Kerkstoel Activ Floors for concrete core activation

Built on experience, driven by innovation
Concrete core activation: rational, economical and sustainable

Building with concrete core activation is building for today and tomorrow: rational, economical and sustainable.

Rational and economical
Concrete core activation aims to keep the temperature within a well-insulated building as constant as possible, day in day out, summer and winter. Gas, electricity and oil costs are constantly rising. It is therefore best to design and build new buildings to be as energy-efficient as possible. In that regard, integrated design leads to more rational choices and is therefore catching on more and more. An integrated design process is necessary for concrete core activation as well.

With traditional heating systems like radiators, the heat is emitted by small appliances demanding high temperatures (> 60 °C), thus consuming much energy. With concrete core activation, the whole ceiling and floor surface is involved in the emission. Using the greatest possible surface area makes it possible to heat the rooms with relatively low temperatures (< 35 °C), and to cool them with relatively high temperatures. This can easily decrease energy consumption by 75%.
Concrete core activation: operating principle

In a storage heater, bricks are heated, which then slowly release their heat to the room, ensuring a comfortable interior climate in the winter. The operating principle of concrete core activation is comparable, but better: with concrete core activation, the concrete mass present in a building, particularly the floor slabs, is taken to the required temperature in order to heat in the winter and cool in the summer. That is killing two birds with one stone.

Special high-grade tubes are placed in the floor slabs according to a plan and pattern pre-calculated in two dimensions using the finite element method. Water flows through these tubes – hot in the winter (30-35 °C) and cold in the summer (15-18 °C). The water emits its heat or cold to the concrete slabs, which in turn take the air of the rooms to the desired temperature by radiation and convection. With floor heating, heat emission only goes in one direction, upwards. With concrete core activation, the entire floor slab assists, and as a consequence, the ceiling as well.

Sustainable

We only have the earth on loan. We are obliged to future generations to leave behind a liveable world for them. Attention to economic, ecological and social aspects is therefore self-evident.
Kerkstoel 2000+ aims to create customised added value through intelligent innovation. With Activ Floors, Kerkstoel 2000+ has developed a system that responds to the demand for economical, sustainable buildings, and that also meets requirements in the construction world: a rapid, high-quality way of working.

Practice proves the success: Kerkstoel 2000+ has already supplied more than 100,000 m² of Kerkstoel Activ Floors.

Kerkstoel Activ Floors are prefabricated concrete slabs (wide-slab floors) which serve as permanent formwork. They are fabricated according to the technical rules PTV 202 and in accordance with the highest quality standards (e.g. ISO 9001). Kerkstoel Activ Floors carries the BENOR quality mark.

The wide-slab floors have a standard width of 2.40 to 3.00 m and can easily span up to 8.50 m. They are 9 to 10 cm thick, smooth underneath and rough on top.

Just as traditional prefabricated concrete slabs, Kerkstoel Activ Floors contain traditional structural reinforcement and lattice girders. Thus, nothing changes in terms of stability, fire resistance and placement. On site, the upper reinforcement layer is also laid and the concrete compression layer is poured.

Kerkstoel Activ Floors contain a loop of tubes fitted while the slabs are being fabricated. The tubes are PE-Xc/AL/PE-Xc tubes from Henco with a diameter of 2 cm. They are exceptionally strong and conduct heat and cold extremely well. Furthermore, they are easy to work. These tubes are ATG approved. If required, they undergo a marble test and/or air pressure test (see also FAQ). Two coupling points situated at the end of the loop couple the slab to the general inlet and outlet piping of the water or to the regulating system.

While the wide-slab floors are being fabricated, the necessary recesses are made for pipes, electric spotlights and ventilation outlets. If required, small blocks of cellular concrete are built in to mark the places, which, if necessary, can be drilled through without damaging the pipes.

The tubes generally lie 6 cm from the bottom, with a spacing (c.t.c.) of 15 cm. The fall of the tubes varies from 15 to 30 cm.

(1) PE-Xc: by means of electron beam crosslinked polyethylene
Heat management

Kerkstoel Activ Floors can emit up to 60 Watt/m² of heat or cold. According to specialist consulting engineers, that is generally amply sufficient. 2/3 of the heat is emitted upwards and 1/3 downwards. The reverse applies for cooling, i.e. 2/3 downwards and 1/3 upwards.

In rooms with an even greater capacity demand, such as bathrooms in homes, or conference rooms in office buildings, intelligent adjustment of the water flow and adapted ventilation can meet the demand to the optimum (see also FAQ).

The conductivity characteristics of the tube and the rate of flow and temperature of the water are the principal parameters for calculating the thermal capacity. The thickness of the floor, the floor finish with or without (insulating) covering floor and the presence or absence of a raised floor determine the architectural and structural criteria.

Concrete core activation is a self-regulating system. The self-regulating capacity – high heat emission on high heat demand, low cold emission on low heat demand or cooling on low heat demand – results from the buffering of thermal energy in the concrete mass. The static character of the system can be overcome by anticipating via intelligent control programmes. In this way, it is still possible to amply satisfy the daily changing needs constantly (see also FAQ).

Want to know more about heat management and heat regulation? Contact Kerkstoel 2000+ for more detailed technical information.

<table>
<thead>
<tr>
<th>COOLING (top)</th>
<th>HEATING (top)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity [W/m²]</td>
<td>Capacity [W/m²]</td>
</tr>
<tr>
<td>c.t.c. [mm]</td>
<td>c.t.c. [mm]</td>
</tr>
<tr>
<td>heating upwards (without covering floor)</td>
<td>heating upwards (without covering floor)</td>
</tr>
<tr>
<td>heating upwards (with covering floor)</td>
<td>heating downwards (with covering floor)</td>
</tr>
<tr>
<td>Average temperature of the water = 18°C</td>
<td>Average temperature of the water = 29°C</td>
</tr>
<tr>
<td>Ambient temperature = 26°C</td>
<td>Ambient temperature = 20°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COOLING (bottom)</th>
<th>HEATING (bottom)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity [W/m²]</td>
<td>Capacity [W/m²]</td>
</tr>
<tr>
<td>c.t.c. [mm]</td>
<td>c.t.c. [mm]</td>
</tr>
<tr>
<td>cooling downwards</td>
<td>heating downwards</td>
</tr>
<tr>
<td>Average temperature of the water = 18°C</td>
<td>Average temperature of the water = 29°C</td>
</tr>
<tr>
<td>Ambient temperature = 26°C</td>
<td>Ambient temperature = 20°C</td>
</tr>
</tbody>
</table>
Kerkstoel Activ Floors – advantages

Broad range of application
Kerkstoel Activ Floors are used in numerous types of building: office buildings, schools, hospitals, assisted living centres, rest and care homes and prisons, but also homes. The system does not suit rooms with high relatively humidity, such as catering kitchens, swimming pools and laundries.

Lower construction costs, no maintenance
For the system to operate well, no false ceilings may be fitted. Those costs are therefore saved. The absence of false ceilings also means that the total construction height can be smaller. That too is a saving. In office buildings for instance, construction costs can fall by € 100/m². The pipes and cables for ventilation, electricity and data transmission are typically accommodated in a raised floor. Because the number of moving parts is small, the system is low-maintenance, which makes a difference in maintenance costs. Lastly, using Kerkstoel Activ Floors makes it possible to work fast, which represents yet another saving (see section ‘Faster, thus less costly installation’).

Less energy consumption
Concrete core activation decreases energy consumption by 75%. That means a saving of approximately € 10/m² per annum. For the average home, that boils down to € 1,200 per annum, for an office building of 2,000 m², the gain can be as much as € 20,000 per annum. Year in year out.
Kerkstoel Activ Floors are ideally suited for use in combination with alternative energy sources, such as geothermal energy and heat pumps. Using Kerkstoel Activ Floors instead of traditional heating and cooling systems reduces the CO2 emissions of the building in question by as much as 43%. Important with a view to EPB requirements: Kerkstoel Activ Floors contribute towards achieving very low E levels (< 40) and K values (25 to 30 and lower). It is also possible to attain the passive house standard.

Optimum comfort
Buildings with concrete core activation provide incomparable comfort. Kerkstoel Activ Floors ensure an optimum social, living and working climate not just to occupants or users. All parties involved in the construction process, such as architects, engineers and contractors, reap the benefits of Kerkstoel Activ Floors. Thanks to an integrated design process and prefabrication, they are able to work punctually and risk-free, according to the highest standards of quality, environment and safety.
Kerkstoel Activ Floors are unique

Superior system
Kerkstoel Activ Floors use a multilayer PE-Xc tube. This contains an aluminium core, so that the coefficient of conductivity is significantly higher than that of a full PE-X tube. This all results in an annual saving of 12%. Moreover, the PE-Xc tube has an oxygen diffusion density of more than 99.9% (PE-X: 96%). This causes less iron carbonate to be produced (7 g per 100 m of pipe per annum) and virtually rules out the silting up of pipes and pumps.

Level ceilings
Kerkstoel Activ Floors are made on steel formwork tables and are not prestressed. The ceilings are therefore smooth and level. A thin layer of sprayed plaster or paint suffices for the finish. Because the slabs are not prestressed, no negative bowing differences occur between adjacent slabs, an important aesthetic benefit in open-plan offices. Perfect ceilings without visible joins are obtained by, where possible, using room-wide wide-slabs (e.g. hospitals, prisons, assisted living centres, rest and care homes and homes).

High-quality fabrication, risk-free installation
For the most part, Kerkstoel Activ Floors are produced in the factory, so production is not dependent on the weather, which benefits both quality and punctuality of supply.
Because the tubes are encapsulated in the concrete, there is no
danger of damage by works by others on the construction site
(reinforcing and/or concreting teams, HVAC fitters, etc.).

Simple connections
The connections are made by means of Vision couplings, a guaran-
teed watertight system. The connections are situated in the casting
layer executed on site, in the raised floor or in special coupling
boxes. In the latter case, they are always accessible.

Faster, thus less costly installation
Because the tubes are pre-fitted and tested in the factory, the
execution period on site is kept to a minimum. This easily saves
one day for a platform of 1,000 m², typically two weeks’ work. This
reduces the indirect construction site costs by at least 10%.

Fewer connection points
Kerkstoel Activ Floors slabs are 2.40 to 3.00 m wide. This reduces
the number of couplings by 50 to 60% compared to traditional
1.20 m wide elements. Faster execution is the logical conse-
quence.
How are the pipes interconnected on the construction site?
On the construction site, the pipe registers are connected to the (main) circulating pipes of the HVAC installation or to the collectors of the regulating system by the same firm that fits the pipework during fabrication of the Kerkstoel Activ Floors. This clearly and unequivocally defines the responsibilities.

A pipe is drilled through (by accident). Now what?
The risk of drilling through is as good as non-existent. Provided that holes are drilled no deeper than 4 cm, it is not possible to touch the pipes, since they lie 6 cm from the bottom of the slab. Furthermore, the pipes lie according to a known, fixed pattern. The places where the slabs may be drilled through can be indicated by means of small cellular concrete blocks. Nevertheless, in the unlikely event of touching a pipe, the leak must be detected, the concrete removed around the leak over a distance of about 30 cm (‘shot away’ locally) and a special connecting piece incorporated. Such a repair is not cheap, so the motto is prevention is better than cure!

A slab breaks during the works on the construction site. What happens then?
The broken slab is taken out of circulation and replaced by an identical slab. If no suitable slab is available as replacement, a new slab will be made as soon as possible (within a few days).

How is quality control guaranteed?
The customer can opt for a marble test and/or (air) pressure test. A marble test, or pellet test, demonstrates the absence of ‘ovalising’ in the pipe registers, and thus the free flow through the tubes. In a (air) pressure test, the pipe circuit is pressured to 6 bar and tested for pressure losses for about a month by reference to (temporary) pressure gauges. Only slabs that fulfil the quality requirements leave the factory.

Can the temperature in two adjoining rooms differ? In other words, is it possible to adjust the temperature in a given room according to need?
Of course. A judicious, integrated design is a condition, however. A maximum temperature difference is normally assumed of 8 °C between two adjacent rooms. Dividing a building into zones based on orientation, heat requirement or desired comfort temperature, and using a 2- or 4-pipe circulating system, makes it possible, if necessary, to cool one room while heating another. The temperature can be intelligently controlled from generating installation: pre-adjustment – adjustment based on supply temperature and/or return temperature of the water – and/or post-adjustment – based on the water flow – makes it possible to control the temperature per zone in indifferent ways. ‘Dead band control’ based on room temperature is also quite common. Individual post-adjustment at room level is mainly achieved in one of the two following ways: by adjusting the water flow or by adapting the number of freshening cycles in the ventilation system by means of VAV valves, with which the air may or
may not be post-heated. Both the water flow and the ventilation cycles are simple to regulate with a valve that can be operated from a sort of thermostat, so that the desired comfort temperature can be attained quite quickly. In exceptional cases, it is possible to consider adding limited ancillary heating.

How are sudden changes in outside temperature absorbed indoors?
All kinds of websites and applications can be found on the internet for predicting the weather. Linking those weather predictions to the temperature control programme (see previous question) makes it possible to set the desired indoor temperature proactively. In unforeseen circumstances, it is possible to boost or reduce the emitted capacity by 15 to 20% by increasing or lowering the temperature of the water by a degree. This normally suffices. Thus, it is possible to guarantee a constantly conformable interior climate throughout the year, without it becoming too hot in the summer or too cold in the winter.
Kerkstoel 2000+ NV
Industrieweg 11
2280 Grobbendonk
Belgium
T: +32 14 50 00 31
F: +32 14 50 15 73
info@kerkstoel.be
www.kerkstoel.be

Kerkstoel 2000+ complies with the highest quality standards.

Double walls • Kerkstoel COMFORT walls • Floor slabs • Kerkstoel ACTIV floors • Floor slabs with polystyrene