

MISCELLANEOUS PROPERTIES OF CALCIUM SILICATE UNITS

On occasion we have received requests for information regarding certain calcium silicate masonry unit properties that are not published in our literature. These include Coefficient of Thermal Expansion, R-value, Sound Transmission Class Rating, Fire Resistance, Initial Rate of Absorption and Saturation Coefficient.

Coefficient of Thermal Expansion is a measure of the movement of materials for a given change in temperature. It is expressed in units of change in length per incremental change in temperature. It is a key factor in designing the movement (expansion) joint system for the masonry veneer. Designers who wish to engineer the movement joint system rather than simply utilizing the empirical guidelines provided would require this value.

While changes in moisture content will also cause cyclical movements to occur, with a drainage wall system, moisture changes within the units and the resultant dimensional changes should be insignificant over the life of the building.

The average coefficient of thermal expansion for calcium silicate masonry units is $k = 4.3 \times 10^{-6} (F^{\circ})^{-1}$.

As an example, a 30 foot length of wall subjected to a 50 degree Fahrenheit increase in temperature will expand about 30 feet \times 50 $F^{\circ} \times 4.3 \times 10^{-6} (F^{\circ})^{-1}$ which works out to be only about 3/32 of an inch. The designer must then select the appropriate movement joint spacing, width and sealant to accommodate this overall movement.

R-Value is a measure of the thermal resistance of the material. The expected R-Value of a nominal 4" bed depth calcium silicate masonry unit is **0.42**. Because the unit is only one component of the wall system, the designer must consider the R-value of the wall system as a whole. The R-value of the component materials are not necessarily additive.

The **Fire Resistance** of a single wythe calcium silicate wall is expected to be at least **one hour**. The overall resistance of the wall system can be significantly higher depending on the components within the wall system.

Saturation coefficient (a.k.a. cold boil ratio) is used in practice as a quick indicator of susceptibility to freeze-thaw deterioration. It is a ratio of the total (24-hour) absorption in cold water to the total (5-hour) absorption in boiling water. It is held that absorption during 5 hours of boiling completely fills the total void space of the masonry specimen; whereas, the absorption of cold water in 24 hours usually does not. This ratio is thus an indirect indication of pore space available to accommodate expansion of absorbed water upon freezing.

Although 10% free space is thought to be sufficient to allow for the freezing expansion, and thus a maximum saturation coefficient of 0.90, there are no calcium silicate-specific testing results that demonstrate a known relationship between saturation coefficient and freeze-thaw durability.

The average saturation coefficient of Arriscraft calcium silicate units is **0.75**

Arriscraft has a long history of directly testing selections from all production runs for freeze-thaw durability. In a period of one week samples are put through 56 cycles of freeze and thaw. This has proven to be a very reliable indication of quality and durability. Freeze-thaw durability of our calcium silicate masonry units has also been tested by an independent laboratory. Following these tests the samples remain in excellent condition with negligible loss in weight and no sign of deterioration.

The **Sound Transmission Class** (STC) rating of solid calcium silicate masonry units such as Renaissance[®] is expected to be at least **45 decibels**. This rating has been estimated from various industry publications containing data on solid masonry units of the same thickness and mass as Renaissance[®]. STC ratings are directly dependent on the mass of the wall.