

## **Pipe Sizing Calculations**

DESIGN STORM: 100 YEAR  
 DATE: 3/6/12  
 DONE BY: BRE  
 FILE: 4810 RATIONAL METHOD.wb3

STORM SEWER DESIGN

(ADS N+12) "n" = 0.010 4'-10"  
 (ADS N+12) "n" = 0.012 12'-3/8"  
 (ADS N+12) "n" = 0.013 42'-60"  
 (Cast Iron) "n" = 0.011

PROJECT: SM-4810  
 LOCATION: Grant Road  
 Acton, MA

FROM	TO	LENGTH (FT)	TRIBUTARY AREA		TIME OF FLOW		RUNOFF COEFF. "C"	RAINFALL INTENSITY (IN/HR)	TOTAL RUNOFF (CFS)	SLOPE OF PIPE (FT/FT)	DIAM (IN)	MANN. "n"	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	VELOCITY (FPS)	DESIGN FLOW DEPTH OF FLOW (FT)	TOTAL ENERGY HEAD (FT)	MANHOLE INVERT DROP (FT)	FALL IN PIPE (FT)	DRAIN INV. ELEVATION		GROUND SURFACE		
			INCR. (ACRES)	TOTAL (ACRES)	TO UPPER (MIN)	SECTION (MIN)														UPPER END (MIN)	LOWER END	UPPER END	LOWER END	
CB-1	DMH-1	24	0.01	0.01	10	0.08	0.84	7.6	0.70	0.013	8	0.011	1.75	5.02	4.73	0.35	0.29	0.64	0.30	156.00	155.70	159.00	158.80	
DMH-1	DMH-2	15	0.01	0.02	10	0.02	0.53	7.6	2.05	0.027	8	0.011	2.59	7.41	8.22	1.05	0.45	1.50	0.30	156.00	155.70	159.00	158.80	
DMH-2	DMH-3	34	0.01	0.06	10	0.06	0.58	7.6	2.78	0.006	12	0.012	3.05	3.88	4.39	0.30	0.74	1.04	0.10	155.60	155.50	158.80	158.00	
DMH-3	DMH-4	34	0.01	0.02	10	0.02	0.68	7.6	2.78	0.005	12	0.011	3.27	4.16	4.67	0.34	0.70	1.04	0.17	156.97	156.80	158.80	158.00	
DMH-4	DMH-5	38	0.01	0.02	10	0.02	0.81	7.6	2.03	0.011	12	0.012	4.31	5.49	5.54	0.48	0.83	0.83	0.10	163.86	163.70	167.00	167.00	
DMH-5	DMH-6	115	0.01	0.38	10	0.11	0.71	7.6	3.38	0.011	12	0.012	4.31	5.49	5.41	0.45	0.84	0.94	0.10	163.86	163.70	167.00	167.00	
DMH-6	DMH-7	17	0.01	0.38	10	0.02	0.37	7.6	0.81	0.027	8	0.011	3.95	5.03	5.66	0.50	1.21	1.21	0.40	163.40	163.40	167.00	165.50	
DMH-7	DMH-8	19	0.01	0.41	10	0.06	0.49	7.6	1.79	0.010	8	0.011	3.48	3.41	6.01	0.56	0.92	0.92	0.19	176.87	176.68	179.80	180.10	
DMH-8	DMH-9	16	0.01	0.41	10	0.05	0.17	7.6	1.16	0.010	8	0.011	4.63	5.89	5.53	0.67	0.66	0.66	0.19	176.87	176.68	179.80	180.10	
DMH-9	DMH-10	3	0.01	0.18	10	0.02	0.42	7.6	3.76	0.010	8	0.011	1.57	4.49	4.91	0.37	0.43	0.43	0.16	176.84	176.94	182.20	180.10	
DMH-10	DMH-11	3	0.01	0.03	10	0.16	0.67	7.6	1.15	0.083	6	0.017	2.09	10.67	6.20	0.60	0.69	0.69	0.10	176.50	176.60	180.10	180.10	
DMH-11	DMH-12	39	0.01	0.08	10	0.08	0.49	7.6	0.45	0.055	6	0.017	1.70	8.64	7.30	0.83	1.00	1.00	4.90	172.50	172.60	180.10	173.70	
DMH-12	DMH-13	62	0.01	0.07	10	0.10	0.30	7.6	0.68	0.041	6	0.017	1.47	7.49	7.36	0.84	0.24	2.54	2.54	1.70	170.91	168.66	173.70	171.70
DMH-13	DMH-14	23	0.01	0.02	10	0.10	0.30	7.6	0.91	0.052	6	0.017	1.66	8.45	4.09	0.25	0.06	0.31	1.20	168.72	167.09	173.70	171.70	
DMH-14	DMH-15	21	0.01	0.02	10	0.08	0.48	7.6	0.91	0.010	8	0.011	1.57	4.49	4.66	0.34	0.37	0.70	0.22	167.86	167.74	171.70	170.80	
DMH-15	DMH-16	1	0.01	0.08	10	0.08	0.45	7.6	0.96	0.010	8	0.011	1.57	4.49	4.71	0.48	0.38	0.72	0.24	167.64	167.46	170.80	168.50	
DMH-16	Infiltration	1	0.01	0.23	10	0.01	0.45	7.6	0.96	0.020	8	0.011	2.21	6.3	6.12	0.58	0.31	0.89	0.10	167.30	167.20	168.50	168.20	

CB CATCH BASIN  
 DMH DRAIN MANHOLE  
 DI DROP INLET  
 AD AREA DRAIN  
 Infiltration Underground Infiltration Area

Closed Drainage System

SM-4810

1 of 6

Project: The Meadows of Acton

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)                      i = rainfall intensity inches/hour

C = runoff coefficient,                      A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

CB-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.10	0.90	0.090
lands/grass	0.01	0.20	0.002
woods	<u>0.00</u>	0.15	<u>0.000</u>
sum =	0.11		sum = 0.092

C = 0.84 = total product / total area

CB-2

Surface Cover	A (ac)	C	Product A x C
impervious	0.24	0.90	0.216
lands/grass	0.27	0.20	0.054
woods	<u>0.00</u>	0.15	<u>0.000</u>
sum =	0.51		sum = 0.270

C = 0.53 = total product / total area

DMH-1

Surface Cover	A (ac)	C	Product A x C
CB-1	0.11	0.84	0.092
CB-2	0.51	0.53	0.270
			<u>0.000</u>
sum =	0.62		sum = 0.362

C = 0.58 = total product / total area

Closed Drainage System

SM-4810

2 of 6

Project: The Meadows of Acton

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)                      i = rainfall intensity inches/hour

C = runoff coefficient,                      A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

CB-3

Surface Cover	A (ac)	C	Product A x C
impervious	0.18	0.90	0.162
lands/grass	0.08	0.20	0.016
woods	<u>0.00</u>	0.15	<u>0.000</u>
sum =	0.26	sum =	0.178

C = 0.68 = total product / total area

CB-4

Surface Cover	A (ac)	C	Product A x C
impervious	0.29	0.90	0.261
lands/grass	0.03	0.20	0.006
woods	<u>0.00</u>	0.15	<u>0.000</u>
sum =	0.32	sum =	0.267

C = 0.83 = total product / total area

DMH-2

Surface Cover	A (ac)	C	Product A x C
CB-3	0.26	0.68	0.178
CB-4	0.32	0.83	0.267
sum =	0.58	sum =	0.445

C = 0.77 = total product / total area

Closed Drainage System

SM-4810

3 of 6

Project: The Meadows of Acton

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

CB-5

Surface Cover	A (ac)	C	Product A x C
impervious	0.07	0.90	0.063
lands/grass	0.22	0.20	0.044
woods	<u>0.00</u>	0.15	0.000
sum =	0.29	sum =	0.107

C = 0.37 = total product / total area

CB-6

Surface Cover	A (ac)	C	Product A x C
impervious	0.20	0.90	0.180
lands/grass	0.28	0.20	0.056
woods	<u>0.00</u>	0.15	0.000
sum =	0.48	sum =	0.236

C = 0.49 = total product / total area

Closed Drainage System

SM-4810

4 of 6

Project: The Meadows of Acton

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

CB-7

Surface Cover	A (ac)	C	Product A x C
impervious	0.10	0.90	0.090
lands/grass	0.31	0.20	0.062
woods	<u>0.00</u>	0.15	0.000
sum =	0.41	sum =	0.152

$C = \boxed{0.37} = \text{total product} / \text{total area}$

DMH-4

Surface Cover	A (ac)	C	Product A x C
CB-7	0.41	0.37	0.152
sum =	0.41	sum =	0.152

$C = \boxed{0.37} = \text{total product} / \text{total area}$

DMH-3

Surface Cover	A (ac)	C	Product A x C
CB-5	0.29	0.37	0.11
CB-6	0.48	0.49	0.24
DMH-4	<u>0.41</u>	0.37	0.15
sum =	1.18	sum =	0.495

$C = 0.42 = \text{total product} / \text{total area}$

Closed Drainage System

SM-4810

5 of 6

Project: The Meadows of Acton

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)                      i = rainfall intensity inches/hour

C = runoff coefficient,                      A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

AD-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.02	0.90	0.018
lands/grass	<u>0.01</u>	0.20	0.002
sum =	0.03	sum =	0.020
C = <u>0.67</u> = total product / total area			

AD-2

Surface Cover	A (ac)	C	Product A x C
impervious	0.03	0.90	0.027
lands/grass	0.06	0.20	0.012
AD-1	<u>0.03</u>	0.67	0.020
sum =	0.12	sum =	0.059
C = <u>0.49</u> = total product / total area			

AD-3

Surface Cover	A (ac)	C	Product A x C
impervious	0.03	0.90	0.027
lands/grass	0.02	0.20	0.004
AD-2	<u>0.12</u>	0.49	0.059
sum =	0.17	sum =	0.090
C = <u>0.53</u> = total product / total area			

AD-5

Surface Cover	A (ac)	C	Product A x C
impervious	0.00	0.90	0.000
lands/grass	<u>0.01</u>	0.20	0.002
sum =	0.01	sum =	0.002
C = <u>0.20</u> = total product / total area			

Closed Drainage System

SM-4810

6 of 6

Project: Great Road

By BRE

Date 3/16/12

Location: Acton, MA

Checked \_\_\_\_\_

Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

AD-4

Surface Cover	A (ac)	C	Product A x C
impervious	0.02	0.90	0.018
lands/grass	0.05	0.20	0.010
AD-3	0.17	0.53	0.090
AD-5	<u>0.01</u>	0.20	0.002
sum =	0.25	sum =	0.120

C = 0.48 = total product / total area

DI-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.00	0.90	0.000
lands/grass	0.03	0.20	0.006
AD-4	<u>0.25</u>	0.48	0.120
sum =	0.28	sum =	0.126

C = 0.45 = total product / total area

CB-8

Surface Cover	A (ac)	C	Product A x C
DI-1	<u>0.28</u>	0.45	0.126
sum =	0.28	sum =	0.126

C = 0.45 = total product / total area