



M E M O R A N D U M

SUBJECT: Management Alert
Results of Core Testing for Concrete Panels
Silver Line Phase 2 (MA-20-0001)

DATE: August 16, 2019

FROM: OIG – Geoffrey A. Cherrington

TO: GMGR – Paul J. Wiedefeld

The Office of Inspector General (OIG) is providing this Management Alert (MA) because of safety concerns related to the manufacturing and installation of concrete panels related to Phase 2 of the Silver Line construction. In addition, OIG is also concerned that if not properly addressed, this matter will create extraordinary cost, maintenance and operational issues for this new line. We are bringing this to your attention at this time as a result of various dates publicized for the acceptance and operation of this new line.

OIG is conducting a review of certain issues surrounding the construction of Phase 2 of the Silver Line that may impact WMATA's acceptance of the project. As a result of the matters uncovered regarding approximately 1500 concrete panels manufactured by a subcontractor and installed throughout Package A of the project, Metropolitan Washington Airports Authority (MWAA) and its contractor decided to apply a silane solution to the panels in an attempt to mitigate moisture from permeating the panels manufactured by the subcontractor.

One of the concerns is that a subcontractor used unapproved aggregate in the concrete that will result in moisture penetrating into the panels from the surface. The presence of moisture could cause Alkali Silica Reaction (ASR). ASR in concrete is a reaction between certain siliceous constituents in the aggregate and the alkali-sodium and potassium hydroxide released during the hydration of cement. ASR creates a gelatinous product that absorbs pore fluid and in so doing expands, inducing internal stress within the concrete. The gel will cause damage to the concrete if moisture is able to penetrate the surface of the concrete from an external source.

To determine whether application of the silane solution would be effective the contractor, through the use of one of its subcontractors, extracted approximately 25 core samples, which were tested by the manufacturer. The test involved, among other things, the extraction of these samples post application of the solution. After the post application cores were extracted, they were tested for the prescribed depth of penetration into the concrete.

On August 13, 2019, OIG was informed by personnel from the Clark Construction Joint Venture that, "Approximately 70% of them have sufficient sealant on them for Evonik to honor the warranty. Approximately 10% are 'on the border,' and the remaining 20% are not sufficient and require additional sealant for the warranty to stand. Evonik also conveyed to us that all of the cores from the brick panels they tested are good." OIG was also advised that, "With this information, CRC is remobilizing its crews to **spray additional product on all non-brick panels**. I suspect this work will begin in approximately the next week or two....additional product needed to be ordered and takes about 1 week to receive."

OIG's concrete consultant commented on these findings as follows: "It is my understanding that 20% of the 25 concrete cores that were tested for depth of penetration by Evonik failed to achieve sufficient penetration for Evonik to honor its warranty of the Protectosil sealant application. Absent a warranty by Evonik, I recommend that WMATA not accept the concrete panels."

OIG will be issuing its final report shortly. Based on the facts and circumstances now known to OIG, however, we believe there is significant question whether the application of the silane solution to the concrete panels is a safe and effective long-term solution to the problem. Even if the core sampling to date is taken as an accurate reflection of the penetration achieved on all treated panels (which is open to question), the 20% failure rate suggested by these test results is of great concern. Furthermore, it remains to be seen whether and to what degree the application of additional solution to the panels will eliminate or substantially reduce this failure rate. There is also the question whether any failure rate at all is acceptable in such a safety-critical component as these concrete panels, which are ubiquitous throughout Phase 2 construction.

Accordingly, until our report is issued, OIG recommends that:

- Based on the information known today, WMATA not accept the application of the silane solution, or any other measures short of complete replacement of the concrete panels, as a resolution of the issue.

If WMATA nevertheless decided to accept a resolution short of replacement of the panels, OIG in that event would recommend as a less desirable approach:

- That WMATA require any resolution to the issue of the panels be guaranteed by a warranty that would protect WMATA if such solution were to fail in future years while Phase 2 is in operation.
- That WMATA obtain sufficient funds from the contractor and/or MWAA to ensure that WMATA is compensated for any future maintenance and/or replacement of the panels in question. Such an arrangement should include the creation of an escrow account that would be controlled by WMATA and accessible as necessary to pay for maintenance or replacement of the panels.
- That WMATA obtain an indemnification/hold harmless agreement from MWAA and the contractor to protect WMATA from potential liability and cost in the event the panels failed and caused harm to a rider, employee or contractor or to the rail line itself.

cc: COUN – P. Lee
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