CORROSION PROBE, INC.

THE COMPLETE ENGINEERING APPROACH - FROM DETECTION TO CORRECT

THE PASSAIC VALLEY SEWERAGE COMMISSIONERS

PVSC

FINAL CLARIFIERS COATING/LINING EVALUATION PROJECT

POST IMMERSION SERVICE

FINAL TEST RESULTS

CORROSION PROBE INC.

06-15-11

Background:

Dvirka & Bartilucci and CPI were retained by PVSC to evaluate coatings to rehabilitate the concrete on the walls of the final clarifiers and provide long-term future corrosion protection of the concrete from liquid phase carbonation. A side-by-side test evaluation program was conducted to evaluate the performance of the various concrete repair and coating alternatives. The use of grout or resurfacing material was required (in most cases) prior to coating application to provide a smooth profile for the coating. This type of approach prevents the film quality problems typical for spray applied coatings over rough concrete substrates and is usually less expensive than thick trowel applied resinous mortar systems. Each qualified respondent was given a test area of approximately 150 square feet inside final clarifier number 4.

After a minimum of 8 to 12 months of immersion service exposure, the installed coating test areas were re-evaluated by CPI and recommendations for acceptable coating systems are presented below.

Introduction:

On June 1st and 2nd, 2011; Corrosion Probe Inc. (CPI) performed a final post immersion service coating re-examination inspection as determined by the field testing criteria established in part 2.0 of the original scope and special requirements of demonstration document. The demonstration project was performed inside final clarifier #4 at the Passaic Valley Sewerage Commissioners in Elizabeth, NJ. The remaining in service demonstration panels include the following:

1. Tnemec panel (P-6) - 217 resurfacing material and series 435 topcoat.
2. Warren Environmental panel (P-8) – S-301-14 without resurfacing material
3. Carboline panel (P-10) – Carboline 510 SG resurfacing material and fiber reinforced PolyBrid 705 topcoat.
4. Carboline panel (P-16) – Carboline 510 SG resurfacing material and PolyBrid705 topcoat without fiber reinforcement.
5. Saureisen panel (P-12) – F-121 resurfacing material and 210 Glaze topcoat.

Testing Procedures:

Testing was performed in accordance with part 2.0 of the original scope and special requirements of demonstration document. The following testing procedures were performed:

1. Adhesion testing of the coating to the concrete repair material or concrete substrate was conducted in accordance with ASTM D6677. A minimum rating of 8 was required to meet the acceptance criteria.

2. Visual inspection for film quality. No detectable pinholes or breeches in the coating were allowable.

Tnemec Panel (P-6) Test Results:

A visual inspection of Tnemec panel (P-6) - 217 resurfacing material and series 435 topcoat revealed substantial through-coating cracking that appeared to mirror similar cracking detected on the 217 resurfacing material on exposed uncoated perimeter locations (see photographs below):

The through-coating cracks ranged between ¼" to 1" respectively.

Through-coating cracks were chipped away from the surface using a five in one tool.

Adhesion Test Results:

Adhesion testing was performed in accordance with ASTM D6677. The Adhesion of the series 435 to 217 resurfacing material was found to be acceptable scoring an 8 out of a possible 10 (see evaluation criteria below).

ASTM D 6677 TABLE 1 RATING SYSTEM

Rating	Description
10	Coating is extremely difficult to remove; fragments no larger than approximately (1/32" by 1/32") removed with great difficulty.
8	Coating is difficult to remove; chips ranging from approximately (1/16" by 1/16") by (1/8" by (1/8") can be removed with difficulty.
6	Coating is somewhat difficult to remove; chips ranging from approximately (1/8" by 1/8") by (1/4" by 1/4") can be removed with slight difficulty.
4	Coating is somewhat difficult to remove; chips in excess of (1/4" by 1/4") can be removed by exerting light pressure with the knife blade.
2	Coating is easily removed; once started with the knife blade, the coating can be grasped with ones fingers and easily peeled to a length of at least (1/4")
0	Coating can be easily peeled from the substrate to a length greater than (1/4").

Conclusion:

Due to the through-coating cracking detected on the Tnemec panel (P-6), CPI has no choice but to disqualify the test panel from the full scale clarifier rehabilitation project.

Warren Environmental (P-8) Test Results:

A visual inspection of Warren Environmental panel (P-8) S-301-14 without resurfacing material revealed no significant changes from the pre-immersion service inspection (see photographs below).

Overview of Warren Environmental S-301-14 material.

Detail of Warren Environmental S-301-14 material.

Adhesion Test Results:

Adhesion testing was performed in accordance with ASTM D6677. The Adhesion of the Warren Environmental S-301-14 material to the concrete substrate was found to be acceptable scoring a 10 out of a possible 10 (see evaluation criteria below).

ASTM D 6677 TABLE 1 RATING SYSTEM

Rating	Description
10	Coating is extremely difficult to remove; fragments no larger than approximately (1/32" by 1/32") removed with great difficulty.
8	Coating is difficult to remove; chips ranging from approximately (1/16" by 1/16") by (1/8" by (1/8") can be removed with difficulty.
6	Coating is somewhat difficult to remove; chips ranging from approximately (1/8" by 1/8") by (1/4" by 1/4") can be removed with slight difficulty.
4	Coating is somewhat difficult to remove; chips in excess of (1/4" by 1/4") can be removed by exerting light pressure with the knife blade.
2	Coating is easily removed; once started with the knife blade, the coating can be grasped with ones fingers and easily peeled to a length of at least (1/4")
0	Coating can be easily peeled from the substrate to a length greater than (1/4").

Conclusion:

The Warren Environmental panel (P-8) meets the acceptance criteria and is therefore able to remain for the full scale clarifier rehabilitation project.

Carboline Panel (P-10) Test Results:

A visual inspection of Carboline 510 SG resurfacing material and fiber reinforced PolyBrid 705 topcoat revealed no significant changes from the pre-immersion service inspection (see photographs below).

Overview of Carboline panel (P-10) 510 SG/Fiber Reinforced PolyBrid 705.

Detail of Carboline panel (P-10) 510 SG/Fiber Reinforced PolyBrid 705.

Adhesion Test Results:

Adhesion testing was performed in accordance with ASTM D6677. The Adhesion of the Carboline SG and Reinforced PolyBrid 705 material was found to be acceptable scoring an 8 out of a possible 10 (see evaluation criteria below).

ASTM D 6677 TABLE 1 RATING SYSTEM

Rating	Description
10	Coating is extremely difficult to remove; fragments no larger than approximately (1/32" by 1/32") removed with great difficulty.
8	Coating is difficult to remove; chips ranging from approximately (1/16" by 1/16") by (1/8" by (1/8") can be removed with difficulty.
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4	Coating is somewhat difficult to remove; chips in excess of (1/4" by 1/4") can be removed by exerting light pressure with the knife blade.
2	Coating is easily removed; once started with the knife blade, the coating can be grasped with ones fingers and easily peeled to a length of at least (1/4")
0	Coating can be easily peeled from the substrate to a length greater than (1/4").

Conclusion:

The Carboline panel (P-10) meets the acceptance criteria and is therefore able to remain for the full scale clarifier rehabilitation project.

Carboline Panel (P-16) Test Results:

A visual inspection of Carboline 510 SG resurfacing material and PolyBrid 705 topcoat revealed no significant changes from the pre-immersion service inspection (see photographs below).

Overview of Carboline 510 SG resurfacing material and PolyBrid 705 panel (P-16).

Detail of Carboline 510 SG resurfacing material and PolyBrid 705 panel (P-16).

Adhesion Test Results:

Adhesion testing was performed in accordance with ASTM D6677. The Adhesion of the Carboline SG and PolyBrid 705 material was found to be acceptable scoring an 8 out of a possible 10 (see evaluation criteria below).

ASTM D 6677 TABLE 1 RATING SYSTEM

Rating	Description
10	Coating is extremely difficult to remove; fragments no larger than approximately (1/32" by 1/32") removed with great difficulty.
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2	Coating is easily removed; once started with the knife blade, the coating can be grasped with ones fingers and easily peeled to a length of at least (1/4")
0	Coating can be easily peeled from the substrate to a length greater than (1/4").

Conclusion:

The Carboline panel (P-16) meets the acceptance criteria and is therefore able to remain for the full scale clarifier rehabilitation project.

Saureisen Panel (P-12) Test Results:

A visual inspection of the Saureisen panel (P-12) F-121 resurfacing material and 210 Glaze topcoat revealed no significant changes from the pre-immersion service inspection (see photographs below).

Overview of Saureisen panel (P-12) F-121 resurfacing material and 210 Glaze topcoat.

Adhesion Test Results:

Adhesion testing was performed in accordance with ASTM D6677. The Adhesion of the Saureisen F-121 resurfacing material and 210 Glaze topcoat material was found to be acceptable scoring an 8 out of a possible 10 (see evaluation criteria below).

ASTM D 6677 TABLE 1 RATING SYSTEM

Rating	Description
10	Coating is extremely difficult to remove; fragments no larger than approximately (1/32" by 1/32") removed with great difficulty.
8	Coating is difficult to remove; chips ranging from approximately (1/16" by 1/16") by (1/8" by (1/8") can be removed with difficulty.
6	Coating is somewhat difficult to remove; chips ranging from approximately (1/8" by 1/8") by (1/4" by 1/4") can be removed with slight difficulty.
4	Coating is somewhat difficult to remove; chips in excess of (1/4" by 1/4") can be removed by exerting light pressure with the knife blade.

2	Coating is easily removed; once started with the knife blade, the coating can be grasped with ones fingers and easily peeled to a length of at least (1/4")
0	Coating can be easily peeled from the substrate to a length greater than (1/4").

Conclusion:

The Saureisen panel (P-12) meets the acceptance criteria and is therefore able to remain for the full scale clarifier rehabilitation project.

This report is respectfully submitted for your review and consideration by,

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