OKLAHOMA DEPARTMENT OF TRANSPORTATION

Date: April 13, 2005

To: Brian Schmitt, Assistant Division Engineer - Roadway Design

From: Bruce Taylor, Deputy Director/Chief Engineer

Subject: Guidance for Parallel Lane Additions to Create Four Lane Divided Highways

Attached is the final approved and signed copy of the referenced guidance developed and presented by the team of ODOT and FHWA staff.

The team should be congratulated for the efforts they made to develop a format that can be easily followed, yet comprehensive. I think it would be a good idea to put this guidance in effect, and then gather comments in about 12-18 months and see if changes are needed.

I would like to ask that you make distribution of this guidance throughout ODOT, FHWA, and the consultants. If you feel it needs to go out under my signature, let me know, and I can draft a transmittal.

BT:lm

Attachment

Guidance for Parallel Lane Additions to Create Four Lane Divided Highways.

The following decision matrix and associated information is intended to provide guidance on the action required for existing lanes when parallel lanes are added to create an ultimate four lane divided facility. The purpose of this guidance is to provide a cost effective manner in which to deal with deficiencies, while at the same time focusing the investment of tax dollars toward maximum benefit.

This guidance outlines a procedure to examine the condition, functionality, and safety performance of the existing lanes in order to set a timeframe for the correction of deficiencies. Obviously, it is more urgent to correct some deficiencies than others, and this guidance attempts to utilize readily available information in order to help us make those decisions.

There are certain expectations from the public of the minimum requirements for a four lane divided facility. As such, the following assumptions should be adhered to for all projects of this type:

1) The newly constructed parallel lanes will meet full 4R design criteria.

2) National Environmental Policy Act (NEPA) clearance for these construction projects should be for the ultimate facility, that is, obtain clearance for all four lanes meeting full design criteria.

3) Speed differential shall not be allowed between opposing directions of traffic. The posted speed limit will be the same on the existing lanes as it is on the new parallel lanes.

4) When examining the existing characteristics, safe speed comparisons should be made to the posted regulatory speed for horizontal alignment, vertical alignment and super-elevation. In addition, if an increase in design speed is anticipated, the comparison should be made to this speed also.

5) Where reference is made to 4R in these guidelines, that means full new construction/ reconstruction design criteria as outlined in numerous sections of the ODOT Roadway Design Manual. Where reference is made to 3R, this is the reduced geometric criteria for 3R non-freeway projects as outlined in Chapter 13 of the ODOT Roadway Design Manual. Characteristics of the existing lanes should be compared to the requirements (3R or 4R) in the "multi-lane divided" category for the appropriate functional classification.

6) Guardrail and other roadside safety appurtenances, along with the signing, striping and traffic control devices, will be modified for four lane operation prior to opening the new lanes to traffic.

7) The decision matrix is intended to be utilized as a tool to help establish scope and timing of improvements. It is <u>not</u> intended as design guidelines. Once it is decided which improvement is necessary, it is important for the designer to go to the appropriate design reference for design guidelines.

This guidance was established by a multi-disciplinary team with representation from ODOT and FHWA.

Concurrence: Bruce E. Taylor
ODOT - Chief Engineer 3/24/05

Walter J. Ludwig
FHWA - Division Administrator 4/1/05

March 5, 2004

PARALLEL LANE ADDITIONS DECISION MATRIX

CHARACTERISTICS OF EXISTING LANES		Source of Data	Element	TRAFFIC VOLUMES Current ADT < 4000			Current ADT 4000–8000			Current ADT ≥ 8000		
Condition	Pavement Base Condition	Needs Study	Condition Rating	8 - 14	4 - 7	0 - 3	8 - 14	5 - 7	0 - 4	12 - 14	8 - 11	0 - 7
	Pavement Wearing Surface Cond.	Needs Study	Condition Rating	7 - 10	4 - 6	0 -3	7 - 10	5 - 6	0 - 4	9 - 10	7 - 8	0 - 6
	Shoulder Condition	Needs Study	Condition Rating	3 - 4	1 - 2	0	3 - 4	2	0 - 1	4	3	0 - 2
	Bridge Condition (BHI)	PONTIS	Condition Rating	> 80	≤ 80	≤ 70	> 85	≤ 85	≤ 75	> 90	-	≤ 90
	Years to Bridge Rehab / Replacement	PONTIS	Years to Action	> 10	-	≤ 10	> 15	-	≤ 15	> 20	-	≤ 20
Functional Performance	Total Roadway Width	Road Inventory	Feet	≥ 28'	< 28'	< 26'	≥ 32'	< 32'	< 26'	≥ 36'	-	< 36'
	Shoulder Width & Type	Needs Study	Shoulder Design Rating #	4 - 6	2 - 3	0 - 1	4 - 6	2 - 3	0 - 1	6	4 - 5	0 - 3
	Total Bridge Width	Bridge Inventory	Feet	≥ 38'	< 38	< 28'	≥ 38'	< 38'	< 28'	≥ 38'	-	< 38
	Bridge Structural Capacity	Bridge Inventory	Bridge Inventory Rating	HS20	<HS20	≤ H15	HS20	< HS20	≤ H15	HS20	-	< HS20
	Vertical Clearance (to Overhead Strs.)	Bridge Inventory	Height from pav't to low beam	≥ 16' 0"	< 16' 0"	≤ 14' 6"	> 16' 0"	< 16' 0"	≤ 14' 6"	≥ 16' 0"	-	< 16' 0"
	Vertical Alignment	As Built Plans	"K" values	Meet 3R	(-20mph) 3R	(-20mph) 3R *	Meet 3R	(-10 mph) 3R	(-20 mph) 3R	Meet 4R	(-10 mph) 4R	(-20 mph) 4R
		Needs Study	SSD Rating	5 - 8	2 - 4	0 - 1	7 - 8	4 - 6	0 - 3	7 - 8	6	0 - 5
	Horizontal Alignment	As Built Plans	Degree of Curve	Meet 3R	DNM 3R	DNM 3R *	Meet 4R	Meet 3R	DNM 3R	Meet 4R	Meet 3R	DNM 3R
		Needs Study	Curves over 5°	None - Light	Moderate	Severe	None - Light	Moderate	Severe	None	Light	Moderate - Severe
	Superelevation	Traffic Division Reconnaissance	Ball Bank Indicator	V - 10 mph	V - 15 mph	V - 20 mph	V	V - 10 mph	V - 15 mph	V	V	V - 10 mph
Roadside Safety	Crash Rate	Collision Database	Crashes per 100 mil veh miles	Adequate	Approaching Critical	Critical	Adequate	Approaching Critical	Critical	Adequate	-	Approaching or Critical
	Specific Accident Types	Collision Database	Collision Clusters	Adequate	Approaching Critical	Critical	Adequate	Approaching Critical	Critical	Adequate	-	Approaching or Critical
	Hazards Rating	Needs Study	Rating	4 - 6	1 - 3	0	4 - 6	2 - 3	0 - 1	6	4 - 5	0 - 3
	Sideslopes	Roadway Design Reconnaissance	Existing Slopes	4:1	3:1	< 3:1 *	4:1	3:1	< 3:1	6:1	4:1	< 4:1
	Clear Zone	Roadway Design Reconnaissance	Deficient Clear Zone	3R	< 3R	< 3R *	3R	< 3R	< 3R	4R	3R	< 3R
Action Recommended for Existing Lanes				(1) **Leave as is for now**	(2) **Fix in 8yr Program**	(3) **Fix with Current Project**	(1) **Leave as is for now**	(2) **Fix in 8yr Program**	(3) **Fix with Current Project**	(1) **Leave as is for now**	(2) **Fix in 8yr Program**	(3) **Fix with Current Project**

* These items must be examined for inclusion in current project if there is an accident history attributed to these characteristics.

PARALLEL LANE ADDITION DECISION MATRIX -NHS ROUTES

NOTES:

Pavement Condition
Pavement Condition rating considers the amount of surface distortion, cracking, rutting, and maintenance requirements.

Bridge Condition
Bridge Health Index (BHI) is the basis of this condition rating.

Bridge Structural Capacity
Bridge Structural Capacity is based upon the inventory rating of the bridge using Load Factor Design.

Total Roadway Width
For purpose of this decision assume 2-12' driving lanes.

Vertical Clearance
This is vertical clearance above the route being widened.

Shoulder Width and Type
Shoulder design rating number is based upon comparing the shoulder width and type required by full design standards to the existing shoulder width and type (paved, combo, gravel or sod).

Vertical Alignment
Existing vertical alignment can be analyzed in two different ways depending upon the data available:

1) Check the existing "K" values against 3R and 4R criteria. (Utilizing current greenbook requirements). Where reference is made to (-20 mph) this means that as a minimum, the existing vertical curve meets requirements for a speed of 20 mph below the design speed.

   or if as builts are unavailable,

2) The stopping sight distance rating is defined in the Needs Study as those less than 55 mph or 425'. This rating is to serve as an indicator of substandard vertical only in the absence of as-built plans, not as design justification, nor is it intended to imply that the design speed is to be 55 mph.

Horizontal Alignment
Existing horizontal alignment can be analyzed in two different ways depending upon the data available:

1) Check the existing degree of curve against 3R and 4R criteria. Where reference is made to (-20 mph) this means that as a minimum, the existing horizontal curve meets requirements for a speed of 20 mph below the design speed.

   or if as builts are unavailable,

2) The extent of Curve Deficiency is defined in the Needs Study as the number of substandard curves per mile. For this rating only, substandard curves are defined as over five degrees for Arterial and over ten degrees for Collectors. This rating is to serve as an indicator of problems in the absence of as built plans, not as a design justification.

Superelevation
If practical, the superelevation should be measured by utilizing a 4' or 6' level directly on the driving lanes then verifying for what speed the super is adequate. If this is not practical, the Ball Bank Indicator may be utilized. The Ball Bank Indicator is a field method of analyzing the safe driving speed of existing curves. Most Field Division Traffic Engineers are equipped with this device. The safe speed for the curve is one in which the reconnaissance vehicle can travel through the curve with the ball being displaced up to ten degrees

off center. Once this safe speed is determined, it should be compared to the posted regulatory speed (V). Do not compare to any advisory speed posting. In addition, if an increase in design speed is anticipated, the comparison should be made to this speed also.

Collision Types

Check for specific type of accidents prevalent on the route. Such as: rear-end, head-on, sideswipe, angular, turning, etc. Do not consider accident types which are expected to be rectified once the additional lanes are constructed, such as head on. If correctable accidents are occurring on the existing facility, this should be considered as a major factor effecting your scoping decision. However, the converse is not true. If accidents are not occurring, this does not necessarily mean that the existing facility is problem free.

Evidence of a particular type of accident throughout the project, will effect the recommendation for the existing lanes. Evidence of high accident locations or accident clusters may warrant spot safety improvements.

General guidelines to quantify problem locations due to accident clusters vary greatly based upon the type of facility. As such, the Safety Branch of Traffic Engineering Division will determine specifically which types of correctable accidents occurred and advise on these in their accident study.

Hazards Ratings

As reported in the Needs Study, this rating is based upon 4 types of hazards:

a) Minor drainage structures within 6' of driving surface.

b) Bridge/bridge boxes less than 28' in width.

c) Blind intersections with less than 375' stopping distance.

d) Blind driveways with less than 375' stopping distance.

Sideslopes

Sideslopes may be evaluated from both the as-built plans and with a hand level during field reconnaisance. Where slopes are noted as 4:1 this means 4:1 or flatter, where noted as <3:1 this means steeper than 3:1.

Clear Zone

Compare actual clear zone with Chapter 11 Clear zone requirements (4R) and the Chapter 13 requirements (3R).

Actions Required for Existing Lanes

can be more completely described as follows:

1) Leave As Is For Now - Any improvements required to bring the existing lanes up to full design standards can be delayed until such time as those improvements are justified by Statewide priorities.

2) Fix in the 8-Year Program - Required improvements to the existing lanes will be set up in a separate project and scheduled in the 8 Year Work Plan.

3) Fix With Current Project - Required improvements to the existing lanes cannot be delayed and must be incorporated in the lane addition project.

How to Use this Decision Matrix

No values on this matrix are intended as design guidelines. This matrix should be utilized to evaluate the characteristics of the existing lanes, when the scope of the project is to add parallel lanes in order to create a four lane divided roadway. Using the characteristics of the existing lanes, the scoping team can determine a recommended action for these lanes and the timing of that action.

The existing lanes should be evaluated in terms of condition, functional performance and roadside safety. Information can be gathered through a combination of information gathered from various studies via the "Geographical Resource Internet Portal System" (GRIP), utilizing as-built plans, and field reconnaisance.

To use the matrix, enter the table at the top for the appropriate current ADT. Highlight the condition ratings obtained from the GRIP system. Highlight the functional performance characteristics obtained from GRIP, as-built plans, and field reconnaisance (if available). Highlight the safety characteristics obtained from GRIP and field reconnaisance.

After each characteristic has been appropriately highlighted, the recommended action for these existing lanes can be determined. The action taken for the existing lanes should be based upon a preponderance of the characteristics of these lanes and can constitute a combination of actions. To follow are brief examples:

Example 1 Your existing facility has a poor pavement and shoulder condition but is in good condition in terms of functional and safety performance. A reasonable scope would be to provide a 10 year overlay of the existing lanes now, then leave the rest of the features "As is".

(See Figure 1)

Example 2 Your existing facility has poor pavement and shoulder condition, but tolerable / inadequate functional and safety performance with many features you would like to correct with a project in the 8 Year Program. Since the existing lanes will automatically be overlaid with a 1½"-2" minimum overlay (in order to cover the existing striping), it is reasonable to assume that the condition of these lanes will be improved to at least fair with the current project. Then another project to upgrade these lanes can be scheduled in the 8 Year Program.

(See Figure 2)

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	Years to Bridge Rehab / Replacement	PONTIS	Years to Action	> 10	-	≤ 10	> 15	-	≤ 15	> 20	-	≤ 20
Functional Performance	Total Roadway Width	Road Inventory	Feet	≥ 28'	< 28'	< 26'	≥ 32'	< 32'	< 26'	≥ 36'	-	< 36'
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	Specific Accident Types	Collision Database	Collision Clusters	None-Few	Some	Many	None	Few	Some-Many	None	Few	Few-Many
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Figure 1 - Example 1

Scope: Overlay Now, then leave as is

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		Needs Study	SSD Rating	5 - 8	2 - 4	0 - 1	7 - 8	4 - 6	0 - 3	7 - 8	6	0 - 5
	Horizontal Alignment	As Built Plans	Degree of Curve	Meet 3R	DNM 3R	DNM 3R *	Meet 4R	Meet 3R	DNM 3R	Meet 4R	Meet 3R	DNM 3R
		Needs Study	Curves over 5°	None - Light	Moderate	Severe	None - Light	Moderate	Severe	None	Light	Moderate - Severe
	Superelevation	Traffic Division Reconnaissance	Ball Bank Indicator	V - 10 mph	V - 15 mph	V - 20 mph	V	V - 10 mph	V - 15 mph	V	V	V - 10 mph
Roadside Safety	Crash Rate	Collision Database	Crashes per 100 mil veh miles	Adequate	Approaching Critical	Critical	Adequate	Approaching Critical	Critical	Adequate	-	Approaching or Critical
	Specific Accident Types	Collision Database	Collision Clusters	None-Few	Some	Many	None	Few	Some-Many	None	Few	Few-Many
	Hazards Rating	Needs Study	Rating	4 - 6	1 - 3	0	4 - 6	2 - 3	0 - 1	6	4 - 5	0 - 3
	Sideslopes	Roadway Design Reconnaissance	Existing Slopes	4:1	3:1	< 3:1 *	4:1	3:1	< 3:1	6:1	4:1	< 4:1
	Clear Zone	Roadway Design Reconnaissance	Deficient Clear Zone	3R	< 3R	< 3R *	3R	< 3R	< 3R	4R	3R	< 3R
				(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Action Recommended for Existing Lanes				**Leave as is for now**	**Fix in 8 yr Program**	**Fix with Current Project**	**Leave as is for now**	**Fix in 8yr Program**	**Fix with Current Project**	**Leave as is for now**	**Fix in 8yr Program**	**Fix with Current Project**

Figure 2 - Example 2

Scope: Schedule upgrade of old lanes in 8 year program