

Hypo-what?

Two Thousand Year Old Radiant Heating

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If you have been around radiant heating for any length of time, you have no doubt heard about the floor heating the Romans used over two thousand years ago. You may have seen the pictures, or even studied the diagrams. No matter what you read, there is nothing to prepare you for the real thing if you are ever lucky enough to encounter it. Fortunately, I had that opportunity in March of this year.

On a tour of parts of the Middle East and Asia Minor in the center of the old Roman Empire, I got to walk the Roman roads, through several ancient Roman cities, and visit the Roman radiant floor heated baths that have been buried in obscurity for centuries. The technology the Romans used in their architecture and construction is mind-boggling. Columns the height of three story buildings carrying massive stone arches weighing many tons is commonplace. They built coliseums and theaters that seat thousands of people with indoor plumbing to handle those inevitable relief stops of the fans. The hundreds of thousands of hand-hewn stones that fit together perfectly to construct multi-story complexes are almost incomprehensible. They were master builders with an eye for creating esthetically pleasing shapes out of massive stone. They were also well advanced in the art of comfort and in heating these great stone creations.

The Romans invented central heating. Not the type we know today, but a form of underfloor heating that also warmed the walls. Known as a hypocaust, it was radical for its day in



Author in the Roman city of Caesarea

comparison with the rest of the known world. Not only was it radical, but it became commonplace to the point that it was found in almost every Roman city from the British Isles to North Africa.

To understand how the Roman system of heating worked, take a look at the photo of the public bathhouse located at the fortress built by King Herod at Masada in Israel. Here you can see where the floor was laid out as a series of stone slabs raised up on pedestals, with a furnace located below the floor of one exterior wall. By placing the fire here, the draught would take the heat under the floor, and up through the walls to chimneys located in the corners of the building. The pedestals are about two feet high, as this was found to be the most efficient height for the air to travel naturally. Once the heated air had passed under the floor, it was drawn into the walls and up the flues by natu-

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ral convection.

Clay tiles with holes can be seen embedded in the walls horizontally. This had the effect of passing the heated air through the walls and into the flues, thereby warming the walls also.

In the Roman baths, the furnace was placed next to the hottest room called the *caludarium*, in which three walls of this room were heated so that the room reached a temperature of up to 120 degrees F (50 degrees C). Patrons often wore wooden sandals to keep from burning their feet on the floor. This is where a Roman version of a hot tub was located.

The warm room *tepidarium* only had one wall heated, which made this room cooler than the *caludarium*. It contained a pool of warm water. A third room was the *frigidarium*. As you can guess, it was where the cold dip took place.



Floor pedestals in a bath house at Beit She-an

The furnace is a covered stone or brick fire pit placed outside of the building. The Romans obviously knew airflow because the placement of the pedestals and flue channels directed the heat provided by the furnace exactly where they wanted it to go. They did it without blowers or dampers. They planned around the natural physics of convection.

So what does that have to do with modern day radiant heating systems? Not much really, but it confirms that radiant heating has stood the test of time. Whether it is a caveman's fire heating a rock that radiates its stored heat long after the fire has gone out, Roman technology that harnesses the heat and puts it where it will do the most good, or a modern hydronic or electric radiant system with all its finite controls, radiant has proven to be the most comfortable form of heating throughout the centuries. [Source](#)



King Herods public bath at Masada

