10. Automated Guideway Transit Capacity Determination

10.1 INTRODUCTION

Automated guideway transit (AGT) generally fits into the category of *Grade Separated Rail* whose capacity determination is specified in Chapter Seven. However, there are some nuances specific to AGT that must be considered. AGT is an almost negligible part of urban, public, fixed guideway transit—less than 1/10th of one percent. Technology ranges widely from the standard gauge advanced light rapid transit downtown people mover in Detroit to small scale monorails in amusement parks.

Setting aside the possible interpretation of the Tandy shuttle in Fort Worth as AGT—operated by heavily rebuilt, manned PCC streetcars—all AGT systems are proprietary designs. As such their performance, acceleration, braking rate, balancing speed and vehicle size and capacity vary greatly.[1]

10.2 TRAIN CONTROL SEPARATION

Train control systems on AGT range from a sophisticated moving-block signaling system to a basic manual system in which only one train may be on a section of line—or the entire line—at a time. Manual or radio dispatching may ensure that a train does not leave a station until the leading train has left the station ahead. One variant uses sectioned power supply. Power is disconnected for a given distance behind an operating train.

These variants are not fully accommodated in the methodology of Chapters Three and Seven. If the basic AGT performance indices are known then the procedures of Chapter Seven will provide an approximation of the minimum train separation time for a range of AGT train controls—from a moving-block signaling system to a simple fixed-block system. A surrogate of this can be roughly simulated by setting the train detection uncertainty factor (B) at four times the minimum braking distance.

The results are shown in Table 10.1 and Figure 10.1 for trains of typical AGT lengths—12.5 m (40 ft), 25m (80 ft) and 50m (160 ft)—based on the specific AGT values in Table 10.2, with terms adjusted from typical rail transit values shaded Refer to Chapter Three, *Train Control and Signaling,* Equation 3-15. The results show that separation times with a simulated single-aspect block system are two to three times longer than with the more complex — and expensive — moving-block signaling system. The moving-block results agree with those of Auer[(R09)], the only

Table 10.1 AGT minimum train separation times

Train Length	Fixed Block	Moving Block
50 m (160 ft)	48.7 seconds	16.7 seconds
25m (80 ft)	37.6 seconds	13.4 seconds
12.5 m (40 ft)	20.5 seconds	11.2 seconds

[1] Details of AGT system characteristics and technology are outside the scope of this report. Details of selected systems can be found in Table 5.15 of the ITE Transportation Planning Handbook (R42).

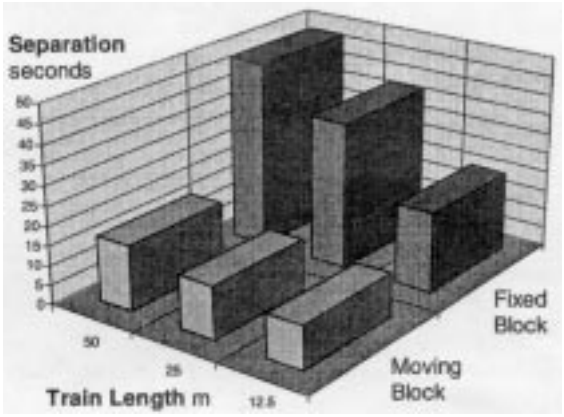

Figure 10.1 AGT train separation versus length

Table 10.2 Suggested AGT separation calculation values

TERM	UNIT	DESCRIPTION	Normal[2]	AGT
P_e	m	positioning error	6.25	6.25
L	m	length of the longest train	200	50
D	m	distance from front of train to exit block	10	0
K	%	% service braking rate	75	75
B		train detection uncertainty constant — fixed block	2.4	4
B		train detection uncertainty constant — moving block	1	1
t_{os}	secs	time for overspeed governor to operate	3	1
t_{jl}	secs	time lost to braking jerk limitation	0.5	0.5
a_s	m/s^2	service acceleration rate	1.3	0.6
d_s	m/s^2	service deceleration rate	1.3	1
t_{br}	secs	brake system reaction time	1.5	0.5
v_{max}	km/h	maximum line velocity	100	80
mb_{sd}	m	moving block safety distance	50	25

[2] Default values for heavy rail. Refer to Chapter Three, *Train Control and Signaling.*

reviewed paper specializing in AGT train control. Here, typical short train AGT separation with moving-block control was cited at 15 sec. The separation range is wide and highly dependent on the train control system of the proprietary AGT system. The best method of determining the minimum train separation is from the system manufacturer or designer. Using the methodology of Chapter Three should be a last resort when specific separation information is not available.

10.3 PASSENGER FLOW TIMES AND DWELLS

AGT systems that are part of a normal transit system can assume flow rates and dwells as determined in Chapter Four, *Station Dwells.* However, most AGT systems are classed as institutional and the majority of passengers are unlikely to be regular, experienced transit users. Doorways are rarely of typical transit width or configuration. The most common arrangement is the quadruple-flow door with associated platform doors—shown in Figure 10.2. Doorway flow times and the associated dwells were monitored on the three C-100 systems at SeaTac airport in May 1995. The range of users varied greatly and included many people with bags and a few with baggage carts. After the arrival of a full flight with a preponderance of business passengers, flow rates reached and exceeded transit levels. At other times, doorway flow rates were below the transit rates documented in Chapter Four.

Under these circumstances, calculating flow times—and from them dwell times—is unwise. The results are unlikely to be accurate or may reflect only a very specific subset of users.

The recommended solution for AGT systems outside the transit sphere is simple. Accept a headway, inclusive of train control separation, dwell time and any operating margin, that conforms with existing operations or is suggested by the system manufacturer. The typical headway of airport systems is 120 sec with a few operating down to 90 sec. Claims have been made for closer headways with some proprietary systems. Headways shorter than 90 sec are possible but may limit dwell times and constrain the operating margin. They should be considered with caution unless off-line stations are adopted—see section 10.5. Off-line stations make closer headways possible and practical—at a price.

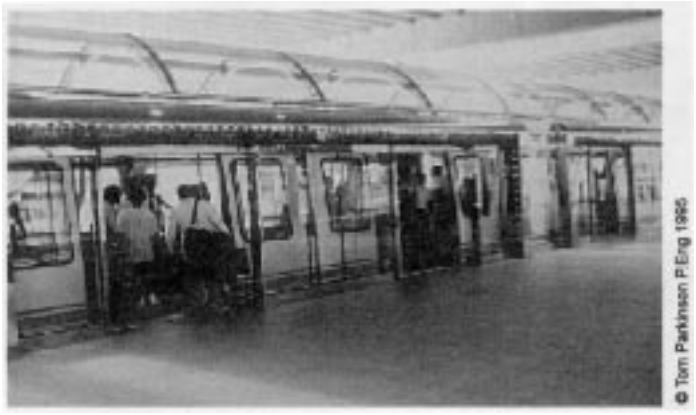

Figure 10.2 Orlando Airport people-mover doorways Adtranz (previously Westinghouse) C-100 system.

10.4 LOADING LEVELS

Loading levels of AGT cars tend to be atypical of normal transit operations. Those systems — such as the Detroit and Miami downtown people movers that are integral parts of transit networks—can use loading levels derived from Chapter Five, *Passenger Loading Levels.*

Other systems range widely. At one extreme are the airport shuttles with wide cars and no or few seats where loading can reach 10 passengers per meter of length under pressure from arriving business type flights. Loading diversity on airport systems fluctuates related to flight arrival times, rather than 15 min peaks-within-the-peak. After an arriving flight, three trains at 120-sec headways can exceed maximum loading levels—to be followed by a number of under utilized trains.

At the other extreme are the narrow, all-seated configuration amusement park monorails with loading as low as 2-3 passengers per meter of train length. The loading diversity factor on the latter type systems attains unity when arrangements—and continual passenger line-ups—ensure that every seat on every train is occupied—in some cases, through all hours of operation.

The hourly achievable capacity of non-transit, AGT requires consultation with the system supplier. The methodologies and calculations of this report should only be used as a last resort—and then treated as a guideline.

10.5 OFF-LINE STATIONS

Off-line stations maximize system capacity. They are used on several rail transit lines in Japan to achieve some of the highest throughput for two-track rapid transit lines in the world. In North America they are the exclusive preserve of one AGT—Morgantown.[3]

Off-line stations permit a train throughput that is partly independent of station dwell time. Throughput is that of the train control system plus an allowance for switch operation, lock and clearance and a reduced operating margin.[4] Morgantown and certain other AGT systems use on-vehicle switching techniques where even this allowance—typically 6 sec—can be dispensed with. In theory, trains or single vehicles can operate at or close to the minimum train control separation—which can be as low as every 15 sec—refer to Figure 10.1.

Major stations with high passenger volumes may require multiple-platform berths, otherwise partial dwell times must be added to the train separation times to obtain the minimum headway. The achievable capacity of such specialized systems should

[3] Systems with multiple platform terminal stations could be regarded as a sub-set of off-line stations. The Mexico City metro and PATH (New York) are examples of such arrangements. Not coincidentally, these two systems achieve respectively the highest passenger throughput and the closest regular headway on the continent—for two-track rail transit systems.

[4] Operating margins are intended to accommodate irregularities in train control separation and dwell times. Off-line stations remove the need to allow for dwell time variations.

be determined through consultation with the system manufacturer or design consultant.

To avoid decreasing main line capacity, the diverging moves for off-line stations should be made at line-operating speeds with adequate off-line station trackage for the deceleration and acceleration distances.

Where full provision is made for these distances system throughput becomes independent of stations and dwells Equation 3-12 or 3-13 in Chapter Three, *Train Control and Signaling,* can be used to calculate the line headway with data values, principally length, adjusted for the specific AGT system.

11. Future Research

11.1 INTRODUCTION

Two issues for future research emerged from the work on this report. The first issue was an inability to obtain meaningful information or data on the reliability of service. The second was the wide disparity between total station dwell time and the actual time used for passengers boarding and alighting.

11.2 SERVICE RELIABILITY

One of the goals of this study was to develop a relationship between closer headways and reliability of service, leading to recommendations for how much operating margin should be accommodated in the headway to avoid routine headway interference and service delays. It is intuitive that as trains run closer together the potential for service irregularities and delays increases. A related margin, the schedule recovery provided at each turn-back station, rarely affects achievable capacity and was not analyzed. Schedule recovery time increases the number of staff and cars to carry a given volume of passengers and is an issue of economy—subject to space limitations at each turn-back.

The project's survey and subsequent telephone and field data collection tasks failed to obtain any suitable material. Some operators calculated the percentage of runs that were missed, others had various assessments of on-time arrivals—trains that reached their destination within five to ten minutes of schedule.

As a result, the project had to rely on the observed headway regularity during the field data collection and on limited headway information provided by a few operators. The results are contained in Chapter Six, *Operating Issues*, Table 6.1. Regularity was tabulated as the coefficient of variation—the standard deviation divided by the mean. The results are shown in Figure 11.1, in descending order of reliability.

It would be expected that light rail with on-street sections at, or ahead, of the survey point would have less reliable headway adherence; that automated systems should be better than manually driven systems; and that systems with longer headways would be better than those running trains close together.

The results are both mixed and contrary to these intuitions. Although Calgary's three light rail entries,[1] all with on-street sections, are at the bottom of the chart, they are mixed with BART's automated and longer headway entry and with the TTC's manual subway operation (Bloor Station). BC Transit, with its advanced automatic train supervision, meets expectations at the top of the chart, but PATH's Journal Square and NYCT's Grand Central listings, both manually driven and among the closest headways in the survey, share this honor.

[1] Calgary's three lines are not scheduled to interlace evenly on the downtown trunk. This result is therefore a result of scheduling—not poor operation.

Surveys have frequently shown that reliability is a key concern if the rail transit industry is to meet the higher customer expectations of the future. Reliability — specifically headway adherence—was a secondary issue in this study. The data from 15 peak periods on seven systems is inadequate to draw conclusions.

This topic merits additional research. The first two of the TCRP's four strategic priorities for 1996 and 1997 transit research are

- *Place the customer first and*
- *Improve transit productivity.*

Research into the reliability of service delivery will meet both these goals as even headways move passengers more efficiently with fewer trains and staff.

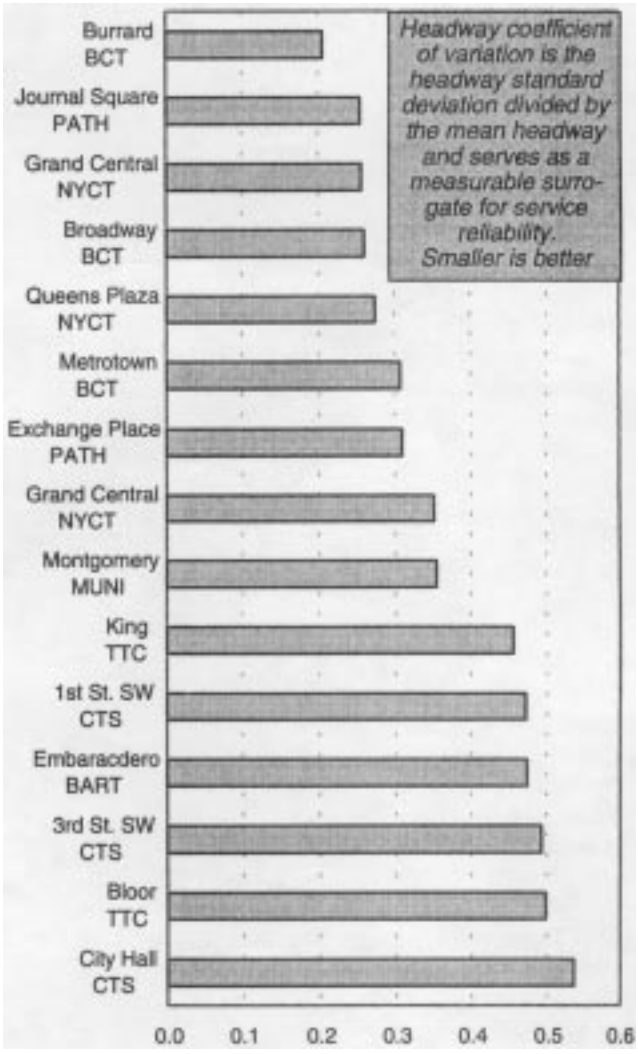

Figure 11.1 Headway coefficient of variation (from Table 6.1)

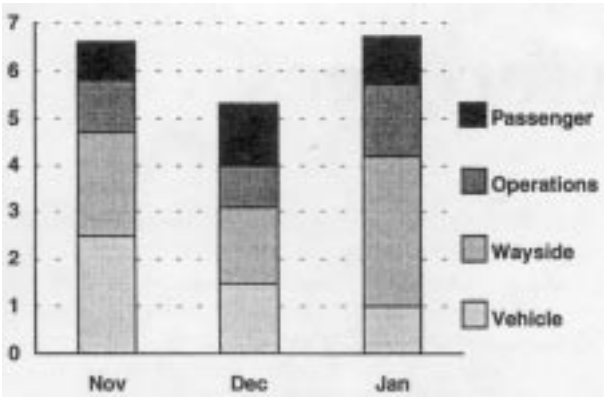

Figure 11.2 Total train operating hours lost per month (equivalent to 0.005% of total hours operated)

Future research should summarize the many surveys of passenger expectations; develop criteria and uniform reporting methods for reliability; establish reliability on existing rail transit systems through telephone and field surveys; relate reliability to efficiency; and produce conclusions and recommendations on the many factors that contribute to, or reduce, system reliability—and so efficiency.

An example of one performance criterion is shown in Figure 11.2., taken from BC Transit's automated SkyTrain operation.

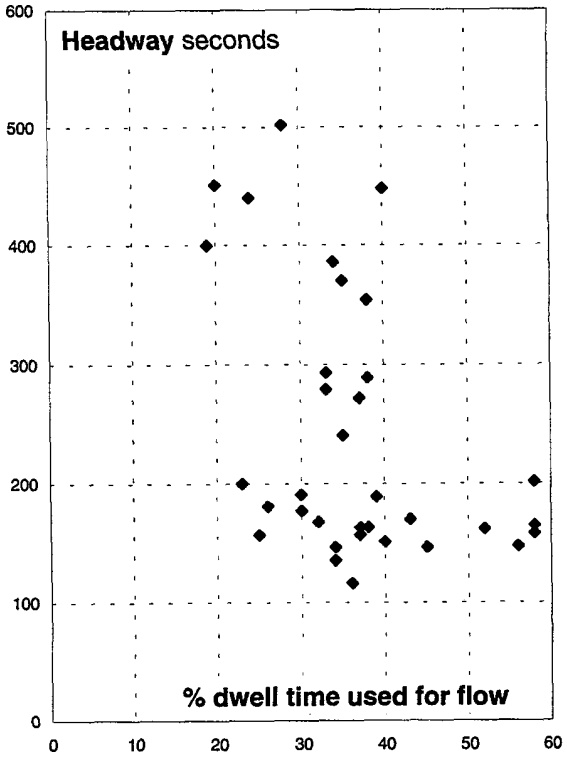

Figure 11.3 Percentage of dwell time at maximum load point stations used for peak-door passenger movements

11.3 STATION DWELLS

The station dwell field data collection and analysis showed a wide variation between the length of the dwell and the time productively used for passenger flow. The bulk of the wasted time was between flow stopping and the train starting to leave the station. A few systems also had a significant loss between the train stopping and the doors opening. The percentage of productive time is shown in Figure 11.3. All data are from the maximum load point station of lines at or close-to capacity.

Two thirds of systems with headways under 200 sec have a flow to dwell ratio of less than 40%; five systems are at or below 30%. Some of this unproductive time is essential. Door opening and closing takes 4 to 6 sec. Confirmation that a train is stopped and correctly positioned at a platform takes less than 1 sec on some automated and most manual systems, but several seconds on others. Safety considerations require some leeway from door closing to train leaving. There is dispute about how much delay is required for safety. Two to 5 sec appears to be a reasonable range used on many systems. The remaining unproductive time, averaging 30-40% of all dwell is wasted—whether due to operational slackness or over cautious safety concerns.

TCRP Report 4, *Aids for Car Side-Door Observation,* [R77] and NCTRDP Report 13, *Conversion to One-Person Operation of Rapid-Transit Trains,* [R78] concentrated on methods to permit train operators to observe side doors as a step towards reducing crewing from two to one on older rail rapid transit systems. Safety and efficiency at the door interface were only reviewed peripherally.

Two North American systems, Vancouver and Miami's Metromover; a few foreign systems; and elevators worldwide maintain exceptional safety standard using pre-programmed dwells without any door observation. The opportunity to tighten up dwells and gain the associated economies is considerable. Research into the passenger-door interface, the effects of different door closing tones or announcements, marking platform door positions, training passengers to wait to the side of the door position and take more responsibility for their actions, and reviewing interior car designs that improve flow rates is overdue.

The benefits are considerable and consistent with the transit industry goal to *improve transit productivity.* Dwell times make up 20 to 40% of total travel time on urban rail rapid transit systems. A modest goal of an overall 10% dwell time reduction would reduce operating costs and car requirements by 3%. On U.S. rail rapid transit alone that saves $120 million a year and 330 cars—a future capital saving of over $600 million[2] at the estimated replacement cost of $2 million per car.

Even such modest dwell reductions would reduce overall travel times, thus making rail rapid transit more attractive to passengers, increasing ridership and meeting another TCRP goal of *placing the customer first.*

The research brief could be expanded to examine the entire issue of operating efficiency. This project found wide variations across the continent. Many of the slack operating practices were not related to restrictive labor practices but to a lack of concern for the brisk, efficient operation that typified the better systems.

[2] Based on U.S. rail rapid transit annual operating costs of $3.9 billion and a fleet of 11,000 cars.

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GLOSSARY

Sources: *Most of the definitions in this glossary are taken from the Transportation Research Board's "Urban Public Transportation Glossary" (1989) and from the American Public Transit Association's "A Glossary of Transit Terminology" (1984).*

Caution: *There is inconsistency in terminology used in the North America transit industry. Many systems have there own specific terminology, a motorman and guard on one system can be an operator and conductor on another.*

ABS—see *control system, automatic block signal.*

ABSOLUTE—A block that no train may enter while the block is occupied by another train.

ABSOLUTE PERMISSIVE—A signal system for a single track or guideway that prevents simultaneous opposing train movements between sidings but permits following movements at a safe distance.

ACCESSIBILITY—A measure of the ability or ease of all people to travel among various origins and destinations

AGT—Automated guideway transit; automated guided transit; see *transit system, automated guideway.*

ALIGHT—To get off or out of a transportation vehicle.

AREA OCCUPANCY—In station and other facility design and in pedestrian movement, the area provided per person.

ARTICULATED RAIL VEHICLE (*articulated car*)—1. An extra-long rail vehicle with two or more bodies connected by joint mechanisms that allows bending in curves yet provide a continuous interior. Typically, the vehicle is 56-100 ft (17-33 m) long. It is very common on light rail transit systems but is also found on several rail rapid transit systems. 2. Rapid transit cars with separate bodies that share a common center truck.

ATO—Automatic train operation.

AUTOMATED GUIDEWAY TRANSIT SYSTEM (AGT)—A transportation system in which automated, driverless vehicles operate on fixed guideways with exclusive right-of-way.

AUTOMATIC BLOCK SIGNAL (*ABS)*—a system governing train separation in which the signals are controlled by the trains themselves. The presence or absence of a train in a block is determined by a track circuit. If the circuitry fails, a restrictive signal is displayed.

AUTOMATIC TRAIN CONTROL SYSTEM (*ATC system*)—1. A system for automatically controlling train movement, enforcing train safety, and directing train operations by computers; see also *automatic train operation, automatic train protection, and automatic train supervision.* 2. A trackside system working in conjunction with equipment installed on the train, arranged so that its operation will automatically result in the application of the brakes to stop or control a train's speed at designated restrictions, should the operator not respond. The system usually works in conjunction with cab signals.

AUTOMATIC TRAIN OPERATION *(ATO)*—The subsystem within automatic train control that performs such functions as speed control, programmed stopping, and (sometimes) door operation.

AUTOMATIC TRAIN PROTECTION *(ATP)*—The subsystem within automatic train control that provides fail-safe protection against collisions, excessive speed, and other hazardous conditions.

AUTOMATIC TRAIN STOP SYSTEM *(ATS* SYSTEM)—A trackside system that works in conjunction with equipment installed on the electric rail car or locomotive to apply the brakes at designated restrictions or on a dispatcher's signal, should the operator not respond properly.

AUTOMATIC TRAIN SUPERVISION *(ATS)*—The subsystem within automatic train control that monitors trains, adjusts the performance of individual trains to maintain schedules, and provides data for adjusting service to minimize the inconveniences otherwise caused by irregularities. May also be used for systems that merely display train status and rely on staff intervention for any corrective action.

BARRIER-FREE—Containing no obstacles that would prevent use by a mobile physically handicapped person or any other person.

BASIC OPERATING UNIT—In rail rapid transit, the smallest number of rapid transit vehicles that can operate independently in revenue service, usually one to three (exceptionally more) cars.

BI-LEVEL—a rail car that has two levels for passenger accommodation. The upper level may extend through the entire length of the car or only over a part of it; this level is sometimes restricted to seated passengers only. Bi-level cars are used principally on commuter rail lines. Double deck cars and gallery cars are types of bi-level cars.

BLOCK—1. A section of track or guideway of defined limits on which the movement of trains is governed by block signals, cab signals, or both; also known as a ***signal block.*** 2. A section of track of defined length, the occupancy of which is regulated

by fixed signal(s), telephone or radio orders, or timetables; also known as a ***block section.***

BLOCK SIGNAL—a standard railroad signal system that uses a fixed signal at the entrance of a block to govern the separation of trains entering the block.

BOARDING—Getting on a transit vehicle.

BUNCHING—With transit units, a situation that occurs when passenger demand is high and dwell times at stops are longer than scheduled. Headways become shorter than scheduled, and platoons of transit units (vehicles or trains) develop, with longer intervals between platoons. The same effect (one transit unit caught by the following) can also be caused by lack of protection from general road traffic congestion or by traffic signal timing. Bunching can become cumulative and can result in delay to passengers and unused capacity.

CAB—1. A rail car with a driving cab. 2. A passenger carrying car used in push-pull service and fitted with a cab at one end, to be used to operate the train when the locomotive is pushing; see also *commuter rail.*

CAB SIGNAL—in rail systems, a signal located in the cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals.

CAPACITY...achievable—A term used in this report to avoid the confusion whereby design capacity can mean either a theoretical or practical maximum number of passengers that can be transported over a given section of a transit line in one direction during a given time period. Achievable capacity is the design capacity factored down to reflect the uneven passenger demand during the peak hour and the uneven loading of cars within a train.

CAPACITY...crush (*crush load)*—the maximum feasible passenger capacity of a vehicle, that is, the capacity at which one more passenger cannot enter without causing serious discomfort to the others. Note that the crush load specification for some rail transit vehicles does not relate to an achievable passenger loading level but is an artificial figure representing the additional weight for which the car structure is designed or for which the propulsion and braking system will meet minimum criteria.

CAPACITY...design—1. For transit, the maximum number of passengers that can be transported over a given section of a transit line in one direction during a given time period (usually 1 hour) under prevailing traffic conditions and design comfort standards. 2. For vehicles, the total number of spaces or people a vehicle can accommodate.

CAPACITY...fleet *(rolling stock capacity)*—the total number of passenger spaces in all vehicles of a transit fleet.

CAPACITY...line—the maximum number of spaces that transit units (vehicles or trains) on a line can transport past a fixed point in one direction per unit of time (usually 1 hour) under actual operating conditions; see also *capacity, theoretical line.*

CAPACITY...normal vehicle—see *capacity, vehicle.*

CAPACITY...rolling stock—see *capacity, fleet.*

CAPACITY...practical—The maximum number of passengers that can be transported over a given section of a transit line in one direction during a given time period (usually 1 hour) under prevailing traffic conditions and design comfort standards.—after allowing for the uneven passenger demand during the peak hour and the uneven loading of cars within a train. In this report Achievable Capacity is used instead of Practical Capacity to avoid confusion with variable definitions of this term used in other capacity work.

CAPACITY...seating *(seated capacity)*—the number of passenger seats in a vehicle.

CAPACITY...standing—the number of standing passengers that can be accommodated in a vehicle under specified comfort standards, expressed in area per standee.

CAPACITY...theoretical line—the maximum number of transit units (vehicles or trains) or spaces that can be carried over a line segment during a given time period with every transit unit operating at the minimum headway that the control system permits. Real operating conditions may reduce this capacity. See also *capacity, line.*

CAPACITY...vehicle *(normal vehicle capacity, total vehicle capacity)*—the maximum number of passengers that the vehicle is designed to accommodate comfortably, seated and standing; may sometimes refer to number of seats only.

CBD—central business district.

CENTRAL BUSINESS DISTRICT (CBD)—The downtown retail trade and commercial area of a city or an area of very high land valuation, traffic flow, and concentration of retail business offices, theaters, hotels and services.

CENTRAL CITY—as defined by the Bureau of the Census, the largest city, or one of the largest cities, in a metropolitan statistical area or urbanized area. The criteria for designating a central city vary with the type of area and the particular census.

CENTRALIZED TRAFFIC CONTROL *(CTC)*—in rail systems, a traffic control system in which signals and switches are controlled from a remotely located (centralized traffic control) panel.

CHECK—in transit operations, a record of the passenger volume on all transit units that pass a specific location or time point (also known as a *passenger riding count or check),* the actual time the unit passes it (also known as a *schedule check),*

the number of passengers who board and alight at each stop on a route or line (also known as an *on-and-off count or check)*, or any combination of these items. The checker may ride the transit unit (an *on-board check)*, follow it in another vehicle, or check the transit units from a particular location (a *point* or *corner check).*

CHECKER—in transit operations, a person who observes and records passenger counts, timing, speeds, vehicle counts, schedule adherence, or other data useful in transit planning and scheduling. The position may be further specified as *schedule checker*, *traffic checker*, and so on.

CLOSE-UP—in rail transit operations the process where a train approaching a station will close-up to the train berthed in the station to the minimum distance permitted by the signaling or train control system. This is usually the critical line condition that, combined with the dwell at the maximum load point station, establishes the minimum headway.

COMMUTER RAIL CAR—a passenger rail car designed for commuter rail services. It usually has many more seats than a conventional long-distance rail passenger car. The car may be hauled by a locomotive, have a self-contained internal combustion engine, or be electrically propelled by power from a third rail or overhead wire. See also *cab.*

COMMUTER RAIL—The portion of passenger railroad operations that carries passengers within urban areas, or between urban areas and their suburbs, but differs from rail rapid transit in that the passenger cars generally are heavier, the average trip lengths are usually longer, and the operations are carried out over tracks that are part of the railroad system in the area.

CONDUCTOR—1. In rail transit operations, the operating employee who may control the doors on rail transit vehicles, or who may have fare-collecting duties, or both—also called guard on some systems. 2. In railroad operations, the operating employee in charge of the train and trail crew.

COUPLER—a device for connecting one rail vehicle to another. The mechanism is usually placed in a standard location at both ends of all rail cars and locomotives.

COUPLER...automatic—1. a coupler that operates automatically. It may also be capable of uncoupling automatically. 2. An automatic connector that joins electric or pneumatic train lines together between rail cars.

CRITICAL LINE CONDITION—in rail transit operations the factor that constrains headway. This is usually the close-in at the maximum load point station or the terminal turnback process, occasionally at junctions.

CRUSH LOAD—The maximum passenger capacity of a vehicle, in which there is little or no space between passengers (i.e., the passengers are touching on another) and one more passenger cannot enter without causing serious discomfort to the others.

CTC—see *centralized traffic control*

DEADHEAD—The movement of a transit vehicle without passengers aboard - often to and from a garage, or from one route to another.

DISPATCHER—The individual who is responsible for keeping trains or other vehicles on schedule.

DOOR MOVEMENT TIME—The time during a rail transit station dwell that passengers are moving through train doorway

DIVERSITY loading—The ratio between achievable (practical capacity) and design capacity (maximum capacity) over the peak hour, reflecting that passengers do not evenly load a car, cars of a train or trains over the peak hour (the 3 levels).

FARE COLLECTION SYSTEM—the procedures and devices used to collect fares and to accumulate and account for fares paid.

FARE COLLECTION SYSTEM...automatic (*AFC)*—the controls and equipment that automatically admit passengers on insertion of the correct fare in an acceptable form, which may be coins, tokens, tickets, or farecards (stored-value farecards must be inserted again on exit, at which point an additional fare may be required). The system may include special equipment for transporting and counting revenues.

FARE COLLECTION SYSTEM...fare-registering turnstile *(faregate)*—a turnstile that unlocks to allow a passenger to enter the paid area after a pass or farecard or the correct amount of money or token is inserted in it. It records the fares paid.

FARE COLLECTION SYSTEM...self-service, proof of payment, barrier-free, honor system—a fare collection system that has no fare-registering turnstiles. This system requires that the passenger be able to display proof of payment (e.g., validated ticket, prepaid pass, valid transfer) while on board the transit vehicle or in a station. Compliance is monitored through random checking by designated transit employees.

FAREBOX—a device that accepts coins, bills, tickets, tokens, or other fare media given by passengers as payment for rides.

FIXED-GUIDEWAY SYSTEM—A system of vehicles that can operate only on its own guideway constructed for that purpose (e.g., rapid trail, light rail). Federal usage in funding legislation also includes exclusive right-of-way bus operations, trolley coaches, and ferryboats as “fixed-guideway” transit.

FLOW RATE *(rate of flow)*—in transportation, the number of units (passengers or vehicles) passing a point on a transportation facility during some period of time, usually counted or computed in units per hour. For example, if 8 buses pass a point in the first half hour and 15 in the second, the volume for the hour is 23. However, the flow rate for the first half

hour is 16 buses/hour, and for the second half hour the flow rate is 30 buses/hour.

GALLERY CAR—A bilevel rail car that has seating and access aisles on a second level along each side of an open well. Tickets of passengers on the second level can be inspected or collected from the lower level.

HANDICAPPED PERSONS—people who have physical or mental impairments that substantially limit one or more major life activities. In the context of transportation, the term usually refers to people for whom the use of conventional transit facilities would be impossible or would create a hardship. These people are also known as *transportation handicapped* or as people who have a *public transportation disability*.

HANDICAPPED ACCESSIBILITY (*full accessibility*)— The extent to which facilities are free of barriers and usable by mobile handicapped people, including wheelchair users.

HEADWAY—the time interval between the passing of the front ends or successive transit units (vehicles or trains) moving along the same lane or track (or other guideway) in the same direction, usually expressed in minutes; see also *service frequency.*

HEADWAY MANAGEMENT—a technique for managing the operation of transit units (vehicles or trains) that focuses on maintaining a certain spacing between units on the same line, instead of on adhering to a timetable. For example, if units become bunched, corrective measures might include delaying the units at the rear of the bunch to provide regular headways and hence load distribution, even at the expense of reducing timetable adherence.

HEADWAY...base—the scheduled headway between transit unit (vehicle or train) trips during an off-peak (usually midday) period.

HEADWAY...interference—headway that is so close that one vehicle or train interferes—delays—the next.

HEADWAY...non-interference—headway (usually including an operating margin) such that in normal operations one train does not delay another.

HEADWAY...policy—1. headway prescribed by reasons other than matching capacity to demand. 2. the maximum permissible headway as established by the transit agency or (often) the policy board, usually for off-peak, low demand periods.

HEAVY RAIL—A type of electric rail transit system characterized by exclusive rights-of-way, multi-car trains, sophisticated signaling and high-platform loading; with the capacity to carry a "heavy volume" of traffic. Also called subways or metropolitan railways (metros). see also *transit system, rail rapid.*

JUNCTION POINT—1. A location at which a rail branch line track connects with a main-line track. 2. A location at which two or more railroads interchange cars over connecting tracks. 3. A location at which several transit lines converge.

LAYOVER-TIME—Time built into a schedule between arrivals and departures, used for the recovery of delays and preparation for the return trip.

LEVEL OF SERVICE *(LOS)*—1. A set of characteristics that indicate the quality and quantity of transportation service provided, including characteristics that are quantifiable *(system performance*, e.g., frequency, travel time, travel cost, number of transfers, safety) and those that are difficult to quantify *(service quality*, e.g., availability, comfort, convenience, modal image). 2. For pedestrians, sets of area occupancy classifications to connect the design of pedestrian facilities with levels of service (A for best through F for worst). 3. For transit rights-of way, see *right-of-way*.

LIGHT RAIL CAR *(LRV, LIGHT RAIL VEHICLE)*—a rail vehicle similar to a streetcar. It may be larger, however, and is often articulated. A light rail car is capable of boarding and discharging passengers at either track or car-floor level.

LIGHT RAIL TRANSIT SYSTEM (LRT)—see *transit system, light rail*

LINE—1. A transportation company (e.g. a bus line). 2. A transit service operating over a specified route or combination of routes. 3. An active (in-use) railroad track or AGT guideway. 4. In network coding, a route and its service level, including mode designation (type of service), line number, headway, and sequence of transfer points (nodes). These factors describe the line's route as an ordered set.

LINE-CLEAR—in rail transit, operation such that trains do not have to stop or slow down due to the train ahead but receive a succession of green signals. See also Headway—non-interference.

LINE...double-track main—a rail main line that has two tracks, usually one for each direction.

LINE...single-track main—a rail main line that has one track. It requires passing sidings for bi-directional operation.

LOAD FACTOR—1. The ratio of used capacity to offered capacity of equipment or a facility during a specified time period. It is usually expressed as a percentage of seats occupied at a given point or (in continuous form) passenger miles (kilometers) divided by seat miles (kilometers). For rail services, the load factor is sometimes expressed as passenger miles (kilometers) per train mile (kilometer) to account for the ability to couple rail cars together to achieve efficiency. 2. The ratio of passenger capacity of a vehicle; also known as a *utilization coefficient.*

LOAD FACTOR—The ratio of passengers actually carried versus the total passenger capacity of a vehicle.

LOADING ISLAND—1. A pedestrian refuge within the right-of-way and traffic lanes of a highway or street. It is provided at designated transit stops for the protection of passengers from traffic while they wait for and board or alight from transit vehicles; also known as a *pedestrian island*. 2. A protected spot for the loading and unloading of passengers. It may be located within a rail transit or bus station.

MANUAL BLOCK—a system of manually governing train movement in a block or a series of consecutive blocks by means of signals, train orders, telephone, or radio.

MANUAL TRAIN OPERATION—a system in which train movement is controlled by the operator (motorman) or engineer.

MAXIMUM LOAD POINT *(MLP)*—the point on a transit line or route at which the passenger volume is the greatest. There is one maximum load point in each direction.

MAXIMUM LOAD SECTION *(MLS)*—the section of a transit line or route that carries the highest total number of passengers for that line or route and direction.

MARRIED PAIR *(MP)*—two semi permanently coupled rail cars (A car and B car) that share some mechanical and electrical equipment and must be operated together as a unit.

MODE—a particular form of travel, for example, walking, traveling by automobile, traveling by bus, traveling by train.

MODE...transit—a category of transit systems characterized by common characteristics of technology, right-of-way, and type of operation. Examples of different transit modes are regular bus service, express bus service, light rail transit, rail rapid transit and commuter rail.

MOTORMAN—Traditional term for train operator or engineer on rapid transit systems. No longer politically correct but still in common use.

MOVING BLOCK (*dynamic block control)*—an automatic train control system that spaces trains according to their location and (sometimes) their relative velocity, stopping performance, and a prescribed safety factor. Moving-block signaling systems are also called transmission or communication based systems. The latter is becoming the preferred term.

MULTIPLE-UNIT *(MU)*—a powered rail car arranged either for independent operation or for simultaneous operation with other similar cars, when connected to form a train of such cars. It may be designated as *DMU (diesel multiple-unit)* or *EMU (electric multiple-unit)*, depending on the source of power.

OFF-LINE—not in the main flow of traffic or not on the main line of traffic, for example, off-line station.

ON-TIME PERFORMANCE—the proportion of the time that a transit system adheres to its published schedule times within stated tolerances; for example, a transit unit (vehicle or train) arriving, passing, or leaving a predetermined point (time point) along its route or line within a time period that is no more than "x" minutes earlier and no more than "y" minutes later than a published schedule time. (Values of 0 minutes for "x" and 5 minutes for "y" are the most common).

OPERATOR—An employee of a transit system who spends his or her workday in the operation of a vehicle, e.g., bus driver, streetcar motorman, trolley coach operator, cable car gripman, rapid transit train motorman, conductor, etc. see also *property, operator*

OPERATING MARGIN—An employee of a transit system who spends his or her workday in the operation of a vehicle, e.g., bus driver, streetcar motorman, trolley coach operator, cable car gripman, rapid transit train motorman, conductor, etc. see also *property, operator*

PASSENGER—a person who rides a transportation vehicle, excluding the operator or other crew members of that transportation vehicle; see also *trip, passenger; trip, linked;* and *trip, unlinked.*

PASSENGER COUNT—a count of the passengers on a vehicle or who use a particular facility.

PASSENGER FLOW (*passenger traffic)*—the number of passengers who pass a given location in a specified direction during a given period.

PASSENGER FLOW TIME...doorway— the time, in seconds, for a single passenger to cross the threshold of a rail transit car doorway, entering or exiting, per single stream of doorway width.

PASSENGER LOAD—the number of passengers on a transit unit (vehicle or train) at a specified point.

PASSENGER MILES *(passenger kilometers)*—the total number of passengers carried by a transit system for a unit of time multiplied by the number of miles (kilometers) they travel. A comparison of passenger miles (kilometers) and seat miles (kilometers) provides a measure of transit system efficiency.

PASSENGER VOLUME *(line volume)*—the total number of passengers carried on a transit line during a given period.

PASSENGER...revenue—a passenger who pays (or has prepaid) a fare.

PASSENGER...transfer—a passenger who changes from one route or line to another route or line.

PCC CAR *(PCC, Presidents' Conference Committee car)*— a streetcar first produced in 1935. Its performance and efficiency were significantly improved over those of any streetcar previously built. The PCC car, characterized by (relatively) lightweight construction, smooth and rapid acceleration and

deceleration, and soft ride, became the standard for U.S. streetcars for many years.

PEAK *(peak period, rush hours)*—1. The period during which the maximum amount of travel occurs. It may be specified as the morning (a.m.) or afternoon or evening (p.m.) peak. 2. The period when demand for transportation service is heaviest.

PEAK-HOUR FACTOR *(peak-hour conversion factor)*— the ratio of the volume during the peak hour to the maximum rate of flow during a selected period within the peak hour.

PEAK/BASE RATIO *(peak/off-peak ratio)*—1. The ratio between the number of vehicles operating in passenger service during the peak hours and that during the base period. 2. The ratio between the number of passengers carried during the peak hours and that during the base period.

PEOPLE MOVER—an automated transportation system (e.g., continuous belt system or automated guideway transit) that provides short-haul collection and distribution service, usually in a major activity center. Once almost synonymous with automated guideway transit. Now primarily used for smaller systems such as those internal to airports.

PLATFORM *(passenger platform)*—that portion of a transit facility directly adjacent to the tracks or roadway at which transit units (vehicles or trains) stop to load and unload passengers. Within stations, it is often called a *station platform.*

PLATFORM....center—a passenger platform located between two tracks or guideways so that it can serve them both.

PLATFORM....high—a platform at or near the floor elevation of the transit unit (vehicle or train), eliminating the need for steps on the transit unit.

PLATFORM....low—a platform at or near the top of the running surface of the transit unit (vehicle or train), requiring the passenger to use steps to board and alight.

PLATFORM....side—a passenger platform located to the outside of the tracks or guideways, as distinguished from a center platform located between the tracks or guideways.

PLATFORM TIME—The time a vehicle is in revenue service.

PROPERTY *(operation, operator, system)*—in the transit industry, a public transit agency or a private transit company with responsibility for transportation services such as bus, ferry, rail; see also *transit district.*

RAIL DIESEL CAR *(RDC, diesel rail car)*—a self-powered rail car that usually has two diesel engines and can usually operate in multiple units (diesel multiple-unit car).

RAIL RAPID TRANSIT—see *transit system, rail rapid*

RAIL RAPID TRANSIT CAR *(rapid transit car, subway car)*—a rail car for rapid transit systems. It is bi-directional, usually powered, and equipped with a control cab at one or both ends. It may be designed to operate in single or multiple units. It has two to five double doors per side, designed for fast boarding and alighting from high-level platforms.

RAPID RAIL—A system which operates high speed, high capacity passenger trains using exclusive fixed guideways, grade separated and with high level station platforms for boarding passengers.

RAPID TRANSIT—Transit service which is operated completely separate from all other modes of transportation. The term "rail rapid transit" frequently refers both to operation of light rail transit vehicles over exclusive right-of-way and heavy trail transit vehicles; the term "bus rapid transit" refers to operation of motor buses over exclusive bus roads or busways.

REGIONAL RAIL SERVICE—see *service, regional rail*

REVENUE MILES *(revenue kilometers)*—miles (kilometers) operated by vehicles available for passenger service.

RIGHT-OF-WAY *(ROW)*— A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes. For transit, rights-of-way may be categorized by degree of their separation: A-fully controlled without grade crossings, also known as *grade separated, exclusive,* or *private*; B-longitudinally physically separated from other traffic (by curbs, barriers, grade separation, etc.) but with grade crossings; C-surface streets with mixed traffic, although transit may have preferential treatment.

RIGHT-OF-WAY....exclusive transit—a right-of-way that is fully grade separated or access controlled and is used exclusively by transit; transit ROW category A.

ROLLING STOCK—The vehicles used in a transit system, including buses and rail cars.

ROUTE MILES *(route kilometers)*—various definitions exist for this statistic: 1. One-way duplicating is total mileage (kilometers) of routes, where the roadway or guideway segments of each individual route are summed up in one direction. For example, a 1 mile (kilometer) segment over which buses operate in both directions would be reported as 2 miles (kilometers); also known as *directional route miles* (kilometers) or *miles (kilometers) of roadway or route.* 2. One-way non-duplicating is total mileage (kilometers) of routes, where a particular roadway or guideway segment is only counted once regardless of number of routes or direction of travel on that segment; also known as *line miles (kilometers)* or *miles (kilometers) of directional roadway.* 3. Two-way mileage (kilometers) is total mileage (kilometers) of each route covered from start to finish. No attention is given to direction of routes or number of routes using any particular segment of roadway or guideway.

RUNNING GEAR—The wheels, axles, springs, axle boxes, frames, and other carrying parts of a bus, truck, rail car, or locomotive.

SECTION 15—The section of the Urban Mass Transportation Act of 1964, as amended, that authorizes the Department of Transportation to gather statistical information about the financing and operations of public transportation systems, based upon a uniform system of accounts and records.

SERVICE—a system or method of providing people with the use of something, for example, transportation.

SERVICE...base period—the level of transit operations during the base period.

SERVICE...commuter—transportation provided on a regularly scheduled basis during peak travel periods for users commuting to work, school and similar destinations.

SERVICE...express—service that has fewer stops and a higher operating speed than regular service.

SERVICE...limited—1. A transit service that operates only during a certain period of the day, or that serves only specific stops (also known as *limited stop service)* or in a specified area, or that serves only certain segments of the population. 2. Line service with some restrictions on boarding and alighting.

SERVICE...local—1. Transit service that involves frequent stops and consequent low average speeds, the purpose of which is to deliver and pick up transit passengers close to their destinations or origins. 2. Transit operation in which all transit units (vehicles or trains) stop at all stations. 3. Transit service in a city or its immediate vicinity, as distinguished from regional transit service or interurban lines.

SERVICE...regional rail *(RGR)*—regional rail passenger service, usually provided by railroad agencies, that consists of electric or diesel-powered trains on grade-separated railroad lines (sometimes with protected grade crossings); see also *transit system, commuter rail.*

SERVICE...revenue—1. Transit service excluding deadheading or layovers. 2. Any service scheduled for passenger trips.

SERVICE...service frequency—the number of transit units (vehicles or trains) on a given route or line, moving in the same direction, that pass a given point within a specified interval of time, usually 1 hour; see also *headway.*

SERVICE...skip-stop—service in which alternate transit units (vehicles or trains) stop at alternate sets of stations on the same route. Each set consists of some joint and some alternate stations.

SHORT TURN—see *turn back*

SIGNAL ASPECT—1. The appearance of a fixed signal conveying an indication, as viewed from the direction of an approaching rail unit. 2. The appearance of a cab signal conveying an indication, as viewed by an observer in the cab of a rail unit.

SIGNAL PRE-EMPTION—in highway operations, an automatic or manual device for altering the normal signal phasing for the sequence of a traffic signal to provide preferential treatment for specific types of vehicles, such as buses or trains.

SIGNAL...automatic block—a system in which signals are actuated automatically by the presence of a train on the track section. Some block signal systems can use an electric circuit to detect the presence of any vehicle, switch positions, broken rail, and so on.

SIGNAL...block—a fixed signal installed at the entrance of a block to govern trains entering and using that section of track.

SIGNAL...wayside—in rail operations, a fixed signal that is located along the track right-of-way.

SINGLE UNIT *(SU)*—a powered rail car, equipped with a control cab at one or both ends, that operates alone.

SPACING—the distance between consecutive vehicles, measured front to front.

SPEED see *velocity*

SPEED...overall trip *(effective operating speed, cycle speed)*—in transit operations, the average speed achieved per round trip, including layover time but excluding deadheading time. It is calculated by individual trips, by running time periods, or for the entire schedule.

SPILL-BACK—in on-street light rail transit operations where trains or motor vehicles fail to clear a signalized intersection and so prevent the following train from entering that block. Particularly acute in downtown streets where the light rail train can be the full length of the block.

STATION—1. An off-street facility where passengers wait for, board, alight, or transfer between transit units (vehicles or trains). A station usually provides information and a waiting area and may have boarding and alighting platforms, ticket or farecard sales, fare collection, and other related facilities. It is also know as a *passenger station.* 2. In railroad operations, a place designated in the timetable by name, at which a train may stop for traffic or to enter or leave the main track, or from which fixed signals are operated.

STATION ACCESSIBILITY—A measure of the ability of all people within a defined area to get to a specific transit station.

STATION...all-stop—in transit systems with skip-stop

schedule or express service, a station that is served by all scheduled transit units (vehicles or trains).

STATION...maximum load point—The busiest station on a line where the longer dwell establishes the minimum headway.

STATION...off-line—a station at which a transit unit (vehicle or train) stops outside of the main track or travel lane so that other units can pass while passengers board and alight.

STATION...on-line—a station in which transit units (vehicles or trains) stop on the main track or travel lane. This is the common design, and the term is used only to distinguish this station from off-line stations.

STREETCAR—an electrically powered rail car that is operated singly or in short trains in mixed traffic on track in city streets. In some areas it is also know as a *trolley car* and, primarily in Europe, as a *tram.*

SUBWAY—1. That portion of a transportation system that is constructed beneath the ground surface, regardless of its method of construction. 2. An underground rail rapid transit system or the tunnel through which it runs. 3. In local usage, sometimes used for the entire rail rapid transit system, even it is not all beneath the ground surface. 4. A pedestrian underpass.

TERMINAL—1. The end station or stop on a transit line or route, regardless of whether special facilities exist for reversing the vehicle or handling passengers; also known as a *terminus.* 2. An assemblage of facilities provided by a railroad or intercity bus service at a terminus or at an intermediate location for the handling of passengers and the receiving, classifying, assembling, and dispatching of trains or dispatching of buses; also known as a *depot.*

TERMINAL...stub—a dead-end terminal in which the entering rail (or other guided) transit unit must depart by the same guideway on which it entered. Because no loop is provided, a bi-directional transit unit (vehicle or train) is necessary.

THROUGH ROUTING—the practice of joining the ends of radial transit routes to travel through downtown instead of having each route turn back in the downtown and return to its origin.

THROUGHPUT—The volume of vehicles passing or people transported past a point or series of points during a given period of time.

TIME...delay—the amount of time by which a transit unit (vehicle or train) in service is delayed from its scheduled time.

TIME...dwell—the time a transit unit (vehicle or train) spends at a station or stop, measured as the interval between its stopping and starting.

TIME...running—the actual time required for a transit unit (vehicle or train) to move from one point to another, excluding time for stops.

TIME...terminal—1. For passengers, the time required at the ends of trips to unpark and park their private vehicles, including any necessary walking time. 2. For rail vehicles, the time allowed at a terminal between arrival and departure for turning vehicles, recovering delays, and preparing for the return trip. 3. The time required for a passenger to pass through a terminal when there is a change of mode.

TRACK MILES *(track kilometers)*—the sum of the oneway linear miles (kilometers) of all trackage in a system, including all main track and trackage in yards, car barns, switches, and turnouts.

TRACK MILES...revenue *(revenue track kilometers)*—the number of miles (kilometers) of track used in passenger-carrying service.

TRACK MILES...service *(service track kilometers)*—the number of miles (kilometers) of track used exclusively in non revenue service.

TRACTION SAFETY INTERLOCK—in rail transit a series circuit of electrical switches that prohibits a train from starting unless all passenger doors are closed and locked.

TRAFFIC—in traffic engineering and transportation planning, the vehicles, people or both that pass a specified point during a given period.

TRAFFIC...annual average weekday *(AAWDT)*—daily traffic that is averaged over a calendar or fiscal year and that includes only weekdays (Mondays through Fridays). It may also exclude holidays.

TRAFFIC CONTROL DEVICE—a sign, signal, marking, or other device placed on or adjacent to a street or highway, by authority of a public body or official that has jurisdiction, to regulate, warn, or guide traffic.

TRAFFIC COUNT—a record of the number of vehicles, people aboard vehicles, or both, that pass a given checkpoint during a given time period. It may be classified by type of vehicle. See also *count.*

TRAILER—1. An unpowered rail car operated in trains with powered cars (rapid transit) or towed by locomotives (regional rail). 2. In some rail rapid transit systems, a trailer may be powered; however, it does not have operator's controls and thus can only be operated in consists with cars that do.

TRAIN—1. Two or more transit vehicles physically connected and operated as a unit; see also *transit unit.* 2. One or more locomotives or self-propelled rail cars, with or without other cars but with marker lights. 3. On a headway sheet, a single transit unit (vehicle or train) and all the scheduled work that it performs during the operating day.

TRAIN BERTH—in rail operations, the space designated for a train of given length to occupy when it is stopped at a station platform, in a terminal, on a transfer track, or at some other designated place.

TRAIN OPERATION—the way in which a train is operated, for example, automatic with automatic overspeed control, or manual with either automatic or manual speed control, or skip-stop.

TRAIN...push-pull—a locomotive and a set of cars equipped with one or more cab cars from which the locomotive can be controlled. The train is either pulled and controlled from the locomotive in the conventional manner or pushed by the locomotive and controlled from the leading car.

TRANSFER—1. A passenger's change from one transit unit (vehicle or train) or mode to another transit unit or mode. 2. A slip of paper, card, or other instrument issued to passengers (either free or with a transfer fee) that gives the right to change from one transit unit or mode to another according to certain rules that may limit the direction of travel or the time in which the change may be made.

TRANSFER PASSENGER—A passenger who transfers to a line after paying a fare on another line.

TRANSIT SYSTEM—the facilities, equipment, personnel, and procedures needed to provide and maintain public transit service.

TRANSIT SYSTEM...automated guideway *(automated guided transit, AGT)*—any guided transit mode with fully automated operation (i.e., no crew on the transit units). The term usually refers, however, only to guided modes with small and medium-sized vehicles that operate on guideways with exclusive right-of-way. The term includes the personal rapid transit concept and group rapid transit or people mover systems.

TRANSIT SYSTEM...commuter rail—a passenger railroad service that operates within metropolitan areas on trackage that usually is part of the general railroad system. The operations, primarily for commuters, are generally run as part of a regional system that is publicly owned or by a railroad company as part of its overall service. In some areas it is called *regional rail.*

TRANSIT SYSTEM...light rail *(LRT)*—as defined by the TRB Subcommittee on Light Rail Transit, a metropolitan electric railway system characterized by its ability to operate single cars or short trains along exclusive rights-of-way at ground level, on aerial structures, in subways, or occasionally, in streets, and to board and discharge passengers at track or car floor level.

TRANSIT SYSTEM...light rail rapid *(LRRT)*—light rail transit with exclusive, grade-separated right-of-way for the entire system. It may have low or high-level platforms and visual or signal control.

TRANSIT SYSTEM...major activity center *(MAC system)*—a transit system that provides service for short trips within small, densely populated major activity centers, such as shopping centers and downtown areas.

TRANSIT SYSTEM...rail— —any of the family of transit modes with rail technology. The major ones, generally in ascending order of performance, are streetcars, light rail transit, rail rapid transit, and commuter or regional rail.

TRANSIT SYSTEM...rail rapid *(heavy rail transit, rapid rail transit)*—a transit system that generally serves one urban area, using high-speed, electrically powered passenger rail cars operating in trains in exclusive rights-of-way, without grade crossings (Chicago is an exception) and with high platforms. The tracks may be in underground tunnels, on elevated structures, in open cuts, at surface level, or any combination thereof. Some local terms used for rail rapid transit are *the elevated, the metro, the metropolitan railway, the rapid, the subway, the underground.*

TRANSIT SYSTEM...streetcar *(street railway, tramway, trolley system)*—a street transit system consisting of electrically powered rail vehicles operating in one to three-car transit units, mostly on surface streets with mixed traffic.

TRANSIT UNIT—one or more transit vehicles coupled and operated together. The term includes single vehicles (bus, rail, or other guideway) and multiple car trains (rail or other guideway).

TRIP—1. A one-way movement of a person or vehicle between two points for a specific purpose; sometimes called a *one-way trip* to distinguish it from a round trip. 2. In rail operations, a mechanical lever or block signal that, when in the upright position, activates a train's emergency braking system. 3. The movement of a transit unit (vehicle or train) in one direction from the beginning of a route to the end of it; also known as a *run.*

TRIP...inbound—a trip toward the central urban area, into the central business district, or to a timed transfer point or major activity center.

TRIP...linked *(linked journey, linked passenger trip)*—a trip from the point of origin to the final destination, regardless of the number of modes or vehicles used.

TRIP...outbound—a trip away from the central urban area, out of the central business district, or away from a timed transfer point or major activity center.

TRIP...passenger—one passenger making a one-way trip from origin to destination.

TRIP...unlinked—1. A trip made in a single vehicle. 2. The boarding of one transit vehicle in revenue service; also known as an *unlinked passenger trip.* 3. Any segment of a linked trip.

TRIPPER—1. A train inserted in the schedule to make one peak period trip. 2. An assignment of work to an operator that is not long enough to qualify as a full day's work.

TURN-BACK—1. In transit operations, to cut short a transit trip (to turn back before reaching the end of the route or line), usually to get back on schedule or to meet peak passenger demands; also known as a *short turn.* 2. In rail operations, a point along a track at which a train may reverse direction.

TURNOUT—1. In rail transportation, the assembly of a switch and a frog with closure rails by which rolling stock or trains can travel from a track onto either one of two diverging tracks; also known as a *track switch.* 2. A short side track or passage that enables trains, automobiles, and similar vehicles to pass one another.

UNIDIRECTIONAL CAR—a rail car (usually light rail or streetcar) that has doors on one side and an operating cab at only one end so that it mush be turned around by separate means at terminals.

URBAN RAIL CAR—a light rail, rail rapid transit, or commuter rail car.

VEHICLE HOUR—the operation of a vehicle for a period of 1 hour.

VEHICLE MILE *(vehicle kilometer)*—the movement of one vehicle over a distance of 1 mile (kilometer).

VELOCITY *(speed)*—the distance passed per unit of time, or the rate of change in location relative to time. For transportation vehicles it is usually measured in miles (kilometers) per hour.

WHEELCHAIR LIFT—a device used to raise and lower a platform that facilitates transit vehicle accessibility for wheelchair users and other handicapped individuals. Wheelchair lifts may be attached to or built into a transit vehicle or may be located on the station platform *(wayside lifts).*

YARD—1. In rail systems, a facility within defined limits that has a system of tracks used for making up trains, storing rail cars, and other purposes. 2. In transit systems, an open storage lot for light rail vehicles, streetcars, electric trolley buses, and motor buses.