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EXECUTIVE SUMMARY

METHODOLOGY FOR THE DESIGN OF URBAN TRANSPORTATION INTERFACE FACILITIES

MASTER

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16. Abstract <p>Procedures and techniques are described which determine measures of the performance of transit station designs. Categories of measures are defined according to the manner by which they are treated in the design process; as a result of policy, or as measures of performance and economic efficiency. Policy items considered include concessions, advertising, personal care facilities, telephones, acoustics, construction materials, design flexibility, parking facilities, and provisions for the handicapped. Performance measures are associated with passenger processing, passenger orientation, the physical environment safety, and security. The policy and performance considerations along with cost factors are used to specify a systematic transit interchange facility design methodology that is recommended to practitioners.</p> <p>Comprehensive descriptions of appropriate analytical techniques for the evaluation of transit station designs are provided in the appendices to the report.</p> <div style="text-align: right; margin-top: 20px;"> <p>This document is PUBLICLY RELEASABLE <u>Barry Steele</u> Authorizing Official Date: <u>7-20-07</u></p> </div>			
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A. Introduction

The planning and design of urban transportation interface facilities represents a critical element in the functioning of a transportation network. This phase of transit system development uses information that is provided from the systems planning stage to select facility components and the spatial configuration and environment of the terminal. The methodology for planning and designing urban transportation interface facilities has been based primarily on "rule of thumb" techniques with little application or system-analytic approaches. The overall purpose of this research is to investigate a formalized and comprehensive approach for transit station design.

Criteria for evaluating alternative transportation interface facility designs have been identified.* Performance measures were subsequently established for these station design criteria and their utilization within a cost-effectiveness decision framework was shown. In order to use the evaluation framework that has been provided, the transportation analyst must be able to derive explicit values of the performance parameters from the alternative designs. Accordingly, the methodological framework and associated techniques for designing and evaluating alternative transit station facilities are investigated. Specifically, methods for establishing policy for station design and for measuring the performance of functional elements of transit terminals are described.

B. Problem Studied

For the purposes of this study it is assumed that the site for the transit station has been selected during the system development stage. Accordingly, adjacent land use measures, demand estimates, and technological and modal supply information are at hand. The study then addresses the development of a generalized transit interface facility design and evaluation methodology. The methodology uses supply, demand and policy

* Hoel, L. A., Demetsky, M. J., and Virkler, M. R., Criteria for Evaluating Alternative Transit Station Designs, March 1976.

requirements to design and measure the performance and cost of alternative terminal facilities. The focus is on the development of a set of tools, procedures and guidelines which can be used to establish policy and standards regarding station design, provide performance measures for the appropriate subsystems, and give estimates for the stated cost components. Information and methodology are collected to show a general step-by-step set of procedures for designing new transit stations as well as renovating existing passenger interface facilities.

C. Results Achieved

The important factors and elements that are associated with a transit station design which enter into the terminal analysis process as a result of policy are first identified. These policy related components include concessions, aesthetics, construction materials, design flexibility, parking facilities, and provisions for the handicapped. Guidelines and directions are provided to assist the planner in identifying the important issues which must be considered prior to establishing policy regarding these station features.

Concerning concessions, the policy analysis must determine whether they will enhance the acceptance and usage of a particular transit station. The evaluation of alternative advertising policy options is quite difficult since the negative effects are not quantifiable. Decisions concerning advertising policy will rely on the experience and judgement of the policy makers. In most cases, positive decisions are justified by the projected revenue. The transit station planner should identify the requirements for personal care facilities relative to local building codes, transit planning practice, and local values. A specific policy can then be established because there is little need to look at alternative policies. A minimum number of telephones should be installed and additional units added as needed. Decisions concerning aesthetic and cultural dimensions must be based solely on their value to the total system and the available resources. Various degrees of artistic refinement relative to the associated cost should be considered prior to establishing policy. The selection of construction materials influences not only the aesthetic

qualities of stations, but also the safety of patrons, and replacement and maintenance considerations.

Expansion considerations are important in areas where population growth is expected. Joint development will be most appropriate where the transit station is a focal point in an activity center. The number of parking spaces required is determined from the size and nature of the transit demand and the parking requirements for appropriate non-transport activities in the station vicinity. Methodologies are available for estimating the number of travelers who access the system by park-and-ride and kiss-and-ride. The extent of which special facilities are provided to aid the mobility of the elderly and the handicapped will be based on legal requirements and the expected usage of the facility by these special users.

The above considerations summarize the major observations that were determined for the policy variables in the transit station design. This information as presented in the report provides the planner with a basis for showing public officials those areas where policy must be established for transit terminal programs. A review of this material will ensure that each resulting policy arises from a systematic appraisal of its impact on the cost, performance, and social acceptance of the transit station.

The next major thrust of the study deals with the investigation of analytical techniques, including appropriate computer models, for analyzing the performance of important transit interchange facility functions. The specific systems addressed are passenger processing, passenger orientation, the physical environment, security, and safety.

Manual computations which measure walk time, delay time, queue lengths, flow conflicts, and the area per passenger are generally sufficient for evaluating alternative terminal sizes, arrangements, and facilities for accommodating passenger flows. Computer simulations are expensive and difficult and are only warranted in cases where a large number of relatively large and sophisticated facilities are considered. Orientation aids which assist pedestrians in choosing the proper route to their destination have a significant influence on the efficiency of the passenger

processing system. Since there are no existing methods for measuring the adequacy of the passenger orientation system of a transit interface facility, an inspection based procedure is developed to assist the designer to improve the orientation aspect by increasing the level of certainty at all decision points.

The elements of the physical environment which are considered in the performance analysis are air quality, air flow rates, temperature, noise, lighting and weather exposure. Manual and computerized techniques are available for designing for air quality, air flow, and temperature. Design standards and techniques are given for noise and lighting.

Alternative variations in security system design can be evaluated in terms of cost vs. service rendered or incidence of crime. Since the impact of a particular security strategy is very difficult to assess, the benefits of, say, more police or surveillance equipment will be a value judgement on the part of the decision maker. Alternative security concepts are shown.

A typical safety study requires a knowledge of all federal and local safety laws (as well as a degree of common sense). Each significant station element must be scrutinized relative to its role and accident potential. After a series of independent reviews by the various interests, a sufficiently safe facility should result.

The final area of terminal performance that must be dealt with is the cost of the facility and its operation. Itemized costs are summed for each component of the total cost. Construction costs are obtained from architectural drawings. Annual operation and maintenance costs are assigned to the station components by extrapolating from recent operating experiences. Finally, the policy and performance analysis methods are combined with the cost considerations to derive a comprehensive transit station design strategy.

A design methodology is provided for application to new station design and evaluation and to station renovation. The procedural method which is described includes the following stages of analysis: data inventory,

policy development, generation of trial station design concepts, initial evaluation of concepts, acceptance of policy and design concepts, development of detailed terminal designs, performance and cost evaluation, and design selection. The recommended methodology provides the planner with various options for arriving at a recommended design relative to the manner by which the various station components are developed.

D. Utilization of Results

The results of this research will be used by transportation planners, facility designers, and transit managers who are concerned with renovating existing facilities and future plans for transit systems. The findings can also be applied in the development of acceptable interchange facilities for new transit modes. The research advances the state-of-the-art with a methodology for designing transportation interface facilities.

E. Conclusions

This research provides a systematic and methodology for planning and designing urban transportation interface facilities. It may be applied to both the development of new stations and the renovation of existing terminals. It remains for the research team to demonstrate the application of the procedures to practical terminal design and evaluation problems. During the testing phase it is likely that certain elements in the methodology will become refined and clearer to the practitioner.

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