NEW

FEISE FOREST ESTATES

CALCULATION REQUIRED DETENTION BASIN DESIGN

(25 Year Storm)

100 Year Flood Elevation - 548.00

Total Subdivision Area = 46.06 Acres

Required Detention = 46.06 - 5.28 (Common Ground) = 40.78 Acres

3.26 Developed 25Y
2.31 Undeveloped

0.95 Difference 0.95 (40.78) = 38.74 cfs

Total Detention Volume Required for 30 Min.

$$38.74 \frac{\text{Ft.}^3}{\text{Sec.}} \quad \frac{60 \text{ Sec.}}{\text{Min.}} \quad (30 \text{ min.}) = 69{,}734 \text{ Ft.}^3$$

CALCULATION VOLUME OF PROPOSED DETENTION BASIN

Elevation	Area	End Area Method	Equals:
552.00	4689	$\frac{7500 + 4682}{2}$ (2)	12,189
554.00	7500		
556.00	10500		18,000
558.00	14500		25,000
560.00	18750		33,250
	Total		88,439 Ft.^{3}

Total Q(in) = 100.83 cfs of this amount 38.74 cfs is detained

100.83 - 38.74 = 62.09 cfs

$$Q\,(\text{Det.}) = \frac{88{,}439}{1{,}800} = 49.13 \text{ cfs}$$

Q (Discharge) = 100.83 - 49.13 = 51.70 cfs

RS

CALCULATIONS FOR REQUIRED DETENTION BASIN DESIGN

(100 Year Storm)

Total Subdivision Area = 46.06 Acres

Required Detention = 46.06 - 5.28 (Common Ground) = 40.78

4.17 Developed
2.95 Undeveloped

1.22 Difference 1.22 X (40.78) = 49.75 cfs

TOTAL DETENTION VOLUME REQUIRED

$$49.75\ (60)\ (30) = 89{,}550\ Ft.^3$$

Proposed Volume of Detention Basin = 111,439
(to emergency spillway elev. 561.00)
Adequate to hold 100 year Storm

Broadcrested Weir (100 Year Storm)

Total Acre = 38.19 X PI Factor (4.17) = 159.25 cfs

$$159.25 = 3.087\ (70)\ (Depth)^{3/2}$$

$$.737 = (Depth)^{3/2} = .816\ Ft. = 9.8"$$ Assume 10" Depth

DESIGN OF STRUCTURE TO PASS 51.70 CFS A DEPTH OF 8.00'

$Q = CA\ 2gh$

$C = .65$ A (Trail One) = (2'W X 2'H) = $4.0\ Ft.^2$

$h_2 = 8.0 - 1.0 = 7.0$

$Q = .65\ (4)\ [\sqrt{2(322)\ 7.0}] = 55.20$ cfs (Adequate)

Broadcrested Weir (Emergency Overflow) Calculation for 25 Year

$Q = 3.087\ LH^{3/2}$

$Q = 3.087\ (70)\ (h)^{3/2}$

$100.83 = 3.087\ (70)\ (Depth)^{3/2}$

$0.47 = (Depth)^{3/2}$

$D = \sqrt[3]{.47} = 0.60\ Ft. = 7.25"$ = Assume 7.5" Depth

FLOW THROUGH GRATE

Total Area of Grade (assuming 2" Border)

(2'6" - 4") (1'3" - 4") = 1.99 Ft.²/Grate

Less Area of Grid:

11 (3/16") (2'6") - 8 (3/16") (1'3")

1.99 Ft. ² - 0.358 Ft. ² - 0.13 Ft.² = 1.85 Ft.²/Grate

$Q = CA\ 2gh$

$100.83 \text{ cfs} = (0.6)(A)\sqrt{2\ (32.2)\ (1')}$

$A = 20.94$ Req.

No. of Grates: $\frac{20.94}{1.85} = 11.32 =$ 12 Grates Needed

$.6\ (12 \times 1.85)\ [\sqrt{2(32.2)\ (1)}] = 106.89$ cfs (Adequate)

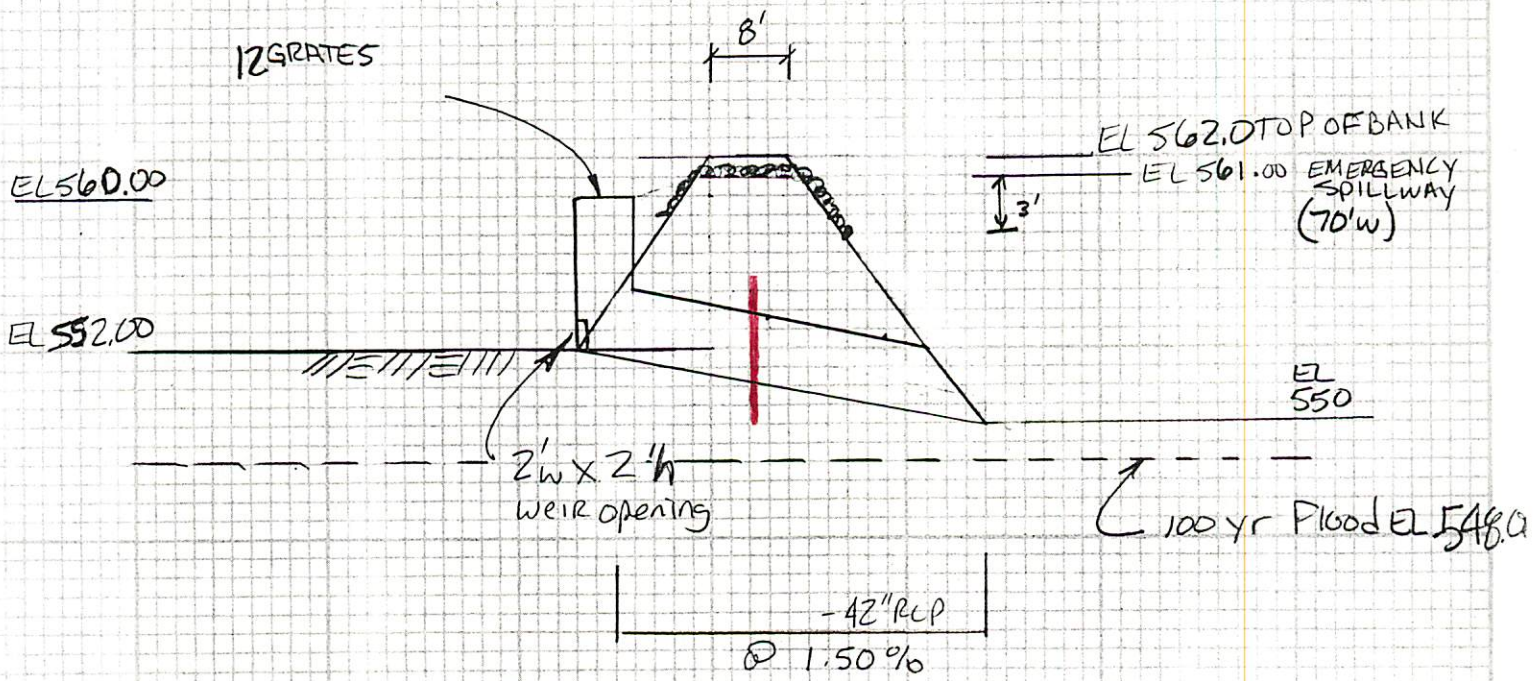
INGRAM-WEHMEYER, INC.
Engineers / Surveyors / Planners

ENGINEERING DESIGN COMPUTATION SHEET

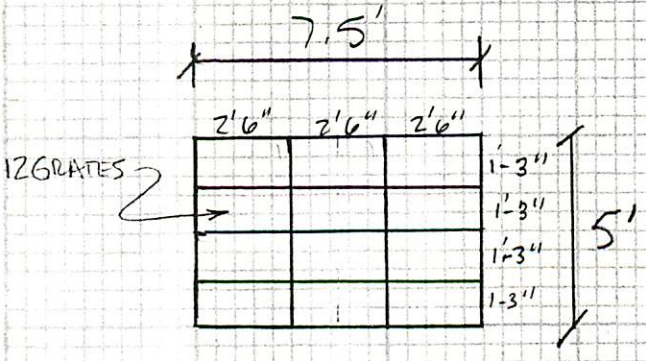
PROJECT NUMBER: _____ SHEET NO. 4 OF 8

DATE: _____ BY _____ CHKD. BY _____

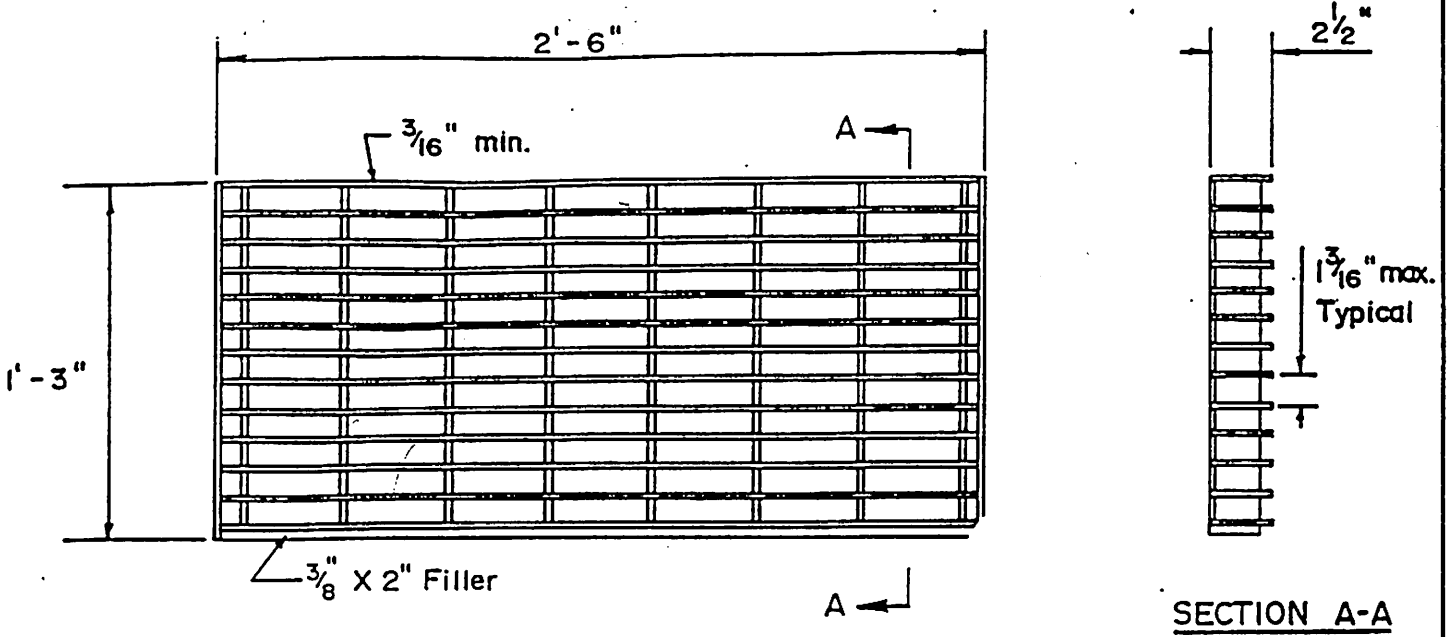
DESCRIPTION: _____

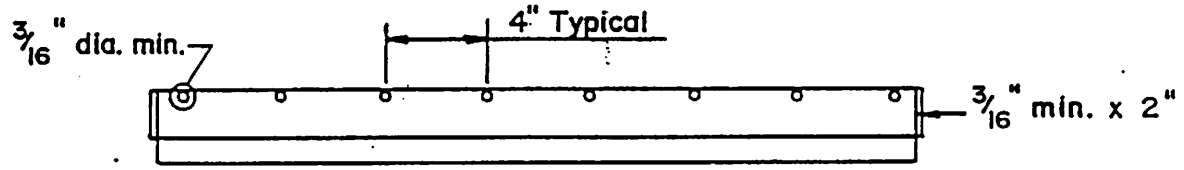


TOP VIEW



CAPACITY of 42" @ 1.5% = 125 CFS
Velocity " " " " with 110.83 cfs = 12.5 FPS



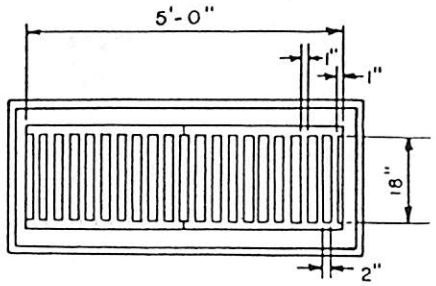


Finish	-	Asphaltic 10 mil. coating
Material	-	Mild carbon steel - ASTM A [redacted] 569
Capacity	-	H-20 loading
Weight	-	65 lb. min.
Tolerances	-	All dimensions ± 1/8"
Identification	-	The manufacturer must place his name or mark on each unit for the purpose of identification

DETAIL OF STEEL GRATE

METROPOLITAN ST. LOUIS SEWER DISTRICT
Standard Details of Sewer Construction

Dr. JVN	Feb. 1977	Sheet 41



TYPICAL PLAN OF DOUBLE INLET GRATING

WATERWAY OPENING = 5.0 SQ. FT. (DOUBLE GRATING)

ASSUME GRATING IS PLACED SO THAT FLOW WILL OCCUR FROM ALL SIDES OF INLET. FOR LOW HEADS DISCHARGE WILL CONFORM WITH GENERAL WEIR EQUATION

$Q = CLH^{3/2}$

WHERE

C = 3.0

L = 13.0 FT. GROSS PERIMETER OF GRATE OPENING (OMITTING BARS) FOR GRATE ILLUSTRATED

H = HEAD IN FEET

FOR HIGH HEADS DISCHARGE WILL CONFORM WITH ORIFICE FORMULA:

$Q = CA\sqrt{2gH}$

WHERE

C = 0.6

A = 5.0 SQ. FT.

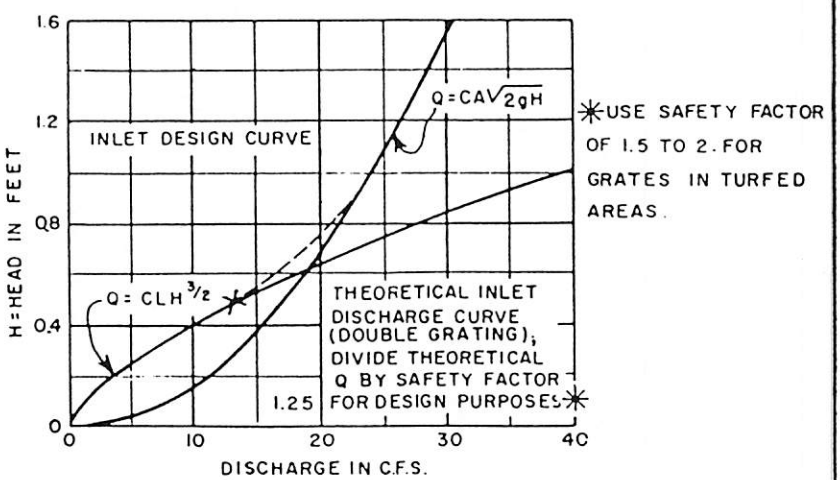
g = ACCELERATION OF GRAVITY IN FEET PER SECOND^2

H = HEAD IN FEET

THEORETICAL DISCHARGE RELATION TO BE MODIFIED BY 1.25 SAFETY FACTOR

COEFFICIENTS BASED ON MODEL TEST OF SIMILAR GRATES WITH RATIO:

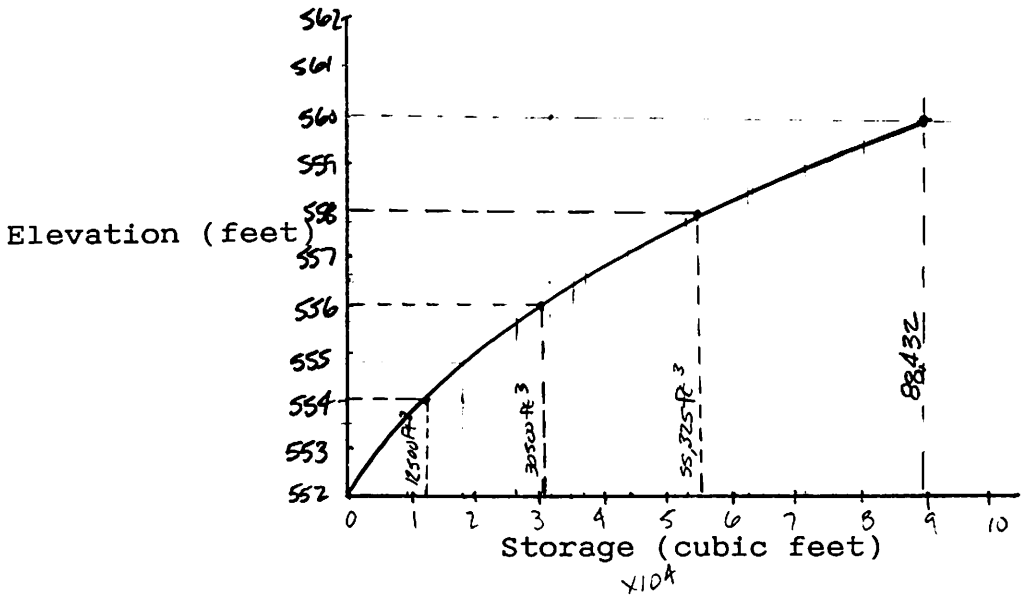
NET WIDTH OF GRATE OPENING TO GROSS WIDTH = 2:3



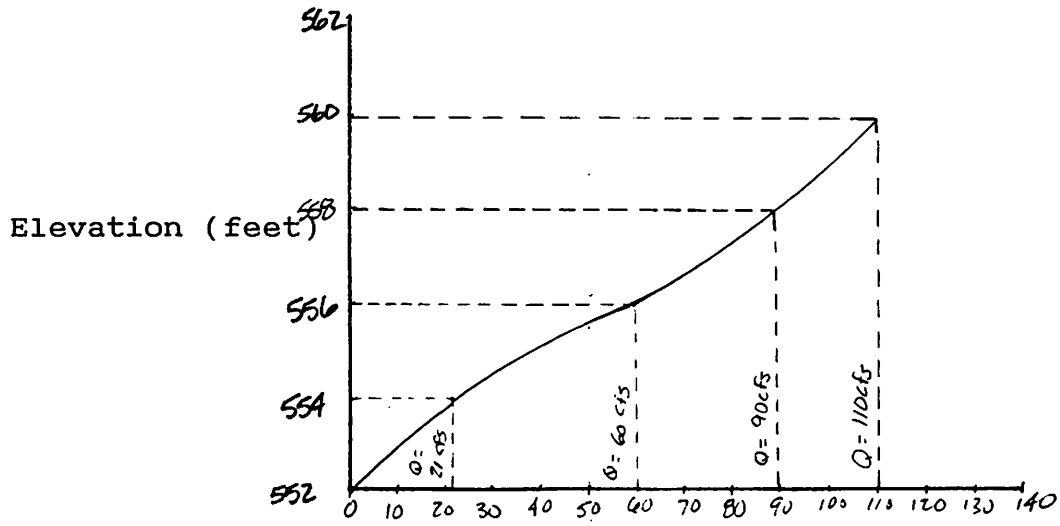
DETERMINATION OF TYPICAL INLET GRATING DISCHARGE CURVE

FIGURE 25. Determination of typical inlet grating discharge curve.

Proposed Basin - Elevation vs. Storage Graph



Proposed Basin - Elevation vs. Outflow Graph



(From ENTRANCE CONTROL Hydrograph)

42" pipe @ 1.5%

$Vel_{discharge} = 12.5$ fps

9-20-88

Time Interval (Minutes)	(Q_{IN}) Inflow Cubic Feet	(Q_{OUT}) Outflow Cubic Feet	(Q_{IN}-Q_{out}) Storage Cubic Feet	(FROM STORAGE GRAPH) Elevation
0	0	0	0	592.00
2	12,099.6	3,177.6	8,922	593.50
4	24,199.2	6,355.2	17,844	594.80
6	36,298.8	9,532.8	26,766	595.65
8	48,398.4	12,710.4	35,688	596.50
10	60,498.0	15,888.0	44,610	597.25
12	72,597.6	19,065.6	53,532	597.70
14	84,697.2	22,243.2	62,454	598.45
16	96,796.80	25,420.8	71,376	599.00
18	108,896.4	28,598.4	80,298	599.40
20	120,208.0	31,776.0	88,432	599.95
22	0			

50.45-6

9 OCT-8

SEDIMENT STORAGE CALCULATIONS

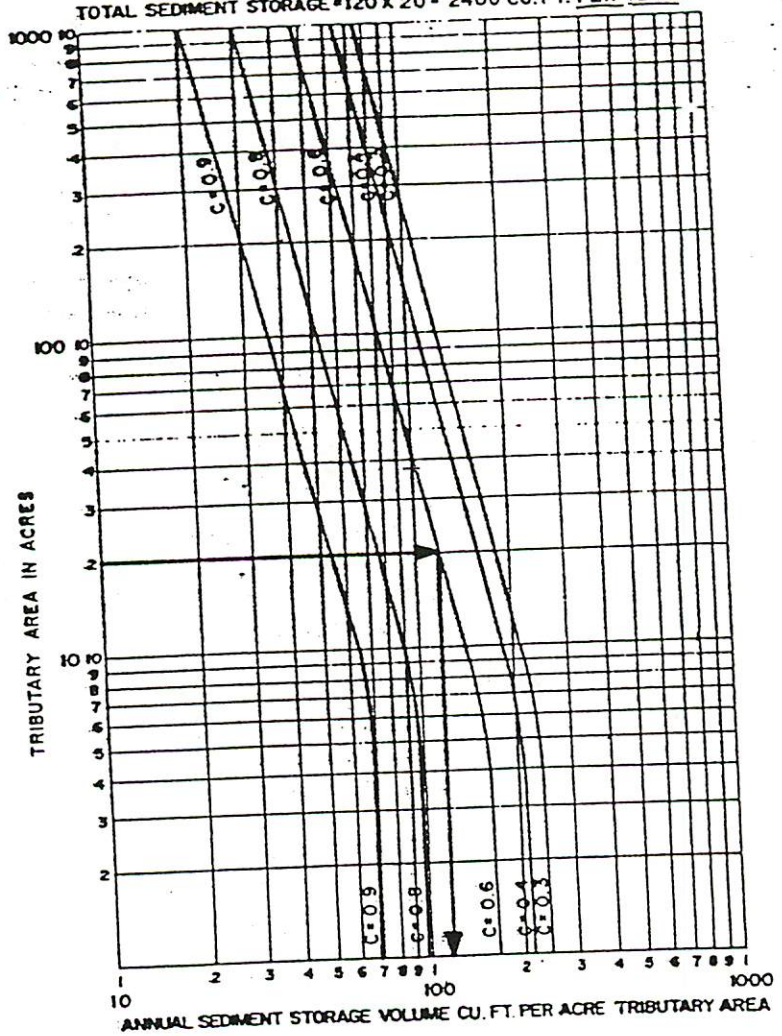
Tributary Area:		38.19 Acres
Runoff Coefficient (Rational Method)	=	0.6
Sediment Storage (Nomograph)	=	100 Ft.^{3} Per Acre Per Year
Total Sediment For 2 Years	=	100 X 38.19 X 2 Yrs.

S_{T2} = 7,638 Cubic Feet

ORIGINAL

2 YEAR SEDIMENT STORAGE REQUIRED

EXAMPLE:
TRIBUTARY AREA = 20 ACRES
RATIONAL METHOD RUNOFF COEFFICIENT "C" = 0.6
SEDIMENT STORAGE = 120 CU. FT. PER ACRE PER YEAR
TOTAL SEDIMENT STORAGE = 120 X 20 = 2400 CU. FT. PER YEAR.



ANNUAL SEDIMENT STORAGE

FIG. 6