BRT STANDARD 2012

THE BRT STANDARD

Version 1.0

The BRT Standard Version 1.0

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Foreword

The first bus rapid transit system opened in Curitiba, Brazil, in 1974, and remains one of the best in the world today. After its opening, there were many imitators across Brazil and in other countries, including the United States. Some of these imitators brought real improvements, but most had only a handful of the elements that made Curitiba's BRT such a phenomenal success. A few of these busways, by concentrating large numbers of polluting old buses onto a single corridor, slowed buses down and blighted adjacent real estate. The Brazilian general public, unfamiliar with the technical differences between the Curitiba BRT system and other busways, became disillusioned with BRT as a solution to its mass-transit problems, and from the mid-1980s until 2012 no new full-featured BRT systems were built in Brazil.

Starting in 1998, there was a second wave of BRT systems. Most significantly, in 2000, Bogotá opened the TransMilenio BRT system. TransMilenio significantly surpassed Curitiba in terms of speed, capacity, quality of service, and the richness of services offered. Its success spurred a number of cities worldwide to build BRT systems, some of which turned out extremely well, bringing new innovations and refinements. The Institute for Transportation and Development Policy (ITDP) and other members of the BRT Standard committee have been lucky enough to be involved in many of these projects. As a result of this rapidly growing body of experience with BRT systems, the international BRT technical community has a much better understanding today of the essential elements of the best BRT systems than it did a decade ago.

At the same time, because there was no agreement on a quality standard for BRT systems, history began to repeat itself. For every new BRT system that was world class, dozens opened that lacked many of the essential features of BRT. The residents and decision makers in cities where these systems were built were largely unaware of the differences between their system and the best BRT systems. As happened in Brazil in the 1980s, in a growing number of such cities, the public and political leaders came to associate BRT with a quality of service significantly inferior to what was expected from rail-based alternatives. This phenomenon occurred in countries from the United States to China, India, and Indonesia, where some new systems were built that actually made conditions worse for transit passengers.

Starting in 2010, ITDP, with support from the Rockefeller Foundation, decided that the time was right to develop a BRT Standard. It was initially developed as a metric for determining the degree to which existing BRT systems in the U.S. were consistent with international best practice. As we faced a similar need in other countries, we began to recognize the applicability of the standard for international use.

In 2011 ITDP convened a meeting in Bogotá bringing together engineers who had worked on the highest-quality BRT systems. Together, we tried to further distill the system features most critical to good BRT performance, and to weigh them in terms of their relative importance. While there was much dispute on the margins, the technical community already had a fairly common understanding of the essential elements of best practice in BRT systems. Throughout 2011 the scoring system was further vetted with experts from the U.S. and abroad, then tested on dozens of systems to see whether the scores seemed consistent with the better-performing systems.

This document, the BRT Standard version 1.0, was developed as a result of that year-long effort.

We hope that the BRT Standard will help encourage municipalities to at least consider the key features of the best BRT systems, and that a few cities will be inspired to go beyond what has been done before. We hope it will be useful to citizens' groups, allowing them to demand better quality and performance from their political leaders. Finally, we look forward to certifying and celebrating those cities that succeed in developing the highest-quality BRT systems.

Sincerely,

Walter Hook
Chief Executive Officer, ITDP

Introduction

The BRT Standard is an effort by leading technical experts to come to a common understanding of what constitutes internationally recognized best practice in BRT system design. The best BRT systems are ones that combine efficiency and sustainability with passenger comfort and convenience. The BRT Standard uses design characteristics that act as proxies for enhanced performance and customer experience. This scoring method celebrates high-quality BRTs, but is not intended to denigrate lighter BRT improvements which may also yield important benefits to customers.

Many people remain unaware of the characteristics of the best BRT systems and their potential to provide a quality of customer service usually associated with metros and subways. This lack of awareness frequently results in demands for rail when BRT may be a comparable and cost-effective alternative. It can also result in inaccurately labeling minimal improvements to standard bus service as BRT.

The BRT Standard provides a framework for system designers, decision makers, and the sustainable transport community to implement and identify top-quality BRT systems. A corridor of a system can be certified as Gold Standard, Silver Standard, or Bronze Standard based on the scorecard. 2012 is a pilot year to test the scorecard and make modifications as needed.

Version 1.0 of the BRT Standard is the culmination of a review by the BRT Standard Committee undertaken during 2011. Only the BRT Standard Committee is currently authorized to confer the BRT Standard Gold, Silver, or Bronze certification on a BRT system.

Who is the BRT Standard Committee?

The BRT Standard Committee is a select group of leading BRT experts that have worked on many of the world's best BRT systems. The committee helped develop the scorecard through reviewing and recommending changes, ultimately signing off on it technically. They will also be charged with testing the scorecard during the pilot year. ITDP is the main convener and secretariat of the BRT Standard. The committee is composed of the following experts who also represent their institutions unless otherwise indicated by an (*):

Walter Hook, *ITDP*
Lloyd Wright, *Asian Development Bank**
Dario Hidalgo, *EMBARQ**
Gerhard Menckhoff, *World Bank (retired)*,
ITDP Vice President
Wagner Colombini Martins, *Logit Consultoria*
Carlos Felipe Pardo, *Slow Research*
Pedro Szasz, *Consultant*
Ulises Navarro, *Modelistica*
Scott Rutherford, *University of Washington*

The emissions scoring detail for buses was recommended by the International Council on Clean Transportation, a member of the Best Practice Network of the ClimateWorks Foundation. Lew Fulton and Tali Trigg of the International Energy Agency have also endorsed the BRT Standard.

What is the BRT Standard?

Certifying a BRT system as Gold, Silver, or Bronze will set an internationally recognized standard for what constitutes best practice in BRT. The elements of best practice recognized by the BRT Standard will have a positive impact on ridership and quality of service in most conditions and contexts. The measures that receive points in the BRT Standard have been evaluated in a wide variety of contexts and when present, they result in consistently improved system performance.

Points are only awarded for those elements of system design that generally improve operational performance and quality of service or minimize adverse environmental impacts of the traffic system. The criteria used to determine the point system were as follows:

- *The points should act as proxies for a higher quality of customer service (speed, comfort, capacity, etc).*
- *The points should be awarded based on a general consensus among BRT experts on what constitutes best practice in system planning and design, and their relative importance.*
- *The points should reward good, often politically-challenging, design decisions made by the project team that will result in superior performance, rather than rewarding system characteristics that may be innate to the corridor.*
- *The metrics and weightings should be easily and equitably applicable to a wide range of BRT systems in different contexts—from lower-ridership, smaller systems to larger, high-volume systems.*
- *The basis for the score should be reasonably clear and independently verifiable without recourse to information that is not readily obtained.*

The BRT Standard depends on easily-observable system characteristics that are associated with high performance. This is, for now, the most reliable and equitable mechanism for recognizing quality in different BRT systems rather than performance measurements. The main reasons for this approach include:

- **The ability to assess both planned and existing systems:** *The BRT Standard is intended to help guide planning and design decisions prior to system implementation. The scoring tool is usable both for planned and built systems, whereas performance standards are only applicable when assessing existing systems.*
- **Good data is rare and expensive:** *While the effect of the system on door-to-door travel time and cost is the ideal appraisal-performance metric, this data is extremely difficult, expensive, and time consuming to collect, and nearly impossible to independently corroborate.*
- **Performance indicators can create perverse incentives:** *Many of the easiest-to-collect performance indicators can create perverse incentives when used in isolation of other harder-to-obtain metrics. For instance, increased bus speeds in the U.S. have generally been achieved by eliminating station stops. While this may be justified in many cases, it can result in longer walking times for passengers. As such, giving points for higher speeds would create a perverse incentive to reward project developers who eliminate more bus stops.*

The BRT Standard, therefore, is needed for recognizing higher-quality systems on a comparable basis in addition to performance-based analysis. Attempts to reliably collect data across a wide variety of systems and compare them in a manner that fairly rewards the better performers have simply proved futile to date. The lack of access to reliable before-and-after information about the effects of the BRT corridor that can be independently corroborated, as well as the complexity of identifying fair and comparable metrics, have undermined efforts to develop a fair recognition scheme.

However, we recognize that a scoring system divorced from any performance metrics also has limitations. The measures included in the BRT Standard will almost always tend to improve performance if the corridor is designed properly for the ridership. If a system or corridor, however, is poorly designed, there is a risk that the BRT system could saturate and congest, reducing bus-operating speeds and making conditions worse for passengers.

To mitigate the risk of conferring a quality brand on a system with good BRT elements but improper sizing, management, or regulations, we decided to assign a limited number of penalty points applicable for already-operational systems where some readily-observable baseline performance metrics were not met.

The BRT Standard has been developed to weigh all BRT systems according to the same criteria rather than relative to a system's demand or a city's population. It does not differentiate based on high-demand, medium-demand, and low-demand BRT systems. The purpose of the BRT Standard is to create one definition of international best practice. Separate scoring systems would undermine that intention.

Going for gold will almost always result in better performance and better quality of service, but may not always be justified from a cost-effectiveness perspective. In most cities, it is possible to achieve Gold Standard in at least some corridors in a cost-effective manner, but a bronze system may be more appropriate in some cases. If a system has not achieved a high BRT Standard score, this does not mean that the system designers did not do a good job. It may be that more significant measures were not justified in a particular case.

The BRT Standard complements other project appraisal tools

The BRT Standard measures how closely a proposed or existing system resembles best practice. Evaluating whether a Gold Standard BRT is justified or well designed for a particular location is better answered by a fair cost benefit analysis or other project appraisal tools that are typically used to evaluate a project in planning phases.

The BRT Standard is intended to complement, and not replace, cost-effectiveness measurements, cost-benefit appraisal tools, and system-performance evaluations. Were the BRT Standard used in isolation of other cost-appraisal methodologies it could potentially encourage overspending on higher-quality BRT infrastructure. This risk should be mitigated by the continued use of cost-effectiveness appraisal or other forms of cost-benefit analysis.

In addition, the BRT Standard may be used as part of broader carbon-measurement tools, but should not replace them, as it only measures certain elements of a BRT project's carbon impacts.

For instance, the Global Environmental Facility (GEF) has recently developed the Transport Emissions Evaluation Models for Projects (TEEMP) tool to predict the likely carbon abatement potential of projects applying for GEF funding that are only in the planning stage. The TEEMP BRT model uses the BRT Standard as the basis for making certain assumptions about the likely speed, modal shift impact, and ridership of a planned new BRT system when more sophisticated modeling data is unavailable.

Similarly, the BRT Standard may be a useful element of project appraisal as a way of testing the credibility of speed improvements or other performance claims made as part of a more systematic “performance-based” metric, such as the U.S. Federal Transit Administration’s cost-effectiveness analysis or the internal rate-of-return analysis required by the development banks during project appraisal, but it is not a replacement for these appraisal tools.

The BRT Standard: Pilot Process

The BRT Standard version 1.0 is a pilot being tested by the BRT Standard Committee during the first half of 2012. Over the past year, the committee considered a wide range of scorecard indicators. Many of these were included in the final scoring system, but some were determined to be beyond the scope of the scorecard.

Land use and green architecture in station design, for example, are recognized as important and should be encouraged in all BRT systems, but are not included. For land use and transit-oriented development, LEED ND’s certification scheme is recommended as the measurement tool for land use-related elements of a BRT project.

After much debate, it was decided not to award any points for good system-management structures, despite the fact that there was a consensus that many of the most important elements of BRT are related to high-quality management. While these issues are critical, some of them are too controversial or too context specific to achieve unanimity for an international standard scoring system. There are many ways that the system operator can achieve higher-quality performance through different contract structures or performance metrics in various regulatory environments, and we were unable to craft a metric to include in this scoring system.

Ultimately, the BRT Standard has two main uses:

1. *To evaluate systems already built to recognize those systems that are of the highest quality. These scorings will be released once a year and will be used as a means to compare systems and reward and celebrate those that have made politically courageous and technically difficult decisions.*

2. *To be used by planners, decision makers, and concerned citizens as a way to evaluate BRT corridors in the planning phase. It will function as a mechanism to understand how close plans come to international best practice and to illuminate where changes could be made to improve the system.*

After the 2012 testing period, the committee will convene again and review comments and scoring and make adjustments. Finalization of the BRT Standard will happen by October 2012, with the goal of releasing the BRT Standard in 2013.

The BRT Standard Committee looks forward to making this an even stronger tool for creating better BRT systems and encouraging better public transport that benefits cities and citizens alike.

BRT Standard Scorecard

This scorecard shows the criteria and point values that make up the BRT Standard, followed by a detailed description for each.

CATEGORY	MAX SCORE
SERVICE PLANNING	
Off-board fare collection	7
Multiple routes	4
Peak frequency	4
Off-peak frequency	3
Express, limited, and local services	3
Control center	3
Located In top ten corridors	2
Hours of operations	2
Multi-corridor network	2
INFRASTRUCTURE	
Busway alignment	7
Segregated right-of-way	7
Intersection treatments	6
Passing lanes at stations	4
Minimizing bus emissions	4
Stations set back from intersections	3
Center stations	3
Pavement quality	2

	MAX SCORE
STATION DESIGN AND STATION-BUS INTERFACE	
Platform-level boarding	6
Safe and comfortable stations	3
Number of doors on bus	3
Docking bays and sub-stops	2
Sliding doors in BRT stations	1
QUALITY OF SERVICE AND PASSENGER INFORMATION SYSTEMS	
Branding	3
Passenger information	2
INTEGRATION AND ACCESS	
Universal access	3
Integration with other public transport	3
Pedestrian access	3
Secure bicycle parking	2
Bicycle lanes	2
Bicycle-sharing integration	1
TOTAL	**100**

POINT DEDUCTIONS	
Low commercial speeds: minimum average commercial speed below 13 kph (8 mph)	-10
Peak passengers per hour per direction (pphpd) below 1,000	-5
Lack of enforcement of right-of-way	-5
Significant gap between bus floor and station platform	-5
Station encroaches on sidewalk or busway	-3
Overcrowding	-3
Poorly-maintained buses and stations	-3
Distances between stations too long or too short	-2

Gold: 85 points or above

Silver: 70–84 points

Bronze: 50–69 points

Scoring in Detail

Definition of a BRT Trunk Corridor

The BRT Standard is to be applied to specific BRT trunk corridors rather than to a BRT system as a whole. This is because the quality of BRT in cities with multiple corridors can vary significantly. For the purposes of the BRT Standard, a BRT trunk corridor is defined as follows:

> *"A section of a road or contiguous roads served by a bus route or multiple bus routes, including the section(s) where the majority of transit trips in the area pass."*

The primary reason for defining the corridor in this way is that in some cities BRT infrastructure is built on the approaches to the city center but then ends just short of the highest-demand part of the bus route(s) in the city center. In order to avoid rewarding BRT systems for leaving out the most difficult, high-demand sections of the bus routes, the corridor length needs to be defined as including the highest-demand, downtown parts of a route. In this way, the corridor will score higher on several of the indicators only if the BRT infrastructure enters the area of highest demand.

Off-board Fare Collection

7 POINTS MAXIMUM

Off-board fare collection is one the most important factors in reducing travel time and improving the customer experience.

There are two basic approaches to off-board fare collection: “Barrier-controlled,” where passengers pass through a gate, turnstile, or checkpoint upon entering the station where their ticket is verified or fare is deducted, or “proof-of-payment,” where passengers pay at a kiosk and collect a paper ticket which is then checked on board the vehicle by an inspector. Both approaches can significantly reduce delay. However, barrier-controlled is slightly preferred because:

- *It is somewhat easier to accommodate multiple routes using the same BRT infrastructure;*
- *It minimizes fare evasion, as every passenger must have his/her ticket scanned in order to enter the system, versus proof-of-payment which requires random checks;*
- *Proof-of-payment can cause anxiety for passengers who may have misplaced lost tickets;*
- *The data collected by barrier-controlled systems upon boarding, and sometimes upon alighting, can be useful in future system planning.*

On the other hand, proof-of-payment systems on bus routes that extend beyond trunk BRT corridors extend the benefits of time savings to those sections of the bus routes that lie beyond the BRT trunk corridor.

Kiosk to buy a ticket for proof-of-payment system, Las Vegas, USA

Turnstiles in Guatemala City’s BRT

OFF-BOARD FARE COLLECTION	POINTS
100% of trunk stations have barrier-controlled, off-vehicle fare collection	7
75% + of trunk stations have barrier-controlled, off-vehicle fare collection	6
Proof-of-payment on all routes that touch the trunk corridor	6
60–75% of trunk stations have barrier-controlled, off-vehicle fare collection	5
45–60% of trunk stations have barrier-controlled, off-vehicle fare collection	4
Proof-of-payment on some routes that run on the trunk corridor	3
30–45% of trunk stations have barrier-controlled, off-vehicle fare collection	2
15–30% of trunk stations have barrier-controlled, off-vehicle fare collection	1
< 15% of trunk stations have barrier-controlled, off-vehicle fare collection	0

Multiple Routes

4 POINTS MAXIMUM

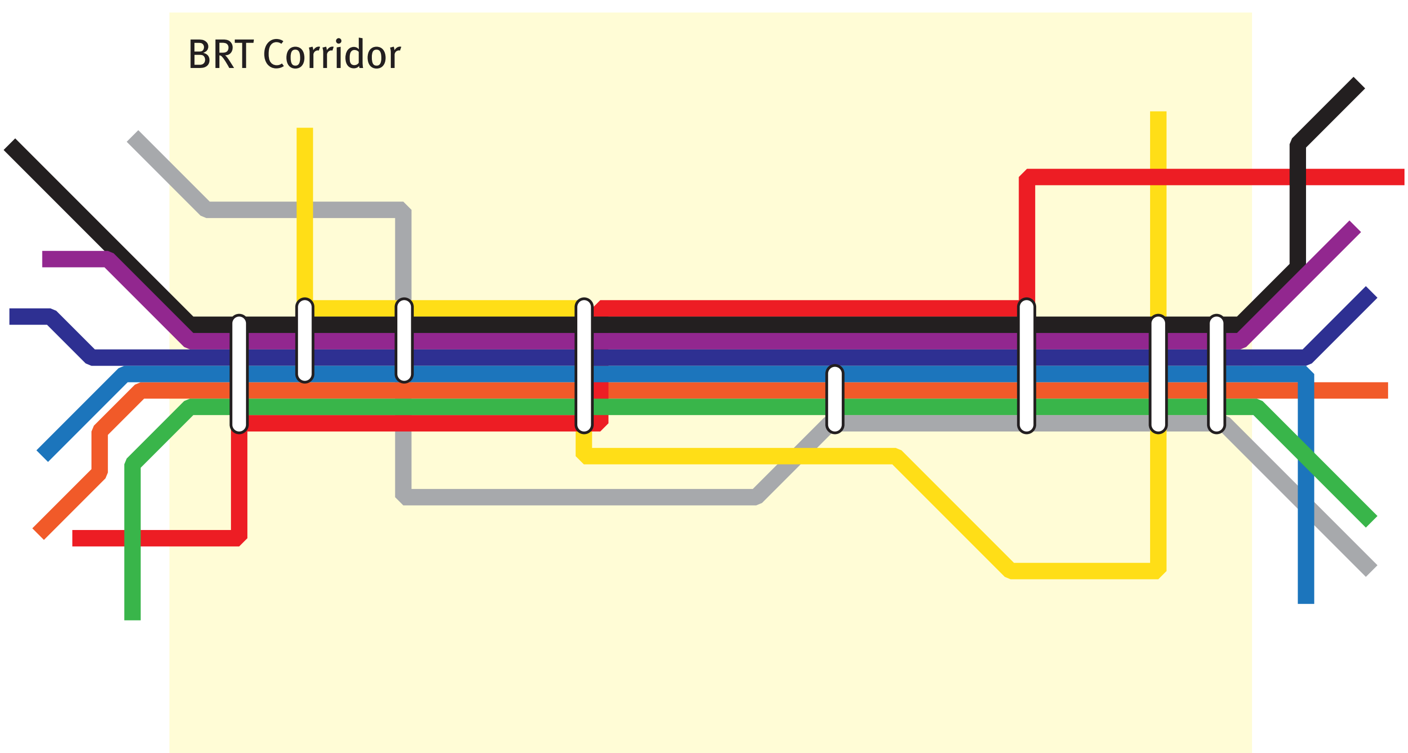
Having multiple routes operate on a single corridor is a good proxy for reduced door-to-door travel times by reducing transfer penalties.

This can include:

- *Routes that operate over multiple corridors, as exists with TransMilenio in Bogotá or Metrobús in Mexico City;*
- *Multiple routes operating in a single corridor that go to different destinations once they leave the trunk line, as exists with the Guangzhou, Cali, and Johannesburg BRT systems.*

This flexibility of bus-based systems is one of the primary advantages of BRT that is frequently not well used or understood.

MULTIPLE ROUTES	POINTS
Two or more routes exist on the corridor, servicing at least two stations	4
No mulitple routes	0



Mexico City's Metrobús, added an additional 20,000 daily passengers just by eliminating the transfer penalty with a direct route connecting Corridor I (Insurgentes) with Corridor II (Eje 4).

Guangzhou has multiple routes, as seen in the passenger information sign, that run on the same corridor.

TransMilenio, Bogotá, Colombia

Peak Frequency

4 POINTS MAXIMUM

How often the bus comes during peak travel times such as rush hour is a good proxy for quality of service and corridor selection. A higher frequency usually means higher ridership, although the scoring of peak frequencies have been set at levels that still allow systems in lower-demand environments to receive some points. Additionally, in order for BRT to be truly competitive with alternative modes, like the private automobile, passengers need to be confident that their wait times will be short and the next bus will arrive soon.

Scoring Guidelines: Peak frequency is measured by the headway or service interval, meaning the number of minutes between buses independent of the route passing the highest-demand segment on the corridor during the peak period. For headways of exactly two, three, five, or seven minutes, round up.

SERVICE INTERVAL (MINUTES)	POINTS
< 2	4
2–3	3
3–5	2
5–7	1
> 7	0

Off-peak Frequency

3 POINTS MAXIMUM

As with peak frequency, how often the bus comes during off-peak travel times is a good proxy for quality of service and corridor selection.

Scoring Guidelines: Off-peak frequency here is measured by the headway (also known as the service interval) between buses independent of the route passing the highest-demand segment on the corridor during the off-peak (mid-day) period. For headways of exactly five, eight, or twelve minutes, round up.

SERVICE INTERVAL (MINUTES)	POINTS
< 5	3
5–8	2
8–12	1
> 12	0

Guangzhou, China
BRT control center

Express, Limited, and Local Services

3 POINTS MAXIMUM

One of the most important ways that mass transit systems increase operating speeds, and reduce passenger travel times, is by providing limited and express services. While local services stop at every station, limited services skip lower-demand stations and stop only at major stations that have higher passenger demand. Express services often collect passengers at stops at one end of the corridor, travel along much of the corridor without stopping, and drop passengers off at the other end. Infrastructure necessary for the inclusion of express, limited, and local BRT services is captured in other scoring metrics.

SERVICE TYPES	POINTS
Local services and multiple types of limited and/or express services	3
At least one local *and* one limited or express service option	2
No limited or express services	0

Control Center

3 POINTS MAXIMUM

Control centers for BRT systems are increasingly becoming a requirement for a host of service improvements, such as avoiding bus bunching, monitoring bus operations, identifying problems, and rapidly responding to them.

A full-service control center monitors the locations of all buses with GPS or similar technology, responds to incidents in real-time, controls the spacing of buses, knows the maintenance status of all buses in the fleet, and records passenger boardings and alightings for future service adjustments. A full-service center should be integrated with a public transport system's existing control center, if it exists, as well as the traffic signal system.

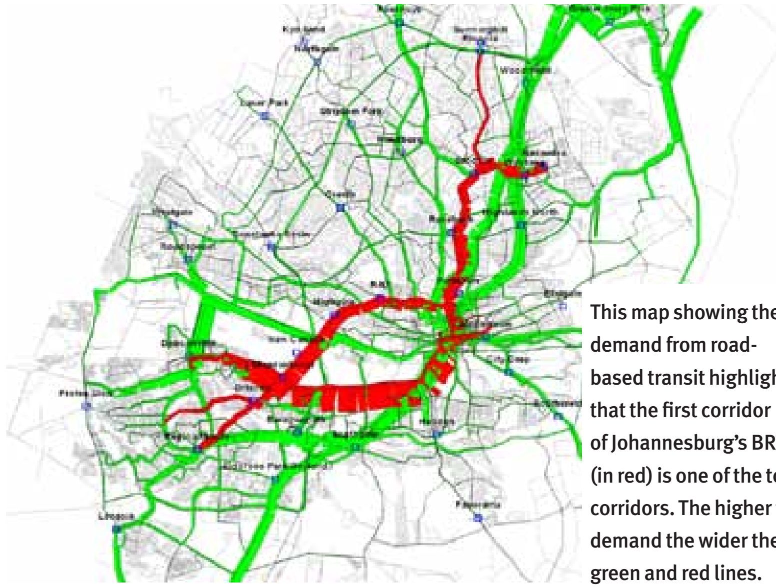
CONTROL CENTER	POINTS
Full-service control center	3
Control center with most services	2
Control center with some services	1
No control center	0

Located In Top Ten Corridors

2 POINTS MAXIMUM

If the BRT corridor is located along one of the top ten corridors, in terms of aggregate bus ridership, this will help ensure a significant proportion of passengers benefit from the improvements. Points are awarded to systems that have made a good choice for the BRT corridor, regardless of the level of total demand.

Scoring Guidelines: If all top ten demand corridors have already benefited from public transport infrastructure improvements and the corridor, therefore, lies outside the top ten, all points are awarded.



This map showing the demand from road-based transit highlights that the first corridor of Johannesburg's BRT (in red) is one of the top corridors. The higher the demand the wider the green and red lines.

CORRIDOR LOCATION	POINTS
Corridor is one of top ten demand corridors	2
Corridor is outside top ten demand corridors	0

Hours of Operations

2 POINTS MAXIMUM

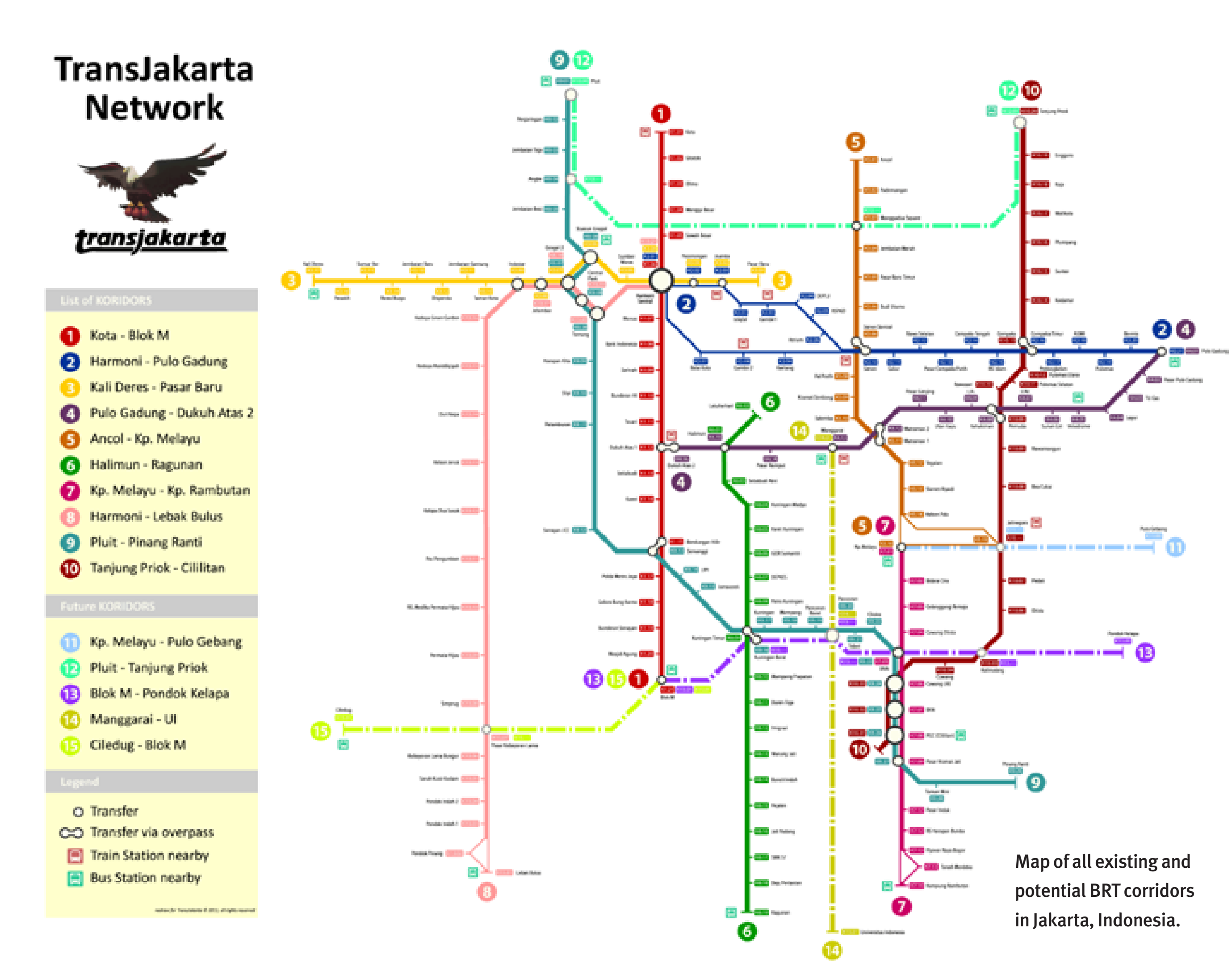
A viable transit service must be available to passengers for as many hours throughout the day and week as possible. Otherwise, passengers could end up stranded or may simply seek another mode.

Scoring Guidelines: Late-night service refers to service until midnight and weekend service refers to both weekend days.

OPERATING HOURS	POINTS
Both late-night and weekend service	2
Late-night service, no weekends OR weekend service, no late-nights	1
No late-night or weekend service	0

TransJakarta, Jakarta, Indonesia

Photo: Matt Johnson



Map of all existing and potential BRT corridors in Jakarta, Indonesia.

Multi-corridor Network

2 POINTS MAXIMUM

Ideally, BRT should include multiple corridors that intersect and form a network as this expands travel options for passengers and makes the system as a whole, more viable. When designing a new system, some anticipation of future corridors is useful to ensure the designs will be compatible with later developments. For this reason, a long-term plan is recognized.

MULTI-CORRIDOR NETWORK	POINTS
Part of an existing or planned BRT network	2
No BRT network planned or built	0

Busway Alignment

7 POINTS MAXIMUM

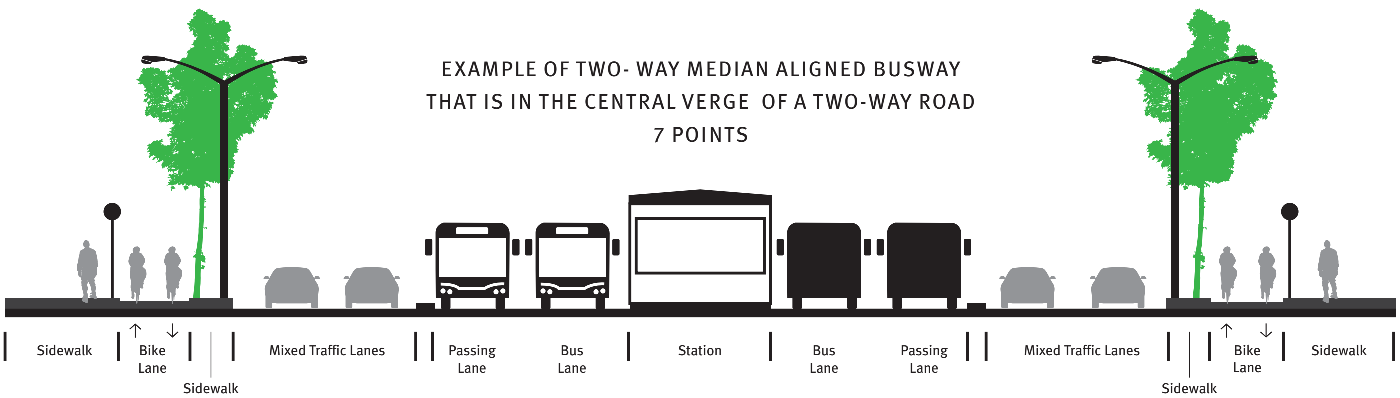
The busway is best located where conflicts with other traffic can be minimized, especially from turning movements from mixed-traffic lanes. In most cases, the central verge of a roadway encounters fewer conflicts with turning vehicles than those closer to the curb, due to alleys, parking lots, etc. Additionally, while delivery vehicles and taxis generally require access to the curb, the central verge of the road usually remains free of such obstructions. All of the design configuration recommendations detailed below are related to minimizing the risk of delays caused by turning conflicts and obstructions.

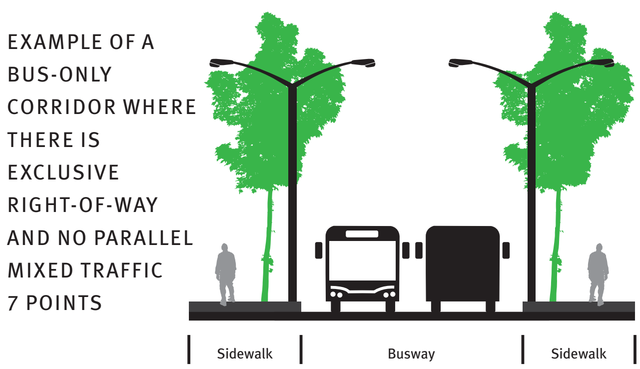
Scoring Guidelines: This scoring is weighted using the percentage of the trunk corridor of a particular configuration multiplied by the points associated with that configuration and then adding those numbers together.

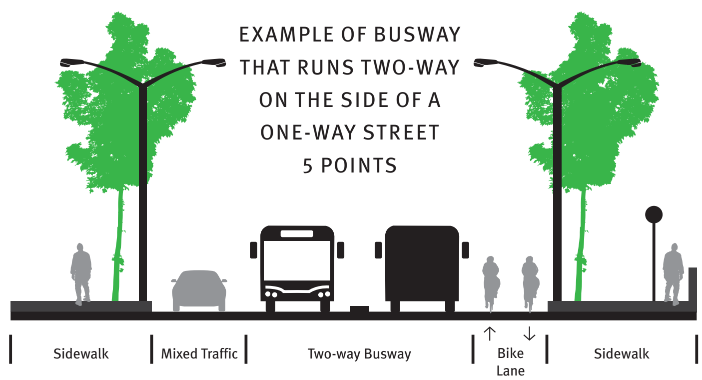
TRUNK CORRIDOR CONFIGURATIONS	POINTS
Two-way median-aligned busways that are in the central verge of a two-way road	7
Bus-only corridors where there is a fully exclusive right-of-way and no parallel mixed traffic, such as transit malls (e.g. Bogotá, Curitiba, Quito, and Pereira), and converted rail corridors (e.g. Cape Town and Los Angeles)	7
Busways that run adjacent to an edge condition like a waterfront or park where there are few intersections to cause conflicts	7
Busways that run two-way on the side of a one-way street	5
Busways that are split into two one-way pairs but are centrally aligned in the roadway	4
Busways that are split into two one-way pairs but aligned to the curb	1
Busways that operate through virtual lanes produced by a series of bus queue-jump lanes at intersections	1
Curb-aligned busway that is adjacent to the curb and protected by parking	1
Curb-aligned busway that is adjacent to the parking lane and the stations are located on the bus bulb	0

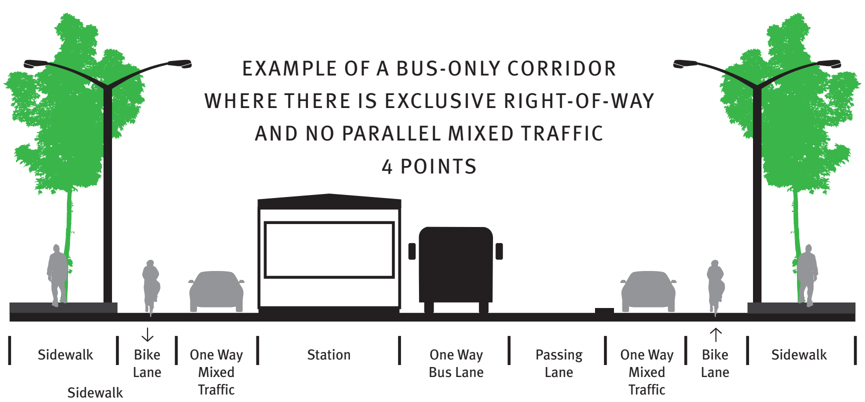
Possible configurations

These sections are only meant to show an example and are not meant to be inclusive of all possible configurations per type.









Megabus, Pereira, Colombia illustrates full segregation.

Segregated Right-of-way

7 POINTS MAXIMUM

A segregated right-of-way is vital to ensuring that buses can move quickly and unimpeded by congestion. Physical design is critical to the self-enforcement of the right-of-way. Physical segregation matters the most in heavily congested areas where it is harder to take a lane away from mixed traffic to dedicate it as a bus lane. Enforcement of the dedicated lanes can be handled in different ways and can have varying degrees of permeability (e.g. delineators, electronic bollards, car traps, camera enforcement, and lane colorization). In some designs the bus stations themselves can act as a barrier. Some permeability is generally advised as buses occasionally break down and block the busway or otherwise need to leave the corridor. Delineators are road markers that define the busway, but are not a physical barrier. Other vehicles can easily cross the barrier into the busway. Delineators act as slight barriers that need enforcement to be effective. Full segregation means that the lane is physically protected, thus self-enforcing. Colorization acts as a visual delineator only.

Scoring Guidelines: The scoring system is based on the amount of corridor that has physically-segregated right-of-way, and the placement of that segregation in relation to observed peak-hour congestion.

TYPE OF SEGREGATED RIGHT-OF-WAY	POINTS
Delineators and colorization and/or full segregation applied to over 90% of the busway corridor length	7
Delineators and colorization and/or full segregation applied to over 75% of the busway corridor length	6
Delineators-only (without colorized pavement or other enforcement measures) applied to over 75% of the busway corridor length	4
Delineators-only (without colorized pavement or other enforcement measures) applied to over 40% of the busway corridor length	2
Colorized pavement with no delineators OR camera-enforcement with no delineators	1

Intersection Treatments

6 POINTS MAXIMUM

There are several ways to increase bus speeds at intersections, all of which are aimed at increasing the green signal time for the bus lane. Forbidding turns across the bus lane and minimizing the number of traffic-signal phases where possible are the most important. Traffic-signal priority when activated by an approaching BRT vehicle is useful in lower-frequency systems.

INTERSECTION TREATMENT	POINTS
All turns prohibited across the busway	6
Most turns prohibited across the busway	5
Approximately half of the turns prohibited across the busway and some signal priority	4
Some turns prohibited across the busway and some signal priority	3
No turns prohibited across the busway but signal priority at most or all intersections	2
No turns prohibited across the busway but some intersections have signal priority	1
No intersection treatments	0

Left turns are not allowed at this intersection along the BRT corridor in Las Vegas, USA.

TransMilenio, Bogotá, Colombia was the first to introduce passing lanes at stations, increasing the system's capacity.

Passing Lanes at Stations

4 POINTS MAXIMUM

Passing lanes at station stops are critical to allow both express and local services. They also allow stations to accommodate a high volume of buses without getting congested from backed-up buses waiting to enter. While more difficult to justify in low-demand systems, passing lanes are a good investment, yielding considerable passenger travel time savings and allowing for flexibility as the system grows.

PASSING LANES	POINTS
At every trunk station	4
At 75% of trunk stations	3
At 50% of trunk stations	2
At 25% of trunk stations	1
At no trunk stations	0

Minimizing Bus Emissions

4 POINTS MAXIMUM

Bus tailpipe emissions are typically a large source of urban air pollution. Especially at risk are bus passengers and people living or working near roadsides. In general, the pollutant emissions of highest concern from urban buses are particulate matter (PM) and nitrogen oxides (NOx). Minimizing these emissions is critical to the health of both passengers and the general urban population.

The primary determinant of tailpipe emission levels is the stringency of governments' emissions' standards. While some fuels tend to produce lower emissions, like natural gas, new emission controls have enabled even diesel buses to meet extremely clean standards. Moreover, "clean" fuels do not guarantee low emissions of all pollutants. As a result, our scoring is based on certified emissions standards rather than fuel type.

Over the last two decades, the European Union and the United States have adopted a series of progressively tighter emissions standards that are being used for this scoring system. Buses must be in compliance with Euro VI and U.S. 2010 emission standards to receive 4 points. These standards result in extremely low emissions of both PM and NOx. For diesel vehicles, these standards require the use of PM traps, ultra-low sulfur diesel fuel, and selective catalytic reduction. To receive three points, buses need to be certified to Euro IV or V with PM traps (note: 50 ppm sulfur diesel fuel or lower required for PM traps to function effectively).

Vehicles certified to the Euro IV and V standards that do not require traps emit twice as much PM as vehicles meeting more recent standards. Therefore, these vehicles are awarded two points. Ideally, buses will include contractually stipulated requirements in the purchase order to control real-world NOx emissions from buses in use, because the actual NOx emissions from urban buses certified to Euro IV and V have been tested at levels substantially higher than certified levels.

EMISSIONS STANDARDS	POINTS
Euro VI or U.S. 2010	4
Euro IV or V with PM traps	3
Euro IV or V	2
U.S. 2004 or Euro III	1
Below Euro III	0

Because that is hard to verify, it is included as a recommendation, but not as a requirement, for receiving the two points.

Only one point is awarded for U.S. 2004 and Euro III standards, because these standards allow ten times as much PM emissions as the U.S. 2010 and Euro VI standards. Buses certified to emission standards less stringent than Euro III receive zero points.

Buses also generate greenhouse gas emissions. Since no clear regulatory framework exists that requires bus manufacturers to meet specific greenhouse gas emission targets or fuel-efficiency standards, there is no obvious way to identify a fuel-efficient bus by vehicle type. For CO_2 impacts, we recommend the use of the TEEMP model which incorporates the BRT Standard into a broader assessment of project-specific CO_2 impacts.

Rea Vaya introduced Euro IV buses for the first time to the country. Johannesburg, South Africa

Stations Set Back from Intersections

3 POINTS MAXIMUM

Stations should be located at least forty meters from intersections to avoid delays. When stations are located just beyond the intersection, delays can be caused when passengers take a long time to board or alight and the docked bus blocks others from pulling through the intersection. If stations are located just before an intersection, the traffic signal can delay buses from moving from the station and thus not allow other buses to pull in. The risk of conflict remains acute, particularly as frequency increases. Separating the stations from the intersections is critical to mitigating these problems.

Scoring Guidelines: The distance from the intersection is defined as the stop line at the intersection to the front of a bus at the forward-most docking bay.

STATION LOCATION	POINTS
100% of trunk stations are at least one of the following: • Set back at least 40 m (120 ft.) from intersection • Fully exclusive busways with no intersections • Grade-separated stations where stations are at-grade • Stations located near intersection due to block length (such as downtowns where blocks are relatively short)	3
65% of trunk stations meet above criteria	2
35% of trunk stations meet above criteria	1
0% of trunk stations meet above criteria	0

Janmarg, Ahmedabad, India has stations that are not immediately adjacent to the intersection.

A center platform station in Quito, Ecuador is eligible.

Center Stations

3 POINTS MAXIMUM

Having a single station serving both directions of the BRT system makes transfers easier and more convenient—something that becomes more important as the BRT network expands. It also tends to reduce construction costs and minimize the necessary right-of-way. In order to receive points, stations must have a center platform that serves both directions of service. Stations with side platforms and other stations that do not serve both directions of service are not eligible.

CENTER STATIONS	POINTS
100% of trunk stations have center platforms serving both directions of service	3
65% of trunk stations	2
35% of trunk stations	1
0% of trunk stations	0


Side platform stations in Quito, Ecuador are not eligible.

Lima, Peru uses reinforced concrete over entire busway.

Pavement Quality

2 POINTS MAXIMUM

Good-quality pavement ensures better service and operations for a longer period by minimizing the need for maintenance on the busway. Roadways with poor-quality pavement will need to be shut down more frequently for repairs. Buses will also have to slow down to drive carefully over damaged pavement. Reinforced concrete is particularly important at stations where the force of frequent bus braking can quickly deteriorate more standard pavements. Continuously reinforced concrete (CRC) is particularly advantageous as it avoids deterioration at joints and reduces noise levels.

PAVEMENT MATERIALS	POINTS
New reinforced concrete designed to fifteen-year life or higher over entire corridor	2
New reinforced concrete designed to fifteen-year life only at stations	1
Projected pavement duration is less than fifteen years	0

Platform-level Boarding

6 POINTS MAXIMUM

Having the bus-station platform level with the bus floor is one of the most important ways of reducing boarding and alighting times per passenger. Passengers climbing steps, even relatively minor steps, can mean significant delay, particularly for the elderly, disabled, or people with suitcases or strollers. The reduction or elimination of the vehicle-to-platform gap is also key to customer safety and comfort. There is a range of measures to achieve gaps of less than 5 cm (2 in.), including guided busways at stations, alignment markers, Kassel curbs, and boarding bridges. This does not take into account which technique is chosen, just so long as the gap is minimized.

Scoring Guidelines: Station platforms should be at the same height as bus floors, regardless of the height chosen.

PERCENTAGE OF BUSES WITH AT-LEVEL BOARDING	POINTS
100% of buses are platform level; system-wide measures for reducing the gap in place	6
80% of buses; system-wide measures for reducing the gap in place	5
60% of buses; system-wide measures for reducing the gap in place	4
100% of buses are platform level with no other measures for reducing the gap in place	
40% of buses	3
20% of buses	2
10% of buses	1
No platform-level boarding	0


Janmarg, Ahmedabad, India

El Mio, Cali, Colombia

Safe and Comfortable Stations

3 POINTS MAXIMUM

One of the main distinguishing features of a BRT system as opposed to standard bus service is a safe and comfortable station environment. Attractive stations further elevate the status of service for the customer.

Scoring Guidelines: Stations should be at least 3.2 m (10.5 ft.) wide. This is the definition for “wide” in the scoring chart below.

STATIONS	POINTS
All trunk corridor stations wide, attractive, weather-protected	3
Most trunk corridor stations wide, attractive, weather-protected	2
Some trunk corridor stations wide, attractive, weather-protected	1

Nantes, France

Number of Doors on Bus

3 POINTS MAXIMUM

The speed of boarding and alighting is partially a function of the number of bus doors. Much like a subway in which a car has multiple wide doors, buses need the same in order to let higher volumes of people on and off the buses. One door or narrow doorways become bottlenecks that delay the bus.

Scoring Guidelines: Buses need to have three or more doors for articulated buses or two wide doors for regular buses to qualify for the below points.

PERCENTAGE OF BUSES WITH 3+ DOORS OR 2 WIDE DOORS	POINTS
100%	3
65%	2
35%	1
0%	0

Lima, Peru

Docking Bays and Sub-stops

2 POINTS MAXIMUM

Multiple docking bays and sub-stops not only increase the capacity of a station, they help provide multiple services at the station as well.

A station is composed of sub-stops that can connect to one another, but should be separated by a walkway long enough to allow buses to pass one sub-stop and dock at another. This reduces the risk of congestion by allowing a bus to pass a full sub-stop and dock at an empty one. Sub-stops can have multiple docking bays—locations within one sub-stop where buses can pull up to let passengers on and off. They are usually adjacent to each other and allow a second bus to pull up behind another bus already at the station to let passengers on and off. A station may be composed of only one sub-stop.

At minimum a station needs one sub-stop and two docking bays. It is usually recommended that one sub-stop not have more than two docking bays, but at that point another sub-stop can be added. Multiple docking bays and sub-stops are important regardless of the level of ridership.

DOCKING BAYS AND SUB-STOPS	POINTS
At least two independent sub-stops at most stations	2
Multiple docking bays but no independent sub-stops	1
One docking bay and one sub-stop only	0

Lima, Peru, has sliding doors where the bus docks at the station.

Sliding Doors in BRT Stations

1 POINT MAXIMUM

Sliding doors where passengers get on and off the buses inside the stations improve the quality of the station environment, reduce the risk of accidents, and prevent pedestrians from entering the station in unauthorized locations.

SLIDING DOORS	POINTS
All stations have sliding doors	1
Otherwise	0

Guangzhou, China's BRT have sliding doors at the gates.

Las Vegas, USA, has a good brand and strong identity that appeals to its customers—from the stations to the buses.

Branding

3 POINT MAXIMUM

BRT promises a high quality of service, which is reinforced by having a unique brand and identity.

BRANDING	POINTS
All buses, routes, and stations in corridor follow single unifying brand of entire BRT system	3
All buses, routes, and stations in corridor follow single unifying brand, but different from rest of the system	2
Some buses, routes, and stations in corridor follow single unifying brand, regardless of rest of the system	1
No corridor brand	0

Las Vegas, USA, used old casino signs at stations, which reinforced the city's identity.

Guangzhou, China, has real time passenger information systems.

Passenger Information

2 POINTS MAXIMUM

Numerous studies have shown that passenger satisfaction is linked to knowing when the next bus will arrive. Giving passengers information is critical to a positive overall experience.

Real-time passenger information includes electronic panels, digital audio messaging (“Next bus” at stations, “Next stop” on buses), and/or dynamic information on handheld devices. Static passenger information refers to station and vehicle signage, including network maps, route maps, local area maps, emergency indications, and other user information.

PASSENGER INFORMATION	POINTS
Real-time and static passenger information corridor-wide (at stations and on vehicles)	2
Moderate passenger information (real-time or static)	1
Very poor or no passenger information	0

Universal Access

3 POINTS MAXIMUM

A BRT system should be accessible to all special-needs customers, including those who are physically-, visually-, and/or hearing-impaired, as well as those with temporary disabilities, the elderly, children, parents with strollers, and other load-carrying passengers.

Scoring Guidelines: Full accessibility means that all trunk stations, vehicles, and fare gates are universally accessible for wheelchairs. System includes drop curbs at all immediate intersections, Braille readers at all stations, and Tactile Ground Surface Indicators leading to all stations.

UNIVERSAL ACCESSIBILITY	POINTS
Full accessibility at *all* stations and vehicles	3
Partial accessibility at *all* stations and vehicles	2
Full or partial accessibility at *some* stations and vehicles	1
Corridor not universally accessible	0

Eugene, USA

Guangzhou, China, has physical integration, like this tunnel connecting the BRT to the Metro.

Integration with Other Public Transport

3 POINTS MAXIMUM

Often, when a BRT system is built in a city, a functioning public transport network already exists, be it rail, bus, or minibus. The BRT system should integrate into the rest of the public transport network. There are three components to BRT integration:

- **Physical transfer points:** *Physical transfer points should minimize walking between modes, be well-sized, and not require passengers to exit one system and enter another*
- **Fare payment:** *The fare system should be integrated so that one fare card may be used for all modes*
- **Information:** *All transit modes, including BRT, should appear in a single set of information. Thus, the BRT system should be integrated into existing public transport maps, and schedules should be available from a single source.*

Scoring Guidelines: The BRT corridor should integrate physically with other public transport modes where lines cross. If no lines cross, points may still be awarded for physical integration. If no other formal public transport modes exist in the city, full points may be awarded for all aspects of integration.

INTEGRATION WITH OTHER PUBLIC TRANSPORT	POINTS
Integration of physical design, fare payment, and informational systems	3
Integration of two of the following: physical design, fare payment, and informational systems	2
Integration of one of the following: physical design, fare payment, and informational systems	1
No integration	0

Metrobus,
Mexico City, Mexico

Pedestrian Access

3 POINTS MAXIMUM

A BRT system could be extremely well-designed and functioning but if passengers cannot access it safely, it cannot achieve its goals. Good pedestrian access is imperative in BRT system design. Additionally, as a new BRT system is a good opportunity for street and public-space redesign, existing pedestrian environments along the corridor should be improved.

Good pedestrian access is defined as:

- *At-grade pedestrian crossings where pedestrians cross a maximum of two lanes before reaching a pedestrian refuge (sidewalk, median)*
- *If crossing more than two lanes at once, a signalized crosswalk is provided*
- *A well-lit crosswalk where the footpath remains level and continuous*
- *While at-grade crossings are preferred, pedestrian bridges or underpasses with working escalators or elevators can also be considered*

PEDESTRIAN ACCESS	POINTS
Good, safe pedestrian access at every station and for a 500-meter catchment area surrounding the corridor	3
Good, safe pedestrian access at every station and many improvements along corridor	2
Good, safe pedestrian access at every station and modest improvements along corridor	1
Not every station has good, safe pedestrian access and little improvement along corridor	0

Secure bike parking in a terminal, TransMilenio, Bogotá, Colombia

Secure Bicycle Parking

2 POINTS MAXIMUM

The provision of bicycle parking at stations is necessary for passengers who wish to use bicycles as feeders to the BRT system. Formal bicycle-parking facilities that are secure (either by an attendant or observed by security camera) and weather protected are more likely to be used by passengers.

BICYCLE PARKING	POINTS
Secure bicycle parking at least in terminal stations and standard bicycle racks elsewhere	2
Standard bicycle racks in most stations	1
Little or no bicycle parking	0

Bike locker, Orange Line, Los Angeles, USA

Parallel bike way to MyCiTi, Cape Town, South Africa

Bicycle Lanes

2 POINTS MAXIMUM

Bicycle-lane networks integrated with the BRT corridor improve customer access, provide a full set of sustainable travel options, and enhance road safety.

Bicycle lanes should ideally connect major residential areas, commercial centers, schools, and business centers to nearby BRT stations in order to provide the widest access. All such major destinations within at least two kilometers of a trunk corridor should be connected by a formal cycle way.

Moreover, in most cities, the best BRT corridors are also the most desirable bicycle routes, as they are often the routes with the greatest travel demand. Yet there is a shortage of safe cycling infrastructure on those same corridors. If some accommodation for cyclists is not made, it is possible that cyclists may use the busway. If the busway has not been designed for dual bike and bus use, it is a safety risk for bicyclists. Bicycle lanes should be built either within the same corridor or on a nearby parallel street.

BICYCLE LANES	POINTS
Bicycle lanes on or parallel to entire corridor	2
Bicycle lanes do not span entire corridor	1
No bicycle infrastructure	0

Bicycle-sharing Integration

1 POINT MAXIMUM

Having the option to make short trips from the BRT corridor by a shared bike is important to providing connectivity to some destinations. Operating costs of providing bus service to the last mile are often the highest cost of maintaining a BRT network (i.e., feeder buses), thus providing a low-cost bicycle-sharing alternative to feeders is generally seen as best practice.

BICYCLE-SHARING INTEGRATION	POINTS
Bicycle sharing at 50% of trunk stations minimum	1
Bicycle sharing at less than 50% of trunk stations	0

Bike share station along BRT corridor in Nantes, France

Point Deductions

Point deductions are only relevant to systems already in operation. They have been introduced as a way of mitigating the risk of recognizing a system as high quality that has made significant design errors or has significant management and performance weaknesses not readily observable during the design phase. The penalties from improperly sizing the infrastructure and operations or from poor system management are as follows

Low Commercial Speeds: minimum average commercial speed below 13 kph (8 mph)

-10 POINTS

Most of the design features included in the scoring system will always result in higher speeds. However, there is an exception: higher demand systems in which too many buses carrying too many passengers have been concentrated into a single lane. In this case, bus speeds could be lower than in mixed traffic conditions. To mitigate the risk of rewarding such a system with a quality standard, this penalty was imposed. Typical BRT operating speeds for the better systems in central city areas tend to be about 15 kph (9.3 mph), so speeds below this indicate the system has been badly "fit" to the demand. A penalty rather than a minimum qualification criterion for a slow speed BRT (as was previously used) allows such a system to still be considered BRT, but to achieve a lower score.

Scoring Guidelines: The minimum average commercial speed refers to the system-wide average speed and not the average speed at the slowest link. A speed of 13 kph can generally be achieved in mixed-traffic conditions in a downtown area. If lower, all ten points should be deducted.

Where commercial speed is not readily available, the full penalty should be imposed if buses are backing up at many BRT stations or junctions.

LOW COMMERCIAL SPEEDS	POINTS
Minimum average commercial speed is below 13 kph (8 mph)	-10

Peak Passengers per Hour per Direction (pphpd) Below 1,000

-5 POINTS

BRT systems with ridership levels below 1,000 passengers per peak hour per direction (pphpd) are carrying fewer passengers than a normal mixed-traffic lane. Very low ridership can be an indication that other bus services continue to operate in the corridor along side, and competing with, the BRT system. Alternatively, it indicates that a corridor was poorly selected.

Almost all cities have corridors carrying at least 1,000 pphpd. Many cities, however, have corridors where transit demand is very low, even below this level. While many Gold-Standard BRT features would still bring benefits in these conditions, it is unlikely that such levels would justify the cost and dedicated right-of-way intrinsic to BRT. This penalty has been created to penalize systems which have done a poor job of service planning or corridor selection, while not overly penalizing smaller, car-oriented cities with low transit demand.

Scoring Guidelines: All five points should be deducted if the ridership on the link in the corridor with maximum peak-hour ridership is under 1,000 pphpd in the peak hour. Otherwise, no deduction is necessary.

PEAK PASSENGERS PER HOUR PER DIRECTION (PPHPD)	POINTS
PPHPD below 1,000	-5

Lack of Enforcement of Right-of-Way

-5 POINTS MAXIMUM

Enforcing the exclusive right-of-way of the busway is critical to achieving higher bus speeds, but the means by which it is enforced are multiple and somewhat context specific. The committee generally recommends on-board camera enforcement and regular policing at points of frequent encroachment, coupled with high fines for violators, to minimize invasions of the lanes by non-authorized vehicles. Camera enforcement at high-risk locations is somewhat less effective, however, the selection of appropriate enforcement is left to local conditions.

LACK OF ENFORCEMENT	POINTS
Regular encroachment on BRT right-of-way	-5
Some encroachment on BRT right-of-way	-3
Occaisional encroachment on BRT right-of-way	-1

Significant Gap Between Bus Floor and Station Platform

-5 POINTS MAXIMUM

Even systems that have been designed to accommodate platform-level boarding could have gaps if the buses do not dock properly. A significant gap between the platform and the bus floor undermines the time-savings benefits of platform-level boarding and introduces a significant safety risk for passengers. Such gaps could occur for a variety of reasons, from poor basic design to poor driver training. Technical opinion varies on the best way to minimize the gap. Most experts feel that optical-guidance systems are more expensive and less effective than measures such as the use of simple painted alignment markers and special curbs at station platforms where the drivers are able to feel the wheel touching the curb, yet the curb does not damage the wheel. Boarding bridges are used successfully in many systems and would tend to eliminate gap problems.

GAP MINIMIZATION	POINTS
Large gaps everywhere or kneeling buses required to minimize gaps	-5
Slight gap remaining at some stations, large gap at remaining stations	-4
Slight gap at most stations	-3
No gap at some stations, slight gap at remaining stations	-2
No gap at most stations, slight gap at remaining stations	-1
No gap at all stations	0

Station Encroaches on Sidewalk or Busway

-3 POINTS MAXIMUM

Some BRT systems have been observed where the sidewalk has been significantly narrowed, encroached upon, or even eliminated to make space for the BRT system. In one case, the busway right-of-way dropped below three meters at the station stop in order to avoid encroaching on the mixed-traffic lane. Rather than giving additional points for these elements of standard design practice it was decided, instead, to penalize their violation.

Scoring Guidelines: The sidewalk at station stops should be of a consistent width to the sidewalk in other parts of the corridor and the sidewalk width should not drop below 2 m (6.5 ft.). The right-of-way for the busway should be no less than 3.5 m (12 ft.) per lane or 3 m (10 ft.) per lane at a BRT station stop.

STATION ENCHROACHMENT	POINTS
Multiple encroachments of bus stops or stations on the sidewalk or busway	-3
Some encroachments of bus stops or stations on the sidewalk or busway	-2
One encroachment of a bus stop or station on the sidewalk or busway	-1

Overcrowding

-3 POINTS

This was included because many systems which are generally well-designed are being operated such that buses are so overcrowded that the systems become alienating to passengers. While average "passenger standing density" is a reasonable indicator, getting this information is not easy so we have allowed a more subjective measure to be used in cases of obvious overcrowding.

Scoring Guidelines: The full penalty should be imposed if the average passenger density for buses during the peak hour is greater than five passengers per square meter (0.46 per square ft.). If this metric is not available, then clearly visible signs of overcrowding on buses or in stations should be used, such as doors on the buses regularly being unable to close, stations overcrowded with passengers because they are unable to board buses that are full, etc.

OVERCROWDING	POINTS
Average passenger density during peak hour is > 5 passengers/sq. m (.46/sq. ft.), or clearly visible signs of overcrowding present	-3

Poorly-maintained Buses and Stations

-3 POINTS MAXIMUM

Even a BRT system that is well built and attractive can fall into disrepair. It is important that buses and stations be regularly cleaned and maintained.

MAINTENANCE OF BUSES AND STATIONS	POINTS
Stations and station approaches with platform or roof damage, graffiti, litter, occupancy by vagrants or vendors	-3
Poor maintenance of buses with litter on floor, graffiti, and damaged seats	-2
Buses and stations are somewhat dirty and unmaintained	-1

Distances Between Stations Too Long or Too Short

-2 POINTS

In a consistently built-up area, the distance between station stops optimizes at around 450 m (1,476 ft.) between stations. Beyond this, more time is imposed on customers walking to stations than is saved by higher bus speeds. Below this distance, bus speeds will be reduced by more than the time saved with shorter walking distances. Thus, in keeping reasonably consistent with optimal station spacing, average distances between stations should not exceed 0.8 km (0.5 mi.), and should not be below 0.3 km (0.2 mi.).

DISTANCE BETWEEN STATIONS	POINTS
Stations are spaced, on average, more than 0.8 km (0.5 mi.) or less than 0.3 km (0.2 mi.) apart	-2

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