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Tuesday, December 20, 2011

RE: ASTM D6433-03 Inspection Study – Requarth Rd., Darke County

SUMMARY

Approximately 1 ½ miles of Requarth Road from Greenville East Corporation Limit to St. Johns Road was paved in 2004 with ¾" 402 Base Asphalt and ¾" 404 Surface Mix. After paving, a ½ mile section from Greenville East Corporation Limit to Jaysville St. was treated with Biorestor, while the remaining pavement was not. The purpose of this study was to determine the Pavement Condition Index (PCI) for the treated and non-treated sections of Requarth Road through the ASTM D6433-03 inspection process and MicroPAVER™ pavement management system (PMS).

ABOUT JG3 CONSULTING

President and CEO James Golden founded JG3 CONSULTING, LLC. (JG3) after 14 years of extensive pavement management and MicroPAVER experience, providing implementation services to private, city, state, township and airport organizations throughout the United Sates. JG3 specializes in all facets of the MicroPAVER pavement management system and ASTM D6433-03 inspection process with 100% of our daily business operations occurring in the field of pavement management.

ASTM D6433-03

The PCI is a numerical indicator based on a scale of 0 – 100 where 0 is considered "failed" condition and 100 considered "excellent" condition that rates the surface condition of the pavement. The PCI provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement, which also indicates the structural integrity and surface operational condition (localized roughness and safety). The PCI cannot measure structural capacity nor does it provide direct measurement of skid resistance or roughness. It provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs. The PCI provides feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures. A breakdown of the 7 condition categories and PCI limits is listed below:

CONDITION CATEGORY	PCI RANGE
Excellent	92 - 100
Very Good	82 - 91
Good	68 - 81
Fair	50 - 67
Poor	35 - 49
Very Poor	20 - 34
Failed	0-19

PCI is generated by inspecting 2500 sf sample locations within a pavement section, documenting the distress type, severity level and quantity. Results are entered into the MicroPAVER™ (PMS) to determine the pavement section's PCI rating. The number of total sample units is determined by dividing the total section area/sample location area (2500 sf). From here, the minimum samples to inspect to follow ASTM D6433-03 can be found by referencing the table below:

TOTAL # OF SAMPLE UNITS IN SECTION	MINIMUM # OF SAMPLE UNITS TO INSPECT
1 - 5	1
6 - 10	2
11 - 15	3
16 - 40	4
OVER 40	10% OF TOTAL SMAPLES

There are 19 possible distresses for asphalt based surface types as indicated below:

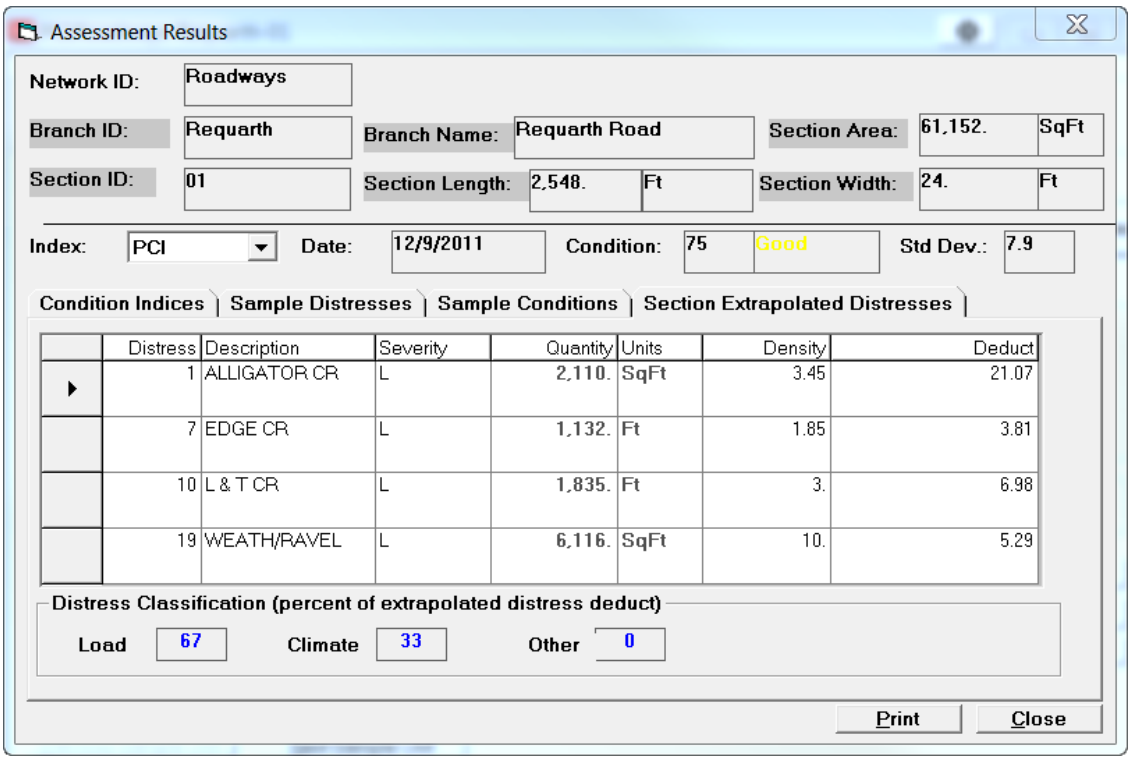
1. Alligator Cracking
2. Bleeding
3. Block Cracking
4. Bumps and Sags
5. Corrugation
6. Depression
7. Edge Cracking
8. Joint Reflection Cracking
9. Lane/Shoulder Drop Off
10. Longitudinal and Transverse Cracking
11. Patch/Utility Cut
12. Polished Aggregate
13. Pothole
14. Railroad Crossing
15. Rutting
16. Shoving
17. Slippage Cracking
18. Swell
19. Weathering/Raveling

STUDY RESULTS

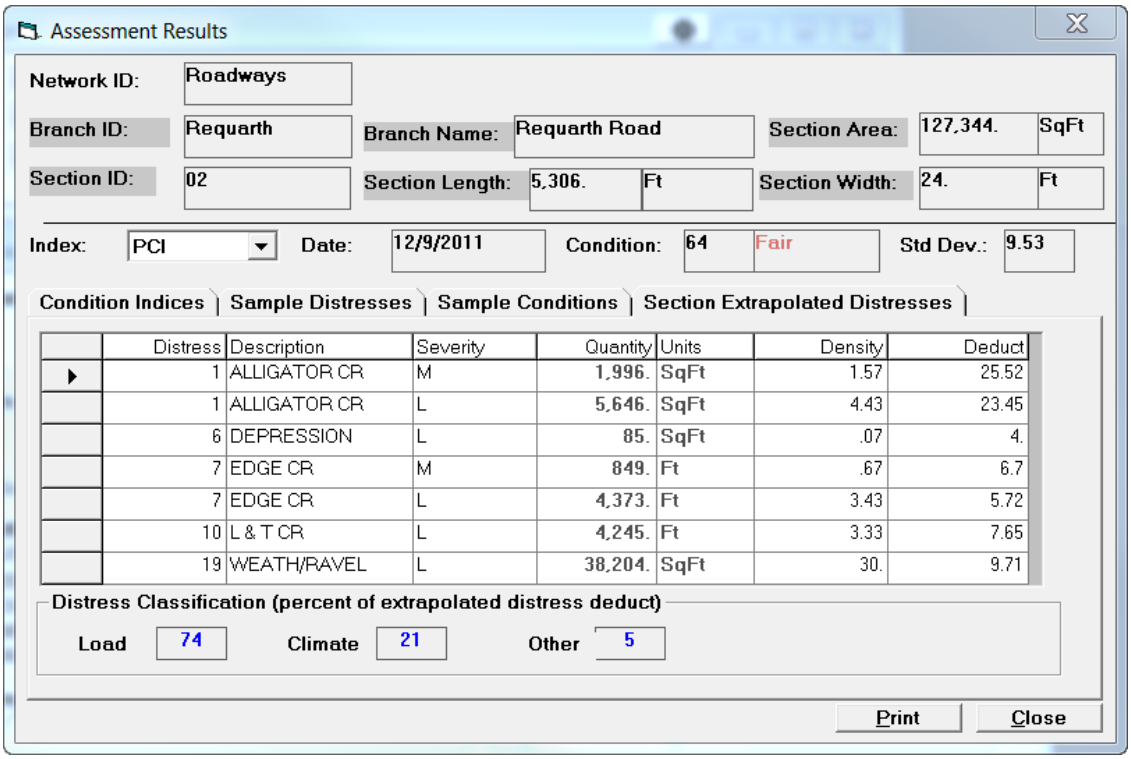
Requarth Road was split into 2 pavement sections for this study:

- Section 01 from Greenville East Corp Limit to Jaysville St, 2548' in length and treated with Biorestor.
- Section 02 from Jaysville St. to St Johns Rd., 5306' in length and not treated with Bi-Re-Stor.

It was determined that Section 1 (Treated with Biorestor) had 24 total possible sample units, referencing the table above (4) 2500 sf samples were inspected. After following the ASTM inspection process it was the determined that the calculated PCI rating was a 75, ranking in the "Good" condition category. A complete breakdown of extrapolated distress type, severity and quantity as well as % of load and climate associated distress is indicated from the calculated PCI screen shot within the MicroPAVER™ PMS below:



It was determined that Section 2 (Not Treated with Biorestor) had 24 total possible sample units, referencing the table above (6) 2500 sf samples were inspected. After following the ASTM inspection process it was the determined that the calculated PCI rating was a 64, ranking in the "Fair" condition category. A complete breakdown of extrapolated distress type, severity and quantity as well as % of load and climate associated distress is indicated from the calculated PCI screen shot within MicroPAVER™ PMS below:



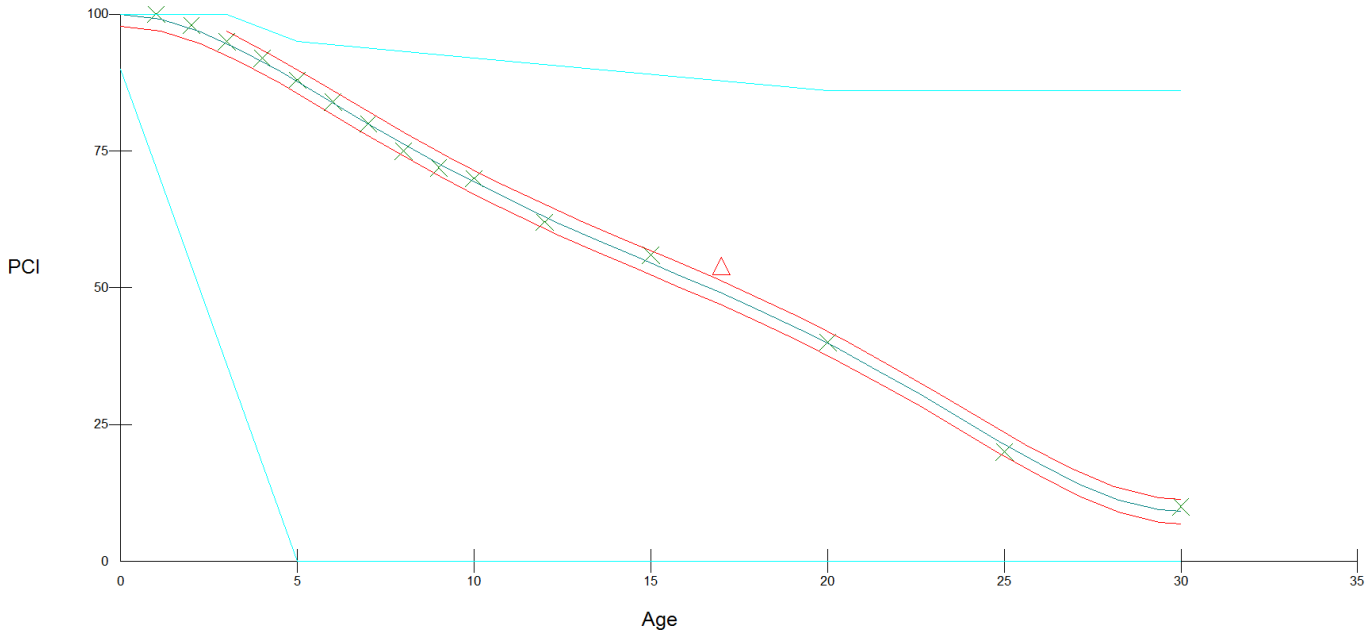
Distress	Description	Severity	Quantity	Units	Density	Deduct
1	ALLIGATOR CR	M	1,996.	SqFt	1.57	25.52
1	ALLIGATOR CR	L	5,646.	SqFt	4.43	23.45
6	DEPRESSION	L	85.	SqFt	.07	4.
7	EDGE CR	M	849.	Ft	.67	6.7
7	EDGE CR	L	4,373.	Ft	3.43	5.72
10	L & T CR	L	4,245.	Ft	3.33	7.65
19	WEATH/RAVEL	L	38,204.	SqFt	30.	9.71

CONCLUSION

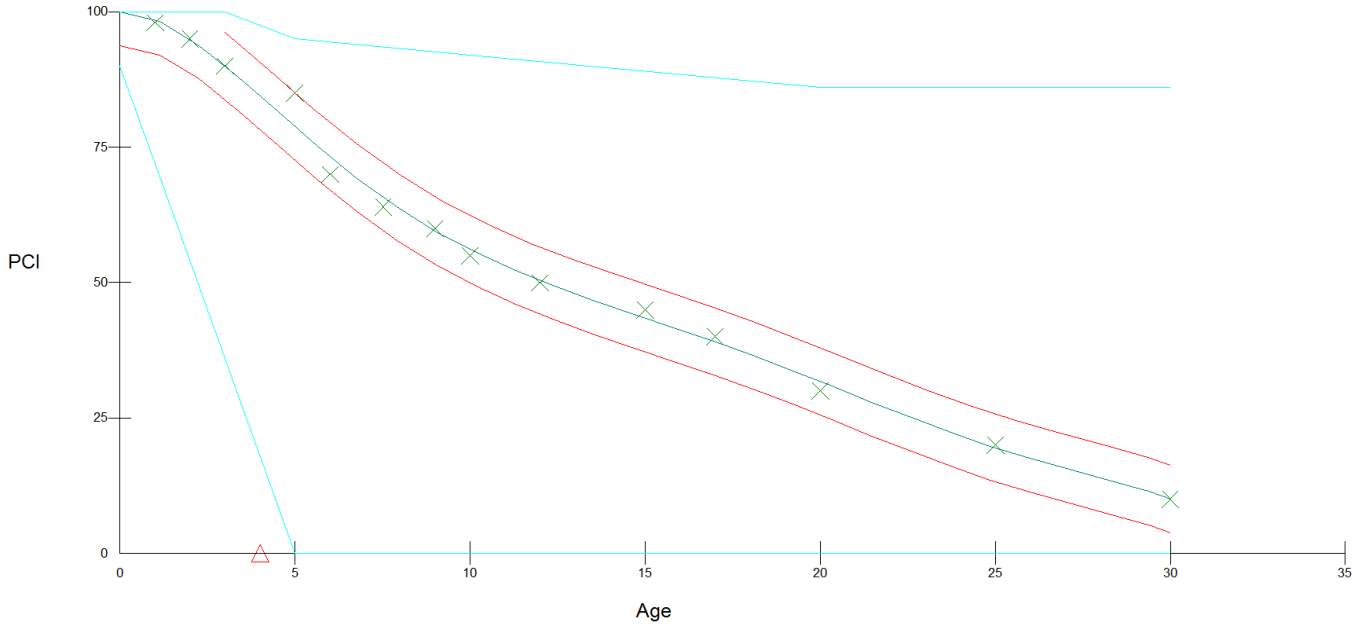
In comparing the 2 pavement sections through the ASTM PCI evaluation it has been determined that the section treated with Biorestor is at a much slower rate of deterioration vs. the section that was not treated. The PCI difference between these two sections is at 11 PCI points. When looking at rates of deterioration, the section treated with Biorestor is dropping on average just 3.6 points per year while the non-treated section is at a 5.1 PCI point drop per year.

The following deterioration curves were developed based on pavement age, maintenance and inspection data to show performance/life expectancy of the treated vs. non-treated sections:

TREATED



NOT TREATED



The percentage of load associated distress and climate related distress within each pavement section were very similar, however the severity levels and quantities were higher in the section not treated. Looking at Alligator cracking, a load associated distress, ASTM D6433-03 defines it as follows:

Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading. Cracking begins at the bottom of the asphalt surface (or stabilized base) where tensile stress and strain are highest under a wheel load. The cracks propagate to the surface initially as a series of parallel longitudinal cracks. After repeated traffic loading, the cracks connect, forming many sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are generally less than 0.5m (1.5 ft) on the longest side. Alligator cracking occurs only in areas subjected to repeated traffic loading, such as wheel paths.

In the case of the treated section, alligator was just beginning to develop as fine hair line thin cracks located within the wheel paths of the section, and occurring in a start/stop pattern. In the non-treated section, these cracks were beginning to open approximately ¼" in width with a network pattern developing moving from the light severity level to the medium severity level. Because alligator cracking is a load associated distress it has a high deduct value highly contributing to the 11 point difference in PCI between the treated and non-treated sections.

Another contributor to the 11 point PCI difference can be found with the climate related distress weathering/raveling. ASTM D6433-03 defines weathering/raveling as follows:

Weathering and raveling are the wearing away of the pavement surface due to a loss of asphalt or tar binder and dislodged aggregate particles. These distresses indicate that either the asphalt binder has hardened appreciably or that a poor-quality mixture is present. In addition, raveling may be caused by certain types of traffic, e.g., tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage are also included under raveling.

Both treated and non-treated sections indicate weathering/raveling, however the PCI study shows a significantly higher acceleration of this distress by approximately 25%.

Based on my experience with asphalt based surface types, rates of deterioration and the ASTM inspection methodology, it is clearly evident that the product Biorestor inhibits the oxidation process while providing for increased flexibility and a longer lifespan of pavements treated after paving.

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President

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