

Appendix E

Testing Program

In an attempt to bridge the gap between rehabilitation and preventive maintenance for local streets, and to reduce program costs, pavement treatments have been placed in test areas over the past few years. Treatments tested include the scrub cape seal, fabric cape seal, double chip seal as well as material tests with new products including rubberized asphalt concrete.

Testing new materials and surface treatments is important because it provides alternatives to traditional maintenance techniques and often provides more cost-effective solutions. Finding alternatives to traditional methods is especially important for low traffic, local streets because when competing for funding, local streets do not typically fare well.

In addition to the pictures incorporated into this appendix of the report, pictures of material and treatment testing areas are incorporated into Appendix F for a more in-depth illustration of the conditions and the results.

PASS® Testing

According to the Western Emulsions, Inc., website, “PASS® emulsion is a polymer modified asphalt-rejuvenating agent. It has enhanced low and high temperature properties and resists low temperature cracking; as well as maintains and restores asphalt pavements without tracking or bleeding. PASS® restorative seals may be applied at ambient temperatures ranging from 45°F to 120°F.”

The product can be used to replace the conventional asphalt oil for chip seals and scrub seals. It has also been used as a crack seal, tack coat and recycling agent in hot and cold recycling applications.

In May 2003, the first PASS® double chip seal was placed on Oak Street between East and Sixth Streets. The application was a double chip seal over the existing pavement. Very little preparatory work was done to the existing, severely cracked, pavement before the application of the PASS® double chip seal.



**Figure 12: Left - PASS® emulsion penetrating the cracked original surface.
Right - Application of the second layer of the double chip seal.**

Currently this block of pavement shows some reflective cracking, however it appears that the base material remains structurally sound. The current condition of the road is better than was expected based upon the amount of truck traffic, the original condition of the road and the minimal repairs completed before the surface treatment was completed.

Since this successful test, PASS® has been the product used in all projects specifying the scrub cape seal and has been used throughout the City with much success in rejuvenating severely deteriorated pavements. The material has also been successfully tested in many configurations of surface seals.

Scrub Cape Seal and Fabric Cape Seal Testing

The fabric cape seals and the scrub cape seals used the rejuvenating emulsion PASS® supplied by Western Emulsion, Inc., to test its compatibility with the fabric. The test areas were located on Harter Avenue and Churchill Downs Avenue, areas intentionally chosen for their high truck traffic and large amount of turning vehicles.

The Harter Avenue test area is bound by Kentucky on the North and Fortna on the south. The surface treatments were placed in September 2003. The area was divided into the four sections listed below. Appendix F contains more photos of the test areas.

1. Control section - no work done
2. Sample 1 – skin paving placed over existing pavement followed by a fabric cape seal using PASS®.
3. Sample 2 – localized patching followed by a scrub cape seal using PASS®.
4. Sample 3a & b – no patching done before treatment, scrub cape seal using PASS®. Sample 3a has varying spray rates 0.28, 0.30 and 0.32 gallons per square yard were used on the southbound lanes. Sample 3b had a spray rate of 0.35 gallons per square yard on the northbound lanes.

The Churchill Downs Avenue test area is a 500 foot stretch of pavement centered on the scale house located at 1462 Churchill Downs Avenue. The test consisted of a fabric chip seal. This process is similar to the fabric cape seal using PASS® with the exclusion of the slurry as the final treatment. The double chip seal follows the same process as a standard chip seal and adds another spray of oil followed by a second layer of rock chips. This was placed in September 2003.



Figure 13: Harter Avenue control section condition in 2007.

Both areas have exceeded the expectations of staff. Photos of the condition in 2006 and 2007 are included in Appendix F. There was some concern about utilizing the fabric treatment in conjunction with the PASS® due to its rejuvenating effects and its impacts on the ability of the fabric to permanently adhere

to the pavement surface. With this concern came the subsequent concern about disbonding between the layers of the treatment under the stress of turning vehicles. Findings show that in the four years since the treatments were placed, deterioration of the pavement surface has been slowed.

Churchill Downs Avenue test site had slight chip loss but not more than would be expected after two years. Additionally, the fabric was found fully adhered to the underlying pavement with no noticeable disbonding.

Harter Avenue Sample 1 is performing exceptionally well. The presence of only minimal fine reflective cracking is visible in the test area. This is a dramatic difference from the control section which has continued to deteriorate. The asphalt wearing surface is in good condition with very few signs of aging.

Harter Avenue Sample 2 is also performing above expectations with limited cracks reflecting to the pavement surface. The asphalt wearing surface is in good condition with very minimal deterioration.

Harter Avenue Sample 3a is showing extensive reflective cracking through the new pavement surface. The asphalt wearing surface is severely distressed and most of the capability to prevent water penetration has been lost.

Harter Avenue Sample 3b is in better condition than 3a which is likely due to the increased amount of the rejuvenating PASS® initially applied to the surface. There are substantial reflective cracks and oxidation.

These results are continued justification for the use of pavement fabric with surface treatments to prevent the early onset of reflective cracking in pavements that are in extreme disrepair. This fabric seal has provided an alternative for local streets that have fallen into the rehabilitation cycle and need very costly reconstruction. Failed streets receiving this treatment are expected to have their serviceable life extended by up to 12 years if preventive maintenance treatments are applied as necessary after the application of the fabric seal.

The cape seal results are impressive when the original pavement condition is considered and compared to the types of conditions to which cape seals are typically applied. It is a testament to the benefit of the additional layer created with the combination of the slurry and chip seals as well as the rejuvenating abilities of the PASS® emulsion.

Rubberized Asphalt Concrete Testing

Rubberized asphalt concrete (RAC) was placed, with little success, in the fall of 1995 in several areas as part of a road reconstruction and rehabilitation project. In 1995, the product was a relatively new product but the reported benefits of RAC were longer life, noise reduction and recycling of used tires. Additionally the specifications allowed for a maximum 2:1 reduction in section thickness when using RAC.

The project placed overlays on the following collector and arterial streets which have moderate to high traffic volumes:

1. Beamer Street from College Street to Walnut Street – reduction used
2. Matmor Road from Oak Avenue to Willow Springs Drive – reduction not used
3. W. Court Street from Ashley Avenue to Cottonwood Street – reduction not used
4. W. Main Street from Cottonwood Street to California Street – reduction used
5. W. Gibson Road from Gary Way to California Street – reduction used
6. E. Gibson Road from County Fair Mall to Matmor Road – reduction not used

Of these overlays, Beamer Street, Matmor Road and Court Street had gross failures and had to be ground out and replaced within two years of placement. Although not a complete failure, East Gibson also had failures that had to be removed and replaced within three years of placement. All of these failed pavements had designs that were controlled by the structural deficiency of the existing pavement.

The overlays that performed well were pavements that did not have structural deficiencies or that did not have overlay thicknesses reduced. The design of the overlays in these areas was controlled by the desire to control reflective cracking.

West Main Street performed acceptably for about 10 years. It is not however, as well as was originally expected for the material. West Gibson Road performed very well and is only exhibiting moderate defects.

The conclusion from this test was that the RAC product with a reduced section was not an acceptable product to use to increase the structural strength of pavements. RAC is not any stronger than conventional AC which means that using the 2:1 reduction in thickness is not appropriate when designing solely for structural deficiencies. RAC does have the benefit of staying more flexible with age than conventional AC. This makes it suitable, in full thickness, for pavements that have structural deficiencies and a probability of reflective cracking. Additionally, RAC in reduced thickness is appropriate for pavements that are severely cracked yet have no structural deficiencies.



Figure 14: Overlay on El Dorado is doing well controlling the reflective cracks.

These findings are all consistent with early test results from Caltrans which spurred the change in the State specifications regarding the use of the 2:1 reduction for structural deficiencies.

Using the information gained from the 1995 experience and the revised State specifications, RAC was placed in 2004 on four collector streets with moderate traffic volumes located in residential areas.

A portion of the cost for this second test project was borne by the City, and a portion was a rebate incentive from the Waste Management Board.

1. Cross Street from East Street to Walnut Avenue – Reconstruction using RAC for the top lift of the pavement section
2. Woodland Avenue from West Street to Mariposa Street- Overlay
3. El Dorado Avenue from Ashley Avenue to Inverness Drive- Overlay
4. El Dorado Avenue from College Street to Bidwell Place - Overlay

Currently, the pavement condition of the test areas is very good. The most notable distress is minor oxidation which is an age related distress and not directly related to the materials used.

The current conditions show that the material performs at least as well as conventional asphalt concrete and warrants additional monitoring. One downside to the RAC product is the increased cost; it is approximately 30-40% more expensive than conventional asphalt concrete. This added cost makes it critical that the product out-perform traditional materials.

Double Chip Seal Testing

Double chip seals were placed on Commerce Circle and the south end of Santa Anita Court in May 2005. These seals were similar to the PASS® double chip that was placed on Oak Avenue in 2003, however, PASS® was not used. Instead, a polymer modified cationic rapid setting asphalt emulsion (PMCRS) was used; PMCRS is a conventional asphalt emulsion used for chip seals.

Commerce Circle was chosen because of the large amount of truck traffic and the condition of the pavement. This area had not received any maintenance to mention before the double chip seal. The area at the south end of Santa Anita Drive was chosen because it was in front of the shipping and receiving gate for a major manufacturing yard and towing company.

The current condition of Santa Anita after two years of service is worse than was expected. There are significant cracked areas and reflective cracking. This may be due in part to the amount of trucks and busses traveling over this section on a daily basis. However it is a definite contrast to the Oak Avenue PASS® double chip seal which was completed two years earlier and is in better overall condition.

Commerce Circle, because of proximity to other work and its cracked condition, was included in the 2007 summer road project and received a slurry seal.



Figure 15: The severely cracked condition of Santa Anita is not what was expected.

Future Testing Plans

Future testing will include the combination of the fabric cape seal and microsurfacing as well as the scrub cape seal and microsurfacing. In both cases the final surface treatment will be microsurfacing rather than slurry seal.

A new material test will use a rejuvenating fog seal product from Western Emulsions, Inc., called PASS® QB. This quick breaking (quick curing) emulsion is used to prevent weathering of pavements by preserving the fine surface aggregates. The emulsion is expected to penetrate, seal and rejuvenate asphalt pavements.

Correspondence with the County of Santa Barbara regarding their success with the product is a major factor in the decision to begin testing with this new material. The County has been successfully using PASS® emulsion products for the past 10 years.

If tests are successful, the fog seal is a potential product for use prior to final acceptance of pavements in new subdivisions to improve the pavement surface condition as well as the appearance.