STS

Thermal Insulation Guide

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Thermal Insulation

Thermal conductivity with symbol "K", and with unit of measurement as W/m K. Thermal Conductivity is the measure of a materials ability to transmit heat.

Generally denser materials have a high thermal conductivity value and are inefficient thermal insulating materials.
Light-weight materials have low conductivity and act as effective thermal insulating materials. The lower the "K" value of a material, the better its insulating efficiency.

The R-value is a measure of thermal resistance used in the building and construction industry. The R-value being discussed is the unit thermal resistance. This is used for a unit value of any particular material. It is expressed as the thickness of the material divided by the thermal conductivity.

Thermal Resistance

Thermal resistance is the measure of the resistance to the passage of heat offered by the thickness of a material, and is expressed as m^2K/W. Thermal resistance of material is obtained by dividing thickness of material in meter by its thermal conductivity (K) value. (R=Thickness in meters / K value).

R (total) of the Partition = R value of individual elements (Boards, insulation, air inside and air outside).

Thermal Transmittance (u)

Thermal transmittance of a building element is a property of its whole construction including air spaces and is the measure of its ability to transmit heat under steady state condition. It is calculated by taking reciprocal of the sum of all the individual thermal resistances. It is expressed as W/m^2K.
The lower the (U) value of the element, the better its thermal insulation.
U value = 1 / R1+R2+R3+... (where R1, R2, R3... are thermal resistance of different elements of building /construction).

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Conversion factor for thermal insulation calculation

The conversion between SI and US units of R-value is
1 h•ft²•°F/Btu = 0.176110 K•m²/W OR
1 K•m²⁄W = 5.678263 h•ft²•°F/Btu.
More simply, R-values may be converted from SI to US units through the following, where RSI is given in metric units. R-value (US) = RSI x 5.678263337
Or converted from US units to SI units, where R-value is given in imperial units.
RSI (SI) = R-value x 0.1761101838.

Calculation of thermal resistance (r) & thermal transmittance (u) thermal conductivity (k) of building materials.

Material	K W/mts. ° K
STS Construction Board	0.2435
Rockwool	0.045
Plaster board	0.170
Brick dry	0.807
Common brick wall	1.154
Concrete	1.442
Fibre board	0.052
Glass sheet	1.053
Pokystyrene EPQ (expanded)	0.035
Polyurethane PUF (foam)	0.024
Plywood	0.138

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STS 118 minute Timber Stud Build-Up

STS 12mm Construction Board, single layer either side of timber stud
Stud detail: C16 Dry Graded Timber 95mm x 45mm
Stud Spacing: 400mm vertical centres
Insulation: Rockwool RWA45 Slab
Total Wall Thickness: 119mm

R Value calculation of STS 118 minute Build-Up:
Components:

Thermal Resistance (R) of STS 12mm Construction Board	= 0.012/0.172
Thermal Resistance (R) of Rockwool RWA45 Slab	= 0.95/0.035
Thereform, R total	= 0.0698 + 27.143 + 0.0698 = 27.283m²K/W
Thermal transmittance (U)	= 1/27.283 = 0.0367 W/m²K

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STS Steel Stud Partition Build-Up

STS 12mm Construction Board, single layer either side of steel stud

Stud detail:	'C' Shaped Galvanised steel stud 92 x 35 x 0.5mm
	Galvanised steel track 94 x 25 x 0.5mm
Stud Spacing:	600mm vertial & 600mm horizontal centres
Insulation:	Rockwool RWA45 Slab
Total Wall Thickness:	118mm

R Value calculation of STS Steel Stud Partition Build-Up:

Components:

Thermal Resistance (R) of STS 12mm Construction Board	= 0.012/0.172
Thermal Resistance (R) of Rockwool RWA45 Slab	= 0.92/0.035
Thereform, R total	= 0.0698 + 27.143 + 0.0698 = 27.283m²K/W
Thermal transmittance (U)	= 1/27.283 = 0.0367 W/m²K

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