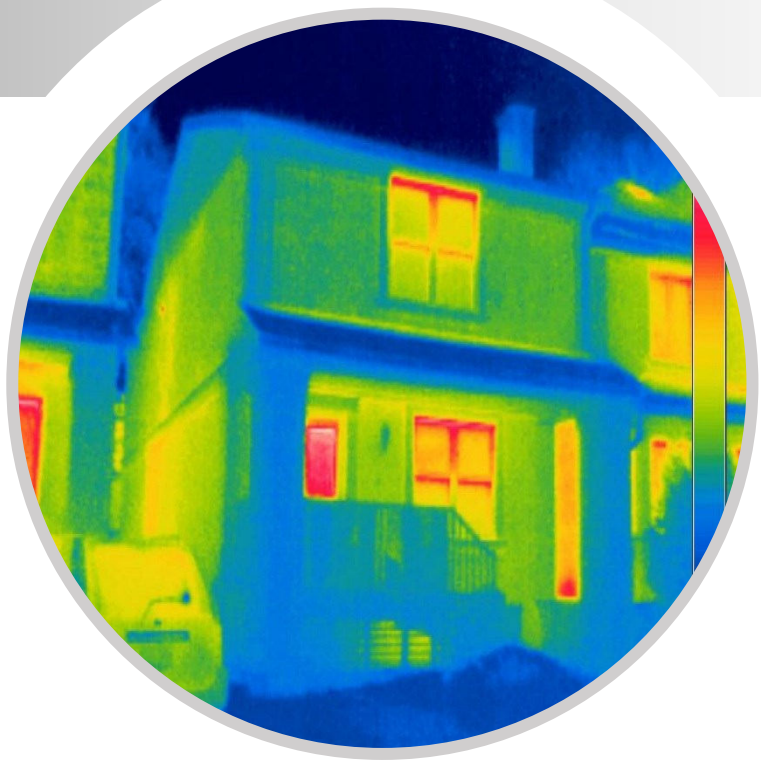

TECHNICAL NOTE #01

# Thermal Conductivity of Clay Brick Masonry

Thermal Conductivity is a measure of the heat flow through a homogenous sample of material of a known thickness, when a known temperature difference is applied across two surfaces. This technical note outlines the results of several masonry walling systems tested to ASTMC1363, to confirm the thermal conductivity values used in calculations of thermal resistance.


## TECHNICAL CONTRIBUTOR

CBA Technical Team
Cermalab


THE VOICE OF THE CLAY BRICK INDUSTRY
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# THERMAL CONDUCTIVITY OF CLAY BRICK MASONRY

## EXECUTIVE SUMMARY

### BACKGROUND

This Technical Note was developed on behalf of the Clay Brick Association of South Africa in response to a call for data from the CSIR (Council Scientific & Industrial Research).

The CBA Technical Committee plans further testing programmes at the Thermal Testing Laboratory in order to confirm the thermal conductivity values which are widely published and used in calculations of thermal resistance and transmittance in buildings.

A review of the ASHRAE fundamentals and NBRI/CSIR reports was undertaken, and results from ASTM C1363 testing compared with the key results as tabulated.

### DEFINITION OF THERMAL CONDUCTIVITY

The Thermal Conductivity co-efficient (k-value or λ-(lambda) value) of a material is specific to that material and it is a measured result of tests conducted in accordance with one of the methods set out below.

Thermal Conductivity is a measure of the heat flow through a homogenous sample of material of a known thickness, when a known temperature difference is applied across two surfaces. The result is expressed as Watts per meter per degree Kelvin.

### TEST METHODS AND STANDARDS

Building materials thermal conductivity is tested in accordance with ASTM C177 by guarded hot-plate apparatus, ASTM C518 by heat flow meter apparatus, and ASTM C1363 by guarded hot-box.

### PUBLISHED INDEPENDENT RESULTS

Suppliers have had products tested to the above test methods and the results have been published by independent sources such as the American Society of Heating Refrigeration and Air-conditioning Engineering in the Fundamentals Handbook, and various South African Council Scientific & Industrial Research (CSIR) publications.

The Clay Brick Association has had a number of masonry walling systems tested to ASTMC1363 in the Thermal Test Laboratory in Pretoria. Further testing is planned in order to categorise brickwork by a density range and supply a range of thermal conductivities corresponding.

**Selected results of the test programme and published results are set out below:**

| Section | Material | Thickness (mm)[6] | Density (Kg/m³) | Specific Heat Capacity (MJ/kg.K) | Conductivity (W/m.K) |
|---|---|---|---|---|---|
| Brick[1][2] | Clay brick | 114 | 1 826 | 0.800 | 0.82 |
| Brick[5] | Clay common | | 1 760 | 0.800 | |
| Solid masonry Walling[4] | Clay face brick with 15mm plastered common internal | 230 | | | 0.790 |
| Plaster [3] | Cement plaster | 13 | 1860 | 0.840 | 0.72 |

## NOTES

1. Figures are as per NBRI Publication X-Bou 2 of 1971 or K61 of 1982
2. Figures for clay bricks as per ASHRAE & NBRI are very similar
3. Figures are as per The ASHRAE Fundamentals Handbook
4. Thermal Test Laboratory result
5. Insulation handbook
6. Thermal conductivity is independent of thickness

## COMMENTS AND CONCLUSIONS

The testing of Clay Brick Masonry walling for thermal conductivity is in broad agreement with other published data and the above co-efficient are suitable for thermal resistance calculations as per Fourier's law or SANS/ISO 6946.

**For further information:**
The Clay Brick Association of South Africa
Website: www.claybrick.org