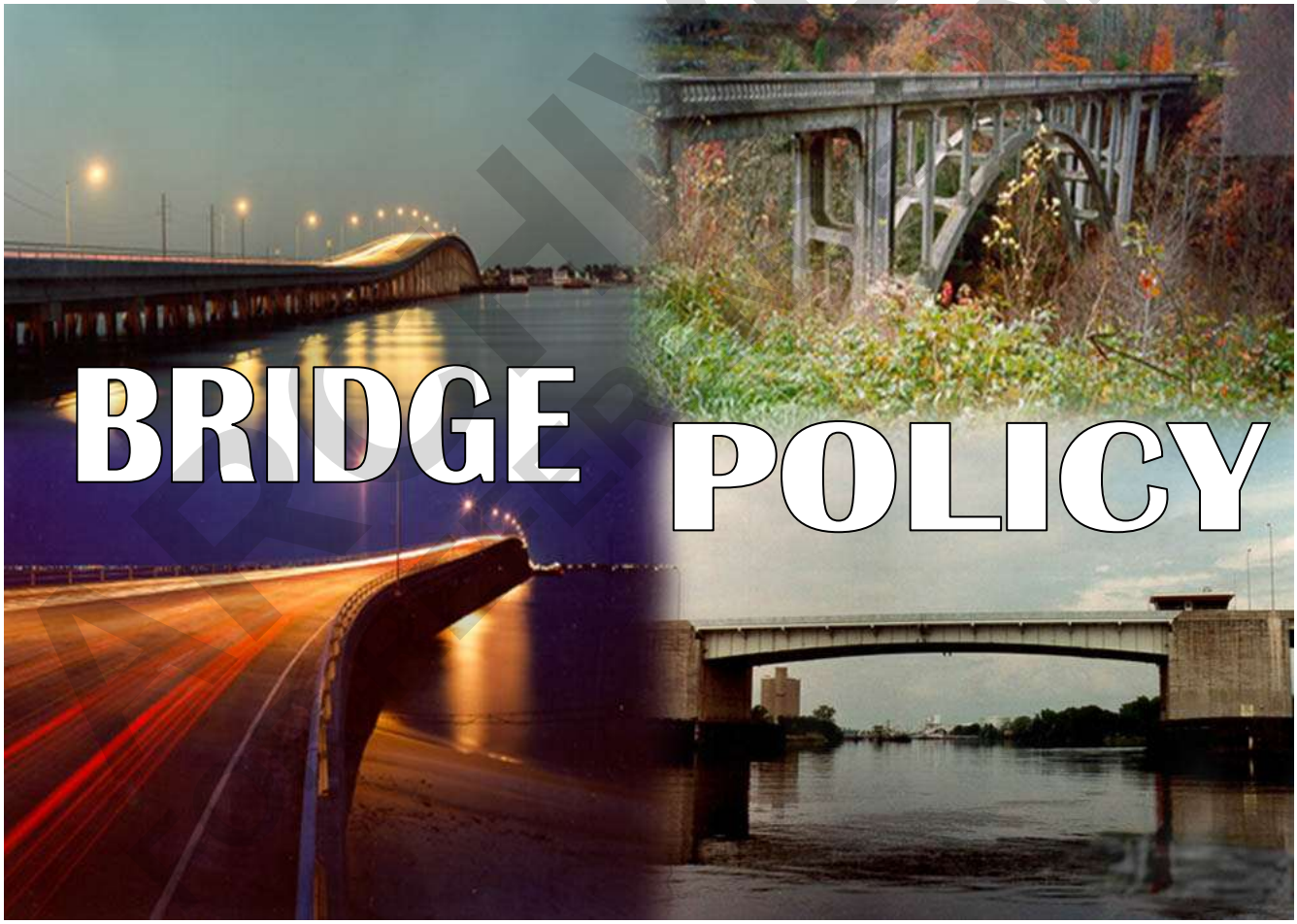
North Carolina Department of Transportation
Highway Design Branch / Design Services Unit



INDEX

BRIDGE POLICY

This Bridge Policy establishes the controlling design elements of new and reconstructed bridges on the North Carolina Highway System. It is intended that this policy be for general use. In special cases where sound engineering judgment so dictates, the requirements of this policy will be adjusted upward or downward as necessary. It will be necessary to examine each individual structure to provide the most economical and safest design.

Background information was obtained from:

1. Standard Specifications for Highway Bridges, AASHTO 1996 and Interim

2. Department of Transportation Division of Highway Bridge Policy, August 24, 1981, March 5, 1985, and November, 1994.

3. A Policy on Geometric Design of Highway and Streets, AASHTO 1984 ,1990 and 1994

4. A Policy on Design Standards-Interstate System June 1967 and December 1988

5. Metropolitan Planning Organization (MPO) – Recommendations from the Local MPO'S.

Where there was an overlap, gap or lack of information, engineering judgment has been used to resolve questionable areas.

The primary factors governing the design elements of a bridge are:

1. Functional Classification of Highway Facility
2. Volume of Traffic
3. Design Speed
4. Safety and Accident Experience
5. Urban Area Boundary (Bicycle and Pedestrian Movement)

This policy addresses each of these factors and establishes the design elements accordingly.

Box culvert type vehicular underpasses are considered for construction in special cases, however, they are not addressed in this policy. (See the Structure Design Unit for Design Information.)

For determining bridge design elements, the functional classification of highway facilities is divided into the following systems:

1. Interstate System - The national system of fully controlled access freeways which accommodates high volumes of traffic for the purpose of facilitating interstate commerce and mobility. The design of this system is subject to more stringent standards than other similar systems to assure nationwide uniformity, and encourage higher safety standards.

2. Freeway System - A divided arterial highway for through traffic with fully controlled access. Access is limited to interchanges. These highways may be staged constructed with some initial at grade intersections.

3. Arterial System - These highways, including expressways, accommodate moderate to high volumes of traffic for travel between major points. These highways are primarily for through traffic, usually on a continuous route, and are generally the top 10% of the total highway system based on relative importance for statewide travel. They usually have at grade intersections. Access can be partially controlled.

4. Collector System - Provides primarily intracounty service with shorter travel distances and generally more moderate speeds. These routes provide service to county seats and towns not on the arterial system. Routes which carry traffic from local roads to arterials are collectors. They usually have at grade intersections. Access is not controlled.

5. Local System - Provides access to farms, residences, businesses, or other abutting properties. The traffic volumes generated by the abutting land uses are largely short trips or a relatively small part of longer trips where the local road connects with major streets or highways of higher classifications. They usually have at grade intersections. Access is not controlled.

The entire North Carolina Highway System has been classified by these functional classifications. The Environmental Planning Document will include the proper classification for each roadway that is being improved.

Bridges Within Urban Area Boundaries

Urban Area Boundaries represent the outer limit of potential urban growth over the long-term planning period – generally 20 to 25 years – and include more than enough land to accommodate anticipated growth. The full approach curbed width is to be provided for bridges with existing urban – type roadway sections (curb and gutter). On urban – type roadways without control of access ADA acceptable sidewalks shall be provided on new bridges. Sidewalks will be provided on structures for non-control of access facilities crossing control of access facilities. Sidewalks shall be provided on one or both sides in

accordance with the project Environmental Planning Document. If future roadway widening is anticipated, additional bridge width should be considered to accommodate the planned curbed width.

Bridges within the Federal-aid urban boundaries with rural-type roadway sections (shoulder approaches) may warrant special consideration. To allow for future placement of ADA acceptable sidewalks, sufficient bridge deck width should be considered on new bridges in order to accommodate the placement of sidewalks. As part of the planning process, the functional classification will be reviewed to determine if its planning designation is applicable for the facility over the 20-year design period. In some cases, a new classification may be established for design purposes and approved in the Environmental Planning Document. Design exceptions would be required for any design elements that do not meet the standards for the functional classification approved for design in the Environmental Planning Document.

EXCEPTIONS TO POLICY

Any bridge with special design requirements such as long span lengths, locations with special significance such as close proximity to historic sites or public parks, movable spans, bridge lengths greater than 200' or other special features, will be designed on an individual basis and may not conform to criteria included elsewhere in this policy. The Environmental Planning Document will include an analysis to determine approximate length, width, median type, navigational clearances or any other pertinent design features. Accident experience or potential will be examined when considering exceptions to the Bridge Policy.

Deck widths exceeding those shown in this policy may be used when future facility upgrading is anticipated and justified in the Environmental Planning Document.

Special consideration should be given to horizontal clearances underneath the structure. If minimum clearance is used, any future widening will require replacement of the structure. Therefore, in areas where traffic growth is anticipated, horizontal clearance shall allow for additional growth.

Bridges improved under the 3-R program shall conform to North Carolina's "Guide for Resurfacing, Restoration and Rehabilitation (R-R-R) of Highways and Streets", and the Subdivision Roads Policy and may not conform to criteria included in this policy.

Minimum bridge width will be the same as the total paved approach.

Refer to Design Exception Policy for requirements on formal or informal documentation for exception to certain design criteria.

EXISTING BRIDGES TO REMAIN IN PLACE

Highway geometric and roadway improvements encourage higher speeds and attract larger vehicles to the highway. Existing substandard structures must be considered for improvement correspondingly. Because of the high cost of new structures, existing bridges and culverts that meet acceptable criteria should be retained as outlined on page 4 and 5 of this manual.

Where an existing highway is to be reconstructed or widened to dual lanes, an existing bridge which fits the proposed alignment and profile may remain in place if it meets the following criteria: The bridge is structurally sound, bridge rails meet or can be upgraded to meet current criteria and standards, its safe load carrying capacity and clear deck width are equal or greater than values shown on pages 4 and 5, and there is no significant accident experience.

Existing bridges which are structurally sound and provide safe loading capacity but are deficient for roadway width will be considered for widening. If it is determined to widen an existing bridge, it shall be widened to the same dimension as recommended for a new bridge.

MINIMUM CLEAR ROADWAY WIDTH FOR BRIDGES TO REMAIN IN PLACE (IN FEET)						
Local Des. ADT	Local (a)	Design ADT	Collector (a)	Arterial	Freeway	Interstate
≤ 250	20	≤ 400	22	28 (b) (f)		
251 To 1500	22	401 To 1500	22	28 (b) (f)		
1501 To 2000	24	1501 To 2000	24	28 (b) (f)		
Over 2000	28	Over 2000	28	28	24’ Plus Paved Shoulders (c)	24’ Plus Pav. Shldr. (d)
MINIMUM VERTICAL CLEARANCES FOR BRIDGES TO REMAIN IN PLACE						
	14		14	14	14	16 (e)

a) Bridges longer than 100 feet may be analyzed individually in accordance with AASHTO.
b) For arterials with 11 foot lanes and design speeds of 40 mph or less, 26 feet may be used.
c) As a minimum, an Accident History Evaluation should be completed to determine if additional width is required. Ultimate widening should be considered for all existing

bridges with less than 3 foot offsets to parapets. Bridges longer than 200’ may be analyzed individually.

d) Bridges longer than 200’ may be analyzed individually in accordance with AASHTO (3.5 foot minimum offset to parapet required).
e) 14’ on Urban Interstate when there is an Alternate Interstate Routing with 16’ clearance.
f) Width of travel way may remain at 22’ on reconstructed highways where alignment and safety records are satisfactory, 1994 G.B. Table VII-2, Page 488.

SAFE LOAD CAPACITIES FOR BRIDGES TO REMAIN IN PLACE WHEN THE APPROACH ROADWAY IS RECONSTRUCTED

TRAFFIC		SAFE LOAD CAPACITY	
	DESIGN ADT	INTERSTATE, FREEWAY & ARTERIAL	LOCAL & COLLECTOR
	under 400	SEE NOTE (1)	SEE NOTE (2)
	400 - 2000	SEE NOTE (1)	SEE NOTE (2)
	2001 - 4000	SEE NOTE (1)	SEE NOTE (2)
	over 4000	SEE NOTE (1)	SEE NOTE (2)

NOTES:

1) The Bridge shall have a safe load capacity of 10% in excess of that required for N.C. Legal Load when rated in accordance with the Manual for Maintenance, Rating and Posting of Bridges on the North Carolina Highway System.

2) The Bridge shall be rated and posted, if necessary, in accordance with the "Manual for Maintenance Inspection, Rating and Posting of Bridges on the N.C. Highway System" to a weight limit determined to meet the needs of the route served; however, the safe load capacity shall be sufficient to carry school buses and vital services vehicles where there is no reasonable or adequate alternate route.

REFERENCES: AASHTO "Manual for Maintenance Inspection of Bridges"

"Manual for Maintenance Inspection Rating and Posting of Bridges on the North Carolina Highways System"

DESIGN LIVE LOAD

The design live load for all new reconstructed, or rehabilitated bridges on the Highway System shall be HS-20. A design other than HS-20 shall not be used unless there are conditions which warrant or justify its use in a particular situation and will require approval by the State Bridge Design Engineer.

HYDRAULIC DESIGN

Stream crossing structures shall be designed in accordance with procedures, criteria and standards contained in the Division of Highways "Guidelines for Drainage Studies and Hydraulic Design."

BRIDGE DECK RAILING

All bridge railings shall conform to current AASHTO criteria and shall have been successfully crash-tested in accordance with FHWA guidelines. Generally bridges with no sidewalks or no anticipated sidewalks should have a Jersey barrier rail. When a sidewalk or designated bikeway is justified, appropriate railings shall be used.

BRIDGE SCOUR

Stream crossing structures shall include design to protect against bridge scour in accordance with HEC 18 (Evaluating Scour At Bridges), dated November, 1995 or subsequent updates.

EARTHQUAKE DESIGN

All structures shall be designed for earthquake forces in accordance with the AASHTO Guide, "Specification for Seismic Design of Highway Bridges."

VESSEL IMPACT

All bridges over navigable waters shall be designed in accordance with the "Guide Specification for Vessel Collision Design of Highway Bridges, 1990" or subsequent updates of this publication.

SIDEWALKS

Sidewalks shall be included on new bridges with curb and gutter approach roadways that are without control of access; in some cases , only one side may warrant a sidewalk. Sidewalks should not be included on controlled access facilities. A determination on providing sidewalks on one or both sides of new bridges will be made during the planning

process according to the NCDOT Pedestrian Policy Guidelines. When a sidewalk is justified, it shall be a minimum of 5'-6" wide. A minimum handrail height of 42" is required.

BIKEWAYS

When a bikeway is required, the bridge shall be designed in accordance with AASHTO standard bicycle accommodations and North Carolina Bicycle Facilities Planning and Design Guidelines to give safe access to bicycles where feasible. A minimum handrail height of 54" is required where bicyclists will be riding next to the handrail.

CROSS SLOPE

The cross slope of a bridge deck shall be the same as the approach travel lane cross slope.

In an area of frequent icing, a reduction in superelevation may be in order. This situation will be dealt with on a project-by-project basis.

APPROACH SLABS

Concrete approach slabs shall be constructed at the ends of all bridges. The approach slab shall be the same width as the bridge gutter to gutter width plus any additional amount that may be necessary to accommodate curbs or sidewalks.

The ends shall be parallel to the bridge end. For structures with 60 degree thru 120 degree skew, a 12' length of approach slab measured along the center line of the bridge shall be used. For structures with skew other than that shown above, a 17' length of approach slab shall be used. For special situations, e.g. very deep superstructures, etc., consideration shall be given to increasing the length of approach slab.

CURB AND GUTTER

The clear width for new bridges on streets with curb and gutter approaches shall be the same as the curb to curb approach width except where bikeways are carried across the structure; in such instances, AASHTO standard bicycle safety accommodations should be provided.

The 2' gutter widths shown in this policy are based upon the use of the standard 2'-6" curb and gutter. If other curb and gutter widths are used, bridge widths will be adjusted accordingly.

UNPAVED APPROACH

When bridges are constructed on unpaved roads, the approaches to the bridge shall be paved with an approved asphalt surfacing for a distance of 100' from the bridge ends.

NOTE: If guardrail lengths are greater than 100', the pavement length shall be extended to the end of the guardrail.

MEDIANS ACROSS BRIDGES

On a divided highway, separate structures shall be provided unless it can be clearly shown that it is more economical to provide a single structure or a single structure is needed for the maintenance of traffic.

On controlled access facilities and non-controlled divided facilities with design speeds greater than 50 mph, a median barrier should be provided on single structures. Where the approach roadway has a median barrier, the same type of barrier shall be continued across the structure. If there is no median barrier on the approach roadway, some type of barrier should be provided on the structure.

END BENTS

All end bent slopes shall have rip-rap or concrete slope protection carried up to the end bent cap and to the limits of the superstructure or beyond the limits of the superstructure for slopes steeper than 1-3/4:1. Normally, for dual bridges with median widths of 46' or less, the end bent slopes shall be paved or stabilized continuously between bridges.

Generally, end bent slopes at all rivers and streams shall be 1-1/2:1; however, final consideration of rate of slope and minimum slope protection requirements will depend upon the Hydraulic Design.

At bridges where a railroad passes underneath the roadway, the end bent slope shall normally be 1-1/2:1 or the same as adjacent cut, however, negotiations with the railroad company may dictate otherwise. At bridges where a railroad passes over the roadway, the end bent embankment slope shall normally be 1-1/2:1 unless negotiations with the railroad company dictate otherwise.

End bent embankment slopes shall be 1-1/2:1 on all other bridges going over roads. End bent slopes occurring in cuts shall be at the same rate of slope as the adjacent roadway cut slopes but, generally no flatter than 2:1.

If the Geotechnical investigation and laboratory results indicate that 1-1/2:1 slopes will be unstable at any bridge end bent, flatter slopes or special designs will be used as specified by the Soils and Foundation Section of the Design Services Unit.

Any bridge end bent occurring in rock may have a special slope design as specified by the Soils and Foundation Section in the Design Services Unit.

VERTICAL CLEARANCES

Vertical clearances for new structures shall be designed above all sections of pavement including the useable shoulder. Future widening and pavement cross slope will be considered in design clearance.

Vertical clearances shall be as shown below. These clearances include a 6" allowance for future resurfacing. An additional 6" range is shown to allow for the flexibility necessary in the coordination of roadway grades with final superstructure depths.

Vertical clearances above these limits must be justified by economics or some vertical control.

1. Over Interstates and Freeways and Arterials
   Vertical Clearances – 16'-6" to 17'-0"

   Note: "17'-0" to 17'-6" vertical clearance is desirable for structures located over Interstates, Freeways, or Arterials constructed with portland cement concrete pavement. If the pavement type is not known during the preliminary design phase, then the desirable clearance range should apply to structures located over these facilities having design year average daily truck traffic of 5000 or greater."

2. Over Local and Collector Roads and Streets
   Vertical Clearance – 15'-0" to 15'-6"

3. Over all Railroads
   Vertical Clearance – 23'-0" to 23'-6" or less if approved by Railroads

4. Navigable Waters
   The U.S. Coast Guard permit determines the minimum clearances for navigable waters. Clearances over waters not regulated by the U.S. Coast Guard will be determined by negotiations and agreement with the appropriate interests.

5. Normal minimum clearance above design high water should be 2'-0" for all Interstates, Freeways, Arterials, and Secondary Crossings of Major Rivers, 1'-0" for all other roads. Where conditions warrant, less than the above may be permitted.

6. Pedestrian overpasses and sign structures vertical clearance – 17'-0" to 17'-6"

DECK WIDTHS AND HORIZONTAL CLEARANCES

Two primary elements of any bridge are the deck width on the bridge and the horizontal clearance between piers underneath the bridge. For determining these dimensions, the functional classification of highway facilities described on Page 2 shall be used.

A study will be made to determine the deck width on any bridge having a high unit cost.

A cost analysis will be made by Structure Design to determine pier necessity and location. The factors included in this analysis are construction cost, maintenance cost, accident cost, future widening potential, for both the mainline and road underneath it, and continuity of section, as well as allowing sufficient lateral offset for placement of a future greenway, sidewalk or rail trail where the project Environmental Planning Document has justified the need for additional lateral offset. Structure Design will coordinate with Roadway Design as necessary.

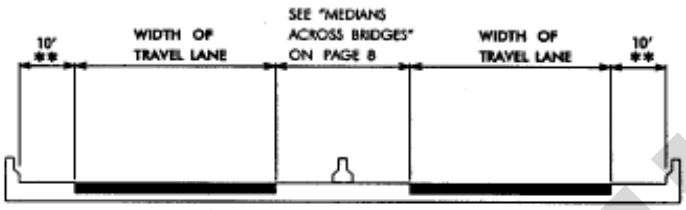
A study will be made at each interchange to insure that adequate sight distance is available. Special attention should be given to the bridge rail design, offset and the crest vertical curve on the structure so that traffic turning from the ramp has adequate sight distance.

When a ditch section is carried under a bridge, coordination will be necessary in the selection of horizontal openings and roadway typical sections so that piers are not placed in the ditch bottom and preferably 2' minimum behind the ditch.

INTERSTATE SYSTEM

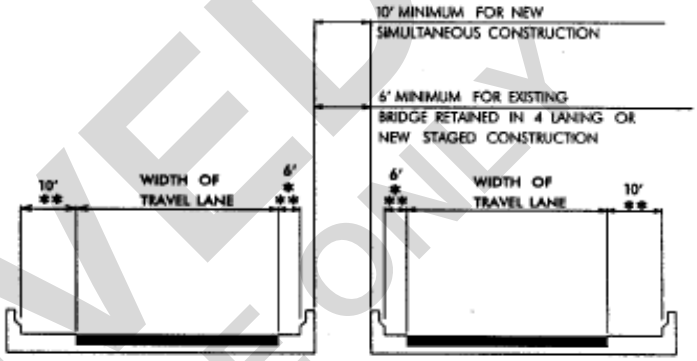
BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED
SHOULDER APPROACH

SINGLE STRUCTURE



** 12' SHOULD BE CONSIDERED WHEN THE DESIGN YEAR TRUCK VOLUMES ARE GREATER THAN 250 DDHV

DUAL STRUCTURE

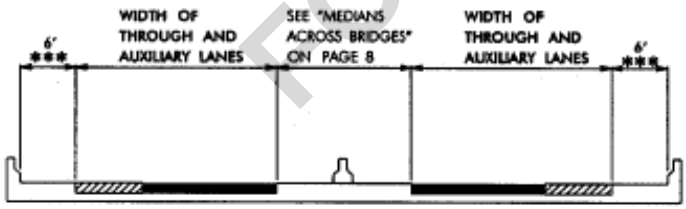


* 10' WITH SIX OR MORE THROUGH LANES
** 12' SHOULD BE CONSIDERED WHEN THE DESIGN YEAR TRUCK VOLUMES ARE GREATER THAN 250 DDHV

INTERSTATE SYSTEM

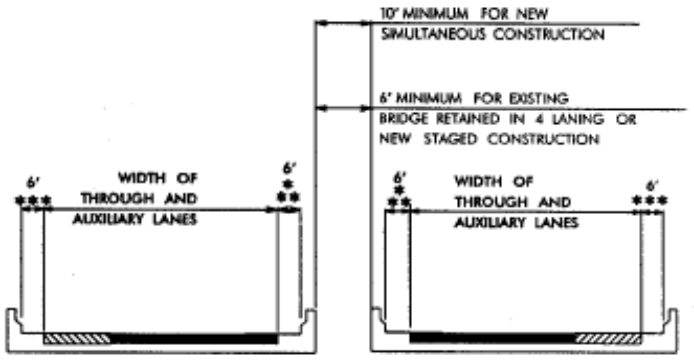
BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED
WITH AUXILIARY LANES
SHOULDER APPROACH

SINGLE STRUCTURE



*** 10' SHOULDER WHEN AUXILIARY LANE CONNECTS INTERCHANGES OR AN AUXILIARY LANE IS LONGER THAN 2500'.

DUAL STRUCTURE



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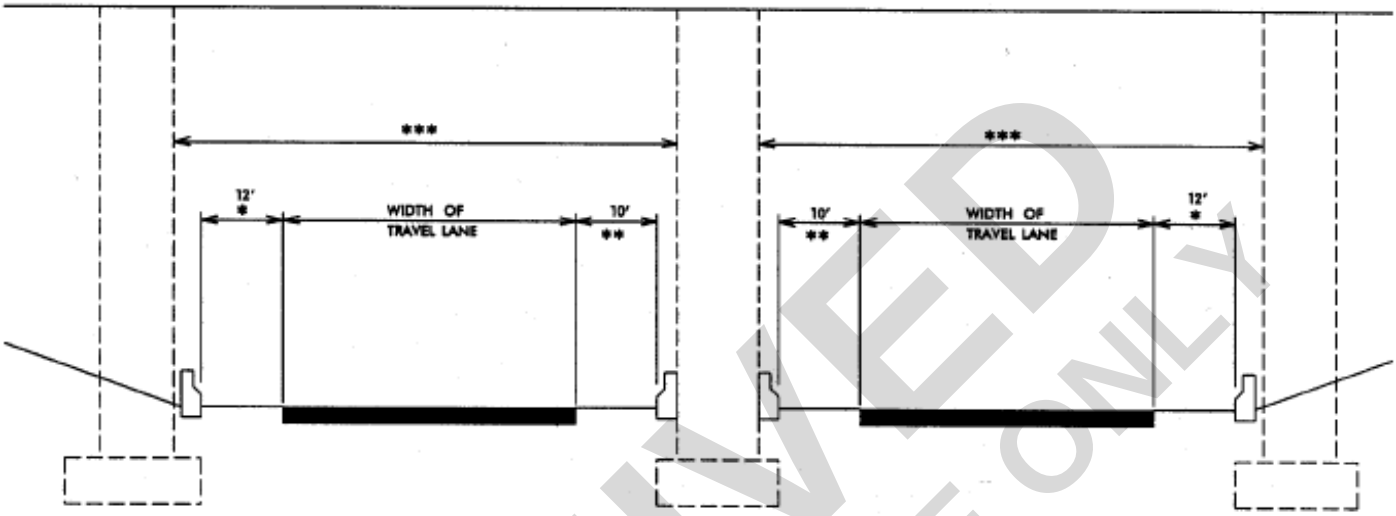
LEGEND

THROUGH TRAVEL LANES

AUXILIARY LANES

INTERSTATE SYSTEM

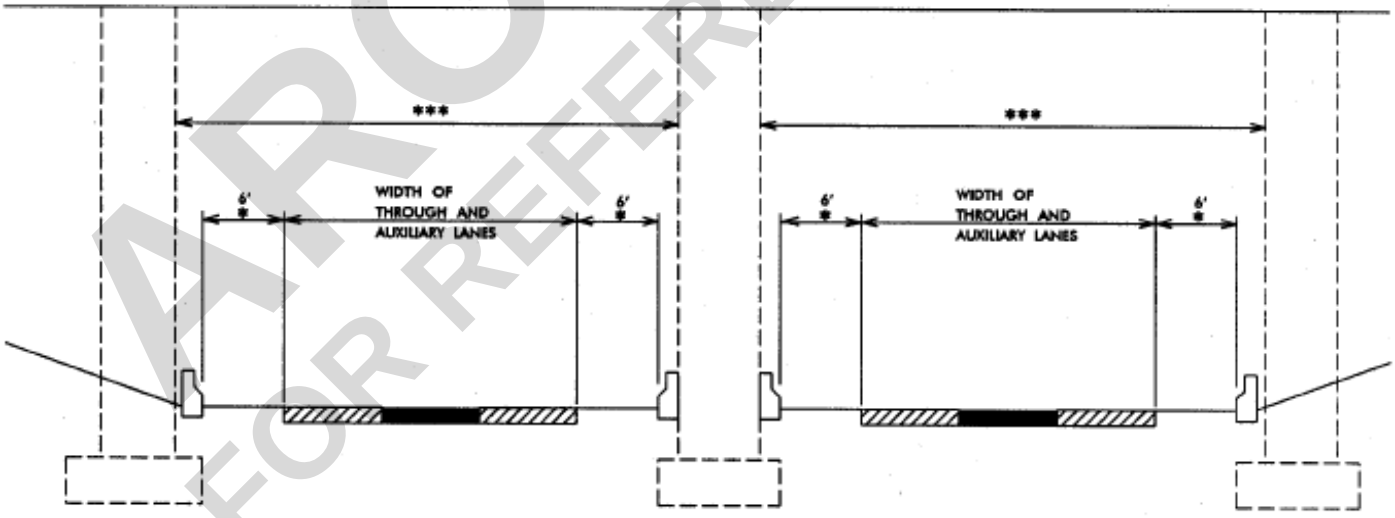
HORIZONTAL CLEARANCES FOR DIVIDED TRAFFIC



* 18' WHEN DESIGN YEAR ADT IS GREATER THAN 50,000 TO ACCOMMODATE FUTURE AUXILIARY LANES OF INTERCHANGE RAMPS OR LOOPS.

** 12' SHOULD BE CONSIDERED WHEN DESIGN YEAR TRUCK VOLUMES ARE GREATER THAN 250 DDHV

SHOULDER APPROACH



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SHOULDER APPROACH WITH AUXILIARY LANES

*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

LEGEND

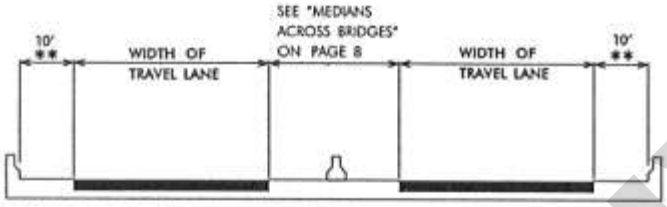
THROUGH TRAVEL LANES

AUXILIARY LANES

FREEWAY SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED

SINGLE STRUCTURE



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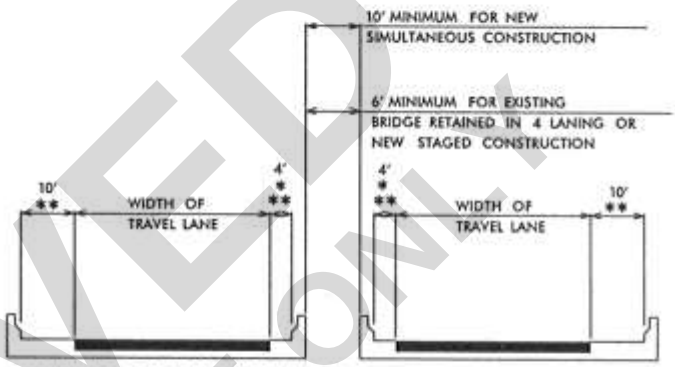
DUAL STRUCTURE



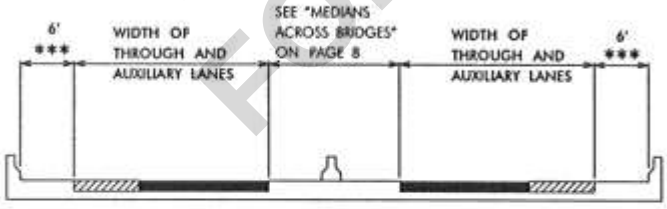
* 10' WITH SIX OR MORE THROUGH LANES.

** 12' SHOULD BE CONSIDERED WHEN THE DESIGN YEAR TRUCK VOLUMES ARE GREATER THAN 250 DDHV.

FREEWAY SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED
WITH AUXILIARY LANES

SINGLE STRUCTURE



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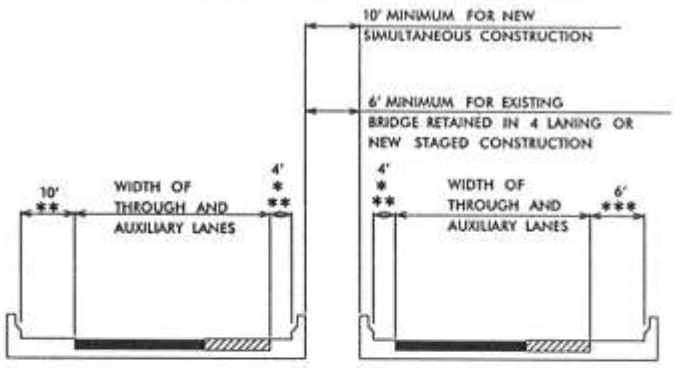
DUAL STRUCTURE



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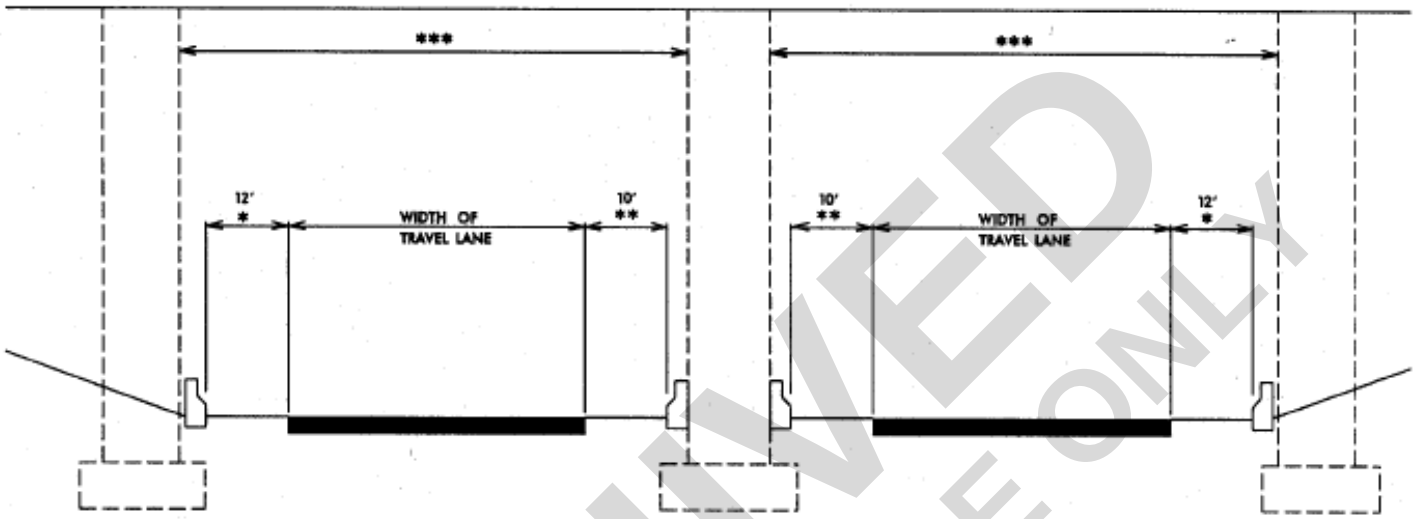
LEGEND

THROUGH TRAVEL LANES

AUXILIARY LANES

FREEWAY SYSTEM

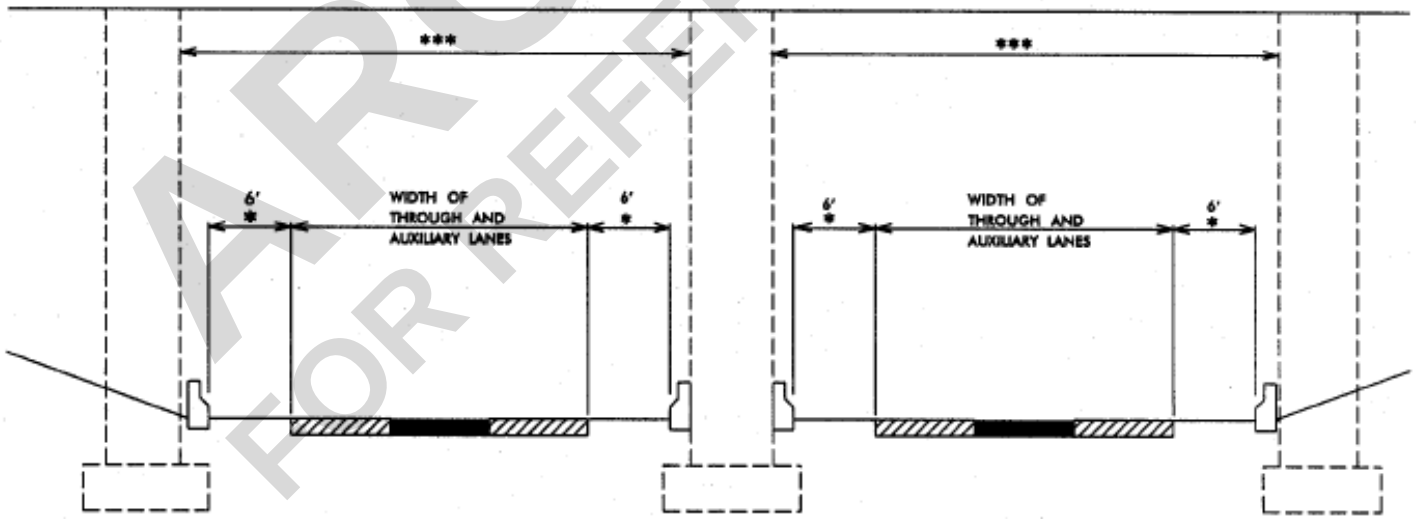
HORIZONTAL CLEARANCES FOR DIVIDED TRAFFIC



* 18' WHEN DESIGN YEAR ADT IS GREATER THAN 50,000 TO ACCOMMODATE FUTURE AUXILIARY LANES OF INTERCHANGE RAMPS OR LOOPS.

** 12' SHOULD BE CONSIDERED WHEN THE DESIGN YEAR TRUCK VOLUMES ARE GREATER THAN 250 DDHV

SHOULDER APPROACH



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SHOULDER APPROACH WITH AUXILIARY LANES

*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

LEGEND

THROUGH TRAVEL LANES

AUXILIARY LANES

ARTERIAL SYSTEM

BRIDGE DECK WIDTHS (FT.)
FOR NEW AND RECONSTRUCTED BRIDGES

TWO–LANE TWO–WAY TRAFFIC

SHOULDER APPROACH

DESIGN YEAR ADT	LESS THAN 400	400 – 1500	1501 – 2000	OVER 2000
DESIGN SPEED (MPH) 40				
45	30' (4' – 22' – 4')	34' (6' – 22' – 6')	34' (6' – 22' – 6')	
50				40' (8' – 24' – 8')
55				
60			36' (6' – 24' – 6')	
70	32' (4' – 24' – 4')	36' (6' – 24' – 6')		

NOTES:

BRIDGE DECK WIDTH CHARTS ARE BASED ON DESIGN YEAR ADT, IF ONLY CURRENT ADT IS AVAILABLE, DESING YEAR ADT SHOULD BE OBTAINED FROM THE TRAFFIC FORECASTING UNIT OF THE STATEWIDE PLANNING BRANCH.

BRIDGES 200' OR GREATER MAY HAVE A LESSER WIDTH, THE OFFSETS TO PARAPET, RAIL OR BARRIER SHALL BE AT LEAST 4' FROM THE NEAREST TRAVEL LANE. 1994 GB, PG. 487

SEE CHAPTER III & TABLE 111-22 OF 1994 GB FOR CURVE WIDENING CONSIDERATIONS, PG. 217

THE OFFST FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS. ENGINEER SHOULD CHECK WITH HYDRALICS TO DETERMINE IF ADDITIONAL OFFSET IS NEEDED TO ACCOMMODATE FOR DRAINAGE.

CURB AND GUTTER APPROACH

CURB TO CURB WIDTH OF APPROACH, SEE PAGE 7 OF THIS MANUAL.

AUXILIARY LANES

WHEN AUXILIARY LANES ARE REQUIRED, ADD ITS WIDTH TO THE WIDTH OF THE TRAVEL LANES.

INTERCHANGES

MINIMUM SHOULDER WIDTHS OF 6' ARE DESIRED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES. THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

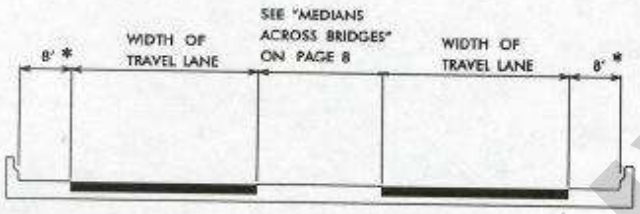
LEGEND

THROUGH TRAVEL LANES

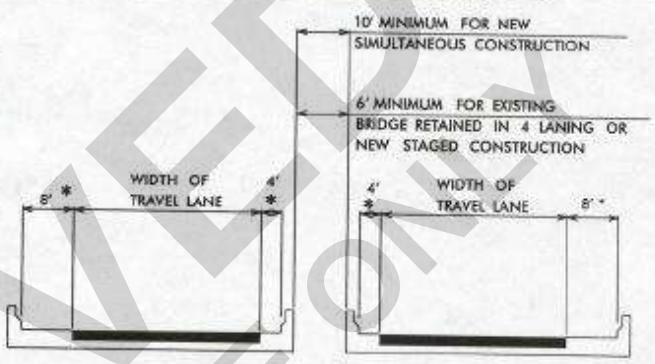
ARTERIAL SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED

SINGLE STRUCTURE



DUAL STRUCTURE

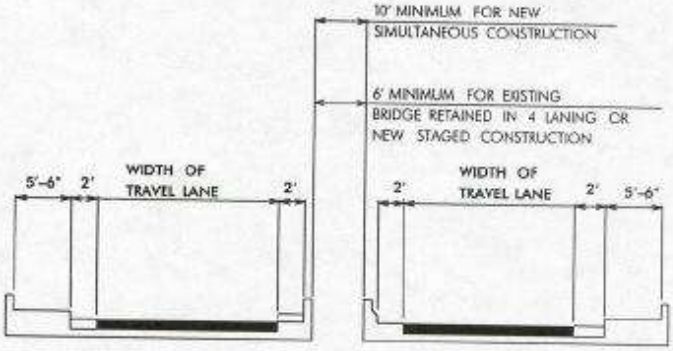


SHOULDER APPROACH

* 10' WITH SIX OR MORE THROUGH LANES

SINGLE STRUCTURE

DUAL STRUCTURE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALKS AND CURB AND GUTTER APPROACHES.

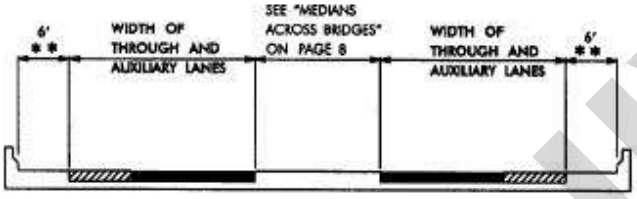
LEGEND

THROUGH TRAVEL LANES

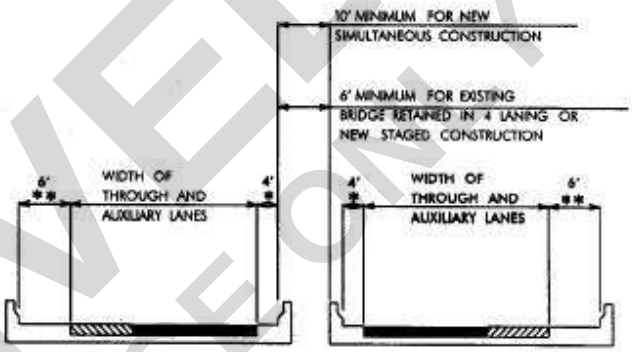
ARTERIAL SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED
WITH AUXILIARY LANES

SINGLE STRUCTURE



DUAL STRUCTURE

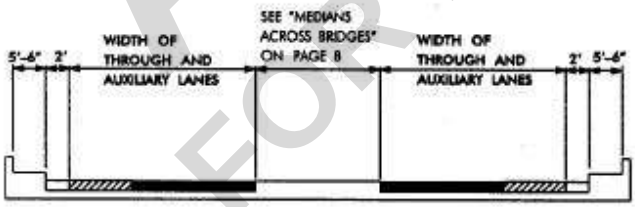


SHOULDER APPROACH

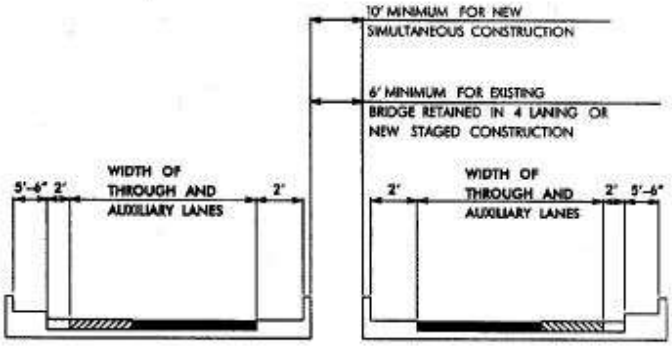
* 10' WITH SIX OR MORE THROUGH LANES

** THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS

SINGLE STRUCTURE



DUAL STRUCTURE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALKS AND CURB AND GUTTER APPROACHES.

LEGEND

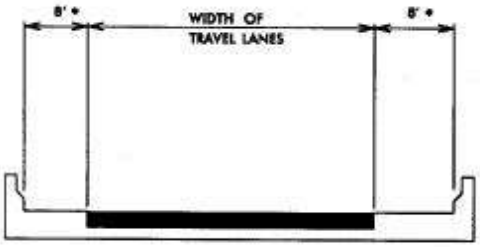
THROUGH TRAVEL LANES

AUXILIARY LANES

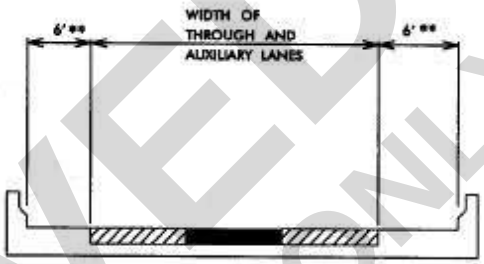
ARTERIAL SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES UNDIVIDED
TWO WAY TRAFFIC

WITHOUT AUXILIARY LANE



WITH AUXILIARY LANE

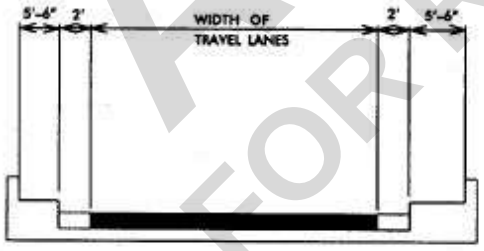


SHOULDER APPROACH

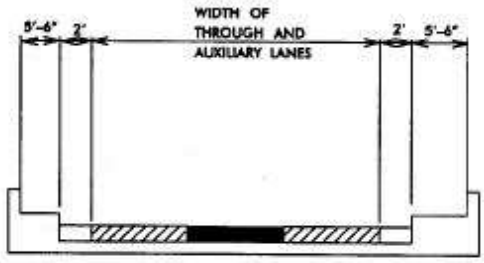
* 10' WITH SIX OR MORE THROUGH LANES AND OR ADT < 40000.

** THE OFFSET FOR BRIDGES WITHIN THE URBAN BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS

WITHOUT AUXILIARY LANE



WITH AUXILIARY LANE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALKS AND CURB AND GUTTER APPROACHES.

LEGEND

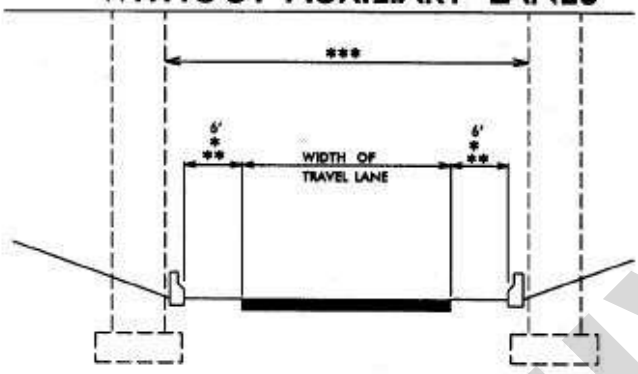
THROUGH TRAVEL LANES

AUXILIARY LANES

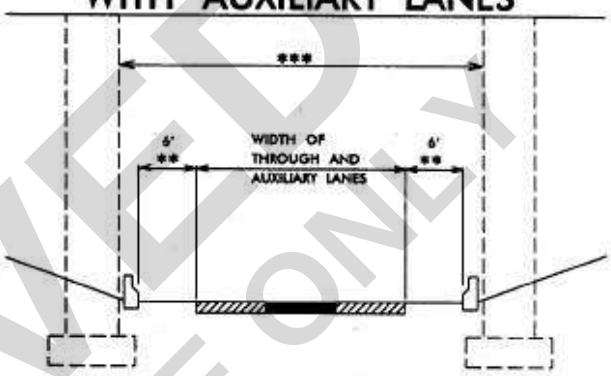
ARTERIAL SYSTEM

HORIZONTAL CLEARANCES FOR UNDIVIDED TWO-WAY TRAFFIC

WITHOUT AUXILIARY LANES



WITH AUXILIARY LANES

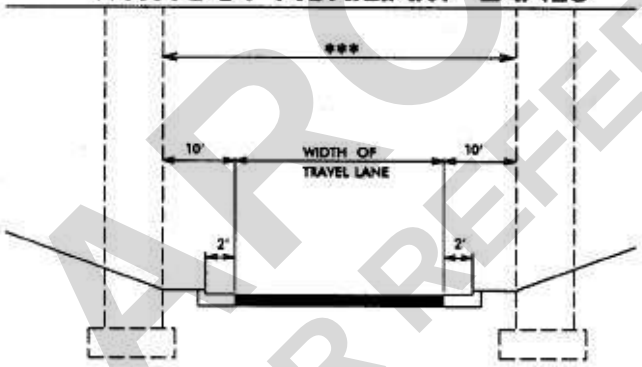


SHOULDER APPROACH

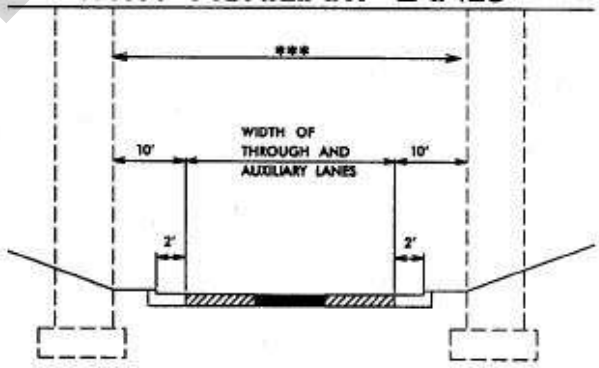
* DESIGN ADT UNDER 2000 USE 6' OFFSET
DESIGN ADT 2000 AND OVER USE 8' OFFSET

** THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS.

WITHOUT AUXILIARY LANES



WITH AUXILIARY LANES



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON CURB AND GUTTER APPROACHES.

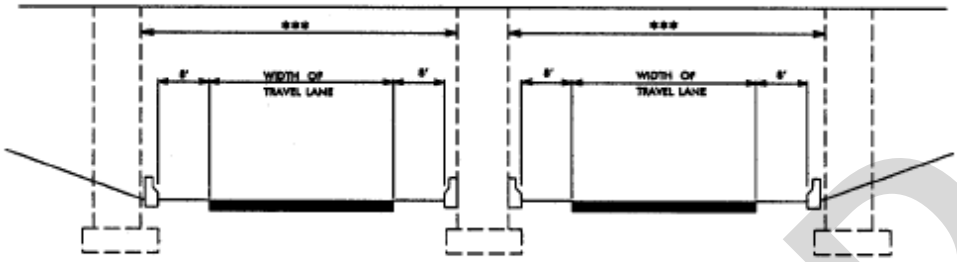
*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

LEGEND

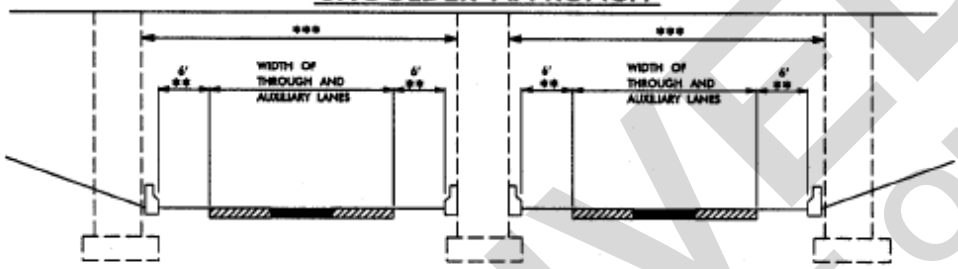
THROUGH TRAVEL LANES
AUXILIARY LANES

ARTERIAL SYSTEM

HORIZONTAL CLEARANCES FOR DIVIDED TRAFFIC

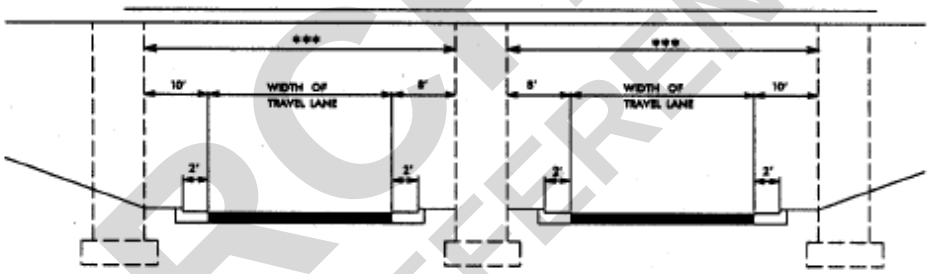


SHOULDER APPROACH

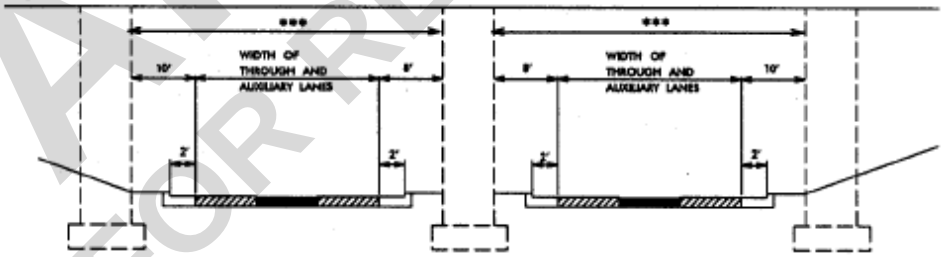


SHOULDER APPROACH WITH AUXILIARY LANES

** THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS.



CURB AND GUTTER APPROACH



CURB AND GUTTER APPROACH WITH AUXILIARY LANES

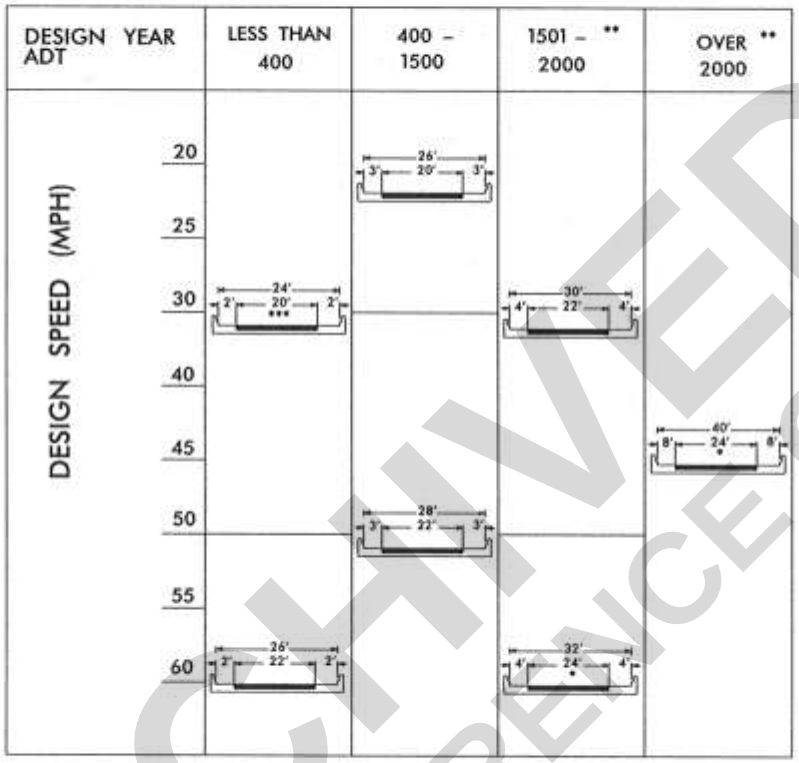
*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

NOTE:
SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON CURB AND GUTTER APPROACHES.

LEGEND
THROUGH TRAVEL LANES
AUXILIARY LANES

COLLECTOR ROADS AND STREETS

BRIDGE DECK WIDTHS (FT)
(MINIMUM VALUES)
TWO-LANE TWO-WAY TRAFFIC



* THE WIDTH OF TRAVELED WAY MAY REMAIN AT 22' ON RECONSTRUCTED HIGHWAYS WHERE ALIGNMENT AND SAFETY RECORDS ARE SATISFACTORY

** FOR BRIDGES IN EXCESS OF 100' IN LENGTH, THE MINIMUM WIDTH OF TRAVELED WAY PLUS 3' ON EACH SIDE IS ACCEPTABLE

*** 18' MINIMUM FOR ADT <250 FOR SPEED ≤ 40 MPH

NOTES:

BRIDGE DECK WIDTH CHARTS ARE BASED ON DESIGN YEAR ADT. IF ONLY CURRENT ADT IS AVAILABLE, DESIGN YEAR ADT SHOULD BE OBTAINED FROM THE TRAFFIC FORECASTING UNIT OF THE STATEWIDE PLANNING BRANCH

THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS. ENGINEER SHOULD CHECK WITH HYDRAULICS TO DETERMINE IF ADDITIONAL OFFSET IS NEEDED TO ACCOMMODATE DRAINAGE.

SEE CHAPTER III & TABLE III-22 OF 1994 GB FOR CURVE WIDENING CONSIDERATIONS, PAGE 217

WHERE THE APPROACH ROADWAY WIDTH (TRAVELED WAY PLUS SHOULDER) IS SURFACED, THAT SURFACE WIDTH SHALL BE CARRIED ACROSS ALL STRUCTURES

CURB AND GUTTER APPROACH

FOR CURB AND GUTTER APPROACHES, SEE PAGE 7 OF THIS MANUAL

AUXILIARY LANES

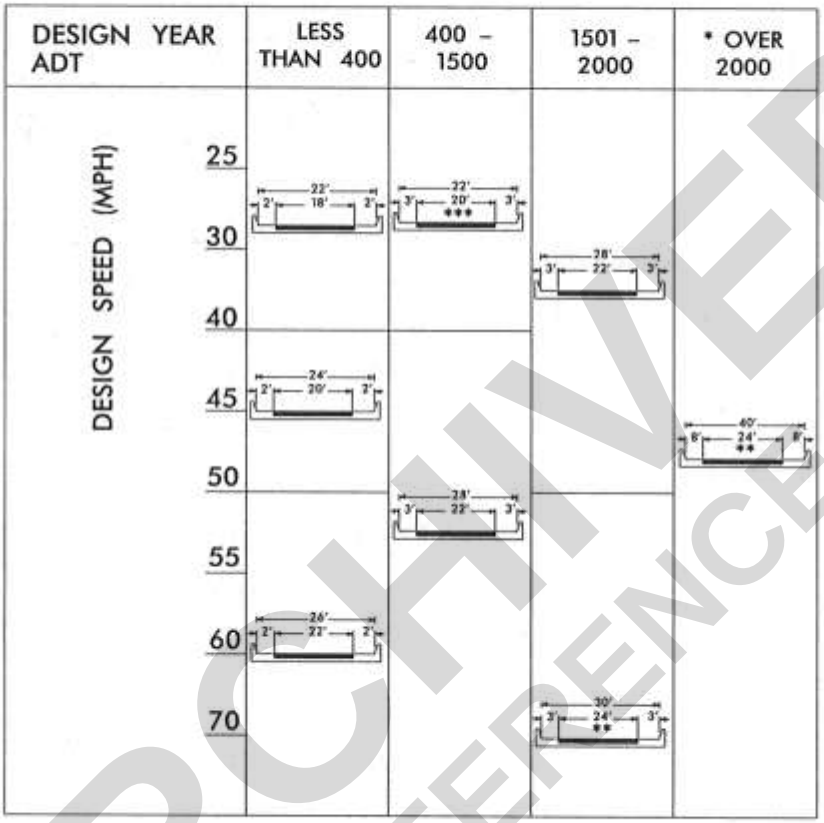
WHEN AUXILIARY LANES ARE REQUIRED, ADD ITS WIDTH TO THE WIDTH OF THE TRAVEL LANES.

INTERCHANGES

MINIMUM SHOULDER WIDTHS OF 6' SHOULD BE USED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES. THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

LOCAL ROADS AND STREETS

BRIDGE DECK WIDTHS (FT)
(MINIMUM VALUES)



* – FOR BRIDGES IN EXCESS OF 100' IN LENGTH, THE MINIMUM WIDTH OF TRAVELED WAY PLUS 3' ON EACH SIDE IS ACCEPTABLE.

** – WIDTH OF TRAVEL WAY MAY REMAIN AT 22' ON RECONSTRUCTED HIGHWAYS WHERE SAFETY RESULTS AND ALIGNMENT ARE SATISFACTORY.

*** – MOUNTAINOUS TERRAIN – ADT 400 – 600 USE OF 18' WIDTH AND 2' SHOULDERS IS ACCEPTABLE 1994 GB, PAGE 422.

NOTES :

BRIDGE DECK WIDTH CHARTS ARE BASED ON DESIGN YEAR ADT. IF ONLY CURRENT ADT IS AVAILABLE DESIGN YEAR ADT SHOULD BE OBTAINED FROM THE TRAFFIC FORECASTING UNIT OF THE STATEWIDE PLANNING BRANCH.

SEE CHAPTER III & TABLE III-22, 1994 GB, FOR CURVE WIDENING CONSIDERATIONS, PAGE 217

THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MINIMUM OF 7'-6" TP ACCOMMODATE FUTURE SIDEWALKS. ENGINEER SHOULD CHECK WITH HYDRAULICS TO DETERMINE IF ADDITIONAL OFFSET IS NEEDED TO ACCOMMODATE FOR DRAINAGE.

CURB AND GUTTER APPROACH

FOR CURB AND GUTTER APPROACHES, SEE PAGE 7 OF THIS MANUAL.

AUXILIARY LANES

WHEN AUXILIARY LANES ARE REQUIRED, ADD ITS WIDTH TO THE WIDTH OF THE TRAVEL LANES.

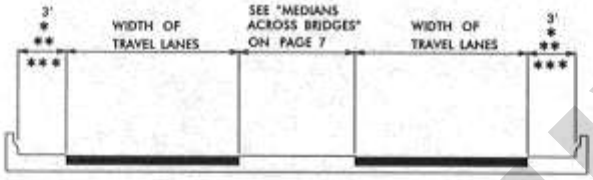
INTERCHANGES

MINIMUM SHOULDER WIDTHS OF 6' SHOULD BE USED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES. THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

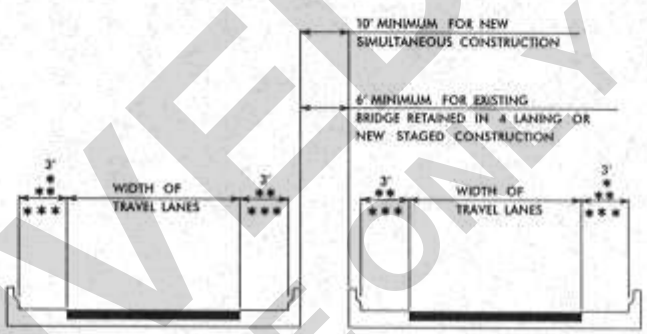
LOCAL AND COLLECTOR SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED

SINGLE STRUCTURE



DUAL STRUCTURE



SHOULDER APPROACH

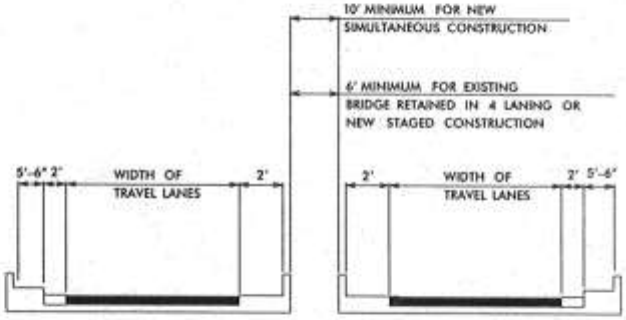
* MINIMUM SHOULDER WIDTHS OF 6' ARE DESIRED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

** FOR STRUCTURES OF 100' OR LESS IN LENGTH AND HAVING 1501 ADT TO 2000 ADT, USE 4' SHOULDERS, FOR OVER 2000 ADT USE 8' SHOULDERS.

*** FOR STRUCTURES OF 100' OR LESS IN LENGTH AND HAVING > 8000 ADT USE 4' SHOULDERS. THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS.

SINGLE STRUCTURE

DUAL STRUCTURE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALK AND CURB AND GUTTER APPROACHES.

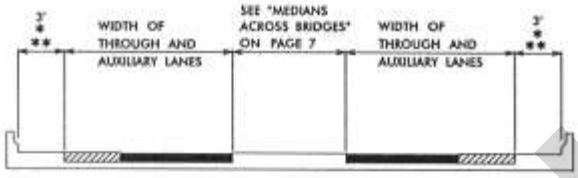
LEGEND

THROUGH TRAVEL LANES

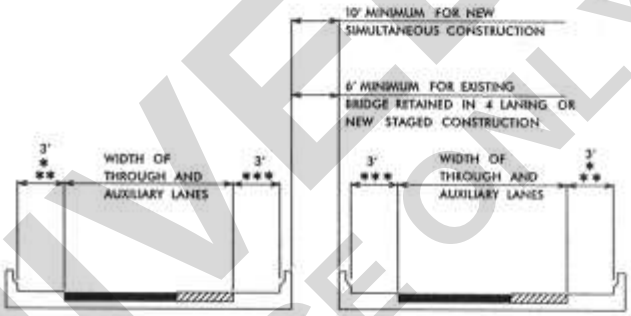
LOCAL AND COLLECTOR SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES DIVIDED
WITH AUXILIARY LANES

SINGLE STRUCTURE



DUAL STRUCTURE



SHOULDER APPROACH

* MINIMUM SHOULDER WIDTHS OF 6' SHOULD BE USED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES. THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

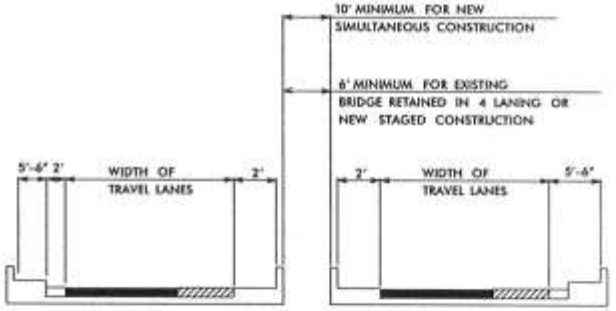
** FOR STRUCTURES OF 100' OR LESS IN LENGTH AND HAVING OVER 2000 ADT, USE 8' SHOULDERS

THE OFFSET FOR BRIDGES WITHIN THE URBAN BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS.

*** FOR STRUCTURES OF 100' OR LESS IN LENGTH AND HAVING > 8000 ADT USE 4' SHOULDERS.

SINGLE STRUCTURE

DUAL STRUCTURE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALK AND CURB AND GUTTER APPROACHES.

LEGEND

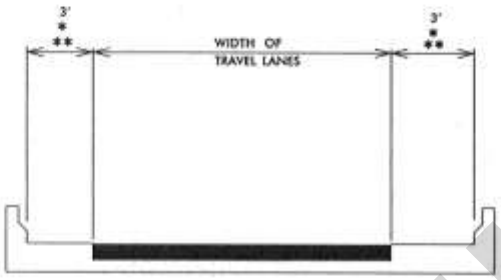
THROUGH TRAVEL LANES

AUXILIARY LANES

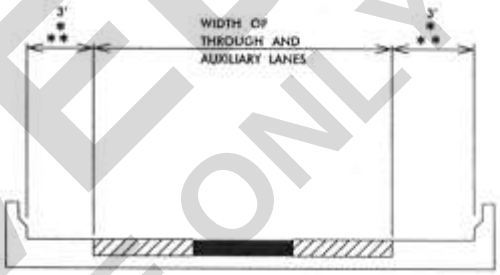
LOCAL AND COLLECTOR SYSTEM

BRIDGE DECK WIDTHS
4 OR MORE LANES UNDIVIDED
TWO–WAY TRAFFIC

WITHOUT AUXILIARY LANE



WITH AUXILIARY LANE



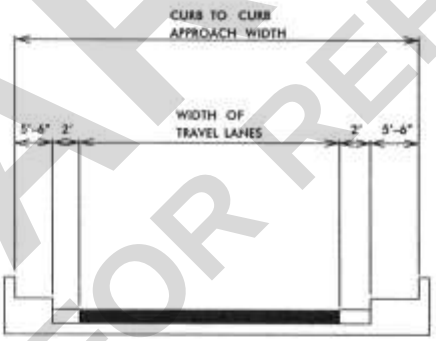
SHOULDER APPROACH

* MINIMUM SHOULDER WIDTHS OF 6' SHOULD BE USED FOR STRUCTURES WHICH ARE LOCATED AT INTERCHANGES. THE MINIMUM VALUES SHOWN ABOVE MAY BE USED IF THE REQUIRED SIGHT DISTANCE CAN BE ACHIEVED.

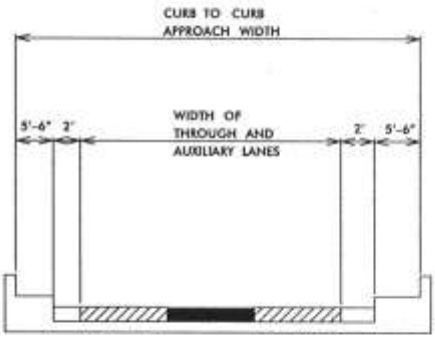
** FOR STRUCTURES OF 100' OR LESS IN LENGTH AND HAVING 1501 TO 2000 ADT, USE 4' SHOULDERS FOR OVER 2000 ADT, USE 8' SHOULDERS

NOTE: THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'–6" TO ACCOMMODATE FUTURE SIDEWALKS

WITHOUT AUXILIARY LANE



WITH AUXILIARY LANE



CURB AND GUTTER APPROACH

NOTE: SEE PAGES 6 AND 7 OF THIS MANUAL FOR ADDITIONAL INFORMATION ON SIDEWALKS AND CURB AND GUTTER APPROACHES.

LEGEND

THROUGH TRAVEL LANES

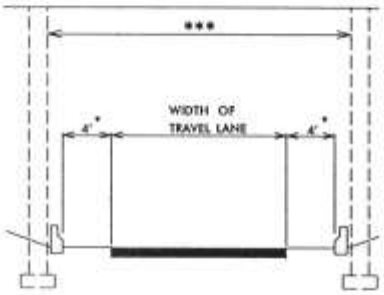
AUXILIARY LANES

LOCAL AND COLLECTOR SYSTEM

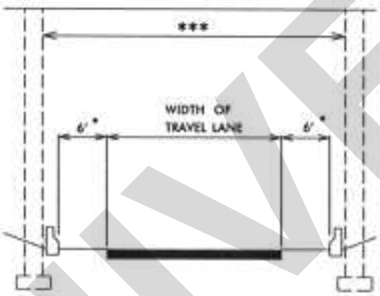
HORIZONTAL CLEARANCES

DESIGN YEAR ADT

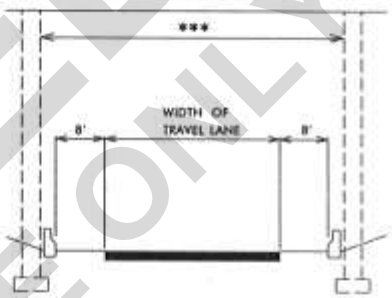
UNDER 400



400 – 2000



OVER 2000



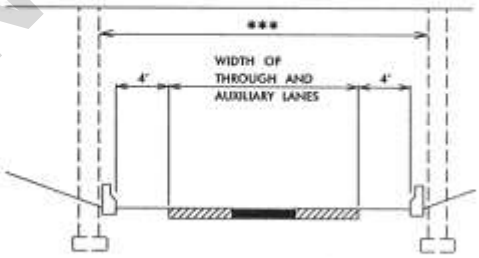
SHOULDER APPROACH

* THE OFFSET FOR BRIDGES WITHIN THE URBAN AREA BOUNDARY MAY BE INCREASED TO A MIN. OF 7'-6" TO ACCOMMODATE FUTURE SIDEWALKS. ENGINEER SHOULD CHECK WITH HYDRAULICS TO DETERMINE IF ADDITIONAL OFFSET IS NEEDED TO ACCOMMODATE FOR DRAINAGE.

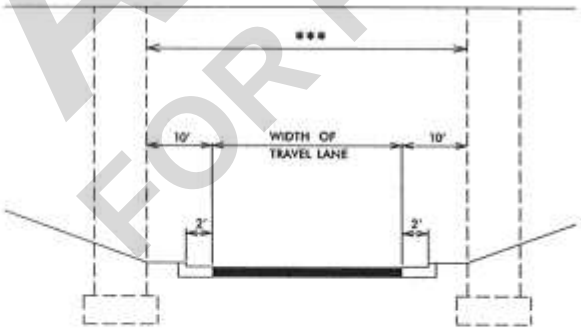
*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

NOTE:

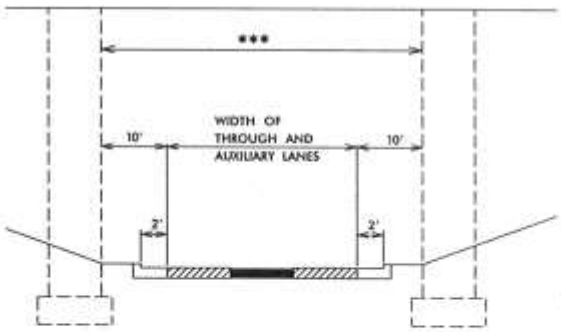
PIER NECESSITY AND LOCATION ARE TO BE DETERMINED BY THE STRUCTURE DESIGN UNIT. SEE THE ROADWAY DESIGN MANUAL CHAPTER 6-10 FOR ENDBENT SLOPE BREAK POINT.



SHOULDER APPROACH WITH AUXILIARY LANES



CURB AND GUTTER APPROACH



CURB AND GUTTER APPROACH WITH AUXILIARY LANES

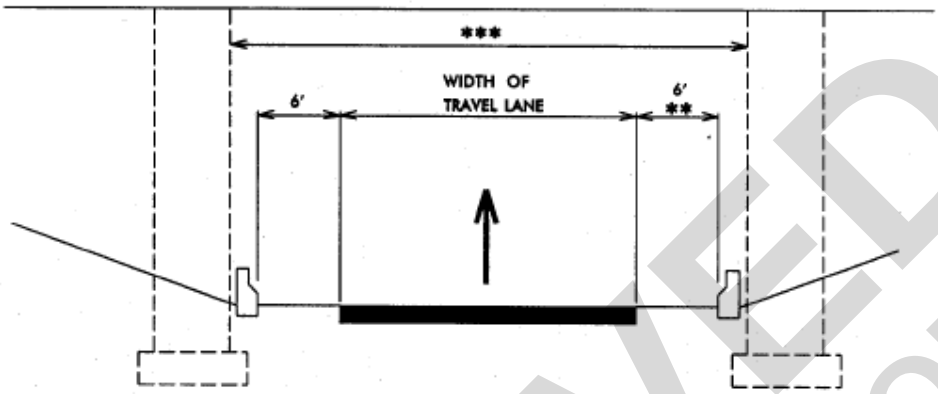
LEGEND

THROUGH TRAVEL LANES

AUXILIARY LANES

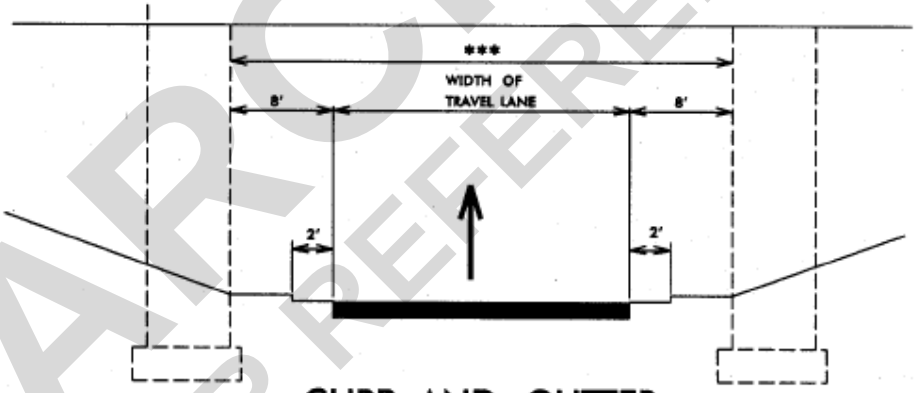
ONE–WAY RAMP

HORIZONTAL CLEARANCES



SHOULDER APPROACH

** USE 10' WITH DIRECTIONAL INTERCHANGE RAMPS. ON DIRECTIONAL INTERCHANGE RAMPS IT IS ACCEPTABLE TO SWITCH THE WIDENED OFFSET TO THE INSIDE OF THE CURVE WHEN NEEDED FOR HORIZONTAL SIGHT DISTANCE.



CURB AND GUTTER APPROACH

NOTE: CURB AND GUTTER ON RAMPS SHOULD BE CONSIDERED ONLY TO FACILITATE PARTICULARLY DIFFICULT DRAINAGE SITUATIONS. CURB AND GUTTER IS NOT RECOMMENDED ON INTERMEDIATE OR DIRECTIONAL RAMPS, EXCEPT IN SPECIAL CASES.

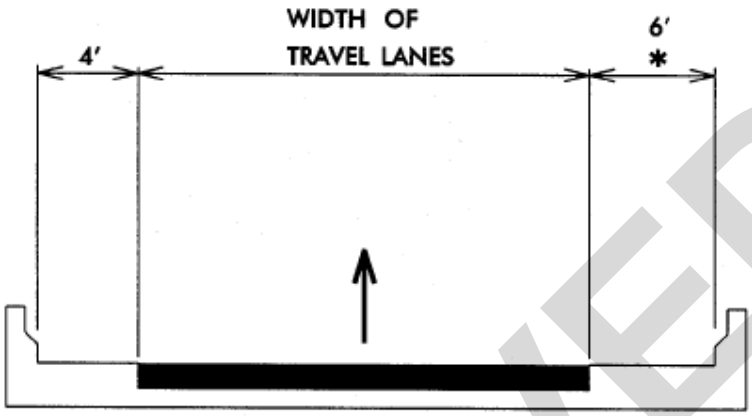
*** SEE EXCEPTIONS TO POLICY ON PAGE 3 OF THIS MANUAL FOR ADDITIONAL INFORMATION.

LEGEND

THROUGH TRAVEL LANES

ONE–WAY RAMP

BRIDGE DECK WIDTHS

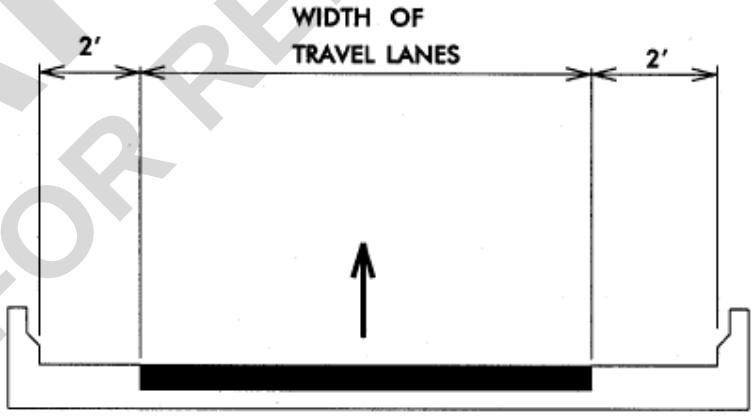


* 10′ FOR DIRECTIONAL INTERCHANGE RAMPS
ON DIRECTIONAL INTERCHANGE RAMPS IT IS ACCEPTABLE TO SWITCH THE WIDENED OFFSET TO THE INSIDE OF THE CURVE WHEN NEEDED FOR HORIZONTAL SIGHT DISTANCE.

FOR ADDITIONAL INFORMATION SEE PAGE 935 TABLE X–3 (1994 A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS)

SHOULDER APPROACH

NOTE: CURB AND GUTTER ON RAMPS SHOULD BE CONSIDERED ONLY TO FACILITATE PARTICULARLY DIFFICULT DRAINAGE SITUATIONS. CURB AND GUTTER IS NOT RECOMMENDED ON INTERMEDIATE OR DIRECTIONAL RAMPS, EXCEPT IN SPECIAL CASES.



CURB AND GUTTER APPROACH

LEGEND

THROUGH TRAVEL LANES