Memo

Date:	Thursday, February 07, 2019
Project:	Kansas City Streetcar Main Street Extension
To:	File
From:	HDR Design Team
Subject:	Design Criteria Review

This memo is to document suggested changes to the streetcar design criteria manual to conform to the Kansas City Streetcar Main Street Extension project. The final design criteria from the Kansas City Downtown Streetcar project reflect much of the information developed over the course of the project. The following are suggested updates that should be made to the document to allow it to be used for the Kansas City Streetcar Main Street Extension project:

Cover Sheet – Title

Replace: *Kanas City Downtown Streetcar*

With: Kansas City Streetcar Main Street Extension

Cover Sheet – City Logo

Update: *City of Fountains/Heart of the Nation logo*

Section 1.0 General

Update: *Various text changes – See track changes in Word document*

Section 2.1.1 Horizontal Alignment

Replace: *Tangent track – Posted speed (+/- 30 MPH)*

With: Tangent track – Posted speed (+/- 30-35 MPH)

Section 2.1.1.3

Replace: $L_S = 1.09VE_U$ ($L_S = 0.29VE_U$ *for Design Speeds ≤ 30 MPH)*

With: $L_S = 0.82VE_U$ ($L_S = 0.29VE_U$ for Design Speeds ≤ 30 MPH)

From TCRP report 155, section 3.2.4.5.1. The recommended standard g force for determination of spiral length which has been documented as safe and comfortable to passengers is 0.15g. The spiral length needed to maintain that g force is 4.89V = Ls. The maximum unbalance of per the starter line design criteria is 6". When dividing the 4.89 by 6 we have 0.82VEu as our term.

Section 2.2.2

Replace:

**Absolute Minimum*	*18 ft - 6 in*	***14 ft - 0 in*

With:

*Absolute Minimum	18 ft - 6 in	13 ft - 4 in

Remove: ** To be verified with vehicle manufacturer

Figure 2.3 (New Figure) Example Track Slab – 115 RE with Insulating Rubber Boot and Flangeway Former

Section 2.3.2.2.4

Replace: *…will be used in the Maintenance and Storage Facility (MSF) yard.*
…rail section leading up to the MSF will…

With: …will be used in the Vehicle Maintenance Facility (VMF) yard.
…rail section leading up to the VMF will…

Section 2.3.2.2.5 Embedded Track Special Trackwork

Remove: *(not currently available domestically)*

{This contradicts language before it regarding 112 TRAM rail}

Section 2.3.2.2.9 Switch Machines

Remove: *To be consistent with a low cost approach, all mainline turnouts will be manual and spring loaded switch points will be used*

The switch mechanism for mainline turnouts will be determined based on frequency of use, operational considerations and cost. In instances where manual switch machines are selected for mainline turnouts, spring loaded switch points will be used

Section 2.3.2.2.14 Rail Lubricators

Remove: *Automatic train-sensing rail lubricators shall be considered for any trackwork with horizontal curve of 500 feet radius or less. In some cases, rail lubricators have reduced significant noise caused by rail transit. Each curve will be evaluated on a case by case basis.*

{These were not used on the base project.}

Section 3.2, 3.3 and 3.4

Update: *Various text changes – See track changes in Word document*

Section 3.4.2

Replace: …*roadways shall be in accordance with A Policy on Geometric Design of Highways and Streets (latest version) of AASHTO*…

With: …roadways shall be in accordance with Division IV Design Criteria, Section 5200 "Streets" from the KC Metro Chapter of APWA…

Section 4.0 Utilities

Update: *The list of public and private utility agencies.*

Section 4.1.1 and 4.2.7

Update: *Various text changes – See track changes in Word document*

Section 5.2 Applicable Codes and Standards, and Sections 5.3 – 5.7

Update: *Added LFD design to applicable codes*
Various text changes – See track changes in Word document

Section 5.3 Loads and Forces

Update: *The list of structures.*

Section 6.2 Dimensions of Stop

Replace: *These stops require approximately 60-70 feet to provide…*

With: These stops require approximately 90-100 feet to provide…

Replace: *The outside pink areas indicate the portion of the platform where it ties into the existing sidewalk; the length of these tie-ins will depend on the existing grades.*

With: The outside pink areas indicate the portion of the platform where it ties into the existing/ proposed sidewalk; the length of these tie-ins will depend on the existing/proposed grades.

Replace: *(maximum 8" with approval from KCMO)*

With: (maximum 8" with approval from KCMO and KCATA)

Section 7.1.2 System Description

Replace: *At the time of this publishing, the Operator of the streetcar system is unknown.*

With: The Kansas City Streetcar Authority (KCSA) is the Operator of the streetcar system

Section 7.2.2 Operating Speeds

Replace: *Tangent track – Posted speed (+/- 30 MPH)*

With: Tangent track – Posted speed (+/- 35 MPH)

Section 8.1 Preliminary Vehicle Data and Critical Dimensions

Replace: *Vehicle will be a double-ended, double-sided, modern streetcar vehicle of a multi-articulated low-floor design. The vehicle uses fixed trucks (limited rotation relative to the carbody),*

which has implications for several aspects of the wheel-rail interface, including elevating the importance of using spiral transitions in all mainline track curves.

Vehicle information is provided in Table 8-1.

With: Additional vehicles procured for the fleet shall be required to conform to vehicle specifications critical to maintain consistent operations, horizontal and vertical clearances, ADA compliance at stops, and compatibility with the existing and proposed track alignments.

{CAF vehicle information and remove "Preliminary from title and exhibit".}

Section 8.5 Weight and Passenger Loading

Remove: *Weights shown are preliminary, actual weights will be included once vehicle selection is finalized.*

Update: Vehicle weight should be verified during procurement of additional vehicles.

Vehicle weight information in Table 8-1 and remove "Preliminary" from table.

Section 8.7 Dynamic Envelope

Replace: *Table 8-1 gives major Vehicle dimensions. The Vehicle Supplier is required to work with the City to ensure that all wayside elements are dimensionally compatible with the Vehicle. The preliminary dynamic envelope and curve offset drawings are attached. Once vehicle selection is finalized, this section will be updated.*

With: Table 8-1 gives major Vehicle dimensions. The Vehicle Supplier is required to work with the City to ensure that all wayside elements are dimensionally compatible with the Vehicle. The preliminary dynamic envelope and curve offset drawings are provided in Table 2.2.1.1b

Section 9.0 Maintenance and Storage Facility

Update: Various text changes – See track changes in Word document

Section 10.4.3.7 Bridge Attachments

Added: *Bridge attachments shall be checked by structural engineers to verify the existing structure can handle the OCS loads using the design code the bridge was originally designed for and/or the latest LRFD code.*

Section 11

Update: *Various text changes – See track changes in Word document*

Section 13 Urban Design

Update: *Various text changes – See track changes in Word document*

Section 14 Traffic

Update: *Various text changes – See track changes in Word document*

Section 14.3 Control of Streetcar Interface with Traffic

Update: {*Additional guidance required upon completion of PE phase TSP Study}*

Section 15.9.1.2 Negative Distribution System

Replace: *Resistance-to-Earth Criteria. The mainline running rails, including special trackwork and all ancillary system connections will be designed to have the following minimum in-service resistance per 1,000 feet of track (2 rails):*

- *At-grade ballasted track with cross-ties (wood or concrete): 300 Ohms*
- *Ballast deck aerial structures: 250 Ohms*
- *Direct fixation track: 250 Ohms*
- *Embedded track: 250 Ohms*

With: *Resistance-to-Earth Criteria. The mainline running rails, including special trackwork and all ancillary system connections will be designed to have the following minimum in-service resistance per 1,000 feet of track (2 rails):*

- *At-grade ballasted track with cross-ties (wood or concrete): 300 Ohms*
- *Ballast deck aerial structures: 250 Ohms*
- *Direct fixation track: 250 Ohms*
- *Embedded track: 100 Ohms*

Section 16

Update: *Various text changes – See track changes in Word document*

The remainder of the design criteria document from the Kansas City Downtown Streetcar project would be applicable for the Kansas City Streetcar Main Street Extension project.