

Waterproof Concrete With Site Supervision Ltd

Because concrete isn't waterproof without experienced, close supervision.

Adding Steel Reinforcing Fibres to Waterproof, Structural Concrete.

The series of books, "Advanced Concrete Technology" has a long chapter about fibre reinforcement in the "Processes" volume.

Ideally, concrete reinforcement would take the full strain when the concrete cracks under load (the design usually limiting the crack width to 0.2mm). Steel bars are placed and tied in the direction they are to work. "Fibres tend to end up in a three-dimensional random distribution" p6/9

To take a sheet of A393 mesh as an example, it would have 5 no. 10mm bars in one direction per metre and another 5 no. 10mm bars in the other. So a square metre of mesh would have 10 linear metres of steel with a mass of 6.16Kgs.

We have used steel fibres twice. Once with 25Kgs of fibres to a cubic metre and once with 20Kgs. Basement walls are typically about 250mm thick so a quarter of a cubic metre to each square metre. A quarter of 25Kgs is very nearly exactly 6.16Kgs, so perhaps it is true to say that this many fibres replace 1 sheet of A393?



The problem is with the random distribution. The fibres could not be as strong in the same two directions as the mesh. "The main benefits in uniaxial tension result from the control of crack widths" p6/11.

Therefore a slab or retaining wall will always need steel bar reinforcement though you might be able to replace much of it with fibres.

Cost.

The fibres we used were Dramix RC 65/35 BN and they cost over £1 a Kg by the time we had paid delivery, so about £1200 a tonne. That compares to about £550 a tonne for rebar. Sometimes mesh costs the same and sometimes a bit more.

Mesh does not need much tying. It does not require a professional to fix it, though cut and bent bars might do.

So you have to conclude that fibres are expensive.

ICF.

However, there are times when it is difficult to tie steel, for instance inside most Insulating Concrete Formwork.

THE EXCEPTION IS POLARWALL WHICH I CAN SUPPLY IN A SPECIAL WATERPROOF CONCRETE FORM.

Mix and Application.

“Use a relatively high proportion of fines” (most waterproof concrete has extra cement and is over-sanded so that requirement is met).

“limit the aggregate .. larger than 14mm” (we tend to specify 10mm maximum aggregate in narrower walls so that we can reduce the pumping pipe to 75mm diameter in order that we can deliver concrete properly to the bottom of the wall).

“Free water cement ratios of less than 0.55 are preferable” (requirement met).

“workability is commonly improved by the addition of plasticisers or super plasticisers to give slumps of more than 100mm.”

“Generally the fibres are added last to the fresh concrete”

My Experience.

I am adding plasticiser and waterproofer to concrete to make it workable and waterproof frequently. I would consider myself more experienced than just about anyone else about to add fibres for the first time. If I had a problem I would think you would have a worse problem.

When I bought the fibres the Dramix chap mentioned that they dry the concrete out a bit because the extra surface area you are adding to the concrete will be coated in liquid removing liquid from the remainder of the mix.

- He wasn't wrong.
- The fibres stiffened the concrete considerably.
- I was caught out quite badly load after load.
- London Concrete's delivery tickets did not state how much water was in the mix already. I did not dare add more.
- I tried adding the fibres before the chemicals but the mix was so dry that the fibres did not distribute themselves. They formed cricket ball-sized clumps of solid fibres.
- Later loads I added more plasticiser first but it still wasn't workable enough for the pump operator.
- I added a drop of water as well and the concrete suddenly lost all cohesion.
- We had to use it but it burst the formwork.
- We moved along and it burst it again.
- I sent the pump away with the job half done and the client upset (to say nothing of the men expected to clear up about a tonne of concrete off the basement floor).



We finished the wall another day and I used the same fibres on another job soon afterwards. These second two pours went fine. I got the concrete supplier to tell me what water could still be added to the mix without exceeding 0.5.

I added it then I added a strong dose of super-plasticiser and both pours went well. It just took a bit of experience first.

So please beware!

© Waterproof Concrete With Site Supervision Ltd 2011.
www.waterproofconcrete.co.uk