaster. Interiors may develop mould. The optimum solution to these problems is application of vented façade systems.

# 8.1 Application Options of CETRIS® Vented Façades

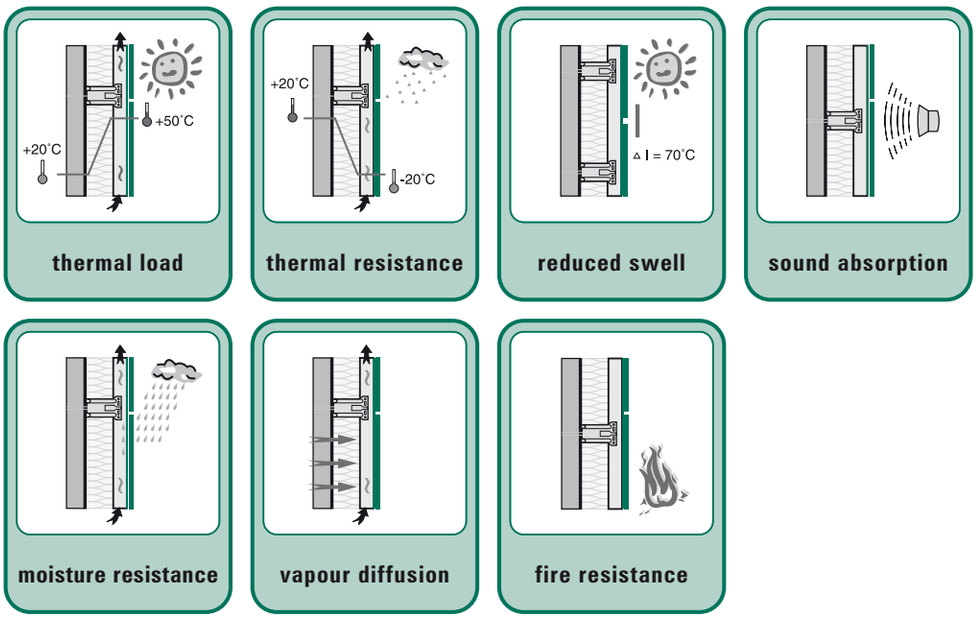
CETRIS® vented façade systems with cement bonded particleboards represent one of the application areas for CETRIS® boards in civil engineering for the protection of peripheral walls against weather effects.
These systems can be used in new developments and for reconstructions of family and apartment houses, office, commercial, industrial and agricultural buildings. The functional and elegant vented façades with CETRIS® boards boards meet high quality, aesthetic, functional and longevity requirements. The vented façade system may be combined with heat insulation.

**Description of façade system**
Vented façade is an integral part of peripheral construction and that is why the construction must be assessed as a whole from the static point of view, or in the case of heat insulation retrofitting from the thermal point of view.

- **Load-bearing construction** – enables insertion of heat insulation and fixation of the façade cladding to the load-bearing wall of the building
- **Heat insulation** – a layer of heat insulating material fixed to the outer face of the peripheral construction of the building
- **Façade cladding** – protects the load-bearing construction and heat insulation against weather effects and creates the aesthetic appearance of the building

## 8.1.1 Advantages of CETRIS® Vented Façades

- **Thermal insulation in winter** – optimum design of heat insulation layer thickness in combination with the vented air gap assures minimum energy consumption for winter heating
- **Thermal insulation in summer** – heat attenuation reduces interior overheating in the summer caused by sunshine
- **Suspended façade** – suspended façades effectively protect against direct weather effects and keep heat insulation and the wall completely dry
- **Vapour diffusion** – vented façades favourably affect vapour diffusion in the construction and thus provide for optimum humidity mode both in the wall and in the heat insulation, or eventually allow for wall drying. The chimney effect of the air flowing between the interior lining and heat insulation provides for constant vapour draining
- **Noise absorption** – heat insulation of mineral wool also absorbs sound and considerably contributes to protection of the interior against external noise
- **Façade cladding** – cladding element of CETRIS® boards allows for countless combinations of sizes, shapes, surfaces and colours for excellent materialisation of all requirements for façade architecture
- **The system eliminates potential unevenness of the existing wall**
- **Individual façade elements are easy to replace**
- **Assembly is performed by the dry method**, which allows for year-round implementation of the works




CETRIS® vented façade systems, when used on load-bearing construction, are systems that together with the existing load-bearing construction create a new peripheral coat of the building which is fully compliant with all functional, thermal, static and architectural requirements with preservation of sufficient longevity. In addition, the system provides dryness and warmth for comfort of living.

## 8.1.2 Categorization of CETRIS® Façade Systems

**A) On the basis of orientation of the CETRIS® boards on the façade, the CETRIS® façade systems are classified as follows:**

**$A_1$) CETRIS® VARIO Façade System**
Boards with visible horizontal and vertical joints between individual façade elements.

**$A_2$) CETRIS® PLANK Façade System**
Boards with overlapped horizontal and visible vertical joints.

**B) Three types of load-bearing grids may be used for CETRIS® board anchoring on the façade:**

**$B_1$) Wooden load-bearing grid**

**$B_2$) System profile load-bearing grid on aluminium or zinc-coated steel basis**
Systems EUROFOX, SPEEDY, SPIDI etc.

**$B_3$) Combined grid anchors**
Anchors + UNI joints + wooden laths

The scope of applications of the vented façade system on wooden and combined load-bearing construction is restricted by fire regulations. Designs of the base construction must comply with relevant laws and standards.

A suspended vented façade system with CETRIS® boards may be fixed to system profiles SPIDI® by SLAVONIA a.s., EUROFOX, DEKMETAL and ETANCO profiles – for details see chapters 8.7.2, 8.7.3, 8.7.6, 8.8.2 and 8.8.3.

# 8.2 Types of CETRIS® Boards for Façade Systems

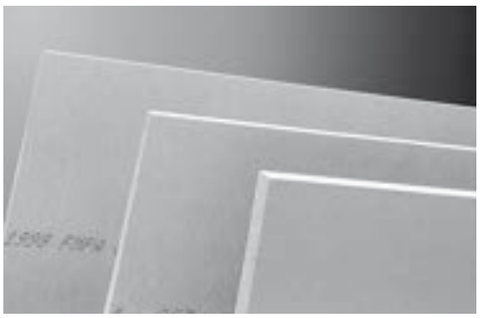
## 8.2.1 CETRIS® BASIC and CETRIS® PROFIL

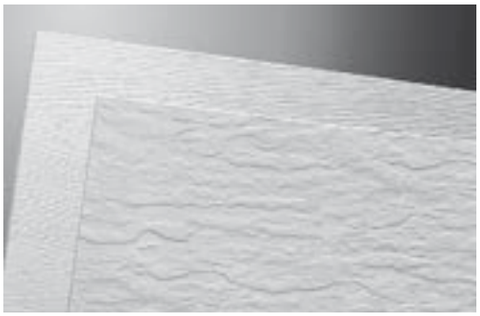
CETRIS® BASIC (CETRIS® PROFIL) is a cement bonded particleboard with a smooth surface (with relief) in the basic variant with a cement gray shade. This board is recommended to be finished with a colour top coat or a transparent paint (in the case of the requirement for preservation of the original cement appearance). The surface finish increases the board protection against weather effects and extends its life.

The recommended paints and technological procedures are listed in Chapter 6 Surface Finishes of CETRIS® Cement bonded particleboard.

When designing façade systems of CETRIS® BASIC (CETRIS® PROFIL) boards without a surface finish it is necessary to respect the board composition and origin – cement product.

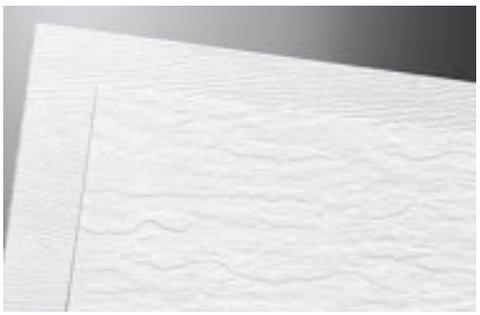
Free lime particles contained in Portland cement may penetrate to the board surface and carbonise in the air with the result of efflorescence disturbing the uniform appearance of the board surface. Therefore complaints about the board appearance cannot be accepted. This phenomenon may partly be prevented by the board treatment with transparent deep penetration paints reducing absorptivity and preventing transport of mineral substances to the board surface.





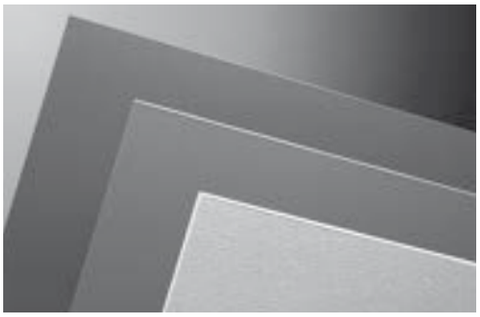
## 8.2.2 CETRIS® PLUS and CETRIS® PROFIL PLUS

CETRIS® PLUS (CETRIS® PROFIL PLUS) is a cement bonded particleboard with a smooth surface (with relief of wood or slate) with a penetration primer (white). The primer reduces the board absorptivity and improves adhesion of the top coat. These boards must be top coated.



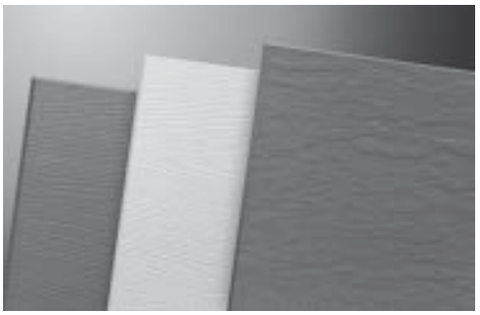
## 8.2.3 CETRIS® FINISH

CETRIS® FINISH is a cement bonded particleboard with a smooth surface and primer plus top coat in colour shades according to RAL or NCS colour tables.



## 8.2.4 CETRIS® PROFIL FINISH

CETRIS® PROFIL FINISH is a cement bonded particleboard (thickness 10 or 12 mm) with a relief surface imitating a wood or slate structure. The board is finished with primer plus top coat in colour shades according to RAL or NCS colour tables.

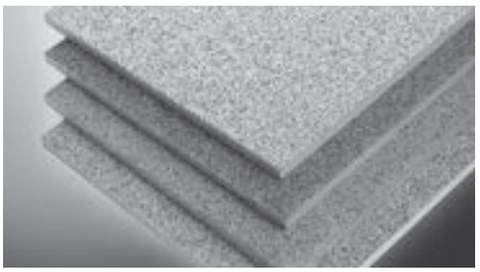


## 8.2.5 CETRIS® LASUR

CETRIS® LASUR is a cement bonded particle board with a smooth surface, treated with pigmented primer paint and acrylic varnish glazing as the top coat in colours according to the colour chart.

## 8.2.6 CETRIS® DEKOR

CETRIS® DEKOR is a cement bonded particleboard 12 and 14 mm thick with a smooth surface, finished with primer and decorative acrylic mosaic plaster in colours according to the colour chart.



# 8.3 CETRIS® VARIO Façade System

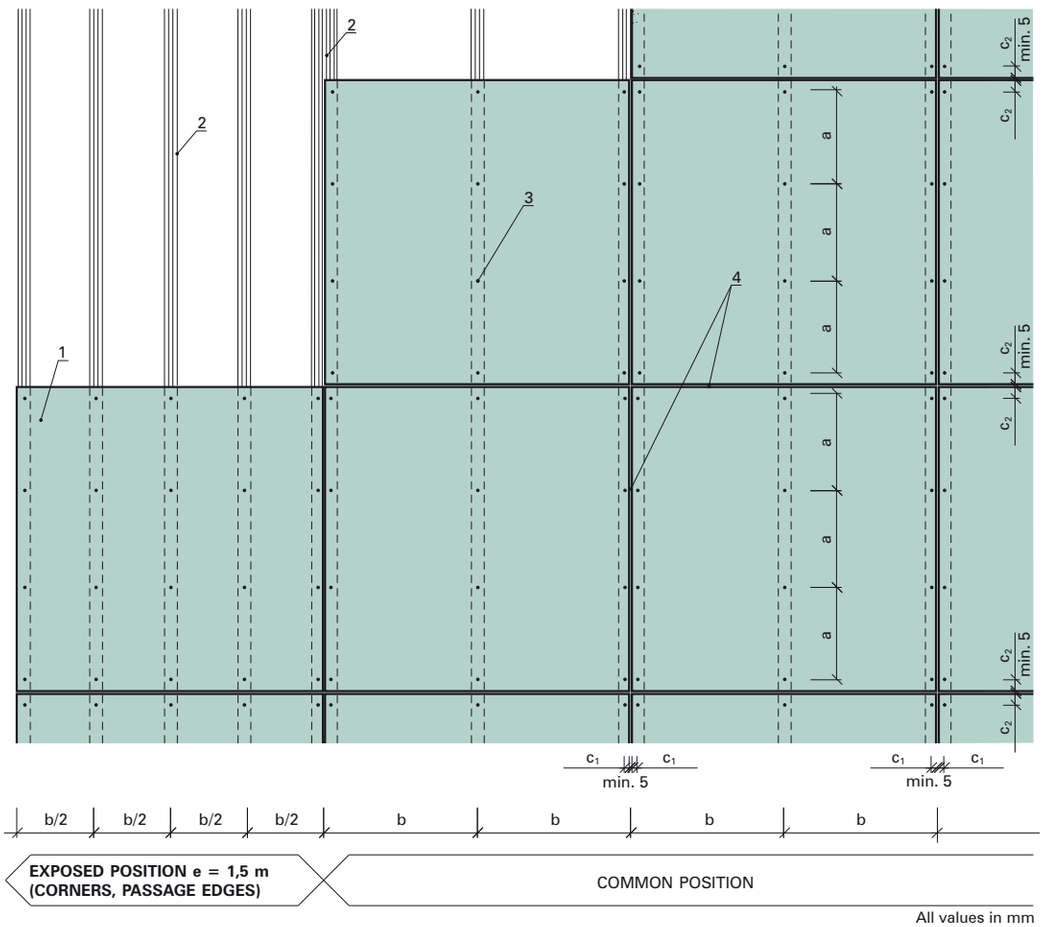
Recommended thicknesses of CETRIS® cement bonded particleboards for façade systems are 10 and 12 mm. For basement lining, higher thicknesses may be supplied.

CETRIS® boards for visible joint systems VARIO are available in the maximum size of 1,250 by 3,350 mm. The boards have pre-drilled holes with the diameter of 10 mm (in the case of the maximum size of 1,600 mm the diameter of the pre-drilled holes is 8 mm). The boards may also be supplied pre-cut to the minimum size of 300 by 300 mm. Hole drilling and load-bearing support spans must comply with the applicable technological regulation. Board fixation to the load-bearing construction must allow for dilations caused by volume changes of the façade boards. The individual façade elements must be placed with gaps of at least 5 mm for the element size up to 1,600 mm and at least 10 mm for the element size up to 3,350 mm. In the case of additional hole drilling in the VARIO system, the hole diameter must be 10 mm (or 8 mm in the case of max. size up to 1,600 mm).

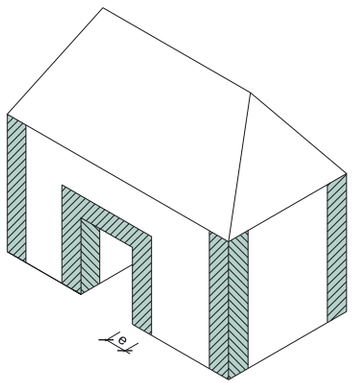
| BOARD THICKNESS (mm) | SCREW (RIVET) SPANS **a** (mm) | SUPPORT SPACING **b** (mm) | SCREW DISTANCE FROM VERTICAL EDGE $c_1$ (mm) | | | SCREW DISTANCE FROM HORIZONTAL EDGE $c_2$ (mm) |
|---|---|---|---|---|---|---|
| | | | wood | zinc coat* | aluminium | |
| 8 | <400 | <420 | >25 <50 | >30 <50<br>>50 <70* | >50 <70 | >70 <100 |
| 10 | <550 | <500 | | | | |
| 12 | <500 | <625 | | | | |
| 14 | <550 | <625 | | | | |
| 16 | <550 | <700 | | | | |

* Applicable to lengthwise laying of CETRIS® boards (width > 1,875 mm).
**Note**: The above values apply to a max. 30 m building height. In the case of taller building cladding with CETRIS® boards please contact the manufacturer.

**Diagram of CETRIS® board laying in the VARIO system**




All values in mm




Exposed positions on building edges, openings, passages in buildings etc.

**e = 1,5 m**

**01 CETRIS® cement bonded particleboard**
**02 vertical supports – load-bearing construction**
**03 screws for CETRIS® board fixation**
**04 joints between CETRIS® boards**

# 8.4 CETRIS® PLANK Façade System

CETRIS® cement bonded particleboards for the PLANK overlapped joint system are available in widths 300 or 200 mm in the recommended length of max. 1,875 mm (for 12 mm thickness). The boards are provided with pre-drilled holes with the diameter of 5 mm (at least 1.2 multiple of the screw diameter). The hole drilling and load-bearing support spacing must comply with the data in the table below.

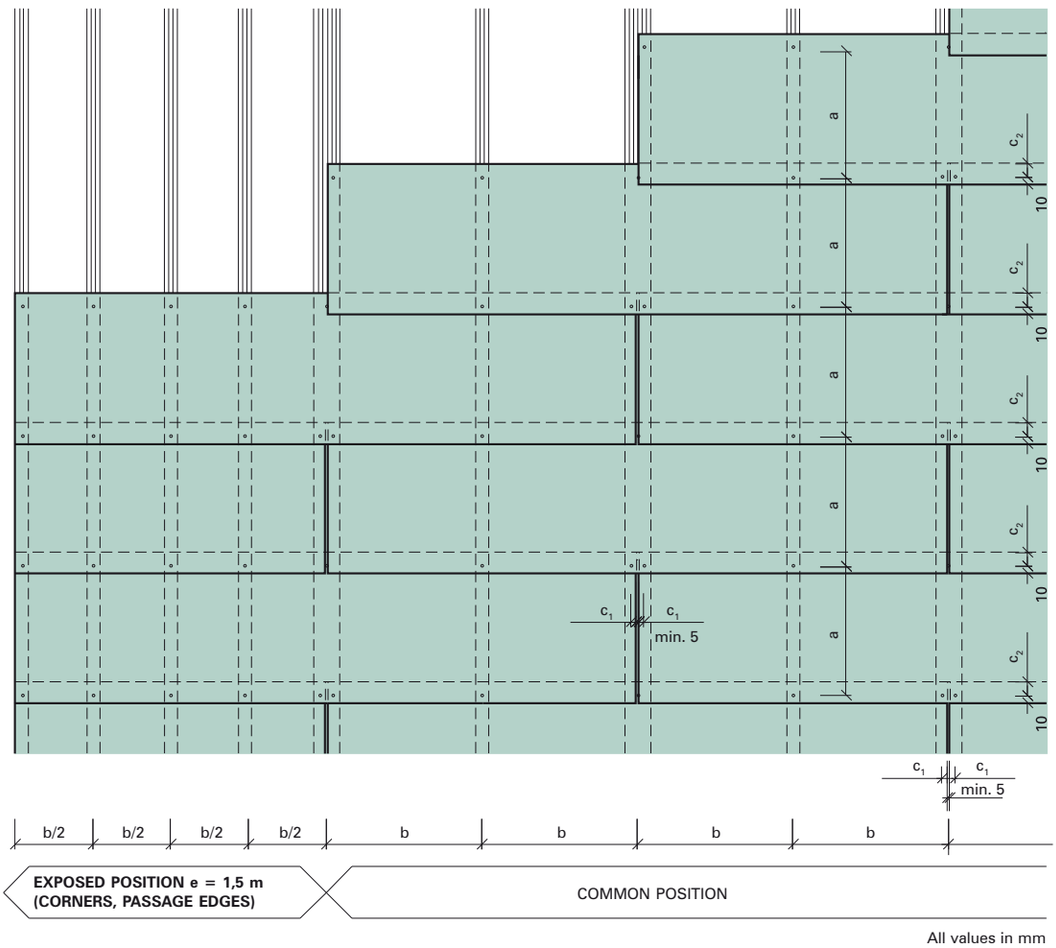
Board fixation to the load-bearing construction must allow for dilations caused by volume changes of the façade boards. The individual façade elements must be placed with joints of at least 5 mm. In the case of additional hole drilling the hole diameter in the PLANK system must be equal to 1.2 multiple of the diameter of the used screw shank.

CETRIS® boards for the PLANK overlapped joint system are supplied with chamfered bottom edge (45 deg.) or phased with semi-circular mill r = 3.2 mm (this does not apply to CETRIS® PROFIL in all modifications).

| BOARD THICKNESS (mm) | SCREW SPANS **a** (mm) | SUPPORT SPACING **b** (mm) | SCREW DISTANCE FROM VERTICAL EDGE $C_1$ (mm) | | | SCREW DISTANCE FROM HORIZONTAL EDGE $c_2$ (mm) | MAXIMUM LENGTH OF THE BOARD (mm) |
|---|---|---|---|---|---|---|---|
| | | | wood | zinc coat | aluminium | | |
| 8 | <400 | <420 | >35 <50 | | | 40 | 1,260 |
| 10 | <450 | <500 | | | | | 1,500 |
| 12 | <350 | <625 | | | | | 1,875 |
| 14 | <500 | <625 | | | | | 1,875 |
| 16 | <500 | <700 | | | | | 2,100 |

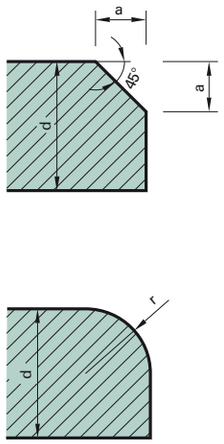
**Note:** The above values apply to a max. 30 m building height. In the case of higher building cladding with CETRIS® boards please contact the manufacturer.
**Warning:** The recommended maximum length of CETRIS® board for the PLANK system equals to triple the spacing of the auxiliary vertical profiles (laths) – i.e. for board thickness 10 mm max. 1,500 mm and for board thickness 12 mm max. 1,875 mm.

**Diagram of CETRIS® board laying in the PLANK system**




All values in mm

**Edge chamfering, edge rounding in the case of CETRIS® boards for the PLANK system**



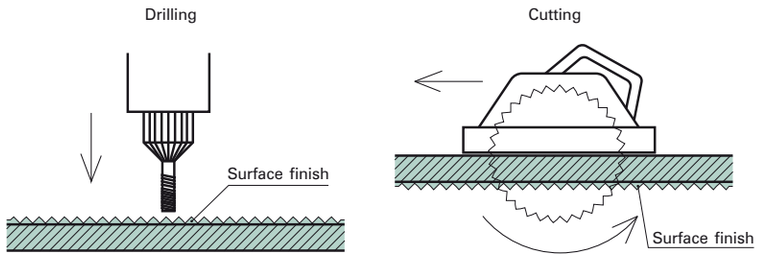

**a = min. 2 mm, max. 5 mm**
**r = 3.2 mm**
**d = thickness of CETRIS® cement bonded particleboard**

# 8.5 Processing of CETRIS® Façade Boards

CETRIS® cement bonded particleboards can be cut with a circular saw with a hard metal tipped blade. For a clean and straight cut it is necessary to use a guide bar and cut the broads from the reverse side to protect the front face against damage.
**Immediately after processing of the boards, the open edges must be be clean from dust, and coated.**

Holes are pre-drilled with a no impact drill on a firm surface. It is recommended to use a drill bit for metal drilling. The holes are drilled from the front side.

**Processing of CETRIS® boards with surface finish**




# 8.6 Packaging and Storage of CETRIS® Façade Boards

CETRIS® cement bonded particleboards are supplied on wooden transport pallets wrapped in protective foil. The individual CETRIS® FINISH and CETRIS® PROFIL boards are separated with softened inlays preventing board damage during transport. The boards may be stored wrapped on a stable firm surface in a dry place protected against rain and dust.

# 8.7 Composition of CETRIS® Façade System

## 8.7.1 Base Construction

The base construction must meet all requirements of the relevant technical standards for these constructions (prescribed by Czech national technical standards – ČSN, construction and technical certificates, and technological procedures). They must above all be homogeneous, coherent, firm and straight, both locally and overall. The individual firmness values for the base are given by the requirements of the individual manufacturers of anchoring technologies and their regulations for designs of individual anchoring elements.

## 8.7.2 Heat Insulation

Where heat insulation is required use hydrophobic boards of mineral fibre of WV type pursuant to DIN 18165 with a valid national certificate is recommended. The recommended classification of reaction to fire pursuant to EN 13 501-1 is A1, or A2, as the case may be. The minimum thickness of the boards is given by the manufacturing programmes of the individual manufacturers and the requirements for heat resistance of the insulation layer (thermal technical calculation).

**Recommended types of mineral boards**

| Manufacturer, contact | Product | Diffusion resistance factor | Heat conductivity coefficient | Flammability level pursuant to EN 13 501-1 |
|---|---|---|---|---|
| **Saint-Gobain Insulations** www.isover.com | ORSIL FASSIL | 1.4 | 0.035 W/mK | A1 |
| | ORSIL HARDSIL | 1.0 | 0.035 W/mK | A1 |
| **Rockwool International A/S** www.rockwool.com | AIRROCK ND | 3.55 | 0.035 W/mK | A1 |
| | AIRROCK ND | 3.55 | 0.035 W/mK | A1 |

The insulation boards are fixed with disc dowels in lengths as instructed by the manufacturer.
The minimum number of dowels per m² is given by instructions of the mineral board manufacturers.

## 8.7.3 Air Gap

The air gap serves for exhaustion of atmospheric humidity and rain and snow moisture penetrated into the open system through joints and for removal of humidity diffusing from the base construction. In the summer the air gap prevents temperature increase in the load-bearing base construction. Humidity condensation in the vented space mainly depends on the intensity of volume flow and speed of the venting stream. The minimum size of the air gap is 25 mm, max. 50 mm.

## 8.7.4 Wind Tight Safety Hydro Insulation

The basic function of these membranes is to provide for wind tightness and limit air movement from/to heat insulation. Another function of these membranes is to prevent water penetration and effectively remove vapours.

The most frequent manifestations of air movement inside the vented façade in the gap between the lamellas and the heat insulation include chimney effect and wind. Thanks to this movement there is heat loss by air flow – heat is exhausted from the heat insulation. In the same way mechanical particles may get into the insulation such as dust which may absorb moisture and negatively affect heat insulation properties. Water may get into the construction of the suspended façade in different ways (rain, gravitation etc.).

A suitable product is DuPont™ Tyvek® Façade – a wind tight and highly vapour permeable membrane. The membrane is laid directly on the surface of the heat insulating materials, anchored with disc dowels and Tyvek® system tape in the places of anchor and disc dowel piercing of the membrane and in the places of membrane overlaps.


## 8.7.5 Wooden Load-Bearing Grid

**Load-bearing constructions**
The load-bearing construction consists of a wooden lath and plank grid. The laths and the planks are made of quality spruce cut timber dried to a max. 12% humidity. Thus dried timber is impregnated with a suitable agent against mould and rot.

**Primary – horizontal – grid**
This grid is used with added heat insulation. The thickness corresponds to the thickness of the insulation, minimum width 50 mm. The size, the anchoring and the spacing are to be specified by the designer on the basis of static and thermal technical assessment of the peripheral construction.

**Secondary – vertical – grid**
The grid forms the venting gap between the façade coat and the load-bearing construction for the façade boards. The lath thickness depends on the structure of the primary grid laths and on the gap venting profile – the minimum cross section should be 250 $cm^2$/m and the max. 500 $cm^2$/m. This means the minimum distance of the inside face of the façade board from heat insulation or load-bearing wall of the building is 25 mm and the max. is 50 mm.

The laths are fixed to the primary grid in spacing depending on the type of the façade cladding. The lath width in the places of contact of two façade elements is a min. 80 mm, the laths in between are 50 mm wide.

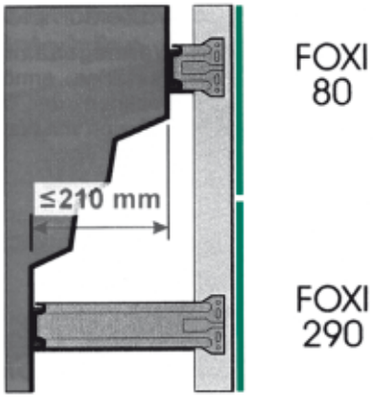
## 8.7.6 Aluminium Load Bearing Grid – Profiles STYL 2000

**Load-bearing construction**
The load-bearing construction is supplied by the company STYL 2000 Brno. The EUROFOX system was developed by a company in Austria of the same name as load-bearing construction for vented façade coats. The STYL 2000 load-bearing construction consists of a set of anchors, profiles and beams. The whole construction is corrosion-resistant thanks to its composition (aluminium, noble aluminium alloys /Al+Mg+Si/, or stainless steel) and resistant to aggressive environments. The economical, statically optimised construction of the basic elements of the system allows for a construction thickness of the coat ranging from 80 mm to 330 mm. Stability of the STYL 2000 load-bearing construction with regard to heat load is given by the system of fixed points and sliding beds (pre-drilled circular and oval holes in FOXI elements for load-bearing profile fixation).

The basic FOXI load-bearing elements level planarity defects of the base constructions within the scope up to 35 mm in the plane perpendicular to the basic reference plane thanks to the connection with the vertical load-bearing profiles using the groove and tongue system.

**FIXI Anchoring Element**
The FIXI anchoring element is made of aluminium alloy AlMg pursuant to DIN 4113, size 32/48/3 mm. The contact surface to the FOXI anchor is notched for increased static action. A circular hole is pre-drilled in the anchoring element with a diameter of 10.5 or 14.5 mm for fixation to the base with a screw and dowel.

**Elements of STYL 2000 System**




**FOXI Anchoring Element**
The FOXI anchoring element is made of aluminium alloy AlMg pursuant to DIN 4113, L shape, size 80/80 to 290 mm, sheet thickness 2 mm. It includes two circular holes with a diameter of 20 mm for the fixation of the FIXI element with a screw and a dowel to the base. For connection with vertical beams the elements are provided with a groove with two circular holes with a diameter of 50 mm (fixed point) and two oval holes with a diameter of 5.0/15 mm (slide connection).

**T, L and Corner Vertical Beams**
The T, L and corner vertical beams are made of aluminium alloy Al Mg Si 05 F25 pursuant to DIN 4113, length 6,000 mm, sheet thickness 1.6 mm.

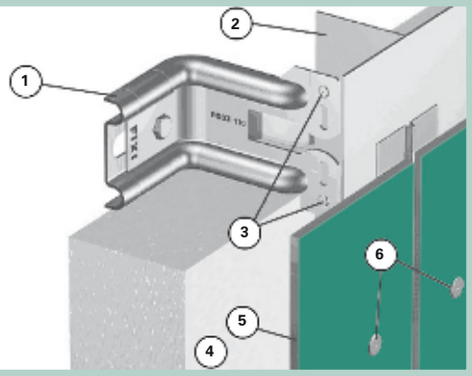
| | |
|---|---|
| L profile | size 60/40 mm |
| T profile | size 60/80 mm |
| Corner profile | size 30/30 mm |

**UNI Joint**
To form the load-bearing grid of combined materials (aluminium anchor, wooden vertical beam) there is the UNI joint. The connections of the individual elements are secured with screws. All wooden elements must be impregnated for protection purposes.

**Self-Cutting Screws 4.2/16 mm**
Self-cutting screws 4.2/16 mm are made of noble steel A4 (corrosion-resistant, stainless) pursuant to DIN 4113. They are used for mutual interconnections of FOXI elements with vertical beams, for connections of auxiliary untypical profiles with the vertical beams pursuant to the project requirements.

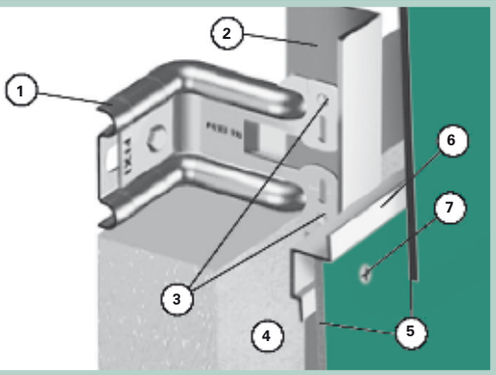
**Auxiliary Profiles**
Auxiliary profiles are made by local manufacturers pursuant to the project requirements from sheet metal, thickness 1 – 2 mm, of aluminium alloy AlMg 3 pursuant to DIN 4113.

**Elements of STYL 2000 system**
**FTA-V-100**



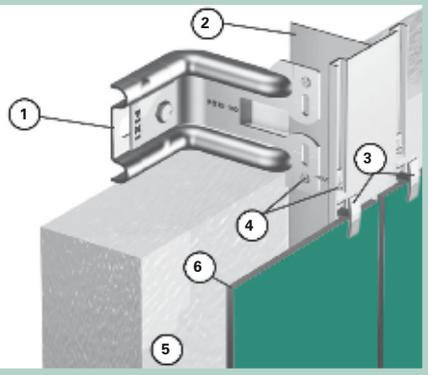

1 FOXI load-bearing anchor with screw and dowel
2 vertical T beam
3 stainless self-cutting screws
4 heat insulation of mineral hydrofobized boards
5 CETRIS® cement bonded particleboard
6 stainless screw

**Elements of STYL 2000**
**FLZ-v-500**



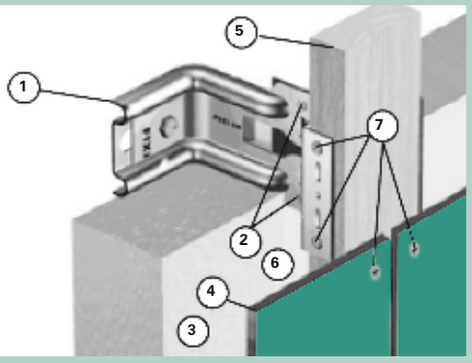

1 FOXI load-bearing anchor with screw and dowel
2 vertical L beam
3 stainless self-cutting screws
4 heat insulation of mineral hydrofobized boards
5 CETRIS® cement bonded particleboard
6 horizontal beam
7 stainless screw

**Elements of STYL 2000**
**FTC-v-200**




1 FOXI load-bearing anchor with screw and dowel
2 vertical T beam
3 aluminium clamps for fixation of CETRIS® cladding boards
4 stainless self-cutting screws
5 heat insulation of mineral hydrofobized boards
6 CETRIS® cement bonded particleboard

**Elements of STYL 2000**
**FUH-v-200**




1 FOXI load-bearing anchor with screw and dowel
2 stainless self-cutting screws
3 heat insulation of mineral hydrofobized boards
4 CETRIS® cement bonded particleboard
5 wooden impregnated beam
6 UNI joint for wooden beam fixation
7 stainless screw

## 8.7.7 Auxiliary Materials

**Screws for fixation of CETRIS® cement bonded particleboards to a grid**

For fixation of CETRIS® cement bonded particleboards **in the PLANK system** (overlapped system), stainless or galvanised screws with sunken heads are used.

**Screws recommended for CETRIS® boards in the PLANK system, thicknesses 10 (12) mm, wooden load-bearing construction:**

- Self-cutting screw for anchoring of CETRIS 4.2 × 35 mm.

**Screws recommended for CETRIS® boards in the PLANK system, thicknesses 10 (12) mm, EuroFox load-bearing construction:**

- EJOT screw Climadur-Dabo TKR 4.8 × 35 mm

For fixation of CETRIS® boards **in the VARIO system** (visible joints), stainless or galvanised screws with semi-circular or hexagonal heads with water-tight washers are used. These washers are coated on the bottom side with vulcanised elastomer EPDM for water-tight and flexible material joining. The type of the bolt/screw also depends on the base type – the load-bearing grid used.

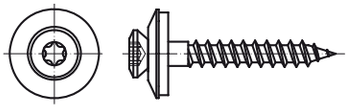
**Screws/bolts recommended for anchoring of CETRIS® boards in the VARIO system, wooden load-bearing construction:**

- JT 3 – 2 – 4,9 × 35 – E 14 (max. CETRIS® board thickness 12 mm)


- JT 4 – FR – 2 – 4,9 × 35 – E 14 (max. CETRIS® board thickness 12 mm)


- JA 3 – LT – 4,9 × 38 – E14 (max. CETRIS® board thickness 14 mm)


- VISIMPEX plumbing scres + EPDM, TX20 4,5 × 35 – 60 mm, stainless steel A2



- SFS TW-S-D12-A14-4.8 × 38, semi-lens timber
- Mage 7060 screw Topex 4.8 × 45 mm, timber, hexagon (max. board thickness 12 mm)
- Mage 7341 screw Topex Ufo 4.8 × 45 mm, timber, semi-lens (max. board thickness 12 mm)
- Visimpex CIBDJ 4,8 × 35 mm

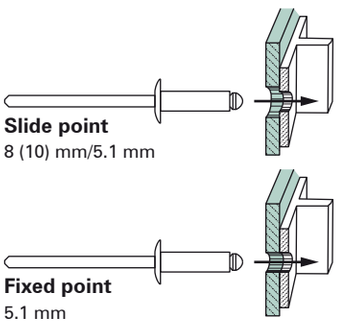
**Screws/bolts recommended for anchoring of CETRIS® boards in the VARIO system, aluminium or zinc-coated load-bearing construction:**

- JT 2 – 3 – 4,8 × 25 (38) – V 14


- SFS SX 3/15-L12-S16 – 5.5 × 38 mm – head IRIUS, CETRIS® board thickness 14 mm)
- SFS SX 3/15-S16 – 5.5 × 38 mm – hexagonal head, clamping length 15 mm
- Mage 7010 – self-cutting screw Topex Ufo 4.8 × 38 mm, to Al zinc-coated, semi-lens (max. board thickness 12 mm)

**CETRIS® board anchoring with rivets**

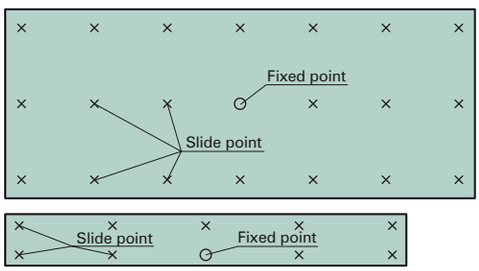
- CETRIS® board needs to be pre-drilled, diameter 8 mm in the case of slide point (or 10 mm for board lengths above 1,600 mm), or 5.1 mm for fixed point (diameter of rivet body).
- The positions of the pre-drilled holes in the board are similar to board anchoring with screws, with one hole in the board pre-drilled with the diameter of 5.1 mm (for the fixed point). The position of the fixed point is chosen pursuant to the board shape and the number of the holes, see diagram:



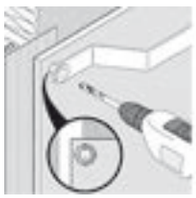
**Slide point**
8 (10) mm/5.1 mm

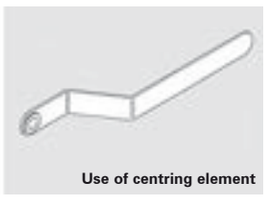
**Fixed point**
5.1 mm

- Stainless rivets are recommended for riveting, or zinc-coated rivets with powder paint variant are also acceptable. The minimum diameter of the rivet head is 14 mm. The length of the rivets depends on the clamping length (thickness of CETRIS® board + thickness of the load-bearing façade construction profile).




x ..... Slide point
o ..... Fixed point





Use of centring element

**Recommended rivet types**

- SFS - AP 14 - 50180 - S (size 5 × 18 mm, head Ø 14 mm, clamping length 10.5 – 15.0 mm)
- SFS - AP 16 - 50180 - S (size 5 × 18 mm, head Ø 16 mm, clamping length 10.5 – 15.0 mm)
- EJOT - K14 - Al/E 5 × 18 mm (head Ø 14 mm, clamping thickness 12 – 14 mm)
- ETANCO rivet Alu/stainless open 4.8 × 18 mm (head diameter 16 mm, clamping thickness 12 – 14 mm)
- BS 4.8 × 25 mm aluminium/stainless A2, head diameter 16 mm, clamping thickness 15 mm

**Note:**
When anchoring CETRIS® boards with screws or rivets it is necessary to install the anchoring elements exactly to the centre of the pre-drilled hole (diameter of pre-drilled hole is 10 mm or 8 mm pursuant to the lengths of the CETRIS® board). Centring elements may be used for accurate installation (for drilling, screwing).

**System of Invisible Fixation (Gluing) of CETRIS® Boards – SikaTack® Panel**
In the case of a requirement for invisible fixation (only applies to the VARIO system and vertical cladding) the CETRIS® boards may be glued to the grid. The recommended system is supplied by the Sika Company and consists of:

- Sika® Cleaner 205 – cleaner and activator for preparation of the glued surface with short venting time
- SikaTack® Panel Primer – primer for cladding boards, aluminium or wooden load-bearing elements
- SikaTack® Klebeland – assembly tape – two-sided adhesive tape for quick fixation of façade boards
- SikaTack® Panel – gluing filler

Recommended system developed by the company AUTO-COLOR consists of the following components:

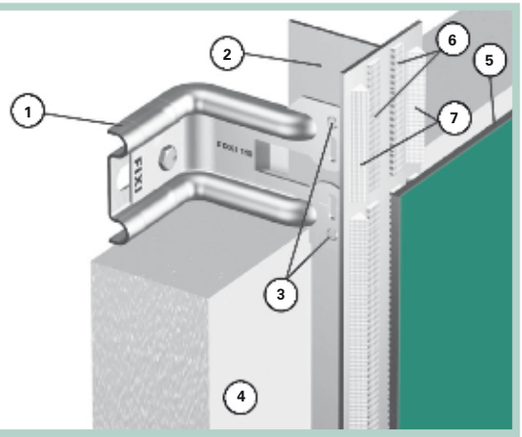
- Dinitrol 520 cleaner-activator – cleaning and activating agent for the preparation of the glued surface
- Dinitrol 550 Multiprimer – primer for facade panels, aluminum or wooden supporting elements
- SPADA double sided mounting tape – fixing adhesive tape for quick fixation of facade boards
- Dinitrol F 500 LP – structural adhesive

Gluing by this technology may only be performed by trained companies and employees, strictly following the effective technological procedure issued by Sika. Technical consultation with the technological department of Sika before gluing is necessary.

Basic principles for use of the SikaTack® Panel gluing system for CETRIS® cement bonded particleboard gluing:

- Recommended board thicknesses 10 and 12 mm
- Suitable bases – aluminium profiles and wooden laths (with planed surface on the gluing side), in the case of zinc-coated profiles surface treatment is necessary (pursuant to the instructions of the gluing system supplier)
- Maximum spacing of supports 500 mm (for 10 mm thickness), or 625 mm (for 12 mm thickness), maximum length of the CETRIS® board equals to triple the max. support spacing (i.e. 1,500 mm for 10 mm thickness and 1,875 mm for 12 mm thickness)
- The profiles must not be oriented horizontally, maximum acceptable profile (lath) length 5 m, dilations between profiles (laths) is necessary
- Dry execution, ambient temperature within the range +10° to +30° C and for at least 5 hours after the assembly the lower limit may not be exceeded

**Board Gluing with SIKA System**




1 FOXI load-bearing anchor with screw and dowel
2 vertical T beam
3 self-cutting stainless screws
4 heat insulation of mineral hydrofobized boards
5 CETRIS® cement bonded particleboard
6 two-side adhesive tape
7 special gluing filler

- Board gluing recommended up to max. 12 m height
- Assembly may only be performed by trained staff acquainted with all principles and requirements.

**Joining Flexible Fillers**
For CETRIS® cement bonded particleboard laying in the PLANK systems flexible fillers are recommended for application under the free ends of the façade boards. The recommended types are acrylic fillers with tensile strength min. 0.1 MPa.

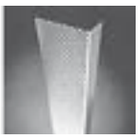
**Rubber Tapes and Washers**
Rubber tapes and washers are used as prevention of contact and fissure corrosion resulting from contact between elements of aluminium alloys and other metals, or for the extended life of wooden constructions (the washers are placed under the vertical joint in the points of contact between two cladding boards on a wooden grid).

**Anchoring Technique**
Wooden grids are fixed with HILTI HRDU, MUNGO, MEA, EJOT, UPAT, POLYMAT etc. frame dowels. The layout and types of the dowels is specified by the designer. Stainless or galvanised screws are to be used for fixation of vertical laths to horizontal ones (secondary and primary grid).

**Complementary Profiles (Laths) to the Façade System**
Details of suspended vented façades (bottom end – venting, upper end – venting, cladding of the openings, external/internal corners etc.) are resolved with shaped profiles (laths) of zinc-coated metal (with optional colour finish), aluminium sheets or PVC (Protector, Baukulit, DK GIPS systems).

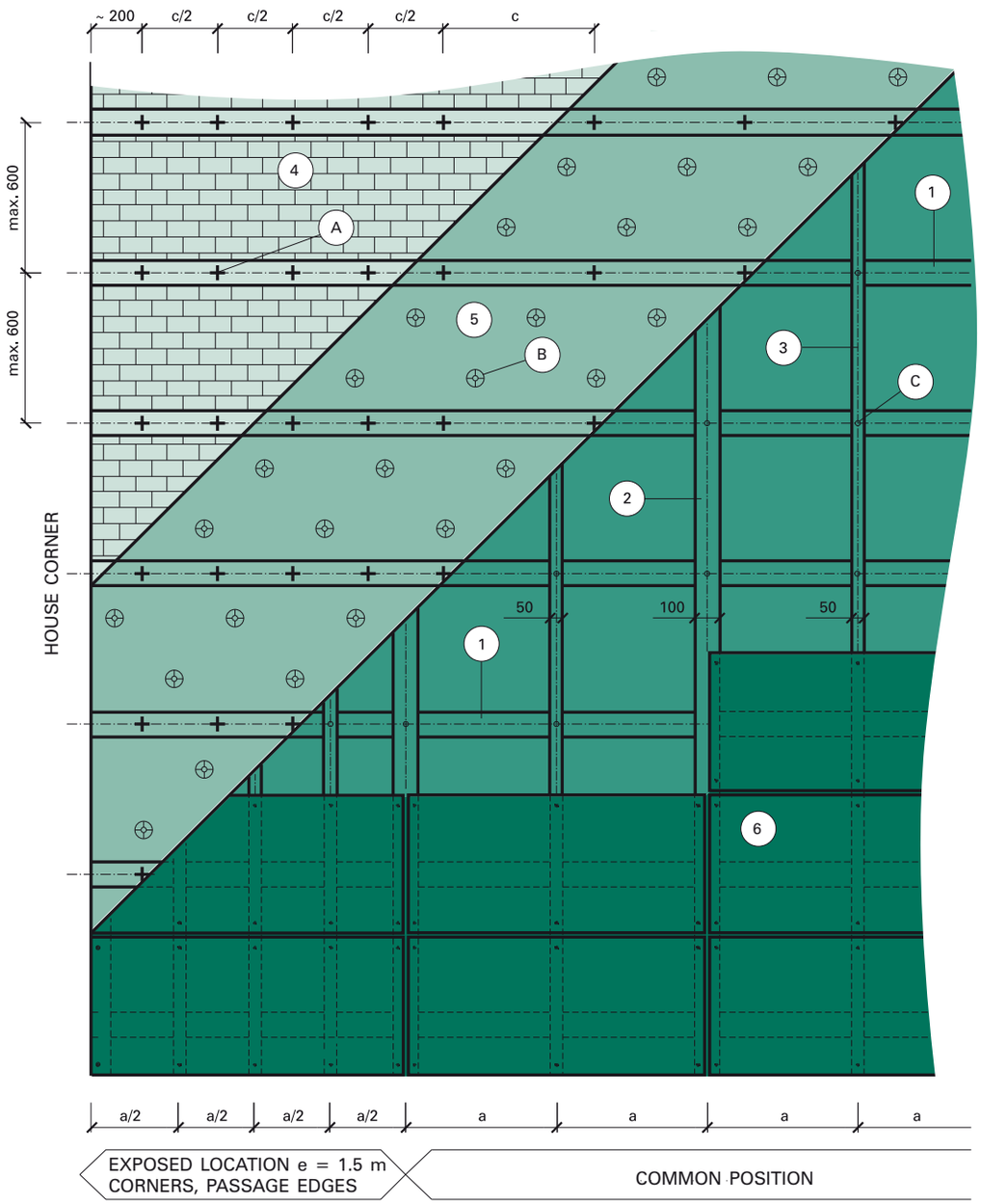
**Clamps for Cladding Board Fixation**
Alternatively the CETRIS® cement bonded particleboards may be clamped or clipped with ETANCO clips. In this case, due to the local fixation of the board along the perimeter only the maximum acceptable format of the CETRIS® board is 400 by 400 mm. **Use of larger formats must be consulted with the manufacturer!**





# 8.8 Technological Procedure of Assembly of CETRIS® Façade System

**CETRIS® VARIO façade system sectional view with thermal insulation on wooden grid**




**Key to anchoring elements:**

**A) Fixation of horizontal profiles to house wall:**
- Concrete wall – frame dowel Hilti HRD, c = 750 mm
- Porous concrete – frame dowel Hilti HRD, c = 600 mm
- Masonry wall – frame dowel Hilti HRD, spacing c = 600 mm
- Base load-bearing capacity must be tested especially in the case of porous concrete

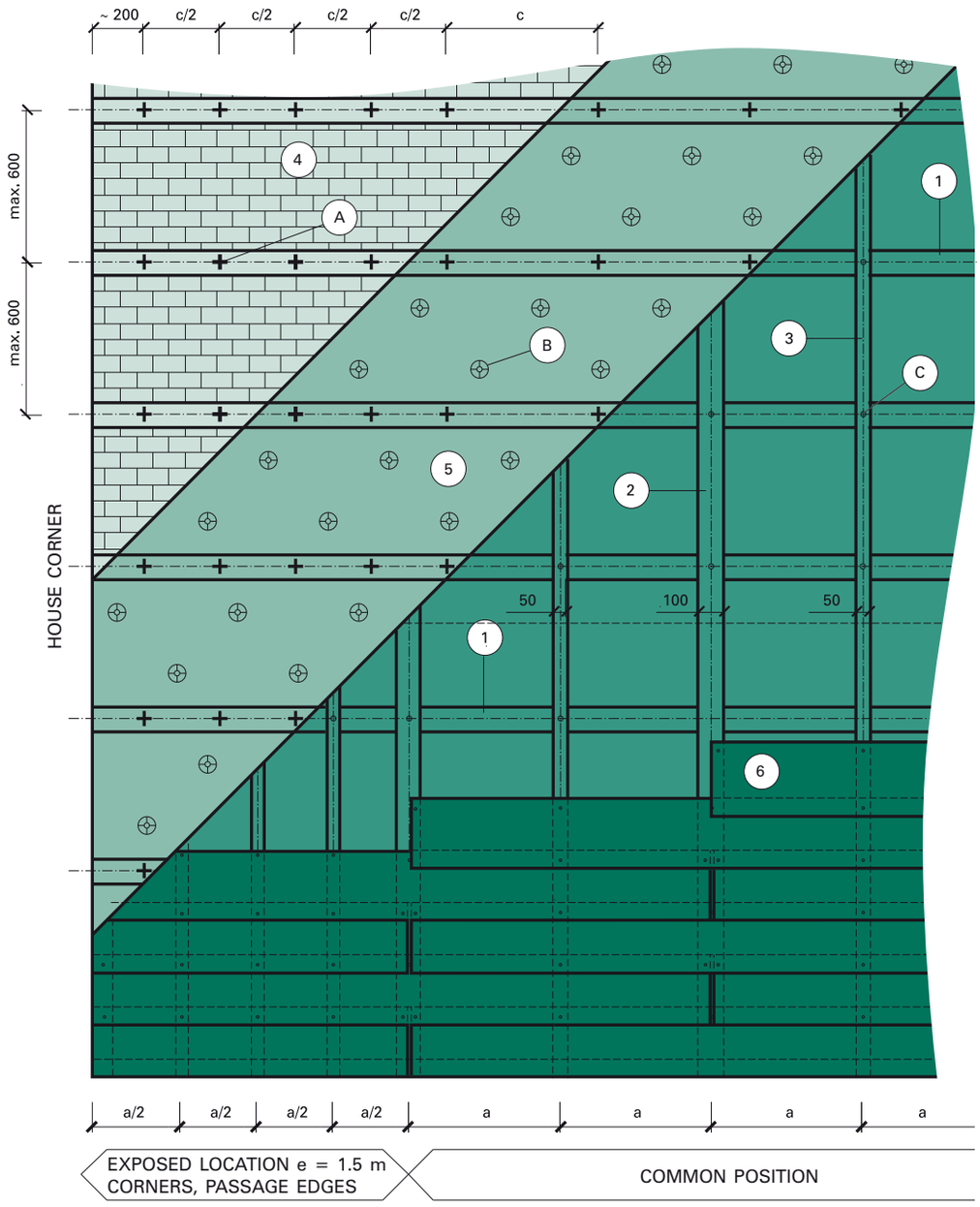
**B) Fixation of heat insulation layer:**
- Disc dowels (depending on the insulation type and thickness) pursuant to the instructions of the insulation material manufacturer

**C) Fixation of vertical laths to horizontal profiles:**
- Screws 6.3 × 80 mm, min. galvanised

**1 horizontal wooden profiles min. 100× heat insulation thickness in mm**
**2 vertical wooden laths 100 × 32 mm**
**3 vertical wooden laths 50 × 32 mm**
**4 base construction**
**5 heat insulation**
**6 CETRIS® cement bonded particleboard**

All values in mm

**CETRIS® PLANK façade system sectional view with thermal insulation on wooden grid**




**Key to anchoring elements:**

**A) Fixation of horizontal profiles to house wall:**
- Concrete wall – frame dowel Hilti HRD, c = 750 mm
- Porous concrete – frame dowel Hilti HRD, c = 600 mm
- Masonry wall – frame dowel Hilti HRD – spacing c = 600 mm

**B) Fixation of heat insulation layer:**
- Disc dowels (depending on the insulation type and thickness) pursuant to the instructions of the insulation material manufacturer
- Base load-bearing capacity must be tested especially in the case of porous concrete

**C) Fixation of vertical laths to horizontal profiles:**
- Screws 6.3 × 80 mm, min. galvanised

**1 horizontal wooden profiles min. 50× heat insulation thickness in mm**
**2 vertical wooden laths 100 × 32 mm**
**3 vertical wooden laths 50 × 32 mm**
**4 base construction**
**5 heat insulation**
**6 CETRIS® cement bonded particleboard**

All values in mm

## 8.8.1 Assembly of Wooden Load-Bearing Façade Construction

**Specification of basic axes and reference plane for brick laying**
If possible the basic axes should be specified, especially the widths of the little pillars between windows, together with the reference plane for façade coat base plane.

**Load-bearing wooden construction of suspended vented façade:**

**Installation of primary grid – horizontal laths**
Fix the wooden laths with dowels to a levelled base for corresponding stability of the resulting load-bearing construction. When selecting the type and size of the dowels the fittingness of the base must be considered. If the base is not sufficiently flat put wooden pieces under the laths to achieve local and overall planarity. To level the individual surfaces place vertical wooden laths along their edges first. Nail the laths and stretch a line between them.
Now the front plane of the wooden grid is specified. The other horizontal laths must be aligned to this plane with the help of wooden pieces or cutting into the wall. Afterwards tighten the laths.

**Heat insulation layer assembly**
For heat insulation first fix the horizontal laths to the base (lath thickness to be identical with the insulation thickness). Then place lengthwise heat insulation and fix to the base with disc dowels. The heat insulation layer is fixed with disc dowels pursuant to the requirements of the anchoring technology manufacturers. The number of the disc dowels is to be specified by the designer on the basis of recommendations of the heat insulation material manufacturers.
The heat insulation layer must adhere to the base, must be continuous without open joints (the individual parts must be placed tightly side by side!). The disc dowels must be firmly fixed to the base and must be tightened to the heat insulation layer.

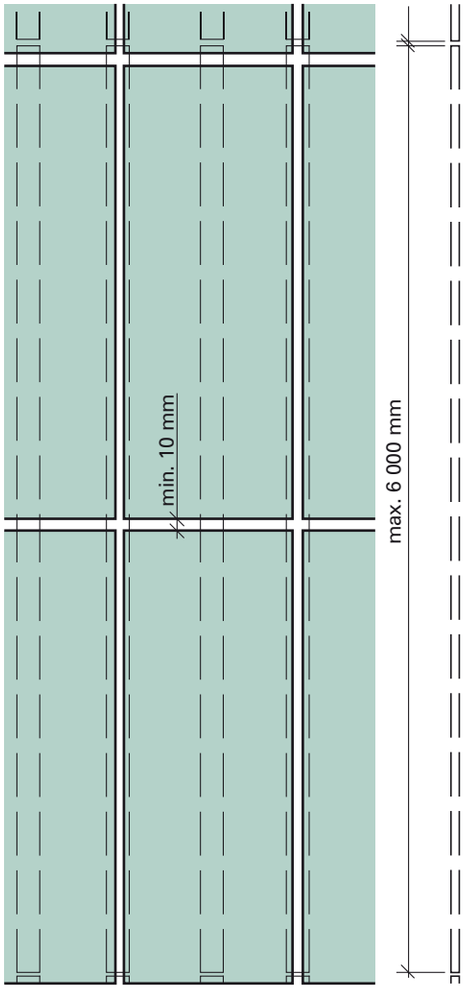
**Installation of secondary grid – vertical load-bearing laths**
Vertical load-bearing laths (minimum width 50 mm, or min. 100 mm in the points of contact between two boards) are fixed with screws to the primary grid. The axial distance between the laths must not exceed the specified values. After fixation of the vertical laths the grid will include an air gap with a minimum width of 25 mm and a maximum width of 50 mm.

**Installation of auxiliary constructions**
The auxiliary constructions are installed pursuant to the requirements of the detail drawings included in the manufacturing documentation. They mainly include auxiliary vertical and horizontal laths defining openings (jambs and heads of windows and doors), inner and outer corners, bottom and top lining etc.

**Maximum length of wooden lath grid is 6 m.** Wooden elements must be dried and treated against humidity, insects and ligniperdous pests. In the case of a combined grid, anchors must be placed on both sides of the wooden laths alternatively (for reduced twisting).

The minimum dilation between the laths in the places of horizontal joints must be 10 mm. Stainless anchoring material is recommended for joining.

**Dilations – wooden grid**




## 8.8.2 Assembly of Aluminium or Zinc-Coated Load-Bearing Construction

Regarding the high thermal expansion the **grid of aluminium profiles** is only made of L profiles, i.e. the vertical contact between boards is always made of **two separate L profiles**.

When assembling the grid of **zinc-coated profiles** it is acceptable to use a **joint profile** for CETRIS® board laying in widths of **up to 1,875 mm**. **In the case of wider boards** (lengthwise laying) the procedure will be the same as in the case of aluminium sub-construction, i.e. **instead of a joint profile use two separate L profiles**.

**The maximum length of an aluminium and zinc-coated profile grid is 3.35 m. The minimum dilation between profiles in the place of horizontal joints must be at least 10 mm.** The load-bearing grid (fixation and spacing of anchors, profile anchoring – fixed and slide points etc.) must be assembled pursuant to the instructions of the grid supplier. All joining materials for aluminium grids must be stainless.

**Fixation of a CETRIS® board to two different grids (different materials or different dilation units) is not permitted!**

**Correct assembly of L profiles in the place of vertical joint**

**Diagram of aluminium L profile installation**

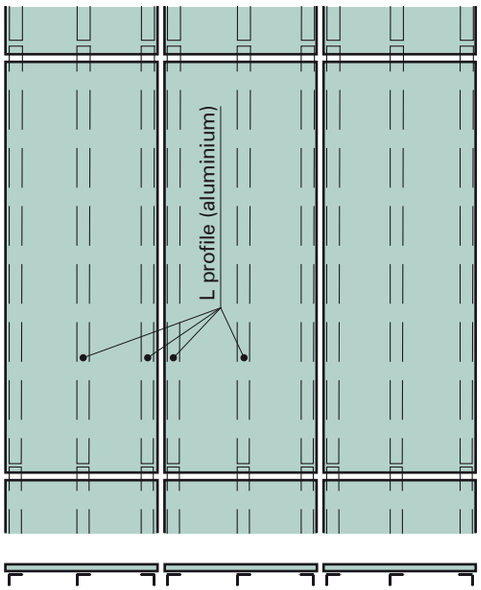



**Diagram of profile installation for board widths > 1,875 mm**

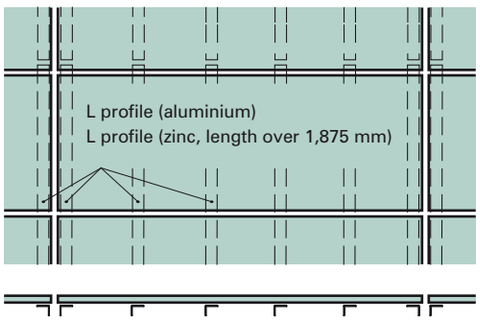
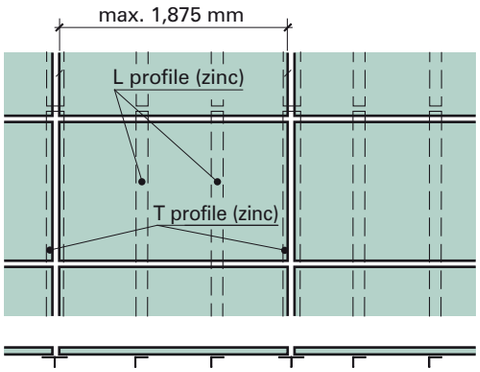
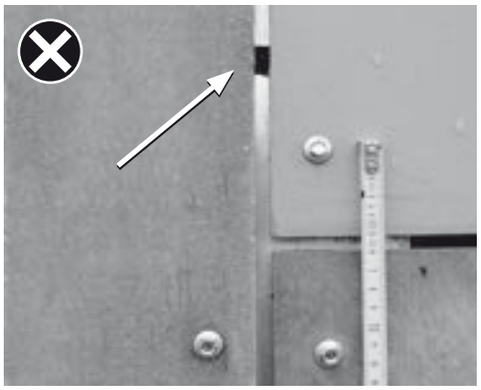



**Diagram of zinc-coated profile installation for boards widths > 1,875 mm**



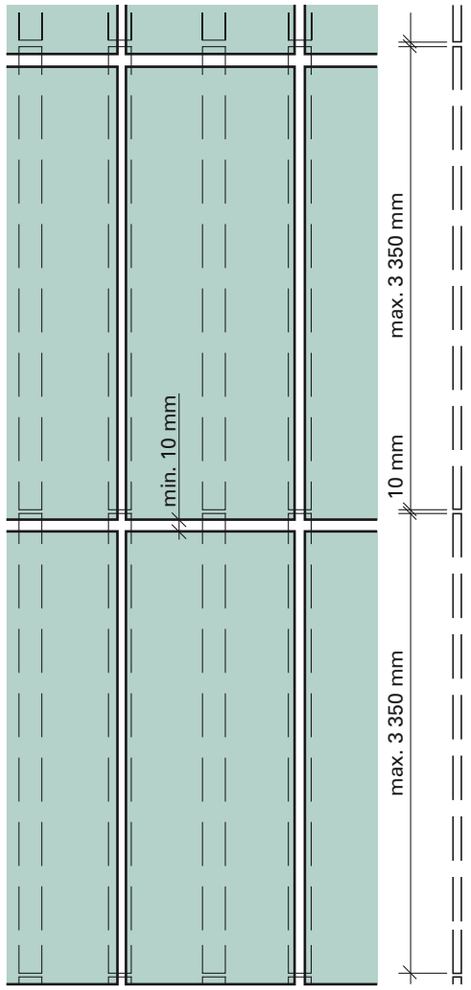

**Exceeded support spacing**
Insufficient anchoring of CETRIS® boards (exceeded maximum spacing of profiles and screws) causes deformations (bulging or swelling) or board damage (cracking)!



**Incorrect grid dilation**
Incorrect profile dilation off the horizontal joint level between CETRIS® boards.

**Unlevelled board base**
When using auxiliary profiles (corner, joint fills) the surface must be levelled along the profile height.

**Dilation – grid of aluminium or zinc-coated profiles**




**Correct use of rubber tape**
For base levelling and board dilation facilitation, a rubber EPT tape must be placed under the CETRIS® boards. The tape will prevent the immediate transfer of heat, humidity and potential corrosion dripping (zinc-coated grid).

## 8.8.3 Assembly of DEKMETAL Load-Bearing Construction

Assembly of the façade system onto a DEKMETAL load-bearing construction may be divided into the following steps:

- Horizontal grid formation
- Thermal insulation assembly
- Diffusion foil fixation
- Vertical profile assembly
- Assembly of façade cladding itself including detail solutions

The first two steps depend on the type of the base construction – whether it is a skeleton with C cassettes used or a wall with brackets and profiles used. Further steps are identical.

The first step of the façade system assembly includes creation of the horizontal part of the grid. If the load-bearing construction is of the skeleton type then C cassettes are used. If the façade cladding is installed to a load-bearing wall then the grid consists of a system of brackets and Z50 profiles.
The following text describes the more common assembly variant – on a brick or concrete wall. The procedure of assembly over C cassettes (assembled base construction) is available from the system supplier.

The DEKMETAL load-bearing system is governed by the same principles for the vertical profile and anchoring element spacing – see tables Maximum Axial Distances of Anchoring Elements in chapters 8.3 CETRIS® VARIO façade system and 8.4 CETRIS® PLANK façade system.

**Tools**
The following tools are used for assembly of the DEKMETAL façades:
- Tighteners – electrical with deep stop and tightening torque. Deep stop is usually used for assembly of the steel construction itself. The tightening torque is applied to anchoring bolts.
- Electrical cutting shears – used for lacquered sheet metal cutting. The shears make straight and curved cuts. They may even cut bent sheets with a special type of cutting head.
- Manual or electrical metal saw – manual saw suffices for minor works. Electrical saw is recommended for longer cuts.
- Riveting tongs – for minor riveting works such as riveting of gutters manual riveting tongs are sufficient.
- Sheet cutting shears. For adaptations of thicker sheets (above 1 mm) lever shears are recommended. Always use a set of left and right shears.
- Folding pliers – for manual folding works two types of folding pliers are used – straight for sheet folding and curved for groove making.

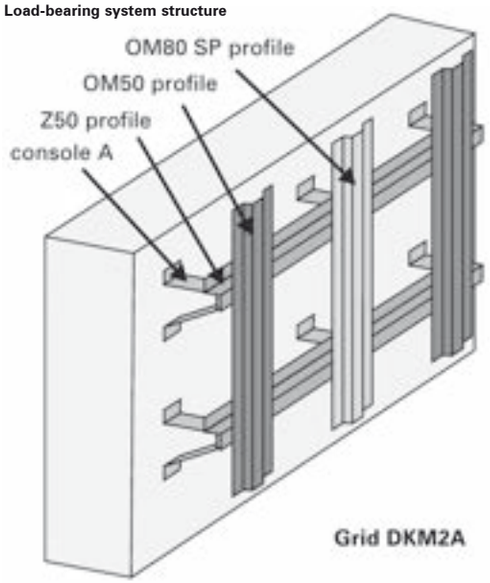
| STRUCTURE TYPE | ON SILICATE WALL | ON C CASSETTE WALL (ASSEMBLED CONSTRUCTION) |
|---|---|---|
| Load-bearing base | Brick concrete wall | Load-bearing C-cassettes |
| Fixation to base | DEKMETAL brackets | |
| Horizontal line elements | Z50 Profile | |
| Oblique line elements | Z50 Profile | Z50 Profile |
| Vertical line elements | Omega 50 (80) Profile | Omega 50 (80) Profile |
| Cladding element | CETRIS® FINISH, FINISH PROFIL, thickness max. 16 mm | |

- Fixation pliers – for temporary fixation of sheets. Measuring equipment – meters, bands, plummets, levelling instrument, theodolite.
- Resawing laser
- Drill.

**Assembly of Horizontal Line Elements of Grid – Brackets and Z 50 Profiles**
For point anchoring to continuous base (brick or concrete wall) there are brackets with pre-drilled holes marked in the drawing documentation. Check the planarity of the existing façade before assembly commencement. Find out the most bulging place of the façade and the difference between the bulge and the façade corners.

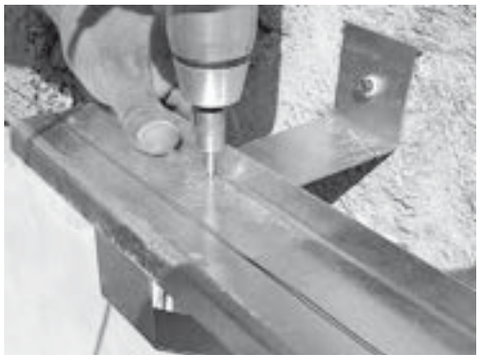
Use the anchoring plan to mark the bracket rows. Mark the bottom row with the foundation L profile with a levelling instrument, and measure the remaining rows with a tape measure. Connect the end points with a colour string and mark the rows on the façade. Use the anchoring plan to fix the brackets to the drawn rows. Fix every bracket with the designed anchoring bolts. After fixation of the end anchors use the plummet to mark the vertical. The vertical should be placed about 2 cm behind the anchor fronts. Join these points in the horizontal direction with a tie wire. Thus the perfectly planar grid has been marked for installation of Z 50 profiles. If you can use a rotary laser, use it for the plane marking instead of the ropes.

**Load-bearing system structure**




Z 50 profiles are fixed to the suspended brackets with self-cutting screws. Place the Z 50 on the suspended brackets, check their correct positioning in relation to the tie wire and screw to each suspended bracket with one screw. The distance of the front belt of the Z50 profile must not be more than 30 mm away from the anchor front.

**Installation of Z50 profile on anchor**



**Use of rectification profile**

If the façade roughness exceeds the levelling limits of the Z50 profile, a U shaped rectification profile must be used. Place the profile on the horizontal surface of the bracket to support the Z profile and screw to the bracket with two bolts. Then place the Z50 to the rectification profile and screw the two profiles together.
The Z50 profiles are connected by overlaps of 100 mm, screwed in the overlapped sections with two self-cutting screws. One in the leg and the other in the front belt. The screws should be placed diagonally in relation to the overlapping sections.
If connecting profiles join at the outer corner of the object, screw them together or bend the profile to form the L shape and connect to the other profiles. Inner corner profile connections are made in a similar way.

In the course of the horizontal grid assembly place the first part of the foundation profile to the wall base. The base moulding detail is implemented before assembly of the individual cladding elements of the façade system. Sufficient attention must be paid to correct marking and assembly of the moulding elements for they will define the basic foundation level of the whole cladding. In the course of assembly of the Z50 profiles, anchor the L shaped foundation profile to the wall. Place the anchoring elements with the spacing of 500 mm. The position of this element creates the foundation plane for all cladding elements. The element must be installed horizontally at the height defined by the laying plan. Together with the n profile assembly fix the second part of the foundation profile to the wall base. Level the profile on both ends with the omega profiles, check planarity and fix with fixing pliers. Screw both parts of the foundation profile from the bottom with the spacing of 500 mm. After that draw the diffusion foil between the foundation profile and screw together the omega profiles.

After fixation of the omega profiles fix the L shaped venting lath. The lath end should touch the gutter nose of the foundation profile. The lath position can be seen in the detail drawing. Fix the laths with screws or rivets.

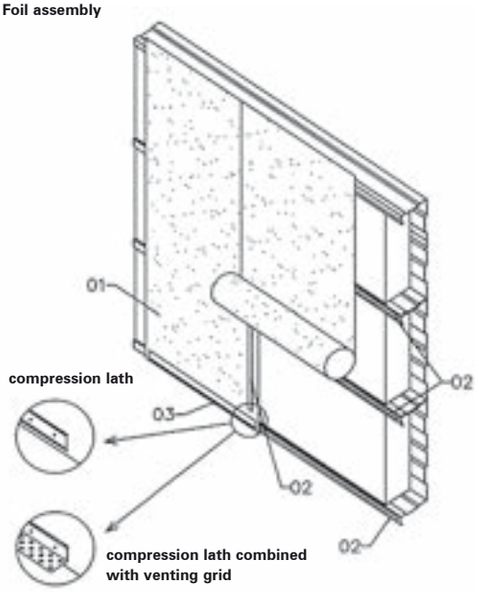
**Safety Hydro Insulation and Air Tight Layer Effectively Permeable for Vapour**
The contact diffusion foil with equivalent diffusion thickness below 0.3 m performs several functions in the façade structure:

- **Safety hydro insulation** – cladding of CETRIS® boards is not perfectly water-tight. Precipitation water in liquid state gets into the construction through small gaps between the individual elements of the coat. Near through passes and openings for the façade venting wind blown snow gets in.
- **Air tight layer** – prevents infiltration. The well joined and worked layer prevents air penetration between the interior and the exterior (especially through details). In the structures with C cassettes air tightness of this layer is a must (the only air tight layer in the structure).
- **Protection of heat insulation against surface cooling** – in the areas of inlet and outlet openings there is the risk of the cold exterior air blowing in the fibres of thermal insulation with short-term reduction of their effectiveness.
- **Protection of heat insulation against dust** – heat insulation properties may also be impaired by dust deposits on the heat insulation fibres. The rate and level of effectiveness decrease depends on the exposition level – that is on the building location.

**Connection of Z50 profiles, overlap 100 mm**

The foils are supplied by their manufacturers with suitable adhesive tapes for joint gluing and detail lining. The foils are fixed to the wall in vertical strips. First fix the two-sided adhesive tape on the Z50 profile belts or C cassettes (polyethylene or butyl-rubber tapes are the most common types used). Roll the foil along the heat insulation and fix the foil to the tape. Anchor the foil by the wall base with a compression lath. Then install the vertical profiles. Timely installation of these elements will prevent the risk of the foil tearing off because of wind. The following strip is laid in the same way with the overlap prescribed by the manufacturer. Fix the foils with the tape in the places of their overlaps.

**Foil assembly**




**Assembly of Vertical Omega Profiles**
Vertical omega profiles are used for definition of the air gap and for creation of the base for the cladding element assembly.
The DEKMETAL portfolio includes two types of these profiles – omega 50 with a 50 mm inside belt width and omega 80 with an 80 mm belt width. The invisible profiles are made of zinc-coated steel. The visible profiles may be painted with a polyester paint.
Use of the individual profile types is defined in the laying plan and assembly principles for CETRIS® boards.

Before starting the assembly first measure and divide the whole wall and check the actual data against the drawing documentation. Mark the position of the omega profile in the middle of the wall. When assembling the first profile make sure it is vertical. Fix the profile in the bottom part with the fixation pliers and screw to the Z profile belt (or to the C cassette) with one screw. Check the verticality of the profile with a spirit level and plummet if necessary and screw it in. Fix the following omega profile with an overlap of 100 mm, and screw the ends with two screws. Check the verticality of the first row after every element assembly using the plummet.
Continue with the omega profile assembly from the middle row. Use spacing laths for maintaining a constant distance.

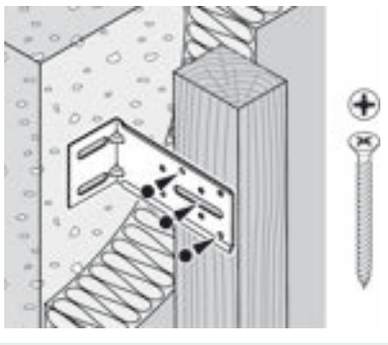
Technical service in the areas of design, supply and assembly of this load-bearing construction is provided by the supplier DEKMETAL s.r.o.

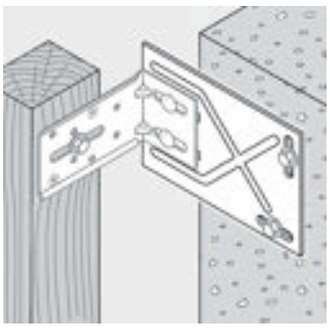
## 8.8.4 ETANCO Load-Bearing Construction

The company ETANCO CZ s.r.o. supplies anchoring (fixation) elements and anchoring technology for civil engineering, especially in specific sectors such as façade and roof cladding, cladding of vented façades, flat roofs etc. The company also provides technical service in the areas of design, supply and assembly of this load-bearing construction.

### COMBINED LOAD-BEARING CONSTRUCTION – WOODEN AND METAL ELEMENTS

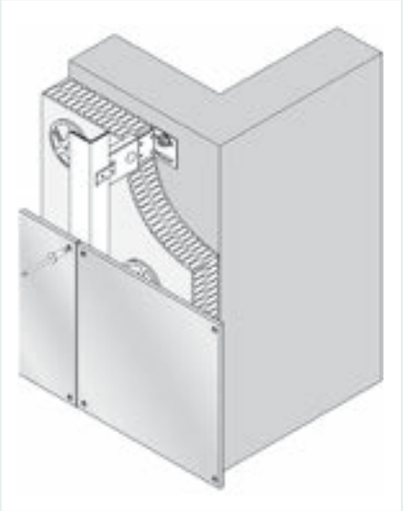
Used for cladding up to 9 m high without limitations, and in the case of higher buildings on the basis of individual assessment of the whole composition with a view to the requirements of ISO 5658-4 for vertical flame spread. The main advantage is variability and affordable pricing.





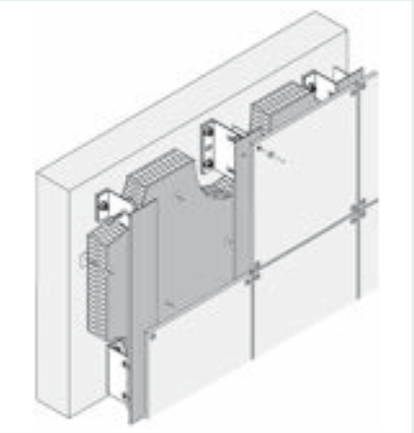
### STEEL CONSTRUCTION

No limitation of maximum height by fire protection regulations. The main advantage is affordable pricing. The design and assembly of the façade boards on the construction must provide for sufficient board and grid profile dilation (max. 3.35 m).
The basic system element of the combined and steel construction are pressed reinforced anchoring brackets of galvanised steel Z 350 – ISOLCO 3000P for vertical grids and BRACKETS for horizontal grids connected with the L construction profile.



### ALUMINIUM CONSTRUCTION

Its advantages include quick and easy assembly. Zinc-coating or other protection not needed. Lower weight (in comparison to steel) allows for suspending higher weights on the construction or reduction of the spacing and thus the number of anchors.
The design and assembly of the façade boards on the construction must provide for sufficient board and grid profile dilation (max. 3.35 m).
The aluminium construction system Façalu LR 110 consists of an ISOLALU wall L piece. These pieces are made in ten different lengths and may be regulated within the range of 68 – 278 mm.
The main element of the grid is represented by three basic aluminium profiles – T, L and Omega. The system also includes polypropylene pressed washers preventing thermal bridge between the load-bearing construction and the L piece.



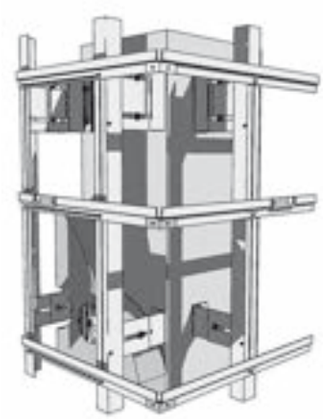
## 8.8.5 Hafix bearing structure

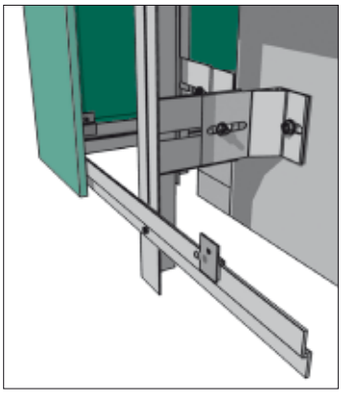
Visimpex a.s. is a manufacturer of complex aluminum façade system Hafix, which is developed in cooperation with company CIDEM Hranice. It is a construction aluminum mounting system for mounting of facade and cladding panels intended for exteriors and interiors. The system was designed primarily for cladding materials, which, are characterized by abnormal changes of their dimensions thanks to their material composition as the result of dilatation of the material.

**Aluminum frame**
The advantage of the aluminum frame is simple and easy installation, high level of durability and reliability. An indisputable advantage of the Hafix system is suspended mounting of boards which eliminates dilatation changes of boards. The grid consists of extendable aluminum L-anchors fixed to the wall with chemical or mechanical anchors. Aluminium L-anchors are isolated from the wall by EPDM rubber strip, which reduces the thermal bridge effect. Aluminum anchors are adjustable in the range of 140 – 230 mm, It is also possible to use conventional fixed anchors size 100 and 200 mm. Furthermore, they allow variable mounting of vertical aluminum L-profiles and thus allow the entire bearing grid level in one line. Dilatation units must comply with the maximum possible size approved in the installation instructions.

Another feature of the system are special aluminum horizontal angled Z profiles, which are mounted on the vertical aluminum L-profiles, thus creating basic bearing grid. Specifically shaped aluminum H-handles are fixed on the facade panels with stainless steel rivets, self drilling screws or by gluing (3M, SikaTack). In this way safe suspension of facade panels to the grid formed by horizontal aluminum angled profiles is provided. These handles are shaped and positioned to eliminate any tension and subsequent damage occured due to the large volume material changes of both the boards and supporting aluminum structure.

**Assembly of the facade system**
The system enables easier assembly on the site, as the boards can be prepared directly from the manufacturer and the necessary shapes and fixing holes have machined directly on the CNC machines desined for this purpose. This means high precision of layout of the mounting holes in the board. On site on the assembly table the handles are fixed to the facade boards, and this eliminates the mounting (screwing and riveting) directly on the facade. This increases the accuracy and safety of the mounting of heavy facade boards and eliminates the so-called. 'Human factor', which is in most cases the main reason of wrong installation of facade boards. This subsequently leads to damage (cracking) because the dilatation of the boards is not made possible. Please find all information about the Hafix system on www.hafix.cz.



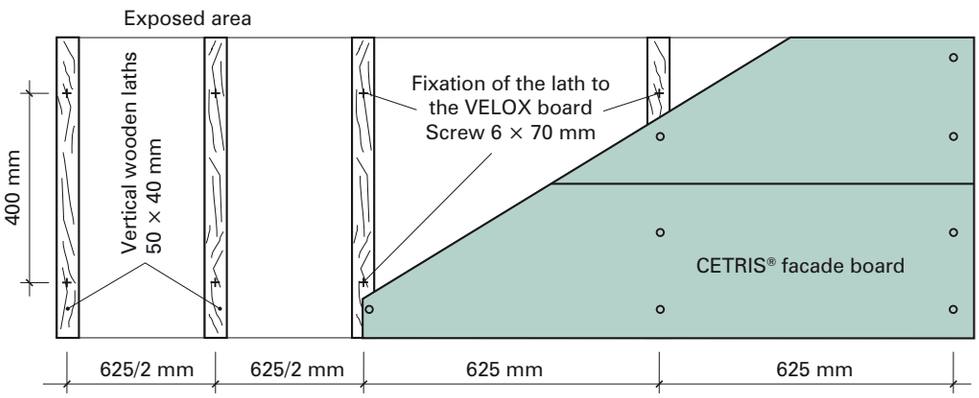


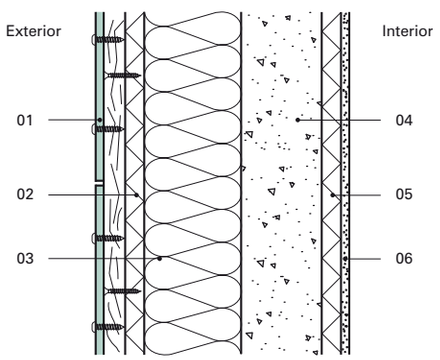

## 8.8.6 CETRIS® facade boards on a wall VELOX

Mounting of the bearing structure (wooden laths 50 × 40 mm) of facade cladding into woodchip-cement board VELOX:

- Screws for wood, diameter 6 mm, length 70 mm
- The maximum distance between of screws 400 mm
- Maximum distance betveen vertical laths is 625 mm. In case of exposed surfaces (corners, passages, etc.) is the maximum distance half of it.

This recommendation holds for the case:
- Maximum building height is 12 m
- Maximum thickness of facade cladding – CETRIS® board is 16 mm




**01 CETRIS® facade board**
**02 Vertical wooden lath 50 × 40 mm**
**03 VELOX WS-EPS board with thermal insulation**
**04 Concrete**
**05 VELOX WSD board**
**06 Plaster**

## 8.8.7 Assembly of CETRIS® Façade Boards

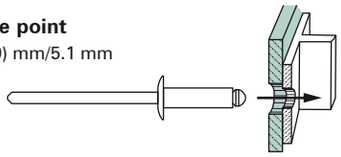
**Installation of CETRIS® boards – VARIO system (visible joints)**
Before the board installation, mark the basic horizontal plane (pursuant to the manufacturing documentation).

**The basic horizontal plane is usually defined by the:**
- Bottom edge of the second horizontal row of CETRIS® cement bonded particleboards
- Level of window and door sills if the board joints follow this level
- Level of window and door transoms if the board joints follow this level
- This horizontal plane subsequently determines all of the perimeter of the building.

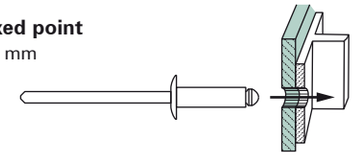
If the project defines more height levels of the coat the other horizontal axes must also be marked in this step pursuant to the manufacturing documentation (the axes are always defined by the bottom edge of the first row of the CETRIS® cement bonded particleboards) for these levels (ideally with a laser). Place the boards side by side with the visible horizontal and vertical joints with the minimum width of 5 mm. CETRIS® cement bonded particleboards are connected visibly with screws or clamps or invisibly with SikaTack glue.

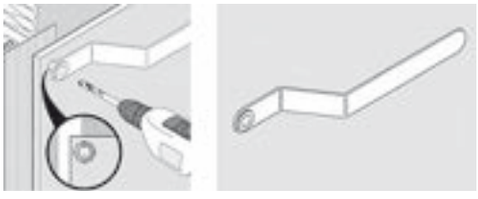
The predrilled holes and joining elements must be placed on the board in prescribed distances (see page 1). When anchoring a board, first fix the fixed point (depending on the size and shape of the board the fixed points are one or two – as close as possible to the board centre). After that, anchor all the slide points, ideally in the clockwise direction.
The screw tightening torque must be preset to prevent deformation of the screw washer or CETRIS® board. The screw (rivet) must be placed in the middle of the predrilled hole perpendicularly to the board plane. When riveting, the slide joint must be achieved with a distance extension of about 1 mm.

**Slide point**
8 (10) mm/5.1 mm



**Fixed point**
5.1 mm



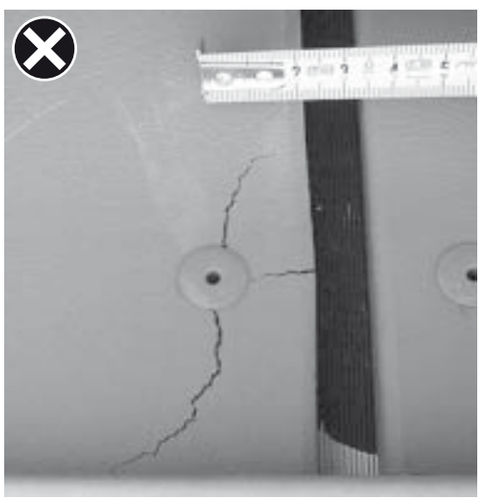


**Installation of CETRIS® Boards – PLANK System (Overlapped Horizontal Joints)**
Before the board installation, mark the basic horizontal plane (pursuant to the manufacturing documentation). The basic horizontal plane in the overlapped system is defined by the upper edge of the first horizontal row of the CETRIS® boards. This plane subsequently defines the whole perimeter of the building. As the boards are laid with overlapped horizontal joints the needed number of boards and their overlaps must be determined.

Number of boards: $N = 1+(H - 300)/250$
Board overlap: $O = (N \times 300 - H)/(N - 1)$

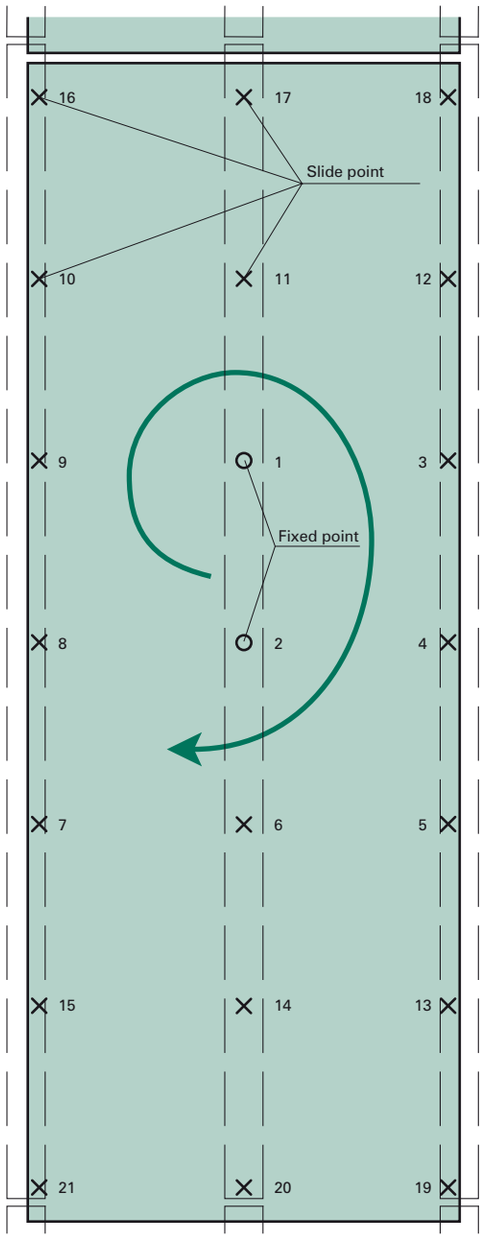
where:
N – number of boards in pieces
H – façade height in mm
O – board overlap in mm, at least 50 mm
300 – CETRIS® PLANK board width in mm
250 – visible width of CETRIS® PLANK board in mm

Begin the board assembly from the bottom by placement of a strip on the basic horizontal plane with the same thickness as the CETRIS® board and the width corresponding to the calculated overlap. Cover the strip with the first row of the cladding boards, width 300 (200) mm.
Place the joining elements to the upper edge of the boards (40 mm from the upper edge, 35 mm from the vertical edge). The screws may only be tightened so they do not deform the façade element and to prevent volume changes of the board. The first row of the cladding boards must be properly leveled to prevent later complications. Before placement of every row of the cladding boards apply the flexible glue under the upper edge of the already fixed boards (cakes with the diameter of about 20 mm with the spacing of approx. 300 mm).
The vertical joints of the boards must be supported and their **width must be at least 5 mm**.



**Distance of the side rivet from the edge too small.**

**Anchoring procedure**



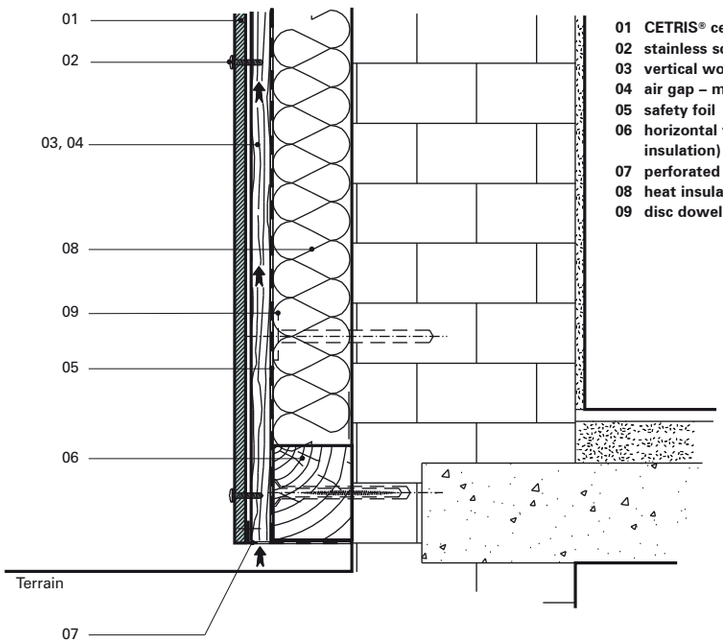
## 8.8.8 Detail Implementation of CETRIS® Façade Systems

The process of assembly of details of the suspended façade coat is designed individually on the basis of the design of the details in the relevant manufacturing documentation drawings. The recommended solutions of these details are shown in figures (on pages 22 – 41).

**Note: The drilling and cutting (or milling) of CETRIS® cement bonded particleboards is only possible with tools of hard metal designed for this type of cut. Where anchoring element penetration is required (for example for exterior lighting of the building, for installation of signs and advertising panels etc.) sufficient dilation of the coat and these anchoring elements must be provided for, i.e. the holes for these elements must be at least 15 mm larger than the largest size of the anchoring element. To restore the surface finish of the visible edges use the paint supplied for this purpose with every order. Assembly of other constructions (such as advertising signs) directly to the suspended façade coat is only possible as an exception on condition of static assessment and solution of joint forces from these constructions and from the coat with regard to thermal expansions of the individual materials.**

**Detail of bottom lining with overlap. CETRIS® board on wooden grid, VARIO system**

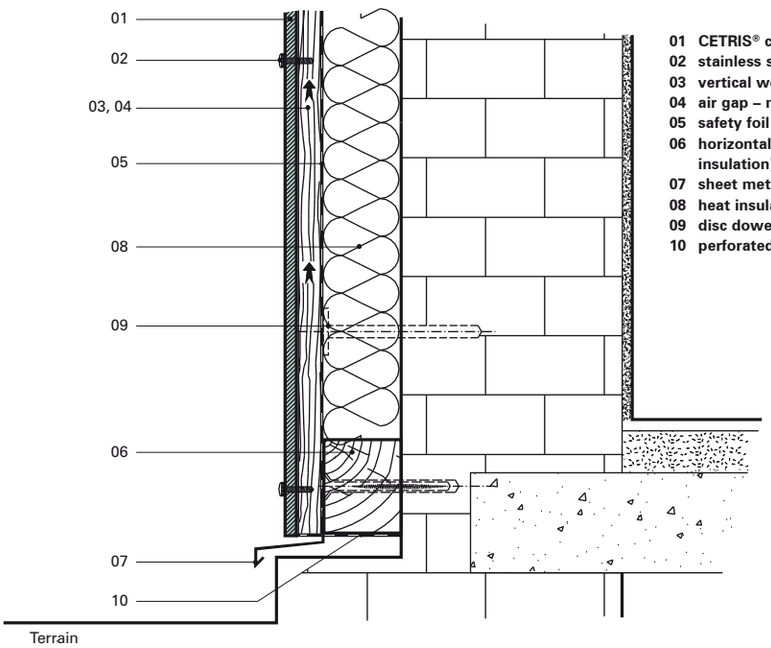
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 perforated venting profile (PROTECTOR)**
**08 heat insulation**
**09 disc dowel**

**Detail of bottom ending with sheet metal cladding. CETRIS® board on wooden grid, VARIO system**

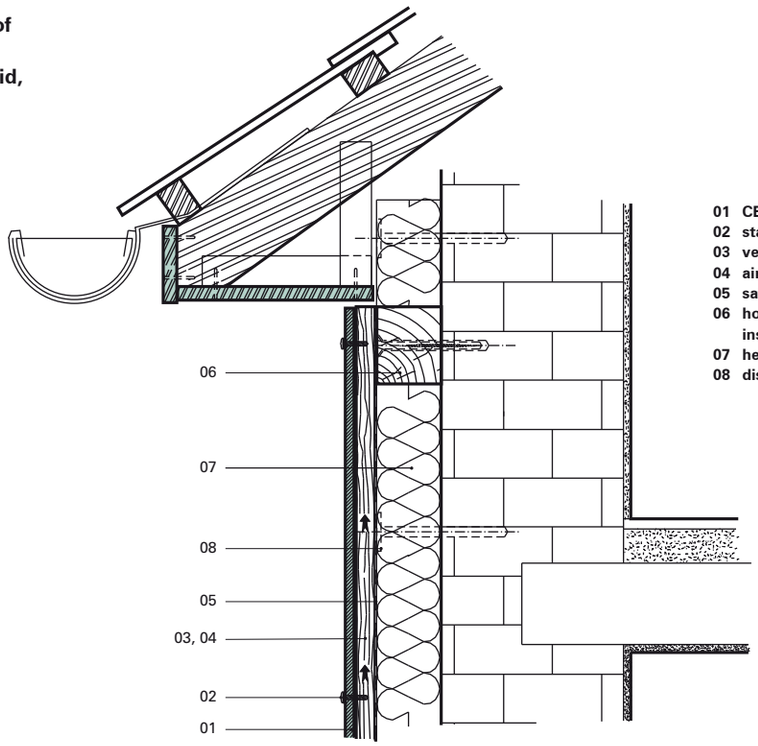
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 disc dowel**
**10 perforated venting profile (PROTECTOR)**

**Detail of upper lining with roof construction overlap.
CETRIS® board on wooden grid, VARIO system**

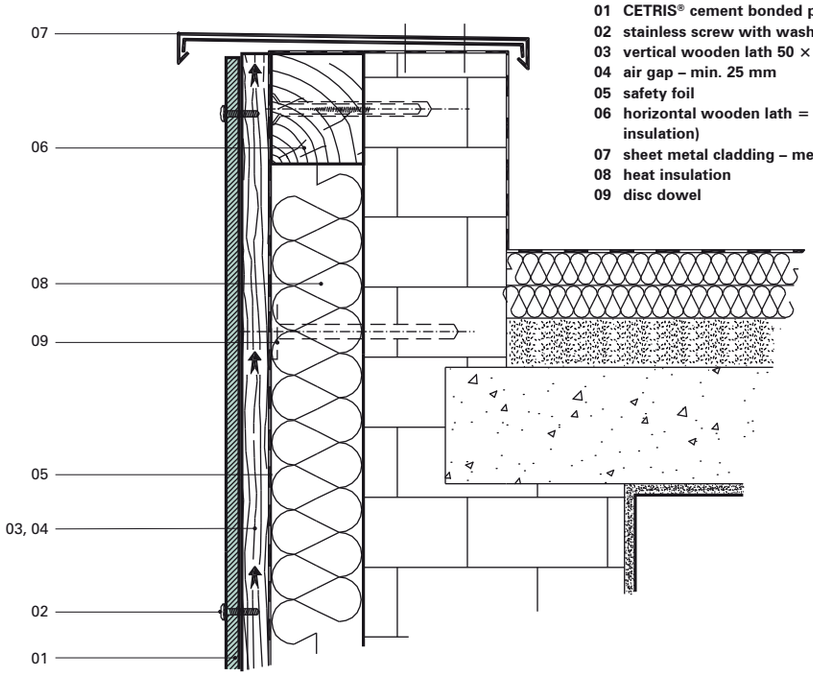
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 heat insulation**
**08 disc dowel**

**Detail of upper ending with attic.
CETRIS® board on wooden grid, VARIO system**

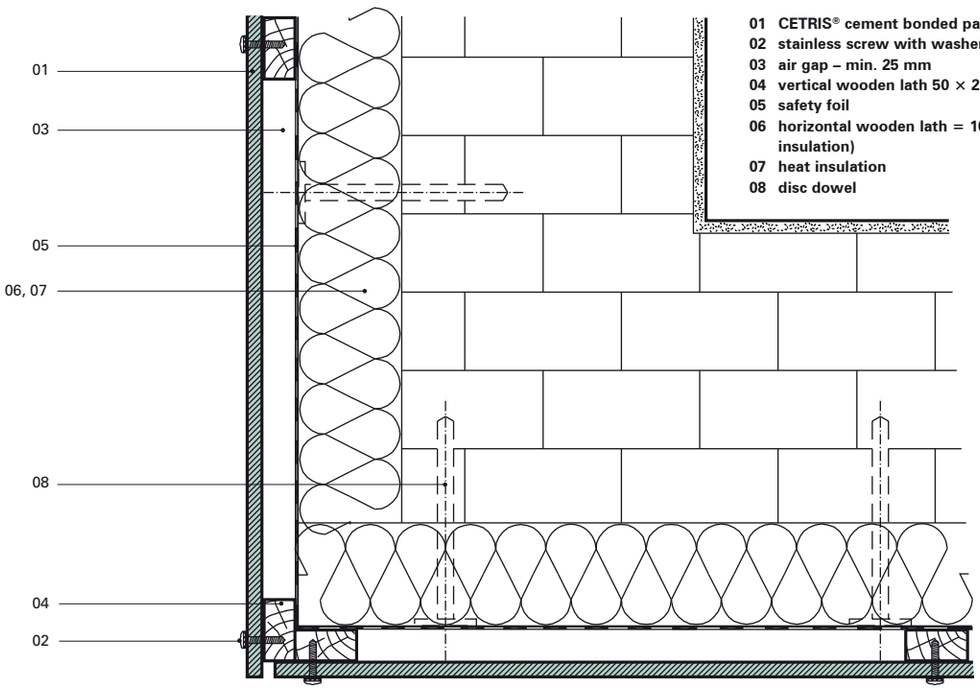
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 disc dowel**

**Detail of exterior corner. CETRIS® board on wooden grid with overlap, VARIO system**

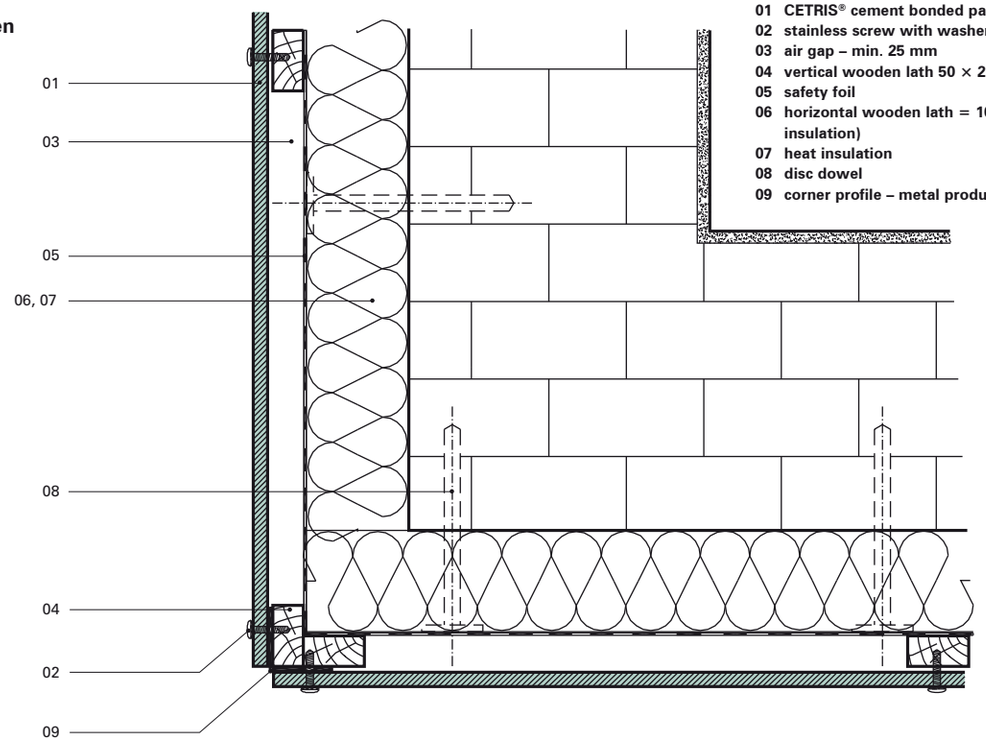
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** disc dowel

**Detail of exterior corner. CETRIS® board on wooden grid with corner profile, VARIO system**

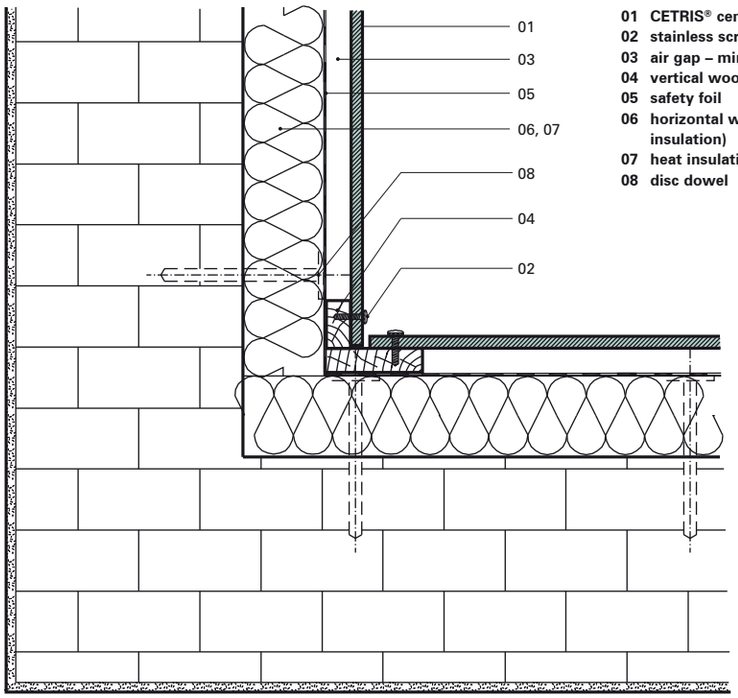
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** disc dowel
**09** corner profile – metal product, or PROTECTOR profile

**Detail of interior corner. CETRIS® board on wooden grid with overlap, VARIO system**

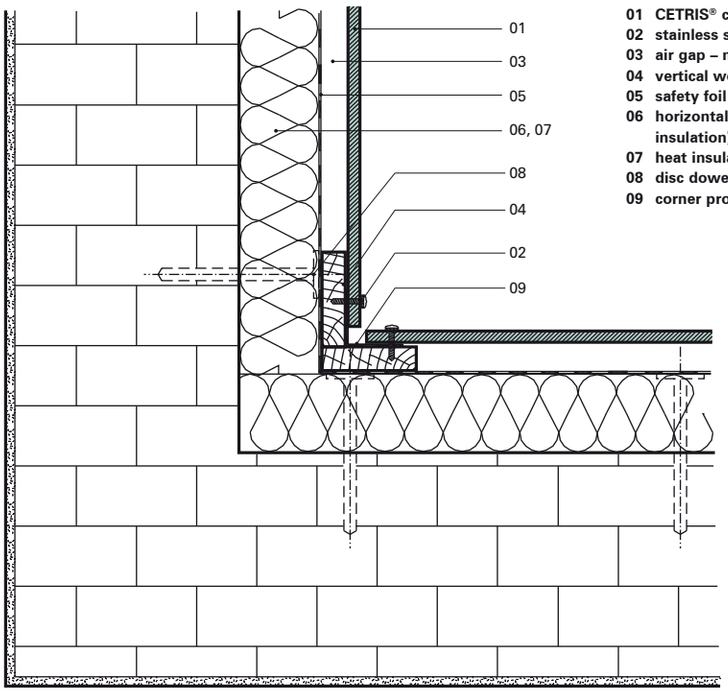
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** disc dowel

**Detail of interior corner. CETRIS® board on wooden grid with corner profile, VARIO system**

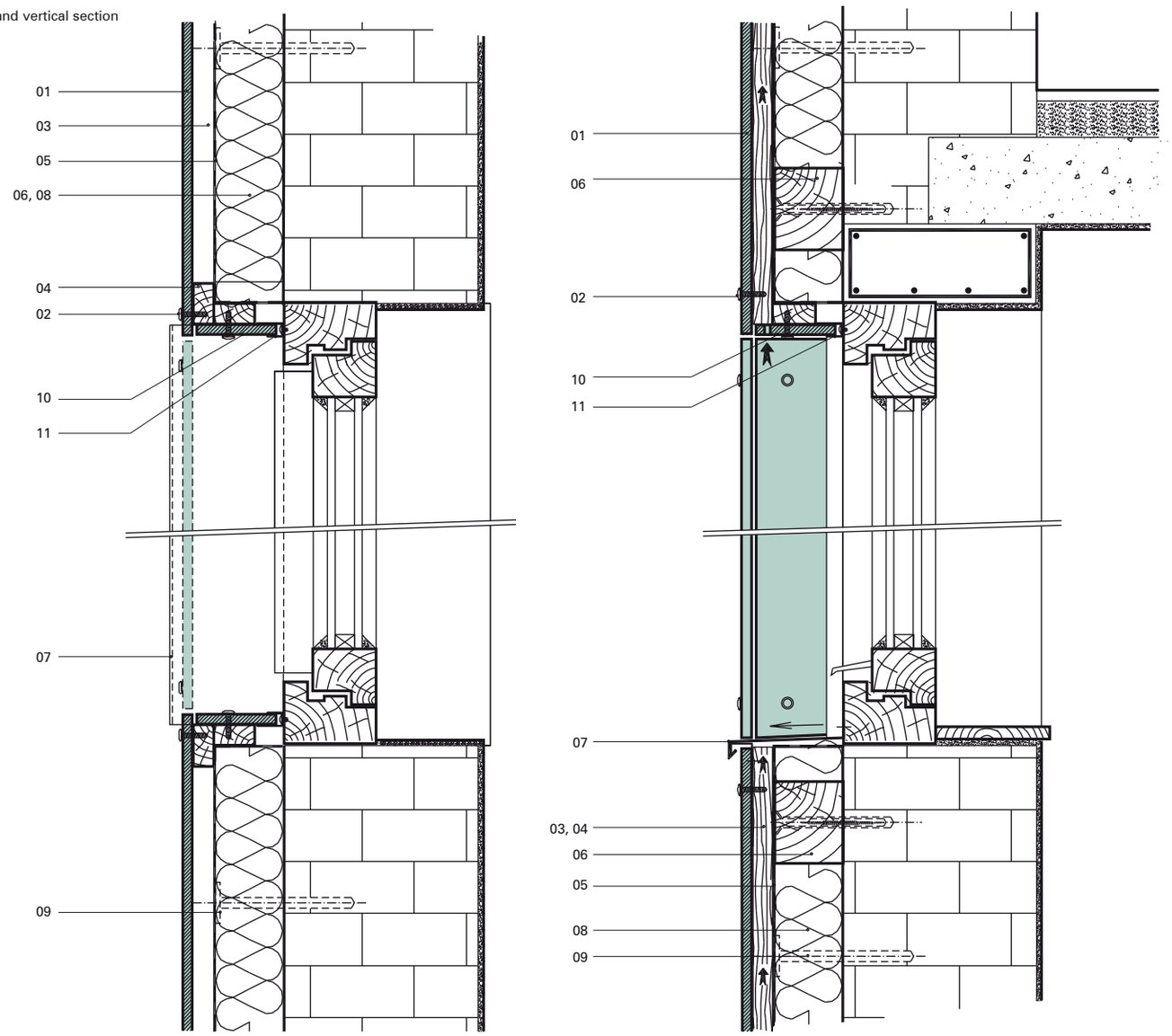
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** disc dowel
**09** corner profile – metal product, or PROTECTOR profile

**Detail of jamb and window head of opening,
CETRIS® boards on wooden grid, VARIO system**

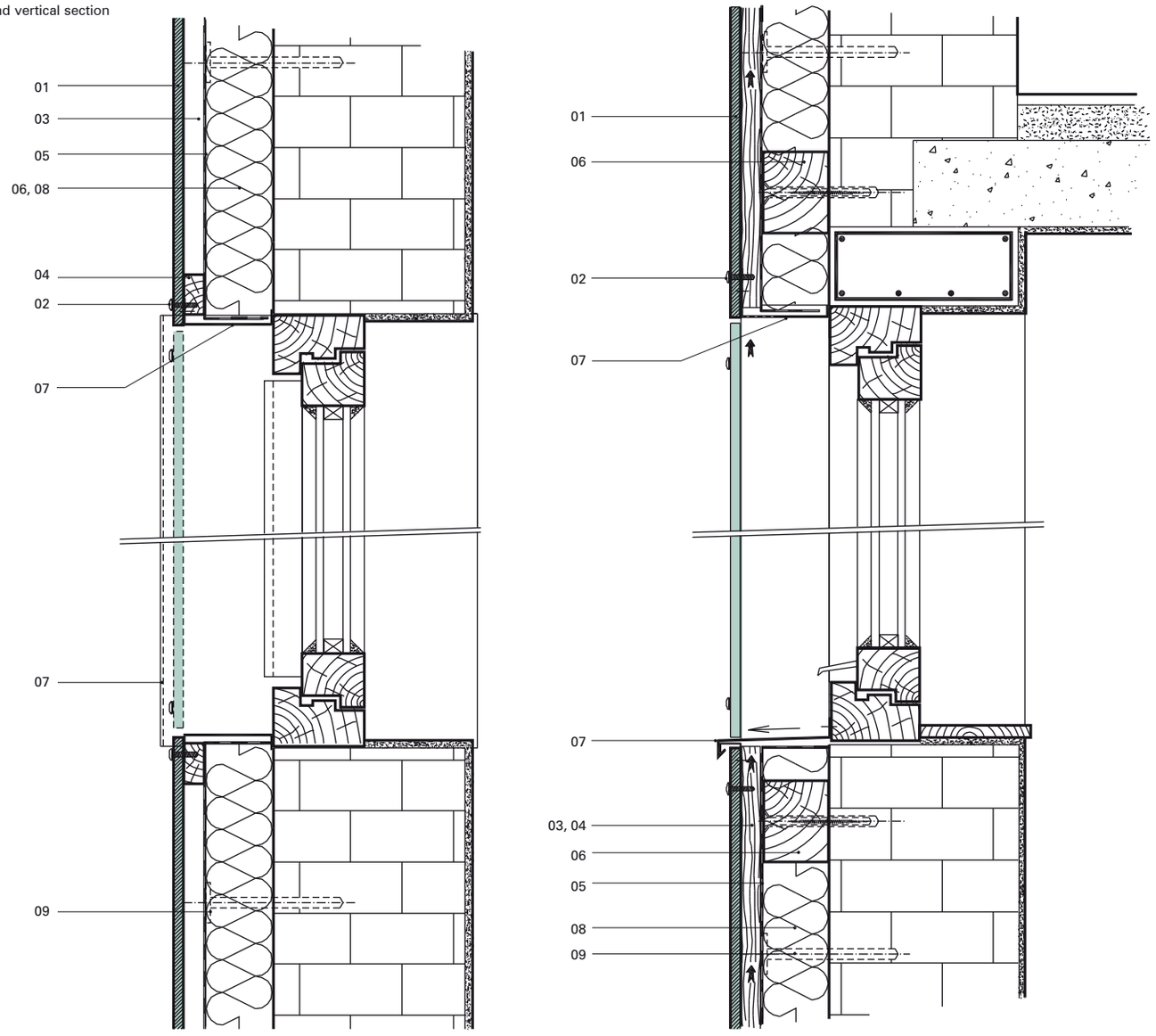
Horizontal and vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 air gap – min. 25 mm**
**04 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 disc dowel**
**10 door head – perforated CETRIS® board**
**11 end profile**

**Detail of jamb and window head with sheet metal cladding of opening, CETRIS® boards on wooden grid, VARIO system**

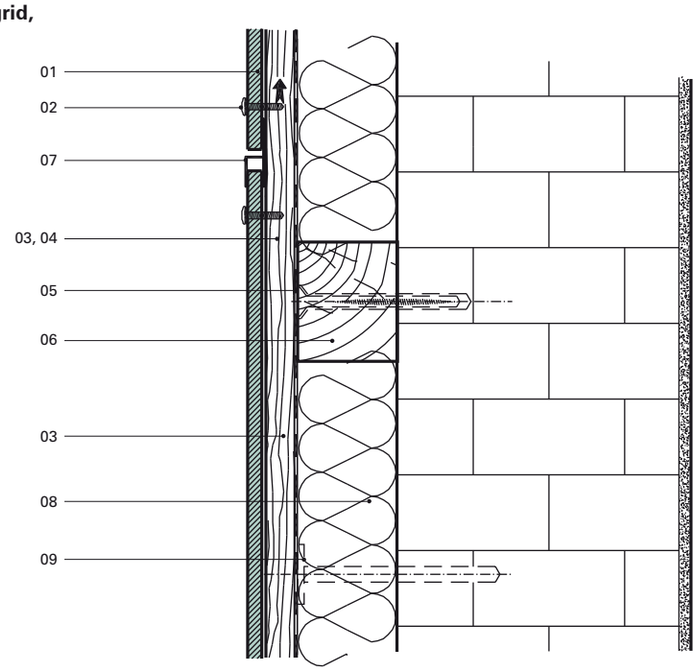
Horizontal and vertical section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** sheet metal cladding – metal product
**08** heat insulation
**09** disc dowel

**Detail of horizontal joint.
CETRIS® board on wooden grid,
VARIO system**

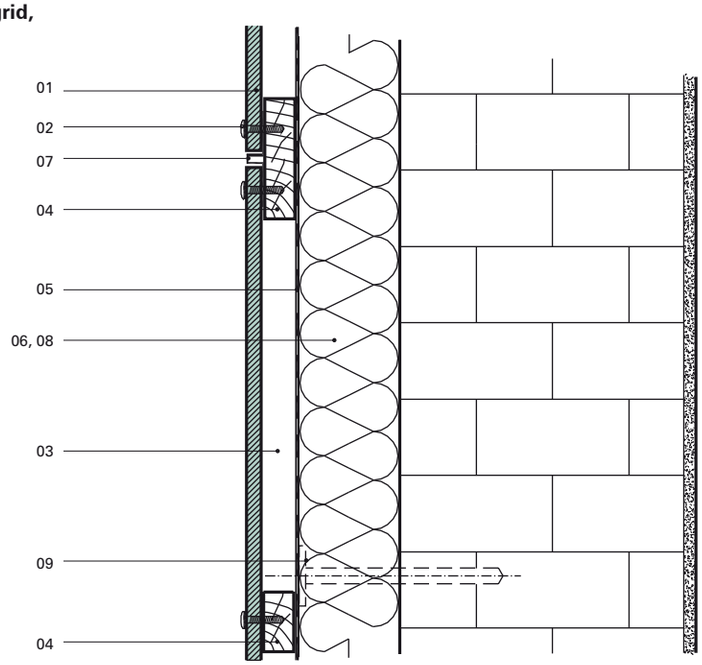
Vertical section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** profile in joint – metal product, or profile PROTECTOR
**08** heat insulation
**09** disc dowel

**Detail of vertical joint.
CETRIS® board on wooden grid,
VARIO system**

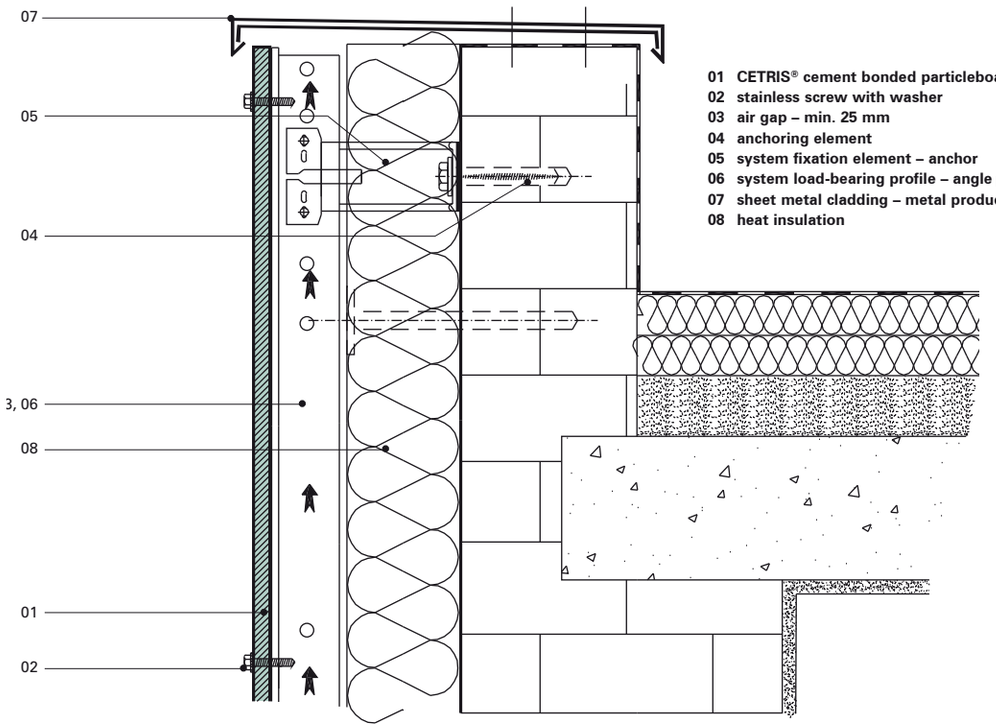
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** profile in joint – metal product, or profile PROTECTOR
**08** heat insulation
**09** disc dowel

**Detail of upper ending with attic. CETRIS® board on system profiles, VARIO system**

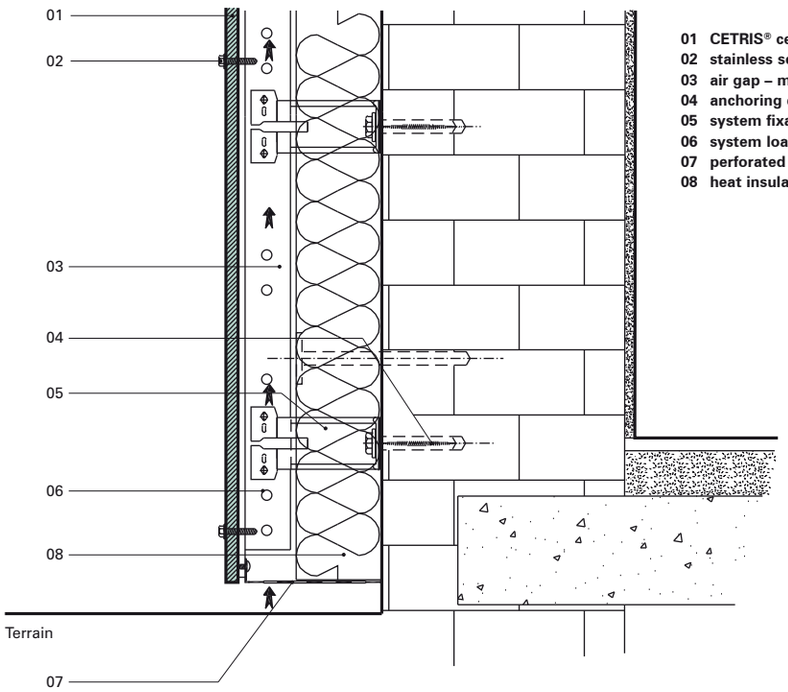
Vertical section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** anchoring element
**05** system fixation element – anchor
**06** system load-bearing profile – angle piece
**07** sheet metal cladding – metal product
**08** heat insulation

**Detail of bottom ending with overlap. CETRIS® board on system profiles, VARIO system**

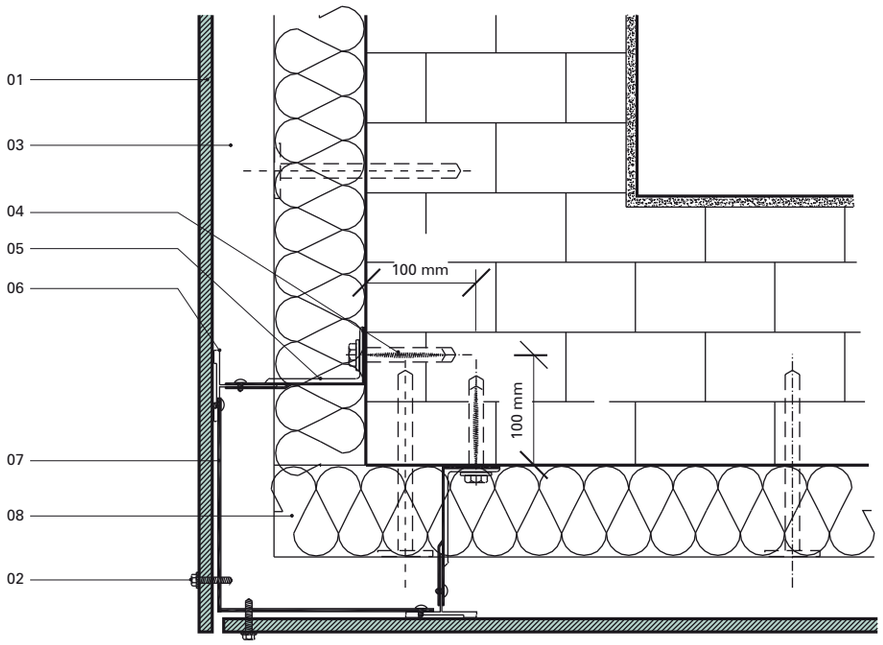
Vertical section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** anchoring element
**05** system fixation element – anchor
**06** system load-bearing profile – angle piece
**07** perforated venting profile (PROTECTOR)
**08** heat insulation

**Detail of exterior corner. CETRIS® board on system profiles, VARIO system**

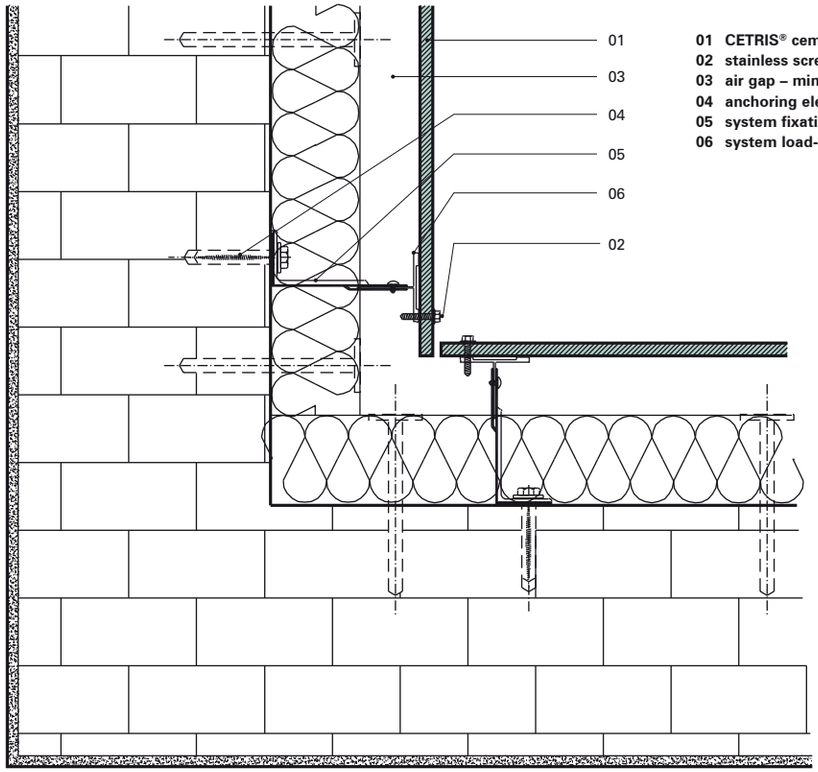
Horizontal section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 aluminium L profile (500 mm)**
**08 heat insulation**

**Detail of interior corner. CETRIS® board on system profiles, VARIO system**

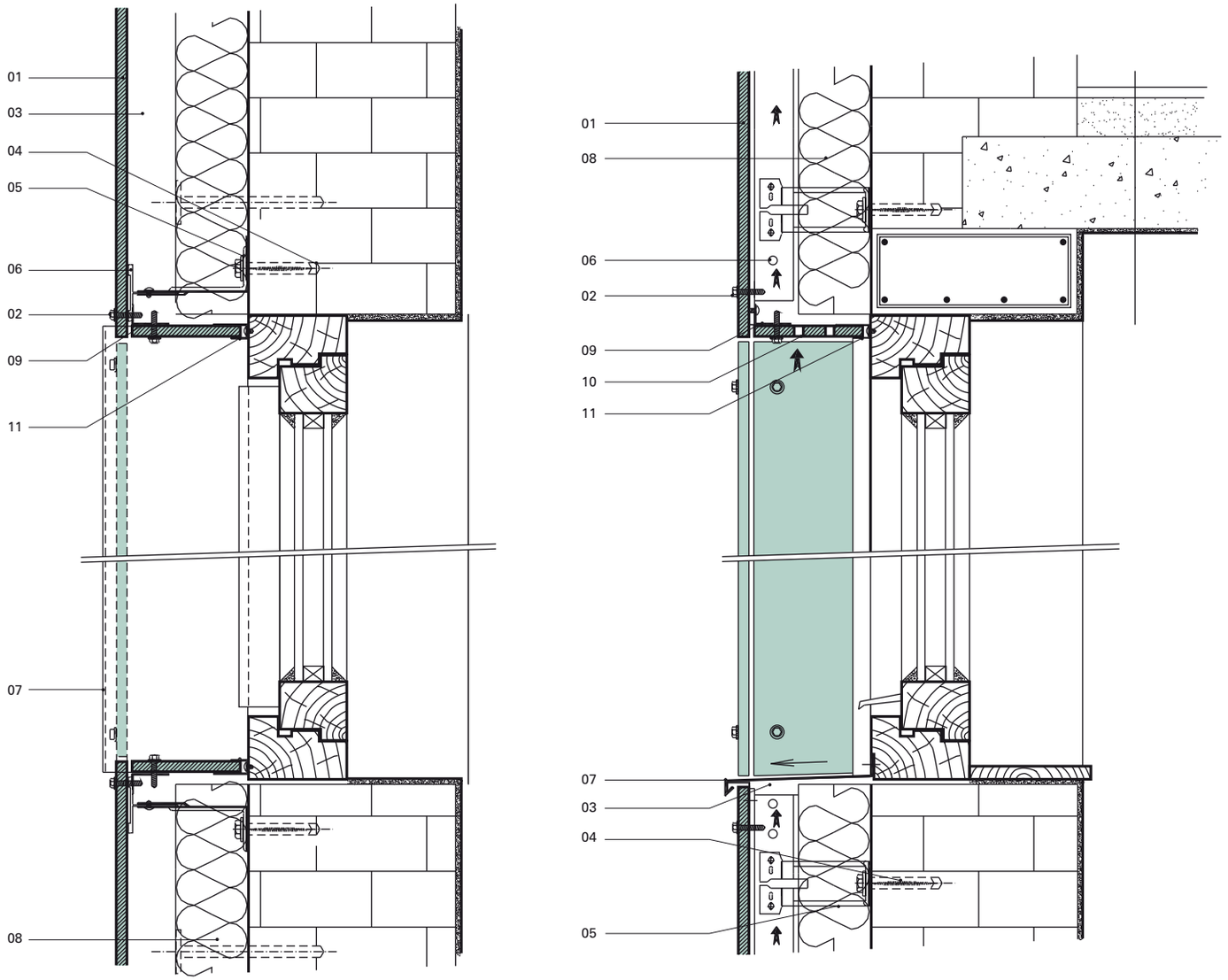
Horizontal section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**

**Detail of jamb and window head of opening, CETRIS® boards on system profiles, VARIO system**

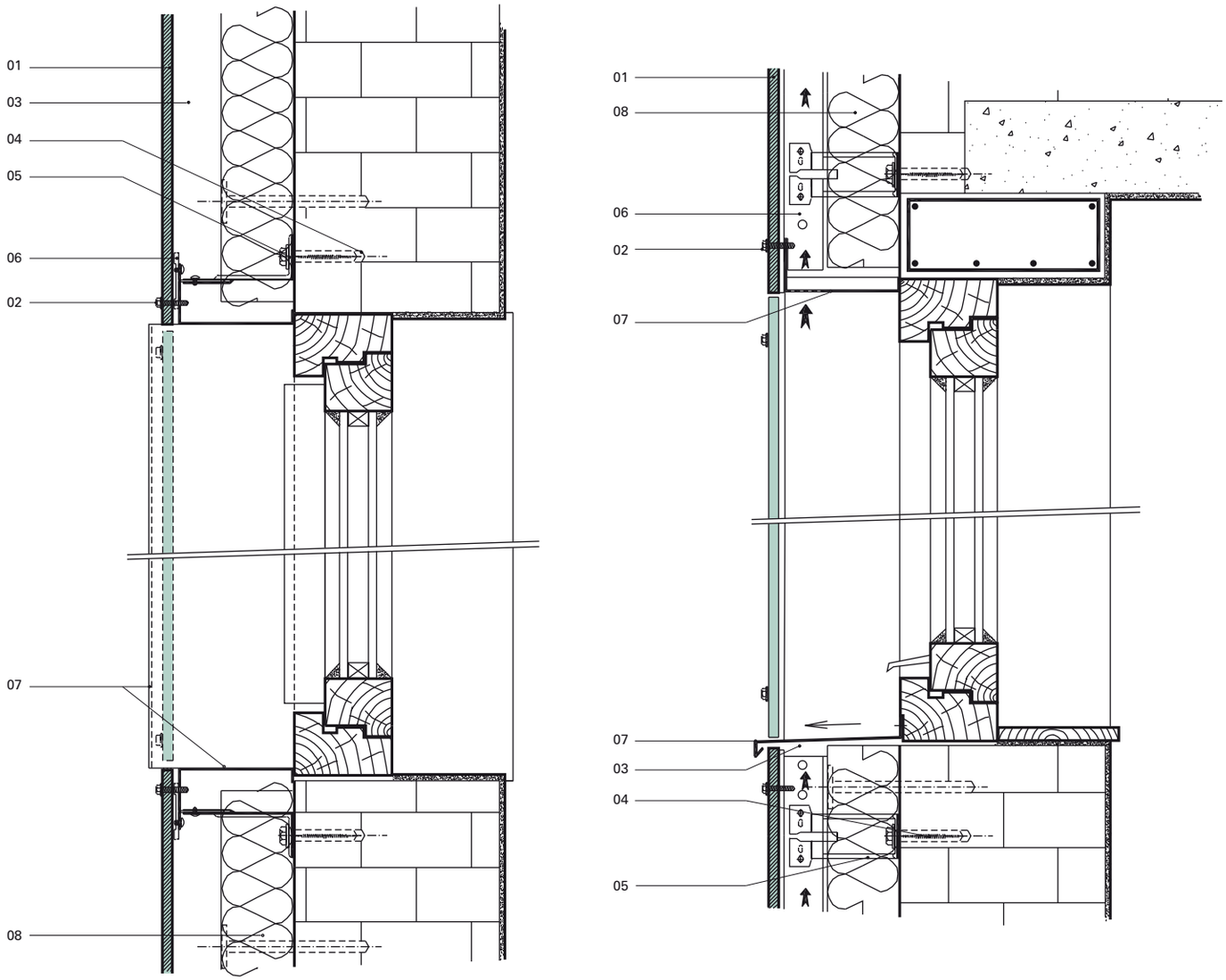
Horizontal and vertical section




**01** CETRIS® cement bonded particleboard
**02** stainless screw with washer
**03** air gap – min. 25 mm
**04** anchoring element
**05** system fixation element – anchor
**06** system load-bearing profile
**07** sheet metal cladding – metal product
**08** heat insulation
**09** aluminium L profile
**10** window head – perforated CETRIS® board
**11** end profile

**Detail of jamb and window head with opening sheet metal cladding of the opening, CETRIS® boards on system profiles, VARIO system**

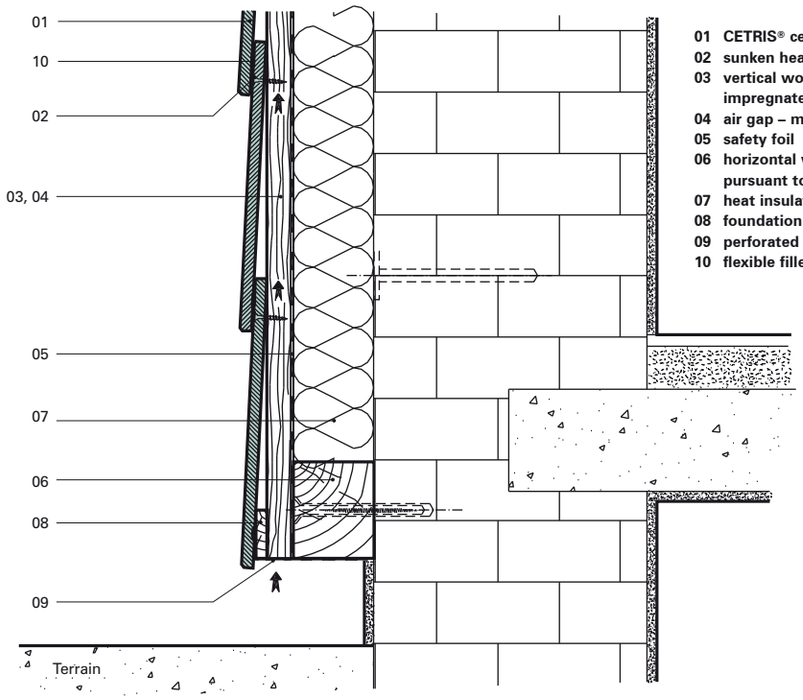
Horizontal and vertical section




**01 CETRIS® cement bonded particleboard**
**02 stainless screw with washer**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 sheet metal cladding – metal product**
**08 heat insulation**

**Detail of bottom ending.
CETRIS® board on wooden grid,
PLANK system**

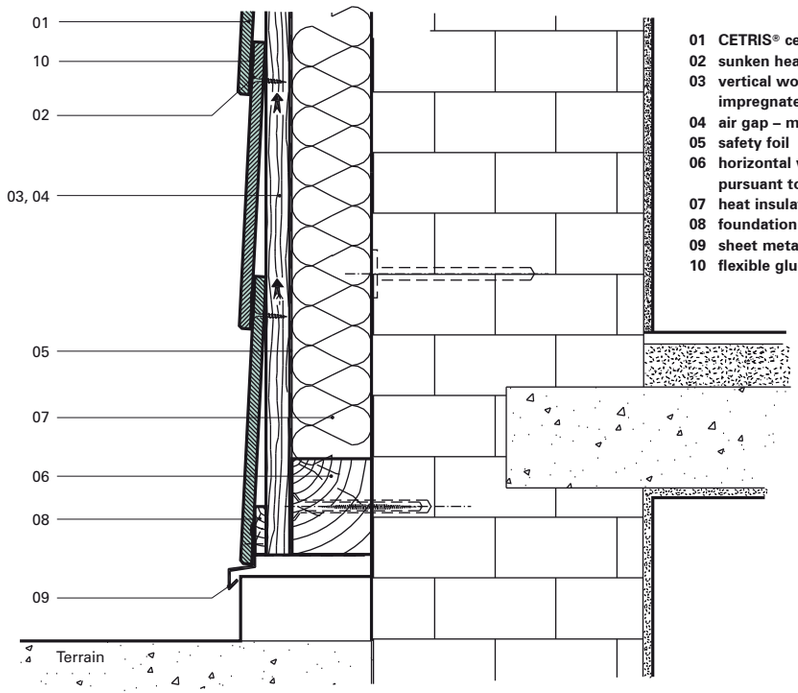
Vertical section




**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**04** air gap – min. 25 mm
**05** safety foil
**06** horizontal wooden lath 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** foundation slab
**09** perforated venting profile (PROTECTOR)
**10** flexible filler

**Detail of bottom ending with sheet metal cladding.
CETRIS® board on wooden grid,
PLANK system**

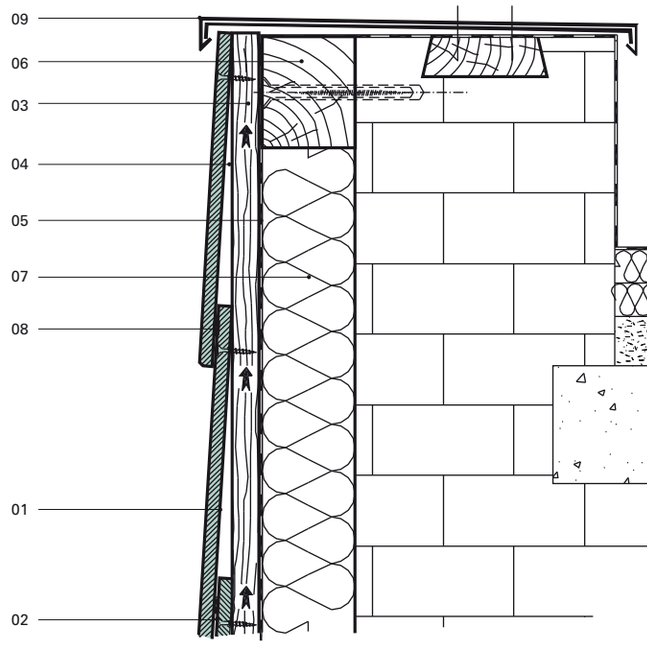
Vertical section




**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**04** air gap – min. 25 mm
**05** safety foil
**06** horizontal wooden lath 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** foundation slab
**09** sheet metal cladding – metal product
**10** flexible glue

**Detail of upper ending. CETRIS® board on wooden grid, PLANK system**

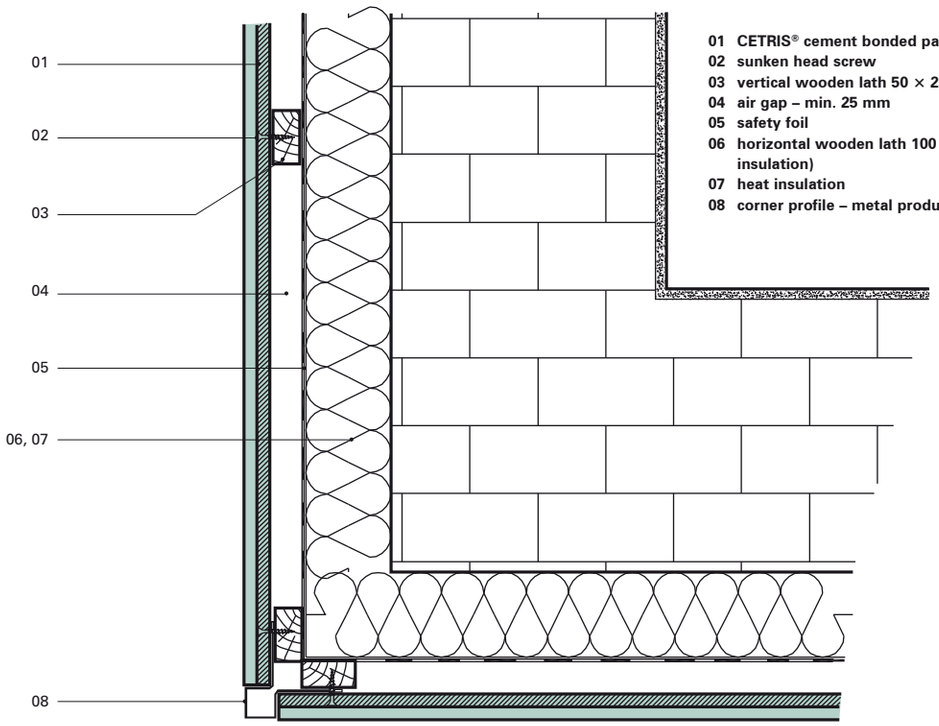
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath 100 mm (thickness pursuant to insulation)**
**07 heat insulation**
**08 flexible glue**
**09 sheet metal cladding – metal product**

**Detail of exterior corner. CETRIS® board on wooden grid with corner profile, PLANK system**

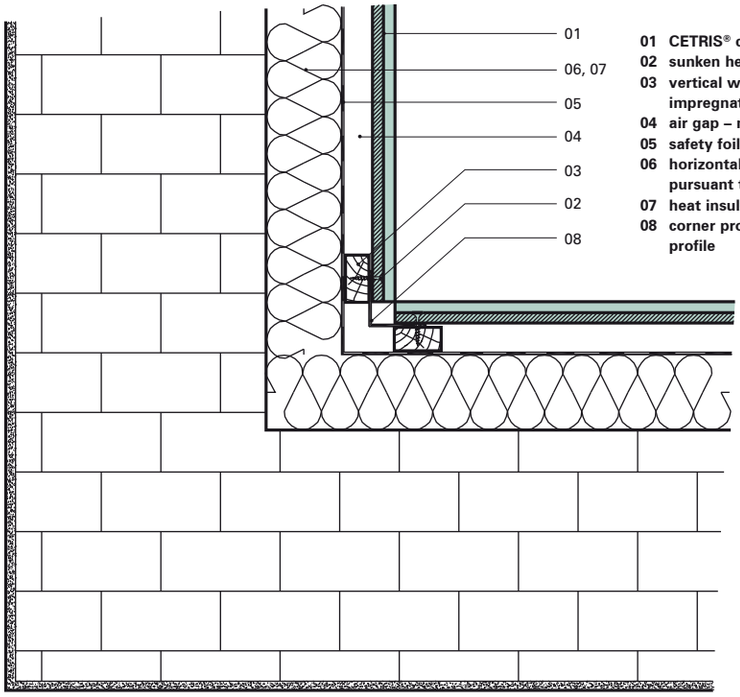
Horizontal section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath 100 mm (thickness pursuant to insulation)**
**07 heat insulation**
**08 corner profile – metal product or PROTECTOR profile**

**Detail of interior corner.
CETRIS® board on wooden grid,
with corner profile, PLANK system**

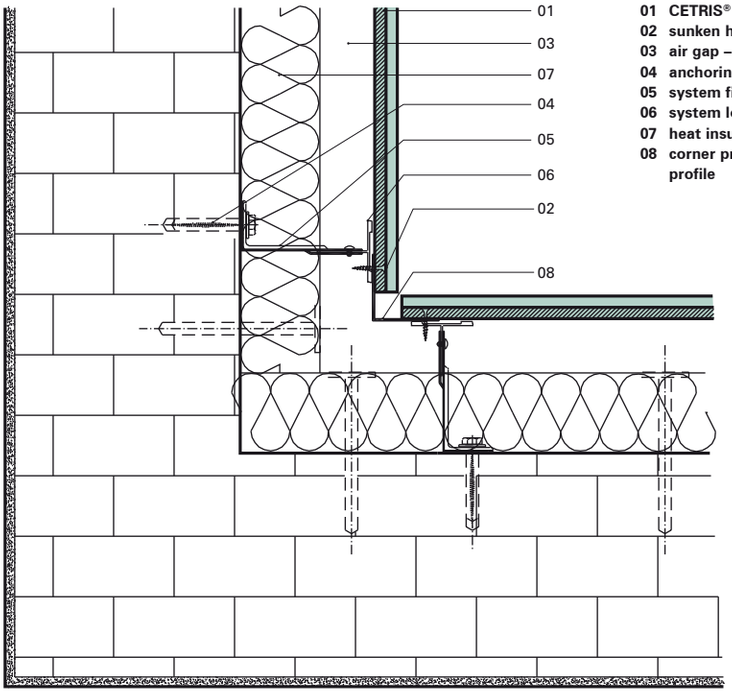
Horizontal section




**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**04** air gap – min. 25 mm
**05** safety foil
**06** horizontal wooden lath 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** corner profile – metal product or PROTECTOR profile

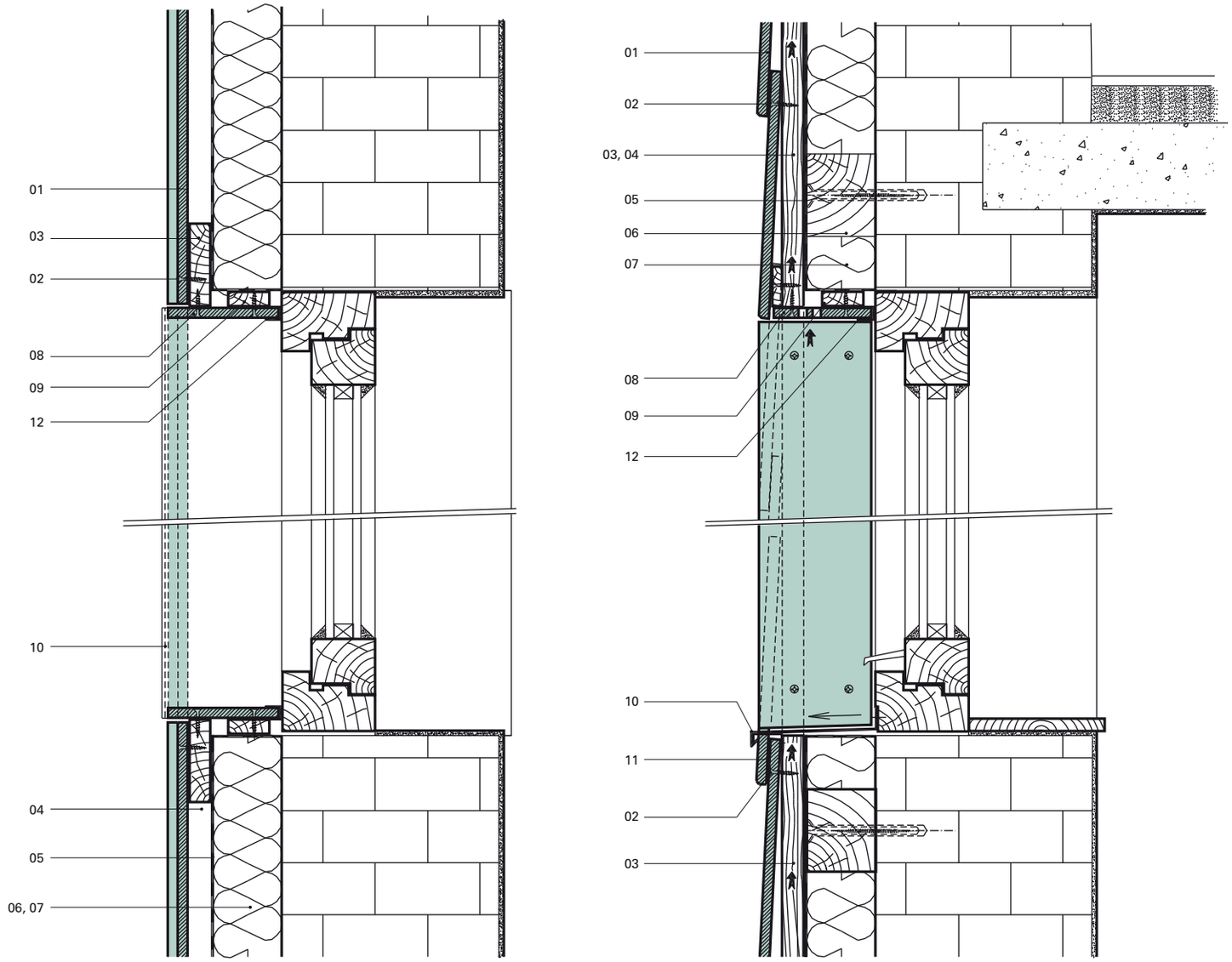
**Detail of interior corner.
CETRIS® board on system profiles
with corner profile, PLANK system**

Horizontal section




**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** air gap – min. 25 mm
**04** anchoring element
**05** system fixation element – anchor
**06** system load-bearing profile
**07** heat insulation
**08** corner profile – metal product or PROTECTOR profile

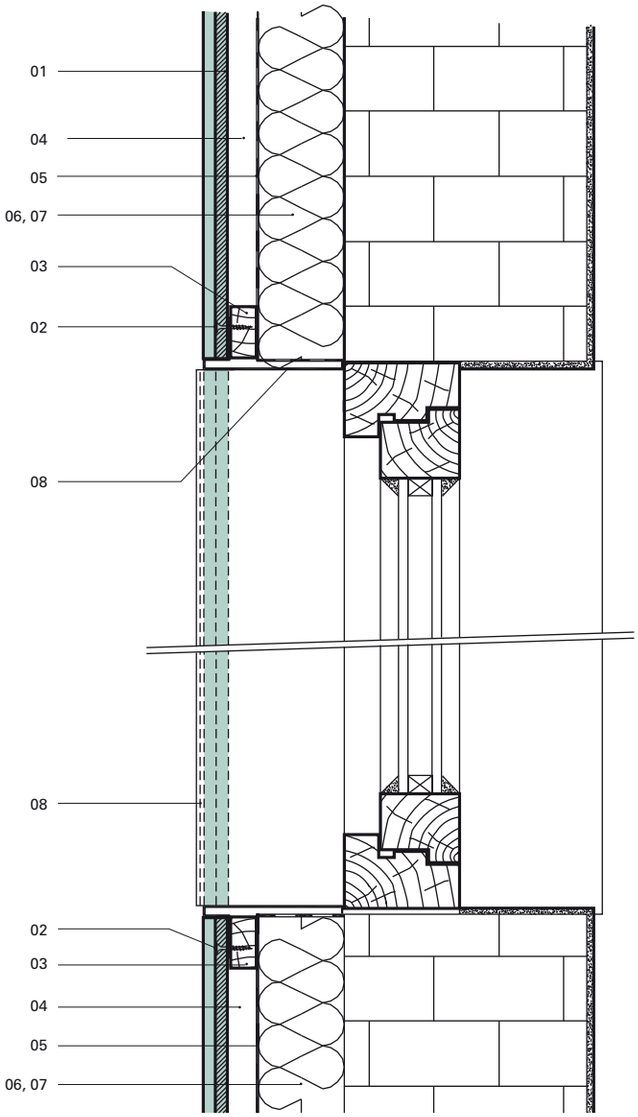
**Detail of jamb and window head of opening, CETRIS® boards on wooden grid, PLANK system**
Horizontal and vertical section

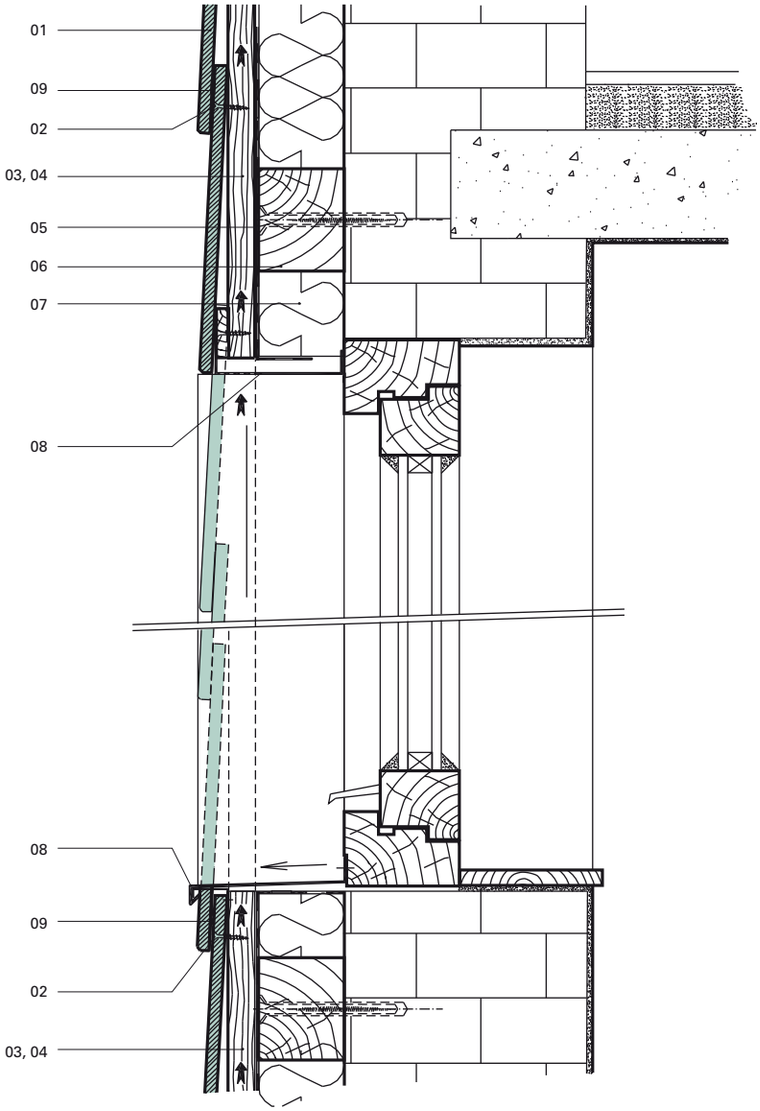



**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** vertical wooden lath 50 × 25 (100 × 25) mm, impregnated
**04** air gap – min. 25 mm
**05** safety foil
**06** horizontal wooden lath = 100 mm (thickness pursuant to insulation)
**07** heat insulation
**08** jamb (window head) cladding – perforated CETRIS® board
**09** wooden board thickness 18 mm
**10** sheet metal cladding – metal product, or PROTECTOR profile
**11** flexible glue
**12** end profile (PROTECTOR)

**Detail of jamb and window head of opening with sheet metal cladding, CETRIS® boards on wooden grid, PLANK system**

Horizontal and vertical section

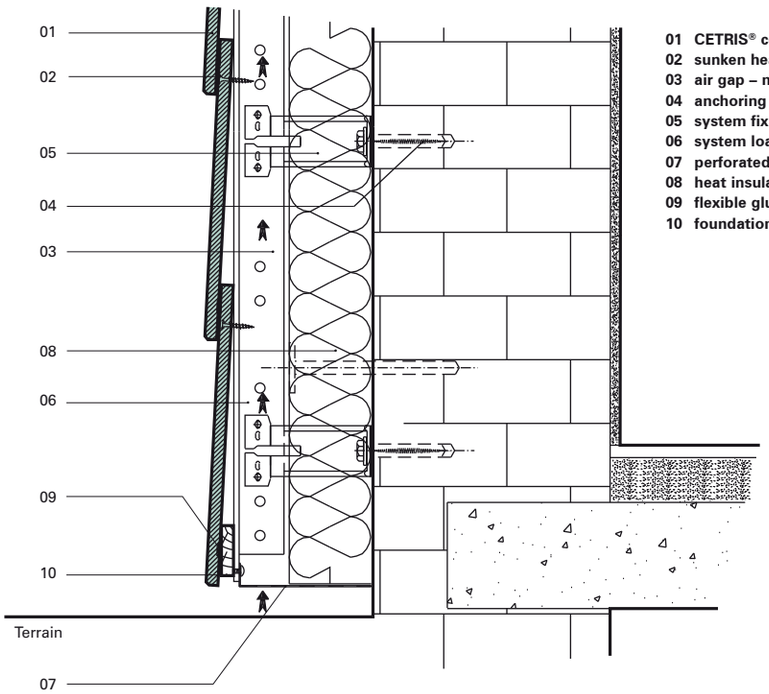



**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 vertical wooden lath 50 × 25 (100 × 25) mm, impregnated**
**04 air gap – min. 25 mm**
**05 safety foil**
**06 horizontal wooden lath = 100 mm (thickness pursuant to insulation)**
**07 heat insulation**
**08 sheet metal cladding – metal product, or PROTECTOR profile**
**09 flexible glue**

**Detail of bottom end with overlap.
CETRIS® board on system profiles,
PLANK system**

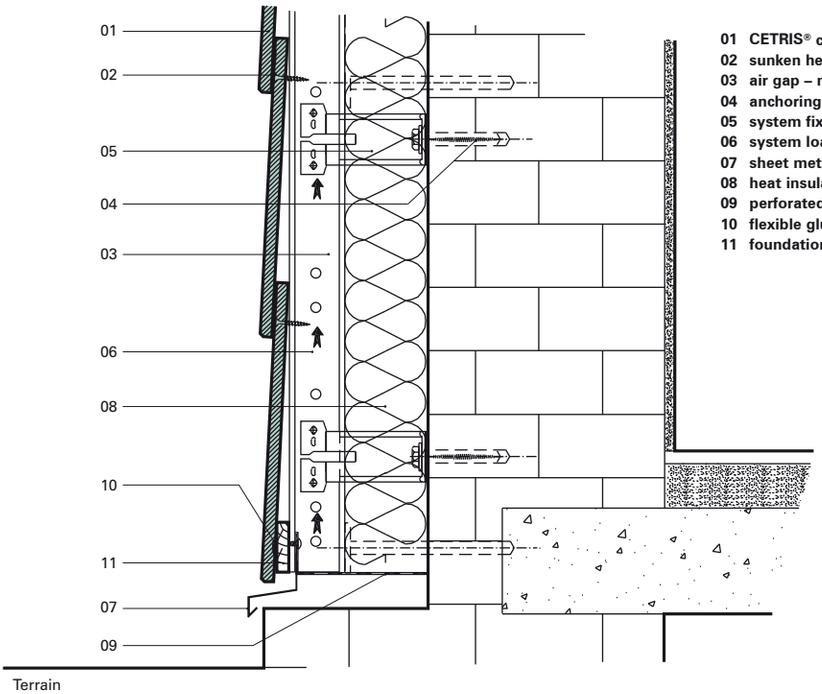
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 perforated venting profile (PROTECTOR)**
**08 heat insulation**
**09 flexible glue**
**10 foundation slab**

**Detail of bottom end with sheet
metal cladding.
CETRIS® board on system profiles,
PLANK system**

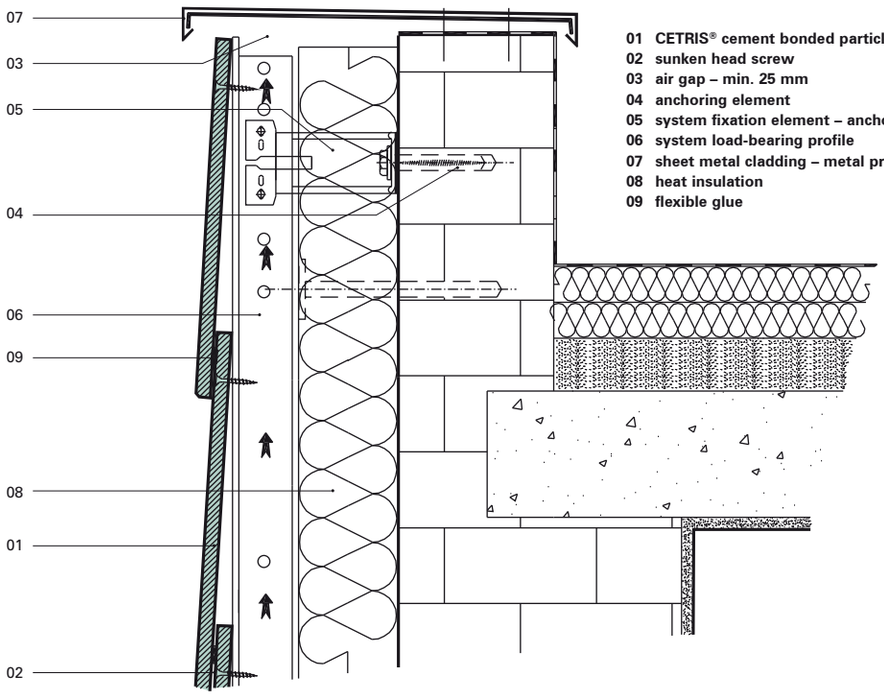
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 perforated venting profile (PROTECTOR)**
**10 flexible glue**
**11 foundation slab**

**Detail of upper end.**
**CETRIS® board on system profiles, PLANK system**

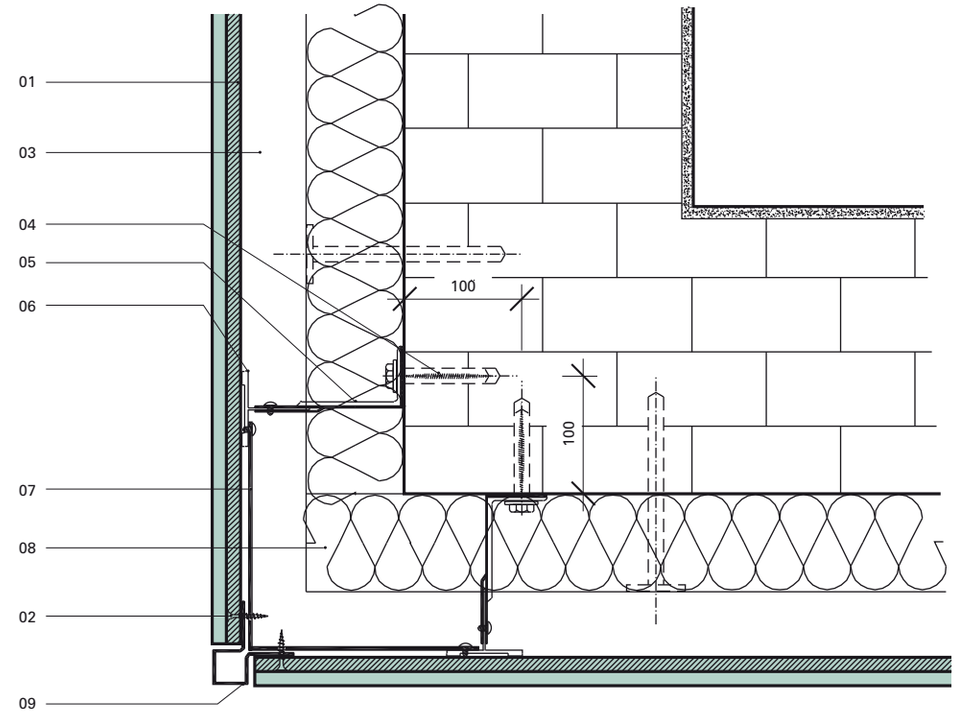
Vertical section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 flexible glue**

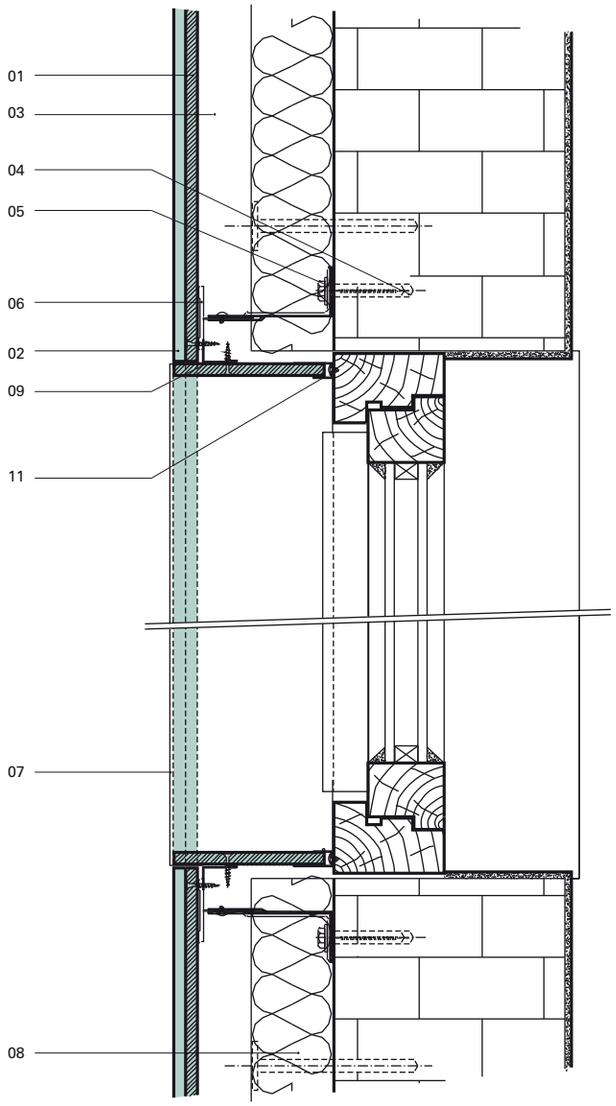
**Detail of exterior corner.**
**CETRIS® board on system profiles, PLANK system**

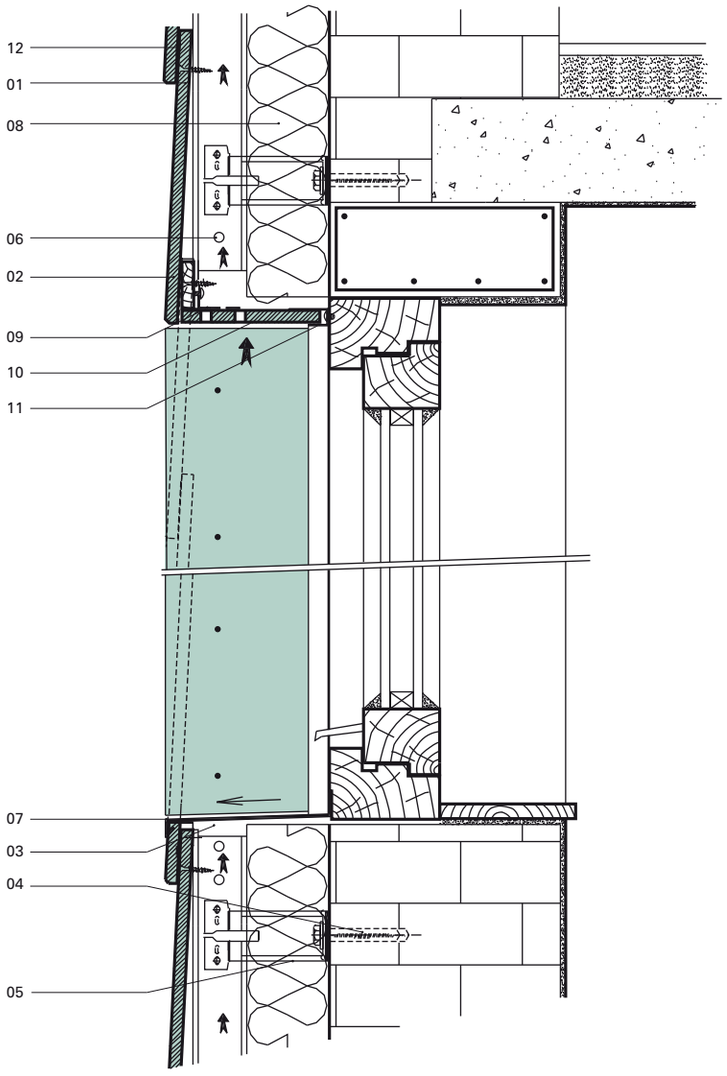
Horizontal section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 aluminium L profile**
**08 heat insulation**
**09 corner profile – metal product or PROTECTOR profile**

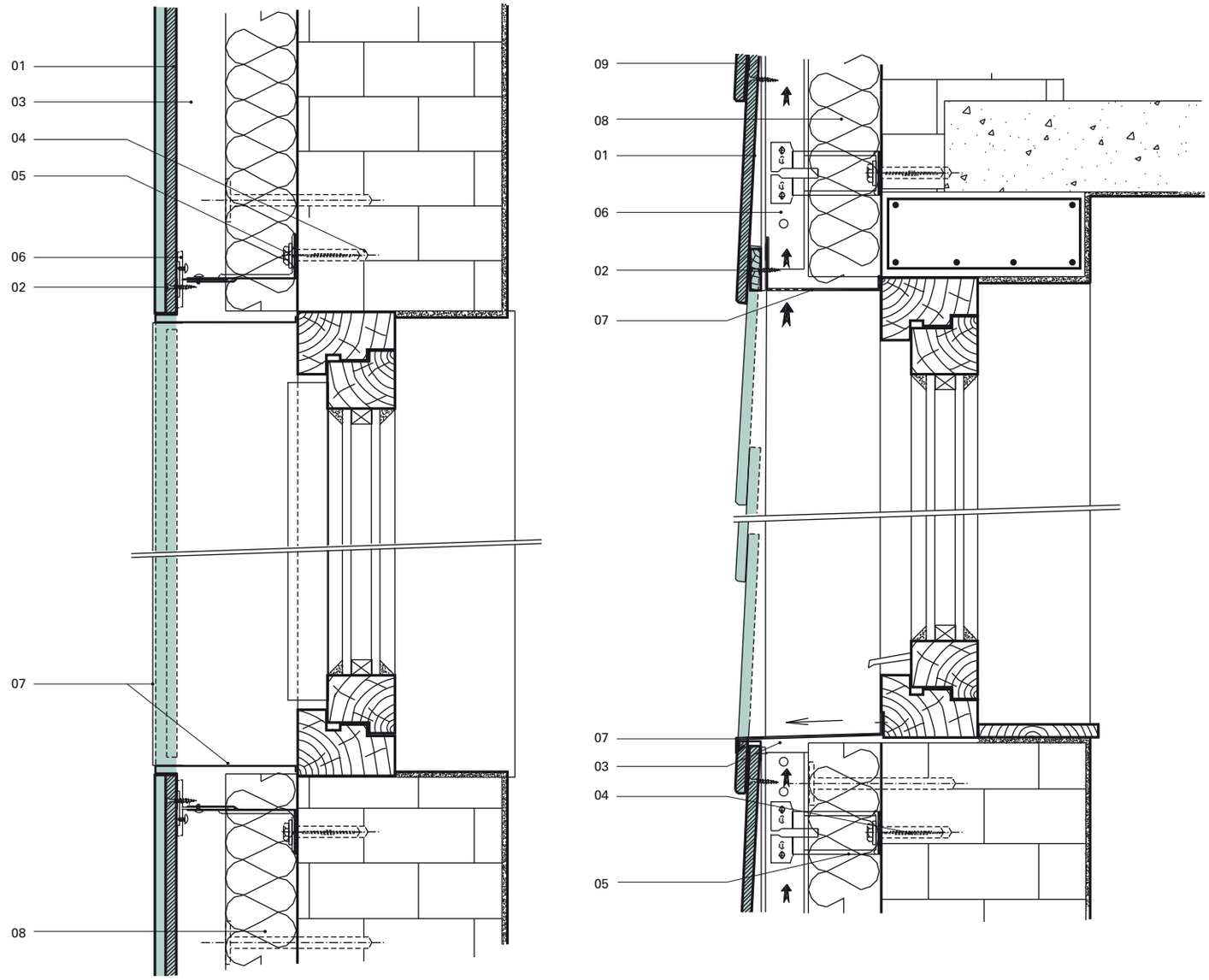
**Detail of jamb and window head of opening. CETRIS® boards on system profiles, PLANK system**
Horizontal and vertical section




**01 CETRIS® cement bonded particleboard**
**02 sunken head screw**
**03 air gap – min. 25 mm**
**04 anchoring element**
**05 system fixation element – anchor**
**06 system load-bearing profile**
**07 sheet metal cladding – metal product**
**08 heat insulation**
**09 aluminium L profile**
**10 jamb (door head) cladding – perforated CETRIS® board**
**11 flexible glue**

**Detail of jamb and window head of opening with sheet metal cladding. CETRIS® boards on system profiles, PLANK system**
Horizontal and vertical section




**01** CETRIS® cement bonded particleboard
**02** sunken head screw
**03** air gap – min. 25 mm
**04** anchoring element
**05** system fixation element – anchor
**06** system load-bearing profile
**07** sheet metal cladding – metal product
**08** heat insulation
**09** flexible glue

# 8.9 Railing, Terrace, Loggia and Balcony panels of CETRIS® Boards

For its high resistance to weather effects, fire and mechanical damage the CETRIS® cement bonded particleboard is used as a cladding element for exterior applications. In addition to building coating the CETRIS® board may be used as panels of railings, staircases, balconies, terraces, loggias etc.

To prevent injuries or material damage in the case of disintegration of these constructions, these thin walled and light constructions need to be impact tested.

Security and usability of infill railings on balconies, terraces, and loggias is assessed according to the standard ČSN 74 3305 Protection of railings. A critical examination verifies the reliability of the railings on the effects of impact load. In this test the railing must resist the soft impact with the energy impact according to the table.
The impact test is used to demonstrate the safety of railings against impact of a person. The test sample, which corresponds to the real execution of the railing, is exposed to the impact of the specimen with the desired incident energy, perpendicularly to the surface of the railing. The soft impact represents a bag filled with glass small balls with 3 mm diameter and the total weight of 50 kg. The point of impact is directed to the places with the least resistance of the railing – mostly in the middle of the railing. After the impact the state of fillings is assessed – among others, the impact must not create a hole through which a ball with a diameter of 76 mm would go through, or there may not occur a crack to the edges of the railing.

| UTILIZATION CATEGORY AREA ACCORDING EN 1991-1-1 | DEFINED USE | VALUE OF IMPACT ENERGY (J) |
|---|---|---|
| A | Residential areas and areas for domestic activities | min. 150 |
| B, C, D, E | Office areas<br>Areas where there may be a gathering of people<br>Business areas | min. 250 |

## 8.9.1 Recommended and Tested Variants of Solutions of Railing panels of CETRIS® Board

### 8.9.1.1 Panel of CETRIS® board thickness 16 mm – mechanically anchored (with screws, rivets) to load-bearing frame

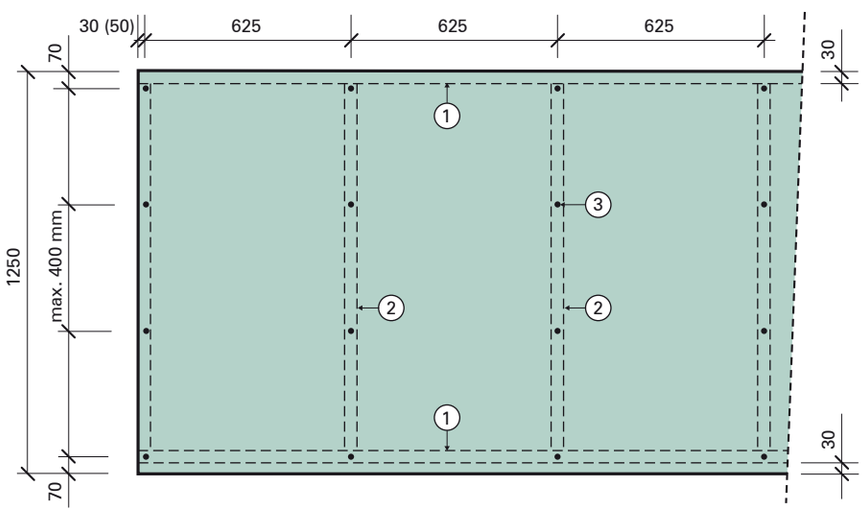
In this variant the panel – CETRIS® board, thickness 14 mm – is fixed to the load-bearing construction with screws or rivets. The load-bearing frame is made of steel profiles 40 × 40 × 4 mm, maximum distance of vertical supports is 625 mm.

This way of installation follows similar principles as facade applications. Due to thermal expansion of metal and contraction of CETRIS® boards due to humidity changes, we distinguish two principles of CETRIS® Board installation **according to maximal length of the used size**.

**Length up to 1 670 mm:**
- boards are placed with minimal gap width of 5 mm
- there are pre-drilled holes 5 mm bigger than the diameter of the used screw / bolt / rivet in the CETRIS® board with the fact that one of the holes (typically in the middle area) is always pre-drilled by the same diameter as the screw / bolt / rivet and it is called a fixed point. Its location
- is chosen according to the size and orientation of the board
- for anchoring are used screws with washers and sealing rubbers - recommended type SFS SX 3/20 - 5.5 × 50 mm (clamping thickness 20 mm) or rivets – recommended types: ETANCO rivet aluminum / stainless open 4.8 × 24 mm (clamping thickness 20 mm), SFS AP 16 - 50210-S 5 × 21 mm (clamping thickness 18 mm)
- the position of the edge screw / rivet from the vertical edge is within the range 30 – 50 mm, from the horizontal edge it is 70 – 100 mm, maximal distance of screws in the direction of vertical support is 400 mm.

**Length over 1 670 mm:**
- boards are laid with gaps of min. width 10 mm
- there are pre-drilled holes 7 mm bigger than the diameter of the used screw / bolt / rivet in the CETRIS® board with the fact that one of the holes (typically in the middle area) is always pre-drilled by the same diameter as the screw / bolt / rivet and it is called a fixed point. Its location
- is chosen according to the size and orientation of the board
- for anchoring are used screws with washers and sealing rubbers - recommended type SFS SX 3/20 - 5.5 × 50 mm (clamping thickness 20 mm) or rivets – recommended types: ETANCO rivet aluminum / stainless open 4.8 × 24 mm (clamping thickness 20 mm), SFS AP 16 - 50210-S 5 × 21 mm (clamping thickness 18 mm)
- the position of the edge screw / rivet from the vertical edge is within the range 50 – 70 mm, from the horizontal edge it is 70 – 100 mm, maximal distance of screws in the direction of vertical support is 400 mm. In cases where there ist no possibility to comply with the required minimal edge distance, it is possible to glue the entire vertical edge of CETRIS® board to the vertical support (e.g. DenBraven Mamut Glue High Tack).

**Load-bearing construction and mechanical anchoring of railing fill – CETRIS® board 14 mm**



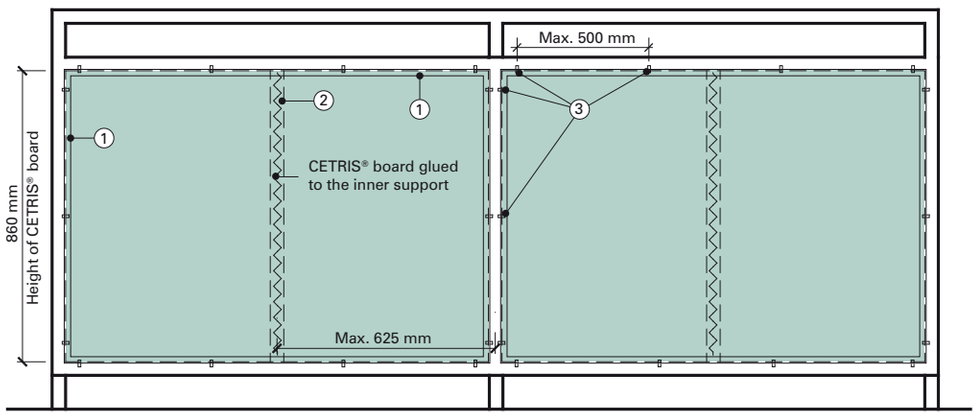

**01 horizontal profile (axial distance max. 1,250 mm)**
**02 vertical profile (axial distance max. 625 mm)**
**03 screw with washer and sealing rubber**

All dimensions in mm

### 8.9.1.2 Panel of CETRIS® board thickness 16 mm (event. 10 mm) – fixed in peripheral lath and glued to inner brace

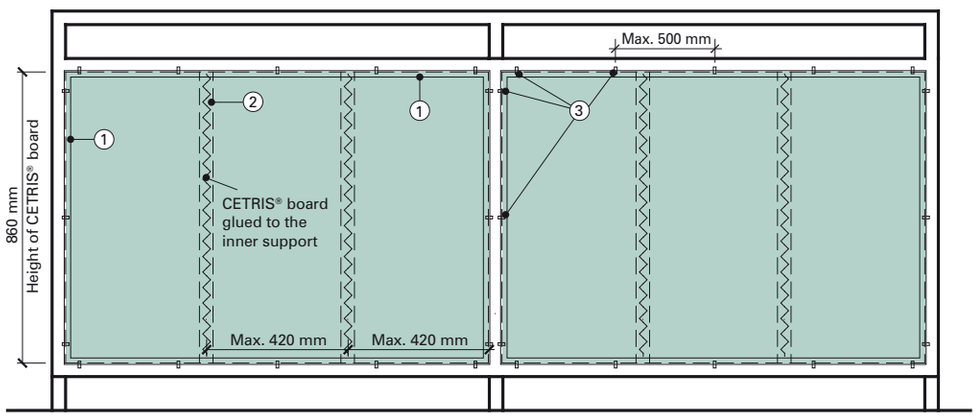
CETRIS® board, used for railing panel, is inserted in a F-shaped lath with edge dilation 3 – 5 mm. The adjusted board is installed in the peripheral frame with vertical braces. The F lath is riveted to the frame along the perimeter (maximum spacing 500 mm).

The CETRIS® board is glued to the inner brace with DenBraven Mamut Glue High Tack. Therefore no anchoring element is visible from the visible side.




**When using CETRIS® board th. 16 mm**, the max. allowed distance of vertical inner brace is 625 mm. A suitable type of the peripheral lath is the F profile PROAL 74009.

**1 Aluminium F-profile PROAL 74009 – for board 16 mm**
**2 Vertical brace 40 × 25 × 4 mm**
**3 Rivets (connection of F lath and load-bearing frame)**




**When using CETRIS® board th. 10 mm**, the max. allowed distance of vertical inner brace is 420 mm. A suitable type of the peripheral lath is the F profile PROAL 74008.

**1 Aluminium F-profile PROAL 74008 – for board 10 mm**
**2 Vertical brace 40 × 25 × 4 mm**
**3 Rivets (connection of F lath and load-bearing frame)**

**All these variants have been successfully certified for the higher impact energy – i.e. 250 J, are therefore suitable for all application classes.**

# 8.10 Roof Overlap Underside Covering

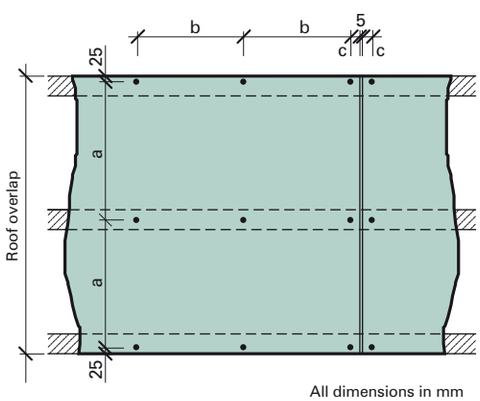
CETRIS® cement bonded particleboards are also widely used for horizontal or oblique cladding of roof construction overlap. The selection of the board type, thickness, support spacing, anchoring method and surface finish are governed by the principles defined in chapters 3, 4 and 5. This text summarises these recommendations.

**Board type selection**
Cladding can be made with CETRIS® BASIC boards with subsequent surface finish or one of the CETRIS® boards with the surface finish already applied – FINISH and FINISH PROFIL.

**Board thickness selection, support spacing**
These two parameters are interrelated. The cladding follows the same principles as façade cladding, just due to the horizontal position the maximum distance between screws is reduced to 1/2 of the support spacing, see table.
Because of the weight of CETRIS® boards, thicknesses 8, 10, and 12 mm are used.

**Support type**
CETRIS® boards are mostly laid over a single-direction grid of wooden laths (width min. 50 mm, or if the lath falls over a joint of two boards, then min. 80 mm), or sheet metal zinc-coated profiles CD. If there is a fire resistance of the cladding required then the CETRIS® board must be mounted on CD profiles, including observance of the other principles defined in chapter 9.3.2.

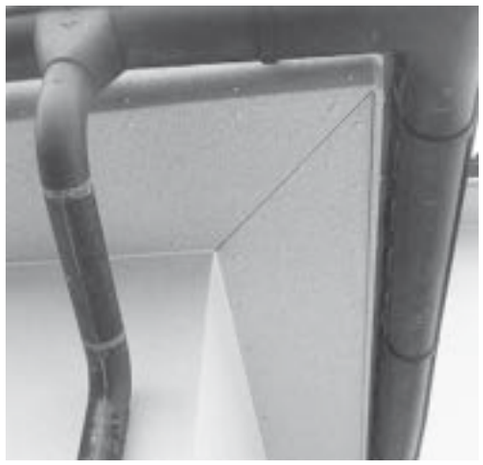
**Board anchoring**
CETRIS® boards are anchored with visible head screws (hexagonal or semi-lens – see chapter 8.7.6). The CETRIS® board is predrilled, the predrilled hole diameter is 8 mm (board length up to 1,600 mm) or 10 mm. Only in the case of a joint-less surface finish of the boards (plaster), sunken head screws are used.




All dimensions in mm

| Board thickness (mm) | Lath distance **a** (mm) | Screw distance **b** (mm) | Spacing **c** (mm) |
|---|---|---|---|
| 8 | 400 | 200 | > 25 < 50 |
| 10 | 500 | 250 | |
| 12 | 625 | 300 | |

If fire resistance is required from the ceiling panels then the CETRIS® board 12 mm must be used, including observance of the other principles defined in chapter 9.3.2.



**Surface finish, joint design**
CETRIS® boards with a surface finish (FINISH, FINISH PROFIL) do not need any further treatment on site, just anchoring to the load-bearing construction.
CETRIS® BASIC or CETRIS® PLUS boards may be treated in several ways:

- **Painting**. The joints between the boards are left empty or filled with flexible filler (i.e. Den Braven ST-5, Soudaflex LM 14, Botact A4, etc.) and provided with primer (penetration) and a final façade top coat (acrylic or silicone paint).

- **Plastering**. In this case please follow the principles defined in chapter 6.4 Exterior Plasters, i.e.:
  – CETRIS® BASIC boards treated with a penetrating primer
  – Insulation (polystyrene, mineral wool) glued and mechanically anchored with dowel discs
  – Cement filler applied and arming textile inserted and plastered
  – The base penetrated and plastered

# 8.11 Cladding of Bottom Structure (Basement)

CETRIS® cement bonded particleboards, used as the cladding of a suspended vented façade, are also suitable for base moulding lining. All principles for use (type of CETRIS® board, board thickness selection, support spacing, anchoring method, surface finish etc.) are defined in the previous text, chapters 3, 4 and 5. The following text summarises these recommendations:

| **Board thickness** (mm) | **Support distance a** (mm) | **Screw distance b** (mm) | **Spacing c (mm)** |
|---|---|---|---|
| 10 | 500 | 250 | > 25 < 50 |
| 12 | 625 | 300 | |
| 14 | 625 | 300 | |
| 16 | 625 | 300 | |

**Board type selection**
Basement cladding can be made with CETRIS® BASIC boards with subsequent surface finish or one of the CETRIS® boards with the surface finish already applied – FINISH and FINISH PROFIL.

**Board thickness selection, support spacing**
These two parameters are interrelated. The cladding follows by the same principles as façade cladding. The minimum recommended board thickness is 10 mm, in the case of possibly increased mechanical load (exposed surfaces – traffic) CETRIS® 14 or 16 mm is recommended.

**Support type**
CETRIS® boards are mostly laid over a single-direction grid of wooden laths (width min. 50 mm, or if the lath falls over a joint of two boards, then min. 80 mm). A recommended solution for anchoring of impregnated wooden elements with simultaneous levelling of the surface is the use of STEN distance screws. Also zinc-coated L profiles may be used (or J profiles) installed on anchors (brackets) – such as DEKMETAL DKM1A.

**Board anchoring**
CETRIS® boards are anchored with visible head screws (hexagonal or semi-lens – see chapter 8.7.6). The CETRIS® board is predrilled, the predrilled hole diameter is 8 mm (board length up to 1,600 mm) or 10 mm.
Only in the case of a joint-less surface finish of the boards (plaster) sunken head screws are used.

**Surface finish, joint design**
CETRIS® boards with a surface finish (FINISH, FINISH PROFIL) do not need any further treatment on site, just anchoring to the load-bearing construction.

CETRIS® BASIC or CETRIS® PLUS boards may be treated in several ways:

- **Painting.** The joints between the boards are left empty or filled with flexible filler (i.e. Den Braven ST-5, Soudaflex LM 14, Botact A4, etc.) and provided with primer (penetration) and a final façade top coat (acrylic or silicone paint).
- **Plastering.** In this case please follow the principles defined in chapter 6.4 Exterior Plasters, i.e.:
  - CETRIS® BASIC boards treated with a penetrating primer
  - Insulation (polystyrene, mineral wool) glued and mechanically anchored with dowel discs
  - Cement filler applied and arming textile needs to be inserted and plastered
  - The base penetrated and plastered

# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

9



CETRIS®

# 9.1 Fire Protection of Building Constructions

The purpose of this chapter is to inform the user about all of the protective technical options of building constructions against the effects of fire with the help of CETRIS® cement-bonded particleboard. This text has been prepared on the basis of fire resistance test results pursuant to European standards.

The knowledge summarised in this chapter results from theoretical-experimental solutions leading to tabular processing of dimensions of vertical and horizontal fire partitions pursuant to the effective European technical standards EN. This catalogue also newly includes texts concerning horizontal ceiling (floor) constructions and steel construction coating. All below mentioned construction data are based on the set of test protocols of PAVÚS – Veselí nad Lužnicí, (prepared by Ing. Bauma CSc. and Ing. Karpaš CSc.) and the tests made by the testing laboratory of FIRES spol. s r. o. Batizovce.

Particular references to the individual protocols and assessments are listed at the end of this chapter. The assembly instructions and model solutions have been prepared on the basis of conclusive tests of the individual applications specified in the test protocols and construction materials.

## 9.1.1 Requirements of Fire Safety of Building Constructions

The requirements for fire safety of building constructions and products built in them are stipulated by the Fire Standards Code. These guidelines are divided into four groups:

- Design standards (requirements for building design with regard to fire safety)
- Test standards (defining methods of testing and proving the required properties)
- Value standards (fire technical properties of selected constructions and materials)
- Subject standards (technical conditions of fire safety equipment)

## 9.1.2 Fire-Related Properties of Building Materials – Flame Spread, Classification Based on National Standards

Cement-bonded particleboard is also classified pursuant to the following national standards:

- DIN 4102 in class B1 – **schwer entflambar (hardly flammable)**
- PN-B-02874:1996 (Protocol NP- 595/02/JF) – classification **niezapalny (non-flammable)**

**Flame Spread Index**

ČSN 73 0863 standard – Specification of the Speed of Flame Spread along the Surface of Building Materials – is used for specification of the flame spread index $\mathbf{i_S}$, characteristics expressing the speed of flame spread in time under exactly defined test conditions. The Flame spread index $\mathbf{i_S}$ has been specified for CETRIS® cement-bonded particleboard with Denasil paint (Protocol 10474) and with façade plaster Bayosan (Test protocol № Z-7.04-94), with dispersion plaster Rudicolor (Test protocol № Z-7.03-94) – always with the result $\mathbf{i_S = 0}$.

## 9.1.3 Classification of Building Products in Euro Classes depending on the reaction to fire

At present the European Union intensely formulates harmonised technical standards of building fire safety as the basis for implementation of the basic requirements of the CPD directive.

The main objective of this directive is to harmonise the national legislation of EU countries with the aim to achieve exclusive use of products meeting the following basic requirements for fire safety in buildings:

- Preservation of load-bearing capacity and stability of the construction for a certain period of time
- Restriction of ignition and spread of fire and its products inside the building
- Restriction of flame spread outside the building
- Possibility of evacuation of persons and animals in the case of fire
- Facilitation of safe intervention of fire and rescue corps

An important part of the harmonised European standards is represented by a new classification system of building materials (products) based on their assumed reaction to fire class, the so called EURO CLASSES, and new related EN test standards.

The new classification system became legally binding after its publication in the Official Journal of the EU. The system has been completed and implemented as the EN 13 501-1 standard, adopted in the Czech Republic in 2003. The new standard eliminated the principal differences in the national systems of EU countries in this area, as a serious obstacle to common trade. Another advantage of the new system is a more accurate evaluation of building products. Pursuant to the new test standards, the system is getting closer to the results of large-scale tests, i.e. behaviour in real fire situations.

The test methods for the purpose of the classification, the classification criteria, the new EURO CLASSES and their identification are shown in Table 1. The tables give an idea of the procedure of classification of a building product into one of the seven classes: The acclimatised test sample is tested by the procedures described in the relevant test standards, the measured test results are entered in the test protocols, these are compared to the relevant classification criteria and the result is processed in the form of EURO CLASS Classification Protocol of Building Product.

**For the purpose of classification of building products pursuant to their reaction to fire test results pursuant to the following European standards are used:**

- **EN ISO 1182:2002 Non-Flammability Test**. This test distinguishes products that will not contribute or will only insignificantly contribute to fire, regardless their practical application. The test is used together with the test pursuant to EN ISO 1716 standard for classification of building products to classes A1, A2, $A1_{fl}$ and $A2_{fl}$.

- **EN IS01716:2002 Specification of Combustion Heat.** This test is used for specification of the maximum amount of heat released by a completely burnt product, regardless its practical application. The test is used together with the test pursuant to the EN ISO 1182 standard for classification of building products to classes A1, A2, $A1_{fl}$ and $A2_{fl}$.

- **EN 13823:2002 Test by single burning item (hereinafter SBI).** This test is used to classify the product contribution to fire progress if the product is exposed to the heat effects corresponding to a single burning item placed in the corner of the room close to the tested product. The test is used for classification to classes A2, B, C and D. Under specific conditions of the combination of components of a heterogeneous product, this test is also suitable for classification to class A1.

- **EN ISO 11925-2:2002 Test of Flammability by single Flame Source (hereinafter Flammability Test).** This test is used for specification of the flammability of the product by single flame. This test is used for classification to classes B, C and D, E, $B_{fi}$, $C_{fi}$, $D_{fi}$ and $E_{fi}$.

- **EN ISO 9239-1: 2002 Determination of the burning behaviour using a radiant heat source** (hereinafter Radiant Panel Test). This test specifies the critical heat flow under which the flames no longer spread along horizontal surfaces. The test is used for classification to classes $A2_{fl}$, $B_{fl}$, $C_{fl}$ and $D_{fl}$.

Non-flammability and burning heat are material characteristics and therefore do not depend on the practical application of the product.

**Table 1: The following criteria are assessed for the purpose of classification of building products pursuant to their reaction to flame**

| CLASS | TEST METHOD | CLASSIFICATION CRITERIA | ADDITIONAL CLASSIFICATION |
|---|---|---|---|
| A1 | EN ISO 1182:2002(1)<br>*and* | T ≤ 30 °C; *and*<br>m ≤ 50 %; *and*<br>$t_f$ = 0 (i.e. without stable burning) | |
| | EN ISO 1716:2002 | PCS ≤2,0 MJ/kg (1) *and* PCS ≤2,0 MJ/kg (2a) *and*<br>PCS ≤1,4 MJ/m² (3) *and* PCS ≤2,0 MJ/kg (4) | |
| A2 | EN ISO 1182:2002(1)<br>*and/or* | T ≤50 °C; and m ≤50 %; and tf ≤20 s | |
| | EN ISO 1716:2002<br>*and* | PCS ≤3,0 MJ/kg (1) *and* PCS ≤4,0 MJ/m² (2)<br>*and* PCS ≤4,0 MJ/m² (3) *and* PCS ≤3,0 MJ/kg (4) | |
| | EN 13823:2002 | FIGRA ≤120 W/s and LFS < sample edge *and*<br>$THR_{600s}$ ≤7,5 MJ | smoke production (5)<br>and flaming drops/particles (6) |
| B | EN 13823:2002<br>*and* | FIGRA ≤120 W/s *and* LFS < sample edge *and*<br>$THR_{600s}$ ≤7,5 MJ | smoke production (5)<br>and flaming drops/particles (6) |
| | EN ISO 11925-2:2002(8)<br>*exposition time = 30 s* | Fs ≤ 150 mm za 60 s | |
| C | EN 13823:2002<br>*and* | FIGRA ≤250 W/s et LFS < sample edge *and*<br>$THR_{600s}$ ≤7,5 MJ | smoke production (5)<br>and flaming drops/particles (6) |
| | EN ISO 11925-2:2002(8)<br>*exposition time = 30 s* | Fs ≤150 mm za 60 s | |
| D | EN 13823:2002<br>*and* | FIGRA ≤750 W/s | smoke production (5)<br>and flaming drops/particles (6) |
| | EN ISO 11925-2:2002(8)<br>*exposition time = 30 s* | Fs ≤150 mm za 60 s | |
| E | EN ISO 11925-2:2002(8)<br>*exposition time = 15 s* | Fs ≤150 mm za 20 s | flaming drops/particles (7) |
| F | **no requirements** | | |

**Notes to Table 1**

1) For homogeneous products and substantial components of heterogeneous products,
2) For any external non-substantial components of heterogeneous products
2a) Alternatively, any non-substantial component with PCS 2 MJ/m² on condition that the product complies with the criteria of EN 13 823: FIGRA 20 W/s, LFS for sample edge and $THR_{600}$ s 4 MJ and s1 a d0,
3) For any internal non-substantial components of heterogeneous products
4) For the product as a whole
5) s1 = SMOGRA 30 m²/s² and $TSP_{600}$ s 50 m², s2 = SMOGRA 180 m²/s² and $TSP_{600}$ s 200 m², s3 = no s1 or s2,
6) d0 = non-flaming drops/particles in the course of 600 s (EN 13823), d1 = drops/particles not burning longer than 10 s in the course of 600 s of the test (EN 13 823), d2= no d0 or d1. Classification d2 means paper ignition (EN ISO 11 925-2),
7) Complies = paper does not ignite (unclassified), non-compliant = paper ignites (classification d2),
8) Under condition of flame acting on the surface and if suitable with regard to the final use of the product, its acting on the edge

The results of flammability tests, SBI and radiant panel tests depend on the practical application of the product. The conditions of practical application include:
- Product position,
- Product location in relation to other neighbouring products (substrate, connecting elements etc.).

Typical positions of the product include:
- Vertical, face side to open space (position of wall/façade),
- Vertical, face side to a cavity,
- Horizontal, exposed side down (ceiling position),
- Horizontal, exposed side up (floor position),
- Horizontal, inside cavity.

All products except for flooring must be tested in the vertical position for the purpose of the classification. Floorings must be tested with the exposed side up pursuant to EN ISO 9239-1 and in the vertical position pursuant to EN ISO 11925-2.

Typical locations in relation to other products include but are not limited to the following:
- Free standing: without any other products in front or behind the tested product. In this case the product is tested free standing with a suitable fixation,
- On the base: glued, mechanically fixed or touching the base. In this case the product is tested together with the base and fixation typical of its practical application,
- With a cavity between the product and the base. This is also how the product must be tested.

**For classification of CETRIS® cement-bonded particleboard, pursuant to its reaction to fire test results the following European standards have been used:**
- EN ISO 1182:2002 Non-flammability test
- EN ISO 1716:2002 Combustion heat specification
- EN 13823:2002 Test by single burning item (SBI)
- EN ISO 11925-2:2002 Test of flammability by single flame source (Flammability test)

On the basis of these tests performed by IBS – Institut für Brandschutztechnik und Sicherheitsforschung Linz (Austria) the CETRIS® cement-bonded particleboard is classified as **A2**. Its additional classification of smoke production is **s1**, flaming drops (particles) **d0**, i.e. total classification is **A2-s1,d0**. This result applies to classification of behaviour in fire except for flooring.

Use of the classification is governed by the following rules. The area of use of the classification results follows from the test conditions depending on the product application in practice. The product can be classified differently for different practical applications. Use of standard bases and fixation methods and their effect on the resulting classification has already been mentioned.
The possibility to extend the classification on products of the same composition but different thicknesses and densities will be specified in the relevant European standards for the respective products. The general rule applicable to these cases is that if a product of two different thicknesses or densities is to be classified, then the worse of the achieved classifications will apply to the thicknesses and densities between the two classified variants.

## 9.1.4 Fire Resistance of Building Constructions

Fire resistance is a specific and decisive property of building constructions. Fire resistance is expressed in time (minutes) for which the assessed construction is able to resist effects of the so called standard fire, i.e. fire progressing under exactly specified conditions. As these parameters are specific for individual building constructions and differ with the ways they are stressed, there are more test methodologies and standards for evaluation of these properties.
Fire resistance is specified by test or calculation, extrapolation and comparison to test standards and regulations by an authorised person who issues the fire resistance classification certificate.

Fire resistance is specified in minutes on basic scale: 15, 30, 45, 60, 90, 120 and 180 minutes.

The values of fire resistance for the individual limit conditions are marked as follows:

Insulation ability **I** | Integrity **E** | Load-bearing capacity and stability **R**

R ..... Load-bearing capacity and stability
E ..... Integrity
I ..... Insulation ability – limit temperature of the non-heated surface
W .... Limit density of heat flow from the non-heated side
S ..... Burning product penetration (... and others, less often used)

The decisive limit conditions are defined for every construction in compliance with the relevant project standard and suitable constructions are selected on the basis of these, such as:
- Constructions meeting the requirements of the three basic limit conditions, i.e. stability (R), integrity (E) and insulation ability (I) are classified with fire resistance **REI**. These requirements must be met by fire compartment partitions, i.e. walls and ceilings
- Non-load-bearing fire partitions (interior walls, partitions and ceiling panels) have their requirements for fire resistance defined on the basis of just two of the limit conditions, i.e. integrity (E) and insulation ability (I), i.e. **EI**
- For load-bearing bar elements (beams and pillars) just load-bearing capacity and stability are required – **R**
- Fire closures are required to show integrity (E) and insulation ability (I), those formerly marked as closures of PB type are now marked pursuant to ČSN 730810 as closures of EI type, and those formerly marked as PO, i.e. requiring integrity (E) and limit density of heat flow (radiation-W), are now marked as closures type **EW**

# 9.2 Vertical Wall Constructions

## 9.2.1 Applicability Range

On the basis of the present data CETRIS® boards may be used in the following types of vertical wall constructions:

- Non-load-bearing walls and partitions up to the height of 6 metres and fire resistance up to 180 minutes, with or without mineral fill (with air gap)
- Additional cladding of walls or advanced walls increasing fire resistance of the existing construction. The precondition is fire resistance of the construction before the cladding application for at least 30 minutes (EI)
- Lift shaft or separate advanced wall – single side coated wall construction
- Peripheral wall on wooden framework – as a load-bearing wall with 3 metres max. height, as a non-load-bearing (fill) wall with 4 metres max. height

As stated in the protocols it is also necessary to comply with the technology of the wall assembly and all assembly procedures used and tested in the context of the sample preparation. This means that the proposed connecting elements, their spacing and layout on the construction and other details are binding and must be complied with for the above attests to be applicable. In addition there are recommended variant solutions for applications and elements which cannot be tested because of the methodologies used or the spatial arrangement of the kilns. These solutions have nevertheless been professionally assessed by expert assessments of PAVUS Praha.

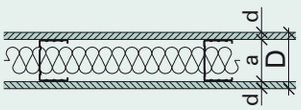
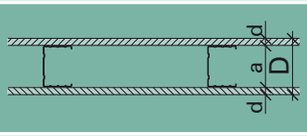
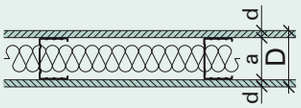
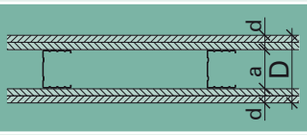
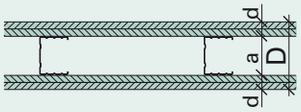
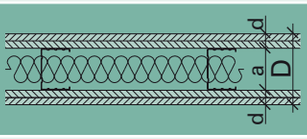
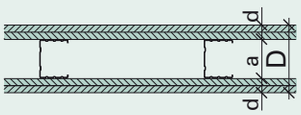
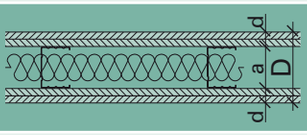
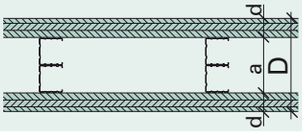
**Important notice**
All data apply to the conditions and loads of the wall constructions by fire in the sense of the effective wording of EN 1363-1, EN 1364-1, EN 1365-1.
The typical samples of the constructions have been tested and the tests have been documented by the state accredited testing laboratory PAVÚS – Veselí n. L. in different wall compositions, and on the basis of these tests the laboratory has issued fire resistance test protocols nos. Pr-02-02.089, Pr-02-02.090, Pr-03-02.066, and Pr-03-02.091. These reports, together with some other tests performed in recent years, have been used as the basis for PAVÚS a.s. Praha (Ing. Karpaš CSc, Ing. Bauma CSc), who then prepared extended applications and the needed dimensional tables generalising the results for the above application range in the context of the final expert assessment.

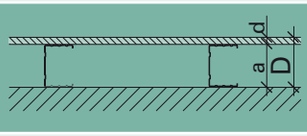
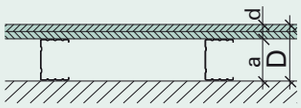
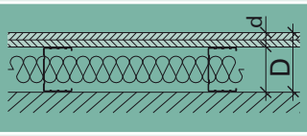
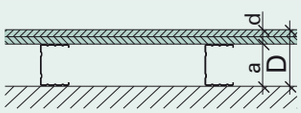
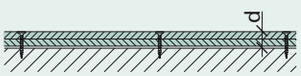
**Important notice**
The results of fire resistance tests and the tables following from them only assess the issue of the technical properties of the constructions in relation to their resistance to actual fire. For that reason axial distances and types of CW profiles found compliant by the tests are specified. These, however, must be considered the minimum limits that must not be exceeded. It needs to be noted that when dimensioning fire partitions what also always needs to be considered is structural requirement for the construction based on the actual loading.

**Assembly of fire constructions may only be carried out by trained staff – see Chapter 9.8 Training of Assembly Companies in Applications with CETRIS® Boards.**

**Description of Construction**
The vertical fire partitions – walls and partition walls – coated with CETRIS® cement-bonded particleboard can be designed on the basis of the fire resistance tests and extended applications of their results through theoretical calculations in several basic variants with different values of fire resistance pursuant to the following Table 2.

**Table 2: Survey of wall constructions**

| TYPE | CONSTRUCTION SCHEME | CONSTRUCTION SIZE (mm) | | | WEIGHT (kg/m²) | MAXIMUM WALL HEIGHT (m) | MINERAL WOOL [1] | | FIRE RESISTANCE | THERMAL RESISTANCE (m²K/W) | WEIGHED SOUND TRANSMISSION LOSS $R_W$ (dB) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | a (mm) (CW profile) | d (mm) | D (mm) (wall thickness) | | | Bulk density (kg/m²) | Insulation thickness (mm) | | | | |
| Non-load-bearing partition wall on steel framework |  | 75 | 12 | 99 | 38.10 | 3.60 | 75 | 60 (75) [9] | EI 45 DP1 | 1.61 [2] | 52 | Page 138 |
| | | 100 | | 124 | | 4.00 | | | | | | |
| |  | 75 | 16 | 107 | 44.80 | 4.50 | - | - | EI 30 DP1 | 0.15 [2] | 44 | |
| |  | 75 | 16 | 107 | 49.30 | 3.60 | 75 | 60 (75) [9] | EI 60 DP1 | 1.65 [2] | - | |
| | | 100 | | 132 | | 4.00 | | | | | | |
| |  | 75 | 10+10 | 115 | 56.00 | 4.00 | - | - | EI 45 DP1 | 0.19 [2] | - | |
| |  | 75 | 12+12 | 123 | 67.20 | 4.00 | - | - | EI 60 DP1 | 0.23 [2] | 50 | |
| |  | 75 | 12+12 | 123 | 71.70 | 4.00 | 75 | 60 (75) [9] | EI 90 DP1 | 1.73 [2] | 56 | |
| |  | 75 | 16+18 | 143 | 95.20 | 4.00 | - | - | EI 90 DP1 | 0.32 [2] | - | |
| |  | 75 | 16+16 | 139 | 94.10 | 4.00 | 75 | 60 (75) [9] | EI 120 DP1 | 1.80 [2] | - | |
| |  | 2×75 | 18+12+12 | 234 | 117.60 | 4.00 | - | - | EI 120 DP1 | 0.40 [2] | - | |
| |  | 2×75 | 18+12+12 | 234 | 122.10 | 4.90 | 75 | 60 | EI 180 DP1 | 1.90 [2] | 61 | |
| | | | | | | 6.40 | | | EI 120 DP1 | | | |
| | | | | | | 9.50 | | | EI 90 DP1 | | | |

| TYPE | CONSTRUCTION SCHEME | CONSTRUCTION SIZE (mm) | | | WEIGHT (kg/m²) | MAXIMUM WALL HEIGHT (m) | MINERAL WOOL [1] | | FIRE RESISTANCE | THERMAL RESISTANCE (m²K/W) | WEIGHED SOUND TRANSMISSION LOSS $R_W$ (dB) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **a** (mm) (CW profile) | **d** (mm) | **D** (mm) (wall thick-ness) | | | **Bulk density** (kg/m²) | **Insulation thickness** (mm) | | | | |
| **Shaft wall** |  | 75 | 12+12 | 99 | 33.60 | 4.00 | - | - | EI 30 [3] | 0.11 [2] | - | Page 138 |
| **Advanced wall on steel construction** |  | 75 | 10 | 85 | 14.00 | 4.00 | - | - | Ei (x) [4] + 15 | 0.05 [2] | - | Page 143 |
| | | 75 | 18 | 93 | 25.20 | 4.00 | - | - | Ei (x) [4] + 30 | 0.09 [2] | - | |
| |  | 75 | 12+12 | 99 | 33.60 | 4.00 | - | - | Ei (x) [4] + 45 | 0.11 [2] | - | |
| | | 75 | 16+16 | 107 | 44.80 | 4.00 | - | - | Ei (x) [4] + 60 | 0.15 [2] | - | |
| |  | 75 | 18+18 | 111 | 54.15 | 4.00 | 75 | 50 | Ei (x) [4] + 90 | 1.67 [2] | - | |
| |  | 75 | 12+12 | 99 | 33.60 | 4.00 | - | - | Ei 30 [5] | 0.11 [2] | - | |
| **Direct wall cladding of CETRIS® boards** |  | | 12 | - | 16.80 | 4.00 | - | - | Ei (x) [4] + 15 | 0.06 [2] | - | Page 143 |
| |  | | 10+10 | - | 28.00 | 4.00 | - | - | Ei (x) [4] + 30 | 0.10 [2] | - | |
| | | | 14+14 | - | 39.20 | 4.00 | - | - | Ei (x) [4] + 45 | 0.13 [2] | - | |
| | | | 18+18 | - | 50.40 | 4.00 | - | - | Ei (x) [4] + 60 | 0.17 [2] | - | |

**Scheme of fire walls on the next page**

**Notes to the table:**

1) Mineral fibre board of prescribed thickness and bulk density, A1 class of fire reaction pursuant to EN 13501-1).
2) Informative value of thermal resistance
3) Fire resistance value for exposition to fire on the CETRIS® board (full coat) side as well as on the profile (hollow) side
4) EI (x) is the original value of fire resistance of the additionally clad wall (minimum 30 minutes).
5) Fire resistance of the existing construction is not required
6) Value of fire resistance for exposition to external fire (fire on the exterior side)
7) Value of fire resistance for exposition to internal fire (fire on the interior side) – as closed fire compartment
8) Wall height over wooden construction may be extended to 4.0 m, unless exposed to load
9) Applies to wall higher than 4.0 m

**Tabulka č. 2: Survey of wall constructions – Fire Walls**

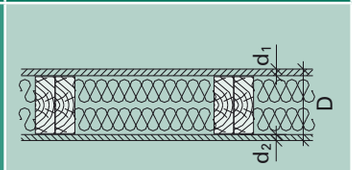
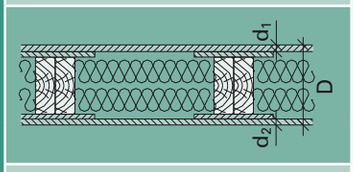
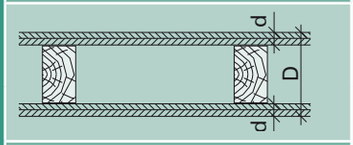
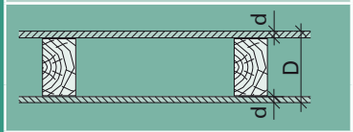
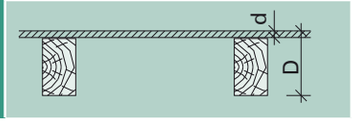
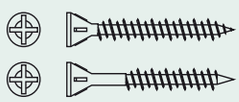
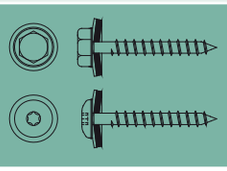
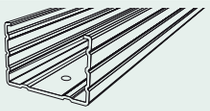
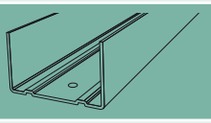
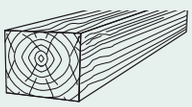
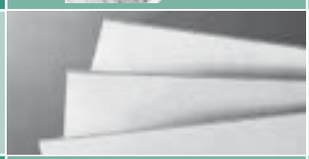
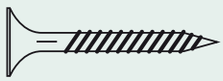
| TYPE | CONSTRUCTION SCHEME | CONSTRUCTION SIZE (mm) | | | WEIGHT (kg/m²) | MAX. WALL HEIGHT (m) | MINERAL WOOL | | FIRE RESISTANCE ACCORDING TO ČSN 73 0810 |
|---|---|---|---|---|---|---|---|---|---|
| | | Bearing Construction | d (mm) | D (mm) (wall thickness) | | | Bulk density (kg/m²) | Insulation thickness (mm) | |
| Fire Walls |  | Wooden post 120 × 100 mm (axial distance max. 625 mm) | $d_1$=14 CETRIS® BASIC<br>$d_2$=12,5 Knauf RED | 146,5 | 43,0 | 3,00 | 40 | 120 | REI 60 DP3<br>REI 15 DP2<br>(i → o)<br>REW 60-ef DP3<br>REW 15-ef DP2<br>(o → i) |
| | | | | | | 4,00 | | | EI 60 DP3 |
| |  | | $d_1$=14 CETRIS® BASIC + pásek 8 mm; $d_2$=12,5 Knauf GKF + pásek 12,5 | 167 | 45 | 3,00 | | | REI 30 DP2<br>(i → o)<br>REW 30-ef DP2<br>(o → i) |
| | | | | | | 4,00 | | | EI 30 DP2 |
| |  | Wooden post 100 × 60 mm (axial distance max. 625 mm) | 12 + 12 | 148 | 74 | 3,00 | There may be mineral insulation of reaction to fire class A1, A2 in the cavity. | | REI 60 DP3<br>REI 45 DP2 |
| | | | | | | 4,00 | | | EI 60 DP3 |
| |  | | 14 | 128 | 45 | 3,00 | | | REI 30 DP3<br>REI 15 DP2 |
| | | | | | | 4,00 | | | EI 30 DP3 |
| |  | | 16 only one-way (fire from the CETRIS® side) | 116 | 27 | 3,00 | | | REI 15 DP2 |
| | | | | | | 4,00 | | | EI 15 DP2 |

**Table 3: Materials for assembly of fire wall constructions – specifications**

| DESCRIPTION | PICTURE | REMARKS | TYPE OF WALL CONSTRUCTION | | | |
|---|---|---|---|---|---|---|
| | | | PARTITION WALLS | ADVANCED WALLS | LOAD-BEARING WALLS | SHAFT WALLS |
| **CETRIS® BASIC**<br>Cement-bonded particleboard, smooth surface, cement grey.<br>Basic size 1,250 × 3,350 mm<br>Bulk density 1,320 ±70 kgm³ |  | Thickness pursuant to fire resistance requirement. | X | X | X | X |
| **CETRIS screw 4.2 × 25, 35, 45, 55 mm**<br>Screws for cement-bonded particleboard, self-cutting, self drilling with sunken heads |  | Screw type pursuant to cladding thickness and load-bearing construction type. | X | X | X | X |
| **Screw 4.8 × 38, 45, 55 mm**<br>Stainless or galvanised screws with semi-circular or hexagonal heads with compressive water tight washer. |  | Screw type (length) pursuant to the cladding thickness. For anchoring of upper layer of CETRIS® boards in exteriors – where the board remains visible.<br>**The board must be predrilled with a min. hole diameter of 8 (10) mm!** | X | X | X | X |

| DESCRIPTION | PICTURE | REMARKS | TYPE OF WALL CONSTRUCTION | | | |
|---|---|---|---|---|---|---|
| | | | PARTITION WALLS | ADVANCED WALLS | LOAD-BEARING WALLS | SHAFT WALLS |
| **CW profile 75, 100 (vertical)**<br>Zinc-coated sheet metal profile<br>75 × 50 × 0.6 mm<br>100 × 50 × 0.6 mm |  | Size pursuant to the requirement for the wall fire resistance and height. Steel profiles may be used as an alternative. | X | X | - | X |
| **UW profile 75, 100 (horizontal)**<br>Zinc-coated sheet metal profile<br>75 × 40 × 0.6 mm<br>100 × 40 × 0.6 mm |  | | X | X | - | X |
| **Steel dowels**<br>For profile anchoring to masonry (concrete) walls |  | Size (diameter and length) pursuant to the construction weights, base types and anchored material. | X | X | X | X |
| **Putty DEXAFLAMM-R**<br>White tixotrophic material for joint filling and screw head covering. |  | Alternatives include fire resistant single-component putties (acrylic, silicon) permanently elastic (Sika Firesil, Den Braven Pyrocryl). | X | X | X | X |
| **ORSIL (ISOVER)**<br>Mineral board thickness 60 mm, bulk density 75 kgm$^{-3}$. |  | Alternatives include mineral board of the same bulk density, flammability class max. B pursuant to ČSN 73 0862, assumed fire reaction class A2 (pursuant to EN 13501). | X | X | - | - |
| **ORSIL (ISOVER) type UNI**<br>Mineral felt thickness 2 × 60 mm, bulk density 40 kgm$^{-3}$. | | | - | - | X | - |
| **Adhesive pins** |  | For stabilisation of position of insulation boards in frame construction. | X | X | X | - |
| **Wooden post**<br>Spruce lumber min. class SII, max. humidity 18 %, size 120 × 100 mm. |  | Alternatively glued logs may be used (Euro Profile). | - | - | X | - |
| **Paper SIBRAL**<br>Mats of aluminium-silicon fibre, th. 13 mm |  | For profile lining on the bottom side, interruption of thermal bridges, as insulation for temperatures up to 1,260° C. | X | X | X | X |
| **KNAUF GKF**<br>Plasterboard KNAUF thickness 12.5 mm. Basic size 1,250 × 2,000 (2,500) mm. |  | Processing, anchoring, filler applications, surface finish of boards pursuant to the instructions of KNAUF company. | - | - | X | - |
| **KNAUF Uniflott**<br>Filler for joint filling between plasterboards. |  | Cannot be used for CETRIS® board joint filling. | - | - | X | - |
| **Screw TN 35**<br>Quick screw (3.5 × 35 mm) for plasterboard anchoring. |  | Cannot be used for CETRIS® board anchoring. | - | - | X | - |

## 9.2.2 Fire Partitions, Shaft Wall on Steel Framework

**9.2.2.1 Load-Bearing Construction**

The load-bearing construction is a frame consisting of steel zinc-coated profiles CW (vertical posts) and UW (horizontal profiles). For specification of the CW profile dimension in relation to the height and total thickness of the wall, the ratio of the wall height hs and thickness **d** should always be lower than **40**. The **hs/d > 40** ratio represents slenderness ratio **L/i** circa 140. The recommended profile sizes are shown in relation to the construction height in Table 5.

Peripheral profiles are anchored in the frame (wall) with steel dowels with the spacing of 625 mm, the joint between the profiles and the wall is filled with DEXAFLAMM-R filler. The axial distance of the vertical interior profiles does not exceed 625 mm.

**9.2.2.2 Construction Composition**

The construction is symmetrically or asymmetrically coated on one or both sides with one or more layers of cement-bonded CETRIS® particleboards. The thickness and the number of the CETRIS® boards, and the mineral wool insertion represent the decisive elements of fire resistance (see the dimension tables for the particular specified construction types). Horizontal overlap of the boards is min. 400 mm. In the case of multilayer coating the joints between the boards are overlapped – in the vertical direction by a profile width (625 mm), and in the horizontal direction by min. 400 mm. For CETRIS® board anchoring to the sheet metal profiles self-cutting screws with sunken heads are used. The screw heads are equipped with blades for countersinking in the board. The screw size is 4.2 × 25 or 35, 45, 55 mm. The screw length must always be at least 10 mm longer than the thickness of the screwed board (in the case of multilayer coating at least 10 mm longer than the total thickness of all anchored layers). Gaps are left between the boards with the minimum width of 5 mm. The joint fill, the wall perimeter filling and coverage of the screw heads is made with DEXAFLAMM-R filler.

**Table 4: Dimensions of partition walls with heights up to 4 m (a steel framework of CW profiles, two-sided, clad with one- or a multi-layer coat of CETRIS® boards with or without interior heat insulation on mineral wool basis)**

| FIRE RESISTANCE [1] | THICKNESS OF TWO-SIDED COAT OF CETRIS® BOARDS (mm) | | | | | |
|---|---|---|---|---|---|---|
| | with air gap [2] | | | with mineral wool [3] | | |
| | COAT | GAP | COAT | COAT | INSULATION | COAT |
| EI 30 | 16 | - | 16 | Not applicable | | |
| EI 45 | 10 + 10 | - | 10 + 10 | 12 | 60 | 12 |
| EI 60 | 12 + 12 | - | 12 + 12 | 16 | 60 | 16 |
| EI 90 | 18 + 16 | - | 18 + 16 | 12 + 12 | 60 | 12 + 12 |
| EI 120 | 18 + 12 + 12 | - | 18 + 12 + 12 | 16 + 16 | 60 | 16 + 16 |
| EI 180 | To be assessed | | | 18 + 12 + 12 | 60 | 18 + 12 + 12 |

**Notes to Table 4:**

1) Classification of min. value of limit conditions of fire resistance is performed pursuant to ČSN 73 0810, the constructions are tested pursuant to EN 1364-1
2) Air gap width 50 mm minimum
3) Mineral insulation Orsil (Isover) or another mineral fibre board with bulk density of at least 75 kg/m³, max. flammability class B (not easy to catch fire) pursuant to ČSN 73 0862 (A2 fire reaction class EN 73501-1 assumed).

**Table 5: Dimensions of partition walls with heights over 4 m (Steel framework of CW profiles, two-sided, clad with one- or multi-layer coat of CETRIS® boards with or without interior heat insulation on mineral wool basis)**

| FIRE RESISTANCE [1] | THICKNESS OF TWO-SIDED COAT OF CETRIS® BOARDS (mm) | | | MAX. WALL HEIGHT (m) |
|---|---|---|---|---|
| | COAT | GAP/INSULATION | COAT | |
| EI 30 DP1 [5] | 16 | without insulation | 16 | 4.5 |
| EI 90 DP1 | 18 + 12 + 12 | 75 mm MW[3] | 18 + 12 + 12 | 9.5 |
| EI 120 DP1 | | | | 6.4 |
| EI 180 DP1 | | | | 4.9 |

**Note:** In the case of wall height above the stated figures, fire resistance must be asessed individually on the basis of the actual conditions.

**Notes to Table 5:**

1) Classification of limit conditions of fire resistance is performed pursuant to EOTA TR 35
2) Air gap width is 75 mm
3) Mineral insulation Orsil (Isover) or another mineral fibre board with bulk density of at least 75 kg/m³, max. flammability class B (not easy to catch fire) pursuant to ČSN 73 0862 (A2 fire reaction class EN 73501-1 assumed). If the insulation does not fill the whole gap then the insulation position must be secured – for example with adhesive pins.
4) In case of partitions with the height over 4 m it is necessary to consider the higher weight of the construction resulting in increased tension in the steel profile, causing a drop of the critical temperature of steel. That is why in the case of higher partitions, the steel framework needs better protection – unless filled with mineral wool in the points of contact between the steel CW profiles and the boards, the coating needs to be padded with a strip of CETRIS® board with the minimum thickness of 12 mm for the strip to overlap the width of the CW profile at least by 60 mm on each side.
5) The upper U-profile must be in place of CW posts min. 100 mm high.

**Table 6: Dimensions of manhole or separate advanced wall (a steel framework of CW profiles, one-sided, clad with two layers of CETRIS® boards without interior heat insulation)**

| FIRE RESISTANCE [1] | THICKNESS OF TWO-SIDED COAT OF CETRIS® BOARDS (mm) | FIRE EXPOSURE |
|---|---|---|
| EI 30 DP1 | 12 + 12 | On the CETRIS® side |
| | | On the profile (cavity) side |

**Notes to Table 6:**

1) Classification of limit conditions of fire resistance is performed pursuant to ČSN 73 0810, the constructions are tested pursuant to EN 1364-1.

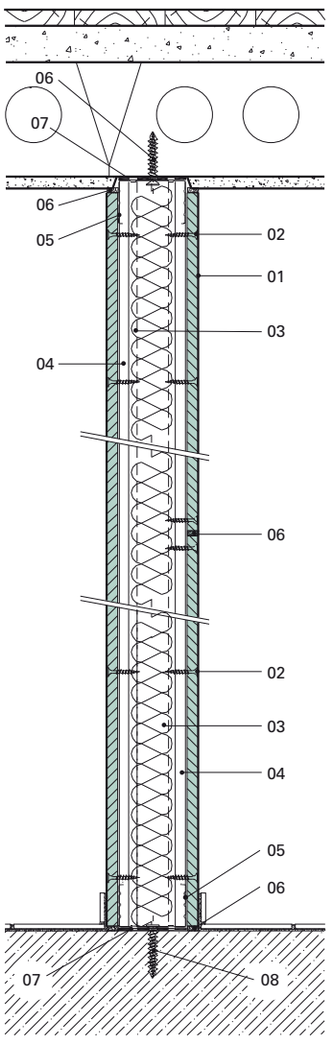
**Note**: The construction may be used also as an advanced wall – for increased fire resistance of the existing wall construction. Fire resistance of the existing construction is not required. Maximum height of this construction is 4.0 m.

**Note**: Requirements for mechanical parameters of elevator shaft coating are specified in EN 81-1 Safety Regulations for Construction and Assembly of Elevators – Part 1: Electrical Elevators. For safe elevator operation the shaft walls must show mechanical compactness sufficient to resist 300 N force acting perpendicularly to the wall on one or the other side, in any place, evenly across a circular or square area of 5 cm²:
- without permanent deformation
- with flexible deformation up to 15 mm.

This parameter has been tested in the Technical Testing Laboratory in Prague, State Establishment, branch office Plzeň. The test was performed on CETRIS® cement-bonded particleboard, thickness 12 mm in one layer, anchored to a steel frame. The axial distance of the support profiles was 625 mm. None of the repeated tests resulted in any permanent deformation or exceeded the prescribed limit of flexible deformation.

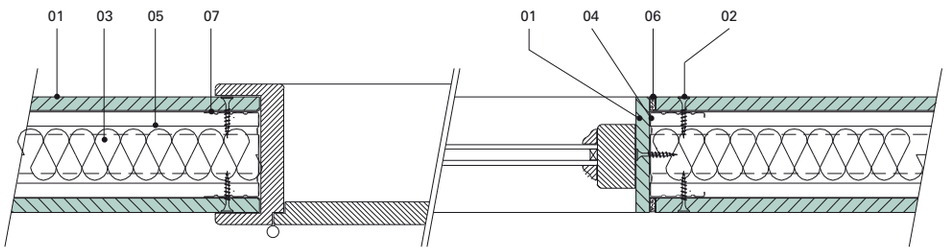
### 9.2.2.3 Model construction designs – partition walls – Details of a wall with single-layer coating

Vertical cross section



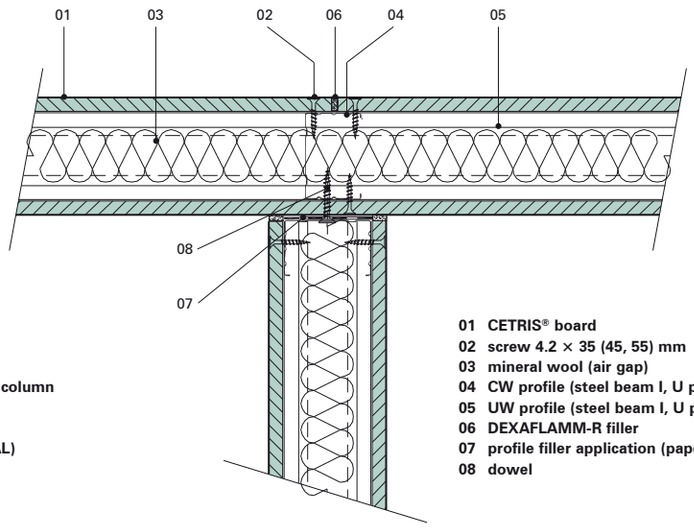

**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 profile filler application (paper SIBRAL)**
**08 dowel**

**Wall opening**
Horizontal cross-section




**01 CETRIS® board**
**02 screw Cetris-Hobau 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 UA profile**

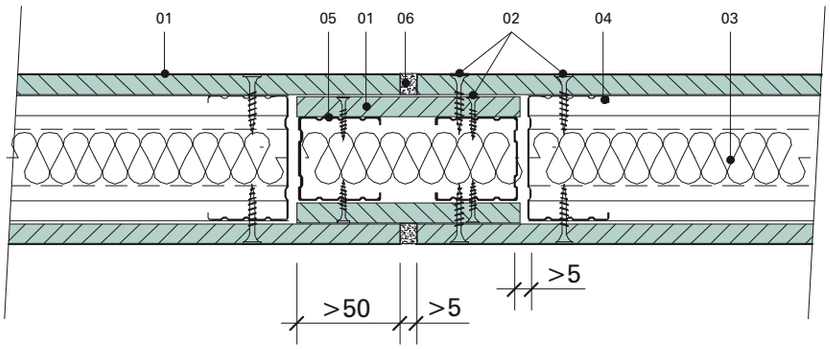
**T-joint**
Horizontal cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 profile filler application (paper SIBRAL)**
**08 dowel**

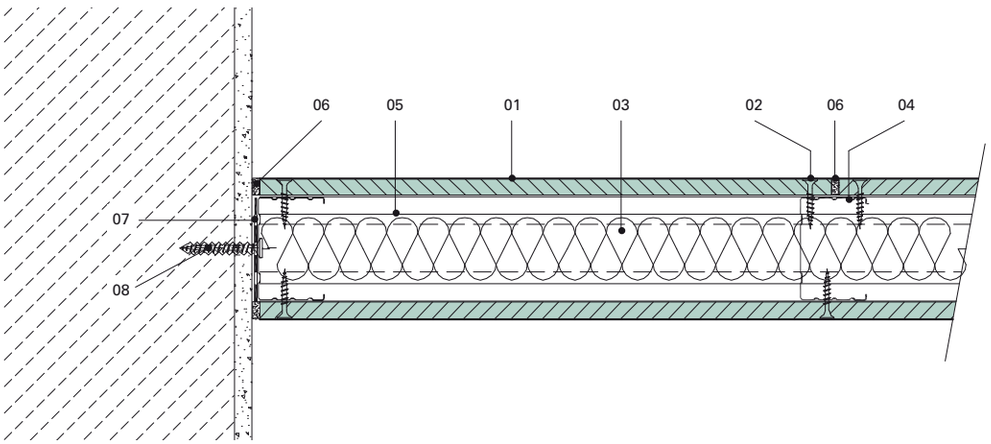
# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

### Joint detail – EI > 60 min
Horizontal cross-section



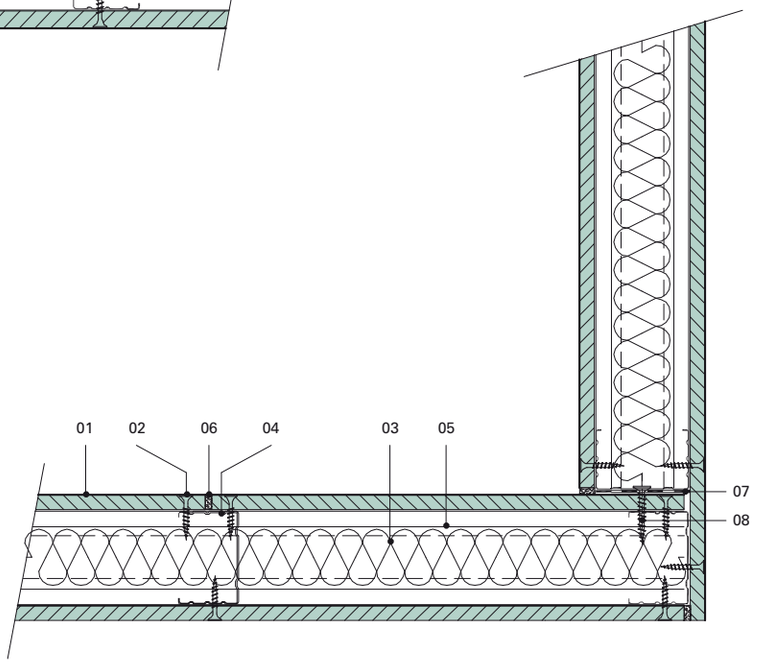

**01** CETRIS® board
**02** screw 4.2 × 35 (45, 55) mm
**03** mineral wool (air gap)
**04** CW profile 75
**05** UW profile 50
**06** DEXAFLAMM-R filler

### Wall connection
Horizontal cross-section




**01** CETRIS® board
**02** screw 4.2 × 35 (45, 55) mm
**03** mineral wool (air gap)
**04** CW profile (steel beam I, U profile) – column
**05** UW profile (steel beam I, U profile)
**06** DEXAFLAMM-R filler
**07** profile filler application (paper FIBREFRAX DURAFELT)
**08** dowel

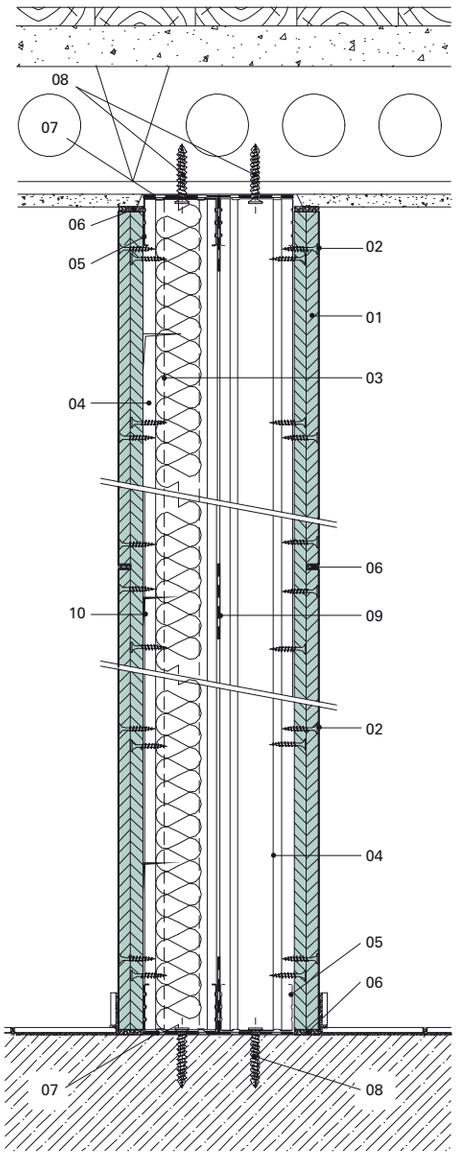
### L joint
Horizontal cross-section




**01** CETRIS® board
**02** screw 4.2 × 35 (45, 55) mm
**03** mineral wool (air gap)
**04** CW profile (steel beam I, U profile) – column
**05** UW profile (steel beam I, U profile)
**06** DEXAFLAMM-R filler
**07** profile filler application (paper FIBREFRAX DURAFELT)
**08** dowel

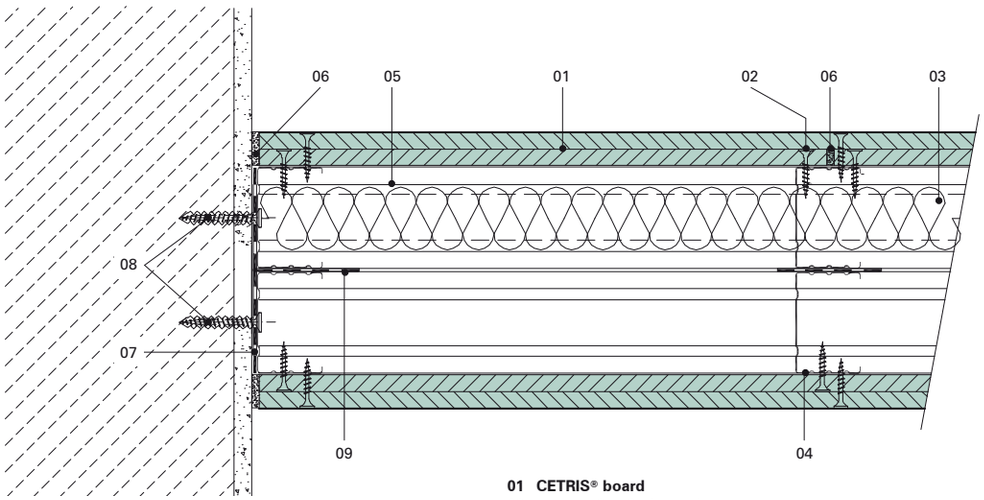
### 9.2.2.4 Model construction designs – partition walls – Details of a wall with multi-layer coating

Vertical cross-section



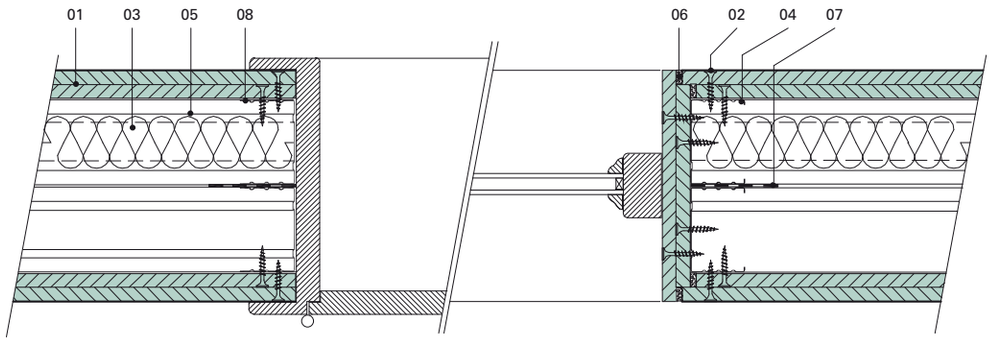

01 CETRIS® board
02 screw 4.2 × 35 (45, 55) mm
03 mineral wool (air gap)
04 CW profile (steel beam I, U profile) – column
05 UW profile (steel beam I, U profile)
06 DEXAFLAMM-R filler
07 profile filler application (paper FIBREFRAX DURAFELT)
08 dowel
09 sealing tape
10 adhesive pin

**Wall connection**
Horizontal cross-section



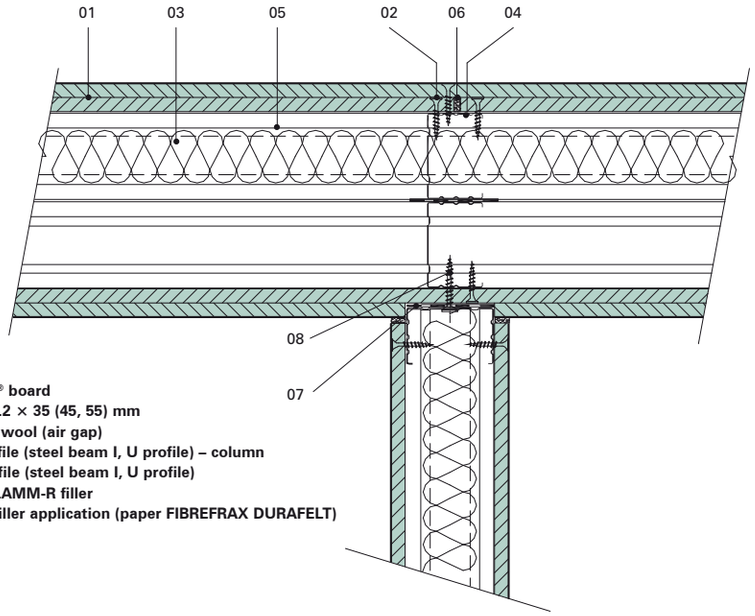

01 CETRIS® board
02 screw 4.2 × 35 (45, 55) mm
03 mineral wool (air gap)
04 CW profile (steel beam I, U profile) – column
05 UW profile (steel beam I, U profile)
06 DEXAFLAMM-R filler
07 profile filler application (paper FIBREFRAX DURAFELT)
08 dowel
09 sealing tape

**Wall opening**
Horizontal cross-section



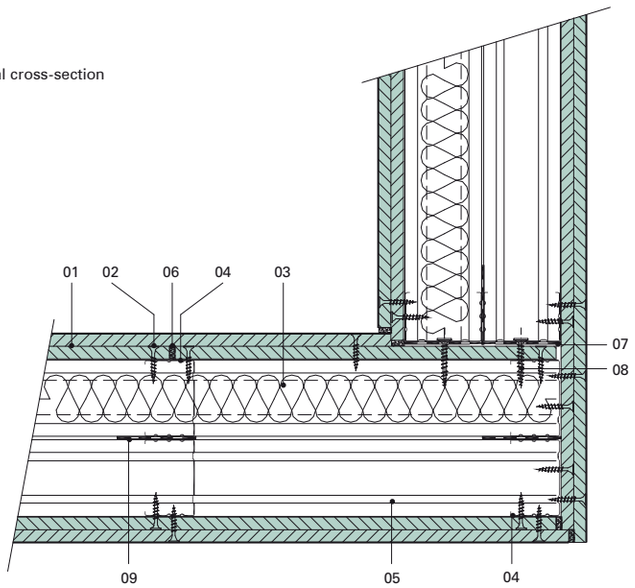

01 CETRIS® board
02 screw 4.2 × 35 (45, 55) mm
03 mineral wool (air gap)
04 CW profile (steel beam I, U profile) – column
05 UW profile (steel beam I, U profile)
06 DEXAFLAMM-R filler
07 sealing tape
08 UA profile (opening jamb)

**T-joint**
Horizontal cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 profile filler application (paper FIBREFRAX DURAFELT)**
**08 dowel**

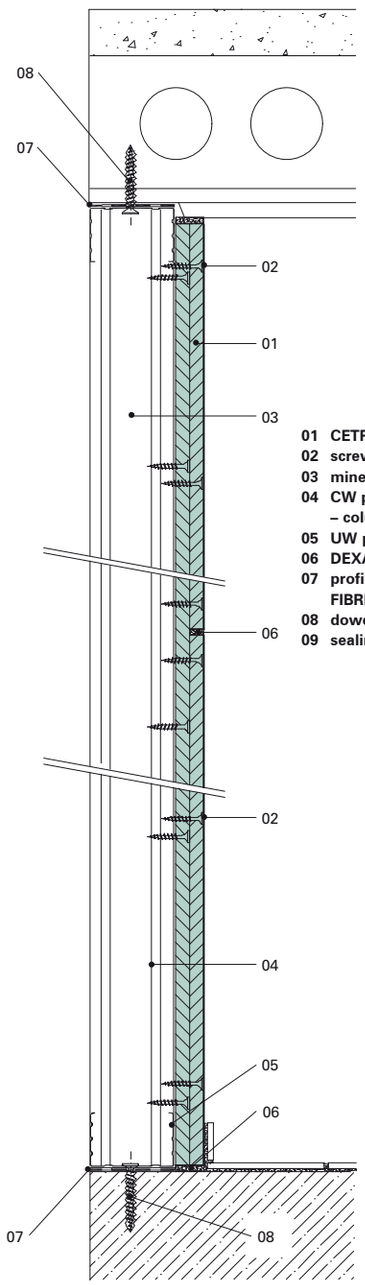
**L joint**
Horizontal cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 profile filler application (paper FIBREFRAX DURAFELT)**
**08 dowel**
**09 sealing tape**

### 9.2.2.5 Model construction designs – partition walls – Details of a shaft wall

Vertical cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 mineral wool (air gap)**
**04 CW profile (steel beam I, U profile) – column**
**05 UW profile (steel beam I, U profile)**
**06 DEXAFLAMM-R filler**
**07 profile filler application (paper FIBREFRAX DURAFELT)**
**08 dowel**
**09 sealing tape**

## 9.2.3 Advanced Walls and Direct Fire Cladding of Walls

Cladding and advanced walls allow for increasing fire resistance of existing fire partitions of D1 or D2 type on condition that these constructions are already fire resistant for at least 30 minutes. Cladding and advanced walls do not increase fire resistance of partitions with zero fire resistance, regardless the material of which they are made (such as single-layer metal walls of corrugated sheet metal etc.).

**Note:** If the existing wall construction is not of type D1 or D2 or does not meet the required fire resistance of EI 30, the solution with a shaft (advanced) wall may still be used – see previous chapter.

**9.2.3.1 Load-Bearing Construction of Advanced Walls**

The load-bearing construction consists of a frame of steel zinc-coated profiles CW 75 × 50 × 0.6 mm. The profiles are anchored in the existing wall construction with steel dowels with the spacing of 625 mm, the joint between the profiles and the wall is filled with DEXAFLAMM-R filler. Axial distance of vertical profiles does not exceed 625 mm.

**9.2.3.2 Construction Composition**

The advanced wall is one-sided clad with one or more layers of CETRIS® cement bonded particleboards. The direct coating of CETRIS® boards is directly applied to the existing construction. Horizontal overlaps of the boards are at least 400 mm. In the case of multilayer cladding the joints between the boards are mutually overlapped – in the vertical direction by a profile width (625 mm), and in the horizontal direction at least 400 mm.

**Table 7: Dimensions of advanced walls**

Advanced walls of CETRIS® boards are one-sided clad constructions fixed to a grid of metal profiles anchored in the existing load-bearing construction with a certain offset – gap. The size of the gap and whether the gap is filled with mineral wool or not and the fire resistance of the CETRIS® board claddings are the decisive factor of the final fire resistance of the whole structure.

| CETRIS® BOARD THICKNESS (mm) | TYPE OF INSULATION | GAP THICKNESS (mm) | FIRE RESISTANCE INCREASED BY… (min) | RESULTING FIRE RESISTANCE (min) |
|---|---|---|---|---|
| 10 | Air | 50 | 15 | EI (x) [1] +15 |
| 18 | Air | 50 | 30 | EI (x) [1] +30 |
| 2 × 12 | Air | 50 | 45 | EI (x) [1] +45 |
| 2 × 16 | Air | 50 | 60 | EI (x) [1] +60 |
| 2 × 18 | Mineral board [2] | 50 | 90 | EI (x) [1] +90 |

**Notes to Table 7:**

1) Original value of fire resistance of the additionally protected wall EI (x)
2) Mineral fibreboard Orsil (Isover) thickness 50 mm with bulk density of at least 75 $kgm^{-3}$, maximum flammability class B (not easy to catch fire) pursuant to ČSN 73 0862 (A2 fire reaction class pursuant to EN 13501-1 assumed)

**Table 8: Dimensions of direct cladding**

Regarding the higher weight of the cladding, the application must always also be assessed from the structural point of view. Direct cladding may only be applied to flat walls with the planarity tolerance not exceeding 5 mm for prevention of tension transfer into the construction.
Fixation to the brick or concrete is exclusively executed with steel dowels within a grid of 300 × 300 mm (this applies to thicknesses of 10 – 12 mm) or within a grid of 450 × 450 mm (this applies to thicknesses 14 mm and up). The thickness of CETRIS® boards and the number of layers depend on the required fire resistance value.

| CETRIS® BOARD THICKNESS (mm) | FIRE RESISTANCE INCREASED BY… (min) | RESULTING FIRE RESISTANCE (min) |
|---|---|---|
| 12 | 15 | EI (x) [1] +15 |
| 2 × 10 | 30 | EI (x) [1] +30 |
| 2 × 14 | 45 | EI (x) [1] +45 |
| 2 × 18 | 60 | EI (x) [1] +60 |

**Notes to Table 8:**

1) Original value of fire resistance of the additionally protected wall EI (x)

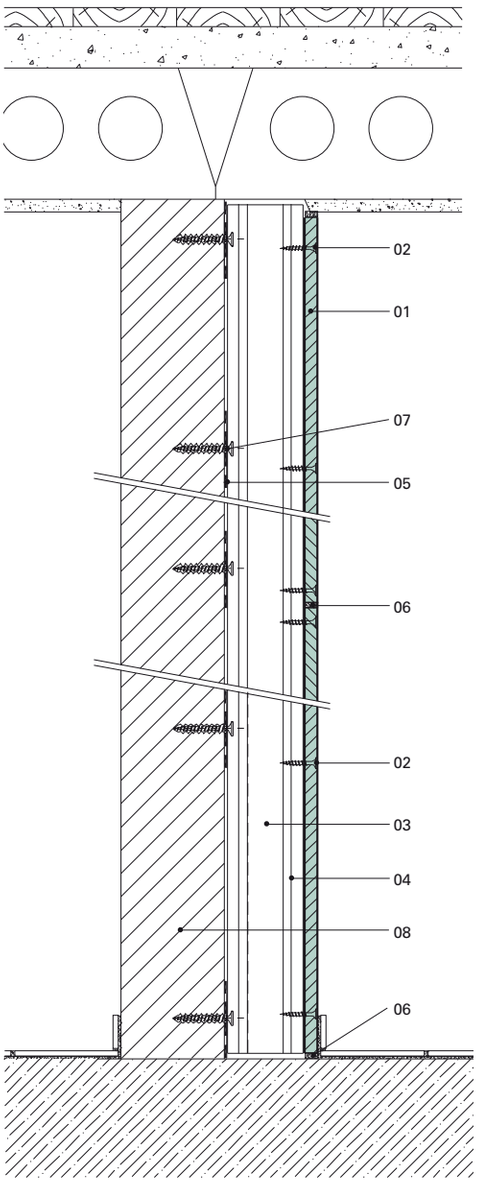
As follows from the tables, the cladding thickness mentioned in them can also increase the fire resistance of walls with a fire resistance value higher than 30 minutes by addition of the value by which the fire resistance increases to the original fire resistance value of the existing wall. Validity of this statement has been verified by calculation even for the extreme value of increase of the required resistance from 120 to 180 minutes. The increased fire resistance applies to all D1 and D2 type walls with a 30 minute minimum fire resistance of the original wall. These tables do not apply to walls of D3 type.
The cladding is not recommended for walls and partitions of plasterboard and gypsum fibre boards.

**Note 1:** Direct wall cladding is only recommended in absolutely necessary cases and over smaller areas, as in the point of the board fixation to the wall the concentrated tensions may cause wall cracking, in effect reducing the fire resistance of the cladding.

# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

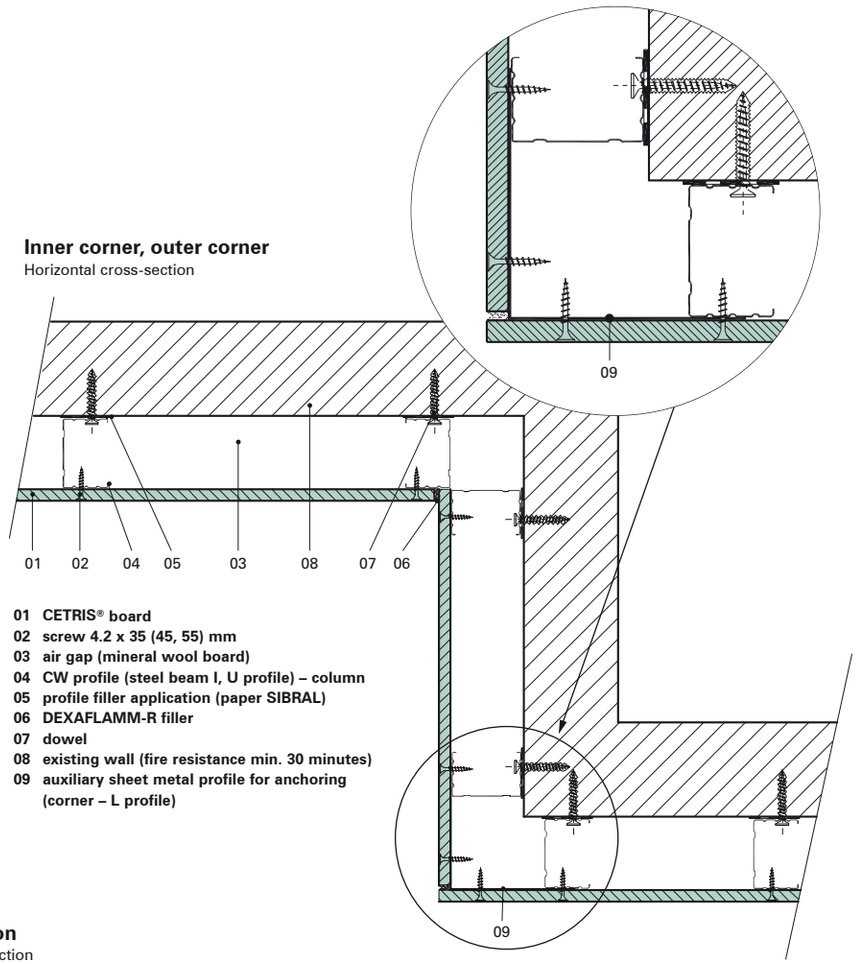
### 9.2.3.3 Model Construction Solutions – Details of Advanced Walls

Vertical cross-section



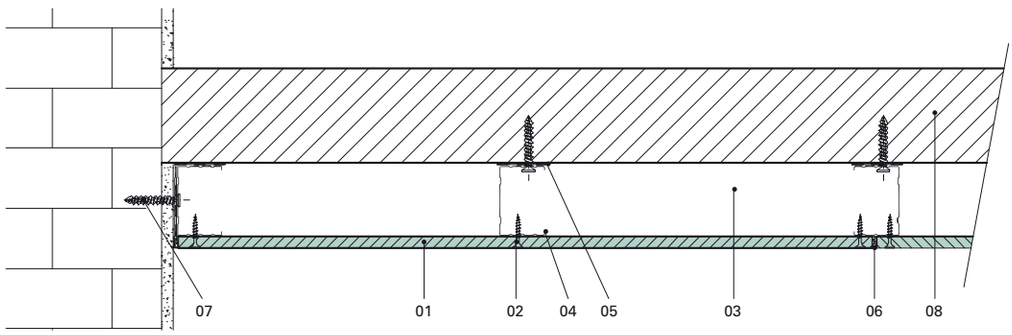

**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 air gap (mineral wool board)**
**04 CW profile (steel beam I, U profile) – column**
**05 profile filler application (paper SIBRAL)**
**06 DEXAFLAMM-R filler**
**07 dowel**
**08 existing wall (fire resistance min. 30 minutes)**

**Inner corner, outer corner**
Horizontal cross-section




**01 CETRIS® board**
**02 screw 4.2 x 35 (45, 55) mm**
**03 air gap (mineral wool board)**
**04 CW profile (steel beam I, U profile) – column**
**05 profile filler application (paper SIBRAL)**
**06 DEXAFLAMM-R filler**
**07 dowel**
**08 existing wall (fire resistance min. 30 minutes)**
**09 auxiliary sheet metal profile for anchoring (corner – L profile)**

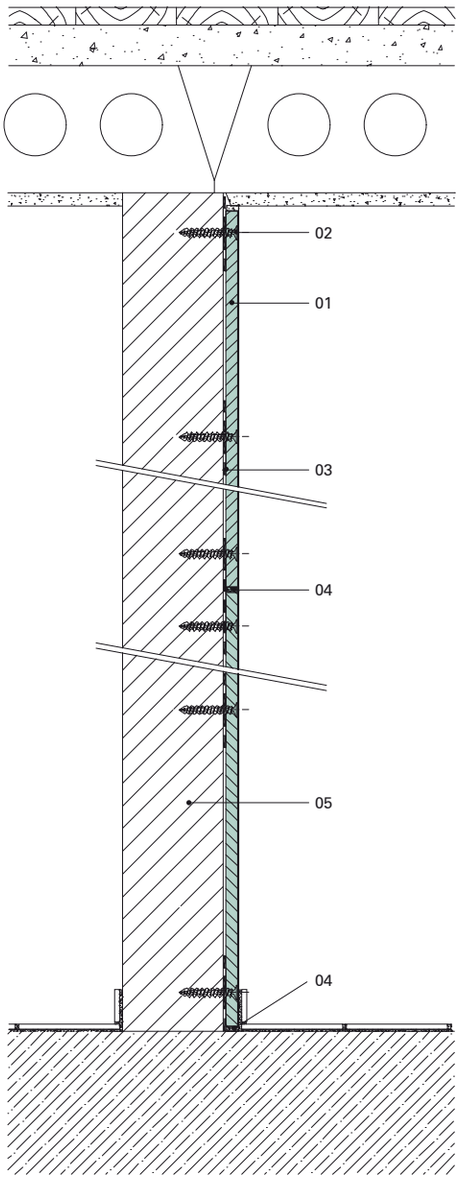
**Wall connection**
Horizontal cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (45, 55) mm**
**03 air gap (mineral wool board)**
**04 CW profile (steel beam I, U profile) – column**
**05 profile filler application (paper SIBRAL)**
**06 DEXAFLAMM-R filler**
**07 dowel**
**08 existing wall (fire resistance min. 30 minutes)**

### 9.2.3.4 Model Construction Solutions – Details of Direct Wall Cladding

Vertical cross-section




**01 CETRIS® board**
**02 dowel**
**03 profile filler application (paper SIBRAL)**
**04 DEXAFLAMM-R filler**
**05 existing wall (fire resistance min. 30 minutes)**

### 9.2.3.5 General Principles of Assembly of Fire Walls on Steel Framework

All building constructions to which the non-load-bearing fire partitions and walls of CETRIS® boards are fixed in any manner, or by which they are supported and which might threaten their stability, must have at least the same fire resistance as the CETRIS® partition itself. If these constructions are structurally stressed then their potential deformations may not interfere with the integrity of the wall of CETRIS® boards. This requirement does not apply if the supporting and load-bearing construction cannot be exposed to thermal stress by fire even under the least favourable conditions for the period of the prescribed fire resistance.

- Maximum spacing of the screws anchoring the CETRIS® boards to the CW profiles must not exceed 200 mm (screws by the edges), or 400 mm (across the surface) and the distance from the board edges must not be less than 25 mm in the case of fire walls. In the case of multilayer coating the screw spacing may be doubled.
- Maximum spacing of screws on CETRIS® strips or assembly inserts must be 100 mm, or less.
- Screws used for anchoring CETRIS® boards to CW profiles must be at least 10 mm longer than the thickness of the anchored board.
- If the CETRIS® board is used as visible coating of an exterior fire construction it must be anchored as façade cladding – i.e. with predrilled holes (8 or 10 mm) and screws with visible heads and sealing washers (see chapter 8.7.7).
- Maximum spacing of dowels for anchoring CW and UW profiles must not exceed 625 mm.
- CETRIS® assembly inserts or strips must always be at least 12 mm thick and their thickness must be equal to the thickness of the coat board.
- The CETRIS® strip at the joints of the CETRIS® boards must overlap on both sides by at least 60 mm, unless otherwise specified in the detail drawing.
- Maximum spacing of CW assembly profiles must not exceed 625 mm, and at the same time must be based on the board thickness and the respective structural assessment. The length of CW profiles is about 15 mm less than the room height.
- Dilation joints and all contacts with the wall and the corner joints must be filled with fire resistant filler DEXAFLAMM-R. The filler must be applied to a minimum depth of 5 mm.
- Areas of CW or UW profiles adjacent to the floor and the ceiling or wall must be covered with fire resistant DEXAFLAMM-R filler. In the case of wall fire resistance more than 60 minutes SIBRAL paper is recommended to be placed under the profiles. The SIBRAL paper is also suitable for partial insulation of potential thermal bridges in the construction
- Boards of multilayer coats must be placed with an overlap of at least 400 mm and always without any cross joint
- Joints of single-layer coats must always be supported with a CW profile under the joint or (in the places where this is impossible for construction reasons) with a CETRIS® strip. In exposed cases – in the case of higher demand for fire resistance – both methods may be used. The boards must be laid tightly and their joints must be filled with filler. In the case of multilayer coating even the inside joints of the bottom layers must be filled with filler.
- All dilation joints in fire partitions with fire resistance above 60 minutes must always be supported with CETRIS® board strips under the joints of the same thickness as the thickness of the coat pursuant to the figure on page 152.
- For the purpose of fire resistances of constructions of more than 60 minutes it is recommended to insulate the insides of the CW and UW profiles adjacent to the load-bearing walls and ceilings with cut mineral wool.
- The position of mineral wool in an air gap of higher thickness than the thickness of the mineral wool strip is recommended to be fixed with adhesive pins.
- In the case of walls without mineral wool fills and with a height of 4 – 6 m it is necessary to underlay the contacts of the boards with the steel CW profiles with CETRIS® strips, thickness at least 12 mm, placed under the joints. The strip should exceed the width of the CW profile by at least 60 mm on each side.
- All openings in CETRIS® fire partitions must be sealed with inserts or in other ways pursuant to the project specifications. Installations inside the partitions (water pipes, electrical wiring etc.) must be wrapped in mineral wool for fire resistance, otherwise the fire resistance of the wall might be reduced by them.
- In the case of cladding of large wall constructions (longer or higher than 6 m) dilations in the load-bearing construction must be designed and made visible in the cladding of CETRIS® boards as well.

**9.2.3.6 Assembly Procedure**

a) Measure the locations of the UW profiles in the horizontal planes and apply DEXAFLAMM-R filler, or paper SIBRAL as needed, onto the places on the floor and on the ceiling where the profiles are to be laid.
b) Fix the profiles to the floor, ceiling or to the walls, as the case may be, with steel dowels. The maximum spacing of the dowels with regard to the weight of the boards has been specified to be 625 mm.
c) Install the CW profiles in the construction with the spacing as per the structural assessment and board thickness, max. 625 mm apart. The length of the CW profiles must be about 15 mm shorter than the height of the room.
d) Insert mineral wool between the profiles if required.
e) Screw in the CETRIS® boards on the prepared construction leaving a gap of at least 10 mm between the floor and the ceiling and the bottom and top edges of the boards. Fix the CETRIS® boards with the screws to the CW profiles only.
f) In the case of double or multilayer coats the boards are laid with an overlap of minimum 400 mm. **NOTE! In the case of three-layer coats the joints of the bottom and the top coat must not be in the same places.**
g) The following applies to anchoring CETRIS® boards to the construction: The maximum axial distances of the screws from each other is 200 mm, only in the case of double or multilayer coating the spacing can be expanded in the first layer to 400 mm max.

## 9.2.4 Fire Walls with Wooden Supporting Structure Clad by Cement Bonded Particle Board CETRIS®

Based on the new fire resistance tests of wall construction, we have significantly extended the offer of wall compositions with wooden supporting structure clad with cement bonded particle boards CETRIS®. The list of structures includes compositions of bearing walls (wall height up to 3 m) and non-load bearing walls (height up to 4 m). The fire resistance is determined according to EN 13 501-2 with sorting of construction components in accordance with ČSN 73 0810, article 3.2.

**9.2.4.1 Load-Bearing Construction**

The load-bearing construction consists of a frame of wooden vertical and horizontal beams mutually connected with screws.

The cross-section of the vertical wooden beams depends on the composition of the construction – it is necessary to keep the cross section mentioned in the table with a list of compositions. The beams can be made of dry spruce lumber (moisture content 18 % compactness class min. S II), alternatively can be used glued lumber.
Wooden beams are anchored to the (wall) frame with steel dowels with the spacing of 625 mm. The gap between the profiles and the wall is filled with DEXAFLAMM-R filler. Axial distance of the vertical internal wooden posts must not exceed 625 mm.

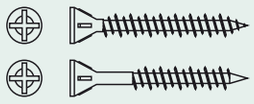
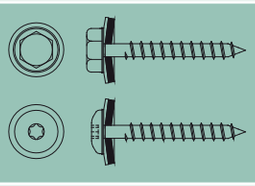
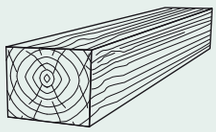
**9.2.4.2 General Principles of Assembly of Fire Walls on a Woden Frame**

The following principles apply to the implementation of the load-bearing wooden frame and for anchoring CETRIS® boards.

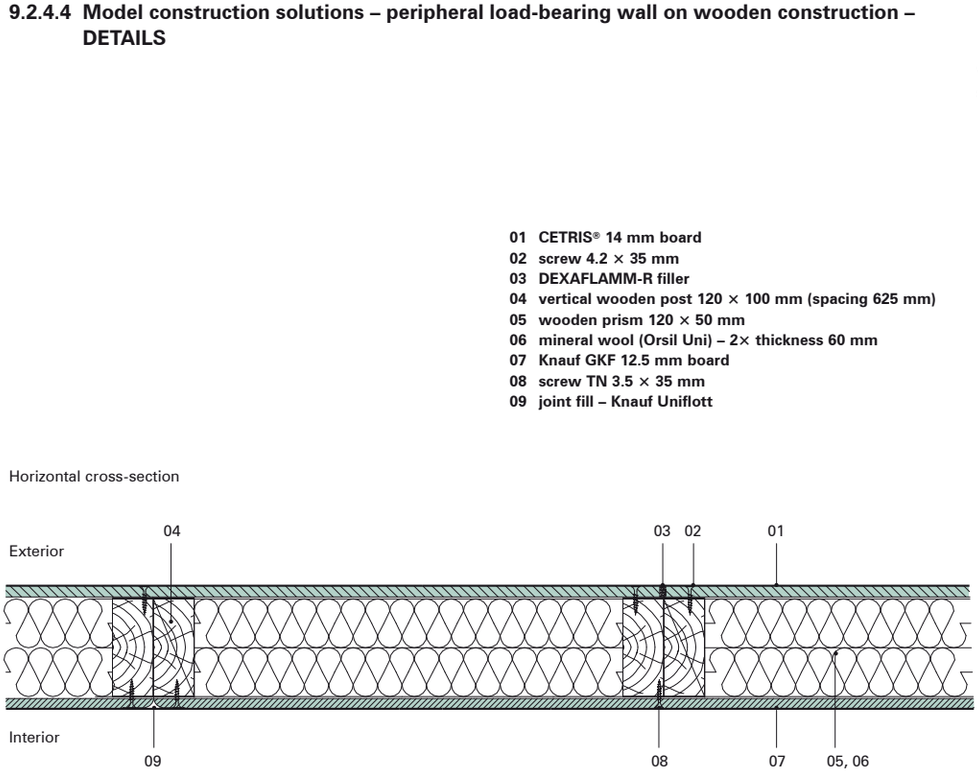
- Maximum spacing of screws anchoring CETRIS® boards to the wooden posts in case of fire wall must not exceed 200 mm (screws at the edges), respectively 400 mm (across the surface) and less than 25 mm from the vertical edge of the boards.
- When installing CETRIS® it is necessary to keep joints with a minimum width of 5 mm, the joints must be filled with DEXAFLAMM-R filler.
- In case of two layers of CETRIS® boards, it is necessary to overlay the joints – in horizontal direction by 625 mm of the post distance, in vertical direction by min. 400 mm. The joints must be filled with DEXAFLAMM-R filler.
- If there is a horizontal joint formed by cladding of the wall with CETRIS® boards, it is necessary to support this gap with wooden stud of min. width 60 mm.
- The maximum spacing of dowels for anchoring of wooden studs should not be more than 625 mm.
- Max. vertical stud distance must be up to 625 mm.
- Dilatation joints and all contacts with the wall, and corner joints must always be filled with fireproof DEXAFLAMM-R filler. The filler must be injected to the minimum depth of 5 mm.
- Areas of wooden beams adjacent to the floor and the ceiling or walls must be treated with DEXAFLAMM-R filler.
- The position of mineral wool in an air gap of higher thickness than the thickness of the mineral wool must be fixed with adhesive pins.
- If there is an underlay tape prescribed on the wooden studs in the composition, it is necessary to use board of width min. 200 mm. The underlay tape is fixed to studs with screws with countersunk head, screw distance is max. 300 mm.
- All openings in fire peripheral wall must be sealed with fire inserts or in other way according to the project specifications. Inst allation inside the partitions (water pipes, electrical wiring, etc.) must be wrapped in mineral wool for fire resistance, otherwise the fire resistance of the wall could be reduced.

**Note:** Anchoring of KNAUF boards, joint filling and surface finish must be implemented in compliance with the regulations of KNAUF company.

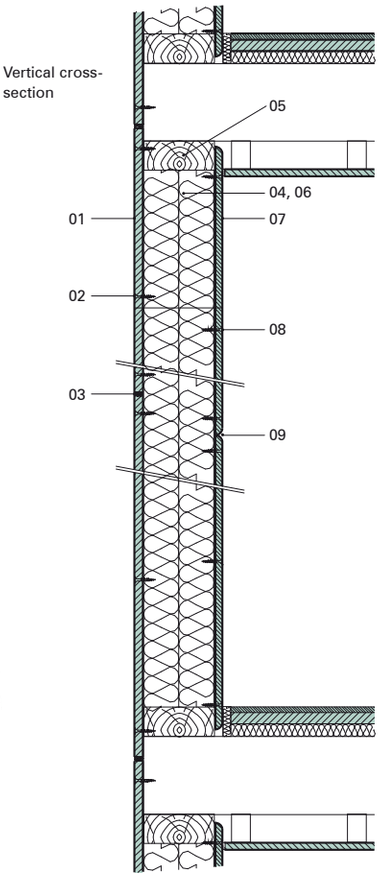
**Materials for fire walls – specifications**

| DESCRIPTION | PICTURE | NOTE |
|---|---|---|
| **CETRIS® BASIC board**<br>Cement bonded particleboard, smooth cement gray surface.<br>Basic size 1,250 × 3,350 mm<br>Bulk density 1,320 ±70 kgm$^3$ |  | Thickness according to requirements for fire resistance. |
| **Screw 4,2 × 25, 35, 45, 55 mm**<br>Screws for cement bonded particleboard, self-tapping, self-drilling, with countersunk head. |  | For internal, event. outdoor cladding, with additional surface treatment. The type of screw according to tile thickness and type of the structure. |
| **Screw 4,8 × 38, 45, 55 mm**<br>Stainless respectively galvanized screws with round or hexagonal head, and with EPDM waterproof pad. |  | Type (length) of the screw according to tile thickness. Intended for anchoring of the upper layer of CETRIS® boards in exterior – if the board remains visible.<br>**The board must be predrilled by diameter min. 8 (10) mm!** |
| **DEXAFLAMM-R filler**<br>White thixotropic material for filling of joints and for re-sealing of screw heads. |  | Alternatively you can use fireproof, single-component fillers (acrylic, silicone) permanently flexible (Sika firesil, Den Braven Pyrocryl). |
| **Mineral (stone) wool**<br>The thickness and bulk density according to specifications. |  | Reaction to fire A1/A2. |
| **Wooden post**<br>Spruce timber, class min. SII, max. humidity 18 %, size 120 × 50 mm, 120 × 100 mm, 120 × 60 mm (according to the composition of the wall). |  | Alternatively you can use glued timber. |
| **Steel dowels**<br>For anchoring of profiles to the wall or concrete. |  | Dimensions (diameter and length) according to weight of the structure, type of base, and the anchored material. |
| **KNAUF Red board**<br>Plasterboard Knauf, thickness 12.5 mm.<br>Basic size 1,250 × 2,000 (2,500) mm. |  | Processing anchoring, sealing, coating of boards according to the instructions of company Knauf. |
| **KNAUF Uniflott**<br>Material for sealing of gypsum boards joints. |  | **Can not be used to fill joints between CETRIS® boards!** |
| **Screw TN 35**<br>Screw 4.0 × 35 mm for fixing of gypsum boards. |  | **Can not be used to anchor CETRIS® boards!** |

### 9.2.4.4 Model construction solutions – peripheral load-bearing wall on wooden construction – DETAILS




**01 CETRIS® 14 mm board**
**02 screw 4.2 × 35 mm**
**03 DEXAFLAMM-R filler**
**04 vertical wooden post 120 × 100 mm (spacing 625 mm)**
**05 wooden prism 120 × 50 mm**
**06 mineral wool (Orsil Uni) – 2× thickness 60 mm**
**07 Knauf GKF 12.5 mm board**
**08 screw TN 3.5 × 35 mm**
**09 joint fill – Knauf Uniflott**




# 9.3 Horizontal Constructions – Ceiling Panels

## 9.3.1 Applicability Range

On the basis of the tests CETRIS® boards may be used in the following types of horizontal constructions:

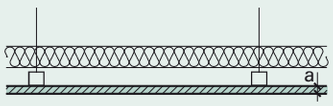
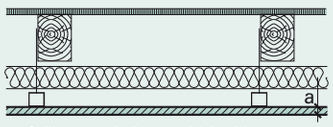
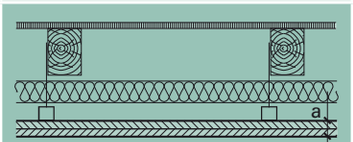
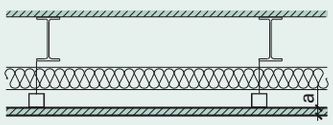
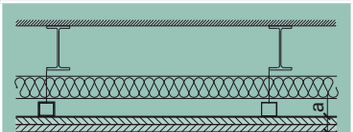
- Separate fire ceiling panel, heat (fire) exposition from underneath. In this case the fire resistance is specified directly by the result of the fire resistance test.
- Ceiling (roof) panel, heat (fire) exposition from underneath. In this case the fire resistance of the composed construction is specified as the sum of fire resistance of the ceiling (roof) construction and the protective panels of CETRIS® boards.

As stated in the protocols it is also necessary to comply with the technology of the ceiling panel assembly and all assembly procedures used and tested in the context of the sample preparation. The ceiling constructions may be of any size on condition that the spacing between the suspensions will not increase and that the expansion measures will be adequately adapted. The test results apply to cavities of any height. This in effect means that the designed joining elements, their spacing and layout and other details are binding and must be complied with for the belowmentioned attests to apply.
The typical samples of the constructions have been tested and the test have been documented by the state accredited testing laboratory PAVÚS – Veselí n. L. in different wall compositions and. On the basis of these tests the laboratory has issued fire resistance test protocols № Pr-03-02.088 and Pr-03-02.089. These reports, together with some other tests performed in recent years, have been used as the basis for PAVUS a.s. Praha (Ing. Karpaš CSc, Ing. Bauma CSc), who then prepared extended applications and the needed dimensional tables generalising the results for the above application range in the context of the final expert assessment.

**Important notice:**
All data apply to the conditions and exposures of horizontal constructions in the case of fire in the sense of the currently valid wording of EN 1364-2. The results of fire resistance tests and the tables following from them only assess the issues of technical properties of the constructions in relation to their resistance to actual fire. For that reason axial distances and types of CD profiles found compliant by the tests are specified. These, however, must be considered the minimum limits that must not be exceeded. It needs to be noted that when dimensioning fire ceiling panels, what also always needs to be considered is the structural demand for the construction. The the load-bearing construction must be adjusted with respect to the actual loading in relation to the weight of the CETRIS® boards.

**Assembly of fire constructions may only be carried out by trained staff – see Chapter 9.4 Training of Assembly Companies in Applications with CETRIS® Boards.**

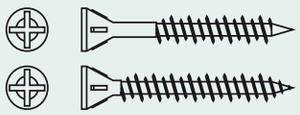
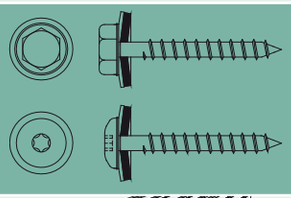
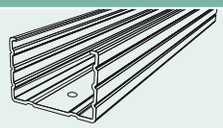
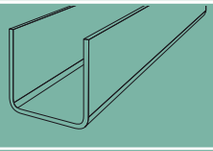
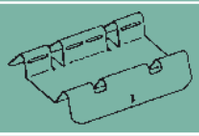
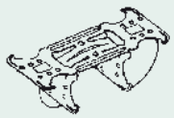
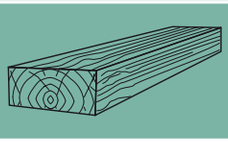
**Table 10: Survey of horizontal constructions**

| TYPE | CONSTRUCTION SCHEME | CEILING PANEL COATING a (mm) | MINERAL WOOL [1] | | CEILING PANEL CONSTRUCTION WEIGHT (kg/m²) | LOAD-BEARING CONSTRUCTION | | | | FIRE RESISTANCE [1] | THERMAL RESISTANCE | DESCRIPTION, SOLUTION DETAILS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BULK DENSITY (kg/m³) | THICKNESS (mm) | | Description | Spacing of assembly profiles (mm) | Spacing of load-bearing profiles (mm) | Spacing of suspensions (mm) | | | |
| Separate ceiling panel |  | 1 × 12 | 75 | 2 × 40 | 21.60 | CD 60 × 27 | 420 | 1,000 | 420 | EI 15 [3] | 2.06 [2] | Page 163 – 172 |
| |  | 2 × 12 | | | 41.60 | | | 900 | | EI 45 [3] | 2.12 [2] | |
| |  | 2 × 12 | - | - | 36.50 | | | 1 000 | | EI 30 | 0.096 | |
| |  | | | | 37.50 | Wooden lath | | | | EI 30 | 0.096 | |
| Ceiling panel under joist ceiling |  Ceiling panels 25 mm thick with tongue and groove connections | 1 × 12 | 75 | 2 × 40 | 21.60 | CD 60 × 27 | | | | REI 30 [4] | 2.06 [2] | |
| |  Ceiling panels 30 mm thick with tongue and groove connections | 2 × 12 | | | 41.60 | | | 900 | | REI 60 [4] | 2.12 [2] | |
| Ceiling panel under steel beam ceiling |  Unprotected steel beams ratio O/A S 300 m² | 1 × 12 | | | 21.60 | | | 1,000 | | REI 30 [4] | 2.06 [2] | |
| |  Unprotected steel beams ratio O/A S 150 m² | 2 × 12 | | | 41.60 | | | 900 | | REI 60 [4] | 2.12 [2] | |

**Notes to Table 13:**

1) Mineral fibre board of prescribed thickness and bulk density, flammability grade max. B (not easy to catch fire) pursuant to ČSN 73 0862 (A2 fire reaction class pursuant to EN 13501-1 assumed).
2) Informative value of thermal resistance of the ceiling panel construction itself.
3) Value of fire resistance of separate ceiling panel for fire exposure from underneath.
4) Value of fire resistance of composed construction for fire exposure from underneath. The resulting fire resistance of the whole composition equals to the sum of fire resistance of the ceiling (roof) construction and the protective ceiling panels of CETRIS® boards. For other variants of the ceiling (roof) construction see the principles specified in Chapter 9.3.3 Fire Ceiling Panels under Ceiling (Roof) Construction.

**Table 11: Materials for assembly of horizontal constructions – specifications**

| DESCRIPTION | PICTURE | NOTE | TYPE OF CEILING PANEL | |
|---|---|---|---|---|
| | | | Separate ceiling panel | Ceiling panel under ceiling (roof) construction |
| **CETRIS® BASIC**<br>Cement-bonded particleboard, smooth surface, cement grey.<br>Basic size 1,250 × 3,350 mm<br>Bulk density 1,320 ±70 kgm³ |  | Thickness 12 mm, number of layers pursuant to fire resistance requirement. | X | X |
| **CETRIS screw 4.2 × 25, 45 mm**<br>Self-cutting and self drilling screws with sunken heads. |  | Screws 4.2 by 25 – coating 1 × 12 mm<br>Screws 4.2 by 45 – coating 2 × 12 mm | X | X |
| **Screw 4.8 × 38, 45, 55 mm**<br>Stainless or galvanised screws with semi-circular or hexagonal heads with compressive water tight washer. |  | Screw type (length) pursuant to the cladding thickness. For anchoring of upper layer of CETRIS® board in exterior – where the board remains visible. The board must be predrilled with a hole diameter of 8 (10) mm! | X | X |
| **CD profile**<br>Zinc-coated sheet metal open profile 27 × 60 × 0.6 mm, length 2.50 – 4.50 m. |  | Creates load-bearing grid for ceiling panel assembly.<br>Fixed with straight or nonius suspension on ceiling (roof) construction. | X | X |
| **UD profile**<br>Zinc-coated sheet metal open profile 28 × 27 × 0.6 mm, length 3.00 m. |  | For ceiling panel anchoring to masonry walls with steel dowels. | X | X |
| **Connector for CD profile** |  | For mechanical connections of CD profiles. | X | X |
| **Straight suspension 1 mm thick, length 125 mm, load-bearing capacity 40 kg** |  | For suspension of metal grid of CD profiles on wooden joists of ceiling construction. | X | X |
| **Nonius suspension, load-bearing capacity 40 kg**<br>Three-part system for fixation of CD profile grid to load-bearing ceiling construction. |  | Allows for setting different heights of the cavity between the ceiling panel and the load-bearing construction. | X | X |
| **Cross connector** |  | For mechanical fixation of crossing CD profiles in vertical arrangement. | X | X |
| **Wooden lath 60 × 40 mm** |  | Creates a wooden base construction (assembly and bearing profile). Dried impregnated timber class S10 ( compactness class C24). | X | X |

| DESCRIPTION | PICTURE | NOTE | TYPE OF CEILING PANEL | |
|---|---|---|---|---|
| | | | Separate ceiling panel | Ceiling panel under ceiling (roof) construction |
| **Planar cross joint NIVEAU** |  | For mechanical fixation of crossing CD profiles in a single plane. | X | X |
| **Steel dowels**<br>For profile anchoring to masonry (concrete) walls |  | Size (diameter and length) pursuant to the construction weights, base types and anchored material. | X | X |
| **Filler DEXAFLAMM-R**<br>White tixotrophic material for joint filling and screw head covering |  | Alternatives include fire resistant single-component fillers (acrylic, silicon) permanently elastic (Sika Firesil, Den Braven Pyrocryl). | X | X |
| **Paper FIBERFRAX DURAFELT**<br>Mats of aluminium-silicon fibre, thickness 13 mm |  | For profile lining on the bottom side, interruption of thermal bridges, as insulation for temperatures up to 1,260° C. | X | X |
| **ORSIL (ISOVER)**<br>Mineral board thickness 2 × 40 mm, bulk density 75 kgm$^{-3}$<br>(max. bulk density 100 kgm$^{-3}$) |  | Alternatives include mineral board of the same bulk density, flammability class max. B pursuant to ČSN 73 0862, assumed fire reaction class A2 (pursuant to EN 13501). | X | X |

## 9.3.2 Separate Fire Ceiling Panel

**9.3.2.1 Load-Bearing Construction – CD Profiles**
The load-bearing construction consists of a grid of steel zinc-coated profiles CD 60 × 27 × 0.6 mm in lengthwise and crosswise directions. The lengthwise and the crosswise profiles may be assembled to a single plane (connected with flat cross joints) or to two planes (the crosswise grid is placed above the lengthwise grid and the two grids are connected with multilevel joints). The grid can hold heat insulation depending on the composition of the suspended ceiling. The crosswise and lengthwise spacing of the profiles, the spacing and the type of suspensions depend on the coat type (weight of the ceiling panel). The grid can hold the heat insulation according to the soffit composition.
The bearing grid can be complemented by UD profile in case of wall structures, it is used for anchoring of the soffit to the vertical structures. Anchoring is done using steel dowels.

**9.3.2.2 Load-bearing Construction – Wooden Laths**
The supporting structure consists of unidirectionally oriented wooden laths of cross-section 60 × 40 mm, with a maximum axial distance of 420 mm. The wooden laths can be attached to the ceiling beams or to roof beams (max. length 1,000 mm) or to the supporting structure by hinges.

**9.3.2.3 Construction Composition**
The composition of ceiling is clad on the bottom side with one or two layers of CETRIS® th. 12 mm. The boards are laid with mutual overlaps of at least 400 mm, to avoid formation of cross joints. In case of multilayer cladding, the joints between the boards are mutually overlaped – always at least by one profile width (420 mm).

**For anchoring of CETRIS® boards on CD profiles** are used self-drilling self-tapping screws 4.2 × 25 mm with countersunk head, and with milling for recessing into the board. The screw length must be at least 10 mm longer than the thickness of the anchored board. In case of multi-layer cladding is necessary to use a screw at least 35 mm long for anchoring of the second CETRIS® layer.

**For anchoring of CETRIS® boards on wooden laths** are used self-drilling, self-tapping screws 4,2 × 35 mm with countersunk head, and with milling for recessing into the board. For anchoring into the second layer of CETRIS® boards it is necessary to use a screw at least 55 long.
Between the boards are omitted joints with a minimum width 5 mm. Joints filling, resealing of the perimeter walls and heads of screws is done by DEXAFLAMM-R filler.

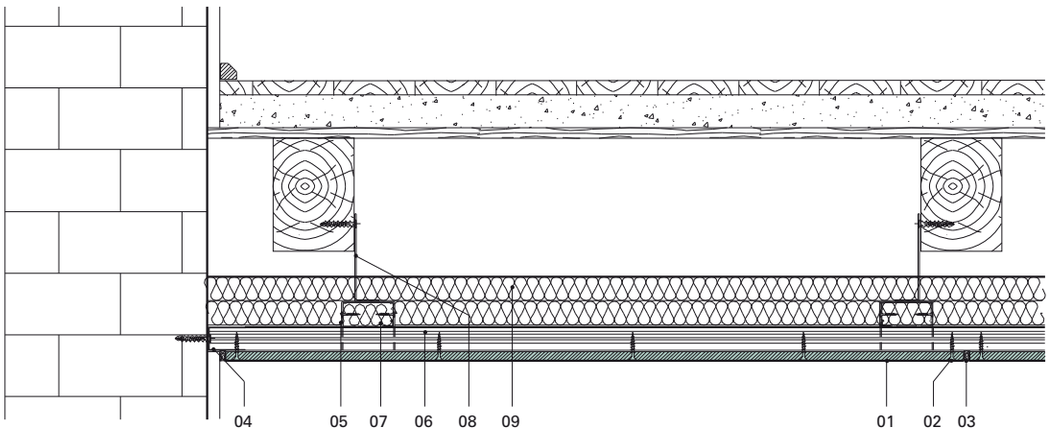
**Table 12: Fire characteristics of separate ceiling panels coated with CETRIS® boards**

| FIRE RESISTANCE [1] | CONSTRUCTION COMPOSITION | | | FIRE EXPOSURE |
|---|---|---|---|---|
| | COATING | LOAD-BEARING STRUCTURE | MINERAL FIBREBOARD [2] | |
| EI 15 DP1 | CETRIS® 1 × 12 mm | CD profiles | 2 × 40 mm | Heat exposition from underneath |
| EI 46 DP1 | CETRIS® 2 × 12 mm | CD profiles | 2 × 40 mm | |
| EI 30 DP1 | CETRIS® 2 × 12 mm | CD profiles | – | |
| EI 30 DP1 | CETRIS® 2 × 12 mm | Wooden laths 60 × 40 mm | – | |

**Notes to Table 15:**
1) Classification of limit fire resistance pursuant to ČSN 73 0810, construction tested pursuant to EN 1365-1
2) Mineral insulation Orsil (Isover) type Uni or another mineral fibre board with bulk density of at least 75 kgm$^{-3}$, flammability grade max. B (not easy to catch fire) pursuant to ČSN 73 0862 (A2 fire reaction class pursuant to EN 13501-1 assumed)

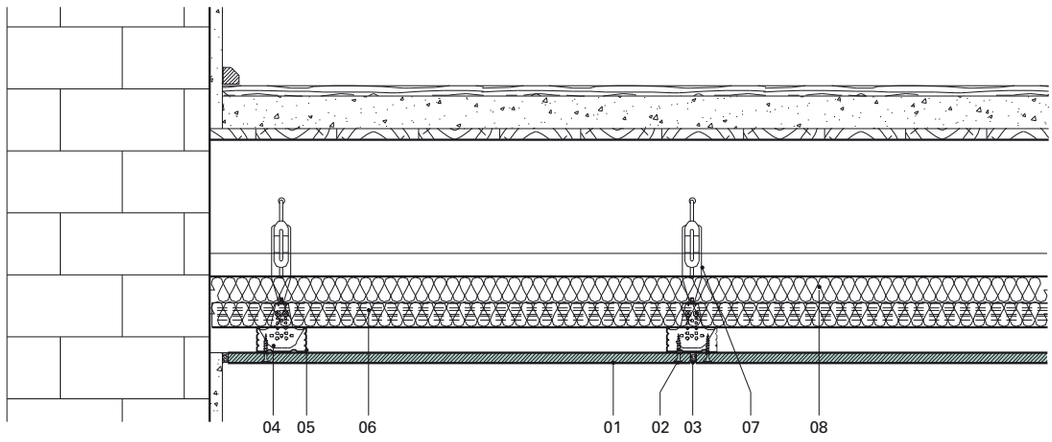
### 9.3.2.3 Model construction solutions – details

Lengthwise cross-section



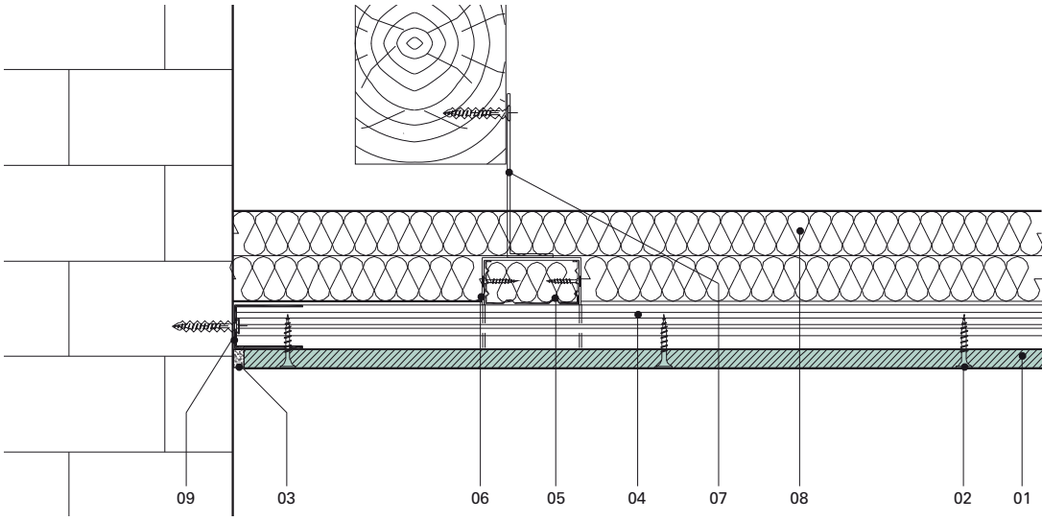

**01 CETRIS® board**
**02 screw 4.2 × 25 (35, 45) mm**
**03 DEXAFLAMM-R filler**
**04 UD profile**
**05 cross connector**
**06 CD profile – assembly**
**07 CD profile – load-bearing**
**08 suspension**
**09 mineral wool**

Crosswise cross-section



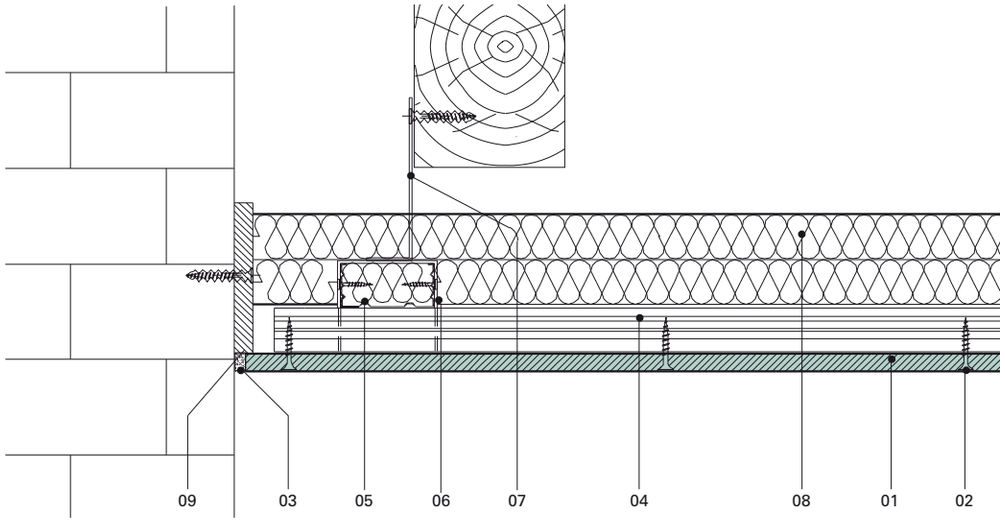

**01 CETRIS® board**
**02 screw 4.2 × 25 (35, 45) mm**
**03 DEXAFLAMM-R filler**
**04 cross connector**
**05 CD profile – assembly**
**06 CD profile – load-bearing**
**07 suspension**
**08 mineral wool**

**Connection with joint filled with filler (sealed with a UD profile)**




**01** CETRIS® board
**02** screw 4.2 × 25 (35, 45) mm
**03** DEXAFLAMM-R filler
**04** CD profile – assembly
**05** CD profile – load-bearing
**06** cross connector
**07** suspension
**08** mineral wool
**09** UD profile

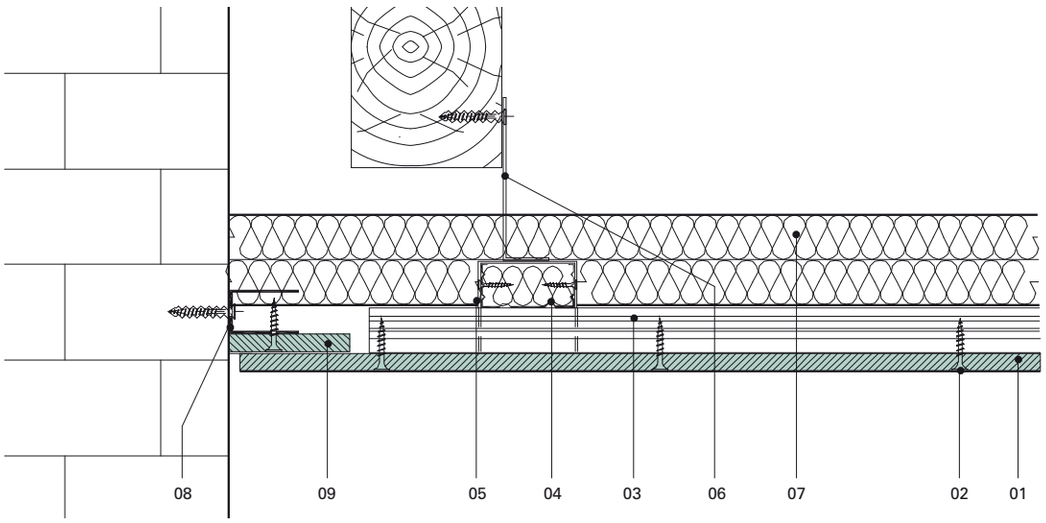
**Connection with joint filled with filler (sealed with a CETRIS strip)**




**01** CETRIS® board
**02** screw 4.2 × 25 (35, 45) mm
**03** DEXAFLAMM-R filler
**04** CD profile – assembly
**05** CD profile – load-bearing
**06** cross connector
**07** suspension
**08** mineral wool
**09** CETRIS® strip

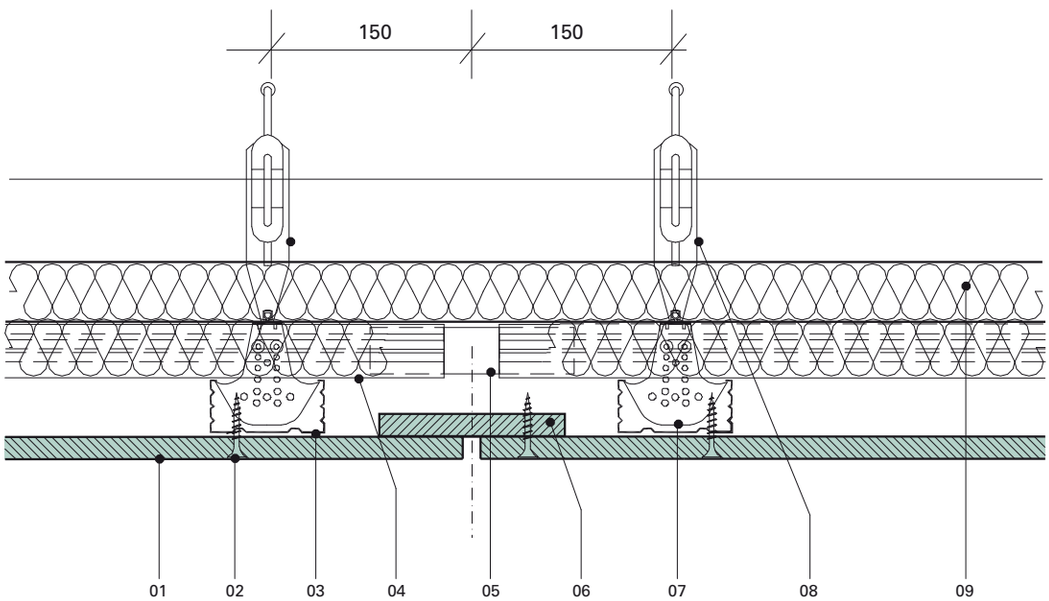
# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

**Connection with supported joint (sealed with a UD profile and CETRIS strip)**




**01** CETRIS® board
**02** screw 4.2 × 25 (35, 45) mm
**03** CD profile – assembly
**04** CD profile – load-bearing
**05** cross connector
**06** suspension
**07** mineral wool
**08** UD profile
**09** CETRIS® strip

**Dilation joint in ceiling panels**

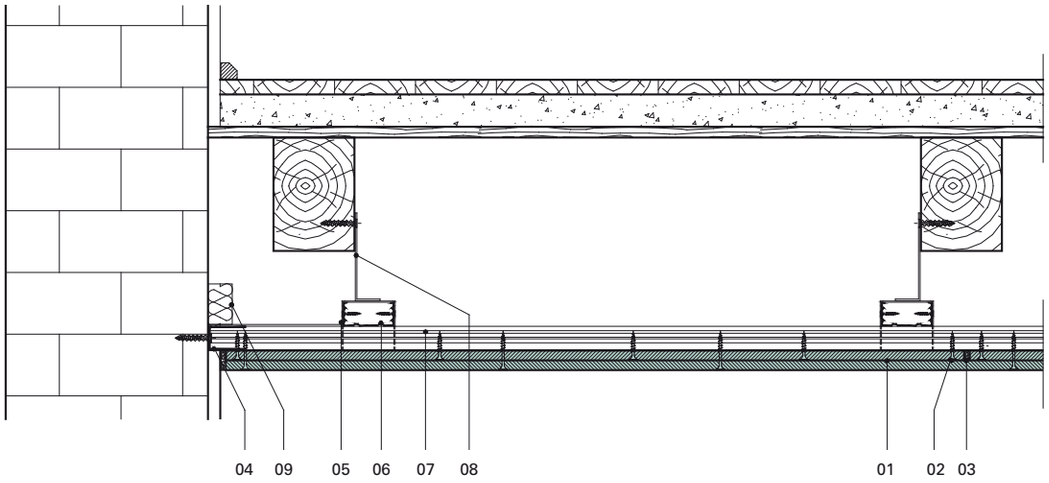



**01** CETRIS® board
**02** screw 4.2 × 25 (35, 45) mm
**03** CD profile – assembly
**04** CD profile – load-bearing
**05** CD joint
**06** CETRIS® strip
**07** cross connector
**08** suspension
**09** mineral wool

All dimensions in mm.

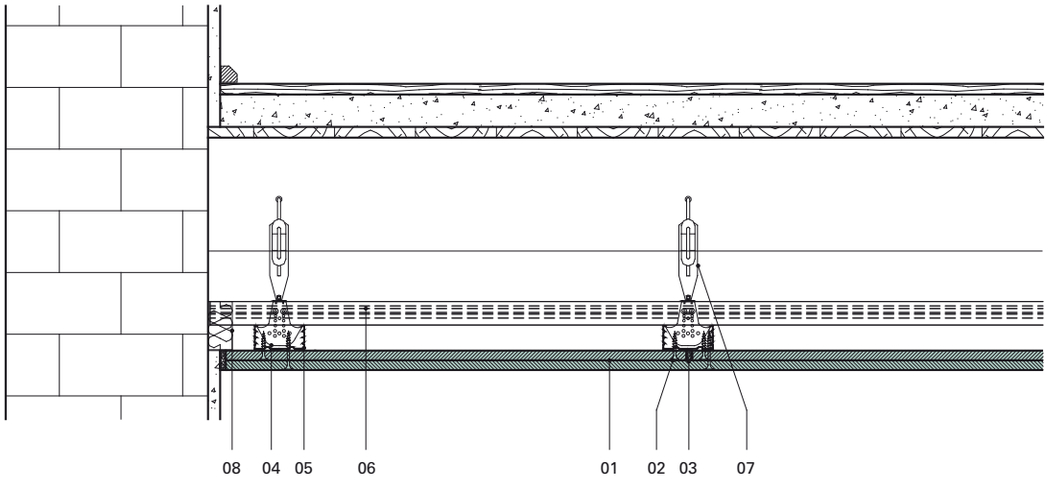
### Fireproof ceiling

Longthwise cross-section




**01** CETRIS® board
**02** screw 4.2 × 25 (45) mm
**03** DEXAFLAMM-R filler
**04** UD profile
**05** cross connector
**06** CD profile assembly
**07** CD profile – load-bearing
**08** suspension
**09** mineral wool – sealing along the wall (min. thick. of 30 mm, height of 50 mm)

Crosswise cross-section

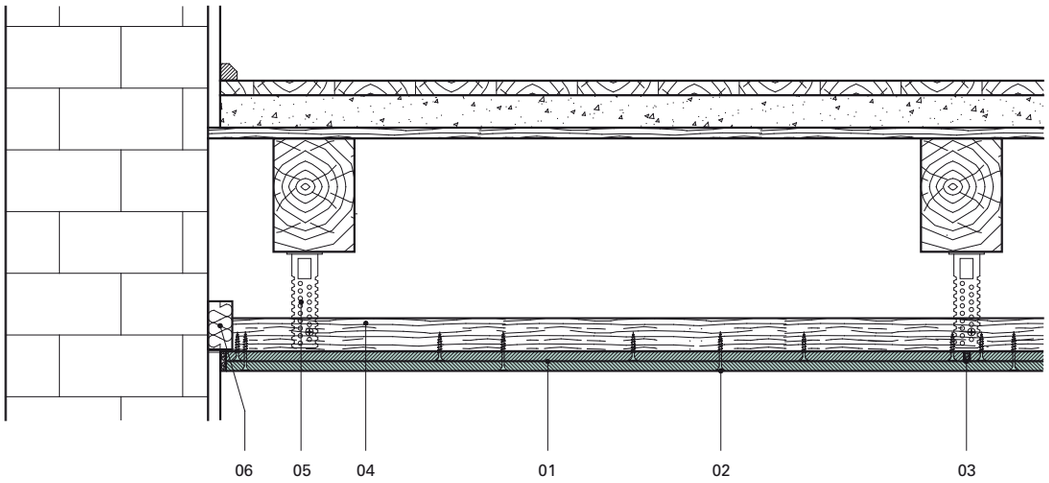



**01** CETRIS® board
**02** screw 4.2 × 25 (45) mm
**03** DEXAFLAMM-R filler
**04** UD profile
**05** cross connector
**06** CD profile assembly
**07** CD profile – load-bearing
**08** suspension
**09** mineral wool – sealing along the wall (min. thick. of 30 mm, height of 50 mm)

# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

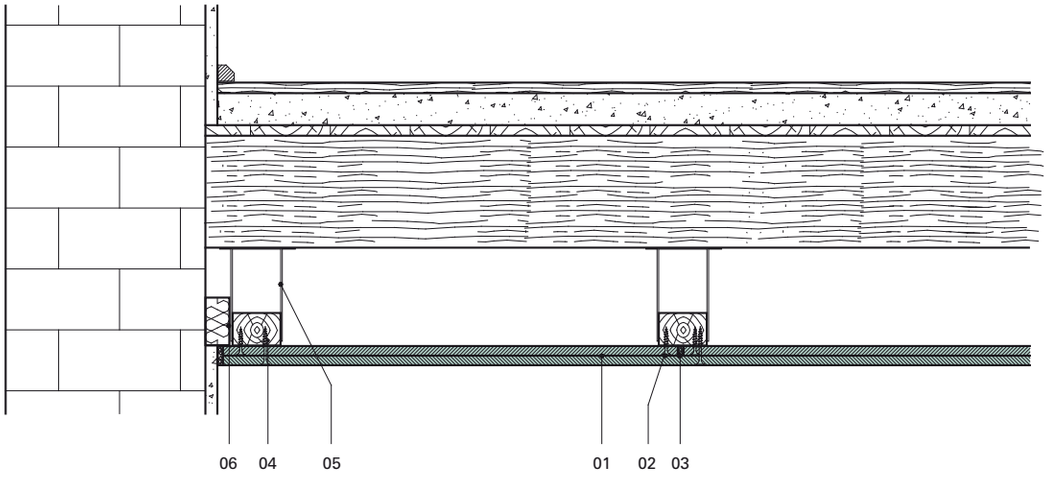
## Fireproof ceiling

Longthwise cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (55) mm**
**03 DEXAFLAMM-R filler**
**04 wooden lath 60 × 40 mm**
**05 straight suspension**
**06 mineral wool – sealing along the wall (min. thick. of 30 mm, height of 50 mm)**

Crosswise cross-section




**01 CETRIS® board**
**02 screw 4.2 × 35 (55) mm**
**03 DEXAFLAMM-R filler**
**04 wooden lath 60 × 40 mm**
**05 straight suspension**
**06 mineral wool – sealing along the wall (min. thick. of 30 mm, height of 50 mm)**

### 9.3.2.4 General Principles of Assembly of Fire Ceiling Panels

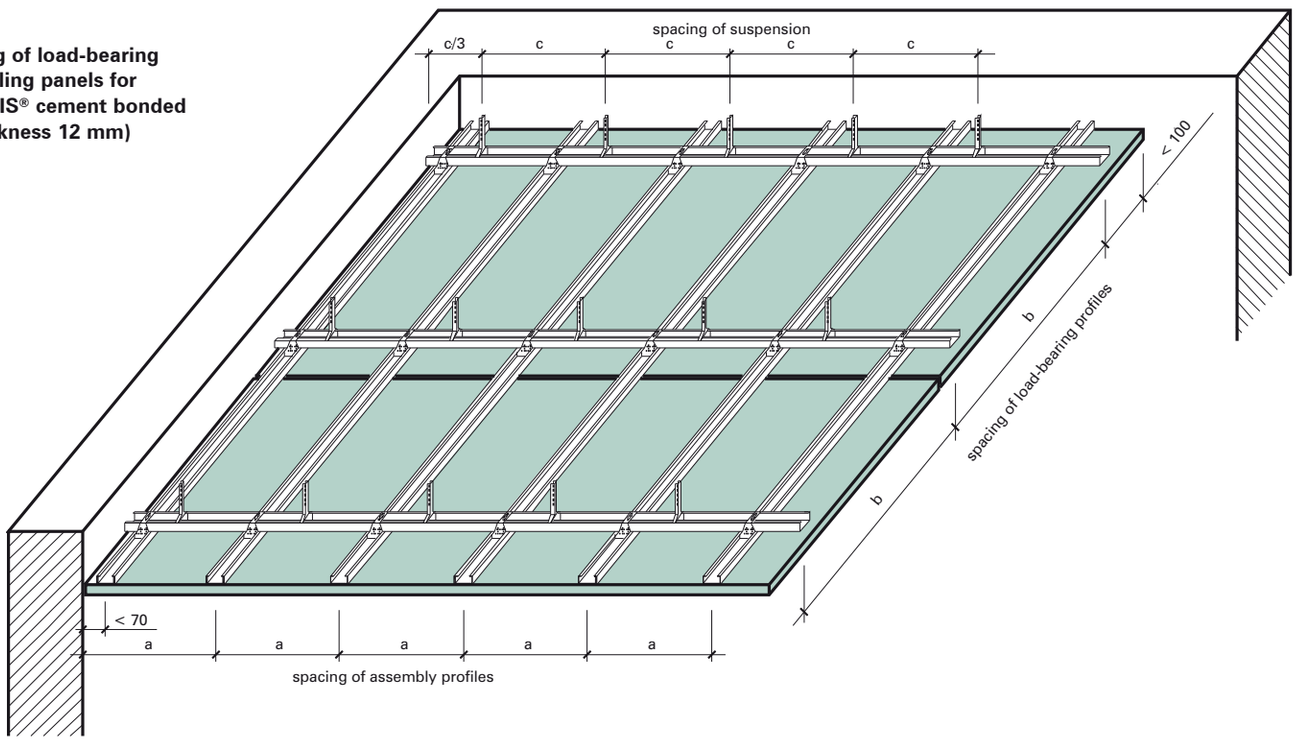
- All structurally independent load bearing building constructions, to which CETRIS® ceiling panels are fixed in any manner or related as boundaries of fire compartments which might threaten their stability if failing, must have at least the same fire resistance as the CETRIS® ceiling and panels themselves. If these constructions are structurally stressed then their potential deformations may not interfere with the integrity of the ceiling or panels of CETRIS® boards. This requirement does not apply if the supporting and load-bearing construction cannot be exposed to thermal stress by fire even under the least favourable conditions for the period of the prescribed fire resistance.
- Maximum spacing of the screws anchoring CETRIS® boards to the CD profiles must not exceed 200 mm (screws by the edges), or 400 mm (across the surface) and the distance from the board edges must not be less than 25 mm in the case of fire ceiling panels.
- Screws used for anchoring CETRIS® boards to CD profiles must be at least 10 mm longer than the thickness of the anchored board.
- If the CETRIS® board is used as visible coating of an exterior fire construction it must be anchored as façade cladding – i.e. with predrilled holes (8 or 10 mm) and screws with visible heads and sealing washers (see chapter 8.7.7).
- CETRIS® assembly inserts or strips must always be at least 12 mm thick.
- CETRIS® strip covering joints between CETRIS® boards must overlap on both sides by at least 10 mm, unless otherwise specified in the detail drawing.
- Maximum spacing of dowels for anchoring UD profiles must not exceed 625 mm.
- The bottom layer of insulation boards is laid over assembly CW profiles and fills the load-bearing CW profile.
- Dilation joints and all contacts with the wall and the corner joints must be filled with refractory filler DEXAFLAMM-R. The filler must be applied to the minimum depth of 5 mm.
- The surface of CD or UD profiles, adjacent to the wall, should be sealed with fire resistant sealant DEXAFLAMM-R as necessary and underlaid with FIBREFRAX DURAFELT paper.
- NIVEAU couplings KNAUF for profiles CD 60 × 27 will be applied for types of suspended ceilings with two layers of CETRIS® boards. The shims of such couplings must be bent and screwed into the the supporting profile with screws LN 3.5 × 9 mm.

**Table 13: Axial distance of assembly CD profiles, load-bearing CD profiles and suspensions**

| CEILING PANEL COATING COMPOSITION | SPACING OF ASSEMBLY PROFILES **a** (mm) | SPACING OF LOAD-BEARING PROFILES **b** (mm) | SPACING OF SUSPENSIONS **c** (mm) | NOTE |
|---|---|---|---|---|
| 1 × 12 mm | < 420 | < 1,000 | < 420 | See Figure 1 |
| 2 × 12 mm | < 420 | < 900 | < 420 | See Figure 2 |

The values apply to ceiling panels and constructions without additional loading (lighting, air conditioning etc.). The visible ceiling constructions in rooms where negative or excess pressure may be created by ventilation and air conditioning technology must be assessed individually.

**Fig. 1)**
**Schematic drawing of load-bearing construction of ceiling panels for coating with CETRIS® cement bonded particleboard (thickness 12 mm)**



# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

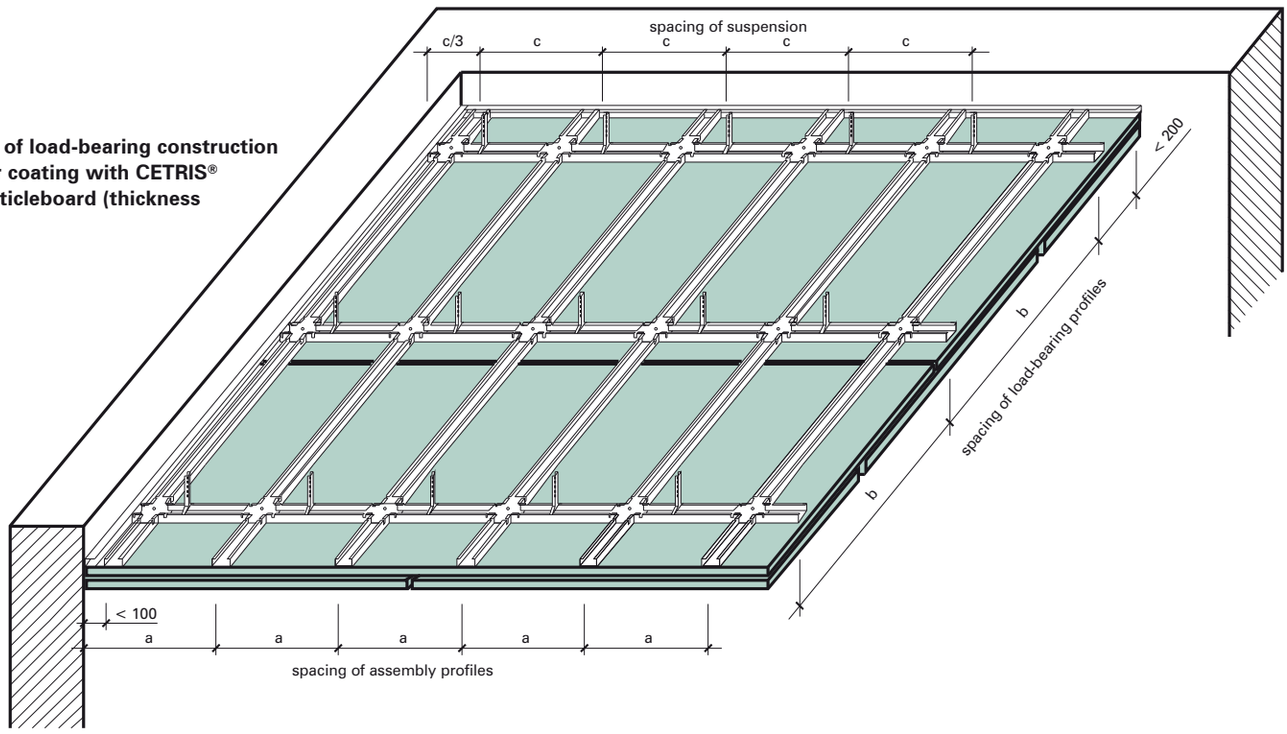



**Fig. 2)**
**Schematic drawing of load-bearing construction of ceiling panels for coating with CETRIS® cement bonded particleboard (thickness 2 × 12 mm)**

- Surfaces of CD or UD profiles adjacent to masonry walls must be covered with fire resistant filler DEXAFLAMM-R and sealed with a layer of FIBERFRAX DURAFELT paper as needed.
- NIVEAU connectors by KNAUF for profiles CD 60 × 27 will be used for ceiling panels of two layers of CETRIS® boards. Fishplates of these joins must be bent and screwed together with the load-bearing profile with screws LN 3.5 × 9 mm.
- KNAUF cross connectors for profiles CD 60 × 27 will be used for ceiling panels of one layer of CETRIS® boards. It is recommended to secure the cross connectors with screws of minimum size M6 × 40 with nuts and washers.
- Joints of multilayer coating must alternate with mutual overlaps of at least 100 mm and without any cross joint whatsoever.
- Joints of single-layer coats must always be supported with a CD profile, or (where impossible for construction reasons) with CETRIS® strips. In exposed cases – in the case of higher demand for fire resistance – both ways are recommended to be used simultaneously. All joints must be filled with filler. In the case of multilayer coats the joints of the bottom layers must be filled with filler too.
- In the case of suspended ceiling composition without inserted mineral wool, it is necessary to insert a strip of mineral wool with a minimum thickness of 30 mm and a height of at least 50 mm over the circumference (along the walls) of the CETRIS® board cladding.

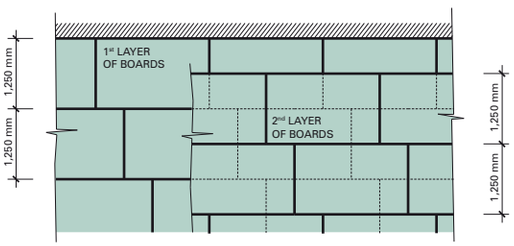
### 9.3.2.5 Notes to Assembly

The system of CETRIS® ceiling panels is fixed to the metal grid of CD profiles crossed either on a single level (cross connectors) or on two different levels (connectors). CETRIS® boards are then fixed to these profiles with screws in one or two layers.
No additional load (such as lighting) may be fixed to the CETRIS® board ceiling panels themselves and no other holes may be drilled in them without further treatment (for ventilation grids etc.). All these adaptations may only be performed by procedures proposed by the project. Lighting must be suspended under the ceiling panels on a separate load-bearing construction. The passages must be sealed with FIBERFRAX DURAFELT paper or mineral wool and DEXAFLAMM-R filler. Locations and types of lamps, potentially sunk in the panels, must be discussed with the fire protection designer in advance and the openings must be treated with fire protection means depending on the lamp and construction type. Ventilation grids for air conditioners must be provided with fire resistance identical with the fire resistance of the through pass.

The following assembly rules must be observed:

- CETRIS® boards must always be assembled with the longer edge perpendicular to the load-bearing profiles.
- All crosswise joints must be supported with a profile or an assembly insert with an overlap of at least 400 mm.
- Fixation must always start from the centre or corner of the board (for elimination of potential tensions).
- When screwing the board always press it tightly to the load-bearing CD profiles. Pre-drilling of the board is recommended.
- When coating large ceilings (longer or wider than 6 m) the dilations on the load-bearing construction must be carefully designed and made visible in the CETRIS® board coating too.

When applying a two-layer ceiling panel construction the second (external) layer must always be overlapped pursuant to the following scheme:



## 9.3.3 Fire Ceiling Panels under Ceiling (Roof) Construction

Fire ceiling panels described in the previous chapter may also be used under ceiling (roof) constructions if the relevant regulations are complied with.
Adding the value of fire resistance of the ceiling panel to the fire resistance value of the protected ceiling (roof) construction itself will result in the total fire resistance of the ceiling (roof) + ceiling panel system. The values apply to all types of ceiling (roof) constructions – concrete, steel, composite steel-concrete and wooden.

Assessment of fire resistance of ceiling (roof) constructions is based on dimension tables included in the following standards:

- **ČSN 73 0821** "Fire Safety of Buildings – Fire Resistance of Building Constructions"
- **ENV 1992-1-2** "Design of concrete structures. General rules. Part 1.2: Structural fire design"
- **ENV 1993-1-2** "Design of steel structures. General rules. Part 1.2: Structural fire design"
- **ENV 1994-1-2** "Design of composite steel and concrete structures. General rules. Part 1.2: Structural fire design"
- **ENV 1995-1-2** "Design of timber structures. General. Part 1.2: Structural fire design"

For easier orientation the frequent occurring cases, especially in the field of wooden and steel ceiling (roof) constructions, will be dealt with in the following chapters.

Specification of fire resistance of concrete ceiling (roof) constructions will not be dealt with here for the generally high fire resistance of such constructions (protection of concrete constructions against fire is required very rarely). If this value needs to be specified the following standards may be used: ČSN 73 0821, ENV 1992-1-2.

### 9.3.3.1 Fire Ceiling Panel under Wooden Construction

When assessing the fire resistance of **wooden** ceiling (roof) construction the whole composition of the construction should be assessed, including the layers above the cover (decks) such as insulation, backfill, flooring (roofing) which also contribute to the construction integrity.
To simplify this procedure the fire resistance of wooden ceilings (roofs) is calculated as the lower of the values of fire resistance of the load-bearing ceiling (roof) beam (ceiling joist) and of the cover of planks or boards.
Table 14 is used for specification of the fire resistance of wooden ceilings. **However, as the thickness of the ceiling planks is hardly ever very high, it is always the ceiling planks that decide the fire resistance of the whole ceiling (roof) construction.**
The important aspects also include the implementation of the ceiling (roofing) – the ceiling integrity is determined by the plank joints; assessment for the centres of the planks is only made in the case of a lath covering of all joints.
This material includes values of fire resistance for the most frequent cases (with minimum fire resistance of the ceiling – roof construction). All details of the issue can be found in ČSN 73 0821 and ENV 1995-1-2 standards.

***Example:***
*An existing joist ceiling includes beams with a diameter of 140 × 160 mm, the ceiling planks are tongue and groove connected and the plank thickness is 25 mm. The required fire resistance after application of ceiling panels is 30 minutes.*

***Procedure:***
1. *Specify the fire resistance of the existing wooden ceiling from the tables as the lower of the following two values:*
   - *Fire resistance of the beam (ceiling joist) – 30 min.*
   - *Fire resistance of the ceiling planks 25 mm thick and tongue and groove connected – 12 min.*

*Therefore the fire resistance of the existing ceiling is 12 min.*

**Table 14: Fire resistance of wooden load-bearing elements (taken from ČSN 73 0821)**

| ELEMENT NAME, VARIANT | FIRE RESISTANCE IN MINUTES |
|---|---|
| **Wooden beams (ceiling joints), bend stressed, unprotected on three sides** | |
| a) Min. width 100 mm, min. height 140 mm | 25 |
| b) Min. width 120 mm, min. height 160 mm | 30 |
| c) Min. width 140 mm, min. height 200 mm | 40 |
| d) Min. width 180 mm, min. height 260 mm | 50 |

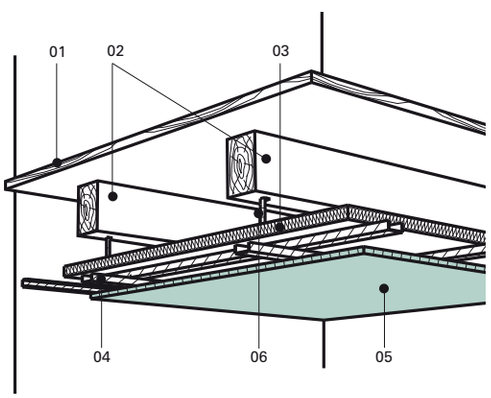
**Note to Table 14:** Fire resistance of wooden beams is specified for beams of massive timber, use of soft timber (spruce, pine, fir) of class I-II is assumed.

**Table 15: Fire resistance of wooden ceiling cover (pursuant to ENV 1995-1-2)**

| CEILING COVER THICKNESS (mm) | FIRE RESISTANCE (PLANK BREAKING) IN MINUTES BY IMPLEMENTATION | | | |
|---|---|---|---|---|
| | TIGHTLY PLACED PLANKS [1] | SEMI-GROOVE JOINT [1] | TONGUE AND GROOVE JOINT [1] | JOINT LATHING [2] |
| 20 | 4.4 | 6.7 | 8.9 | 18.2 |
| 25 | 6.2 | 9.3 | 12.4 | 27.1 |
| 30 | 8.2 | 12.2 | 16.3 | 36.8 |
| 35 | 10.3 | 15.4 | 20.6 | 47.5 |
| 40 | 12.6 | 18.9 | 25.2 | 58.9 |

**Notes to Table 15:**
1) Fire resistance specified by the time to plank breaking in the places of joints
2) Fire resistance specified by the time to plank breaking in the places of full thickness

*2. Design of ceiling panel construction*
*Required fire resistance of the ceiling panels = Required total fire resistance – Fire resistance of the existing ceiling construction, i.e. 30 – 12 = 18 minutes => The sufficient ceiling panel construction will be 1 layer of CETRIS® boards, thickness 12 mm, with fire resistance EI 21 D1*




**01** ceiling planks
**02** wooden beam
**03** mineral wool
**04** CD profile
**05** CETRIS® cement bonded particleboards
**06** suspension

#### 9.3.3.2 Fire Ceiling Panels under Steel (Steel-Concrete) Construction

Fire resistance of steel constructions – their effectiveness in fire protection and ability to resist fire – is determined by their shape, or the proportion of the circumference of the steel construction exposed to fire O (in mm) and the cross section area of the construction A (in mm²) and the method of protection of the load-bearing beams (unprotected vs. protected with cladding, paint etc.). This material includes values of fire resistance for the most frequently occurring cases (with minimum fire resistance of the ceiling – roof – construction). All details can be found in ČSN 73 0821, ENV 1993-1-2 standards.

**Table 16: Fire resistance of ceilings of steel beams (unprotected) exposed to fire on three sides**

| DESCRIPTION OF CONSTRUCTION | FIRE RESISTANCE IN MINUTES AT PROPORTION O/A*10³ (m⁻¹) | |
|---|---|---|
| | >100 <150 | >150 <300 |
| Ceiling of steel beams, unprotected, exposed to fire on three sides | 15 | 10 |

**Fire resistance of construction of shaped unprotected sheet metal profiles cold drawn**

| NAME OF ELEMENT, VARIANT | FIRE RESISTANCE IN MINUTES |
|---|---|
| Sheet metal filled with concrete class B20, min. thickness 40 mm, without additional reinforcement | 20 |
| Sheet metal filled with concrete class B20, min. thickness 40 mm, with additional reinforcement (area min. 15 % of sheet metal cross section area, coverage 30 mm) | 45 |

The parameters of suspended ceiling panels clad with CETRIS® cement bonded particleboard were tested in 2007 in the context of certification pursuant to EN 13 964 Suspended Ceilings. The result of the tests is an EC Certificate of conformity for Suspended ceiling panels with the following declared values, including but not limited to:

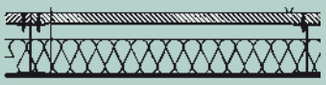
- **Fire resistance** (variants EI 15 and EI 45 – see above)
- **Reaction to fire A2 s1,d0**
- **Susceptibility to breaking – impact resistance 1A.** A ceiling panel of one layer of CETRIS® boards, thickness 12 mm (assembled on a grid of CD profiles) was tested pursuant to EN 13 964 standard, annexe D, by 36 hits by a ball, 12 times vertical and 24 from various directions at an angle of 60°. The tests were based on the maximum impact speed (1A – nearly 60 km/hr), and the ball was shot to different places on the ceiling (board joints, between supports etc.). In the course of the test and after its completion the appearance of the ceiling panels was monitored continuously – the appearance was not damaged in any way, and no defect (crack) developed. Thus the compactness, function and safety of the ceiling panel were not compromised.
- **Sound transmission loss Rw = 43 dB** (applies to the variant with a single-layer CETRIS® coat of 12 mm).
- **Thermal resistance of ceiling panel 2.26 m²K/W**

# 9.4 Horizontal Constructions – Ceilings and Floors

## 9.4.1 Introduction

Horizontal constructions (ceiling, roof, floor constructions) are mostly exposed to fire on their bottom part. The required fire resistance is achieved in these cases by ceiling panels (for the solutions see Chapter 9.3 Horizontal Constructions – Ceiling Panels). CETRIS® cement bonded particleboards can also improve the fire resistance of horizontal constructions exposed to fire from the upper size. This fire load is characteristic mainly for ceiling and floor constructions forming horizontal partitions between the floors of a house.

**Ceiling Construction (Steel Load-Bearing Construction) – Exposed to Fire from Upper Side**

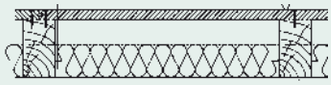
| CONSTRUCTION SCHEMATIC | THICKNESS OF UPPER LAYER OF CETRIS® d (mm) | AXIAL DISTANCE OF LOAD-BEARING PROFILES [1] (mm) | MINERAL WOOL | | CEILING PANEL TYPE | FIRE RESISTANCE [2] |
|---|---|---|---|---|---|---|
| | | | Thickness a (mm) | Bulk density (kgm⁻³) | | |
|  | 22 | 625 | 80 | 25 | Zinc-coated sheet metal 0.55 mm | REI 45 RE 60 |
| | 22 | 625 | 80 | 25 | Particleboard thickness 10 mm | |
| | 22 | 625 | 80 | 25 | Plasterboard thickness 12.5 mm | |
| | 18 | 420 | 80 | 25 | Zinc-coated sheet metal 0.55 mm | |

**Notes to table:**

1) The test was performed with steel I profiles 140 with the span of 4 m.

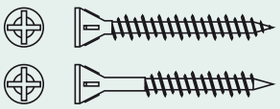
2) Classification of limit fire resistance pursuant to EN 13 501-2, constructions tested pursuant to EN 1365-1 and EN 1364-2 with reduced vertical load with the intensity of 100 kg/m².

**Ceiling construction[3] (wooden load-bearing construction) – exposed to fire from the upper side**

| CONSTRUCTION SCHEMATIC | THICKNESS OF UPPER LAYER OF CETRIS® **d** (mm) | AXIAL DISTANCE OF LOAD-BEARING PROFILES [1] (mm) | MINERAL WOOL | | BOTTOM CEILING PANEL TYPE | FIRE RESISTANCE [2] |
|---|---|---|---|---|---|---|
| | | | Thickness **a** (mm) | Bulk density ($kgm^{-3}$) | | |
|  | 22 | 625 | 80 | 25 | Wooden laths 50 by 30 mm (axial distance 500 mm) for anchoring of any panel. | REI 45<br>RE 30 |
| | 2 × 12 | 625 | 80 | 25 | | |

**Notes to table:**
1) The test was performed with wooden prisms 80 by 140 mm (spruce logs) with the span of 4 m.
2) Classification of limit fire resistance pursuant to EN 13 501-2, constructions tested pursuant to EN 1365-1 and EN 1364-2 with reduced vertical load with the intensity of 100 $kg/m^2$.
3) Alternative use as floor construction.

**Materials for fire construction implementation**

| DESCRIPTION | PICTURE | NOTE |
|---|---|---|
| **CETRIS® BASIC, PD, PDB**<br>Cement-bonded particleboard, smooth surface, cement grey.<br>Basic size 1,250 × 3,350 mm<br>Bulk density 1,320 ±70 $kgm^3$ |  | Thickness pursuant to fire resistance requirement.<br>Floor board CETRIS® PD, PDB, tongue and groove connections. |
| **CETRIS screw 4.2 × 45, 55 mm**<br>Self-cutting and self-drilling screws with sunken heads. |  | For CENTRIS® board anchoring to load-bearing construction. |
| **ORSIL (ISOVER)**<br>Mineral board thickness 80 mm, bulk density 25 $kgm^{-3}$ |  | Alternatives include mineral board of the same bulk density, flammability class min. A2 (pursuant to EN 13501-1). |

## 9.4.2 General Principles of Assembly

Complete principles for floor construction assembly see Chapter 7 Floor Systems.
Main principles to be stressed in this context:

- Maximum spacing of screws anchoring CETRIS® boards to beams must not exceed 300 mm.
- Maximum distance from the edge 25 mm. The screw must be at least 20 mm longer than the thickness of the fixed board (steel construction) or 30 mm (wooden construction). When laying two layers of CETRIS® boards each layer needs to be anchored separately.
- In the case of ceiling/floor constructions CETRIS® boards are laid tightly (without gaps). CETRIS® PD (or PDB) floor boards must be glued in their tongue and groove joints with a dispersion glue – such as Uzin MK 33, Henkel Ponal etc.
- When using CETRIS® boards without treated edges (tongue and groove) the joints off the supports must be supported with CETRIS® strips of the same thickness. The minimum width of the strip is 100 mm, maximum spacing of screws anchoring the strip 200 mm.
- The boards must be laid to avoid cross joints – with a minimum overlap of 625 mm. The minimum size of any cut board must be 250 mm. CETRIS® boards are always laid with the longer edge perpendicular to the beams.
- The ceiling cavity fill – mineral wool – must be laid across the ceiling area in the prescribed thickness of the layer.
- All joints – between the ceiling and the walls – must be sealed with mineral wool.

# 9.5 Steel Construction Cladding with CETRIS® Cement Bonded Particleboards

## 9.5.1 Introduction

Steel is an inorganic material and therefore may be classified as a non-flammable substance without special testing. Following direct exposure to fire, steel construction elements lose their load-bearing power due to exposure to high temperatures (increasing to up to 550° C as soon as after 5 minutes of burning) and the building construction stability is compromised. It is therefore necessary to protect all steel elements adequately where fire resistance is required.
CETRIS® cement bonded particleboard cladding assures that the critical temperature of steel disintegration is only achieved after elapse of the specified time. The cladding of CETRIS® boards may be applied directly on the steel profiles or through an auxiliary construction.

Selection of thickness of the CETRIS® cement bonded particleboard cladding in the case of protection of steel constructions depends primarily on the following three factors:

- Length of required protection – fire resistance in minutes
- Design temperature
- Cross-sectional coefficient Ap/V

**The length of the required protection** (fire resistance) is required in the following intervals: 15, 30, 45, 60, 90, 120, 180 and 240 minutes.

**The design temperature** depends on the intensity of the element loading (coefficient of utilisation of the cross section at normal temperature $\theta_D$). Unless specified otherwise, the value of 500°C is used, corresponding to the coefficient range of 0.78 to 0.80.

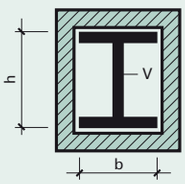
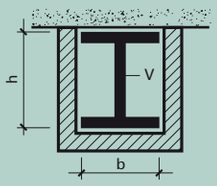
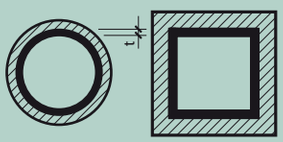
For details see EN 1993-1-2 standard, Euro code 3: Design of steel structures. General rules. Part 1.2: Structural fire design, Chapter 4.2.4.
A significant factor defining the shape of the cross section is the ratio Ap/V – **cross-sectional coefficient of protected steel profile** (in the past the ratio O/A was used).

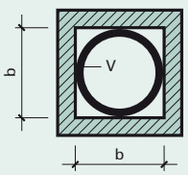
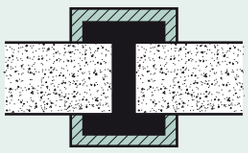
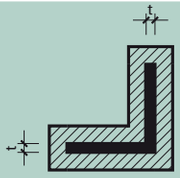
The elements of the Ap/V ratio include:
**$A_p$** .... **perimeter** of the protected steel profile in cm (originally marked O).
**V** ..... **area** of crosswise section of the steel profile in cm² (originally marked A).

When specifying the size of the heated perimeter it is necessary to always consider just the part of the steel construction exposed to flame in the course of fire (usually all sides of the column and three sides of the beam) – see table.

The effect of this factor is significant – subtle profiles (cross sections with high $A_p/V$ ratios) approach the critical temperature more quickly, and therefore need to be protected with thicker cladding.

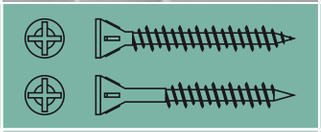
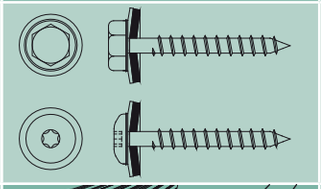
## 9.5.2 Calculation of Ap/V

| SHAPE OF CROSS SECTION | EXPOSURE TO FIRE | $A_p/V$ ($m^{-1}$) |
|---|---|---|
|  | From four sides | $1000\ \frac{2b + 2h}{V}$ |
|  | From three sides | $1000\ \frac{2h + b}{V}$ |
|  | From four sides | $1000\ \frac{O}{V}$ |
|  | From four sides | $\frac{1000}{t}$ |

| SHAPE OF CROSS SECTION | EXPOSURE TO FIRE | $A_p/V$ ($m^{-1}$) |
|---|---|---|
|  | From four sides | $1000\ \frac{4b}{V}$ |
|  | From four sides | $\frac{2000}{t}$ |
|  | From four sides | $\frac{1000}{t}$ |
|  | From four sides | $\frac{2000}{t}$ |

Cross-section dimensions **b**, **h**, **t** in mm, cross-section area **V** in mm².

**Materials for fire construction implementation**

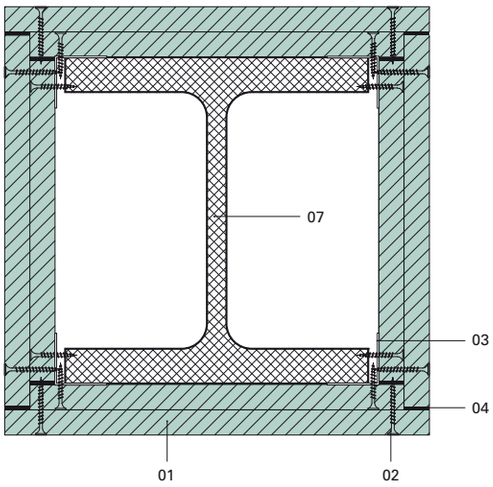
| DESCRIPTION | PICTURE | NOTE |
|---|---|---|
| **CETRIS® BASIC PD (PDB)**<br>Cement-bonded particleboard, smooth surface, cement grey.<br>Basic size 1,250 × 3,350 mm<br>Bulk density 1,320 ±70 kgm³ |  | Thickness pursuant to fire resistance requirement, maximum 24 mm.. |
| **CETRIS screw 4.2 × 25, 35, 45, 55 mm**<br>Self-cutting and self-drilling screws with sunken heads. |  | Screw type (length) pursuant to the cladding thickness. Suitable for interiors and for anchoring bottom layers in exterior applications. |
| **Screw 4.8 × 38, 45, 55 mm**<br>Stainless or galvanised screws with semi-circular or hexagonal heads with compressive water tight washer. |  | Screw type (length) pursuant to the cladding thickness. For anchoring of upper layer of CETRIS® board in exteriors – where the board remains visible. The board must be predrilled with holes of 8 (10) mm min. diameter! |
| **Auxiliary construction**<br>Zinc-coated sheet metal profiles<br>CD 60 × 27 × 0.6 mm<br>L 50 × 50 × 0.6 mm<br>Clamp to flanges of "I" beams |  | For creation of auxiliary construction for cladding assembly. Screws or rivets are used for anchoring of the profiles or clamps to the steel cross section. |
| **Filler DEXAFLAMM-R**<br>White tixotrophic material for joint filling and screw head covering. |  | Alternatives include fire resistant single-component fillers (acrylic, silicon) permanently elastic (Den Braven Pyrocryl). |

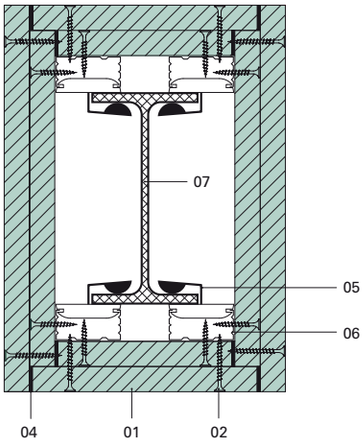
## 9.5.3 Methods of Cladding (directly, or on auxiliary construction)

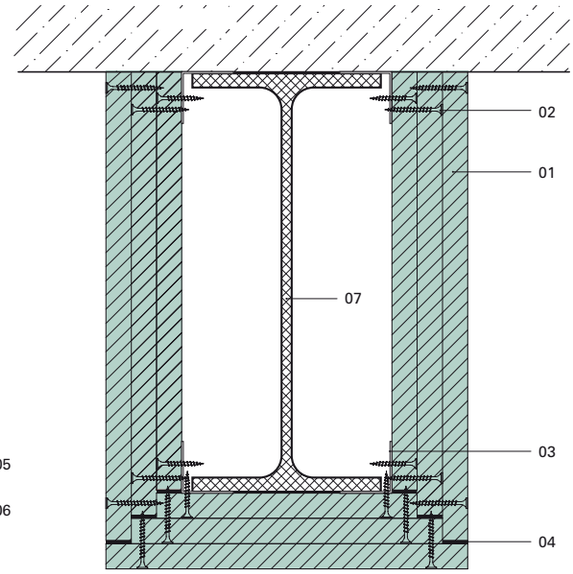
Cladding of CETRIS® cement bonded particleboards can be applied directly on the steel profile – in this case it is recommended to use the easier way of anchoring the CETRIS® boards protecting the web with the auxiliary L profile 50 × 50 × 0.6 mm. This profile is laid directly on the flange with the offset of about 6 mm from the profile edge – the gap is for the screw anchoring the upper CETRIS® board (protecting the profile flange).

Alternatively the cladding of CETRIS® cement bonded particleboards may also be assembled to an auxiliary construction – for example on CD profiles clamped to flanges of the I beams or suspensions.

**01 CETRIS® board cladding**
**02 screw 4.2 × 25 (35, 45, 55) mm**
**03 auxiliary "L" profile 50 × 50 × 0.6 mm**
**04 Dexaflamm R filler**
**05 clamp to flanges of "I" beam**
**06 CD profile 60 × 27 × 0.6 mm**
**07 protected steel cross section**




## 9.5.4 Dimension Tables

**Classification of fire resistance R 15**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 80 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 120 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 160 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 200 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 240 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 280 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 320 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 360 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 400 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 440 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

**Classification of fire resistance R 30**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 12 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 80 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 16 | 14 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 120 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 10 | 18 | 16 | 14 | 12 | 12 | 12 | 12 | 12 | 12 |
| 160 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 10 | 20 | 18 | 14 | 12 | 12 | 12 | 12 | 12 | 12 |
| 200 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 22 | 18 | 16 | 14 | 12 | 12 | 12 | 12 | 12 |
| 240 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 22 | 20 | 18 | 14 | 12 | 12 | 12 | 12 | 12 |
| 280 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 22 | 20 | 18 | 14 | 12 | 12 | 12 | 12 | 12 |
| 320 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 24 | 20 | 18 | 14 | 12 | 12 | 12 | 12 | 12 |
| 360 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 24 | 20 | 18 | 16 | 12 | 12 | 12 | 12 | 12 |
| 400 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 24 | 20 | 18 | 16 | 14 | 12 | 12 | 12 | 12 |
| 440 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 24 | 20 | 18 | 16 | 14 | 12 | 12 | 12 | 12 |

**Classification of fire resistance R 45**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 16 | 16 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 18 | 16 | 14 | 14 | 12 | 10 | 10 | 10 | 10 |
| 80 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 10 | 10 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 12 | 12 |
| 120 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 10 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 12 |
| 160 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 30 | 28 | 26 | 24 | 20 | 18 | 16 | 14 | 12 |
| 200 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 32 | 30 | 28 | 24 | 22 | 20 | 18 | 16 | 12 |
| 240 | 28 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 34 | 30 | 28 | 26 | 24 | 20 | 18 | 16 | 14 |
| 280 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 12 | 12 | 34 | 32 | 30 | 28 | 24 | 22 | 20 | 16 | 14 |
| 320 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 36 | 34 | 30 | 28 | 24 | 22 | 20 | 18 | 14 |
| 360 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 36 | 34 | 30 | 28 | 24 | 22 | 20 | 18 | 14 |
| 400 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 36 | 34 | 30 | 28 | 26 | 22 | 20 | 18 | 14 |
| 440 | 30 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 38 | 34 | 30 | 28 | 26 | 24 | 20 | 18 | 14 |

**Classification of fire resistance R 60**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 22 | 20 | 18 | 18 | 16 | 14 | 12 | 12 | 10 | 24 | 22 | 20 | 18 | 16 | 16 | 14 | 12 | 10 |
| 80 | 28 | 26 | 24 | 22 | 20 | 18 | 18 | 16 | 14 | 32 | 30 | 26 | 24 | 22 | 20 | 20 | 18 | 16 |
| 120 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 36 | 34 | 32 | 28 | 26 | 24 | 22 | 22 | 18 |
| 160 | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 40 | 36 | 34 | 32 | 30 | 28 | 26 | 24 | 20 |
| 200 | 36 | 34 | 32 | 30 | 26 | 24 | 22 | 20 | 18 | 42 | 40 | 38 | 36 | 32 | 30 | 28 | 24 | 22 |
| 240 | 36 | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 46 | 44 | 40 | 38 | 34 | 32 | 30 | 28 | 24 |
| 280 | 38 | 36 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 48 | 44 | 40 | 38 | 36 | 34 | 30 | 28 | 26 |
| 320 | 38 | 36 | 34 | 32 | 30 | 26 | 24 | 22 | 20 | 48 | 44 | 42 | 40 | 38 | 34 | 30 | 28 | 26 |
| 360 | 38 | 36 | 34 | 32 | 30 | 28 | 26 | 24 | 20 | 48 | 46 | 44 | 40 | 38 | 34 | 32 | 30 | 26 |
| 400 | 40 | 36 | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 50 | 46 | 44 | 40 | 38 | 34 | 32 | 30 | 28 |
| 440 | 40 | 38 | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 50 | 48 | 44 | 40 | 38 | 36 | 32 | 30 | 28 |

# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

**Classification of fire resistance R 90**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 32 | 32 | 30 | 28 | 26 | 24 | 24 | 22 | 20 | 34 | 34 | 32 | 30 | 28 | 26 | 26 | 22 | 20 |
| 80 | 42 | 40 | 38 | 36 | 34 | 32 | 30 | 28 | 28 | 46 | 44 | 42 | 40 | 38 | 36 | 34 | 32 | 30 |
| 120 | 48 | 46 | 44 | 42 | 40 | 38 | 36 | 34 | 32 | 54 | 52 | 50 | 46 | 44 | 42 | 40 | 38 | 36 |
| 160 | 52 | 50 | 48 | 44 | 42 | 40 | 38 | 36 | 34 | 60 | 58 | 56 | 52 | 50 | 48 | 46 | 42 | 40 |
| 200 | 54 | 52 | 50 | 48 | 44 | 42 | 40 | 38 | 36 | 64 | 62 | 60 | 58 | 54 | 52 | 48 | 46 | 44 |
| 240 | 56 | 54 | 50 | 48 | 46 | 44 | 42 | 40 | 38 | 70 | 68 | 64 | 60 | 58 | 56 | 52 | 50 | 48 |
| 280 | 58 | 54 | 52 | 50 | 48 | 46 | 42 | 40 | 38 | 72 | 68 | 66 | 62 | 60 | 58 | 54 | 50 | 48 |
| 320 | 58 | 56 | 54 | 50 | 48 | 46 | 44 | 42 | 40 | 74 | 70 | 68 | 64 | 60 | 58 | 54 | 52 | 50 |
| 360 | 58 | 56 | 54 | 52 | 50 | 46 | 44 | 42 | 40 | 74 | 70 | 68 | 64 | 62 | 58 | 56 | 54 | 50 |
| 400 | 60 | 58 | 54 | 52 | 50 | 48 | 46 | 42 | 40 | 74 | 72 | 68 | 66 | 62 | 60 | 58 | 54 | 50 |
| 440 | 60 | 58 | 56 | 52 | 50 | 48 | 46 | 44 | 40 | 76 | 72 | 70 | 66 | 64 | 60 | 58 | 54 | 50 |

**Classification of fire resistance R 120**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 44 | 42 | 40 | 38 | 36 | 34 | 34 | 32 | 30 | 46 | 44 | 42 | 40 | 38 | 36 | 36 | 34 | 32 |
| 80 | 56 | 54 | 52 | 50 | 48 | 46 | 44 | 42 | 40 | 62 | 60 | 58 | 54 | 52 | 50 | 48 | 46 | 44 |
| 120 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 48 | 46 | 72 | 70 | 68 | 64 | 62 | 60 | 58 | 54 | 52 |
| 160 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 52 | 50 | - | - | 76 | 72 | 70 | 68 | 64 | 62 | 58 |
| 200 | 72 | 70 | 68 | 66 | 62 | 60 | 58 | 56 | 54 | - | - | - | - | 76 | 72 | 70 | 66 | 64 |
| 240 | 74 | 72 | 70 | 68 | 64 | 62 | 60 | 58 | 56 | - | - | - | - | - | - | 76 | 72 | 70 |
| 280 | - | 74 | 72 | 68 | 66 | 64 | 62 | 60 | 56 | - | - | - | - | - | - | - | 74 | 70 |
| 320 | - | 76 | 72 | 70 | 68 | 66 | 62 | 60 | 58 | - | - | - | - | - | - | - | 76 | 74 |
| 360 | - | - | 74 | 72 | 68 | 66 | 64 | 62 | 58 | - | - | - | - | - | - | - | - | 74 |
| 400 | - | - | 74 | 72 | 70 | 68 | 64 | 62 | 60 | - | - | - | - | - | - | - | - | 74 |
| 440 | - | - | 76 | 72 | 70 | 68 | 66 | 62 | 60 | - | - | - | - | - | - | - | - | 76 |

**Classification of fire resistance R 180**

| PROFILE TYPE | OPEN PROFILE (I, LI, L,...) | | | | | | | | | CLOSED PROFILE (□, ▭, ○...) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design temperature | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| $A_p/V$ | Thickness of CETRIS® cement-bonded particleboard needed for keeping the steel temperature below the design temperature (mm) | | | | | | | | | | | | | | | | | |
| 44 | 64 | 62 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 56 | 54 |
| 80 | - | - | - | - | 76 | 74 | 72 | 70 | 68 | - | - | - | - | - | - | - | - | 74 |

**Notes to the table:**
The values specified for the minimum cross section coefficient may also be used for profiles with a lower coefficient.
The dimension tables apply to all steel classes except for class S 185 and all steel types identified with E (pursuant to EN 10 025 or EN 10 113 standard).

### 9.5.5 General Principles of Cladding Assembly

- The maximum thickness of a CETRIS® board is 24 mm, higher thickness requirements must be resolved with multilayer cladding of boards with a maximum layer thickness of 24 mm.

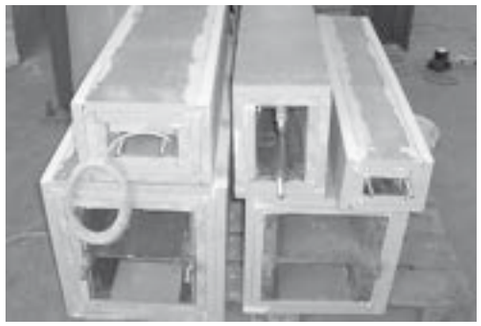
- Maximum spacing of anchoring screws must not exceed 400 mm, when using CETRIS® 14 mm boards or thinner the distance must be reduced to 200 mm. The minimum distance of the screws from the edge is 25 mm. The screws must be at least 10 mm longer than the thickness of the anchored board. In the case of multilayer cladding the screw length must be at least 5 mm longer than the thickness of the two connected layers.

- For interior anchoring and for anchoring of bottom layers of multilayer cladding of CETRIS® boards in the exterior, sunken head screws may be used. Upper layers of CETRIS® boards in exteriors must be anchored with screws with semi-circular or hexagonal heads and water tight compressive washers and the CETRIS® board must be predrilled (min. hole diameter 8 mm). The predrilled holes must be filled with fire resistant filler DEXAFLAMM-R.

- Joints of multilayer cladding must be overlapped by a min. 400 mm and cross joints must be prevented.

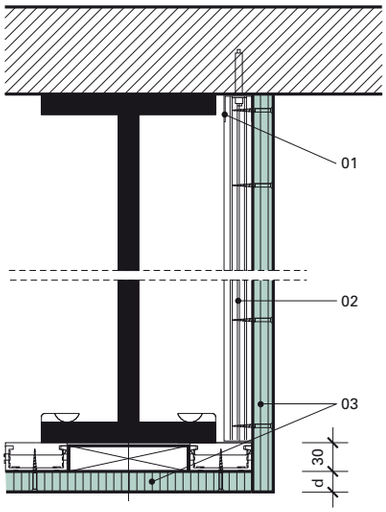
- In the case of single-layer cladding the joints not laying on the steel profile flanges must be laid over a strip of CETRIS® board of the same thickness as the cladding. The minimum width of the strip is 100 mm, and the maximum spacing of the strip anchoring screws is 200 mm.

- All joints between CETRIS® boards of 3 – 10 mm width, wall and corner contacts must be filled with Dexaflamm-R filler.



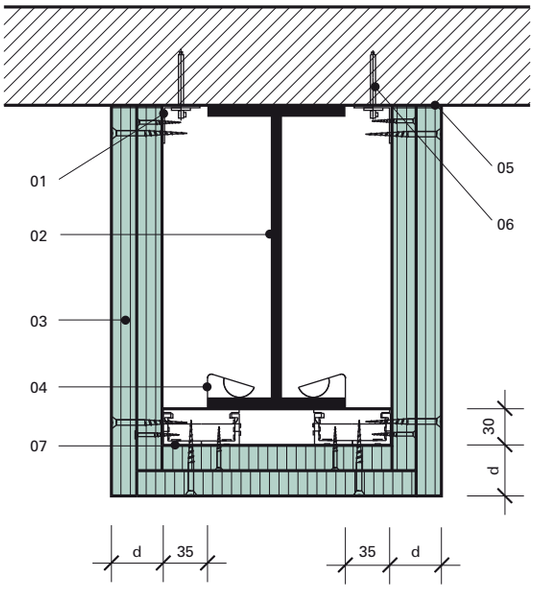
# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

Crosswise cross-section



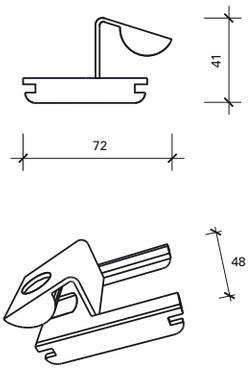

**01 UD profile 28 × 27 × 0.6 mm**
**02 CD profile 60 × 27 × 0.6 mm, spacing 400 to 600 mm, depending on the beam height and under joints**
**03 CETRIS® cement bonded particleboards**

Crosswise cross-section

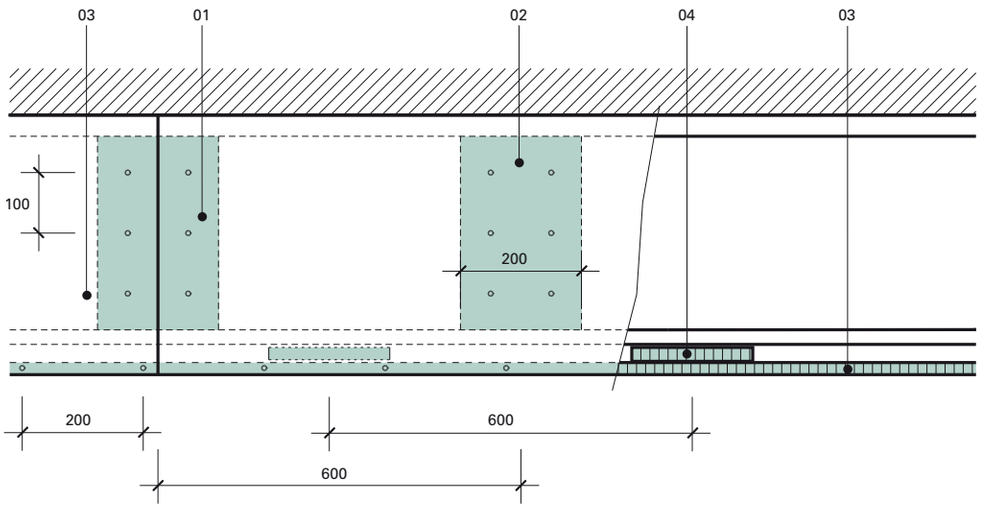



**01 angle piece 50 × 50 × 0.6 mm**
**02 steel beam**
**03 CETRIS® cement bonded particleboards with overlapped joints**
**04 clamps Knauf®**
**05 filled with Dexaflamm R filler**
**06 steel dowel with screw**
**07 CD 60 × 27 × 0.6 mm**

KNAUF clamp

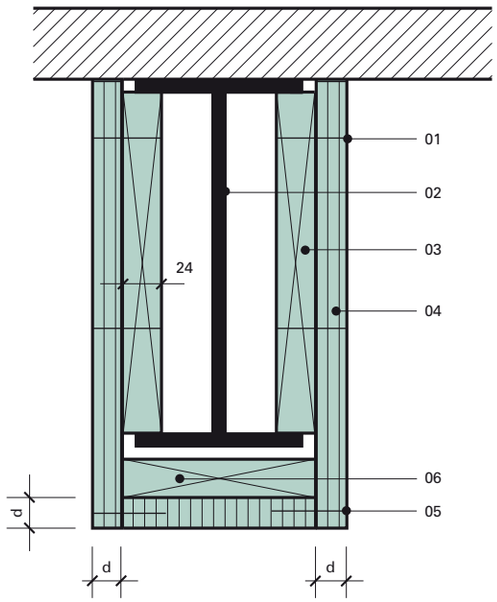



Longitudinal section



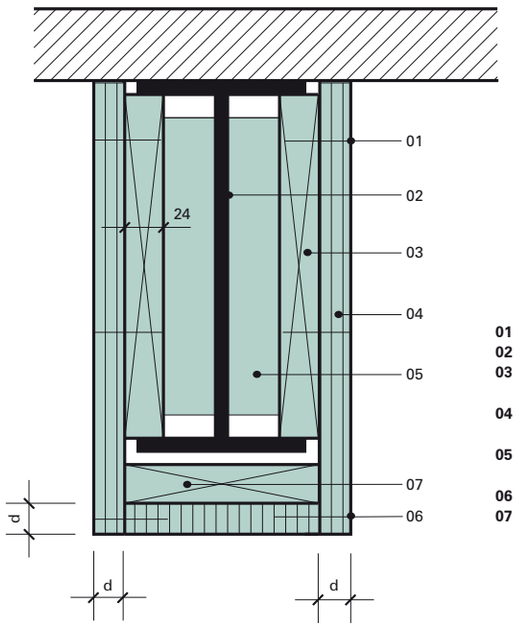

**01 CETRIS® cement bonded particleboard strip under joint**
**02 assembly insert of CETRIS® cement bonded particleboard**
**03 CETRIS® cement bonded particleboard**
**04 CETRIS® cement bonded particleboard strip**

Crosswise cross-section



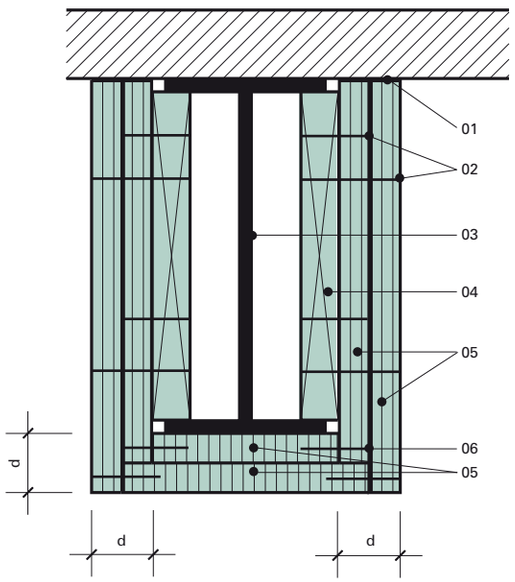

**01** screws
**02** steel beam
**03** assembly insert of CETRIS® cement bonded particleboard
**04** CETRIS® cement bonded particleboard
**05** screws
**06** CETRIS® board in the case of single-layer cladding for joint coverage

Crosswise cross-section




**01** screws
**02** steel beam
**03** assembly insert of CETRIS® cement bonded particleboard
**04** CETRIS® cement bonded particleboard
**05** support of CETRIS® cement bonded particleboard
**06** screws
**07** CETRIS® in the case of single-layer cladding for joint coverage

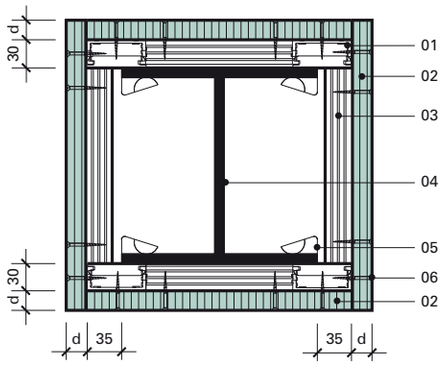
Crosswise cross-section




**01** filled with Dexaflamm R filler
**02** screws
**03** steel beam
**04** assembly insert of CETRIS® cement bonded particleboard
**05** CETRIS® cement bonded particleboard (joint overlap min. 50 mm)
**06** screws

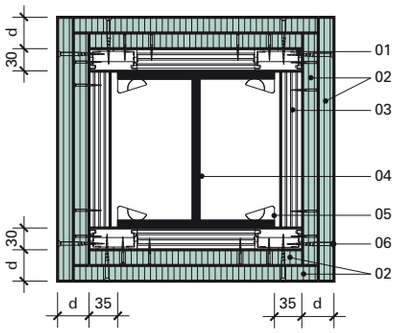
# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

Horizontal cross-section



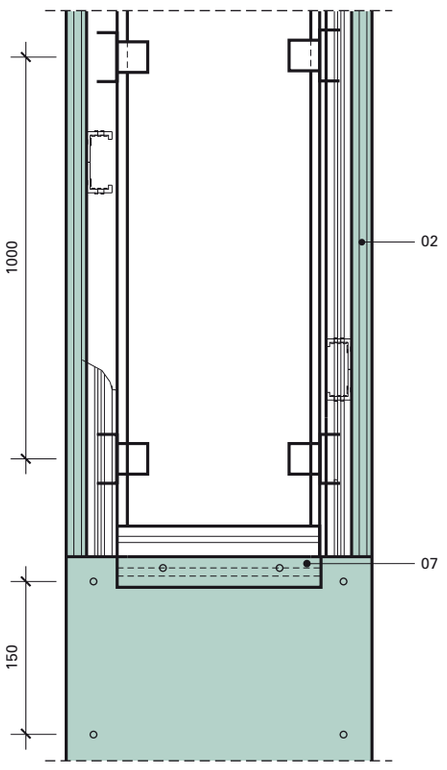

**01** CD profile 60 × 27 × 0.6 mm
**02** CETRIS® cement bonded particleboard
**03** CD profile 60 × 27 × 0.6 mm (under joints)
**04** steel column
**05** Knauf clamps
**06** screws
**07** CD profile 60 × 27 × 0.6 mm (under joints)

Horizontal cross-section

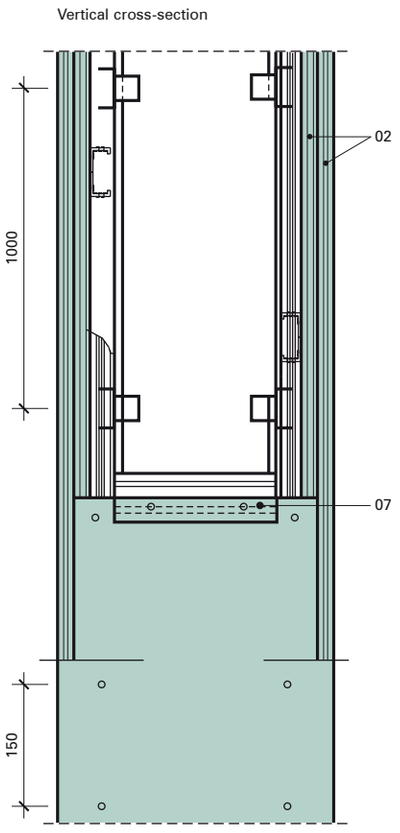



**01** CD profile 60 × 27 × 0.6 mm
**02** CETRIS® cement bonded particleboard (overlapped joints)
**03** CD profile 60 × 27 × 0.6 mm (under joints)
**04** steel column
**05** Knauf clamps
**06** screws
**07** CD profile 60 × 27 × 0.6 mm (under joints)

Vertical cross-section




Vertical cross-section




All dimensions in mm

# 9.6 Wall and Ceiling cladding with Fire Protection Effect

CETRIS® cement bonded particleboard is newly tested for its ability to protect flammable materials against ignition. In the testing and classification standards the application is described as wall and ceiling cladding with fire protection effect – cladding of flammable parts of buildings. This requirement mainly applies to timber constructions in Western Europe.

The cladding in this case means the outermost part of a vertical element (such as a wall, a partition, a peripheral wall) or the bottommost part of a horizontal or inclined element (such as a ceiling, a roof or a ceiling panel). The purpose of this type of cladding is to protect flammable material against ignition. Cladding of K class is cladding protecting flammable material against fire for a specified period of time, including carbonisation and other damage, and also preventing the protected elements from catching fire on both sides at the same time. In addition requirements for reaction to fire may be applied to the cladding products.

## 9.6.1 Test procedure for fire protective cladding

The test procedure for specification of the ability of the cladding materials covering flammable materials to protect these materials against ignition during pre-specified fire exposition is defined in EN 14 135 standard Coverings. Determination of fire protection ability.

The cladding is fixed to the bottom side of a horizontally oriented flammable base and exposed from the bottom to predefined standard thermal and pressure conditions in the kiln.

The clad (flammable) materials with a density of at least 300 kg/m$^3$ are represented in the tests by chipboard 19 mm thick, not treated with any flame retarder (not impregnated) whose density is at least 680 kg/m$^3$.

The tested cladding is applied to a standard horizontal construction – with top wooden prisms 45 × 95 mm (600 mm apart) and chipboard thickness 19 (±2 mm) – in the form of a plain ceiling panel. The cladding itself may be assembled directly on the chipboard (without cavity), or on auxiliary laths (with cavity).

The recorded values include temperature increase on the bottom side of the flammable base. The cladding is monitored and time to damage is recorded. The record of the condition after test includes both damage to the cladding and defects of the flammable base.

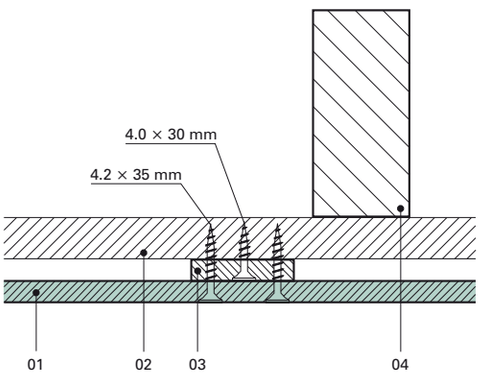
Cladding is expected to provide for fire protection of materials under them and prevent fire in cavities unless the cladding collapses in the course of the test pursuant to EN 14 135 within the given test time (for example 10 minutes, 30 minutes or 60 minutes) and unless the fire gets into any cavity in the cladding and the following requirements are fulfilled for the specified period of time:

- The mean temperature measured on the bottom side of the chipboard and mean temperature measured on the non-exposed side of the cladding must not exceed the baseline value by more than 250° C and the maximum temperature measured in any place on these elements must not exceed the initial temperature by more than 270° C
- No ignition or carbonisation of any part of the bottom side of the chipboard or non-exposed side of the cladding may occur. Thawing and shrinkage are considered damage while discoloration is not.

## 9.6.2 Cladding with CETRIS® Cement Bonded Particleboard with Fire Protection Effects

CETRIS® cement bonded particleboard is tested as cladding of flammable materials in the following composition:

| CLADDING COMPOSITION | CAVITY | AUXILIARY CONSTRUCTION | FIRE RESISTANCE | CLASSIFICATION |
|---|---|---|---|---|
| **CETRIS® 10 mm** (tightly laid boards, no filler) | 10 mm | wooden laths 70 × 10 mm | 10 minutes | **K10** |




**01 CETRIS® cement bonded particleboard**
**02 chipboard 19 mm**
**03 wooden lath 10 × 70 mm**
**04 wooden beam 49 × 95 mm**

## 9.6.3 General Principles of Assembly of Cladding of CETRIS® Cement Bonded Particleboard with Fire Protection Effects

- CETRIS® boards are laid without cross joints
- CETRIS® boards are laid tightly without gaps. A joint must be visible along the perimeter or in the case of an area larger than 6 × 6 m. The minimum width of the joint must be 15 mm and the joint must be supported with a strip of CETRIS® board of the same thickness as the cladding laid underneath (10 mm), with the minimum with of 150 mm
- Maximum spacing of the CETRIS® 10 mm anchoring screws must not exceed 200 mm (by the edges), or 400 mm (in the middle), and the screws must be at least 25 mm away from the board edge.
- Minimum length of screws for CETRIS® board anchoring must be 35 mm
- All points of contact between CETRIS® boards must be laid over wooden laths
- Maximum distances of support wooden laths is 625 mm, and the minimum lath width is 70 mm
- Minimum width of the cavity (lath thickness) is 10 mm.

# 9.7 Light Composed Roofing

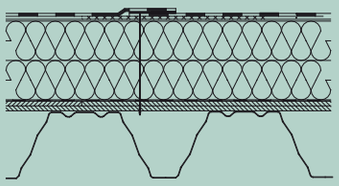
## 9.7.1 Introduction

Light composed roofing is a combination of materials with resulting high-standard parameters of use. The load-bearing construction is made by profiled trapeze sheet metal, fire resistance is provided by two layers of CETRIS® cement bonded particleboards, high thermal resistance is achieved by use of insulation boards of elastified foam polystyrene. The composition also includes vapour barrier and hydro insulating layers with high resistance to weather effects.

The test of fire resistance of this composition has been performed pursuant to EN 1365-2:2001 Fire resistance tests for loadbearing elements. Floors and roofs.
The assembled test sample (a beam with overlapped end) was loaded with increased load for the inside forces and tensions to correspond to the values of a continuous beam with two equal fields. Direct application allows use of this composition for inclined roofs with the slant range from 0° to 25°.

This roof construction meets the fire safety requirements pursuant to the updated ČSN 73 0810: 2009 Standard, Fire Safety of Buildings, Common Provisions.
Use of CETRIS® cement bonded particleboards assures high rigidity of the roofing. At the same time the boards form a firm flat base protecting the subsequently laid heat insulating and hydro insulating layers from damage – especially during assembly.

## 9.7.2 Fire Characteristics

| CONSTRUCTION - SCHEMATIC | CONSTRUCTION DESCRIPTION | FIRE RESISTANCE |
|---|---|---|
|  | • Hydro insulating foil MERX MK 15 thickness 1.5 mm<br>• Separation textile (non-woven glass fibre textile)<br>• Insulating boards EPS 100S - 2 layers, thickness 60 mm<br>• Vapour barrier PE<br>• CETRIS® cement bonded particleboards Basic – 2 layers, thickness 10 mm<br>• Load-bearing trapeze sheet metal TR 150/280/0,75 (or other pursuant to structural assessment) | **REI 30**<br>(pursuant to EN 13 501-2)<br><br>**REI 15 DP1 ***<br>(pursuant to ČSN 73 0810:2009) |

*** Note:** Classification pursuant to ČSN 73 0810 applies to the part of the roofing consisting of the load-bearing and fire partitioning layers.

## 9.7.3 General Principles of Assembly

• **Trapeze sheet metal** must be anchored in supports in every bottom wave with two screws with the minimum diameter of 5.5 mm with washers. The edge supports (steel or concrete beams) must be sufficiently stiff in crosswise bend and twist for transfer of horizontal membrane forces. Lengthwise connection of trapeze sheet metal pieces must be secured with self-cutting screws 4.8 × 20 mm with the maximum spacing of 500 mm.
The limit conditions for use of other types of trapeze sheet metals include:

– Maximum bend momentum above the support 3,554 Nm
– Maximum bend momentum in the field 2,000 Nm
– Maximum transverse strength 3,703 N
– Maximum bend tension above support 99.8 MPa

These values apply to trapeze sheet metal of steel class S 320 GD, skid limit $f_Y$ = 320 MPa.

Technical and professional design services for a suitable trapeze sheet metal is provided by the company Kovové profily s.r.o.

• **CETRIS® cement bonded particleboards** are laid tightly in both layers, without gaps. The second layer joint overlap must be min. 625 mm. CETRIS® boards are anchored after laying with screws IR2-4.8 × 50 mm or SC3/35-PH2-4.8 × 45 mm. Both screws were tested by the supplier for the guaranteed minimum rated value of 400 N per element (safety factor 2.5). The screw spacing in the lengthwise and the crosswise direction is max. 600 mm. CETRIS® BASIC boards are always laid tightly by dilation field (max. 6.70 × 6.70 m). Dilation joints must be implemented between the fields (15 mm) and filled with mineral wool strips.
In the case of no requirement for fire resistance, a single layer of CETRIS® boards of minimum thickness 16 mm will suffice – even in this case the minimum rated value of load-bearing capacity 400 N is guaranteed.

• **Vapour barrier** must be laid pursuant to the instructions of the supplier, with about 150 mm overlap.

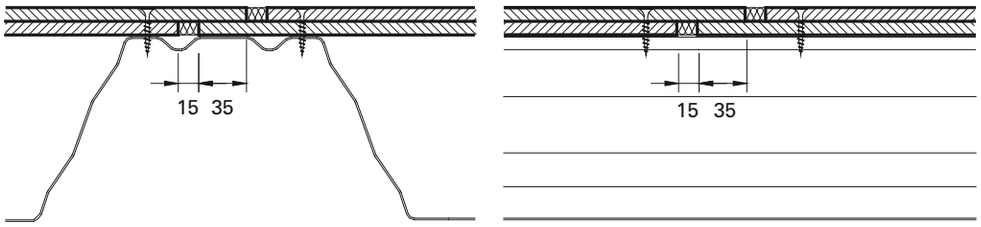
• **Insulation boards of foam polystyrene** must be laid in two layers, with the minimum thickness of each individual layer 60 mm. The joints of the upper layer of insulation boards must show min. 250 mm overlaps.

• **Separation layer** – unwoven glass fibre textile 200 gr/m². Overlap circa 150 mm.

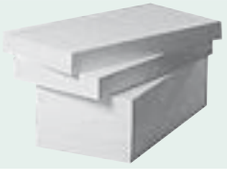
• **Hydro insulating foil Merx MK 15**. The foil overlap is about 150 mm, and in the overlays the foil is anchored mechanically – with IW-T Fastening of waterproof membranes and insulation (supplier SFS intec). Anchor spacing circa 400 mm. The screw supplier guarantees the minimum rated value of 400 N per element (safety factor 2.5). Mutual adhesion of the foils is provided by heating with a hot air gun and mechanical pressing together (with a roller).
Technical and professional design services for a suitable type of vapour barrier, separation foil and hydro insulation is provided by the company Coleman S.I.

Details by the through passes, roof gullies, skylight, attics etc. must be lined with mineral wool, thickness min. 40 mm, on the side across the full height of the heat insulation layer of EPS.

**Implementation of dilation joint between CETRIS® boards**




**Materials for assembly of fire resistant roofing**

| DESCRIPTION | PICTURE | NOTE |
|---|---|---|
| **Trapeze sheet metal TR 150/280/0.75**<br>Profiled load-bearing sheet metal element, minimum thickness 0.75 mm (supplier Kovové profily). |  | On the basis of structural assessment another type may be used (on condition of compliance with the conditions specified in the classification protocol). |
| **CETRIS® Basic Board.**<br>Cement bonded particleboard, cement grey smooth surface.<br>Standard size 1,250 × 3,350 mm.<br>Bulk density 1,320 ±70 kg/m³. |  | Thickness and number of layers pursuant to the fire resistance requirements. One layer of minimum thickness 16 mm will suffice where no fire resistance is required. |
| **IW-T Fastening of waterproof membranes and insulation**<br>Supplier SFS intec |  | Screw load-bearing capacity tested – guaranteed minimum rated value of load-bearing capacity 400 N. |
| **Vapour barrier – PE foil**<br>Supplier Coleman S.I. | | May be substituted with another type if thickness ≤ 2 mm and heating capacity H ≤ 15 MJ/m². |
| **Insulating boards**<br>Foam polystyrene EPS 100S, thickness 60 mm (supplier Rigips). |  | Insulation boards used must show compressive strength of a min. 100 kPa, declared coefficient of thermal conductivity λ = 0.036 W/mK, fire reaction class E, max. bulk density 30 kg/m³. |
| **Separation glass fibre textile – 200 gr/m²**<br>(supplier Coleman S.I.). | | |
| **Hydro insulating foil MERX MK 12, thickness 1.2 mm**<br>(supplier Coleman S.I.). |  | Composition classified with DP1 must include hydro insulation included in the composition with EPS in class BROOF(t3). |
| **Fixation element Isofast IG and telescope R45**<br>For fixation of hydro insulation and heat insulation in CETRIS® boards (supplier SFS intec). |  | |

# Application of CETRIS® Boards in Fire Protection pursuant to EN Standards

Product certificate:
**Fire ceiling panel constructions clad with CETRIS® boards**

PAVUS, a. s.
AUTORIZOVANÁ OSOBA 216

CERTIFIKÁT VÝROBKU
č. 0142/216/§5/2004

vydaný
pro výrobce:

CIDEM Hranice a.s.
Školní 1088, 753 40 Hranice
IČ 14617081

stát původu výrobku:
Česká republika

POŽÁRNÍ STĚNOVÉ KONSTRUKCE OPLÁŠTĚNÉ DESKAMI CETRIS

Ing. Jaroslav Dušek
ředitel PAVUS, a.s. - AO 216

Product certificate:
**Fire wall constructions clad with CETRIS® boards**

PAVUS, a. s.
AUTORIZOVANÁ OSOBA 216

CERTIFIKÁT VÝROBKU
č. 0143/216/§5/2004

vydaný
pro výrobce:

CIDEM Hranice a.s.
Školní 1088, 753 40 Hranice
IČ 14617081

stát původu výrobku:
Česká republika

POŽÁRNÍ PODHLEDOVÉ KONSTRUKCE OPLÁŠTĚNÉ DESKAMI CETRIS

Ing. Jaroslav Dušek
ředitel PAVUS, a.s. - AO 216

Product certificate:
**Fire cladding of steel constructions with CETRIS® boards**

PAVUS, a.s.

CERTIFIKÁT VÝROBKU
č. 216/C6a/2006/0157
vydaný pro

výrobce:
CIDEM Hranice, a.s., Školní 1088, 753 40 Hranice
místo výroby:
CIDEM Hranice, a.s., Školní 1088, 753 40 Hranice
stát původu výrobku:
Česká republika

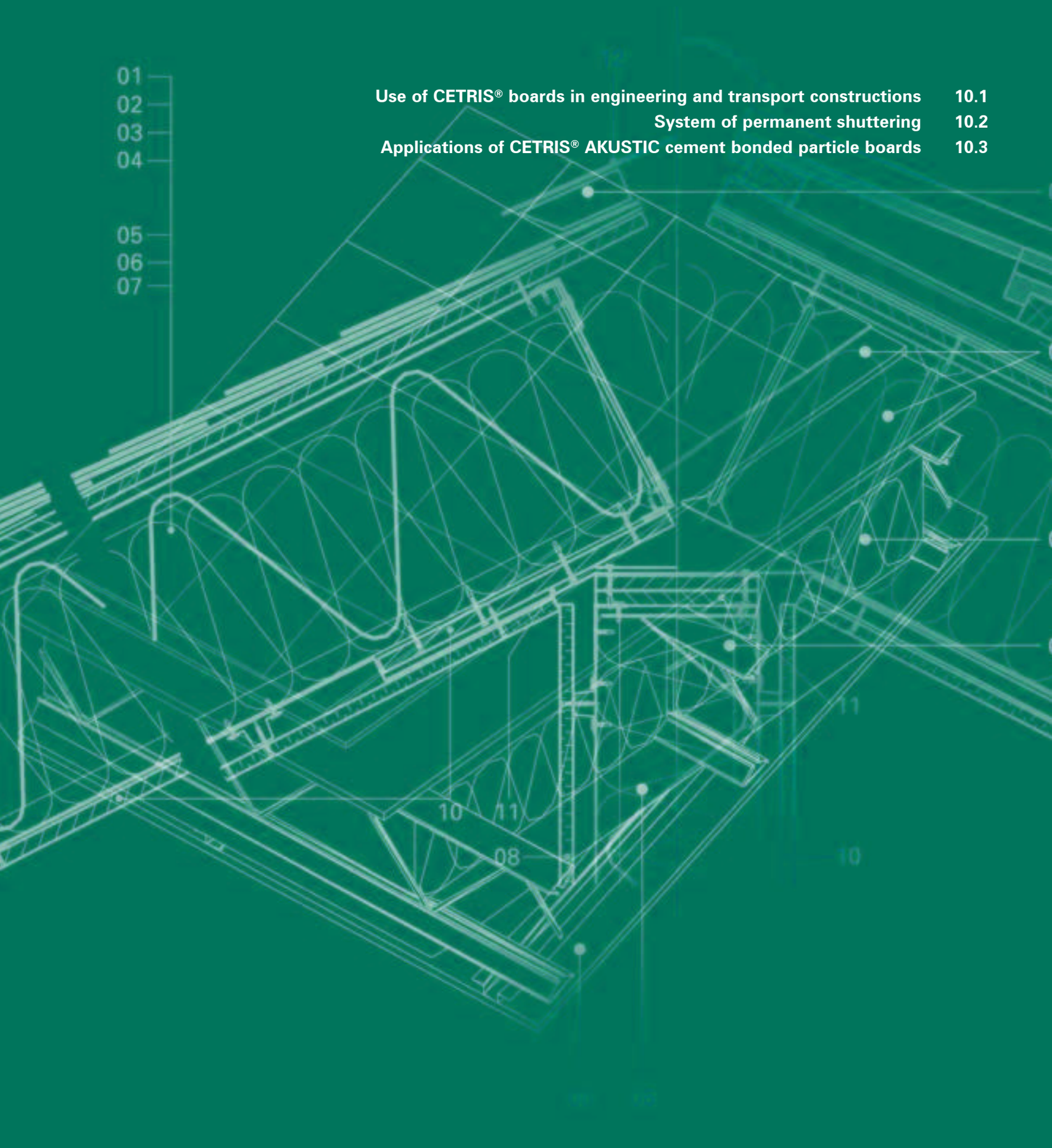
Protipožární obklad ocelových konstrukcí cementotřískovými deskami CETRIS®

Ing. Jaroslav Dušek
ředitel PAVUS, a.s. - AO 216

# Other applications of CETRIS® boards

10





# 10.1 Use of CETRIS® boards in engineering and transport constructions

**Use of CETRIS® boards**

In the construction or reconstruction of transport structures system of permanent shuttering in the joints on bridge supporting structures (between beams or between the beam prefa ledge) is mainly applied. CETRIS® board creates a flat bottom (or side) shuttering surface of the planned element (column, beam, bridge construction, etc.). During concreting, the concrete mixture and shuttering CETRIS® boards are connected, after concreting, CETRIS® board remains the part of the whole structure.

This application does not require any treatment of the inner side and edges of CETRIS® boards before concreting. The outer (visible) side of CETRIS® board can be provided with surface treatment after concreting, which besides of aesthetic effect increases the resistance of the board against weathering, frost and especially extends its lifetime. The thickness of CETRIS® board does not lessen covering of reinforcement, nor is counted into the anchorage depth of additionally inserted (drilled) anchors. If CETRIS® boards are designed for areas with high stress (alternating exposure to water, frost and defrosting chemicals), is the suitability of cement bonded particle boards CETRIS® verified by test of appropriate technical-qualitative conditions for the road constructions. This test is based on ČSN 73 1326 (Determination of surface resistance of cement concrete against water and chemical defrosting chemicals). The cement bonded particle board CETRIS® complied with 115 frost cycles.

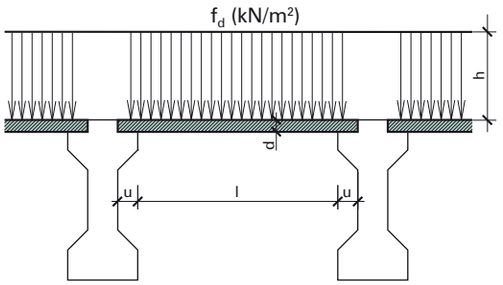
**Determination of thickness "d" of CETRIS® boards**

According to the magnitude of the load transfered by the board, the correct thickness of CETRIS® board is determined. The decisive load is called Mounting load during the concreting of the constructruction. CETRIS® board transferres pressure (weight) of concrete mix, and the weight of the workers by its surface to bearing supports. After solidification and hardening the concrete with reinforcement bears the entire load, CETRIS® board fulfills merely the function of the external cladding.

To determine the thickness of boards there is dimensioning table processed, based on the following assumptions:

**1** Vertical even load represents the actual weight of the concreted ceiling panel. There is also the weight of the board itself included. In case of application of CETRIS® boards where movement of people on the surface (called Walkable boards) is assumed, the boards must be able to transfer also concentrated load of normative value 1.50 kN working on the area of 100 × 100 mm directly on the surface boards in the middle of its range. Instances where boards do not meet these requirements, are marked with the red boxes in the table. The table states the worst static condition – simple beam. If the board operates as continuous beam, her load carrying capacity is higher.

**2.** Calculation was made on the assumption of elastic material behavior, and respecting the following mechanical and physical properties of CETRIS® boards, which were determined by the following tests: Under load shown in given tables maximum normal stress in marginal fibers of the boards from standard load does not exceed 3.60 N / mm² for boards thickness up to 32 mm, and 3.00 N / mm² for boards thickness 34 – 40 mm ( it is achieved 2.5 times the safety for the boards of thickness up to 32 mm, respectively 3 times the thickness the safety for the boards of thickness 34 up to 40 mm).

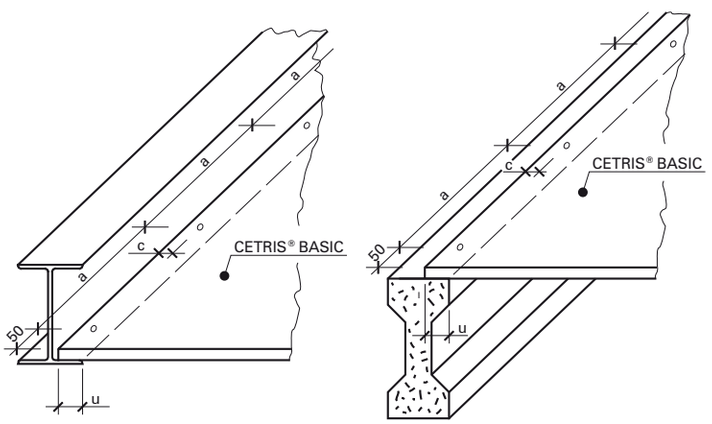



**Case 1** – Horizontal impact (CETRIS® board creates the lower formwork of bridges, beams, etc.)

| | |
|---|---|
| Flexural bending modulus | 4,500 Nmm$^{-2}$ |
| Tensile bending strength | 9 Nmm$^{-2}$ |
| Shear modulus perpendicular to the plane of the board | 2,500 Nmm$^{-2}$ |
| Shear Strength | 2 Nmm$^{-2}$ |
| Density | 1,400 kg/m$^3$ |
| Transverse shortening coefficient | n = 0,15 |

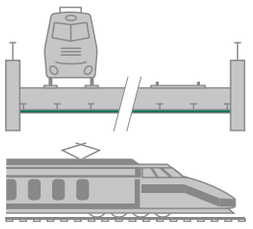
**3** The maximum elastic deflection of CETRIS® boards, from operational load, including their own weight, must not exceed 1/300 of the span. Additional shaping of the boards within long-term load was not considered, because the boards will be used only as formwork in this particular case.

**4** The positioning length of CETRIS® boards "u" on supports must reach min. 40 mm. This value is determined also with regard to any anchoring of the board in support – the recommended distance of screws from the edge of board is 25 mm – see pictures and table:

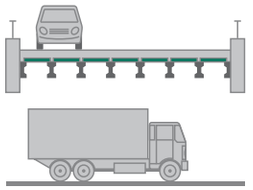



| BOARD THICKNESS „d" (mm) | a (mm) | c (mm) | u (mm) |
|---|---|---|---|
| 18, 20 | 300 | 25 | min. 40 |
| 22, 24, 26, 28, 30 | 400 | | |
| 32, 34, 36, 38, 40 | 600 | | |

**Railway bridge**



**Road bridge**



**The result of the calculation is a table determining maximum standardized vertical load of the boards in kN/m²**

| SPAN | Maximum vertical load $f_d$ (kN/m²) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| l (m) | d=18 mm | d=20 mm | d=22 mm | d=24 mm | d=26 mm | d=28 mm | d=30 mm | d=32 mm | d=34 mm | d=36 mm | d=38 mm | d=40 mm |
| 0.200 | 38.63 | 47.72 | 57.77 | 68.78 | 80.76 | 93.69 | 107.58 | 101.95 | 115.12 | 129.10 | 143.87 | 159.44 |
| 0.250 | 24.63 | 30.44 | 36.86 | 43.90 | 51.55 | 59.82 | 68.70 | 65.09 | 73.51 | 82.44 | 91.88 | 101.84 |
| 0.300 | 17.03 | 21.05 | 25.51 | 30.38 | 35.69 | 41.42 | 47.58 | 45.06 | 50.90 | 57.10 | 63.65 | 70.55 |
| 0.350 | 12.44 | 15.39 | 18.66 | 22.23 | 26.12 | 30.33 | 34.85 | 32.99 | 37.27 | 41.81 | 46.62 | 51.68 |
| 0.400 | **8.50** | **11.72** | 14.21 | 16.94 | 19.92 | 23.13 | 26.58 | 25.15 | 28.42 | 31.90 | 35.57 | 39.44 |
| 0.450 | **5.89** | **8.15** | 10.91 | 13.32 | 15.66 | 18.19 | 20.91 | 19.78 | 22.36 | 25.10 | 27.99 | 31.04 |
| 0.500 | **4.23** | **5.86** | **7.87** | 10.28 | 12.62 | 14.66 | 16.86 | 15.94 | 18.02 | 20.23 | 22.57 | 25.04 |
| 0.550 | **3.11** | **4.34** | **5.84** | **7.64** | 9.78 | 12.05 | 13.86 | 13.09 | 14.81 | 16.63 | 18.56 | 20.60 |
| 0.600 | **2.34** | **3.28** | **4.42** | **5.81** | 7.45 | 9.36 | 11.58 | 10.93 | 12.37 | 13.90 | 15.51 | 17.22 |
| 0.650 | **1.79** | **2.52** | **3.41** | **4.50** | 5.78 | 7.28 | 9.02 | 9.25 | 10.47 | 11.77 | 13.14 | 14.59 |
| 0.700 | **1.38** | **1.96** | **2.67** | **3.53** | 4.56 | 5.75 | 7.14 | 7.91 | 8.96 | 10.08 | 11.26 | 12.50 |
| 0.750 | **1.08** | **1.54** | **2.12** | **2.81** | **3.64** | 4.60 | 5.72 | 6.83 | 7.74 | 8.71 | 9.74 | 10.82 |
| 0.800 | **0.84** | **1.22** | **1.69** | **2.26** | **2.93** | 3.72 | 4.64 | 5.70 | 6.75 | 7.60 | 8.49 | 9.44 |
| 0.850 | **0.66** | **0.97** | **1.36** | **1.82** | **2.38** | **3.04** | 3.80 | 4.67 | 5.67 | 6.67 | 7.46 | 8.30 |
| 0.900 | **0.52** | **0.77** | **1.09** | **1.48** | **1.95** | **2.50** | 3.14 | 3.87 | 4.70 | 5.64 | 6.60 | 7.34 |
| 0.950 | **0.40** | **0.62** | **0.88** | **1.21** | **1.60** | **2.07** | **2.60** | 3.22 | 3.92 | 4.72 | 5.61 | 6.53 |
| 1.000 | **0.31** | **0.49** | **0.71** | **0.99** | **1.32** | **1.72** | **2.17** | 2.70 | 3.30 | 3.97 | 4.74 | 5.58 |
| 1.050 | **0.23** | **0.38** | **0.58** | **0.81** | **1.09** | **1.43** | **1.82** | **2.27** | 2.78 | 3.37 | 4.02 | 4.75 |
| 1.100 | **0.17** | **0.30** | **0.46** | **0.66** | **0.90** | **1.19** | **1.53** | **1.92** | 2.36 | 2.86 | 3.43 | 4.06 |
| 1.150 | **0.12** | **0.22** | **0.36** | **0.54** | **0.75** | **0.99** | **1.28** | **1.62** | **2.00** | 2.44 | 2.93 | 3.48 |
| 1.200 | **0.07** | **0.16** | **0.28** | **0.43** | **0.61** | **0.83** | **1.08** | **1.37** | **1.71** | 2.09 | 2.52 | 3.00 |

These values were also converted to the maximum permissible thickness of the concrete layer on the horizontal formwork, and to maximum allowable vertical height of the formwork. Density of concrete was assumed 2,500 kg/m³.

| SPAN | Maximum height of the concrete layer h (mm) **h** (m) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| l (m) | d=18 mm | d=20 mm | d=22 mm | d=24 mm | d=26 mm | d=28 mm | d=30 mm | d=32 mm | d=34 mm | d=36 mm | d=38 mm | d=40 mm |
| 0.200 | 1.55 | 1.91 | 2.31 | 2.75 | 3.23 | 3.75 | 4.30 | 4.08 | 4.60 | 5.16 | 5.75 | 6.38 |
| 0.250 | 0.99 | 1.22 | 1.47 | 1.76 | 2.06 | 2.39 | 2.75 | 2.60 | 2.94 | 3.30 | 3.68 | 4.07 |
| 0.300 | 0.68 | 0.84 | 1.02 | 1.22 | 1.43 | 1.66 | 1.90 | 1.80 | 2.04 | 2.28 | 2.55 | 2.82 |
| 0.350 | 0.50 | 0.62 | 0.75 | 0.89 | 1.04 | 1.21 | 1.39 | 1.32 | 1.49 | 1.67 | 1.86 | 2.07 |
| 0.400 | **0.34** | 0.47 | 0.57 | 0.68 | 0.80 | 0.93 | 1.06 | 1.01 | 1.14 | 1.28 | 1.42 | 1.58 |
| 0.450 | **0.24** | **0.33** | 0.44 | 0.53 | 0.63 | 0.73 | 0.84 | 0.79 | 0.89 | 1.00 | 1.12 | 1.24 |
| 0.500 | **0.17** | **0.23** | **0.31** | 0.41 | 0.50 | 0.59 | 0.67 | 0.64 | 0.72 | 0.81 | 0.90 | 1.00 |
| 0.550 | **0.12** | **0.17** | **0.23** | 0.31 | 0.39 | 0.48 | 0.55 | 0.52 | 0.59 | 0.67 | 0.74 | 0.82 |
| 0.600 | **0.09** | **0.13** | **0.18** | 0.23 | 0.30 | 0.37 | 0.46 | 0.44 | 0.49 | 0.56 | 0.62 | 0.69 |
| 0.650 | **0.07** | **0.10** | **0.14** | 0.18 | 0.23 | 0.29 | 0.36 | 0.37 | 0.42 | 0.47 | 0.53 | 0.58 |
| 0.700 | **0.06** | **0.08** | **0.11** | **0.14** | 0.18 | 0.23 | 0.29 | 0.32 | 0.36 | 0.40 | 0.45 | 0.50 |
| 0.750 | **0.05** | **0.06** | **0.08** | **0.11** | **0.15** | 0.18 | 0.23 | 0.27 | 0.31 | 0.35 | 0.39 | 0.43 |
| 0.800 | | **0.05** | **0.07** | **0.09** | **0.12** | 0.15 | 0.19 | 0.23 | 0.27 | 0.30 | 0.34 | 0.38 |
| 0.850 | | | **0.05** | **0.07** | **0.10** | **0.12** | 0.15 | 0.19 | 0.23 | 0.27 | 0.30 | 0.33 |
| 0.900 | | | | **0.06** | **0.08** | **0.10** | 0.13 | 0.15 | 0.19 | 0.23 | 0.26 | 0.29 |
| 0.950 | | | | **0.05** | **0.06** | **0.08** | **0.10** | 0.13 | 0.16 | 0.19 | 0.22 | 0.26 |
| 1.000 | | | | | **0.05** | **0.07** | **0.09** | 0.11 | 0.13 | 0.16 | 0.19 | 0.22 |
| 1.050 | | | | | | **0.06** | **0.07** | **0.09** | 0.11 | 0.13 | 0.16 | 0.19 |
| 1.100 | | | | | | **0.05** | **0.06** | **0.08** | 0.09 | 0.11 | 0.14 | 0.16 |
| 1.150 | | | | | | | **0.05** | **0.06** | **0.08** | 0.10 | 0.12 | 0.14 |
| 1.200 | | | | | | | | **0.05** | **0.07** | 0.08 | 0.10 | 0.12 |

**Note:** The values in bold – the board before the casting is not freely walkable.

## 10.2 System of permanent shuttering

In permanent shuttering system cement bonded particle boards CETRIS® form prefabricated formwork elements. There are alomost limitless possibilities of applications of the permanent shuttering. This system is ideal for all building structures such as walls, ceilings, beams, columns, stairs, but also skew walls, slanted ceilings and also non-bearing separating walls and partitions.
Individual elements of the system (wall, ceiling panels) are prepared in advance at the factory – they are cut to size, assembled with each other through a system of profiles and metal elements. On site the element is just stabilized and quenched with concrete. Compared to traditional methods of using large concrete formwork technology this method eliminates the high cost of making the formwork and subsequent removal of the formwork.

**The main parts of permanent shuttering:**

- cement bonded particle board CETRIS® BASIC
- structural bearing part - the concrete mixture. The concrete mixture consists of portland cement, silica gravel of different grain size, water and viscous additives. These additives adjust the mixture so that there is no need to add more water (always just so much that the concrete mixture is properly mixed).
- Patented clutch



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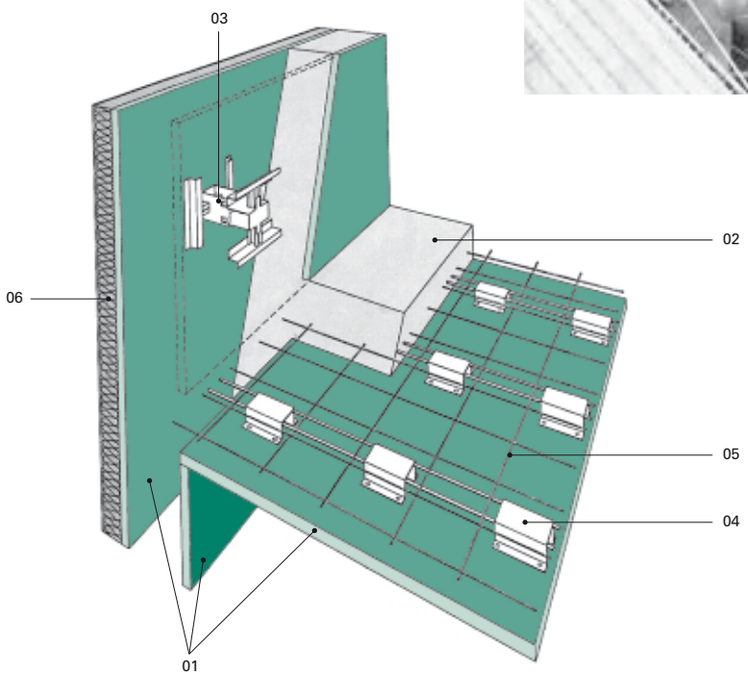
**Wall and ceiling construction of permanent shuttering from VST**




**01** cement bonded particle boards CETRIS® BASIC (thickness. 24 mm)
**02** concrete
**03** steel spacer wall element
**04** HT steel profile
**05** ceiling concrete reinforcement
**06** wall thermal insulation

## 10.2.1 Advantages of permanent shuttering

**Load capacity**
Load capacity of a 25 cm thick wall constructed by permanent shuttering system using B25 concrete is almost ten times higher than of a wall made of hollow bricks class 6 and mortar class I (with comparative room height of about 2.6 m).

**Flammability grade**
CETRIS® cement bonded particle board creating cladding element of permanent shuttering is classified in reaction to fire class A2-s1, d0.

**Adhesive strength (cohesion)**
Wall elements of permanent shuttering system are complemented with thermal insulation from the outside. When testing the cohesion of the individual layers of the system the following values and failures were found:

**Fire protection**
In case of fire CETRIS® cement bonded particle board protects the concrete core. In the comparative test (fire test with an exposure time of 30 minutes) there was a slight peeling off part of cement bonded particle board CETRIS® layer in depth of about 7 mm.

**Heat accumulation**
Accumulation efficiency of 25 cm thick wall formed by permanent shuttering system is about 82% higher than of the 25 cm thick wall of hollow bricks. Both compared walls were provided with the outside 70 mm layer of mineral wool.

**Moisture equalization**
The inner layer of permanent shuttering system, i.e.. CETRIS® cement bonded particle board, is mold and fungi resistant, and has positive effect on healthy climate in a room.
Structurally important concrete core forms vapor barrier. Cement bonded particle board CETRIS® has a warm surface when touched.

**Protection against noise conducted by air**
The degree of sound reduction R'wr of a wall 25 cm wide created by permanent shuttering system is about 20% higher than of a 25 cm wide plastered wall of hollow bricks.

**Extremely short construction time**
Walls made by permanent shuttering system are constructed in extremely short construction time.

| | |
|---|---|
| The connection between the sound insulating plate and adhesive | 0.15 – 0.19 $Nmm^{-2}$ |
| The connection between the CETRIS® cement bonded and adhesive | 0.60 – 0.80 $Nmm^{-2}$ |
| The connection between the CETRIS® cement and concrete core | 0.72 $Nmm^{-2}$ |

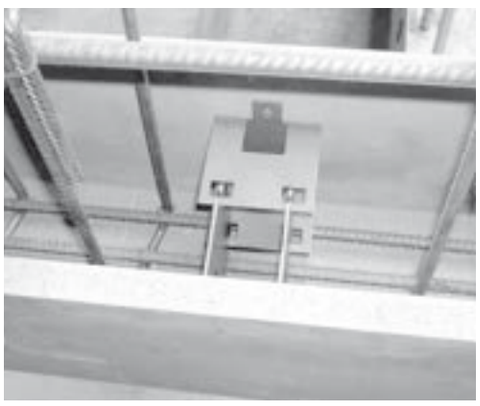
Failure (tear away) has always occured in CETRIS® cement bonded particle boards board.

## 10.2.2 Wall elements

The permanent shuttering system is a method of construction through components, which consist of cement bonded particle boards CETRIS® interconnected with **metal spacer elements**.

Designed wall elements are produced to measure and are simply assembled on the site, and mainly in a short time using the patented **tooth technology**.

Furthermore electrical wiring is installed (thus avoiding of additional demolition and plastering work). **In this way the walls create a designed ground plan and after pouring concrete get the final stability.**



The finished building

### 10.2.3 Ceiling elements

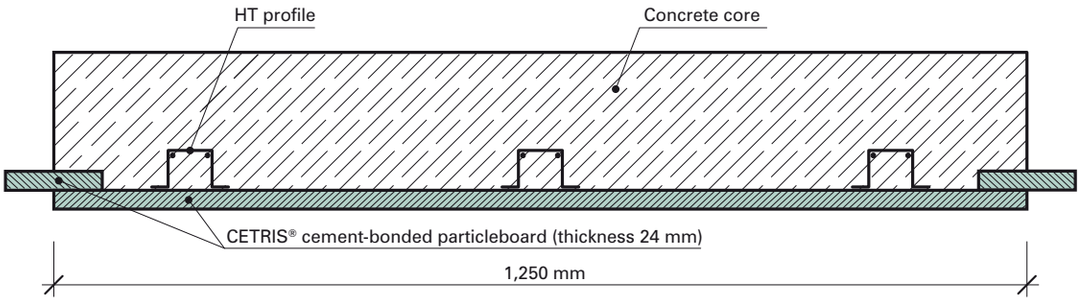
With the Permanent shuttering system also horizontal components – ceiling elements can be created. Cement bonded particle board CETRIS® in this case is used unilaterally – at the lower face. The element is complemented by a HT profile and overlapping profile (edge profile).

The ceiling element has a standard width of 1,250 mm, the length up to 6,000 mm. At the actual execution supports at a distance of 1.25 meters under ceiling panel are sufficient. For laying of the reinforcement no spacers washers are needed, the reinforcement is placed directly onto the HT profile beams. The thickness of the overconcreting depends on the span of the ceiling element, and the size of imposed load is in range of 100 – 300 mm.

**Advantages of the Permanent shuttering system**

- It enables delivery of up to 520 m2 of ceiling elements on one truck.
- I is possible to manipulate with the greatest ceiling element (weight about 285 kg) by conventional lifters.
- Easy installation, laying and reinforcement – Supports are sufficient at a distance 1.25 m, the reinforcement is placed directly on HT profiles, the average consumption of about 3 kgm$^2$ steel reinforcements.

**Ceiling element**



# 10.3 Application of CETRIS® AKUSTIC cement bonded particle board

The CETRIS® AKUSTIC cement bonded particle board is made by working (drilling the regular holes) the basic type of CETRIS® BASIC board. Aside from the existing high mechanical parameters, this treatment also improves the product's acoustic properties. While the solid – base board of CETRIS® stands out predominantly with its high value of sound transmission loss, the drilled board is used as a sound absorbing cladding.

As compared to other acoustic cladding materials when the CETRIS® AKUSTIC cement bonded particle board is used, an extra high mechanical breakthrough resistance (for example, impact of a ball) and moisture resistance are secured – all of this with a high reaction-to-fire class (A2 -s1,d0) maintained. These parameters predestinate this new type of CETRIS® board mainly for the sports facilities, the areas with fluctuating temperatures and moistures and the structures with specific requirements.

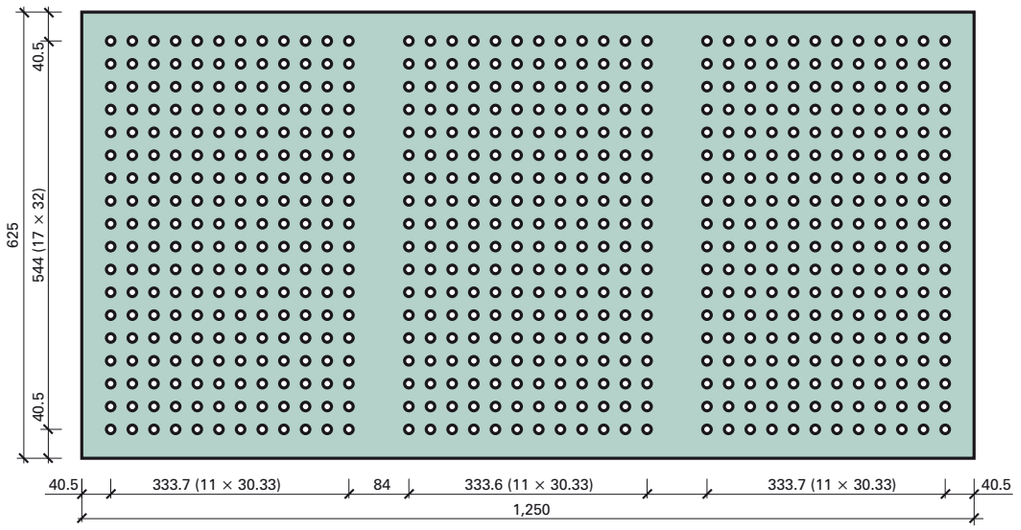
By building the CETRIS® AKUSTIC cement bound particle-board into the wall cladding system or the soffit (below the floor or roof structure) together with the bearing structure, the acoustically effective textile and inserted rock wool produce not only aesthetically interesting but also functional cladding that improves the architectural acoustics. Acoustics is also one of the important criteria in designing and implementing the civil engineering projects. It is the requirements for the impact transmission loss and the airborne sound transmission loss that are mainly put to the engineering structures – predominantly in cases when the structures (walls, ceilings...) separate the premises with different source of sound.

In the situation when both noise source and users are present in the same room it is necessary to deal with the architectural acoustics. The lining of CETRIS® AKUSTIC board participates favourably in the improvement of architectural acoustics and sound absorption in inner premises.

Grammar school Wil, Switzerland

**Limit size deviations of CETRIS® AKUSTIC board**

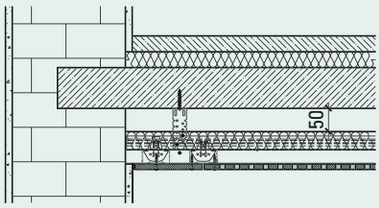
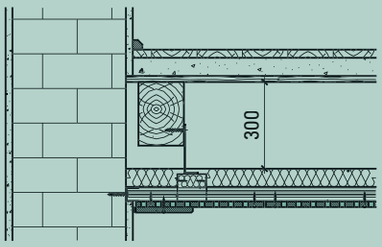
| THICKNESS OF BOARD (mm) | TOLERANCES (mm) | | | |
|---|---|---|---|---|
| | thickness | width | length | spacing of holes |
| 8, 10 | ±0,7 | ±3,0 | ±3,0 | ±2,0 |
| 12, 14 | ±1,0 | | | |
| 16, 18 | ±1,2 | | | |



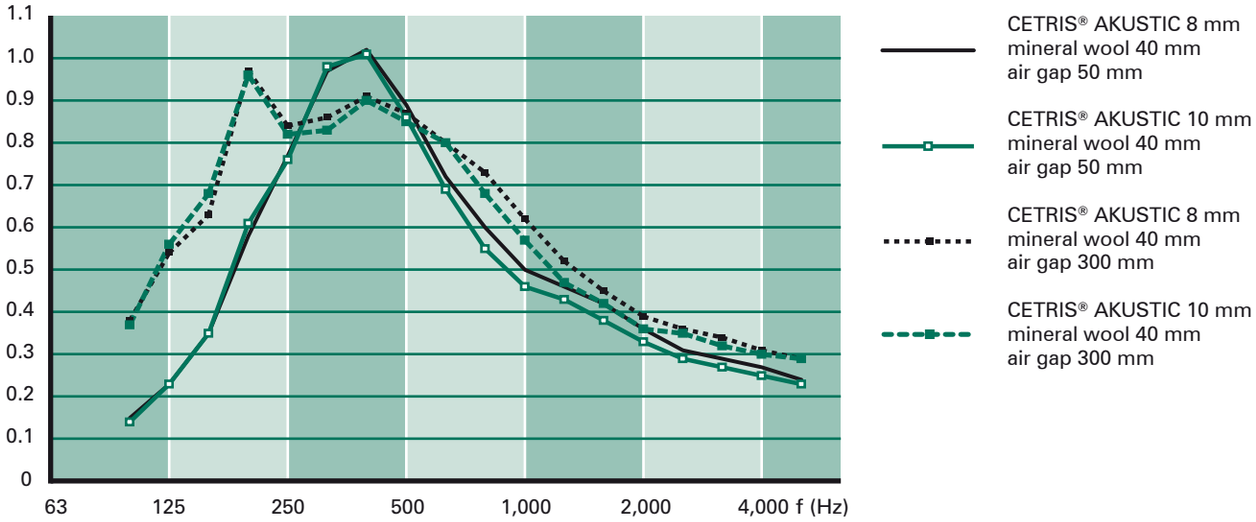
| Summary of physical and mechanical properties of the CETRIS® AKUSTIC cement bonded particleboard | |
|---|---|
| Density | 1,150 – 1,450 kg/m³ |
| Mass balanced moisture at 20° C and relative humidity of 50 % as per EN 634-1 | 9 ±3 % |
| Moisture expansion coefficient under the air humidity change from 35 % to 60 % as per EN 13 009 | $39.6 \times 10^{-3}$ |
| Thermal expansion coefficient as per EN 13 471 (temperature change from 20° C to 60° C) | $10.8 \times 10^{-6}$ $K^{-1}$ |
| Ball impact resistance class as per EN 13 964: – th. 8 mm | 3A class (velocity of 4 m/s) |
| – th. 10 mm | 2A class (velocity of 8 m/s) |
| Reaction-to-fire class as per EN 13 501-1 | A2 -s1,d0 |

## Sound Absorption Factor α as per EN ISO 354

The sound absorption rate indicates the ratio of the unreflected sound energy and the reflected sound energy. α = 0 by complete reflection while α = 1 by complete absorption. The course of sound absorption factor in dependence on frequency in the various composition options with the CETRIS® AKUSTIC board is determined as follows (see Table):

| DIAGRAM | STRUCTURE DESCRIPTION | VALUES OF ABSORPTION COEFFICIENT α (in dependence on the sound frequency) | | | | | | MEAN VALUE OF α |
|---|---|---|---|---|---|---|---|---|
| | | 125 Hz | 250 Hz | 500 Hz | 1,000 Hz | 2,000 Hz | 4,000 Hz | |
|  | The CETRIS® AKUSTIC board, th. 8 mm<br>Vlies fabric, mineral wool th. 40 mm<br>Air gap, th. 50 mm | 0.23 | 0.77 | 0.89 | 0.50 | 0.36 | 0.27 | **0.63** |
| | The CETRIS® AKUSTIC board, th. 10 mm<br>Vlies fabric, mineral wool th. 40 mm<br>Air gap, th. 50 mm | 0.23 | 0.76 | 0.86 | 0.46 | 0.33 | 0.25 | **0.61** |
|  | The CETRIS® AKUSTIC board, th. 8 mm<br>Vlies fabric, mineral wool th. 40 mm<br>Air gap, th. 300 mm | 0.56 | 0.82 | 0.85 | 0.57 | 0.36 | 0.30 | **0.69** |
| | The CETRIS® AKUSTIC board, th. 10 mm<br>Vlies fabric, mineral wool th. 40 mm<br>Air gap, th. 300 mm | 0.54 | 0.84 | 0.87 | 0.62 | 0.39 | 0.31 | **0.67** |

**Graphical representation of the course of the sound absorption factor**




## Surface Finish

We recommend that the gaps between the CETRIS® AKUSTIC boards remain open (free) and underlaid with separation fabric (flees). When applying paint to the perforated boards the principles apply that are listed in the CETRIS® Basic data for Designing and for Realization, Chapter no. 6 Surface treatment.

Because of pre-drilling, the built-in boards must not be painted by spraying for the acoustic textile not to be damaged.

## Assembly

The system of soffits of CETRIS® AKUSTIC is fixed to a metal grate of CD profiles that are crossed either in one plane (using the cross connectors) or at two levels (connectors). As alternative, the substructure of wooden laths and scantlings can be used. Then, the CETRIS® AKUSTIC boards are mounted in one layer to the auxiliary structure using the screws.

**The following rules must be observed during assembly:**

- We recommend to secure the KNAUF cross connectors for CD 60 × 27 profiles with M 6 × 40 screw with nut and washer as minimum. The connection of the carrying grid of 80 × 40 mm scantlings (mounting profiles and carrying profiles) must be secured with two 4.2 × 70 mm screws as minimum. To connect the wooden carrying profile to the straight suspension, a minimum of two 4.5 × 35 mm screws must be used.
- The CETRIS® AKUSTIC boards can be laid with overlap ("to bind") or with so called cross joint. The spacing of holes in inner pane is identical to the outer pane.
- Sheathing with perforated boards always begins from the room centre. That is the reason why it is convenient to mark the positions of boards on the bearing structure. With irregular or non-rectangular ceiling plan view a jointless (undrilled) strip of the CETRIS® BASIC board is recommended along the perimeter approx 150 mm wide.
- The CETRIS® AKUSTIC boards must always be assembled with their longer edge perpendicular to the carrying profiles (laths). The shorter edges are placed on the mounting profiles (laths).
- During assembly, a contraction joint must be considered between each board in a uniform width of min. 3 mm (it applies for a standard format of 1,250 × 625 mm). The joint must be considered along the room's perimeter as well.
- The CETRIS® AKUSTIC boards must not bind directly from the wall or soffit sheathing to the surrounding structures. They must not be anchored to the perimeter profile. The contraction joint in a structure must also be considered in the sheathing of CETRIS® AKUSTIC boards.
- Before anchoring the boards, the hole row linkage must be verified - not only in a crosswise and longitudinal directions but in a diagonal direction as well. Using self-drilling screws the acoustic boards shall be fastened to the sub-structure of either wooden laths or CD profiles. The CETRIS® AKUSTIC boards shall be pressed against the sub-structure. Tighten firstly the screws in a corner where they are in contact with the already fastened boards on the face or lateral side. Then proceed with driving in the screws to the open area so that possible tension is removed.
- Max. pitches of the screws that anchor the CETRIS® AKUSTIC boards to the CD profiles or wooden laths in soffits must not be larger than 200 mm from each other and a minimum of 25 mm from the board edge.
- When being screwed the board must always be firmly pressed to the carrying CD profiles, and it is recommended to pre-drill the board – the diameter of drilling bit corresponds to 1.2 times the screw diameter (this applies for internal premises). When anchoring outdoors or in the premises with substantial changes in a moisture content (for example, saunas, swimming pools) the boards must be pre-drilled with a 8 mm diameter bit (for a screw diameter up to 5 mm) and screws must be used with visible heads and sealing washers.

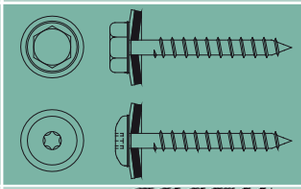
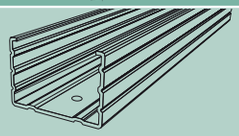
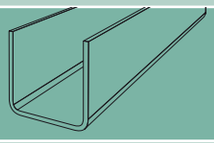
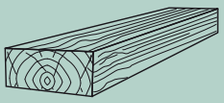
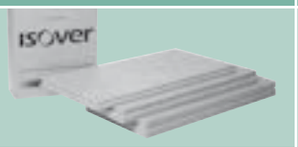
**We recommend that the assembly is executed by two workers as minimum.**

**Additional load of the soffit**

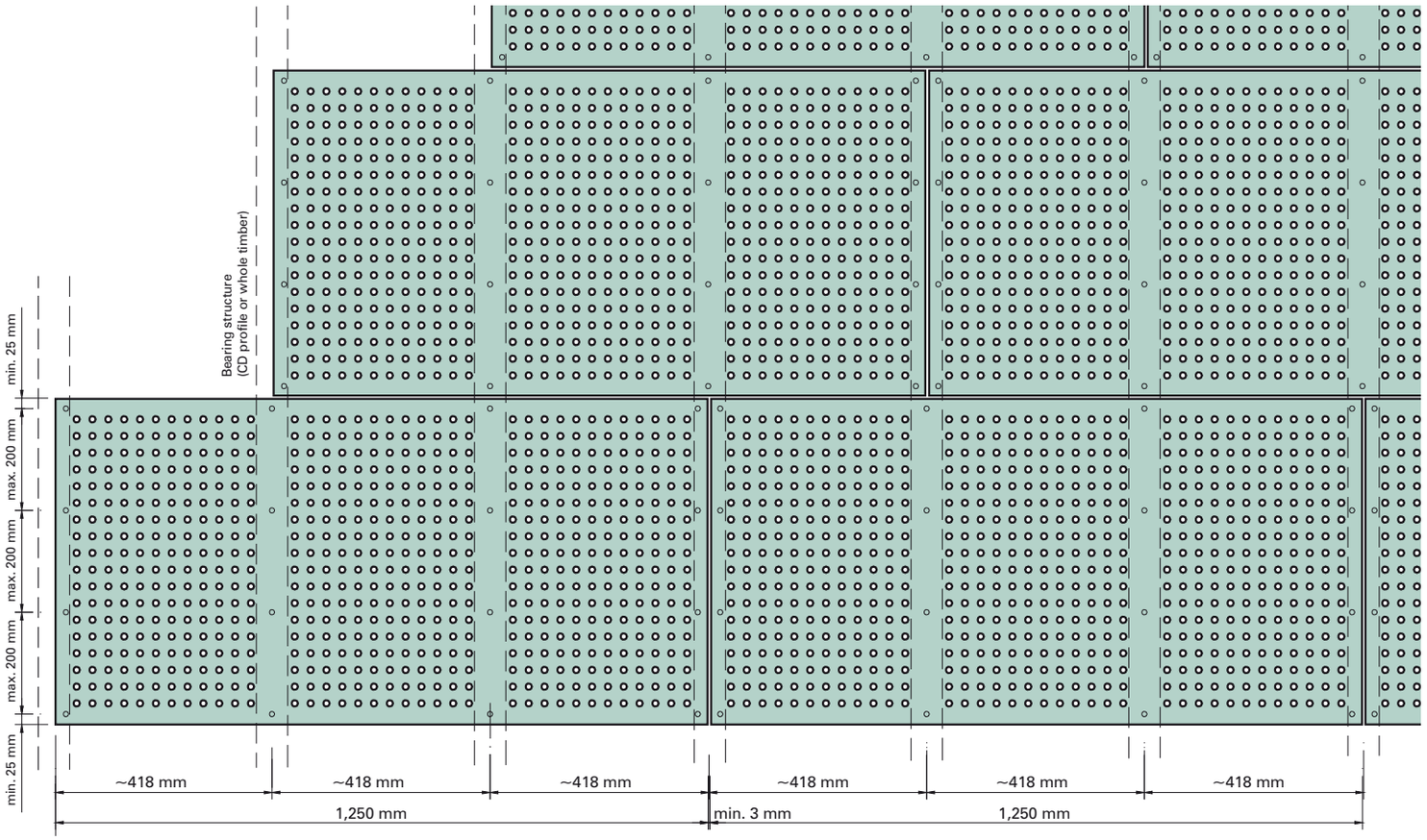
Burdens can be attached to the very sheathing of the CETRIS® AKUSTIC board (e.g., lights, air-conditioning, etc.) of a max. weight of 1.5 kg. Max. one burden is permitted to be mounted in one pane as delimited by the bearing structure (CD profiles or wooden laths). With burdens (suspended objects) of a weight up to 10 kg, these burdens must be anchored to the structural elements (of the bearing structure).

Maximum permitted additional load of the bearing structure is 15 kg/m$^2$. Larger objects must be anchored separately to the bearing structure of a ceiling – adhering to the instructions given in the contract documents.

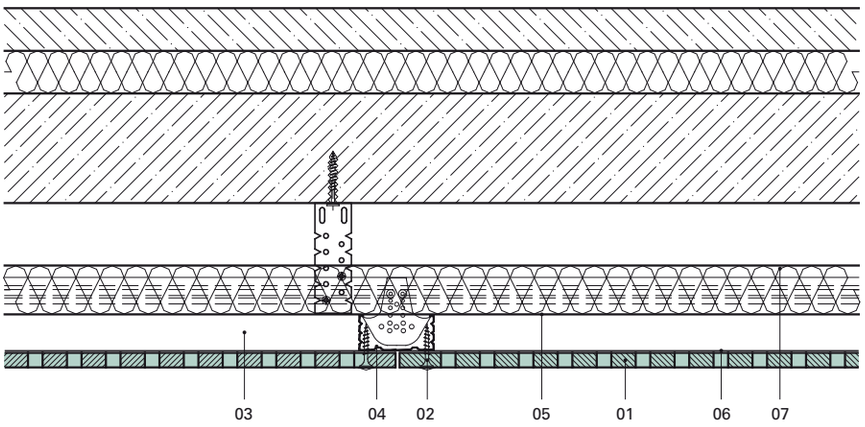
**Materials for the assembly of the CERTIS® AKUSTIC perforated boards – specification**

| DESCRIPTION/DESIGNATION | IMAGE (DIAGRAM) | REMARK |
|---|---|---|
| **Vlies Fabric**<br>Absorption glass-fibre fabric – it prevents the mineral wool fibres or, as the case may be, dust from falling through.<br>Manufacturer: Saint-Gobain Vertex, s.r.o. |  | To comply with the reaction to fire of A2 for the complete composition a special type of insulation – Isover Akustic SSP 2 (with one-side bonded black glass fabric) – must be used instead of the flees fabric and standard mineral wool. |
| **Screw 4.2 × 25 mm (4.2 × 35 mm)**<br>Self-drilling countersink-head wood screws. |  | Screws for anchoring the CETRIS® AKUSTIC board th. 8 and 10 mm to the CD profile (in case of wooden grate the screw of 4.2 × 35 mm must be used). Upon the completion of assembly a plastic front cap is put on the screw. The front-head screws may be used as alternative. |
| **Screw 4.8 × 38, 45, 55 mm**<br>Stainless steel or galvanized screws with semi-circular or hexagonal head, with the presser waterproof washer. |  | Type (length) of the screw according to tile thickness. Designed for anchoring of the upper layer of the board CETRIS® in exterior – where the board remains visible. **The board must be predrilled with diameter min. 8 (10) mm!** |
| **CD Profile**<br>A galvanized metal-sheet open profile of 27 × 60 × 0.6 mm, length of 2.50 – 4.50 m. |  | It forms a carrying grid for the assembly of soffits. The soffits are mounted to the ceiling or roof structure using either straight or nonius suspension. |
| **UD Profile**<br>A galvanized metal-sheet open profile of 28 × 27 × 0.6 mm, length 3.00 m. |  | It is used for fixing the profiles to the walls, using steel dowels. |
| **Whole Timber**<br>Section of 80 × 40 mm. |  | It forms a wooden strapping (mounting profile as well as carrying profile). The dried up impregnated structural lumber of S10 class (strength class C24). |
| **Mineral Wool**<br>Thickness 40 mm, Orsil ORSIK type, inserted between the carrying CD profiles (eventually wooden laths). |  | It can be replaced with another type of mineral wool with density of 22 $kgm^{-3}$, reaction-to-fire class A1. |
| **Mineral Wool**<br>Isover Akustik SSP 2<br>(P3/4) 4, th. 40 mm. |  | Hydrophobized mineral wool with single side bonded black glass fabric, reaction-to-fire class A1. |

**Laying of CETRIS® AKUSTIC cement bonded particle boards**

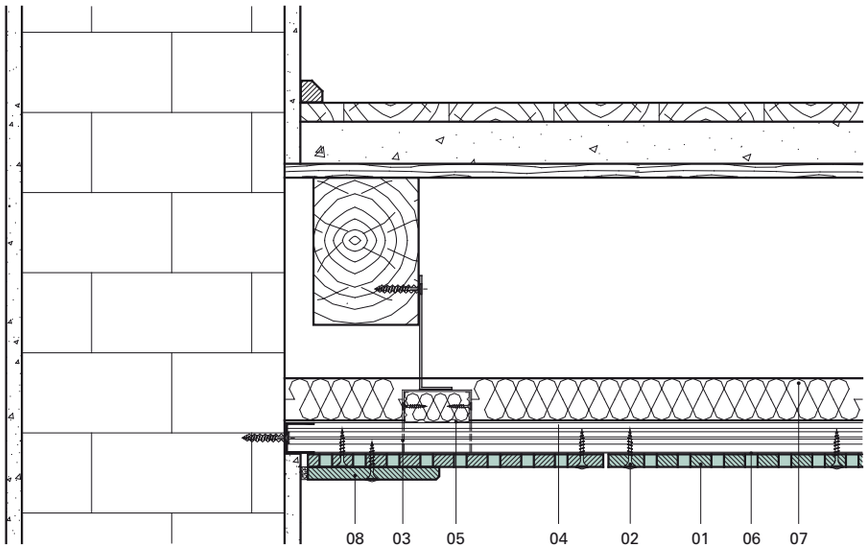



**Joint between the boards**




**01** CETRIS® AKUSTIC board
**02** Screw 4.2 × 25 (35) mm with plastic front cap
**03** Cross connector
**04** Mounting CD profile (or a whole timber)
**05** Carrying CD profile (or a whole timber)
**06** Absorption fleece
**07** Mineral wool

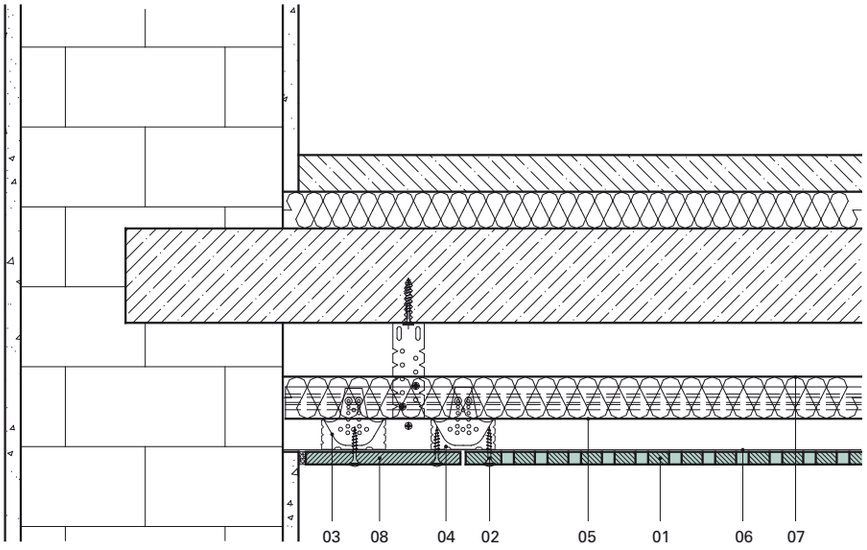
### Soffit edge detail – rim




**01** CETRIS® AKUSTIC board
**02** Screw 4.2 × 25 (35) mm with plastic front cap
**03** Cross connector
**04** Mounting CD profile (or a whole timber)
**05** Carrying CD profile (or a whole timber)
**06** Absorption fleece
**07** Mineral wool
**08** Rim – CETRIS® BASIC board

### Soffit edge detail – full strip

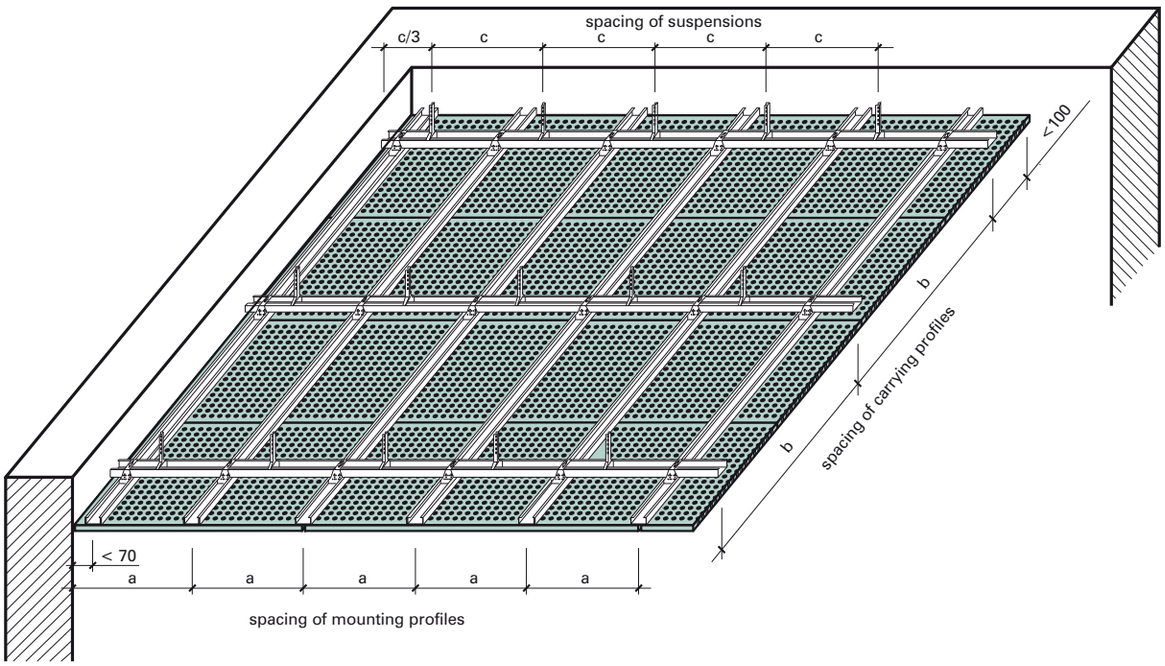
cross-sectional view

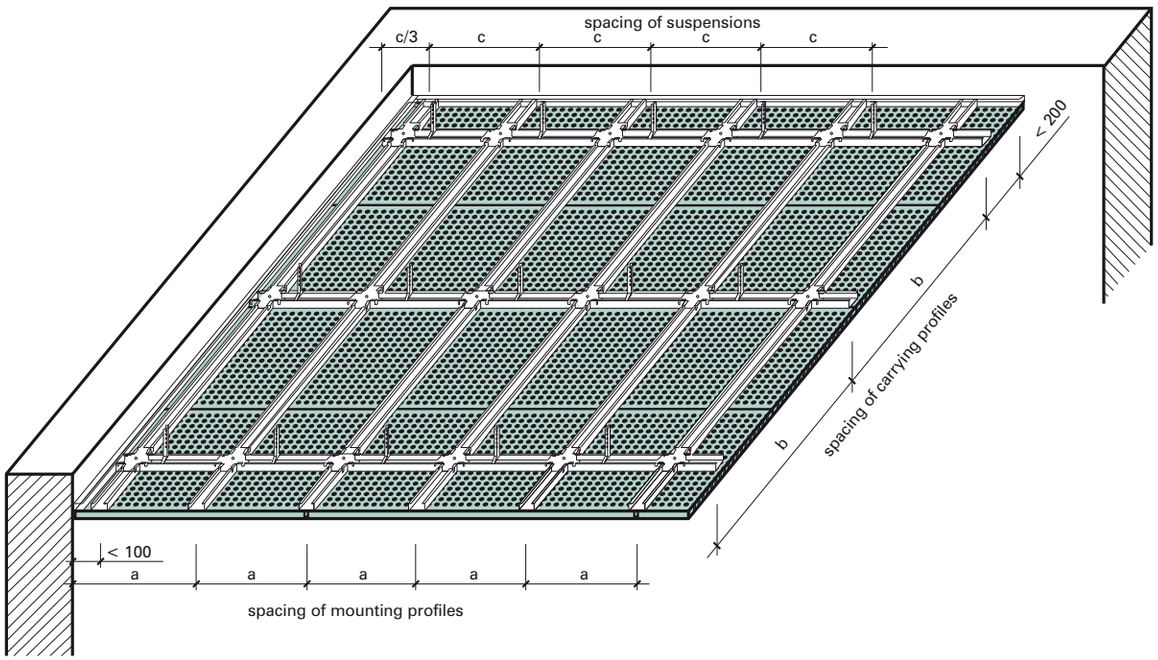


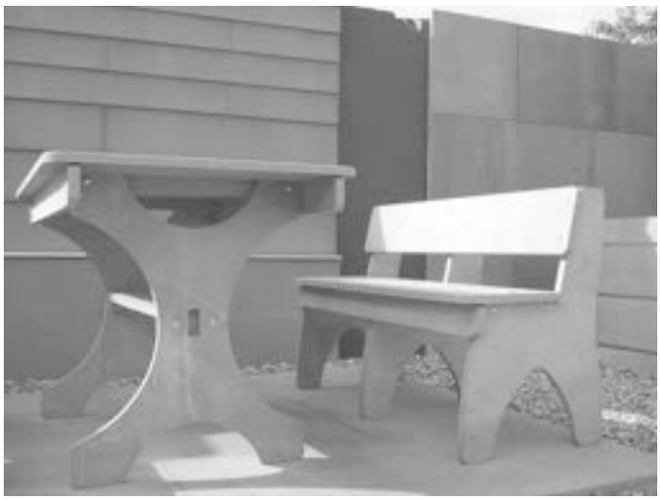

**01** CETRIS® AKUSTIC board
**02** Screw 4.2 × 25 (35) mm with plastic front cap
**03** Cross connector
**04** Mounting CD profile (or a whole timber)
**05** Carrying CD profile (or a whole timber)
**06** Absorption fleece
**07** Mineral wool
**08** Strip – CETRIS® BASIC board

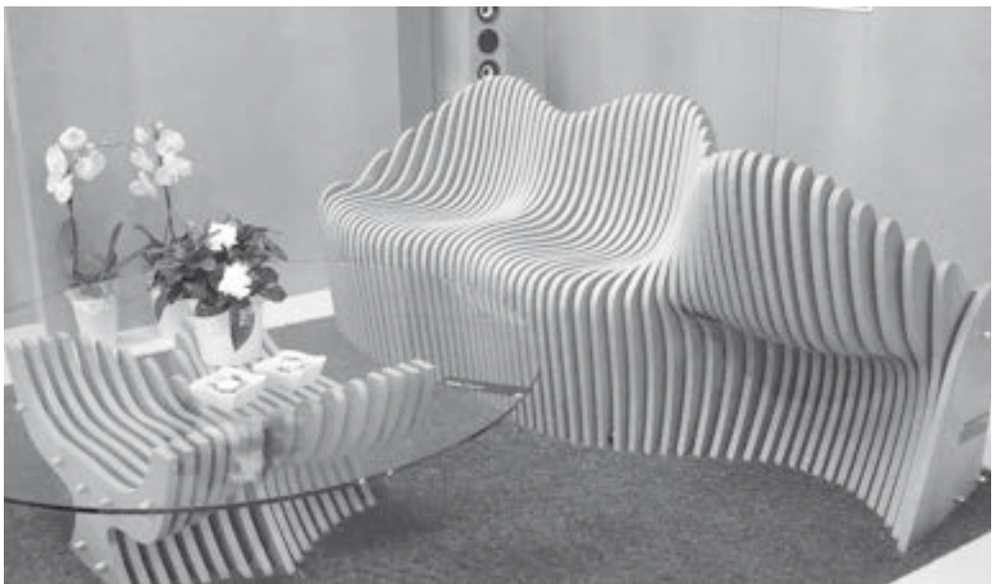
**Axial spacing of the mounting elements and supporting members (CD profiles, wooden laths) and suspensions:**

| THICKNESS OF BOARD (mm) | SPACING OF MOUNTING PROFILES **a** (mm) | SPACING OF CARRYING PROFILES **b** (mm) | SPACING OF SUSPENSIONS **c** (mm) |
|---|---|---|---|
| 8 | <420 | <1,000 | <625 |
| 10 | <420 | <1,000 | <420 |







# 11.3 Contacts on technical and sales departments of CETRIS division

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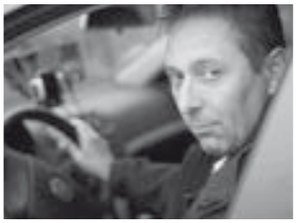

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## 11.2 List of mentioned manufacturers

| PRODUCT | SUPPLIER | CONTACT | CHAPTER NUMBER |
|---|---|---|---|
| Screws | Heinz Bühnen spol. s r.o. | Přerovská 35, 782 71 Olomouc, web.edb.cz/heinzbuhnen | 5.1, 8.7, 9.2.4, 9.4.4 |
| Screws CETRIS facade system | VISIMPEX a.s. | Seifertova 33, 750 05 Přerov, www.visimpex.cz | 5.1, 8.7, 9.2, 9.3 |
| Screws, rivets SFS | SFS intec s.r.o. | Vesecko 500, 511 01 Trutnov, www.sfsintec.cz | 5.1, 8.7 |
| Screws EJOT | EJOT CZ spol. s r.o. | Zděbradská 65, 251 01 Říčany – Jažlovice, e-mail: info@ejot.cz, www.ejot.cz | 5.1, 8.7 |
| Staples | Air Hammer upevňovací technika | Průmyslová ul., 250 70 Odolena Voda, www.airhammer.cz | 5.2 |
| Acrylic sealant S-T5, Pyrocryl | Den Braven Czech and Slovakia | 793 91 Úvalno, e-mail: info@denbraven.cz, www.denbraven.cz | 6.1, 9.2, 9.3 |
| Sealant Soudalfex 14LM | Inva spol. s r.o. | J. Suka 1753, 738 02 Frýdek Místek, e-mail: centrala@soudal.cz, www.soudal.cz | 6.1 |
| Building chemicals | MAPEI spol. s r.o. | Smetanova 192, 772 11 Olomouc, e-mail: info@mapei.cz, www.mapei.cz | 6.1, 6.6, 7.9 |
| Sealant DEXAFLAMM-R | TORA, spol. s r.o. | Olšík 583, 763 64 Spytihněv, e-mail: tora@torasro.cz , www.torasro.cz | 6.2, 9.2, 9.3 |
| Painting systems | DENAS COLOR a.s. | Sokolovská 361/2, 743 01 Bílovec, e-mail: denas@denas.cz , www.denascolor.cz | 6.2 |
| | STOMIX Žulová spol. s r.o. | Žulová 178, e-mail: stomix@stomix.cz , www.stomix.cz | 6.2 |
| | EKOLAK Bílovice spol. s r.o. | 687 12 Bílovice, e-mail: ekolak@hitech.cz, www.ekolak.cz | 6.2 |
| | TEX Color spol. s r.o. | Hodokovická 20, 406 06 Liberec 6 | 6.2 |
| | STO-VIDA LUBINA spol. s r.o. | Lubina 433, 742 21 Kopřivnice, e-mail: vida@vida-lubina.cz , www.vida-lubina.cz | 6.2 |
| | MISTRAL Slavoňov | okres Náchod, e-mail: mistral1@hrk.pvtnet.cz, www.mistral-paints.cz | 6.2 |
| | AUSTIS spol. s r.o. | Dalejská 680, 154 00 Praha 5, e-mail: tech.info@austin.cz, www.austin.cz | 6.2 |
| | CHEMOLAK Trade spol. s r.o. | Vratimovská 11, 718 00 Ostrava, e-mail: tech.info@austin.cz, www.austin.cz | 6.2 |
| | KEIM FARBEN spol. s r.o. | Vídeňská 119, 619 00 Brno, e-mail: keim@brn.pvtnet.cz, www.keim.cz | 6.2 |
| | BIOPOL PAINTS spol. s r.o. | Okřínek 29, 290 01 Poděbrady, e-mail: info@biopol.cz, www.biopol.cz | 6.2 |
| | de REM, s.r.o. | Palánek 1, 682 01 Vyškov, www.derem.cz | 6.2 |
| | REMMERS CZ, s.r.o. | Kelovratská 1445, 250 011 Říčany u Prahy, www.remmers.cz | 6.2 |
| | IMESTA Dřevčice | Dřevčice 9, 471 41 Dubá u České Lípy, www.imesta.cz | 6.2 |
| | DPC Systems (TOLLENS) | Kšírova 120, 619 00 Brno | 6.4, 7.9 |
| Materials for jointless finish | BASF Stavební hmoty | K Májovu 1244, 537 01 Chrudim, e-mail: info.cz@basf.com, www.basf-cc.cz | 6.3, 6.4, 7.9 |
| | MaDT a.s. | Slezská 950, 735 14 Orlová, e-mail: info@madt.cz, www.madt.cz | 6.3, 6.4 |
| | RENOP CZ | 664 57 Měnín 433, www.renop.cz | 6.3, 6.4 |
| Construction chemicals | BOTAMENT System baustoffe s.r.o. | Borská 40, 316 00 Plzeň, www.botament.cz, e-mail: botament.plzen@botament.cz | 6.3, 6.4, 7.9 |
| | SCHÖNOX CZ | Všeborovice 98, 362 63 Karlovy Vary – Dalovice, e-mail: schoenox@iol.cz, www.schonox.cz | 6.6, 7.10 |
| Insulation boards | Rigips, s.r.o. | Počernická 272/96, 108 03 Praha 10 – Malešice, e-mail: rigips@rigips.cz, www.rigips.cz | 7.5, 9.6 |
| Nop foil | OBB stavební materiály | Frýdecká 793, 720 00 Ostrava 20, www.obb.cz | 7.5.2 |
| | TECHNOPLAST a.s. | Komenského 75, 768 11 Chropyně, www.technoplast.cz | 7.5.2 |
| Softened PE foil | EKOMAT spol. s r.o. | Dobrá 195, 739 51 Dobrá, www.ekoflex.cz | 7.5.2 |
| Dry bedding BACHL | BACHL spol. s r.o. | Brněnská 669, 664 42 Modřice u Brna, e-mail: bachl@bachl. cz, www.bachl.cz | 6.3, 6.4, 7.9 |
| Dry bedding LIAPOL | LIAS Vintířov k.s. | 357 44 Vintířov, www.liapor.cz | 7.5.1 |
| Dilatation profiles | Schlüter® DITRA Schliter Systems | Leknínova 3167/4, 106 00 Praha 10, e-mail: info@schlueter.de, www.schlueter.de | 7.9.5, 7.4.2 |
| Construction chemicals | Henkel ČR, spol. s r.o. | U Průhonu 10,170 04 Praha 7, www.henkel.cz | 7.5.2 |
| Glue UZIN MK-33 | UZIN | Štítného 19, 130 00 Praha 3, www.uzin.cz | 7.7.3 |
| System insulating boards for floor heating | MARBET CZ | K. Rudého 3824, 767 01 Kroměříž | 7.10 |
| | FANA, s.r.o. | 756 51 Zašová 168, e-mail: fana@fana.cz, www.fana.cz | 7.5 |
| Thermo Boden System | AEG Home Comfort spol. s r.o. | K Hájům 946, 155 00 Praha 5, e-mail: info@aeg-hc.cz, www.aeg-hc.cz | 7.10 |
| EUROFOX profiles | Styl 2000 | Koliště 33, 602 00 Brno, e-mail: brno@styl2000.cz, www.styl2000.cz | 8.1 |
| SPIDI® profiles | ISODOM a.s. | Hněvkovská ul. 56, 148 00 Praha 4, e-mail: info@isodom.cz, www.isodom.cz | 8.1 |
| Insulation materials | Saint-Gobain Orsil s.r.o. | Čermákova 7, 120 00 Praha 2, e-mail: info@isover.cz, www.isover.cz | 8.7 |
| | Rockwool a.s. | U Háje 507/26, 147 00 Praha 4 – Braník, e-mail: info@rockwool.cz, www.rockwool.cz | 8.7 |
| Gluing system for facade boards | Sika CZ s.r.o. | Bystrcká 36, 624 00 Brno, e-mail: sika@cz.sika.com, www.sika.cz | 8.7 |
| | AUTO-COLOR spol. s r.o. | Ampérova 482, 462 03 Liberec, www.a-c.cz | 8.7 |
| Anchoring systems (dowels) | Hilti ČR spol. s r.o | Uhříněvská 734, P.O. Box 29, 252 43 Praha-Průhonice, www.hilti.cz | 8.7 |
| | fischer centrum Zlín | Lešetín I / 355, 760 01 Zlín, e-mail: fischer@polymat.cz, www.polymat.cz | 8.7 |
| Complementary materials (laths, profiles) | SARGON Brno a.s. | Brněnská 679, 664 42 Modřice, e-mail: sargon@sargon.cz, www.sargon.cz | 8.7 |
| | STEN CZ | Radkovice 64, 334 01 Přeštice, e-mail: info@sten-uchytky.cz, www.sten-uchytky.cz | 8.7 |
| | DK GIPS spol. s r.o. | Pakoměřice 45, 250 65 Líbeznice, www.dkgips.cz | 8.7 |
| Windproof membrane | DuPont CZ spol. s r.o. | Pekařská 14, 155 00 Praha 5, www.tyvek.com | 8.7 |
| Screws, bolts, façade profiles | ETANCO CZ s.r.o. | Pražská 686, 500 02 Hradec Králové, e-mail: etanco@etanco.cz, www.etanco.cz | 8.7.7 |
| Screws | Akros v.o.s., | Chřibská 41, 182 00, Praha 8 – Ďáblice, e-mail: akros@akros.cz, www.akros.cz | 8.7.7 |
| Sealing tapes, washers | Tremco illbruck s.r.o. | Úvalská 737/34, 100 00 Praha 10, www.tikatalog.cz | 8.7.7 |
| Dekmetal facade system | Dektrade a.s. divize Dekmetal | Dřísy 286, 277 11 okres Mělník, www.dekmetal.cz | 8.8 |
| Fibrefrax Durafelt felt | Unifrax Limited | www.sibral.cz | 9.2, 9.3 |
| Profiles CW, UW, CD, UD, couplings, hangers | Knauf Praha, s.r.o. | Mladoboleslavská 949, 197 00 Praha 9 – Kbely, www.knauf.cz | 9.2, 9.3 |
| Isover mineral wool | Saint Gobain Orsil spol. s r.o. | Masarykova 197, 517 50 Častolovice, www.isover.cz | 9.2, 9.3 |
| Steel dowels | Hilti ČR spol. s r.o | Uhříněveská 734, 252 43 Průhonice, Praha – západ, www.hilti.cz | 9.2, 9.3 |
| Sealant Dexaflamm-R | Tora Spytihněv spol. s r.o. | Olšík 583, 763 64 Spytihněv, www.torasro.cz | 9.2, 9.3 |
| Sealant Den Braven Pyrocryl | Den Braven Czech and Slovakia | 793 91 Úvalno, www.denbraven.cz | 9.2, 9.3 |
| Sealant Sika firesil | SIKA CZ spol. s r.o. | Bystrcká 36, 624 00 Brno, www.sika.cz | 9.2, 9.3, 6.1, 6.2, 7.5.2 |
| Trapezoidal sheet | Kovové profily, spol. s r.o. | Podnikatelská 545, 190 11 Praha 9 – Běchovice, www.kovoveprofily.cz | 9.6 |
| Roof foils | Coleman S.I., a.s. | Smetanova 1484 755 01 Vsetín, e-mail: info@coleman.cz, www.coleman.cz | 9.6 |
| Sunday system | AmTech sp. Z o.o. | Fabrycna 10, PL 36-060 Glogow Mlp., www.amtech.com.pl | 10.1.1 |
| Lindab structural system | Lindab spol.s r.o. | Na Hůrce 1081/6,161 00 Praha 6 Ruzyně, www.lindab.cz | 10.1.2 |
| TEKTA structural system | Folber Praha s.r.o. | Klenovická 186, 142 01 Praha 4, www.folber.cz | 10.1.3 |
| VPG Verbundsysteme Planungs-Produktions-Baugesellschaft GmbH | VST-Austria | Seespitzstraße 4, A+5700 Zell am See, www.vst-austria.at | 10.2 |

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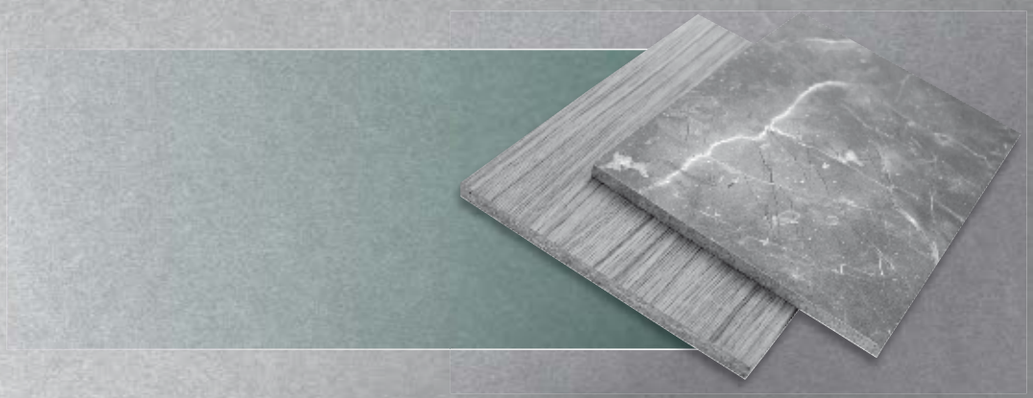
Our technicians will be happy to **answer your questions and give you professional advice** for a task or problem that you are just dealing with. Join the discussion on our website and share with us your experiences, opinions, and ideas with using CETRIS® cement bonded particle boards.



# CETRIS® **LASUR**

is a cement bonded particleboard with a smooth surface treated with pigmented primer and final colored varnish glazing in shades as per the colour chart

## Designation of CETRIS® **LASUR**

CETRIS®
LASUR 001

CETRIS®
LASUR 002

CETRIS®
LASUR 003

CETRIS®
LASUR 004

CETRIS®
LASUR 005

CETRIS®
LASUR 006

CETRIS®
LASUR 007

# CETRIS® **DEKOR**

is a cement bonded particleboard treated with acrylate mosaic decorative plaster in shaded as per the colour chart

## Designation of CETRIS® **DEKOR**

CETRIS®
DEKOR 212 F

CETRIS®
DEKOR 214 F

CETRIS®
DEKOR 222 F

CETRIS®
DEKOR 118 F

*Note:* The color chart is only approximate

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of cement bonded particleboards
in Europe

CETRIS® boards in class A2

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