Part IV

ISLANDS

A—INTRODUCTION

Section 312.—Function of Islands

The term "island" is applied to certain areas within the roadway from which vehicular traffic is diverted by pavement markings or other warning devices, or excluded by physical construction. Such islands are designed to segregate pedestrians and vehicles or otherwise to control streams of traffic in order to minimize conflicts, expedite traffic flow, or increase safety. For the purposes of this manual, an island includes not only the restricted area, but also all end protection or other approach-end treatment.

Previous editions of this manual have dealt with rotary islands (traffic circles). Although rotary islands admittedly are devices for traffic control they are rather to be regarded as basic elements of highway design. The following discussion is confined to traffic control islands that are or can be located in relatively restricted roadway or intersection areas.

For similar reasons, the treatment of divisional islands here applies primarily to urban and suburban installations, where intersections are frequent and the islands are correspondingly discontinuous, rather than to extended median strips in open country.

Certain features of island design, however, such as approach-end treatment and illumination, are to be regarded as generally applicable to all islands, including those of the rotary and divisional types.

The right of a pedestrian to occupy a pedestrian island in safety is commonly protected by law. Act V of the Uniform Vehicle Code (secs. 17, 103) for example, defines a "safety zone" and prohibits motor vehicles from entering a safety zone at any time, regardless of whether or not the physical construction would permit such entry.

Section 313.—General Engineering Requirements

As islands are placed in areas which would otherwise be available for vehicular traffic, they should be installed only after careful engineering study to determine their necessity and value. Islands should be so designed and placed as not to create additional traffic hazards.

They should be plainly visible to oncoming vehicle operators, both by day and by night, and accordingly should be of a color contrasting with the street surface. They should be illuminated, signed, and marked as herein recommended, depending on their design and the traffic conditions.

In the determination of type and size of structure or device, consideration should be given to maintenance as well as construction cost. Esthetics should be given full consideration but should not be permitted to decrease the usefulness of the island.
Section 314.—Classification

Islands may be classed functionally and physically as follows:

1. Pedestrian islands: 14
   (a) Loading islands (secs. 316–330).
   (b) Refuge islands (secs. 331–344).

2. Traffic islands:
   (a) Divisional islands (secs. 345–355).
   (b) Channelizing islands (secs. 356–366).

These several types of islands are illustrated in figures 27–30. 18

Pedestrian islands include all areas in roadways set aside exclusively

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14 See definitions on page 5 indicating relation of pedestrian islands to safety zones.

18 The photographs in this part of the manual were chosen to illustrate certain features of islands. Other features that appear in the pictures, such as signs, markings, and signals, may vary from the standards set forth in this manual.

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Figure 27.—A raised loading island with illuminated metal grill buffer and approach-end pavement marking.

Figure 28.—A refuge island with low marker lights, arrow, and sign. Pedestrians can cross the street without stepping up on this island.

Figure 29.—A divisional island extending from a bridge pier. The approach end is signed, striped, and reflectorized.

Figure 30.—Channelizing islands at an intersection, with supplementary signs and pavement markings. Concrete curbs delineate the island edges.

for persons on foot. Traffic islands include all areas created for the separation and directing of vehicular traffic. The basic functions of the two groups are different, and they are accordingly treated separately herein. However, an island may serve as both a pedestrian island and a traffic island.
Section 315.—Standardization

Islands are not adaptable to detailed standardization, inasmuch as they cover areas of widely varying sizes and shapes and require adaptation in each case to the roadway and traffic characteristics. This is particularly true with respect to end protection, approach-end treatment, and illumination. This manual sets forth certain basic requirements, based upon present knowledge, which should be considered in the location, design, and construction of islands, certain minimum dimensions that should be observed, and advantages and disadvantages of certain types and designs. Although further study and experimentation is under way in various communities, and should be encouraged, it is recommended that present-needed installations be designed in accordance with the approved practices described in this manual.

Additional information on island design is contained in the following publications of the American Association of State Highway Officials: A Policy on Highway Types (Geometric), A Policy on Intersections at Grade, A Policy on Rotary Intersections, and A Policy on Grade Separations for Intersecting Highways.

B.—LOADING ISLANDS

Section 316.—Legal Authority

Loading islands, being in the roadway, can be established only on the authority of the local or State highway authorities. A model of legal authority for the establishment of loading islands (safety zones) is presented in the Model Traffic Ordinance (sec. 51), and authority for the exclusion of vehicular traffic from such islands is provided in Act V of the Uniform Vehicle Code (sec. 103). No other legal authority is involved.

Section 317.—Functions

The main function of loading islands is to afford protection to streetcar riders at loading, discharge, and transfer points, and to riders of busses and trolley busses using such islands. They also expedite traffic by permitting other vehicles to continue in motion while the public vehicles are stopped for loading.

Section 318.—Warrants

Loading islands are warranted and should be established at streetcar stops under any of the following conditions:

1. Where both vehicular and pedestrian traffic are heavy.
2. Where the speed of vehicular traffic along the roadway is relatively high.
3. Where accident experience indicates the need.

Loading islands may be used by busses and trolley busses as well as by streetcars. The chief advantage of this is that it concentrates all of the mass-transportation vehicles in one traffic lane and leaves the other lanes free for vehicles not required to stop frequently. Disadvantages are that bus passengers, having to cross traffic lanes, are deprived of the greater safety of loading at the curb, and that these free-wheeled vehicles which might do their loading at the curb may, while using the loading islands, delay streetcars unable to reach the islands.

When a separate loading place is used by busses or trolley busses, it should be located at the curb and well away from the loading island, to avoid congestion in the traffic lane beside the island.

Section 319.—Location

Loading islands at street intersections should be extended to the crosswalk, unless this is not feasible because of switches, streetcar turning movements, or similar conditions. They shall not, however, be continued within the crosswalk (figs. 27, 31, 32). Loading islands should in general be located at intersections, but a midblock island may be warranted in a long city block.

In no case shall a loading island be established unless there is at least one adequate traffic lane between the curb and the island.

Figure 31.—A raised loading island in a business district, with metal grill platform protected by side rails and metal splash plates. The steel buffer and pylon are striped and illuminated.

Where it is intended to permit automobiles and trucks to pass on the left of islands (sec. 328), such islands, to serve transit vehicles (streetcars or busses) moving in opposite directions, should not be located laterally opposite each other.

Section 320.—Access

Access to loading islands adjacent to intersections and of sufficient length to accommodate four or more transit vehicles should be safeguarded by a marked cross walk from the near sidewalk in addition to the cross walk at the intersection. Midblock loading islands should have at least one marked cross walk from the near sidewalk or across the entire roadway, depending upon conditions.

Section 321.—Elements of Design

Loading islands shall be of a permanent type, and shall be designed to afford the necessary protection to streetcar riders or other pedestrians and at the same time create as little hazard as possible to passing vehicles.
Loading islands will ordinarily have four distinct parts: (1) The area intended to be occupied by pedestrians, (2) a physical barrier at the approach end to prevent motor vehicles from entering the pedestrian area, (3) devices at the approach end to warn vehicle operators of the presence of the island and to direct them into a suitable path or paths past it, and (4) illuminating devices adequate to make all parts of the island clearly visible at night. They may in addition require side protection.

**Section 322.—Designation of Area**

The pedestrian areas of loading islands are in practice specifically designated either by platforms or by some other means.

*Platforms.*—Platforms raised above the pavement level to approximately the height of the adjacent curbs and with adequate safeguards (secs. 324–326) afford the best protection to pedestrians (figs. 31, 33, 34).

The platforms are usually permanent structures of concrete or other sturdy materials, with the surface properly sloped for drainage. In some instances, for economy or convenience, they are made of wood. In all cases they should be built substantially and of proper height, and the outside edges should be faced smoothly.

*Other means.*—Other means of designation in use include rows of fixed posts connected by chains or rails, mushroom buttons, pavement markings, or various combinations of these or other devices (fig. 35).

Platforms are the most satisfactory means of designation, providing the greatest actual protection and the greatest sense of security to pedestrians. Posts and chains or rails are next in order of effectiveness. Islands designated by simple pavement markings, with or without mushroom buttons or portable stanchions but without other protec-

**Figure 32.—A raised loading island with highly effective approach and treatment of pavement marking, pointed curb, sign, reflector cluster, and low marker lights. This island has no buffer.**

**Figure 33.—Pole and chain provide side protection for this raised loading island. The rounded buffer is striped and illuminated for high visibility.**

**Figure 34.—Enc protection for this loading island is furnished by heavy metal posts, the center one low enough to allow clear view of the reflectorized cluster. Side protection is provided by posts and chains, set back from the curb. The clean-cut openness of this island permits good visibility.**

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buffers to assure adequate clearances for all types of streetcars in present or prospective use in the community.

Where vertical posts are used, three or more should be set to form a deflecting arc. These may be connected with horizontal members and should be provided with a sheet-steel facing to deflect a vehicle hitting them at an angle.

Figure 35.—A street-level loading island in a business district. The loading area is protected by metal posts with sheet-metal splash plate, and the pylon is striped and illuminated for high visibility.

the width should be greater and sufficient to enable riders to reach the desired vehicle entrances without undue crowding or delay.

Because of the differences in widths of streetcars, no standard distance from the rail can be specified. Platforms should be built to accommodate the narrowest car. If any cars are operated which will overhang the edge of the island, warning to this effect should be given by plainly visible line markings on the surface of the island indicating a safe clearance distance.

Height.—The platform height of a loading island shall be from 5 to 7 inches, except where transit vehicles require a lesser height for clearance, and in general shall conform to local standards of curb height for sidewalks.

Where additional thickness of roadway pavement surfacing is anticipated due allowance should be made for it.

Section 324.—End Protection

Loading islands outside of congested business districts and wherever feasible within business districts shall, at the end toward approaching traffic, have adequate physical protection in the form of a buffer to withstand the impact of a colliding vehicle. This buffer may be a concrete block, a series of solid posts or pipes, or other massive structure (figs. 27, 33, 34, 36–38).

A concrete block is an effective buffer (figs. 33, 36, 37). It should be sloped or rounded to deflect a colliding vehicle not meeting it head-on, and should be so constructed and marked as to be highly visible. It should be of an attention-arresting color, usually in sharp contrast with the color of the pavement. In addition, effective illumination, reflectors, indented facets, or other high-visibility treatment is recommended. Care must be exercised in the design of concrete

Figure 36.—A concrete loading island with end protection provided by a rounded concrete buffer. Two alternating flashing lights and an illuminated striped panel warn drivers of approaching vehicles of the island's presence.

Figure 37.—A raised loading island with protection provided by an illuminated and reflectorized buffer with long sloping prow.
Section 325.—Approach-End Treatment

The approach end of a loading island, whether or not protected by a buffer, shall be carefully designed to provide a maximum degree of warning of the presence of the island, and, where necessary, definite indication of the proper vehicle path or paths to be followed.

Various types and forms of such treatment have been used and deemed satisfactory. Experimentation on other forms and on modifications of present forms is developing new possibilities and should be continued. The following devices, which vary greatly in details, are in present use:

1. Pavement markings, with or without mushroom buttons (sec. 330).
2. Signs (sec. 329).
3. Reflecting devices (secs. 152, 158).
4. Flashing yellow beacons (sec. 278).
5. Contrasting pavement colors and textures.
6. Jiggio bars (see definition, page 5).
7. A vertical element sloping up to the island nose.
8. Various combinations of 1 to 7.

Figures 27, 31-38 are typical illustrations of some of the foregoing. A development of the sloping vertical element is the prow (see definition, page 5). Prows installed to date, with lengths varying from 10 to 40 feet and with wide variations in shape, indicate the need for further study to determine their relative merits and the most effective design (figs. 37, 38).

Whatever the form or forms of approach-end treatment and end protection, their adequate night illumination is vital (sec. 327).

Section 326.—Side Protection

Side protection of loading islands is warranted only where unusually hazardous conditions indicate its need, as where crowds of waiting passengers would otherwise overflow the island, particularly where a platform is not provided. Such protection should be provided by a line of fixed or firmly secured posts, not less than 3 feet high and set not more than 3 feet apart, connected by chains or rails. The purpose of this is not only to keep motor vehicles off the island but also to keep streetcars and bus riders within the island and discourage crossing between island and sidewalk at other than designated points (figs. 31, 33-38).

In addition to a chain or rail connection of posts for side protection it is desirable to place a substantial sheet of metal along the line of posts, on the side of vehicular traffic, to prevent vehicle wheels from striking the posts, to divert such traffic away from the loading island, and to serve as a splash plate. Such a plate should be of adequate height to serve the intended purpose. Splash plates are particularly advantageous at islands without a raised platform (fig. 35), but are also used in some cities in conjunction with platforms (fig. 31). Where space permits, some form of solid wall may be employed (fig. 39).

When posts without a splash plate are used on raised platforms they should be set back somewhat from the platform edge to lessen the likelihood of being hit by motor vehicles (fig. 34).

Where a cross walk leads to a loading island, any side-protection posts should leave an opening the full width of the cross walk.

Section 327.—Illumination and Reflectorization

All loading islands, including their approach-end treatment, shall be provided with:

1. General illumination of the entire area, including adjacent vehicular-traffic lanes, or as much of the area as is required for safe operation;
2. Intensified illumination and reflectorization to show clearly the outlines of buffers or other structures, collision with which would seriously damage motor vehicles or imperil pedestrians.

Loading islands shall not be installed unless they can be adequately illuminated. It is desirable to have two independent sources of light in case of failure of one.

Figure 39.—Approach-end treatment to give advance warning of the presence of this loading island consists of high and low reflector clusters, yellow-painted curb, and mushroom button.
The effectiveness of approach-end treatment of islands depends greatly upon illumination and reflectorization. There are numerous possible ways of providing these, and the successful devices and combinations of devices suggested herein should not preclude further research and experimentation. Figures 27, 31–39 illustrate some of the forms of illumination and reflectorization that have thus far been used.

Section 328.—Direction of Flow

Whenever loading islands are established in roadway areas, the local traffic authority shall specify, in each case, whether vehicles may pass on both sides of the island or are restricted to pass only on the right. The rule at each island, or in each locality, should be determined after careful analysis, taking into account width of roadway, volume of motor traffic, and volume and character of transit services. A uniform rule, however, along any one street or in one area where conditions are substantially similar, will be more readily understood and observed.

The requirement that automobiles and trucks shall pass to the right of the loading island may virtually eliminate one traffic lane. However, on streets where parking is permitted the restrictive effect may be minimized by adoption and enforcement of the provision in Act V of the Uniform Vehicle Code (sec. 112) which prohibits parking alongside the islands and for proper distances beyond their ends. In locations where the traffic of transit vehicles stopping alongside loading islands is light and other traffic is fairly heavy, it is usually desirable to permit the general traffic to pass on either side of the island. Allowing other than transit vehicles to pass to the left of the island, however, may seriously delay streetcars and busses in reaching the islands, with consequent loss of time to passengers and derangement of transit schedules.

Section 329.—Signs

Standard signs indicating the permitted directions of flow shall be placed at the approach end of every loading island that is in the line of traffic flow. When vehicles are required to pass to the right of the island a regulatory Keep Right sign as provided in section 42 shall be used. When passing is permitted on either side the Double Arrow warning sign as provided in section 56 shall be used. Such signs shall be adequately reflectorized or illuminated. They should normally be mounted at a height of 10 feet above the pavement to the lowest point of the sign. A duplicate sign, placed with its lower edge at least 7 feet above the pavement, is recommended as a means of giving advance information to approaching traffic.

Standard parking prohibition signs (sec. 47) shall be placed along the curb of the sidewalk adjacent to all loading islands to prohibit parking opposite the entire length of the island and for such distances beyond the ends thereof as are necessary to expedite the flow of traffic (see Act V of the Uniform Vehicle Code, sec. 112).

Section 330.—Markings

The approach-end treatment of a loading island shall include pavement markings as provided in section 139.

The ends of all loading islands toward approaching traffic shall be marked in accordance with section 151. The latter applies particularly to buffers and lighting standards. Markings are also very effective when placed on the curbs of islands in or adjacent to the line of approaching vehicular traffic (sec. 163). If curb or pavement markings are used in other nearby locations to indicate parking prohibitions (sec. 148), such indications should also be used opposite loading islands.

The use of a contrasting color, reflectorized paint, or other special treatment is recommended to indicate clearly the presence of the island, in which case additional curb markings are generally unnecessary.

**Summary Specifications for Loading Islands**

Designation of area—Platform preferable; other means include fixed posts or mushroom buttons or combinations of these, with or without pavement markings.

Dimensions:

- **Length**—Sufficient to accommodate adequate number of streetcars or buses.
- **Width**—Four feet minimum, wider where needed to prevent overcrowding.

End protection—Use of buffer is mandatory outside of congested business districts, desirable in such districts.

Approach-end treatment—Adequate to warn of presence of island and indicate proper vehicle path or paths.

Side protection—Posts, posts and chains, plates, etc., as conditions require. Illumination—General illumination of entire area; intensified illumination and reflectorization of buffers or other structures.

Signs—Standard Keep Right sign or Double Arrow sign as required. Markings—Standard approach pavement markings; standard markings on buffer or curbs.

C—REFUGE ISLANDS

Section 331.—Legal Authority

The models of legal authority applicable to loading islands (safety zones) cited in section 316 are equally applicable to refuge islands, and no other legal authority is involved.

Section 332.—Functions

The main function of refuge islands is to provide a place of safety for pedestrians caught within the roadway on cross walks by changing signals or by oncoming traffic at unsignalized intersections. In congested areas they also expedite vehicular traffic by permitting vehicles to proceed without waiting for pedestrians to cross the entire roadway.

Section 333.—Warrants

Where any one or a combination of the following conditions indicate the need, one or more refuge islands shall be installed:

1. High accident frequency.
2. Dense pedestrian traffic.
3. Dense vehicular traffic.
4. High-speed vehicular traffic.
5. Wide roadway.
6. Complex intersection.
Refuge islands are warranted and shall be used in urban areas on exceptionally wide roadways or in large or irregularly shaped intersections where there is a considerable amount of pedestrian traffic and where heavy volumes of vehicular traffic make it difficult and dangerous for pedestrians to cross (figs. 28, 40, 41). No refuge island shall be placed where it will leave less than two lanes available for traffic between it and the adjacent curb or another island. So placing a refuge island as to confine right-turning movements to a single lane, however, may be desirable if there is not a heavy turning movement.

Refuge islands should not be located in roadways carrying fast-moving vehicles unless they can be so placed, usually in the center of the roadway between the opposing streams of traffic, as not to create hazards to the vehicles. At any other point on such roadways where there is any considerable pedestrian movement across the roadway pedestrians should be protected by other means, such as a pedestrian-actuated traffic signal or a pedestrian underpass or overpass.

In urban areas, however, where the vehicular traffic is relatively slow-moving, particularly in intersections without traffic signal control, pedestrians in any considerable number should not be required to find their way through more than four lanes of two-way traffic without the refuge of a center island, or through more than three lanes in one direction without an intermediate island. Such islands may also be desirable at signalized intersections to reduce the clearance periods and expedite traffic.

Section 334.—Location
Refuge islands shall normally be centered on the median line of the roadway. On roadways with streetcar tracks, and two or more lanes of moving traffic on each side of them, refuge islands should be provided on each side of the tracks.

The parts of refuge islands used by pedestrians should be in line with the cross walks.

Section 335.—Elements of Design
Refuge islands normally have the same four distinct parts as loading islands: (1) the area intended to be occupied by pedestrians, (2) a physical barrier at the approach end to prevent motor vehicles from entering the pedestrian area, (3) devices at the approach end to warn vehicle operators of the presence of the island and to direct them into a suitable path or paths past it, and (4) illuminating devices adequate to make all parts of the island clearly visible at night.

Section 336.—Designation of Area
Refuge islands are in practice designated by platforms, markings, or mushroom buttons (figs. 28, 40–45). Raised platforms for part of the width of the cross walk are preferable as they afford pedestrians a greater sense of security. Part of the area, however, should be kept at pavement level to facilitate use by baby carriages, wheel chairs, and crippled or aged persons (fig. 42).

Whatever the form of designation, the requirements for end protection and approach-end treatment stated in sections 339 and 340 apply.

Section 337.—Continuous Median Strip
In roadways requiring median islands at each intersection, consideration should be given to the alternative of a continuous median strip between intersections. Such a strip will obviate the expense of buffers and other approach-end protection at each intersection, minimize weaving between intersections, and afford other advantages of a divided highway. Disadvantages are that it will bar vehicles on one side of the street from direct access to alleys, filling stations and other business facilities, and residences on the other side.

Section 338.—Dimensions
Length and width.—Refuge islands shall be at least 4 feet and preferably at least 6 feet wide. The usable length along the roadway, including the part at pavement level for baby carriages,
Figure 42.—Combination channelizing and refuge islands with marker lights. The center islands extend into but not entirely across the cross walks.

Figure 43.—A combination channelizing and refuge island, with protection from approaching traffic provided by the illuminated buffer and pew at the left. The small buffer at the right provides protection from turning vehicles and serves as a base for the traffic signal.

Figure 44.—Combination divisional, channelizing, and refuge islands with desirable tapered shape, curb-level marking lights, and overhead illumination.

Figure 45.—Channelizing islands and pavement markings at a complicated intersection. The raised islands also serve as refuge islands.

Wheel chairs, and infirm persons, shall not be less than 5 feet nor less than the width of the cross walk.

Local conditions will determine whether the part of the island at street level is to be adjacent to the intersection, at the center of the cross walk, or elsewhere. In any event the entire area used by pedestrians should be so designed as to be protected against any encroachment by motor vehicles, including those making left turns.
Height.—The platform height of refuge islands shall be from 5 to 7 inches, and in general shall conform to local standards of curb height for sidewalks.

Where additional thickness of roadway pavement surfacing is anticipated, due allowance should be made for it.

Section 339.—End Protection

In areas where vehicle speeds are relatively high, a refuge island should have adequate physical protection at the end toward approaching traffic in the form of a buffer to withstand the impact of a colliding vehicle. This buffer may be a concrete block, a series of solid posts or pipes, or other massive structure (figs. 40, 41, 43).

Even in business districts, where speeds may be high after business hours, some form of buffer at the approach end of a refuge island is desirable.

The types of buffers are the same as those described in section 324. Figures 40, 41, 43 show some of the types of end protection that have been used.

Section 340.—Approach-End Treatment

The approach end of a refuge island, whether or not protected by a buffer, shall be carefully designed to provide a maximum degree of warning of the presence of the island and, where necessary, a definite indication of the proper vehicle path or paths to be followed (sec. 325).

Section 341.—Side Protection

When part of the refuge island is kept at pavement level, as recommended in section 336, a mushroom button or more substantial protection should be provided at any corner which might otherwise be encroached upon by turning vehicles.

Section 342.—Illumination and Reflectorization

All refuge islands, including their approach-end treatment, shall be provided with:

1. General illumination of the entire area, including adjacent vehicular-traffic lanes, or as much of the area as is required for safe operation;
2. Intensified illumination and reflectorization to show clearly the outlines of buffers or other structures, collision with which might seriously damage motor vehicles or imperil pedestrians.

Refuge islands shall not be installed unless they can be adequately illuminated. It is desirable to have two independent sources of light in case of failure of one.

Section 343.—Signs

On every refuge island that is in the line of traffic, standard regulatory or warning signs as described in section 329 for loading islands shall be placed at the end toward approaching traffic.

Section 344.—Markings

The approach-end treatment of a refuge island in the line of traffic flow shall include pavement markings as provided in section 139.

The ends of all refuge islands toward approaching traffic shall be marked in accordance with section 151. The latter applies particularly to buffers and lighting standards. Markings are also very effective when placed on the curbs of islands in or adjacent to the line of approaching vehicle traffic (sec. 153). If curb or pavement markings are used in other nearby locations to indicate parking prohibitions (sec. 149), such indications should also be used opposite refuge islands.

The use of a contrasting color, reflectorized paint, or other special treatment is recommended to indicate clearly the presence of the island, in which case additional curb markings are generally unnecessary.

Summary Specifications for Refuge Islands

| Designation of area: Platform preferable; other means include fixed posts, mushroom buttons, pavement markings, or combinations of these. |
| Dimensions: |
| Length: Cross-walk width, with 5 feet minimum. |
| Width: Four feet minimum; preferably 6 feet. |
| End protection: Use buffer where speeds are relatively high; desirable in all areas. |
| Approach-end treatment: Adequate to warn of presence of island and indicate proper vehicle path or paths. |
| Side protection: Mushroom buttons or curb, as needed to prevent vehicle encroachment. |
| Illumination: General illumination of entire area; intensified illumination and reflectorization of buffers or other structures. |
| Signs: Standard Keep Right sign or Double Arrow sign as required. |
| Markings: Standard approach pavement markings; standard markings on curb or curbs. |

D—DIVISIONAL ISLANDS

Section 345.—Legal Authority

Divisional islands are elements of street and highway design and accordingly no special authority is required for their installation.

Section 346.—Functions

Divisional traffic islands are placed longitudinally in roadways to serve any of the following purposes:

1. Along the center line of a roadway of four or more lanes, to separate the streams of traffic flowing in opposite directions (fig. 46).
2. Other than along the center line, in a roadway of six or more lanes, where it is desired to separate the slow-moving local traffic serving the abutting property from the faster through traffic in the center of the roadway.
3. In a roadway of any width, to guide traffic away from a fixed obstruction, such as a bridge support or pedestrian-island buffer (fig. 29).
4. In a roadway at any point where traffic is regularly stopped for toll or inspection purposes.

In some cases they are placed in a roadway of two lanes to prevent vehicles going in the same direction from passing one another at hazardous points, such as narrow bridges, viaducts, underpasses, or dangerous curves. Curved divisional islands are sometimes placed partly around a rotary island to separate the streams of traffic from different entering highways.
Section 347.—Warrants

Any one or a combination of the following conditions may indicate the desirability of installing one or more divisional islands:

1. High accident frequency.
2. Dense vehicular traffic.
3. High-speed vehicular traffic.
4. Wide roadway.
5. Physical obstruction in roadway.

Divisional islands shall be placed in new major thoroughfares of four or more lanes to separate traffic moving in opposite directions. Any streetcar tracks in such new construction shall be within the divisional island.

This discussion is intended to apply primarily to urban areas where intersections are frequent, rather than to open country where continuous median strips are a matter of highway design.

As highway surfaces have been improved and speeds of automobiles have risen, the hazards of passing have vastly increased. While this condition has been met to some extent by widening the roadway to three, four, and even more lanes, the hazard still remains so long as there is a common surface in the center of the highway which is accessible to traffic moving in opposite directions. The only adequate means of eliminating such hazard is the provision of a median strip to separate opposing traffic streams. These strips may be of any width from a narrow curbing to a broad landscaped area.

Median strips, preferably raised, are therefore also recommended for existing roadways where the width permits. Their use to avoid costly end protection and approach-end treatment of refuge islands at a succession of intersections is suggested in section 337.

It is recognized that narrow median strips do not provide adequate protection for left-turning movements and for cross traffic which must wait at the island. Ordinarily this can be accomplished only by widening the island (sec. 350).

Designation of temporary islands by sandbags, stanchions, markings, or other means may be desirable to test a proposed layout under actual traffic flow.

Section 348.—Elements of Design

Divisional islands normally have three distinct parts: (1) the area from which motor vehicles are intended to be excluded, (2) an area at the approach containing devices to warn vehicle operators of the presence of the island and to indicate a suitable path or paths past it, and (3) reflecting or illuminating devices adequate to make the island safe and effective at night.

Unless the island serves also as a refuge island, only sufficient end protection is required to prevent damage to vehicles, to signs or markers, and to the island itself. To afford this the island should contrast in color with the adjacent pavement, and be so designed and located that the proper course of travel is obvious, easy to follow, and unquestionably continuous.

When divisional islands are used to prevent overtaking and passing at hazardous points they should be long enough and so designed as not to introduce a surprise element. A divisional island should not begin on a sharp curve or at the top of or just over a hillcrest.

Section 349.—Designation of Area

In most cases divisional islands are designated by curbs outlining the area, with suitable filler of pavement, turf, or shrubs, depending upon the width, location, and other conditions (Figs. 33, 44–48).

Raised curbs are not essential where encroachment on the island is not dangerous to motorists, pedestrians, or property. In this case,
islands may be designated by pavement markings, stanchions, mushroom buttons, or combinations of these. Sharply contrasting flush sections 15 to 36 inches wide have also been used. Large islands, usually in park areas, may be constructed without curbs, depending instead upon the contrast between the pavement and the island surface or vegetative cover, or upon delineation by guard posts or mounded earth.

At the approach end, divisional islands sometimes are designed to rise gradually from about the pavement level to the height of the curb or mounded center of the normal full-width section. On the other hand, an approach-end treatment, or the island itself, may consist entirely of jiggle bars.

At some locations it may be necessary to place a pedestrian barrier on and along a divisional island to prevent indiscriminate pedestrian crossing of the roadway. The pedestrian barrier usually consists of some form of woven-wire or picket fence at least 3 feet high, located centrally between the island curbs for a full block length, or for a distance of several hundred feet each side of a pedestrian overpass or underpass. Pedestrian barriers so located materially increase the visibility of the divisional island to motorists, and give it a greater over-all effectiveness as a traffic separator.

Section 350—Dimensions

While the dimensions and shapes of traffic islands cannot be standardized in detail, certain basic principles which are particularly applicable to divisional islands should be observed.

Width.—The width of a divisional island depends on numerous elements, including available right-of-way, traffic-lane requirements, and the extent to which the island is given added protective functions at intersections.

Fixed divisional islands in new construction shall be at least 4 feet wide (fig. 29). This standard, however, should not preclude placing narrower islands in existing roadways where total width is restricted. A single raised and rounded curb has proved effective in some cases.

Where right-of-way is available or obtainable at reasonable cost for a divisional island substantially wider than 4 feet, several points should be taken into account in determining the appropriate width, particularly adjustment to adjoining traffic lanes and protection at cross streets:

1. Adjustment to adjoining traffic lanes.—This is a paramount consideration. As a general rule divisional islands should not be placed where they will confine any part of the roadway on either side to less than two free-flowing lanes. The width of these through traffic lanes will be governed by the volume, type, and speed of traffic and by conditions at the locality, somewhat greater widths being necessary for higher speed conditions. For any section of street or highway it is desirable to provide pavements of uniform width. However, variation in width usually is necessary on small-radius curves at intersections and on ramp connections.

In very exceptional cases where a divisional island is desirable even though there is not sufficient space for two lanes of moving traffic on either side of the island, it may be designed for a single lane on the less important side, but this lane should be wide enough to enable other vehicles to proceed slowly past a disabled vehicle, and the restricted width should be limited to sections of relatively short length.

In new construction consideration should be given to the possible need for future narrowing of the divisional island to provide additional traffic lanes.

2. Protection at cross streets.—At cross streets it is desirable that divisional islands be of sufficient width to provide protection for vehicles crossing, making left turns, or making U-turns (figs. 46, 49). For cross traffic an island width slightly greater than the length of a vehicle is necessary for protection of the vehicle when it is stopped between the through lanes approximately at right angles to the divided street. Divisional island widths of about 20 feet will protect a passenger car or light truck, but widths of 50 to 500 feet are necessary to protect buses and commercial vehicles crossing approximately at right angles. Greater widths may be necessary, depending upon the minimum turning radius of the vehicles involved, to provide protection for vehicles making left turns to or from the cross road and those making U-turns on the divided streets so that these movements can be made between the proper lanes and with minimum interference with other traffic. An analysis of minimum design for these conditions is to be found in A Policy on Highway Types (Geometric) of the American...
A curb higher than 6 inches should not be used on the end of an island where the width is less than 6 feet, to prevent damage to the underparts of a vehicle straddling the island.

Barrier curbs intended to confine vehicles to the pavement or to individual lanes should be at least 9 inches high, with a batten of about 1 inch. Such curbs are sometimes favored for narrow divisional islands. It should be recognized, however, that curbs nearly vertical, particularly barrier curbs, reduce the effective width of pavement for vehicle operation, as drivers do not operate close to them. That objection has been partly met in some cases by double curbs, in which a lower step 7 or 8 inches high is surmounted by an additional step set back 5 or 6 inches.

Night visibility of island curbs is important, and construction with white concrete, white stone chips, incorporated reflectors, or reflective facings is recommended.

Section 352.—Approach-End Treatment

Approach-end treatment as here described applies to the beginning of a divisional island, not to each successive part of an island resulting from breaks at or between intersections.

The approach ends of all divisional islands shall be carefully designed to provide, for approaching traffic, a maximum degree of warning of the presence of the island and, where necessary, a definite indication of the proper path or paths to be followed.

Application of this rule, identical with that laid down for loading islands in section 325, will require somewhat different treatment. Unless the island serves also as a pedestrian island there will be no

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*Sometimes called "shadowing lanes," "pocket lanes," "slots," or other names in local use.*
need for a buffer or prow to prevent a motor vehicle from mounting the island. On the other hand, particularly at points where vehicle speeds are high, advance warning of the presence of a divisional island and guidance as to the path or paths vehicles should follow is as important as at pedestrian islands, and additional indications are needed at the island proper (figs. 29, 48, 50).

As stated in section 325, the following devices are in use:
1. Pavement markings, with or without mushroom buttons (sec. 355).
2. Signs (sec. 354).
3. Reflecting devices (secs. 152, 159).
4. Flashing yellow beacons (sec. 279).
5. Contrasting pavement colors and textures.
7. A vertical element sloping up to the island nose.
8. Various combinations of 1 to 7.

In addition, the approach end of the island may be tapered or otherwise shaped to guide vehicles into the proper roadway or roadways.

In advance of the curbed island nose, pavement markings (sec. 189) or other devices may be placed to outline or fill up the roadway area normally unused by vehicles following a path to clear the island.

Island approach ends should be provided with a form of high-visibility indication to be effective both in daytime and at night. This may be done through the construction of white concrete curbs, by a curb surface coating of light-colored stone chips, paint, or other reflective material, by construction with indented facets to reflect light from headlamps, by incorporation of reflector buttons or other reflective materials, or by other suitable means. Signs located near the ends of the islands and illuminated or suitably reflectorized may be used alone or in conjunction with other treatment. Also, floodlights or other special units for area illumination, or flashing beacons with yellow lenses might be used. To the extent practicable some high-visibility treatment should be continued along the island.

Low-level reflector buttons rather quickly become ineffective, because of dirt, unless frequently cleaned.

At the beginning of a divisional island constituting a median strip the island nose should be offset to the left, as faced by approaching traffic, the right curb of the island forming a diverging taper to deflect traffic toward the right. Where a divisional island is introduced between two lanes of traffic moving in the same direction, similar offsets may be used on each side of the nose to direct traffic into the separate roadways. In both cases the curved nose should be semicircular, preferably about 3 feet in diameter, the curves widening beyond to the full width of the island. At cross-road openings in divisional islands the island nose may be made semicircular or of a tapered and rounded shape for left-turning movements, consistent with the island width.

Section 354.—Signs

A curbed divisional island in the line of traffic flow shall be protected at the approach end by the appropriate reflectorized or illuminated sign or marker. Where the curb-to-curb width is sufficient, 3 feet or more, a regulatory Keep Right sign as described in section 42 shall be used. On narrower islands the reflectorized hazard marker described in section 156 shall be used. To reduce the likelihood of being struck, such signs or markers may be set back about 10 feet from the end of the island.

Section 355.—Markings

The approach end of a divisional island in the line of traffic flow should be designed, signed, and marked to indicate its presence and also to outline the proper vehicle paths. Where necessary the approaches to such islands shall be marked in the manner provided for refuge islands in section 344.

### Summary Specifications for Divisional Islands

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation of area.</td>
<td>Vertical or sloping curbs and filler, mushroom buttons, pavement markings, contrasting materials or island cover, or combinations according to conditions.</td>
</tr>
<tr>
<td>Dimensions.</td>
<td>Width. Four feet minimum in new construction; 20 feet or upward desirable.</td>
</tr>
<tr>
<td>Other dimensions.</td>
<td>Depend on conditions.</td>
</tr>
<tr>
<td>Approach-end treatment.</td>
<td>Adequate to warn of presence of island and indicate proper vehicle path or paths.</td>
</tr>
<tr>
<td>Illumination.</td>
<td>Effective reflectorization or illumination of approach-end treatment.</td>
</tr>
<tr>
<td>Signs.</td>
<td>Standard Keep Right sign or reflectorized hazard marker.</td>
</tr>
<tr>
<td>Markings.</td>
<td>Where necessary, standard approach pavement markings.</td>
</tr>
</tbody>
</table>

### E—CHANNELIZING ISLANDS

Section 356.—Legal Authority

Channelizing islands are elements of street and highway design and accordingly no special authority is required for their installation.

Section 357.—Functions

Channelizing islands are used at intersections to guide motor vehicles into orderly courses. They prevent or reduce undesirable weaving and maneuvering by keeping the vehicles in clearly defined paths. They provide convenient space for necessary signs. They may protect turning vehicles from through traffic moving at higher speeds. They may establish the desired angles for the crossing of vehicle paths. They may permit streams of traffic moving in the same general direction to converge at very small angles, minimizing possible conflicts. Their field of use is discussed in greater detail on pages 51 and 52 of "A Policy on Intersections at Grade," issued by the American Association of State Highway Officials.
Section 358.—Warrants

Any one or a combination of the following conditions may indicate the desirability of installing one or more islands to channelize or segregate vehicles:

1. High accident frequency.
2. Dense vehicular traffic.
3. High-speed vehicular traffic.
4. Complex intersection.
5. Wide roadway.
6. Difficulty in providing adequate control by standard signs and markings.

Specific warrants cannot be stated. Each location calls for special study. Channelizing islands are warranted and desirable in existing squares, plazas, and other broad expanses of pavement where without them there is a considerable amount of traffic moving in various directions without desirable orderliness. They are warranted at many intersections where traffic signals involving greater costs of installation and operation, would otherwise be called for under one or more of the signal warrants described in sections 207 and 234. At other intersections where traffic control signals are warranted, the construction of islands may increase the efficiency of the signals.

Proper channelization is desirable at many intersections. A few islands carefully designed and placed to direct the preponderant currents of traffic, however, are far better than a larger number of small islands which create too many channels, confuse vehicle operators, and result in new points of conflict.

Section 359.—Elements of Design

Channelizing islands normally have three distinct parts: (1) the area from which motor vehicles are intended to be excluded, (2) an area at the approach end containing devices to warn vehicle operators of the presence of the island and to indicate a suitable path or paths past it, and (3) illuminating devices adequate to make the island safe and effective at night.

Unless the island serves also as a refuge island, only sufficient end protection is required to prevent damage to vehicles, to signs or markers, and to the island itself. To afford this the island should contrast in color with the surface of the adjacent pavement, and be so designed and located that the proper course of travel is obvious, easy to follow, and unquestionably continuous.

The provision, location, and design of channelizing islands at important grade intersections, particularly irregular intersections, merit careful study. Designation of temporary islands by sandbags, stanchions, markings, or other means may be desirable to test a lay-out under actual traffic flow.

In new construction at intersections, where traffic signals or lights are likely to be utilized as a second stage development, the initial channelization should be patterned to fit the ultimate plan with a minimum of change. It is of considerable assistance to provide conduits or cables initially under the pavements for future use.

Section 360.—Designation of Area

In most cases channelizing islands are designated by curbs outlining the area, with suitable filler of pavement, turf, or shrubs, depending upon the width, location, and other conditions (figs. 50, 44, 45, 49-58).

Figure 51.—Separation to permit the addition of central islands was an important factor in the channelization of this intersection. High-visibility curbs were used and an overhead traffic signal regulates the principal crossing movement.

Figure 52.—This channelized T intersection has stop control for crossing movements. The near island is delineated by jiggles and painted stripes.

Raised curbs are not essential where encroachment on the island is not dangerous to motorists, pedestrians, or property. Islands of this nature may be designated by pavement markings, stanchions, mushroom buttons, or combinations of these (fig. 54). Flush pavement sections 15 to 36 inches wide of sharply contrasting color have also been used. Large channelizing islands, usually in rural areas, may be constructed without curbs, depending instead upon the contrast between the pavement and the island surface or vegetative cover, or upon delineation by guard posts (fig. 55) or mounded earth.
Figure 53.—Channelizing islands of various sizes and shapes are used at the terminals of highway grade separation ramps.

Figure 54.—Painted stripes and stanchions designate this island area from which motor vehicles are excluded.

Figure 55.—These ramp terminals are outlined by guard posts along the shoulders. A low, rounded dividenal island along the main highway discourages improper left turns.

Section 361.—Dimensions

No fixed rules can be laid down as to dimensions of channelizing islands. They should not be so small as to be inconspicuous to operators of approaching vehicles.

Curbed channelizing islands in new construction shall be at least 4 feet wide. However, this should not preclude placing narrower islands in existing roadways where width is restricted. They should be of proper width to establish correct lane widths. Given in Table 3 are pavement widths for separate turning lanes as recommended by the American Association of State Highway Officials in A Policy on Intersections at Grade (page 94) and A Policy on Grade Separations for Intersecting Highways (page 83).

Table 3.—Pavement widths for separate turning lanes, passenger and truck types of traffic.

<table>
<thead>
<tr>
<th>Radius</th>
<th>Turning speed</th>
<th>One-way one-lane operation</th>
<th>Two-lane operation, either one-way or two-way</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m.p.h.</td>
<td>Feet</td>
<td>Feet</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>14</td>
<td>18</td>
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<td>75</td>
<td></td>
<td>13</td>
<td>18</td>
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<tr>
<td>100</td>
<td></td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>13</td>
<td>18</td>
</tr>
</tbody>
</table>

As recommended by the American Association of State Highway Officials.

The character and purpose of an island should determine its height. Those serving also as pedestrian islands should be 5 to 7 inches high. Islands on which there are signals, monuments, or the like, and those...
intended as a positive bar to vehicular traffic, obviously require curbs of suitable height. Small islands on which there are no objects susceptible to injury may be low or flush with the pavement to minimize possible damage to vehicles mounting them.

Section 362.—Curbs

The specifications and recommendations for curbs bounding divisional islands (sec. 351) are equally applicable for curbs of channelizing islands.

Section 363.—Approach-End Treatment

The approach ends of all channelizing islands shall be carefully designed to provide for approaching traffic a maximum degree of warning of the presence of the island and, where necessary, a definite indication of the proper path or paths to be followed (figs. 30, 50, 51, 56, 57).

Figure 56.—Advantage is taken of curvature in this approach-end treatment consisting of a contrasting pavement wedge leading to the curbed island base. The overhead signs are illuminated.

The detailed information regarding approach-end treatment of divisional islands (sec. 352) is equally applicable to that of channelizing islands. To the extent practicable some high-visibility treatment should be continued around the island.

Low-level reflector buttons rather quickly become ineffective, because of dirt, unless frequently cleaned.

Section 364.—Illumination and Reflectorization

A high intensity of well-directed street lighting is very desirable at the approach end of channelizing islands and at intersections containing such islands, to show clearly their locations and the proper lanes for vehicles to travel. Where facilities for such lighting are not available, the deficiency should be overcome as fully as possible by such means or combinations as are suggested in section 363.

Section 365.—Signs

Channelizing islands in the lines of traffic streams shall be protected at the approach ends by appropriate reflectorized or illuminated signs. As conditions require, a regulatory Keep Right sign as described in section 42 or a Destination sign as described in section 113 shall be used.

Channelizing islands forming separate turning lanes, i.e., those islands lying to the right or left of pavements for through-traffic streams, likewise should be protected by one or more destination signs at the approach or turn-off end. The assembly on the island may consist of a destination sign with messages for both the through streams and the turning movements, or, where the latter have been provided for in advance of the island, only for the through streams. Where site conditions permit, a destination sign should be provided in advance of the turn-off lane formed by the islands, and if necessary the same message repeated in the assembly on the island.

Section 366.—Markings

Channelizing islands in the line of traffic streams, and the approaches to such islands, shall be marked in the manner provided for refuge islands in section 344, not only to indicate the presence of the island but also to outline the proper vehicle paths.

Summary Specifications for Channelizing Islands

Designation of area.—Vertical or sloping curbs and filler; mushroom buttons, pavement markings, contrasting materials or island cover, or combinations according to conditions.

Dimensions:

Width.—Four feet minimum in new construction.

Other dimensions.—Depend on conditions.

Approach-end treatment.—Adequate to warn of presence of island and indicate proper vehicle path or paths.

Illumination.—Effective illumination of approach-end treatment.

Signs.—Standard Keep Right sign or Destination sign.

Markings.—Standard approach pavement markings.