DRAINAGE — RUNOFF — 2

Q = Aci RATIONAL FORMULA (Logical approach).

Q = RUNOFF = Peak discharge of watershed in cubic feet per second (c.f.s.) due to maximum storm assumed. See Figs. A to F, Pg. 18-01 (Usually 10 – 25 years).
A = Area of watershed in acres.
C = Coefficient of runoff, Table B below (Measure of losses due to infiltration, etc.).
i = Intensity of rainfall in inches per hour based on concentration time. See Pg. 18-0
Concentration time = time required for rain falling at most remote point to reach discharge point. Concentration time may include Overland flow time, Fig. H, Pg. 18-01, and Channel flow time, Pg. 18-05, 18-06, 18-69 and 18-71.

TABLE A-COMPUTATION FORM FOR RATIONAL FORMULA.

LOCATION			A		C	TIME OF FLOW - MIN.			L *	Q c.f.s.	DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	IN CHANNEL	TIME OF CONC			CHANNEL OR PIPE SIZE	SLOPE ft. per ft.	n	CAPACITY FULL c.f.s.	V ft. per sec.	LENGTH ft.	FALL ft.	OTHER LOSSES ft. †	INV. ELEV. UPPER END	INV. ELEV. LOWER END
FIRST ST.	A	B	1.8	1.8	.44	16.5	0.3	16.5	3.8	3.0	15"	.008	.015	4.6	3.9	60	0.48	0	82.00	81.52
MAIN RD.	B	C	1.9	3.7	.50		2.5	16.8	3.7	6.8	D-2	.011	.030	12.0	2.8	420	4.62	0	81.52	76.90
" "	C	D	2.0	5.7	.50		1.8	19.3	3.5	10.0	21"	.007	.015	11.1	4.5	480	3.36	2.20	74.70	70.34

* Note that the sequence of design as in example, Fig. J, Pg. 18-01 involves trial assumptions in determining i.
† Fall in manhole.

TABLE B – VALUES OF C = RUNOFF / RAINFALL

SURFACES			VALUE PROPOSED MIN.	VALUE PROPOSED MAX.	VALUE BY OTHER AUTHORITY MIN.	VALUE BY OTHER AUTHORITY MAX.	
ROOFS, slag to metal.			0.90	1.00	0.70	0.95	①
PAVEMENTS	Concrete or Asphalt.		0.90	1.00	0.95	1.00	②
	Bituminous Macadam, open and closed type.		0.70	0.90	0.70	0.90	③
	Gravel, from clean and loose to clayey and compact.		0.25	0.70	0.15	0.30	①
R.R. YARDS			0.10	0.30	0.10	0.30	①
EARTH SURFACES	SAND, from uniform grain size, no fines, to well graded, some clay or silt.	Bare	0.15	0.50	0.01	0.55	④
		Light Vegetation	0.10	0.40	0.01	0.55	④
		Dense Vegetation	0.05	0.30	0.01	0.55	④
	LOAM, from sandy or gravelly to clayey.	Bare	0.20	0.60			
		Light Vegetation	0.10	0.45			
		Dense Vegetation	0.05	0.35			
	GRAVEL, from clean gravel and gravel sand mixtures, no silt or clay to high clay or silt content.	Bare	0.25	0.65			
		Light Vegetation	0.15	0.50			
		Dense Vegetation	0.10	0.40			
	CLAY, from coarse sandy or silty to pure colloidal clays.	Bare	0.30	0.75	0.10	0.70	④
		Light Vegetation	0.20	0.60	0.10	0.70	④
		Dense Vegetation	0.15	0.50	0.10	0.70	④
COMPOSITE AREAS	City, business areas.		0.60	0.75	0.60	0.95	⑤
	City, dense residential areas, vary as to soil and vegetation.		0.50	0.65	0.30	0.60	⑤
	Suburban residential areas, " " "		0.35	0.55	0.25	0.40	⑤
	Rural Districts, " " "		0.10	0.25	0.10	0.25	②
	Parks, Golf Courses, etc., " " "		0.10	0.35	0.05	0.25	①

NOTE: Values of "C" for earth surfaces are further varied by degree of saturation, compaction, surface irregularity and slope, by character of subsoil, and by presence of frost or glazed snow or ice.

① Bryant & Kuichling, Report, Back Bay Sewerage District, Boston, 1909.
② Metcalf and Eddy, American Sewerage Practice, 1928. Mc Graw-Hill.
③ Used by City of Boston, reported by Metcalf & Eddy.
④ Used by City of Detroit, reported by Metcalf & Eddy.
⑤ L.C. Urquhart, Civil Engineering Handbook, 1940. Mc Graw-Hill.