



# FY2021 CENTRAL TEXAS TURNPIKE SYSTEM ANNUAL INSPECTION REPORT



SH 130

SH 45SE

SH 45N

SL1

April 23, 2021

Mr. Benjamin H. Asher  
Interim Toll Operations Division Director  
Texas Department of Transportation  
125 East 11th Street  
Austin, TX 78701

Subject: FY 2021 Inspection of the Central Texas Turnpike System

Dear Mr. Asher:

As General Engineering Consultant to the Central Texas Turnpike System (CTTS) and in accordance with Section 707 of the Indenture of Trust, Atkins North America, Inc. is pleased to submit the FY 2021 Central Texas Turnpike System Annual Inspection Report.

The condition of the CTTS continues to be maintained in good repair, working order and condition, achieving an overall score of 86 (out of 100). This is a weighted rating that combines the four components of the CTTS: SL1, SH 45N, SH 130 (Segments 1 through 4), and SH 45SE. The results of this year's inspection are indicative of the age of the system and the proactive manner in which the system is maintained.

The Austin District and Toll Operations Division have comprehensive maintenance contracts in place and are funded for routine maintenance sufficient to address deficiencies that were identified this year. There is reserve maintenance funding in place to make any necessary periodic repairs and improvements that may be required.

This report contains a comprehensive summary of inspection results in tabular form. The Introduction, Inspection Results, and Recommendations are included in the body of the report.

If you have any questions, please feel free to call.

Sincerely,



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# CENTRAL TEXAS TURNPIKE SYSTEM

## ANNUAL INSPECTION REPORT FOR THE FISCAL YEAR ENDING AUGUST 31, 2021

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## List of Acronyms and Abbreviations

AET	All-Electronic Tolling
AVI	Automatic Vehicle Identification
BRINSAP	Bridge Inventory, Inspection and Appraisal Program
CFR	Code of Federal Regulations
CIP	Cast-In-Place
CSC	Customer Service Center
CTTS	Central Texas Turnpike System
DVAS	Digital Video Audit System
FHWA	Federal Highway Administration
FM	Farm-to-Market Road
FY	Fiscal Year
GEC	General Engineering Consultant
GIS	Geographic Information System
HMLT	High-Mast Light Tower
HVAC	Heating, Ventilation, and Air Conditioning
IH	Interstate Highway
IVIS	Intelligent Vehicle Identification System
MSE	Mechanically Stabilized Earth
OSB	Overhead Sign Bridge
PBMC	Performance-Based Maintenance Contract
PMIS	Pavement Management Information System
SH	State Highway
SL1	State Loop 1 (MoPac)
TMS	Toll Management System
TOD	Toll Operations Division
TRM	Texas Reference Marker
TTC	Texas Transportation Commission
TxCAP	Texas Condition Assessment Program
TxDOT	Texas Department of Transportation
TxMAP	Texas Maintenance Assessment Program
TxTAP	Texas Traffic Assessment Program

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UPS   Uninterruptible Power Supply  
US   United States Highway

## Executive Summary

As General Engineering Consultant (GEC) to the Central Texas Turnpike System (CTTS) and in accordance with Section 707 of the Indenture of Trust (dated July 15, 2002) between the Texas Transportation Commission (TTC) and Bank One, National Association, as Trustee, Atkins North America, Inc. (Atkins) is pleased to submit the CTTS Annual Inspection Report for the fiscal year (FY) ending August 31, 2021. The



findings contained in this report are based on the assessment of inspection data compiled for the roadways, building facilities, toll elements and structures within the system; in coordination with the Texas Department of Transportation (TxDOT) Toll Operations Division (TOD), Austin District Maintenance office, and Project Finance, Debt, and Strategic Contracts Division; and Atkins' general knowledge of the condition of the CTTS.

This is the fourteenth annual inspection of the CTTS since it opened to traffic. The CTTS is currently comprised of State Loop 1 (SL1) from State Highway (SH) 45N to Farm-to-Market (FM) 734; SH 130 Segments 1 through 4, SH 45N; and SH 45SE for a total of 72.8 centerline miles. The annual inspection covers Roadways, Pavement Traffic Operations and Appurtenances, Roadside, Building Facilities, Toll Elements and Structures (bridges, overhead sign bridges, high-mast light towers, traffic signals) along tolled mainlanes, ramps, and frontage roads of the system. The CTTS became an All-Electronic Tolling (AET) roadway in January 2013, with the removal of the cash collection option.

The FY 2021 inspections show that the condition of the CTTS continues to be maintained in good repair, working order and condition, achieving an overall rating of 86 (out of 100). The category of Pavement, which makes up 55% of the overall score, achieved an overall rating of 85.4, which is a decrease from last year's rating of 87.9. This decrease was primarily due to increased pavement cracking on SH 130 and SL1, as well as increased edge drop-offs on SL1, SH 130 and SH 45SE. The category of Traffic Operations & Safety Appurtenances, which makes up 25% of the overall score, decreased from 84 to 81.6, primarily due to striping and small signs which have reached the end of their service life on SH 130, SH 45SE and SH 45N. The category making up the remaining 20%, Roadside, decreased from 93.0 to 91.9, primarily due to vegetation



management on SH 130 and SH 45SE. It is anticipated that a majority of the deficiencies identified will be addressed within the upcoming fiscal year through one of the following: existing Performance-Based Routine Maintenance Contract (PBMC); ongoing projects let in FY 2021 including, SH 130 maintenance-let concrete repair and asphalt overlay, SH 45N frontage road mill and inlay with full-depth repair, system-wide restriping and a large sign panel replacement project, or as part of the ongoing SH 130 Segments 2 and 3 expansion projects. Segments 2 and 3 are being widened to include additional travel and auxiliary lanes from SH 45N to SH 71 for a total project length of approximately 22 miles.

A visual inspection of 57 building facilities was conducted that included, architectural elements, mechanical components, electrical components, and toll booth structures. This year's findings revealed that 92.9% of the elements were rated Good to Excellent, indicating that a majority of inspected elements do not need immediate maintenance or repairs. This year's findings are a decrease of 6.5% from last year's 99.4% of elements rated Good to Excellent. The decrease is primarily due to paint chipping, damaged curb and concrete pavement and rust on the roadside cabinets.

Toll Management System (TMS) is visually inspected during monthly lane audits and any cosmetic or performance related deficiencies identified are submitted to the Toll System Integrator for resolution and/or repair. To supplement the monthly lane audit, Atkins performed a visual inspection of toll elements, which includes in-lane and roadside tolling equipment and appurtenances not covered under the facilities category. Items included in the toll elements inspection are Automatic Vehicle Identification (AVI) readers, antennas, violation enforcement cameras, Digital Video Audit System (DVAS) cameras, lane server equipment, host server equipment and the Intelligent Vehicle Identification System (IVIS) through pavement loop sensors. This year's findings show that 100% of the elements inspected were rated Good to Excellent.

All bridges and bridge-class culverts within the CTTS are inspected biennially as part of TxDOT's Bridge Inventory, Inspection and Appraisal Program (BRINSAP) to implement the National Bridge Inspection Standard (NBIS). These standards are issued by the Federal Highway Administration (FHWA) and are discussed in detail in the Code of Federal Regulations (CFR), 23 CFR 650C. Results from the latest inspection (FY 2020) indicate that 90.6% of the inspected components were rated Good to Excellent.

Inspections for 37.35 miles of retaining walls on the CTTS were conducted this year. Findings for this year's inspections indicate that 85% of wall elements inspected were rated Good to Excellent.

Inspections for Overhead Sign Bridges (OSBs), High-Mast Light Towers (HMLT) and Traffic Signals occur biennially, with half of the roadway inspections in one year, and the other half

conducted in the alternate year. This year, SH 45N, and SH 45SE were inspected, and the findings based on FHWA's rating system indicate that 99.9% of the OSB components inspected, 99.5% of the HMLT components inspected and 98.0% of the Traffic Signals inspected were rated Satisfactory to Good.

TxDOT Austin District's mechanism for routine maintenance of CTTS roadways is through a comprehensive PBMC, which requires the contractor to maintain the roadway at a specific level of service and quality. Atkins has reviewed the contract and found that all established performance measures are consistent with industry standards and TxDOT maintenance policies required to preserve the quality of the CTTS.

The FY 2021 CTTS annual operating, maintenance and capital budgets approved by the TTC in August 2020, via Minute Order 115839, included maintenance budgets of approximately \$6.9M for routine roadway maintenance; \$5.7M for toll system routine maintenance; and \$20.2M for non-routine, unusual or extraordinary maintenance of roadways and building facilities. The FY 2021 approved non-routine, unusual or extraordinary roadway maintenance budget consists of SH 130 improvements, including frontage road overlay work at SH 71, full depth pavement repair from SH 71 to SH 45SE, and large guide sign panel replacement. The building facilities non-routine maintenance budget includes SH 130 electrical ground repair, Uninterruptible Power Supply (UPS) building replacement, toll booth glass replacement, generator turbo replacement, chiller coil replacement and stucco repair.

In January 2017, the TTC approved using the CTTS capital contribution account to fund on-going expansion projects for SH 130 Segments 2 and 3 (from SH 45N to SH 71) via Minute Order 114813; Minute Order 115839 (approved on August 27, 2020) allocates \$30.3M for this project in FY 2021. In June 2017, the TTC also approved using available CTTS revenues for an east-south direct connector from US 290 to SH 130 via Minute Order 114958; Minute Order 115839 approved on August 27, 2020 allocates \$27.9M for this project in FY 2021. As of the date of this report, the east-south direct connector from US 290 to SH 130 was complete and open to traffic.

Based on the condition of the system TxDOT demonstrates a commitment to system preservation and improvement. By continually monitoring system conditions and ensuring that its system is maintained in good repair, working order and condition, TxDOT is able to provide for the safety and convenience of its patrons while maintaining a stable investment for bond holders.

# Section 1 INTRODUCTION



SH 130

SH 45SE

SH 45N

SL1



## 1.0 INTRODUCTION

### 1.1. GENERAL DESCRIPTION AND PROCEDURE OF INSPECTION

The CTTS annual inspection is conducted based on six major categories of the system: roadways, retaining walls, bridges, building facilities, toll elements and structures. For roadway inspections, elements fall within three general categories: pavement, traffic operations & safety appurtenances and roadside. The Pavement category includes assessment of rutting, cracking, failures, ride and edges. The Traffic Operations & Safety Appurtenances category consists of assessing large and small signs, raised pavement markers, striping and graphics, attenuators, delineators and object markers. The Roadside category entails inspection of vegetation management, litter, sweeping, trees and brush, drainage, encroachments, safety barriers and guardrail end treatments.

For building facilities inspections, three general building types are assessed: The Customer Service Center (CSC) building, toll plaza administration buildings (mainlane plazas), and toll plaza buildings (ramp plazas). The major elements in each of the three building types are subdivided



into four categories – architectural, electrical, mechanical, and tollbooths. In addition to the buildings, canopy structures are inspected at each mainlane and roadway ramp plaza.

The Toll Element Inspection consists of an annual visual inspection of the in-lane and roadside tolling equipment and appurtenances including AVI readers, antennas, violation

enforcement cameras, DVAS cameras, lane server equipment, host server equipment and pavement loop sensors (IVIS).

The inspection of certain structures are conducted on a biennial cycle. Bridges on the CTTS were inspected in FY 2020 as part of the TxDOT Federal Bridge Inspection Program. The next inspection is scheduled for FY 2022. The inspection of OSBs, HMLTs and traffic signals is also conducted every other year but is staggered such that approximately half of the structures are inspected each year. This year's structures inspection included OSBs, HMLTs and traffic signals on SH 45N, and SH 45SE.

An inspection of retaining walls on the system was conducted this year, which included a visual condition assessment of panels, coping, foundations, joints, wall alignment, slopes, backfill and drainage.

An inventory of large guide signs was conducted, and a condition assessment is included in the traffic operations score within the roadway inspection results. In addition, a nighttime illumination inspection was conducted.

The assessment of roadways within the CTTS were combined utilizing percentage breakdowns from the former Texas Condition Assessment Program (TxCAP) scoring system, which combined data from three inspection sources: the Texas Maintenance Assessment Program (TxMAP), the Pavement Management Information System (PMIS), and the Texas Traffic Assessment Program (TxTAP), thus providing a simplified and concise scoring for each roadway category, component, corridor, and overall system score.

Atkins performs visual condition assessments based on criteria aligning with a 5-point rating scale for the components described in subsection 2.2, Roadways. The results of the inspections are scored and weighted in accordance with the former TxCAP system, allowing for continued comparison of the CTTS roadway conditions to past performance as the system ages. The ratings assigned to the CTTS can be used to make general recommendations on system components needing improvement. A summary of the rating system is described in more detail and the scores are included in section 2, subsection 2.2.

Inspections are conducted in accordance with standard procedures developed by the FHWA and TxDOT and involve an extensive visual examination of all elements relative to the category of inspection. Inspection data is collected and organized in real-time by means of computer tablets pre-loaded with a Geographic Information System (GIS)-based collection application for visualization and analysis. The GIS base maps, and output data are spot-checked to verify accuracy and consistency.

Due to the time duration between inspection activities and publication of this report, some identified deficiencies may have already been addressed through ongoing maintenance or construction activities. These improvements are typically funded through an approved budget and performed through existing routine maintenance contracts, or through separately let periodic maintenance or construction contracts.

## 1.2. DESCRIPTION OF THE CENTRAL TEXAS TURNPIKE SYSTEM



The CTTS is comprised of four main roadway corridors. The first corridor, SL1 Extension, is approximately 4 miles in length and runs south from the SH 45N interchange to FM 734 (Parmer Lane). SH 45N, the second of CTTS's four corridors, begins west of US 183 at Ridgeline Boulevard and extends east approximately 12.8 miles to the SH 130 interchange north of Pflugerville, Texas. The third corridor, SH 130 (Segments 1 through 4) begins north of Georgetown, Texas at IH 35 and extends 49 miles south to US 183 in southeast Travis County. The fourth corridor, SH 45SE is approximately 7 miles in length and runs west from US 183 to the IH 35

interchange in south Travis County. All four CTTS corridors are multi-lane, access-controlled toll roads. The four corridors combined provide 72.8 centerline miles to the state highway system and include 238 bridges and major culverts, and 57 buildings. The system's main roadway corridors are summarized in Table 1 and illustrated on Figure 1.

**Table 1. Central Texas Turnpike System Corridors**

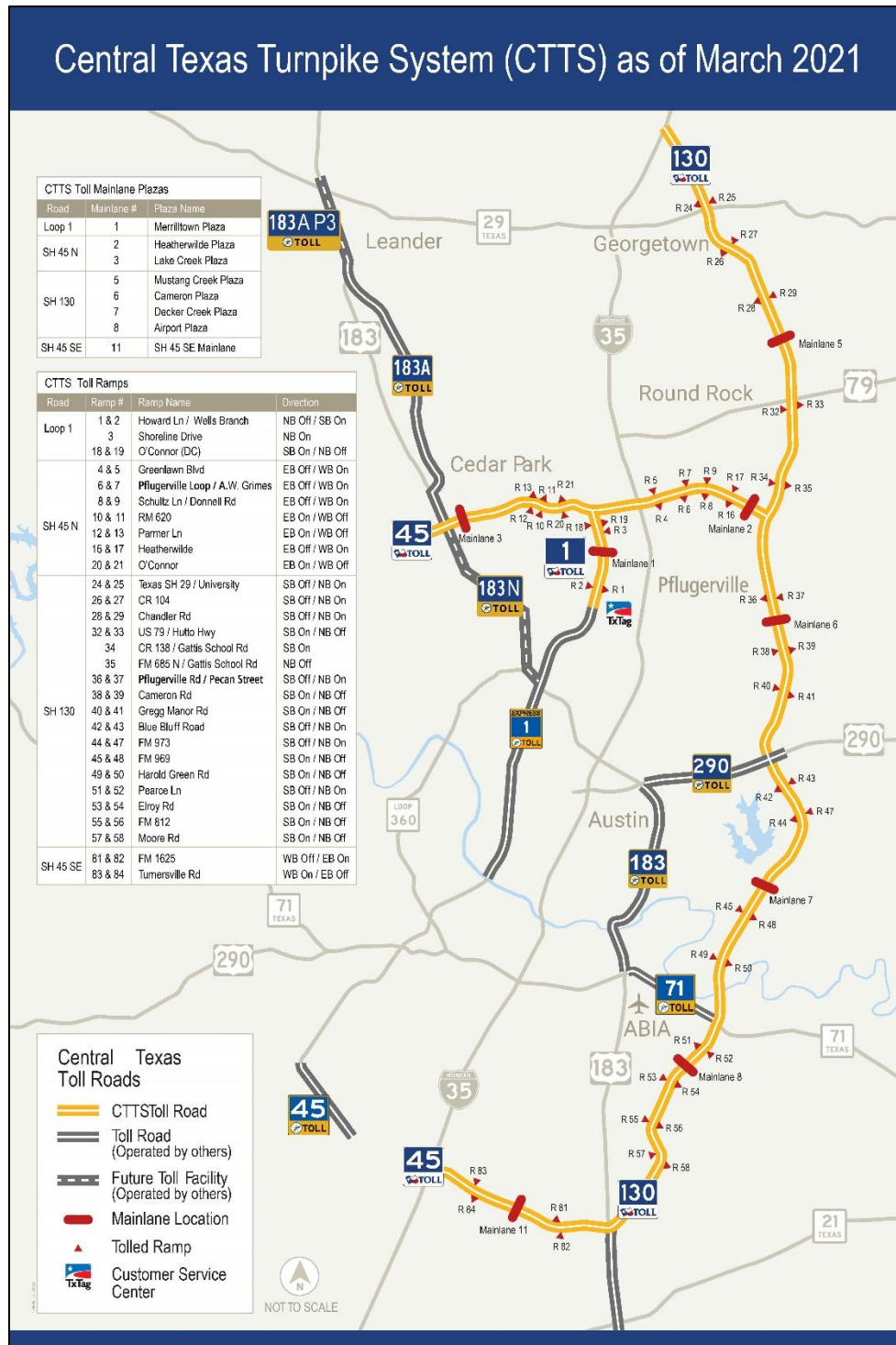
Roadway	Centerline Mile Lengths (Miles)	Open to Traffic Date
SL1 (From SH 45N to FM 734)	4.0	October 2006
SH 45N	12.8	October 2006 (Seg. 3 - 6); April 2007 (Seg. 7 - 8)
SH 130 (Segments 1 through 4)	49.0	December 2006 (Seg. 1); October 2006 (Seg 2); September 2007 (Seg. 3); April 2008 (Seg. 4)
SH 45SE	7.0	May 2009
<b>Total</b>	<b>72.8</b>	



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An additional 41 miles of SH 130 Segments 5 and 6 connect the CTTS portion of SH 130 to IH 10 northeast of Seguin, Texas. Since Segments 5 and 6 are operated and maintained by others, they are outside the CTTS and are not included in the annual inspections.

**Figure 1: Central Texas Turnpike System (CTTS)**



# SECTION 2

## FY2021 MAINTENANCE INSPECTION RESULTS

Section 2  
FY2021 Maintenance  
Inspection Results



SH 130

SH 45SE

SH 45N

SL1

## **2.0 FISCAL YEAR 2021 MAINTENANCE INSPECTION RESULTS**

### **2.1. INTRODUCTION**

The findings of the FY 2021 Annual Inspection of the CTTS are based on an extensive visual inspection and evaluation of its roadways, bridges, retaining walls, building facilities, toll elements, and structures and are outlined below. The ratings assigned to the various roadway elements are presented along with a general description of the condition of the roadways, bridges, retaining walls, buildings, toll elements and structures at the time of inspection.

The CTTS inspection does not take into account the criticality of the elements in relation to each other. When reviewing deficiencies, a number of considerations influence the desired level of service. These include safety, protection of private and public investment, comfort, economics, environmental impact, aesthetics, and funding constraints. A pavement failure, for example, would receive priority over a comparably rated deficiency in litter removal because it may have an immediate impact on the overall safety of the system.

### **2.2. ROADWAYS**

The roadway inspection is divided into three general categories of roadway elements: pavement, traffic operations & safety appurtenances and roadside. A sketch identifying the major elements of a typical roadway is included as Figure 2.

Atkins utilized a roadway rating procedure based on the original 25 roadway elements outlined in the former TxCAP system, allowing for continued comparison of the CTTS roadway conditions with past performance as the system ages. Visual condition assessments are based on criteria aligning with a 5-point rating scale as shown in Table 2. Each rated component is converted to a percentage by multiplying each score by 20, and the resulting score weighted by applying the former TxCAP values outlined in Table 3 to determine the overall score for each category. Each category's overall score is then weighted to obtain a total composite score for the entire roadway system.





**Table 2. CTTS Roadway Inspection Rating Scale**

Grade	Rating	Description
5	Excellent	Feature is in above average condition. No deficiencies noted. <b>No maintenance necessary.</b>
4	Good	Feature appearance and functionality/operability are adequate. <b>No immediate maintenance or repairs necessary.</b>
3	Degraded	Feature appearance or functionality/operability are below average. <b>Maintenance is required but does not require expedited repair to protect the system.</b>
2	Unsatisfactory	Feature appearance or functionality/operability are substandard. <b>Maintenance is required, as soon as practical*, but does not require expedited repair to protect the system.</b>
1	Failing	Feature appearance or functionality/operability are unacceptable. <b>Feature has failed and may require expedited repair to protect the public or system.**</b>

\* Timeframe for which repair work would be prioritized and scheduled (under normal circumstances).

\*\* The need for expedited repair to be determined based on response time set forth in TxDOT maintenance protocols for a specific deficiency.

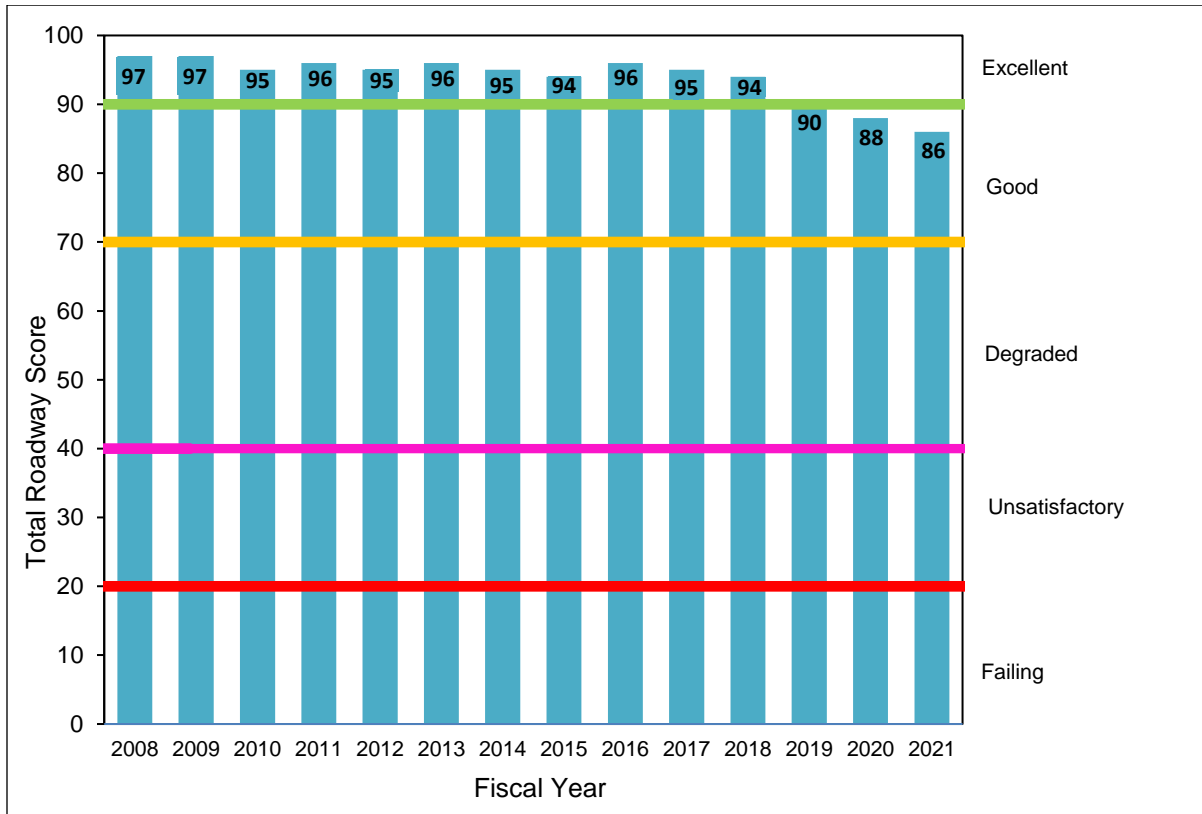
Inspection data is collected and organized in real-time by means of computer tablets pre-loaded with a GIS-based collection application for visualization and analysis. The GIS base maps and output data are spot-checked for accuracy and consistency. Inspection results are organized by facility name, roadway/ramp segment, lane direction, and Texas Reference Marker (TRM), as applicable.

All of the major elements within each category and corresponding scores are shown in Tables 4 through 7 for each roadway in the system. A rating of three (3) or below indicates that the element is degraded and reported as deficient. Inspection scores for all roadways within the CTTS are summarized in Table 8. The inspection results shown include major categories of these roadway types: mainlane roadways, frontage roads, ramps, and interchanges.

The results of this year's annual inspection indicate that the CTTS roadway elements are being maintained in good repair, working order and condition with an overall roadway score of 86. Figure 3 illustrates how the overall roadway score has historically trended since the initial inspection in 2008.



**Figure 3: CTTS Historical Roadway Scores – All Roadways**



**Table 3. TxCAP Roadway Weighted Scoring Values**

	<b>Original Percentage</b>	<b>Adjusted Percentage</b>
<b>Pavement Score</b>		
Rutting	18.18	21.28
Cracking	18.18	21.28
Failures	21.82	25.53
Ride	12.73	14.89
Edges	14.55	17.02
<b>Traffic Operations &amp; Safety Appurtenances Score</b>		
Raised Pavement Markers	16.00	17.39
Striping, Pavement Graphics	20.00	21.74
Attenuators	12.00	13.04
Delineators	12.00	13.04
Signs – Small	16.00	17.39
Signs – Large	16.00	17.39
<b>Roadside Score</b>		
Vegetation Management	15.00	16.67
Litter & Debris	10.00	11.11
Sweeping	10.00	11.11
Trees & Brush	10.00	11.11
Drainage	15.00	16.67
Encroachments	5.00	5.56
Safety Barriers	15.00	16.67
Guardrail End Treatments	10.00	11.11
<b>Overall Score</b>		
<b>Pavement</b>	<b>55.00</b>	
<b>Traffic Operations &amp; Safety Appurtenances</b>	<b>25.00</b>	
<b>Roadside</b>	<b>20.00</b>	
<b>Total</b>	<b>100.00</b>	

**Table 4. Condition of CTTS Roadway Elements – SL1**

Category	Component	Sub Score <sup>(1)</sup>	TxCAP Weighted Value <sup>(1)</sup>	Weighted Score <sup>(1)</sup>
<b>Pavement Score</b>	Rutting	90.0	21.3%	19.2
	Cracking	65.0	21.3%	13.8
	Failures	91.9	25.5%	23.4
	Ride	85.4	14.9%	12.7
	Edges	77.3	17.0%	13.1
	Shoulders	0.0	0.0%	0.0
<b>SL1 - Pavement Score</b>				<b>82.2</b>
<b>Traffic Operations &amp; Safety Appurtenances Score</b>	Raised Pavement Markers	84.2	17.4%	14.7
	Striping, Pavement Graphics	81.6	21.7%	17.7
	Attenuators	92.5	13.0%	12.0
	Delineators	84.6	13.0%	11.0
	Signs – Large	84.3	17.4%	14.7
	Signs – Small	78.8	17.4%	13.7
	Shoulder Texturing	0.0	0.0%	14.7
<b>SL1 - Traffic Operations &amp; Safety Appurtenance Score</b>				<b>83.8</b>
<b>Roadside Score</b>	Vegetation Management	95.7	16.7%	16.0
	Litter & Debris	83.5	11.1%	9.3
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	93.0	11.1%	10.3
	Drainage	89.5	16.7%	14.9
	Encroachments	98.8	5.7%	5.5
	Safety Barriers	86.3	16.7%	14.4
	Guardrail End Treatments	87.7	11.1%	9.7
	Mail Boxes	0.0	0.0%	0.0
<b>SL1 - Roadside Score</b>				<b>91.2</b>
<b>Category Score</b>	Pavement	82.2	55.0%	45.2
	Traffic Operations & Safety Appurtenances	83.8	25.0%	21.0
	Roadside	91.2	20.0%	18.2
<b>SL1 - Roadway Subscore</b>				<b>84.4</b>
<b>SL1 - Total Roadway Score<sup>(2)</sup></b>				<b>84</b>

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number

**Table 5. Condition of CTTS Roadway Elements – SH 45N**

Category	Component	Sub Score <sup>(1)</sup>	TxCAP Weighted Value <sup>(1)</sup>	Weighted Score <sup>(1)</sup>
<b>Pavement Score</b>	Rutting	97.8	21.3%	20.8
	Cracking	81.1	21.3%	17.3
	Failures	87.0	25.5%	22.2
	Ride	89.3	14.9%	13.3
	Edges	94.4	17.0%	16.0
	Shoulders	0.0	0.0%	0.0
<b>SH 45N - Pavement Score</b>				<b>89.6</b>
<b>Traffic Operations &amp; Safety Appurtenances Score</b>	Raised Pavement Markers	91.2	17.4%	15.9
	Striping, Pavement Graphics	79.9	21.7%	17.3
	Attenuators	84.8	13.0%	11.0
	Delineators	78.2	13.0%	10.2
	Signs – Large	84.0	17.4%	14.6
	Signs – Small	74.7	17.4%	13.0
	Shoulder Texturing	0.0	0.0%	0.0
<b>SH 45N - Traffic Operations &amp; Safety Appurtenance Score</b>				<b>82.0</b>
<b>Roadside Score</b>	Vegetation Management	93.2	16.7%	15.6
	Litter & Debris	96.6	11.1%	10.7
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	86.8	11.1%	9.6
	Drainage	88.6	16.7%	14.8
	Encroachments	97.1	5.7%	5.4
	Safety Barriers	88.9	16.7%	14.8
	Guardrail End Treatments	88.6	11.1%	9.8
	Mail Boxes	0.0	0.0%	0.0
<b>SH 45N - Roadside Score</b>				<b>91.8</b>
<b>Category Score</b>	Pavement	89.6	55.0%	49.3
	Traffic Operations & Safety Appurtenances	82.0	25.0%	20.5
	Roadside	91.8	20.0%	18.4
<b>SH 45N - Roadway Subscore</b>				<b>88.2</b>
<b>SH 45N - Total Roadway Score<sup>(2)</sup></b>				<b>88</b>

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number

**Table 6. Condition of CTTS Roadway Elements – SH 130 (Segments 1 through 4)**

Category	Component	Sub Score <sup>(1)</sup>	TxCAP Weighted Value <sup>(1)</sup>	Weighted Score <sup>(1)</sup>
<b>Pavement Score</b>	Rutting	95.9	21.3%	20.4
	Cracking	73.9	21.3%	15.7
	Failures	83.9	25.5%	21.4
	Ride	85.6	14.9%	12.8
	Edges	77.9	17.0%	13.2
	Shoulders	0.0	0.0%	0.0
<b>SH 130 - Pavement Score</b>				<b>83.5</b>
<b>Traffic Operations &amp; Safety Appurtenances Score</b>	Raised Pavement Markers	87.7	17.4%	15.3
	Striping, Pavement Graphics	75.8	21.7%	16.4
	Attenuators	92.5	13.0%	12.0
	Delineators	73.9	13.0%	9.6
	Signs – Large	85.0	17.4%	14.8
	Signs – Small	72.3	17.4%	12.6
	Shoulder Texturing	0.0	0.0%	0.0
<b>SH 130 - Traffic Operations &amp; Safety Appurtenance Score</b>				<b>80.7</b>
<b>Roadside Score</b>	Vegetation Management	80.0	16.7%	13.4
	Litter & Debris	93.9	11.1%	10.4
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	91.1	11.1%	10.1
	Drainage	90.3	16.7%	15.1
	Encroachments	99.2	5.7%	5.6
	Safety Barriers	94.9	16.7%	15.8
	Guardrail End Treatments	97.0	11.1%	10.8
	Mail Boxes	0.0	0.0%	0.0
<b>SH 130 - Roadside Score</b>				<b>92.3</b>
<b>Category Score</b>	Pavement	83.5	55.0%	45.9
	Traffic Operations & Safety Appurtenances	80.7	25.0%	20.2
	Roadside	92.3	20.0%	18.5
<b>SH 130 - Roadway Subscore</b>				<b>84.6</b>
<b>SH 130 - Total Roadway Score<sup>(2)</sup></b>				<b>85</b>

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number

**Table 7. Condition of CTTS Roadway Elements – SH 45SE**

Category	Component	Sub Score <sup>(1)</sup>	TxCAP Weighted Value <sup>(1)</sup>	Weighted Score <sup>(1)</sup>
<b>Pavement Score</b>	Rutting	96.1	21.3%	20.5
	Cracking	85.0	21.3%	18.1
	Failures	93.7	25.5%	23.9
	Ride	87.8	14.9%	13.1
	Edges	67.8	17.0%	11.5
	Shoulders	0.0	0.0%	0.0
<b>SH 45SE - Pavement Score</b>				<b>87.1</b>
<b>Traffic Operations &amp; Safety Appurtenances Score</b>	Raised Pavement Markers	84.0	17.4%	14.6
	Striping, Pavement Graphics	74.6	21.7%	16.2
	Attenuators	94.3	13.0%	12.3
	Delineators	82.4	13.0%	10.7
	Signs – Large	84.7	17.4%	14.7
	Signs – Small	72.9	17.4%	12.7
	Shoulder Texturing	0.0	0.0%	0.0
<b>SH 45SE - Traffic Operations &amp; Safety Appurtenances Score</b>				<b>81.2</b>
<b>Roadside Score</b>	Vegetation Management	82.1	16.7%	13.7
	Litter & Debris	76.1	11.1%	8.4
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	90.2	11.1%	10.0
	Drainage	85.5	16.7%	14.3
	Encroachments	98.0	5.7%	5.5
	Safety Barriers	95.9	16.7%	16.0
	Guardrail End Treatments	93.8	11.1%	10.4
	Mail Boxes	0.0	0.0%	0.0
<b>SH 45SE - Roadside Score</b>				<b>89.4</b>
<b>Category Score</b>	Pavement	87.1	55.0%	47.9
	Traffic Operations & Safety Appurtenances	81.2	25.0%	20.3
	Roadside	89.4	20.0%	17.9
<b>SH 45SE - Roadway Subscore</b>				<b>86.1</b>
<b>SH 45SE - Total Roadway Score<sup>(2)</sup></b>				<b>86</b>

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number



**Table 8. Condition of CTTS Roadway Elements – All Roadways**

Category	Component	Sub Score <sup>(1)</sup>	TxCAP Weighted Value <sup>(1)</sup>	Weighted Score <sup>(1)</sup>
<b>Pavement Score</b>	Rutting	95.9	21.3%	20.4
	Cracking	75.9	21.3%	16.2
	Failures	86.3	25.5%	22.0
	Ride	86.8	14.9%	12.9
	Edges	81.8	17.0%	13.9
	Shoulders	0.0	0.0%	0.0
<b>All Roadways - Pavement Score</b>				<b>85.4</b>
<b>Traffic Operations &amp; Safety Appurtenances Score</b>	Raised Pavement Markers	88.1	17.4%	15.3
	Striping, Pavement Graphics	77.4	21.7%	16.8
	Attenuators	91.3	13.0%	11.9
	Delineators	76.8	13.0%	10.0
	Signs – Large	84.8	17.4%	14.8
	Signs – Small	73.6	17.4%	12.8
	Shoulder Texturing	0.0	0.0%	0.0
<b>All Roadways - Traffic Operations &amp; Safety Appurtenances Score</b>				<b>81.6</b>
<b>Roadside Score</b>	Vegetation Management	85.1	16.7%	14.2
	Litter & Debris	92.4	11.1%	10.3
	Sweeping	100	11.1%	11.1
	Trees & Brush	90.0	11.1%	10.0
	Drainage	89.5	16.7%	14.9
	Encroachments	98.6	5.7%	5.5
	Safety Barriers	92.7	16.7%	15.5
	Guardrail End Treatments	93.5	11.1%	10.4
	Mail Boxes	0.0	0.0%	0.0
<b>All Roadways - Roadside Score</b>				<b>91.9</b>
<b>Category Score</b>	Pavement	85.4	55.0%	47.0
	Traffic Operations & Safety Appurtenances	81.6	25.0%	20.4
	Roadside	91.9	20.0%	18.4
<b>All Roadways - Roadway Subscore</b>				<b>85.9</b>
<b>All Roadways - Total Roadway Score<sup>(2)</sup></b>				<b>86</b>

(1) - Numbers are rounded to three (3) significant digits

(2) - Value is rounded to the nearest whole number

### 2.2.1. Pavement

The Pavement category includes rutting, cracking, pavement failures, ride rating, and edges. Figure 4 illustrates a typical roadway pavement section on the system. Pavement throughout the CTTS achieved an overall score of 85.4, which is a decrease from last year's score of 87.9. The decrease in score was primarily due to increased pavement cracking on SH 130 and SL1, as well as increased edge drop-offs on SL1, SH 130 and SH 45SE. Because of the extensive presence of sulfates in the area of SH 130 and SH 45SE, the soils have a tendency to expand and contract. In addition, portions of SL1 fall within the mapped outcropping of the Del Rio clay, which is known for its expansive characteristics with changes in moisture content. Over the past few years, there has been significant seasonal rainfall, which could cause movement in the soil subgrade and the pavement structure, leading to increased surface defects.

**Figure 4: Typical Roadway Pavement Section**



The current roadway PBMC requires the maintenance contractor to address all pavement deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. TxDOT let two maintenance contracts in FY 2020 to address some of the non-routine pavement deficiencies: (1) SH 45 mill and inlay with full depth repair; and (2) SH 130 Segment 4 (SH 71 to US 183), which consists of performing pavement overlays on the existing pavement structure. In addition, the ongoing SH 130 Segments 2 and 3 expansion projects, are scheduled to be complete by summer 2021.

As noted in the FY 2020 Annual Inspection Report, geotechnical engineers on the GEC team continue to monitor pavement cracking on the northbound SL1 entrance ramp just north of Shoreline Drive. This year's findings show the same patterns of pavement cracking as those presented in the FY 2020 report with no significant change in the magnitude of cracking. Atkins recommends that the cracks in the pavement and top of the retaining wall area, such as the coping joints and the exit lane to gore pavement joint be inspected twice a year and that degraded seal be repaired.

### **2.2.2. Traffic Operations & Safety Appurtenances**

The Traffic Operations & Safety Appurtenances category ratings are based on the condition of all features that guide, protect, and assist the patron while traveling the CTTS roadways. Figure 5 shows an example of road signs scored in this category.

A Traffic Operations & Safety Appurtenance score rating of 81.6 was achieved across all roadways in the system, a decrease from 84.0 last year. The decrease in score was primarily due to striping and small signs on SH 130, SH 45SE and SH 45N that have reached the end of their service life. In addition, the lowest Traffic Operations & Safety Appurtenances element score was small signs, which received a score of 72.3 and was noted on SH 130.

**Figure 5: Large Guide Sign on SH 130**



In addition, a complete large guide sign inventory was performed, and both daytime and nighttime assessments were conducted. The findings for this year's inspection indicate that 32.2% of the large signs received a rating of 3 or below, with 3.4% receiving a 1 or 2 rating. The remainder of the signs received a 4 or 5 rating, which is considered Good to Excellent. The signs receiving ratings of 3 or below were rated down primarily because of degraded retro reflectivity.

The former TxCAP rating system did not include an evaluation of lighting systems, but consistent with previous years, a nighttime inspection of the CTTS luminaires was performed to assess whether the bulbs were functioning. High-mast lights, safety lighting, and continuous lighting were examined as part of this inspection. During the FY 2021 inspection, it was found that 533 high-mast light bulbs out of 1428 total, 161 continuous light bulbs out of total 339, and 547 safety light bulbs out of 2,032 total received ratings that indicate that luminaire (light bulb) replacement is needed.

The current roadway PBMC requires the maintenance contractor to address all traffic operations & safety appurtenances deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. In addition, with the large guide signs approaching the end of their typical service life, TxDOT let a system-wide large sign replacement project that is currently in process, which will address many of the sign deficiencies that were identified during this year's inspections.

### **2.2.3. Roadside**

The determination of the Roadside score for roadside features is generally based on the consideration of vegetation management, litter removal, drainage structures, and other elements located outside the paved travel way (Figure 6). The Roadside category achieved an overall score of 91.9, a decrease from 93.0 last year. The decrease in score was primarily due to vegetation management on SH 130 and SH 45SE.

The current roadway PBMC requires the maintenance contractor to address roadside deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. In addition, it is anticipated that the pavement upgrade projects, as well as the SH 130 expansion projects mentioned in subsection 2.2.1, will address some of the roadside deficiencies that were found.



**Figure 6: Roadside Conditions**

### **2.3. BUILDING FACILITIES**

The building facilities inspection is based on three general building types: the CSC building, toll plaza administration buildings (mainlane plazas), and toll plaza buildings (ramp plazas). The CTTS building quantities are detailed in Table 9. In addition to the three building types, canopy structures are present at all ramp plazas and the old mainlane cash lanes, with the exception of a few locations: SH 45N at O'Connor Drive; SH 45SE; and ramps south of Cameron Road on SH 130. The major characteristics of each building type are subdivided into four categories: architectural, electrical, mechanical, and toll booth components. Currently 57 buildings exist and were in service at the time of the FY 2021 inspection. As part of the inspection process, all relevant structural components and associated mechanical and electrical systems for all building facilities were visually inspected.

The ratings are assigned based on the observed conditions, and the descriptions of the numerical grading system are based on the same 5-point system utilized for the roadway system elements. Elements rated deficient are compared to the total number of elements inspected to determine a deficiency percentage for each element.

The inspection findings indicate that 92.9% of the elements were rated Good to Excellent along SL1, SH45N and SH 130. There are no facility elements on SH 45SE as it was constructed for all-electronic tolling only. The method of toll collection is accomplished through overhead gantry structures, instead of toll plaza buildings. As a result, overhead gantry structures on the system are covered under subsection 2.4.3 Overhead/Cantilever Sign Structures below.

This year 6,885 facility asset items were inspected, of which 36 were rated as Unsatisfactory (rating of two or less) condition. The results are summarized in Tables 10 through 12, and a system-wide summary is shown in Table 13. Examples of deficiencies found include structural settlement, missing bollards, paint chipping or delaminating. Similar to the inspection results from the previous year, the deficiency rating for the CTTS building facilities is Good, with components currently meeting all performance requirements. The current PBMC building facilities maintenance contract requires the maintenance contractor to address all building facilities deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. Some elements such as bollards, attenuators, parking and driveway pavement, roadway gates, and non-sidewalk concrete pavement fall under the purview of the roadway PBMC. A listing of those roadway deficiencies has been forwarded to TxDOT's Austin District.

**Table 9. Central Texas Turnpike System Building Quantities – FY 2021**

<b>Building Types</b>	<b>SL1</b>	<b>SH 45N</b>	<b>SH 130</b>	<b>SH 45SE</b>	<b>Totals</b>
Customer Service Center	1	0	0	0	1
Mainlane Plazas	1	2	8	0	11
Ramp Plazas	3	12	30	0	45
<b>Totals</b>	5	14	38	0	57



In 2015, as a result of numerous loop sensor failures on CTTS facilities, per TOD request, Atkins conducted a study to investigate the potential causes of the failures. These in-pavement loop sensors, shown on Figure 7, are part of the IVIS system, which detect and classify vehicles traveling through the toll zone. The study found that multiple issues could be attributed to the failures, including damage to the loop sensor wire, improper loop sensor installation, and pavement cracking in the vicinity of the sensors. While pavement cracks were found to be one of the potential causes, the study did not show a direct relationship between the presence of pavement cracks and loop sensor failures. Furthermore, a life-cycle cost analysis determined that it is more economical for TOD to continue to replace loop sensors that fail until the toll zone pavement requires complete replacement. TxDOT continuously monitors these locations and performs supplementary inspections and maintenance to ensure that the toll system's collection capabilities are not affected. From FY 2017 through FY 2019 ten locations were replaced, in FY 2020 one location was replaced.

**Figure 7: Toll System Pavement Showing IVIS**



### **2.3.1. Customer Service Center**

The TxTag CSC, as shown on Figure 8, provides customer service and account management support for TxDOT's toll projects throughout the state. TxTag is one example of a toll transponder which patrons use to pay tolls electronically by establishing a prepaid account. The CSC also provides system and accounting services for Pay By Mail customers who are billed monthly for their tolls.

The CSC became operational in July 2006, and operates 5 days a week, Monday through Friday. In 2013, the focus of toll collection moved from manual collection to AET when the CTTS stopped collecting cash in the lanes. As a result, the CSC's role has become more important in the collection and accounting of toll revenue. The CSC contains TOD's system database that houses information on daily transactions, the toll revenue due by toll collection type, the interoperable revenue due from other agencies, and financial reporting information. The facility also houses staff, including general administration, quality assurance, accounting and reconciliation, human resources, and facility administration.



**Figure 8: Customer Service Center**

### **2.3.2. Mainlane and Ramp Plaza Building Facilities and Canopies**

The toll plaza administration building facilities and canopies are located either as part of a mainlane toll plaza (Figure 9) or ramp toll plaza facility. The canopies typically extend from the administration buildings outward, over the tollbooths or toll collection equipment located between the travel lanes. The administration buildings located at mainlane toll plazas are connected to the toll collection booths/equipment by means of an underground tunnel. This facilitates the transport of personnel, toll collection data, and supplies.



**Figure 9: Mainlane Toll Plaza Canopy**

### **2.3.3. Architectural**

Architectural elements include walls, windows, doors, flooring, canopy, site ground, and parking areas. Of the 4,732 architectural elements inspected, 11 elements received a score lower than a three (3) rating.

### **2.3.4. Electrical**

Electrical elements include building electrical features, wiring, UPS, traffic signals, roadside cabinets, and generators (see Figure 10). Of the 1,065 total elements inspected in the electrical category, only 4 elements received a score lower than a three (3) rating.

### 2.3.5. Mechanical

Mechanical elements include plumbing fixtures, sewer/septic lines and well and water lines. Of the 196 total elements rated in the mechanical category, 13 elements related to plumbing and water well/water lines were rated lower than a three (3) rating.



**Figure 10: Facility Generators**

### 2.3.6. Toll Booths

As noted earlier, all tollbooths have been closed and decommissioned as part of the AET conversion but were inspected during the FY 2021 inspection efforts since these are still assets on the CTTS. Exceptions include assets considered inactive, such as toll booth heating, ventilation, and air conditioning (HVAC), and therefore, were not inspected. Of the 892 total elements inspected in the tollbooth category, 8 received a score lower than three (3).

**Table 10. Condition of CTTS Building Facilities – SL1**

Category	Element	Number Inspected	Number Rated Less Than 3	Percent Deficient
Architectural	Area Lights	165	0	0.0%
	Bollards	25	0	0.0%
	Canopy	17	1	5.9%
	Elevators, Dumbwaiters	2	0	0.0%
	Exterior Doors	14	0	0.0%
	Exterior Walls	31	0	0.0%
	Exterior Windows	75	0	0.0%
	Finishes	136	0	0.0%
	Fire Extinguishers & Cabinets	192	0	0.0%
	Fuel Storage	1	0	0.0%
	Handrail	4	0	0.0%
	HVAC System	174	0	0.0%
	Interior Doors	139	0	0.0%
	Interior Flooring	140	0	0.0%
	Interior Walls & Ceilings	447	0	0.0%
	Irrigation System/Site Grounds	7	1	14.3%
	Lockers	0	0	0.0%
	Parking Area & Drive Pavement	43	0	0.0%
	Roof Drain	3	0	0.0%
	Systems (Comms/Alarms)	73	0	0.0%
	Interior Signs	30	0	0.0%
	Exterior Wall	0	0	0.0%
Electrical	Building Electrical Fixtures	193	0	0.0%
	Generators	8	0	0.0%
	Traffic Signal	15	0	0.0%
	Uninterrupted Power Supply (UPS)	2	0	0.0%
	Wiring	43	0	0.0%
	Roadside Cabinet	3	0	0.0%
Mechanical	HVAC System	1	0	0.0%
	Plumbing Fixtures	30	1	3.3%
	Sewer/Septic Lines	1	0	0.0%
	Well/Water Lines	23	0	0.0%
Toll Booths	Area Lights-Toll	4	0	0.0%
	Attenuator	19	0	0.0%
	Booth Pit	2	0	0.0%
	Concrete Pavement	19	1	5.3%
	Counter/Drawer	18	0	0.0%
	Gates	2	0	0.0%
	Interior Booth	23	1	4.3%
	Nose Flashers	20	1	5.0%
	Signs	7	0	0.0%
	Toll AC	0	0	0.0%
	Toll Indicator	22	0	0.0%
	Window	22	0	0.0%

**Table 11. Condition of CTTS Building Facilities – SH 45N**

Category	Element	Number Inspected	Number Rated Less Than 3	Percent Deficient
Architectural	Area Lights	92	3	3.3%
	Bollards	49	1	2.0%
	Canopy	59	0	0.0%
	Elevators, Dumbwaiters	3	0	0.0%
	Exterior Doors	12	0	0.0%
	Exterior Walls	29	0	0.0%
	Exterior Windows	27	0	0.0%
	Finishes	46	0	0.0%
	Fire Extinguishers & Cabinets	78	0	0.0%
	Fuel Storage	4	0	0.0%
	Handrail	13	1	7.7%
	HVAC System	111	0	0.0%
	Interior Doors	70	0	0.0%
	Interior Flooring	64	0	0.0%
	Interior Walls & Ceilings	205	0	0.0%
	Irrigation System/Site Grounds	7	0	0.0%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	90	0	0.0%
	Roof Drain	7	0	0.0%
	Systems (Comms/Alarms)	32	0	0.0%
	Interior Signs	23	0	0.0%
	Exterior Wall	1	0	0.0%
Electrical	Building Electrical Fixtures	142	0	0.0%
	Generators	15	0	0.0%
	Traffic Signal	35	1	2.9%
	Uninterrupted Power Supply (UPS)	5	0	0.0%
	Wiring	61	0	0.0%
	Roadside Cabinet	15	0	0.0%
Mechanical	HVAC System	0	0	0.0%
	Plumbing Fixtures	25	1	4.0%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water Lines	21	0	0.0%
Toll Booths	Area Lights-Toll	2	0	0.0%
	Attenuator	39	1	2.6%
	Booth Pit	4	0	0.0%
	Concrete Pavement	47	0	0.0%
	Counter/Drawer	25	0	0.0%
	Gates	0	0	0.0%
	Interior Booth	20	0	0.0%
	Nose Flashers	36	1	2.8%
	Signs	21	0	0.0%
	Toll AC	0	0	0.0%
	Toll Indicator	53	0	0.0%
	Window	12	0	0.0%



**Table 12. Condition of CTTS Building Facilities – SH 130 (Segments 1 through 4)**

Category	Element	Number Inspected	Number Rated Less Than 3	Percent Deficient
Architectural	Area Lights	171	1	0.6%
	Bollards	86	0	0.0%
	Canopy	148	2	1.4%
	Elevators, Dumbwaiters	0	0	0.0%
	Exterior Doors	21	1	4.8%
	Exterior Walls	56	0	0.0%
	Exterior Windows	52	0	0.0%
	Finishes	99	0	0.0%
	Fire Extinguishers & Cabinets	149	0	0.0%
	Fuel Storage	26	0	0.0%
	Handrail	14	0	0.0%
	HVAC System	206	0	0.0%
	Interior Doors	125	0	0.0%
	Interior Flooring	111	0	0.0%
	Interior Walls & Ceilings	381	0	0.0%
	Irrigation System/Site Grounds	33	0	0.0%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	197	0	0.0%
	Roof Drain	13	0	0.0%
	Systems (Comms/Alarms)	52	0	0.0%
	Interior Signs	47	0	0.0%
	Exterior Wall	1	0	0.0%
Electrical	Building Electrical Fixtures	253	1	0.4%
	Generators	26	0	0.0%
	Traffic Signal	72	1	1.4%
	Uninterrupted Power Supply (UPS)	11	0	0.0%
	Wiring	134	0	0.0%
	Roadside Cabinet	32	1	3.1%
Mechanical	HVAC System	1	0	0.0%
	Plumbing Fixtures	55	4	7.3%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water Lines	39	7	17.9%
Toll Booths	Area Lights-Toll	37	0	0.0%
	Attenuator	47	0	0.0%
	Booth Pit	12	0	0.0%
	Concrete Pavement	127	0	0.0%
	Counter/Drawer	35	0	0.0%
	Gates	3	0	0.0%
	Interior Booth	20	0	0.0%
	Nose Flashers	49	2	4.1%
	Signs	47	0	0.0%
	Toll AC	6	0	0.0%
	Toll Indicator	81	1	1.2%
	Window	20	0	0.0%



**Table 13. Condition of Building Facilities – CTTS (All Roadways)**

Category	Element	Number Inspected	Number Rated Less Than 3	Percent Deficient
Architectural	Area Lights	428	4	0.9%
	Bollards	160	1	0.6%
	Canopy	224	3	1.3%
	Elevators, Dumbwaiters	5	0	0.0%
	Exterior Doors	47	1	2.1%
	Exterior Walls	116	0	0.0%
	Exterior Windows	154	0	0.0%
	Finishes	281	0	0.0%
	Fire Extinguishers & Cabinets	419	0	0.0%
	Fuel Storage	31	0	0.0%
	Handrail	31	1	3.2%
	HVAC System	491	0	0.0%
	Interior Doors	334	0	0.0%
	Interior Flooring	315	0	0.0%
	Interior Walls & Ceilings	1033	0	0.0%
	Irrigation System/Site Grounds	47	1	2.1%
	Lockers	4	0	0.0%
	Parking Area & Drive Pavement	330	0	0.0%
	Roof Drain	23	0	0.0%
	Systems (Comms/Alarms)	157	0	0.0%
	Interior Signs	100	0	0.0%
	Exterior Wall	2	0	0.0%
Electrical	Building Electrical Fixtures	588	1	0.2%
	Generators	49	0	0.0%
	Traffic Signal	122	2	1.6%
	Uninterrupted Power Supply (UPS)	18	0	0.0%
	Wiring	238	0	0.0%
	Roadside Cabinet	50	1	2.0%
Mechanical	HVAC System	2	0	0.0%
	Plumbing Fixtures	110	6	5.5%
	Sewer/Septic Lines	1	0	0.0%
	Well/Water Lines	83	7	8.4%
Toll Booths	Area Lights-Toll	43	0	0.0%
	Attenuator	105	1	1.0%
	Booth Pit	18	0	0.0%
	Concrete Pavement	193	1	0.5%
	Counter/Drawer	78	0	0.0%
	Gates	5	0	0.0%
	Interior Booth	63	1	1.6%
	Nose Flashers	105	4	3.8%
	Signs	75	0	0.0%
	Toll AC	6	0	0.0%
	Toll Indicator	156	1	0.6%
	Window	45	0	0.0%

### 2.3.7 Toll Elements

Atkins conducted an inspection of tolling elements and infrastructure for the CTTS Toll Management System (TMS). The inspection consists of a visual inspection of the in-lane and roadside tolling equipment and appurtenances not covered under the facilities category. Toll elements included in the inspection are: AVI readers, antennas, violation enforcement cameras, DVAS cameras, lane and host sever equipment and pavement loop sensors.

The ratings are assigned based on the observed conditions, and the descriptions of the numerical grading system are based on a 3-point system as shown in Table 14. Of the 928 total elements inspected in the toll element category; no elements received a scored lower than two (2).

**Table 14 – CTTS Toll Element Inspection Rating Scale**

Grade	Rating	Description
3	Excellent	Feature is like new with no deficiencies noted. <b>No maintenance is necessary.</b>
2	Good	Feature appearance has cosmetic damage but is functioning. <b>No immediate maintenance or repairs necessary.</b>
1	Failing	Feature appearance or functionality/operability are unacceptable. <b>Feature has failed and may require expedited repair.</b>

The Toll System Integrator conducts an annual performance audit to verify that system reliability and accuracy has not degraded over time and that the system continues to satisfy the System Integrator's contractual requirements. Based on the annual audit performed in April 2020, all system performance requirements were satisfied. The 2021 annual performance audit was underway as of the date of this report; however, the results were not available. Additionally, the TMS is visually inspected during monthly lane audits and any cosmetic or performance-related deficiencies identified are submitted to the Toll System Integrator for resolution and/or repair.

## 2.4. STRUCTURES

The structures inspections on the CTTS includes the evaluation of various components of the system bridges, retaining walls, OSBs, cantilever sign structures, HMLTs and traffic signals. Structures inspections on the CTTS generally occur on a biennial schedule. Bridge inspections on the CTTS were performed during FY 2020, therefore, the next detailed bridge inspections will

be performed in FY 2022. Likewise, inspections for HMLTs, OSBs and Traffic Signals occur biennially, with SH 130 and SL1 inspections conducted in one year, and SH 45N and SH 45SE conducted in the alternate year. This year, SH 45N and SH 45SE were inspected. Table 15 summarizes the quantity of all major structures of the CTTS, including the structures that were not inspected this year.

**Table 15. Quantities of CTTS Major Structures**

Category	SL1	SH 45N	SH 130	SH 45SE	Total
Bridges	16	73	121	28	238
Retaining Walls	54	158	81	26	319
Overhead/Cantilever Signs	26	84	89	24	223
High-Mast Light Towers	2	61	27	29	119
Traffic Signals	12	29	50	4	95
<b>Totals</b>	<b>110</b>	<b>405</b>	<b>368</b>	<b>111</b>	<b>994</b>

### 2.4.1. Bridges

Under BRINSAP, TxDOT developed a statewide inventory and inspection status of all bridges. Figure 11 shows an example of a bridge on the CTTS. The existing bridge conditions are rated and grouped by the following categories: (1) Deck; (2) Substructure; (3) Superstructure; (4) Channel; (5) Culverts; (6) Approaches; (7) Miscellaneous; and (8) Traffic Safety. The typical bridge categories and components inspected are listed in Table 16. The numerical score generated for each component based on a 10-point rating scale is shown in Table 17.



**Figure 11: SH 45N Bridge at Greenlawn Blvd**

TxDOT inspects all bridges within the CTTS biennially, with findings from the most recent inspection (FY 2020) indicating that 90.6% of the components were rated Good to Excellent. A total of 749 components in the categories used to evaluate bridge load ratings were inspected on the 238 structures within the CTTS. Only 70 components (9.4%) had a rating as low as 6 (Satisfactory), with the remainder of the ratings all in the 7 to 9 range (Good to Excellent). The

components that received a six (6) rating involved issues such as clogged/disconnected deck drains, deck joint degradation, delamination of concrete on abutment backwalls, erosion of ditches and around bents, loss of backfill material under riprap, and cracks/settlement of approach slabs.

**Table 16. Bridge Categories and Components Inspected**

Category	Components Inspected
Deck	Deck surface and joints, rails, sidewalks, medians, striping, and drainage
Superstructure	Concrete beams, beam connections and bearings
Substructure	Columns, bents, abutments, foundations, riprap
Channel	Condition of stream or creek being crossed
Culverts	Headwalls, wingwalls, slab footing, safety devices
Approaches	Approach slabs, guard fence
Miscellaneous	Vertical underclearance, bridge warning devices
Traffic Safety	Approach rails, impact attenuators

**Table 17. Bridge Inspection Rating Scale**

Grade	Rating	Description
9	Excellent	All elements are in excellent condition.
8	Very Good	There were no problems noted.
7	Good	Element has some minor problems. Minor maintenance may be needed.
6	Satisfactory	Minor deterioration of structural elements (limited). Maintenance may be needed.
5	Fair	Minor deterioration of structural elements (extensive). Minor rehabilitation may be needed.
4	Poor	Deterioration significantly affects structural capacity. Major rehabilitation may be needed.
3	Serious	Deterioration seriously affects structural capacity. Repair / rehabilitation is required immediately.
2	Critical	Element shows advanced deterioration. It may be necessary to close the bridge until repaired.
1	Failing	Bridge is closed to traffic, but repairable.
0	Failed	Bridge is closed, but beyond repair.

Review of Bridge Inspection Follow-Up Worksheets for the inspected bridges indicates that most of the components requiring follow-up action received a Routine recommendation type indicating that actions are required within 24 months. None of the inspected components are considered Critical indicating that action is required within 30 days. However, 23 components were identified as Urgent, indicating that action is required within 6 months.

The current roadway PBMC requires the maintenance contractor to address bridge deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. For bridge deficiencies not covered under the PBMC scope or identified as Critical or Urgent, the TxDOT Bridge Division and TxDOT Austin District Maintenance office collaborate to identify a contract mechanism to repair the deficiency. For example, back wall repair recommendations on Cameron Road and Blue Bluff Road that were noted in the SH 130 Bridge Condition Survey conducted by TxDOT in 2017 and included in the BRINSAP documentation are currently being addressed by the SH 130 expansion project mentioned in subsection 2.2.1.

## 2.4.2. Retaining Walls

The CTTS contains 319 retaining wall locations, totaling 37.35 miles in length. Table 18 shows a breakdown of wall count and lengths for each CTTS roadway.

**Table 18. CTTS Retaining Wall Count and Length (By Roadway Corridor)**

Corridor	Wall Count	Length (Miles)
SH 130	81	9.87
SH 45N	158	17.41
SL1	54	7.06
SH 45SE	26	3.02
<b>Total</b>	<b>319</b>	<b>37.35</b>

Wall inspections consist of visually inspecting wall face, coping, foundations, joints, panel finishes, top slope, toe slope, backfill, cast-in-place (CIP) sections, and Mechanically Stabilized Earth (MSE) walls. Typical retaining walls categories and components are listed in Table 19.

**Table 19. Retaining Wall Categories and Components Inspected**

Category	Components Inspected
Wall	Wall face, coping, foundations, joints, panel finishes, and CIP sections
Earth	Top slope, toe slope, backfill, CIP, and MSE wall

The numerical score generated for each component is similar to the scale for roadway and building facilities and is based on a 5-point numerical system, ranging from a 5 rating, which is considered Excellent, or no maintenance required, to a one (1) rating, which is considered Failing, and may require expedited repair to protect the public or system.

The findings for this year's inspection of retaining walls indicate that 85% of the wall elements inspected were rated Good to Excellent. Deficiencies noted for retaining walls included silt accumulation and vegetation present in flumes, cracks in panel coping, erosion at mow strip, impact damage to wall barrier, and vegetation growth in panels.

The geotechnical engineers on the GEC team continue to monitor not only the pavement cracking on the northbound SL1 entrance ramp just north of Shoreline Drive, but also the related MSE retaining wall face, which showed evidence of minor but noticeable deformation or bulging wall panels, water stains, and minor vegetation growth. This year's findings indicate that there are no visually significant changes to the deformation from last year, no evidence of loss of backfill material, and no sign of additional movement or cracks observed at the concrete pad (mow strip) at the toe of the MSE wall.

Also as previously noted in the FY 2020 report, engineers continue to monitor surface run-off that appears to be seeping down behind the retaining wall adjacent to the gore of the southbound exit ramp at SL1 and FM 734 (Parmer Lane), resulting in some settlement and shifting of the retaining wall. As a short-term solution, sealant was applied to prevent water from infiltrating the construction joints while barrier was placed at the base of the wall to limit the wall's migration. The TxDOT Austin District is continuing its coordination with the TxDOT Bridge Division to closely monitor this area and develop a long-term solution.



### 2.4.3. Overhead and Cantilever Sign Structures

Overhead and cantilever signs, which provide directional information to patrons throughout the CTTS, are suspended above the travel way by large support structures, such as those pictured on Figure 12. For the inspection process, the condition of these structures is determined based on the visual inspection of two components: 1) sign structure horizontal members; and 2) sign structure vertical members, foundation, and protection system. Inspection of the horizontal member component includes assessment of chord truss members, upper and lower chords, verticals, diagonals, upper bracing, lower bracing, and all connections. Inspection of vertical members, foundations, and the protection system includes assessment of above-ground concrete columns, steel columns, bracing, connections, below-ground foundations (for exposed drilled shafts and vertical movement), and protective railings and/or guard fences.



**Figure 12: Overhead Sign Structure**

Beginning in FY 2011, inspections for overhead and cantilever sign structures were conducted biennially, with SH 130 and SL1 inspections conducted in one year, and SH 45N and SH 45SE conducted in the alternate year. During this year's inspection, the overhead and cantilever sign structures on SH 45N and SH 45SE were inspected, totaling 108 structures.

At TxDOT's request, the GEC evaluates overhead sign structures using two methodologies. The first methodology is similar to TxDOT bridge inspections, utilizing inspection forms to evaluate elements on a 10-point numerical rating scale (see Table 20), where a grade of a nine (9) indicates that an element is in Excellent condition and a grade of zero (0) indicates that an element has Failed. With this approach, inspectors assign a numerical rating for each element of the

superstructure and substructure components, resulting in an overall component rating based on the lowest of the element ratings.

Findings for this year's inspections utilizing this first methodology indicate that 14 of the 108 sign structures received a condition rating of a six (6), which indicates that the structure is in Satisfactory condition and 7 of the 108 structures received a condition rating of five (5), which indicates that the structure is in Fair condition. Both ratings indicate the structures have minor deterioration requiring maintenance or minor rehabilitation. No structure received a rating lower than a five (5).

**Table 20. Overhead Sign Structures (10-Point Rating Scale)**

Grade	Rating	Description
9	Excellent	All elements are in excellent condition.
8	Very Good	Element is in very good condition with no problems noted.
7	Good	Element is in good condition with some minor problems.
6	Satisfactory	Element is in satisfactory condition, with minor deterioration of structural elements. Maintenance may be needed.
5	Fair	Element is in fair condition, with minor deterioration of structural elements. Minor rehabilitation may be needed.
4	Poor	Element is in poor condition, with deterioration significantly affecting structural capacity. Major rehabilitation may be needed.
3	Serious	Element is in serious condition, with deterioration seriously affecting structural capacity. Repair or rehabilitation is required immediately.
2	Critical	Element is in critical condition. Element should be closed or placed out of service until repaired.
1	Failing	Element is failing and is closed/out of service, but repairable.
0	Failed	Element is closed/out of service and beyond repair.

The second inspection methodology is an approach that is based on FHWA guidelines. Inspectors use an element-based inspection form to quantify every element on a 5-point rating scale (see Table 21), where a grade of one (1) indicates an element in Good condition and a grade of five (5) indicating an element has Failed. Items assessed include superstructure (truss members and all connections), substructure (chord to tower connections, lateral bracing connections, and base connections), concrete foundations, steel protective coating condition, potential corrosion on steel members, and conditions of protective guard fence and railings. Photographs are taken of the structures' current condition and any distresses. Horizontal clearances are noted for safety.

Findings for this year's inspections utilizing the FHWA's Elements Based methodology indicate that 99.9% of the 80,839 components were rated Satisfactory to Good. This percentage is identical to the SH 45N and SH 45SE inspection that was conducted in FY 2019.

**Table 21: Overhead Sign Structure FHWA Elements Based (5-Point) Rating Scale**

Grade	Rating	Description
1	Good	The elements are new or like new condition with no significant deficiencies.
2	Satisfactory	Minor damage, deterioration, or misalignment to the elements may be observed.
3	Fair	Moderate damage/deterioration that does not significantly affect the element strength or integrity. Repair may be needed.
4	Poor	Major or multiple defects that significantly impact the serviceability or integrity of the structure. Recommend repair or replacement of element within specified time frame.
5	Critical	Any condition where the element has failed, or failure is imminent. Recommend immediate repair or replacement of element.

#### 2.4.4. High-Mast Light Towers

HMLT structures, like the one pictured on Figure 13, provide illumination for improved nighttime visibility at various locations along the CTTS, such as interchanges and toll building facilities.

The condition of HMLTs is based on visual inspection of the following components: (1) high-mast light pole foundation; and (2) high-mast light pole, including assessment of anchor bolts, base plates, column support, compartment doors, vertical alignment, cracks, and protection. Since these structures are usually not as complex as most bridge structures, the 10-point bridge inspection rating scale is not used, as shown in Table 20. Instead, the FHWA's Elements Based rating scale, shown previously in Table 21 for overhead sign structures, is used. This rates every individual element on a 5-point rating scale. It is similar to numerical rating scales used around the country for similar type structural elements.



**Figure 13: High-Mast Light Tower**

Beginning in FY 2011, the HMLTs inspection occurred biennially with inspections being alternated on two roadways per year. During this year's inspection, SH 45N and SH 45SE were inspected, which consists of 90 structures. The results indicate that 99.5% of the 22,466 components were rated Satisfactory to Good which is a 0.1% improvement from the SH 45N and SH 45SE inspection that was conducted in FY 2019.

## 2.4.5. Traffic Signals



**Figure 14: Traffic Signal**

Traffic signals like the one shown on Figure 14 are located at various interchanges within the CTTS system. Traffic signals assist in controlling traffic in a safe, orderly and efficient manner. They benefit the traveling public by providing orderly movement of vehicles, improved safety, reduced travel times and an increase in the amount of traffic that an intersection can handle.

The condition of a Traffic signal is based on visual inspection of the following components: 1) traffic signal foundation; and 2) signal poles, including assessment of anchor bolts, base plates, column support, arm, chord and cable connections and members, attachments and luminaries. Like HMLTs, these structures are not as complex as most bridge structures and the 10-point bridge inspection rating scale is not used, as shown in Table 20. Instead, the FHWA Elements Based rating scale, shown previously in Table 21 for overhead sign structures, is used. This rates every individual element on a 5-point rating scale. It is similar to numerical rating scales used around the country for similar type structural elements. Starting in FY 2020, inspections for traffic signals were conducted biennially, with SH 130 and SL1 inspections conducted in one year, and SH 45N and SH 45SE conducted in the alternate year. During this year's inspection, SH 45N and SH 45SE were inspected, which consists of 33 traffic signals. The results indicate that 98.0% of the 691 components were rated Satisfactory to Good.



# SECTION 3

## PROGRAM STATUS, COMMITMENTS, AND RECOMMENDATIONS

Section 3  
Program Status, Commitments,  
and Recommendations



SH 130

SH 45SE

SH 45N

SL1

## **3.0 PROGRAM STATUS, COMMITMENTS, AND RECOMMENDATIONS**

### **3.1. PROGRAM STATUS**

The inspection findings this year indicate that the current maintenance program implemented by TxDOT for the roadways, building facilities, toll elements and structural assets of the CTTS have kept the overall condition of CTTS assets in good repair, working order and condition. An effective and proactive maintenance policy has contributed to ensuring a safe highway for CTTS users as required by the CTTS Bond Indenture.

### **3.2. PROGRAMMED COMMITMENTS**

As required by the bond indenture, the TTC approved the FY 2021 annual operating, maintenance and capital budgets prior to the start of the fiscal year via Minute Order 115839. The maintenance budget amounts approved included \$6.9M for routine roadway maintenance and utilities, \$5.7M for routine toll system maintenance, and \$20.2M of the capital maintenance budget for non-routine, unusual or extraordinary maintenance. TxDOT projects to expend the entire approved amounts for routine roadway maintenance and non-routine, unusual or extraordinary maintenance.

In FY 2021, the TxDOT Austin District has completed or is in the process of completing preventative roadway maintenance activities which include mill and inlay with full-depth pavement repair and a pavement overlay. Later this fiscal year, the TxDOT Austin District is scheduled to perform complete restriping of all CTTS corridors in addition to a large guide sign replacement project for SH 130, SL1 and SH 45N. TOD building facilities expenditures for FY 2021 consist of SH 130 electrical ground repair, UPS building replacement, toll booth glass replacement, generator turbo replacement, chiller coil replacement and stucco repair.

TxDOT has also included funding in the budget for three major infrastructure improvements. In January 2017, the TTC approved using the CTTS capital contribution account to fund expansion projects currently under construction for SH 130 Segment 2 & 3 from SH 45N to SH 71 via Minute Order 114813; Minute Order 115839 approved on August 27, 2020, allocates \$30.3M for this project in FY 2021. In June 2017, the TTC also approved using available CTTS revenues for an east-south direct connector from US 290 to SH 130 via Minute Order 114958; Minute Order 115839, approved on August 27, 2020 allocates \$27.9M for this project in FY 2021.

Atkins will work with TxDOT to review and comment on the proposed maintenance and non-routine, unusual or extraordinary funding levels for FY 2022 prior to the approval of those funding levels at the August 2021 TTC meeting.



### **3.3. RECOMMENDATIONS**

#### **3.3.1. ROADWAY**

Based on FY 2021 visual inspections, for the Pavement category, there was increased pavement cracking and edge drop-offs at various locations throughout the system, with the lowest scores noted on SH 130 and SL1 (cracking) and SH 130, SL1 and SH 45SE (edge drop-offs). In the Traffic Operations & Safety Appurtenances category, pavement markings, and small signs show areas in need of maintenance throughout the system, with the lowest scores noted on SH 130 and SH 45SE (striping); SH 130, SH 45SE and SH 45N (signs). In the Roadside category, vegetation management received the lowest overall rating, with the lowest scores noted on SH 130 and SH 45SE.

Atkins recommends addressing Pavement, Traffic Operations & Safety Appurtenances, and Roadside elements that are identified as Degraded, or a three (3) numerical rating, or lower. A Degraded rating indicates that a feature appearance, functionality, or operability is below average, and that maintenance is required, but does not require expedited repair to protect the system.

Based on the review of this year's roadway deficiencies and programmed projects, the majority of the deficiencies identified with the numerical rating of three (3) or lower would fall under the scope of the existing roadway PBMC, and ongoing and future projects including the, SH 45 mill and inlay with full depth pavement repair, SH 130 Segment 4 pavement overlay, or will be addressed in the ongoing SH 130 Segments 2 and 3 expansion projects, which is scheduled to be complete by Summer of 2021.

In addition, Atkins recommends continued maintenance, as well as further monitoring (as needed) of the pavement cracks located at the northbound SL1 entrance ramp north of Shoreline Drive.

#### **3.3.2. BUILDING FACILITIES**

Based on FY 2021 visual inspections, 7% of the building facility assets were identified as Degraded or Unsatisfactory, or a three (3) numerical rating or lower. Examples of deficiencies found included burned out lamps, missing bollards, paint chipping or delaminating, or instant hot water inoperative.

Atkins recommends addressing building facilities elements that are identified as Degraded, or a three (3) numerical rating, or lower. The current building facilities PBMC requires the building facilities maintenance contractor to address all facilities deficiencies that are considered routine. Routine deficiencies include response times that are stipulated and addressed as part of the PBMC scope. For building facilities items that are not covered under the facilities contract, those

deficiencies have been forwarded to the TxDOT Austin District to be addressed by the roadway PBMC.

### **3.3.3. TOLL ELEMENTS**

Based on the FY 2021 visual inspection, no toll element rated below a two (2) numerical rating, meaning that there is only cosmetic damage, but no loss of functionality, and therefore no immediate maintenance or repairs are necessary. In addition to the annual visual inspection, the Toll System Integrator conducts an annual performance audit to verify that system reliability and accuracy has not degraded over time and that the system continues to satisfy the System Integrator's contractual requirements.

### **3.3.4. STRUCTURES**

Based on the recent bridge findings contained in the FY 2020 BRINSAP, 90.6% of the bridge components were rated Good to Excellent, with 9.4% of the components receiving a rating as low as a six (6) which is Satisfactory. The components receiving a six (6) rating had deficiencies such as clogged/disconnected deck drains, deck joint degradation, delamination of concrete on abutment backwalls, erosion of ditches and around bents, loss of backfill material under riprap, and cracks/settlement of approach slabs. It is recommended that items that were rated Satisfactory or lower be addressed and returned to the proper condition level. It is also recommended that any bridge components that were identified with an Urgent or a Routine priority level be addressed and returned to the proper condition level.

Based on FY 2021 inspection in the retaining wall category, the findings for this year's inspection of retaining walls indicate that 85% of the wall elements inspected were rated Good to Excellent, receiving condition ratings of four (4) or greater. Deficiencies noted for retaining walls included silt accumulation and vegetation present in flumes, cracks in panel coping, erosion at mow strip, impact damage to wall barrier, and vegetation growth in panels. Atkins recommends addressing retaining walls elements that are identified as Degraded, or a three (3) numerical rating, or lower.

In addition, Atkins recommends continued maintenance and annual monitoring of the retaining wall located at the northbound SL1 entrance ramp north of Shoreline Drive, where wall panels show evidence of deformation, as well as the continued monthly monitoring of the southbound exit ramp at SL1 and FM 734 (Parmer Lane), where surface run-off appears to be seeping down behind the wall, resulting in some settlement and shifting of the retaining wall.

During the FY 2021 inspection, the overhead and cantilever sign structures on SH 45N and SH 45SE were inspected, which total 108 structures. Findings for this year's overhead sign structures

inspections indicate that 14 of the 108 sign structures received a condition rating of a six (6), which indicates that the structure is in Satisfactory condition (10-point scale), and 7 of the 108 structures received a condition rating of five (5), which indicates that the structure is in Fair condition. Both ratings indicate structures have minor deterioration of structural elements requiring maintenance or minor rehabilitation. No structure received a rating lower than a five (5). Findings for this year's inspections utilizing the FHWA's Elements Based methodology (5-point rating scale) indicate that 99.9% of the 80,839 components were rated Satisfactory to Good. Atkins recommends addressing sign structures that receive a Satisfactory rating (10-point scale) or lower, or a Fair rating (5-point scale), three (3) numerical rating or lower.

During the FY 2021 inspection, the High-Mast Light Towers (HMLT) on SH 45N and SH 45SE were inspected, which consists of 90 structures. The results indicate that 99.5% of the 22,466 components were rated Satisfactory to Good. Atkins recommends addressing structures that receive a Fair rating (5-point scale), three (3) numerical rating or lower.

Based on the FY 2021 inspection of Traffic Signals on SH 45N and SH 45SE, 98.0% of the 691 components were rated Satisfactory to Good. Atkins recommends addressing signals components receiving a Fair rating (5-point scale), three (3) numerical rating or lower.

Based on the review of this year's structural deficiencies, the majority of items identified would fall under the scope of the routine PBMC or may be addressed in the on-going large guide sign replacement project.

Recent restrictions due to the Coronavirus (COVID-19) pandemic have been implemented, which limited the Texas workforce to essential services and activities; however, construction and maintenance activities on TxDOT facilities are deemed essential services by state and local governments. As of the date of this report, there have been no impacts to CTTS maintenance functions, as they are also considered essential and the maintenance contractors have not reported a reduction in staff.



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