

Ohio D.O.T.  
LOCATION & DESIGN MANUAL

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Feb. 1978

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## (702) SHOULDER STANDARDS

### 702.1 GENERAL

Shoulders are used to provide an area for the accommodation of disabled vehicles, for the lateral support of the base and surface courses and to generally improve the safety of a highway.

### 702.2 TYPES

There are currently three types of shoulders being used for new construction; paved, bituminous surface treated and aggregate. The turf shoulder, formerly used on low class highways, has now been replaced with the aggregate shoulder, on all State Highways being maintained by the State; and also on all other roads which are approved by the agency responsible for their maintenance.

### 702.3 PAVED SHOULDERS

Paved shoulders are to be provided on all freeways and arterials if the current average total of B and C units exceeds 1000 per day.

.31 MATERIAL For rigid pavement the shoulders shall be constructed of either 452 or 301, as shown on Fig. 702-1. For composite and flexible pavement the designs should be 301 with a seal coat of 409.

.32 PIPE UNDERDRAINS Shallow underdrains, 30 inches deep in soil and 12 inches in rock, are used to drain the subbase. Deep underdrains, 50 inches deep, are used to drain the subgrade. If the pavement slopes both directions, such as a six or eight lane divided freeway, there shall be underdrains located on both edges of the pavement. If there is a granular subgrade, no subbase or underdrains are required.

### 702.4 BITUMINOUS SURFACE TREATED SHOULDERS

Bituminous treated shoulders are to be provided on all arterials and collectors if the current ADT includes between 250 and 1000 B and C units.

.41 MATERIAL Bituminous surface treated shoulders shall be constructed as shown on Fig. 702-2.

.42. AGGREGATE DRAINS Aggregate drains (Item 605.05) shall be used to drain the subbase. For conventional rigid pavements the drains shall be located at each end of each transverse joint. For other pavements, drains shall be located at 50-foot intervals on each side of the pavement and staggered so that each drain is 25 feet from the adjacent drain on the opposite side. For superelevated pavement the drain shall be located on the low side only, at each transverse joint in conventional rigid pavement and at 25 foot intervals for other pavement.

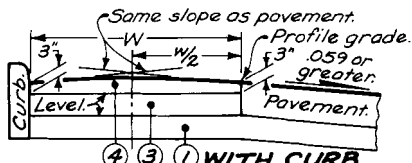
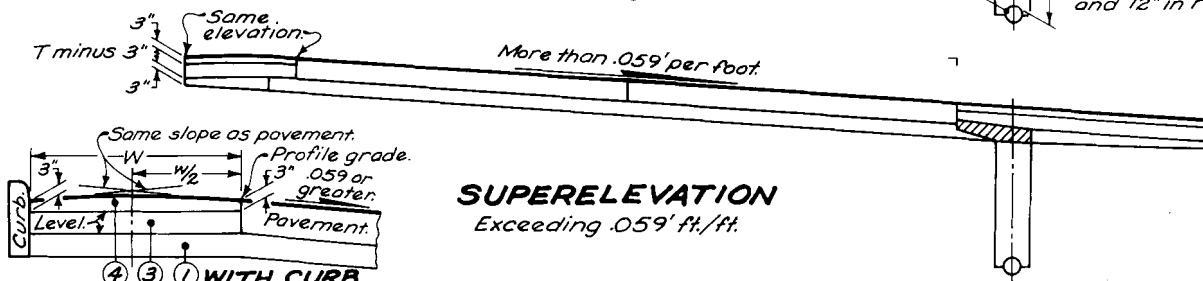
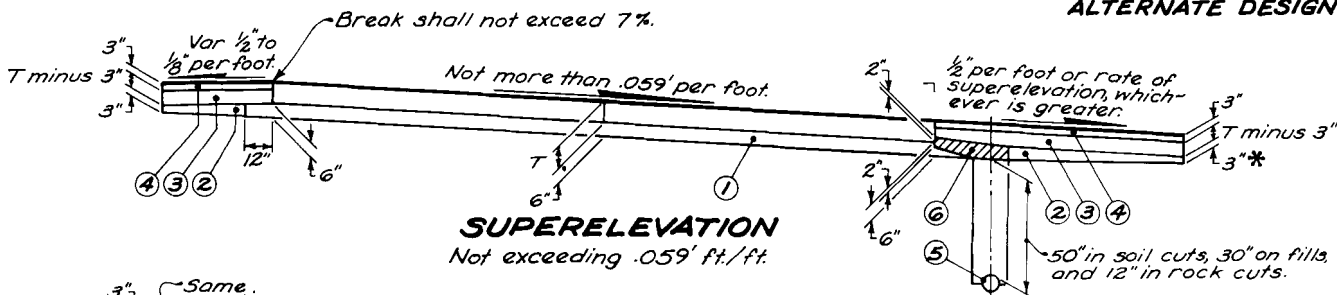
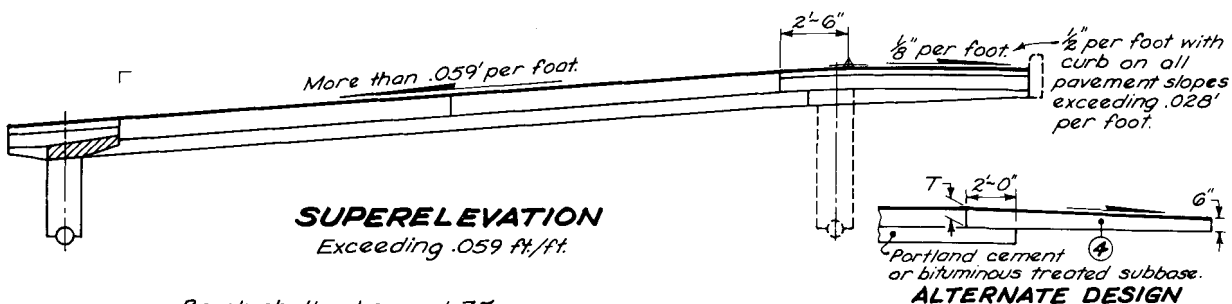
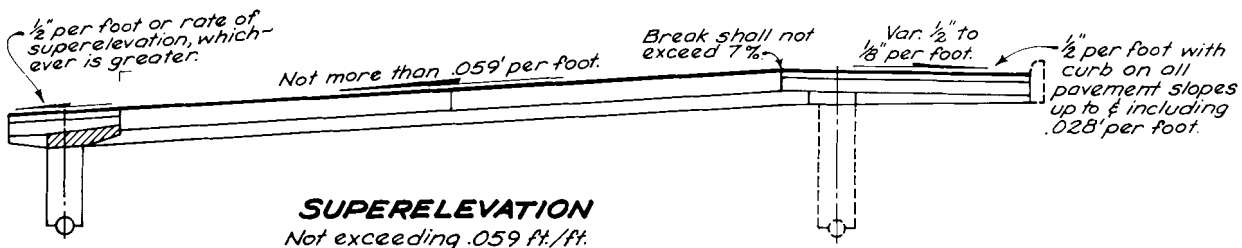
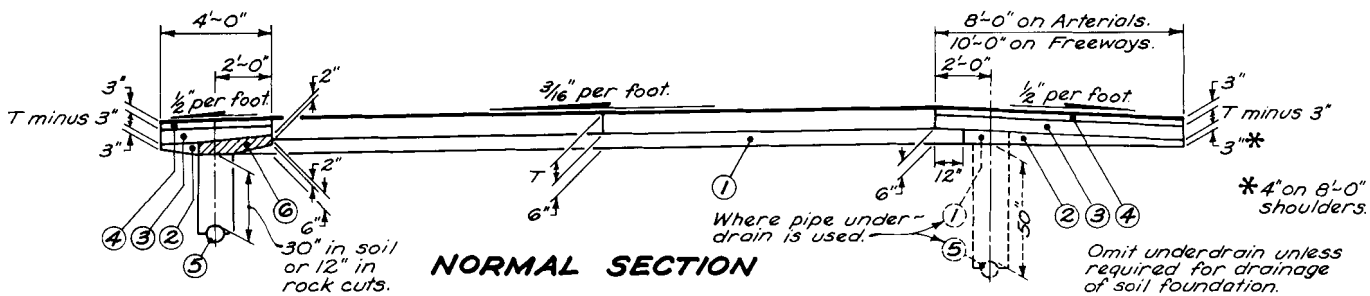
.43 PIPE UNDERDRAINS Where aggregate cannot be used to drain the base or subbase, shallow pipe underdrains shall be used and constructed as shown on Fig. 702-1. Where drainage of subgrade is necessary, deep pipe underdrains shall be used and constructed as shown on Fig. 702-1.

#### 702.5 AGGREGATE SHOULDERS

Aggregate shoulders are to be provided on all collectors or locals if the current average total of B and C units is less than 250 per day. They shall be constructed as shown on Fig. 702-2.

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# UNDERDRAINS, SUBBASE & SHOULDER PAVING



## LEGEND

- ① 310 Subbase, Grading "A", as per plan (See General Note).
- ② 310 Subbase, Regular Grading.
- ③ 304 Aggregate Base.
- ④ 301 Bituminous Aggregate Base (AC-20) RT-11 or RT-12 as per plan (See note in Proposal).
- ⑤ 605 Pipe Underdrain.
- ⑥ Special drainage connection, using No. 8 or 9 aggregate (See note in Proposal).

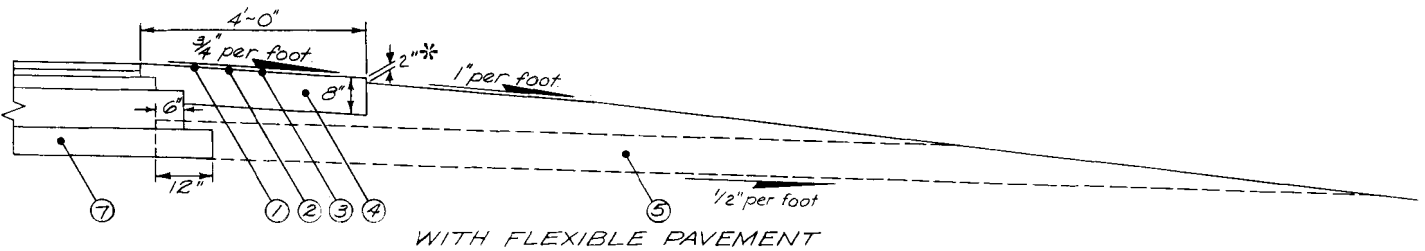
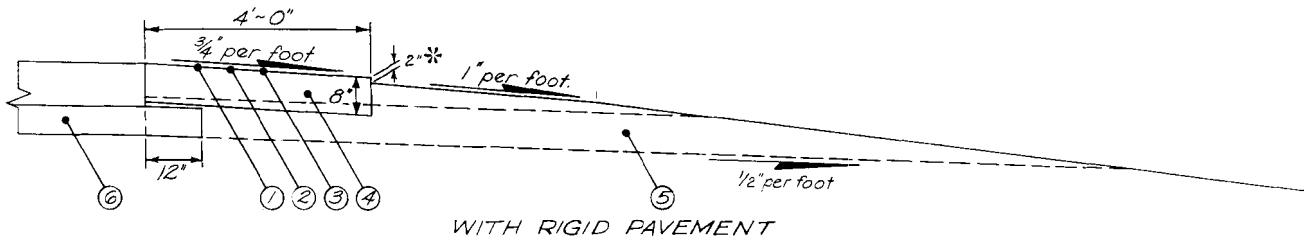
## SEQUENCE OF OPERATIONS

1. Install pipe underdrain on outside shoulder, where required. Installation of shallow underdrain in median may be deferred until pavement is placed.
2. Place subbase out to outside edge of underdrain or to one foot beyond edge of pavement where no underdrain is present. Payment shall be made for all subbase placed in this operation.
3. Construct pavement.
4. Remove subbase and any contaminated backfill over drain and replace with No. 8 or 9 aggregate as shown by ⑥.
5. Complete shoulder construction.

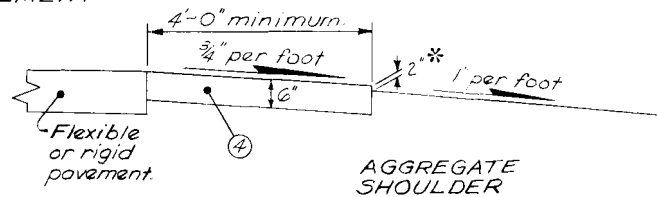
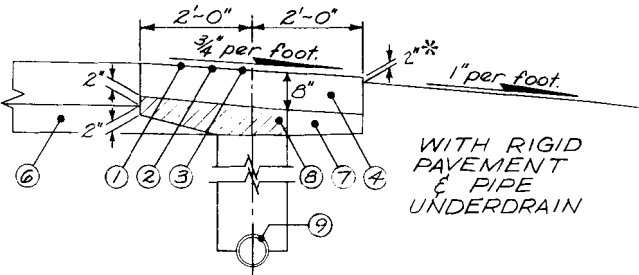
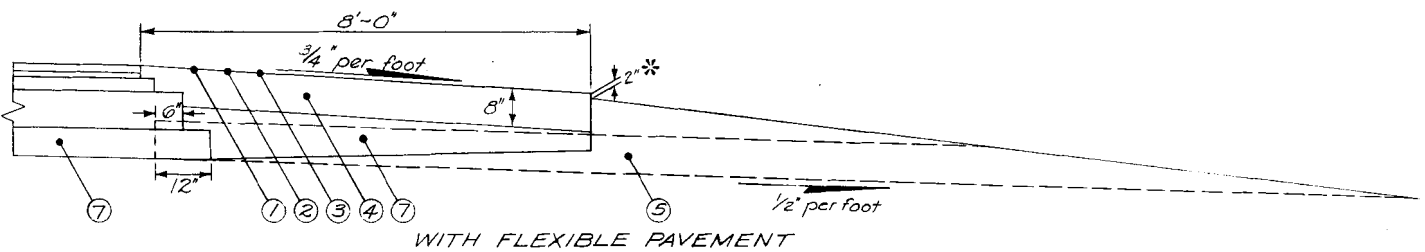
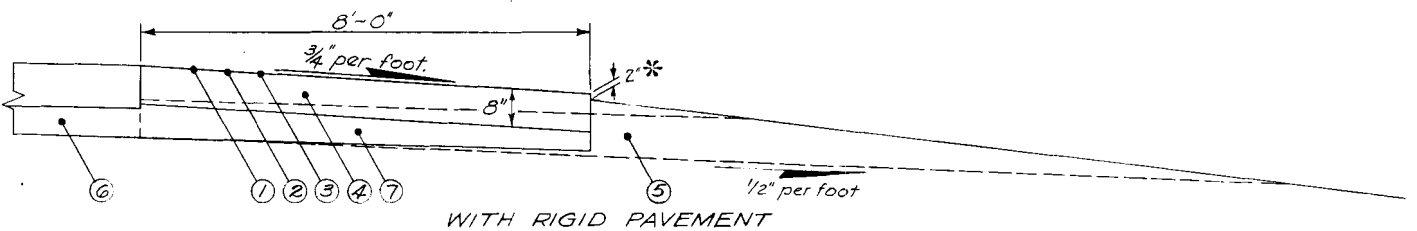
NOTE: Earth shoulder shall be two inches lower than the paved shoulder.

## BITUMINOUS SURFACE TREATED AND AGGREGATE SHOULDERS

250 to 500 B & C TRUCKS IN CURRENT ADT



501 to 1000 B & C TRUCKS IN CURRENT ADT



LESS THAN 250 B & C TRUCKS  
IN CURRENT ADT

### LEGEND

- ① 408 Bituminous Prime Coat: RT-2 or RT-3 at 0.40 gal. per sq. yd.
- ② 409 Seal Coat Bituminous Material: RT-9 or RT-10; or MC-800 or MC-3000 (or etc.) at 0.30 gal. per sq. yd.
- ③ 409 Seal Coat Cover Aggregate No. 8 at 0.008 cu. yd. per sq. yd.
- ④ 304 Aggregate Base (or 703.10 Screenings)
- ⑤ 605 Aggregate Drains.
- ⑥ 310 Subbase, Grading "A".
- ⑦ 310 Subbase, Regular Grading.
- ⑧ Special drainage connection using No. 8 or 9 aggregate (See note in Proposal).
- ⑨ 605 Pipe Underdrains.

### NOTES

- \* In lieu of the first sentence of 605.05 of the specifications, the aggregate drains shall be installed after the 310 Subbase has been placed, but prior to the construction of the bituminous surface treated shoulder.
- \* Omit 2" drop on high side of super-elevated curves when the earth shoulder slopes toward the surface treated shoulder.  
For curved alignment, treated shoulders shall be sloped as shown on Figure 702-1, except that on two-lane highways the 4' wide shoulder adjacent to the high side of a super-elevated pavement need not be rounded.

## (703) ROADSIDE GRADING AND SLOPE DESIGN

### 703.1 PURPOSE

This section is concerned with the design of slopes, ditches, parallel channels and grading of interchanges. It incorporates into the roadside design, the concepts of vehicular safety developed through dynamic testing. Designers are urged to consider flat inslopes and backslopes, wide gentle ditch sections and elimination of guardrail in their initial approach to the selection of the alignment and grade. It is expected that above-minimum values will be used, if possible, and minimum values will be used only where higher values will result in excessive cost. See Figures 703-1 through 703-6.

### 703.2 SLOPES

.21 GENERAL - Inslopes and backslopes shall be as flat as possible. Dynamic testing has shown that a car is not likely to roll over on 6:1 slopes. Wherever possible the designer shall provide 6:1 inslope and 4:1 backslope combinations, or flatter. As shown on Figure 703-2, fill slopes may vary between 8:1 and 3:1 without protective guardrail. Projects should be examined throughout, in an effort to obtain flat slopes at a low cost. Fill slopes can be flattened with material which otherwise might be wasted, and backslopes can be flattened to reduce borrow.

With classifications at or above UA 50 and RMA 50, a 30 foot wide recovery area shall be provided along the mainline right shoulders and along both sides of directional roadways and ramps. The transition between a 30 foot recovery area and the 15 foot shoulder, with guardrail, shall normally be 150 feet.

.22 NORMAL CUT SLOPES 6:1 backslopes shall be used wherever minimum right-of-way will permit. For deeper cuts, 4:1 backslopes should be used in areas where available right-of-way will not permit 6:1 slopes, but 4:1 will fit the right-of-way condition for a considerable distance. 3:1 slopes shall be used for all remaining soil cut backslopes under 15 feet high. For cuts over 15 feet, 2:1 slopes may be used. See Figure 703-1.

.23 ROCK AND SHALE CUT SLOPES In rock or shale cuts, the maximum rate of slope will be determined by the Soils Engineer. The designer shall then examine the project to ascertain whether moderate slopes could be used to the advantage of reducing borrow within reasonable haul distance.

In deep rock or shale cuts where slopes steeper than 1:1 are to be used, a 10'-wide bench shall be provided between the top of the ditch backslope and the toe of the rock face. (See Figure 703-3).

In shale cuts, the designer shall not use backslopes steeper than 2:1 unless excessive waste would result. In any event, 2:1 slopes shall be used for all shale cut sections less than 20 feet in depth and the bench shall be omitted. In this and the following paragraph, depth of cut shall be measured from the top of shale or rock to the ditch flow line.

Backslopes steeper than 2:1 shall not be used in rock cuts until the depth exceeds 16 feet, and the bench shall be omitted.

### 703.3 DRAINAGE

When the depth of the design discharge accumulating in a roadside or median ditch exceeds the desirable maximum established for the various highway classifications, a storm sewer will be required to intercept the flow and carry it to a satisfactory outlet. See Sec. 1155. If right-of-way and earth work considerations are favorable, a deep parallel side ditch (see Figure 703-3), may be more practical and should be considered instead of a storm sewer. In some cases where large areas contribute flow to a highly erodible soil cut, an intercepting ditch may be considered near the top of the cut to intercept the flow from the outside and thereby relieve the roadside ditch.

Standard depth ditches are desirable and they require minimum pavement profile grades of 0.48% to 0.24%. Where flatter pavement grades are necessary, special ditches will be required and a ditch profile developed so that ditch flow lines can be shown on each cross section.

At driveways, where the roadside ditch is less than 30 feet from the edge of pavement, the ditch and driveway pipe shall be located as shown on Fig. 703-7, to assure there is no obstruction within the 30-foot wide recovery area.

Requirements for driveway pipe location shall therefore be applied to all new construction, reconstruction, widening and resurfacing projects if regrading of the roadsides to safety standards is included in the work. New driveways constructed by permit shall also conform with the above if other such installations on the route conform, otherwise the new driveway pipe may be located in the existing roadside ditch.



#### 703.4 PARALLEL CHANNELS

- (a) Where it is desirable that a stream, intercepted by the improvement, be relocated parallel to the roadway, the channel shall be located beyond the limited access line in a channel easement. This does not apply to conventional intercepting erosion control ditches located at the top of cut slopes in rolling terrain. This arrangement locates the channel beyond the right-of-way fence, which will serve as an additional guard to help stop an out-of-control vehicle. See figure 703-3.
- (b) In areas of low fill and shallow cut, protection along a channel by a wide bench is usually provided. Fill slope should not exceed 8:1 when this design is used, and maximum height from shoulder edge to bench shall not exceed 10 feet. If it should become necessary to use slopes steeper than 8:1, guardrail shall be provided and fill slopes as steep as 2:1 may be used.
- (c) In cut sections, 5 feet or more in depth, earth barrier protection can be provided. This design probably affords greater protection, where very deep channels are constructed, and requires less excavation. See Figure 703-3.
- (d) Where the sections alternate between cut and fill and it is desired to use but a single design, barrier protection would be less costly if borrow is needed.
- (e) Earth bench or earth barrier protection, provided adjacent to parallel channels, shall not be breached for any reason other than to provide an opening for a natural or relocated stream, requiring a drainage structure larger than 42 inches in rise. Outlet pipes from median drains or side ditches shall discharge directly into the parallel channel.
- (f) Channels and toe-of-slope ditches used in connection with steep fill slopes, are both removed from the normal roadside section by benches. The designer shall establish control offsets to the center of each channel or ditch, at appropriate points which will govern their alignment, so that they will flow in the best and most direct course to the outlet. Bench width shall be varied as necessary.

## 703.5 INTERCHANGE GRADING

### GENERAL

Inslopes and interchange interiors shall be contour graded so that the least amount of guardrail is required and so that maximum safety is provided with corresponding ease of maintenance. Low height of eye feature in modern vehicles becomes critical on ramps as they approach entrance or merge areas, especially if guardrail is erected on the merging side of the vehicle. Merging sight distance shall therefore, be unobstructed by guardrail or earth mounds.

At a road crossing within an interchange area, bridge spill-through slopes shall be 2:1 unless otherwise required by structure design, and shall be flattened to 3:1 in each corner cone and maintained at 3:1 or flatter, if within the interior of an interchange. Elsewhere in interchange interiors, fill slopes in excess of 16 feet in height shall not exceed 3:1 and shall be protected with guardrail. Normal slopes shall be used for fill slopes less than 16 feet in height. Roadsides similar to those used for two-lane highways of 1,000 ADT or more shall be used for ramps and the left shoulders on turning roadways, except that slopes in excess of 3:1 shall not be used in interchange interiors. Normal ditches shall be used where permitted, except that backslopes shall not exceed 3:1. The use of roadside or rampside ditches shall generally be avoided in the interiors of all trumpets, loops in fill, and at the high roadways of diamonds and loops in cut.

.51 GORE AREA (See Figure 703-4) Gore areas of trumpets and diamonds, and exteriors of loops adjacent to the exit point, shall be graded to obtain slopes (6:1 or flatter) which will not endanger a vehicle which is unable to negotiate the curvature because of excess speed.

.52 TRUMPET INTERIORS (See Figure 703-4) Interior areas of trumpets shall be graded to slopes not in excess of 8:1, with each sloping downward from each side of the triangle to a single rounded low point. Roadside ditches shall not be used. Exteriors should be graded in accordance with the mainline or ramp standards.

.53 LOOP INTERIORS (See Figure 703-5) If channels are permitted to cross the loop interior, slopes shall not be steeper than 4:1. In cut, the interior shall be graded to form a normal dip section adjacent to the

lower part of the loop and the backslope shall be extended to intersect the opposite shoulder of the upper part of the loop, unless the character and the amount of material or the adjacent earth work balances indicate that the cost would be prohibitive. Roadside cleanup and landscaping shall be provided in undisturbed areas of loop interiors.

.54 DIAMONDS

- (a) If the location of the ramp intersection at the crossroad is relatively near to the main facility, a continuous slope between the upper roadway shoulder and the lower roadway ditch will provide the best and most pleasing design.
- (b) If the ramp intersection at the crossroads is located at a considerable distance from the main facility, then both ramp and mainline roadsides shall have independent designs, until the slopes merge near the gore.
- (c) In the design of entrance ramps, sight distance at the left rear to the mainline is of the utmost importance to an entering vehicle, for the purpose of early adjustment to the approaching traffic pattern, and should be as long as feasible.
- (d) If the quadrant is entirely, or nearly so, in cut, it is suggested that the combination of a 3:1 backslope at the low roadway ditch and a gentle downslope from the high roadway shoulder will provide the best design in the wide portion of the quadrant. Approaching the gore, the slopes should transition to continuous 4:1 and 6:1 or flatter slopes.
- (e) Quadrants located entirely in fill areas should have independently designed roadways for ramp, mainline and crossroad. Each should be provided with normal slopes not greater than 3:1, with the otherwise ungraded areas sloped to drain without using ditches.
- (f) If the quadrant is located partially in cut and partially in fill, the best design would feature a gentle fill slope at the upper roadway and a gentle backslope at the lower roadway, joined to a bench at the existing ground level which is sloped to drain.

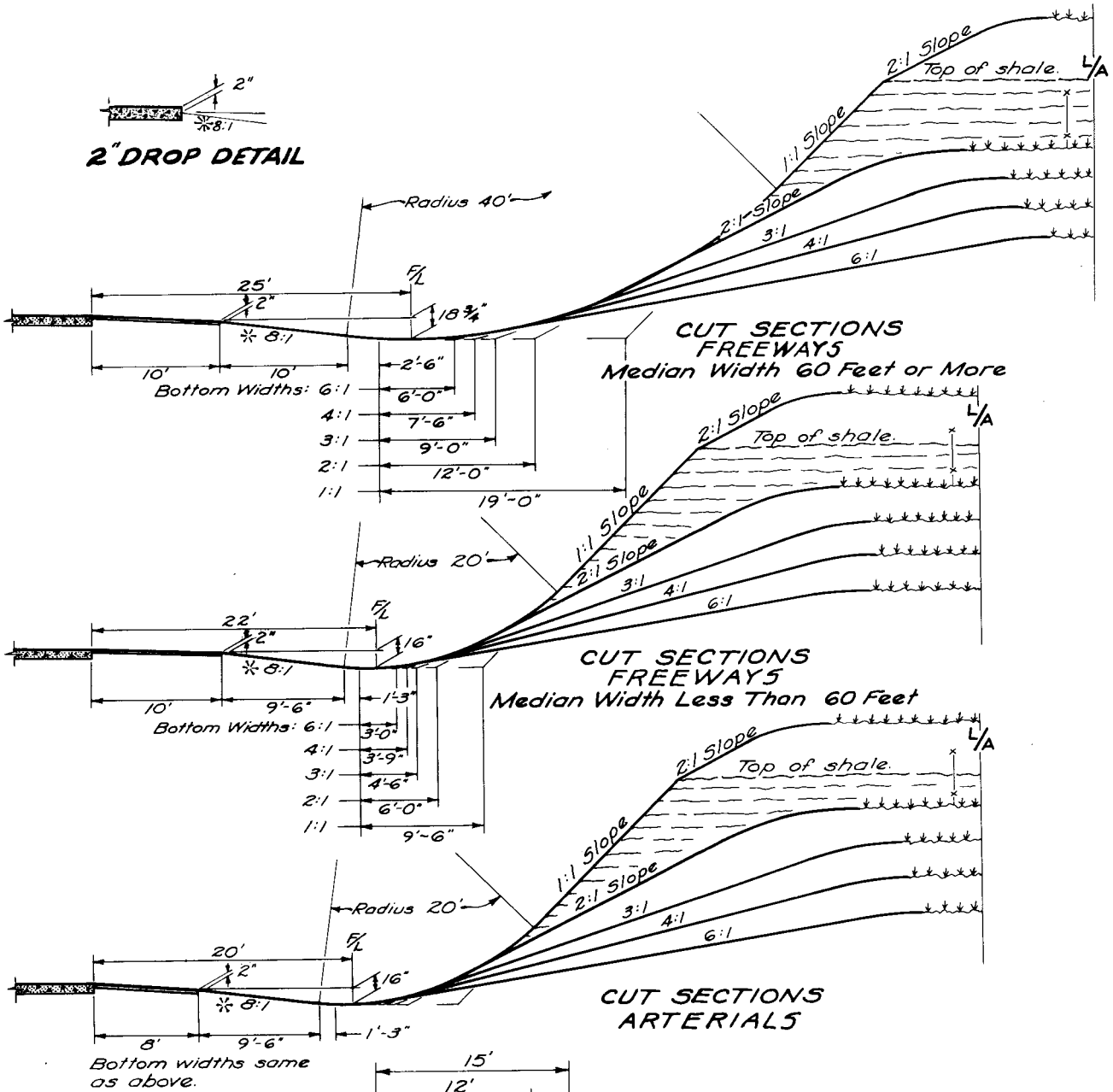
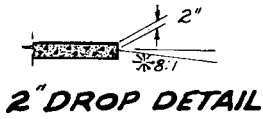
- (g) The combination of a long diamond ramp having gentle alignment, with a loop ramp in the same interchange quadrant, is not to be treated as a trumpet, but each ramp shall be designed independently of the other in accordance with the suggested details set forth above.

#### 703.6 ROADSIDE DESIGNS FOR LOWER CLASS HIGHWAYS

Roadside designs for lower class highways shall generally be as indicated on Figure 703-6. Design principles applied to freeways shall also be applied to designs of lower class highways, such as an examination of the project for the purpose of finding the best roadside design at the least cost, reducing the need for guardrail, removal of channels from close proximity to the pavement, etc.

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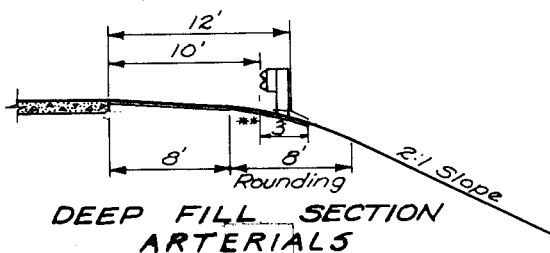
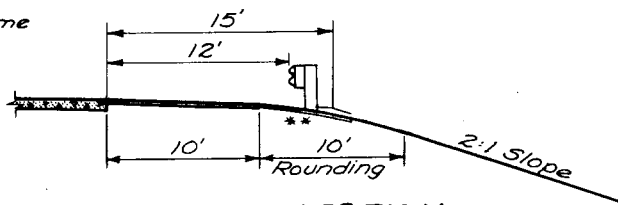
# ROADSIDE DESIGNS ~ FREEWAYS AND ARTERIALS



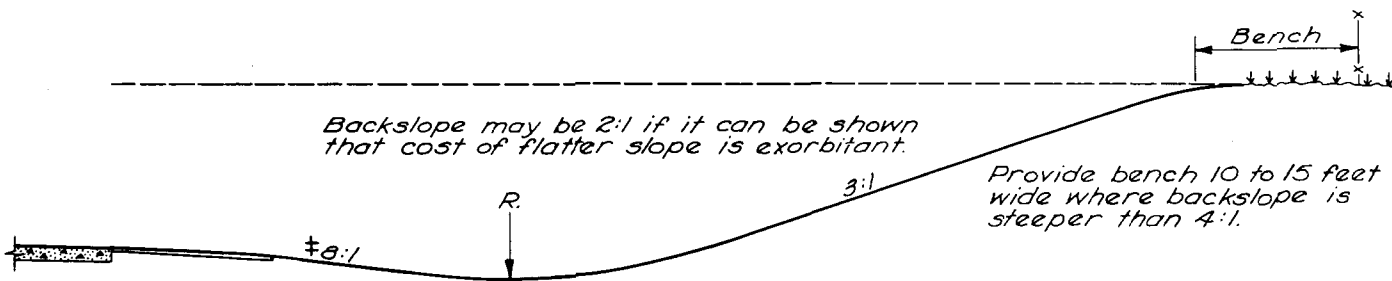
Bottom widths same as above.

\* 6:1 slope may be used with the horizontal distance remaining the same, thereby increasing the ditch depth.

\*\* Optional erosion control 3" of 30I with or without asphalt curb.

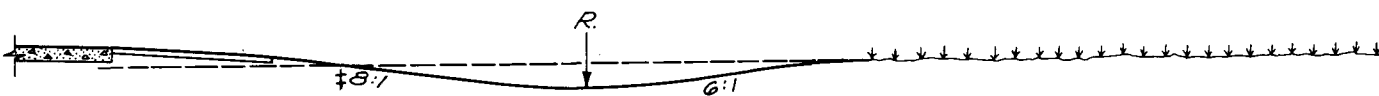


# SLOPE TREATMENT ~ FREEWAYS AND ARTERIALS



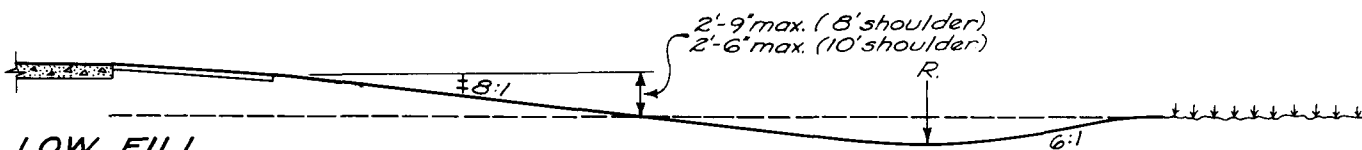
## DEEP CUT IN SOIL

Radius of roadside ditch curve shall be as shown on Figure 703-1.



## SHALLOW CUT or LOW FILL

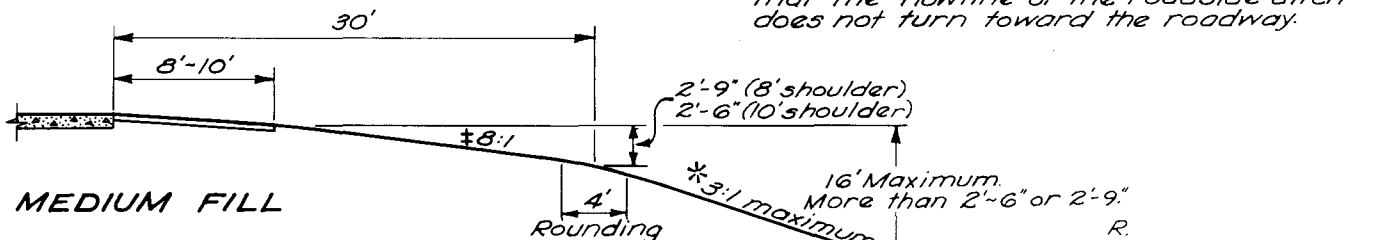
Application of these sections shall be varied where necessary to avoid frequent changes in slope ratios and to maintain reasonably straight side ditches.



## LOW FILL

Radius of roadside ditch curvature "R" shall be the same length for toe-of-slope ditches as used in cuts.

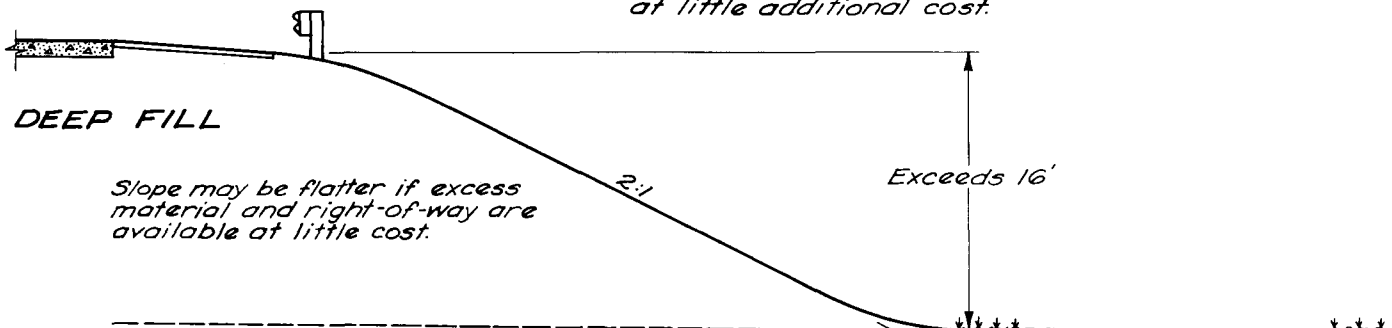
Slope transition between low fill design and medium fill design shall be such that the flowline of the roadside ditch does not turn toward the roadway.



## MEDIUM FILL

8:1 slope may be used

\* 4:1 Slope may be used on high-speed roads where right-of-way is available at little additional cost.



## DEEP FILL

Slope may be flatter if excess material and right-of-way are available at little cost.

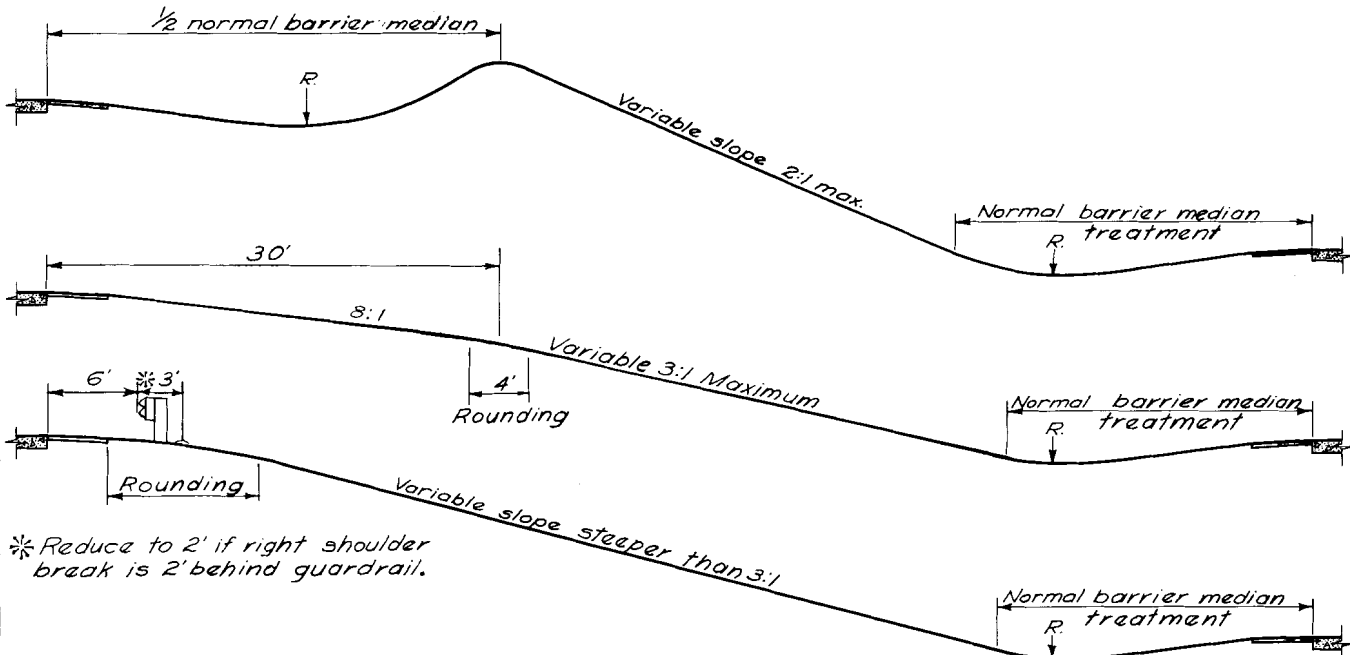
Exceeds 16'

Bench

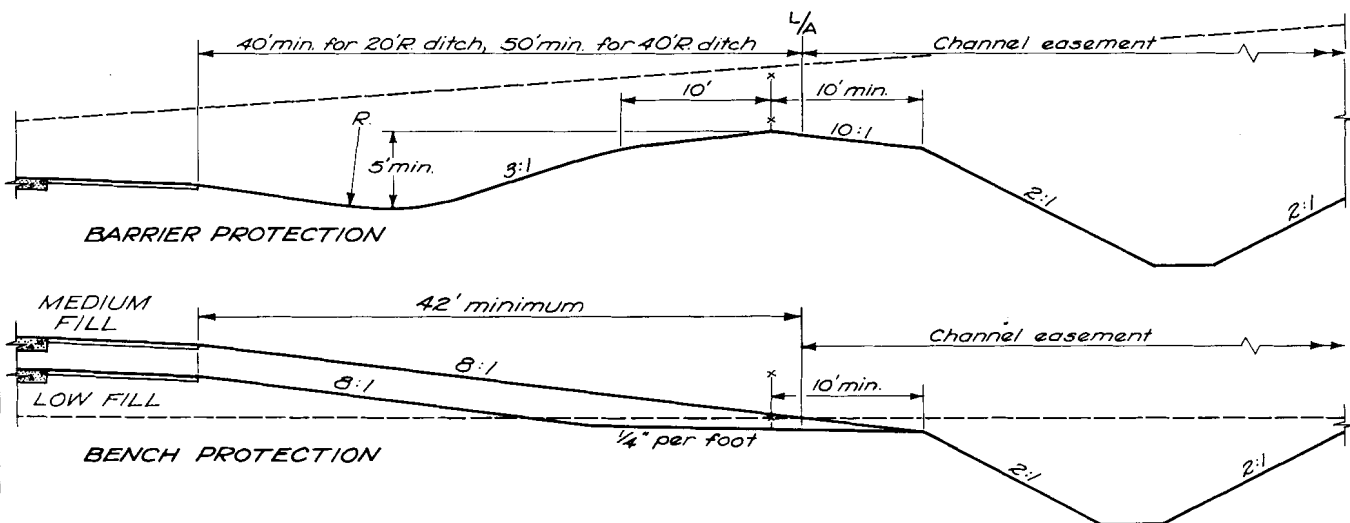
Channel slopes may be as steep as 2:1.

# SPECIAL DESIGNS ~ FREEWAYS AND ARTERIALS

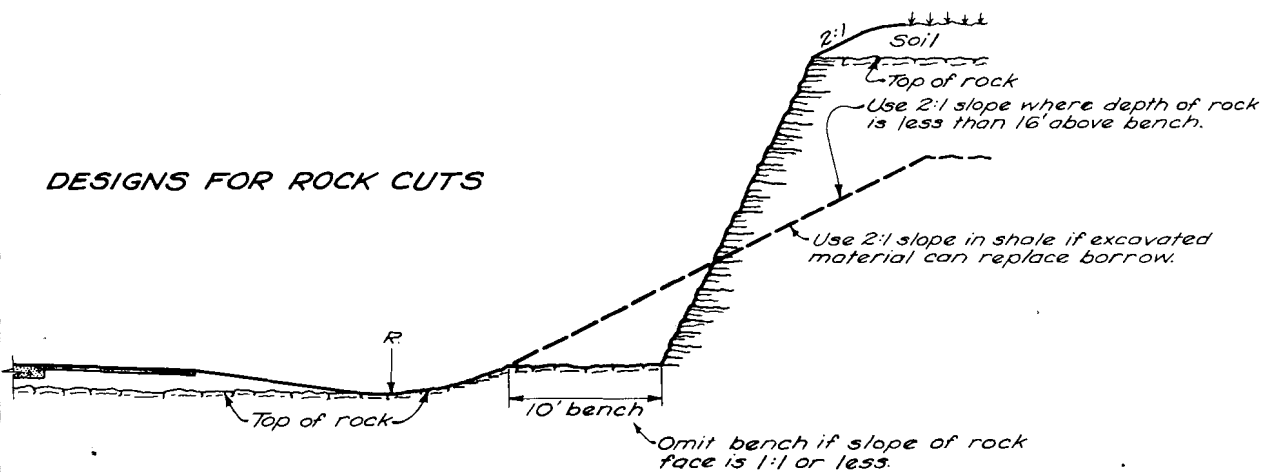
## ALTERNATE MEDIAN DESIGNS ~ SEPARATE PROFILES

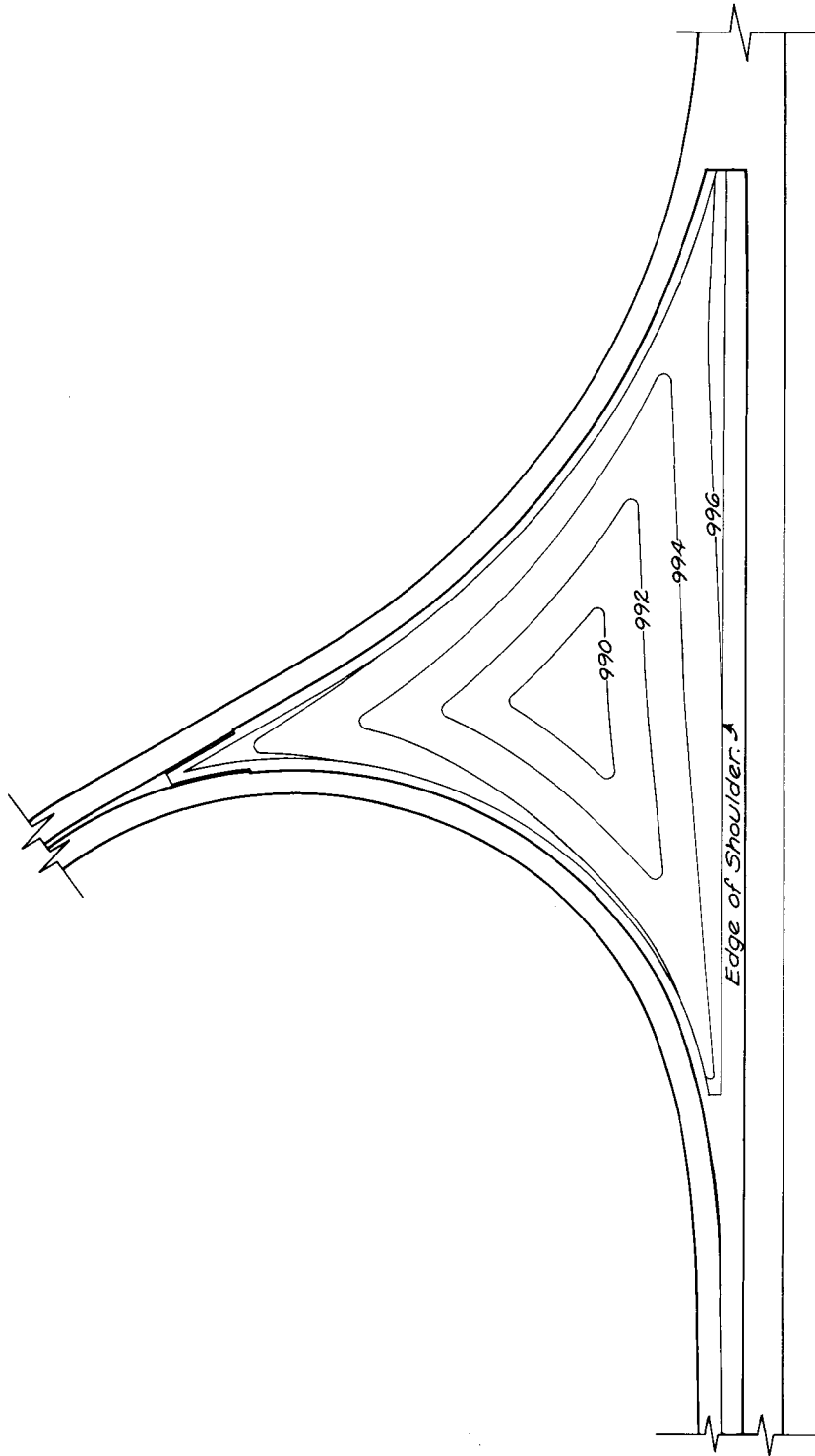


## DESIGNS FOR DEEP PARALLEL SIDE DITCHES



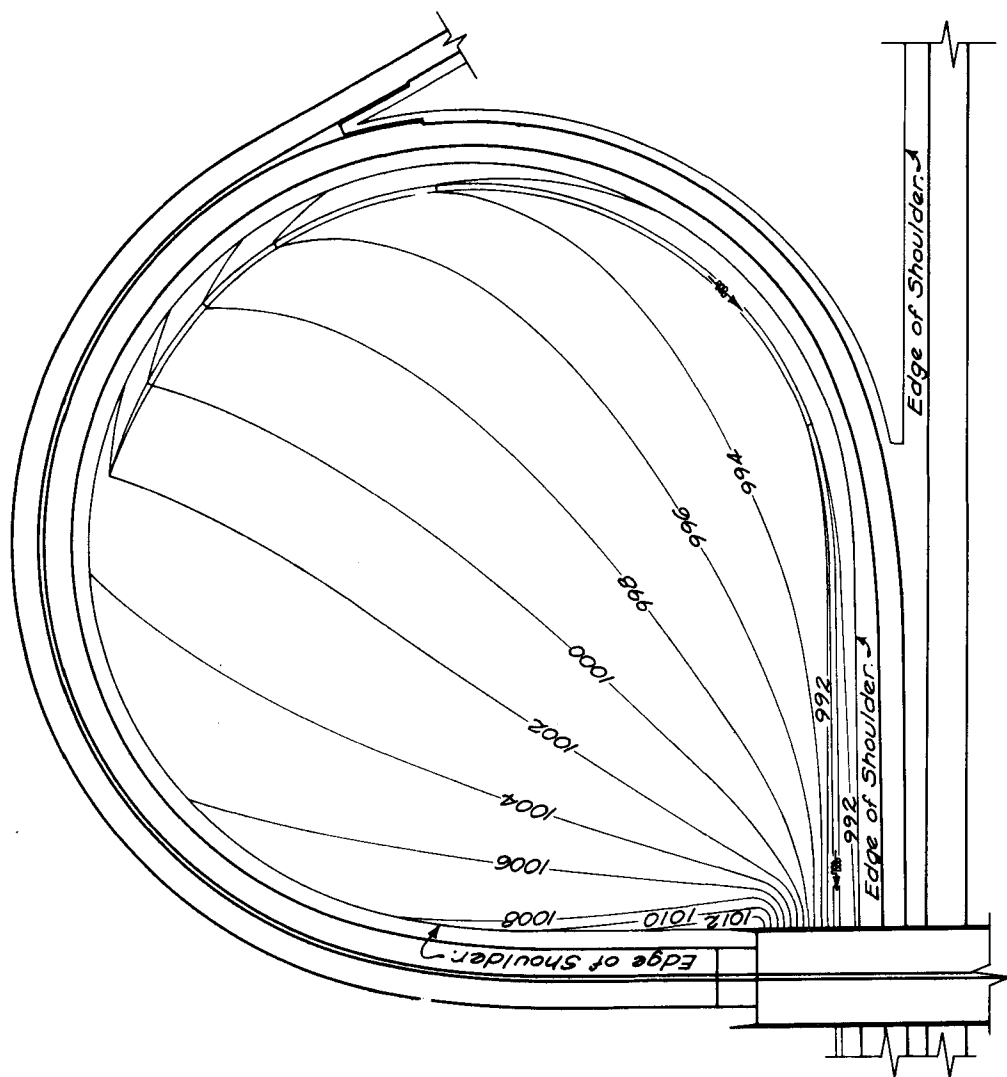
## DESIGNS FOR ROCK CUTS





**CONTOUR GRADING  
of  
TRUMPET INTERIORS**

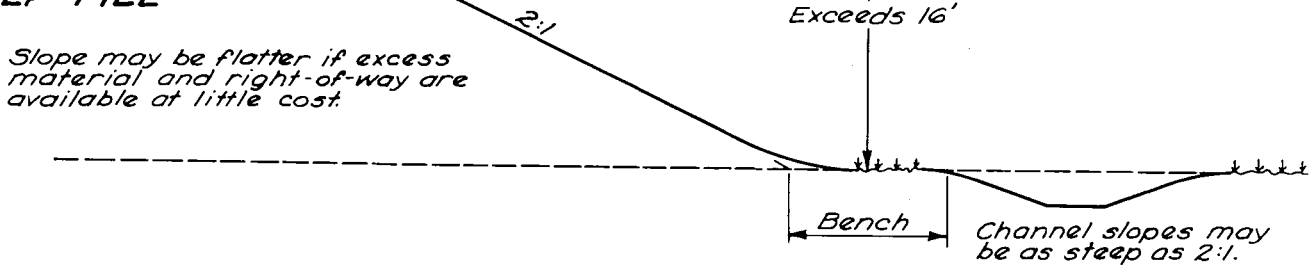
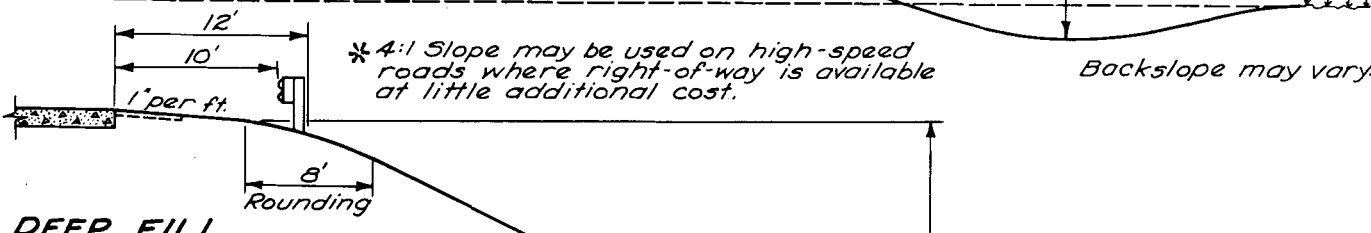
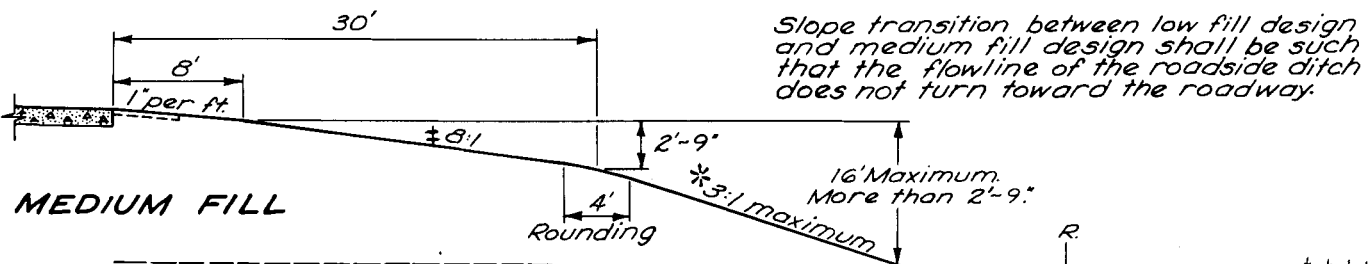
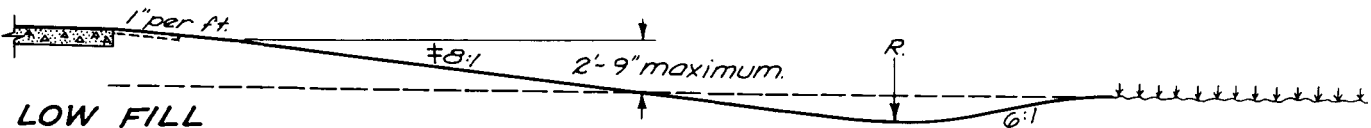
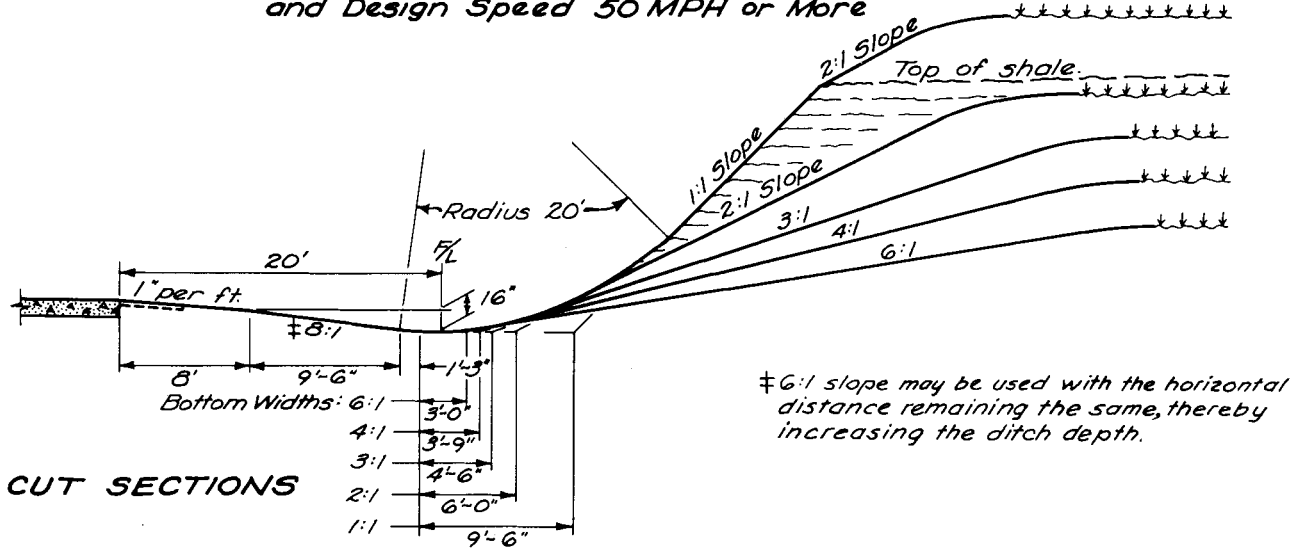




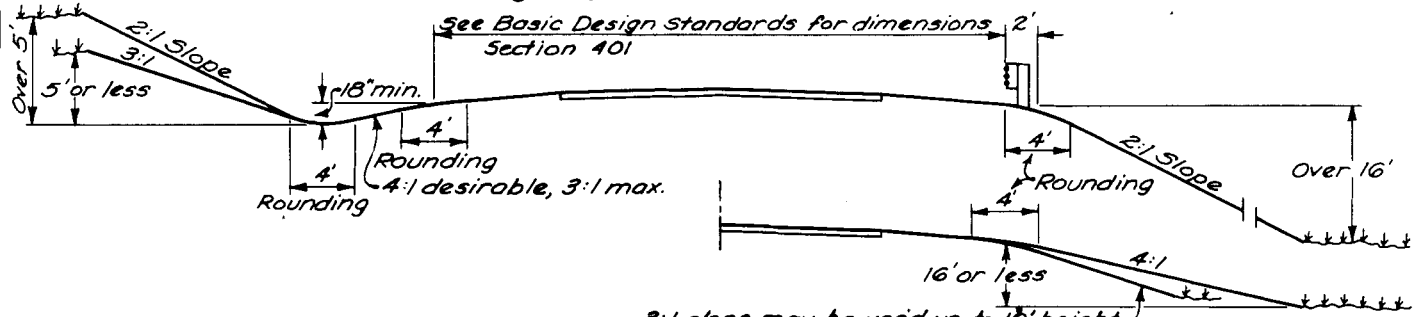
**CONTOUR GRADING  
of  
LOOP INTERIORS  
IN CUT**

# ROADSIDE DESIGNS ~ TWO-LANE HIGHWAYS

HIGHWAYS WITH DESIGN TRAFFIC 1000 ADT OR MORE  
and Design Speed 50 MPH or More

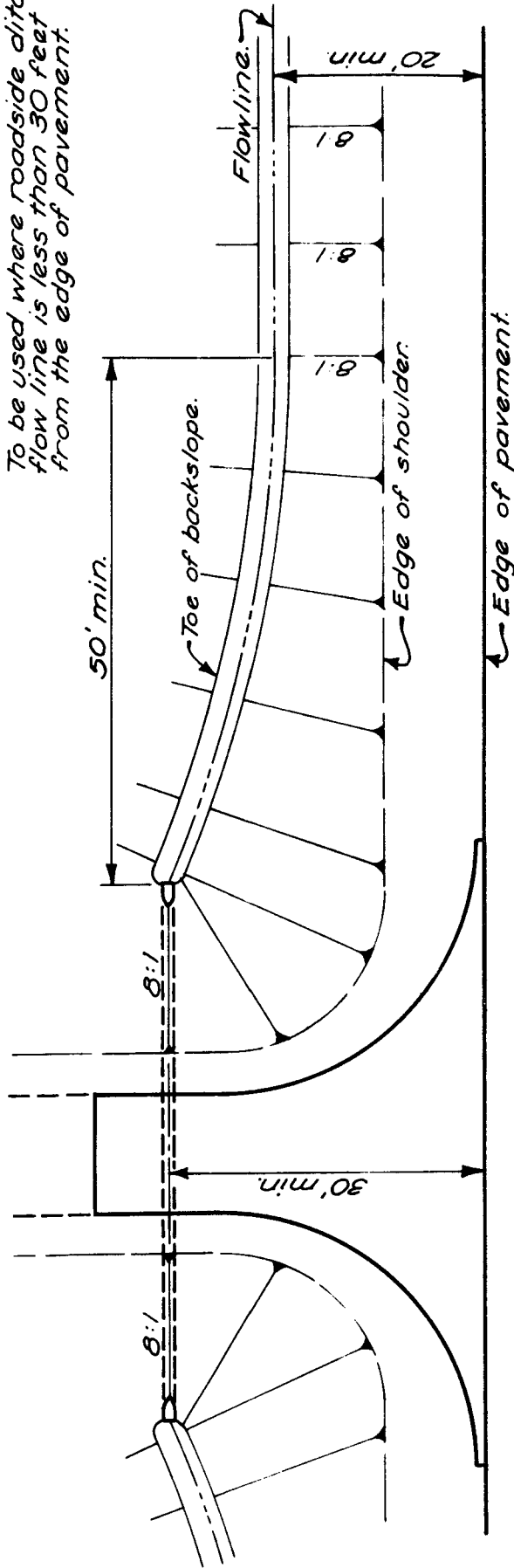


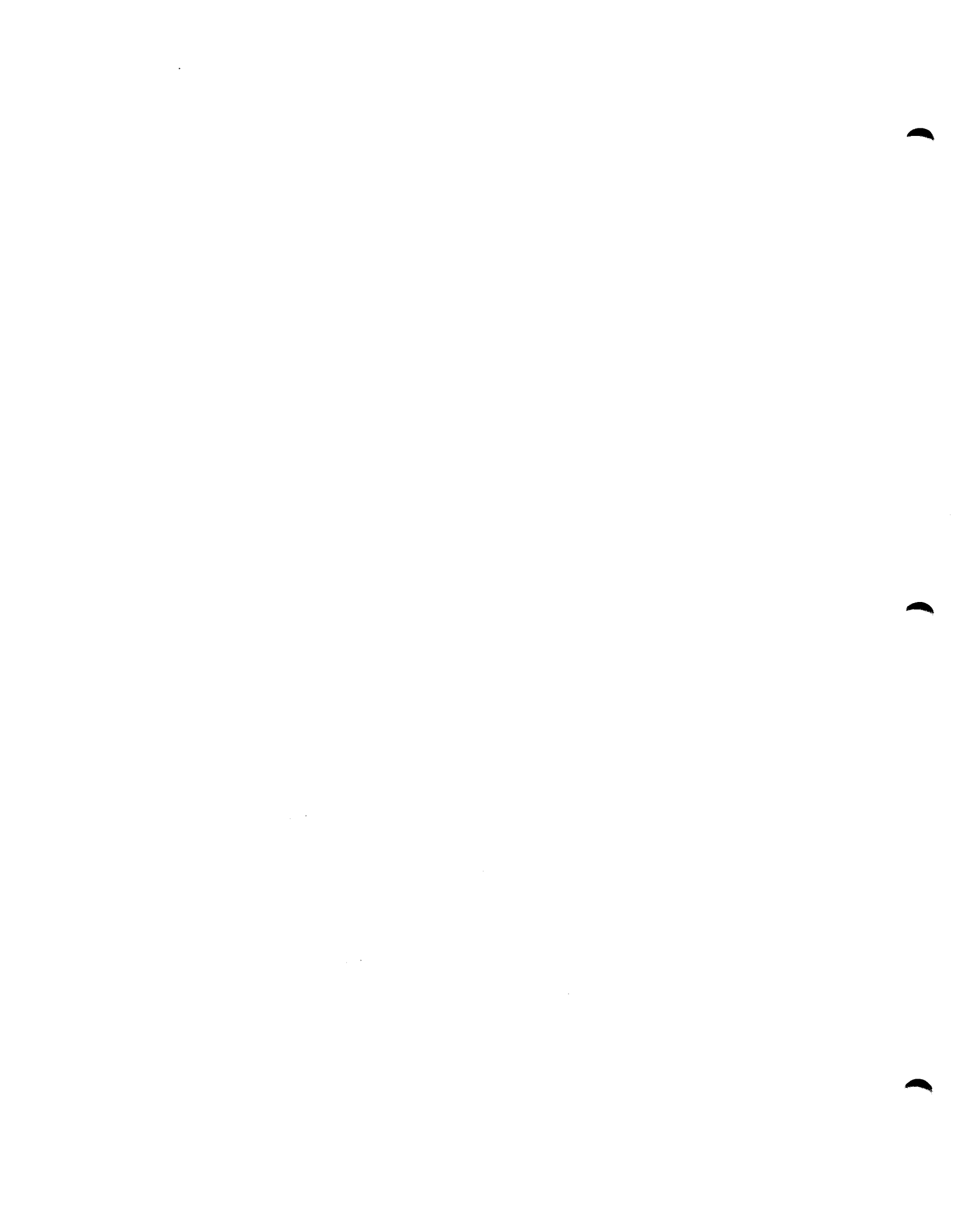
## HIGHWAYS WITH DESIGN TRAFFIC LESS THAN 1000 ADT and Design Speeds Less than 50 MPH



# SLOPES AND DITCHES AT DRIVEWAYS AND CROSSROADS IN CUT OR LOW FILL Design Speed 50 MPH or more

To be used where roadside ditch flow line is less than 30 feet from the edge of pavement.





## (704) MEDIAN STANDARDS

### 704.1 GENERAL

A median is a desirable element on all streets or roads with four or more lanes and classified as freeways or arterials. The principal functions of a median are to prevent interference of opposing traffic, to provide a recovery area for out-of-control vehicles, to provide areas for emergency stopping and left turn lanes and to minimize headlight glare. A median should be highly visible both day and night and in definite contrast to the roadway.

### 704.2 WIDTH

The width of a median is the distance between the inside edges of the pavement. Width depends upon the type of facility, cost, topography and right-of-way. A constant width median is not necessary and independent profiles may be used for the two roadways. Variation in the median width and roadway elevations are elements of the overall design of a divided highway.

.21 RURAL The desirable median width for freeways is 84 feet. In areas with flat or rolling topography, the minimum median width shall be 40 feet; however, in rugged terrain, narrower medians may be used. The desirable median width for arterials is 60 feet.

.22 URBAN The desirable median width for freeways is 24 feet. Narrower medians may be used for lower classes of divided highways or in areas where the right-of-way costs would be excessive.

### 704.3 TYPES

Medians are divided into types depending upon width and treatment of the median area and drainage arrangement. In general, raised or barrier medians are applicable to urban areas, while wide depressed medians apply to rural areas.

.31 RURAL Medians in rural areas are normally depressed to a swale in the center and constructed without curbs (see Figure 704-1).

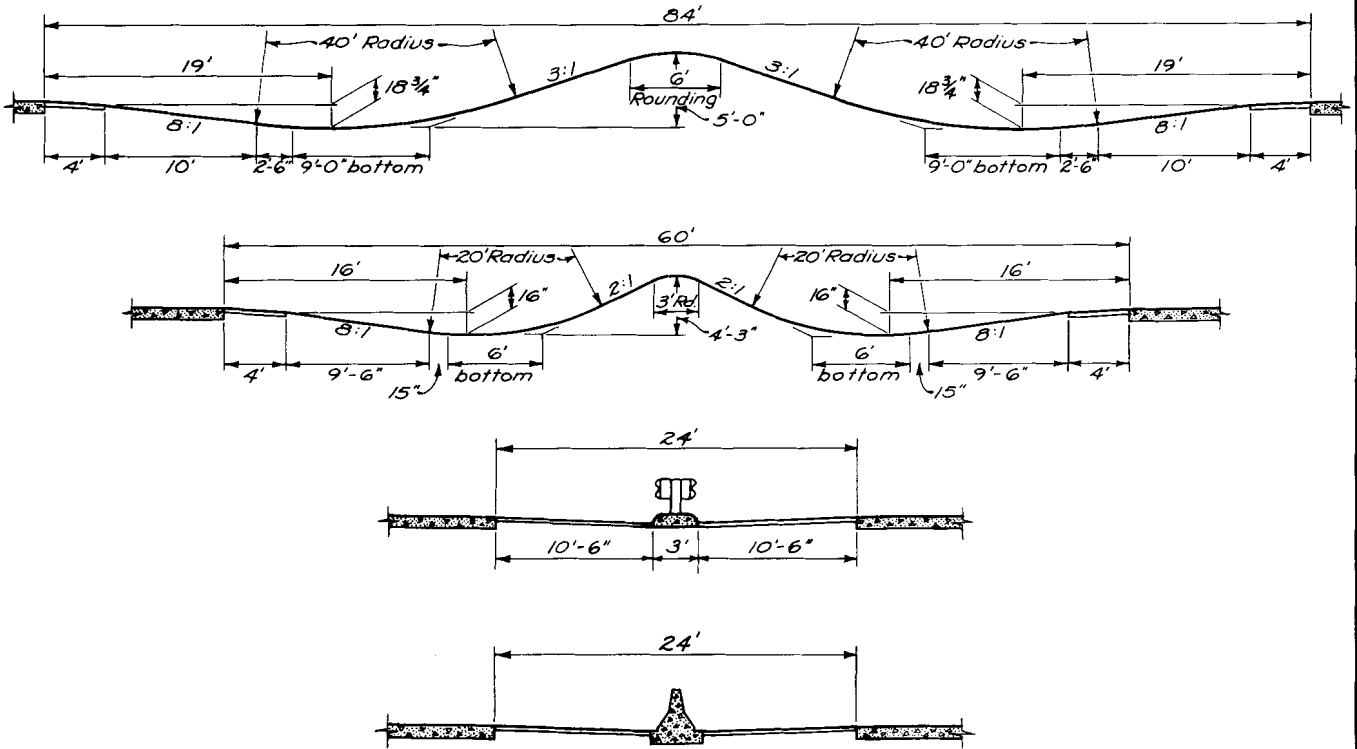
.32 URBAN There are various types of medians applicable to urban areas. The type selected depends on the traffic volume, speed, degree of access and available right-of-way.

- (a) On major streets with numerous business drives, a median consisting of an additional lane, striped for left-turn lanes is functional.
- (b) The solid concrete median (see Standard Construction Drawing MC-6) may be used where an all-paved section is appropriate and where a wider median cannot be justified.
- (c) Guardrail may be used in conjunction with the solid concrete median on freeways that do not meet the criteria for concrete median barrier. See Figures 704-1 and 704-2.

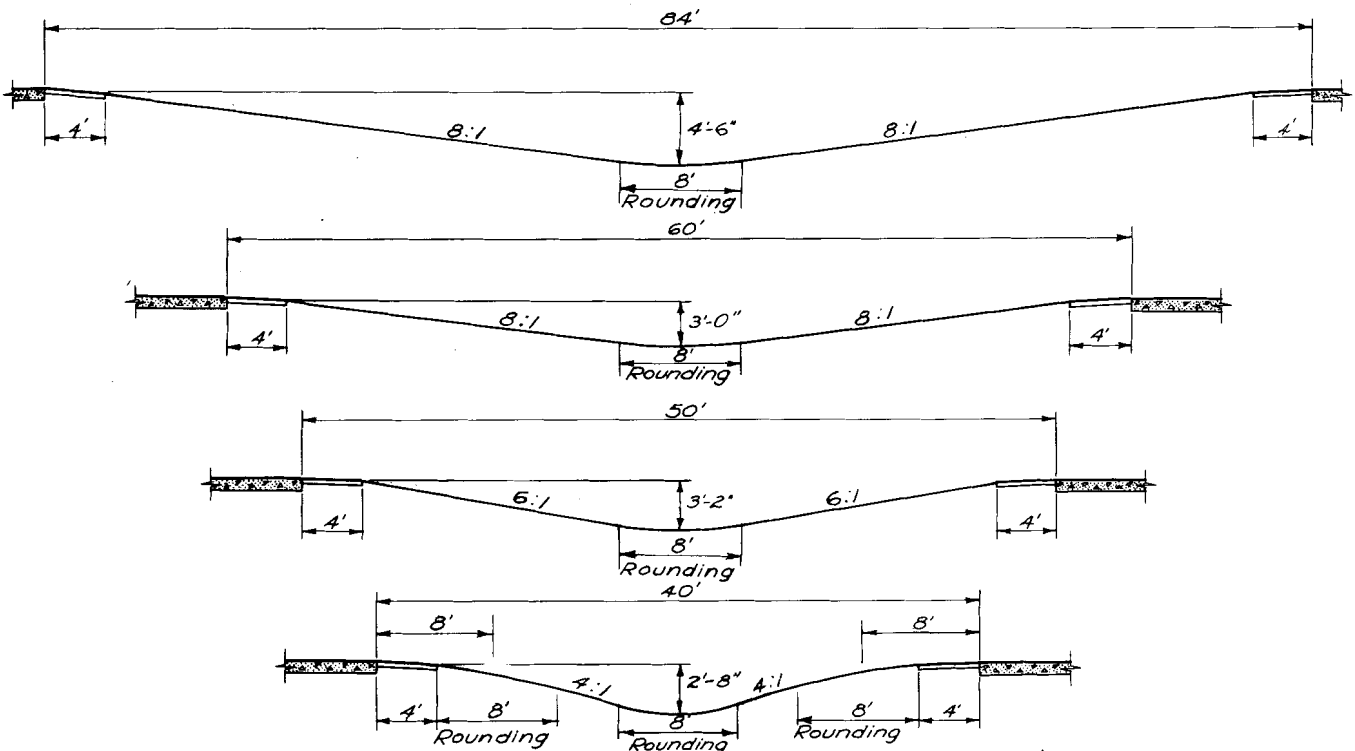
704.4 MEDIAN OPENINGS - See Section 607

# MEDIAN DESIGNS ~ RURAL FREEWAYS & ARTERIALS

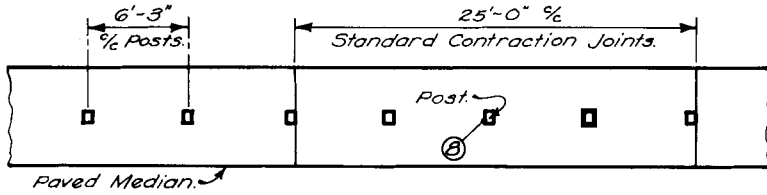
## BARRIER MEDIANS



## DEPRESSED MEDIANS



# PAVED BARRIER MEDIAN



**JOINT DETAIL AT GUARDRAIL POSTS**

## NOTES

In lieu of the spacing requirements of Standard Drawing MC-6, expansion and contraction joints shall be provided in the concrete median as required hereon whenever guardrail is specified.

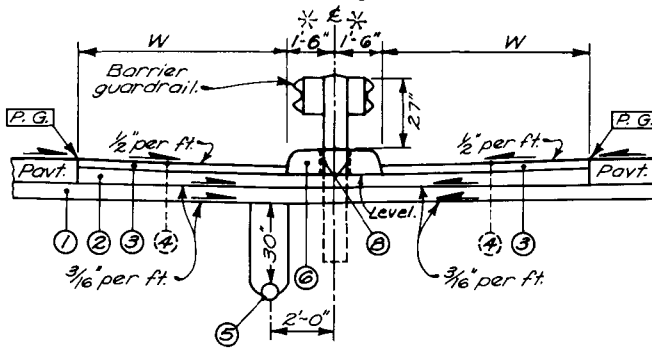
$\frac{1}{4}$ " expansion joints, 705.03, shall be provided at each construction joint, at each end of each inlet and approximately 20 feet and 60 feet beyond each approach slab, cost included with 612 for payment.

Contraction joints shall conform with details shown on Standard Drawing BP-4, 305 Base, except that spacing shall be 25'. Joint opening shall not extend below surface of shoulder paving.

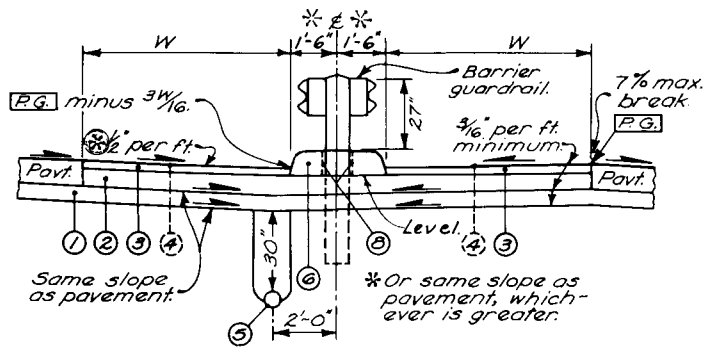
Circular or square openings may be cast in the median paving so that guardrail posts may be installed later. Maximum dimensions for openings shall be 18" diameter or 18" square. Remaining space shall be filled with 1:3 grout or Class C concrete.

## LEGEND

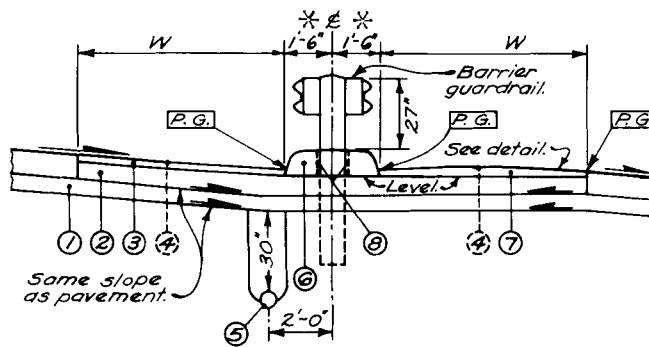
- ① 310 Subbase.
- ② 304 Aggregate Base.
- ③ 301 3" Bituminous Aggregate Base.
- ④ 409 Seal Coat using 0.008 cu. yd. No. 8 aggregate per sq. yd. and 0.30 gal. bituminous material per sq. yd. (See note in proposal). (Adjacent to flexible pavement only.)
- ⑤ 605 Pipe Underdrain.
- ⑥ 612 Concrete Median (See Standard Drawing MC-6).
- ⑦ 301 Bituminous Aggregate Base (See detail).
- ⑧ For square-sawed wood posts  $\frac{1}{4}$ " 705.03 expansion joint material shall be used on all four sides for the depth of median. When steel posts are used, a coating of an oil such as SAE 140 or other "bond-breaking" material shall be applied to the depth of median prior to placing the concrete. Payment shall be included in 612.



**NORMAL SECTION**



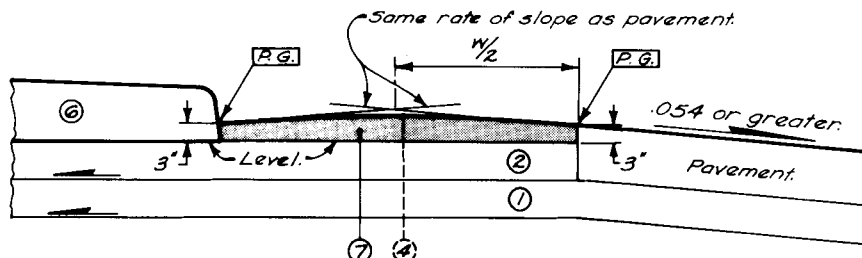
**SUPERELEVATED SECTION  
LESS THAN .054**



**SUPERELEVATED SECTION  
.054 OR GREATER**

⊗ Unless otherwise indicated on the plan.

P.G. = Profile grade.



**PAVED SHOULDER DETAIL**



(706) CURBS

706.1 GENERAL

The type of curb and its location affect driver behavior patterns which, in turn, affect the safety and utility of a road or street. Curbs, or curbs and gutters, are used mainly in urban areas, but occasionally are used in rural areas. Following are various reasons for justifying the use of curbs, or curbs and gutters:

- (a) Where required for drainage.
- (b) Where needed for channelization, delineation, control of access or other means of improving traffic flow and safety.
- (c) Where necessary because of certain restrictions, such as, narrow median, not enough right-of-way for ditches, etc.
- (d) To control parking where applicable.

706.2 TYPES AND USES

There are two general types of curbs; barrier curbs and mountable curbs. Barrier curbs are relatively high and steep-faced. Mountable curbs are designed so that vehicles can cross them with varying degrees of ease.

The curb sections detailed in Standard Construction Drawings BP-5 and BP-7 and as shown on Figure 706-1, are approved types to be used as stated below:

- (a) Type 1 Curb (asphalt curb) is used mostly for temporary situations; such as channelizing traffic, special drainage problems, etc.
- (b) Type 2 Curb is 6" high and is considered mountable. It is widely used along pavement edges and is preferred to Type 6 curb for better drainage design.
- (c) Type 3 & Type 4 Curbs are 4" high and are mountable. They are used for channelizing islands and occasionally along medians and pavement edges. Type 3 is preferred for channelizing islands, with the gutter sloped at the same rate as the adjacent pavement.
- (d) Type 6 Curb is 6" high and is widely used in all situations.

- (e) Type 7 Curb is the barrier type and is used in areas where it is essential that the traffic is controlled, particularly truck traffic.
- (f) Type 8 Curb is similar to the Type 7 except it is a free-standing curb with pavement on both sides.

### 706.3 POSITION OF CURB

.31 **EDGE OF PAVEMENT** Curbs at the edge of pavement have an effect on the lateral placement of moving vehicles. Drivers tend to shy away from them, therefore, all curbs should be offset at least one foot and preferably two feet from the edge of the traffic lane. Where curb and gutter is used, the standard gutter width is two feet. See Figures 706-2(a&b).

.32 **PAVED SHOULDERS** Curbs shall be offset from the pavement edge so that no part of the curb encroaches within the normal paved shoulder along through roads. For position of curbs on ramps see Figure 706-2(d).

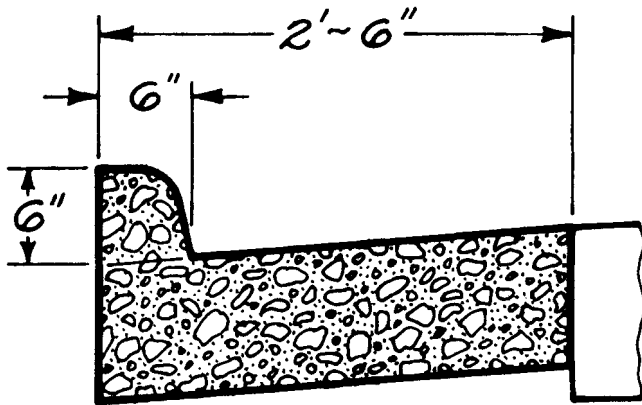
.33 **NON-CURBED MAINLINES** Where there is no curb on the mainline, the intersecting roads and drives shall have no curb located closer to the mainline edge of pavement than 8 feet, or the shoulder width, whichever is greater.

### 706.4 CURB DESIGN DETAILS

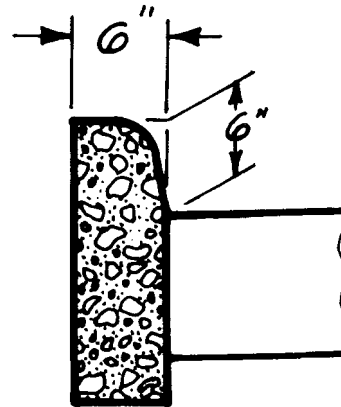
All dimensions are to the point where the face of curb intersects the pavement.

The transition in the height of curb shall be made in a distance of 10 feet to a zero inch height. See Figure 706-2(c). If the curb is flared horizontally, it should be offset 3 foot minimum, or to the outside edge of the paved shoulder. See Figure 706-2(d).

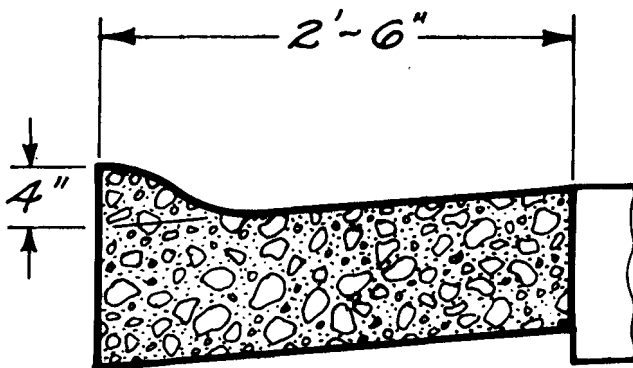
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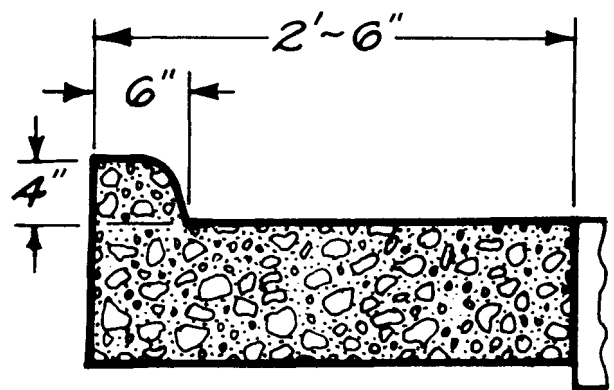
**TYPE 2**



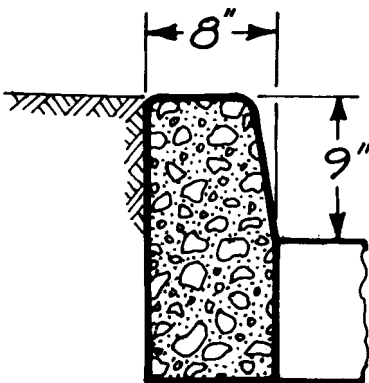
**TYPE 6**



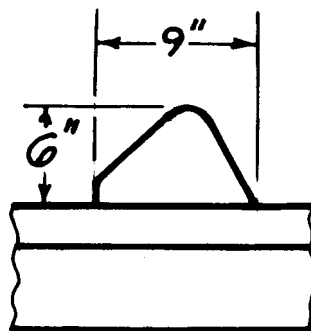
**TYPE 3**



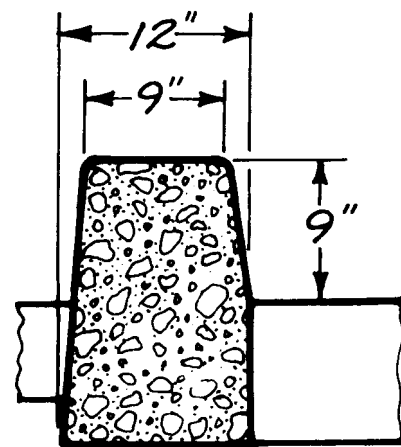
**TYPE 4**



**TYPE 7**



**TYPE 1**  
**CURB TYPES**

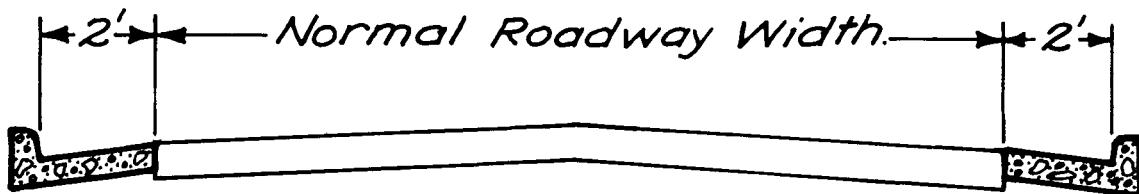


**TYPE 8**

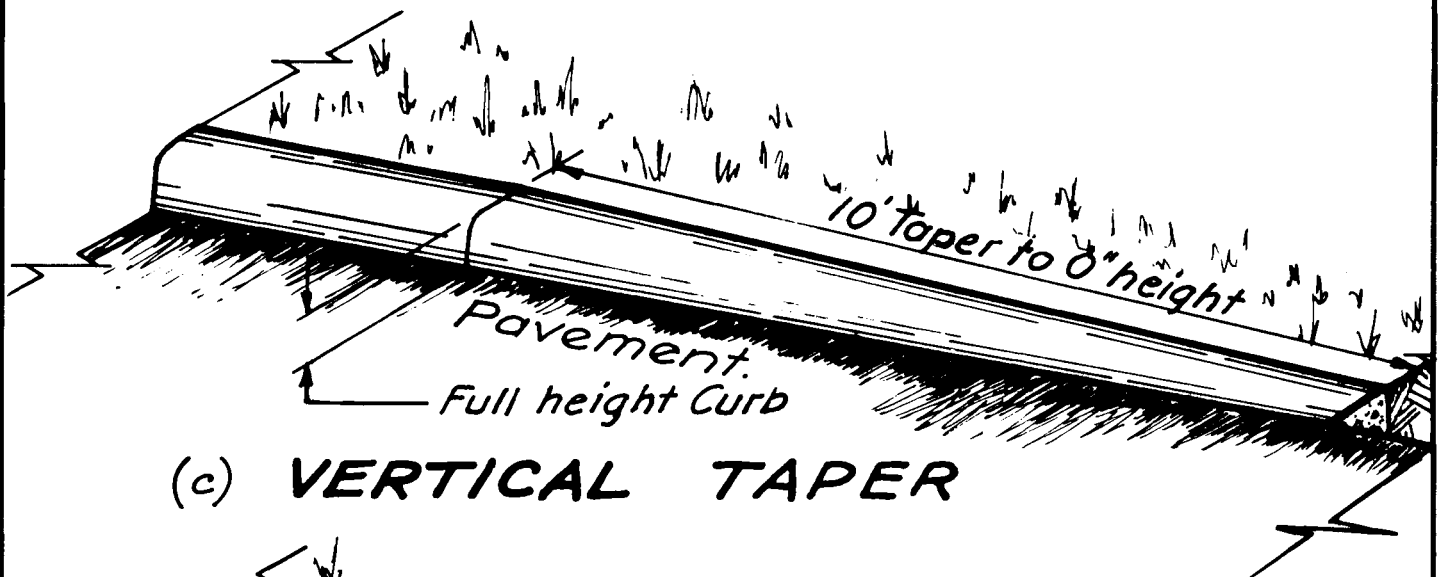
**FIGURE 706-1**



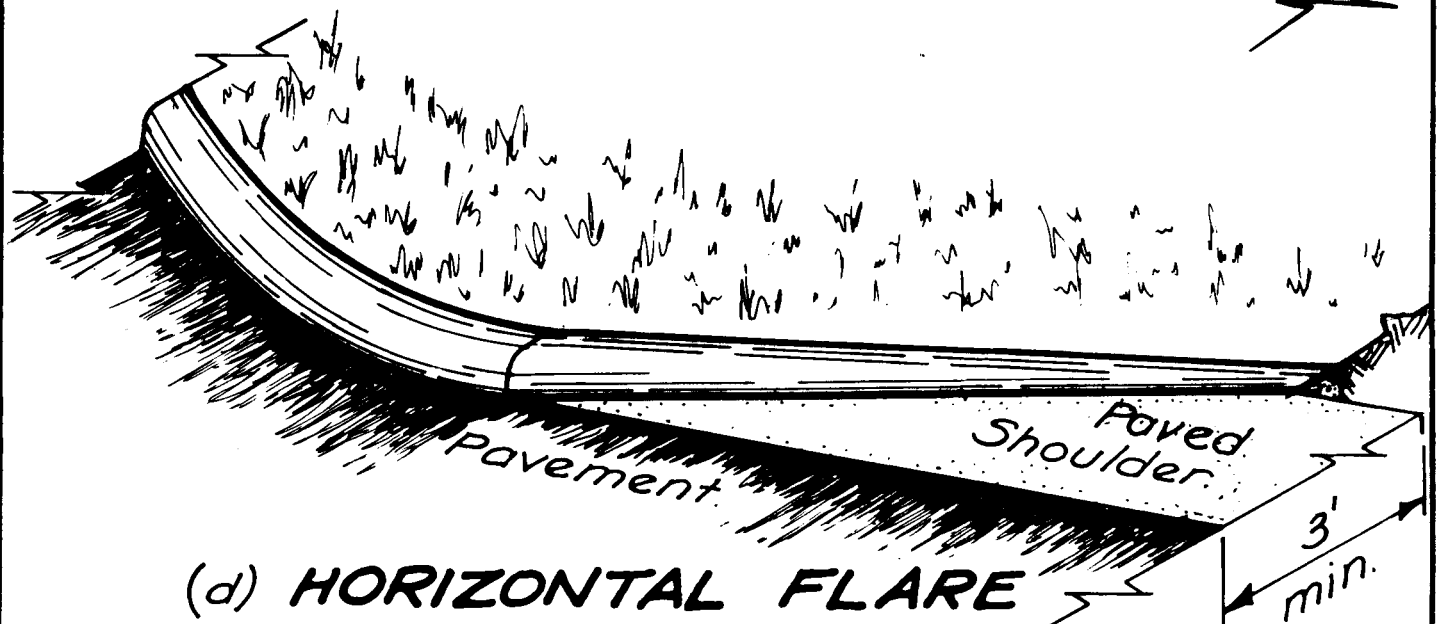
(a) **CURBED SECTION**



(b) **CURB & GUTTER SECTION**



(c) **VERTICAL TAPER**



(d) **HORIZONTAL FLARE**  
**SPECIAL DETAILS**

(708) EROSION CONTROL AT BRIDGE ENDS

708.1 GENERAL

For the purpose of reducing problems of erosion in the vicinity of bridge ends, details as shown on Standard Construction Drawing MC-7 shall be followed.

708.2 CORNER CONE

Item 667, Seeding and Jute Matting or Item 668, Seeding and Excelsior Matting shall be placed on all bridge approach embankment corner cones, beginning at the edge of the crushed aggregate or concrete slope protection.

708.3 SODDED FLUME

Item 660, Reinforced Sodding shall be used to provide a sodded flume, per MC-7, at the end of the 26 foot long curb at each bridge corner; except none is required where the roadway embankment slope is 6:1 or flatter, such as in the median of a divided highway. Sodded flumes are not required with curbed approach roadways.

A sodded flume may be specified on the plan near the end of uncurbed bridges if the designer determines this erosion protection is needed. Use in such locations will usually be initiated by the bridge designer.

brl

