```
       ******  HYDRA  ******* (Version 6.0) *****            Date **-04-98
                                                              Page No   1

   Example Storm Drain Analysis  -  Rational Method


 +++ Commands Read From File C:\HYDRA\EXSTO.HDA
   JOB
   SWI 2
   PDA 0.012 300  .914 .610 0.8 .0030
   RAI 5 170 10 132 15 112 20 100 25 90 30 81

                              IDF CURVE

 .17E+03*...............................................................
        .                                                              .
        .                                                              .
        .                                                              .
 .13E+03.          *                                                   .
        .                                                              .
        .                    *                                         .
        .                                                              .
        .                              *                               .
 .85E+02.                                        *                     .
        .                                                              .
        .                                                              .
        .                                                              .
        .                                                              .
 .43E+02.                                                              .
        .                                                              .
        .                                                              .
        .                                                              .
        .                                                              .
 .00E+00*...............................................................
        5.       9.      12.      16.      19.      23.      26.      3

                        PLOT-DATA (TIME Vs.VALUE)
-------------------------------------------------------------------------
     5.   170.00    25.   90.00    0.    .00    0.    .00    0.    .00
    10.   132.00    30.   81.00    0.    .00    0.    .00    0.    .00
    15.   112.00     0.     .00    0.    .00    0.    .00    0.    .00
    20.   100.00     0.     .00    0.    .00    0.    .00    0.    .00
-------------------------------------------------------------------------
   HGL 1
   REM Begin Mainline 1 to OUTLET
   NEW Start Lateral 1 to MH1
   REM Link 1  Lateral 1 to 2
   STO .05 .4 10
   STO .04 .9 10
   PIP 7.3 101.2 101.2 100.00 99.93 300
 +++ Tc =  10.0 min
 +++ CA =    .1
 +++ Link #  1,  Flow depth =    .093 m
```

HYDRA EXAMPLE

Figure 36-16D

Example Storm Drain Analysis - Rational Method

```
  PNC 1 2 .92 0 0 1
  REM Link 2 Lateral 2 to MH1
  STO .05 .4 10.2
  STO .04 .9 10.2
  PIP 1.0 101.2 101.35 99.93 99.92
+++ Tc =  10.2 min
+++ CA =    .1
+++ Link #  2,  Flow depth =    .132 m
  PNC 2 21 1.22 90 0 1
  REM LINK 3 MAINLINE MH1 to MH2
  PIP 43.0 101.35 100.83 99.92 99.40 300
+++ Tc =  10.2 min
+++ CA =    .1
+++ Link #  3,  Flow depth =    .123 m
  PNC 21 22 1.22 180 0 1
  HOL 3
  NEW Lateral 3 to MH2
  REM Link 4 Lateral 3 to MH2
  STO .02 .9 11.2
  STO .06 .4 11.2
  PIP 1.0 100.68 100.83 99.48 99.47 300
+++ Tc =  11.2 min
+++ CA =    .0
+++ Link #  4,  Flow depth =    .078 m
  PNC 3 22 1.22 0 0 1
  REM Link 5 MH2 to MH3
  REC 3
  PIP 22.0 100.83 100.62 99.40 99.13 300
+++ Tc =  11.2 min
+++ CA =    .2
+++ Link #  5,  Flow depth =    .144 m
  PNC 22 23 1.22 180 0 1
  NEW Lateral 4 to 5
  REM Link 6 Street Inlets 4 to 5
  STO .12 .4 10
  STO .05 .9 10
  PIP 7.3 100.56 100.56 99.24 99.20 300
+++ Tc =  10.0 min
+++ CA =    .1
+++ Link #  6,  Flow depth =    .141 m
  PNC 4 5 .76 0 0 1
  REM Link 7 Street Inlet 5 to MH 3
  HOL 5
  STO .13 .4 10.1
  STO .05 .9 10.1
  PIP 9.0 100.56 100.62 99.20 99.14 300
+++ Tc =  10.1 min
+++ CA =    .2
+++ Link #  7,  Flow depth =    .201 m
```

HYDRA EXAMPLE
(continued)

Figure 36-16D

```
Example Storm Drain Analysis  -  Rational Method

  PNC 5 23 1.22 135 0 1
  REM Link 8 MH3 to MH4
  REC 5
  PIP 35.0 100.62 100.20 99.06 98.64 375
+++ Tc =  10.2 min
+++ CA =     .3
+++ Link #  8,  Flow depth =    .188 m
  PNC 23 24 1.22 180 0 1
  NEW Lateral 6 to 7
  REM Link 9 Inlets 6 to 7
  STO .04 .9 11.5
  PIP 7.3 100.00 100.00 98.80 98.76 300
+++ Tc =  11.5 min
+++ CA =     .0
+++ Link #  9,  Flow depth =    .084 m
  PNC 6 7 .92 0 0 1
  REM Link 10 Inlet 7 to MH4
  HOL 7
  STO .02 .9 11.5
  STO .10 .4 11.5
  PIP 1.0 100.00 100.20 98.76 98.75 300
+++ Tc =  11.7 min
+++ CA =     .1
+++ Link # 10,  Flow depth =    .117 m
  PNC 7 24 1.22 180 0 1
  REM Outfall Link:  MH4 to Outlet
  REC 7
  PIP 24.5 100.2 98.95 98.56 98.44 450
+++ Tc =  11.7 min
+++ CA =     .1
+++ Cover at lower manhole     .023 m
+++ Link # 11,  Flow depth =    .140 m
  PNC 24 25 0 135 2
  END
 END OF INPUT DATA.
```

HYDRA EXAMPLE
(continued)

Figure 36-16D

Example Storm Drain Analysis - Rational Method

*** Start Lateral 1 to

Pipe Design

Link	Length (m)	Diam (mm)	Invert Up/Dn (m)	Slope (m/m)	Depth Up/Dn (m)	Min. Cover (m)	Velocity Act/Full (m/s)	--Flow-- Act/Full (m^3/s)	Estimated Cost ($)
1	7	300	100.000 99.930	.010	1.200 1.270	.875	1.131 1.455	.020 .103	0.
2	1	300	99.930 99.920	.010	1.270 1.430	.945	1.389 1.486	.040 .105	0.
3	43	300	99.920 99.400	.012	1.430 1.430	1.105	1.490 1.634	.040 .116	0.

Length = 51. m Total length = 51. m
Cost = 0. Total Cost = 0.

*** Lateral 3 to MH2

Pipe Design

Link	Length (m)	Diam (mm)	Invert Up/Dn (m)	Slope (m/m)	Depth Up/Dn (m)	Min. Cover (m)	Velocity Act/Full (m/s)	--Flow-- Act/Full (m^3/s)	Estimated Cost ($)
4	1	300	99.480 99.470	.010	1.200 1.360	.875	1.046 1.486	.015 .105	0.
5	22	300	99.400 99.130	.012	1.430 1.490	1.105	1.615 1.646	.054 .116	0.

Length = 23. m Total length = 74. m
Cost = 0. Total Cost = 0.

HYDRA EXAMPLE
(continued)

Figure 36-16D

Example Storm Drain Analysis - Rational Method

*** Lateral 4 to 5 Pipe Design

Link	Length (m)	Diam (mm)	Invert Up/Dn (m)	Slope (m/m)	Depth Up/Dn (m)	Min. Cover (m)	Velocity Act/Full (m/s)	--Flow-- Act/Full (m^3/s)	Estimated Cost ($)
6	7	300	99.240 99.200	.005	1.320 1.360	.995	1.061 1.100	.034 .078	0.
7	9	305	99.200 99.140	.007	1.360 1.480	1.030	1.351 1.226	.069 .089	0.
8	35	375	99.060 98.640	.012	1.560 1.560	1.154	1.875 1.889	.102 .209	0.

Length = 51. m Total length = 59. m
Cost = 0. Total Cost = 0.

*** Lateral 6 to 7 Pipe Design

Link	Length (m)	Diam (mm)	Invert Up/Dn (m)	Slope (m/m)	Depth Up/Dn (m)	Min. Cover (m)	Velocity Act/Full (m/s)	--Flow-- Act/Full (m^3/s)	Estimated Cost ($)
9	7	300	98.800 98.760	.005	1.200 1.240	.875	.807 1.100	.012 .078	0.
10	1	300	98.760 98.750	.010	1.240 1.450	.915	1.312 1.486	.032 .105	0.
11	24	450	98.560 98.440	.005	1.640 .510	.023	1.074 1.363	.045 .217	0.

HYDRA EXAMPLE
(continued)

Figure 36-16D

Example Storm Drain Analysis - Rational Method

Hydraulic Gradeline Computations

Link #	Down-stream Node #	Hydraulic Gradeline Elevation	Crown Elev.	Possible Surcharge	Ground Elev.	Super-crit.?	Manhole Depth	Loss Coef
1	2	100.075	100.235	N	101.200	Y	.138	.15
2	21	100.059	100.225	N	101.350	Y	.130	.15
3	22	99.564	99.705	N	100.830	Y	.153	.17
4	22	99.553	99.775	N	100.830	Y	.153	.17
5	23	99.272	99.435	N	100.620	Y	.188	.05
6	5	99.415	99.505	N	100.560	Y	.208	.15
7	23	99.341	99.445	N	100.620	Y	.188	.05
8	24	98.824	99.021	N	100.200	Y	.139	.03
9	7	98.887	99.065	N	100.000	Y	.120	.15
10	24	98.863	99.055	N	100.200	Y	.139	.03
11	25	98.578	98.897	N	98.950	Y	.000	.00

Link #	Terminal Node #	Hydraulic Gradeline Elevation	Ground Elevation	Loss Coef.
1	1	100.188	101.200	1.50
4	3	99.704	100.680	1.50

NORMAL END OF HYDRA

HYDRA EXAMPLE
(continued)

Figure 36-16D