**DATA DOCUMENTATION**

The data described here is that used in the Open Access paper “Application of expanded perlite encapsulated bacteria and growth media for self-healing concrete” by Alazhari et al (2017). https://doi.org/10.1016/j.conbuildmat.2017.11.086

**Mix composition**

Details of the design of the mortar mixes are provided in the paper.

This sheet provides all data relating to calculation of the spore and nutrient content of the seven mortar mixes.

The mortar mixes were produced using Portland fly ash cement (CEM II/B-V), standard sand (BS EN 196-1) and tap water. The sand to cement ratio in the control mortar (MC) was 3.0 and the water to cement ratio was 0.5 by mass. Combinations of coated perlite with nutrients (CPN) and coated perlite with spores (CPS) were added to the concrete as self-healing agents as a combined replacement of 20% by volume of sand. In mortar M100 the sand was replaced with CPN only. In M90 to M50, a combination of CPN and CPS were added in ratios of 9:1, 4:1, 7:3, 3:2 and 1:1, respectively. The mix number reflects the percentage of CPN to total coated EP (CPS + CPN) by volume. This is reflected in Columns D and E.

The aggregate content (in volume) in terms of volume are given in columns G to I, where the total volume of sand is 0.813 $cm^3$ as determined by dividing the mass of sand (1350 g) by its loose bulk density (1660 $g/cm^3$).

This has been converted to relative mass in columns K to M by multiplying by the loose bulk density. The loose bulk density of the CPN and CPS were 665 $g/cm^3$ and 625 $g/cm^3$ respectively.

Based on the known ca-acetate, YE and spore content of CPN and CPS the actual ca-acetate, YE and spore content of each mix can then be calculated as given in columns P, Q and R. The spore content is based on a calculation that 1 g of spores contains $2.6 \times 10^{12}$ spores.

**Particle size distribution**

The cumulative percentage of each of the two types of perlite passing the 8 mm, 4 mm, 2 mm, 1 mm, 0.5 mm, 0.25 mm and 0.2 mm sieves is given in this sheet.

**Optical density**

Spore germination in the three growth media was determined by a qualitative procedure involving the percentage decrease in $OD_{600}$ (optical density measurement at 600 nm) of spore suspensions during germination as described in the paper. Sample solutions were obtained every two hours up to eight hours and overnight.

The optical densities are given in Columns D to F at times from 0 to 29 hours.

**Carbonate productivity**

As described in the paper: "…from the cultures of *B. pseudofirmus*, ten-fold serial dilutions were taken to obtain samples with cells (CFU) ranging from $7.4 \times 10^9$ to $7.4 \times 10^{10}$ ($7.4 \times 10^9$, $1.85 \times 10^{10}$, $3.7 \times 10^{10}$, $5.55 \times 10^{10}$, $7.4 \times 10^{10}$). Cells were added to 10 ml of each of the growth media (GM) (triplicates of each).

Column D gives the number of cells per ml of GM.

The approximate number of bacteria cells per g of calcium acetate for the carbonate productivity test is then calculated in Columns E to G by dividing through by the amount of calcium acetate in each GM (cells E7, F7 and G7) in g. The same values are given in mg in Columns M to O.

Calcite production was determined as described in the paper and the mean mass of carbonate crystals for each mix is given in Columns I to K (in mg).

The ratio of calcite to ca-acetate is given in Columns Q to S.

The theoretical values for $CaCO_3$ is based on the following equation:

$$Ca(C_4H_6O_4) + 4O_2 \rightarrow CaCO_3 + 3CO_2 + 3H_2O$$

Where the molecular mass of $CaCO_3$ is 100 and that of $Ca(C_4H_6O_4)$ [calcium acetate] is 158.

**Initial surface absorption**

The permeability of the concrete was measured using a scaled-down and slightly modified version of the initial surface absorption method in BS 1881-208, as previously described by Sharma et al [https://doi.org/10.1111/jam.13421], and as shown in the paper.

The initial surface absorption of each mix was obtained at 10 min, 30 min, 60 min and 120 min. The mean results are given in this worksheet. They are compared with the mean initial surface absorption of a control mix prior to cracking.