

Recommend Approval: <u>Bonnie Johnson</u> 11/10/16 Team Leader Date <u>Shane</u> 11/10/16 Division Chief Date	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved: <u>Sejal Bunt</u> 11/21/16 Director Date	PROCEDURES FOR DETERMINING THE RIDE SPECIFICATION PAY LIMITS AND PAY ADJUSTMENTS	MSMT 736

SCOPE:

These procedures are used to determine the Ride Specification Pay Limits and Pay Adjustments. The Administration will perform the pay adjustment calculations for the Overall IRI and for Defect Cost and then will calculate the Total Pay Adjustment.

REFERENCE DOCUMENTS:

- Section 535
- MSMT 563
- [Spreadsheet application for calculating Ride Specification Limits](#)

DEFINITIONS:

The pay adjustment will be calculated based on the pay limits.

Where:

	DESCRIPTION	UNITS
PF	Pay Factor for Overall IRI	Dollars per lane-mile
INCENTIVE	Incentive for Overall IRI	Dollars
DISINCENTIVE	Disincentive for Overall IRI	Dollars
$P_{\text{defect},i}$	Defect Cost for a given 25' section	Dollars per section
DEFECT COST	Sum of the defect costs ($P_{\text{defect},i}$) for all defect sections	Dollars
IRI_{AVG}	Overall average IRI for the project	Inches per mile
$IRI_{\text{defect},i}$	IRI for a given 25' defect section	Inches per mile
NS	Number of tested 25 foot Sections	Sections

PROCEDURE:

1. Determine The IRI Values for Maximum Incentive, Full Pay, Disincentive And Defects:

Use the spreadsheet application located at: <http://roads.maryland.gov/index.aspx?pageid=32> to calculate IRI_a , IRI_b , IRI_c , IRI_d and IRI_e .

Locate the RideSpecLimits" tab and use it to calculate IRI_a , IRI_b , IRI_c , IRI_d and IRI_e . Enter the information into the yellow highlighted cells in Step 1 to compute the pay limits.

2. Compute the Defect Cost:

Use the “RideSpecLimits” tab to compute the defect cost. Enter the information into the yellow highlighted cells in Step 2 to compute the defect cost for a given defect section.

The remaining spreadsheet tabs show the range of defect costs for each functional class.

Compute the defect cost for each defect section using the appropriate formula for the functional class:

Interstates & Freeways/Expressways:

$$P_{\text{defect}, i} = 100 + \left(\frac{270 * (IRI_{\text{defect}} - IRI_e)}{(600 - IRI_e)} \right)$$

All Other Routes:

$$P_{\text{defect}, i} = 100 + \left(\frac{190 * (IRI_{\text{defect}} - IRI_e)}{(600 - IRI_e)} \right)$$

Locals:

$$P_{\text{defect}, i} = 80 + \left(\frac{180 * (IRI_{\text{defect}} - IRI_e)}{(600 - IRI_e)} \right)$$

Where: $P_{\text{defect}, i}$ = Defect cost for section i

IRI_{defect} = IRI value of section i

IRI_e = IRI_e obtained from Step 1

The total defect cost for the project is the sum of the defect costs of all 25’ sections.

Note: OMT’s Asphalt Technology Division (ATD) computes the total defect cost for every project using the Ridetool 2013 program and in accordance with these procedures.

3. Determine the Maximum Incentive And Disincentive Costs:

Based on the predominant functional classification for the project limits, obtain the maximum incentive (P_{max}) and maximum disincentive (P_{min}) from the table below:

FUNCTIONAL CLASS	MAXIMUM INCENTIVE FOR OVERALL RIDE (P_{max} in dollars per lane mile)	MAXIMUM DISINCENTIVE FOR OVERALL RIDE (P_{min} in dollars per lane mile)
Interstates & Freeways/Expressways	7350	7350
All other routes	6150	6150
Locals	5300	5300

4. Pay Adjustment Calculations:

Overall IRI. The overall average IRI for the project (IRI_{AVG}) will be calculated as the average IRI value of all tested 25 ft sections on the project. The pay adjustment for Overall IRI will then be calculated based on the factors below.

Incentive. $PF = P_{max}$, when IRI_{AVG} is less than or equal to IRI_a
 $PF = P_{max} \times (IRI_b - IRI_{AVG}) / (IRI_b - IRI_a)$, when IRI_{AVG} is greater than IRI_a
and less than IRI_b

$INCENTIVE = PF \times NS \times (25/5280 \text{ lane miles per section})$
 $DISINCENTIVE = 0$

Full Pay. When IRI_{AVG} is greater than or equal to IRI_b and less than or equal to IRI_c

$INCENTIVE = 0$
 $DISINCENTIVE = 0$

Disincentive. $PF = P_{min} \times (IRI_{AVG} - IRI_c) / (IRI_d - IRI_c)$, when IRI_{AVG} is greater than IRI_c
and less than IRI_d ,
 $PF = P_{min}$, when IRI_{AVG} is greater than or equal to IRI_d

$INCENTIVE = 0$
 $DISINCENTIVE = PF \times NS \times (25/5280 \text{ lane miles per section})$

Defect Cost. The IRI for each individual section will be used to calculate any cost to be applied for defects on the project. This pay adjustment applies only to the pavement within the tested sections. $DEFECT \text{ COST} = \text{Sum of the defect costs } (P_{\text{defect},i})$ for all defect sections.

Total Pay Adjustment. A total pay adjustment (TPA) will be made based on the total of any incentive and disincentive for Overall IRI minus any defects. TPA resulting in increased payment will be paid under the item Pavement Surface Profile Pay Adjustment. This item amount has been established by the Administration and shall not be revised. TPA resulting in decreased payment will be deducted from monies owed. The TPA shall be subject to conditions (a) and (b) below.

$\text{Total Pay Adjustment} = \text{INCENTIVE} - \text{DISINCENTIVE} - \text{DEFECT COST}$

- (a) Regardless of the measured profile of any test section, incentive payment will not be permitted for the project when the Contractor's QC data was not submitted on time in conformance with 535.03.02.

$\text{Total Pay Adjustment} = 0 - \text{DISINCENTIVE} - \text{DEFECT COST}$

- (b) The total value of Overall IRI disincentive and Defect Cost shall not be more than the Maximum Disincentive pay adjustment for all of the profiled 25 foot sections.

If DISINCENTIVE + DEFECT COST is greater than $P_{\min} \times NS \times (25/5280 \text{ lane miles per section})$
then Total Pay Adjustment = $- P_{\min} \times NS \times (25/5280 \text{ lane miles per section})$

CALCULATIONS:

Example:

Roadway Classification: Urban Freeway/Expressway

Existing IRI = 225

Scope of paving: Grinding, 0.75” Wedge/Level, and 1.25” HMA overlay

1. Determine The IRI Values for Maximum Incentive, Full Pay, Disincentive And Defects:

Based on this information, make the following selections in Step 1 to calculate IRI_a, IRI_b, IRI_c, IRI_d and IRI_e.

Existing IRI:	225
Number of HMA lifts:	1
Grinding on the project?	Yes
Wedge/Level?	Yes
Functional Class:	Interstates & Freeways/Expressways

Calculate the following values for IRI_a, IRI_b, IRI_c, IRI_d and IRI_e:

2. Compute the Defect Cost:

Based on the IRI_e value obtained in Step 1, assume that the following 25’ sections are classified as “defects”:

Begin Station	End Station	L_IRI	R_IRI	Average IRI (IRI _{defect})
100	125	185	190	188
135	160	212	220	216
180	205	175	182	179

Given that the functional classification of the roadway is Urban Freeway/Expressway, use the following formula to compute the defect cost for each defect section:

$$P_{\text{defect}, i} = 100 + \left(\frac{270 * (IRI_{\text{defect}} - IRI_e)}{(600 - IRI_e)} \right)$$

Calculate the defect costs for each defect section as follows:

Begin Station	End Station	L_IRI	R_IRI	Average IRI (IRI _{defect})	Defect Cost (P _{defect, i})
100	125	185	190	188	\$ 107.02
135	160	212	220	216	\$ 124.89
180	205	175	182	179	\$ 101.28
				Total	\$ 333.19

The total defect cost for the project is the sum of the defect cost of all sections; which equals \$333.19.

3. Determine the Maximum Incentive And Disincentive Costs:

Given that the roadway functional class is Urban Freeway/Expressway, the maximum incentive (P_{max}) for the project is \$7,350 per lane mile, and the maximum disincentive (P_{min}) is \$7,350 per lane mile.