General Description of Key Physical Properties As Described in ASTM C-534 AND ASTM C-1427

ASTM C-534
(Standard Specification for Preformed Flexible **Elastomeric** Cellular Thermal Insulation in Sheet and Tubular Form)

ASTM C-1427

(Standard Specification for Preformed **Polyolefin** Cellular Thermal Insulation in Sheet and Tubular Form)

Thermal Conductivity (k factor)

The thermal conductivity of a material, commonly referred to as the k factor, is a measure of the product's ability to conduct heat. Since the purpose of insulation is to retard heat loss or gain, the lower the k factor the better the insulation. k factor is measured in units of *BTU-inch/hour square-foot thickness*. That is, it measures the steady state heat flux in BTU (British Thermal Units) for 1 inch of insulation in a 1-hour time period over a square foot area. This value is multiplied by the difference in the temperature between the two surfaces (degrees F) to obtain the total BTU loss per square foot. Thus the lower the k value, the fewer BTUs is lost.

Thermal conductivity is measured by several test methods, all employing the same basic principle. The insulation material is placed between two heated platens of different temperatures and the heat gain of one of the platens is measured. ASTM C177 (Guarded Hot Plate Method) and ASTM C518 (Heat Flow Meter Method) are widely used for flat sheet and ASTM C335 (Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation) is used for tubular products. The measurements are commonly conducted at a 75° F mean temperature.

Water Vapor Permeability (wvt)

Water vapor transmission (wvt), is the measure of water-moisture vapor (not water) passed through the product under a given set of environmental conditions. Water vapor transmission is important because as the product picks up moisture, a good conductor of heat, it will correspondingly lose its ability to insulate. All our insulation products are closed- cell foams. This closed-cell structure is an inherent moisture vapor retarder. No additional jacketing is required.

The effects of water vapor transmission on closed cell insulation products occur over a long period of time. Water vapor transmission is measured in *perm – in*. The units are a measure of the amount of moisture (measured in terms of weight gain by a desiccant) gained over a period of time after the transmittance has reached a steady state. The lower the value the better. ASTM E96 (desiccant (dry cup) method/50% RH) is most commonly used to measure this property.

Water Absorption

Water absorption is the measure of the product's ability to absorb water after immersion over a set period of time and under specific conditions. It is typically measured in units of percentage weight gain based on the product's original weight, per ASTM test method D1056. Water is an excellent conductor of heat, thus if a product absorbs water it will correspondingly lose its insulation value. It is advantageous to use insulation products that do not readily absorb water. Our closed cell insulation products have low water absorption values.

The latest revision of ASTM C534 recommends the use of ASTM C209 (Test Methods for Cellulosic Fiber Insulating Board) as the method to measure water absorption which utilizes a unit of measure as weight gain per given surface area. Past versions of ASTM C534 recommended the use of ASTM D1056. Both are measures of water absorption, but the units of measure are significantly different. Varying the exposure times and pressure in the test methods and varying the area of the sample and weight in the calculations is not uncommon. Care must be taken not to confuse information from different test methods measuring the same property.

Dimensional Stability

Dimensional stability is a measure of the product resistance to shrinkage when exposed to elevated temperatures. ASTM C534 calls for a 7-day at 200°F test and requires less than 7% linear shrinkage. This is a critical property when considering the stresses that may be seen on butt joints and seams. Linear shrinkage and the tensile modulus of the product must be considered together.

Ozone Resistance

Ozone resistance is a measure of the products ability to resist the degradation effects of ozone in the atmosphere. Ozone causes many materials to increase in hardness and crack over time. As a general rule, it is not a factor in most insulation applications. However, parts of the world with high populations and lack of emission controls have higher ozone concentrations, which may cause a concern. In addition, some types of equipment generate ozone i.e. electric motors, high voltage electrical equipment, mercury vapor lamps and automobiles.

All **NOMACO Insualtion** products meet the requirements of ASTM D1171 at 50-pphm ozone concentration, which is acceptable for most insulation applications. Ozone and UV (ultra violet radiation) are not the same and should not be confused.