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DoD Corrosion Prevention and Control Program

Demonstration of Antimicrobial Corrosion-Resisting Interior Coating Systems for Military Facilities in Warm, Humid Locations

Final Report on Project F10-AR04

Rebekah C. Wilson and Lawrence Clark

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Construction Engineering Research Laboratory

Demonstration of Antimicrobial Corrosion-Resisting Interior Coating Systems for Military Facilities in Warm, Humid Locations

Final Report on Project F10-AR04

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Final report

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Under Project F10-AR04, “Application of New Corrosion-Resistant Mold Abatement Technologies for Interior Surfaces of Buildings at Fort Polk, LA”

Abstract

This demonstration/validation project investigated the use of new corrosion-resistant mold-abatement coatings for interior building surfaces. The demonstration site was an office building at Fort Polk, LA, a continually warm, humid locale where profuse mold growth affects quality of life and imposes high maintenance costs. Three selected products, off-the-shelf interior paints formulated to prevent mold and mildew growth, were applied and compared with the performance of a standard interior coating that served as the experimental control. Each of three rooms was painted with one of the three demonstrated coatings, and one was painted with the control coating. Gypsum wallboard specimens were also prepared, coated, and mounted in a mechanical room for observation and evaluation.

The building's heating, ventilation, and air conditioning (HVAC) system was unexpectedly upgraded soon after the demonstration coatings were applied, apparently due to a scheduling change or miscommunication related to a planned future renovation. This improvement eliminated the mold-promoting environmental conditions inside the building, so no significant mold or fungal growth was observed over the 12 month evaluation period. Therefore, the project did not produce any conclusions about coating performance.

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Preface

This demonstration was performed for the Office of the Secretary of Defense (OSD) under Department of Defense (DoD) Corrosion Prevention and Control Project F10-AR04, "Application of New Corrosion-Resistant Mold Abatement Technologies For Interior Surfaces of Buildings at Fort Polk, LA." The proponent was the U.S. Army Office of the Assistant Chief of Staff for Installation Management (ACSIM), and the stakeholder was the U.S. Army Installation Management Command (IMCOM). The technical monitors were Daniel J. Dunmire (OUSD(AT&L)), Bernie Rodriguez (IMPW-FM), and Valerie D. Hines (DAIM-ODF).

The work was performed by the Materials Branch of the Facilities Division (CEERD-CFM), U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL), Champaign, IL. At the time this report was prepared, Vicki L. Van Blaricum was Chief, CEERD-CFM; Donald K. Hicks was Chief, CEERD-CF; and Kurt Kinnevan, CEERD-CZT, was the Technical Director for Adaptive and Resilient Installations. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti, and the Director was Dr. Ilker Adiguzel.

Significant portions of this work were performed by Mandaree Enterprise Corporation, Warner Robins, GA. The contributions of subcontractor Joe Davis of Bullet Painting, LLC, is also acknowledged. In addition, Georgia Lewis of the Fort Polk Directorate of Public Works is gratefully acknowledged for her support and assistance in this project.

The Commander of ERDC was COL Bryan S. Green, and the Director was Dr. Jeffery P. Holland.

Unit Conversion Factors

Multiply	By	To Obtain
degrees Fahrenheit	(F-32)/1.8	degrees Celsius
feet	0.3048	meters
gallons (U.S. liquid)	3.785412 E-03	cubic meters
inches	0.0254	meters
mils	0.0254	millimeters
pounds (force) per square inch	6.894757	kilopascals
square feet	0.09290304	square meters

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1 Introduction

1.1 Problem statement

The National Association of Corrosion Engineers (NACE) defines corrosion as the “the deterioration of a material, usually a metal, that results from a chemical or electrochemical reaction with its environment” (http://www.nace.org/StarterApps/Wiki/Dynamic.aspx?id=1923&__taxonomyid=258). According to *The Annual Cost of Corrosion for the Facilities and Infrastructure of the Department of Defense* (Herzberg, O’Meara, and Stroh 2014), the annual corrosion cost attributable to general building maintenance is $627 million. This is the single largest category of corrosion costs for the Department of Defense (DoD). Included in this category of expenditures is the repair and refurbishment of areas that have been damaged by mold and mildew growth (Herzberg, O’Meara, and Stroh 2014, Table 2-22). Figure 1 shows examples of mold propagating inside a concrete barracks structure at Fort Polk, Louisiana, and Figure 2 shows mold growth in a pumphouse that is also located at Fort Polk.

Figure 1. Mold in Fort Polk barracks on concrete block walls and concrete ceiling.

Figure 2. Mold in Fort Polk pumphouse with concrete block walls.

Conventional paints and coatings offer little resistance to microbial growth in warm, humid environments. Walls become discolored by biofilms, and noxious odors often develop. Mold and mildew growth can be hazardous to the health of people who are frequently exposed and to individuals who have elevated sensitivities to these microbes in the environment.

Mold is tenacious, once established, and may require costly and detailed removal efforts which themselves may involve irritating or hazardous chemicals. However, technological advances in antimicrobial chemicals have provided an opportunity to introduce mold- and fungus-resisting properties into interior latex paints. Products resulting from these advances are advertised to prevent the growth of mold and mildew in residential structures, office buildings, and other commercial spaces. The application of antimicrobial coatings in military installation facilities could reduce the cost of maintenance as well as medical care or lost productivity related to personnel exposure.

Researchers from the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL) selected Fort Polk, LA, as the site for a DoD Corrosion Prevention and Control (CPC) project that would demonstrate and validate the effectiveness of several promising antimicrobial interior surface treatments. Fort Polk is located roughly 50 miles north of the Gulf of Mexico, in a region that is hot and moist during much of the year, providing favorable conditions for overabundant growth of mold, mildew, and fungi inside buildings.

1.2 Objective

The objective of this CPC project was to demonstrate and validate three types of antimicrobial treatments and coatings for interior building surfaces in a location that is susceptible to excessive mold growth.

1.3 Approach

Building 1630 at Fort Polk was selected for the coating demonstration. This building is a 10,762 sq ft structure that houses offices, a conference room, restrooms, and a mechanical room. Most building walls are painted concrete masonry. Personnel from ERDC-CERL, the Fort Polk Directorate of Public Works (DPW), and Mandaree Enterprise Corporation (MEC) surveyed the building to plan and program the work.

Four rooms were chosen to test and evaluate three antimicrobial coatings and one control coating. A coating previously scheduled for maintenance work throughout the building was selected as the control coating for this demonstration. The control coating was Sherwin Williams' ProMar 200* interior acrylic latex, which conforms to Master Painter's Institute (MPI) coating specification Number 52, *Latex, Interior, semi-gloss (MPI Gloss Level 2*, http://www.sherwinwilliams.com/document/SDS/en/035777110355/US/).

Foster 40-20† is a fungicidal polyacrylate copolymer emulsion protective coating that is an architectural coating formulated with both an antimicrobial preservative and an algaecide, agents which inhibit the growth of mold, mildew, and algae on surfaces (http://www.fosterproducts.com/docHandler.aspx?docid=1ad71545-b2e1-44e8-858c-d2ce5e6d564a).

Caliwel‡ with BNA (bi-neutralizing agent) is an antimicrobial interior latex coating that combines an active biocide with an agent that raises the surface pH, creating a surface that is hostile to microorganisms, including not just mold, but also viruses, bacteria, and algae. The coating uses a semi-permeable microencapsulated matrix system to maintain the effect of the high pH agent over an extended service life.

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* ProMar 200 is a registered trademark of The Sherwin-Williams Company, Cleveland, OH.

† Foster 40-20 is a registered trademark of H.B. Fuller Construction Products Inc., Aurora, IL.

‡ Caliwel is a registered trademark of Alistagen Corporation, New York, NY.

Hirshfield's Platinum Ceramic* is an acrylic latex that incorporates the product Microban® into its line of interior paints. This product has been previously incorporated into products such as kitchen cutting boards, footwear, textiles, and more to prevent microbial growth.

1.4 Metrics

The two metrics for judging coating performance were paint film thickness and antimicrobial performance.

Each manufacturer's specifications for wet and dry film thicknesses, at the time of the demonstration, are listed below:

- ProMar 200: 8 mils wet; 3.2 mils dry
- Foster 40-20: 20 mils wet; 11 mils dry
- Caliwel: n/a wet; 2 mils dry
- Platinum Ceramic: 3.5 mils wet; 1.2 mils dry

Antimicrobial performance was assessed through inspections conducted in accordance with *Mold Inspection Standards of Practice* (International Association of Certified Indoor Air Consultants 2010).

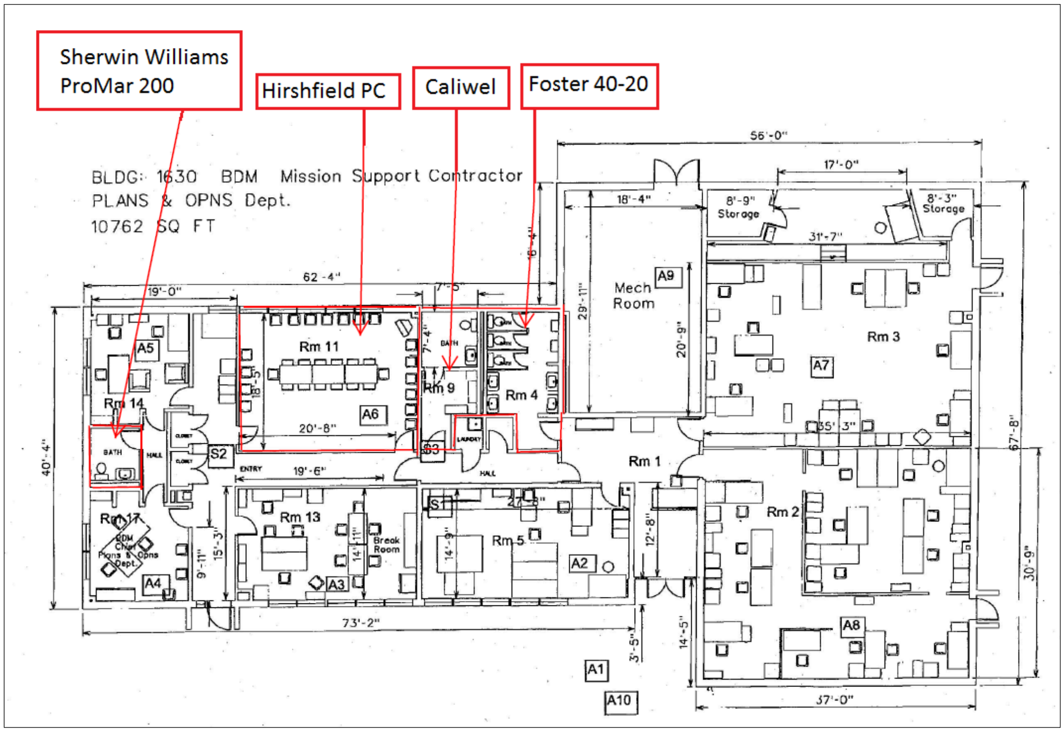
* Hirshfield's Platinum Ceramic and Microban are registered trademarks of Hirshfield's Paint Manufacturing, Minneapolis, MN.

2 Technical Investigation

2.1 Project overview

Figure 3 shows the coating locations within the demonstration site (Building 1630).

Figure 3. Coating test locations in Building 1630.



Prior to surface preparation and coating applications, rooms were prepared by a general contractor hired by the Fort Polk DPW. The general contractor removed hardware and accessories, and installed new gypsum board or repaired any deteriorated wall surfaces. Surfaces were masked as appropriate. Existing surfaces were cleared of loose coatings and other debris, and any cracks or gaps were filled with Sherwin Williams 950A white acrylic caulk. The walls were found to be free of oils and grease, so no cleaning solution was needed.

Sherwin Williams ProMar 200 acrylic primer was used to prime all gypsum surfaces that were repaired or newly refurbished. Walls in Room 4, Room 11, and the restroom near Room 14 had been primed with Sherwin Williams ProMar 400 acrylic primer by the DPW general contractor prior to the start of this project. Figure 4 shows primer being rolled on a new gypsum board in Room 9 with a ½-inch nap roller. A 3-inch nylon brush was used to apply primer to the areas where a roller could not be used. The primer was given 4 hours to dry before applying the antimicrobial topcoats.

Figure 4. Sherwin Williams ProMar 200 acrylic primer applied to new gypsum board installed in Room 9.

2.2 Application

Prior to application, the Sherwin Williams control, Caliwel, and the Hirshfield's coatings were poured into separate 5-gallon buckets from the manufacturers' 1-gallon cans. Each gallon was stirred for 30–45 seconds using a wooden stir stick. Once collected into the bucket, the paint was stirred again once every 15 minutes. The Foster coating was thicker than the other coatings, and it required the use of a drill and paddle to adequately stir the material.

Figure 5 shows the Sherwin Williams control and the Hirshfield's coatings, as applied with a 1-inch nap roller and a 3-inch nylon brush. The brush was used for places such as corners and small areas that a roller could not reach. Each coating was applied to the walls to provide 4–6 mils of wet film thickness (Table 1). Wet film thickness was measured using a standard wet film thickness gauge (Figure 6).

The Foster and Caliwel coatings were applied using a conventional airless sprayer. The Foster coating required the use of a Graco GMAX II 5900HD sprayer with a 100-foot hose and a 521 tip that was set at 3300 psi. The Caliwel coating was less viscous than the Foster coating, and it was sprayed using a Graco Nova 390 electric airless sprayer, as shown in Figure 7. A 50-foot hose and a 515 tip at 3300 psi were used to apply 4–6 mils of wet film thickness to the walls. The spray coatings were applied holding the spray gun approximately 10–12 inches from the wall surface. No thinner was added to any of the coatings. The coatings were given approximately 24 hours to dry before applying a second coat. The first coat was applied at an average ambient temperature of 78°F and 84% relative humidity. The second coat was applied at an average ambient temperature of 80°F and 87% relative humidity.

Figure 5. Coating application using 1-inch nap roller (left) and nylon brushes (right) for Sherwin Williams and Hirshfield's coatings.

Table 1. Actual applied thickness of coatings and manufacturer's data sheet requirements for final thickness.

Coating	Measured wet film applied thickness per coat (mils)	Required final thickness (wet/dry) in mils
Sherwin Williams ProMar 200	4–6	8/3.2
Foster 40-20	8–12	20/11
Caliwel with BNA	8–12	--/2
Hirshfield's Platinum Ceramic	4–6	3.5/1.2

Figure 6. Wet film thickness gauge.

Figure 7. Coating application using conventional airless sprayer for Caliwel and Foster coatings.

2.3 Performance monitoring

A sheet of gypsum wallboard was securely mounted to a masonry wall in the mechanical room using 1 x 2 in. furring strips, as shown in Figure 8. The surface area of the wallboard was divided vertically into four equal areas, and each area was primed with Sherwin Williams ProMar 200 and then painted with one of the four coating systems. The topcoats were applied in the same manner as described in section 2.2. A second coat was applied approximately 24 hours after the first coat. The test site was revisited after 4, 8, and 12 months of exposure to evaluate the performance of the coatings inside the building and on the test sections.

Figure 8. Gypsum board coated with Sherwin Williams ProMar 200, Hirshfield's Platinum Ceramic, Caliwel, and Foster 40-20 (left to right) in 2 x 4 foot sections and hung in the mechanical room of Building 1630.

3 Discussion

3.1 Results

Soon after the observation period began, the building was rehabilitated to accommodate a new occupant. Two significant difficulties resulted:

1. In the areas demonstrating Foster 40-20 and Caliwel systems, the walls were later repainted with an unknown coating. The ceilings were left unmodified, so the demonstrated Foster and Caliwel systems remained only on the ceilings, but not on the walls.
2. Between application of the test coatings and the 4-month inspection, the HVAC system within the building had been upgraded, which effectively dehumidified the interior and virtually eliminated the direct cause of indoor mold growth. Consequently, it is unclear if the lack of mold indicates successful paint performance or a successful air-conditioning application. Because the HVAC refurbishment changed the testing environment, the demonstrated coatings were not subjected to the same environment as the previous coating system.

It is also important to note that the coatings were not applied in accordance with the recommendations of the product data sheets(refer to Table 1). The ProMar systems should have included one more coat with a final wet thickness of 8 mils, but actually a thickness of only 4–6 mils was applied. The Hirshfield's coating was applied too thick, at 4–6 mils, but should have only been 1.2 mils thick. Caliwel was also applied too thick at 8–12 mils, when only 2 mils was specified by the manufacturer. The Foster coating was applied at 8–12 mils thickness, so it is not clear that it was applied according to the manufacturer's specification of 11 mils.

3.1.1 4-month inspection report

The 4-month inspection report noted the installation of a new HVAC system (section 3.1) and its impact on the testing environment. The report also noted that two of the rooms being used for the project had been painted over (Room 9 and Room 4) with an unknown coating, leaving only the ceilings as viable test surfaces.

Mechanical room test panels. None of the test panels in the mechanical room showed any signs of mold or mildew in this inspection (Figure 9).

Figure 9. Test panels in the mechanical room after 4 months.

Room 4 – Foster 40-20. Noting the addition of a new HVAC system and repainting of most test surfaces, the inspection found no signs of mold or mildew on the ceiling. The repainted walls also showed no signs of mold or mildew (Figure 10 and Figure 11).

Figure 10. Walls in Room 4coated with an unknown coating, and ceiling coated with Foster 40-20 after 4 months.

Figure 11. Room 4 after 4 months.

Room 9 – Caliwel with BNA. Under the conditions noted above, the washroom by Room 9 appeared to be unaffected by any mold or mildew growth (Figure 12 and Figure 13).

Figure 12. Washroom of Room 9 recoated with an unknown coating after 4 months.

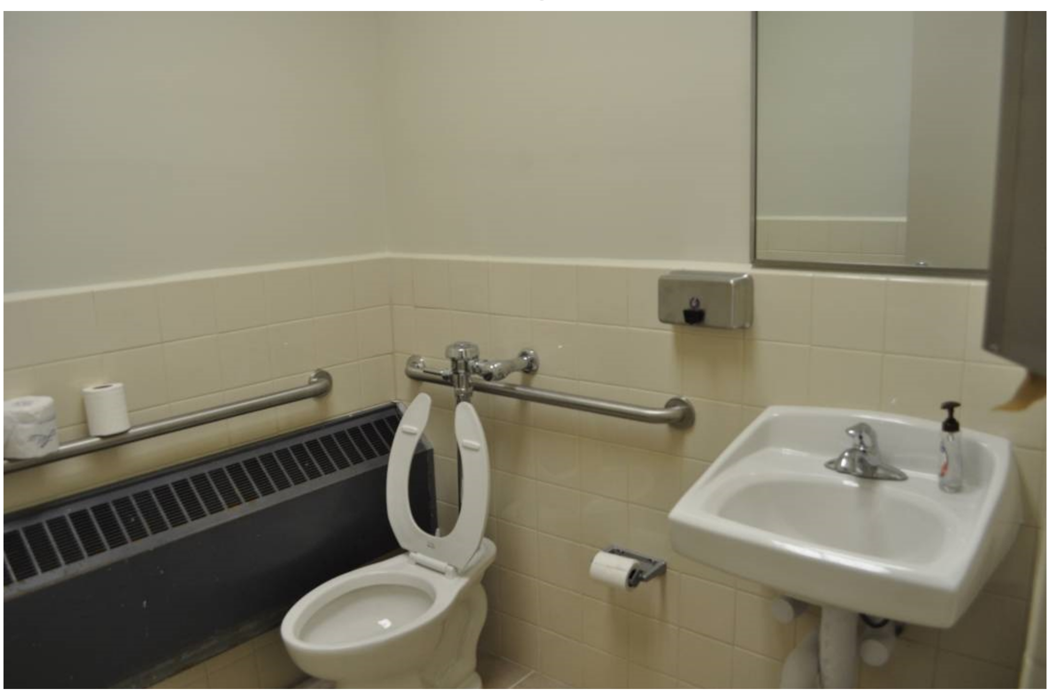


Figure 13. Division of Room 9 with unknown coating in the washroom walls and Caliwel on the ceiling.

Room 11 – Hirshfield's Platinum Ceramic. Room 11 showed no signs of mold or mildew other than stains found on the piece of plywood that frames a window air-conditioning unit. The stains appeared to be from exterior water intrusion. This area was specified for close monitoring during the follow-on inspections (Figure 14, Figure 15, and Figure 16).

Figure 14. Room 11 after 4 months.

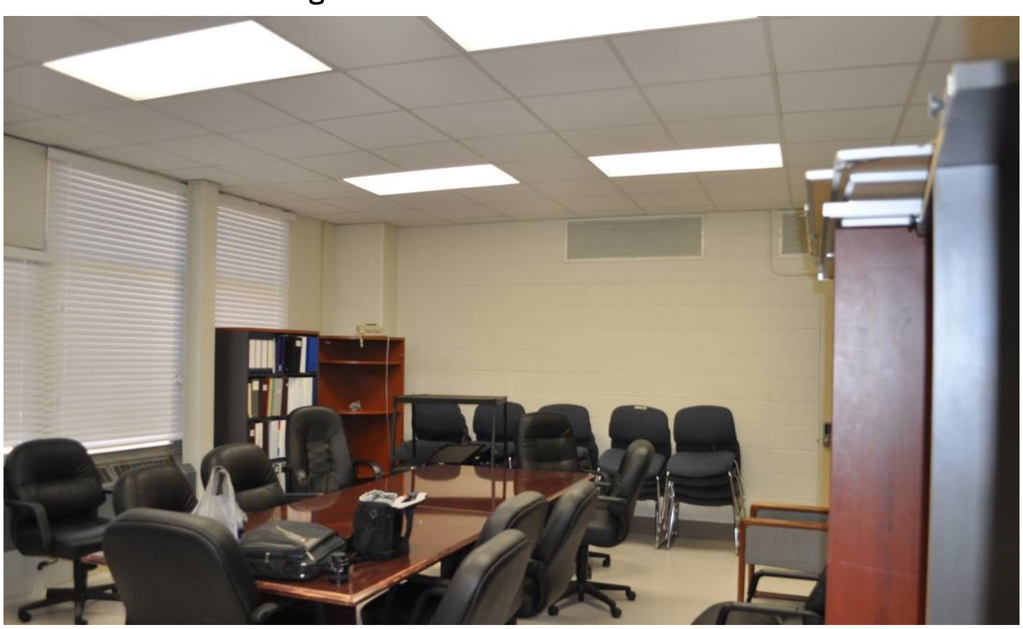


Figure 15. I- beam in Room 11 after 4 months.

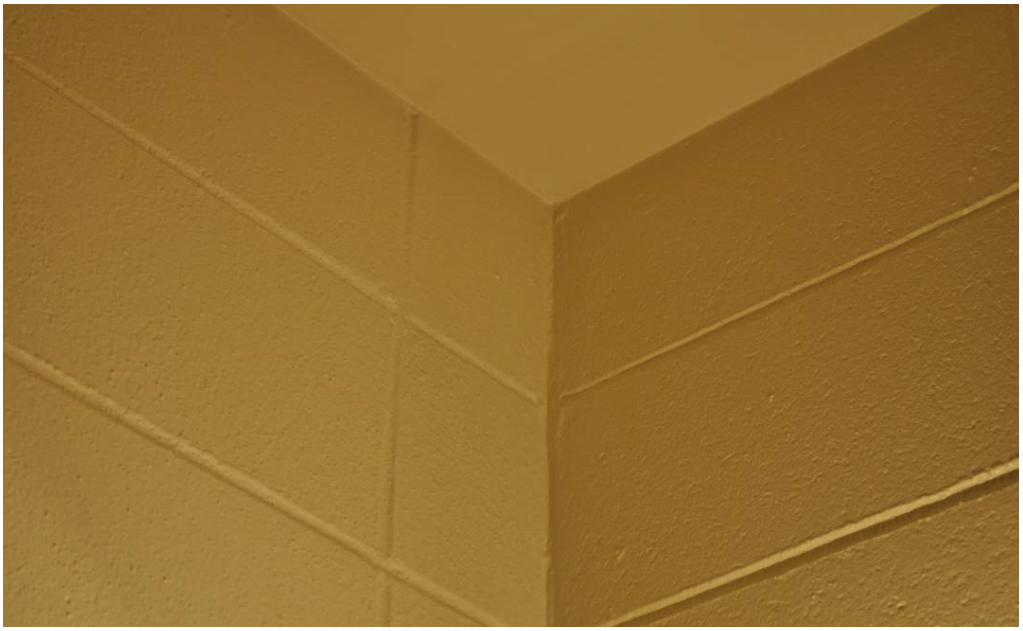
Figure 16. Window air-conditioning unit in Room 11 after 4 months.

Room 14, adjacent washroom – Sherwin William ProMar 200 (control). The washroom next to Room 14 showed no signs of mold or mildew. The room was originally coated from floor to ceiling, but tile had been installed halfway up the side walls, including around the sink and toilet areas, after coating application (Figure 17, Figure 18, and Figure 19).

Figure 17. Washroom next to Room 14 after 4 months.

Figure 18. Ceiling vent in the washroom next to Room 14 after 4 months.

Figure 19. Block walls and gypsum ceiling of washroom next to Room 14, after 4 months.



3.1.2 8-month inspection

Mechanical room test panels. None of the test panels in the mechanical room showed any signs of mold or mildew (Figure 20). Handprints and residue had been left on the gypsum test panel. The condition inside the room continued to be less humid than previously due to refurbishment of the building.

Figure 20. Test panels in the mechanical room after 8 months.

Room 4 – Foster 40-20. There were no signs of mold or mildew on the ceiling. The repainted walls also showed no signs of mold or mildew (Figure 21 and Figure 22).

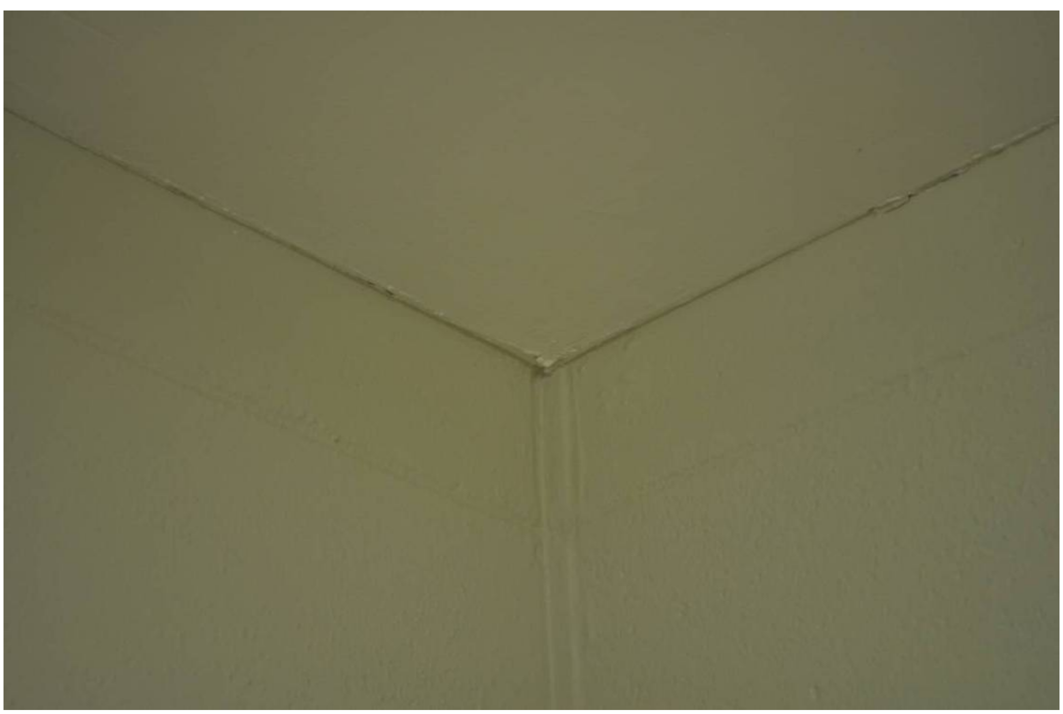
Figure 21. Walls coated with an unknown coating and ceiling coated with Foster 40-20 in Room 4 after 8 months.

Figure 22. Room 4 after 8 months.

Room 9 – Caliwel with BNA. The demonstration coating on the ceiling showed no signs of mold or mildew (Figure 23). The repainted walls, using an unknown coating, also showed no signs of mold or mildew (Figure 24).

Figure 23. Washroom of Room 9, after 8 months, with an unknown coating on the block walls. Caliwel is still present on the ceiling.

Figure 24. Washroom of Room 9, after 8 months, with unknown coating on the block walls. Caliwel is still present on the ceiling.



Room 11 – Hirshfield's Platinum Ceramic. Room 11 showed no signs of mold or mildew other than the stains found on the piece of plywood that surrounds a window air-conditioning unit (Figure 25). The stains appeared to be from exterior water intrusion. There were no additional signs of mold or mildew since the previous inspection (Figure 26 and Figure 27).

Figure 25. Window air-conditioning unit in Room 11 after 8 months.

Figure 26. Air vent in Room 11 after 8 months.

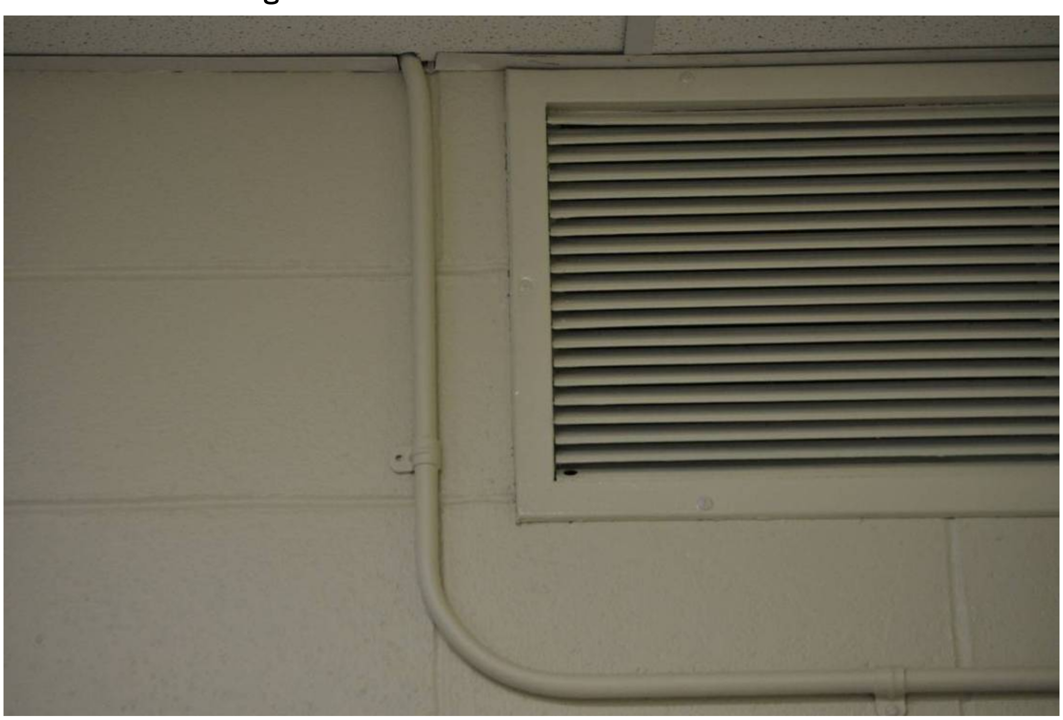


Figure 27. I-beam in Room 11 after 8 months.

Room 14, adjacent washroom – Sherwin William ProMar 200 (control). The washroom next to Room 14 showed no signs of mold or mildew (Figure 28, Figure 29, and Figure 30).

Figure 28. Washroom next to Room 14 after 8 months.

Figure 29. Ceiling vent in the washroom next to Room 14 after 8 months.

Figure 30. Block walls and gypsum ceiling
of the washroom next to Room 14 after 8 months.

3.1.3 12-month Inspection

Mechanical room test panels. None of the test panels in the mechanical room showed any signs of mold or mildew (Figure 31). All standing water that was present in the beginning of the test period dried up and did not reoccur. Humidity remained significantly lower than before renovations.

Figure 31. Test panels in the mechanical room after 12 months.

Room 4 – Foster 40-20. There were no signs of mold or mildew on the ceiling (Figure 32 and Figure 33). The repainted walls (coating unknown) also showed no signs of mold or mildew.

Figure 32. Walls in Room 4 coated with an unknown coating and ceiling coated with Foster 40-20 after 12 months.

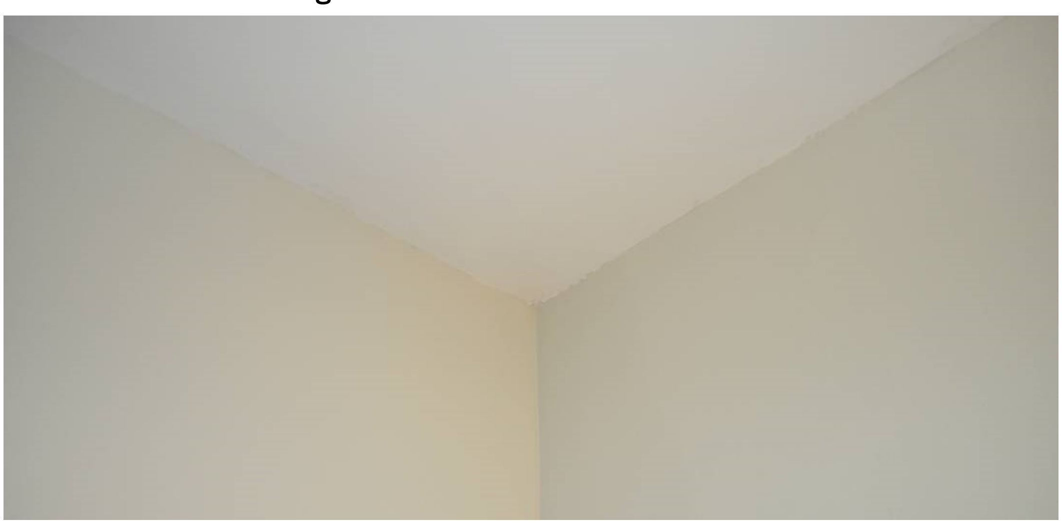


Figure 33. Vent in Room 4 after 12 months; inspector noted that no mold was present.

Room 9 – Caliwel with BNA. The ceilings continued to show no signs of mold or mildew. The repainted walls (coating unknown) also showed no signs of mold or mildew (Figure 34 and Figure 35).

Figure 34. Washroom of Room 9, recoated with an unknown coating, after 12 months.

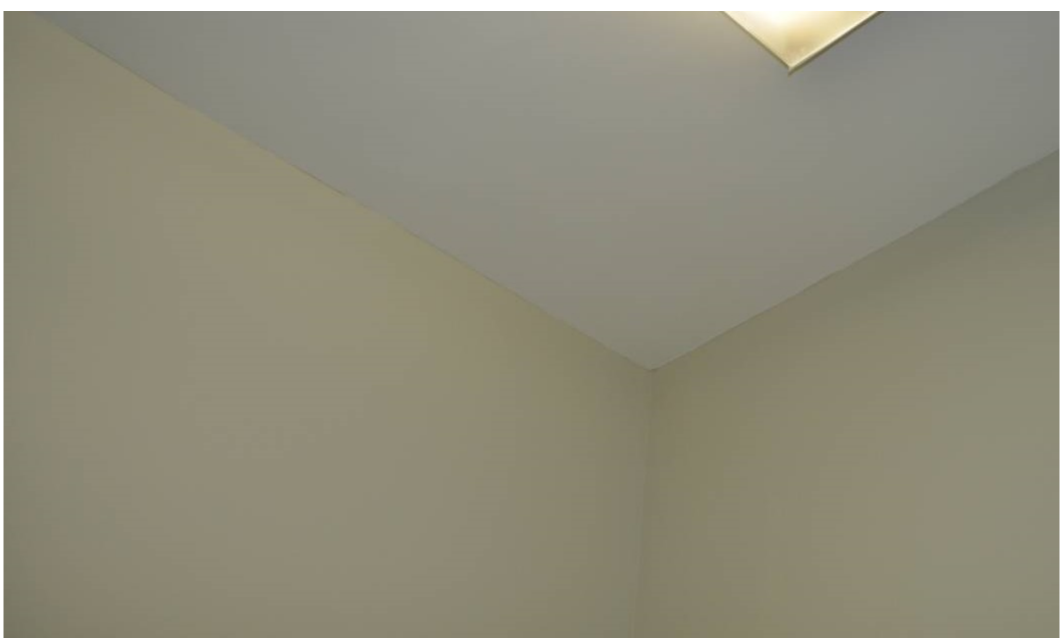


Figure 35. Room 9 with unknown coating in the washroom and on the block walls, after 12 months.

Room 11 – Hirshfield's Platinum Ceramic. Room 11 showed no signs of mold are mildew other than the stains found on the piece of plywood that surrounds a window air-conditioning unit. The stains appeared to be from exterior water intrusion (Figure 36). Mostly, there appeared to be no additional signs of mold, mildew, or water intrusion from the last inspection (Figure 37). However, an HVAC vent on the interior of the room had begun to show signs of mildew, as shown in Figure 38.

Figure 36. Window air-conditioning unit in Room 11, after 12 months.

Figure 37. I-beam in Room 11, after 12 months.

Figure 38. Air vent in Room 11, after 12 months.

Room 14, adjacent washroom – Sherwin William ProMar 200 (control). The washroom next to Room 14 shows no signs of mold or mildew (Figure 39, Figure 40, and Figure 41).

Figure 39. Washroom next to Room 14, after 12 months.

Figure 40. Ceiling vent in the washroom next to Room 14 after 12 months.

Figure 41. Block walls and gypsum ceiling of washroom next to Room 14 after 12 months.

3.2 Lessons learned

3.2.1 Demonstration coordination and site-control issues

The test site was originally chosen for its environment and high potential for mold growth. However, to prepare for occupancy by a new tenant, the building interior was partially refurbished. An upgraded HVAC system, including air conditioner, was installed; all walls, including those with the demonstrated coatings, were a painted with a conventional interior latex paint. As previously noted, the air-conditioning system greatly reduced the indoor heat and humidity that promoted mold growth, so the demonstration site no longer provided a suitable environment for testing antimicrobial coatings. Also, painting over the demonstration coatings made it impossible to observe their antimicrobial efficacy. In future demonstrations of this type, project teams should proactively investigate and coordinate with installation personnel to determine whether any scheduled maintenance and repair activities could significantly alter the test environment. It is crucial for the project manager to discuss scheduled maintenance and repairs with all associated site managers so that there is full consensus on site availability for the duration of the testing program. Such coordination should help to avoid schedule clashes during the demonstration.

3.2.2 Performance test design

Applying hindsight, a more thorough assessment of antimicrobial coating performance could have been obtained by using test coupons placed in a humidity cabinet. Periodic observations would have provided additional data both on coating performance and on duration of antimicrobial capability. The additional testing with in-service observation could have provided significant data to at least support qualified conclusions about coating antimicrobial performance.

3.2.3 Supervision of paint application

Instructions to paint applicators must be explicit and clear that coatings must be applied according to all manufacturer specifications, including wet film thickness. Additionally, work by painters should be supervised closely enough by installation personnel to confirm that the coatings are being applied according to specification.

4 Economic Summary

4.1 Costs and assumptions

Table 2 breaks down the total costs for this demonstration/validation project, and Table 3 shows field demonstration costs.

Table 2. Breakdown of total project cost for antimicrobial coatings.

Description	Amount, $K
Labor	309.4
Contracts	90.6
Travel	25.0
Reporting	20.0
Air Force and Navy participation	5.0
Total	450.0

Table 3 Project field demonstration costs for antimicrobial coatings.

Item	Description	Amount, $K
1	Labor for project management and execution	63.7
2	Travel for project management	20.3
3	Cost for anti-mold paints and test panels	6.6
	Total	90.6

Chapter 3 (section 3.1) explained why the coatings could not be evaluated as planned at Fort Polk. Soon after the observation period began, the building was rehabilitated to accommodate a new occupant. Therefore actual economic benefit data for this project could not be obtained, and an actual ROI could not be calculated.

Because the coatings were actually applied, however, the following cost assumptions can be made for this project.

Alternative 1. The Foster coating offers a 10-year limited warranty against mold and mildew growth. Additionally, the Foster case study "Mold Gets 10 Years to Life" provides field test results that showed the Foster coating had successfully mitigated mold growth in an HVAC duct. This current study has shown that the Foster coating is effective in preventing mold growth for 12 months, and it is assumed in the economic analysis that it will continue to do so for 10 years. At the end of 10 years, the surface will require recoating, costing $0.63 per square foot for coating material. Costs for supplies are $0.82 per square foot, and costs for labor are $3.22 per square foot. The total cost for coating an area of 2,000 square feet with Foster 40-20 is $9,340.

Alternative 2. The Caliwel coating does not offer a warranty against mold and mildew growth; however, it does make the claim that the anti-fungal properties of the coating will last up to 6 years. This current economic analysis assumed that the Caliwel coating will continue to prevent mold and mildew growth for up for 6 years. At the end of 6 years, the surface will require recoating, for which the costs are $0.48 per square foot for the coating material. Costs for supplies are $0.82 per square foot, and costs for labor are $3.22 per square foot. The total cost for coating an area of 2,000 square feet with Caliwel is $9,040.

Alternative 3. The Hirshfield's coating failed to prevent mildew growth on a metallic ceiling duct after 12 months of testing and therefore, it is not part of this analysis. This observation does not indicate a definite failure to perform, but rather, it is inconclusive because of the loss of experimental control.

Control. The control coating, Sherwin Williams ProMar 200, did not show signs of mold or mildew growth; however, the room in which it was supplied was not subjected to direct HVAC ventilation as was the room in which the Hirshfield's coating was applied. The cost of the Sherwin Williams ProMar 200 coating is $0.19 per square foot. Costs for supplies are $0.82 per square foot, and costs for labor are $3.22 per square foot. The total cost for coating an area of 2,000 square feet with a conventional MPI-52 coating, such as Sherwin Williams ProMar 200, is $8,460.

4.2 Projected return on investment (ROI)

Because coating evaluations could not be performed as planned, the actual ROI for this demonstration is zero (0).

It was essential that these coatings were to be placed in an environment that promoted mold growth. Due to the demonstration site's renovation, which included a new HVAC system, this type of environment was no longer present, which voids the validity of the results discussed.

The original, projected ROI for this project was assessed at 10.78, and it was determined by using assumptions presented above and the guidelines prescribed by OMB Circular A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.”

To help ensure a successful project in the future, the project site’s DPW must assess if any upcoming maintenance will affect any ongoing project; in a case such as this, it must determine if anything will affect the temperature and humidity of the building. The highest ROI would be obtained within a building with high, year-round humidity and very little ventilation.

5 Conclusions and Recommendations

5.1 Conclusions

The local environment of Building 1630 at Fort Polk prior to the start of the test was heavily conducive to the growth of mold and mildew, and although the test coatings were specifically designed by the manufacturers to combat and mitigate the growth of mold and mildew, the building's environment was expected to accelerate results in comparison to a standard-condition office environment. However, the building underwent refurbishment during the test period, which reduced the severity of the environment. After a 12-month test period, only one area of mildew was found. The area with mildew growth was isolated on a metallic HVAC vent in Room 11, which was coated with Hirshfield's Platinum Ceramic. Because of this finding, it can be concluded that the Hirshfield's coating is not fully effective on metallic ducts where condensation might occur. All other rooms and coatings in the test were without signs of mold or mildew.

Due to the conditions of the test site being changed, the test conditions were not conducive to mold and mildew growth and were not sufficient for an effective evaluation of performance of the antimicrobial capabilities of the test coatings. Performing only visual periodic inspections without concurrent testing of the antimicrobial properties of the test coatings did not provide sufficient data to render good performance assessments of the coatings. Based on observations made during this project, the authors conclude that the demonstrated coatings performed as well as the standard latex control coating in an environment that is not susceptible to excessive mold growth.

5.2 Recommendations

5.2.1 Applicability

The rehabilitation of the building's HVAC system eliminated the excessive humidity and moisture needed to promote aggressive mold and mildew growth. Therefore, the authors can offer no general recommendation about wider applicability of the demonstrated coatings.

5.2.2 Implementation

Because the results of this project were inconclusive, DoD-wide implementation of the demonstrated coatings cannot be recommended without further study that incorporates the lessons learned, as discussed in section 3.2.

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14. ABSTRACT

This demonstration/validation project investigated the use of new corrosion-resistant mold-abatement coatings for interior building surfaces. The demonstration site was an office building at Fort Polk, LA, a continually warm, humid locale where profuse mold growth affects quality of life and imposes high maintenance costs. Three selected products, off-the-shelf interior paints formulated to prevent mold and mildew growth, were applied and compared with the performance of a standard interior coating that served as the experimental control. Each of three rooms was painted with one of the three demonstrated coatings, and one was painted with the control coating. Gypsum wallboard specimens were also prepared, coated, and mounted in a mechanical room for observation and evaluation.

The building's heating, ventilation, and air conditioning (HVAC) system was unexpectedly upgraded soon after the demonstration coatings were applied, apparently due to a scheduling change or miscommunication related to a planned future renovation. This improvement eliminated the mold-promoting environmental conditions inside the building, so no significant mold or fungal growth was observed over the 12 month evaluation period. Therefore, the project did not produce any conclusions about coating performance.

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