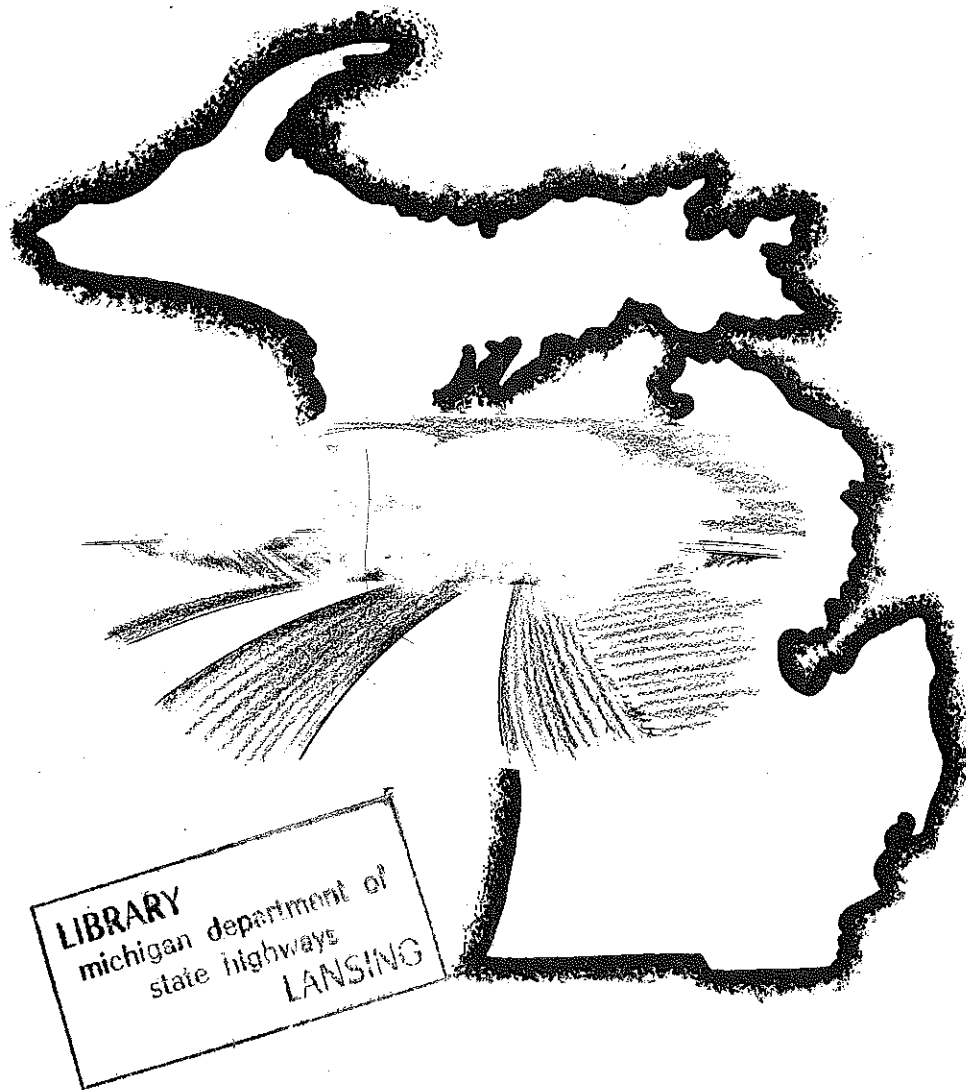
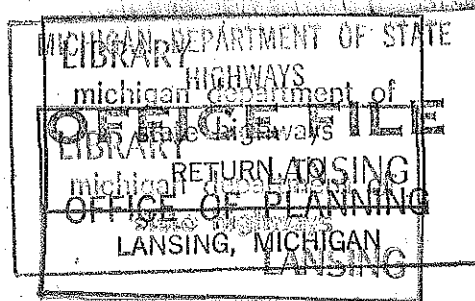


**A POLICY FOR WEIGH STATIONS,
REST AREAS AND TOURIST INFORMATION LODGES
ON LIMITED ACCESS HIGHWAYS**



**MICHIGAN STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER**

A POLICY FOR
WEIGH STATIONS, REST AREAS
AND TOURIST INFORMATION LODGES
ON LIMITED ACCESS HIGHWAYS



MICHIGAN
STATE HIGHWAY DEPARTMENT
John C. Mackie, Commissioner

Prepared by
Office of Planning
Planning Division

June 1958



STATE OF MICHIGAN
OFFICE OF THE HIGHWAY COMMISSIONER
LANSING

JOHN C. MACKIE
COMMISSIONER

We have established within this report a basic policy relative to the incorporation of truck weighing stations, safety rest areas and tourist information lodges in the planning and construction of Michigan's limited access highway network.

The ramifications of design and operation of a limited access highway system, which will give the people of Michigan increased safety, sustained speed, and high traffic capacity, dictate the need for a firm policy base that will establish the principles of placement, service and traffic operation of these several auxiliary facilities.

Therefore, the principles herein developed and summarized shall constitute the official policy of the Michigan State Highway Department and shall be adhered to in the planning and construction of Michigan's limited access highway system.

John C. Mackie
STATE HIGHWAY COMMISSIONER

S U M M A R Y

The following points of policy are developed within this paper:

Tourist Information Lodges

1. First priority of determination and inclusion be given to the major routes of tourist entry on Michigan's borders.
2. Tourist information lodges proposed for inclusion on limited access highways shall be planned and designed for intramedial placement.
3. Design standards for this type of facility shall be such that all types of vehicles can enter, use and leave the area with minimal difficulty in changing speed, parking and maneuvering. The lengths of the speed-change lanes are especially important.
4. The picnic areas shall be fenced and buffered against the traffic stream.

Safety Rest Areas

1. The policy for safety rest areas offered by the Bureau of Public Roads in reference to Interstate routes shall constitute a guide for all limited access highways.
2. Design standards as shown on Plate 2 (or higher), shall be used in laying out the traffic operation of the safety rest areas.
3. The following items shall be included in each rest area:
 - a. Public Telephones
 - b. Information Boards
4. Picnic areas shall be included, but the essential difference in land use and traffic character in Southern and Northern Michigan shall be recognized and considered. In Southern Michigan the picnic areas shall be minimal to discourage local usage, while in the north they may be more extensive.
5. Either intramedial or exterior placement is acceptable but in the northern areas the median location is preferable.
6. In the southern portion of the state an all-weather building shall be provided to house the water and sanitary facilities. It shall be well-maintained and supervised.
7. A minimum number of rest areas shall be developed initially on each limited access route to allow for the accrual of operational experience.

Weigh Stations

1. When an interchange is planned in the general area where a new weigh station is indicated, consideration shall be given to the expansion of the interchange to include a weigh station, especially if the intersecting road is a trunkline carrying commercial traffic which could also be checked at that point. In all other cases, the many advantages of the intramedial placement scheme indicate its general desirability in planning new weigh stations on limited access highways. ^{1/}

2. Regardless of which type of installation is ultimately selected for a specific location, the possible eventual utilization of electronic over-load detectors and scales recessed in the traffic lanes of the highway is a definite possibility and should be considered. This type of equipment is commercially available and is reported to be simple and reliable in operation. The use of these devices eliminates the need for all trucks to pass over the static scales for precise weighing. The elimination of unnecessary maneuvering and delay would be appreciated by the commercial haulers and would do much to expedite the steady flow of traffic. The latter will become increasingly important as highway traffic volumes approach the limits of roadway capacity.
3. The storage areas for impounded vehicles shall be so placed that they are observable from the scale house but shall not interfere with the weighmasters view of the traffic stream.
4. The scale house and approaches shall be designed so that one weighmaster can operate the station when necessary.
5. The design standards used in laying out the complete weigh station facility shall be based upon the design and performance characteristics of trucks; especially in regard to the length of deceleration and acceleration lanes.

1/ An exception to this point is outlined in the Appendix - "A Combined Service Area For Use On Limited Access Highways."

WEIGH STATIONS, REST AREAS
A POLICY FOR AND TOURIST INFORMATION LODGES
ON LIMITED ACCESS HIGHWAYS

Michigan's accelerated "Five Year Construction Program" is based primarily upon the limited access highway. Limited access roads, in general, and Interstate Routes, in particular, present a whole new concept of highway design and operation. This type of road will provide several obvious advantages - high capacity, sustained speed, and increased safety. Conversely, the motorist and commercial driver will discover that the multitude of commercial services such as restaurants, gasoline stations, and the several other services convenient or, in fact, necessary to automotive travel are not to be found adjacent to the travel flow as on free access roads.

An Interstate route, in particular, by existing definition and regulation, eliminates many of the auxiliary features which have by need and custom become an integral part of automotive travel in this country. We can, by location, design and regulation, eliminate on a limited access road the many establishments that provide food, fuel, service, emergency help, communications and information; but we cannot eliminate the need for these items. In some measure, provision must be made for the motorists basic needs. There is also the problem of providing for the needs of police posts, maintenance garages and truck weighing stations. The problems of public telephones, emergency service patrols and land use zoning at interchange points will also warrant consideration.

The limited access highway concept poses a wealth of problems and questions; some of which are the concern of this report, and others which will only be answered by research or experience. It behooves us to take a long and serious look at what the future may hold in the way of problems that this type of highway will engender and their possible solutions.

This report will concern itself with just three facilities that are presently extant to some degree in our highway system, and our need and ability to incorporate them into the planning and design of the routes that will constitute Michigan's future highway network. They are tourist information lodges, safety rest areas and truck weighing stations.

TOURIST INFORMATION LODGES The tourist information lodge is basically a courtesy service provided by the Highway Department, assisted by various tourist agencies, to aid tourists and other users entering Michigan, and to some extent those traveling from Michigan to other states. The existing lodges are equipped with washroom and toilet facilities, public telephones and, in some cases, picnic areas. The attendants provide information regarding routes to drive and roads undergoing repair or relocation; dispense Michigan and outstate maps, tourist resort folders and generally aid the traveling public in any way that does not conflict with legitimate business interests. They do not provide any commercial items for sale; such as cigarettes, soft drinks or sandwiches. Nor do they actually book resort, motel or other lodgings, and at present they do not sell hunting and fishing licenses.

The several items that follow should be given consideration in planning a tourist information lodge:

1. Traffic Operation - A tourist information lodge located on any one of Michigan's major routes of entry is going to be subjected to a nearly constant flow of traffic entering and leaving the area during the summer months when recreational traffic is at its peak. Therefore, the lodge area must be so placed and designed that vehicles can leave the traffic stream, park, utilize the services provided by the lodge and resume their journey in safety and with minimum friction and disturbance to through traffic. This is no small matter and will require a maximum of designing skill.
2. Costs - The original cost of a facility of this type is a variable dependent on the complexity and scale of the design. Operational

costs of existing lodges are based in part upon a crew of two to three employees during the summer months.

3. Utilities - A full complement of utilities is essential to the operation of a facility of this type and these utilities should be designed and arranged to function adequately during extremely heavy periodic usage.
4. Services - An information lodge, as previously noted, has been primarily a dispenser of information, routes, maps and tourist literature; and, in addition, it usually provides washrooms, telephones and picnic areas.

The intent of a tourist information lodge is that, in a sense, it will act as a "port of entry and exit" for the State of Michigan. It combines informational services with some physical conveniences. It serves both directions of traffic flow at its point of location, but design preference should be given to traffic entering Michigan. The passenger vehicle and its occupants are the principal reason for its being, but it will be utilized to some extent by commercial drivers. All of these factors must be considered in the design and placement of such a facility.

The problem of operational placement is common to all three types of facilities that are considered in this paper and each will be discussed individually. Basically, however, on a limited access facility, the possibilities of placement are three (as shown on Plate 1):

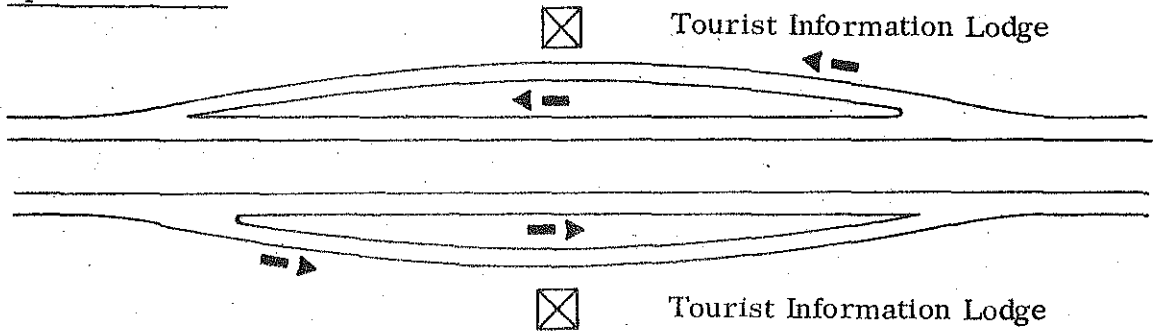
1. Intramедial - in which the two roadways are spread and the facility is placed in the widened median area.
2. Exterior - in which the facility is located to the right of one direction of traffic flow.
3. Split - in which duplicate facilities are constructed to the right of each directional roadway.

There are relatively few tourist information lodges contemplated for inclusion in the five year construction program. Even so, the "split" scheme would entail problems of original cost and operational and maintenance expense that immediately preclude its possible use in this era of rising costs.

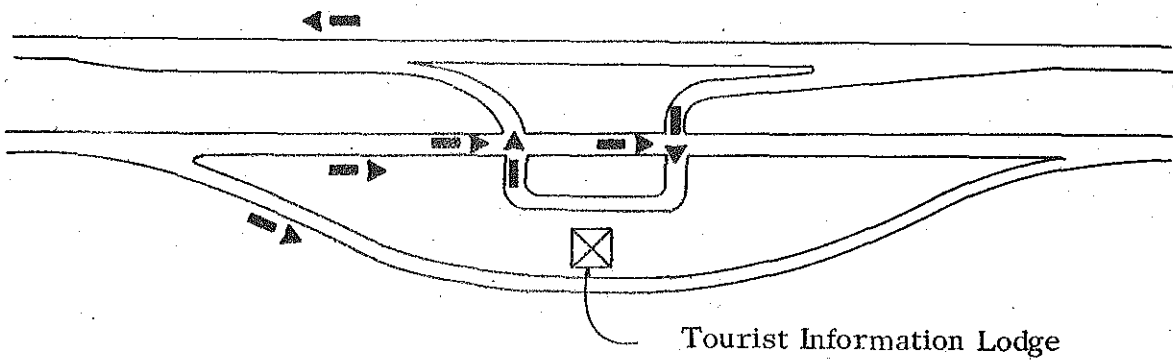
The exterior placement would serve one direction of the traffic stream quite well but would pose severe problems of operation and design for the other. For instance, on a

PLACEMENT SCHEMES
For
TOURIST INFORMATION LODGES
ON LIMITED ACCESS HIGHWAYS

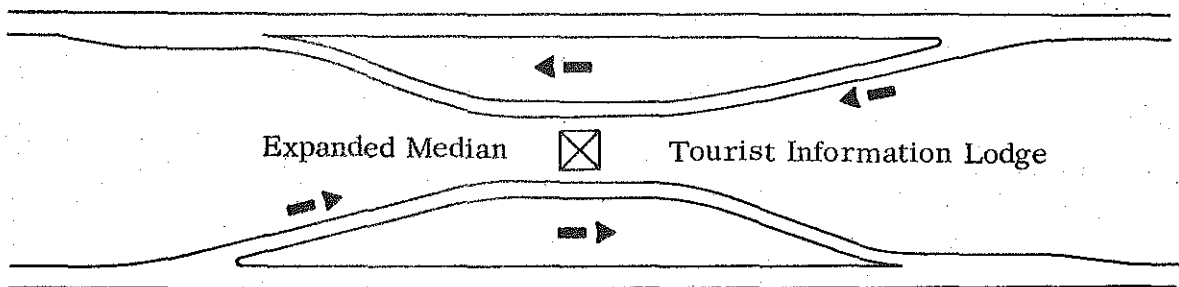
Split Placement



Exterior Placement



Intramedial Placement



north-south highway, if the information lodge were located to the east of the highway, the north bound vehicles would be able to enter and leave the lodge area quite freely. South bound traffic, however, faces an entirely different situation with two possible solutions:

1. Deceleration and storage space could be provided in the median area (as shown in the sketch) for vehicles crossing the north bound traffic flow, while proceeding into and out of the lodge area.
2. In the case of Interstate routes where crossing at grade is not allowed, a structure would be required to provide entry and exit to south bound traffic desiring to use the lodge facilities.

While this scheme, in the at-grade version, could be constructed and operated at minimum cost, it is deficient from the standpoint of traffic operation and would develop an accident-potential situation. The alternate version, involving structures and ramps would incur factors of cost that are not warranted. Considering the total picture, we can not recommend a layout of this type.

An intramedial placement for tourist information lodges warrants a great deal of consideration. On a limited access highway it is a comparatively easy matter to widen the median sufficiently to allow for this type of design. The advantages are obvious - direct access into and out of the lodge area from both directions of travel, immunity from adverse land use build-up outside of the right-of-way, compact utilities; and with proper design and construction, excellent parking and rest areas can be easily included in the package.

There has been some question relative to vehicles leaving and entering the traffic stream from the inside lanes of the roadways as would occur in this particular type of placement; the reentry phase being a point of particular consideration. However, there is at present more opinion than factual data available as a guide in deciding this issue. The only definitive experience which can be quoted at this time is offered by the Garden State Parkway in New Jersey.

Mr. D. Louis Tonti, the executive director of the Garden State Parkway, in a letter dated April 2, 1958, makes the following statements:*

"We have five service areas in the medial zone which have been in operation since 1955, together with two picnic areas Our accident experience at these locations has been as favorable as that throughout the Parkway. The results have been satisfactory in all respects In the light of our favorable experience we had no hesitancy in choosing the medial area location for our Montvale Service Area which is now under construction on the connection to the New York Thruway."

Mr. Tonti further makes the point that with equal design, and signing, there has been no more difficulty experienced in maneuvers from the left lane, than from the right or outside lane.

The advantages of the intramedial layout far outweigh those of the alternates considered. Its general use for tourist information lodge placement is desirable.

It is our belief and recommendation, based upon an analysis of the overall picture, primary purpose, original and operating costs, traffic operation and long-term usage, that the following points of policy be utilized in the determination, planning and operation of tourist information lodges in Michigan:

1. First priority of determination and inclusion be given to the major routes of tourist entry on Michigan's borders.
2. Tourist information lodges proposed for inclusion on limited access highways shall be planned and designed for intramedial placement.
3. Design standards for this type of facility shall be such that all types of vehicles can enter, use and leave the area with minimal difficulty in changing speed, parking and maneuvering. The lengths of the speed-change lanes are especially important.
4. The picnic areas shall be fenced and buffered against the traffic stream.

* Mr. Tonti's complete letter is a part of the Addenda of this report.

SAFETY REST AREAS The Michigan motorist has been conditioned by long experience to expect that there will be a multitude of commercial services readily available beside the roadway. Food, lodging, gasoline, and emergency service have been either directly available or as close as the nearest telephone. As previously stated, however, the limited access concept will be causative of a radical change in this picture. No commercial establishment will be allowed to locate on a limited access highway. The motorist who desires food or lodging can leave the highway at reasonably spaced points to fulfill his needs; the traveler who runs out of gasoline or experiences mechanical failure is in a more difficult predicament.

That there are deficiencies in motorist service in the limited access concept is recognized and is a matter of some concern. In fact, the laws and regulations that provide for and regulate the Interstate system, while eliminating many of the services that motorists consider necessary, do recognize that there are some conveniences that cannot be eliminated even from an Interstate route.

These features are covered by the memorandum: "A Policy on Safety Rest Areas for the National System of Interstate and Defense Highways", published in December, 1957 by the Bureau of Public Roads.

The policy delineated by this publication, while quite general in some phases, does act as a guide for the various states involved in Interstate Planning and makes the following points:

1. Safety rest areas are to be provided for public use within the rights-of-way of Interstate routes. They will include sanitary and other facilities that are deemed reasonably necessary for the suitable accommodation of the public, when proper maintenance and supervision are assured.
2. The rest areas will include parking space for both passenger vehicles and trucks. Special rest areas for trucks may be deemed necessary at a later time, if experience so dictates.

3. An Interstate route to be built as a divided highway should be designed as two separate one-way roads. Generally, on a divided highway the rest area should be located on the right, in advance of the site serving opposing traffic, but it can be located in a wide median if sufficient space is available or, could even be included in an interchange area under some circumstances.
4. The size of a rest area is a variable, but generally not more than three acres should be developed.^{1/} Consideration should be given, however, to the need for future expansion. There is a preference for many small rest areas rather than a few large ones but this must be tempered by consideration of roadside friction and installation cost. There is no data available at present to determine potential usage based on vehicle-volumes.
5. The distance between sites may vary from ten to thirty miles depending upon the vehicle-volume usage of the road and the development of the area through which it passes.
6. The actual site location should consider present and future land use adjacent to the site. It should consider natural features such as trees and streams and should take advantage of grade changes to aid trucks in slowing and accelerating.
7. Rest area sites should be considered on the approach to urban centers. This location would allow people to check maps and routes and obtain rest before encountering heavy traffic conditions. It would allow truck drivers to rest for a while if they arrive too early for a scheduled docking time.
8. A safety rest area shall be signed as follows:
 - a. An entrance sign
 - b. A sign one-half mile prior to the entrance
 - c. A sign one mile prior to the entrance
 - c. A sign two to five miles prior to the entrance

Across from the rest area, on the opposite roadway, there shall be an advisory sign indicating the mileage to the next rest area serving that direction of travel.

9. Emergency telephones connected to a special switchboard are considered as public utilities and, therefore, might be included in a safety rest area. Public telephones are considered as private utilities and, therefore, may not be permissible; if permissible on an Interstate route, a rest area would be a logical place for installation.^{2/}
10. The features that are to be included in a safety rest area actually depend on the policies of the individual states.

^{1/} The exigencies of desirable service and adequate operational design indicate that three acres is not a sufficiently adequate area for general usage.

^{2/} A later policy published by the Bureau of Public Roads, June, 1958, states: "Public pay station telephones may be installed on Interstate Highways as a convenience to highway users - the booths are to be located only within safety rest areas."

The policy established by the Bureau of Public Roads, while generally defining the area of consideration for safety rest areas, very wisely leaves the detail of analysis and design to the individual states to incorporate into their frame-work of experience and need. Therefore, we have primarily utilized information from the many sources within the Michigan State Highway Department in developing the following items of consideration:

1. The Facility - The problem of the type of safety rest area to be developed in Michigan is peculiar in the sense that the part of the state generally south of M-20 is highly urbanized with the economy based upon industry; north of M-20 the urban centers are smaller and the economy is based more upon the tourist industry. These variations in land use and economy tend to develop two different types of traffic pictures with differing needs.

The traffic volumes occurring on the highway system in the southern part of the state, while subjected to summer travel highs, remain relatively constant throughout the year.

The characteristic of southern Michigan highway traffic, indicating an all-season use for rest areas on the major routes, implies that the rest areas shall be designed on basis of permanent all-weather facilities open to public usage at least eighteen hours a day, and perhaps around the clock.

An attractive, efficiently designed, all-weather building is essential to the operation of rest areas on limited access highways in the urbanized areas. This building will house the water supply and sanitary facilities and provide shelter for the rest area attendant who will be needed to perform the ordinary housekeeping functions. It is impossible to over-emphasize the need for full-time supervision and a high standard of cleanliness.

In the northern, less populated areas of Michigan, the basic rest area package should be developed and operated in relation to the high seasonal traffic fluctuation and the more informal nature of the summer-travel trip purpose.

Among the items that should be provided to aid the traveler are a map and a directory of the area adjacent to the route for as much as fifty miles ahead; showing motel, restaurant and gas station information. This service would eliminate the need for a great deal of time consuming, exploratory side-road driving by motorists seeking essential services.

As previously mentioned within the body of this report, there are other services that might be provided within a rest area on a limited access highway. Primary consideration should be given to the inclusion of public telephones. It has been found that the telephones provided in rest areas on the Ohio Turnpike are in almost constant use during peak hours. The service that a telephone provides in case of serious accident is, of course, quite obvious. It is felt that every effort should be made to include public telephones within a rest area.

The grounds of a safety rest area should be clean and well-maintained and provided with a fence sufficient to maintain its identity and prevent haphazard entry and exit. The parking areas should be capable of being well lighted. Our own experience, plus that of other states, indicates the desirability of including picnic tables, waste receptacles and outside water taps for the convenience of the traveling family. Ohio has even seen fit to include dog exercise areas for the convenience of the family pet.

2. Costs - The cost of providing safety rest areas will vary with the actual location, however, the following may be considered as typical:

Right-of-Way	\$ 3,000.00
Grading & Drainage	28,000.00
Base & Surface	55,550.00
Building	16,000.00
Fencing	6,125.00
TOTAL	\$ 108,675.00

3. Number and Location - The policy formulated by the Bureau of Public Roads establishes a framework within which the individual state is allowed considerable latitude in establishing the location and frequency of rest areas. This policy is basically applicable to all limited access highways.

In Southern Michigan the spacing of the urban centers is such that, in general, rest areas can be placed at an average distance-frequency of thirty-five miles. This spacing will allow the interjection of additional installations at some future time, if the need occurs. They should also be located five to ten miles from the present urban centers in order to avoid future adverse land-use build-up and friction.

In the northern areas the physical spacing can be lengthened considerably and the precising of the actual locations can be more dependent upon scenic views and land virtues rather than the proximity of urban centers.

4. Traffic Operation and Design - The technical aspects of a safety rest area that will provide a maximum of desired services with a minimum of friction with the traffic stream, will vary from location to location.

However, much thought has been given to the general problem and some recommendations have been developed, including a typical traffic layout which is shown on Plate 2.

Again the question of relative placement, intramedial or exterior, as discussed in the section regarding information lodges, is basic to the problem. It is worthwhile to restate at this point that the Garden State Parkway in New Jersey has experienced no more traffic operational difficulties with their intramedial service areas than with those placed outside the roadways. Therefore, the choice of placement, medial or exterior, is dependent on other factors.

Intramedial placement serves both directions of traffic flow and is insulated to some extent from adverse land use development while the exterior location serves only one direction of travel efficiently and safely.

In general, in Southern Michigan either type of placement is acceptable; but, where an exterior design is used it should be placed to the right of the traffic flow approaching an urban center. In the northern areas, where there is more opportunity to spread the roadways and the primary use of the rest area will be more closely akin to recreational pursuits, the intramedial design is recommended.

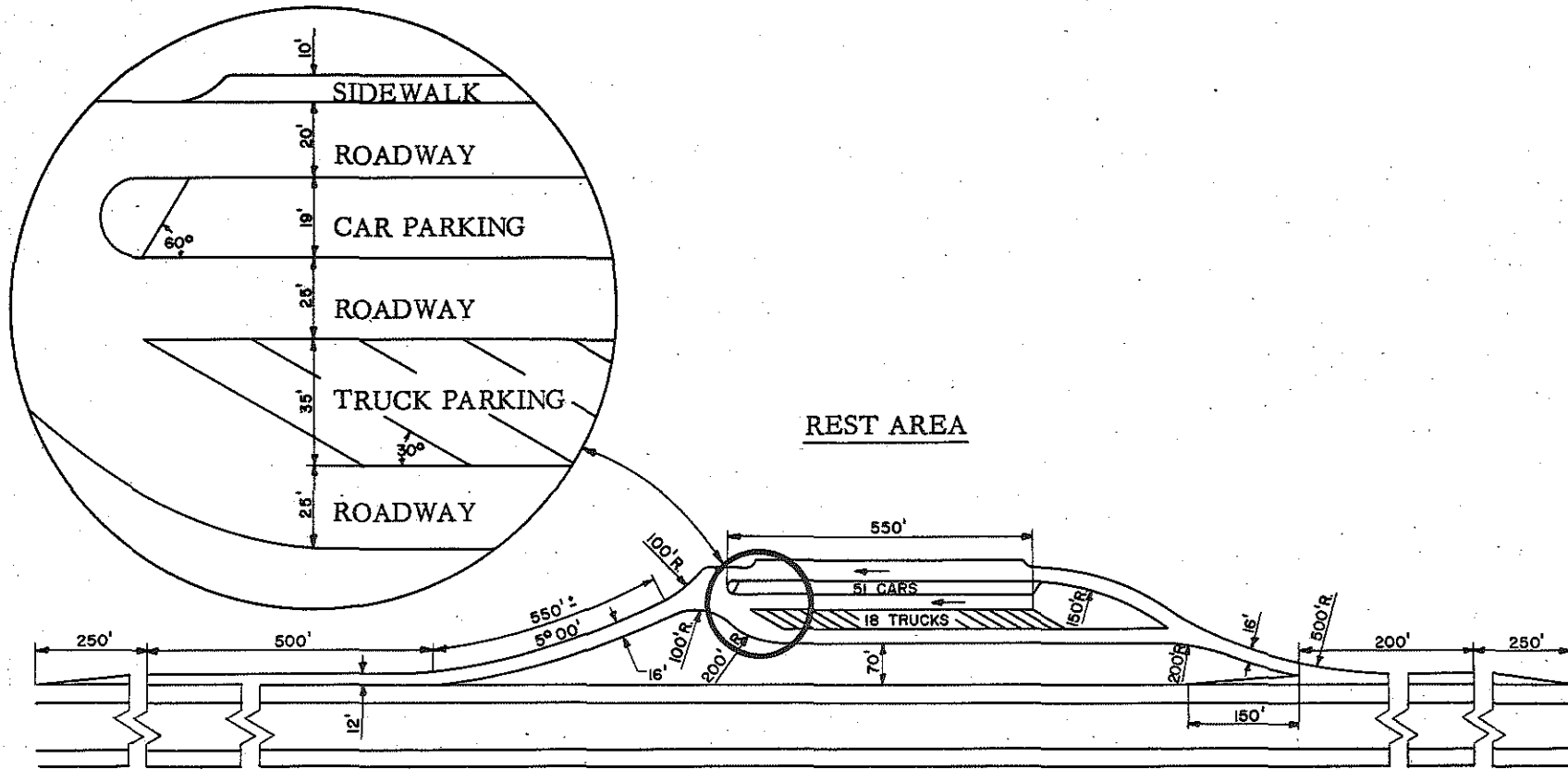
The typical traffic layout plan attached to this report (Plate 2), represents the combined ideas of the Maintenance and Traffic Divisions and the Office of Planning.

The primary points of this plan and basic reasoning are as follows:

- A. Parking is provided for fifty-one cars and eighteen trucks. This is an initial provision that could be considerably expanded if experience so warrants.^{1/} Car stalls are designed for nine-foot widths and truck stalls are set at fourteen-foot widths.
- B. It is anticipated that the drivers using this route will have become "velocitated" and, therefore, will experience a tendency to enter the parking area at a relatively high rate of speed. For this reason a 450 foot deceleration lane on the roadway and a 300 foot additional deceleration length at the rest area entrance is indicated. The design of the turning roadway will further reduce the speed of entering vehicles.

An acceleration length of 1300 feet is set forth with 550 feet off the roadway and 750 feet on the roadway.

^{1/} A letter in the Addenda - H. G. Bauerle, Director of the Traffic Division, to Mr. N. E. MacDougall, Division Engineer, Bureau of Public Roads, May 28, 1958 - details the basis for establishing the initial number of parking spaces.



NOTE:

Median Control (Guard Rail or Swamp Ditch) to be provided to first Interchange on Decel. side of Rest Area & 300' beyond end of Accel. lane.

- C. A seventy-foot separation from the roadway proper to the rest area is shown on the plan. This distance will tend to discourage shoulder parking, eliminate apparent friction, and will allow the design curvature necessary to slow entering traffic.
- D. In those locations where rest areas are not placed opposite each other, or located in the median area to serve both directions of travel, a positive form of median control such as a guard rail or swamp ditch is indicated to prevent U-turns and pedestrian crossovers.
- E. A rest area shall not be located within operational influence proximity of an interchange point.

It is a conclusion of this paper that the concept of a safety rest area is highly desirable, but only a partial answer to the problems developed by the elimination of commercial services from proposed limited access routes. It is our recommendation that the following points of policy be adhered to in planning and operating safety rest areas on limited access highways in Michigan.

- 1. The policy for safety rest areas offered by the Bureau of Public Roads in reference to Interstate routes shall constitute a guide for all limited access highways.
- 2. Design standards as shown on Plate 2 (or higher), shall be used in laying out the traffic operation of the safety rest areas.
- 3. The following items shall be included in each rest area:
 - A. Public Telephones
 - B. Information Boards
- 4. Picnic areas shall be included, but the essential difference in land use and traffic character in Southern and Northern Michigan shall be recognized and considered. In Southern Michigan the picnic areas shall be minimal to discourage local usage, while in the north they may be more extensive.
- 5. Either intramedial or exterior placement is acceptable but in the northern areas the median location is preferable.
- 6. In the southern portion of the state an all-weather building shall be provided to house the water and sanitary facilities. It shall be well-maintained and supervised.
- 7. A minimum number of rest areas shall be developed initially on each limited access route to allow for the accrual of operational experience.

WEIGH STATIONS

It is a facet of our automotive based economy that an increasingly large portion of the nation's goods and products is transported by trucks along the highway network. Over a comparatively short period of years, truck traffic has increased tremendously, until it constitutes a large increment of the daily traffic load. Similarly, the economic pressures of competition have caused the size and weight of trucks to increase.

Inevitably, as trucks and cargoes have approached the maximum weights that highways can support, short of roadway damage and failure, enforced truck weight restrictions have become necessary. In Michigan, the State Highway Department has a Weighmaster Section that regulates truck weights and sizes on the State Trunkline system.

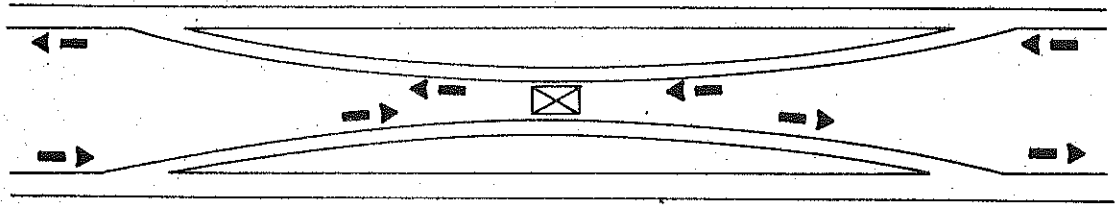
The Weighmasters have developed two basic methods of enforcing truck weight and size regulations. They are road patrol weighmasters with portable scales and the permanent weighing station. This paper will concern itself only with the permanent weigh stations and the problems attendant to incorporating this facility into the planning, construction and operation of limited access highways.

There are several factors that must be considered in the design, placement and operation of a weigh station, particularly in reference to limited access highways. Among them are the following:

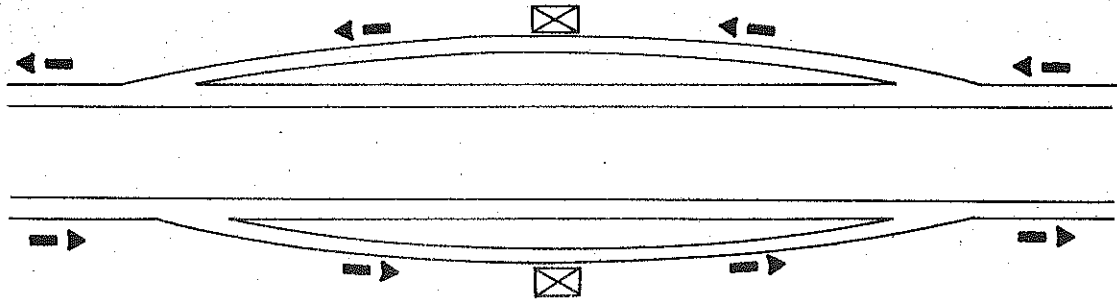
1. Traffic Operation - The ability of a truck to leave the traffic stream, decelerate, maneuver into the scales, resume speed and rejoin a moving traffic stream, is limited by its design characteristics, such as low engine power to gross weight ratios, distance needed to stop while avoiding "brake fade" and cargo shifting, and simply, its huge size. Some of this can be offset by placement of the weigh station in a location where the truck can take advantage of grade changes to aid in deceleration into the scales and acceleration back onto the highway; and by design layout that minimizes maneuvering problems.
2. Storage Space - It is fundamental to the design of a weigh station that sufficient parking area be provided for the storage of impounded vehicles. This parking area should be well lighted and observable from the scale house. Similarly, it should not block the weighmaster's view of the traffic stream.

PLACEMENT SCHEMES
For
WEIGH STATIONS
ON LIMITED ACCESS HIGHWAYS

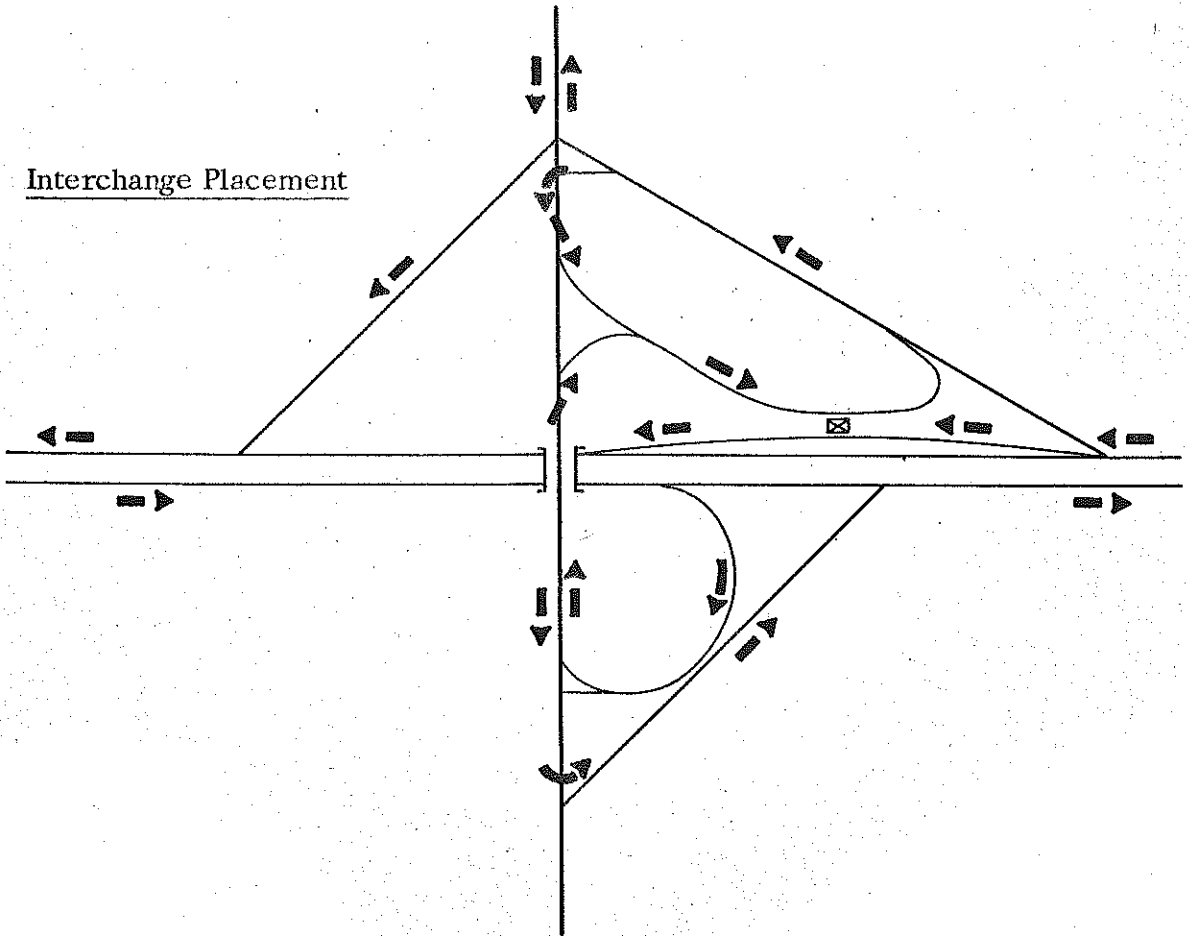
Intramedial Placement



Split Placement



Interchange Placement



3. Utilities - The operation of a weigh station is as dependent as any other business upon utilities of various sorts. Electrical connections, water, heat, sanitary facilities and departmental and public telephones are essential to its operation and must be provided for.
4. Cost - The construction and operation of a weigh station is an expensive project. The number of personnel, the type of equipment used, land costs and facility maintenance must be considered. The following is a breakdown on the construction cost of a typical weigh station, as based on past experience:

Right-of-Way	\$ 2,700.00
Grading & Drainage	30,000.00
Base & Surface	55,500.00
Building	50,000.00
Scales	11,800.00
TOTAL	\$150,000.00

5. Location - The existing pattern of average daily truck volumes on the trunkline system is determinable from the 1957 truck traffic map. This pattern, in conjunction with an analysis of the proposed construction program, is a sound base for determining points of location for weigh stations that will result in a minimum number of enforcement gaps.

Three basically different placement schemes for weigh stations operations on limited access highways have been given consideration for the purposes of this report and will be described in detail. They are shown schematically on Plate 3 and are listed below:

1. Split - In which duplicate facilities are placed to the right of each directional roadway.
2. Interchange Placement - In which a single facility is emplaced in an area within the interchange ramps.
3. Intramedial - In which a facility is placed between the roadways in a widened median.

The Split-Type Placement scheme would have a higher initial cost and would be the most expensive to maintain and operate. It would require duplication of facilities - scale houses, holding areas and utilities, and would require a weighmaster in each scale house even during slack periods of operation. In this era of efficiency and economy, it is difficult to justify this particular layout.

An Interchange Placement scheme, which is shown schematically on Plate 3 as a modified "diamond" interchange, has several advantages. It would allow one scale house to control and weigh vehicles from both directions of travel on the major highway, and from the intersecting road if it were also a trunkline. One weighmaster could operate the installation during periods of low commercial traffic volumes.

The disadvantages of the interchange scheme are several. An element of adverse distance for all directional movements but one is inherent in all interchange placement schemes.^{1/} Ramp maneuvering is difficult for large trucks and during bad weather this is especially a problem of concern. Another point of consideration is the relatively low traffic capacity of interchanges, and the possibility that traffic volumes on the interchange would cause operational congestion and prevent the efficient operation of the weigh station.

There will undoubtedly be situations in the construction of Michigan's limited access highway network where an interchange can be utilized to advantage for the location of a weigh station. In these cases, the interchange layout should be given consideration.

The basic virtue of the Intramedial weigh station placement is the economy and neatness of the package, and, in this period of rising costs, that is a tremendous argument in its favor. Placing the entire operation in the median area allows one scale house to control and weigh both directions of traffic and during periods of light commercial traffic, one weighmaster can operate both scales. The storage area for impounded vehicles could easily be included within the median and utilities would be compact and, therefore, more economical to install and maintain.

It is our recommendation, based upon the primary function of a weigh station and an analysis of the factors affecting its location and operation, that the following points be

^{1/} As shown on Plate 3, east bound trucks would be required to drive an extra 7,000 feet through the interchange in order to be weighed and then resume their trip.

established as policy in planning for the inclusion of weigh stations on limited access highways:

1. When an interchange is planned in the general area where a new weigh station is indicated, consideration shall be given to the expansion of the interchange to include a weigh station, especially if the intersecting road is a trunkline carrying commercial traffic which could also be checked at that point. In all other cases, the many advantages of the intramedial placement scheme indicate its general desirability in planning new weigh stations on limited access highways.^{1/}
2. Regardless of which type of installation is ultimately selected for a specific location, the possible eventual utilization of electronic overload detectors and scales recessed in the traffic lanes of the highway is a definite possibility and should be considered. This type of equipment is commercially available and is reported to be simple and reliable in operation. The use of these devices eliminates the need for all trucks to pass over the static scales for precise weighing. The elimination of unnecessary maneuvering and delay would be appreciated by the commercial haulers and would do much to expedite the steady flow of traffic. The latter will become increasingly important as highway traffic volumes approach the limits of roadway capacity.
3. The storage areas for impounded vehicles shall be so placed that they are observable from the scale house but shall not interfere with the weighmasters view of the traffic stream.
4. The scale house and approaches shall be designed so that one weighmaster can operate the station when necessary.
5. The design standards used in laying out the complete weigh station facility shall be based upon the design and performance characteristics of trucks; especially in regard to the length of deceleration and acceleration lanes.

CONCLUSION It is the conclusion of this paper that the points of policy as outlined herein are essential guide-posts in establishing a system of tourist information lodges, rest areas and weigh stations on the ultimate limited access highway system as planned for Michigan. By no means, however, should they be construed as inflexible or not subject to the modification of experience. The limited access concept, while not new in

^{1/} An exception to this point is outlined in the Appendix - "A Combined Service Area For Use On Limited Access Highways."

itself, lacks the background data that can only be acquired by the construction and operation of long-mileage highways of this type. It is our belief that we should plan wisely and with an open mind, be observant of the results and amenable to the lessons learned.

A D D E N D A

GARDEN STATE PARKWAY
Office of the Executive Director

D. Louis Tonti
Executive Director

April 2, 1958

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Chairman
John B. Townsend
Vice Chairman-
Secretary
Sylvester C. Smith, Jr.
Treasurer

C O P Y

Mr. Robert A. Palmer
Route Location Engineer
Michigan State Highway Department
Lansing 26, Michigan

Dear Mr. Palmer:

The reluctance of some people in your State to using the medial strip for rest areas, as explained in your letter of March 21, 1958, is reminiscent of the resistance experienced when we pioneered the idea of placing some of our service areas in that location.

We have five service areas in the medial zone which have been in operation since 1955, together with two picnic areas. Also, many of our off-ramps and on-ramps at interchanges either leave the Parkway or enter from the left. The service areas and the deceleration and acceleration lanes are brightly lighted. The Parkway is not lighted generally - only at service areas, interchanges, etc. There is adequate advance signing in all cases. No advertising signs and lights or other signs and lights are in competition with those on the Parkway which, of course, eliminates confusion and promotes safety. Our accident experience at these locations has been as favorable as that throughout the Parkway. The results have been satisfactory in all respects.

During the design stage and after opening to traffic, there was a flurry of criticism. However, this disappeared almost immediately. Some of the objections were as follows:

It was contended that a left turn from what is usually termed the "fast lane" is contrary to the driving experience of the average motorist. However, drivers were as much accustomed to making left turns as right turns, and as matter of fact were very alert to making left turns because they had been making them under more dangerous conditions than would be the case on the Parkway where the transitions could be made speedily and safely on long easy curving alignments.

It was contended that right-lane drivers would have difficulty working their way over to the left in order to be in a position to enter the deceleration lane leading to the service area. However, left-lane drivers would have to do the same thing in the opposite direction to reach a service area located to the right. Advance signing gives plenty of time to do either.

It was contended that higher speeds would be necessary to enter on the left than on the right. We anticipated high speeds on all Parkway lanes and were not convinced that entering or leaving on the left would be appreciably different than on the right.

Mention was made of the dead spot which impaired a driver's vision to the rear when entering from the left. However, this same dead spot occurs when entering from the right although rear-view side mirrors which many drivers use may offer a little better rear vision entering from the right. However, we felt that on a highway with all modern facilities including well lighted points of contact, and acceleration lanes, together with the normal caution of drivers entering high speed lanes, that no appreciable difference would result.

The right of way of the Parkway is relatively narrow through our metropolitan municipalities because of right of way costs and the desire to preserve ratables. As a consequence, service areas there are located to the right.

In the light of our favorable experience, we had no hesitancy in choosing the medial area location for our Montvale Service Area which is now under construction on the connection to the New York Thruway.

I hope the above will be helpful to you. If you desire anything further please do not hesitate to let me know. We are always glad to assist in any way possible.

Very truly yours,

D. LOUIS TONTI

DLT:TS:led

MICHIGAN STATE HIGHWAY DEPARTMENT

LANSING, 26



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May 28, 1958

COPY

Mr. N. E. MacDougall
Divisional Engineer
Bureau of Public Roads
123 West Allegan
Lansing, Michigan

Attention: Mr. Robert Brewster

Dear Mr. MacDougall:

As per your telephone request with Mr. Doyle, the following is a brief background on how the Traffic Division has arrived at a parking-space requirement for rest areas of approximately 50 passenger-car spaces and 19 truck spaces. It should be understood the values determined are only a rough estimate based on parking spaces provided on the turnpikes and analytical reasoning as to how usage of interstate rest areas will compare with turnpike service plaza usage.

Data was available only for the New Jersey, Ohio and Indiana Turnpikes. All of these turnpikes provide roughly 200 spaces at each service plaza for passenger cars and about 30 spaces for trucks. Spacing is from 10 to 12 miles on the New Jersey Turnpike, 26 miles on the Indiana Turnpike, and 30 miles on the Ohio Turnpike. Spacing on F. A. I. #2, in Michigan will be 35 miles.

Other items considered are:

1. It is felt the length of the average stop at an interstate rest area will be about half of the length of an average stop on the turnpikes since restaurants are not available on the interstate system and many stops will be for rest purposes only.
2. It is reasoned twice as many stops take place along a turnpike per vehicle as will take place along the interstate system proper. Assuming the number of rest stops necessary will be the same either system, it is reasoned that every other stop along the interstate system will be made off of the interstate route at a restaurant or gas station.

3. Further, the turnpikes probably contain a higher amount of long-distance travel than will be present on the interstate system. It is reasoned that the interstate routes will carry about three-fifths the amount of through traffic or long-distance traffic as the turnpikes. This point is considerably debatable since it is known that the turnpikes carry a considerable amount of local traffic also.

4. A factor for spacing is used that the interstate spacing will be one and two-thirds as great as turnpike spacing.

5. The above figures are for passenger cars. It is reasoned that for trucks, all the factors are the same except it is estimated truck usage of the interstate system will be considerably greater than truck usage of the turnpikes. This is especially true in the case of the Ohio and Indiana Turnpikes.

Using the above factors, the number of spaces required for interstate areas will be proportional to the length of the average interstate stop as opposed to the average turnpike stop, proportional to the number of stops, proportional to the amount of long-distance traffic, and inversely proportional to spacing. This would require 50 passenger-car spaces at interstate rest areas and 19 truck spaces. The figures arrived at were specifically for F. A. I. Route #2 and naturally should be adjusted within the State for lighter-travel routes, routes which will not carry as much long-distance travel or routes where rest-area spacing will differ appreciably from F. A. I. Route #2 spacing. We feel these figures can best be determined on the basis of the Highway Department's intimate knowledge of each of the routes and conditions. We realize the method here is somewhat arbitrary, but we are also conscious that no one has experience in this matter; and, thus, we can only compare interstate usage to turnpike usage.

In determining the amount of parking provided or the size of rest area, consideration should be given to the fact that part of the expenditure for each rest area is relatively fixed in regard to acceleration and deceleration lanes and sewage disposal facilities, and further that a man will be stationed at the various rest areas 24 hours a day.

As suggested by you, consideration was given to developing rest-area parking-space requirements based on rest-area spacing and design-hour volumes. A figure as estimated (rough estimate) of one rest-area parking space per 1800 design-hour volume miles. However, many of the factors by which this figure was developed are intangible and, thus, this method of estimating rest-area size is felt to be impractical. The reliability of the figure could be increased by tabulating certain O-D data available in Michigan from O-D field sheets. This, however, would involve many man hours of work and also, of course, use of IBM equipment. Even after such tabulation, the result would not be reliable enough to base rest-area design on.

We would be most happy to discuss this subject any time with you and to work with you towards a methodology of determining rest-area size. We feel, however, that this could be done only after some rest areas have been built along the interstate system and studies can be made as to how they are used.

Very truly yours,

Harold G. Bauerle, Director
Traffic Division

HGB:vio

cc: E. C. Eckert
J. D. Cruise

A COMBINED SERVICE AREA FOR USE ON

LIMITED ACCESS HIGHWAYS

Within this paper we have made specific recommendations relative to the operational placement of each type of facility considered. There is another type of facility design which has not been specifically recommended, but which, in certain circumstances, has considerable merit. This is a combined service area utilizing a "crisscross" design.

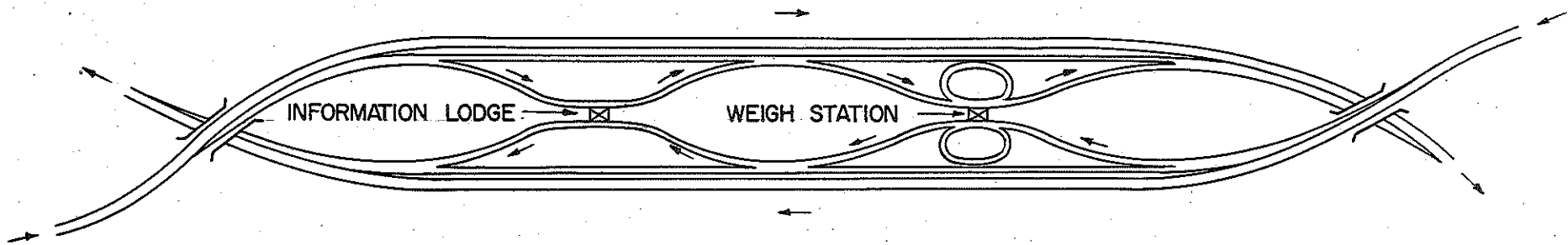
At any specific location where there is an indicated need for several facilities, (rest area, weigh station, information lodge, etc.) they could be combined in one area by utilizing this scheme.

As shown in the graphic view, the "crisscross" design, through the use of two structures, places all of the desired services in one widened median area and accomplishes the following points:

1. Takes maximum advantage of minimum physical space.
2. Combines and simplified utilities.
3. Provides direct protection to the service area from adverse land-use buildup adjacent to the right-of-way.
4. Provides excellent traffic operation, through the use of collector-distributor lanes within the area.
5. Access to the service area is via the outside lanes of the directional roadways.

A
COMBINED SERVICE AREA
(CRISSCROSS DESIGN)

For Use On
Limited Access Highways



NOTE: This layout is schematic only
and not intended as an actual
design.