



Pavement Engineering
Pavement Management
Asset Management
GIS Linkage & Mapping
Visual Condition Rating
Deflection Testing

April 16, 2013

Job No. 13-039

County of Marin
Public Works Department
P.O. Box 4186
San Rafael, CA 94913

Attn: R. J. Suokko, P.E.
Associate Civil Engineer

Subject: Pavement Evaluation & Project Treatment Review, 2013
Point San Pedro Road between Union and 1000' east of Heritage Drive

Dear Mr. Suokko:

CHEC Management Systems, Inc. has completed our field evaluation of Point San Pedro Road between Union and 1000 ft. east of Heritage Drive. The purpose of the field evaluation was to determine if a Bonded Wearing Course (BWC) is an appropriate surface treatment for use during the 2013 construction season.

Bonded Wearing Course

To understand if a Bonded Wearing Course (BWC) is a viable option for Point San Pedro Road we first must understand what a BWC is, and what type of road condition is optimum for this product to last long term. In this letter CHEC will discuss whether this process has been used successfully in the past by other local agencies such as Caltrans or other Counties in the area.

A BWC is a surface treatment that is essentially the marriage of two treatments into one process that will provide a long term durable product. The first treatment is an open graded asphalt concrete mix with the second treatment being a thick emulsion spray to help "seal" the existing surface and cracks from water intrusion. This marriage allows us to obtain the best of both worlds in one final product. We get to have the superior seal of the existing surface from the emulsion while obtaining a noise reducing, anti-hydroplaning surface from the open-graded asphalt concrete. If the process is completed correctly the final product should last ten to twelve years.

Control Factors of Bonded Wearing Course

For a BWC there are certain conditions that may disqualify the use of this type of surface treatment. In general there are three factors for AC pavements that may disqualify BWC from being used.

1. A BWC should not be placed over high severity alligator cracking
2. A BWC should not be placed in areas where rutting is greater than 0.50 inches
3. A BWC should not be placed in areas where high severity block cracking is present

A BWC is not a structural enhancing layer. So, if high severity alligator cracking is present then the pavement area needs a thicker overlay than the BWC. Secondly, if rutting greater than 0.50 inches is present then the spray emulsion may pond in these rutted areas causing bleeding through the open-graded asphalt concrete surface layer. Lastly, if the block cracking has a high severity (small blocks) then the treatment may not bond correctly causing premature failures.

The three factors discussed above were used as the primary evaluation tool as we visited the site on April 12, 2013.

Site Evaluation

On April 12, 2013, Mr. James B. Curtis, President and Mr. Gary Otremba, P.E., Vice President of Engineering Operations arrived on site at the southwest end of the project area to start the pavement evaluation. It is our understanding that the overall project length is approximately 3.7 miles and has multiple pavement sections because it meanders in and out of City and County jurisdiction. In the past, the county has completed some maintenance overlays and chip seals. The specific treatments completed by the City are unknown to CHEC at this time. Since the past treatments completed are not a decision criteria for evaluating whether a BWC is a viable treatment option, CHEC is not concerned about the past history data from the City.

Currently the street has four lanes of traffic, two in each direction, with a raised median in the center. The shoulders of the street vary depending on the location and which agency maintains the street. Occasionally the street has curb and gutter present on the shoulder of the street as well as in the median of the street where drainage structures are also present.

From information provided, there are three different design options the County is looking at utilizing depending on the defects present. The different design options are

as follows:

- For streets that are structurally sound and have a minimal amount of defects present the design option is:
 - Perform full-depth AC repairs as needed; wedge cut / mill edges where appropriate and place a 1.0 inch BWC later across entire surface.
- For streets that have more defects but are structurally sound for the most part the treatment option is:
 - Perform full-depth AC repairs, mill entire surface 3.0 inches place a 2.0 inch AC leveling course with a 1.0 inch BWC layer to follow.
- For the sections of street that have the most severe defects present, the design would require full-depth AC repairs to be completed, mill the entire street 3.5 inches and then place a 1.0 inch AC leveling, paving mat, 1.5" resurfacing, with a 1.0 inch BWC layer to follow.

Utilizing the information above we drove the street sections and performed the visual condition assessment for each pavement section. CHEC found that the street sections have very few areas where the alligator cracking is "pumping" or mud staining due to the deflections of the pavement under loadings. The areas that are exhibiting pumping can easily be taken care of by completing full-depth AC repairs in those localized areas.

It is our professional opinion that the treatment options described above are correct per the defects and conditions seen in the field. BWC's have been utilized in Marin County by CALTRANS as recent as last construction season. The BWC is a viable treatment option that will provide the County with a surface layer that will out-perform typical surface treatments such as slurry seals, cape seals or chip seals.

The County may consider placing a paving mat, such as TruPave on the milled surface prior to placing the 2.0 inch overlay on the areas that are in the worst condition. This will aid in reflective crack control as well as provide a waterproof membrane. Crack filling and full-depth AC repairs will still need to be completed as part of the overall project.

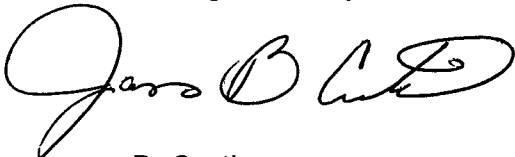
The only other design consideration that the County may need to evaluate is the depth of the edge milling with respect to the surface layer thickness. Because a BWC is comprised of an open-graded asphalt concrete, water will be transported just below the surface through the layer to the edges of the pavement. If the milling depth is too deep the water may "dam up" or pond within the surface layer near the pavement edges when curb and gutter are present. If traffic is placing loads where the water is ponding or standing, failures may occur. Edge milling could be $\frac{3}{4}$ to $\frac{1}{2}$ inch, and may work better and allow the BWC to be slightly higher than the adjacent structures, allowing proper drainage.

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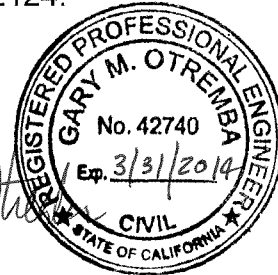
CHEC Management Systems, Inc. appreciates the opportunity to work with the County of Marin on this project and look forward to future opportunities to provide engineering design or project management services as required. A good resource for understanding the uses and design parameters of a BWC can be found through the CALTRANS CP2 Task Force. The Maintenance Technical Advisory Guide (MTAG) Chapter 11 is on Bonded Wearing Course and provides a complete discussion of the benefits of BWC.

If you have any questions or comments, please call (800) 523-2124.

Very truly yours,
CHEC Management Systems, Inc.



James B. Curtis
President



Mr. Gary Otremba, P.E.
Vice President of Engineering Ops.
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