Texas Department of Transportation

TxTag

FY2020

CENTRAL TEXAS TURNPIKE SYSTEM

ANNUAL INSPECTION REPORT

SH 130 | SH 45SE | SH 45N | SL1

100067487 / WH / 2020

Atkins North America, Inc.
11801 Domain Boulevard, Suite 500
Austin, Texas 78758
Telephone: +1 (512) 327-6840
Fax. +1 (512) 327-2453

www.atkinsglobal.com/northamerica

April 15, 2020

Mr. Richard Nelson
Toll Operations Division, Director
Texas Department of Transportation
125 East 11th Street
Austin, TX 78701

Subject: FY 2020 Inspection of the Central Texas Turnpike System

Dear Mr. Nelson:

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 2020 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 88 (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 project and the proactive manner in which the project 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,

Tammy B. Sims, P.E.
Project Director

Cc: Linda Sexton
Marcy Saenz, P.E.
LaTasha Brookins, P.E.
Omar DeLeon, P.E.
Brenda Guerra, P.E.
Thomas W. Lowe, P.E.

CENTRAL TEXAS TURNPIKE SYSTEM

ANNUAL INSPECTION REPORT FOR THE FISCAL YEAR ENDING AUGUST 31, 2020

Contents

List of Tables

List of Figures

List of Acronyms

AC	Air Conditioning
AET	All-Electronic Tolling
AVI	Automatic Vehicle Identification
BRINSAP	Bridge Inventory, Inspection and Appraisal Program
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
GPR	Ground Penetrating Radar
HMLTs	High-Mast Light Towers
HVAC	Heating, Ventilation, and Air Conditioning
IH	Interstate Highway
IVIS	Intelligent Vehicle Identification System
MSE	Mechanically Stabilized Earth
NBIS	National Bridge Inspection Standard
OSB	Overhead Sign Bridge
PBMC	Performance-Based Maintenance Contract
PFD	Project Finance, Debt, and Strategic Contracts Division
PMIS	Pavement Management Information System
RRP	Roadway Rating Procedure
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
UPS	Uninterruptible Power Supply
VES	Violation Enforcement System
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, 2020. The findings contained in this report are based upon 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 (PFD); and Atkins' general knowledge of the condition of the CTTS.

This is the thirteenth annual inspection of the CTTS since it opened to traffic in 2006. 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 covered roadways (pavement, traffic operations and appurtenances, roadside), building facilities, toll elements, 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 2020 inspections show that the condition of the CTTS continues to be maintained in good repair, working order and condition, achieving an overall rating of 88 (out of 100). The category of Pavement, which comprises 55% of the overall score, achieved an overall rating of 87.9, which is a slight decrease from last year's rating of 88.4. This decrease was primarily due to increased pavement cracking on SH 130 and SL1, as well as increased edge drop-offs on SL1 and SH 45SE. The category of Traffic Operations & Safety Appurtenances, which comprises 25% of the overall score, decreased from 88.2 to 84, primarily due to small signs on SH 130 which were missing or have reached the end of their service life, and reduced level of reflectivity on delineators on SH 130, SH 45SE and SH 45N. The category covering the remaining

20%, Roadside, decreased from 94.1 to 93.0, primarily due to litter on 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), FY 2020 projects including a crack sealing project which was completed in the winter of 2019 after our inspections, SH 130 maintenance-let overlay, Next Generation concrete surfacing, a complete restriping of CTTS and a large sign panel replacement project, or will be addressed 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.

Visual inspection of 57 building facilities was conducted, this includes architectural elements, mechanical components, electrical components, and toll booth structures. This year's findings reveal that 99.4% of the elements were rated Good to Excellent, indicating that inspected elements do not need immediate maintenance or repairs. This year's findings are a decrease of 0.1% from last year's 99.5% of elements rated Good to Excellent.

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 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, 23 CFR 650C. Results from the FY 2020 inspection indicate that 90.6% of the inspected components were rated Good to Excellent.

Inspections for 39.87 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 (HMLTs) and Traffic Signals occur biennially, with half of the roadways conducted in one year, and the other half conducted in the alternate year. This year, SL1 and SH 130 were inspected, and the findings

based on FHWA's rating system indicate that 99.5% of the OSB components inspected, 99.7% of the HMLT components inspected and 99.0% of the Traffic Signals inspected were rated Satisfactory to Good.

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

The FY 2020 CTTS annual operating, maintenance and capital budgets approved by the TTC in August 2019, via Minute Order 115579, included maintenance budgets of approximately $6.2M for routine roadway maintenance, $4.7M for toll system routine maintenance, and $24.1M for non-routine, unusual or extraordinary maintenance of roadways and building facilities. The FY 2020 approved non-routine, unusual or extraordinary roadway maintenance budget consists of SH 130 improvements, including frontage road overlay work at SH 71, full depth repair from SH 71 to SH 45SE, and large guide sign panel replacement. The building facilities non-routine maintenance budget includes Uninterruptible Power Supply (UPS) replacements, server room air conditioning (AC) unit replacement, power surge protector replacement, lighting upgrades, UPS battery replacements, and building structural repairs at the SL1 mainlane plaza and the TxTag Customer Service Center (CSC) building.

In January 2017, the TTC approved use of the CTTS capital contribution account to fund expansion projects currently under construction of SH 130 Segment 2 & 3 (from SH 45N to SH 71) via Minute Order 114813; Minute Order 115579 approved on August 29, 2019 allocates $71.0M for this project in FY 2020. In June 2017, the TTC also approved the use of available CTTS revenues for an east-south direct connector from US 290 to SH 130 via Minute Order 114958; Minute Order 115579 approved on August 29, 2019 allocates $35.6M for this project in FY 2020.

Based on the condition of the system TxDOT has demonstrated 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, edges and shoulders; the Traffic Operations & Safety Appurtenances category consists of assessing large and small signs, raised pavement markers, striping and graphics, attenuators, delineators and object markers, railroad crossings, work zones, guardrails, end treatments attenuators and anchor terminals; and the Roadside category entails inspection of vegetation management, litter, sweeping, trees and brush, drainage, detention ponds and encroachments.

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 structures is 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 130 and SL1.

An inspection of retaining walls on the system was conducted this year, and 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 Section 2.2. 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, Roadways.

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 deficiencies identified 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 CENTRAL TEXAS TURNPIKE SYSTEM

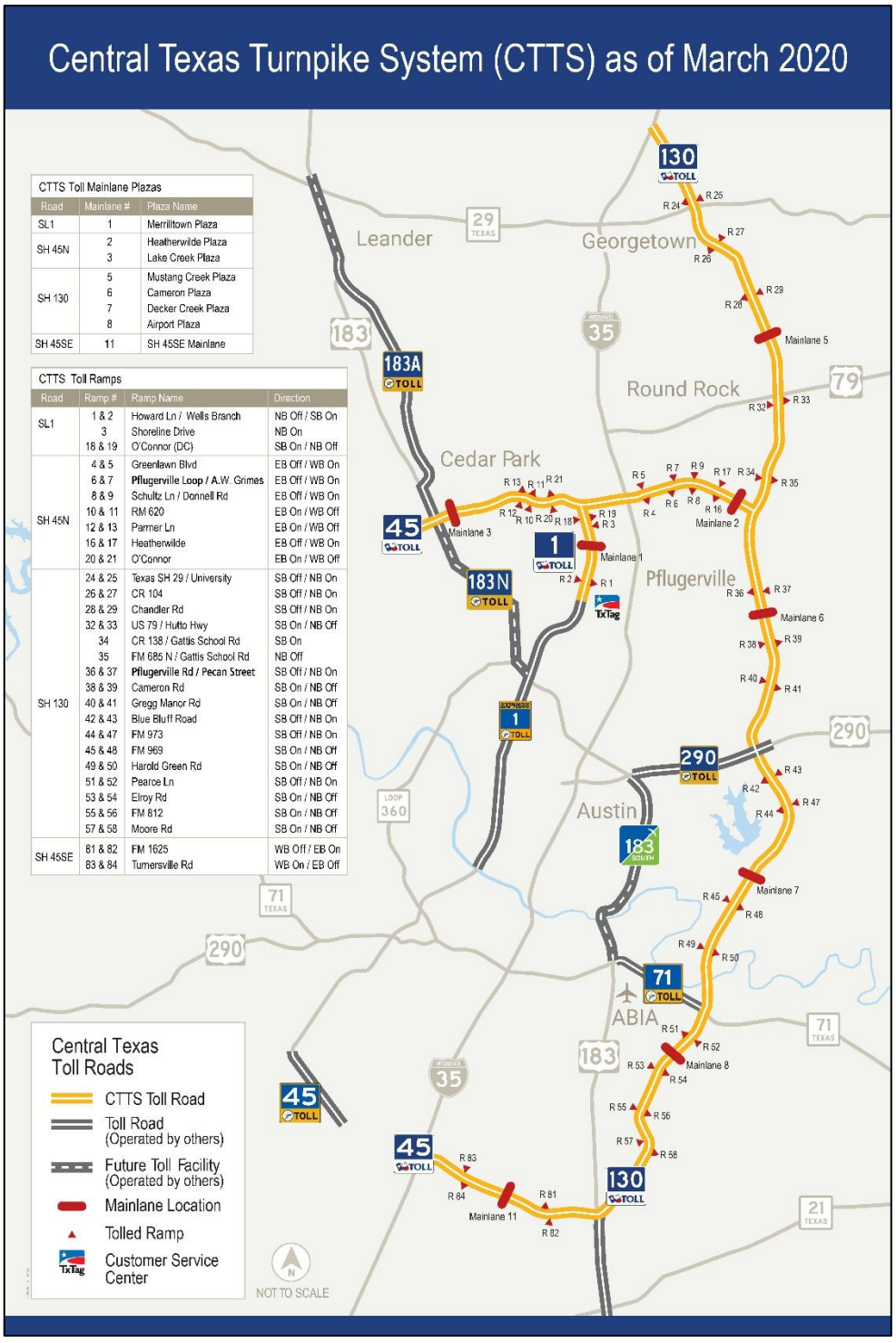
The CTTS is comprised of four main roadway corridors. The first corridor, SL1 Extension, is approximately 4 miles in length and runs south from the SH 45N interchange to FM 734 (Parmer Lane). SH 45N, the second of CTTS's four corridors, begins west of US 183 at Ridgeline Boulevard and extends east approximately 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 of the 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

Component	Centerline Mile Lengths (Miles)	Open to Traffic Date
State Loop 1 (From SH 45N to FM 734)	4.0	October 2006
State Highway 45N	12.8	October 2006 (Seg. 3 - 6); April 2007 (Seg. 7 – 8)
State Highway 130 (Segments 1 through 4)	49.0	December 2006 (Seg. 1); October 2006 (Seg 2); September 2007 (Seg. 3); April 2008 (Seg. 4)
State Highway 45SE	7.0	May 2009
Total	**72.8**	

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 were not included in the annual inspection.

Figure 1: Central Texas Turnpike System (CTTS)



SECTION 2
FY2020 Maintenance Inspection Results

SH 130 SH 45SE SH 45N SL1

2.0 FISCAL YEAR 2020 MAINTENANCE INSPECTION RESULTS

2.1. INTRODUCTION

The findings of the FY 2020 Annual Inspection of the CTTS are based on an extensive inspection and evaluation of the roadways, bridges, retaining walls, building facilities, toll elements, and structures and are outlined in the following sections. 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 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 (RRP) based on using the original 25 roadway elements outlined in the former TxCAP system, allowing for continued comparison of the CTTS roadway conditions to past performance as the system ages. Visual condition assessments are based on criteria aligning with a 5-point rating scale 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.

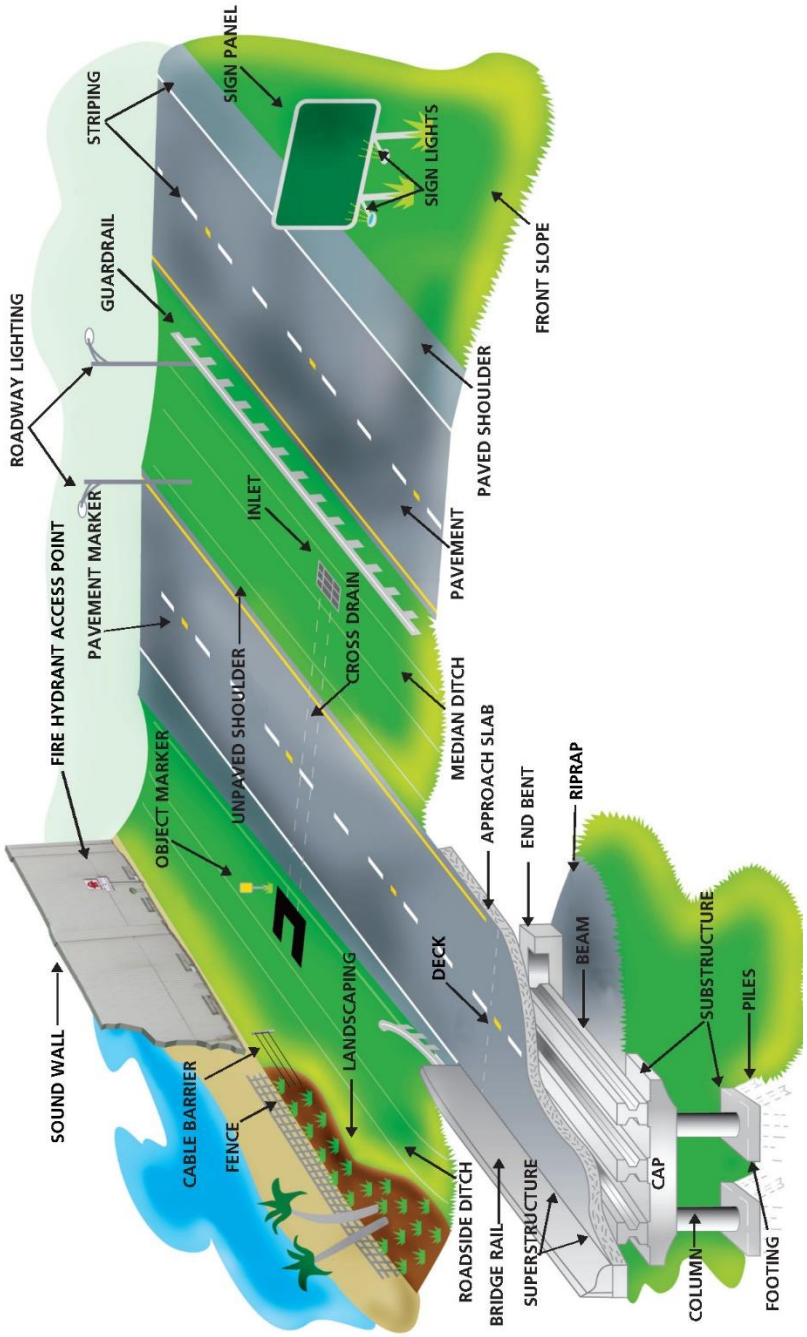


Figure 2: Major System Elements

Table 2. CTTS Roadway Inspection Rating Scale

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

* 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 to verify 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 contained within each category and the 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 contained 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 88. Figure 3 illustrates how the overall roadway score has historically trended since the initial inspection was conducted in 2008.

Figure 3: CTTS Historical Roadway Scores – All Roadways

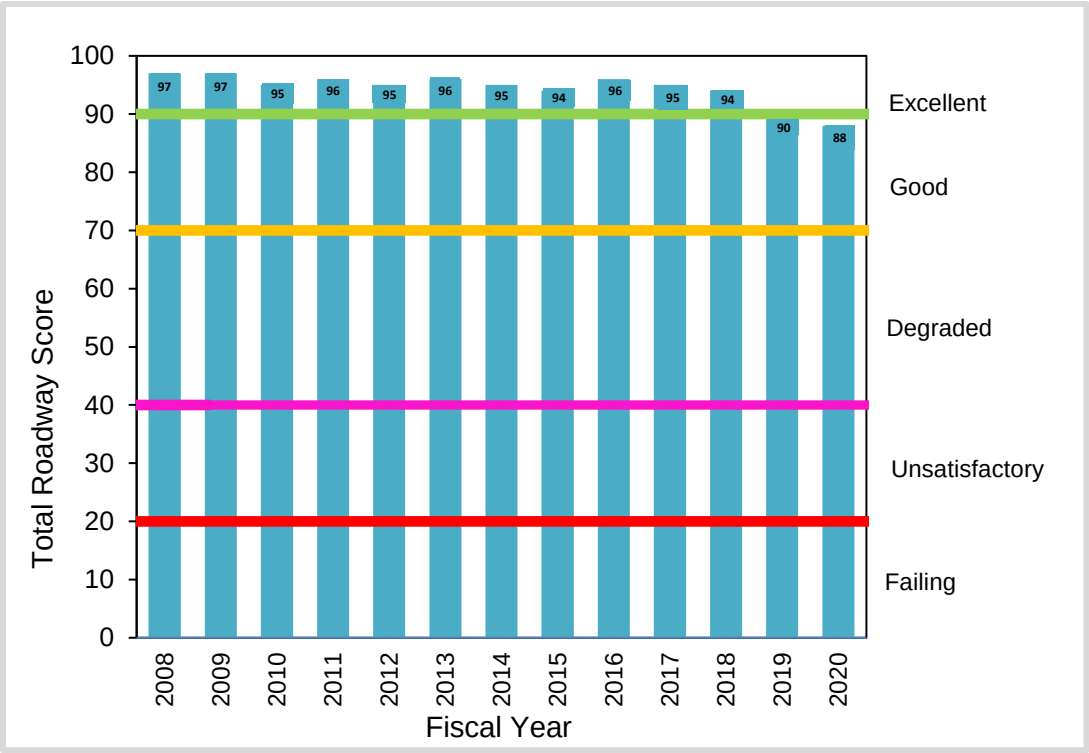


Table 3. TxCAP Roadway Weighted Scoring Values

	Original Percentage	Adjusted Percentage
Pavement Score		
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
Traffic Operations & Safety Appurtenances Score		
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
Roadside Score		
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
Overall Score		
Pavement	**55.00**	
Traffic Operations & Safety Appurtenances	**25.00**	
Roadside	**20.00**	
Total	**100.00**	

Table 4. Condition of CTTS Roadway Elements – SL1

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	91.9	21.3%	19.6
	Cracking	66.9	21.3%	14.2
	Failures	92.7	25.5%	23.6
	Ride	84.2	14.9%	12.5
	Edges	78.8	17.0%	13.4
	Shoulders	0.0	0.0%	0.0
SL1 - Pavement Score				**83.3**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	87.3	17.4%	15.2
	Striping, Pavement Graphics	84.8	21.7%	18.4
	Attenuators	93.9	13.0%	12.2
	Delineators	86.5	13.0%	11.2
	Signs – Large	89.7	17.4%	15.6
	Signs – Small	80.0	17.4%	13.9
	Shoulder Texturing	0.0	0.0%	0.0
SL1 - Traffic Operations & Safety Appurtenance Score				**86.5**
Roadside Score	Vegetation Management	94.8	16.7%	15.8
	Litter & Debris	84.6	11.1%	9.4
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	87.1	11.1%	9.7
	Drainage	89.5	16.7%	14.9
	Encroachments	96.9	5.7%	5.4
	Safety Barriers	89.3	16.7%	14.9
	Guardrail End Treatments	88.5	11.1%	9.8
	Mail Boxes	0.0	0.0%	0.0
SL1 - Roadside Score				**91.0**
Category Score	Pavement	83.3	55.0%	45.8
	Traffic Operations & Safety Appurtenances	86.5	25.0%	21.6
	Roadside	91.0	20.0%	18.2
SL1 - Roadway Subscore				**85.6**
SL1 - Total Roadway Score (2)				**86**

(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 (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	98.9	21.3%	21.1
	Cracking	82.0	21.3%	17.5
	Failures	87.0	25.5%	22.2
	Ride	92.2	14.9%	13.7
	Edges	94.3	17.0%	16.0
	Shoulders	0.0	0.0%	0.0
SH 45N - Pavement Score				**90.5**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	90.9	17.4%	15.8
	Striping, Pavement Graphics	83.0	21.7%	18.0
	Attenuators	87.6	13.0%	11.4
	Delineators	80.3	13.0%	10.4
	Signs – Large	87.0	17.4%	15.1
	Signs – Small	77.4	17.4%	13.5
	Shoulder Texturing	0.0	0.0%	0.0
SH 45N - Traffic Operations & Safety Appurtenance Score				**84.2**
Roadside Score	Vegetation Management	91.1	16.7%	15.2
	Litter & Debris	82.9	11.1%	9.2
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	92.8	11.1%	10.3
	Drainage	92.8	16.7%	15.5
	Encroachments	99.4	5.7%	5.6
	Safety Barriers	89.7	16.7%	15.0
	Guardrail End Treatments	95.3	11.1%	10.6
	Mail Boxes	0.0	0.0%	0.0
SH 45N - Roadside Score				**92.5**
Category Score	Pavement	90.5	55.0%	49.8
	Traffic Operations & Safety Appurtenances	84.2	25.0%	21.1
	Roadside	92.5	20.0%	18.5
SH 45N - Roadway Subscore				**89.4**
SH 45N - Total Roadway Score (2)				**89**

(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 1–4)

Category	Component	Sub Score (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	96.4	21.3%	20.5
	Cracking	76.1	21.3%	16.2
	Failures	87.3	25.5%	22.3
	Ride	94.4	14.9%	14.1
	Edges	83.2	17.0%	14.1
	Shoulders	0.0	0.0%	0.0
SH 130 - Pavement Score				**87.2**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	88.0	17.4%	15.3
	Striping, Pavement Graphics	80.1	21.7%	17.4
	Attenuators	94.9	13.0%	12.3
	Delineators	73.4	13.0%	9.5
	Signs – Large	87.0	17.4%	15.1
	Signs – Small	78.5	17.4%	13.7
	Shoulder Texturing	0.0	0.0%	0.0
SH 130 - Traffic Operations & Safety Appurtenance Score				**83.3**
Roadside Score	Vegetation Management	93.4	16.7%	15.6
	Litter & Debris	88.9	11.1%	9.9
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	91.7	11.1%	10.2
	Drainage	93.2	16.7%	15.6
	Encroachments	98.9	5.7%	5.5
	Safety Barriers	94.6	16.7%	15.8
	Guardrail End Treatments	95.0	11.1%	10.5
	Mail Boxes	0.0	0.0%	0.0
SH 130 - Roadside Score				**94.2**
Category Score	Pavement	87.2	55.0%	48.0
	Traffic Operations & Safety Appurtenances	83.3	25.0%	20.8
	Roadside	94.2	20.0%	18.8
SH 130 - Roadway Subscore				**87.6**
SH 130 - Total Roadway Score (2)				**88**

(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 (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	95.0	21.3%	20.2
	Cracking	88.3	21.3%	18.8
	Failures	94.1	25.5%	24.0
	Ride	89.3	14.9%	13.3
	Edges	68.8	17.0%	11.7
	Shoulders	0.0	0.0%	0.0
SH 45SE - Pavement Score				**88.0**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	88.8	17.4%	15.5
	Striping, Pavement Graphics	75.7	21.7%	16.4
	Attenuators	91.7	13.0%	11.9
	Delineators	73.2	13.0%	9.5
	Signs – Large	86.5	17.4%	15.1
	Signs – Small	72.7	17.4%	12.6
	Shoulder Texturing	0.0	0.0%	0.0
SH 45SE - Traffic Operations & Safety Appurtenances Score				**81.0**
Roadside Score	Vegetation Management	77.6	16.7%	13.0
	Litter & Debris	69.3	11.1%	7.7
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	89.5	11.1%	9.9
	Drainage	81.8	16.7%	13.7
	Encroachments	100	5.7%	5.6
	Safety Barriers	96.4	16.7%	16.1
	Guardrail End Treatments	95.9	11.1%	10.6
	Mail Boxes	0.0	0.0%	0.0
SH 45SE - Roadside Score				**87.7**
Category Score	Pavement	88.0	55.0%	48.4
	Traffic Operations & Safety Appurtenances	81.0	25.0%	20.3
	Roadside	87.7	20.0%	17.5
SH 45SE - Roadway Subscore				**86.2**
SH 45SE - Total Roadway Score (2)				**86**

(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 (1)	TxCAP Weighted Value (1)	Weighted Score (1)
Pavement Score	Rutting	96.5	21.3%	20.6
	Cracking	77.7	21.3%	16.6
	Failures	88.2	25.5%	22.5
	Ride	92.6	14.9%	13.8
	Edges	84.8	17.0%	14.4
	Shoulders	0.0	0.0%	0.0
All Roadways - Pavement Score				**87.9**
Traffic Operations & Safety Appurtenances Score	Raised Pavement Markers	88.8	17.4%	15.5
	Striping, Pavement Graphics	81.1	21.7%	17.6
	Attenuators	93.8	13.0%	12.2
	Delineators	76.5	13.0%	9.9
	Signs – Large	87.2	17.4%	15.2
	Signs – Small	77.9	17.4%	13.6
	Shoulder Texturing	0.0	0.0%	0.0
All Roadways - Traffic Operations & Safety Appurtenances Score				**84.0**
Roadside Score	Vegetation Management	91.8	16.7%	15.3
	Litter & Debris	85.5	11.1%	9.5
	Sweeping	100.0	11.1%	11.1
	Trees & Brush	91.6	11.1%	10.2
	Drainage	92.0	16.7%	15.4
	Encroachments	99.0	5.7%	5.5
	Safety Barriers	92.9	16.7%	15.5
	Guardrail End Treatments	94.5	11.1%	10.5
	Mail Boxes	0.0	0.0%	0.0
All Roadways - Roadside Score				**93.0**
Category Score	Pavement	87.9	55.0%	48.3
	Traffic Operations & Safety Appurtenances	84.0	25.0%	21.0
	Roadside	93.0	20.0%	18.6
All Roadways - Roadway Subscore				**87.9**
All Roadways - Total Roadway Score (2)				**88**

(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, edges and shoulders. Figure 4 illustrates a typical roadway pavement section on the system. Since last year, TxDOT completed preventative maintenance activities after our inspection that included full depth repairs on rigid pavement and crack seal work was completed in the Winter of 2019 throughout the corridors. Pavement throughout the CTTS achieved an overall score of 87.9, which is a decrease from last year's score of 88.4. The decrease in score was primarily due to cracking on SL1 and SH 130 with an overall score of 77.7 across all four corridors. Because of the extensive presence of sulfates in the area of SH 130 and SH 45SE, the soils have the 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 can 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 which are stipulated and addressed as part of the PBMC scope. TxDOT let three maintenance contracts in FY 2019 to address some of the non-routine pavement deficiencies: (1) SH 130 Segment 1 (IH 35 to SH 45N), which consists of Next Generation concrete surfacing; and (2) SH 130 Segment 4 (SH 71 to US 183), which consists of performing pavement overlays on the existing

pavement structure and (3) crack sealing operations. In addition, the ongoing SH 130 Segments 2 and 3 expansion projects, are scheduled to be complete by Fall of 2020.

As noted in the FY 2019 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. Last year's findings from a Ground Penetrating Radar (GPR) survey indicated that there have been no significant changes to the pavement cracks since FY 2018, however, there were several occurrences of anomalies that display characteristics that are typically observed from voids in the tilted ridged pavement panels at the drainage feature on the south side of the toll booth which appeared to have enlarged. It was recommended that further investigation be considered in order to verify whether or not a void is present underneath the slab and if further repairs are needed. In November of 2019 the GEC geotechnical engineers selected two (2) core locations in areas where GPR exhibited high amplitude results to verify if voids were present below the concrete pavement layer. Both cores appear to confirm the presence of voids below the concrete pavement layer. Atkins recommends that these voids be filled with flowable fill meeting the requirements of TxDOT Specification Item 401 Flowable Backfill. A site observation of the pavement cracking near the toll plaza at the SL1 entrance ramp just north of Shoreline Drive indicates that the pavement cracking appears to be consistent with what was observed by previous observation reports. Atkins recommends that the cracking sealant be inspected twice a year and that degraded sealant 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 84.0 was achieved across all roadways in the system, compared to 88.2 last year. The decrease in score was primarily due to degraded delineators, particularly on SH 130, which received a score of 73.4. In addition, the lowest traffic operations & safety appurtenances element score was small signs, which received a score of 72.7 and was noted on SH 45SE.

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 indicated that 13.6% of the large signs received a rating of 3 or below, with 2.9% 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 consisted of various deficiencies, such as degraded retro reflectivity, loose, separated, or bent panels, punctures, warping, peeling, and signs being hit and fallen to the ground.

The former TxCAP rating system does not include an evaluation of lighting systems, but consistent with previous years, a nighttime inspection of the CTTS luminaires was performed in order to assess whether the bulbs were illuminating. High-mast lights, safety lighting, and continuous lighting were examined as part of this inspection. During the FY 2020 inspection, it was found that 38 high-mast lights, 25 continuous lights, and 114 safety lights received ratings that indicate that luminaire (light bulb) replacement is needed in order to achieve an acceptable level of 80%.

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 which are stipulated and addressed as part of the PBMC scope. In addition, with the large guide signs approaching the end of the typical service life, TxDOT is scheduled to let a

systemwide large sign replacement project in the Spring of 2020, 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 upon the consideration of vegetation management, litter removal, drainage structures, and other elements located outside of the paved travel way (Figure 6). The roadside category achieved an overall score of 93.0, compared to 94.1 last year. The decrease in score was primarily due to increased litter, particularly on SH 45SE, which received a score of 69.3.

The current roadway PBMC requires the maintenance contractor to address roadside deficiencies that are considered routine. Routine deficiencies include response times which 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 Section 2.2.1 will be addressing 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; 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 2020 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 obtain a percent deficient for each element.

The inspection findings indicate that 99.4% of the elements were rated Good to Excellent. A summary of the results for SL1, SH 45N, and SH 130 are contained in Tables 10 through 12, and a system-wide summary is shown in Table 13. There are no facility elements on SH 45SE as it was constructed to have 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 Section 2.4.3 (Overhead/Cantilever Sign Structures) in the report.

Approximately 6,801 facility asset items were inspected, of which 41 were rated as Unsatisfactory (rating of two or less) condition. Examples of deficiencies found include burned out lamps, missing bollards, paint chipping or delaminating, or instant hot water not working. 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 which 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 Austin District.

Table 9. Central Texas Turnpike System Building Quantities – FY 2020

Building Types	SL1	SH 130	SH 45N	SH 45SE	Totals
Customer Service Center	1	0	0	0	1
Mainlane Plazas	1	8	2	0	11
Ramp Plazas	3	30	12	0	45
Totals	5	38	14	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 in Figure 7, are called IVIS that 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 such time when 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. In FY 2017 two locations were replaced, in FY 2018 four locations were replaced and in FY 2019 four locations were replaced.

Figure 7: Toll System Pavement Showing IVIS

2.3.1. Customer Service Center

The TxTag CSC, as shown in 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 that 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 five (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 system database 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.

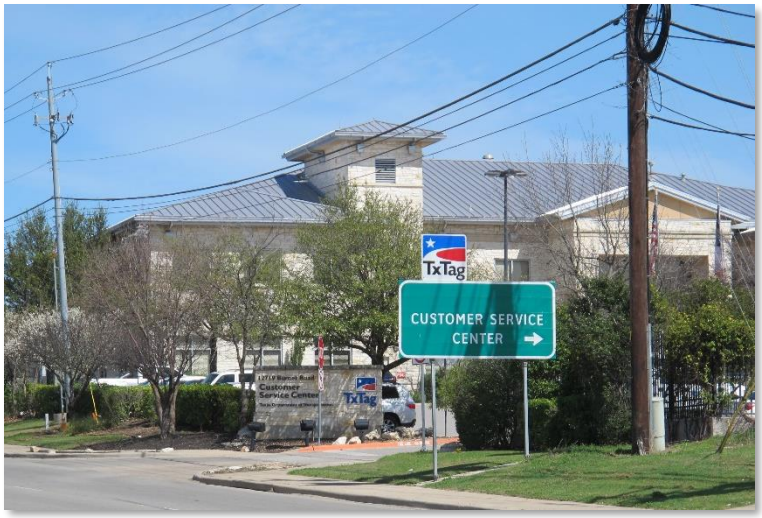


Figure 8: Customer Service Center

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 4,647 architectural elements inspected, 28 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 1,072 total elements inspected in the electrical category, only one (1) element 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 195 total elements rated in the mechanical category, four (4) elements related to plumbing 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 2020 inspection efforts since these are still assets on the CTTS. The exception were assets considered inactive, such as toll booth heating, ventilation, and air conditioning (HVAC), and therefore, were not inspected. Of the 887 total elements inspected in the tollbooth category, eight (8) elements received a score lower than a three (3).

All 6,801 facility elements inspected are categorized into architectural, electrical, mechanical and tollbooth items and their corresponding inspection results are summarized in Tables 10 through 12, with a system-wide summary shown in Table 13.

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	1	4.0%
	Canopy	17	1	5.9%
	Elevators, Dumbwaiters	2	0	0.0%
	Exterior Doors	14	0	0.0%
	Exterior Walls	34	0	0.0%
	Exterior Windows	78	1	1.3%
	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	175	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	8	0	0.0%
	Lockers	0	0	0.0%
	Parking Area & Drive Pavement	41	0	0.0%
	Roof Drain	3	0	0.0%
	Systems (Comms/Alarms)	73	0	0.0%
	Exterior Wall	0	0	0.0%
Electrical	Building Electrical Fixtures	194	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	18	2	11.1%
	Counter/Drawer	18	0	0.0%
	Gates	2	0	0.0%
	Interior Booth	23	1	4.3%
	Nose Flashers	19	0	0.0%
	Signs	7	0	0.0%
	Toll AC	0	0	0.0%
	Toll Indicator	22	0	0.0%
	Window	13	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	93	2	2.2%
	Bollards	46	2	4.3%
	Canopy	56	0	0.0%
	Elevators, Dumbwaiters	3	0	0.0%
	Exterior Doors	12	0	0.0%
	Exterior Walls	30	0	0.0%
	Exterior Windows	25	0	0.0%
	Finishes	46	0	0.0%
	Fire Extinguishers & Cabinets	78	0	0.0%
	Fuel Storage	4	0	0.0%
	Handrail	12	0	0.0%
	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	9	0	0.0%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	89	2	2.2%
	Roof Drain	7	1	14.3%
	Systems (Comms/Alarms)	32	0	0.0%
	Exterior Wall	1	0	0.0%
Electrical	Building Electrical Fixtures	145	0	0.0%
	Generators	15	0	0.0%
	Traffic Signal	34	0	0.0%
	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	27	2	7.4%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water Lines	21	0	0.0%
Toll Booths	Area Lights-Toll	1	0	0.0%
	Attenuator	38	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	50	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	9	5.3%
	Bollards	88	2	2.3%
	Canopy	152	3	2.0%
	Elevators, Dumbwaiters	0	0	0.0%
	Exterior Doors	21	1	4.8%
	Exterior Walls	57	0	0.0%
	Exterior Windows	51	0	0.0%
	Finishes	98	0	0.0%
	Fire Extinguishers & Cabinets	146	1	0.7%
	Fuel Storage	27	0	0.0%
	Handrail	14	0	0.0%
	HVAC System	202	0	0.0%
	Interior Doors	124	0	0.0%
	Interior Flooring	110	1	0.9%
	Interior Walls & Ceilings	379	0	0.0%
	Irrigation System/Site Grounds	32	0	0.0%
	Lockers	2	0	0.0%
	Parking Area & Drive Pavement	218	1	0.5%
	Roof Drain	13	0	0.0%
	Systems (Comms/Alarms)	52	0	0.0%
	Exterior Wall	1	0	0.0%
Electrical	Building Electrical Fixtures	252	1	0.4%
	Generators	27	0	0.0%
	Traffic Signal	74	0	0.0%
	Uninterrupted Power Supply (UPS)	11	0	0.0%
	Wiring	135	0	0.0%
	Roadside Cabinet	33	0	0.0%
Mechanical	HVAC System	1	0	0.0%
	Plumbing Fixtures	53	1	1.9%
	Sewer/Septic Lines	0	0	0.0%
	Well/Water Lines	38	0	0.0%
Toll Booths	Area Lights-Toll	38	0	0.0%
	Attenuator	48	1	2.1%
	Booth Pit	12	0	0.0%
	Concrete Pavement	131	0	0.0%
	Counter/Drawer	35	0	0.0%
	Gates	2	1	50.0%
	Interior Booth	20	0	0.0%
	Nose Flashers	48	1	2.1%
	Signs	46	0	0.0%
	Toll AC	5	0	0.0%
	Toll Indicator	81	0	0.0%
	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	429	11	2.6%
	Bollards	159	5	3.1%
	Canopy	225	4	1.8%
	Elevators, Dumbwaiters	5	0	0.0%
	Exterior Doors	47	1	2.1%
	Exterior Walls	121	0	0.0%
	Exterior Windows	154	1	0.6%
	Finishes	280	0	0.0%
	Fire Extinguishers & Cabinets	416	1	0.2%
	Fuel Storage	32	0	0.0%
	Handrail	30	0	0.0%
	HVAC System	488	0	0.0%
	Interior Doors	333	0	0.0%
	Interior Flooring	314	1	0.3%
	Interior Walls & Ceilings	1031	0	0.0%
	Irrigation System/Site Grounds	49	0	0.0%
	Lockers	4	0	0.0%
	Parking Area & Drive Pavement	348	3	0.9%
	Roof Drain	23	1	4.3%
	Systems (Comms/Alarms)	157	0	0.0%
	Exterior Wall	2	0	0.0%
Electrical	Building Electrical Fixtures	591	1	0.2%
	Generators	50	0	0.0%
	Traffic Signal	123	0	0.0%
	Uninterrupted Power Supply (UPS)	18	0	0.0%
	Wiring	239	0	0.0%
	Roadside Cabinet	51	0	0.0%
Mechanical	HVAC System	2	0	0.0%
	Plumbing Fixtures	110	4	3.6%
	Sewer/Septic Lines	1	0	0.0%
	Well/Water Lines	82	0	0.0%
Toll Booths	Area Lights-Toll	43	0	0.0%
	Attenuator	105	2	1.9%
	Booth Pit	18	0	0.0%
	Concrete Pavement	196	2	1.0%
	Counter/Drawer	78	0	0.0%
	Gates	4	1	25.0%
	Interior Booth	63	1	1.6%
	Nose Flashers	103	2	1.9%
	Signs	74	0	0.0%
	Toll AC	5	0	0.0%
	Toll Indicator	153	0	0.0%
	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 shown in Table 14. Of the 896 total elements inspected in the toll element category, no elements received a scored lower than a two (2) rating.

Table 14 – CTTS Toll Element Inspection Rating Scale

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

The Toll System Integrator conducts an annual performance audit to verify that system reliability and accuracy has not degraded over time and the system continues to satisfy the System Integrator's contractual requirements. Based on the 2019 annual audit performed in April, all system performance requirements were satisfied. The 2020 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, overhead sign structures, cantilever sign structures, high-mast light structures and traffic signals. Structures inspections on the CTTS generally occur on a biennial cycle. 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 130 and SL1 were inspected. Also, a comprehensive visual inspection of traffic signals was conducted for the first time this year. 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	170	87	34	345
Overhead/Cantilever Signs	26	75	89	24	214
High-Mast Light Towers	2	61	27	29	119
Traffic Signals	12	29	50	4	95
Totals	**110**	**408**	**374**	**119**	**1011**

2.4.1. Bridges

Typically, under BRINSAP, TxDOT develops 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 indicate 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 which are stipulated and addressed as part of the PBMC scope. For bridge deficiencies not covered under the PBMC scope or are identified as Critical or Urgent, the Bridge Division and Austin District Maintenance collaborate to identify a contract mechanism to repair the deficiency. For example, back wall repair recommendations on Cameron Road and Blue Bluff that were noted in the SH 130 Bridge Condition Survey conducted by TxDOT in 2017 and included in the BRINSAP documentation will be addressed in the SH 130 expansion project mentioned in Section 2.2.1.

2.4.2. Retaining Walls

The CTTS consists of 345 retaining wall locations, totaling 39.87 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)

Road	Wall Count	Length (Miles)
SH 130	87	10.35
SH 45N	170	18.82
SL1	54	7.06
SH 45SE	34	3.64
Total	**345**	**39.87**

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. The 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 noted earlier in this report, engineers continue to monitor surface run-off that may 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 placed to prevent the water from infiltrating the construction joints. The Austin District is continuing its coordination with the Bridge Division to closely monitor this area and establish 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 in Figure 12. For the typical 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 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

Starting 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 130 and SL1 were inspected, which is a total of 115 structures.

As required by TxDOT, 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 (refer to Table 20), where a grade of a nine (9) indicates that an element 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 16 of the 115 sign structures received a condition rating of a six (6), which indicates that the element is in Satisfactory condition, with minor deterioration of structural elements. No structure received a rating lower than a six (6).

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 (refer to 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. Photos 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 Elements Based methodology indicate that 99.5% of the 72,766 components were rated Satisfactory to Good. This is a 0.1% decline over the SH 130 and SL1 inspection that was conducted in FY 2018.

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 in 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 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 130 and SL1 were inspected, which consists of 29 structures. The results indicate that 99.7% of the 6,351 components were rated Satisfactory to Good and is a 0.1% decline from the SH 130 and SL1 inspection that was conducted in FY 2018.

2.4.5. Traffic Signals

Figure 14: Traffic Signal

Traffic Signals like the one shown in 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 pole, 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. This is the first year that Traffic Signals have been visually inspected and will occur biennially with inspections being alternated on two roadways per year. During this year's inspection, SH 130 and SL1 were inspected which consists of 62 traffic signals. The results indicate that 99.0% of the 1,365 components were rated Satisfactory to Good.

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 that has been implemented by TxDOT for the roadways, building facilities, 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 2020 annual operating, maintenance and capital budgets prior to the start of the fiscal year via Minute Order 115579. The maintenance budget amounts approved included $6.2M for routine roadway maintenance and utilities, $4.7M for routine toll system maintenance, and $24.1M 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 2020, the Austin District has completed or is in the process of completing preventative roadway maintenance activities that include full depth repairs on concrete pavement, crack seal work on frontage roads and Next Generation concrete surfacing and overlay work on Segments 1 and 4. Later this fiscal year, the Austin District is scheduled to perform complete restriping of all CTTS corridors as well as a large guide sign replacement project for SH 130, SL1 and SH 45N. TOD building facilities expenditures for FY 2020 consist of UPS replacements, server room AC unit replacement, power surge protector replacement, lighting upgrades, UPS battery replacements, and building structural repairs at the SL1 mainlane plaza and the TxTag CSC building. TxDOT has also included funding in the budget for three major infrastructure improvements. In January 2017, the TTC approved use of the CTTS capital contribution account to fund expansion projects of SH 130 Segments 2 & 3 via Minute Order 114813; the approved budget allocates $71.0M for this project in FY 2020. In June 2017, the TTC approved the use of available CTTS revenues for an east-south direct connector from US 290 to SH 130 via Minute Order 114958; the approved budget allocates $35.6M for this project in FY 2020.

Atkins will work with TxDOT and will review and comment on the proposed maintenance and non-routine, unusual or extraordinary funding levels for FY 2021 prior to the approval of those funding levels at the August 2020 TTC meeting.

3.3. RECOMMENDATIONS

3.3.1. ROADWAY

Based on FY 2020 visual inspections, in 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 SL1 and SH 45SE (edge drop-offs). In the Traffic Operations & Safety Appurtenances category, delineators, pavement markings, and signs show areas in need of maintenance throughout the system, with the lowest scores noted on SH 45SE (striping and signs) and SH 130 (delineators). In the Roadside category, litter received the lowest overall rating, with the lowest scores noted on 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 SH 130 maintenance-let overlay, Next Generation concrete surfacing, crack sealing and large sign replacement projects, or will be addressed in the ongoing SH 130 Segments 2 and 3 expansion projects, scheduled to be complete by Fall of 2020.

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 2020 visual inspections, less than 0.6% of the building facility assets were identified as Degraded, or a three (3) numerical rating, with less than 0.07% identified as being rated lower than Unsatisfactory, or a two (2) numerical rating. Examples of deficiencies found included burned out lamps, missing bollards, paint chipping or delaminating, or instant hot water not working.

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 which 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 Austin District to be addressed by the roadway PBMC.

3.3.3. TOLL ELEMENTS

Based on the 2020 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 consisted of 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 2020 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 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 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 2020 inspection, the overhead and cantilever sign structures on SH 130 and SL1 were inspected, which is a total of 115 structures. Findings for this year's overhead sign structures

inspections indicate that 16 of the 115 sign structures received a condition rating of a six (6), which indicates that the element is in Satisfactory condition (10-point scale), with minor deterioration of structural elements. No structure received a rating lower than a six (6). Findings for this year's inspections utilizing the FHWA Elements Based methodology (5-point rating scale) indicate that 99.5% of the 72,766 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 2020 inspection, the High-Mast Light Towers (HMLT) on SH 130 and SL1 were inspected, which consists of 29 structures. The results indicate that 99.7% of the 6,351 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 2020 inspection of Traffic Signals on SH 130 and SL1, 99.0% of the 1,365 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 future large guide sign replacement project.

Recent restrictions due to the Coronavirus (COVID-19) pandemic have been implemented limiting the Texas workforce to essential services and activities; however, construction and maintenance activities on TxDOT facilities have been deemed as 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 deemed essential and the maintenance contractors have not reported a reduction in staff. Additionally, Atkins' FY 2020 inspection of the CTTS was completed in January 2020; therefore, the pandemic did not affect the inspection and the reporting results.

125 E. 11th Street. Austin, TX 78701
512.463.8588
www.txdot.gov

11801 Domain Blvd #500, Austin, TX, 78758
512.327.6840 / 800.880.5949
www.atkinsglobal.com/northamerica

ATKINS
Member of the SNC-Lavalin Group

100067487 / WH / 2020