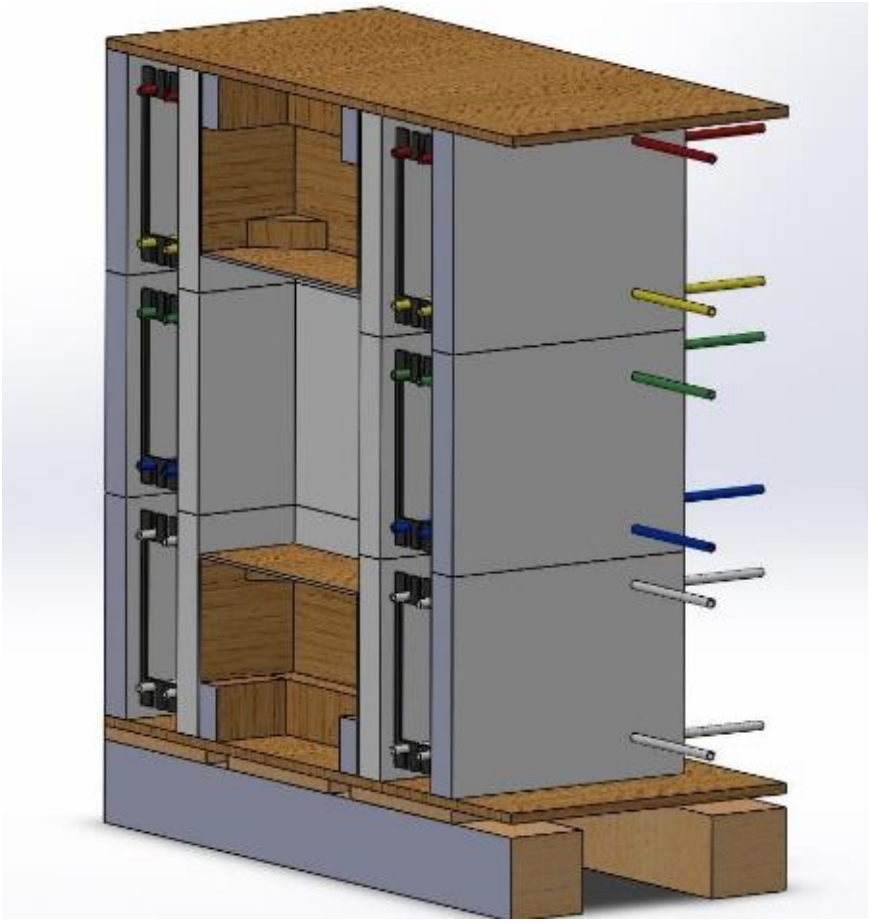
Radiative Heating in Insulated Concrete Forms



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Abstract

With rising energy costs and more incentive to go green, there has been a major push over the last decade for people to become environmentally friendly. A major portion of energy in America goes toward heating homes in the winter months. Radiant heating is an efficient way to reduce energy costs in a home, but radiant heating has been limited to floor applications. The idea of a wall based radiant heating application is an attractive one since it allows for more surface area for the heating coupled with better convective boundaries than a floor would typically have. To research this application Insulated Concrete Form (ICF) walls were chosen as the medium to apply the radiant wall heating to due to the concretes large thermal mass and the polystyrenes low conductive properties to prevent heat loss. To test this hypothesis, PEX piping was installed in an ICF wall and hot water at 100^{o}F was pumped through the test structure. The inside test chamber was maintained at an average temperature of 80^{o}F for the entirety of the

winter of 2016, with outside ambient temperatures ranging from 0°F all the way to 60°F. The test structure was modelled and the model was deemed accurate, allowing the structure to be modelled with cooler hot water around 80°F, which is consistent with the performance of a solar powered hot water heater. The model concluded that solar powered hot water would produce inside test chamber temperatures of 70°F.