



ENGINEERING DESIGN COMPUTATION SHEET

PROJECT NUMBER: 5346

SHEET NO. 1 OF     

DATE: 10/2/92

BY JY CHKD. BY     

DESCRIPTION: FEISE FOREST DETENTION

CALC. REQ. DET. BASIN DESIGN

100yr Flood elev 548.00

TOTAL SUBD. AREA = 46.06 Acres OK  
REQ. DET = 46.06 - 5.28 (Common ground) = 40.78 Acres

(GS)  $\frac{3.26 \text{ Dev.} + 2.31 \text{ Undev.}}{0.95, \text{ Diff.}} \cdot 0.95(40.78) = 38.74$

TOTAL DET. VOLUME REQ.  
(For 30 min)

$38.74 \frac{\text{ft}^3}{\text{sec}} \left( \frac{60 \text{ sec}}{\text{min}} \right) (30) = 69,734 \text{ ft}^3$  OK

CALC. VOLUME OF PROPOSED DET. BASIN

EL. 552.00	AREA 4686	} $\frac{7500 + 4682}{2} (2) = 12,182$	18,000
EL. 554.00	AREA 7500		25,000
EL. 556.00	AREA 10500		33,250
EL. 558.00	AREA 14500		<u>88,432</u>
EL. 560.00	AREA 18750		✓ TOTAL 88,432 ft <sup>3</sup>

TOTAL  $Q_{in} = 100.83 \text{ cfs}$  of this amount 38.74 is DETAINED 15 YEAR

$100.83 - 38.74 = 62.09 \text{ cfs}$

$Q_{DET} = \frac{88,432}{1800} = 49.13 \text{ cfs}$

$Q_{DISCHARGE} = 100.83 - 49.13 = 51.70 \text{ cfs}$



## ENGINEERING DESIGN COMPUTATION SHEET

PROJECT NUMBER: \_\_\_\_\_

SHEET NO. 2 OF \_\_\_\_\_

DATE: \_\_\_\_\_

BY SY CHKD. BY \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

DESIGN OF STRUCTURE TO PASS 51.70 cfs @ Depth of 8.00'

$$Q = CA \sqrt{2gh}$$

$$C_d = .65$$

$$C_d = .6 \text{ OK}$$

CONSERVATIVE

$$A_1 (\text{TRAIL ONE}) = (2'w \times 2'h)$$

$$= 4.0 \text{ ft}^2$$

$$h_2 = 8.0 - 1.0 = 7.0 \checkmark$$

$$Q = .65(4) (\sqrt{2(32.2)7.0}) = 55.20 \text{ cfs} \quad (\text{Adequate OK } \checkmark)$$

BROADCRESTED WEIR (emergency overflow) CALC.

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

length of travel 70'

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

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

$$0.47 = (\text{depth})^{3/2}$$

$$D = \sqrt[3]{0.47} = 0.60 \text{ FT} = 7.25'' = \underline{\underline{\text{Assume } 7.5'' \text{ depth}}}}$$



PROJECT NUMBER: \_\_\_\_\_

SHEET NO. 3 OF 8

DATE: \_\_\_\_\_

BY SY CHKD. BY \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

## Flow through GRATE

TOTAL AREA of grate (Assuming 2" BORDER FOR INTEGRITY)

$$(2'6'' - 4'') (1'3'' - 4'') = 1.99 \text{ FT}^2 / \text{GRATE}$$

Less area of grid :  $11 \left( \frac{3}{16}'' \right) (2'6'') - 2 \left( \frac{3}{16}'' \right) (1'3'')$

$$1.99 \text{ FT}^2 - 0.358 \text{ FT}^2 - 0.13 \text{ FT}^2 = 1.85 \text{ FT}^2 / \text{grate}$$

$$Q = CA \sqrt{2gh}$$

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

$$A = 20.94 \text{ REQ.}$$

$$\# \text{ of grates } \frac{20.94}{1.85} = 11.32 \approx 12 \text{ grates needed}$$

$$\therefore 0.6(12 \times 1.85) (\sqrt{2(32.2)(1)}) = 106.89 \text{ cfs} \quad \checkmark \text{ Adequate}$$

\* See next page for DIAGRAM



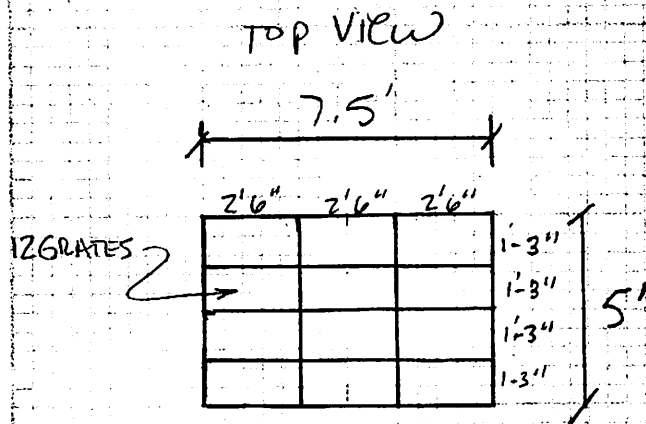
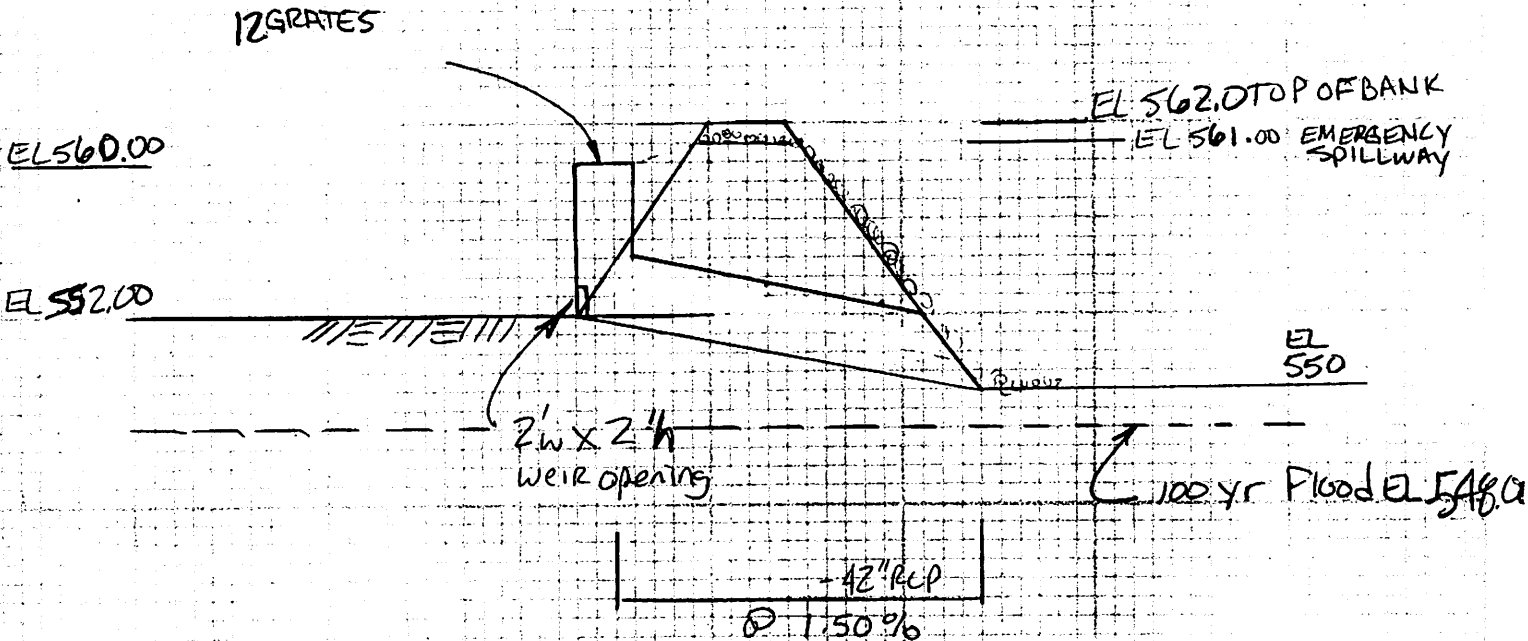
PROJECT NUMBER: \_\_\_\_\_

SHEET NO. 4 OF 8

DATE: \_\_\_\_\_

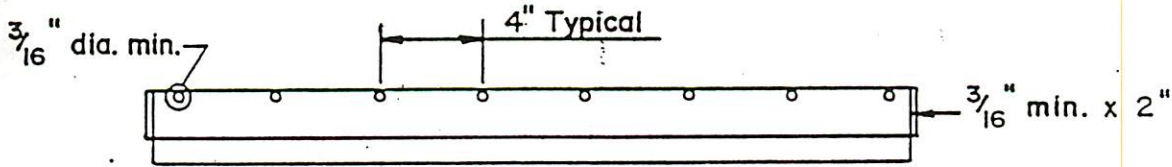
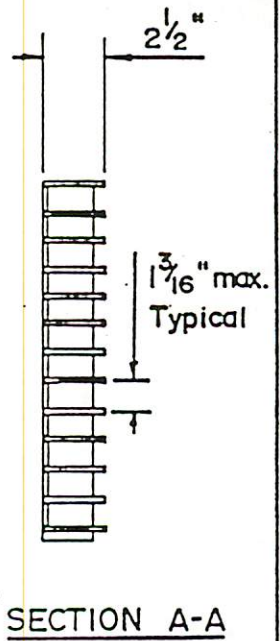
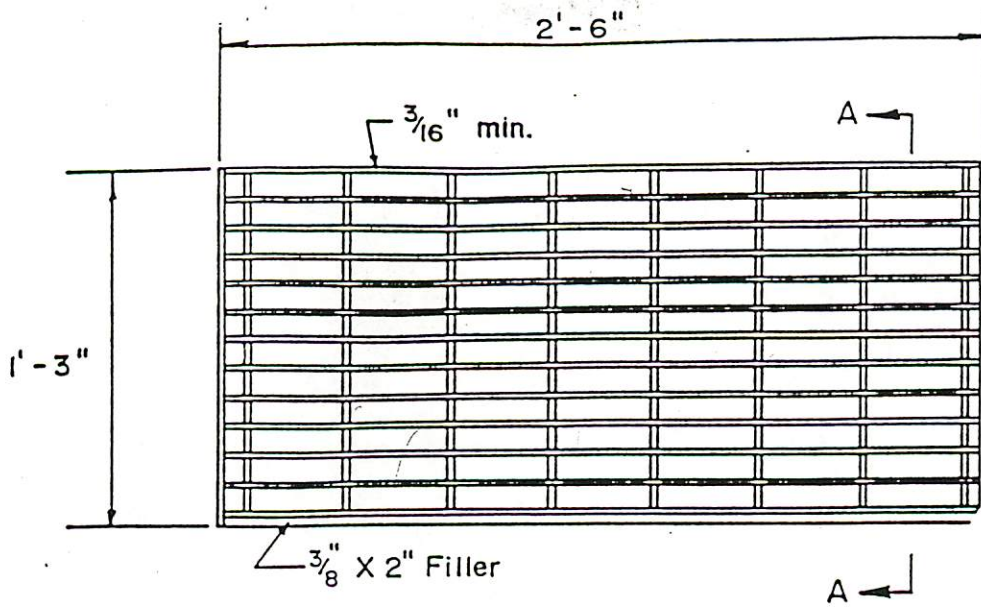
BY \_\_\_\_\_ CHKD. BY \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_



CAPACITY OF 42" @ 1.50% = 125 CFS  
Velocity " " " "  
with 110.83 CFS = 12.5 FPS

5/8



- Finish - Asphaltic 10 mil. coating
- Material - Mild carbon steel - ASTM A 4 569
- Capacity - H-20 loading
- Weight - 65 lb. min.
- Tolerances - All dimensions  $\pm \frac{1}{8}$ "
- Identification - The manufacturer must place his name or mark on each unit for the purpose of identification

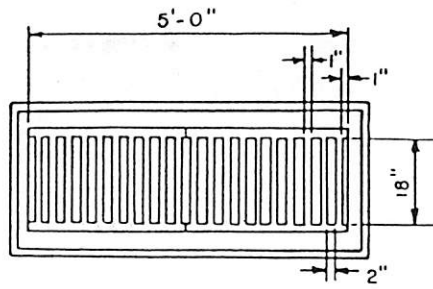
DETAIL OF STEEL GRATE

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.

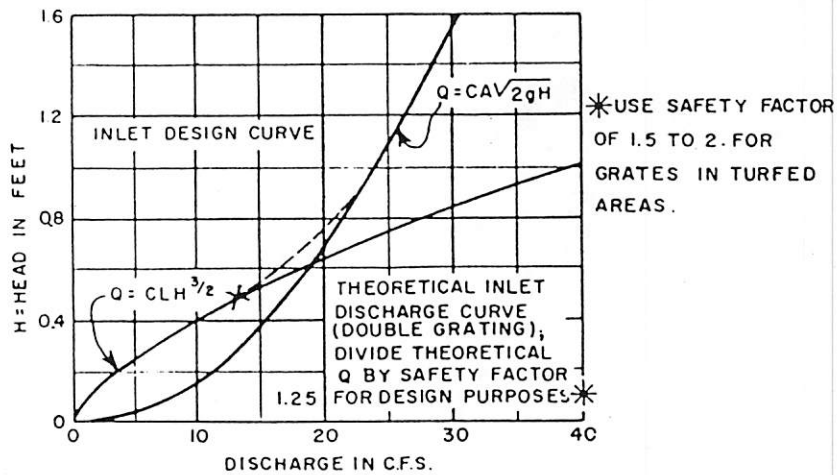
g = ACCELERATION OF GRAVITY IN FEET PER SECOND<sup>2</sup>

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:

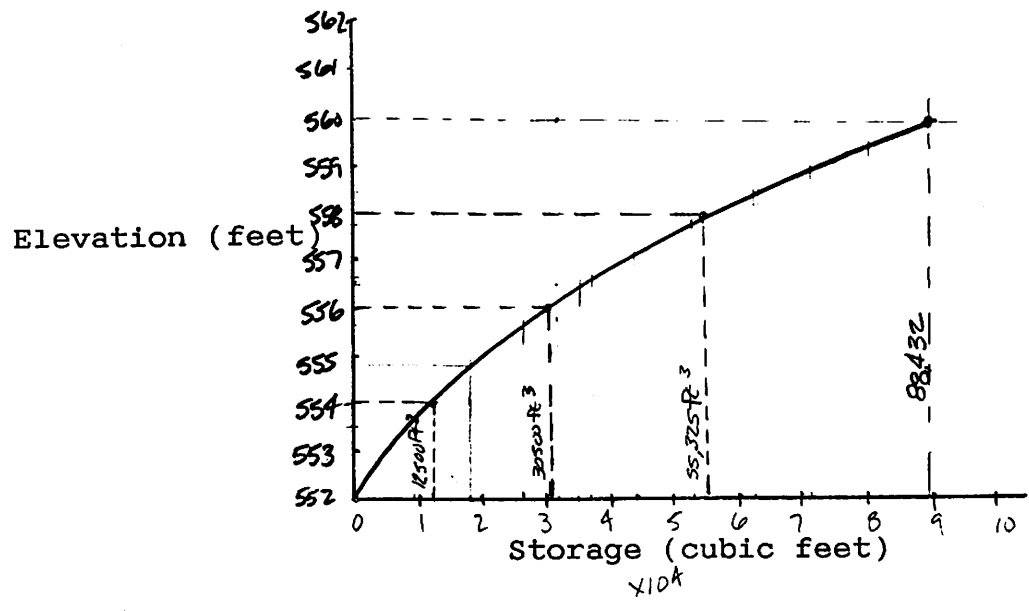
NET WIDTH OF GRATE OPENING TO GROSS WIDTH = 2:3



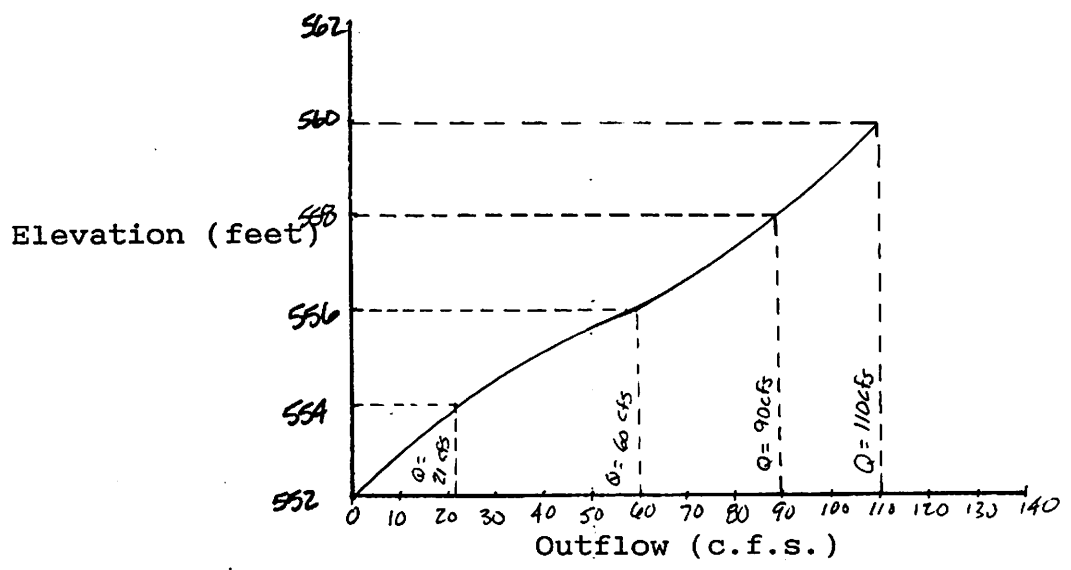
**DETERMINATION OF TYPICAL INLET GRATING DISCHARGE CURVE**

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 <sub>IN</sub> ) Inflow Cubic Feet	(Q <sub>OUT</sub> ) Outflow Cubic Feet	(Q <sub>IN</sub> -Q <sub>OUT</sub> ) Storage Cubic Feet	(FROM STORAGE) GRAPH Elevation
0	0	0	0	592.00
2	12,099.6	3,177.6	8922	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

80-8