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UNIVERSITY OF TECHNOLOGY

Litecrete (NZ) Pty

Thermal Conductivity Assessment

Submitted by:
Mr Glen Lawson
B.App.Sc (Physics) Mem. AIRAH

CURTIN ENGINEERING, SCIENCE & COMPUTING

Divisional Consultancy Coordination Unit

Curtin University of Technology

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REPORT ON: Thermal Conductivity Assessment -Composite Aerated Concrete

FOR: Litecrete (NZ) Ltd

PREPARED BY:

Mr Glen Lawson
B.App.Sc (Physics) Mem. AIRAH
Department of Applied Physics
Curtin University of Technology

This Report has been written and tests performed in accordance with AS/NZS 4859.1

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1.0 INTRODUCTION

Client: Litecrete (NZ) Ltd
Sample description: Composite /aerated concrete

2.0 TEST PROCEDURE

Measurements were made using a Double Sided Guarded Hotplate Apparatus in close accordance with ASTM C-177, capable of accurate and reproducible measurements on a wide variety of insulating materials including loose fill cellulose, fibrous materials, solids etc.

The Guarded Hot Plate Apparatus is considered a primary (or absolute) method and is generally interchangeable with the Heat Flow Meter Apparatus used in other laboratories.
Two identical samples are located between two isothermal cold surface assemblies and a central guarded hot plate composed of a metered section in the center thermally isolated from a concentric guarded area.
The spacing between the plates is variable to accommodate a range of test thicknesses. Maximum sample thickness is dependant on the type of material and its thermal properties.
Heat is applied to one face of each sample and the other side is cooled using a precision temperature controlled recirculation water cooler system.
Once a steady state thermal condition is reached and maintained various parameters are measured in triplicate and thermal conductivity calculated.
The Apparatus can be operated with either vertical or horizontal heat flow directions. Unless requested and reported the standard heat flow direction is vertical.
For specimens of adequately high density (i.e. greater than 5-10 kg/m2) the relationship between thermal conductivity and thermal resistance is simply:
$R=t/k$.
The R Value can be calculated for any reasonable thickness using this formula.

ASTM C-177 is the standard pertaining to the use and operation of the Guarded Hot Plate Apparatus.
In addition to this we reference other specific material standards with minor modifications such as:
ASTM C-653 “Determination of the Thermal Resistance of Low Density Blanket Type Mineral Fibre Insulation (Specifically using procedure C, average of three results at D_{av}).
ASTM C-687 for loose fill materials such as cellulose fibre and
ASTM C-167 for guidance on thickness and density measurements.

Any testing performed to AS/NZ 4859.1 rather than ASTM C-177 may require additional sample preparation and is costed based on client discussion and requirements.

Certification of Analysis

This report has been written and tests performed in accordance with AS/NZ 4859.1

Measurement reference number		0118,0119,0120
Calibration Reference material		NIST SRM 1453
Sample		
Specimen For Test ID (SFT)		"PH" Composite concrete.
Metering Area (A)	=	0.04 m^2
Sample Thickness (t)	=	37.7 +/- 0.5 mm
Sample Density	=	1217 +/- 1 kg/m3
Temperature of cold plate (T_c)	=	15.3 +/- 0.1 deg
Temperature of hot plate (T_h)	=	28.9 +/- 0.1 deg
Temperature difference (Delta T)	=	13.6 +/- 0.2 deg
Mean Temperature	=	22.1 +/- 0.1 deg
Power to hot plate (VI)	=	(15.43)*(0.592) Watts

Thermal Conductivity (k)	=	0.32 +/- 0.003 $Wm^{-1}K^{-1}$

Thermal Resistance (R) @ 50mm	=t/k =	0.16 +/- 0.06 m^2KW^{-1}
("R value")		
at approx 2.7 % moisture content by weight		
(average of moisture content before and after test procedure)		

Ambient Temperature	=	21.0 deg
Ambient Humidity	=	51.3 %
Date of measurement		3/11/2005 - 17/11/2005