



6. VEHICLE GUIDELINES

It is important to note that these Transitway Guidelines are not meant to be overly prescriptive, but rather provide a basis for understanding the elements important to vehicle decision making in an industry where technology, styling, and vendors are evolving quickly. The Transitway Guidelines should be considered collectively when making vehicle decisions for transitways.

6.1. LRT AND COMMUTER RAIL VEHICLES

The vehicles for LRT and Commuter Rail must be compatible with the existing rail and infrastructure systems and must adhere to current state and federal law.

Future vehicle purchases will consider compatibility with the existing rail and infrastructure systems as the factor of utmost importance. Effective January 1, 2015, Minnesota Statute 473.4056 established that all light rail vehicles must meet or exceed the standards established in the Americans with Disabilities Act. The statute also established that all vehicles must include two dedicated spaces for wheelchair users in each car and seating for a companion adjacent to each of the wheelchair-dedicated spaces.

6.2. BUS RAPID TRANSIT VEHICLE SIZING AND CAPACITY REQUIREMENTS

When determining the vehicle sizing and seating requirements for BRT station-to-station service, it is important to consider the service type and characteristics. Important considerations should include:

- **Passenger load standards/peak loads**
- **Passenger trip lengths (time and distance)**
- **Ridership demand at end of vehicle life**
- **Service characteristics (speed, maneuvering)**
- **Interior organization of vehicle features such as seats, wheelchair securements, fare-collection equipment, and bicycles**

This guideline is a tool for bus rapid transit (BRT) planners and implementers to understand the important considerations when sizing and configuring a vehicle for BRT station-to-station service. There is no “ideal” BRT vehicle that will fit the needs of every corridor in the region. In addition, a guideline recommending a specific vehicle configuration would limit the flexibility of those vehicles for use on other corridors or as characteristics of the corridor change. All vehicles should be ADA compliant. Table 6-1 summarizes vehicle types and their passenger loads and appropriate service types. BRT station-to-station vehicles would match with options associated with local service but a more detailed analysis of service type using the considerations listed above should be done in addition to the guidance in the following sections.



Vehicle type should be determined and purchased according to service types and passenger loads. Interlined and start-up services may provide exceptions.

Table 6-1 – Metropolitan Council Fleet Management Procedure: Vehicle Type Determination Chart

Vehicle Type	Passenger Loads*	Service Type	Minimum Vehicle Life
Commuter Coach	Min: 30 Max: 57	Express with a one-way trip length greater than 15 miles AND duration greater than 30 minutes	14 years
Articulated Diesel Transit Bus	Min: 30 Max: 58 (Express) Max: 73 (Urban Local)	Express, Local	12 years
Articulated Hybrid Transit Bus	Min: 44 Max: 73	Local	12 years
40' Hybrid Transit Bus	Min: 29 Max: 48	Local	12 years
40' Diesel Transit Bus	Min: 20 Max: 38 (Express) Max: 48 (Local)	Express, Local	12 years
30' Transit Bus	Min: 13 Max: 26	Medium-Volume Local; Low-Volume Express	12 years

*Peak loading pattern

6.3. PASSENGER BOARDING ON BRT VEHICLES

Boarding on BRT service should be as quick and convenient as possible for all passengers. All vehicles should be ADA compliant. Important considerations should include at a minimum:

- **Location of wheelchair access and type of securement**
- **Location and quantity of bicycle storage**
- **Boarding demand at each station**
- **Opportunity for level boarding**
- **Number and width of doors**
- **Fare-collection technology (on-board or off-board)**
- **Interior organization of seating and other features**

The disability community prefers wheelchair securements to be as close to the wheelchair-loading door and as easily navigable as possible. In addition, wheelchair securement technology is rapidly changing, increasing the speed and ease of boarding. Innovation in wheelchair securements should be explored for transitway vehicles. The same concepts apply to bicycle storage, but it is also important to ensure that bicycles do not interfere with passenger movements and do not negatively affect the



ability to serve demand for space in the vehicle. Other region examples exhibit the need for multiple-door boarding and off-board fare collection, and the need for space provided by an articulated bus when considering on-board bicycle storage.

Passenger boarding speed and convenience is related to demand at each station. Boarding at low-demand stations may be quick and convenient with limited improvements over existing service while higher-demand stations may require additional amenities to improve boarding speeds (such as multiple-door boarding or wider doors). The organization of seating and interior features and opportunity for level boarding also affects the passenger boarding process.

6.4. CUSTOMER COMFORT AND SAFETY ON BRT VEHICLES

BRT station-to-station vehicles should create a safe, secure and comfortable environment for passengers and drivers. Important considerations should include at a minimum:

- **Natural and artificial lighting**
- **Window size, number, type, tint**
- **Color scheme**
- **Seating arrangement, style, and standing stanchions and handles**
- **Opportunity for off-board fare collection**

BRT vehicles should be designed to ensure the safety of both passengers and drivers during transport and during boarding and alighting. Vehicles should be designed to create a sense of personal security and personal comfort for passengers. Visibility, lighting, and easy access to and from the vehicle are important aspects to consider.

BRT station-to-station vehicles should feel similar to LRT vehicles (LRVs) in the interior. The level of investment in these corridors warrants a higher-quality design inside vehicles with improved, distinctive features, and a distinctive feel. For example, LRVs use fixed windows that do not open and the interior is climate-controlled at all times. This approach reduces interior noise and provides a consistent climate for passengers in the vehicles.

6.5. INTERIOR AND EXTERIOR STYLING OF BRT VEHICLES

The exterior and interior of BRT vehicles should portray the sleek, modern, and premium experience of BRT station-to-station service. This can be accomplished through a combination of styling and branding/paint scheme options.

The styling of both the interior and exterior of BRT vehicles is closely tied to the aesthetics at a snapshot in time and the identity and branding of the vehicle. As vehicle technology evolves at a rapid pace, it would be difficult to maintain a distinctively more modern look for vehicles operating BRT service over other vehicles in the regional fleet. In many cases, regional providers are already operating BRT-style vehicles on regular bus service. In order to maintain a distinctive look, BRT vehicles should



portray the characteristics of the service using a combination of styling options that are available at the time of purchase and branding/paint schemes developed for the service.

6.6. INTERIOR NOISE ON BRT VEHICLES

BRT station-to-station vehicles should strive to achieve interior noise levels similar to LRT. Primary sources of interior noise from buses include heating, ventilating, and air conditioning systems, fare-collection equipment, door and window build type, overall build quality, and engine noise.

Vehicle-related noise levels inside LRT vehicles are lower than those inside buses in the regional transit fleet. Much of the noise inside buses comes from the engine, mechanical components (HVAC, fare box), and wind noise from open or leaky windows and doors. LRVs have less engine noise, fewer mechanical components, and more secure doors and windows. The rail guideway for LRT is also a contributing factor behind the reduced interior vehicle noise, but the quality of the ride for BRT as it relates to guideway is often outside the scope of the vehicle specifications.

6.7. FEATURE INTEGRATION ON BRT VEHICLES

Features of the BRT station-to-station vehicles (customer information technology, security systems, etc.) should be integrated into the design of the bus as much as possible.

Outfitting BRT vehicles with technology that is integrated into the original design of the vehicle rather than becoming a post-delivery add-on is important. This requires the technology features of a vehicle to be known and clearly articulated during the design of the original specifications. When technology features are integrated into the design of the vehicle, it illustrates to the customer that technology and customer information are important components of the service and creates a premium feel, similar to LRT.

6.8. PROPULSION TECHNOLOGY FOR BRT VEHICLES

BRT vehicle propulsion should be assessed on an individual basis for each transitway and vehicle purchased for the transitway in the region. Important considerations for the propulsion technology assessment include:

- **Compatibility with existing support infrastructure and staff expertise**
- **Life-cycle cost of propulsion technology and associated operating costs (including any costs for associated support facilities)**
- **Operating characteristics of service**
- **Externalities such as affect on environment, land uses immediately adjacent to transitway, and noise**



The analysis of vehicles in this region and other regions illustrated that propulsion technology has a significant effect on vehicle capital costs. The technology can also have a significant effect on support infrastructure and maintenance and staff training. Depending on service characteristics, hybrid technology can reduce fuel consumption and have an effect on operating costs. There can also be environmental and perception benefits associated with hybrid vehicle technology. However, standard diesel propulsion technology is becoming cleaner, quieter, and more efficient. It is impossible to determine what propulsion technologies will be in the future and it is difficult to recommend a one-size-fits-all technology for BRT transitways around the region. Thus, the recommendation is to do an analysis of different considerations related to vehicle propulsion for each implementation of BRT vehicles including funding availability and local support.

6.9. COST CONSIDERATIONS FOR BRT VEHICLES

Cost assumptions for BRT station-to-station vehicle purchases should be developed collaboratively, with parties responsible for the following:

- **Transitway development**
- **Initial vehicle funding**
- **Vehicle procurement, operations, repair, and replacement**

These cost assumptions should be developed early in the transitway planning process and collaboratively revisited as the transitway progresses through development.

Vehicles may also include opportunities for enhancements above agreed on vehicle designs. The desire to include such enhancements, called local betterments, should be coordinated with the funding and operating partner agencies in the earliest stage of the development process. Early coordination should include the local entity requesting the betterment and specific discussion about commitments to fund the incremental costs of the betterment, including any associated incremental costs such as facility needs, ongoing repair and maintenance, training, and/or replacement.

Technical information and regional expertise verified the wide range of factors that affect vehicle costs including: propulsion technology, styling options, availability of replacement parts, order quantity, testing requirements, procurement timeline, warranty information, customization options for component feature selection, evolving technology, fleet integration, and emission standards. Given the uncertainty of many of these factors for the BRT fleet, it is difficult to identify specific cost guidelines for BRT vehicles. Instead, it is recommended that the discussion about vehicle costs be a collaborative effort between the funding and operating partner agencies to identify vehicle options that align with the Transitway Guidelines and are acceptable to the stakeholders.

Similarly, if the stakeholders cannot come to consensus on an acceptable vehicle, local betterments may need to be addressed early in the transitway process. Vehicle betterments can have significant effects on other transitway components and may need to be coordinated with other betterments, as determined by the collaborative partners.



6.10. BRT VEHICLE INTEGRATION AND COMPATIBILITY

BRT station-to-station vehicles do not need to be integrated with the standard fleet. Branding schemes may preclude the use of standard fleet vehicles on BRT transitways for daily BRT operations. To the extent possible, BRT station-to-station vehicles should be compatible across transitways for ease of through-routing, potential cost savings, and flexibility in reallocating vehicles with changing service plans and passenger loads.

No recommendations are made requiring that BRT vehicles be the same as the regular fleet because it is too restrictive and would limit the branding options to distinguish the vehicle.