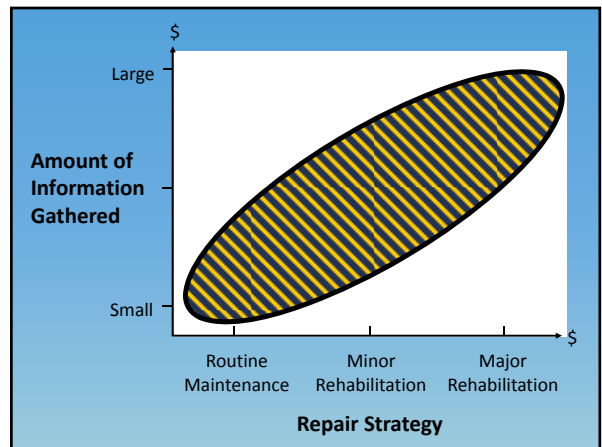
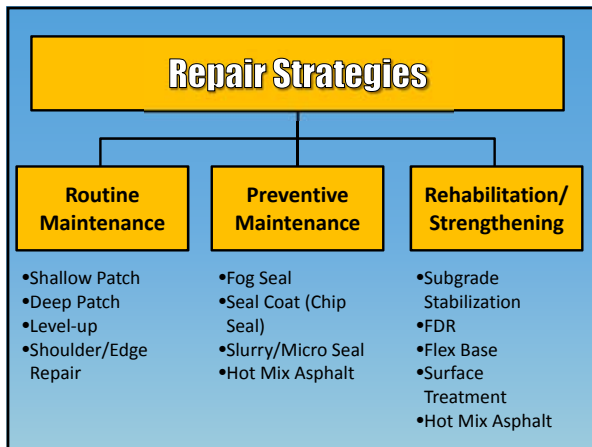
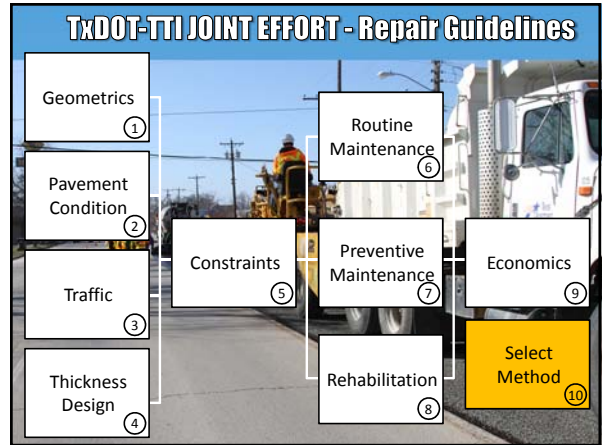


Select Strategy

PP-16-13

Maintenance Division
Inter Agency Contract

Summer 2016



STEP 1 GEOMETRICS/PAVEMENT CHARACTERISTICS

- Farm to Market Road System
 - Narrow (18 to 22 ft.)
 - Limited thickness
 - Narrow right-of-way
- Traffic control



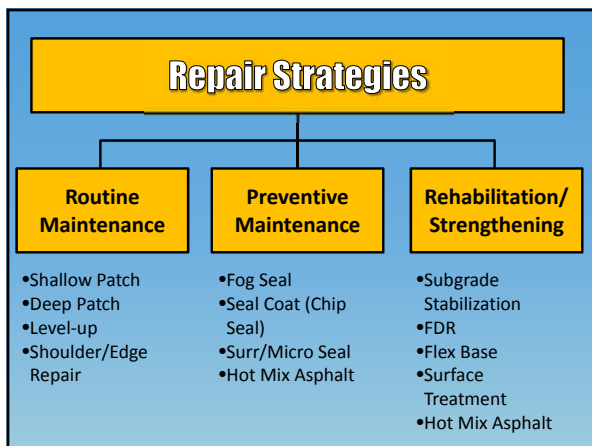
STEP 2 PAVEMENT CONDITION

Anticipated Maintenance/Rehabilitation	Pavement Condition Investigation	
	Level	Activities
Routine Maintenance	1	Historic records/visual condition & perhaps GPR
Preventive Maintenance	1 & 2	GPR/FWD & perhaps DCP
Rehabilitation	1, 2 & 3	Field sampling and laboratory testing



STEP 3 TRAFFIC

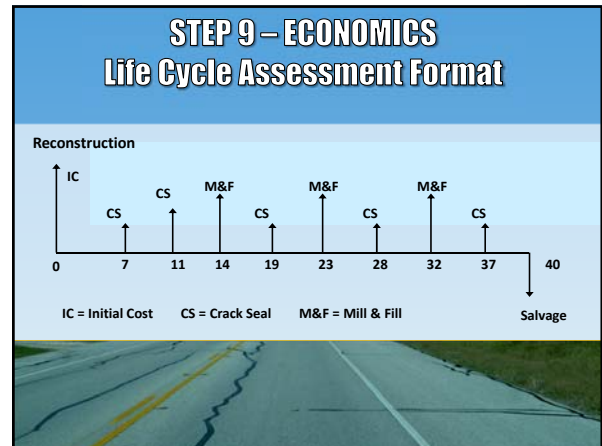
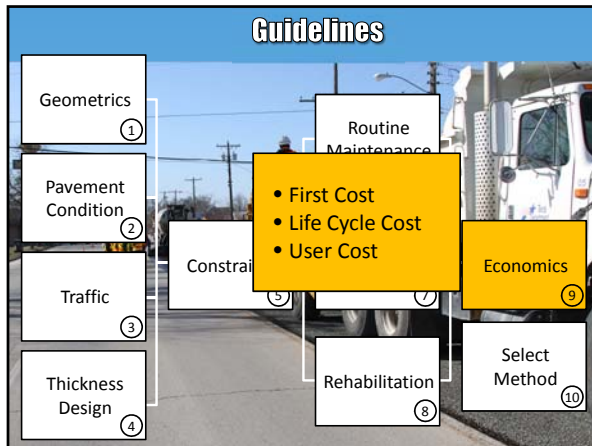
Total Traffic =
 Typical/existing traffic
 +
 Oil development/production traffic

STEP 5 CONSTRAINTS

- Financial
- Work force availability
- Equipment availability
- Materials availability
- Weather conditions
- Traffic control





Structural Design Considerations

Subgrade	Shoulder Widths, Ft	
	Recommended	Minimum
Soft	6	4
Stiff	4	2

ESALs per Well during Development & Operation for Different Texas Formations

	Barnett Shale Region	Eagle Ford Shale Region	Permian Basin Region
Number of trucks for well development	5,413	15,170	10,324
ESALs per well after 20 years (trip to well) for well development	5,804	10,641	6,151
ESALs per well after 20 years (trip from well) for well development	3,823	13,694	10,792

Energy Sector Pavement Design Catalog for 4-Layer (Surface, Flex Base, FDR, Subgrade) Pavement (Flex Base Thickness in Inches)

Traffic, ESAL	<0.5 Million				0.5-1.5 Million				1.5-3.0 Million				3.0-4.0 Million				>4.0 Million			
EF #Wells	<10				10-90				90-200				200-270				270-340			
PB #Wells	<20				20-110				110-250				250-340				340-440			
BS #Wells	<40				40-210				210-470				470-640				640-810			
Eagle Ford (Subgrade Modulus < 7ksi)																				
Surface	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA		
CM 6"	11	7	6	12	8	6	12	9	7	6	12	10	7	6	12	10	7	6		
CM 8"	9	6	6	10	6	6	10	7	6	6	10	7	6	6	10	7	6	6		
AE/NS 6"	12	8	6	12	9	7	12	10	7	6	12	10	7	6	12	10	7	6		
AE/NS 8"	12	6	6	12	7	6	12	10	7	6	12	10	7	6	12	10	7	6		
Medium Subgrade (Subgrade Modulus < 7 - 15 ksi)																				
CM 6"	7	6	6	10	6	6	12	6	6	6	12	6	6	6	12	6	6	6		
CM 8"	6	6	6	7	6	6	10	6	6	6	12	6	6	6	12	6	6	6		
AE/NS 6"	12	6	6	12	6	6	12	6	6	6	12	6	6	6	12	6	6	6		
AE/NS 8"	12	6	6	12	6	6	12	6	6	6	12	6	6	6	12	6	6	6		
Permian Basin (Subgrade Modulus > 15 ksi)																				
CM 6"	6	6	6	6	6	6	10	6	6	6	12	6	6	6	12	6	6	6		
CM 8"	6	6	6	6	6	6	10	6	6	6	12	6	6	6	12	6	6	6		
AE/NS 6"	6	6	6	9	6	6	12	6	6	6	12	6	6	6	12	6	6	6		
AE/NS 8"	6	6	6	8	6	6	12	6	6	6	12	6	6	6	12	6	6	6		

BS # Wells: Number of wells serviced by road in Barnett Shale; PB = Permian Basin; EF = Eagle Ford Shale
 CM 6" = Cement Modified FDR, 6 in. thick CM 8" = Cement Modified FDR, 8 in. thick
 AE/NS 6" = Asphalt Emulsion FDR or Non-Stabilized FDR, 6 in. thick
 AE/NS 8" = Asphalt Emulsion FDR or Non-Stabilized FDR, 8 in. thick
■ Not Recommended - Premature Failure Expected

Energy Sector Pavement Design Catalog for 3-Layer (Surface, FDR, Subgrade) Pavement (FDR Base Thickness in Inches)

Traffic, ESAL	<0.5 Million				0.5-1.5 Million				1.5-3.0 Million				3.0-4.0 Million				4.0-5.0 Million				>5.0 Million			
EF #Wells	<10				10-90				90-200				200-270				270-340							
PB #Wells	<20				20-110				110-250				250-340				340-440							
BS #Wells	<40				40-210				210-470				470-640				640-810							
Eagle Ford (Subgrade Modulus < 7 ksi)																								
Surface	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA	2" CST	4" HMA	6" HMA						
Stiff Base	8	6	6	6	9	7	6	6	10	8	6	6	8	7	6	6	8	7	6					
Med. Base	9	7	6	6	11	9	6	6	11	9	7	6	10	8	6	6	11	9	6					
Soft Base	11	9	7	6	14	11	9	7	15	12	10	8	14	12	9	7	15	12	9					
Medium Subgrade (Subgrade Modulus < 7 - 15 ksi)																								
Stiff Base	7	6	6	6	8	7	6	6	9	7	6	6	8	7	6	6	8	7	6					
Med. Base	8	6	6	6	10	8	6	6	10	8	6	6	9	7	6	6	10	8	6					
Soft Base	10	8	6	6	13	10	8	6	13	11	9	6	12	10	7	6	13	10	7					
Permian Basin (Subgrade Modulus > 15 ksi)																								
Stiff Base	6	6	6	6	7	6	6	6	7	6	6	6	7	6	6	6	7	6	6					
Med. Base	7	6	6	6	8	7	6	6	8	7	6	6	8	6	6	6	8	6	6					
Soft Base	8	6	6	6	10	8	6	6	10	8	6	6	9	7	6	6	10	7	6					

BS # Wells: No. of wells serviced by road in Barnett Shale Stiff: E_{FDR} = 300 ksi
 PB # Wells: No. of wells serviced by road in Permian Basin Medium: E_{FDR} = 200 ksi
 EF # Wells: No. of wells serviced by road in Eagle Ford Shale Soft: E_{FDR} = 100 ksi
■ Not Recommended - Premature Failure Expected



Select Strategy Documents

Document Number	Title
ESB-16-10	Performance of Pavements in the Energy Sector
IR-16-04	Traffic Loads for Segment and Corridor-Level Analysis
RR-16-02	Project and Pavement Performance Associated with Energy Development and Production

Documents available on TxDOT Maintenance Division SharePoint site at <https://txdot.sharepoint.com/sites/division-mnt/site/pages/home.aspx>