Accommodating Truck Traffic on Texas Highways:

Survey Results

by

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Introduction

Truck traffic volume on Texas highways is on the increase. Gradual implementation of NAFTA, the explosive growth along the Mexican border of *maquilladoras* for manufacture of US-bound consumer goods, a turbulent US rail industry, and widespread inception of "just-in-time" delivery are but a few of the circumstances which are combining to place unprecedented demands on our state transportation system.

In developing strategies to meet the increased demands, it would be helpful to know what actions are currently being taken by the various TxDOT organizational units to mitigate the negative impacts associated with increasing levels of trucks on the state highway system. In January 2001 TxDOT Assistant Executive Director Mike Behrens assigned the Research and Technology Implementation Office (RTI) to find out what actions are currently being taken by TxDOT districts and divisions in response to increasing truck traffic.

This report presents the compilation of responses to a questionnaire sent to all districts, divisions, and offices within TxDOT. The questionnaire asked two questions:

1. Has your district/division/office implemented any specific actions or countermeasures due to increasing truck traffic volumes on the Texas highway system? If so, please describe briefly.

2. In your opinion, are there any processes or procedures that should be changed to better accommodate increasing truck traffic volumes on the Texas highway system?

The response to the questionnaire was good. Out of 53 organizational units surveyed, 37 replied to the questionnaire, for an overall response rate of 70%. Perhaps most importantly, 24 of 25 districts replied, for a 96% district response rate.

Report Organization

This report is presented in three parts. Part I is a narrative summary of actions currently being taken to mitigate the impacts of increasing truck traffic levels on the Texas highway system. Part II is a narrative summary of actions that have been suggested by survey respondents to better accommodate increasing levels of truck traffic. Both Parts I and II are organized by general subject matter headings. Conclusions are presented in Part III.

PART I – ACTIONS CURRENTLY BEING TAKEN IN RESPONSE TO INCREASED LEVELS OF TRUCK TRAFFIC ON THE TEXAS HIGHWAY SYSTEM

This section of the report is a narrative summary of responses to the first survey question:

"Has your district/division/office implemented any specific actions or countermeasures due to increasing truck traffic volumes on the Texas highway system?"

Pavement Type Selection

Eleven of twenty-four districts report increased use of concrete pavement for mainlanes. There is also increased use of concrete pavement at intersections and for rest stop parking areas. Pavement type selection includes life cycle cost analysis in at least three of these districts. However, lack of resources for funding the higher initial costs of superior-performing products continues to be the final determining factor in most cases.

Pavement Design and Construction

Survey responses indicate an increased awareness of the importance of accurate traffic data. Several districts emphasized that current traffic data is used for design purposes, including recognition of loaded vs. unloaded truck traffic travel patterns and incorporation of that information into project design criteria. However, no practical means of accommodating illegal overweight vehicles has been established. As the Bryan District reminded, overweight trucks can destroy an entire section of FM road in just one night.

Perhaps one of the most significant actions taking place in response to increasing truck traffic is the ongoing development of Heavy Duty Hot Mix Asphalt Pavement Specifications. Designed to give stone-on-stone contact, these heavy duty mixes may achieve modulus values some 50% higher than conventional mix designs at a cost increase of 25-30%. The heavy-duty specifications are intended for use on roadways carrying an average of 5000 trucks per day. Pilot testing has recently concluded on five projects, and full-depth projects are now planned for the Waco, Laredo, and Fort Worth districts. Expected life of roads constructed with heavy duty mixes is indefinite, minor rehabilitation being expected after 15 - 20 years.

Other actions being taken by the districts include:

- Use of the Hamburg Wheel Test during pavement mix design.
- Increased use of high-end binders (PG 76 -22 and above).
- Construction of thicker asphalt pavement layers.
- Increased use of hot mix asphalt as base material.

- Increased use of lime as an anti-stripping agent.

- Increased use of modified-binder HMAC as base material and surface course.

- Implementation of density profile and longitudinal joint specifications to obtain longer pavement life.

Pavement Maintenance

- Six districts report shoulder retrofitting and widening in response to increasing pavement edge damage attributed to truck traffic. One district reports a marked increase in pavement edge damage along entrance ramps due to trucks parking just prior to highway merge zones.

- Districts have increased the use of strip seals, crack sealing, and intermittent microsurfacing applications as part of the normal overlay cycle.

- The Dallas District notes an overall increase in extensive repair and rehab work needed due to truck traffic.

- The Childress District is now using hot mix instead of cold mix asphalt for maintenance patching work.

Bridges and Structures

- The bridge design load for new construction and rehabilitation projects has been increased from HS-20 to HS-25 for many structures along major routes throughout the state. Implementation of the AASHTO LRFD Specification will result in a design load comparable to HS-25. Use of increased design loads may result in somewhat heavier substructures, superstructures, and foundations. The Bridge Division is currently looking at changes needed to incorporate the heavier design load into current standards.

- The Bridge Division is requiring more rugged sealed expansion joints (SEJ-Ps) at locations where truck traffic is expected to be heavy.

- The off-system bridge participation-waived/equivalent match program was initiated by the Bridge Division in the summer of 2000 to accelerate the repair of deficient bridges.

- The Bridge Division recently coordinated the development of a web-based map that provides location information and restriction requirements for on-system and off-system load-restricted bridges throughout the state. Truckers can use the map as a planning tool to avoid routes with load-restricted or closed bridges.

Several districts responded with additional information including:

- Providing increased vertical clearance at grade separation structures.
- Removing abandoned RR structures.
- Installing overheight vehicle warning systems.
- The Houston District has installed the Heavy Truck (HT) bridge rail at selected major interchanges to contain errant 18-wheelers. The Bridge Division reminds us that standard TxDOT bridge rails are adequate for most locations and advises prudence in the use of the HT rail.

Geometric Design

Nine districts indicate various geometric improvement efforts to better accommodate increasing levels of truck traffic. The Texas Super 2 geometric design guidelines have been adopted or are being considered for adoption in at least three districts. These guidelines for intermittent passing lanes, developed by Texas Tech University under TxDOT-sponsored research, were developed to provide improved capacity and traffic safety on two lane routes which do not carry enough traffic to warrant upgrading to a four lane facility. Super 2 guidelines have been implemented along US 83 and US 82 in the Childress District and are being used for design of SH 121 improvements in the Paris District. The Tyler District is currently considering Super 2 guidelines for proposed shoulder widening and rehabilitation projects.

Other actions that districts are taking include:

- A proliferation of lane and shoulder widening projects (not necessarily Super 2).
- Providing increased sight distance and using larger turning radii at intersections.
- Constructing additional acceleration/deceleration and turning lanes at intersections.
- Providing passing and climbing lanes.

Work Zone Safety

Four districts responded by describing efforts underway to improve work zone safety, although enforcement issues remain problematic:

- Increased use of concrete barriers for the separation of live lanes from work zones and two-way live lane detours on four-lane divided highways.
- Use of radar speed monitor trailers in work zones.

- Designated truck lanes through work zones. Trucks are presently restricted to the right lane through IH 10 E work zones in the Houston District, while the left lane is designated for trucks in Waco District work zones.

Traffic Control Devices

Numerous examples of accommodating increasing levels of truck traffic through use of traffic control devices were cited by the districts, including:

- Installation of strobe warning lights at major signalized intersections (CHS) and overhead or dual school zone flashers.

- Increased use of rumble strips at intersections and city approaches.

- More illumination at intersections.

- Installation of near-side traffic heads at high-speed intersections.

- Truck Tipping Hazard signs erected at selected interchanges.

- Variable transverse striping and speed markings placed at selected interchanges

Traffic Management

Traffic management centers currently exist in the Houston, San Antonio, Dallas and Ft. Worth metropolitan areas. Several district initiatives are currently under way to more fully develop and integrate traffic management centers and ITS technologies:

- The Amarillo District is planning integration of rural ITS with ITS infrastructure in the Amarillo urban area. Ultimately the system will receive and disseminate district-wide information regarding weather conditions, construction advisories, and incident location. Efforts are proceeding with installation of video cameras and dynamic message signs within the Amarillo metropolitan area and along segments of rural IH 40 and US 87. A Traffic Management Center will be constructed at the District Headquarters building. Much of the impetus behind this effort has been the increasing volume of truck traffic.

- The Childress District plans to implement rural ITS (ATIS) for IH 40 and US 287, providing motorists with weather condition and alternate route information.

- The Corpus Christi District is in the process of changing over exclusively from inductive loop detectors to wireless video (vivds) for vehicle detection.

- The Houston District is initiating traffic management improvements, including the use of FY2000 earmarked funds to provide highway advisory radio installations at rest areas

along IH 10, as well as the installation of dynamic message signs along IH 10 to serve Houston, Yoakum, and San Antonio. Other efforts include support of TxDOT research to develop a methodology for communicating advisory speed information to trucks on direct connectors.

- The Houston District has also instituted a "Recovery" contract with a service vendor for providing the proper equipment, labor and towing capabilities to clear incidents (crashes and lost loads) involving 18-wheelers from within the boundaries of IH 610 in Houston.

Truck Parking Facilities

Construction of additional rest stops and truck parking areas continues after a period of inactivity. Increased median widths are being incorporated into the design of new facilities to accommodate additional truck parking needs in the Corpus Christi District. Concrete pavement is now being used for truck parking at rest areas in the Yoakum District.

What actions are being taken to accommodate increasing levels of truck traffic on Texas highways?

	Pavement Type Selection	Pavement Design and Construction	Pavement Management and Maintenance	Geometric Design Elements	Highway Planning	Work Zone Safety	Bridges and Structures	Traffic Control Devices	ITS	Truck Parking and Storage Area Improvements	Other/Remarks
Abilene District	Value Engineering study to evaluate use of PCCP on Interstate System										
Amarillo District	PCCP being used on IH 40			Widening US 385 w/passing lanes	Developing Phase I Corridor projects; adding US 54 to Trunk System	Separating live lanes from work zones; using radar speed monitors			Development of ITS and Traffic Management Center		
Atlanta District	Increased use of PCCP	Increased use of modified HMAC for both surface and base course					HS-25 design loading	New sign sheeting with higher reflective entrance angle			
Austin District											No specific actions being taken
Brownwood District											No specific actions being taken
Bryan District				Campaigned for adoption of 2R design standards; providing as much pavement and shoulder width as possible	Project development for widening all two-lane roads on Texas Trunk System.						
Childress District	Increased use of PCCP	Using Hamburg wheel to design flexible pavements, increased % lime, limiting gravel screenings and field sands; upgrading PG binders	Using hot mix instead of cold mix for patching; increased strip sealing and crack sealing prior to overlays; reducing rutting due to trucks through combination of 8 year overlay cycle w/intermittent microsurfacing.	Implementing Texas Super 2 on high truck trafic volume roads; adding turning lanes at intersections.				Strobe lights at signalized major intersections on US 287; rumble strips at intersections and city approaches; more illumination at intersections	Planning to implement rural ITS for IH40 and US287.	Constructing safety rest areas on US287 to allow more truck parking.	

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Corpus Christi	Increased use of PCCP	Using Hamburg wheel to design flexible pavements; using PG 76-22 binder; implemented density profile spec and longitudinal joint density specs; using lime as anti-strip agent		Increasing turning radii at intersections and driveways; introducing more accel/decel lanes; placing gore area between thru lanes and right turn lanes to improve corner sight distance; providing positive offset on opposing left turn lanes to improve sight distance; will add passing lane on US 59			Increasing vertical clearance at grade separation structures; removing abandoned structures (RRs); installed overheight warning systems	Installing near-side traffic signal heads at high speed signalized intersections; installing overhead or dual scool zone flashers	Changing over exclusively from loop detectors to wireless video detection (vivds)	Increasing median widths on new designs to accommodate truck storage	
Dallas District		Pavements are designed using current traffic data which reflects current truck traffic volumes	Extensive pavement repair and rehab due to truck traffic								
El Paso District	Converting from HMAC to PCCP on IH 10										
Fort Worth District		Designing and constructing thicker pavements; utilizing "loaded" vs. "empty" truck traffic distribution on divided highways using current traffic data	Utilizing various overlay strategies to increase pavement life; retrofitting concrete shoulders on some routes								

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Houston District		Pavements are designed using current traffic data which reflects current truck traffic volumes			SH 146 being designed as primary truck route to new Bayport facility; supporting research on managed lane project	Trucks restricted to right lane through construction zones on IH 10 E	Using HT (Heavy Truck) rail on major interchanges	Truck Tipping signs installed at selected interchanges; variable transverse striping and speed markings on pavement at selected interchanges	Installed dynamic message signs at extremes of District boundaries and within Yoakum District to divert truck traffic; highway advisory radio installations at IH 10 rest areas; truck classification/spe		STEP grant to HPD targeting hazardous moving violations with ability to perform safety inspections by trained officers; "Recovery" contract for proper equipment and towing ability for truck crashes and lost loads within IH
Laredo District	Increased use of PCCP, especially at intersections	Pavement designs modified to add more structural capacity; increased use of HMAC base material in lieu of flex base along truck routes; "Perpetual Pavement" design for IH 35 corridor		Widening roads in Laredo and Eagle Pass	Added freeway type facility from Laredo to International Bridge IV; providing truck route at Eagle Pass from Bridge II to FM 1021		Grade separation structures and muti-level interchange constructed for truck traffic				
Lubbock District	Increased use of concrete pavement	Pavements are designed using current traffic data which reflects current truck traffic volumes									
Lufkin District		Using heavy duty HMACP designs (Perpetual pavements)			2 truck lanes to be provided for in ultimate typical section for IH 69						
Odessa District											No specific actions being taken
Paris District		Increasing pavement thickness		Designing segment of SH 121 as a Super 2 facility							

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Pharr District	Increased use of PCCP, especially at intersections						Using HS-25 loading along major routes				
San Antonio District		Pavements are designed using current traffic data which reflects current truck traffic volumes	Adding shoulders to two-lane roads	Geometrics determined using current traffic data which reflects current traffic mix and volume; beginning to construct passing lanes along two-lane roads	Trying to get US 281 added to NHS; investigating "special-use" lanes on IH 35 from Loop 1604 to downtown San Antonio						Developing Hazardous Materials Routing Plan for Bexar County region
Tyler District	Increased use of concrete pavement on IH rehab and reconstruction projects based on LCCA; increased use of concrete intersections on all US, SH and LP reconstruction projects	Using PG 76-22 binder on all HMAC high-volume roadways and intersections	Shoulder widening program being implemented through maintenance contract	Considering Super 2 design for shoulder widening projects		Evaluating 12 ft shoulders to assist in traffic control	May go to HS-25 and HS-30 loading along major routes				Many cities are instituting truck routes for infrastructure preservation and mobility reasons
Waco District		More emphasis on thicker HMAC pavement design instead of deep flex base sections with thin overlays; using heavy duty mix designs (Heavy Duty SMA, Stone Filled ACP); using Porous Friction Course for wet weather safety		Passing and climbing lanes being added on steeper grades of high-volume truck routes		Trucks restricted to left lane through construction zones; increased nighttime work reducing congestion					

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Wichita Falls	Evaluating concrete pavements with 30-year LCCA on major rehab projects	Using PG 76-22 or higher binder on all HMAC high-volume roadways; using heavy duty mix designs (SMA, Heavy Duty SMA, Stone Filled ACP); providing thicker pavement sections; installing WIM sites on US 287 and IH 35 for truck weight and volume data									
Yoakum District		Using heavy duty HMACP designs; higher PG binders; Hamburg Wheel testing; thicker HMAC sections (12 in. minimum for FM roads); increased width on FM rehab projects (28 ft. minimum) to provide lateral support	Increased demand for mill and inlay projects at intersections and main lanes in loaded direction from gravel producers							Providing concrete pavement for parking at rest areas	
Bridge Division							Increased design load from HS 20 to HS 25 ; requiring stronger sealed expansion joints on some structures				Developed web-based map of load restricted bridges in Texas; initiated off system bridge particpation-waived/equivalent match program
Construction Division		Developed more stringent specifications for heavy-duty HMAC									Have calibrated DPS field standards used to verify portable axle scales

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Motor Carrier Division											Developed Truck Safety Perspective report for WASHTO; jointly developed ITS/CVO Business Plan
Maintenance Division										Designing rest areas with more truck parking capacity	
Traffic Operations Division											Jointly developed ITS/CVO Business Plan; established multi-agency Texas ITS/CVO steering committee; active in FHWA Commercial Vehicle Information Systems and Networks program
Transportation Planning and Programming Division					Developed cross section for I 69 that includes rail facilities within ROW						
Research and Technology Implementation Office											Several research projects have been conducted over the few years dealing specifically with trucks and trucking issues, such as the Model Border Crossing Facility project, effects of truck tire sizes and pressures on pavements, various NAFTA studies, and a on the feasibility of dedicated truck lanes

PART II - SUGGESTED ACTIONS TO MITIGATE THE EFFECTS OF INCREASING LEVELS OF TRUCK TRAFIC ON THE TEXAS HIGHWAY SYSTEM

This section of the report is a narrative summary of responses to the second survey question: "In your opinion, are there any processes or procedures that should be changed to better accommodate increasing truck traffic volumes on the Texas highway system?"

Basic Data Gathering

Responses indicate a need for data describing the impacts resulting from increasing levels of truck traffic. This data is needed to identify the extent of truck traffic impacts and how best to address these impacts. Examples would include number of accidents and type, number and location of bridges being hit vs. load width and height, pavement failures vs. vehicle classification/truck load, bridge design loads vs. truck loads, etc.

Funding

Lack of adequate funding levels for pavement maintenance, repair, and rehabilitation is seen as a significant impediment to the districts in accomplishing their work. Access to funds is needed to cover higher initial costs of projects where life cycle cost analysis indicates that a particular product (such as concrete pavement) would provide a more cost-effective engineering solution. Expansion of the Trade Fair concept we currently use to allow the transfer of funds from one category to another could conceivably succeed in providing additional flexibility for this and similar situations.

The Tyler District indicates an urgent need in East Texas for supplemental funding of shoulder widening programs. Current funding levels barely take care of mainlane needs, while significant cost-effective benefits which could be realized from a shoulder widening program go untouched.

Responses indicate dissatisfaction with current funding allocation methods. Suggestions include allocation of funds based on the remaining life of pavements (instead of distress only), using PMIS as a baseline, load rating existing pavements, and making allocations based on current truck traffic volumes.

Commercial trucks are not perceived as paying their fair share of road taxes in relation to the amount of damage they cause. Adjustment of the diesel fuel tax and revisions to the 2060 Overweight Permit fee structure would help to address this issue.

Truck Weight Monitoring and Enforcement

It was stated that local and intrastate agricultural traffic that never crosses the state line is often overweight and seldom weighed on a state scale. Suggestions are for more portable scales or smaller permanent agricultural weigh stations along market routes.

The Houston District recommends building on our partnership with the trucking industry and enforcement agencies to promote increased education and enforcement of weight and safety requirements.

Truck Parking Facilities

Four respondents indicated a need for increased truck parking areas statewide. In several truck forums held in Texas, one of the complaints from the trucking industry is the lack of truck parking at rest areas. According to many of the truck drivers, the rest areas are filled to capacity, forcing drivers to pull over to the shoulder of the highway to stop and rest. This becomes a safety hazard to both the travelling public and truck drivers. Consideration should be given to providing additional safe parking areas. Shoulders and ramps should be constructed as wide as possible to accommodate frequent roadside truck parking.

Geometric Design

Several district responses suggest a review of existing design standards to determine if they are still appropriate for current and projected future truck traffic volumes. Specific recommendations made by districts include:

- Reduce design criteria for maximum percent grade to result in a speed reduction of only 5 mph, rather than the 10 mph reduction allowed under present standards.

- Adopt the Texas Super 2 guidelines as the standard for primary two-lane roads with high truck traffic volumes.

- Consideration of different design standards for rehabilitation projects. ROW restrictions, particularly in cities, make major changes difficult. If standards are increased too much, rehabilitation of existing facilities might not be possible. Loops around towns might be the only alternative; however, loops are expensive, require a large amount of ROW, are unpopular in many areas and take a long time to develop and construct.

Traffic Operations

One third of all responses indicated a need for managed lanes along our freeways, especially through urban and metropolitan areas. Responses were divided as to the best way to separate truck traffic from smaller vehicles. Suggestions include "preferred truck lanes", "designated truck lanes", "truck only lanes", and "truck-excluded lanes". The Waco District indicated interest in conducting a pilot project along IH 35. Passenger cars and light trucks would have at least one lane free of heavy trucks but would be allowed to use the "truck preferred" lanes as necessary. A project such as this would offer a good opportunity for assessing the effects of designated truck lanes on traffic operations and pavement performance.

Other specific suggestions for mitigating the effects of heavy trucks on traffic operations include:

- Place increased emphasis on traffic control methods in suburban areas and the transition from high-speed rural to lower-speed urban areas and the how driver behavior is affected.

- Find ways to install rural ITS systems in less time.

- Educate local governments on what they can legally do to restrict truck traffic on state facilities.

- Consider restricted hours of operation and/or lane use fees for trucks along certain sections of roadway.

- Place special emphasis on the operational impact of the truck/car traffic mix regarding safety and congestion. The special needs (width, sight and stopping distance, merges, etc.) of truck traffic, especially within restricted construction zones, should be highlighted.

- Consider providing separate turning lanes at intersections and special signing along high volume truck traffic routes.

- Traffic management centers need to emphasize truck traffic operations, including truck-oriented dynamic message sign displays.

- Provide wider shoulders along controlled access facilities to assist in traffic control during maintenance operations and incident events.

Pavement Design and Construction

- Three districts emphasized the need for more hard data on traffic volumes, axle weights, and travel patterns for pavement design purposes.

- The heavy duty hot mix asphalt concrete pavement specifications described in Part I of this report should be utilized on high-volume truck traffic routes.

- The AASHTO Joint Task Force on Pavements has sponsored a $6 million research project to implement mechanistic pavement design concepts. Texas has been a vital and moving force behind this research and has representatives on the research panel and the AASHTO JTFP. This effort is expected to produce a new and powerful computer program that will be able to model heavy truck loads and tire pressures. The anticipated completion date is early 2002. Implementation of this product could save millions of dollars in premature failure of under-designed pavements. We need to implement the Mechanistic Pavement Design concepts developed by the AASHTO Joint Task Force.

- Responses generally indicate a need to build more robust pavement sections, using concrete pavement or thicker HMACP over stronger base and subgrade materials. The

Laredo District recommends eliminating flexible base material altogether in favor of asphaltic concrete. The Childress District expressed concern over the need to ensure the quality of PG asphalt as delivered to the jobsite.

- The Bridge Division recommends providing varying pavement structure sections for facilities with designated truck lanes.

Transportation Planning

Four districts responded with suggestions to designate certain roadway segments as designated truck routes or truck reliever routes. Designation of a facility as a truck route should be accompanied by increased funding and would help to preserve the pavements through many smaller municipalities.

Other suggestions for improvement include:

- Fully developing the Texas Trunk System.
- Supporting the revitalization of rail freight.
- A better understanding of the origins, connections and destinations of transported goods.
- Facilitating modal connections that will maximize the intermodal connections between ships, rail and trucks for transporting goods.

Access Management

Development of improved access management techniques and requirements was suggested. Where possible and afforded the opportunity, TxDOT and property developers should work more closely in planning truck stops and other similar facilities adjacent to the major roadways. Through improved access management, TxDOT should be able to better regulate access to these facilities and minimize the adverse impacts to facility operation (i.e. intersections, ramps, and main lanes).

It was also suggested that our driveway permit process be updated to better accommodate truck traffic.

What actions should be taken to better accommodate increasing levels of truck traffic in Texas?

	Finance	Truck Weight Monitoring and Enforcement	Geometric Design Standards	Operations	Truck Parking and Rest Areas	Pavement Design and Construction	Truck Routes	Other
Abilene District	Access to funds for higher initial costs of premium products such as PCCP							
Amarillo District		Increased monitoring of agricultural truck traffic weights						
Atlanta District			Build wider shoulders to accommodate truck parking		Build wider shoulders to accommodate truck parking			
Austin District				Consider truck lanes thru metropolitan areas; designate inside lane as "preferred truck" lane				
Brownwood District			Review current design standards; standards should vary as a function of % trucks; different standards for rehab projects where ROW is limited	Consider "truck only" lanes; consider "truck excluded" lanes	Need more rest areas			
Bryan District	Costs of pavement damage from oil and gas industry should be borne by industry, not the travelling public - use PMIS as baseline, load rate the rural system, and modify the 2060 permit program							
Childress District			AdoptTexas Super 2 as standard for primary two-lane roads	Emphasis on traffic control methods for road transition from hi-speed rural to low-speed urban; find ways to install rural ITS in less time	Consider more truck parking areas statewide	Need to better ensure quality of PG asphalt as delivered to jobsite		
Corpus Christi District								Update the driveway permit process to better accommodate trucks

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	Finance	Truck Weight Monitoring and Enforcement	Geometric Design Standards	Operations	Truck Parking and Rest Areas	Pavement Design and Construction	Truck Routes	Other
Dallas District				Restrict rucks to designated lanes on freeways, construct separate truck lanes; educate local governments on what they can legally do to restrict truck traffic on state facilities				
El Paso District						Upgrade pavement structures, using PCCP or thicker section HMACP w/stouter subgrade		
Fort Worth District	Change the procedure for allocation of rehab funds, based on remaining life as well as distress							
Houston District		Build on partnership w/trucking industry and enforcement units to encourage education and enforcement		Consider the operational impact of the truck/car traffic mix; highglight special needs of truck traffic, especially within work zones				
Laredo District						Use more PCCP with asphalt base, eliminate flex base and subgrades	More funding should be made available for truck routes	
Lubbock District	% trucks should have a more prominent role in allocation formulas for maintenance and rehab funds							
Lufkin District						Collect more hard data from WIM sites on heavy truck corridors		
Pharr District			Review current design standards and ensure that high truck volumes are accommodated					

What actions should be taken to better accommodate increasing levels of truck traffic in Texas?

	Finance	Truck Weight Monitoring and Enforcement	Geometric Design Standards	Operations	Truck Parking and Rest Areas	Pavement Design and Construction	Truck Routes	Other
San Antonio District	Need increased funding if increasing truck traffic accommodations are to be implemented		Be cognizant of increasing % trucks and continue to update design manuals	Concerns with operational aspects of designated truck lanes			Designate statewide truck routes	
Tyler District	Need funding for ahoulder program for roads carrying more than 5,000 vpd							
Waco District			Reduce design criteria for max % grades to result in reduction of operating speeds of 5 mph rather than 10 mph; increased use of shoulders; increased curb return radii; increased stopping sight distance	Need to reduce requirement for trucks to stop at signalized intersections; Would like to have a pilot project on IH 35 with designated truck lanes; consider separate turning lanes and special signing where truck traffic volumes are heavy		Need better estimates of truck traffic volumes for pavement design purposes; construct heavier pavement sections	Consider designated truck reliever routes around municipalities with pop. >5,0000	Improved access management techniques; work closer with developers in planning truck stops and similar facilities adjacent to major roadways
Wichita Falls District	Fully develop the Texas Trunk System		Provide more truck climbing lanes on steep grades	Use designated truck lanes; restrict hours of operation on certain roadway sections; require lane use fees on certain roadway sections			Designate interstate truck routes;designate overload truck routes;	Support the revitalization of rail freight
Yoakum District						Need better estimates of truck traffic volumes, weights, and travel patterns for pavement design purposes with additional year-round counters		

What actions should be taken to better accommodate increasing levels of truck traffic in Texas?

	Finance	Truck Weight Monitoring and Enforcement	Geometric Design Standards	Operations	Truck Parking and Rest Areas	Pavement Design and Construction	Truck Routes	Other
Bridge Division	Need additional funding and preliminary engineering assistance to accelerate rehab/repair of bridges; recommend increase in state diesel fuel tax for maintenance funding			Recommend designated truck lanes		Increased monitoring on high truck traffic routes to determine rate of deterioration; provide varying pavement section for roadways with designated truck lanes		
Construction Division						Implement AASHTO Joint Task Force Mechanistic Pavement Design concepts		
Environmental Affairs Division				May need to provide exclusive truck lanes				Need better understanding of truck origins, destinations, connections; maximize intermodal connections; gather data to identify impacts of increased truck traffic
Maintenance Division	Higher road use taxes on trucks							
Motor Carrier Division								Implement provisions of *ITS/CVO* Business Plan
Traffic Operations Division				Traffic Management Centers need to emphasise truck traffic operations, including truck-oriented DMS messages	Provide additional truck parking areas			
Transportation Planning and Programming Division				Use exclusive truck lanes on freeway facilities				
International Relations Office				Consider truck-only lanes				

What actions should be taken to better accommodate increasing levels of truck traffic in Texas?

	Finance	Truck Weight Monitoring and Enforcement	Geometric Design Standards	Operations	Truck Parking and Rest Areas	Pavement Design and Construction	Truck Routes	Other
Research and Technology Implementation Office								Continue to use TxDOT research program to improve mobility and safety for all Texas motorists

PART III – CONCLUSIONS

The conclusions presented below are based on collective consideration of responses to the questionnaire. Conclusions are drawn based on both the number of similar responses as well as the manner in which responses were stated.

1. We need to be building stronger and more durable pavement structures. Introduction of the heavy-duty HMAC specifications for high-volume truck routes is seen as a significant development in the evolution of flexible pavements in Texas. However, almost half of the districts indicate concrete pavement to be the material of choice for carrying truck traffic. Higher initial costs limit more extensive use of concrete pavement in Texas, even though a life cycle cost analysis may indicate concrete pavement to be most cost-effective when compared to HMAC under certain project conditions.

2. Attention to preventive maintenance programs is becoming even more important as ever-stiffer, more rut-resistant, less crack-resistant, and more costly pavements come into use.

3. Districts see an urgent need for shoulder widening and retrofit projects, especially on narrow, rural two-lane routes where pavement edge deterioration is exacerbated by increasing levels of truck traffic.

4. The Super 2 geometric design guidelines for two-lane facilities with intermittent passing lanes are being implemented in several locations where traffic volumes do not justify construction of a more costly four-lane facility. The Super 2 concept decreases congestion and enhances safety at a modest cost, and should be actively promoted for use across the state, especially where districts are already considering shoulder widening or passing lane projects.

5. A significant number of responses indicated a need for dedicated truck lanes, especially through congested urban areas. There is considerable discord among respondents as to how the lanes should be designated (e.g., "trucks only", "trucks excluded"), but the perception of need to separate large trucks from smaller vehicles by designated lanes is prevalent. Easing of congestion is the expected benefit, resulting in improved traffic operations and increased motorist safety. Costlier, more durable pavement structures could be used where needed most, to carry truck traffic within designated truck lanes. An evaluation of traffic operations, motorist safety and pavement performance in conjunction with dedicated truck lanes could be performed as suggested on a pilot project through the Waco District along IH 35, which will be entirely rehabilitated over the next several years.

6. Truck traffic volume is increasing faster than available levels of funding for transportation system preservation and improvements. Several actions have been undertaken at various locations around the state in an effort to accommodate increasing levels of truck traffic. However, no systematic or comprehensive guidance is currently available to assist the districts in coping with increasing levels of truck traffic.