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Technical report

Results of the thermal testing of insulating cob mixes at Plymouth University

Plymouth University

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Results of the thermal testing of insulating cob mixes at Plymouth University

I. Using the Matrix

These are the mixes for the insulating cob as devised by ESITC and agreed by all partners at the technical meeting in Portsmouth in April.

Mix number	Soil	Fibre	Fibre content (%)	Water content (%)
1	UK3	Hemp shiv	50	65.6
2	UK3	Hemp shiv	50	107.3
3	UK3	Hemp shiv	25	107.3
4	UK3	Reed	25	107.3
5	FR3	Reed	25	131.3
6	FR3	Hemp shiv	25	131.3
7	UK4	Reed	25	62.1
8	UK4	Reed	50	62.1

Table 1. Matrix for thermal testing of insulating cob mixes.

NB. Mix number 8 was changed to 35% reed as it proved very difficult to make a consistent mix with 50% reed and the UK4 soil

II. Methodology

At Plymouth it was agreed to make and test three tiles of each mix. The tiles were made in moulds that equated to the specification of the Netzsch heat flow meter, and measured 300 x 300 x 70mm (natural shrinkage resulted in dry tiles that were about 290 x 290mm x 70mm)

The material was tamped down into the mould in layers by hand, until a uniform consistency was reached. This meant that the tiles with 50% fibre had a dry density of around 360kg/m³, and the mixes with 25% fibre had a density of 650 – 700kg/m³.

After being removed from the mould, each tile was oven dried at 40°C until they reached an equilibrium weight, where subsequent weighings at 24hour intervals were within 1% of each other.

The dry tiles were then remeasured, and prepared for testing in the Netzsch heat flow meter. Each tile was measured at three temperature settings: 0°C - 20°C, 10°C - 30°C and 20°C - 40°C. The results shown below are for the first setting (there was little difference between each setting).

III. Results

Mix no.	Material	Density	Conductivity
1	UK3 50% Shiv D1	358.3	0.10614
1	UK3 50% Shiv D2	359.9	0.10180
1	UK3 50% Shiv D3	349.1	0.10443
2	UK3 50% Shiv W1	351.9	0.10849
2	UK3 50% Shiv W2	363.0	0.10792
2	UK3 50% Shiv W3	362.2	0.11160
3	UK3 25% Shiv W1	736.1	0.19460
3	UK3 25% Shiv W2	709.7	0.21337
3	UK3 25% Shiv W3	712.5	0.21911
4	UK3 25% Reed W1	703.7	0.18683
4	UK3 25% Reed W2	688.7	0.18802
4	UK3 25% Reed W3	650.3	0.16907
5	FR3 25% Reed W1	662.5	0.17688
5	FR3 25% Reed W2	626.4	0.16739
5	FR3 25% Reed W3	646.1	0.17106
6	FR3 25% Shiv W1	672.6	0.18297
6	FR3 25% Shiv W2	712.2	0.18624
6	FR3 25% Shiv W3	703.9	0.20921
7	UK4 25% Reed W1	572.1	0.14777
7	UK4 25% Reed W2	640.4	0.16653
7	UK4 25% Reed W3	615.0	0.16485
8	UK4 35% Reed W1	550.9	0.14330
8	UK4 35% Reed W2	549.0	0.14975
8	UK4 35% Reed W3	528.7	0.13431

Table 2. Results of testing insulating mixes

The results can be plotted on a graph, showing the relationship between the density of the material and the conductivity:

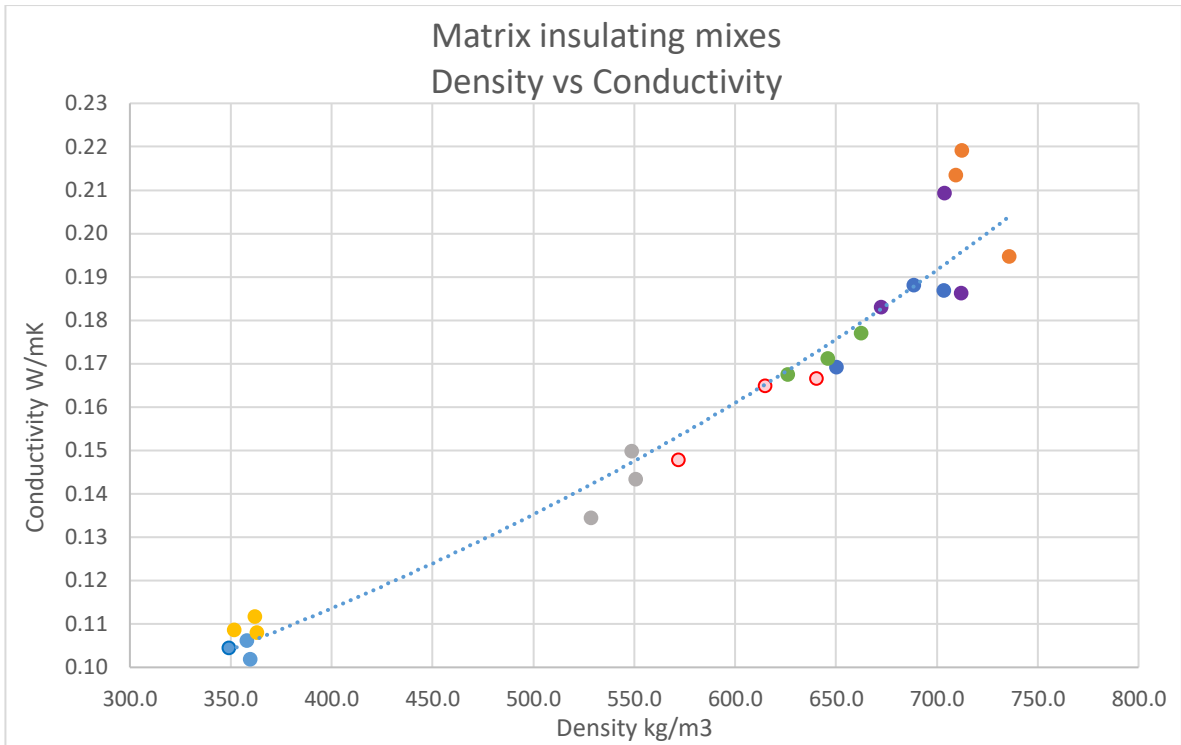


Fig.1 Results of Plymouth testing of insulating cob tiles

IV. Wider Context

These results can also be plotted on a second graph that includes other conductivity results from Plymouth.

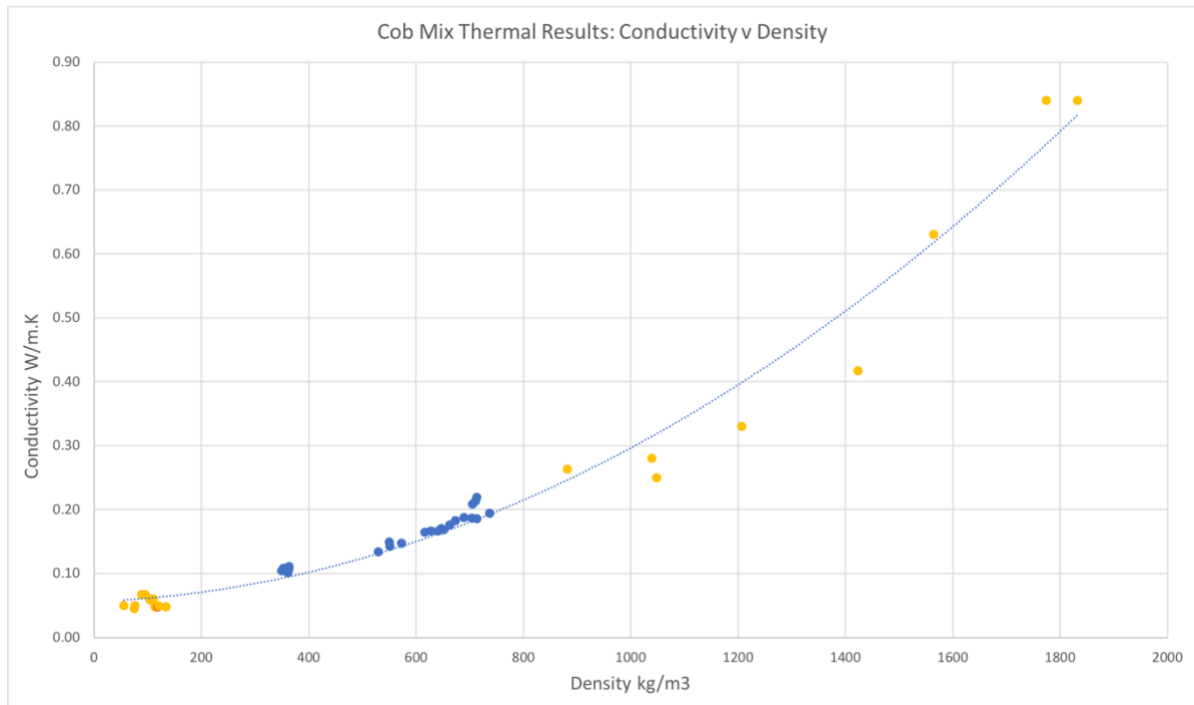


Fig.2 The results from Fig.1 shown in a wider context

In this graph, the results from Fig.1 are shown in blue, with a wider range of results shown in yellow to demonstrate where the insulating cob results fit on a longer curve. The yellow markers with a lower conductivity are from the testing of the different fibres

that were being considered for CobBauge, and the yellow markers with a higher conductivity are from a range of structural cob mixes.