



Date 2.20.88 Page 1 of 11

Project Bradford Place

Item Revised Drainage Calcs System 100

I HYDROLOGY

Use Rational Method $Q = CIA$

Determine "C"

<u>Node</u>	<u>Soil Type</u>	<u>Land Use</u>	<u>C₂</u>	<u>C₁₀₀</u>
103	D	Res 1/8 Ac	0.57	0.79
102	D	Res 1/8 Ac	0.57	0.79
101	MH			
100	End section			

Determine "I"

Assume $t_c = 15 \text{ min.}$ $\therefore I_2 = 3.83$

$I_{100} = 7.37$

Determine "A"

<u>Node</u>	<u>Plan. Units</u>	<u>Area SF</u>	<u>Area Ac.</u>
103	8.70	87,000	2.00
102	5.33	53,300	1.22
101	MH		
100	End section		



Date 2.20.88 Page 2 of 11

Project Braaford Place

Item Revised Drainage Calc's

Determine Q_2

<u>Node</u>	<u>C_2</u>	<u>I_2</u>	<u>A</u>	<u>Q_2</u>
103	0.57	3.83	2.00	4.4
102	0.57	3.83	1.22	2.7
101	MH			
100	End section			

Determine Q_{100}

<u>Node</u>	<u>C_{100}</u>	<u>I_{100}</u>	<u>A</u>	<u>Q_{100}</u>
103	0.79	7.37	2.00	11.6
102	0.79	7.37	1.22	7.1
101				
100				



Date 2.20.88 Page 3 of 11

Project Bradford Place

Item Revised Drainage Calcs

II INLET SIZING (Use 100-year Storm)

<u>Node</u>	<u>Q₁₀₀</u>	<u>Inlet Condition</u>	<u>Q_{max} @ Inlet *</u>	<u>USE</u>
103	11.6	Sump	13.0	L=5' Type 1A
102	7.1	Sump	13.0	L=5' Type 1A
101				
100	End section			

* DWS = 0.3' above T.C.

NOTE: FOR ALTERNATE GRATE INLET, SEE PAGE 3A

III STREET FLOW 2-YR

<u>Node</u>	<u>Q₂</u>	<u>Distribution</u>	<u>st. slope</u>	<u>d</u>	<u>d_{max}</u>	<u>Comment</u>
103	4.4	60% (S) = 2.6	1.84%	0.22	0.3	OK
		40% (N) = 1.8	0.76%	0.23	0.3	OK
102	2.7	90% (S) = 2.4	1.84%	0.21	0.3	OK
		10% (N) = 0.3	0.76%	0.12	0.3	OK

IV STREET FLOW 100 YR

<u>Location</u>	<u>Contrib. Areas</u>	<u>Q₁₀₀</u>	<u>street slope</u>	<u>Q_{max} *</u>	<u>Comment</u>
Approaching Nodes 103 & 102 from S.	60% 103 = 90% 102 =	7.0 6.4 13.4	1.84%	54.8	OK Use Roll CB w/ 0.3' wk Gr.
Approaching Nodes 103 & 102 from N.	40% 103 = 10% 102 =	4.6 0.7 5.3	0.76%	35.2	OK "

(* see Page 4)



Date 2.24.88 Page 3A of

Project Bradford Place

Item Revised Drainage Calc's

ALTERNATE GRATE (GUTTER) INLET

Use Neenah R-4470 Grate (1'x4') Area opening = 1.5 SF.

Node 103 $Q_{100} = 11.6 \text{ cfs}$

Check Weir Eq'n

$$Q = CLH^{3/2}$$

$$11.6 = 3.0 \times L \times 0.5^{3/2}$$

$$L = 10.93'$$

w/ SF of 33% $L = 10.93 \times 1.33 = 14.54'$

Check Orifice Flow Eq'n

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

$$11.6 = 0.6 \times A \times \sqrt{2 \times 32.2 \times 0.5}$$

$$A = 3.41$$

w/ SF of 33% $A = 3.41 \times 1.33 = 4.54 \text{ SF}$

USE 3 GRATES

$$L = 26'$$

$$A = 4.50 \text{ SF}$$

Node 102 $Q_{100} = 7.1 \text{ cfs}$

Check Weir flow Eq'n

$$Q = CLH^{3/2}$$

$$7.1 = 3.0 \times L \times 0.5^{3/2}$$

$$L = 6.69'$$

w/ SF of 33% $L = 6.69 \times 1.33 = 8.90'$

Check orifice flow Eq'n

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

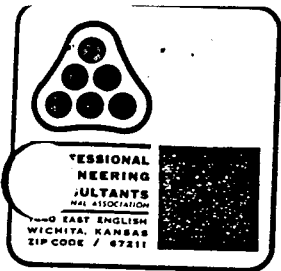
$$7.1 = 0.6 \times A \times \sqrt{2 \times 32.2 \times 0.5}$$

$$A = 2.09$$

w/ SF of 33% $A = 2.09 \times 1.33 = 2.77 \text{ SF}$

USE 2 GRATES

$$L = 18' \quad A = 2.00 \text{ SF}$$



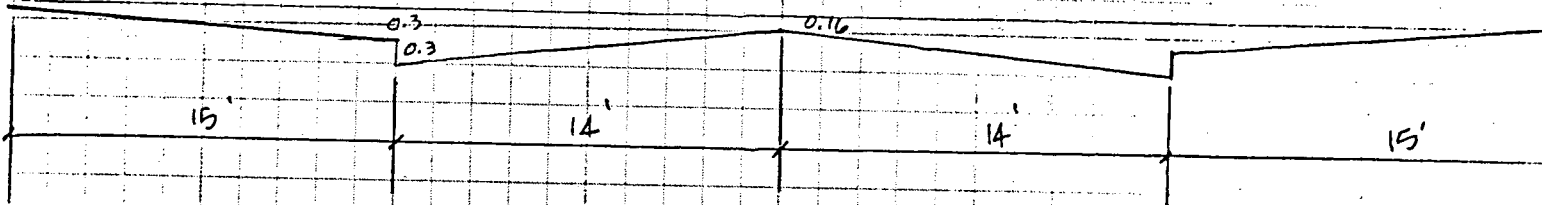
Date 2.20.88 Page 4 of 11

Project Bradford Place

Item Rev. Drainage Calc's.

Determine capacities of Roll-curb streets w/
various Walk Grades for 100-year storm analysis
(58' R-O-W)

0.3'
Walk Grade



$$p = \frac{(2 \times 14.5 \times 0.03) + (2 \times 2.8 \times 0.013) + (2 \times 12 \times 0.016)}{58.6}$$

$$= \frac{(0.87) + (0.0728) + (0.384)}{58.6} = \frac{1.3268}{58.6} = 0.0226$$

$$A = (2 \times \frac{1}{2} \times 15 \times 0.3) + (28 \times 0.16) + (2 \times \frac{1}{2} \times 14 \times 0.44)$$

$$= 4.5 + 4.48 + 6.16$$

$$= 15.14 \text{ SF}$$

$$p = 58.6$$

$$R = A/p = 15.14/58.6 = 0.258362$$

$$R^{2/3} = 0.40565$$

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

$$= \frac{1.486}{0.0226} \times 15.14 \times 0.40565 \times S^{1/2}$$

$$Q = 403.82 \sqrt{S}$$

5/11

100 j, 188.6500 100 3 4 3
110 t,bradford place addition
120 t,revise drainage calculations
130 t,project no. 472-76-245-81750-000-000-001
140 i, 103 0.79 2.00 0.00 0.00 11.50 15.00 192.48
150 i, 102 0.79 1.22 0.00 0.00 7.10 15.00 192.50
160 m, 101 192.00
170 m, 100 188.65
180 p, 103 102 27.30 18 0.013 100.00 0.00
190 p, 102 101 179.30 24 0.013 15.00 0.00
200 p, 101 100 118.00 24 0.013 90.00 0.00
210 e

6/11

Input File: brad100

bradford place addition
revise drainage calculations
project no. 472-74-245-21750-000-000-001

Storm Frequency = 2-Year

* * * H Y D R O L O G Y * * *

*****											*****				*****			
Tributary Area											Hydrology Summation				Conduit Data			
*****											*****				*****			
Node to	C	Area	Slope	Length	TC(0)	I(0)	Q(0)	TC	I	Q	Sum Q	Size	Velocity	Length	TT	TT+TC		
Node		(Ac)	(%)	(Ft)	(Min)	(In/Hr)	(CFS)	(Min)	(In/Hr)	(CFS)	(CFS)		(Ft/Sec)	(Ft)	(Min)	(Min)		
*****											*****				*****			
103	102	0.79	2.00	0.00	0.0	15.00	4.06	11.60	15.00	4.06	11.60	11.60	18"	6.56	27.30	0.07	15.07	
102	101	0.79	1.22	0.00	0.0	15.00	4.06	7.10	15.07	4.06	7.09	18.69	24"	5.95	179.30	0.50	15.57	
101	100	0.00	0.00	0.00	0.0	0.00	0.00	0.00	15.57	4.00	0.00	18.69	24"	5.95	118.00	0.33	15.90	
*****											*****				*****			

7/11

Date: 03-02-1988
Time: 14:49:31

Input File: brad100

bradford place addition
revise drainage calculations
project no. 472-76-245-01750-000-000-001

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

```

*****
Node      Hyd-Slope  Friction   Bend      Transition  Manhole  Deflection  Junction  Total  Hyd-El  Desired*  Diff. ‡
(Ft/Ft)   (Ft)       (Ft)      (Ft)      (Ft)       (Ft)      (Ft)      (Ft)    (Ft)   Elevation Elevation (Ft)
*****
103      0.01217    0.3329    0.0000    0.0000     0.0000    0.0000    0.0000    0.3329  192.0000  192.4800    0.48
102      0.00682    1.2235    0.0000    0.0239     0.0000    0.3796    0.4914    2.1185  191.6673  192.5000    0.83
101      0.00682    0.8052    0.0000    0.0000     0.0275    0.0320    0.0342    0.9768  189.5488  192.0000    2.45
100      0.00000    0.0000    0.0000    0.0000     0.0000    0.0000    0.0000    0.0000  188.6500  188.6500    0.00
*****

```

* = T.C.

‡ = Positive number indicates HGL below T.C.

For 100-year storm, HGL could be 0.30' above T.C.
(Diff. = -0.30)



Date 2.20.08 Page 8 of 11

Project Bradford Place

Item Revised Drainage Calcs - Area @

Bradford & Gatewood Sts.

I HYDROLOGY

Use Rational Formula $Q = CIA$

$$\left. \begin{array}{l} C_2 = 0.57 \\ C_{100} = 0.79 \end{array} \right\} \text{From Page 1}$$

$$\left. \begin{array}{l} I_2 = 3.83 \\ I_{100} = 7.37 \end{array} \right\} \text{From Page 1}$$

$$A = 3.94 \text{ Ac.}$$

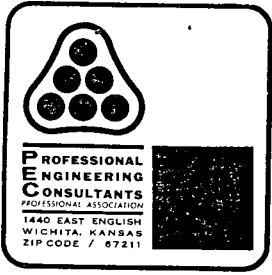
$$Q_2 = 0.57 \times 3.83 \times 3.94 = 8.6 \text{ cfs}$$

$$Q_{100} = 0.79 \times 7.37 \times 3.94 = 22.9$$

II STREET FLOW - 2YR

<u>Location</u>	<u>Q₂</u>	<u>Distribution</u>	<u>st. slope</u>	<u>d</u>	<u>d_{max}</u>	<u>Comment</u>
on Bradford	8.6	70% North = 6.0	0.70%	0.36'	0.3'	OK*
West of Gatewood		30% South = 2.6	1.35%	0.23'	0.3'	OK

* depth of flow exceeds roll curb height for approx 100 LF & abuts reserve in this area & assumed acceptable.



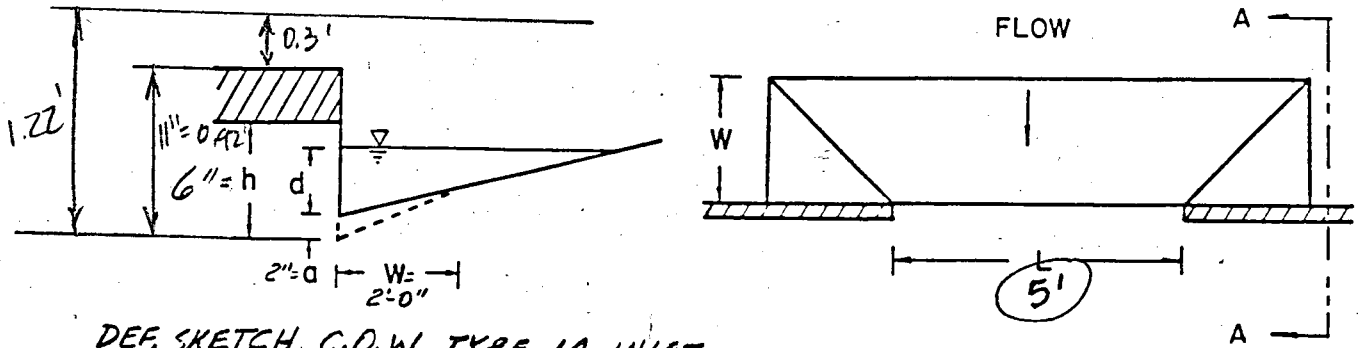
Date 2.20.88 Page 9 of 11

Project Bradford Place

Item Revised Drainage Calcs.

III STREET FLOW - 100 YR

<u>Location</u>	<u>Q₁₀₀</u>	<u>street slope</u>	<u>Q_{max}</u>	<u>Comment</u>
Approaching Gatewood on Bradford	22.9	0.7%	33.7	OK Use Roll CB. w/ 0.3' WK Gr.



DEF. SKETCH, C.D.W. TYPE 1A INLET

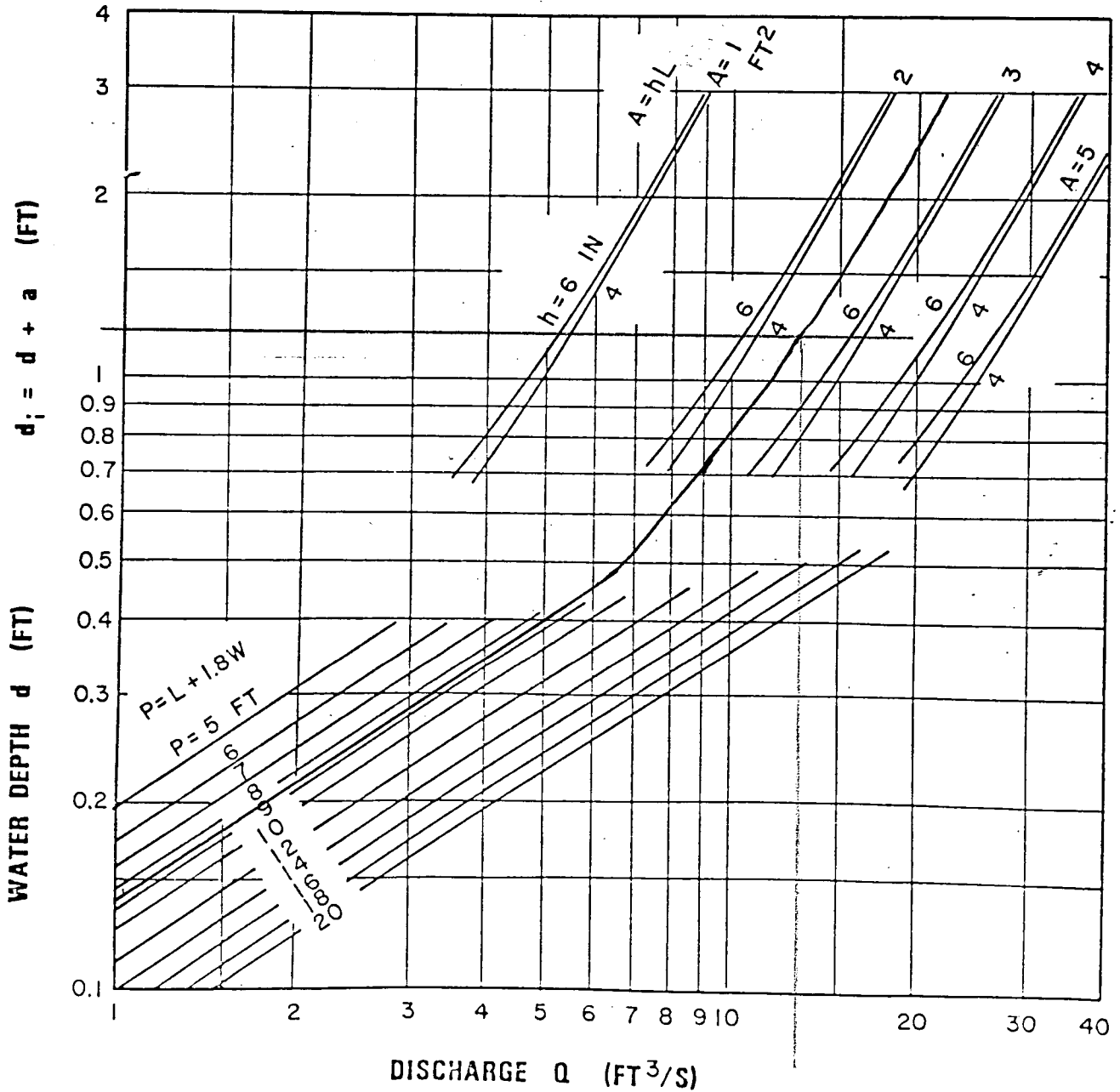


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, FHWA, MAR., 1974

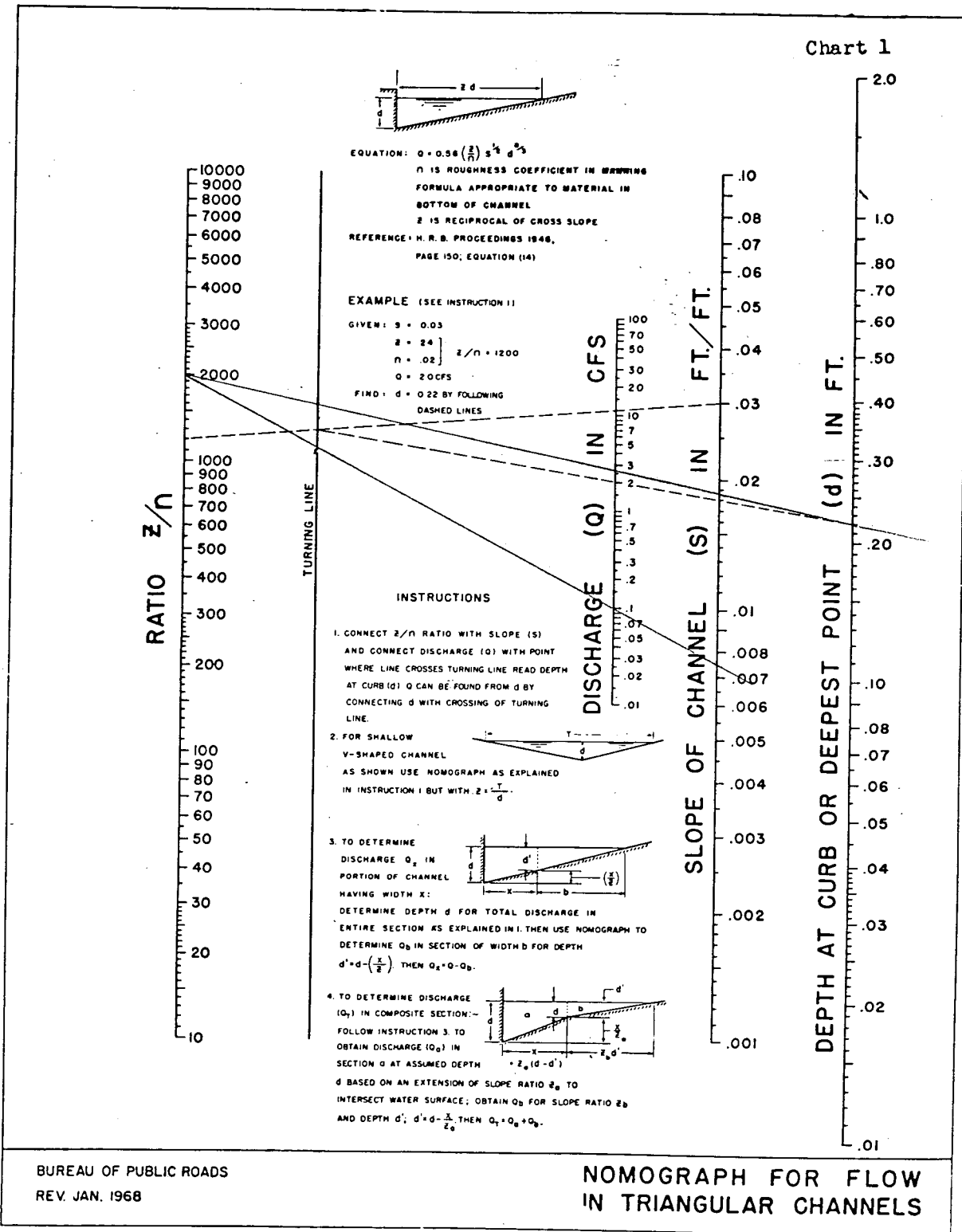
$x/\text{slope} = 3/8''/1 = 0.03125'$

$Z = 1/0.03125 = 32$

$n = 0.016$

$Z/n = 2000$

11/11

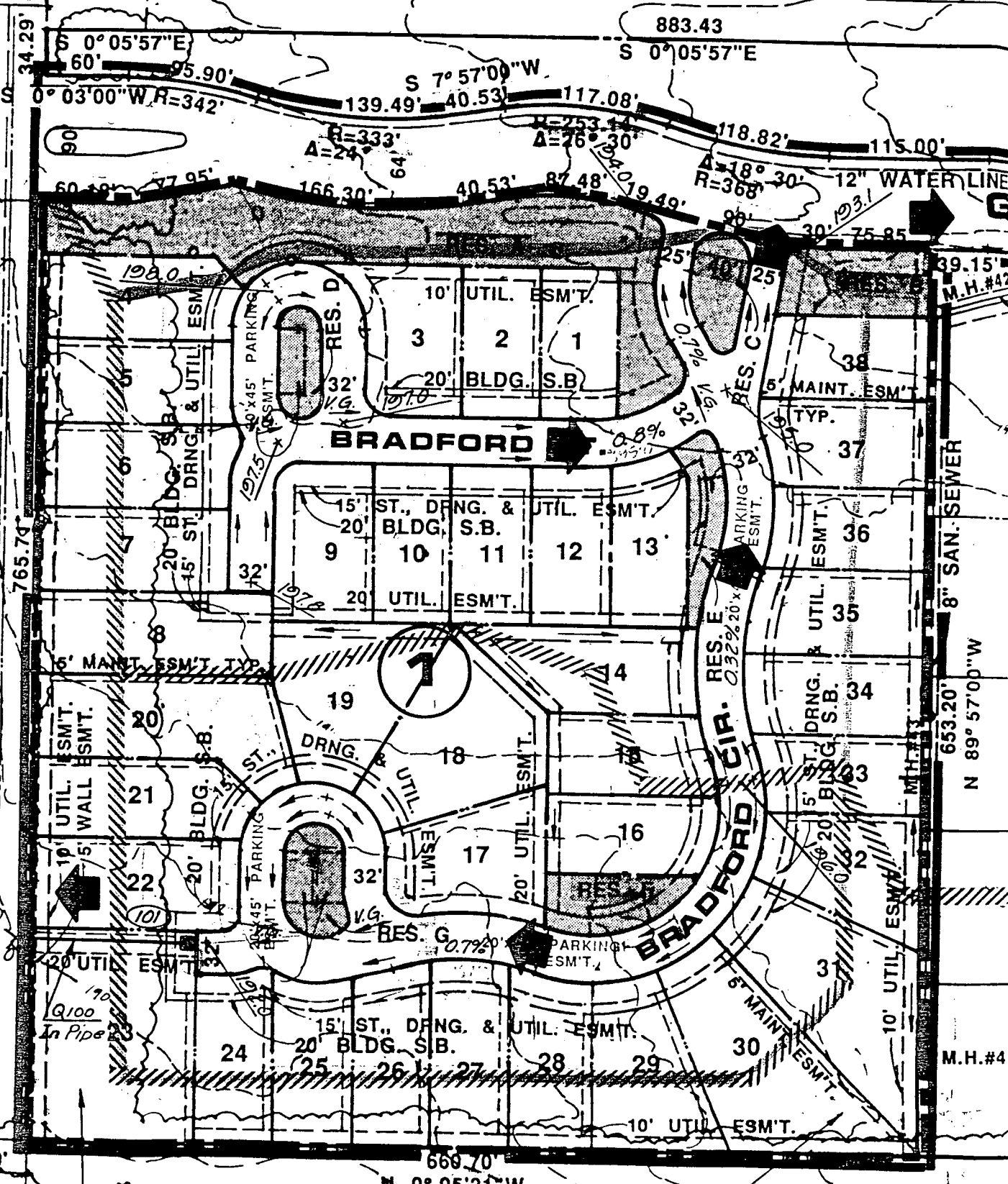


N.W. COR. N.E. 1/4
SEC. 17, T27S, R2E

13TH STREET NO. 1

S 89° 57'00"E
COMPLETE ACCESS CONTROL

50'
16" WATER LINE
4" GAS LINE



SWIMMING POOL

883.43

S 0° 05' 57" E
60' 95.90'
S 7° 57' 00" W
139.49' 40.53' 117.08'
R=333' A=24° 64'
R=253.44' A=26° 30'
118.82' 115.00'
A=18° 30' R=368'
12" WATER LINE

BRADFORD

BRADFORD CIP.

8" SAN. SEWER

653.20'
N 89° 57'00"W

M.H.#44

669.70'
N 0° 05' 21" W

FREE OPEN AREAS OF NEENAH GRATES (Continued)

CATALOG NO.	TYPE	SQ. FT. OPEN	CATALOG NO.	TYPE	SQ. FT. OPEN	CATALOG NO.	TYPE	SQ. FT. OPEN	CATALOG NO.	TYPE	SQ. FT. OPEN
R-4385-H	G	1.6	R-4440	B	0.4	R-4608	A	0.8	R-4770	C	2.4
R-4385-J	G	2.5	R-4441	A	0.2	R-4609	A	1.0	R-4780	C	3.1
R-4385-K	G	2.7	R-4441-A	A	0.3	R-4610	A	1.0	R-4781	C	3.0
R-4389	C	0.1	R-4442	A	0.3	R-4620	A	0.5	R-4790	B	1.5
R-4389-A	B	0.1	R-4442-A	A	0.4	R-4630	C	1.0	R-4792	C	1.8
R-4389-A1	B	0.2	R-4443	A	0.4	R-4632	C	1.1	R-4795	A	3.2
R-4389-B	B	0.2	R-4444	A	0.4	R-4640	A	1.1	R-4796	B	1.6
R-4389-F	B	0.5	R-4445	A	0.4	R-4641-A	A	1.2	R-4797	B	1.6
R-4389-O	B	0.1	R-4446	A	1.1	R-4641-B	B	1.3	R-4798	C	2.4
R-4390	B	0.3	R-4449	A	0.8	R-4641-C	C	1.1	R-4800	B	1.4
R-4391	B	0.5	R-4450	A	0.8	R-4641-F	A	1.7	R-4802	A	2.5
R-4391-A	B	0.5	R-4450-A	A	0.9	R-4642	B	1.7	R-4803	B	1.8
R-4392	B	0.8	R-4450-B	B	0.7	R-4643	A	0.9	R-4804	A	2.2
R-4393	C	1.1	R-4450-C	C	0.8	R-4644	B	0.9	R-4804-B	C	2.1
R-4394-B	B	0.2	R-4451	C	0.7	R-4645	B	1.6	R-4805	A	2.6
R-4395	B	0.2	R-4453	C	1.2	R-4646	C	1.1	R-4806	D	2.2
R-4395-A	B	1.0	R-4454	C	0.9	R-4648-A	C	1.4	R-4807	C	1.7
R-4396	B	0.3	R-4455	B	0.5	R-4649	A	1.0	R-4807-A	A	1.9
R-4396-A	C	0.5	R-4460	A	0.9	R-4650	A	0.9	R-4807-C	A	1.9
R-4398	B	0.2	R-4462	B	0.9	R-4650-A	A	1.3	R-4807-D	D	2.0
R-4400	B	0.1	R-4468	A	1.5	R-4650-B	B	1.1	R-4807-E	B	3.0
R-4401	A	0.1	R-4470	A	1.5	R-4650-1	A	1.1	R-4808	C	1.4
R-4402-A	B	0.1	R-4475	B	1.5	R-4650-2	C	1.4	R-4809	C	1.5
R-4402-B	B	0.1	R-4480	B	0.5	R-4652	A	1.5	R-4809-A	D	2.7
R-4403	A	0.3	R-4481	B	0.4	R-4653	A	1.6	R-4810	C	1.5
R-4404	B	0.2	R-4490	A	1.0	R-4654	A	1.9	R-4811	C	1.9
R-4404-C	B	0.5	R-4494	B	1.1	R-4654-C	C	3.6	R-4815	C	2.9
R-4405	B	0.4	R-4496	A	0.5	R-4654-1A	C	2.3	R-4817	A	2.4
R-4405-A	C	0.5	R-4500	A	0.8	R-4655-B	B	1.6	R-4820	C	1.6
R-4405-B	A	0.5	R-4510	B	0.8	R-4655-C	C	1.6	R-4821-A	C	1.7
R-4405-C	B	0.4	R-4511	A	0.5	R-4655-D	A	1.5	R-4821-B	D	1.8
R-4405-M5	C	1.8	R-4521	C	1.0	R-4655-F	B	2.3	R-4821-E	B	2.3
R-4405-3	A	0.3	R-4522	B	0.8	R-4656	B	2.5	R-4821-F	D	2.3
R-4405-5	B	0.4	R-4523	A	0.8	R-4659	B	1.0	R-4822	A	1.9
R-4406	B	0.5	R-4523-A	A	0.8	R-4660	C	1.1	R-4822-B	C	1.8
R-4406-A	B	0.4	R-4523-B	A	0.7	R-4661	B	0.8	R-4825	C	1.8
R-4406-B	B	0.3	R-4523-C	B	1.1	R-4662	A	1.3	R-4825-A	A	2.1
R-4406-C	A	0.4	R-4524	A	1.0	R-4670	C	1.1	R-4825-B	C	1.6
R-4406-1	A	0.5	R-4524-B	B	0.9	R-4670-A	A	1.0	R-4826	A	1.3
R-4406-2	C	0.6	R-4524-C	C	0.9	R-4671	A	1.1	R-4827	D	2.3
R-4407-E	B	3.0	R-4524-D	C	0.9	R-4672	C	1.1	R-4828	A	1.9
R-4407-2A	B	0.6	R-4525	A	0.8	R-4672	C	1.1	R-4828-B	D	2.4
R-4408	B	0.3	R-4525-A	C	1.0	R-4689	C	1.4	R-4829	C	2.2
R-4409	A	0.4	R-4525-B	B	0.9	R-4690	B	1.0	R-4830	C	0.9
R-4409-A	C	0.7	R-4526	A	1.8	R-4692-A	D	2.2	R-4831	C	1.5
R-4409-B	A	0.6	R-4527	B	1.5	R-4698	A	1.7	R-4832	C	1.5
R-4409-C	B	0.5	R-4527-A	B	1.2	R-4710	C	1.2	R-4832-A	A	3.1
R-4409-E	A	0.5	R-4527-B	A	1.2	R-4711	C	1.8	R-4832-B	C	1.7
R-4409-F	C	0.5	R-4529	B	0.6	R-4715	B	3.8	R-4832-1	B	1.6
R-4409-G	B	0.8	R-4530	A	0.8	R-4717-A	B	2.1	R-4833	A	2.3
R-4410	B	0.8	R-4540	C	1.1	R-4718	A	2.8	R-4834	A	1.6
R-4411-B	B	0.4	R-4541	A	1.0	R-4720	C	0.9	R-4834-B	B	1.7
R-4412	B	0.9	R-4544	A	1.8	R-4721	C	1.0	R-4835	C	3.7
R-4413-A	A	0.6	R-4545	A	1.6	R-4721-A	A	1.2	R-4835-1	C	4.9
R-4413-B	B	0.6	R-4548	A	1.0	R-4725	C	1.6	R-4835-2	C	3.2
R-4414	B	0.8	R-4550	C	0.8	R-4726	A	1.3	R-4836	C	3.6
R-4421	C	1.0	R-4550-A	A	1.0	R-4729	A	1.4	R-4837	A	2.2
R-4421-A	A	1.5	R-4551	A	1.1	R-4730	A	2.0	R-4838	A	3.1
R-4423	A	1.2	R-4552	A	0.6	R-4731	A	2.5	R-4838-A	A	2.1
R-4423-A	A	0.8	R-4553	B	0.9	R-4732	A	1.0	R-4838-1	C	2.8
R-4424	A	0.6	R-4557	A	0.8	R-4734	B	0.8	R-4839	A	2.1
R-4426	C	1.6	R-4558	C	1.1	R-4736	C	1.1	R-4840	C	2.8
R-4427	B	0.8	R-4560	B	1.0	R-4738	A	1.1	R-4841	C	2.8
R-4430	B	0.6	R-4570-1	A	0.9	R-4738-B	B	1.4	R-4842-1	D	2.7
R-4430-A	A	0.6	R-4571	B	1.3	R-4739	C	1.3	R-4842-2	D	2.6
R-4430-B	B	0.7	R-4572	D	1.3	R-4740	C	2.1	R-4843	A	2.6
R-4430-C	C	1.4	R-4573	A	1.1	R-4750	C	2.4	R-4845	A	2.3
R-4431-B	B	0.8	R-4574	A	1.0	R-4750-1	A	0.9	R-4846	C	5.6
R-4432	C	1.1	R-4575	A	1.7	R-4751	C	1.9	R-4848	A	1.8
R-4433	C	0.6	R-4575-A	A	1.6	R-4752	C	2.3	R-4849	A	1.5
R-4433-A	B	1.1	R-4575-C	C	1.7	R-4752-1	A	2.1	R-4850	C	2.8
R-4433-A1	B	0.5	R-4579	A	0.8	R-4753	C	2.0	R-4851	A	2.3
R-4433-B	C	1.0	R-4583	A	0.9	R-4754-C	C	4.2	R-4852	C	2.2
R-4433-C	A	0.7	R-4584	A	1.4	R-4755-A	B	1.4	R-4853	A	2.5
R-4435-1	C	0.8	R-4585	A	0.9	R-4755-B	A	2.8	R-4853-A	A	3.1
R-4436	D	0.6	R-4586	A	0.7	R-4755-C	C	2.9	R-4853-B	C	2.4
R-4436-A	B	0.7	R-4600	A	0.9	R-4755-D	A	2.1	R-4853-1	D	2.7
R-4437	B	0.8	R-4603	A	1.2	R-4755-1	B	2.1	R-4853-2	C	2.2
R-4437-A	A	0.7	R-4603-A	A	0.7	R-4756	C	4.3	R-4853-7	D	3.1
R-4437-B	A	0.7	R-4604	C	1.3	R-4757	A	2.1	R-4854	A	3.2
R-4437-C	C	0.7	R-4604-C	A	0.7	R-4758	C	2.8	R-4855	A	2.0
R-4438	B	0.8	R-4604-D	A	1.5	R-4759	C	1.5	R-4856	C	3.1
R-4438-A	A	0.5	R-4604-E	B	1.0	R-4760	C	1.7	R-4857	A	3.2
R-4438-C	C	0.7	R-4605	B	2.3	R-4761	D	1.9	R-4859-C	A	2.4
R-4439	B	1.2	R-4607	A	0.9	R-4762	C	1.4			
						R-4765	A	1.4			

Type K indicates "Special" grate style and is not among standard types as illustrated.

SQUARE AND RECTANGULAR DRAINAGE GRATES

Heavy Duty

The gratings in this series are rated heavy duty when supported on all four sides. Combinations of two or more standard gratings in any size are often used to cover larger drainage areas. For this condition, gratings are rated heavy duty when installed with the shortest dimension spanning the opening.

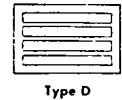
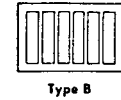
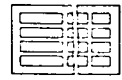
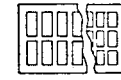
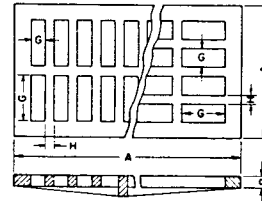
Other special sizes quoted on request in the event none of the standards shown in this series meet your requirements. In ordering replacement gratings to be used on existing catch basins, be sure to specify the exact size of opening in which the grate will be used.

Many of the gratings in this series can be adapted to trench frames with support on two sides as shown on pages 258 and 259. Most are qualified as heavy duty when the short dimension spans the trench. Advise loading requirements so we can confirm design selection for intended use.

For extreme conditions of load and shock, we recommend Ductile Iron. See page 6 for complete specifications.

Specify:

1. Catalog number.
2. R-4899 angle frame when required. (See page 243.)



The above schematic drawing identifies basic dimensions only and does not apply to all grate designs. Bar and rib depths, plate thicknesses, and seating widths, may vary on different sizes and styles. If your project has design restrictions, ask for approval drawings.

If any of the gratings in this series are to be used in bicycle traffic area, please check catalog page 89 for safety standards.

Free open areas for most gratings in this section are listed on pages 304-308.

Catalog No.	Dimensions in inches				Wt. Lbs.	Grate Type
	A	B	G	H		
Square — Heavy Duty						
R-4400	8x8	1 1/4	1x5	1	13	B
R-4401	8x8	1	3/8x3	3/8	10	A
R-4408	10 1/4 x 10 1/4	1	7/8 x 3 1/4	1	18	B
R-4440	12x12	1	1 1/8 x 10	1	20	B
R-4441	12x12	1	5/8 x 2	3/4	25	A
R-4441-A	12x12	2	5/8 x 4 7/8	3/4	48	A
R-4444	12x12	2	1 5/8 x 4	1	45	A
R-4511	14x14	1 1/2	1 1/2 x 5 1/2	1 1/8	45	A
R-4550	15x15	1 1/4	3 1/2 x 3 1/2	3/4	35	C
R-4552	16x16	1 3/4	1 1/4 x 6 1/4	1 1/4	75	A
R-4557	16x16	1 1/4	1 1/16 x 3 3/8	3/4	40	A
R-4558	17 5/8 x 17 5/8	1 1/4	1x5	1/2	45	C
R-4660	18x18	1 1/2	3x4 1/2	1 1/4	60	C
R-4661	18x18	1 1/2	1 3/4 x 15 1/2	3/4	78	B
R-4662	19 3/4 x 19 3/4	2 1/2	1 3/8 x 8 1/2	1	135	A
R-4720	20x20	1 3/4	1 3/8 x 3 1/2	1 1/4	110	C
R-4721-A	21x21	1 3/4	1 1/2 x 8	1 1/4	108	A
R-4725	21x21	2	3x3	1	105	C
R-4760	22x22	1 3/4	3x5 3/4	1	110	C
R-4761	22x22	1 3/4	1 1/2 x 20	7/8	125	D
R-4765	23x23	2	1x6 1/4	1	146	A
R-4805	24x24	3	2 1/2 x 10 1/2	3/4	210	A
R-4808	24x24	2	3/8 x 5 3/8	1/2	175	C
R-4809	24x24	2	5/8 x 10 3/4	3/4	165	C
R-4810	24x24	2	1 3/4 x 6	1 1/4	165	C
R-4820	24x24	2	2x6	1 1/4	180	C†
R-4826	24x24	2	1x6	1 1/4	190	A
R-4830	24x24	2	1x5	2	185	C†
R-4831	24x24	1 1/2	1x9 3/4	1	170	C
R-4832	24x24	1 3/8	1x4 1/2	1	135	C
R-4832-1	24x24	1 3/4	1x21	1	160	B
R-4832-A	25 7/8 x 25 7/8	1 1/2	3 1/4 x 11 3/8	3/4	145	A
R-4832-B	26x26	1 3/4	1 1/16 x 4	1	200	C
R-4833	26x26	2	2x7	1	160	A
R-4850	27x27	2	2 1/2 x 7 1/2	1	175	C
R-4851	27x27	2	2x10 1/2	1 1/2	210	A
R-4852	27x27	2	1 1/2 x 5	1	210	C
R-4880	28x28	2	1 1/2 x 7 1/4	1	210	C
R-4880-A	28x28	2	1 1/2 x 11 3/8	1	285	A
R-4880-C	30x30	1 1/2	1 1/4 x 5 7/8	1 1/4	260	C
R-4881	31 1/2 x 31 1/2	2 1/2	2 1/4 x 9 1/4	3/4	310	A
R-4882	34x34	2	2x14 1/2	1 1/8	285	A
R-4884*	36x36	1 3/4	2x4	1 3/8	480	C
R-4889*	45x45	1 1/2	2x6	1	410	C

†Convex.

*Grate in two pieces.

Catalog No.	Dimensions in inches				Wt. Lbs.	Grate Type
	A	B	G	H		
Rectangular — Heavy Duty						
R-4389-F	4 3/4 x 22 3/8	1 3/4	1 x 2 3/4	1	32	B
R-4389-O	6x12	1 1/4	3/4 x 4	1	16	B
R-4390	6x24	1	3/4 x 4 1/2	1	23	B
R-4391-A	7x9	7/8	1x5	1	9	B
R-4392	7 1/4 x 48	1 5/8	1 1/2 x 4 1/4	1	90	B
R-4393	7 1/2 x 50	1 3/4	7/8 x 5 1/2	3/4	95	C
R-4403	8x14	1	1 1/2 x 2 1/8	1/2	18	A
R-4404-C	8x24	1	1 1/16 x 5 7/8	1	30	B
R-4406	8x24	1 3/4	1 1/16 x 6	1	50	B
R-4406-1	8x24	1 3/4	1 x 2 5/8	3/4	50	A
R-4406-2	8x24	1 3/4	1x5	1	50	C
R-4406-A	9x24	7/8	3/8 x 6	1/2	30	B
R-4406-C	9 1/4 x 23 7/8	1	1 x 2 7/8	1	40	A
R-4407-2A	9 1/2 x 24	1 3/4	1 x 7 1/2	1	55	B
R-4409	10x17 3/4	1 1/2	1 x 3 1/2	1	45	A
R-4409-A	10x24	1 3/4	1 1/4 x 4 3/4	1	60	C
R-4409-C	10x24	1 3/4	1x7	1	70	B
R-4409-E	10x24	1 3/4	1 x 3 1/2	1	65	A
R-4409-G	10x24	1 1/2	2x8	1	45	B
R-4410	10x29	1 1/2	2x8	1	55	B
R-4412	10x32 5/8	1 3/4	1 1/2 x 7 1/2	1 1/4	85	B
R-4421	10x40	1 1/8	1 1/4 x 8 1/2	1	75	C
R-4423-A	10 1/4 x 48	1 5/8	1 1/2 x 3 3/8	1	130	A
R-4424	10 1/2 x 23 1/8	1 3/4	2x2	1	60	A
R-4430	11x20	2	1 1/4 x 9	1	65	B
R-4430-A	11x24	1 1/2	3/4 x 4 3/8	3/4	55	A
R-4430-B	11 1/2 x 24	1 1/2	1 x 6 5/8	1	65	C
R-4430-C	11 1/4 x 46 1/8	1 1/2	1x8	1	120	C
R-4431-B	11 3/8 x 24	1	1 1/4 x 9 3/8	1	35	B
R-4435-1	11 7/8 x 14	2	1x5 1/2	1	48	C
R-4443	12x14	1 3/4	1 1/2 x 5 1/4	1 1/4	48	A
R-4449	12x24	1 1/2	1 1/2 x 4 1/4	1	65	A
R-4450	12x24	1 3/4	1x4 1/2	1	70	A
R-4450-A	12x24	1 3/4	2x2	1	75	A
R-4450-B	12x24	1 3/4	1 1/16 x 9	1	68	B
R-4450-C	12x24	1 3/4	1 1/8 x 10 1/4	1	70	C
R-4451	12x24	2	1 1/2 x 3 3/4	1	85	C
R-4454	12x26	1 1/2	1/2 x 11 1/2	1/2	60	C
R-4460	12x30	2	1 1/4 x 4	1	120	A
R-4462	12x35 3/4	1 1/2	3/4 x 9	1	115	B
R-4470	12x48	1 3/4	1x4 1/2	1	160	A
R-4475	12x55 3/4	2	1 1/16 x 9	2	230	B
R-4481	12 7/8 x 13	2	1 1/2 x 9 1/2	1	50	B
R-4490	13x23	1 1/8	2x5	1	40	A
R-4525	14x24	2	1x5 1/2	1	95	A
R-4525-A	14x24	2	1 3/8 x 10	1	100	C
R-4525-B	14x24	2	1x12	1	90	B
R-4530	14 1/2 x 22	2	1 1/2 x 5 1/2	1 1/4	95	A