



Density does matter

Thermal conductivity and density

Thermal conductivity (K) is the measure of heat transference given in K. (W/m K or Btu.in/ft².hr. oF). Thermal conductivity is one of the most important properties of an insulating material and must always be considered first when selecting a product.

The increase in thermal conductivity is faster when density is lower and operation temperatures are higher.

The insulation capacity of mineral rock wool is based on the low thermal conductivity of air. Heat transference is the transport of energy from a high temperature region to one of low temperature.

Heat can be transferred in three ways:

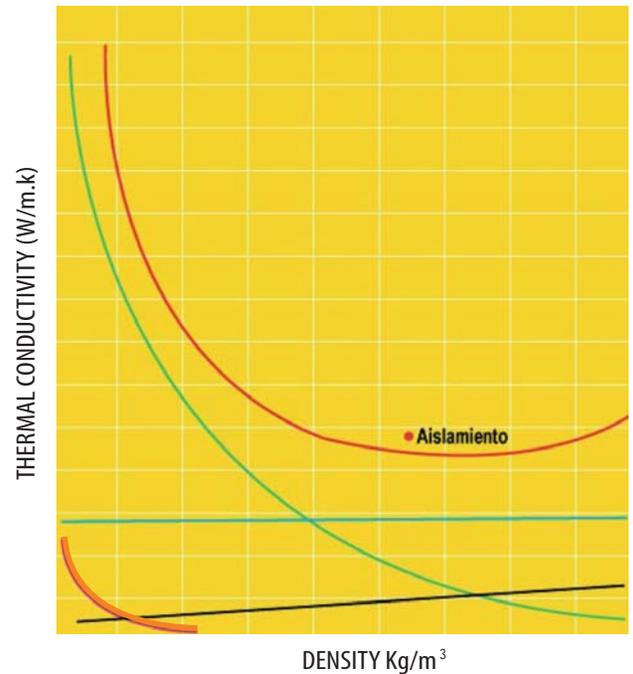
1. By conduction: from particle to particle
2. By convection: by means of a flow process
3. By radiation: by radiant energy

Thermal conductivity (K) varies with temperature, fiber structure, distribution and fiber orientation, percentage of non fibrous particles and the insulation density.

Total thermal conductivity is the product of (4) components:

- Static air thermal conductivity in the cavities of fibers
- Radiation
- Thermal conductivity through fibers
- Convection

The main relation among these components at a given temperature is shown in the following graphic:



$$\lambda_{\text{Aislamiento}} = \lambda_{\text{Aire}} + \lambda_{\text{Convección}} + \lambda_{\text{Radiación}} + \lambda_{\text{Fibras}}$$

■ $\lambda_{\text{Aislamiento}}$
 ■ λ_{Aire}
 ■ $\lambda_{\text{Radiación}}$
 ■ $\lambda_{\text{Convección}}$
 ■ λ_{Fibras}



The mineral rock wool fibers are layed out vertically, horizontally and diagonally, giving as a result, a multidirectional weave that assures high rigidity that prevails throughout time. This is a very important factor, because if an insulator allows its thickness to be modified, then its insulating capacity would be modified as well.

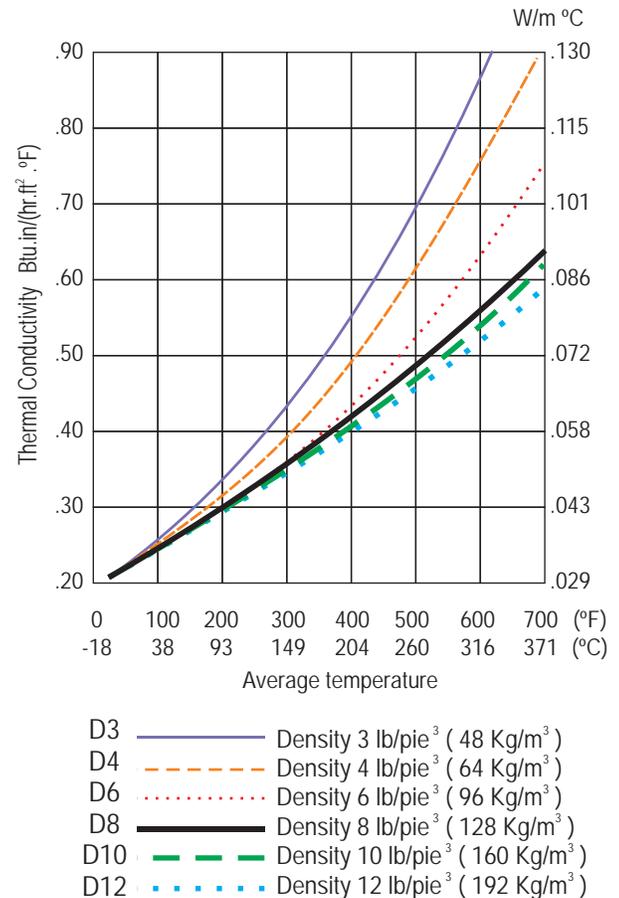
STONEWOOL HAVE LOWEST IMPACT ON ENVIRONMENT

There is a very close relation between the density of an insulator and its coefficient of thermal conductivity (K). If the density in materials is low, the air cells are of great size, which means a relatively high coefficient of conductivity.

As density increases, the size of the air chambers is reduced until they reach their ideal situation. At this moment, the lowest value of thermal conductivity coefficient is reached (K). A greater compression of the product, increasing its density, would eliminate the air cells producing an increase in the coefficient. The fewer and smaller the air cells are, the more efficient the insulator will be.

The resistance to air flow is an indicator of the quality of insulation in respect to its thermal and acoustic properties. Still air (or better yet, some gases), is the element which represents the power of insulation better. For this reason, insulating materials contain numerous air cells which are prisoned amongst the solid elements that constitute them.

The following is the thermal conductivity of fibrous materials at different densities in function of average temperatures.



Thermal Behavior (Unidades Inglesas)

Temperatura promedio (°F)	Btu.in/(hr.ft ² .°F)					
	D3	D4	D6	D8	D10	D12
25	0.21	0.21	0.22	0.22	0.22	0.22
75	0.25	0.24	0.23	0.23	0.23	0.23
100	0.27	0.26	0.25	0.25	0.25	0.25
200	0.34	0.32	0.30	0.30	0.30	0.30
300	0.43	0.40	0.36	0.36	0.35	0.35
400	0.55	0.49	0.42	0.42	0.41	0.40
500	0.70	0.62	0.53	0.49	0.47	0.46
600	0.87	0.75	0.63	0.56	0.54	0.52
700	1.06	0.90	0.75	0.64	0.62	0.59

Thermal Behavior (Sistema Internacional)

Temperatura promedio (°F)	W/m.°C					
	D3	D4	D6	D8	D10	D12
-4	0.030	0.030	0.032	0.032	0.032	0.032
24	0.036	0.035	0.033	0.033	0.033	0.033
38	0.039	0.037	0.036	0.036	0.036	0.036
93	0.049	0.046	0.043	0.043	0.043	0.043
149	0.062	0.058	0.052	0.052	0.050	0.050
204	0.079	0.071	0.061	0.061	0.059	0.058
260	0.101	0.089	0.076	0.071	0.068	0.066
316	0.125	0.108	0.091	0.081	0.078	0.075
371	0.153	0.130	0.108	0.092	0.089	0.085



Oficina principal

Calle 46N° 71-121
 PBX: (574) 274 4149.
 Email: info@calorcol.com
 Copacabana - Antioquia - Colombia

Centros de distribución

Bogotá: Cra 97 N° 24C - 75 Bg 40 Fontibón PBX (571) 415 9302 Cel: 316 5272521

Barranquilla:
 Cel. 316 5278492

Bucaramanga:
 Cel. 316 2550568

Cali:
 Cel. 316 5278486

Pereira:
 Cel. 316 8751095

Exportaciones:
 Exportaciones@calorcol.com

NIT: 811034480-0