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Identificativo IVA IT 01792290031
Capitale Sociale € 50.666.520 i.v.
Società soggetta a direzione e coordinamento della Alberto Giacomini Holding S.a.s. di Alberto Giacomini

Business Area	**Radiant Systems**
Technical Focus	**Designing a Radiant System**

In order to get the maximum comfort out of a radiant system, it is paramount to go through a precise design phase (ref. UNI EN 1264).

First of all it is fundamental to know the characteristics of the building, namely the exposure to cardinal points and the degree of insulation, in order to calculate heat dispersion and loss. The comfort temperature indicated by the legislator is 20°C, with a maximum surface temperature of 29°C.

The top layer of floor covering is one of the key aspects: it is important to know the type of material and its thickness. Ceramic floors offer a lower insulation and hardwood floors are synonym to a higher degree of insulation.

As per the manifold, it is preferable to place it in a central area in order to optimize the distribution of supply and return circuits. This distribution can be done both with a "spiral" or "serpentine" configuration. The first solution is preferable for a more homogeneous distribution of surface temperature of the floor, as the supply and return circuits are laid in an alternating manner. The "serpentine" distribution causes a continuous variation of the surface temperature of the floor. The thermal performance of the system is also determined by the supply temperature of the circuits. To optimize these parameters the distance between two pipe passages of the pipe can be optimized according to energy needs. For example, near large windows the distance can be less, so that the heat exchange is higher.

In the design phase, Giacomini engineers use giacoklima® calculation software tool, developed in-house, and also distributed free of charge to designers and architects.

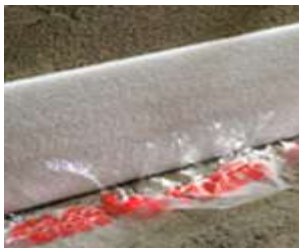
INSTALLATION AND LEAK TESTING

To start installing a radiant system it is mandatory to have external doors and windows, internal door frames, finished walls and electrical systems.

You can install electrical systems and sanitary water systems in two ways:

1) Either directly on the base foundation and then cover them with cement
2) Or, in case the depth isn't enough, you can lay the systems in the 30cm area bordering the walls.

LAYING PERIMETER WALL INSULATION



The perimeter wall insulation band must be placed along the walls and along any other component that penetrates into the base foundation (for example columns). It is an insulating band that connects the base with the finished floor. This in turn allows small movements of the top layer (few millimeters). The band should be secured to the ground so as to avoid movement during the casting of concrete. The upper part of the perimeter band will be cut only when the entire floor covering is completed.

INSTALLATION OF INSULATION PANELS

Once the band is laid, the insulation panel can be positioned. This operation is significantly different depending on the type of panel chosen. In any case it is preferable to lay the panels so that subsequent rows are "mismatched" or staggered between them. This avoids panels to get lifted due to an uneven base level.

In some cases, to securely anchor the pipes to the panel, it is a good practice to use the R983 or K809 clips, especially if you are laying the pipe with particularly bent angles, up to the limit of five times the outer diameter.

PIPE LAYING

Pipe installation is carried out according to the project, trying to follow recommended paths to ensure desired heat yields.
In laying the pipes you need to create angles with a radius in line with the pipe technical features.

To make tighter bends you need to use curve reinforcement (R549B) that prevent tight spots and bottlenecks. Crossing the expansion joints it is important to protect the pipe with sheath, in order to avoid excessive mechanical stress.

Near the manifold pipes are very close together and heat loss is very high: it is therefore appropriate to use insulation for the part of the pipe going from the manifold to the floor.

EXPANSION JOINTS

Thermal shock may cause subtle movements of the floor: to prevent damage occurring overtime, you need to install expansion and fractionation joints.

These joints may be positioned, if necessary, taking into account the norm UNI EN 1264-4 : ".... closing areas of 40 square meters, with a maximum length of 8 m. In case of rectangular areas, these measures may be overcome by limiting the ratio to 2: 1 ".

The Division shall be made in correspondence to the joint in order to separate the different environments from the point of view of expansion.

In correspondence to the crossing of the joints, the pipes must be covered by a protective sheath of at least 20 cm in length.

LOADING OF THE SYSTEM

The installation must be carried out carefully to remove the air contained in the pipes. This procedure must be done manually by filling the pipes as follows:

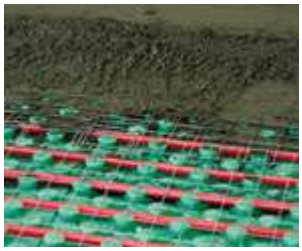
1. close all return circuits
2. open all supply manifolds
3. act on each return manifold, opening one circuit at the time

To complete this operation, open the manual handle of the return manifold built-in valve, leaving all other valves closed. Then let the system drain (from the drain valve) until there is no air left in the circuits. Only then close the circuit and open the next one. The same operation needs to be performed on all circuits. At the end open all the valves and check that the drain is air-free.

LEAK-TESTING THE SYSTEM

Before laying of the support layer, to make sure that during installation operations have not accidentally damaged to the pipes. You must proceed to filling loop by loop, and to vent any air pockets. After that, you can run a test with water at least twice the working pressure and not less than 6 bar.

INSTALLING THE SUPPORT LAYER



Once you make sure that there are no leaks, you can proceed and install the support layer.

• In the case of screed with additive, we recommend the use of an appropriate mesh, to obtain a better distribution of loads. Make sure that the system is set on a test level pressure and that the outside temperature is not lower than 5°C. The screed must be laid trying to coat pipes, starting from the outside towards the center. For screed composition you should use the appropriate K376 additive, adding it directly in the drum while mixing cement: the quantity is 1 liter for every 100 kg of cement.

• To further reduce thickness, the GIACOKLIMA dry system the support layer can consist of a first surface of glued zinc-coated steel sheets K805P, 250x500mm or 500x500mm, staggered elements, in order distribute heat more evenly.

SYSTEM START-UP

According to the UNI EN 1264-4 norm, in the case of screed with additive, system start-up must take place after at least 21 days from the laying of screed. The start-up must be carried out at an inlet temperature between 20 and 25°C, maintained for at least 3 days. Afterwards, maximum allowed temperature must be maintained for at least 4 days.

Focus on Italy

The European standard EN 1264, elaborated by CEN (European Committee for standardization) has been implemented in Italy between 1999 and 2003 and took the status of Italian national law under the name UNI EN 1264. The scope of the standard - in its first version – covered radiant underfloor systems, fueled with hot water in residential buildings, offices and other buildings destined to residential-like uses.