



HANDLING PROPERTIES OF FRESH METASTAR™ CONCRETE

MetaStar is a hydrophilic powder, and easily disperses in water. Because of its high surface area it generally has the effect of increasing the viscosity of wet concrete.

For example, **MetaStar** might influence the water/cement ratio or the bleeding and compaction properties, depending on the exact formulation of the concrete. It is sometimes advantageous that **MetaStar** can be used to increase "stickiness". The viscosity of **MetaStar** concrete is controlled by the normal methods: e.g. by adjusting the dose and type of superplasticiser or by using coarser grades of sand.

MIXING WITH METASTAR

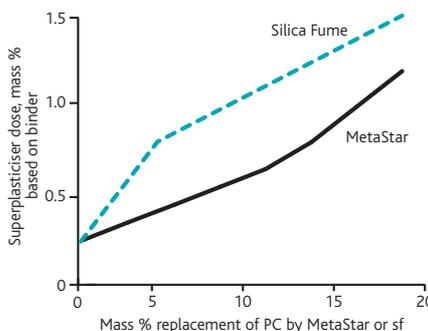
Lump or powder **MetaStar** readily disperses in water to give an agglomerate-free suspension of particles averaging 2 micrometers in diameter. In the case of wet concrete, **MetaStar** powder can be added at any convenient stage - even as the final ingredient into a ready mixed concrete lorry. Mixing can be gentle, but it is important that mixing should be thorough in order to distribute the **MetaStar** evenly. With dry-mix concrete it is more difficult to achieve even distribution so it may be helpful to pre-mix **MetaStar** with the Portland cement.

WATER/CEMENT RATIO

If no superplasticiser is used, it may be necessary to increase the water/cement ratio slightly in order to maintain the required compaction factor. For example when **MetaStar** replaces 10 mass% of the Portland cement, the w/c ratio increases from 0.67 to 0.71 for a constant compaction factor of 0.90. Table 1 gives data for other **MetaStar** replacement levels.

FIGURE 1: Superplasticiser dose required for 75mm slump, comparing silica fume and **MetaStar** concretes

Data courtesy of University of Dundee



Mix design: 410 kg binder/m³,
0.45 water/binder ratio

SUPERPLASTICISER DOSE

If low w/c ratios are specified, **MetaStar** requires a higher dose of superplasticiser to maintain a constant slump, as illustrated in Figure 1. In this example, **MetaStar** concrete requires less superplasticiser than does the equivalent silica fume concrete.

TABLE 1: Effect of **MetaStar** on concrete workability and strength

% substitution of PC by MetaStar	Compaction factor	Water/binder ratio	Density (kg/m ³)	Compressive strength at 28 days (N/mm ²)
0	0.90	0.67	2413	39.5
5	0.92	0.69	2396	41.5
10	0.91	0.71	2406	45.0
15	0.91	0.74	2400	45.0

BLEEDING

At low replacement levels (i.e. 5 mass % or less) **MetaStar** significantly improves the thixotropic properties of concrete, without greatly affecting its flow properties under shear. This means that the concrete is easy to level, surface finish is good and bleeding is greatly reduced.

COMPATIBILITY WITH ADDITIONS

MetaStar is compatible with all the common plasticisers & superplasticisers, such as lignosulphonates, sulphonated naphthalene-formaldehyde condensates, sulphonated melamine - formaldehyde condensates and the newer "comb" polymers.

MetaStar is compatible with air entraining agents and waterproofing aids. It may be possible to reduce slightly the doses which are required to attain specified performance in the final concrete.

MetaStar is also compatible with fibre additions such as polypropylene, glass and vegetable fibres. The bond between the fibre and the cementmatrix can be strengthened (because the interface zone is densified). Another benefit is that calcium hydroxide is less likely to chemically attack the fibre.

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