

October 16, 2008

Mr. Allan Orr
Blue Steel Chemicals
9659 - 49 Avenue
Edmonton, Alberta
T6E 5Z5

RE: RePlay - Agricultural Oil Seal & Preservation Agent

Dear Mr. Orr

We are writing this letter to say how pleased we are with the preliminary findings of a trial placement of RePlay, Agricultural Oil Seal & Preservation Agent. The project encompassed a portion of Hagen Way and a portion of Hagen Link in the South West portion of the City of Edmonton.

The project was chosen due to the presence of check cracking (transverse hairline cracks) in the surface of the FAC (Final Acceptance) overlay placed earlier in the summer of 2008. The check cracking was found through coring to extend from the surface of the asphalt down and generally terminate at the first occurrence of a rock in the mix, within 5 to 10mm of the surface. The presence of these cracks is typically a result of a tender mix, which is defined as a mix that does not possess enough internal strength at higher temperatures to support compaction equipment during rolling, a hump in the sand gradation curve or improper rolling techniques such as rolling to fast, stopping too quick, excessive rolling or finish rolling at too high a temperature.

Generally check cracking does not affect the structural integrity of the pavement structure, but our standard repair is to mill off the surface 10-15mm of Asphalt and replace it with sound asphalt.

On the section of Hagen Way and Hagen Link, the City of Edmonton allowed the contractor to place RePlay on the surface of the checked asphalt to see if the cracks could be sealed without having to remove and replace the asphalt.

The RePlay material was supplied and placed by Blue Steel Chemicals using the manufacturers recommended dosage rate using a truck mounted spray bar. The material was applied to the road and allowed to cure for approximately 30 minutes before traffic was allowed onto the surface.

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Three Weeks after placement of the RePlay materials staff from the City of Edmonton's Quality Assurance Testing Laboratory retrieved several 150mm diameter cores from the site to visually assess the performance of the RePlay.

Upon examining the cores it was noted that the RePlay material had penetrated the surface of the asphalt to depths ranging from 20mm to 40mm, which is consistent with the literature provided from BioSpan Technologies Inc. It was also noted that the cracks, while still visible on the surface of the cores were sealed the full depth when looking at the side of the cores. Again this is consistent with the literature from BioSpan Technologies Inc.

The City of Edmonton will continue to monitor the trial section of RePlay and look forward to working with you in the placement of several other trial sections.



Hugh B. Donovan P.Eng.
Construction Services Engineer
Engineering Services Branch
Transportation Department
City of Edmonton



July 5, 2010

RePlay® Agricultural Oil Seal and Preservation Agent

**Location: Victoria Avenue from Elphinstone Street to Angus Street (Eastbound)
Fleet Street from 7th Avenue to Hall Street (North and Southbound)**

Asphalt production determined the sections on both Streets to be good candidates for a trial application. The intent is to create a sealed surface that will resist deterioration from air, water and de-icing salt penetration. These sections of Victoria and Fleet were paved late in 2009 construction season and displayed very open porous pavement structures. The application of the RePlay® product should reduce the surface voids and penetrate into the asphalt concrete to seal it and extend the service life of the pavement before any premature maintenance.

Employees from the materials testing laboratory cut 4 cores and performed 4 Sand Patch tests (ASTM E965) at each location prior to the application of the RePlay® product. Another round of cores and Sand Patch tests were completed after the application to provide a comparison. The cores were taken to observe the void structure, and to measure the penetration of the product. The sand patch test was performed to measure the macro texture of the asphalt and to determine a mean texture depth. Any successive Sand Patch testing could be performed to measure the long term changes in the macro texture and the product ages and weathers the seasons.

The two tables below displays the **Sand Patch** test results

Location	Date	Mean Texture Depth (mm)
3231 Victoria – 2.3 m. N. of curb	June 9 th , 2010	0.547
3033 Victoria – 2.4 m. N. of curb	June 9 th , 2010	0.705
2901 Victoria – 2.1 m. N. of curb	June 9 th , 2010	0.714
2807 Victoria – 2.1 m. N. of curb	June 9 th , 2010	0.643
3231 Victoria – 2.3 m. N. of curb	June 15 th , 2010	0.421
3033 Victoria – 2.4 m. N. of curb	June 15 th , 2010	0.536
2901 Victoria – 2.1 m. N. of curb	June 15 th , 2010	0.490
2807 Victoria – 2.1 m. N. of curb	June 15 th , 2010	0.429

The Victoria Avenue location displayed on average a 25% reduction in Mean Texture Depth as determined from the Sand Patch test.

Location	Date	Mean Texture Depth (mm)
1243 Fleet – 5.5 m. W. of curb (North bound)	June 9 th , 2010	0.340
1143 Fleet – 4.9 m. W. of curb (North bound)	June 9 th , 2010	0.515
1158 Fleet – 5.3 m. E. of curb (South bound)	June 9 th , 2010	0.520
1234 Fleet – 5.2 m. E. of curb (South bound)	June 9 th , 2010	0.476
1243 Fleet – 5.5 m. W. of curb (North bound)	June 15 th , 2010	0.316
1143 Fleet – 4.9 m. W. of curb (North bound)	June 15 th , 2010	0.462
1158 Fleet – 5.3 m. E. of curb (South bound)	June 15 th , 2010	0.476
1234 Fleet – 5.2 m. E. of curb (South bound)	June 15 th , 2010	0.454

The Fleet Street location displayed on average an 8% reduction in Mean Texture Depth as determined from the Sand Patch test.

The cores obtained from Victoria Avenue and Fleet Street indicated a high amount of voids and were poorly consolidated. After the RePlay® application the surfaces of the cores voids were closed, and any of the voids that extended below the surface were closed. The penetration of the RePlay® product for Victoria Avenue was not detectable to be measured; however the pictures of the sides of the cores compared before and after the application seem to show the voids to be significantly reduced.

Example pictures of cores taken at #1243 Fleet Street, Northbound lane, 5.5 m West of the curb.





It appears that the penetration of the product has closed the surface significantly, and should provide a barrier to air, water and de-icing salt penetration to the voids within the pavement layer. Monitoring of these section as well as future testing will determine the long term performance of the RePlay® product.

Victoria Avenue from Angus to Elphinstone was paved in both East and Westbound directions. Comparisons of both lane directions should prove a good indication of the long term performance of the RePlay® product.

Further pictures of all of the cores taken on the Fleet Street and Victoria Avenue projects can be found at: I:\Graphics\AP&FS\Testing Lab and Roadways Inspection\2010\Replay Application.

Please contact me if you have further questions on this topic.

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Dear Shel:

After several years of treatment, I am pleased to announce that the cracks in the roads we treated with REPLAY have not reopened and the edges are still intact. We also noticed that there hasn't been any decrease in nighttime visibility of our lane striping. The overall appearance of the treated roads is better than the non-treated ones and there seems to be an improvement in skid resistance.

We will be hiring a lab to test some sample boring for Oxidation, Penetration, Marshall Hammer test, Moisture Permeability and Friction or Skid Resistance test. We will advise you of the results as soon as we receive them.

After our application, we saw penetration from 1" to 1 3/4" down in the cracks the next day, even though we had a slight wind drift problem at the time of application. We'll be interested in what the results show 4 years later.

Let me know when the next time you are going to be in town.

Thanks,

Floyd Stenneche

Douglas County Road Supt.
Omaha, Nebraska

OMAHA, NEBRASKA Replay Road Test

