BOTHWELL-ACCURATE
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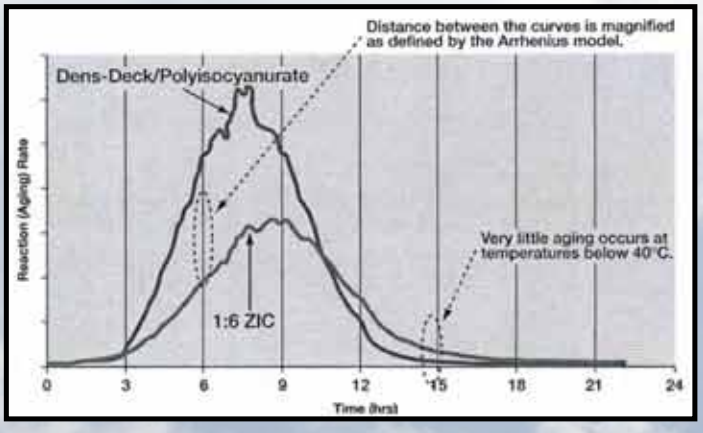
LIGHTWEIGHT INSULATING CONCRETE ROOF INSULATION SYSTEMS
SUSTAINABLE BUILDING ENVELOPE DESIGN - PART 2
BULLETIN 3 - SRIS-0903

Lightweight Insulating Concrete Roof Insulation Systems have proven to be valuable in meeting sustainable building objectives by reducing mechanical and thermal stresses on the roof membrane resulting in increased service life.

A substrate's heat capacity directly affects the temperature of the roof membrane it is in contact with. Heat capacity is the amount of heat an object can hold. Rigid foam plastic board stock insulations with high R-values are intended to decrease heat transfer between the interior and exterior of a building. They have less ability to absorb and release heat than traditional substrates such as wood and concrete. As a result, the roof membrane is exposed to higher heat for longer periods of time. Increasing the membrane temperature 18°F (10°C) doubles the aging rate (The Arrhenius Equation) of the roof membrane. Thus, using a substrate with a high heat capacity helps to pull heat away from the roof membrane.

The "thermal inertia" or mass effect of light weight insulating concrete roof insulation systems also reduces extreme temperature fluctuations and the resulting thermal stresses that cause membrane fatigue failure. The graph below shows the thermal lag provided by lightweight insulting concrete roof insulation versus polyisocyanurate systems. This has the added benefit of reducing fluctuations in HVAC loading requirements.



At each of the circled locations, where the curves display a membrane temperature difference of 18°F (10°C), the membrane aging rate doubles, as defined by the Arrhenius Equation.