

These Digests are issued in the interest of providing an early awareness of the research results emanating from projects in the NCHRP. By making these results known as they are developed, it is hoped that the potential users of the research findings will be encouraged toward their early implementation in operating practices. Persons wanting to pursue the project subject matter in greater depth may do so through contact with the Cooperative Research Programs staff, Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418

Areas of Interest: 12 planning, 54 operations and traffic control, 55 traffic flow, capacity, and measurements (1 highway transportation)

Responsible Staff Engineer: Mr. Robert E. Spicher

## Development of a New Highway Capacity Manual

### Status Report

*An NCHRP staff digest of the progress and status of research being conducted to develop a new HIGHWAY CAPACITY MANUAL.*

#### INTRODUCTION

This Digest provides a status report on the research that is currently being directed to the development of a new *HIGHWAY CAPACITY MANUAL*. This research is being conducted by the NCHRP, FHWA, the TRB Committee on Highway Capacity and Quality of Service (A3A10), and others.

The Manual currently being used was published by HRB in 1965 as *HRB Special Report 87*, and over 36,000 copies have been printed to date. Research described in this Digest is directed to replacing the 1965 Manual with a totally new set of capacity analysis techniques that will reflect the advances in technology and changing traffic conditions that have taken place over the past 20 years. The new Manual is scheduled for publication in 1985.

Readers should understand that the research reports and interim publications described in this Digest, including *TRB Circular 212*, are draft materials that may be revised and that have not yet been approved by the TRB Committee on Highway Capacity and Quality of Service for inclusion in the next Manual. These materials are being made available to provide an early awareness of the types of new procedures that are being developed and to obtain feedback from the user community. In this regard, review comments on any of the available interim documents would be appreciated and should be sent to Robert E. Spicher, Projects Engineer, NCHRP, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, DC, 20418. Comments should be submitted as soon as possible; the final deadline is October 1, 1983.

## SUMMARY OF RESEARCH

### NCHRP-Sponsored Projects

NCHRP Project 3-28 is a multiphase effort with the overall objective of providing the basis for a revision of the *HIGHWAY CAPACITY MANUAL*. Phase I (Project 3-28) accomplished the threefold objective of (1) determining the current and future needs of users of the HCM, (2) assembling existing information for dissemination as an interim document prior to revision of the entire Manual, and (3) identifying gaps in the available techniques that require additional research to develop new information for inclusion in the revised Manual. This work, conducted by JHK & Associates and Northwestern University, resulted both in a research report which provided the basis for subsequent phases and *TRB Circular 212* which has been widely distributed. *Circular 212* includes preliminary information on:

- Freeway Capacity Procedures (including weaving).
- Critical Movement Analysis.
- Unsignalized Intersections.
- Transit.
- Pedestrians.

Demand for *Circular 212* has been quite high; over 9,000 copies have been printed. However, changes may and probably will be made to much of this information. As noted in the Introduction to the Circular --

Some of these procedures are widely accepted already; others are in need of field validation. Some may not withstand the rigors of extensive application; they may be either dropped or modified before being advanced as recommended practice in a permanent publication. Nevertheless, it is the considered judgment of the TRB Committee on Highway Capacity and Quality of Service that the methods presented here can be put to use until such time as a revised Manual becomes available.

The primary area in which changes to the *Circular 212* procedures are anticipated is in the signalized intersection procedures. NCHRP Project 3-28(2), described later in this Digest, has resulted in a revised and expanded version of the signalized intersection analysis technique which, tentatively, will replace the critical movement analysis procedure in the Circular. Another area of potential change is in the freeway weaving section analysis; FHWA is currently sponsoring research to further evaluate the weaving procedures.

Phase II of NCHRP's research includes two projects that were initiated to satisfy the high-priority research needs identified in Phase I. These projects include NCHRP Project 3-28(2) for urban signalized intersections and Project 3-28A for 2-lane rural highways.

The objective of Project 3-28(2) was to develop procedures for capacity analysis of the intersection as a complete unit and of each individual intersection approach. This research, also conducted by the JHK/Northwestern University research team, has been completed. The proposed procedures are undergoing final review at this time; copies of the draft chapter are available as noted in the last section of this Digest.

The objective of NCHRP Project 3-28A is to develop a procedure to evaluate the capacity and level of service for two-lane, two-way rural roads and to document the procedure in an appropriate form for inclusion in a revised Manual. TTI and KLD Associates are conducting this work, and a draft chapter will be submitted to the NCHRP in March 1983.

The objective of the third phase, NCHRP Project 3-28B, is to assemble and review existing information related to highway capacity, determine the most appropriate material for inclusion in the new HCM, refine and reformat that material as necessary, synthesize state-of-the-art information, and prepare a complete draft of the new Manual. The Polytechnic Institute of New York is the primary contractor, and TTI is serving as a subcontractor. Also, a number of experts in the highway capacity field are serving as special consultants to PINY, and the researchers are working closely with the TRB Committee on Highway Capacity and Quality of Service. This contract is scheduled for completion in mid-1984.

Some follow-up research may also be conducted by NCHRP after the new Manual has been published. The Manual's format will be such that updated, revised, or new information can be easily incorporated.

#### FHWA-Sponsored Projects

The results of an FHWA study conducted by Polytechnic Institute of New York on freeway capacity were reported in *TRB Circular 212*. FHWA currently has a contract with Jack Leisch & Associates to develop supporting information for the weaving section nomographs that are also included in *TRB Circular 212*. Another study will be initiated in the very near future to compare the detailed procedures developed by PINY for freeway weaving section analysis to the nomographs. Tentatively, both procedures will be included in the new Manual with an identification of the most appropriate applications for each.

Currently, FHWA's major effort is devoted to the development of a chapter for urban arterial capacity. This project, "Quality of Flow on Urban Arterials," is being conducted by PRC Voorhees, and a draft chapter for the Manual should be available by mid-1983. The FHWA arterial study and NCHRP's intersection study are closely related and complement each other, i.e., the intersection analysis method can be used as part of the arterial analysis.

FHWA will also develop a chapter for the Manual describing basic traffic characteristics used in the various capacity procedures.

## Other Research

In addition to sponsored research, the TRB Committee on Highway Capacity and Quality of Service is developing draft materials for several chapters (e.g., pedestrians, transit). Related information from other sources, including state research programs, university research, and capacity manuals from other countries, is also being used.

## CONTENT OF NEW MANUAL

The new Manual will differ from the 1965 Manual in many ways including (1) there will be greater emphasis on urban facilities, i.e., intersections, arterials, transit, and pedestrian treatments; (2) there will be more than one level of analysis (e.g., planning, operations, design) for various chapters, and in some cases different techniques will be used for each level; (3) several of the new procedures will be relatively more complex in order to provide for the consideration of factors not addressed in the earlier procedures (the negative aspects of this increase in complexity should be offset by the trend toward computer applications); and (4) provisions will be made for updating individual chapters. The preliminary chapter outline is given in Table 1. Each chapter will follow the same basic format - a section describing the basic methodology, a section detailing the application procedures, and a section containing sample problems. Blank forms will also be provided to aid the user in completing the calculations.

TABLE 1

### CHAPTER ORGANIZATION OF THE NEW HCM

#### PART I: PRINCIPLES OF CAPACITY

- Chapter 1 - Introduction, Definitions, and Concepts
- Chapter 2 - Traffic Characteristics

#### PART II: FREEWAYS

- Preface
- Chapter 3 - Basic Freeway Segments
- Chapter 4 - Weaving Areas
- Chapter 5 - Ramps and Ramp Terminals
- Chapter 6 - Freeways: The Total Facility

#### PART III: RURAL HIGHWAYS

- Preface
- Chapter 7 - Multilane Highways
- Chapter 8 - Two-Lane Highways

#### PART IV: URBAN STREETS

- Preface
- Chapter 9 - Signalized Intersections
- Chapter 10 - Unsignalized Intersections
- Chapter 11 - Arterial Streets
- Chapter 12 - Transit
- Chapter 13 - Pedestrians
- Chapter 14 - Bicycles
- Chapter 15 - Urban Systems

## GLOSSARY

## LIST OF SYMBOLS

### AVAILABILITY OF INTERIM REPORTS

The following reports are available; readers are reminded that the procedures and data are subject to change. Please note that feedback is requested by October 1, 1983.

1. *TRB Circular 212*, "Interim Materials on Highway Capacity." Available from the TRB Publications Office, 2101 Constitution Avenue, N.W., Washington, DC, 20418. Cost: \$10.00.

2. "NCHRP Signalized Intersection Capacity Method." Draft Final Report, NCHRP Project 3-28(2), JHK & Associates and The Traffic Institute, Northwestern University. Available from Robert E. Spicher, Projects Engineer, NCHRP, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, DC, 20418. Cost: \$7.00.

3. "Two-Lane, Two-Way Rural Highway Level of Service and Capacity Procedures." Draft Final Report, NCHRP Project 3-28A, Texas Transportation Institute and KLD Associates, Inc. Available from Robert E. Spicher, Projects Engineer, NCHRP, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, DC, 20418. Cost: \$3.00. Report will be available on April 1, 1983.

**TRANSPORTATION RESEARCH BOARD**

National Research Council  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418

NON-PROFIT ORG.  
U.S. POSTAGE  
PAID  
WASHINGTON, D.C.  
PERMIT NO. 42970

000015M001  
JAMES W HILL  
RESEARCH SUPERVISOR

IDAHO TRANS DEPT DIV OF HWYS  
P O BOX 7129 3311 W STATE ST  
BOISE ID 83707