City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 29, 1996

Steve Metro
Wilson & Company
4775 Indian School Rd. NE
Albuquerque, NM 87110

RE: ENGINEER CERTIFICATION FOR HIGH DESERT/TRACT 7 APARTMENT COMPLEX (E23-D3A) CERTIFICATION STATEMENT DATED 1/16/96 HOLD HARMLESS LETTER DATED 1/29/96.

Dear Mr. Metro:

Based on the information provided on your January 25, 1996 resubmittal, the above referenced site is acceptable for Engineer Certification.

If I can be of further assistance, please feel free to contact me at 768-2667.

Sincerely,

Bernie J. Montoya

Bernie J. Montoya, CE
Engineering Associate

BJM/dl

c: Andrew Garcia
File

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 6, 1995

CERTIFICATE OF COMPLETION AND ACCEPTANCE

Doug Collister
High Desert Investment Corp.
13000 Academy Rd. NE
Albuquerque, NM 87111

RE: PROJECT NO. 4809.91 HIGH DESERT PHASE 1-B
(MAP NO. E-23 & F-23)

Dear Mr. Collister:

This is to certify that the City of Albuquerque accepts Project No. 4809.81 completed according to approved plans and construction specifications. Please be advised this certificate of completion and acceptance shall only become effective upon final plat approval and filing in the office of the Bernalillo County Clerk's Office.

The project is described as follows:

- The project consists of contruction of the following utilities, sanitary sewer, water and storm sewer . Also included was curb and gutter, paving and striping and signage. This was constructed on Spain Road from + - 800 feet east of Tramway to Imperata, on Imperta from Spain Road to + - 1650 feet north of Spain and on Cortaderia St. from Spain Road to + - 900 feet north of Spain Road as shown on sheets 1 thru 38 of the City approved project plans.

The contractor's correction period begins the date of this letter and will be effective for a period of one (1) year.

DRAINAGE REPORT
PINNACLE AT HIGH DESERT
APARTMENT COMPLEX

Prepared for:

TRAMMELL CROW RESIDENTIAL

Prepared by:

Wilson & Company, Engineers & Architects
6611 Gulton Court, N.E.
Albuquerque, New Mexico

JUNE 1994

WILSON
&COMPANY

PINNACLE AT HIGH DESERT
APARTMENT COMPLEX

DRAINAGE REPORT

Site Location: The site is located on the northeast corner of the proposed extension of Spain Road and Cortaderia Street, approximately one block east of Tramway.

Methodology: For this site, Section 22.2 of the City of Albuquerque DPM was followed to calculate the peak runoff. The method designated Part A was used to determine the runoff from each on-site basin. The charts and formulas in Part A were followed using the 100 year frequency, 6 hour rainfall as the design storm. The site is located in Zone 4 as determined from figure A. The peak discharge was determined using Table-9. The off-site flows were analyzed in a drainage report prepared by Bohannan-Huston, Inc. (BH) entitled "High Desert Drainage Management Plan."

Existing Conditions: The site is currently undeveloped draining from east to west. The southern portion of the property is reserved for water harvesting. This easement is shown on the Plan.

EXISTING CONDITIONS

AREA (ACRE)	LAND TREATMENT	ZONE	PEAK DISCHARGE (CFS/ACRE)	Qp 100 (CFS)
33.1	A	4	2.20	72.82

Proposed Conditions: The site will continue to drain from east to west. The site has been divided into 9 drainage basins. Basin H drains to the Spain Road Storm Sewer via a private storm sewer system on site. Basin F, which is mostly undeveloped, drains to a detention and desiltation pond adjacent to Cortaderia Street which is discharged to the Storm Sewer System in Cortaderia Street. Using the muscle equation, Basin F generates 910 CF of sediment during a 100 year storm. The desiltation poind has a volume of 3,000 CF with 1 foot of freeboard. Finally, runoff from Basins A through E, G and I are collected in a private storm sewer system and conveyed to the public storm sewer in Cortaderia Street. All private on-site storm sewers and storm inlets were sized for 100 year runoff. The number of storm inlets were increased to allow for clogging.

The total flow discharged to the Cortaderia Storm Sewer from Basins A through E, G and I is 88.7 CFS and the discharge from the desiltation pond in Basin F is 20.4 CFS. The total discharge into the Cortaderia Storm Sewer System is 109.1 LFS which is less than the 125 CFS allowed in the High Desert Drainage Master Plan. The flow into the Spain Road Storm Sewer is 14.0 CFS which is also less than the 32 CFS shown in the High Desert DMP. There are four water harvesting systems in the "dry" arroyo, as required by High Desert Development, Inc. These water harvesting systems do not affect the site drainage system.

There are no off-site flows that drain to the property. The following Table shows the developed site conditions.

ZONE 4

BASIN	LAND TREATMENT	AREA (ACRES)	PEAK DISCHARGE (CFS/ACRES)	Qp 100 (CFS)
A	B D	1.36 0.30	2.92 5.25	5.5
B	B D	1.47 1.08	2.92 5.25	10.0
C	B D	1.37 1.39	2.92 5.25	11.3
D	B D	1.84 1.53	2.92 5.25	13.4
E	B D	2.49 2.69	2.92 5.25	21.4
F	B A D B D	5.20 2.14 0.52	2.20 2.92 5.25	20.4
G	B D	2.10 4.00	2.92 5.25	27.1
H	B D	0.97 2.12	2.92 5.25	14.0
I	B D	0.38 0.15	2.92 5.25	1.9

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PROJ SHEET

SUBJ. OF

DRAFT

CABIN	LAND TREATMENT	AREA (ACRES)	PEAK DISCHARGE (CFS/ACRE)	Q100 (CFS)
A	B	1.36	2.92	5.5 CFS
	D	0.30	5.25	
B	B	1.47	2.92	10.0
	D	1.08	5.25	
C	B	1.37	2.92	11.3
	D	1.39	5.25	
D	B	1.84	2.92	13.4
	D	1.53	5.25	
E	B	2.79	2.92	21.4
	D	2.69	5.25	
F	A	5.20	2.20	20.4
	B	2.14	2.92	
	D	0.52	5.25	
G	B	2.10	2.92	27.1
	D	4.00	5.25	
H	B	0.97	2.92	14.0
	D	2.12	5.25	
I	B	0.38	2.92	1.9
	D	0.15	5.25	

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Determine sediment wash load for Basin F to size sediment pond

BASIN F TOTAL AREA = 7.86 ACRES Q_P = 20.4 CFS
V_P = 0.65 AC FT

LAND TREATMENT	AREA
A	5.20 Ac
B	2.14 Ac
D	0.52 Ac

MUSLE EQUATION

$Y_S = R_W K LS C P$

$R_W = \alpha (V q_P)^{\beta}$

$\alpha = 285 \quad \beta = 0.56$

$R_W = 285[(0.65)(20.4)]^{0.56}$

$\boxed{R_W = 1212}$

$100K = 2.1 M^{1.14}(10^{-4})(12-a) + 3.25(b-2) + 2.5(c-3)$

Soil type Emb SM

$M = (30)(100-0) = 3000$

$100K = 2.1(3000)^{1.14} 10^{-4} (12-0) + 3.25(2-2) + 2.5(5-3)$

$\boxed{K = 0.28}$

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Topographic Factor, LS

$$LS = \left(\frac{\lambda}{72.6}\right)^{n} (0.065 + 0.0454 S + 0.0065 S^2)$$

S = % Slope = 4.5%

$n = 0.4$

λ = Slope length = 100 ft

$$LS = \left(\frac{100}{72.6}\right)^{0.4} (.065 + .0454(4.5) + .0065(4.5)^2)$$

$\boxed{LS = 0.46}$

Cover and maintenance factor

$\boxed{C = 0.35}$

Erosion Control Practice factor

$\boxed{P = 1.0}$

$$Ys = Rw\ K\ LS\ C\ P$$

$$Ys = 1212\ (0.28)(0.46)(0.35)(1.0)$$

$Ys = 54.6$ tons for 100 yr storm

$$\text{Volume} = \frac{54.6\ \text{tons} \quad (2000\ \text{lbs/ton})}{120\ \text{lbs/ft}^3} = 910\ \text{CF} = .02\ \text{ACRE-FT}$$

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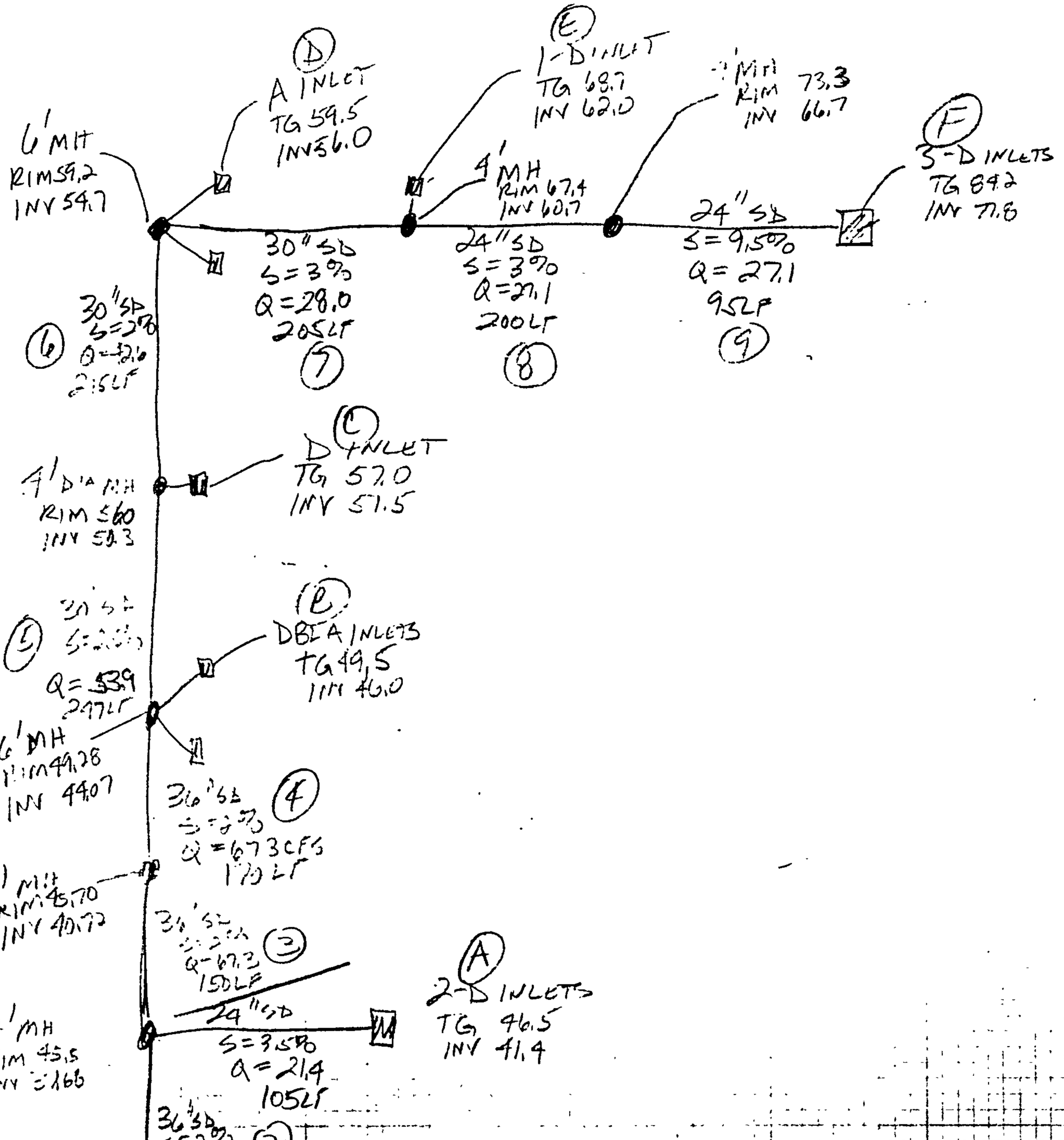


Run date: 06-13-1994
File: SSHGL.ST3

Return Period = 100 Yrs
Rainfall file: NOT SPECIFIED

LINE 1 / Q = 88.7 / HT = 36 / WID = 36 / N = .013 / L = 70 / JLC = .5

OUTFALL

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	36.38	34.27	33.52	12.71	38.88	13.74	4.91	6.98
UPSTRM	38.63	34.31	35.77	12.77	41.16	15.22	5.73	6.95

Drainage area (ac)	= 0	Slope of invert (%)	= 3.214
Runoff coefficient	= 0	Slope energy grade line (%)	= 3.253
Time of conc (min)	= 8	Critical depth (in)	= 34
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 3.6
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 8.2
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 44.5
Runoff contr (cfs)	= 88.7	Minimum cover (ft)	= 4
Default Q (cfs)	= 88.7	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 119.6		

LINE 2 / Q = 88.7 / HT = 36 / WID = 36 / N = .013 / L = 95 / JLC = .5

DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	39.89	36.00	35.77	12.55	42.34	0.00	5.73	7.07
UPSTRM	41.58	36.00	37.68	12.55	44.02	0.00	4.82	7.07

Drainage area (ac)	= 0	Slope of invert (%)	= 2.011
Runoff coefficient	= 0	Slope energy grade line (%)	= 1.769
Time of conc (min)	= 7	Critical depth (in)	= 34
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 3.6
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 8.2
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 45.5
Runoff contr (cfs)	= 88.7	Minimum cover (ft)	= 4
Default Q (cfs)	= 88.7	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 94.6		

LINE 3 / Q = 67.3 / HT = 36 / WID = 36 / N = .013 / L = 150 / JLC = .3

DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	42.80	36.00	37.68	9.52	44.21	0.00	4.82	7.07
UPSTRM	44.33	36.00	40.72	9.52	45.73	0.00	1.98	7.07

Drainage area (ac)	= 0	Slope of invert (%)	= 2.027
Runoff coefficient	= 0	Slope energy grade line (%)	= 1.018
Time of conc (min)	= 6	Critical depth (in)	= 32
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 2.7
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 6.3
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 45.7
Runoff contr (cfs)	= 67.3	Minimum cover (ft)	= 4
Default Q (cfs)	= 67.3	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 94.9		

LINE 4 / Q = 67.3 / HT = 36 / WID = 36 / N = .013 / L = 170 / JLC = .5

DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	44.75	36.00	40.72	9.52	46.16	0.00	1.98	7.07
UPSTRM	46.73	31.92	44.07	10.16	48.33	22.82	2.21	6.63

Drainage area (ac)	= 0	Slope of invert (%)	= 1.971
Runoff coefficient	= 0	Slope energy grade line (%)	= 1.279
Time of conc (min)	= 5	Critical depth (in)	= 32
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 2.7
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 6.3
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 49.28
Runoff contr (cfs)	= 67.3	Minimum cover (ft)	= 4
Default Q (cfs)	= 67.3	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 93.6		

LINE 5 / Q = 53.9 / HT = 30 / WID = 30 / N = .013 / L = 247 / JLC = .5

DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	47.53	30.00	44.07	10.98	49.40	0.00	2.71	4.91
UPSTRM	52.68	28.59	50.30	11.17	54.62	12.69	3.20	4.83

Drainage area (ac)	= 0	Slope of invert (%)	= 2.522
Runoff coefficient	= 0	Slope energy grade line (%)	= 2.112
Time of conc (min)	= 4	Critical depth (in)	= 29
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 2.2
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 5.0
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 56
Runoff contr (cfs)	= 53.9	Minimum cover (ft)	= 4
Default Q (cfs)	= 53.9	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 65.1		

LINE 6 / Q = 42.6 / HT = 30 / WID = 30 / N = .013 / L = 215 / JLC = .7

DNLN = 5

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	53.65	30.00	50.30	8.68	54.82	0.00	3.20	4.91
UPSTRM	56.92	26.60	54.70	9.26	58.25	19.02	2.00	4.60

Drainage area (ac)	= 0	Slope of invert (%)	= 2.047
Runoff coefficient	= 0	Slope energy grade line (%)	= 1.593
Time of conc (min)	= 3	Critical depth (in)	= 27
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 1.7
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 4.0
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 59.2
Runoff contr (cfs)	= 42.6	Minimum cover (ft)	= 4
Default Q (cfs)	= 42.6	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 58.7		

LINE 7 / Q = 28.0 / HT = 30 / WID = 30 / N = .013 / L = 205 / JLC = .5

DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	57.85	30.00	54.70	5.71	58.35	0.00	2.00	4.91
UPSTRM	62.59	22.64	60.70	7.05	63.36	25.82	4.20	3.97

Drainage area (ac)	= 0	Slope of invert (%)	= 2.927
Runoff coefficient	= 0	Slope energy grade line (%)	= 2.441
Time of conc (min)	= 2	Critical depth (in)	= 23
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 2.6
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 67.4
Runoff contr (cfs)	= 28	Minimum cover (ft)	= 4
Default Q (cfs)	= 28	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 70.2		

LINE 8 / Q = 27.1 / HT = 24 / WID = 24 / N = .013 / L = 200 / JLC = .5

DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	62.97	24.00	60.70	8.63	64.13	0.00	4.70	3.14
UPSTRM	68.53	21.99	66.70	8.99	69.79	13.28	4.60	3.02

Drainage area (ac)	= 0	Slope of invert (%)	= 3.000
Runoff coefficient	= 0	Slope energy grade line (%)	= 2.829
Time of conc (min)	= 1	Critical depth (in)	= 22
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 2.5
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 73.3
Runoff contr (cfs)	= 27.1	Minimum cover (ft)	= 4
Default Q (cfs)	= 27.1	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 39.2		

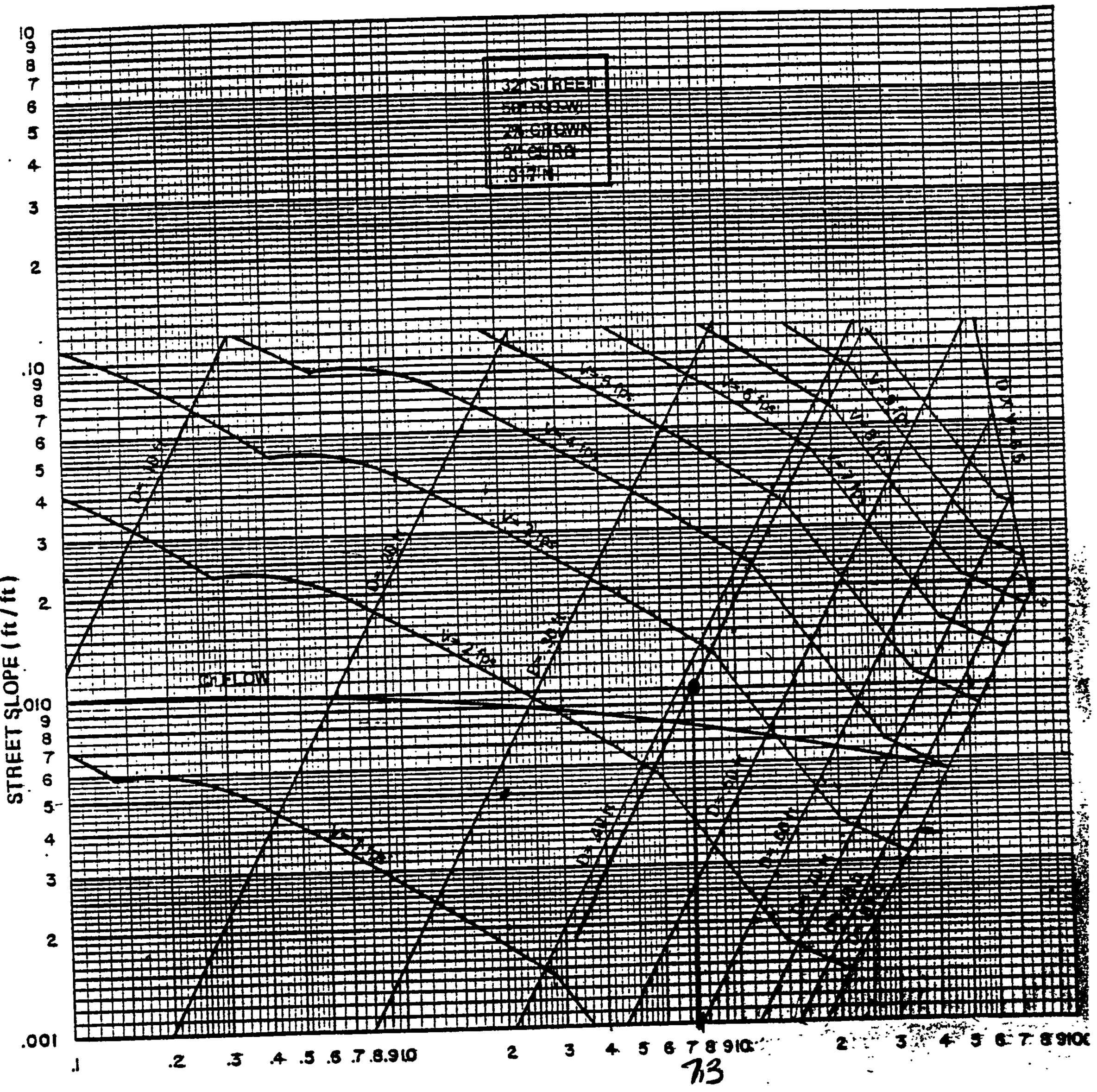
LINE 9 / Q = 27.1 / HT = 24 / WID = 24 / N = .013 / L = 95 / JLC = .5

DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	69.16	24.00	66.70	8.63	70.32	0.00	4.60	3.14
UPSTRM	80.26	21.99	77.80	8.99	81.51	13.28	4.40	3.02

Drainage area (ac)	= 0	Slope of invert (%)	=11.684
Runoff coefficient	= 0	Slope energy grade line (%)	=11.787
Time of conc (min)	= 0	Critical depth (in)	= 22
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 0.00	Req'd grate area (sf)	= 2.5
Cumulative C*A	= 0.0	Natural ground elev (ft)	= 84.2
Runoff contr (cfs)	= 27.1	Minimum cover (ft)	= 4
Default Q (cfs)	= 27.1	Depth at inlet opening (in)	= 48
Line capac. (cfs)	= 77.3		

STREET CAPACITY



North Entrance Corridor

$S = 1\%$

$D = 1.41'$

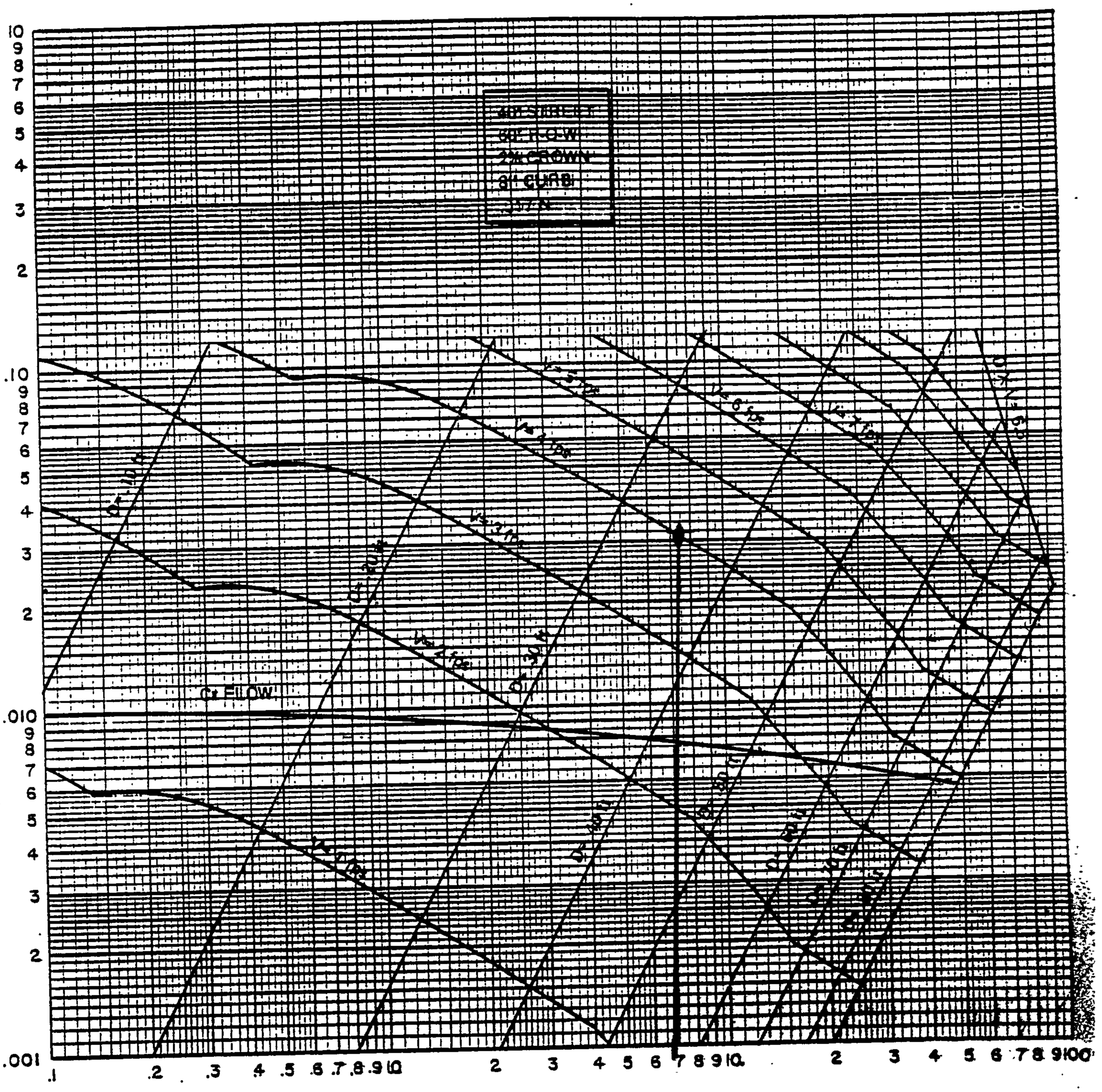
70 $\frac{1}{2}Q = 73$ cfs

73

REV. 3-83

PLATE 22.3 D-1

STREET CAPACITY

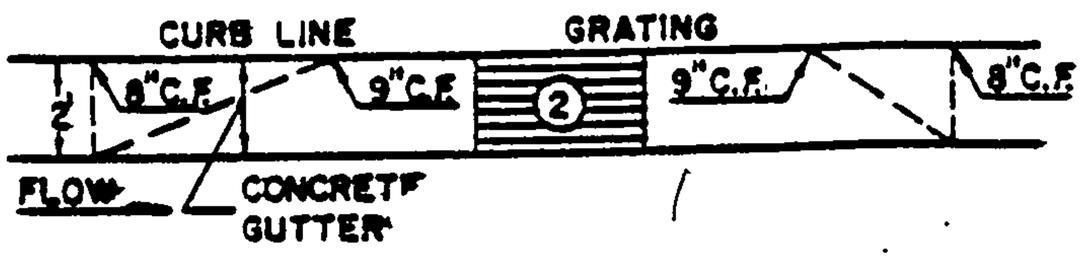


South Entrance Cortaderia
S = 3.2%
7 1/2 Q = 6.7 CFS

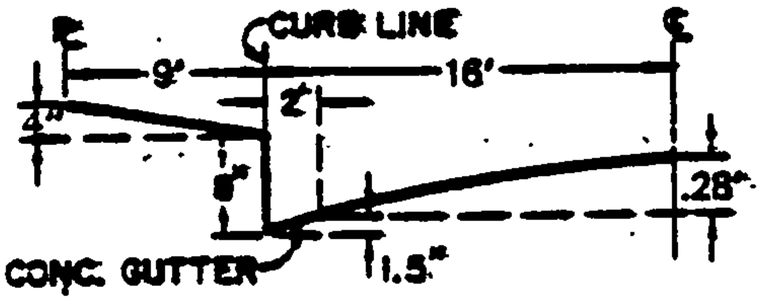
REV. 3-83

PLATE 22.3 D-2

GRATING CAPACITIES FOR TYPE "A", "C" and "D"



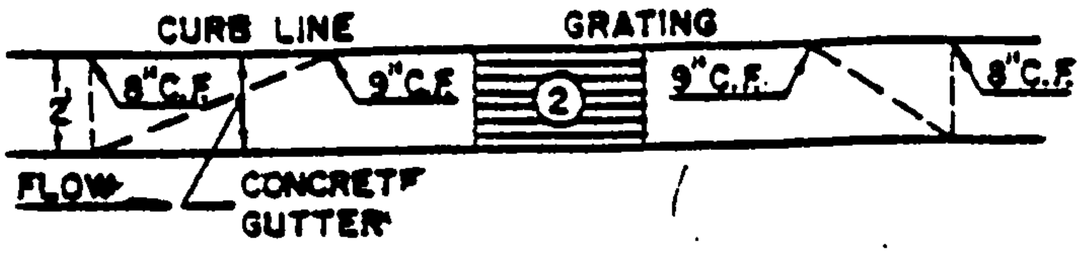
GRATING & GUTTER PLAN



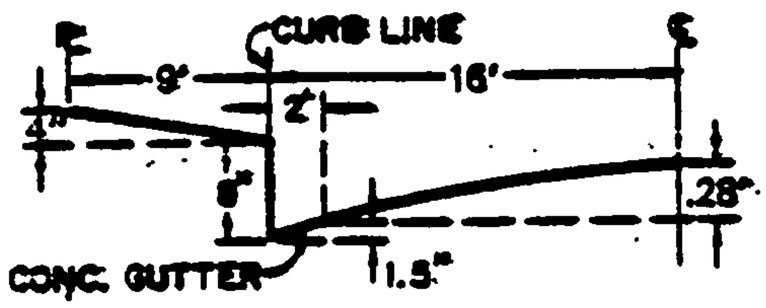
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

North Entrance Cortaderia
S = 1% Q = 5 CFS/inlet
D = .41

GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

South Entrance Cortaderia
S=3.2% 74 Q=4.6 CFS/inlet
D=.35 FT

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CALCULATE INLET CAPACITIES

BASIN E : (A) INLET - SUMP CONDITION

$Q_P = 21.4$ CFS

TG 46.5 24" STORM DRAIN

INV 41.9

6" CURB HEIGHT

USING ORIFICE EQUATION

$Q = CA\sqrt{2gh}$

$C = 0.6$

$A = 3.14\ ft^2$

$h = 46.5 - 41.9 + .5(2) + .5 = 4.6\ ft$

$Q = 0.6(3.14)\sqrt{2(32.2)(4.6)} = 32.4$ CFS

CHECK GRATE

$Q = 0.6(6.0)\sqrt{2(32.2)(.5)}$

$Q = 20.4$ CFS CONTROLS

ADD ANOTHER A TO ACCOUNT FOR CLOGGING USE "DOUBLE A" INLETS

BASIN D (B) INLETS SOUTH ENTRANCE CONTAINMENT

FROM PLATES D-2 + D-5 SECTION 22.3 DPM

INLET CAPACITY 4.6 CFS/inlet

Q BASIN B = 13.4 CFS

REQUIRE 3-A INLETS

WHERE S > 3% USE 1.5 times inlets

THEREFORE USE DOUBLE A INLETS ALONG EACH CURB

COMP _____ CK. _____ DATE _____

WILSON & COMPANY

LOC _____ FILE _____ PROJ _____ SHEET _____ SUBJ _____ OF _____

BASIN C Ⓒ INLETS — SUMP CONDITION

Q_P = 11.3 CFS

TG 57.0 — 18" SD

INV 51.5 — 6" CURB

CHECK STORM SEWER CONTROL

$Q = 0.6(1.77)\sqrt{2(32.2)(5.25)}$

Q = 19.5 CFS

CHECK GRATE

$Q = 0.6(6.0)\sqrt{2(32.2)(6)}$

Q = 20.4 CFS

STORM SEWER CONTROLS

USE 1 D-INLET

BASIN A&B Ⓓ INLETS NORTH ENTRANCE CORTADERIA

FROM PLATES D-2 + D-5 SECTION 22.3 DPM

INLET CAPACITY Q = 7.3 CFS S = 2%

Q = 14.5 CFS

INLETS REQUIRED [2 - A INLETS]

BASIN B Ⓔ INLET

Q = 1 CFS

USE 1-D INLET

BASIN G Ⓕ INLETS — SUMP CONDITION

Q = 27.1 CFS

TG 84.2 — 24" SD

INV 77.8 — 6" CURB

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LOC. FILE

PROJ SHEET

SUBJ. OF

CHECK STORM SEWER

$Q = 0.6(3.14)\sqrt{2(32.2)(84.7-78.8)}$

$Q = 36.7$ CFS

CHECK GRATES DBL D

$Q = 0.6(12.0)\sqrt{2(32.2)(.5)}$

$Q = 40.8$ CFS

USE DOUBLE D INLETS

BASIN H (G) INLETS

$Q_P = 14.0$ CFS

TG = 84.0 24" STORM

INV = 77.5 6" CURB

CHECK STORM SEWER

$Q = 0.6(3.14)\sqrt{2(32.2)(6.0)}$

$Q = 37.0$ CFS

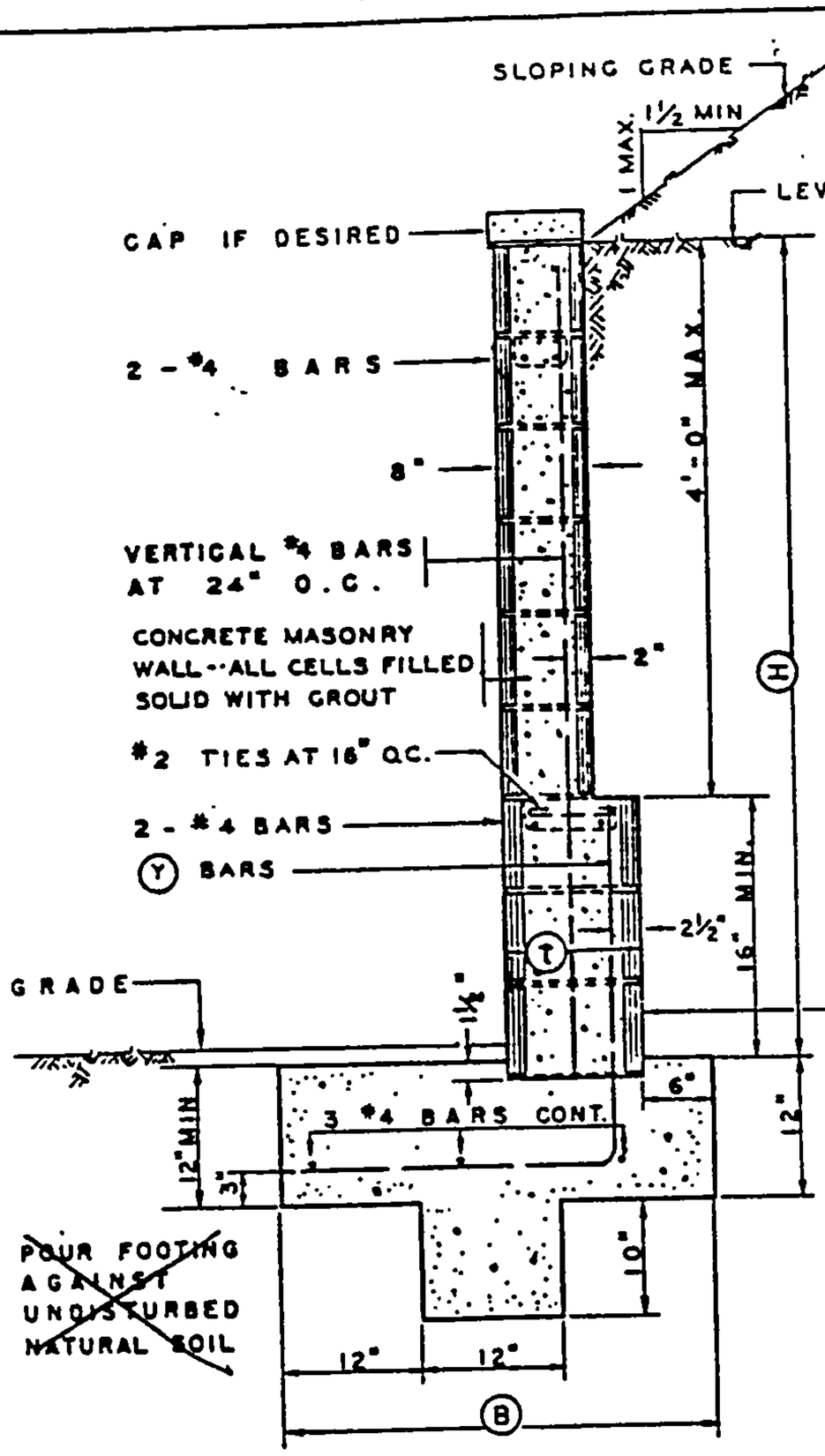
CHECK GRATE

$Q = 0.6(6)\sqrt{2(32.2)(.5)}$

$Q = 20.4$ CFS

USE SINGLE D INLET

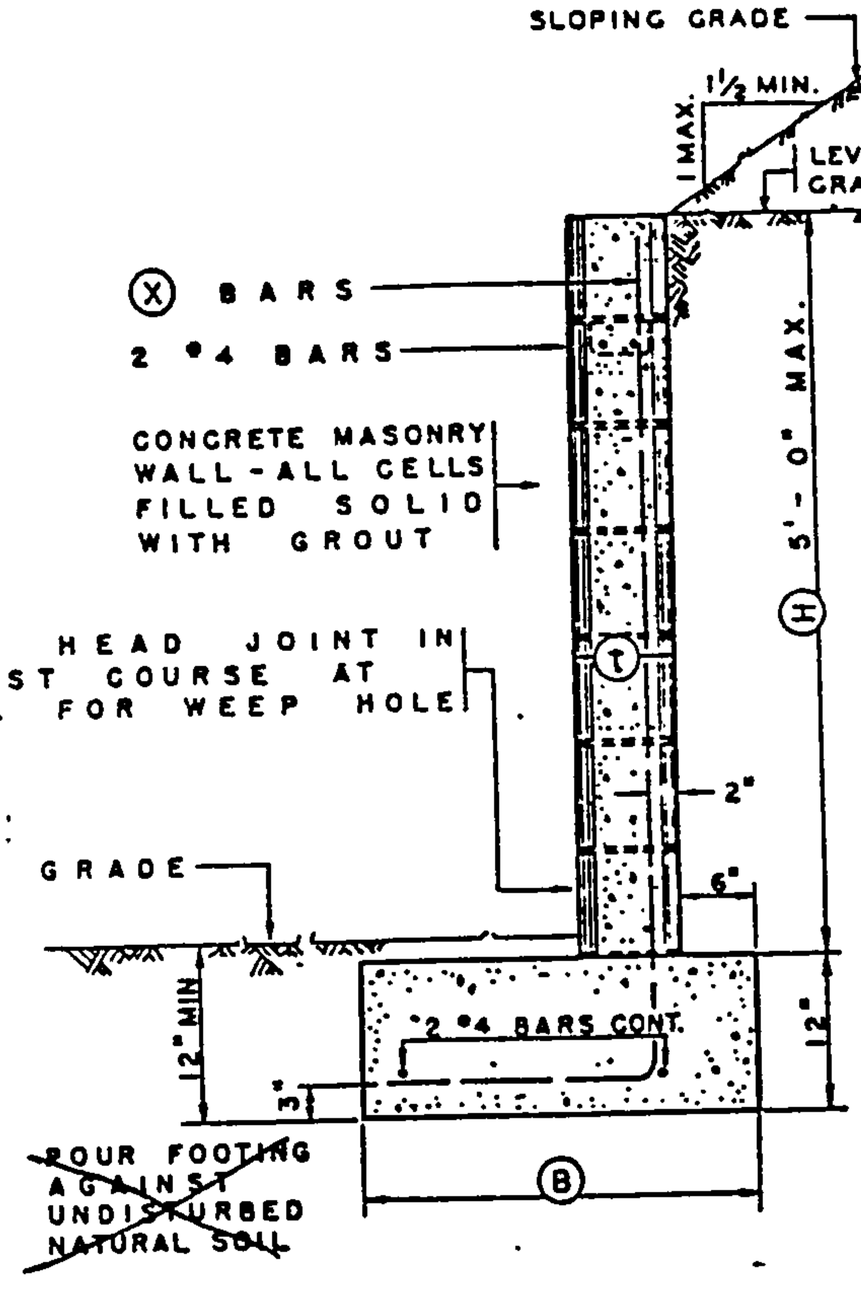
RETAINING WALLS



TYPICAL SECTION OVER 5'-0"
½" = 1'-0"

(H)	(t)	(B)	(X) BARS	(Y) BARS
3' 4' 5'	6" 8" 8"	1'-9" 2'-2" 2'-9"	#3 AT 32" O.C. #4 AT 48" O.C. #4 AT 24" O.C.	— — —
6' 7' 8'	12" 12" 12"	3'-3" 3'-10" 4½-6"	— — —	#4 AT 24" O.C. #4 AT 16" O.C. #5 AT 16" O.C.

DESIGN FOR LEVEL GRADE ABOVE WALL



TYPICAL SECTION 5'-0" MAX.
½" = 1'-0"

(H)	(t)	(B)	(X) BARS	(Y) BARS
3' 4' 5'	8" 8" 8"	2'-3" 3'-0" 3'-6"	#3 AT 24" O.C. #4 AT 24" O.C. #5 AT 16" O.C.	— — —
6' 7' 8'	12" 12" 12"	4'-0" 4'-9" 5½-6"	— — —	#5 AT 24" O.C. #6 AT 16" O.C. #7 AT 16" O.C.

DESIGN FOR SLOPING GRADE ABOVE WALL

NOTE- CONCRETE IN FOOTING TO TEST 2,000 LBS. PER SQ. IN. AT 28 DAYS
CONCRETE BLOCK - GRADE "A" UNITS A.S.T.M. C-90
GROUT - 1 PART CEMENT, 3 PARTS SAND, 2 PARTS PEA GRAVEL
MORTAR - 1 PART CEMENT, ½ PART LIME PUTTY, 4½ PARTS SAND

MAXIMUM STRESSES
f_s = 18,000 P.S.I.
f_m = 225 P.S.I.
SHEAR V = 15 P.S.I.
BOND U = 100 P.S.I.
SOIL PRESSURE = 1,000 LBS. PER SQ.FT.
CONCRETE TO SOIL FRICTION COEFFICIENT = 0.4