

SUDAS Revision Submittal Form

Status Date: As of 5/18/2023 Topic: Time of concentration
Manual: Design Manual Location: Section 2B-4, B, 1, b and 3, c

Requested Revision:

B. Rational Method

1. Rational Method Characteristics:

b. The following are additional factors that might not normally be considered, yet could prove important:

- 1) The storm duration gives the length of time over which the average rainfall intensity (i_T) persists. Neither the storm duration, nor i_T , says anything about how the intensity varies during the storm, nor do they consider how much rain fell before the period in question.
- 2) A 20% increase or decrease in the value of C has a similar effect as changing a 5 year recurrence interval to a 15 year or a 2 year interval, respectively.
- 3) The chance of all design assumptions being satisfied simultaneously is less than the chance that the rainfall rate used in the design will actually occur. This, in effect, creates a built-in factor of safety.
- 4) In an irregularly-shaped drainage area, a part of the area that has a short time of concentration (T_c) may cause a greater runoff rate (Q) at the intake or other design point) than the runoff rate calculated for the entire area. This is because parts of the area with long concentration times are far less susceptible to high-intensity rainfall. Thus, they skew the calculation.
- 5) A portion of a drainage area that has a value of C much higher than the rest of the area may produce a greater amount of runoff at a design point than that calculated for the entire area. This effect is similar to that described above. In the design of storm sewers for small subbasin areas such as a cul-de-sac in a subdivision, the designer should be aware that an extremely short time of concentration will result in a high estimate of the rainfall intensity and the peak rate of runoff. The time of concentration estimates should be checked to make sure they are reasonable. ~~For most applications, a minimum T_c of 15 minutes may be assumed.~~
- 6) When utilizing the Rational Method for street intake design (spacing, street spread calculations, and storm sewer pipe sizing) a minimum T_c of 15 minutes may be used. Using T_c values lower than 15 minutes may result in an overly conservative design with unnecessarily short intake spacing and over-sized storm sewer pipes. T_c values less than 15 minutes for street intake spacing may still be appropriate based on engineering judgement and the size and shape of the drainage area. When not using the Rational Method for street intake spacing, the appropriately calculated T_c should be used.
- 67) In some cases, runoff from a portion of the drainage area that is highly-impervious may result in a greater peak discharge than would occur if the entire area was considered. In these cases, adjustments can be made to the drainage area by disregarding those areas where flow time is too slow to add to the peak discharge. Sometimes it is necessary to estimate several different times of concentration to determine the design flow that is critical for a particular application.
- 78) When designing a drainage system, the overland flow path is not necessarily the same before and after development and grading operations have been completed. Selecting overland flow paths in excess of 100 feet in urban areas and 300 feet in rural areas should be done only after careful consideration.

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3. Use of the Rational Method:

- c. Rainfall Intensity:** The intensity (i_T) is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency, with duration equal to the time of concentration. The method(s) for determining time of concentration are presented in Section 2B-3.

~~From a practical standpoint, using a T_c of less than 15 minutes may yield unreasonably high flow rates. For most applications, a minimum T_c of 15 minutes may be used.~~

After the T_c has been determined, the rainfall intensity should be obtained. For the Rational method, the design rainfall intensity is that which occurs for the design year storm whose duration equals the time of concentration. Tables 2B-2.02 through 2B-2.10 in Section 2B-2 provide the Iowa rainfall data from Bulletin 71 to allow determination of rainfall intensity based on duration equaling the time of concentration.

Reason for Revision: Modified discussions on minimum time of concentration.

Comments: None.

District:	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> 6	2/22/2023 Webinar
Comments:	Reducing the time of concentration to 5 minutes would mean a significant increase of intakes (and therefore cost) added to street designs. One guest present during the webinar gave a quick summary of the impacts of changing the time of concentration from 15 mins to 5 or 10 mins.						
District:	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> 6	4/2023 Meetings
Comments:	None.						
Action:	<input type="checkbox"/> Deferred		<input type="checkbox"/> Not Approved		<input checked="" type="checkbox"/> Approved		

Final District Action Summary: All 6 districts approved.

Board of Directors Action: Approved.