

James C. Echols
Metropolitan Washington Council of
Governments

Many public transportation system managers view operating standards with skepticism and are often reluctant to make a clear statement of what operating standards they use. There are probably several reasons for this.

- 1. Transit system managers are concerned that any service standard that is explicitly adopted will be too rigidly applied, especially by nonoperating agencies. This produces a tendency in the transit industry to use standards defensively.*
- 2. Different operating standards apply to different modes and to different-sized metropolitan areas.*
- 3. Transit operating standards that are currently being used were determined by the society of another period. However, these operating standards are a part of the industry that is losing more revenue riders each year. This lag in developing new operating standards reinforces the defensive attitude within the industry.*
- 4. The concentrated city of a few years ago is now a suburbanized metropolitan complex. The old casual-*

ness has been replaced by concerns with safety, shopping centers, and supermarkets. Transit is trying to find its role in the new society, and new rules for operating standards are not yet clear.

Clear statements of transit service operating standards would be very helpful both to the industry and to governmental agencies. Judgments on the relative merits of transit operations can be made, and the performance of individual systems could be measured and compared to similar systems. Operating standards could help set minimum as well as desirable performance levels for transit services.

The 4 papers that follow present distinctly separate views of operating standards. Hill speaks from the vantage of the manager of an all-bus transit system in a medium-sized metropolitan area; James is a private consultant; Rice was manager of a newly formed regional transit authority that acquired a privately owned bus operating company; and Krambles presents the large metropolitan area, multimodal transit operators' views. Weiner's paper, which discusses standards within a regional planning context, was not presented at the conference but is included to give another dimension to the subject.

F. Norman Hill
San Antonio Transit System

San Antonio is an old city that was originally selected in 1691 by a Spanish expedition as a mission site and formally established in 1718 by Spain. The Spanish governor, sent here by the king, laid out the town boundaries, which lasted until 1940. The center

PUBLIC TRANSPORTATION OPERATING STANDARDS

of the city was the San Fernando Cathedral and the Military Plaza. The governor established the city limits as a 36-square mile area extending 3 miles north, south, east, and west from the cupola of the cathedral. The San Antonio River meanders throughout the center of the city, and all of the important travel ways of the early days led to the cathedral, the plaza, and the river.

The central square of 36 square miles is still the core of San Antonio. The city now has expanded to an area of 190 square miles in practically all directions. A segment from the northwest to the northeast is the most rapidly growing and heavily populated new area.

From this brief description, it can be conceived that San Antonio streets are extended in all directions as spokes of a wheel, with the cathedral and the surrounding area as the hub. The main downtown streets do not have regular spacing, width, or direction, and routing transit service becomes quite difficult, especially with cross-town lines operating through the CBD.

San Antonio is the fifteenth largest city in the United States and the third largest in Texas. The city's 1970 census population was 654,153, an 11.3 percent increase since 1960. The present transit service area of San Antonio is somewhat smaller than the San Antonio urbanized area as defined by the 1970 U.S. Census of Population, but it includes the cities of San Antonio, Alamo Heights, Balcones Heights, Castle Hills, Terrell Hills, and Olmos Park as well as the San Antonio International Airport, Ft. Sam Houston, Brooke Army Medical Center, Brooks Field and Brooks Aerospace Medical Center, and Kelly and Lackland Air Force Bases. The San Antonio central business district encompasses an area of slightly more than 1 square mile—where the highest concentration of person trips by all travel modes occurs.

The San Antonio Transit System is an entity of the city of San Antonio, having been purchased from the private owner by the city on May 1, 1959. The system operates through a revenue bondholder's indenture, which provides that a board of trustees, appointed by the city council, shall in turn employ a chief executive officer and general manager of the system, who shall be responsible for the daily operations. The Board of Trustees consists of 4 members, on staggered terms, serving 8 years each without being eligible for reappointment; the mayor of the city is a fifth and ex officio member.

The San Antonio Transit System operates 33 basic lines with 66 route variations. There are 273.67 street-miles of bus routes in its service area. Of the 33 basic lines, 28 provide crosstown service through the CBD, 3 are loop lines that start in outlying areas and turn back within the CBD to return to their starting points, and 2 provide crosstown service outside the CBD.

The transit system has been highly successful in its operating results compared to most of the transit systems throughout the country. It has been unique, perhaps, in the respect that it not only has met its operating costs each year with wage increases and improvements in fringe benefits out of fare-box receipts but also has made without the benefit of tax money or subsidies the following capital improvements, regularly scheduled indenture payments, and contingent liability payments:

1. New heavy equipment maintenance facility;
2. New bus operators' station facility;
3. Regularly scheduled payment of interest and principal of revenue bonds issued for purchase of the system;
4. A \$240,000 revenue bond reserve;
5. Minimum deposits of \$30,000 a month or more to a renewal and replacement fund;
6. Modernization of its aged fleet of 261 buses with new air-conditioned buses;
7. Payment of principal and interest on general obligation bonds issued by the city for the purchase of the system; and
8. Regular monthly "in-lieu-of-taxes" payments to the city of \$150,000 or 3 percent of the gross revenues, whichever amount was greater.

After the take-over of operations from the private operator, the new management

decided that one of the first things that needed to be done was to establish operating criteria or standards that would serve as a basis for the rendering of the present service, the extension of present routes, and the expansion of service into new developments with new lines.

In the development of these criteria or standards, the new management decided to obtain a detailed aerial map of the entire San Antonio urbanized area that would show very clearly the location and concentration of residences, industrial areas, shopping areas, other traffic generators, and the usable arterials and general streets. This aerial map was used to carefully study the geographical and physical layout of the San Antonio area and to plot routes for transit service. After making these detailed studies, the management and the Board of Directors adopted a set of minimum standards that have to be met before an extension of bus service is made. This plan, keyed to provide an economic basis for the operation of the system, proved to be a successful criterion for providing excellent transit service within the realm of the transit revenue dollar. The following are the minimum standards used in determining whether bus service is justified.

PRETRIAL STANDARDS

A. Route

1. The route must be of all-weather paving of sufficient strength to carry heavy traffic.
2. Streets must be capable of safely accommodating vehicular traffic, including buses.
3. The proposed route must be accessible to residents who are considered potential bus riders.
4. All bus routes should be located so as to take into consideration the future growth of the city and should be laid out by the San Antonio Transit System in accordance with its best judgment and experience.

B. Potential

1. The area under consideration should not duplicate areas currently served. The area to be served should meet at least 1 of the 2 following qualifications:
 - a. It must average 3 family dwelling units per acre in the area to be served, which is the area within 1,320 feet of the proposed extension except that dwelling units within 1,320 feet of the present end of the bus line will not be counted.
 - b. In lieu of qualification a, the area may qualify if it exceeds 960 dwelling units per mile of route extension, counting only the dwelling units within the 1,320 feet of the proposed extension and not including those houses within 1,320 feet of the end of the existing route.
2. If the extension requires an additional bus, the area to be served must, in addition to the above requirements, also include a minimum of 500 dwelling units to justify peak-hour trial service.
3. Because of difficulties in accurately forecasting the number of bus riders per family dwelling unit in various sections of the city, judgment and current experience on bus lines serving similar areas will have to be considered in setting standards.
4. The presence of bus-passenger traffic generators, such as plants, factories, large office buildings, amusement centers, and, in some cases, schools, must also be considered. The riding from these traffic generators has to be estimated and added to the riding that can be expected in the area from residential dwelling units.

TRIAL OPERATION

- A. In cases where pretrial standards are satisfactorily met, service will be provided in accordance with the estimated potential of the area.
- B. The trial operation will normally continue for a period of 60 days and if, at the end of the 60-day trial period, passenger checks show that the revenue-passenger rides originating in the area on trial amount to as much as an average of 3 adult revenue-passengers per bus-mile operated, then the service will be continued as long as the minimum standard of 3 adult revenue-passengers per bus-mile is met.

In the event any extension fails to meet this minimum standard by the end of the trial period, then such trial service will be discontinued. If after 1 year has elapsed the density of population in the area has increased to the point where it would be reasonable to believe that the above minimum standards of an average of 3 adult revenue-passengers per bus-mile will be met, then another trial operation may be scheduled.

Besides the adoption of the minimum standards for service and route extensions, a decision was also made to establish and maintain, as long as possible, a low basic-fare structure. At the time of the city take-over, the basic adult fare was 17 cents with an additional 5 cents for each of 3 zones. These outer zones were spaced on a $1\frac{1}{2}$ -mile radius beyond the $2\frac{3}{4}$ -mile central zone. Since May 1, 1959, only 2 fare adjustments have had to be made—the first in 1961 from 17 cents to 20 cents for the basic adult fare, and the second in 1970 from 20 to 25 cents for the basic adult fare. Meanwhile, we maintained the 5-cent additional-zone fare, a special system-wide 10-cent student fare, and a transfer charge of 2 cents for adults and 1 cent for students.

Since May 1, 1959, the application of these criteria to the system has resulted in 59 major extensions of service and the removal of only 3 such extensions. Street-miles of operation have risen one-third since 1959, from 198 to 264 miles. Contrary to trends in most large U.S. cities that have reduced bus-miles of service during the last decade, San Antonio has increased bus-miles from 7,732,000 in 1960 to 8,164,000 in 1971. This increase was accomplished with a decrease in bus-hours of service, accomplished by a 17 percent increase in average bus operating speeds—from 11 mph in 1959 to 12.9 in 1971.

In establishing frequency of service, we decided that the load factor (the number of passengers on board at a maximum load point) was not to exceed 150 percent of the seating capacity in peak periods. This load factor is in line with generally accepted industry criteria. A recent study of the system showed that during the peak morning hour the system-wide load factor is 104, meaning that 4 percent of the passengers are standing. These load counts are made at maximum load points, which are in the CBD boundary and within 1 mile from the city center point. During the afternoon peak hour, the average load factor is 98, meaning that only 2 percent of the seats are empty.

Great emphasis is placed on schedule adherence, and operators are checked to the half minute at check points. A current check of all lines shows that 96.7 percent of the bus trips are on time in the morning and 93.7 percent are on time in the afternoon and evening. These values are well above the national averages.

The responsibility for planning new service or changes in service is divided. The director of research and schedules has the responsibility for constantly studying the growth patterns of the city, the establishment of new residential areas and housing developments, and the location of new traffic generators, industries, schools, and the like. His principal tool is the large aerial photo map of the entire urbanized area, which is periodically updated. Inspection trips are also made to areas where there are frequent requests for service extensions or where new developments are being planned.

The director of operations has the responsibility for providing and supervising the daily service required in the community. He uses the results of schedule preparation developed in the Research and Schedule Department. The Department of Operations, however, makes its own study of changes, requirements and extensions of service, new traffic generators, and new residential areas either by on-street observers or by street service supervisors who cover the entire community in radio-controlled supervisory cars.

When either department determines the need for establishing a new service or making a change in existing service, the directors have a preliminary discussion of the problem at hand. They then proceed in their respective ways to develop necessary information and data on a suitable and usable thoroughfare, the housing density pattern of the area involved, and the type of service and frequency of service to be rendered. The examination of the aerial photo map usually dictates the usable thoroughfares available and the concentration of density of housing along those thoroughfares. After the data are reviewed, the Department of Operations conducts a field survey and plots on a street map each house, apartment, commercial and industrial complex, and other traffic generators such as schools, churches, and shopping centers.

If a usable thoroughfare is found and the density of housing pattern along such a thoroughfare reflects a density of 3 houses per acre, the Department of Research and Schedules must then design a schedule on the basis of the summation of the housing

density pattern of the area to be served. This, in turn, is developed into headway requirements, running time, and estimated mileage and cost of labor to operate the necessary or required equipment. The new service is established for a determined period of time, usually no fewer than 60 days, but sometimes longer depending on the conditions. Revenue results are closely watched while the service is being merchandised through a door-to-door approach. If the service, monitored periodically during the trial period, proves successful such that revenues exceed cost of operations, the service is retained. If it does not meet these requirements, then the service is carefully reviewed. If no further improvements can be foreseen for the continuance of its operation, the service is then discontinued.

Thus, the criteria established during the system's first year of operation have permitted the providing of service that has been patronized to a sufficient degree by the community to permit growth of the system. Also the use of such criteria has produced sufficient income to meet annual wage increase demands in excess of the cost of living, to make material improvements in the benefits of all the employees, to completely replace the obsolete fleet of vehicles with a modern, air-conditioned fleet, and to build new bus operators' facilities and maintenance facilities on the property.

Since May 1, 1959, we have met all operating costs and all indenture obligations and paid the city the principal and interest on general obligation bonds and the "in-lieu-of-tax" payments of 3 percent of gross revenues or \$150,000, whichever was greater.

The low basic fare and the zone system have been very meaningful and attractive in maintaining patronage. The number of patrons increased each year until 1970, when a major strike took place and a very severe drop in riding was experienced. Patronage has not since been entirely regained. The merchandising program, the operation of on-time, dependable, and frequent service, and the use of clean, modern, well-lighted, air-conditioned vehicles have combined to justify continuation of the original standards. Of course, any of these standards as set up must remain flexible and reflect changing economic conditions. Moreover, standards that have worked so well in San Antonio are not necessarily applicable to other types of communities. Nevertheless, we are very willing to consult with other transit operators or to make available the data resulting from the operation of our service and the criteria we employ in supervising and monitoring the service.

D. H. James
Urban Transportation Consultant

Practically every newspaper or news magazine mentions some new standard, or set of standards, that has just been proposed or adopted. Various federal, state, and local agencies set, interpret, and enforce standards in many fields: automobile safety standards, air pollution standards, tire construction standards, food and drug standards, advertizing standards.

In the public transportation field, however, this is not so. The Urban Mass Transportation Administration (UMTA), the agency that would most logically set and enforce standards for the industry, has not as yet done so. The American Transit Association (ATA), the industry trade association, has what it calls "transit pars," but these are merely gauges of internal efficiency and have nothing to do with performance of the system as far as the general public is concerned. The Institute for Rapid Transit, another industry trade association, has published a guide covering rapid transit safety regulations and standards, but, again, this is mostly for internal use.

Various regulatory agencies have attempted to set some minimum standards in various transit operating areas, but none is either very comprehensive or universally ap-