

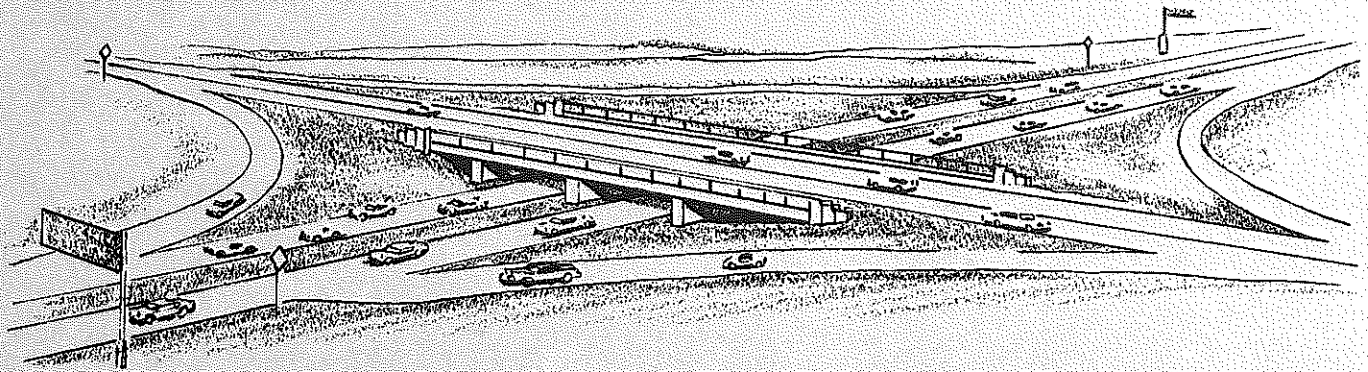
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Annual Report of

TRAFFIC DIVISION

1960



MICHIGAN STATE HIGHWAY DEPARTMENT

JOHN C. MACKIE, COMMISSIONER

MICHIGAN
STATE HIGHWAY DEPARTMENT
John C. Mackie - Commissioner

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ANNUAL REPORT
OF
TRAFFIC DIVISION

Harold G. Bauerle - Director
Lowell J. Doyle - Ass't Director

January 1961

PREFACE

The first Annual Report of the Traffic Division was compiled for the 1959 calendar year. This was deemed advisable in order to reacquaint ourselves and outline for others the scope and magnitude of the work involved in operating the State trunkline system. This first effort was so well received that it was decided to again compile and perhaps refine by some documentation a similar report for the calendar year of 1960.

In this 1960 Annual Report an attempt is made to outline and demonstrate both graphically and narratively the involved effort necessary to produce the bulk and dollar volume of the listed work. Due to the relatively complex and diversified nature of problems involved in operating the State highway system, this report is, for clarity, divided into the categoric functions as outlined in the attached organization charts. In this manner the activities of the Survey, Geometrics, Operations, Research and Districts Sections during 1960 are described separately, even though all functions are interrelated and coordinated in the achievement of the common goal of providing free, convenient and safe transportation over our highway system.

The following narrative report describes the various functions in some detail; the express purpose being toward the simplification of succeeding reports, which when the function is known, can become an outline of items and quantities of work accomplished.

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TRAFFIC DIVISION

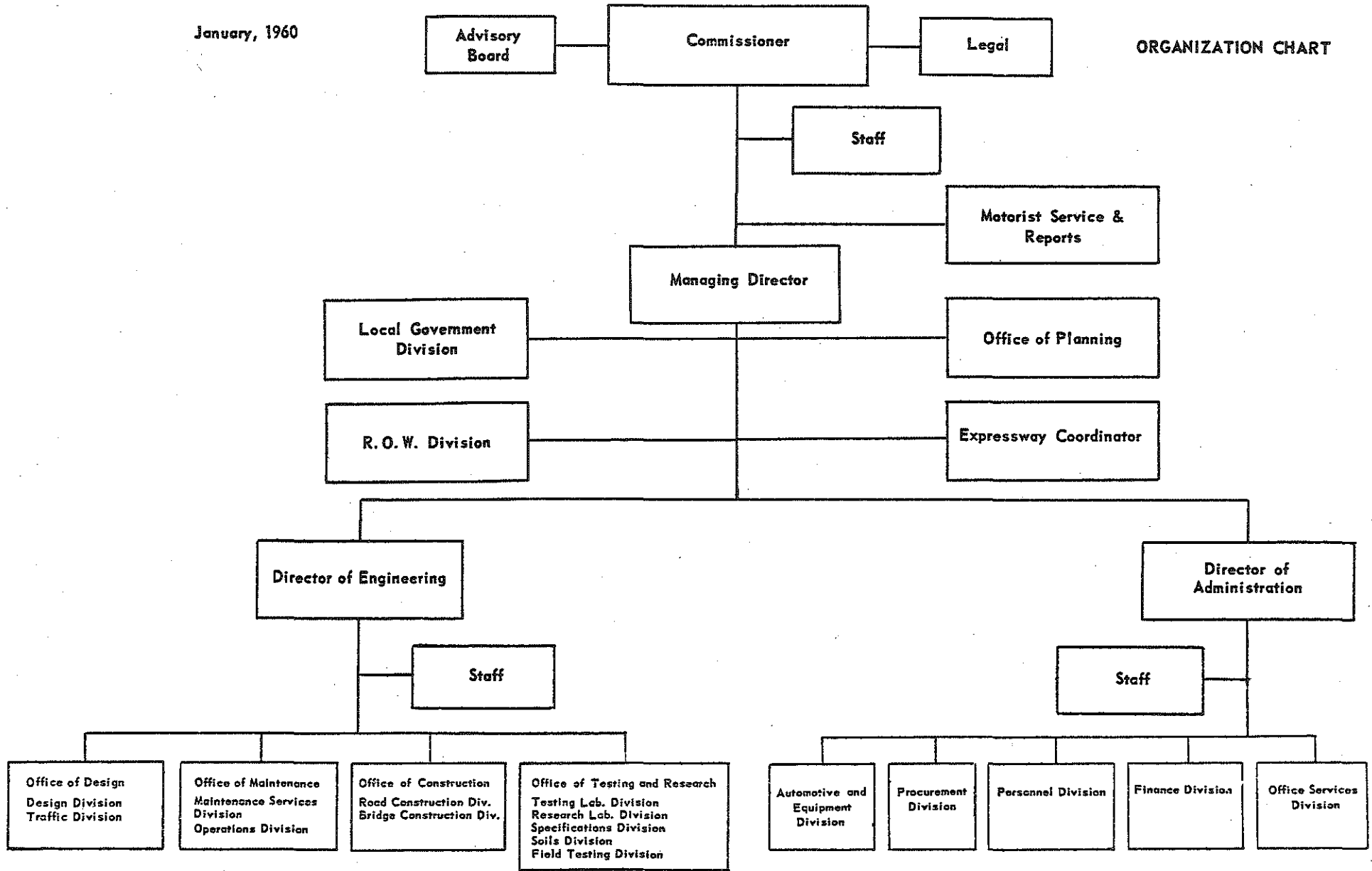
Harold G. Bauerle - Director

Lowell J. Doyle - Assistant Director

MICHIGAN STATE HIGHWAY DEPARTMENT

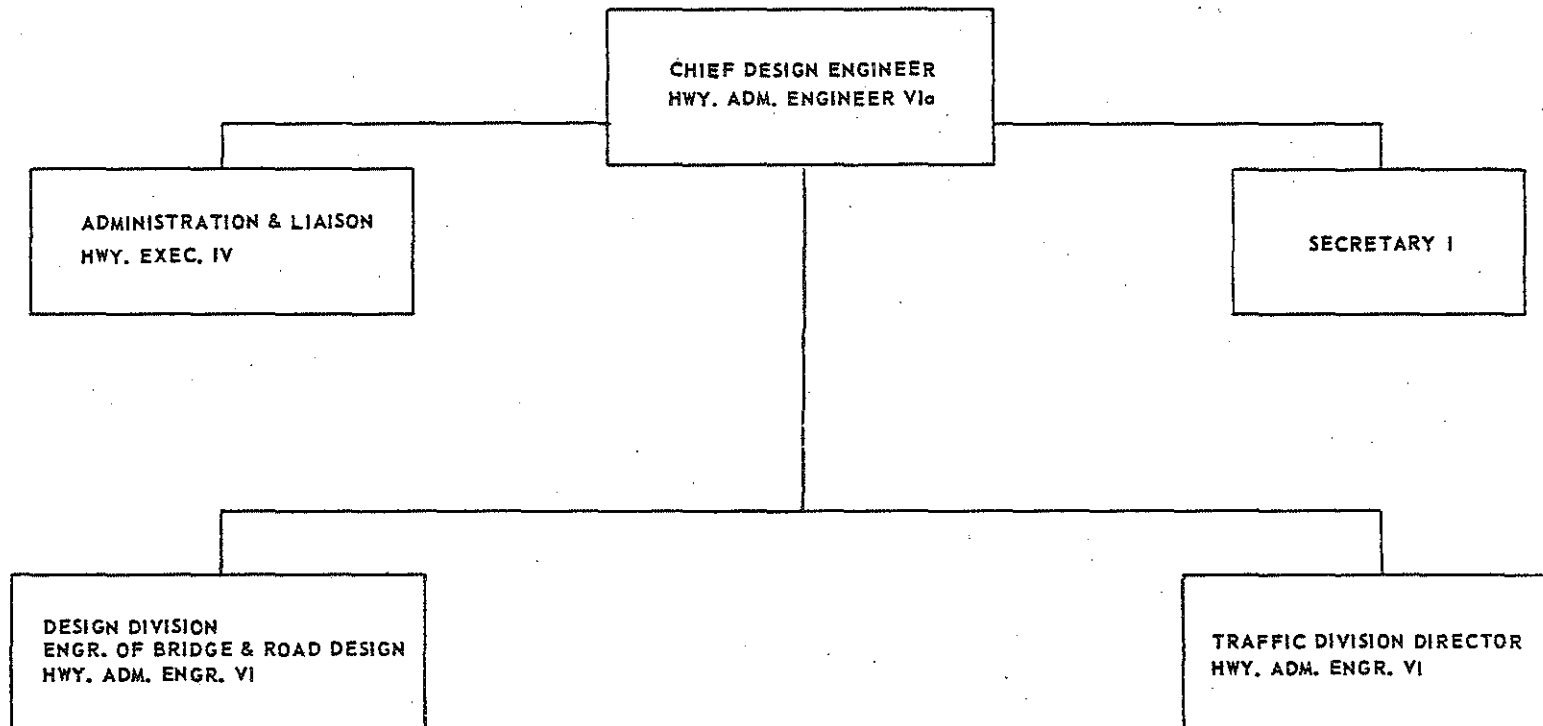
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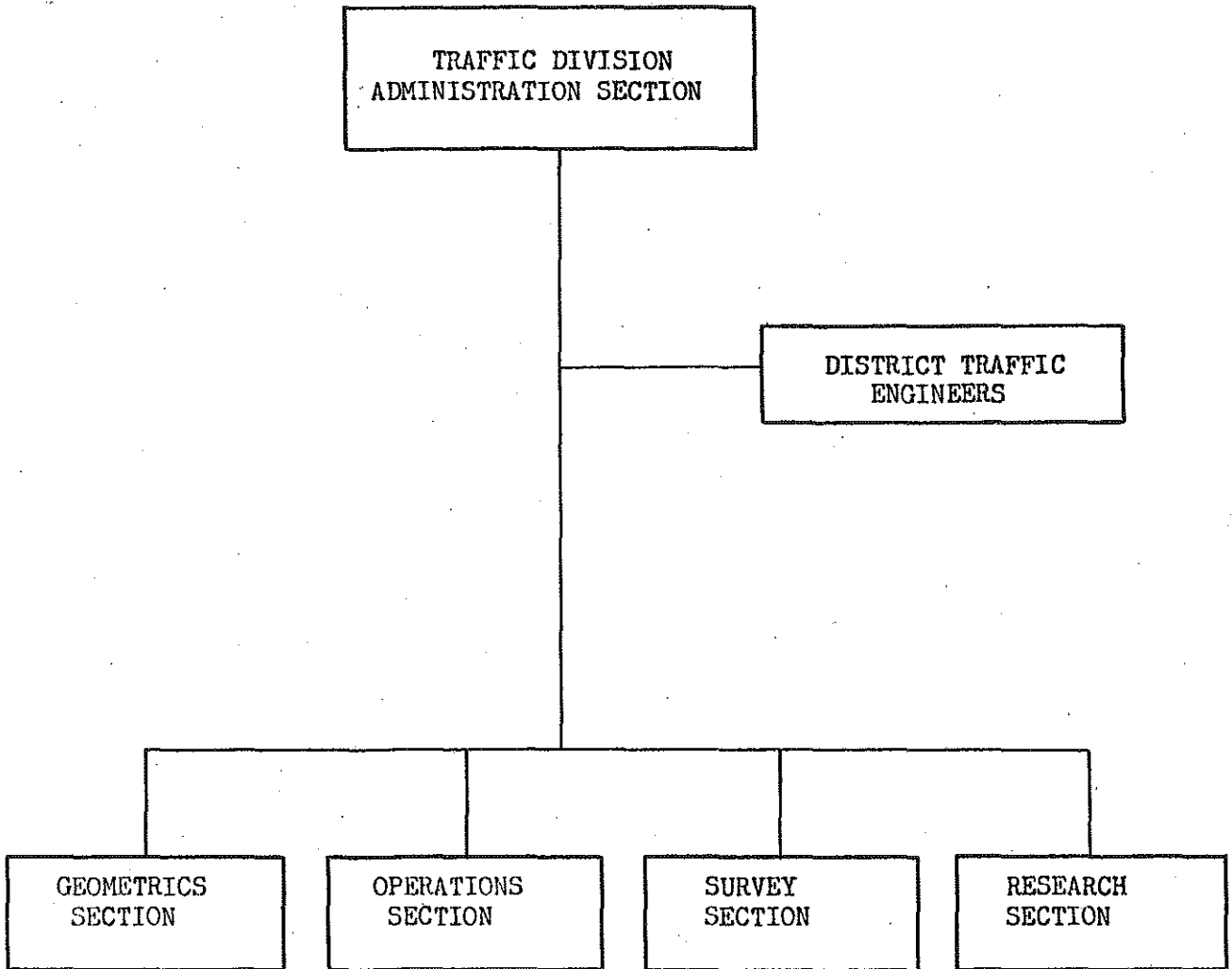
ORGANIZATION CHART

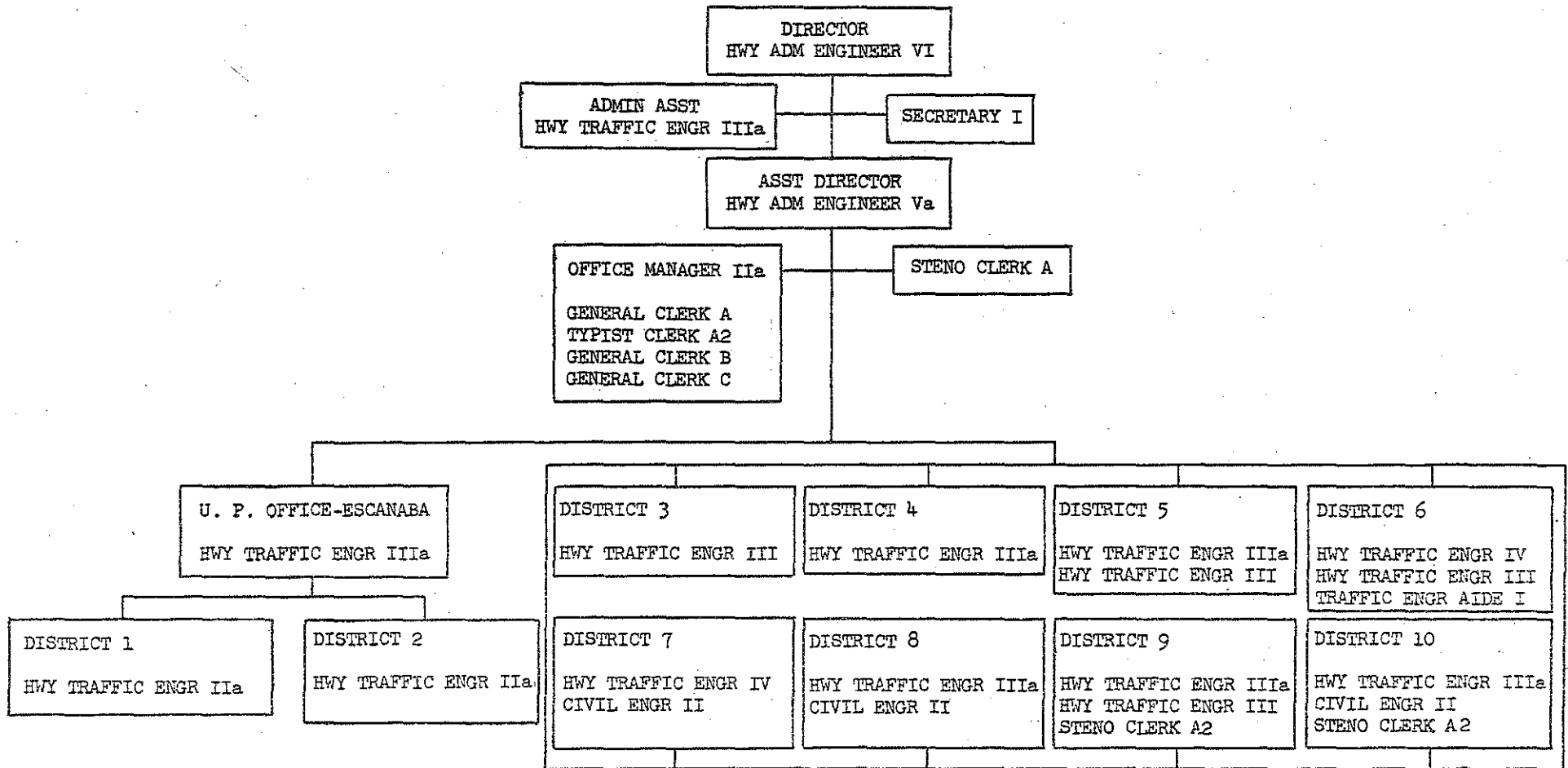


JULY 1960

ORGANIZATION CHART
OFFICE OF DESIGN ADMINISTRATION







JANUARY 1960

ORGANIZATION CHART

OFFICE OF ENGINEERING
TRAFFIC DIVISION-GENERAL ADMINISTRATION

TRAFFIC DIVISION ACTIVITIES

The Traffic Division of the Office of Design is assigned the duties of statewide investigations and recommendations on state trunklines pertaining to traffic operations and traffic hazards. The Division controls all sign and signal erections and pavement marking. Personnel of the Division represent the State at hearings and meetings in municipalities in connection with parking and speed restrictions. They prepare and review all policies and standards for traffic operational adequacy. They study and compute traffic estimates for the present and future which enable the Department to design highways today based on future traffic expectation. The Division prepares plans, programs and supporting data for operational betterments which are safety corrections at high accident locations and intersections. The Division conducts research to develop and improve operational characteristics to provide a more efficient trunkline system.

TRAFFIC SURVEY SECTION

J. F. Negri - Engineer of Surveys

TRAFFIC SURVEY SECTION

J. F. NEGRI
HWY. TRAFFIC ENGR. V
SECTION HEAD

W. M. LEPCZYK
HWY. TRAFFIC ENGR. IIIA
ASST. SECTION HEAD

SECTY. & TYPING POOL
A. J. HELFRICHS

SURVEYS & ROAD INVENTORY

M. J. STEFFES
TRAFFIC TECH. III
UNIT HEAD

OPR. SURVEYS
& SPEED
C. HILL
TRAFFIC TECH IIA

FIELD
SUPERVISOR
C.E. HARDMAN
TRAFFIC TECH II

STATEWIDE
O&D SURVEYS
M.C. LAMB
TRAFFIC TECH IIA

14

8

3

TABULATIONS & COMPUTATIONS

M. P. FLACHS
HWY. TRAFFIC ENGR III
UNIT HEAD

D. F. CASE
TRAFFIC TECH II
ASST. UNIT HEAD

STATEWIDE
L. E. WARD
TRAFFIC AIDE I

SPEEDS &
LOADOMETER
M. W. EGELER
TRAFFIC AIDE I

O. P. & PLAN
SURVEYS
E. L. STOKESBURY
TRAFFIC AIDE I

P.T. R.S.
J. DYER
TRAFFIC AIDE I

1

3

4

5

TRENDS & FORCASTS

W. L. STEINFATT
HWY. TRAFFIC ENGR IIIA
UNIT HEAD

R. M. LICKLY
HWY. TRAFFIC ENGR. III
ASST. UNIT HEAD

ELECTRONIC MAINT.

W. CARUSS
ELECTRONIC TECH. IIA
UNIT HEAD

FIELD INS. & REPAIR
R. E. BLAKESLEE
TRAFFIC REC. REPR.

LANSING SHOP
E. F. BEARD
TRAFFIC REC. REPR.

7

1

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER
TRAFFIC DIVISION

| | |
|------------|-------|
| AUTH. NO. | DRAWN |
| CONT. SEC. | DATE |
| REP. | SCALE |
| SHEET OF | PLAN |

SURVEY SECTION

THE SURVEY SECTION in its function of gathering traffic data for the entire Department has been particularly busy this year. The additional new mileage of Interstate and Arterial highway opened to traffic during 1960 has increased the demands for information from the Survey Section. Traffic volume comparisons between the new and old facilities, traffic flow through interchanges and establishing new permanent traffic recorder stations on the new facilities, all add to the work load. Types of survey necessary to obtain the desired information are also becoming more involved. Understandably, the traffic flow through an interchange or negotiating a New Jersey left turn installation is much more complicated than the standard, at grade, turning movement. Consequently, more personnel are required and new recording forms must be devised for both field and office use. The Survey Section has been equal to the additional demands made upon it as the following resume of 1960 activities bear out.

THE PERMANENT TRAFFIC RECORDER UNIT continued its weekly inspection and maintenance visits. During these visits 3,020 short manual classification counts were made in addition to the routine work.

Two new permanent directional stations were added this year, one on I-94 near Marshall and the other on I-96 near Cascade. These are directional or dual stations which require four installations. Since last year two additional permanent stations have reverted to the County Road system or rather, were located on sections of trunkline which have been turned back to the county system. These stations are still important to our statewide traffic pattern groups and continue to be maintained under the new status. Currently, 52 installations are being maintained on the state trunkline system and seven on the county system. Traffic volumes are now being reported for daily crossings on the Mackinac and Blue Water Bridges and the Ironton Ferry.

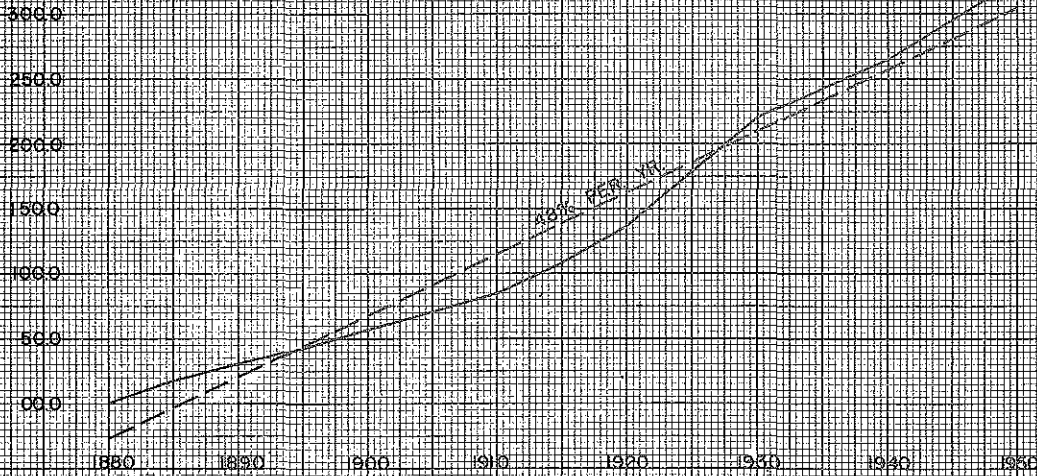
Traffic volumes from these continuously counting sources are used in a number of different analyses. One of these is graphically illustrated in the "Trend of Traffic" chart on page 11. This graph plots the average traffic volumes (full line) against a trend line indicating the slope of traffic increase (dashed). Only the past two years are shown here for illustrative purposes only. It is interesting to note the fall-off from the trend line experienced between May and August of 1960, a period of normally high traffic volumes. Reasons for these occasional slides or dips are not readily apparent and are not definitely categorized until some years have passed. Only future experience can determine if an adjustment in the trend line is indicated or if the downturn is only temporary. Two other graphs also shown on page 11, indicate some very interesting comparisons: (1) Percent of increase of population (driver age group 15-70) and (2) Percent of increase of vehicle miles driven. It should be noted that all percentages of increase or trend lines are very nearly parallel which suggests an interrelationship among the various growth lines.

Major re-evaluation of statewide traffic patterns is being made through the regrouping of permanent traffic recorder stations, supplemented by a network of stations at which portable recorder counts are taken. These are a function of the statewide traffic survey, a continuing survey which was explained in some detail in the 1959 Annual Report. During 1960 a total of 3,427 machine volume counts were taken as well as 355 manual classification counts.

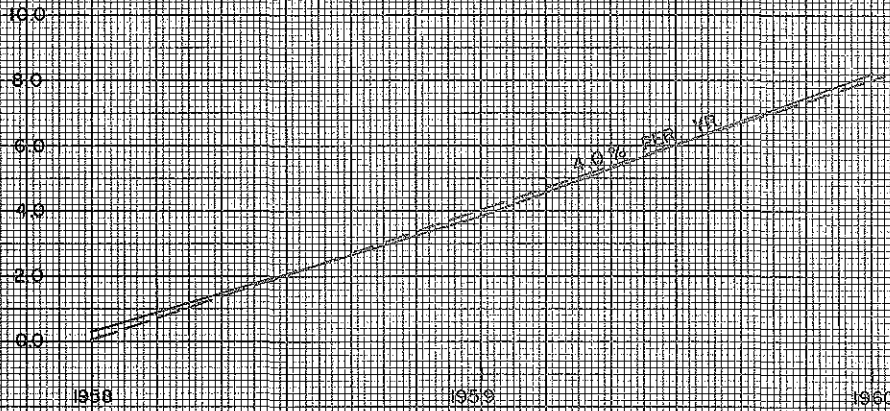
One further use of this information is in the preparation of a statewide traffic flow map. One is now being prepared utilizing 1960 traffic data and will be published soon.

THE OPERATIONAL TYPE OF TRAFFIC SURVEY is used to gather data for analysis of problem areas to determine what corrective measures are necessary. These are manual counts, separated as to directional traffic movement and taken during certain specified hours. Two-hundred and thirty-five different locations were

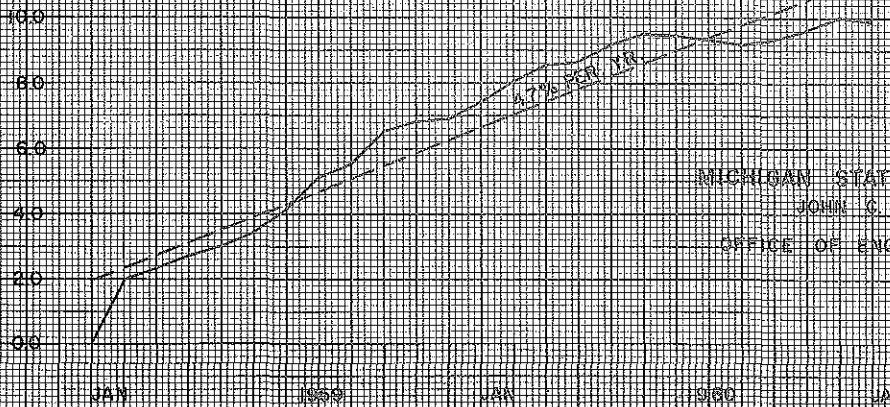
PERCENT OF INCREASE
IN POPULATION
MICHIGAN
15-TO YR. AGE GROUP
1880-1950



PERCENT OF INCREASE
IN VEHICLE MILES DRIVEN
MICHIGAN
1955 TO 1960



PERCENT OF INCREASE IN TREND OF TRAFFIC
AS REFLECTED AT 46 AUTOMATIC TRAFFIC RECORDERS
MICHIGAN
JANUARY 1955 TO JANUARY 1961



MICHIGAN STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER
OFFICE OF ENGINEERING-TRAFFIC DIVISION

studied by this type of survey as well as an additional number of sign and signal observance studies and parking surveys. A few additional and more complex interchange studies were also made, necessitating the use of colored cards.

Two complete (external and internal) metropolitan area origin and destination studies were made during 1960, one encompassing the Ann Arbor-Ypsilanti area and the other, the Benton Harbor-St. Joseph complex. Students as temporary summer employees, plus a number of local people in each area, were used in conducting these studies, supervised of course by the Division's permanent employees. All office work in connection with compiling, coding and checking the field data has been completed and the results transmitted for card punching and final analysis.

A new type of Interstate origin and destination, in cooperation with the Mississippi Valley State Highway Departments, was completed during 1960. This study is based on interviews taken at points near where latitude and longitude lines (each degree) intersect major trunkline routes. Seventy-four such stations were established and interviews and classified traffic counts taken during periods varying from 8 to 24 hours at each station. A total of 263,514 personal interviews were taken and a volume of 411,393 vehicles recorded. This data is now being coded and will be transmitted to the member Mississippi Valley States who request this information. Analysis of data obtained in this study will more accurately determine traffic movement throughout the midwestern states.

VEHICLE SPEED STUDIES, currently by means of radar, are another continuing function of the Survey Section. These are made at predetermined stations or locations to check the adequacy of existing, or the necessity for establishing, new speed zones. 1,814 recheck stations and 128 new locations were taken during this past year. In addition to this continuing function, daytime and nighttime speed studies are made at 26 stations to provide the Bureau of Public Roads with speed trend data. These studies are taken quarterly, or four times a year. A graphic representation of average vehicle speeds is shown on page 14. This chart

is continuous from 1950, or prior to the Michigan speed law enactment in March of 1956. From this period both day and night speeds are recorded. Also indicated is the date of enactment of the law raising truck speeds from 45 to 50 MPH. While trucks are not shown as a group on this chart, they are included in the "all vehicle" classification.

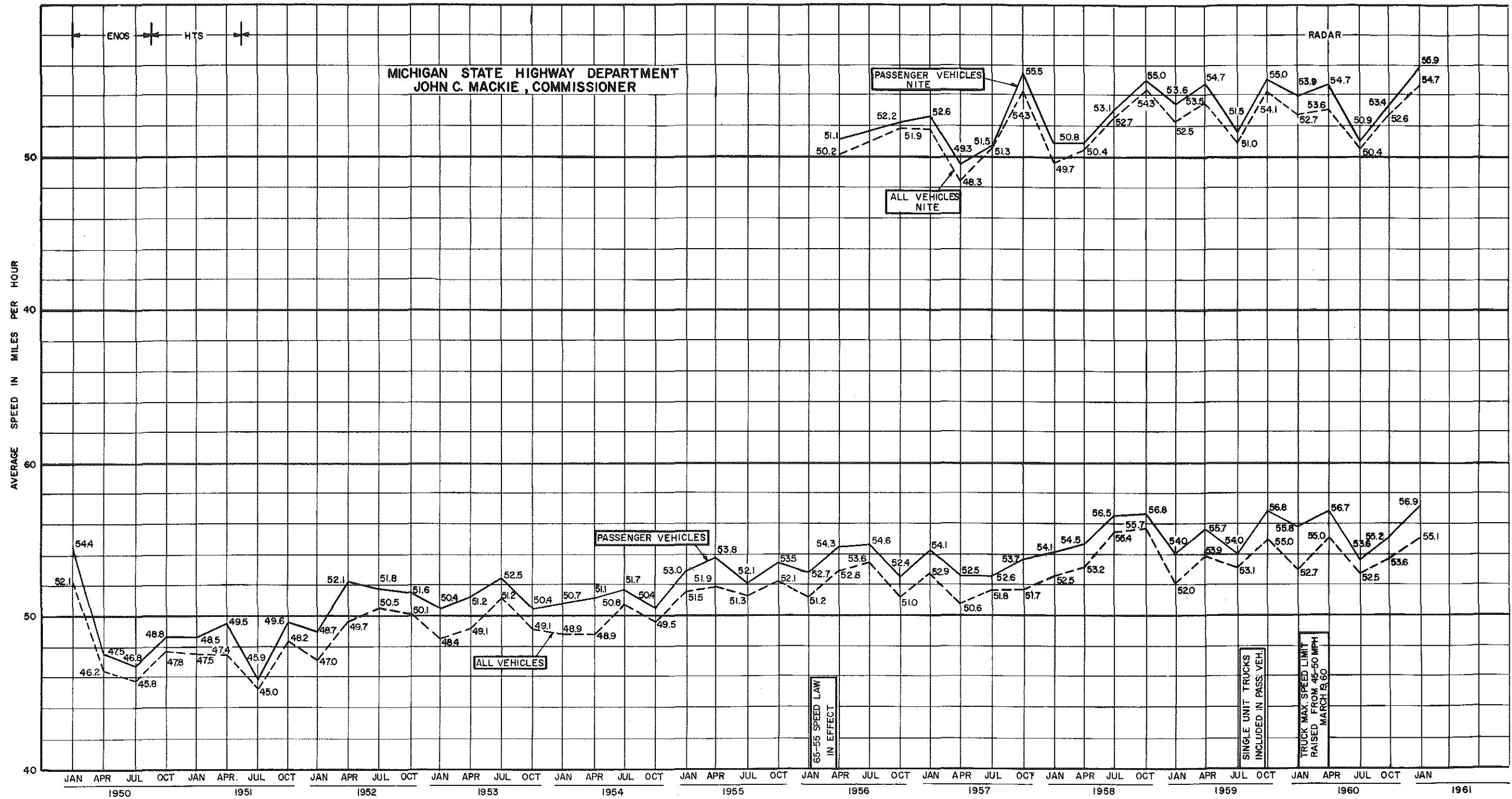
A number of special studies consistent with speeds are also required--during the past year 15 gap studies, 7 restraint, 4 back-up and 5 running time and delay studies were taken.

THE ANNUAL LOADOMETER, or truck weight, study was again taken at 12 locations throughout the state. This is an annual study requested by the Bureau of Public Roads and requires that truck weights by axle, truck type, axle spacing and total classification and volume count data be taken on every road system in the state. In addition to this information, interviews determine the type of fuel used and whether commodity carried is full, one-half or one-quarter of the loading capacity. A field crew of about 12 men working on an extremely tight schedule for three or four weeks is required to obtain this field information. An additional period of several months is required by the office staff to code, compile and analyze this material into report form.

THE TRENDS AND FORECASTS UNIT is mainly responsible for estimating future traffic to the design year (usually 20 years hence) on highways being constructed today. The procedure involved in arriving at this estimation with any degree of accuracy is far too complex to outline here. The manual "Estimating Traffic on Michigan Highways" published in 1959 describes this procedure in detail and is available to anyone who may be interested. Suffice to state that estimating is a lengthy, involved process which cannot be short-cut to an end result.

During 1960 this unit spent a considerable amount of time preparing traffic estimates for the complete Interstate System for inclusion in the 104(b) 5 Study.

MICHIGAN VEHICULAR SPEED TRENDS BY TYPES



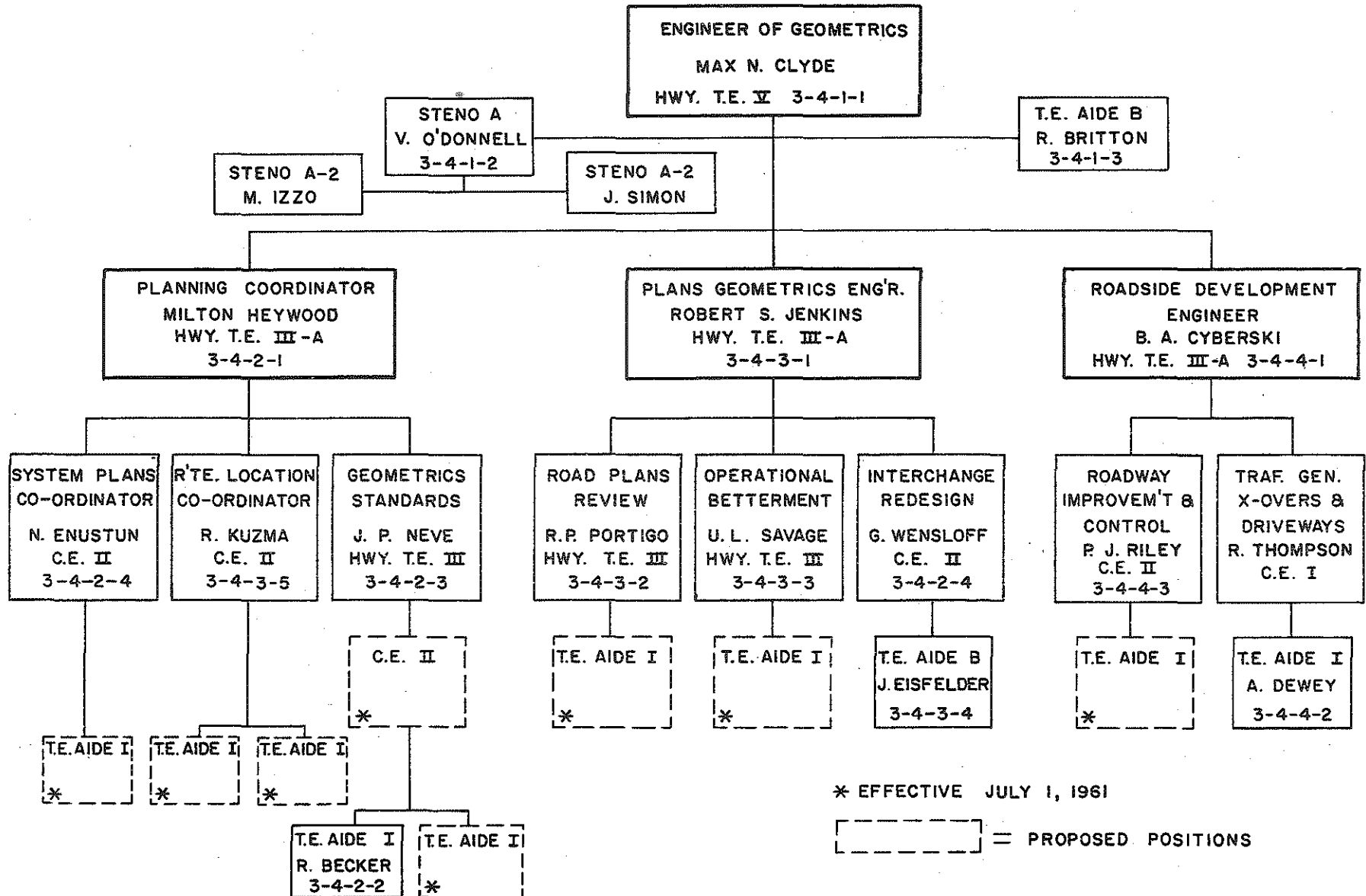
They were however still able to complete traffic estimates for 98 other projects and complete estimates for six previously issued Engineering Reports on which revisions had been made.

Work is also still progressing on the comparison analysis for the adequacy of number and placement of the permanent traffic recorders in relation to the various highway systems and traffic patterns. This is a necessary function because, due to economic and highway changes, the Michigan traffic pattern is constantly changing.

TRAFFIC GEOMETRICS SECTION

Max N. Clyde - Engineer of Geometrics

M. S. H. D. TRAFFIC DIVISION ORGANIZATION—GEOMETRICS SECTION



* EFFECTIVE JULY 1, 1961

 = PROPOSED POSITIONS

GEOMETRICS SECTION

One of the most important considerations in the geometric requirements of the Highway Department as a whole, is the fact that over the past several years Department operations have concentrated on a new type of state highway--the freeway. Roads constructed prior to the inception of the freeway were generally of the two-line, free access type which in no way compare with freeways in regard to geometric requirements. The freeways currently in the planning, design, construction and operation stages represent a multitude of problems relatively new to past principles of geometric design. As very little practical experience data was available from which to develop new standards, it was necessary to rely on theoretical concepts to provide adequate laneage capacity and merge and weave areas through the intricate interchanges.

At this point the liaison necessary between the Geometrics Section and other sections and divisions begins to become apparent. In order to provide for adequate capacity the traffic estimate for the design year is necessary and the Estimating Unit of the Survey Section provides these figures. The type of interchange provided depends largely upon the traffic desire in the area plus a consideration of terrain and local requirements. So, close working relations with the Planning and Route Location Divisions are necessary. This liaison continues through the Design, Grade Inspection, Bureau approval and to some extent even through the construction stages. When consideration is given to this sequence of procedural steps and the pressure of an accelerated construction program is added, one begins to appreciate the scope and timing of work encompassed by the Geometrics Section.

This Section is presently operating with three units--Planning Coordination, Plans Geometrics and Roadside Development. It is basically responsible for determination or approval of all geometric features as related to the development of highway facilities. This includes interchanges, intersections, highway cross sections, pavement intersections, roadside control, crossovers and all other features directly affecting the maneuvering of the driver and his vehicle.

Specifically, this Section aids in providing the traffic engineering necessary to adequately plan, design and construct a highway to provide safe, free and comfortable transportation through the design year.

During 1960, the PLANNING COORDINATION UNIT lent its supervisor to the 104(b)5 Study to expedite the geometrics and justification of capacity (laneage) and interchanges necessary to this report. This study lasted considerably longer than was originally anticipated and this man's services were lost to the Section for a period of approximately eight months. Information gained in this study, however, will be of value as the listed projects actually reach the program stage.

The unit's functions were still expedited in spite of the handicap, as the following accomplishments will attest:

Review of preliminary engineering reports is one of the duties of this unit-- 18 of these reports were reviewed for geometric and capacity adequacy and recommendations were made for subsequent consideration by the Review Board. Participation was given in the route studies for 10 additional engineering reports.

Since the inception of the Department policy requiring cities to have an approved Street Plan before trunkline programming in the city is attempted, the Office of Planning has been aiding the cities in this endeavor. It is part of the Planning Coordination Unit's function to review the proposed plans for trunkline adequacy. Five such plans were reviewed and recommendations made. Aid was also given in the preparation of six additional plans.

This unit supervisor also interchanged with the Section Head in attendance at the meetings of the Detroit Freeway Technical Sub-Committee, and acting as an observer at the meetings of the Detroit Freeway Planning Committee. This involved detailed study of the geometrics and other proposed traffic features on Detroit's proposed new freeways.

In addition to these functions, this unit also aided in the study of 33 special problem areas or proposed new features. Included in these were

justifications for special interchange geometrics, a traffic study for a proposed mall in Saginaw and other studies of a special nature.

Development and review of standards is always an important phase of any operation and in this instance, it becomes the responsibility of the Planning Coordination Unit. During the past year, 18 reports and policies were reviewed and pertinent comments made; two standards were reviewed and comments made; two standards were reviewed and signed and two additional standards were prepared, reviewed and signed.

Several publications, reports and presentations were also prepared, among which were: Six special reports and presentations; "Addendum to Diamond Interchange Report" prepared; "Merging Facilities on Two-Lane, Two-Way Roads" prepared; "Freeway Ramp Capacity Study" for the Highway Research Board completed and an Interchange Betterment procedure was established. Work on the preparation of a Geometric Design Manual is also continuing.

A considerable amount of field work was done in connection with standards and reports preparation which included: 51 interchanges surveyed for sight distance adequacy; two special sight distance studies conducted and 63 locations investigated in the course of developing design standards, policies and procedures.

THE PLANS GEOMETRICS UNIT in one of its functions continues to provide the necessary traffic engineering review through the design and construction stages on the projects started by the Planning Coordination Unit in the preliminary stages. In performance of this duty, 257 road plan projects were reviewed for operational adequacy and comments sent to the Road Design Division. At the final plan stage, 199 sets of road-plan tracings were reviewed prior to approval and signing by the Director of the Traffic Division.

In addition to their work on plans geometrics, this unit is also responsible for administrating the Operational Betterment Program. This program is budgeted

yearly at one million dollars and is used to provide reconstruction and channelization at intersections and other problem areas. Priorities are assigned by means of a formula involving accidents, density and capacity which assures the higher priorities to the most deficient locations. Implementing a betterment project requires coordination with Governmental Agencies and other divisions within the Department. The process can best be followed and understood by referring to the Flow Sheet on page 22. Projects are now assigned on a two-year basis, with the second year subject to revision as changes occur to provide a more comprehensive program. In the past year, 25 operational betterment projects were either completed or placed under contract and studies were completed and sent to the Chief Engineer for approval for 30 additional locations.

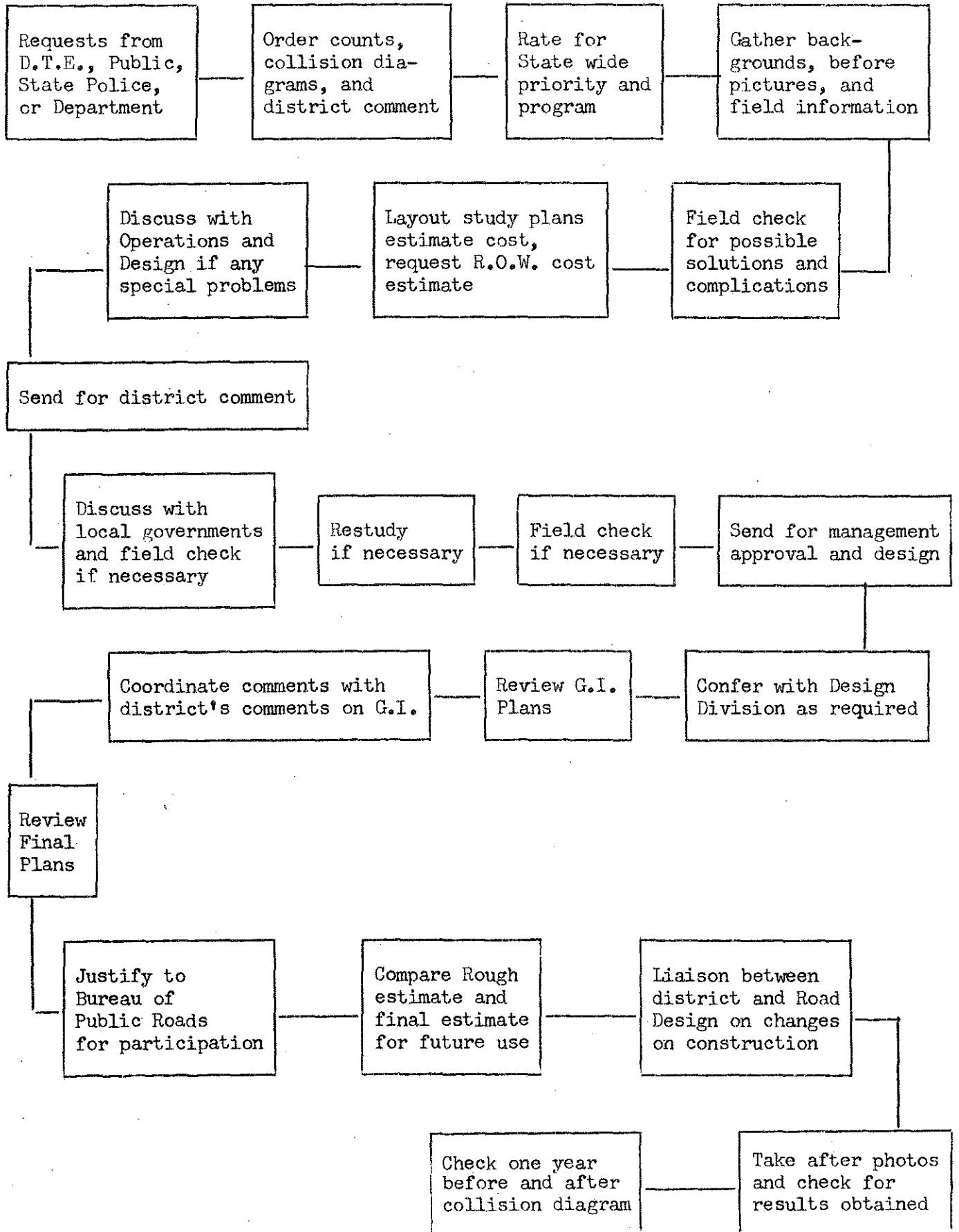
During 1960, two new functions were added to this unit's responsibility:

(1) review of right-of-way plans for late changes in design or stage construction requiring additional right-of-way; and (2) redesign of interchanges which are not functioning properly. This is preliminary work and is being done now for possible inclusion in future betterment programs. Five of these were redesigned this year.

THE ROADSIDE DEVELOPMENT UNIT is responsible for administering roadside control in accordance with Department policy. Included in this function of roadside housekeeping are the placing of curb and guard rail to control access to the roadway, control of parking off the roadway but within the right-of-way, location and construction of crossovers and review of applications for driveway permits.

During the past year 887 applications for commercial driveways were reviewed, however, in the future this volume will be somewhat diminished. A new policy has been devised recently under which only the problem applications will be given to this unit for review. This new policy was possible because of a recently prepared publication: "Standards and Procedures for Driveways". The unit is to be commended for this manual and its worth is being realized by the favorable comments received from the people to whom it was sent.

FLOW SHEET
FOR TYPICAL OPERATIONAL BETTERMENT PROJECT



Another unit function is pertinent in this same connection--that of advising and working with private developers of large traffic generators, such as shopping centers, factories, etc. Immeasurable benefit can, and is being gained in this endeavor, both to the Department and the developer by adhering to sound design in the placement of entrances, exits, parking lots, etc. This aid was given at 28 different locations and assurance can be given that these will operate much more efficiently because of this advance planning.

Roadway Improvement and Control Projects are administered under an annual budget of \$150,000 and includes minor channelization, crossovers and placement of curb and guard rail. Curb and guard rail in this connection included that used to provide smoother traffic flow and reduce conflict points by restricting points of entrance. During the past year, however, the greatest need was for crossovers, mostly of the directional type. Approximately two-thirds (or \$100,000) of the entire budget was expended on projects of this nature. In fact this demand is becoming so great that work is in progress to provide a set of standards to use in expediting design of crossovers. Eighty-seven projects were authorized and constructed during the past year under the total Roadway Improvement and Control budget.

There are also several functions of this Section which overlap unit lines and consequently become a Section endeavor. Among these were replies made to 177 letters from the public requesting information, registering complaints and so on. Two motion picture films were produced, edited and presented before various groups to point out and analyze freeway problems. These films are entitled "Urban Interchange Spacing" and "Interchange Ramp Problems on Detroit Freeways". Work is also continuing on a color slide file which will eventually contain pictures of every interchange and every problem area in the State. These last will of course contain the before and after pictures, showing means taken to correct the deficiencies.

The work of this Section has been extremely hampered during the year due to lack of adequate space. It has however in spite of the deficiency turned out an exceptional amount of work.

TRAFFIC OPERATIONS SECTION

W. L. Marvin - Engineer of Traffic Operations

TRAFFIC OPERATIONS SECTION

W. L. MARVIN
Traffic Engr. V
Section Head

Margie GRACE
Steno-Clerk A

Diane NORTH
Steno-Clerk A2

Betty MC LEOD
Steno-Clerk A2

Beulah WHALEY
Steno-Clerk A2

TRAFFIC REGULATIONS UNIT

R. A. RIGOTTI
Traffic Engr. IV
Unit Head

Virginia HICKS
General Clerk B

REGULATORY GROUP

J. R. HOYT
Traffic Engr. III

2

STANDARDS AND PROCEDURES GROUP

3

ELECTRICAL DEVICES UNIT

J. E. HOBBLA
Traffic Engr. IV
Unit Head

Minnie PEARCE
General Clerk A

SIGNAL INSTALLATION GROUP

D. A. BREWER
Elect. Engr. III

4

SIGNAL OPERATING GROUP

S. D. COOL
Civil Engr. II

2

REFLECTIVE DEVICES UNIT

M. R. HOFFMAN
Traffic Engr. IV
Unit Head

Betty BOYKO
General Clerk B

STANDARD SIGNING GROUP

W. L. BORTON
Traffic Engr. III

2

EXPRESSWAY SIGNING GROUP

5

TRAFFIC ANALYSIS UNIT

R. E. HEFRON
Traffic Engr. IV
Unit Head

Mabel FOSTER
Typist Clerk A2

J. W. WRIGHT
Traffic Analysis III

4

26

| | | | |
|--|--------------------|------------|-------------|
| MICHIGAN STATE HIGHWAY DEPARTMENT JOHN C. MACKIE, COMMISSIONER TRAFFIC DIVISION | ORGANIZATION CHART | AUTH. NO. | DRAWN |
| | Traffic Operations | CONT. SEC. | DATE 3-9-61 |
| | Traffic Division | REF. | SCALE |
| | | SHEET OF | PLAN |

OPERATIONS SECTION

THE OPERATIONS SECTION is mainly concerned with the operation and regulation of traffic over the state trunkline system to provide safe, convenient and efficient transportation for the majority of motorists. This is accomplished through the application of sound traffic engineering in the development of standards and warrants for signing and signalization, and speed and parking controls. Authority to implement these regulations and controls is granted to the State Highway Commissioner (in some cases with the cooperation of the Commissioner of State Police) by Legislative Act. It is the responsibility of this Section to operate within the Statute limitations. The office of the Attorney General provides the determination and opinions in controversial issues, when such cases arise.

The Operations Section is presently operation with four units: Regulations, Electrical Devices, Reflective Devices and Accident Analysis. They have, in effect, four main functions of responsibility:

1. Responsibility for operation and direction of traffic through utilization of signals, signs, markings, speed and parking.
2. Formulate policies and warrants for use of all traffic control devices.
3. Formulate standards, specifications and instruction in use of all traffic control devices and regulation of traffic.
4. Analyze and classify all accident reports toward determination of high accident locations and recommendations involving operating efficiency of traffic control devices.

THE TRAFFIC REGULATIONS UNIT, in order to operate more efficiently, is divided into two groups. The first is responsible for vehicle operation on the trunkline system, insofar as speed and parking is concerned, and the second is mostly responsible for standards and procedures. In this second group is the responsibility for the preparation and revision of the Michigan Manual of Uniform Control Devices, which constitutes the legal authority for installation and use of all traffic control devices. This manual is currently being revised and a new addition will be

published in the near future. This group has also been conducting a review of all instruction letters which have been issued during the past fifteen years in order to revise and consolidate them into one volume. A rough draft has been prepared and after corrections have been made the final copy will be released.

This group also has the responsibility for preparation and submission to the Director of Administration all proposed new legislation for the Traffic Division. Fifteen recommendations were transmitted in 1960 for consideration by the 1961 Legislature. All House and Senate Bills introduced into the 1960 Legislature which affected traffic operations were reviewed, evaluated and comments forwarded to the Director of Administration. Also a number of legal questions affecting traffic operations were referred to the Attorney General's Office for legal opinion.

During 1960 a number of Traffic Control Orders were issued; this entails a study of conditions by the District Traffic Engineer in cooperation with State Police and local officials and the various reports submitted. Upon agreement of a specified regulation the Traffic Control Order forms are prepared and transmitted for signature by the State Highway Commissioner and Commissioner of State Police (in most cases both are involved). After signatures are secured, a copy of the order is then mailed to the clerk of the governmental unit involved, signs are erected and after a specified date, the regulation becomes enforceable. During the past year 137 Traffic Control Orders for speed control zones and 128 for parking control were issued. Fifty-nine orders for revocation of existing restrictions were written and 37 were issued restricting the use of limited access highways to motor vehicles.

A "pilot" Traffic Control Order for school speed limits was prepared for discussion, review and approval. These are now in use. Also new Traffic Control Order forms have been prepared to reflect the language of the affected statutes and these are currently being reviewed by the Attorney General. Upon receiving their approval, these will be printed and will become the revised form.

Route capacity analyses were made in several cities in connection with parking studies and recommendations for parking restrictions were made from the data so determined. In addition "Parking Use" studies were taken in several other cities which were then analyzed to determine the need for parking restrictions along trunklines within their boundaries.

THE ELECTRICAL DEVICES UNIT has the responsibility of determining the need for installing and operating the electrical control devices on the trunkline system. The principal electrical devices used for this purpose are the traffic signals and flasher signals, but also include to a lesser extent, illuminated signs, barricade flashers and highway lighting.

During 1960 this unit received requests for signal installations at 20 different new locations. Study determined, however, that the necessary traffic warrants could not be met at 15 of the locations and these requests were not approved. Two-hundred and nineteen requests were received for surveys and these were ordered and the results analyzed. In the course of the year, the unit personnel were required to make 259 field trips for the purpose of gathering information to expedite some phase of work.

The Electrical Devices Unit accomplishes its installation work through issuance of Work Authorizations. These Work Authorizations are issued to the Office of Maintenance and constitute their authority to either do the work with their own personnel or place with a contracting agency depending upon the nature of the work and the area involved. During 1960 a total of 420 authorizations were issued for various types of installations which amounted to a total dollar value of \$407,199.06. The table below indicates a partial breakdown of work involved, by District:

| District | Stop and Go | Flasher | Moderni- zation | Keep Right | Inter- Conn. | Misc. | Total |
|----------|-------------|---------|-----------------|------------|--------------|-------|-------------|
| 1 | 0 | 3 | 4 | 3 | 0 | 2 | \$ 9,291.59 |
| 2 | 0 | 3 | 1 | 0 | 0 | 0 | 3,175.00 |

| District | Stop and Go | Flasher | Moderni- zation | Keep Right | Inter- Conn. | Misc. | Total |
|--|----------------|-----------|--------------------|---------------|-----------------|-----------|---------------------|
| 3 | 0 | 2 | 4 | 0 | 0 | 2 | 7,571.00 |
| 4 | 3 | 8 | 4 | 0 | 1 | 3 | 21,508.80 |
| 5 | 4 | 15 | 21 | 2 | 2 | 8 | 45,842.60 |
| 6 | 7 | 20 | 39 | 2 | 2 | 6 | 75,370.28 |
| 7 | 5 | 12 | 29 | 5 | 0 | 17 | 44,191.00 |
| 8 | 4 | 21 | 18 | 3 | 4 | 12 | 64,329.24 |
| 9 | 6 | 2 | 42 | 0 | 3 | 0 | 52,504.00 |
| 10 | 4 | 11 | 42 | 0 | 3 | 6 | 80,000.55 |
| Painting signal heads on US-10 (Detroit) | | | | | | | 1,650.00 |
| Statewide Rest Area Signs | | | | | | | 1,765.00 |
| Total | 33 | 97 | 204 | 15 | 15 | 56 | \$407,199.06 |

THE REFLECTIVE DEVICES UNIT has the responsibility for development of Standards for all signing and pavement marking necessary to adequately guide the motorist safely and conveniently to his destination. The Michigan Manual of Uniform Traffic Control Devices is of course the guide for this unit in the determination of the kind, size and placement of signs on the State trunkline system. The Interstate Sign Manual serves the same function in the sign determination on the Interstate system.

As was reported last year, a statewide sign inventory was started. This year the inventory was completed for all trunklines in St. Clair and Macomb Counties. Five other trunklines have also been completed through their entire lengths--M-43, M-50, M-89, M-119 and US-112.

Actual work installation ordered by this unit is accomplished by the issuance of Work Authorizations to the Office of Maintenance. During the past year 98 authorizations were issued and amounted to a dollar volume of \$335,428. The majority of this work encompassed the placement of overhead and other signing on the Arterial Freeway System.

In addition to this work, sign plans were prepared for the inclusion of final signing in the construction contracts on 21 projects. This provides for final signing on 247.587 miles of freeway (both interstate and arterial) at an estimated cost of \$1,349,414.89. The work involved in preparing contract sign plans and estimates is detailed and exacting. Each sign must be shown in correct position, indicating legend, standard letter-size, type of base, etc. Also, scheduled letting dates had to be met, which was accomplished even though some overtime was occasionally necessary.

THE ACCIDENT ANALYSIS UNIT is primarily concerned with accidents which occur on the rural trunkline system. The State Police submit copies of all such accident reports to this unit. During the past year 31,285 accident reports were reviewed and analyzed. Of these 2199 indicated some road deficiency and were referred to the Office of Maintenance for investigation. Requests for engineering attention were indicated on 279 other reports and these were in turn referred to the proper division for study.

In addition to this routine type of analysis, monthly reports on fatal accidents on rural trunklines are prepared and submitted to the Motorists Services Division. These reports are analyzed to indicate the type of accident in which the fatality occurred, age of driver and other pertinent information as indicated by the report.

The highest 10 accident locations are also determined by District and statewide. This determination is made on a basis of two or more accidents per year in the northernmost four districts and an occurrence of four or more accidents per year in the other six districts. All of this information is continually used by the other sections in the Division in their determination of corrective measures to alleviate the number of accidents which are occurring. The unit also prepares collision diagrams for use in this determination.

Special studies and analyses are also continually being called for and made by this unit. During the past year 41 "Before and After" studies were made; special location studies were also made on I-75 through Monroe County, I-96 between Farmington and Brighton, US-23 (Fenton-Clio) and US-24A (Detroit-Toledo). "Wet Pavement" accident summaries for all ten districts were also completed for the Testing and Research Division.

This unit also has the responsibility for collecting, compiling and submitting to the National Safety Council the Annual Inventory of Traffic Safety Activities of the Highway Department. This inventory is used for various purposes and is more fully explained under the chapter on "Awards" on page 52.

The Traffic Operations Section, by nature of its work, probably has more direct contact with the driving public than any other section in the Division; consequently, more personal requests for information are received. It may be of general interest to realize the volume of mail that is received, and of course, answered by this Section. During 1960, 4,374 pieces of mail were received and answered. This has been increasing yearly (actually a 10% increase over 1958) and averages about 170 pieces per pay period. Considering that this volume of correspondence is handled over and above the regular work load, lends some realization of the activity of this Section.

TRAFFIC RESEARCH SECTION

E. F. Gervais - Engineer of Research

ORGANIZATION
TRAFFIC RESEARCH SECTION

SECTION HEAD

E. F. GERVAIS
Engineer of Traffic Research V

STENOGRAPHER

DONNA M. BURCHAM

ASSISTANT

KEITH E. BUSHNELL
Traffic Engineer IV

LABORATORY UNIT

FRANK DeROSE
Traffic Engineer III

CONRAD DUDEK
Civil Engineer I

HERBERT R. SCHOEPKE
Traffic Technician II

FIELD STUDIES UNIT

WALTER ROTH
Traffic Engineer III A

CHARLES E. RICHARD
Electrical Engineer II

ROBERT E. TRAILL
Engineering Aide A

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TRAFFIC RESEARCH SECTION

THE TRAFFIC RESEARCH SECTION is mainly responsible for the determination of the effectiveness of the tools of traffic engineering on the vehicle driver. Specifically, they determine the driver reaction and resultant effectiveness of various geometric design features, traffic control devices, signing, etc. They also are responsible for development of equipment for traffic research, control and survey; investigate research of outside agencies to determine the application to reports and manuals of work accomplished.

The Research Section is organized into two units: Laboratory Unit and Field Studies Unit. However, while each unit is responsible for certain functions, the nature of the work is such that unit lines must continually be crossed; and therefore, most projects develop as a Section endeavor. They will be considered in this manner in this report and no attempt will be made to outline efforts of each unit per se.

During the past year a number of different research projects have been developed-- some have been resolved and others are continuing. The following is a brief description listing of work accomplished in rough chronological order rather than by importance:

The evaluation of the marking of no passing zones was continued as further field checks were desired. The development of a new, practical and yet simplified field method has been undertaken and will be completed before the final report is submitted.

In cooperation with the City of Detroit, a signal head color study was undertaken to compare the effect of dark green signal heads versus the yellow signal heads. "Before" observation in driver behavior and observance of the signals has been completed. The signals were then painted yellow and "after" observation will be made following an adjustment period and when good weather permits.

The Ramp and Lane Usage Study on South Cedar (US-27) in Lansing has been initiated. Markings and signing will be applied experimentally and their effect on driver behavior will be evaluated. Camera observation will record the "before" and "after" observations for analysis.

A Lane Signal Field Test was conducted for models of lane signals submitted by manufacturers. This test was performed to evaluate the visibility of the "x" and "arrow" under day and night conditions. These lane signals were models of those to be used for freeway lane control.

The study of a Ramp Closed Signal was initiated to determine the effectiveness of a signal with the legend "Ramp Closed" as a blank out signal, to control the entrance to a freeway on-ramp. This sign proved about 90% ineffective. Other legends and types of signs will be studied to determine a sign and equipment of proper design to effectively close traffic from the freeway entrance ramps.

The Ford-Lodge Interchange Ramp Study analysis and report which was submitted by Ramo-Wouldridge has been reviewed and revisions and corrections have been in progress. The final report of this project will be written by the Section and be submitted for approval and distribution.

Observations are still being carried on to study the effect of time and weather upon the material used on the internally illuminated overhead signs. These have been installed at the south approach of the Mackinac Bridge and in the Bay City area.

Investigations are still being carried on in conjunction with the Survey Section concerning the proper accuracy and versatility of various detector devices, sonar and radar, for speeds and volumes.

Development is being carried on to design an intervalometer in order to take time spaced moving pictures. This will allow the film to be exposed at a rate of 1 frame per second or 88 frames per second depending on requirements. Thus, film can be conserved when movies are used for recording of field data and traffic behavior.

Work was performed on the design of a highway delineator to develop a delineator which would simplify installation and reduce maintenance.

Development of an internally illuminated yield right-of-way sign is progressing. Samples of this sign have been installed in the Detroit area and inspection and observations are continuing.

An overhead internally illuminated "Keep Right" sign has been under development and study. This sign has been installed at locations in the Lansing area. Observations and inspection are continuing at the respective locations.

A study has been started in the Alpena area regarding the placement of "No Passing Signs" on the left side of the roadway. The signs have been placed and observations will be taken to evaluate their effect upon driver passing practices.

A Traffic Pacer Signal Study has been undertaken in cooperation with General Motors Technical Center. This signal will indicate speeds which drivers must maintain to hit "green" at the stop and go signal they are approaching. Planning stages have been completed and placement of these speed signals will be installed in the near future. Their evaluation will follow installation.

A study of the Capacity of New Jersey Left Turns was begun to determine and to establish warrants for New Jersey Left Turns.

The Traffic Research Section has had the major responsibility of the T.V. Surveillance and Control Project in cooperation with the City of Detroit, Wayne County and the Bureau of Public Roads.

Personnel in the Research Section wrote complete specifications and supervised the installation of fourteen closed circuit television chains on a 3.2 mile section of the John Lodge Expressway.

The entire system was completed on December 23, 1960 at a cost of \$182,000 and is the most extensive closed circuit television system in the world.

A joint project has also been established with the General Railway Signal Company and nearly \$60,000 worth of detecting, computing and recording equipment was installed in the test area for study purposes. This equipment has been donated

to the project at no cost to the State or to the participants. The General Railway Signal Company engineers are anxious to provide this service because in so doing their own equipment will be given a thorough and practical check-out. This equipment uses a whole new concept in the computation of traffic density and appears to be the basic equipment from which an automatic signal control system can be evolved.

Specifications were also completed for a new type control system which will allow remote switching of 46 pairs of lane signals, 21 variable speed signals and 9 ramp closed signals, from a control center.

This will be the first time that extremely rugged and reliable supervisory control equipment complete with alarm system to indicate lamp burnout has been used for traffic control.

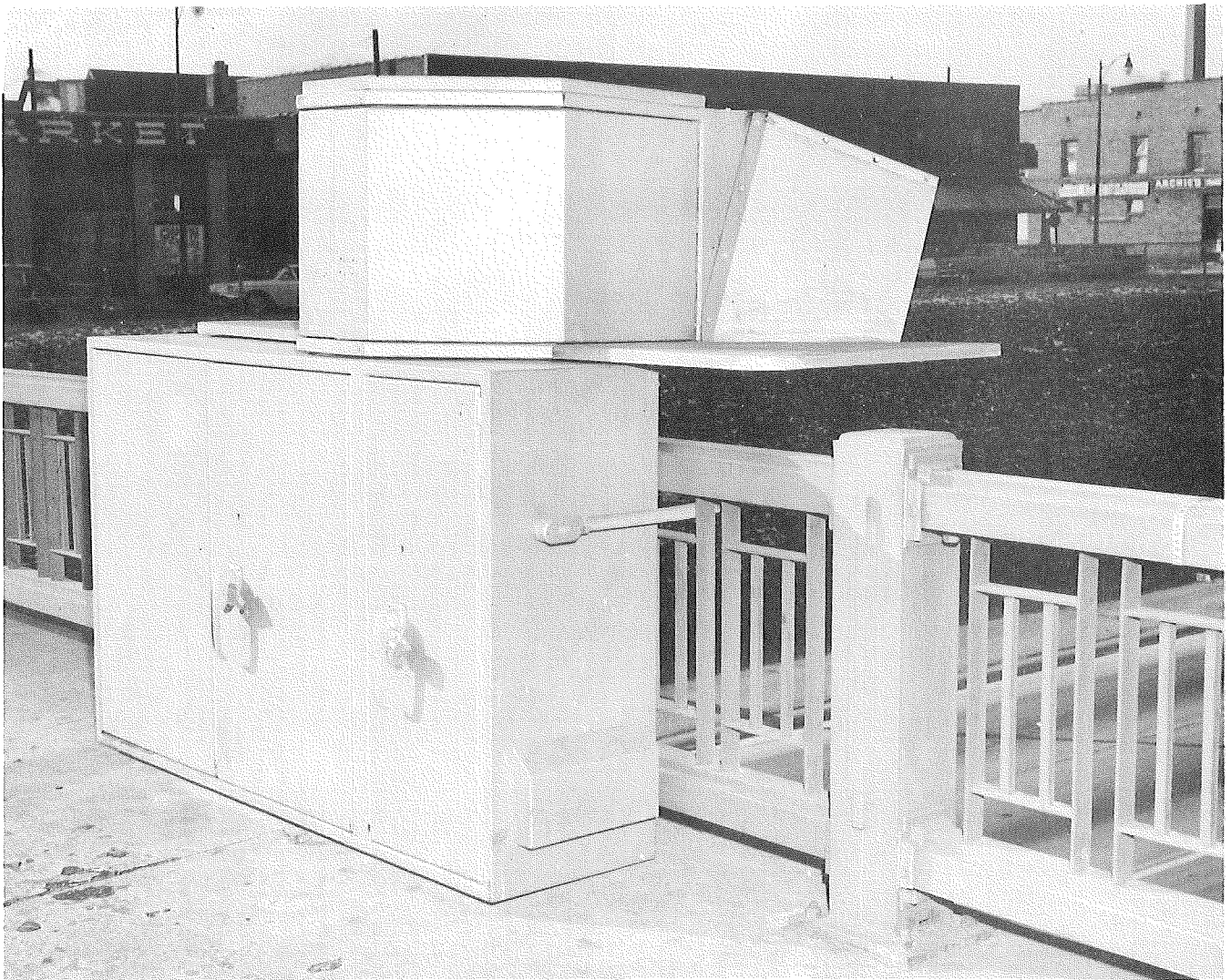
The photographs on the following pages indicate to some degree the installation and recording equipment involved in this project.



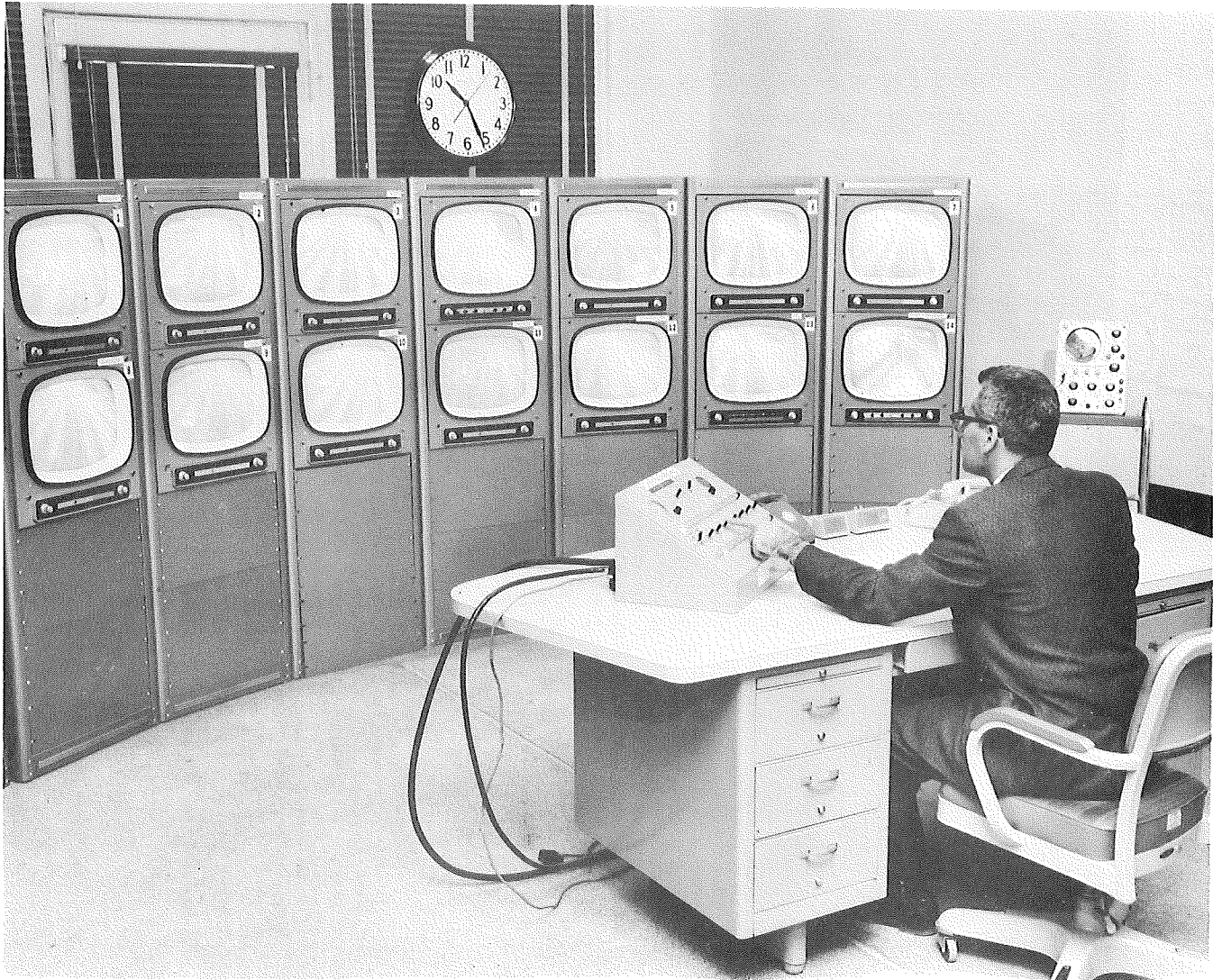
Michigan Bell Telephone Crews Entering Freeway and Preparing
to Lay Cable for the Television Surveillance Project.



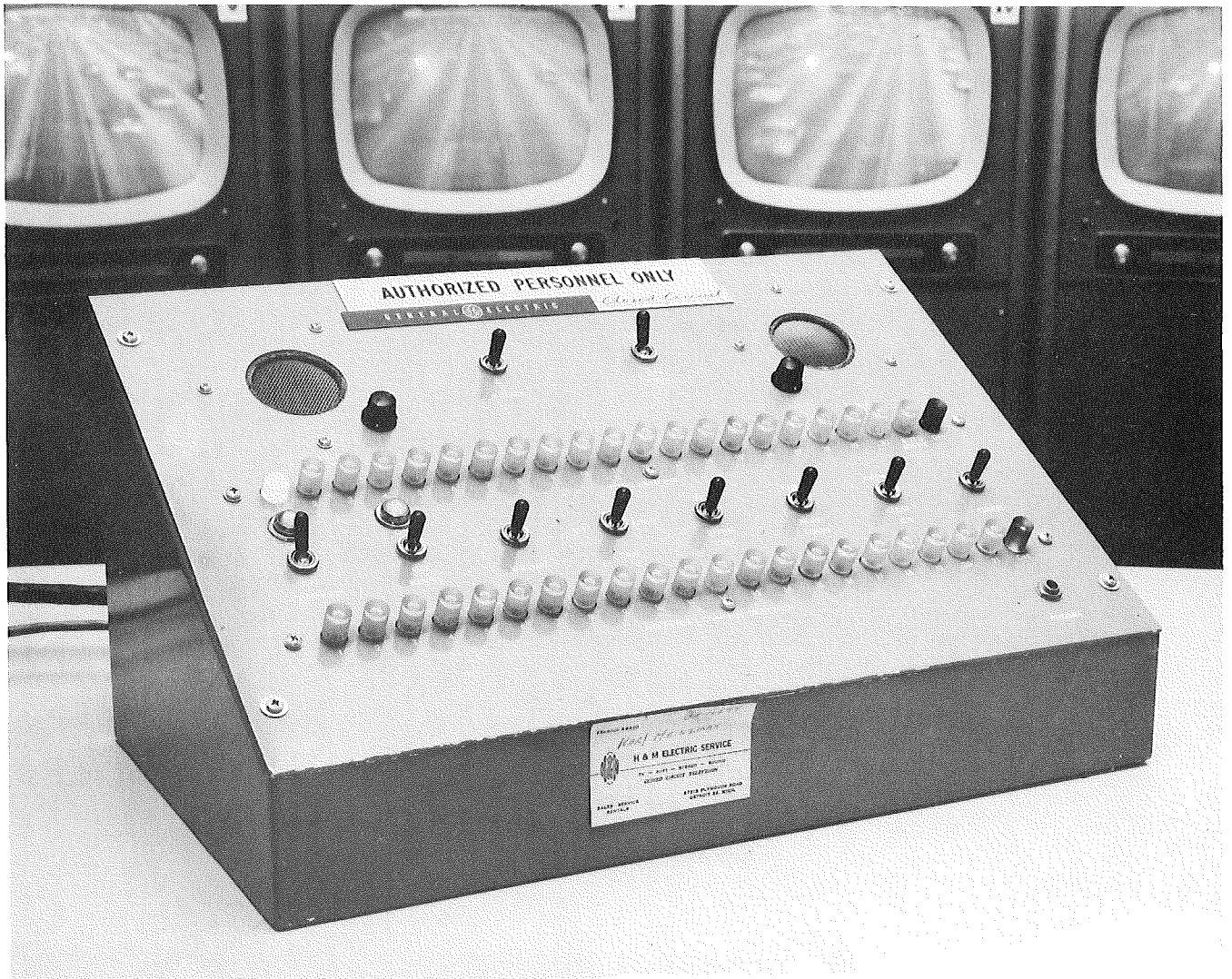
Michigan Bell Telephone Crew Laying Coaxial Cable on Freeway Median.



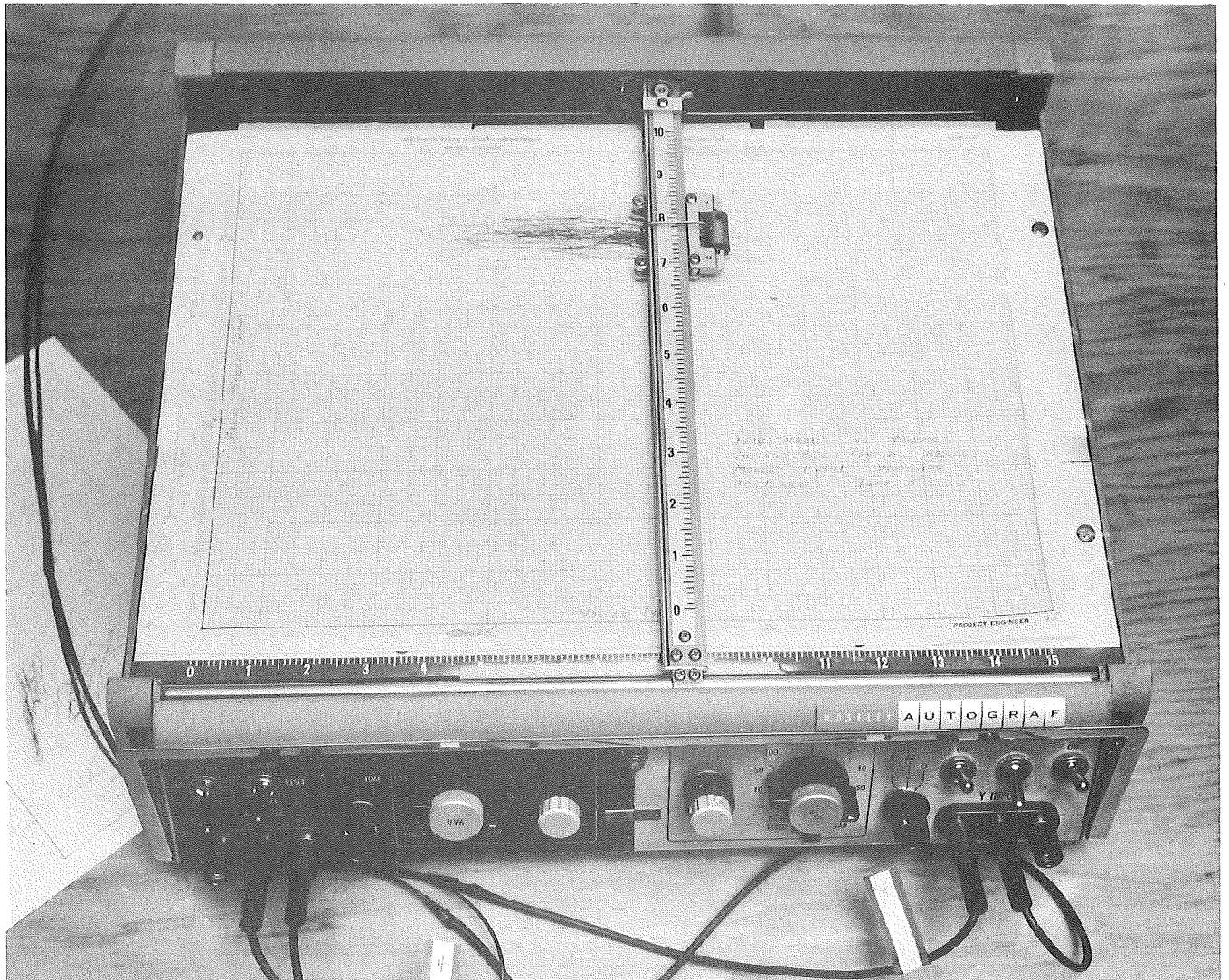
Typical Installation of Metal Housing on Bridge Over Freeway,
Containing Television Camera and all Related Field Equipment.



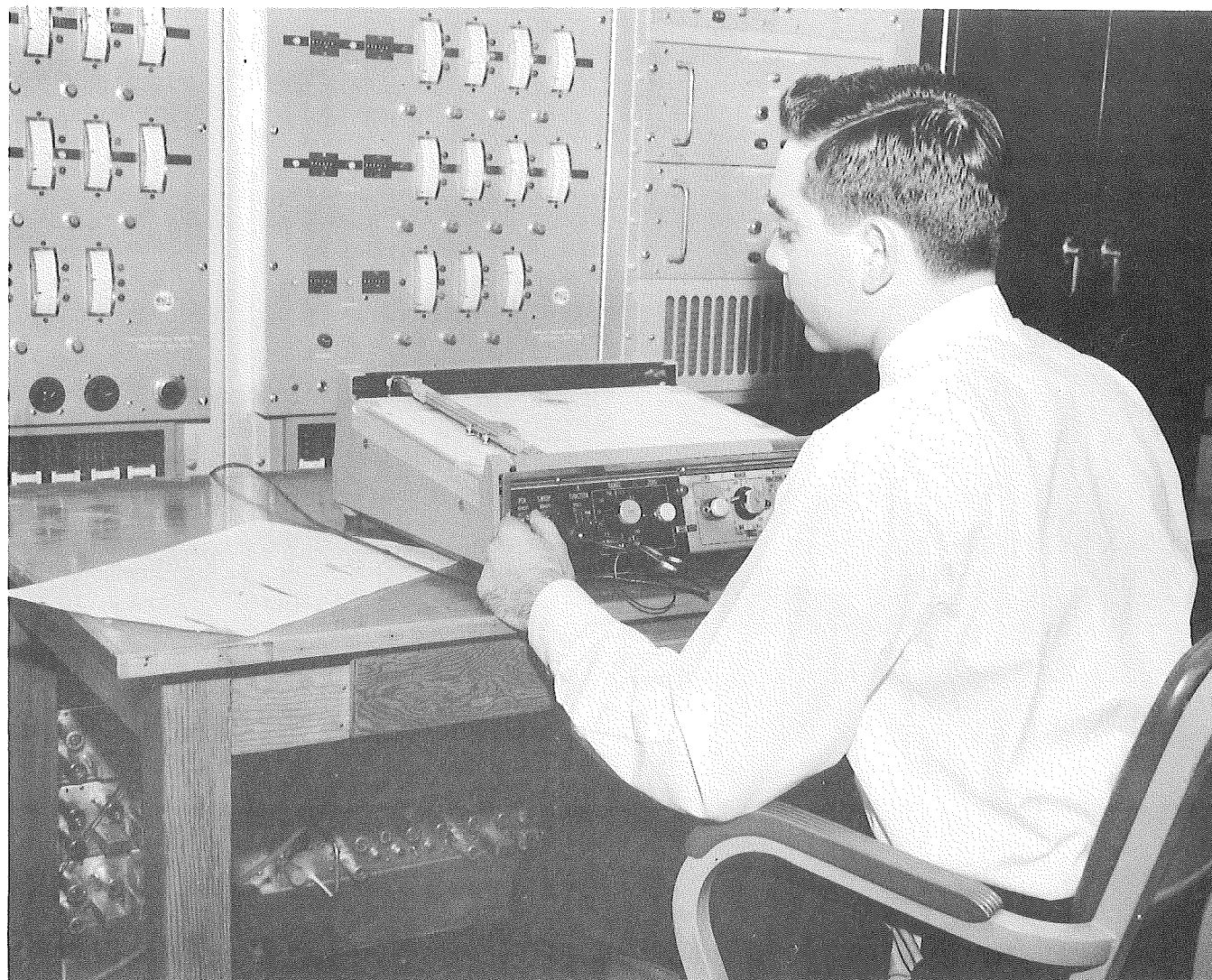
T.V. Surveillance Control Room Showing Monitor Arrangement,
Camera Control Console and Operator.



Close Up View of Camera Control, Showing all Available Remote Control Functions.



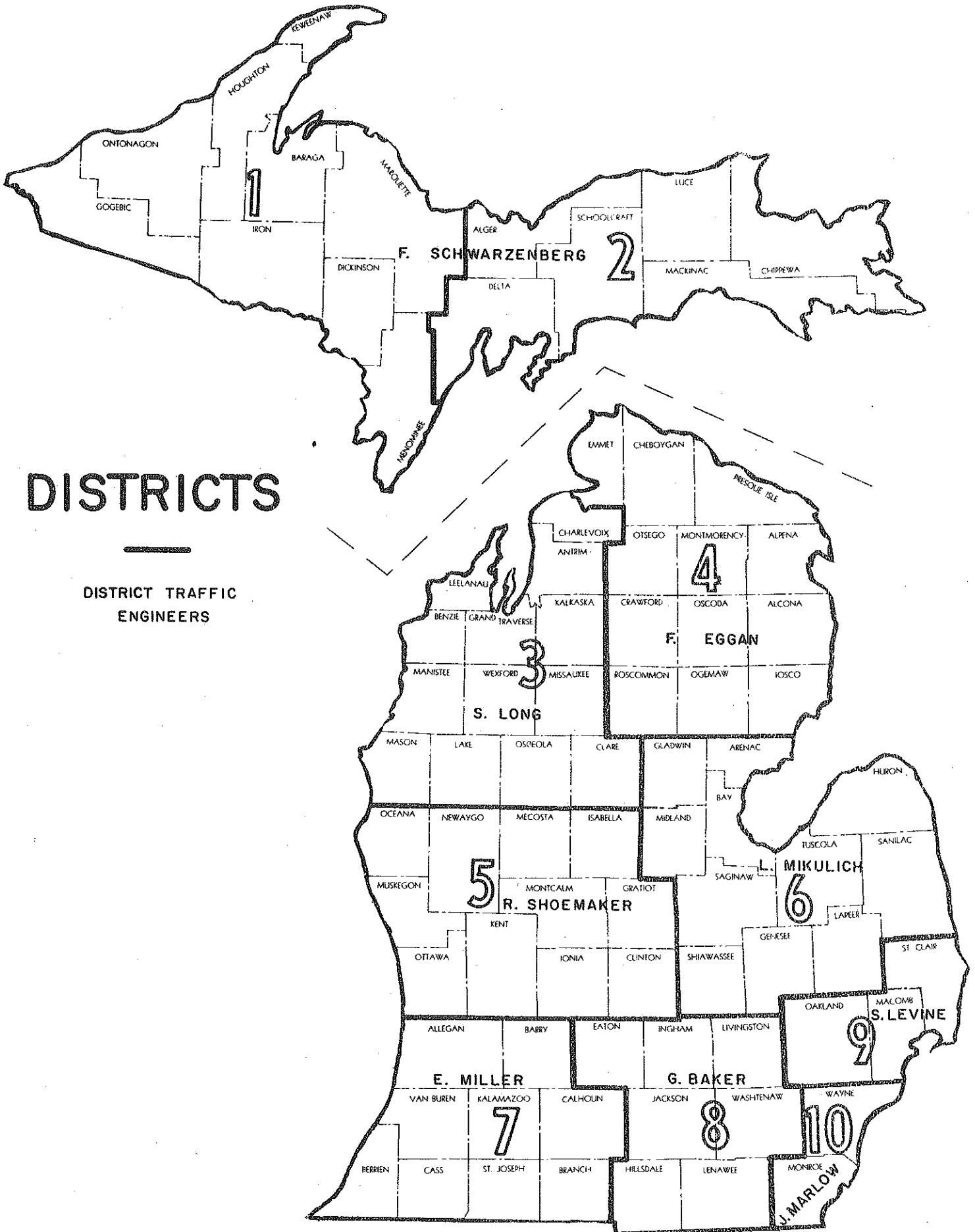
X-Y Plotter Operating with Analog Input, Plotting Speed Versus
Volume for One Lane of the Freeway.



Operator Adjusting the X-Y Plotter to Obtain a New Set of Curves
From Freeway Traffic.

DISTRICT TRAFFIC ENGINEERS

L. J. Doyle - Assistant Director



DISTRICTS

DISTRICT TRAFFIC ENGINEERS

DISTRICT TRAFFIC ENGINEERS

THE DISTRICT TRAFFIC ENGINEERS are considered as the fifth section of the Traffic Division and as such are directly responsible to the Assistant Director. The Department policy of decentralizing actual work responsibility and placing it in the Districts is followed by the Traffic Division. The District Traffic Engineer has full responsibility to act for the Traffic Division within his District. He makes all contacts, makes his own decisions and/or recommendations and administers all necessary traffic engineering; acting of course within Department and Division policy.

District Work Authorizations are issued by the District Traffic Engineer to provide actual work in place. During 1960, 1350 District Work Authorizations, at a dollar value of \$526,886 were issued. These include sign fabrication and erection, construction barricades and signing, placing guard posts and guard rail, signing for temporary routes and special pavement marking.

While the number and dollar value of the authorizations issued is considerable, it constitutes only a small part of the District Traffic Engineers' actual duties. Contacts with individuals, Governmental Officials and representatives from business and industry, while impossible to enumerate, take up a major portion of his time. He is continually asked to be in attendance at council meetings, as well as being requested to speak at various Service Club meetings, Safety Group meetings, P.T.A. gatherings, etc.

He is also required to conduct a number of field investigations in conjunction with State Police and local officials to decide on speed zones and parking restrictions. He also contacts a number of individuals who have registered complaints either to him or to the Lansing Office, determines the nature of the problem and either resolves the difficulty on the spot or submits a report with recommendations to the Lansing Office.

In conjunction with other District Office personnel, the District Traffic Engineer represents the Division at all pre-construction meetings, G.I. inspection of preliminary plans, determination of temporary routes and any other occasion requiring traffic engineering techniques.

In addition to these routine duties, he is often called on to conduct investigations for special studies such as the case in District No. 1. The District Traffic Engineer in this instance was asked to make contact and investigations with the various mining companies' officials to determine the possibility of trunkline cave-in as a result of mine subsidence. Also a case in the 4th District can be noted where the District Traffic Engineer was asked to select a bridge for experimental reflective painting. In this same District a research project involving the study of left-hand signing of no-passing zones was started. In some instances the District Traffic Engineer is required to testify or be in attendance at court cases or hearings. This happened in the 5th and 8th Districts several times. Other special investigations or cases of this nature have undoubtedly occurred in all Districts if all activities could be recalled.

The foregoing is however a brief description of the volume of "routine" duties which the District Traffic Engineer is required to resolve and a few of the extracurricular ones which fall to his lot.

PERSONNEL

TO EXPEDITE the ever increasing amount of work listed in this report, the Traffic Division has added 12 new positions during the past year. This brings the total now to 169; which is composed of 62 classified engineers, 10 technicians, 47 engineering aides and 50 non-engineers (repairmen, clerks, typists, etc.).

During the past year an in-service training program was inaugurated with the purpose of informing all personnel of the activities of the Division as a whole. This was conducted by the Section Heads to a class composed of unit heads of all sections. It was very well received and the plan now is to prepare a manual of Division activities for distribution to all engineering personnel who will be the next members of the training class. This will be a continuing function, conducted periodically, toward the result of keeping all engineering and technical personnel fully informed of all Division activities.

CIVIC ACTIVITIES

The Traffic Division has participated in several activities of an educational nature. The Traffic Safety Center at Michigan State University conducts courses for Driver Education instructors as well as a "Work Shop" for Police Officers. Several of the Division personnel have appeared as guest speakers and instructors at these courses in cooperation with the University. Aid has also been given to other State Colleges and civic groups who have requested it.

The Assistant Director of the Traffic Division has the responsibility of representing the Highway Department on the Review Board for the Peabody Award winning radio show entitled "You are the Jury". This Board edits and clears all material used on the show prior to presentation. The Board is composed of representatives from the Secretary of State's Office, Department of Public Instruction, Michigan State Police, Judges' Association and the Michigan State Highway Department.

The Director of the Traffic Division usually prepares material for presentation and frequently called upon to represent the State Highway Commissioner at the monthly meeting of the State Safety Commission.

AWARDS

CERTIFICATE OF RECOGNITION

This award is in recognition of an annual endeavor in which the fifty states and many cities participate. The scope of the effort encompasses ten parts or sections, each of which covers some specific phase of traffic safety. Section 4, "Traffic and Highway Engineering", is the one under which the Highway Department data is submitted. The Accident Analysis Unit of the Traffic Operations Section has the responsibility for gathering, compiling and submitting this data to the National Safety Council.

The information contained in all sections of the inventory provides the means of determination and evaluation in a number of fields of endeavor:

1. Annual progress report of the White House Conference on Highway Safety.
2. Individual State Analyses prepared by the National Safety Council.
3. Compilation of factual experience for the purpose of improving standards and methods of evaluation.
4. International Association of Chiefs of Police awards - (Police Traffic Supervision - Section 5).
5. American Association of Motor Vehicle Administrators - (Driver Licensing, Section 6).
6. National Safety Council awards.

The various states are divided into groups based on accomplishment, trunkline mileage, expenditures, population, vehicle registration, etc. Michigan is included in a group of eight states based on this evaluation: California, Illinois, Indiana, Michigan, New York, Ohio, Pennsylvania and Texas.

Each year all participants are judged by a committee of National Safety Council and Institute of Traffic Engineers representatives at a meeting usually held in Chicago. The accomplishments of the participants are evaluated using a national criteria for performance level. In the case of highway departments the performance

is based on about 100 items of questions of a diversified nature relative to all work that the departments perform in any phase of highway traffic safety. Although there is no actual winning place, or conversely, a losing one, performance of the individual state (in each group) is evaluated on a percentage basis. Therefore, the state adjudged the highest percentage of accomplishment can be considered at the highest level of its group. Michigan was rated at 96%, the highest in its group, in 1960 (for 1959 activities). However, all states in Class A had a very high performance level and all were awarded the Certificate of Achievement on an equal basis.

In reporting receipt of this award in this publication, it should be understood that while the Traffic Division gathers and transmits the material for the inventory, several other divisions in the Department have contributed their time and effort toward achievement of the end result and should receive due credit and recognition. In other words, this award is a Highway Department honor, gained through total Departmental cooperation and effort.

A.A.A. PEDESTRIAN AWARD

Michigan received the highest rating of all the fifty states in all categories covered in the appraisal of the American Automobile Association Pedestrian Program. The following categories or sections were included in the evaluation:

- A. Pedestrian casualties
- B. Records and uses
- C. Legislation and enforcement
- D. Engineering
- E. Organization
- F. School traffic safety
- G. Public information

The Accident Analysis Unit was also responsible for the gathering, compiling and submitting to the American Automobile Association all the data required in this report. Again, while the Traffic Division is responsible for all engineering toward accomplishing these goals, due credit must also be given other agencies who have participated in its achievement.

The Michigan State Highway Department and the State as a whole can feel justly proud to have received these two awards for achievement in the fields of traffic and pedestrian safety.

ADDENDUM

It is our feeling in the Traffic Division that a periodic summary of work programs and accomplishments serves a useful purpose both to the Division personnel responsible for completing the work and to other divisions by reiterating the contributing functions of our activities. The responsibility for providing free, convenient and safe transportation over the trunkline system placed on the Commissioner can only be fulfilled by the complete utilization of all units of the Department to obtain the desired end result. The progress made in the coordination of traffic considerations from the original planning stage through construction should be a source of satisfaction to the personnel of this Division. Our efforts will continue to be directed toward fulfillment of this coordination throughout the entire Department and in so doing continue to serve the highway needs of the traveling public to the best of our ability.