


DATE: September 20, 2006 421-06-02

SUBJECT: Section 1042, Latex Modified Concrete
Section 711.3(e), Latex Emulsion Admixture

TO: All Assistant District Executives - Construction

FROM: Roger L. Apple, P.E., Acting Director 
Bureau of Construction and Materials

Recent placements of Latex Modified Concrete (LMC) overlays performed by several contractors in several Districts have resulted in substandard performance. In some cases, the LMC has flash set or achieved a false set resulting in the contractor not being able to satisfactorily finish the overlay. Other finished surfaces have not closed up under the finish rollers, drag pan or bull-float. Other overlays have cracked extensively requiring replacement by the prime contractor.

In all of the problematic placements, the latex emulsion was supplied by Noveon, Inc., 207 Telegraph Drive, Gastonia, NC. The product name is Styrofan 1186. Two samples of this manufacturer's latex emulsion lifted from recent placements failed to meet specification requirements. Noveon is listed in Bulletin 15 as a Provisional Approval which requires that the contractor or manufacturer notify MTD of any use of the Noveon emulsion. Because of the failures identified, Noveon has been moved to Level 3 Certification which requires increased Quality Control testing as well as testing performed by an independent laboratory. Noveon is responsible for correlating these test results and presenting them to the District and MTD for evaluation and approval prior to use. The District Materials Unit must coordinate their review of the test results with Patricia Miller of the Materials and Testing Division (MTD) at 717-787-2489.

In an effort to achieve quality latex overlays, the attached construction procedures representing best practices should be reviewed or addressed with both the prime contractor and LMC supplier (mobile mixer). These procedures will be incorporated into an existing section of the Project Office Manual, Section C-10-3 'Latex Modified Concrete Overlays on Bridge Decks' with the next revision.

Please direct any questions on testing of latex emulsions to David Kuniega at 717-787-3966 or dkuniega@state.pa.us, or any operational questions to Philip Micklitsch, P.E. at 570-368-4377 or pmicklitsc@state.pa.us.

This memorandum will be supplemented if MTD changes the Bulletin 15 status of Noveon, Inc.

Attachment

The following 'best practices' will be incorporated into the Project Office Manual, Section C-10-3 'Latex Modified Concrete Overlays on Bridge Decks' with the next revision.

- 1) Adhere to the requirement in Section 1042.2 for Compatibility Testing during the mix design process. Allow sufficient time to evaluate rather than just a few hours prior to placement at the time of mixer calibration. Constituent components can be sent to the laboratory of the emulsion manufacturer for evaluation. This should identify any mix designs with extreme flash set. Mixes that have consistently been placed without problem and have been field proven can be exempted from this process. The intended latex emulsion supplier must be identified by the LMC producer in sufficient time to permit the District to make any necessary arrangements for sampling and testing. Some combinations of specific sources of cement, latex emulsion, sand, and aggregate may cause flash set. Past experience has shown that changing one or more of these components can remedy the flash set problem.
- 2) Require careful control of sand and aggregate components. High minus 200 sieve material can drastically affect moisture demand. If not already tested by a concrete plant QC technician, run, or require the contractor to run, gradation tests on coarse and fine aggregates. Require that moisture tests be run immediately prior to placements to account for aggregate moistures. Require the contractor to tarp aggregate piles to shield from sun and rain. Require thorough mixing of any project storage piles to create uniform moistures prior to sampling and testing and use of the material. Do not allow mobile mixers to be charged with aggregates for longer than the 12-hour maximum permitted by the specifications. Shorter hold times are preferred. Require loaded mixers to be shielded from direct sun.
- 3) Require that mobile mixers be evacuated of any residual cement, latex, water, and aggregates. All aggregates and water must be purged. Any latex and/or cement that cannot specifically be accounted for by certification and history must be purged. Latex may be pumped off and recovered but cement is typically wasted as it is run through mixer to empty the bin. Mixers must be calibrated as specified in Section 1042.3(a) of the specifications. Require that a yield test be performed at calibration. Monitor the material produced for the yield test to assure the material remains workable for sufficient time to allow for proper placement and finishing. This is critical for the success of the placement and the quality of the finished surface, i.e., closure of the surface, reduction of surface tears, and proper grade.
- 4) The contractor must provide proper product certification for each latex tanker used on the project prior to use of the latex. Certificates of test results for Noveon's Stryofan 1186 must be reviewed by MTD prior to use on the project. Samples must be taken from each tanker load of emulsion and submitted to MTD. Any latex already in the mobile mixer when it arrives on the project must also be sampled if the Representative allows use of the material. Emulsion in tankers must be circulated prior to use on the project. Latex emulsion solids can settle out if allowed to sit undisturbed for several days. Tankers should be stored in shade, if possible, or covered with wet burlap or misting hoses to minimize emulsion temperatures. Do not allow any agents to be added to the latex emulsion in the field by anyone, including the manufacturer's representative.
- 5) Monitor raw cement temperatures and completed mix temperatures. Require the contractor to have the proper equipment to monitor surface evaporation as required using ACI 305R-91, Figure 2.1.5 nomograph. Mitigation measures to be taken when evaporation rates are excessive must be addressed in the QC Plan and available prior to the placement.

- 6) Conduct a pre-placement meeting to discuss the QC Plan and operational concerns with the prime contractor, subcontractor (if involved), LMC producer (mobile mixers), and inspection staff. Decide at this meeting if a technical representative is needed at the placement. Try to make the placement during hours of darkness, after the deck structure has lost the heat of the day and the before any significant heat from direct morning sunshine, preferably before 9:00 AM.
- 7) Do not permit LMC to be used in Type 3 repair areas placed concurrently with the overlay. Differential cure rates can contribute to surface cracking. Type 2 repairs can be placed concurrently with the overlay if they do not generally exceed 2" in depth. Encourage the use of modified Class AAA concrete for patches deeper than 2".
- 8) Assure that the discharge chute of the mobile mixer is as close as physically possible to the finishing machine. Allow sufficient space for workers conducting the brooming operation, wheelbarrows for the removal of spent LMC/aggregate, and spud vibrations of joints. Otherwise, assure that the mixing operation stays close enough to the finishing machine so there is no more than five minutes from when LMC is deposited on the deck to when the finishing operation begins.
- 9) Assure that curing covers are placed as soon as possible. A few burlap marks are preferable to drying shrinkage cracks. Burlap must be fully moistened but not dripping wet. Partially dampened burlap will wick water away from the surface of the overlay creating the potential for surface drying cracks. Cover with polyethylene sheeting as soon as possible but do not permit loss of moisture in the burlap cover to the atmosphere.