Appendix E: Precast R-Value Calculations
The next analysis that was performed was the Steady State Isothermal Analysis Method #1:

Using a series-parallel method of calculation, Isothermal Analysis predicts the effects of irregular sized and spaced penetrations through an insulation layer. Individually, steel or concrete have significant effects on the insulation layer and can be predicted with this analysis method.

The Isothermal Analysis by itself has been proven a bit aggressive when figuring the effects of solid concrete sections and therefore has been tempered with U-Value average to account for the restricted conduction zones affected by solid concrete.

The steady state thermal analysis shows the total isothermal R-value for the wall, with the ability to factor in thermal breaks such as metal ties or solid concrete sections.

You will notice in the findings shown in the Isothermal Analysis that the THERMOMASS wall panel has a material R-Value of **R-11.49**. The Isothermal Analysis shows .90% thermal loss in this wall panel with the use of fiber composite connectors. The overall material R-Value of the THERMOMASS wall consists of an **R-11.39**.

The competing wall system which consists of 2X4 steel studs (16” oc), 2” XPS insulation, full exterior brick w/ brick ties connected back to the steel studs. Due to the thermal conductivity of the brick ties this assumed R-11.66 wall actually performs at an **R-7.76** (33% reduction).
Performance Mass Analysis:

A precast concrete sandwich wall panel system constructed with The THERMOMASS Insulation System maximizes the thermal mass effect of concrete, thereby reducing the heating and cooling loads and providing an R-Value greater than what can be expected by the material alone (R-11.49) or by which code requires.

When utilizing climate data for Perrysburg, OH the proposed 3-in exterior concrete / 2-in extruded polystyrene insulation / 5-in interior concrete THERMOMASS Wall Panel performs at R-20.64.

This is determined by taking into account climate data, building orientation, occupancy type, and facility type. ASHRAE/IESNA Standard 90.1-1989: System Performance Criteria is the standard calculation used.

This criteria determines the R-Value performance and the heating and cooling load adjustments for the effects of concrete mass within the building envelope. The results of the analysis are detailed in image to the right.