

PA 30
1-75

A-50366

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
ENGINEERING COMPUTATIONSNAME OF STRUCTURE DEY STREET ESCALATORS
SUBJECT MATTER SEWERAGE DESIGNSHEET NO. 1 OF 3
MADE BY J. SPENCER DATE 9/10/75
CHECKED BY _____ DATE _____I DETERMINE CAPACITY OF EXISTING 15" VITRIFIED CLAY PIPE:

a) MANNING'S FORMULA

$$Q = \frac{1.486}{n} A R^{4/3} S^{1/2}$$

Q = CAPACITY IN CFS

n = ROUGHNESS COEFFICIENT

A = CROSS SECTIONAL AREA OF WATER IN THE PIPE IN S.F.

R = HYDRAULIC RADIUS IN FEET = $\frac{d}{4}$ d = DIAMETER

S = SLOPE

- b) USING CHART OBTAINED FROM CITY OF NY - DEPT OF WATER RESOURCES FOR 10", 12", 15", 18" & 24" DIA. PIPES USING GIVEN CAPACITY (Q) AND SLOPES (S) FOR EACH I SOLVED MANNING'S FORMULA FOR THE UNKNOWN (n)

FOR 10", 12", 15" & 18" AT SLOPES OF
 $\frac{1}{8}$ "/FT, $\frac{1}{4}$ "/FT AND $\frac{1}{2}$ "/FT
 n = .013 IN ALL CASES

FOR 24" PIPE AT SLOPES OF $\frac{1}{8}$ "/FT, $\frac{1}{4}$ "/FT & $\frac{1}{2}$ "/FT
 n = .015 FOR ALL SLOPES

c) SOLVE FOR CAPACITY OF 15" ϕ PIPE (EXISTING)

FROM Dwg No. R-457 DATED JUNE 1916
 RECORD DRAWING OF SEWERS
 CHURCH ST CORTLAND ST TO DEY ST.
 ROUTE NO. 5 SECTION 110.1

SLOPE OF 15" ϕ PIPE

Rec'd 401234
 CHS
 10/2/75 56/8

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
ENGINEERING COMPUTATIONS

NAME OF STRUCTURE DEY STREET ESCALATORS
SUBJECT MATTER SEWERAGE DESIGN

SHEET NO. 2 OF 3
MADE BY J. SPENCER DATE 9/14/77
CHECKED BY _____ DATE _____

INVERT EL. - 108.37 AT MANHOLE WITH STREET EL. OF 124.47
OF 15"
Ø PIPE

INVERT EL. - 107.71 AT MANHOLE WITH STREET EL. OF 123.50

PIPE LENGTH IS 20'

$$\therefore S = \frac{108.37' - 107.71'}{20'} = .033$$

$$Q = \frac{1.486 A R^{2/3} S^{1/2}}{n}$$

$$= \frac{1.486 (1.227 \text{ FT}^2) (4605 \text{ FT}) (.1817)}{.013}$$

$$Q = 11.73 \text{ FT}^3/\text{SEC.}$$

$$A = 57.12^2$$

$$= \pi (.625)^2$$

$$= 57.390625 = 1.227 \text{ FT}^2$$

$$R = \frac{d}{4} = .3125 \text{ FT}$$

$$R^{2/3} = .4605 \text{ FT}$$

$$S = .033$$

$$S^{1/2} = .1817$$

II DETERMINE CAPACITY OF 18" Ø & 24" Ø PIPES AT SLOPE
OF EXISTING 3'-6" x 2'-4" SEWER

$$S = .01947$$

	18" Ø	24" Ø
A	1.767 FT ²	3.142 FT ²
R	.375 FT	.5 FT
R ^{2/3}	.520	.630
S	.02185	.02185
S ^{1/2}	.1478	.1478
n	.013	.015

BY USING MANNING'S FORMULA

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SUBJECT MATTER SEWERAGE DESIGNSHEET NO. 3 OF 3
MADE BY J. SPENCER DATE 9/10/71
CHECKED BY _____ DATE _____ $Q \text{ FOR } 18" \phi = 15.44 \text{ FT}^3/\text{SEC}$ $Q \text{ FOR } 24" \phi = 28.98 \text{ FT}^3/\text{SEC}$

IN BOTH CASES THE CAPACITY IS GREATER THAN THE
EXISTING 15" ϕ VITRIFIED CLAY PIPE CAPACITY

REPLACE THE EXISTING AFFECTED SECTION OF
3'-6" x 2'-4" SEWER WITH A 18" ϕ PIPE

ATTENTION

DRAIN SIZE	SLOPE = 0.0104 (1/4" / FT.)	SLOPE = 0.0208 (1/2" / FT.)	SLOPE = 0.0417 (1/2" / FT.)
6"	BLDG. CODE 4,300 SQ. FT. MAX. CAP. = 0.574 CFS	BLDG. CODE 6,100 SQ. FT. MAX. CAP. = 0.806 CFS	BLDG. CODE 8,700 SQ. FT. MAX. CAP. = 1.15 CFS
8"	BLDG. CODE 9,300 SQ. FT. MAX. CAP. = 1.23 CFS	BLDG. CODE 13,000 SQ. FT. MAX. CAP. = 1.75 CFS	BLDG. CODE 18,400 SQ. FT. MAX. CAP. = 2.47 CFS
10"	$n = .013$ BLDG. CODE 16,500 SQ. FT. MAX. CAP. = 2.22 CFS	$n = .013$ BLDG. CODE 23,500 SQ. FT. MAX. CAP. = 3.13 CFS	$n = .013$ BLDG. CODE 33,000 SQ. FT. MAX. CAP. = 4.46 CFS
12"	$n = .013$ BLDG. CODE 26,700 SQ. FT. MAX. CAP. = 3.64 CFS	$n = .013$ BLDG. CODE 37,500 SQ. FT. MAX. CAP. = 5.13 CFS	$n = .013$ BLDG. CODE 53,000 SQ. FT. MAX. CAP. = 7.27 CFS
15"	$n = .0129$ BLDG. CODE 47,600 SQ. FT. MAX. CAP. = 6.6 CFS	$n = .013$ BLDG. CODE 67,000 SQ. FT. MAX. CAP. = 9.30 CFS	$n = .0129$ BLDG. CODE 95,000 SQ. FT. MAX. CAP. = 13.20 CFS
18"	$n = .013$ BLDG. CODE 89,219 SQ. FT. MAX. CAP. = 10.7 CFS	$n = .013$ BLDG. CODE 126,248 SQ. FT. MAX. CAP. = 15.1 CFS	$n = .013$ BLDG. CODE 178,649 SQ. FT. MAX. CAP. = 21.4 CFS
24"	$n = .015$ BLDG. CODE 195,476 SQ. FT. MAX. CAP. = 20.0 CFS	$n = .015$ BLDG. CODE 276,566 SQ. FT. MAX. CAP. = 28.2 CFS	$n = .015$ BLDG. CODE 391,331 SQ. FT. MAX. CAP. = 40.0 CFS

Please Refer to Calculation

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THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
ENGINEERING COMPUTATIONS

NAME OF STRUCTURE DEY ST ESCALATORS
SUBJECT MATTER SEWER PROFILE

SHEET NO. 1 OF 1
MADE BY J. Spooner DATE 9/1/41
CHECKED BY _____ DATE _____

