Condition Assessment Guidance

Connecticut Department of Transportation

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1.0 Introduction

1.1 Background and Purpose

The mission of the Bureau of Public Transportation at Connecticut Department of Transportation (CTDOT) is "to develop, maintain, and operate a system that provides for the safe, efficient and sustainable movement of people and goods." In pursuit of that mission, CTDOT has three transit objectives:

- Maintain existing systems at a state of good repair and enhance system safety and security
- Improve efficiency and effectiveness of transit service delivery
- Expand services to capture a greater share of existing markets and address specific new markets.

CTDOT faces an unusual challenge because of the transit service delivery model in Connecticut. Unlike many other state DOTs, CTDOT owns transit systems including bus operations throughout the state as well as the Shore Line East and New Haven Line commuter rail service.

Fifty percent of CTDOT's annual operating budget is dedicated to Public Transportation statewide operations. CTDOT has direct financial responsibility for millions of dollars of transit assets in Connecticut, but contracts out the operation of transit service to private companies. To meet the requirements for developing a transit asset management plan, established in the final rule on Transit Asset Management by the Federal Transit Administration (FTA), CTDOT is obligated to collect data, manage, and report on transit assets throughout the state.

As part of the rule on transit asset management, providers must develop and implement transit asset management (TAM) plans. Transit providers may be required to either develop their own TAM plan or participate in a group TAM plan depending on whether they are Tier I or Tier II. The FTA rule on Transit Asset Management defines Tier I and Tier II providers:

> *Tier I provider* means a recipient that owns, operates, or manages either (1) one hundred and one (101) or more vehicles in revenue service during peak regular service across all fixed route modes or in any one non-fixed route mode, or (2) rail transit.
>
> *Tier II provider* means a recipient that owns, operates, or manages (1) one hundred (100) or fewer vehicles in revenue service during peak regular service across all non-rail fixed route modes or in any one non-fixed route mode, (2) a subrecipient under the 5311 Rural Area Formula Program, (3) or any American Indian tribe.

States must develop a group TAM plan for Tier II transit providers, while Tier I providers must develop their own TAM plans. Tier II providers may also choose to forgo the group plan and develop individual plans.

A TAM plan needs to include TAM and SGR policy, TAM plan implementation strategy, an asset inventory, condition assessments, a description of systems used to predict capital needs, a project-based prioritization of investments, a description of key TAM activities, a list of TAM resources, and an outline for updating the plan and TAM practices.

The condition assessment must be performed at a level of detail sufficient to support capital planning. Also, ideally, the condition assessment should support calculation of the SGR performance measures FTA has defined for four capital assets categories: equipment (non-revenue vehicles), rolling stock (revenue vehicles), infrastructure (rail fixed-guideway, track, signals, and systems), and facilities. This document establishes an approach for calculating asset condition for each of the four asset categories.

1.2 Document Organization

This guidebook is organized into five main sections:

- **Section 1** describes the background of the project and the organization of this document.
- **Section 2** describes the inventory data and condition assessment approach for revenue vehicles.
- **Section 3** describes the inventory data and condition assessment approach for facilities.
- **Section 4** describes the inventory data and condition assessment approach for fixed guideway.
- **Section 5** describes the inventory data and condition assessment approach for equipment.
- **Appendix A** includes a detailed list of assessment items for Administrative and Maintenance Facilities
- **Appendix B** includes recommended inspection procedures for Administrative and Maintenance Facilities
- **Appendix C** includes a detailed list of assessment items for Passenger Facilities
- **Appendix D** includes a detailed asset hierarchy for rail guideway

2.0 Revenue Vehicles

2.1 Inventory Data

Revenue vehicles are inventoried by vehicle fleet. All vehicles in a given fleet share the same vehicle type, make/model, model year, and operator. Other inventory data collected for a fleet may include, but is not limited to, vehicle length and fuel type. Figures 1 to 4 illustrate the asset hierarchy for revenue vehicles. Figure 1 shows three subclasses of vehicles: bus, rail, and ferryboat. Figure 2 shows the five vehicle types defined for buses, Figure 3 shows the six defined for rail, and Figure 4 shows the three for ferry.

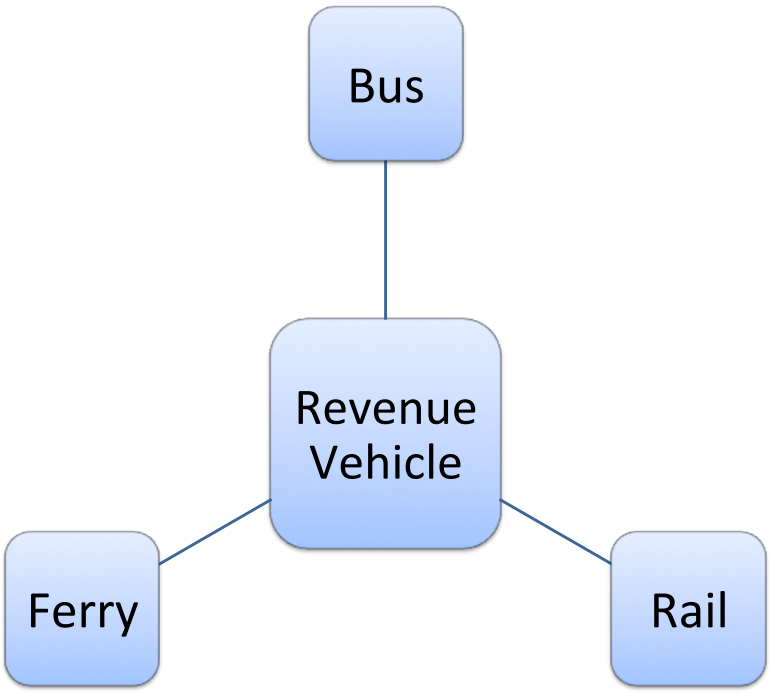

Figure 1. Asset Hierarchy – Revenue Vehicles

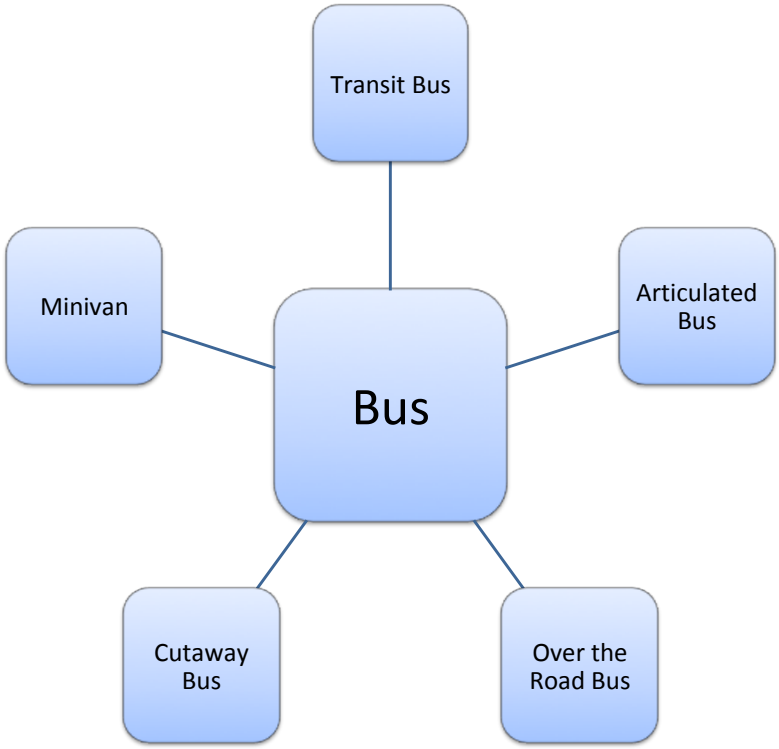

Figure 2. Asset Hierarchy – Revenue Vehicles – Bus

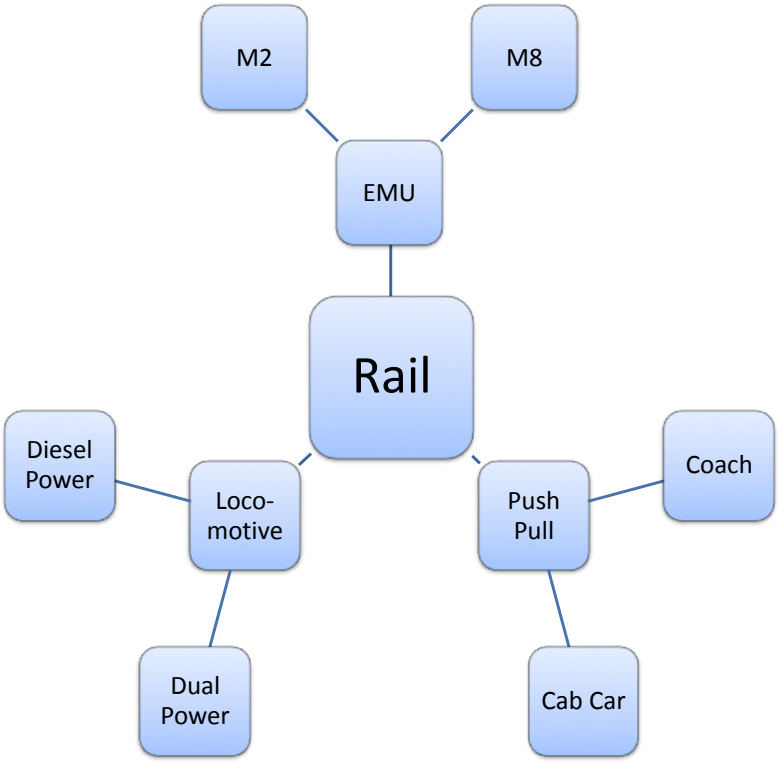

Figure 3. Asset Hierarchy – Revenue Vehicles – Rail

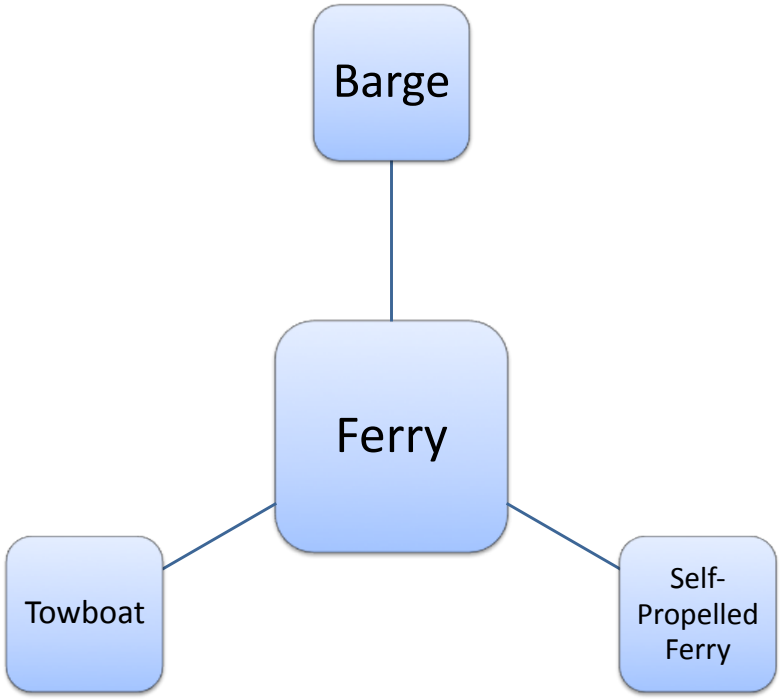

Figure 4. Asset Hierarchy – Revenue Vehicles – Ferry

2.2 Condition Assessment Approach

The purpose of the vehicle condition assessment is to provide an overall snapshot of the current state of repair of a vehicle fleet to aid in decisions concerning when it is most cost effective to replace it.

FTA's mandated SGR performance measure for revenue vehicles is the percentage of vehicles that have met or exceed their Useful Life Benchmark (ULBs). The ULB is age at which a vehicle has reached the end of its economic useful life. This value may be specified in terms of vehicle age, mileage and/or other factors. FTA provides a set of default ULB values by vehicle type, all of which are specified in terms of vehicle age.

Following FTA's model, CTDOT uses fleet age as its indicator of vehicle condition. A vehicle is deemed to be in good repair if its age is less than the ULB specified for the corresponding vehicle type. Likewise, a vehicle is deemed to no longer be in good repair if its age equals or exceeds the corresponding ULB.

CTDOT has worked with their Tier I and Tier II service providers in Connecticut to define custom ULB values. Connecticut's ULB values for revenue vehicles are listed in Table 1.

Table 1. ULB Values for Revenue Vehicles

Tier I	Tier II	Asset Class	ULB (years)
●	●	Transit Bus	12
●		Articulated Bus	12
●	●	Cutaway Bus	5
●		Over the Road Bus	12
	●	Minivan	5
●		Rail Locomotive (Dual Power or Diesel)	25
●		Rail Push Pull (Coach or Cab Car)	25
●		Rail Electric Multiple Unit (M2 or M8 RMU)	25
●		Ferryboat	42

2.3 Assessment of Existing Data

Inventory data including model year (used to determine age) are stored by vehicle in CORE-CT and in inventory registries of Connecticut transit providers including the 12 transit districts participating in the Connecticut Group TAM Plan. For the purpose of developing its TAM Plan, CTDOT extracted revenue vehicle data from CORE-CT and transit providers, aggregated it by fleet, and imported the data into a separate transit asset inventory database, SGRtransdata.

3.0 Facilities

Two types of transit facilities are defined in the Connecticut SGR database: administrative/ maintenance facilities, and passenger facilities. The condition assessment approach is similar for both facility types, and relies on visual inspection of primary facility components. However, the specific facility components and available data differ between the two types of facilities. Section 3.1 discusses the recommended condition assessment approach for administrative/ maintenance facilities and Section 3.2 discusses the recommended approach for passenger facilities.

3.1 Administrative/Maintenance Facilities

3.1.1 Inventory Data

For administrative/maintenance facilities both the overall facility site and each individual building on the site are included in the inventory. In some cases, there may be only one building on a given site, but larger facilities may include multiple buildings.

Inventory data for the facility site may include, but is not limited to, the site address, operator and land area. Inventory data for buildings may include, but is not limited to, the operator, floor area, construction cost and date.

3.1.2 Condition Assessment Approach

The purpose of the facility condition assessment is to provide an overall snapshot of the current state of repair of a facility to aid in decisions concerning capital investments to improve the facility's condition. This section describes how to assess the condition of an administrative/ maintenance facility.

The approach described here is based on FTA's guidance detailed in *TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation*. FTA's guidance is intended to support calculation of FTA's mandated SGR performance measure for facilities, which is the percentage of facilities within an asset class rated less than three on the five-point scale used in the FTA Transit Economic Requirements Model (TERM). As described in FTA's guidance document, the components were established based upon American Society of Testing and Materials (ASTM) documents that provide standards for classification of buildings and related features, but these have been customized in certain respects to address common features of transit facilities.

To assess facility conditions an inspector should assign a value of 1 to 5 to each of the major components of the facility. The condition rating values and their descriptions are listed in Table 2. The components are listed in Table 3. Specific subcomponents the inspector should examine for each component are listed in Appendix A. The inspector may wish to assess the condition of these individual sub-components or simply use the list as a reference when performing the inspection. Further, when performing inspections at a sub-component level for certain sub-components, the inspector may wish to specify the percentage of the sub-component quantity in each condition rather than a single, overall condition. If sub-component conditions are assessed they should be aggregated to obtain an overall score for the component using the approach

described here for aggregating component scores. Suggested inspection procedures are included in Appendix B.

Table 2. FTA TERM Condition Assessment Scale

Rating	Condition	Description
5	Excellent	No visible defects, new or near new condition, may still be under warranty if applicable
4	Good	Good condition, but no longer new, may be slightly defective or deteriorated, but is overall functional
3	Adequate	Moderately deteriorated or defective; but has not exceeded useful life
2	Marginal	Defective or deteriorated in need of replacement; exceeded useful life
1	Poor	Critically damaged or in need of immediate repair; well past useful life

The specific components of administrative/maintenance facilities are listed below. Note that the first nine components listed in the table should be assessed for each building in the facility, and the final component, Site, should be assessed for the site as a whole.

Table 3. Administrative/Maintenance Facility Condition Assessment Components

Inventory Unit	Component	Notes	Typical Useful Life* (years)	Component Condition Weight**
Building	Substructure		30	1.0
Building	Shell		30	1.0
Building	Interior		30	1.0
Building	Plumbing	May need to assess based on age	20	1.0
Building	HVAC	May need to assess based on age	20	1.0
Building	Electrical	May need to assess based on age	30	1.0
Building	Fire Protection	See Table 5	20	1.0
Building	Conveyance	See Table 5	20	1.0
Building	Equipment	Includes fixed specialty equipment	30	1.0
Site	Site		50	1.0

*Useful life can be utilized for components that cannot be visually inspected.
**Component Condition Weight represents the relative importance of the component compared to other components. By default, these numbers are 1.0. However, based on the agency's experiences and practices, the inspector can use a different number to lower or raise the importance of a component and thus change how component conditions impact the overall facility condition.

For some components, a visual inspection may be insufficient for establishing conditions. In cases where the inspector finds that he or she cannot assess conditions of a component visually, the inspector should estimate the age of the component (the time since it was constructed or last rehabilitated), and estimate the condition based on the age using useful life for the component listed in Table 3 with the scale shown in Table 4. Useful life is the average amount of time in years that an item, component, or system is economically efficient to keep in operation. This approach will typically be required for Plumbing, HVAC and Electrical, but may also be required for other components. Refer to the discussion of rail guideway assets and Table 7 for further details on this conversion scale.

Table 4. Conversion Scale: Component Age to FTA TERM Condition Rating

Component Age as % of Useful Life	Rating	Condition
New	5	Excellent
≤ 50%	4	Good
>50% ≤100%	3	Adequate
>100% ≤125%	2	Marginal
>125%	1	Poor

For Fire Protection and Conveyance, separate inspections are typically performed to assess code compliance. The inspector should utilize the results from those inspections in performing their condition assessment. Specifically, the inspector should use the condition assessment scale shown in Table 5 for these components.

Table 5. Fire Protection and Conveyance Condition Assessment Scale

Rating	Condition	Description
5	Excellent	System is new and there are no identified code issues
4	Good	System is not new, but there are no identified code issues
3	Adequate	Isolated code issues exist that can be addressed through maintenance
2	Marginal	Code issues exist that do not necessitate facility closure
1	Poor	Extensive code issues have been identified that may necessitate facility closure

Given the individual component conditions, the overall condition of the facility is calculated as:

$$Condition = \frac{\sum_{i=1}^{n} c_i f_i r_i}{\sum_{i=1}^{n} f_i r_i}$$

where c_i is the condition of component i, f_i is the replacement cost factor listed in Table 3, and r_i is the replacement cost of the component.

3.1.3 Assessment of Existing Data

Inventory data on Connecticut facilities are stored in CORE-CT and the transit providers' asset registries, but the level of detail stored on each facility varies. Thus, for the purpose of developing its TAM Plan, CTDOT extracted data on administrative/maintenance facilities from CORE-CT and the transit providers' asset registries, then manually reviewed data for each facility. Except in the case of a selected Tier II facilities that have been recently inspected, component-level condition data are not available for administrative/maintenance facilities. However, the overall condition of CTDOT-owned facilities has been previously established. Thus, component-level conditions were manually determined for each facility using the available component-level data, overall facility condition, and facility age. Data for each facility and building were imported into the transit asset inventory database, SGRtransdata.

3.2 Passenger Facilities

3.2.1 Inventory Data

For passengers facilities the overall facility site, each individual building on the site, and each rail platform (if applicable) are included in the inventory. In some cases, there may be only one building and/or platform on a given site, but larger facilities may include multiple buildings and/or platforms.

Inventory data for the facility site may include, but is not limited to, the site address, operator and land area. Inventory data for buildings may include, but is not limited to, the operator, floor area, parking spaces (for parking lots), construction cost and date.

3.2.2 Condition Assessment Approach

The condition assessment approach for passenger facilities is similar to that for administrative/maintenance facilities. The approach described here is based on FTA's guidance detailed in *TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation*. FTA's guidance is intended to support calculation of FTA's mandated SGR performance measure for facilities, which is the percentage of facilities within an asset class rated less than three on the five-point TERM scale.

To assess facility conditions an inspector should assign a value of 1 to 5 to each of the major components of the facility. The condition rating values and their descriptions are listed in Table 2. The components are listed in Table 6. Specific subcomponents the inspector should examine for each component are listed in Appendix C. The inspector may wish to assess the condition of

these individual sub-components or simply use the list as a reference when performing the inspection. Further, when performing inspections at a sub-component level, for certain sub-components the inspector may wish to specify the percentage of the sub-component quantity in each condition rather than a single, overall condition. If sub-component conditions are assessed they should be aggregated to obtain an overall score for the component using the approach described here for aggregating component scores. Suggested inspection procedures are included in Appendix B.

Regarding the specific components of passenger facilities, note that first nine listed in the table below should be assessed for each building in the facility. Three components should be assessed for each platform, and Site should be assessed for the site as a whole.

Table 6. Passenger Facility Condition Assessment Components

Inventory Unit	Component	Notes	Typical Useful Life (years)*	Component Condition Weight**
Building	Substructure		30	1.0
Building	Shell		30	1.0
Building	Interior		30	1.0
Building	Plumbing	May need to assess based on age	20	1.0
Building	HVAC	May need to assess based on age	20	1.0
Building	Electrical	May need to assess based on age	30	1.0
Building	Fire Protection	See Table 5	20	1.0
Building	Conveyance	See Table 5	20	1.0
Building	Fare Collection		20	1.0
Platform	Structure		30	1.0
Platform	Canopy		30	1.0
Platform	Electrical		30	1.0
Site	Site		50	1.0

*Useful life can be utilized for components that cannot be visually inspected.
**Component Condition Weight represents the relative importance of the component compared to other components. By default, these numbers are 1.0. However, based on the agency's experiences and practices, the inspector can use a different number to lower or raise the importance of a component and thus change how component conditions impact the overall facility condition.

The other details of the assessment process are identical to that described previously for administrative/maintenance facilities. Table 4 lists rating values to use if the inspector uses age as a proxy for condition. Table 5 lists specific condition assessment language to use for fire protection and conveyance. Given the individual component conditions, the overall condition of

the facility is calculated as:

$$Condition = \frac{\sum_{i=1}^{n} c_i f_i r_i}{\sum_{i=1}^{n} f_i r_i}$$

where c_i is the condition of component i, f_i is the replacement cost factor listed in Table 6, and r_i is the replacement cost of the component.

3.2.3 Assessment of Existing Data

Inventory data on Connecticut facilities are stored in CORE-CT and the transit providers' asset registries, but the level of detail stored on each facility varies. Thus, for the purpose of developing its TAM Plan, CTDOT extracted data on passenger facilities from CORE-CT and the transit providers' asset registries, and then manually reviewed data for each facility to establish the inventory. Data for each facility, platform and building were imported into the transit asset inventory database, SGRtransdata.

Existing condition data available for passenger facilities varied by specific type of facility. For Tier II facilities and for CTfastrak stations, an overall condition rating was assigned. For these facilities, component-level conditions were manually determined for each facility using the overall facility condition and facility age.

For rail stations, more detailed assessments were recently performed. These inspections were performed for different facility components using the 10-point National Bridge Inventory (NBI) condition scale (with values ranging from 0 to 4) rather than the 5-point TERM scale described here. NBI conditions were converted to the TERM scale by dividing the rating by 2 and then rounding to the nearest integer value. Thus, a component was deemed to have a TERM rating of 2 if its NBI rating was 5 (fair) or less.

The rail facility inspections were mapped to component conditions as follows:

- The condition for Substructure was established based on the value for Foundations.
- The condition for Shell was established based on the minimum of Roof and Exterior Walls.
- The condition for Interior was established based on the minimum of Interior Walls, Floors, Windows/Skylights/Doors, Stairs/Ramps and Walking Surfaces.
- The condition for Plumbing was established based on the minimum of the two ratings for Drainage and the rating for Restrooms.
- The condition for HVAC was established based on the minimum of HVAC, Duct Work, Compressors, and Blowers.
- The condition for Conveyance was established based on the minimum of Elevator Pit, Elevator Machine Room, Elevator Cab, and Escalator.
- The condition for Site was established based on the value for Site-Electrical.

For rail platforms, the condition was determined for the components Structure, Canopy and Electrical. For each of these the condition was determined by taking the minimum of the subcomponent ratings.

The station data included information on station bridges, but this was considered to be part of the data set of Fixed Guideway – Structures.

4.0 Fixed Guideway

Two types of fixed guideway are defined in the Connecticut SGR database: rail, and bus. Rail guideway includes the Connecticut-owned portion of the Northeast Corridor, as well as three branch lines: New Canaan, Danbury and Waterbury. The inventory is structured such that additional freight rail guideway and related assets may be added if desired. Bus guideway includes the pavement, bridges and ancillary assets associated with the CTfastrak guideway running from New Britain to Hartford. Section 4.1 discusses the recommended condition assessment approach for rail guideway and Section 4.2 discusses the recommended approach for bus guideway.

4.1 Rail

4.1.1 Inventory Data

Rail fixed guideway inventory data is organized into four primary categories: track, power, structure, and signals/communications, as depicted in Figure 5. Each of these four categories is further divided into a two-level hierarchy. Note the hierarchy is based on that recommended by Metro North Railroad (MNR) based on that agency's work to implement a new enterprise asset management system. The rail guideway asset hierarchy is presented in detail in Appendix D.

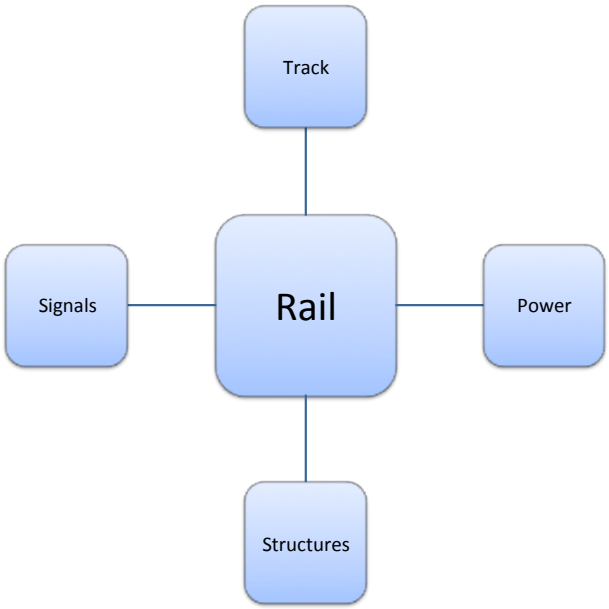

Figure 5. Asset Hierarchy – Fixed Guideway – Rail

Figure 6 shows the hierarchy for Track. Track is classified Main or Special. Main track is further divided into five subcategories, and special track is further divided into two subcategories. Track is inventoried by segment.

Figure 7 shows the hierarchy for Power. Power is divided into four subcategories: Supply System Traction Power; Supply System Transmission Power; Traction Power Distribution; and Signal Power System. Each of these is further divided into four subcategories. Assets in the subcategories Supply System Traction Power, Supply System Transmission Power, and Signal

Power System are inventoried by site (e.g., by substation). Traction Power Distribution is inventoried by track segment.

Figure 8 shows the hierarchy for Structures. Three basic categories of structures are defined: Undergrade Structure; Retaining Wall and Overhead Structure. Each of these is further subdivided into two or three subcategories. Each individual structure is included in the inventory.

Figure 9 shows the inventory for Signals/Communications. This subcategory is further divided into the following: Signaling; Train Detection Control; Communication/Monitoring; Security System; and Positive Train Control. Assets in this subcategory are inventoried by piece of equipment.

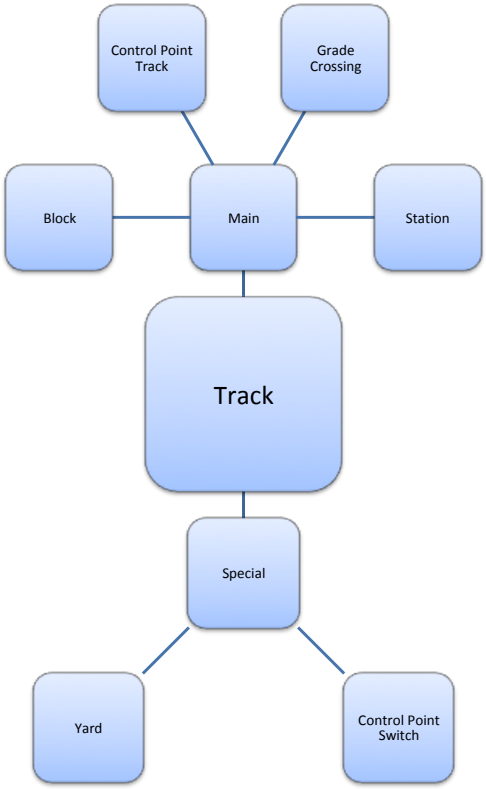

Figure 6. Asset Hierarchy – Fixed Guideway – Rail – Track

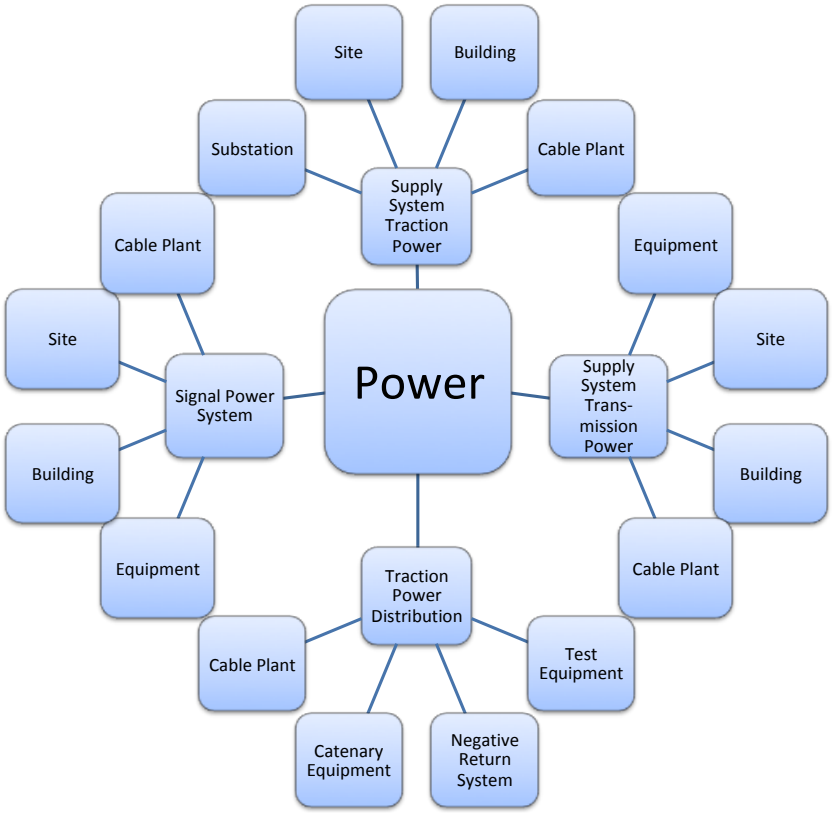

Figure 7. Asset Hierarchy – Fixed Guideway – Rail – Power

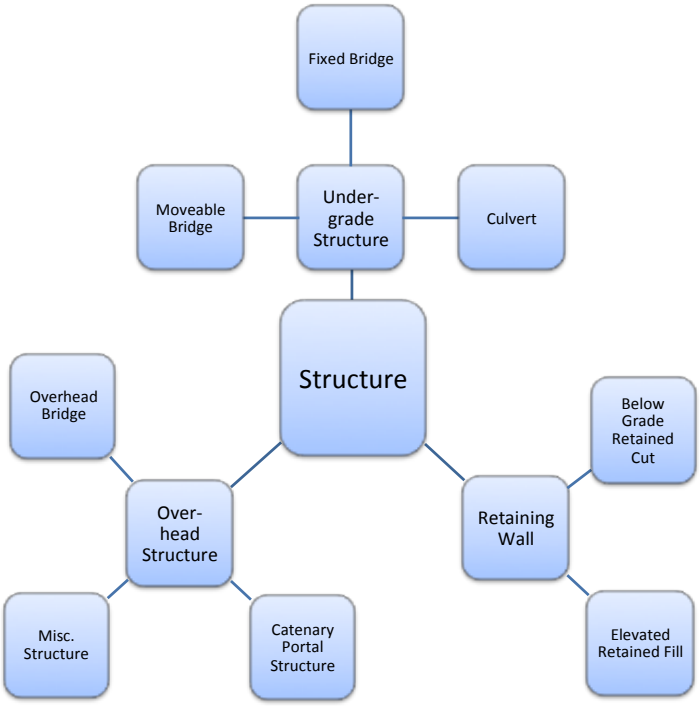

Figure 8. Asset Hierarchy – Fixed Guideway – Rail – Structure

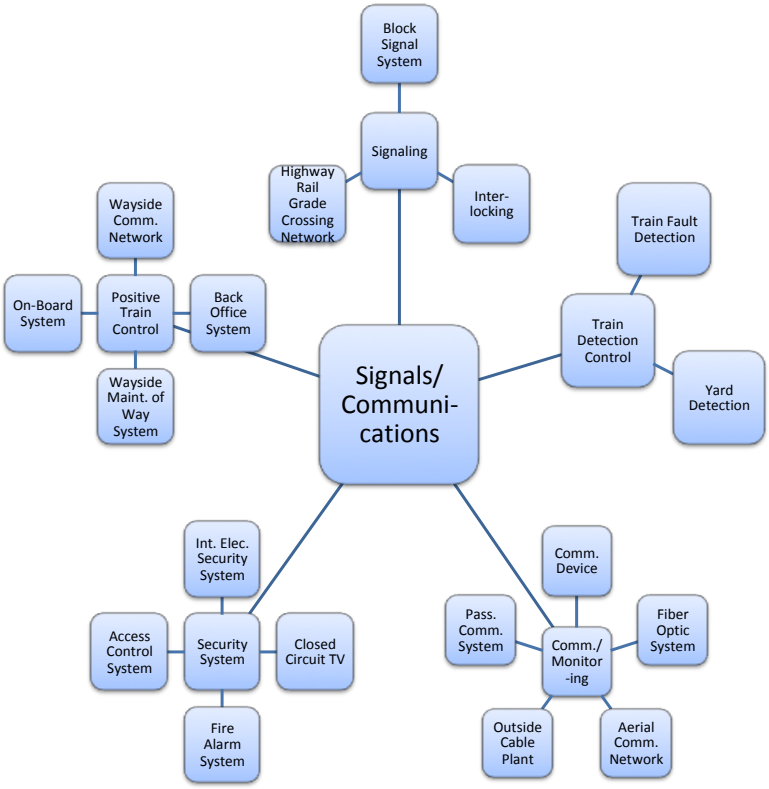

Figure 9. Asset Hierarchy – Fixed Guideway – Rail – Signal/Communications

4.1.2 Condition Assessment Approach

MNR and Amtrak have each identified a need for a comprehensive condition assessment approach for assessing rail guideway on the Northeast Corridor. Such an approach would ideally consider results of visual inspections, including track walks and other forms of inspection already performed on a routine basis, results obtained from inspection by rail geometry car, and other inputs. However, no such comprehensive approach has yet been defined. Thus, both MNR and Amtrak use asset age as a proxy for condition for most assets, with the notable exception of structures.

For all rail guideway assets other than structures, CTDOT assesses condition based on asset age, using an approach patterned on current MNR and Amtrak practices. For each asset type a ULB value is specified in years. Asset condition is then approximated by comparing the age of the asset (years since it was either constructed or last rehabilitated) to the ULB. A condition rating is assigned on the five-point TERM scale based on Table 7.

As described below in 4.1.3, MNR rail guideway asset data has four condition categories, each defined by age relative to useful life. CTDOT adapted this approach and added a fifth condition category (New/5/Excellent) to allow for mapping of MNR condition data to the TERM five-point scale.

Table 7. Conversion Scale: Rail Guideway Asset Age to FTA TERM Condition Rating

Asset Age as % of ULB	Rating	Condition
New	5	Excellent
≤ 50%	4	Good
>50% and ≤100%	3	Adequate
>100% and ≤125%	2	Marginal
>125%	1	Poor

ULB values for rail guideway assets are discussed in Section 4.1.3.

For structures a detailed assessment approach has already been defined and implemented. CTDOT performs visual inspections of structures in the subcategories Undergrade Structure and Overhead Structure. These are patterned on the approach used for highway bridges. Through the inspection CTDOT assess condition of the bridge deck, superstructure and substructure condition using the 10-point National Bridge Inventory (NBI) condition scale (with values ranging from 0 to 4) rather than the 5-point TERM scale described here. For culverts a single overall culvert rating is specified.

4.1.3 Assessment of Existing Data

Pending implementation by MNR of its new enterprise asset management system, the system of record for data on the rail guideway inventory is the set of track charts maintained for the Northeast Corridor and branch lines. The charts show locations of major assets, and detail when assets were most recently rehabilitated. However, the track charts do not provide the level of detail required to populate the asset inventory illustrated in Figures 6 to 9.

As a supplement to the track charts, MNR maintains a less detailed, summary inventory of rail guideway assets for use in preparation of the Metropolitan Transportation Authority (MTA) Twenty Year Needs Assessment (TYNA). This summary inventory groups assets by ULB, and details the asset quantities in each of four condition categories:

- 1: 0 to 50 percent of useful life (4 or 5 on the TERM scale)
- 2: 50 to 100 percent of useful life (3 on the TERM scale)
- 3: 100 to 125 percent of useful life (2 on the TERM scale)
- 4: more than 125 percent of useful life (1 on the TERM scale)

Based on the above definitions, an asset in Category 3 or 4 (1 or 2 on the TERM scale) has exceeded its useful life and is not in good repair. However, in some cases MNR has established that an asset is still in good repair, despite exceeding its useful life, or alternatively, that it is no longer in good repair though it is still less than its useful life. To address such situations MNR tracks assets in a second set of categories that mirror the first set, but include adjustments for engineering judgment.

The MNR data were used to populate data on Track and Power in the CTDOT database. Table 8 summarizes the assets in the summary inventory for Track. Table 9 summarizes the assets for Power.

Table 8. MNR TYNA Summary Inventory - Rail

Category	Subcategory	ULB (years)
Rail	Tangent	40
	Curves <2 degrees	30
	Curves 2-4 degrees	20
	Curves >4 degrees	10
Ties	Concrete	40
	Wood	30
Turnouts	High Speed	25
	Mainline	20
	Yard	30
	Siding	30
Surfacing	Interlockings	4
	Control Point to Control Point	4

Table 9. MNR TYNA Summary Inventory - Power

Category	Subcategory	ULB (years)
Catenary Plant	Overhead Catenary	50
	Sectionalizing Insulators	3
	Synthetic Insulators	3
	Pulleys	15
Cable Plant	AC Feeder Cable	40
	Signal Power 12kV	50
	Catenary Poles	100
AC Substation Plant	Metal Clad	30
	RTU Sectionalizing	30
	Substation Wayside Switchyard	30
	Anchor Bridge Substation	30
	Snow Melter Transformers/Unit Substation	30
	Supply Stations	40
	MOD’s	20
Signal Power Plant	Substations	20
	MOD’s	20
	Transformers	30
Transmission Plant	Transformers, Small Pad Mount	40
	Yard Power Distribution System	30

CTDOT's existing structures data were used to populate the data for the category Structure. Condition data in the existing data set are expressed using the 10-point NBI scale. NBI conditions were converted to the TERM scale by dividing the rating by 2 and then rounding to the nearest integer value. Thus, a component was deemed to have a TERM rating of 2 if its NBI rating was 4 (poor) or less.

For the category Signals work remains to be performed to develop a full inventory. Thus, for this category the CTDOT inventory has entries for the Northeast Corridor, New Canaan Branch, Danbury Branch, and Waterbury Branch.

4.2 Bus

4.2.1 Inventory Data

Asset categories defined for Bus Fixed Guideway include Pavement and Structure. CTDOT's approach for inventorying these assets is to extend the approach used for highway assets, for which existing systems and approaches are well defined.

4.2.2 Condition Assessment Approach

For pavement CTDOT uses a Pavement Condition Index (PCI) to measure the condition of CTDOT-maintained pavements. PCI is calculated for each 0.1-mile segment based on five metrics. The overall PCI is a weighted average of the following metrics shown in Table 10 below.

Table 10. Pavement Condition Index Metrics

Metric	Weight	Description
Roughness	10%	An indicator of pavement roughness experienced by road users traveling over the pavements. The International Roughness Index (IRI) is computed from a single longitudinal profile
Rutting	15%	Rutting is quantified for asphalt pavements by measuring the depth of ruts along the wheel path. Rutting is commonly caused by a combination of high traffic volumes, heavy vehicles and the instability of the pavement mix.
Cracking	25%	Cracks in the pavement surface can be caused or accelerated by aging, loading, poor drainage, frost heaves or temperature changes, or construction flaws. Cracking is measured in terms of the percentage of cracked pavement surface.
Disintegration	30%	Disintegration is the wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt binder. CTDOT calculates the disintegration metric using pavement age.
Drainage	20%	Drainage refers to the ability of the surface of the roadway to drain. CTDOT uses the collected cross slope and grade of the roadway to compute the drainage metric

The PCI is scaled from 1.0 to 9.0, with 9.0 describing a pavement without defects. Within this scale, roadways with a PCI less than 4.0 are classified in "Poor" condition, those between 4.0

and less than 6.0 are in “Fair” condition, 6.0 to less than 8.0 PCI indicates “Good” condition, and 8.0 to 9.0 indicates “Excellent” condition. A pavement section for which the PCI is 6 or greater is classified as being in a state of good repair.

For structures CTDOT uses a similar approach for rail and highway bridges. As described previously, bridges are inspected visually. Conditions of bridge decks, superstructures and substructures are assessed using the 10-point NBI scale.

4.2.3 Assessment of Existing Data

CTDOT collects pavement inventory and condition data using specially equipped Fugro Roadware Automatic Road Analyzer (ARAN) vans. The entire CTDOT-maintained mainline is measured each year. CTDOT performed an initial data collection run of CTfastrak guideway in March 2015, prior to the system opening. CTDOT is establishing a process for regular data collection, data processing, and integration with the Pavement Management System.

CTDOT has already inventoried and inspected the bridges on the CTfastrak guideway and is managing these together with other highway bridges.

5.0 Equipment

5.1 Inventory Data

The Equipment asset class includes service vehicles and other equipment with a value of $50,000 or more. Service vehicles are inventoried by vehicle fleet. All vehicles in a given fleet share the same vehicle type, make/model, model year, and operator. Figure 10 shows the different types of service vehicles inventoried, including four types of "rubber tire" vehicles and two types of rail service vehicles.

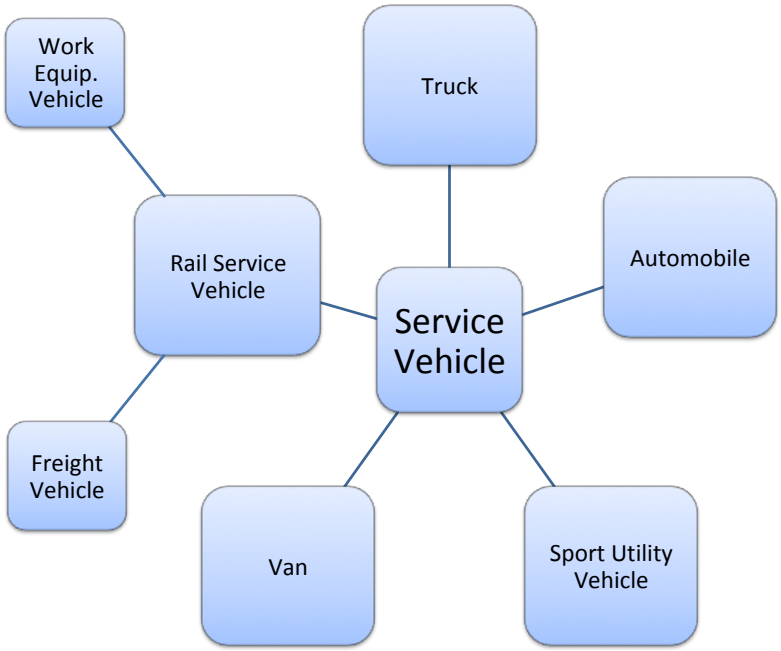

Figure 10. Asset Hierarchy – Equipment – Service Vehicles

Other equipment is inventoried by specific item. Inventory data include, but are not limited to, item descriptions, purchase cost, and purchase date.

5.2 Condition Assessment Approach

CTDOT uses the same basic approach for assessing condition of equipment as it does for revenue vehicles. This approach is discussed in Section 2. Specifically, A ULB value is established for equipment type. A piece of equipment is assessed as being in good repair if its age is less than the corresponding ULB, and not in good repair if it meets or exceeds the ULB. This approach supports reporting of FTA's mandated SGR performance measure for equipment: the percentage of service vehicles that have met or exceed their ULB. Connecticut's ULBs for equipment are listed in Table 11.

Table 11. ULBs for Equipment

Tier I	Tier II	Asset Class	ULB (years)
●	●	Trucks and Rubber Tire Vehicles	14
●	●	Automobiles	5
●	●	Sport Utility Vehicles	5
●		Steel Wheel Vehicles	25
●	●	Vans	5

5.3 Assessment of Existing Data

Inventory data including model year (used to determine age) are stored by service vehicle in CORE-CT and the transit providers' asset registries. For the purpose of developing its TAM Plan, CTDOT extracted revenue vehicle data from CORE-CT and the transit providers' asset registries, aggregated it by fleet, and imported the data into a separate transit asset inventory database, SGRtransdata.

For other equipment inventory data, such as equipment description, purchase cost, and purchase date, are stored in CORE-CT and the transit providers' asset registries as well. CTDOT extracted data on other equipment, filtering out data for items costing less than $50,000 or permanently affixed to a facility, and imported the data into SGRtransdata.

Appendix A. Detailed List of Items for Admin / Maintenance Facility Condition Assessment

Tables A-1 through A-10 present detailed lists of items for condition assessment at administration or maintenance facilities. The tables are organized by the ten components described in the approach. In addition to the items, the tables include notes for inspection (where applicable) and units of measure. This information in this appendix is also included in a separate spreadsheet.

Where these items are assessed, one would typically assign an overall value to the item. But in cases where units of measures are not “inspect as each”, an inspector may determine the percentage of total quantity in each condition.

Table A-1. Substructure

Category	Item	Notes	Unit of Measure
Foundations	Exposed Foundation Elements		inspect as each
	Other Structural Components		inspect as each
Basement	Slab		sq. ft.

Table A-2. Shell

Category	Item	Notes	Unit of Measure
Superstructure	Structural Frame	Columns, pillars, walls	inspect as each
Roof	Roof Waterproofing		inspect as each
	Roof Penetration Flashing Systems	Chimney, skylights, eaves, surroundings	inspect as each
	Roof Drainage Systems	Gutters	inspect as each
Exterior	Building Envelope - Masonry/Concrete Walls		sq. ft.
	Building Envelope - Cladding		sq. ft.
	Building Envelope - Windows and Glazing		sq. ft.
	Building Envelope - Doors, Glazing, Door Hardware		sq. ft.
	Building Envelope - Garage Doors		sq. ft.
	Bird Proofing System		inspect as each
	Exterior Finishes		inspect as each
Shell Appurtenances	Means of Egress	Stairs, fire escapes	inspect as each
	Vertical Openings		inspect as each
	Cat Walks		inspect as each
	Inspection Pits		inspect as each
Building Expansion Joints	Building Expansion Joints		linear ft.

Table A-3. Interior

Category	Item	Notes	Unit of Measure
Partitions	Interior Walls		sq. ft.
	Interior Windows and Glazing		sq. ft.
	Interior Doors, Glazing, Door Hardware		sq. ft.
Stairs	Interior Stairs and Landings		units
Finishes	Flooring System		sq. ft.
	Ceiling System		sq. ft.
	Wall Finishes		sq. ft.
Other	Interior Amenities	Signage, built-in furnishings, appliances	inspect as each
	Built-In Seating		inspect as each

Table A-4. Plumbing

Category	Item	Notes	Unit of Measure
Domestic Water Distribution	Water Heaters		inspect as each
	Water Treatment Systems		inspect as each
	Backflow Prevention		inspect as each
Pumps	Pumps	Sump, well, domestic	inspect as each
Bathroom Fixtures	Bathroom Fixtures		inspect as each
Other Plumbing Items / Fixtures	Other Plumbing Fixtures	Piping, insulation, etc.	inspect as each

Table A-5. HVAC

Category	Item	Notes	Unit of Measure
HVAC	Energy Recovery Units		units
	Heat Pumps		units
	Make-Up Units		units
	Air Handling Units		units
	Boilers		units
	Burners		units
	Furnaces		units
	Unit Heaters		units
	Radiant Heaters		units
	Finned Tube Radiation and Convertors		units
	Air Conditioning Units	Split package, commercial through-the-wall, water-cooled package	units
	Splits and Mini-Splits		units
	Cooling Towers		units
	Condensers	Air-Cooled, evaporative	units
	Chillers		units
	HVAC Air Terminals		units
	Fans	Centrifugal, axial, roof-mounted, propeller	units
	Coils		units
	Heat Exchangers		units
	Reciprocating Compressors		units
	Air Curtains		units
	Water Treatment System		inspect as each
	Other HVAC Pumps (excluding heat pumps)		inspect as each
	Other HVAC Components	Piping, ductwork, etc.	inspect as each

Table A-6. Electrical

Category	Item	Notes	Unit of Measure
Electrical Service / Distribution	Power Distribution / Switchgear	Service entrance through subpanels	inspect as each
	Generator and Transfer Switch		inspect as each
	Transformers	Non-utility owned only	inspect as each
	DC Power Substation / Traction Power Substation		inspect as each
	AC Power Substation		inspect as each
	Service Panels		inspect as each
Backup Power	Uninterruptible Power Supply (UPS)		inspect as each
Lighting	Interior Lighting		inspect as each
	Exterior Lighting		inspect as each
Other Electrical	Other Electrical Components	Conduits, etc.	inspect as each
Lightning Protection System	Lightning Protection System		inspect as each

Table A-7. Fire Protection

Category	Item	Notes	Unit of Measure
Fire Protection	Fire Detection System		inspect as each
	Fire Suppression Systems	Sprinklers, standpipes, extinguishers, hydrants	inspect as each

Table A-8. Conveyance

Category	Item	Notes	Unit of Measure
Elevators	Elevators		units
Escalators	Escalators		units
Lifts	Passenger Lifts		units

Table A-9. Equipment

Category	Item	Notes	Unit of Measure
Stationary Equipment	Hydrogen Fuel Cells		inspect as each
	Photovoltaic Panels		inspect as each
	Paint Booths		inspect as each
	Air Compressors		inspect as each
	Special Work Station Ventilation	Vehicle, welding, soldering, etc.	inspect as each
	Vehicle Washing Equipment		inspect as each
	Fall Protection Systems		inspect as each
	Rail Car Wash		inspect as each
	Sand Blasting System		inspect as each
	Radio Cell Towers		inspect as each
	In-Ground Lifts		inspect as each
	Other Stationary Equipment		inspect as each

Table A-10. Site

Category	Item	Notes	Unit of Measure
Site Equipment	Motor Fuel Island Tanks and FMU		units
	Tank Monitoring System		units
	Fuel Oil Tank		units
	Potable Water Tank		units
	Propane Tank		units
	Generator Tank	Independent from generator, i.e. not a base tank	units
	Chloride and Brine Storage Tanks		units
	Chloride System		inspect as each
	Brine System		inspect as each
Roads / Parking Lots / Sidewalk / Curbing	Access Road		sq. ft.
	Parking Lots		sq. ft.
	Sidewalks and Walkways		sq. ft.
	Pavement Markings		inspect as each
	Bollards and Handrails		inspect as each
Security	Fences		linear ft.
	Gates and Barrier Arms		inspect as each
	Camera / Surveillance System		inspect as each
	Guard Shack		inspect as each
Site Septic, Environmental, & Stormwater Management	Waste Oil Tank		units
	Waste Antifreeze Tank		units
	Wastewater Management / Drainage		inspect as each
	Oil-Water Separator Tank		units
	Sanitary/Stormwater Pumping Systems		inspect as each
	Septic System Tank		units
	Septic System Leaching Fields or Cesspools		inspect as each
	Septic System Reserve Field		inspect as each

For each of the items listed in Tables A-1 through A-10, an inspector may fill out the following "Yes/No" questions shown in Table A-11. These items were added following discussions with CTDOT and transit provider staff but are not directly applicable to the condition assessment ratings.

Using these questions could help an agency understand the importance of each asset while considering capital planning needs. The determination of safety critical, operations critical or the other fields could be initially made by the manager of the department in which the assets reside. The determination could then be reviewed and approved by Chief Operating Officer and Chief Financial Officer (who keeps the inventory).

An agency using these questions may want to establish further criteria for these items.

Table A-11. Yes/No Questions

Question	Description
Applicable?	Does the item exist at the facility / building? If it does, then answer Yes. If it does not, answer No.
Safety Critical?	A "Yes/No" question intended to highlight safety critical components.
Operations Critical?	A "Yes/No" question intended to highlight operations critical components.
Obsolete / Modernization?	A "Yes/No" question intended to highlight obsolete components.
Operating Savings Opportunity?	A "Yes/No" question intended to highlight operating savings opportunities.

Additional questions for an inspector to consider are listed below in Table A-12.

Table A-12. Additional Questions

Additional Questions
Is there adequate office space?
Is a break area provided?
Are male and female locker rooms and showers provided?
Is the facility ADA compliant?
Is the facility OSHA compliant?
Does a communications (data) system exist?
Does a phone system exist?

Appendix B. Recommended Inspection Procedures for Administrative and Maintenance Facilities

Facility condition assessment involves visual inspection of facility components to determine asset condition. This appendix includes recommended inspection procedures for administrative and maintenance facilities, organized by component and listed in Table B-1. These procedures are adapted from FTA's guidance document *TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation.*

Table B-1. Recommendation Facility Inspection Procedures

Component	Procedures
Substructure	• Foundations: Inspect walls, columns, pilings, other structural elements for signs of decay or structural integrity concerns. • Basement: Inspect non-foundation and structural elements such as facing materials, insulation, slab, floor underpinnings, crawl spaces, etc.
Shell (e.g., roof, exterior structure, walls)	• Inspect roof, including roof surface (tiles, membrane, shingles, gravel etc.), gutters, eaves, skylights, flashing, chimney surrounds, and sealants, hardware and painted or coated surfaces. Note evidence of ponding, or roof leaks, significant age – and other indicators that repair may be necessary. Note age of roof(s) and whether warranty is still in effect. • Inspect building envelope, façade, curtain wall system, glazing system, exterior sealants, exterior balconies, doors, stairways, and parapets. Note signs of cracks, openings, missing elements, detached elements, deteriorated sealants, and other issues that may lead to penetration of water into the building. Also, not any concerns with structural integrity. • Inspect fire escapes, noting any loose connections, deteriorated elements, or blockage, that would impact the function or safety of fire escapes. • Inspect gutters and downspouts. Note maintenance needs, need for cleaning, loose elements, and detachment. • Inspect superstructure / structural frame, including columns, pillars, and walls. Note any signs of decay or structural integrity concerns. • Inspect windows, doors, and all finishes (paint, masonry). Note any functionality or safety issues.
Interior	• Inspect soundness and finish of drywall, partitions, interior doors, fittings, ceiling tiles, and signage. • Inspect stairs including fire and access issues. • Inspect interior finishes, including materials used on walls, floors, and ceilings, such as tile, paint, and other coatings. Look for roughness and damage.
Plumbing	• Inspect fixtures and pipes for water distribution, sanitary waste, rainwater drainage, and any damage or leaks. • If not accessible, determine or estimate the age of plumbing system.

HVAC	• Inspect systems and their elements for energy supply, heating and cooling systems, distribution systems, terminal and package units, controls and instrumentation including testing and balancing, and chimneys. Specifically, inspect coils, housing, drains, and wiring and evaluate overall performance of the system. • Note apparent or reported age of the equipment, past material element replacements/ upgrades, and the apparent level of maintenance exercised. If heating equipment is shut down or not operational at the time of the walk-through survey, provide an opinion of the condition to the extent observed. Note refrigerants and fuels used and their suitability or need for improvement / upgrade. • If elements are not accessible, determine or estimate the age of the HVAC system.
Electrical	• Inspect electrical service & distribution, noting deficiencies or needed / recommended upgrades • Inspect lighting and branch wiring (interior and exterior), communications and security, noting deficiencies or needed / recommended upgrades • Examine other electrical system-related pieces such as lightning protection, generators, emergency lighting, and elements related to electrical service and distribution such as conduit, boxes, solar panels and mountings for any damage wire chaffing or loose or corroded connections. Evaluate overall performance of the system. • If elements are not accessible, determine or estimate the age of the electrical system.
Fire Protection	• Inspect sprinklers, standpipes, hydrants, fire alarms, emergency lighting, smoke evacuation, stairwell pressurization, and any other specialized elements relating to overall protection system and code compliance.
Conveyance (e.g., elevators, escalators, wheelchair lifts)	• Inspect condition, function, and code compliance of elevators, escalators, lifts, and any other fixed apparatuses for the movement of goods or people.
Equipment (e.g., lifts, washing systems)	• Inspect equipment, noting age, condition, and functional deficiencies or safety issues.
Site (e.g., sidewalks, parking lot, grounds)	• Inspect roadways/driveways and associated signage, markings, and equipment. Look for cracking or settling of the concrete or asphalt. • Inspect parking lots and associated signage, markings, and equipment. Look for cracking or settling of the concrete or asphalt • Inspect pedestrian areas and associated signage, markings, and equipment. Inspect the curbing and ramps for cracking, settling, holes, uneven surfaces and trip hazards. Pay special attention to wheelchair ramp areas and other ADA / access considerations • Site development such as fences, walls, and miscellaneous structures. Look for corrosion, structural integrity and condition of paint.

	• Landscaping, Site Utilities: Look for signs of drainage problems such as flooded areas, eroded soil and water damage to the asphalt and clogged storm drain inlets. • Visually inspect the irrigation system, if installed. Look for signs of leaks, such as sagging areas in grass and/or pooling water. Look for dead spots in the grass which would indicate lack of water possibly caused by a mechanical failure.

Appendix C. Detailed List of Items for Passenger Facility Condition Assessment

Tables C-1 through C-10 present detailed lists of items for condition assessment at passenger facilities. The tables are organized by the eleven components described in the approach. In addition to the items, the tables include notes for inspection (where applicable) and units of measure.

This information in this appendix is also included in a separate spreadsheet.

Table C-1. Substructure

Category	Item	Notes	Unit of Measure
Foundations	Exposed Foundation Elements		inspect as each
	Other Structural Components		inspect as each
Basement	Slab		sq. ft.

Table C-2. Shell

Category	Item	Notes	Unit of Measure
Superstructure	Structural Frame	Columns, pillars, walls	inspect as each
Roof	Roof Waterproofing		inspect as each
	Roof Penetration Flashing Systems	Chimney, skylights, eaves, surroundings	inspect as each
	Roof Drainage Systems	Gutters	inspect as each
Exterior	Building Envelope - Masonry/Concrete Walls		sq. ft.
	Building Envelope - Cladding		sq. ft.
	Building Envelope - Windows and Glazing		sq. ft.
	Building Envelope - Doors, Glazing, Door Hardware		sq. ft.
	Building Envelope - Garage Doors		sq. ft.
	Bird Proofing System		inspect as each
	Exterior Finishes		inspect as each
Shell Appurtenances	Means of Egress	Stairs, fire escapes	inspect as each
	Vertical Openings		inspect as each
	Cat Walks		inspect as each
Building Expansion Joints	Building Expansion Joints		linear ft.

Table C-3. Interior

Category	Item	Notes	Unit of Measure
Partitions	Interior Walls		sq. ft.
	Interior Windows and Glazing		sq. ft.
	Interior Doors, Glazing, Door Hardware		sq. ft.
Stairs	Interior Stairs and Landings		units
Finishes	Flooring System		sq. ft.
	Ceiling System		sq. ft.
	Wall Finishes		sq. ft.
Other	Interior Amenities	Signage, built-in furnishings, appliances	inspect as each
	Built-In Seating		inspect as each

Table C-4. Plumbing

Category	Item	Notes	Unit of Measure
Domestic Water Distribution	Water Heaters		inspect as each
	Water Treatment Systems		inspect as each
	Backflow Prevention		inspect as each
Pumps	Pumps	Sump, well, domestic	inspect as each
Bathroom Fixtures	Bathroom Fixtures		inspect as each
Other Plumbing Items / Fixtures	Other Plumbing Fixtures	Piping, insulation, etc.	inspect as each

Table C-5. HVAC

Category	Item	Notes	Unit of Measure
HVAC	Energy Recovery Units		units
	Heat Pumps		units
	Make-Up Units		units
	Air Handling Units		units
	Boilers		units
	Burners		units
	Furnaces		units
	Unit Heaters		units
	Radiant Heaters		units
	Finned Tube Radiation and Convertors		units
	Air Conditioning Units	Split package, commercial through-the-wall, water-cooled package	units
	Splits and Mini-Splits		units
	Cooling Towers		units
	Condensers	Air-Cooled, evaporative	units
	Chillers		units
	HVAC Air Terminals		units
	Fans	Centrifugal, axial, roof-mounted, propeller	units
	Coils		units
	Heat Exchangers		units
	Reciprocating Compressors		units
	Air Curtains		units
	Water Treatment System		inspect as each
	Other HVAC Pumps (excluding heat pumps)		inspect as each
	Other HVAC Components	Piping, ductwork, etc.	inspect as each

Table C-6. Electrical

Category	Item	Notes	Unit of Measure
Electrical Service / Distribution	Power Distribution / Switchgear	Service entrance through subpanels	inspect as each
	Generator and Transfer Switch		inspect as each
	Transformers	Non-utility owned only	inspect as each
	DC Power Substation / Traction Power Substation		inspect as each
	AC Power Substation		inspect as each
	Service Panels		inspect as each
Backup Power	Uninterruptible Power Supply (UPS)		inspect as each
Lighting	Interior Lighting		inspect as each
	Exterior Lighting		inspect as each
Other Electrical	Other Electrical Components	Conduits, etc.	inspect as each
Lightning Protection System	Lightning Protection System		inspect as each

Table C-7. Fire Protection

Category	Item	Notes	Unit of Measure
Fire Protection	Fire Detection System		inspect as each
	Fire Suppression Systems	Sprinklers, standpipes, extinguishers, hydrants	inspect as each

Table C-8. Conveyance

Category	Item	Notes	Unit of Measure
Elevators	Elevators		units
Escalators	Escalators		units

Table C-9. Fare Collection

Category	Item	Notes	Unit of Measure
Fare Collection	Turnstiles		units
	Ticket Machines		units
	Other Fare Collection Items		inspect as each

Table C-10. Platform

Category	Item	Notes	Unit of Measure
Structure	Overlay		inspect as each
	Double Tee		inspect as each
	Joints		inspect as each
	Bearings		inspect as each
	Footing		inspect as each
	Rail Post Foundation		inspect as each
	Rail Post Connection		inspect as each
	Railing Connection		inspect as each
	Paint/Coatings		inspect as each
	Stairs/Ramps		inspect as each
	Other		inspect as each
Canopy (Deck)	Columns		inspect as each
	Structural Connections		inspect as each
	Roof Framing Elements		inspect as each
	Roof Decking		inspect as each
	Drainage System		inspect as each
	Skylights		inspect as each
	Electrical Connections		inspect as each
	Non-Electrical Connections		inspect as each
	Snow Guards		inspect as each
	Column Footings		inspect as each
Electrical	Emergency Lighting		inspect as each
	Platform Lighting		inspect as each
	Grounding		inspect as each
	PA System		inspect as each
	PIDS System		inspect as each
	VMS Signs		inspect as each

Table C-11. Site

Category	Item	Notes	Unit of Measure
Roads / Parking Lots / Sidewalk / Curbing	Access Road		sq. ft.
	Parking Lots		sq. ft.
	Sidewalks and Walkways		sq. ft.
	Pavement Markings		inspect as each
	Bollards and Handrails		inspect as each
Security	Fences		linear ft.
	Gates and Barrier Arms		inspect as each
	Camera / Surveillance System		inspect as each
	Guard Shack		inspect as each
Site Septic, Environmental, & Stormwater Management	Wastewater Management / Drainage		inspect as each
	Oil-Water Separator Tank		units
	Sanitary/Stormwater Pumping Systems		inspect as each
	Septic System Tank		units
	Septic System Leaching Fields or Cesspools		inspect as each
	Septic System Reserve Field		inspect as each

For each of the items listed in Tables C-1 through C-11, an inspector may consider the following questions shown in Table C-12.

These items were added following discussions with CTDOT and transit provider staff but are not directly applicable to the condition assessment ratings.

Using these questions could help an agency understand the importance of each asset while considering capital planning needs. The determination of safety critical, operations critical or the other fields could be initially made by the manager of the department in which the assets reside. The determination could then be reviewed and approved by Chief Operating Officer and Chief Financial Officer (who keeps the inventory).

An agency using these questions may want to establish further criteria for these items.

Table C-12. Yes/No Questions

Question	Description
Applicable?	Does the item exist at the facility / building? If it does, then answer Yes. If it does not, answer No.
Safety Critical?	A “Yes/No” question intended to highlight safety critical components.
Operations Critical?	A “Yes/No” question intended to highlight operations critical components.
Obsolete / Modernization?	A “Yes/No” question intended to highlight obsolete components.
Operating Savings Opportunity?	A “Yes/No” question intended to highlight operating savings opportunities.

Additional questions concerning the entire facility for an inspector to consider are listed below in Table C-13.

Table C-13. Additional Questions

Additional Questions
Is there adequate office space?
Is a break area provided?
Are male and female locker rooms and showers provided?
Is the facility ADA compliant?
Is the facility OSHA compliant?
Does a communications (data) system exist?
Does a phone system exist?

Appendix D. Detailed Rail Guideway Asset Hierarchy

CTDOT organizes transit assets according to an asset hierarchy. One of the four top-level categories of the hierarchy is fixed guideway, which is divided into rail and bus assets at the second level. The rail guideway hierarchy is further broken down in three additional levels, presented below in Table D-1. Note that this is an ideal hierarchy based on the approach being developed by MNR. CTDOT's working hierarchy, based on MNR's working hierarchy, is presented in Tables 8 and 9.

Table D-1. Detailed Rail Guideway Asset Hierarchy

Level 3	Level 4	Level 5
Track	Main	Block
		Control Point Track
		Grade Crossing
		Station
	Branch	Control Point Switch
		Yard
Power	Supply System Traction Power	Equipment
		Site
		Building
		Cable Plant
	Supply System Transmission Power	Equipment
		Site
		Building
		Cable Plant
	Traction Power Distribution	Test Equipment
		Negative Return System
		Catenary Equipment
		Cable Plant
	Signal Power System	Equipment
		Site
		Building
		Cable Plant
Structure	Undergrade Structure	Moveable Bridge
		Fixed Bridge

		Culvert
	Retaining Wall	Below Grade Retained Cut
		Elevated Retained Fill
	Overhead Structure	Catenary Portal Structure
		Miscellaneous Structure
		Overhead Bridge
Signals/Communications	Signaling	Block Signal System
		Interlocking
		Highway Rail Grade Crossing Network
	Train Detection Control	Train Fault Detection
		Yard Detection
	Communications/Monitoring	Communication Devices
		Fiber Optic System
		Aerial Communication Network
		Outside Cable Plant
		Passenger Communication System
	Security Systems	Integrated Electronic Security System
		Closed Circuit TV
		Fire Alarm System
		Access Control System
	Positive Train Control (Network)	Wayside Communication Network
		Back Office System
		Wayside Maintenance of Way System
		On-Board System