Design Standards Letter

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Section/Plan No.: None

Subject: Design Data for Combination Curb Opening and Grate Type Drop Inlets and Curb Opening Type Drop Inlets

Body

TO ALL DIVISION, DISTRICT AND URBAN ENGINEER:

Subsequent to issuing Design Letter No. 22, 1959, dated August 3, 1959, advising of the addition of Drawing No. 36X-1 (Combination Curb and Grate Inlets) to the list of approved standards for use in the handling of pavement drainage on urban and expressway design involving curb and gutter adjacent to driving lanes, several inquiries have been received regarding a table of hydraulic data for Type 36X and 36T drop inlets.

In response to these inquiries we are attaching one print each of Table IV and Chart IV. These are to be used for determining the length of curb opening required in the combination inlet.

We are also attaching one print of Chart V, which is to be used in conjunction with the Table attached to Design Letter No. 17, 1955, for determining the length of curb opening required for the curb inlet alone.

All discharge figures given under heading "Gutter Flow" in Table IV are based on one condition, that is maximum depth of flow with allowable width of spread. The combination curb opening and grate type inlets should not be used in all cases of partial flow. For instance, the Type G inlet should be used where the design discharge does not exceed its capacity with allowable bypass.

The following example will illustrate the method to be used in determining the length of curb opening required for partial flow conditions:

Given: Design Q = 2.7 c.f.s.
Grade 5.0%, cross slope 0.04' per foot.
Curb & gutter section adjacent to pavement.
Flow line 2" below pavement edge.

To Find: Inlet opening required.

Solution; Refer to Table IV for gutter flow data based on 5.0% grade with 0.04' cross slope and read as follows:

Q = 5.56 c.f.s. at 0.35 maximum depth of flow.

Partial Discharge Ratio = 2.7 or 49% of maximum discharge.
5.56

Enter Chart IV with 49% and find partial depth = 0.28 on solid line curve for gutter flow 0.35' maximum depth.

Refer to Table IV for curb opening capacity on 5.0% grade with 0.04' cross slope and read Q - 3.28 c.f.s. for a 7' 6" opening.

Then 3.28 = 0.44 c.f.s. (per foot of opening).
7.5

Enter Chart IV with partial flow depth of 0.28' and find 61% on dashed line curve for curb opening interception (0.35' maximum depth).

0.44 x 61% = 0.27 c.f.s. interception per foot of opening for design condition.

First: try a 5'0" curb opening.

0.27 x 5.0 = 1.35 Q for 5' opening at partial flow depth of 0.28',

2.70 - 1.35 = 1.35 Q (Curb opening bypass to grate).

Refer to Table IV, under column labeled "2' x 2' grate Q" and read 2.95 allowable grate capacity for .04' cross slope on 5.0% grade.

Q 2.95 (Allowable grate capacity) - 1.35 (Curb opening bypass) = 1.60 c.f.s. which indicates that the 5' 0" curb opening in combination with 2' x 2' grate is more than is needed to handle 2.7 Q, therefore a shorter curb opening should be investigated.

Second; try a 2' 6" curb opening.

0.27 x 2.5 = 0.68 Q for 2' 6" opening at partial flow depth of 0.28',

2.70 - 0.68 = 2.02 Q (Curb opening bypass to grate).

2.95 (Grate capacity) - 2.02 (Bypass) = 0.93 excess capacity.

The 2' 6" curb opening in combination with 2' x 2' grate is still a little more than

adequate for partial flow capacity.

Allowable grate capacities as indicted in Table IV are based on a flow depth of 0.42' in depressed section in all cases.

Chart V is used in the same manner for determining the required length of curb opening as illustrated above for Chart IV.

We trust that these charts and table will be of assistance to your designers in partial flow problems. In the event that additional information is needed or clarification required as to the use of the table and charts, please advise.

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