J. Ride Quality Requirements.
THIS ENTIRE SUBPART IS CHANGED TO:

The Department will evaluate the final riding surface of the mainline travel lanes using the International Roughness Index (IRI) according to ASTM E 1926. The final riding surface is defined as the last lift of the pavement structure where traffic will be allowed. The Department will use the measured IRI to calculate the pay adjustment (PA) as specified in Table 401.03.03-7. PA will be based on lots of 0.01 mile length. The PA will be positive for superior quality work or negative for inferior quality work.

The department may evaluate the ramps, shoulders and others paved sections for IRI and calculate the PA if the RE requests testing due to suspected unacceptable ride quality based on visual inspection. Visual inspection by the RE is considered sufficient grounds for such evaluation.

1. **Smoothness Measurement.** The Department will test the longitudinal profile of the final riding surface for ride quality with a Class 1 Inertial Profiling System according to AASHTO M 328 and NJDOT R-1. If project conditions preclude the use of the Class 1 Inertial Profiling System, the Department will use a Class 1 walking profiler or lightweight profiler.
2. **Quality Control Testing.** Perform quality control testing during lift placement to ensure compliance with the ride quality requirements specified in Table 401.03.03-7.
3. **Preparation for IRI Testing.** Provide traffic control when the Department performs IRI testing. Perform mechanical sweeping of the surface before IRI testing. To facilitate auto triggering on laser profilers, place a single line of preformed traffic marking tape perpendicular to the roadway baseline at the beginning and end of each lane, shoulder, and ramp to be tested or at the direction of the Department. Submit the actual stationing for each traffic marking tape location to the RE.
4. **Quality Acceptance.** The Department will determine acceptance and provide PA based on the following:
    a. **Pay Adjustment.** The number of lots for final pay adjustment will be reduced by the number of lots excluded for each segment shown in Table 401.03.03-7. Lots excluded from final PA will be those with the highest recorded IRI numbers for respective roadway and bridge deck segments. A single average IRI value and the corresponding PA for each 0.01 mile lot will be reported. IRI units are in inches per mile.

Table 401.03.03-7 Pay Equations for Ride Quality			
	Excluded	**Pay Equation(s)**	
Route A from MP 20.3 to MP 22.2	NB Lane 1 - 5 Lane 2 – 6 SB Lane 1 - 4 Lane 2 - 5	PA on lots of 0.01 mile length PA=PAE Target IRI (T) = 60 Inch/Mile	
Route A Ramps and Shoulders and other paved sections within the project limit not included above.	Will include, if tested	PA on lots of 0.01 mile length	
		IRI ≤ 120	PA = $0
		120 < IRI ≤ 170	PA = (IRI – 120) x (–$10.00)
		IRI > 170	Maximum Negative Pay or Corrective action
Overlaid Bridge Decks on Route A Between MP 20.3 and MP 22.2	None	PA on lots of 0.01 mile length	
		$IRI<T_{Deck}$	PA=PAE
		$T_{Deck}\leq IRI\leq 120$	PA=0
		$120<IRI\leq 170$	PA=PAE
		IRI>170	Maximum Negative Pay or Corrective action
Pay Adjustment Equation (PAE)=	$\frac{A}{-37.75347\times \mathrm{LN}(\text{Target IRI})+194.87}-\frac{A}{-37.75347\times \mathrm{LN}(\text{ IRI})+194.87}$		
A=	$A=1267.2\times\left[\frac{M}{9}+\frac{ND}{150}\right]$		
M=	Bid price of Milling, per Square Yard		
N=	Bid price of last lift of the pavement structure to be evaluated, per. Ton		
D=	Average thickness of last lift to be evaluated, Inch		
T_{Deck}=	Target IRI for Bridge Deck Overlay and equal to Target IRI (T) of travel lanes of the roadway section where Overlaid Bridge Deck is located.		

Lane designation is by increasing numbers from left to right in the direction of traffic with left lane being Lane 1.

b. Corrective Action. If the average IRI is greater than the 170 inches per mile after testing is performed, the Department may require corrective action or assess the maximum negative pay adjustment as computed in Table 401.03.03-7. If the Department requires corrective action, the Contractor must submit a plan for corrective action. If the Contractor's plan for corrective action is approved and the lot is corrected, the Department will retest and evaluate the corrected area as a new lot that must meet the same requirements as the initial work. If the Contractor's plan for corrective action is not approved, the Department may require removal and replacement. The replacement work is subject to the same requirements as the initial work.

NJDOT R-1 – OPERATING INERTIAL PROFILER SYSTEMS FOR EVALUATING PAVEMENT PROFILES

THIS ENTIRE TEST METHOD IS CHANGED TO:

A. Scope. This test method describes the procedure for operating, verifying the calibration of an ASTM E 950 Class 1 Inertial Profiler System (IPS) and testing riding surface for pavement profiles evaluation.

B. Apparatus. Use an IPS that meets the requirements of AASHTO M 328 and ASTM E 950, Class 1 and the following:

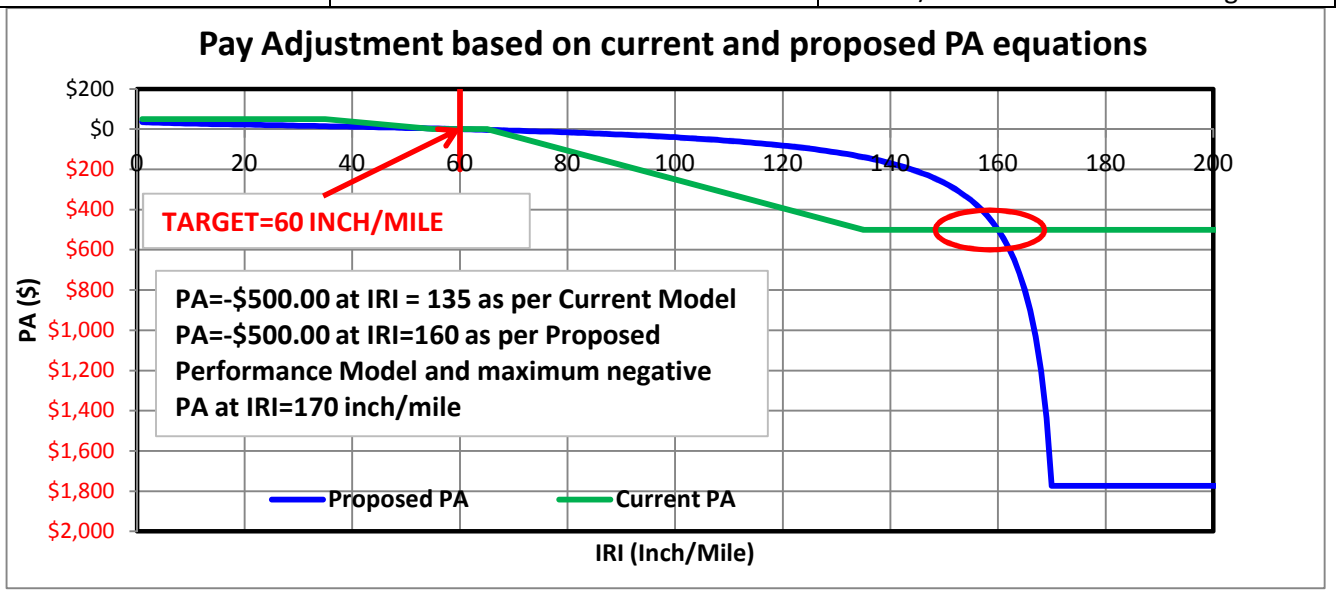
1. Certify the IPS according to AASHTO R 56 at least every 3 years. If a system component is replaced, re-certify the system. Perform the certification at a site approved by the Department.
2. The data system provides the raw profile data in an ASCII format acceptable to the Department.
3. The computer program uses a high-pass filter set at 300 feet and reads an ASCII or text file for computing the International Roughness Index (IRI) in inches per mile.
4. The current version of *ROADRUF*, *ProVal*, or other Department approved pavement profile analysis software is used to compute the IRI.

C. Procedure. Perform the following steps:

1. Operate the IPS according to AASHTO R 57 and ASTM E 950.
2. On a daily basis before data collection, check the equipment and operating system for operational stability and calibration. Perform necessary calibration procedures according to equipment manufacturer's procedures and applicable standards. Operators shall maintain a log documenting the calibration history.
3. Ensure that the operators of the IPS have completed a profile training course, such as NHI Course 131100, have been trained specifically on the IPS they will be operating, and are proficient in the operation of the IPS.
4. Make provisions to automatically start and stop the IPS recording at the beginning and end of testing.
5 Ensure retroreflective traffic striping tape or other approved mechanism is placed at the beginning and end of each direction of travel for automatically triggering the start and stop of profile measurements.
6. Prior to collecting data, stabilize the profiler in accordance with AASHTO R 57. Collect data in a continuous run through the length to be tested.
7 Test the full extent of each wheel path of each lane in the longitudinal direction of travel. The wheel path is defined as being located approximately 3 feet on each side of the centerline of the lane and extending for the full length of the lane. Lanes are defined by striping.
8 Perform three test runs in each lane scheduled for testing.
9. Report the average IRI value and the corresponding PA for each 0.01 mile lot. The average IRI value is the average of the IRI measurements from the left and right wheel path for each run taken at a speed within the recommended range specified by the equipment manufacturer.

COMPARISON OF CURRENT AND PROPOSED RIDE QUALITY PAY ADJUSTMENT EQUATION

		Current	Proposed
(1) Exclusions			
(i)	Threshold for Impediments	20 ft	50 ft
(ii)	Rail Tracks (Rail Road)	20 ft (Single) or Longitudinal length of Rail track+20 ft (for multiple rails)	Longitudinal length of Rail track+50 ft
(iii)	Short Segments	Exclusion length = Length+20’	Exclusion length = Length+50’
(iv)	Exclusions	Calculated as per locations shown in Examples of Localized Factors.	Additional Locations are added in Examples of Localized Factors
(2) Pay Adjustment Equations			
(i)	Base IRI	45 inch/mile for Freeway/ Limited Access Highway	50 inch/mile for Freeway/Limited Access Highway
		55 inch/mile for other than Freeway/Limited Access Highway	60 Inch/Mile for other than freeway with speed limit ≥35 MPH
			70 Inch/mile for other than freeway with speed limit <35 MPH
(ii)	Type of Pay Adjustment equations	Linear slopes on both sides of zero band with positive pay adjustment to negative pay adjustment ratio= 1:10...	Based on models developed from the Network IRI Performance data
(iii)	Maximum Positive Pay Adjustment	$50 at Target IRI-25.	Dependent on type of treatment and bid price of surface course. Opportunity to earn positive PA greater than $50 depending upon bid price of Surface Course and IRI of final riding surface.
(iv)	Maximum Negative Pay Adjustment	$-500.00 at Target IRI+75	Dependent on type of treatment and bid price of surface course. Maximum negative PA=Cost of Surface course for the lot at IRI=170 Inch/Mile
(v)	Slope of Negative Pay Adjustment	Linear, Pay Adjustment for every 1 inch/mile IRI beyond zero band = -$7.143	Exponential slope, flat close to the target and steeper as IRI approaches to 170 inch/mile. Similar slopes within 30-40 inch/mile on either side of target.

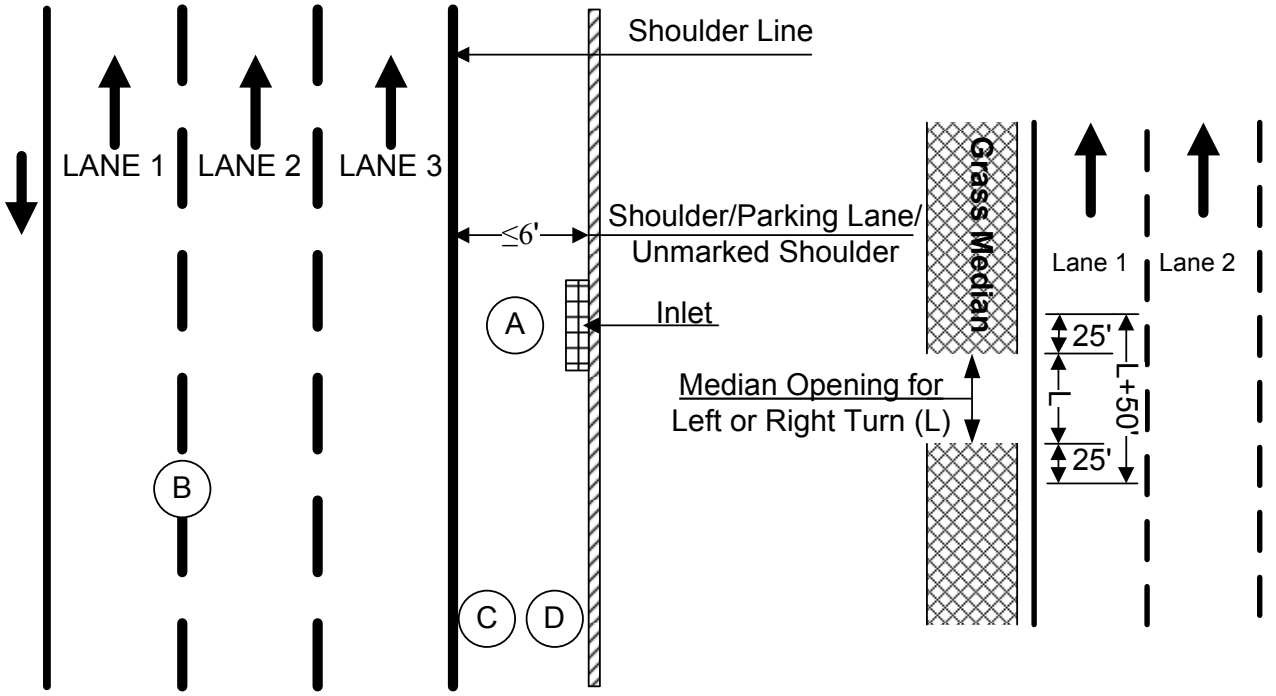


COMPARISON SUMMARY OF RIDE QUALITY PAY ADJUSTMENT

	Original Pay Adjustment					New Pay Adjustment								Project IRI Distribution		
	Target	Exclusions	IRI Delivered before Exclusions	IRI Delivered after Exclusions	PA	Target	Exclusions	Delivered after exclusions	M Milling Price, Per SY	N Surface Course Price, Per T	D Thickness, Inch	A	PA	IRI	# of Lots	Total Lots (One Lot = 0.01 Mile)
Project 1														<61	81	
2" SMA									$3.00	$99.00	2	$2,095	($1,537)	61-71	34	
3" SMA	61	17	80	70	($21,209)	66	37	65	$3.00	$99.00	3	$2,931	($2,150)	72-101	54	195
2" HMA									$3.00	$75.00	2	$1,690	($1,239)	102-170	20	
3" HMA									$3.00	$75.00	3	$2,323	($1,704)	>170	6	
Project 2														<61	86	
2" SMA									$3.00	$99.00	2	$2,095	$1,373	61-71	9	
3" SMA	61	7	54	50	$1,104	66	11	49	$3.00	$99.00	3	$2,957	$1,938	72-101	22	119
2" HMA									$3.00	$75.00	2	$1,690	$1,108	102-170	1	
3" HMA									$3.00	$75.00	3	$2,323	$1,523	>170	1	
Project 3														<61	243	
2" SMA									$3.00	$99.00	2	$2,095	($64,535)	61-71	186	
3" SMA	61	8	81	79	($75,478)	66	18	77	$3.00	$99.00	3	$2,957	($95,264)	72-101	252	799
2" HMA									$3.00	$75.00	2	$1,690	($52,044)	102-170	83	
3" HMA									$3.00	$75.00	3	$2,323	($71,561)	>170	35	
Project 4														<61	120	
2" SMA									$3.00	$99.00	2	$2,095	$2,650	61-71	1	
3" SMA	61	3	37	36	$5,075	66	3	36	$3.00	$99.00	3	$2,957	$3,740	72-101	3	125
2" HMA									$3.00	$75.00	2	$1,690	$2,138	102-170	1	
3" HMA									$3.00	$75.00	3	$2,323	$2,938	>170	0	

New PA Equation

$$PA = \frac{A}{-37.75347 \times LN(TARGET) + 194.87} - \frac{A}{-37.75347 \times LN(IRI) + 194.87} \qquad A = 1267.2 \times \left[\frac{M}{9} + \frac{ND}{150}\right]$$



IMPEDIMENTS

-Count Manhole "A" and inlet in "Lane 3".
-Count Manhole "B" in "Lane 1" & "Lane 2".
-Count Manhole "C" & "D" in "Lane 3".

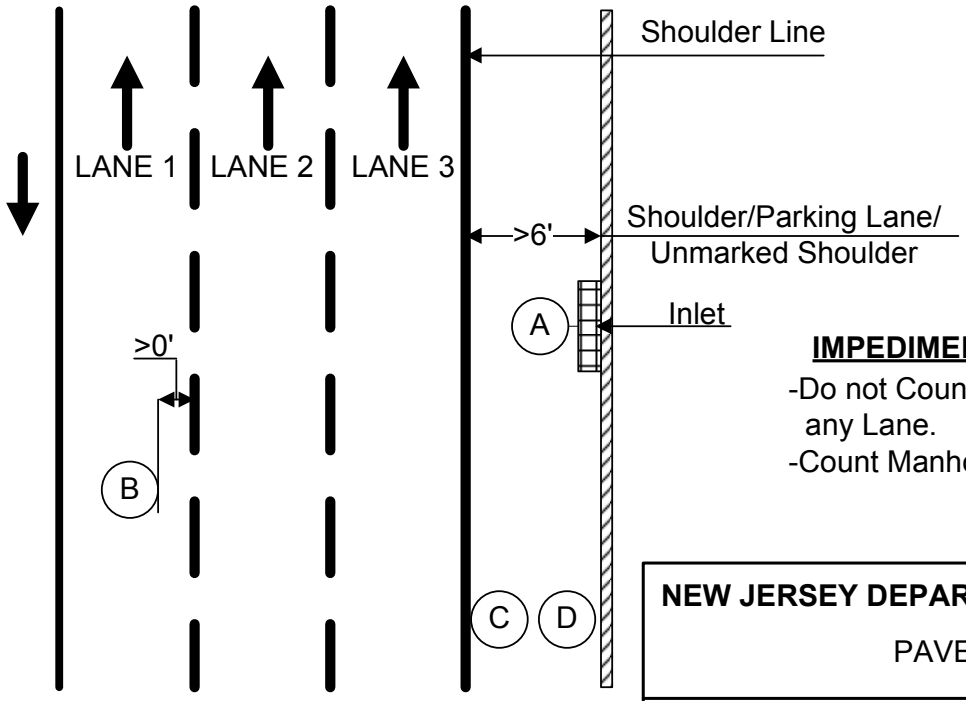
Note: Parking lane or unmarked shoulder is additional area adjacent to 12 ft wide travel way available for parking, break down etc. and not marked as a shoulder.

Figure-1

IMPEDIMENTS/ SHORT SECTION (SS)

-Count "L" in Lane 1 as a "SS", if Left Shoulder width is ≤ 6'. Do not count any manhole or inlet or any impediment, if located within L+50'.

Figure-2



IMPEDIMENTS

-Do not Count Manholes "A, C & D" and inlet in any Lane.
-Count Manhole "B" in "Lane 1".

Figure-3

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PAVEMENT DESIGN

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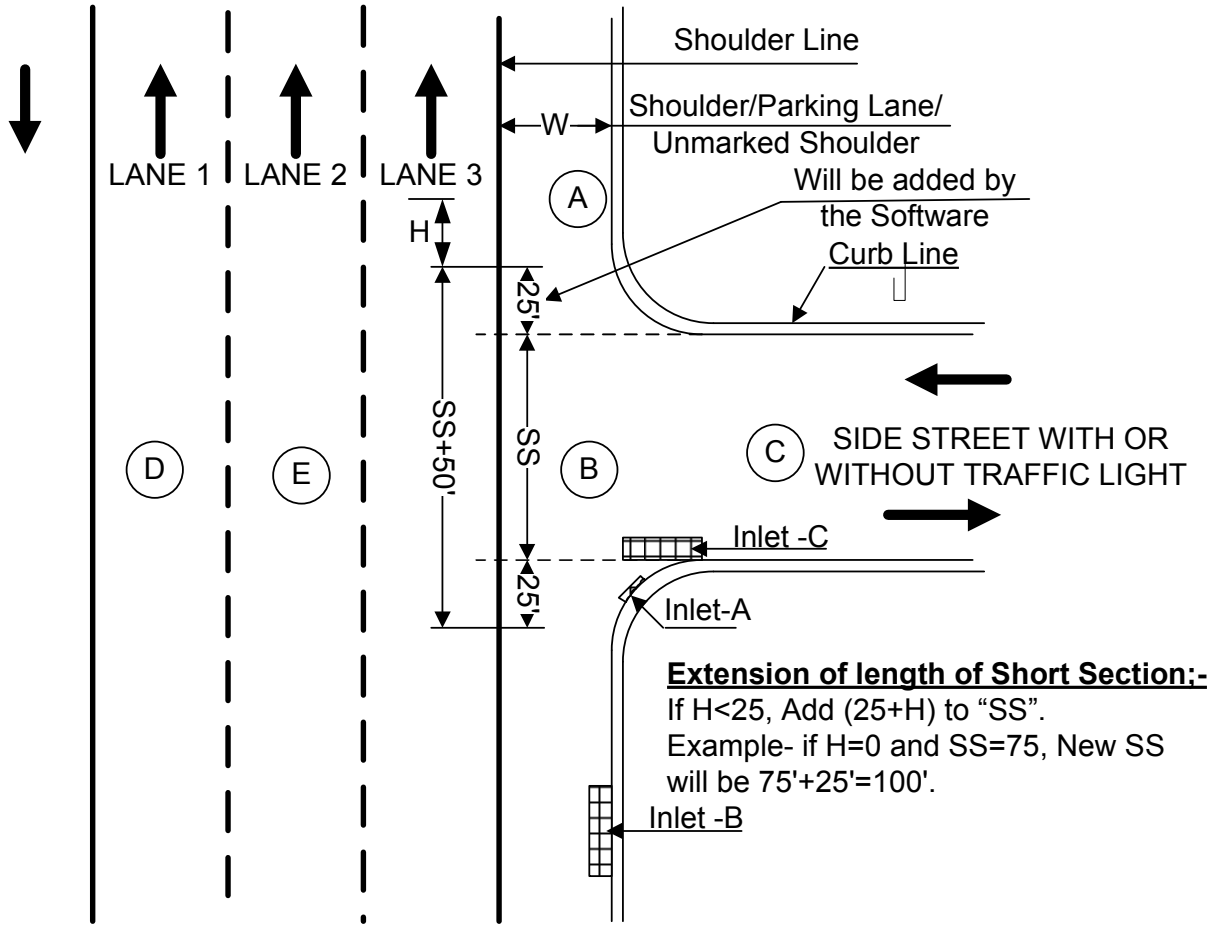
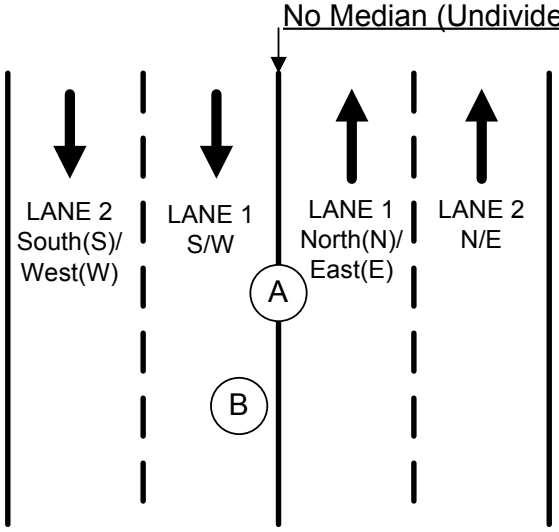


IMPEDIMENTS/ SHORT SECTION (SS) **(Figure-4)**

-Count Manhole "A" in "Lane 3", if W≤6'
-Count SS (Short Section) in "Lane 3", if W≤6'.
-Do not Count Manhole "B" in "Lane 3", if it is located within SS+50' i.e. excluded Area.
-Count Inlet "A" in "lane 3", if W is ≤ 6' and located outside the excluded length i.e. SS+50'.
-Count Inlet "B" in Lane 3, if W ≤6'
-Do not count inlet "C" and manhole "C".
-Count Manhole "D" & "E" in "Lane 1" & "Lane 2" respectively.
-If H<25', add (H+25)' to "SS" and do not count this manhole/inlet/utility valve for exclusion. Example- if manhole "A" is located at 15' from the end of "SS", add 25+15=40' to SS. Now "SS" is SS+40'.



IMPEDIMENTS **(Figure-5)**

-Count Manhole "A" in "Lane 1 S/W" and "Lane 1 N/E"
-Count Manhole "B" in "Lane 1 S/W"

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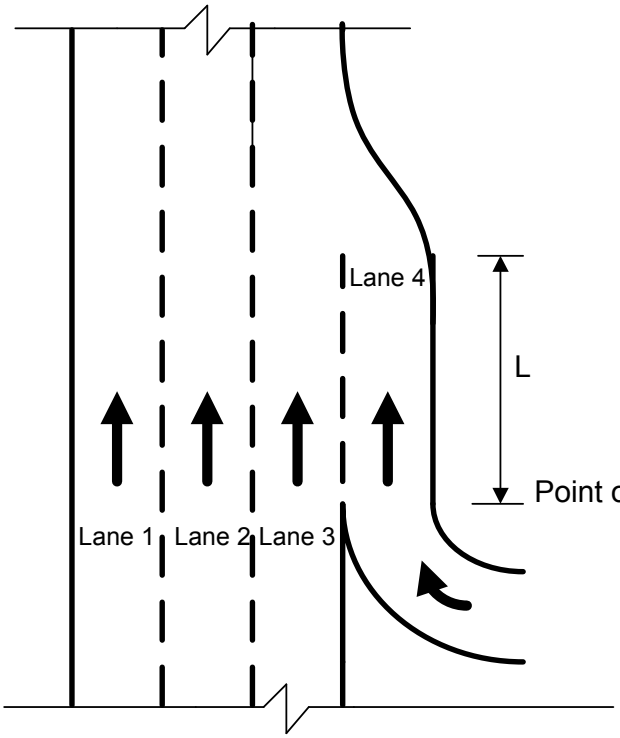


FIGURE 6
ACCELARTION LANE LENGTH

Lane 4 will be tested, if L≥1000 ft.

Note: -If multiple curves are existing within the length L, Pavement Design Unit should be consulted to determine limits of ride quality.

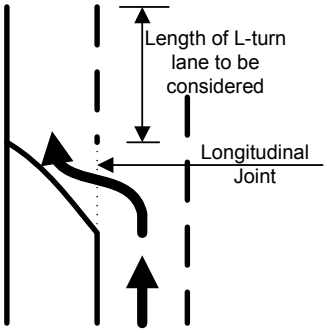


FIGURE 8
LENGTH OF L-TURN LANE

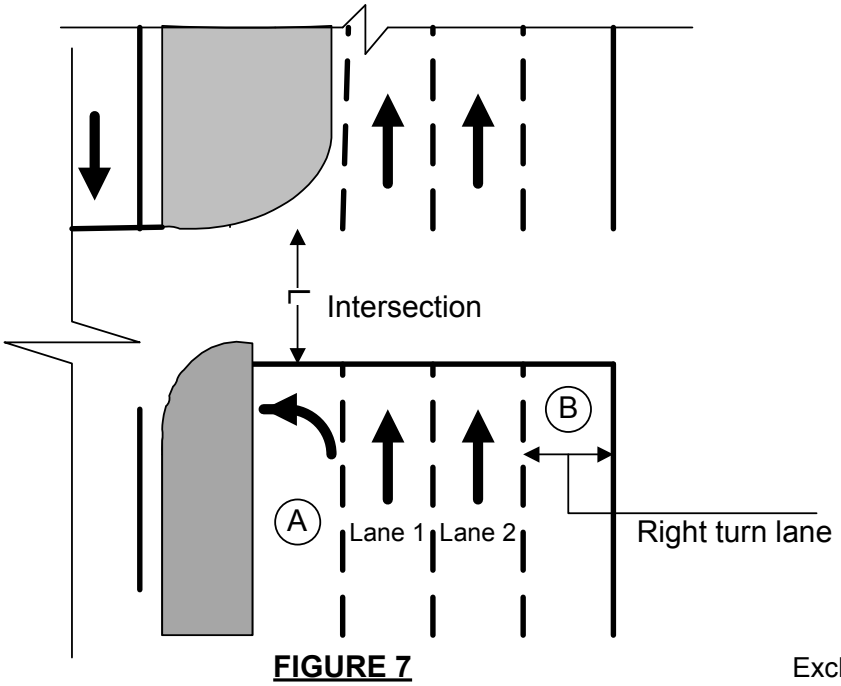
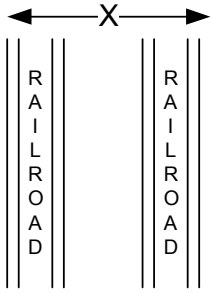


FIGURE 7
INTERSECTION WITH TURNING LANES

1. If left turn lane < 1000 ft, left turn lane will not be tested. Do not count "L" as "SS" for lane 1. Also, do not count Manhole "A" for lane 1.
2. If left turn lane ≥ 1000 ft, left turn lane will be tested as a Lane. Do not count "L" as "SS" for L-turn lane, if lane terminate at the intersection. If L-turn lane continue after intersection, count "L" as "SS" for L-turn lane. Count manhole/ inlet/utility valves located in L-turn lane for L-turn lane.
3. if right turn lane < 1000', right turn lane will not be tested. Do not count "L" as "SS" for Lane .
4. If right turn lane ≥ 1000 ft, right turn lane will be tested as a lane. Count "L" as "SS" for right turn lane and count all metal as "IM" located within R-turn lane for R-turn lane.



Exclusion Width=X+Threshold length of Impediment

FIGURE 9
LENGTH OF L-TURN LANE

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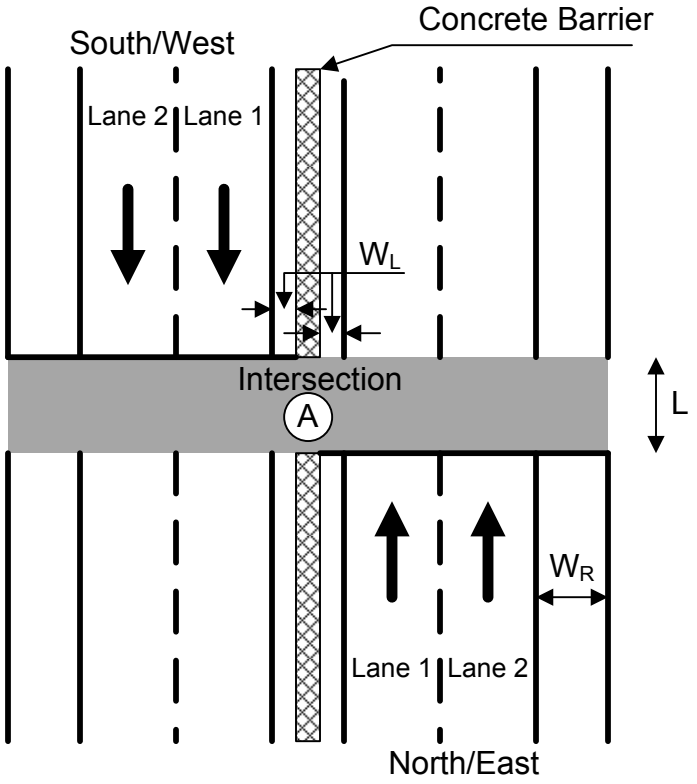


W_L= Width of left shoulder

FIGURE 10

PAVING BOTH DIRECTIONS UNDER THE CONTRACT

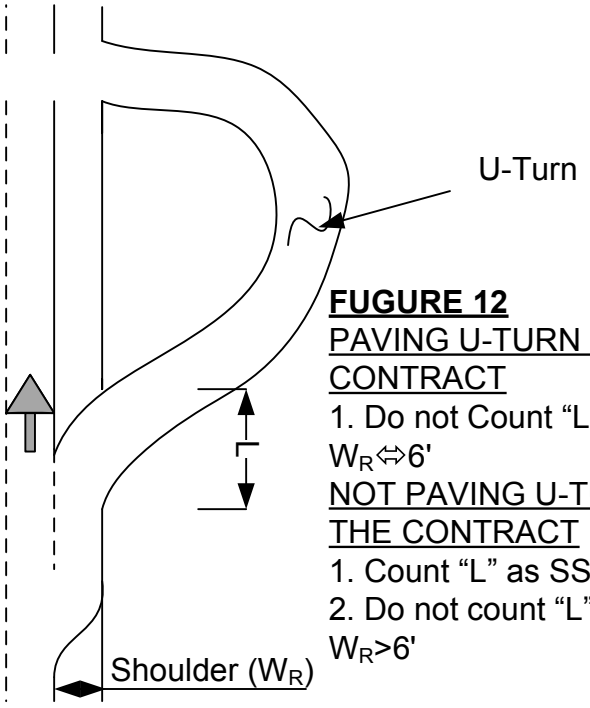
1. Do not count "L" as SS for lane 1 for any width of W_L.
2. Count all metals located within left shoulder as IM for Lane 1, if $W_L \leq 6'$.
3. Count "A" as "IM" for Lane 1 of both directions, if $W_L \leq 6'$.
4. Do not Count any metal or manhole A as "IM", if $W_L > 6'$.

PAVING ONE DIRECTION UNDER THE CONTRACT

5. Count "L" for lane 1, if $W_L \leq 6'$.
6. Count "A" as "IM" for Lane 1, if $W_L \leq 6'$.
7. Do not count "L" for lane 1 as SS, if $W_L > 6'$.
8. Do not count any metal located within left shoulder, if $W_L > 6$.

RIGHT SHOULDER

9. Count "SS" for lane 2, if $W_R \leq 6'$.
10. Do not Count "SS" for lane 2, if $W_R > 6'$.



FUGURE 12

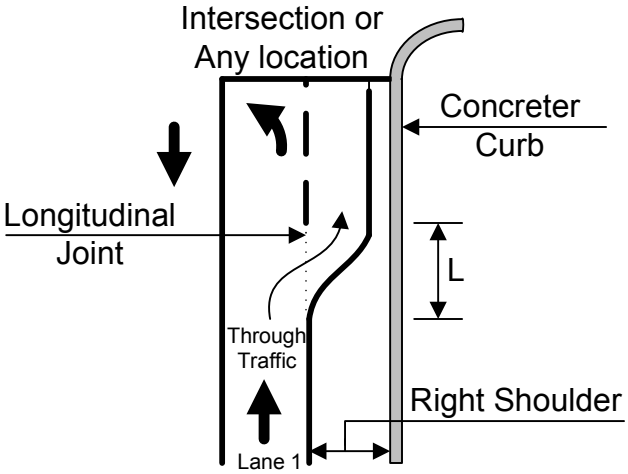
PAVING U-TURN UNDER THE CONTRACT

1. Do not Count "L" as SS, if $W_R \Leftrightarrow 6'$

NOT PAVING U-TURN UNDER THE CONTRACT

1. Count "L" as SS, if $W_R < 6'$
2. Do not count "L" as SS, if $W_R > 6'$

FIGURE 11 – CROSSING OVER LONGITUDINAL JOINT



Count "L" for Lane 1 as SS.

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