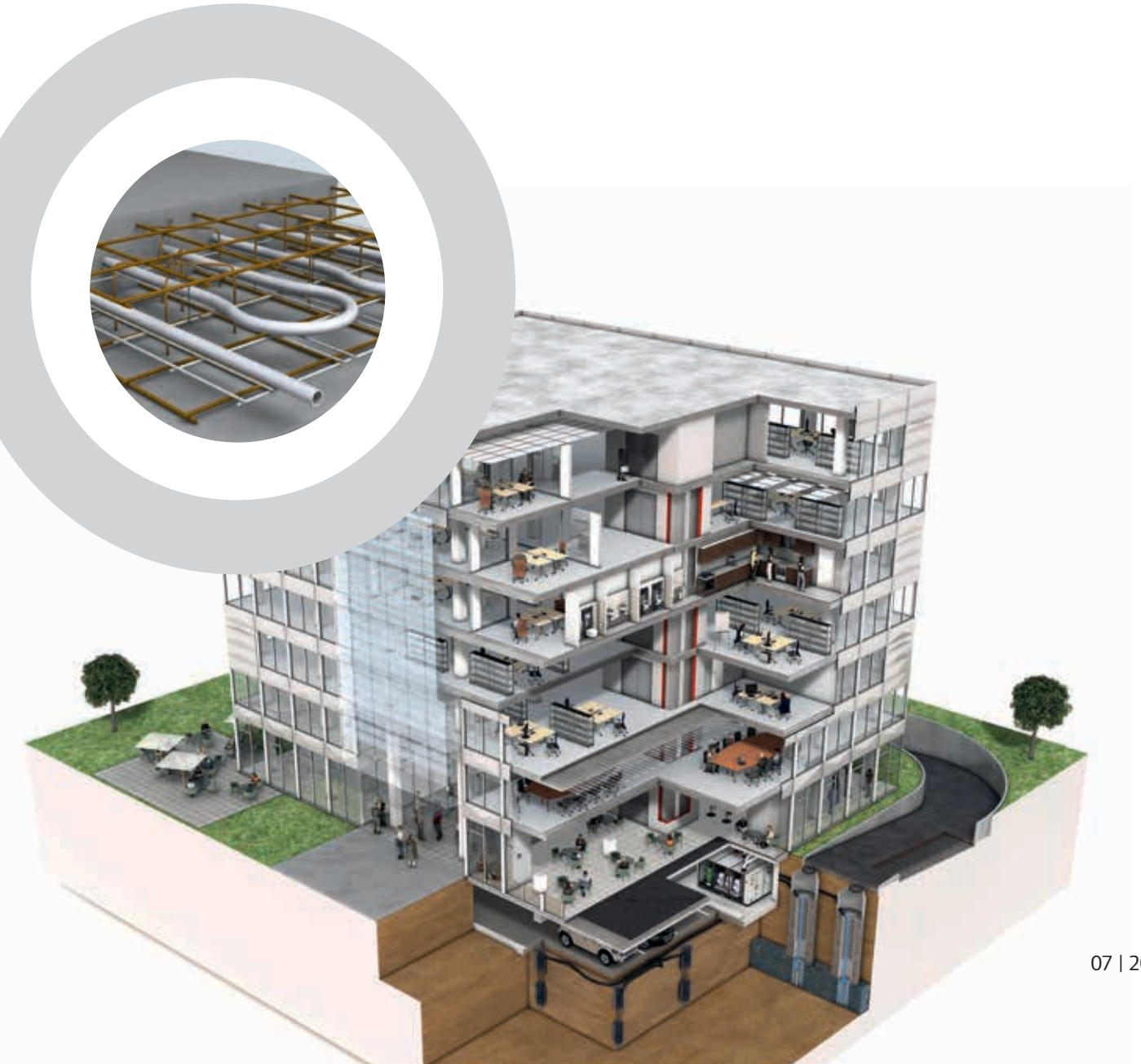
Uponor Contec
Construction methods

THERMALLY ACTIVE BUILDING SYSTEMS



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The flexibility and adaptability of the Uponor Contec system is demonstrated by the fact that it has already been installed in all possible slab or wall constructions. Whether the selected construction method is cast in situ, filigree (part precast), fully precast or permanent formwork, the Uponor Contec system is flexible enough to meet project demands in conjunction with the related variations of slab constructions.

In this section the most common floor and wall constructions are examined. To illustrate these construction methods, some reference cases of previous projects equipped with the Uponor Contec system are shown.

In situ slab construction

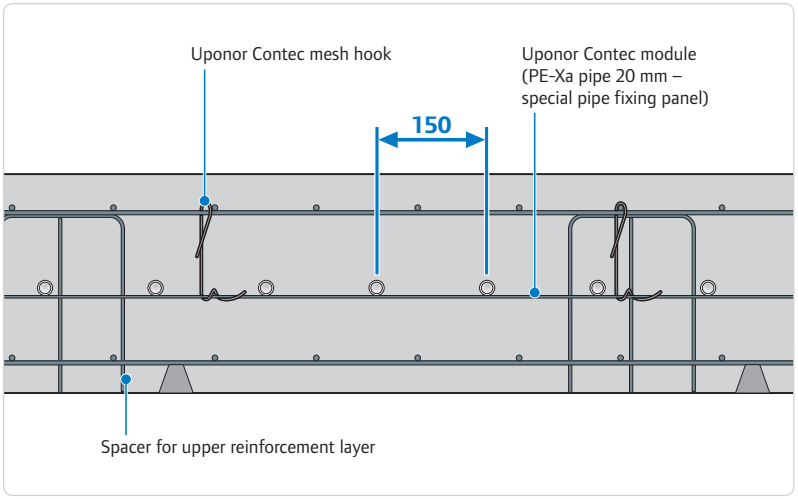
In situ concrete slabs are currently the most common type of floor construction for office buildings. The Contec system components, modules, mesh hooks and the patented ceiling lead-through elements were developed specifically for this type of slab.

To find out more about the patented mesh hook element method from Uponor, and its advantages, see chapter 5, section 5.2: “Installation steps”.

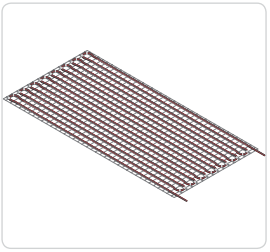
The Uponor Contec system is typically designed and installed in situ in modules for faster, safer and more accurate installation.

The Uponor Contec modules are installed in the centre of the floor

In situ concrete casting



Uponor Contec, mesh hook element method



Modular design

Post-tension concrete slab

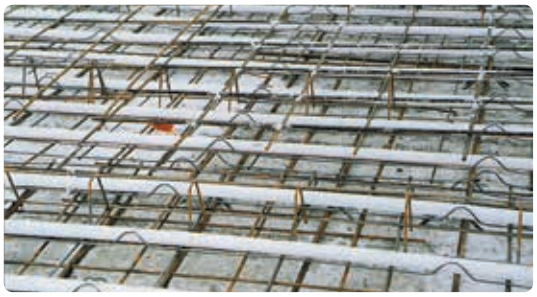
In order to overcome the natural weakness that concrete has in relation to tension, post-tension slab can be used for the length of the floor. This method is called pre-stressing and means that the slab has been pre-stressed to increase its strength (called, in this sense, a post-tension concrete slab).

The advantages of a post-tension concrete slab include reduced construction costs and lighter construction due to a thinner slab. The fact that the construction itself is thinner provides cost savings in foundation and reduction in building heights, thus resulting in reduced exterior finishing costs. The Uponor Contec system has already been incorporated into this construction method in various projects.

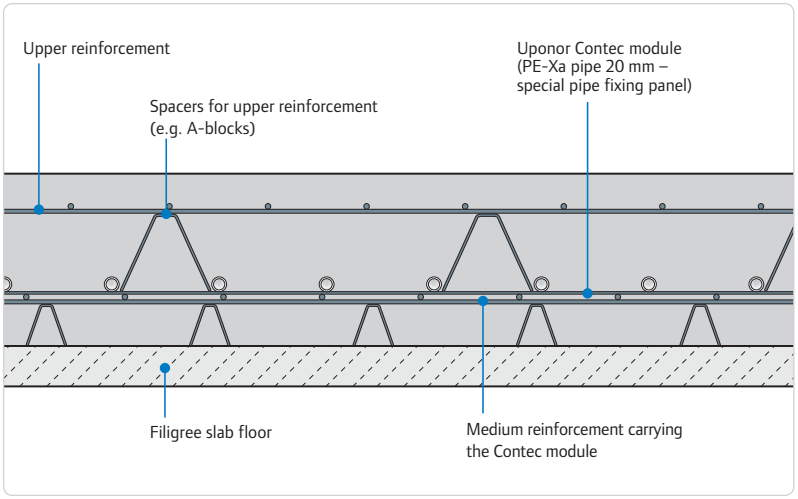
The Uponor Contec modules are installed in the centre of the floor

Filigree floor slab

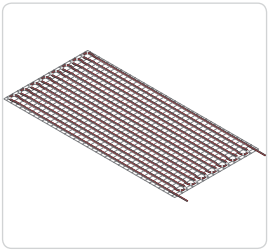
The Uponor Contec modules are also suitable for installation in filigree slab floors as they allow for fast installation. In this case, the mesh carriers, which normally serve as spacers for the upper reinforcement layer, are shortened so that they can carry the medium reinforcement layer and the Contec modules.



Uponor Contec modules placed on mesh carriers



Uponor Contec in filigree slab floors



Modular design

Precast concrete floors

Common precast elements

The installation of modules in precast concrete structures is a widely used method. The modular design enables the concrete element manufacturer to supply the precast parts with fully integrated concrete core activation to the site on time.

Uponor Contec modules incorporated into precast concrete slab

Crane transporting the precast concrete slab element to the correct position

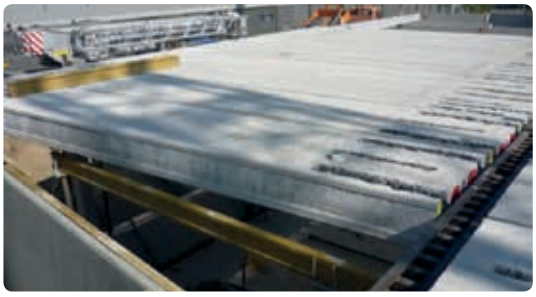
Hollow core

Another precast floor construction is the hollow core slab. This type of precast slab constructed from prestressed concrete comes with voids of tubular shape along the full length of the slab. This characteristic of hollow core slab makes it lighter than the typical slab construction, thus providing advantages of reduced material and transportation costs, as well as fast installation.

This type of slab construction is popular in countries with high penetration of precast concrete solutions and with low seismic activity.

Precast hollow core slab, equipped with concrete core activation and distribution lines, as installed in the University of Bochum




Uponor Contec modules incorporated into precast hollow core

Permanent formwork slabs

Over the last decades there have been many attempts by structural engineers to decrease the weight of the slabs. As seen above, one solution was the introduction of precast hollow core slabs. The limitations of such slabs due to lack of flexibility and limited architectural freedom has led engineers to pursue other solutions. One of these is permanent formwork or lost shuttering. Trapezoidal metal sheet floors, often called metal deck or ComFlor®, constitute two examples of these types of installations.

Specifically in relation to floors with metal sheets such as trapezoidal sheet metal floors, the output capacity of the radiant heating/cooling system could be increased by almost 50 %. However, in this case, the ability of the floor to save energy is compromised. The Uponor Contec modules are typically installed on top of the trapezoidal metal sheet. Nevertheless, in order to utilise the higher capacity of floors with metal sheets and at the same time benefit from the energy saving advantages of screed and concrete, the Contec modules could be installed inside the correspondent screed, above the concrete layer.

Uponor Contec installed in metal deck

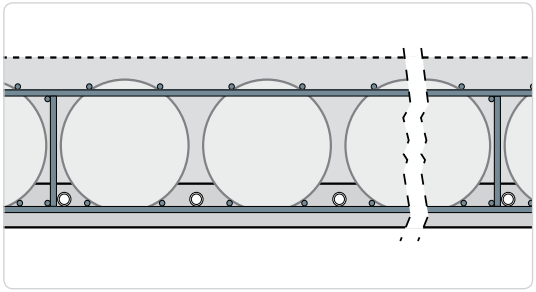
Special applications

Some of the more than 100 projects realized with Uponor Contec so far, have involved a number of special floor constructions, for which Uponor provided support during design and implementation.

Since the focus in the last decades has been on minimising the weight of slabs, biaxial slabs with hollow cavities have been introduced. The purpose of these hollow cavities (filled with spheres, other elements or kept void) is to displace concrete from areas in the span in which it has no structural benefit. Some common voided biaxial slab systems around the world are: BubbleDeck®, Cobiax®, U-Boot®, ripped slabs, waffle slabs and polystyrene voiding blocks. Contec has been used to thermally activate the slabs in these voided biaxial slab systems.

1. BubbleDeck®

Uponor has worked together with BubbleDeck® to incorporate Contec modules in the lower part of the slab. The piping can be installed either at the precast site or on site.



Floor section of BubbleDeck® (Type BD 230) with Uponor Contec

BubbleDeck® and Uponor Contec as precast element

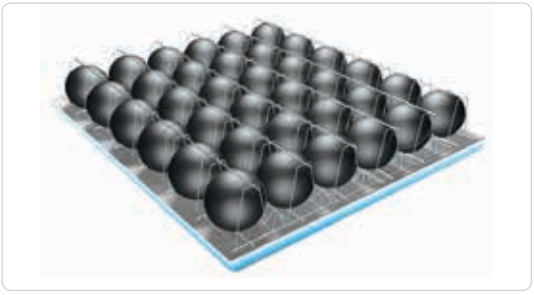
2. Cobiax®

In this system, hollow bodies of elliptically shaped plastic are mounted with a light metal mesh between the upper and lower reinforcement. This creates a long-spanning, biaxial slab without beams, reducing weight and thus support structures and foundation design.

Floor section of Cobiax® modules with Uponor Contec

Cobiax® modules, coupled with Uponor Contec system as precast modules

In collaboration with Hanson, Uponor developed a concept to embed Uponor PE-Xa piping inside the Omnia precast floor panel, equipped with Cobiax void forming. The result was the Coolslab® system.

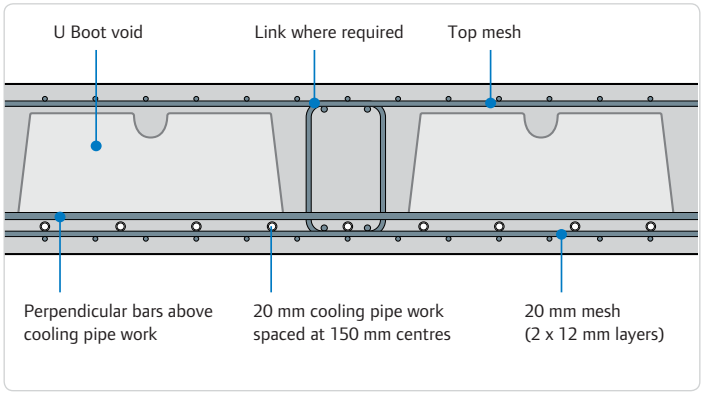


The Coolslab® system, as developed by Hanson and Uponor. The Uponor Contec system is prefabricated in the precast section

3. U-Boot®

The reduction of transportation costs and CO_2 emissions was among the main driving forces for the invention of another system of void formers.

This system, known as U-Boot®, consists of recycled polypropylene formwork. The U-Boot® system creates mushroom pillars, which are mounted into the slab, allowing lighter construction with large span and no beams, thus also minimising material and transportation costs. The biggest advantage of the system is that it is stackable and that because of its shape, the U-Boot® creates a grid of orthogonal "I" beams, so that reinforcement can be calculated according to widely used international and local standards.

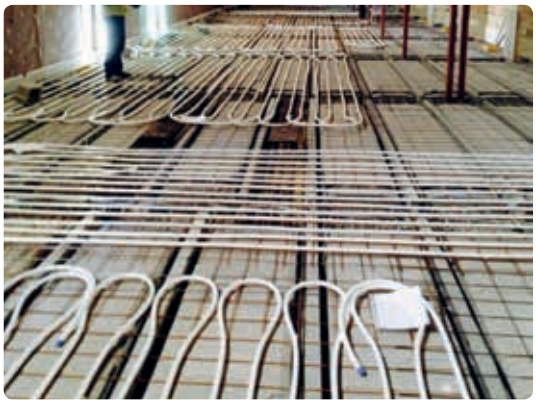


Floor section of U-Boot® with Uponor Contec system

Uponor Contec installation, concreting and U-Boot modules installation

4. Ribbed and waffle slabs

Ribbed and waffle slabs are further types of voided slab. Contec has also been used in these slab types as a special addition to thermally activate the slab. One example for these methods is the waffle slab utilising the SKYRAIL® system.

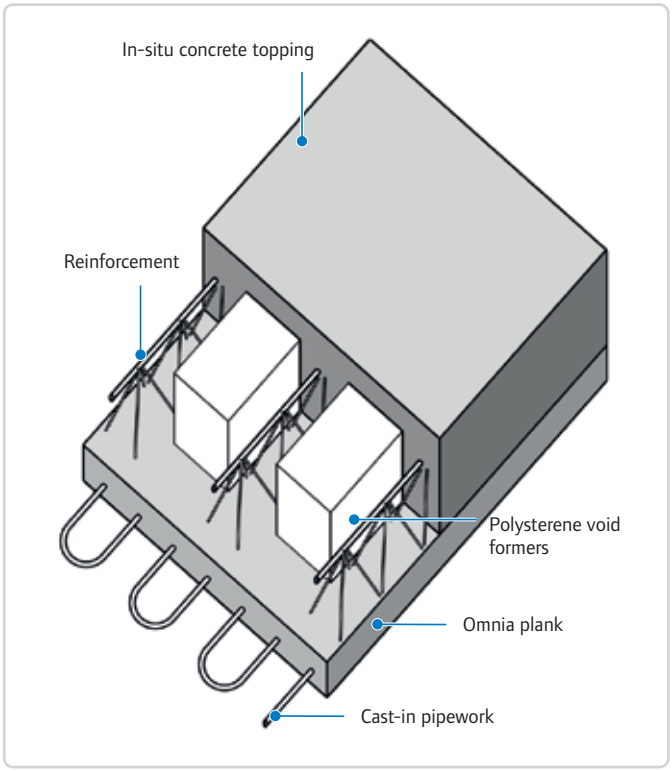


Uponor Contec system installation with ribbed slab

5. Polystyrene voiding blocks

Another voided slab construction method that aims to reduce the weight of slabs is the polystyrene voiding blocks method: blocks of polystyrene are mounted in the floor in order to reduce the amount of concrete poured on site.

The Omnicore® system belongs to this method and was developed by Hanson and Uponor as a variation of the Coolslab® system. In this system, blocks of polystyrene are mounted into the upper part of the precast section. That way, the amount of required in situ concrete is reduced, thus decreasing the total weight of the floor.



Coolslab®, developed by Uponor and Hanson, as proposed for the Manchester Metropolitan University (MMU) project

Source: S. Doody et al. "The Development of an 'Activated' Thermal Mass pre-cast structural floor with an Architecturally Fair Faced finish, to deliver Space Conditioning from Ground Sourced Cooling", Feilden Clegg Bradley Studios, Paper submitted as Practice-located Research for the RIBA President's Award for Research 2010.

6. Renovation of historical buildings

In the historic docks of Hamburg, a number of old warehouses have been converted into modern office buildings. In some of these buildings, concrete core activation has been successfully integrated into the old building structure using a tailor-made construction method. As the room ceilings were rather low, there was no space available for air channels.

Hamburg docklands

Tailor-made installation between ceiling beams

Wall installation

In buildings with glass façades, concrete slabs are often the only components providing thermal storage mass. However, Uponor Contec modules for concrete core activation can also be integrated into solid heavy weight internal walls. Combined with concrete core activated floors, such solutions significantly increase the heating/cooling performance of the building. They have the additional positive effect of allowing wet shells to dry much quicker with heating.

The Uponor Contec system can be designed and installed in modules for in situ installation, bringing all the advantages of module installation as illustrated in section 4.1. Apart from that, the Uponor Contec system can be installed horizontally or vertically and in all possible wall heights, thus providing absolute installation flexibility.

Uponor Contec modules installed in wall

Uponor Contec modules installed in wall

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