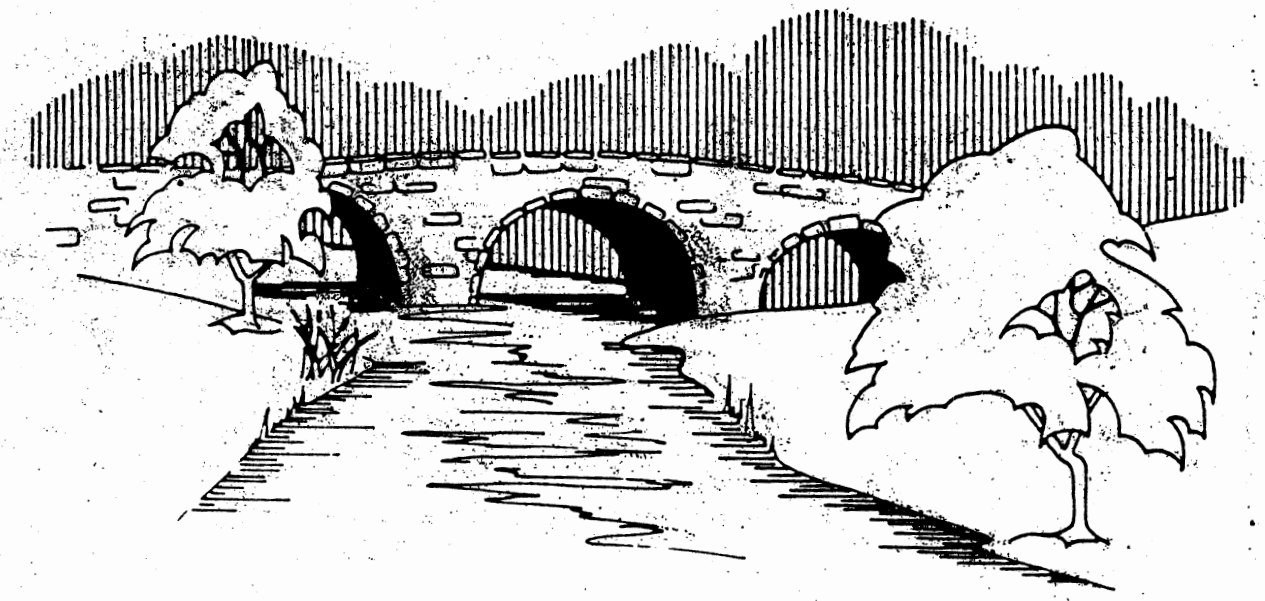
new jersey department of transportation

design manual



bridges and structures

Second Edition 1987

SECTION 22

DECK DRAINAGE

1.22.1 HYDRAULIC CRITERIA

(a) In design of the drainage for bridge decks, the rational method included in the Federal Highway Administration's publication Drainage of Highway Pavements - Hydraulic Engineering Circular No. 12, may be used as a guide. The formula is:

$$Q = CiA$$

Where Q = peak of runoff in cfs.
C = runoff coefficient.
i = Average rainfall intensity in inches per hour.
A = drainage area in acres.

The following assumptions shall apply

Runoff coefficient, C - 0.9 for both concrete and asphalt pavements.

i - average rainfall intensity in inches per hour shall be:

(1) Crest or straight rate longitudinally - 10 year frequency flood = 7 inches per hour.

(2) Sags - 50 year frequency flood = 9 inches per hour.

1.22.2 CROSS SLOPES

(a) The minimum cross rate on driving lanes on bridge decks shall be 1 percent for concrete pavement roadway and 1½ percent for bituminous pavement roadway. The minimum cross rate on shoulders shall be 2 percent but preferably up to 4 percent.

1.22.3 GRADES

(a) Drainage of bridge decks requires adequate grade. Vertical curves on bridge decks should provide a minimum fall of 0.05 foot per station. This fall

shall not extend over a length greater than 100 feet. The flatest allowable tangent grade shall be 0.12 percent. The flatest allowable tangent grade on long bridges, where drainage is confined to the bridge deck, shall be 0.25 percent.

1.22.4 INLETS AND DOWNSPOUTS

(a) Bridges of spans less than 150 feet may normally be designed without curb inlets.

(b) Bridge drains on stream bridges, with curbs, shall be located midway between diaphragms or crossframes and shall discharge directly into the stream in such a way that no part of the superstructure or adjacent structure can be affected.

(c) For bridge drains on bridges over land, horizontal runs of drain pipe shall be avoided whenever a reasonable modification of the design scupper spacing will permit placement of drains adjacent to piers at the low end of spans. Scuppers shall not be discharged on embankments.

(d) Where horizontal runs of drain pipe cannot be avoided, the minimum pitch shall be 1 inch per foot.

(e) Drainage from bridge superstructure or embankments shall not discharge onto or drain across a railroad Right-of-Way without the approval of the railroad company.

(f) Downspouts, where required, shall be not less than 8 inch diameter, galvanized steel alloy pipe. No painting of pipe is required. They shall be provided with readily accessible cleanouts. Details should be such that no water is discharged against any portion of the structure. See Standard Specifications for alternative fiberglass pipe.

(g) Downspouts shall be located on the side away from traffic.

(h) Bicycle grates for inlets should be considered for use in accordance with guide lines established by the MEMORANDUM,All Design Units dated January 26, 1983.

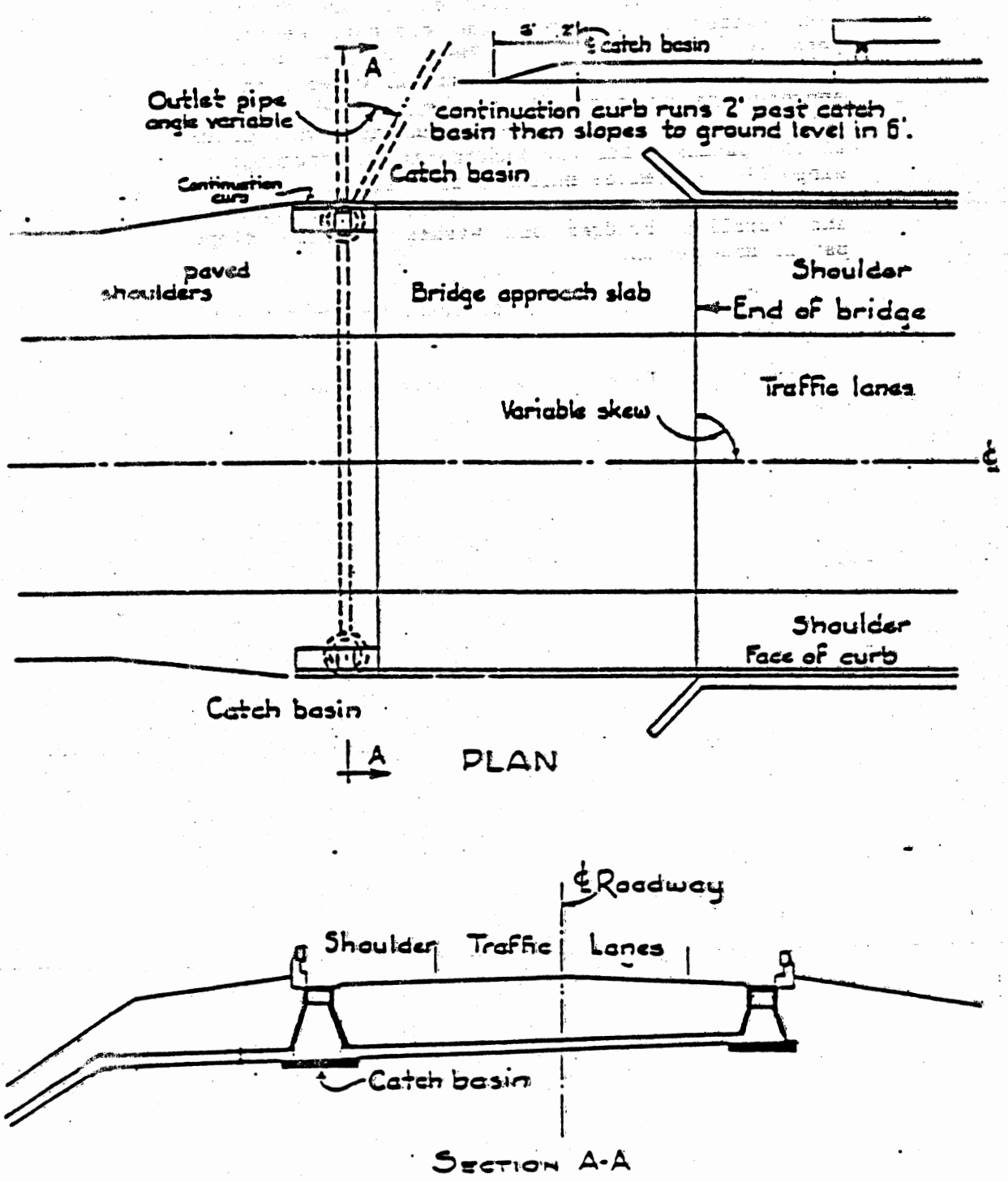
1.22.5 CATCH - BASIN SYSTEM AT BRIDGE ENDS

(a) If a bridge is on a grade or in a sag where it may collect highway drainage, a catch basin should be

provided just off the upgrade end of the bridge in each gutter to intercept the drainage before it gets on the structure. Most bridge drainage systems are marginal, and additional water from the approach roadways should not be imposed on them. Water should be prevented from running down a crack at the paving notch and undermining an abutment or wingwall. A similar nuisance is created when water runs down a median strip between parallel roadways and parallel bridges and washes out the slope paving underneath.

This applies to new bridge designs, bridge replacements, and reconstruction projects.

The sketch on Page 1.22-4 illustrates the concept desired.



Bridge-end catch basin system