

9300000 Materials for Concrete Repair.  
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

Barry Smith  
850-414-4776

Comments: (10-19-11) Horizontal Why is there no maximum time for initial setting under Rapid Hardening? With the removal of the compressive strength requirement at 3 hours, does that mean the initial is limited to 24 hours? Vertical Will the current products on the QPL for vertical need to be retested to FM 5-516? Is the intent to add 2 new categories to the QPL, High Performance and Ultra-high Performance? Will the pourable version of the vertical products be tested for all physical property requirements after being mixed to the manufacturer's recommendation for pourable? Have the products currently listed been tested this way (pourable)?

Response:

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Krishna Sandepudi, PhD, PE, SE  
[ksandepudi@g-and-o.com](mailto:ksandepudi@g-and-o.com)

Comments: (10-24-11) Section 930-2.2: the correction "~~0.02,048 lb/ft<sup>2</sup>~~ 100 g/m<sup>2</sup>" – suggest keeping lb/ft<sup>2</sup> and use 100 g/m<sup>2</sup> within parentheses, if it is essential.

Response:

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Tom Richardson  
[tom.richardson@basf.com](mailto:tom.richardson@basf.com)

Comments: (11-4-11) I'm still waiting for Technical Department to complete their review but one item I noticed was the new "Time of Setting (Initial), minutes in table 1 with Rapid Hardening set at minimum 30 minutes. Basically it's the same as very rapid at 29 minutes. Manufactures offer two rapid set formulas to adjust set time between the Winter and Summer temperature differences. This new change eliminates most hot weather (summer) formulations. I suggest you keep the 60 minutes to give a contractor time for placement in the Florida Summer heat. It's one thing to get a quick set but it's another to get it out of the bucket for placement.

Response:

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K.Zinck  
[ken.zinck@dot.state.fl.us](mailto:ken.zinck@dot.state.fl.us)

Comments: (11-16-11) Why are we using metric units in this section and US units in all other area of this spec?<<>>930-2.2 Material Supply, Storage, and Marking: The material shall be pre-proportioned including aggregate. Deliver products in original, unopened containers with manufacturer's name, date of manufacture, and clearly marked with all information described below, expiration date, product identification label and batch numbers. Store the material in an elevated dry and weather protected enclosure in full compliance with the manufacturer's recommendations. Material must be used within manufacturer's recommended shelf life. The material from which the containers are made shall have water vapor transmission not greater than 0.02,048 lb/ft<sup>2</sup>100 g/m<sup>2</sup> in 24 hours as determined in accordance with Procedure B of ASTM E-96.

Response:

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Fred Goodwin FICRI, FACI  
[fred.goodwin@basf.com](mailto:fred.goodwin@basf.com)

Comments: (11-17-11) **1.** BASF uses a lot code that includes traceability to date of manufacture. Does this comply? **2.** If manufacturing date is known and shelf life is published, is it also required to have the material expiration date explicitly stated? **3.** ASTM standards change. Suggest either listing a specific revision date so that the numbered sections do not change with subsequent revisions or listing the section headings such as "the initial reading shall be taken upon demolding and specimens then immediately placed into air storage with subsequent readings taken at 4, 7, 14, and 28 days." It is also necessary to specify the specimen dimensions as 1", 2" and 3" width and depth are allowed for 10" length prisms. This changes the surface to volume ratio which is a major influence on the rate of drying shrinkage. Another influence not covered in C157 is the use of mineral oil as a release agent (C157 refers to C490 where this comes from). Oil inhibits evaporation and can influence the test results. **4.** I think the intent is to have the strength of the repair material approximately match the strength of the substrate concrete. By setting minimum performance requirements in Table 1 and requiring rapid hardening for lower strength concrete and very rapid hardening for high strength concrete or low strength concrete, this does not achieve this objective. The strength development rate is really an indicator for return to service and is not really related to ultimate compressive strength. **5.** No where do I find it explicitly stated that C39 is to be used for concrete and C109 for mortars. Also cylinders generally produce about 80-85% of cube compressive strength due to the different L/Diameter ratio of 2:1 and cubes having 1:1:1 L/W/D. **6.** Need to designate specimen size. If one wants to have comparable shrinkage values between mortar and concrete use the same bar size which then fixes the surface area to volume ratio so everything dries at the same rate. If measurements on different bar sizes are carried out for a sufficient length of time (about 1 year) then the ultimate shrinkage becomes fairly close, but certainly not at 28 days. **7.** The properties of the substrate need to be defined in terms of strength and surface texture and moisture content. In slant shear bond testing, using a high strength substrate that is quite rough and in a SSD condition creates higher strength than using a low strength substrate that is smooth on the bonding surface and either very dry or saturated wet. Tensile adhesion testing per ASTM C1583 with defined substrate properties can then be reproduced in field applied materials as a performance check, slant shear cannot. Also C1583 has a better reproducibility than slant shear. **8.** This appears to be wrong. The flow/slump test time for very rapid materials should be at a shorter interval after mixing than for rapid hardening materials. The way it is written, I could be reaching initial set during the flow testing if my material had an allowed initial set of 10 minutes and I were testing the flow at 15 minutes. **9.** The water to cement ratio needs to be defined to control the resistivity. I could conceivably use a superplasticizer to achieve a very low W/C that would then produce high resistivity and still comply with the prescriptive and performance consistency requirements. **10.** Need to include a better definition or reference for 89 gradation aggregates as this is unclear to this reader.

Response:

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Daley, Carlton  
(407) 482-7819

Comments: (11-18-11) 1. Section Number omission; At the beginning of **Section 930-4**, the section number that start the **General** comments should have been 930-4.1, but it was remained as 930-3.1,a minor oversight I want to make sure is addressed if I am not mistaken. 2.Compressive Strength; In **Section 930-54.3, Table 2**, Physical Properties of Repair Materials for Vertical Surfaces. If we are using the 7-day strength (5000 psi) minimum requirements under “Ultra-high Performance” as the minimum cut-off for the 28-day strength (Greater than or equal to strength at 7 days). What happens if the minimum 7-day strength falls short of 5000 psi, would the 28-day strength minimum requirement still be based on the 7-day minimum? In other words, if the 7-day strength is not meeting the minimum requirement of 5000 psi, let’s say it’s at 4500 psi, should that be the minimum for the 28-day strength (Greater than or equal to strength at 7 days, 4500psi)?

Response:Comment #1, corrected, Spec’s Department.

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