Georgia Department of Transportation
Office of Materials and Testing

Standard Operating Procedure (SOP) 46

Procedure for Calculating Pay Reduction for Failing
Roadway and Bridge Approach Smoothness

I.   General

It is the responsibility of the Bituminous Construction Branch of the Office of Materials and Testing to monitor the quality of all Bituminous Materials used and placed on asphaltic concrete constructed roadways on Georgia Department of Transportation (GDOT) projects. All on-system roadway and resurfacing bridge approach projects establish specified smoothness requirements in Section 400.3.06.C. In accordance with Section 400.3.06.C.4, *"when recommended by the Office of Materials and Testing, a pay reduction may be accepted in lieu of correction for roadways and bridge approaches that fail to achieve specified smoothness indexes. The Office of Materials and Testing may recommend a waiver of profile smoothness requirements when improvement over pre-construction smoothness profile exceeds 25 percent for urban roadways, as defined in Table 9, and 15 percent for bridge approaches"*.

Standard Operating Procedure 46 exists to reference the procedure used by the Bituminous Branch of the Office of Materials and Testing to determine all asphaltic concrete related roadway and resurfacing bridge approaches pay factor reductions for smoothness related failures. Under no circumstances shall roadways or bridge approaches receiving greater than a 0.25 pay factor reduction meet the criteria for a recommended pay reduction. In these circumstances corrective work, up to and including removal and replacement, will be required to improve the smoothness for the failing sections. Additionally, in accordance with Section 400.3.06.C.3.b, correct individual bumps or depression exceeding 1/8 in. in 10 ft (3 mm in 3 m) straightedge requirement as directed by the Engineer. Please note that the Office of Materials and Testing may recommend a waiver for specified smoothness requirements when pre-construction smoothness testing indicate that improvement necessary to meet specified requirements is not possible under the work as Let.

II.   Specified Smoothness Requirements Section 400.3.06.C For Roadways

Table 1 — Pavement Smoothness Target Requirement

Construction Description	Smoothness Index
All Asphaltic Concrete OGFC and PEM on interstate including resurfacing and new construction. Asphaltic Concrete OGFC and PEM placed on state routes as new construction.	750
Asphaltic Concrete SMA or dense-graded surface mixtures placed directly beneath the Asphaltic Concrete OGFC or PEM on interstates. Asphaltic Concrete OGFC and PEM placed on state routes as resurfacing. All new construction on state routes with exception of OGFC and PEM as stated above.	825
All other resurfacing on state routes (excluding LARP, PR, airports, etc.)	900
All Urban new construction and resurfacing on state routes within curb and gutter sections located in posted 35 miles per hour (MPH) or less speed zones.	1175

Table 2 — Pavement Smoothness Corrective Work Requirement

Construction Description	Smoothness Index
All Asphaltic Concrete OGFC and PEM placed on interstate including resurfacing and new construction. Asphaltic Concrete OGFC and PEM placed on state routes as new construction.	825
Asphaltic Concrete SMA or dense-graded surface mixtures placed directly beneath the Asphaltic Concrete OGFC or PEM on interstates. Asphaltic Concrete OGFC and PEM placed on state routes as resurfacing. All new construction on state routes with exception of OGFC and PEM as stated above.	900
All other resurfacing on state routes (excluding LARP, PR, airports, etc.)	1025
All Urban new construction and resurfacing on state routes within curb and gutter sections located in posted 35 miles per hour (MPH) or less speed zones.	1250

A. Method of Calculating Pay Reduction For Roadway Smoothness Pay Factor Reduction

An applied pay factor reduction will be determined by calculating a percentage using the specified corrective work required smoothness requirement and the actual smoothness that is then subtracted from the 1.0 pay quantity. This calculation will be provided for each failing mile section. The overall project smoothness will not be used. The contract unit price per ton for the surface mix will be used to determine a cost per square yard and the calculated pay factor reduction will be applied to the square yards in the failing mile section(s). Table 3 displays examples of applied pay factor reductions for various failing sections.

Table 3 –Roadway Smoothness Pay Reduction Calculation Example

MP From	MP To	Correct. Smoothness	Actual Smoothness	Pay factor	$ Per Ton	Spread Rate	SY cost	Linear Distrace	Width	SY mix	Pay for mix	Reduction Pay
A	B	C	D	E	F	G	H	I	J	K	L	M
				1-(C/D)				|A-B|*5280		(I*J)/9	(H*K)	(E*L)
1	2.25	1025	1125	0.089	$77.25	165	$6.37	6600.00	12.00	8800.00	$56,056.00	$4,988.98
2	3	1025	1275	0.196	$81.25	135	$5.48	5280.00	12.00	7040.00	$38,579.20	$7,561.52
1	2	1025	1026	0.001	$82.00	135	$5.54	5280.00	12.00	7040.00	$39,001.60	$39.00
1	2	1250	1350	0.074	$68.52	165	$5.65	5280.00	12.00	7040.00	$39,776.00	$2,943.42
2	3	1025	1375	0.255	$71.50	165	$5.90	5280.00	12.00	7040.00	$41,536.00	*
* Corrective Work Requried Without Waiver Recommendation												

III.   Specified Smoothness Requirements Section 400.3.06.C For Bridge Approaches (Resurfacing Projects)

For Resurfacing Projects:

a. The Department will determine a profile index value using the laser road profiler in accordance with test method GDT 126.

b. The Department will determine the Half Car Simulation (HCS) IRI for each HMA asphalt 1/10th of mile (0.16 km) segments adjacent to each bridge joint for each lane. The HCS IRI will be reported in 1/20th of mile (0.08 km) segment readings in accordance with GDT 126.

- **Keep the Target profile index value under 825 mm/km and correct profile locations exceeding 900 mm/km using the Laser Road Profiler. Correct individual bumps or depression exceeding 1/8 inch in 10 ft (3 mm in 3 m) straightedge requirement as directed by the Engineer.**

c. Ensure Resurfacing projects meet the profile index value for the specified 1/10th mile (0.16 km) segment of roadway up to the bridge joint.

B. Method of Calculating Pay Reduction For Bridge Approach Smoothness (Resurfacing Projects) Pay Factor Reduction

An applied pay factor reduction will be determined by calculating a percentage using the specified corrective work required smoothness requirement and the actual smoothness that is then subtracted from the 1.0 pay quantity with an additional 2.5 times the pay factor reduction. This calculation will be provided for each failing bridge approach. The contract unit price per ton for the surface mix will be used to determine a cost per square yard and the calculated pay factor reduction will be applied to the square yards in the failing bridge approach section(s). Table 3 displays examples of applied pay factor reductions for various failing bridge approaches.

Table 4 – Bridge Approach Smoothness Pay Reduction (Resurfacing Project) Calculation Example

BA/BE	BE/BA	Correction Smoothness	Actual Smoothness	Pay factor	$ Per Ton	Spread Rate	SY cost	Linear Distrace	Width	SY mix	Pay for mix	Reduction Pay
A	B	C	D	E	F	G	H	I	J	K	L	M
				1-(C/D)				|A-B|*5280		(I*J)/9	(H*K)	(E*L)*2.5
0	0.1	900	950	0.053	77.25	165	$6.37	528	12	704	$4,484.48	$594.19
0	0.1	900	1060	0.151	81.25	135	$5.48	528	12	704	$3,857.92	$1,456.36
0.1	0	900	1175	0.234	82	135	$5.54	528	12	704	$3,900.16	$2,281.59
0.1	0	900	1225	0.265	68.52	165	$5.65	528	12	704	$3,977.60	*
* Corrective Work Required Without Waiver Recommendation												

IV Report

The Office of Materials and Testing will provide a letter of recommendation to the District Engineer to include a pay factor reduction cost or specified smoothness waiver for all failing smoothness projects. The Director of Construction, State Construction Engineer, Area Engineer and OMAT's Material Audits Unit will be copied all letters of recommendation.

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State Materials Engineer

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Director of Construction