Discussion

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Oil permeability of hardened cement pastes and concretes*

A. J. Watson and C. C. Oyeka

Contribution by Philip H. Perkins
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I found the paper by Dr Watson and Dr Oyeka both interesting and informative. However, I would like to see information on the basis they used for the selection of the mix proportions for the concretes they tested.

The mix proportions used were interesting academically, but I wonder what relation they bear to concrete that is likely to be used in practice. It seems to me that the water/cement ratio would be limited to a

maximum of 0.48 to 0.50, and that the cement content would not be less than, say, 330 kg/m³, except in massive structures, and in any case would be unlikely to exceed about 400 kg/m³. I would welcome the authors' comments on these aspects.

With regard to workability, this would normally be determined by the need to compact the concrete 'fully' during its placement.

Reply by the author

I would like to thank Mr Perkins for his contribution discussing the paper by myself and Dr Oyeka concerning the basis of our selection of mix proportions for the concretes used in the investigation.

As far as I know, there are no published recommendations for the mix proportions of oil-retaining concrete and presumably most designers would use BS 5337 as a guide. We are continuing this work at Sheffield and one of our objectives is to assess the value of BS 5337 recommendations with regard to oil. For instance, we are looking at the flow of oil

through various crack widths. The cement content will influence the development of shrinkage cracks and also determine the pore structure of the hardened concrete. Part of our present investigation is also to find out in greater detail how pore structure, and hence mix proportions, influence permeability. For this reason we sometimes use 'unrealistic' mix proportions in order to emphasize effects upon permeability. In general the lower the water/cement ratio, the lower the porosity and some limit such as $w/c = 0.50$ is necessary.

*Pages 85-95 of *MCR* 115.