



DeWild Grant Reckert and Associates Company

Consulting Engineers

July 5, 2000

4425 Singing Hills Boulevard
Suite 300
Sioux City, IA 51106
(712) 266-1554
Fax (712) 266-1707

Mr. Jim Geusebroek
KC Engineering PC
4300 S. Lakeport Road
Suite 205
Sioux City, IA 51106


**Re: Proposed Freezer Addition, Cloverleaf Cold Storage
Napoleon, Ohio
DGR File 250042**

Dear Jim:

DGR prepared the enclosed Storm Water Runoff Analysis in May 1998 for the freezer addition to the Cloverleaf Cold Storage Company in Napoleon, Ohio, which was constructed in 1998. DGR has reviewed this report as it pertains to the proposed freezer expansion to be constructed on the far northwest corner of the building in 2000. In the developed conditions portion of the 1998 report, the site was broken into four drainage subareas. The proposed 2000 freezer expansion falls within subarea no. 1 of the 1998 report. When our runoff computations for subarea no. 1 were performed in 1998, a C value of 0.90 was used for the entire area even though the area covered by the proposed 2000 freezer expansion was in grass at that time. The city of Napoleon's design criteria calls for a C value of 0.90 to be used for roof area; therefore, we do not expect any increase in the runoff from the site as calculated in the 1998 report resulting from this 2000 freezer expansion.

Sincerely,

DEWILD GRANT RECKERT
AND ASSOCIATES COMPANY


Brian Mastbergen, P.E.

BKM:pak

Enclosure

STORM WATER RUNOFF ANALYSIS

Proposed Freezer Addition
Cloverleaf Cold Storage Company
Napoleon, Ohio

May 1998

Existing site conditions consist of a grass area with an asphalt parking lot. Elevation difference across the site is approximately 3 feet from near the east property line to the middle of the existing warehouse.

A drainage ditch on the west and north side of the property discharge the site runoff in an easterly direction.

Existing Conditions:

The site is generally divided into two drainage subareas with half the site flowing west to a ditch and half flowing north to a ditch.

Flow @ west ditch:

$$Q_5 = CIA$$

$$C = 0.55$$

$$T_c = \text{less than 20 min.}$$

$$I_{5 \text{ yr.}} = 3.15 \text{ in./hr.}$$

$$A = 2.09 \text{ ac.}$$

$$Q_5 = (0.55)(3.15 \text{ in./hr.})(2.09 \text{ ac.})$$

$$Q_5 = 3.62 \text{ cfs}$$

Flow @ north ditch:

$$Q_5 = CIA$$

$$C = 0.55$$

$$T_c = \text{less than 20 min.}$$

$$I_{5 \text{ yr.}} = 3.15 \text{ in./hr.}$$

$$A = 2.09 \text{ ac.}$$

$$Q_5 = 3.62 \text{ cfs}$$

Total existing runoff from site:

$$Q_{5 \text{ total}} = 7.2 \text{ cfs}$$

Capacity of existing 12" CMP (northwest): $Q_{\max} = 0.4$ cfs (see attachment)

Capacity of existing 48" CMP (northwest): $Q_{\max} = 23.3$ cfs (see attachment)

Capacity of existing 54" CMP (northeast): $Q_{\max} = 47.6$ cfs (see attachment)

Developed Conditions:

Drainage Areas: (see attached drawing)

Subarea No. 1 -

120 x 180'	=	0.50 ac.
265' x 135'	=	0.82 ac.
100' x 170 x 1/2	=	0.20 ac.
35 x 170"	=	<u>0.14</u> ac.
		1.66 ac.

Subarea No. 2 -

165 x 225'	=	0.85 ac.
170' x 100 x 1/2	=	<u>0.20</u> ac.
		1.05 ac.

Subarea No. 3 -

385' x 90	=	0.80 ac.
-----------	---	----------

Subarea No. 4 -

380' x 120'	=	1.05 ac.
45' x 265'	=	<u>0.27</u> ac.
		1.32 ac.

Time of Concentration (T_c) -

Estimate roof to gutter 10 min.

Travel time, 730' to outlet @ NE corner of site
assume $v = 1.5$ fps.

$$T_c = \frac{730'}{1.5 \text{ ft}} \frac{\text{sec.}}{60} \frac{\text{min}}{60} = 8.1 \text{ min.}$$

$$T_c = 10 \text{ min} + 8.1 \text{ min} = 18.1 \text{ min.}$$

Will use: $T_c = \underline{20 \text{ min.}}$

Total runoff from site:

$$Q_5 = CIA$$

$$A = 4.83 \text{ ac.}$$

$$I_5 = 3.15 \text{ in./hr.}$$

$$C = 0.90$$

$$Q_5 = 13.7 \text{ cfs}$$

$$Q_{10} = CIA$$

$$A = 4.83 \text{ ac.}$$

$$I_5 = 3.74 \text{ in./hr.}$$

$$C = 0.90$$

$$Q_{10} = 16.3 \text{ cfs}$$

The attached calculations indicate that for a 5-year storm event the existing site runoff is approximately 7.2 cfs. It is estimated 3.6 cfs discharge through the storm sewer on the east side of the property along the asphalt street. The remaining 3.6 cfs follow to the ditches which border the property on the north and west.

It is intended that subareas no. 3 and 4 (the building and dock area) will surface flow and discharge through this existing storm sewer system. The runoff for a 5-year storm event under developed conditions is approximately 7.9 cfs. It is believed this runoff will surcharge the storm sewer and result in on-site flooding at the catch basins.



Pipe Report - *EXISTING*

Pipe	Up Node	Dn Node	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	I (in/hr)	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Gr Elev (ft)	Dn Gr Elev (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)	Description
P-3	I-3	I-2	0.50	0.55	0.28	0.28	3.15	0.87	290.00	0.08069	12 incl	0.013	3.57	74.75	72.41	77.70	76.64	1.91	3.19	75.14	73.68	
P-1	I-1	I-2	1.01	0.55	0.56	0.56	3.15	1.76	65.00	0.24462	12 incl	0.013	6.21	74.00	72.41	77.02	76.64	1.98	3.19	74.56	73.68	
P-2	I-2	Outlet	0.57	0.55	0.31	1.14	3.15	3.63	146.00	0.05753	12 incl	0.013	3.01	72.41	71.57	76.64	79.50	3.19	6.89	73.68	72.38	

Node Report - *EXISTING*

Node	Inlet A (acres)	C	Inlet CA (acres)	Ext CA (acres)	Tot CA (acres)	TC (min)	Ext TC (min)	Up Flow Time (min)	Sys Flow Time (min)	I (in/hr)	Tot CIA (cfs)	5	Add. Q (cfs)	CO (cfs)	Known Flow (cfs)	Tot Up Added (cfs)	Q (cfs)	Gr Elev (ft)	Rim (ft)	HGL In (ft)	HGL Out (ft)	I (in/hr)	Inlet Q (cfs)	Description
I-3	0.50	0.55	0.28	0.00	0.28	0.00	0.00	0.00	0.00	3.15	0.87		0.00	0.00	0.00	0.00	0.87	77.70	77.70	75.14	675.14	3.15	0.87	
I-1	1.01	0.55	0.56	0.00	0.56	0.00	0.00	0.00	0.00	3.15	1.76		0.00	0.00	0.00	0.00	1.76	77.02	77.02	74.56	674.56	3.15	1.76	
I-2	0.57	0.55	0.31	0.00	1.14	0.00	0.00	2.38	2.38	3.15	3.63		0.00	0.00	0.00	0.00	3.63	76.64	76.64	73.68	673.68	3.15	1.00	
Outlet	N/A	N/A	N/A	N/A	1.14	N/A	0.00	2.90	2.90	3.15	3.63		N/A	N/A	N/A	0.00	N/A	79.50	79.50	72.38	672.38	N/A	N/A	

Pipe Report - Existing

Pipe	Up Node	Dn Node	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	I (in/hr)	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Gr Elev (ft)	Dn Gr Elev (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)	Description
P-3	I-3	I-2	0.50	0.55	0.28	0.28	3.74	1.04	290.00	0.08069	12 inci	0.013	3.57	74.75	72.41	77.70	76.64	1.91	3.19	75.17	74.25	
P-1	I-1	I-2	1.01	0.55	0.56	0.56	3.74	2.09	65.00	0.24462	12 inci	0.013	6.21	74.00	72.41	77.02	76.64	1.98	3.19	74.61	74.25	
P-2	I-2	Outlet	0.57	0.55	1.14	1.14	3.74	4.31	146.00	0.05753	12 inci	0.013	3.01	72.41	71.57	76.64	79.50	3.19	6.89	74.25	72.44	

Pipe Report - DEVELOPED

Pipe	Up Node	Dn Node	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	I (in/hr)	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Gr Elev (ft)	Dn Gr Elev (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)	Description
P-3	I-3	I-2	0.50	0.55	0.28	0.28	3.15	0.87	290.00	0.013	12 inch	0.013	3.57	74.75	72.41	77.70	76.64	1.91	3.19	78.56	76.64	
P-1	I-1	I-2	2.12	0.90	1.91	1.91	3.15	6.06	65.00	0.013	12 inch	0.013	6.21	74.00	72.41	77.02	76.64	1.98	3.19	79.93	76.64	
P-2	I-2	Outlet	0.57	0.55	0.31	2.50	3.15	7.93	146.00	0.013	12 inch	0.013	3.01	72.41	71.57	76.64	79.50	3.19	6.89	78.42	72.59	

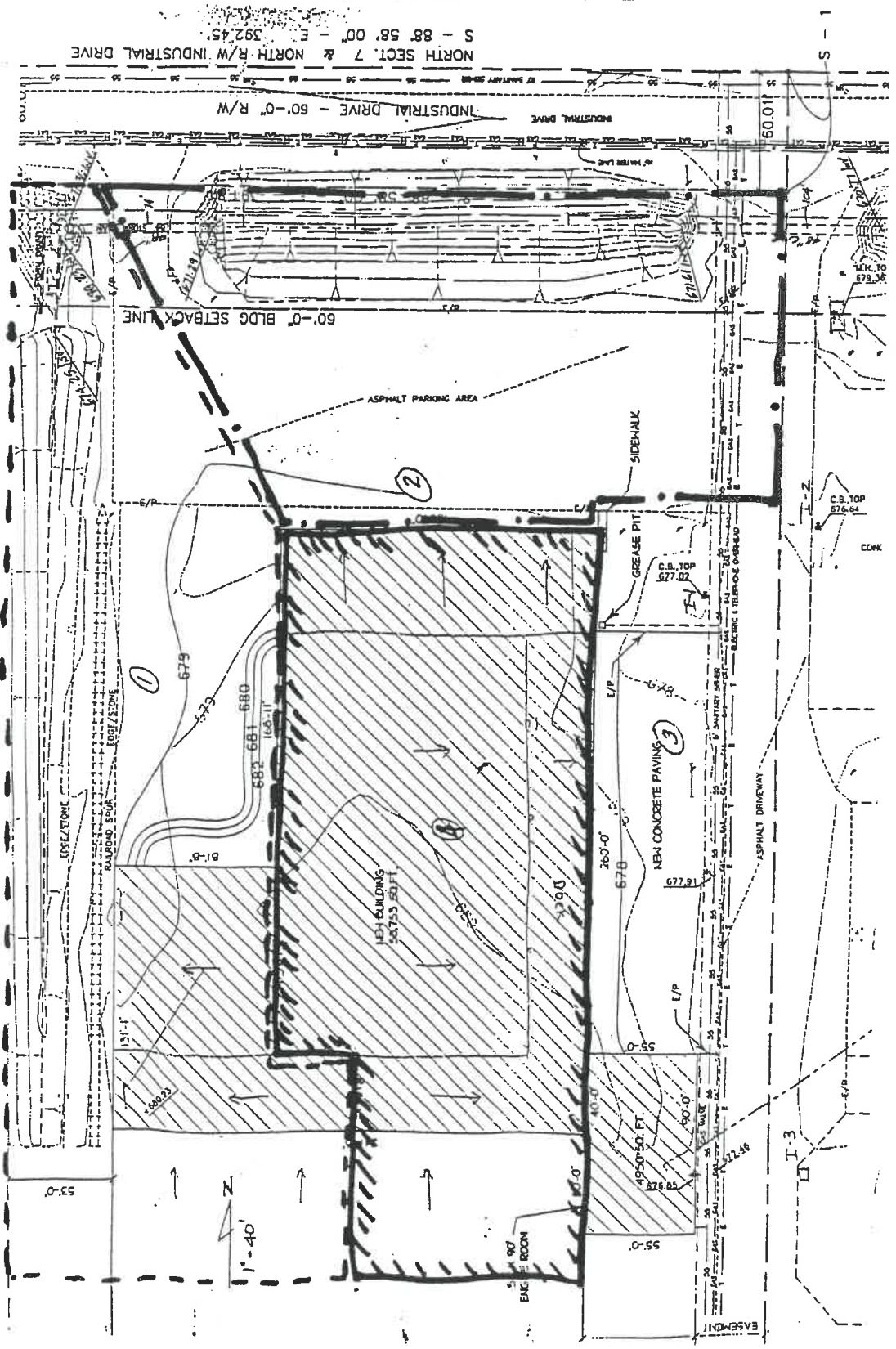
Node Report - DEVELOPERS

Node	Inlet A (acres)	Inlet C (acres)	Inlet CA (acres)	Ext CA (acres)	Tot CA (acres)	TC (min)	Ext TC (min)	Up Flow Time (min)	Sys Flow Time (min)	I (in/hr)	Tot CIA (cfs)	Add. Q (cfs)	CO Flow (cfs)	Known Flow (cfs)	Tot Up Added (cfs)	Q (cfs)	Gr Elev (ft)	Rim (ft)	HGL In (ft)	HGL Out (ft)	I (in/hr)	Inlet Q (cfs)	Description
I-3	0.50	0.55	0.28	0.00	0.28	0.00	0.00	0.00	0.00	3.15	0.87	0.00	0.00	0.00	0.00	0.87	77.70	77.70	78.56	678.56	3.15	0.87	
I-1	2.12	0.90	1.91	0.00	1.91	5.00	0.00	0.00	5.00	3.15	6.06	0.00	0.00	0.00	0.00	6.06	77.02	77.02	79.93	679.93	3.15	6.06	
I-2	0.57	0.55	0.31	0.00	2.50	0.00	0.00	5.15	5.15	3.15	7.93	0.00	0.00	0.00	0.00	7.93	76.64	76.64	78.42	678.42	3.15	1.00	
Outlet	N/A	N/A	N/A	N/A	2.50	N/A	0.00	5.41	5.41	3.15	7.93	N/A	N/A	N/A	0.00	N/A	79.50	79.50	72.59	672.59	N/A	N/A	

Pipe Report - DEVELOPED

Pipe	Up Node	Dn Node	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	I (in/hr)	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Gr Elev (ft)	Dn Gr Elev (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)	Description
P-3	I-3	I-2	0.50	0.55	0.28	0.28	3.74	1.04	290.00	0.08069	12 inch	0.013	3.57	74.75	72.41	77.70	76.64	1.91	3.19	81.00	76.64	
P-1	I-1	I-2	2.12	0.90	1.91	1.91	3.74	7.19	65.00	0.24462	12 inch	0.013	6.21	74.00	72.41	77.02	76.64	1.98	3.19	82.93	76.64	
P-2	I-2	Outlet	0.57	0.55	0.31	2.50	3.74	9.41	146.00	0.05753	12 inch	0.013	3.01	72.41	71.57	76.64	79.50	3.19	6.89	80.80	72.60	

REDUCED 50%



NORTH SECT 7 & NORTH R/W INDUSTRIAL DRIVE - E. 392.45' - S - 88.58.00"

INDUSTRIAL DRIVE - 60'-0" R/W

60'-0" BLDG SETBACK LINE

ASPHALT PARKING AREA

SIDEWALK

GREASE PIT

C.B. TOP 677.02

C.B. TOP 676.64

CONK

IND. BUILDING 58,755 SQ. FT.

NEW CONCRETE PAVING

ASPHALT DRIVEWAY

53'-0"

1" = 40'

ENC. ROOM

49'50" 50. FT.

90'-0"

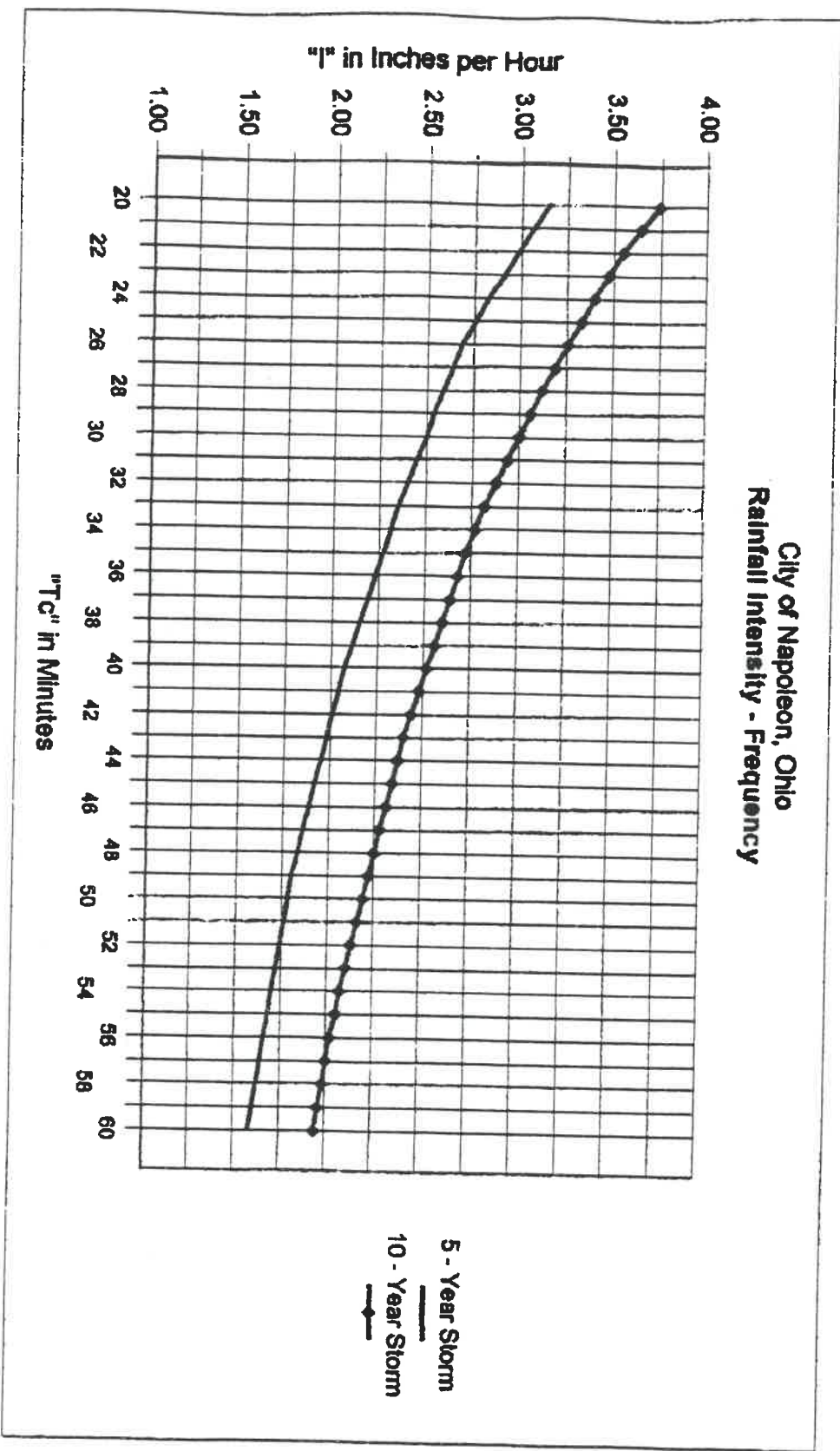
55'-0"

EASEMENT

I-3

S - 1

City of Napoleon, Ohio Rainfall Intensity - Frequency (24 Hr. Rainfall)		
Time of Concentration (Tc)	5 Year Storm Intensity (Inches/Hour)	10 Year Storm Intensity (Inches/Hour)
20	3.15	3.74
21	3.07	3.64
22	2.99	3.55
23	2.91	3.47
24	2.83	3.40
25	2.76	3.33
26	2.69	3.26
27	2.64	3.19
28	2.59	3.12
29	2.54	3.06
30	2.50	3.00
31	2.45	2.94
32	2.40	2.88
33	2.35	2.82
34	2.31	2.77
35	2.27	2.72
36	2.23	2.68
37	2.19	2.64
38	2.15	2.60
39	2.11	2.56
40	2.07	2.52
41	2.04	2.48
42	2.01	2.44
43	1.98	2.40
44	1.95	2.37
45	1.92	2.34
46	1.89	2.31
47	1.86	2.28
48	1.83	2.25
49	1.80	2.22
50	1.78	2.19
51	1.76	2.16
52	1.74	2.13
53	1.72	2.10
54	1.70	2.07
55	1.68	2.05
56	1.66	2.02
57	1.64	2.00
58	1.62	1.98
59	1.60	1.96
60	1.58	1.94



4. Runoff Coefficients (C)

The runoff coefficient to be used for residential areas (excluding apartments) shall be 0.35. All other areas shall be based on a weighted coefficient of runoff using the following ranges:

<u>TYPE OF GROUND COVER</u>	<u>COEFFICIENT OF RUNOFF</u>
Concrete or Asphalt Pavement	0.85 - 0.95
Roof Area	0.90 -
Gravel Roadways	0.4 - 0.6
For Impervious Soils	0.3 - 0.55 -
For Pervious Soils	0.15 - 0.25
Agricultural Ground	0.15 - 0.25

5. Sizing of Sewers

Storm sewers will be designed to flow just full for the 5 year - intensity - duration - frequency curve. The hydraulic grade line will be checked by using the 10-year intensity - duration - frequency curve.

6. Drainage Plan

An overall drainage area layout plan showing the limits of the area contributing to each drainage pick-up point, shall be submitted with the detailed construction plans. The drainage design within the development shall be adequate to handle the entire contributing watershed area, along with its existing, proposed or probable future development, and not just the area being submitted for approval.

If the development is to be done in phases, the overall drainage plan will be submitted with the first set of detailed construction drawings.

7. Pipe Selection and Design

Storm sewers and culverts shall be designed to conform to the requirements of the latest O.D.O.T. "Construction and Materials Specifications" and the City of Napoleon's "Standard Specifications for Water Main, Sanitary Sewer and Storm Sewer Construction". Pipe under paved surfaces shall be O.D.O.T. Item 603, Type "B" Conduit with Class "A" or "B" bedding. Pipe outside of paved areas shall be O.D.O.T. Item 603, Type "C" Conduit with Class "A" or "B" bedding. The minimum allowable cover for Class "C" pipe is eighteen (18") inches. The minimum cover for pipe under pavement is nine (9") inches measured from the top outside crown of the pipe to the finished subgrade.

The minimum size of pipe under pavement will be twelve (12") inches and the minimum grade for crossovers between catch basins will be 1.0%.

8. Backfill Material

All areas under paved surfaces and five (5') ft. either side of paved surfaces shall be backfilled with granular material meeting the requirements of O.D.O.T. Item 310.02 and mechanically tamped in six (6") inch layers.

All other areas may be backfilled with finely divided earth free of rocks and sod mechanically tamped in six (6") inch layers.

9. Catch Basins and Gutter Flows

The maximum allowable width of the sheet gutter flow from the face of the curb shall be eight (8') ft.

Catch basins are to be constructed as per the "Standard Construction Drawings". Alternate construction or castings must be approved by the City Engineering Department.

10. Storm Sewer Service Connections

a. All storm sewers within the public right-of-way either dedicated or to be dedicated, shall be designed to include a 6" tee or a 6" wye and 6" crossover connection, extended to the right-of-way line for each building lot in a development.

b. In areas where street drainage would be provided by gutter flow only, the storm sewer shall be extended beyond its upper terminus with a sewer of sufficient size to handle the equivalent of 1.25 gpm from each house served. The minimum size of the extension shall be eight (8") inches laid at 0.34% grade.

A six (6") inch tee or a 6" wye and a 6" crossover connection will be provided for each lot or building served by the extension.

c. The location and the elevation of the service connection at the right-of-way line shall be shown on the detailed plans.

11. Manholes

Manholes shall be provided at intervals not to exceed four hundred (400') feet at all abrupt changes in direction or grade, and at the terminus of the sewer.

12. Storm Sewer Outlet

The proposed outlet for the storm drainage system must be approved at the time of the preliminary plan. If a proper outlet is not available to handle all of the runoff from a watershed, a method of retaining storm water should be provided. Calculations for sizing a retention pond or basin should be submitted with the preliminary plan.

C. Sanitary Sewers

1. General

In general the sanitary sewers shall meet the requirements of the Ohio Environmental Protection Agency and the City of Napoleon's "Standard Specifications for Water Main, Sanitary Sewer and Storm Sewer Construction" and the Sewer Use Ordinance No. 1245.

2. Sewer Extensions

If a development can be reasonably served by the extension of an existing sewer, the developer will provide sanitary sewer laterals and service connections to serve every lot or building in the development. Service connections for each lot shall be extended to the right-of-way line and properly plugged.