Treviño-Uribe Rancho Damage Remediation; Preliminary Observations

figure 1. typical wall condition following asphaltic application

Introduction

The Consultant was asked to participate in the development of a process for removing or mitigating damage from an application of an asphaltic material to the north façade of the Treviño-Uribe Rancho National Historic Landmark. As part of that process, the Consultant recorded observations about the scope and character of the asphalt application; constructed a representative test panel for testing a variety of removal agents; conducted “spot tests” with a number of off-the-shelf materials and a removal agent provided by the paving contractor; and developed a general, conceptual program for how the removal work might be carried out. This report describes observations and results from those preliminary investigations.

Observations

An asphaltic prime coat material was applied to wide areas of the north, honorific façade of the Fort on the afternoon of January 11, 2010. Prime coats are typically used to prepare road base material so that a new asphalt layer will adhere to it.

figure 2. N facade, Kitchen #2 July 2009

figure 3. N facade, Kitchen #2 January 2010

This and other facades of the complex were repointed and stabilized between spring and autumn 2009. In the course of that work, which included wall base protection through most of the north façade (as well as the east exterior and courtyard facades), limited plaster edge protection and consolidation was carried out. The façade was also documented at that time with high-resolution digital photography.

Approximately 880 square feet of the façade wall area were affected by the recent application of prime coat. In general, the north elevation between one foot and seven feet above the *banqueta* is more than 75% affected with the asphaltic material, while the 12" above and below this section show between about 10 and 75% impact. There are scattered droplets of material along the roofline and on the chimney of Kitchen No.2. Approximately 150 square feet of *banqueta*, stairs, and other horizontal stone surfaces are also impacted, as well as three historic wood doors.

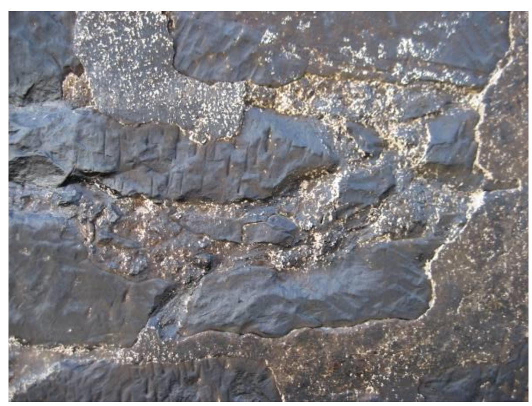

figure 4. typical coverage near wall center

Exposed sandstone in the affected areas shows almost complete coverage while adjacent areas of plaster typically show wide but incomplete coverage. The prime coat material seems to have spread across the surface of the stone in a generally even, very thin coating. Observed samples found loose along the *banquetas* show a coating less than .1mm in depth. Plaster samples show a heavier accumulation and deeper penetration, ranging from approximately .2mm - .5mm, but slightly less spreading. This pattern seems to be due to the greater density of the sandstone, and the greater porosity of the plaster.

Weather history of San Ygnacio indicates that on the day of the application, January 11, 2010, the low temperature was 36F, and the high temperature was 55F, with overcast skies. In the week that followed, lows ranged from 45F to 55F. Highs began a warming trend on the day of the application to the mid-70sF a week later, to 86F on January 21 and 22. Several of the days that week included light precipitation.

Prime Coat Material

A sample of about 1 pint of the prime coat material was provided to the consultant. The paving contractor identified the prime coat as "MC-30," a "cutback asphalt." "MC" stands for "medium cure" -- as opposed to "RC," for "rapid cure." The type of prime coat selected for a particular application depends to a great extent on weather and temperature conditions.

The second half of the material designation, in this case "30", refers to the relative percentage of solvents included in the "cutback". The lower the number, the greater proportion of solvent in the cutback and the lower is its viscosity. MC-30 contains 35 - 40% solvent. Rapid cure prime coats use highly volatile solvents like gasoline, while medium cure coatings use somewhat less volatile solvents like kerosene. The American Society for Testing and Materials (ASTM) for medium cure asphalt is ASTM D2027. (For more information see "Asphalt Materials and Uses" published by TXDOT's Construction Division, at: ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/AsphaltMaterialsandUses.pdf .)

Test Panel and Spot Testing

A 48" wide by 40" high by +/-3" thick test panel was constructed to test a variety of products and methods for removal of the paving prime coat. The panel was built onto one of the buttresses in the courtyard erected during the

2009 stabilization project. Stone and stone fragments from that stabilization were built into the panel, anchored and pointed with mortar made from the formula developed as a sympathetic match for the original material. That mortar contains 1 part white Portland cement: 3 parts hydrated chemical lime: 11 parts sand.

figure 5. test panel before MC-30 application

Although efforts were made to match the character of the north façade, there are limits to which the test panel will be representative. These include differences in vapor pressure through the wall that may influence the efficacy of some test materials; a difference in orientation (test panel is oriented N-S); small potential differences in characteristics of the mortars and plasters of the north wall and the panel; and, due to scheduling issues, the relatively short time the test panel was allowed to cure before the asphaltic material was applied to it. Overall, however, the test panel is a very close approximation of the north façade as a ground for the MC-30 material as well as for its removal.

The panel was divided into six test areas. Each of the six was defined with a border of lime plaster and a scored line. The upper right corner of each test area was also covered with lime plaster. The formula used in this plaster was a slurry of approximately 1 part hydrated chemical lime to 3 parts fine sand. As the north façade includes areas coated with a thin lime wash, a similar coating (composed of lime slurry) was brushed onto the lower left corner of each test area.

While the panel was curing, spot tests were conducted on stone scraps with several off-the-shelf materials from a local building supply, as well as with a material provided by the paving contractor. The intention of the spot tests was to narrow the number of products worth testing on the panel.

The MC-30, still warm from the tanker truck, was brushed onto the upper surface of several small, loose stones gathered from the scrap pile. A few discarded pieces of lime plaster formed during the recent stabilization work were also treated. The off-the-shelf items being tested were selected on the basis of references in the product description to removal of tar or grease, and their relatively low toxicity. PES-51, the product that had been recommended to the contractor, was also tested.

The tests were made by applying liberal amounts of the removal product to the surface of the stone treated with MC-30. After allowing a dwell time consistent with available product application instructions, the affected surface was dabbed with a clean cotton rag. On the basis of how much asphaltic material came off with this simple test, the off-the-shelf products were narrowed to one, called "Black Jack Asphalt and Tar Remover." The only other product that demonstrated effectiveness was the PES-51, provided by the contractor.

figure 6. spot testing and poultices

Subsequently, these two products were applied to other test stones and plaster samples. A poultice was made from the product mixed with cellulose insulation (recycled newspaper). Additional sample poultices were made by mixing the removal material with hydrated lime and the cellulose insulation.

Both the PES/lime/cellulose poultice and the PES/cellulose poultice removed the majority of the MC-30 where they had been applied, and in small, limited areas demonstrated the ability to remove more than 95% of the asphaltic coat. The "Black Jack" tar remover tended to spread the asphalt material much more than the PES-51, which is a central concern in the removal process. From this test it was determined that the PES-51 was the most effective of the products spot-tested, and the only of those products immediately at hand bearing further testing for this application.

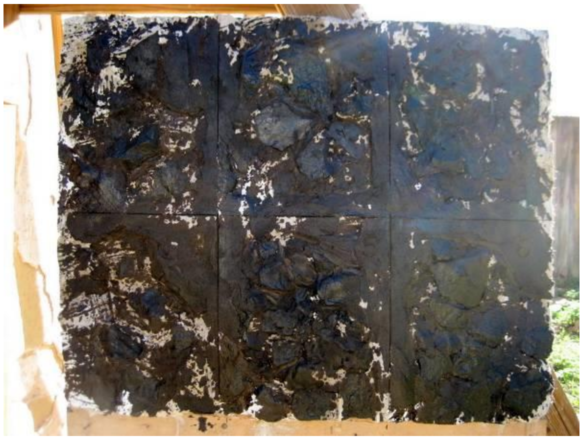

figure 7. test panel with MC-30

On the afternoon of 23 January, MC-30 was applied to the test panel. At this point the plaster and some mortar areas had cured less than 12 hours. The MC-30 was heated to a low boil, and applied to the panel by spattering from about 2' with a 2" China bristle brush until approximately 85% of the surface was covered. At the application temperature, the material is slightly more viscous than water.

The major component of PES-51 is the naturally-occurring substance limonene, found in citrus products such as oil of orange. The remainder of PES-51 is described as biologically-derived microbial agents. PES-51 was evaluated by the National Oceanic and Atmospheric Administration in 1994 (http://response.restoration.noaa.gov/book_shelf/984_PES-51.pdf) for remediation of oil spills.

figure 8. sub-panel 6 before PES-51

figure 9. panel after PES-51

One day after the test panel was coated with MC-30, PES-51 was applied to the lower right sub-panel, labeled 6. The material was applied by brushing with a 2" China bristle brush until the whole area of panel 6 had been lightly washed, similar to the amount of material that would be applied with a hand sprayer set to provide a light but constant sprinkling. The MC-30 showed immediate and widespread loosening and apparent emulsification in the PES.

The manufacturer's application guidelines for PES-51 recommend a dwell time of 3 – 5 minutes, avoiding evaporation from the surface. The manufacturer recommends removal by spray rinse with water or by mopping the PES-51 from the surface with a clean rag.

After allowing a dwell time of 3 minutes, a poultice of cellulose insulation in lime slurry was applied to the upper left-hand corner of sub-panel 6 (with no additional PES-51 added); a poultice of cellulose insulation saturated with water was pressed into the upper right-hand corner, and the bottom half of this sub-panel was rinsed with a light water spray from a hand-held spray tank. Runoff was collected in additional, dry cellulose material in a tray below the panel.

Although both poultices and the spray rinse were completed within 5 minutes of the maximum dwell time recommended, it seemed that the product's effectiveness decreased rapidly following the initial application. A film formed over the surface within about 5 minutes, and subsequent rinse water beaded on the surface. Additional applications of the PES were not carried out at that time.

figure 10. detail of areas of poultices

When the poultices had thoroughly dried – about 5 hours after application – they were carefully removed from the test panel. Both poultices came off in generally large, cohesive pieces, without removing any of the panel stone or plaster surface with them. Results similar to those obtained with the poultices applied to the separate stones were repeated here, even though these poultices were bound principally with water rather than additional PES.

A clear pattern of removal was evident where both poultices were applied, although within each pattern there was considerable variation in the degree to which the MC-30 was removed. Some areas treated with a poultice show a minimum effect, while others show almost complete removal of the MC-30. A less conspicuous pattern exists on the lower half of the test area, which received only a water wash following the application of the PES.

The effectiveness of the PES applications, both with and without poultices, seems heavily influenced by the timing and rate of the product’s evaporation. The first PES-treated areas to come in contact with a rinse of any kind were the poultices, and the most complete removal within those areas was where the poultice was applied first. This sequence of events probably delayed the formation of the protein film and allowed more thorough emulsification of the MC-30.

In Summary

The unfortunate application of the prime coat material to the north façade of the Treviño Fort could have long-lasting negative consequences for both the conservation and the interpretation of this important resource. The MC-30 application should be removed and/or mitigated to the greatest extent possible, using materials and procedures that have been thoroughly tested and proven to be safe and effective – both for the historic building and for those applying it.

To date, only one material has been field tested that shows potential as part of a cleaning/removal program. Others have been identified which have been used in similar applications, and these should also be field tested. Any materials proposed for use should be thoroughly tested for potential adverse consequences to the historic fabric, if these products have not already been tested in a laboratory environment. An application procedure should be developed and finalized through testing before implementation at the Fort. Given the significance of this National Historic Landmark, all materials and procedures used in the remediation should be consistent with the highest standards of historic preservation.

Finally, there does seem to be an element of time-sensitivity to the removal of the MC-30. At least some of the materials that have been recommended as removal agents can only be effective within a week or two of the initial asphaltic application.

figure 11. test panel in Fort courtyard