



TMC – Tinni Management Consulting

PAVEMENT INFORMATION NOTE

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OXIDE USE IN CONCRETE

The following is the response from George Smorchevski of BORAL to Matt Gunter and Michael McLeod from Bonville, who queried the effects of synthetic metallic colouring agents (oxides) on the performance of high-grade concretes, especially the durability.

"I can offer the following comments:

Iron Oxides (red, black and so on) are very fine particles of Iron Oxide which colour the concrete by enveloping individual particles of cement with a layer of colouring oxide. As I mentioned, they are very fine particles and should be allowed for in the mix design, as they are significantly finer than the particles of cement and will alter the performance of concrete.

It is not unusual to add around 5% of Oxides by weight of cement and this is a significant amount of additional fines.

If the total amount of water in the concrete mix - due to the increased amount of fines - has not changed (usually up) and the strength remains the same and not lower, then it may be safe to assume that the durability of concrete is not altered much by the addition of Oxide.

However, Yellow colours or colours that have a significant Yellow content usually increase the Water Demand (higher porosity) and lower the strength.

If you notice that the strength is lower or the water content is up, it may be advisable to conduct some tests such as:

1. AVPV - simple test for absorption and Porosity, done on normal 100x200mm cylinders
2. Sorptivity - RTA test performed on 100x100x350mm beams - simple and can be done by most Laboratories that have a 50%rH test room
3. NORD Test for Chloride Diffusion - a test that determines the amount and concentration profile of Chloride Ions that is able to penetrate into the depth of concrete - a more advanced test, but often specified on major Civil Projects (tunnels etc.
4. German Standard test for Water Penetration under pressure - DIN 1048 - uses 150mm specimens and forces water into the interior of concrete - may not need to do this one as Sorptivity and AVPV results can be sufficient.

Generally, if the water penetration is significantly increased, then the risk of Chloride and Sulphate ingress is higher and Durability may suffer. RTA guidelines on W/C and Sorptivity may be used as a guide.

Chloride Diffusion test then becomes important, as Durability is usually a concern as Chlorides reach the reinforcing steel and the potential for reo rusting becomes a reality."